Habitat Conservation Plan for the Hine's Emerald Dragonfly, Blanding's Turtle, Spotted Turtle, Leafy Prairie Clover, and Lakeside Daisy

Romeoville Area, Will County, Illinois

Submitted To:
U.S. Fish and Wildlife Service

By:
Hanson Material Service

February 3, 2021

Habitat Conservation Plan for the Hine's Emerald Dragonfly, Blanding's Turtle, Spotted Turtle, Leafy Prairie Clover and Lakeside Daisy in support of the issuance of an Incidental Take Permit under the Endangered Species Act (16 USC §1531-1543) for the Hine's emerald dragonfly and Blanding's turtle and spotted turtle; and Incidental Take Authorization under the Illinois Endangered Species Protection Act (520 ILCS 10/) authorization for the Hine's emerald dragonfly, Blanding's turtle, and spotted turtle in Will County, Illinois.

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Title of Proposed Action: Habitat Conservation Plan for the issuance of an Endangered Species Act Incidental Take Permit and an Illinois Endangered Species Protection Act Incidental Take Authorization for incidental take of the Hine's emerald dragonfly, Blanding's turtle, and spotted turtle in association with legally authorized activities, Will County, Illinois[1].

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Federal Legal Mandate for Proposed Action: Endangered Species Act of 1973, as amended, 16 USC §1539(a)(1)(B) ("Section 10"), as implemented by 50 CFR 17.22 for endangered species.

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EXECUTIVE SUMMARY

Hanson Aggregates Midwest, Inc. d/b/a Hanson Material Service (HMS) and its predecessor companies have been operating a limestone quarry on multiple properties in the vicinity of Romeoville in Will County, Illinois, for more than sixty years. The mining operations support approximately 85 employees. Most of the properties are located within the lower Des Plaines River Valley, which contains habitat for several threatened and endangered species. Under its current mining plan, HMS will run out of primary available surface limestone reserves in approximately 2026, threatening the facility's existence and employees' livelihoods, and will negatively impact the beneficiaries of the limestone resources, including the municipalities and other HMS clients and their projects. HMS therefore needs to expand its mining operations.

However, some of the land on which HMS must expand its mining operations contains habitat for endangered species. Therefore, in accordance with federal, state and local law, HMS will preserve, restore, enhance, and maintain over 500 acres of additional land which serves or will serve as habitat for the species. This action will not only make up for the impacts to the species from the mining activity but will also significantly contribute to the conservation of those species in the future. This Habitat Conservation Plan (HCP) sets forth the details of HMS' plan to do so.

Through this HCP, HMS can both meet its business needs and meaningfully contribute to the conservation of the Covered Species (defined below). Under this HCP, HMS' activities will impact 49.6 acres of adult Hine's emerald dragonfly (HED) habitat and may also result in taking up to 12 Blanding's turtles and two spotted turtles. To compensate for those impacts, HMS will enhance, restore and/or preserve 531 acres of Covered Species habitat near the impacted area, thus significantly contributing to the conservation of these species.

HMS' HCP represents the culmination of over 15 years of cooperation, planning and studies to develop a multi-species HCP for a portion of the lower Des Plaines River Valley. It has been carefully designed to respond to the long-term conservation needs of the Covered Species and their habitats, to accommodate the permit needs of HMS, and to monitor the plan's implementation and effectiveness over the life of the permit. This HCP has been developed to meet the Endangered Species Act (ESA) Section 10(a)(2)(A) requirements for a conservation plan that addresses Section 10(a)(2)(B) issuance criteria for an Incidental Take Permit (ITP) issued by the U.S. Fish & Wildlife Service (USFWS) and the requirement for a Title 17 IAC Section 1080 issuance of an Incidental Take Authorization from the Illinois Department of Natural Resources (IDNR).

Under this HCP, HMS is applying for a 30-year Incidental Take Permit (ITP) from the USFWS and a 30-year Incidental Take Authorization (ITA) from the IDNR for the Covered Species. This permit period allows the HCP to remain effective and provide adequate protection for the Covered Species during HMS' planned surface mining and related activities at its Romeoville facility, as well as activities during its sub-surface mining operations that may require an ITP or ITA. HMS plans to have regular meetings with the USFWS, IDNR and other stakeholders, as needed, throughout the life of the ITP and ITA to evaluate the success of and possible changes to the implementation of the HCP; to address any adaptive management considerations, potential

changed circumstances, or unforeseen circumstances; and to consider any other issues that may affect HMS' implementation of the HCP.

Species Included in the HCP

The overriding biological goal of this HCP is to meaningfully contribute to the conservation of the federally and state-listed (threatened and endangered) species found in the Permit Area (geographic area where activities covered by the ITP and ITA occur) and Planning Area. This HCP addresses conservation measures for the following species (collectively referred to as "the Covered Species") in support of HMS' application for both an ITP and ITA:

- Federal and Illinois endangered Hine's emerald dragonfly *(Somatochlora hineana),* and its critical habitat;
- Illinois endangered Blanding's turtle (*Emydoidea blandingii*);
- Illinois endangered spotted turtle (*Clemmys guttata*);
- Federal and Illinois endangered leafy prairie clover (*Dalea foliosa*); and
- Federal threatened and Illinois endangered Lakeside daisy *(Hymenoxys acaulis).*

Covered Lands

This HCP includes a Permit Area (2,072 acres) and a Planning Area (35,445 acres). The Permit Area is located within the lower Des Plaines River Valley and contains two federally designated critical habitat units (CHUs) for the HED (75 Fed. Reg. 21394-21453) and contains all areas where HMS' activities that may affect the Covered Species or their habitat (i.e. Covered Activities) occur. This area contains springs, seeps, wet prairies, marshes, and other wetland habitats currently used by the HED, Blanding's and spotted turtles, and leafy prairie clover (Lakeside daisy is found in the Planning Area but not in the Permit Area). The Permit Area also includes historic and potentially restorable habitat that may be used in the future by the Covered Species with the implementation of the mitigation measures included in this plan. HMS, along with Commonwealth Edison (ComEd), NRG Energy, and other private entities, owns and/or manages land located within the Permit Area.

The Planning Area includes all HED habitat areas near the Permit Area and lands that have been determined to be important groundwater recharge areas for wetlands that provide habitat for the HED and other Covered Species located within CHUs 1, 2, and 7. All habitat areas for Covered Species (including CHUs) that might potentially be impacted by Covered Activities are also included in the Planning Area. The Planning Area is extensive, and includes portions of the Villages of Romeoville, Homer Glen, Lemont, Orland Park, and Cities of Crest Hill and Lockport.

Covered Activities

In accordance with its Mining Plan, HMS first proposes to complete its current surface mining in Pierce Eich Quarry (35 acres), located west of Route 53, by approximately 2026. (See Figure 2 in Appendix A for the location of all HMS parcels.) When this mining is nearly complete, HMS proposes to resume surface mining in Middle Quarry (approximately 1 acre) and start surface

mining in Middle Parcel. Mining of Middle Parcel will start at the south end (from Middle Quarry) and progress generally in a northerly direction. Mining will occur on approximately 115 acres of the 125-acre parcel and is estimated to take approximately 20 years. In addition, HMS proposes to surface mine 36 acres in East Parcel (immediately north of East Quarry) which will not require an ITP or ITA. In total, HMS proposes to surface mine 187 acres at the Romeoville facility over a period of 35 years, but a 30-year permit will cover all activities that require a permit.

In approximately 15 years and prior to completion of surface mining operations at the Romeoville facility, HMS will begin sub-surface mining operations at a depth of 350 feet below the surface at the facility. All sub-surface mining and support operation during the ITP period will occur on or under already developed or mined areas owned by HMS. In addition to the actual mining of limestone, other associated operations at the Romeoville facility will continue, such as crushing, washing, and sizing of limestone; truck, rail, and barge loading; and activities of support offices that are required for processing and shipping the limestone. In addition, HMS will retain a small setback area along the west side of North and Far North Parcels (350' back from Route 53) for future development. The setback area on North Parcel is 6.49 acres and Far North Parcel is 10.65 acres.

HMS also proposes to undertake various habitat restoration and management activities that will be covered by the permit. These activities will include, among other things, cutting and applying herbicide to invasive shrubs and trees, applying herbicide to invasive herbaceous species, seeding and planting native species, conducting prescribed burns, and discing or tilling soil in specific locations. In addition, an access road covering about 0.39 acres and a number of temporary routes will be constructed through ComEd Parcel and a small portion of Long Run Parcel for access during the wet dolomite prairie transplant and other restoration activities. The transplant will involve the removal of fill material from ComEd Parcel and placement of wet-mesic dolomite prairie sod (6.01 acres) salvaged from Middle Parcel into the ComEd Parcel.

Potential Biological Impacts, Avoidance and Minimization Measures, and Mitigation

Hine's Emerald Dragonfly

The first recorded occurrence of the HED in Illinois was a collection from 1983 that was not confirmed until 1987. The HED was listed as state endangered in Illinois in 1991, listed as federally endangered in January 1995, and a Recovery Plan was published in September 2001. Critical Habitat was designated for the HED in September 2007 and revised in April 2010. After the HED was listed, and before the Recovery Plan was even published, HMS began meeting with local, state and federal agencies to confer about its continued mining operations in the area and how the company could ensure both the viability of its business as well as the viability of the HED in the area. Thus began a truly cooperative industry/agency undertaking.

The principal threat to the HED in Illinois is habitat degradation and alteration. HED larvae are restricted to wetland habitats (e.g. marshes, seeps and sedge meadow) with thin soils over limestone bedrock. Adult HED use these same wetlands as well as adjacent open uplands, such as meadows and old fields. This degradation and alteration include direct loss of habitat, such as filling of wetlands, as well as possible indirect alterations of habitat, such as changes in surface

and sub-surface hydrology. Alteration of hydrologic regimes in the Planning Area might adversely affect the larval and breeding habitat of the species by changing water temperature, flow, chemistry, and volume. Quarries, road construction, municipal and private wells, addition of impervious surfaces, and alteration of surface drainage patterns could all cause reductions in the suitability of habitat or the outright loss of suitable larval and breeding habitat. Transportation and roadways are also a threat to the dragonfly, both from direct mortality (i.e., hitting) and habitat destruction or fragmentation. Land use practices, fire suppression, and agricultural development have also reduced available habitat as well as the abundance of insects for prey across the dragonfly's range.

Under this HCP, HMS will avoid impacts to the HED by not surface mining certain parcels it owns, and instead will preserve those parcels through a Declaration of Covenants, Conditions, and Restrictions (that will be converted to a conservation easement if a qualified entity is found to hold it). These parcels include River South, Fitzpatrick Seep, River South Bluff, River, North, Far North, River North, ComEd, and Long Run for a total of 530.9 acres, of which 518.9 will be permanently protected.

No direct take of the adult HED is anticipated to occur during mining operations in Middle Parcel because all stripping (removal of overburden) will be conducted, as much as possible, outside the adult HED flying season (May 15 to October 15). If overburden removal is conducted during flying season all vehicles will travel at low speeds (i.e., < 15 mph). In addition, actual mining will follow overburden removal and will occur at least 150 feet away from remaining adult HED habitat. No take of larvae is anticipated because recent studies have found no evidence of successful breeding or appropriate larval habitat conditions on the parcel.

HMS also plans to implement a number of measures to avoid potential impacts its surface mining may have on the contribution of groundwater to the habitat of the HED and other Covered Species. Measures to avoid potential groundwater related impacts include: 1) supplementation of shallow groundwater in River South Bluff Parcel and 2) enhancement of surface water infiltration on the Forest Preserve District of Will County (FPDWC) property in the southwest corner of Route 53 and Renwick Road. In addition, dewatering in the Pierce Eich Quarry will end after surface mining in that parcel is complete. Natural inundation of this area will occur and provide a long-term avoidance measure for potential groundwater impacts.

Surface mining of Middle Parcel will, however, result in the loss of 40.81 acres of adult HED foraging and dispersal habitat (but no larval habitat). All but about 6.5 acres of this habitat is low quality habitat dominated by *Phragmites* and old field vegetation. The development of the setback areas at the west end of North and Far North parcels will also result in the loss of 8.40 acres of adult HED habitat in total (also low quality old filed vegetation), and construction of an access route in Long Run and ComEd Parcels is expected to result in an impact to 0.39 acres of adult HED habitat. Thus, a total of 49.60 acres of adult HED habitat is expected to be impacted by HMS activities in the Permit Area. This represents a loss of only 3.3% of the known adult HED habitat (49.60 ac/1526 ac) within the CHUs in Illinois. There is additional HED habitat in Illinois beyond the CHUs.

To mitigate for the loss of this habitat, HMS plans to restore and enhance habitat on eight of its parcels: ComEd, Long Run, Fitzpatrick Seep, River South, River, North, Far North, and River North Parcels. In total, HMS will restore 182.2 acres, enhance 139.2, and maintain 32.5 acres of adult HED habitat on 518.9 acres of permanently protected land. As a result, this plan will permanently protect 17.9% of all HED Critical Habitat in Illinois and, through habitat restoration, will increase known adult HED habitat in the Lower Des Plaines River Valley of Illinois by 11.9%.

Blanding's & Spotted Turtles

The Blanding's turtle was listed in Illinois as a state threatened species in 1999 and was changed to state endangered in 2009. In addition, Blanding's turtle was petitioned in 2012 for federal listing, and a 90-day "substantial" finding was published by USFWS on July 1, 2015, indicating that listing may be warranted for the Blanding's turtle (after further review). The greatest threats to the species are loss and fragmentation of both wetland and nesting habitat, predation, collecting, and automobile strikes. The Blanding's turtle has been found recently in a number of parcels throughout the Planning Area including Lockport Prairie Nature Preserve (LPNP), Romeoville Prairie Nature Preserve (RPNP), HMS' Middle, North, Far North and River North Parcels and the adjacent ComEd Rights-of-Ways, and HMS' Long Run and ComEd Parcels.

The spotted turtle is a state endangered species which also was petitioned in 2012 for federal listing and received a 90-day "substantial" finding by USFWS on July 1, 2015, indicating that listing may be warranted for the spotted turtle (after further review). The species' greatest threats are habitat loss and fragmentation due to invasive species, changes in hydrology, urban development, and collection for the pet trade industry. Within the Planning Area, the spotted turtle is known to occur in LPNP and RPNP.

Since HMS is mining almost all of Middle Parcel, it is estimated to impact all of the potential Blanding's turtle and spotted turtle habitat (29.14 acres) on the parcel. Little direct take (mortality) of either covered turtle species is anticipated to occur during mining operations in Middle Parcel because a number of avoidance and minimization measures (AMMs) will be implemented before and during mining operations to prevent the take of the turtle species. Blanding's turtle is known to occur on ComEd and Long Run Parcels, and the same AMMs will be used in these parcels during mitigation activities. However, an access road will be installed on the southern boundary of ComEd parcel impacting 0.39 acres of potential Blanding's and spotted turtle habitat. Therefore, the total habitat impact for the Covered turtles is 29.53 acres. Based on the documented occurrences of Blanding's turtle in the Permit Area, take is conservatively requested for a total of 12 individuals of this species. This level of take is not expected to have a significant effect on the regional population. Because spotted turtles are not believed to be present on any HMS' property, proposed activities would have no impact on the species. However, as a precaution, take is requested for a total of two spotted turtles. This is not expected to have a significant effect on the Illinois population. Furthermore, both turtle species will benefit from the mitigation measures (i.e. habitat restoration) described above.

Leafy Prairie Clover

The leafy prairie clover (LPC) was listed as federally endangered in 1991. The species is listed as endangered in Illinois. Threats to the LPC include habitat loss, competing invasive species,

shade suppression by woody species, and fire suppression. LPC is known to occur on several parcels in the Planning Area, including: LPNP, RPNP, ComEd Parcel, Long Run Parcel, Lockport Prairie East, and Dellwood Park West Nature Preserve. With the implementation of avoidance measures, HMS anticipates very little (less than five individual plants) to no take of LPC plants.

Lakeside Daisy
The Lakeside daisy was listed as federally threatened in 1988. The species is listed as endangered in Illinois. The two known Lakeside daisy sites in Will County are located in LPNP and RPNP. No impact is anticipated for the Lakeside daisy.

Other Key Elements of the HCP

The HCP also includes a monitoring and reporting section, the goal of which is to provide a reliable basis for documenting compliance with and effectiveness of the HCP and ITP throughout the permit term. HMS' monitoring and reporting program will (1) document implementation of and compliance with AMMs and mitigation measures; (2) document both the anticipated and actual take of Covered Species (whether through individuals or surrogates); (3) evaluate the effectiveness of the conservation program; (4) assess the need for responses to changed circumstances or adaptive management; (5) document the implementation and effectiveness of any measures undertaken to respond to changed circumstances or adaptive management measures; and (6) explain how implementation, including funding, continues to be assured.

Adaptive management is a process by which management practices are incrementally improved through implementation of plans that provide opportunities to learn from experience. This HCP includes an adaptive management program designed to gauge the effectiveness of the conservation program and to propose alternative or modified management measures in response to the monitoring results. As new information from monitoring, research (by others), or day-to-day management becomes available, the information will be evaluated in the context of this HCP's goals and objectives.

The HCP also includes "No Surprises" assurances, addresses changed and unforeseen circumstances, implementation costs, funding assurances, and an analysis of alternatives.

1.0 INTRODUCTION and BACKGROUND

This Habitat Conservation Plan (HCP) has been developed to meet the Endangered Species Act (ESA) Section 10(a)(2)(A) requirements for a conservation plan that addresses Section 10(a)(2)(B) issuance criteria for an Incidental Take Permit (ITP) (16 USC §1539 (a)(2)(A) and (B)). This HCP is designed to accommodate the permit needs of Hanson Aggregates Midwest, Inc. d/b/a Hanson Material Service (HMS), respond to the long-term conservation needs of the Covered Species (defined below) and their habitats, and monitor the plan's implementation effectiveness. HMS is applying for a 30-year ITP from the U.S. Fish & Wildlife Service (USFWS) and a 30-year Incidental Take Authorization (ITA) from the Illinois Department of Natural Resources (IDNR) (520 ILCS 10/5.5(a) and (b)). A permit period of 30 years is needed to cover the expected duration of HMS' surface mining operations at its Romeoville facility that require an ITP and ITA (Figures 1 and 2, Appendix A).

This document represents the culmination of over 15 years of cooperation, planning and studies by industry and the agencies to develop a multi-species HCP for a portion of the lower Des Plaines River Valley. The overriding biological goal of this HCP is to meaningfully contribute to the conservation of the federally and state-listed (threatened and endangered) species found in the Permit Area and Planning Area. The Permit Area is the geographic area where activities that are likely to negatively affect the Covered Species (i.e. Covered Activities) occur. Covered Activities are covered by the ITP and ITA. The Planning Area includes the Permit Area and nearby HED habitat areas (including all those that potentially could be impacted by Covered Activities) and estimated groundwater recharge areas for HED larval habitat within and adjacent to the Permit Area as shown on Figure 2 and 3, respectively, in Appendix A. This HCP addresses conservation measures for the following species (collectively referred to as the Covered Species) in support of HMS' application for both an ITP and ITA:

- Federal and Illinois endangered Hine's emerald dragonfly *(Somatochlora hineana)* ("HED,") and its critical habitat;
- Illinois endangered Blanding's turtle[1] (*Emydoidea blandingii*);
- Illinois endangered spotted turtle[1] (*Clemmys guttata*);
- Federal and Illinois endangered leafy prairie clover (*Dalea foliosa*); and
- Federal threatened and Illinois endangered Lakeside daisy *(Hymenoxys acaulis).*

If other state or federally listed species are found in the Planning Area and could be affected by HMS' activities, HMS will amend the HCP and apply for an incidental take permit or authorization as appropriate and needed.

1.1 Purpose and Need

The purpose of this HCP is to evaluate the impacts of HMS' proposed activities on the Covered Species listed in Section 1.0 and their habitats (including federally designated Critical Habitat Units (CHUs) for the HED) and to propose measures for avoiding, minimizing, or mitigating for potential incidental take of these species and their habitats. This HCP document does not include an Environmental Assessment (EA) and is <u>not</u> intended to meet the requirements of the National

[1] Federal ITP will be sought for Blandings and Spotted turtle because both were petitioned for federal listing in 2012.

Environmental Policy Act (NEPA) for the USFWS. A separate NEPA document has been prepared by USFWS.

HMS and its predecessor companies have been operating a limestone quarry on multiple properties in the vicinity of Romeoville in Will County, Illinois, for more than sixty years. The mining operation supports approximately 85 employees. HMS owns several properties within the Permit Area totaling 1,437 acres (Figure 2, Appendix A). HMS is projected to run out of available surface limestone reserves in 2026, which seriously threatens the facility's existence and employees' livelihoods, and will negatively impact the beneficiaries of the limestone resources, including the municipalities, local and state transportation agencies, and other customers of HMS products and their projects. HMS therefore needs to expand its mining operations. HMS' mining plans are described in more detail in Section 3.0 and in Appendix E. Through this HCP, HMS will meet the needs of the Covered Species as well as its own business needs. The need for the HCP is to authorize, pursuant to the ESA and HRS Chapter 195D, the take of threatened or endangered species (or species under consideration for listing) incidental to mining limestone. In order to obtain such authorization, HMS developed this HCP that meets the USFWS and IDNR issuance criteria for an ITP and ITA.

1.2 History of the HCP

HMS and two other businesses operating in the same area, Midwest Generation (MWGen) (now owned by NRG Energy) and Commonwealth Edison (ComEd), along with regulatory agencies created a "Right of Way Management Team" ("ROWMT") in 1996 to address issues related to their operations in the Romeoville area, including HED maintenance. In September 2005, the IDNR submitted a Grant Proposal to USFWS for funds to study the HED, which funds were given, along with significant funds from HMS (then MSC). The three businesses initiated a habitat conservation planning process in 2006 shortly after the grant was awarded. They initially came together as "Lead Partners" to develop a joint HCP document to address HED conservation and land use needs. Over a period of several years, the lead partners also engaged a number of additional public and private landowners (referred to as Supporting Partners) in the development of a plan including: Chicago-Romeoville Airport, Forest Preserve District of Will County (FPDWC), Lockport Township Park District, Lewis University, Village of Romeoville, Village of Homer Glen, City of Lockport, and Village of Lemont (Figure 3, Appendix A). Due to business and timing issues, the original Lead Partners eventually decided to address their HCP needs separately. ComEd opted to prepare a low-effect HCP, which it submitted to USFWS in December 2013. A permit was then issued to ComEd by USFWS on June 1, 2014 (USFWS permit #TE 28464B-0).

Many contributors have shared years of research and data and have helped develop the technical understanding that has served as the foundation for this HCP. As with most rare species, the scientific understanding of the biology and ecology of the species included in this HCP may change over time. Consequently, this HCP includes adaptive management and was designed, to the extent possible, to allow for the inclusion of new information as it becomes available.

The area of land that is subject to this HCP has been divided into two areas:

- Permit Area (approximately 2,072 acres): this is the geographic area in which activities that are likely to negatively affect Covered Species (i.e. Covered Activities) will occur (Figure 2, Appendix A). The Permit Area includes all mining and other above-ground mining activities

in HMS' Romeoville facility and all mitigation, avoidance, and minimization measure areas owned by HMS. Although HMS does not own all the land within the Permit Area, all of HMS' Covered Activities as well as the mitigation, avoidance, and minimization measures that will occur within the Permit Area will take place only on land owned by HMS. One avoidance measure takes place outside the Permit Area but within the Planning Area and is described below.

- Planning Area (approximately 35,445 acres): this is the geographic area which includes the Permit Area as well as other nearby HED habitat areas (including all those that potentially could be impacted by Covered Activities), and estimated groundwater recharge areas for HED larval habitat within and adjacent to the Permit Area (i.e. Lockport Prairie, River South, ComEd, and Long Run Parcels) (Figure 3, Appendix A). An avoidance measure, located on property not owned by HMS (i.e. FPDWC infiltration pond), is also found within the Planning Area adjacent to the southwest corner of the Permit Area.

1.3 HCP Planning Process

During the HCP planning process, HMS conducted critical reviews of the known and possible stresses on each of the species and their known or potential habitat found on land which HMS owns, manages, or on which it conducts business. During this process, HMS coordinated with the USFWS, U.S. Army Corps of Engineers (USACE), and the IDNR, who provided guidance to ensure compliance with the requirements of federal and state regulations, laws, and procedures. Information was also shared with experts (e.g. hydrologists and biologists) to ensure sound analyses and conclusions.

The HCP planning process followed a multi-step approach that served as a decision-making tool. This process can be condensed into the following key steps:

1. Evaluation of stresses affecting the Covered Species and their habitats under existing land uses and proposed activities by HMS.
2. Incidental-take analysis for alternative scenarios.
3. Creation of plans to avoid, minimize, and mitigate for stress and/or incidental take under existing and proposed activities.
4. Development of an HCP to allow business activities on the land to continue and to allow HMS to enter into binding agreements with the U.S. Fish and Wildlife Service (USFWS) and Illinois Department of Natural Resources (IDNR) on incidental-take issues.

This plan also brought together many partners, including those that own land, regulate land use, and use land through conveyed easements. HMS worked with ComEd, MWGen, and USFWS to recruit a comprehensive group of supporting partners over the years. Figure 3 in Appendix A identifies HMS properties as well as land ownership by all the recruited partners. While actively engaged partners in this HCP own or manage most of the land within the Planning Area, other lands and activities within this area that could affect the Covered Species and their habitat are beyond the control of the HCP partners. The following entities agreed to be partners in the HCP process and were active in the early development of this conservation plan (also see Appendix D):

- ComEd
- Midwest Generation (now owned by NRG Energy)
- Chicago-Romeoville Airport

- Forest Preserve District of Will County
- Village of Homer Glen
- Village of Lemont
- Lewis University
- City of Lockport
- Lockport Township Park District
- Village of Romeoville

Detailed Recovery Plans have been prepared by USFWS for the HED, leafy prairie clover, and Lakeside daisy (USFWS 2001; USFWS 1990; USFWS 1996). There are no Recovery Plans for the Blanding's turtle or the spotted turtle in Illinois, but significant research on their local populations and ecology, along with recovery efforts elsewhere, have been used to help determine the conservation needs for these species in this HCP. The Planning Area represents the western-most extent of the range of the spotted turtle in North America and is the only location where it co-occurs with the Blanding's turtle in Illinois (Harding 1997; pers. comm. with B. Semel, IDNR 2010). In the absence of recovery plans, guidance from researchers (M. Dreslik and D. Mauger) with local knowledge and experience with the turtles' ecologies has played a crucial role in conservation planning for these species in this HCP. The commitments made in this HCP positively contribute to the recovery goals for all the Covered Species.

1.4 Biological Goals and Objectives of the HCP

Section 10(a)(2)(A) of the ESA requires that an HCP specify the measures that the permittee will take to minimize and mitigate to the maximum extent practicable the impacts of the taking of any federally listed animal species as a result of activities addressed by the HCP.

As part of the USFWS Five Point Policy set forth in the 2000 Addendum to the HCP Handbook, HCPs must establish biological goals and objectives (65 Fed. Reg. 35242, June 1, 2000). According to the 2016 HCP Handbook, biological goals serve as the foundation of the conservation strategy and should be used to guide how the plan is developed and implemented, and the objectives are the specific steps to achieve the goals (USFWS and NMFS, 2016). The purpose of the biological goals is to ensure that the operating conservation program in the HCP is consistent with the conservation and recovery goals established for the species. Recovery Plan goals for each species are discussed in Section 2.2. Thus, this HCP must be consistent with recovery goals, but is not required to result in the recovery of an ESA-listed species.

The biological goals for this HCP are:

- To meaningfully contribute to the conservation of the Covered Species found in the Permit and Planning Area;
- Protect Covered Species and habitat by avoiding and minimizing take of Covered Species and impacts to their habitat to the maximum extent practicable; and
- To restore, enhance, and preserve Covered Species habitat as mitigation for impacts to habitat.

The following definitions for "avoidance," "minimization," and "mitigation" were agreed upon by HMS and USFWS and apply throughout this document:

Avoidance: Avoid the impact altogether to a resource (e.g. Covered Species or its habitat) from an activity. This could be done by not taking the action or parts of the action that could cause the impact or putting in place measures to prevent the impact of the activity.

Minimization: Reduce the impact to a resource (e.g. Covered Species or its habitat) from an activity. This could be done by limiting the degree or magnitude of the action that causes the impact or putting in place measures to limit the impact of the activity.

Mitigation: Compensate for the impact to a resource (e.g. Covered Species or its habitat) from an activity. This can be done by repairing, rehabilitating, or restoring the affected environment (e.g. habitat), or replacing or providing substitute resources or environments (e.g. species or habitat). This includes restoration (and enhancement) of habitat as well as preservation of habitat without restoration.

The biological objectives that will be implemented to achieve these goals are listed below. Specifics about the actions taken to meet these goals and measurable outcomes (e.g. performance standards) to determine if goals have been achieved are found in the sections referenced below and in this Chapter 6. A description of how these actions will address the recovery criteria for the HED is found in Section 5.1.2.

- Implement avoidance and minimization measures to prevent take of Covered Species and impact to their habitat, including, impacts to groundwater (see Section 5.1.3, 5.2.3, and 5.3.3);
- Restore potential habitat and enhance existing Covered Species habitat (see Section 5.1.7);
- Restore disturbed areas post-construction to pre-construction conditions (see Section 5.1.3, 5.2.3, and 5.3.3);
- Protect restored and enhanced habitat areas (see Section 5.1.7);
- Control erosion and sedimentation from planned work (where appropriate) (see Section 5.1.3 and 5.2.3);
- Work cooperatively with adjacent landowners and regulatory agencies; and
- Implement a monitoring program to track the progress of avoidance, minimization, and mitigation measures (AMMs) (see Sections 6.2.3, 6.2.4, and 6.2.5).

1.5 Regulatory and Legal Framework for Plan

This HCP serves as the basis for USFWS and IDNR decisions regarding the issuance of an Incidental Take Permit under Section 10 of the federal ESA (16 USC §1539(a)(1)(B)) and issuance of an Incidental Take Authorization under the Illinois Endangered Species Protection Act (IESA) (520 ILCS 10/5/5), respectively. This HCP may also be used by the USFWS and IDNR as a resource in connection with their required agency action consultations under the ESA and Illinois Natural Areas Preservation Act (see below).

Section 9 of the ESA prohibits the "take" of threatened or endangered species (16 USC §1538), with "take" defined as "the attempt or action to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" such species (16 USC §1532(19)). However, Section 10 authorizes the issuance of a permit by USFWS for take that may occur incidentally to otherwise lawful activities with the submittal of an HCP (16 USC §1539(a)(1)(B) and (a)(2)(A)). An HCP must include the required description of effects of the anticipated take on affected species and habitat, and the measures proposed to avoid, minimize, and mitigate resulting impacts (see Chapter 5). The requirements of a

conservation plan and issuance of a permit under federal ESA Section 10 are included in this HCP and are described in Sections 1.5.1 below.

The Illinois Endangered Species Protection Act (IESPA) contains a provision similar to Section 9 of the federal ESA which makes it unlawful to take a (state-listed) threatened or endangered species (520 ILCS 10/3). "Take," in reference to animals and animal products, is defined as "to harm, hunt, shoot, pursue, lure, wound, kill, destroy, harass, gig, spear, ensnare, trap, capture, collect, or to attempt to engage in such conduct (520 ILCS 10/2)." "Take," in reference to plants and plant products, is defined as "to collect, pick, cut, dig up, kill, destroy, bury, crush, or harm in any manner." (Id.) However, like Section 10 of the ESA, the IESPA provides a mechanism for authorizing take that occurs incidental to an otherwise lawful activity (520 ILCS 10/5.5(a)). This "Incidental Take Authorization" is issued under prescribed terms and conditions, as described below in Section 1.5.2.

1.5.1 Federal Endangered Species Act

The ESA and its implementing regulations prohibit the take of any fish or wildlife species that is federally listed as threatened or endangered without prior approval under Section 10, as noted. The ESA defines "take" as "to harass, *harm*, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." (16 USC §1532(19) Federal regulations implementing the ESA further define the term "harm" in the "take" definition to mean any act that actually kills or injures a federally listed species, including significant habitat modification or degradation (50 CFR 17.3).

Section 10 - Section 10 of the ESA establishes a process for obtaining an ITP, which authorizes non-federal entities to incidentally take federally listed wildlife or fish subject to certain conditions. "Incidental take" is defined by ESA as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." (16 USC §1539(a)(1)(B)) Preparation of a conservation plan, generally referred to as an HCP, is required for all Section 10(a) permit applications. The USFWS and the National Marine Fisheries Service (NMFS) have joint authority under the ESA for administering the incidental take program. NMFS has jurisdiction over anadromous fish species, and USFWS has jurisdiction over all other fish and wildlife species in the United States.

Section 7 - Section 7 of the ESA requires all federal agencies to ensure that any action they authorize, fund, or carry out is "not likely to jeopardize the continued existence" of any endangered or threatened species listed under the ESA or result in the destruction or adverse modification of its critical habitat. (16 USC §1536(a)(2)) In this case, USFWS must engage both in intra-agency consultation (for issuance of the ITP) and inter-agency consultation with the United States Army Corps of Engineers (USACOE) because HMS also seeks a permit under §404 of the federal Clean Water Act in connection with its activities. (33 USC §1344) The internal consultation is performed after an HCP is developed by a non-federal entity (e.g. HMS) and submitted for formal processing and review. Provisions of Sections 7 and 10 of the ESA are similar, but Section 7 requires consideration of several factors not explicitly required by Section 10. Specifically, Section 7 requires consideration of the indirect effects of a project, effects on federally listed plants, and effects on critical habitat (the ESA requires that USFWS identify critical habitat to the maximum extent that is prudent and determinable when a species is listed as threatened or endangered). (16 USC §1536(a)(2)) Under the regulations implementing Section 7, the internal consultation is to result in a Biological Opinion prepared by the USFWS regarding whether implementation of the

HCP, as well as issuance of the §404 permit, will result in jeopardy to any listed species or will adversely modify critical habitat. (50 CFR §402.14(g) and (h))

Section 10 Process

The Section 10 process for obtaining an ITP has three primary phases: (1) the HCP development phase; (2) the formal permit processing phase; and (3) the post-issuance phase.

During the HCP development phase, the project applicant prepares a plan that integrates the proposed project or activity with the protection of listed species. According to Section 10 (a)(2)(A), an HCP submitted in support of an ITP application must specify:

> *"(i) the impact which will likely result from such taking;*
>
> *(ii) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps;*
>
> *(iii) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and*
>
> *(iv) such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan."*
>
> 16 USC 1539(a)(2)(A)

The HCP development phase concludes, and the permit processing phase begins, when a complete application package is submitted to the appropriate permit issuing office. A complete application package for an HCP consists of an HCP, a permit application, a fee from the applicant, and a draft NEPA analysis and document. The USFWS must also publish a Notice of Receipt of a Permit Application in the Federal Register; prepare a Section 7 Biological Opinion; prepare a Set of Findings, which evaluates the Section 10(a)(1)(B) permit application in the context of permit issuance criteria (see below); and prepare a document in compliance with the National Environmental Policy Act (NEPA) requirements. A Section 10 ITP is granted upon a determination by USFWS that all requirements for permit issuance have been met. Section 10 (a)(2)(B) specifies the following criteria for issuance of the ITP:

> *(i) the taking will be incidental;*
>
> *(ii) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;*
>
> *(iii) the applicant will ensure that adequate funding for the plan will be provided;*
>
> *(iv) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and*
>
> *(v) the measures, if any, required under subparagraph (A) (iv) will be met.*
>
> 16 USC 1539(a)(2)(B)

If, after an opportunity for public comment, the USFWS finds that the criteria for issuance of the ITP have been met, the permit shall be issued. The ITP shall contain such terms and conditions as

USFWS deems necessary or appropriate to determine compliance, including, but not limited to, reporting requirements (Id.).

During the post-issuance phase, the permittee implements the HCP and the USFWS monitors compliance and the long-term progress and success of the HCP. The public is notified of permit issuance by means of the Federal Register.

1.5.2 Illinois Endangered Species Protection Act (IESPA)

The IESPA states that it is unlawful for any person:

1. *To possess, take, transport, sell, offer for sale, give or otherwise dispose of any animal or the product thereof of any animal species which occurs on the Illinois List [a list of species of animals and plants listed by the Endangered Species Protection Board as endangered or threatened];*
2. *To deliver, receive, carry, transport or ship in interstate or foreign commerce plants listed as endangered by the federal government without a permit therefore issued by the Department as provided in Section 4 of this Act;*
3. *To take plants on the Illinois List without the express written permission of the landowner; or*
4. *To sell or offer for sale plants or plant products of endangered species on the Illinois List.*

520 ILCS 10/3

However, the Illinois Department of Natural Resources (IDNR) may authorize, under prescribed terms and conditions, any taking otherwise prohibited if that taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. No taking under that section may be authorized unless the applicant submits a Conservation Plan. (520 ILCS 10/5.5)

The Conservation Plan submitted by the applicant must include the following: (Item 5 is not applicable to this HCP because the USFWS is not requiring an implementing agreement.)

1. *A description of the impact that the proposed taking is likely to have on one or more species on the Illinois list;*
2. *The steps the applicant or other parties will take to minimize and mitigate that impact and the funding that will be available to implement those steps, including but not limited to bonds, insurance, or escrow;*
3. *What alternative actions to the taking the applicant considered and the reasons why those alternatives will not be used;*
4. *Data and information to assure that the proposed taking will not reduce the likelihood of the survival or recovery of the endangered species or threatened species in the wild within the State of Illinois, the biotic community of which the species is a part, or the habitat essential to the species' existence in Illinois;*
5. *An implementing agreement that specifically names and describes the obligations and responsibilities of all the parties that will be involved in the taking as authorized by the permit; and*
6. *Any other measures that the IDNR may require as being necessary or appropriate for purposes of the plan.*

520 ILCS 10/5.5(b)

The IDNR may authorize the incidental taking if it finds that the taking will meet all of the following requirements:

1. *The taking will not be the purpose of, but will be only incidental to, the carrying out of an otherwise lawful activity;*
2. *The parties to the conservation plan will, to the maximum extent practicable, minimize and mitigate the impact caused by the taking;*
3. *The parties to the conservation plan will ensure that adequate funding for the conservation plan will be provided;*
4. *Based on the best available scientific data, the IDNR has determined that the taking will not reduce the likelihood of the survival or recovery of the endangered species or threatened species in the wild within the State of Illinois, the biotic community of which the species is a part, or the habitat essential to the species' existence in Illinois;*
5. *Any measures required under paragraph (6) of subsection (b) [necessary or appropriate] will be performed; and*
6. *The public has received notice of the application and has had the opportunity to comment before the IDNR has made any decision regarding the application.*

520 ILCS 10/5.5(c)

If an applicant is party to an HCP approved by the USFWS pursuant to Section 10 of the ESA, the IDNR may authorize taking that is incidental to the carrying out of an otherwise lawful activity (520 ILCS 10/5.5(f)). Authorization shall be issued only if the provisions of the HCP are found to meet the requirements of 520 ILCS 10/3 (Id.). Compliance with the state Conservation Plan requirements is discussed in Appendix I.

1.5.3 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (42 USC §4312 *et seq.)* requires that federal agencies analyze the environmental impacts of their actions (in this instance, issuance of an ITP) and include public participation in the planning and implementation of their actions. Under the NEPA regulations (implemented by the Council on Environmental Quality) compliance is obtained through one of three actions:

1. Preparation of an Environmental Impact Statement (generally prepared for high-effect HCPs);
2. Preparation of an Environmental Assessment (generally prepared for moderate effect HCPs); or
3. Preparation of a categorical exclusion (allowed for low-effect HCPs).

40 CFR §1501

The NEPA process helps federal agencies make informed decisions with respect to the environmental consequences of their actions and ensures that measures to protect, restore and enhance the environment are included, as necessary, as a component of their actions. Since the proposed avoidance, minimization, and mitigation measures set forth in this HCP will result in little or no impact to listed species, USFWS is preparing an Environmental Assessment (EA) for this HCP consistent with the law in this area.

1.5.4 Illinois Natural Areas Preservation Act

A separate protection system exists in Illinois under the authority of the Illinois Natural Areas Preservation Act (NAPA) (525 ILCS 30) for areas with a nature preserve designation. The NAPA penalizes any person who "willfully kills, injures, disturbs or removes any animal or plant or willfully damages, destroys or removes any object, or attempts to do any of the preceding, on a dedicated area (525 ILCS 30.23)." There are five protected nature preserve areas within the Planning Area:

- Lockport Prairie (FPDWC)
- Romeoville Prairie (FPDWC)
- Long Run Seep (IDNR)
- Dellwood Park West (Lockport Township Park District (LTPD))
- O'Hara Woods (Village of Romeoville)

The five nature preserves are owned by FPDWC, IDNR, LTPD, or the Village of Romeoville. This HCP is not intended to cover any *activities* on the protected nature preserves, but some concern has been expressed about possible groundwater impacts to some of the preserves. While the NAPA does not contain an incidental take provision similar to the federal and state endangered species acts, the statute does contain a "consultation" provision. Section 17 of the NAPA says, *inter alia*, that "each agency of State or local government must evaluate, through a process of consultation with the Department, whether actions… authorized, funded, or carried out by the agency of State or local government are likely to result in the destruction or adverse modification of any natural area." 525 ILCS 30/17 Under Section 17, if the proposed action is found likely to have an adverse impact on a natural area, the agency shall study the proposed action to determine possible methods of eliminating or mitigating the adverse impact. HMS has been working with IDNR and the Nature Preserves Commission during the HCP planning process to ensure that no planned activities conflict with the NAPA. This coordination has focused on avoiding possible groundwater impacts to Lockport Prairie. In addition, HMS will continue to consult with the INPC in case any special use permits are required for management activities or other authorized activities.

1.5.5 Clean Water Act Permits

When an applicant applies for a dredge and fill permit under Section 404 of the federal Clean Water Act (33 U.S.C. §1344), the U.S. Army Corps of Engineers (USACE) must notify the USFWS of the application if there are listed or proposed listed species in the "action area" (that is, "all areas to be affected directly or indirectly by the Federal action…)" (50 C.F.R Sec. 402.02). The HED and the turtles covered by this HCP are dependent upon wetlands. While HMS does not intend to "dredge or fill" wetlands during its mining activities (it intends to remove overburden), the law in this area has been inconsistently interpreted over the last several years and, as such, is ambiguous. Therefore, since HMS' proposed activity will impact wetlands, to be conservative, the company submitted a Section 404 permit application to both the USACE and the IEPA (which must issue a water quality certification under Section 401 of the CWA) on January 31, 2019. HMS has addressed the public comments it received on its Section 404 permit application and has revised its application in response to the Request for Additional Information letter it received from the USACE dated April 29, 2020. This HCP will also serve as the basis for decisions from those agencies. The company's Section 404 permit application includes a restoration plan that fully mitigates for the filling of all wetlands (30.1 acres) which will be impacted, in any regard, from the Covered Activities.

1.6 Planning Area and Permit Area

This HCP consists of a Permit Area (2,072 acres) (Figure 2, Appendix A) and a Planning Area (35,445 acres) (Figure 3, Appendix A). The Permit Area is located within the lower Des Plaines River Valley and contains two federally designated CHU's for the HED (75 Fed. Reg. 21394-21453), and other areas in which activities that are likely to negatively affect the HED habitat (i.e. Covered Activities) will occur. The Permit Area contains springs, seeps, dolomite prairie communities, and other wetland habitats currently used by the HED, Blanding's turtle, and LPC and potentially by spotted turtle. Lakeside daisy is found in the Planning Area but not the Permit Area. The Permit Area also includes historic and potentially restorable habitat that may be used in the future by the Covered Species with the implementation of the conservation and mitigation measures included in this plan. HMS, along with ComEd and NRG Energy, and other private entities, own and/or manage land located within the Permit Area (Figure 3, Appendix A).

The Planning Area includes all HED habitat areas near the Permit Area and lands that have been determined to be important groundwater recharge areas for wetlands that provide habitat for the HED and other Covered Species located within CHUs 1, 2, and 7. All habitat areas for Covered Species (including CHUs) that potentially may be impacted by Covered Activities are also included in the Planning Area. The Planning Area includes portions of the Villages of Romeoville, Homer Glen, Lemont, Orland Park, and Cities of Crest Hill and Lockport (Figure 3, Appendix A). These municipalities, as well as other supporting partners (listed in Section 1.3) and non-participating entities, use or have authority or jurisdiction over land in the Planning Area. ComEd owns and manages land in both the Permit and Planning Areas, and the FPDWC and IDNR own and manage land within the Planning Area.

To address the contribution of groundwater to wetlands providing habitat for the HED and other Covered Species, HMS has conducted extensive groundwater data collection and modeling activities for over a decade at a number of parcels within the Permit or Planning Area that contain or are adjacent to habitat. Initial submittals to USFWS included groundwater monitoring and modeling reports for Lockport Prairie Nature Preserve (GAS 2008; GRAEF 2009) and HMS properties (STS/AECOM 2009). HMS has continued to collect hydrology-related data and has had AECOM expand and improve its groundwater model on the company's behalf. An expanded groundwater model, which includes all of HMS' mining and mitigation parcels and surrounding environs, was completed in 2012. A report detailing the construction of the model, input assumptions and preliminary results was submitted to USFWS in October 2012 (AECOM 2012). In response to USFWS and USGS comments (as technical reviewer for USFWS) on the October 2012 report and groundwater model, additional field data were collected in 2013. New data were incorporated into the model and further analyses were conducted. Field data collected in 2013 were submitted in a Documentation Report dated September 2013 (AECOM 2013a). Additional groundwater information, including response to comments, additional groundwater modeling analysis as well as field data and analyses, has been submitted periodically over the past seven years, including: AECOM (2013b, 2014a, 2014b, 2015a, 2015b, 2015c, 2016, 2017 and 2018) and HMS (2017 and 2018). Additional surface and soil water data were also collected and analyzed on many of the parcels in the Permit Area by AES (AES 2012).

These studies have primarily focused on evaluation of groundwater dynamics west of the Des Plaines River for areas such as River South Parcel, Lockport Prairie Nature Preserve, and Romeoville Prairie Nature Preserve. However, significant studies were also conducted east of the Des Plaines River and Illinois and Michigan (I&M) and Chicago Sanitary and Ship (CSS) Canals

for the ComEd and Long Run parcels. One study on the east side of the River provided qualitative estimates for the potential recharge zone for ComEd and Long Run parcels (AECOM 2011). These investigations have been used to evaluate potential impacts from surface mining and other development activities. Avoidance and minimization measures (AMMs) were developed for potential groundwater impacts and those conservation strategies are presented in this plan (see Section 5.1.3). Continued monitoring will allow for tracking and, if necessary, the refinement of these AMMs (see Chapter 6).

Critical Habitat Units

Critical habitat is defined in Section 3 of the Endangered Species Act as:

> *(i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and*
>
> *(ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species (16 U.S.C. §1532(5)(A)).*

During the process of determining which areas to propose as critical habitat, the USFWS considers physical and biological features (primary constituent elements) that are essential to the conservation of the species and, within areas occupied by the species at the time of listing, may require special management considerations and protection.

In 2010, USFWS finalized the designation of critical habitat for the HED (USFWS 2010a). In Illinois, there are seven critical habitat units (CHUs) for the HED located along the lower third of the lower Des Plaines River Valley near Lockport. HMS owns property within CHUs 2 and 7, which make up much of the Permit Area (Figure 2, Appendix A). CHUs 1 and 3 are found within the Planning Area but outside the Permit Area. All CHUs within the Planning Area are described below.

CHU 1: Approximately 351 acres located in Will County, east of Route 53, north of Caton Farm Road, south of Route 7 and west of the Des Plaines River. CHU 1 is comprised of natural areas associated with Lockport Prairie Nature Preserve, ComEd ROW, Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) property and the NRG Energy, rail line.

CHU 2: Approximately 439 acres located in Will County, south of 135th Street, east of Route 53, north of Route 7, and west of the Des Plaines River (quarry areas excluded). Most of CHU 2 is owned by HMS including Middle Parcel (planned mining expansion site), River Parcel, River South Parcel, and Fitzpatrick Seep, North Parcel, Far North Parcel, and River North Parcel (planned mitigation sites). This CHU also includes ComEd ROWs.

CHU 3: Approximately 366 acres located in Will County and comprised of Romeoville Prairie Nature Preserve and ComEd ROW.

CHU 7: Approximately 447 acres located in Will County and includes ComEd and Long Run parcels (planned mitigation sites), IDNR's Long Run Seep Nature Preserve and ComEd easements (located on the east side of the Des Plaines River, south of 135th Street, and east and west of New Avenue).

1.7 Species to be Covered by the Permit

The selection process for the species covered in this HCP was established and initially completed in 2006. The records of occurrence from the previous 10 years for federal and Illinois listed species within the HCP Planning Area were reviewed. The process involved collaboration and coordination between agencies and landowners to review recent and historical data included in the Illinois Natural Heritage database. The process was repeated again in 2012 and applied to a new Planning Area to update the list of species covered in the HCP.

Based on this research, HMS, MWGen, and ComEd (previously referred to as the "Lead Partners" working on a coordinated HCP) compiled a short list of species for agency review. These three companies worked with USFWS and IDNR to reach a consensus that this HCP will cover federally listed animal and plant species and state-listed animals that had a record of occurrence within ten years within the Planning Area. Species that had not been recorded in the Planning Area in a decade or more (e.g. since 1996) were not included. The final listing of Covered Species, as agreed by the three companies and reviewed and approved by USFWS and IDNR in 2006, included the HED, Blanding's turtle, spotted turtle, and leafy prairie clover.

In 2012, the list of Covered Species for the HCP was updated because the Planning Area had been expanded to include all 7 CHUs and the Illinois list of endangered and threatened species had been revised since the initial list was agreed upon in 2006. The update was completed by obtaining the current state-listed species in the vicinity of the revised Planning Area (from the Illinois Natural Heritage database through the IDNR) and applying the same set of criteria as was used in 2006. As a result, two additional species, the black-billed cuckoo and the Lakeside daisy, were added to the list of Covered Species. This list was agreed upon by the IDNR at a meeting on February 28, 2012. The federally listed species for the HCP were confirmed by the USFWS at previous meetings, including the decision to address the Blanding's and spotted turtles at the federal level. These turtle species are included in the federal ITP application because they were petitioned for listing at the federal level in 2012 and may become listed during the duration of the ITP. The Planning Area for this HCP includes four of the seven CHUs (CHUs 1, 2, 3 & 7). The black-billed cuckoo has been found only in CHU 5, located north of the Planning Area, and thus is not included in this HCP.

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2.0 ENVIRONMENTAL SETTING and BIOLOGICAL RESOURCES

2.1 Environmental Setting

The Permit Area is located within and immediately adjacent to the Lower Des Plaines River Valley in Will County, Illinois (Figure 1, Appendix A). It is 2,072 acres in size, and its boundaries were drawn to include all properties in HMS' Romeoville facility (Figure 2, Appendix A). As stated before, HMS does not own or control all the land within the Permit Area. HMS' properties within the Permit Area are listed in Table 1, below, and total 1,437 acres. HMS properties include production facilities with surface limestone mines, roads, conveyors, sorting and screening operations, an office, and a shipping port on the canal. These facilities also include closed landfills as well as other operations and uses. HMS' holdings also include properties purchased for conservation purposes and are included in the mitigation plan of this HCP. Other operations on and adjacent to HMS property within the Permit Area include an asphalt plant owned by Palumbo, a ready-mix concrete plant operated by Prairie Materials, a pre-stress concrete plank plant operated by Illini Precast, a concrete pipe yard owned by Lucky Development and operated by Concrete Specialties, and a concrete crushing facility operated by Concrete Xchange. NRG Energy and ComEd also have properties and easements within the Permit Area (Figure 3, Appendix A). These include NRG Energy's Will County Station and railroad properties and ComEd's substation, ROWs, and transmission easements.

Table 1. HMS Properties within the HCP Permit Area.

Hanson Material Service Properties	**Acreage**
ComEd Parcel	103.0
East Parcel	46.7
East Quarry	218.7
Far North Parcel	50.4
Fitzpatrick Seep	5.5
Lockport Shop Parcel	75.0
Long Run Parcel	182.6
Middle Parcel	124.9
Middle Quarry	80.1
North Parcel	31.4
Pierce-Eich Quarry	268.5
River North Parcel	24.8
River Parcel	61.0
River South Bluff Parcel	23.7
River South Parcel	65.7
Stone Processing Parcel	74.9
HMS Total	**1,436.9**

The Planning Area is 35,445 acres, and its boundaries were drawn to include the Permit Area, CHUs adjacent (or nearly adjacent) to the Permit Area (CHUs 1, 3, and the remainder of 7), and the estimated ground water recharge area (and buffers, where estimated) for springs and wetlands in CHU 1, River South Parcel in CHU 2, and ComEd and Long Run Parcels in CHU 7 (Figure 4,

Appendix A). All habitat areas for Covered Species (including CHUs) that potentially may be impacted by Covered Activities are also included in the Planning Area. As a result, the Planning Area includes portions of Romeoville, Crest Hill, and Joliet on the west side of the river, and Lockport, Homer Glen, Lemont, and Orland Park on the east side (Appendix A, Figure 3). Most of the estimated recharge areas and buffers to CHU 1 & 2 contain residential development and agricultural land (Figure 5, Appendix A). The area within the recharge area is dominated by agricultural land but also contains much developed land (i.e. institutional, transportation, and industrial) and some open land, whereas the area outside the recharge area but within the two mile buffer is dominated by residential development with some agricultural land, open space, and other development. Large portions of the area within the recharge zones are owned or managed by individual public or private entities, including Lewis University, Joliet Port Authority, and the FPDWC (Figure 4, Appendix A). The estimated recharge zone for CHU 7 is dominated by residential development, agricultural land, and open space. In addition, this area contains numerous smaller landowners than those on the west side of the river, except for FPDWC which owns/manages several preserves in this area. Further, these FPDWC sites contain several areas of higher potential recharge within the estimated recharge zone (AECOM 2011). Long Run Seep Nature Preserve (part of CHU 7), owned by Illinois Department of Natural Resources (IDNR), is also located in this part of the Planning Area. The FPDWC and IDNR are conservation agencies that manage land with the goal of supporting biodiversity and other natural resources, scientific research, and public education. In addition, Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) owns numerous vacant properties along the river and canals for flood control and water conveyance. ComEd also has ROW and easements in both the Planning and Permit Areas.

2.1.1 Climate

The lower Des Plaines River Valley is situated in Will County, Illinois, which has a temperate, humid, continental climate. The State Climatologist Office for Illinois has summarized climate normals from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (Illinois State Water Survey 2012). Climatic normals for the Lewis University Airport weather station (Romeoville WFO), which is located in the Planning Area, are based on a thirty-year average from years 1981 to 2010. The warmest month of the year is July with an average high temperature of 84.0 °F, whereas January is the coldest month of the year with an average low temperature of 15.8 °F. Average annual precipitation is 40.07 inches per year with July being the wettest month averaging 4.71 inches of precipitation. Average annual snowfall is 32.3 inches per year, the majority of which falls in December and January (average of 9.3 and 10.8 inches per month respectively).

It is possible that climate change will influence the Planning Area and Covered Species over the term of the HCP. The Chicago Climate Action Plan (2008) states that temperatures have risen by 2.6 °F since 1980 and that 15 of the last 20 years have experienced above average annual temperatures. Potential climate change impacts relevant to this HCP include longer growing seasons, range and distribution changes for plants and animals, earlier onset of plant blooming and animal migration in spring, variation in the timing, intensity, and amount of precipitation, increased surface and groundwater temperatures, later freeze dates, and earlier ice-off dates. The extent of these possible effects on the HCP and Covered Species are addressed in more detail in Chapter 8.

2.1.2 Topography and Geology

A portion of the Des Plaines River Valley from just southwest of Chicago's Midway Airport to Joliet is notable for its glacial history and resultant landscape. The HCP Planning Area lies on the northern flank of a Paleozoic bedrock structure known as the Kankakee Arch, which separates the Illinois and Michigan Basins. As a result of this structure, the bedrock has an easterly dip, resulting in exposure of the oldest formations along the Des Plaines River. The near surface bedrock formations are sedimentary rocks formed in ancient, shallow to deep seas. In the area of the Des Plaines River Valley, this is primarily Silurian Period limestone bedrock of the Niagara Series. Covering the bedrock are deposits of flagstones, cobble, and gravel deposited by outlet flow from glacial Lake Chicago. On the lower terrace is a layer of alluvium deposited by the Des Plaines River. Vertical cliffs were carved by torrential meltwaters from this most recently glaciated portion of Illinois.

Areas within the lower Des Plaines River Valley have well-drained glacial outwash soils that support seeps, fens, and springs. Areas of exposed limestone create a harsh environment that supports a number of hardy plants. While the low gravel ridges parallel to the river stay dry, the floodplain environments stay wet for long periods. The highly resistant surface rocks and "tight" layering of underlying limestone rocks have both a seasonally high water table and also do not quickly encourage infiltration of ground water. Therefore, seasonally wet or inundated conditions are common in some areas. The fens, marshes, and wet prairies that occur in low spots, including dolomite prairies, add to the variety of habitats and resultant biodiversity. Groundwater recharge areas for the seeps extend beyond the Des Plaines River geologic valley and into glacial till deposits (Figure 4 & 5, Appendix A). Throughout its current range, the Hine's emerald dragonfly (HED) is typically known to occupy areas where limestone is near the surface and groundwater is emerging as seeps or springs (USFWS 2001; 75 FR 21394-21453). Like much of the Chicago area, natural land cover has been extensively altered through increasing urbanization. Expanding development, as well as the encroachment of invasive plant species, continues to be a major stressor on the dolomite prairie habitat and the HED (IDNR 2005).

2.1.3 Hydrology: Groundwater, Wetlands, Surface Water

Groundwater

Several recent studies have investigated groundwater hydrology within the HCP Planning Area which included studies at Illinois Nature Preserves and at HMS properties. Graef, Anhalt, Scholemer and Associates (GAS), completed studies of the Lockport Prairie Nature Preserve and Romeoville Prairie Nature Preserve (GAS 2004b, 2005a, 2005b, and 2008). Reporting completed for these studies included discussion on recharge zones, water balance estimations, and predictive groundwater modeling. Similar investigations and modeling have been conducted by AECOM on behalf of HMS for their properties, including the River South, West Quarry (Pierce Eich), Middle Parcel, ComEd, and Long Run Parcels (STS/AECOM 2009; AECOM 2012). In addition, predictive modeling of future surface mining in the Romeoville Quarry was conducted to evaluate possible groundwater conditions in the River South Parcel and other nearby CHUs including Lockport Prairie and Romeoville Prairie Nature Preserves (AECOM 2012, 2013a, & 2013b). Additional groundwater information, including response to comments, field data and analyses, has been submitted periodically over the past six years, including: AECOM (2014a, 2014b, 2015a, 2015b, 2015c, 2016, 2017 and 2018) and HMS (2017 and 2018).

Infiltration in the recharge zones supplies the shallow aquifers that feed the springs, seeps, and wetlands known to support the HED and the turtle species. AECOM investigations have provided

the hydraulic properties of the aquifer in the vicinity of the Romeoville Quarry and have documented groundwater levels and flows of groundwater that discharge to larval habitat areas within the Permit and Planning Areas. Predictive groundwater modeling simulations have been conducted for future mining construction. Several hydrologic enhancements have been proposed to eliminate potential impacts from mining on the local sensitive receptors of groundwater discharge.

The HCP study area is based on the estimated groundwater recharge zones developed by GRAEF (formerly GAS) and AECOM. GRAEF hydrologists estimated the probable groundwater recharge zones for the primary seasonal seepage locations found in Lockport Prairie (CHU 1) and River South (CHU 2) (GAS 2004b, 2005a, and 2005b) (Figure 4, Appendix A). The recharge area for ComEd and Long Run Parcels (CHU 7) on the east side of the Des Plaines River was delineated by AECOM (2011) (Figure 4, Appendix A).

GRAEF determined recharge area delineation for all areas using "flow net analysis" of the Silurian Aquifer potentiometric surface. They delineated three zones for each parcel, including: 1) the primary recharge area, 2) a recharge area buffer, 3) and a 2-mile buffer, which included lands adjacent to the recharge area (Figure 4, Appendix A). The primary recharge area is defined as the area in which infiltrating precipitation has the greatest potential for supplying water to each respective parcel. Recharge area buffers are described as the widest estimated areas that may provide some limited infiltrated surface water to the parcels. The two-mile wide buffer was developed subjectively based on the average contribution area for a municipal water supply well. HMS has conservatively included the two-mile buffer into the HCP study area to ensure the area was evaluated and land-use can be effectively managed in the future.

The recharge area for groundwater discharging to and flowing beneath the ComEd and Long Run Parcels (CHU 7) was delineated by AECOM (2011). The estimated recharge area is very large (22.7 square miles) and extends southeast from the parcels approximately 11 miles (AECOM 2011) (Figure 4, Appendix A). This is several times the size of the recharge zones for Lockport Prairie (CHU1) and River South (CHU 2) on the west side of the river, but all areas extend to the highest potentiometric surfaces that divide groundwater flow on each respective side of the river. The estimated recharge zones and buffers have been used to define the extent of the Planning Area because maintaining groundwater recharge function is considered to be important for preserving the springs and suitable HED habitats on each of these properties. Recharge areas have not been documented for the other CHU's.

Additional development (or re-development) activities, such as residential and commercial building, road construction and maintenance, citing of new landfills, other mines, construction or alteration of municipal and private wells, or any other activities that increase impervious surfaces or alter surface drainage patterns, may alter groundwater quantity, flow direction, or quality. Thus, recharge areas and buffers are included for planning purposes since there is a potential for land use changes, however small, to negatively affect quantity and quality of groundwater reaching the HED habitats in these areas (GAS 2005a; GAS 2008; USFWS 2005).

Wetlands

HMS has identified wetlands on all its parcels within the Permit Area that are involved in planned mining or conservation activities. Figures 6.1 & 6.2 in Appendix A show current delineated or field-verified wetland areas on the HMS properties. HMS followed the methods and procedures outlined in the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual (USACE 1987) to

conduct wetland delineations on its properties within the Permit Area, except those currently being used in mining operations. Wetland acreage for each of these parcels is found in Table 2.

Table 2. Wetlands on HMS Properties involved in planned mining or conservation activities within the HCP Permit Area.

Hanson Material Service Properties	Wetland Acreage
East Parcel	0.0
Far North Parcel	14.5
Fitzpatrick Seep	1.9
ComEd Parcel	61.1
Long Run Parcel	175.8
Middle Parcel	29.7
Middle Quarry	0.0
North Parcel	19.6
Pierce Eich Quarry	0.0
River North Parcel	13.6
River Parcel	40.8
River South Bluff Parcel	2.39
River South Parcel	62.3
Stone Processing Parcel	0.0
Total Wetlands	**421.8**

Wetlands are changing on each of these and other properties within the Planning Area, including within the protected and managed nature preserves. In the time that the HED has been under careful investigation, some of the highest quality wetlands (e.g. sedge meadows) have been invaded by aggressive weedy species, such as cattails (Mierzwa 2008). Unmanaged cattail thatch reduces access that ovipositing adult HED require and has changed the patterns used by foraging HED. Invasive plant species, such as common reed (*Phragmites australis)*, reed canary grass (*Phalaris arundinacea)*, narrow-leaved and hybrid cattail (*Typha angustifolia and Typha X glauca)*, purple loosestrife (*Lythrum salicaria)*, and smooth and European buckthorn (*Rhamnus frangula* and *Rhamnus cathartica)*, represent a great risk to wetland biodiversity and the HED habitat. These species can reduce wetland biodiversity through aggressive competition, shade suppression, thatch build-up, and dewatering (Chicago Region Biodiversity Council 1999; Zedler and Kercher 2004). AES has observed the expansion of common reed and buckthorn on HMS properties over the past 12 year as reflected in revised vegetation / land cover maps of the parcels (e.g. Middle, North, Far North, and ComEd Parcels).

Other activities which may contribute to the degradation of wetlands in the HCP Permit Area include:

- historic agricultural ditches through wetlands
- nutrient and contaminant (e.g. deicing materials) loading in storm water runoff from nearby local roadways and communities
- erosion and sedimentation
- ground water impacts from land use and development activities

- hydraulic segregation due to railroad beds and roadways

Surface Water

Most of the Permit Area and the central portion of the Planning Area are located within the lower Des Plaines River Valley which is part of a 378-square-mile watershed that includes portions of Cook, Will, and DuPage Counties. The mean annual precipitation for the basin is approximately 35 inches. The minimum watershed elevation (538 feet msl) is at the southern boundary of the Planning Area just north of Joliet and the maximum elevation is in the northwestern portion of the watershed in Cook County near Inverness (690 feet msl) (IDNR 2000).

The Des Plaines River is the main river system present in the valley. Waterways within the HCP Planning Area include the Illinois and Michigan (I&M) Canal, Chicago Sanitary and Ship (CSS) Canal, Long Run Creek, Fiddyment Creek, and Mink Creek. The I&M and CSS Canals were excavated to allow shipping by barge. Both Canals generally parallel the Des Plaines River. Long Run and Fiddyment Creeks are located east of the Des Plaines River and flow into the I&M Canal. Mink Creek is located west of the river and flows west to the DuPage River.

Aside from Long Run and Fiddyment Creeks, there are no named tributaries to the Des Plaines River within the HCP Planning area. However, water from surface, storm water, and groundwater sources flow to the Des Plaines River via ditches or small rivulets (sometimes called streamlets) that flow through wet dolomite prairies, marshes, and floodplain forests.

The majority of the slope of the watershed is one foot per mile; however, the slope is steeper between Lockport and Joliet where it is approximately 5.25 feet per mile. The valley above Lockport is surrounded by 80-100-foot bluffs that are located 1,500 to 2,500 feet east and west of the Des Plaines River (IDNR 2000). The bluff height within the Planning Area, however, is variable.

2.1.4 Vegetation

Historic Conditions and Trend

According to early aerial photographs (Figure 7, Appendix A), maps and original land survey records (INHS 2002) (Figure 8, Appendix A), the Permit Areas historically contained extensive grassland that transitioned to open wetlands. Some wooded riparian areas with scattered oak savanna and small forest copses were also present. Examples of remnant grassland and open wetland are found in some FPDWC preserves within the Planning Area.

The pre-settlement vegetation in the Permit Area, which is mostly within the river valley, was almost all prairie and wetland (Figure 8, Appendix A). The Planning Area outside the Permit Area and west of the river valley was almost all prairie, whereas the east side was a mix of prairie and woodlands, including forests and savanna. Some wetlands were found on the east side of the Planning Area in low-lying areas with hydric soils. Over time, a majority of land has been converted from pre-settlement prairies, woodlands, and wetlands to agricultural uses as well as residential, industrial, and other commercial development. (Figure 5, Appendix A).

Current vegetation

Vegetation found in the Permit and Planning Areas within the river valley ranges from remnant high quality natural areas, such as Lockport Prairie, Romeoville Prairie, and River South, to disturbed or degraded vacant areas, to highly altered lands, such as developed areas and quarries (Figure 5, Appendix A; HMS existing condition maps, Appendix F). These disturbed areas include large areas that have been used for decades for approved landfills that have since been closed, scraped and spoil areas, ditches, dikes, old railroad beds, power lines, railroad easements, and fence lines. Most of these disturbed lands are dominated by weedy and invasive plant species and provide little or no habitat for the Covered Species. The vegetation found in the Planning Area outside the Permit Area includes conventional landscaping in developed areas, some areas of natural land-cover, and many other areas of row-cropped agricultural fields.

Both native and non-native plant communities are found within both the Permit and Planning Areas in the river valley. Native plant communities include dolomite prairie, sedge meadow, emergent marsh (cattail or bulrush), wetland shrubland, upland woodland, and young floodplain forest. Non-native communities include marsh (common reed), wet meadow (reed canary grass), turf, Eurasian meadow/old field, and upland shrubland (European buckthorn).

Even the remnant natural areas (e.g. Lockport and Romeoville Prairies) have experienced some level of direct and/or indirect impacts from the initial agricultural conversion, such as livestock grazing, and subsequent development activities. In addition, invasive plants, both woody and herbaceous, continue to threaten these remnant communities, particularly their diversity, composition, structure, and ecological function. Groundwater-fed natural wetlands dominated by graminoid (grass-like) plants, such as marsh, sedge meadow, and dolomite prairie, with underlying limestone bedrock are the remnant communities that provide habitat to the HED (USFWS 2005). These communities may have been impacted by changes in groundwater due to increased development in the recharge areas (GAS 2005a and 2008).

2.1.5 Wildlife

Changes in vegetation and wildlife habitat within both the Permit and Planning Areas have been considerable over time, with the exception of the few remaining natural area remnants. Consequently, these areas now primarily support common urban wildlife species. Most of the native wildlife diversity of the region and in the Permit and Planning Areas has declined or has been extirpated, with exceptions for those species that flourish in urban environments (Chicago Region Biodiversity Council 1999; Chicago Wilderness consortium 2006; Greenberg 2002). Species such as white-tailed deer and raccoons have increased dramatically in abundance in recent decades in urban and suburban areas due to their ability to adapt to increasingly metropolitan environments (Etter 2002; Gehrt 2004). Animals such as Virginia opossums and striped skunks also compete well in disturbed settings (Gehrt 2004). Most of the native wildlife that was present in the pre-settlement ecosystems in the Permit and Planning Areas is now found at low levels of abundance (Chicago Region Biodiversity Council 1999; Chicago Wilderness consortium 2006). However, many rare and declining native species are still found in the largest remnant natural areas in the Permit and Planning Areas (e.g. nature preserves and HMS properties).

Hundreds of bird species protected by the federal Migratory Bird Treaty Act spend at least some portion of the year within the HCP Planning Area, which provides suitable breeding habitat and important migratory stop-over habitat for birds. Birds known to occur within the HCP Planning Area include waterfowl, shorebirds, raptors, waterbirds, and landbirds. Common waterfowl species include Canada goose, wood duck, mallard, American black duck, blue-winged teal, and

bufflehead; while common waterbirds include double-crested cormorant, great blue heron, great egret, and sora. Raptors within the HCP Planning Area include sharp-shinned hawk, Cooper's hawk, red-tailed hawk, bald eagle, American kestrel, and great horned owl. Shorebirds expected to occur within the HCP Planning Area during some portion of the year include killdeer, greater yellowlegs, lesser yellowlegs, solitary sandpiper, spotted sandpiper, American woodcock, and Wilson's snipe. Landbirds within the HCP Planning Area include downy woodpecker, hairy woodpecker, eastern wood peewee, willow flycatcher, red-eyed vireo, blue jay, American crow, tree swallow, black-capped chickadee, white-breasted nuthatch, house wren, American robin, gray catbird, cedar waxwing, yellow warbler, black-and-white warbler, American redstart, ovenbird, common yellowthroat, scarlet tanager, northern cardinal, indigo bunting, song sparrow, field sparrow, chipping sparrow, savannah sparrow, swamp sparrow, brown-headed cowbird, red-winged blackbird, common grackle, Baltimore oriole, house finch, and American goldfinch.

The bald eagle, which is afforded protection by the federal Bald and Golden Eagle Protection Act, is known to occur within the HCP Permit Area. A pair of bald eagles has been nesting on an island within the Des Plaines River since at least 2010, and bald eagles use the river corridor during their annual spring and fall migration. Golden eagles are not known to nest or winter within the HCP Planning Area. USFWS was contacted about the eagles by HMS in April 2010. The local USFWS eagle expert observed the nesting pair during blasting in the West (Pierce Eich) Quarry on May 18, 2010. The USFWS representative stated that the blast was faintly acknowledged by an adult eagle and unnoticed by the eaglets inside the nest. The conclusion was that the breeding pair is accustomed to the disturbance near the nesting site – including the quarry, train traffic, and airplanes (pers. comm. with M. Sailor, USFWS 2010).

2.1.6 Existing Land Use

Present day land use across the Permit and Planning Area is depicted in Figure 5 in Appendix A. Current land use is a highly fragmented mix of residential and industrial development, agriculture, and public and privately-held open space.

2.2 Species of Concern in the Program Area

This section provides a summary of each of the HCP Covered Species.

2.2.1 Wildlife Species of Concern

Following are the species for which HMS is seeking a federal ITP and a state ITA. Take of a listed animal species requires a federal permit and/or state authorization, whereas take of listed plants do not.

Hine's Emerald Dragonfly

Species Description

The HED is a moderately large species of dragonfly with a wingspan of 3.5 to 3.7 inches and a body length of 2.3 to 2.5 inches. The body is dark brown to dark metallic green with a pair of yellow lateral strips on each side and bright green eyes (Vogt and Cashatt 1994; USFWS 2001). The HED larvae are light to dark brown aquatic nymphs. They are typically densely covered in setae, which gives them a "hairy" appearance. The final instar head width is greater than 6.0 mm and total length greater than 20.0 mm (Foster and Soluk 2004; Soluk et al. 2009). A detailed

discussion on the HED larval characteristics is presented in Cashatt and Vogt (2001) and Soluk et al. (2009).

Life History and Habitat

The HED breeding season lasts from early June to late August in Illinois (USFWS 2001; Vogt and Cashatt 1994, 1997). Females oviposit (lay eggs) in shallow water of rivulets and channels or in muddy depressions within marsh or sedge meadows, depositing 500 - 1,000 eggs (D. Soluk and R. Demots, University of South Dakota, pers. comm. 2013). Eggs overwinter and hatch in the spring (Soluk and Satyshur 2005). Based on studies of other dragonfly species (Duffy 1994 and Wissinger 1998), the survival rate of the HED eggs to mature larvae is likely less than 1% to 5.5% but possibly lower (D. Soluk and R. DeMots, University of South Dakota, pers. comm. 2012). In general, dragonfly larval mortality is extremely high during the first few larval instars. This natural mortality is a result of predation, cannibalism, and sometimes starvation. However, very small larvae (headwidth < 2.00 mm) grow faster than larger larvae (Satyshur 2008).

Hine's emerald dragonfly eggs overwinter and subsequent larval development has been shown to take 3-5 years (Soluk and Satyshur 2005). Captive rearing experiments, Soluk et al. (2009) estimate that larval development is 4.87 winters to emergence. Approximately 8% of the larval population, age 1 or above, are pre-emergent (e.g. prior to emerging as adults) referred to as F-0 larvae (Foster and Soluk 2004).

The larvae have the capability to move about a terrestrial environment, a characteristic that may set them apart from other aquatic insect larvae (Soluk et al. 1999). The HED larvae are restricted to wetland habitats (e.g. marshes, seeps, and sedge meadows) with thin soils over limestone bedrock (USFWS 2001; USFWS 2005; Nuzzo 1995; and Mierzwa et al. 1998). Larvae eat smaller insects and shed their skin many times. The HED larvae then crawl out of the water and shed their skin a final time, emerging as flying adults.

Adult HED use wetlands as well as a mixture of adjacent uplands. Adults will also fly over and forage in open upland areas such as meadows and old fields (Vogt and Cashatt 1994) but will avoid large areas of open water and dense shrub thickets or forested areas (USFWS 2005). In addition, they have been documented to travel several miles (Mierzwa et al. 1995). There is some evidence that females use upland habitat during non-breeding times to avoid interactions with males (Soluk 2005; Foster 2001). The adult HED flight season in Illinois can start as early as late May and ends in early October (Vogt and Cashatt 1994; Soluk et al. 1996; Mierzwa et al. 1997). The peak of adult emergence normally occurs in July, and few adults are observed after mid-August. Adult HED typically live at least two weeks and can live up to six weeks (Soluk et al. 1996; Mierzwa (editor) 1995; USFWS 2001).

HED ecology is linked with the ecology and behavior of the burrowing devil crayfish (*Cambarus diogenes*) and possibly other species of burrowing crayfish. The burrows of the devil crayfish provide refuge for the HED larvae both from dry conditions in mid to late summer, and during the winter (Soluk et al. 1999; Pintor and Soluk 2006).

Range and Location

The HED was first described from sites in northwestern Ohio (Williamson 1931; Vogt and Cashatt 1994) and it is currently thought to be extirpated from Ohio and Indiana. The Northern Recovery Unit consists of documented HED sites in Door and Kewaunee Counties in Wisconsin, and sites in Alcona, Alpena, Charlevoix, Mackinac, Menominee, and Presque Isle Counties in Michigan. The

Southern Recovery Unit consists of sites in Iowa, Ozaukee and Richland Counties, Wisconsin; Cook, DuPage and Will Counties, Illinois; and Dent, Iron, Phelps, Reynolds, and Ripley Counties in Missouri (USFWS 2013). The HED is known to occur at several sites in Illinois, shown in Table 3 (USFWS 2005; Mierzwa and Webb 2012d; Mierzwa and Webb 2014; Soluk 2005; Soluk et al. 2007; Soluk and Worthington 2010). The Illinois sites occur along an approximately 18-mile length of the lower Des Plaines River Valley (13 miles) and the Cal-Sag Channel (5 miles) with the largest portion of the population in the Planning Area (Figures 9.0-9.7, Appendix A). Adult HED have also been recently found 30 miles northwest of this area at Spring Lake Nature Preserve and Spring Creek Valley Forest Preserve in Cook County (Cashatt 2016; Soluk et al. 2016) as well as further to the west in Winnebago County, IL (Gibbons 2020).

Table 3. Known HED Occurrences in Illinois CHUs, as of 2014.

Site Name	CHU	Land Manager	HED Occurrence (by lifecycle stage)
Crest Hill Sewage Treatment Plant*	N/A	City of Crest Hill	Adult and larval
Lockport Prairie Nature Preserve	1	FPDWC	Adult and larval
North Parcel	2	HMS	Adult
Middle Parcel	2	HMS	Adult and historic larval
River Parcel	2	HMS	Adult
River South Parcel	2	HMS	Adult and larval
Romeoville Prairie Nature Preserve	3	FPDWC	Adult and potential larval
Black Partridge Forest Preserve	4	FPDCC	Adult and potential larval
Keepataw Preserve	4	FPDWC	Adult and larval
Waterfall Glen Forest Preserve	5	FPDDC	Adult and larval
McMahon Woods Nature Preserve	6	FPDCC	Adult and larval
Long Run Seep Nature Preserve	7	IDNR	Adult and larval
ComEd and Long Run Parcels	7	HMS	Adult and historic larval

*Not shown on the Figures in Appendix A. Outside CHUs and GIS data not available.

The HED habitat locations within the Planning Area are shown on Figure 9.0 - 9.7 in Appendix A. Historic habitat is an area that was occupied or provided suitable habitat in the past, but no longer provides suitable habitat. Potential larval habitat is an area that has the correct habitat characteristics for HED larvae to be present, but they have not been identified at that location. Both HED adult-use and larval-production areas are indicated on this figure. The Habitat Mapping Protocol (Appendix B) describes the protocol used to map the HED adult and larval habitat, which was developed by HMS, MWGen, and ComEd in consultation with USFWS and leading HED biologists (K. Mierzwa and D. Soluk). The amount (acres) of HED adult and larval habitat found within each CHU, as shown in Figures 9.0 – 9.7, is listed in Table 1 of Appendix B. In addition to the areas shown on the maps and identified in the table above, the HED adults have been documented outside CHUs but within the Planning Area at Dellwood Park West and Lockport Prairie East and outside the Planning Area at Argonne National Laboratories just north of CHU 5 (Soluk 2019).

Population Size and Genetics

"Population" is defined as a group of individuals of the same species, co-existing at the same time and in the same geographic area and capable of interbreeding (Purves et al 1998). For the purposes of the USFWS HED Recovery Plan, the lower Des Plaines River Valley is considered one population. The USFWS HED Recovery Plan defines a subpopulation as a local population occurring at a specific geographic site, such as Lockport Prairie Nature Preserve. A subpopulation

may include more than one local population (e.g. separate and specific larval habitat) when adult HED habitat ranges cover a number of these nearby specific breeding sites. This co-mingling of adult HED from different larval sites allows for genetic exchange between the sites. In cases where larval habitat constitutes what appears to be separate subpopulations, but adult HED habitat is contiguous (e.g. Middle Parcel, River South, and Lockport), the geographic area used by the adults defines the edges of the subpopulation because it is assumed that the adult HED are freely using the entire area and genetically mixing (USFWS 2001). Treating all HED in the Lower Des Plaines River Valley as part of one population is also supported by the results of a recent genetic study which indicates that HED from various habitat sites in the Lower Des Plaines River Valley of Illinois are all part of one genetic population (Monroe and Britten 2014).

Tables C-1, C-2 and C-3 in Appendix C provide a summary of the recorded foraging-flying adult HED in HMS' Middle, ComEd, Long Run, and River South Parcels (Mierzwa and Webb 2012a and 2012b). Data indicate population numbers have been lower in recent years in these parcels. A sudden drop in the HED population numbers at Middle and River South Parcels occurred after the 2005 drought and as a result the population numbers were lower between 2005 and 2011 than they were in the previous ten years (1995-2004). Conditions that could influence the data, such as weather, may vary from year to year; because of the long HED larval period, drought or flood events can potentially influence the size of HED cohorts for several years. Based on the results of the most recent adult HED surveys in Middle (2011) and River South (2012) Parcels, current adult HED populations are estimated to be four and 71 individuals in these parcels, respectively. River Parcel adult HED population is estimated to be 10 individuals based on its most recent survey (2013), and the current adult population in ComEd and Long Run Parcels is estimated to be about five individuals based on the 2011 survey results. The Keepataw site has been monitored extensively since 2004 (Soluk 2005; Soluk et al. 2011) and estimated adult HED population size is 10 +/-4 (Soluk and Mierzwa 2012). In addition, recent adult HED surveys have been completed along rail lines within the Planning Area, but population estimates were not calculated as part of these studies (Soluk and Worthington 2010; Mierzwa et al. 2010).

The current HED (larval) population size in Illinois (lower Des Plaines River Valley) was estimated by Soluk and Mierzwa (2012) to be 2,063 and, based on standard error, may be in the range of 1,000 – 3,000. For this study, all larval survey data collected in the most productive sites in Illinois was compiled and analyzed to generate larval population estimates at each site (and each breeding location within each site) and to provide an estimate for the entire HCP Planning Area. Data used in the analysis were collected in Lockport Prairie Nature Preserve, Long Run Seep Nature Preserve, Keepataw Forest Preserve, and HMS' River South, Middle, Long Run, and ComEd Parcels. In addition, this data was compared to adult HED data from HMS' parcels collected in the same years to check and help calibrate total (larval and adult) population estimates. Using the calibration model, the adult HED population was estimated to be within the range of 87 - 243 adults (estimate includes standard error - Soluk and Mierzwa 2012), far from the recovery criteria of 1,500 adult HED and well below what most research (Shtickzelle et al. 2005; Traill et al. 2007; Frankham et al. 2010) suggests is required to maintain a viable insect population. At Illinois sites with adequate datasets, numbers have been reduced since about 2002 but have fluctuated since then. In addition, the core of the Illinois population is currently concentrated at two sites, with one site, Lockport Prairie, contributing 54-56% and another, River South, contributing 30-35% to the Illinois population, or combined 84-91% of the entire Illinois population.

Assessment of the genetic structure of HEDs based on microsatellite DNA analysis of samples from sites in Illinois, Wisconsin, and the Upper Peninsula of Michigan revealed a clear spatial pattern for

this species indicating five separate populations within the study area: one population in Illinois; a second in Ozaukee County (Cedarburg Bog), Wisconsin; a third in southwest Wisconsin (Lower Wisconsin River); a fourth that is in Kewaunee and Door Counties, Wisconsin; and a fifth population in the Upper Peninsula of Michigan (Monroe and Britten 2014). The assignment of individual sites to populations reflects the information from this research as well as the known flight distance of the species (USFWS 2013). Based on mark recapture HEDs can fly at least 3.4 miles (5.5 km) (Mierzwa et al. 1995a; Cashatt and Vogt 1996) but most likely not further than 30 miles (48.28 km) (D. Soluk, pers. comm. 2012).

Allelic richness is greatest in the Illinois population and lowest in the two northern populations found in Door Peninsula, WI, and the Upper Peninsula, MI (Monroe and Britten 2014). Most genetic variation is within populations (91%) with very little genetic variation among sites within populations (3%) and among populations (6%). However, this level of genetic diversity may not be maintained by regular gene flow in the future due to the loss of stepping stone habitats that must have existed previously based on the species dispersal capabilities.

Based on tenets of genetics, the long-term viability of any species is based on a combination of population size and genetic diversity that are essential to counteract catastrophic events (Dudash and Fenster 2000). In order for a species to persist, its population-level genetic diversity must be maintained and distinct haplotypes (genetic variants) must be preserved. For some species, even a small loss of genetic diversity will preclude a species' ability to withstand significant changes to the environment.

Based on recent genetic analyses by Dr. Meredith Mahoney (pers. comm. 2012), of 141 samples of Hine's emerald dragonfly tissue analyzed for mitochondrial DNA (mtDNA) variation, there are 21 haplotypes rangewide, with up to six differences (1.1%) among them. Missouri exhibits the greatest genetic diversity across the range of the species with 13 of the 21 haplotypes found in Missouri including 10 that are unique to the state; whereas, Michigan has been found to only contain one haplotype and Wisconsin has four haplotypes.

Hine's emerald dragonfly sites in Illinois had previously been thought of as being the most genetically diverse (Purdue et al. 1996) prior to the discovery of sites in Missouri (M. Mahoney, pers. comm. 2012). There are six different haplotypes that have been found in Illinois, four of which are unique to Illinois, with up to five differences (0.92% divergence) among them. The differences (number or %) are the maximum observed base pair substitutions between haplotype pairs looking either range wide or just within Illinois or other regions. Some haplotype pairs have only one or two differences between them. The four unique haplotypes were all found in sites (Lockport Prairie Nature Preserve, River South and Middle parcels, and Romeoville Prairie) within a close proximity (approx. 4.25 miles (6.84 km)) of each other. The haplotypes unique to Illinois are B, C, E, and F. Alternatively, haplotype D, which is found across the species range, has not yet been found in Illinois, though two other widespread haplotypes (A and G) do occur. Analyses of museum samples from extirpated Ohio populations found genetic variants that are not seen in other, extant, populations (Purdue et al. 1996 and Mahoney pers. comm. 2012). Range wide analysis showed little geographic structuring of genetic variation and most variation (77-86%) is within states (Mahoney pers. comm. 2012). Due to the relatively high genetic diversity and unique haplotypes in HED populations in Illinois and Missouri, the long-term viability of the species range-wide would be compromised if the genetic diversity of these populations is threatened.

While the populations in the southern portion of the species range (Missouri and Illinois) are believed to be smaller, there is greater genetic diversity within the southern populations which makes them extremely important to the survival and recovery of the species. Alternatively, the populations in the northern portion of the species range (Wisconsin and Michigan) are larger yet have less genetic diversity.

The vulnerability of HED southern populations and the species as a whole to effects from demographic and genetic stochasticity may be increasing due to the severity of the threats to the small populations. Demographic stochasticity can cause small populations to vary widely in size. Genetic stochasticity is random changes in a population's genetic makeup that can have deleterious effects on the ability of individuals to survive and reproduce. A drastic reduction in population size can exacerbate the effects of genetic stochasticity or can lead to the further decline of a population to extirpation. As a population loses individuals, it may lose genetic variation, which may reduce the species' fitness or ability to cope with environmental change. So while the southern populations may currently contain genetic diversity that may be necessary for the species to survive and adapt in a changing environment, the potential for the southern populations to become extirpated is compounded by several direct and indirect threats and by small population sizes, which compromise the viability of the species rangewide.

Conservation Status

The HED is a federally and state-listed endangered species that survives in Illinois, Wisconsin, Missouri, Michigan, and Ontario, Canada. The first recorded occurrence of this species in Illinois was a collection from 1983 that was not confirmed until 1987 (Cashatt and Vogt 1990). The HED was listed as state-endangered in Illinois in 1991 (Illinois Administrative Code 1992, Illinois List of Endangered and Threatened Fauna, 17 IAC 1010. 1992, Illinois Register 16 (1):107), listed as federally endangered in January 1995 (USFWS 1995), and a Recovery Plan was published in September 2001 (USFWS 2001). The species also is listed as state-endangered in Ohio, Michigan, Missouri, and Wisconsin. The International Union for the Conservation of Nature (IUCN) also lists the HED as endangered (Moore 1997; USFWS 2001), and The Nature Conservancy lists this species as globally imperiled (USFWS 1995).

Based on the current population status and distribution and the continuing threats to the species and its habitat, the Hine's emerald dragonfly continues to be in danger of extinction throughout all or a significant portion of its range.

Threats

The principal threat to the HED in Illinois is habitat degradation and alteration. Residential and commercial development, mining, roadway and pipeline construction, landfills and filling of wetlands could reduce suitable habitat for the HED (USFWS 2001). Changes in surface and subsurface hydrology could adversely affect larval and breeding habitat by changing water temperature, flow, chemistry, and volume (USFWS 2005). Groundwater, which also drives wetland hydrology, could be impacted by various development activities, such as mining or use of municipal and private wells (GAS 2008; USFWS 2005). Other development activities that increase impervious surfaces and alter surface drainage patterns could also result in reducing the suitability of habitat or the loss of larval and breeding habitat (USFWS 2005). Contamination of groundwater or surface water from landfills, pesticides, road salts and other chemicals is also a concern (USFWS 2005). Transportation and roadways are also a threat to this species, both from direct mortality and from habitat destruction or fragmentation. Adult HED mortality from direct impacts with vehicles or trains has been documented and may reduce the HED population sizes (Steffens 1997, 1998;

Soluk et al. 1998b; USFWS 2001; Soluk and Moss 2003). Land use practices, fire suppression and past agricultural development have also reduced available habitat as well as the abundance of insects for prey across its range.

In addition to the above threats to the HED in Illinois that are covered in the species Recovery Plan (USFWS 2001), the U.S. Fish and Wildlife Service and their partners have learned about additional threats since the Recovery Plan was issued and these are described below.

Invasive Species Threat

The Hine's emerald dragonfly Recovery Plan identified the need for studies to evaluate the short and long-term responses of larvae and adult HED to habitat management practices including non-native species control. This is an on-going need as invasive species continue to threaten the Hine's emerald dragonfly and its habitat.

Invasive vegetation can potentially impact Hine's emerald dragonfly behavior and habitat. The encroachment of cattails (*Typha* spp.) and woody vegetation has the potential to affect adult HED flight behavior and movement. Mierzwa (2008) suggests that adult HED breeding habitat is being encroached upon by the accumulation of layers of cattail thatch at marshes in Illinois sites that have not been maintained by continued prescribed fire; heavy thatch may restrict adult HED access to breeding streamlets and limit larval presence through shade-induced reductions in productivity. During HED habitat assessment and adult surveys conducted in the Upper Peninsula of Michigan, observers found that utility right-of-ways that are kept clear of woody vegetation appear to serve as flight corridors (D. Soluk, pers. comm. 2012). In addition, observations of HED adults in Missouri revealed that the species will not fly more than 100 meters (328 feet) into closed canopy forest (T. Vogt, Missouri Department of Natural Resources, pers. comm. 2007). It is likely that decades of fire suppression have allowed woody vegetation to encroach upon Ozark fen communities and closed-in areas that served as corridors to movement.

Other invasive plant species can impact habitat features that help fulfill life history requirements. For example, a necessary component of larval habitat is groundwater. Encroachment of woody invasive species in upland areas has the potential to allow greater runoff of precipitation and loss of subsurface water through evapotranspiration (Parish and Sellar 2006).

Herbaceous invasive species can also impact necessary breeding habitat features. For example, common reed (*Phragmites australis*) is believed to displace crayfish (D. Soluk, pers. comm., 2009), and hence their burrows that serve as refugia for HED larvae, possibly due to the thick rhizomatous mat that develops in monocultures of the species. At the River South Parcel, no crayfish, burrows, or HED larvae have been found within monotypic stands of common reed (Mierzwa, pers. comm. 2013). Preliminary study results from research being conducted at the Meissner Preserve in Door County, Wisconsin, indicates that crayfish burrow numbers decrease with increasing density of reed canary grass (D. Soluk, pers. comm., 2013).

Barriers to Movement

Since the Recovery Plan was written, new information has been gained on barriers to adult HED movement. These barriers to movement can affect dispersal and flight behavior that may lead to isolated populations and increase the vulnerability of HED to effects from demographic and genetic stochasticity. The long-term viability of any species is based on a combination of population size and genetic diversity that are essential to counteract stochastic or catastrophic events. Fragmentation or barriers to movement can lead to reduced population sizes and/or a loss in genetic

diversity. Barriers to movement that may lead to fragmentation include closed canopy forest and bridges.

Observations of adult HED flight behavior around the Interstate 355 (I-355) bridge that extends over the Des Plaines River Valley in Illinois were made before and after bridge construction (Soluk et al. 2011, p. 14). Research has shown a decrease in observed adult HED activity beneath the bridge since the completion of the bridge deck, with adults avoiding the area underneath the bridge. In general, dragonflies were often observed flying towards the bridge, quickly increasing flight height to deck level, and then crossing at or near traffic height. In 2011, of the eleven possible HEDs observed, three flew directly over the bridge, and none flew under it; the remaining individuals did not attempt to cross the bridge. At this time, it is unclear what causes the various flight behaviors observed or what other bridges may serve as barriers to movement. Methods to mitigate this impact are being assessed. Preliminary studies were initiated in 2012 to observe specific aspects of HED flight behavior around barriers and to assess the potential to discourage road crossing with various mitigative measures (e.g. planted vegetation, netting, etc.) (D. Soluk, pers. comm., 2012). Observations at the I-355 bridge during 2014 indicate that the presence of white cloth directly under the bridge did not increase flight activity under the bridge (Soluk *et. al.* 2015). Separate experiments conducted from 2012 to 2014 in Door County, Wisconsin indicate that diversion netting deters HED from attempting to cross roadways (Soluk *et. al.* 2014, 2015) and that decreasing vehicle speed would reduce HED mortality during road crossings (Furness 2014; Soluk *et. al.* 2015).

All-Terrain Vehicles

All-terrain vehicles (ATVs) have caused impacts to wetland vegetation and rivulets in Hine's emerald dragonfly breeding habitat. A year after HED larvae were found at Blue Flag Fen in Missouri, extensive damage from an ATV trail and associated rutting had altered the hydrology of the fen, resulting in surface water at the site becoming reduced and confined (Walker and Smentowski 2005). Damage from ATV activity was reported at rivulet 2N in Lockport Prairie Nature Preserve in Illinois (Soluk 2008). The rivulet was damaged when deep (up to 40 centimeters (15.75 inches)) ruts caused by an ATV led to altered flow paths for this stream channel, with the channel moving as far as 16.5 ft. (5 m) off of its previous configuration. Extensive down-cutting through organic soils was observed, as well as heavy silt deposition with dead adult crayfish embedded in the silt. Moore (2005) and Vogt (2005) recommended using fencing, planted vegetation, or 'shot rock' as a barrier to ATV encroachment.

USFWS HED Recovery Plan

The objective of the USFWS HED Recovery Plan is to assure the long-term viability of the HED populations (USFWS 2001). When this is achieved, the HED may be removed from the federal list of endangered and threatened wildlife and plants. One of the main goals of this HCP is to positively contribute to the objective of the USFWS HED Recovery Plan. The USFWS HED Recovery Plan provides criteria for reclassifying the HED from endangered to threatened and criteria for removing the HED from the federal list (e.g. delisting). The criteria for delisting are provided below.

Goals of the USFWS HED Recovery Plan:

The Hine's emerald dragonfly will be considered for delisting when all of the following criteria are achieved:

1. Each of the two Recovery Units contains a minimum of three populations composed of at least three subpopulations. Each HED subpopulation contains a minimum of 500 reproductive adults for 10 consecutive years.
2. Within each subpopulation, there are at least two breeding habitat areas, each fed by separate seeps and/or springs.
3. For each population, the habitat supporting at least three subpopulations should be legally or formally protected and managed for Hine's emerald dragonfly, using long-term protection mechanisms such as watershed protection, deed restrictions, land acquisition, or nature preserve dedication. In addition, mechanisms protecting the up-gradient groundwatershed will also be in place within five years.

The USFWS HED Recovery Plan identifies three potential subpopulations in Illinois. The USFWS' Biological Opinion for the I-355 South Extension identifies ten habitat sites in the lower Des Plaines River Valley that make up the Illinois population and together function as a metapopulation (USFWS 2005). Two of these sites, FPDWC's Lockport Prairie and HMS' River South property, contain the largest HED subpopulations in the state.

The HED 5-year review (USFWS 2013) also identifies three Illinois subpopulations, and includes habitat sites documented since the Recovery Plan. The 5-year review characterizes the Illinois population as follows:

Illinois Subpopulation 1: Lockport Prairie Nature Preserve, River South Parcel, Middle Parcel, Romeoville Prairie, Long Run Seep Nature Preserve, and Long Run/ComEd Parcel. Although not stated, foraging activity at non-breeding sites such as River Parcel and Dellwood Park West would be included as part of this subpopulation. HED movement is documented between all of the sites on the west side of the Des Plaines River on the basis of either marked animals or observations of animals midway between the sites (Mierzwa et al. 1995; Mierzwa et al. 2010). Cross-river movement remains undocumented at this time but is inferred by daily presence at Dellwood Park West immediately across the river from Lockport Prairie. The Long Run complex of sites is believed to be largely supported by breeding at Long Run Seep Nature Preserve and possibly to a lesser extent on the Long Run Parcel; the connection with the other sites is inferred but undocumented at this time.

Illinois Subpopulation 2: Keepataw, Black Partridge, and Waterfall Glen. The sites are contiguous and movement is documented for the first two and inferred for the third site. Important breeding sites are known at Keepataw and Waterfall Glen, and both have added potential habitat as a result of recent restoration projects. However, the recently constructed I-355 extension bridge over the Des Plaines River Valley may act as a barrier to movement that may fragment this subpopulation and the Illinois population.

Illinois Subpopulation 3: Cherry Hill Woods, McMahon Fen, and Palos Fen. Only McMahon Fen is known to support breeding at this time, and only in a single streamlet. The other two sites (located outside of the CHUs) are based on single adult HED observations. The three sites are in reasonably close geographic proximity but are not contiguous, and movement is probable (there are few major barriers to movement) but undocumented at this time.

Addressing USFWS HED *Recovery Plan Goals*

HMS' HCP will contribute to each of the goals (criteria for delisting) of the Recovery Plan. The Planning Area for this HCP includes all of the habitat areas of Subpopulation 1, which is by far the

largest and most important subpopulation of the Illinois population. This HCP includes measures to protect, enhance and restore, and preserve many of the habitat areas for this subpopulation. How these measures specifically address each of these goals is described in Section 5.1.2.

Blanding's turtle

Species Description

The Blanding's turtle is medium-sized (up to 24 cm (9.4 in)) with a domed, smooth, dark carapace speckled with small, pale, yellow spots. The most distinguishing characteristics are the bright yellow coloring on the underside of its neck, a notched upper jaw, and a hinged plastron. The plastron is yellow with large dark blotches on the edge of each plastral scute, but in older turtles, the entire plastron may be black. Males are larger than females, have longer tails with the cloacal opening located behind the edge of the carapace, concave plastrons for mating, and a dark upper jaw. Females have a shorter tail with the cloacal opening located at the edge of the carapace, a flat plastron, and some light striping on their upper jaw (Kipp 2000).

Habitat and Life History

The Blanding's turtle is a semi-aquatic species that spends most of its time in wetland habitat but moves long distances over land to reach nesting locations or to move between wetland complexes. The home range of turtles studied at Chain of Lakes State Park (Lake and McHenry Counties, Illinois) have been found to be up to 2.3 ha (5.68 ac) (Rowe and Moll 1991), while at Lockport Prairie (Will County, Illinois) juveniles were found to have a home range of 4.98 ha (2.06 ac), females 12.74 ha (31.48 ac), and males 10.59 ha (26.17 ac) (Banning et al. 2006). The Blanding's turtle habitat includes the clean waters of marshes, ephemeral wetlands, vegetated ponds, wet prairies, sedge meadows, oxbows, fens, and slow-moving waters in sloughs and rivers. Adjacent uplands containing open grasslands or old fields in sandy soils are commonly used as nesting habitat. Blanding's turtles are primarily carnivorous, feeding on crayfish, snails, insects, crustaceans, worms, small fish, frogs, and aquatic plants. The turtle is a long-lived species; individuals require 14 to 21 years to reach sexual maturity and can live up to 75 years. Blanding's turtle typically have high adult survival rates, but low reproductive success and small clutch sizes. Females nest in late May and June and may lay one clutch of 3-17 eggs. Nests are often depredated by raccoons, foxes, skunks, domestic dogs, and other small mammals. Reproductive success, as well as the survivorship of juvenile and adult turtles, is important for maintaining stable populations of this long-lived species (Congdon et al. 1983; Congdon et al. 1993). The turtles winter most often underwater, partially buried in soft substrate.

Range and Location

The Blanding's turtle range is concentrated in the Great Lakes region, extending from southern Ontario and northwestern Pennsylvania, through Ohio, Indiana, Michigan, Illinois, Wisconsin, and southern Minnesota and is found in Nebraska, Iowa, and extreme northeastern Missouri.

Figure 10 in Appendix A shows the parcels with known recent (2002-2014) Blanding's occurrences in the Planning Area. This figure shows that the Blanding's turtle has been found recently in a number of parcels throughout the Planning Area including Lockport Prairie, Romeoville Prairie, HMS' Middle, North, Far North, and River North Parcels and the adjacent ComEd ROWs and HMS' Long Run and ComEd Parcels. In addition, River South and River Parcels contain suitable habitat for Blanding's turtles. Until 2015, Lockport Prairie and Romeoville Prairie were the only sites within the Permit Area where formal studies and surveys had been conducted (Dreslik et al.

2005; Banning et al. 2006; Banning & Dreslik 2010). In 2015 Feng and Dreslik (2015) conducted a survey of Blanding's and spotted turtle on a number of HMS' parcels within the Permit Area.

Studies and Surveys within the Planning and Permit Areas

In Lockport Prairie, 42 Blanding's turtles are estimated to occur (Banning et. al 2006). A Population Viability Analysis (PVA) conducted in 2006 showed that over the next 50 years the LPNP population of Blanding's turtles has a 27.5% chance of extinction and is currently experiencing a negative growth rate (Banning et al. 2006).

Blanding's turtle has been found on HMS' parcels a number of times in the past few years. In the spring of 2015, the Illinois Natural History Survey (INHS) captured six juvenile Blanding's turtles on Middle Parcel, one hatchling on River North Parcel, and three adults and one juvenile on ComEd Parcel (Feng and Dreslik 2015). Prior to this, presence on Middle Parcel was inferred based on three adult turtles observed crossing the access road north of Middle Parcel, one in the late 1990s, one in June 2011, and one in June 2013 (Mierzwa, unpublished field notes). The turtle observed in 2013 was entering North Parcel, and the other two were headed toward Middle Parcel. In April 2012, a Blanding's turtle was found in the southeast corner of ComEd Parcel along the access road that runs along its boundary with Long Run Parcel, and another was found in May 2014 in the northeast corner of Long Run Parcel near a crude oil cleanup area (J. Mengler, pers. comm., 2014). In 2009, INHS conducted a turtle study in Romeoville Prairie during which time a female Blanding's turtle was radio tracked to the Far North Parcel, south of the preserve (Banning and Dreslik 2010). While tracking this female, another female and juvenile Blanding's turtle were found in the same area and tracked to River North Parcel. In addition, a gravid female Blanding's turtle was found dead on the east shoulder of Rt. 53 near the southwest corner of Far North Parcel in 2008 (Banning and Dreslik 2010). Prior to these sightings, the last observation of a Blanding's turtle on HMS property was reported about 20 years ago (Mierzwa 1996). A single adult Blanding's turtle was also observed crossing the road east of the existing quarry, near the southeast end of Middle Parcel in 1994, and a juvenile Blanding's was observed on River South Parcel in 1995.

Conservation Status

The Blanding's turtle was listed in Illinois as a state threatened species in 1999 (Dreslik and Philips 2006) and changed to state endangered in 2009 (IESPB 2009) because it was formerly wide-spread but was nearly extirpated from Illinois due to habitat destruction, collecting, or other development pressures (IESPB 2012). Blanding's turtle was petitioned in 2012 for federal listing (CBD 2014). A 90-day "substantial" finding was published by USFWS on July 1, 2015, indicating that listing may be warranted for the Blanding's turtle (after further review). The IUCN (2014) listed the Blanding's turtle as endangered in 2013 due to its extensive, slow decline in population size.

Although Blanding's turtle has become one of the most well-studied species of freshwater turtle in the U.S., studies to date are strongly site-specific and of limited spatial and temporal scale. Data on range-wide population dynamics and viability remain scarce (Congdon et al. 2008); therefore, it remains difficult to make range-wide statements on long-term viability.

Most populations are small, scattered, and disjunct. Large populations are known in only a few locations range-wide. The largest population is in Nebraska, with an estimated 130,000 individuals, or 20-57 turtles per hectare (Congdon et al. 2008).

In Illinois, the Blanding's turtle was formerly widespread, but at the time of listing (1999) was considered to have been nearly extirpated from Illinois due to habitat destruction, over-collecting,

or other pressures from the development of the state (IESPB 2012). As early as the late 1800s, researchers began noticing the Blanding's turtle disappearance from the prairie wetlands of Illinois (Congdon et al. 2008). The Blanding's turtle was likely historically more wide-spread throughout Illinois, primarily throughout the northern third of the state, but today the species' range is limited to northern and northeastern Illinois in localized, small, often isolated sub-populations. The highest concentration of Blanding's turtles occurs in northeastern Illinois, interestingly coinciding with the highest human populations within the state (McHenry, Lake, Kane, Cook, DuPage, and Will Counties). A combination of factors may explain this, including the highest historic population density in this region of Illinois relative to the rest of the state, plus the presence of a significant number of parks and preserves in this region as compared to that in the rest of the state, which is largely cropland (IESPB 2013).

NatureServe (2014) estimates that the short-term trend for the global, range-wide population spans from relatively stable to an expected decline of 30%. The long-term trend for the species is an anticipated global decline of 30-50%. According to NatureServe, the range-wide conservation status of Blanding's turtles is as follows:

- S1 (Critically Imperiled) – Missouri, New Hampshire, Pennsylvania, South Dakota, Nova Scotia, Quebec
- S2 (Imperiled) – Indiana, Maine, Massachusetts, Minnesota, New York (S2/S3), Ohio
- S3 (Vulnerable) – Illinois, Iowa, Michigan, Wisconsin (S3/S4), Ontario
- S4 (Apparently Secure) – Nebraska

The U.S. state listings for Blanding's turtles are as follows (sources: state DNR and Fish and Game sites):

- State Endangered (protected from take) – Illinois, Indiana, Maine, Missouri, New Hampshire
- State Threatened (protected from take) – Iowa, Ohio, Massachusetts, Minnesota, New York,
- State Special Concern (protected from collecting/poaching) – Michigan, Wisconsin,
- State Candidate (status currently under review) – Pennsylvania
- Unlisted – Nebraska, South Dakota

In Canada, the Blanding's turtle is federally endangered in Nova Scotia and federally threatened in Ontario and Quebec.

Threats

Major threats to the species include road mortality (from both road crossings and attempted nesting along gravelly roadside edges), development of upland nesting habitat, wetland degradation and loss, habitat fragmentation, egg predation by over-abundant predators (e.g. raccoons), collecting for the pet trade, and inherent factors such as delayed sexual maturity and low fecundity. Wetland degradation and loss is not limited to direct wetland impacts. Indirect impacts such as water level draw-down and pesticide drift from adjacent crops into wetlands can also lead to Blanding's turtle mortality (WDNR 2006; Congdon et al. 2008).

Addressing Blanding's Turtle Recovery Goals

The Blanding's turtle is not currently federally listed, and thus a federal Recovery Plan has not been prepared for the species. The Blanding's turtle is state-listed in Illinois; however, the Illinois DNR

has no current plans to develop a state-wide recovery plan. The Illinois Endangered Species Protection Board (IESPB) and IDNR had intended in 2012 to develop a recovery plan for the Blanding's Turtle, but were not able to complete that effort. Currently, there is no plan or schedule to work on a state-wide recovery plan for the species. The IESPB and IDNR jointly developed a Conservation Assessment document for internal conservation planning and recovery strategies, but it has not been approved and released for public use because some of the guidances may not conform to state endangered species laws without special permitting (i.e. captive breeding and reintroduction) (IESPB 2013).

Potential Blanding's turtle habitat

Blanding's turtles have been found throughout much of the Planning Area with recent documented occurrences in all of the HED Critical Habitat Units (CHUs 1-3 & 7) (Figure 10). Findings in recent years indicate that Blanding's turtle is more widespread in the lower Des Plaines River Valley than previously thought. This may be in part due to their long travel distances (Banning et. al. 2006) and indicates that suitable habitat is present in much of the Permit and Planning Areas. Figure 12 in Appendix A shows the mapped potential habitat of Blanding's turtles, on HMS' properties within the Permit Area. Table C-4 in Appendix C shows the habitat rankings for Blanding's turtle's potential use of HMS' properties based on vegetation mapping. Table C-5 shows the acres of high, moderate, and low ranked potential habitat for Blanding's turtle on each HMS parcel within the Permit Area. Only 29.14 acres of moderate or high-ranking potential Blanding's turtle habitat is found in Middle Parcel. This consists of cattail and *Phragmites* dominated marsh, wet-mesic dolomite prairie, and old-field vegetation (Table C-4). Most of the parcel (95.75 acres) has been disturbed in the past (e.g. filled or scraped), and these areas are considered low potential habitat. In addition, barriers to access to the site also limit the turtles' use of the parcel.

Spotted turtle

Species Description

The spotted turtle is a small turtle (up to 12 cm (4.7 in)) with a smooth, broad, dark carapace dotted with small yellow spots. The head is spotted or uniformly dark and the limbs are dark above and yellow to orange below. The plastron is not hinged. It is yellow or orange with a black blotch covering a portion of each scute. In some males or older females, the black pigment may cover nearly the entire plastron. Mature males usually have a tan chin, brown eyes, a slightly concave plastron, and an elongated and compressed carapace. Mature females have a yellow or orange chin, orange eyes, a flat plastron, and a rounder carapace (Ernst et al. 1994).

Habitat and Life History

The spotted turtle is a semi-aquatic species that spends most of its time in wetland habitat, but often moves into uplands as it travels between wetland complexes or to aestivate. Spotted turtles are known to aestivate on land or in aquatic habitats for long periods during times of drought and during the warmest times of the summer. Spotted turtles inhabit shallow vegetated wetlands with a soft substrate, including shallow marshes, sedge meadows, cattail marshes, and wet dolomite prairies. Females nest in open, sunny locations with moist, well-drained soils in sedge meadows and wet prairies. Turtles winter in muskrat or other small mammal burrows or in shallow water in the soft organic substrate. Spotted turtles are omnivorous, feeding on crayfish, worms, snails, insects, crustaceans, aquatic plants, and algae. They are a long-lived species, requiring 7 to 14 years to reach sexual maturity (Ernst et al. 1994). Females nest from May to July and may lay one clutch of 3-5 eggs. Spotted turtles studied in Lockport Prairie in the Des Plaines River Valley had home

ranges that averaged between 2.59 ha (6.4 ac) (females) to 5.26 ha (13.0 ac) (males) (Banning et al. 2006). Common predators include raccoons and muskrats (Harding 1997).

Range and Location

Nationally, the spotted turtle range is concentrated in two main areas: the Great Lakes region and along the eastern seaboard. The Great Lakes region extends from northeastern Illinois into the western and southern lower peninsula of Michigan, northern Indiana and Ohio, western Pennsylvania, and southern Ontario (Wilson 1994). In Illinois, the spotted turtle is limited to the lower Des Plaines River Valley. Figure 11 in Appendix A shows the parcels within the Planning Area with known recent spotted turtle occurrences. These include only Lockport Prairie and Romeoville Prairie. However, like the Blanding's turtle, suitable habitat occurs in the Planning Area outside of these preserves.

Studies and Surveys within the Planning and Permit Areas

The first formal spotted turtle survey was conducted on HMS properties by the INHS in spring 2015, but no spotted turtles were found. Surveys have also been conducted in surrounding nature preserves, and spotted turtles have been documented in both Romeoville Prairie Nature Preserve and Lockport Prairie Nature Preserve (Anthonysamy 2012; Banning et al. 2006). At the time of the study, Lockport Prairie was believed to support a population of 81 spotted turtles, or 2.2 per hectare (Banning et. al 2006). No estimate was calculated for Romeoville Prairie, but the population is believed to be considerably smaller.

During HED survey work conducted since 1994, incidental observations of turtles were noted. No spotted turtle was ever observed within HMS property, though several other species were encountered, including Blanding's turtles (Mierzwa, unpublished field notes). Spotted turtles appear to be more ecologically-constrained than Blanding's turtle, requiring higher quality marshes and sedge meadows than that which Blanding's turtles will tolerate. In addition, unlike Blanding's turtles, spotted turtles will not use larger rivers such as the nearby Des Plaines River for dispersal (Anthonysamy 2012; Banning et al. 2006). To date, it is presumed that spotted turtles do not occur within the HMS properties, and those present within the surrounding nature preserves are remaining onsite and not migrating into the lower-quality habitats available within the HMS Permit Area.

Conservation Status

The spotted turtle became listed as a state endangered species in Illinois in 1977 due to restricted habitats or low population levels in Illinois (IESPB 2012) and was petitioned in 2012 for federal listing (CBD 2014). A 90-day "substantial" finding was published by USFWS on July 1, 2015, indicating that listing may be warranted for the spotted turtle (after further review).

The spotted turtle is considered a critical species for state conservation according to the Illinois Comprehensive Wildlife Conservation Plan (IDNR 2005). A critical species is defined in the previously referenced plan as "Illinois' species in greatest need of conservation that need to be managed within the natural division, if they are to be effectively conserved in Illinois."

The spotted turtle was listed in the IUCN red list as endangered in 2013 (IUCN 2014). The IUCN states that over that past 25 years, the spotted turtle has likely sustained a 50% reduction in range-wide population size due to mortality factors such as road collisions, illegal collecting, habitat loss, and predation.

Range-wide, spotted turtle populations are scattered, localized, and disjunct, with numerous local populations ranging from a few individuals upwards to an occasional population of over 1,000 individuals. Great Lakes populations appear to be most at-risk, but eastern populations recently appear to be in trouble as well. Range-wide habitat and population studies are limited, but most studies agree that overall, the species may be in decline (CITES 2013, and references therein).

In Illinois, the spotted turtle has always had a limited distribution and is believed to have historically occurred only within the northeastern counties, particularly within the marshes and wet prairies of what later became the greater Chicagoland area (Cook County). For years, the spotted turtle was feared extirpated from Illinois until three populations were discovered in Will County in the early 1980s along the Des Plaines River. One population is located on private land and faces development pressure and the remaining two are protected in Illinois Nature Preserves. No spotted turtles have been found in Cook County since the early 1950s (Dreslik et al. 1997). Today the species appears to be limited to Will County (INHS 2004).

Nature Serve (2014) estimates that the short-term trend for the global, range-wide population spans from relatively stable (e.g. southern New England) to an expected decline of 30%. The long-term trend for the species spans from a possible global population increase of 10-25% to a decline of 30%, depending on location. According to Nature Serve, the range-wide conservation status of spotted turtles is as follows:

- S1 (Critically Imperiled) – Illinois, Vermont, District of Columbia, West Virginia, Quebec
- S2 (Imperiled) – Indiana, Michigan
- S3 (Vulnerable) – Ohio, Maine, New Hampshire, Delaware, New Jersey, New York, Pennsylvania, North Carolina, Georgia, Florida, Ontario
- S4 (Apparently Secure) – Connecticut, Massachusetts, Virginia
- S5 (Secure) – Maryland, Rhode Island, South Carolina

The U.S. state-listings for spotted turtles are as follows:

- State Endangered (protected from take) – Illinois, Indiana, Maine, Vermont
- State Threatened (protected from take) – Michigan, Ohio, South Carolina
- State Special Concern (protected from collecting/poaching) – New York, Pennsylvania, New Hampshire
- Unlisted – Massachusetts, Connecticut, Delaware, New Jersey, Rhode Island, Maryland, Virginia, West Virginia, North Carolina, Georgia, Florida

In Canada, the spotted turtle is federally endangered in Ontario and Quebec.

Threats

The greatest threats to the spotted turtle are habitat loss and fragmentation due to invasive plant species changing the structure of wetland communities, changes in hydrology, urban development, and collection for the pet trade industry. Spotted turtles are also vulnerable to predation by over-abundant predators such as raccoons. In addition, spotted turtles appear to be poor dispersers; new habitat opportunities are unlikely to be colonized, and isolated populations are unlikely to find each other. Delayed sexual maturity and low fecundity also limit population growth of the species (Harding 1997; Harding 2013).

Addressing Spotted Turtle Recovery Goals

The spotted turtle is not currently federally listed, and thus a federal Recovery Plan has not been prepared. The spotted turtle is state-listed in Illinois, but currently there are no plans to develop a state-wide recovery plan.

Potential Spotted Turtle Habitat

Spotted turtles, thus far, have been found in two nature preserves in the Planning Area (Figure 11) and, like the Blanding's turtle, suitable habitat occurs outside these preserves. Figure 13 in Appendix A shows the mapped potential habitat of spotted turtles on HMS' properties within the Permit Area. Table C-4 in Appendix C shows the habitat rankings for spotted turtle's potential use of HMS' properties based on vegetation mapping. Table C-5 shows the acres of high, moderate, and low ranked potential habitat for spotted turtle on each HMS parcel within the Permit Area. Only 29.14 acres of moderate or high ranking potential spotted turtle habitat is found in Middle Parcel. This consists of cattail- and *Phragmites*-dominated marsh, wet-mesic dolomite prairie, and old-field vegetation (Table C-4). Most of the parcel (95.75 acres) has been disturbed in the past (e.g. filled or scraped), and these areas are considered low potential habitat. However, based on limited confirmed occurrences of spotted turtle in the area and their limited mobility, it is unlikely that they use the parcel (see Section 5.2.4).

2.2.2 Plant Species of Concern

These species are included in the HCP, but no federal ITP or state ITA is being sought for these because they are not required for plants. There are no Federal prohibitions under the Endangered Species Act for the take of listed plants on non-Federal lands, unless taking of those plants is in violation of State law. However, before the U.S. Fish and Wildlife Service issues a permit, the effects of the permit on listed plants must be analyzed because Section 7 of the ESA requires that issuance of an Incidental Take Permit must not jeopardize any listed species, including plants.

Leafy Prairie Clover

Species Description

Leafy prairie clover (LPC) is easily distinguished from most other species of the genus east of the Mississippi River on the basis of the leaflet number, which ranges from 9 (Barneby 1977) to 31 (Gleason and Cronquist 1963) but typically is between 20 and 27 (Fernald 1950). Leafy prairie clover is a glabrous, stout, perennial herb, with one to several stems 20 to 80 cm (8 to 31 in) long arising from a hardened root crown. Leaves are alternate and oddly pinnately compound. Flowers have a lavender-purple calyx with five petals. Flowers grow on dense conic to cylindrical heads that are between 0.4 and 8.9 cm (0.15 to 3.5 in) long and 0.6 to 1.0 cm (0.24 to 0.4 in) wide (DeMauro and Riddle, unpublished data) with short peduncles, 0 to 2 mm (0 to 0.08 in) long.

Life History

LPC is a short-lived herbaceous perennial that has no capacity for vegetative spread (Baskin and Baskin 1973; Schwegman and Glass, unpublished data). In March, new ramets (stems) begin to grow from buds on the root crown just below the soil surface. By July, these ramets are 40 to 65 cm (15.7 to 25.6 in.) tall (Baskin and Baskin 1973). A single ramet will develop one or more inflorescence buds in late June. Flowering begins in late July, peaks in mid-August, and can continue until late August. Flowers are hermaphroditic and protandrous (Wemple 1970). LPC seeds ripen by early October and disperse from the erect dead ramets from late fall to early spring (Baskin and Baskin 1973). Potential dispersal vectors include wind, gravity, birds, and small mammals.

Dormant seeds are capable of forming a persistent seed bank. Seeds from Illinois populations readily germinate without scarification (R. Betz, Northeastern Illinois University, pers. comm., 1992). Germination occurs in April and by late May the seedlings have several leaves (Baskin and Baskin 1973). Spring fires appear to stimulate germination and establishment, possibly by the removal of accumulated duff and subsequent creation of more openings in which buried seeds can germinate and survive.

Habitat

Leafy prairie clover is found only in open limestone cedar glades, limestone barrens, and dolomite prairies that have shallow, silt to silty-clay loam soils over flat and often highly fractured limestone with frequent expanses of exposed bedrock at surface elevations typically between 168 and 213 m (550 and 700 ft). These habitats experience high surface and soil temperatures, generally have low soil moisture, are wet in the spring and fall, and become dry in summer (Quarterman 1989; DeMauro 1986; White 1978).

Although LPC plants can persist in partial shade, the species' preferred habitat is open sun with a soil depth from 4 to 45 cm (1.6 to 17.7 in) (DeMauro, unpublished data; Baskin and Baskin 1973), but is most abundant in 10 to 30 cm (3.9 to 11.8 in) of soil. LPC occurs in the relatively mesic and wet-mesic portions of the soil moisture gradient, typically in association with dry washes. The wet-mesic component is probably critical to population persistence, particularly in drought years. Leafy prairie clover may be reduced or excluded from areas supporting dense perennial grasses or woody vegetation due to competition and shading (Quarterman 1989; Smith and Wofford 1980).

Range and Location

The center of the LPC range is the limestone cedar glades of central Tennessee and northern Alabama, where the species is considered likely endemic (Baskin and Baskin 1973). The Illinois population is disjunctive, where it is now restricted to dolomite prairies on river terraces in the northeastern part of the state (Kurz and Bowles 1981). Several leafy prairie clover populations have been monitored in properties containing appropriate mesic to wet-mesic dolomite prairie habitat within and outside the Planning Area. These include Lockport Prairie Nature Preserve, Romeoville Prairie Nature Preserve, Lockport Prairie East, Keepataw Preserve (FPDWC 2012), and HMS' ComEd Parcel (Radke et al. 2004a, 2004b) (Figure 14, Appendix A). LPC is also found in two other locations within the Planning Area: Long Run Parcel and Dellwood Park West Nature Preserve which is located immediately south of Lockport Prairie East (Figure 14, Appendix A). Outside the Planning Area, a natural population also is found at Midewin National Tallgrass Prairie, and introduced populations are found at Des Plaines Conservation Area and Fabyan Forest Preserve (USFWS 2014a).

Table C-6 in Appendix C provides a summary of the monitoring results of population estimate and stem count surveys conducted by FPDWC staff for Romeoville Prairie, Lockport Prairie, Lockport Prairie East, and Keepataw Preserves (FPDWC 2012). This table also includes the number of plugs that were planted in Lockport Prairie East, Romeoville Prairie, and Keepataw Prairie which began in 2008. It is important to note that prior to 2007 the district counted all plants at each site and after 2007 the district created plots and counted plants located within each plot. HMS consultants (Radke et al. 2004a, 2004b) conducted surveys for the LPC on HMS' ComEd Parcel. They estimated the population to be 290 plants in 2003 and counted 3,345 plants in 2004. Estimates from 2003 were based on the number of ramets counted with the assumption of 4 ramets per plant. In addition, USFWS collected LPC seed from ComEd parcel in 2006 and 2007. Although they were not conducting a population survey, they estimated the population to be greater than 1,000 plants in

both years (M. Redmer, pers. comm., 2012). Additional LPC populations have been found in ComEd Parcel since the surveys (AES 2012) and one has been found at the far north end of Long Run Parcel near ComEd Parcel (J. Mengler, pers. comm., 2011), but no stem counts or population estimates were conducted. No other populations are known to occur within the Planning Area.

Conservation Status

The leafy prairie clover was listed as federally endangered in 1991 (USFWS 1991). The species is listed as endangered in Tennessee (Somers et al. 1989) and Illinois (Illinois Endangered Species Protection Board 1990).

Threats

Threats to the leafy prairie clover include habitat loss, competing invasive species, shade suppression by woody species and fire suppression.

USFWS Leafy Prairie Clover Recovery Plan

A Recovery Plan exists for the leafy prairie clover (USFWS 1996). The goal of the plan is delisting of the species. The recovery strategy includes enhancement and maintenance of population viability through habitat protection, management and population restoration. Delisting for the Illinois population will occur when a minimum of three populations ranked as having high viability are protected and managed for 10 consecutive years.

USFWS Leafy Prairie Clover Recovery Plan Goals

1. Identify and prioritize protection, management and restoration needs for all viable populations for each geographic region. The USFWS Leafy Prairie Clover Recovery Plan identifies Lockport Prairie, Romeoville Prairie, and Keepataw Forest Preserve. The populations on HMS' ComEd and Long Run Parcels were not known at the time the Recovery Plan was published.
2. Evaluate potential Illinois recovery sites. One site within the Planning Area is considered a high potential recovery site: Lockport Prairie East.
3. Initiate and complete preserve design and implement the protection and management required to meet recovery criteria.
    a. Develop preserve designs with protection and management of leafy prairie clover as a priority.
    b. Implement protection by seeking the highest level of protection possible for a parcel (e.g. designation as an Illinois Nature Preserve).
    c. Develop a management plan for a parcel and include leafy prairie clover.
    d. Implement management plans, including prescribed burning, exotic species control, protection from overuse and illicit activities, and herbivore damage.
    e. Increase population through enhancement of current populations or establish new populations.
4. Develop and implement population monitoring programs.
5. Conduct research to enhance recovery efforts.
6. Develop materials to inform the public about the status of the species and USFWS Leafy Prairie Clover Recovery Plan objectives.

Addressing USFWS Leafy Prairie Clover Recovery Goals
HMS' HCP addresses the biological goals and objectives of the USFWS Leafy Prairie Clover Recovery Plan through avoidance and minimization measures and restoration, management, and protection of habitat.

Lakeside Daisy
The Lakeside daisy (LD) was listed as federally threatened in 1988. The two known LD sites in Will County were established with 1,100 transplants into appropriate habitat in 1988 (Lockport Prairie Nature Preserve and Romeoville Prairie Nature Preserve). Populations at these sites continue with low to moderate success (USFWS 2010b). The USFWS issued a Recovery Plan for the species on September 19, 1990.

This plant is found in dry, rocky prairie grassland underlain by limestone. It requires open sites with full sun. Although it grows in Great Lakes states and along the Canadian shore of Lake Huron, it is named for Lakeside, Ohio, near one of its best-known sites.

The final rule (53 FR 23742) listing LD as threatened identified the threats to the survival as habitat destruction, succession of overgrowth by woody species, over-collecting for gardens, inadequacy of existing regulatory mechanisms, and the species' self-incompatibility. The most significant threats range-wide are habitat destruction and succession of woody species.

Lakeside daisy is a clump-forming, herbaceous perennial that produces solitary, daisy-like flowers on stout, hairy stalks. The leaves form dense basal rosettes that arise from a short, thick, branching base (caudex) with a similarly short, thick taproot. The narrow, one-nerved, dark green leaves, which may range to about 16 cm in length, are lanceolate (lance-shaped) to oblanceolate (narrower at the base), and in addition to being somewhat thick in texture, are strongly punctate (dotted with glands). Flowers are borne solitarily on relatively stout, softly hairy peduncles that elongate through the flowering period, ranging from about 10-40 cm in height when seeds are dispersed. The bright yellow, daisy-like flower heads, as in similar composites, are inflorescences composed of both disk (central) and ray (outer) florets, the ray florets 3-toothed on the margin. The fruits are small, top-shaped, hairy achenes. It is unlikely that flowering plants of Lakeside daisy would be confused with another species, particularly because there are very few early blooming composites and none that would even be superficially similar to this rarity (Penskar 2002).

According to USFWS Recovery Plan for the Lakeside daisy (*Hymenoxys herbacea*) (September 19, 1990):

> *Disease and predation were not listed as threats to the Lakeside daisy at the time of listing (53 FR 23742), though herbivory was included as an ecological threat to both natural and restored populations in the Recovery Plan (USFWS 1990). Predation, namely deer and rabbit herbivory, of this plant has appeared to increase within the introduced populations in Lockport Prairie Nature Preserve and Romeoville Prairie Nature Preserve in Will County, Illinois (K. Lah, pers. comm. 2006). Alternatively, inflorescences at these sites have been found on the ground next to rosettes, indicating trampling by wildlife or internal parasites, i.e., cutworms or insects, within the plants (Juanita Armstrong, Natural Resource Land Manager, Forest Preserve District of Will County, Illinois, pers. comm. 2010). These factors pose a threat to Lakeside daisy populations since rosettes are not able to regenerate if herbivory on leaves is too intense (USFWS 1990), or if significant damage to the plants is caused by other sources.*

Lakeside daisy populations are also threatened by human use of the habitat, including ATV access, which can destroy plants and habitat. The population at Hiawatha National Forest/Stratton Memorial Nature Sanctuary in Mackinac County, Michigan is threatened by ATV access due to its close proximity to a public road ROW and a utility ROW (S. Huebner, pers. comm. 2009). Non-native invasive species, such as Oxeye daisy (*Leucanthemum vulgare*); Spotted knapweed, (*Centaurea stoebe*); and Smooth brome (*Bromus inermis*) are threatening Lakeside daisy with their introduction through ATV access (S. Huebner, pers. comm. 2008, 2009). To protect this population, regular maintenance is required to remove nonnative invasive species and woody encroachment.

Climate change may be a serious threat for a rare, endemic plant species like the Lakeside daisy. The habitat for the Lakeside daisy currently spans a narrow range of habitat types, including dry, limestone prairies and alvar communities, which are globally rare. According to regional precipitation and temperature models, increased temperatures and increased rainfall may alter the habitat for the Lakeside daisy in such a way that the plant cannot adapt, or invasive plants may encroach (Union of Concerned Scientists 2009). It is not known how the Lakeside daisy will be impacted by temperature or precipitation increases.

Addressing USFWS Lakeside Daisy Recovery Goals

HMS' HCP addresses the biological goals and objectives of the USFWS Lakeside Daisy Recovery Plan through avoidance and minimization measures. Lakeside daisy is not found on HMS' property and no impacts are expected from planned activities.

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3.0 PROJECT DESCRIPTION and ACTIVITIES

3.1 Project Description

HMS and its predecessor companies have been operating limestone quarries in the vicinity of Romeoville in Will County, Illinois for more than sixty years. HMS' quarry and support operations occupy over 1,400 acres at this location; it is one of the largest aggregate operations, in terms of production, in the region. This facility is unique because it is the only regional limestone production operation that can ship materials via truck, rail, and barge. Transporting limestone product by barge provides numerous benefits to the local community and to the environment. It is safer than other forms of transport, reduces traffic, improves air quality, and reduces carbon emissions. Therefore, this facility is an important and economical limestone source for both local and regional markets.

HMS proposes to continue surface mining its two currently active quarries (Pierce Eich and Middle Quarries) in its Romeoville facility, to expand surface mining into Middle Parcel, to expand surface mining of the East Quarry north into East Parcel, and eventually to perform sub-surface mining of Galena-Platteville limestone starting at a depth of approximately 350 feet below the surface throughout its facility. HMS plans to nearly complete surface mining in its Pierce Eich Quarry before resuming mining in Middle Quarry or starting mining in Middle Parcel (Figure 2 and 15.1, Appendix A). Surface mining in the East Parcel is anticipated to start around the time of completion of surface mining in the other parcels. All this surface mining is anticipated to be completed over a period of approximately 35 years. However, all surface mining that will require an ITA or ITP (Pierce Eich Quarry, Middle Quarry, and Middle Parcel) is anticipated to be completed in 30 years therefore, HMS is seeking a 30-year permit. Mining East Parcel does not require an ITP or ITA. Sub-surface mining will start prior to the completion of surface mining and may occur in approximately 15 years. Associated mining activities (e.g. crushing, conveying, screening, and stockpiling) will also occur during the permit term. These plans are explained in detail in HMS' Mining Plan found in Appendix E and summarized in Section 3.2 below. In addition, HMS will retain a small setback strip along the west side of North and Far North Parcels (350' back from Route 53) for possible future development (see Figure 16).

Most importantly for purposes of this HCP, HMS proposes to conduct activities and implement extensive measures that will avoid, minimize, and/or mitigate impacts to the Covered Species and their habitats. These activities and measures are summarized in Section 3.2 below and described in greater detail in Chapter 5 and the Restoration Plan Set (Appendix F).

3.2 Activities Covered by the Permit

According to the Mining Plan (Appendix E), HMS first will complete surface mining in Pierce Eich Quarry. As of the end of 2019, an additional 35 acres was projected to be mined in this parcel by 2026 (Figure 15.1, Appendix A). As this mining is nearing completion, HMS will resume surface mining in Middle Quarry (approximately 1 acre) and start surface mining in Middle Parcel. Mining of Middle Parcel will start at the south end (from Middle Quarry) and progress generally in a northerly direction. Mining will occur on approximately 115 acres of the 125-acre Middle Parcel and is estimated to take approximately 20 years. In addition, HMS plans to surface mine 36 acres of limestone in East Parcel located immediately north of the East Quarry. This area is part of the mining operations and includes an old settling pond for the water used at the facility (no longer in use) and mining product surge and stockpiles. This area contains no wetlands or Covered Species

habitat and will not require an ITP or ITA to mine. In total, HMS plans to surface mine 187 acres at the Romeoville facility.

While HMS does not plan to surface mine on the North and Far North Parcels (which will be preserved in perpetuity along with other parcels further described in Chapter 5), the company will retain a small setback strip along the west side of those parcels (350' back from Route 53) (see Figure 16) for possible future sale and development (e.g. commercial development). The setback areas on North and Far North Parcels are 6.49 and 10.65 acres, respectively. Both of these areas are old fill areas that have revegetated with old field vegetation and invasive shrubs and are much higher (10+ feet) than the adjacent wetlands to the east. They are marginal HED foraging habitat and low-quality turtle habitat. These areas are included in HMS' requested take due to the loss of HED habitat, including critical habitat. Any additional impacts during construction/operation of the site would be the responsibility of the owner/operator of the developed site.

Approximately 15 acres in Pierce Eich and nine acres of Middle Quarry that could be mined under the Illinois Mining Regulations will not be mined and will reduce potential groundwater impacts (Figure 15.2). This is an 11% (24 ac of 211 ac) reduction in HMS' potential surface mining area. In addition, surface mining of North Parcel (approx. 29 acres) and Spangler Property (approx. 61 acres), which were included or considered for inclusion in previous mining plans, are not a part of this mining plan. These two parcels, which would have increased the surface mining area by 48% (90 ac of 187 ac), were not added to the plan in order to prevent potential groundwater impacts. Thus, this HCP requires HMS to forego mining over 110 acres of property to ensure hydrological impacts are kept to a minimum.

The surface mining process requires removal of overburden material (i.e. soil and vegetation) prior to removing limestone along the quarry wall using explosives. Although mining (i.e. limestone removal) in Middle Parcel will not begin until approximately 2026, overburden removal will start within the first few years of the mining plan implementation. As an avoidance measure during the stripping (i.e. overburden removal) phase, the highest quality vegetation and habitat in Middle Parcel - the 6.01-acre wet dolomite prairie located in the central portion of the parcel, will be carefully salvaged and transplanted to a mitigation parcel (ComEd Parcel).

In approximately 15 years and before surface mining operations are complete at the Romeoville facility, HMS will begin sub-surface mining operations at the facility. Underground mining will take place in the Galena-Platteville formation located approximately 200 feet below the bottom of the quarries (approximately 350 feet below ground surface) and will occur under each of the three surface mined parcels included in this plan (during the permit period) as well as other HMS parcels (after the permit period). HMS plans to use the room and pillar method of extraction for its sub-surface mining.

In addition to the actual mining of limestone, other associated operations at the Romeoville facility, such as crushing, washing, and sizing of limestone; truck, rail, and barge loading; and other support activities, are required for processing and shipping the limestone. A marine operation and a maintenance shop also are located at the facility and will continue to operate for the duration of mining activities.

HMS also will undertake various, extensive habitat restoration and management activities that will be covered by the ITP and ITA. These activities will include, among others, cutting and applying herbicide to invasive shrubs and trees, applying herbicide to invasive herbaceous species, seeding

and planting native species, conducting prescribed burns, and discing and tilling soil in specific locations. In addition, a gravel road covering 0.39 acres and a number of temporary routes will be constructed through the ComEd Parcel and a small portion of Long Run Parcel for access during the wet dolomite prairie transplant and other restoration activities. The transplant will involve the removal of fill material from the ComEd Parcel and placement of 6.01 acres of wet-mesic dolomite prairie from Middle Parcel into the ComEd Parcel. In addition, a number of measures will be taken to avoid or minimize impacts during these activities. These activities and measures are described in more detail in the mitigation sections of Chapter 5 and the Restoration Plan Set (Appendix F).

In addition to habitat restoration activities, HMS plans to implement a number of measures to avoid potential groundwater impacts to the HED and other Covered Species habitat, which have been developed after years of hydrological studies. These include the installation of infiltration galleries in the River South Bluff Parcel and creation of an infiltration pond on FPDWC property in the southwest corner of Route 53 and Renwick Road. These measures are discussed more in Chapter 5.

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4.0 ALTERNATIVE ANALYSIS

For a number of years, Hanson Material Service (HMS), has been exploring and evaluating several operational strategies for conducting business in the HCP Permit Area. HMS has explored strategies to minimize anticipated stresses to the Covered Species and their habitats from future mining. This section outlines the alternatives HMS considered, the preferred alternative chosen, and consequences associated with each.

HMS considered and analyzed a number of different mining plans that would reduce impacts to the Covered Species and/or designated Critical Habitat while meeting the company's need to continue surface mining at the Romeoville Quarry. These included surface mining various combinations of parcels at the Romeoville facility, subsurface mining, and surface mining at other quarry locations (the "no-action" alternative). Detailed economic, biological, and hydrological studies informed and guided the alternatives analysis process. Upon concluding this analysis, HMS determined that the alternatives would not achieve the purpose and need of this project and/or would be more detrimental to the Covered Species than the preferred alternative. Table C-7 (Appendix C) compares the potential impacts of surface mining each parcel included in this analysis and subsurface mining.

4.1 No-Action Alternative

Under the No-Action alternative, the HCP would not be implemented and USFWS would not issue the requested ITP. In other words, no activities that would result in "take" of Covered Species or modification of Critical Habitat (CH) would be conducted, no permit would be obtained, and no conservation or mitigation plan would be implemented.

No-action for HMS means very limited future surface mining and no subsurface mining at HMS' Romeoville facility. Because no ITP would be sought, an HCP would not be completed and no ecological restoration or management of HMS' other parcels that provide Covered Species habitat or potential habitat would occur. The only surface mining that would take place at the Romeoville facility, under the No-Action Alternative, would be in East Parcel (36 acres) at the north end of East Quarry. This area can be mined without a permit because no impact to the Covered Species or their habitat, including indirect groundwater impacts, can be ascertained as a result of this mining. This alternative would deprive HMS of the opportunity to quarry all but a very small amount of the remaining surface reserves in the Des Plaines River Valley. As a result, mining operations at the Romeoville facility would be limited to mining just East Parcel, which will likely be completed in approximately five years and the company would not be able to mine further until the Covered Species are no longer listed - unlikely to occur for decades. This would result in HMS losing 57 million tons of surface stone reserves and more than 300 million tons of subsurface reserves, which were acquired and, in most cases, permitted for mining prior to the listing of the Covered Species, costing the company millions of dollars in profit. Moreover, over 205 well-paying jobs would be lost and would severely damage the local economy.

Since this alternative includes very limited mining at the Romeoville facility (36 acres in East Parcel), the local area would have to be supplied largely with limestone from other quarries outside the region. The Romeoville area market, like many limestone markets, is a localized market, due in large part to the high cost of truck delivery. The typical truck delivery distance from the Romeoville facility to HMS customers is approximately 10 miles. The next closest HMS limestone location is the Federal Quarry in McCook, Illinois, approximately 20 miles from Romeoville. The increase in

delivery distance increases the delivered cost of the limestone to customers, meaning limestone for the Romeoville area could not be supplied economically from other HMS locations.

The Romeoville facility is unique because it is the only regional limestone quarry that can ship materials via truck, rail, and barge. Therefore, this facility is a critical limestone source for HMS serving both local and regional markets. Because of its location on the Chicago Sanitary and Ship Canal, limestone products can be shipped from this location on barges to distant customers. In fact, approximately two-thirds (or 67%) of the products from the Romeoville facility (approximately 1.3 million tons each year) are shipped via barge. Barges carry aggregate to various locations along the Illinois Waterway system from Chicago to Peoria. If the Romeoville facility were no longer in operation, all of this material would have to be supplied via truck, which is costlier and significantly less fuel-efficient than shipping by barge and increases air pollution and carbon generation. Barges can move one ton of cargo 514 miles on a single gallon of fuel, while trucks can haul the same amount of cargo on one gallon of diesel fuel only 59 miles. In addition to the increase in fuel consumption to ship aggregate by truck, there would be increased equipment use and manpower, raising costs even more. This translates to at least $5 more per ton to ship from Romeoville to Chicago by truck rather than by barge - more than a 300% increase in costs. The change in the transportation mode from barge to truck would cost an additional $6.5 million to transport this same material.

Using barges to transport aggregate material reduces the number of trucks on the road as well as the associated diesel emissions. In order to ship 1.3 million tons (average annual barge shipments) of aggregate material by truck, an additional 59,000 truck shipments would be on the surface roads and interstates around Chicago annually. Truck shipping emits considerably more air pollutants than barge shipping due to the increased amount of diesel fuel consumed by trucks. The difference in the amount of air contaminants emitted during truck and barge shipping is listed in Table 4 below.

Table 4. Air emissions produced transporting aggregate material.

Air Emissions (Grams/Ton-mile)				
	Hydrocarbons	Particulate Matter	Nitrogen Oxides	Carbon Monoxide
Barge	0.014123	0.007955	0.27435	0.0432
Truck	0.10	0.06	1.45	0.37

Based on the above emissions, the increased truck traffic would significantly increase air pollution in the Chicago area. Therefore, transporting aggregate product by barge benefits the local community and the environment by reducing traffic, improving air quality, and reducing the quarry's carbon footprint. In addition, far fewer accidents and fatalities are associated with shipping freight by barge than by train or truck. There is one injury in the marine transport sector for every 95 in rail and 1,609 in the highway sector as well as one fatality in the marine transport sector for every 18 in rail and 132 in the highway sectors. Barge delivery is not available at other HMS facilities in the Chicago area. This transportation option is critical to HMS' operations.

Perhaps most importantly, the no-action alternative would also result in no ecological restoration or management of Middle Parcel or other HMS parcels that provide Covered Species' habitat or potential habitat (i.e. Fitzpatrick Seep, River South, ComEd, Long Run, River, North, Far North, and River North Parcels). These are the largest undeveloped, unprotected, and unmanaged private

parcels that provide habitat for the HED in Illinois and habitat for the other Covered Species in the Lower Des Plaines River Valley. They represent a potential linkage across the landscape that would reduce genetic and population isolation between protected lands that contain the Covered Species. As such, these lands represent some of the most promising locations for habitat restoration for the maintenance and expansion of the HED, Blanding's and spotted turtles, and LPC habitats and populations in the Des Plaines River Valley. Without the active management of these sites, the current and potential future habitat they contain will continue to degrade. This includes Middle Parcel, which will not be mined under this alternative, but without management its adult HED habitat (40.81 acres), Blanding's turtle habitat and potential spotted turtle habitat (29.14 acres) will continue to degrade and eventually will be lost.

The negative effects of invasive herbaceous species, such as narrow-leaved cattail, reed canary grass, and common reed and invasive woody species, on the HED habitat has been listed as a threat to the species in the HED Recovery Plan (USFWS 2001) and 5-Year Review (USFWS 2013). Mierzwa (2007) suggests that dense cattail growth and resulting thick thatch layer may inhibit adult HED use of breeding habitat. Other research indicates that common reed and reed canary grass degrade larval habitat areas by reducing crayfish burrow densities (USFWS 2013) that are critical for HED larval survival. In addition, in-field observations suggest that adult HED avoid heavily wooded areas (USFWS 2013).

Other research also has documented the negative impacts of invasive species' encroachment on native plant communities (Apfelbaum and Sams 1987; Apfelbaum 1985). Species such as reed canary grass, cattail, and common reed form dense monocultures that prevent the growth and reproduction of native plant species. Diverse native plant communities provide food, shelter, nesting space, and protection for wildlife. For example, foliage height diversity has been positively correlated with bird species diversity, and later-stage successional communities support a greater diversity of wildlife (Morrison et al. 2006). Declines in oak savanna species diversity have been correlated to declines in breeding bird and butterfly species diversity (Haney and Apfelbaum 1990). Remnant communities are generally higher quality than other communities (e.g. greater diversity) and many species of prairie- and savanna-inhabiting insects in the Chicago region are known to be remnant-dependent (Panzer et. al.1995). Research has also documented that invasive herbaceous (e.g. common reed and reed canary grass) and woody (e.g. buckthorn) species can negatively affect the behavior and habitat of adult and larval HED (USFWS 2014b). Therefore, as plant communities in the Planning Area succumb to invasion and lose diversity, it is reasonable to expect subsequent declines in wildlife species diversity (Apfelbaum and Chapman 1997; Haney and Apfelbaum 1990). The substantial decline of habitats as a result of invasion by exotic and weedy species, as described above, will reduce the ability of HMS' parcels and other habitat areas to support the HED, the covered turtles, and LPC.

Lastly, this ("No Action") alternative also does not include any of the groundwater impact avoidance measures proposed by HMS under the Preferred Alternative with the complete conservation package (i.e. River South Bluff Parcel infiltration gallery and Forest Preserve District of Will County (FPDWC) infiltration pond). While the proposed groundwater enhancement measures are intended to prevent groundwater impacts from future surface mining, these engineered enhancements are flexible in their design and may be utilized to prevent or reduce unforeseen groundwater impacts to wetlands habitats from other anthropogenic sources, such as increased withdrawal of nearby community water supply wells and/or citing of new production wells. The proposed hydrological enhancements under the Preferred Alternative provide the flexibility of supplying additional water in periods of extended droughts. HMS will provide additional water to

address the above situations only if directed to do so by the regulatory agencies. The Preferred Alternative also offers long-term solutions to maintaining local hydrology in wetland habitat areas by plugging the tunnel under Rt. 53 and allowing the Pierce-Eich Quarry's groundwater level to return to historic levels after surface mining is complete. The benefit of improving local hydrology will not be realized under the No Action Alternative. There are no plans under this scenario to plug the tunnel under Rt. 53 to seal off the Pierce Eich Quarry in order to increase groundwater levels.

Thus, the No Action Alternative is rejected because it is impracticable. It would (1) effectively shut down Hanson Material Service's operations in Romeoville in approximately five years, thus failing entirely to achieve HMS' purpose and need; (2) increase local market costs, and increase road traffic and resulting pollution; and (3) without any mitigation measures, it would result in continued degradation of the Covered Species' habitat, reducing the likelihood of survival and recovery of the Covered Species in the wild.

4.2 Subsurface Mining Alternative

The next alternative HMS considered was underground mining. In order to subsurface mine, an extensive engineering plan and stone analysis will need to be prepared. Until this work is completed, the option to underground mine is a consideration and may be practicable, but it is not certain that this alternative is viable. This alternative would allow HMS to continue its mining operations at its Romeoville Facility. Subsurface mining would extract aggregate from the Galena-Platteville Groups, which are located approximately 300 to 700 feet below ground surface at the Romeoville Facility. These units underlie the shaley and argillaceous bedrock formations within the Maquoketa Group. Due to the low permeability of the Maquoketa Group, they act as a regional aquitard limiting the vertical transmission of groundwater from the overlying Silurian Aquifer.

The Silurian Aquifer discharges into the Des Plaines River Valley supplying groundwater to seeps and wetlands that support HED and other Covered Species habitat. Subsurface mining would require penetration of the entire thickness of the Silurian Aquifer, so impacts to local hydrology may occur. The access shaft and ventilation shafts that penetrate the lower Silurian Bedrock and the Maquoketa Aquitard would require avoidance measures to be installed to prevent the potential loss of water from the Silurian Aquifer. The decline tunnel entrance (the decline) will most likely emanate through the base of one of the existing quarries. Hydraulic controls will be put into place to limit groundwater flow into the decline from the exposed portion of the Silurian Aquifer. Only the lowest reaches of the Silurian Aquifer will be exposed in the decline if it is advanced from the floor of the Quarry.

In order to construct the decline, a groundwater control program will be implemented to decrease groundwater flow from the aquifer through the Brainard (uppermost) Formation of the Maquoketa Group. Limiting groundwater seepage through the decline is necessary for not only the prevention of head loss in the Silurian Aquifer but also tunnel stabilization and worker safety. The groundwater control program will most likely entail probing during advancement of the decline to test the hydraulic characteristics of the bedrock. Typical Chicago area groundwater control measures for underground mining will be used to ensure groundwater does not enter the subsurface mine through the decline. Potential effects on the Silurian Aquifer are minimal since seepage to the decline will be minimized and any trivial water loss would occur at the base of the quarry, so it would be hydraulically isolated from the upper potentiometric surface outside of the mined area. Similarly, ventilation shafts would be constructed with avoidance measures to prevent groundwater from entering the subsurface mine and avoid dewatering of the Silurian Aquifer.

To prevent water from flowing from the upper aquifer into the decline tunnel and ventilation shafts, they are planned to be constructed and sealed progressively, in short increments, with a hydrostatic lining through the water bearing strata. The hydrostatic liner consists of a substantial thickness of reinforced (fiber, mesh, or both) structural concrete applied to the perimeter walls of the decline or shaft to resist water pressure. The liner thickness will be approximately 12 to 21 inches. The hydrostatic liner will be keyed into the low permeable rocks of the Maquoketa Group to ensure hydraulic short-circuiting does not occur. When the decline tunnel reaches dry strata, a grout plug will be formed around the tunnel at the junction in the rock to stop water tracking down the back of the lining into the Scales Shale. Further field investigation is being planned to evaluate site specific conditions at the decline and shaft locations, with the investigation results being used to inform the hydrostatic liner designs.

Although head loss within the Silurian Aquifer is not anticipated from any dewatering that might occur below the aquitard (STS/AECOM 2008), HMS would pursue an incidental take permit because of the potential for minor impacts to the Silurian Aquifer. Under this scenario, however, the Pierce Eich Quarry would not be inundated with water because access and ventilation shafts will be advanced from the bottom of this and other existing HMS quarries as well as other areas.

Subsurface aggregate mining presents numerous challenges, including design constraints, structural integrity, additional safety measures, and product quality, which influence whether a company can even contemplate subsurface mining. Before beginning subsurface mining, extensive core sampling of the limestone needs to be completed. To date, only limited sampling of the limestone to determine quality has been performed. Once it is determined that the subsurface limestone can be marketed, the room and pillar design and height of the rooms of the mine will be determined based on the limestone's structural strength.

Subsurface mining is also costlier and requires more time to develop than surface mining, for several reasons. Subsurface mining requires the development of declines into which trucks, conveyors, and operators will descend and through which limestone will be routed back to the surface processing plant and stockpiles. Constructing such decline shaft and initial bottom work typically takes 12-18 months. Therefore, after factoring in time for engineering and planning (approximately 6 months), it typically takes at least two years to get an underground mine to start producing limestone. In contrast, extending an existing surface mine can occur within days. In addition, both capital and operational costs are higher for underground mines; subsurface mining requires additional infrastructure, such as a ventilation system, an underground power distribution system, roof bolting (to prevent collapse) and rib scaling. It also requires additional and specialized equipment (e.g. roof bolt machines) to install these systems and to operate an underground mine (e.g. underground crusher and conveyor equipment). In addition, much of the limestone must be left in place (for floors and roofs and the pillars that support them) which results in utilization of about 50% of the limestone in contrast to surface mining which utilizes about 95% of the limestone. This also results in space limitation underground which requires operational modifications that reduce extraction efficiency. Underground mining requires additional safety training of employees, air monitoring, and additional inspection and securing of the ceiling. All of these factors result in higher labor and energy costs and increased risk. In the end, these added measures result in production costs for subsurface mining that are approximately 25% higher than surface mining. In addition to higher operational costs, it is estimated that the capital costs for underground mining at the Romeoville facility for the first five years will be approximately $53M. In contrast, no additional capital costs would be required to surface mine the same amount of limestone. This

increase in costs will result in increased prices for customers which under today's market conditions would lead to a loss of market share for HMS.

This alternative would leave all the known surface limestone reserves, with the possible exception of 36 acres in East Parcel, untapped. This would jeopardize the economic viability of the proposed mining project because the added expenses to mine underground would prevent the facility from competing against other surface mines with lower expenses. It is important to note that underground mining products likely will be much more price competitive in the future when subsurface mining is proposed under the Preferred Alternative because far fewer local/regional surface mines will be in operation at that time. While the underground mining alternative would eliminate almost all of the potential impacts to listed species and their habitat, it would also, more importantly, eliminate the conservation package of the preferred alternative designed to benefit the Covered Species and their habitat. Therefore, under this alternative, the remaining habitat on Middle Parcel and other HMS parcels will continue to degrade and eventually will be lost. As a result, this alternative is rejected because it does not achieve the purpose and need of the applicant's proposed activity and, with a greatly reduced conservation package, it may reduce the likelihood of survival and recovery of the Covered Species in the wild.

4.3 Reduced Surface Mining Alternatives

Impacts to the Covered Species and their habitat also could potentially be reduced by changing/reducing surface mining in the proposed mining plan. Currently, the Pierce Eich Quarry (269 ac), Middle Parcel (125 ac), Middle Quarry (80 ac), North Parcel (31 ac), East Quarry (219 ac), and East Parcel (47 ac) are zoned to allow surface mining. There are several different ways mining can be reduced to lessen potential impacts on the Covered Species, and some are discussed below. Each of these scenarios also includes surface mining in East Parcel and sub-surface mining when surface reserves are nearly exhausted.

Reduced Surface Mining Alternative 1(Exclude Pierce Eich)

The first surface mining reduction alternative would eliminate the planned and IDNR-permitted expansion of Pierce Eich Quarry, but maintain surface mining of Middle Parcel, Middle Quarry, and East Parcel. Discontinuing mining in the Pierce Eich Quarry (as of the end of 2019) would result in a reduction in the planned surface-mined area by 35 acres, or 19% (35 of 187 acre). Ceasing operations in the Pierce Eich Quarry would prevent any potential future groundwater impacts to River South Parcel and Lockport Prairie Nature Preserve (LPNP) both of which are federally designated critical habitat for the HED and contain potential or known habitat for both covered turtles. However, under this alternative, River South Parcel and LPNP, which contain the most productive HED breeding habitat in the state, will be more susceptible to unforeseen anthropogenic impacts and possible extended drought conditions than under the preferred alternative since groundwater enhancements in the preferred alternative (i.e. AMMs) proposed for these parcels (i.e. River South Bluff Parcel groundwater infiltration gallery and FPDWC infiltration pond), which could be used to lessen the effect of these impacts, will not be implemented. In addition, Pierce Eich Quarry will not be filled because the tunnel plug under Route 53 would not be installed. Surface and subsurface mining operations would continue as planned in the Preferred Alternative in Middle Quarry and Middle Parcel. Although Reduced Surface Mining Alternative 1 would eliminate any potential future indirect mining impacts on groundwater in the habitat areas of River South and LPNP, these sensitive areas would not benefit from the planned AMMs that could buffer potential anthropogenic impacts to groundwater and extended drought, or the permanent

solution to potential groundwater impacts by allowing Pierce Eich Quarry to naturally inundate and maintain near-constant head conditions west of Route 53.

Groundwater modeling simulations indicate that surface mining Middle Parcel - without the benefit of an inundated Pierce-Eich Quarry may have some effects on hydrology of the Covered Species habitat in nearby parcels. Surface mining of Middle Quarry and East Parcel will not affect hydrology at other parcels because of the limited mining in Middle Quarry (1.3 acres) and the location of East Quarry between two hydraulic boundaries – the river and the canals. However, surface mining in Middle Parcel will likely affect groundwater levels in the adjacent North Parcel, the Midwest Generation easement parcel (located north and east of North Parcel), and the Far North Parcel. Based on long-term simulations in the groundwater model, the cone of depression from Middle Parcel extends about twice as far to the north under this alternative as it does under the Preferred Alternative (fully encompassing Far North Parcel) and may be observed in the southwest portion of River North Parcel. This alternative would not benefit from the near-constant head levels in the filled Pierce Eich Quarry, so the resulting cone of depression suggests there is a greater susceptibility to groundwater level impacts north of Middle Parcel. However, groundwater modeling results do not indicate impacts to groundwater levels in RPNP. In addition, the impacts to River Parcel from this alternative and the Preferred Alternative are similar.

The habitat of the Covered Species will remain close to current conditions on these parcels adjacent or near Middle Parcel because they are also strongly influenced by surface water. The wetlands on the North parcels are strongly influenced by surface water because of the size of the watershed that drains to them (AECOM 2014b). This is also true for River Parcel since almost all of the wetlands on the parcel are adjacent to the river and its backwaters. Restoration activities would continue to be planned for North Parcel, Far North Parcel, River North, and River Parcel to improve wetland and Covered Species' habitat conditions and offset potential groundwater impacts if this alternative was pursued. Groundwater modeling does indicate that surface-mining Middle Parcel will not impact groundwater levels in River South Parcel. Water level changes are also not projected to be impacted at RPNP, although monitoring would have to be conducted to verify these results since the extent of drawdown south of RPNP would be greater under this scenario.

All of the parcels adjacent to or north of Middle Parcel contain adult HED habitat but none contain larval habitat (Figure 9.2 and 9.3). These same parcels, including RPNP, contain known Blanding's turtle habitat, but only RPNP contains known spotted turtle habitat (Figures 10 & 11). Since there is a possible risk to hydrology at North, Far North, and River North, and the associated habitat to the Covered Species, groundwater AMMs may be required to protect these nearby parcels in this mining alternative. Specific AMMs for this alternative were not fully evaluated, since it is not the preferred alternative. However, the goal of AMMs for this alternative would be to provide hydraulic separation to limit the propagation of drawdown from Middle Parcel to parcels to the north. Two AMM possibilities would be supplementing groundwater quantities or reducing hydraulic conductivity within the bedrock to reduce the effects of quarry dewatering. Installation of a detention/infiltration pond to capture runoff on the north side of the Far North Parcel (as described in Chapter 5) would provide supplemental water to the bedrock aquifer and provide a buffer between HMS parcels and RPNP. Pumping water to a drainage way that flows to the wetlands on North and Far North Parcels could also help maintain the hydrology of these sites. Again, these AMM scenarios have not been fully evaluated and are not preferred because of performance and cost concerns.

Pierce Eich is not designated critical habitat. Therefore, the direct impact to critical habitat under this alternative would be the same as it is under the Preferred Alternative. Although mining Middle Parcel would impact 115 acres of mapped HED Critical Habitat, there is no suitable larval habitat on the parcel, and the usable adult HED habitat is only 40.81 acres (see Figures 9.2 and 17) which is not a limiting factor for HED survival. Both adult HED habitat Primary Constituent Elements (PCEs) are present on the parcel but only three of five larval habitat PCEs (1, 3, and 5) are present (see Section 5.1.6) (Note for PCE 1 that soils are hydric but not histosols). In addition, although there is recent evidence of attempts to breed on the site (i.e. territorial males), it is very unlikely, due to site conditions, that those attempts have been successful (Mierzwa 2013).

This Reduced Surface Mining Alternative 1 would have the same direct impacts to critical habitat as the Preferred Alternative, but would have less indirect impacts, such as the potential for impacts to groundwater levels in some habitat areas. However, under this alternative, the Covered Species and their habitat will not benefit from the groundwater enhancements planned for River South that are included in the Preferred Alternative.

Finally, removing Pierce Eich from the surface mining plan would leave approximately 19% of the available surface limestone reserves untapped, a fact which significantly reduces the economic viability of the proposed mining project. As explained above, this reduction in the surface mining area might reduce some environmental (groundwater) impacts at River South but other impacts would remain (i.e. impacts to critical habitat). Most significantly, a reduction in the mining plan would reduce proportionately the planned mitigation in the Preferred Alternative which is designed to benefit the Covered Species and their habitat. It would also reduce planned groundwater avoidance and enhancement measures that will buffer anthropogenic changes to groundwater supplies, and as a result help stabilize the near-term and long-term hydrology of local habitats. Because of these issues, this alternative was rejected by HMS; it achieves only a portion of the purpose and need of HMS' proposed activity and, without the complete conservation package (i.e. mitigation and AMMs), would reduce the likelihood of survival and recovery of the Covered Species in the wild.

Reduced Surface Mining Alternative 2 (Exclude Middle Parcel)

The second surface mine reduction alternative would maintain the full mine build-out in Pierce Eich Quarry, Middle Quarry, and East Parcels, but would exclude Middle Parcel from the mining plan. Eliminating Middle Parcel from the mining plan would result in the reduction of available surface mining area by 61%, or a loss of 115 acres out of an available 187 acres. Middle Parcel is the only federally designated Critical Habitat for the HED and known habitat for the Blanding's turtle in the Preferred Alternative that would be mined, so this alternative would eliminate direct impact to these protected resources. As explained under the previous alternative, although mining Middle Parcel would impact 115 acres of mapped Critical Habitat, there is no suitable larval HED habitat on the parcel and the usable adult HED habitat is only 40.81 acres (see Figures 9.2 and 17). Both adult PCEs are present on the parcel but only three of five larval PCEs (1, 3, and 5) are present (see Section 5.1.6). In addition, although breeding likely occurred (infrequently and in small numbers) on the parcel in the past (Cashatt *et. al*. 1993) (Vogt and Cashatt 1999) and there is evidence of recent attempts to breed on the site (i.e. territorial males), it is very unlikely, due to site conditions, that it has been successful (Mierzwa 2013). In addition to the known HED adult habitat, there are 24.85 acres of land that could be restored to adult HED habitat if Middle Parcel were not mined (see Restorable Habitat memo; Appendix B).

Site hydrology may only slightly improve in Middle Parcel under this alternative. Assuming Pierce Eich is allowed to inundate in this alternative, Middle Parcel would likely be less susceptible to groundwater level declines during periods of little rainfall. In addition, seasonal fluctuations of groundwater levels adjacent to the Middle Quarry may become less pronounced due to the near-constant head conditions in the Pierce-Eich Quarry. However, since groundwater levels have consistently remained in the shallow subsurface in the Middle Parcel over the past decade, significant improvements to the Parcel's vegetation and habitat would not be expected since hydrologic conditions will remain similar. Improvement of HED breeding habitat is difficult to imply since groundwater discharge at the ground surface would still not be likely – or at least occur at such infrequencies that it would not suggest significant HED breeding habitat could be established or maintained. Significant improvement to Blanding's turtle habitat would not be expected either.

Potential groundwater impacts to adjacent (North and River Parcels) and nearby parcels (Far North, River North, and River South) will be avoided in this alternative. AMMs would be constructed for River South Parcel and LPNP and Pierce Eich quarry would be allowed to inundate after mining is complete.

However, because Reduced Surface Mining Alternative 2 includes future mining of Pierce Eich, it would still have potential indirect groundwater impacts to River South and LPNP, which contain most of the HED breeding habitat in the state. Those potential groundwater impacts could be avoided under this alternative, as they would be under the Preferred Alternative, through the use of groundwater AMMs described in Section 5.1.3 (i.e. River South Bluff Parcel infiltration galleries and FPDWC infiltration pond). Therefore, this alternative would have some of the same environmental impacts as the Preferred Alternative (i.e. indirect groundwater impacts to habitat areas), but would eliminate others, such as direct impacts to HED Critical Habitat and Blanding's turtle habitat and the reduction in habitat connectivity. It is important to note that much of the habitat connectivity would be regained under the Preferred Alternative through the restoration of habitat on parcels adjacent to and near Middle Parcel (i.e. River, North, Far North, and River North Parcels), and this restoration will not occur under this alternative.

Additionally, removing Middle Parcel from the surface mining plan would leave approximately 61% of the available surface limestone reserves untapped, thereby significantly reducing the economic viability of the proposed mining project. As explained above, that reduction in the surface mining plan area will reduce some environmental impacts but not others. Most significantly, however, a reduction in the mining plan would reduce proportionally the planned mitigation (designed to benefit the Covered Species and their habitat) in the Preferred Alternative. If Middle Parcel is not included in the mining plan, far less acreage of habitat and potential habitat will be preserved and/or restored but instead will continue to degrade. As a result, this alternative was rejected because it would achieve only a portion of the purpose and need of the HMS' proposed activity and, without the comprehensive conservation package (i.e. mitigation and AMMs), would reduce the likelihood of survival and recovery of the Covered Species in the wild.

4.4 Surface Mining Other HMS Romeoville Parcels Alternative

Surface mining of Middle Parcel (115 acres) and/or Pierce Eich Quarry (35 acres) could potentially be reduced or eliminated by mining other areas in HMS' Romeoville facility, such as River, North, Far North, and River North Parcels. These alternative parcels would be mined in addition to other planned parcels: Middle Quarry and East Quarry. Alternative parcels could provide approximately

61, 29, 46, and 25 acres, respectively, of mining reserves of what is believed to be similar quality stone as that found in Middle Parcel and Pierce Eich Quarry. However, the actual quality of the stone in these parcels has never been determined because these alternative parcels have a number of limitations.

First, mining any of these parcels would result in proportionally greater wetland impacts than mining Middle Parcel (29.7 wetland acres of 125 total acres (of which 115 acres will be mined)) (see Figure 15.1) since they all have a higher proportion of wetlands (River: 40.8 of 61 acres, North: 19.6 of 31 acres, Far North: 14.5 of 50 acres, and River North: 13.6 of 25 acres). In addition, while North Parcel contains 1.85 acres of high-quality wetlands (i.e. wet-mesic dolomite prairie and sedge meadow), none of the other parcels do. This compares with 6.01 acres of wet-mesic dolomite prairie on Middle Parcel.

Second, nearly all of River and over half of River North Parcel are in the floodplain of the Des Plaines River.

Third, each of the above parcels contains federally designated critical habitat for the HED, and mining any of them would fragment habitat and reduce connectivity (including isolating the portion of Middle Parcel preserved under this alternative). However, like Middle Parcel, none of these parcels have all the larval PCEs (see Section 5.1.6). These four parcels only have two of five larval habitat PCEs (3 and 5) with the exception of North Parcel, which also contains occupied crayfish burrow (PCE 4). Although they all contain wetlands with hydric soils, none have organic soils (i.e. histosols) (PCE 1) according to the Will County Soil Survey (Struben 2012). Middle Parcel also contains PCE 3 and 5 and hydric soils but not histosols for PCE 1. All four of these parcels, like Middle Parcel, contain both adult HED habitat PCEs (5 and 6). Although none of the natural wetland communities on any of these five parcels are located near breeding/larval habitat, some on each parcel do provide open corridors for adult HED movement and dispersal.

Middle Parcel contains 40.81 acres of mapped adult HED habitat, while River, North, Far North, and River North Parcels contain 30.35, 18.32, 26.71, and 1.80 acres of adult HED habitat, respectively (see Appendix B, Table B-1) for a total of 77.18 acres. Middle Parcel also has 115 minable acres, which is far more than any other parcel. Adult HED have been observed on Middle, North, River North, and River Parcels, but Middle Parcel has been surveyed far more often (i.e. 17 years) than the other parcels. There is no current larval habitat on any of these parcels.

Fourth, three of these parcels (i.e. North, Far North, and River North) contain known Blanding's turtle habitat and potential spotted turtle habitat, while River Parcel contains only potential habitat for both turtles. Middle Parcel also contains known Blanding's turtle habitat and potential spotted turtle habitat; it contains 29.14 acres of potential turtle habitat. Additionally, six juvenile Blanding's turtles were found on the site in 2015 (Feng and Dreslik 2015). Prior to this, Blanding's turtle had only been observed near but not on the parcel. No Spotted turtles have been found on or near Middle Parcel. North Parcel contains 20.22 acres of potential habitat, and Blanding's turtle was observed entering that parcel from Middle Parcel in 2013. Far North Parcel contains 18.56 acres of potential turtle habitat, and a Blanding's turtle was tracked to the site in 2009. Two Blanding turtles were tracked to River North Parcel that same year (Banning and Dreslik 2010), and one was found on the parcel in 2015 (Feng and Dreslik 2015). This parcel contains 14.63 acres of potential turtle habitat. No spotted turtles have been found on North, Far North or River North Parcels.

Fifth, mining any of the three "North" parcels would negatively impact the groundwater hydrology of RPNP (also designated critical habitat) due to their closer proximity to the preserve than Middle Parcel. Mining Middle Parcel, conversely, would not impact the groundwater levels in RPNP. Mining any of the "North" parcels also would affect the groundwater levels on the other adjacent and nearby parcels, including Middle Parcel. Hydrologic impacts of the North parcels are interpolated based on inferences of the hydrogeologic setting and previous modeling that included North Parcel (AECOM 2012). RPNP contains habitat for all five covered species; therefore, groundwater impacts to the preserve could negatively affect the habitat of any of these species. Aside from LPNP, RPNP is the only parcel in the Permit or Planning Area that contains habitat for all five covered species.

Sixth, there are many operational limitations associated with the area north of Middle Parcel including: 1) ComEd, not HMS, owns a substantial portion of this area; 2) it is closer to residential areas and Far North and River North Parcels are not zoned for mining (and the Village of Romeoville is unlikely to approve mining); and 3) Far North contains a closed landfill. Finally, surface mining from a new (unmined) location would be much costlier and less efficient than mining from an existing mine face. Mining in Middle Quarry and Middle Parcel will be done on existing mine faces.

As a result, this alternative was rejected by HMS because the feasibility of mining in those areas is very unlikely given all of the operational limitations. In addition, even if it were allowed, it would not reduce the impacts to wetlands or Covered Species habitat (and may even increase them, compared with the Preferred Alternative) and may have detrimental effects to groundwater hydrology in the vicinity of the RPNP. Like other alternatives that involve reducing the planned surface mining, mitigation efforts would be less than those in the Preferred Alternative, which would reduce the benefit to the Covered Species. Therefore, this alternative could reduce the likelihood of survival and recovery of the Covered Species in the wild. In addition, mining in this area would be more difficult and costlier than mining in Middle Parcel (under the Preferred Alternative) and, therefore, will not achieve the purpose and need of HMS' proposed activity.

4.5 HMS' Preferred Alternative

HMS' aggregate and support operation at its Romeoville, Illinois, facility is unique because it is the only regional limestone production operation that can ship materials via truck, rail, and barge. Transporting limestone product by barge provides numerous benefits to the local community and the environment. It is safer than other forms of transport; it reduces traffic, improves air quality, reduces carbon emissions, and reduces costs (for the customers). Therefore, this facility is an important and economical limestone source for both local and regional markets. In addition, HMS has a significant positive impact on the local economy by way of payroll, tax base, and secondary employment.

Under the Preferred Alternative, HMS plans to continue surface mining its two currently active mines, Pierce Eich and Middle Quarry, and to expand surface mining into Middle Parcel and East Parcel. HMS proposes to mine 35 additional acres in Pierce Eich and only one additional acre in Middle Quarry. Pierce Eich will be mined first and when mining is nearly completed there, HMS will resume mining Middle Quarry and begin surface mining in Middle Parcel. (Therefore, there may be concurrent mining of Pierce Eich with Middle Quarry and/or Middle Parcel during the last few years of mining Pierce Eich.) Approximately 115 acres will be mined in Middle Parcel. HMS also plans to surface mine 36 acres in East Parcel. All of this surface mining is estimated to take

about 35 years. However, since mining East Parcel will not require an ITP or ITA, HMS is seeking a 30-year permit. This alternative also includes subsurface mining, which is planned to start prior to the completion of surface mining, once the company has been able to demonstrate success with underground mining and once local market conditions indicate that establishing an underground mine is financially viable. Underground mining will occur approximately 350 feet below the surface of the Romeoville Facility. HMS anticipates having local technical experience and equipment to mine underground in place prior to completion of mining surface reserves (see Section 4.2 Subsurface Mining Alternative for more details on underground mining). Under this alternative, all access and ventilation shafts installed during the permit period will be located in mined areas or other areas of HMS' property not preserved under the HCP. The mining plan is described in greater detail in Chapter 3 and in the HMS Mining Plan (Appendix E).

HMS' Preferred Alternative will protect, restore, and enhance wetland and habitat quality on several designated HMS-owned parcels; it will also protect the groundwater supply to some of these and other important habitat areas.

As part of the Preferred Alternative, HMS will restore, enhance, or maintain 354.0 acres of Covered Species habitat on eight HMS parcels (River South, Fitzpatrick Seep, River, North, Far North, River North, ComEd, and Long Run Parcels). This will include salvaging and transplanting the wet-mesic dolomite prairie in Middle Parcel (6.01 acres) to the ComEd Parcel. Restoration plans are summarized in Chapter 3 and described in greater detail in Chapter 5 and in the Restoration Plan Set (Appendix F). This plan also includes permanent protection of 518.9 acres of the 530.9 acres preserved through a Declaration of Covenants, Conditions, and Restrictions (declaration of restrictions), including the eight mitigation parcels listed above, plus the River South Bluff Parcel. The restoration, enhancement, maintenance, and preservation of habitat that is included in the conservation plan of this alternative is designed to protect and enhance important existing habitat areas for the Covered Species, restore and expand habitat in other areas, and protect and enhance corridors for movement of these species.

Under the Preferred Alternative, HMS also plans to implement a number of avoidance and minimization measures (AMMs) to prevent potential groundwater impacts to the HED and other Covered Species habitat from future mining of Pierce Eich Quarry. The AMMs include installation of infiltration galleries in River South Bluff Parcel to supplement shallow groundwater supplies to River South Parcel and construction of an infiltration pond on FPDWC property at the southwest corner of Rt. 53 and Renwick Rd. to prevent potential negative impacts on groundwater levels at LPNP. In addition, this alternative provides a permanent solution to potential groundwater impacts from mine dewatering, since dewatering of the Pierce Eich Quarry will cease after mining is complete, in conformance with its permit and reclamation plan. A plug in the tunnel under Route 53 will allow the parcel to be naturally inundated and maintain near-constant head conditions west of Route 53. These measures are discussed in Chapter 5 and are addressed in several groundwater modeling documents, including AECOM 2013b, AECOM 2014b, AECOM 2015a, and AECOM 2016.

The conservation package under the Preferred Alternative is sufficient because all proposed AMMs and mitigation were selected and designed to directly avoid or offset all potential impacts to the Covered Species from the proposed activities. Therefore, no additional conservation measures are needed.

While it is true that all other surface mining alternatives evaluated above would avoid impacts to Covered Species habitat on Middle Parcel and/or groundwater impacts to other habitat areas, the degradation of wetland and habitat quality and function will continue under all but the Preferred Alternative. The Preferred Alternative is the only alternative that includes a comprehensive conservation package (AMMs and mitigation) that will help ensure the continued survival and recovery of the Covered Species in the wild. Untouched, the condition of the wetland habitat in Middle Parcel will continue to decline because of invasion by weedy, woody (e.g. buckthorn) and herbaceous (e.g. *Phragmites*) species. Such degradation will occur not only in Middle Parcel but also in other parcels owned by HMS that contain Covered Species habitat, such as River South. Furthermore, the Preferred Alternative offers short- and long-term solutions to potential hydrologic impacts from surface mine dewatering, which is not included in most other alternatives.

The strength of the Preferred Alternative is that it not only meets HMS' business needs, it also provides a comprehensive mitigation plan and conservation package that will protect existing habitat for the Covered Species and goes beyond compensating for any "take" of these species by enhancing, restoring, and maintaining hundreds of acres of their habitat, thus providing potential for recovery of these species. Permitting the proposed use of surface reserves in Pierce Eich, Middle Quarry, and Middle Parcel will help initiate and fund, through an accepted Habitat Conservation Plan, the protection, preservation, restoration, and management of high-quality wetlands and Covered Species habitat in this area of the lower Des Plaines River Valley.

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5.0 POTENTIAL BIOLOGICAL IMPACTS, IMPACT ANALYSIS, and MITIGATION

5.1 Hine's Emerald Dragonfly

The principal threat to the HED in Illinois is habitat degradation and alteration. This includes direct loss of habitat, such as the filling or removal of wetlands, as well as indirect alterations of habitat, such as changes in surface and sub-surface hydrology. Alteration of hydrologic regimes could adversely affect the larval and breeding habitat of the species by changing water temperature, flow, chemistry, and volume. Quarries, road construction, municipal and private wells, addition of impervious surfaces, and alteration of surface drainage patterns could all cause reductions in the suitability of habitat or the outright loss of suitable larval and breeding habitat. Transportation and roadways are also a threat to this species, both from direct mortality and habitat destruction or fragmentation. Land use practices, fire suppression, agricultural development, and expansion of invasive species have also reduced available habitat for the HED, as well as the abundance of insects for prey across its range. The following chapter details the anticipated impacts from HMS' Covered Activities on the HED within the Permit Area as well as the mitigation plan and conservation package to off-set these impacts.

5.1.1 Activities and Impact Analysis

HMS proposes to continue surface mining its two currently active quarries (Pierce Eich and Middle Quarries) at its Romeoville facility, expand the Middle Quarry surface mining into Middle Parcel, expand surface mining of the East Quarry to the north into East Parcel, and perform sub-surface mining of Galena-Platteville limestone underlying its facility. HMS plans to resume surface mining Middle Quarry and expand into Middle Parcel when surface mining in Pierce Eich Quarry is nearly complete (Figure 2 and 15.1, Appendix A). Surface mining in East Parcel, which will not impact the HED or its habitat, is anticipated to start while surface mining is underway in Middle Parcel, probably around the time of its completion. All surface mining is anticipated to be completed over a period of approximately 35 years. However, all surface mining that will require an ITP or ITA (Pierce Eich Quarry, Middle Quarry, and Middle Parcel) is anticipated to be completed in the 30-year permit period. Subsurface mining will start in approximately 15 years and prior to the completion of surface mining. Associated mining activities (e.g. crushing, conveying, screening, and stockpiling) will also occur during the permit term. These plans are explained in detail in HMS' Mining Plan found in Appendix E and summarized in Section 3.2. In addition, HMS will retain a small setback strip (350' back from Route 53) along the west side of North and Far North Parcels for possible future development while the rest of the parcels will be preserved in perpetuity (Figure 16).

HMS proposes to conduct activities and implement measures that will avoid, minimize, or mitigate impacts to the HED and its habitat. These are described in greater detail later in this chapter (Section 5.1.3 & 5.1.6) and in the Restoration Plan Set (Appendix F). This will include constructing a permanent access route through wetlands in Long Run and ComEd parcels.

Approximately 41 acres of Middle Parcel are used as adult HED habitat (open and well-vegetated wetland and upland areas) (see Figure 17 and the Restoration Plan Set in Appendix A). The remainder of the site (84 acres) is fill material, scraped areas, buckthorn thickets, and young woodlands. It is very unlikely that occupied larval habitat exists on Middle Parcel (Mierzwa 2013). Observations of territorial males have been made at low frequencies and is the only evidence of possible breeding that has been documented on this parcel over the past 20 years, but by itself does

not indicate successful breeding. There has been no evidence of successful population recruitment (larvae, exuviae, tenerals) in over 20 years (Mierzwa and Webb 2009). The lack of perennial surface water and the absence or extreme rarity of crayfish and their burrows, or any other suitable sub-surface refugia, is believed to preclude the possibility of larval survival under current conditions.

No direct take of adult HED is anticipated to occur during mining operations in Middle Parcel because all stripping (removal of overburden) will be conducted outside the adult HED flying season (May 15 to October 15). In addition, overburden removal to expose the bedrock to be mined will proceed at least 150 feet in advance of the actual mining and all vehicles operating within the flying season will travel at low speeds (i.e. < 15 mph). No take of larvae is anticipated because no HED larvae are found on the parcel based on several years of studies that have not found larvae or appropriate habitat conditions (Mierzwa and Webb 2012c and Mierzwa 2013a).

Mining Middle Parcel is not anticipated to have any potential impacts to groundwater levels at nearby larval habitat areas or at local Illinois Nature Preserves since the Pierce-Eich Quarry will be inundated when mining in Middle Parcel is complete (AECOM 2014b). An inundated Pierce Eich Quarry provides hydraulic controls on groundwater levels since it will provide near constant head conditions. Thus, the expansion of the cone of depression that would have otherwise propagated outward from Middle Parcel will be limited by the influence of the inundated Pierce Eich Quarry. Steady-state drawdown from Middle Parcel after full buildout is expected to be limited to the area immediately adjacent to the future quarry primarily on the north and east sides (AECOM 2014b). Drawdown will likely extend throughout North Parcel and possibly be noticeable in the southern portion of Far North Parcel. Drawdown in River Parcel, located east of Middle Parcel, will decrease quickly as it moves away from Middle Parcel and approaches the river. Drawdown west of Middle Parcel will be limited by the inundated Pierce Eich Quarry.

The predicted drawdown of the water table will be one to three feet in North Parcel from mining Middle Parcel. One exception is the very south-central portion of the site where drawdown adjacent to the quarry would likely increase (AECOM, Dec 19, 2014). Movement of an enhanced cone of depression into the area underlying North Parcel will induce more flow from surface water to groundwater beneath these parcels. Reduction in any base flow from groundwater to the wetlands would be expected and impact the hydrology of the parcel. The hydroperiod of the North and Far North wetlands, however, are fed predominately by surface water.

Significant quantities of surface water runoff support the hydrology of North and Far North Parcel wetlands. The watershed for these parcels extends nearly a mile west of Route 53 onto portions of Romeoville High School, ComEd Easement, as well as the Nottingham Ridge and Hampton Park subdivisions. The watershed encompasses approximately 320 acres. The estimated surface water discharge to these parcels is approximately 14 million cubic feet per year, assuming an average precipitation of 39.6 in./yr (NCDC at Lewis Airport from 1997-2012) and a runoff rate of 30% for the moderately impervious watershed. Much of the surface water runoff collected from this watershed is stored within the wetlands before it evaporates, infiltrates, drains to the Des Plaines River or is utilized by the wetland vegetation. In addition, most of Far North Parcel does not appear to be significantly affected by Middle Parcel mining since much of the parcel is upland fill.

Surface elevations within the wetlands located directly west of the Midwest Generation easement vary between 583 and 584 ft msl, but the water table averages 582 ft msl based on the water levels collected at well NP-2S. Therefore, groundwater is typically a few feet below the base of the

wetland areas throughout the year. In addition, observations of these wetland areas indicate that they become seasonally inundated in response to rainfall events. Most of the wetlands on North and Far North Parcels are cattail and *Phragmites* dominated marshes neither of which is dependent on groundwater hydrology. This also indicates that most wetlands on site are surface water fed and, therefore, reductions in groundwater levels are not anticipated to change vegetation significantly and diminish habitat quality in North Parcel. Furthermore, any potential negative change in habitat in North or Far North Parcel will be offset by the overall improvement to the parcels' habitat through the removal of invasive species, including *Phragmites* and buckthorn, as part of mitigation under this HCP.

Any potential change in habitat due to groundwater draw down in River Parcel will also be offset through the removal of woody and herbaceous invasive species, such as *Phragmites*, green ash, and buckthorn. Groundwater impacts to habitat in this parcel will be very limited because almost all wetlands on the site are found along the river and its backwaters which heavily influence their hydrology.

Although both HED and Blanding's turtle habitat areas are found on North and Far North Parcels, that habitat is limited due to the history of disturbance (e.g. fill) on the parcels. No HED larval habitat is present in North Parcel. Larval surveys and field inspections on North Parcel have found no larvae or groundwater sourced rivulets (Mierzwa 2013b and Mierzwa and Webb 2014). Likewise, no suitable larval habitat has been found on Far North Parcel (AES 2013 and Mierzwa and Webb 2016).

Temporary or permanent avoidance and minimization measures for hydrologic impacts do not appear warranted for mining Middle Parcel. Potential hydrological impacts are already being minimized due to Middle Parcel's location next to the Des Plaines River and the positive hydraulic influence after the inundation of Pierce Eich Quarry. Monitoring of habitat on North, Far North, River North, and River will continue throughout the HCP period to ensure hydrology changes are not negatively impacting HED or covered turtle habitat.

Surface mining of the Pierce Eich (West) Quarry, located west of Route 53 and included in the Permit Area (Figure 2, Appendix A), will continue out to its permitted (IDNR permit #143-98) limits (35 ac remaining of 206 ac total). This parcel does not contain HED habitat (Figure 9, Appendix A) but is located within the estimated groundwater recharge zone of River South Parcel and within the two-mile recharge buffer for both River South Parcel and Lockport Prairie Nature Preserve (LPNP) (Figure 4, Appendix A) (GAS 2004b and 2005b). River South and LPNP contain both larval and adult HED habitat and are the two most productive breeding areas in the state (as well as the Southern Recovery Unit) and account for 84-91% of the Illinois population (Soluk and Mierzwa 2012). Mining the remaining surface reserves in the Pierce Eich Quarry will likely result in potential groundwater impacts to River South and River South Bluff Parcels. The potential for decline in groundwater levels and corresponding seep discharge rates is less for LPNP. No direct take of adult or larval HED is anticipated during mining operations at Pierce Eich because it does not contain HED habitat.

Neither Middle Quarry nor East Parcel contain habitat for the HED or other listed species. Thus, no direct take is anticipated during the mining of these parcels. East Parcel is hydraulically separated from all larval habitat areas (and Critical Habitat Units) by the Des Plaines River to the west and the Chicago Ship & Sanitary and I&M canals to the east. Expansion of the East Quarry to the north will result in a decline in water levels to the north, but propagation of the cone of depression will not

extend to the east and west because of these hydraulic barriers. Thus, no potential impacts to the groundwater hydrology in habitat areas are expected from mining (36 acres) in this parcel. Only one acre will be mined in Middle Quarry. No potential groundwater impacts to nearby larval habitat (e.g. River South) are expected from this activity either, since the area to be mined is adjacent to the existing surface mine.

The small setback strip (350' back from Route 53) along the west side of North (6.49 acres) and Far North Parcels (10.65acres) that may be developed during the permit period contains old field and buckthorn thickets on fill and provide 1.10 and 7.30 acres of adult HED habitat, respectively. No larval habitat is present in these areas. An Ecological Maintenance Easement will be placed on the west 350 feet of the North and Far North Parcels when they are sold or developed that allows for impacts (i.e. dust and smoke) to the parcels from any ecological management activities on the adjoining North and Far North Parcels (see Ecological Maintenance Easement in Appendix I).

5.1.2 Biological Goals and Objectives

As stated in Section 1, the overall goal of this HCP is to positively contribute to the objective of the USFWS HED Recovery Plan. The objective of the Recovery Plan is to assure the long-term viability of the HED populations (USFWS 2001). The Recovery Plan provides criteria for reclassifying the HED from endangered to threatened and criteria for removing the HED from the federal list (i.e. delisting). The criteria for delisting are provided below and in Section 2.2.1.

The Recovery Plan also provides a recovery outline that recommends specific actions to be taken to achieve the recovery criteria and meet the plan's objectives. These actions are:

- protect and manage extant populations,
- conduct studies,
- conduct searches for additional HED populations,
- conduct an information and education program,
- conduct a reintroduction and augmentation program, and
- review and track recovery progress.

HMS has made commitments that will contribute to meeting the recovery criteria by following the recommended actions listed above, as applicable. HMS' specific avoidance, minimization, and mitigation measures are discussed in the sections below (5.1.3 & 5.1.7) as well as in the Restoration Plan Set (Appendix F).

Addressing Recovery Plan Goals

This habitat conservation plan will contribute to realization of each of the three Criteria for delisting set forth in the Recovery Plan in the following ways:

1. *CRITERION 1: Each of the two Recovery Units contains a minimum of three populations composed of at least three subpopulations. Each subpopulation contains a minimum of 500 reproductive adults for 10 consecutive years.*

This plan will protect, expand, restore, and enhance habitat in the Southern Recovery Unit for the HED, specifically for Illinois Subpopulation 1 which is by far the largest subpopulation of the second largest population (Illinois) in the Southern Recovery Unit (the Northern Unit comprises

portions of Northern Wisconsin and Michigan only). Subpopulation 1 is the core of the Illinois population, comprising 84-91% of the entire state population. This plan will protect (by avoiding impacts) the groundwater hydrology of three Critical Habitat Units (CHU 1 - Lockport Prairie Nature Preserve; CHU 2 - River South-Fitzpatrick seep; and CHU 3 – Romeoville Prairie Nature Preserve) and restore, enhance, and/or preserve habitat in two CHUs (CHU 2 - River South-Fitzpatrick seep, River Parcel, North Parcel, Far North Parcel, and River North Parcel; and CHU 7-ComEd and Long Run Parcels). Specific habitat preservation, restoration and enhancement objectives are included in the Section 5.1.7.

2. *CRITERION 2: Within each subpopulation, there are at least two breeding habitat areas, each fed by separate springs and/or seeps.*

There are at least three separate breeding areas in Subpopulation 1: Lockport Prairie, River South, and the Long Run Seep/Long Run and ComEd Parcel complex. Each of these areas has multiple seeps or springs feeding larval habitat and each will be protected and/or restored under this plan. The groundwater impacts to River South-Fitzpatrick Seep and Lockport Prairie Nature Preserve from future mining expansion will be prevented through the implementation of avoidance measures (i.e. infiltration galleries, infiltration basin, and inundation of Pierce Eich Quarry) (see Sections 5.1.3) and habitat will be restored or enhanced in North, Far North, River North, River, River South-Fitzpatrick Seep, ComEd, and Long Run Parcels using well-established restoration techniques (see Section 5.1.7 and Restoration Plan Set (Appendix F)).

3. *CRITERION 3: For each population, the habitat supporting at least three subpopulations should be legally or formally protected and managed for the Hine's emerald dragonfly, using long-term protection mechanisms such as watershed protection, deed restrictions, acquisition, or nature preserve dedication. In addition, mechanisms protecting the up-gradient groundwatershed will also be in place within 5 years.*

Lockport Prairie and Romeoville Prairie are currently under protection by the Forest Preserve District of Will County (FPDWC) as well as by the Illinois Nature Preserve Commission. Long Run Seep is under protection by IDNR and the Illinois Nature Preserve Commission. HMS' properties, including Fitzpatrick Seep, River South, River South Bluff, River, North, Far North, River North, ComEd, and Long Run Parcels, will all be protected (through a declaration of restrictions that will be converted to a conservation easement if a qualified entity can be found to hold it) as part of this plan (Figure 16, Appendix A). These parcels comprise most of CHU 2 and 7 and their protection, along with the parcels already under protection (listed above), will result in the protection and conservation of all or substantial portions of the four Critical Habitat Units that comprise the Illinois Subpopulation 1 (and contain at least 84-91% of the total Illinois population). Note that some of the ROWs and easements that run through HMS' properties will not be specifically held under formal land protection contracts, but will be managed with conservation guidelines for operational usage that is intended to benefit the HED and adjacent HED habitat while maintaining operational activities.

This plan also includes the implementation of avoidance measures to protect the groundwater hydrology of LPNP and River South from potential impacts of HMS mining operations. Therefore, this plan provides protection from mining to the groundwater of the two largest breeding habitat areas of the Illinois population. The plan also includes supporting partners' commitments, agreements, and plans to protect surface and groundwater by landowners, land managers, and

governing bodies within the surface watershed and groundwater recharge zones of known HED habitats within the HCP Planning Area (Appendix D).

5.1.3 Measures to Avoid and Minimize Impacts

Avoid Mining Parcels

Under this HCP, HMS will not surface mine, but instead will protect the following parcels through a declaration of restrictions: River South, Fitzpatrick Seep, River South Bluff, River, North (except along Route 53), Far North (except along Route 53), River North, ComEd, and Long Run Parcels (Figure 16). The declaration of restrictions allows for the development of up to 12 acres (of the 530.9 acres preserved) for the installation of sub-surface mining ventilation shafts after the permit period. All required permits will need to be obtained for these future development activities prior to installation.

Groundwater Impact Avoidance Measures

HMS plans to implement a number of measures to avoid potential impacts surface mining may have on groundwater conditions in the habitat of the HED and other Covered Species. The primary measures that will be implemented to avoid potential groundwater-related impacts from quarry dewatering include: 1) the supplement of shallow groundwater in River South Bluff Parcel, and 2) the enhancement of surface water infiltration in the FPDWC property at the southwest corner of Route 53 and Renwick Road. In addition, dewatering in the Pierce Eich Quarry will be terminated after surface mining in that parcel is complete. Natural inundation of the mined area west of Route 53 will occur after the parcel is mined and will provide a long-term avoidance measure for potential groundwater impacts occurring in the future since effects from dewatering will be eliminated.

River South Parcel – Groundwater modeling completed for the Romeoville Quarry has indicated that temporary declines in shallow groundwater levels in the vicinity of the River South Bluff Parcel will be likely without avoidance measures from the expansion of the Pierce Eich Quarry. Groundwater is observed to discharge at the ground surface along the toe of the parcel's eastern slope. Discharged water then drains to River South Parcel and eventually to the Des Plaines River via culverts installed beneath the railroad line or through the coarse gravel ballast below the tracks. A temporary decline in groundwater levels would result in less groundwater discharge at the River South Parcel.

Three linked infiltration galleries will be installed in the River South Bluff Parcel to supplement water to various areas of this parcel so groundwater levels remain consistent with current conditions. A linear correlation of groundwater levels to discharge rates has been observed in the parcel (AECOM 2015a), so maintenance of groundwater levels will result in comparable discharge rates to match existing conditions. The rates at which supplemental water will be supplied to the galleries will initially be based on field pilot testing and pumping estimates required during simulations of quarry construction to maintain head levels in the groundwater model. Rates of adding supplemental water will be adjusted based on the results of the preliminary field testing of the infiltration galleries. In addition, water will be added to the galleries if monitoring suggests that head levels are not being maintained within prescribed background water level ranges and calculated quarry influence. Background groundwater levels are summarized in the Groundwater Monitoring Plan included in Appendix G-1.

A key element of the infiltration galleries planned for River South Bluff Parcel is the flexibility that they offer, since the rates and volumes of supplemental water can be varied. Additional water may

be added throughout the year (if directed by agencies to do so), so extra water can be supplied to the habitat during hydrologically-stressful periods, including times of regional droughts or unanticipated water declines from anthropogenic sources. Source water for the galleries will be obtained from the Middle Quarry sump. Water quality testing of the Quarry water has already been completed (AECOM 2014b). Additional water sources, including groundwater from the Deep Bedrock Aquifer, will be explored during contingency option evaluations, if needed. Justification for usage of groundwater from the Deep Bedrock Aquifer will be provided to demonstrate the water will not have potential impacts on the covered species and their habitat, if needed.

Another key element of the galleries is their simplicity. Source water from the quarry will flow initially into the northern-most gallery via a drop pipe opening to a perforated gallery pipe. The perforated gallery will be installed near the top of the bedrock (approximately 8-10 feet below ground surface) and will allow for percolation to occur in the vadose zone (at the top of bedrock) which mimics natural recharge conditions. Water will flow by gravity to the remaining galleries. Initial flows to each gallery will be determined by the size and location of the gallery. Flow adjustments to each gallery will be made based on field conditions. Additional discussion on the design of the infiltration galleries is included in "River South Infiltration Gallery Design Development: Additional Design Considerations" (AECOM 2015a).

Active infiltration in River South Bluff Parcel will provide a temporary means to avoid the potential hydrologic impacts that may be caused by surface mining the remaining reserves in the Pierce Eich Quarry. To permanently avoid these impacts, Pierce Eich Quarry will be allowed to inundate naturally after mining in the parcel is completed to prevent future dewatering. Supplemental water to River South Bluff Parcel will no longer be required once groundwater levels reach baseline levels. Groundwater modeling simulations indicate that baseline levels at River South will be reached within three years of the start of the Pierce Eich quarry inundation. Groundwater level monitoring and active infiltration will continue in the River South Bluff parcel until sufficient data are collected that indicates supplemental water is no longer needed. Data collected during the post-Pierce Eich mining period will be submitted to the overseeing regulatory agencies (e.g. USFWS and IDNR) for their concurrence that decommissioning of the infiltration galleries may occur.

Lockport Prairie Nature Preserve (LPNP) – It is possible that groundwater levels within the recharge zone of LPNP could experience minor impacts from dewatering activities in the Pierce Eich quarry (AECOM 2012). Therefore, to avoid any such possible impacts, measures will be implemented to prevent potential interference of the groundwater recharge zones of the Pierce Eich Quarry and LPNP.

This avoidance measure will involve HMS installing an infiltration pond on property owned by the FPDWC in the southwest corner of Route 53 and Renwick Road. The infiltration pond would be built to detain surface water before it discharges under Renwick Road to the north. Infiltration of the ponded surface water will increase the present volume of groundwater recharging in the area (AECOM 2014b and 2016). The proposed infiltration pond is located just south of the divide between the LPNP and Pierce Eich Quarry recharge areas. Therefore, water at this location will provide a buffer to maintain the current location of the groundwater divide. FPDWC Pond is proposed to be constructed in a former mined area so infiltration will occur directly to bedrock.

The proposed infiltration pond is relatively large (over 13 acres) and would detain significant quantities of runoff emanating from a 186-acre area watershed located west of the pond. Runoff will be conveyed to the infiltration pond via natural drainage (AECOM, 2016). Like the River

South Bluff Parcel Infiltration Galleries, this infiltration pond will not be needed once Pierce Eich Quarry naturally inundates after mining is completed and groundwater levels reach baseline levels.

Additional Avoidance Measures – Additional avoidance measures will be implemented if the prescribed avoidance measures at the River South Bluff Parcel and FPDWC pond are deemed insufficient in supplementing groundwater supplies or mining/dewatering impacts are greater than expected. The need for additional avoidance (contingency) measures will be assessed through the collection and evaluation of assessment monitoring data and will be part of the adaptive management process as depicted in the monitoring flow charts presented in Appendix G-1. The first step of the adoption of contingency avoidance measures is the evaluation of their effectiveness.

Fortunately, numerous alternative avoidance measures have been preliminarily evaluated during the development of the preferred alternative. These measures have been conceptually and numerically evaluated as a pro-active approach in developing alternatives for avoiding potential groundwater impacts. Alternative avoidance measures will be revisited during the evaluation of contingency measures should they be required. Discussion of the monitoring procedures is included in Chapter 6 and in the Groundwater Monitoring Plan provided in Appendix G-1.

Several additional/alternative avoidance measures have been identified and preliminarily evaluated for various areas around the Romeoville Quarry. A sample of these potential contingency measures is provided in the groundwater section of Chapter 8 (Section 8.2.9). If any of these contingency avoidance measures are implemented and impact a mitigation area, the impact will be compensated for by restoring or enhancing habitat on Long Run Parcel or another property agreeable to HMS, USFWS, and IDNR.

The goal of protecting HED habitat by preventing groundwater impacts will be achieved when the planned above groundwater protection measures, and others discussed in Section 8.2.9, if needed, are implemented successfully and confirmed through monitoring as described in Chapter 6 and Appendix G-1.

Minimizing Impacts and Take in Middle Parcel

HMS will salvage vegetation and substrates (i.e. soil) of the wet-mesic dolomite prairie and sedge meadow in Middle Parcel (6.01 acres) to re-use in restoring areas in ComEd Parcel (Restoration Plan Set, Appendix F). This will be done to save the highest quality plant community and minimize the impact to the highest quality habitat area in the parcel. This transplant will result in re-establishing this plant community in a parcel (ComEd) that will be restored and preserved in perpetuity under this HCP. The benefits of restoring this parcel are discussed in the HED Mitigation section below.

Overburden removal in Middle Parcel, including the wet-mesic dolomite prairie, will start after initial restoration of River, North, Far North, and River North Parcels (i.e. brushing, thinning, and controlling *Phragmites*) is completed. This restoration is anticipated to take two years. This will allow all of the adult HED habitat in Middle Parcel (including the entire wet-mesic dolomite prairie) to remain until restoration of adult HED habitat in these adjacent parcels is completed. In addition, a portion of the restoration of ComEd Parcel will also be completed prior to the wet-mesic prairie transplant. According to the surface mining plan (see Appendix E), the transplant will not start until about three years after HMS receives the ITP and ITA. This should allow time to review and adjust restoration activities in the other HMS properties before proceeding with final impacts to habitat in Middle Parcel. Furthermore, this schedule also will allow for the salvaging of substrates

and desirable native plant materials to take place during the appropriate phenological period to assure the most successful re-establishment of these plant communities in the former scraped and removed spoil pile locations in ComEd property.

Operational Avoidance Measures

Several measures will be taken during the mining process and other development activities to avoid taking adult HED or harming remaining habitat (see Mining Plan, Appendix E). These include:

- Conducting overburden (i.e. vegetation and soil) removal outside flying season (i.e. May 15 to October 15) and active turtle season (March 15 – Oct. 31), if possible. If any overburden removal is conducted during flight season or active turtle season, vehicle speed requirements below will be followed, and turtle impact prevention measures will be taken (see Section 5.2.3) to avoid impacts to covered species.
- Operating all vehicles at reduced speeds (< 15 mph) within and adjacent to HED habitat during flying season (i.e. May 15 to October 15) (Soluk *et al.* 2014).
- In addition, all trains operated by HMS will also travel at reduced speed (< 15 mph), near or adjacent to habitat during flying season (i.e. May 15 to October 15).
- Conducting all blasting according to State limits (i.e. air over-pressure (i.e. noise), vibration, and frequency) and a sufficient distance (150 ft) from remaining habitat of Covered Species to avoid direct and indirect (e.g. vibration, dust, and groundwater) impacts. (Distance from remaining habitat does not apply to setback areas or other areas that will not be mined).
- Keeping a vegetation buffer of 50 feet adjacent to the wet-mesic dolomite prairie on Middle Parcel until the prairie is removed for transplant.
- Using heavy equipment during woody vegetation removal (e.g. Skidsteer or Loaders) outside flying season (i.e. May 15 to October 15), if possible. If not, the speed restriction applies (i.e. <15 mph).
- Using a water truck to wet down areas and control dust on roads adjacent to adult HED habitat.
- Installing or implementing sediment control measures (e.g. silt fence) in areas of soil disturbance.
- Implementing vehicle fluid spill protection measures (e.g. daily vehicle leak inspections and spill kits) in habitat areas.

Avoidance During Restoration

HMS' mitigation will involve restoring, enhancing, and maintaining 354 acres of land on eight parcels (see Section 5.1.7 and Appendix F). A number of measures will be taken during these efforts to avoid taking individual HEDs or impacting habitat. These measures will include:

- Using existing routes for access and minimizing construction of new access roads.
- Avoiding placing access routes in wetland areas, especially higher quality wetlands, and using alternate routes through degraded uplands instead.
- Using matting (e.g. timber or composite) for temporary wetland crossing (access routes) for heavy equipment and road vehicles.
- Maintaining surface water flow after construction of access roads.
- Using road vehicles and heavy equipment only in frozen or dry conditions or on access routes.
- Delivering and staging heavy equipment in upland areas outside of rapid recharge areas.
- Placing sediment control measures (e.g. silt fence or wattles) around access routes and other areas of soil disturbance.

- Operating vehicles at low speeds (< 15 mph) during adult HED flying season.
- Accessing on foot (no vehicles) areas within a 20-meter (65 foot) buffer of HED larval habitat year-round as mapped unless agreed upon by USFWS. Foot traffic will be minimized in these areas and stepping in rivulets will be avoided. Foot traffic should be avoided during inundated or heavily saturated conditions.
- Ensuring vehicles crossing larval rivulets will use matting or a bridge constructed from composite matting.
- Removing woody vegetation in larval habitat areas conducted on foot using only hand tools (e.g. chainsaws). Herbicide application done by hand wicking (or other methods approved by USFWS) within a 20-meter buffer of HED larval habitat with aquatic-approved herbicides. Herbicide can be applied to cut woody vegetation within larval habitat buffer by dabbing or painting (or other methods approved by USFWS).
- Applying herbicide by foliar spraying invasive vegetation conducted only outside of the 20-meter buffer around HED larval habitat and with an aquatic-approved herbicide and surfactant.
- Seeding in larval habitat will be done on foot in late fall under dry conditions.
- Creating or modifying rivulets (including hydrology) only in areas unoccupied by larval HED. HED occupied rivulets or other larval habitat areas will be modified only with approval from USFWS).
- Stockpiling and/or burning piles of cut vegetation in upland areas.
- Chipping of woody vegetation will take place in low quality upland areas.
- Conducting prescribed burns outside HED flight season. More restrictions apply to avoid impact to covered turtle species (see Section 5.2.3).
- Properly maintaining vehicles, checking for leaks at the start of each work day, repairing leaks if needed before using vehicles on site. Carrying absorbent materials with equipment or having them accessible at the site to contain spills if they occur.
- Accessing wetland areas with water levels deeper than 12 inches using amphibious vehicles (access would be limited to the timeframe of November 1 - March 14 to avoid covered turtles).
- Crossing wetlands (with <12 inches of standing water) without HED breeding habitat with low ground pressure vehicles (5 pounds per square inch).
- HMS staff and contractors will utilize maps, either electronic or hard copy, showing wetlands and the HED habitat areas, when completing restoration work.

More information about the restoration plans and these measures can be found in the Restoration Plan Set (Appendix F). These avoidance measures are consistent with the approved management and restoration activities found in USFWS Section 7 review of HED management and restoration in Illinois (USFWS 2014).

The goal of protecting HED habitat by preventing impacts during operations and restoration will be achieved when the above protection and avoidance measures are implemented successfully and confirmed through monitoring as described in Chapter 6.

Public Education and Outreach Program

HMS, in conjunction with ComEd and MWGen, designed and implemented a public education and outreach program with Biodiversity Project (now Bluestem Communications), a nonprofit,

environmental communications organization. This group of companies was awarded in 2006 and received in 2009, a planning grant for up to $370,163 from the USFWS, managed by the IDNR. The companies used this grant money to help fund the studies for this HCP, HCP writing and planning, and implementing projects performed by regional partners to support the HED conservation efforts. This grant program funded projects that focused on groundwater infiltration, stormwater BMPs, and restoration to benefit the HED habitat. This grant program funded eleven projects totaling $260,733. Descriptions of the projects are listed below:

1. *Village of Homer Glen, $18,160:* Restoration of Long Run Creek, which flows through Long Run Seep Nature Preserve and Long Run Parcel. The project included three phases. First, a photographic and physical survey of the creek was completed. Second, creek blockages were removed using municipal employees, volunteers and community service groups. Third, a pilot planting program that will promote infiltration while reducing sedimentation and flooding was implemented. Homer Glen collaborated with the Long Run Creek Watershed Planning Committee on this project.

2. *Village of Lemont, $31,743:* Planning and retrofitting an existing sod-based stormwater detention pond with native vegetation. Grant money funded the design, implementation, and long-term stewardship of approximately 2.5 acres of naturalized detention in Bambrick Park.

3. *Village of Romeoville, $31,835:* Redesigning an industrial area retention basin outflow structure adjacent to Romeoville Prairie. This project improved the outflow structure to prevent the frequent overflow of the basin. The water from this basin feeds Romeoville Prairie so the improvement allowed for better regulation of flow and enhanced water quality to the prairie.

4. *Lockport Township Park District, $14,341:* Creation and installation of an HED educational play-piece with educational signage in Brent Hassert Park. The park designed a dragonfly play piece to serve as a constant reminder that the park was designed to help improve the HED habitat. The educational signage included information on the BMPs used in the park, information on the HED and what people can do to help protect it.

5. *Forest Preserve District of Will County, $18,117 (project managed by HMS):* Groundwater studies for Lockport Prairie Nature Preserve. This study, suggested by representatives from the Illinois State Geologic Survey and USFWS, enhanced the models used in groundwater studies from the Lockport Prairie Nature Preserve and provided more accurate information on the hydrology of the area.

6. *Forest Preserve District of Will County, $40,000:* This project extended invasive species removal and control already initiated at Dellwood Park West onto Lockport Prairie East to begin the restoration and enhancement of these rare natural community remnants. The FPDWC hired contractors to remove invasive trees and shrubs across roughly 35 acres through cutting and burning to eliminate competition and allelopathic conditions for desirable native species, with follow-up herbicide applications to suppress re-sprouts. Invasive and weedy herbaceous species were also treated with herbicides to allow native populations to re-colonize appropriate habitat areas.

7. *Lewis University, $68,537:* Rainwater collection system for the Power House at Lewis University in Romeoville, Illinois. The system was designed and installed to collect approximately 200,000 gallons of water per year. The water is used for irrigation and cooling tower make-up water. This project reduced Lewis University's dependence on the aquifer by approximately 200,000 gallons per year.

8. *Illinois Nature Preserves Commission, $15,000:* This project included removal of invasive threats and restoration/maintenance of pristine dolomite prairie in Long Run Seep Nature Preserve.

9. *Village of Lemont, $18,000:* The Village of Lemont was a coordinating partner in the development of the Long Run Creek Watershed Plan. The Watershed Plan requires a public education and outreach plan. The Village used the grant to go above and beyond the federal requirements to develop a strategic campaign and to implement a pilot project identified in the final education plan. The pilot project focused on homeowners in the watershed and behavior changes they can make that will ultimately increase infiltration and support the HED habitat needs.

10. *Lower Des Plaines Ecosystem Partnership, $5,000:* Grant money was used as matching funds for the development of the Long Run Creek Watershed Plan (funded by a Section 319 grant from the IEPA). The Watershed Plan is an important comprehensive plan for Long Run Creek, which supports significant HED habitat. The Watershed Plan will guide and encourage the local jurisdictions in the watershed to adopt practices and ordinances that protect the waterway and adjacent habitat.

11. The other program funded by this grant included an education and outreach program designed and implemented with Biodiversity Project. The major target audiences for this public education and outreach program were homeowners, municipal staff and construction professionals in the Planning Area. Public and private landowners in the groundwater recharge areas play an important role in maintaining the groundwater that feeds the HED larvae habitat. The education and outreach program focused on actions that will help increase the amount of water infiltration in the recharge areas.

The homeowner outreach was performed primarily through direct, person-to-person conversations at public events attended by Biodiversity Project staff. The goal of the homeowner outreach was not just education on the species, but to also help citizens make behavior changes that would increase the water quality and recharge quantity from their homes with the understanding that clean, plentiful water is important for the dragonfly as well as the community at large. The direct homeowner outreach events included an educational booth displayed at festivals, farmers markets and community events featuring:

- Three large displays showing the local area, habitat locations, information about the HED and actions homeowners can take to help.
- Brochures containing similar information about what people can do, including information on learning more about rain gardens, pesticide use, and rain barrels.
- A craft project for kids to attract families to the booth and engage them while staff talked to the adults.
- A pin or magnet for people to take home with an HED illustration.

Additional public outreach included:

- Information for supporting project partners and municipalities to include on their websites and in municipal newsletters.
- Newspaper articles picked up by local papers about the re-grant program, the HED, and prairie tours.
- Brochures distributed through supporting project partners and other organizations.
- Educational tours of Lockport Prairie Nature Preserve led by biologists and FPDWC staff focusing on the endangered species and habitat.

Outreach to developers was primarily performed via a toolbox developed for supporting project partners and municipalities, which includes material they can distribute in their planning and permitting departments. The toolbox focuses on the BMPs identified by Applied Ecological Services, Inc. (AES) as the most beneficial in the recharge area (e.g. vegetated swales, buffer strips, naturalized detention, porous pavement, open spaces, and native landscaping). The toolbox included:

- Case studies and factsheets of BMPs that are important for the recharge area.
- PowerPoint presentation on the HCP and the HED.
- Communication recommendations about the HED, BMPs, and recharge area.
- Online resources for additional information on BMPs.
- An image bank of Covered Species.
- Articles for municipal newsletters.

HMS has also been involved with other public efforts in the area, including attendance at the Lower Des Plaines Ecosystem Partnership meetings and contributing to the development of the Long Run Creek Watershed Plan. HMS contributed to the watershed plan by participating in stakeholder meetings and funding a portion of the project.

HMS collaboration with Supporting Partners

HMS was instrumental in recruiting various municipalities and large public or private landowners in the Planning Area (known as "Supporting Partners") during the HCP planning process. HMS and Biodiversity Project worked with these partners to identify ways they could protect or enhance groundwater in recharge areas or benefit the HED habitat in other ways. All of the Supporting Partners listed in Section 1.3 have made commitments to take steps on their property or within their jurisdiction to protect or enhance groundwater or improve habitat. Some of these partners also completed grant-funded projects described above. Their commitments and a description of their role in the HCP are found in Appendix D.

Furthermore, communication and coordination are important to the successful implementation of this HCP. HMS will coordinate its planned activities along NRG Energy's rail line and ComEd's electrical distribution and transmission ROWs with these partners to facilitate its restoration goals and objectives while at the same time ensuring these partners' safe operations.

5.1.4 Calculation of Incidental Take

After evaluating planned activities and avoidance and minimization measures, HMS identified potential direct and indirect impacts to the HED and its habitat. This section provides anticipated

take estimates for adult and larval HED habitat. All estimates of larval and adult HED habitat acreages are based on the current HED habitat map derived from the most currently available GIS data (see Tables 5 & 6). The location of HED habitat (as mapped by D. Soluk and/or K. Mierzwa) is shown on Figures 9.0-9.7 of Appendix A and is categorized as follows:

- HED Larvae Occupied Rivulets – Rivulets that contain all HED Larval Primary Constituent Elements (PCEs), have been sampled at least one time between 1996 and 2011 (or since), and have been documented as supporting HED larvae during one or more sampling events. Average width of rivulet channels is 1.0 foot, and lateral movement of larvae outside of the rivulet channel is assumed to extend up to 0.5 meters from the center of the channel for a total occupied width of one meter.
- HED Larvae Habitat Areas – Larval habitat areas lack well-defined rivulet channels but are influenced by subsurface flow or upwelling. These areas contain all HED Larval PCEs, have been sampled at least one time between 1996 and 2011 (or since), and have been documented as supporting HED larvae during one or more sampling events.
- Undocumented Rivulets – Rivulets that contain all HED Larval PCEs, have been sampled at least one time between 1996 and 2011(or since), but have not been documented as supporting HED larvae.
- Historic HED Larvae Habitat Areas – Areas that contained all HED Larval PCEs at one time and were documented as supporting HED larvae 15 or more years ago. These areas no longer contain all HED Larval PCEs and have been sampled one or more times between 1994 and 2011 (or since) but have not been documented as supporting larvae in the last 15 years. Or an area or rivulet that has been documented as supporting HED larvae in the last 15 years, but conditions of the area have changed since the documentation to make it unsuitable for HED larvae.
- HED Adult Habitat Areas – Adult habitat areas contain both of the HED Adult PCEs. The areas include all open wetland and adjacent open upland habitats within CHUs. Developed and hardscape areas (e.g. roads, railroads, parking lots, industrial sites and fill) are excluded.

A description of the process used to determine and map HED habitat is located in Appendix B. A summary of HED habitat types and their respective acreages are shown in Tables 5 and 6 below.

Table 5. HED Adult Habitat Acreages.

Critical Habitat Unit	Adult Habitat (acres)	CHU Area (acres)
CHU 1	231.8	351
CHU 2	203.1	439
CHU 3	260.3	366
CHU 4	311.8	575
CHU 5	202.5	293
CHU 6	177.3	430
CHU 7	139.1	447
Total	**1,525.9**	**2,901**

Table 6. HED Larval Habitat Acreages within the Critical Habitat Units (CHUs).

Critical Habitat Unit	Parcel	Larval Habitat Name*	Larval Habitat Category	Occupied Larval Habitat (acres)	Historic Larval Habitat (acres)
CHU 1	Lockport Prairie	2S	Occupied	0.118	-
CHU 1	Lockport Prairie	1 FS	Occupied	0.004	-
CHU 1	Lockport Prairie	2 FS	Occupied	0.004	-
CHU 1	Lockport Prairie	1S	Occupied	0.057	-
CHU 1	Lockport Prairie	1S Upper	Occupied	0.062	-
CHU 1	Lockport Prairie	2N	Occupied	0.045	-
CHU 1	Lockport Prairie	1N	Undocumented	None	-
CHU 2	River South	South Meadow	Historic	None	0.474
CHU 2	Middle Parcel	Middle Parcel	Historic	None	1.559
CHU 2	River South	0.5, 1.0, 4.0	Undocumented	None	-
CHU 2	River South	2.0, 2.5	Occupied	0.079	-
CHU 2	River South	Emerald Meadow	Occupied	0.107	-
CHU 2	River South	3.0	Occupied	0.031	-
CHU 2	River South	5.0	Occupied	0.020	-
CHU 2	River South	6.0	Occupied	0.021	-
CHU 3	Romeoville Prairie	RM-SPRG1, RMST1	Undocumented	None	-
CHU 4	Keepataw	KS2T5 PLE	Occupied	0.008	-
CHU 4	Keepataw	KPE1	Occupied	0.002	-
CHU 4	Keepataw	KPE2	Occupied	0.015	-
CHU 4	Black Partridge	BPE1S	Undocumented	None	-
CHU 5	Waterfall Glen	WG2S	Occupied	0.014	-
CHU 5	Waterfall Glen	WGPstr1-4	Undocumented	None	-
CHU 6	McMahon Woods	McMahon Str 1	Occupied	0.027-0.033	-
CHU 6	McMahon Woods	McMahon Str 2	Occupied	0.009-0.014	-
CHU 6	McMahon Woods	McMahon Str 9	Occupied	0.012	-
CHU 6	McMahon Woods	McMahon Str 11	Occupied	0.003	-
CHU 6	McMahon Woods	McMahon Str 3-8, 10, 12	Undocumented	None	-
CHU 7	Long Run Parcel	LPO Str1	Historic	None	0.012
CHU 7	Long Run Parcel	LPO Str1	Undocumented	None	
CHU 7	Long Run Seep	Long Run Seep Str	Occupied	0.025	-
			Total (acres)	**0.674**	**2.045**

*As designated by K. Mierzwa and D. Soluk in various sampling reports.

HMS Calculation of Incidental Take

Under HMS' preferred alternative, surface mining will directly impact the habitat present in Middle Parcel only. Under the proposed mining plan, over a period of about 20 years, the entire surface aggregate resources of Middle Parcel will be mined to the limits of mining allowed under the

Illinois Mining Regulations (62 IAC 300.110) (~115 acres) (Figure 15.1, Appendix A). In addition, the frontage areas (along Rt. 53) of North and Far North Parcels contain adult HED habitat and will be developed, and a very small amount of adult HED habitat also will be impacted in ComEd Parcel during restoration activities.

Take and Habitat Impact/Take Estimates - HED

As a result of surface mining Middle Parcel, at most 40.81 acres of adult HED habitat and no larval habitat will be impacted/taken in Middle Parcel. In Middle Parcel, about 40.81 total acres of adult HED foraging habitat (including 6.01 acres of wet dolomite prairie and sedge meadow, 22.97 acres of *Phragmites* marsh, 0.1 acres of cattail marsh,11.3 acres of upland old field vegetation, 0.30 acre of mesic dolomite prairie, 0.04 acres wet prairie, and 0.08 acre each of reed canary grass and cattail marsh) will be lost (Figure 17, Appendix A). All but about 6.5 acres of this habitat is low quality. Within this area is about 1.56 acres of historic larval habitat (Figure 9.2, Appendix A). No larval habitat is thought to occur on Middle Parcel because no evidence of successful larval production has been found on the property since 1997 (Cashatt and Sims 1993; Cashatt et al. 1993; Vogt and Cashatt 1999; Mierzwa and Webb 2010; Mierzwa 2013). Observations of territorial males, indicating that there may be attempts by this species to breed, is the only evidence of breeding that has been documented from this parcel over the past 20 years. During this time there has been no evidence of successful population recruitment (larvae, exuviae, tenerals) (Mierzwa and Webb 2009). Construction of an access route in Long Run and ComEd Parcels is expected to result in a very small impact to adult HED habitat (0.39ac) (no larval or suspected larval habitat areas will be impacted). In addition, at most, 8.40 acres of adult HED habitat will be impacted when the frontage areas of North and Far North Parcels are developed (also low quality old field vegetation and habitat). Thus, a total of 49.6 acres of adult HED habitat is expected to be impacted by HMS activities in the permit area.

Pierce Eich Quarry is located west of Route 53 and is within the estimated groundwater recharge zone buffer for River South Parcel and the two-mile recharge area buffer for both River South Parcel and LPNP (Figure 4). Continued surface mining of Pierce Eich Quarry (35 ac remaining of 206 ac total) and the remainder of Middle Quarry (1.3 ac) is not expected to have any groundwater impacts (i.e. reduction in groundwater levels or discharge rates) on the habitat in River South and LPNP due to the implementation of groundwater avoidance measures. The avoidance measures and their effectiveness are summarized in the previous section (Section 5.1.3), and are detailed in several AECOM (2013b, 2014a, 2014b, 2016, 2017, and 2019) and HMS (2017 and 2019) studies. Similarly, surface mining of Middle Parcel (115 ac) is also not expected to have any groundwater impacts to these two parcels since it will be completed after Pierce Eich Quarry is no longer dewatering the groundwater. Mining Middle Parcel, however, is expected to affect the groundwater levels in adjacent and nearby parcels (i.e. North, Far North, and River Parcels). Impacts to North and Far North will be reduced by the inundation of Pierce Eich Quarry. In addition, the wetlands in all three parcels are heavily influenced by surface water which will help prevent any impacts to adult HED habitat. Furthermore, habitat on these three parcels will be improved through invasive species removal. RPNP is located a sufficient distance and direction from all surface mining operations that changes in groundwater levels and subsequent habitat impacts are not anticipated.

River South and LPNP contain both larval and adult HED habitat and are the two most productive breeding areas in Illinois (and the Southern Recovery Unit). Lockport Prairie accounts for 54-56% of the Illinois population and River South accounts for 30-35% of the population - combined they account for 84-91% of the entire state population. Romeoville Prairie does not have any confirmed larval habitat. Mining East Parcel (36 ac) is not expected to have any groundwater impacts to these

parcels or any other habitat area in the Planning Area because it is hydraulically isolated from these areas by the Des Plaines River on the west and two canals on the east. These surface water features provide hydraulic controls, since they are in direct connection with the Silurian Bedrock.

HMS' proposed activities will not impact the Covered Species or their habitat in any other properties in the HCP Permit or Planning Area. All anticipated impacts described above will be mitigated for through the restoration, enhancement, maintenance, and protection of habitat in other HMS parcels in the Permit area (see Mitigation – Section 5.1.7 and Appendix C, Table C-9). Surface mining operations in Middle Parcel will eventually directly impact all wildlife habitats on Middle Parcel. However, restoration measures implemented on the other HMS parcels included in the mitigation package will greatly improve overall habitat quality for wildlife.

Wetlands

The proposed surface mining activity in HMS' Middle Parcel will impact a total of 29.74 acres of wetlands. In Middle Parcel most of these are highly degraded or low-quality wetlands (i.e. 22.97 acres invaded by *Phragmites*, including scraped areas)) (Figure 17, Appendix A). Impacts to the 6.01-acre wet-mesic dolomite prairie will be avoided by carefully removing and transplanting it as part of HMS' mitigation. Aside from 0.39 acres of impacts to wetlands on ComEd Parcel, no wetlands will be lost on any other HMS properties included in this HCP. HMS submitted a permit application to the U.S. Army Corps of Engineers and other regulatory agencies for all anticipated wetland impacts associated with this HCP on January 31, 2019 and later provided additional information requested by the USACE in an April 29, 2020 letter.

Summary Incidental Take

This analysis indicates that under the Preferred Alternative total impacts will result in the loss of approximately 49.6 acres of adult HED habitat: adult foraging and/or dispersal habitat in Middle, North, Far North, and ComEd Parcels. This loss represents 3.3% of the known adult HED habitat (49.6 of 1526 ac) in CHUs in Illinois (Figure 9.0, Appendix A). (Note: There is known HED habitat in the lower Des Plaines River Valley outside of CHUs (e.g. Lockport Prairie East and Dellwood Park West.) There will be no loss of adult HED habitat elsewhere in the HCP Planning Area. There are no anticipated impacts to larval habitat as the result of HMS planned activities. All potential groundwater impacts to larval habitat will be prevented through the use of avoidance measures described above in Section 5.1.3 (AECOM 2013b, 2014a, 2014b, 2015a, 2015b, 2015c, 2016, 2017, 2018, 2019). (Note: Only 40.1 acres of adult HED habitat on Middle Parcel is within the CHU boundary and 0.7 acres is outside the boundary (see Figure 17). This reduces the loss of habitat within the CHUs to 48.9 acres or 3.2%. The larger number is used in this document to ensure that all habitat impacts are accounted for and permitted.)

5.1.5 Impact of Take

All but two of the HED habitat sites (both adult or adult and larval) in Illinois are found in the lower Des Plaines River Valley and are within or near the seven designated Critical Habitat Units (USFWS 2007 and 2010). Based on current HED habitat mapping (Figures 9.0-9.7; Appendix A), this HCP estimates that there are 1,525.20 acres of known adult HED habitat and 0.67 acres of suitable HED larval habitat in the river valley (within the CHUs). Numerous surveys of adult and larvae HED have been conducted at many of the known habitat locations. Population estimates based on these studies vary widely from year to year and from site to site. The most recent estimate of the HED adult and larval populations within the river valley, based on a review of nearly all HED studies conducted in Illinois, is 165 adults and 2,063 larvae (Soluk and Mierzwa 2012). These

HED habitat acreages and population estimates were used as the basis for the impact of take analysis.

HMS Impact of Take

HMS' Covered Activities will result in the loss of 49.6 acres of adult HED habitat in Middle and portions of North, Far North, and ComEd Parcels which is 3.3% of the known adult HED habitat (49.6 of 1,525 ac) (Figures 9.0, 9.2, and 17, Appendix A). No direct impacts or indirect groundwater impacts to larval HED habitat are anticipated from HMS' planned activities and, therefore, no impact to or take of larval habitat is expected.

The take calculation above describes the reasonable worst-case estimate of take in individuals and also the maximum acreage of known and suitable HED habitat impacted by HMS, in instances where impacts rise to the level of mortality, harm, or harassment. Harm may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (16 U.S.C. 1532(19))." The take analysis builds on the take calculation by further explaining the anticipated impact this reasonable worst-case take is anticipated to have on the HED at the individual and population level.

Individual Level

Based on the assessment of the potential biological impacts and take (Section 5.1.4) in this HCP, Covered Activities identified to cause take (direct or indirect) (that were not avoided or self-mitigating) include only the removal of adult HED foraging habitat and movement/dispersal corridor due to the surface mining of Middle Parcel, development of the far western portion of North and Far North Parcels, and construction of an access route in ComEd Parcel. These activities will result in the loss of 49.6 acres of adult HED habitat.

HED larvae are very unlikely to be found in Middle Parcel (Mierzwa and Webb 2012a and Mierzwa 2013), in the impacted areas of North and Far North Parcels (upland frontage area along Rt. 53), and ComEd Parcel (two-track road through degraded wetland). Thus, surface mining and development of these parcels are not anticipated to cause any direct take of larvae or larval habitat. In addition, potential groundwater impacts to larval habitat areas in nearby parcels (i.e. River South and LPNP) from mining Pierce Eich will be avoided through implementation of avoidance measures (AECOM 2013b, 2015a, 2016, 2017, and 2019 and HMS 2017 and 2019). Therefore, no take of the HED larvae or larval habitat is anticipated from HMS' activities.

Direct mortality to the HED from mining operations on Middle Parcel will be avoided by completing operations (e.g. vegetation and soil removal) in habitat areas outside the HED adult flying season or using vehicles at reduced speed if operations occur during the flying season. Some mining activities that occur outside habitat areas (e.g. blasting and hauling of rock) will be conducted during adult HED flight season but will be completed in a manner or location that results in negligible or insignificant impact and thus does not result in take (see Section 5.1.3).

However, removal of habitat in Middle Parcel and the western portion of North and Far North Parcels (done outside adult HED flight season) will result in a reduction of foraging and perching/resting habitat and will displace adult HED that would have used that habitat the next season. This will result in indirect impacts. These displaced HED are expected to use the remaining on-site suitable habitat or habitat found on adjacent parcels. Until all overburden (i.e. vegetation and soil) is removed from Middle Parcel or developed in North and Far North Parcels, the HED

could utilize the remaining habitat areas in these parcels. However, after a significant amount of the vegetation is removed, adult HED will need to utilize habitat on adjacent parcels (i.e. River, North, Far North, River North, and ComEd ROW). Vegetation quality in adjacent parcels is as good as much of the adult HED habitat removed from Middle Parcel, but these parcels have less of the best quality community (e.g. wet-mesic dolomite prairie). However, with respect to foraging, the HED respond to habitat structure rather than species composition, as evidenced by frequent foraging over reed canary grass at River South and avoidance of *Phragmites* monocultures on the eastern half of Middle Parcel. The adjacent parcels provide the same type of habitat as Middle Parcel with vegetation appropriate for foraging, perching, and resting but not for breeding. In addition, adult HED habitat on River and North Parcels will be expanded and improved through enhancement of vegetation structure by removing *Phragmites* and invasive woody vegetation. These adjacent parcels will be used as dispersal corridors that will allow the HED to reach more distant habitat (i.e. in Romeoville Prairie, River South Parcel, or ComEd/Long Run Parcels). Thus, all the same habitat functions provided by Middle Parcel are provided by adjacent parcels. The loss of habitat on ComEd/ Long Run Parcel from the installation of an access road is very small (0.39 acres) and will be limited to the work area with the implementation of avoidance measures (see Section 5.1.3) and thus is not expected to have any perceptible impact on HED behavior.

The impact of removing habitat from Middle Parcel and the west ends of North and Far North Parcels on HED behavior may depend in part on the carrying capacity of nearby habitat. Transient animals may see little effect, since they do not pause for very long and tend to avoid territorial interactions. Foraging animals spend longer intervals in one area, and if adjacent habitat is not extensive enough to support all foraging animals then there could be an increase in energy expenditure as dragonflies seek out other habitat areas at greater distances. Given the long-range flight capabilities of some dragonflies and the documented minimum 5.4 km dispersal distances of the HED (Mierzwa (editor) 1995), energy expenditure alone is not expected to be an issue. However, a reduction in available food coupled with increased energy expenditure could stress the HED. In addition, some animals could disperse for long distances in directions away from suitable habitat, thus effectively removing themselves from the breeding habitat, or could be forced to cross roads or other areas where there is increased risk of mortality, injury, or predation. This, along with a reduction in available food, would constitute harm or harassment, and therefore take. However, it is important to note that very few HED territorial interactions have been observed in recent years at Middle or River Parcels, suggesting that those areas are not presently at or near carrying capacity for foraging activity.

Population-Level

As described above, individual adult HED may experience more stress and a slightly increased chance of mortality as a result of HMS' mining activities. For the viability of the species, it is important to know how these potentially adverse effects to individual HED affect the overall health and viability of the population in the lower Des Plaines River Valley (i.e. the largest Illinois population of the Southern Recovery Unit). Middle Parcel is in the southern half of the string of HED habitat sites on the west side of the Des Plaines River and just north (~3500 feet) of the two most productive breeding sites in Illinois, (River South and Lockport Prairie) which account for 84-91% of the Illinois population.

The analysis that follows describes impact of the incidental take requested on HED at the population level.

HED habitat (adult and larval) is found in or near seven federally designated Critical Habitat Units located in the lower Des Plaines River Valley (USFWS 2005, 2007, and 2010). Based on existing vegetation mapping and aerial photo interpretation, approximately 1,525 acres of adult HED habitat have been mapped within the lower Des Plaines River Valley (within CHUs) (Figure 9.0-9.7, Appendix A). There have been numerous surveys of adult and larvae HED conducted at a number of these known habitat locations. Population estimates based on these studies vary widely from year to year and from site to site. The best current estimate of HED adult and larval population within the river valley is 165 adults and 2,063 larvae (Soluk and Mierzwa 2012).

HMS anticipates that "take" in the form of mortality (slight increase in chance based on stress), harm and harassment will occur at only one location as a result of proposed activities - Middle Parcel. Based on recent studies, habitat that may be lost in North and Far North does not appear to be used often by adult HED (Mierzwa and Webb 2014 and 2016). Three adult HED individuals will be impacted per year (entirely through displacement) at Middle Parcel once all habitat is removed. Three individuals is about 1.8% (3 of 165) of the estimated annual adult HED population in the lower Des Plaines River Valley. However, this level of impact will never occur because mitigation measures designed to offset this take (i.e. habitat restoration on nearby parcels) will start to be implemented right after the permit is issued and will be completed before all habitat impacts on Middle Parcel have taken place. A total of approximately fifty acres of adult HED habitat will be lost in all three parcels which is 3.3% of the known HED habitat (49.6 ac of 1,525 ac) within the lower Des Plaines River Valley (within the Critical Habitat Units). Again, no impacts to larval habitat are anticipated from proposed mining or development because all indirect groundwater impacts to larval habitat areas (i.e. River South and Lockport Prairie) will be avoided through avoidance measures included in the HCP (see Section 5.1.3). Therefore, take at Middle Parcel (as well as North and Far North Parcels) is expected to have a very limited effect on the overall health and viability of the HED population within the lower Des Plaines River Valley. Consequently, no impacts are expected range-wide to HED populations in other states.

Genetic-Level Implications

As discussed above, HMS' planned activities are expected to have a very limited effect on the overall health and viability of the HED population in the lower Des Plaines River Valley. Based on recent genetic analyses by Dr. Meredith Mahoney (pers. comm. 2012), of 141 samples of Hine's emerald dragonfly tissue analyzed for mitochondrial DNA (mtDNA) variation, there are 21 haplotypes rangewide, with up to six differences (1.1%) among them. Missouri exhibits the greatest genetic diversity across the range of the species with 13 of the 21 haplotypes found in Missouri including 10 that are unique to the state; whereas, Michigan has been found to contain only one haplotype and Wisconsin has four haplotypes.

Hine's emerald dragonfly sites in Illinois had previously been thought of as being the most genetically diverse (Purdue et al. 1996) prior to the discovery of sites in Missouri (M. Mahoney, pers. comm. 2012). There are six different haplotypes (genetic variants) that have been found in Illinois, four of which are unique to Illinois, with up to five differences (0.92% divergence) among them. The differences (number or percentage) are the maximum observed base pair substitutions between haplotype pairs looking either range wide or just within Illinois or other regions. Some haplotype pairs have only one or two differences between them. The four unique haplotypes were all found in sites (Lockport Prairie Nature Preserve, River South and Middle Parcels, and Romeoville Prairie) within a close proximity (approx. 4.25 miles (6.84 km)) of each other. The haplotypes unique to Illinois are B, C, E, and F. Alternatively, haplotype D, which is found across the species range, has not yet been found in Illinois, though two other widespread haplotypes (A

and G) do occur. Analyses of museum samples from extirpated Ohio populations found genetic variants that are not seen in other, extant, populations (Purdue et al., 1996, and Mahoney pers. comm. 2012). Range wide analysis showed little geographic structuring of genetic variation and most variation (77-86%) is within states (Mahoney pers. comm. 2012). Due to the relatively high genetic diversity and unique haplotypes in HED populations in Illinois and Missouri, the long-term viability of the species range-wide would be compromised if the genetic diversity of these populations is threatened.

A more recent study, however, has revealed more geographic structuring of genetic variation. An assessment of the genetic structure of Hine's emerald dragonflies based on microsatellite DNA analysis of samples from sites in Illinois, Wisconsin, and the Upper Peninsula of Michigan revealed a clear spatial pattern for this species indicating five separate populations within the study area: one population in Illinois; a second in Ozaukee County (Cedarburg Bog), Wisconsin; a third in southwest Wisconsin (Lower Wisconsin River); a fourth that is in Kewaunee and Door Counties, Wisconsin, and a fifth population in the Upper Peninsula of Michigan (Monroe and Britten 2014). The assignment of individual sites to populations reflects the information from this research as well as the known flight distance of the species (USFWS 2013). Based on mark recapture studies Hine's emerald dragonflies can fly at least 3.4 miles (5.5 km) (Mierzwa et al. 1995a; Cashatt and Vogt 1996) but most likely not further than 30 miles (48.28 km) (D. Soluk, pers. comm. 2012). While most populations in the southern portion of the species range are believed to be smaller, there is greater genetic diversity within the southern populations which makes them extremely important to the survival and recovery of the species. Alternatively, the populations in the northern portion of the species range are larger yet have less genetic diversity. This is supported by Monroe and Britton's (2014) study that found allelic richness is greatest in the Illinois population and lowest in the two northern populations found in Door Peninsula, WI, and the Upper Peninsula, MI. This study also revealed most genetic variation is within populations (91%) with very little genetic variation among sites within populations (3%) and among populations (6%). However, this level of genetic diversity may not be maintained by regular gene flow in the future due to the loss of stepping stone habitats that must have existed previously based on the species dispersal capabilities.

The vulnerability of Hine's emerald dragonfly populations in the South and the species as a whole, to effects from demographic and genetic stochasticity, may be increasing due to the severity of the threats to the small populations. Demographic stochasticity can cause small populations to vary widely in size. Genetic stochasticity means random changes in a population's genetic makeup that can have deleterious effects on the ability of individuals to survive and reproduce. A drastic reduction in population size can exacerbate the effects of genetic stochasticity or can lead to the further decline of a population to extirpation. As a population loses individuals, it may lose genetic variation, which may reduce the species' fitness or ability to cope with environmental change. So, while the southern populations may currently contain genetic diversity that may be necessary for the species to survive and adapt in a changing environment, the potential for the Southern populations to become extirpated is compounded by several direct and indirect threats and by small population sizes, which compromises the viability of the species rangewide.

These studies reveal the importance of the Illinois population to maintaining the genetic diversity of the species range-wide as well as the importance of maintaining the size of the population to prevent the loss of genetic diversity and reduced fitness of the population. Almost the entire Illinois population is found within and adjacent to the lower Des Plaines River Valley and it contains three sub-populations. Subpopulation 1 is located within the Planning Area, while Subpopulations 2 and 3 are located north and northeast of the planning area, respectively. Subpopulation 1, which

includes the Permit Area, contains by far the greatest number of individuals and the greatest genetic diversity (i.e. all 4 unique haplotypes) of the Illinois populations. Therefore, Subpopulation 1 is critical to maintaining the genetic diversity and viability of the Illinois population.

Further, maintaining connectivity between habitat sites within this subpopulation is very important in preserving its genetic diversity as well as that of the entire Illinois population. Surface mining Middle Parcel will reduce connectivity within the subpopulation and lower Des Plaines River Valley. This could result in decreased gene flow which could lead to inbreeding depression and reduced fitness of the population. Therefore, HMS will improve connectivity around Middle Parcel by preserving and expanding habitat on adjacent parcels to create dispersal corridors that facilitate adult HED movement. River, North, Far North and River North Parcels (150.5 acres) will be preserved, and habitat will be restored and expanded (74.8 acres) on all four Parcels. These genetic studies also point to the importance of maintaining current breeding locations (larval habitat) of Subpopulation 1. HMS will avoid all impact to the groundwater hydrology of River South and Lockport Prairie (which account for 84-91% of the Illinois population) or any other larval habitat area from its continued mining operations through the implementation of avoidance measures (i.e. infiltration galleries and basins). In addition, HMS will be greatly expanding habitat adjacent to another breeding location within this subpopulation (ComEd and Long Run Parcels). Due to these avoidance and mitigation measures, HMS concludes that the anticipated impacts from its Covered Activities do not pose a significant risk to the HED population or its genetic diversity and fitness.

5.1.6 Effects on Critical Habitat

Critical Habitat was designated for the HED in September 2007 (and revised in April 2010) (USFWS 2007 & 2010). Seven Critical Habitat Units were designated in Illinois, all in or near the lower Des Plaines River Valley and four are included in the HCP Planning Area (Figure 4, Appendix A) (USFWS 2007 & 2010). In determining which areas to designate as Critical Habitat, the USFWS identified Primary Constituent Elements (PCE) which they determined are necessary to meet the biological needs of the species. PCEs are those physical and biological features that are essential to the conservation of the species, and within areas occupied by the species at the time of listing, that may require special management considerations and protection. To be designated critical habitat for the HED, an area must contain sufficient PCEs to support at least one life history function. Seven PCEs were identified for HED habitat: five for larval habitat and two for adult habitat. These are listed below:

For egg deposition and larval growth and development (larval habitat):

1) Organic soils (histosols, or with organic surface horizon) overlying calcareous substrate (predominantly dolomite and limestone bedrock);
2) Calcareous water from intermittent seeps and springs and associated shallow, small, slow flowing streamlet channels, rivulets, and/or sheet flow within fens;
3) Emergent herbaceous and woody vegetation for emergence facilitation and refugia;
4) Occupied burrows maintained by crayfish for refugia; and
5) Prey base of aquatic macroinvertebrates, including mayflies, aquatic isopods, caddisflies, midge larvae, and aquatic worms.

For adult foraging; reproduction; dispersal; and refugia necessary for roosting, resting, escape from male harassment, and predator avoidance (especially during the vulnerable teneral stage) (adult habitat):

6) Natural plant communities near the breeding/larval habitat which may include fen, marsh, sedge meadow, dolomite prairie, and the fringe (up to 328 ft (100m)) of bordering shrubby and forested areas with open corridors for movement and dispersal; and
7) Prey base of small, flying insect species (e.g. dipterans).

The following statements from USFWS regarding the designation of critical habitat were taken into consideration in determining potential effects on critical habitat from activities:

> *To the greatest extent possible, we avoided including developed areas containing buildings, rail lines, electrical substations, and other urban infrastructure within critical habitat units. Where we have not been able to map out these structures we have excluded them by text. As stated in this rule, critical habitat does not include human-made structures existing on the effective date of a final rule not containing one or more of the primary constituent elements (see definition of ''primary constituent elements'' in subsequent section). Therefore, human-made structures including utility poles, power lines, rail lines, and the generating station are not included in the critical habitat designation (21398 Federal Register / Vol. 75, No. 78 / Friday, April 23, 2010 / Rules and Regulations).*
>
> *When determining critical habitat boundaries, we made every effort to avoid including developed areas such as buildings, paved areas, and other structures and features that lack the PCEs for the species. The scale of the maps we have prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of all such developed areas. Any such structures and the land under them inadvertently left inside critical habitat boundaries shown on the maps of this final rule are excluded from this rule by text and are not designated as critical habitat. Therefore, Federal actions limited to these areas would not trigger Section 7 consultation under the Act, unless they affect the species or PCEs in critical habitat (Federal Register /Vol. 75, No. 78 / Friday, April 23, 2010 /Rules and Regulations 21409).*

The following section discusses the effects of HMS' proposed activities on CHUs within the Planning Area. All CHUs that are impacted or could be impacted are discussed below. For Parcels with expected impacts, each PCE is listed and discussed as to whether it exists in the parcel, how it will be impacted, how impacts will be avoided and minimized and how impacts will be mitigated.

HMS Effects on Critical Habitat

Middle Parcel (CHU 2)

Middle Parcel is the only designated Critical Habitat (CHU 2) that will be mined. Pierce Eich, Middle Quarry, and East Parcel will be mined but are not in designated Critical Habitat, and no mining activities are planned on any other HMS parcels in Critical Habitat. Middle Parcel, however, does not contain all of the PCEs and the PCEs that are present are only found in limited areas of the parcel.

Larval Habitat PCE

1. Organic soils (histosols, or with organic surface horizon) overlying calcareous substrate (predominantly dolomite and limestone bedrock):

There are approximately 30 acres of wetlands on Middle Parcel, but approximately 5 acres of wetlands contain *Phragmites* growing on previously scraped areas (i.e. very little soil with no organic matter development). Almost all the non-wetland areas have been scraped, filled, or altered in some way by past activities. Therefore, PCE #1 exists on no more than 25 acres of the parcel. A portion of the hydric soils on this parcel (6.01 acres in the wet-mesic dolomite prairie) will be salvaged and transplanted to a mitigation parcel (ComEd). The remaining 19 acres will be lost during the mining process. The loss of this soil will be mitigated through the restoration of approximately 30.1 acres of wetlands in currently non-wetland areas containing hydric or formerly hydric soil in mitigation parcels on both the west (River and River South) and east (Long Run and ComEd) sides of the river. In addition, another approximately 249 acres of wetlands and uplands with hydric soil will be enhanced with approximately 117 acres on the west side of the river (River, River South, and Fitzpatrick Seep) and approximately 132 acres on the east side (Long Run and ComEd). Additional wetlands with hydric soils will be enhanced on North, Far North, and River North Parcels on the west side of the river.

2. Calcareous water from intermittent seeps and springs and associated shallow, small, slow flowing streamlet channels, rivulets and/or sheet flow within fens:

Surface and groundwater studies (AES 2012a & 2013; AECOM 2009) as well as observation during site investigations (Mierzwa and Webb 2012c) indicate that Middle Parcel is dry during much of the growing season and that surficial discharge of groundwater on the parcel in the form of seeps or springs occurs very infrequently. Rivulets or streamlets of groundwater discharge are not present in Middle Parcel. Only one possible observance of a groundwater seep has been reported on Middle Parcel in the past 25 years (TAMS 1994), but channelization from the discharge (in the form of a rivulet) was not present and the seep was over 100 meters southwest of the areas where HED exuviae were found in 1993. The one seep witnessed at the Parcel was too small to form a streamlet (Mierzwa 2009). Cashatt et al. (1993) documented HED reproduction within a small area of cattail marsh, within small streamlets which may have been deer trails. Observations in 1994 and 1995 indicated that the streamlets at Middle Parcel had “slight but almost unmeasurable flow” (Mierzwa et al. 1995; Gochee 1995). No streamlets were visible upgradient on the site, including on a scraped area of exposed bedrock at the western edge and just inside the berm. After significant rainfall events, surface saturation in adjacent dolomite prairie was observed to recede west to east, thus precipitation falling within Middle Parcel is believed to have been transmitted as interflow through the organic substrate on top of shallow bedrock prior to discharging to the marsh where breeding activity was observed. Conditions at Middle Parcel, both in the mid-1990s and more recently, were further characterized and mapped by Mierzwa and Webb (2009). Even though the wetlands in Middle Parcel are dry for much of the growing season and rivulets are not present, groundwater levels within the Parcel have remained consistent over the period of 2005 to 2013 (Appendix G-1, Attachment 1). The maintenance of groundwater levels and similar observations over the past two decades indicate that hydrologic conditions have remained stable within the parcel during this time frame.

Throughout much of the Parcel (from north to south), the water table is within three to five feet of the surface and deeper potentiometric head levels are typically 0.5 to 1.5 feet above the water table elevation. This indicates that there is an upward flow of groundwater from deeper portions of bedrock that helps to maintain head levels and cool temperatures of groundwater near the ground

surface. Fluctuations occur seasonally throughout the parcel but are more recognizable near the face of the Quarry on the south end of the Parcel. However, deep bedrock piezometric heads are consistently higher than shallow head levels throughout the year at all other areas. Thus, groundwater occurs consistently through this parcel at shallow depths and has remained relatively stable during at least the last decade. Groundwater has not been observed to discharge at the ground surface with sufficient quantities of water to form rivulets critical for establishment of HED larvae over the past 25 years.

On the occasions when surface flows pool to form minor rivulets, the source of these features appears to be from heavy precipitation since sources of groundwater discharge are not present. Documentation of conditions of the parcel prior to HMS' monitoring indicates similar conditions. These reports mention a rivulet, but an assessment of the rivulet with respect to groundwater contributions or rainfall runoff was not conducted. Therefore, the presence of seeps on this parcel is extremely limited since only one seep has been confirmed in literature and is believed to be related to surface water drainage and not supersaturated calcareous water consistently discharging from the ground. Thus PCE #2 currently does not exist nor is it believed to have been present for at least the last 25 years on the parcel. No avoidance and minimization measures (AMMs) or mitigation are planned for PCE #2.

3. Emergent herbaceous and woody vegetation for emergence facilitation and refugia:

Nearly all the emergent wetlands on the Parcel are dominated by *Phragmites* (23 acres) and only 0.1 acre of cattail dominated marsh is found on the site. Some cattails are also found along the edges of the 6.01-acre wet-mesic dolomite prairie in areas where it borders the *Phragmites*-dominated marsh. In addition, woody vegetation (mostly invasive shrubs) borders much of the wetlands on the site. Thus, PCE #3 is present in no more than 1-2 acres of marsh on the parcel and an additional 21 acres of *Phragmites* and invasive woody vegetation near the historic larval habitat on the parcel. The loss of these marsh areas will be mitigated by the restoration or enhancement of 113 acres of marsh/emergent wetlands in all eight of the mitigation parcels.

4. Occupied burrows maintained by crayfish for refugia:

There is no evidence of crayfish presence on Middle Parcel; most telling is that crayfish have not been captured despite multiple years of intensive larval sampling at Middle Parcel in the late 1990s and in 2009-11 (Mierzwa and Webb 2009, 2011), while they have been captured at ComEd and North Parcels and every year of sampling at River South Parcel (Mierzwa and Webb 2013). Also, considerable effort has been spent searching for burrows with no success. For example, no crayfish burrows have been found in or near (within 30 feet of) streamlet systems in Middle Parcel during three years of larval sampling (Mierzwa and Webb 2009, 2010, and 2012c); streamlets on Middle Parcel do not appear to be heavily influenced by groundwater, although this may be a limiting factor for HED but not for crayfish. It is suspected, based on 1990s soil sampling, that the soil on much of Middle Parcel is simply too shallow to allow establishment of burrows to depths below the frostline (Mierzwa and Webb 2009, 2011). A similar pattern is seen at Long Run/ComEd where burrows are present where soil is deep and absent where it is shallow (Mierzwa and Webb 2011).

In summary, there is no evidence that crayfish burrows or crayfish were present even in the mid 1990s. None were observed at that time (Mierzwa and Webb 2009) nor more recently during larval sampling (Mierzwa and Webb 2009, 2010, and 2012c); thus PCE #4 is unlikely to be present on the site. No AMMs or mitigation are planned for PCE #4.

5. Prey base of aquatic macroinvertebrates, including mayflies, aquatic isopods, caddisflies, midge larvae and aquatic worms:

Aquatic macroinvertebrates are present on-site but may be limited due to the very limited amount of surface water during the growing season. Thus, PCE #5 is present on the parcel but likely limited to the 30 acres of wetlands on site. All wetland impacts will be avoided (i.e. 6.01-acre wet-mesic prairie transplant) or mitigated through the restoration (24 acres) or enhancement (225 acres) of wetlands on five of the wetland mitigation parcels (River, River South, Fitzpatrick Seep, Long Run, and ComEd). Wetland habitat improvements will also occur on the other HCP mitigation parcels (North, Far North, and River North).

Adult HED Habitat PCE

6. Natural plant communities near the breeding/larval habitat which may include fen, marsh, sedge meadow, dolomite prairie, and the fringe (up to 328 ft (100 m)) of bordering shrubby and forested areas with open corridors for movement and dispersal:

Approximately 7 acres of native wetland communities (all wetlands, excluding *Phragmites*-dominated areas on both scraped and unscraped areas (23 acres)) are found on Middle Parcel and most are bordered by woody vegetation. However, no native upland plant communities are found on the parcel. In addition, the 7 acres of native wetland communities found on site are not near current larval habitat. The closest currently productive larval habitat to Middle Parcel is about 4,500 feet away (River South Parcel). However, adult HED habitat on the site (40.81 acres) (which includes open non-native upland communities) does provide open corridors for movement and dispersal. Thus, PCE #6 is present on the site. This loss of dispersal habitat will be mitigated for through the restoration of open dispersal habitat on approximately nine acres in North Parcel, 26 acres in Far North Parcel, 10 acres in River North Parcel, 29 acres in River Parcel, 28 acres on River South and Fitzpatrick Seep, and 80 acres in ComEd and Long Run Parcels. In addition, all these parcels as well as River South Bluff Parcel will be preserved.

7. Prey base of small, flying insect species (e.g. dipterans):

Flies and other flying insects have been observed on site; thus, PCE #7 is present. These prey insects will be lost with loss of habitat on the parcel (40.81 acres). This loss will be mitigated through the restoration of 29 acres of adult HED habitat on River Parcel and 154 acres on the other mitigation parcels.

Mitigation in Critical Habitat
ComEd and Long Run Parcels (CHU 7)

As part of the mitigation package, habitat on North, Far North, River North, River, River South, Fitzpatrick Seep, ComEd, and Long Run Parcels will be restored or enhanced. These mitigation efforts will not harm the PCEs on these parcels but are designed to improve most, if not all, of the PCEs. The only exception is the construction of an access road in Long Run and ComEd Parcels and other work related to the wet-mesic dolomite prairie transplant. Installation of the access road will result in 0.39 acres of permanent impacts and 0.03 acres of temporary impacts (see Restoration Plan Set, Appendix F). All other work related to the transplant takes place in degraded upland areas (i.e. buckthorn thicket growing on spoil piles) and therefore will not impact PCEs.

Larval Habitat PCE

1. Organic soils (histosols, or with organic surface horizon) overlying calcareous substrate (predominantly dolomite and limestone bedrock):

Hydric soils are present in ComEd and Long Run Parcels. Soil survey maps identify wetland areas in the parcels as hydric silt loam and silty clay loam soils. Soil samples from wetland delineations confirm these soils. Soil was scraped and deposited in nearby piles mostly in ComEd Parcel years ago prior to HMS ownership. PCE #1 is present in the area of the permanent impact (i.e. wetland within and along a two-track access road) but is not in the area of the temporary impacts because these areas were previously scraped. Impacts will be minimized through the implementation of measures described in the Restoration Plan Set (e.g. erosion and sediment control) (Appendix F). The transplant of 6.01 acres of wet mesic dolomite prairie with native hydric soil adjacent to the impact area will mitigate for the loss of hydric soil on ComEd and Middle Parcels.

2. Calcareous water from intermittent seeps and springs and associated shallow, small, slow flowing streamlet channels, rivulets and/or sheet flow within fens:

Discharged groundwater enters the northeast corner of ComEd Parcel through a drainage swale to the north and a culvert and seep through the train tracks. Water from the seep eventually flows into a rivulet-like feature (~400 ft in length). Groundwater may seep through the tracks in other locations of ComEd or Long Run Parcels, but no other discrete locations have been found. However, groundwater levels in the proposed transplant areas (i.e. scraped area) are typically within six inches of ground surface and are present within a foot of ground surface across much of the ComEd Parcel (STS 2009). In addition, HED larvae were found in a streamlet feature at the very north end of Long Run Parcel (but is now classified as Historic larvae habitat), indicating that appropriate groundwater hydrology is present in this location too. Therefore, PCE #2 is known to be present in at least two locations on these parcels. The closest disturbance to these features during restoration activities is over 200 feet away (i.e. installation of the access road for wet-mesic prairie transplant area). Therefore, with proper installation of avoidance measures, none of these features will be impacted by the installation of the access road. In addition, restoration on these parcels (i.e. invasive woody removal) will likely improve site hydrology.

3. Emergent herbaceous and woody vegetation for emergence facilitation and refugia:

Almost all of Long Run Parcel is wetland (175.8 of 183 ac) and over half of ComEd Parcel (61.1 of 103 ac) is wetland. Approximately 30 acres of emergent wetlands, excluding monotypic stands of *Phragmites*, are found on these two parcels, and woody vegetation (mostly invasive shrubs) borders much of the wetlands on the site. Thus, PCE #3 is present on over 30 acres of marsh and other woody areas bordering wetlands on the parcel. No marsh areas and no or little native woody vegetation will be impacted during the access road installation. Proper erosion and sediment control measures will be used to prevent any impacts to nearby emergent areas (see Restoration Plan Set, Appendix F). All wetland habitat impacts on these parcels will be mitigated for through wetland restoration and enhancement on these same parcels.

4. Occupied burrows maintained by crayfish for refugia:

Occupied crayfish burrows have been found on ComEd (Mierzwa and Webb 2012c) and Long Run (Brown and Soluk 2012) Parcels in recent years. Other likely larval habitat areas on these parcels (e.g. marsh and sedge meadow in the northeast corner of ComEd) have been searched for crayfish burrows but none have been found. Thus, PCE #4 is present in at least two locations on these

parcels, but both are at least 300 feet from the impact area. Therefore, with proper installation of avoidance measures, none of these burrows will be impacted by the installation of the access road.

5. Prey base of aquatic macroinvertebrates, including mayflies, aquatic isopods, caddisflies, midge larvae and aquatic worms:

Almost all of Long Run Parcel is wetland (175.8 of 183 ac) and over half of ComEd Parcel (61.1 of 103 ac) is wetland, so plenty of aquatic macroinvertebrate habitat is present on site. Thus, PCE #5 is present on these parcels. Both permanent and temporary impacts may affect habitat for macroinvertebrates. Timber or composite matting will be used to provide access through some wetland areas (temporary impacts (0.03 ac)). Vegetation typically recovers within a year after removal of this matting. Habitat will be lost in the area where the permanent access road is installed (0.39 ac). Proper erosion and sediment control measures will be used to prevent impacts to adjacent wetland areas (see Restoration Plan Set, Appendix F). Restoration of 25.1 acres of wetland on these two parcels will mitigate for the very small loss of aquatic macroinvertebrate habitat.

Adult HED Habitat PCE

6. Natural plant communities near the breeding/larval habitat which may include fen, marsh, sedge meadow, dolomite prairie, and the fringe (up to 328 ft (100 m)) of bordering shrubby and forested areas with open corridors for movement and dispersal:

Approximately 52 acres of native communities (i.e. mesic dolomite prairie, wet-mesic dolomite prairie, wet prairie, sedge meadow, cattail marsh, and other native emergent vegetation) are found on ComEd and Long Run Parcels. One larval habitat area (north end of Long Run) has been confirmed on these parcels (but is now classified as Historic larvae habitat). Some of these native communities are found near (within 100 m) the larval habitat while others are located further away but provide corridors for movement and dispersal. Thus, PCE #6 is present on the site. All of the areas impacted by the access road are located more than 100 meters away. This loss of dispersal habitat will be mitigated for through habitat restoration and enhancement on these same parcels.

7. Prey base of small, flying insect species (e.g. dipterans)

Flies and other flying insects have been observed on site. In addition, foraging adult HED have been observed on these parcels indicating the presence of appropriate food items (Mierzwa and Webb 2009 and 2012b). Thus, PCE #7 is present. The permanent loss of 0.39 acres of habitat will have very little, if any, impact on the flying insect population in these parcels. Any loss that may be experienced will be mitigated for through habitat restoration and enhancement on these same parcels.

Other parcels within CHU 2 that could be affected by mining or other development activities:
Parcels adjacent to and near Middle Parcel are also within CHU 2. These include River, North, Far North, and River North Parcels. None of these parcels contain larval habitat, and all have only two of five larval habitat PCEs (3 and 5) with the exception of North Parcel, which also contains occupied crayfish burrow (PCE 4). Although they all contain wetlands with hydric soils, none have organic soils (i.e. histosols) (PCE 1) according the Will County Soil Survey (Struben 2012). All four of these parcels contain both adult HED habitat PCEs (5 and 6). Although none of the natural wetland communities on any of these five parcels are near breeding/larval habitat (>3,000 feet),

some of the wetlands on each parcel do provide open corridors for adult HED movement and dispersal.

The small setback strip (350 ft back from Route 53) along the west side of North (6.5 ac) and Far North Parcels (10.7 ac) may be developed during the permit period. These areas contain old field and buckthorn thickets on fill and provide 1.1 and 7.3 acres of adult HED habitat, respectively, and no larval habitat. No larval PCEs are present in either of these areas. Adult HED PCE #7 is likely present in both areas, but PCE #6 may only occur in the North Parcel setback area. The North Parcel setback area is within 300 meters of documented HED adult wetland habitat. However, no adult HED use has been documented on Far North Parcel, and it is located further away than North Parcel from the nearest known larval habitat.

The inundation of Pierce Eich Quarry will reduce the potential groundwater impacts on neighboring parcels from mining Middle Parcel. Surface mining in Middle Parcel will likely only affect groundwater levels in the adjacent North Parcel and possibly the Midwest Generation easement parcel (immediately east of North Parcel) based on long-term simulations in the groundwater model. Other nearby areas will not experience significant changes in hydrology since declines in groundwater levels are predicted to be minimal and limited to the southern-most portion of the Far North Parcel. Furthermore, the HED habitat on these parcels, including the PCEs, will likely remain in current conditions, since the wetlands on these parcels are highly influenced by surface water (AECOM 2014b). This is also true for River Parcel because nearly all of its wetlands are found along the river and its backwaters (Figure 6.1, Appendix A). Almost all of the northwest portion of River Parcel is upland and is dominated by non-native old field vegetation. In addition, any impacts to the PCEs on the North, Far North, and River Parcels will be mitigated through the habitat restoration on these parcels (9, 27, and 29 acres on each parcel, respectively).

Other CHUs and other parcels with larval habitat in the Planning Area:
Lockport Prairie Nature Preserve (CHU 1)
River South Parcel (CHU 2)
Romeoville Prairie Nature Preserve (CHU 3)
Long Run Seep Nature Preserve (CHU 7)

Lockport Prairie and River South are both located in Critical Habitat (CHU 1 & 2, respectively), and all seven PCEs are present in both of these parcels. Romeoville Prairie is also in Critical Habitat (CHU 3), and all seven PCEs are likely present in this parcel as well. All three of these parcels are located on the same (west) side of the river as the proposed mining activities, and two of them (River South and Lockport Prairie) potentially could experience indirect groundwater effects from the mining. However, through the implementation of avoidance measures (i.e. infiltration galleries and an infiltration basin), none of HMS' mining activities are expected to impact these parcels or any of their PCEs. Long Run Seep Nature Preserve (CHU 7) is located on the east side of the river, and thus will also be unaffected by HMS' mining activities.

5.1.7 HED Compensatory Mitigation

HMS proposes the following mitigation plan to offset estimated habitat impacts and incidental take of the HED from the surface mining of Middle Parcel and other activities. HMS' mitigation involves the use of a science-based restoration and land management program that focuses on significantly contributing to the success of the HED Recovery Plan goals. Although these mitigation efforts are designed to benefit the HED, the habitat improvements will also benefit the

other Covered Species (i.e. spotted and Blanding's turtle and LPC). Elements of this program include a remedial restoration phase structured around necessary intervention to quickly improve the ecological health of the communities on which the HED and the other Covered Species depend, followed by a maintenance phase, which maintains the desirable ecological conditions. Restored and managed areas will be monitored (see Chapter 6). This will provide feedback on the effectiveness of both phases, which will facilitate adaptive management, and allow program changes and refinements to increase effectiveness. The mitigation package for the HED is designed to meet the following biological goals:

1. River South and Fitzpatrick Seep: Improve and expand current adult and larval HED habitat areas found on the River South Parcel and Fitzpatrick Seep. Both adult and larval HED habitat will be expanded through the reduction of invasive species.
2. Long Run and ComEd parcels: Restore adult and potential larval HED habitats. Adult HED habitat will be expanded through the reduction of invasive species, especially woody species. Historic and potential larval HED habitat may be restored in areas where appropriate hydrology, soil, and plant structure exist or can be developed.
3. Middle Parcel: Minimize the impacts to the highest quality habitat area by transplanting the wet-mesic dolomite prairie in Middle Parcel to areas in ComEd Parcel where topsoil has been scraped off or existing spoil piles will be removed.
4. River, North, Far North, and River North Parcels: Restore and enhance adult HED habitat by removing invasive shrubs and trees and reducing *Phragmites.* This will also include some turtle nesting habitat enhancements on River Parcel.
5. Habitat protection: All parcels with restored or enhanced habitat will be protected in perpetuity (i.e. North, Far North, River North, River, River South, Fitzpatrick Seep, ComEd and Long Run). In addition, River South Bluff Parcel will also be protected in perpetuity to help ensure protection of habitat in River South Parcel. Permanent protection will be provided through a declaration of restrictions on these parcels that will be converted to a conservation easement held by a qualified conservation organization if one can be found. (Note: All North and Far North Parcels will be preserved except for a 350-ft-wide frontage area along Rt. 53. In addition, the declaration of restrictions will allow 12 acres within the preserved parcels to be used for the installation of ventilation shafts after the permit period ends)

In total, 531 acres of property will be preserved through a declaration of restrictions, which will be established within 30 days after HMS' receipt of all required permits and authorizations from federal, state and local agencies to proceed with the project, and prior to any "take" of the Covered Species. (If any of the permits and authorizations are invalidated by a court of competent jurisdiction such that HMS is not allowed to move forward with its project, the declaration of restrictions shall likewise be invalidated.)

The declaration of restrictions will be recorded with Will County and will later be converted to conservation easement. The conservation easement will be granted to an entity entitled to hold such easement under Illinois law (the Conservation Entity) and its terms will be enforceable under Illinois Law (the Real Property Conservation Rights Act (765 ICCS 120) and the Illinois Natural Areas Preservation Act (525 ILCS 30)) and by USFWS. The USFWS must approve the easement holder but not withhold approval unreasonably. The Declaration of Covenants, Conditions, and Restrictions is found in Appendix J.

After the declaration of restrictions is converted to a conservation easement, HMS will be allowed access to these parcels to implement all avoidance and minimization measures and as well as perform all enhancement, restoration, and maintenance activities during the permit period to reach the performance standards contained in Section 6 of the HCP. These activities will be performed by HMS throughout the 30-year permit period; upon expiration, those activities will be handled by the Conservation Grantee, who will manage the parcels in accordance with the conservation easement.

HMS will fund the restoration, enhancement, maintenance, and management during the permit period (30 years) on its own, as described in Section 7 below. Thereafter, funding for the ongoing management and maintenance of the declaration of restrictions or conservation easement Property will progress according to the terms of the declaration of restrictions or conservation easement.

Measures to achieve the above five biological goals will be implemented while being sensitive to the needs of other entities operating in the Permit Area in connection with their operational needs in adjacent ROWs and easements and minimizing additional risk of take. Additional details of this plan can be found in the Restoration Plan Set (Appendix F).

As part of its subsurface mining plans that would take place after the permit period, HMS may need to conduct underground operations on the preserved mitigation parcels which would require the construction and maintenance of access and air shafts, access roads, utility lines, staging areas, equipment and material storage, fencing, and any other improvements or facilities reasonably necessary to conduct or support underground mining. HMS agrees that the access improvements shall: (a) not exceed more than twelve (12) acres of the mitigation parcels in total; and (b) be constructed so as to have the least amount of impact to the mitigation values established in the USFWS Permit and the 404 Permit.

No access improvements shall be located within two hundred (200) feet of HED larval habitat nor within the upgradient water supply of the larval area. Nor shall they be located in an area used by Blanding's or spotted turtle for nesting. All permits required for these improvements will be obtained at the time of installation which will be years, if not decades, after the termination of the permits for this HCP.

Restoration in River South Parcel and adjacent Fitzpatrick Seep

HMS will implement a strategy that will enhance current adult and larval HED habitat and restore likely historic HED adult habitat and, where possible, expand larval habitat by restoring native plant communities and appropriate habitat structure. Vegetation will be restored through the removal and/or application of herbicide to invasive woody and herbaceous species and by re-establishing native species. Since ComEd's ROW runs between these two parcels and along the western edge of River South Parcel, HMS will coordinate this work with ComEd as needed. In addition, the groundwater supply in these parcels will also be protected from mining impacts with avoidance measures HMS will implement (i.e. infiltration galleries in River South Bluff Parcel) (see Section 5.1.3).

Reduce invasive species:

HMS will remove and/or apply herbicide to invasive plant species as necessary to restore former HED adult and larval habitat locations (e.g. where suitable hydrology may be present). These are critical locations where invasive species, such as European buckthorn and common reed, have grown over the formerly suitable wetland habitats, preventing adult HED from accessing them for foraging, ovipositing and breeding. HMS will carefully reduce or eliminate the invasive species in

these locations and restore plant communities and, if possible, hydrology suitable for the HED. Some important larval habitat areas in River South, such as Emerald Meadow, have been completely overgrown by cattails. Measures will be taken to greatly reduce cattail in these areas and restore more preferable habitat structure for the HED.

Restoration in ComEd and Long Run Parcels

HMS will implement restoration plans for these properties to enhance and restore habitat for the HED and other Covered Species. Restoring ComEd Parcel along with the northern portion of Long Run Parcel will expand HED habitat around and near the only known larval HED habitat areas (current and historic) on the east side of the river (i.e. within Long Run Parcel and Long Run Seep Nature Preserve). These plans will improve adult and larval HED habitat by:

1. removing invasive woody species;
2. reducing invasive herbaceous species through herbicide applications, prescribed burning, and other means;
3. re-establishing appropriate native vegetation in areas formerly dominated by invasive species;
4. potentially re-establishing larval habitat through the implementation of items 1-3 above;
5. removing spoil piles; and
6. transplanting the wet-mesic dolomite prairie from Middle Parcel to former spoil areas and historic scraped areas.

Coordination with ComEd:

ComEd has several easements that cross ComEd Parcel (this parcel is owned by HMS). ComEd will manage the woody vegetation within most of its easements, but HMS will coordinate with ComEd to complete other management (e.g. follow-up herbiciding or prescribed burning) within these easements to ensure consistent management across the site. In addition, HMS will review its restoration plans for the parcel with ComEd to help facilitate and coordinate mitigation efforts, minimize risk of take, and maintain proper access.

Removing invasive woody species and re-establish native vegetation:

HMS will restore large areas of adult HED habitat by removing invasive shrubs (e.g. buckthorn) and trees (e.g. green ash) in ComEd Parcel and the northern portion of Long Run Parcel. This will be done in conjunction with herbicide applications to non-native herbaceous vegetation (e.g. reed canary grass) and the re-establishment of appropriate native wetland species. Establishment of native wetland communities will also be facilitated through improved wetland hydrology due to the removal of woody vegetation that will result in the reduction of water loss through evapotranspiration. Restoring these native open wetland communities will also improve habitat for the covered turtle species.

Creating larval habitat:

Although HMS does not anticipate a need to mitigate for impacts to larval habitat, its restoration measures may nonetheless facilitate the formation of more larval habitat. Once the invasive woody vegetation is removed or reduced, soil hydrology will improve, and existing rivulets may flow and new ones may form. Improved hydrology is anticipated from the reduction in water loss through evapotranspiration. As larger areas of invasive woody vegetation are removed in these parcels, this "wetting up" phenomenon, along with invasive species control, may create larval HED habitat conditions. HMS anticipates some historic rivulets—drainage routes over these properties, will likely re-establish and may become accessible to the HED without intervention (e.g. excavation).

Invasive species removal may also restore HED access to some rivulets which historically supported breeding activity and still retain suitable hydrology, but which have become so overgrown that dragonflies are no longer able to enter them. As stated above, HMS does not anticipate needing to restore larval habitat on these parcels as part of its mitigation efforts. However, if it is needed and rivulets do not re-establish after these restoration efforts, measures could be taken to create new larval habitat. This could be achieved by other hydrological restoration measures, such as installing passive controls on drainage ditches, which may help restore the hydrology of seasonally dewatered areas. In addition, rivulets could be constructed by hand, in areas with appropriate hydrology, using low impact techniques developed in the Interstate-355 project.

Spoil pile removal and wet dolomite prairie transplant:
Restoration on ComEd Parcel will involve spoil pile removal and the restoration of these spoil removal areas and older scraped areas with transplanted wet-mesic dolomite prairie. Historic excavation of soils in ComEd Parcel has left large areas of exposed bedrock. Spoils were piled in adjacent areas as well as other locations in the parcel. HMS will transplant the salvaged native soils and vegetation from the wet-mesic dolomite prairie in Middle Parcel to the scraped and former spoil pile areas. This will restore these areas to productive adult foraging HED habitat (as well as Blanding's turtle habitat).

During the transplant, topsoil with vegetation salvaged from HMS' Middle Parcel will be removed and delivered to the scraped and spoil removal areas using access routes along previous haul roads (see Restoration Plan Set; Appendix F). Spoil piles will be removed before and/or during the transplant process to reveal the bedrock beneath. These spoil areas currently have dense thickets of common buckthorn, and results of the test plots on these spoil piles have demonstrated that they contain almost no native seed bank.

Because the site hydrology has been altered from soil removal and the presence of a seasonally hot exposed bedrock surface, re-soiling also will reduce evaporative water loss, allowing the restoration of wetland hydrology in this scraped area. It is anticipated that the hydrology in this area will support the transplanted wet-mesic prairie because groundwater investigations have already documented it to be suitable for maintaining root zone moisture. Groundwater levels in the scraped area are typically within six inches of ground surface and are present within a foot of ground surface across much of the ComEd Parcel (STS 2009). Only areas closer to the regional sink on the west side of the Parcel, the Chicago Sanitary and Ship Canal (and I&M Canal), have slightly deeper groundwater levels. In fact, throughout the eastern and central portions of the Parcel, deeper bedrock piezometric heads indicate groundwater elevation at or above ground surface. These strong upward gradients indicate that cool groundwater supplies will be consistently near (i.e. slightly above or below) ground surface. In addition, the same plant community currently grows in and around the margins of the bedrock scrape and spoil areas, which are at the same topographic elevations with similar surface hydrology as the dolomitic wet-mesic prairie's original location in Middle Parcel.

Improve connection with Long Run Seep Natural Preserve:
Long Run Seep Nature Preserve, owned by the Illinois Department of Natural Resources (IDNR), is directly east, across New Avenue and the railroad tracks, from the HMS Long Run Parcel. HMS will improve the connectivity between habitats in the two parcels. Currently, dense invasive woody vegetation found within the HMS property obstructs the connection of suitable HED habitat between these properties. Restoration on HMS' parcels will improve the connections between the

habitat areas in these properties by removing and reducing the invasive woody vegetation and by re-establishing native vegetation in ComEd Parcel and the northern portion of Long Run Parcel.

Benefits of HMS Ecological Restoration and Mitigation

The existing ecological conditions on the HMS properties that will be restored as part of this HCP are displayed in the existing conditions sheets in the Restoration Plan Set in Appendix F. The proposed restored conditions (Restoration Zone sheets in the Restoration Plan Set) of these same parcels show a major shift from large areas dominated by invasive woody vegetation to wet prairie and sedge meadow communities. Table 7 below documents the existing and proposed vegetation types and their acreages that will result from the restoration of HMS parcels included in this HCP. The primary habitat types to benefit are the most important habitats for the HED, the turtles, and leafy prairie clover (LPC). These habitat types—wet prairie, sedge meadows, and emergent wetlands, are the primary habitats identified in the HED Recovery Plan to restore and assist in the recovery of the HED. Conversely, there will be a dramatic reduction in areas dominated by weedy trees and shrubs. The turtles and LPC will also benefit from the HED restoration efforts in these same properties.

Table 7. Existing and proposed restored habitat types in HMS properties (River South, Fitzpatrick Seep, River, North, Far North, River North, ComEd, and Long Run Parcels).

Land Cover Habitat Type	Existing Acres	% Cover	Proposed Acres	% Cover	Change in % Cover
Old Field/Grassland	23.25	6.4%	48.74	13.5%	7.1%
Woodland Upland	11.37	3.1%	1.63	0.5%	-2.7%
Woodland Bottomland	27.44	7.6%	0	0.0%	-7.6%
Savanna	0	0.0%	5.99	1.7%	1.7%
Wet/Wet-Mesic Savanna	0	0.0%	26.15	7.2%	7.2%
Shrubland Upland	74.95	20.8%	2.13	0.6%	-20.2%
Shrubland Bottomland	40.3	11.2%	0	0.0%	-11.2%
Dry/Mesic Prairie	0.9	0.2%	0.67	0.2%	-0.1%
Wet-Mesic/Wet Prairie	13.34	3.7%	77.46	21.5%	17.8%
Wet Prairie/Sedge Meadow	9.66	2.7%	68.13	18.9%	16.2%
Wet Meadow - Reed Canary	44.26	12.3%	13.95	3.9%	-8.4%
Marsh - Cattail/Emergent	78.1	21.6%	113.28	31.4%	9.8%
Marsh - Phragmites	34.63	9.6%	1.34	0.4%	-9.2%
Scraped	1.64	0.5%	0	0.0%	-0.5%
Fill-Other Material	1.32	0.4%	1.32	0.4%	0.0%
Total	**361.16**	**100.0%**	**360.79**	**100.0%**	

*All areas within parcels that will have some restoration occur on them are included. Therefore, not all areas included will be restored and the total acreage is larger than the total to be restored and enhanced (281 acres).

**Old Field/Grassland includes Old Field/ Upland Grassland and Old Field/Wet existing landcovers. Dry/Mesic Prairie includes Dry Dolomite Prairie, Dry-Mesic Dolomite Prairie and Mesic Dolomite Prairie existing landcover. Wet-Mesic/Wet Prairie includes Wet-Mesic Dolomite Prairie existing landcover and both Mesic/Wet-Mesic Prairie and Wet/Wet-Mesic Prairie restoration zones. Marsh – Cattail/Emergent includes Marsh-Bulrush Sweetflag existing landcover and Emergent restoration zone.

***See Table C-8 in Appendix C for existing and proposed restored habitat types in each mitigation parcel.

Table 8 below is a summary of the habitat benefits of HMS mitigation plans. The nine parcels permanently protected under this HCP (River South, Fitzpatrick Seep, River South Bluff, River, North, Far North, River North, ComEd, and Long Run Parcels) encompass 531 acres and currently contain 229 acres of adult HED habitat, a quarter acre of larval habitat, and 406 acres of potential Blanding's and spotted turtle habitat. Preservation of these parcels will protect 17.9% of all HED Critical Habitat in Illinois. In addition, approximately 139 acres of HED and covered turtle habitat will be enhanced, 182 acres will be restored, and 32 acres will be maintained on these parcels. All areas where habitat structure was significantly changed (i.e. brushing or thinning of weedy woody vegetation and removal of *Phragmites*) are considered "restored," all other areas that were improved in other ways (e.g. herbiciding and/or seeding) are considered "enhanced," and areas that are managed solely with fire are considered "maintained." Acres of habitat restoration and enhancement along with maintained acres in each mitigation parcel are listed in Table 9. As a result of the habitat restoration in this plan, known adult HED habitat in Illinois will increase by 11.9%. A more detailed summary of HMS' mitigation plan and its benefits is found in Table C-9 in Appendix C. Restoration on these parcels will also result in the creation of approximately 80 acres of potential Blanding's and spotted turtle habitat by converting over half of the low potential turtle habitat (141 acres) to medium or high potential habitat (Table C-10).

The biological goal of restoring covered species potential habitat and enhancing existing habitat will be achieved when the performance standards for habitat restoration and enhancement (see Chapter 6) are met in mitigation areas equaling the acreages listed in Table 8. The biological goal of Covered Species habitat protection will be achieved when the number of acres listed in Table 8 is protected through establishment of a declaration of restrictions on the parcels listed above. Of the 530.9 acres preserved through the declaration of restrictions, 12 acres will be allowed to be developed after the permit period ends for the installation of ventilations shafts for subsurface mining. As a result, 518.9 acres will be permanently protected.

Table 8. HMS mitigation benefits: the HED and covered turtle habitat areas protected, maintained, enhanced, and restored.

Habitat	**Acres Protected**
HED larval/adult	0.26ac (1,979 ln ft) / 229 ac (known habitat)*
Blanding's turtle	406 ac (potential habitat)**
Spotted turtle	406 ac (potential habitat)**
Total property preserved (permanently protected)	531 ac (519 ac)
Habitat	**Acres Maintained, Enhanced or Restored**
HED habitat maintained	32.5 ac
HED habitat enhanced	139.2 ac
HED habitat restored	182.2 ac
Blanding's and spotted Turtle habitat maintained	32.5 ac
Blanding's and spotted Turtle habitat enhanced	139.2 ac
Blanding's and spotted Turtle habitat restored	182.2 ac

*See Appendix B for breakdown by parcel.

** Based on potential habitat rankings of High and Medium (see Figures 12 & 13). Acres of protected potential turtle habitat in each mitigation parcel are listed in Table C-10 in Appendix C. In addition, approximately 80 acres of Low

potential habitat will be converted to High or Medium through habitat restoration, bringing the total protected to approximately 486 acres.

Table 9. Acres of habitat restoration, enhancement, and maintenance on each mitigation parcel

Mitigation Parcel	Parcel Size (acres)	Acres Restored	Acres Enhanced	Acres Maintained
ComEd / Long Run	285.5	79.8	77.6	0.0
River South & Fitzpatrick Seep	71.2	27.7	38.5	0.0
River Parcel	61.0	28.6	23.1	4.7
North Parcel	31.4	9.4	0.0	12.5
Far North Parcel	50.4	26.5	0.0	12.1
River North Parcel	24.8	10.2	0.0	3.2
Total		**182.2**	**139.2**	**32.5**

HMS will, over the 30-year permit period, restore, enhance, maintain, and manage 354 acres of habitat for the HED and the covered turtle species in the quantities and on the parcels listed in Table 9 and described above. These habitat improvements and preservation of 531 acres (and permanent protection of 519 acres) that includes all these areas and adjacent habitat and potential habitat area will more than offset the impacts of "take" of the HED and the other covered species and will, therefore, to the maximum extent practicable, minimize and mitigate such impacts (ESA section 10(a)(2)(B)ii).

5.1.8 Mitigation of the Impact of Take

Below is an explanation of how HMS' above mitigation plan will directly off-set its anticipated impact of take (see Section 5.1.5).

Mitigation at the population level

All impacts to individual HED, the HED habitat, and to the HED populations will be off-set by measures in HMS' mitigation package included in this HCP. Lost/displaced adult HED individuals in Middle Parcel are anticipated to be replaced by an increase in adult HED numbers in North and River Parcels (immediately adjacent to Middle Parcel) and Far North and River North Parcels (~1600 ft north of Middle Parcel) and River South Parcel (~3500 ft south of Middle Parcel) as a result of habitat restoration and enhancement measures. These measures will improve and expand adult HED habitat in all these parcels. In addition, all these parcels will be permanently protected, thereby preserving the dispersal corridor between RPNP and LPNP. Restoration and enhancement measures in Long Run and ComEd Parcels also will add approximately 157 acres of adult HED habitat (restored and enhanced, including opening up of dense shrub cover which currently precludes HED flight) on the east side of the river. The restoration in Long Run and ComEd Parcels will increase and strengthen the adult HED population on the east side of the river, and also contribute to the population on the west side of the river as a result of a net gain in foraging habitat close to existing breeding sites, with a possible net gain in breeding habitat.

Impacts to connectivity due to the loss of habitat in Middle Parcel will be mitigated by the adult HED habitat enhancements on North and River Parcels (immediately adjacent to Middle Parcel) and Far North and River North Parcels located between Middle Parcel and RPNP. Frequent adult HED use of River, North, and River North Parcels was documented in recent years (Mierzwa and Webb 2012a, 2012d, 2014 and 2016, and Mierzwa 2013). Evidence of movement between

Romeoville Prairie and River North was documented in 2016, along with observations of probable breeding and dispersal at Romeoville Prairie (Mierzwa and Webb 2016). In addition, loss of connectivity will be further mitigated by the restoration and enhancement of 157 acres in ComEd and Long Run Parcels directly across the river (east) from Middle, North, Far North, and River North Parcels. HED have been documented flying above the river at the extreme southern end of River South Parcel (Vogt and Cashatt 1999), and there is evidence that they cross the river in considerable numbers between Lockport Prairie and Dellwood Park West (Mierzwa et al. 2010) as well as travel long distances (north and south) along the river valley. Evidence of long-distance dispersal was documented by Mierzwa (editor,1995) when they recorded that four (2.2%) of the 183 dragonflies marked on Lockport Prairie, River South, and Middle Parcel were later observed at sites other than the one they were marked on; with dispersal distances ranging from 3.3 to 5.4 km.

It is anticipated that more adult HED from various locations throughout the river valley will be utilizing ComEd and Long Run Parcels once they are restored. It is also expected that restored areas at River, North, Far North, and River North Parcels will see increased use by HED originating from River South and RPNP, and this will contribute to connecting the southern sites (Lockport Prairie and River South) with sites to the north (RPNP and others) and possibly with those on the east side of the river. This will result in maintaining north-south connectivity within Sub-population 1 and the entire river valley (Figure 18, Appendix A). The restoration and enhancement of ComEd and the northern portion of Long Run Parcels is expected to result in a net gain of habitat for females foraging away from breeding sites and for males dispersing between sites or foraging. In addition, based on the recent discovery of larval habitat in Long Run Parcel (Brown and Soluk 2012) (now considered lost/historic habitat by USFWS), more larval habitat also may be created as a result of restoration in these parcels.

In summary, HMS will impact 49.6 acres of approximately 1,526 acres of known HED habitat within the lower Des Plaines River Valley area (and only 3.3% within CHUs). The loss of habitat in this location will result in narrowing the area of connectivity between adult HED habitat sites on the west side of the river because the habitat on Middle Parcel and the western portions of North and Far North Parcels will be removed. These impacts are relatively minor given that a north-south corridor will remain intact via River Parcel, North Parcel, River North Parcel, and the ComEd ROW. The vast majority of adult HED habitat and individuals will be unharmed by the activities on Middle and other parcels. In addition, the impacts to adult HED habitat and connectivity will be mitigated for by the preservation or restoration (i.e. removal of weedy woody vegetation and *Phragmites*) of all adjacent and nearby parcels owned by HMS. These parcels currently provide foraging habitat and a movement corridor and will provide even more after restoration on River, North, Far North, and River North Parcels. Preservation and opening up of this corridor through weedy woody vegetation and *Phragmites* removal will maintain connectivity between habitat areas north and south of Middle Parcel and may increase movement to and from Romeoville Prairie. Restoration and enhancement of Long Run and ComEd Parcels will also help improve connectivity between habitat locations within the river valley and expand habitat to HED originating from Long Run Seep Nature Preserve.

In addition to mitigation measures to off-set direct habitat impacts from mining, HMS will implement a number of avoidance measures to prevent potential groundwater-related impacts to known larval habitat areas (see Section 5.1.3). As a result, the core breeding populations in the state (River South and Lockport Prairie) will be protected.

Therefore, there will be very limited adverse effects to the overall health and viability of the HED populations within the HCP Planning Area and the lower Des Plaines River Valley resulting from surface mining of Middle Parcel and continued mining of existing mines. Moreover, even these limited impacts will be more than offset by HMS' mitigation measures included in this HCP: restoration or enhancement of 321 acres of habitat on 519 acres of permanently protected land (within 531 acres preserved under a declaration of restrictions). This will result in increasing adult HED habitat in the Lower Des Plaines River Valley by over 12% and preserve nearly 18% of all Critical Habitat in Illinois.

Mitigation at the genetic level

The HED population in the lower Des Plaines River Valley will be impacted by HMS' surface mining operations through the loss of adult HED habitat in Middle Parcel and a reduction in connectivity between remaining habitat locations. This could result in reduced dispersal and gene flow between breeding sites to the south (e.g. River South) and other habitat areas to the north (e.g. RPNP). Loss of adult HED habitat on the western portion of North and Far North Parcels, however, is not expected to have an impact on the HED population because of its poor quality and peripheral location. As stated above, habitat improvements on River, North, Far North, and River North Parcels will maintain a movement/dispersal corridor and preserve connectivity between these sites on the west side of the river. In addition, restoring ComEd Parcel and the north portion of Long Run Parcel will contribute to improved connectivity between the only two current and former breeding habitat sites on the east side of the river (i.e. ComEd/Long Run and Long Run Seep Nature Preserve) while encouraging movement across the river between Long Run and ComEd parcels and River and River South parcels and Romeoville Prairie (Exhibit 18; Appendix A). Also, habitat restoration and enhancement on the east side will create more useable habitat and lead to a larger population on the east side of the river. This, too, should encourage increased cross-river dispersal and improve connectivity in the river valley which will contribute to gene flow (even with potential increased predation) within Subpopulation 1 and the rest of the Illinois population to help maintain its genetic diversity and fitness.

5.2 Blanding's and Spotted Turtles

The Blanding's turtle was listed in Illinois as a state threatened species in 1999 (Dreslik and Philips 2006) and was changed to state endangered in 2009 (IESPB 2009). The greatest threats to the species are loss and fragmentation of both wetland and nesting habitat, predation, collecting, and automobile strikes (WDNR 2006 & Congdon et al. 2008). In addition, Blanding's turtle was petitioned in 2012 for federal listing (CBD 2014). The 90-day "substantial" finding was published by the USFWS on July 1, 2015, indicating that listing may be warranted for the Blanding's turtle (after further review). Its habitat includes the clean waters of marshes, ephemeral wetlands, vegetated ponds, wet prairies, sedge meadows, oxbows, fens, and slow-moving waters in sloughs and rivers. Adjacent uplands containing open grasslands or old fields in sandy soils are commonly used as nesting habitat. This turtle winters most often underwater, partially buried in soft substrate. The Blanding's turtle has been found recently in a number of parcels throughout the Permit Area including Lockport Prairie, Romeoville Prairie, HMS' Middle, North, Far North, and River North Parcels and the adjacent ComEd ROWs, and HMS' Long Run and ComEd Parcels (Figure 10).

The spotted turtle is a state endangered species and also was petitioned in 2012 for federal listing (CBD 2014). The 90-day "substantial" finding was published by the USFWS on July 1, 2015, indicating that listing may be warranted for the spotted turtle (after further review). The greatest threats to the species are habitat loss and fragmentation due to invasive plant species, changes in

hydrology, urban development, and collection for the pet trade industry. Spotted turtles inhabit shallow vegetated wetlands with a soft substrate, including shallow marshes, sedge meadows, cattail marshes, and wet dolomite prairies. Females nest in open, sunny locations with moist well-drained soils in sedge meadows and wet prairies. They winter in muskrat or other small mammal burrows or in shallow water in the soft organic substrate. Within the Permit Area, the spotted turtle is known to occur in Lockport Prairie and Romeoville Prairie (Figure 11).

5.2.1 Activities and Impact Analysis

As described in Section 5.1.1, HMS proposes to continue surface mining its two currently active quarries (Pierce Eich and Middle Quarries) in its Romeoville facility, expand surface mining into Middle Parcel, expand surface mining of the East Quarry north into East Parcel, and perform sub-surface mining of Galena-Platteville limestone underlying its facility. Surface mining in East Parcel and sub-surface mining will not impact turtles or their habitat. All surface mining is anticipated to be completed over a period of about 35 years, and surface mining requiring a permit will be completed in 30 years. Subsurface mining will start approximately 15 years after the ITP is issued and prior to the completion of surface mining. Associated mining activities (e.g. crushing, conveying, screening, and stockpiling) will also occur during the permit term. These plans are explained in detail in HMS' Mining Plan found in Appendix E and summarized in Section 3.2. HMS may also develop the setback areas at the west end of North and Far North Parcels.

Middle Parcel contains about 29.14 acres of potential spotted and Blanding's' turtle habitat (Figures 12 & 13). These potential habitat areas contain most of the wetlands on site. The remainder of the site is fill deposits, scraped areas, buckthorn thickets, and young woodlands. The setback areas at the west end of North and Far North Parcels contain no mapped potential turtle habitat.

Since HMS is mining almost all of Middle Parcel, it is estimated to impact all of the potential Blanding's turtle habitat (29.14 acres) and all of the potential spotted turtle habitat (29.14 acres) on the parcel. Little direct take (mortality) of either covered turtle species is anticipated to occur during mining operations in Middle Parcel because a number of avoidance and minimization measures will be implemented before and during mining operations to prevent the take of the turtle species. However, a few turtles may remain on the parcel after the exclusion fence is installed, and there is a possibility that some of these turtles, especially burrowed or inactive ones, could be overlooked during monitoring, resulting in a direct impact. A secondary and indirect effect may be the displacement of turtles utilizing Middle Parcel.

No direct take (mortality) of either covered turtle species is anticipated to occur during the development or use of the setback areas on North and Far North Parcels because they are in low quality areas and the same avoidance and minimization measures will be implemented, as needed, in these areas to prevent the take of the turtle species. It is possible that turtle habitat on these two parcels, as well as River Parcel, could be impacted because of a drawdown in groundwater from mining Middle Parcel. Current vegetation and habitat, however, is expected to be maintained because wetlands on these three parcels are heavily influenced by surface water (see Section 5.1.6).

Blanding's turtle is also found in ComEd Parcel, and the same measures will also be used during the construction of a permanent access route and wet prairie transplant activities in Long Run and ComEd parcels to avoid take. The avoidance and minimization measures are described in greater detail later in this chapter (Section 5.2.3 and 5.2.5) and the Restoration Plan Set (Appendix F). However, 0.39 acres of potential Blanding's turtle habitat will be impacted during the installation of

the access road on the southern boundary of ComEd Parcel bringing the total potential Blanding's turtle habitat loss to 29.53 acres. Although it will implement a number of AMMs to minimize take from any of its Covered Activities, as a precaution, HMS is conservatively requesting take of 12 Blanding's and two spotted turtles to cover all its activities under the HCP.

In addition, surface mining of the Pierce Eich Quarry, located west of Route 53 and included in the Permit Area (Figure 2, Appendix A), will continue to be mined to its permitted (IDNR permit #143-98) limits (35 ac remaining of 206 ac total). This parcel does not contain turtle habitat (Figure 10-13, Appendix A) but is located in the estimated groundwater recharge zone buffer for River South Parcel and the estimated two-mile recharge buffer for both River South Parcel and LPNP (Figure 4, Appendix A) (GAS 2004b and 2005b) both of which contain turtle habitat. Avoidance measures will be implemented to prevent potential groundwater impacts to River South and LPNP from mining the remainder of Pierce Eich Quarry.

Neither Middle Quarry nor East Parcel contain turtle habitat. Thus, no direct take is anticipated during the mining of these parcels. East Parcel is separated from all potential turtle habitat areas by the Des Plaines River or two canals. Thus, no potential impacts to the groundwater hydrology in habitat areas are expected from continued mining (36 ac) in this area. Only one acre will be mined in Middle Quarry, and no potential groundwater impacts to nearby turtle habitat (e.g. River South) are expected from this activity.

5.2.2 Turtle Biological Goals and Objectives

Neither the Blanding's nor the spotted turtle are currently federally listed, and thus a federal Recovery Plan has not been written for either. Both turtles are state-listed, but it is HMS' understanding that state Recovery Plans have not been developed for either species. The AMMs and mitigation measures that are part of this HCP, however, do address many of the goals and objectives found in other turtle recovery plans (e.g. Hays et al. 1999).

5.2.3 Turtle Measures to Avoid and Minimize Impacts

Prior to any construction operations (i.e. activities that involve heavy equipment, such as truck or front-end loaders) during mining, other development, or restoration, measures will be taken to avoid taking or harming either covered turtle species. These avoidance and minimization measures are listed below.

1. Maintain and repair existing fencing on the west and north sides and add fencing to the east side of the Middle Parcel to reduce the likelihood of turtle entry. Fencing should be flush with the ground (or extended 6" into the ground where possible) to reduce burrowing (or Jersey barriers may be used in some locations). One-way flaps will be installed at the bottom of the fence in selected locations to allow turtles within the parcel to leave but not re-enter. These fence improvements should be done at least one season before mining operations begin to prevent entry of turtles into the parcel from the north. Work will be performed during turtle dormant season (Nov. 1 to March 15). Fence should be inspected monthly during the turtles' active season.

2. Tree and brush removal (for both mining and restoration) will be conducted, to the extent possible, during turtle dormant season (Nov. 1 to March 15) to avoid take.

3. Overburden (i.e. soil and herbaceous vegetation) and other earth moving activities, also will be conducted, to the extent possible, during the turtle dormant season (Nov.1 to March 15).
4. To protect turtles during earth moving activities (i.e. overburden removal and prairie transplant activities) occurring during their active season, silt fence will be installed around the construction area prior to tree and shrub and overburden removal to prevent entry by turtles. Embed silt fence four to six inches into the ground to reduce burrowing. All construction areas - both in wetland and uplands, should be included. In Middle Parcel, overburden removal, and thus silt fence installation, may be done in phases. Silt fence around active earth moving areas should be inspected daily during the turtles' active season.
5. Trap and remove turtles in construction areas prior to starting activities which could cause harm or mortality. Thus, trapping will be done in each phase area identified and fenced-off and will be completed in the spring (or fall) prior to starting mining preparation activities in that area. Traps will be used and inspected according to the accepted turtle trapping protocol.
6. If earth moving activities (during mining or restoration activities) are conducted during the turtles' active period (March 16 to October 31), construction areas (where heavy equipment will be used, and surrounded by silt fence) will be searched each day before starting work. Turtles will be relocated, if found. Protocol for handling and relocating turtles will need to be developed with the IDNR. A permit is required to handle state-listed turtles. A biologist, permitted to handle state-listed turtles, will be present on-site during activities using heavy equipment during the turtle's active period.
7. Relocate turtles from mine expansion area to nearby protected habitat areas (e.g. HMS or FPDWC property). For restoration areas, possibly move to temporary off-site holding areas until activities are completed or move to on-site appropriate habitat a sufficient distance away with little to no restoration activities. If translocated turtles appear unhealthy in any way to the trained and permitted ecologist(s) performing the translocation, they will undergo a health screening for known turtle diseases.
8. No inspections or trapping will take place in areas that have already been cleared of vegetation and soil. The only exception would be areas adjacent to currently vegetated areas that may be used for vehicle traffic during stripping.
9. All blasting will take place in areas already cleared of vegetation and soil. At least 150 feet of bedrock will be exposed between the active mining area and vegetation to be removed. This does not apply to setback areas or other areas that will not be mined.
10. In mining and prairie transplant areas, install silt fences, straw rolls (i.e. wattles), or other erosion control measures to prevent sedimentation into wetland and prairie habitat.
11. In prairie transplant area, keep all vehicles (e.g. trucks, skid steers, and other heavy equipment) within fenced construction area. In other restoration areas use vehicles during frozen or dry conditions and use low-pressure tires or tracks.
12. Properly maintain vehicles, check for leaks at the start of each workday, repair leaks if needed before using vehicle on site. Carry absorbent materials with equipment or have them accessible at the site to contain spills if they occur.

13. Conduct environmental awareness training for all contractors and train restoration crew to identify Blanding's and spotted turtles. Crews should avoid spraying them and other turtles with herbicide and hitting them with a vehicle.

14. Access wetland areas with water levels deeper than 12 inches using amphibious vehicles – but access would be limited to the turtles' dormant period (November 1 - March 14).

15. Cross wetlands (with less than12 inches of standing water) without HED breeding habitat with low ground pressure vehicles (five pounds per square inch).

16. Minimize use of road salts in areas immediately adjacent to turtle habitat.

17. Stage vehicles and heavy equipment in upland areas outside of rapid recharge areas.

18. Prescribed burning within wetlands will typically be implemented between November 1 and March 14 in order to avoid impacts to Blanding's and spotted turtle. However, weather needs to be considered to understand the species' overwintering periods in a particular year. Therefore, to maximize management opportunities while minimizing risks from fire, managers will also use the following prescription criteria to provide flexibility to the above dates when the mean 5-day temperature is below 50 °F: 1) peak daily high temperature is less than 50 °F and cloudy to mostly cloudy weather or, 2) if sunny, then only when peak daily high temperature is less than 45 °F.

The goal of protecting covered turtles and covered turtle habitat by preventing impacts during operations and restoration will be achieved when the above protection and avoidance measures are implemented successfully and confirmed through monitoring as described above and in Chapter 6.

5.2.4 Turtle Calculation of Incidental Take

Blanding's Turtle

Presence of Blanding's turtle on Middle Parcel was recently confirmed by Illinois Natural History Survey (INHS) when they found six juveniles on the property in May and June 2015 (Feng and Dreslik 2015). Prior to this, presence was inferred based on three adult turtles observed crossing the access road north of Middle Parcel - one in the late 1990s, one in June 2011, and one in June 2013 (Mierzwa, unpublished field notes). Two of the three turtles would have entered the elevated (from fill material) and wooded north end of Middle Parcel if they continued in the same direction as originally observed and were able to find a way under the chain link fence (the turtle observed in 2013 was entering North Parcel). Additional Blanding's turtles were observed well southeast of Middle Parcel in the late 1990s, one adult on the gravel edge east of the railroad tracks near the extreme northern end of River South Parcel within 20 meters of the Des Plaines River, and one juvenile near the large pond on River South Parcel in 1995 (Mierzwa, unpublished field notes).

More detailed information on Blanding's turtles is available from sites north and south of Middle Parcel. INHS conducted Blanding's turtle studies at the 108-acre Romeoville Prairie Nature Preserve (Banning and Dreslik 2010). During this study some turtles crossed 135th Street, and five (three adult females, one juvenile, and one hatchling) were encountered on or near Hanson Material Service property from 2008 to 2010. All of these observations were on Far North or River North Parcels or adjacent ComEd right-of-way, and most were associated with a small marsh complex or

a channel near the Des Plaines River. Another young (1-year-old) Blanding's turtle was found in this area by INHS in May 2015. An additional gravid female Blanding's turtle was found dead on Rt. 53 near the southwest corner of the Far North Parcel in 2008 (Banning and Dreslik 2010), and GHD found the weathered remains of a long dead adult female Blanding's turtle near the north end of the River North Parcel in June 2015 (Mierzwa and Webb 2016). Banning and Dreslik (2010) summed up their findings as follows:

> *"Our data indicates that turtles may either reside year-round at MSP (Material Service property) or for only a portion of the activity season (e.g. nesting). A gravid female temporarily moved south from Romeoville Prairie to MSP via the Des Plaines River to nest. Blanding's turtles are capable of moving several kilometers and could possibly travel north from Lockport Prairie nature preserve to MSP as well. Additional monitoring (e.g. trapping, visual searches, radio telemetry) would be necessary to accurately determine the number of individuals found on site."*

Feng and Dreslik (2015) captured six juvenile Blanding's turtles at Middle Parcel in 2015. All were in ditches between the marsh and fill material to the east, and in another ditch at the eastern edge of the fill material and just west of a quarry road and the rail line. They noted "pipes" (culverts installed as part of rail upgrades more than 10 years ago) and suggested that adults move into Middle Parcel from the river via these culverts. Feng and Dreslik (2015) noted that "the vegetation (*Phragmites*) seems to prevent adults from persisting, and all of the captures on this parcel were juveniles." These findings indicate that some breeding may occur on site. Given the saturated shallow soils in the wetland portion of Middle Parcel, the most suitable nesting sites are probably on the considerably higher, better drained, open, and sunlit fill material at the eastern edge.

Earlier studies (Banning et al. 2006) evaluated the Blanding's turtle population, at the 254-acre Lockport Prairie Nature Preserve. Combining 2004 and 2005 study results, the Blanding's turtle population at Lockport Prairie was estimated at 42 individuals. Actual captures included 17 adult, four immature, and 12 juvenile animals.

Most of the sites with confirmed multiple observations include areas of known or probable core habitat, including interspersed open water, marsh, and sedge meadow (Romeoville Prairie, Lockport Prairie, Far North Parcel, and River South Parcel). Middle Parcel differs from these other sites in that the parcel does not include any permanent or semi-permanent open water habitat. Most of the vegetated marsh is currently dominated by common reed with little structural diversity (although in the mid-1990s most of this marsh was cattail dominated). Other parts of the site retain native plant communities including wet-mesic dolomite prairie; however, these communities provide only dispersal or foraging habitat. The better-quality parts of Middle Parcel also do not include any known suitable nesting habitat; except for areas of old fill material, most of the site is too wet, too densely vegetated, or has soils too thin for nesting. Nesting that may have occurred on-site likely would have taken place on the upland fill in the eastern part of the parcel. Although eggshell fragments from nest predation (by raccoons and other mammals) are frequently observed at River South and some other nearby sites, this has not so far been noted at Middle Parcel. Perhaps the greatest limitation is the relatively small size of Middle Parcel; the Blanding's turtle is a very mobile species with individual movements sometimes exceeding a kilometer. Thus, Middle Parcel could support at least some needs of a few individual turtles for some limited time, but it seems less likely that individual turtles would remain within the site for extended periods of time. Movement into or out of the site may be from the north and possibly from the east via culverts and ditches connecting to the Des Plaines River; a historically scraped area on the western edge just inside the

berm, and the ditches east of the site are among the few relatively level pathways in and out of Middle Parcel. Three sets of railroad tracks with only a few level crossings form a filter barrier for overland crossing especially for smaller turtles. The Middle Quarry to the south, Rt. 53, and developed lands to the west are formidable barriers to turtle movements in those directions.

Based on the above information, and especially on documented nesting at Far North Parcel and at River South (based on a hatchling Blanding's turtle captured there in the fall of 1995), it is assumed that adult Blanding's turtles periodically cross Middle Parcel or forage/reside there for some period of time. This is most likely to occur in late spring or early summer when female turtles are moving to or from nesting sites and turtle activity in general is relatively high. Based on the findings of Feng and Dreslik (2015) some nesting may also occur on Middle Parcel, most likely in the eastern part on upland. Adult males or dispersing juveniles could potentially also cross the site. However, the near absence of open water or diverse deep emergent marsh, the abundance of dense monotypic *Phragmites*, and the scarcity of invertebrates and small vertebrates documented during larval dragonfly studies (Mierzwa and Webb 2009) are believed to limit the duration of turtle presence on Middle Parcel. Because of the absence of permanent or semi-permanent deep open water or emergent marsh, the limited area of juvenile habitat (shallow semi-permanent sedge-dominated wetlands), and shallow depth to bedrock which may limit adequate hibernating refugia from winter freezing, it is believed that not more than a few adult Blanding's turtles are likely to be present on Middle Parcel at any one time. The rationale for this estimate is explained below.

The population estimate is derived from a simple analysis of Blanding's turtle density at Lockport Prairie. Using the Banning et al. (2006) population estimate of 42 turtles at that site, and an area of 254 acres (the extent of the dedicated Illinois Nature Preserve) yields an estimate of 0.165 Blanding's turtles per acre. Extrapolating the same density to the 29.14 acres of estimated potential turtle habitat at Middle Parcel (Figure 12, Appendix A) would yield an estimate of 4.8 turtles for the entire site. However, Lockport Prairie includes multiple known core areas of deep semi-permanent marsh which support much of the turtle population, and the site is large enough to allow multiple activity centers for each turtle. Activity centers tend to coincide with the core areas of semi-permanent marsh, but at any given time not every core area of habitat will be occupied as an activity center, and individual Blanding's turtles typically move among several activity centers in a season. Movements can cover considerable distances. For example, an adult female Blanding's turtle captured near the Illinois-Wisconsin border and tracked using radio telemetry moved 228 meters in the first 24 hours after release, and an additional 537 meters over the next five days before settling into a marsh complex for several weeks. Later the turtle returned to near its original location, covering more than 800 meters in a few days (Mierzwa and Thiele 1996). In McHenry County Illinois, Rowe and Moll (1991) documented mean daily movements of 44.5 meters within activity centers, duration of presence within one activity center ranging from eight to 55 days, and distances between activity centers of up to one kilometer.

The absence of core wetland habitat, the constrained size (individual turtles frequently and routinely move greater distances than can be contained within Middle Parcel), and the presence of non-habitat in adjacent areas to the west and south suggests that Middle Parcel may not be able to support a density of turtles similar to a large preserve with extensive prime habitat including Des Plaines River backwaters and several large ponds. In addition, the 29-acre Middle Parcel area cited above includes extensive areas of common reed-dominated marsh which are unlikely to support adult Blanding's turtles. If a high-quality 29-acre portion of Lockport Prairie with core habitat and surrounded by much larger areas of good quality habitat is capable of supporting five Blanding's turtles, it is assumed that a lesser-quality area of 29 acres at Middle Parcel, with no core habitat and

surrounded by non-habitat or degraded habitat would support fewer adult turtles and that those turtles would not likely remain on the site for long periods of time. A few additional hatchlings or juveniles may also be present until they disperse. This estimate is consistent with the results of INHS' recent (May-June 2015) survey that found six juvenile Blanding's turtles on Middle Parcel within two months (Feng and Dreslik 2015).

Therefore, as many as eight Blanding's turtles (adults, juveniles, and hatchlings) could be present on Middle Parcel at any one time. Blanding's turtles are also known to occur on ComEd Parcel in or near where restoration activities that could result in take will occur, including four that were found in 2015 (Feng and Dreslik 2015). The portions of North and Far North Parcels that may be developed during the permit period contain old field and buckthorn thickets on fill and are not considered potential Blanding's turtle habitat (Figure 12). However, turtle habitat on these two parcels potentially could be impacted by a reduction in groundwater levels from mining Middle Parcel. These impacts are expected to be largely off-set by the abundant surface water supply to the wetlands on these parcels as well as habitat improvements. As discussed above, HMS will implement numerous AMMs to avoid taking any Blanding's turtles during mining and any development and restoration activities; therefore, HMS does not expect to take more than six (6) Blanding's turtles. However, as a precaution, HMS is requesting take of up to twelve (12) Blanding's turtles during the permit period.

Spotted Turtle

Spotted turtle presence has been documented at three locations in Will County: Lockport Prairie Nature Preserve, Romeoville Prairie Nature Preserve, and on private land adjacent to a quarry north of Romeoville Prairie (Anthonysamy 2012; Banning et al. 2006; Mauger, pers. comm.). The two nature preserve populations are extant, while the northern population is known from only a few specimens and is believed to be extirpated. The Lockport Prairie population was estimated at 81 turtles, or 2.2 per hectare (Banning et al. 2006). The Romeoville Prairie population is thought to be considerably smaller, although no estimate is available.

Spotted turtles have never been reported on Hanson Material Service property despite field work nearly every year since 1994. While much field work has taken place in summer when spotted turtles are rarely surface-active, efforts have been made to search for the species at River South and Middle Parcels during the spring months especially in the mid-1990s (Mierzwa unpublished field notes) and including immediately after prescribed fire on River South, Middle, North, Long Run and ComEd parcels. These efforts resulted in multiple observations of Blanding's and painted turtles on some sites but not spotted turtles. In addition, a survey by INHS in May and June 2015 of Middle Parcel and other HMS parcels found eleven Blanding's but no spotted turtle.

Spotted turtles at Lockport Prairie and Romeoville Prairie have much smaller home ranges (2.2 ha and 1.8 ha minimum convex polygon for males and females, respectively) and mean daily dispersal distances (12.2 and 14.7 meters for males and females, respectively) than Blanding's turtles (Anthonysamy 2012). Spotted turtles also tended to be limited to relatively high-quality shallow marshes and sedge meadows in the interior of the sites, and "almost never" used peripheral wetlands which tended to be more silted (Anthonysamy 2012). Most spotted turtle observations have been in the central or southern parts of Lockport Prairie and none were at the north end of the preserve close to Route 7 (Feng and Dreslik 2015; Banning et al. 2006; Mierzwa 1988). Unlike other species of turtles, spotted turtles do not use the Des Plaines River or adjacent riparian areas for dispersal (Anthonysamy 2012; Banning et al. 2006). Radio telemetry studies documented that while Blanding's turtles at both nature preserves often moved considerable distances onto adjacent

sites, spotted turtle movements were restricted to the interior areas of the preserves and no off-site movements were noted (Banning et al. 2006).

Because intervening barriers, very small home ranges, and very short movement distances likely preclude long-distance dispersal, and because extensive field work by numerous individuals over a 20-year span has failed to document spotted turtle presence on Hanson Material Service property, the population size is assumed to be zero. During the 20-year study period seven other turtle species (snapping turtle, painted turtle, red-eared slider, musk turtle, Blanding's turtle, eastern spiny softshell, and northern map turtle) have been documented on or adjacent to one or more HMS parcels (Feng and Dreslik 2015; Mierzwa, unpublished field notes).

As explained above, it is very unlikely that spotted turtles are present on Middle Parcel or other HMS parcels. It is even less likely that they are found on ComEd Parcel, where restoration activities that could result in take will occur, because it is separated from its known habitat areas by a river and two canals, and they were not found in 2015 surveys. HMS will implement numerous AMMs to avoid taking any spotted turtles that may be present during both mining and any development or restoration activities; therefore, HMS does not believe that take of any spotted turtle will occur. However, as a precaution, HMS is requesting take of up to two (2) spotted turtles during the permit period.

5.2.5 Turtle Impact of Take

Blanding's Turtle

Take is requested for a total of twelve Blanding's turtles. As many as eight Blanding's turtles (adult and juveniles) are estimated to use the 29.1 acres of potential foraging and dispersal habitat on Middle Parcel. Removal of dolomite prairie and seasonal marsh communities at Middle Parcel would result in a direct loss of dispersal habitat and potential (but limited) foraging habitat. Core area habitat for adult turtle is not present on Middle Parcel because diverse permanent marsh with open water and vegetated areas is not present on site, the site has dried during at least part of most years since the onset of monitoring, and because prey items are limited. Although exclusion fences and preconstruction surveys would be implemented to avoid and minimize impacts, the take request is intended to account for the possibility of overlooking any turtle that may be present on-site during work or any inactive turtles within the site prior to the beginning of work. Potential impacts to habitat in parcels immediately north of Middle Parcel and the potential take and loss of 0.39 acres of potential habitat during the wet-mesic prairie transplant in ComEd Parcel is also factored into this take request.

The Blanding's turtle is not federally listed or proposed for listing at this time. The Center for Biological Diversity filed a petition on July 11, 2012, seeking Endangered Species Act protection for 53 species of amphibians and reptiles including the Blanding's turtle. The 90-day finding was published on July 1, 2015 and determined that listing may be warranted for the Blanding's turtle. The species is included in this Habitat Conservation Plan because of its State of Illinois status and because the possibility of a proposal for federal listing and eventual listing cannot be precluded during the life of the HCP. Thus, Blanding's turtle is considered a Covered Species at the federal level under this HCP.

The take calculation above describes the reasonable worst-case estimate of take in individuals by HMS including instances where the impacts to habitat rise to the level of potential harm. The take

analysis builds on the take calculation by further explaining the anticipated impact this reasonable worst-case take is anticipated to have on Blanding's turtle at the individual and population level.

Individual Level

Based on the assessment of the potential biological impacts and take in this HCP, Covered Activities that can cause take (that were not avoided or self-mitigating) included only the removal of foraging habitat, movement/dispersal corridor, and possible nesting habitat during the surface mining of Middle Parcel. This mining will result in the loss of 29.1 acres of habitat potentially used by an estimated population of up to eight individuals (adults, juveniles, and hatchlings). Mining Middle Parcel could also impact habitat on North and Far North Parcels. These impacts if they occur are likely to be minor because the wetlands on these parcels are supported by surface water.

Evidence of nesting on Middle Parcel (juvenile turtles) was first documented in 2015 (Feng and Dreslik 2015). Nesting, if it occurs, is likely limited to areas of upland fill because most of the rest of the site has saturated soils through the winter and spring months. In addition, soils on most of the site with natural vegetation are less than 18 inches deep to bedrock, limiting potential nest depth and placing eggs or juveniles at winter freeze risk in cold years with little insulating snow cover. Thus, the presence of nests is inferred only by the presence of juveniles.

The take estimate also allows for the possibility that turtles would be present and undetected by biological monitors and would not move off the site on their own after installation of exclusion fences or would intersect fences and return to the interior of the site before being detected. In this event there is some risk of direct impacts to Blanding's turtles during overburden removal. In addition, direct impacts to Blanding's turtles from mining operations on Middle Parcel will be avoided or minimized through the implementation of a number of other measures described in the previous section (5.2.3).

Removal of vegetation at Middle Parcel will displace Blanding's turtles that would have used that habitat in future seasons and result in indirect impacts. Once exclusion fences are in place any movement from other locations into or through Middle Parcel would be precluded. Because Blanding's turtles have large home ranges and move between core areas, displaced animals are expected to use North Parcel, Far North Parcel, and River North Parcel. Habitat restoration will occur on all three of these parcels. Ponds and river backwaters on River Parcel also offer potential habitat, especially after restoration activities remove invasive species and increase habitat diversity. All four of these parcels will be protected under this HCP.

Because there is no suitable habitat to the west of Middle Parcel, where IL Rt. 53, agricultural fields, a quarry, and residential subdivisions predominate; or to the south, where an existing quarry is present; loss of Middle Parcel is not expected to disrupt migration corridors. Turtles can continue to use River Parcel immediately east of Middle Parcel along the river. To reach the next known occupied and suitable site to the south (River South Parcel, more than 1,500 m distant) already requires that animals move to or almost to the Des Plaines River. Proposed mining activities will not affect the river or riverbank.

Although Blanding's turtles have been found on Middle Parcel, a number of barriers restrict their access to the site. Deep historic fill and tree and shrub cover on the north portion of the site are a partial barrier to the dolomite prairie, although it appears that at least a few turtles successfully cross this area. Other more significant barriers to dispersal include a quarry to the south and three

sets of railroad tracks to the east and between it and the Des Plaines River. However, culverts and ditches are thought to offer a connection to the Des Plaines River.

Suitable Blanding's' turtle habitat, however, is found in nearby parcels. Suitable permanent or semi-permanent aquatic habitat is known to be present on Lockport Prairie, Romeoville Prairie, and River South Parcel, and probably on River, North, Far North, and River North Parcels. Based on available observations, Blanding's turtle activity centers are believed to be present at Lockport Prairie, Romeoville Prairie, River South, in river backwaters of River North Parcel, and in a marsh complex within the utility corridor south and east of Far North Parcel.

Nesting was documented at Far North Parcel in 2010, and suitable nesting habitat is available in other parcels near Middle Parcel. Very similar well drained uplands are present on parts of River and North Parcels as well as Far North Parcel. All are currently accessible to turtles, and all have nearby wetland habitat for juvenile dispersal and foraging. Therefore, loss of Middle Parcel habitat is not likely to constrain future breeding opportunities for the species. Some of the proposed enhancement (e.g. thinning of trees on River Parcel and management of *Phragmites* on River South) would enhance habitat, resulting in a likely long-term net gain in available habitat for Blanding's turtle. Clearing of buckthorn and shrub cover on upland parts of River South in particular would enhance potential nesting habitat which is not currently available because of nearly complete shading. A juvenile was found near an area to be cleared in the mid-1990s, suggesting that enhancement could expand already existing breeding habitat.

In summary, loss of Middle Parcel habitat would reduce the area of habitat available to Blanding's turtle in the future. This loss of habitat would be unlikely to reduce breeding success because 1) the area to be impacted is not unusually high-quality turtle habitat; 2) areas of equal habitat value are available and fairly widespread in the vicinity; and 3) some areas not currently available as nesting or foraging habitat would become available to Blanding's turtles as a result of HCP restoration activities.

Three adults and one juvenile Blanding's turtles were found on the ComEd Parcel (Feng and Dreslik 2015) but appear to be relatively uncommon there. While restoration activities at this site, including construction of an access road, will result in the loss of 0.39 acres of habitat and may temporarily displace one or two turtles, the species will experience a longer-term net gain from habitat restoration.

Population Level

Congdon et al. (1993) identified demographic-level threats to Blanding's turtle populations as a result of recruitment levels insufficient to sustain populations over long periods of time. Factors contributing to low recruitment may include nest predation by artificially over-abundant omnivores such as raccoons and skunks and highway mortality of adult female turtles. Activities covered in this HCP are not likely to affect egg predation, and it may be possible to reduce road-related mortality of adult turtles by placing exclusion fencing in a way that eliminates or reduces crossings of the quarry access road; certainly, no HCP activity is expected to increase road crossings. Because HCP activities would not increase long-term population level impacts and may actually mitigate road impacts to some extent, and because of the low level of requested take relative to the regional population, the HCP activities are not expected to have a significant effect at the population level. Much larger populations are found at other nearby sites, such as LPNP, RPNP and Keepataw Preserve and likely River South.

Spotted Turtle
Although spotted turtles are not believed to be present on Hanson Material Service property, and proposed activities are not anticipated to have any impact on the species, HMS is requesting take of two spotted turtles as a precaution. This take would have no effect on the Illinois population.

5.2.6 Turtle Compensatory Mitigation

HMS' mitigation includes creating open habitat and restoring or enhancing native open communities (i.e. mesic and wet prairie and sedge meadow) on eight of HMS' mitigation parcels (River South, Fitzpatrick Seep, River, North, Far North, River North, ComEd and Long Run), located on both the west and east sides of the river. These restoration efforts provide improved habitat for the HED and both covered turtle species. In addition, all of these parcels will be permanently protected under this HCP. A summary of the amount of Blanding's and spotted turtle habitat and potential habitat improved and preserved is found in Table 8 in Section 5.1.7. These parcels will be protected through a declaration of restrictions on each within 30 days after required permits for this project are received and any potential legal action is resolved.
HMS will provide additional mitigation for take of Blanding's turtle by creating and enhancing nesting habitat in open upland areas (with gentle south or west facing slopes) adjacent to adult wetland habitat in River Parcel by creating bare soil areas by discing or tilling. These areas may be augmented with sand to provide appropriate loose soil and seeded with dry prairie species to prevent erosion. HMS will also remove the shrub and tree line along railroad tracks on the west side of River Parcel to reduce cover for turtle nest predators and will trap or otherwise remove egg predators, such as raccoons, in this area if there is evidence of substantial egg predation.

5.3 Other Covered Species

Leafy Prairie Clover
The leafy prairie clover (LPC) was listed as federally endangered in 1991 (USFWS 1991). The species is listed as endangered in Tennessee (Somers et al. 1989) and Illinois (Illinois Endangered Species Protection Board 1990). Threats to the LPC include habitat loss, competing invasive species, shade suppression by woody species, and fire suppression.

Leafy prairie clover is found only in open limestone cedar glades, limestone barrens, and dolomite prairies that have shallow, silt to silty-clay loam soils over flat and often highly fractured limestone or dolomite with frequent expanses of exposed bedrock. These habitats experience high surface and soil temperatures, generally have low soil moisture, are wet in the spring and fall, and become dry in summer (Quarterman 1989; DeMauro 1986; White 1978).

Lakeside Daisy
The Lakeside daisy was listed as federally threatened in 1988. Threats to the survival of the species include habitat destruction, succession of overgrowth by woody species, over-collecting for gardens, inadequacy of existing regulatory mechanisms and the species' self-incompatibility. The most significant threats range-wide are habitat destruction and succession of woody species. This plant is found in dry, rocky prairie grasslands underlain by limestone. It requires open sites with full sun.

5.3.1 Other Covered Species Activities and Impact Analysis

Leafy prairie clover

LPC is known to occur on several parcels in the Planning Area. These include: Lockport Prairie Nature Preserve, Romeoville Prairie Nature Preserve, ComEd Parcel, Long Run Parcel, Lockport Prairie East, and Dellwood Park West Nature Preserve (Figure 14, Appendix A). Some populations in some of these locations, such as Romeoville Prairie (CHU 3) and HMS' ComEd Parcel (CHU 7), are found within the ComEd ROW and easements. LPC is found on other parcels in the lower Des Plaines River Valley, but no other populations are currently known in the Permit or Planning Areas. This includes Middle Parcel where several plant surveys have been conducted in recent years (AES 2012b, 2017 and 2018).

HMS' surface mining plan includes mining the remainder of Pierce Eich and Middle Quarry and mining Middle and East Parcels. LPC is not found on any of these parcels. However, there are populations on HMS' ComEd and Long Run Parcels which are included in HMS' mitigation package. Restoration on these parcels includes activities that will use heavy equipment during the wet-mesic prairie transplant process. Potential groundwater impacts to populations found on Lockport Prairie and Romeoville Prairie will be prevented through the implementation of avoidances measures discussed in Section 5.1.3.

Lakeside Daisy

The two known Lakeside daisy sites in Will County are located in Lockport Prairie Nature Preserve (CHU 1) and Romeoville Prairie Nature Preserve (CHU 3). Potential groundwater impacts to populations found on these parcels will be prevented through the implementation of the avoidance measures (by avoiding mining or the potential impacts of mining) discussed in Section 5.1.3.

5.3.2 Other Covered Species Biological Goal and Objectives

The biological goals and objectives of the federal Recovery Plan for the leafy prairie clover include the measures described below (USFWS 1996). The end goal of the plan is delisting of the species. The recovery strategy includes enhancement and maintenance of population viability through habitat protection and management and population restoration. The delisting goal for the Illinois population will occur when a minimum of three populations ranked as high viability are protected and managed for 10 years.

Recovery Outline

1. Identify and prioritize protection, management, and restoration needs for all viable populations for each geographic region. In Illinois, the Plan identifies Lockport Prairie, Romeoville Prairie, and Keepataw Forest Preserve. *The populations found on HMS' ComEd and Long Run Parcels are not mentioned in the plan but could contribute to the recovery of the species.*
2. Evaluate potential Illinois recovery sites. One site within the HCP Planning area is considered a high potential recovery site: Lockport Prairie East.
3. Initiate and complete preserve design and implement the protection and management required to meet recovery criteria.
    3.1. Develop preserve designs with protection and management of LPC as a priority.

3.2. Implement protection – seek to obtain highest level of protection possible for parcel (Illinois Nature Preserve = highest protection).
3.3. Develop management plans – create management plan for parcel and address LPC specifically.
3.4. Implement management plans – implement prescribed burning, woody plant succession, exotic species control, protection from overuse and illicit activities and herbivore damage.
3.5. Increase population through enhancement of current populations or establish new populations.
4. Develop and implement population monitoring programs.
5. Conduct research to enhance recovery efforts.
6. Develop materials to inform the public about the status of the species and Recovery Plan objectives.

HMS' AMMs address many of the biological goals and objectives of the LPC Recovery Plan.

A Recovery Plan also was written for the Lakeside daisy (USFWS 1990) but its goals and objectives were not considered for this HCP because no impacts to the species are anticipated from HMS planned activities.

5.3.3 Other Covered Species Measures to Avoid and Minimize Impacts

Leafy prairie clover
HMS will locate and flag all LPCs located within planned construction areas (i.e. where heavy equipment, such as trucks and front-end loaders, are used) within ComEd and Long Run Parcels. Where possible, construction activities will avoid these plants. Where it is not possible, HMS will use composite matting or will remove and transplant LPC plants to other suitable areas in these parcels or plant them back in the same location after construction is finished. Or as part of mitigation, LPC will be planted in a nursery to be used for seed production for future restoration efforts. LPC are most likely to be found in the construction area during the spoil pile removal and wet prairie transplant operations.

Potential groundwater impacts to populations found on Lockport Prairie and Romeoville Prairie will be prevented through the implementation of avoidances measures discussed in Section 5.1.3.

Lakeside Daisy
Potential groundwater impacts to populations found on Lockport Prairie and Romeoville Prairie will be prevented through the implementation of avoidances measures discussed in Section 5.1.3.

5.3.4 Other Covered Species Calculation of Incidental Take

Leafy Prairie Clover
With the implementation of avoidance measures, HMS anticipates very little (less than ten individual plants) to no take of LPC plants.

Lakeside Daisy
No take of Lakeside daisy is anticipated from HMS planned activities with the implementation of avoidances measures.

5.3.5 Other Covered Species Impact of Take

Leafy Prairie Clover
HMS anticipates take will be very small (less than ten individual plants) and a very small portion of the population on ComEd and Long Run Parcels and an even smaller portion of the entire population found within the Planning Area and the entire lower Des Plaines River Valley. The LPC population on ComEd Parcel was estimated to be over 1000 plants in 2006 and 2007 (M. Redmer, pers. comm., 2012). Thus, the impact of take of LPC plants from HMS activities will be insignificant.

Lakeside Daisy
No take is anticipated for the Lakeside daisy, thus there is no impact of take on the population.

5.3.6 Other Covered Species Compensatory Mitigation

Leafy Prairie Clover
If take of LPC occurs during HMS' mitigation activities for the other Covered Species, HMS will collect seed on site (and/or from recovered plants gown in a nursery) for one season and hand broadcast that seed into areas from which LPC plants were removed or other suitable areas in the same parcel. In addition, LPC likely has a viable seedbank in ComEd Parcel that will respond positively to the restoration work that is planned for the site as it has in other nearby sites (e.g. Dellwood Park and Lockport Prairie East).

Lakeside Daisy
No mitigation is needed or planned for the Lakeside daisy.

6.0 MONITORING, REPORTING, AND ADAPTIVE MANAGEMENT

6.1 Introduction and General Requirements

Under the Endangered Species Act (ESA) and associated regulations, a Habitat Conservation Plan (HCP) must describe the steps that an applicant will take to monitor the impacts of its Covered Activities on the Covered Species (50 C.F.R. 17.22(b)(1)(iii)(B) and 17.32(b)(1)(iii)(C)(2)). The USFWS' Five-Point Policy offers guidance for that monitoring, and provides that USFWS and the applicant must ensure that the monitoring program of an HCP provide information to: (1) evaluate compliance, (2) determine if the biological goals and objectives are being met, and (3) provide feedback information for an adaptive management strategy, if one is used (65 Fed. Reg. 35242, 35253, June 1, 2000). The 2016 HCP Handbook states that monitoring reports must contain the information needed to ensure the permittee is complying with the HCP and terms and conditions of the permit as well as to determine if the HCP is meeting the biological objectives (USFWS and NMFS 2016). The Handbook advises that the HCP specify the type of data and information collected, the level of detail required, and the frequency for reporting. The monitoring, reporting, and adaptive management described below are designed to effectively achieve the species-specific biological goals and objectives presented in Chapter 5 of this HCP.

6.1.1 Monitoring

Monitoring is a repeated measurement and analysis of a resource over time to determine its status and trend. Monitoring should be able to be replicated in space and time, and it should be repeated in the same locations. Monitoring can be used to assess, inform, and achieve management actions and objectives. Pre-activity surveys (i.e., inventories) and other studies provide baseline information about the distribution and/or the abundance of a resource. Inventories can form a basis for the monitoring program if replicated across time. They can also help to: (1) identify areas where species of concern (covered and not covered) are located, (2) prioritize areas to target for conservation, and (3) determine potential impacts to a species resulting from habitat loss.

An HCP must address three types of monitoring: compliance, effectiveness, and validation monitoring. *Compliance monitoring* provides means for the USFWS and IDNR to verify that HMS is carrying out the terms and conditions of the HCP, ITP, and ITA (i.e. doing what the applicant said it would do). *Effectiveness monitoring* will enable the USFWS, IDNR, and HMS to evaluate the effects of its Covered Activities on the Covered Species and determine whether the conservation program of the HCP is effectively achieving its biological goals and objectives. Through effectiveness monitoring, HMS, USFWS, and IDNR will also be able to assess the need for implementation of adaptive management measures to improve the HCP's conservation strategy. *Validation monitoring* evaluates whether models used in designing or implementing the conservation program are correct. When applied to adaptive management (feedback loop), this type of monitoring is also referred to as "iterative modeling." These three types of monitoring will be used in conjunction with milestones that trigger adaptive management as appropriate. Monitoring is discussed further in Section 6.2 below.

6.1.2 Reporting

HMS' monitoring and reporting program will: (1) document its implementation of and compliance with avoidance and minimization measures (AMMs) and mitigation measures; (2) document both the anticipated and actual take of Covered Species (either as individuals or surrogates, such as acres

of habitat lost/impacted); (3) evaluate the effectiveness of the conservation program; (4) assess the need for responses to changed circumstances or adaptive management; (5) document the implementation and effectiveness of any measures undertaken to respond to changed circumstances or adaptive management measures; (6) conduct validation monitoring of hydrologic parameters used in predictive modeling; and (7) explain how implementation, including funding, will continue to be assured. Monitoring reports will be submitted to the USFWS and IDNR and are described in greater detail in Section 6.3.

6.1.3 Adaptive Management

Adaptive management is an iterative process consisting of the following steps: 1) assess the problem, 2) design management, 3) implement management actions, 4) monitor system and species response, 5) evaluate if biological goals and objectives are being met, 6) adjust management, and 7) repeat. Adaptive management is a fundamental and required component of all HCPs, and it helps facilitate compliance, ensure achievement of biological goals and objectives, and allow for iterative modeling. Adaptive management is discussed further in Section 6.2.6 of this HCP.

6.2 Monitoring Plan

HMS will implement a detailed monitoring program that will track all activities covered by the HCP that require oversight to ensure compliance and/or measurement to determine effectiveness. These activities will include permitted activities that may result in take, AMMs, and mitigation measures. The combination of prior notification as well as compliance, effectiveness, and validation monitoring will ensure that HMS, USFWS, IDNR, and other parties are aware of the status of the Covered Activities, compliance with this HCP, the effectiveness of AMMs and mitigation, any biological take, and adaptive management practices. Monitoring will be performed frequently enough to allow evaluation, assessment and potential adaptive management changes and response before impacts occur to the covered species or their habitat. More detail on monitoring frequency is found in Sections 6.2.4 and the Monitoring Plans in Appendix G.

Overall implementation of the HCP will be accomplished by utilizing an HCP Implementation Team comprised of HMS and its consultants to establish and implement the overall management processes and systems. HMS will designate an HCP Coordinator, who will be responsible for monitoring compliance with the HCP, ITP, and ITA as HMS engages in the Covered Activities within the Permit Area. Monitoring of Covered Activities, including but not limited to implementation of the AMMs, mitigation, and adaptive management measures as appropriate, will be performed by HMS personnel and/or contracted environmental specialists.

6.2.1 Prior Notification

As part of HMS' commitment to facilitate communication with USFWS and IDNR regarding activities covered in this HCP, ITP, and ITA, HMS will provide prior notification of planned projects annually. This prior notification will include: (1) notification of the routine activities that will be carried out for operation and maintenance, safety, or new construction purposes, and (2) notification of whether projects or activities are in the vicinity of Covered Species or their habitat. This notification, as more fully explained below, will be provided electronically to the USFWS Chicago Field Office and the IDNR. This annual notification is for informational purposes only and no response is necessary from the agencies prior to HMS proceeding with the planned covered

project in accordance with the HCP, ITP, and ITA. However, the agencies will have the opportunity to make site-specific recommendations for HMS' consideration.

Prior notification information will include a general description (activity type and location) of the projects to be undertaken in the HCP Permit Area during the upcoming year. Since it may be necessary to perform projects during the year that were not originally planned, the list of projects may be periodically updated, if needed, and provided to the USFWS and IDNR points of contact prior to starting the unplanned project.

6.2.2 Biological Goals and Objectives

The biological goals and objectives for this HCP are presented in Section 1.4 of this HCP and are elaborated on further in Chapter 5. As presented in Section 1.4:

> *Section 10(a)(2)(A) of the ESA requires that an HCP specify the measures that the permittee will take to minimize and mitigate to the maximum extent practicable the impacts of the taking of any federally listed animal species as a result of activities addressed by the HCP.*

As part of the USFWS Five Point Policy, HCPs must establish biological goals and objectives (65 Fed. Reg. 35242, June 1, 2000). The purpose of the biological goals is to ensure that the operating conservation program in the HCP is consistent with the conservation and recovery goals established for the species. Recovery Plan goals for each species are discussed in Section 2.2. However, this HCP is not required to result in the recovery of an ESA-listed species or contribute to the recovery objectives outlined in their respective USFWS recovery plans.

The biological goals for this HCP are:

- To meaningfully contribute to the conservation of the Covered Species found in the Permit and Planning Area;
- Protect Covered Species and habitat by avoiding and minimizing take of Covered Species and impacts to their habitat to the maximum extent practicable; and
- To restore, enhance, and preserve Covered Species habitat as mitigation for impacts to habitat.

The biological objectives that will be implemented to achieve these goals are listed below. Specifics about the actions taken to meet these goals and measurable outcomes (e.g. performance standards) to determine if goals have been achieved are found in the sections referenced below and in this chapter.

- Implement avoidance and minimization measures to prevent take of Covered Species and impact to their habitat, including impacts to groundwater (see Sections 5.1.3, 5.2.3, and 5.3.3);
- Restore potential habitat and enhance existing Covered Species habitat (see Section 5.1.7);
- Restore disturbed areas post-construction to pre-construction conditions (see Section 5.1.3, 5.2.3, and 5.3.3);
- Protect existing, restored and enhanced habitat areas (see Section 5.1.7);
- Control erosion and sedimentation from planned work (where appropriate) (see Section 5.1.3 and 5.2.3);

- Work cooperatively with adjacent landowners and regulatory agencies; and
- Implement a monitoring program to track the progress of avoidance and minimization measures (AMMs) and mitigation measures (see Section 6.2.3, 6.2.4, and 6.2.5).

6.2.3 Compliance Monitoring

Overview and Term

Compliance with the terms and conditions of the HCP, ITP, and ITA will be ensured through compliance monitoring (defined in Section 6.1.1 above). Compliance monitoring will take place before, during, and after Covered Activities occur, as well as before, during, and after restoration/enhancement measures are implemented in each parcel. Covered Activities (e.g. mining) will be monitored as long as they last (defined as 30 years in this HCP), and restoration and management activities also will be monitored for compliance as long as they are being implemented.

Compliance Monitoring - General Methods and Personnel

Compliance monitoring will be conducted to ensure that all Covered Activities, as well as AMMs and mitigation measures, are conducted as planned and described in the HCP and associated documents (e.g. the Restoration Plan), and to take corrective action whenever they are not. For example, successful implementation of AMMs (addressed in Chapter 5 of this HCP) will be monitored and documented by one or more acceptable methods, such as visual field inspection, during implementation of Covered Activities. The effectiveness of AMMs will also be monitored and is discussed in Section 6.2.4.

As described in Chapter 5, for certain Covered Activities (i.e. involving earth moving or other use of heavy equipment) in known or possible habitat areas for Covered Species (i.e. covered turtles and LPC), HMS will perform a pre-activity survey (i.e. inventory). Earth moving activities include overburden removal in Middle Parcel and transplant activities in ComEd Parcel. These surveys will be done by contracted ecological consultants who meet qualifications established by USFWS and IDNR. When a Covered Species is found during one of these surveys, the measures detailed in Chapter 5 will be taken to avoid take of the species.

HMS will develop and utilize a "project tracking database" to manage monitoring and implementation data to support the annual report described in Section 6.3 below. Specifically, to assist with compliance monitoring, HMS will monitor and track the following information in the project tracking database:

- All implemented Covered Activities;
- All AMMs to be applied to Covered Activities;
- All implemented mitigation activities;
- All AMMs to be applied to mitigation activities;
- Total number and percentage of Covered Activities and mitigation activities for which AMMs were implemented;
- The number and locations of Covered Activities and mitigation areas where Covered Species were identified on or near a worksite, and the AMMs implemented at those worksites;
- Total take of each Covered Species and the mitigation measures taken to compensate for such take over the term of the permit; and

- Comparison of HMS' requested versus actual take.

All of this information will be included in the annual report to be submitted by HMS. This documentation will be used to verify that HMS is complying with the HCP, ITP, and ITA, including proper implementation of AMMs and mitigating for any take of Covered Species. The monitoring section of the annual report will provide details of mitigation actions, including descriptions of these actions and documentation of real property transactions.

Compliance monitoring will address possible impacts to hydrology (groundwater and surface water, both on and off the HMS property) and Covered Species and habitat (as they relate to mining and restoration/mitigation activities).

Hydrology Compliance Monitoring

Hydrology compliance monitoring includes evaluating the implementation of the AMMs, including their installation and management. AMMs will be installed to enhance the groundwater resources in the form of infiltration galleries in the River South Bluff Parcel and an infiltration pond located in the FPDWC property on the southwest corner of Route 53 and Renwick Road. The evaluation of the hydrology-related AMMs will provide verification that they have been installed as proposed. Any modifications to the design or operation of the AMMs will be reported in the construction documentation report(s). Variations to the design, implementation and/or operation of the AMMs may occur during final design and/or construction. Modifications to the preliminary design of the AMMs may occur to account for changed conditions in the field that are different than anticipated or changes to optimize system performance. Optimization modifications may include ways to reduce water or power usage or implement new monitoring technologies. The documentation report(s) of the AMMs will provide confirmation that the AMMs have been constructed appropriately and report modifications from preliminary designs. The documentation report(s) of the hydrology-related AMMs will be prepared within 180 days of construction completion and will be signed and sealed by a Professional Engineer registered in the State of Illinois. Documentation reporting for the River South infiltration galleries and FPDWC Property Pond may be provided together or separately depending on the timing of their construction. After construction, the maintenance of the infiltration gallery and pond will be monitored to ensure proper functioning. More details on how the hydrology related AMMs will be inspected and monitored are found in Section 6.1 and 6.2 of the Groundwater Monitoring Plan included in Appendix G-1.

Compliance monitoring also will be used to verify that protocols set forth in the Groundwater Monitoring Plan are being followed. Compliance monitoring activities will consist of evaluating the data collection processes and frequencies for monitoring groundwater levels, temperature and water quality. The frequency of groundwater level measurements, groundwater quality sample collection, and documentation reporting will be compared to those set forth in the Groundwater Monitoring Plan in Tables 2-2, 2-4A, 2-4B, 2-5A, and 2-5B. The Groundwater Monitoring Plan is included in Appendix G-1. Compliance monitoring evaluations of field data collection and reporting will be provided annually.

Surface Water Resources

Surface water resources will be protected through erosion control measures implemented for any earth moving activities covered under the HCP. These activities include overburden removal in Middle Parcel, the wet-mesic prairie transplant in Middle and ComEd/Long Run Parcels, and

construction of FPDWC Pond and River South Bluff Parcel infiltration galleries. An erosion control plan, including a Stormwater Pollution Prevention Plan (SWPPP) will be developed for these projects. Implementation of these plans will be monitored, as required by the permitting agency, for compliance. An erosion control plan for the wet-mesic prairie transplant is found in the Restoration Plan Set (Appendix F).

Compliance Monitoring of Covered Species and Habitat

Numerous avoidance and minimization measures (AMMs) will be implemented during mining operations and restoration activities to avoid impacts to the Covered Species (see Chapter 5).

The five species covered under this HCP are listed below:

- Hine's emerald dragonfly (HED) and its critical habitat
- Blanding's turtle and its habitat
- Spotted turtle and its habitat
- Leafy prairie clover (LPC)
- Lakeside daisy

Compliance Monitoring During Mining Operations

Several AMMs will be used during the mining process to avoid taking adult HED or covered turtles. AMMs for the HED are listed under Operational Avoidance Measures in Section 5.1.3 and for Blanding's and spotted turtles in Section 5.2.3. Personnel will monitor and enforce the proper implementation of the AMMs unless noted otherwise. A check list of AMMs will be developed and all applicable measures will be checked frequently enough to ensure their proper functioning (or as specified in the AMM description) during mining operations to ensure compliance. All activities not in substantial compliance will be corrected that day or discontinued until corrected. A report listing all non-compliant activities (if they occur) and corrective actions taken will be generated and submitted to USFWS and IDNR monthly. In addition, mining progress will be tracked annually by measuring the size and depth of the mines. Mining operations will not occur in or near LPC or LSD habitat; thus, no AMMs are planned.

Compliance Monitoring During Restoration Efforts

Several AMMs will be used during restoration efforts to avoid taking adult or larval HED, covered turtles, or the Leafy Prairie Clover (LPC). AMMs for HED are listed under Avoidance During Restoration in Section 5.1.3, for Blanding's and spotted turtle in Section 5.2.3, and for LPC in Section 5.3.3. Personnel will monitor and enforce the proper implementation of these AMMs unless noted otherwise. A check list of AMMs will be developed and all applicable measures will be checked frequently enough to ensure their proper functioning (or as specified in the AMM description) during restoration activities to ensure substantial compliance. All activities not in compliance will be corrected that day or discontinued until corrected. A report listing all non-compliant activities (if they occur) and corrective actions taken will be generated and submitted to USFWS and IDNR monthly. Restoration efforts will not occur in or near LSD habitat; thus, no AMMs are planned.

Compliance Monitoring of Wet-Mesic Dolomite Prairie Transplant

Unless noted otherwise, personnel will monitor and enforce the proper implementation of all AMMs associated with the salvage and transplanting of 6.01 acres of wet-mesic dolomite prairie (see Chapter 5 and Restoration Plan Set, Appendix F). Prior to and during the transplant, personnel

will ensure that the correct equipment and techniques are used to complete the project successfully, (as specified in Section 5 and the Restoration Plan Set) including:

- Appropriate equipment: removal vehicle, bucket/scraper, transport vehicle, unloading and placement vehicle; and
- Appropriate technique: removal, transport, and placement in transplant location.

Personnel will ensure proper implementation of all *Mining Operations* and *Mitigation/Restoration Efforts* AMMs (referenced above) applicable to construction of the access road, which will be installed in the Long Run and ComEd Parcels to enable the wet-mesic dolomite prairie transplant.

A check list of AMMs will be developed and all applicable measures will be checked frequently enough to ensure their proper functioning (or as specified in the AMM description) during transplant operations to ensure substantial compliance. All activities not in compliance will be corrected that day or discontinued until corrected. A report listing all non-compliant activities and corrective actions taken will be generated and submitted to USFWS and IDNR monthly.

6.2.4 Effectiveness Monitoring

Overview and Term

As described under Section 6.1.1 above, effectiveness monitoring will enable the USFWS, IDNR, and HMS to evaluate the *effects* of the Covered Activities on Covered Species and determine whether the conservation program of the HCP is *effectively* achieving its biological goals and objectives. Under this HCP, HMS will *monitor the effects* of the Covered Activities that require compensatory mitigation. In addition, there are several AMMs, as well as mitigation measures, that will be *monitored for effectiveness* as part of the adaptive management program. Effectiveness monitoring will be initiated upon implementation of the Monitoring Plan and will continue as long as Covered Activities last (estimated to be 30 years in this HCP) and restoration and/or management activities (and other mitigation efforts) continue (also until the end of the 30-year permit period or when the permit is terminated).

Effectiveness Monitoring - General Methods and Personnel

In addition to the items listed in Section 6.2.3 above, HMS' HCP Coordinator will compile a list of all activities performed, indicating the type of activity, where it occurred, the amount of habitat affected, the AMMs implemented, and the actual or calculated take of Covered Species (i.e., numbers of individuals or acres of habitat). Specifically, the HCP Coordinator will use data collected during the previous year to report the areas of temporary and permanent habitat loss based on the size of the work area (determined during any pre-activity surveys or other site-specific evaluation) and the percentage of that area providing suitable habitat for each species. For each species, the total acreage (across sites) of occupied or potential habitat impacts will be calculated. Activities which result in take that can be monitored in terms of individuals of Covered Species or acres of habitat will also be tracked and included in the overall annual compensation calculation.

HMS will be responsible for monitoring the effectiveness of mitigation measures. Appendix G (G-2 and G-3) contains current monitoring protocols for habitat and the HED and will be updated as needed during the life of the permit. It is the responsibility of HMS to ensure that the effectiveness monitoring is performed sufficiently, completely, and in accordance with this HCP, the ITP, and ITA. Frequency of effectiveness monitoring for the HED and habitat is discussed in their respective sections below in this section. HMS will report monitoring results to the USFWS and IDNR. If the

results from the monitoring of the mitigation measures demonstrate a lack of success, additional mitigation measures will be implemented to compensate for the shortfall as discussed in the adaptive management section (6.2.6) of this chapter and changed circumstances sections in Chapter 8.

In addition to monitoring effectiveness of the mitigation, HMS is responsible for evaluating the effectiveness of avoidance and minimization measures (AMMs). For each AMM, HMS and the USFWS evaluated the risk to the species if it were to fail and the likelihood that the AMM would be successful. This evaluation identified AMMs with a moderate to high degree of risk to the species in the event the AMM fails (e.g. River South Bluff Parcel infiltration galleries). Since River South Parcel is the parcel with larval habitat located in closest proximity to the proposed surface mining in the Pierce Eich Quarry, the potential risks to the Covered Species are greatest in this area. Therefore, HMS has developed a monitoring strategy to account for this risk. Groundwater levels will be monitored at much higher frequencies in the River South/River South Bluff Parcel than other parcels during each monitoring period. Remote monitoring devices, such as telemetry devices, will be installed so that near-real time monitoring data will be accessible via cellular or satellite modems.

At least two monitoring wells within the River South (RP-2S) and River South Bluff (RP-1D) Parcels will have remote monitoring devices installed in them to record water levels every four hours. The data collected from these remote monitoring devices will be retrieved and reviewed on a weekly basis. Additional remote monitoring devices will be installed within wells RP-1S, RP-2D, MW-7C, MW-12C, and CEP-4D. These instruments will record water temperature and groundwater levels every four hours. The W-1 seep and well G-102 will have automated devices deployed for near-continuous monitoring (every four hours) of temperature and specific conductance. The instrument at G-102 will also record water levels. These instruments will be accessed for data downloads at least monthly.

Process control monitoring devices installed within the infiltration gallery systems will provide information during operation of the infiltration galleries so that modifications to the infiltration system can be tracked to respond to changing conditions. Thus, uncertainty of the infiltration gallery effectiveness is addressed through greater monitoring frequencies, systems capable of remotely providing groundwater level data and a means to respond to changing conditions.

If water levels are not maintained within targeted ranges using estimated infiltration rates, then additional water volumes will be infiltrated. The three proposed galleries will be designed to have excess capacity, as will the conveyance piping from the Middle Quarry sump. If infiltration capacities are reached, or the distribution of the water is insufficient, additional avoidance measures will be incorporated, such as installing an additional gallery(s) and/or supplementing more water. Documentation report(s) of physical enhancement(s) to AMMs will provide information on the modifications from preliminary designs and will be prepared within 180 days of construction completion. The documentation report will be signed and sealed by a Professional Engineer registered in the State of Illinois. This approach of iteratively collecting and assessing data, along with providing enhancements if necessary, is consistent with the adaptive management program described in Section 6.2.6.

Compliance monitoring (confirmation that the AMMs are implemented appropriately) will be conducted and reported prior to effectiveness monitoring. As with compliance monitoring, effectiveness monitoring will address impacts to hydrology as it relates to groundwater and surface

water, both on and off the HMS property within the Planning Area and on the Covered Species and their habitat as they relate to mining and restoration activities.

Effectiveness Monitoring of Hydrology

Hydrology will be monitored at the mitigation parcels to measure the effectiveness of the AMMs, restoration, and mitigation efforts. Success of hydrologic AMMs will be determined by the collection and evaluation of field monitoring data. The evaluation of monitoring data will provide documentation that: (1) *groundwater hydrology* is being maintained in current HED larval habitat areas that could be affected by HMS' activities, (2) *groundwater quality* is also being maintained in these same areas, and that (3) *surface hydrology* suitable for the Covered Species is being maintained or improved in areas of habitat restoration and hydrology enhancement. Evaluation of monitoring data will include documenting that groundwater hydrology is being maintained within the historical range of background levels in known and potential larval areas that could be affected by mining.

Groundwater Resources

HMS will: (1) install groundwater hydrology AMMs to protect groundwater-fed habitats in parcels that could be affected by their Covered Activities, and (2) monitor groundwater hydrology in parcels that contain or may contain HED larval habitat (or areas just upgradient of these parcels) and may be affected by HMS activities. In addition, groundwater levels will be monitored outside of the potential affected area, so regional or "background" trends in the Silurian Aquifer can be related to trends within potentially affected areas. Parcels in CHUs that modeling shows with confidence will not have their groundwater impacted by HMS activities (or wetlands that are surface water fed) will be monitored less frequently. Details of the effectiveness monitoring of groundwater hydrology AMMs are addressed in Section 3 and 4 of the Groundwater Monitoring Plan, which is included in Appendix G-1.

Shallow groundwater in and around transplant areas and other habitat restoration areas will be recorded routinely. Groundwater levels throughout the project area will be monitored using the scheme discussed in Section 4 of the Groundwater Monitoring Plan included in Appendix G-1. Monitoring frequencies vary based on location and time period within the HCP Permit as outlined on Tables 2-2, 2-4A, 2-4B, 2-5A, and 2-5B of the Groundwater Monitoring Plan.

The hydrology monitoring effort will collect data that can be used to evaluate whether the HCP is effectively achieving its goals and objectives. As part of this process, the AMMs will be monitored for effectiveness as part of the adaptive management program. The groundwater monitoring program (Appendix G-1) has been developed with timeframes of data collection and evaluation that are short enough so that additional monitoring and potential adaptive management changes can occur in a timely manner. The following sections summarize the monitoring process for groundwater levels and water quality: routine, verification, assessment, adaptive management and mitigation.

Routine Monitoring – Groundwater levels and water quality will be routinely monitored at numerous locations as identified in Table 2-2, 2-4A, 2-4B, 2-5A, and 2-5B of Appendix G-1 to provide sufficiently frequent information to effectively evaluate site conditions. Data collected during routine monitoring will be compared to the historical range of water levels (lower 5% of observed water levels absent of drought periods as displayed on Table 2-2) and water quality data (Attachment 2-Table 1) found in Appendix G. Routine monitoring is considered to be a part of each of the monitoring time periods, which include: First Year of Operation, Regular Operation, Pierce

Eich Quarry Recovery Period and Post-Pierce Eich Quarry Performance Period. Frequency of routine monitoring depends on monitoring time period and monitoring location. At two locations (RP-1D and RP-2S), telemetry units will be affixed to the wells so that water level data that is recorded several times per day can be accessed remotely. Telemetry units will be accessed weekly for data download and review. Manual water levels will vary from weekly to quarterly depending on the monitoring period. Field personnel will record water levels using an electronic tablet with prescribed templates that will alarm the user of a potential groundwater trigger. Verification will occur immediately by re-checking the water level and meter to confirm the first measurement was not erroneously read or recorded by the field staff. This process will reduce the time between identifying a groundwater trigger and making changes in adaptive management. In the rare incidence of an instrument or tablet malfunction, a verification contingency scenario has been developed as outlined in Figure 4-1.

Verification Monitoring – This monitoring consists of a single follow-up monitoring event to confirm the result of a water level or water quality parameter concentration obtained during routine monitoring. If the water level or water quality concentration is not within the predetermined background levels, then assessment of the potentially changed conditions will be initiated. Verification monitoring will not be implemented for data comparisons of seasonal averages. Further details on the timing and procedures of verification monitoring are included on the monitoring decision flow charts included in the Groundwater Monitoring Plan (Appendix G-1) as Figures 4-1, 4-2, 4-2, and 4-4.

Assessment Monitoring – This monitoring consists of monitoring water level or water quality in an individual parcel or across several parcels to obtain the information to assess variations from the routine monitoring data. Water level and/or water quality assessments will be based on the data collected during a period of more frequent measurements at wells near where the observation(s) occurred as well as monitoring of surrounding wells and seeps. The assessment monitoring report will include a summary of conditions as they compare to the planned AMM operation and performance. In addition, the assessment report will provide an evaluation of any change in water levels, identify potential causes, and identify adaptive management action(s) that have been taken or will be evaluated to support the groundwater hydrology of local habitats. Details of assessment monitoring can be found in Section 4.2.3 of the Groundwater Monitoring Plan (Appendix G-1).

Adaptive Management – The strategies implemented for adaptive management consist of an iterative process of routine monitoring, assessment monitoring and implementation of revised operational plans, if necessary. The performance and operation of the avoidance measures will be routinely monitored through inspections and routine monitoring. Field data will be reviewed to verify that avoidance measures are operating as planned. Changes to avoidance measures will be implemented (if possible) to mitigate for the potential for changed conditions. The details of the Adaptive Management process for groundwater impact avoidance measure(s) are found in Section 4.2.4 for water level, Section 4.3.4 for water quality, and on the decision flow charts included as Figures 4-1, 4-2, 4-2, and 4-4 of the Groundwater Monitoring Plan (Appendix G-1).

Contingency Measures - If modifications to avoidance measures cannot be completed or are not effective, then contingency measures will be pursued in consultation with regulatory agencies. Evaluation of contingency options will assess how project goals can be achieved through alternative means.

If measured groundwater levels or water quality parameters continue to fall outside of historical or anticipated range of background levels, and the data indicates that other parties or circumstances outside the control of HMS are the cause, HMS will not be held responsible for the changes (see Chapter 8).

Seep Discharge

Seep discharge will be routinely monitored downgradient of the River South Bluff Parcel infiltration galleries. Water temperatures and specific conductance at the W-1 seep will be recorded every four hours so interferences from infiltrated water can be evaluated. In addition, semi-annual water quality samples will be collected from the W-1 seep discharge. Water quality samples of seep discharge at the W-1 location will be collected coincidently to groundwater quality samples collected at well RP-8S West, which is located immediately downgradient of the northern infiltration gallery (Gallery A). Sample frequencies are summarized on Table 2-4A of Appendix G-1 for W-1 seep and RP-8S West. Water quality samples will be analyzed for general constituents, metals, major anions, as well as field stabilization parameters, including pH, dissolved oxygen, conductivity, and temperature as tabulated on Table 2-4B of Appendix G-1. Results of seep water quality will be compared to the historical dataset included in Attachment B-2 of Appendix G-1 and evaluated in the same fashion as groundwater in accordance with the flow chart depicted in Figure 4-2 of Appendix G-1. Seep monitoring is considered part of the groundwater monitoring program and therefore included in Appendix G. Specific discussion on water quality sampling procedures, parameter lists, and frequency is included in Section 4.3 of the Groundwater Monitoring Plan.

Surface Water Resources

Effectiveness monitoring will also include inspecting and monitoring surface water flow and quality. Surface water will be inspected or monitored in mitigation sites to determine if surface hydrology is being maintained in existing habitat areas or has been reestablished in restored habitat areas. The following methods will be used to evaluate the effect of habitat restoration activities on surface hydrology.

- Surface water will be visually inspected in the following areas:
  - Mitigation parcels that contain HED larval habitat and where habitat restoration activities may affect site surface hydrology and larval habitat will be inspected weekly and within 24 hours of a 0.5 inch or greater rain event during construction. These inspections will focus on ensuring that mitigation activities are not changing surface water flow patterns (or water quality). Therefore, both flow patterns and turbidity will be inspected visually.
  - Areas where no HED larval habitat exists currently but may be created through adult habitat restoration. These inspections will focus on detecting improved surface water flow patterns for larval habitat. These inspections will occur monthly from April through July during the first two years after habitat restoration is complete.

Effectiveness Monitoring of Habitat (Vegetation)

Success of restored, enhanced, and managed habitat areas will be determined by monitoring and documenting the plant community composition, structure, and diversity. Habitat monitoring methods will be similar to the ones used in the test plots study conducted in the mitigation parcels (AES 2012b). The goals of vegetation restoration/enhancement/management are to halt the degradation of current habitat and improve habitat quality in low quality or non-habitat areas. This will be achieved by reducing the abundance of invasive woody and herbaceous species in restored

and enhanced habitat areas, reestablishing a dominance of native species in these areas, increasing native plant diversity, and restoring appropriate habitat structure.

To determine if the above desired changes are occurring, the following vegetation metrics will be monitored. Much of this monitoring will occur along transects. Permanent transects will be established in representative areas of each restored community (i.e. restoration zone) on each mitigation parcel or parcel group (e.g. River South and Fitzpatrick Seep). See Appendix G (G-3) for more details on vegetation monitoring methods.

- *Plant species abundance* - Plant species cover and frequency will be measured along established transects (using quadrats) to determine:
  - % native cover, or relative importance value (RIV)
  - % alien (adventive) cover, or RIV
- *Plant species diversity* - Calculated metric based on quadrat data or species lists collected in/around each transect or in each restoration/planting zone.
  - FQI or mean C
- *Habitat structure* - Measure the following to quantify the change in weedy tree and shrub cover:
  - Stem counts and/or canopy intercept along established transects
  - Use aerial photographs and/or LIDAR to:
    - Document the change in (i.e. reduction of) weedy/invasive trees and shrubs
    - If imagery allows, document the reduction of specific herbaceous weeds (e.g. *Phragmites* and/or cattail)
    - On the ground confirmation (i.e. ground-truthing) of herbaceous weed reduction will be conducted if needed.

Vegetation monitoring will be done once every other year (i.e. years 1, 3, and 5) in each mitigation parcel for the first five years or until performance standards are met. A site inspection will be conducted on alternating years. For the next ten years, full (i.e. quantitative) vegetation monitoring will be completed once every three years, and a site inspection will occur each year prior to a monitoring year. For the remainder of the permit (approximately 15 years), full monitoring will occur once every five years, and a site inspection will occur twice between each monitoring event. Half of the mitigation sites will be inspected each year between the full monitoring years, so that all sites will be inspected every other year.

The following vegetation performance standards have been established to determine the success of the habitat restoration and enhancement areas.

- Less than 10% cover by non-native and/or weedy native trees or shrubs (e.g. green ash, box elder, or gray dogwood) in both the ground layer and the woody canopy layer within three years after the start of restoration. This standard must be met again at the end of year 5.
- At least 70% native cover in the ground layer at the end of year 3 after restoration. This standard must be met again at the end of year 5.
- None of the three most dominant ground layer plant species may be non-native species (according to Swink and Wilhelm 1994) or common reed (*Phragmites australis*) within three years after the start of restoration. This standard must be met again at the end of year 5.

These performance standards will serve as triggers for adaptive management; if a given

performance standard is not met within the time frame specified above, appropriate measures will be taken to address the issue. Adaptive management may include additional woody vegetation removal efforts, overseeding with appropriate native species, and/or additional control of undesirable herbaceous species. In addition, these performance standards are to be maintained during the life of the permit, and adaptive management will be employed as needed to achieve this.

Other Habitat Improvements

Other planned habitat improvements will also be monitored but will not be held to performance standards. These include:

- HED larval habitat restoration: Remove and reduce weedy species (e.g. cattail and willow) in larval HED areas (e.g. Emerald Meadow and areas immediately adjacent to occupied rivulets). The extent of cattails, willows, or other weedy species will be measured with a GPS or on an aerial photograph before and after treatment to calculate the area of habitat expansion. The goal of this restoration is to expand the habitat area (i.e. area with less than 20% woody species, cattail, or *Phragmites*) by 40%. If no appropriate habitat exists (as defined above) in these areas, then restoring 40% of the former habitat area will be the goal. If after two years of management, this expansion is not achieved, then management methods will be reevaluated and adjusted as needed to expand habitat. Management will continue as needed to maintain 40% expansion of the habitat area, unless no increased adult HED use of these areas is observed. The size of these habitat areas will be measured annually until the above goal is achieved and every third year while they are being managed. HMS is not required to restore larval HED habitat because no impacts to larval habitat are anticipated from their Covered Activities. These habitat improvements are being done in recognition of the importance of breeding habitat in River South Parcel to the viability of HED population in the Lower Des Plaines River Valley in Illinois.
- Turtle nesting habitat creation: Turtle nesting habitat will be created in River Parcel as described in Section 5.2.6. The condition and use of these areas will be inspected each month during the turtle active season (March 16 to Oct. 31). If, after two years, no evidence of use is observed and habitat conditions degrade (i.e. loose soil conditions are not maintained or plant species that inhibit nesting by the turtles establish in the area), then management methods will be reevaluated and adjusted as needed to restore the originally targeted habitat conditions. This reevaluation process will be repeated every two years. If it is determined that appropriate nesting habitat cannot be created at this location, then turtle nesting restoration will be attempted in another appropriate location on an HMS mitigation parcel.

Effectiveness Monitoring of Wet-Mesic Dolomite Prairie Transplant

The following vegetation performance standards have been established to determine the success of the wet-mesic dolomite prairie transplant areas.

- Native cover should be ≥90% of the pre-transplant native cover three years and five years after transplant.
- Mean C and FQI for all transplant areas combined should be ≥90% of the pre-transplant values three years and five years after transplant.

These performance standards will serve as triggers for adaptive management; if a given performance standard is not met, appropriate measures will be taken to address the issue. Adaptive

management may include overseeding with appropriate native species and/or additional control of undesirable woody or herbaceous species.

Baseline quantitative vegetation data has not been collected in the wet-mesic dolomite prairie of Middle Parcel since 2009; therefore, it will be resampled before transplant to document its current (i.e. pre-transplant) condition.

Effectiveness Monitoring of Covered Species

Effectiveness monitoring will be conducted for all species covered by this HCP that could be impacted by the Covered Activities (including mitigation activities) (i.e. HED, Blanding's and spotted turtles, LPC).

Hine's Emerald Dragonfly (HED)

The HED will be monitored in a number of HMS parcels in the Permit Area during the permit period. Adult monitoring will be conducted using the method developed and used by Ken Mierzwa and his colleagues for over 15 years to estimate density (Appendix G; G-2). Larval monitoring will be conducted using a methodology developed by Dan Soluk and used by his team as well as by Mierzwa's team (Appendix G; G-2). Other monitoring methods, approved by the USFWS and IDNR, may be considered as well. Data from previous HED monitoring as well as population estimates derived from this data (Soluk and Mierzwa 2012) will serve as a baseline for all HED monitoring conducted as part of the HCP.

HMS will monitor HED on their parcels that will be restored or enhanced or potentially could be impacted by a Covered Activity (e.g. mining). HMS will monitor:

- Newly restored or enhanced adult habitat areas on its parcels (i.e. Far North, River North, North, River, Long Run, and ComEd Parcels). These parcels will be monitored for adults every four years on a rotating basis (i.e. each parcel will be monitored on average every four years) until vegetation performance standards have been met. Thereafter or during times when habitat is not being impacted by Covered Activities, adult monitoring will be conducted in restored or enhanced habitat areas every five years for the duration of the permit.
- All known adult habitat areas on HMS parcels (i.e. River South and Fitzpatrick Seep) that could be impacted by mining the Pierce Eich Quarry will be monitored for adults every three years while the Covered Activities (or their potential effects) continue and then every five years for the duration of the permit.
- Point Counting of adult HED at various locations will be performed during the permit to confirm dispersal pathways and parcel connectivity. The location of the work will be determined by the results of the transects on the parcels and vegetation condition. Point counting will be conducted at least ten times during the length of the permit for an average of every three years.
- Known larval habitat areas on HMS parcels (i.e. River South Parcel) adjacent to restoration activities using heavy equipment will be sampled for larvae every two years while restoration activities are conducted. After the restoration activities are complete, the nearby larval habitat will be monitored every five years.
- Known larval habitat areas on HMS parcels that potentially could be affected by Covered Activities (e.g. River South Parcel) will have representative sampling performed for larvae and be visually inspected on an annual basis while the Covered Activities (or their potential

effects) continue. After the potential effects of the Covered Activities are permanently addressed (e.g. inundation of Pierce Eich Quarry) and temporary avoidance measures are abandoned, the parcel will be monitored for larvae every five years.

- HMS will visually inspect suspected locations of potential larval habitat (e.g. Fitzpatrick Seep, ComEd and Long Run Parcels) in restored/enhanced areas every five years after adult restoration/enhancement activities are completed for the duration of the permit.

Monitoring Direct and Indirect Effect on the HED

Effectiveness monitoring will measure the effectiveness of both the restoration and mitigation measures as well as AMMs. Monitoring the effectiveness of AMMs will allow for the evaluation of assumptions that were part of the calculation of take for the HED for a range of activities that result in indirect and/or direct effects.

HMS, USFWS, and IDNR are not aware of any studies that have monitored the response of HED populations to many of the proposed activities included in this HCP and covered by the ITP or ITA. Therefore, several assumptions were made when estimating the take and impact of take of these activities. HMS will conduct effectiveness monitoring to evaluate these assumptions and the response of HED populations to planned activities that have the potential to result in take through direct or indirect effects.

Indirect Effects

HMS will monitor the HED populations in River South during the ITP and ITA period. In addition, HMS will monitor groundwater levels within River South and River South Bluff Parcels and Lockport Prairie Nature Preserve (LPNP). The results of such studies will be used, through adaptive management, to adjust AMMs or, if necessary, Covered Activities. Adult HED monitoring schedule for River South is discussed in the HED monitoring section above. The Groundwater monitoring schedule is provided in Appendix G-1.

Direct Effects

The only activity that is anticipated to directly affect the HED is the removal of adult habitat in Middle, North, and Far North Parcels. Surface mining in Middle Parcel will remove approximately 40.8 acres of adult habitat and development in the other two parcels will remove 8.4 acres. Adult use of adjacent habitat (i.e. River, North, and Far North Parcels) will be monitored by HMS before, during, and after the removal of habitat from Middle Parcel. In addition, adult HED will be monitored at River South (for indirect effects of mining and effectiveness of AMMs and mitigation), as well as at ComEd and Long Run Parcels (for the effectiveness of mitigation). These effectiveness monitoring activities will provide an accurate estimate of the HED population on HMS property and will assist in tracking the size of the overall Illinois population (e.g. Lower Des Plaines) throughout the duration of the permit. Adult HED monitoring schedule is discussed in the HED monitoring section above.

If adult HED density drops 40% or more from baseline, then additional adult monitoring will be done the following summer. If lower density numbers are confirmed in the second year, adaptive management will be triggered.

If the mean HED larval population estimate for a single site drops by 40% or more from baseline, and if all streamlets monitored at that site in that year show at least a 10% decline; and if the decline

occurs across two or more consecutive larval age classes, then adaptive management will be triggered.

Blanding's and Spotted Turtles

All effectiveness monitoring of covered turtles will be completed as part of AMMs during earth moving activities (e.g. mining, prairie transplant, or site development) (see Section 5.2.3). HMS will set traps for turtles in these areas the season before work starts and will search and remove any turtles daily during work. All moved (translocated) turtles will be monitored for a year using radio telemetry. See Section 5.2.3 for more details about AMMs to be implemented to protect the covered turtles. No other monitoring of turtles is planned by HMS.

Leafy prairie clover

LPC populations will be monitored before, during, and after restoration work in HMS' ComEd and Long Run Parcels. Monitoring is part of the AMMs for LPC that are described in Section 5.3.3. As described in this section, if restoration activities (e.g. prairie transplant) cannot avoid all LPC populations, some may have to be transplanted.

- All LPC found and flagged within the construction area prior to the start of work will be transplanted to other appropriate locations within ComEd or Long Run Parcels. Transplanted plants will be flagged, and their location will be recorded with a GPS so they can be found during monitoring.
- Transplanted plants will be monitored during and after construction. Plants will be visually inspected to determine survivorship.
- LPC lost during their transplant or the prairie transplant construction activities will be replaced by seeding or planting LPC in appropriate areas of ComEd or Long Run Parcels.

Lakeside Daisy (LSD)

Within the Planning Area, Lakeside daisy is found only in Lockport Prairie and Romeoville Prairie. Potential groundwater impacts to these populations will be prevented through the implementation of avoidance measures discussed in Section 5.1.2. Therefore, no monitoring of LSD is planned.

6.2.5 Validation Monitoring

Validation monitoring is conducted to test the validity of the basic assumptions that underpin the understanding of the project. Validation monitoring will be used to confirm the cause and effect relationship between the project controls (e.g. AMMs such as infiltration galleries or infiltration pond) and physical (water level/water quality) response.

Extensive groundwater modeling completed for the HMS Romeoville Quarry indicates that the proposed AMMs will be effective in avoiding or minimizing potential hydrology impacts from mining the remaining surface reserves in Pierce Eich and Middle Parcels. Uncertainty in the modeling results were reduced through an analysis of varying input parameters and assumptions in a sensitivity analysis. A duplicate model was also created that offers a different solution to the three-dimensional flow of groundwater. The results of the two modeling set-ups allowed comparison of the results and reduced uncertainty in the ability to conservatively assess predictive scenarios of implementation of the AMMs and quarry construction.

The groundwater modeling simulations are examples of scientific hypotheses, and as such cannot be proven or validated (Konikow and Bredehoeft 1992). Therefore, predictive results will be tested and evaluated using revised inputs and/or assumptions as new information becomes available. If incorrect assumptions or inputs are found to have been inappropriately utilized, the results of predictive analyses may be invalidated. However, the invalidation of the groundwater model(s) is not likely since the conceptual set-up, input parameters, and solution methods have all been reviewed by experts from the USGS at each step during development. Rather, the evaluation of new information may lead to improved conceptual models, refined ranges of parameter inputs, and a new basis for evaluating the regional groundwater flow system.

Validation monitoring will consist of comparison of future data to the groundwater models' conceptual construction, inputs, and results. Validation monitoring will be used to improve the ability of the models to analyze the groundwater flow system.

An assessment of new data with regards to the groundwater modeling inputs, assumptions and results will be evaluated as it becomes available. Validation monitoring events, descriptions and schedules are outlined in the following table.

Table 10. Verification monitoring events and reporting scheduling.

Monitoring Period	Monitoring Event	Description
Years 1 and 2 of Permit Period	1.) River South Preliminary Testing 2.) FPDWC Pond 3.) New Monitoring Wells	• Evaluate whether head/discharge relationships observed during preliminary testing can be incorporated into the groundwater models • Evaluate preliminary testing of pond to the range of flux values used in predictive modeling. • Compare hydraulic data collected at new monitoring wells to range of hydraulic conductivity inputs.
Annually	Water Quality Assessment	Water Samples will be routinely collected in the River South Bluff Parcel and LPNP to assess water quality of the seeps discharging in the parcels. The specific sampling points, frequency, and parameter lists for River South Bluff Parcel and LPNP are summarized in Appendix G-1 on Tables 2-4A/B and Table 2-5A/B, respectively. The results will be reviewed annually to verify that avoidance measures are not having effects on water quality. Discussion of the water quality sampling is included in Section 4.3 of Appendix G-1.
	Availability of New Information	Conduct an assessment to evaluate if: • Any new research is available that has been conducted in the area by university, state or federal researchers that may refine data inputs and/or assumptions? Any new extraction wells been installed or taken offline?
	Recovery of the Pierce-Eich (West) Quarry (Only to occur after mining of the Parcel)	Groundwater modeling predicts that groundwater levels in the northern portion of the River South Parcel will return to background levels within three years of plugging the tunnel under Route 53. Groundwater levels in River South/River South Bluff Parcels, FPDWC Property pond, and LPNP will be closely monitored for at least six years after the Quarry is plugged to evaluate response to the stoppage of pumping in the quarry. Groundwater levels will be evaluated to determine when flow to the galleries can be reduced and eventually shut down.
Every 5-Years	Infiltration Gallery Performance Review	Every 5-years conduct evaluation of an individual infiltration gallery performance by comparing infiltration rates and corresponding water levels to the results obtained during the preliminary testing events.
Reporting Schedules		
Annually	Include validation monitoring data assessments in the Annual Report, which will be submitted annually to USFWS by March1.	
5-Year Groundwater Modeling Reviews	Evaluate new information in the groundwater model with respect to changes to inputs/assumptions. Reviews of groundwater modeling predictive analyses will be conducted at least every 5 years.	

6.2.6 Adaptive Management

Overview of Adaptive Management

As introduced in Section 6.1.3, adaptive management is a process by which management practices are incrementally improved through implementation of plans that provide opportunities to learn from experience. A timely change in impact minimization and mitigation approaches in accordance

with new knowledge provides the cornerstone for a successful HCP. As new information from monitoring, research (by others), or day-to-day management becomes available, the information will be evaluated in the context of this HCP's goals and objectives.

The goal of adaptive management as included in this HCP is to ensure that the conservation program measures (implementation of AMMs and mitigation for take of Covered Species) function as desired and meet their intended biological goals and objectives. The adaptive management process for AMMs and mitigation procedures that have significant uncertainty and consequences for the Covered Species are discussed below. Specifically, data will be collected and analyzed to confirm that AMMs are effective and that mitigation sufficiently compensates for the impact of take of the species.

Based on the best scientific information currently available, it is expected that the HCP's conservation measures will effectively achieve the biological goals and objectives. However, there is some uncertainty associated with some AMMs and mitigation strategies, as well as with species habitat locations and population estimates within the HCP planning area. Results of effectiveness monitoring may also indicate that some AMMs or mitigation measures are more or less effective than anticipated. Therefore, in addition to monitoring, the HCP includes an adaptive management program designed to propose alternative or modified management measures in response to the monitoring results.

The USFWS defines adaptive management as "a method for examining alternative strategies for meeting measurable biological goals and objectives and then, if necessary, adjusting future conservation management actions according to what is learned (65 Fed. Reg. 35252)." It is a tool used to address uncertainty in the conservation of species included in an HCP. The foundation of an adaptive management strategy is identifying the uncertainty to be addressed. The Five-Point Policy also notes that:

> [o]ften, a direct relationship exists between the level of biological uncertainty for a take species and the degree of risk that an incidental take permit could pose for that species. Therefore, the operating conservation program may need to be relatively cautious initially and adjusted later based on new information, even though a cautious approach may limit the number of alternative strategies that may be tested.

Although the adaptive management strategy anticipates future modifications to implementing the conservation program, the strategy becomes part of the HCP's provisions and, therefore, is integral to the proper implementation of the plan. As such, the adaptive management strategy is subject to the USFWS "No Surprises" rule and assurances (discussed further in Chapter 8).

7-Step Process of Adaptive Management

Expanding on the framework (outlined in Section 6.1.3), adaptive management consists of a repeating 7-step process:

1. *Assess the problem*: What are the potential impacts? What are the uncertainties or assumptions about how the species, habitat, and groundwater will respond to impacts and management actions? These issues are addressed in Chapter 5 of this HCP.
2. *Management design*: Explain how management is designed to address impacts and achieve biological goals and objectives. These issues are addressed in Chapter 5 of this HCP.

3. *Implement management actions*: Describe how and when management actions will be implemented to achieve the desired outcomes. Describe how management intervention and follow-up monitoring will be used to improve management decisions. Explain how decisions will be guided by management objectives. These issues are addressed in Chapters 5 and 6 of this HCP.
4. *Monitor system and species response*: Explain how monitoring will be used to inform whether management actions need to be adjusted or changed. This issue is addressed in earlier sections of this chapter (Chapter 6). It is important to note that an HCP's monitoring program and adaptive management strategy are integrally linked. Monitoring should be able to indicate whether adaptive management needs to be implemented and, once adaptive management is used, the monitoring program should be able to adequately assess its effectiveness. The monitoring program is essential to determine whether the strategy is providing the desired outcome of achieving the biological goals and objectives of the HCP. Under this HCP, the analyses of Covered Species and their habitat and associated monitoring data will be used to identify if and where adaptive management actions should be implemented. Specifically, data from the monitoring program will be used to determine when adaptive management is necessary (e.g. through the use of a trigger) and to select the appropriate adaptive management strategy to implement. When an adaptive management action is implemented, the monitoring program will be used to evaluate the response of the Covered Species and/or impact to habitat and whether the action effectively addresses the concern identified. HMS' responsibilities for integrating the monitoring and adaptive management programs of this HCP include: (1) gathering monitoring data on the effectiveness of AMMs and mitigation and maintaining a database; (2) assessing results of AMM and mitigation monitoring to determine effects on Covered Species and habitats; (3) if effects are not what was anticipated, implementing, in coordination with the USFWS and IDNR, the necessary changes to the conservation program to ensure minimization and mitigation consistent with the USFWS permit issuance criteria; and (4) monitoring and evaluating the implementation and effectiveness of adaptive management strategies.
5. *Evaluate if biological goals and objectives are being met:* Explain how monitoring and other information (e.g. new biological information reported or published) will or may be used to evaluate if goals and objectives are being achieved. Monitoring (described in detail in earlier sections of this chapter and Appendix G of this HCP) coupled with adaptive management will provide the empirical data to assess if biological goals and objectives are being met.
6. *Adjust management*: How decisions will be made as to how or whether management needs to be adjusted. As discussed in earlier sections of this chapter), if monitoring results trigger adaptive management (e.g. a performance standard is not met) and/or biological goals and objectives are found not to be met, management will be adjusted in order to achieve performance standards and biological goals and objectives.
7. *Repeat*: How often will things be evaluated and how often might management actions need to be adjusted. Monitoring frequencies vary among different metrics, as do interventions such as adjusted management (see earlier sections of this chapter).

Applying and Implementing Adaptive Management

Not every area of uncertainty in an HCP is appropriate to address through adaptive management. Adaptive management is a process for considering alternative strategies for meeting biological goals and objectives and modifying future conservation strategies based on what is learned from monitoring and the implementation of the alternative strategies. Therefore, adaptive management is best suited to address uncertainty in the HCP's conservation framework. Accordingly, the HCP

focuses adaptive management on critical biological processes or conservation measures where uncertainty may influence the accuracy or prediction or effectiveness of proposed conservation measures.

If the monitoring results reveal that AMMs or mitigation are not performing as intended and not meeting the biological goals and objectives of the HCP, HMS will develop and implement strategies to improve the AMMs and/or mitigation efforts being implemented. Consistent with the cyclical design of adaptive management, should a change to AMMs or mitigation be triggered, further monitoring of that revised or new measure would be required to gauge its effectiveness. This will continue until the alternative achieves the desired effectiveness, or it is jointly determined with the USFWS and IDNR that the presumed response cannot be achieved. Whenever it is determined that the goal of an AMM or mitigation cannot be achieved, HMS will:

1) calculate additional take that has occurred, if any;
2) identify any mitigation required to compensate for that unanticipated take;
3) evaluate whether there is a need to further adjust the allowable level of take in the permit;
4) if necessary, amend the HCP and ITP in accordance with the terms of Chapter 9; and,
5) evaluate whether the taking still will not appreciably reduce the likelihood of the survival and recovery of the species in the wild, pursuant to 16 U.S.C §1539(a)(2)(B)(iv), 50 C.F.R. §§ 17.22(b)(2)(i)(D) and 17.32(b)(2)(i)(D).

In the event that a goal of an AMM or mitigation cannot be achieved, each of the above items will be addressed, at a minimum, through the annual report and feedback mechanisms identified in Section 6.3 below.

In any case where an AMM simply fails to provide the anticipated protection and there is evidence from effectiveness monitoring or other credible sources (e.g. the local USFWS Field Office) documenting failure that results in additional take, the HCP and, if necessary, the ITP may be amended in accordance with Chapter 9. Similarly, if there is evidence that the AMMs perform better than expected; the compensatory mitigation requirements may be reevaluated and reduced by the USFWS, if appropriate.

Adaptive Management of Groundwater AMMs

Adaptive management measures will be implemented if the prescribed avoidance measures at the River South Bluff Parcel and FPDWC pond are deemed insufficient in supplementing groundwater supplies or mining/dewatering impacts are greater than expected. The need for adaptive management measures will be assessed through an iterative process of the collection and evaluation of routine, verification and assessment monitoring data. These steps will encompass the adaptive management process as depicted in the monitoring flow charts (Figures 4-1 through 4-4) presented in Appendix G-1.

Different options for adaptive management measures have been preliminarily evaluated during the development of the preferred alternative. These measures have been conceptually and numerically evaluated as a pro-active approach in developing alternatives for avoiding potential groundwater impacts. The performance and operation of the avoidance measures will be monitored through inspections and monitoring. Field data will be reviewed to verify that avoidance measures are operating as planned. Changes to avoidance measures will be implemented (if possible) to mitigate

for the potential for changed conditions. These options will be revisited should monitoring data indicate that the avoidance measures may be insufficient and adjustment to the avoidance measures or supplement measures are needed. One example of an adaptive management strategy includes the adjustment of the amount of water conveyed to the infiltration galleries – whether more water is needed or whether the flow rates to each gallery need to be adjusted. The FPDWC Pond may also be evaluated for implementation of adaptive management changes, including adjustment of the spillway to maintain more water or increasing the frequency of sedimentation removal. Assessment monitoring will continue until a demonstration can be made that the adaptive measures have been successful.

Discussion of the groundwater monitoring procedures is included in this chapter and in more detail in Section 4.1 of the Groundwater Monitoring Plan provided in Appendix G-1. Adaptive management measures not specified in the Groundwater Monitoring Plan may be implemented if new information provided by monitoring data or other studies supports alternative measures and those alternative measures are reviewed and approved by USFWS.

The processes described in this section address species-specific adaptive management. This process is separate from the process for addressing responses to changed and/or unforeseen circumstances described in Chapter 8.

6.3 Reporting

6.3.1 Annual Report

Per 50 CFR 13.45, HMS will file an annual report with the USFWS and IDNR for the previous calendar year by March 1st. INPC, ACOE, and FPDWC will be notified that the report is available following each filing. Each annual report will include the following:

1. Brief summary or list of Covered Activities completed during the reporting year;
2. Annual and cumulative acreage of land disturbed;
3. Pre-construction documentation, when needed, of Covered Species;
4. AMMs implemented, including frequency, type, and description, if needed;
5. Summary of all Compliance Monitoring;
6. Summary of all Effectiveness Monitoring;
7. Summary of all Validation Monitoring;
8. An assessment of AMM implementation and any changes made to improve implementation of AMMs;
9. Annual and cumulative take level for each Covered Species;
10. List, description (with graphic representation, if needed), and quantification of mitigation activities, and their performance from the previous year;
11. Description of implemented adaptive management measures during the year and why they were needed;
12. A cumulative table of all adaptive management changes to the HCP (cumulative);
13. Description of any changed or unforeseen circumstances that occurred and how they were addressed;
14. Description of any minor or major amendments
15. Summary of meetings held with supporting partners and/or regulatory agencies; and

16. An estimate and description of the anticipated compensatory mitigation for the coming year, including any changes to the mitigation plan.
17. Funding expenditures, balance, and accrual

Meetings: Feedback Mechanism and Implementation

HMS, USFWS, IDNR, and other stakeholders as appropriate, will convene as needed during the first year of implementation of the HCP and at least annually until the end of the permit period, unless USFWS and IDNR determine that an annual meeting is not needed. HMS and USFWS representatives will have the joint responsibility of setting up the meeting and notifying the other required attendees. In addition to these set meetings, HMS, USFWS, and IDNR may convene stakeholder meetings as needed throughout the life of the permit. Such meetings may be in person or by conference call.

The purpose of these meetings will be: (1) to review the data provided in the annual reports; (2) to address any issues with implementation of the HCP; (3) to consider whether implementation can be streamlined; (4) to determine whether the avoidance, minimization, and mitigation measures have been effective and goals have been achieved, and whether any adaptive management is needed; and (5) to address other HCP-related concerns. There will be a summary report of these meetings (i.e. meeting minutes). This summary report will be prepared by HMS or its designated representative, but the USFWS and IDNR will be given the opportunity to review and concur with the report prior to its finalization and being made available to the public. This review cycle does not preclude the use of adaptive management in the interim if circumstances indicate changes are warranted.

Maintaining Current Data for HCP Species

USFWS and IDNR will inform HMS of any changes in the listing status of species covered under this HCP or if critical habitat has been designated within or adjacent to the HCP Planning Area. USFWS and IDNR also will inform HMS of any new or revised recovery plans or 5-year reviews for the Covered Species. USFWS and IDNR will provide annually, in writing: (1) updated lists of listed and candidate species within the HCP Planning Area, and (2) other information pertaining to Covered Species that specifically may inform the implementation of the HCP. USFWS, IDNR, and HMS will coordinate to determine whether any of the information warrants consideration in the adaptive management process or as a changed circumstance.

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7.0 FUNDING

HMS can assure USFWS and IDNR that adequate funding will be available to successfully implement its specific commitments under this HCP. HMS' assurances are consistent with the general information contained in this HCP.

To obtain an Incidental Take Permit under Section 10 of the Endangered Species Act and the corresponding Incidental Take Authorization under the Illinois Endangered Species Protection Act, HMS must provide adequate written assurance that it is committed to funding the avoidance measures, mitigation, monitoring, and reporting required for its specific HCP commitments over the life of its individual permit. HMS' history over the past 14 plus years of funding project development, including pre- and post-mining studies, demonstrates its capability and commitment to continue such funding. HMS will generate sufficient income each year through its routine operations over the 30 year life of the permit to ensure that all costs associated with funding the conservation plan will be covered and included in its annual budget.

7.1 HMS Funding Commitment

7.1.1 Introduction

HMS' funding commitment is designed to cover all aspects of the conservation program, including mitigation (e.g. habitat restoration), AMMs (e.g. infiltration gallery and turtle searches), maintenance for both mitigation and AMMs, monitoring (e.g. compliance and effectiveness), reporting, changed circumstances, and program administration and management.

7.1.2 Costs to implement HMS' Conservation Plan

The costs to implement the HCP will vary from year to year depending on the nature and extent of the covered activities undertaken. The HCP costs fall into five general categories.

The costs of the conservation program will include:

- Avoidance and minimization measures and mitigation
- Costs related to establishing a declaration of restrictions or a conservation easement
- Adaptive management
- Monitoring and reporting
- Changed circumstances, and
- Program administration and management

Each of these categories is discussed in more detail below.

7.1.2.1 Avoidance, Minimization, and Mitigation Costs

HMS' avoidance and minimization measures and mitigation activities include all aspects of the habitat restoration, installation and operation of infiltration galleries and infiltration pond, installation of silt fence and other measures to avoid take of covered turtles, other measures, and maintenance of all these measures. HMS will implement and fund the initial mitigation and AMMs prior to take of the covered species; therefore, no funding assurance will be required or provided for

these measures. Maintenance and monitoring costs during the permit period will be secured by a performance bond.

- The initial mitigation and habitat restoration, including the prairie transplant, will be completed by an ecological contractor and will cost HMS approximately $3 Million. The initial mitigation will be implemented prior to a corresponding take of the covered species. This will consist of habitat restoration on a number of parcels and is expected to take place over the first three years of the project and prior to impacting the covered species' habitat. The prairie transplant will occur in approximately year 4 of the ITP and ITA and after the completion of the initial mitigation. Therefore, the funds for the initial mitigation and habitat restoration, including the prairie transplant, will not be assured. Once restoration is complete, maintenance will be required in all restored and enhanced areas for the duration of the HCP. Over the 30 year life of the permits, vegetation maintenance costs will be approximately $2.5 Million, and performance of the work will be secured by a performance bond annually for the following year.

- Groundwater impact avoidance measures (i.e. River South Bluff infiltration galleries and FPDWC pond) will be designed and constructed by an environmental engineering firm and contractor, respectively. This work will cost HMS approximately $3 million and they will be constructed prior to a corresponding take of the covered species. The tunnel under Route 53 which connects the Pierce-Eich Quarry to the Middle Quarry will be plugged after mining is completed in the Pierce-Eich Quarry (west of Route 53). The cost for this plug is approximately $600,000. The infiltration gallery will continue to operate until the tunnel plug has been installed and the Pierce-Eich Quarry is holding water to restore the groundwater levels in and around River South parcel to baseline conditions. Therefore, the tunnel plug will not be secured with a performance bond since it is an avoidance measure that will replace a previously constructed avoidance measure. If the groundwater does not reach levels that allow the infiltration gallery to be decommissioned, then it will continue to operate.

- Other avoidance and mitigation measures, described in Sections 5.1.3 and 5.1.2, will be used by HMS as part of its Conservation Program. These AMMs also will be funded by the company and budgeted for on an annual basis as an operating expense.

7.1.2.2 Cost Related to Establishing a Declaration of Covenants, Conditions, and Restrictions or Conservation Easement

HMS commits to preserving nine parcels it owns and are part of its conservation program: River South, River South Bluff, Fitzpatrick Seep, River, North, Far North, River North, Long Run, and ComEd Parcels. In order to ensure the long-term preservation and maintenance of these properties, HMS will file a declaration of restrictions over these parcels within 30 days after all required permits for this project are received and any potential legal action is resolved. It is the intention of HMS that the declaration of restrictions (later to be converted to a conservation easement if a qualified entity can be found to hold it) on these parcels will be perpetual, thus outliving the life span of the HCP agreement. HMS will deposit $120,000 in an interest-bearing account within 90 days of permit issuance that will be used to maintain the mitigation parcels after the permit is expired. The dollars in this account will be transferred to the holder of the conservation easement after it is impressed.

7.1.2.3 Adaptive Management

HMS is committed to utilizing adaptive management practices in order to ensure the long-term success of the project. Adaptive management refers to potentially needed changes to the HCP based on new information gathered over the course of implementing the HCP through monitoring, improved modeling, and/or new technology. Adaptive management may result in changing the way that AMMs are implemented; altering mitigation projects; or requiring other changes to the HCP. Any costs of adaptive management are, by their nature, impossible to estimate because they are dependent on future events and on information that will not be available until after project implementation and monitoring has occurred. If financial assurances are determined to be needed to initiate adaptive management, the appropriate financial assurances will be provided.

7.1.2.4 Monitoring

The monitoring program, including reporting requirements, is described in Chapter 6 and Appendix G. Monitoring will be required for many aspects of both the mining plan and the conservation program. Monitoring associated with groundwater, vegetation and the HED will be ongoing throughout the life of the permit and a performance bond will be obtained on an annual basis to secure the work planned for the following year.

7.1.2.5 Changed Circumstances

Changed circumstances refer to external, future circumstances that could impact the HCP's operating conservation program and can be reasonably anticipated and planned for. Such changed circumstances could include climate change, tornados, flood, drought, fire, oil spill, etc. For a more detailed discussion of changed circumstances, see Chapter 8.

Reasonably foreseeable circumstances described in Chapter 8 could prompt the need to restore or replace one or more mitigation projects. Due to the uncertainty surrounding future impacts from changed circumstances and effective measures to rectify them, HMS estimates approximately $100,000 to perform this work and it will be guaranteed through a performance bond. This will provide the appropriate assurances that funds will be in place for future restoration actions directly related to degradation of mitigation land from changed circumstances. The costs associated with changed circumstances are difficult to predict because they are dependent on unknown future events. Although it is reasonably foreseeable that some changed circumstances will occur over the life of the ITP, it is very unlikely that multiple changed circumstance events would occur that would result in mitigation failure. Application of changed circumstances funds toward corrective measures will occur when a changed circumstance is triggered. Should changed circumstances result in the need for HMS to expend additional funds than those estimated here, HMS will increase the performance bond commensurate with the costs for such actions as determined at that time.

7.1.2.6 Administrative and Management Costs

The administrative costs associated with this HCP include program management and oversight, training, data management, reporting and software costs. The administrative and management costs will be budgeted by the company as an annual operating expense.

7.1.3 Funding Assurances

HMS can demonstrate its ability to adequately fund its HCP program as required by the USFWS' implementing regulations. HMS has chosen several mechanisms to cover its various financial obligations under the HCP.

To summarize;

1. Mitigation/habitat restoration will be implemented prior to take of the covered species and costs associated with this work will be funded by the company and no financial assurances will be provided.
2. The costs for the infiltration galleries and pond will be funded by the company and no financial assurances will be provided because they will be installed before take occurs.
3. The costs associated with the plugging of the Route 53 tunnel will be funded by the company and no financial assurances will be provided. Once Pierce Eich Quarry is inundated it will replace the need for the infiltration galleries and pond avoidance measures.
4. Monitoring associated with groundwater, vegetation and the Hine's emerald dragonfly will be ongoing throughout the life of the permit and will be funded by the company. This work will be secured by a performance bond that will be obtained on an annual basis for the work planned for the following year.
5. The costs associated with the vegetation maintenance over the 30 year life of the ITP and ITA will be approximately $2.5 Million, and company funding will be provided annually for the following year and guaranteed through a performance bond.
6. The costs associated with the Administrative and Management activities will be funded by the company as an annual operating expense.

8.0 CHANGED and UNFORESEEN CIRCUMSTANCES

8.1 Introduction

HMS recognizes that circumstances can change during the term of an HCP. Those altered circumstances, some due to natural events or factors outside the control of HMS, could merit changes in the implementation of this HCP's mitigation plans and conservation package. This chapter defines those "changed circumstances" that HMS reasonably anticipates and can plan for, as well as the "triggers" for HMS' responses to those changed circumstances to address the possible effects on a Covered Species or habitat. This chapter also discusses "unforeseen circumstances; that is, changes in circumstances which could not reasonably have been anticipated by HMS and USFWS at the time of developing this HCP.

8.1.1 Federal "No Surprises" Assurances

The Federal "No Surprises Rule," 63 Fed. Reg. 8859 (Feb. 23, 1998) (codified at 50 C.F.R. §§ 17.3, 17.22(b), and 17.32(b)) assures HMS that as long as the company is properly implementing its HCP and the Incidental Take Permit, no additional commitment of land, water, or financial compensation will be required, and no restrictions on the use of land, water, or other natural resources will be imposed beyond those specified in the HCP without HMS' consent. The No Surprises rule was developed to provide Incidental Take Permit applicants with long-term economic and regulatory certainty. The "No Surprises" rule has two major components: changed circumstances and unforeseen circumstances.[2]

8.1.2 Changed Circumstances

The term "changed circumstances" is defined under the regulations promulgated pursuant to the Endangered Species Act, as follows:

> Changed Circumstances means changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the USFWS, and that can be planned for (e.g. the listing of a new species, or a fire or other natural catastrophic event in areas prone to such events) (50 C.F.R. §§ 17.3).

If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and are provided for in the HCP, HMS will be expected to implement such measures. If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and such measures *were not* provided for in the HCP, USFWS will not require any additional measures beyond those provided for in the HCP, without the consent of HMS, provided the HCP is being properly implemented. "Properly implemented" means that the commitments and the provisions of the HCP and permit have been or are being fully implemented by HMS (50 C.F.R. § 17.3).

[2] The Illinois Endangered Species Protection Act (520 ILCS 10/), also requires applicants to describe steps they will take to minimize and mitigate impacts, including, under the implementing regulations, "adaptive management practices that will be used to deal with changed or unforeseen circumstances…" (17 IAC 1080.10(a)(2)(E). Please see Appendix I. The adaptive management practices described in this chapter will include notification to the Illinois Department of Natural Resources, whenever necessary.

Changed Circumstances and Mitigation Success Criteria

Specific management objectives and desired outcomes have been developed as part of this HCP's mitigation and conservation plan, primarily represented by HMS' stated success criteria (e.g. performance standards). By monitoring and evaluating the Covered Species' habitat and/or habitat components as described in the HCP, HMS can determine whether the HCP's mitigation and conservation plan are meeting their intended objectives. Once the objectives and outcomes have been accomplished, HMS will have fully mitigated for any "take" associated with the HCP activities.

HMS has tried to anticipate the impact of its permitted activities, as well as the minimization, mitigation (i.e. restoration, recovery actions, protection, and management measures), and monitoring measures which will be necessary to conserve the Covered Species and their habitats. In addition, HMS has provided for flexible expenditure of mitigation funds and the implementation of mitigation measures (i.e. incorporation of adaptive management) to meet and address future uncertainties. As described in Chapter 6, adaptive management is an iterative process that includes 1) gathering data through monitoring, 2) assessing monitoring results and effects on Covered Species, 3) implementing in coordination with USFWS and IDNR, if needed, changes to the conservation program (including planned response to changed circumstances), and 4) monitoring and evaluating the effectiveness of the adaptive management strategies. Using this approach, HMS is planning for the potential impacts of changed circumstances and intends to reduce the potential adverse impacts of such changed circumstances on the Covered Species and their habitats to the extent possible, as described below.

8.1.3 Unforeseen Circumstances

The term "unforeseen circumstances" is defined under the regulations promulgated by the Endangered Species Act as follows:

> Unforeseen circumstances means changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the USFWS at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of the Covered Species (50 C.F.R. §§ 17.3).

The USFWS bears the burden of demonstrating that unforeseen circumstances exist, using the best available scientific and commercial data available (50 C.F.R. §17.22(b)(5)(iii)(C)).

If additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, USFWS may require additional measures of HMS where the HCP is being properly implemented only if such measures are limited to modifications within conserved habitat areas, if any, or to the HCP's operating conservation program for the affected species, and maintain the original terms of the plan to the maximum extent possible (50 C.F.R. §§ 17.22(b)(5)(iii)(B) and 17.32(b)(5)(iii)(B)). Additional conservation and mitigation measures will not involve the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources otherwise available for development or use under the original terms of the conservation plan without the consent of the permittee (HMS) (50 C.F.R. §§ 17.22(b)(5)(iii)(A)).

Of course, notwithstanding these assurances, nothing in the "No Surprises" rule will be construed to limit or constrain USFWS, any other Federal agency, or a private entity, from taking additional actions, at its own expense, to protect or conserve a species included in a conservation plan (50 C.F.R. §§ 17.22(b)(6) and 17.32(b)(6)).

8.2 Changed Circumstances Addressed in this HCP

HMS is requesting regulatory assurances under the "No Surprises" rule for the federally listed HED, Blanding's turtle and spotted turtle. HMS will be responsible for implementing remedial measures in response to those changed circumstances addressed in this chapter. If a changed circumstance occurs within the HCP planning area, USFWS and HMS will coordinate and determine if additional conservation and mitigation measures are necessary. In such an event, USFWS may determine that additional measures are necessary. Again, as stated above, pursuant to the "No Surprises" rule and regulations, if such measures are addressed in this HCP, HMS will implement them. If additional measures are deemed necessary to respond to a changed circumstance and such measures *are not* provided for in this HCP, USFWS will not require any additional conservation or mitigation measures without the consent of HMS, as long as this HCP is being properly implemented.

The following circumstances are reasonably anticipated by HMS and are therefore addressed in this chapter:

1. Climate change (in the Chicago area)
2. Change in listing status of species in the HCP area
3. Change in habitat range or newly identified species
4. Fire
5. Drought
6. Severe wind/tornados
7. Invasion of a new plant species
8. Invasion of a new non-plant species
9. Changes in surface or groundwater hydrology, including flood
10. Accidental harmful human activity
11. Vandalism or illegal human activity
12. Disease
13. Oil spill or natural gas leaks
14. Train derailment

8.2.1 Climate Change in the Chicago Area

Description

Global climate change has affected and will continue to affect the climate of the Chicago area. Average annual temperatures in the region have increased by 2.6ºF (1.44ºC) since 1980, and are expected to increase further in future decades, according to the Chicago Climate Action Plan (CCAP 2008). Models predict that Chicago's annual average temperature is likely to increase 1-1.5ºF (0.56-0.83ºC) over the next few decades and to increase by 3-8ºF (1.66-4.44ºC) by the end of the century (depending on the level of greenhouse gas emissions) (CCAP 2008). With these increases, Chicago's summer climate could be similar to that of Springfield, IL, within a couple decades and like that of Knoxville, TN, or possibly Houston, TX, depending on the level of

greenhouse gas emissions, by the end of the century. The possible effect of these changes on the Covered Species and changed circumstances are discussed below.

Effect on Species and Habitats/Ecosystems

This increase in temperature will affect local species and the ecosystems on which they depend (CCAP 2008). Based on their ability to tolerate the increased temperatures and other related changes in habitat, some species will decline in abundance in the region while others will increase. In addition, some species (from warmer areas) will move into the region while others will move, likely north, out of the region. Locally declining species that cannot disperse or migrate out of the region will decrease in population size or possibly die out. Changes in species composition, especially plants, in local ecosystems will alter habitats and will likely contribute to further changes in animal composition. Climate change is also likely to alter the timing of both plant and animal processes (e.g. flower bloom times and bird migration time), which could alter biological interactions in current ecosystems. Due to the rapid rate of change and barriers to movement from habitat loss and fragmentation, modern climate change is anticipated to result in a loss of biodiversity.

Changed and Unforeseen Circumstances

The CCAP report uses projections based on climate change models from the Intergovernmental Panel on Climate Change (IPCC) to predict likely temperature increase in the future under both a low greenhouse gas emissions and high greenhouse gas emissions (worst case) scenario. According to IPCC models (using both emissions scenarios), the Chicago region annual average temperature is predicted to increase 1.8-3.6ºF (1-2ºC) by 2039 and 2.7-9ºF (1.5-5ºC) by 2069.

Effect of Climate Change on Other Changed Circumstances

Climate change will include not only an increase in temperature but also will include changes in weather patterns (CCAP 2008). Such weather pattern changes may cause many of the other changed circumstances examined in this section. A summary of these possible effects is provided below.

Summers are expected to become hotter and drier (due to a similar amount of rain but with more evaporation). Therefore, unplanned fires may become more frequent and their intensities could be greater. Warmer temperatures could allow new invasive species from warmer climates (e.g. Kudzu) to move into the area; some existing invasive species in the region may favor warmer temperatures. Diseases and insect pests are also more prevalent in warmer climates, and plants and animals stressed by increased temperatures will be more susceptible to disease. Further, increased flooding (as discussed below) will also promote disease.

Average rainfall is expected to increase (20% by the end of the century) but most of it will be in the winter and spring. Rain also is predicted to occur in fewer and larger events which may result in more surface runoff. These changes in rain patterns are predicted to increase flooding, especially in the spring. However, droughts are predicted to increase due to increased average summer temperature with no increase in summer rainfall. In addition, lake levels are predicted to decline due to increased evaporation. These changes could reduce groundwater recharge, if the increase in total annual rainfall does not offset the reduction in infiltration due to increased runoff and evaporation. In addition, increased air temperatures can be expected to increase surface- and groundwater temperatures.

Weather pattern changes resulting from climate change may produce more storms with high winds or tornados. Tornado records provide evidence that this may be occurring. The frequency of

reported tornados in the US has increased over the past fifty years, and 2011 was one of the most active years for tornados since modern record keeping began in 1950 (NOAA 2011). However, the frequency of strong tornados (F3-F5) over this same time period does not show this same (i.e. increasing) trend (NOAA 2012). If this increasing tornado frequency is real and continues, more tornadoes and wind storms may be expected in the Chicago area in the future. The CCAP report does not discuss wind or tornadoes, perhaps because they operate at a much smaller scale than changes in climate. According to the National Science and Technology Council's *Scientific Assessment on Climate Change* (NSTC 2008), "[t]rends in other extreme weather events that occur at small spatial scales--such as tornadoes, hail, lightning, and dust storms--cannot be determined at the present time due to insufficient evidence." This is because tornadoes are short-fused *weather*, on the time scale of seconds and minutes, and a space scale of fractions of a mile across. In contrast, *climate* trends take many years, decades, or millennia to develop, spanning vast areas of the globe.

Climate change also increases the chance of a change in a species' range and its population size. In general, ranges are expected to shift north. This could result in a listed species leaving the area or another entering. In addition, the populations of a number of species in the area may decline because of loss of habitat, inability to migrate, and stress from increased temperatures. If the decline is great enough, it could result in those species becoming listed as threatened or endangered.

Increased Temperatures Adverse Effects on HED

The current range of the HED extends from southern Missouri to northern Michigan. Therefore, the species (and its appropriate habitat) does exist in a warmer climate than currently found in northern Illinois. Chicago's climate is predicted to be as warm as the current climate of southern Missouri under the worst-case scenario (high emissions model) in about 50 years (after the end of the permit). Therefore, the HED is predicted to be able to tolerate the elevated temperature predicted for the Chicago area (even under the high emissions scenario) during the life of the permit. The HED, however, may change the time of its active period in response to warmer temperatures.

Trigger: A decline in the HED population within the HCP area of 40% to 59% from baseline accompanied by a 3.6ºF (2ºC) to 7.1ºF increase in the annual temperature over baseline (permit year temperature) will be considered a changed circumstance triggering a response from HMS. Changes in both population and temperature will be based on a five-year running average. An increase of 7.2ºF (4ºC) or greater or a decline in population by 60% or greater will be considered an unforeseen circumstance.

Response: HMS will inform USFWS and IDNR when its monitoring detects a decline in the HED population within the HCP Planning Area of 40% or more from baseline accompanied with a 3.6ºF (2°C) increase in the annual temperature over baseline (permit year temperature). If this occurs HMS will implement one or both of the following corrective actions:

(1) Implement additional work or operational changes at or near mitigation site(s) in coordination with USFWS to improve habitat conditions and to address the source of potential negative impacts in areas with declining populations.

(2) Work with USFWS to place the affected population into a captive facility for its maintenance until a suitable site for reintroduction into the wild becomes available.

Trigger: A one week (7 days) to three week and six day (27 days) change in the timing of the first adult emergence, based on results of monitoring conducted by HMS or other stakeholders in the

HCP area (e.g. FPDWC or IDNR) accompanied by a measured 3.6ºF (2ºC) to 7.1ºF increase in the annual temperature over baseline (permit year temperature) will be considered a changed circumstance. Changes in both emergence date and temperature would be based on a five-year running average. HMS will start to monitor for emergence time after a 2.7ºF (1.5ºC) temperature increase is detected (using a five-year running average) and will use currently known (based on previously collected data or expert opinion) emergence time for the Illinois populations as a baseline. A change in emergence of greater than four weeks or an increase in temperature of 7.2ºF (4ºC) or more will be considered an unforeseen circumstance.

Response: HMS will inform USFWS and IDNR when an identified change in the time of the HED's active period (i.e. 7 to 27 days) in the Planning Area has occurred accompanied by a measured 3.6ºF (2ºC) to 7.1ºF increase in the annual temperature over baseline (permit year temperature). If this occurs, HMS will adjust the timing of operations to accommodate changes in the HED's active periods. HMS will also participate in population salvage and captive rearing efforts on its properties. Corrective action will be implemented after notification of and consultation with USFWS. HMS may, but will not be required to, assist with other measures initiated by USFWS or IDNR to address this changed or unforeseen circumstance.

Increased Temperatures' Adverse Effects on Blanding's and Spotted Turtle

Blanding's turtle (BT) and spotted turtle (ST) in the HCP area are in the southern portion of their ranges, indicating that they may have limited tolerance for increased temperatures. As temperatures increase appropriate habitat will remain in the HCP area, because the plant communities that provide habitat (e.g. marsh) are found further south, but the turtles may experience increased physiological stress. Reptiles are sensitive to changes in air and water temperature (Carey and Alexander 2003). This is, in part, because reptiles are ectothermic, and temperatures outside of their thermal optima cause stress. In addition, turtles may change their active period in response to increased temperatures. Due to their substantially larger size, Blanding's and Spotted turtles should be less temperature-sensitive than the HED. However, because both turtles are at the southern end of their range of the Midwest/Great Lakes populations, they may be more sensitive to temperature change. Also, it is known that temperature affects the sex ratio of their eggs (Harding 1997 and Ewert and Nelson 1991). Therefore, the same temperature triggers will be used for the Covered Turtles as are used for the HED.

Trigger: A documented 3.6ºF (2ºC) to 7.1ºF increase in the annual temperature (based on a five-year running average) will be considered a changed circumstance. An increase of 7.2ºF (4ºC) or greater will be considered an unforeseen circumstance.

Response: HMS will inform USFWS and IDNR when it documents a measured 3.6ºF (2ºC) to 7.1ºF increase in the annual temperature over baseline (permit year temperature). If this occurs, HMS will coordinate with USFWS and IDNR to adapt management and other activities as needed.

Trigger: A two-week (14 day) change in the date of first emergence of BT or ST (based on a three-year running average) is detected accompanied by a 3.6ºF (2ºC) to 7.1ºF increase in the annual temperature (based on a five-year running average) will be considered a changed circumstance. HMS will start monitoring emergence of turtles after a temperature increase of 2.7ºF (1.5ºC) is detected (based on a five-year running average). First emergence now is typically early March to early April with a wide variation year to year depending on weather. Currently known (based on previously collected data or expert opinion) emergence time for the lower Des Plaines River valley population will be used as a baseline. A four-week (28 day) or greater change in the date of first

emergence of BT or ST or an increase of 7.2ºF (4ºC) or greater will be considered an unforeseen circumstance.

Response: HMS will inform USFWS and IDNR when it documents that a change of 14 days in Blanding's turtle or spotted turtle emergence date has occurred in the Planning Area accompanied by a 3.6ºF (2ºC) temperature increase. If this occurs, HMS will coordinate with USFWS and IDNR on remedial actions or adaptive measures that will be implemented, including:

(1) Implement additional work or operational changes at or near activity and mitigation site(s) that provide BT or ST habitat in coordination with USFWS and IDNR to improve habitat conditions and address the source of potential negative impacts in these areas.

(2) Work with USFWS and IDNR to develop and implement a capture and relocation plan that may involve moving turtles to more suitable habitat locations (i.e. with lower temperatures) north of the HCP area.

8.2.2 Change in the Listing Status of a Species in the HCP Permit Area

HCP Species Description

This section addresses state or federal listing of currently unlisted species that are "adequately covered" (as defined in 50 CFR 17.3) in the HCP subsequent to issuance of the requested permit. "Adequately covered" means, with respect to unlisted species, that a proposed conservation plan has satisfied the permit issuance criteria under section 10(a)(2)(B) of the ESA that would otherwise apply if the unlisted species covered by the plan were actually listed. For the USFWS to cover a species under a conservation plan, it must be listed on the section 10(a)(1)(B) permit.

Listing of an unlisted species that is "adequately covered" (as defined in 50 CFR 17.3) in the HCP subsequent to issuance of the requested permit will be considered a changed circumstance.

Trigger: Listing of a currently unlisted species as federally endangered or threatened under the ESA that is "adequately covered" (as defined in 50 CFR 17.3) in the HCP subsequent to issuance of the requested permit.

Response: If an unlisted species that is "adequately covered" in the HCP is listed subsequent to issuance of the requested permit, no further conservation measures or other action will be required. The federal permit will afford protection against take liability for such species under Section 9 of the ESA and that species will be listed under the permit/authorization. HMS has requested that the Blanding's turtle and spotted turtle be named on the requested permit because both have been proposed for federal listing. This HCP contains adequate coverage for those species if they become federally listed provided HMS is properly implementing the HCP and permitting conditions. Both the Blanding's and spotted turtle are currently state-listed and, again, will be adequately covered by this HCP.

Non-HCP Species

Listing of a currently unlisted species that is neither addressed in the HCP nor "adequately covered" (50 CFR 17.3) by the HCP will require an amendment to the HCP and a permit application if HMS' otherwise legal activities are causing a take of the previously unlisted species.

Species Delisting Description

Delisting of an HCP-Covered Species during the term of the ITP.

Delisting of an HCP-Covered Species by the USFWS and/or IDNR during the term of the ITP will be considered a changed circumstance.

Trigger: Delisting of an HCP-Covered Species by the USFWS and/ or IDNR during the term of the ITP.

Response: Upon receipt of written notification from USFWS or IDNR of delisting of an HCP-Covered Species during the term of the ITP, HMS, IDNR, and USFWS will confer on a case-by-case basis to determine how such delisting of an HCP Covered Species will be addressed thereafter under the HCP, ITP, and ITA. HMS will continue all conservation measures specific to any delisted HCP-Covered Species until such discussions are complete. For those species which HMS' conservation activities may contribute to the recovery of the species, HMS will complete its ongoing mitigation projects. HMS may participate with USFWS and IDNR in a five-year post-delisting monitoring plan.

8.2.3 Change in Habitat Range

Description
Identification of an HCP-Covered Species, including "adequately covered" species (as defined in 50 CFR 17.3), in new locations or habitat in the Planning Area will be considered a changed circumstance.

Trigger: Identification of an HCP-Covered Species, including "adequately covered" species (as defined in 50 CFR 17.3), in new locations or habitat based on results of documented scientific research or academic study performed by consultants to HMS or others in the Planning Area (e.g. FPDWC, HMS, or IDOT). USFWS and IDNR, who are responsible for monitoring federal and state species listings, will notify HMS in writing of the change and provide documented scientific research data and other information regarding a change in the habitat range of an HCP Covered Species or "adequately covered" species found within the HCP Planning Area (as defined in 50 CFR 17.3). HMS will submit monitoring results to the USFWS and IDNR as required in Chapter 6 of this HCP and will point out any results that indicate new habitat locations for the HCP Covered Species and adequately covered species. For the purpose of this trigger, new locations include newly discovered occurrences or habitats, as well as historical occurrences that are later shown to be extant or reoccupied. It may also include newly discovered occurrences or habitat outside the Planning Area, but only to the extent that their proximity indicates species presence or habitat suitability on lands within the Planning Area.

Response: Upon written notification from the USFWS or IDNR of the documented scientific research data, HMS will implement AMMs to avoid and minimize adverse effects and "take" of new occurrences of habitat. To the extent that "take" cannot be avoided, HMS will mitigate for the impact of any "take" consistent with Chapter 5. If it is determined that the amount of authorized "take" may be exceeded and that the impacts to the species will be greater than anticipated, HMS will enter into discussions with USFWS and IDNR about how to minimize take in order to keep it below what is allowed by the permit.

8.2.4 Fire

Description

Fires have occurred historically in the Chicago region and have shaped and sustained the natural ecosystems of the area (Chicago Region Biodiversity Council, 1999). Historically, these fires were started by lightning strikes or Native Americans. Suppression of fires started after European settlement. More recently, however, the importance of fire for maintaining natural communities has been recognized, and today prescribed burning is one of the most important techniques used to manage these areas. Natural fires (i.e. lightning started) are very rare today, however, it is possible that natural fires may become more frequent in the Chicago area with hotter and drier summers as a result of climate change. According to Dave Robson, Natural Areas Manager for the Forest Preserve District of Will County (FPDWC), they experience an unplanned fire (mostly unintended arson) on their properties along the lower Des Plaines River about once every 3-4 years. However, no unintentional or unplanned fires have occurred on HMS-owned property at its Romeoville facility. HMS has owned ComEd/Long Run Parcels since 1998 and the rest of the Romeoville facility properties for over 70 years. The lack of unintended fires is likely due to the fact that HMS, unlike the FPDWC, does not allow public access to its properties. Thus, any (the first) unplanned fire on HMS property would be a changed circumstance. Any additional fires would constitute unforeseen circumstances.

Changed vs. Unforeseen Circumstances – Unplanned fires greater than 0.1 acres

Prescribed burning will be used in mitigation efforts as a restoration and management tool. The first unplanned fire greater than 0.1 acre in size within any mitigation sites in the HCP area will be considered a changed circumstance.

Any additional unplanned fires greater than 0.1 acre within any mitigation sites in the HCP area will be considered an unforeseen circumstance. Also, all accidental fires (greater than 0.1 acres) and all arson events (regardless of size) on HMS property in the HCP Permit Area will be reported to local authorities, IDNR and USFWS.

Fire's Adverse Effects on HED Mitigation Sites

Prescribed burning will be used as a restoration and management tool on mitigation sites. Such burning will be conducted in accordance with the restoration and management plan found in the mitigation section of the HCP (Chapter 5) and Restoration Plan Set (Appendix F) and will benefit the HED by improving the conditions of the habitat. A fire could potentially harm the HED if it is conducted during the adult flight season (i.e. mid-May to mid-October). Prescribed burns are not conducted during this time; thus, a fire during this time of year would be unplanned. Natural fires and unplanned human-caused (e.g. arson) fires are very rare on HMS properties but could become more common in the Chicago area as summers become hotter and drier as a result of climate change.

Trigger: An unplanned fire (natural or human-caused) greater than 0.1 acre in size occurs in a mitigation parcel owned by HMS.

Response: In response to the trigger, HMS will do the following: 1) assess the extent and impact of the fire, including the potential for direct harm to the HED; 2) identify and implement additional measures to prevent unplanned fires in the future; and 3) adjust future plans or other aspects of mitigation in the affected area, as needed, to protect the HED and enhance its habitat. In addition, if operational equipment and structures are damaged, HMS will contact USFWS and IDNR about

needed repairs and will start repairs after consulting with USFWS and IDNR. HMS will report to USFWS and IDNR any actions taken. Also, all accidental fires (greater than 0.1 acres) and all arson events (regardless of size) on HMS property in the HCP Permit Area will be reported to local authorities, IDNR, and USFWS.

Fire's Adverse Effects on Blanding's and Spotted Turtle Mitigation Sites

Prescribed burning will be used as a restoration and management tool on mitigation sites. Such burning will be conducted in accordance with restoration and management plans found in the mitigation section of the HCP (Chapter 5) and will benefit BT and ST by improving the condition of habitat. A fire potentially could harm BT and ST if it is conducted during their active season (i.e. March 16 to October 31). Prescribed burns may be conducted during this time (e.g. after March 15) only under the conditions specified by USFWS in its Section 7 review of HED habitat management and restoration (USFWS 2014b). Natural and unplanned human-caused (e.g. arson) fires are very rare on HMS properties but could become more common in the Chicago area as summers become hotter and drier as a result of climate change.

Trigger: An unplanned fire (natural or human caused) greater than 0.1 acre in size occurs in a mitigation parcel owned by HMS.

Response: In response to the trigger, HMS will do the following: 1) assess the extent and impact of the fire, including the potential for direct harm to the BT and ST; 2) identify and implement additional measures to prevent unplanned fires in the future; and 3) adjust future burn plans or other aspects of mitigation in the affected area, as needed, to protect the Blanding's and spotted turtle and enhance its habitat. In addition, if operational equipment and structures are damaged, HMS will contact USFWS and IDNR about needed repairs and will start repairs after consulting with USFWS and IDNR. HMS will report to USFWS and IDNR any actions taken. Also, all accidental fires (greater than 0.1 acres) and all arson events (regardless of size) on HMS property in the HCP Permit Area will be reported to local authorities, IDNR, and USFWS.

8.2.5 Drought

Description

Drought is a normal and recurring temporary feature of Illinois' climate. While drought is generally recognized as a deficiency of precipitation that results in a water shortage over an extended period of time, specific definitions vary based on the activities or groups affected. Drought definitions are dependent on environmental, social, and economic factors (State Water Plan Task Force 2011). From an environmental perspective, the definition of drought typically considers the relationship of precipitation to factors such as air temperature, soil type, and geologic characteristics (Changnon 1987). According to the Illinois State Water Survey, Illinois has experienced five severe droughts (1980-1981, 1988-1989, 1999-2000, 2005, and 2007) since the mid-1950s that have negatively impacted the state's economy and natural resources (ISWS 2011). This frequency is consistent with Changnon et al. (1996) which states that droughts have occurred in approximately ten percent of all years in the past century in Illinois. Climate change is expected to result in increased evaporation in the Midwest during summer due to increased average air temperatures and longer periods between rainfalls. This is expected to lead to more frequent periods of drought throughout the region (USGCRP 2009).

For this HCP, the Palmer Drought Severity Index (PDSI) will be used for recognizing drought and planning response measures. The PDSI is a mathematical index that is calculated based on

precipitation and temperature data and has proven to be a useful monitoring tool to trigger drought contingency plans (State Water Plan Task Force 2011). Drought values on the PDSI range from zero through negative four with the following classifications: 0 = normal conditions, -1 = mild drought, -2 = moderate drought, -3 = severe drought, and -4 = extreme drought (Palmer 1965). This HCP assumes that a PDSI score of negative three or negative four may interfere with and affect the normal life cycles of the Covered Species.

Changed Circumstance vs. Unforeseen Circumstance

Periodic droughts are characteristic of the climate in Illinois, and HMS has planned for the possibility of droughts occurring during the 30-year permit duration. Based on the historic occurrence of droughts during 26% of the years since 1980 (8 years in a 31-year span (1980-2011)) in Illinois, changed circumstances will be deemed to have occurred after more than seven drought years (i.e. 8 or 9 drought years) are experienced during the permit period. If more than nine drought years occur during the permit period, then that will be considered an unforeseen circumstance. A drought of three years duration will also be considered a changed circumstance, as no drought occurring since 1980 in Illinois has lasted more than two years. A drought lasting more than three years will be considered an unforeseen circumstance.

Hine's Emerald Dragonfly

Natural hydrologic cycles, including dry periods, may be an important part of the larval ecology of the HED. HED larvae gain a competitive advantage over the larvae of other dragonfly species during seasonal dry periods in streamlets by utilizing crawfish burrows that are deeper in the water table. However, USFWS identifies environmental extremes, including drought, as a threat to the species in the USFWS HED Recovery Plan. Severe drought may disrupt ecological and hydrological processes in marshes and sedge meadows and dry out the slowly flowing water sources, from shallow streams to groundwater seeps, for longer than HED larvae can persist in crawfish burrows. Drought also may alter the quality or pH of water in HED habitat, both of which are thought to be important to HED recruitment since the larvae are aquatic for three to five years (USFWS 2013).

Trigger: A PDSI score of negative three or less is documented within the HCP Planning Area by recognized experts/agencies at a frequency that is described above as a changed circumstance, as well as the survival of less than 70% aerial coverage (i.e. 30% loss) of restored HED habitat protected as part of the mitigation plan (Chapter 5) and a reduction in the HED population by 40% or more from baseline (based on a five-year running average) within the HCP Planning area.

Responses: HMS will inform USFWS and IDNR when it documents a PDSI score of negative three or less for the HCP Planning Area at a frequency that is described above as a changed circumstance and the survival of less than 70% aerial coverage of restored HED habitat and reduction in HED population of 40% or more from baseline within the HCP Planning Area. HMS will take one of the following actions: (1) work to re-establish HED habitat (e.g. vegetation and/or hydrology) at the original mitigation site, or (2) establish the original level of mitigation at a new mitigation site. HMS will monitor HED populations on its property to document any population change due to drought.

Blanding's Turtle and Spotted Turtle

Habitat available to BT and ST may shrink with diminishing surface water and wetlands during periods of drought which are severe enough to reduce water levels in these habitats. Lower water levels may increase distance between wetland habitats and suitable upland nesting habitat,

potentially reducing reproductive success. Drought may also result in reduced water quality in these habitats, which may pose a threat to the species (Lee 1999).

Trigger: A PDSI score of negative three or less is documented within the HCP Planning Area by recognized experts/agencies for the area at a frequency that is described above as a changed circumstance, as well as the survival of less than 60% aerial coverage (i.e. 40% loss) and 30% or greater change (increase) in wetland indicator status of restored BT and ST habitat protected as part of the mitigation plan (Chapter 5).

Responses: HMS will inform the USFWS and IDNR when it obtains documentation of a PDSI score of negative three or less in the HCP Planning area at a frequency that is described above as a changed circumstance and the survival of less than 60% aerial coverage and 30% or more increase in the wetland indicator status of restored BT and ST habitat. If this occurs, HMS will take one of the following actions: (1) re-establish aquatic and/or emergent vegetation at the original mitigation site, or (2) establish the original level of mitigation in a new mitigation site.

8.2.6 Severe Wind/Tornadoes

Description

While tornadoes are known to occur throughout the region, the likelihood that any particular place will be struck by a tornado is low. One measure of tornado frequency is the annual average number of tornadoes per 10,000 square miles by state. In Illinois, the annual average number of tornadoes per 10,000 square miles is 9.7 (average determined from time period of 1991 to 2010). On average in the U.S., the frequency that any particular square mile of land may be hit by a tornado is about every thousand years (NOAA 2012).

Changed vs. Unforeseen Circumstances

When a tornado occurs and damages or destroys a minimization and/or mitigation effort covered by the HCP, HMS will implement conservation measures appropriate to remediate the circumstance. This would include an evaluation of the affected site, implementing corrective action, and implementing additional monitoring (if appropriate).

HMS will consult the U.S. Weather Service to determine the Enhanced Fujito Scale classification of the severe wind/tornado event to determine if the occurrence is a changed or unforeseen circumstance. The Enhanced Fujito Scale is a method to assess tornado damage. It uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to the 28 indicators (Wind Science and Engineering Center 2004). It classifies F0-F5 damage as calibrated by engineers and meteorologists across 28 different types of damage indicators (mainly various kinds of buildings, but also a few other structures as well as trees). The scale takes into account the typical strengths and weaknesses of different types of construction, since the same wind does different things to different kinds of structures. In the Enhanced Fujito Scale, there are different, customized standards for assigning any given F rating to a well-built, well-anchored wood-frame house compared to a garage, school, skyscraper, unanchored house, barn, factory, utility pole, or other type of structure (U.S. Tornado Climatology 2011).

Most tornadoes (around 77%) in the U.S. are considered weak (EF0 or EF1) and about 95% of all U.S. tornadoes are below EF3 intensity (NOAA 2012). Based on this information, damages incurred by severe winds and tornadoes classified as EF0 and EF1 (per the Enhanced Fujito Scale)

will be considered a changed circumstance. Damages incurred by severe winds and tornadoes classified as EF2 – EF5 will be considered an unforeseen circumstance.

Tornado Adverse Affects on HED or Blanding's or spotted Turtle Habitat

When a tornado occurs and damages or destroys an AMM and/or mitigation effort covered by the HCP and located within the HMS permit area, HMS will implement conservation measures appropriate to remediate the circumstance. This would include an evaluation of the affected site, implementing corrective action and implementing additional monitoring (if appropriate).

Tornado Adverse Affects on Implementation of an AMM

Trigger: The trigger to implement corrective action where a tornado negatively affects the implementation of an AMM is when the AMM becomes ineffective due to the tornado. For example, a silt fence or infiltration galleries may be damaged due to the tornado.

Response: In response to the trigger, HMS will implement one or more of the following corrective actions:

(1) Restore the AMM; and or

(2) Clean-up the disturbed area to allow for the reestablishment of the AMM in that area. Repair to AMMs will be completed as soon as possible to protect species and their habitat. HMS will report to the USFWS any actions taken.

Tornado Adverse Affects on HED Mitigation Site

Trigger: The trigger to implement corrective action where a tornado negatively affects the establishment and/or maintenance of a mitigation site at any time during the life of the permit is if at least 25% of the vegetation established in the mitigation area is destroyed.

Response: In response to the trigger, HMS will implement one or more of the following corrective actions:

(1) Restore the destroyed portion of the mitigation site; and/or

(2) Clean-up the mitigation site to allow for normal growth of the new vegetation

8.2.7 Invasion of a New Plant Species

Description

Management of invasive species only applies to mitigation areas. Other areas within the Permit Area will be left in the condition they were at the start of the HCP. Invasive and weedy plant species have and continue to alter the composition, structure, and diversity of native plant communities in the Chicago region. These changes are usually detrimental to native plant species and typically result in altering the habitat of the animals that live in these communities. Invasive plant species of particular concern in the HCP area include reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), and bush honeysuckles (*Lonicera maackii, L. tatarica, etc.*). Current lists of invasive plant species for the region will be consulted. All invasive species currently found in mitigation sites in the HCP Permit

Area, and identified as degrading the Covered Species habitat, will be managed according to the mitigation plans found in Chapter 5 and the Restoration Plan Set (Appendix F).

Changed vs. Unforeseen Circumstances

The occurrence of any new invasive species in a mitigation site in the HCP Permit Area and found on an invasive species list(s) agreed to by USFWS, IDNR, and HMS will be considered a changed circumstance. HMS will develop a management plan for new invasive species found in mitigation areas (and take measures to prevent introduction of new species) based on the best information available at the time. Any other invasive species not found on the agreed-to invasive species list and occurring on an HMS mitigation parcel will be considered an unforeseen circumstance and not planned or budgeted for. In addition, any infestation of a new invasive species or the spread of an existing invasive species (that cannot be controlled by any accepted management techniques) that results in a mitigation site not functioning (e.g. providing habitat) as designed for more than 1/5 of the years in the permit period (i.e. 6 years) is also considered an unforeseen circumstance.

Invasive Species Adverse Affects on HED Mitigation Site or Measure

HED avoid flying in densely wooded areas. Thus, invasive shrubs and weedy trees reduce or, if dense enough, eliminate adult use of habitat. They can also cause the reduction and or loss of larval habitat, if present. HED prefer wet prairie, sedge meadows, and native marsh communities for both feeding and breeding. Thus, the invasion or spread of invasive herbaceous species can also reduce or eliminate both adult and larval habitat.

Trigger: A relative increase over baseline conditions in the abundance (>/=25% increase in absolute cover; e.g. 20% to 25% absolute vegetation cover) of an invasive plant species known to be present in a mitigation site at the beginning of the HCP and identified for management in the Mitigation Plan found in Chapter 5 or the Restoration Plan Set (Appendix F). This will only apply to those plant species with at least 10% absolute vegetation cover in larval habitat areas (i.e. those areas where USFWS herbiciding restrictions apply) and at least 25% absolute vegetation cover in non-larval habitat areas.

Response: HMS will inform USFWS and IDNR when it documents that a >/=25% relative increase in absolute vegetation cover of an invasive species (with at least 10% absolute cover in larval habitat areas and at least 25% absolute cover in non-larval habitat areas) has occurred on the mitigation site. If this occurs, mitigation plans and execution will be evaluated by HMS in coordination with USFWS and IDNR. Invasive species management plans and techniques will be adjusted, as needed, to control and reduce the target species.

Trigger: The occurrence of a new invasive species in a mitigation site (i.e. on a local or regional invasive species list agreed to by USFWS, IDNR, and HMS, but not found on the mitigation site before) and at an abundance (>10% absolute vegetation cover) that threatens a site or substantial portion of a site's function as HED habitat.

Response: Upon written notification (and documentation) from HMS that a new invasive species has been found on the mitigation site at an abundance that threatens a site or substantial portion of a site's function as HED habitat (>10% absolute vegetation cover), a management plan for the new invasive species found in mitigation areas will be developed by HMS in coordination with USFWS and executed based on the best information (i.e. scientific data and BMPs) available at the time.

Invasive Species Adverse Affects on Blanding's and Spotted Turtle Mitigation Site or Avoidance Measure

BT and ST preferred habitat is open wetlands, such as native marsh communities and associated open water as well as sedge meadows and wet prairie. BT and ST are found less frequently in wooded wetlands. Thus, invasive shrubs and weedy trees can degrade or, if dense enough, eliminate BT and ST habitat. In addition, the invasion or spread of invasive herbaceous species can also degrade native open wetlands and reduce their suitability as BT or ST habitat.

Trigger: A relative increase over baseline conditions in the abundance (>25% increase in absolute cover; e.g. 25% to 32% absolute vegetation cover) of an invasive plant species known to be present in a mitigation site at the beginning of the HCP and identified for management in the mitigation plan found in Chapter 5 or the Restoration Plan Set (Appendix F). This only applies to species that have at least a 25% absolute vegetation cover.

Response: HMS will inform USFWS and IDNR when it documents that a >25% relative increase in absolute vegetation cover of an invasive species (with at least a 25% absolute vegetation cover) has occurred on the mitigation site. If this occurs, HMS will evaluate its mitigation plans and execution in coordination with USFWS and/or IDNR. Invasive species management plans and techniques will be adjusted, as needed, to control and reduce the target species.

Trigger: The occurrence of a new invasive species in a mitigation site (i.e. on an invasive species list agreed to by USFWS, IDNR and HMS but not found on the mitigation site before) and at an abundance (e.g. >10% absolute vegetation cover or RIV) that threatens a site or substantial portion of a site's function as BT or ST habitat.

Response: HMS will inform USFWS and IDNR when it documents that a new invasive species has been found on the mitigation site and at an abundance that threatens a site or substantial portion of a site's function as BT or ST habitat (>10% absolute vegetation cover), a management plan for the new invasive species found in mitigation areas will be developed by HMS in coordination with USFWS and/or IDNR and executed based on the best information (i.e. scientific data and BMPs) available at the time.

Invasive Species Adverse Affects on Leafy Prairie Clover or Lakeside Daisy

Leafy prairie clover (LPC) (*Dalea foliosa*) is found only in open limestone cedar glades, limestone barrens, and dolomite prairies. Lakeside daisy (LD) (*Hymenoxys herbacea)* is found in dry, rocky prairie grassland underlain by limestone. These species are not found in wooded wetlands. Thus, invasive shrubs and weedy trees can degrade or, if dense enough, eliminate LPC and LD habitat. In addition, the invasion or spread of invasive herbaceous species can also degrade native open prairies and reduce their suitability as LPC or LD habitat.

Trigger: A relative increase over baseline conditions in the abundance (>25% increase in absolute cover; e.g. 25% to 32% absolute vegetation cover) of an invasive plant species known to be present in a mitigation site at the beginning of the HCP and identified for management in the mitigation plan found in Chapter 5 or the Restoration Plan Set (Appendix F). This only applies to species that have at least a 25% absolute vegetation cover.

Response: HMS will inform USFWS and IDNR when it documents that a >25% increase in absolute vegetation cover of an invasive species has occurred on the mitigation site. If this occurs, mitigation plans and execution will be evaluated by HMS in coordination with USFWS and/or

IDNR, and invasive species management plans and techniques will be adjusted, as needed, to control and reduce the target species.

Trigger: The occurrence of a new invasive species in a mitigation site (i.e. on an invasive species list agreed to by USFWS, IDNR, and HMS but not found on the mitigation site before) and at an abundance (>10% absolute vegetation cover) that threatens a site's LPC or LD populations or habitat.

Response: HMS will inform USFWS and IDNR when it documents that a new invasive species has been found on the mitigation site at an abundance that threatens a site's LPC or LD populations or habitat (>10% absolute vegetation cover), and a management plan for the new invasive species found in mitigation areas will be developed by HMS in coordination with USFWS and executed based on the best information (i.e. scientific data and BMPs) available at the time.

8.2.8 Invasion of a New Non-plant Species

Description
Documented scientific research in the Permit Area regarding invasion of new non-plant macro-organisms, such as insects and vertebrates that negatively affect one of the "Covered Species." Such affects may include a new predator or a competing species.

Changed vs. Unforeseen Circumstances
Documented scientific research confirming the presence of a new non-plant macro-organism in the Permit Area that negatively affect one of the Covered Species. If this species is found on a publicly available regional invasive species list, it will be considered a changed circumstance. If the new invasive species is not on a publicly available regional invasive species list and has not been previously documented in the HCP Planning Area, it will be considered an unforeseen circumstance.

Trigger: Documented scientific research confirming the presence of a new non-plant macro-organism (found on a publicly available regional invasive species list) in the Permit Area that negatively affects one of the Covered Species. The USFWS and IDNR, who are responsible for monitoring federal and state species listings, will notify HMS in writing of the invasion and provide scientific data and other information documenting the effects on the Covered Species.

Response: Vegetation management and mitigation plans will be evaluated with USFWS to determine if changes are needed. Vegetation management and mitigation plans and techniques will be adjusted, as needed, to reduce the impact on Covered Species. However, other methods of controlling the species that do not involve changing management plans, such as direct removal of the species, will also be considered.

8.2.9 Changes in Surface or Groundwater Hydrology, Including Flood

Description
Wetlands communities within the lower Des Plaines River Valley provide habitat for the animal species covered in this HCP (i.e. HED, ST, and BT). The hydrology of these wetlands is a function of river level, amounts of surface runoff, and groundwater recharge and discharge rates. Maintaining groundwater levels is important for some of the wetland communities that are preferred habitat for these species, such as wet dolomite prairies and sedge meadows. Groundwater

is especially important to the HED because its aquatic larvae are found in groundwater-fed wetlands and have specific temperature tolerances that are provided by discharging groundwater. In addition, surface water influences on these sensitive groundwater-fed wetlands are typically limited. Too much surface water runoff or abnormal backwater levels from the Des Plaines River may likely diminish the quality of groundwater-fed wetlands and reduce habitat quality for HED larvae.

Changed and Unforeseen Circumstances

Groundwater and surface water have been monitored on the HMS mitigation parcels for over a decade. Water level monitoring datasets have been used to document observed variations to establish baseline conditions at each of these sites (see Section 2.0 of the Groundwater Monitoring Plan in Appendix G-1). Historical groundwater elevations within HMS mitigation parcels have been plotted on cumulative frequency plots to show number of measurements, range of observed elevations, and proportion of observations relative to groundwater elevations. The information provided on the cumulative frequency plots, including frequency, difference in water level frequencies, range of elevations, and shape of the frequency curve have been used to develop low-level groundwater level monitoring triggers. They will also be used to evaluate future groundwater elevation monitoring data.

It can be reasonably assumed that groundwater levels will fluctuate. It is anticipated that water level variations will be similar to historically observed levels illustrated on the cumulative frequency curves (Attachment 1 of Appendix G-1). The process of monitoring, verification, assessment, and adjustment of avoidance measures is illustrated in the decision flow chart provided on Figure 4-1 in the Groundwater Monitoring Plan (Appendix G-1). Evaluation of potentially changed circumstances will be triggered coincidently with adaptive management assessments that are triggered from routine, verification, and assessment monitoring criteria as defined in Section 4.1 of the Groundwater Monitoring Plan (Appendix G-1). Routine water level monitoring includes the collection and evaluation of groundwater levels, and the comparison of results against the groundwater level action criteria that includes: 1) maintenance of levels within planned ranges, 2) maintenance of levels within historical averages on a seasonal basis, and 3) consistency with regional elevations occurring in the Silurian Aquifer outside of the area of influence of Pierce Eich Quarry's cone of depression (refer to Section 4.2 of Appendix G-1). Additional data collected during assessment monitoring will be used in adaptive management evaluations. During this process, an evaluation will be conducted to determine if a changed circumstance has occurred (as described below). Adjustments to AMMs will also be considered in areas where such measures may have an influence on water levels returning to background conditions. Changed circumstances can be confirmed during the iterative process of data collection and evaluation stages of assessment monitoring, adaptive management evaluation/controls and contingency evaluation/implementation.

Groundwater variations likely related to site activities will be quickly addressed though the adaptive management strategies, including five day or less turnaround time for existing AMMs. However, changes in groundwater levels and groundwater quality are not anticipated at several parcels outside of the cone of depression resulting from surface mining conducted by HMS. Areas where no impacts to groundwater levels or groundwater quality are anticipated - based on groundwater modeling simulations - include Romeoville Prairie Nature Preserve and areas north of 135th Street/Romeoville Road, LPNP area south of Division Street, as well as all parcels located east of the canals. Therefore, verified groundwater level or water quality triggers (as defined in Table 2-2 and Attachment 2-Table 1 of Appendix G-1, respectively) in these areas where no impacts to groundwater levels or groundwater quality are anticipated, will constitute a potential unforeseen circumstance. Notification of potential unforeseen circumstance will be submitted in the

notification to initiate assessment monitoring. Unforeseen circumstances will be identified in the assessment monitoring report (submitted within 30 days of the notification letter) after preliminary assessment monitoring data can be reviewed that confirms changes to water levels or water quality.

If assessment monitoring is triggered in wells where no impacts are anticipated (outside of the estimated cone of depression from planned mining) but not observed in other monitoring wells that may be influenced by HMS' activities (i.e. within the estimated cone of depression from planned mining), these changes to the groundwater conditions are most likely due to factors outside of HMS' influence and will be considered an unforeseen circumstance. If, however, data are presented by regulatory agencies that demonstrates that the actions of HMS are the cause of the decline in groundwater levels (and it is agreed upon in consultation with HMS), then HMS will (within 7 days of reaching conclusion in consultation) provide USFWS with documentation of planned corrective actions to address hydrology concerns. If such data are not presented and/or findings not agreed upon, the detected changes to groundwater conditions will be considered to be due to an action or situation out of the control of HMS. This will be considered an unforeseen circumstance and HMS will not be responsible for addressing the degradation of hydrologic conditions. Under this situation, USFWS and IDNR along with other applicable regulatory agencies will address the cause of the adverse hydrology impacts. HMS will assist in addressing hydrology impacts by increasing monitoring frequency in monitoring wells closest to the unforeseen hydrologic impacts and by providing monitoring data as needed.

Decrease in Ground Water Adversely Affects an HED Mitigation Site or Measure or Other Habitat Areas

Groundwater is especially important to the HED because its aquatic larvae are found in groundwater-fed wetlands and have specific water temperature requirements provided by groundwater discharging from dolomitic aquifers. A decline in groundwater levels from background conditions may result in the drying out of HED larval habitat.

Avoidance measures implemented for the River South Parcel and the north end of LPNP have been developed to be flexible so they can be adjusted to account for reasonably anticipated changes in future groundwater levels. Each avoidance measure is designed to provide or hold additional water to supplement current surface water storage and optimize the hydroperiod available for groundwater infiltration. The storage capability of these AMM features will help moderate groundwater reductions during periods of lower precipitation. Thus, conceptual designs have incorporated anticipated fluctuation in groundwater levels.

River South / River South Bluff Parcel Water Levels

Trigger: The success of the avoidance measures at the HED mitigation sites is the maintenance of groundwater levels so they are at or above observed levels and seasonal averages of background datasets and correlate to trends within the Silurian Aquifer outside of the quarry's potential area of influence. The process of site inspections, collection of water level and water quality data, comparison to background levels, adjustment of avoidance measures (if needed), submission of data and findings to regulators, and the implementation of additional avoidance measures, if needed, is the adaptive management process that allows for changes in groundwater levels and water quality to be addressed.

Due to its proximity to the open-pits of Romeoville Quarry, water level decreases at River South and River South Bluff Parcels will generally be the result of the expanding quarry footprint or the combined effect of mine expansion and third-party water well extraction. Groundwater modeling

simulations indicate seep discharges will decrease up to 25 to 30% along the eastern portion of the River South Bluff Parcel due to the planned surface mining included in this plan. Supplemental water will be added to three infiltration galleries within this parcel at rates up to 40 gpm to compensate for predicted impacts from Pierce Eich Quarry construction. These rates have been established through pilot infiltration field testing and comprehensive groundwater modeling efforts. The galleries and water distribution system supplying the supplemental water will be designed to handle roughly twice the predicted flow to account for natural variations in the distribution of the flow within the subsurface or underestimations in the predicted results. This additional capacity allows for flexibility in the avoidance measure. However, if greater quantities of supplemental water (more than 80 gpm) are required to meet groundwater level targets (defined in Section 4.2 of Appendix G-1) then this would be considered a changed circumstance. The need for additional supplemental water above the existing capacity would be identified during assessment monitoring. Additional supplemental water would be provided in a timely manner proposed by HMS (i.e. within 180 days) but developed in consultation with USFWS.

Response: HMS will support avoidance measures for the River South and River South Bluff Parcels through conditions that are reasonably anticipated to occur. Therefore, the maximum capacity of the infiltration galleries at River South (80 gpm) is being designed to account for an extended seasonal drought to occur during the final years of surface mining in the Pierce Eich Quarry. However, if more water is required (and changed circumstance is triggered) HMS will supply additional water at a rate of 80 gpm (for a total of 160 gpm) to the River South AMM to account for possible underestimations from gallery pilot testing and modeling simulations. If needed, an additional infiltration gallery would be constructed as a contingency measure to assist flow distribution in the parcel. If water level monitoring continued to indicate that even more supplemental water would be required to maintain historical levels, this would be considered an unforeseen circumstance since the maximum contingency pumping rate (160 gpm) is several times higher than the anticipated highest steady-state infiltration rate of 40 gpm.

If there is evidence that outside influences (e.g. new municipal wells) are affecting groundwater levels in the River South Parcel vicinity (regardless the amount of supplemental water needed), this will also be considered an unforeseen circumstance. Evaluation of potentially changed or unforeseen circumstances will be triggered coincidently with adaptive management and contingency evaluation assessments and will be discussed with USFWS as outlined in the groundwater level monitoring flow chart (Figure 4-1 of Appendix G). USFWS may utilize the assessment monitoring data to investigate the cause of the change in ground water levels. If changes in groundwater levels are found not to be solely caused by HMS' action but by an action or situation out of the control of HMS, then HMS will not be held responsible or liable for the degradation of hydrologic condition. Rather, HMS would be proportionately responsible to address effects from their mining. Under this situation, USFWS and IDNR along with other applicable regulatory agencies will address the cause of the adverse water level impacts beyond the control of HMS. HMS will assist in addressing hydrology impacts and will provide additional monitoring data as it becomes available.

Water Levels in Other HMS Mitigation Parcels and Other Nearby Habitat Areas

Other measures are being considered to address and respond to possible unanticipated groundwater conditions (i.e. changed circumstances) in other HMS mitigation parcels and other nearby habitat areas, and some of these are briefly described below. These plans will be developed and

implemented if a changed circumstance in groundwater levels is detected through the groundwater monitoring process described in the Groundwater Monitoring Plan (Appendix G-1).

- North side of Quarry (RPNP) – An infiltration pond on Far North Parcel similar to the FPDWC property pond would be used to retain surface water that would otherwise run off-site directly to the Des Plaines River. The infiltration pond would be located on the north side of Far North Parcel and allow for more surface water to infiltrate and recharge groundwater. This infiltration area was originally conceived to provide a buffer from potential mining impacts to the hydrology of RPNP. However, groundwater modeling predicts that changes to groundwater levels or discharges in RPNP will not occur from the proposed mining of the Romeoville Quarry. Therefore, this avoidance measure is not planned to be implemented upon HCP approval unless groundwater level monitoring suggests there are unanticipated impacts (i.e. changed circumstance) from HMS mining north of this area.

- North side of Quarry (North, Far North and River North Parcels) – Additional water could be added to these parcels by pumping sump water into the drainage channel that enters from the west and flows to the wetlands on these parcels. This could be done as needed, especially during the dry season, to address unanticipated impacts (i.e. changed circumstance).

- Adjacent to Pierce Eich Quarry (e.g. Collegeview Subdivision) – Infiltration basins could be positioned outside of the active mining area in the Pierce Eich Quarry to be utilized as temporary avoidance measures should unexpected drawdowns (i.e. changed circumstance) occur in the Silurian Aquifer at local wells (such as the Collegeview Water Supply wells). Water collected in the Pierce Eich Quarry would be recirculated into the infiltration basins to minimize the effects of the surface mining.

- South side of Quarry (LPNP) – Additional water can be supplemented to the Silurian Aquifer through active infiltration immediately north of LPNP if a changed circumstance is detected in the data associated with the infiltration pond on FPDWC property. An infiltration basin and pond on Former Pipe Parcel would enable the capture of runoff from the large Lewis University watershed.

River South / River South Bluff Parcel Water Quality

Trigger: Groundwater and seep water quality will also be monitored. A 99% confidence interval about mean concentrations of routine groundwater and seep water constituents will be used to determine when assessment (potentially changed circumstance) monitoring is triggered for water quality. The water quality triggers are summarized in Attachment 2 of Appendix G-1. Changed circumstances will be iteratively evaluated and possibly confirmed during assessment monitoring, adaptive management evaluations and contingency reviews as outlined on the water quality monitoring flow chart for the River South and River South Bluff Parcels (Figure 4-2 of Appendix G-1). A changed circumstance will be confirmed if water quality parameters do not return to levels or concentrations that are within background datasets after continued assessment monitoring of contingency measures, as specified below.

A changed circumstance will occur when HMS confirms a groundwater quality constituent that is above or below historically observed values for a period of three consecutive seasonal quarters.

Likewise, a changed circumstance will occur when HMS confirms background constituents in upgradient wells trend (either higher or lower) for three consecutive seasonal quarters. Seasonal quarters are defined in the Groundwater Monitoring Plan (Appendix G-1) as Spring (March, April & May), Summer (June, July & August), Fall (September, October, and November), and Winter (December, January & February). An unforeseen circumstance will occur after six out of ten quarters are observed to have water quality concentrations outside (higher or lower than) background levels or when HMS confirms background constituents in upgradient wells trend (either higher or lower) for six consecutive seasonal quarters. Background concentrations at specific sampling locations and media are defined in Attachment 2 of the Groundwater Monitoring Plan (Appendix G-1).

Response: Upon confirmation of a changed circumstance in groundwater quality concentration(s), assessment monitoring will continue, and an assessment monitoring report will be issued (within 30 days of receipt of data) following collection and analysis of additional water quality data. Assessment monitoring data may indicate that AMMs need to be modified to maintain effectiveness. Adjustment to the AMM's is part of the on-going management plan for groundwater resources at HED mitigation sites. However, if assessment monitoring suggests third parties are the cause of groundwater quality changes, the assessment monitoring data and analysis will be submitted to USFWS for review. USFWS may utilize the assessment monitoring data to investigate the cause of the change in ground water quality concentrations. If changes in groundwater quality are found not to be caused by HMS' action but by an action or situation out of the control of HMS, then HMS will not be held responsible or liable for the degradation of hydrologic condition. Under this situation, USFWS and IDNR along with other applicable regulatory agencies will address the cause of the adverse water quality impacts. HMS will assist in addressing hydrology impacts and will provide additional monitoring data as it becomes available.

LPNP Water Level and Water Quality Monitoring

Trigger & Response: HMS will provide and maintain avoidance measures for the LPNP through conditions that are reasonably anticipated to occur. Groundwater modeling indicates slight reductions in groundwater levels will be offset by the FPDWC Pond. Worst-case scenarios for drawdowns without the pond may be 0.2 to 0.3 feet at monitoring locations in LPNP north of Division Street, and the FPDWC Pond is designed to offset this level of change. If four consecutive quarterly measurements indicate trends in water levels (decreasing water levels) or water quality (increasing or decreasing) in LPNP monitoring wells outside of the FPDWC Pond monitoring wells (i.e., G-101, G-102, MW-6B, and MW-9B), then a changed circumstance will be triggered. Adjustments will be made to the FPDWC Pond AMM in order to maintain water levels in LPNP in response to the changed circumstance. However, unforeseen circumstances will occur if groundwater levels are maintained below the mean or seasonal mean levels (or water quality parameters are maintained outside background levels) for four consecutive quarters after contingency (changed circumstance) measures are implemented at the FPDWC Pond. If it is determined at any point that outside influences are likely affecting groundwater in LPNP area, this will also be considered an unforeseen circumstance. Assessment monitoring data will be collected to confirm trends in groundwater levels and groundwater quality data to detect if changed or unforeseen circumstances occur.

Decrease in Groundwater Adversely Affects a Blanding's Turtle or Spotted Turtle Mitigation Site or Measure

Groundwater is important to the BT and ST because they live in wetlands, such as marshes and sedge meadows, along with ponds and other slow-moving waters. A shallow water table and

occasional groundwater discharge locations promote and/or provide surficial water to many of the wetlands within the HCP area (i.e. in the lower Des Plaines River Valley). Lower water table elevations or reduced groundwater discharge rates may result in the drying out of some wetlands which may lead to a reduction in BT and ST habitat.

Trigger: A changed circumstance will occur when average groundwater levels over a five-year period in or near a mitigation parcel where AMM's are not present, such as North, Far North, ComEd and Long Run Parcels indicates a decline and is accompanied by a measurable change in wetland vegetation in the same parcel. A decline in water levels will be considered when 80% of seasonal averages are less than background averages over the five-year period (or 48 of the 60 months). Measurable change in wetland vegetation in the same parcel will be determined through a 30% decrease in total cover (if at or below 100% total cover) or 30% increase in Mean Wetness from baseline. A 50% decrease in total cover (if at or below 100% total cover) or 50% increase in Mean Wetness from baseline will be considered an unforeseen circumstance. HMS will monitor vegetation on its mitigation parcels, but not on property owned or managed by others.

Response: Upon documentation of a decrease in five-year groundwater level averages accompanied by change in wetland vegetation in the same parcel, HMS will investigate the cause of the reduced ground water levels and will report their findings to USFWS.

If it is determined through consultation among HMS and regulatory agencies that the actions of HMS are the cause (in part or completely) of the decline in groundwater levels, then HMS will (within 60 days) provide USFWS with documentation of planned corrective actions to address hydrology concerns. If changes in groundwater levels are found to be in part caused by HMS' action as well as an action or situation out of the control of HMS, then HMS will not be held fully responsible or liable for the degradation of hydrologic condition. Rather, HMS would be proportionately responsible for addressing effects from their activities. However, if the decline is found not to be caused by HMS' action but by an action or situation out of the control of HMS, then an unforeseen circumstance will be triggered, and HMS will not be responsible for addressing the degradation of hydrologic condition. Under this situation, USFWS and IDNR along with other applicable regulatory agencies will address the cause of the adverse hydrology impacts. HMS will assist in addressing hydrology impacts and providing monitoring data as needed.

Change in Surface Water Due to Flood

For the purpose of this HCP, the definition of a flood is adapted from the Illinois Emergency Management Agency (IEMA) as "a general and temporary condition of partial or complete inundation of normally dry land areas from: (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land." Since 1981, 99 of the 102 counties in Illinois have been federally declared as major disaster areas due to flooding. Will County has had four federally declared flood disasters since 1981 (IEMA 2011).

Data from the nearest U.S. Geological Survey (USGS) gauge (#05532500) on the Des Plaines River, located approximately 22 miles upstream of the HCP Area in Riverside, Illinois, indicate that in the past 60 years, the river has been above flood stage (7.0 ft) at that location a total of 24 times (IDNR OWR 2009 and USGS 2011). While it is likely that not all of these flood events impacted the HCP Area, winter and spring events caused by a combination of rainfall and snowmelt are more likely to have impacted downstream areas than summer events caused by isolated thunderstorms (pers. comm., staff hydrologist, National Weather Service Chicago Office). Since 1948, 14 winter

and spring flood events have been recorded at the Riverside gauge including three moderate (8.0 ft) winter/spring floods in 1948, 1982, and1997, and one major (9.0 ft) flood in 1969 (IDNR OWR 2009 and USGS 2011). Severe summer weather has caused summer flood events to impact the HCP Area twice in recent years; strong thunderstorms caused a four-day flood in August 2007 which impacted the HCP Area, and the remnants of Hurricane Ike produced a four-day major flood in September 2008 (NCDC 2007 and 2008). These were the longest two flood periods recorded in the area over the past 18 years (USGS 2011). The closest and most optimal gauge on the Des Plaines River, per the USGS NWIS website (https://waterdata.usgs.gov/nwis/uv?site_no=05533600), is located immediately upstream of the Permit Area at Lemont (#05533600). Although this gauge is too new (installed in 2010) to provide much historical data, it will enable more accurate detection of flood-stage water levels in this area of the river in the future.

Heavy downpours are now twice as frequent in the Midwest as they were a century ago. Both summer and winter precipitation levels have been above average for the last three decades, the wettest period in a century. The Midwest has experienced two record-breaking floods in the past 15 years. Due to the effects of climate change, precipitation is likely to continue to increase in winter and spring, with more heavy downpours. This is expected to lead to more frequent periods of flooding (USGCRP 2009). In addition, increased flooding is also likely to promote disease (see Section 8.2.12).

Changed Circumstance vs. Unforeseen Circumstance

Floods have been frequent and regular events in northeast Illinois over the past 60 years and appear to have increased in severity in the past two decades; 15 of the 24 recorded flood events on the Des Plaines River at Riverside in the 60 years prior to 2011 have occurred since 1993. This means that floods have occurred in 71% of the years since 1993. Therefore, HMS anticipates that floods will occur frequently during the permit duration, particularly during the late winter/early spring snowmelt periods and following severe summer storms. As a result, a changed circumstance will be more than 21 documented flood events (water levels above flood stage (13.2 ft) at the new Lemont gauge and subsequent flooding of HCP area documented by a recognized expert) within the 30-year permit period. Twenty-eight flood events (or more) during the permit period will be an unforeseen circumstance. A changed circumstance also will be three flood events per calendar year, as none of the past 60 years have seen river levels exceeding flood stage more than twice a year near the HCP Area (IDNR OWR 2009 and USGS 2011). The fourth flood and any subsequent floods in a calendar year will be considered unforeseen circumstances. Two major flood events (water levels above major flood stage (15.0 ft) at the new Lemont gauge (NOAA 2020) and subsequent flooding of HCP area documented by a recognized expert) during the permit duration will be considered a changed circumstance, but any additional major floods will be considered an unforeseen circumstance as river levels exceeding major flood stage have been recorded only twice in the Des Plaines River near the HCP Area in the 60 years prior to 2011 (IDNR OWR 2009 and USGS 2011). Any floods lasting longer than four days will also be considered a changed circumstance, as no flood in the past 18 years has lasted longer than four days, even following the Hurricane Ike storm system (USGS 2011). Any floods lasting longer than five days will be considered an unforeseen circumstance.

Hine's Emerald Dragonfly

HED are likely adapted to regular flooding events which are common in the HCP Area. However, severe or persistent flooding may impact HED reproduction and/or recruitment by affecting aquatic and emergent vegetation structure in wetland habitats. Flooding may also disrupt hydrological processes in HED habitats by inundating slowly flowing streamlets and other sources of surface

water with high volumes of flood water. Sedimentation and pollution associated with the erosion and runoff during flood events may impact water quality or pH.

Trigger: The trigger to initiate a response is the documentation of three flood events in a year in the HCP Planning Area (or any other flood frequency defined as a changed circumstance above) following the detection of water levels above flood stage at USGS gauge #05533600 on the Des Plaines River at Lemont and observation of resultant damage to infrastructure (e.g. rail ballast or culverts) designed to maintain or enhance the hydrology of HED habitat at a mitigation site.

Responses: Following the damage to infrastructure designed to enhance or maintain the hydrology of an HED mitigation site, HMS will be responsible for repairing the damage if it owns the infrastructure. If not, USFWS will contact the owner about the damage, and USFWS and HMS will cooperate with the owner as needed to help make the repairs, but HMS will not be responsible for making the repairs. If, due to flood impacts on hydrology infrastructure or other mitigation measures, a new mitigation site is established, habitat (i.e. streamlets) at the abandoned mitigation site will not be replaced or repaired but will instead be established at the new site, preferably in the Des Plaines River Valley.

Trigger: The trigger to initiate a changed circumstance response is documentation of three flood events in the HCP Area within a year (or any other flood frequency defined as a changed circumstance above) following the detection of water levels above flood stage at USGS gauge #05533600 on the Des Plaines River at Lemont and observation of the removal or destruction of more than 25% of the adult HED habitat (i.e. vegetation cover) (or more than 20% in larval habitat areas) which has been restored or protected on a parcel as part of the mitigation plan (Chapter 5 and Appendix F) at any point in the permit duration. Removal or destruction of more than 50% of adult habitat (or 40% of larval habitat) will be considered an unforeseen circumstance.

Responses: Upon documentation from HMS of the loss of more than 25 percent of adult HED habitat (or 20% of larval habitat) restored or protected as part of the HCP, HMS will take one of the following actions: (1) work to re-establish HED habitat (e.g. streamlets or vegetation) at the original mitigation site, or (2) establish the original level of mitigation at a new mitigation site, preferably in the Des Plaines River Valley.

Blanding's and Spotted Turtles

BT and ST are unlikely to be affected by the regular flooding events which occur in the HCP Area. Woody debris and other basking habitat may be covered during periods of flooding, but a reduction in basking habitat is unlikely to affect BT unless the flood event persists for several days or washes most debris downstream, and ST rarely basks on woody debris. Recruitment success of these species may be impacted if wetland or upland nesting habitat is inundated by severe flooding during the breeding season. Sedimentation and pollution associated with the erosion and runoff during flood events may impact water quality or pH.

Trigger: The trigger to initiate a changed circumstance response is the documentation of three flood events in a year (or any other flood frequency defined as a changed circumstance above) in the HCP Planning Area by a recognized expert following the detection of water levels above flood stage at USGS gauge #05533600 on the Des Plaines River at Romeoville and observation of resultant damage to infrastructure (i.e. rail ballast, culverts, streamlets) designed to maintain or enhance the hydrology of BT and ST habitat at a mitigation site.

Responses: Following three flood events in a year and damage of infrastructure designed to maintain or enhance the hydrology of a covered turtle mitigation site, HMS will be responsible for repairing the infrastructure if they own it. If not, USFWS will contact the owner about the damage, and USFWS and HMS will cooperate with owner as needed to make the repairs. If, due to flood impacts on other mitigation measures, a new mitigation site is established, habitat at the abandoned mitigation site will not be replaced or repaired but will instead be established at the new site.

Trigger: The trigger to initiate a changed circumstance response is documentation of three flood events in a year (or any other flood frequency defined as a changed circumstance above) in the HCP Planning Area by a recognized expert following the detection of water levels above flood stage at USGS gauge #05533600 on the Des Plaines River at Lemont and observation of the removal or destruction of more than 25% of higher quality BT or ST habitat, such as preferred wetland habitat (i.e. marsh (not dominated by *Phragmites*), wet prairie, and sedge meadow) and dispersal habitat between core wetlands habitats in any parcel which has been restored or protected as part of the mitigation plan (Chapter 5 and Appendix F) at any point in the permit duration. Removal or destruction of more than 50% of higher quality BT and ST habitat will be considered an unforeseen circumstance.

Responses: Upon documentation of three flood events in a year and the loss of more than 25% of higher quality BT or ST habitat restored or protected on a parcel as part of the HCP, HMS will take one of the following actions: (1) work to re-establish BT or ST habitat at the original mitigation site, (2) establish the original level of mitigation in a new mitigation site, preferably in the Des Plaines River Valley.

8.2.10 Accidental Harmful Human Activity

Description
Harmful activities are those that are caused by HMS or its contractors during mining, restoration or management, or any other work that negatively impacts a Covered Species or their habitat (e.g. spills, tire ruts).

Changed Circumstance vs. Unforeseen Circumstance
Documented negative impact on a Covered Species or its habitat caused by HMS employees or contractors based on a site inspection and investigation of the accident by HMS, in coordination with the USFWS and IDNR, will be considered a changed circumstance. Any accidental harmful human activities that result from third parties are not the responsibility of HMS and will be considered an unforeseen circumstance.

Trigger: Documented negative impact on a Covered Species or its habitat caused by HMS employees or contractors based on a site inspection and investigation of the accident by HMS in coordination with USFWS and IDNR. HMS will notify USFWS and IDNR within 24 hours of learning of an accident, so the site inspection and investigation can be coordinated.

Response: If it is determined, based on the investigation, that the accident was caused by HMS or one of its contractors, HMS will work with USFWS, IDNR, and other state and federal agencies, as necessary, to develop and implement an appropriate response to a changed circumstance. Typical corrective actions will include restoring the impacted area to pre-disturbance conditions. All responses will be approved by USFWS and IDNR. HMS will report to USFWS and IDNR any

actions taken. Actions necessary to respond to the disturbance will be mitigated for in accordance with Chapter 5 if they should impact the species or its habitat.

8.2.11 Vandalism or Other Destructive or Illegal Human Activity

Description

Vandalism or other destructive or illegal human activities include unauthorized use of a vehicle (on or off road) through vegetation, poaching, trespassing, and dumping of materials within the CHUs in the Permit Area. There is little history of vandalism or other destructive activities on HMS property in the Romeoville facility, thus very little is anticipated during the permit period. Therefore, two incidents during the permit period will be considered a changed circumstance and four will be considered unforeseen.

Changed and Unforeseen Circumstances

Documenting two acts of vandalism or other destructive or illegal human activity on an HMS mitigation parcel based on a site assessment in coordination with the USFWS and IDNR will be considered a changed circumstance. Documented four or more acts of vandalism or other destructive or illegal human activity on an HMS mitigation parcel based on a site assessment in coordination with the USFWS and IDNR will be considered an unforeseen circumstance. HMS will notify USFWS and IDNR within 24 hours of learning of possible vandalism or destructive or illegal activity on one of their mitigation parcels, so the site inspection and investigation can be coordinated.

Trigger: Documentation of two or more acts of vandalism or other destructive or illegal human activity based on a site inspection and investigation by HMS, in coordination with the USFWS and IDNR.

Response: After documentation of two or more acts of vandalism on HMS' mitigation parcels, HMS will work with the USFWS, IDNR, and other state and federal agencies to develop and implement an appropriate response. Typical corrective actions will include restoring the impacted area to pre-disturbance conditions. All responses will be approved by USFWS and IDNR, and HMS will report to USFWS and IDNR any actions taken. After four or more acts of vandalism (an unforeseen circumstance), HMS will contact USFWS but will not be required to take corrective action.

8.2.12 Disease

Description

During the term of the requested permit, it is anticipated that disease may affect some of the Covered Species or their habitat within the HCP area. Diseases which may affect HED are not currently known. However, other species of dragonfly are known to be affected by parasitic diseases, such as the parasite-caused metabolic disease identified in the twelve-spotted skimmer (*Libellula pulchella*) by Marden and Schilder (Kennedy 2006). BT and ST may be susceptible to a variety of coccidian, hemoflagellate, and monogean parasites, as well as lung flukes, roundworms, leaches, and others. However, little is known about whether such parasites negatively affect populations (Congdon and Keinath 2006). Vegetation which comprises habitat for the HED, BT, and ST within the HCP area may be subject to diseases caused by parasitic fungi, bacteria, viruses, nematodes, and other organisms (Asselin 2011). It is not possible to predict with any certainty the frequency, extent, or severity of disease outbreaks. However, climate change may influence the

effects of disease on Covered Species or their habitat. In general, diseases tend to be more prevalent in warmer climates, and plants and animals stressed by increased temperatures may be more susceptible to disease. Occurrence of current diseases within the HCP area may increase, and new diseases may arrive with increased temperatures.

Changed Circumstance vs. Unforeseen Circumstance

As part of this HCP's changed circumstances, HMS will address any detrimental disease once over the permit duration. A detrimental disease is one that is confirmed to harm a Covered Species or interfere with, damage, disrupt, or destroy planned minimization or mitigation measures. Should a detrimental disease outbreak be confirmed more than once over the permit duration, the circumstance will be considered unforeseen.

Hine's Emerald Dragonfly

HED populations may be particularly vulnerable to the impacts of disease based on the small, isolated nature of most populations and the limited genetic diversity of the species as described in the original recovery plan for the species (USFWS 2001). A disease could have devastating effects on a population that does not have the genetic diversity to allow some members to survive the disease or on a population that is too isolated to be bolstered by immigration.

Trigger: The trigger to initiate a response by HMS to address disease affecting an HED population is written notification from USFWS of the disease. Notification shall include documented scientific research and/or evidence from recognized experts (i.e. those who have been studying HED for at least 10 years) that confirms the presence of a disease and demonstrates a negative effect on the HED population. HMS will also notify USFWS if they become aware of a disease affecting the HED populations on their properties.

Responses: In the event that disease is demonstrated to negatively affect HED populations and threaten their continued existence within the HCP area, avoidance, minimization, and mitigation measures would be reevaluated. HMS will coordinate with USFWS and IDNR to develop and implement revisions to the HCP that attempt to lessen the impact of the disease on the HED.

Trigger: HMS will inform USFWS and IDNR when it documents a disease affecting the establishment of vegetation for suitable HED habitat mitigation, including documented evidence from researchers or consultants that confirms the presence of a disease and demonstrates a negative effect on the ability to establish and maintain suitable vegetation in the HCP Planning Area.

Responses: In the event that disease is demonstrated to affect the establishment and maintenance of vegetation for suitable HED habitat mitigation, HMS will attempt to restore or replace the existing mitigation on-site or establish additional mitigation at a new site to replace the affected portion of the original site.

Blanding's and Spotted Turtle

Blanding's turtle populations may be vulnerable to impacts from disease based on the life strategy of the species, which is characterized by high adult survival rates and high longevity but delayed sexual maturity, small clutch size, and low reproductive rates (Lee 1999). Spotted turtle is also a long-lived species with delayed sexual maturity (requiring 7 to 14 years to reach sexual maturity). If a disease significantly impacts the survival rate of sub-adult or adult age classes of a population, recruitment levels may not be high enough to prevent the population from declining.

Trigger: The trigger to initiate a response by HMS to address disease affecting a Blanding's or spotted turtle population is written notification from USFWS or IDNR of documented evidence that confirms the presence of a disease and demonstrates a negative effect on the Blanding's turtle or spotted turtle population in the HCP Planning Area. HMS will also notify USFWS if they become aware of a disease affecting Blanding's or spotted turtle populations on their properties.

Responses: In the event that disease is demonstrated to negatively affect populations of Blanding's or spotted turtle and threatens their continued existence within the HCP area, avoidance, minimization, and mitigation measures would be reevaluated. HMS would coordinate with USFWS and IDNR to develop and implement revisions to the HCP that attempt to lessen the impact of "take" incurred by protected species due to disease.

Trigger: HMS will inform the USFWS and IDNR when a disease negatively affecting the establishment of vegetation for suitable Blanding's or spotted turtle habitat mitigation is identified through monitoring or documented by researchers or consultants that confirms the presence of a disease and demonstrates a negative effect on the ability to establish and maintain suitable vegetation.

Responses: In the event that disease is demonstrated to negatively affect the establishment and maintenance of vegetation for suitable Blanding's or spotted turtle habitat mitigation, HMS will attempt to restore or replace the existing mitigation on-site, or establish additional mitigation at a new site to replace the affected portion of the original site.

8.2.13 Oil Spills or Gas Leaks

Description

Numerous oil and gas pipelines run through and adjacent to property within the HCP Permit Area. Almost ten years ago two oil leaks occurred within the HCP Planning Area within a few months of each other. The Enbridge spill near Romeoville Prairie released about 250,000 gallons of crude oil in September 2010, and the West Shore/Buckeye Pipeline spill released approximately 74,000 gallons on HMS' Long Run Parcel and adjacent properties in December 2010. Since 2000, an average of approximately 24 pipeline incidents per year have occurred in Illinois (PHMSA 2020). The U.S. Department of Transportation (USDOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) defines pipeline incidents as those resulting in fatality or injury resulting in hospitalization, $50,000 or more in total costs, highly volatile liquid releases of five barrels or more or liquid releases of 50 barrels or more, and/or liquid releases resulting in unintentional fire or explosion.

Changed and Unforeseen Circumstances

Oil pipeline leaks (from a third party) of the size (250,000 gallons) and frequency (two per year) that have occurred in the HCP area will be considered a changed circumstance. More frequent (>2/year) or larger (>250,000 gallons) oil spills will be considered an unforeseen circumstance. Any gas pipeline leak or explosion will be an unforeseen circumstance. Any oil spills or natural gas pipeline leaks that result from pipeline company integrity digs are not the responsibility of HMS and will be considered an unforeseen circumstance.

An Oil Spill Adversely Affects a HED Mitigation Site or Measure

An oil (crude or refined) spill in HED habitat will result in the total loss of habitat in the area contaminated by the oil and possibly the taking of individual HED affected by the spill. All

vegetation and animal life will be killed or greatly harmed in this area. All larval HED and any adult HED that come in direct contact with the oil will be killed. Other nearby adult HED may be harmed by the oil vapors/fumes, and other larval HED downstream of the spill may be harmed or killed by exposure to toxic compounds (e.g. VOCs, SVOC, and metals) in the water released (via surface or groundwater) from the oil in the spill area.

Trigger: An oil spill (of 250,000 gallons or less and at a frequency of no more than two a year) in areas containing habitat for HED or upstream of HED habitat on HMS property.

Response: The oil and pipeline companies are responsible for the response and clean-up of the oil spills. The USEPA is the lead federal agency during the response and clean up phase. HMS will work with the oil and pipeline companies, the USEPA, and any other involved private entities or public agencies, as HMS did with the Buckeye spill, to clean up the spill as quickly as possible in order to minimize damage to natural resources, as well as property and public health. HMS will also work closely with the oil and pipeline companies, USFWS, and others involved during the restoration phase. HMS will plan, but not budget, for oil spills, because all costs to remediate will be the responsibility of the oil and pipeline company.

New and additional safeguards, such as improved early/immediate pipeline leak detection systems, may be required to be put in place by the pipeline companies in this area as a result of the recent spills.

An Oil Spill Adversely Affects a Blanding's Turtle or Spotted Turtle Mitigation Site or Measure
An oil (crude or refined) spill in BT or ST habitat will result in the total loss of habitat in the area contaminated by the oil and possibly the taking of individual BT or ST affected by the spill. All vegetation and animal life, including BT and ST, that come in direct contact with the oil will be greatly harmed or killed. Other BT and ST outside the spill area but nearby may be harmed by the oil vapors/fumes, and others downstream of the spill may be harmed by exposure to toxic compounds (e.g. VOCs, SVOCs, and metals) in the water released (via surface or groundwater) from the oil in the spill area.

Trigger: An oil spill from a third party (of 250,000 gallons or less and at a frequency of no more than two a year) in areas containing habitat for BT or ST or upstream of BT or ST habitat on HMS property.

Response: The oil and pipeline companies are responsible for the response and clean-up of the oil spills. The USEPA is the lead federal agency during the response and clean up phase. HMS will work with the oil and pipeline companies, the USEPA, and any other involved private entities or public agencies, as HMS did with the Buckeye spill, to clean up the spill as quickly as possible in order to minimize damage to natural resources, as well as property and public health. HMS will also work closely with the oil and pipeline companies, USFWS, and others involved during the restoration phase. HMS will plan, but not budget, for oil spills because all costs to remediate will be the responsibility of the oil and pipeline company.

New and additional safeguards, such as improved early/immediate pipeline leak detection systems, may be required to be put in place by the pipeline companies in this area as a result of the recent spills.

8.2.14 Train Derailment

Description
Several railways traverse the HCP Permit area, including one railroad line on the west side of the Des Plaines River owned by NRG Energy , and two railroad lines on the east side of the Des Plaines River, one owned by Canadian National (CN) and one owned by Burlington Northern Santa Fe (BNSF). In addition to the railroad line owners, other railroad companies have trackage rights to operate on each of these lines (e.g. CN, Amtrak, Metra, and Union Pacific).

Changed Circumstance vs. Unforeseen Circumstance
Due to the presence of train traffic through the HCP Area and the unpredictable nature of such accidents, one train car derailment in a protected area occupied by the Covered Species will be considered a changed circumstance. However, train car derailments are rare events and additional derailments (i.e. more than one) throughout the duration of the permit period will be considered unforeseen.

Hine's Emerald Dragonfly
An accidental train car derailment along one of the railroad lines in an area occupied by HED could have direct or indirect impacts. The magnitude of these impacts would be dependent on a number of variables including: (1) the location of the derailment, (2) the nature of the derailment (i.e. number of cars, loaded vs. unloaded cars, contents of cars, cars remaining upright vs. contents spilled, etc.), (3) the time of year (active vs. inactive HED periods), and (4) the success of restoration efforts.

Trigger: The trigger to initiate a response from HMS is notification that an accidental train car derailment has occurred in an HCP mitigation area.

Responses: In the event of an accidental train car derailment, HMS will respond by coordinating with the responsible party(ies) (i.e. railroad line owner and operator) and natural resource regulatory agencies to: (1) determine the extent of impacts to HED and HED habitat, (2) develop an emergency (i.e. short term) response plan, and (3) develop an appropriate long-term response and habitat restoration plan. The railroad will be fully responsible for all restoration and cleanup activities, including funding, from the train car derailment.

Blanding's Turtle and Spotted Turtle
An accidental train car derailment along one of these railroad lines in an area occupied by BT or ST could have direct or indirect impacts. The magnitude of these impacts would be dependent on a number of variables including: (1) the location of the derailment, (2) the nature of the derailment (i.e. number of cars, loaded vs. unloaded cars, contents of cars, cars remaining upright vs. contents spilled, etc.), (3) the time of year (active vs. inactive covered turtle periods), and (4) the success of restoration efforts.

Trigger: The trigger to initiate a response by HMS is notification that an accidental train car derailment has occurred in a protected area occupied by Blanding's turtle or spotted turtle or a mitigation area restored for Blanding's turtle or spotted turtle.

Responses: In the event of an accidental train car derailment, HMS will respond by coordinating with the responsible party(ies) (i.e. railroad line owner and operator) and natural resource regulatory agencies to: (1) determine the extent of impacts to BT or ST or their associated habitat, (2) develop an emergency (i.e. short term) response plan, and (3) develop an appropriate long-term response

and habitat restoration plan. The railroad will be fully responsible for all restoration and clean up from the train car derailment.

8.3 Conclusion

To mitigate for the impact of changed circumstances that may occur during the permit term and may require an immediate response, HMS will implement the adaptive management process incorporated into this HCP. As described in Chapter 6, adaptive management is an iterative process that when applied to changed circumstances will include: 1) gathering data through monitoring; 2) assessing monitoring results and effects on Covered Species; 3) implementing in coordination with USFWS and IDNR, if needed, changes to the conservation program (including planned response to changed circumstances); and 4) monitoring and evaluating the effectiveness of the adaptive management strategies. This will be done when changes in management practices are necessary to achieve or maintain the HCP's biological objectives and to respond to unexpected monitoring results or new scientific information. In emergency or time sensitive situations, HMS will notify USFWS and IDNR but will not await a response from these agencies before they make such changes and will report to USFWS and IDNR any actions taken pursuant to this section.

For those identified changed circumstances that are not as time-critical in nature, HMS and the appropriate state and federal agencies will confer and agree upon the appropriate adaptive changes and refinements in the management of the species, habitats, or other important areas that may be impacted by any changed circumstance. If, through the on-going coordination and cooperation of HMS with USFWS, IDNR, and other aligned agencies throughout the permit duration, specific new management strategies are identified to address changed circumstances, they will be developed and implemented as deemed necessary and appropriate. This, however, will not require any additional resources from HMS than those already identified in the HCP.

While HMS believes that the initial measures to be enacted and funded through its commitments will be effective in contributing to the recovery of the Covered Species and their habitats, it is anticipated that conditions within the HCP area, including the protected habitats, and the overall condition of individual species will change over time. Therefore, adaptive management will be used in implementing avoidance, minimization, and mitigation measures, as well as changed circumstances. When a determination is made that an aspect of the HCP mitigation and conservation plans is not meeting its intended objectives, HMS, USFWS and IDNR will evaluate the causal factors and determine what additional adaptive management measures may be necessary to ensure that the objectives of this HCP continue to be met under the identified changed circumstance.

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9.0 AMENDMENT PROCESS

An HCP and/or ITP may be modified in accordance with the ESA, the USFWS' implementing regulations, and this chapter. HCP and permit modifications are not anticipated on a regular basis; however, modifications to the HCP and/or ITP may be requested by either HMS or USFWS. USFWS also may amend the ITP at any time for just cause, and upon a written finding of necessity, during the permit term in accordance with 50 C.F.R. § 13.23(b). The categories of modifications are administrative changes, minor amendments, and major amendments.

9.1 Administrative Changes

Administrative changes are internal changes or corrections to the HCP that may be made by HMS, at its own initiative, or approved by HMS in response to a written request submitted by USFWS. Requests from USFWS shall include an explanation of the reason for the change as well as any supporting documentation. Administrative changes on HMS' initiative do not require preauthorization or concurrence from USFWS.

HMS will document each administrative change in writing and provide USFWS with a summary of all changes, as part of its annual report, along with any replacement pages, maps, and other relevant documents for insertion in the revised document.

Administrative changes include the following:

- Corrections of typographical, grammatical, and similar editing errors that do not change intended meanings;
- Corrections of any maps, tables, or appendices in the HCP to reflect approved amendments, as provided below, to the HCP, IA, or ITP.

9.2 Minor Amendments

Minor amendments are changes to the HCP whose effects on HCP species, the conservation strategy, and HMS' ability to achieve the biological goals and objectives of the HCP are either beneficial or not significantly different from those described in the HCP. Such amendments also will not increase impacts to the listed species, their habitats, and the environment beyond those analyzed in the HCP, NEPA document, and the BO or increase the levels of "take" beyond that authorized by the ITP. Minor amendments also may require an amendment to the ITP. The USFWS and HMS must approve a proposed minor amendment in writing before it may be implemented. Any proposed minor amendment will become effective on the date of the written approval.

HMS or USFWS may propose minor amendments by providing written notice to the other party. Such notice shall satisfy the provisions of 50 C.F.R. § 13.23 as well as include a description of the proposed minor amendment; the reasons for the proposed amendment; an analysis of the environmental effects, if any, from the proposed amendment, including the effects on covered species and an assessment of the amount of take, if any, of the species; an explanation of the reason(s) the effects of the proposed amendment conform to and are not different from those described in the HCP as originally adopted; and any other information required by law. When HMS proposes a minor amendment to the HCP, USFWS may approve or disapprove such amendment, or recommend that the amendment be processed as a major amendment as provided below. USFWS will provide HMS with a written explanation for its decision. When USFWS proposes a minor

amendment to the HCP, HMS may agree to adopt such amendment or may choose not to adopt the amendment. HMS will provide USFWS with a written explanation for its decision. USFWS retains its authority to amend the ITP, however, consistent with 50 C.F.R. § 13.23. Proposed minor amendments require a public notice in the Federal Register.

Providing a proposed amendment is consistent in all respects with the criteria in the first paragraph of this section, minor amendments include, but are not limited to, the following:

- Updates to the land cover map or to take species occurrence data;
- Changes to any measure in the conservation strategy to respond to changed circumstances, as described in Chapter 8 of the HCP;
- Minor changes to survey or monitoring protocols that are not proposed in response to adaptive management and that do not adversely affect the data gathered from those surveys;
- Minor changes to the reporting protocol.

9.3 Major Amendments

A major amendment is any proposed change or modification that does not satisfy the criteria for an administrative change or minor amendment. Major amendments to the HCP and ITP are required if HMS desires, among other things, to modify the projects and activities described in the HCP such that they may affect the impact analysis or conservation strategy of the HCP, affect other environmental resources or other aspects of the human environment in a manner not already analyzed, or result in a change for which public review is required. Major amendments must undergo the same formal review process as the original HCP and ITP, including appropriate NEPA analysis, a Federal Register notice, and an intra-USFWS Section 7 consultation.

In addition to the provisions of 50 C.F.R. § 13.23(b), which authorize USFWS to amend an ITP at any time for just cause and upon a finding of necessity during the permit term, the HCP and ITP may be modified by a major amendment upon HMS' submission of a formal permit amendment application and the required application fee to USFWS, which shall be processed in the same manner as the original permit application. Such application generally will require submittal of a revised Habitat Conservation Plan and preparation of an environmental review document in accordance with NEPA. The specific document requirements for the application may vary, however, based on the substance of the amendment. For instance, if the amendment involves an action that was not addressed in the original HCP or NEPA analysis, the documents may need to be revised or new versions prepared addressing the proposed amendment. If circumstances necessitating the amendment were adequately addressed in the original documents, an amendment of the ITP might be all that would be required.

Upon submission of a complete application package, USFWS will publish a notice of the receipt of the application in the Federal Register, initiating the NEPA and HCP public comment process. After the close of the public comment period, USFWS may approve or deny the proposed amendment application. HMS may, in its sole discretion, reject any major amendment proposed by USFWS.

Changes that would require a major amendment to the HCP and/or ITP include, but are not limited to:

- Revisions to the covered lands that do not qualify as a minor amendment;
- Addition of a species to the ITP that was not addressed or not adequately analyzed in the HCP, NEPA document and the BO;
- Increases in the amount of take allowed for covered activities or adding new covered activities to the HCP;
- Modifications of any action or component of the conservation strategy under the HCP, including AMMs, mitigation, funding, or schedule, that may increase the levels of take authorized by the ITP or substantially change the effects of the covered activities on Covered Species, the nature or scope of the conservation program, or consequences to the human environment;
- A major change in performance standards if monitoring or research indicates that existing performance standards are not attainable because technologies to attain them are either unavailable or infeasible, and the new performance standards were not contemplated in this original HCP and the associated NEPA document.

9.4 Treatment of Changes Resulting from Adaptive Management or Changed Circumstances

Unless explicitly provided in Chapters 6 or 8 of this HCP, the need for and type of amendment to deal with Adaptive Management or Changed Circumstances will be determined by USFWS, in coordination with HMS, at the time such responses are triggered.

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11.0 LIST OF ACRONYMS

Acronym	Definition
AES	Applied Ecological Services, Inc.
AMM	Avoidance and Minimization Measure
ASWMP	alternative stormwater management practice
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe
BT	Blanding's turtle
CCAP	Chicago Climate Action Plan
CFR	Code of Federal Regulations
CH	Critical Habitat
CHU	Critical Habitat Unit
CN	Canadian National
ComEd	Commonwealth Edison
CSS	Chicago Sanitary and Ship Canal
EA	Environmental Assessment
EF Scale	Enhanced Fujita Scale
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FPD	Forest Preserve District
FPDCC	Forest Preserve District Cook County
FPDDC	Forest Preserve District DuPage County
FPDWC	Forest Preserve District of Will County
FQI	Floristic Quality Index
GAS	Graef, Anhalt, Scholemer and Associates
GHA	Gewalt Hamilton Associates, Inc.
GIS	Geographic Information System
HCP	Habitat Conservation Plan
HED	Hine's emerald dragonfly
HMS	Hanson Material Service
I&M	Illinois & Michigan
ICC	Illinois Commerce Commission
IDNR	Illinois Department of Natural Resources
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
IESPA	Illinois Endangered Species Protection Act
IESPB	Illinois Endangered Species Protection Board
ILCS	Illinois Compiled Statutes
INHS	Illinois Natural History Survey
INPC	Illinois Nature Preserve Commission
IPCC	Intergovernmental Panel on Climate Change
ISWS	Illinois State Water Survey

ITA	Incidental Take Authorization
ITP	Incidental Take Permit
IUCN	International Union for the Conservation of Nature
LD	Lakeside daisy
LPC	leafy prairie clover
LPNP	Lockport Prairie Nature Preserve
LTPD	Lockport Township Park District
MVP	Minimum Viable Population
MWGen	Midwest Generation
MWRDGC	Metropolitan Water Reclamation District of Greater Chicago
NEPA	National Environmental Policy Act
NIIPP	Northern Illinois Invasive Plant Partnership
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PCE	Primary Constituent Elements
PDSI	Palmer Drought Severity Index
PVA	Population Viability Analysis
RIV	Relative Importance
ROW	Right of Way
RPNP	Romeoville Prairie Nature Preserve
ST	Spotted turtle
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WDNR	Wisconsin Department of Natural Resources
WFO	Weather Forecast Office

APPENDIX A:
Figures

Figure 1.
Location Map

Location
Will County, IL
Cook County, IL

0 2 4 Miles

N W E S

Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 03, 2015

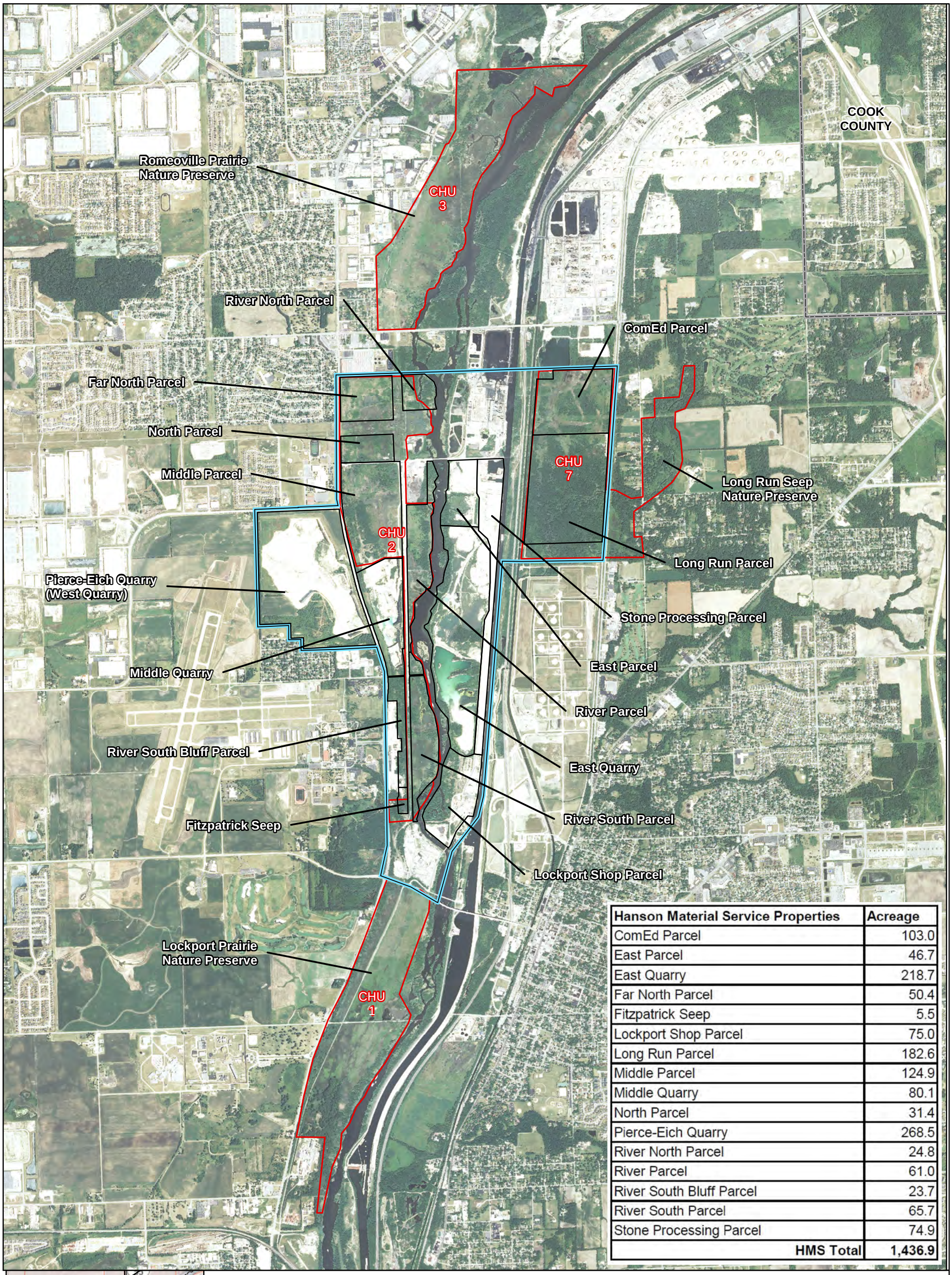
Legend
- County Boundary
- HCP Planning Area
- HCP Permit Area

Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Data sources include:
ESRI Topographic Basemap

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service



Hanson Material Service Properties	Acreage
ComEd Parcel	103.0
East Parcel	46.7
East Quarry	218.7
Far North Parcel	50.4
Fitzpatrick Seep	5.5
Lockport Shop Parcel	75.0
Long Run Parcel	182.6
Middle Parcel	124.9
Middle Quarry	80.1
North Parcel	31.4
Pierce-Eich Quarry	268.5
River North Parcel	24.8
River Parcel	61.0
River South Bluff Parcel	23.7
River South Parcel	65.7
Stone Processing Parcel	74.9
HMS Total	**1,436.9**

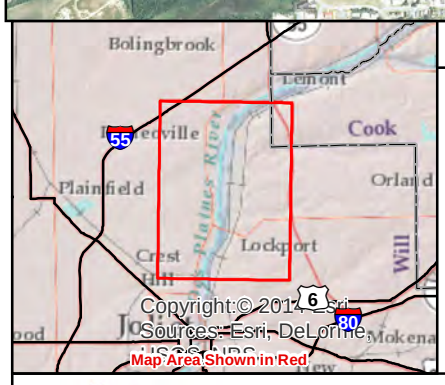


Figure 2. Permit Area & HMS Parcels

Location
Will County, IL

0 1,375 2,750 Feet

Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 17, 2015

Legend
- HCP Permit Area (2,072 Acres)
- Critical Habitat Units (CHU)
- HMS Parcel Boundaries

Data sources include:
Orthophotography: NAIP 2012
HMS, ESRI

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

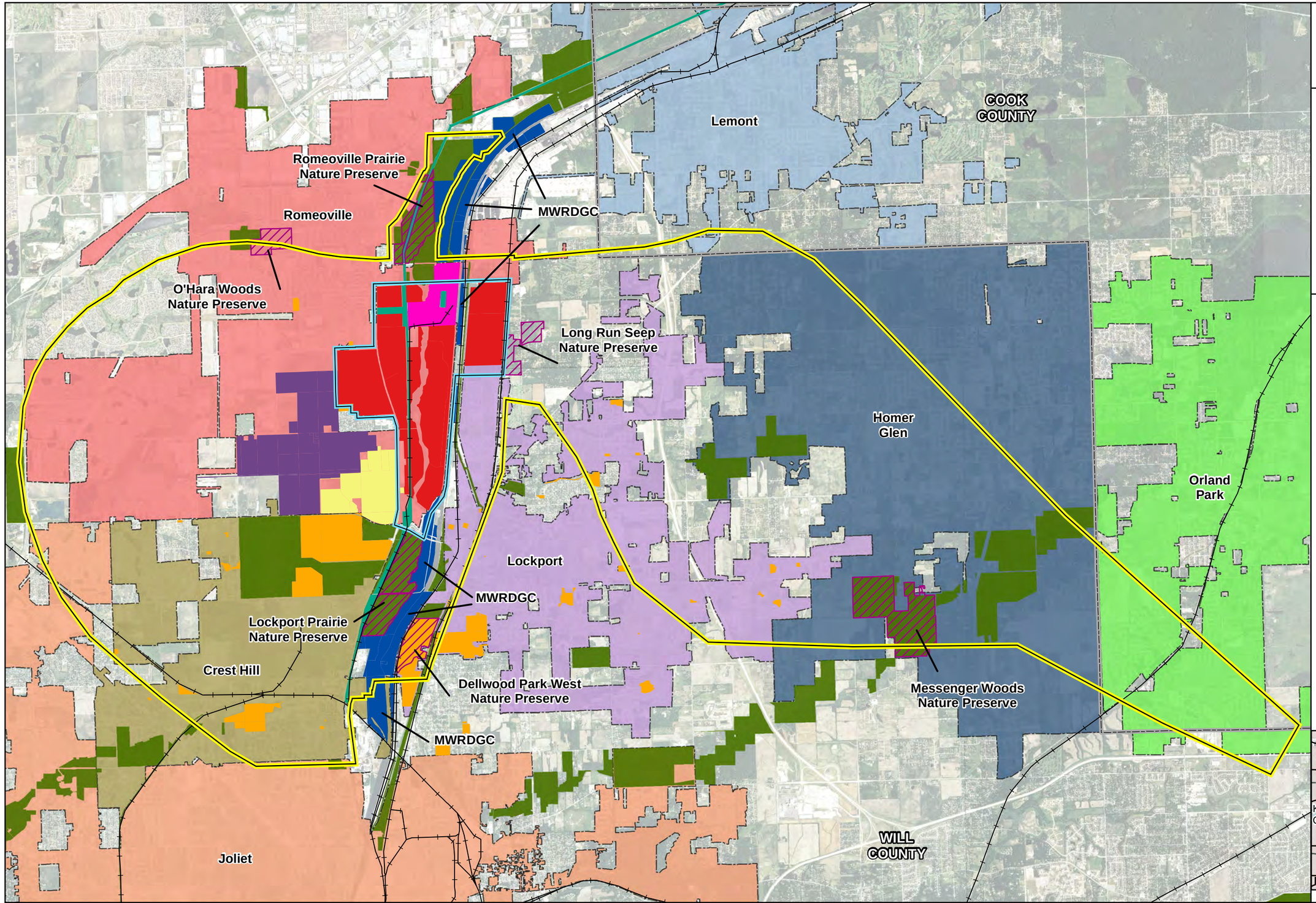


Figure 3. Land Ownership or Jurisdiction in HCP Planning Area

Location
Will County, IL
Cook County, IL

0 3,000 6,000 Feet

N W E S

Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 17, 2015

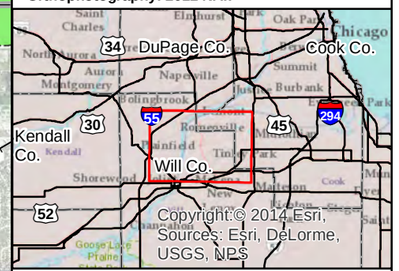
Legend

- HCP Planning Area (35,445 Acres)
- HCP Permit Area (2,072 Acres)
- County Boundaries
- HMS Properties
- Nature Preserves within Planning Area
- Railroads

Supporting Partners

- Homer Glen
- Lemont
- Lockport
- Romeoville
- Forest Preserve District of Will County
- Chicago-Romeoville Airport
- Lewis University
- Lockport Township Park District
- Midwest Generation
- ComEd

Data sources include:
ESRI
HMS
Will County
Forest Preserve District of Will County
U.S. Census
Orthophotography: 2012 NAIP



Copyright © 2014 Esri, Sources: Esri, DeLorme, USGS, NPS

Map Area Shown in Red

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service

Figure 4. Planning Area & Groundwater Recharge Areas

Location
Will County, IL
Cook County, IL

0 3,000 6,000 Feet

N W E S

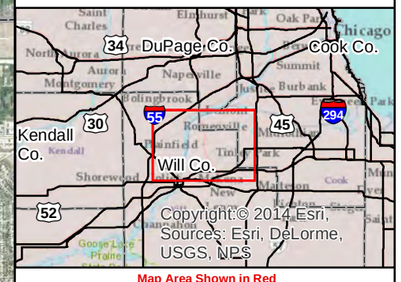
Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 17, 2015

Legend

- HCP Planning Area (35,445 Acres)
- Critical Habitat Units (CHU)
- LOCKPORT PRAIRIE (LP)
- LP Recharge Area [1,631 ac]
- LP Recharge Area Buffer [1,874 ac]
- LP Two Mile Buffer on Recharge Buffer [9,465 ac]
- RIVER SOUTH (RS)
- RS Recharge Area [1,096 ac]
- RS Recharge Area Buffer [1,398 ac]
- RS Two Mile Buffer on Recharge Buffer [8,259 ac]
- HMS ComEd & Long Run Parcels
- Estimated Recharge Zone
- Forest Preserves

Data sources include:
ESRI
Forest Preserve District of Will County
Forest Preserve District of Cook County
Orthophotography: 2012 NAIP



Map Area Shown in Red

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service

Figure 5. Current Land Use of HCP Planning Area

Location
Cook and Will Counties, Illinois

0 3,500 7,000 Feet

N W E S

Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 17, 2015

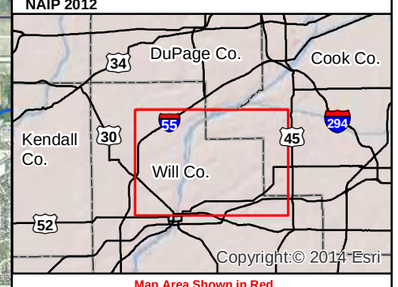
Legend

- County Boundary
- HCP Planning Area
- HCP Permit Area
- Critical Habitat Units
- ComEd & Long Run Parcels Estimated Recharge Zone
- Lockport Prairie Recharge Area
- Lockport Prairie Recharge Area Buffer
- Lockport Prairie Two Mile Buffer on Recharge Buffer
- River South Recharge Area
- River South Recharge Area Buffer
- River South Two Mile Buffer on Recharge Buffer

2005 Land Use

- Residential (10,725 Acres)
- Commercial (527 Acres)
- Institutional (830 Acres)
- Industrial (1,612 Acres)
- Transportation/Utilities (1,101 Acres)
- Agricultural (9,434 Acres)
- Open Space - Recreation (1,265 Acres)
- Open Space (7,495 Acres)
- Under Construction/Vacant (1,508 Acres)
- Open Water (948 Acres)

Data sources include:
CMAP 2005 Land Use
Orthophotography:
NAIP 2012



Map Area Shown in Red

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service

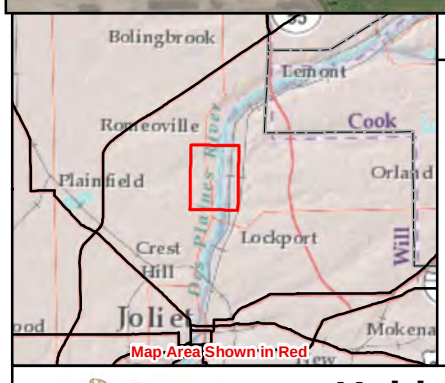


Figure 6.1. Wetlands Located on HMS Properties within HCP Permit Area - CHU 2

Location
Will County, IL

0 500 1,000 Feet

Map produced by:
Applied Ecological Services, Inc.

Last Modified: October 06, 2020

Legend
- HCP Permit Area
- Parcel Boundaries
- ComEd Easement
- Critical Habitat Units (CHU)
- Delineated Wetlands
- NRG Energy Will County Station

Data sources include:
Orthophotography: NAIP 2019
HMS, ESRI

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

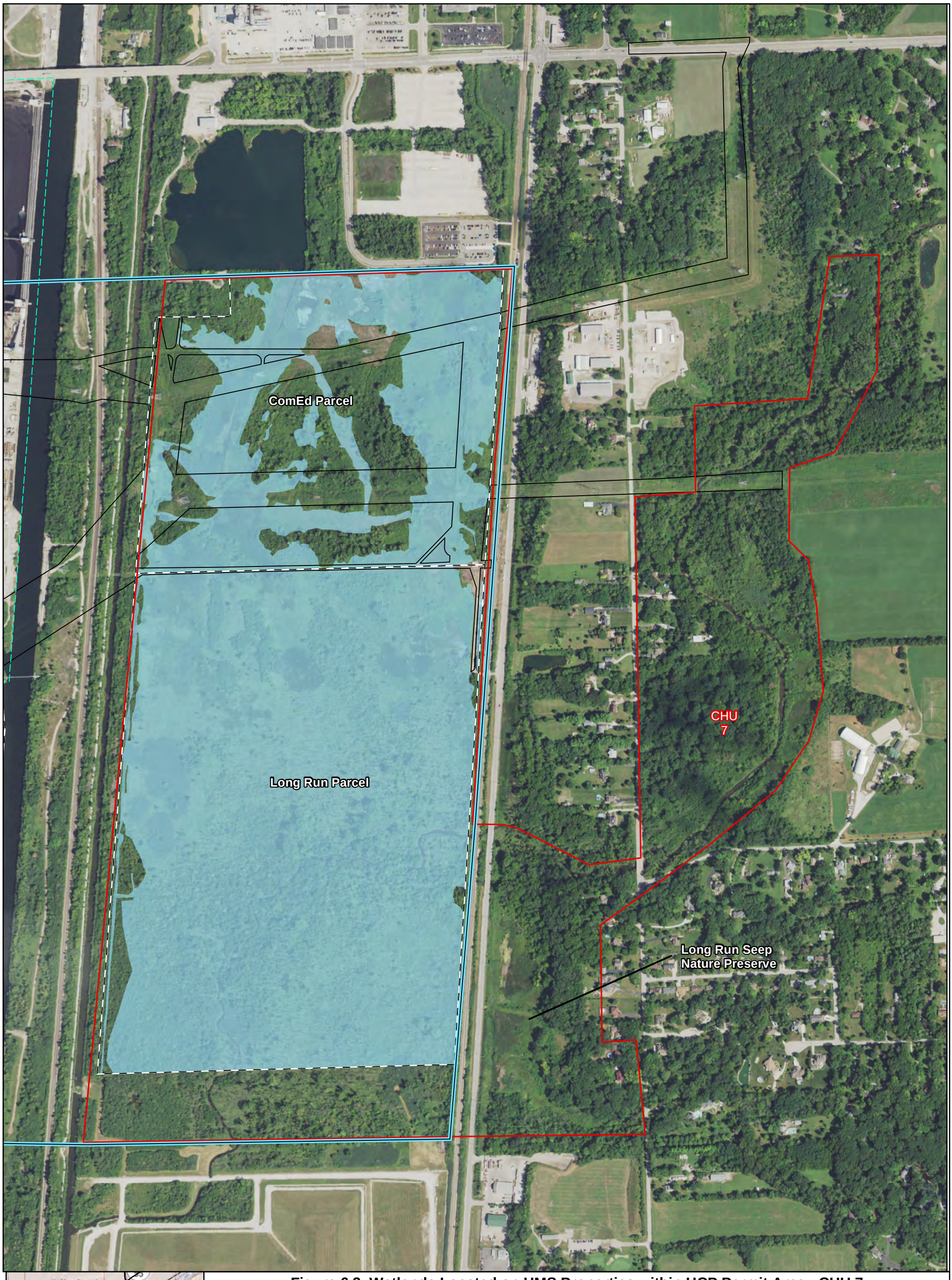


Figure 6.2. Wetlands Located on HMS Properties within HCP Permit Area - CHU 7

Location
Will County, IL

0 300 600 Feet

Map produced by:
Applied Ecological Services, Inc.

Last Modified: April 03, 2020

Legend
- HCP Permit Area
- Parcel Boundaries
- ComEd Easement
- Critical Habitat Units (CHU)
- Delineated Wetlands

Data sources include:
Orthophotography: NAIP 2019
HMS, ESRI

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

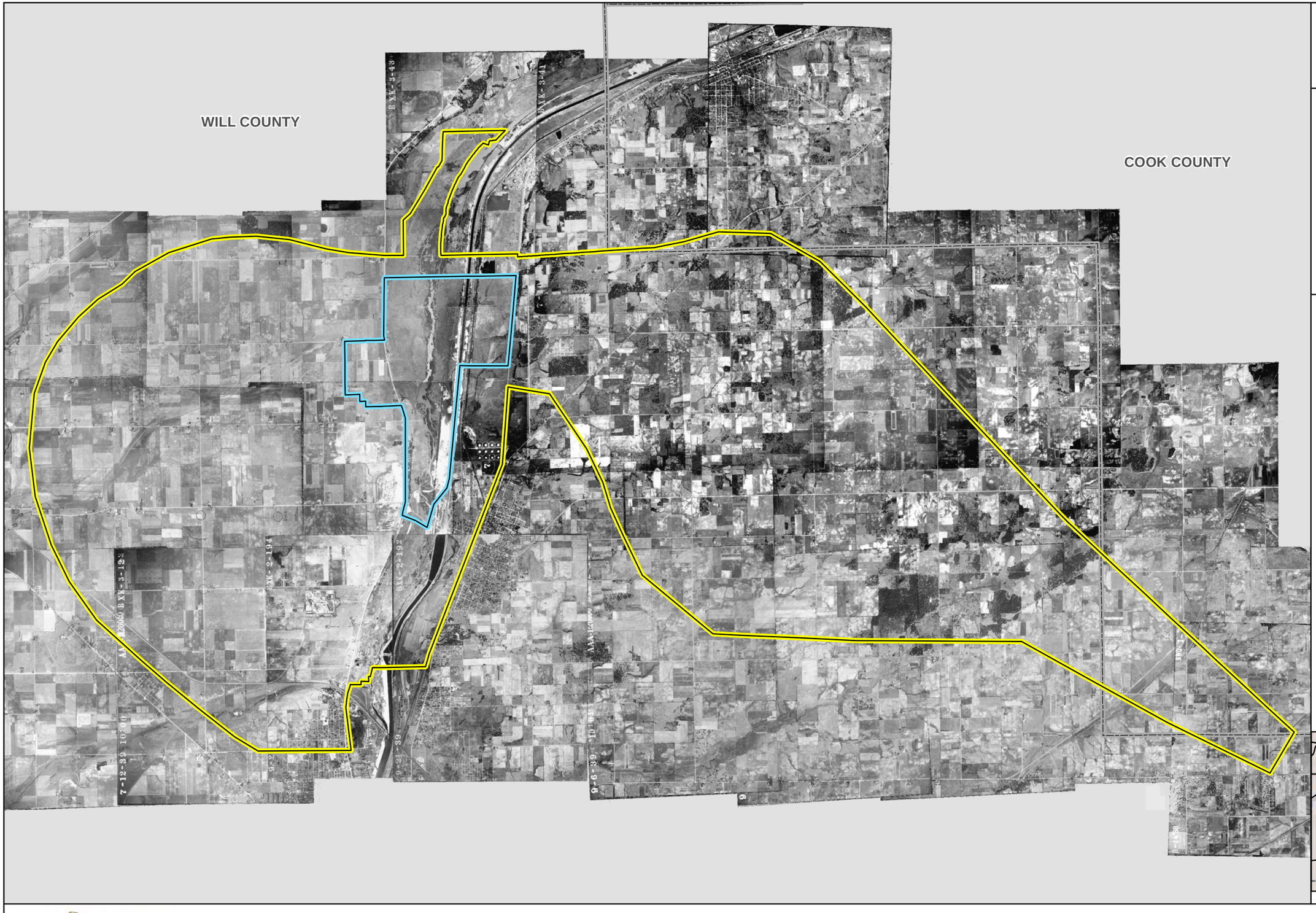


Figure 7.
1938-1939
Aerial Photography

Location
Cook and Will Counties, Illinois

0 3,500 7,000 Feet

N W E S

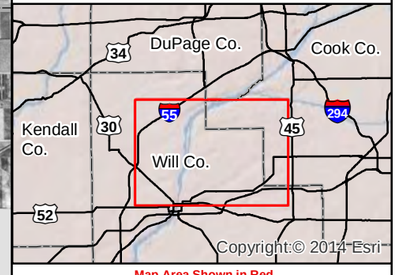
Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 03, 2015

Legend

- County Boundary
- HCP Planning Area
- HCP Permit Area

Data sources include:
1938/39 Illinois Historic Aerial Photography, ISGS



Map Area Shown in Red

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service

Figure 8.
Historic Vegetation Map of HCP Planning Area

Location
Cook and Will Counties, Illinois

0 3,500 7,000 Feet

N W E S

Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 03, 2015

Legend

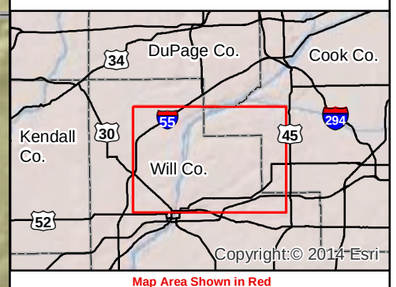
- County Boundary
- HCP Planning Area
- HCP Permit Area

Historic Land Cover

- Prairie
- River
- Swamp
- Timber/forest/grove/wooded

Data sources include:
NED 30m
INHS GLO Project

The Illinois Natural History Survey (INHS) used maps created by the General Land Office (GLO) in the 1850's based on the Public Land Surveys conducted between 1804-1843. These maps, which documented the land cover at that time, were georecified and digitzed by the INHS to create the Historic Landcover of Illinois.



Map Area Shown in Red

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service

Waterfall Glen Forest Preserve
DuPage County
CHU 5
Keepataw Preserve
CHU 4
CHU 6 - 3.9 Miles to the East
See CHU 6 Map Inset Below
Black Partridge Forest Preserve
Romeoville Prairie Nature Preserve
CHU 3
Cook County
NRG Energy Will County Station
ComEd Parcel
River North Parcel
Far North Parcel
North Parcel
CHU 2
CHU 7
Middle Parcel
River Parcel
Long Run Seep Nature Preserve
Long Run Parcel
Will County
River South Parcel
CHU 1
Lockport Prairie Nature Preserve
Lockport Prairie East
Dellwood Park West Nature Preserve
Crest Hill WWTP
CHU 6
McMahon Woods Nature Preserve
CHU 6
Cook County

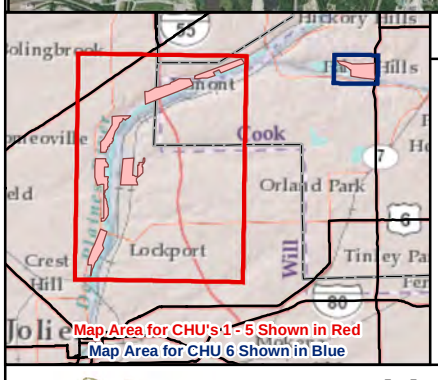


Figure 9.0. HED Habitat Map CHU Overview

Location
Will County, IL
Cook County, IL
DuPage County, IL

0 1,750 3,500 Feet

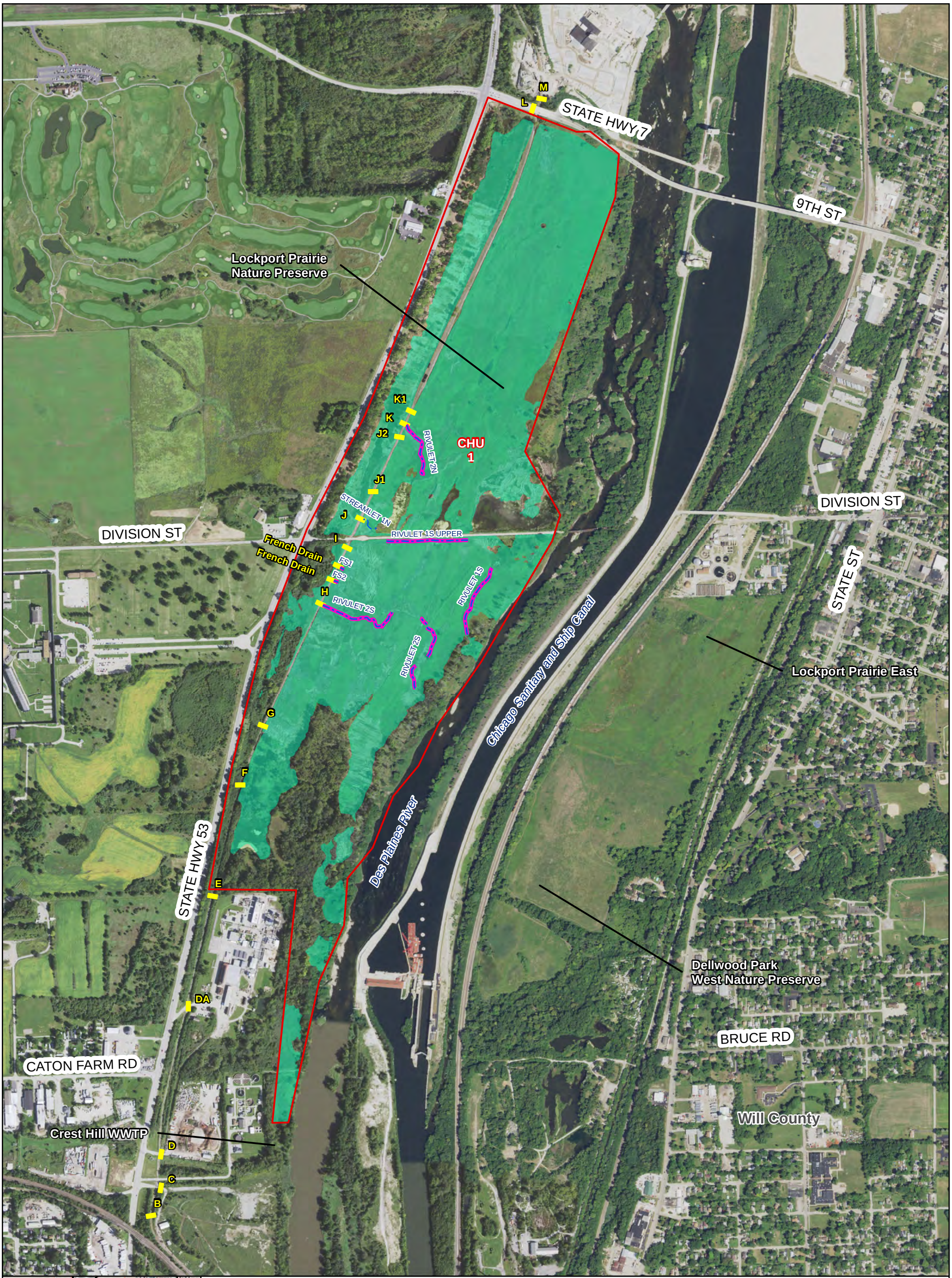
Map produced by:
Applied Ecological Services, Inc.

Last Modified: October 06, 2020

Legend
- Historically Occupied Rivulets
- HED Larvae Occupied Rivulets
- Unoccupied Rivulets
- Historic HED Larvae Habitat Areas
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Critical Habitat Units (CHU)
- County Boundary

Data sources include:
Orthophotography: NAIP 2019
ESRI, Will, DuPage, and Cook Counties

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



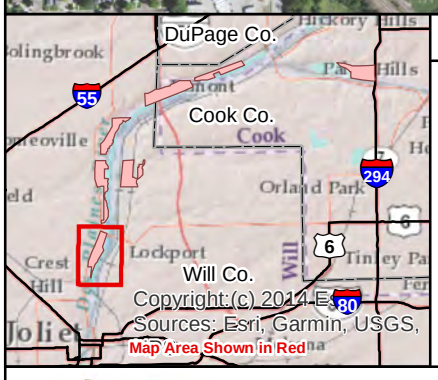


Figure 9.1. HED Habitat Map CHU 1

Location
Will County, IL

0 450 900 Feet

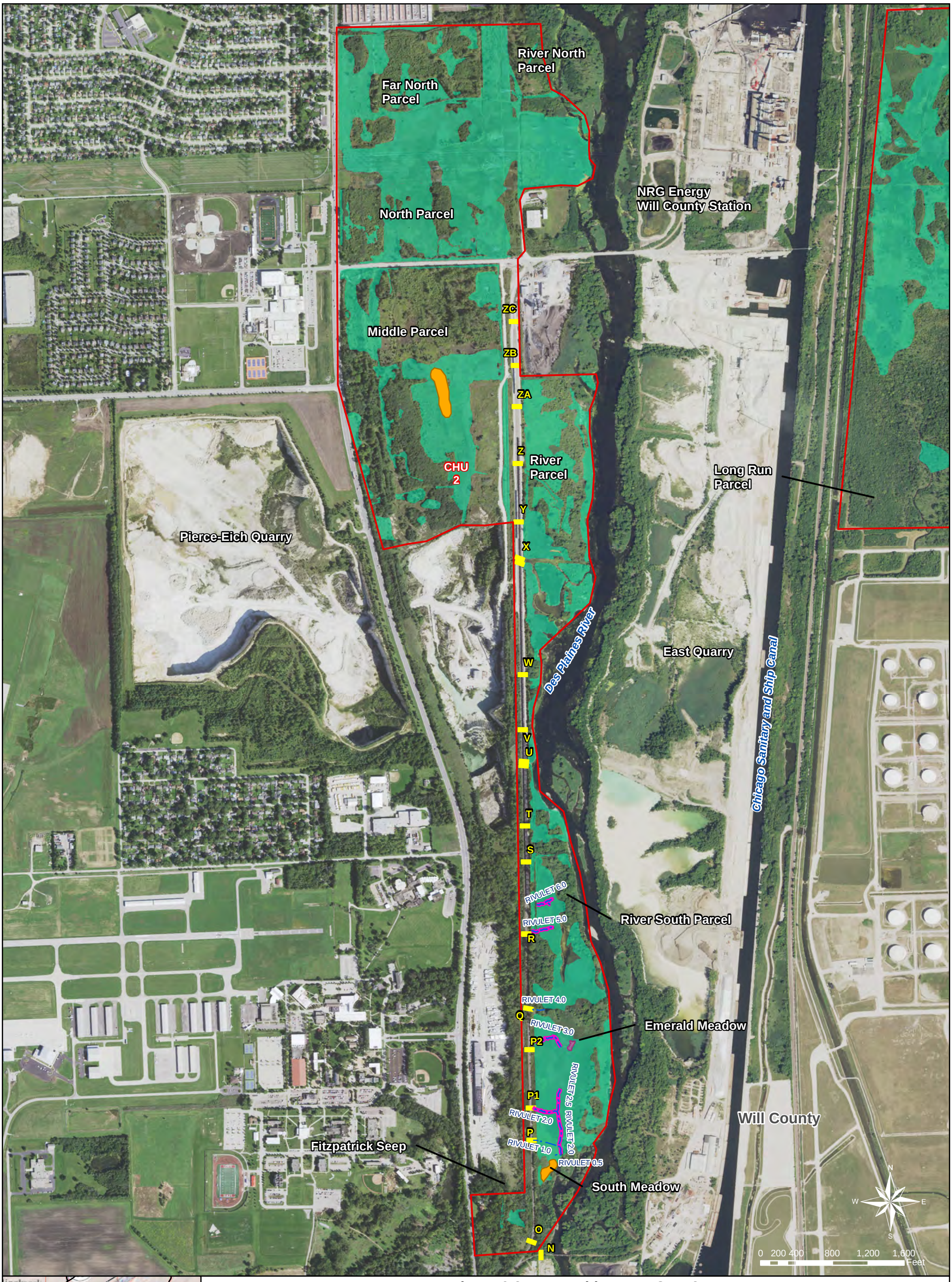
Map produced by:
Applied Ecological Services, Inc.

Last Modified: April 03, 2020

Legend
- Historic HED Larvae Habitat Areas
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Critical Habitat Units (CHU)
- A Culverts

Data sources include:
Orthophotography: NAIP 2019
ESRI, Will County

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



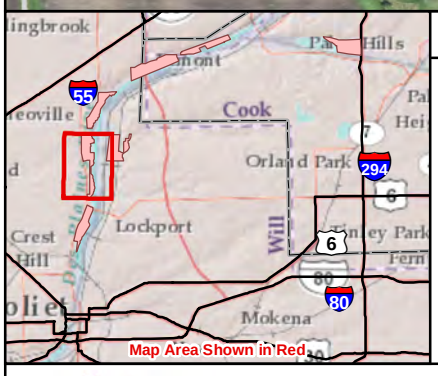


Figure 9.2. HED Habitat Map CHU 2

Location
Will County, IL

APPLIED ECOLOGICAL SERVICES

Last Modified: October 06, 2020
Map produced by: tos
Sources: NAIP 2019, ESRI, Will County

Legend

- Historically Occupied Rivulets
- HED Larvae Occupied Rivulets
- Unoccupied Rivulets
- Critical Habitat Units (CHU)
- Culverts
- A
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Historic HED Larvae Habitat Areas

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

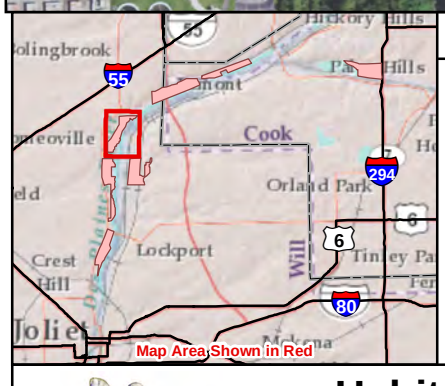


Figure 9.3. HED Habitat Map CHU 3

Location
Will County, IL

0 350 700 Feet

N W E S

Map produced by:
Applied Ecological Services, Inc.

Last Modified: April 03, 2020

Legend
- Historic HED Larvae Habitat Areas
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Critical Habitat Units (CHU)

Data sources include:
Orthophotography: NAIP 2019
ESRI, Will County

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

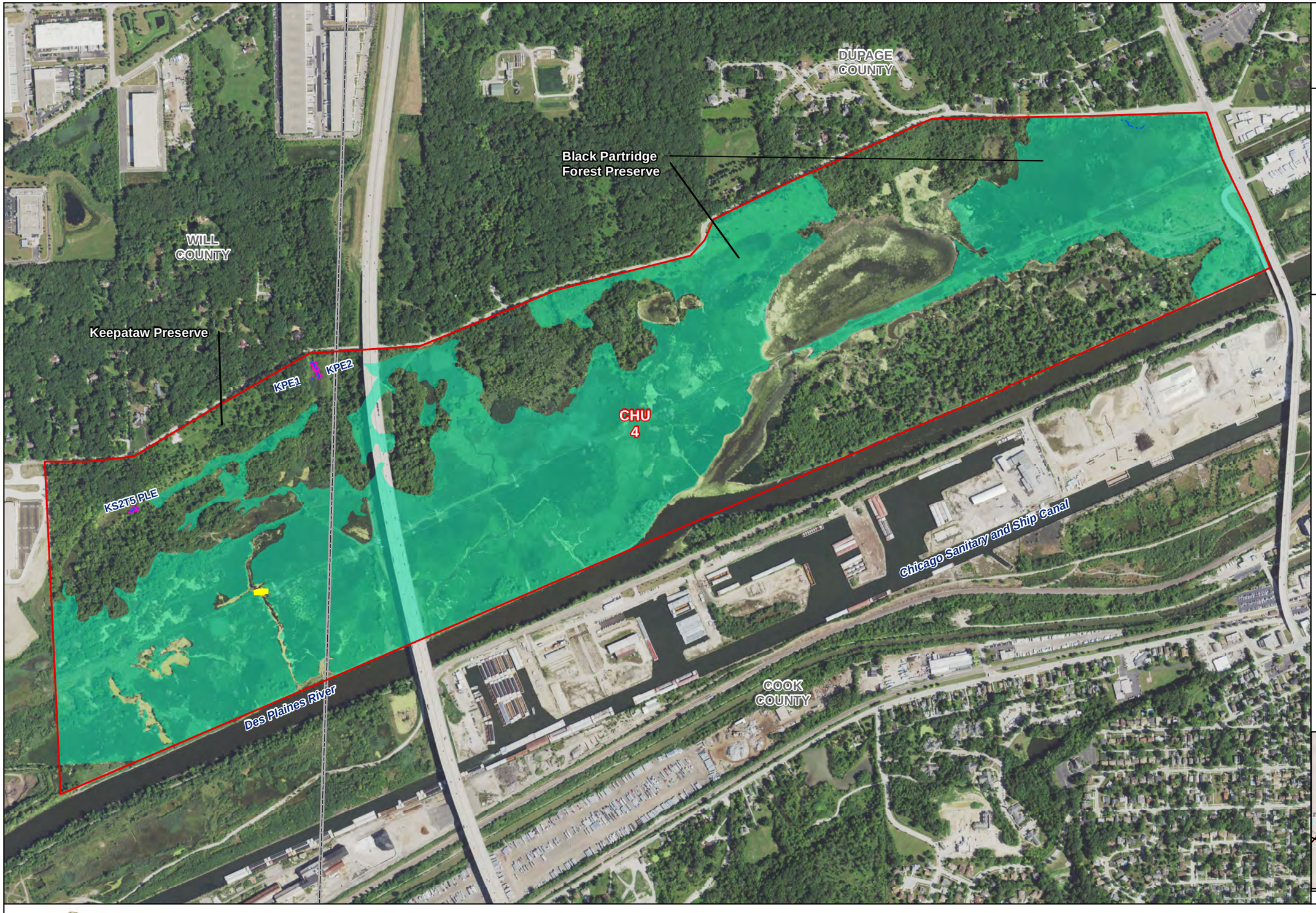


Figure 9.4.
HED Habitat Map
CHU 4

Location
Will County, IL
Cook County, IL

0 400 800 Feet

N W E S

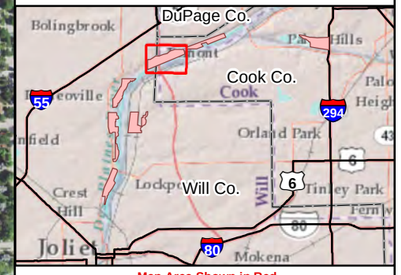
Map produced by:
Applied Ecological Services, Inc.

Last Modified: April 03, 2020

Legend

- Historic HED Larvae Habitat Areas
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Critical Habitat Units (CHU)
- County Boundary
- Culverts

Data sources include:
ESRI, Will County, Cook County
Orthophotography: 2019 NAIP



Map Area Shown in Red

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service

Figure 9.5.
HED Habitat Map
CHU 5

Location
Cook County, IL
DuPage County, IL

0 400 800 Feet

N
W E
S

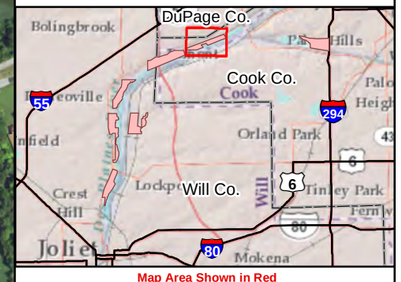
Map produced by:
Applied Ecological Services, Inc.

Last Modified: April 03, 2020

Legend

- Historic HED Larvae Habitat Areas
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Critical Habitat Units (CHU)
- County Boundary
- Culverts

Data sources include:
ESRI, Will County, Cook County
Orthophotography: 2019 NAIP



Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service

Figure 9.6.
HED Habitat Map
CHU 6

Location
Cook County, IL

0 400 800 Feet

N W E S

Map produced by:
Applied Ecological Services, Inc.

Last Modified: April 03, 2020

Legend

- Historically Occupied Rivulets
- HED Larvae Occupied Rivulets
- Unoccupied Rivulets
- Historic HED Larvae Habitat Areas
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Critical Habitat Units (CHU)
- County Boundary

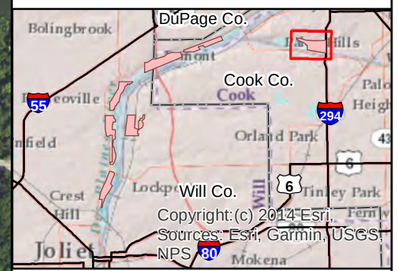
McMahon Woods
Nature Preserve

McMahon Str1
McMahon Str2
McMahon Str3
McMahon Str7
McMahon Str4
McMahon Str10
McMahon Str5
McMahon Str11
McMahon Str6
McMahon Str12
McMahon Str8
McMahon Str9

CHU 6

Calumet Sag Channel

Data sources include:
ESRI, Cook County
Orthophotography: 2019 NAIP

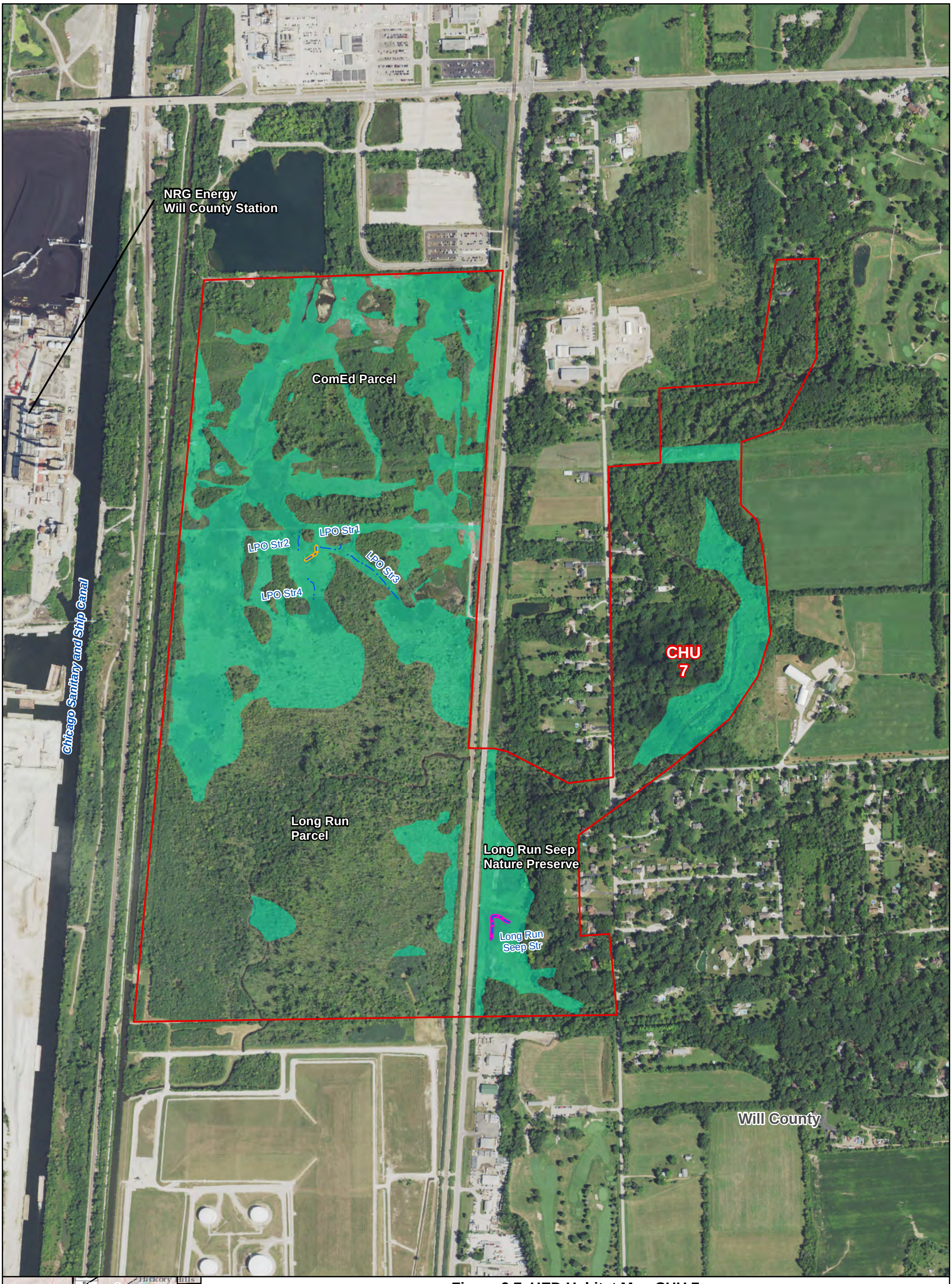


Copyright (c) 2014 Esri, Sources: Esri, Garmin, USGS, NPS

Map Area Shown in Red

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois

Hanson Material Service



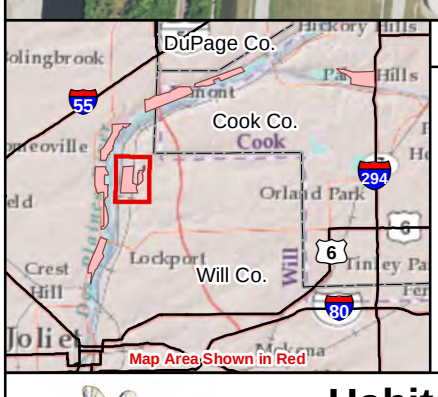


Figure 9.7. HED Habitat Map CHU 7

Location
Will County, IL

0 500 1,000 Feet

Map produced by:
Applied Ecological Services, Inc.

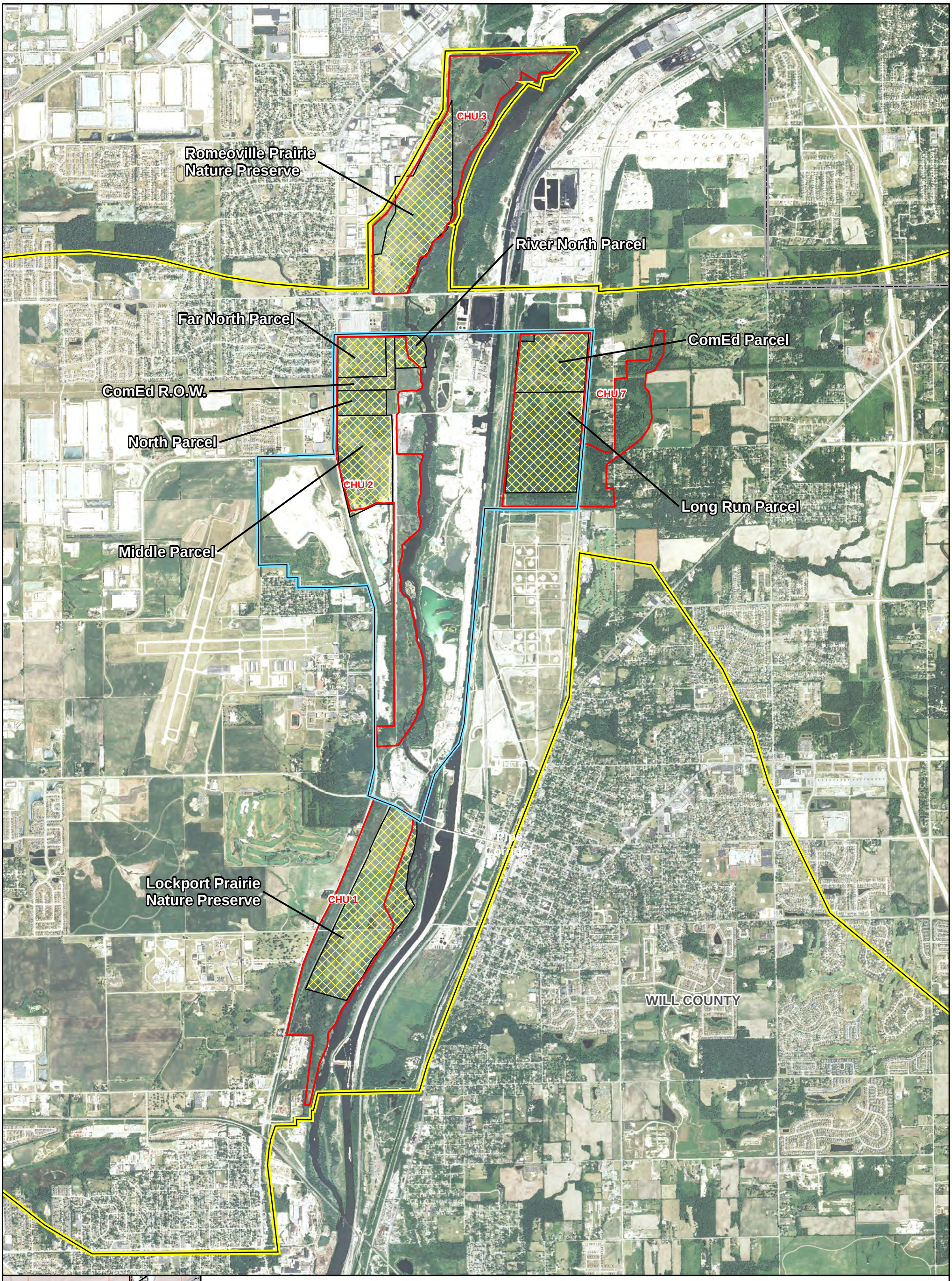
Last Modified: October 06, 2020

Legend

- Historically Occupied Rivulets
- HED Larvae Occupied Rivulets
- Unoccupied Rivulets
- HED Larvae Habitat Areas
- HED Adult Habitat Only
- Historic HED Larvae Habitat Areas
- Critical Habitat Units (CHU)

Data sources include:
Orthophotography: NAIP 2019
ESRI, Will County

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



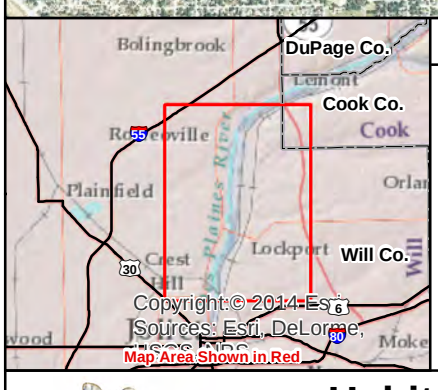


Figure 10. Parcels with Recently (2002 - 2015) Documented Occurrence of Blanding's Turtle

Location
Will County, IL

0 1,500 3,000 Feet

N W E S

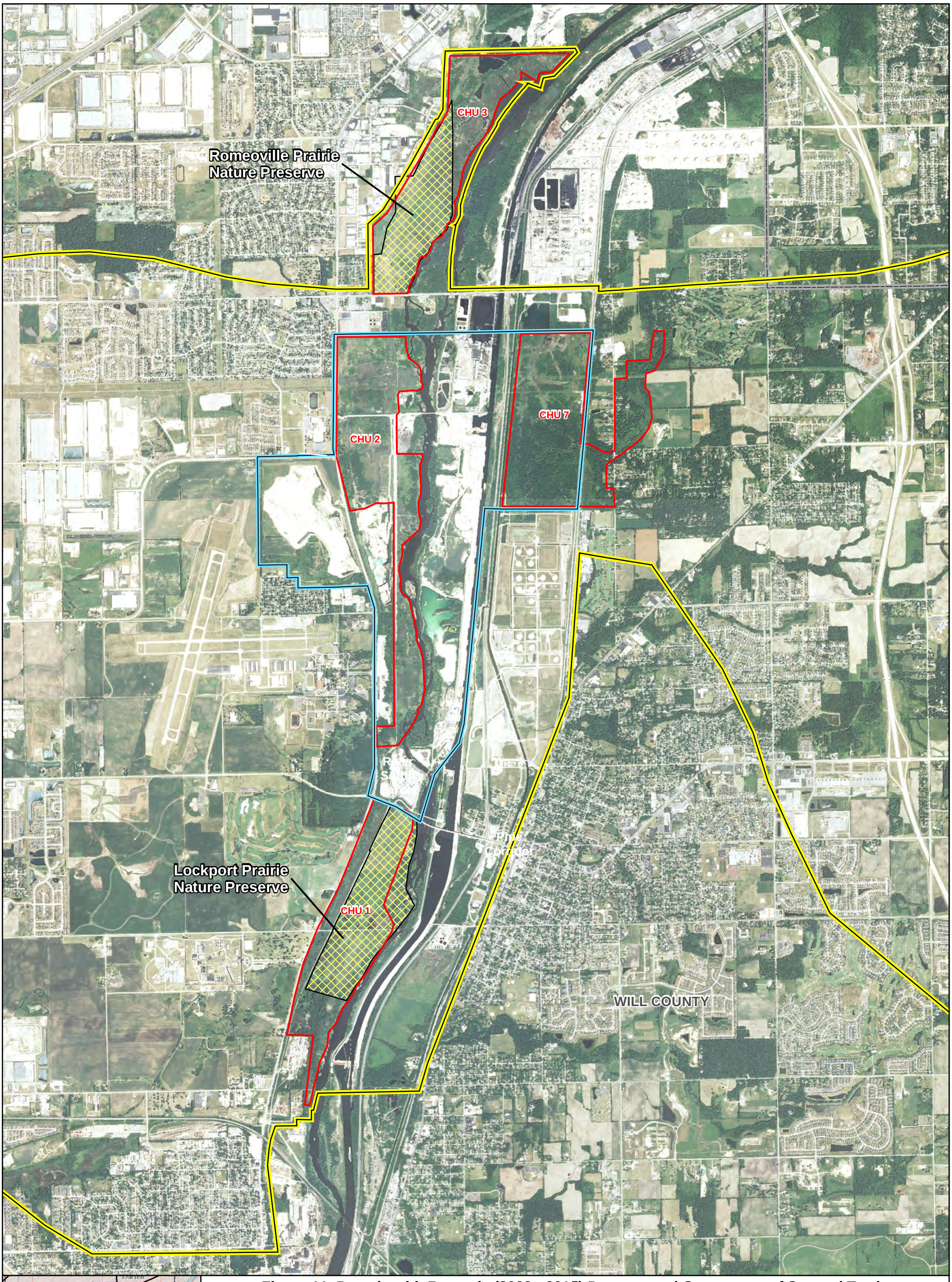
Map produced by: AES Last

Modified: May 20, 2019

Legend
- County Boundary
- HCP Planning Area
- HCP Permit Area
- HED Critical Habitat Units
- Parcel Boundary
- Parcel with Recently Documented Occurrence of Blanding's Turtle

Data sources include: AES, INHS Orthophotography: NAIP 2012

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



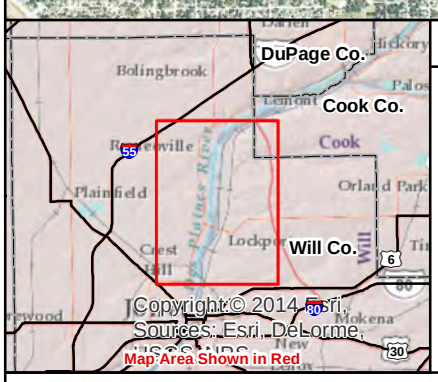


Figure 11. Parcels with Recently (2002 - 2015) Documented Occurrence of Spotted Turtle

Location
Will County, IL

0 1,500 3,000
Feet

N
W E
S

Map produced by: AES Last

Modified: May 20, 2019

Legend

- County Boundary
- HCP Planning Area
- HCP Permit Area
- HED Critical Habitat Units
- Parcel Boundary
- Parcels with Recently Documented Occurrence of Spotted Turtle

Data sources include: IDNR Orthophotography: NAIP 2012

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

River North Parcel

NRG Energy Will County Station

ComEd Parcel

Far North Parcel

North Parcel

Middle Parcel

Long Run Parcel

River Parcel

River South Parcel

Lockport Prairie

Note: Illinois Natural History Survey used data collected on Blanding's turtle habitat use in 2005 and 2006 in Lockport Prairie Nature Preserve to classify and rank land cover types found in the Des Plaines River Valley as high, moderate, or low potential for use by Blanding's turtles. Then HMS used site-specific knowledge of their property (e.g. hydrology, surrounding land use, invasive species, etc.) and the ecological conditions present to modify the rankings of some areas as appropriate.

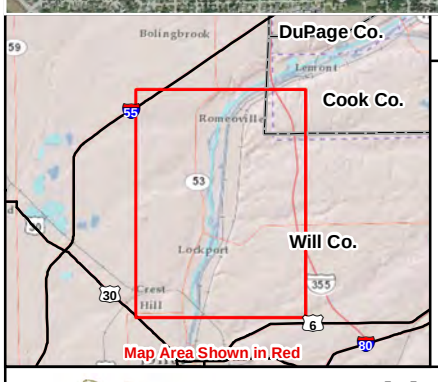


Figure 12. Habitat Ranking Map for the Blanding's Turtle

Location
Will County, IL

0 1,500 3,000 Feet

Map produced by: AES

Last Modified: October 06, 2020

Legend

- HCP Planning Area
- HCP Permit Area
- Property Boundaries
- HED Critical Habitat Units

Blanding's Turtle Habitat Ranking
Acres of Habitat within HMS Parcels within Permit Area

- High (162.4 Acres)
- Moderate (273.3 Acres)
- Low (237.2 Acres)

Data sources include: AES, INHS Orthophotography: NAIP 2017

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

River North Parcel

NRG Energy Will County Station

Far North Parcel

ComEd Parcel

North Parcel

Long Run Parcel

Middle Parcel

River Parcel

River South Parcel

Lockport Prairie

Note: The Blanding's turtle habitat ranking classification was revised by Dave Mauger, a turtle expert with the FPDWC and applied to spotted turtle to create a classification for this turtle. Then based on individual property owner's site-specific knowledge of their property (e.g. hydrology, surrounding land use, invasive species, etc.) and the ecological conditions present, the rankings of some areas were modified as appropriate.

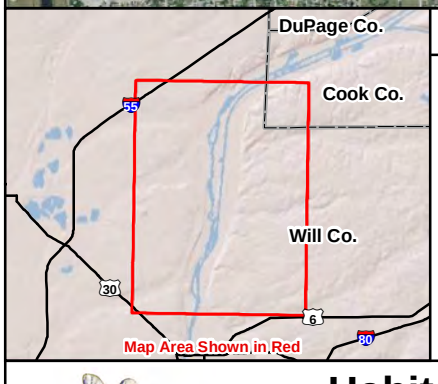


Figure 13: Habitat Ranking Map for the Spotted Turtle

Location
Will County, IL

0 1,500 3,000
Feet

N
W E
S

Map produced by: AES

Last Modified: October 06, 2020

Legend

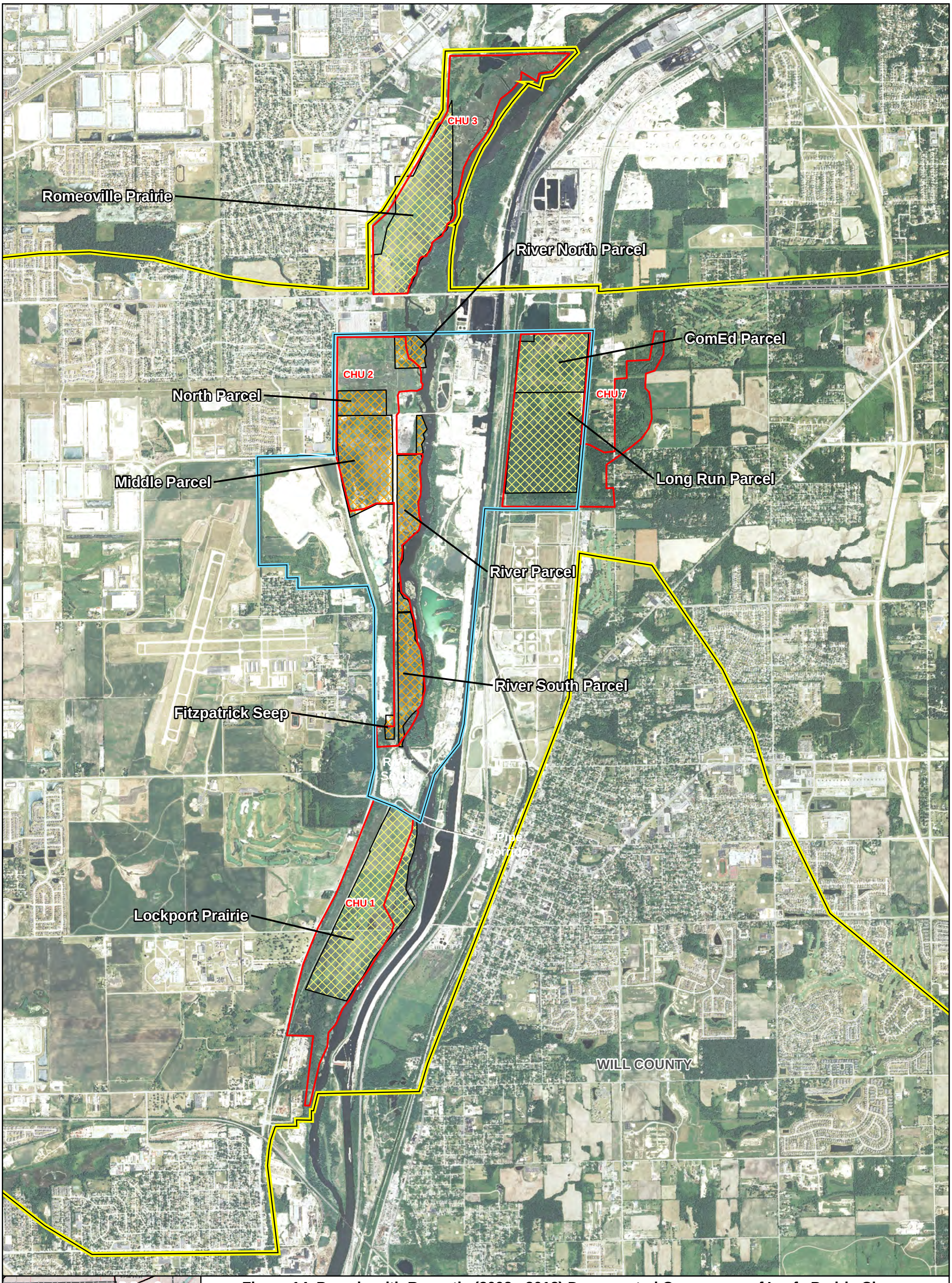
- HCP Planning Area
- HCP Permit Area
- Property Boundaries
- Critical Habitat Units

Spotted Turtle Habitat Ranking
Acres of Habitat within HMS Parcels within Permit Area

- High (179.9 Acres)
- Moderate (255.8 Acres)
- Low (237.2 Acres)

Data sources include: AES, INHS Orthophotography: NAIP 2017

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



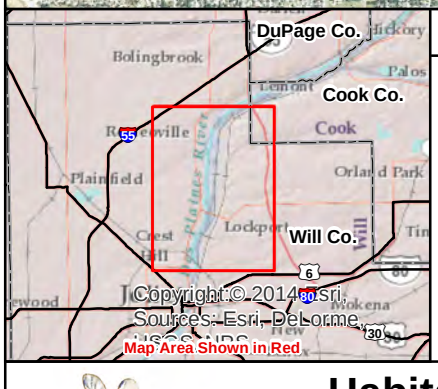


Figure 14. Parcels with Recently (2002 - 2012) Documented Occurrence of Leafy Prairie Clover

Location
Will County, IL

0 1,500 3,000 Feet

Map produced by: AES

Last Modified: June 18, 2015

Legend

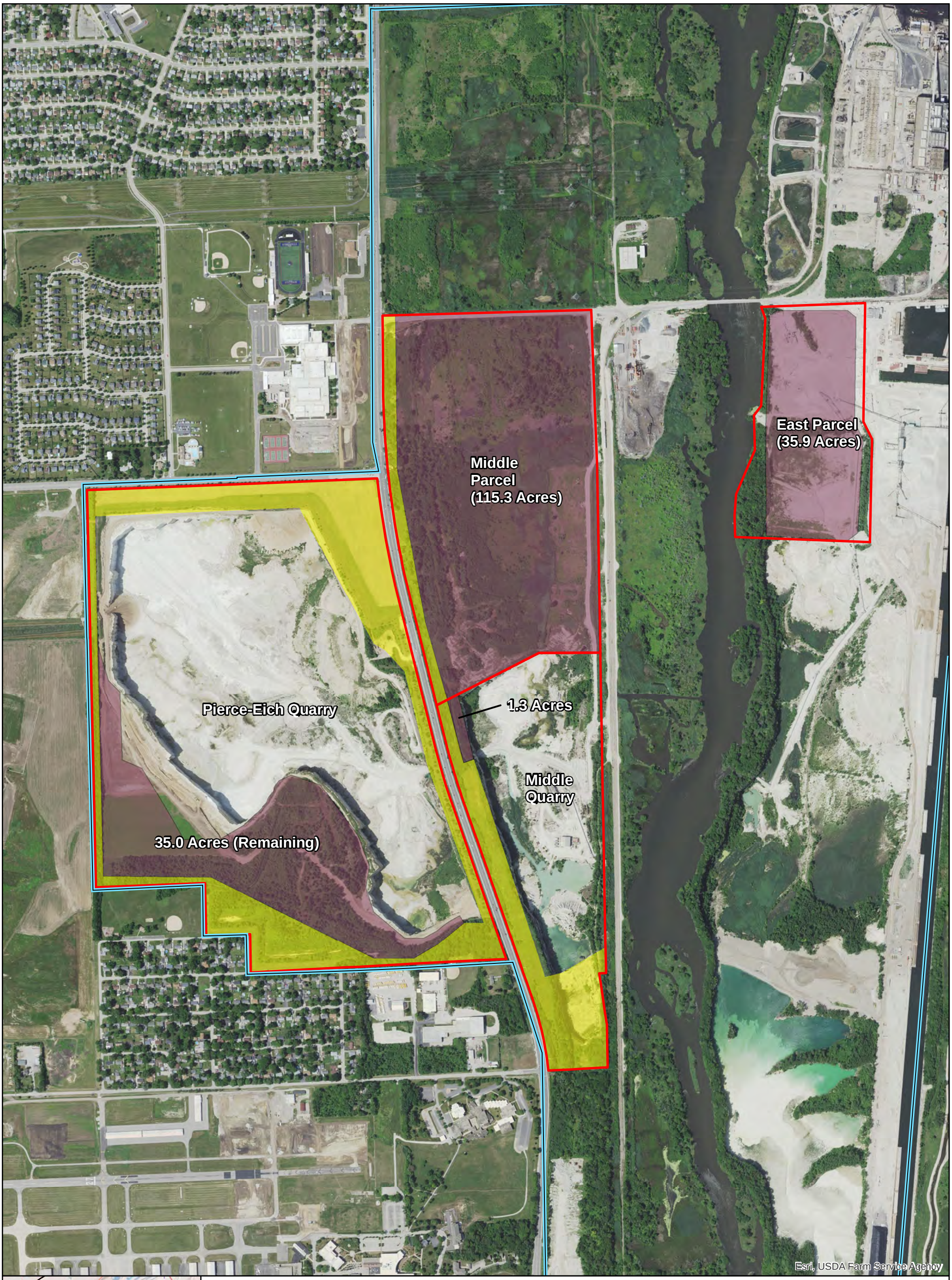
- County Boundary
- HCP Planning Area
- HCP Permit Area
- HED Critical Habitat Units
- Parcel Boundary

Status of Leafy Clover Occurrence

- Parcel with Leafy Prairie Clover
- Parcel Surveyed (No Leafy Prairie Clover Found)

Data sources include: IDNR Orthophotography: NAIP 2012

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



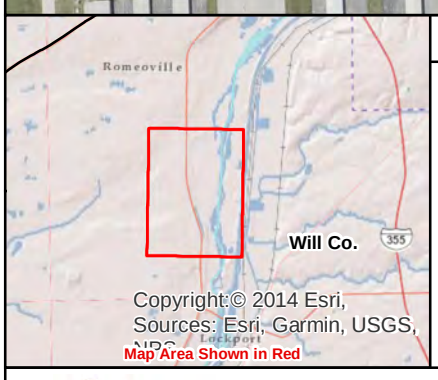


Figure 15.1. HMS Surface Mining Plan

Location
Will County, IL

0 350 700
Feet

N
W E
S

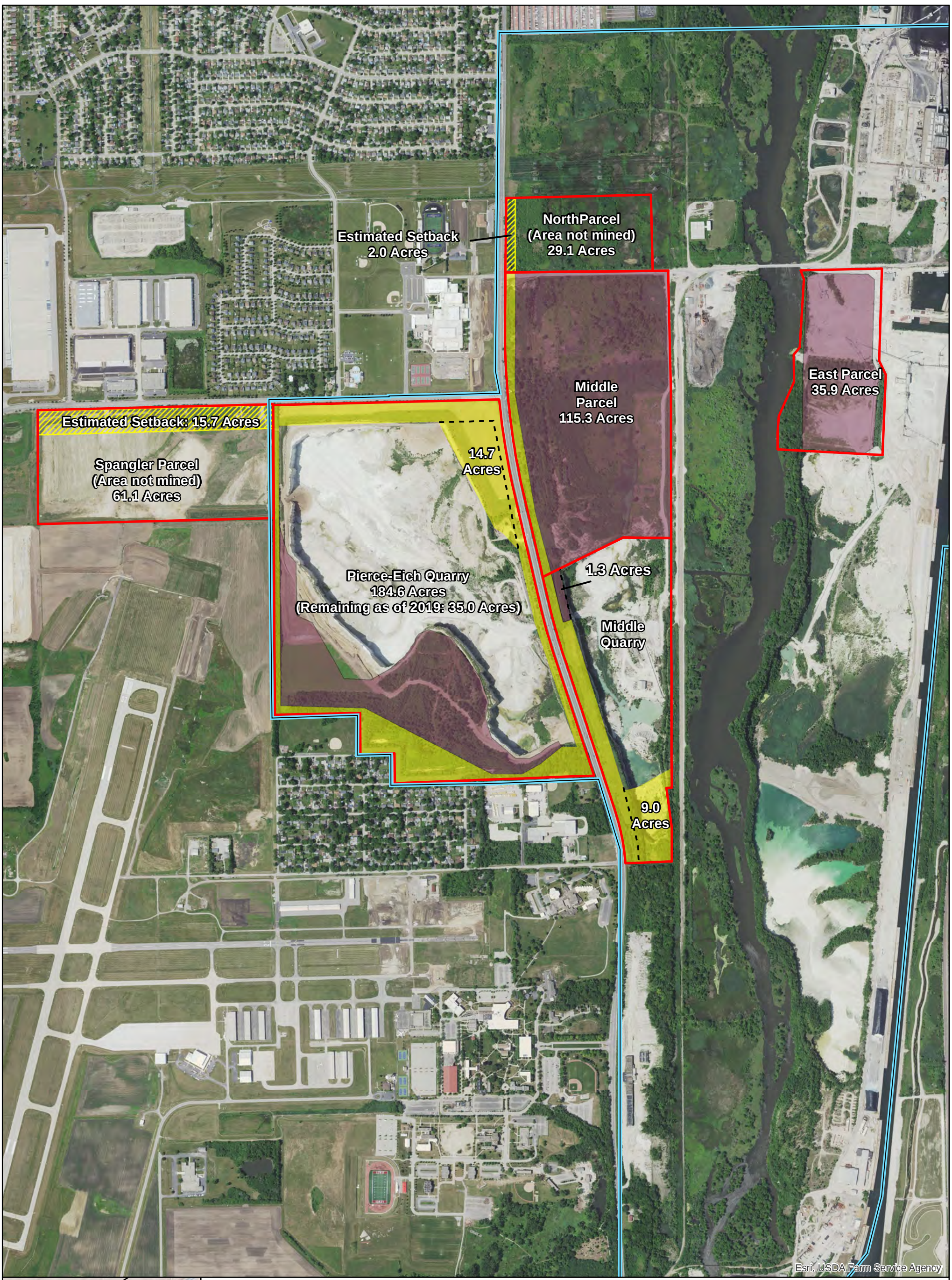
Map produced by:
Applied Ecological Services, Inc.

Last Modified: March 14, 2019

Legend
- HCP Permit Area
- Mining Area
- Setback Area (Unmined)
- Parcel Boundary

Data sources include: HMS **Orthophotography: NAIP 2017**

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



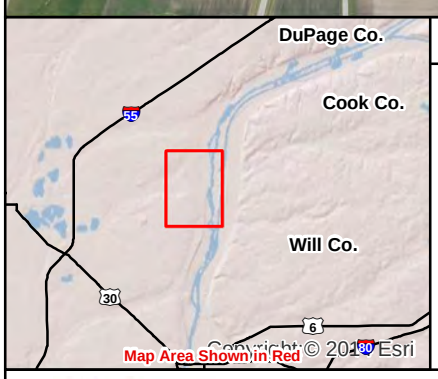


Figure 15.2. HMS Areas Mined and Not Mined

Location
Will County, IL

0 500 1,000 Feet

N W E S

Map produced by:
Applied Ecological Services, Inc.

Last Modified: March 14, 2019

Legend
- HCP Permit Area
- Parcel Boundary
- Mining Area
- Setback Area (Unmined)
- Estimated Setback

Data sources include: HMS **Orthophotography: NAIP 2017**

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

Far North Parcel
River North Parcel
ComEd Parcel
North Parcel
Long Run Parcel
River Parcel
River South Bluff Parcel
River South Parcel
Fitzpatrick Seep Parcel

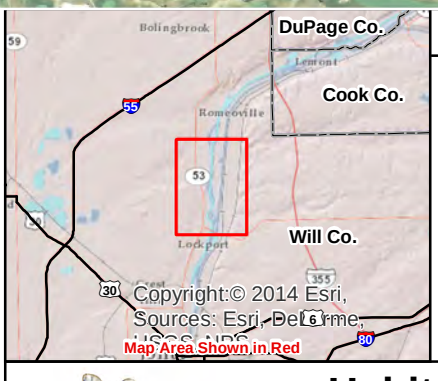


Figure 16. HMS Parcels Protected Under the HCP

Location
Will County, IL

0 625 1,250 Feet

N W E S

Map produced by: AES

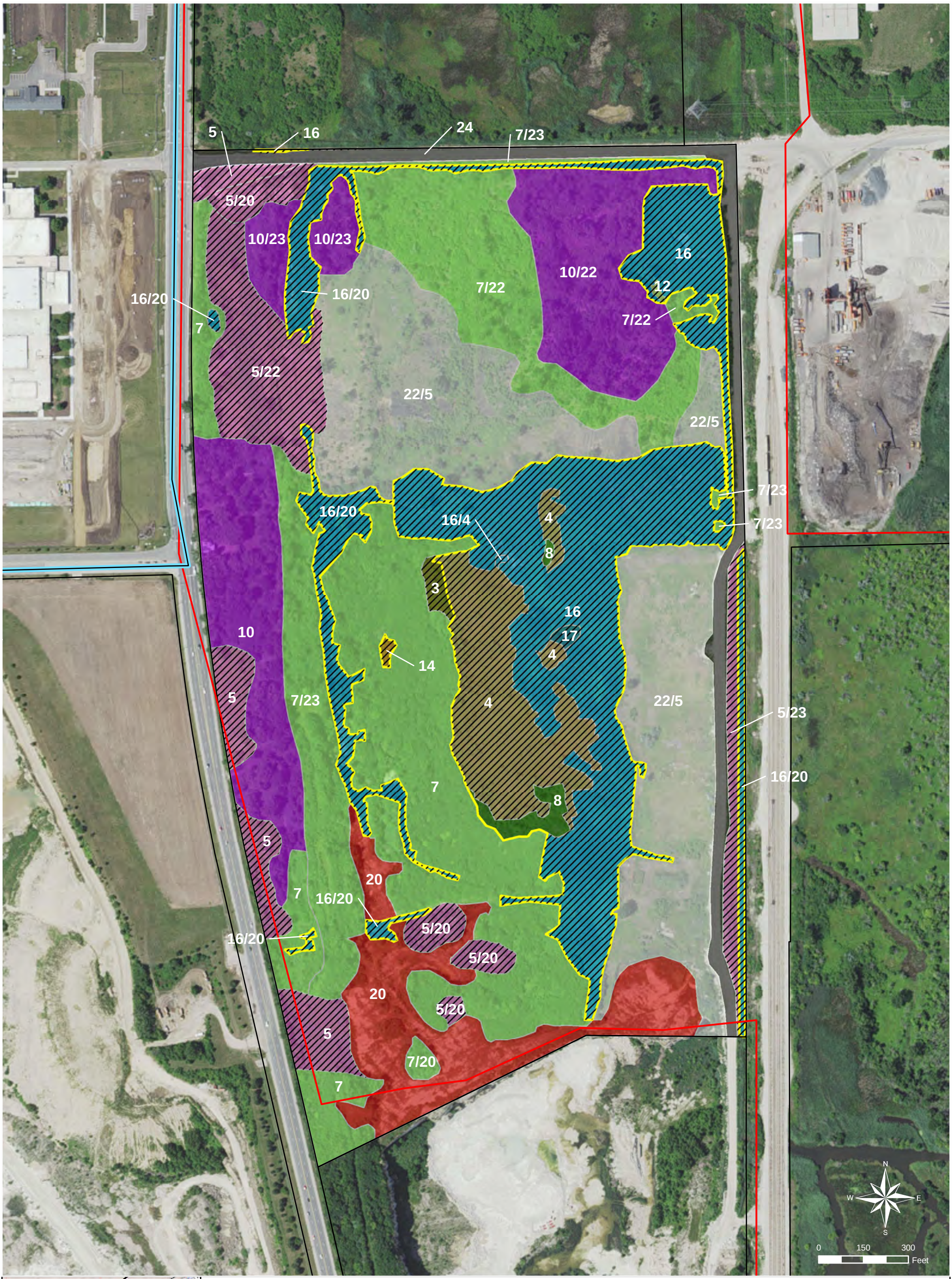
Last Modified: January 11, 2016

Legend
- HCP Planning Area
- HCP Permit Area
- Property Boundaries
- Critical Habitat Units

Type of Protection
- Permanent Protection (530.8 Ac.)

Data sources include: Orthophotography: NAIP 2012

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



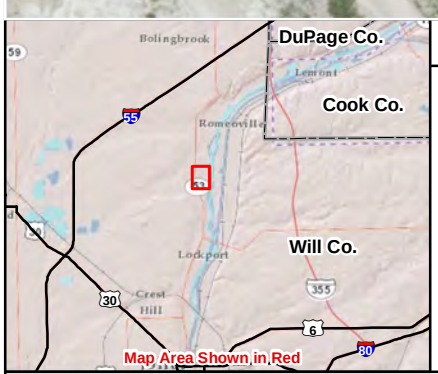


Figure 17: Middle Parcel HED Habitat Impacts

Location
Will County, IL

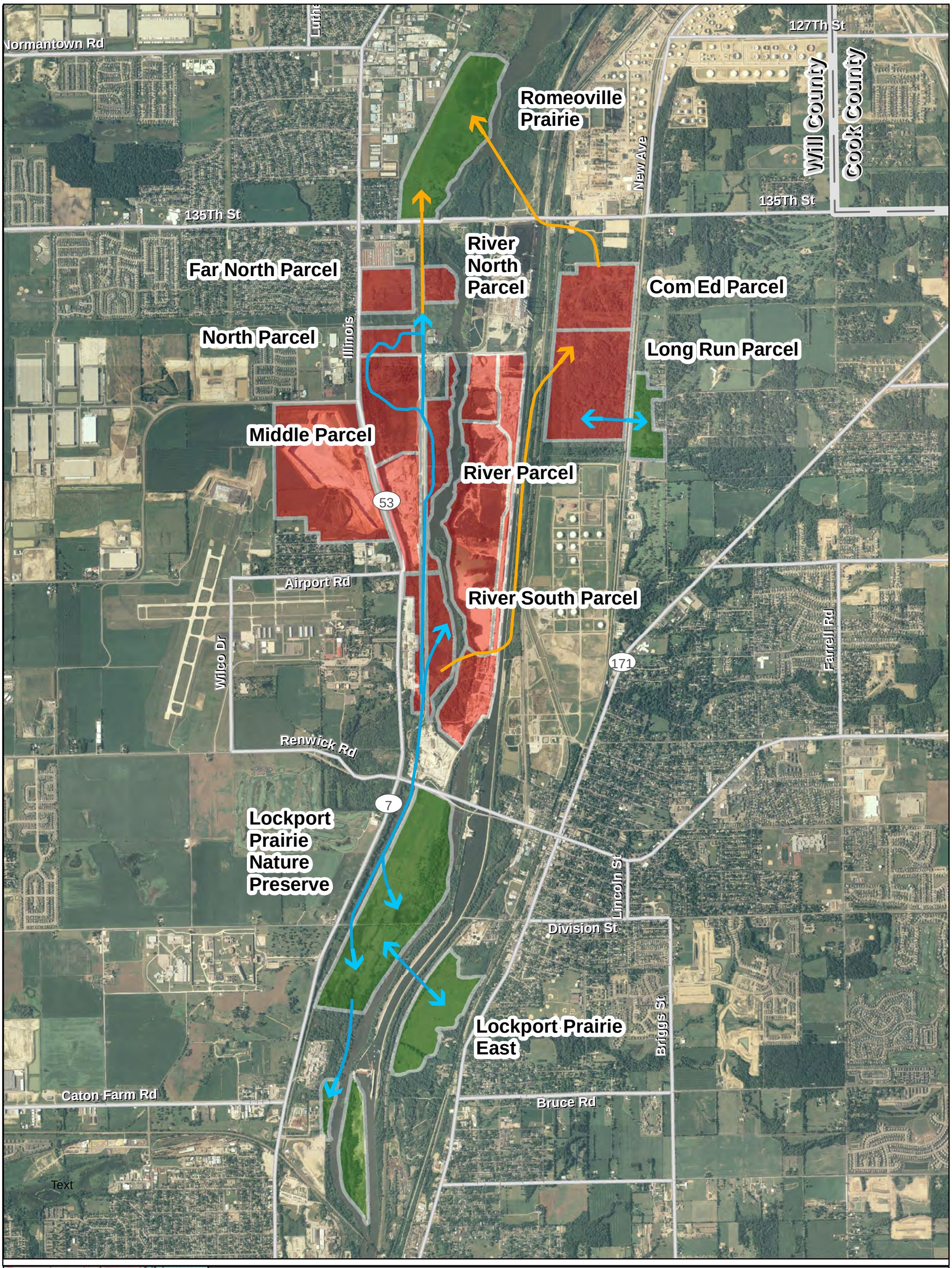
APPLIED ECOLOGICAL SERVICES

Last Modified: October 06, 2020
Map produced by: tos
Sources: AES, NAIP 2019, ESRI, Will County

Legend
- HCP Permit Area
- Property Boundaries
- Critical Habitat Units
- Wetland Impacted Acres: 29.7 ac (updated 2018)
- CHU HED Habitat Impacts (40.1 ac)
- Middle Parcel HED Habitat Impacts (40.8 ac)

Landcover - Middle NRI All (updated 2018)
- 03: Mesic Dolomite Prairie (0.3 acres)
- 04: Wet-Mesic Dolomite Prairie (6.01 acres)
- 05: Old Field/Upland Grassland (11.3 acres)
- 07: Shrubland Upland (32.6 acres)
- 08: Shrubland Bottomland (0.7 acres)
- 10: Woodland Upland (15.8 acres)
- 12: Wet Prairie/Sedge Meadow (0.04 acres)
- 14: Wet Meadow-Reed Canary (0.1 acres)
- 16: Marsh-Phragmities (23.0 acres)
- 17: Marsh-Cattail (0.1 acres)
- 20: Scraped (7.8 acres)
- 22: Fill-CCR (22.2 acres)
- 24: Developed (4.8 acres)

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service



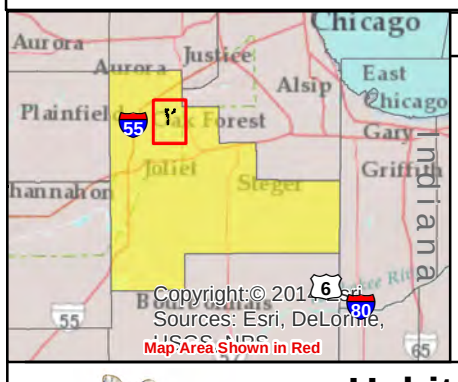


Figure 18. HED Dispersal Map

Location
Will County, IL

0 1,375 2,750 Feet

N W E S

Map produced by: GHD

Last Modified: June 18, 2015

- HMS Parcels
- Other HED Habitat Sites
- Will County, IL
- County Boundaries
- Confirmed Dispersal
- Potential Dispersal

Data sources include: ESRI World Imagery, StreetMap USA, National Atlas, USGS 2007 NAIP Orthoimagery, 2015 Parcel Data, GHD.

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

APPENDIX B:

HED Habitat Mapping

HMS Hine's Emerald Dragonfly Habitat Conservation Plan
February 3, 2021

Methods Used to Map Hine's Emerald Dragonfly Habitat within the Habitat Conservation Plan Permit Area

Prepared by: Brian Bub, Stantec
Randy Boisvert, HMS
Bill Stoll, AES
Julia Wozniak, MWGen
Sara Race, ComEd
Marcy Knysz, Cardno JFNew

Date: September 5, 2012 (revised December 11, 2013 and May 28, 2019)

As part of the Hine's Emerald Dragonfly (HED) Habitat Conservation Plan (HCP), the Lead Partners – Hanson Material Service (HMS), Midwest Generation EME LLC (MWGen), and Commonwealth Edison (ComEd) – retained the services of HED experts Dr. Dan Soluk, University of South Dakota, and Ken Mierzwa, GHD, to complete a comprehensive assessment of the HED population within the Lower Des Plaines River Valley, Illinois. Soluk and Mierzwa completed their assessment based on a thorough review of adult and larval survey data collected from various sites between 1996 and 2011. The results of the review were summarized in a report entitled "An Assessment of Hine's Emerald Dragonfly (*Somatochlora hineana*) Population Size in the Lower Des Plaines River Valley, Illinois" which was presented to the HCP Lead Partners in January 2012. As part of the HCP, the Lead Partners have mapped areas of larval habitat referred to in the Soluk and Mierzwa population report, as well as adult habitat present within HED Critical Habitat Units (CHUs). The purpose of this appendix is to summarize the methods used for mapping larval and adult habitat in CHUs within the HCP Permit Area as depicted on figures in the HCP.

Larval Habitat

Larval habitat as described by Soluk and Mierzwa (2012) was based on the HED Larval Primary Constituent Elements (PCEs) which include:

1. Organic soils (histosols, or with organic surface horizon) overlying calcareous substrate (predominantly dolomite and limestone bedrock).
2. Calcareous water from intermittent seeps and springs and associated shallow, small, slow flowing streamlet channels, rivulets, and/or sheet flow within fens.
3. Emergent herbaceous and woody vegetation for emergence facilitation and refugia.
4. Occupied burrows maintained by crayfish for refugia.
5. Prey base of aquatic macro-invertebrates, including mayflies, aquatic isopods, caddisflies, midge larvae, and aquatic worms.

Using the HED Larval PCEs as a guide, four different HED larvae habitat categories were mapped. Each category is listed and defined below:

- HED Larvae Occupied Rivulets – Rivulets that contain all HED Larval PCEs, have been sampled at least one time between 1996 and 2011, and have been documented as supporting HED larvae during one or more sampling events. Average width of rivulet channels is 1.0 feet (0.3 m), and lateral movement of larvae outside of the rivulet channel

is assumed to extend up to 1.6 feet (0.5 m) from the center of the channel for a total occupied width of 3.3 feet (1.0 m).

- HED Larvae Habitat Areas – Larval habitat areas lack well defined rivulet channels, but are influenced by subsurface flow or upwelling. These areas contain all HED Larval PCEs, have been sampled at least one time between 1996 and 2011 (or since), and have been documented as supporting HED larvae during one or more sampling events.
- Undocumented Rivulets – Rivulets that contain all HED Larval PCEs, have been sampled at least one time between 1996 and 2011 (or since), but have not yet been documented as supporting HED larvae.
- Historic HED Larvae Habitat Areas – Areas that contained all HED Larval PCEs at one time, and were documented as supporting HED larvae 15 or more years ago. These areas no longer contain all HED Larval PCEs, have been sampled one or more times between 1994 and 2011 (or since), but have not been documented as supporting larvae in the last 15 years. Or an area or rivulet that has been documented as supporting HED larvae in the last 15 years but conditions of the area have changed since the documentation to make it unsuitable for HED larvae.

Adult Habitat

Similar to larval habitat, HED adult habitat was mapped based on HED Adult PCEs which include:

1. Natural plant communities near the breeding/larval habitat which may include fen, marsh, sedge meadow, dolomite prairie, and the fringe (up to 328 feet [100 m]) of bordering shrubby and forested areas with open corridors for movement and dispersal.

2. Prey base of small flying insect species (e.g., dipterans).

Only one category was designated as HED adult habitat:

- HED Adult Habitat Areas – Adult habitat areas contain both of the HED Adult PCEs. The areas include all open wetland and adjacent open upland habitats within CHUs. Developed and hard-scape areas (e.g. roads, railroads, parking lots, industrial sites, fly ash fill) are excluded. This mapping convention was agreed to in consultation among the Lead Partners, Dr. Dan Soluk, Ken Mierzwa, and Kris Lah, Endangered Species Team Leader, USFWS.

The adult habitat areas were mapped using a combination of Lead Partner habitat assessments for their respective properties, vegetation community maps acquired from area Forest Preserve Districts (e.g. shape files), and heads-up digitizing through desktop aerial photo interpretation for areas without existing or available vegetation community data.

Table B-1. Acreages of adult and larval habitat within the CHUs.

CHU / Location / Name	*HED Habitat Type (acres)*		*Historically Documented HED Larval Habitat (acres)*	*Totals*
	Adult Habitat Only	*Larval Habitat*		
CHU-1	**231.549**	**0.290**		**231.839**
Lockport Prairie	231.549			231.549
Lockport Prairie 1FS				
1FS (FRENCH DRAIN)		0.004		0.004
Lockport Prairie 1S Lower				
RIVULET 1S		0.057		0.057
Lockport Prairie 1S Upper				
RIVULET 1S UPPER		0.062		0.062
Lockport Prairie 2FS				
2FS (FRENCH DRAIN)		0.004		0.004
Lockport Prairie 2N				
RIVULET 2N		0.045		0.045
Lockport Prairie 2S				
RIVULET 2S		0.118		0.118
CHU 2	**200.765**	**0.258**	**2.033**	203.056
Far North Parcel	26.713			26.713
Middle Parcel	38.493		1.559	40.052
Midwest Gen Station	13.814			13.814
North Parcel	18.324			18.324
River North Parcel	1.986			1.986
River Parcel	30.747			30.747
ComEd ROW	30.085			30.085
River South	39.954			39.954
River South 2.0 and 2.5				
RIVULET 2.0 and 2.5		0.079		0.08
River South 3.0				
RIVULET 3.0		0.031		0.031

River South 5.0				
RIVULET 5.0		0.020		0.020
River South 6.0				
RIVULET 6.0		0.021		0.021
River South Emerald Meadow				
EMERALD MEADOW		0.107		0.107
River South South Meadow				
SOUTH MEADOW			0.474	0.474
Fitzpatrick Seep				
	0.649			0.649
CHU 3	**260.296**			260.296
Romeoville Prairie				
	260.296			260.296
CHU 4	**311.726**	**0.025**		311.751
Black Partridge				
	193.500			193.500
Keepataw Preserve				
	118.226			118.226
Keepataw Preserve				
KPE1		0.002		0.002
KPE2		0.015		0.015
KS2T5 PLE		0.008		0.008
CHU 5	**202.523**	**0.014**		202.551
Waterfall Glen				
	202.523			202.523
Waterfall Glen				0
WG2		0.014		0.014
CHU 6	**177.189**	**0.062**		177.251
McMahon Woods				
	177.189			177.189
McMahon Woods				
McMahon Str1		0.027-0.033		0.033
McMahon Str2		0.009-0.014		0.014
McMahon Str9		0.012		0.012
McMahon Str11		0.003		0.003
CHU 7	**139.106**	**0.025**	**0.012**	**139.143**
ComEd Parcel				
	47.683			47.683
Long Run Parcel				
	62.405			62.405

Long Run Parcel LPO Str1			0.012	0.011
Long Run Seep	29.018			29.018
Long Run Seep Str		0.025		0.025
Grand Total	**1523.154**	**0.674**	**2.045**	**1525.873**

APPLIED ECOLOGICAL SERVICES
SPECIALISTS IN ECOLOGICAL SCIENCE, RESTORATION, MANAGEMENT, AND RESEARCH
120 W MAIN ST • WEST DUNDEE, IL 60118 • (847) 844-9385

Memorandum

To: Kris Lah and Louise Clemency (USFWS)

From: Bill Stoll (AES) and Randy Boisvert (HMS)

Date: 10/31/14 (updated 05/28/19)

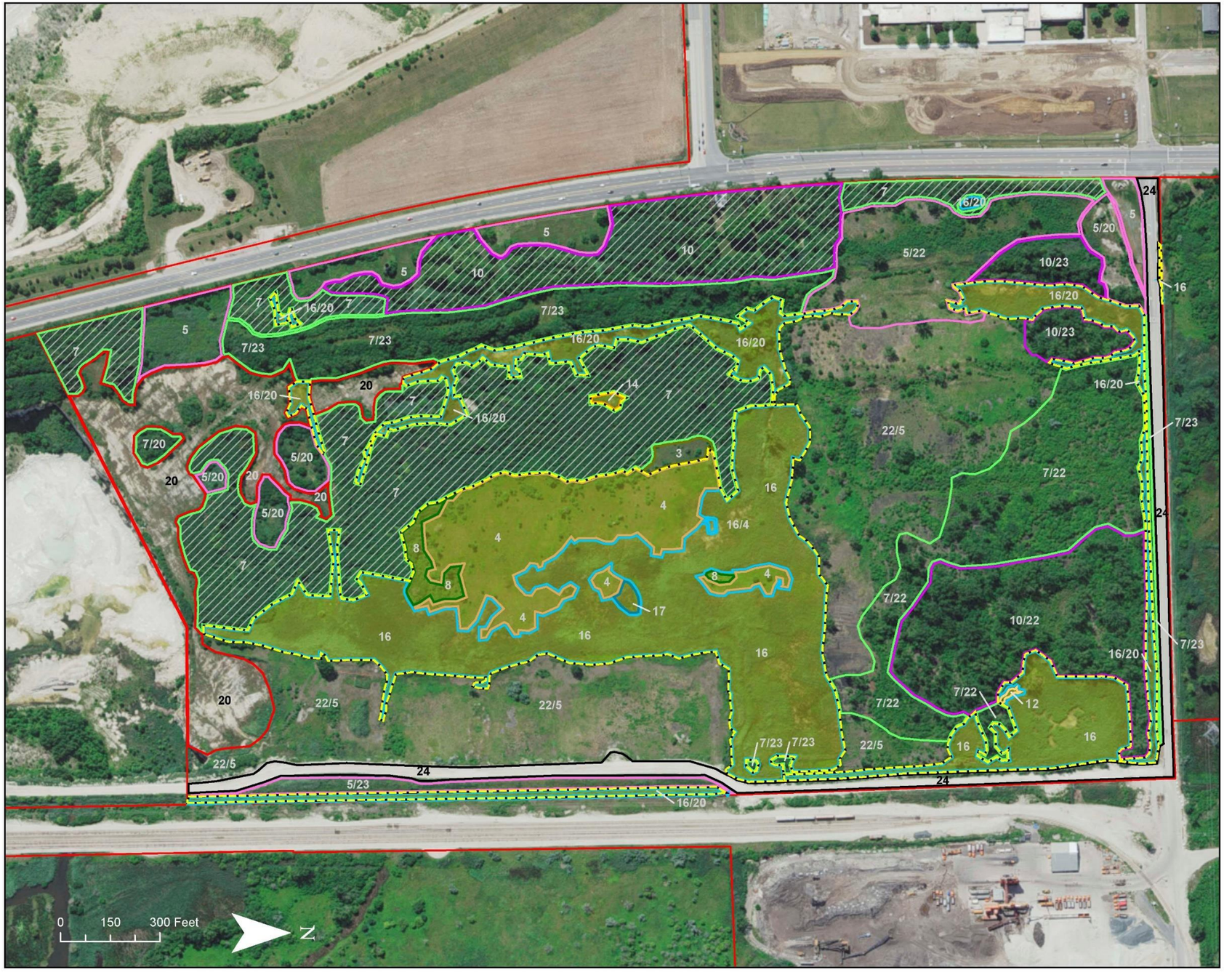
RE: Existing and restorable habitat in HMS' Middle Parcel

On page 1 of the USFWS comments on the Executive Summary and Chapters 1-3 of the Draft HCP several questions were asked about adult HED habitat on Middle Parcel. These included: 1) how current habitat was determined, 2) why other areas were excluded, and 3) how much of the excluded area could be restored to habitat? Our response to these three questions is below.

1. Yes, current adult habitat was determined using the habitat mapping protocol found in Appendix B of the Draft HCP. Mapping of adult habitat was based on the presence of both adult PCEs. In the end, all parties involved in the mapping agreed that the best way to map this was to include all open wetlands and adjacent open uplands, excluding developed and hard-scrape areas such as roads, parking lots and fill areas. Using this protocol 40.1 acres of current adult habitat was mapped on Middle Parcel (see HCP Figure 9.2 attached).

2. Areas excluded from adult habitat on Middle Parcel and other CHUs are those that are dominated by woody growth (i.e. typically invasive shrubs or weedy native trees or both), developed (e.g. roads), or significantly disturbed is some other way (e.g. scraped or filled areas). These areas do not contain both adult PCEs.

3. There is about 24.9 acres of restorable adult HED habitat on Middle Parcel (see attached map). Restorable habitat includes all areas that are not currently habitat but could be restored to adult habitat using typical restoration methods for the Chicago Area and the Midwest, such as brushing, herbiciding, burning, and seeding and/or planting. In Middle Parcel, restorable habitat includes all upland shrubland and woodland areas (see attached map). Restorable adult habitat does not include areas that require grading or significant hydrological modification to establish the appropriate native plant communities. Therefore, it does not include any fill or scrape areas because these areas would require earth moving to be restored to an appropriate native community.



Restorable Areas in Middle Parcel

Hanson Material Service Corporation

Romeoville, Will County, Illinois

- Parcel Boundary (124.8 acres)
- Wetland (29.74 acres)
- Restorable Habitat (24.85 acres)

Landcover Type

- 01: Dry Dolomite Prairie (0.0 acres)
- 02: Dry-Mesic Dolomite Prairie (0.0 acres)
- 03: Mesic Dolomite Prairie (0.30 acres)
- 04: Wet-Mesic Dolomite Prairie (6.01 acres)
- 05: Old Field/Upland Grassland (11.30 acres)
- 06: Old Field/Wet (0.0 acres)
- 07: Shrubland Upland (32.62 acres)
- 08: Shrubland Bottomland (0.67 acres)
- 09: Savanna (0.0 acres)
- 10: Woodland Upland (15.84 acres)
- 11: Woodland Bottomland (0.0 acres)
- 12: Wet Prairie/Sedge Meadow (0.04 acres)
- 13: Wet Dolomite Prairie (0.0 acres)
- 14: Wet Meadow-Reed Canary (0.08 acres)
- 15: Marsh-Bulrush/Sweet Flag (0.0 acres)
- 16: Marsh-Phragmities (22.96 acres)
- 17: Marsh-Cattail (0.12 acres)
- 18: Pond/Open Water (0.0 acres)
- 19: Spring/Seep (0.0 acres)
- 20: Scraped (7.84 acres)
- 21: Surface Mined (0.0 acres)
- 22: Fill-CCR (22.21 acres)
- 23: Fill-Other Material (0.0 acres)
- 24: Developed (4.82 acres)

Applied Ecological Services, Inc.
17921 W Smith Rd
Brodhead, WI 53520
Phone: 847-844-9385
Email: info@appliedeco.com
www.appliedeco.com

Data Sources:
NAIP 2017 (aerial, 1m)
Coordinate System:
IL SP East NAD83

AES Project #: 19-0054

Revisions:
05May2009 - first draft

Mapped by:TOS
October 06, 2020

HMS Hine's Emerald Dragonfly Habitat Conservation Plan
February 3, 2021

APPENDIX C:

Additional Tables

Table C-1: Annual adult HED observations at Middle Parcel.

Year	Number of Transects	Number of Observations	Estimated density (per hectare)	Estimated population size
1995	28	1	n/a	n/a
1996	48	6	0.24	2
1997	48	3	0.14	1
1998	32	3	0.27	2
1999	48	14	6.06	51
2000	48	11	4.24	36
2001	36	5	0.6	5
2002	36	9	0.69	6
2003	36	6	0.75	6
2004	36	11	1.14	10
2005	36	0	0	0
2006	36	2	0.2	2
2007	36	4	0.23	2
2008	36	3	0.53	4
2009	36	1	0.19	2
2010	36	1	0.18	0
2011	36	4	0.57	4
Mean		**5**	**0.94**	**8**

*modified from Mierzwa and Webb 2012a

Table C-2: Annual adult HED observations at Long Run/ComEd Parcel.

Year	Number of Transects	Number of Observations	Estimated density (per hectare)	Estimated population size
2004	12	4	0.37	--
2005	18	0	0.00	--
2006	18	9	0.49	--
2007	18	7	0.32	--
2008	18	3	1.09	--
2009	18	2	0.18	--
2010	20	7	1.44	60
2011	15	3	0.36	5
Mean		**4**	**0.46**	**n/a**

*modified from Mierzwa and Webb 2012b

Table C-3: Annual adult HED observations at River South.

Year	Number of Transects	Number of Observations	Estimated density (per hectare)	Estimated population size
1995	32	48	4.83	180
1996	48	92	2.92	109
1997	48	96	3.44	131
1998	32	98	6.91	308
1999	48	97	4.73	211
2000	48	99	5.87	262
2001	36	55	2.67	119
2002	36	79	4.89	218
2003	36	15	1.37	61
2004	36	24	1.56	70
2005	36	3	0.20	9
2006	36	6	0.40	18
2007	36	20	1.20	54
2008	36	10	1.16	52
2009	36	6	0.80	36
2010	36	4	0.29	13
2011	36	13	1.61	71
2012	36	13	1.61	71
Mean		**43**	**2.58**	**111**

*modified from Mierzwa and Webb 2012d

Table C-4: HCP Habitat rankings for Blanding's and spotted turtle.

Habitat	Classification for Blanding's turtle	Classification for Spotted turtle
Pond	High	High
Marsh-Cattail	High	High
Wet Prairie/Sedge Meadow	High	High
Marsh-Bulrush	High	High
Wet Prairie-Reed Canary Grass	High	High
Wet Mesic to Wet Dolomite Prairie	Moderate	High
Bottomland Shrubland	Moderate	Moderate
Bottomland Woodland	Moderate	Moderate
Dry Mesic - Mesic Dolomite Prairie	Moderate	Moderate
Dry Dolomite Prairie	Moderate	Moderate
Old Field/Upland Grassland	Moderate	Moderate
Marsh-*Phragmites*	Moderate	Moderate
Grassland/Open Canopy Habitat Adjacent to Wetland	Moderate	Moderate
Developed	Low	Low
Turf	Low	Low
Upland Shrubland	Low	Low
Upland Woodland	Low	Low
Mined Lands	Low	Low
Fill/Fly Ash	Low	Low

*based on data collected on Blanding's turtle habitat use at Lockport Prairie from 2005 to present and consultation with Dave Mauger of the FPDWC.

Note: Joint habitat types are not included. If a joint habitat type (e.g. 6/12/14/15) includes any or part of a primary habitat type that is deemed "critical", that joint category should also be deemed critical.

Table C-5: Potential habitat for Blanding's and spotted turtle on HMS Parcels.

Blanding's Turtle Potential Habitat Acreage on HMS Parcels					
HMS Parcels	**Habitat Rankings**			**Total Acreage (High, Moderate)**	**Total Acreage**
	High	**Moderate**	**Low**		
ComEd Parcel	24.13	39.78	39.04	63.91	102.95
Far North Parcel	5.73	12.83	31.84	18.56	50.40
Fitzpatrick Seep	0.16	1.76	3.56	1.92	5.48
Long Run Parcel	51.94	121.82	8.81	173.76	182.57
Middle Parcel	0.12	29.02	95.75	29.14	124.89
North Parcel	11.33	8.89	11.20	20.22	31.42
River North Parcel	6.98	7.65	10.19	14.63	24.82
River Parcel	23.43	26.50	11.05	49.93	60.98
River South Bluff	0.99	1.40	21.32	2.39	23.71
River South Parcel	37.60	24.70	3.44	62.30	65.74
Grand Total	**162.41**	**274.35**	**236.20**	436.76	672.96

Spotted Turtle Potential Habitat Acreage on HMS Parcels					
HMS Parcels	**Habitat Rankings**			**Total Acreage (High, Moderate)**	**Total Acreage**
	High	**Moderate**	**Low**		
ComEd Parcel	34.40	29.51	39.04	63.91	102.95
Far North Parcel	5.73	12.83	31.84	18.56	50.40
Fitzpatrick Seep	0.16	1.76	3.56	1.92	5.48
Long Run Parcel	51.94	121.82	8.81	173.76	182.57
Middle Parcel	6.17	22.97	95.75	29.14	124.89
North Parcel	12.48	7.72	11.20	20.20	31.40
River North Parcel	6.98	7.65	10.19	14.63	24.82
River Parcel	23.43	26.50	11.05	49.93	60.98
River South Bluff	0.99	1.40	21.32	2.39	23.71
River South Parcel	37.60	24.70	3.44	62.30	65.74
Grand Total	**179.88**	**256.86**	**236.20**	436.74	672.94

Table C-6: Summary of recorded surveyed and planted leafy prairie clover plants completed by Forest Preserve District of Will County from 1983-2011.

Year	Romeoville Prairie	Lockport Prairie Nature Preserve	Lockport Prairie East	Keepataw Prairie
1983	159	no data	no data	no data
1986	347	no data	no data	no data
1987	156	no data	no data	no data
1988	271	no data	no data	0
1989	no data	no data	no data	24
1990	380	1514	no data	2000
1991	651	2803	no data	no data
1992	295	4105	no data	50
1993	385	no data	no data	118
1994	no data	5424	no data	no data
1996	1870	1768	no data	no data
1998	2616	no data	no data	98
1999	1510	no data	no data	82
2000	1627	1906	no data	333
2002	674	2481	no data	143
2003	1232	5016	no data	1196
2004	no data	4570	no data	no data
2005	609	2061	no data	1519
2006	2726	13345	no data	0
2008	177 found \ 553 planted	428 found	94 planted	100 planted
2009	143 found \ 178 planted	327 found	7 planted	0
2010	46 found \ 41 planted	217 found	1190 found / 12 planted	no data
2011	40 found \ 80 planted	257 found	no data	no data

*Note – Beginning in 2008 plots were used instead of entire site counts

Table C-7: Alternative Analysis Comparison Table
10/8/2020

Potential Mining Parcels Evaluated during the Alternatives Analysis

Areas That Could be Mined	Acres of Surface Mining	Limitations to Mining	Number of HED Adults Taken	Number of HED Larvae Taken	Acres of Adult HED Critical Habitat Impacted	Acres of Larval HED Critical Habitat Impacted	HED Larval Habitat That may be Hydrologically Impacted	Degree of Hydrological Impacts	Number of Blanding's Turtles Taken	Number of Spotted Turtles Taken	Proposed AMMs or Mitigation to Address Impacts
West Quarry (Pierce Eich)* - 19% of proposed surface mining alternative	35.0	None.	0	0	0 ac. (directly); Potentially indirectly - Middle Parcel (40.8 ac), River South (40.0 ac) and LPNP (231.8 ac total adult habitat - but only northern portion (N of Division St.) may be impacted) (acreages from HED habitat maps - Fig 9.0-9.7, Appendix A; and Table 1, Appendix B)	0 ac. (directly); Indirectly - River South (0.26 ac) and LPNP (0.29 ac total larval habitat - but only habitat north of Division St. (Rivulet 2N, 0.05 ac) could be potentially impacted)	River South - Larval habitat areas predicted to be adversely impacted by modeled/potential groundwater change.	Moderate to potentially substantial. However, hydrological impacts will be avoided by enhancing groundwater supplies. Installation and operation of infiltration galleries in the River South Bluff Parcel will temporarily supplement groundwater levels as needed. Inundation of Pierce Eich after surface mining is complete will restore baseline groundwater conditions to River South.	None. Groundwater impacts could result in habitat modification that could possibly cause "harm" to BT. This potential change in vegetation will have only a minor impact on BT because there will still be plenty of adjacent and nearby appropriate habitat (e.g. along the river). In addition, AMMs designed to avoid groundwater impacts will be installed, and thus no change in vegetation is expected to occur and as a result no harm or take.	None. No ST found on site - impact to potential habitat is not "harm" and thus not "take." In addition, AMMs designed to avoid groundwater impacts will be installed, and thus no change in vegetation.	Groundwater Enhancements in River South Bluff Parcel (infiltration galleries) and inundation of Pierce Eich to provide a long-term solution.
							LPNP - Potential minor groundwater impacts to larval and adult habitat north of Division St.	Potentially minor to negligible and limited to far north end of parcel. Potential hydrological impacts will be avoided through groundwater enhancement installation(s) (FPDWC Property infiltration pond (at Renwick & Rt. 53)). Inundation of Pierce Eich will prevent long-term impacts.	None. Potential impacts not enough to modify/impact habitat enough to cause "harm" and constitute "take." Even if a change in vegetation occurs there will still be plenty of adjacent and nearby appropriate habitat. In addition, AMMs designed to avoid groundwater impacts will be installed, and thus no change in vegetation.	None. Potential impacts not enough to modify/impact habitat enough to cause "harm" and constitute "take." Even if a change in vegetation occurs due to drier conditions there will still be plenty of adjacent and nearby appropriate habitat. In addition, AMMs designed to avoid groundwater impacts will be installed, and thus no change in vegetation.	Groundwater Enhancements near LPNP (i.e. FPDWC property pond at Renwick Rd. & Rt. 53.), Inundation of Pierce Eich will provide a long-term solution.
							RPNP - None. No occupied larval habitat on parcel or groundwater impacts.	None. Groundwater levels at RPNP are not predicted to be impacted from West Quarry mining.	None. No groundwater impacts thus not modifying/impacting habitat.	None. No groundwater impacts, thus not modifying/impacting habitat.	None.
							Middle Parcel - None. No larval habitat on site.	Groundwater impacts may occur - but will be temporary. During mining of the remaining reserves in Pierce-Eich, Middle Parcel may observe small to moderate impacts to groundwater levels due to expansion of the cone of depression into Middle Parcel. However, expansion of the cone will be limited because no new mining will occur in the NE portion of Pierce Eich and only a small portion of reserves remain in the NW portion. Most mining will occur in the SW portion of Pierce-Eich, which is separated from Middle Parcel by areas that have already been mined. The expanded cone of depression in Middle Parcel will be temporary since the Pierce-Eich Quarry will be inundated after mining is complete. Groundwater levels have remained relatively shallow in Middle Parcel over the past decade. Therefore, significant improvement to the parcel's hydrology after the inundation of Pierce-Eich is not expected since groundwater levels are expected to return to conditions that are similar to existing conditions.	Habitat change highly unlikely to occur due to potential groundwater changes; thus, no take. In addition, any groundwater impacts would be for a short duration until Pierce Eich is inundated.	None - Spotted turtle not found on site.	None - Site to be surface mined.
Middle Quarry* - 0.5% of proposed surface mining alternative	1.3	None.	0	0	0 ac.	0 ac.	None.	None.	0	0	None
Middle Parcel* - 61% of proposed surface mining alternative	115.3	29.7 acres of wetlands; all of which will be impacted by mining and will require a USACE permit.	Take – loss of 40.8 acre of adult HED habitat. Number of individuals: 3 annually (through displacement), but this will never be fully realized because restoration of adjacent foraging and dispersal habitat (i.e. River, North, Far North, and River North Parcels) will take place before impacts to habitat on Middle Parcel occur.	None. No larval production on site.	40.8 ac. (directly) in Middle Parcel and (indirectly) in North (18.3 ac.), Far North (26.7 ac.), River North (2.0 ac.), and River (30.7 ac.) Parcels through a predicted reduction in long-term groundwater levels. Both PCE 6 & 7 are present on all of these parcels. However, the natural wetland communities on these parcels are not near larval habitat (>3,000 ft) - but some do provide open corridors for movement. Wetlands in North and Far North Parcels are largely influenced by surface water considering its large watershed (AECOM 2014b), but they may experience quicker water loss between rainfall events especially in areas closest to Middle Parcel (i.e. southern portion of North Parcel). Because of its distance from Middle Parcel and next to the river, River North will not likely observe significant changes in its hydrology. The northwest portion of River Parcel will be drier due to its proximity to Middle Parcel but most of this area is upland - nearly all wetlands in the parcel are along the river and its backwaters. Hydrologic impacts will be reduced under the preferred alternative with the inundation of Pierce Eich Quarry. No impacts are anticipated at River South Parcel and RPNP. In addition, restoration on North, Far North, River North, and River (invasive species removal) will help offset potential negative impacts to habitat.	0 ac. (directly). However, some PCE's are present on Middle Parcel (1 (<25 ac), 3 (23 ac), & 5 (29.7 ac)) and will be directly impacted. 0 (indirectly) Possible indirect impact may occur at North, Far North, River North, and River Parcels related to a predicted decrease in groundwater levels. Some larval PCEs are present on these parcels: 3 and 5 in Far North, River and River North Parcels, and 3, 4, and 5 in North Parcel. No larval habitat is found on any of these parcels. These impacts will be reduced under the preferred alternative since the inundation of Pierce Eich Quarry will reduce predicted drawdown in these parcels.	No direct and indirect hydrological impacts to larval HED habitat from mining MP will occur because no larval habitat is found in Middle, North, Far North, River North, or River Parcels. North Parcel potential larval habitat is considered marginal. Far North and River North Parcels contain no suitable larval habitat.	Moderate. Areas adjacent to the north and east side of Middle Parcel are likely to experience a lowered water table. Predicted impacts to the water table decrease as distance from Middle Parcel increases. To the north it may extend to Far North Parcel and SW portion of River North Parcel. Discharge of large quantities of surface water runoff in North and Far North Parcels minimizes these groundwater impacts. These impacts will be further reduced under the preferred alternative with the inundation of Pierce Eich. River Parcel is also likely to experience a lowered water table. This impact is limited by the influence of the river and the fact that the northwestern portion of the Parcel, directly east of Middle Parcel, is almost all upland. A depiction of the steady-state groundwater conditions anticipated in these Parcels was provided in AECOM's December 2014 Response to Reviewer Comments and other subsequent documents.	9 BT. Six turtles were found on Middle Parcel and one in River North in 2015, and others have been found in Far North and River North Parcels and near North and Middle Parcels in previous years. We estimate as many as eight could be found on Middle Parcel and indirect impacts to North and Far North Parcels could impact turtle habitat there. We are employing avoidance measures to minimize take and as a result believe it will be far less than 8. However, we are requesting a take of 9 total to be cautious. Note: The other 3 requested (for a total of 12) are to cover possible take in ComEd Parcel during restoration activities (i.e. prairie transplant).	2 ST. No spotted turtle found on or near Middle Parcel - including during 2015 survey. Employing avoidance measures so we minimize take. Requesting take of 2 to be safe.	Habitat restoration in River, North, Far North, River North, River South, Fitzpatrick Seep, Com Ed and Long Run Parcels (and preservation). Inundation of Peirce Eich Quarry to minimize groundwater impacts to parcels north of Middle Parcel.
East Parcel* - 19.2% of proposed surface mining alternative	35.9	None.	0	0	0 ac.	0 ac.	No direct and indirect hydrological impacts to larval HED habitat from mining East Parcel will occur due its distance to the nearest larval habitat and because it is hydraulically isolated from adjacent areas to the east and west due to its location between the River and the canals.	None. The East Parcel is hydraulically isolated from adjacent areas to the east and west due to its location between the River and the canals. Additional drawdown may occur to the north under areas already developed in the vicinity of the Romeoville Quarry's scale house, office and ComEd buildings.	0	0	Routine groundwater monitoring at well CEP-4D will continue throughout the entire permit period to verify groundwater levels are not being effected by surface mining west of the canals.

Potential Mining Parcels Evaluated during the Alternatives Analysis

Areas That Could be Mined	Acres of Surface Mining	Limitations to Mining	Number of HED Adults Taken	Number of HED Larvae Taken	Acres of Adult HED Critical Habitat Impacted	Acres of Larval HED Critical Habitat Impacted	HED Larval Habitat That may be Hydrologically Impacted	Degree of Hydrological Impacts	Number of Blanding's Turtles Taken	Number of Spotted Turtles Taken	Proposed AMMs or Mitigation to Address Impacts
Subsurface mining*	0 ac. Subsurface mining to begin during permit period (30 yrs) at the Romeoville facility. Decline and ventilation shaft will be placed within an existing quarry during permit period, thus having no impacts to habitat. Mining will occur below Maquoketa Group (aquitard) - which will prevent impacts to Silurian Aquifer. Typical groundwater control measures for underground mining will be used to ensure groundwater does not enter the decline or air shafts.	Significantly more expensive than surface mining, more safety concerns, and other complicating factors (explained in the HCP).	None. Above ground operations associated with underground will be no greater than they are with current surface mining. There is no anticipated take with current operations, thus we anticipate none with sub-surface mining.	0	0 ac.	0 ac.	0 ac. Subsurface mining will not impact the hydrology of the HED adult or larval habitat. Subsurface mining will occur below a regionally confining layer of shaley bedrock (Maquoketa Group), which provides hydraulic separation of the overlying Silurian Aquifer and the underlying Ordovician and Cambrian bedrock units, so no additional drawdown of the Silurian Aquifer will occur. Access to sub-surface mining will occur within the footprint of an existing surface mine (such as the Middle Quarry or East Quarry). Ventilation shafts will also be placed in surface mining areas during the permit period. Thus, hydrology in larval habitat areas will not be impacted by subsurface mining.	Negligible to no impacts. Access to the subsurface mine will penetrate the lower portion of the Silurian bedrock units that are not mined at the Romeoville facility. Minor quantities of groundwater that are transmitted through these lower permeable units may be collected and removed or isolated from the decline through use of hydraulic barriers. However, since access to the subsurface mine occurs within an already dewatered portion of the Silurian Aquifer, propagation of additional groundwater impacts in the Aquifer are not anticipated.	None. Potential groundwater impacts to habitat will be eliminated by designing and constructing subsurface mines to prevent any groundwater movement through openings in aquitard. No habitat impacts, thus no take.	None. Potential groundwater impacts to habitat will be eliminated by designing and constructing subsurface mines to prevent any groundwater movement through openings in aquitard. No habitat impacts, thus no take.	Subsurface mining will occur beneath aquitard that separates the upper and lower aquifers. Penetrations through upper aquifer will be sealed to prevent groundwater entering mine. This is a routine underground mining procedure.
River	61.0	In floodplain and floodway. More wetlands than MP (40.8 ac.).	3 annually. About the same as Middle Parcel - adult density is a little higher than Middle Parcel (based on K. Mierzwa's studies) but there is less adult habitat (30.7 ac.)	None. No larval habitat present.	30.7 ac (acreages from HED habitat maps - Fig 9.0-9.7, Appendix A; Table 1, Appendix B). PCE 7 present but not 6 because not near larval habitat.	0 ac. HED larval habitat not found in River Parcel. Only PCEs 3 & 5 present on site.	Possibly - maybe River South. No known larval habitat in Middle, North, Far North, and River North - and groundwater impacts unlikely or very limited.	Moderate impact to Middle Parcel (assuming it is not mined), since drawdown would propagate into the east side of it leaving it more susceptible to variations in precipitation. Limited impacts would likely be observed in other parcels due to the River Parcel's location adjacent to River and between East Quarry and Middle Quarry. Most likely potential for impacts (besides Middle Parcel) would occur in southeastern portion of North Parcel. River South is hydraulically separated from River Parcel because of Middle Quarry.	Unknown - possibly present.	Unknown - less likely than Blanding's - found only in RPNP and LPNP and have much shorter movement distances than Blanding's and don't move along rivers.	None - not feasible to mine.
North Parcel	29.4 (31.4 ac - 2 ac set back)	Parcels north of entrance road not contiguous, thus more difficult to mine. Proportionally more wetlands than MP (19.6 of 31 ac.).	Several - based on K. Mierzwa's 2014 study. South central open portion of parcel used for foraging according to K. Mierzwa.	Possible - but unlikely. No suitable rivulets located in surveys; wetlands largely influenced by surface water; numerous crayfish burrows but no larvae found.	18.3 ac (acreages from HED habitat maps - Fig 9.0-9.7, Appendix A; Table 1, Appendix B). PCE 7 present but not 6 because not near larval habitat. Adult habitat on adjacent parcels (e.g. Middle and Far North) may be impacted indirectly through groundwater impacts.	0 ac. Habitat marginal and unlikely to support HED larvae according to Ken M.'s 2013 study. Only PCEs 3, 4 & 5 present on site.	Possibly - but unlikely - no suitable larval habitat in Far North, River North or Middle. Possible larval habitat in RPNP could be affected.	The hydrology in the southern portion of RPNP may be slightly impacted as well as Far North, River North, and the northern portion of Middle Parcel.	Yes - but unknown. Known to occur on adjacent parcels and occurrence on North Parcel inferred from these nearby sightings. None were found in 2015 survey which may indicate low numbers on the parcel.	Unknown - not likely to be present - found only in RPNP and LPNP and have much shorter movement distances than Blanding's.	None - not feasible to mine.
Far North	46.4 (50.4 - 4 ac set back)	Not zoned for mining; portion of parcel contains a former fill area. Parcels north of entrance road not contiguous thus more difficult to mine. Proportionally more wetlands than MP (14.5 of 50 ac.).	Possible. 2015 survey found none. Parcel contains dispersal habitat and not foraging, according to K. Mierzwa.	None. No suitable larval habitat on the parcel according to K. Mierzwa's 2014 and 2015 assessments.	26.7 ac (acreages from HED habitat maps - Fig 9.0-9.7, Appendix A; Table 1, Appendix B). PCE 7 present but not 6 because not near larval habitat.	0 ac. No suitable larval habitat observed by K. Mierzwa (2014 & 2015) - no crayfish burrow or streamlets observed. Only PCEs 3 and 5 present on site.	Possibly - Posable habitat in RPNP could be affected.	Moderate. Adjacent wetland habitats are believed to be primarily fed through surface water discharges, but mining could impact their hydrology. Southern areas of FRPNP could also be impacted.	Yes - but unknown. Known to occur on parcel and adjacent parcels. One found just west of parcel during 2015 survey. Likely has more than North Parcel due to closer proximity to River North Parcel and RPNP.	Unknown - not likely to be present - found only in RPNP and LPNP and have much shorter movement distances than Blanding's.	None - not feasible to mine.
River North	24.8	Not zoned for mining; most of parcel in floodplain. Parcel north of entrance road not contiguous, thus more difficult to mine. Proportionally more wetlands than MP (13.6 of 25 ac.).	Several - based on K. Mierzwa's 2015 study. Parcel contains dispersal habitat and limited foraging habitat, according to K. Mierzwa.	None. No larval habitat present - hydrology of parcel likely highly influenced by river. Also, no suitable habitat on parcel according to K. Mierzwa's 2014 & 2015 assessments.	2.0 ac (acreages from HED habitat maps - Fig 9.0-9.7). PCE 7 present but not 6 because not near larval habitat.	0 ac. No suitable habitat on parcel according to K. Mierzwa (2014 & 2015). No rivulets observed; hydrology of parcel likely highly influenced by river.	Possibly - Posable habitat in RPNP could be affected.	Uncertain - but likely limited due to location adjacent to river. Possible impact to adjacent parcels and southern areas of RPNP.	Yes - but unknown - Known to occur on parcel and adjacent parcels. One found on W edge of parcel during 2015 survey. Likely has more than North and Far North Parcels due to closer proximity to river and RPNP.	Unknown - less likely than Blanding's - found only in RPNP and LPNP and have much shorter movement distances than Blanding's and don't move along rivers.	None - not feasible to mine.

* Part of Preferred Alternative

Table C-8: Existing and proposed restored habitat types in HMS properties (River South, Fitzpatrick Seep, River, North, ComEd, Long Run Parcels, Far North, and River North).

Land Cover Habitat Type	Existing Acres	% Cover	Proposed Acres	% Cover	Change in % Cover
River South and Fitzpatrick Seep Parcels					
Old Field/Grassland	0.47	0.7%	0	0.0%	-0.7%
Woodland Upland	3.48	5.0%	1.63	2.4%	-2.7%
Woodland Bottomland	15.94	23.1%	0	0.0%	-23.1%
Savanna	0	0.0%	0	0.0%	0.0%
Wet/Wet-Mesic Savanna	0	0.0%	11.39	16.5%	16.5%
Shrubland Upland	2.19	3.2%	0	0.0%	-3.2%
Shrubland Bottomland	4.88	7.1%	0	0.0%	-7.1%
Dry/Mesic Prairie	0	0.0%	0	0.0%	0.0%
Wet-Mesic/Wet Prairie	0	0.0%	6.23	9.0%	9.0%
Wet Prairie/Sedge Meadow	2.6	3.8%	12.56	18.2%	14.4%
Wet Meadow - Reed Canary	7.5	10.8%	4.93	7.1%	-3.7%
Marsh - Cattail/Emergent	25.6	37.0%	31.06	44.9%	7.9%
Marsh - Phragmites	5.16	7.5%	0	0.0%	-7.5%
Scraped	0	0.0%	0	0.0%	0.0%
Fill-Other Material	1.32	1.9%	1.32	1.9%	0.0%
Total	**69.14**	**100.0%**	**69.12**	**100.0%**	
River Parcel					
Old Field/Grassland	9.54	16.9%	12.06	21.4%	4.5%
Woodland Upland	7.89	14.0%	0	0.0%	-14.0%
Woodland Bottomland	9.79	17.4%	0	0.0%	-17.4%
Savanna	0	0.0%	4.32	7.7%	7.7%
Wet/Wet-Mesic Savanna	0	0.0%	13.36	23.7%	23.7%
Shrubland Upland	2.65	4.7%	0	0.0%	-4.7%
Shrubland Bottomland	1.3	2.3%	0	0.0%	-2.3%
Dry/Mesic Prairie	0	0.0%	0	0.0%	0.0%
Wet-Mesic/Wet Prairie	0	0.0%	3.96	7.0%	7.0%
Wet Prairie/Sedge Meadow	0	0.0%	1.3	2.3%	2.3%
Wet Meadow - Reed Canary	12.43	22.1%	8.59	15.2%	-6.8%
Marsh - Cattail/Emergent	6.46	11.5%	12.76	22.6%	11.2%
Marsh - Phragmities	6.31	11.2%	0	0.0%	-11.2%
Scraped	0	0.0%	0	0.0%	0.0%
Fill-Other Material	0	0.0%	0	0.0%	0.0%
Total	**56.37**	**100.0%**	**56.35**	**100.0%**	

Land Cover Habitat Type	Existing Acres	% Cover	Proposed Acres	% Cover	Change in % Cover
North Parcel					
Old Field/Grassland	0.4	1.6%	0.4	1.6%	0.0%
Woodland Upland	0	0.0%	0	0.0%	0.0%
Woodland Bottomland	0	0.0%	0	0.0%	0.0%
Savanna	0	0.0%	0	0.0%	0.0%
Wet/Wet-Mesic Savanna	0	0.0%	0	0.0%	0.0%
Shrubland Upland	3.77	15.4%	2.13	8.7%	-6.7%
Shrubland Bottomland	2.56	10.5%	0	0.0%	-10.5%
Dry/Mesic Prairie	0.07	0.3%	0.07	0.3%	0.0%
Wet-Mesic/Wet Prairie	1.16	4.7%	2.04	8.3%	3.6%
Wet Prairie/Sedge Meadow	0.69	2.8%	2.33	9.5%	6.7%
Wet Meadow - Reed Canary	0	0.0%	0	0.0%	0.0%
Marsh - Cattail/Emergent	10.59	43.3%	17.47	71.5%	28.1%
Marsh - Phragmites	5.19	21.2%	0	0.0%	-21.2%
Scraped	0	0.0%	0	0.0%	0.0%
Fill-Other Material	0	0.0%	0	0.0%	0.0%
Total	**24.43**	**100.0%**	**24.44**	**100.0%**	
ComEd/Long Run Parcels					
Old Field/Grassland	4.51	2.9%	0	0.0%	-2.9%
Woodland Upland	0	0.0%	0	0.0%	0.0%
Woodland Bottomland	0.32	0.2%	0	0.0%	-0.2%
Savanna	0	0.0%	1.67	1.1%	1.1%
Wet/Wet-Mesic Savanna	0	0.0%	0	0.0%	0.0%
Shrubland Upland	38.4	24.3%	0	0.0%	-24.3%
Shrubland Bottomland	30.61	19.4%	0	0.0%	-19.4%
Dry/Mesic Prairie	0.23	0.1%	0	0.0%	-0.1%
Wet-Mesic/Wet Prairie	12.18	7.7%	65.23	41.4%	33.7%
Wet Prairie/Sedge Meadow	6.37	4.0%	51.73	32.9%	28.8%
Wet Meadow - Reed Canary	23.69	15.0%	0	0.0%	-15.0%
Marsh - Cattail/Emergent	29.68	18.8%	38.8	24.6%	5.8%
Marsh - Phragmites	10.17	6.4%	0	0.0%	-6.4%
Scraped	1.64	1.0%	0	0.0%	-1.0%
Fill-Other Material	0	0.0%	0	0.0%	0.0%
Total	**157.8**	**100.0%**	**157.43**	**100.0%**	

Land Cover Habitat Type	Existing Acres	% Cover	Proposed Acres	% Cover	Change in % Cover
Far North Parcel					
Old Field/Grassland	6.47	16.3%	25.58	64.3%	48.1%
Woodland Upland	0	0.0%	0	0.0%	0.0%
Woodland Bottomland	0	0.0%	0	0.0%	0.0%
Savanna	0	0.0%	0	0.0%	0.0%
Wet/Wet-Mesic Savanna	0	0.0%	0	0.0%	0.0%
Shrubland Upland	19.1	48.1%	0	0.0%	-48.1%
Shrubland Bottomland	0.95	2.4%	0	0.0%	-2.4%
Dry/Mesic Prairie	0	0.0%	0	0.0%	0.0%
Wet-Mesic/Wet Prairie	0	0.0%	0	0.0%	0.0%
Wet Prairie/Sedge Meadow	0	0.0%	0.21	0.5%	0.5%
Wet Meadow - Reed Canary	0.21	0.5%	0	0.0%	-0.5%
Marsh - Cattail/Emergent	5.44	13.7%	12.86	32.3%	18.7%
Marsh - Phragmites	7.57	19.0%	1.11	2.8%	-16.3%
Scraped	0	0.0%	0	0.0%	0.0%
Fill-Other Material	0	0.0%	0	0.0%	0.0%
Total	**39.74**	**100.0%**	**39.76**	**100.0%**	
River North Parcel					
Old Field/Grassland	1.86	13.6%	10.7	78.2%	64.6%
Woodland Upland	0	0.0%	0	0.0%	0.0%
Woodland Bottomland	1.39	10.2%	0	0.0%	-10.2%
Savanna	0	0.0%	0	0.0%	0.0%
Wet/Wet-Mesic Savanna	0	0.0%	1.4	10.2%	10.2%
Shrubland Upland	8.84	64.6%	0	0.0%	-64.6%
Shrubland Bottomland	0	0.0%	0	0.0%	0.0%
Dry/Mesic Prairie	0.6	4.4%	0.6	4.4%	0.0%
Wet-Mesic/Wet Prairie	0	0.0%	0	0.0%	0.0%
Wet Prairie/Sedge Meadow	0	0.0%	0	0.0%	0.0%
Wet Meadow - Reed Canary	0.43	3.1%	0.43	3.1%	0.0%
Marsh - Cattail/Emergent	0.33	2.4%	0.33	2.4%	0.0%
Marsh - Phragmites	0.23	1.7%	0.23	1.7%	0.0%
Scraped	0	0.0%	0	0.0%	0.0%
Fill-Other Material	0	0.0%	0	0.0%	0.0%
Total	**13.68**	**100.0%**	**13.69**	**100.0%**	

Table C-9: Summary of HMS Mitigation Plan and its Benefits

10/7/2020

Summary Mitigation Benefits and Project Impacts	
Total Acres Preserved by HMS (518.9 acres Permanently Protected)	**530.9**
Total Acres Restored, Enhanced or Maintained Habitat	**354.0**
Total Acres of Adult HED Habitat Impacted	**49.6**
Total Acres of Larval HED Habitat Impacted	**0.0**
Total Acres of Potential/Suitable Covered Turtle Habitat Impacted	**29.1**

All impacted potential turtle habitat is within and part of the impacted adult HED habitat.

530.9 acres will be preserved under a Deed Restriction that will allow for up to 12 acres of development for the installation of ventilation shafts after the ITP and ITA permits expire. Therefore, 518.9 acres of the 530.9 acres under the Deed Restriction will be permanently protected.

Parcel Name	Total Acres	Acres Permanently Protected	Quality and Condition of Habitat (plant communities /vegetation)	Current HED adult habitat (acres)	Current HED larval habitat (acres)	Current Potential/ Suitable Turtle Habitat (acres)	Restored Turtle and HED Habitat (acres)	Enhanced Turtle and HED Habitat (acres)	Maintained Turtle and HED Habitat (acres)	Total Turtle and HED Habitat managed with prescribed burning (acres)	Protection Mechanism
North	31.4	24.9	Much of site filled or disturbance historically; most of site degraded; some small remnant areas.	18.3	0.00	20.2	9.4	0.0	12.5	21.9	Deed Restriction*
Far North	50.4	39.8	Most of site filled or disturbance historically; all of site degraded; no remnant areas.	26.7	0.00	18.6	26.5	0.0	12.1	38.7	Deed Restriction*
ComEd/Long Run	285.5	285.5	Much of site scrapped or filled historically; most of site degraded; some remnant areas.	109.9	0.00	237.7	79.8	77.6	0.0	157.4	Deed Restriction*
River	61.0	61.0	Most of site filled or disturbance historically; all of site degraded; no remnant areas.	30.4	0.00	49.9	28.6	23.1	4.7	56.4	Deed Restriction*
River North	24.8	24.8	Most of site filled or disturbance historically; all of site degraded; no remnant areas.	1.8	0.00	14.6	10.2	0.0	3.2	13.5	Deed Restriction*
River South and Fitzpatrick Seep	71.2	71.2	Little of site filled or disturbance historically; but most of site degraded from alter historic surface hydrology; some remnant areas.	40.0	0.26	64.2	27.7	38.5	0.0	66.2	Deed Restriction*
River South Bluff	23.7	23.7	Much of site filled or disturbance historically; all of site degraded.	0.0	0.00	2.4	0.0	0.0	0.0	0.0	Deed Restriction*
Total	**548.0**	**530.9**		227.1	0.26	407.6	182.2	139.2	32.5	354.0	

Total Acres Preserved (518.9 acres Permanently Protected)	**530.9**
Total Acres of Restored or Enhanced Habitat	**321.4**
Total Acres of Restored, Enhanced or Maintained Habitat	**354.0**
Total Acres of Preserved but not Restored, Enhanced or Maintained Habitat	**176.9**

Restored Habitat: All areas where habitat structure will be significantly changed (i.e. brushing or thinning of weedy woody vegetation and removal of *Phragmites*).

Enhanced Habitat: All other habitat areas that will be improved in other ways (e.g. herbiciding and/or seeding).

Maintained Habitat: All areas that will be managed solely with prescribed burning. Note that Restored and Enhanced habitat areas will also be burned as part of the long-term management of these areas.

*Deed Restriction will be converted to a Conservation Easement if a qualified entity to hold the easement is found.

Current potential/suitable turtle habitat are those ranked as high or moderate (See Table C-4 and Figures 12 & 13). Restoration of turtle habitat meets the definition above and occurs in low and moderate ranked habitat areas.

Table C-10: Acres of protected potential turtle habitat* in mitigation parcels.

Parcel	Acreages of protected habitat (high and medium potential)	Acreages of protected habitat (low potential)
ComEd Parcel	63.90	39.04
Far North Parcel	18.24	31.84
Fitzpatrick Seep	1.92	3.56
Long Run Parcel	173.76	8.81
North Parcel	19.8	11.51
River North Parcel	14.63	10.19
River Parcel	49.92	11.05
River South Bluff Parcel	1.65	22.06
River South Parcel	62.28	3.43
Grand Total	406.1	141.49

*Acreages of protected potential habitat for both Blanding's and spotted turtle overlap in all parcels, resulting in the same acreages/parcel for both species.

APPENDIX D:

Supporting Partner Commitments and Supplemental Documents

History of Recruitment

Early in the process of developing this Habitat Conservation Plan (HCP), Hanson Material Service (HMS) began working with the U.S. Fish & Wildlife Service (USFWS) and other "lead" partners involved at the time – Commonwealth Edison (ComEd) and Midwest Generation (MWGen), who later signed on as supporting partners – to recruit and engage entities that manage land or otherwise have land use jurisdiction within the groundwater recharge zone of the Hine's emerald dragonfly larval habitat areas. Twenty-four potential partners were identified and invited to participate; of those, 10 entities made explicit commitments to participating in land management or other activities in a manner that will benefit groundwater and HED habitat. These entities are referred to as supporting partners in this project.

Supporting partners own land, regulate land use, and/or use land through conveyed easements. Their commitments to this project are important because studies have indicated that development, current land use, and groundwater use in the Planning Area have negatively impacted groundwater by reducing quantities (GRAEF 2009). Therefore, the supporting partners' activities could have an indirect impact on the habitat of covered species. To help prevent possible groundwater reduction, supporting partnersmade commitments, outlined in this appendix, that will protect and enhance groundwater resources.

The planning efforts that lead to the collaborative nature of this HCP began with the Right-of-Way Management Team (ROWMT), which included USFWS, Illinois Department of Natural Resources, U.S. Army Corps of Engineers, Illinois Nature Preserve Commission (INPC), Forest Preserves District of Will County (FPDWC), HMS, ComEd and Midwest Generation. From 1996 to 2005, the ROWMT provided a forum for discussions between organizations that needed to maintain rail and power line corridors through known HED habitat areas. The committee raised awareness in the surrounding municipalities about how local ordinances and policies could unintentionally pollute ground and surface water and harm the HED.

Collaboration with supporting partners was an important component in developing this HCP. Most supporting partners that were engaged in this HCP process made commitments to better manage water resources (e.g. drinking water supplies and stormwater).

The benefits of this plan's collaborative nature include:

- shared data
- coordinated education and outreach programming for the public and the supporting partners
- funding for supporting partners' projects to protect groundwater or habitat
- a collective atmosphere of concern for the endangered species covered by this HCP
- an engaged community of private businesses, municipalities, and local, state, and federal government agencies actively protecting the recharge area
- commitments from supporting partners to better manage water resources for the protection of groundwater

Supporting Partners

The following entities were actively engaged in the process of developing this HCP for many years and made certain commitments to protecting groundwater resources in the HED critical habitat areas. ComEd and MWGen were deeply involved in the HCP development process, serving with HMS as part of the lead partners group until 2013. Each has remained committed to cooperating with HMS on this HCP.

Supporting Partners	
Commonwealth Edison Two Lincoln Center, 7th Floor Oakbrook Terrace, Illinois 60181	Midwest Generation 235 Remington Boulevard Bolingbrook, Illinois 60440
Chicago-Romeoville Airport Hanson Professional Services Inc. 815 Commerce Drive, Suite 200 Oak Brook, Illinois 60523	Lemont, Village of 418 Main Street Lemont, Illinois 60439
Forest Preserve District of Will County 17540 West Laraway Road Joliet, Illinois 60433	Lockport, City of Engineering Department 17112 South Prime Boulevard Lockport, Illinois 60441
Homer Glen, Village of 14933 S Founders Crossing Homer Glen, Illinois 60491	Lockport Township Park District 1911 South Lawrence Avenue Lockport, Illinois 60441
Lewis University One University Parkway Romeoville, Illinois 60446	Romeoville, Village of Department of Public Works 615 Anderson Drive Romeoville, Illinois 60446

Several other entities own, manage or use land within the HCP Planning Area. The following entities are aware of the HCP but, despite concerted efforts made over the years to recruit them, were never active in the process. USFWS may continue efforts to engage some of these entities over the years.

- Amtrak
- Canadian National
- City of Crest Hill
- City of Joliet
- Cook County Forest Preserve District
- DuPage County Forest Preserve District
- Illinois Department of Transportation
- Metra
- Metropolitan Water Reclamation District of Greater Chicago
- Statesville Correctional Center
- Will County Land Use Department
- Village of Orland Park
- Village of Plainfield
- Village of Woodridge

Current Activities
The following table outlines the types of activities currently conducted by each of the supporting partners in the groundwater recharge zone.

Supporting Partners	Activity
Midwest Generation (now NRG Energy)	Continued use, repair and maintenance of rail line corridor to deliver coal to one power plant
Commonwealth Edison	Continued maintenance, repair and replacement of power lines and structures Vegetation management to maintain reliability in accordance with the Illinois Commerce Commission (ICC) Distribution and transmission lines and structures within the most sensitive areas (Lockport Prairie and River South) were removed.
Chicago-Romeoville Airport	Continued operations and changes under approved master plan, including stormwater BMPs
Forest Preserve District of Will County	Continued management and restoration of conservation lands
Village of Homer Glen	Continued municipal operations with specific commitments to protect groundwater
City of Lockport	Continued municipal operations with specific commitments to protect groundwater
Village of Lemont	Continued municipal operations with specific commitments to protect groundwater
Lewis University	Continued educational institution operations and growth, with use of stormwater BMPs
Lockport Township Park District	Continued recreational use of new and existing parks with use of stormwater BMPs and groundwater protection
Village of Romeoville	Continued municipal operations with specific commitments to protect groundwater

To minimize potential indirect impacts to HED habitat, supporting partners who have made commitments under this HCP have agreed to make environmentally responsible decisions regarding land use, zoning, and water management and propose to review future plans with the USFWS. These supporting partners currently do not need nor intend to apply for incidental take permits; however, if the need for permits should arise in the future, their work on and participation in the development of this HCP could inform and expedite such a process.

The supporting partners originally made commitments to this HCP in 2009 and 2010; with the exception of the City of Lockport, each supporting partner then updated their commitment in 2013 by submitting a letter of intent outlining activities each entity has taken or will take to support HED habitat needs. The letters are included in this appendix. Such commitments include:

- Implementing stormwater best management practices (BMPs)

- Adopting policy to support and encourage BMPs
- Education and outreach regarding the HED
- Native vegetation restoration
- Invasive species removal

Supporting this HCP

Without involvement in the HCP planning process, the supporting partners may not have committed to efforts to improve stormwater management and groundwater protection in their operations. Water management in these areas indirectly impacts the habitats of covered species. Since supporting partners operate in communities adjacent to known HED habitat, their tributary surface water drainage and groundwater recharge are linked to the quality, quantity, chemistry, and temperature of water that discharges at the seeps that provide water to habitats. As such, the supporting partners' commitments to implementing stormwater BMPs and adopting policies that support such practices assist with protecting and enhancing the quality and quantity of groundwater feeding the habitat of the HED and the other covered species.

The commitments made and measures implemented by supporting partners to protect and enhance groundwater and habitat have and will continue to benefit the HED and its habitat. For example, restoration efforts by FPDWC have increased, the amount of native vegetation and habitat for HED and other covered species in the Planning Area as well as improved groundwater infiltration in a recharge zone for HED larval habitat (i.e. Prairie Bluff and Lockport Prairie East). In addition, implementation of stormwater BMPs by other partners have and will improve the treatment and infiltration of stormwater. Many BMPs, such as rain gardens and vegetated swales, use native vegetation and are designed to promote groundwater protection and enhancement. Furthermore, ComEd's Low Impact HCP is designed to protect all the species covered under this HCP, within their Right-of-Way and easements within the HCP Planning Area and the other Critical Habitat Units.

Specific commitment letters follow. Further, HMS, USFWS and the supporting partners have agreed to continue meeting to foster communication about the health of the species, efforts to protect the HED and it habitat, regulatory changes, outreach opportunities, and to identify other potential resources that could assist the partners with activities that benefit the species.

VILLAGE OF LEMONT

Village of Lemont
418 Main Street • Lemont, Illinois 60439

Village of Faith

Mayor
Brian K. Reaves

Village Clerk
Charlene M. Smollen

Trustees
Debby Blatzer
Paul Chialdikas
Clifford Miklos
Rick Sniegowski
Ronald Stapleton
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Engineering Department
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Finance Department
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fax (630) 257-1598

Police Department
14600 127th Street
phone (630) 257-2229
fax (630) 257-5087

Public Works
16680 New Avenue
phone (630) 257-2532
fax (630) 257-3068

www.lemont.il.us

16 August 2013 #058-13

Meg Kelly, Project Manager
Biodiversity Project
4507 N. Ravenswood Ave, Suite 106
Chicago, IL 60640

RE: Acknowledgement and re-confirmation of commitment

Dear Ms. Kelly,

The Village of Lemont continues to be in support of the Habitat Conservation Plan for the Hine's Emerald Dragonfly and confirms commitment to the project. The Village has taken steps to enhance surface and groundwater resources and continues to seek opportunities to protect biodiversity and critical habitats within the Village.

Measures currently in place:

- The storm water management chapter of the Unified Development Ordinance encourages the use of naturalized detention basins using native plantings and provisions for stewardship.
- Additionally, the Department encourages developers to employ bioswales, permeable pavement and infiltration trenches in their designs. A recent example includes the development of the municipal police station which has permeable pavers and infiltration trenches.
- Other measures include a soil erosion chapter of the Unified Development Ordinance which states that natural vegetation should be retained and protected and areas immediately adjacent to natural watercourses, lakes, ponds, and wetlands should be left undisturbed wherever possible. The standards and specifications contained in *Standards and Specifications for Soil Erosion and Sediment Control* and the *Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control* are incorporated into this chapter.
- Adoption of the Green Lemont Initiative, which provides a framework for Village staff and outside agencies to pursue green initiatives. Many of the

recommendations of the plan will enhance surface and groundwater resources and are similar to the mitigation efforts under the HCP.

- Bi-annual hazardous waste recycling event that accepts prescription medical waste, CFL light bulbs, latex paint and batteries to protect water quality.

The department is committed to pursuing HCP mitigation measures. In addition to the actions listed above, staff currently has the following HCP mitigation commitments under consideration:

- Include the Long Run Creek Watershed Plan recommendations and educational materials into future planning and development initiatives.
- Pursue changes to the storm water management regulations that would mandate or incentivize the use of more storm water BMPs.
- Provide BMP toolbox to developers and citizens that can be used for selecting and designing proper storm water management methods in new developments, retrofits and residential yards.
- Engage the community in groundwater protection and HED conservation
    - Implement demonstration projects, which provide on the ground examples of alternative storm water management projects and one-page fact sheets on the costs, expected benefits and maintenance needs.
    - Coordinate with agencies, schools and citizens on educational efforts around the HED, its habitat and stewardship needs.
    - Seek grant opportunities for community projects that benefit and are consistent with the HED and HCP needs, including such measures as native landscaping.
- Participate in the HCP watershed annual meeting to highlight accomplishments and learn about the status of other efforts.

Department staff is working on an update to the Lemont Comprehensive Plan and will enhance the natural resources element to include the importance of habitat conservation, biodiversity, native landscaping and natural resource management.

VILLAGE OF LEMONT

Martha M. Glas
Village Planner

FOREST PRESERVE DISTRICT OF WILL COUNTY

Forest Preserve District
OF WILL COUNTY

Bringing People and Nature Together

17540 W. Laraway Road / Joliet, IL 60433
815.727.8700 / fax 815.722.3608
ReconnectWithNature.org

JOSEPH M. BABICH, President
DONALD GOULD, Vice President
LEE ANN GOODSON, Secretary
STEPHEN M. WILHELMI, Treasurer
MARCELLA M. DEMAURO, Executive Director

27 June, 2013

Meg Kelly, Projects Manager
Biodiversity Project
4507 North Ravenswood Avenue, Suite 106
Chicago, Illinois 60640

Ms. Kelly,

The Forest Preserve District of Will County (FPDWC) is re-confirming its commitment as part of the Hine's Emerald Dragonfly Habitat Conservation Plan (HCP) to update and implement a comprehensive management plan for the properties it manages within the HCP area. According to the boundaries of the revised HCP planning area developed earlier this year, those FPDWC properties would include Lockport Prairie Nature Preserve (LPN), Romeoville Prairie Nature Preserve (RPN), Prairie Bluff Preserve (PBP), Lockport Prairie East (LPE), Dellwood Park West (DPW), Messenger Woods Nature Preserve (MWN), Messenger Marsh Preserve (MMP), Fiddyment Creek Preserve (FCP), and O'Hara Woods Preserve (OWP). The FPDWC is currently managing all of these preserves to improve ecological health and maintain biological diversity using common ecological management practices, such as invasive species control through herbicide applications, brushing, and prescribed burning, according to existing management and restoration plans many of which already recognize existing or potential HED habitat.

The FPDWC has a long term lease with the Illinois Department of Natural Resources to manage PBP, and an intergovernmental agreement with the Lockport Township Park District to manage a portion of their Dellwood Park West property. Our commitment to include those properties within our HCP planning and management efforts will continue as long as those agreements remain in place.

Sincerely,

David Robson
Natural Resource Management Supervisor

VILLAGE OF ROMEOVILLE

Village of Romeoville
Where Community Matters

Public Works Department

Mayor
John Noak

Clerk
Dr. Bernice E. Holloway

Trustees
Linda S. Palmiter
Jose (Joe) Chavez
Brian A. Clancy Sr.
Dave Richards
Sue A. Micklevitz
Ken Griffin

Director
Dan Bromberek

June 19, 2013

Biodiversity Project
4507 N. Ravenswood Avenue, Suite 106
Chicago, IL 60640
Attn: Meg Kelly, Projects Manager

Re: Hine's Emerald Dragonfly Habitat Conservation Plan

Dear Ms. Kelly:

We have received the letter dated May 22, 2013 from Randall Boisvert of Hanson Material Service requesting reconfirmation of the Village of Romeoville's 2009 commitment to the Habitat Conservation Plan project for the Hine's Emerald Dragonfly. A description of any updates or revisions to the commitments was also requested.

The Village of Romeoville remains committed to supporting the Habitat Conservation Plan project. A description of the program status with respect to the summary of the commitments benefiting the Hine's Emerald Dragonfly that was included with the letter is attached.

If we can be of further assistance, or if additional information is required, please contact me at 815-886-1870.

Very Truly Yours,
Eric Bjork
Superintendent of Operations

Village of Romeoville

The Village of Romeoville is largely developed and is nearly built out. Thus, few open space areas remain in the Village where alternative stormwater management strategies can be employed to improve, enhance, or maintain groundwater recharge to support necessary hydrology. The Village is committed to a multi-step process for future plans that includes:

1. strongly encouraging permit applicants to use alternative stormwater management techniques and strategies for any new development project, noting that the Village directs developers seeking annexation of property within the provisionally-defined groundwater recharge zone to consult with the USFWS regarding conservation of infiltration volumes post-construction.
   Current Status: The Village continues to request implementation of stormwater BMPs in new development plans in accordance with village and IL EPA NPDES requirements. Developers seeking annexation within the groundwater recharge zone and applicants for projects to be constructed within the Primary Habitat Conservation Plan area continue to be directed to consult with the USFWS.

2. strongly encouraging applicants to use alternative stormwater management techniques and strategies for any retrofit opportunities.
   Current Status: Applicants continue to be required to implement stormwater BMPs in plans for redevelopment areas in accordance with village and IL EPA NPDES requirements. Recent examples include the downtown redevelopment project and the Veterans Memorial Park project.

3. continued cooperation with independent parties representing this HCP partnership who are conducting monitoring of the aquifer depth at the one shallow well that is within the 2-mile buffer area, near the provisionally-defined groundwater recharge zone, and at other wells. Noting that the Village had been proactive in planning for its future water needs during a period of large growth and development, the construction of additional shallow wells in the future will likely not be necessary and the Village is committed to not constructing any additional shallow wells, though the possibility cannot be completely ruled out. Also, the Village has implemented a rain barrel program to promote water conservation.
   Current Status: The Village has cooperated with all requests received to date for available information and access to facilities. The most recent request was received from the USGS- IL Water Science Center on behalf of the USFWS. The Village has a water conservation ordinance, and has continued to advertise and provide the rain barrel program to promote water conservation.

4. continued implementation of stormwater discharge BMPs, including distribution of educational materials to residents, inspection for illicit discharges, inspection of construction site sediment control, monitoring drainage facilities post-construction, and continued implementation of pollution prevention measures.
   Current Status: Implementation of the BMPs has continued in fulfillment of NPDES stormwater program requirements.

5. considering cooperation in the implementation of demonstration projects that provide viewable, on-the-ground examples of alternative stormwater management projects, at such time that these projects may be proposed or become available.
   Current Status: No demonstration projects have been proposed or have become available. Examples of recently-installed alternative stormwater management measures are located throughout the village, descriptions and photographs of which were provided for inclusion in the Public Education Toolbox provided by Biodiversity Project.

6. reports to the HCP partnership that document program accomplishments
   Current Status: This commitment is fulfilled by this update.

LOCKPORT TOWNSHIP PARK DISTRICT

Lockport Township
PARK DISTRICT

1911 S. Lawrence Avenue
Lockport, Illinois 60441
(815) 838-1183
Fax: (815) 838-4974
www.lockportpark.org

June 4, 2013

Meg Kelly
Projects Manager
Biodiversity Project
4507 North Ravenswood Avenue
Suite 106
Chicago, IL 60604

Dear Meg,

Please accept this letter as confirmation that the Lockport Township Park District continues to be committed to the HED HCP. The Hassert Park Project is now completed. We have included all of the design elements previously outlined with the exception of the infiltration basins.

Regarding the splash park, we are utilizing City of Crest Hill water. That water drains into our passive stormwater conveyance system.

Please feel free to contact me should you have further questions or concerns.

Sincerely,

Sue A. Micklevitz
Executive Director

VILLAGE OF HOMER GLEN

Mayor James P. Daley, Jr.
jdaley@homerglen.org
www.homerglen.org

Village of HOMER GLEN
Community and Nature . . . in Harmony

14933 S. Founders Crossing
Homer Glen, Illinois 60491
(708) 301-0632

June 10, 2013

Meg Kelly, Projects Manager
Biodiversity Project
4507 North Ravenswood Avenue, Suite 106
Chicago, Illinois 60640
mkelly@biodiverse.org

Dear Ms. Kelly:

The Village of Homer Glen has completed a significant portion of our Hine's Emerald Dragonfly protection projects. I'm happy to include the before and after photos for our Long Run Creek project, done for the benefit of the dragonfly. If you have any additional questions about this project please feel free to contact staff member, Michael Salamowicz at msalamowicz@homerglen.org.

My best to you and your colleagues. Here's to a successful 2013!

Respectfully,
Village of Homer Glen

Jim Daley
Mayor

Encl.

After

Before

LEWIS UNIVERSITY

LEWIS UNIVERSITY
A Catholic and Lasallian University

June 20, 2013

Meg Kelly, Project Manager
Biodiversity Project
4507 Ravenswood Avenue, Suite 106
Chicago, Illinois 60640

Dear Meg,

Lewis University continues to embrace sustainability as depicted in our recently completed Campus Master Plan, http://www.lewisu.edu/masterplan/index.htm. Lewis continues to add additional sustainable features to our campus and also has successfully completing a LEED Silver, Science Center and a LEED Certified, Student Residence Hall (Sheil Hall).Lewis University will continue to participate in the HCP partnership by attending meetings and to creating education programs that will educate citizens and students on the importance of infiltration of groundwater recharge. Lewis University has implemented new and continuing activities to work towards their HCP commitments including:

- Pilot program for "Phydura" (an all natural weed and grass killer), utilized as a replacement for the herbicide commonly known as "Round-up".
- Eco salt still being used on sidewalks (beet juice extract), mix sand with road salt, along with brine solution for ice control
- 189 new trees have been planted campus wide
- The Morton Register, coordinated by The Morton Arboretum, has recognized our Romeoville campus for meeting professional standards required to be designated as an Level I arboretum.
- The Glen was constructed last year; this environmentally-friendly feature provides storm water detention and natural drainage for the campus. It also delivers needed water to the recharge zone for the endangered Hine's Emerald Dragonfly. The infiltration trench that winds through the detention basin allows rain water to percolate into the ground. This feature also has a rain water collection system, which collects 7000 gallons of water to be diverted from outflow to waterways and used for irrigation.
- Lewis has been recognized by the Arbor Day Foundation for the fourth consecutive year as a Tree Campus USA
- Storm water retention enhancements constructed
- New bioswales have been installed at many locations on campus
- Several new rain water collection systems have been installed
- Core aeration turf areas continues

LEWIS UNIVERSITY
A Catholic and Lasallian University

As the university continues to expand we will remain a working partner as the current University Master Plan clearly reflects our commitment to sustainability, including stormwater management BMPs.

Sincerely,

Donald D. Castello
Associate Vice President for Facilities, Lewis University

CHICAGO-ROMEOVILLE AIRPORT

Future Plans and Mitigation Summary

The Joliet Regional Port District owns and operates Chicago-Romeoville Airport (the Airport). The airport sits on 981 acres (as of July 2013, approximately 20% impervious, and 80% pervious), maintained as mowed grass or cultivated cropland. Although no portion of the Airport is within the HCP, the Airport is located within the primary recharge area of River South and Lockport Prairie Aircraft do fly over the primary HCP but are high enough (220 feet) not to have an effect upon the habitat (Soluk et al.1995, 1996, 1998).

The Airport plans to acquire an additional 147 acres as part of the future airport layout plan. After acquisition, as small percentage (less that 15-10%) of this land will be converted to impervious surfaces. The pervious ground within the Airport limits will be converted to a low profile, native, deep rooted vegetation except for approximately 330 acres which may remain in crop production. In addition, once these lands are acquired by the Airport, development of these lands is limited to what is shown on the Airport Layout Plan.

Runway 2-20 is currently 6,500 feet long and the proposed improvements include a final runway length of 7,200 feet. The increased impervious area of the runway extension will cause additional stormwater runoff that will be directed primarily to the infiltration basin (Basin 8) which is located east of the runway. Stormwater is then detained within Basin 8 per FAA regulations (Advisory Circular 150/5200-33A), then flows west under the new runway and will be discharged into the DuPage River watershed. There are no wetland areas located within the property lines and all the detention basins are dry bottom basins. FAA policy (AC 150/5200-33A, "Hazardous Wildlife Attractants on or near Airports") on stormwater detention will not permit permanent water retention on airport property. T

The USDA conducted a year long wildlife study in 2011 that provided recommendations for stormwater management and wildlife hazards for the Airport and surrounding adjacent properties. The study recommends perimeter fence around the property, maintaining vegetation at 5-8 inches using entophytic fescue, and draining stormwater basins within 48 hours. Fescue is a deep rooted grass that will help promote infiltration while not being a wildlife attractant.

Basin 8 is located on the northeast corner of the Airport, located in the low area directly above the gravely, sandy layer just above the dolomite rock layer. Basin 8 is designed to maximize the infiltration rate by placing 4" of topsoil directly over the dolomite rock and restricting the flow of the 2 year storm out of the basin. All future designs for the Airport will incorporate open swales and other water quality improvements to treat the stormwater before it reaches Basin 8 and infiltrates into the ground. These future designs will increase the infiltration rate and will aid in groundwater recharge, which is critical to the habitat of the HED.

Hangar facilities are planned for the east and west sides of the southern end of Runway 2-20. Additional aprons and buildings are also planned near the terminal building. A short

runway parallel to Runway 2-20 will create additional impervious area on the northwest portion of Airport property. And, a westward extension of Runway 9-27 is planned, lengthening the runway to 6,500 feet.

Hydrology at the Airport may change slightly in the future with the construction of additional aprons, hangars, roads, parallel runway, and the runway extension. Additional detention facilities will be required to accommodate additional runoff. The runoff from impervious areas will be directed into a stormwater system and conveyed offsite. The stormwater system is composed of detention basins that are in series and connected by grassed waterways and culvert pipes. This aids in the pretreatment of stormwater by slowing flow velocities and increasing the detention times to promote sedimentation. Where feasible and practical, future facilities runoff will be directed through a multi-tiered, native grassed sedimentation area and an infiltration basin (Basin 8) to increase water quality of runoff and increase infiltration volumes.

When all facilities are constructed on the Airport Layout Plan, as shown in Figure 2, 49% of all newly constructed impervious areas runoff will be directed to the infiltration basin, which is designed to promote infiltration and aid groundwater recharge. The remaining 51% of the newly constructed impervious area runoff will still be directed to a series of open swales, culvert pipes, and stormwater detention basins before being released according to established flow rates. Methods to promote infiltration and improve water quality will be incorporated into future stormwater management design plans. Infiltration will aid in the recharge of groundwater which is critical to the habitat of the HED. The Airport is aware that water quality and groundwater recharge is an important aspect of the HCP and will be conscience of this in future designs.

CITY OF LOCKPORT

City of Lockport
Summary of commitments that will benefit the Hine's Emerald Dragonfly
Drafted by: Biodiversity Project, 2010

The City of Lockport is currently engaged in planning for a Water System Master Plan. Many components of this plan are yet to be finalized, but many ordinances and programs are in place to help manage surface stormwater and groundwater recharge zones for the HED habitat area.

Current Measures in the City of Lockport include:

1. strongly encouraging stormwater BMPs for all new and retrofit projects
2. monitoring the aquifer within and around the groundwater recharge zones and providing data to the HCP partnership
3. attending meetings and providing information to the HCP partnership
4. continuing to enforce stormwater discharge BMPs by inspecting for illicit discharges, construction site sediment control, and monitoring drainage facilitates and continuing to implement pollution prevention measures

The City of Lockport has made the following additional commitments:

1. codify stormwater BMPs as a requirement for new and retrofit construction
2. codify water conservation methods
3. provide a user-friendly BMP toolkit to developers and citizens to educate them on the best tools and methods for stormwater management
4. allow USFWS 30 days to review new developments within the surface watershed and groundwater recharge zones
5. submit the HED map and information to the city council as part of the argument against new shallow wells in the groundwater recharge or buffer zones of the HED habitat
6. participate in the HCP partnership by providing progress reports on the HCP commitments at least once a year
7. increase public awareness of the importance of groundwater protection and HED conservation
8. engage and educate other municipal departments, like tourism, to work together to promote this HCP

APPENDIX E:
Mining Plan

HMS MINING PLAN

Introduction

The Romeoville Quarry has been in continuous operation since the mid-1950s. The property is composed of several properties from which yearly production requirements are attained. Today, the operation has the capacity to produce five million tons of material per year, depending on demand.

This Mining Plan covers approximately 35 years and is contingent upon the receipt of regulatory approval of an Incidental Take Permit (ITP) and Incidental Take Authorization (ITA) covering mining operations by HMS. It also assumes approval of required wetland permits and other state authorizations. HMS continues to quarry surface deposits of dolomite limestone[1] and it anticipates continuing surface mining operations for approximately the next 35 years. See *Figure 1: HMS Surface Mining Permit Parcels* for a visual description.

HMS plans to begin sub-surface mining operations in approximately 2035. The entry portal and staging area for sub-surface mining will most likely occur in either Middle Parcel, Middle Quarry or East Quarry. Once the entry portal location is finalized, mining plans and sequences will be finalized to accommodate the development of the sub-surface mining. Existing mining infrastructure, including staging, handling, and shipping areas will continue to be used for both surface and sub-surface mining for at least the next 35 years. In addition to the actual mining of limestone, other associated operations at the Romeoville facility (including crushing, conveying, screening, stockpiling, washing, and sizing of limestone; truck, rail, and barge loading; and activities of support offices) are required for processing and shipping the limestone to customers. A marine operation and a maintenance shop are located at the facility and will continue to operate for the duration of mining activities. Some processing and conveyance equipment, as well as underground water pumps and associated infrastructure, will be added once underground mining commences.

HMS anticipates that once all surface mining operations have ceased, the quarries will be filled and the historic groundwater regime will return. This is consistent with the reclamation plan filed with the Illinois Department of Natural Resources but will occur only in the Pierce-Eich Quarry during the timeframe of this Mining Plan and the Incidental Take Permit.

[1] Dolomite is a rock that after being deposited as a Calcium based CaCO3 limestone, underwent a chemical change over a long period of time and was converted to a Magnesium based CaMg(CO3)2 limestone. Dolomite limestones are harder than Calcium limestones, for this reason they are much more preferred for uses in construction, especially in areas where the greater strength and/or resistance to continuous abrasion would be required.

Geologic Description

The HMS Romeoville Operation parallels the Des Plaines River Valley, and HMS is actively operating the quarry located west of Illinois Route 53 and south of Taylor Road. The dolomite limestone mined at this location is of Silurian age and was deposited in the shallow seas that covered this part of the world approximately 430 million years ago. The unconsolidated materials that overlie the Silurian bedrock consist predominately of Glacial deposited clay tills that are sandy and mixed with variable amounts of small gravel. The thickness of this unconsolidated overburden ranges between 6 to 28 feet, averaging around 16 feet.

The underlying Silurian bedrock was deposited in a sequence of horizontal stratigraphic layers referred to as "Bedding", a feature of deposition that within this area has remained relatively flat with only a minimum 5 degree gentle dip to the northeast. See *Figure 2: HMS Surface Mining Parcel Topography*.

Coinciding with the bedding is another feature identified as "Jointing", a characteristic feature of natural partings in the rock that are generally vertical to the bedding. Measuring and mapping these joints as seen in the exposed quarry walls and observed along the quarry floor, was undertaken and is shown on the attached *Figure 3: HMS Surface Reserves Polar Diagram* that identifies the direction of both the dominant Primary Jointing and the more passive Secondary Jointing. Characteristics of both the jointing and natural bedding are important factors to determine the best and most optimum parameters for blasting and mining. For reference, the dominant and secondary jointing patterns are displayed on *Figure 4: HMS Surface Reserves Geologic Jointing*.

The jointing patterns in reserves mined by HMS are general to the Silurian dolomite surface mines. Following is the geologic description of the different stratigraphic units of Silurian bedrock quarried at this site from top to bottom. See *Figure 5: HMS Mining Reserves Geologic Cross-Section*, for a visual description of Silurian limestone deposits.

The uppermost unit is the Sugar Run Formation consisting of a thin to medium bedded, dense, hard, fine grained, medium light gray to brownish gray dolomite that weathers buff brown. The thin platy bedding of this unit generally ranges between 4" to 8"; up through the early 1900's, the Sugar Run was quarried extensively as a building stone and marketed as "Joliet Marble." To a much lesser degree it is still popular for use as a flag stone, even though at this location it is not mined separately for this purpose. Because of variable differences in surface erosion of the upper Sugar Run unit at this location, the quarried thickness ranges between 10 feet to 25 feet.

Underlying the Sugar Run is the Joliet Formation which can be subdivided into three different members; they are from top to bottom, the Romeo, the Markgraf, and the Brandon Bridge. The upper Romeo Member, named for its exposure at different locations in the Romeoville area, averages about 27 feet thick and is generally medium to massive bedded. Its color varies from light grey to bluish grey with some intermittent pinkish mottling and is moderately vuggy with some

random small cavities (some occasionally lined with pyrite crystals); on occasion a few scattered small light grey to white chert nodules have been seen in thin intermittent bands. The next member of the Joliet Formation is the Markgraf. The Markgraf is approximately 21 feet thick, is light grey to pinkish buff grey in color and medium bedded with a fine grained texture; the upper portion is slightly argillaceous and has occasional scattered bands of light grey to white chert nodules (few up to 4"), the stone becomes more silty textured near its base. The lowest member of the Joliet Formation is the Brandon Bridge, which is a moderately massive grey to brownish grey argillaceous dolomite with frequent thin (less than 1/8") green shale partings throughout. Its average thickness is about 30 feet, and it has zones of reddish grey to greenish grey mottling along its lower base;

Underlying the Joliet Formation is the Kankakee Formation which is about 46 feet thick. The Kankakee is subdivided into four separate members; they are the Plaines, Troutman, Offerman, and the Drummond. The upper most member is the Plaines, a thick bedded medium grained very light grey to nearly white dolomite; underlying the Plaines is the Troutman Member, a pinkish brown grey fine to medium grained dolomite with thin wavy beds separated by thin green shale stringers; underlying the Troutman is the Offerman Member, a grey dolomite with some pinkish hue, slightly argillaceous, thin bedded overall with smoother bedding features than its upper member units; these three members (the PTO) average a total thickness of about 35 feet. The lowest member of the Kankakee is the Drummond Member, a light medium grey slightly vuggy dolomite with semi frequent random shale stringers and scattered white chert nodules. Because of these chert nodules, it's not uncommon for the Drummond to be inadvertently identified as the upper part of the next underlying Elwood Formation.

The lowest exposed formation in the quarry is the Elwood Formation. In general, incidental layers (less than 5 feet) of this formation have been quarried. The Elwood is a light brownish grey dolomite that's thin bedded with frequent shale partings, is quite argillaceous and has numerous large (up to 4") white chert nodules. Overall, as identified in drill records, the Elwood in this area is approximately 30 feet +/-thick.

Underlying the Elwood Formation is the Wilhelmi Formation, the lowest unit of the Silurian age bedrock system. Drill records identify the Wilhelmi Formation as being between 5 feet to 15 feet thick and consisting of a brown grey to dark grey very argillaceous to shaley thin platy bedded dolomitic limestone. At the basal contact of the Wilhelmi is the next underlying geologic unit, the Maquoketa Group of the Ordovician age system. The Maquoketa Group is very shaley and consists of from top down, the Brainard shale, the Fort Atkinson (a very argillaceous and shaley dolomite), and the 75' plus thick aquitard Scales shale member. Sub-surface dolomitic limestone reserves occur below the Scales shale aquitard in the Galena Group.

Surface Mining Operations

Under the mining plan, the surface aggregate resources of Pierce-Eich Quarry, Middle Parcel, Middle Quarry, and East Parcel will be mined to the extent allowed under applicable state and federal permits. The project mining setbacks after all anticipated applicable permits are received are illustrated on *Figure 1: HMS Surface Mining Permit Parcels*. The sequence and volume of limestone quarried will be dictated by market conditions, quality of limestone, and speed of overburden removal. This Mining Plan is for guidance purposes and is subject to change. However, no new mining areas will be added to the plan. This plan was developed based on the current best available information.

Assuming current market conditions, it is anticipated that surface mining of Pierce-Eich Quarry will continue until approximately 2026. When mining in Peirce Eich Quarry is nearly completed or earlier if conditions dictate, HMS will resume surface mining operations in Middle Quarry and expand into Middle Parcel. Mining the surface reserves in Middle Parcel is anticipated to continue through approximately 2048. The progression of mining surface reserves is illustrated in *Figure 6: HMS Anticipated Surface Mining Sequence*. Dates and sequence of mining are subject to change due to the quality of the dolomite limestone and pace of extraction, which is affected by market demand.

The first component of surface mining consists of stripping overburden materials (i.e. soil and vegetation) that overlie the desired surface limestone. Overburden is kept on site and incorporated into berms in the setback areas or kept in separate stockpiles in the mining pit in anticipation of future marketing opportunities. Any overburden placed in the berms as it is removed from the site will not disrupt surface water flow to any remaining endangered species' habitat. In Middle Parcel, the overburden (i.e. soil and vegetation) of the wet-mesic dolomite prairie will be salvaged and re-located to the ComEd Parcel as part of the Mitigation Plan.

Surface mining occurs along a vertical rock face that is approximately 135 feet high. Surface limestone reserves are mined via blasting that frees the material from the walls. The limestone is then loaded onto dump trucks which transport the material to a crusher located in Middle Quarry. From Pierce-Eich, the dump trucks travel through a tunnel located underneath Illinois Route 53. The crusher on Middle Quarry reduces material to less than eight inches in size before materials fall to a conveyor for transport to HMS' processing and shipping facilities on the east side of the Des Plaines River. The conveyor is routed through a tunnel underneath the Des Plaines River. Materials are then taken through final crushing, screening and stockpiling along the Chicago Sanitary and Ship Canal before shipping to a final destination either via overland truck, rail or barge. See *Figure 7: HMS Surface Mining Material Flow* for a visual depiction of this process.

Generally, the bottom elevation of the quarries for surface mining is 475 feet above mean sea level, keeping in mind that Pierce-Eich is hummocky with higher elevations toward the north.[2] Surface mining occurs in the Silurian deposits of limestone down through the Drummond layer. Surface and sub-surface mining reserves are separated by a Scales shale aquitard, which prevents water from traveling between the shallow and deep aquifers (STS/AECOM 2008). See *Figure 5: HMS Mining Reserves Geologic Cross-Section*.

It is anticipated that extensive sub-surface mining will begin sometime around 2035 and will continue past the duration of the Incidental Take Permit. A more detailed description of sub-surface mining is contained in the below section entitled "Sub-surface Mining Operations."

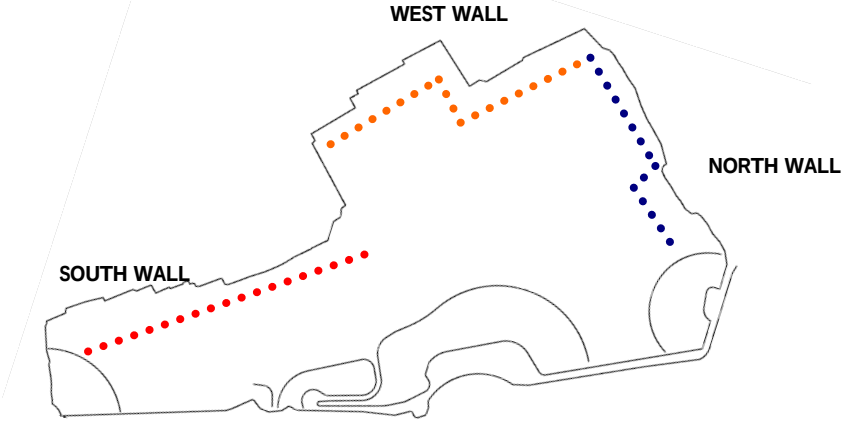
Pierce-Eich Quarry

HMS will first complete the mining of an additional 35 acres (as of the end of 2019) of surface reserves until approximately 2026 on Pierce-Eich Quarry. Shortly before the completion of the Pierce-Eich Quarry, HMS will start surface mining in Middle Quarry and Middle Parcel.

Production

The Romeoville Quarry is regulated by a unique set of blasting restrictions. According to the terms of the Village of Romeoville 1995 Annexation Agreement, blast vibrations are limited to a maximum peak particle velocity of 0.5 in/sec on any one of the three legs (radial, transverse, and vertical), and the Village will assess substantial monetary fines for violation of this limit. In respect of this limit, the operation has partnered with Dyno Nobel as both a supplier for blasting products and as a consultant for professional services (to potentially include annual signature hole work and blasting program analysis). Today, all blasting at Romeoville utilizes Dyno's DigiShot Electronic Initiation System, as well as either augured ANFO, Titan 1000 pumped emulsion, or both.

The production areas for Pierce-Eich are referred to herein as the North, South, and West high walls (see graphic).



[2] Personal communication with Randall Boisvert dated 7/20/2012.

The North high wall has distances ranging from 900 to 1,100 feet to the nearest protected structure, generally requiring lower pounds of explosives per deck, per hole. In order to maintain consistent fracturing, while still providing acceptably low particle velocities, blasting on this face will utilize 12' x 13' square (burden x spacing distance) patterns, with adjustments made depending on the geology and fracturing of the native rock during advancement. Efforts began in 2011 to re-orient this face to run parallel with Taylor Road. This action will redirect the primary blast forces away from the Nottingham Ridge subdivision and into the farm field to the west of the property, thus lowering the residents' perception of the vibrations.

The West high wall has distances from 1,100 to 1,700 feet to the nearest protected structure. These increased distances allow for greater pounds per delay than the North high wall, and thus the pattern can be expanded to 16' x 16', with adjustments as needed as dictated by the seismic monitoring. Advancement will continue along the established face.

The South high wall has distances of 600 to 800 feet to the nearest protected structure, once again limiting the explosive pounds per delay. This area will continue to be mined with 12' x 13' foot patterns, again being adjusted as fragmentation, seismic readings, and community impacts dictate. As is the case on the North wall, the South wall will also be reoriented to reduce the impact of blasting on the College View subdivision. The South wall will turn northwest and become perpendicular to the mine limit setback.

Stripping

The overburden thickness varies considerably across the three faces. The overburden estimates for stripping were calculated utilizing the polygonal area of influence method. This technique assumes a constant overburden thickness around each core hole that extends half of the distance to the next hole. Due to increased overburden volumes – especially in the south – it is imperative that stripping activity continue unabated through each winter shutdown period over the next several years.

Stripping operations were initially focused in the north, and are advancing to the west and south, where stripping will encounter the most substantial amounts of overburden.

Overburden from the North and West faces – calculated to be between 25' to 28' thick – has been deposited in the existing quarry on either the currently existing north sand/gravel stockpile, the east topsoil/clay stockpile, or new stockpiles that were created. Overburden from the South face – calculated to be between 25' to 54' thick – will be deposited on the south topsoil/clay stockpile in the quarry.

Reserves

Currently, (as of the end of 2019) there is approximately 16 million tons of reserves on 35 acres remaining in Pierce-Eich. It is anticipated that surface mining will be completed in 2026.

Middle Quarry and Middle Parcel

Under the mining plan, HMS will expand surface mining operations in Middle Quarry north into Middle Parcel. Middle Parcel contains approximately 40 million tons of reserves. Only a small area (approximately one acre) of Middle Quarry, located in the northwest corner between the tunnel under Route 53 and the Middle Parcel, will be mined (Figures 1 & 6). HMS will mine the Middle Parcel and Middle Quarry after mining of Pierce-Eich is nearly complete and in a progression illustrated in *Figure 6: HMS Anticipated Surface Mining Sequence*. Mining will occur on approximately 115 acres of the 125 acres of Middle Parcel and is estimated to take approximately 20 years to complete.

The Middle Parcel mining will begin in the southern end of the parcel and move north. Prior to mining an area, vegetation and substrate (overburden) are removed. Stripping of overburden on Middle Parcel will begin approximately two years after approval is obtained from all relevant regulatory agencies. The wet dolomite prairie will not be removed until approximately a year or two after overburden removal begins on this parcel (i.e. year four after permit approval). This high-quality wetland will be carefully removed and relocated to a mitigation parcel (See Restoration Plan Set) and used to create Hine's emerald dragonfly habitat under the Habitat Conservation Plan (HCP) accompanying the ITP. This mining plan will allow the highest quality vegetation and HED habitat to be retained in the Middle Parcel until it is time for it to be transplanted. This sequencing also provides time for early mitigation efforts to be completed and demonstrate success.

The southern end of Middle Parcel is highly disturbed and contains filled areas and scraped areas that have been colonized by weedy species. This area will be mined first under the mining plan. As stated above, the wet-mesic dolomite prairie in the central portion of Middle Parcel will not be removed for approximately three to four years after authorizations are received and when it is, it will be carefully transplanted in HMS' ComEd Parcel and used to create HED habitat under HMS' HCP.

East Parcel

Under the mining plan, HMS also plans to surface mine 36 acres of limestone in East Parcel located at the north end of East Quarry during the permit period. Neither an ITP nor an ITA is required to mine this area. It is anticipated that mining at this location will start near the end of the 30-year ITP but may continue after the permit period. If the sub-surface mine portal is developed in the East Quarry, then the timing of this mining may be changed substantially.

Operational Avoidance Measures
Several measures will be taken during the mining process to avoid taking adult HED or covered turtle species or harming remaining habitat. These can be found in Section 5.1.3 and 5.2.3 of the HCP.

Sub-surface Mining Operations
Sub-surface mining of the deeper Galena-Platteville formation will occur at the Romeoville Quarry. See *Figure 5: HMS Mining Reserves Geologic Cross Section*.

The entry portal and staging for sub-surface mining will occur in either Middle Parcel, Middle Quarry or East Quarry. Construction will begin concurrent with surface mining operations in approximately 2035, construction of the decline and other sub-surface mining facilities will be completed so that underground mining can be up and running before surface reserves are exhausted.

The portal will consist of a tunnel that penetrates the shale aquitard separating recoverable surface from sub-surface materials. The aquitard overlays all underground reserves and will prevent sub-surface mining from having any effects on shallow (Silurian) groundwater and surface hydrology (AECOM 2008). The underground mining, in the Galena-Platteville formation, will be completed using the room and pillar method of extraction.

The top of the Galena Group is at USGS MSL elevation of 275. The Galena-Platteville formation is approximately 335 feet thick (Figure 5). The formation will be mined in three different layers about 70 feet high. Any water that enters the underground mine will be pumped to the on-site settling ponds.

The sub-surface mining tunnel will be large enough to accommodate conveyance machinery and earthmoving equipment. Sub-surface mining will use smaller "shots" of explosives to loosen rock material to allow for removal and crushing. The explosions will be nearly undetectable on the surface. Some underground crushers and conveyance equipment will be used. Air and safety shafts will be constructed in numerous locations.

The decline tunnel and ventilation shafts will be constructed to prevent water from flowing from the upper aquifer into the tunnel or shafts. The decline tunnel and ventilation shafts are planned to be constructed and sealed progressively, in short increments, with a hydrostatic lining through the water bearing strata. The hydrostatic liner consists of a substantial thickness of reinforced (fiber, mesh, or both) structural concrete applied to the perimeter walls of the decline or shaft to resist water pressure. The liner thickness will be approximately 18 to 21 inches thick in the decline and 12 to 18 inches in the shaft. The hydrostatic liner will be keyed into the low permeable rocks of the Maquoketa Group to ensure hydraulic short-circuiting does not occur. When the decline tunnel reaches dry strata, a grout plug will be formed around the tunnel at the junction in the rock to stop water tracking down the back of the lining into the Scales Shale. Further field investigation is being

planned to evaluate site specific conditions at the decline and shaft locations, with the investigation results being used to inform the hydrostatic liner designs.

Again, as the sub-surface mine is not expected to be developed for approximately 15 years, the project has not been designed and the location of the portal, and air and safety shafts, mining method, and horizontal mining horizons are all subject to change. However, it is certain that the entry portal and staging area for sub-surface mining will be located in one of the three parcels listed above (i.e. Middle Parcel, Middle Quarry or East Quarry) after they have been mined Any air or safety shafts that are needed during ITP period will be placed in mined or developed area, and the subsurface mining will also occur under these areas during the ITP period.

Flooding and Water Cycling

Occasionally some minor flooding occurs on parcels adjacent to the Des Plaines River that have yet to be mined. However, all quarries are surrounded by earthen berms greater in height than the 100-year flood elevation that form a flood protection barrier, and are not subject to flooding. The East Quarry is shown as located in a floodplain as defined by the latest PRELIMINARY Flood Insurance Rate Maps from the Federal Emergency Management Agency (dated Nov. 6, 2000), but the East Quarry is protected from flooding by earthen berms as shown in ***Figure 8: HMS Surface Mining Parcel Floodplain***. Though neither is located in a floodplain, surface mining activities on Middle Quarry and Middle Parcel will continue to benefit from additional protection from flooding provided by the existing rail road bed which acts as a flood protection barrier.

Minor amounts of seepage occur from the walls of existing surface mines, and it is anticipated that minor seepage will occur with future surface mining activities as well. Seepage and water entering the site from precipitation are recycled through the Romeoville Quarry's operations, with any surplus water discharged into the Des Plaines River under an NPDES permit. See ***Figure 9: HMS Surface Mining Water Cycle.***

Currently, water is recycled using four pumps on-site. Pump #1 is the discharge pump located in Middle Quarry which pumps water from a sump to the Des Plaines River. Pump #2 is also located in Middle Quarry, and pumps water to the processing plant for washing product, dust control and other operational purposes. Pump #2 can also discharge to the Des Plaines River when there is excessive water in the sump and when Pump #1 is out of operation for service. Pump #3 is located in the East Quarry, where it pumps water to the sump in Middle Quarry from the settling pond and processing plant. HMS also has the ability to install an additional pump next to pump #3 as a backup or to discharge additional water to the Des Plaines River. The smallest pump, Pump #4 is located in Pierce-Eich Quarry, and it transmits water to the sump on Middle Quarry. An additional pump will be installed for sub-surface mining operations. It is anticipated that this pump will feed into, and integrate with, current pumping operations.

An additional water pump will be installed in the Middle Quarry to transfer groundwater seepage to the proposed infiltration gallery in the River South Bluff Parcel located directly west of the River South Parcel.

Surface and sub-surface mining reserves are separated by a Scales shale aquitard, which prevents water from traveling between the shallow and deep aquifers (AECOM 2008)*. See *Figure 5: HMS Mining Reserves Geologic Cross-Section*. For a full description of any effects of surface mining operations on groundwater, refer to AECOM's groundwater modeling reports (AECOM 2012, 2013b, 2014a and 2014b)*.

Summary

Under the proposed mining plan, HMS will quarry surface reserves on Pierce-Eich, Middle Quarry, Middle Parcel, and East Parcel through approximately 2055 HMS plans to begin construction of sub-surface mining operations in approximately 2035 and will continue to subsurface mine past the end of the ITP. See *Figure 10: HMS Mining Sequence of Operations* for a visual summary showing the estimated timing of HMS mining operations throughout the duration of the permit.

*See Habitat Conservation Plan reference list.

Figures 1 - 10: See the Following Pages

Figure 1: HMS Surface Mining Permit Parcels

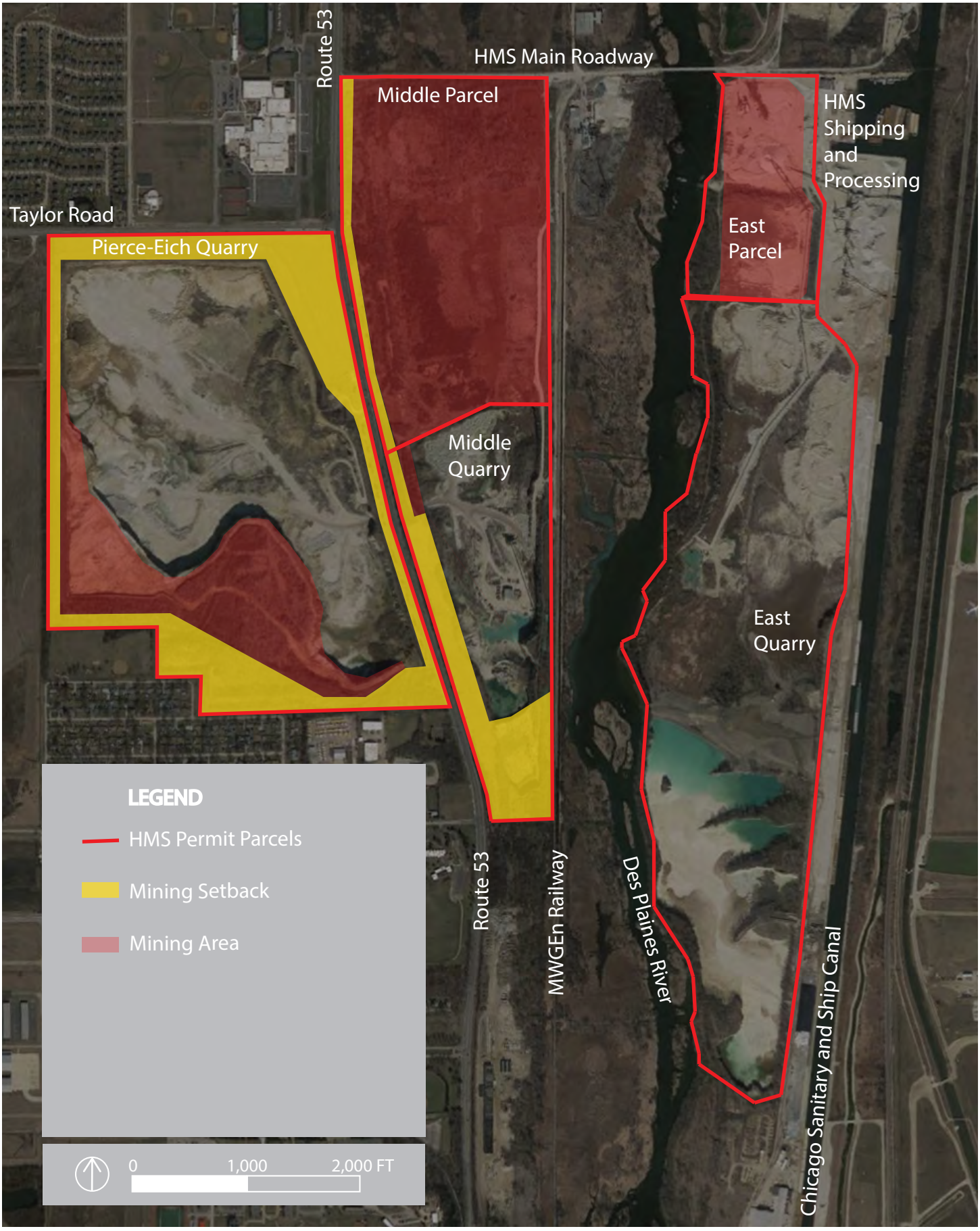


Figure 2: HMS Surface Mining Parcel Topography

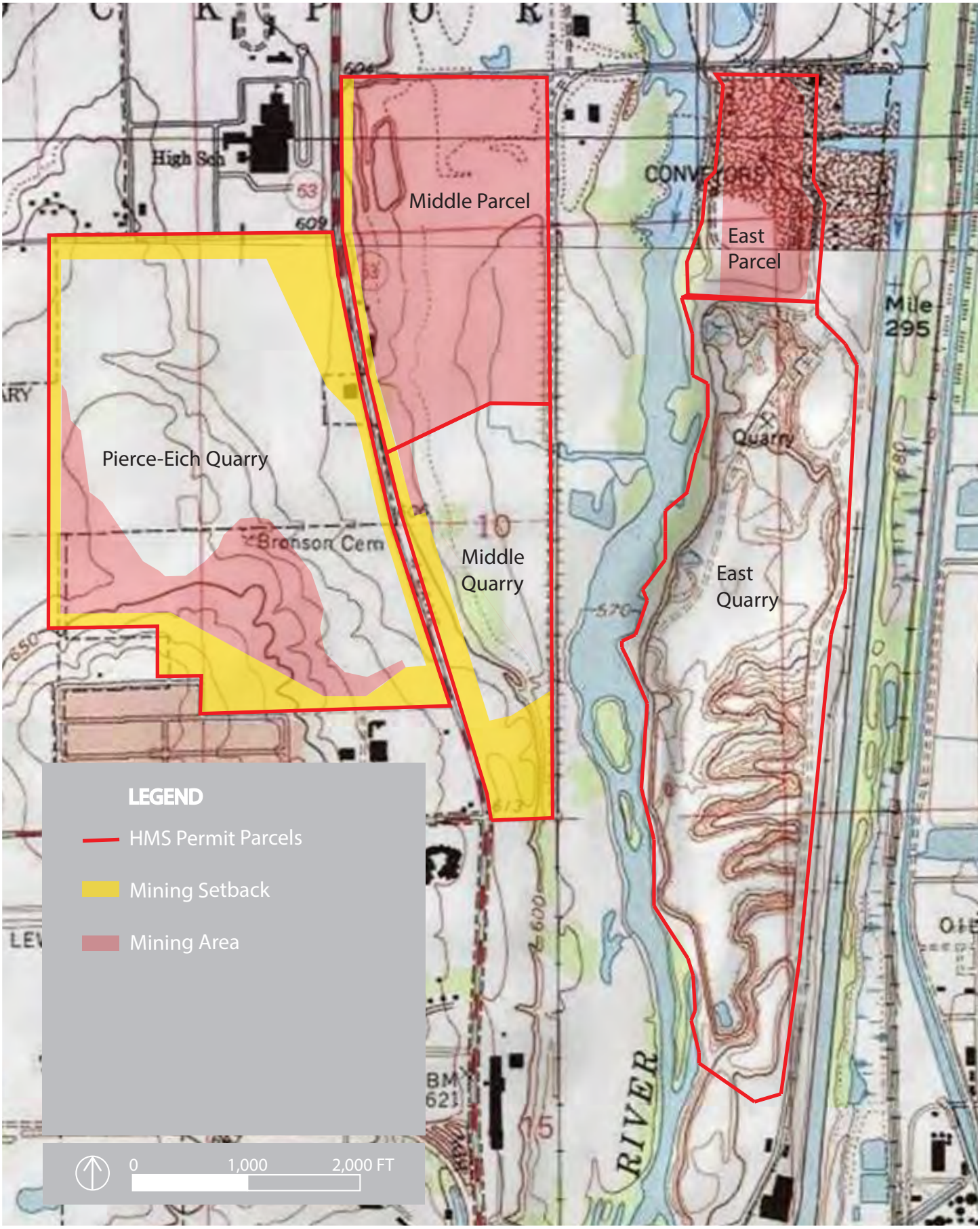


Figure 3: HMS Romeoville Quarry Polar Diagram

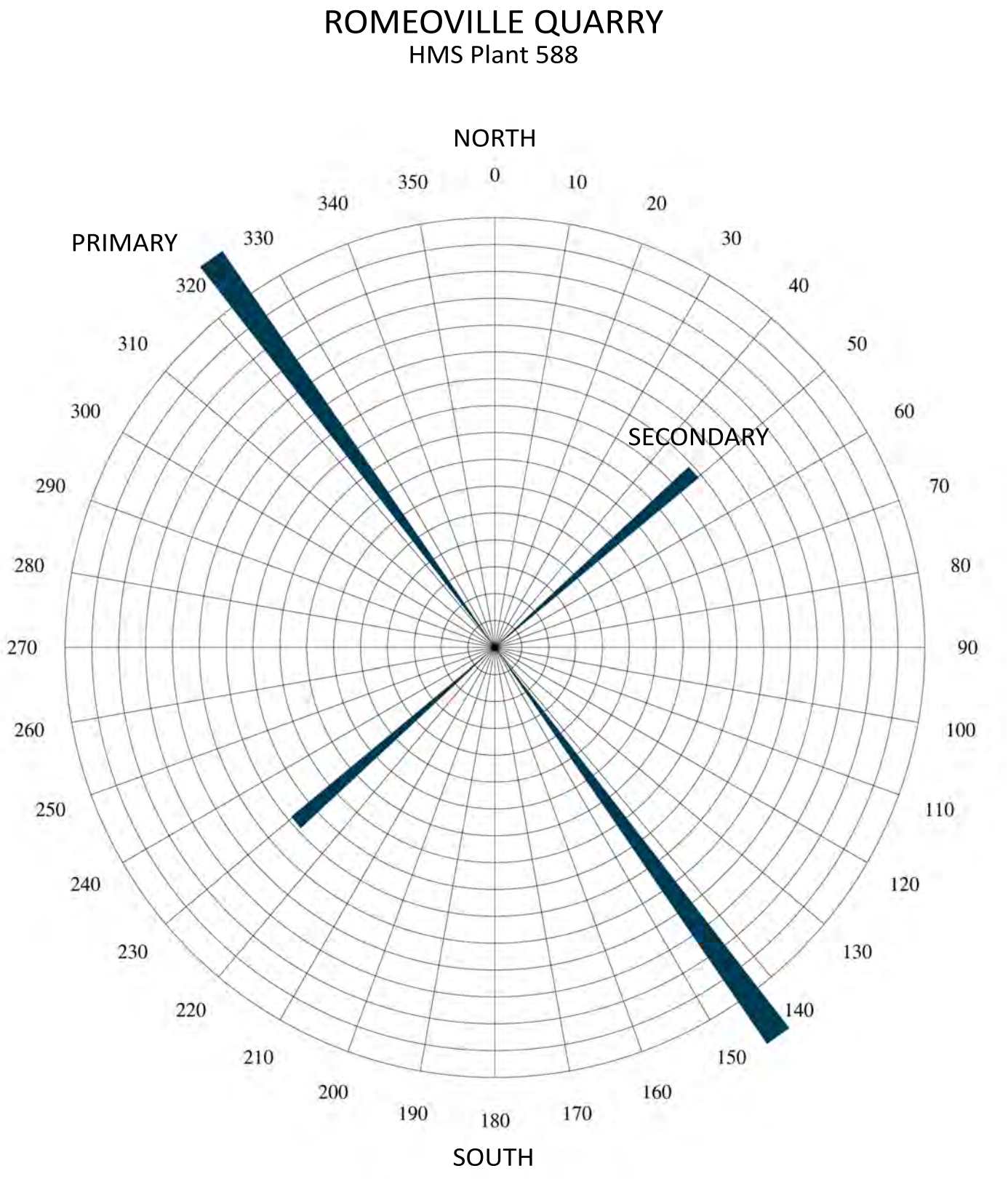


Figure 4: HMS Surface Reserves Geologic Jointing

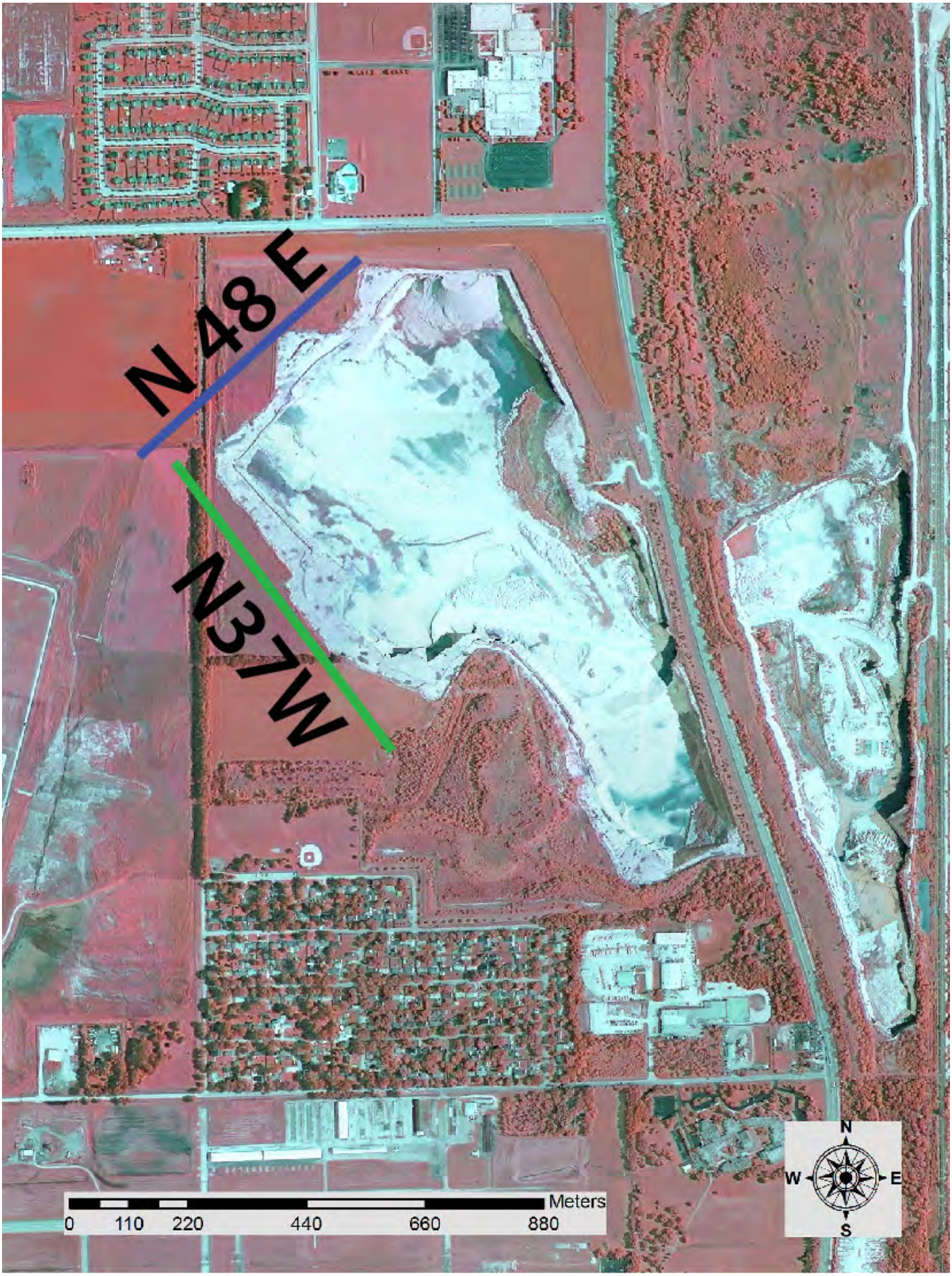
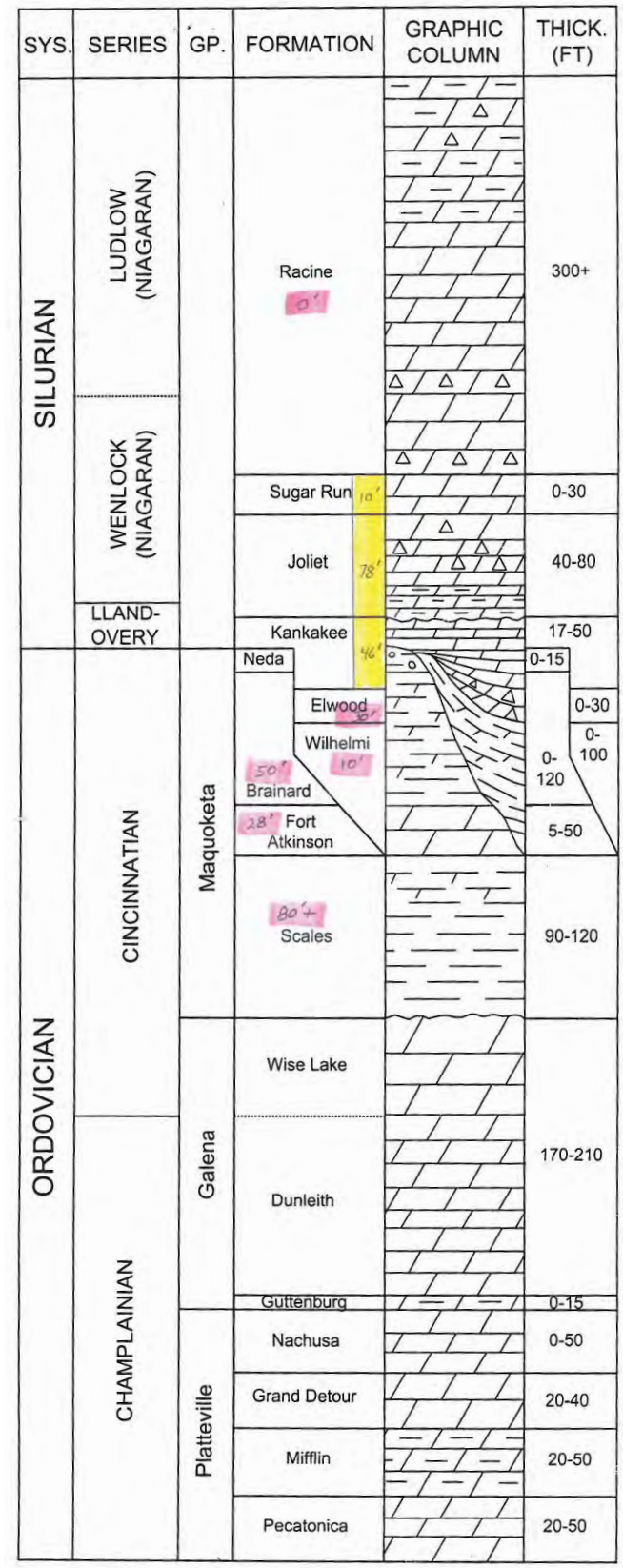
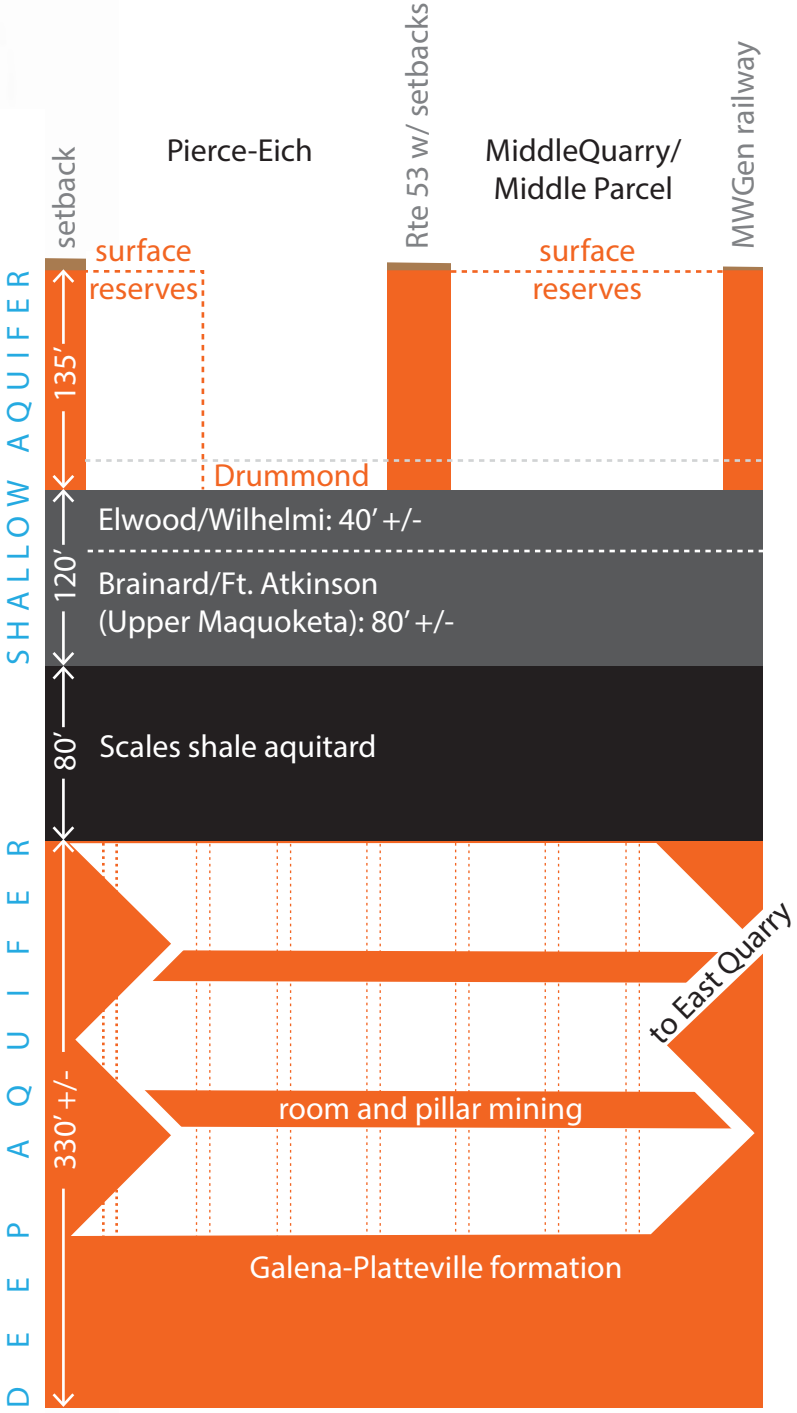


Figure 5: HMS Mining Reserves Geologic Cross-Section



Silurian and Ordovician post-Ancell Group strata of northeastern Illinois



Corresponding East-West Section of HMS Surface Mining Operations
(not to scale)

Figure 6: HMS Anticipated Surface Mining Sequence

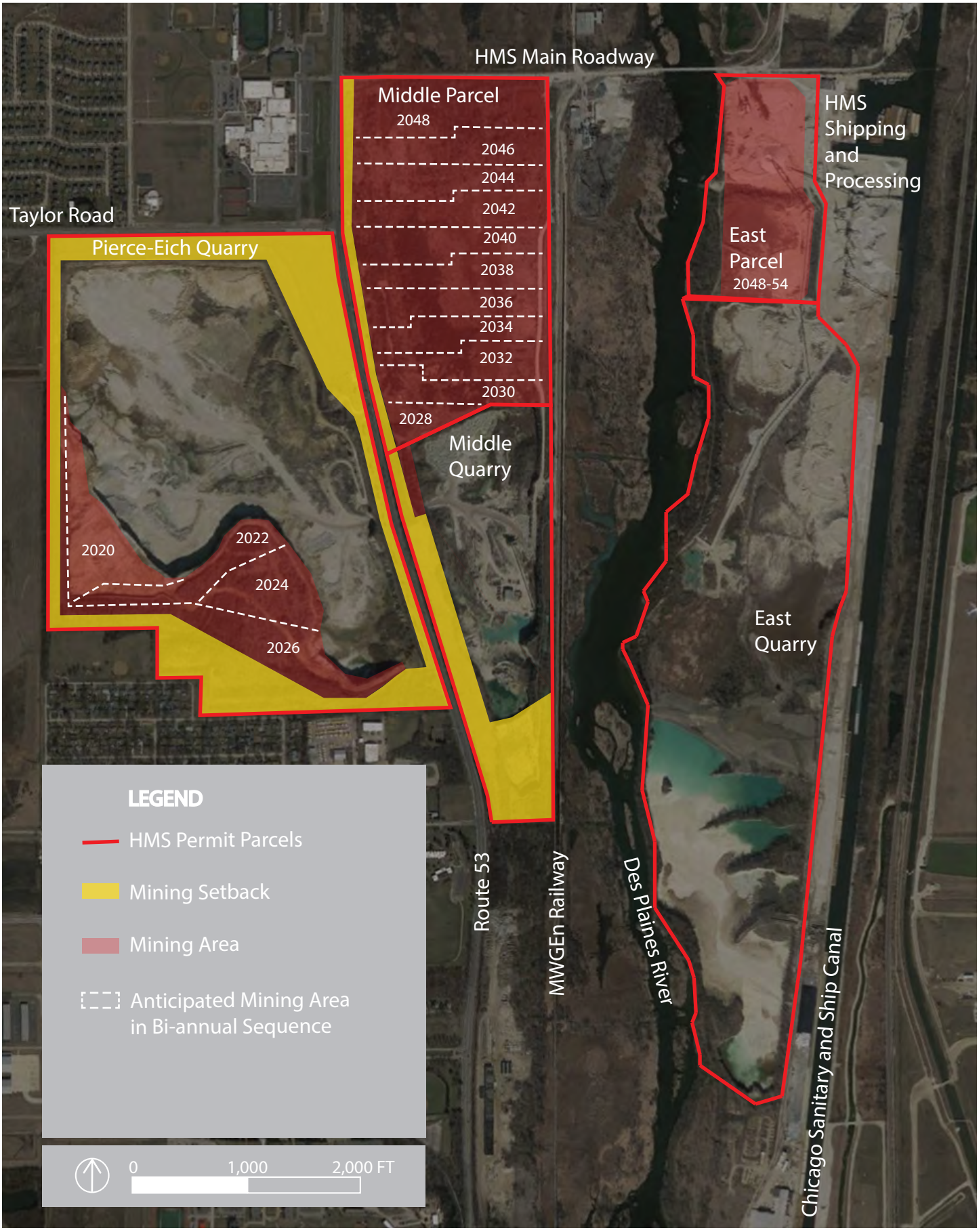


Figure 7: HMS Surface Mining Material Flow

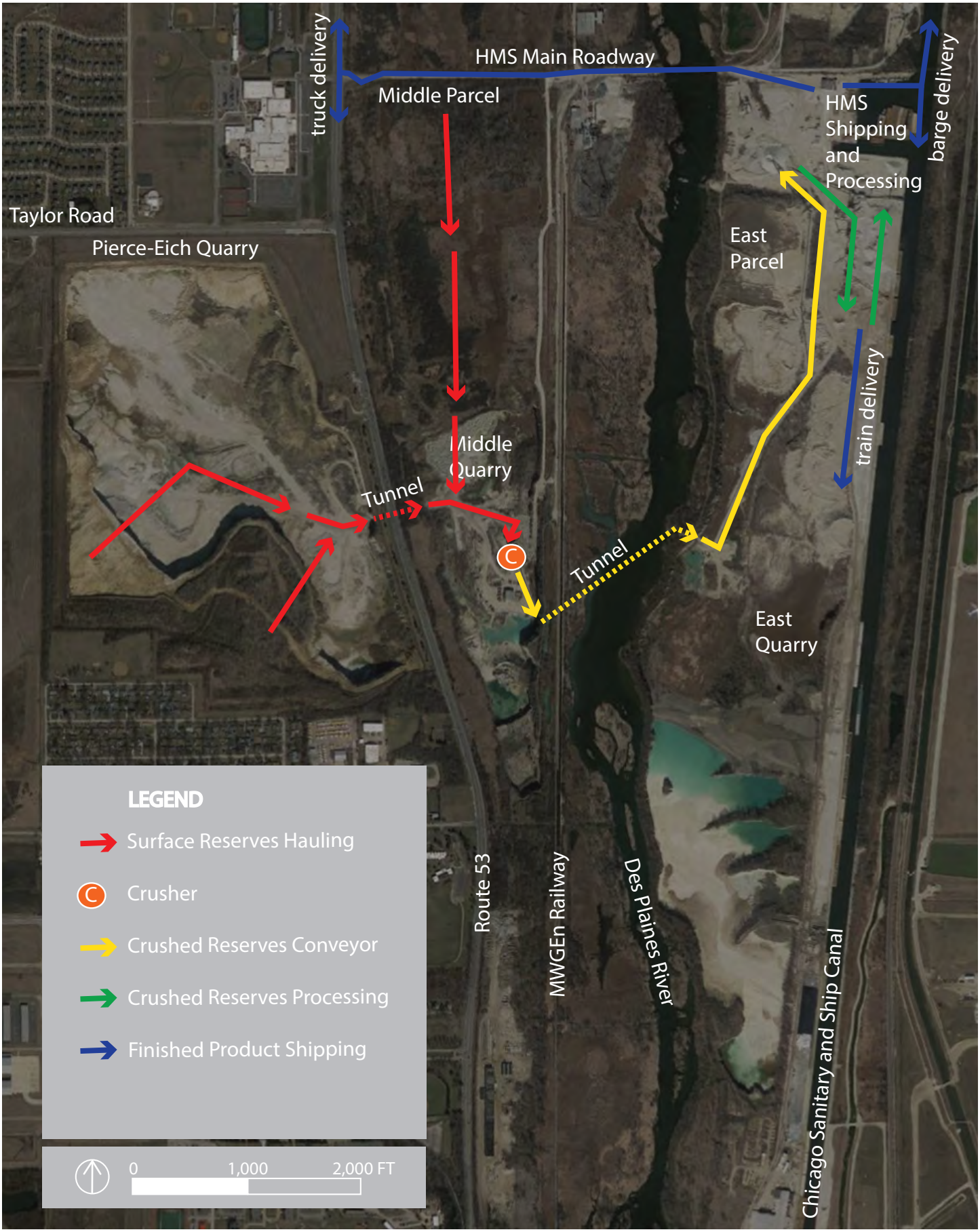


Figure 8: HMS Surface Mining Parcel Floodplain

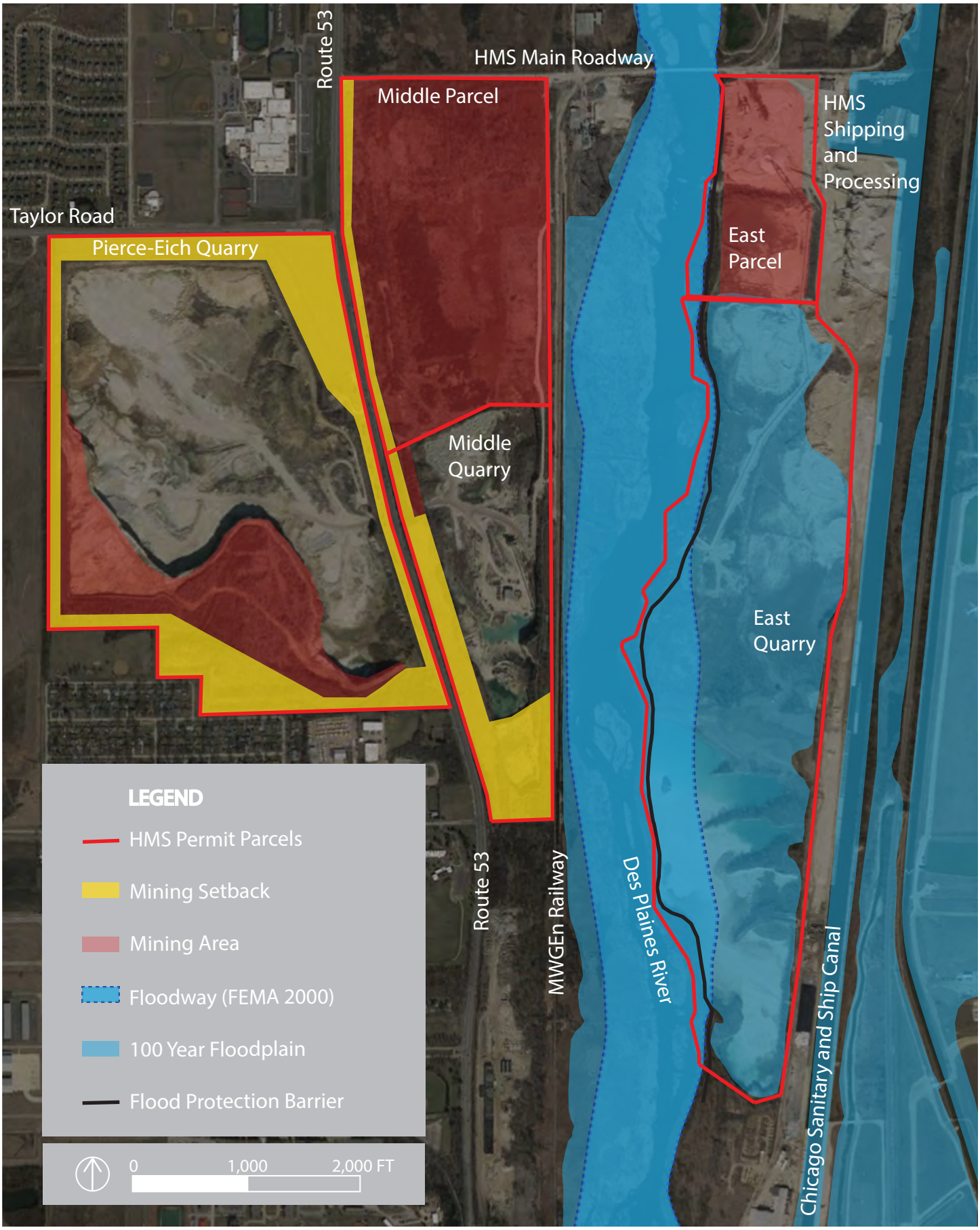


Figure 9: HMS Surface Mining Water Cycle

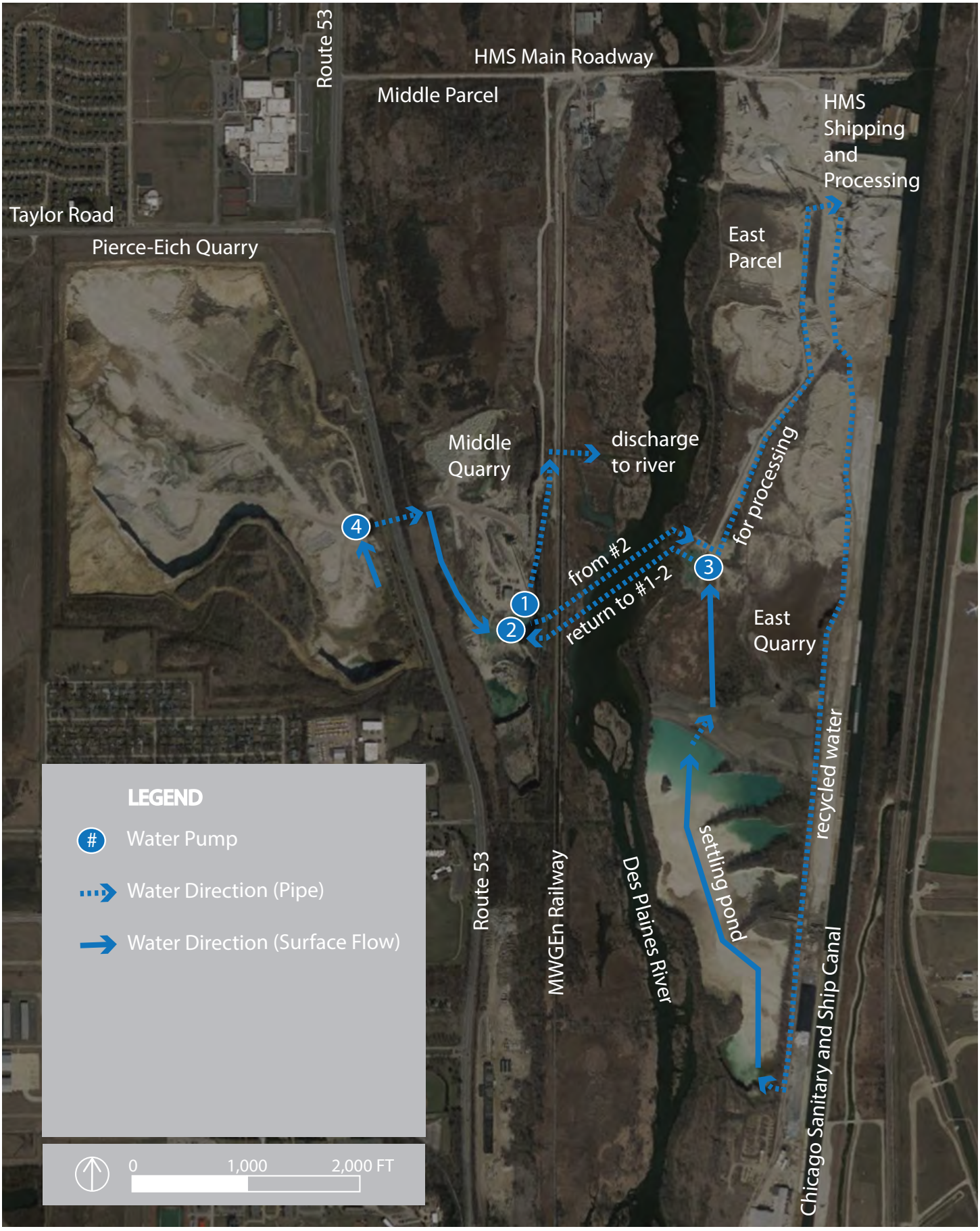
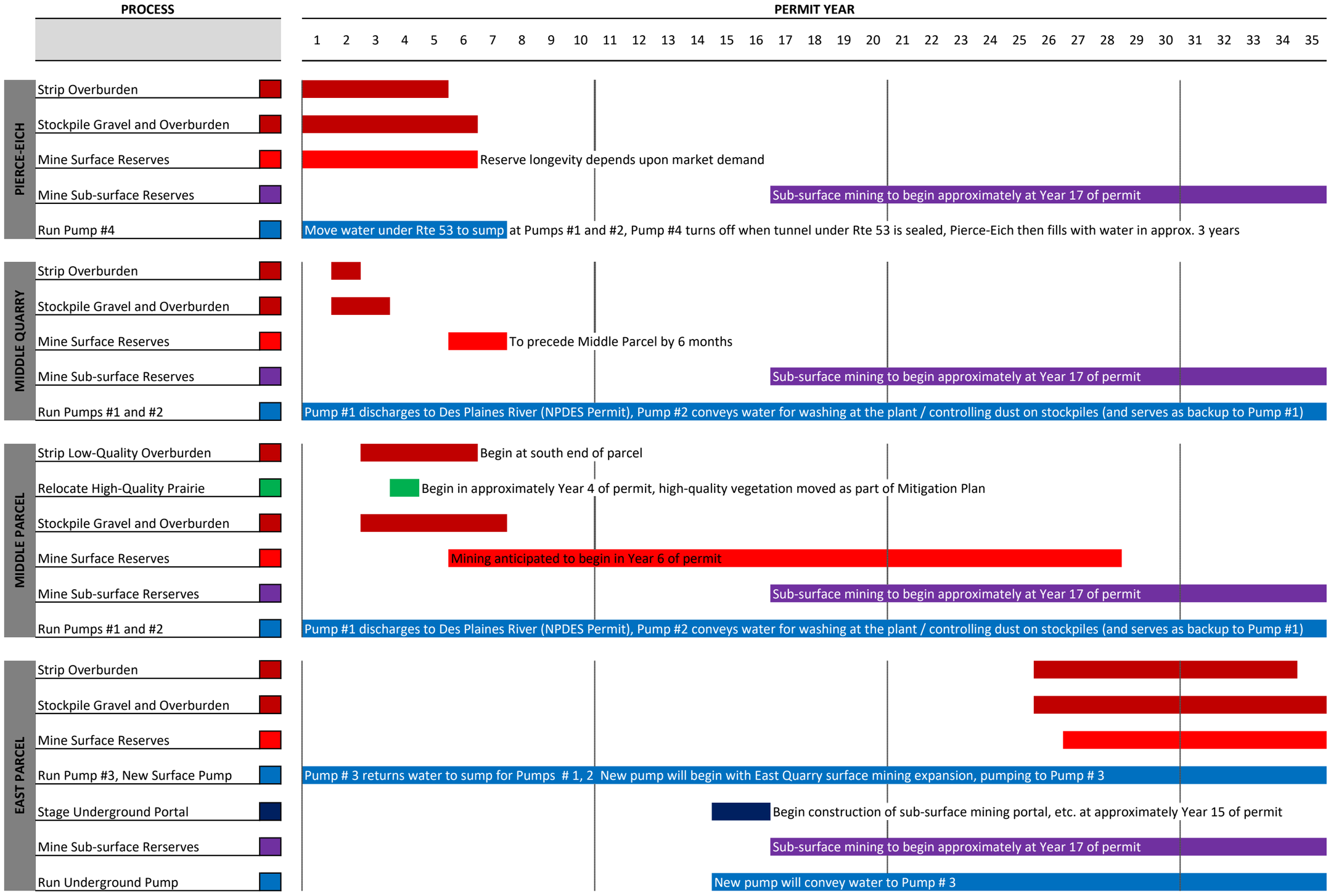


Figure 10: HMS Anticipated Mining Sequence of Operations



APPENDIX F:
HMS Restoration Plan Set

FINAL PLANS FOR

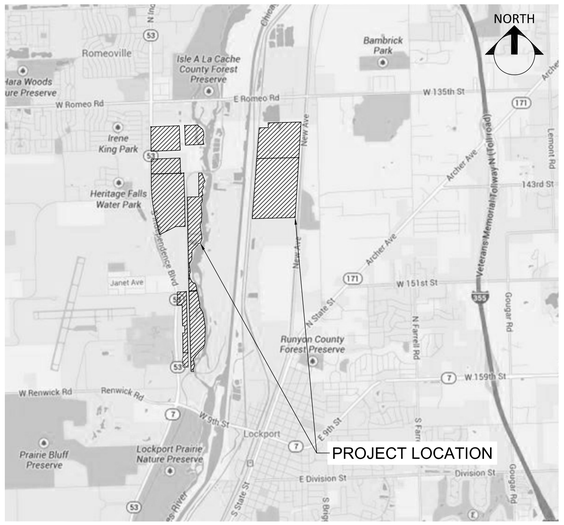
HANSON MATERIAL SERVICE CORPORATION

SURFACE MINING MITIGATION AND RESTORATION

ROMEOVILLE, WILL COUNTY, ILLINOIS

LOCATION MAP

N.T.S.



*THIS PROJECT WILL OCCUR ON 10 PARCELS OF LAND OWNED BY HANSON MATERIAL SERVICE (ABBREVIATED IN THESE DRAWINGS AS "HMS"). COMED PARCEL AND LONG RUN PARCEL ARE COLLECTIVELY REFERENCED IN DRAWING SHEETS AS "COMED/LONG RUN PARCELS." FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, RIVER SOUTH PARCEL, AND RIVER PARCEL ARE COLLECTIVELY REFERENCED IN DRAWING SHEETS AS THE "PARCELS RIVER." MIDDLE PARCEL AND NORTH PARCEL ARE REFERENCED IN DRAWING SHEETS EITHER, INDIVIDUALLY BY NAME, OR COLLECTIVELY, AS "MIDDLE/NORTH PARCELS." FAR NORTH PARCEL AND RIVER NORTH PARCEL ARE COLLECTIVELY REFERENCED IN DRAWING SHEETS AS "FAR NORTH/RIVER NORTH PARCELS." SEE SHEET C-2 PARCEL OVERVIEW FOR A GRAPHICAL DEPICTION OF PARCEL LOCATIONS AND NAMES.

DRAWING INDEX

Sheet	Description
C-1	COVER SHEET
C-2	PARCEL OVERVIEW*
E-1	EXISTING CONDITIONS - LANDCOVER - MIDDLE/NORTH PARCELS
E-2	EXISTING CONDITIONS - LANDCOVER - COMED/LONG RUN PARCELS
E-3	EXISTING CONDITIONS - LANDCOVER - PARCELS RIVER
E-4	EXISTING CONDITIONS - LANDCOVER - FAR NORTH/RIVER NORTH PARCELS
E-5	EXISTING CONDITIONS - SOILS AND WETLANDS - MIDDLE/NORTH PARCELS
E-6	EXISTING CONDITIONS - SOILS AND WETLANDS - COMED/LONG RUN PARCELS
E-7	EXISTING CONDITIONS - SOILS AND WETLANDS - PARCELS RIVER
E-8	EXISTING CONDITIONS - SOILS AND WETLANDS - FAR NORTH/RIVER NORTH PARCELS
W-1	WETLAND IMPACTS - MIDDLE PARCEL
W-2	WETLAND IMPACTS - COMED/LONG RUN PARCELS
W-3	WETLAND RESTORATION - COMED/LONG RUN PARCELS
W-4	WETLAND RESTORATION - PARCELS RIVER
H-1	HABITAT RESTORATION AND ENHANCEMENT PLAN - COMED/LONG RUN PARCELS
H-2	HABITAT RESTORATION AND ENHANCEMENT PLAN - PARCELS RIVER
H-3	HABITAT RESTORATION AND ENHANCEMENT PLAN - NORTH PARCEL
H-4	HABITAT RESTORATION AND ENHANCEMENT PLAN - FAR NORTH/RIVER NORTH PARCELS
T-1	WET PRAIRIE TRANSPLANT PLAN - MIDDLE PARCEL
T-2	WET PRAIRIE TRANSPLANT PLAN - SOIL DEPTH TOPOGRAPHY - MIDDLE PARCEL
T-3	WET PRAIRIE TRANSPLANT PLAN - SOIL DEPTH TRANSECTS - MIDDLE PARCEL
T-4	WET PRAIRIE TRANSPLANT PLAN - COMED/LONG RUN PARCELS
D-1	DRAINAGE AND GRADING PLAN - MIDDLE PARCEL
D-2	DRAINAGE AND GRADING PLAN - COMED/LONG RUN PARCELS
S-1	EROSION CONTROL PLAN - MIDDLE PARCEL
S-2	EROSION CONTROL PLAN - COMED/LONG RUN PARCELS
I-1	INVASIVE SPECIES REMOVAL PLAN - COMED/LONG RUN PARCELS
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I-3	INVASIVE SPECIES REMOVAL PLAN - NORTH PARCEL
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R-1	RESTORATION ZONES - COMED/LONG RUN PARCELS
R-2	RESTORATION ZONES - PARCELS RIVER
R-3	RESTORATION ZONES - NORTH PARCEL
R-4	RESTORATION ZONES - FAR NORTH/RIVER NORTH PARCELS
R-5	RESTORATION ZONES - SEEDING LISTS - PROVIDED BY HMS
R-6	RESTORATION ZONES - SEEDING & PLANTING LISTS - PROVIDED BY CONTRACTOR
M-1	MONITORING PLAN - COMED/LONG RUN PARCELS
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P-1	PRESERVATION ONLY - NORTH PARCEL
P-2	PRESERVATION ONLY - COMED/LONG RUN PARCELS
P-3	PRESERVATION ONLY - PARCELS RIVER
P-4	PRESERVATION ONLY - FAR NORTH/RIVER NORTH PARCELS
N-1 TO N-2	PROJECT NOTES
N-3 TO N-8	PROJECT SPECIFICATIONS

GENERAL NOTES

1. TOPOGRAPHIC DATA DERIVED FROM LiDAR GIS DATASET FOR WILL COUNTY, DATED 2014, AS PUBLISHED BY THE ILLINOIS GEOSPATIAL DATA CLEARINGHOUSE .
2. THE OWNER SHALL BE NOTIFIED 24 HOURS PRIOR TO THE START OF ANY CONSTRUCTION.
3. MULTIPLE GAS LINES EXIST ON THE COMED AND LONG RUN PARCELS. ALL UTILITY COMPANIES SHALL BE CONTACTED PRIOR TO START OF CONSTRUCTION FOR EXACT LOCATIONS OF ALL UTILITIES AND THEIR PROTECTION DURING CONSTRUCTION. IF UTILITIES ARE ENCOUNTERED THAT CONFLICT WITH NEW CONSTRUCTION, THE OWNER SHALL BE NOTIFIED SO THE CONFLICT MAY BE RESOLVED. CONTACT J.U.L.I.E., AT 811 OR 1-800-892-0123 TWO WORKING DAYS PRIOR TO BEGINNING EXCAVATION.
4. ALL PERMITS REQUIRED FOR CONSTRUCTION SHALL BE OBTAINED BY OWNER. ADEQUATE SIGNAGE AND WARNING DEVICES TO INFORM AND PROTECT THE PUBLIC SHALL BE INSTALLED AND MAINTAINED.
5. UNLESS AUTHORIZED BY PROPERTY OWNER THERE SHALL BE NO ENTERING ONTO PRIVATE PROPERTY.
6. IF PARTIAL CLOSURE OF ANY PUBLIC STREET IS REQUIRED DURING CONSTRUCTION, A WRITTEN TRAFFIC CONTROL PLAN SHALL BE SUBMITTED AND APPROVED BY THE APPROPRIATE AUTHORITY PRIOR TO COMMENCING CONSTRUCTION. ANY PERMITS REQUIRED FOR PARTIAL ROAD CLOSURE SHALL BE OBTAINED BY CONTRACTOR. ALL TRAFFIC CONTROL SIGNAGE, FLAGGERS, AND MARKINGS SHALL BE INCIDENTAL TO CONTRACT.

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HMS Surface Mining Mitigation and Restoration Plans

Romeoville, Will County, Illinois

Hanson Material Service Corporation
c/o Lehigh Hanson
620 West 183rd Street
Thornton, Illinois 60476

AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms c-1 cover page.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

SHEET TITLE

Cover Sheet

SHEET NUMBER

C-1

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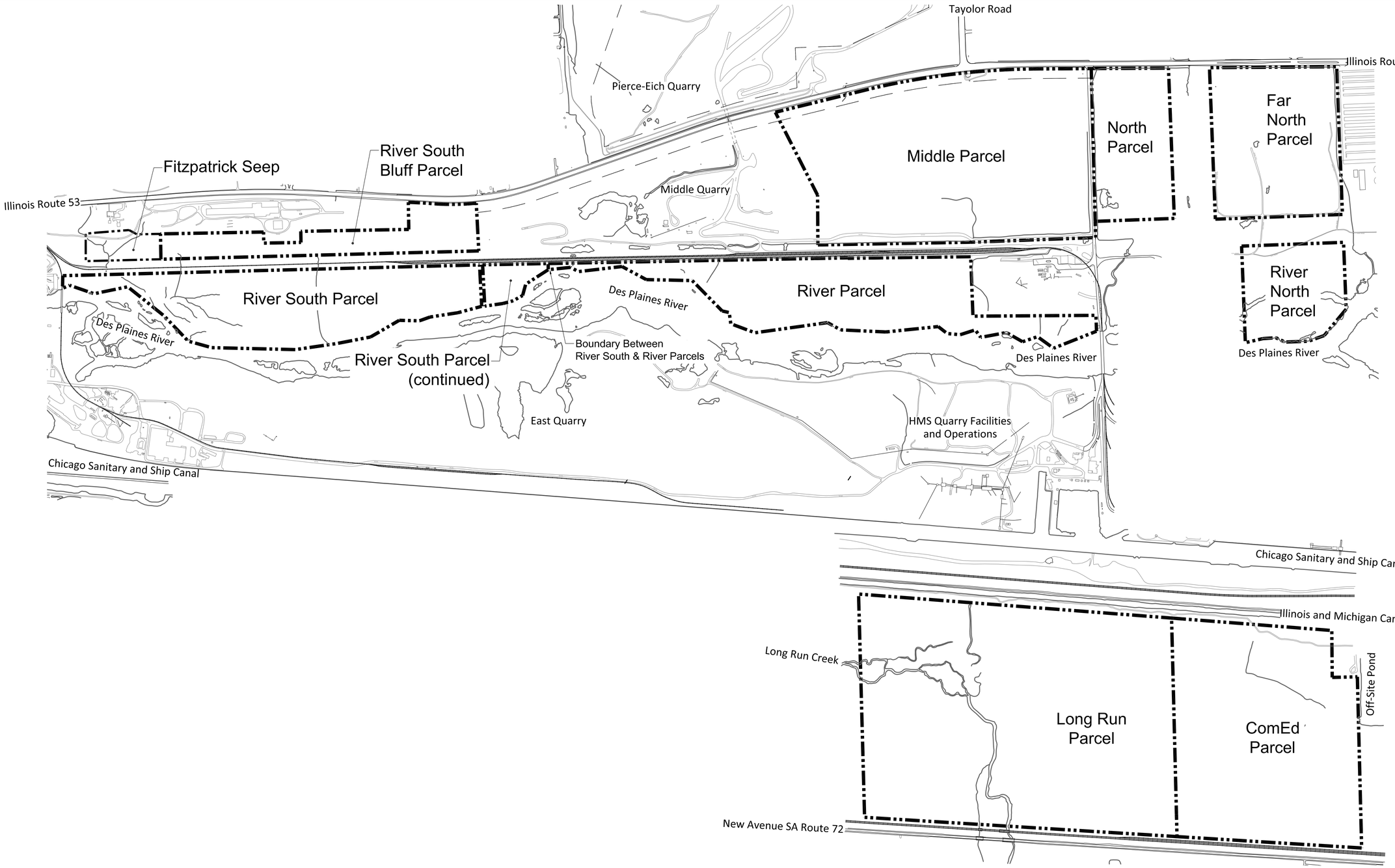

PARCEL OVERVIEW

1" = 500'

LEGEND

Symbol	Description
—·—·—	Parcel Boundary

NOTES

1. Middle Parcel and North Parcel are collectively referenced in drawing sheets as the "Middle/North Parcels." For drawings regarding Middle/North Parcels, refer to the following sheets: E-1, E-5, W-1, T-1, T-2, T-3, D-1, S-1, I-3, R-3, H-3, M-3, P-1.
2. ComEd Parcel and Long Run Parcel are collectively referenced in drawing sheets as the "ComEd/Long Run Parcels." For drawings regarding ComEd/Long Run Parcels, refer to the following sheets: E-2, E-6, W-2, W-3, T-4, D-2, S-2, I-1, R-1, H-1, M-1, P-2.
3. Fitzpatrick Seep, River South Bluff Parcel, River South Parcel, and River Parcel are collectively referenced in drawing sheets as the "Parcels River." For drawings regarding the Parcels River, refer to the following sheets: E-3, E-7, W-4, I-2, R-2, H-2, M-2, P-3.
4. Far North Parcel and River North Parcel are collectively referenced in drawing sheets as the "Far North/River North Parcels." For drawings regarding the Far North/River North Parcels, refer to the following sheets: E-4, E-8, I-4, R-4, H-4, M-4, P-4.

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AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms c-2 parcel overview.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 500'

0 250 500 1,000

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Parcel Overview

SHEET NUMBER

C-2

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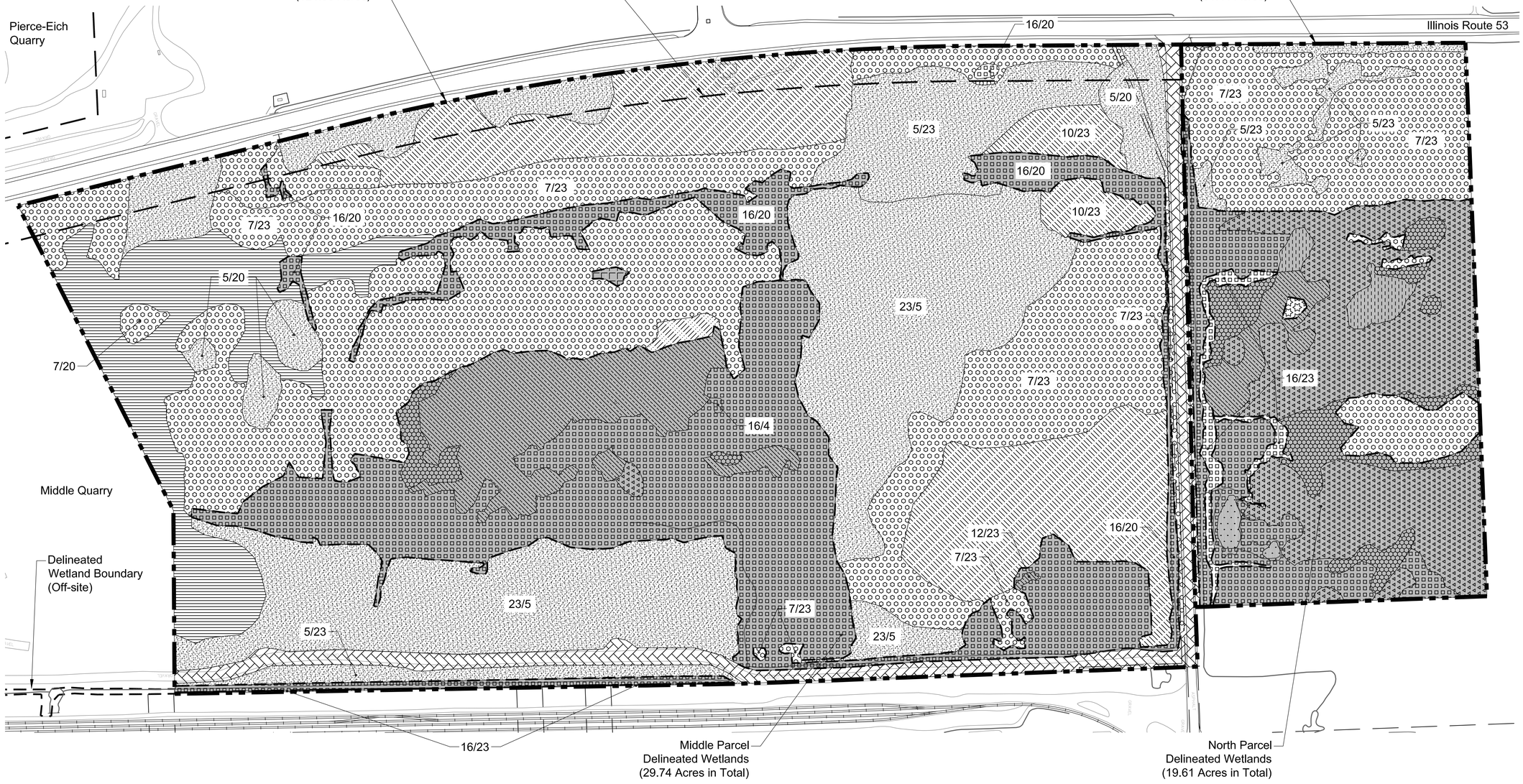

MIDDLE PARCEL AND NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Watercourse
	Mining Setback
	Easement Boundary
	Existing Wetland Area (Middle P. = 29.74 Acres, North P. = 19.61 Acres)

EXISTING LANDCOVER (Middle P./North P.)

Symbol	Description	Acres
	02: Dry-Mesic Dolomite Prairie	0 / 0.07
	03: Mesic Dolomite Prairie	0.30 / 0
	04: Wet-Mesic Dolomite Prairie	6.01 / 1.16
	05: Old Field/Upland Grassland	33.53 / 1.44
	07: Shrubland Upland	32.65 / 9.16
	08: Shrubland Bottomland	0.67 / 2.56
	10: Woodland Upland	15.85 / 0
	12: Wet Prairie/Sedge Meadow	0.04 / 0.69

EXISTING LANDCOVER (Middle P./North P.)

Symbol	Description	Acres
	14: Wet Meadow-Reed Canary	0.08 / 0
	16: Marsh-Phragmites	22.97 / 5.25
	17: Marsh-Cattail	0.12 / 10.59
	18: Pond/Open Water	0 / 0.24
	20: Scraped	7.84 / 0
	24. Developed	4.82 / 0.25
	23: Fill	

NOTES

1. Primary landcover areas are noted according to the Existing Landcover key. However, in some instances a distinguishable secondary landcover may also be present concurrent with a primary landcover in an area.
2. Where a secondary landcover vegetation is present, the primary and secondary landcover vegetation are noted numerically on the map above. For example, "16/17" is an area consisting primarily of "Marsh-Phragmites" and secondarily "Marsh-Cattail."
3. Soils were scraped or fill materials were deposited in many places on these parcels in the past. Scrape areas with no or little vegetation are shown on this map. All scrape and fill areas (with or without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-5.

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AES Proj. #: 20-0109
Designed By: WWS
Drawn By: WCC
Checked By: WWS
hms e-1 to e-4 landcover.dwg
Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

ONE INCH = 150'

NORTH

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Landcover - Middle/North Parcels

SHEET NUMBER

E-1

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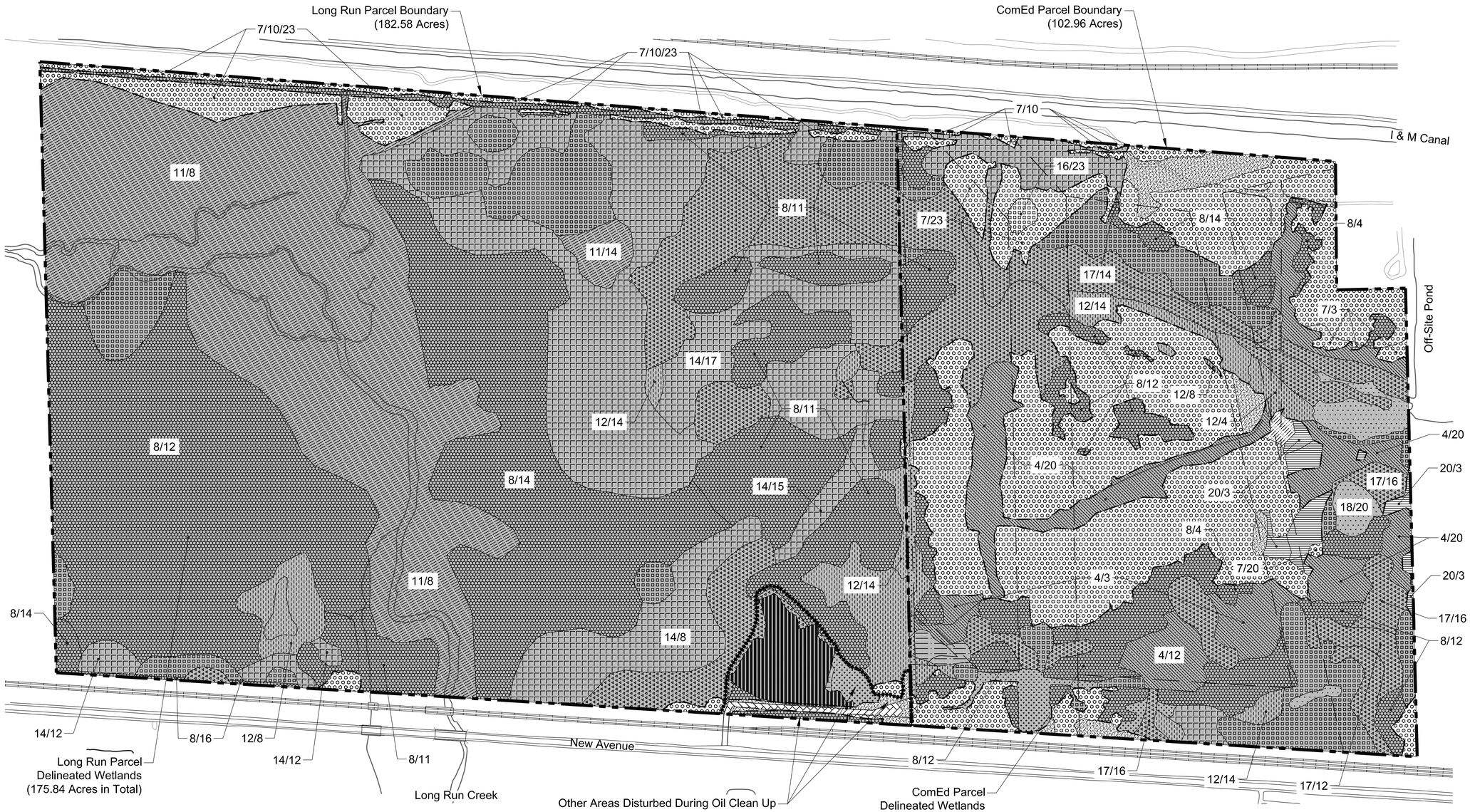

COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Oil Cleanup Boundary
	Watercourse
	Easement Boundary
	Existing Wetland Area (ComEd P. = 61.14 Acres, Long Run P. = 175.84 Acres)

EXISTING LANDCOVER

Symbol	Description	Acres
	03: Mesic Dolomite Pairie	0.23
	04: Wet-Mesic Dolomite Prairie	12.18
	05: Old Field/Upland Grassland	3.04
	06: Old Field/Wet	2.46
	07: Shrubland Upland	42.89
	08: Shrubland Bottomland	82.12
	11: Woodland Bottomland	43.18
	12: Wet Prairie/Sedge Meadow	8.36
	14: Wet Meadow-Reed Canary	36.09

EXISTING LANDCOVER

Symbol	Description	Acres
	15: Marsh-Bulrush/Sweet Flag	0.50
	16: Marsh-Phragmites	17.97
	17: Marsh-Cattail	29.76
	18: Pond/Open Water	2.04
	20: Scraped	1.64
	24: Developed	0.45
	Oil-Contaminated Area	2.61
	10: Woodland Upland	
	23: Fill	

NOTES

1. Primary landcover areas are noted according to the Existing Landcover key. However, in some instances a distinguishable secondary landcover may also be present concurrent with a primary landcover in an area.
2. Where a secondary landcover vegetation is present, the primary and secondary landcover vegetation are noted numerically on the map above. For example, "16/17" is an area consisting primarily of "Marsh-Phragmites" and secondarily "Marsh-Cattail."
3. Soils were scraped and deposited along with other materials in many places on this parcel in the past. Scrape areas with no or little vegetation are shown on this map. All scrape and fill areas (with and without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-6.
4. A crude oil pipeline release occurred along New Avenue in December 2010. The wetland area impacted (area within the Oil Cleanup Boundary) is not included as part of this permit application or the HCP.

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Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms e-1 to e-4 landcover.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Landcover - ComEd/Long Run Parcels

SHEET NUMBER

E-2

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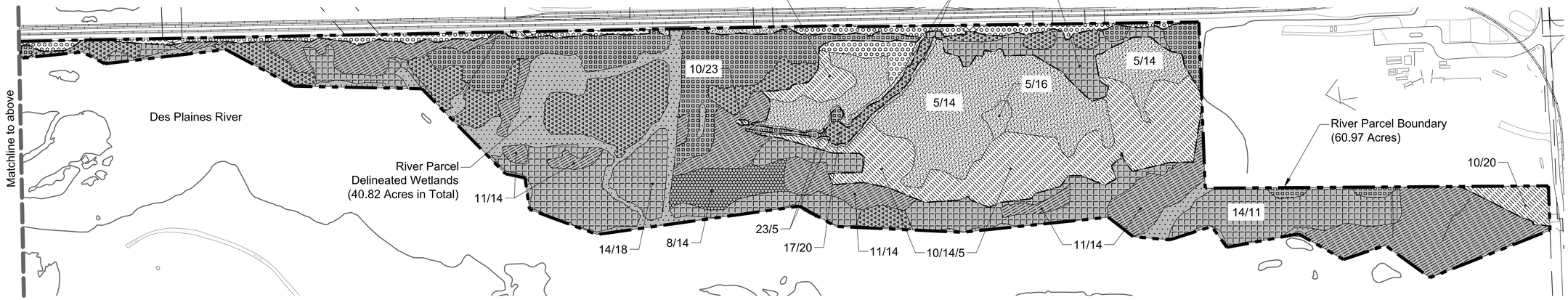
FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, AND RIVER SOUTH PARCEL

1" = 200'



RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Watercourse
	USFWS 65' HED Larval Habitat Buffer
	Existing Wetland Area (Fitzpatrick Seep = 1.92 Acres, River South Bluff P. = 2.39 Acres, River South P. = 62.28 Acres, River P. = 40.82 Acres)

EXISTING LANDCOVER (F.S., R.S.B.P., R.S.P./River P.)

Symbol	Description	Acres
	05: Old Field/Upland Grassland	0 / 9.54
	06. Old Field/Wet	0.47 / 0
	07: Shrubland Upland	2.33 / 2.65
	08: Shrubland Bottomland	5.39 / 1.30
	10: Woodland Upland	22.99 / 7.89
	11: Woodland Bottomland	16.83 / 9.79
	12: Wet Prairie/Sedge Meadow	2.60 / 0
	14: Wet Meadow-Reed Canary	7.57 / 12.43

EXISTING LANDCOVER (F.S., R.S.B.P., R.S.P./River P.)

Symbol	Description	Acres
	15: Marsh-Bulrush/Sweet Flag	0.21 / 0
	16: Marsh-Phragmites	5.16 / 6.31
	17: Marsh-Cattail	26.21 / 6.46
	18: Pond/Open Water	2.06 / 4.54
	19: Spring/Seep	0.10 / 0
	23: Fill	2.99 / 0
	24: Developed	0 / 0.07
	20: Scraped	

NOTES

1. Primary landcover areas are noted according to the Existing Landcover key. However, in some instances a distinguishable secondary landcover may also be present concurrent with a primary landcover in an area.
2. Where a secondary landcover vegetation is present, the primary and secondary landcover vegetation are noted numerically on the map above. For example, "16/17" is an area consisting primarily of "Marsh-Phragmites" and secondarily "Marsh-Cattail."
3. Various materials were deposited in many places on these parcels in the past. Areas of fill with no vegetation are shown as Fill on this map. All fill areas (with and without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-7.

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Designed By: WWS
Drawn By: WCC
Checked By: WWS
hms e-1 to e-4 landcover.dwg
Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 200'
0 100 200 400
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Landcover - Parcels River

SHEET NUMBER

E-3

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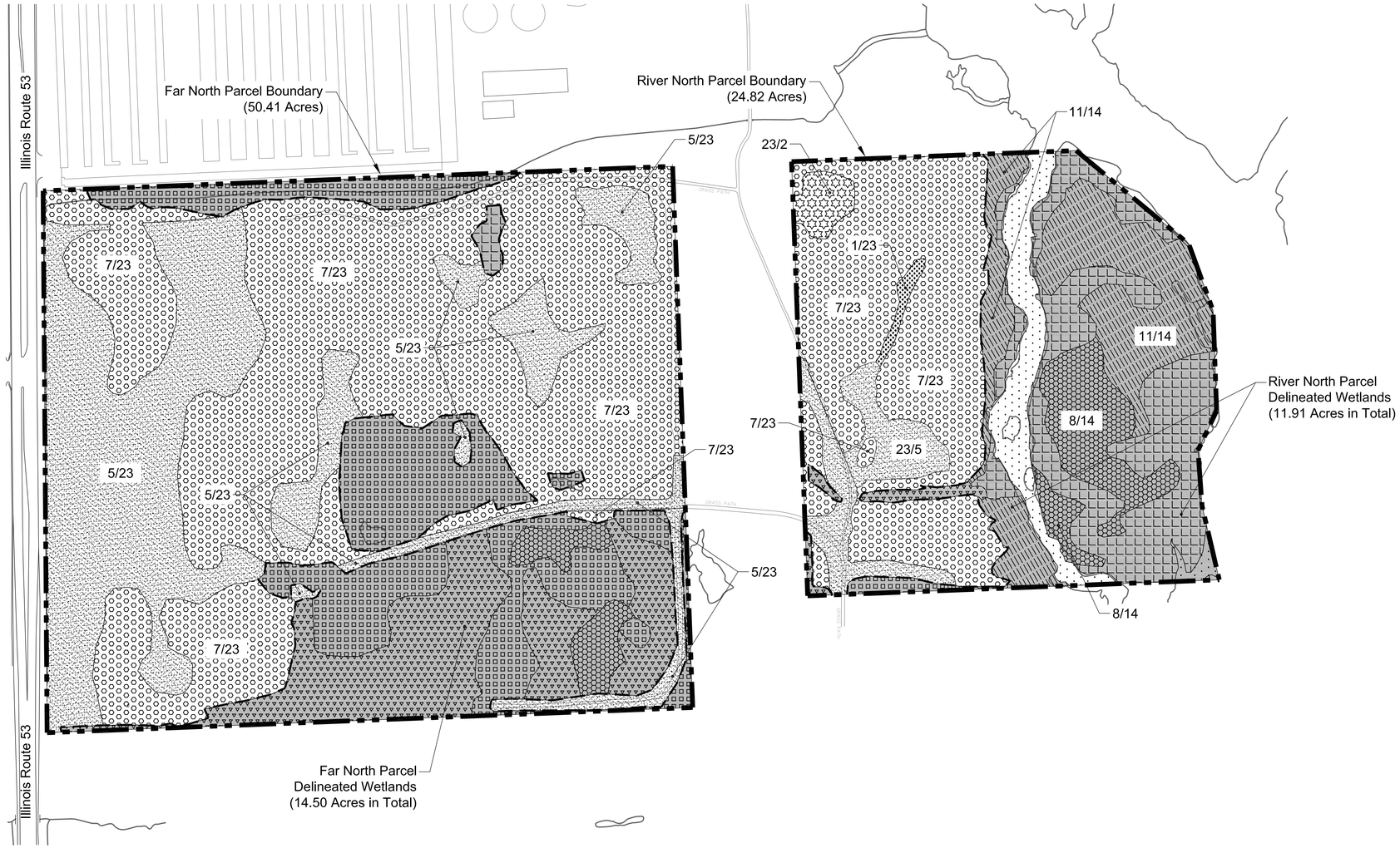

FAR NORTH PARCEL AND RIVER NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Field-Verified Wetland Boundary
	Watercourse
	Existing Wetland Area (Far North P. = 14.50 Acres, River North P. = 11.91 Acres)

EXISTING LANDCOVER (Far North P./River North P.)

Symbol	Description	Acres
	01: Dry Dolomite Prairie	0 / 0.16
	02: Dry-Mesic Dolomite Prairie	0 / 0.44
	05: Old Field/Upland Grassland	13.45 / 1.86
	07: Shrubland Upland	22.45 / 8.84
	08: Shrubland Bottomland	0.95 / 2.04
	11: Woodland Bottomland	0 / 4.27
	14: Wet Meadow-Reed Canary	0.21 / 4.78

EXISTING LANDCOVER (Far North P./River North P.)

Symbol	Description	Acres
	16: Marsh-Phragmites	7.82 / 0.23
	17: Marsh-Cattail	5.52 / 0.33
	18: Pond/Open Water	0 / 1.87
	23: Fill	

NOTES

1. Primary landcover areas are noted according to the Existing Landcover key. However, in some instances a distinguishable secondary landcover may also be present concurrent with a primary landcover in an area.
2. Where a secondary landcover vegetation is present, the primary and secondary landcover vegetation are noted numerically on the map above. For example, "16/17" is an area consisting primarily of "Marsh-Phragmites" and secondarily "Marsh-Cattail."
3. Fill materials were deposited in many places on these parcels in the past. All areas of fill (with or without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-8.

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HMS Surface Mining Mitigation and Restoration Plans

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Hanson Material Service Corporation
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Thornton, Illinois 60476

AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms e-1 to e-4 landcover.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Landcover - Far North/River North Parcels

SHEET NUMBER

E-4

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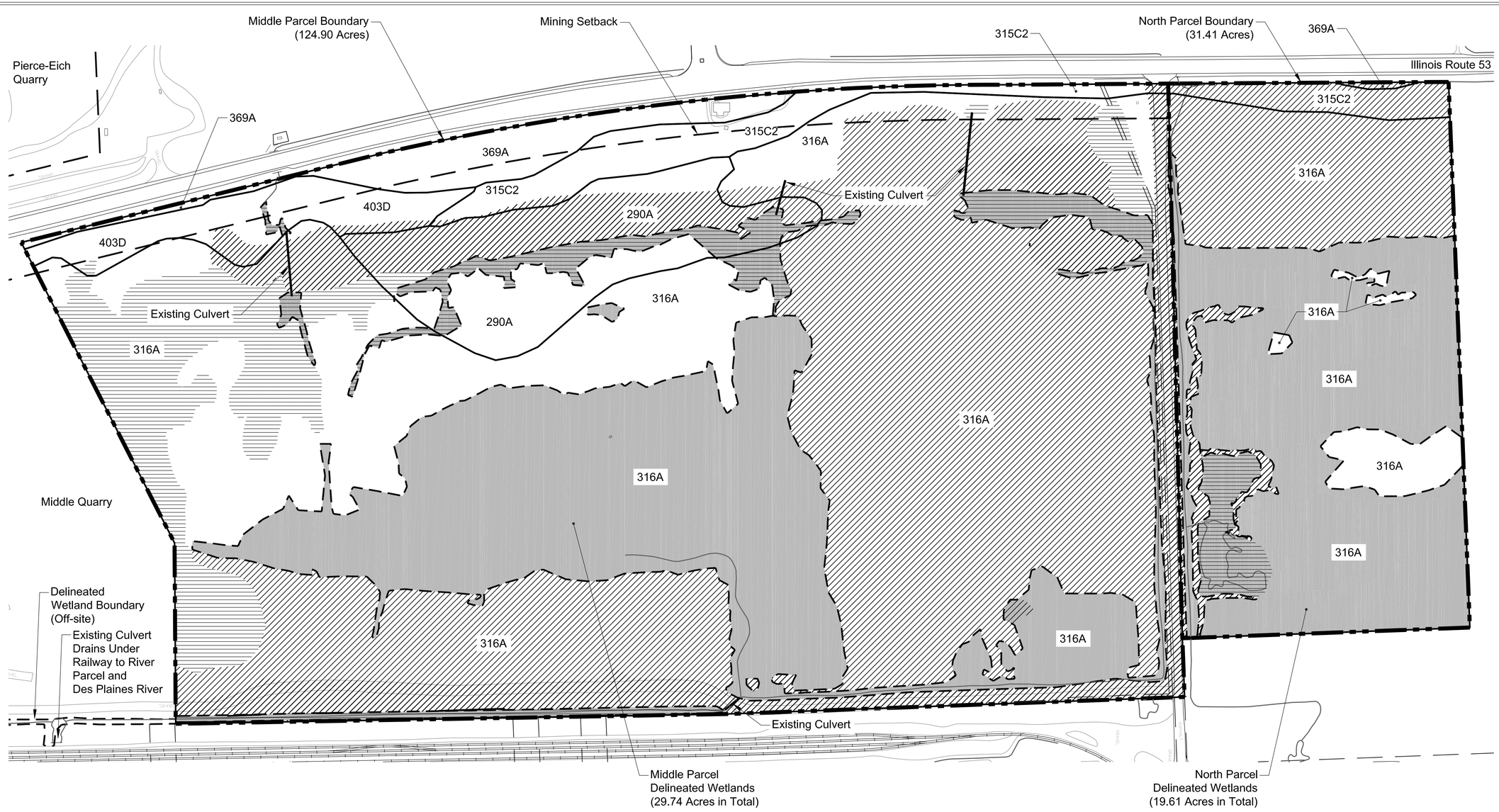

MIDDLE PARCEL AND NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Soil Unit Boundary
	Mining Setback
	Easement Boundary
	Watercourse
	Existing Wetland Area (49.35 Acres)

SOIL DESCRIPTION

Soil Unit	Soil Map Unit Name
290A	Warsaw silt loam, 0 - 2% slopes
315C2	Channahon silt loam, 4 -6 % slopes, eroded
316A	Romeo Silt Loam, 0 - 2% slopes
369A	Waupecan silt loam, 0 - 2% slopes
403D	Elizabeth silt loam, 6 -12% slopes

CURRENT SUBSTRATE CONDITION

Symbol	Description
	Scraped Area (Approx.)
	Filled Area - Other Material (Approx.)

NOTES

1. Soil map unit data acquired from N.R.C.S., SSURGO Database.
2. Wetland delineation prepared by Hey & Associates (2004). Modifications to wetland delineation made by AES to North Parcel (2005 and 2019) and Middle Parcel (2012 and 2018).
3. Current substrate condition assessed in the field by AES.

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Checked By: WWS
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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 150'
0 75 150 300
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Soils and Wetlands - Middle/North Parcels

SHEET NUMBER

E-5

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COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Soil Unit Boundary
	Oil Cleanup Boundary
	Watercourse
	Easement Boundary
	Existing Wetland Area (236.98 Acres)

SOIL DESCRIPTION

Soil Unit	Soil Map Unit Name
67A	Harpster silty clay loam, 0 - 2% slopes
314A	Joliet silt loam, 0 - 2% slopes
316A	Romeo silt loam, 0 - 2% slopes
318D2	Lorenzo loam, 6 - 12% slopes, eroded
969F	Casco-Rodman complex, 20 - 30% slopes
8451A	Lawson silt loam, 0 - 2% slopes, occasionally flooded

CURRENT SUBSTRATE CONDITION

Symbol	Description
	Scraped Area (Approx.)
	Filled Area - Other Material (Approx.)
	Filled Area - Soil (Approx.)
	Oil-Contaminated Area (Approx.)

NOTES

1. Soil map unit data acquired from N.R.C.S.
2. Wetland delineation prepared by Hey & Associates (2004). Modifications to wetland delineation made by AES to ComEd Parcel (2012 and 2018) and Long Run Parcel (2012 and 2019).
3. Current substrate condition assessed in the field by AES.
4. Much of the Oil-Contaminated Area has been excavated, re-filled with soil for restoration, and subsequently restored.

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REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 200'
0 100 200 400
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Soils and Wetlands - ComEd/Long Run Parcels

SHEET NUMBER

E-6

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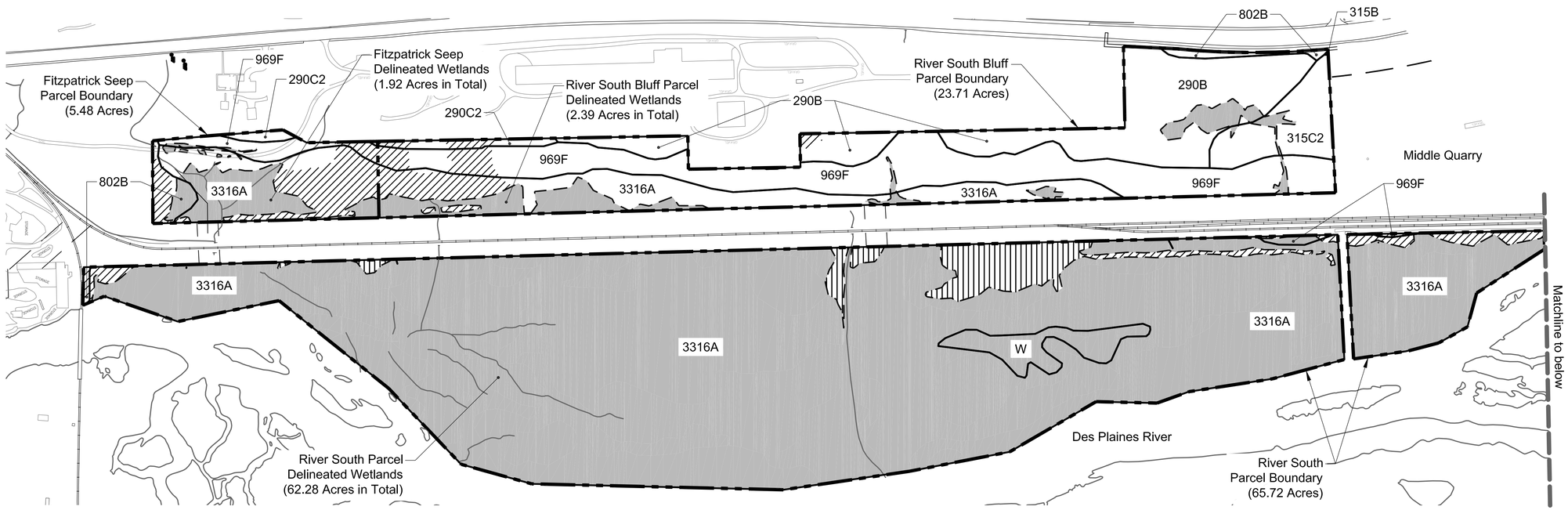
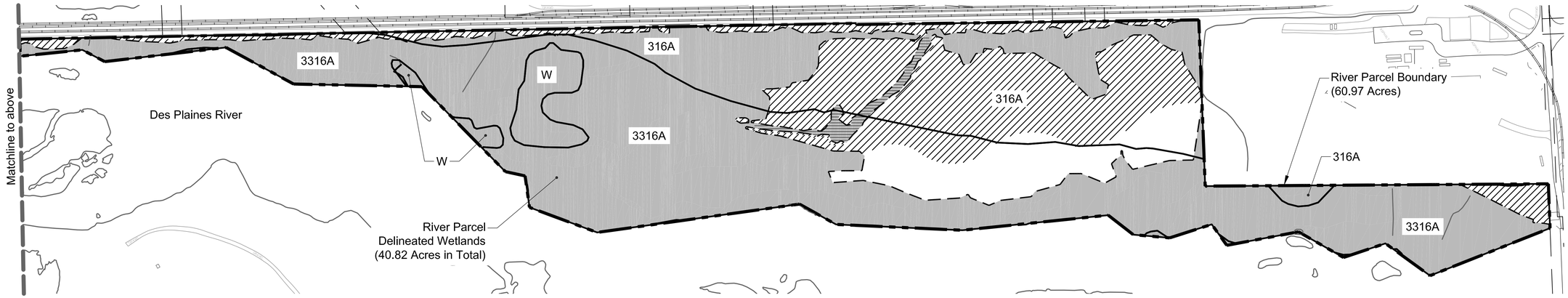


FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, AND RIVER SOUTH PARCEL

1" = 200'



RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Soil Unit Boundary
	Watercourse
	Existing Wetland Area (107.41 Acres)

SOIL DESCRIPTION

Soil Unit	Soil Map Unit Name
290B	Warsaw silt loam, 2 - 4% slopes
290C2	Warsaw silt loam, 4 - 6% slopes, eroded
315B	Channahon silt loam, 2 - 4% slopes
315C2	Channahon silt loam, 4 - 6 % slopes, eroded
316A	Romeo silt loam, 0 - 2% slopes
3316A	Romeo silt loam, 0 - 2% slopes, frequently flooded

SOIL DESCRIPTION

Soil Unit	Soil Map Unit Name
802B	Orthents, loamy undulating
969F	Casco-Rodman complex, 20 - 30% slopes
W	Water

CURRENT SUBSTRATE CONDITION

Symbol	Description
	Filled Area - Other Material (Approx.)
	Filled Area - Soil (Approx.)
	Scraped Area (Approx.)

NOTES

1. Soil map unit data acquired from N.R.C.S.
2. Wetland delineation prepared by Hey & Associates (2004). Modifications to wetland delineation made by AES to River Parcel (2012, 2019), River South Parcel (2012, 2019), and River South Bluff Parcel/Fitspatrick Seep (2019).
3. Current substrate condition assessed in the field by AES.

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Coordinate System:	Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Soils and Wetlands - Parcels River

SHEET NUMBER

E-7

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FAR NORTH PARCEL AND RIVER NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Field-Verified Wetland Boundary
	Soil Unit Boundary
	Watercourse
	Existing Wetland Area (26.41 Acres)

SOIL DESCRIPTION

Soil Unit	Soil Map Unit Name
315C2	Channahon silt loam, 4 - 6 % slopes, eroded
316A	Romeo silt loam, 0 - 2% slopes
369A	Waupecan silt loam, 0 - 2% slopes
3316A	Romeo silt loam, 0 - 2% slopes, frequently flooded
802B	Orthents, loamy undulating
W	Water

CURRENT SUBSTRATE CONDITION

Symbol	Description
	Filled Area - Other Material (Approx.)

NOTES

1. Soil map unit data acquired from N.R.C.S.
2. Wetland delineation prepared by AES (2019).
3. Current substrate condition assessed in the field by AES.

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Drawn By: WCC

Checked By: WWS

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Existing Conditions - Soils and Wetlands - Far North/River North Parcels

SHEET NUMBER

E-8

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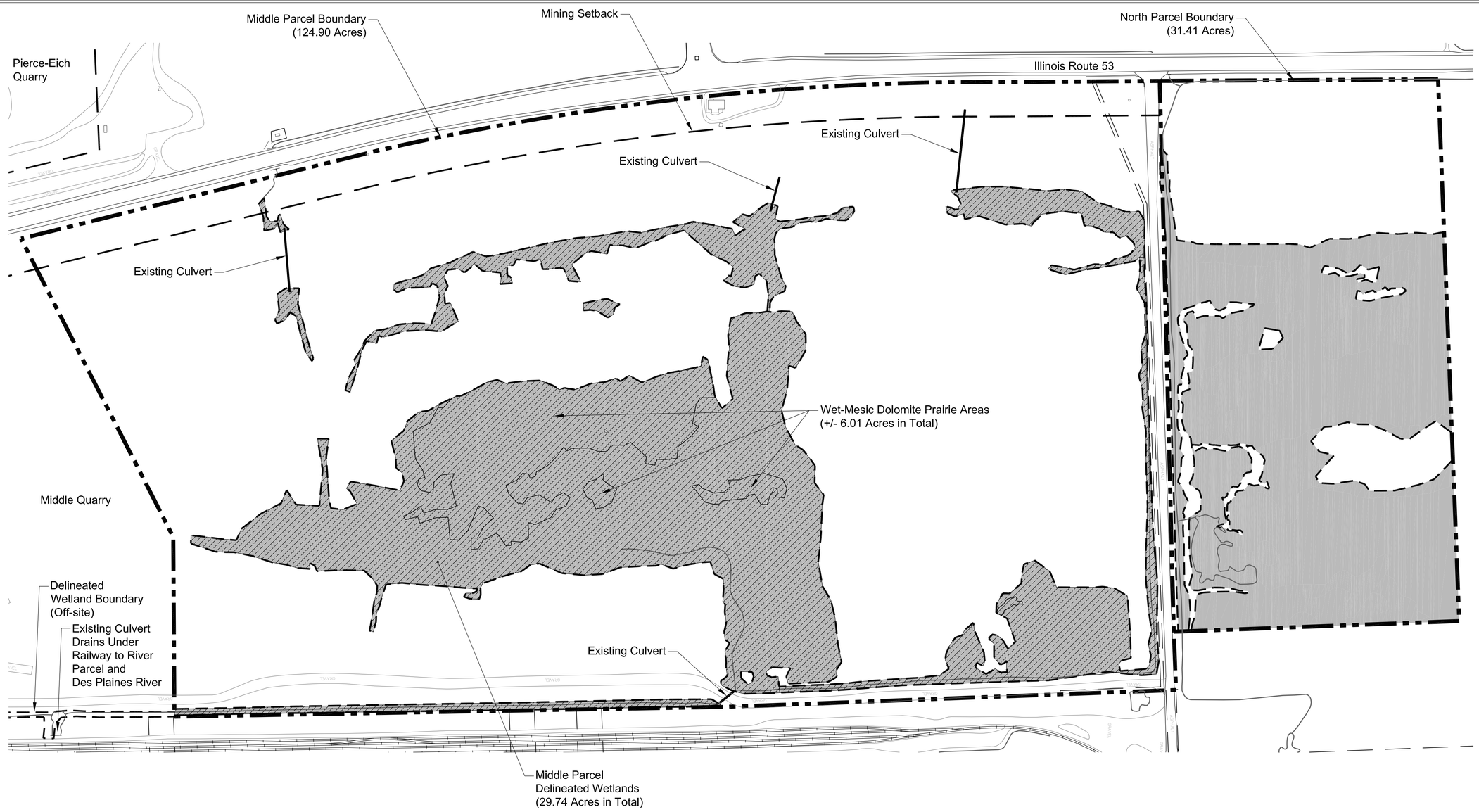

MIDDLE PARCEL AND NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Mining Setback
	Easement Boundary
	Watercourse

WETLAND IMPACTS - MIDDLE PARCEL

Symbol	Description	Acres
	Existing Wetland Area	29.74
	Wetland Impacts	29.72

NOTES

1. Wetland Impacts on Middle Parcel occur in areas that will be filled or significantly altered during expanded surface mining activities (i.e. overburden removal). The removal and transplant of Wet-Mesic Dolomite Prairie to ComEd Parcel is part of the wetland impacts on Middle Parcel.
2. 0.02 acres of wetland is located on Middle Parcel north of the entrance drive and will not be impacted by mining.

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

ONE INCH = 150'

NORTH

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wetland Impacts - Middle Parcel

SHEET NUMBER

W-1

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COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Watercourse
	Easement Boundary

WETLAND IMPACTS

Symbol	Description	Acres
	Existing Wetland Area	236.98
	Permanent Wetland Impacts	0.37
	Temporary Wetland Impacts	0.03

NOTES

1. Permanent Wetland Impacts include building of roads for access to transplant activities, wetland restoration and enhancement activities, and for future maintenance activities.
2. Temporary wetland impacts include temporary wetland crossing structures (i.e. matting) that will be removed after wetland mitigation activities are complete.

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wetland Impacts - ComEd/Long Run Parcels

SHEET NUMBER

W-2

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COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	Easement Boundary
	Existing Wetland Areas

WETLAND MITIGATION AREAS

Symbol	Description	Acres
	Wetland Restoration (Re-establishment)	25.06

NOTES

1. Wetland restoration is creating wetlands in areas that are currently upland (non-wetlands). All these areas were disturbed in the past and were likely wetlands prior to disturbance.

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Checked By: WWS

hms w-3 to w-4 wetland mitigation.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wetland Restoration - ComEd/Long Run Parcels

SHEET NUMBER

W-3

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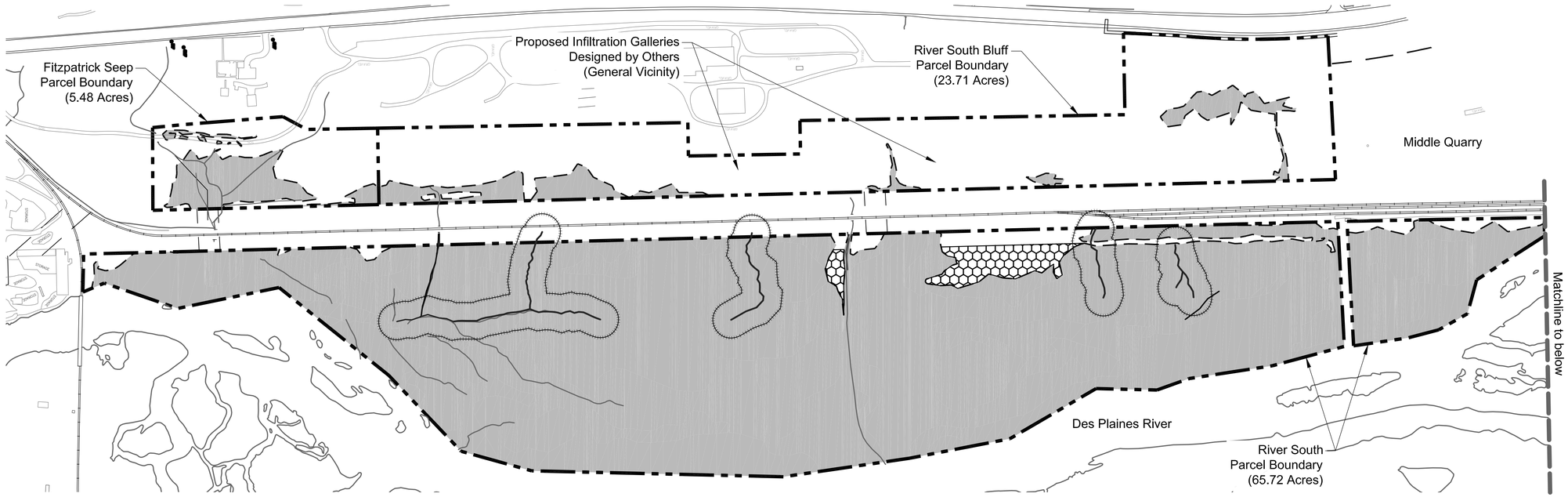
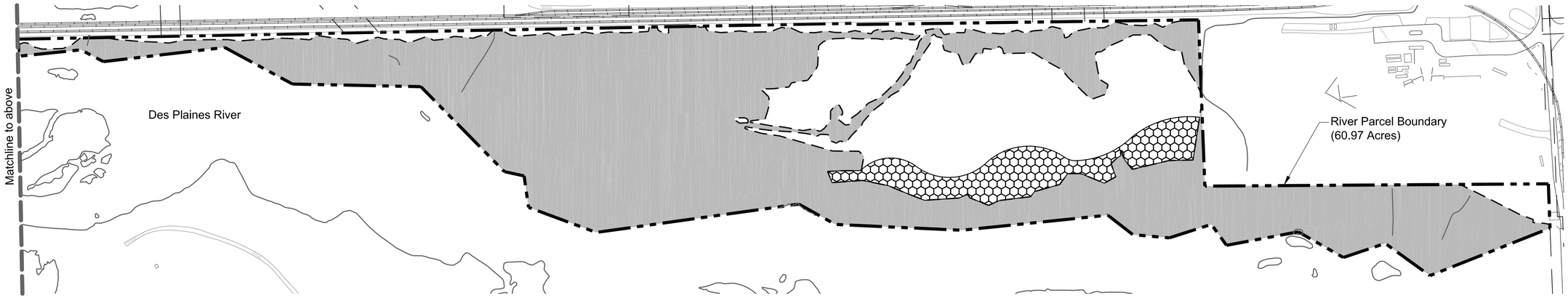


FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, AND RIVER SOUTH PARCEL

1" = 200'



RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	USFWS 65' HED Larval Habitat Buffer
	Existing Wetland Areas

WETLAND MITIGATION AREAS

Symbol	Description	Acres
	Wetland Restoration (Re-establishment)	5.08

NOTES

1. Wetland restoration is creating wetlands in areas that are currently upland (non-wetlands). All these areas were disturbed in the past and were likely wetlands prior to disturbance.

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Checked By: WWS

hms w-3 to w-4 wetland mitigation.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wetland Restoration - Parcels River

SHEET NUMBER

W-4

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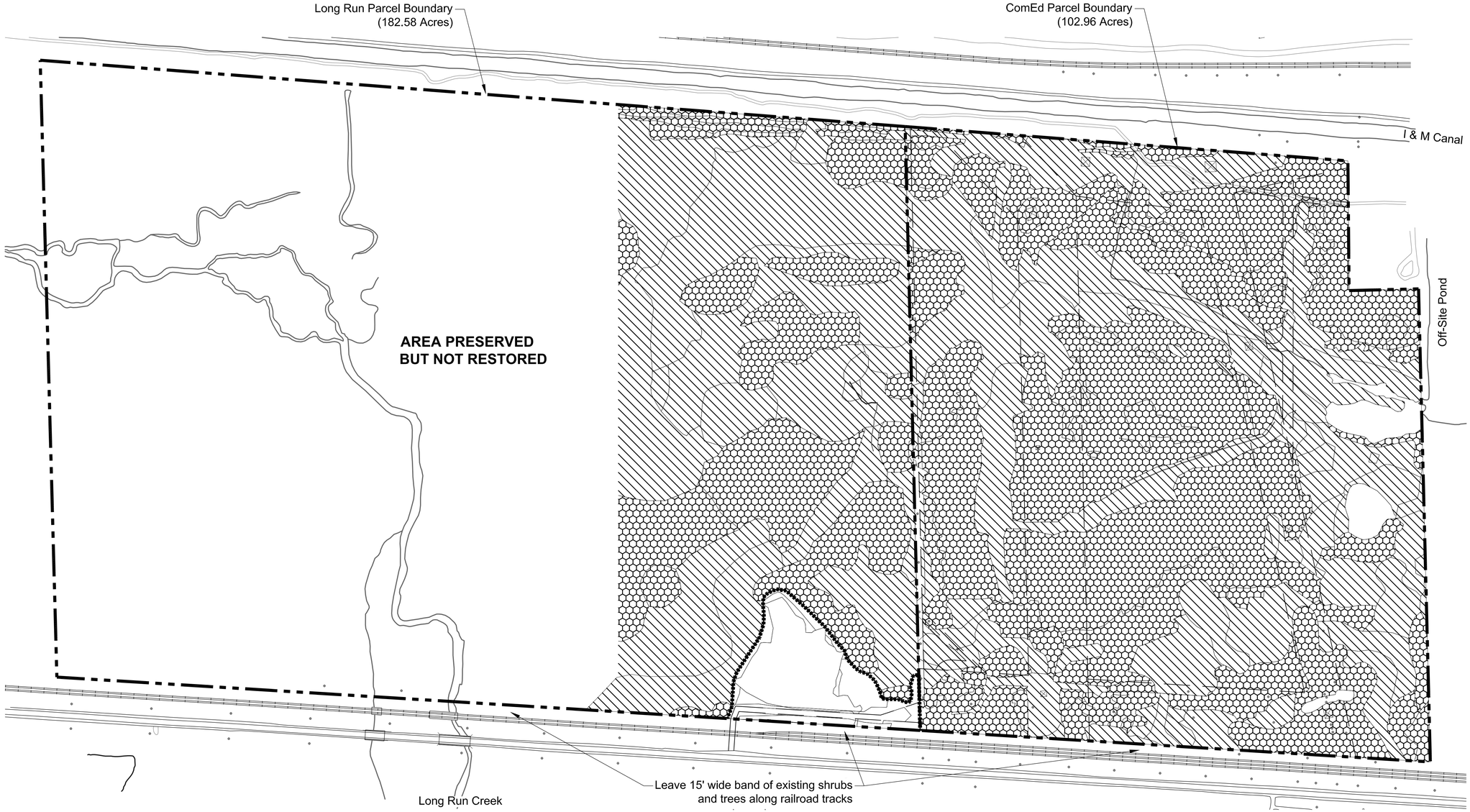

COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Oil Cleanup Boundary
	Watercourse
	Easement Boundary
☒	Utility Tower

HABITAT RESTORATION AND ENHANCEMENT

Symbol	Description	Acres
	Habitat Restoration	79.79
	Habitat Enhancement	77.63

NOTES

1. No notes for this sheet.

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Drawn By: WCC

Checked By: WWS

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Coordinate System: Illinois State Plane NAD83

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11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Habitat Restoration and Enhancement - ComEd/Long Run Parcels

SHEET NUMBER

H-1

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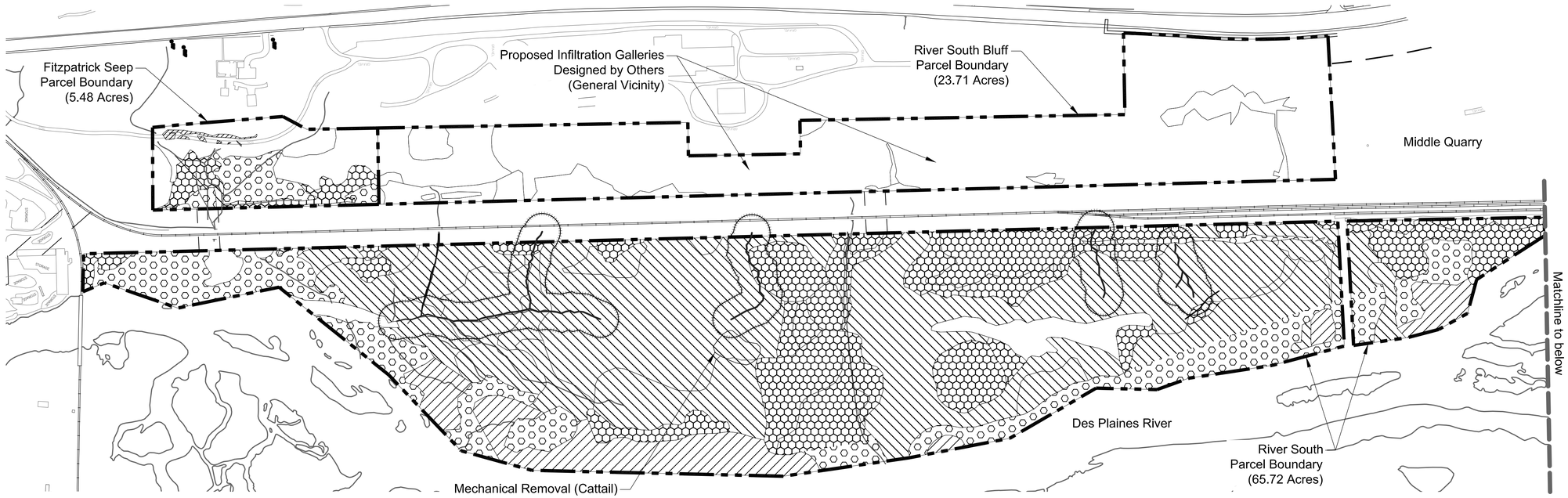

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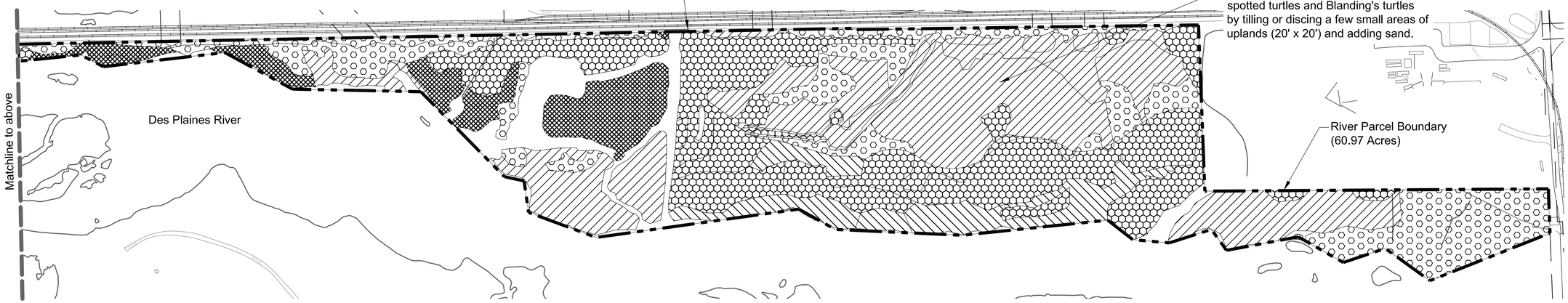
1" = 200'



RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	USFWS 65' HED Larval Habitat Buffer (7.02 Acres)

RESTORATION AND ENHANCEMENT (Fitz. Seep, River S.)

Symbol	Description	Acres
	Habitat Restoration	16.36
	Habitat Restoration (Without Seeding or Planting)	11.30
	Habitat Enhancement	33.13
	Habitat Enhancement (Without Seeding or Planting)	5.38

RESTORATION AND ENHANCEMENT (River Parcel)

Symbol	Description	Acres
	Habitat Restoration	17.12
	Habitat Restoration (Without Seeding or Planting)	11.46
	Habitat Enhancement	4.17
	Habitat Enhancement (Without Seeding or Planting)	18.92
	Habitat Maintenance	4.68

NOTES

1. Habitat Restoration (Without Seeding or Planting) includes herbicide treatment of the ground layer in Fitzpatrick Seep, River South, and River Parcels.

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Drawn By: WCC	
Checked By: WWS	
hms h-1 to h-4 habitat resto enhance.dwg	
Coordinate System: Illinois State Plane NAD83	

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Habitat Restoration and Enhancement - Parcels River

SHEET NUMBER

H-2

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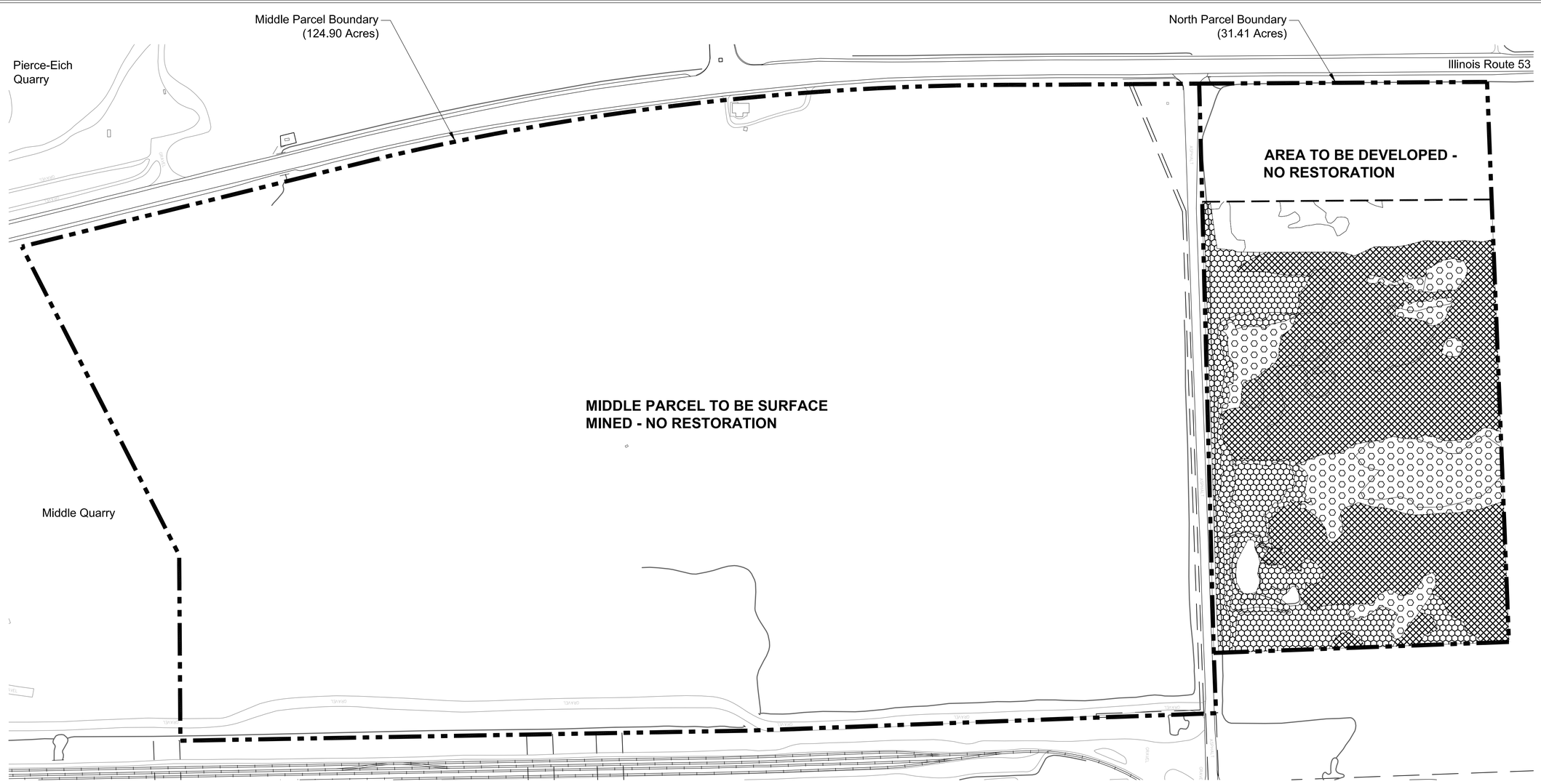

MIDDLE PARCEL AND NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Restoration Limit Line
	Watercourse
	Easement Boundary

RESTORATION AND ENHANCEMENT (North Parcel)

Symbol	Description	Acres
	Habitat Restoration	5.20
	Habitat Restoration (Without Seeding or Planting)	4.21
	Habitat Maintenance	12.51

NOTES

1. Habitat Restoration (Without Seeding or Planting) does not include any ground layer herbicide treatment in North, Far North, and River North Parcels.

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Coordinate System: Illinois State Plane NAD83

REVISIONS

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11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Habitat Restoration and Enhancement - North Parcel

SHEET NUMBER

H-3

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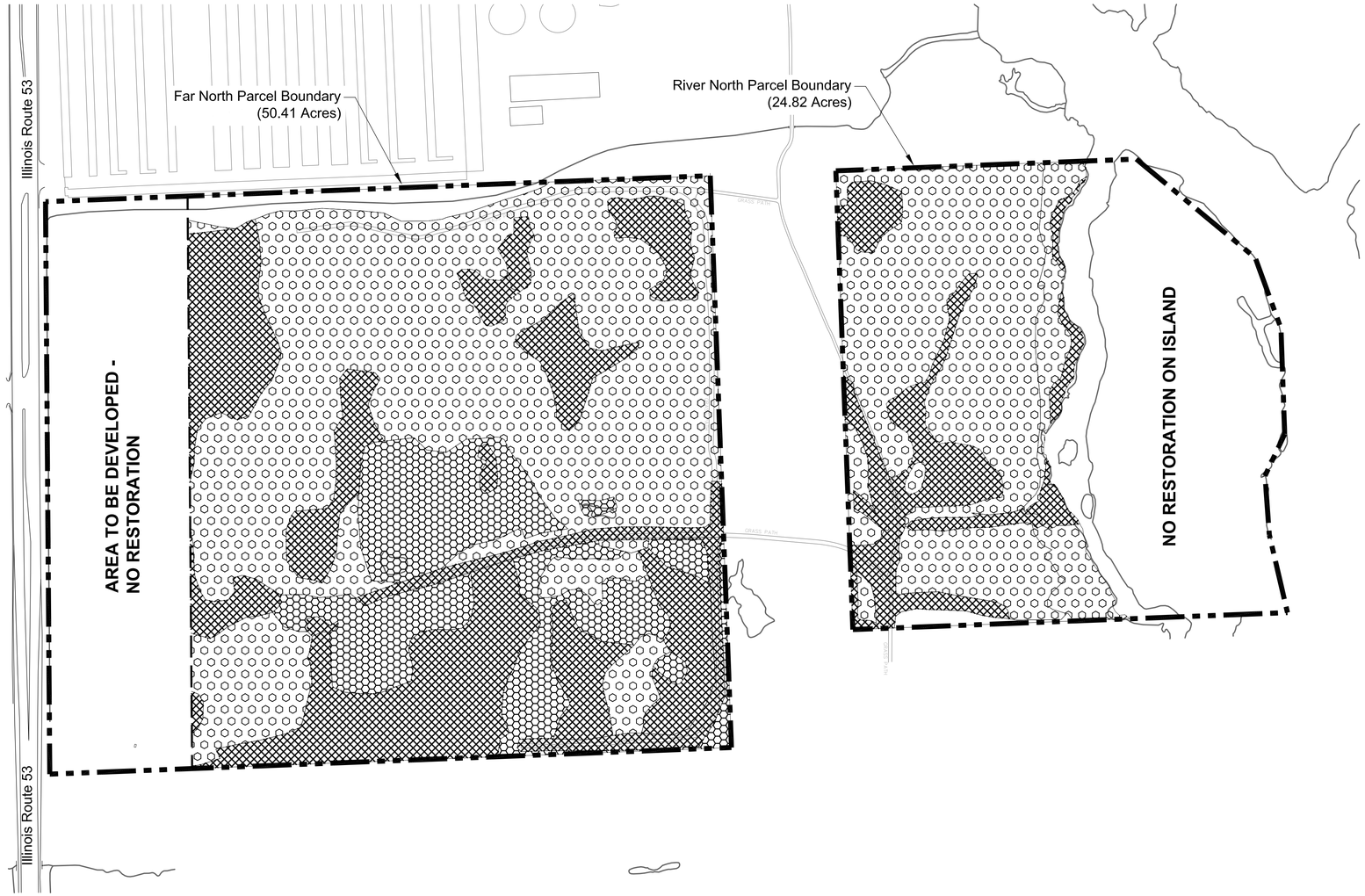

FAR NORTH PARCEL AND RIVER NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
——·——	Parcel Boundary
— — —	Restoration Limit Line
———	Watercourse

RESTORATION AND ENHANCEMENT (Far North P./River North P.)

Symbol	Description	Acres
	Habitat Restoration	6.47 / 0
	Habitat Restoration (Without Seeding or Planting)	20.05 / 10.24
	Habitat Maintenance	12.13 / 3.22

NOTES

1. Habitat Restoration (Without Seeding or Planting) does not include any ground layer herbicide treatment in North, Far North, and River North Parcels.

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Habitat Restoration and Enhancement - Far North/River North Parcels

SHEET NUMBER

H-4

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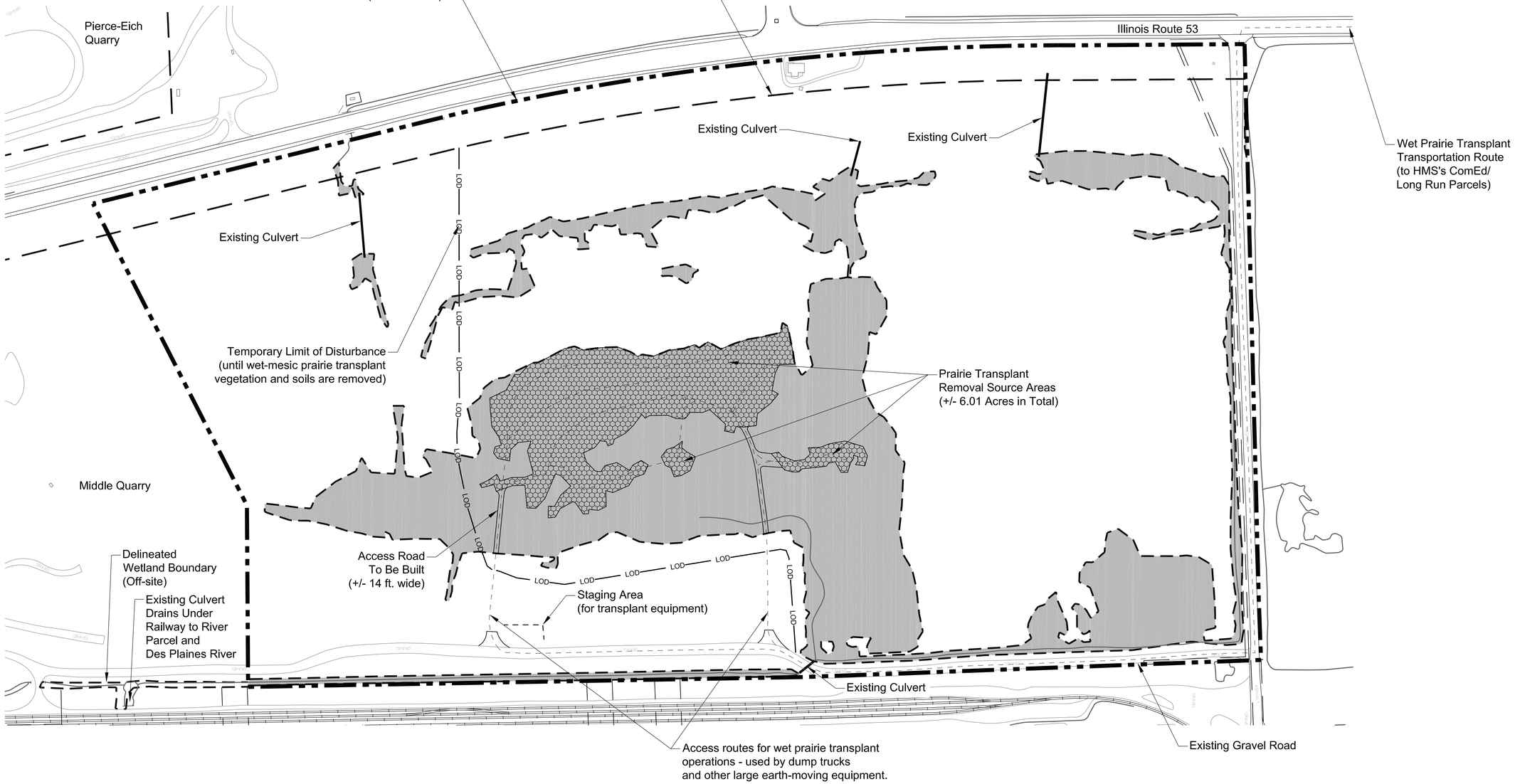

MIDDLE PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Mining Setback
	Easement Boundary
	Watercourse
	Transplant Removal Route
	Access Road
LOD	Temporary Limit of Disturbance

TRANSPLANT KEY

Symbol	Description	Acres
	Existing Wetland Areas	29.74
	Wet-Mesic Prairie Removal Areas	6.01

NOTES

1. Sedimentation and Erosion Control measures shall be implemented according to the notes contained on Sheets S-1 and N-2.
2. Access Road construction shall be executed according to the notes contained on Sheet N-1.
3. Wet Prairie Transplant Removal operations shall be executed according to the notes contained on Sheet N-1.
4. Mining shall not occur within 150 feet of wet-mesic dolomite prairie until wetland soil and vegetation are removed for transplanting to ComEd/Long Run Parcels.
5. If transplant operations occur during Hines' emerald dragonfly flight season, vehicles shall travel at speeds less than 15 miles per hour.
6. Transplant activities shall be implemented consistent with Blanding's and Spotted Turtle Avoidance and Minimization Measures contained on Sheet N-1.

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Designed By: WWS

Drawn By: WCC

Checked By: WWS

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Coordinate System: Illinois State Plane NAD83

REVISIONS

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3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wet Prairie
Transplant Plan -
Middle Parcel

SHEET NUMBER

T-1

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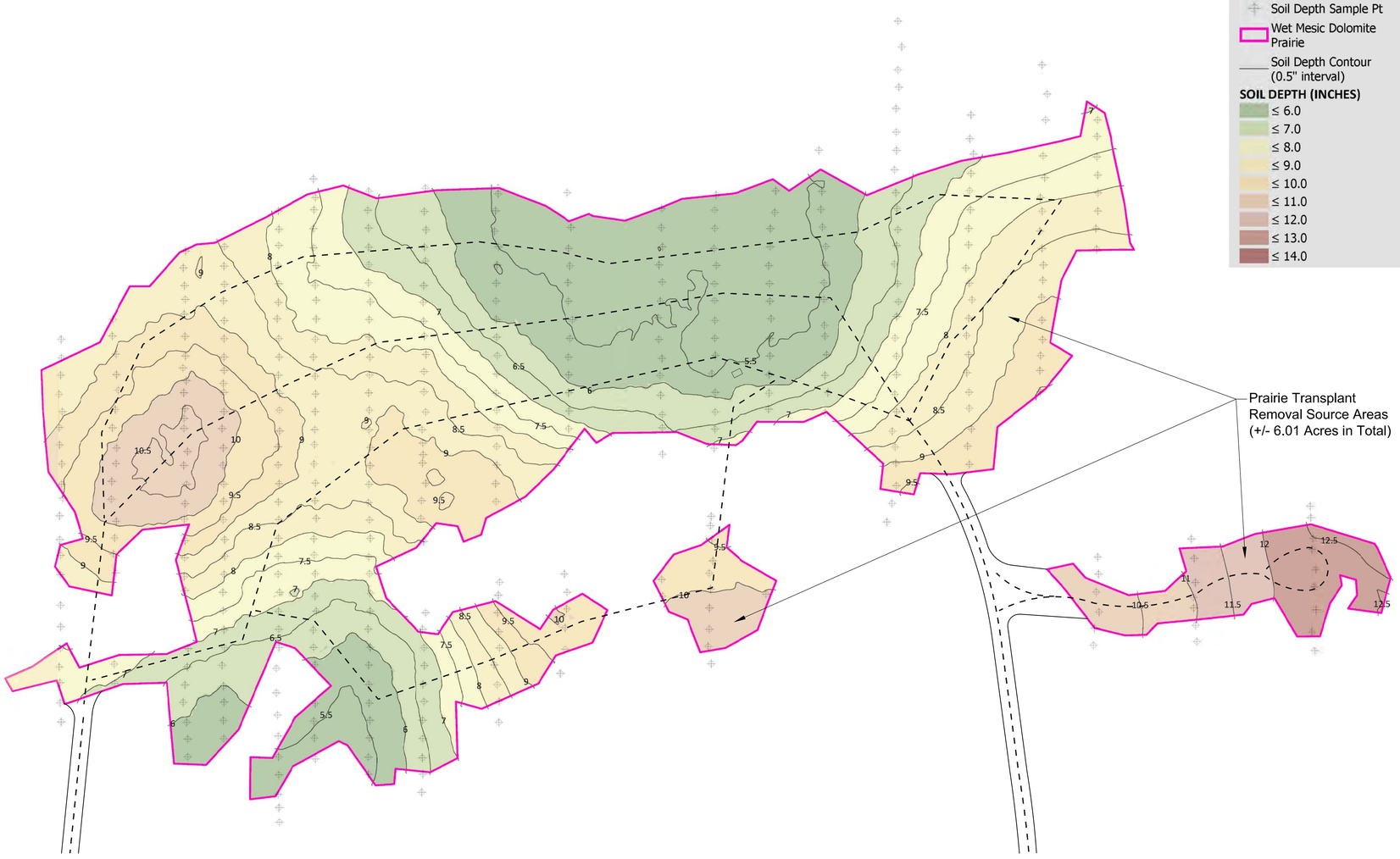

MIDDLE PARCEL

1" = 50'

LEGEND

Symbol	Description
- - - - - -	Transplant Removal Route
═══	Access Road

NOTES

1. Refer to Sheets T-1, S-1, and N-2 for further information on wet prairie transplant and erosion control.

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Checked By: WWS

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 50'

0 25 50 100

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wet Prairie Transplant Plan -Soil Depth Topography - Middle Parcel

SHEET NUMBER

T-2

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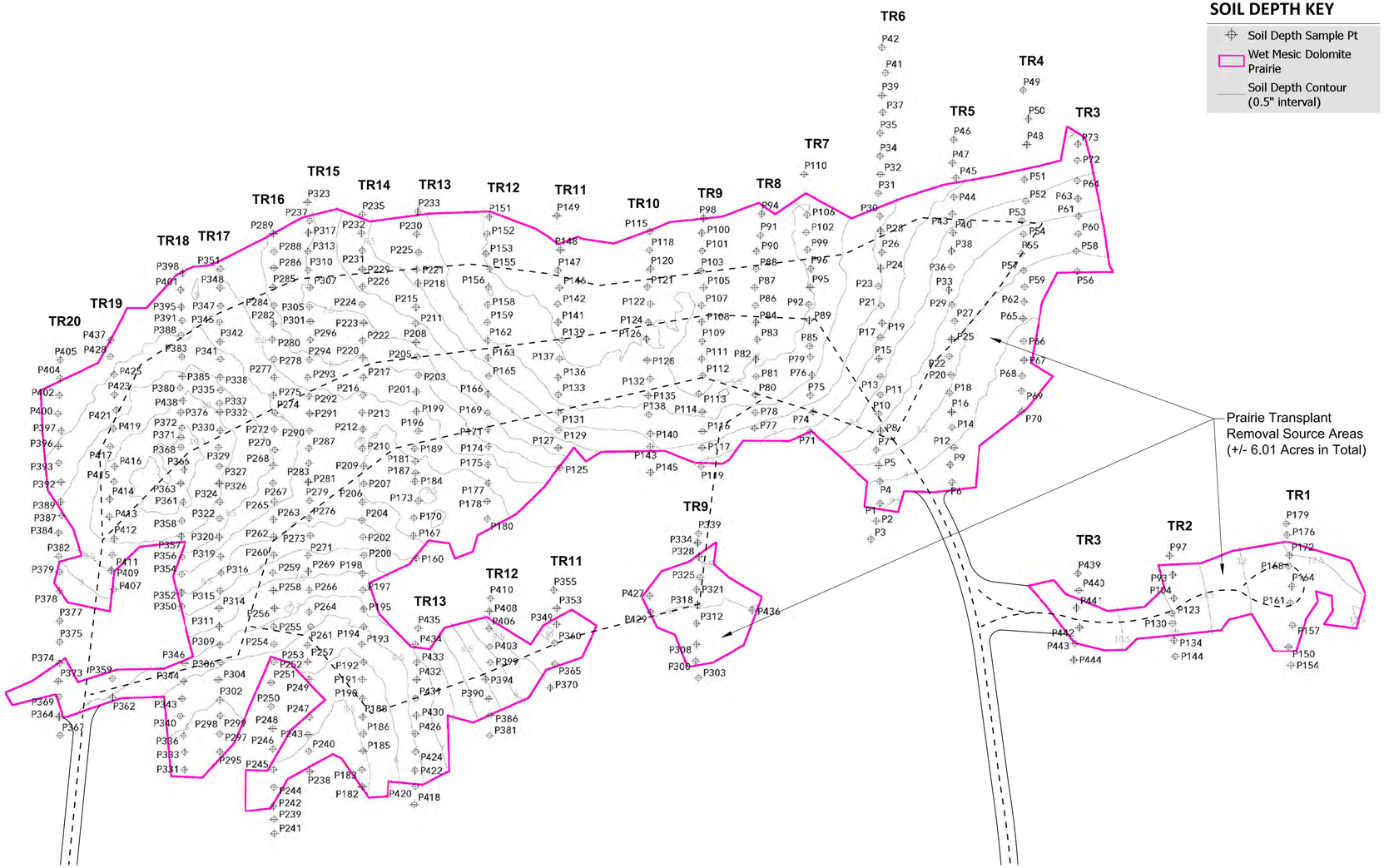

SOIL DEPTH KEY

- Soil Depth Sample Pt
- Wet Mesic Dolomite Prairie
- Soil Depth Contour (0.5" interval)

MIDDLE PARCEL

1" = 50'

LEGEND

Symbol	Description
- - - - - -	Transplant Removal Route
═══════	Access Road

NOTES

1. Refer to Sheets T-1, S-1, and N-2 for further information on prairie transplant and erosion control.
2. The transect point data is presented from right to left because this corresponds to the general layout of the transacts on the map as displayed.

TRANSECT, POINT, AND DEPTH (INCHES)

Tr.	Pt.	In.
15	237	10
15	238	6
15	240	2
15	243	5
15	247	6
15	249	3
15	253	6
15	257	7
15	261	4
15	264	4
15	266	8
15	269	6
15	271	12
15	273	8
15	276	8
15	279	10
15	281	7
15	283	7
15	287	5
15	290	10
15	291	10
15	292	10
15	293	10
15	294	6
15	296	7
15	301	6
15	305	9
15	307	7
15	310	8
15	313	5
15	317	10
15	323	10
16	239	7
16	241	6
16	242	3
16	244	2
16	245	4
16	246	4
16	248	20
16	250	12
16	251	8
16	252	6
16	254	8
16	255	6
16	256	5
16	258	7
16	259	6
16	260	7
16	262	12
16	263	10
16	265	10
16	267	7
16	268	11
16	270	5
16	272	15
16	274	6
16	275	11
16	277	4
16	278	8
16	280	10
16	282	6
16	284	7
16	285	10
16	286	5
16	288	8
16	289	10
17	295	3
17	297	6
17	298	6
17	299	4
17	302	3
17	304	9
17	306	4
17	309	6
17	311	7
17	314	11
17	315	8
17	316	4
17	319	8
17	320	9
17	322	13
17	324	10
17	326	9
17	327	16
17	329	6
17	330	12
17	332	14
17	335	9
17	337	9
17	338	7
17	341	10
17	342	5
17	345	6
17	347	13
17	348	9
17	351	7
20	364	6
20	367	11
20	369	6
20	373	7
20	374	6
20	375	8
20	377	5
20	378	6
20	379	6
20	382	7
20	384	17
20	387	3
20	389	14
20	392	9
20	393	6
20	396	4
20	397	9
20	400	8
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20	405	4
19	359	6
19	362	6
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19	409	13
19	411	15
19	412	9
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19	414	13.5
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19	416	10
19	417	11
19	419	7
19	421	8.5
19	423	12
19	425	8
19	428	8
19	437	8
18	331	5
18	333	5
18	336	4
18	340	6
18	343	4
18	344	4
18	346	6
18	350	11
18	352	7
18	354	7
18	356	6
18	357	9
18	358	10
18	361	12
18	363	13
18	366	11
18	368	12
18	371	12
18	372	17
18	376	11.5
18	380	9
18	383	11
18	385	8
18	388	12
18	391	2.5
18	395	11
18	398	14
18	401	9.5
18	438	13
7	71	6
7	74	5
7	75	8
7	76	2.5
7	79	2
7	85	5
7	89	5
7	92	2
7	95	8
7	96	5
7	99	10
7	102	5
7	106	3
7	110	6.5
8	77	5
8	78	10
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8	81	5
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8	83	7
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8	88	5
8	90	6
8	91	4
8	94	3
8	436	10
9	98	3
9	100	4
9	101	7
9	103	6
9	105	3
9	107	5
9	108	7
9	109	5
9	111	4
9	112	5
9	113	3
9	114	3
9	116	9
9	117	6
9	119	10
9	300	10
9	303	9
9	308	11
9	312	16
9	318	8
9	321	8
9	325	9
9	328	12
9	334	12
9	339	11
10	115	3
10	118	9
10	120	9
10	121	8
10	122	4
10	124	10
10	126	5
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10	138	9
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10	143	7
10	145	4
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10	429	8
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11	131	4
11	133	2
11	136	4
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11	141	5
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11	148	3
11	149	3
11	349	8
11	353	7
11	355	13
11	360	14
11	365	8
11	370	14
7	110	6
7	168	1
7	172	1
7	176	1
7	179	1
6	1	10
6	2	13
6	3	15
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6	5	7
6	7	9
6	8	10
6	10	4
6	11	12
6	13	9
6	15	8
6	17	10
6	19	8
6	21	3
6	23	4
6	24	4
6	26	10
6	28	12
6	30	4
6	31	3
6	32	5
6	34	5
6	35	7
6	37	8
6	39	6
6	41	3
6	42	6

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
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3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 50'
0 25 50 100
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wet Prairie Transplant Plan -Soil Depth Transects - Middle Parcel

SHEET NUMBER

T-3

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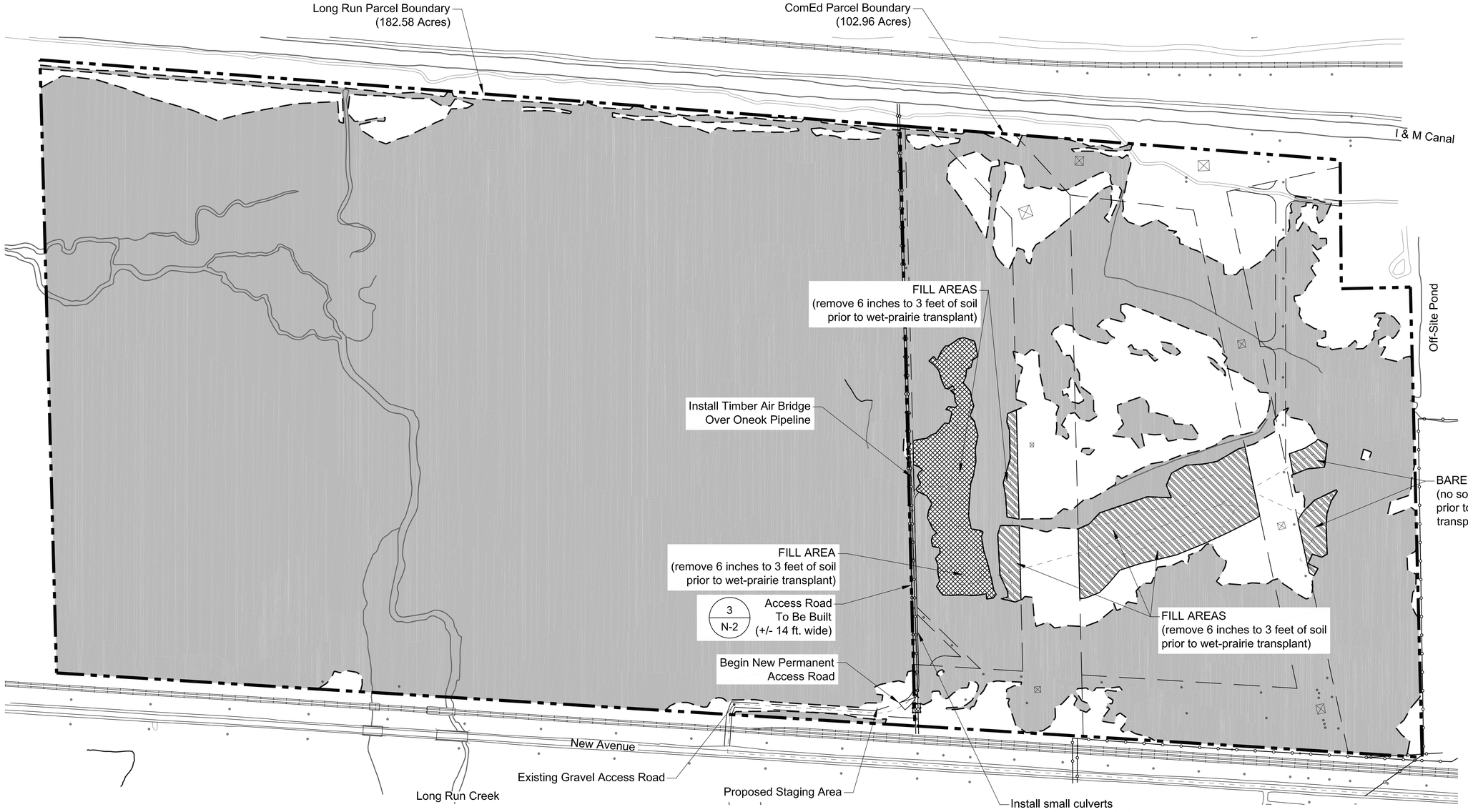

COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Watercourse
	Easement Boundary
	Underground Pipeline
	Pipeline Gauge Station
	Utility Tower
	Power Pole

LEGEND

Symbol	Description
	Transplant Installation Route (Temporary)
	Transplant Installation Route (Permanent) See Detail on Sheet N-2

TRANSPLANT KEY

Symbol	Description	Acres
	Existing Wetland Areas	236.98
	Complete Transplant Area	3.75
	Possible Transplant Area	6.21

NOTES

1. Sedimentation and Erosion Control measures shall be implemented according to the notes contained on Sheets S-1 and N-2.
2. Access Road construction shall be executed according to the notes contained on Sheet N-1.
3. Wet Prairie Transplant Installation operations shall be executed according to the notes contained on Sheet N-1.
4. If transplant operations occur during Hines' emerald dragonfly flight season, vehicles shall travel at speeds less than 15 miles per hour.
5. Blanding's and Spotted Turtle Avoidance and Minimization Measures are found on Sheet N-1.
6. Fill material from the transplant areas will be removed from ComEd Parcel by the contractor and hauled back to the quarry on the west side of the canal during transplant.

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Thornton, Illinois 60476

AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms t-1 to t-4 transplant.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
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3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

ONE INCH = 200'

NORTH

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Wet Prairie Transplant Plan - ComEd/Long Run Parcels

SHEET NUMBER

T-4

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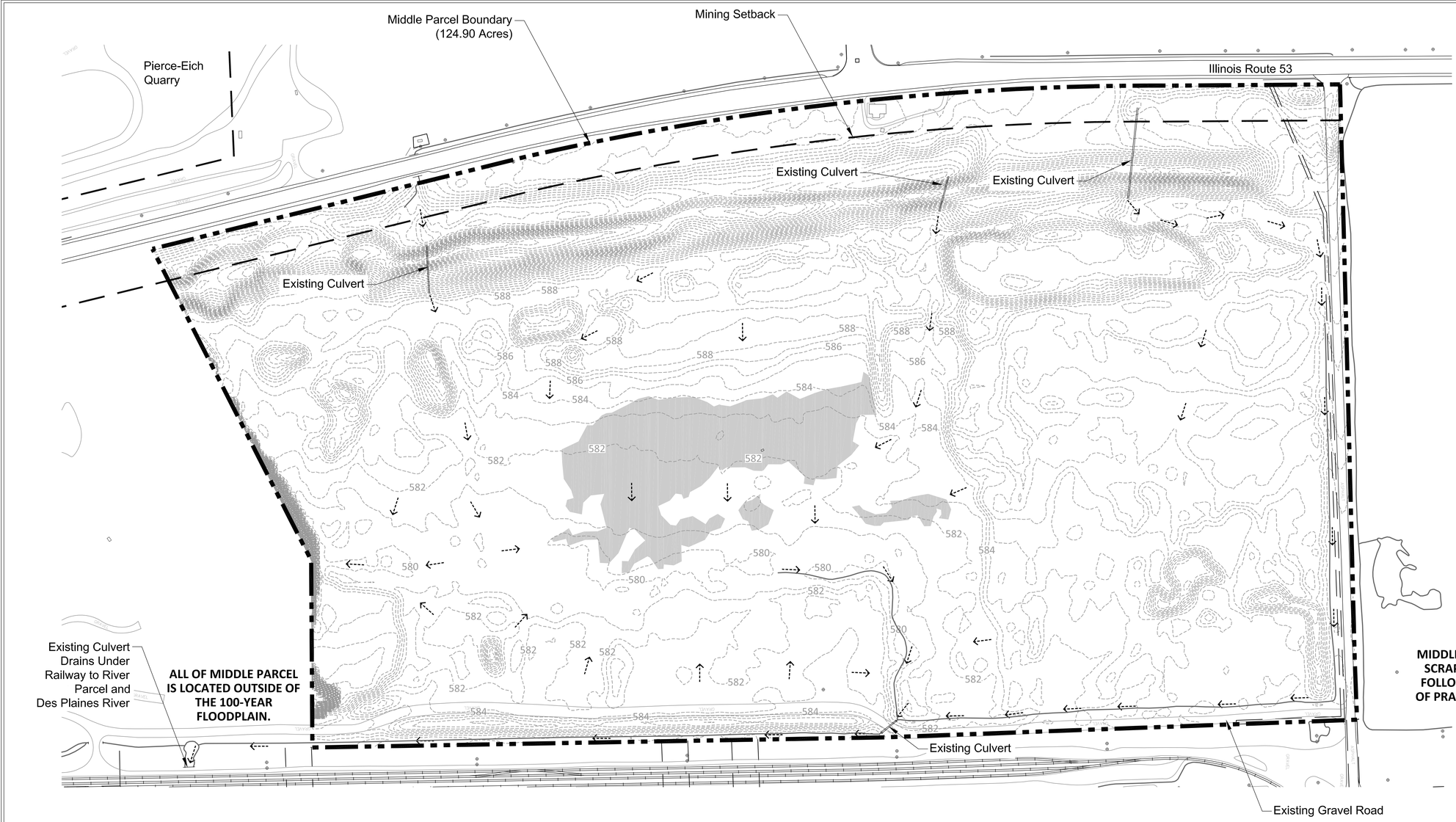

MIDDLE PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	100-Year Floodplain Boundary
	Watercourse
	Surface Drainage Direction
	Easement Boundary
⊕	Power Pole

GRADING KEY

Symbol	Description
	Wet Prairie Removal Areas
588	Existing Major Contour
587	Existing Minor Contour

NOTES

1. All of Middle Parcel is outside of the 100-year floodplain.
2. No proposed contours are shown because following removal of Wet Prairie Transplant areas all remaining surface material in Middle Parcel will be disposed of into Middle Quarry, and Middle Parcel will be mined.
3. For depth of Wet Prairie Transplant material be be removed, refer to Sheets T-2 and T-3.
4. Sedimentation and Erosion Control Measures shall be implemented according to Sheet S-1 and the notes contained on Sheet N-2.
5. Wet Prairie Transplant Removal operations shall be executed according to Sheet T-1 to T-3 and the notes contained on Sheet N-1.

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Drawn By: WCC

Checked By: WWS

hms d-1 to d-2 drainage grading.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Drainage and Grading Plan - Middle Parcel

SHEET NUMBER

D-1

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COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	100-Year Floodplain Boundary
	Watercourse
	Surface Drainage Direction
	Easement Boundary
	Underground Pipeline
	Pipeline Gauge Station
	Utility Tower
	Power Pole

GRADING KEY

Symbol	Description
	Wet Prairie Transplant Areas
588	Proposed Major Contour
587	Proposed Minor Contour
588	Existing Major Contour
587	Existing Minor Contour

NOTES

1. Sedimentation and Erosion Control Measures shall be implemented according to Sheet S-2 and the notes contained on Sheet N-2.
2. Wet Prairie Transplant Installation operations shall be executed according to Sheet T-4 and the notes contained on Sheet N-1.

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Coordinate System: Illinois State Plane NAD83

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3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Drainage and Grading Plan - ComEd/Long Run Parcels

SHEET NUMBER

D-2

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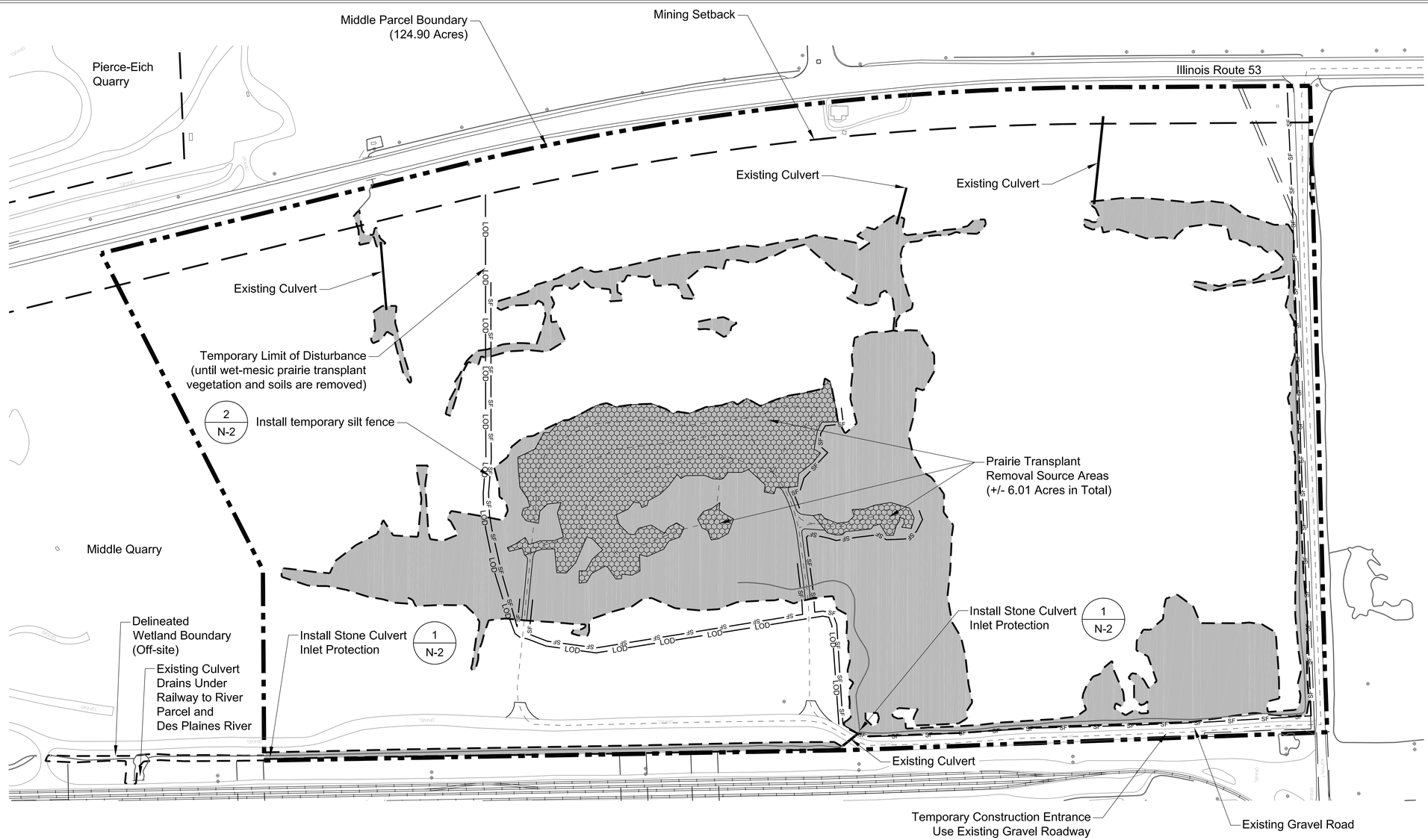

MIDDLE PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Mining Setback
	Easement Boundary
	Watercourse
	Transplant Removal Route (Temporary)
	Transplant Removal Route (Gravel)
SF	Silt Fence (Entrenched)
LOD	Temporary Limit of Disturbance

TRANSPLANT KEY

Symbol	Description	Acres
	Existing Wetland Areas	29.74
	Wet-Mesic Prairie Removal Areas	6.01

NOTES

1. Sedimentation and Erosion Control Measures shall be implemented according to the notes contained on Sheet N-2.
2. Access Road construction shall be executed according to the notes contained on Sheet N-1.
3. Wet Prairie Transplant operations shall be executed according to the notes contained on Sheet N-1.
4. If transplant operations occur during Hines' emerald dragonfly flight season, vehicles shall travel at speeds less than 15 miles per hour.

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Coordinate System: Illinois State Plane NAD83

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5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

NORTH

ONE INCH = 150'

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WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Sedimentation and Erosion Control Plan - Middle Parcel

SHEET NUMBER

S-1

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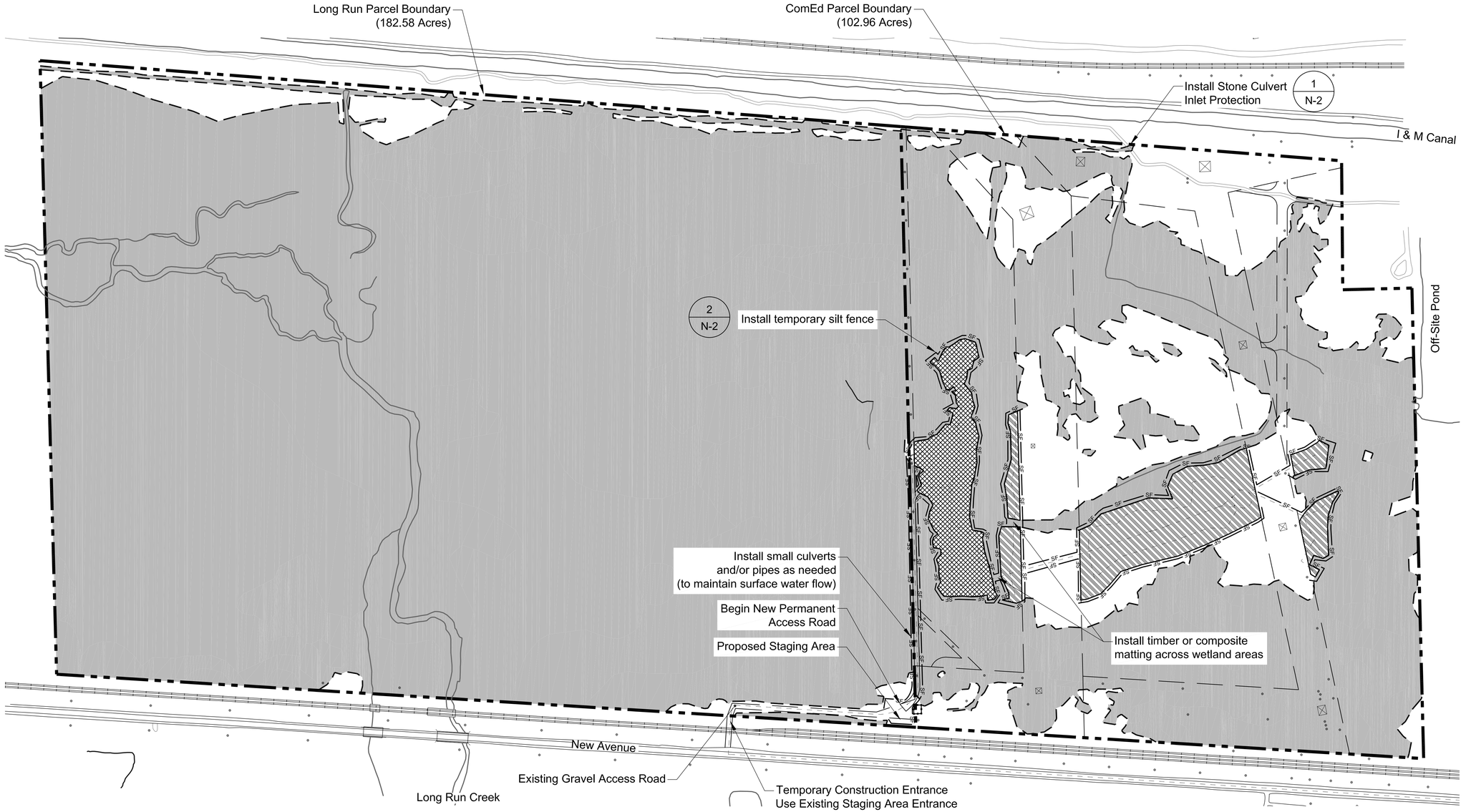

COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Delineated Wetland Boundary
	Watercourse
	Easement Boundary
SF	Silt Fence (Entrenched)
	Transplant Installation Route (Temporary)
	Transplant Installation Route (Gravel)
	Utility Tower
	Pipeline Gauge Station

TRANSPLANT KEY

Symbol	Description	Acres
	Existing Wetland Areas	236.98
	Complete Transplant Area	3.75
	Possible Transplant Area	6.21

NOTES

1. Sedimentation and Erosion Control Measures shall be implemented according to the notes contained on Sheet N-2.
2. Access Road construction shall be executed according to the notes contained on Sheet N-1.
3. Wet Prairie Transplant Installation operations shall be executed according to the notes contained on Sheet N-1.
4. If transplant operations occur during Hines' emerald dragonfly flight season, vehicles shall travel at speeds less than 15 miles per hour.

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3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Sedimentation and Erosion Control Plan - ComEd/Long Run Parcels

SHEET NUMBER

S-2

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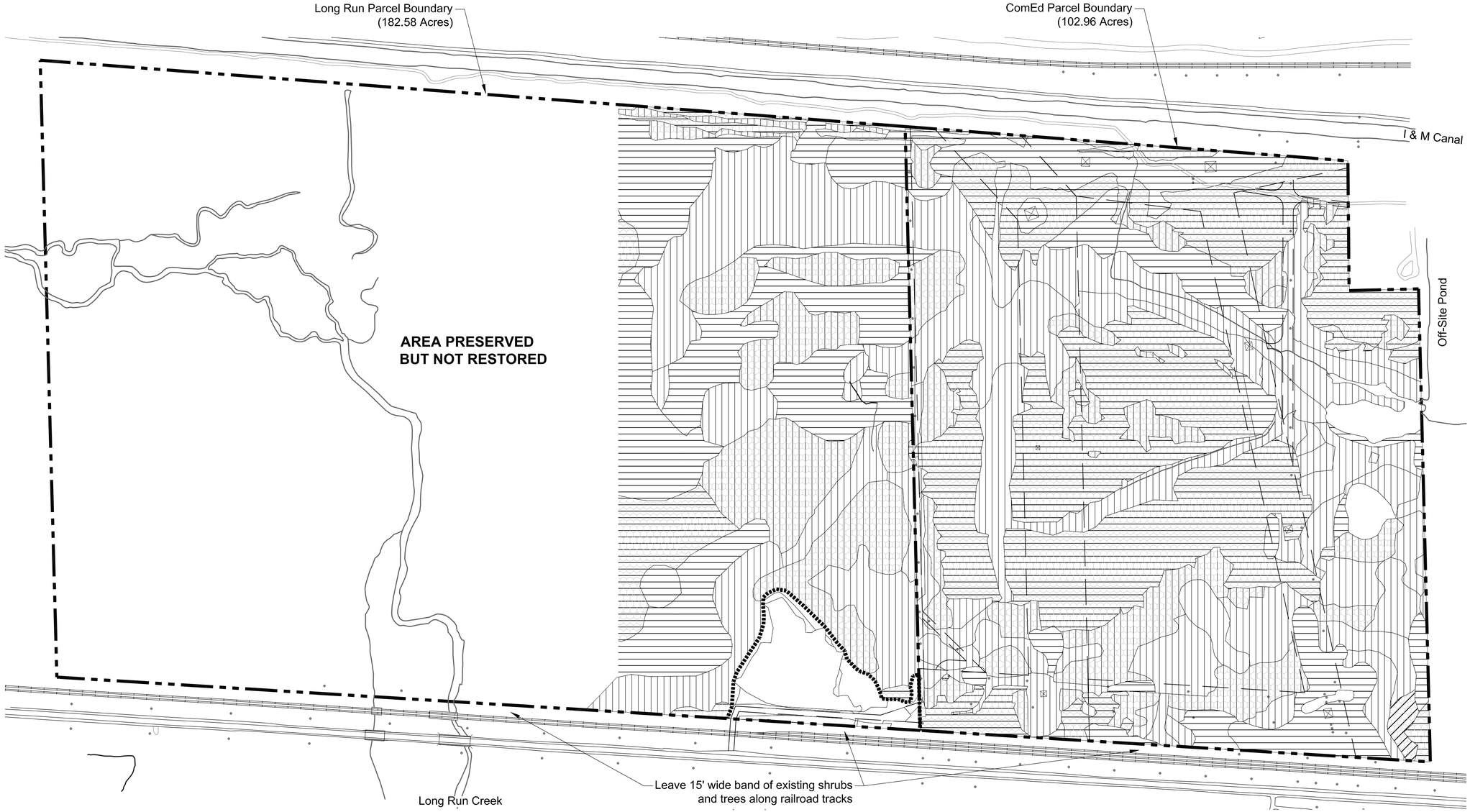

COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Oil Cleanup Boundary
	Watercourse
	Easement Boundary
⊠	Utility Tower

INVASIVE SPECIES REMOVAL

Symbol	Description	Acres
	Brushing	69.34
	Spot Herbicide	80.18
	Broadcast Herbicide	76.79
	USFWS-approved Herbicide (e.g. Handwicking)	0.46

NOTES

1. Invasive species removal techniques (Herbicide Application and Brushing) shall be executed according to the notes on Sheet N-1.

BRUSHING

1. Except for non-native shrubs, leave a 15' wide band of existing shrubs and trees along railroad tracks east of ComEd and Long Run Parcels.

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NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

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Invasive Species Removal Plan - ComEd/Long Run Parcels

SHEET NUMBER

I-1

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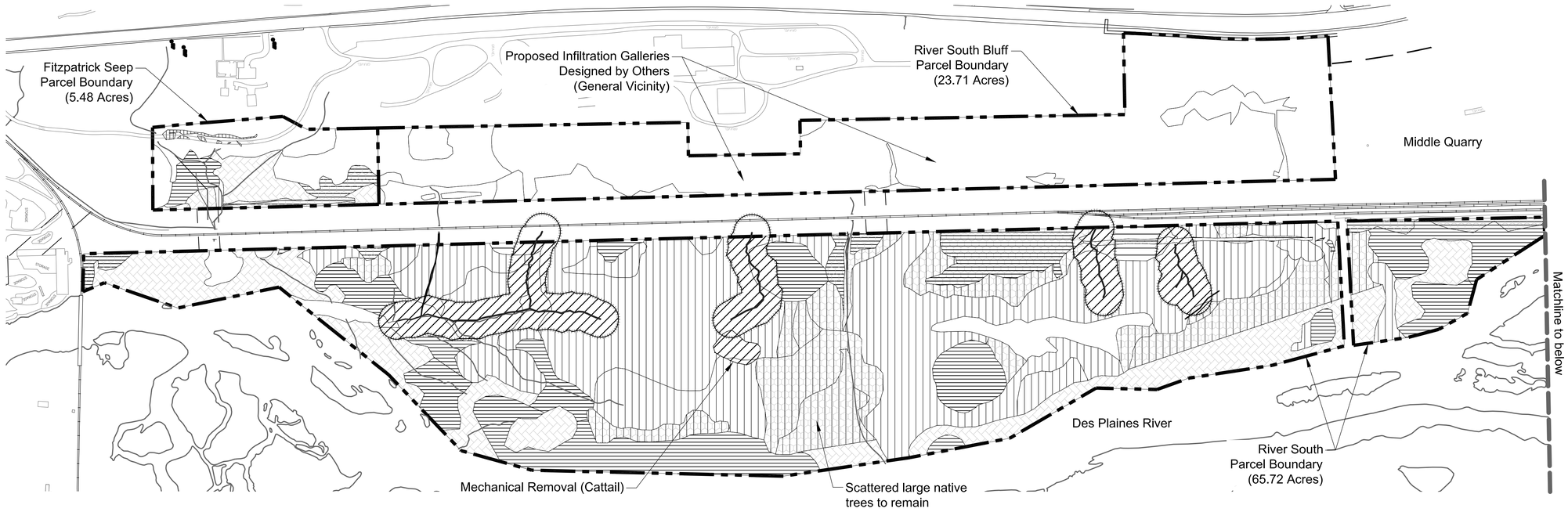

FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, AND RIVER SOUTH PARCEL

1" = 200'

RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	USFWS 65' HED Larval Habitat Buffer (7.02 Acres)

INVASIVE SPECIES REMOVAL (River Parcel)

Symbol	Description	Acres
	Brushing	11.82
	Wet-Mesic Savanna Brushing	9.79
	Spot Herbicide	21.06
	Broadcast Herbicide	21.02

INVASIVE SPECIES REMOVAL (Fitz. Seep, River S.)

Symbol	Description	Acres
	Brushing	13.80
	Wet-Mesic Savanna Brushing	12.86
	Spot Herbicide	33.10
	Broadcast Herbicide	15.33
	USFWS-approved Herbicide (e.g. Handwicking)	6.67

NOTES

1. Invasive species removal techniques (Herbicide Application, Brushing, and Wet-Mesic Savanna Brushing) shall be executed according to the notes on Sheet N-1.
2. Mechanical removal of cattail shall be with a weed whip.
3. No invasive species removal will occur on River South Bluff Parcel.
4. Another infiltration basins/pond is proposed as part of a strategy to maintain or improve groundwater recharge to other HED habitat areas, and is briefly described on Sheet N-1.
5. Wet-Mesic Savanna Brushing includes the removal of invasive shrubs, thinning of weedy trees, and broadcast or spot herbicide as needed.

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Coordinate System: Illinois State Plane NAD83

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5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Invasive Species Removal Plan - Parcels River

SHEET NUMBER

I-2

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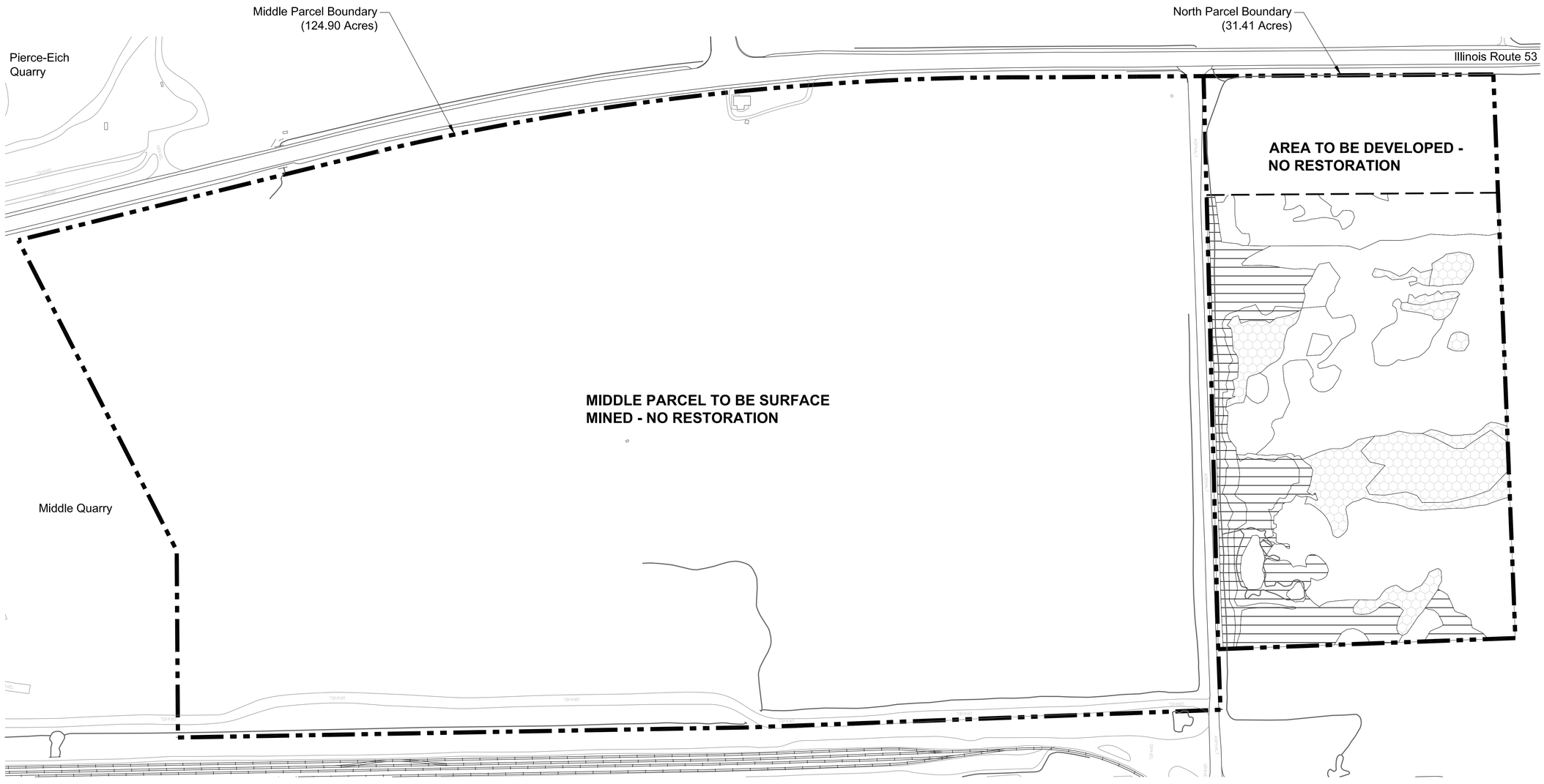

MIDDLE PARCEL AND NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Restoration Limit Line
	Watercourse

INVASIVE SPECIES REMOVAL (North Parcel)

Symbol	Description	Acres
	Brushing	4.21
	Broadcast Herbicide	5.20

NOTES

1. Invasive species removal techniques (Brushing and Broadcast Herbicide Application) shall be executed according to the notes on Sheet N-1.

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Coordinate System: Illinois State Plane NAD83

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5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

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SHEET TITLE

Invasive Species Removal Plan - North Parcel

SHEET NUMBER

I-3

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FAR NORTH PARCEL AND RIVER NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
▬ · ▬	Parcel Boundary
— — —	Restoration Limit Line
———	Watercourse

INVASIVE SPECIES REMOVAL (Far North P./River North P.)

Symbol	Description	Acres
⬡	Brushing	20.05 / 10.24
▥	Broadcast Herbicide	6.47 / 0

NOTES

1. Invasive species removal techniques (Brushing and Broadcast Herbicide Application) shall be executed according to the notes on Sheet N-1.

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Coordinate System: Illinois State Plane NAD83

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10/7/2020	USFWS HCP	WCC	WWS

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NORTH

ONE INCH = 150'

0 75 150 300

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Invasive Species Removal Plan - Far North/River North Parcels

SHEET NUMBER

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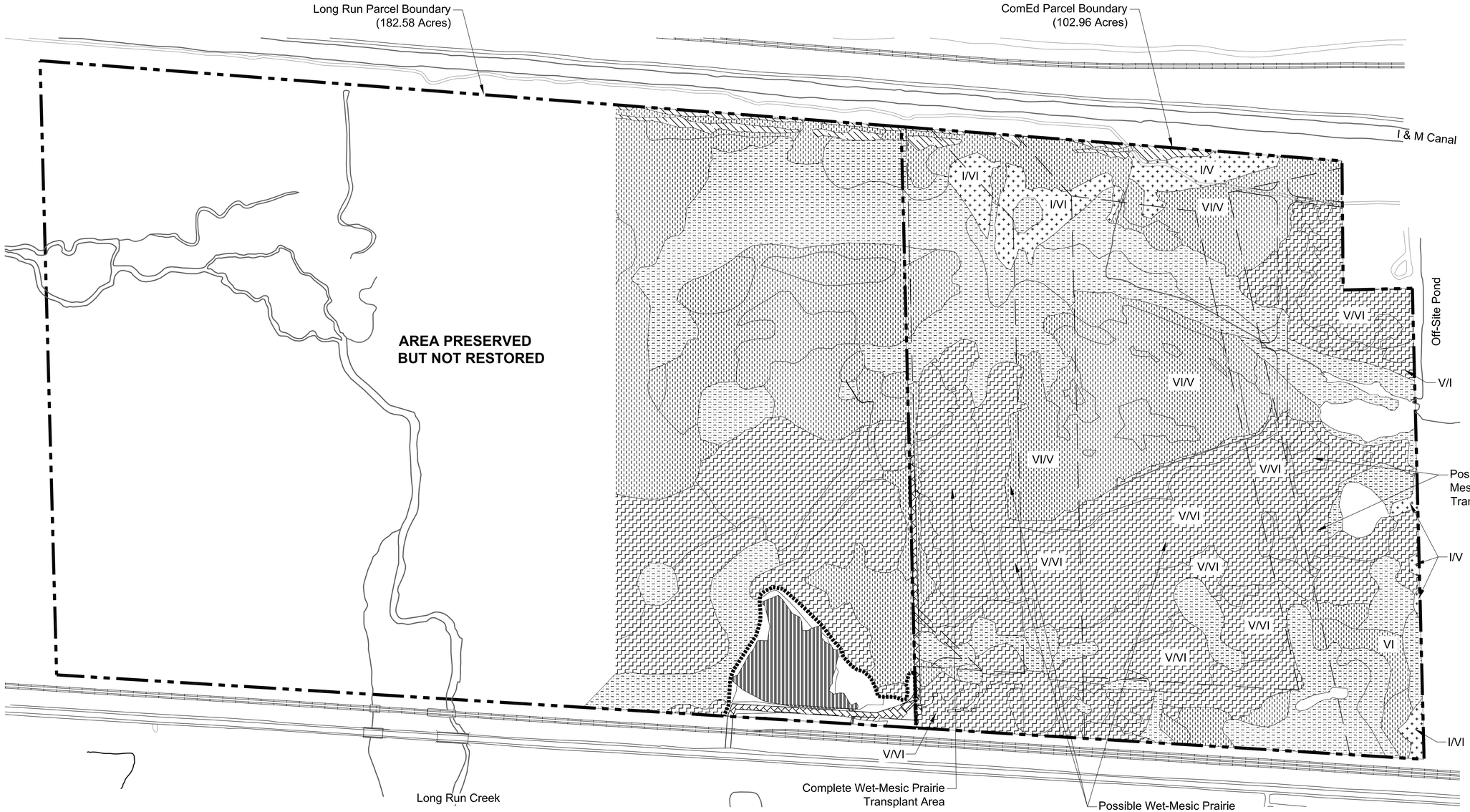

COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	Easement Boundary
	Developed
	Oil-Contaminated Area 2.61 Acres (Restored by Others)
	Oil Cleanup Boundary

RESTORATION ZONES

Symbol	Description	Acres
	I : Mesic/Wet-Mesic Prairie	4.78
	II : Savanna	1.67
	V : Wet/Wet-Mesic Prairie	60.44
	VI : Wet Prairie/Sedge Meadow	51.73
	VII : Emergent	38.80

NOTES

1. Sheets R-5 and R-6 contain Planting and Seeding species lists and quantities for the Restoration Zones.
2. The approximate 6.01 acres of transplant from Middle Parcel is included in Restoration Zone V : Wet/Wet-Mesic Prairie. Some over-seeding may occur in these areas. For drawings regarding the transplant areas on ComEd/Long Run Parcels, please refer to Sheet T-2.
3. Seeding and planting will occur after invasive species removal is completed (see Sheet I-1). Seeding and planting shall occur at varying rates depending on the condition of the ground layer and its response to invasive species removal.
4. Site conditions will change after invasive species removal, and restoration zones may need to be adjusted. Prior to seeding and planting, contractor and the client's consultant will meet on-site to review seeding and planting areas and coordinate installation.
5. Native species collected in the Wet-Mesic Dolomite Prairie in Middle Parcel prior to the transplant will be used to over-seed the transplant areas on ComEd Parcel (See Sheet T-4).
6. Areas which shall be seeded with a combination of seed mixes are noted numerically on the map above. For example, "VI/V"is an area to be seeded with seeds from both "Wet Prairie/Sedge Meadow" and "Wet/Wet-Mesic Prairie."
7. Prescribed burning shall be used to manage all restored, enhanced, and maintained areas (see Sheets H-1 to H-4).
8. No seeding and planting shall occur in Savanna zones on ComEd and Long Run Parcels.

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Coordinate System: Illinois State Plane NAD83

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3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

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NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Restoration Zones - ComEd/Long Run Parcels

SHEET NUMBER

R-1

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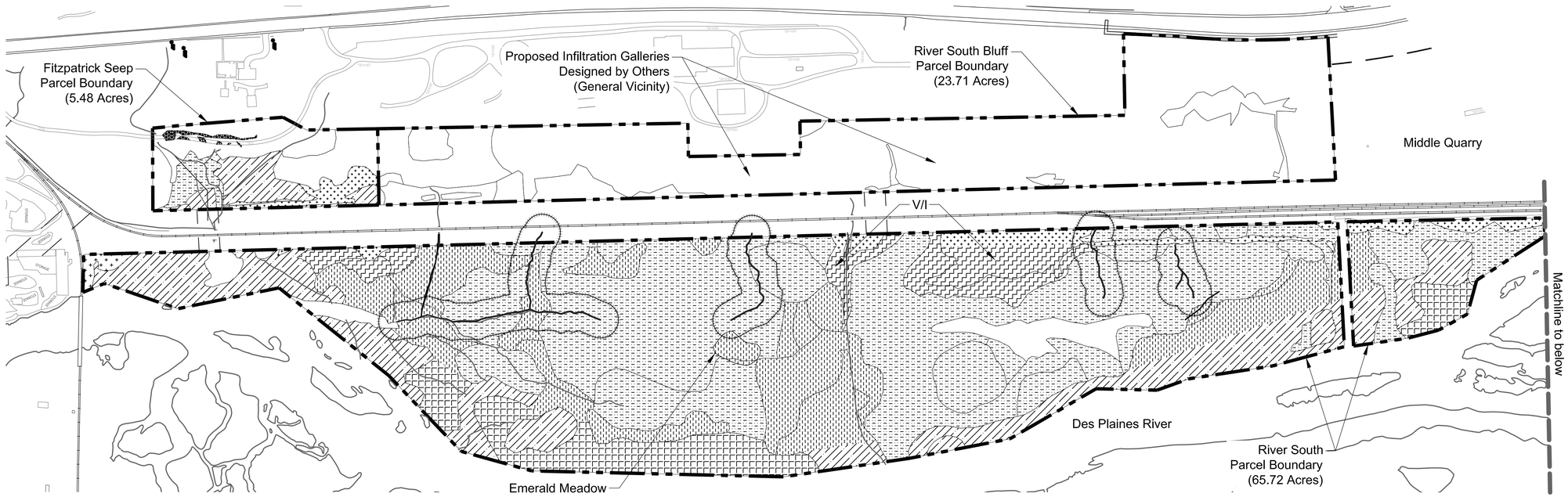

FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, AND RIVER SOUTH PARCEL

1" = 200'

RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	USFWS 65' HED Larval Habitat Buffer

RESTORATION ZONES (Fitz. Seep + River S.)

Symbol	Description	Acres
	I : Mesic/Wet-Mesic Prairie	2.65
	IV : Wet/Wet-Mesic Savanna	11.39
	V : Wet/Wet-Mesic Prairie	3.58
	VI : Wet Prairie/Sedge Meadow	12.56
	VII : Emergent	30.96
	VIII: Floodplain-Wet Meadow	4.93
	19: Spring-Seep	0.10

RESTORATION ZONES (River Parcel)

Symbol	Description	Acres
	II : Savanna	4.32
	IV : Wet/Wet-Mesic Savanna	13.36
	V : Wet/Wet-Mesic Prairie	3.96
	VII : Emergent	6.64
	VIII : Floodplain-Wet Meadow	8.59
	IX : Upland Field	12.06
	12: Wet Prairie/Sedge Meadow	1.30
	17: Marsh-Cattail	6.13

NOTES

1. Roman numerals indicate Restoration Zone names. Arabic numerals indicate Existing Landcover names, and some of these areas are to be enhanced (see Sheet I-2).
2. Planting and seeding shall occur on Fitzpatrick Seep, River South, and River Parcels. Sheets R-5 and R-6 contain Planting and Seeding species lists and quantities for the Restoration Zones.
3. No planting, seeding or restoration shall occur on River South Bluff Parcel.
4. No seeding and planting shall occur in the Wet/Wet-Mesic Savanna on River and River South Parcels, except where noted on this sheet.
5. No seeding or planting shall occur in Floodplain-Wet Meadow, Spring-Seep, Savanna, Upland Field, and Marsh-Cattail on any of the parcels on this sheet.
6. Seeding and planting shall occur after invasive species removal is completed (see Sheet I-2). Seeding and planting shall occur at varying rates depending on the condition of the ground layer and its response to invasive species removal.
7. Prescribed burning shall be used to manage all restored, enhanced, and maintained areas (see Sheets H-1 to H-4).

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NORTH

ONE INCH = 200'

0 100 200 400

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Restoration Zones - Parcels River

SHEET NUMBER

R-2

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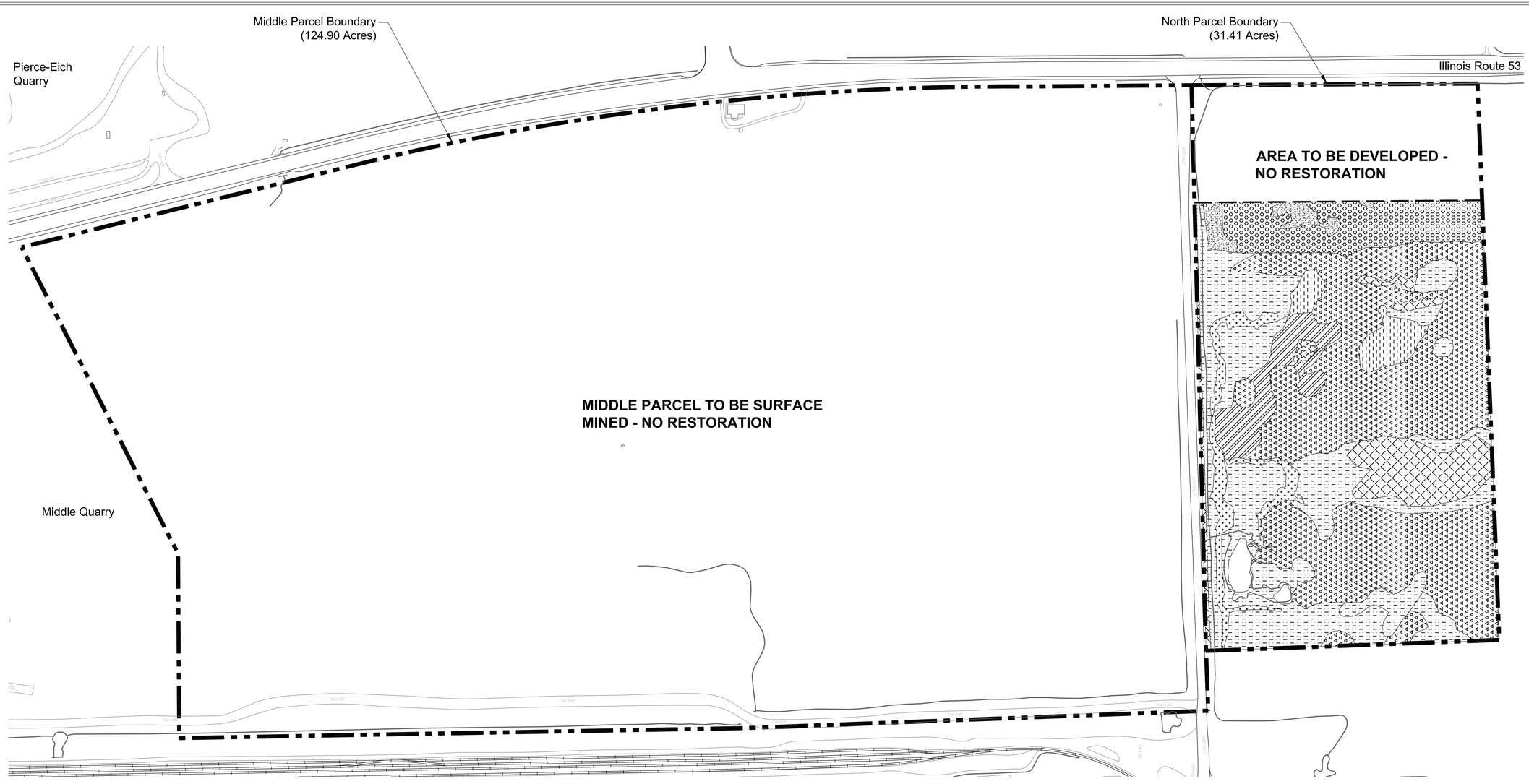

MIDDLE PARCEL AND NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Restoration Limit Line
	Watercourse
	Developed

RESTORATION ZONES (North Parcel)

Symbol	Description	Acres
	I: Mesic/Wet-Mesic Prairie	0.88
	02: Dry-Mesic Dolomite Prairie	0.07
	III : Wet Meadow	1.64
	04: Wet-Mesic Dolomite Prairie	1.16
	VII : Emergent	6.88

RESTORATION ZONES (North Parcel)

Symbol	Description	Acres
	07: Shrubland Upland	2.13
	IX : Upland Field	0.40
	12: Wet Prairie/Sedge Meadow	0.69
	17: Marsh Cattail	10.59

NOTES

1. Roman numerals indicate Restoration Zone names. Arabic numerals indicate Existing Landcover names, and some of these areas are to be enhanced (see Sheet I-3).
2. The only planting or seeding to occur on North Parcel will be in areas where Phragmites is removed. Refer to Sheet I-3 for invasive species removal information.
3. Prescribed burning shall be used to manage all restored, enhanced, and maintained areas (see Sheets H-1 to H-4).

Applied Ecological Services, Inc.

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HMS Surface Mining Mitigation and Restoration Plans

Romeoville, Will County, Illinois

Hanson Material Service Corporation
c/o Lehigh Hanson
620 West 183rd Street
Thornton, Illinois 60476

AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms r-1 to r-4 resto plan.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Restoration Zones - North Parcel

SHEET NUMBER

R-3

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FAR NORTH PARCEL AND RIVER NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
▬ · ▬	Parcel Boundary
— — —	Restoration Limit Line
———	Watercourse

RESTORATION ZONES (Far North P./River.P)

Symbol	Description	Acres
	01: Dry Dolomite Prairie	0 / 0.16
	02: Dry-Mesic Dolomite Prairie	0 / 0.44
	III : Wet Meadow	0.21 / 0
	IV : Wet/Wet-Mesic Savanna	0 / 1.40
	VII : Emergent	7.41 / 0
	VIII : Floodplain-Wet Meadow	0 / 0.43
	IX : Upland Field	25.58 / 10.70
	16: Marsh Phragmites	1.11 / 0.23
	17: Marsh Cattail	5.45 / 0.33

NOTES

1. Roman numerals indicate Restoration Zone names. Arabic numerals indicate Existing Landcover names, and some of these areas are to be enhanced (see Sheet I-4).
2. The only planting or seeding to occur on Far North and River North Parcels will be in areas where Phragmites is removed. Refer to Sheet I-4 for invasive species removal information.
3. No seeding and planting shall occur in the Wet/Wet-Mesic Savanna zones on River North Parcel.
4. Prescribed burning shall be used to manage all restored, enhanced, and maintained areas (see Sheets H-1 to H-4).

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hms r-1 to r-4 resto plan.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

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11/10/2016	BID SET	WCC	WWS
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1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Restoration Zones - Far North/River North Parcels

SHEET NUMBER

R-4

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HMS PROVIDED SEED		
EMERGENT	**76.39 acres**	**Total**
GRASSES AND SEDGES	**COMMON NAME**	**Seed (oz)**
Carex lacustris	Lake sedge	3.82
Juncus nodosus	Joint rush	2.23
Juncus torreyi	Torrey's rush	13.40
Eleocharis elliptica	golden seeded spikerush	1.16
Eleocharis erythropoda	bald spikerush	8.29
Glyceria septentrionalis	floating manna grass	0.26
Scirpus acutus	Hard-stemmed bulrush	145.25
Scirpus validus	softsetm bulrush	6.06
Scirpus atrovirens	Dark green rush	30.17
Scirpus fluviatilis	River bulrush	180.00
Scirpus pendulus	Red bulrush	35.27
FORBS		
Acorus calamus/americanus	Sweet flag	2.00
Aster puniceus	Swamp aster	3.40
Aster simplex	Panicled aster	3.88
Caltha palustris	Marsh marigold	4.96
Chelone glabra	Turtlehead	0.47
Iris virginica shrevei	Blue flag iris	17.95
Lycopus americanus	Water horehound	8.55
Lythrum alatum	Winged loosestrife	0.75
Mentha arvensis villosa	Wild mint	1.59
Cephalanthus occidentalis	Buttonbush	1.21
Cicuta maculata	Water hemlock	14.97
Penthorum sedoides	ditch stonecrop	1.26
Ludwigia polycarpa	False loosestrife	7.57
Mimulus ringens	Monkey flower	1.23
Polygonum amphibium stipulaceum	Water knotweed	0.10
Lycopus uniflorus	Northern bugleweed	0.76
Polygonum hydropiperoides	Mild water pepper	5.81
Oxypolis rigidor	Cowbane	0.47
Polygonum punctatum	Dotted smartweed	109.39
Proserpinaca palustris	Marsh mermaid	0.47
Rumex orbiculatus	Great water dock	3.74
Sagittaria latifolia	Arrowhead	3.37
Sium suave	Water parsnip	1.64
Phyla lanceolata	lance leaf fog fruit	1.10
Sparganium eurycarpum	Bur reed	178.11
Total (oz)		**800.66**
Pounds per acre		**0.66**

HMS PROVIDED SEED		
SEDGE MEADOW / WET PRAIRIE	**64.29 acres**	**Total**
GRASSES AND SEDGES	**COMMON NAME**	**Seed (oz)**
Calamagrostis canadensis	Blue joint grass	0.54
Carex buxbaumii	Buxbaum's sedge	6.00
Carex crawei	Early fen sedge	13.00
Carex granularis	Pale sedge	6.00
Carex cristatella	Crested sedge	23.30
Carex hystericina	Bottlebrush sedge	2.60
Carex lupulina	Hop sedge	0.10
Carex pellita	Wooly sedge	13.70
Carex sartwelli	Running marsh sedge	9.13
Carex stricta	Tussock sedge	13.31
Carex suberecta	Prairie straw sedge	43.59
Deschampsia caespitosa glauca	Tufted hair grass	41.08
Glyceria striata	Fowl manna grass	10.19
Juncus torreyi	Torrey's rush	13.40
Scirpus pendulus	Red bulrush	35.27
Spartina pectinata	Prairie cord grass	15.36
FORBS		
Agalinis purpurea	Purple false foxglove	11.00
Aster novae-angliae	New England aster	0.73
Eupatorium perfoliatum	Boneset	4.12
Aster puniceus	Swamp aster	3.40
Bidens polylepis	Bur marigold	36.36
Bidens coronata	Tall swamp marigold	0.28
Cirsium muticum	Swamp thistle	0.12
Epilobium coloratum	Cinnamon willow herb	12.12
Eutrochium maculatum	Joe-pye weed	26.98
Lobelia siphilitica	Great blue lobelia	22.73
Lysimachia quadrflora	Praire loosestrife	5.44
Ranunculus hispidus	rough buttercup	*
Mentha arvensis villosa	Wild mint	1.59
Pycnanthemum virginianum	Mountain mint	5.38
Satureja arkansana	Arkansas mint	9.38
Euthamia graminifolia	Grass-leaved goldenrod	0.06
Solidago uliginosa	Bog goldenrod	32.85
Solidago ohioensis	Ohio goldenrod	8.00
Solidago riddellii	Riddell's goldenrod	16.26
Stachys tenuifolia	smooth hedge nettle	*
Verbena hastata	Blue vervain	14.15
Angelica atropurpera	great angelica	74.83
Scutellaria lateriflora	Mad dog skullcap	2.27
**trace*		
Total (oz)		**534.62**
Pounds per acre		**0.52**

HMS PROVIDED SEED		
WET/WET-MESIC PRAIRIE	**67.99 acres**	**Total**
GRASSES AND SEDGES	**COMMON NAME**	**Seed (oz)**
Andropogon gerardii	Big bluestem grass	3.44
Carex pellita	Wooly sedge	13.70
Carex molesta	Field oval sedge	0.20
Carex scoparia	lance fruited oval sedge	0.20
Carex stipata	Prickly sedge	4.04
Carex vulpinoidea	Brown fox sedge	0.58
Juncus dudleyi	Dudley's rush	3.85
Deschampsia caespitosa glauca	Tufted hair grass	30.00
Dichanthelium acuminatum	tapered rossette grass	6.15
Elymus riparius	river bank rye	1.71
Panicum flexile	Wiry panic grass	2.71
Muhlenbergia mexicana	Leafy satin grass	3.00
Spartina pectinata	Prairie cord grass	30.72
FORBS		
Allium cernuum	Nodding wild onion	13.48
Hypoxis hirsuta	Yellow star grass	0.05
Helianthus grossesseratus	sawtooh sunflower	0.41
Physostegia virginiana	False dragonhead	0.05
Rudbeckia laciniata	wild golden glow	0.29
Pycnanthemum virginianum	Mountain mint	5.38
Satureja arkansana	Low calamint	9.38
Sisyrinchium albidum	Blue-eyed grass	0.25
Verbena hastata	Blue vervain	14.15
Vernonia fasciculata	Ironweed	0.18
Total (oz)		**143.92**
Pounds per acre		**0.13**

HMS PROVIDED SEED		
MESIC / WET-MESIC PRAIRIE	**8.30 acres**	**Total**
GRASSES AND SEDGES	**COMMON NAME**	**Seed (oz)**
Andropogon scoparius	**Little bluestem grass**	10.15
Carex bicknellii	Copper-shouldered oval sedge	14.40
Juncus dudleyi	Dudley's rush	3.85
FORBS		
Allium cernuum	Nodding wild onion	13.48
Aster ericoides	Heath aster	0.03
Aster laevis	Smooth blue aster	14.38
Trichostema bractiatum	fluxweed	4.53
Liatris spicata	Marsh blazing star	0.38
Hypericum sphaerocarpium	round fruited st John's wort	28.83
Total (oz)		**90.03**
Pounds per acre		**0.68**

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AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms r-5 to r-6 planting lists.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

SHEET TITLE

Restoration Zones - Seeding Lists - Provided by HMS

SHEET NUMBER

R-5

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CONTRACTOR SUPPLIED SEEDS AND PLANTS

EMERGENT	76.39 acres	Total	
GRASSES AND SEDGES	COMMON NAME	Seeds (oz)	Plants (per acre)
Carex lacustris	Lake sedge	60.00	250
Juncus effusus	Common rush	42.00	
Leersia oryzoides	Rice cut grass	120.00	
Scirpus acutus	Hard-stemmed bulrush		200
Scirpus fluviatilis	River bulrush	80.00	100
Scirpus validus	softsetm bulrush	60.00	
FORBS			
Acorus calamus/americanus	Sweet flag	60.00	250
Asclepias incarnata	Swamp milkweed	68.00	
Caltha palustris	Marsh marigold		100
Iris virginica shrevei	Blue flag iris		200
Alisma subcordatum	Water plantain	76.00	
Polygonum amphibium stipulaceum	Water knotweed		100
Pontederia cordata	Pickerel weed		200
Sagittaria latifolia	Arrowhead	60.00	
Sparganium eurycarpum	Bur reed		200
Total (oz)		**626.00**	
Pounds per acre		**0.51**	
Plant per acre			**1,600**
Total plants			**122,224**

CONTRACTOR SUPPLIED SEEDS AND PLANTS

SEDGE MEADOW / WET PRAIRIE	64.29 acres	Total	
GRASSES AND SEDGES	COMMON NAME	Seed (oz)	Plants (per acre)
Calamagrostis canadensis	Blue joint grass	240.00	200
Carex buxbaumii	Buxbaum's sedge		250
Carex cristatella	Crested sedge	200.00	
Carex hystericina	Bottle brush sedge	300.00	
Carex pellita	Wooly sedge	200.00	100
Carex sartwelli	Running marsh sedge	160.00	
Carex stricta	Tussock sedge		250
Elymus virginicus	Virginia wild rye	1,200.00	
Leersia oryzoides	Rice cut grass	600.00	
Spartina pectinata	Prairie cord grass		400
FORBS			
Agalinis purpurea	Purple false foxglove	40.00	
Aster novae angliae	New England aster	160.00	
Aster puniceus	Swamp aster	160.00	
Bidens coronata	Tall swamp marigold	40.00	
Eupatorium perfoliatum	Boneset	120.00	
Euthamia graminifolia	Grass-leaved goldenrod	80.00	
Eutrochium maculatum	Joe-pye weed	120.00	
Helenium autumnale	Sneezeweed	160.00	
Mentha arvensis villosa	Wild mint	80.00	
Pycnanthemum virginianum	Mountain mint	120.00	
Scutellaria lateriflora	Mad dog skullcap	60.00	
Stachys tenuifolia	smooth hedge nettle	120.00	
Verbena hastata	Blue vervain	160.00	
Total (oz)		**4,320.00**	
Pounds per acre		**4.20**	
Plant per acre			**1,200**
Total plants			**77,148**
SHRUBS*			
Cornus obliqua	Pale dogwood		4
Cornus stolonifera	Red-osier dogwood		4
Hypericum kalmianum	Kalm's st. john's wort		4
Salix discolor	Pussy willow		4
Salix petiolaris	Meadow willow		4
Spiraea alba	Meadowsweet		4
Plant per acre			**24**
Total plants			**1,543**

CONTRACTOR SUPPLIED SEEDS AND PLANTS

WET/WET-MESIC PRAIRIE	67.99 acres	Total	
GRASSES AND SEDGES	COMMON NAME	Seed (oz)	Plants (per acre)
Bromus ciliatus	Fringed brome	80.00	
Calamagrostis canadensis	Blue joint grass	80.00	150
Carex pellita	Wooly sedge		150
Andropogon gerardii	big bluestem grass	800.00	
Carex vulpinoidea	Brown fox sedge	80.00	
Juncus dudleyi	Dudley's rush	120.00	
Muhlenbergia mexicana	Leafy satin grass	80.00	
Elymus virginicus	Virginia wild rye	1,200.00	
Panicum virgatum	Swirch grass	600.00	
Spartina pectinata	Prairie cord grass		200
Sphenopholis intermedia	Slender wedge grass	80.00	
Sporobolus heterolepis	Prairie dropseed	120.00	100
FORBS			
Allium cernuum	Nodding wild onion	40.00	80
Asclepias sullivantii	Prairie milkweed	20.00	60
Boltonia asteroides	False ater	80.00	
Aster novae-angliae	New England aster	100.00	
Cacalia plantaginea	Prairie indian plantain	40.00	60
Helianthus grossesseratus	sawtooh sunflower	90.00	
Monarda fistulosa	Wild bergamot	90.00	
Helenium autumnale	Sneezeweed	120.00	
Physostegia virginiana	False dragonhead	80.00	
Pycnanthemum virginianum	Mountain mint	80.00	
Rudbeckia hirta	Black-eyed Susan	240.00	
Senecio pauperculus	Balsam ragwort	20.00	
Euthamia graminifolia	Grass-leaved goldenrod	160.00	
Verbena hastata	Blue vervain	80.00	
Total (oz)		**4,480.00**	
Pounds per acre		**4.12**	
Plant per acre			**800**
Total plants			**54,392**

CONTRACTOR SUPPLIED SEEDS

MESIC / WET-MESIC PRAIRIE	8.30 acres	Total
GRASSES AND SEDGES	COMMON NAME	Seed (oz)
Andropogon gerardii	Big bluestem grass	220.00
Andropogon scoparius	Little bluestem grass	200.00
Carex brevior	Plains oval sedge	16.00
Carex gravida	Long-awned bracted sedge	16.00
Elymus virginicus	Virginia wild rye	80.00
Panicum virgatum	Switch grass	120.00
Sorghastrum nutans	Indian grass	200.00
FORBS		
Aster laevis	Smooth blue aster	16.00
Aster novae-angliae	New England aster	16.00
Baptisia alba	White wild indigo	16.00
Cacalia plantaginea	Prairie Indian Plantain	8.00
Coreopsis tripteris	Tall coreopsis	16.00
Dalea purpurea	Purple prairie clover	16.00
Desmodium canadense	Showy tick trefoil	22.00
Eryngium yuccifolium	Rattlesnake master	16.00
Heliopsis helianthoides	False sunflower	30.00
Liatris pycnostachya	Prairie blazing star	16.00
Monarda fistulosa	Wild bergamot	16.00
Parthenium integrifolium	Wild quinine	16.00
Pycnanthemum virginianum	Common mountain mint	16.00
Ratibida pinnata	Yellow coneflower	30.00
Rudbeckia hirta	Black-eyed susan	60.00
Rudbeckia subtomentosa	Sweet black-eyed Susan	16.00
Silphium integrifolium	Rosinweed	16.00
Silphium laciniatum	Compass plant	30.00
Euthamia graminifolia	Grass-leaved goldenrod	16.00
Solidago rigida	Stiff goldenrod	16.00
Tradescantia ohiensis	Common spiderwort	16.00
Vernonia faciculata	Ironweed	16.00
Veronicastrum virginiana	Culver's root	8.00
Zizia aurea	Golden alexanders	16.00
Total (oz)		**1,312.00**
Pounds per acre		**9.88**

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Coordinate System: Illinois State Plane NAD83

REVISIONS

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1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

SHEET TITLE

Restoration Zones - Seeding & Planting Lists - Provided by Contractor

SHEET NUMBER

R-6

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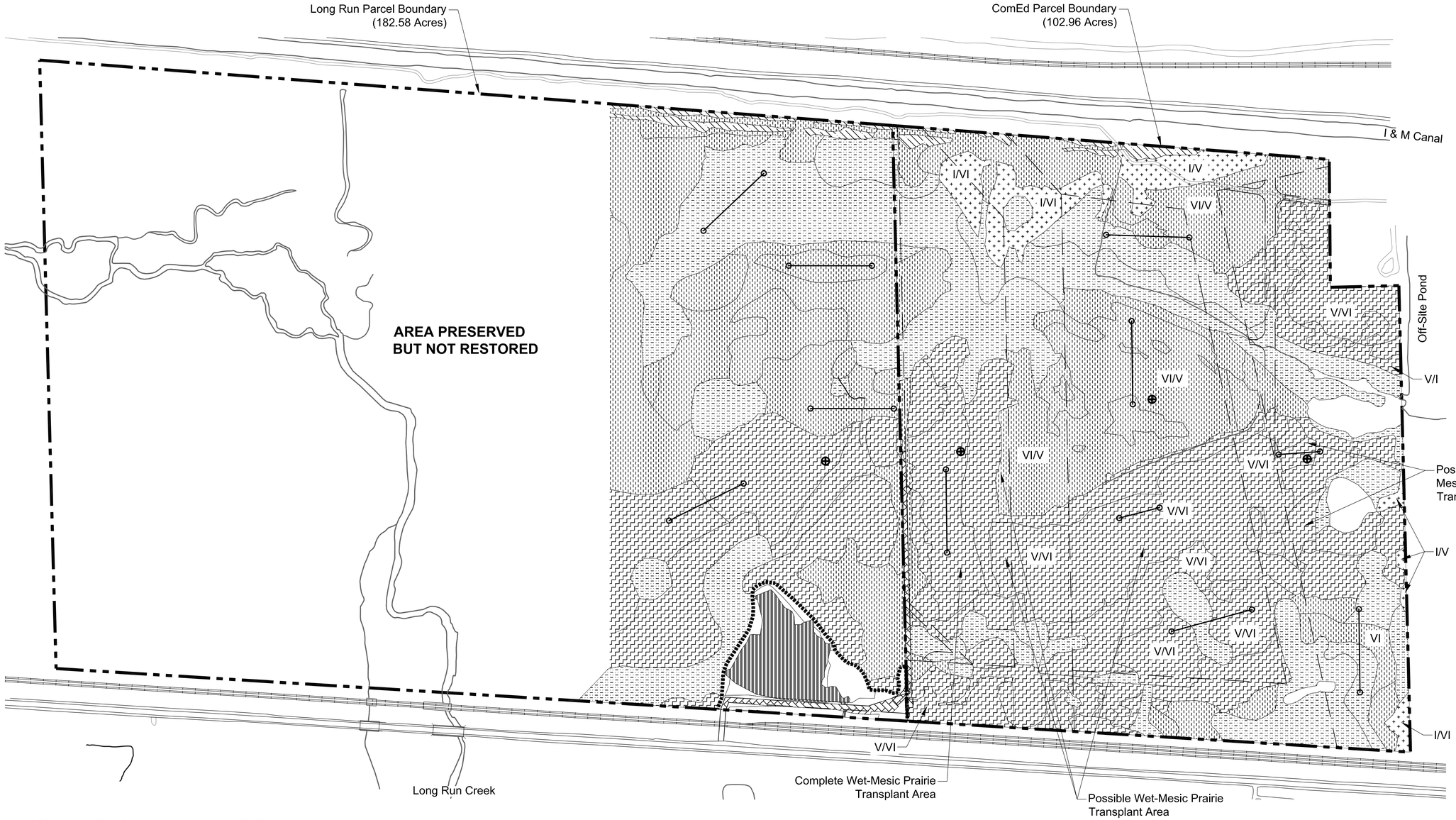

COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	Easement Boundary
	Developed
	Oil-Contaminated Area 2.61 Acres (Restored by Others)
	Oil Cleanup Boundary

LEGEND

Symbol	Description
	Monitoring Transects for Wetland Mitigation and Habitat Restoration (100m or 50m)
⊕	Telog and Soil Moisture Meter

RESTORATION ZONES

Symbol	Description	Acres
	I : Mesic/Wet-Mesic Prairie	4.78
	II : Savanna	1.67
	V : Wet/Wet-Mesic Prairie	60.44
	VI : Wet Prairie/Sedge Meadow	51.73
	VII : Emergent	38.80

NOTES

1. Roman numerals indicate Restoration Zone names. Arabic numerals indicate Existing Landcover names, and some of these areas are to be enhanced (see Sheet I-1).

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hms m-1 to m-4 monitoring plan.dwg
Coordinate System: Illinois State Plane NAD83

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10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 200'
0 100 200 400
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Monitoring Plan - ComEd/Long Run Parcels

SHEET NUMBER

M-1

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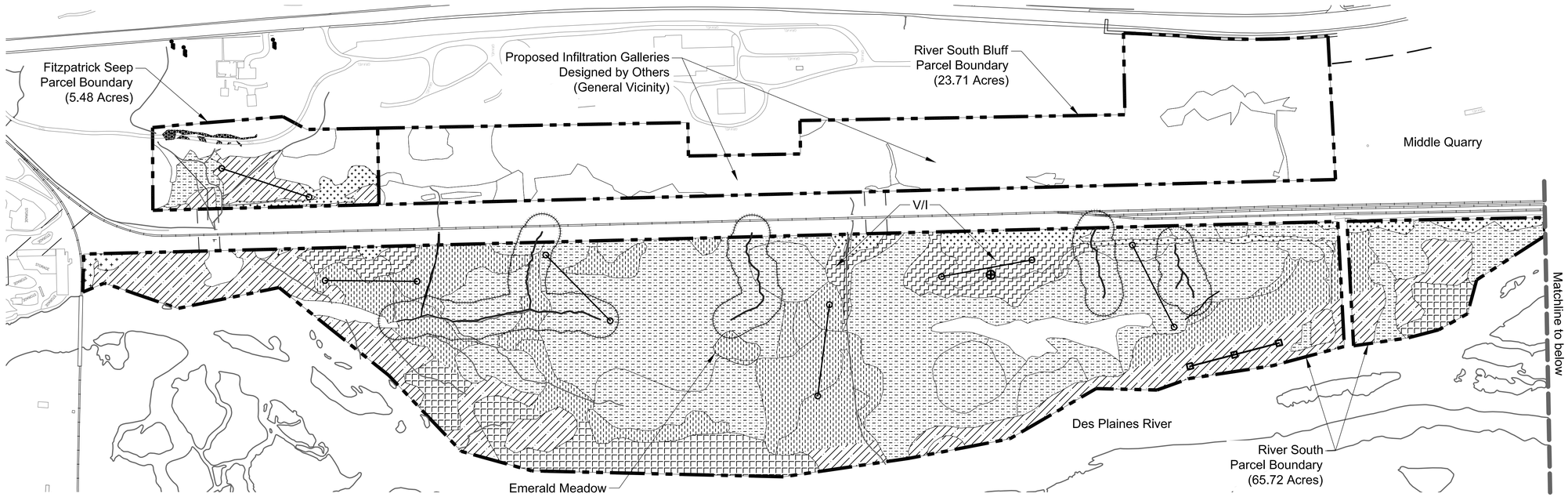
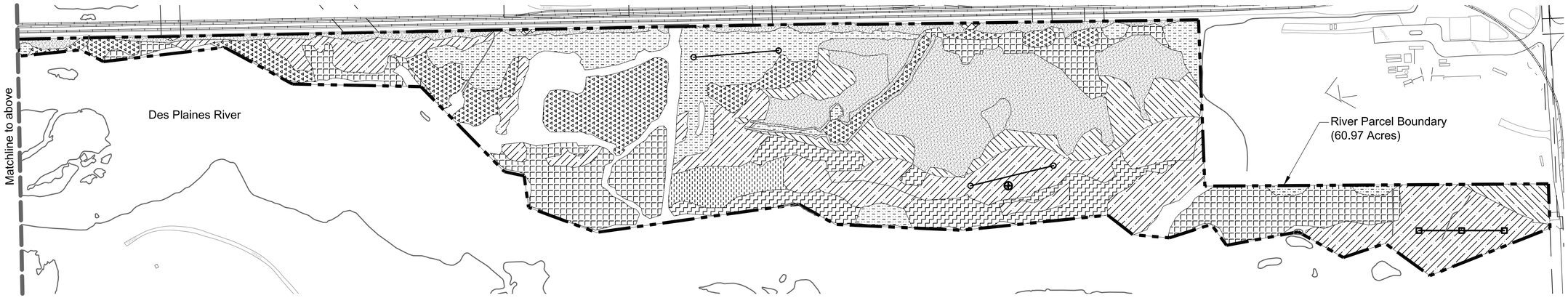


FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, AND RIVER SOUTH PARCEL

1" = 200'



RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	USFWS 65' HED Larval Habitat Buffer
	Monitoring Transects for Wetland Mitigation and Habitat Restoration (100m)
	Telog and Soil Moisture Meter
	Additional Monitoring Transects for Habitat Restoration (100m)

RESTORATION ZONES (Fitz. Seep + River S.)

Symbol	Description	Acres
	I : Mesic/Wet-Mesic Prairie	2.65
	IV : Wet/Wet-Mesic Savanna	11.39
	V : Wet/Wet-Mesic Prairie	3.58
	VI : Wet Prairie/Sedge Meadow	12.56
	VII : Emergent	30.96
	VIII: Floodplain-Wet Meadow	4.93
	19: Spring-Seep	0.10

RESTORATION ZONES (River Parcel)

Symbol	Description	Acres
	II : Savanna	4.32
	IV : Wet/Wet-Mesic Savanna	13.36
	V : Wet/Wet-Mesic Prairie	3.96
	VII : Emergent	6.64
	VIII : Floodplain-Wet Meadow	8.59
	IX : Upland Field	12.06
	12: Wet Prairie/Sedge Meadow	1.30
	17: Marsh-Cattail	6.13

NOTES

1. Roman numerals indicate Restoration Zone names. Arabic numerals indicate Existing Landcover names, and some of these areas are to be enhanced (see Sheet I-2).
2. Infiltration galleries are proposed in River South Bluff Parcel as part of a strategy to maintain/improve groundwater recharge in River South Parcel. These are intended to support HED habitat restoration and management.

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HMS Surface Mining Mitigation and Restoration Plans

Romeoville, Will County, Illinois

Hanson Material Service Corporation
c/o Lehigh Hanson
620 West 183rd Street
Thornton, Illinois 60476

AES Proj. #: 20-0109
Designed By: WWS
Drawn By: WCC
Checked By: WWS
hms m-1 to m-4 monitoring plan.dwg
Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 200'
0 100 200 400
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Monitoring Plan - Parcels River

SHEET NUMBER

M-2

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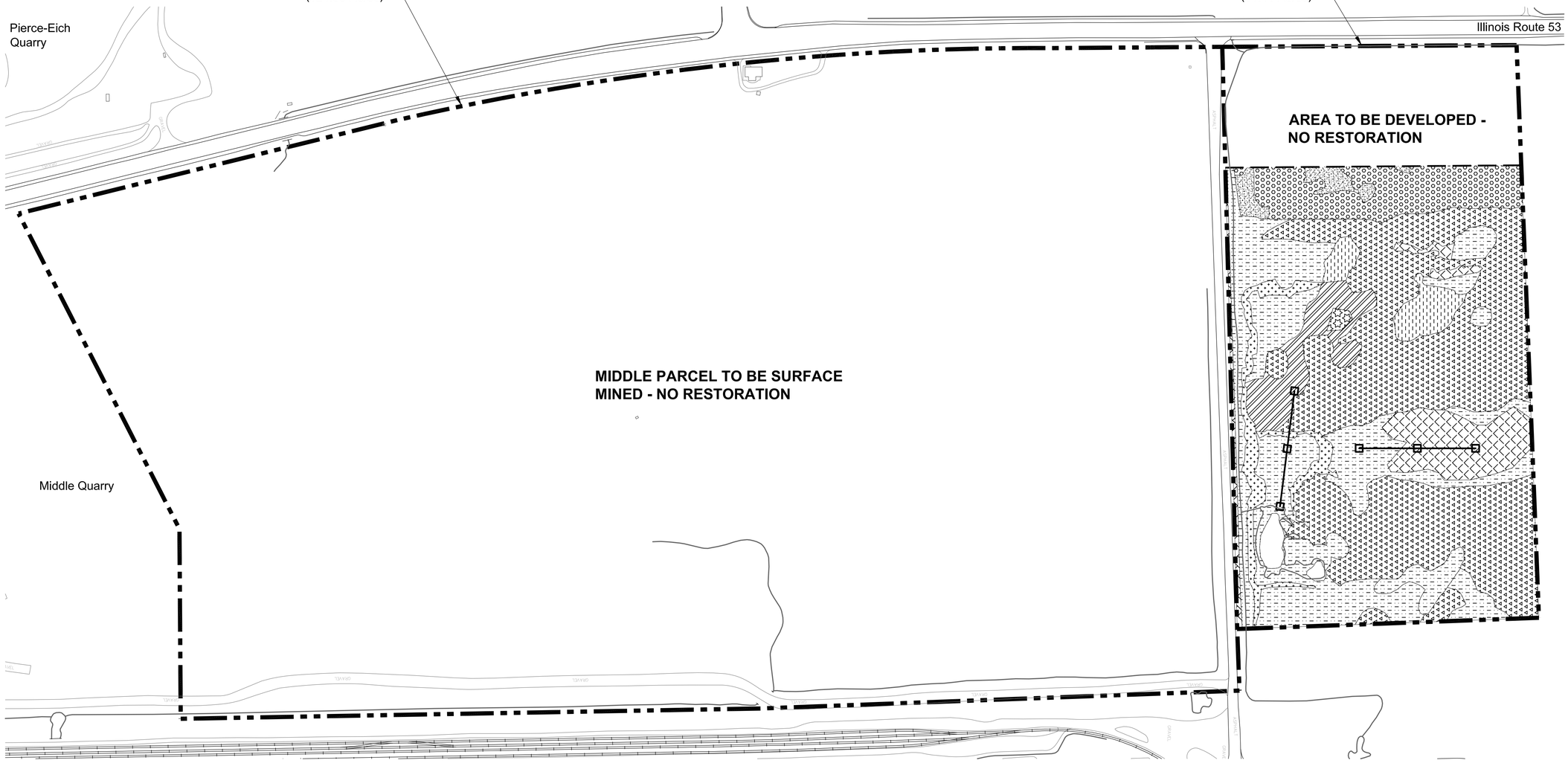

MIDDLE PARCEL AND NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Restoration Limit Line
	Watercourse
	Developed
	Additional Monitoring Transects for Habitat Restoration (100m)

RESTORATION ZONES (North Parcel)

Symbol	Description	Acres
	I: Mesic/Wet-Mesic Prairie	0.88
	02: Dry-Mesic Dolomite Prairie	0.07
	III : Wet Meadow	1.64
	04: Wet-Mesic Dolomite Prairie	1.16
	VII : Emergent	6.88

RESTORATION ZONES (North Parcel)

Symbol	Description	Acres
	07: Shrubland Upland	2.13
	IX : Upland Field	0.40
	12: Wet Prairie/Sedge Meadow	0.69
	17: Marsh Cattail	10.59

NOTES

1. Roman numerals indicate Restoration Zone names. Arabic numerals indicate Existing Landcover names, and some of these areas are to be enhanced (see Sheet I-3).
2. The only planting or seeding to occur on North Parcel will be in areas where Phragmites is removed. Refer to Sheet I-3 for invasive species removal information.

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Drawn By: WCC

Checked By: WWS

hms m-1 to m-4 monitoring plan.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

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1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Monitoring Plan - North Parcel

SHEET NUMBER

M-3

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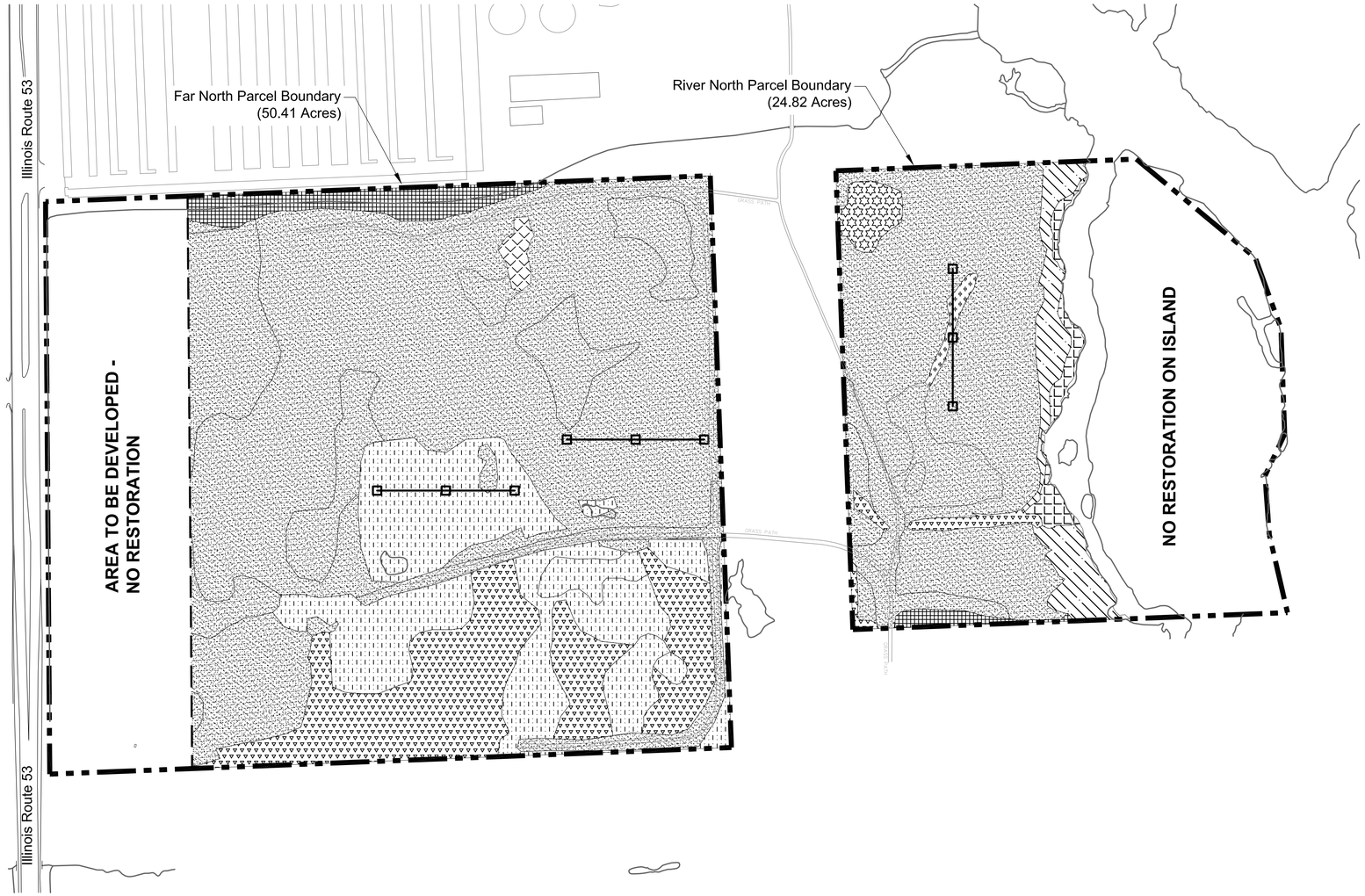

FAR NORTH PARCEL AND RIVER NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Restoration Limit Line
	Watercourse
	Additional Monitoring Transects for Habitat Restoration (100m)

RESTORATION ZONES (Far North P./River.P)

Symbol	Description	Acres
	01: Dry Dolomite Prairie	0 / 0.16
	02: Dry-Mesic Dolomite Prairie	0 / 0.44
	III : Wet Meadow	0.21 / 0
	IV : Wet/Wet-Mesic Savanna	0 / 1.40
	VII : Emergent	7.41 / 0
	VIII : Floodplain-Wet Meadow	0 / 0.43
	IX : Upland Field	25.58 / 10.70
	16: Marsh Phragmites	1.11 / 0.23
	17: Marsh Cattail	5.45 / 0.33

NOTES

1. Roman numerals indicate Restoration Zone names. Arabic numerals indicate Existing Landcover names, and some of these areas are to be enhanced (see Sheet I-4).
2. The only planting or seeding to occur on Far North Parcel will be in areas where Phragmites is removed. Refer to Sheet I-4 for invasive species removal information.
3. No seeding and planting shall occur in the Wet/Wet-Mesic Savanna zones on River North Parcel.

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Drawn By: WCC

Checked By: WWS

hms m-1 to m-4 monitoring plan.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

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11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Monitoring Plan - Far North/River North Parcels

SHEET NUMBER

M-4

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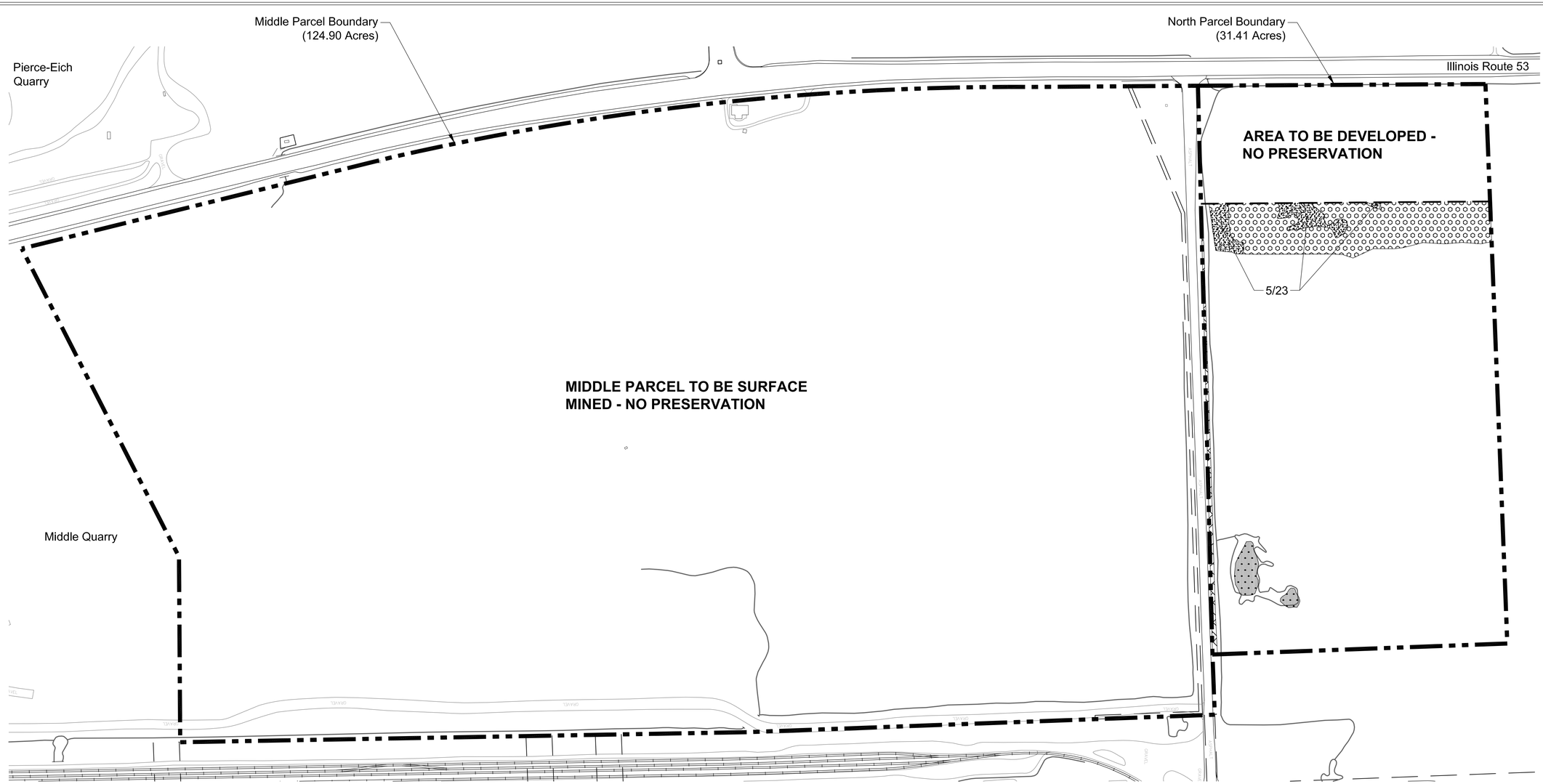

NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	Preservation Limit Line
	Easement Boundary
	Existing Wetland Area - Preserved Only

EXISTING LANDCOVER (North P.)

Symbol	Description	Acres
	05: Old Field/Upland Grassland	0.40
	07: Shrubland Upland	2.13
	18: Pond/Open Water	0.24
	24: Developed	0.25
	23: Fill	

NOTES

1. Existing landcover is shown for all areas that will be preserved only.
2. Primary landcover areas are noted according to the Existing Landcover key. However, in some instances a distinguishable secondary landcover may also be present concurrent with a primary landcover in an area.
3. Where a secondary landcover vegetation is present, the primary and secondary landcover vegetation are noted numerically on the map above. For example, "16/17" is an area consisting primarily of "Marsh-Phragmites" and secondarily "Marsh-Cattail."
4. Soils were scraped or fill materials were deposited in many places on these parcels in the past. Scrape areas with no or little vegetation are shown on this map. All scrape and fill areas (with or without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-5.

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AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

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Coordinate System: Illinois State Plane NAD83

REVISIONS

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5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Areas to be Preserved Only - North Parcel

SHEET NUMBER

P-1

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COMED PARCEL AND LONG RUN PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Oil Cleanup Boundary
	Watercourse
	Easement Boundary
	Existing Wetland Area - Preserved Only

EXISTING LANDCOVER

Symbol	Description	Acres
	05: Old Field/Upland Grassland	0.45
	06: Old Field/Wet	0.49
	07: Shrubland Upland	4.49
	08: Shrubland Bottomland	51.51
	11: Woodland Bottomland	42.85
	12: Wet Prairie/Sedge Meadow	1.99
	14: Wet Meadow-Reed Canary	12.40

EXISTING LANDCOVER

Symbol	Description	Acres
	15: Marsh-Bulrush/Sweet Flag	0.04
	16: Marsh-Phragmites	7.80
	17: Marsh-Cattail	0.54
	18: Pond/Open Water	2.04
	24: Developed	0.87
	Oil-Contaminated Area	2.61
	10: Woodland Upland	
	23: Fill	

NOTES

1. Existing landcover is shown for all areas that will be preserved only.
2. Primary landcover areas are noted according to the Existing Landcover key. However, in some instances a distinguishable secondary landcover may also be present concurrent with a primary landcover in an area.
3. Where a secondary landcover vegetation is present, the primary and secondary landcover vegetation are noted numerically on the map above. For example, "16/17" is an area consisting primarily of "Marsh-Phragmites" and secondarily "Marsh-Cattail."
4. Soils were scraped and deposited along with other materials in many places on this parcel in the past. Scrape areas with no or little vegetation are shown on this map. All scrape and fill areas (with and without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-6.
5. A crude oil pipeline release occurred along New Avenue in December 2010. The wetland area impacted is not included as part of this permit application or the HCP.

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Coordinate System: Illinois State Plane NAD83

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5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 200'
0 100 200 400
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Areas to be Preserved Only - ComEd/Long Run Parcels

SHEET NUMBER

P-2

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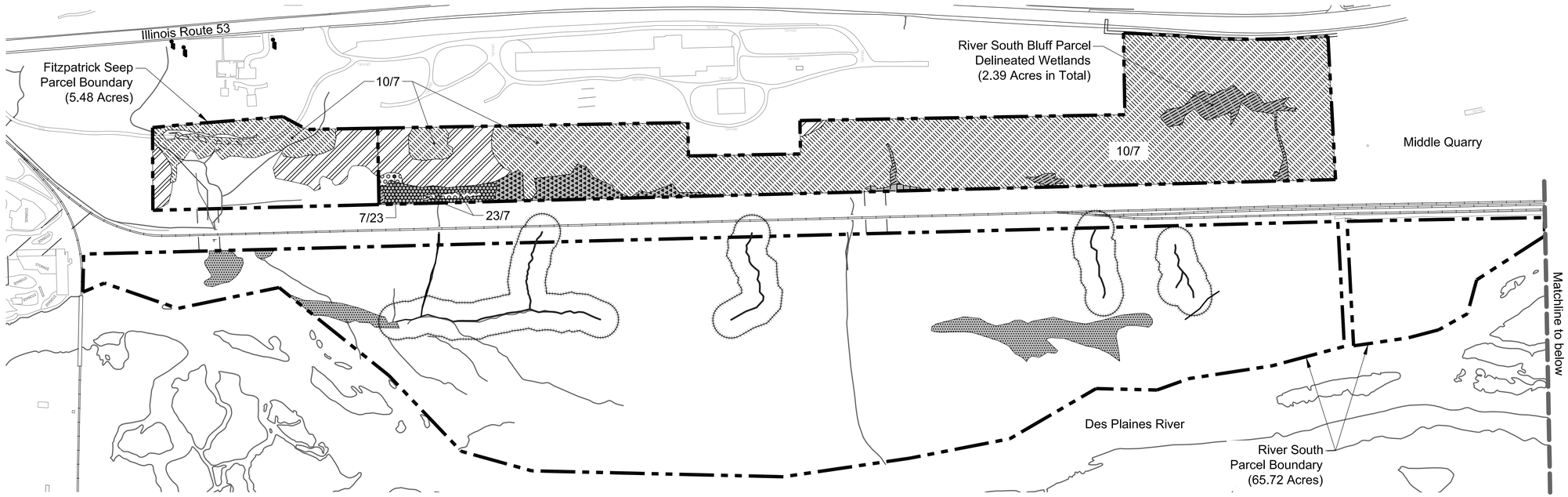

FITZPATRICK SEEP, RIVER SOUTH BLUFF PARCEL, AND RIVER SOUTH PARCEL

1" = 200'

RIVER PARCEL

1" = 200'

LEGEND

Symbol	Description
	Parcel Boundary
	Watercourse
	USFWS 65' HED Larval Habitat Buffer
	Existing Wetland Area - Preserved Only

EXISTING LANDCOVER (F.S., R.S.B.P., R.S.P./River P.)

Symbol	Description	Acres
	07: Shrubland Upland	0.14 / 0
	08: Shrubland Bottomland	0.51 / 0
	10: Woodland Upland	21.15 / 0
	11: Woodland Bottomland	0.89 / 0
	14: Wet Meadow-Reed Canary	0.07 / 0

EXISTING LANDCOVER (F.S., R.S.B.P., R.S.P./River P.)

Symbol	Description	Acres
	17: Marsh-Cattail	0.92 / 0
	18: Pond/Open Water	2.06 / 4.54
	23: Fill	2.99 / 0
	24: Developed	0 / 0.07

NOTES

1. Existing landcover is shown for all areas that will be preserved only.
2. Primary landcover areas are noted according to the Existing Landcover key. However, in some instances a distinguishable secondary landcover may also be present concurrent with a primary landcover in an area.
3. Where a secondary landcover vegetation is present, the primary and secondary landcover vegetation are noted numerically on the map above. For example, "16/17" is an area consisting primarily of "Marsh-Phragmites" and secondarily "Marsh-Cattail."
4. Various materials were deposited in many places on these parcels in the past. Areas of fill with no vegetation are shown as Fill on this map. All fill areas (with and without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-7.

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5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH
ONE INCH = 200'
0 100 200 400
WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Areas to be Preserved Only - Parcels River

SHEET NUMBER

P-3

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FAR NORTH PARCEL AND RIVER NORTH PARCEL

1" = 150'

LEGEND

Symbol	Description
	Parcel Boundary
	Preservation Limit Line
	Watercourse
	Existing Wetland Area - Preserved Only

EXISTING LANDCOVER (Far North P./River North P.)

Symbol	Description	Acres
	08: Shrubland Bottomland	0 / 2.04
	11: Woodland Bottomland	0 / 2.88
	14: Wet Meadow-Reed Canary	0 / 4.35
	16: Marsh-Phragmites	1.11 / 0.23
	18: Pond/Open Water	0 / 1.87

NOTES

1. Existing landcover is shown for all areas that will be preserved only.
2. Primary landcover areas are noted according to the Existing Landcover key.
3. Soils were scraped or fill materials were deposited in many places on these parcels in the past. All areas of scrape or fill (with or without vegetation) are presented visually in the Soils and Wetlands Map on Sheet E-8.

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Coordinate System: Illinois State Plane NAD83

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3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

NORTH

ONE INCH = 150'

0 75 150 300

WHEN SCALED TO 24" X 36" SHEET

SHEET TITLE

Areas to be Preserved Only - Far North/River North Parcels

SHEET NUMBER

P-4

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FEDERALLY-LISTED SPECIES IN WORK AREAS

Hines' Emerald Dragonfly (HED) - Avoidance and Minimization Measures

1. All work in or near (within 65') known HED larval habitat areas will be supervised by an ecologist or restoration specialist knowledgeable in HED ecology.
2. All invasive species control measures within 65' of known larval habitat will follow current USFWS protocol. (See Invasive Species Removal - Herbiciding)
3. Use existing routes for access and minimize construction of new access roads.
4. Avoid placing access routes in wetlands areas, especially higher quality wetlands, and use alternate routes through degraded uplands instead.
5. Use matting (e.g. timber or composite) for temporary wetland crossing (access routes) for heavy equipment and road vehicles.
6. Maintain surface flow after construction of access roads.
7. Use road vehicles and heavy equipment only in frozen or dry conditions or on access routes.
8. Deliver and stage heavy equipment in upland areas outside of rapid recharge areas;
9. Place sediment control measures (e.g. silt fence or wattles) around access routes and other areas of soil disturbance.
10. Operate vehicles at low speeds (< 15 mph) during adult HED flying season.
11. Access on foot (no vehicles) areas within a 20 meter (65 foot) buffer of HED larval habitat year round as mapped unless agreed upon by USFWS; Foot traffic will be minimized in these areas and stepping in rivulets will be avoided. Foot traffic should be avoided during inundated or heavily saturated conditions.
12. Vehicles crossing larval rivulets will use matting or a bridge constructed from composite matting.
13. Conduct woody vegetation removal in larval habitat areas on foot using only hand tools (e.g. chainsaws).
14. Seeding in larval habitat will be done on foot in late fall under dry conditions.
15. Create or modify rivulets (including hydrology) only in areas unoccupied by larval HED. HED occupied rivulets or other larval habitat areas will be modified only with approval from USFWS.
16. Stockpile and/or burn piles of cut vegetation in upland areas;
17. Chip woody vegetation in low quality upland areas.
18. Conduct prescribed burns outside HED flight season. More restrictions apply to avoid impact to covered turtle species (see Turtle Avoidance and Minimization Measures)
19. Properly maintain vehicles, check for leaks at the start of each work day, repair leaks if needed before using vehicle on site. Carry absorbent materials with equipment or have them accessible at the site to contain spills if they occur.
20. Access wetland areas with water levels deeper than 12 inches using amphibious vehicles (access would be limited to the time frame of November 1 - March 14 to avoid covered turtles);
21. Cross wetlands (with <12 inches of standing water) without HED breeding habitat with low ground pressure vehicles (5 pounds per square inch);
22. HMS staff and contractors will utilize maps, either electronic or hard copy, showing wetlands and the HED habitat areas, when completing restoration work.

Blanding's and Spotted Turtles - Avoidance and Minimization Measures

1. Maintain and repair existing fencing on the west and north sides of Middle Parcel adjacent to other turtle habitat to reduce the likelihood of turtle entry. Fencing should be flush with the ground (or extended 6" into the ground where possible) to reduce burrowing (or Jersey barriers may be used in some locations). One-way flaps will be installed at the bottom of the fence in selected locations to allow turtles within the parcel to leave but not re-enter. These fence improvements should be done at least one season before mining operations begin to prevent entry of turtles into parcel. Work will be performed during turtle dormant season (Nov.1 to March 15). Fence should be inspected monthly during the turtles' active season.
2. Tree and brush removal (for both mining and restoration) will be conducted, to the extent possible, during turtle dormant season (Nov. 1 to March 15) to avoid take.
3. Overburden (i.e. soil and herbaceous vegetation) and other earth moving activities, also will be conducted, to the extent possible, during the turtle dormant season (Nov.1 to March 15).
4. To protect turtles during earth moving activities (i.e. overburden removal and prairie transplant activities) occurring during their active season, install silt fence around the construction area prior to tree and shrub and overburden removal to prevent entry by turtles. Embed silt fence 4-6 inches into the ground to reduce burrowing. All construction areas - both in wetland and uplands - should be included. In Middle Parcel, overburden removal, and thus silt fence installation, may be done in phases. Silt fence around active earth moving areas should be inspected daily during the turtles' active season.
5. Trap and remove turtles in construction areas prior to starting activities which could cause harm or mortality. Thus, trapping will be done in each phase area identified and fenced off and will be completed in the spring (or fall) prior to starting mining preparation activities in that area. Traps will be used and inspected according to the accepted turtle trapping protocol.
6. If earth moving activities (during mining or restoration activities) are conducted during the turtles' active period (March 16 to October 31), construction areas (where heavy equipment will be used - and is surrounded by silt fence) will be searched each day before starting work. Turtles will be relocated, if found. Protocol for handling and relocating turtles will need to be developed with the IDNR. A permit is required to handle state listed turtles. A biologist, permitted to handle State listed turtles, will be present on site during activities using heavy equipment during the turtle's active period.
7. Relocate turtles from mine expansion area to nearby protected habitat areas (e.g. HMS or FPDWC property). For restoration areas, possibly move to temporary off-site holding areas until activities are completed or move to on-site appropriate habitat a sufficient distance away with little to no restoration activities. Translocated turtles will undergo a health screening for known turtle diseases if they appear unhealthy in any way to the trained and permitted ecologist(s) performing the translocation.
8. No inspections or trapping will take place in areas that have already been cleared of vegetation and soil. The only exception would be areas adjacent to currently vegetated area that may be used for vehicle traffic during stripping.
9. In mining and prairie transplant areas - Install silt fences, straw rolls (i.e. wattles), or other erosion control measures to prevent sedimentation into wetland and prairie habitat.
10. In prairie transplant area, keep all vehicles (e.g. trucks, skid steers, and other heavy equipment) within fenced construction area. In other restoration areas use vehicles during frozen or dry conditions - and use low pressure tires or tracks.
11. Properly maintain vehicles, check for leaks at the start of each work day, repair leaks if needed before using vehicle on site. Carry absorbent materials with equipment or have them accessible at the site to contain spills if they occur.
12. Conduct environmental awareness training for all contractors and train restoration crew to identify Blanding's and spotted turtles. Crews should avoid spraying them and other turtles with herbicide and hitting them with a vehicle.
13. Access wetland areas with water levels deeper than 12 inches using amphibious vehicles - but access would be limited to the turtles' dormant period (November 1 - March 14).
14. Cross wetlands (with less than12 inches of standing water) without HED breeding habitat with low ground pressure vehicles (5 pounds per square inch).
15. Stage vehicles and heavy equipment in upland areas outside of rapid recharge areas.
16. Prescribed burning within wetlands will typically be implemented between November 1 and March 14 in order to avoid impacts to Blanding's and spotted turtle. However, weather needs to be considered to understand the species' overwintering periods in a particular year. Therefore to maximize management opportunities while minimizing risks from fire, managers will also use the following prescription criteria to provide flexibility to the above dates when the mean 5-day temperature is below 50F: 1) peak daily high temperature is less than 50F and cloudy to mostly cloudy weather or, 2) if sunny then only when peak daily high temperature is less than 45F.

INVASIVE SPECIES REMOVAL

Herbiciding

1. Herbicide application done by hand wicking (or other methods approved by USFWS) within a 20 meter (65 feet) buffer of HED larval habitat with aquatic approved herbicides. Herbicide can be applied to cut woody vegetation within larval habitat buffer by dabbing or painting (or other methods approved by USFWS).
2. Herbicide application by foliar spraying invasive vegetation conducted only outside of the 20 meter (65 feet) buffer around HED larval habitat and with an aquatic approved herbicide and surfactant.
3. All Phragmites on site (mapped stands and unmapped populations) are to be herbicided. USFWS herbiciding protocol shall be followed in HED larval habitat areas (see #1 above).

Brushing

1. Remove all non-native and weedy native trees and shrubs, including buckthorn, honeysuckle, hawthorn, ash, gray dogwood, and willow trees.
2. Do not remove native shrubs such as red osier dogwood. Leave one-half of willow shrubs.
3. Undesired species shall be removed by cutting and stump herbiciding , basal bark herbiciding, or girdling. Cutting and stump herbiciding within 65' of HED larval habitat shall follow current USFWS herbiciding protocol. Girdling is the primary method recommended for removing large trees.
4. Cutting shall be done by hand with a chainsaw or with a forestry mower depending on tree size and site conditions. Slash from forestry mower shall be left in place. Forestry mower will be used only under dry or frozen conditions.
5. Cut shrubs and trees shall be dropped in place. Where density of downed woody material is great enough to suppress vegetation growth, it shall be gathered into small piles and burned. Burn piles shall be created only in areas with low quality ground layer vegetation.

Wet-Mesic Savanna Brushing

1. Remove all non-native and weedy native shrubs such as buckthorn, honeysuckle, hawthorn, and gray dogwood.
2. Remove all non-native trees, as well as box elder. Achieve a 30% canopy cover by removing all remaining weedy native trees <10" D.B.H. If needed, trees >10" D.B.H. can be removed to achieve 30% canopy cover.
3. Undesired species shall be removed by cutting and stump herbiciding , basal bark herbiciding, or girdling. Girdling is the primary method recommended for removing large trees.
4. Cutting shall be done by hand with a chainsaw or with a forestry mower depending on tree size and site conditions. Slash from forestry mower shall be left in place. Forestry mower will be used only under dry or frozen conditions.
5. Cut shrubs and trees shall be dropped in place. Where density of downed woody material is great enough to suppress vegetation growth, it shall be gathered into small piles and burned. Burn piles shall be created only in areas with low quality ground layer vegetation.

WET PRAIRIE TRANSPLANT

Access Roads

1. Access roads will be used by large trucks and other heavy earth-moving equipment.
2. Access roads shall be approximately 14 feet wide.
3. Permanent or main access roads shall be constructed as shown in Detail 3 (Sheet N-2) or in an equivalent method that allows for safe usage by trucks and other heavy earth moving equipment.
4. Temporary access roads in wetland areas shall be constructed of timbers or composite matting.
5. Construction of access route through shrubland upland areas shall require removal of woody vegetation prior to road construction.

Wet Prairie Removal

1. A front-end loader shall be used to remove wet-mesic dolomite prairie sod (vegetation with soil).
2. Removed sod (vegetation with soil) shall be placed in a truck for transport to HMS' ComEd/Long Run Parcels. See Sheets D-1, T-2, and T-3 for existing topography and depth of sod to be removed.
3. The Wet Prairie Transplant Transportation Route to HMS's ComEd/Long Run Parcels shall travel north on Illinois Route 53 to east on 135th Street to south on New Avenue SA Route 72 to the access road on HMS's Long Run Parcel. See Sheets T-1 and T-4 for transportation route on Middle and ComEd/Long Run Parcels.
4. A crossing guard will be stationed at the railroad tracks on the access road to Long Run Parcel to direct and control traffic over the tracks.

Wet Prairie Installation

1. Fill areas shall be prepared as transplant recipient sites by: a) removing woody vegetation with a forestry mower or bulldozer, and b) removing soil/fill down to bedrock using a bulldozer and front-end loader.
2. Removed soil/fill and woody debris shall be loaded into dump trucks using front-end loaders for disposal into existing HMS quarries or other locations on HMS property.
3. Wet prairie sod (vegetation and soil) reclaimed from Middle Parcel shall be transported to ComEd/Long Run Parcels. See Sheets T-1 and T-4.
4. Reclaimed wet prairie sod shall be placed on exposed bedrock in the designated transplant recipient areas. See Sheet D-2 for existing topography and proposed topography following placement of wet prairie sod.
5. The Wet Prairie Transplant Transportation Route returning to HMS's Middle Parcel shall travel north on New Avenue SA Route 72 to west on 135th Street to south on Illinois Route 53 and the main access for HMS's Romeoville Quarry operations. See Sheet T-1 for access on Middle Parcel.

HED GROUNDWATER RECHARGE STRATEGIES

Infiltration Galleries

1. The Habitat Conservation Plan for the HED on HMS property also includes the construction of groundwater infiltration galleries on HMS's River South Bluff Parcel, as indicated on various sheets.
2. In addition, another infiltration basin/pond is proposed for FPDWC property at the southwest corner of Route 53 and Renwick Road. This proposed infiltration area is beyond the scope of this restoration plan set and is intended to benefit groundwater supply at Lockport Prairie Nature Preserve (located to the south of the proposed project).

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HMS Surface Mining Mitigation and Restoration Plans

Romeoville, Will County, Illinois

Hanson Material Service Corporation
c/o Lehigh Hanson
620 West 183rd Street
Thornton, Illinois 60476

AES Proj. #: 20-0109
Designed By: WWS
Drawn By: WCC
Checked By: WWS
hms n-1 to n-8 notes.dwg
Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

STAMPED

DATED: October 7, 2020

SHEET TITLE

Project Notes

SHEET NUMBER

N-1

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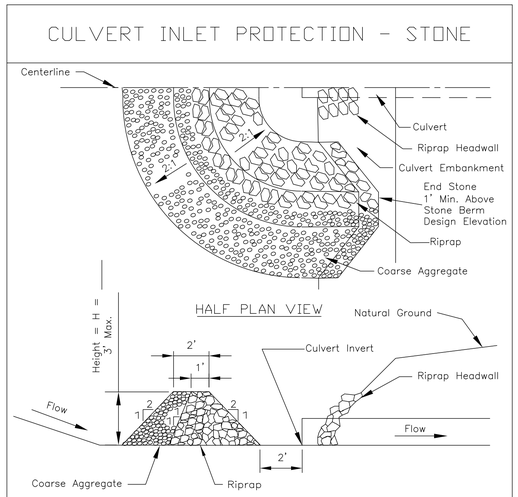
SEDIMENTATION AND EROSION CONTROL

Sedimentation and Erosion Control Measures

1. Unless otherwise indicated, all vegetative and structural erosion and sediment control practices will be constructed according to minimum standards and specifications in the Illinois Urban Manual, latest revision.
2. The Will-South Cook Soil and Water Conservation District (WSCSWCD) must be notified one week prior to the pre-construction conference, one week prior to the commencement of land disturbing activities, and one week prior to the final inspection.
3. An erosion and sediment control plan shall be completed (see Sheets S-1 and S-2). A copy of the approved erosion and sediment control plan shall be maintained on the site at all times.
4. Prior to commencing land-disturbing activities in areas other than indicated on these plans (including but not limited to, additional phases of development and off-site borrow or waste areas) a supplementary erosion control plan shall be submitted for review by the WSCSWCD.
5. The contractor is responsible for installation of any additional erosion control measures necessary to prevent erosion and sedimentation as determined by the WSCSWCD.
6. Soil disturbance shall be conducted in such a manner as to minimize erosion. Soil stabilization measures shall consider the time of year, site conditions and the use of temporary or permanent measures.
7. Soil erosion and sediment control features shall be constructed prior to the commencement of hydrologic disturbance of upland areas.
8. Disturbed areas shall be stabilized with permanent measures (typically seeding) immediately following grading.
9. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved, or after the temporary measures are no longer needed.
10. All temporary and permanent erosion control measures must be maintained and repaired as needed.
11. Soil stockpiles shall not be located in a flood prone area or a designated buffer protecting waters of the United Sates or isolated waters of Will County.
12. It is the responsibility of the owner and/or general contractor to inform any sub-contractor(s) who may perform work on this project, of the requirements in implementing and maintaining these erosion control plans and the National Pollutant Discharge Elimination System (NPDES) permit requirements set forth by the Illinois EPA.
13. The erosion control measures indicated on the plans are the minimum requirements. Additional measures may be required, as directed by the Engineer or Government Agency.

Inspection and Maintenance Schedule

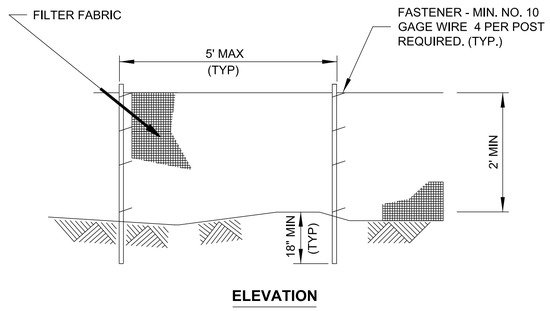
1. Soil erosion and sediment control shall be inspected and maintained at least once every seven calendar days and/or within 24-hours of the end of a storm event that is 0.5-inches or greater or equivalent snowfall. The Contractor shall also perform visual inspections at least daily when working in and/or near a stream or river.
2. The Contractor shall not track or spill dirt clumps onto adjacent roadways. At a minimum, the Contractor shall perform street sweeping at the end of each day's operation, or coordinate with the municipality to clean. Additional street cleaning shall be done as necessary.



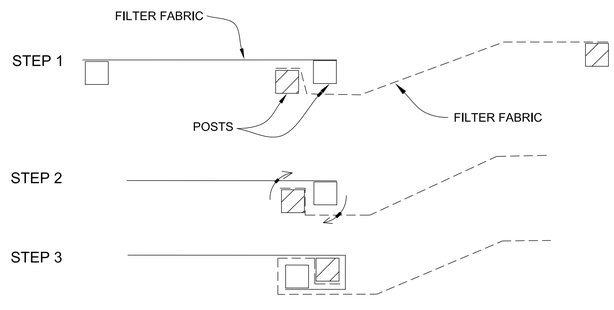
Notes:
1. Sediment shall be removed when the sediment has accumulated to one–half the height of the stone berm.
2. Coarse aggregate shall meet one of the following IDOT coarse aggregate gradations, CA–1, CA–2, CA–3 or CA–4.
3. Riprap shall meet IDOT gradation RR–3 or RR–4. Any permanent riprap, such as for the culvert headwall, shall meet IDOT Quality Designation A.
4. Coarse aggregate and riprap shall be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
5. The maximum drainage area to the culvert being protected is 3 acres.
6. See plans for H dimension.
7. Tie the stone berm into the culvert embankment a minimum of 1 foot above the design elevation of the stone berm.

REFERENCE			NRCS Natural Resources Conservation Service	STANDARD DWG. NO.
Project				IL-508ST
Designed	Date			SHEET 1 OF 1
Checked	Date			DATE 1-29-99
Approved	Date			

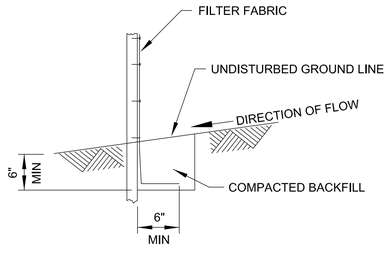
1 / N-2 **STONE CULVERT INLET PROTECTION**
N.T.S.



ELEVATION



ATTACHING TWO SILT FENCES

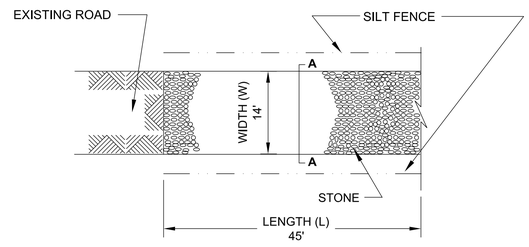


FABRIC ANCHOR DETAIL

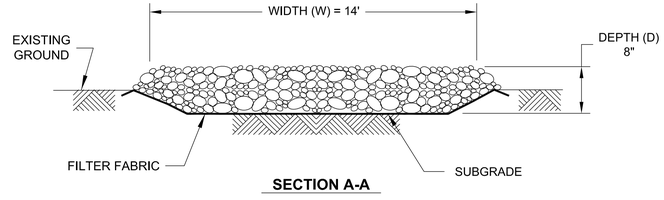
NOTES:

1. TEMPORARY SEDIMENT FENCE SHALL BE INSTALLED PRIOR TO ANY GRADING WORK IN THE AREA TO BE PROTECTED. THEY SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND REMOVED IN CONJUNCTION WITH THE FINAL GRADING AND SITE STABILIZATION.
2. FILTER FABRIC SHALL MEET THE REQUIREMENTS OF MATERIAL SPECIFICATION 592 GEOTEXTILE TABLE 1 OR 2, CLASS WITH EQUIVALENT OPENING SIZE OF AT LEAST 30 FOR NON-WOVEN AND 40 FOR WOVEN.
3. FENCE POSTS SHALL BE EITHER STANDARD STEEL POST OR WOOD POST WITH A MINIMUM CROSS-SECTIONAL AREA OF 3.0 SQ. IN.
4. PLACE THE END POST OF THE SECOND FENCE INSIDE THE END POST OF THE FIRST FENCE.
5. ROTATE BOTH POSTS AT LEAST 180 DEGREES IN A CLOCKWISE DIRECTION TO CREATE A TIGHT SEAL WITH THE FABRIC MATERIAL.
6. CUT THE FABRIC NEAR THE BOTTOM OF THE STAKES TO ACCOMMODATE THE 6" FLAP.
7. DRIVE BOTH POSTS A MINIMUM OF 18 INCHES INTO THE GROUND AND BURY THE FLAP.
8. COMPACT BACKFILL (PARTICULARLY AT SPLICES) COMPLETELY TO PREVENT STORMWATER PIPING.

2 / N-2 **SILT FENCE**
N.T.S.



PLAN VIEW



SECTION A-A

NOTES:

1. FILTER FABRIC SHALL MEET THE REQUIREMENTS OF MATERIAL SPECIFICATION 592 GEOTEXTILE, TABLE 1 OR 2, CLASS I, II OR IV AND SHALL BE PLACED OVER THE CLEARED AREA PRIOR TO THE PLACING OF ROCK.
2. STONE SHALL MEET ONE OF THE FOLLOWING IDOT COARSE AGGREGATE GRADATIONS, CA-1, CA-2, CA-3, OR CA-4 AND BE PLACED ACCORDING TO CONSTRUCTION SPECIFICATION 25 ROCKFILL USING PLACEMENT METHOD 1 AND CLASS III COMPACTION.

3 / N-2 **TRANSPLANT HAUL ROAD**
N.T.S.

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AES Proj. #: 20-0109
Designed By: WWS
Drawn By: WCC
Checked By: WWS
hms n-1 to n-8 notes.dwg
Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
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5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

SHEET TITLE

Project Notes

SHEET NUMBER

N-2

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GENERAL PROVISIONS

PART 1. DEFINITIONS

WHEREVER THE FOLLOWING TERMS ARE USED, THE INTENT AND MEANING SHALL BE INTERPRETED AS FOLLOWS:

CONTRACTOR: THE INDIVIDUAL, FIRM, PARTNERSHIP, JOINT VENTURE, OR CORPORATION CONTRACTING WITH OWNER FOR PERFORMANCE OF WORK DESCRIBED IN THESE SPECIFICATIONS AND PLAN SET.

OWNER: HANSON MATERIAL SERVICE CORPORATION OR ITS AUTHORIZED REPRESENTATIVE.

PLANS AND SPECIFICATIONS:
THE APPROVED PLANS AND SPECIFICATIONS TITLED "FINAL PLANS FOR HANSON MATERIAL SERVICE CORPORATION SURFACE MINING MITIGATION AND RESTORATION PLANS" DATED OCTOBER 7, 2020, WHICH SHOWS THE CHARACTER, DIMENSIONS, AND DETAILS OF THE WORK TO BE DONE.

WORK: WORK SHALL MEAN THE FURNISHING OF ALL LABOR, MATERIALS, EQUIPMENT, AND OTHER INCIDENTALS NECESSARY OR CONVENIENT TO SUCCESSFULLY COMPLETE THE PROJECT.

LIMITS OF CONSTRUCTION:
A BOUNDARY LINE FOR THE WORK AS SHOWN ON THE PLANS DEFINED IN THE FIELD BY STAKING OR FLAGGING.

PART 2. QUALIFICATIONS

QUALIFIED BIDDERS HAVE BEEN SELECTED BY THE OWNER.

THE SUCCESSFUL BIDDER WILL HAVE A DEGREED ECOLOGIST, WHO HAS KNOWLEDGE IN RESTORATION ECOLOGY, ON STAFF AND HAS WORKED FOR THE COMPANY FOR AT LEAST 2 YEARS. (RESUME WILL BE REQUIRED TO BE SUBMITTED AS PART OF THE BID). THIS PERSON MUST BE ON-SITE DAILY TO SUPERVISE THE TECHNICAL NATURE OF THE PROJECT AND MAKE SURE SPECS ARE MET AND THAT THE PROJECT IS COMPLETED SUCCESSFULLY. IF SUCH DOCUMENTATION IS NOT PROVIDED, OR IS INADEQUATE, THE OWNER SHALL HAVE THE RIGHT TO REJECT THE BID.

THE BIDDER SHALL ALSO PROVIDE A LIST OF EQUIPMENT AND A DESCRIPTION AND LOCATION OF ITS INTENDED USE; A LIST OF SAID PERSONS PERFORMING THE WORK AND THEIR QUALIFICATIONS FOR OPERATING AND MAINTAINING THE LISTED EQUIPMENT; AND A LIST OF SAID PERSONS' QUALIFICATIONS AND APPROPRIATE CERTIFICATIONS FOR PERFORMING WORK (E.G. HERBICIDE APPLICATIONS). THE BIDDER SHALL SUPPLY COPIES OF VALID HERBICIDE APPLICATOR LICENSES IN THE GENERAL, RIGHT-OF-WAY, AND AQUATICS CATEGORIES FOR EACH WORKER AS APPROPRIATE PER TASK. SAID DOCUMENTATION MUST BE RE-SUBMITTED PRIOR TO COMMENCING WORK FOR EACH ADDITIONAL WORKER NOT INCLUDED IN THE INITIAL LIST.

PART 3. GENERAL

WORK DESCRIBED HEREIN CONSISTS OF FURNISHING AND TRANSPORTING ALL MATERIALS AND EQUIPMENT REQUIRED TO, BUT NOT LIMITED TO, CLEARING AND GRUBBING, SHRUB AND TREE REMOVAL, REMOVING AND TRANSPLANTING NATIVE PRAIRIE SOD (INTACT VEGETATION AND SOIL), APPLYING HERBICIDE, PREPARING SOILS, PLANTING WET AND MESIC PRAIRIE, SEDGE MEADOW, AND EMERGENT VEGETATION, AND INSTALLING EROSION CONTROL BLANKET AND OTHER EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES. THE CONTRACTOR SHALL FURNISH, TRANSPORT, AND INSTALL ALL SEED AND PLANT PLUGS AND PERFORM ALL SOIL PREPARATION AND SUCH AUXILIARY WORK AS MAY BE NECESSARY TO COMPLETE WORK IN ACCORDANCE WITH THE SPECIFICATIONS AND PLANS. THE CONTRACTOR SHALL FURNISH ALL REQUIRED MATERIALS, EQUIPMENT, TOOLS, LABOR, AND INCIDENTALS, UNLESS OTHERWISE PROVIDED IN THE SPECIFICATIONS OR PLANS.

EXCEPT AS SPECIFICALLY DESCRIBED IN THE PLANS AND SPECIFICATIONS, THE FOLLOWING DOCUMENTS SHALL PREVAIL:

A. ALL PERTINENT CODES, STANDARDS, AND ORDINANCES OF THE VILLAGE OF ROMEOVILLE AND WILL COUNTY, WHERE APPLICABLE.
B. ILLINOIS URBAN MANUAL, LATEST EDITION BY THE USDA NATURAL RESOURCES CONSERVATION SERVICE (NRCS);
C. OSHA, MSHA, AND ALL OTHER APPLICABLE SAFETY STANDARDS.

UNLESS SPECIFIED OTHERWISE WITHIN THIS PLAN SET, THE CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ALL MATERIALS. IN THE EVENT OF ANY INCONSISTENCIES BETWEEN THE MANUFACTURER'S SPECIFICATIONS AND THESE SPECIFICATIONS, THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY BEFORE CONTINUING WORK SO THAT THE INCONSISTENCIES MAY BE RESOLVED.

THE CONTRACTOR SHALL HAVE AN ENGLISH SPEAKING REPRESENTATIVE ONSITE AT ALL TIMES DURING PERFORMANCE OF CONSTRUCTION ACTIVITIES.

THE CONTRACTOR SHALL ESTABLISH WORK HOUR RESTRICTIONS BETWEEN 7:00 AM TO 5:00 PM, MONDAY THROUGH FRIDAY UNLESS APPROVED BY THE OWNER.

PART 4. LEGAL RESPONSIBILITIES

THE CONTRACTOR SHALL AT ALL TIMES OBSERVE AND COMPLY WITH ALL FEDERAL AND STATE LAWS, LOCAL LAWS, ORDINANCES, AND REGULATIONS WHICH IN ANY MANNER AFFECT THE CONDUCT OF THE WORK, AND ALL SUCH ORDERS OR ENACTMENTS THAT EXIST AT THE PRESENT AND WHICH MAY BE ENACTED LATER, OF LEGISLATIVE BODIES OR TRIBUNALS HAVING LEGAL JURISDICTION WHICH MAY HAVE AN AFFECT ON THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED PERMITS FOR CONSTRUCTION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR SITE SAFETY.

PART 5. FAMILIARITY WITH JOB SITE

CONTRACTOR SHALL BECOME FAMILIAR WITH CONDITIONS AT THE JOB SITE PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY IF SITE CONDITIONS ARE SUCH THAT INHIBIT PROGRESS OF THE WORK.

THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE LOCATION OF ALL OVERHEAD UTILITY LINES AND BE RESPONSIBLE FOR HAVING ALL UNDERGROUND UTILITIES LOCATED BY SERVICING AGENCY. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE PROTECTION OF UTILITY FACILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE OR DESTRUCTION OF UTILITY FACILITIES RESULTING FROM NEGLIGENCE OR MISCONDUCT IN THE CONTRACTOR'S MANNER OR METHOD OF EXECUTION OF THE WORK, OR CAUSED BY DEFECTIVE WORK OR THE USE OF UNSATISFACTORY MATERIALS. WHENEVER ANY DAMAGE OR DESTRUCTION OF A UTILITY FACILITY OCCURS AS A RESULT OF WORK PERFORMED BY THE CONTRACTOR, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE UTILITY COMPANY AND THE OWNER. THE CONTRACTOR SHALL CALL J.U.L.I.E. AT 800-892-0123 SUFFICIENTLY IN ADVANCE OF COMMENCING WORK.

PART 6. CONSTRUCTION TRAFFIC AND STAGING

THE SITE SHALL BE ACCESSED FROM LOCATIONS INDICATED ON THE PLANS. THE CONTRACTOR SHALL INSURE THAT EQUIPMENT MOVEMENT WILL USE AN ESTABLISHED TRAVEL LANE FROM THE ACCESS AREAS TO THE WORK AREA TO MINIMIZE EFFECTS ON THE NATURAL AREAS. UPON COMPLETION OF ACTIVITY AT THE SITE, THE CONTRACTOR IS EXPECTED TO RESTORE ANY AFFECTED AREA FOR TRAVEL OR OTHER ACTIVITY OUTSIDE OF THE CONSTRUCTION ZONE TO A CONDITION EQUIVALENT TO THAT EXISTING PRIOR TO DISTURBANCE. WHEN NOT IN USE, CONTRACTOR VEHICLES, EQUIPMENT AND SUPPLIES SHALL BE STORED IN AN AREA APPROVED BY THE OWNER IN ORDER TO LIMIT THE MOVEMENT OF EQUIPMENT AND MATERIALS ON-SITE. THE OWNER IS NOT RESPONSIBLE FOR THE SECURITY OF AND/OR DAMAGE TO EQUIPMENT OR MATERIALS DURING CONSTRUCTION.

EXCAVATION

PART 1. GENERAL

NO SOIL BORINGS OR GEOTECHNICAL INVESTIGATION WAS CONDUCTED FOR THIS PROJECT.

CLEARING AND REMOVAL OF ALL UNDESIRABLE VEGETATIVE GROWTH WITHIN THE RESTORATION AREAS SHALL BE AS DESIGNATED BY THE PLANS AND THE PROJECT ECOLOGIST. REMOVED VEGETATIVE MATERIALS SHALL BE DISPOSED OF ON SITE AS SPECIFIED IN THE FINAL PLANS.

SPOIL AREAS ON COMED PARCEL TO RECEIVE TRANSPLANTED WET PRAIRIE SOD SHALL BE REMOVED BY THE CONTRACTOR. SPOILS REMOVED DURING TRANSPLANT SHALL BE DISPOSED OF IN HMS QUARRIES OR OTHER LOCATIONS ON HMS PROPERTIES AS DIRECTED BY THE OWNER (SEE SHEET N-1). ANY TOPSOIL STOCKPILED FOR FUTURE USE SHALL BE RELATIVELY FREE OF LARGE ROOTS, STICKS, WEEDS, BRUSH, STONES LARGER THAN TWO INCH DIAMETER, OR OTHER LITTER AND WASTE PRODUCTS INCLUDING EXTRANEOUS MATERIALS NOT CONDUCIVE TO PLANT GROWTH.

EXCAVATED MATERIALS SHALL BE STOCKPILED IN SEQUENCE TO MINIMIZE RE-HANDLING. FAILURE TO PROPERLY SEQUENCE THE STOCKPILE OPERATIONS SHALL NOT CONSTITUTE A CLAIM FOR ADDITIONAL COMPENSATION. NO MATERIAL SHALL BE STOCKPILED IN DRAINAGE WAYS, FLOOD ROUTING AREAS, WETLANDS, PROPOSED UTILITY LOCATIONS, AND UTILITY EASEMENTS OR RIGHTS-OF-WAY.

ALL TRANSPLANT OPERATIONS SHALL BE CONDUCTED AS DESCRIBED IN THE WET PRAIRIE TRANSPLANT, SEDIMENT AND EROSION CONTROL, AND DRAINAGE AND GRADING PLANS (SEE SHEETS T-1, T-2, T-3, T-4, S-1, S-2, D-1, D-2, AND N-1 OF PLAN SET).

CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER DISPOSAL OF ALL MATERIALS, CONSTRUCTION DEBRIS, SOIL AND OTHER WASTE. DISPOSAL OF ALL MATERIALS, CONSTRUCTION DEBRIS, , AND OTHER WASTES (BUT NOT SOIL AND SPOILS) SHALL BE AT AN OFF-SITE DISPOSAL SITE THAT IS PROPERLY LICENSED AND PERMITTED TO ACCEPT THE PARTICULAR MATERIALS, CONSTRUCTION DEBRIS, AND OTHER WASTES DELIVERED TO IT IN ACCORDANCE WITH ALL ILLINOIS AND FEDERAL ENVIRONMENTAL LAWS AND REGULATIONS. FAILURE TO IDENTIFY DISPOSAL SITE(S) FOR MATERIALS, CONSTRUCTION DEBRIS, AND OTHER WASTES OR TO SUBMIT SUCH INFORMATION WHEN REQUESTED BY THE OWNER IS A MATERIAL BREACH. THE COSTS TO REMOVE AND DISPOSE OF EXCAVATION MATERIALS, CONSTRUCTION DEBRIS, SOIL AND OTHER REGULATED WASTE ARE INCLUDE IN THE UNIT PRICE FOR THIS PAY ITEM.

UPON REQUEST OF THE OWNER, CONTRACTOR SHALL PROVIDE THE OWNER WITH COPIES OF ALL LOAD TICKETS, MANIFESTS, BILLS OF LADING, SCALE TICKETS AND OTHER PERTINENT DOCUMENTS, INCLUDING COPIES OF ALL PERMITS AND/OR LICENSES FOR THE PROPOSED TRANSFER STATION, CCDD SITE AND/OR LANDFILL. IN THE EVENT THAT THE TRANSFER STATION, CCDD SITE AND/OR LANDFILL PROPOSED FOR USE BY CONTRACTOR DOES NOT POSSESS THE NECESSARY PERMITS AND/OR LICENSES TO ACCEPT THE MATERIALS, CONSTRUCTION DEBRIS, OR OTHER WASTES, CONTRACTOR WILL REPLACE THE TRANSFER STATION AND/OR LANDFILL. IF THE CONTRACTOR DISPOSES OF MATERIALS, CONSTRUCTION DEBRIS, OR OTHER WASTES AT A SITE WHICH IS NOT PROPERLY PERMITTED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE REMOVAL OF THE WASTE TO A PROPERLY LICENSED/PERMITTED LANDFILL OR DISPOSAL SITE, INCLUDING FINES, PENALTIES AND ATTORNEY'S FEES.

CONTRACTOR SHALL NOTIFY THE OWNER WITHIN 24 HOURS OF RECEIPT OF ANY ENVIRONMENTAL COMPLAINTS, FINES, CITATIONS, VIOLATIONS OR NOTICES OF VIOLATION ("CLAIMS") BY ANY GOVERNMENTAL BODY OR REGULATORY AGENCY AGAINST CONTRACTOR OR ANY OF HIS SUBCONTRACTORS OR ANY THIRD PARTY RELATING TO THE LOADING, HAULING OR DISPOSAL OF MATERIAL, CONSTRUCTION DEBRIS, SOIL OR OTHER WASTES IN CONNECTION WITH THE PROJECT. CONTRACTOR WILL PROVIDE EVIDENCE TO THE OWNER THAT ANY SUCH CLAIM HAS BEEN ADDRESSED TO THE SATISFACTION OF THE ISSUER OR INITIATOR OF ANY SUCH CLAIM.

CONTRACTOR SHALL HAUL ANY MATERIALS, CONSTRUCTION DEBRIS, SOIL AND OTHER WASTES IN VEHICLES AND/OR CONTAINERS COMPLYING WITH ALL APPLICABLE ENVIRONMENTAL LAWS. ALL EQUIPMENT USED TO TRANSFER MATERIALS, CONSTRUCTION DEBRIS, SOIL OR OTHER WASTES SHALL BE DESIGNED TO PREVENT SPILLAGE DURING THE HAULING OPERATION. ALL HAULING EQUIPMENT SHALL FULLY COMPLY WITH ALL VILLAGE, STATE, AND FEDERAL REGULATIONS, LAWS AND ORDINANCES PERTAINING TO SIZE, LOAD WEIGHT, SAFETY AND ANY ENVIRONMENTAL LAWS.

THE QUANTITIES GIVEN FOR EARTHWORK ARE INTENDED AS A GUIDE FOR THE CONTRACTOR IN DETERMINING THE SCOPE OF THE COMPLETED PROJECT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ALL MATERIAL QUANTITIES ITSELF AND APPRAISE ALL SITE CONDITIONS. NO CLAIMS FOR EXTRA WORK WILL BE RECOGNIZED UNLESS ORDERED IN WRITING BY THE OWNER.

PRIOR TO ONSET OF GRADING OPERATIONS THE EARTHWORK CONTRACTOR SHALL FAMILIARIZE ITSELF WITH THE TEMPORARY EROSION AND SEDIMENT CONTROL SPECIFICATIONS (SEE SHEETS S-1 AND S-2). THE INITIAL ESTABLISHMENT OF EROSION AND SEDIMENT CONTROL PROCEDURES AND THE PLACEMENT OF FILTERS, FENCING, ETC. TO PROTECT ADJACENT PROPERTY SHALL OCCUR BEFORE MASS GRADING BEGINS AND IN ACCORDANCE WITH THE SOIL EROSION CONTROL CONSTRUCTION SCHEDULE.

1.1 DESCRIPTION
A. GRADING SHALL INCLUDE ALL CLEARING; GRUBBING; REMOVAL OF STRUCTURAL ELEMENTS WITHIN THE LIMITS OF CONSTRUCTION; EXCAVATION STOCKPILING AND REPLACEMENT; TOPSOIL EXCAVATION, STOCKPILE AND REPLACEMENT; PRAIRIE SOD (I.E. VEGETATION AND SOIL) REMOVAL AND TRANSPLANT; ROCK AND COBBLE REMOVAL, STOCKPILING AND REPLACEMENT CONSTRUCTION AS SHOWN ON THE PLANS, DETAILED IN THESE SPECIFICATIONS, AND IN ACCORDANCE WITH SECTIONS 201 THROUGH 214 OF THE IDOT SPECIFICATIONS.

1.2 RELATED SECTIONS
A. TEMPORARY EROSION AND SEDIMENT CONTROL, SOIL PREPARATION, SEEDING.

1.3 QUALITY ASSURANCE
A. QUALIFICATIONS OF WORKMEN: PROVIDE AT LEAST ONE PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING EXECUTION OF THIS PORTION OF THE WORK AND WHO SHALL BE THOROUGHLY FAMILIAR WITH THE TYPE OF EQUIPMENT BEING USED AND THESE PLANS AND SPECIFICATIONS. SAID PERSON SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION.
B. STANDARDS: ALL MATERIALS, EQUIPMENT, AND PROCEDURES USED DURING THIS PORTION OF THE WORK SHALL MEET OR EXCEED APPLICABLE FEDERAL, STATE, COUNTY AND LOCAL LAWS AND REGULATIONS.

CONTINUED ON NEXT SHEET

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HMS Surface Mining Mitigation and Restoration Plans

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AES Proj. #: 20-0109
Designed By: WWS
Drawn By: WCC
Checked By: WWS
hms n-1 to n-8 notes.dwg
Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
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DATED: October 7, 2020

SHEET TITLE

Project Notes - Specifications

SHEET NUMBER

N-3

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1.4 SUBMITTALS

A. MATERIALS: THE CONTRACTOR SHALL SUBMIT TO THE OWNER FOR APPROVAL A COMPLETE LIST OF ALL MATERIALS TO BE USED DURING THIS PORTION OF THE WORK PRIOR TO DELIVERY OF ANY MATERIALS TO THE SITE. INCLUDE COMPLETE DATA ON SOURCE, AMOUNT AND QUALITY. THIS SUBMITTAL SHALL IN NO WAY BE CONSTRUED AS PERMITTING SUBSTITUTION FOR SPECIFIC ITEMS DESCRIBED ON THE PLANS OR IN THESE SPECIFICATIONS UNLESS APPROVED IN WRITING BY THE OWNER.

B. EQUIPMENT: THE CONTRACTOR SHALL PROVIDE A LIST OF EQUIPMENT AND A DESCRIPTION AND LOCATION OF ITS INTENDED USE, AND A LIST OF SAID PERSONS PERFORMING THE WORK AND THEIR QUALIFICATIONS FOR OPERATING AND MAINTAINING THE LISTED EQUIPMENT.

C. AFTER THE WORK IS COMPLETED THE CONTRACTOR SHALL SUBMIT TO THE OWNER RECORD DRAWINGS. THE CONTRACTOR SHALL MARK IN RED INK ON THE ORIGINAL PLANS ANY FIELD CHANGES OR DEVIATIONS FROM THE ORIGINAL PLANS.

PART 2. PRODUCTS

2.1 MATERIALS

A. TOPSOIL SHALL BE SUITABLE ORGANIC SOIL OBTAINED FROM ON-SITE SOURCES OR AS APPROVED BY THE OWNER. ALL TOPSOIL SHALL BE APPROVED BY THE OWNER BEFORE USE.

B. EXCAVATION SHALL CONSIST OF SOIL, WHICH IS NOT TOPSOIL.

PART 3. EXECUTION

3.1 GENERAL

A. THE CONTRACTOR SHALL PROVIDE TEMPORARY MEANS OF PREVENTING EROSION OF EXCAVATED MATERIALS. SUCH MEASURES SHALL BE SUBJECT TO THE APPROVAL OF THE OWNER.

B. THE CONTRACTOR SHALL PROVIDE CONTROL AND GRADE STAKES FOR THE GRADING CONSTRUCTION.

3.2 CLEARING AND GRUBBING

A. GENERAL: THE FOLLOWING ITEMS SHALL BE PERFORMED WHEREVER THEY OCCUR WITHIN THE PROJECT BOUNDARY. MATERIALS DESIGNATED FOR DISPOSAL SHALL BE DISPOSED OF BY REMOVAL FROM THE SITE. THESE MATERIALS SHALL NOT BE DISPOSED OF BY BURNING.

B. CLEARING: CLEARING SHALL CONSIST OF THE REMOVAL AND DISPOSAL OF ALL OBSTRUCTIONS SUCH AS FENCES, WALLS, ACCUMULATIONS OF RUBBISH OF WHATEVER NATURE AND EXISTING STRUCTURES, LOGS, SHRUBS, BRUSH, GRASS, LEAVES, AND OTHER VEGETATION. CLEARING MAY BE PHASED AT THE OWNER'S REQUEST TO MINIMIZE THE EROSION POTENTIAL DURING CONSTRUCTION.

C. GRUBBING: SHALL INCLUDE REMOVAL OF ALL STUMPS WITHIN THE CONSTRUCTION LIMITS.

3.3 EXCAVATION

A. EXCAVATION SHALL CONSIST OF THE EXCAVATION OF ALL EARTHEN MATERIALS, INCLUDING TOPSOIL, SUBSOIL, FRACTURED ROCK, SPOILS, AND FILL MATERIAL. EXCAVATED MATERIAL MAY BE STORED ON-SITE WITHIN THE LIMITS OF CONSTRUCTION, TEMPORARY CONSTRUCTION EASEMENT, OR TEMPORARILY STOCKPILED OFF-SITE AT A LOCATION SELECTED AND PAID FOR BY THE CONTRACTOR. THE CONTRACTOR SHALL INCLUDE PERMANENT DISPOSAL OF EXCAVATION MATERIAL THAT IS NOT USED FOR UNCLASSIFIED FILL. EXCAVATION STOCKPILED SHALL BE ENCLOSED WITH SILT FENCE.

3.4 CLEAN-UP, REMOVAL, AND REPAIR

A. CLEAN UP: THE WORK AREA SHALL BE KEPT FREE OF DEBRIS BY THE CONTRACTOR. AT NO TIME SHALL TRASH OR OTHER MATERIAL BE ALLOWED TO ACCUMULATE AT THE PROJECT SITE. ALL TOOLS SHALL BE KEPT IN APPROPRIATE CARRYING CASES, TOOL BOXES, ETC. ROADS, SIDEWALKS, PATHS, TRAILS, AND PAVED AREAS SHALL BE KEPT FREE OF MUD AND DIRT.

B. REMOVAL: AFTER WORK HAS BEEN COMPLETED REMOVE TOOLS AND ALL OTHER DEBRIS GENERATED BY THE CONTRACTOR.

C. REPAIR: THE CONTRACTOR SHALL REPAIR ANY DAMAGES THAT OCCURRED DURING COMPLETION OF THE WORK DESCRIBED IN THIS SECTION. SAID DAMAGES MAY INCLUDE, BUT ARE NOT LIMITED TO, TIRE RUTS IN THE GROUND, DAMAGE TO PLANTED AREAS, DAMAGE TO TRAILS, ETC. ALL AREAS DAMAGED BY THE CONTRACTOR DURING THE EXECUTION OF THIS WORK SHALL BE REPAIRED BY CONTRACTOR AND RESTORED TO THE CONDITIONS SHOWN ON THE PLANS AT NO ADDITIONAL COST TO THE OWNER. ALL AREAS OUTSIDE OF THE CONSTRUCTION LIMITS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO PRE-CONSTRUCTION GRADES AND STABILIZED WITH APPROPRIATE SEED OR PLANTINGS.

3.5 INSPECTION

A. PRIOR TO THE COMMENCEMENT OF PLANTING CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN A PROVISIONAL ACCEPTANCE OF THE GRADING FROM THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SCHEDULING A PROVISIONAL ACCEPTANCE INSPECTION WITH THE OWNER.

3.6 ACCEPTANCE AND GUARANTEE

A. PROVISIONAL ACCEPTANCE: THE WORK SHALL BE PROVISIONALLY ACCEPTED BY THE OWNER PRIOR TO ANY SEEDING OR PLANTING CONSTRUCTION. IF THE OWNER CONSIDERS THE GRADING WORK TO BE IN SUBSTANTIAL COMPLIANCE WITH THE PLANS AND SPECIFICATIONS, THE WORK SHALL BE PROVISIONALLY ACCEPTED AND CONSIDERED 90% COMPLETE.

B. FINAL ACCEPTANCE: THE GRADING WORK SHALL BE CONSIDERED 100% COMPLETE AFTER THE CONTRACTOR HAS COMPLETED ALL CLEAN-UP, REMOVAL, AND REPAIR AS DESCRIBED IN 3.4 OF THIS SECTION.

C. WET-MESIC PRAIRIE TRANSPLANT; PROVISIONAL ACCEPTANCE: IF THE OWNER CONSIDERS THE WET-MESIC PRAIRIE TRANSPLANT TO BE IN SUBSTANTIAL COMPLIANCE WITH THE PLANS AND SPECIFICATIONS, THE WORK SHALL BE PROVISIONALLY ACCEPTED AND CONSIDERED 90% COMPLETE. FINAL ACCEPTANCE: THE WET-MESIC PRAIRIE TRANSPLANT SHALL BE CONSIDERED 100% COMPLETE WHEN THE FOLLOWING VEGETATION PERFORMANCE STANDARDS HAVE BEEN MET THREE SEASONS AFTER PROVISIONAL ACCEPTANCE: 1) NATIVE COVER IS AT LEAST 90% OF THE PRE-TRANSPLANT NATIVE COVER AND 2) MEAN C AND FQI FOR ALL TRANSPLANT AREAS COMBINED SHOULD BE 90% OF THE PRE-TRANSPLANT VALUES.

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1. GENERAL

UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL SOIL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CONSTRUCTED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS IN THE ILLINOIS URBAN MANUAL (IUM), LATEST REVISION AND WITH ALL APPLICABLE COUNTY AND LOCAL ORDINANCES AND REGULATIONS.

THE SOIL AND WATER CONSERVATION DISTRICT MUST BE NOTIFIED ONE WEEK PRIOR TO THE PRE-CONSTRUCTION CONFERENCE AND ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITIES.

IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO INFORM ANY SUB-CONTRACTOR(S) WHO MAY PERFORM WORK ON THIS PROJECT, OF THE REQUIREMENTS IN IMPLEMENTING AND MAINTAINING THESE EROSION CONTROL PLANS AND THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT REQUIREMENTS SET FORTH BY THE ILLINOIS EPA.

THE EROSION CONTROL MEASURES INDICATED ON THE PLANS (SEE SHEETS S-1 AND S-2) ARE THE MINIMUM REQUIREMENTS. ADDITIONAL MEASURES MAY BE REQUIRED, AS DIRECTED BY THE OWNER TO PREVENT EROSION AND SEDIMENTATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF SAID MEASURES.

BEFORE COMMENCING CLEARING AND SITE GRADING WORK TEMPORARY ROCK CONSTRUCTION ENTRANCE SHALL BE INSTALLED AS DIRECTED BY THE OWNER. THE ENTRANCE SHALL BE MAINTAINED PERIODICALLY FOR ITS EFFECTIVENESS TO REMOVE DIRT WHICH COULD LEAVE THE SITE BY CONSTRUCTION VEHICLES.

ALL ROADWAYS SHALL BE KEPT CLEAN - FREE OF DIRT, MUD AND DEBRIS, AT ALL TIMES.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER INSTALLATION AND MAINTENANCE OF ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL DEVICES.

THE CONTRACTOR SHALL INSPECT AND DOCUMENT EROSION AND SEDIMENT CONTROL MEASURES AT LEAST ONCE EVERY SEVEN (7) CALENDAR DAYS AND/OR WITHIN 24-HOURS OF THE END OF A STORM EVENT THAT IS 0.5-INCHES OR GREATER OR EQUIVALENT SNOWFALL.

NO SEDIMENT SHALL BE ALLOWED TO ENTER THE EXISTING STORM SEWER SYSTEM OR WETLANDS. THE CONTRACTOR SHALL INSTALL INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING THE STORM SEWER SYSTEM.

ALL STORM SEWER, CATCH BASINS, AND SUMPS WITHIN THE PROJECT AREA ARE TO BE CLEANED AT THE END OF CONSTRUCTION OF THE PROJECT AND PRIOR TO FINAL ACCEPTANCE. CLEANING MAY ALSO BE REQUIRED DURING THE COURSE OF CONSTRUCTION OF THE PROJECT IF IT IS DETERMINED THAT THE SILT DEBRIS TRAPS ARE NOT PROPERLY FUNCTIONING AND THEIR PERFORMANCE IS IMPAIRED.

SOIL STOCKPILES SHALL BE LOCATED TO AVOID EROSION OF SAID STOCKPILE ONTO OFF-SITE AREAS OR INTO DRAINAGE WAYS/WATERWAYS OR WETLANDS. IF A STOCKPILE IS TO REMAIN IN PLACE MORE THAN THREE DAYS, IT SHALL BE FURNISHED WITH APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES SUCH AS SILT FENCES. STOCKPILES TO REMAIN FOR 30 DAYS OR MORE SHALL BE TEMPORARILY SEEDED.

IF DEWATERING SERVICES ARE USED, ADJOINING PROPERTIES AND DISCHARGE LOCATIONS SHALL BE PROTECTED FROM EROSION. DURING DEWATERING OPERATIONS, WATER WILL BE PUMPED INTO SEDIMENT BASINS OR SILT TRAPS. DEWATERING DIRECTLY INTO FIELD TILES OR STORMWATER STRUCTURES IS PROHIBITED.

CONSTRUCTION EQUIPMENT STAGING AREA SHALL BE SURROUNDED BY SILT FENCE. PROPOSED LOCATION IS SHOWN ON PLANS BUT THE ACTUAL LOCATION SHALL BE DETERMINED BY THE OWNER AND CONTRACTOR.

THE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE PLACED EFFECTIVELY UNTIL ALL THE PERMANENT EROSION CONTROL ITEMS ARE FULLY FUNCTIONAL.

THE GUARANTEE PERIOD SHALL BEGIN AFTER ALL THE PERMANENT EROSION CONTROL MEASURES ARE FULLY FUNCTIONAL AND ACCEPTABLE TO THE OWNER.

UPON COMPLETION OF ANY EARTH MOVING OPERATIONS, INCLUDING TOPSOIL RESPREADING, ALL DISTURBED AREAS SHALL BE SEEDED AS NOTED ON THE PLAN. ANY AREAS NOT DESIGNATED AS BEING SEEDED WITH A NATIVE SEED MIX SHALL BE SEEDED WITH A MIX APPROVE BY THE OWNER OR ITS REPRESENTATIVE.

TEMPORARY AND TURF SEEDING AND MULCHING SHALL BE IN ACCORDANCE WITH SECTIONS 250 AND 251 OF THE IDOT SPECIFICATIONS, WITH THE FOLLOWING EXCEPTION - MULCHING SHALL BE APPLIED AT A RATE OF ONE (1) TON PER ACRE.

1.1 DESCRIPTION

A. TEMPORARY EROSION AND SEDIMENT CONTROL SHALL INCLUDE TEMPORARY CONSTRUCTION MEASURES REQUIRED TO PREVENT THE MOVEMENT OF ERODED SEDIMENT AND CONTAMINANTS FROM THE CONSTRUCTION AREA OF THE SITE DURING CONSTRUCTION.

1.2 RELATED SECTIONS

A. SEEDING; GRADING, SOIL PREPARATION.

1.3 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKMEN: PROVIDE AT LEAST ONE PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING EXECUTION OF THIS PORTION OF THE WORK AND WHO SHALL BE THOROUGHLY FAMILIAR WITH THE TYPE OF EQUIPMENT BEING USED AND THESE PLANS AND SPECIFICATIONS. SAID PERSON SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION.

B. STANDARDS: ALL MATERIALS, EQUIPMENT, AND PROCEDURES USED DURING THIS PORTION OF THE WORK SHALL MEET OR EXCEED APPLICABLE FEDERAL, STATE INCLUDING ILLINOIS EPA REQUIREMENTS, COUNTY AND LOCAL LAWS AND REGULATIONS.

1.4 SUBMITTALS

A. NOT APPLICABLE.

PART 2. PRODUCTS

2.1 MATERIALS

A. SOIL EROSION AND SEDIMENTATION CONTROL MATERIALS SHALL BE OF THE MATERIALS AND CONSTRUCTION SPECIFIED BY THE IDOT SPECIFICATIONS AND THE WILL-SOUTH COOK COUNTY SOIL & WATER CONSERVATION DISTRICT (WCSWCD). IN THE EVENT OF ANY INCONSISTENCIES BETWEEN THESE TWO AGENCIES, THE WCSWCD SPECIFICATIONS SHALL PREVAIL.

PART 3. EXECUTION

3.1 GENERAL

A. CONTRACTOR SHALL INSTALL EROSION AND SEDIMENT CONTROL MEASURES AS SHOWN ON THE PLAN AND AS DESCRIBED IN IUM.

B. CONTRACTOR SHALL INSTALL STABILIZED CONSTRUCTION ENTRANCE AND SHALL BE CONSTRUCTED ACCORDING TO THE APPLICABLE PORTIONS OF IUM CODE 930.

C. CONTRACTOR SHALL INSTALL ROCK CHECK DAM AND SHALL BE CONSTRUCTED ACCORDING TO IUM CODE 905 AND STANDARD DRAWING IL-605CA.

D. CONTRACTOR SHALL INSTALL SILT FENCE AND SHALL BE CONSTRUCTED ACCORING TO THE APPLICABLE PORTIONS OF IUM CODE 920. SILT FENCE STAKES SHALL BE INSTALLED ON 5-FOOT CENTERS, CONSISTENT WITH SECTION 280 OF THE IDOT SPECIFICATIONS (SEE DETAIL 2; SHEET N-2). CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING SILT FENCE FOR EACH PHASE OF CONSTRUCTION UNTIL DISTURBED AREAS ARE STABILIZED WITH 90% COVER OF COVER CROP AND/OR PERMANENT VEGETATION.

CONTINUED ON NEXT SHEET

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HMS Surface Mining Mitigation and Restoration Plans

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AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
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DATED: October 7, 2020

SHEET TITLE

Project Notes - Specifications

SHEET NUMBER

N-4

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3.2 CLEAN-UP, REMOVAL, AND REPAIR

A. CLEAN UP: THE WORK AREA SHALL BE KEPT FREE OF DEBRIS BY THE CONTRACTOR. AT NO TIME SHALL TRASH OR OTHER MATERIAL BE ALLOWED TO ACCUMULATE AT THE PROJECT SITE. ALL TOOLS SHALL BE KEPT IN APPROPRIATE CARRYING CASES, TOOL BOXES, ETC. PARKING AREAS, ROADS, SIDEWALKS, PATHS, TRAILS, AND PAVED AREAS SHALL BE KEPT FREE OF MUD AND DIRT.

B. REMOVAL: THE CONTRACTOR SHALL MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL THE PERMANENT VEGETATION IS ESTABLISHED IN CONFORMANCE WITH THESE SPECIFICATIONS.

C. REPAIR: THE CONTRACTOR SHALL REPAIR ANY DAMAGES THAT OCCURRED DURING COMPLETION OF THE WORK DESCRIBED IN THIS SECTION. SAID DAMAGES MAY INCLUDE, BUT ARE NOT LIMITED TO, TIRE RUTS IN THE GROUND, DAMAGE TO PLANTED AREAS, DAMAGE TO TRAILS, ETC. ALL AREAS DAMAGED BY THE CONTRACTOR DURING THE EXECUTION OF THIS WORK SHALL BE REPAIRED BY CONTRACTOR AND RESTORED TO THE CONDITIONS SHOWN ON THE PLANS AT NO ADDITIONAL COST TO THE OWNER. ALL AREAS OUTSIDE OF THE CONSTRUCTION LIMITS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO PRE-CONSTRUCTION GRADES AND STABILIZED WITH APPROPRIATE SEEDING OR PLANTING.

3.3 INSPECTION

A. AFTER INSTALLATION OF TEMPORARY EROSION AND SEDIMENT CONTROL FOR EACH PHASE OF CONSTRUCTION AS SHOWN ON THE PLANS, THE CONTRACTOR SHALL SCHEDULE WITH THE OWNER A PROVISIONAL ACCEPTANCE INSPECTION OF THE WORK.

B. THE CONTRACTOR SHALL CONDUCT DAILY INSPECTIONS OF ALL FENCING TO ENSURE THAT IT IS MAINTAINED IN AN UPRIGHT POSITION.

3.4 ACCEPTANCE AND GUARANTEE

A. PROVISIONAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 90% COMPLETE UPON PROVISIONAL ACCEPTANCE BY THE OWNER. NO GRADING ACTIVITY FOR ANY PHASE OF CONSTRUCTION SHALL COMMENCE PRIOR TO PROVISIONAL ACCEPTANCE OF SOIL EROSION AND SEDIMENTATION CONTROL WORK DESCRIBED IN THIS SECTION FOR EACH PHASE OF CONSTRUCTION.

B. FINAL ACCEPTANCE: THE TEMPORARY EROSION CONTROL WORK SHALL BE CONSIDERED 100% COMPLETE AFTER THE CONTRACTOR HAS COMPLETED ALL CLEAN-UP, REMOVAL, AND REPAIR AS DESCRIBED IN 3.2 OF THIS SECTION.

SELECTIVE WOODY BRUSH & TREE REMOVAL

PART 1. GENERAL

1.1 DESCRIPTION

A. THIS SECTION INCLUDES THE SELECTIVE REMOVAL AND DISPOSAL OF WOODY BRUSH INCLUDING TREES AND SHRUBS.

1.2 RELATED SECTIONS

A. GRADING.

1.3 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKMEN: PROVIDE AT LEAST ONE PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING EXECUTION OF THIS PORTION OF THE WORK, WHO SHALL BE THOROUGHLY FAMILIAR WITH THIS TYPE OF WORK AND THE TYPE OF MATERIALS BEING USED. SAID PERSON SHALL BE COMPETENT AT IDENTIFICATION OF PLANT MATERIALS TO BE CUT AND TO BE PRESERVED DURING THE SEASON (SUMMER, FALL, AND WINTER) WORK IS TO BE COMPLETED. SAID PERSON SHALL ALSO DIRECT ALL WORK PERFORMED UNDER THIS SECTION.

B. STANDARDS: ALL MATERIALS USED DURING THIS PORTION OF THE WORK SHALL MEET OR EXCEED APPLICABLE FEDERAL, STATE, COUNTY AND LOCAL LAWS AND REGULATIONS. THE USE OF ANY HERBICIDE SHALL FOLLOW DIRECTIONS GIVEN ON THE HERBICIDE LABEL. IN THE CASE OF A DISCREPANCY BETWEEN THESE SPECIFICATIONS AND THE HERBICIDE LABEL, THE LABEL SHALL PREVAIL.

1.4 SUBMITTALS

A. MATERIALS: THE CONTRACTOR SHALL SUBMIT TO THE OWNER FOR APPROVAL A COMPLETE LIST OF ALL MATERIALS TO BE USED DURING THIS PORTION OF THE WORK PRIOR TO DELIVERY OF ANY MATERIALS TO THE SITE. INCLUDE COMPLETE DATA ON SOURCE, AMOUNT AND QUALITY. THIS SUBMITTAL SHALL IN NO WAY BE CONSTRUED AS PERMITTING SUBSTITUTION FOR SPECIFIC ITEMS DESCRIBED ON THE PLANS OR IN THESE SPECIFICATIONS UNLESS APPROVED IN WRITING BY THE OWNER.

B. EQUIPMENT: THE CONTRACTOR SHALL PROVIDE A LIST OF EQUIPMENT AND A DESCRIPTION AND LOCATION OF ITS INTENDED USE, AND A LIST OF SAID PERSONS PERFORMING THE WORK AND THEIR QUALIFICATIONS FOR OPERATING AND MAINTAINING THE LISTED EQUIPMENT.

C. LICENSES: PRIOR TO ANY HERBICIDE USE THE CONTRACTOR SHALL SUBMIT TO THE OWNER A CURRENT COPY OF THE STATE OF ILLINOIS COMMERCIAL PESTICIDE APPLICATOR'S LICENSE, WITH CERTIFICATION IN THE FORESTRY CATEGORY, FOR EACH PERSON WHO WILL BE APPLYING HERBICIDE AT THE PROJECT SITE. A COPY OF EACH COMMERCIAL PESTICIDE APPLICATOR'S LICENSE MUST BE MAINTAINED ON SITE AT ALL TIMES DURING COMPLETION OF THE WORK.

PART 2. PRODUCTS

2.1 MATERIALS

A. HERBICIDE TO BE USED FOR BASAL APPLICATIONS SHALL BE TRICLOPYR: 3,5,6-TRICHLORO-2-PYRIDINYLOXYACETIC ACID, BUTOXYETHYL ESTER, TRADE NAME GARLON 4 OR EQUIVALENT AS APPROVED IN WRITING BY THE OWNER AND USFWS.

B. HERBICIDE TO BE USED FOR FOLIAR APPLICATIONS SHALL BE TRICLOPYR: 3,5,6-TRICHLORO-2- PYRIDINYLOXYACETIC ACID, TRIETHYLAMINE SALT, TRADE NAME GARLON 3A, OR EQUIVALENT AS APPROVED IN WRITING BY OWNER AND USFWS.

PART 3. EXECUTION

3.1 METHOD

A. THE CONTRACTOR SHALL DISPOSE OF ALL WOODY SPECIES WITHIN THE CONSTRUCTION LIMITS ACCORDING TO THE NOTES FOUND ON SHEET N-1 OF THE PLAN SET.

B. TREES AND SHRUBS SHALL BE REMOVED BY CUTTING WITH HAND TOOLS INCLUDING, BUT NOT NECESSARILY LIMITED TO, GAS POWERED CHAIN SAWS, GAS POWERED CLEARING SAWS, BOW SAWS, AND LOPPERS, AND HEBICIDING THE CUT STUMPS. TREES AND SHRUBS CAN BE REMOVED BY CUTTING AND STUMP HERBICIDING, GIRDELING, OR FOLIAR SPRAYING.

C. SPECIAL ATTENTION SHALL BE APPLIED TO THOSE AREAS WHERE WOODY BRUSH AND/OR TREES ARE TO BE REMOVED VIA CUTTING AND STUMP HERBICIDING. IN SAID AREAS, STUMPS AND ROOT BALLS ARE NOT TO BE REMOVED BUT RATHER HERBICIDED AND ALLOWED TO DECOMPOSE IN PLACE. THIS PROVIDES SOIL STABILIZATION UNTIL THE ESTABLISHMENT OF VEGETATION.

D. THE CONTRACTOR SHALL REMOVE ALL TREES AND SHRUBS WITHIN THE GRADING LIMITS THAT REMAIN FROM PREVIOUS SELECTIVE WOODY BRUSH AND TREE REMOVAL.

E. ALL STUMPS WITHIN THE GRADING LIMITS DESIGNATED ON THE PLAN FOR REMOVAL SHALL BE GRUBBED, UNLESS IT IS DETERMINED BY THE CONTRACTOR AND APPROVED BY THE OWNER THAT SOME STUMPS CAN REMAIN. STUMPS TO REMAIN SHALL BE CUT FLUSH WITH THE SURROUNDING GRADE AND TREATED IMMEDIATELY WITH AN APPROVED HERBICIDE.

F. ALL CUT MATERIAL SHALL BE LEFT IN PLACE OR GATHERED INTO SMALL PILES AND BURNED ON-STIE (SEE NOTES ON SHEET N-1). PILES SHALL BE BURNED ON-SITE AS SOON AS CONDITIONS ALLOW.

G. A SUPPLY OF CHEMICAL ABSORBENT SHALL BE MAINTAINED AT THE PROJECT SITE. ANY CHEMICAL SPILLS SHALL BE PROPERLY CLEANED UP AND REPORTED TO THE OWNER WITHIN 24 HOURS.

H. THE CONTRACTOR SHALL MAINTAIN COPIES AT THE PROJECT SITE OF ALL CURRENT PESTICIDE APPLICATOR'S LICENSES, HERBICIDE LABELS, AND SDS'S (SAFETY DATA SHEETS) FOR ALL CHEMICALS UTILIZED DURING COMPLETION OF THE WORK.

3.2 CLEAN-UP, REMOVAL AND REPAIR

A. CLEAN UP: THE WORK AREA SHALL BE KEPT FREE OF DEBRIS BY THE CONTRACTOR. AT NO TIME SHALL TRASH OR OTHER MATERIAL BE ALLOWED TO ACCUMULATE AT THE PROJECT SITE, EXCEPT IN BURN PILES CREATED BY THE CONTRACTOR. ALL TOOLS SHALL BE KEPT IN APPROPRIATE CARRYING CASES, TOOL BOXES, ETC. PARKING AREAS, ROADS, SIDEWALKS, PATHS, TRAILS, AND PAVED AREAS SHALL BE KEPT FREE OF MUD AND DIRT.

B. REMOVAL: AFTER WORK HAS BEEN COMPLETED REMOVE TOOLS AND ALL OTHER DEBRIS GENERATED BY THE CONTRACTOR.

C. REPAIR: THE CONTRACTOR SHALL REPAIR ANY DAMAGES THAT OCCURRED DURING COMPLETION OF THE WORK DESCRIBED IN THIS SECTION. SAID DAMAGES MAY INCLUDE, BUT ARE NOT LIMITED TO, TIRE RUTS IN THE GROUND, DAMAGE TO PLANTED AREAS, DAMAGE TO TRAILS, ETC. ALL AREAS DAMAGED BY THE CONTRACTOR DURING THE EXECUTION OF THIS WORK SHALL BE REPAIRED BY CONTRACTOR AND RESTORED TO THE CONDITIONS SHOWN ON THE PLANS AT NO ADDITIONAL COST TO THE OWNER. ALL AREAS OUTSIDE OF THE CONSTRUCTION LIMITS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO PRE-CONSTRUCTION GRADES AND STABILIZED WITH APPROPRIATE SEEDING OR PLANTING.

3.3 INSPECTION

A. AFTER COMPLETION OF SELECTIVE WOODY BRUSH AND TREE REMOVAL, THE CONTRACTOR SHALL SCHEDULE WITH THE OWNER A PROVISIONAL ACCEPTANCE INSPECTION OF THE WORK.

3.4 ACCEPTANCE AND GUARANTEE

A. PROVISIONAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 90% COMPLETE AFTER INITIAL WOODY BRUSH AND TREE REMOVAL IS COMPLETED, AND THE CONTRACTOR HAS COMPLETED ALL CLEAN UP, REMOVAL, AND REPAIR AS DESCRIBED IN 3.2 OF THIS SECTION.

B. FINAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 100% COMPLETE AFTER THE CONTRACTOR HAS COMPLIED WITH ALL PROVISIONS OF THE GUARANTEE DESCRIBED IN 3.4C. OF THIS SECTION.

C. GUARANTEE: LESS THAN 10% COVER BY NON-NATIVE AND/OR WEEDY NATIVE TREES OR SHRUBS (E.G. GREEN ASH, BOX ELDER, OR GRAY DOGWOOD) IN BOTH THE GROUND LAYER AND THE WOODY CANOPY LAYER THREE YEARS AFTER RESTORATION BEGAN.

SEEDING

PART 1. GENERAL

1.1 DESCRIPTION

A. THIS SECTION INCLUDES INSTALLATION OF SEED (EMERGENT, WET PRAIRIE / SEDGE MEADOW, WET/WET-MESIC PRAIRIE, AND MESIC/WET-MESIC PRAIRIE) AS DESIGNATED ON THE PLANS.

1.2 RELATED SECTIONS

A. SOIL PREPARATION, MANAGEMENT OF PLANTINGS

1.3 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKERS: PROVIDE AT LEAST ONE PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING EXECUTION OF THIS PORTION OF THE WORK, WHO SHALL BE THOROUGHLY FAMILIAR WITH THE TYPE AND OPERATION OF EQUIPMENT BEING USED. SAID PERSON SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION.

B. STANDARDS: ALL MATERIALS AND METHODS USED DURING THIS PORTION OF THE WORK SHALL MEET OR EXCEED APPLICABLE FEDERAL, STATE, COUNTY AND LOCAL LAWS AND REGULATIONS. ALL SEED SHALL BE FREE FROM INSECTS AND DISEASE. SPECIES SHALL BE TRUE TO THEIR SCIENTIFIC NAME AS SPECIFIED.

1.4 SUBMITTALS

A. MATERIALS: THE CONTRACTOR SHALL SUBMIT TO THE OWNER FOR APPROVAL A COMPLETE LIST OF ALL MATERIALS TO BE USED DURING THIS PORTION OF THE WORK PRIOR TO DELIVERY OF ANY MATERIALS TO THE SITE. INCLUDE COMPLETE DATA ON SOURCE, AMOUNT AND QUALITY. THIS SUBMITTAL SHALL IN NO WAY BE CONSTRUED AS PERMITTING SUBSTITUTION FOR SPECIFIC ITEMS DESCRIBED ON THE PLANS OR IN THESE SPECIFICATIONS UNLESS APPROVED IN WRITING BY THE OWNER OR ITS REPRESENTATIVE. ANY SUBSTITUTIONS MADE TO THE ORIGINAL SEED LISTS SHALL BE APPROVED IN WRITING BY THE OWNER'S CONSULTING ECOLOGIST.

B. EQUIPMENT: THE CONTRACTOR SHALL PROVIDE A LIST OF EQUIPMENT AND A DESCRIPTION AND LOCATION OF ITS INTENDED USE, AND A LIST OF SAID PERSONS PERFORMING THE WORK AND THEIR QUALIFICATIONS FOR OPERATING AND MAINTAINING THE LISTED EQUIPMENT.

C. AFTER THE WORK IS COMPLETED THE CONTRACTOR SHALL SUBMIT TO THE OWNER RECORD DRAWINGS THAT SHOW IN RED INK ON THE ORIGINAL PLANS ANY FIELD CHANGES OR DEVIATIONS FROM THE ORIGINAL PLANS.

PART 2. PRODUCTS

2.1 MATERIALS

A. ALL GRASS SPECIES SHALL BE SUPPLIED AS PURE LIVE SEED. SEE SEEDING LISTS AND QUANTITIES ON SHEETS R-5 AND R-6 OF THE PLAN SET.

B. SEED OF ALL SPECIES NATIVE TO ILLINOIS SHALL BE FROM WITHIN A 200-MILE RADIUS OF THE PROJECT SITE UNLESS APPROVED IN WRITING BY THE OWNER'S CONSULTING ECOLOGIST.

PART 3. EXECUTION

3.1 METHOD

A. PRIOR TO SEEDING, AREAS NOT REGRADED AND CONTAINING OLD FIELD, OR OTHER NON-NATIVE HERBACEOUS VEGETATION SHALL BE HERBICIDED TWICE (2×) AND UNTIL 100% OF VEGETATION IN THE AREA TO BE SEEDED IS DEAD FOLLOWING APPLICATION METHODS IN SECTION: MANAGEMENT OF PLANTINGS.

B. SEEDING SHALL BE CONDUCTED IN SPRING (AS SOON AS THE SOIL IS FREE OF FROST AND IN A WORKABLE CONDITION BUT NO LATER THAN JUNE 30) OR AS A LATE FALL DORMANT SEEDING (AFTER NOVEMBER 1ST).

C. ALL SEED SHALL BE INSTALLED WITH A RANGELAND TYPE GRAIN DRILL OR NO-TILL PLANTER, SUCH AS BY TRUAX OR EQUIVALENT, OR BROADCAST, FOLLOWED BY RAKING IN OR IMPRESSING SEED INTO THE SOIL WITH A CULTIPACKER ROLLER. ALL METHODS SHALL BE APPROVED BY THE OWNER OR ITS REPRESENTATIVE.

D. IF SOIL IS TOO WET OR GRADE IS TOO STEEP TO INSTALL SEED AS DESCRIBED IN 3.1C ABOVE, A MECHANICAL BROADCAST SEEDER, SUCH AS A CYCLONE, SHALL BE USED. HAND BROADCASTING OF SEED MAY NEED TO BE EMPLOYED IN MANY AREAS. WITHIN 24 HOURS, OR AS SOON AS SITE CONDITIONS PERMIT, BROADCAST SEEDED AREAS SHALL BE ROLLED, DRAGGED PERPENDICULAR TO THE SLOPE, OR RAKED IN.

E. IF AREA TO BE SEEDED WAS TREATED WITH HERBICIDE, SEEDING SHALL OCCUR NO LESS THAN 14 DAYS AFTER HERBICIDE APPLICATION.

F. SEED SHALL NOT BE DELIVERED UNTIL THE PROJECT SITE HAS BEEN PREPARED FOR PLANTING. ALL SEED SHALL BE SHIPPED IN THE ORIGINAL, SEALED CONTAINER WITH THE LABEL INFORMATION INTACT AND LEGIBLE.

G. SEED SHALL BE KEPT IN ITS ORIGINAL CONTAINER WITH THE LABEL INTACT AND LEGIBLE. THE SEED SHALL BE STORED AWAY FROM MOISTURE, EXCESSIVE HEAT, AND DIRECT SUNLIGHT. THE SEED SHALL BE PROTECTED FROM RODENTS, INSECTS, AND OTHER VERMIN.

CONTINUED ON NEXT SHEET

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Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
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N-5

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3.2 CLEAN-UP, REMOVAL AND REPAIR

A. CLEAN UP: THE WORK AREA SHALL BE KEPT FREE OF DEBRIS BY THE CONTRACTOR. AT NO TIME SHALL TRASH OR OTHER MATERIAL BE ALLOWED TO ACCUMULATE AT THE PROJECT SITE. ALL TOOLS SHALL BE KEPT IN APPROPRIATE CARRYING CASES, TOOL BOXES, ETC. PARKING AREAS, ROADS, SIDEWALKS, PATHS, TRAILS, AND PAVED AREAS SHALL BE KEPT FREE OF MUD AND DIRT.

B. REMOVAL: AFTER WORK HAS BEEN COMPLETED REMOVE TOOLS AND ALL OTHER DEBRIS GENERATED BY THE CONTRACTOR.

C. REPAIR: THE CONTRACTOR SHALL REPAIR ANY DAMAGES THAT OCCURRED DURING COMPLETION OF THE WORK DESCRIBED IN THIS SECTION. SAID DAMAGES MAY INCLUDE, BUT ARE NOT LIMITED TO, TIRE RUTS IN THE GROUND, DAMAGE TO PROTECTED TREES OR OTHER PLANTING AREAS, DAMAGE TO TRAILS, ETC. ALL AREAS DAMAGED BY THE CONTRACTOR DURING THE EXECUTION OF THIS WORK SHALL BE REPAIRED BY THE CONTRACTOR AND RESTORED TO THE CONDITION SHOWN ON THE PLANS AT NO ADDITIONAL COST TO THE OWNER. ALL AREAS OUTSIDE OF THE CONSTRUCTION LIMITS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO THE PRE-CONSTRUCTION CONDITION.

3.3 INSPECTION

A. AFTER COMPLETION OF SEEDING, THE CONTRACTOR SHALL SCHEDULE WITH OWNER A PROVISIONAL ACCEPTANCE INSPECTION OF THE WORK.

3.4 ACCEPTANCE AND GUARANTEE (PERFORMANCE STANDARDS)

A. PROVISIONAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 90% COMPLETE AFTER ALL SEED HAS BEEN INSTALLED AND THE CONTRACTOR HAS COMPLETED ALL REQUIRED CLEAN UP, REMOVAL, AND REPAIR AS DESCRIBED IN 3.2 OF THIS SECTION.

B. FINAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 100% COMPLETE AFTER THE CONTRACTOR HAS MET OR EXCEEDED THE PERFORMANCE STANDARDS GIVEN IN 3.4C OF THIS SECTION.

C. THE CONTRACTOR SHALL GUARANTEE SEEDED AND/OR PLANTED AREAS WILL MEET OR EXCEED THE FOLLOWING PERFORMANCE CRITERIA THREE FULL GROWING SEASONS AFTER PROVISIONAL ACCEPTANCE: AT LEAST 70% RELATIVE COVER BY NATIVE SPECIES IN EACH PLANT COMMUNITY. NONE OF THE THREE MOST DOMINANT GROUND LAYER PLANT SPECIES MAY BE NON-NATIVE SPECIES (ACCORDING TO WILHELM AND RERICHA 2017) OR COMMON REED (PHRAGMITES AUSTRALIS).

D. REMEDIAL ACTION: IF SEEDED AREAS FAIL TO MEET THE TERMS OF THE GUARANTEE SHOWN ABOVE, THE CONTRACTOR WILL DEVELOP A REMEDIAL ACTION PLAN THAT TAKES INTO CONSIDERATION THE SITE GOALS AND SPECIFIC DEFICIENCIES CAUSING THE REMEDIAL ACTION. THE CONTRACTOR WILL SUBMIT THE REMEDIAL ACTION PLAN TO THE OWNER FOR APPROVAL. CONTRACTOR WILL IMPLEMENT THE REMEDIAL ACTION PLAN AND SUBMIT A REPORT THAT DESCRIBES THE REMEDIAL ACTION TAKEN. IF REMEDIAL SEEDING OR PLANTING IS REQUIRED, CONTRACTOR WILL NOT BE REQUIRED TO PERFORM ADDITIONAL REMEDIAL SEEDING/PLANTING FOR A MINIMUM OF TWO GROWING SEASONS.

HERBACEOUS PERENNIAL PLANTING

PART 1. GENERAL

1.1 DESCRIPTION

A. THIS SECTION INCLUDES INSTALLATION OF LIVE HERBACEOUS PERENNIAL PLANTS WITHIN EMERGENT, SEDGE MEADOW/WET PRAIRIE, AND WET/WET-PRAIRIE PLANT COMMUNITY AS DESIGNATED ON THE PLANS.

1.2 RELATED SECTIONS

A. SOIL PREPARATION, MANAGEMENT OF PLANTINGS

1.3 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKERS: PROVIDE AT LEAST ONE PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING EXECUTION OF THIS PORTION OF THE WORK, WHO SHALL BE THOROUGHLY FAMILIAR WITH THE TYPE AND OPERATION OF EQUIPMENT BEING USED. SAID PERSON SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION.

B. STANDARDS: ALL MATERIALS AND METHODS USED DURING THIS PORTION OF THE WORK SHALL MEET OR EXCEED APPLICABLE FEDERAL, STATE, COUNTY AND LOCAL LAWS AND REGULATIONS. ALL LIVE HERBACEOUS PERENNIAL PLANTS SHALL BE FREE FROM INSECTS AND DISEASE.

1.4 SUBMITTALS

A. MATERIALS: PRIOR TO DELIVERY OF ANY MATERIALS TO THE SITE, SUBMIT TO THE OWNER A COMPLETE LIST OF ALL LIVE HERBACEOUS PERENNIAL PLANTS TO BE USED DURING THIS PORTION OF THE WORK. INCLUDE COMPLETE DATA ON SOURCE, QUANTITY, AND QUALITY. TAGS SHALL REMAIN ON DELIVERED MATERIAL UNTIL OWNER OR OWNERS CONSULTING ECOLOGIST'S APPROVAL. THIS SUBMITTAL SHALL IN NO WAY BE CONSTRUED AS PERMITTING SUBSTITUTION FOR SPECIFIC ITEMS DESCRIBED ON THE PLANS OR IN THESE SPECIFICATIONS UNLESS APPROVED IN WRITING BY THE OWNER OR ITS REPRESENTATIVE. ANY SUBSTITUTIONS MADE TO THE ORIGINAL LIST SHALL BE APPROVED IN WRITING BY THE OWNER'S CONSULTING ECOLOGIST.

B. EQUIPMENT: THE CONTRACTOR SHALL PROVIDE A LIST OF EQUIPMENT AND A DESCRIPTION AND LOCATION OF ITS INTENDED USE, AND A LIST OF SAID PERSONS PERFORMING THE WORK AND THEIR QUALIFICATIONS FOR OPERATING AND MAINTAINING THE LISTED EQUIPMENT.

C. AFTER THE WORK IS COMPLETED THE CONTRACTOR SHALL SUBMIT TO THE OWNER RECORD DRAWINGS THAT SHOW IN RED INK ON THE ORIGINAL PLANS ANY FIELD CHANGES OR DEVIATIONS FROM THE ORIGINAL PLANS.

PART 2. PRODUCTS

2.1 MATERIALS

A. ALL LIVE HERBACEOUS PLANTS SHALL BE POTTED, TWO YEAR OLD NURSERY GROWN STOCK FROM WITHIN A 200-MILE RADIUS OF THE PROJECT SITE UNLESS APPROVED IN WRITING BY THE OWNER'S CONSULTING ECOLOGIST.

B. PLANT LISTS CAN BE FOUND IN THE RESTORATION SEED AND PLANT LISTS ON SHEETS R-5 AND R-6 OF THE PLAN SET.

PART 3. EXECUTION

3.1 METHOD

A. PLANTING OF ALL LIVE HERBACEOUS PERENNIAL PLANTS SHALL BE COMPLETED AFTER MAY 15 BUT NO LATER THAN JULY 1.

B. ALL LIVE HERBACEOUS PERENNIAL PLANTS SHALL BE APPROVED BY THE OWNER'S CONSULTING ECOLOGIST PRIOR TO INSTALLATION.

C. PROVIDE HEALTHY, VIGOROUS LIVE HERBACEOUS PERENNIAL PLANTS; DO NOT USE MATERIALS THAT HAVE BEEN IN COLD STORAGE FOR LONGER THAN 45 DAYS.

D. DELIVER LIVE HERBACEOUS PERENNIAL PLANTS TO PROJECT SITE AFTER PREPARATIONS FOR PLANTING HAVE BEEN COMPLETED.

E. LIVE HERBACEOUS PERENNIAL PLANTS SHALL BE PACKED IN SUCH A MANNER AS TO INSURE ADEQUATE PROTECTION AGAINST WIND DAMAGE, DESICCATION, AND OTHER PHYSICAL DAMAGE WHILE IN TRANSIT.

F. IF PLANTING IS DELAYED MORE THAN FOUR HOURS AFTER DELIVERY, KEEP PLANTS IN REFRIGERATED CONTAINER OR SET PLANTS IN SHADE PROTECTED FROM WEATHER AND MECHANICAL DAMAGE, AND KEEP MOIST AND COOL.

H. HERBACEOUS PERENNIAL PLANTS SHALL BE DISTRIBUTED EVENLY THROUGHOUT THE SPECIFIED ZONES (SEE SHEETS R-1 AND R-2 OF THE PLAN SET) AT SPECIFIED RATES (SEE SHEETS R-5 AND R-6 OF THE PLAN SET)

I. ALL HERBACEOUS PERENNIAL PLANTS SHALL BE HEALED IN AND WATERED TO PREVENT DESICCATION.

J. IF PLANTING INTO AN AREA TREATED WITH HERBICIDE, PLANT MATERIALS SHALL BE INSTALLED NOT LESS THAN 14 DAYS AFTER HERBICIDE TREATMENT.

3.2 CLEAN-UP, REMOVAL AND REPAIR

A. CLEAN UP: THE WORK AREA SHALL BE KEPT FREE OF DEBRIS BY THE CONTRACTOR. AFTER THE WORK IS COMPLETE, CLEAN UP ANY REMAINING MATERIALS, PLANT CONTAINERS, DEBRIS, TRASH, ETC. AVOID DRIVING OR WALKING OVER PLANTED AREAS TO MINIMIZE DISTURBANCE.

B. REMOVAL: AFTER WORK HAS BEEN COMPLETED REMOVE ANY TOOLS, EQUIPMENT, EMPTY CONTAINERS, AND ALL OTHER DEBRIS GENERATED BY THE CONTRACTOR.

C. REPAIR: THE CONTRACTOR SHALL REPAIR ANY DAMAGES THAT OCCURRED DURING COMPLETION OF THE WORK DESCRIBED IN THIS SECTION. SAID DAMAGES MAY INCLUDE, BUT ARE NOT LIMITED TO, TIRE RUTS IN THE GROUND, DAMAGE TO PLANTED AREAS, DAMAGE TO TRAILS, ETC. ALL AREAS DAMAGED BY THE CONTRACTOR DURING THE EXECUTION OF THIS WORK SHALL BE REPAIRED BY CONTRACTOR AND RESTORED TO THE CONDITIONS SHOWN ON THE PLANS AT NO ADDITIONAL COST TO THE OWNER. ALL AREAS OUTSIDE OF THE CONSTRUCTION LIMITS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO THE PRE-CONSTRUCTION GRADES AND STABILIZED WITH APPROPRIATE SEED OR PLANTINGS.

3.3 INSPECTION

A. AFTER COMPLETION OF PLANTING, THE CONTRACTOR SHALL SCHEDULE WITH THE OWNER A PROVISIONAL ACCEPTANCE INSPECTION OF THE WORK.

3.4 ACCEPTANCE AND GUARANTEE (PERFORMANCE STANDARDS)

A. PROVISIONAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 90% COMPLETE AFTER THE CONTRACTOR HAS COMPLETED ALL REQUIRED CLEAN UP, REMOVAL, AND REPAIR AS DESCRIBED IN 3.2 OF THIS SECTION.

B. FINAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 100% COMPLETE AFTER THE CONTRACTOR HAS MET OR EXCEEDED THE GUARANTEES GIVEN IN 3.4.C OF THIS SECTION.

C. THE CONTRACTOR SHALL GUARANTEE PLANTED AREAS WILL MEET OR EXCEED THE FOLLOWING PERFORMANCE CRITERIA ONE FULL GROWING SEASON AFTER PROVISIONAL ACCEPTANCE: 70% SURVIVORSHIP OF ALL HERBACEOUS PLANTS. IF MORE THAN 30% OF THE PLANTS DO NOT SURVIVE AFTER ONE YEAR, THE CONTRACTOR SHALL RETURN TO THE SITE AND REPLANT LOST PLANTS AS SPECIFIED BY THE OWNER AND/OR TO MEET THE PERFORMANCE STANDARD.

SHRUB PLANTING

PART 1. GENERAL

1.1 DESCRIPTION

A. THIS SECTION INCLUDES PLANTING OF SHRUBS AS DESIGNATED ON THE PLAN.

1.2 RELATED SECTIONS

A. MANAGEMENT OF PLANTINGS

1.3 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKERS: PROVIDE AT LEAST ONE PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING EXECUTION OF THIS PORTION OF THE WORK WHO SHALL BE THOROUGHLY FAMILIAR WITH THE TYPE AND OPERATION OF EQUIPMENT BEING USED. SAID PERSON SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION.

B. STANDARDS: ALL MATERIALS AND METHODS USED DURING THIS PORTION OF THE WORK SHALL MEET OR EXCEED APPLICABLE FEDERAL, STATE, COUNTY AND LOCAL LAWS AND REGULATIONS. ALL PLANT MATERIALS SHALL BE FREE FROM INSECTS AND DISEASE. SPECIES SHALL BE TRUE TO THEIR SCIENTIFIC NAME AS SPECIFIED.

1.4 SUBMITTALS

A. MATERIALS: THE CONTRACTOR SHALL SUBMIT TO THE OWNER FOR APPROVAL A COMPLETE LIST OF ALL MATERIALS TO BE USED DURING THIS PORTION OF THE WORK PRIOR TO DELIVERY OF ANY MATERIALS TO THE SITE. INCLUDE COMPLETE DATA ON SOURCE, AMOUNT AND QUALITY. TAGS INDICATING GENUS AND SPECIES (E.G. CORNUS OBLIQUA) AND SIZE OF MATERIAL SHALL REMAIN ON DELIVERED MATERIAL UNTIL OWNER AND/OR OWNER'S CONSULTING ECOLOGIST APPROVAL. THIS SUBMITTAL SHALL IN NO WAY BE CONSTRUED AS PERMITTING SUBSTITUTION FOR SPECIFIC ITEMS DESCRIBED ON THE PLANS OR IN THESE SPECIFICATIONS UNLESS APPROVED IN WRITING BY THE OWNER. ANY SUBSTITUTIONS MADE TO THE ORIGINAL SHRUB LIST SHALL BE APPROVED IN WRITING BY THE OWNER'S CONSULTING ECOLOGIST.

B. EQUIPMENT: THE CONTRACTOR SHALL PROVIDE A LIST OF EQUIPMENT AND A DESCRIPTION AND LOCATION OF ITS INTENDED USE, AND A LIST OF SAID PERSONS PERFORMING THE WORK AND THEIR QUALIFICATIONS FOR OPERATING AND MAINTAINING THE LISTED EQUIPMENT.

C. AFTER THE WORK IS COMPLETED THE CONTRACTOR SHALL SUBMIT TO THE OWNER RECORD DRAWINGS THAT SHOW IN RED INK ON THE ORIGINAL PLANS ANY FIELD CHANGES OR DEVIATIONS FROM THE ORIGINAL PLANS.

PART 2. PRODUCTS

2.1 MATERIALS

A. SEE SHRUB LIST ON SHEET R-6 OF THE PLAN SET FOR SHRUB LIST AND QUANTITIES.

B. ALL SHRUBS MUST MEET ANSI STANDARDS FOR NURSERY STOCK.

C. ALL SHRUBS MUST BE PROVIDED IN #3 OR #5 CONTAINERS.

D. SPECIES SHALL BE TRUE TO THEIR SCIENTIFIC NAME AS SPECIFIED.

E. PLANT MATERIAL SHALL BE CHECKED FOR ANY DAMAGE, UNAUTHORIZED SUBSTITUTION, AND TO ESTABLISH NURSERY-GROWN STATUS. PLANT MATERIAL SHOWING DESICCATION, ABRASION, SUN-SCALD, DISFIGURATION, OR UNAUTHORIZED SUBSTITUTION SHALL BE REJECTED. PLANT MATERIAL THAT MEASURES LESS THAN SPECIFIED, OR HAS BEEN POLED, TOPPED-OFF, OR HEADED-BACK, SHALL BE REJECTED.

PART 3. EXECUTION

3.1 METHOD

A. PLANTING OF ROOT-PRUNED CONTAINER SHRUBS SHALL PREFERENTIALLY OCCUR BETWEEN SEPTEMBER 20 AND NOVEMBER 20.

B. ALL PLANT MATERIAL SHALL BE APPROVED BY THE OWNER AND/OR OWNER'S CONSULTING ECOLOGIST PRIOR TO INSTALLATION. IDENTIFICATION TAGS SHALL REMAIN ON EACH SHRUB UNTIL OWNER OR ECOLOGIST APPROVAL.

C. DELIVER SHRUBS TO PROJECT SITE AFTER PREPARATIONS FOR PLANTING HAVE BEEN COMPLETED.

D. ROOT-PRUNED CONTAINER SHRUBS SHALL BE PROTECTED FROM EXCESSIVE HEAT OR COLD ONCE UNLOADED. DO NOT ALLOW ROOTBALL TO FREEZE OR DRY OUT. IF MATERIAL CANNOT BE PLANTED IMMEDIATELY, WATER EVERY 3 TO 4 DAYS (OR AS NEEDED) AND AGAIN IMMEDIATELY BEFORE PLANTING.

E. FOR ROOT-PRUNED CONTAINER SHRUBS, REMOVE THE PLASTIC CONTAINER IN WHICH THE SHRUBS HAVE BEEN GROWING PRIOR TO PLANTING. IT IS NOT RECOMMENDED TO CUT OR DISTURB THE ROOTBALL AFTER CONTAINER HAS BEEN REMOVED.

F. DO NOT PLANT ROOT-PRUNED CONTAINER SHRUBS ANY DEEPER THAN THE LEVEL AT WHICH THEY WERE GROWING IN THE CONTAINER. PLANT PITS SHALL HAVE VERTICAL SIDES AND A FLAT BOTTOM AND SHALL BE 2× THE WIDTH OF THE ROOT BALL.

G. DO NOT PRUNE PLANT MATERIAL FOR SHAPE FOLLOWING PLANTING.

CONTINUED ON NEXT SHEET

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REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

SHEET TITLE

Project Notes - Specifications

SHEET NUMBER

N-6

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3.2 CLEAN-UP, REMOVAL AND REPAIR

A. CLEAN UP: THE WORK AREA SHALL BE KEPT FREE OF DEBRIS BY THE CONTRACTOR. AFTER THE WORK IS COMPLETE, CLEAN UP ANY REMAINING MATERIALS, PLANT CONTAINERS, DEBRIS, TRASH, ETC. AVOID DRIVING OR WALKING OVER PLANTED AREAS TO MINIMIZE DISTURBANCE.

B. REMOVAL: AFTER WORK HAS BEEN COMPLETED REMOVE ANY TOOLS, EQUIPMENT, EMPTY CONTAINERS, AND ALL OTHER DEBRIS GENERATED BY THE CONTRACTOR.

C. REPAIR: THE CONTRACTOR SHALL REPAIR ANY DAMAGES THAT OCCURRED DURING COMPLETION OF THE WORK DESCRIBED IN THIS SECTION. SAID DAMAGES MAY INCLUDE, BUT ARE NOT LIMITED TO, TIRE RUTS IN THE GROUND, DAMAGE TO PLANTED AREAS, DAMAGE TO TRAILS, ETC. ALL AREAS DAMAGED BY THE CONTRACTOR DURING THE EXECUTION OF THIS WORK SHALL BE REPAIRED BY CONTRACTOR AND RESTORED TO THE CONDITIONS SHOWN ON THE PLANS AT NO ADDITIONAL COST TO THE OWNER. ALL AREAS OUTSIDE OF THE CONSTRUCTION LIMITS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO PRE-CONSTRUCTION GRADES AND STABILIZED WITH APPROPRIATE SEED OR PLANTING.

3.3 INSPECTION

A. AFTER COMPLETION OF PLANTING, THE CONTRACTOR SHALL SCHEDULE WITH THE OWNER A PROVISIONAL ACCEPTANCE INSPECTION OF THE WORK.

3.4 ACCEPTANCE AND GUARANTEE (PERFORMANCE STANDARDS)

A. PROVISIONAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 90% COMPLETE AFTER THE CONTRACTOR HAS COMPLETED ALL PLANTING, AND COMPLETED ALL REQUIRED CLEAN UP, REMOVAL, AND REPAIR AS DESCRIBED IN 3.2 OF THIS SECTION.

B. FINAL ACCEPTANCE: THE WORK SHALL BE CONSIDERED 100% COMPLETE AFTER THE CONTRACTOR HAS MET OR EXCEEDED THE GUARANTEES GIVEN IN 3.4C. OF THIS SECTION.

C. THE CONTRACTOR SHALL GUARANTEE SHRUBS WILL MEET OR EXCEED THE FOLLOWING PERFORMANCE CRITERIA ONE FULL GROWING SEASON AFTER PROVISIONAL ACCEPTANCE: 90% SURVIVAL OF ALL PLANTED SHRUBS. IF MORE THAT 10% OF PLANTED SHRUBS DO NOT SURVIVE AFTER ONE YEAR, THE CONTRACTOR SHALL RETURN TO THE SITE AND REPLANT LOST SHRUBS AS SPECIFIED BY THE OWNER AND/OR TO MEET THE PERFORMANCE STANDARD.

MANAGEMENT OF PLANTINGS

PART 1. GENERAL

1.1 DESCRIPTION

A. THIS SECTION INCLUDES THE MANAGEMENT AND MONITORING TASKS AND PERFORMANCE STANDARDS FOR ALL PLANT COMMUNITIES (EMERGENT, SEDGE MEADOW/WET PRAIRIE, WET/WET-MESIC, AND MESIC/WET-MESIC PRAIRIE) FOR FIVE YEARS FOLLOWING INITIAL SEEDING/PLANTING OF EACH PLANT COMMUNITY.

1.2 RELATED SECTIONS

A. SEEDING, HERBACEOUS PERENNIAL PLANTING, SHRUB PLANTING

1.3 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKMEN: PROVIDE AT LEAST ONE PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING EXECUTION OF THIS PORTION OF THE WORK, WHO SHALL BE THOROUGHLY FAMILIAR WITH THE TYPE AND OPERATION OF EQUIPMENT BEING USED. SAID PERSON SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION.

B. STANDARDS: ALL MATERIALS AND METHODS USED DURING THIS PORTION OF THE WORK SHALL MEET OR EXCEED APPLICABLE FEDERAL, STATE, COUNTY AND LOCAL LAWS AND REGULATIONS. THE USE OF ANY HERBICIDE SHALL FOLLOW DIRECTIONS GIVEN ON THE HERBICIDE LABEL. IN THE CASE OF A DISCREPANCY BETWEEN THESE SPECIFICATIONS AND THE HERBICIDE LABEL, THE LABEL SHALL PREVAIL.

1.4 SUBMITTALS

A. MATERIALS: THE CONTRACTOR SHALL SUBMIT TO THE OWNER FOR APPROVAL A COMPLETE LIST OF ALL MATERIALS TO BE USED DURING THIS PORTION OF THE WORK PRIOR TO DELIVERY OF ANY MATERIALS TO THE SITE. INCLUDE COMPLETE DATA ON SOURCE, AMOUNT AND QUALITY. THIS SUBMITTAL SHALL IN NO WAY BE CONSTRUED AS PERMITTING SUBSTITUTION FOR SPECIFIC ITEMS DESCRIBED ON THE PLANS OR IN THESE SPECIFICATIONS UNLESS APPROVED IN WRITING BY THE OWNER.

B LICENSES: PRIOR TO ANY HERBICIDE USE, THE CONTRACTOR SHALL SUBMIT TO THE OWNER A CURRENT COPY OF THE STATE OF ILLINOIS COMMERCIAL PESTICIDE APPLICATOR'S LICENSE, WITH CERTIFICATION IN THE APPROPRIATE CATEGORIES, FOR EACH PERSON WHO WILL BE APPLYING HERBICIDE AT THE PROJECT SITE. A COPY OF EACH COMMERCIAL PESTICIDE APPLICATOR'S LICENSE MUST BE MAINTAINED ON-SITE AT ALL TIMES DURING COMPLETION OF THE WORK.

C. EQUIPMENT: THE CONTRACTOR SHALL PROVIDE A LIST OF EQUIPMENT AND A DESCRIPTION AND LOCATION OF ITS INTENDED USE, AND A LIST OF SAID PERSONS PERFORMING THE WORK AND THEIR QUALIFICATIONS FOR OPERATING AND MAINTAINING THE LISTED EQUIPMENT.

D. PERMITS: PRIOR TO THE COMMENCEMENT OF ANY CONTROLLED BURNING, THE CONTRACTOR SHALL SECURE APPLICABLE PERMITS.

E. AFTER THE WORK IS COMPLETED, SUBMIT TO THE OWNER AN ANNUAL REPORT SUMMARIZING MANAGEMENT ACTIVITIES/PERFORMANCE STANDARD ASSESSMENTS COMPLETED DURING THE PAST CALENDAR YEAR BY THE CONTRACTOR.

PART 2. PRODUCTS

2.1 MATERIALS

A. HERBACEOUS SPECIES TO BE REMOVED IN AREAS WITHOUT STANDING WATER OR SATURATED SOILS SHALL BE TREATED WITH GLYPHOSATE, N-(PHOSPHONOMETHYL) GLYCINE, TRADE NAME ROUNDUP OR EQUIVALENT AS APPROVED IN WRITING BY OWNER.

B. HERBACEOUS SPECIES TO BE REMOVED IN AREAS WITH STANDING WATER OR SATURATED SOILS SHALL BE TREATED WITH GLYPHOSATE, N-(PHOSPHONOMETHYL) GLYCINE IN A FORM APPROVED FOR AQUATIC APPLICATIONS SUCH AS RODEO OR EQUIVALENT AS APPROVED IN WRITING BY OWNER OR IT'S REPRESENTATIVE.

C. HERBICIDE TO BE USED FOR BASAL APPLICATIONS SHALL BE TRICLOPYR: 3,5,6-TRICHLORO-2-PYRIDINYLOXYACETIC ACID, BUTOXYETHYL ESTER, TRADE NAME GARLON 4 OR EQUIVALENT AS APPROVED IN WRITING BY THE OWNER OR IT'S REPRESENTATIVE.

D. HERBICIDE TO BE USED FOR FOLIAR APPLICATIONS (IF APPLICABLE) SHALL BE TRICLOPYR: 3,5,6-TRICHLORO-2-PYRIDINYLOXYACETIC ACID, BUTOXYETHYL ESTER, TRADE NAME GARLON 3 OR EQUIVALENT AS APPROVED IN WRITING BY OWNER OR IT'S REPRESENTATIVE.

E. OTHER PRODUCTS SUCH AS GRASS-SPECIFIC HERBICIDES MAY BE PROPOSED BY THE CONTRACTOR FOR APPROVAL BY THE OWNER.

F. THE CONTRACTOR SHALL SUBMIT TO THE OWNER FOR APPROVAL PROPOSED RATES OF HERBICIDE APPLICATION PRIOR TO COMMENCING THE WORK DESCRIBED IN THIS SECTION.

PART 3. EXECUTION

3.1 METHOD - HERBICIDE APPLICATION

A. CONTRACTOR SHALL ERADICATE HERBACEOUS SPECIES PER SECTION: SEEDING TO MEET THE GUARANTEE IN 3.4C. THIS GUARANTEE STATES: THE CONTRACTOR SHALL GUARANTEE SEEDED AND/OR PLANTED AREAS WILL MEET OR EXCEED THE FOLLOWING PERFORMANCE CRITERIA THREE FULL GROWING SEASONS AFTER PROVISIONAL ACCEPTANCE: AT LEAST 70% RELATIVE COVER BY NATIVE SPECIES IN EACH PLANT COMMUNITY. NONE OF THE THREE MOST DOMINANT GROUND LAYER PLANT SPECIES MAY BE NON-NATIVE SPECIES (ACCORDING TO WILHELM AND RERICHA 2017) OR COMMON REED (PHRAGMITES AUSTRALIS).

B. CONTRACTOR SHALL ERADICATE WOODY SPECIES PER SECTION: SELECTING WOODY BRUSH AND TREE REMOVAL TO MEET THE GUARANTEE IN 3.4C. THIS GUARANTEE STATES: LESS THAN 10% COVER BY NON-NATIVE AND/OR WEEDY NATIVE TREES OR SHRUBS (E.G. GREEN ASH, BOX ELDER, OR GRAY DOGWOOD) IN BOTH THE GROUND LAYER AND THE WOODY CANOPY LAYER THREE YEARS AFTER RESTORATION BEGAN.

B. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT NATIVE SPECIES AND AREAS OUTSIDE OF THE PROJECT AREA DURING EXECUTION OF THE WORK DESCRIBED IN THIS SECTION. THE CONTRACTOR SHALL RESTORE ALL AREAS AFFECTED OR DISTURBED BY THE WORK ACCORDING TO THE APPROVED PLANS AND SPECIFICATIONS AT NO ADDITIONAL COST TO THE OWNER.

C. A SUPPLY OF CHEMICAL ABSORBENT SHALL BE MAINTAINED AT THE PROJECT SITE. ANY CHEMICAL SPILLS SHALL BE PROPERLY CLEANED UP AND REPORTED TO THE OWNER WITHIN 24 HOURS.

D. THE CONTRACTOR SHALL MAINTAIN COPIES AT THE PROJECT SITE OF ALL CURRENT PESTICIDE APPLICATOR'S LICENSES, HERBICIDE LABELS, AND SDS'S (SAFETY DATA SHEETS) FOR ALL CHEMICALS UTILIZED DURING COMPLETION OF THE WORK.

E. HERBICIDE SHALL BE MIXED AND PLACED IN CONTAINERS AWAY FROM ANY NATURAL AREA, TREES, SHRUBS, HERBACEOUS OR WOODY GROWTH, OR BODY OF WATER. HERBICIDES SHALL NOT BE TRANSPORTED TO THE WORK AREA IN ANY CONTAINER OTHER THAN THAT USED FOR APPLICATION.

F. OTHER NOTES REGARDIG HERBICIDING ARE FOUND ON SHEET N-1 OF THE PLAN SET.

3.2 METHOD - MOWING

A. THE CONTRACTOR SHALL MOW HERBICIDED AND SEEDED PORTIONS OF THE SEDGE MEADOW/WET PRAIRIE, WET/WET-MESIC PRAIRIE AND MESIC/WET-MESIC PRAIRIE PLANT COMMUNITIES TO A HEIGHT OF 8-10” (AFTER VEGETATION IN SAID AREAS REACHES A HEIGHT OF 24” AND BEFORE NON-NATIVE SPECIES GO TO SEED) TWO TIMES DURING THE FIRST GROWING SEASON FOLLOWING PLANTING (APPROXIMATELY MID JUNE AND MID AUGUST) UNLESS THE OWNER'S CONSULTING ECOLOGIST DETERMINES THAT MOWING IS NOT NEEDED. THE CONTRACTOR SHALL ALSO MOW TO A HEIGHT OF 12” ONE TIME DURING THE SECOND GROWING (APPROXIMATELY MID JUNE) UNLESS THE OWNER'S CONSULTING ECOLOGIST DETERMINES THAT MOWING IS NOT NEEDED.

B. MOWING SHOULD BE DONE WITH A ROTARY BUSH HOG STYLE MOWER TO ENSURE CLIPPINGS ARE DISPERSED RATHER THAN DEPOSITED IN DENSE MATS, IF CONDITIONS ALLOW (I.E. NOT WET), OR USING WEED WHIPS.

3.3 METHOD - PRESCRIBED BURNING

A. PRESCRIBED BURNING SHALL BE THE PRIMARY METHOD FOR LONG-TERM ECOLOGICAL MANAGEMENT AND WEED CONTROL ON THE SITE. BURNING SHALL BE CONDUCTED IN THE FALL (NOVEMBER-DECEMBER) OF THE THIRD YEAR FOLLOWING INITIAL PLANTING OR SPRING (MARCH) OF THE FOURTH YEAR FOLLOWING PLANTING. BURNING SHOULD BE CONDUCTED BY AN ENTITY EXPERIENCED IN BURN PLANNING AND PERMIT APPLICATION AS WELL AS PRESCRIBED BURN MANAGEMENT. SEE OTHER BURNING RESTRICTIONS UNDER BLANDING'S AND SPOTTED TURTLES ON SHEET N-1 OF THE PLAN SET.

B. PRIOR TO THE COMMENCEMENT OF PRESCRIBED BURNING, THE OWNER AND CONTRACTOR SHALL COMPILE A BURN PLAN THAT OUTLINES A PLAN OF ACTION, IDENTIFIES CONTINGENCIES, AND LISTS THE NAMES AND PHONE NUMBERS OF EMERGENCY AGENCIES (FIRE DEPARTMENT, POLICE DEPARTMENT, ETC.). PROPER NOTICE OF INTENT TO BURN SHALL BE GIVEN.

C. THE CONTRACTOR SHALL APPLY FOR AND RECEIVE ALL REQUIRED PERMITS PRIOR TO THE COMMENCEMENT OF PRESCRIBED BURNING.

3.4 CLEAN-UP, REMOVAL AND REPAIR

A. CLEAN UP: THE WORK AREA SHALL BE KEPT FREE OF DEBRIS BY THE CONTRACTOR. AT NO TIME SHALL EMPTY HERBICIDE CONTAINERS, TRASH, OR OTHER MATERIAL BE ALLOWED TO ACCUMULATE AT THE PROJECT SITE. ALL CLEANING OF HERBICIDE CONTAINERS SHALL BE DONE AWAY FROM THE OWNER'S PROPERTY OR ANY SURROUNDING AREA. ALL TOOLS SHALL BE KEPT IN APPROPRIATE CARRYING CASES, TOOLBOXES, ETC. PARKING AREAS, ROADS, SIDEWALKS, PATHS AND PAVED AREAS SHALL BE KEPT FREE OF MUD AND DIRT.

B. REMOVAL: AFTER WORK HAS BEEN COMPLETED REMOVE TOOLS, EMPTY CONTAINERS, AND ALL OTHER DEBRIS GENERATED BY THE CONTRACTOR.

C. REPAIR: REPAIR ANY DAMAGES CAUSED BY THE CONTRACTOR DURING COMPLETION THE WORK DESCRIBED IN THIS SECTION. SAID DAMAGES MAY INCLUDE, BUT ARE NOT LIMITED TO, TIRE RUTS IN THE GROUND, DAMAGE TO PLANTED AREAS, DAMAGE TO TRAILS, SMOKE AND/OR FIRE DAMAGE, ETC. THE CONTRACTOR SHALL BE LIABLE FOR REMEDYING DAMAGES TO PLANT MATERIALS AND PROPERTY AT NO COST TO THE OWNER CAUSED BY CONTRACTOR NEGLIGENCE DURING COMPLETION OF THE WORK.

D. REPLANTING: AREAS OF PLANTING FAILURE WILL NEED TO BE REPLANTED. CONTRACTOR SHALL IDENTIFY THE AREAS OF FAILURE WITH THE OWNER AND DETERMINE THE REASON FOR FAILURE. REPLANTING (IF NOT DUE TO VANDALISM OR REASONS NOT IDENTIFIED IN THE SITE WORK PLANTING SPECIFICATIONS) SHALL BE DONE BY THE CONTRACTOR AS PART OF THE SITE WORK TASKS. OTHER PLANTING FAILURE AREAS WILL BE REPLANTED BY CONTRACTOR AS EXTRA WORK AUTHORIZED IN WRITING BY THE OWNER PRIOR TO COMMENCEMENT OF THE CONSTRUCTION.

3.5 INSPECTION

A. AT THE REQUEST OF THE OWNER, THE CONTRACTOR SHALL SCHEDULE AN INSPECTION WITH THE OWNER TO REVIEW THE WORK COMPLETED BY THE CONTRACTOR PURSUANT TO THIS SECTION.

3.6 ACCEPTANCE AND GUARANTEES (PERFORMANCE STANDARDS)

A. FINAL ACCEPTANCE: MANAGEMENT SHALL BE CONSIDERED 100% COMPLETE AFTER THE CONTRACTOR HAS COMPLIED WITH ALL PARTS OF THIS SECTION AND MEETS ALL GUARANTEES (PERFORMANCE STANDARDS) FOR SECTION: EXCAVATION (3.6C), SELECTING WOODY BRUSH AND TREE REMOVAL (3.4C), SEEDING (3.4C), HERBACEOUS PERENNIAL PLANTING (3.4C), AND SHRUB PLANTING (3.4C).

B. CONTINUED MANAGEMENT: THE PERFORMANCE STANDARDS FOR EXCAVATION (WET-MESIC PRAIRIE TRANSPLANT), SELECTING WOODY BRUSH AND TREE REMOVAL, AND SEEDING ARE REQUIRED TO BE MET AGAIN AFTER FIVE YEARS.

CONTINUED ON NEXT SHEET

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HMS Surface Mining Mitigation and Restoration Plans

Romeoville, Will County, Illinois

Hanson Material Service Corporation
c/o Lehigh Hanson
620 West 183rd Street
Thornton, Illinois 60476

AES Proj. #: 20-0109
Designed By: WWS
Drawn By: WCC
Checked By: WWS
hms n-1 to n-8 notes.dwg
Coordinate System: Illinois State Plane NAD83

REVISIONS

Date	Description	Drawn by	Checked by
11/10/2016	BID SET	WCC	WWS
3/21/2018	USFWS HCP	WCC	WWS
1/25/2019	USFWS HCP	WCC	WWS
5/29/2019	USFWS HCP	WCC	WWS
3/20/2020	USFWS HCP	WCC	WWS
10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

SHEET TITLE

Project Notes - Specifications

SHEET NUMBER

N-7

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ALL MITIGATION AREAS WILL BE MONITORED EACH OF THE FIRST FIVE YEARS. PERFORMANCE STANDARDS WILL BE ASSESSED AND REPORTED ON FOR THREE OF FIVE GROWING SEASONS (YEARS 1, 3, AND 5). THE MONITORING PROTOCOL BELOW WILL BE FOLLOWED:

MONITORING

- ANNUAL MONITORING OF ALL PLANT COMMUNITIES SHALL BE CONDUCTED FOR FIVE FULL GROWING SEASONS FOLLOWING INITIAL PLANTING OR SEEDING.
- MONITORING SHALL BE CONDUCTED BY QUALIFIED PROFESSIONALS WITH ADEQUATE PLANT IDENTIFICATION SKILLS AND ECOLOGICAL RESTORATION EXPERIENCE TO MAKE RECOMMENDATIONS REGARDING MANAGEMENT OF NATIVE PLANT COMMUNITIES.
- IN YEARS 1, 3, AND 5 AN ANNUAL SITE INSPECTION WILL OCCUR IN THE SPRING (BEFORE JUNE 1), AND QUANTITATIVE SAMPLING WILL OCCUR IN THE SUMMER (JULY OR AUGUST). IN YEARS 2 AND 4, ONLY A SPRING SITE INSPECTION WILL OCCUR. RECOMMENDATIONS WILL BE COMMUNICATED IN WRITING AND WITH MAPS TO THE OWNER AND MAINTENANCE CONTRACTOR WITHIN A WEEK OF ALL MONITORING TRIPS.
- QUANTITATIVE SAMPLING WILL OCCUR ALONG TRANSECTS SHOWN ON SHEETS M-1 TO M-2 OF THE PLANS SET. ONE SQUARE METER QUADRATS WILL BE SAMPLED EVERY 10 METERS ALONG EACH TRANSECT. PERCENT AERIAL COVER WILL BE RECORDED FOR ALL SPECIES FOUND IN EACH QUADRAT. SPECIES LISTS WILL BE COLLECTED IN THE WET-MESIC PRAIRIE TRANSPLANT AREAS ONLY. TRANSECT DATA SHALL BE SUMMARIZED USING THE FLORISTIC QUALITY ASSESSMENT AND APPLICATION COMPUTER PROGRAM OR EQUIVALENT.
- PHOTOGRAPHS WILL BE TAKEN AT THE END OF EACH TRANSECT TO DOCUMENT THE SITE CONDITIONS THROUGH TIME.

REPORTING

- AN ANNUAL REPORT SHALL BE PREPARED AND SUBMITTED TO THE OWNER AT THE END OF EACH GROWING SEASON AND NOT LATER THAN JANUARY 31 OF THE FOLLOWING YEAR.
- THE REPORT SHALL IDENTIFY MANAGEMENT RECOMMENDATIONS AND TASKS THAT HAVE BEEN CONDUCTED THROUGHOUT THE GROWING SEASON AND OUTLINE FUTURE MANAGEMENT RECOMMENDATIONS.
- THE REPORT SHALL INCLUDE A SECTION THAT ADDRESSES THE REQUIRED PERFORMANCE STANDARDS INCLUDED IN THE PLAN/SPECIFICATIONS.
- SITE PHOTOGRAPHS SHALL BE INCLUDED IN THE REPORT TO DOCUMENT THE SITE CONDITIONS.

SUMMARY OF GUARANTEES (PERFORMANCE STANDARDS) IS INCLUDED BELOW:

SECTION: EXCAVATION (3.6C)

- FINAL ACCEPTANCE: THE WET-MESIC PRAIRIE TRANSPLANT SHALL BE CONSIDERED 100% COMPLETE WHEN THE FOLLOWING VEGETATION PERFORMANCE STANDARDS HAVE BEEN MET THREE SEASONS AFTER PROVISIONAL ACCEPTANCE: 1) NATIVE COVER IS AT LEAST 100% ABSOLUTE COVER OR 100% OF THE PRE-TRANSPLANT NATIVE COVER AND 2) MEAN C AND FQI FOR ALL TRANSPLANT AREAS COMBINED SHOULD BE 100% OF THE PRE-TRANSPLANT VALUES.

SECTION: SELECTING WOODY BRUSH AND TREE REMOVAL (3.4C)

- GUARANTEE: LESS THAN 10% COVER BY NON-NATIVE AND/OR WEEDY NATIVE TREES OR SHRUBS (E.G. GREEN ASH, BOX ELDER, OR GRAY DOGWOOD) IN BOTH THE GROUND LAYER AND THE WOODY CANOPY LAYER THREE YEARS AFTER RESTORATION BEGAN.

SECTION: SEEDING (3.4C)

- THE CONTRACTOR SHALL GUARANTEE SEEDED AND/OR PLANTED AREAS WILL MEET OR EXCEED THE FOLLOWING PERFORMANCE CRITERIA THREE FULL GROWING SEASONS AFTER PROVISIONAL ACCEPTANCE: AT LEAST 70% RELATIVE COVER BY NATIVE SPECIES IN EACH PLANT COMMUNITY. NONE OF THE THREE MOST DOMINANT GROUND LAYER PLANT SPECIES MAY BE NON-NATIVE SPECIES (ACCORDING TO WILHELM AND RERICHA 2017) OR COMMON REED (PHRAGMITES AUSTRALIS).

SECTION: HERBACEOUS PERENNIAL PLANTING (3.4C)

- THE CONTRACTOR SHALL GUARANTEE PLANTED AREAS WILL MEET OR EXCEED THE FOLLOWING PERFORMANCE CRITERIA ONE FULL GROWING SEASON AFTER PROVISIONAL ACCEPTANCE: 70% SURVIVORSHIP OF ALL HERBACEOUS PLANTS. IF MORE THAN 30% OF THE PLANTS DO NOT SURVIVE AFTER ONE YEAR, THE CONTRACTOR SHALL RETURN TO THE SITE AND REPLANT LOST PLANTS AS SPECIFIED BY THE OWNER AND/OR TO MEET THE PERFORMANCE STANDARD.

SECTION: SHRUB PLANTING (3.4C)

- THE CONTRACTOR SHALL GUARANTEE SHRUBS WILL MEET OR EXCEED THE FOLLOWING PERFORMANCE CRITERIA ONE FULL GROWING SEASON AFTER PROVISIONAL ACCEPTANCE: 90% SURVIVAL OF ALL PLANTED SHRUBS. IF MORE THAT 10% OF PLANTED SHRUBS TO NOT SURVIVE AFTER ONE YEAR, THE CONTRACTOR SHALL RETURN TO THE SITE AND REPLANT LOST SHRUBS AS SPECIFIED BY THE OWNER AND/OR TO MEET THE PERFORMANCE STANDARD.

THE PERFORMANCE STANDARDS FOR EXCAVATION (WET-MESIC PRAIRIE TRANSPLANT), SELECTING WOODY BRUSH AND TREE REMOVAL, AND SEEDING ARE REQUIRED TO BE MET AGAIN AFTER FIVE YEARS.

END OF SPECIFICATIONS

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HMS Surface Mining Mitigation and Restoration Plans

Romeoville, Will County, Illinois

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AES Proj. #: 20-0109

Designed By: WWS

Drawn By: WCC

Checked By: WWS

hms n-1 to n-8 notes.dwg

Coordinate System: Illinois State Plane NAD83

REVISIONS

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10/7/2020	USFWS HCP	WCC	WWS

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DATED: October 7, 2020

SHEET TITLE

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APPENDIX G:
Monitoring Methods

APPENDIX G-1:
Groundwater Monitoring

Prepared for:
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Groundwater Monitoring Plan for Habitat Conservation Plan
HMS Romeoville Quarry

AECOM
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October 9, 2020

Mr. Randy Boisvert
Hanson Material Service
Area Environmental Manager
2235 Enterprise Drive
Suite 3504
Westchester, IL 60154

RE: Groundwater Monitoring Plan for Habitat Conservation Plan at Hanson Material Service's Romeoville Quarry, Romeoville, Illinois – AECOM Project 60517559

Dear Mr. Boisvert,

AECOM has prepared the attached monitoring plan that summarizes the planned collection and submission of ground water data associated with the Habitat Conservation Plan (HCP) for HMS' Romeoville Quarry. The monitoring plan includes the following tasks:

- Development of baseline water level and water quality statistics
- Specification of monitoring locations for seep and groundwater monitoring
- Frequency for monitoring activities
- Basis for comparing new monitoring data
- Criteria for additional monitoring through verification and assessment
- Methods for assessment monitoring
- Evaluation of monitoring data for possible causes and/or strategies for remedial actions

This plan also includes preliminary avoidance measure testing and the protocol for construction, inspection, operation and monitoring activity documentation. The plan includes reporting protocols for preliminary testing and documentation of changes to avoidance measure operations. Finally, the plan outlines the analysis process for the following events:

- Criteria for evaluating when adaptive measures will be undertaken, and
- Planned future termination of avoidance measure monitoring.

In the event that you have any questions regarding the attached report or supporting information, please do not hesitate to contact either of the undersigned at (414)-944-6172 or (312) 323-2171, respectively.

Yours sincerely,

Gary M. Braun, P.G.
Senior Hydrogeologist

William J. Weaver, P.E., D.WRE
Senior Principal Engineer – Vice President

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cc: Mr. Bill Stoll, Applied Ecological Services
Mr. Steve Kornder, PhD., AECOM

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- 1-B - Groundwater Level Hydrographs
- 1-C - Cumulative Frequency Plots
- 1-D - Evaluation of "Background" Conditions in Aquifer
- 1-E - Seep W-1 Water Temperature Data

Attachment 2 Summary of Existing Water Quality Data

Attachment 3 AECOM Technical Guidance Documents

Attachment 4 Standard Field Forms

1.0 Project Background

Groundwater conditions comprise one of several key elements that are essential to support adult and larvae habitat of the Hine's emerald dragonfly (HED), as well as the habitat of other Covered Species in the Habitat Conservation Plan (HCP) including the Blanding's and spotted turtles. This groundwater monitoring plan is submitted by Hanson Material Service (HMS) as a key element for the future surface mining operation in Romeoville, Illinois (Romeoville Quarry). An overview map of the Romeoville Quarry property and the permit area limits are illustrated on Figure 1-1. HMS plans to implement a number of measures to avoid potential surface mining impacts to groundwater conditions in surrounding areas.

Measures proposed to avoid potential groundwater related impacts include: 1) shallow groundwater supplementation at the River South Bluff Parcel, and 2) enhancement of surface water infiltration upgradient of LPNP. Furthermore, dewatering in the West Quarry (also known as the Pierce-Eich Quarry) will be terminated after surface mining in that parcel is complete. Natural inundation of the mined area west of Route 53 will occur after the parcel is mined and will provide a long-term avoidance measure for potential future groundwater impacts to the subject habitat areas.

HMS will follow the monitoring requirements detailed in this document. The planned program will include collection of groundwater elevation and water quality datasets. The planned monitoring activities focus on areas covered by the HCP and allow for an evaluation of the effectiveness of the measures implemented to avoid or minimize (avoidance and minimization measures; AMMs) potential surface mining impacts to groundwater at local habitats. The groundwater monitoring data and evaluations will be submitted to the U.S. Fish and Wildlife Service (USFWS) and Illinois Department of Natural Resources (IDNR). This process will provide on-going communication with the responsible regulatory agencies.

Groundwater levels collected at HMS' various parcels will be evaluated against the baseline historical water level datasets. Routine monitoring will provide consistent measurements during quarry construction to evaluate if groundwater levels are changing over time. The monitoring program will replicate measurements that have been collected in the past at a number of key monitoring locations that have been determined to be important in evaluating the resource. These monitoring points typically have historical data for which background datasets have been statistically developed. Future monitoring results will therefore have a basis for comparison with historical data. The water level monitoring data are intended to provide documentation that avoidance measures are effective. Routine monitoring will also provide information to help determine if additional measures would be needed to avoid potential impacts to local hydrology.

1.1 Organization of Groundwater Monitoring Plan

This groundwater monitoring plan provides various information and background information for the project. It establishes baseline groundwater elevation datasets, proposes triggers for increases in groundwater monitoring frequency, summarizes inspections of avoidance measures, establishes standard field procedures and summarizes the planned documentation reports that will be prepared for the monitoring activities.

The plan is organized as follows:

Section 1.0 -- Project background information summary.

Section 2.0 -- A review of historical groundwater levels, establishment of baseline levels and selection of wells to monitor in the future.

Section 3.0 -- Description of the various time periods that will occur during the proposed mining activities.

Section 4.0 -- Sequential procedures for data collection, evaluation and adjustment from start to completion of permit

Section 5.0 -- Summary of notification and reporting procedures.

Section 6.0 -- Procedures to be followed for conducting inspections of AMMs.

Section 7.0 -- Standard procedures for collecting groundwater monitoring data.

1.2 Purpose of Groundwater Monitoring Plan

This monitoring plan has been developed to satisfy the monitoring items outlined in the HCP and Incidental Take Permit Handbook (USFWS, 2016). The plan has been prepared to describe the following steps that HMS will take to monitor the impacts of the covered activities on local groundwater conditions:

(1) Evaluate compliance

(2) Determine if goals and objectives are being met

(3) Provide feedback information for adaptive management strategies (if needed).

Data collection and reporting requirements are specified in this monitoring plan to ensure the conservation program is being implemented properly. Monitoring, reporting and adaptive management are planning tools to effectively achieve the hydrology goals and objectives.

Effectiveness monitoring will address impacts to groundwater and seep water hydrology both on and off the HMS property in the HCP Planning Area within the Des Plaines River Valley. The impact assessment will consider species and habitat as they relate to mining and restoration activities. Hydrology will be monitored at the mitigation parcels to measure the effectiveness of the AMMs, restoration, and mitigation efforts. Success of hydrologic AMMs will be assessed through the collection and evaluation of field monitoring data. Field data will be collected in areas that are impacted by mine dewatering and the AMMs, as well as regional aquifer data collected in areas that are not impacted. One of the purposes of the monitoring plan is to provide an evaluation of the location, timing, and magnitude of hydraulic impacts associated with the quarry, and to evaluate the effect regional aquifer trends have on water levels and of area hydrology.

The evaluation of monitoring data will provide documentation that groundwater hydrology is being maintained in habitat areas for the covered species that could be affected by HMS' activities. Evaluation of monitoring data will include documenting that groundwater hydrology is being maintained within background levels in known and potential larval areas that could be affected by mining. The groundwater monitoring program has been developed to provide the robustness required

to detect significant water level variations and provide sufficient time to implement adaptive management measures to maintain hydrologic conditions for the covered species.

1.3 Groundwater Evaluations Conducted for HCP

Numerous studies have been completed to evaluate the groundwater and surface water resources in the vicinity of the HMS Romeoville Quarry in preparation of the HCP Application. Data collected in these studies were used to develop groundwater flow models to evaluate the groundwater flow system as it relates to the proposed surface mining activities. Extensive groundwater modeling and field testing completed at the HMS Romeoville Quarry and surrounding vicinity indicates that proposed AMMs will be effective in avoiding potential hydrology impacts from mining the remaining surface reserves in the West Quarry, Middle Quarry and Middle Parcel. The results of the field studies and groundwater modeling evaluations prepared by AECOM on behalf of HMS for the HCP are summarized in the following reports:

- Response to USFWS Comments on the Background Water Quality Monitoring Report for the Proposed FPDWC Infiltration Pond, Hanson Material Service (HMS), dated May 6, 2019.
- Background Water Quality Monitoring Report for the Proposed Forest Preserve District of Will County (FPDWC) Infiltration Pond, from AECOM, dated October 15, 2018.
- Groundwater Sampling Considerations for FPDWC Pond Memorandum, from AECOM, dated May 12, 2017.
- Response to HCP Review Comments (on hydrology related issues), HMS dated January 20, 2017.
- Groundwater Evaluation of Infiltration Pond on Forest Preserve District of Will County Property dated January 13, 2016.
- River South Infiltration Gallery Design Development: Infiltration Gallery Pilot Testing Data Submittal, dated December 11, 2015.
- Hydrology Meeting Minutes and copy of AECOM PowerPoint Slides from December 3, 2015 Hydrology HCP Meeting.
- Hydrology Meeting Minutes and copy of AECOM PowerPoint Slides, which includes discussion of USGS Review Comments on AECOM's December 19, 2014 and January 14, 2015 submittals on the Updated Groundwater Model and Preliminary Tracer Test Results, respectively; Information presented on April 3, 2015 Hydrology HCP Meeting at Midewin National Tall Grass Prairie, Illinois.
- River South Infiltration Gallery Design Development: Additional Design Considerations, dated March 10, 2015.
- River South Infiltration Gallery Design Development: Memorandum of Preliminary Tracer Test Results, dated January 14, 2015.
- Response to USFWS & USGS Review Comments (regarding groundwater related sections of February 2014 pre-decisional draft HCP). Letter to HMS dated December 19, 2014.
- River South Infiltration Gallery Design Development: Additional Comments on Field Testing and Monitoring, dated November 5, 2014.
- River South Infiltration Gallery Design Development: Memorandum of Case Histories and Technical Articles, dated August 4, 2014.

- River South Infiltration Gallery Design Development: Memorandum of Work Plan for Field Testing and Monitoring, dated June 11, 2014.
- Groundwater Modeling Addendum: Response to Review Comments, Copy of PowerPoint Slides presented at May 29th 2014 Hydrology HCP Meeting in Barrington, Illinois. Slides forwarded via email on June 3, 2014.
- Electronic File Release - Ground Water Modeling Files included in the Addendum to the Groundwater Modeling Evaluation of Surface Mining Impacts of Romeoville Quarry were released to USGS for review on January 16, 2014.
- Addendum to the Groundwater Modeling Evaluation of Surface Mining Impacts of Romeoville Quarry, prepared for Hanson Material Service, dated December 2013.
- Groundwater Monitoring Data Submission for Hydrologic Support of Habitat Conservation Plan, prepared for Romeoville Quarry Hanson Material Service, dated September 23, 2013.
- Electronic File Release - Ground Water Modeling Files used for the Groundwater Modeling Evaluation of Surface Mining Impacts of Romeoville Quarry were released to USGS for review on November 7, 2012.
- Groundwater Modeling Evaluation of Surface Mining Impacts of Romeoville Quarry, prepared for Hanson Material Service, dated October 15, 2012.
- Submission of Historical Groundwater Related Reports for Romeoville Quarry - For Village of Romeoville's Technical Reviewer (Re-Submission of STS|AECOM, 2009 and STS, 1997), dated May 4, 2012
- Ground Water Recharge Evaluation of the ComEd and Long Run Parcels of the HMS Romeoville Quarry, dated May 5, 2011
- Estimate of Groundwater Inflow to Romeoville Quarry, AECOM Memorandum to Lehigh-Hanson, dated March 3, 2010.
- Surface and Ground Water Evaluation Summary in the Vicinity of the Hanson Material Service Yard 61 (Project 1-15942-R), dated January 8, 2009.
- Evaluation of the Potential of Leakage through the Maquoketa Group from mining within the Galena-Platteville Formations, Yard 61 in Romeoville, Illinois, dated March 12, 2008.

In addition, third party data were collected for various groundwater-related reports for nearby communities and Nature Preserves. Some of these data sources include:

- Summary of Ground Water Monitoring from 2001 through 2008 Lockport Prairie Nature Preserve and 2008 Ground Water Monitoring Data, prepared by Graef, prepared for CorLands, dated April 20, 2009.
- Romeoville Prairie Nature Preserve Water Level Monitoring Report, prepared by Graef, prepared for CorLands, dated May 24, 2007.
- Ground water levels recorded by University of St. Francis in Joliet from 2011 to 2013.

The information gathered in these studies have been used in the development of the groundwater monitoring program by establishing historical datasets and determining appropriate monitoring wells for future monitoring.

1.4 Proposed Operation Plan for Romeoville Quarry

Following is a summary of the proposed Quarry operation plan and the planned groundwater enhancements that will be implemented to avoid impacts to the habitat of HED and other covered species. HMS' mining plan for its Romeoville facility is found in Appendix E of the HCP. This summary is provided to outline the operational and avoidance measures of the HCP.

1. Surface mining at the HMS Romeoville facility will be limited to the West Quarry until mining approaches completion, which will be for a period of about 7 to 10 years. Water collected in the West Quarry will be managed the same way that it has for the existing operation. This water is conveyed to Middle Quarry for distribution. This water is used for plant operations, product rinsing, dust control and other similar operational needs. Excess water is discharged to the Des Plaines River as provided for in the existing NPDES permit. This water collected in the Middle Quarry is proposed to be utilized for planned groundwater infiltration.
2. When surface mining in the West Quarry approaches completion, a water barrier will be installed between the West and Middle Quarries. This barrier will be located under the Route 53 road embankment and will block the future dewatering of the West Quarry. Mining will continue in the Middle Parcel/Middle Quarry during and after the closing of the West Quarry. Seepage and precipitation from all quarries will continue to be conveyed to the primary sump located in the southern portion of the Middle Quarry. Dewatering in the West Quarry will cease when the West Quarry water barrier is completed. Water will then inundate the West Quarry since groundwater seepage and precipitation will no longer be conveyed from this area.
3. Groundwater enhancements will be constructed when the HCP is approved at locations adjacent to the River South parcel and at the FPDWC Parcel located on the southwest corner of Route 53 and Renwick Road. These groundwater enhancement systems will include infiltration galleries in the River South Bluff Parcel, and a wet bottom infiltration pond on the FPDWC Parcel.
4. The infiltration galleries at River South Bluff Parcel will begin operation when their construction is complete. The systems will be operated and maintained for the entire duration of mining in the West Quarry and will continue after mining completion until baseline conditions are reached in groundwater levels as defined in Section 3.4.
5. Water level monitoring will continue for several years after baseline conditions are reached to confirm water levels are maintained without further supplemental water.
6. The infiltration galleries in River South Bluff Parcel will be taken off-line after groundwater baseline conditions are reached and maintained. Operation protocols, maintenance triggers, and baseline condition are discussed in this submittal.
7. The FPDWC Pond is designed to provide a dual purpose throughout the life of the surface mining operation plan. It will provide groundwater infiltration and will also provide rainwater runoff management. The infiltration pond will be maintained by HMS until baseline conditions are reached.
8. When the Middle Parcel surface mining operations are complete, dewatering will continue into the future. Underground mining planned at the facility in the future will most likely be accessed from an existing Quarry (Middle or East Quarry). This configuration for accessing the underground mining operations will require continued dewatering in this area. Once mining reserves are exhausted in each quarry, the quarry may either be flooded and/or filled with material. Fill materials will consist of: 1) overburden displaced from previous quarrying

operations on the property or 2) clean construction or demolition debris (CCDD) regulated under 35 Illinois Administrative Code (IAC) 1100, or similar materials.

1.5 Potential Impacts

Surface mining in the West Quarry is proposed to continue to its permitted limits as illustrated in the Mining Plan documents, which are included in Appendix E of the HCP. The West Quarry is regulated under IDNR permit #143-98. There are 35 acres remaining in reserves in this Parcel from the total area of 206 acres. The parcel does not contain HED habitat but is located in the estimated groundwater recharge zone buffer for River South Parcel and the estimated two-mile recharge buffer for both River South Parcel and Lockport Prairie. The HMS Parcels are illustrated in Figure 1-1 for reference.

Mining of the remaining surface stone reserves in the West Quarry will likely result in potential groundwater impacts to River South and River South Bluff Parcels due the its proximity to the recharge zone for River South. The potential for the declines in groundwater levels and corresponding seep discharge rates will decrease with increasing distance from the West Quarry. Minimal groundwater impacts to Lockport Prairie Nature Preserve (LPNP) would occur if no avoidance measures were implemented. In addition, surface mining in the West Quarry and Middle Parcel does not appear to influence groundwater levels beyond the North Parcel into Romeoville Prairie Nature Preserve (RPNP). No direct take of adult or larval HED or the other covered species is anticipated during the mining operations in the West Quarry because it does not contain habitat. Water will be supplied to the River South Bluff Parcel via infiltration galleries to supplement the predicted loss of water levels. The supplemental water will avoid potential interference between the dewatering of the West Quarry and the hydrology of the River South Parcel.

Neither Middle Quarry nor the East Quarry expansion area contain habitat for the HED or other covered species. Thus, no direct take is anticipated during the mining of these parcels. East Quarry is hydraulically separated from all covered species habitat areas by the River to the west and the Chicago Sanitary and Ship Canal and Illinois & Michigan (I&M) Canal (Canals) to the east. Expansion of the East Quarry to the north will result in a decline in water levels to the north, but propagation of the cone of depression will not extend to the east and west due to these hydraulic barriers. Thus, no potential impacts to the groundwater hydrology in habitat areas are expected from continued mining (36 acres) in this area. No potential groundwater impacts to nearby larval habitat (e.g. River South) are expected from this activity either, since the area to be mined is adjacent to the existing surface mine.

1.6 Avoidance Measures

Measures to avoid potential surface mining impacts to groundwater conditions will be implemented by HMS after HCP approval. Measures to avoid potential groundwater related impacts include: 1) supplementation of shallow groundwater in River South Bluff Parcel, and 2) enhancement of surface water infiltration upgradient of LPNP. In addition, dewatering in the West Quarry will be terminated after surface mining in that parcel is complete. Natural inundation of the mined area west of Route 53 will occur after the parcel is mined and will provide long-term avoidance measures for potential groundwater impacts occurring in the future since groundwater levels will rebound to near pre-mining levels.

1.6.1 River South Infiltration Galleries

The River South Bluff Parcel groundwater infiltration galleries are planned to be constructed adjacent to the River South Parcel to enhance groundwater conditions during construction of the West Quarry. These infiltration galleries will use water pumped from the Romeoville Quarry to supplement shallow groundwater supplies. Three infiltration galleries are proposed to be strategically placed to supplement water where it will have the greatest benefit at the River South Parcel seep areas to satisfy the project goals (AECOM, 2015b). The galleries will be constructed of rock filled trenches extending down to or near the bedrock surface. Perforated pipes will be placed in the crushed stone to provide for an efficient transfer of water to the void spaces in the rocks. The rock void space will comprise approximately 30% of the gallery.

Water will be conveyed to the infiltration galleries via pipe that will constructed below ground or buried to prevent freezing to allow for year-round operation. Native groundwater will be the water source as it collects and is pumped from the Quarry sump located approximately 2500 feet to the north. The gallery pump will be placed in the Middle Quarry sump and will be rated to provide the planned peak flow capacity through the conveyance pipe. The pump will likely be mounted on the existing pump stand(s). Discharge pipes will likely be attached to the quarry side walls prior to reaching the top elevation of the quarry. Pump controls will be automated, and provisions will be made for ease of backup pump installation as well as connections for an emergency generator during extended power outages. The proposed infiltration galleries will minimize the potential for significant impacts from local quarrying on groundwater hydrology at the River South Parcel.

1.6.2 LPNP Avoidance Measures

Groundwater levels within the recharge zone of LPNP may experience minor impacts from dewatering activities in the West Quarry. Observation wells within LPNP could experience near-imperceivable water level decreases on the order of 0.1 feet if no avoidance measures were implemented. Therefore, the need for groundwater protection improvements for the LPNP is not extensive. Regardless, due to the potential of any impact at LPNP, avoidance measures will be implemented to prevent potential interference between the groundwater recharge zones of West Quarry and LPNP.

An infiltration pond is proposed to be installed on a FPDWC parcel located in the southwestern corner of Route 53 and Renwick Road. The infiltration pond will be built to detain surface water before it discharges to the River. Infiltration of the ponded surface water will increase the existing volume of groundwater recharge in the area. The infiltration pond is located on the groundwater divide between the LPNP and West Quarry recharge areas. Therefore, water at this location will provide a buffer to maintain the current location of the groundwater divide. The FPDWC Pond is proposed to be constructed in a former mined area by installing a berm and spillway to detain surface water from the existing drainage outflow route located below Renwick Road.

The FPDWC Pond is well positioned to accomplish this, since it provides the following features:

- Ideal location between the Quarry and LPNP.
- Hydrostratigraphic setting conducive for effective groundwater buffering.
- The pond water originates via a small stream in the northwest corner of the site that drains an approximate 186-acre watershed, which provides an abundant groundwater recharge source.
- This pond would only be needed as a temporary groundwater enhancement buffer until groundwater baseline conditions are met and AMMs are no longer needed.

- Analysis indicates that this groundwater enhancement option performs well.

The proposed infiltration pond will average over 13 acres in size and will detain significant quantities of runoff from its approximately 186-acre watershed. Storm water runoff conveyed to this pond will be retained and detained to enhance groundwater recharge. The infiltration pond will act as a hydrologic buffer between the Quarry and LPNP and will provide additional safeguards against extended dry periods.

1.6.3 Long-Term Avoidance Measures

The natural inundation of the West Quarry provides a long-term solution to avoid potential hydrology impacts in the future and is one of the important advantages of the preferred mining alternative. The recovery of groundwater levels west of Route 53 provides long-term solutions for the hydrology of local habitat of the HED and other species. Therefore, incorporation of the West Quarry filling is important to the long-term success of maintaining hydrologic conditions in HED habitat areas. Dewatering in the West Quarry will be terminated after surface mining in that parcel is complete and the tunnel under Route 53 is plugged.

2.0 Background Datasets and Targeted Monitoring Points

2.1 Evaluation of Existing Groundwater Level Monitoring Data

Existing groundwater level monitoring data have been collected and statistically summarized to develop an understanding of the range of levels historically observed and the frequency of those levels. Raw water level data and statistical tables of the monitoring data are included in Attachment 1-A. Hydrographs of the groundwater levels are provided in Attachment 1-B. Summary statistics include: number of measurements, minimum and maximum elevations, range of recorded elevations, mean, seasonal mean and standard deviation of the sample sets. Summary statistics are also provided excluding data collected during drought periods, so groundwater action levels are not biased low.

Groundwater monitoring data from January 1998 through August 2018 (excluding water levels recorded during droughts) have been used to form baseline datasets from which low-water level triggers and seasonal averages are established. These datasets form the basis for which future groundwater levels are assessed. The periods of drought during this period were recognized using the Palmer Drought Severity Index (PDSI) for Illinois, which classifies droughts from zero through negative four with the following classifications (ISWS, 2016):

0 to -0.5	Normal
-0.5 to -1.0	Incipient Drought
-1.0 to -2.0	Mild Drought
-2.0 to -3.0	Moderate Drought
-3.0 to -4.0	Severe Drought
< -4.0	Extreme Drought

When the PDSI was -2 (moderate drought) or lower, as highlighted below, groundwater level data were ignored so the low-water level triggers and seasonal averages were not biased low.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	0.35	0.55	1.15	1.48	1.32	2.62	2.33	2.04	1.30	1.68	1.40	1.03
1999	1.96	1.94	1.23	1.72	1.30	1.61	-0.42	-0.63	-0.95	-1.31	-2.55	-2.74
2000	-2.83	-2.38	-2.78	-2.72	-0.04	1.29	1.67	1.65	1.83	1.47	1.69	1.54
2001	1.35	1.96	-0.70	-1.22	0.05	0.05	0.15	0.42	0.59	1.93	1.92	1.97
2002	1.96	1.79	1.83	2.10	3.22	-0.13	-0.64	-0.32	-0.95	-0.74	-1.43	-1.64
2003	-2.09	-1.85	-2.17	-2.16	0.61	0.66	1.20	0.83	1.31	1.06	1.64	1.73
2004	1.63	-0.47	-0.08	-0.91	0.79	0.46	0.71	1.67	0.63	1.40	2.26	2.01
2005	3.35	0.04	-0.57	-1.12	-1.78	-2.63	-2.80	-2.72	-2.67	-3.20	-3.23	-3.74
2006	-3.34	-3.39	0.64	-0.22	-0.37	-0.68	0.09	0.31	0.51	1.07	1.38	1.84
2007	2.18	2.26	-0.19	-0.14	-1.00	-0.98	-0.94	-0.73	-1.52	-1.38	-1.90	0.30
2008	0.53	1.78	2.25	2.32	2.72	3.04	3.71	3.04	4.59	4.36	3.93	4.52
2009	3.73	3.73	3.72	4.27	4.37	4.34	4.58	4.99	4.41	6.56	6.10	6.32
2010	5.56	4.92	4.20	3.31	3.40	4.29	4.52	3.99	3.81	2.91	2.60	2.15
2011	1.67	2.20	1.77	2.98	3.07	3.64	-0.07	-0.70	-0.48	-0.84	0.52	0.94
2012	0.89	-0.17	-1.29	-1.51	-2.24	-3.06	-4.35	-4.28	-3.37	-2.62	-3.07	-3.14
2013	0.72	1.12	1.00	2.27	2.86	3.10	-0.02	-0.73	-1.44	-1.20	-1.31	-1.25
2014	-1.12	-0.74	-1.18	0.56	0.15	1.14	1.17	1.96	2.36	3.04	3.04	2.77
2015	2.38	2.01	1.56	1.14								

Monthly PDSI for Illinois 1998-2015 (www.sws.uiuc.edu/atmos/statecli/climate-change/ildrought.htm)

Historical datasets may not necessarily be consistent in length, frequency and seasonality. Furthermore, water levels have been collected from various data sources including third party consultants, various state and federal agencies, as well as other researchers unaffiliated with HMS. Thus, some variability exists in the background datasets and should be evaluated with these variables in mind. These data provide a reasonable interpretation of historical conditions and provide a basis for future comparisons of future groundwater level data.

Most historical groundwater level data have been collected using manual water level indicators accurate to ±0.01 foot. Other water levels are collected using automated monitoring devices. These devices allow for higher frequency of data collection events. Historical groundwater elevations are plotted on cumulative frequency plots, which are provided in Attachment 1-C. Cumulative frequency plots allow the historical water level data to be displayed graphically. These plots are useful since they show the number of measurements, range of observed elevations and proportion of observations that are less than or equal to particular values. The range of elevations and median level are important in establishing the historical datasets. The shape of the cumulative frequency curves is valuable when considering the importance of a particular elevation.

Water level frequencies can be assessed in terms of absolute elevations or relative differences, including proportions or percentages. These comparisons can be established using historical data or data collected in the future. The information provided on the cumulative frequency plots, including the range of elevations and shape of the frequency curve, will be used in the evaluation of future groundwater elevation monitoring data. The background datasets were developed using as much as the historical data as possible to account for natural variations and fluctuations in groundwater levels. The low water level “trigger” elevations were determined using the lowest 5% of data presented on cumulative frequency plots that exclude drought data. The cumulative frequency plots for applicable monitoring wells are included in Attachment 1-C. Low water level trigger elevations for individual wells are summarized in Table 2-2.

2.2 River South / River South Bluff Parcels

Manual groundwater level measurements have generally been recorded at monitoring wells in the River South and River South Bluff Parcel on a quarterly basis. Monitoring was initiated in September 2005 with the installation of well nests RP-1S/RP-1D and RP-2S/RP-2D as shown on Figure 2-1. Additional wells were installed in July 2012 and October 2014. Groundwater flow in these parcels is generally west to east, as described in AECOM, 2009 and 2015a. Upward gradients are observed occasionally on the bluff and in the wetland areas of these parcels as indicated on the site hydrographs and described in AECOM, 2009.

Automated water level recordings taken every 4 hours at well pairs RP-1D/RP-1S and RP-2D/RP-2S were also collected over an approximate 1½ year period from March 2012 to November 2014. Nearby monitoring wells RP-3S East and RP-3S West were installed in July 2013 and began automated water level monitoring shortly after installation. Groundwater levels from automated and manual readings are included in the River South Parcel hydrograph included in Attachment 1-B. Daily precipitation data recorded at the Lewis University Airport in tenths of millimeters (NCDC, 2015) are also included on the hydrograph. A statistical summary of all input data for these hydrographs is included in Attachment 1-A.

The groundwater level hydrographs indicate that monitoring wells on the River South Bluff Parcel are sensitive to precipitation. Quick spikes in groundwater elevations correlate to rainfall events. Spikes from rainfall events slowly dissipate until the following rainfall event occurs (refer to Figure 4-1 in

AECOM, 2015b). The shallow subsurface geology in this parcel consists of coarse alluvium deposits (Willman, 1971) which are overlain by gravel fill at the surface. Coarse sand and gravel deposits of the Mackinaw Formation are in close proximity to the northwest and southwest. Thus, fast water level response to precipitation events and dramatic increases in groundwater levels to significant rainfall events is not unusual for these wells.

Monitoring well RP-1D appears to experience elevation drops relatively quickly after rainfall events when compared to RP-3S East and RP-3S West. Monitoring well RP-1D will be a focus during gallery operations and quarry expansion routine monitoring since it is sensitive to precipitation and is predicted to have some drawdown during quarry construction based on predictive groundwater modeling simulations. Average head conditions at RP-1D could decrease about 1.5 feet over the course of the remaining years of surface mining during West Quarry construction without avoidance measures.

Targets for Future Monitoring

Groundwater elevations will be collected routinely at nearly all of the monitoring wells in the River South and River South Bluff Parcels. Wells will have different frequencies of measurements based on distinct monitoring periods during the permitted time frame as graphically depicted on Table 2-1. Monitoring periods vary primarily with changing site activities, which are discussed in greater detail in Section 3.0. Monitoring frequencies also vary based on location of the monitoring wells and their relative position to the infiltration galleries, whether upgradient or downgradient.

The groundwater monitoring schedule is summarized in Table 2-2. Thirteen (13) monitoring wells in the River South Bluff Parcel and two (2) wells in the River South Parcel will be monitored as part of the HCP. One site well will be excluded from routine monitoring (RP-6A) since it is completed in the overburden deposits and is dry. It was installed to evaluate the potential for groundwater flow occurring on the bedrock surface. Well RP-6A will not be abandoned so it is available for assessment monitoring should it be necessary. However, erroneous water level readings can easily be obtained at this well since water is maintained in the bottom cap of the well. Caution in interpreting water level readings from this well is required. This well may be monitored occasionally but will not be part of the routine monitoring program.

Several monitoring wells in these parcels are of particular interest for the following reasons:

- Significant available historical data
- Locations either upgradient of or immediately downgradient of the galleries
- Locations between galleries which may not be affected by supplement water
- Deeper screened intervals
- Screened intervals within the Des Plaines River Valley

Rationale for wells to be included in the monitoring program and key aspects of the various monitoring wells in the River South Parcels are summarized in the following matrix.

Monitoring Well (RS Bluff Parcel) (except where noted)	Rationale for inclusion / Role in Monitoring Program
RP-1D & RP-1S	Deeper well screened at a depth of approximately 150 feet below ground surface (ft. bgs) that will likely not be affected by infiltration of supplemental water; Pair can determine vertical gradients; Northern-most wells; Significant number of historical readings.
RP-2D & 2S (River South Parcel)	Monitoring wells in River South Parcel (Des Plaines River Valley); Significant number of historical readings
RP-3S East & West	Paired well set to evaluate horizontal gradients in location between Galleries A and B; several years of available data for wells that may not be impacted by infiltration water.
RP-4S	Downgradient of Gallery B
RP-5S East & West	Paired well set located downgradient of Gallery C, can evaluate elevations and horizontal gradients
RP-6S	Southern-most well, easily accessible
RP-8S East & West	Immediately upgradient of W-1 seep and immediately downgradient from Gallery A location, respectively
RP-9S North & South	Both wells are downgradient from Gallery A location and important to verify flow directions
RP-10S	Upgradient of all galleries

2.2.1 W-1 Seep Temperatures

Temperatures of discharge water from the W-1 seep in the River South Parcel have been recorded every four hours (six times daily) during a roughly 3½ year period extending from November 2014 through March 2018. The W-1 seep occurs at the base of the River South Bluff just east of monitoring well RP-8S East, as shown on Figure 2-1. The temperature recording instrument is positioned about 40 to 50 feet east of the bluff at the failed W-1 weir location. The water temperatures have varied from 3.9˚C to 16.6˚C during this period. This temperature minimum and maximums were recorded in early March and July/August, respectively. The highest average temperatures (14.41˚C) were recorded in September, whereas the lowest average temperatures (8.80˚C) were recorded in February. These readings indicate a slight buffering of groundwater temperatures when compared to air temperatures, since air temperatures typically peak in July and are at their lowest at the end of January in the Romeoville area (NCDC, 2015).

The results of the W-1 temperature monitoring are summarized in Attachment 1-E. These temperatures provide a basis for on-going evaluation of seep water temperatures as described in Section 4-4.

2.3 LPNP and FPDWC Pond Area

Groundwater elevations at LPNP were collected from third party consultants and researchers who monitored at least a portion of the monitoring wells associated with LPNP since 2001. The water level monitoring data collections varied from monthly measurements (from 2001 to 2007), to more recent seasonal measurements (2011 to 2013) that were collected weekly from July 2011 to December 2013. Groundwater elevation data collected at LPNP from 2001 to 2013 are summarized in Attachment 1-A.

Historical water level data were collected at a total of fifty (50) monitoring wells and temporary monitoring wells, in addition to water level collection along two rivulets and a pond as illustrated on Figure 2-2A&B. Twenty-seven (27) of the fifty (50) monitoring points were 2" diameter PVC monitoring wells that are protected within steel surface casings. These monitoring wells are generally located within nine (9) different well nests positioned around LPNP. The remaining twenty-three (23) monitoring points consisted of unprotected 1" diameter temporary PVC wells that appear to have been damaged during controlled burns conducted in the prairie and therefore are no longer serviceable for future monitoring. Inspections by AECOM field personnel indicate that several of the existing 2" PVC monitoring wells appear to be in good condition and viable candidates for future monitoring. To the best of our knowledge, the following monitoring wells are serviceable and will be utilized to evaluate groundwater levels within LPNP and areas upgradient of it:

- MW-6A, MW-6B, MW-6C & MW-6N
- MW-7C & MW-7D
- MW-8A & MW-8B
- MW-9A & MW-9B
- MW-11A, MW-11B & MW-11C
- MW-12B & MW-12C

Due to their diverse topographic positions and locations, these wells offer a wide array of groundwater level data that will be collected and inspected for potential variations in groundwater levels at LPNP. Other monitoring wells were not chosen for routine monitoring since they may be influenced by groundwater withdrawals from Crest Hill municipal wells or by surface water levels such as those located in close proximity to the Des Plaines River. Additional available LPNP wells will be measured should assessment monitoring be triggered to collect more information to evaluate the need for potential adaptive management strategies.

Two additional monitoring wells (G101 and G102) will be installed downgradient of the FPDWC Pond as illustrated in Figure 2-3. These shallow monitoring wells will be installed east and southeast of the FPDWC Pond to assess potential changes in groundwater levels and water quality from infiltration of pond water. Monitoring well G101 will attempt to be located on the embankment of Route 7 on the east side of the road. There is a narrow portion of the embankment within the right-of-way that appears to be suitable for a drill rig to get into and install the monitoring well. HMS will obtain the required permits and approvals to access this location for drilling and monitoring activities. A stick-up well completion will be sought for well G101. Monitoring G102 is proposed to be located along the east side of the access road that runs along the former EJ&E tracks in the northern portion of LPNP.

Routine monitoring at new LPNP wells G101 and G102 will include collection and analysis of groundwater level and water quality data. Additionally, the water level in the FPDWC Pond (monitoring point "FP-1") will be monitored throughout the West Quarry mining and recovery period

using an automated recording device. A manually-recorded graduated staff gauge will also be installed in the pond to collect corroborating data and for calibration of the automated recording device. Groundwater levels at G101 and G102 will be assessed during initial testing and monitoring of the infiltration pond. While these wells will not have significant historical datasets, they will be useful in monitoring future trends that can be used to evaluate the effectiveness of the AMM through development of a background dataset.

2.3.1 Additional Background Data Collection for FPDWC Pond Area

Field activities associated with collection of new background monitoring data for the FPDWC Pond will be initiated within 60 days of HCP approval. Groundwater monitoring wells G101 and G102 will be installed to further assess hydrologic conditions in the immediate area of the pond prior to, during, and after its construction. New groundwater quality data collected from monitoring wells G101 and G102 will supplement the water quality data collected during background water quality evaluation for the proposed FPDWC Infiltration Pond (AECOM, 2018).

Preliminary activities will include securing permits and access agreement with Illinois Department of Transportation (IDOT) and the FPDWC for the installation of monitoring wells G101 and G102, respectively. The wells will consist of 2-inch diameter Schedule 40 PVC that will be installed in 6-inch diameter boreholes advanced using traditional rotary methods. Boreholes will advance to an approximate depth of 12 to 15 feet into bedrock and completed using 10-foot well screens with 0.010-inch factory slotted openings and backfilled with 20/40-sized coarse filter pack silica sand. The sand pack will be extended to a depth of 2 to 4 feet above the top slotted interval and sealed with bentonite chips. The remainder of the annular space will be backfilled with either a high-solids bentonite grout or bentonite chips that will be hydrated on regular intervals. A stick-up monitoring well surface completion will be sought through IDOT permitting to make the well more accessible for sampling and to reduce the potential for cross-contamination from surface water runoff. If necessary, concrete filled bollards will be installed to protect the well along Route 53. Both monitoring wells will be developed using surge and purge methods to entrain fine particulates within the filter pack. In-situ hydraulic conductivity tests will be performed at each well after well development.

Groundwater quality at G101 and G102 will be sampled for a variety of water quality parameters (specified below) to assess “pre-mitigation” background conditions. Water level and water quality data will be collected prior to the construction of the FPDWC Pond. Four discrete sampling/monitoring events will occur at monitoring points around the pond at the following locations:

Water Level Monitoring Locations			**Water Quality Monitoring Locations**
G-101	MW-7C	MW-11A	G-101
G-102	MW-7D	MW-11B	G-102
MW-6A	MW-8A	MW-11C	
MW-6B	MW-8B	MW-12B	
MW-6C	MW-9A	MW-12C	
MW-6N	MW-9B		

Scheduling of the four monitoring events will be partially dictated by the pond construction timetable. Background monitoring at G101 and G102 is scheduled to occur quarterly (once every

three months) during the permit's first year. However, background monitoring will be condensed to a minimum of 8-months, so background sampling/monitoring can occur prior to the construction of the pond. In this scenario, sampling would be scheduled every other month. Daily water levels will be collected at wells G101 and G102 during the first year of operation to assist in evaluating potential seasonal effects of the Pond's flow to LPNP. Furthermore, temperature and specific conductance will be monitored continuously at G102 (every 4 hours) throughout the usage of the FPDWC Pond.

Background groundwater quality assessments will include a variety of field stabilization and indicator parameters. Field parameters will include: pH, specific conductance, temperature, turbidity, oxidation-reduction potential (ORP) and dissolved oxygen (DO). The parameters will be analyzed by field instruments during low-flow sampling techniques. Water will be collected by both – field filtering prior to collection and not field filtering the samples. Analysis of the filtered (dissolved) and unfiltered (total) metal fractions will allow assessment of the propensity of metals to adsorb to suspended matter and interfere with accurate estimations of aqueous concentrations. The constituent list for background sampling will include metals (Al, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Ni, K, Se, Ag, Na, Th, V, Zn), anions (Cl, SO_4, CO_3, HCO_3), and indicator parameters (alkalinity, NH_4, NO_3, total nitrogen, total phosphorus, and total dissolved solids). In addition, at least one sampling event will include volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). The analytical methods and detection limits will remain consistent with the background sampling summarized in AECOM, 2018. The lower limit of quantitation (LLOQ) will be sought for these compounds so evaluation of detected concentrations can be made against U.S. EPA Region 5 ecological screening levels.

These chemical constituents will provide data for evaluating some of the common types of biogeochemical reactions affecting transport of solutes in groundwater and surface-water, including acid-base reactions, precipitation and dissolution of minerals, sorption and ion exchange, and oxidation-reduction reactions. The water quality results will be compiled in a database for the creation of time-trend graphs, comparison to applicable water quality standards listed in Attachment 2 – Table 1, refinement of background concentrations, and future comparisons of new data to background or regional water quality results.

After the initial pre-pond construction sampling is complete, groundwater level and water quality assessment will continue during the initial testing of the pond - and beyond, to assess potential changes to area hydrology in response to the enhanced infiltration at the FPDWC Pond. The initial performance testing and monitoring scope of work for the infiltration pond is described in Section 3.2.2. Routine water quality monitoring of the FPDWC Pond and LPNP locations are described in Section 4.3.

2.4 North / Far North / River North Parcels and RPNP

Limited historical groundwater level datasets are available for the North, Far North and River North Parcels. Four monitoring wells (NP-2S, NP-3S, NP-5S and NP-6S) were installed in the Far North Parcel in 2013. These monitoring wells are completed within the upper 15 feet of weathered bedrock, so they represent the upper potentiometric surface of the Silurian Aquifer. Existing groundwater data suggests that groundwater levels vary more than 12-feet across the Far North Parcel – from an average of 593.4 feet above NAVD88 or mean sea level (ft. msl) at upgradient well NP-6S to 581.2 ft. msl at well NP-2S. Well NP-6S is located in the southwest portion of the Far North Parcel and NP-2S is located in the eastern portion of the parcel as illustrated in Figure 2-4. The Des Plaines River is located about 800 feet east of NP-2S and has an approximate average stage of 576 ft. msl at this

location. Water depths vary from 3 ft. bgs at NP-2S to 12 ft. bgs at NP-6S. The highest observed water level variations of ~3.5 feet have been observed at well NP-5S and NP-2S thus far.

Groundwater levels in the North Parcel are not projected to show any variability from surface mining for fifteen plus (15+) years. A cone of depression from mining the Middle Parcel will only extend into the North Parcel during mining of the northern-most reserves of Middle Parcel. The cone of depression is not predicted to extend significantly beyond the extents of the limits of the Middle Quarry since the West Quarry will be fully inundated by the time surface mining progresses in the northern portion of the Middle Parcel. Discussion of simulated drawdown in the North Parcel is included in AECOM (2014f).

Since groundwater levels immediately north of the Middle Quarry are not predicted to be influenced by surface mining for some time, there is sufficient time to collect background water level data. At least 15 years are available to collect background data in the Far North Parcel wells prior to possible surface mining influences. Groundwater levels will be collected quarterly in the Far North Parcel monitoring wells for a period of five (5) years after HCP approval to establish a dataset of groundwater level elevations, seasonal fluctuations, and identify low water level triggers. This dataset will be used to compare future groundwater levels to background monitoring data. Background datasets will also be collected at monitoring wells MW-24 and MW-25 located in the southern end of RPNP – north of Romeoville Rd and west of the Des Plaines River. After the background data collection period, monitoring wells MW-24 and MW-25 will be available for routine monitoring.

The frequency of water level measurements at monitoring wells NP-2S, NP-3S, NP-5S, NP-6S and RPNP wells MW-24, MW-25 and PW-4D will be reduced to a minimum of semi-annual monitoring for the duration of the permit after the initial 5-year quarterly monitoring period is complete. However, water level monitoring frequencies will increase to quarterly during: 1.) the first five (5) years of mining in the East Quarry and 2.) the first five (5) years of mining in the Middle Parcel.

Only one well (PW-4D) has sufficient background groundwater level data available to establish a low water level trigger. Well PW-4D is a deeper well, screened approximately 45 to 50 feet below ground surface and was installed in October 2011. This well has been periodically monitored for groundwater levels since its installation. It is believed this well is located in a more-permeable portion of the Silurian Aquifer because of its proximity to Romeoville's Municipal Well No. 3 located on Beverly Griffith Dr. approximately 1.5 miles to the west. Romeoville Well No. 3 yields over 700 gallons per minute (gpm), but groundwater levels at PW-4D varies very little which is indicative of high hydraulic conductivity. The range of recorded water levels – from a maximum level of 592.58 ft msl to a minimum level of 590.19 ft msl, is less than 2.5 feet. Since this well fluctuates so little, the lower 5% groundwater level "trigger" may not necessarily be accurate. Regardless, a low water level trigger of 590.23 ft msl has been established for this well.

2.5 ComEd and Long Run Parcels

Monitoring wells in the ComEd and Long Run Parcels have been used to collect groundwater levels in these areas for nearly a decade. Many of the monitoring well pairs were installed in the fall of 2005, which corresponds to the longest drought observed in the last 15 years. Twelve (12) semi-permanent monitoring wells are located in these parcels. There were many other observation points that have been historically monitored in these parcels as well, including several temporary PVC piezometers and surface water monitoring points installed by AECOM. In addition, groundwater and surface water monitoring locations were added after a third-party oil pipeline release occurred in 2010 that impacted Long Run Parcel.

Select monitoring wells have been identified to continue groundwater level monitoring based on their location, depth of installation and accessibility. The following summary lists the wells that will be maintained in the groundwater monitoring network and their role or rational for inclusion:

Monitoring Well	Rationale for Inclusion / Role in Monitoring Program
CEP-1D (ComEd Parcel)	Deep well in north-central portion of ComEd Parcel; Significant historical data available; The shallow piezometer in the well nest (CEP-1S) is a 1" diameter PVC casing completed near ground surface which is prone to flooding, and therefore not included in monitoring network
CEP-2D & 2S (Long Run Parcel)	Nested well pair in southeastern part of study area; very accessible; next to oil spill containment area; Significant historical data available
CEP-3D & 3S (ComEd Parcel)	Important nested well pair upgradient of ComEd Parcel that show upward gradients with the highest potentiometric levels across both parcels; Significant historical data available; Poor accessibility & difficult to locate
CEP-4D & 4S (Long Run Parcel)	Nested well pair in downgradient position from much of Long Run Parcel and Transplant Area; Significant historical data available; Poor accessibility & difficult to locate
CEP-10S (ComEd Parcel)	Newer shallow bedrock monitoring well located downgradient of Transplant Area
CEP-11D & 11S (ComEd Parcel)	Newer nested monitoring well pair side-gradient of Transplant Area
CEP-12S (ComEd Parcel)	Newer shallow bedrock monitoring well located upgradient of Transplant Area

ComEd / Long-Run Parcels will continue routine monitoring through the pre-transplant and post-vegetation performance monitoring period. The one exception is the monitoring at well CEP-4D, which will continue throughout the entire permit period.

2.6 West Quarry

Groundwater levels have been monitored at several monitoring wells regularly in the West Quarry Parcel since the surface mining in the Parcel began in the mid-1990's. Monitoring wells P-21, P-22, and P-23 are located on the southern side of the quarry between Collegeview Subdivision and the active mining area as illustrated on Figure 2-6. Groundwater levels collected at these monitoring wells have been used by HMS to evaluate groundwater levels at the nearby Collegeview Subdivision water supply wells. Groundwater levels at these wells compare favorably to elevations predicted in groundwater modeling evaluations conducted in the mid-1990's. Groundwater level monitoring will continue quarterly at wells P-21, P-22, and P-23 until water levels respond from the inundation of the West Quarry.

2.7 Water Quality Monitoring

2.7.1 River South / River South Bluff Parcel Background

Several water quality samples were collected prior to- and coincident to- the field testing of infiltration galleries at upgradient, downgradient and source quarry water to analyze the potential for variation in water quality during active infiltration in River South Bluff Parcel (AECOM, 2015a). Additional groundwater samples were collected during the background monitoring period (AECOM, 2009 and AECOM, 2013b). Water quality analyses focused on the major cations and anions which make up the dissolved fraction of the water sources.

Water quality results from field testing indicate that water sources are evenly mixed with cations and there is no dominant speciation. Anion plots suggest the different water sources may be slightly bicarbonate-type dominant. Combined plots indicate that the water sources are well mixed between $CaHCO_3$ type and Ca-Mg-Cl type water. Samples collected at different wells and surface water sources appear to be very similar in chemical composition. Thus, water quality testing indicates that there is no discernable difference in seep or groundwater quality data. Testing also indicated that long-term infiltration of Romeoville Quarry sump water will provide similar water quality to what is observed at local ground- and surface- water sources at the River South Parcels.

Groundwater quality flowing to and out of seeps located on the River South Bluff Parcel will be periodically monitored to confirm the effectiveness of on-going avoidance measures implemented on the parcel. Future water quality monitoring for the HCP is addressed in Section 4.3.

2.7.2 FPDWC Pond Area Background

A dataset of water quality information – from surface water and groundwater sources – has been collected in and around the proposed FPDWC Pond area to characterize existing or "background" conditions (AECOM, 2018). The characterization was completed prior to potential site disturbances from construction and use of the infiltration pond that will be completed after issuance of HMS' HCP and associated permits. Upper and lower background concentrations were developed from the FPDWC Pond dataset, which are estimated concentrations based on the quarterly sampling conducted from the 4th quarter 2017 through the 3rd quarter 2018 at three local monitoring wells. These concentrations allow for a better assessment of new water quality data. Further assessment of the FPDWC Pond area will be conducted as part of the HCP implementation. Supplemental background water quality data collection for the FPDWD Pond is discussed in Section 2.3.1.

2.7.3 Water Quality Background Dataset

A statistical summary of major water quality constituent concentrations in groundwater and surface water is provided in Table 1 of Attachment 2. This dataset includes water quality results collected primarily by AECOM from surface and groundwater sampling locations at the Romeoville Quarry and local Forest Preserves. Groundwater samples represent both shallow and deep portions of the Silurian Aquifer based on the well screen interval. Applicable concentrations for future water quality comparisons have been set to be the maximum detected or upper 99% confidence interval (C.I.) about the mean based on number of samples and variability within dataset. The statistical summaries provide a general range for anticipated conditions for consideration of future data comparisons.

Statistics of the major cations and anions collected across Will County are also summarized to provide additional information on the spatial and temporal variations of the background water quality dataset (Roadcap, Cravens and Smith, 1993). The county-wide groundwater data are useful for secondary

comparisons to account for possible spatial and/or temporal variability that exists in groundwater due to the human influences associated with changing urban development and agriculture. As stated in Roadcap, Cravens, and Smith (1993), "*…the natural quality of the groundwater in the Silurian dolomite is quite variable, both horizontally and vertically, and because the natural groundwater quality has been affected by human activities that are changing in both time and space, it is difficult to discern to what extent groundwater quality is naturally occurring versus human-influenced."* The expanded Silurian Aquifer water quality dataset may shed light on what is the expected range for the same constituents in the same (or very similar) hydrostratigraphic settings.

3.0 Time Periods of Groundwater Monitoring

Various avoidance and habitat restoration activities proposed for the Romeoville Quarry have varying degrees of projected effects on the hydrology at local parcels. The potential impact to covered species habitat varies based on proximity to the surface mining activities, avoidance measures and restoration activities. The groundwater monitoring plan has been developed to account for various risk tolerances by adjusting monitoring frequencies and data review at each of the applicable parcels or group of parcels. A chronological progression of changes in the monitoring program has been developed as described below.

3.1 Background Monitoring Data Collection – North, Far North and River North Parcels

Groundwater levels will be collected quarterly at four monitoring wells in the Far North Parcel for a period of five (5) years after the Incidental Take Permit (ITP) is issued to establish a dataset on groundwater level elevations and seasonal fluctuations. Groundwater levels are not predicted to be influenced by surface mining for some time in the North Parcel. There will be sufficient time to collect background water level data at the wells illustrated in Figure 2-4 that will be used to interpret groundwater levels in the North, Far North, and River North Parcels. At least 15 years are available to collect background data in this vicinity prior to the potential drawdown occurring in the North Parcel from the mining of adjacent Middle Parcel as discussed in AECOM, 2015b.

The background dataset will be used to compare future groundwater levels to historical monitoring data. The frequency of water level measurements will be reduced to a minimum of semi-annual (routine) monitoring for the duration of the permit after the initial 5-year quarterly monitoring period is complete. The lone exceptions are quarterly monitoring which will commence during the first five years of mining in the East Quarry and Middle Parcel.

3.2 Preliminary Testing and Monitoring – River South and FPDWC Pond

Measures to avoid potential impacts to local hydrology will be implemented by HMS after the ITP is issued. These measures include: 1) supplementing shallow groundwater in River South Bluff Parcel, and 2) enhancing surface water infiltration upgradient of LPNP. Once these avoidance measures are implemented, an initial assessment of each of the measures will be conducted. Initial assessments will progress in the River South and River South Bluff Parcel by pumping water to the infiltration galleries and monitoring water level changes. The infiltration pond on FPDWC property will be assessed through natural inundation. Discussion of the initial testing and monitoring at these parcels are provided in Sections 3.2.1 and 3.2.2, respectively.

3.2.1 Preliminary Evaluation of River South Bluff Parcel Infiltration Galleries

The amount of supplemental water to be delivered to the infiltration galleries has been estimated by evaluating the effect infiltration galleries have on groundwater levels in groundwater modeling simulations. Thus, groundwater modeling evaluations have estimated the rate of water required in the galleries to maintain groundwater levels in the River South and River South Bluff Parcel during construction of the West Quarry. Simulations add water to the model at nodes positioned at the

location of the proposed galleries. Infiltration rates are simulated to incrementally increase during West Quarry construction to maintain consistent water levels. Infiltration rates are projected to increase yearly from 3 gpm to 40 gpm during build-out of the West Quarry. While groundwater levels will vary significantly based on precipitation, seasonal averages are anticipated to remain near historically observed levels. Additional supplemental water will be provided to the galleries as necessary to meet water level demands.

The exfiltration from the infiltration galleries is difficult to estimate since the water balance of the galleries (flow in and out) is unsteady due to varying exfiltration rates at different head conditions and the variability of inflow rates. The relationship between infiltration rate and result in head change at the water table will be estimated during design and verified during initial testing.

Initial testing of the River South Bluff Parcel infiltration galleries will occur shortly after installation to evaluate the efficiency of each gallery at infiltrating supplied water and raising groundwater levels. Preliminary testing and monitoring events will be staged so that each gallery is tested individually at varying infiltration rates, followed by a comprehensive stepped test of all three galleries simultaneously. The staged approach for testing the galleries can be compared to a stepped pumping test that is used to evaluate the hydraulic properties of a water well and its connectivity with an aquifer.

Initial hydraulic testing will consist of pumping water into each newly constructed gallery at progressively increasing rates and monitoring water levels and temperatures within the gallery and at nearby monitoring wells. Since only subtle changes to the groundwater levels may occur, preliminary testing will be conducted over several days at each infiltration gallery location so minor nuances in the water level data can be ascertained. Water levels will be monitored with automated recording devices at frequencies no greater than ten (10) minutes in the galleries and at nearby monitoring wells during individual gallery testing.

River South Parcel and River South Bluff Parcel wells will be monitored at least weekly during the preliminary testing period. Since gallery testing may occur over the period of two weeks, monitoring will not occur simultaneously at all site wells since the field testing will be focused on each individual gallery which is being tested. Several monitoring wells, including RP-1D, RP-2S and RP-10S, will be monitored continuously at a minimum of 1-hour intervals throughout initial gallery testing to collect background data and potential downgradient water levels changes.

The preliminary testing plan includes three unique tests at the following galleries:

- Gallery A (Northern Gallery) – Water levels and temperatures will be recorded in the gallery and at wells RP-1D, RP-1S, RP-2S, RP-2D, RP-8S East, RP-8S West, RP-9S North, RP-9S South, RP-3S West and RP-3S East. The W-1 seep discharge will be periodically monitored for temperature, pH, DO, and conductivity. Discharge rates will also be estimated at W-1 location.
- Gallery B (Middle Gallery) – Water levels and temperatures will be recorded in the gallery and at RP-3S West, RP-3S East, RP-4S, RP-2S and RP-2D.
- Gallery C (Southern Gallery) – Water levels and temperatures will be recorded in the gallery and at wells RP-2S, RP-2D, RP-5S East and RP-5S West.

Seep discharge will be monitored downstream of Galleries B and C (if present). Field personnel will also look for seeps occasionally during and at the end of each of the preliminary tests of galleries B

and C. If new seeps are found, their location will be documented, and a flow rate will be approximated. This information will be used to more fully assess the effects of the infiltration galleries and the hydrology of the River South habitat.

If present at the start of testing, seep discharge monitoring downgradient from Galleries B and C will include water quality monitoring (temperature, pH, DO, ORP, and conductivity) and flow rate monitoring at locations where flow is present and can be reasonably estimated. Seep discharge measurements are nearly impossible to collect due to bypass-flow through highly weathered bedrock at the surface and interflow through the railroad ballast. Regardless, attempts will be made to estimate seep discharge rates to elaborate on the stage-discharge relationship established at W-1 seep location (AECOM, 2015). Re-evaluation of potential seep discharge will be conducted prior to each of the individual gallery tests. Individual gallery testing will be followed by a stepped test of the entire infiltration system where water is supplied to all three galleries simultaneously.

Preliminary testing of Gallery A will include water quality sampling of environmental indicator parameters (as specified on Table 2-4B) at monitoring wells RP-1D, RP-8S West, RP-8S East, W-1 Seep, and RP-10S (as specified on Table 2-4A). Samples will be collected immediately prior to and after preliminary testing events at each infiltration gallery. Follow-up sampling will be conducted quarterly during the first year of operation to confirm the preliminary results. Semi-annual and annual samples will be collected at key monitoring wells and at the W-1 seep during routine monitoring after the first year of operation. The schedule of water quality sampling is outlined on Table 2-4A. Water quality constituents are summarized on Table 2-4B and discussed in Section 4.3. Water samples will be collected in accordance with the procedures outlined in Section 7.4.

Objectives of the initial testing include the following:

- Estimate maximum infiltration rates at each gallery location,
- Evaluate infiltration rate changes as a function of head within each gallery, and
- Estimate linear and non-linear head changes in adjacent monitoring well locations as function of infiltration rates.

Storage times and anisotropy ratios of the overburden and bedrock may also be estimated based on the gallery testing.

The stepped-infiltration tests are designed to investigate the performance of the aquifer and gallery under variable infiltration rate conditions. Infiltration rates will be increased from an initially low constant rate through a sequence of progressively higher infiltration rate intervals. The head levels in the gallery will be allowed to generally stabilize at each progressive pumping rate. This process will be repeated for a total of four (4) intervals over a two (2) day period. Initial testing will be conducted in a manner that sufficiently stresses the gallery and allows time for water levels to reach equilibrium within the gallery during each infiltration rate. Estimation of infiltration will be calculated from the pumping and water level data. These estimates will be used for future adjustments to the infiltration system and can be used to adjust groundwater modeling scenarios if needed.

The performance of the galleries will be investigated to determine head losses as a function of infiltration rates. Aquifer loss, as well as linear and nonlinear head losses in the gallery, will be evaluated to determine its efficiency. A working yield of each gallery can be estimated.

Specific details of the test procedure are provided below:

Antecedent Monitoring – Prior to beginning of testing, background static water levels in the aquifer will be recorded to account for natural or manmade trends in groundwater levels that might impact the outcome of the test. Static water level measurements will be taken at a minimum of one reading every hour for at least a 24-hour period prior to initial testing.

Infiltration Rates - Provisions will be made so flows to the galleries are maintained at a relatively constant rate over the course of each step. Periodic measurements of flow rates will be made so that the discharge rate is reasonably accurate.

Head and Recovery Measurements – Water level measurements will be continuously recorded at a minimum of ten (10) minute intervals in the gallery and adjacent observation monitoring wells before and after gallery testing. Recovery of the aquifer after infiltration will be monitored to assess the hydraulic characteristics of the aquifer.

Analysis of Data - The hydraulic characteristics for each gallery will be evaluated based on infiltration rates versus head levels within the gallery, increase in groundwater level as a function of elapsed time and distance of the well from the gallery. The presence of boundary conditions and evidence of anisotropic responses will also be evaluated.

3.2.2 Preliminary Evaluation of FPDWC Parcel Infiltration Pond

The FPDWC infiltration pond will be monitored after its construction to evaluate its effectiveness to create and maintain a hydraulic boundary between LPNP and West Quarry recharge areas. Preliminary testing and monitoring will be focused on estimating the pond's water balance and recording nearby groundwater levels. A pressure transducer with automated data recording capabilities will be used to record water levels in the pond at 10-minute intervals during preliminary testing. In addition, rates of inflow-outflow, precipitation and evaporation will be estimated during this period. Measurements of inflow and outflow rates will be conducted during site visits, if possible. Field measurements will be compared to flow estimates developed from readings of pressure transducers positioned at flow-through structures positioned upgradient and downgradient of the pond in sections of channelized flow. Precipitation and evapotranspiration weather data will continue to be obtained at Lewis University and O'Hare Airports, respectively.

Water levels in the pond will be compared to adjacent groundwater levels. The two new shallow monitoring wells, G101 and G102 along with existing LPNP well MW-6A will be monitored on 4-hour intervals during the preliminary testing period of the pond. In addition, existing wells MW-6B, MW-6C, MW-6N, MW-8B, MW-9A, MW-9B, MW-11A, MW-11B, MW-11C, MW-12B, and MW-12C will be monitored twice a week during preliminary testing, which will last three (3) months after its construction. Periodic inspections for seeps at or near the LPNP bluffs downgradient of the FPDWC Pond (and well G101) will also be conducted when field personnel are near G101. However, it should be noted that seeps along the toe of LPNP's slope have been observed to fluctuate considerably seasonally. Personal observations of these seeps suggest that they are difficult to locate and fluctuate seasonally (and year over year), and lack specific background data on flow rates. Therefore, reviewers are cautioned that periodic inspections of seep discharge do not provide substantiating evidence for or against the Pond's performance.

The response of water levels in these monitoring wells will be evaluated by comparing: the build-up of groundwater during rainfall events, the maintenance of levels at full stage, and the decline of water within the pond during dry periods. A hydro-period analysis of the pond will be conducted so that estimated groundwater infiltration rates can be projected into the future based on the volume of

surface water runoff collected in the pond, and the effect this water would have on groundwater levels. Long-term water level monitoring frequencies in the pond (FP-1) will be maintained at hourly intervals throughout surface mining operations in the West Quarry and continue until the cessation of the River South infiltration galleries. FP-1 will be accessed monthly for data download and reviewed at least on a seasonal quarterly basis. Field documentation, water level measurement, water quality sampling and inspection techniques will be recorded in accordance with the procedures provided in Section 7.2.

3.3 Groundwater Level Monitoring during West Quarry Inundation

Groundwater modeling simulations of the surface mining and subsequent inundation of the West Quarry indicate that groundwater levels will return to baseline conditions reasonably quickly with the most distal areas of the cone of depression recovering within a few years, whereas areas adjacent to the Quarry on HMS property may require the better part of a decade to equilibrate. Thus, the response of groundwater levels to inundation of the West Quarry and its return to baseline conditions vary based on proximity to it and are largely dependent on precipitation. Baseline conditions are those that were observed prior to the issuance of the Habitat Conservation Plan for this site.

Potential drawdown of the Silurian Aquifer would be at a maximum in areas adjacent to the West Quarry. The drawdown would decrease as distance from the Quarry increases. Groundwater level changes are not anticipated at the FPDWC Pond or at locations south of it during construction of the West Quarry. Conversely, wells P-21, P-22, and P-23 located immediately south of the West Quarry that monitor groundwater levels near Collegeview Subdivision will observe significant increases in groundwater elevations during inundation of the quarry. These increases will occur over an extended period until the water level within the West Quarry equilibrates. The River South Bluff Parcel will experience a faster response in groundwater levels compared to the P-series wells since they are further away.

Modeling simulations using a conservative recharge inputs indicate baseline conditions within the River South and River South Bluff Parcel will occur within three (3) years of the West Quarry beginning to fill. Modeling simulations assume constant recharge rates, so water level recoveries will be different based on variable inflow rates and precipitation. However, groundwater modeling is the best way to estimate the response to inundation of the West Quarry since recharge was held constant, and at a conservative rate.

Active infiltration coupled with groundwater level and water quality monitoring will continue in the River South Parcels for a period of no shorter than three (3) years after West Quarry begins to fill. This period of time is referred to as the West Quarry Inundation Period. The West Quarry inundation phase will begin when the Quarry begins to fill and end after three years provided the following criteria are met: 1) monitoring data at the prescribed monitoring wells do not exhibit water levels that are less than the lower 5% trigger elevation, 2) yearly water level averages are observed to be about equal to or greater than background averages (± 0.5 ft.), and 3) observations of seep locations remain consistent. Groundwater monitoring and infiltration will continue until the preceding water level criteria are met.

Once these criteria are met, a notification of discontinuation of the infiltration gallery operations will be submitted and will serve as the end of the West Quarry Inundation Period. The notification will provide the initial three years (or more) of data that justifies the termination of the River South Bluff Parcel as an avoidance measure. Water quality monitoring at the River South Parcel, River South Bluff Parcel,

FPDWC Pond, and LPNP will also terminate once the River South Infiltration Galleries are discontinued.

3.4 Post-West Quarry Inundation Monitoring to Cessation of Monitoring

After potential groundwater level responses indicate that baseline conditions are met and maintained, *water level* monitoring will continue at LPNP, FPDWC Pond, and the River South (River and Bluff) Parcels for a period of three years after West Quarry Inundation Period concludes – or 6 years after the West Quarry begins to fill (provided the water level response criteria are met). Thus, the West Quarry inundation includes a ~3-year response time for groundwater levels to return to baseline conditions, and a ~3-year post-response verification monitoring period provided the water level response criteria are met. Post-West Quarry inundation monitoring period will be used to confirm that groundwater levels are being maintained at baseline (pre-permit) conditions. In addition, the Post-West Quarry inundation monitoring will be used to collect data to evaluate if unforeseen conditions of mining in the Middle Parcel and/or mining and filling of the West Quarry have occurred.

Three (3) criteria will be used to determine if water levels have successfully maintained baseline levels after AMMs are discontinued:

1.) Seasonal mean groundwater levels are equal to or greater than historical seasonal mean water levels for the majority of three-year period (9 out of 12 seasonal quarters),

2.) All twelve seasonal quarters within the three-year monitoring period must be within the range of historical mean values, and

3.) There must not be any monitoring well (or wells) that has triggered (by either manual or automatically recorded water level data) Assessment Monitoring protocol during the final 2-years of monitoring within the Post-West Quarry Inundation Period.

Baseline conditions are assumed to be historical mean (≥50% of cumulative frequency) and seasonal mean levels as summarized on Table 2-3. Groundwater levels will be considered at baseline levels when mean and seasonal mean levels are maintained at or above historical mean and seasonal mean water levels without supplemental water input for a minimum of 9 seasons over a three-year (12 season) period. This frequency will allow for the potential for below average precipitation during a season or two during this evaluation period. Average water levels throughout all 12 seasonal periods, however, must be within the range of historically observed averages. In addition, individual readings collected will be compared to groundwater elevation low-level trigger elevations. There must not be any monitoring well (or wells) that has triggered (by either manual or automatically recorded water level data) Assessment Monitoring protocol during the final two-years of monitoring within the Post-West Quarry Inundation Period. The low-level groundwater elevation triggers were developed using historical groundwater elevation data as described in Section 2.0. The background dataset excludes drought data recorded in October 2005 through February 2006; and June through December 2012, so the low water level triggers are conservative.

Groundwater levels observed to be lower than historical elevations would constitute an unacceptable impact. Should such an elevation be confirmed, then additional monitoring would be conducted and an evaluation into possible causes would be conducted. However, an impact to water levels south of the HMS facility is not likely after inundation of the West Quarry since mining in the Middle Parcel is located north of the existing Middle Quarry. Such an impact to groundwater levels would most likely be beyond the adaptive controls of HMS.

A notice of cessation of monitoring in the River South Parcels, FPDWC Pond, and LPNP will be submitted with the groundwater level monitoring data from these areas collected during the Post-West Quarry inundation monitoring period that exhibits compliance with the three criteria listed above. The infiltration galleries will be decommissioned when no longer needed as avoidance measures. Routine monitoring will continue in the North / Far North / River North and ComEd and Long Run Parcels throughout the entire HCP permit period.

3.5 Monitoring of Transplant Area

Groundwater monitoring in the ComEd and Long Run Parcels will continue on a semi-annual basis until the wet-mesic dolomite prairie is transplanted from Middle Parcel. Groundwater resources on the east side of the Des Plaines River and Canals are hydraulically separated from the surface mining activities occurring on the west side of the River. HMS has no control over groundwater within the habitat areas of these parcels. Groundwater levels across the ComEd Parcel and the northern portion of Long Run Parcel will be monitored to detect any changes during or after the transplant.

The transplant of the vegetation to these parcels will occur about three (3) years after the HCP permit is received. A couple years of removing soil and vegetation on Middle Parcel south of the transplant area (wet-mesic dolomite prairie) will be needed prior to reaching this area. Transplanting is projected to occur in the third year and require about a year to complete. Thus, performance monitoring of the transplanted vegetation will begin approximately the third or fourth year of the permit. The performance monitoring period for the vegetation is five (5) years and will include quarterly groundwater level monitoring. Semi-annual groundwater monitoring is projected to continue for another five (5) years to provide for establishment of the vegetation and satisfaction of the performance standards.

Vegetation performance standards are required to be maintained for the entire permit period. Groundwater monitoring outside of well CEP-4D could be resumed if vegetation monitoring indicates that drier than normal conditions exist. The groundwater data collection would be restarted to allow for water levels to be evaluated supporting an assessment of hydrology of the transplanted area and associated habitat conditions.

Groundwater monitoring in the ComEd / Long Run Parcel will continue at well CEP-4D, throughout the permit period. Water levels at CEP-4D will be used to assess potential drawdown from the mining activities occurring west of the Canals.

4.0 Groundwater Evaluations and Procedures

4.1 Groundwater Monitoring Processes

The hydrology monitoring effort will include data collection activities that are structured to evaluate if the HCP is effectively achieving plan goals and objectives. The monitoring program will compare future groundwater data to historical levels. The processes for groundwater level and groundwater quality monitoring are illustrated in the flow charts presented on Figure 4-1 (groundwater level monitoring) and Figures 4-2, 4-3 and Figure 4-4 for water quality monitoring, respectively. The five sequential monitoring processes, include:

1.) Routine Monitoring

2.) Verification Monitoring

3.) Assessment Monitoring

4.) Adaptive Management (Evaluations & Controls)

5.) Contingency Evaluation and Implementation

A brief description of each of the groundwater monitoring steps is provided below. These processes are discussed in greater detail for groundwater level and groundwater quality in Sections 4.2 and 4.3, respectively.

Routine Monitoring – Groundwater levels and water quality will be routinely monitored at the specified locations as identified in Table 2-2 and Tables 2-4A through 2-5B, respectively to provide information to effectively evaluate site conditions. Data collected during routine monitoring will be compared to the historical range of water levels and water quality data. Routine monitoring is an essential aspect of the plan. Short-term and long-term data assessments will be based on field information collected during routine monitoring. Frequency of routine monitoring depends on monitoring time period and monitoring location. Numerous automated recording devices will collect several water levels daily. Automated recording devices will have their data downloaded at least on a monthly basis. At two locations (RP-1D and RP-2S) telemetry units will be affixed to the wells so that recorded water level data can be accessed weekly for data download and review. Manual water levels will vary from weekly to semi-annual depending on the monitoring period and location.

Verification Monitoring – A single follow-up monitoring event will serve as a check for routine water level or water quality parameter concentration monitoring. If the follow-up water level or water quality concentration is above (or below for field pH) predetermined background levels, then assessment of the potentially changed conditions will be initiated. Verification monitoring will not be implemented for data comparisons of seasonal or long-term trends. Timing of verification is detailed in the following sections. In some cases, verification may occur during the same day by checking equipment and repeating field measurements if anomalies are witnessed during data collection.

Assessment Monitoring – Water level or water quality assessment monitoring in an individual parcel or across several parcels will be performed to obtain information to assess the variations in the routine monitoring data. Assessment monitoring for groundwater levels will typically be initiated within a

couple of days of the routine monitoring event since field tablets will quickly identify water level triggers and allow for same-day verification. In fact, since adjustment of infiltration galleries can be expedited, the turnaround time between routine monitoring and adaptive management for the River South Bluff Parcel will be very quick – occurring within a few days or even the same day as the routine monitoring occurs. At the very latest, assessment monitoring will be initiated within 15 days after the routine monitoring event. In the case of evaluating seasonal or long-term averages (for Groundwater Level Monitoring Criterion #2), assessment monitoring will be initiated within 10 days (at the latest) after the routine evaluation of the seasonal or long-term data has been conducted without a verification monitoring event.

Water level and/or water quality assessments will be based on the data collected during a period of more frequent measurements at wells (and seeps) near where the unexpected or anomalous observation(s) were recorded. The assessment monitoring report will include a summary of conditions as they compare to the planned AMM operation and performance. In addition, the assessment report will provide an evaluation of the change in water levels or water quality, identify potential causes and identify adaptive management action(s) that have been taken or will be evaluated to support the groundwater hydrology of local habitats.

Adaptive Management – An interactive process of routine monitoring, assessment monitoring, and implementation of revised operational plans will be pursued if Assessment Monitoring determines that this is necessary. The performance and operation of the avoidance measures will be monitored through inspections and monitoring. Field data will be reviewed to verify that avoidance measures are operating as planned. Changes to avoidance measures will be implemented (if possible) to mitigate for the potential for changed conditions. The turnaround time between routine monitoring and adaptive management will be minimized (e.g., between 0 and 5 days) for existing AMMs.

Notification of potential changed circumstance will be submitted in the notification to initiate assessment monitoring. Changed circumstances will be identified in the assessment monitoring report (submitted within 30 days of the notification letter) after preliminary assessment monitoring data can be reviewed that confirms changes to water levels or water quality.

If it is determined through consultation among HMS and regulatory agencies that the actions of HMS are the cause of the decline in groundwater levels, then HMS will (within 7 days of reaching conclusion in consultation) provide USFWS with documentation of planned corrective actions to address hydrology concerns. If it is found not to be caused by HMS' action but by an action or situation out of the control of HMS, then an unforeseen circumstance will be triggered, and HMS will not be responsible for addressing the degradation of hydrologic condition. Under this situation, USFWS and IDNR along with other applicable regulatory agencies will address the cause of the adverse hydrology impacts. HMS will assist in addressing hydrology impacts and providing monitoring data as needed.

Contingency Measures - If modifications to avoidance measures cannot be completed or are not effective, then contingency measures will be pursued in consultation with regulatory agencies. Evaluation of contingency options will assess how project goals can be achieved through alternative means.

If measured groundwater levels or water quality parameters continue to fall outside of historical or anticipated ranges of background levels, and the data indicates that other parties or circumstances outside the control of HMS are the cause, HMS will not be held responsible for the changes or

consequences of such changes. Refer to Chapter 8 of the HCP for a complete discussion of changed conditions.

4.2 Groundwater Level Monitoring

4.2.1 Groundwater Level Monitoring – Routine Monitoring

Groundwater levels will be routinely monitored to provide sufficiently frequent information so that verification, assessment, adaptive management, and mitigation processes can be identified and addressed in a timely manner. The historical range of groundwater levels and the development of background conditions are included in Attachment 1. Routine monitoring of groundwater levels will occur at the locations identified in Table 2-2.

The frequency of routine water level monitoring may vary based on well location and activities occurring at the Quarry. Monitoring frequencies will vary throughout each of the "Monitoring Time Periods" as summarized in Table 2-1, including: Preliminary Monitoring, First Year of Operation Monitoring, Routine Monitoring during Operation, West Quarry Recovery Period, and Post West Quarry Recovery Period.

Frequency of Routine Monitoring depends on monitoring period and monitoring location. For River South and LPNP, the frequencies are as follows:

a. Automated recording devices will collect several water levels daily. Telemetry units will be accessed weekly for data download and review. Remote devices will be accessed monthly for data download. Data reviews will be conducted at least on a quarterly basis.
b. Most manual water levels will be collected in the following frequencies:
   i. At least weekly during Preliminary Monitoring / Testing Period
   ii. Monthly during First Year of Operation
   iii. Quarterly during West Quarry Operation, West Quarry Recovery, and Post West Quarry Recovery Periods

The exceptions, including monitoring at North/Far North, RPNP, and ComEd Parcels, are outlined on Table 2-2.

Routine water level monitoring will include the collection and evaluation of groundwater levels, and the comparison of results against the following groundwater level action criteria: 1) water levels maintain planned level ranges in the short term, 2) are not consistently lower than historical seasonal mean levels, and 3) are consistent with regional elevations occurring in the Silurian Aquifer outside of the area of influence of the Quarry's cone of depression. Routine groundwater-level monitoring will commence within one (1) month of the ITP issuance. Continuous water-level monitoring will follow shortly thereafter, following procurement, set-up, and installation of new monitoring stations. Continuous monitoring will commence no later than two (2) months after ITP issuance.

The process of the three-groundwater level monitoring action criteria is depicted in the flow chart matrix illustrated in Figure 4-1 and summarized below.

Groundwater Level Monitoring Criterion #1

LOW WATER LEVEL TRIGGER –

If at any point water levels in a monitoring well drop below the low water level trigger elevation as defined in Table 2-2 for that well, verification monitoring will be initiated. The low-water trigger elevations are based on the lower 5% of historically observed values discussed in Section 2 and

provide a signal for immediate action ("trigger") to assess current groundwater levels. Field personnel will record water levels using a mobile electronic device with prescribed templates that will alarm the user of a potential groundwater trigger. Verification will occur immediately by re-checking the water level and meter to confirm the first measurement was not erroneously read or recorded by the field staff. This process will reduce the time between identifying a groundwater trigger and making changes in adaptive management. In most cases, the duration between identifying a water level trigger and starting assessment monitoring will be 5 days or less. In the rare incidence of an instrument or tablet malfunction, a verification contingency scenario has been developed as outlined in Figure 4-1.

The background water level datasets were developed using as much of the historical data as possible to account for natural variations and fluctuations in groundwater levels. One exception is that water level readings recorded during extended drought periods were excluded from background datasets as developed in agreement with USGS recommendations. The removal of water level readings recorded during extended drought periods is a protective measure so that signal elevations are not biased low so adaptive management actions can occur before potentially harmful hydrologic conditions occur.

Routine groundwater level collection will vary based on the frequencies established in each monitoring period as summarized on Table 2-1. In general, manual groundwater levels will be collected in the following frequencies:

- At least weekly during Preliminary Monitoring / Testing Period
- Monthly during 1st year of operation
- Quarterly during West Quarry Operation, West Quarry Recovery and Post West Quarry Recovery Periods
- Semi-annual monitoring will also be deployed for wells that have historically observed very little fluctuations

Automated recording devices will collect several water levels daily at wells RP-1D, RP-1S, RP-2D, RP-2S, MW-7C, MW-12C, G-102, and CEP-4D. Telemetry units will be installed at RP-1D and RP-2S and accessed weekly for data download and review. Manually recorded water levels will be reviewed against the low-water level trigger elevations as soon as possible. However, to account for varied conditions, such as field employee demands, holiday schedules, etc., the maximum allotted time to review manually collected water levels is 72 hours of collection.

The goal of groundwater level monitoring Criterion #1 is to provide a rapid turnaround time from data collection to download and data evaluation. Decisions can be made quickly to mobilize verification monitoring, and if needed, assessment monitoring and adaptive management strategies. The advantage of this assessment is that there is limited data processing and reporting requirements that inhibit the adaptive management process. The limitations of this criterion are encompassed in Criteria #2 and #3, which include safeguards to prevent water levels being maintained at less than historical average levels and evaluations of observed groundwater levels relative to "background" conditions within the Silurian Aquifer, respectively.

Groundwater Level Monitoring Criterion #2:

REVIEW OF SEASONAL GROUNDWATER LEVEL DATA –

Since most monitoring wells in the background dataset do not have extensive monitoring data collected over an extended period of time, only the monitoring wells with sufficient historical data – at least 25 water level readings per season – had estimated seasonal low water levels developed. The

low range of seasonal averages is very difficult to determine because of the lack of continuous data collected over a long period of time. Despite the lack of thorough datasets, an estimate of seasonal low water level averages was developed using a function of the standard deviations from mean levels (of non-drought data) measured during each season. The distribution of all of the seasonal standard deviations was evaluated. The range of standard deviations was large, since some wells fluctuate considerably throughout the season, while others do not. The distribution of the seasonal standard deviations was not normal, so it was broken into four groups based on natural breaks in the dataset. Constants were developed for each group that represents a deviation from the mean that works for each well-season group. For standard deviations groups of: <0.5, <1.0 to 0.5, <2.5 to 1, and >2.5, constants of 1.0, 0.8, 0.6, and 0.4, respectively were multiplied with the unique well-season standard deviation and subtracted from the seasonal mean to estimate a seasonal low average. Seasonal low groundwater elevations are summarized on Table 2-3.

This criterion is intended to be applied to monitoring wells that have sufficient water level data to review. Thus, monitoring wells that have automated monitoring devices that collect discrete groundwater levels several times a day will be the focus of this groundwater level monitoring criterion. The groundwater monitoring wells with higher frequency (automated) data collection (as summarized on Table 2-2) and have seasonal low averages developed, include: RP-1D, RP-1S, RP-2D, RP-2S, and MW-7C. In some cases, however, a monitoring well or group of monitoring wells may have numerous groundwater level readings within the same season. This may occur during the first year of operation, preliminary testing, or possibly during assessment monitoring. To account for monitoring well data that may not necessarily be collected automatically, all monitoring wells that have one or more monitoring events in each month of the quarter will be assessed using Criterion #2. Furthermore, seasonal low water levels will be developed for RPNP well MW-25 during the first five years of monitoring, so future comparisons can be made if needed.

The goal of this groundwater level monitoring assessment (Criterion #2), is to maintain seasonal water level averages that are within the historical dataset. The advantages of this criterion include seasonal and long-term trend analyses that can be used to evaluate the effectiveness of AMMs. This is valuable data comparison despite the longer time frame for which data are collected and analyzed. The field data will be reviewed at the start of each season or within 5 days of collection or remote download. Verification monitoring will not be implemented for data comparisons of seasonal averages. Therefore, Assessment Monitoring will be initiated without verification for this criterion (#2). In this case, a letter of intent to initiate assessment monitoring will be submitted within 5 days of quarterly data review.

Groundwater Level Monitoring Criterion #3:

COMPARISON OF GROUNDWATER LEVEL DATA TO GENERAL AQUIFER TRENDS –

The relative performance of AMMs will be evaluated by comparing background groundwater levels and trends in the Silurian Aquifer (outside of the cone of depression of the Romeoville Quarry) to groundwater levels and trends that may be affected by the Quarry. This evaluation will allow for potential adjustments of the AMMs based on the regional aquifer trends. The comparison of groundwater levels in areas potentially affected by the Quarry to background conditions of the Aquifer will be evaluated in *Groundwater Level Monitoring Criterion #3.* This criterion will include the following three benchmarks:

3a.) Evaluate head differences and mean levels correlated at specified well pairs –
   i. Do new water level data points fall outside of predicted limits?

3b.) Evaluate on-going normalized groundwater level data –

i. Do new water level data indicate a variation of less than negative (-)2.0 standard deviations?

ii. Is a downward trend of four consecutive quarters observed?

3c.) Evaluate on-going normalized head differences –

i. Do quarterly monitoring data indicate normalized head differences between well pairs that are > +2.0 standard deviations?

These routine groundwater level monitoring evaluation events will consist of quarterly (seasonal) review of all water levels measurements – whether collected manually or through the use of automated equipment – and evaluated against the benchmarks in *Criterion #3*. For certain benchmarks, discrete water levels will be extracted from the continuous monitoring data. For example, specific well-pairs for comparisons in *Criterion 3a and 3c* will be reviewed using manual water levels or synchronous maximums and minimums for each well recorded in the previous 3-month season.

The four-consecutive quarter downward trends in normalized groundwater levels as dictated in *Criterion 3b$_{ii}$* will not be assessed using continuous monitoring data since Groundwater Monitoring *Criterion 2* is tailored more for discrete monitoring data. The quarterly review will coincide with the seasonal mean water level review outlined in *Criterion #2*.

During these water level review events, well pairs will be used to assess if groundwater levels possibly affected by Quarry dewatering still correlate to wells outside the potentially affected area. On-going mean water levels and head differences at pre-determined well pairs will be plotted to assess if there is continued correlation of wells in River South to wells in LPNP. The comparison of new data to the predicted range of head difference and mean water levels is covered under Criterion #3a. The final two benchmarks rely on the normalized water level data. These three benchmarks covered under Criterion #3 are detailed as follows:

3a.) Correlated Well Pairs

Evaluate head differences and mean levels correlated at specified well pairs –

i. Do new water level data points fall outside of predicted limits?

Aquifer background wells have been evaluated in relation to discharge area wells using plots of groundwater levels at various monitoring well pairs positioned in River South Parcel, River South Bluff Parcel, Prairie Bluff Preserve and LPNP (AECOM, 2017a). The correlation diagrams assisted in evaluating trends in the groundwater levels at various locations within the aquifer and were used to identify wells that correlate well which each other. Evaluation of historical water level data indicates that the following well pairs should be evaluated to assess if new data is trending in similar fashion to historical data or whether assessment monitoring should be triggered.

Assessment monitoring will be triggered if new routine quarterly water level data falls outside the bounds of the following historical groundwater level correlation plots as shown in Attachment 1-D:

RP-1D and MW-6B

RP-1S and MW-6B

RP-2D and MW-8B

RP-2S and MW-8B

Groundwater levels will be collected from each of the well pairs during the same day. Since the River South Parcel monitoring wells will have automated data collection devices, the water levels may be pulled from the monitoring devices. Additional correlation diagrams may be utilized to compare groundwater levels in these parcels, but the well pairs listed above appear to have the highest statistical and conceptual correlation between each other. Other well pairs either do not indicate a strong correlation or have limited number of synchronous water level data to ideally be used for enforceable routine monitoring triggers.

The predicted range of future water levels are calculated using the difference between the water levels plotted against the mean water levels as shown in Attachment 1-D. The calculated limits of agreement give the range of 95% of future measurements using the following equations (Bartlett and Frost, 2008):

- Lower Head Difference Limit = mean difference – 1.96 x Standard Deviation (of the differences)
- Upper Head Difference Limit = mean difference + 1.96 x Standard Deviation (of the differences)

- Lower Mean Head Limit = mean head level – 1.96 x Standard Deviation (of the mean head levels)
- Upper Mean Head Limit = mean head level + 1.96 x Standard Deviation (of the mean head levels)

Verification monitoring will be triggered if a new water level monitoring dataset is observed to be outside of the following calculated limits of agreement:

RP-1D and MW-6B	Difference between RP-1D and MW-6B (feet)	Mean of RP-1D and MW-6B (ft msl)
Limits of Agreement (-)	-4.16	574.07
Limits of Agreement (+)	8.78	595.42
RP-1S and MW-6B	Difference between RP-1S and MW-6B (feet)	Mean of RP-1S and MW-6B (ft msl)
Limits of Agreement (-)	-1.22	581.56
Limits of Agreement (+)	8.68	590.32
RP-2D and MW-8B	Difference between RP-2D and MW-8B (feet)	Mean of RP-2D and MW-8B (ft msl)
Limits of Agreement (-)	12.52	569.24
Limits of Agreement (+)	14.12	571.45
RP-2S and MW-8B	Difference between RP-2S and MW-8B (feet)	Mean of RP-2S and MW-8B (ft msl)
Limits of Agreement (-)	12.39	568.53
Limits of Agreement (+)	13.85	571.67

Verification monitoring, which will be conducted within 5 days of the routine monitoring, will consist of a single follow-up monitoring event in which the water levels in the well pairs are measured again to verify that their head levels are within the historical limits of agreement. Due to the complicated nature

of this routine monitoring criteria, field verification is still being maintained. However, efforts will be made to automate these calculations using the field tablet.

Historical comparison of monitoring well data in River South Parcel to LPNP data is limited to wells RP-1D, RP-1S, RP-2D and RP-2S due to the limited number of groundwater measurements that were generally taken synchronously. However, these wells (RP-1D, RP-1S, RP-2D and RP-2S) can be compared to other monitoring wells at River South, including wells that will not likely be influenced by the infiltration galleries, including RP-3S East, RP-3S West, RP-6S, as well as upgradient well RP-10S should additional on-going analyses be required. Furthermore, LPNP monitoring well pairs can also be evaluated should assessment monitoring be triggered. LPNP monitoring well pairs that should be considered for assessment monitoring include upgradient/background wells (MW-7C, MW-12B and MW-12C), bluff wells (MW-6C, and MW-3C if located), and valley wells (MW-8A, MW-8B and MW-9B) as summarized below:

- MW-6C and MW-7C
- MW-6C and MW-12B/MW-12C
- MW-8B and MW-7C
- MW-8B and MW-12C
- MW-9B and MW-7C

These well pairs are the best for assessing the magnitude and direction of background effects should assessment monitoring be required since they provide some indication of correlated groundwater levels.

3b.) Evaluation of Normalized Groundwater Data

In addition to the evaluation of the range and mean of groundwater levels relative to each other, the groundwater levels and trends at each well pair will be evaluated by using normalized groundwater data. By normalizing the groundwater level data, the relative changes to water levels at separate locations can be evaluated on a common scale – relative to the variance of water levels within each monitoring well to their mean (or seasonal mean) water levels and the head difference between them. For example, groundwater levels will fluctuate at discharge zones greater than in recharge zones. Thus, this method allows for a quick assessment of the magnitude of water level change versus what may be expected, and trends in groundwater levels. This criterion also sets the basis for Criterion 3c, which evaluates the normalized difference between wells in the background and discharge areas.

The normalized time series will consist of on-going (quarterly) data review to evaluate the variation of routine groundwater level monitoring data – collected manually and automatically - relative to historical mean and seasonal mean datasets. These robust statistical charts will provide long-term trends in the groundwater monitoring data and identify outliers within the monitoring data. Assessment monitoring will be triggered if new routine quarterly groundwater level monitoring data indicate a variation of less than negative (-) 2.0 standard deviations. This occurrence is likely indicative of an anomalously low water level, as was observed in the historical dataset. Historical normalized plots of these monitoring wells are illustrated in Attachment 1-D. Drought data were included in these plots to demonstrate the effectiveness of the method in identifying low water level events and trends in groundwater levels. Drought data will be removed from the dataset for on-going normalized data assessments.

Normalized data trends will also be assessed. Assessment monitoring will be triggered if a downward trend of four consecutive quarters is observed. If an individual water level triggers either of the benchmarks (i.e., normalized data less than negative 2.0 standard deviations or a downward trend of four consecutive quarters is observed), then verification monitoring will occur within 5 days to check if

the data from automated water level monitoring devices are correct. An assessment monitoring plan will be submitted within 5 days of confirming the anomalously low water level.

The following wells will be used in Criterion 3b, to assess normalized groundwater levels at River South, River South Bluff, Prairie Bluff Preserve and LPNP Parcels:

- RP-1D
- RP-1S
- RP-2D
- RP-2S
- MW-6B
- MW-7C
- MW-8A
- MW-12B
- MW-12C

The normalized head difference between the two wells listed on the graphs in Attachment 1-D are described under Criterion 3c.

3c.) Evaluation of Normalized Groundwater Head Differences

To recognize the potential for changes in elevation differences – despite groundwater levels being maintained within the range of historical mean seasonal levels and within two standard deviations of normalized mean values – normalized head differences will be plotted for *Groundwater level monitoring Criterion #3c* as on-going routine monitoring data are collected. The normalized head differences will be used to evaluate if higher water levels are occurring in background versus subtle declines in water levels within monitoring wells in groundwater discharge areas. Normalized head differences of the background groundwater monitoring dataset are illustrated in Attachment 1-D and summarized below:

- MW-7C and MW-12B
- RP-1D and MW-7C
- RP-2D and MW-7C
- MW-6B and MW-7C
- MW-8A and MW-7C

Normalized head differences will be evaluated during routine quarterly groundwater level monitoring. Verification monitoring will apply if a single routine monitoring water level is collected that results in normalized head difference that exceeds + 2.0 standard deviations. Assessment monitoring will be triggered if the normalized head difference between the background well and target well is verified to exceed +2.0 standard deviations. Verification monitoring will occur within 5 days of the routine monitoring event. An assessment monitoring plan will be submitted within 5 days of verification and initiated within 5 days of the notification (or a maximum of 15 days from the routine monitoring event). Assessment monitoring should consider additional well pairs for evaluating aquifer background based on normalized head differences, including: RP-1S and MW-12B, RP-2S and MW-12C, MW-6B and MW-12B, and MW-8A and MW-12C. These well pairs are screened and positioned appropriately for comparison but had insufficient data points that corresponded between them to justify inclusion in routine monitoring.

Thus, water level data collected at one well will not be adjusted or corrected based on water levels recorded at other monitoring wells. Rather, on-going assessments of normalized groundwater monitoring data will be used to assess whether groundwater levels within areas potentially impacted

by the Quarry are lower than what other "background" aquifer wells not likely impacted by the Quarry may suggest. These assessments incorporate historical data trends, as well as evaluate new data as it is collected. These are important considerations for evaluating whether further assessment, adaptive management, and mitigation measures may be required near local sensitive hydrologic areas. The aforementioned criteria will be used as an on-going assessment tool to evaluate temporal trends which may not be evident in water level tables, hydrographs, and/or potentiometric maps.

4.2.2 Groundwater Level Monitoring – Verification Monitoring

Verification monitoring will consist of a single follow-up monitoring event to confirm the result of a manual water level result obtained during routine monitoring. If the water level is below (or outside) predetermined or predicted background levels or confirms a normalized data exceedance, then assessment of the potentially changed conditions will be initiated. Verification monitoring for water levels will occur within 5 days of the routine monitoring event or 5 days from review of remotely collected data. Verification monitoring of remotely collected data will simply consist of field verification of recorded water levels. An assessment monitoring plan will be submitted within 5 days of confirming the anomalous water level(s).

(1) For Criterion #1, verification monitoring will primarily occur during the routine water level monitoring event. Field personnel will record water levels using an electronic tablet with prescribed templates that will alarm the user of a potential groundwater trigger. Verification will occur immediately by re-checking the water level to confirm the first measurement was not erroneously read or recorded by the field staff. This process will reduce the time between identifying a groundwater trigger and making changes in adaptive management. In most cases, the duration between identifying a water level trigger and starting Assessment monitoring will be 5 days or less. In the rare incidence of an instrument or tablet malfunction, a verification contingency scenario has been developed. In this case, verification monitoring will consist of a single follow-up water level monitoring event to confirm the result obtained during routine (manual or automated) monitoring. If the water level collected during verification monitoring is below the low-water trigger "action" elevation, as summarized on Table 2-2 and described in Section 4.2.1 above, then assessment of potentially changed conditions will be initiated. For automated monitoring stations, follow-up verification monitoring will be used to verify the groundwater levels recorded by the remote instrument(s) are accurate. Verification monitoring for water levels will occur within 5 days of the routine monitoring event or 5 days from review of remotely collected data.

(2) Verification monitoring will not be implemented for data comparisons of seasonal or long-term averages (Criterion #2); therefore, Assessment Monitoring will be initiated without verification. In this instance, a letter of intent to initiate assessment monitoring will be submitted within 5 days of quarterly data review.

(3) Criterion #3 (*3a,3b,3c*):

    a. For Criterion #3a, verification monitoring will be triggered if a new water level monitoring dataset is observed to be outside of the calculated limits of agreement. Verification monitoring, which will be conducted within 5 days of the routine monitoring, will consist of a single follow-up monitoring event in which the water levels in the well pairs are measured again to verify that their head levels are within the historical limits of agreement.

b. For Criterion, #3b, if an individual water level triggered either of the benchmarks (i.e., normalized data less than negative 2.0 standard deviations or a downward trend of four consecutive quarters is observed), then verification monitoring will occur within 5 days to check if data from automated monitoring is correct.

c. For Criterion #3c, verification monitoring will apply if a single routine monitoring water level is collected that results in normalized head difference that exceeds + 2.0 standard deviations. Assessment monitoring will be triggered if the normalized head difference between the background well and target well is verified to exceed +2.0 standard deviations. Verification monitoring will occur within 5 days of the routine monitoring event. An assessment monitoring plan will be submitted within 5 days of verification and initiated within 5 days of the notification (or a maximum of 15 days from the routine monitoring event). In most cases, the duration from routine monitoring to the start of assessment monitoring will be less than a week.

Efforts will be conducted to validate monitoring results while field personnel are still on-site. For example, if water levels are observed to be less than anticipated, infiltration gallery inflow rates may be increased immediately. These minor adjustments demonstrate the flexibility of the AMMs to quickly respond to potential water level changes. After minor variations of infiltration flow rates, monitoring will be conducted several times a week using telemetry recorded data to continue the assessment of water levels. Situations may also occur where duplicate water levels are collected within the same routine monitoring event to verify possible transcription errors.

4.2.3 Groundwater Level Monitoring – Assessment Monitoring

An assessment of groundwater conditions will be conducted if groundwater level results are verified to be lower than the range of background values for individual well trigger elevations, below seasonal mean levels, or outside of the anticipated range of fluctuations compared to data points outside of the cone of depression. The assessment monitoring notification will outline what additional monitoring will occur, as well as the duration and frequency. The date of the assessment notification will be used going forward for compliance purposes due to the varied nature of the routine monitoring program that includes a definitive date(s) for field monitoring, but less definitive for remote monitoring (i.e., office work) that may be assessed over the course of several days or a weekend.

Assessment monitoring will include the following monitoring activity:

- More frequent monitoring/sample collection of the well(s) where the observation(s) occurred
- More frequent monitoring of surrounding wells and/or seeps

Assessment monitoring of water levels will commence in an individual parcel or across several parcels to obtain the information to assess the observed variations in the routine monitoring data. Water level and/or water quality assessments will be based on the data collected during a period of more frequent measurements at wells near where the observation(s) occurred as well as monitoring of surrounding wells and seeps. Notification of the intent to initiate assessment monitoring and the plan for assessment monitoring outlining the number of monitoring points, frequency, and duration proposed for the assessment monitoring period will be submitted within 5 days of a positive verification.

Assessment monitoring will commence within 5 days of the notification letter or no later than 15 days from initial routine water level monitoring event. Newly collected assessment monitoring data will be evaluated in 21 days from Assessment Monitoring notification, Adaptive Management adjustment, or

Contingency Action. If Adaptive Management adjustments are deemed necessary, then an Assessment Monitoring report will be submitted within 30 days of notification, with additional data being submitted every 30 days thereafter until assessment monitoring is no longer necessary.

If Adaptive Management measures are not necessary, then the Assessment Monitoring report will also be submitted within 30 days of notification, Adaptive Management adjustment, or implementation of contingency measure. The Assessment Monitoring reports will include a summary of conditions as they compare to the planned AMM operation and performance. In addition, the assessment report will provide an evaluation of the drop in water levels, identify potential causes and identify adaptive management action(s) that have been successfully implemented or will be evaluated to support the groundwater hydrology of local habitats. Addendum(s) will be provided with additional assessment monitoring data should supplementary information be required as part of the assessment monitoring plan every 30 days thereafter.

In areas where AMM's are implemented, Assessment Monitoring will largely be bypassed so adjustments to the AMM's can be conducted timely (adaptive management controls) without the need for collecting and analyzing additional data. Adjustments to the River South infiltration galleries will be conducted within 7 days of notification. If additional water is required at the FPDWC Pond, supplemental flow will be provided within 14 days of notification. These shortcuts to adaptive management control are illustrated on Figure 4-1 as dashed lines.

4.2.4 Groundwater Level Monitoring – Adaptive Management Strategies

Adaptive management of the groundwater resources consists of an iterative process of collecting field data (assessment monitoring), evaluating the results, and implementing strategies to maintain hydrologic conditions. Existing AMMs will be evaluated for ways to improve performance if flows are maximized. Supplemental or new AMMs will be pursued as necessary to maintain hydrologic conditions and will be summarized so adaptive management strategies can be evaluated in consultation with pertinent regulatory agencies.

An example adaptive management strategy includes the adjustment of the amount of water conveyed to the infiltration galleries. If flow to the galleries is adjusted while the River South Parcel is in an assessment monitoring phase, this monitoring will continue until a demonstration can be made that the adaptive measures have been successful in maintaining hydrologic conditions as described in Section 4.1 and illustrated on Figure 4-1. However, if additional galleries are needed to provide flows above the current designed maximums, plans for new galleries, including gallery location and planned infiltration rates will be evaluated in consultation with pertinent regulatory agencies.

The FPDWC Pond may also be evaluated for implementation of adaptive management changes. The pond is designed to allow for adjustments. For example, if the performance of the pond's infiltration capability is restricted by sedimentation build-up at the base of the pond, then sediment would be removed, and the pond's infiltration performance would be re-evaluated. If these modifications are insufficient, the contingency actions would be evaluated and implemented. Parcels without AMMs in place would advance directly into contingency evaluations since minor AMM adjustments are not available.

4.2.5 Groundwater Level Monitoring – Contingency Evaluation & Implementation

Several alternative avoidance measures have been evaluated during strategy sessions for developing the current AMMs. These alternative AMMs will be re-evaluated if the planned AMMs underperform or if unforeseen conditions are observed and AMM refinements are required. If modifications to

avoidance measures cannot be completed or are not effective, contingency measures will be pursued in consultation with the regulatory agencies. Evaluation of contingency options will assess how project goals can be achieved through alternative means if obtainable.

If groundwater levels continue to fall outside of historical or anticipated ranges of background levels, and the data indicates that other parties or circumstances outside the control of HMS are responsible, then HMS will not be held accountable for changes to hydrology (see Chapter 8 of the HCP).

4.3 Groundwater Quality Monitoring

Groundwater quality will be routinely monitored to provide information so that verification, assessment, adaptive management, and mitigation processes can be identified and addressed in a timely manner. The historical range of groundwater quality and the development of background concentrations are included in Attachment 2. Routine water quality monitoring consists of the collection, and data evaluation of water quality data. The frequency of routine water quality monitoring will vary based on sample location and activities occurring at the Quarry. The schedule of water quality monitoring is included in Table 2-4A for the River South / River South Bluff Parcels, and Table 2-5A for the LPNP and FPDWC Pond Areas, respectively. The sample frequencies and constituent lists for these two locations are included on Table 2-4B and Table 2-5B.

River South / River South Bluff Parcel Water Quality Monitoring

Water quality parameters will include field parameters and routine indicator parameters as summarized in Table 2-4B. Field parameters collected will include: temperature, DO, specific conductance, pH, ORP, and turbidity. Minor variations in water levels or field water quality parameters may indicate that refinement of operational parameters of the galleries might be necessary. Water temperatures will be recorded at several key monitoring locations including RP-1D, W-1 seep, and RP-2S, using submerged automated recording devices. Specific conductance will also be monitored using automated devices at W-1 seep and RP-1S.

Water quality samples will be sent to a local analytical laboratory for testing of the following constituents (Table 2-4B):

- Major anions: chloride (Cl), sulfate (SO_4), bicarbonate alkalinity
- Metals (Al, Sb, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Pb, K, Mg, Mn, Ni, Na, Se, Ag, Th, V, Zn)
- Indicator parameter: total dissolved solids (TDS)

The water quality results will be compiled into a database for the creation of time-trend graphs and comparison of new data to historical concentrations.

FPDWC Pond Water Quality Monitoring

After the initial pre-pond construction sampling is complete (as described in Section 2.3.1), groundwater level and water quality assessment will continue during the initial testing of the pond - and beyond, to assess potential changes to area hydrology in response to the enhanced infiltration at the FPDWC Pond. Water quality samples will be collected at locations in and around the FPDWC Pond, including G101, G102, MW-6A, MW-6B, MW-9A, and from the pond after construction (FP-1). Continuous, automated, temperature and specific conductance readings will be collected at well G102 on 4-hour intervals.

Routine monitoring will include anions (Cl, SO_4, CO_3, HCO_3), metals (Al, Sb, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Pb, K, Mg, Mn, Ni, Na, Se, Ag, Th, V, Zn), and indicator parameters (alkalinity, NH4, NO_3, total nitrogen, total phosphorus, and total dissolved solids), as well as the following field parameters: pH, specific conductance, temperature, turbidity, ORP, and DO. The samples will be collected during three seasonal sampling events: 1) in March to account for spring-thaw runoff, and after Early-season and Late-season placement of turf management products that will be collected between May 15th and June 15th and September 15th and October 15th, respectively. These timeframes have been established based on the periods immediately after typical applications that reflect the active growing seasons of both cool- and warm-season grasses when placement of turfgrass products provides optimal performance (GCSSA, 2009 and Throssell et al., 2009).

4.3.1 Routine Monitoring of Groundwater Quality

Evaluation of water quality data will proceed in a very similar fashion as the water level monitoring data. The process of evaluating water quality data is illustrated in Figure 4-2 of Attachment 2. Routine monitoring data will be compared to the representative background dataset summarized in Table 1 of Attachment 2. Results will either trigger verification monitoring or a continuation of routine monitoring. Comparison of water quality will be evaluated using the following criteria:

1) Concentrations of water quality parameters – are they higher (or lower in the case of pH) than observed in the historical dataset as tabulated in Table 1 of Attachment 2?
2) Are concentration trends apparent in the dataset? Do concentrations exhibit four consecutive sample increases or decreases?

If criteria 1 is positive, then a one-of-one verification resample will be collected to validate the result (Gibbons, Bauhmik, and Aryal, 2009). If the follow-up sample verifies the routine monitoring sample, then assessment monitoring will be initiated. There will be no verification resampling for criteria 2. If criteria 2 is positive, the assessment monitoring will be initiated as outlined in the water quality monitoring process flow chart (Figure 4-2).

Routine monitoring will have standard laboratory turnaround times of seven (7) working days. Review of the water quality monitoring data results will occur within three (3) working days of receiving the datasets via email. If resampling or verification monitoring is necessary, it will occur within seven (7) days of receipt of routine monitoring results. Verification sampling analysis will be expedited using a three (3) working day turnaround time.

4.3.2 Verification Monitoring of Groundwater Quality

Verification monitoring of a potential water quality criteria 1 exceedance will consist of a single resample to assess the validity of the routine monitoring results. Verification resampling is the best currently available approach to balancing false positive and false negative rates in groundwater monitoring applications (Gibbons, Bauhmik, and Aryal, 2009). If verification resampling were not conducted to check if initial readings are maintained outside of anticipated values, false positives rates would be too high. Conversely, collection of more than one resampling event (i.e., two of two sampling strategy as described in Gibbons et al., 2009) would yield a false positive rate that would be too low. Thus, a single resample verification event maximizes the statistical power of the monitoring program by balancing events and minimizing false positive rates.

For verification monitoring to be valid, all sample measurements need to be statistically independent which will generally require sufficient time between resample collections, so the assumption of

statistical independence is reasonable. Verification sampling will occur within 7 days of receiving the electronic results of the initial routine monitoring results and will be analyzed using an expedited turnaround time of 3 days.

When possible, replicate readings of field parameter measurements will be collected to verify initial results if potential erroneous readings are suspected or readings are outside the anticipated range of values as summarized in Attachment 2 - Table 1. Replicate field parameter measurements will be collected in the field the same day or next day of initial readings. The replicate field parameter readings can be used to negate initial results and may be helpful in avoiding a separate verification monitoring event if the initial results are not duplicated (or verified to be anomalous). For example, pH, conductivity or dissolved oxygen readings may be re-checked after equipment is recalibrated. Alternatively, replicate sampling may be used to check for possible transcription errors. Other factors that may alter field parameter readings are ambient temperature, sunlight, humidity, etc. Factors that may be the cause of the erroneous readings, such as poor calibration, ambient temperatures, humidity, sunlight, etc. will be checked in the field the same day when possible. Verification resampling will not occur for positive results of water quality criteria 2.

4.3.3 Assessment Monitoring of Groundwater Quality

As with water level monitoring, assessment monitoring for water quality will consist of increased sample collection of seep and groundwater samples surrounding the area where the potential exceedance (above or below anticipated levels) occurred. The increased number of sample locations will be accompanied by an increase in sampling frequency. At a minimum, six water quality samples – collected from monitoring wells or seep discharge location(s) - near the well where the initial "trigger" concentration was detected. If possible, monitoring wells and/or seep locations will be sampled at locations upgradient and downgradient of the subject well (or seep location). Water quality sample collections will be augmented at higher frequencies as outlined below:

Frequency of Groundwater Sample Collection		
Routine Monitoring Sample Frequency	Increase in Sample Frequency to:	Assessment Monitoring Sample Frequency
Annual or Semi-Annual	→	Quarterly
Quarterly	→	Monthly
Monthly	→	Every 2 weeks
Higher frequencies may be utilized for applicable field parameters.		

The assessment monitoring data will be evaluated to determine if adaptive management measures are necessary and one of the following will occur:

- An assessment monitoring data report will be submitted describing why adaptive management measures are not necessary.
- Submit a summary of how the adaptive measures have been successfully implemented.

Assessment monitoring data will be submitted within 21 days of receiving the data and will continue for the timeframe outlined in either the preliminary notification or preliminary assessment monitoring report. If necessary, follow-up assessment monitoring data will be submitted as addendum(s) within

30 days of receiving data results. Assessment monitoring will revert back to routine monitoring, as illustrated on Figure 4-2 when all proposed assessment monitoring data is collected, reviewed, and changed conditions have not occurred and adaptive management measures are not necessary. If adaptive management measures are necessary, then evaluation of contingency options will be conducted in consultation as illustrated in Figure 4-2.

Additional groundwater monitoring parameters outlined as possible assessment monitoring strategies are summarized in Table 2-4B and Table 2-5B for River South and LPNP, respectively. Potential pollutants that may be added during assessment monitoring include VOCs, SVOCs, BOD, low level mercury (USEPA, 2002a), and a general pesticide scan (as described in Sandstrom, Kanagy, Anderson, & Kanagy, 2016). The pesticide scan is a:

> *"A liquid chromatography-tandem mass spectrometry (LC-MS/MS) method was developed for determination of 229 pesticides compounds (113 pesticides and 116 pesticide degradates) in filtered water samples from stream and groundwater sites. The pesticides represent a broad range of chemical classes and were selected based on criteria such as current-use intensity, probability of occurrence in streams and groundwater, and toxicity to humans or aquatic organisms."*

This analytical method capable of determining a broad range of pesticide compounds at low concentrations may be needed to assess water quality should verification monitoring suggest potential changes in conditions.

4.3.4 Groundwater Quality Monitoring – Adaptive Management Strategies

Adaptive management of the groundwater resources consists of an interactive process of collecting field data (assessment monitoring), evaluating the results, and implementing strategies to maintain hydrologic conditions. Existing AMMs will be evaluated for ways to improve water quality. Supplemental or new AMMs will be pursued as necessary to maintain water quality and will be summarized so adaptive management strategies can be evaluated in consultation.

4.3.5 Groundwater Quality Monitoring – Contingency Evaluation & Implementation

Several alternative avoidance measures have been evaluated during strategy sessions for developing the current AMMs. These alternative AMMs will be re-evaluated if the planned AMMs underperform or if unforeseen conditions are observed and AMM refinements are required. If modifications to avoidance measures cannot be completed or are not effective, contingency measures will be pursued in consultation with the regulatory agencies. Evaluation of contingency options will assess how project goals can be achieved through alternative means if obtainable.

If groundwater quality deteriorates beyond historical or anticipated ranges of background levels, and the data indicates that other parties or circumstances outside the control of HMS are responsible, then HMS will not be held accountable for changes to hydrology (see Chapter 8 of the HCP).

4.4 Monitoring of Seep Discharge

Seep discharge will be routinely monitored downgradient of the River South Bluff Parcel infiltration galleries. Water temperatures at the W-1 seep will continue to be recorded every four hours to confirm consistent seep water temperatures.

A mathematical least squares regression line, which is illustrated in Figure 4-5, has been modeled after the average weekly temperatures observed at W-1 over a 2014-2018 monitoring period. The W-1 temperature data are included in Attachment 1-E. The upper and lower 95% confidence intervals have been developed as a measure to evaluate future water temperatures. Temperature data collected on 4-hour intervals at W-1 will be evaluated on a quarterly basis. Assessment monitoring of W-1 seep temperatures will be triggered if weekly average temperatures are observed to fall outside of the 95% confidence interval as summarized on Table 2-6.

In addition, water quality samples will be collected from W-1 quarterly during the first year of operation (one sample per season), followed by semi-annual sampling that will be conducted each spring (March, April, or May) and fall (September, October, November) during surface mining of the West Quarry as well as the West Quarry recovery period. Water quality samples will be analyzed for the environmental indicator parameters as summarized in Table 2-4B. The seep water quality will be compared to the applicable surface water concentrations summarized in Table 1 of Attachment 2. Evaluation of seep water quality will follow the same procedures (evaluation of routine monitoring data, verification, and assessment monitoring) as groundwater quality as discussed in Sections 4.3.1 through 4.3.3.

Estimations of discharge rates will be attempted during preliminary gallery testing to verify existing stage-discharge relationships as first published in AECOM (2015A). In addition, seep discharge will be monitored for field parameters (including: temperature, pH, dissolved oxygen and conductivity) downstream of Galleries B and C during preliminary gallery testing, if present. The potential need for monitoring seep discharge will be evaluated prior to each of the individual gallery tests.

4.5 Biological Monitoring of FPDWC Pond Water

A biological monitoring plan has been developed in consultation with USFWS and USGS for on-going evaluation of the FPDWC Pond. The biological monitoring will test the Pond's water so its quality doesn't cause unintended water quality degradation that would harm HED or constituents of its habitat by introducing runoff impurities into groundwater. The monitoring approach has been developed as an alternative to testing specific constituents since biological monitoring includes the synergistic, antagonistic, and additive effects of all the chemical, physical, and biological components which may adversely affect the physiological and biochemical functions of the test organisms.

The monitoring program will have the cumulative capacity to detect increased presence of impurities that may pose a concern to HED and prey at seeps within LPNP. The chronic toxicity of FPDWC Pond water will be evaluated using the *Ceriodaphnia dubia* (*c. dubia*) 7-day survival and reproduction water toxicity test (USEPA, 2002b). The Whole Effluent Toxicity (WET) testing for c. *dubia* in water collected from the FPDWC Pond during its lifecycle within the HCP by using less than 24-hour old neonates during a three-brood (seven-day) static renewal test.

The primary goal of the WET testing in the HCP is to provide on-going monitoring to check for possible negative synergistic effects that surface water flowing into the pond has on aquatic biota. For each test, about one gallon of water from the Pond will be collected during three separate events on Monday, Wednesday, and Friday of the test week. Each sample will be shipped overnight to the test laboratory. This will allow for the test water to be replenished as described by the method during the 7-day test period. The WET testing will occur during three key time periods throughout the year, including: 1) March (during typical times of snow melt runoff), 2) after early season turf management product applications (between May 15th and June 15th), and 3) after the late season applications of turf management products at the golf course are conducted (between September 15th and October 15th).

The WET testing procedures were developed primarily for NPDES permitting to test the potential impact of effluents on receiving waters. The test dilution water would typically be the river, or water body, to which the effluent is being discharged. Receiving water upgradient of the discharge would be collected and used as dilution water. The effluent dilution ratio is calculated as a ratio of the effluent flow to the low flow in the river. Test results are considered passing if the statistical analysis of the reproduction data does not indicate a difference from the control at the effluent dilution ratio.

For this testing, the pond water is basically equivalent to an effluent. However, only a fraction of the water being infiltrated from the Pond will discharge to the surface water in LPNP. Most will remain in groundwater until discharging into the Des Plaines River. Of the groundwater that discharges as seeps in LPNP, the surface water slowly flows to the south for nearly a mile through the wetland between the LPNP Bluff and railroad tracks. During this period, any water from the Pond is being significantly diluted from additional volumes of groundwater discharge and surface water flows. In addition, water is being lost through seepage through the railroad ballast, evaporation, and evapotranspiration from the dense vegetation. Thus, water that flows to the sensitive HED areas through LPNP Culverts 4 and 5 will consist of only a small fraction (less than 5%) of water that emanates from the Pond.

AECOM modeling conducted for the Romeoville Quarry (and presented in Kay et al., 2018), indicates that during lower than average periods of precipitation, approximately 16,400 ft^3/d of groundwater currently discharges from the Silurian Aquifer to seeps in LPNP. This is predicted to decrease to about 16,000 ft^3/d at full buildout of the West Quarry. The make-up water that may be influenced from the Pond (i.e., 400 ft^3/d) accounts for 2.5% of the overall discharge to LPNP. A factor of safety of two-times this discharge rate (800 ft^3/d) results in a contribution of 5% of discharge from the Pond to LPNP. This estimation is believed to be conservative, since recharge rates were conservatively set to below average rates used when compared to modeling conducted by Graef, Anhalt, Schloemer & Associates, Inc. (2004). Furthermore, there is no consideration of dilution, retardation, evaporation, or evapotranspiration that will be occurring once the discharged water mixes with surface water. Additionally, natural attenuation processes in groundwater systems that act to transform, retard, and attenuate solutes are ignored. Despite these considerations, USFWS and USGS requested a higher factor of safety of 4-times the estimated discharge of 10% (or 4x's estimated pond water to groundwater content of 2.5%). Thus, an effluent estimate of 10% will be implemented into the biological monitoring program.

The effects of the Pond water infiltration (i.e., effluent) in chronic toxicity tests will be estimated based on the calculation of the IC25. The IC25 value is a statistical calculation of the effluent concentration which causes a 25% reduction in growth or reproduction of test organisms. The IC25 is then compared to the proportion of effluent (Pond water) in the control water, to determine if toxicity has occurred at a level of concern. If the IC25 is lower than 10%, the effluent (Pond water) has the potential to inhibit aquatic organisms in the receiving water of LPNP.

The IC25 is calculated using point estimation techniques (USEPA, 2002b) using the reproduction and survival results from evaluating six dilution series that include (in terms of % effluent): 100, 50, 25, 12.5, and 6.25, and 0.0 (100% lab control water).

The WET testing will be conducted for routine biomonitoring events, as well as special investigations. Data from chronic toxicity tests performed as part of the hydrology monitoring requirements evaluated during effectiveness monitoring events. An acceptable test will consist of *c. dubia* IC25 that is greater than 10%. If IC25 is less than 10%, then a verification sample will be collected as part of the monitoring program decision flow chart (Figure 4-4). Should the verification sample fail the WET

Testing, then the FPDWC Infiltration Pond will be drained and inflow will be allowed to bypass the retaining berm and eventually discharge to the Des Plaines River. The Pond will be allowed to fill following the collection of an acceptable *c. dubia* 7-day chronic toxicity test.

The use of lab control water is believed to be a conservative approach to evaluating the toxicity of the Pond water (i.e., test effluent). The laboratory control water is utilized to culture and maintain a healthy *c. dubia* population for WET testing. Use of the control water for dilution provides a very reproducible water for chronic testing since the *c. dubia* are cultured and acclimated to this water. This ensures that survival and reproduction in the control are maximized, which in turn increases the sensitivity of the chronic test. Utilization of a groundwater, or a surface water, for the control and dilution introduces additional variability. Since the organism is not acclimated to the control water it can result in increased mortality and a potential delay in reproduction. Increase mortality in the control can result in a control failure which invalidates the test and potentially requires a repeat test.

Chronic test (i.e., the effluent dilution series) results are evaluated against the reproduction in the control. Mortality in the control reduces that reproduction. Reproduction may also be adversely impacted by organism stress, which translates into a delay in reproduction. Typically, a healthy *c. dubia* will produce 3 broods of young in a 7-day test. The 3rd brood is frequently the largest and often born on day seven of the test. Dilution water acclimation stress may delay reproduction by one or two days. This results in fewer young and a reduced test sensitivity. Finally, utilization of groundwater as control and dilution water may also introduce seasonal variability. This seasonal variability will make it difficult to understand if there are seasonal changes in the effluent series results. Consequently, AECOM believes the acclimation and seasonal variability issues are minimized by the utilization of the laboratory control water, while control success and overall test sensitivity are maximized.

5.0 Reporting and Notifications

Reporting of the monitoring and inspection data is a critical component to the success of the HCP. Information collected from tasks outlined in this monitoring plan will be submitted to document the maintenance and effectiveness of the AMMs and support habitat management. Documentation will vary from the reporting of on-going inspections and routine monitoring to annual reporting. Details on the timing and content of various deliverables are provided on the water level, water quality, and WET testing flow charts provided on Figures 4-1 through 4-4, respectively.

The following tasks are anticipated to generate documentation and/or analysis that will become a part of the dataset available to evaluate project goals:

(1) Installation details and preliminary testing results of the avoidance measures

(2) Evaluation of possible operational changes based on preliminary testing results

(3) AMM effectiveness monitoring data (quarterly/seasonal submittals), including

  i. Groundwater level tables and hydrographs

  ii. Comparison of water levels to Monitoring Criterion #1, #2, and #3

  iii. Temperature monitoring results

  iv. Water quality data

  v. WET testing results

(4) Notification of intent to initiate assessment monitoring will be accompanied by the submission of verification monitoring data and an assessment monitoring plan

(5) Assessment monitoring data submission

(6) Evaluation of assessment monitoring data (if needed), including

  i. Possible changes in initial (assumed) circumstances

  ii. Possible revisions to existing avoidance measures, or

  iii. Supplements to the existing avoidance measures.

(7) Review of compliance monitoring checklist

(8) Documentation of implementation and effectiveness of any measures undertaken to respond to changed circumstances or adaptive management measures

(9) Validation monitoring of hydrologic parameters used in predictive modeling

A report of monitoring results will be submitted annually and will include: 1) a summary of the project objectives, 2) an overview of site background information, 3) a description of field activities, 4) an evaluation of the data based on project objective levels, and 5) conclusions from the monitoring results.

Monitoring reports will be submitted to the USFWS and IDNR in a reasonable timeframe after the information becomes available to support AMM and habitat management decisions with the latest information on these subject matters. Notifications will be submitted to USFWS and IDNR in general accordance with the following time frames:

- Submit well construction documentation – for the installation, abandonment, or replacement of monitoring points within 90 days of completion.
- Submit AMM construction documentation within 180 days compliance of completion.
- Include annual data collection activities, raw data, discussion of monitoring data and monitoring summaries with the Annual Report for the site – due March 1st
- Submit notification of confirmed water level change and intent to initiate assessment monitoring within 7 days after confirmation.
- Submit notification of confirmed water quality parameter change and intent to initiate assessment monitoring within 14 days of receiving confirmation results are from the analytical laboratory.
- Submit passing WET testing results within 30 days of completion.
- Submit assessment monitoring data within 30 days of notification. Additional water level and/or water quality data that are collected and evaluated during Assessment Monitoring will be submitted as addendum to the original Assessment Monitoring Report every 30 days, as applicable, to report new data and findings until Assessment Monitoring reverts back to Routine Monitoring.

Other anticipated reporting activities, include:

- Initial groundwater level monitoring report for North, Far North, and River North Parcels after approximately five years of monitoring data are collected, that will be assessed to document background conditions at these Parcels prior to surface mining occurring in Middle Parcel.
- Construction documentation report of the West Quarry tunnel plugging under Route 53.
- Demonstration report that water levels have fully recovered in River South/River South Bluff Parcel after inundation of West Quarry (Post-AMM Report).
- Documentation of the compliance monitoring activities, including hydraulic testing of AMM's and review/updating of groundwater model. These activities will occur on five-year intervals.

6.0 Operation and Maintenance of Avoidance Measures

6.1 River South Infiltration Galleries

The Infiltration galleries will be inspected and monitored at frequencies indicated below to collect information to assess that the galleries are operating properly and meeting their design criteria for flows and water quality. The following summarize the inspection and monitoring activities to evaluate if the infiltration galleries are operating properly:

Physical inspection of galleries – Inspections will be conducted by opening manhole covers to each gallery. Inspection will include: evaluation of sediment build-up, evidence of manhole damage/shifting, evidence of animal intrusion, visual confirmation of proper operation, visual or camera observation of pipe conditions, pipe and manhole cleaning and monitoring of levels. Inspections will also evaluate for the presence of biological communities or chemical precipitates, and valve vaults will be inspected to insure proper operation. The physical inspection of the galleries will be conducted every four years of operation unless flow volumes, water levels or other information indicates a potential problem. Inspection of the galleries will likely be included in assessment monitoring tasks.

Maintenance of water quality – Water quality monitoring of the infiltration gallery source water, including the major anion and cations described in Section 4.3, will be performed periodically to confirm the water quality of the source water is consistent. An initial water quality assessment was performed on the quarry sump water and was demonstrated to be very similar to existing groundwater quality in the River South Bluff Parcel (AECOM, 2015a). Corrective measures will be implemented to insure adequate water quality is being maintained in the galleries, if necessary. Water quality testing of source water will be completed every year for the first 4 years of infiltration operation and then every three years of operation.

Equipment operation – Pumps will be checked by recording run times. If necessary, the amperage and voltage that pumps are pulling will be checked to verify proper operation. If the pump ceases to operate, pumping will be supplemented by a secondary sump pump until the damaged pump is repaired. The pump will be of a standard design that could be quickly replaced if necessary. Provisions will be included for connections to emergency generators. Condition of the equipment will be assessed every other year during operation of the infiltration gallery.

Flow volumes – Flow rates and the volume of water conveyed to the infiltration galleries will be monitored using pump run times, flow totalizers and level monitoring devices in the galleries. If flow rates decrease unexpectedly or if gallery levels rise too high, the monitoring equipment will pick this up and shut down the pumps. An assessment of the cause will be identified, and mitigation measures will be implemented when this occurs. The volume of water pumped to the galleries will be compared to the projected pumping schedule provided in AECOM (2015b). Flow volumes will be recorded on a weekly basis. Trends in pumping rates will be evaluated on a quarterly basis during the operation of the infiltration gallery.

If routine inspections identify a possible maintenance issue, measures will be implemented to correct the problem.

6.2 FPDWC Parcel Infiltration Pond

Maintenance activities required for the FPDWC Pond after construction and initial assessment are expected to be minimal. The pond design uses precipitation runoff to supplement groundwater supplies and the outlet is a gravity flow spillway. Routine monitoring at the pond includes measurement of water levels in the pond and in adjacent groundwater monitoring wells. General observations will also include the amount of vegetation and sedimentation build-up in the pond. Photographs of the pond will be routinely taken so that qualitative assessments of vegetation and sedimentation can be conducted to determine if the pond needs to be cleaned out. The infiltration pond is not anticipated to decrease in effectiveness as a temporary enhancement to groundwater during this timeframe. Erosion and sedimentation controls will be incorporated into the pond inlet. Therefore, significant erosion should not occur in the inlet that would result in deposition of sediment within the infiltration pond. The remainder of the watershed has well-developed vegetation.

Future development will be subjected to the Will County storm water ordinance that has strong soil erosion and sediment control requirements that will limit future erosion and sediment deposition potential at the pond. Because of the sedimentation controls incorporated into the FPDWC infiltration pond and its watershed, it does not appear to be a candidate for a significant reduction in groundwater infiltration. Regardless, the FPDWC infiltration pond is being designed to be capable of being dewatered such that periodic maintenance can be performed in the unlikely event that sediment removal is necessary. Another positive performance factor is the limited timeframe that this infiltration pond is slated to serve as a temporary AMM for potential impacts to LPNP.

7.0 Field Monitoring Procedures

Field monitoring procedures, which are included in Attachment 3, shall be reviewed by field personnel prior to each site visit. Each individual involved in the monitoring and/or inspection activities should be knowledgeable in the contents and implementation of this plan and be aware of the potential health and safety concerns associated with the field activities at the HMS Romeoville Quarry.

7.1 Health and Safety Plan

A health and safety plan (HASP) is required for all groundwater, surface water and avoidance measure inspections and monitoring events at the HMS Romeoville Facility. A summary of general safety procedures that will be incorporated into the HASP are provided below. The responsibility of designing the site HASP will be the duty of the party performing the actual work and will be completed prior to start of field activities. At a minimum, the HASP shall include:

- Name key personnel and alternates responsible for site safety.
- Describe the risks associated with the field operations being performed.
- Confirm that field personnel are adequately trained to perform their job responsibilities and to handle the specific hazardous situations that they may encounter.
- Describe the protective clothing and equipment to be worn by personnel during groundwater sampling operations.
- Describe the actions to be taken to mitigate any existing field hazards.
- Define site and sampling point access measures and include a site map with sampling point locations marked.
- Establish any required field decontamination procedures for equipment between sample points.
- Set forth a field contingency plan for safe and effective response to emergencies including maps of emergency routes on and off site with location(s) of nearest hospitals.

The HASP is developed to assist personnel in understanding and avoiding potential health and safety concerns that may be associated with the field activities at the Romeoville Facility. The plan shall be reviewed by field personnel prior to each site visit and each individual involved in the monitoring and/or inspection activities should be knowledgeable in the contents and implementation of this plan.

7.2 Field Documentation

All field notes will be completely and accurately documented so that the information is accurate for recording the annual report for the year's monitoring event. All field information will be entered on a standard Field Information Log or equivalent form (see Attachment 4). An individual field log page is shown in Attachment 4. All entries should be legible and made in blue or black, indelible ink. Entry errors will be crossed out with a single line, dated, and initialed by the person making the corrections. Individual field entries will include the following information at the minimum:

- Inspector's name, date and time of daily activities.

- Location of inspection and/or monitoring activities.
- Monitoring well location of groundwater level.
- Depth to water from top of PVC point of measurement.
- Depth to bottom of well from top of PVC and stick-up (measured periodically).
- Source of water sample (if taken).
- Sample Identification name/number (if taken).
- Sample preservatives (if used).
- Record of Field Parameter measurements (if taken).
- Test(s) to be performed on the sample.

Immediately after collection, samples shall be placed in iced coolers to maintain sample temperature requirements.

7.3 Water Level Measurement and Well Inspection Techniques

The first step of water level monitoring is to remove the well cap if it is not vented. The cap should be removed for several minutes before measurement to allow water levels to equilibrate to atmospheric pressure. The depth to water is to be measured. The device used to measure the water level surface and depth of the well shall be sufficiently sensitive and accurate in order to obtain a measurement to the nearest 0.01 foot reliably. An electronic water level meter will usually be appropriate for this measurement. If not already present, an easily identified reference point for water level measurements should be marked. If no mark is present, the highest elevation of the PVC casing is the measuring point for all water level measurements. This location and elevation of the mark or highest elevation is the surveyed location.

At each well location, water levels should be measured several times in quick succession to ensure that the well has equilibrated to atmospheric conditions prior to recording the measurement. All parcel wells should be measured prior to water quality sampling whenever possible. This will provide a water level database that represents a synoptic sampling event. Information on the integrity of the well, such as the presence of siltation, broken cover, vandalism, etc. should also be provided as summarized in Allen (2011) and discussed below:

> *Integrity inspections occur each site visit with observations of alterations reported, as these changes in and around the well may have an effect on well integrity in the short- or long-term. Likewise, integrity inspections may consist of an annual hydrograph check based on the water-level fluctuations of continually or frequently measured wells. Any out of the ordinary fluctuation may indicate compromised integrity. If the well is suitable for a total depth measurement, the depth of the well is checked and compared in relation to previous measurements. Well integrity could be compromised if the well depth has considerable variation as it could have heaved or been pinched within the casing or infiltrated with sediment and/or other foreign objects.*
>
> *If access to the well is suitable for a hydraulic test, some type of repeatable hydraulic test must be conducted upon site establishment, and as necessary throughout the life of the well. As described above, the field evaluation, annual evaluation of the hydrograph, and annual measurement of total depth will provide a good initial check on well integrity. But a quantitative*

measure of well performance/integrity is valuable and necessary periodically, whenever the above evaluation methods indicate a possible degradation in well performance. The approach used for a hydraulic test is to induce a change in water level in the well and measure the water level as it returns to equilibrium. This test can be done in many ways, and some flexibility is necessary based on well construction, well accessibility, and instrument configuration, for example. The purpose of the hydraulic test for well integrity is to determine if the response of the well has changed over time. The goal is not to calculate aquifer properties, although it might be a useful additional step. Regardless of the method used to induce water-level change, the main objective of a water-integrity test is to establish a baseline hydraulic connection between the well and the aquifer after well installation which will be able to be repeated and compared to in the future if well integrity is in question.

Some network wells are measured infrequently but are in a regular measurement program. This is common for wells that are part of a synoptic or mass measurement program. Potentiometric surface maps commonly are produced from these measurements. Even though these wells are measured infrequently, it is important that their integrity be evaluated. Each measurement should be evaluated by comparing it to past measurements. If a measurement is outside the range of expected measurements, as suggested from past measurements, it should be re-evaluated. If potentiometric surface maps are made from the water-level measurements, any measurement that seems to deviate from the conceptual model of the groundwater-flow system should be re-evaluated. Best hydrologic judgment should be used to determine the accuracy of the measurement and the extent to which the measured value is representative of the aquifer hydraulic head. If measurements are judged to be anomalous, field-related well integrity checks may be needed to determine the integrity of the well; methods such as total well depth measurement (and comparison to previous depth measurements), well-integrity hydraulic tests, borehole geophysical logs, and borehole camera surveys can be used for this purpose.

7.4 Monitoring and Measuring Equipment QA/QC Procedures

The following procedures are provided to ensure all applicable equipment being used for testing and measuring is controlled, calibrated in general accordance with equipment manual requirement and available for use when required. These procedures do not apply to equipment or devices used to obtain indications, approximations or estimates of data that do not impact the deliverables, or where formal calibration is not an industry-recommended practice for the type of equipment involved. For example, a water level indicator is not subject to formal calibration and is not an industry-recommended practice and would not be subject to these procedures.

These procedures apply to all applicable measuring, monitoring, inspection and testing equipment used by HMS staff or subcontractors in the performance of their monitoring duties for this project, including:

- Establish and maintain a test and measuring equipment register or make individual calibration records available to project team members that include; a unique identifier traceable to the calibrated equipment, to what standard or method, the date of calibration, who calibrated the equipment and the date for re-calibration.
- Identify calibration status of testing and measuring equipment and not adjust calibration settings without authorization.

- Retain a copy of the calibration certificate for loaned, rented or leased equipment and make sure supporting documents are available to certify that the equipment is within the calibration limits or equipment is operational according to the manufacturer's requirements.
- Verify quality of existing data should anomalies be observed during re-calibration.
- Check calibration records to confirm calibration is current and shall remain current for the duration of intended use.
- Maintain equipment in its protective containers while in transport and at all time while not being used.
- Confirm results are within the tolerance/accuracy required.
- Conduct and record any initial field calibration as per equipment type (e.g., record that a zero calibration has been completed).
- Verify measurement records contain equipment serial number and date of measurement.
- Train personnel in the use of monitoring and measuring equipment.
- Report all equipment malfunctions, damage and subsequent as appropriate.
- Quarantine and label any equipment deemed not fit for use to prevent inadvertent use.

7.5 Water Quality Sampling

Low-stress sampling techniques will be employed to collect samples representative of the bedrock aquifer. Field parameters, including conductivity, dissolved oxygen, pH, and temperature, will be monitored using flow-through cells during sampling to evaluate when steady-state conditions are met during purging. Groundwater samples will be collected from the designated wells and submitted to an accredited laboratory for the analysis of the constituents listed in Section 3.3. Supporting documentation, including field sampling sheets, chains of custodies and laboratory reports will be submitted as part of the annual monitoring reports.

All forms will be filled in as completely as possible. Care shall also be taken handling sample containers. Following collection, all samples will be immediately placed on ice in a cooler. Glass sample containers will be protected during shipment. Samples will be packed with wet ice in each cooler. Sample coolers will be either delivered to a local courier location for priority overnight delivery or hand delivered to the selected laboratory for analysis. Samples will be preserved as appropriate based on the analytical method. The laboratories will provide pre-preserved sample containers for sample collection. Proper custody procedures will be followed throughout all phases of sample collection and handling.

After collection, each sample will be maintained in the sampler's custody until formally transferred to another party (e.g., FedEx). For all samples collected, chain of custody (CoC) forms will document the date and time of sample collection, the sampler's name, and the names of all others who subsequently held custody of the sample. Specifications for chemical analyses will also be documented on the CoC form. CoC protocols will be used throughout sample handling to establish the evidentiary integrity of sample containers. These protocols will be used to demonstrate that the samples were handled and transferred in a manner that would eliminate possible tampering.

The laboratory will be responsible for providing electronic deliverables, including spreadsheet and/or database summaries, as well as PDF copies of the analyses. After receipt of analytical laboratory results, the data will be verified for completeness and undergo validation to ensure analytical results

meet the project quality objectives. A list of nonconformities will be generated, if applicable. All data that requires qualifying will be flagged by an appropriate qualifying symbol. The data will be managed in a water quality database for proper storage and allow for fast comparison to background datasets and development of time-trend graphs.

7.6 New Monitoring Well Installation / Replacement

New monitoring well installations completed as a part of this permit will be observed and logged by a field technician. The geologic materials and stratigraphic sequence will be reviewed by a geologist. A detailed description of the subsurface materials will be summarized in a boring log for each new monitoring well. Well completion reports will be completed that provides the detailed information of the monitoring well installation. Sample boring logs and well completion reports are included in Attachment 3.

In most cases, monitoring wells will consist of 10-ft long, 2-inch diameter Schedule 40 PVC well screen with 0.010-inch machine slotted openings and 10-ft long sections of 2-inch diameter Schedule 40 PVC solid riser pipes that extend to 2.5 feet above the ground surface. The annular space between the well screen and the borehole wall will be backfilled with coarse silica filter pack sand to a depth of 2 feet above the top slot in the well screen. The remainder of the borehole's annular space will be filled with 3/8-inch bentonite chips. For shallow monitoring wells, the sand and bentonite will be gravity fed at the surface and allowed to settle through the casing. Deeper wells, if needed to be replaced will use tremie methods to place the sand pack and grout annular sealant. The screened portion of shallow wells have been generally placed 15 feet below the bedrock surface, so that the screen and sand pack monitor the water table in the bedrock and yet a seal of at least 2 feet exists just below the bedrock surface.

Steel protective casings that are at least 5-feet in length will be installed at each newly installed monitoring well. A concrete pad at least 4 inches thick and 2-feet wide should be placed at the base of each protective casing. If necessary, yellow painted steel bollards may be considered to protect monitoring wells from vehicular damage. After new well installations, well development will be completed to remove or entrain fine particulates suspended during drilling and/or well installation. Field parameters of the purge water were recorded periodically. Well development will continue until pH, specific conductance and temperature readings stabilize. Field surveys will confirm new well locations with elevations recorded to the nearest 0.01 ft. and reported in the same horizontal coordinate system and vertical datum as previously reported (refer to Table 2-2 for specifications).

7.7 Monitoring Well Abandonment

The Will County Health Department (WCHD) will be contacted prior to the sealing of any monitoring wells to determine whether they wish to be present to observe any of the abandonments. The WCHD will also be asked to identify any potential local permitting requirements for abandonment. Sealing of wells will be conducted in accordance with 77 IAC 920.120.

The well abandonment procedures will consist of the following steps:

- Remove any dedicated sampling apparatus
- Measure depth of the well and verify its original construction details.
- Fill well casing with bentonite pellets or high solids bentonite slurry emplaced using a tremie pipe.

- Remove protective cover and concrete pad.
- Top off borehole with granular bentonite as necessary to adjust for settlement.
- Restore ground surface to native condition to minimize the potential for ponding and induced infiltration.

Boreholes not completed as monitoring wells will be sealed in accordance with the minimum requirements of 35 IAC 811.316 and 77 IAC 920.120. Boreholes drilled and not completed as monitoring wells will be sealed using granular, pelleted, or slurry bentonite. Illinois Department of Public Health Well Sealing Forms will be provided to either the Illinois Department of Public Health or the Will County Health Department, as appropriate, within 30 days following completion of the work.

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Tables

Table 2-1

Time Periods for Hydrology Monitoring

HMS Romeoville Quarry

Parcel and Actitivity	Preliminary Testing / Monitoring	Period of Habitat Conservation Plan: Year 1 (2020/2021)	Year 2 (2021/2022)	Year 3 (2022/2023)	Year 4 (2023/2024)	Year 5 (2024/2025)	Year 6 (2025/2026)	Year 7 (2026/2027)	Year 8 (2027/2028)	Year 9 (2028/2029)	Year 10 (2029/2030)	Year 11 (2030/2031)	Year 12 (2031/2032)	Year 13 (2032/2033)	Year 14 (2033/2034)	Year 15 (2034/2035)	Year 16 (2035/2036)	Year 17 (2036/2037)	Year 18 (2037/2038)	Year 19 (2038/2039)	Year 20 (2039/2040)	Year 21 (2040/2041)	Year 22 (2041/2042)	Year 23 (2042/2043)	Year 24 (2043/2044)	Year 25 (2044/2045)	Year 26 (2045/2046)	Year 27 (2046/2047)	Year 28 (2047/2048)	Year 29 (2048/2049)	Year 30 (2049/2050)	Year 31 (2050/2051)	Year 32 (2051/2052)	Year 33 (2052/2053)	Year 34 (2053/2054)	Year 35 (2054/2055)	Year 36 (2055/2056)	Year 37 (2056/2057)	Year 38 (2057/2058)	Year 39 (2058/2059)	Year 40 (2059/2060)
Generalized Mining Plan																																									
Surface Mining of West Quarry																																									
Surface Mining of Middle Parcel																																								
Plugging of West Quarry Tunnel																																								
Inundation of West Quarry												Estimated																													
Surface Mining of East Quarry		Timing of East Quarry mining is currently undetermined.																																							
River South / River South Bluff Parcels, FPDWC Pond (FPDWC Pond), and Lockport Prairie Nature Preserve (LPNP)																																								
Preliminary Monitoring / Testing Period																																								
First Year of Operation																																								
Routine Monitoring During Operation																																								
WQ Recovery Period																																								
Post WQ Recovery Period																																								
Romeoville Prairie Nature Preserve (RPNP)																																								
Background Monitoring Period (MW-25 and MW-26)																																								
Routine Monitoring (MW-25 and MW-26)																																								
Routine Monitoring (PW-4D)																																								
North/Far North/River North Parcels																																								
Background Monitoring Period																																								
Routine Monitoring																																								
ComEd / Long Run Parcels																																								
Transplant Monitoring Period																																								
Pre- and Post-Transplant Monitoring Period												Estimated																													
Routine Monitoring at well CEP-4D																																								
West Quarry																																								
Routine Monitoring During Operation																																								
WQ Recovery Period																																								
Post WQ Recovery Period												Estimated																													

Notes:

WQ = West Quarry

Surface mining in the Middle Parcel is estimated to be completed in 2048. Routine groundwater monitoring may be scheduled for the duration of the HCP permitted timeframe of 40 years.

Table 2-2
Groundwater Level Monitoring Schedule
HMS Romeoville Quarry

Parcel	Monitoring Location	Top of PVC Measuring Point	Ground Surface Elevation	Date of Survey	Elevation at which Verification Monitoring is Triggered (Lower 5% of Historical Ground Water Elevations) **Excluding drought data**		Northing	Easting	Monitoring Schedule	
									Minimum Frequency[1]	Duration
		(ft msl)	(ft msl)		(ft msl)	Note on trigger elevation	(feet)	(feet)		
River South Bluff Parcel	RP-1D	603.19	601.2	A	580.89	Lower 5% of observed levels estimated from manual and automated measurements.	1,800,244	1,055,304	Hourly Every 4 hrs	During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-1S	603.98	600.8	A	581.72		1,800,235	1,055,305	Hourly Every 4 hrs	During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-3S East	604.23	601.6	C	582.61	Lower 5% of observed water levels measurements.	1,799,604	1,055,282	Daily to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-3S West	605.24	603.2	C	583.06		1,799,592	1,055,216	Daily to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-4S	604.02	602.2	C	578.63	Insufficient data to determine lower 5% of observed elevations. The lowest measured elevation is provided as a basis for comparisons.	1,799,134	1,055,305	10 min. to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-5S East	602.11	600.1	C	584.62		1,798,492	1,055,316	10 min. to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-5S West	606.20	604.0	C	586.79		1,798,557	1,055,244	10 min. to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-6S	608.48	606.2	C	585.30		1,798,176	1,055,194	Daily to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-8S East	603.90	601.0	D	583.20		1,799,933	1,055,351	10 min. to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-8S West	604.27	601.2	D	584.76		1,799,937	1,055,220	10 min. to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-9S North	603.16	599.7	D	584.27		1,799,974	1,055,276	10 min. to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-9S South	602.49	599.7	D	584.84		1,799,898	1,055,277	10 min. to Weekly Intervals Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-10S	610.41	607.2	D	585.53		1,799,968	1,054,910	Hourly Monthly Quarterly	During Preliminary Gallery Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	W-1 Seep	N/A		D	N/A	Temperature Monitoring at Seep Discharge	1,799,962	1,055,454	Hourly[3] Every 4 hrs[3]	During Preliminary Gallery Testing Through Post WQ Recovery Monitoring Period
River South Parcel	RP-2D	581.88	579.2	A	575.37	Lower 5% of water levels determined from manual and automatically recorded data (Excludes drought data)	1,799,229	1,055,624	Hourly Every 4 hrs	During First Year of Operation Through Post WQ Recovery Monitoring Period
	RP-2S	582.27	579.3	A	575.40		1,799,234	1,055,617	Hourly Every 4 hrs	During First Year of Operation Through Post WQ Recovery Monitoring Period
FPDWC Parcel	FP1 (Stage Gauge in Pond)	TBV	TBV	---	N/A	Assessment elevation is not applicable for infiltration pond, since it will be used for water balance estimates.	1,795,405 (Est.) (TBD)	1,054,412 (Est.) (TBD)	15 min. Interval[3] Hourly[3]	During Preliminary Pond Testing Through Post WQ Recovery Monitoring Period

Table 2-2
Groundwater Level Monitoring Schedule
HMS Romeoville Quarry

Parcel	Monitoring Location	Top of PVC Measuring Point	Ground Surface Elevation	Date of Survey	Elevation at which Verification Monitoring is Triggered (Lower 5% of Historical Ground Water Elevations) **Excluding drought data**		Northing	Easting	Monitoring Schedule	
									Minimum Frequency[1]	Duration
		(ft msl)	(ft msl)		(ft msl)	Note on trigger elevation	(feet)	(feet)		
LPNP	MW-6A	619.15	616.5	---	585.99	Lower 5% of observed levels estimated from manual measurements collected by third party consultants and researchers. (Excludes drought data)	1,792,908	1,054,107	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-6B	619.21	616.3	---	586.23		1,792,908	1,054,107	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-6C	619.11	616.3	---	586.31		1,792,908	1,054,107	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-6N	624.75	622.5	---	587.96		1,793,208 (Est.)	1,053,922 (Est.)	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-7C	674.75	672.1	---	605.46		1,795,386 (Est.)	1,049,812 (Est.)	Hourly[2] Every 4 hrs[2]	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-7D	674.81	672.1	---	605.29		1,795,386 (Est.)	1,049,812 (Est.)	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-8A	569.33	566.5	---	563.34		1,790,258	1,053,527	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-8B	569.33	566.5	---	563.23		1,790,258	1,053,527	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-9A	574.64	571.7	---	567.55		1,792,505	1,054,479	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-9B	574.38	571.7	---	568.12		1,792,505	1,054,479	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-11A	567.37	562.6	---	560.76		1,794,152 (Est.)	1,056,204 (Est.)	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-11B	567.40	562.5	---	561.26		1,794,152 (Est.)	1,056,204 (Est.)	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-11C	567.46	562.5	---	561.41		1,794,152 (Est.)	1,056,204 (Est.)	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-12B	644.61	642.61	---	601.31		1,794,152 (Est.)	1,056,204 (Est.)	Monthly Quarterly	During First Year of Operation Through Post WQ Recovery Monitoring Period
	MW-12C	644.69	642.1	---	601.37		1,794,152 (Est.)	1,056,204 (Est.)	Hourly[2] Every 4 hrs[2]	During First Year of Operation Through Post WQ Recovery Monitoring Period
	G-101 (proposed)	TBD	TBD	---	TBD	To be estimated from preliminary data collection and analysis	1,794,450 (TBD) (Est.)	1,055,408 (TBD) (Est.)	4-Hr Intervals Hourly Daily Quarterly	Background Monitoring Period After Installation During Preliminary Testing During First Year of Operation Through Post WQ Recovery Monitoring Period
	G-102 (proposed)	TBD	TBD	---	TBD		1,793,868 (TBD) (Est.)	1,055,136 (TBD) (Est.)	4-Hr Intervals Hourly Every 4 hrs[2]	Background Monitoring Period After Installation During Preliminary Testing Through Post WQ Recovery Monitoring Period
ComEd / Long Run Parcels	CEP-1D	589.73	586.6	A	585.31	Lower 5% of observed levels estimated from manual measurements. (Excludes drought data)	1,810,412	1,060,958	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-2S	590.29	587.2	A	584.34		1,808,232	1,061,615	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-2D	590.32	587.5	A	584.37		1,808,218	1,061,575	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-3S	595.05	592.0	A	589.69		1,810,410	1,061,754	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-3D	595.07	592.0	A	589.85		1,810,374	1,061,753	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-4S	587.40	584.5	A	579.48		1,807,899	1,059,861	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-4D	587.73	584.3	A	579.54		1,807,868	1,059,877	4-Hr Intervals[2]	Through duration of Permit
	CEP-10S	587.73	584.7	B	583.85	Lower 5% of observed levels estimated from readings collected automatically and manually (No drought data to exclude)	1,808,473	1,060,356	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-11S	587.90	585.0	B	582.47		1,808,822	1,060,557	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-11D	587.48	584.9	B	582.62		1,808,819	1,060,556	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period
	CEP-12S	590.76	587.3	B	586.30		1,808,527	1,061,055	Quarterly Semi-Annual (Spr. & Fall)	Transplant Monitoring Period Pre- and Post-Transplant Monitoring Period

Table 2-2
Groundwater Level Monitoring Schedule
HMS Romeoville Quarry

Parcel	Monitoring Location	Top of PVC Measuring Point	Ground Surface Elevation	Date of Survey	Elevation at which Verification Monitoring is Triggered (Lower 5% of Historical Ground Water Elevations) **Excluding drought data**		Northing	Easting	Monitoring Schedule	
									Minimum Frequency[1]	Duration
		(ft msl)	(ft msl)		(ft msl)	Note on trigger elevation	(feet)	(feet)		
RPNP	PW-4D	596.42	593.6	B	590.23	Estimated level since little fluctuation observed at well from manual WLs	1,817,034	1,056,447	Semi-Annual (Spr. & Fall)	Through duration of Permit
	MW-24	595.23	592.4	---	TBD	A background groundwater level dataset to be established for use in future comparisons and assessment monitoring, if necessary.	1,811,673 (Est.)	1,054,738 (Est.)	Quarterly Semi-Annual (Spr. & Fall)	Five (5) Year Background Monitoring Period; First 5 Years of East Quarry Mining; First 5 Years of Middle Parcel Mining Through Entire Permit Period
	MW-25	594.04	591.0	---	TBD		1,811,673 (Est.)	1,054,855 (Est.)	Quarterly Semi-Annual (Spr. & Fall)	Five (5) Year Background Monitoring Period; First 5 Years of East Quarry Mining; First 5 Years of Middle Parcel Mining Through Entire Permit Period
North / Far North / River North Parcels	NP-2S	587.07	585.2	C	TBD	Groundwater levels will be collected for 5 years to establish background	1,809,407	1,055,028	Quarterly Semi-Annual (Spr. & Fall)	Five (5) Year Background Monitoring Period; First 5 Years of East Quarry Mining; First 5 Years of Middle Parcel Mining Through Entire Permit Period
	NP-3S	591.15	589.3	C	TBD		1,809,882	1,055,006	Quarterly Semi-Annual (Spr. & Fall)	Five (5) Year Background Monitoring Period; First 5 Years of East Quarry Mining; First 5 Years of Middle Parcel Mining Through Entire Permit Period
	NP-5S	601.52	599.2	C	TBD		1,809,811	1,054,735	Quarterly Semi-Annual (Spr. & Fall)	Five (5) Year Background Monitoring Period; First 5 Years of East Quarry Mining; First 5 Years of Middle Parcel Mining Through Entire Permit Period
	NP-6S	607.55	605.4	C	TBD		1,809,180	1,053,855	Quarterly Semi-Annual (Spr. & Fall)	Five (5) Year Background Monitoring Period; First 5 Years of East Quarry Mining; First 5 Years of Middle Parcel Mining Through Entire Permit Period
West Quarry	P-21	683.11	680.3	E	504	Based on lowest predicted levels from original (1990's) GW model.	1,802,198	1,052,119	Quarterly	Through Post WQ Recovery Monitoring Period
	P-22	671.51	668.5	E	522		1,801,887	1,052,457	Quarterly	Through Post WQ Recovery Monitoring Period
	P-23	646.95	644.0	E	522		1,801,898	1,053,058	Quarterly	Through Post WQ Recovery Monitoring Period

Notes:

Project Benchmark: Army Corps of Engineers Point "FISH BAR 22 2008"
Horizontal Datum: NAD83(2007) Illinois East (feet)
Vertical Datum: NAVD 88 (feet)
LPNP: Lockport Prairie Nature Preserve
RPNP: Romeoville Prairie Nature Preserve
N/A: Not Applicable.
TBD: Elevation or location to be determined when well is installed.
TBV: Elevation to be verified after plan approval through additional monitoring or resurveying.

Date of Survey:
A) Oct-05
B) May-11
C) Aug-13
D) Nov-14
E) Unknown

[1] Minimum monitoring frequencies during preliminary testing of the infiltration galleries will vary from 10 minute to weekly intervals based on individual gallery testing. Since individual gallery testing may occur over the period of two weeks, data collection will not occur simultaneously at all site wells since field monitoring will be focused on each individual gallery which is being tested as summarized in Section 3.2.1. Several monitoring wells, including RP-1D, RP-2S and RP-10S, will be monitored continuously at a minimum of 1-hour intervals throughout initial gallery testing to collect background data and potential downgradient water levels changes.

[2] Automated monitoring instruments will be deployed at RP-1D, RP-1S, RP-2D, RP-2S, MW-7C, MW-12C, and CEP-4D to record water levels every 4-hours. An instrument will record conductivity and water levels at G-102 every 4-hours. Telemetry units will be installed at RP-1D and RP-2S and accessed weekly for data download and review.

[3] Automated monitoring instruments will also be deployed at W-1 Seep and FP-1. Temperature will be recorded at W-1 and water level at FP-1.
Drought data exclusions include months with Palmer Drought Severity Index of less than negative two.

Table 2-3
Seasonal Low Groundwater Levels
HMS Romeoville Quarry

Table 2-3: The Seasonal Low Water Level Criterion #2 is intended to be applied to monitoring wells that have sufficient water level data to review. Thus, monitoring wells that have automated monitoring devices that collect discrete groundwater levels several times a day will be the focus of this groundwater level monitoring criterion. The groundwater monitoring wells with planned automated data collection (higher frequency monitoring) are indicated below. In some cases, a monitoring well or group of monitoring wells may have numerous groundwater level readings within the same season. Therefore, monitoring wells with at least 25 readings in a season had seasonal low averages estimated for them for potential review during Assessment Monitoring, for example.

Parcel	Monitoring Location	Seasonal Low Average:	Winter	Spring	Summer	Fall
		Statistical Information:	(ft msl)	(ft msl)	(ft msl)	(ft msl)
River South Bluff Parcel	RP-1D (high frequency monitoring)	Average	586.02	587.63	589.06	585.29
		Standard Deviation	3.10	2.93	4.04	3.52
		Seasonal Low Value	584.78	586.46	587.44	583.88
	RP-1S (high frequency monitoring)	Average	583.77	584.97	583.37	583.81
		Standard Deviation	2.06	2.69	1.81	2.11
		Seasonal Low Value	582.53	583.89	582.28	582.55
	RP-3S East	Average	589.03	591.26	590.49	587.83
		Standard Deviation	2.94	2.21	2.77	4.45
		Seasonal Low Value	587.85	589.93	589.38	586.05
	RP-3S West	Average	589.63	591.64	590.95	588.44
		Standard Deviation	2.77	2.15	2.61	4.31
		Seasonal Low Value	588.52	590.34	589.91	586.71
River South Parcel	RP-2D (high frequency monitoring)	Average	576.92	577.21	576.96	576.62
		Standard Deviation	0.26	0.29	0.69	0.96
		Seasonal Low Value	576.66	576.92	576.41	575.85
	RP-2S (high frequency monitoring)	Average	577.04	577.17	576.75	576.76
		Standard Deviation	0.28	0.19	0.63	1.12
		Seasonal Low Value	576.76	576.98	576.25	576.09
LPNP	MW-6A	Average	---	588.95	588.65	588.06
		Standard Deviation	---	0.75	1.24	2.94
		Seasonal Low Value	---	588.35	587.90	586.89
	MW-6B	Average	---	588.48	588.50	587.47
		Standard Deviation	---	0.72	1.49	1.32
		Seasonal Low Value	---	587.91	587.61	586.67
	MW-6C	Average	---	588.25	588.41	587.59
		Standard Deviation	---	0.59	0.68	0.85
		Seasonal Low Value	---	587.78	587.86	586.91
	MW-7C (high frequency monitoring)	Average	---	607.57	606.76	606.32
		Standard Deviation	---	0.64	0.93	0.70
		Seasonal Low Value	---	607.06	606.01	605.76
	MW-7D	Average	---	607.75	606.82	606.47
		Standard Deviation	---	0.51	1.03	1.03
		Seasonal Low Value	---	607.35	606.20	605.85
	MW-8A	Average	---	564.12	563.92	563.93
		Standard Deviation	---	0.14	0.32	0.34
		Seasonal Low Value	---	563.97	563.60	563.59
	MW-8B	Average	---	563.89	563.64	563.71
		Standard Deviation	---	0.07	0.32	0.25
		Seasonal Low Value	---	563.82	563.32	563.46

Table 2-3
Seasonal Low Groundwater Levels
HMS Romeoville Quarry

Table 2-3: The Seasonal Low Water Level Criterion #2 is intended to be applied to monitoring wells that have sufficient water level data to review. Thus, monitoring wells that have automated monitoring devices that collect discrete groundwater levels several times a day will be the focus of this groundwater level monitoring criterion. The groundwater monitoring wells with planned automated data collection (higher frequency monitoring) are indicated below. In some cases, a monitoring well or group of monitoring wells may have numerous groundwater level readings within the same season. Therefore, monitoring wells with at least 25 readings in a season had seasonal low averages estimated for them for potential review during Assessment Monitoring, for example.

Parcel	Monitoring Location	Seasonal Low Average:	Winter	Spring	Summer	Fall
		Statistical Information:	(ft msl)	(ft msl)	(ft msl)	(ft msl)
ComEd / Long Run Parcels	CEP-10S	Average	584.86	584.93	584.53	584.61
		Standard Deviation	0.18	0.24	0.66	0.32
		Seasonal Low Value	584.68	584.69	584.00	584.29
	CEP-11S	Average	584.57	584.63	583.88	584.07
		Standard Deviation	0.19	0.22	0.98	0.72
		Seasonal Low Value	584.38	584.41	583.10	583.50
	CEP-11D	Average	584.39	584.50	583.86	584.11
		Standard Deviation	0.18	0.22	0.83	0.78
		Seasonal Low Value	584.21	584.28	583.19	583.48
	CEP-12S	Average	587.66	587.61	587.11	587.45
		Standard Deviation	0.24	0.26	0.83	0.47
		Seasonal Low Value	587.42	587.35	586.45	586.98
RPNP	MW-25 (TBD)	Average	---	---	---	---
		Standard Deviation	---	---	---	---
		Seasonal Low Value	---	---	---	---

Notes:
Vertical Datum: NAVD 88 (feet)
LPNP: Lockport Prairie Nature Preserve
RPNP: Romeoville Prairie Nature Preserve
Blank cells ('---') indicates no available data
Seasonal Low Value was calculated when 25 or more water readings were available for a unique well and season
TBD: Seasonal low water levels will be determined as additional monitoring data are collected during first five years of monitoring.
Drought data that were collected when the monthly Palmer Drought Severity Index was less than negative two have been excluded.

Table 2-4A

Schedule of Water Quality Monitoring River South / River South Bluff Parcels

HMS Romeoville Quarry

Parcel and Actitivity	Preliminary Testing / Monitoring	Period of Habitat Conservation Plan																																							
		Year 1 (2020/2021)	Year 2 (2021/2022)	Year 3 (2022/2023)	Year 4 (2023/2024)	Year 5 (2024/2025)	Year 6 (2025/2026)	Year 7 (2026/2027)	Year 8 (2027/2028)	Year 9 (2028/2029)	Year 10 (2029/2030)	Year 11 (2030/2031)	Year 12 (2031/2032)	Year 13 (2032/2033)	Year 14 (2033/2034)	Year 15 (2034/2035)	Year 16 (2035/2036)	Year 17 (2036/2037)	Year 18 (2037/2038)	Year 19 (2038/2039)	Year 20 (2039/2040)	Year 21 (2040/2041)	Year 22 (2041/2042)	Year 23 (2042/2043)	Year 24 (2043/2044)	Year 25 (2044/2045)	Year 26 (2045/2046)	Year 27 (2046/2047)	Year 28 (2047/2048)	Year 29 (2048/2049)	Year 30 (2049/2050)	Year 31 (2050/2051)	Year 32 (2051/2052)	Year 33 (2052/2053)	Year 34 (2053/2054)	Year 35 (2054/2055)	Year 36 (2055/2056)	Year 37 (2056/2057)	Year 38 (2057/2058)	Year 39 (2058/2059)	Year 40 (2059/2060)
Generalized Mining Plan																																									
Surface Mining of West Quarry		■	■	■	■	■	■	■																																	
Surface Mining of Middle Parcel							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Plugging of West Quarry Tunnel								■	■																																
Inundation of West Quarry									■	■	■	Estimated																													
River South / River South Bluff Parcels:																																									
Preliminary Monitoring / Testing Period	Gallery A: (Northern)																		Gallery A:	WLs and temps will be recorded in the gallery and at wells RP-1S, RP-8S East, RP-8S West, RP-9S North, RP-9S South, RP-3S West, and RP-3S East. The W-1 seep discharge will be periodically monitored for temp., pH, DO, and conductivity. Discharge rates will also be estimated at W-1 location. Environmental indicator parameters will be monitored before and after preliminary testing at RP-1D, RP-8S West, RP-8S East, W-1 Seep and RP-10S.																					
	Gallery B: (Middle)																		Gallery B:	WLs and temps will be recorded in the gallery and at RP-3S West, RP-3S East RP-4S, RP-2S and RP-2D																					
	Gallery C: (Southern)																		Gallery C:	WLs and temps will be recorded in RP-5S West and RP-5S East																					
First Year of Operation		■																		Quarterly sampling at: River South & River South Bluff Parcel wells: RP-1D, RP-10S, RP-8S West & W-1 Seep; RP-4S & RP-2S; RP-5S West & RP-5S East; Infiltration gallery source water (Refer to Table 2-3B for Parameter List)																					
Routine Monitoring During Operation			■	■	■	■	■	■	■	■	■	■	■							Semi-annual sampling at: RP-8S West & W-1 Seep; Annual sampling at: RP-1D, RP-2S, RP-4S, RP-5S East, infiltration gallery source water (Refer to Table 2-3B for Parameter List)																					
West Quarry Recovery Period														■	■	■				Semi-annual sampling at: RP-8S West & W-1 Seep (Refer to Table 2-3B for Parameter List)																					
Post West Quarry Recovery Period																	■	■	■	Water quality sampling to be terminated when galleries are no longer being used.																					

Notes:

WQ = Water Quality
WLs = Water Levels
Temp(s) = Temperature(s)
DO = dissolved oxygen
ORP = oxidation-reduction potential

Table 2-4B
Sample Frequency and Constituent List for River South / River South Bluff Parcels Water Quality Monitoring
Romeoville Quarry, Romeoville, Illinois

Monitoring Period	Sample Frequency	Sample Information		Environmental Indicator Parameters													Possible Parameters for Assessment Monitoring								
				Field Parameters						General WQ Parameters							Nutrients					Potential Pollutants			
		Location	Type	Temperature[1]	Turbidity[2]	pH	Conductivity	Dissolved Oxygen	Oxidation-Reduction Potential	Total Dissolved Solids	Major Anions	Chloride	Sulfate	Bicarbonate Alkalinity	Metals (Total)[3]	(Al, Sb, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Pb, K, Mg, Mn, Ni, Na, Se, Ag, Th, V, Zn)	Total Phosphorus	Total K Nitrogen	Nitrate/Nitrite	Ammonia	Biochemical Oxygen Demand	Mercury, Low Level (EPA 1631)	SVOCs	VOCs	General Pesticide Scan (Method 5–B11)
Through West Quarry Recovery	Every 4 Hours	W-1 Seep	SW	R	-	-	R	-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-
		RP-2S	GW	R	-	-	R	-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-
First Year of Operation	Quarterly (One per Season)	Infiltration Gallery Source Water	SW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-1D	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-2S	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-4S	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-5S East	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-5S West	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-8S West	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-10S	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		W-1 Seep	SW	R/V	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
Routine Monitoring During Operation	Semi-Annual (Spring & Fall)	RP-8S West	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		W-1 Seep	SW	R/V	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
	Annual (Conducted in Spring)	Infiltration Gallery Source Water	SW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-1D	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-2S	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-4S	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		RP-5S East	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
West Quarry Recovery Period	Semi-Annual (Spring & Fall)	RP-8S West	GW	R	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
		W-1 Seep	SW	R/V	R/V	R/V	R/V	R/V	R/V	R/V		R/V	R/V	R/V		R/V	AM	AM	AM	AM	AM	AM	AM	AM	AM
Post-West Quarry Recovery Period	---N/A---	Sample locations to be abandoned.	-N/A-	Water quality sampling to be terminated when galleries are no longer being used.																					

Legend:

SW	Surface Water
GW	Groundwater
R	Constituent will be analyzed during Routine Monitoring
V	Constituent will be analyzed during Verification Monitoring
AM	Constituent may be analyzed during Assessment Monitoring (which includes assessment of adaptation / corrective measures) if specified in the Assessment Monitoring Work Plan and Notification.

Notes:

1 Temperature is a field parameter that will be measured during each sampling event. However, temperature monitoring at W-1 seep will have verification monitoring.

2 Turbidity will be monitored during each sampling event, but does not have predictive limits.

3 Metals will not be field filtered prior to lab analyses.

Abbreviations:

ORP	Oxidation-Reduction Potential
WQ	Water Quality
BOD	Biochemical Oxygen Demand

- Sandstrom, M.W., Kanagy, L.K., Anderson, C.A., & Kanagy, C.J. (2016). Determination of pesticides and pesticide degradates in filtered water by direct aqueous-injection liquid chromatography-tandem mass spectrometry; Chap. 11 of Sec. B, Methods of the NWQL Book 5, Laboratory Analysis; USGS Techniques and Methods 5–B11.
- United States Environmental Protection Agency (2002a), Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry; EPA-821-R-02-019 August 2002.

Table 2-5A

Schedule of Water Quality Monitoring at Lockport Prairie Nature Preserve and FPDWC Pond Areas

HMS Romeoville Quarry, Illinois

Parcel and Actitivity	Preliminary Testing / Monitoring	Period of Habitat Conservation Plan																																							
		Year 1 (2020/2021)	Year 2 (2021/2022)	Year 3 (2022/2023)	Year 4 (2023/2024)	Year 5 (2024/2025)	Year 6 (2025/2026)	Year 7 (2026/2027)	Year 8 (2027/2028)	Year 9 (2028/2029)	Year 10 (2029/2030)	Year 11 (2030/2031)	Year 12 (2031/2032)	Year 13 (2032/2033)	Year 14 (2033/2034)	Year 15 (2034/2035)	Year 16 (2035/2036)	Year 17 (2036/2037)	Year 18 (2037/2038)	Year 19 (2038/2039)	Year 20 (2039/2040)	Year 21 (2040/2041)	Year 22 (2041/2042)	Year 23 (2042/2043)	Year 24 (2043/2044)	Year 25 (2044/2045)	Year 26 (2045/2046)	Year 27 (2046/2047)	Year 28 (2047/2048)	Year 29 (2048/2049)	Year 30 (2049/2050)	Year 31 (2050/2051)	Year 32 (2051/2052)	Year 33 (2052/2053)	Year 34 (2053/2054)	Year 35 (2054/2055)	Year 36 (2055/2056)	Year 37 (2056/2057)	Year 38 (2057/2058)	Year 39 (2058/2059)	Year 40 (2059/2060)
Generalized Mining Plan																																									
Surface Mining of West Quarry																																									
Surface Mining of Middle Parcel																																									
Plugging of West Quarry Tunnel																																									
Inundation of West Quarry												Estimated																													
FPDWC Pond, and Lockport Prairie Nature Preserve (LPNP)																																									
Preliminary Monitoring Period	LPNP:																			<u>LPNP</u>: G101 and G102 Background monitoring at G101 and G102 is scheduled to occur quarterly (once every three months) during the permit's first year. However, background monitoring will be condensed to a minimum of 8-months, so background sampling/monitoring can occur prior to the construction of the pond. In this scenario, sampling would be scheduled every other month.																					
First Year of Operation																				Continuous monitoring (every 4hrs) of groundwater level, temperature, and specific conductance will occur at well G102. In addition, three seasonal sampling events will be conducted at: <u>LPNP wells</u>: G101, G102, MW-6A, MW-6B, MW-9A <u>FPDWC Pond</u>: FP-1																					
Routine Monitoring During Operation																																									
WQ Recovery Period																																									
Post WQ Recovery Period																				Water quality sampling to be terminated when River South Bluff Parcel galleries are no longer being used.																					

<u>Notes</u>:

FPDWC = Forest Preserve District of Will County

LPNP = Lockport Prairie Nature Preserve

WQ = West Quarry

Table 2-5B
Sample Frequency and Constituent List for FPDWC Pond Monitoring
Romeoville Quarry, Romeoville, Illinois

Monitoring Location[1]		Constituent List	Notes	Routine Monitoring: Spring-Thaw (March)	Routine Monitoring: Early Season Placement of Turf Management Products (May 15th - June 15th)	Routine Monitoring: Late Season Placement of Turf Management Products (Sept 15th - Oct. 15th)	Possible Verification Sampling Constituents[2]	Sampling for Assessment Monitoring[2]	Sampling for Adaptation Management (e.g., Pond water continues to fail, trucking water inefficient, sampling to look into WQ problem)
FPDWC Pond	Routine Monitoring Parameters	Hydrology Parameters							
		Water Level Monitoring	(Automated WL Monitoring)	Continuous Monitoring (Data collected every four hours)					
		Water Temperature Monitoring	(Automated w/ WL readings)	Continuous Monitoring (Data collected every four hours)					
		Biological Indicator							
		Ceriodaphnia dubia (7-day survival & reproduction water toxicity test)		X	X	X	X	X (verify fresh pond water is acceptible after draining)	X (Additional sample(s) to verify WQ in Pond is acceptible)
FPDWC Pond and LPNP Monitoring Wells		Environmental Indicator Parameters							
		Field Parameters:							
		Temperature & Conductivity	Automated at monitoring well G-102	Continuous Monitoring (Data collected every four hours)					
		Temperature		X	X	X	X	X	X
		Turbidity		X	X	X	X	X	X
		pH		X	X	X	X	X	X
		Conductivity		X	X	X	X	X	X
		Dissolved Oxygen		X	X	X	X	X	X
		Oxidation-Reduction Potential		X	X	X	X	X	X
		General Water Quality Parameters							
		Total Dissolved Solids		X	X	X	X	X	X
		Major Anions							
		Chloride		X	X	X	X	X	X
		Sulfate		X	X	X	X	X	X
		Bicarbonate Alkalinity		X	X	X	X	X	X
		Metals (Collected for Total & Dissolved; Unfiltered & Filtered sample collection)							
		(Al, Sb, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Pb, K, Mg, Mn, Ni, Na, Se, Ag, Th, V, Zn)		X	X	X	X	X	X
		Nutrients:							
		Total Phosphorus		X	X	X	X	X	X
		Total K Nitrogen		X	X	X	X	X	X
		Nitrate/Nitrite		X	X	X	X	X	X
		Ammonia		X	X	X	X	X	X
FPDWC Pond and LPNP Monitoring Wells	Possible Assessment Monitoring Parameters	Potential Pollutants							
		SVOCs	(possible sampling during assessment monitoring)	---	---	---	---	X	X
		VOCs		---	---	---	---	X	X
		Biochemical Oxygen Demand (BOD)	(expect low BOD)	---	---	---	---	(possible analysis)	(possible analysis)
		Low Level Mercury (EPA 1631E)	(clean hands/dirty hands sampling)	---	---	---	---	(possible analysis)	(possible analysis)
		General Pesticide Scan (as described in Sandstrom et al., 2016)	(banned pesticides not expected; scan for possible pesticide to occur during assessment monitoring)	---	---	---	---	(possible analysis)	(possible analysis)
FPDWC Pond		Target Pesticides/Fungicides							
		Trifloxystrobin	(possible sampling during assessment monitoring)	---	---	---	---	(possible analysis)	(possible analysis)
		Chlorothalonil		---	---	---	---	(possible analysis)	(possible analysis)
		Thiram		---	---	---	---	(possible analysis)	(possible analysis)
		Semi-Permeable Sampling Bags	Sampling limited to Adaptive Management processes, if applicable	---	---	---	---	(no SPMD/POCIS sampling in AM, unless specific parameter/parameter list is dictated)	(possible analysis, since the root cause of WQ issue being sought)

Abbreviations:

AM - Assessment Monitoring
FPDWC - Forest Preserve District of Will County
POCIS - Polar Organic Chemical Integrative Sampler
SPMD - Semi-Permeable Monitoring Device
SVOCs - Semi Volatile Organic Compounds
VOCs - Volatile Organic Compounds
WL - Water Level
WQ - Water Quality

[1] Monitoring Locations:

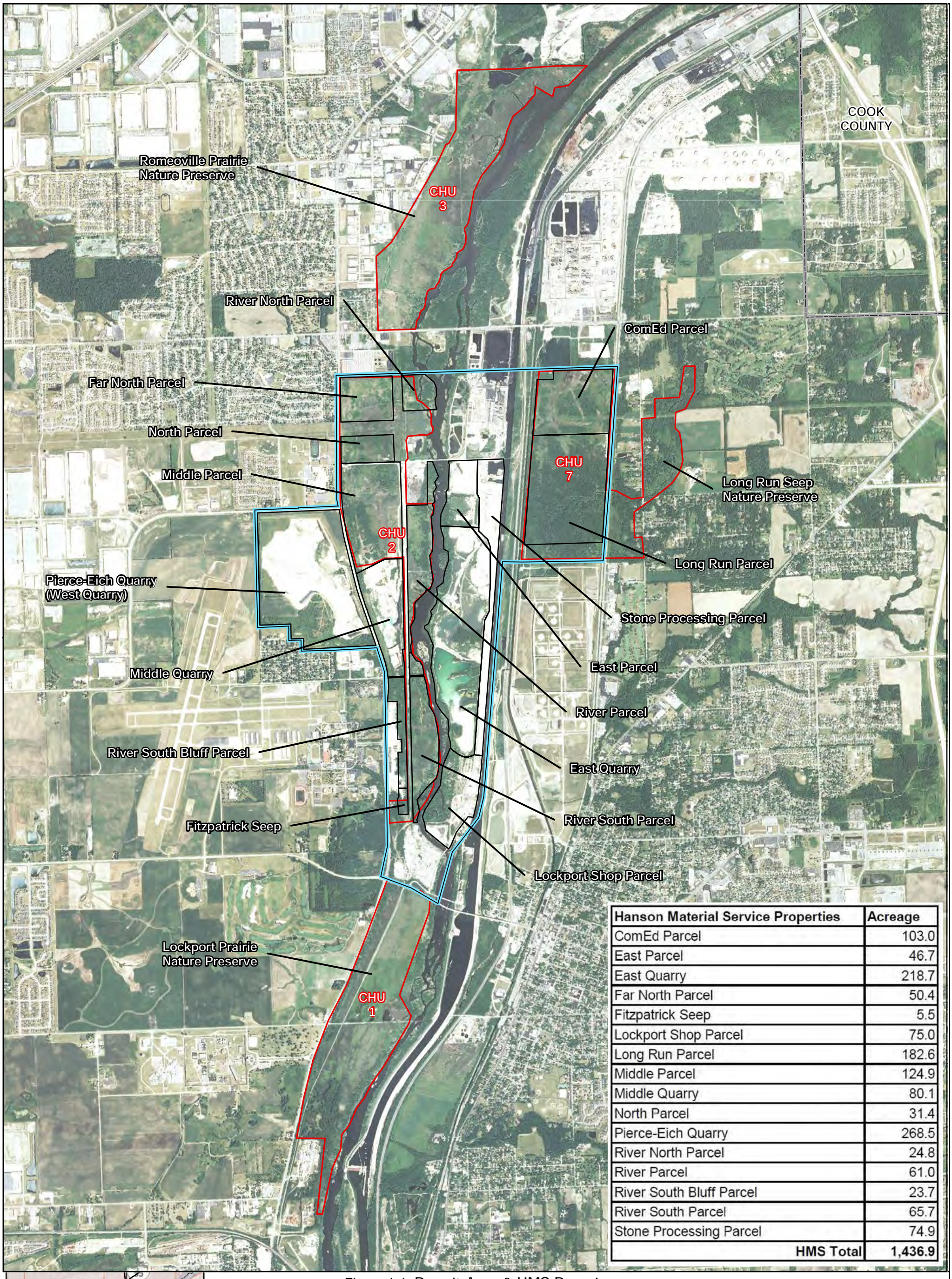
Surface Water (at FPDWC Pond): FPDWC Pond - Backwater Prior to Construction (FP-0); FPDWC Pond - After Berm Construction (FP-1)

Groundwater Monitoring Wells: G101, G102, MW-6A, MW-6B, MW-9A

2 Verification Monitoring may be limited to the well or surface water location where the potential Routine Monitoring trigger was observed. However, additional constituents may be sampled during Verification Monitoring to assist in developing strategy for the Assessment Monitoring plan.

Sandstrom, M.W., Kanagy, L.K., Anderson, C.A., & Kanagy, C.J. (2016). Determination of pesticides and pesticide degradates in filtered water by direct aqueous-injection liquid chromatography-tandem mass spectrometry; Chap. 11 of Sec. B, Methods of the NWQL Book 5, Laboratory Analysis; USGS Technique 5–B11.

Figures



Hanson Material Service Properties	Acreage
ComEd Parcel	103.0
East Parcel	46.7
East Quarry	218.7
Far North Parcel	50.4
Fitzpatrick Seep	5.5
Lockport Shop Parcel	75.0
Long Run Parcel	182.6
Middle Parcel	124.9
Middle Quarry	80.1
North Parcel	31.4
Pierce-Eich Quarry	268.5
River North Parcel	24.8
River Parcel	61.0
River South Bluff Parcel	23.7
River South Parcel	65.7
Stone Processing Parcel	74.9
HMS Total	**1,436.9**

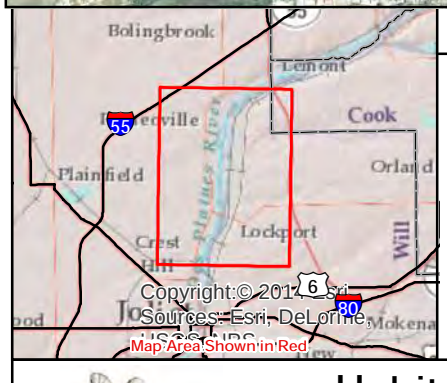


Figure 1-1: Permit Area & HMS Parcels

Location
Will County, IL

0 1,375 2,750 Feet

Map produced by:
Applied Ecological Services, Inc.

Last Modified: June 17, 2015

Legend
- HCP Permit Area (2,072 Acres)
- Critical Habitat Units (CHU)
- HMS Parcel Boundaries

Data sources include:
Orthophotography: NAIP 2012
HMS, ESRI

Habitat Conservation Plan - Lower Des Plaines River Valley, Illinois
Hanson Material Service

LEGEND:

RP-1S — MONITORING WELL LOCATION

W-1 — SURFACE WATER MONITORING LOCATION

TENTATIVE GALLERY LOCATION

0' 75' 150' 300'

SCALE

AECOM
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1555 RiverCenter Dr
Milwaukee, WI
414.944.6080

AECOM

ROMEVILLE QUARRY HCP SUPPORT
ROMEVILLE, ILLINOIS

GROUNDWATER MONITORING PLAN
RIVER SOUTH AND
RIVER SOUTH BLUFF PARCEL

Project Number:	Drawn By:	Date:	Figure No. 2-1
60225330	ANS	1/26/2016	

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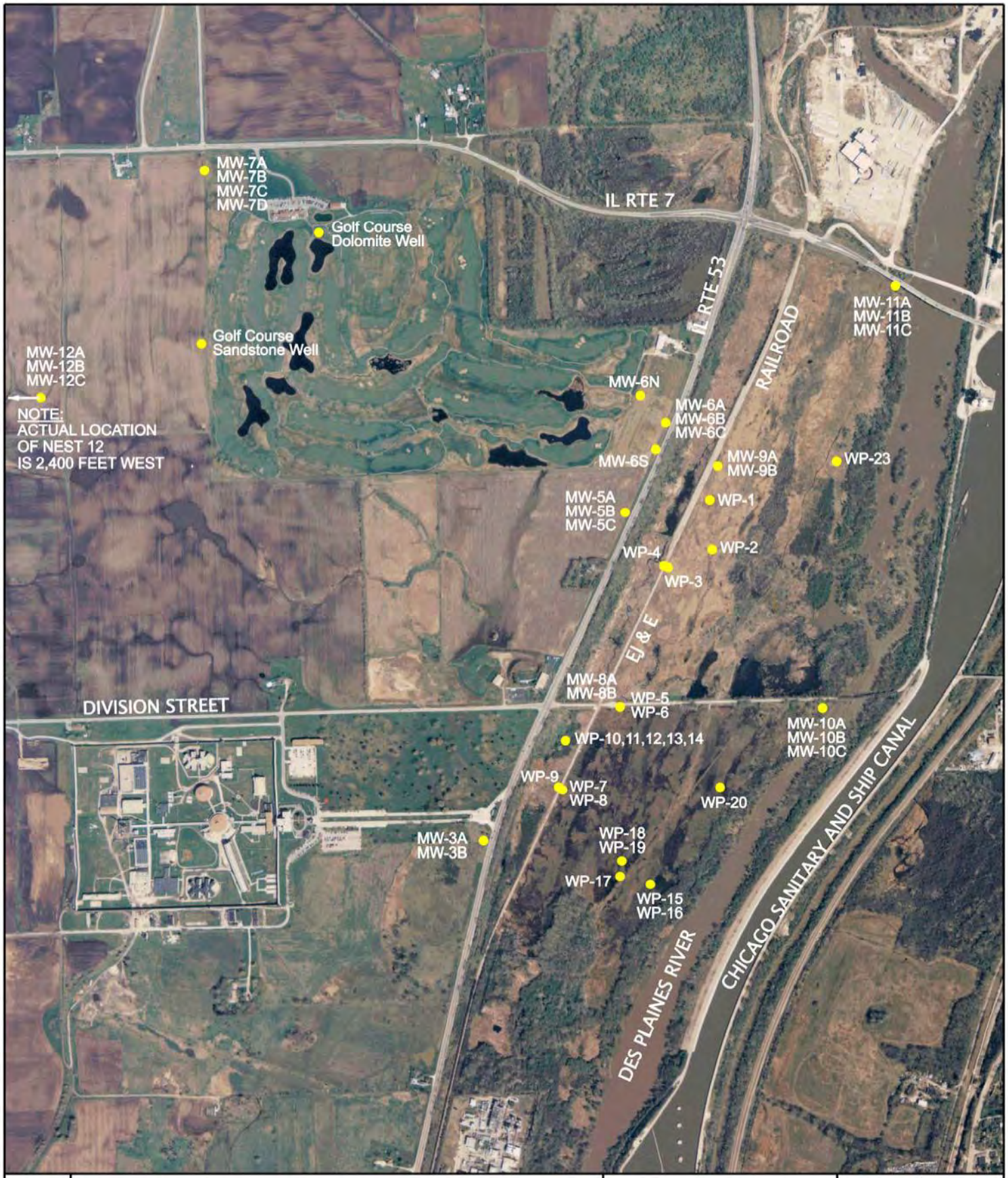


MONITORING WELL LOCATION MAP

LOCKPORT PRAIRIE NATURE PRESERVE
GROUND WATER MODEL
LOCKPORT, ILLINOIS

PROJECT NUMBER:	2008 0085
DATE:	12-17-08
PROJECT MGR:	GBP
DRAWN BY:	JZ
FILE NAME:	mwloc085.dgn
SCALE:	1" = 1,200'
REVISED:	

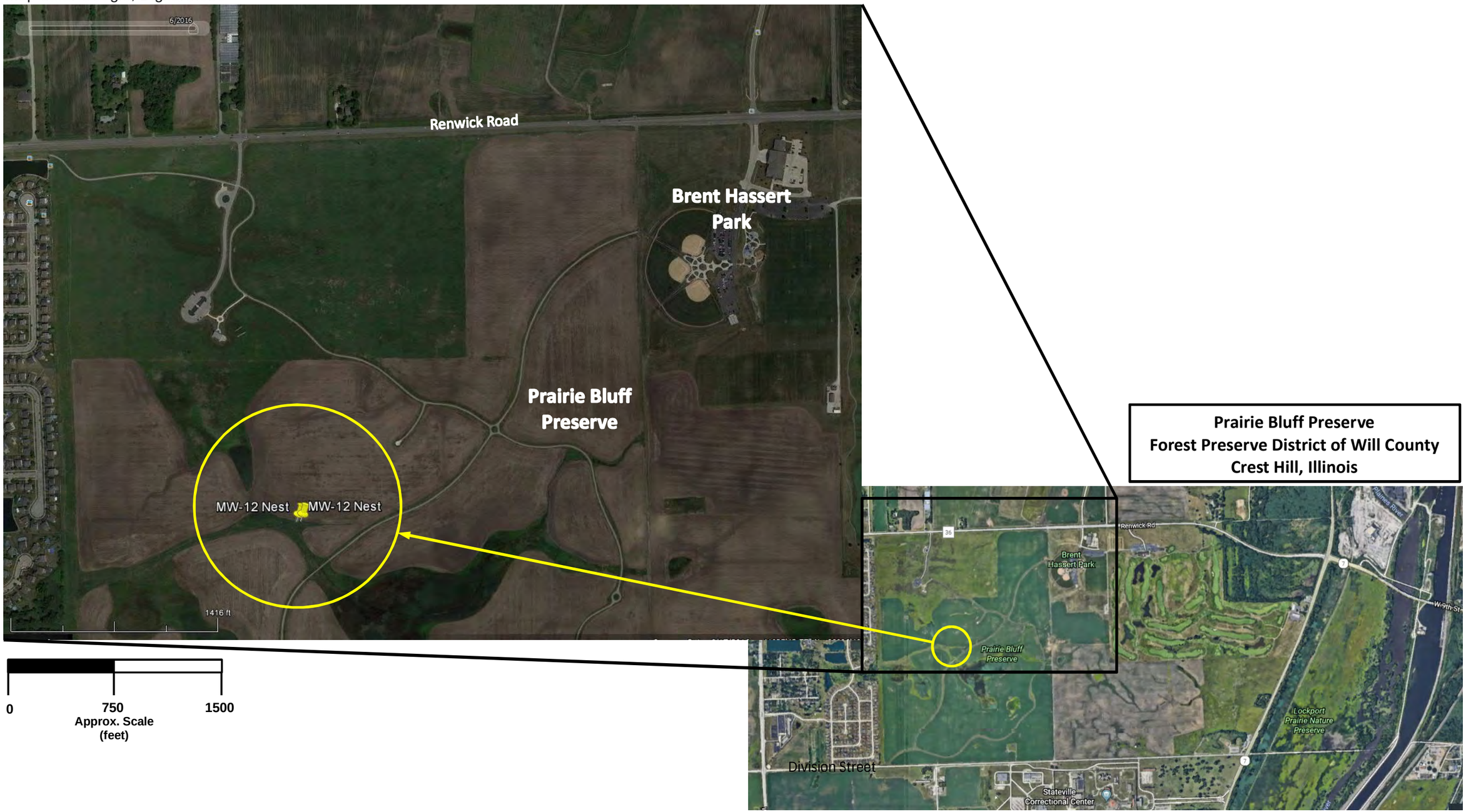
From:

GRAEF ANHALT SCHLOEMER and Associates Inc.

L:\Jobs2008\20080085\CAD\Site\dgn\00\N_00_mwloc085.dgn

FIGURE 2-2A: Monitoring Well Location Map for Lockport Prairie Nature Preserve

Map data: Google, DigitalGlobe

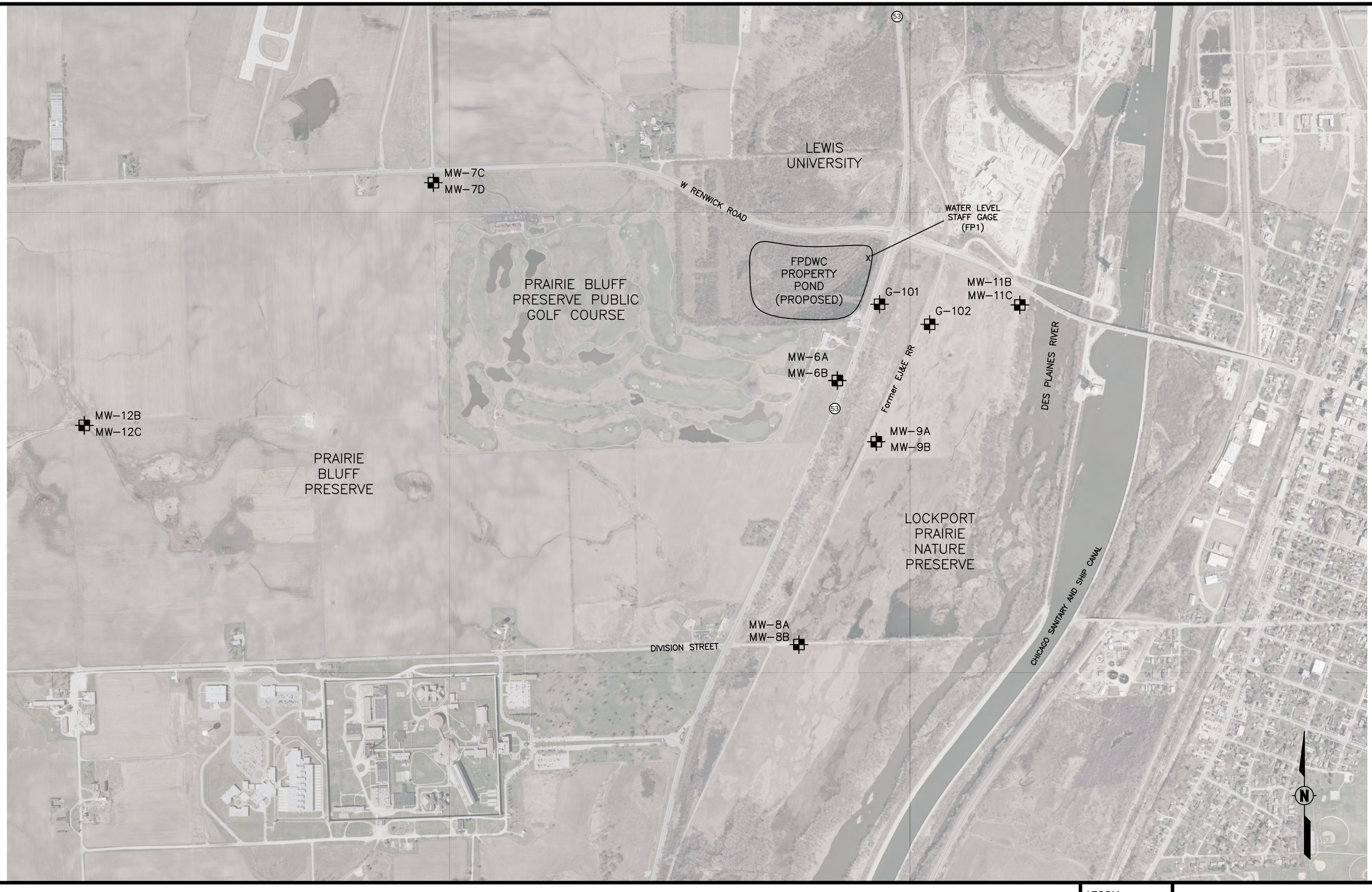


Monitoring Well Location Map for Monitoring Well Nest #12
Lockport Prairie Nature Preserve
HMS HCP Romeoville Quarry, Romeoville, Illinois

AECOM

Project #60517593	August 2018	Figure 2-2B

File Name: P:\60571463_TEMP\Report\Figures\Docs\Bedrock Elevation Map01.docx [Local G:\60225330_HMS-Romeoville\2012_HMS\2015_\4\GWMP_Final\2016_Updates2\Attachments\LPNP Location Map.docx]



LEGEND:

WP–4 MONITORING WELL LOCATION

Notes:
1. Parcel boundaries are approximate
2. Monitoring wells G-101 and G-102 are proposed locations
3. FPDWC = Forest Preserve District of Will County

1000 0 1000 2000

1" = 1000'

AECOM
Milwaukee Office
1555 RiverCenter Dr
Milwaukee, WI
414.944.6080

GROUNDWATER MONITORING PLAN LOCKPORT PRAIRIE NATURE PRESERVE AND FPDWC POND - LOCKPORT, ILLINOIS

Project Number:	Drawn By:	Date:	Figure No.2-3
60225330	ANM	9/25/2018	

LEGEND:

NP-6S MONITORING WELL LOCATION

NOTE:

- BACKGROUND IMAGERY FROM 2005 ILLINOIS CHICAGO URBAN AREA ORTHOPHOTOGRAPHY (ILLINOIS STATE GEOLOGICAL SURVEY)
- ROMEOVILLE PRAIRIE NATURE PRESERVE BOUNDARY APPROXIMATE

800 0 800 1600

1" = 800'

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1555 RiverCenter Dr
Milwaukee, WI
414.944.6080

AECOM

ROMEVILLE QUARRY HCP SUPPORT
ROMEVILLE, ILLINOIS

GROUNDWATER MONITORING PLAN
ROMEOVILLE PRAIRIE NATURE PRESERVE
& NORTH / FAR NORTH PARCELS

Project Number:	Drawn By:	Date:	Figure No. 2-4
60225330	ANS	5/13/2019	

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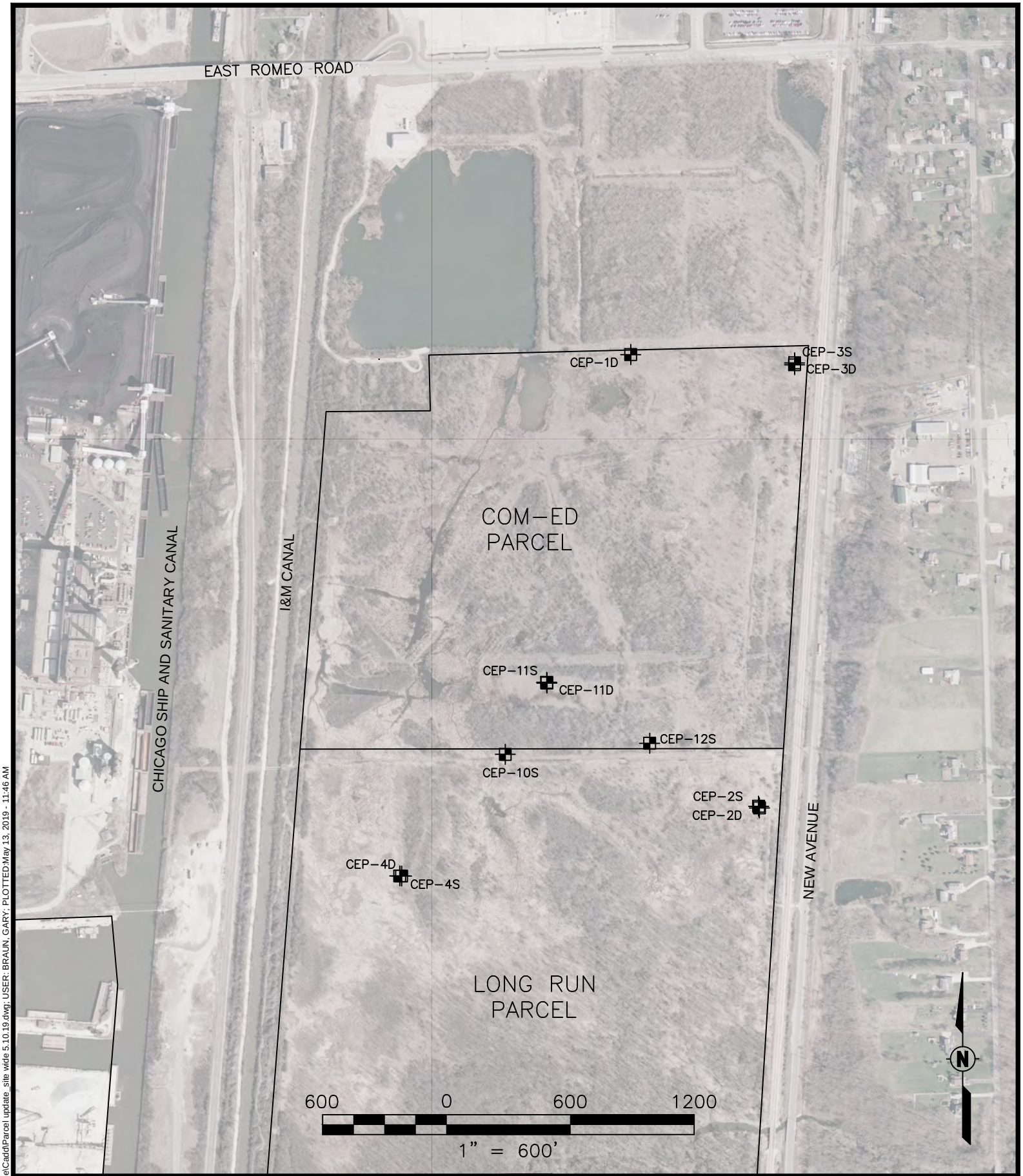

LEGEND:

CEP-1D MONITORING WELL LOCATION

PARCEL BOUNDARY

NOTE:

- BACKGROUND IMAGERY FROM 2005 ILLINOIS CHICAGO URBAN AREA ORTHOPHOTOGRAPHY (ILLINOIS STATE GEOLOGICAL SURVEY)
- LONG RUN / COMED PARCEL BOUNDARY APPROXIMATE

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Milwaukee, WI
414.944.6080

AECOM

GROUNDWATER MONITORING PLAN
COM-ED AND LONG RUN PARCELS

HMS ROMEOVILLE QUARRY
ROMEVILLE, ILLINOIS

Project Number:	Drawn By:	Date:	Figure No.2-5
60225330	ANS	1/26/2016	

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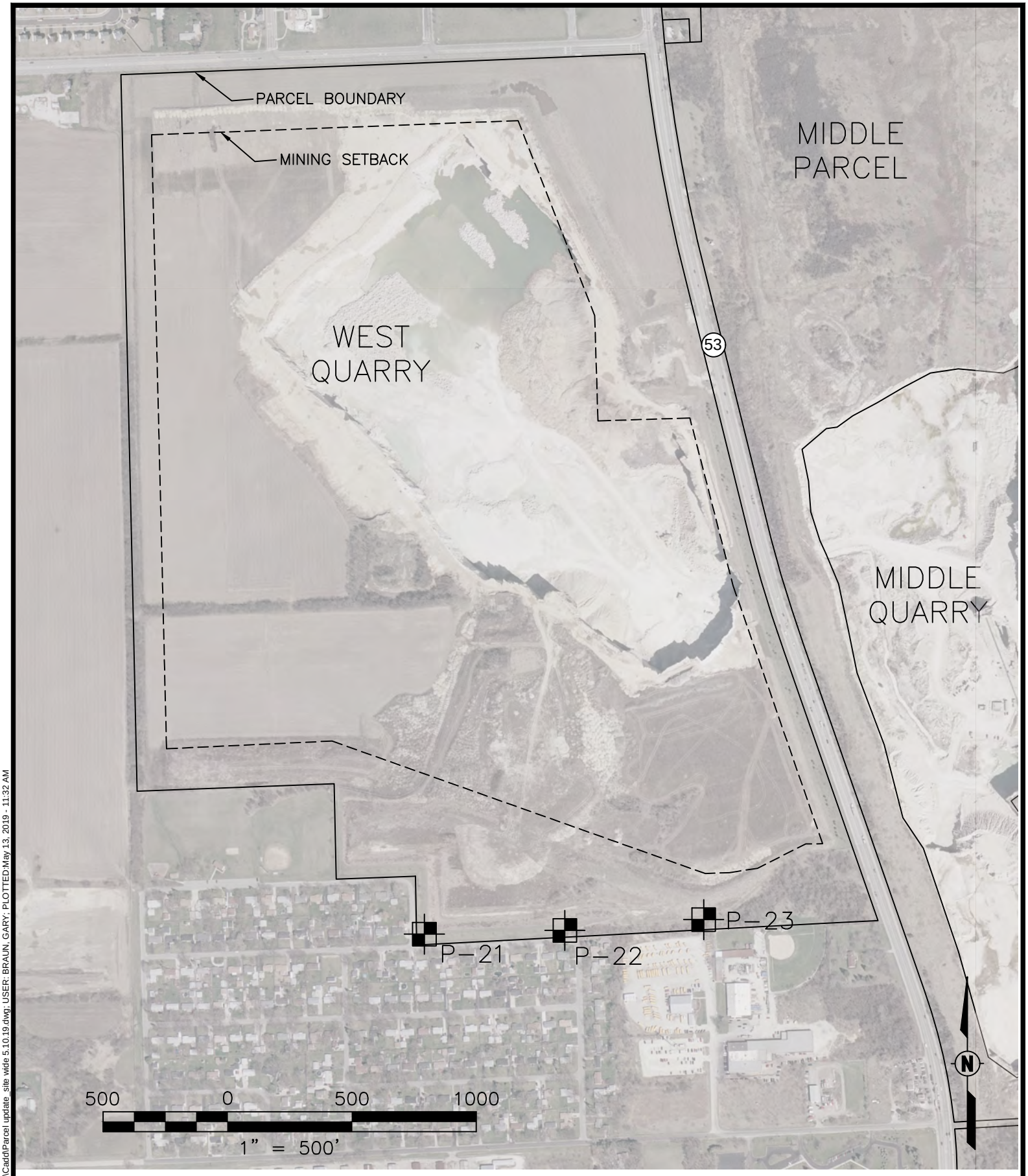

LEGEND:

P-21 MONITORING WELL LOCATION

Note: Background imagery from 2005 ILLINOIS CHICAGO URBAN AREA ORTHOPHOTOGRAPHY (Illinois State Geological Survey)

AECOM
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1555 RiverCenter Dr
Milwaukee, WI
414.944.6080

AECOM

GROUNDWATER MONITORING PLAN
WEST QUARRY - HMS ROMEOVILLE QUARRY

ROMEVILLE, ILLINOIS

Project Number:	Drawn By:	Date:	Figure No.2-6
60225330	ANS	1/26/2016	

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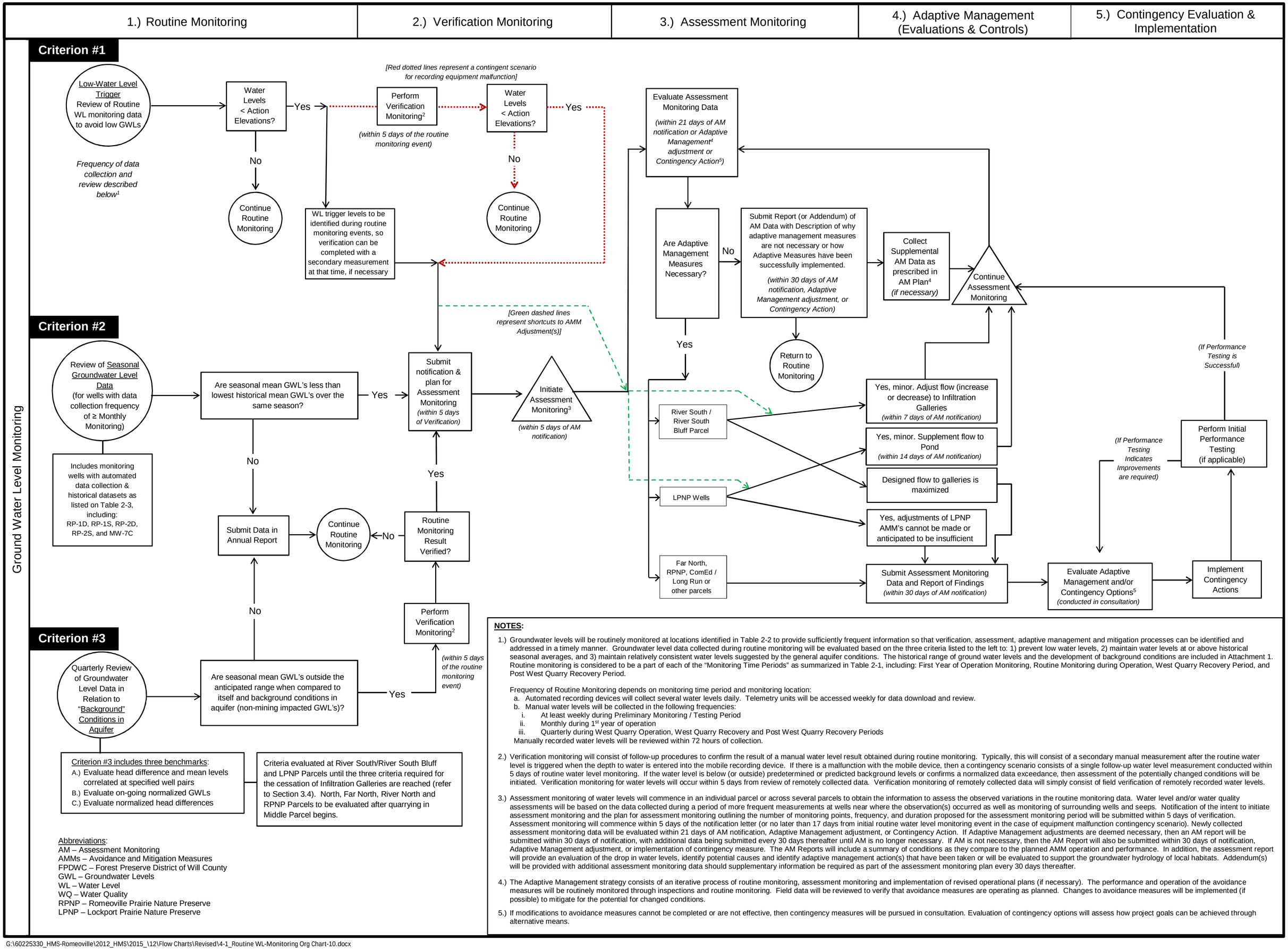
Figure 4-1

Flow Chart of Groundwater Level Monitoring Process

HMS Romeoville Quarry - Habitat Conservation Plan Groundwater Monitoring Plan



Abbreviations:
AM – Assessment Monitoring
AMMs – Avoidance and Mitigation Measures
FPDWC – Forest Preserve District of Will County
GWL – Groundwater Levels
WL – Water Level
WQ – Water Quality
RPNP – Romeoville Prairie Nature Preserve
LPNP – Lockport Prairie Nature Preserve

NOTES:

1.) Groundwater levels will be routinely monitored at locations identified in Table 2-2 to provide sufficiently frequent information so that verification, assessment, adaptive management and mitigation processes can be identified and addressed in a timely manner. Groundwater level data collected during routine monitoring will be evaluated based on the three criteria listed to the left to: 1) prevent low water levels, 2) maintain water levels at or above historical seasonal averages, and 3) maintain relatively consistent water levels suggested by the general aquifer conditions. The historical range of ground water levels and the development of background conditions are included in Attachment 1. Routine monitoring is considered to be a part of each of the "Monitoring Time Periods" as summarized in Table 2-1, including: First Year of Operation Monitoring, Routine Monitoring during Operation, West Quarry Recovery Period, and Post West Quarry Recovery Period.

Frequency of Routine Monitoring depends on monitoring time period and monitoring location:
a. Automated recording devices will collect several water levels daily. Telemetry units will be accessed weekly for data download and review.
b. Manual water levels will be collected in the following frequencies:
   i. At least weekly during Preliminary Monitoring / Testing Period
   ii. Monthly during 1st year of operation
   iii. Quarterly during West Quarry Operation, West Quarry Recovery and Post West Quarry Recovery Periods

Manually recorded water levels will be reviewed within 72 hours of collection.

2.) Verification monitoring will consist of follow-up procedures to confirm the result of a manual water level result obtained during routine monitoring. Typically, this will consist of a secondary manual measurement after the routine water level is triggered when the depth to water is entered into the mobile recording device. If there is a malfunction with the mobile device, then a contingency scenario consists of a single follow-up water level measurement conducted within 5 days of routine water level monitoring. If the water level is below (or outside) predetermined or predicted background levels or confirms a normalized data exceedance, then assessment of the potentially changed conditions will be initiated. Verification monitoring for water levels will occur within 5 days from review of remotely collected data. Verification monitoring of remotely collected data will simply consist of field verification of remotely recorded water levels.

3.) Assessment monitoring of water levels will commence in an individual parcel or across several parcels to obtain the information to assess the observed variations in the routine monitoring data. Water level and/or water quality assessments will be based on the data collected during a period of more frequent measurements at wells near where the observation(s) occurred as well as monitoring of surrounding wells and seeps. Notification of the intent to initiate assessment monitoring and the plan for assessment monitoring outlining the number of monitoring points, frequency, and duration proposed for the assessment monitoring period will be submitted within 5 days of verification. Assessment monitoring will commence within 5 days of the notification letter (or no later than 17 days from initial routine water level monitoring event in the case of equipment malfunction contingency scenario). Newly collected assessment monitoring data will be evaluated within 21 days of AM notification, Adaptive Management adjustment, or Contingency Action. If Adaptive Management adjustments are deemed necessary, then an AM report will be submitted within 30 days of notification, with additional data being submitted every 30 days thereafter until AM is no longer necessary. If AM is not necessary, then the AM Report will also be submitted within 30 days of notification, Adaptive Management adjustment, or implementation of contingency measure. The AM Reports will include a summary of conditions as they compare to the planned AMM operation and performance. In addition, the assessment report will provide an evaluation of the drop in water levels, identify potential causes and identify adaptive management action(s) that have been taken or will be evaluated to support the groundwater hydrology of local habitats. Addendum(s) will be provided with additional assessment monitoring data should supplementary information be required as part of the assessment monitoring plan every 30 days thereafter.

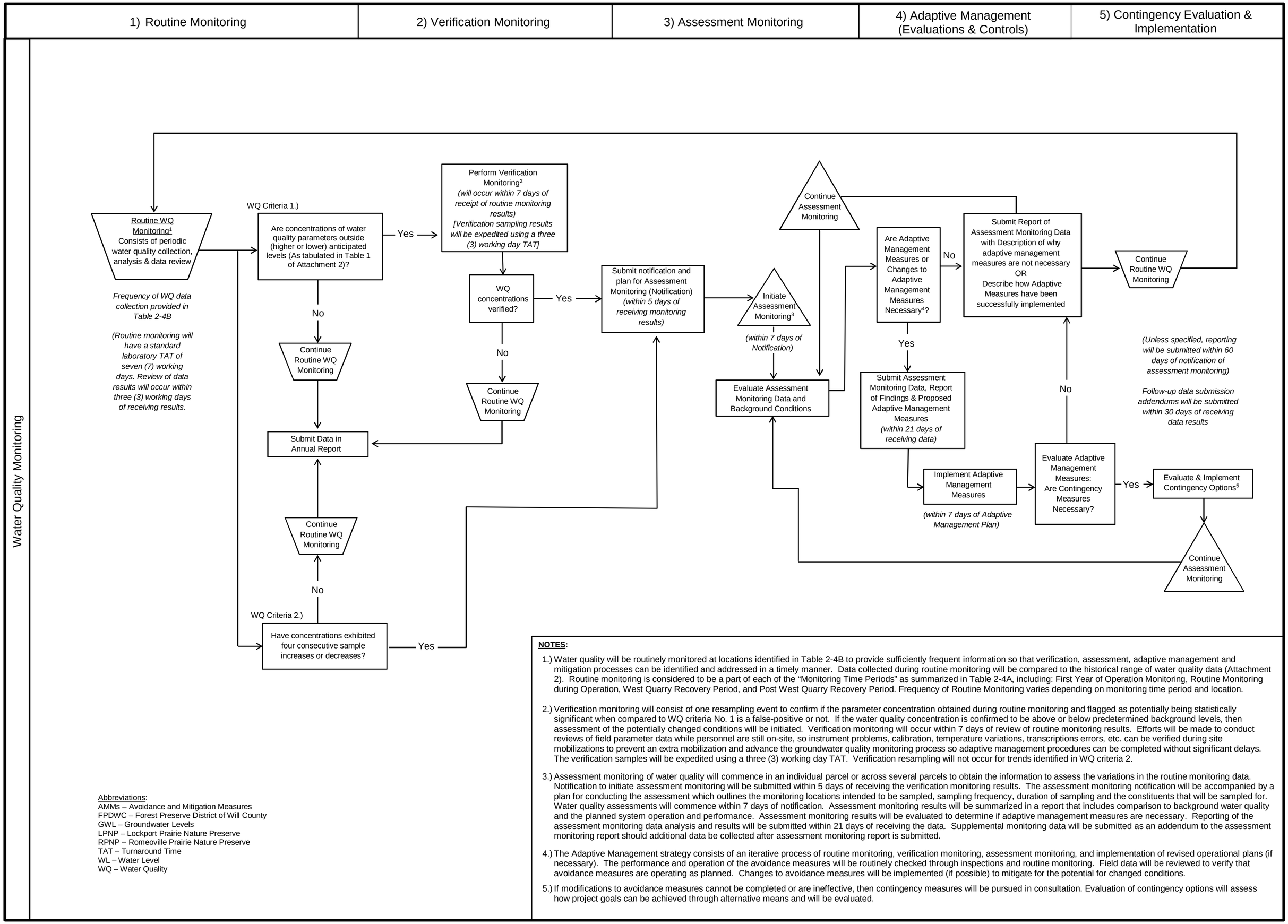
4.) The Adaptive Management strategy consists of an iterative process of routine monitoring, assessment monitoring and implementation of revised operational plans (if necessary). The performance and operation of the avoidance measures will be routinely monitored through inspections and routine monitoring. Field data will be reviewed to verify that avoidance measures are operating as planned. Changes to avoidance measures will be implemented (if possible) to mitigate for the potential for changed conditions.

5.) If modifications to avoidance measures cannot be completed or are not effective, then contingency measures will be pursued in consultation. Evaluation of contingency options will assess how project goals can be achieved through alternative means.

Figure 4-2

Flow Chart of Groundwater Quality Monitoring Process at River South & River South Bluff Parcels

HMS Romeoville Quarry - Habitat Conservation Plan Groundwater Monitoring Plan



Abbreviations:
AMMs – Avoidance and Mitigation Measures
FPDWC – Forest Preserve District of Will County
GWL – Groundwater Levels
LPNP – Lockport Prairie Nature Preserve
RPNP – Romeoville Prairie Nature Preserve
TAT – Turnaround Time
WL – Water Level
WQ – Water Quality

NOTES:

1.) Water quality will be routinely monitored at locations identified in Table 2-4B to provide sufficiently frequent information so that verification, assessment, adaptive management and mitigation processes can be identified and addressed in a timely manner. Data collected during routine monitoring will be compared to the historical range of water quality data (Attachment 2). Routine monitoring is considered to be a part of each of the "Monitoring Time Periods" as summarized in Table 2-4A, including: First Year of Operation Monitoring, Routine Monitoring during Operation, West Quarry Recovery Period, and Post West Quarry Recovery Period. Frequency of Routine Monitoring varies depending on monitoring time period and location.

2.) Verification monitoring will consist of one resampling event to confirm if the parameter concentration obtained during routine monitoring and flagged as potentially being statistically significant when compared to WQ criteria No. 1 is a false-positive or not. If the water quality concentration is confirmed to be above or below predetermined background levels, then assessment of the potentially changed conditions will be initiated. Verification monitoring will occur within 7 days of review of routine monitoring results. Efforts will be made to conduct reviews of field parameter data while personnel are still on-site, so instrument problems, calibration, temperature variations, transcriptions errors, etc. can be verified during site mobilizations to prevent an extra mobilization and advance the groundwater quality monitoring process so adaptive management procedures can be completed without significant delays. The verification samples will be expedited using a three (3) working day TAT. Verification resampling will not occur for trends identified in WQ criteria 2.

3.) Assessment monitoring of water quality will commence in an individual parcel or across several parcels to obtain the information to assess the variations in the routine monitoring data. Notification to initiate assessment monitoring will be submitted within 5 days of receiving the verification monitoring results. The assessment monitoring notification will be accompanied by a plan for conducting the assessment which outlines the monitoring locations intended to be sampled, sampling frequency, duration of sampling and the constituents that will be sampled for. Water quality assessments will commence within 7 days of notification. Assessment monitoring results will be summarized in a report that includes comparison to background water quality and the planned system operation and performance. Assessment monitoring results will be evaluated to determine if adaptive management measures are necessary. Reporting of the assessment monitoring data analysis and results will be submitted within 21 days of receiving the data. Supplemental monitoring data will be submitted as an addendum to the assessment monitoring report should additional data be collected after assessment monitoring report is submitted.

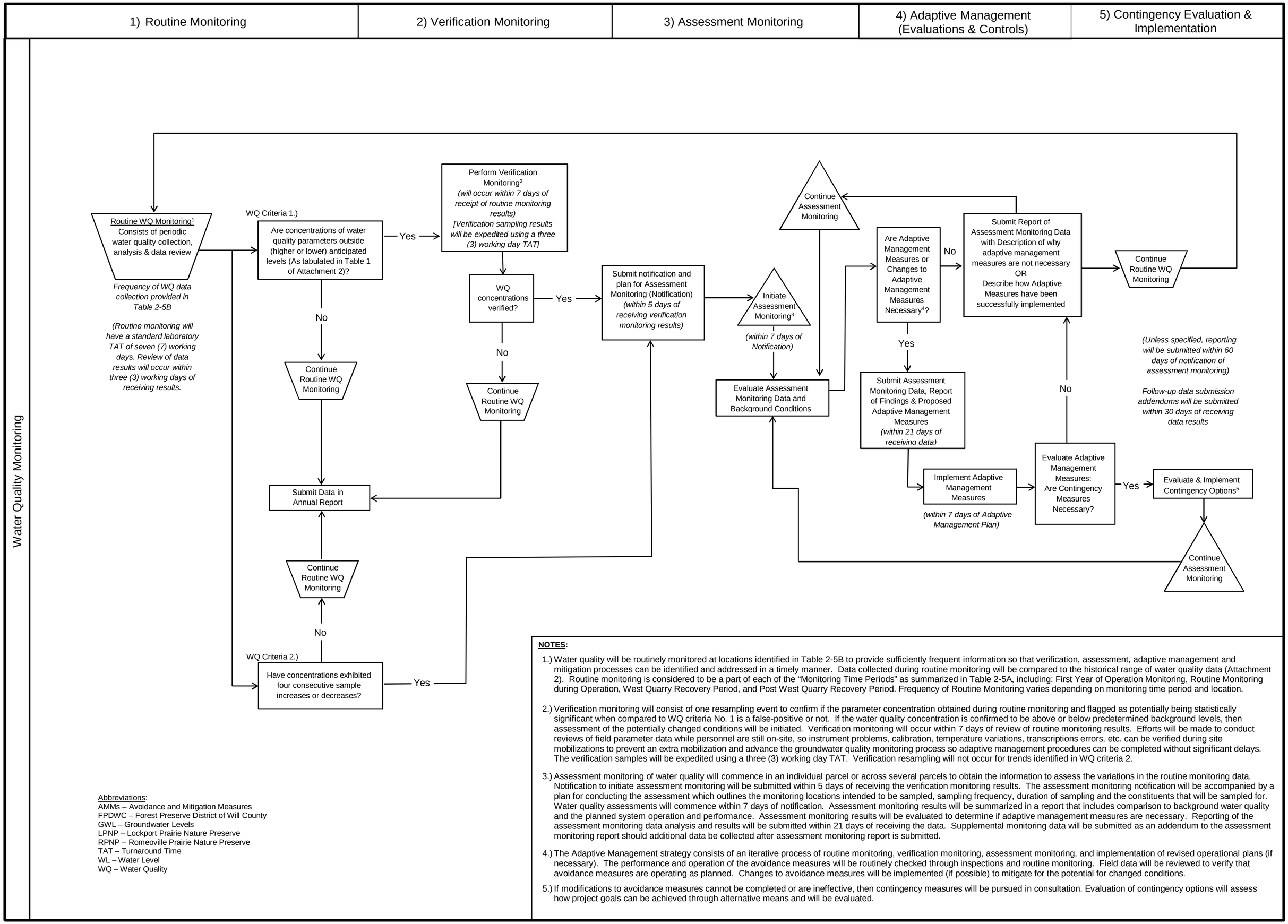
4.) The Adaptive Management strategy consists of an iterative process of routine monitoring, verification monitoring, assessment monitoring, and implementation of revised operational plans (if necessary). The performance and operation of the avoidance measures will be routinely checked through inspections and routine monitoring. Field data will be reviewed to verify that avoidance measures are operating as planned. Changes to avoidance measures will be implemented (if possible) to mitigate for the potential for changed conditions.

5.) If modifications to avoidance measures cannot be completed or are ineffective, then contingency measures will be pursued in consultation. Evaluation of contingency options will assess how project goals can be achieved through alternative means and will be evaluated.

Figure 4-3

Flow Chart of Groundwater Quality Monitoring at FPDWC Pond

HMS Romeoville Quarry - Habitat Conservation Plan - Groundwater Monitoring Plan



Abbreviations:
AMMs – Avoidance and Mitigation Measures
FPDWC – Forest Preserve District of Will County
GWL – Groundwater Levels
LPNP – Lockport Prairie Nature Preserve
RPNP – Romeoville Prairie Nature Preserve
TAT – Turnaround Time
WL – Water Level
WQ – Water Quality

NOTES:

1.) Water quality will be routinely monitored at locations identified in Table 2-5B to provide sufficiently frequent information so that verification, assessment, adaptive management and mitigation processes can be identified and addressed in a timely manner. Data collected during routine monitoring will be compared to the historical range of water quality data (Attachment 2). Routine monitoring is considered to be a part of each of the "Monitoring Time Periods" as summarized in Table 2-5A, including: First Year of Operation Monitoring, Routine Monitoring during Operation, West Quarry Recovery Period, and Post West Quarry Recovery Period. Frequency of Routine Monitoring varies depending on monitoring time period and location.

2.) Verification monitoring will consist of one resampling event to confirm if the parameter concentration obtained during routine monitoring and flagged as potentially being statistically significant when compared to WQ criteria No. 1 is a false-positive or not. If the water quality concentration is confirmed to be above or below predetermined background levels, then assessment of the potentially changed conditions will be initiated. Verification monitoring will occur within 7 days of review of routine monitoring results. Efforts will be made to conduct reviews of field parameter data while personnel are still on-site, so instrument problems, calibration, temperature variations, transcriptions errors, etc. can be verified during site mobilizations to prevent an extra mobilization and advance the groundwater quality monitoring process so adaptive management procedures can be completed without significant delays. The verification samples will be expedited using a three (3) working day TAT. Verification resampling will not occur for trends identified in WQ criteria 2.

3.) Assessment monitoring of water quality will commence in an individual parcel or across several parcels to obtain the information to assess the variations in the routine monitoring data. Notification to initiate assessment monitoring will be submitted within 5 days of receiving the verification monitoring results. The assessment monitoring notification will be accompanied by a plan for conducting the assessment which outlines the monitoring locations intended to be sampled, sampling frequency, duration of sampling and the constituents that will be sampled for. Water quality assessments will commence within 7 days of notification. Assessment monitoring results will be summarized in a report that includes comparison to background water quality and the planned system operation and performance. Assessment monitoring results will be evaluated to determine if adaptive management measures are necessary. Reporting of the assessment monitoring data analysis and results will be submitted within 21 days of receiving the data. Supplemental monitoring data will be submitted as an addendum to the assessment monitoring report should additional data be collected after assessment monitoring report is submitted.

4.) The Adaptive Management strategy consists of an iterative process of routine monitoring, verification monitoring, assessment monitoring, and implementation of revised operational plans (if necessary). The performance and operation of the avoidance measures will be routinely checked through inspections and routine monitoring. Field data will be reviewed to verify that avoidance measures are operating as planned. Changes to avoidance measures will be implemented (if possible) to mitigate for the potential for changed conditions.

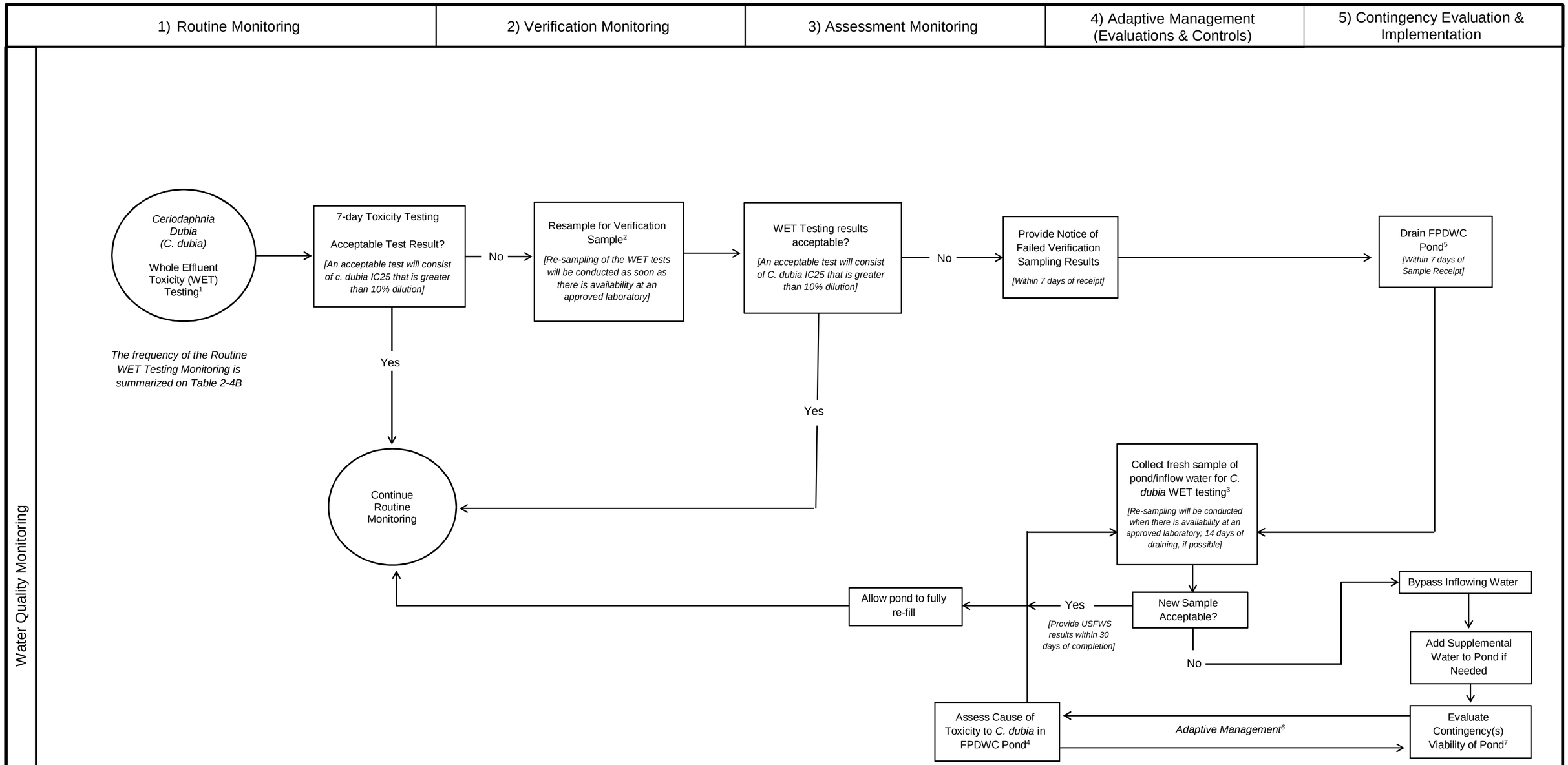
5.) If modifications to avoidance measures cannot be completed or are ineffective, then contingency measures will be pursued in consultation. Evaluation of contingency options will assess how project goals can be achieved through alternative means and will be evaluated.

G:\60225330_HMS-Romeoville\2012_HMS\2015_\12\Flow Charts\Revised\Routine Monitoring at FPDWC Pond_Chart1-r01.docx

Figure 4-4

Flow Chart of Whole Effluent Toxicity Testing Procedures at FPDWC Pond

HMS Romeoville Quarry - Habitat Conservation Plan Groundwater Monitoring Plan



Abbreviations:
AMMs – Avoidance and Mitigation Measures
FPDWC – Forest Preserve District of Will County
GWL – Groundwater Levels
IC25 – Inhibition concentration that would cause 25% reduction in mean young per female or in growth for the test population
LPNP – Lockport Prairie Nature Preserve
RPNP – Romeoville Prairie Nature Preserve
TAT – Turnaround Time
WET – Whole Effluent Toxicity
WL – Water Level
WQ – Water Quality

NOTES:

1.) WET testing at the FPDWC Pond will be monitored three times per year to provide sufficiently frequent information so that verification, assessment, adaptive management and mitigation processes can be identified and addressed in a timely manner. WET tests that do not include a failed test will be submitted to USFWS within 30 days of completion.

2.) Verification monitoring will consist of a single follow-up monitoring event to confirm the initial WET testing result.

3.) The pond will be drained if verification testing fails. Follow-up test(s) will be required before the Pond is allowed to fully recharge. Additional sampling will be dependent on precipitation and laboratory testing availability. Thus, notification will be made if sampling of fresh pond water cannot be collected within 14 days of pond drainage.

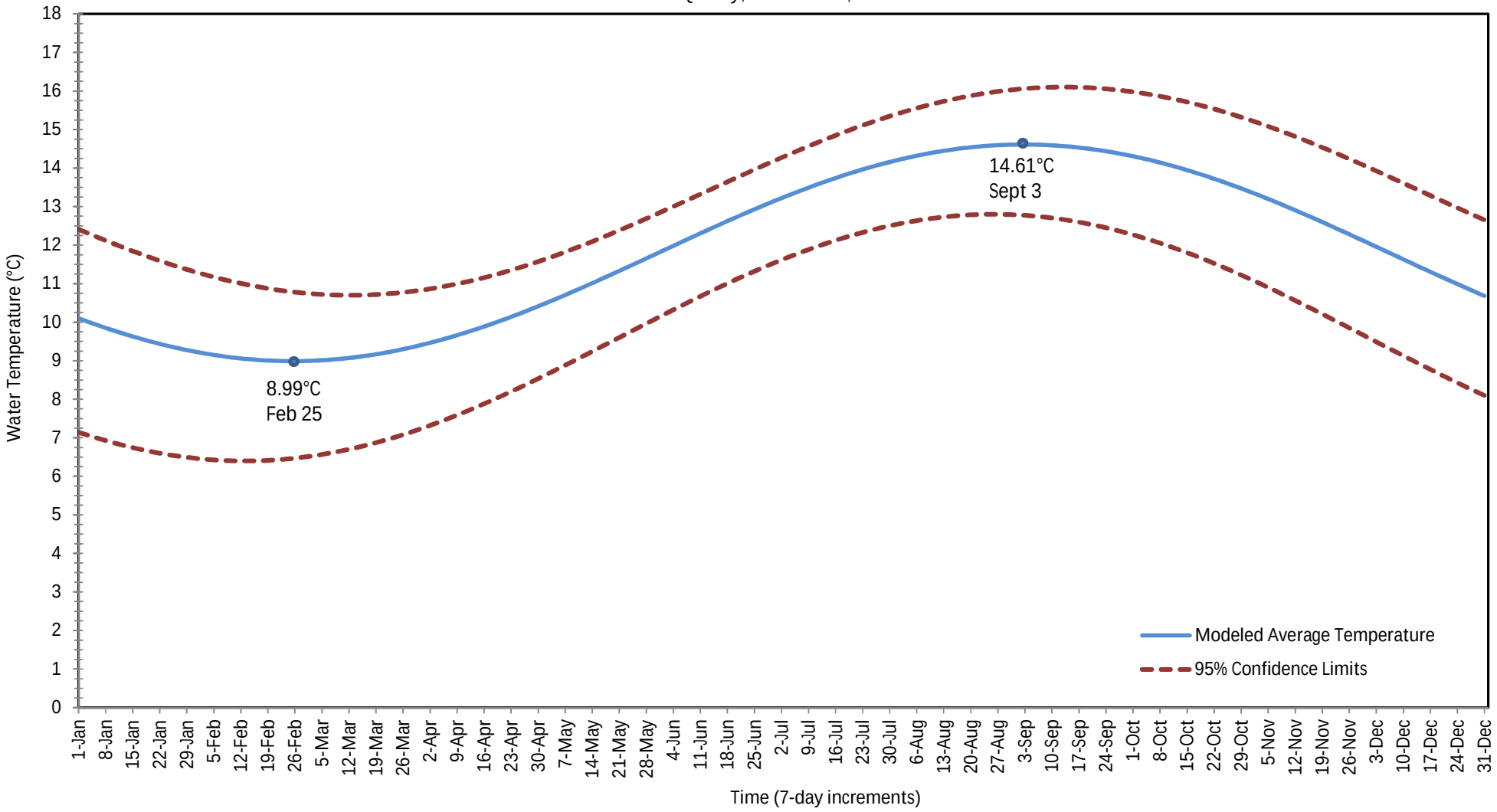
4.) Assessment monitoring may be required to evaluate potential causes of water quality degradation.

5.) Notification to drain pond will be submitted within 7 days of receiving the verification monitoring results. Reporting of additional monitoring will be submitted within 90 days of notification.

6.) The Adaptive Management strategy consists of an iterative process of routine monitoring, verification monitoring, assessment monitoring, and implementation of revised operational plans (if necessary). The performance and operation of the avoidance measures will be routinely checked through inspections and routine monitoring. Field data will be reviewed to verify that avoidance measures are operating as planned. Changes to avoidance measures will be implemented (if possible) to mitigate for the potential for changed conditions.

7.) If modifications to avoidance measures cannot be completed or are ineffective, then further contingency measures will be pursued in consultation. Evaluation of contingency options will assess how project goals can be achieved through alternative means and will be evaluated.

Figure 4-5
Modeled Average Seep Temperature with 95% Confidence Limits
Monitoring Point W-1, River South Parcel
Romeoville Quarry, Romeoville, Illinois



\\usmwk1fs001\prod\Data\GIS\60225330_HMS-Romeoville\2012_HMS_On-Going\WL Monitoring\Troll Data\HMS Temp probe data_Rev2.xlsx

ATTACHMENTS

Attachment 1

Summary of Existing Groundwater Monitoring Data

Attachment 1-A

Water Level Data and Statistical Summary Tables

Groundwater Elevations – River South Bluff Parcel (RP-1D)

(Hanson Material Services – Romeoville Quarry)

Date and Time	**RP-1D**
9/26/05 0:00	580.74
10/11/05 0:00	579.08
10/25/05 0:00	579.73
12/19/05 0:00	578.40
6/5/06 0:00	584.01
11/14/06 0:00	588.03
3/15/07 0:00	586.58
4/17/08 0:00	587.67
7/18/08 0:00	583.17
8/18/08 0:00	579.79
12/2/08 0:00	580.20
2/19/09 0:00	589.79
8/13/09 0:00	581.52
10/23/09 0:00	589.18
2/2/10 0:00	586.37
4/13/10 0:00	586.79
8/9/10 0:00	591.53
1/26/11 0:00	583.85
5/3/11 0:00	590.50
7/5/11 0:00	585.29
10/4/11 0:00	584.21
12/28/11 0:00	586.44
3/30/12 0:00	586.36
3/30/2012 15:28	586.36
3/30/2012 19:28	586.12
3/30/2012 23:28	586.10
3/31/2012 3:28	586.07
3/31/2012 7:28	586.01
3/31/2012 11:28	585.96
3/31/2012 15:28	585.96
3/31/2012 19:28	585.90
3/31/2012 23:28	585.91
4/1/2012 3:28	585.94
4/1/2012 7:28	585.78
4/1/2012 11:28	585.77
4/1/2012 15:28	585.96
4/1/2012 19:28	585.98
4/1/2012 23:28	586.04
4/2/2012 3:28	586.11
4/2/2012 7:28	586.06
4/2/2012 11:28	586.00
4/2/2012 15:28	586.05
4/2/2012 19:28	585.95
4/2/2012 23:28	585.87
4/3/2012 3:28	585.92
4/3/2012 7:28	585.82
4/3/2012 11:28	585.73
4/3/2012 15:28	585.78
4/3/2012 19:28	585.67
4/3/2012 23:28	585.55
4/4/2012 3:28	585.61
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4/5/2012 15:28	585.24
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4/5/2012 23:28	585.08
4/6/2012 3:28	585.11
4/6/2012 7:28	585.07
4/6/2012 11:28	584.93
4/6/2012 15:28	585.02
4/6/2012 19:28	585.10
4/6/2012 23:28	584.97
4/7/2012 3:28	584.96
4/7/2012 7:28	584.93
4/7/2012 11:28	584.81
4/7/2012 15:28	584.88
4/7/2012 19:28	584.98
4/7/2012 23:28	584.87
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4/8/2012 7:28	584.79
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4/8/2012 15:28	584.72
4/8/2012 19:28	584.82
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4/9/2012 3:28	584.73
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4/14/2012 19:28	583.96
4/14/2012 23:28	583.99
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4/15/2012 7:28	583.77
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4/16/2012 7:28	584.59
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Groundwater Elevations – River South Bluff Parcel (RP-1D)

(Hanson Material Services – Romeoville Quarry)

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9/9/2013 16:00	581.11
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9/11/2013 4:00	580.92
9/11/2013 8:00	580.94
9/11/2013 12:00	580.97
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9/11/2013 20:00	580.92
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9/12/2013 8:00	580.81
9/12/2013 12:00	580.88
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9/16/2013 20:00	581.12
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9/21/2013 16:00	580.52
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10/2/2013 12:00	580.23
10/2/2013 16:00	580.30
10/2/2013 20:00	580.23
10/3/2013 0:00	580.15
10/3/2013 4:00	580.22
10/3/2013 8:00	580.18
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10/3/2013 16:00	580.18
10/3/2013 20:00	580.28
10/4/2013 0:00	580.94
10/4/2013 4:00	582.30
10/4/2013 8:00	583.36

Groundwater Elevations – River South Bluff Parcel (RP-1D)

(Hanson Material Services – Romeoville Quarry)

10/4/2013 12:00	583.98	10/28/2013 16:00	580.82	11/21/2013 15:00	588.55	12/15/2013 19:00	583.33	1/8/2014 23:00	583.96	2/2/2014 3:00	584.30
10/4/2013 16:00	584.49	10/28/2013 20:00	580.76	11/21/2013 19:00	588.59	12/15/2013 23:00	583.25	1/9/2014 3:00	583.97	2/2/2014 7:00	584.37
10/4/2013 20:00	584.68	10/29/2013 0:00	580.78	11/21/2013 23:00	588.54	12/16/2013 3:00	583.34	1/9/2014 7:00	583.96	2/2/2014 11:00	584.28
10/5/2013 0:00	584.64	10/29/2013 4:00	580.81	11/22/2013 3:00	588.53	12/16/2013 7:00	583.37	1/9/2014 11:00	583.98	2/2/2014 15:00	584.26
10/5/2013 4:00	584.68	10/29/2013 8:00	580.76	11/22/2013 7:00	588.57	12/16/2013 11:00	583.29	1/9/2014 15:00	583.98	2/2/2014 19:00	584.33
10/5/2013 8:00	584.61	10/29/2013 12:00	580.78	11/22/2013 11:00	588.51	12/16/2013 15:00	583.35	1/9/2014 19:00	583.90	2/2/2014 23:00	584.26
10/5/2013 12:00	584.37	10/29/2013 16:00	580.82	11/22/2013 15:00	588.48	12/16/2013 19:00	583.28	1/9/2014 23:00	583.93	2/3/2014 3:00	584.22
10/5/2013 16:00	584.31	10/29/2013 20:00	580.74	11/22/2013 19:00	588.50	12/16/2013 23:00	583.17	1/10/2014 3:00	583.95	2/3/2014 7:00	584.30
10/5/2013 20:00	584.40	10/30/2013 0:00	580.75	11/22/2013 23:00	588.42	12/17/2013 3:00	583.23	1/10/2014 7:00	583.92	2/3/2014 11:00	584.24
10/6/2013 0:00	585.11	10/30/2013 4:00	580.79	11/23/2013 3:00	588.34	12/17/2013 7:00	583.30	1/10/2014 11:00	583.93	2/3/2014 15:00	584.19
10/6/2013 4:00	586.08	10/30/2013 8:00	580.73	11/23/2013 7:00	588.30	12/17/2013 11:00	583.22	1/10/2014 15:00	583.98	2/3/2014 19:00	584.22
10/6/2013 8:00	586.85	10/30/2013 12:00	580.73	11/23/2013 11:00	588.18	12/17/2013 15:00	583.23	1/10/2014 19:00	583.97	2/3/2014 23:00	584.19
10/6/2013 12:00	587.22	10/30/2013 16:00	580.80	11/23/2013 15:00	588.05	12/17/2013 19:00	583.15	1/10/2014 23:00	584.37	2/4/2014 3:00	584.13
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10/7/2013 0:00	587.49	10/31/2013 4:00	581.65	11/24/2013 3:00	587.70	12/18/2013 7:00	583.14	1/11/2014 11:00	589.11	2/4/2014 15:00	584.06
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10/7/2013 8:00	587.33	10/31/2013 12:00	585.55	11/24/2013 11:00	587.53	12/18/2013 15:00	583.18	1/11/2014 19:00	591.30	2/4/2014 23:00	584.14
10/7/2013 12:00	587.04	10/31/2013 16:00	587.45	11/24/2013 15:00	587.40	12/18/2013 19:00	583.19	1/11/2014 23:00	591.95	2/5/2014 3:00	584.10
10/7/2013 16:00	586.82	10/31/2013 20:00	588.60	11/24/2013 19:00	587.29	12/18/2013 23:00	583.13	1/12/2014 3:00	592.49	2/5/2014 7:00	584.08
10/7/2013 20:00	586.59	11/1/2013 0:00	589.51	11/24/2013 23:00	587.21	12/19/2013 3:00	583.19	1/12/2014 7:00	592.79	2/5/2014 11:00	583.98
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10/8/2013 12:00	585.59	11/1/2013 16:00	591.23	11/25/2013 15:00	587.12	12/19/2013 19:00	583.22	1/12/2014 23:00	593.28	2/6/2014 3:00	583.91
10/8/2013 16:00	585.36	11/1/2013 20:00	591.26	11/25/2013 19:00	587.09	12/19/2013 23:00	583.15	1/13/2014 3:00	593.42	2/6/2014 7:00	583.92
10/8/2013 20:00	585.18	11/2/2013 0:00	591.28	11/25/2013 23:00	587.08	12/20/2013 3:00	583.19	1/13/2014 7:00	593.45	2/6/2014 11:00	583.90
10/9/2013 0:00	584.91	11/2/2013 4:00	591.38	11/26/2013 3:00	587.00	12/20/2013 7:00	583.33	1/13/2014 11:00	593.41	2/6/2014 15:00	583.84
10/9/2013 4:00	584.71	11/2/2013 8:00	591.30	11/26/2013 7:00	586.91	12/20/2013 11:00	583.42	1/13/2014 15:00	593.46	2/6/2014 19:00	583.81
10/9/2013 8:00	584.62	11/2/2013 12:00	591.13	11/26/2013 11:00	586.85	12/20/2013 15:00	583.59	1/13/2014 19:00	593.42	2/6/2014 23:00	583.85
10/9/2013 12:00	584.47	11/2/2013 16:00	591.08	11/26/2013 15:00	586.75	12/20/2013 19:00	583.84	1/13/2014 23:00	593.43	2/7/2014 3:00	583.84
10/9/2013 16:00	584.29	11/2/2013 20:00	590.89	11/26/2013 19:00	586.59	12/20/2013 23:00	584.07	1/14/2014 3:00	593.62	2/7/2014 7:00	583.83
10/9/2013 20:00	584.16	11/3/2013 0:00	590.66	11/26/2013 23:00	586.53	12/21/2013 3:00	584.36	1/14/2014 7:00	593.71	2/7/2014 11:00	583.82
10/10/2013 0:00	583.99	11/3/2013 3:00	590.57	11/27/2013 3:00	586.47	12/21/2013 7:00	584.77	1/14/2014 11:00	593.66	2/7/2014 15:00	583.76
10/10/2013 4:00	583.82	11/3/2013 7:00	590.38	11/27/2013 7:00	586.35	12/21/2013 11:00	585.04	1/14/2014 15:00	593.65	2/7/2014 19:00	583.70
10/10/2013 8:00	583.75	11/3/2013 11:00	590.05	11/27/2013 11:00	586.31	12/21/2013 15:00	585.27	1/14/2014 19:00	593.51	2/7/2014 23:00	583.72
10/10/2013 12:00	583.67	11/3/2013 15:00	589.85	11/27/2013 15:00	586.25	12/21/2013 19:00	585.51	1/14/2014 23:00	593.36	2/8/2014 3:00	583.74
10/10/2013 16:00	583.55	11/3/2013 19:00	589.53	11/27/2013 19:00	586.10	12/21/2013 23:00	585.74	1/15/2014 3:00	593.37	2/8/2014 7:00	583.72
10/10/2013 20:00	583.44	11/3/2013 23:00	589.12	11/27/2013 23:00	586.08	12/22/2013 3:00	586.10	1/15/2014 7:00	593.30	2/8/2014 11:00	583.71
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10/11/2013 8:00	583.10	11/4/2013 11:00	588.34	11/28/2013 11:00	585.98	12/22/2013 15:00	587.42	1/15/2014 19:00	593.00	2/8/2014 23:00	583.62
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10/11/2013 20:00	582.88	11/4/2013 23:00	587.44	11/28/2013 23:00	585.74	12/23/2013 3:00	588.64	1/16/2014 7:00	592.77	2/9/2014 11:00	583.57
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10/12/2013 8:00	582.58	11/5/2013 11:00	586.82	11/29/2013 11:00	585.72	12/23/2013 15:00	589.25	1/16/2014 19:00	592.18	2/9/2014 23:00	583.45
10/12/2013 12:00	582.58	11/5/2013 15:00	586.67	11/29/2013 15:00	585.76	12/23/2013 19:00	589.32	1/16/2014 23:00	591.88	2/10/2014 3:00	583.52
10/12/2013 16:00	582.53	11/5/2013 19:00	586.55	11/29/2013 19:00	585.67	12/23/2013 23:00	589.36	1/17/2014 3:00	591.76	2/10/2014 7:00	583.49
10/12/2013 20:00	582.42	11/5/2013 23:00	586.33	11/29/2013 23:00	585.66	12/24/2013 3:00	589.30	1/17/2014 7:00	591.63	2/10/2014 11:00	583.47
10/13/2013 0:00	582.39	11/6/2013 3:00	586.28	11/30/2013 3:00	585.77	12/24/2013 7:00	589.24	1/17/2014 11:00	591.35	2/10/2014 15:00	583.50
10/13/2013 4:00	582.32	11/6/2013 7:00	586.44	11/30/2013 7:00	585.72	12/24/2013 11:00	589.14	1/17/2014 15:00	591.15	2/10/2014 19:00	583.42
10/13/2013 8:00	582.21	11/6/2013 11:00	587.05	11/30/2013 11:00	585.69	12/24/2013 15:00	588.99	1/17/2014 19:00	590.91	2/10/2014 23:00	583.38
10/13/2013 12:00	582.21	11/6/2013 15:00	588.15	11/30/2013 15:00	585.73	12/24/2013 19:00	588.87	1/17/2014 23:00	590.58	2/11/2014 3:00	583.47
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10/13/2013 20:00	582.12	11/6/2013 23:00	590.08	11/30/2013 23:00	585.52	12/25/2013 3:00	588.63	1/18/2014 7:00	590.19	2/11/2014 11:00	583.40
10/14/2013 0:00	582.09	11/7/2013 3:00	590.64	12/1/2013 3:00	585.61	12/25/2013 7:00	588.49	1/18/2014 11:00	589.90	2/11/2014 15:00	583.44
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10/14/2013 16:00	582.01	11/7/2013 19:00	591.57	12/1/2013 19:00	585.39	12/25/2013 23:00	587.93	1/19/2014 3:00	588.91	2/12/2014 7:00	583.40
10/14/2013 20:00	581.90	11/7/2013 23:00	591.53	12/1/2013 23:00	585.29	12/26/2013 3:00	587.73	1/19/2014 7:00	588.83	2/12/2014 11:00	583.33
10/15/2013 0:00	581.87	11/8/2013 3:00	591.43	12/2/2013 3:00	585.41	12/26/2013 7:00	587.56	1/19/2014 11:00	588.62	2/12/2014 15:00	583.41
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10/15/2013 20:00	581.73	11/8/2013 23:00	590.96	12/2/2013 23:00	585.15	12/27/2013 3:00	586.93	1/20/2014 7:00	587.81	2/13/2014 11:00	583.32
10/16/2013 0:00	581.66	11/9/2013 3:00	590.74	12/3/2013 3:00	585.24	12/27/2013 7:00	586.78	1/20/2014 11:00	587.64	2/13/2014 15:00	583.43
10/16/2013 4:00	581.72	11/9/2013 7:00	590.54	12/3/2013 7:00	585.28	12/27/2013 11:00	586.70	1/20/2014 15:00	587.51	2/13/2014 19:00	583.37
10/16/2013 8:00	581.64	11/9/2013 11:00	590.32	12/3/2013 11:00	585.17	12/27/2013 15:00	586.63	1/20/2014 19:00	587.41	2/13/2014 23:00	583.20
10/16/2013 12:00	581.56	11/9/2013 15:00	590.02	12/3/2013 15:00	585.18	12/27/2013 19:00	586.48	1/20/2014 23:00	587.27	2/14/2014 3:00	583.22
10/16/2013 16:00	581.63	11/9/2013 19:00	589.71	12/3/2013 19:00	585.13	12/27/2013 23:00	586.45	1/21/2014 3:00	587.11	2/14/2014 7:00	583.23
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10/17/2013 0:00	581.47	11/10/2013 3:00	589.12	12/4/2013 3:00	585.00	12/28/2013 7:00	586.34	1/21/2014 11:00	586.96	2/14/2014 15:00	583.17
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10/17/2013 8:00	581.54	11/10/2013 11:00	588.64	12/4/2013 11:00	585.01	12/28/2013 15:00	586.29	1/21/2014 19:00	586.83	2/14/2014 23:00	583.01
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10/18/2013 0:00	581.45	11/11/2013 3:00	587.78	12/5/2013 3:00	584.74	12/29/2013 7:00	586.30	1/22/2014 11:00	586.63	2/15/2014 15:00	583.06
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10/18/2013 8:00	581.57	11/11/2013 11:00	587.40	12/5/2013 11:00	584.73	12/29/2013 15:00	586.33	1/22/2014 19:00	586.41	2/15/2014 23:00	583.00
10/18/2013 12:00	581.48	11/11/2013 15:00	587.19	12/5/2013 15:00	584.69	12/29/2013 19:00	586.22	1/22/2014 23:00	586.32	2/16/2014 3:00	583.02
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10/18/2013 20:00	581.51	11/11/2013 23:00	586.88	12/5/2013 23:00	584.57	12/30/2013 3:00	586.27	1/23/2014 7:00	586.19	2/16/2014 11:00	582.87
10/19/2013 0:00	581.43	11/12/2013 3:00	586.79	12/6/2013 3:00	584.54	12/30/2013 7:00	586.23	1/23/2014 11:00	586.15	2/16/2014 15:00	582.88
10/19/2013 4:00	581.53	11/12/2013 7:00	586.65	12/6/2013 7:00	584.61	12/30/2013 11:00	586.11	1/23/2014 15:00	586.04	2/16/2014 19:00	582.91
10/19/2013 8:00	581.55	11/12/2013 11:00	586.61	12/6/2013 11:00	584.56	12/30/2013 15:00	586.11	1/23/2014 19:00	585.99	2/16/2014 23:00	582.82
10/19/2013 12:00	581.46	11/12/2013 15:00	586.58	12/6/2013 15:00	584.50	12/30/2013 19:00	585.96	1/23/2014 23:00	586.00	2/17/2014 3:00	582.86
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10/19/2013 20:00	581.43	11/12/2013 23:00	586.40	12/6/2013 23:00	584.41	12/31/2013 3:00	585.87	1/24/2014 7:00	585.99	2/17/2014 11:00	582.94
10/20/2013 0:00	581.32	11/13/2013 3:00	586.39	12/7/2013 3:00	584.35	12/31/2013 7:00	585.80	1/24/2014 11:00	586.05	2/17/2014 15:00	583.00
10/20/2013 4:00	581.37	11/13/2013 7:00	586.26	12/7/2013 7:00	584.43	12/31/2013 11:00	585.63	1/24/2014 15:00	586.02	2/17/2014 19:00	583.01
10/20/2013 8:00	581.40	11/13/2013 11:00	586.22	12/7/2013 11:00	584.44	12/31/2013 15:00	585.66	1/24/2014 19:00	585.92	2/17/2014 23:00	582.87
10/20/2013 12:00	581.31	11/13/2013 15:00	586.22	12/7/2013 15:00	584.37	12/31/2013 19:00	585.53	1/24/2014 23:00	585.98	2/18/2014 3:00	582.80
10/20/2013 16:00	581.37	11/13/2013 19:00	586.09	12/7/2013 19:00	584.36	12/31/2013 23:00	585.38	1/25/2014 3:00	585.95	2/18/2014 7:00	582.85
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10/21/2013 20:00	581.18	11/14/2013 23:00	585.61	12/8/2013 23:00	584.32	1/2/2014 3:00	585.14	1/26/2014 7:00	585.65	2/19/2014 11:00	582.98
10/22/2013 0:00	581.09	11/15/2013 3:00	585.67	12/9/2013 3:00	584.22	1/2/2014 7:00	585.19	1/26/2014 11:00	585.61	2/19/2014 15:00	583.01
10/22/2013 4:00	581.10	11/15/2013 7:00	585.59	12/9/2013 7:00	584.17	1/2/2014 11:00	585.06	1/26/2014 15:00	585.54	2/19/2014 19:00	583.19
10/22/2013 8:00	581.18	11/15/2013 11:00	585.51	12/9/2013 11:00	584.15	1/2/2014 15:00	585.01	1/26/2014 19:00	585.41	2/19/2014 23:00	583.38
10/22/2013 12:00	581.15	11/15/2013 15:00	585.53	12/9/2013 15:00	584.07	1/2/2014 19:00	584.96	1/26/2014 23:00	585.28	2/20/2014 3:00	583.62
10/22/2013 16:00	581.16	11/15/2013 19:00	585.42	12/9/2013 19:00	584.01	1/2/2014 23:00	584.81	1/27/2014 3:00	585.27	2/20/2014 7:00	583.94
10/22/2013 20:00	581.17	11/15/2013 23:00	585.34	12/9/2013 23:00	584.04	1/3/2014 3:00	584.81	1/27/2014 7:00	585.19	2/20/2014 11:00	584.30
10/23/2013 0:00	581.11	11/16/2013 3:00	585.41	12/10/2013 3:00	584.04	1/3/2014 7:00	584.91	1/27/2014 11:00	585.15	2/20/2014 15:00	585.15
10/23/2013 4:00	581.13	11/16/2013 7:00	585.39	12/10/2013 7:00	584.07	1/3/2014 11:00	584.86	1/27/2014 15:00	585.16	2/20/2014 19:00	586.33
10/23/2013 8:00	581.20	11/16/2013 11:00	585.30	12/10/2013 11:00	584.06	1/3/2014 15:00	584.89	1/27/2014 19:00	585.05	2/20/2014 23:00	587.74
10/23/2013 12:00	581.21	11/16/2013 15:00	585.35	12/10/2013 15:00	583.97	1/3/2014 19:00	584.94	1/27/2014 23:00	585.05	2/21/2014 3:00	589.28
10/23/2013 16:00	581.21	11/16/2013 19:00	585.30	12/10/2013 19:00	583.84	1/3/2014 23:00	584.85	1/28/2014 3:00	585.16	2/21/2014 7:00	590.53
10/23/2013 20:00	581.23	11/16/2013 23:00	585.20	12/10/2013 23:00	583.85	1/4/2014 3:00	584.83	1/28/2014 7:00	585.12	2/21/2014 11:00	591.42
10/24/2013 0:00	581.17	11/17/2013 3:00	585.39	12/11/2013 3:00	583.88	1/4/2014 7:00	584.89	1/28/2014 11:00	585.06	2/21/2014 15:00	592.05
10/24/2013 4:00	581.14	11/17/2013 7:00	585.60	12/11/2013 7:00	583.82	1/4/2014 11:00	584.81	1/28/2014 15:00	585.09	2/21/2014 19:00	592.58
10/24/2013 8:00	581.17	11/17/2013 11:00	585.74	12/11/2013 11:00	583.80	1/4/2014 15:00	584.72	1/28/2014 19:00	584.97	2/21/2014 23:00	593.03
10/24/2013 12:00	581.15	11/17/2013 15:00	585.98	12/11/2013 15:00	583.76	1/4/2014 19:00	584.71	1/28/2014 23:00	584.88	2/22/2014 3:00	593.33
10/24/2013 16:00	581.12	11/17/2013 19:00	586.54	12/11/2013 19:00	583.65	1/4/2014 23:00	584.62	1/29/2014 3:00	584.98	2/22/2014 7:00	593.52
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10/25/2013 0:00	581.10	11/18/2013 3:00	588.57	12/12/2013 3:00	583.75	1/5/2014 7:00	584.63	1/29/2014 11:00	584.86	2/22/2014 15:00	593.71
10/25/2013 4:00	581.05	11/18/2013 7:00	589.32	12/12/2013 7:00	583.73	1/5/2014 11:00	584.61	1/29/2014 15:00	584.90	2/22/2014 19:00	593.73
10/25/2013 8:00	581.09	11/18/2013 11:00	589.70	12/12/2013 11:00	583.73	1/5/2014 15:00	584.56	1/29/2014 19:00	584.82	2/22/2014 23:00	593.77
10/25/2013 12:00	581.09	11/18/2013 15:00	590.02	12/12/2013 15:00	583.75	1/5/2014 19:00	584.53	1/29/2014 23:00	584.72	2/23/2014 3:00	593.73
10/25/2013 16:00	581.10	11/18/2013 19:00	590.15	12/12/2013 19:00	583.64	1/5/2014 23:00	584.47	1/30/2014 3:00	584.84	2/23/2014 7:00	593.65
10/25/2013 20:00	581.11	11/18/2013 23:00	590.12	12/12/2013 23:00	583.62	1/6/2014 3:00	584.38	1/30/2014 7:00	584.89	2/23/2014 11:00	593.59
10/26/2013 0:00	581.10	11/19/13 0:00	590.04	12/13/2013 3:00	583.69	1/6/2014 7:00	584.39	1/30/2014 11:00	584.81	2/23/2014 15:00	593.47
10/26/2013 4:00	581.08	11/19/2013 3:00	590.20	12/13/2013 7:00	583.62	1/6/2014 11:00	584.37	1/30/2014 15:00	584.83	2/23/2014 19:00	593.34
10/26/2013 8:00	581.09	11/19/2013 7:00	590.23	12/13/2013 11:00	583.58	1/6/2014 15:00	584.30	1/30/2014 19:00	584.75	2/23/2014 23:00	593.29
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10/26/2013 16:00	581.01	11/19/2013 15:00	590.03	12/13/2013 19:00	583.50	1/6/2014 23:00	584.30	1/31/2014 3:00	584.57	2/24/2014 7:00	593.07
10/26/2013 20:00	580.94	11/19/2013 19:00	589.88	12/13/2013 23:00	583.47	1/7/2014 3:00	584.23	1/31/2014 7:00	584.63	2/24/2014 11:00	592.94
10/27/2013 0:00	580.95	11/19/2013 23:00	589.62	12/14/2013 3:00	583.59	1/7/2014 7:00	584.24	1/31/2014 11:00	584.51	2/24/2014 15:00	592.80
10/27/2013 4:00	580.93	11/20/2013 3:00	589.47	12/14/2013 7:00	583.59	1/7/2014 11:00	584.23	1/31/2014 15:00	584.54	2/24/2014 19:00	592.61
10/27/2013 8:00	580.90	11/20/2013 7:00	589.36	12/14/2013 11:00	583.55	1/7/2014 15:00	584.18	1/31/2014 19:00	584.57	2/24/2014 23:00	592.49
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10/27/2013 16:00	580.95	11/20/2013 15:00	588.97	12/14/2013 19:00	583.45	1/7/2014 23:00	584.16	2/1/2014 3:00	584.50	2/25/2014 7:00	592.17
10/27/2013 20:00	580.89	11/20/2013 19:00	588.78	12/14/2013 23:00	583.38	1/8/2014 3:00	584.12	2/1/2014 7:00	584.61	2/25/2014 11:00	591.97
10/28/2013 0:00	580.86	11/20/2013 23:00	588.55	12/15/2013 3:00	583.48	1/8/2014 7:00	584.08	2/1/2014 11:00	584.53	2/25/2014 15:00	591.79
10/28/2013 4:00	580.84	11/21/2013 3:00	588.46	12/15/2013 7:00	583.46	1/8/2014 11:00	584.06	2/1/2014 15:00	584.50	2/25/2014 19:00	591.49
10/28/2013 8:00	580.76	11/21/2013 7:00	588.52	12/15/2013 11:00	583.40	1/8/2014 15:00	584.01	2/1/2014 19:00	584.47	2/25/2014 23:00	591.24
10/28/2013 12:00	580.78	11/21/2013 11:00	588.50	12/15/2013 15:00	583.42	1/8/2014 19:00	583.94	2/1/2014 23:00	584.33	2/26/2014 3:00	591.08

Groundwater Elevations – River South Bluff Parcel (RP-1D)

(Hanson Material Services – Romeoville Quarry)

2/26/2014 7:00	590.77
2/26/2014 11:00	590.45
2/26/2014 15:00	590.27
2/26/2014 19:00	589.96
2/26/2014 23:00	589.66
2/27/2014 3:00	589.46
2/27/2014 7:00	589.12
2/27/2014 11:00	588.81
2/27/2014 15:00	588.72
2/27/2014 19:00	588.48
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2/28/2014 3:00	588.21
2/28/2014 7:00	588.06
2/28/2014 11:00	587.84
2/28/2014 15:00	587.80
2/28/2014 19:00	587.63
2/28/2014 23:00	587.36
3/1/2014 3:00	587.29
3/1/2014 7:00	587.15
3/1/2014 11:00	586.90
3/1/2014 15:00	586.85
3/1/2014 19:00	586.78
3/1/2014 23:00	586.58
3/2/2014 3:00	586.55
3/2/2014 7:00	586.52
3/2/2014 11:00	586.34
3/2/2014 15:00	586.32
3/2/2014 19:00	586.30
3/2/2014 23:00	586.14
3/3/2014 3:00	586.09
3/3/2014 7:00	586.09
3/3/2014 11:00	585.94
3/3/2014 15:00	585.91
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3/4/2014 7:00	585.78
3/4/2014 11:00	585.67
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3/4/2014 23:00	585.54
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3/5/2014 7:00	585.44
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3/5/2014 15:00	585.28
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3/6/2014 23:00	585.15
3/7/2014 3:00	585.13
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3/7/2014 19:00	585.06
3/7/2014 23:00	585.18
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7/20/2014 12:00	589.40
7/20/2014 16:00	589.29
7/20/2014 20:00	589.10

Groundwater Elevations – River South Bluff Parcel (RP-1D)

(Hanson Material Services – Romeoville Quarry)

7/21/2014 0:00	588.95	8/14/2014 4:00	593.05	9/7/2014 8:00	587.52	10/1/2014 8:00	584.73	10/25/2014 12:00	586.04	11/18/2014 11:00	583.40
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7/24/2014 0:00	586.81	8/17/2014 4:00	588.99	9/10/2014 8:00	586.50	10/4/2014 8:00	594.09	10/28/2014 12:00	585.40	1/19/17 0:00	592.94
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7/25/2014 8:00	586.34	8/18/2014 12:00	587.80	9/11/2014 16:00	593.38	10/5/2014 16:00	593.83	10/29/2014 20:00	585.17		
7/25/2014 12:00	586.28	8/18/2014 16:00	587.72	9/11/2014 20:00	593.49	10/5/2014 20:00	593.48	10/30/2014 0:00	585.14		
7/25/2014 16:00	586.32	8/18/2014 20:00	587.58	9/12/2014 0:00	593.40	10/6/2014 0:00	593.35	10/30/2014 4:00	585.08		
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7/27/2014 16:00	585.83	8/20/2014 20:00	587.15	9/14/2014 0:00	591.76	10/8/2014 0:00	591.00	11/1/2014 4:00	584.82		
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7/29/2014 4:00	585.46	8/22/2014 8:00	591.42	9/15/2014 12:00	589.46	10/9/2014 12:00	588.72	11/2/2014 15:00	584.76		
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8/1/2014 0:00	585.02	8/25/2014 4:00	595.71	9/18/2014 8:00	587.15	10/12/2014 8:00	586.58	11/5/2014 11:00	584.38		
8/1/2014 4:00	584.97	8/25/2014 8:00	595.57	9/18/2014 12:00	587.10	10/12/2014 12:00	586.57	11/5/2014 15:00	584.47		
8/1/2014 8:00	585.06	8/25/2014 12:00	595.37	9/18/2014 16:00	587.09	10/12/2014 16:00	586.53	11/5/2014 19:00	584.41		
8/1/2014 12:00	585.55	8/25/2014 16:00	595.33	9/18/2014 20:00	586.96	10/12/2014 20:00	586.46	11/5/2014 23:00	584.33		
8/1/2014 16:00	586.74	8/25/2014 20:00	595.26	9/19/2014 0:00	586.87	10/13/2014 0:00	586.29	11/6/2014 3:00	584.46		
8/1/2014 20:00	587.84	8/26/2014 0:00	595.08	9/19/2014 4:00	586.84	10/13/2014 4:00	586.19	11/6/2014 7:00	584.43		
8/2/2014 0:00	588.54	8/26/2014 4:00	595.05	9/19/2014 8:00	586.71	10/13/2014 8:00	586.18	11/6/2014 11:00	584.28		
8/2/2014 4:00	588.88	8/26/2014 8:00	594.94	9/19/2014 12:00	586.67	10/13/2014 12:00	586.21	11/6/2014 15:00	584.28		
8/2/2014 8:00	589.08	8/26/2014 12:00	594.78	9/19/2014 16:00	586.73	10/13/2014 16:00	586.15	11/6/2014 19:00	584.20		
8/2/2014 12:00	589.10	8/26/2014 16:00	594.92	9/19/2014 20:00	586.63	10/13/2014 20:00	586.15	11/6/2014 23:00	584.12		
8/2/2014 16:00	588.96	8/26/2014 20:00	595.20	9/20/2014 0:00	586.57	10/14/2014 0:00	586.32	11/7/2014 3:00	584.23		
8/2/2014 20:00	588.81	8/27/2014 0:00	595.26	9/20/2014 4:00	586.55	10/14/2014 4:00	586.74	11/7/2014 7:00	584.29		
8/3/2014 0:00	588.58	8/27/2014 4:00	595.38	9/20/2014 8:00	586.44	10/14/2014 8:00	587.23	11/7/2014 11:00	584.23		
8/3/2014 4:00	588.30	8/27/2014 8:00	595.43	9/20/2014 12:00	586.39	10/14/2014 12:00	587.54	11/7/2014 15:00	584.29		
8/3/2014 8:00	588.05	8/27/2014 12:00	595.31	9/20/2014 16:00	586.44	10/14/2014 16:00	587.82	11/7/2014 19:00	584.30		
8/3/2014 12:00	587.85	8/27/2014 16:00	595.28	9/20/2014 20:00	586.35	10/14/2014 20:00	588.05	11/7/2014 23:00	584.20		
8/3/2014 16:00	587.64	8/27/2014 20:00	595.24	9/21/2014 0:00	586.31	10/15/2014 0:00	588.25	11/8/2014 3:00	584.28		
8/3/2014 20:00	587.41	8/28/2014 0:00	595.04	9/21/2014 4:00	586.30	10/15/2014 4:00	588.67	11/8/2014 7:00	584.30		
8/4/2014 0:00	587.20	8/28/2014 4:00	594.96	9/21/2014 8:00	586.23	10/15/2014 8:00	589.23	11/8/2014 11:00	584.16		
8/4/2014 4:00	586.95	8/28/2014 8:00	594.90	9/21/2014 12:00	586.17	10/15/2014 12:00	589.80	11/8/2014 15:00	584.15		
8/4/2014 8:00	586.74	8/28/2014 12:00	594.70	9/21/2014 16:00	586.28	10/15/2014 16:00	590.33	11/8/2014 19:00	584.12		
8/4/2014 12:00	586.64	8/28/2014 16:00	594.60	9/21/2014 20:00	586.21	10/15/2014 20:00	590.74	11/8/2014 23:00	584.02		
8/4/2014 16:00	586.52	8/28/2014 20:00	594.52	9/22/2014 0:00	586.16	10/16/2014 0:00	591.04	11/9/2014 3:00	584.06		
8/4/2014 20:00	586.36	8/29/2014 0:00	594.33	9/22/2014 4:00	586.21	10/16/2014 4:00	591.22	11/9/2014 7:00	584.15		
8/5/2014 0:00	586.29	8/29/2014 4:00	594.22	9/22/2014 8:00	586.13	10/16/2014 8:00	591.33	11/9/2014 11:00	584.13		
8/5/2014 4:00	586.54	8/29/2014 8:00	594.14	9/22/2014 12:00	586.05	10/16/2014 12:00	591.35	11/9/2014 15:00	584.13		
8/5/2014 8:00	587.67	8/29/2014 12:00	593.96	9/22/2014 16:00	586.12	10/16/2014 16:00	591.38	11/9/2014 19:00	584.11		
8/5/2014 12:00	588.92	8/29/2014 16:00	593.85	9/22/2014 20:00	586.06	10/16/2014 20:00	591.40	11/9/2014 23:00	584.00		
8/5/2014 16:00	589.88	8/29/2014 20:00	593.76	9/23/2014 0:00	585.94	10/17/2014 0:00	591.28	11/10/14 0:00	584.14		
8/5/2014 20:00	590.46	8/30/2014 0:00	593.56	9/23/2014 4:00	585.99	10/17/2014 4:00	591.28	11/10/2014 3:00	584.01		
8/6/2014 0:00	590.86	8/30/2014 4:00	593.41	9/23/2014 8:00	585.94	10/17/2014 8:00	591.05	11/10/2014 7:00	584.10		
8/6/2014 4:00	591.05	8/30/2014 8:00	593.31	9/23/2014 12:00	585.82	10/17/2014 12:00	591.04	11/10/2014 11:00	584.10		
8/6/2014 8:00	591.06	8/30/2014 12:00	593.14	9/23/2014 16:00	585.87	10/17/2014 16:00	590.85	11/10/2014 15:00	584.11		
8/6/2014 12:00	591.09	8/30/2014 16:00	592.96	9/23/2014 20:00	585.83	10/17/2014 20:00	590.58	11/10/2014 19:00	584.07		
8/6/2014 16:00	591.07	8/30/2014 20:00	592.81	9/24/2014 0:00	585.70	10/18/2014 0:00	590.43	11/10/2014 23:00	583.98		
8/6/2014 20:00	590.84	8/31/2014 0:00	592.58	9/24/2014 4:00	585.75	10/18/2014 4:00	590.20	11/11/2014 3:00	583.93		
8/7/2014 0:00	590.57	8/31/2014 4:00	592.37	9/24/2014 8:00	585.73	10/18/2014 8:00	589.91	11/11/2014 7:00	583.98		
8/7/2014 4:00	590.31	8/31/2014 8:00	592.24	9/24/2014 12:00	585.61	10/18/2014 12:00	589.75	11/11/2014 11:00	583.93		
8/7/2014 8:00	589.90	8/31/2014 12:00	592.06	9/24/2014 16:00	585.65	10/18/2014 16:00	589.58	11/11/2014 15:00	583.87		
8/7/2014 12:00	589.59	8/31/2014 16:00	591.86	9/24/2014 20:00	585.63	10/18/2014 20:00	589.33	11/11/2014 19:00	583.85		
8/7/2014 16:00	589.40	8/31/2014 20:00	591.70	9/25/2014 0:00	585.51	10/19/2014 0:00	589.20	11/11/2014 23:00	583.81		
8/7/2014 20:00	589.07	9/1/2014 0:00	591.46	9/25/2014 4:00	585.55	10/19/2014 4:00	589.06	11/12/2014 3:00	583.80		
8/8/2014 0:00	588.76	9/1/2014 4:00	591.24	9/25/2014 8:00	585.55	10/19/2014 8:00	588.84	11/12/2014 7:00	583.87		
8/8/2014 4:00	588.55	9/1/2014 8:00	591.08	9/25/2014 12:00	585.44	10/19/2014 12:00	588.71	11/12/2014 11:00	583.93		
8/8/2014 8:00	588.20	9/1/2014 12:00	590.87	9/25/2014 16:00	585.48	10/19/2014 16:00	588.67	11/12/2014 15:00	583.92		
8/8/2014 12:00	587.95	9/1/2014 16:00	590.65	9/25/2014 20:00	585.47	10/19/2014 20:00	588.50	11/12/2014 19:00	583.93		
8/8/2014 16:00	587.87	9/1/2014 20:00	590.44	9/26/2014 0:00	585.35	10/20/2014 0:00	588.37	11/12/2014 23:00	583.91		
8/8/2014 20:00	587.65	9/2/2014 0:00	590.24	9/26/2014 4:00	585.38	10/20/2014 4:00	588.34	11/13/2014 3:00	583.85		
8/9/2014 0:00	587.41	9/2/2014 4:00	590.03	9/26/2014 8:00	585.40	10/20/2014 8:00	588.12	11/13/2014 7:00	583.85		
8/9/2014 4:00	587.28	9/2/2014 8:00	589.88	9/26/2014 12:00	585.31	10/20/2014 12:00	587.98	11/13/2014 11:00	583.86		
8/9/2014 8:00	587.05	9/2/2014 12:00	589.77	9/26/2014 16:00	585.32	10/20/2014 16:00	587.93	11/13/2014 15:00	583.81		
8/9/2014 12:00	586.82	9/2/2014 16:00	589.62	9/26/2014 20:00	585.31	10/20/2014 20:00	587.74	11/13/2014 19:00	583.79		
8/9/2014 16:00	586.82	9/2/2014 20:00	589.47	9/27/2014 0:00	585.20	10/21/2014 0:00	587.64	11/13/2014 23:00	583.78		
8/9/2014 20:00	586.72	9/3/2014 0:00	589.29	9/27/2014 4:00	585.20	10/21/2014 4:00	587.63	11/14/2014 3:00	583.74		
8/10/2014 0:00	586.53	9/3/2014 4:00	589.14	9/27/2014 8:00	585.25	10/21/2014 8:00	587.47	11/14/2014 7:00	583.73		
8/10/2014 4:00	586.49	9/3/2014 8:00	588.95	9/27/2014 12:00	585.19	10/21/2014 12:00	587.35	11/14/2014 11:00	583.76		
8/10/2014 8:00	586.36	9/3/2014 12:00	588.87	9/27/2014 16:00	585.20	10/21/2014 16:00	587.34	11/14/2014 15:00	583.74		
8/10/2014 12:00	586.16	9/3/2014 16:00	588.78	9/27/2014 20:00	585.21	10/21/2014 20:00	587.20	11/14/2014 19:00	583.70		
8/10/2014 16:00	586.20	9/3/2014 20:00	588.61	9/28/2014 0:00	585.10	10/22/2014 0:00	587.08	11/14/2014 23:00	583.69		
8/10/2014 20:00	586.25	9/4/2014 0:00	588.48	9/28/2014 4:00	585.07	10/22/2014 4:00	587.09	11/15/2014 3:00	583.66		
8/11/2014 0:00	586.26	9/4/2014 4:00	588.35	9/28/2014 8:00	585.14	10/22/2014 8:00	586.99	11/15/2014 7:00	583.62		
8/11/2014 4:00	586.67	9/4/2014 8:00	588.14	9/28/2014 12:00	585.09	10/22/2014 12:00	586.86	11/15/2014 11:00	583.64		
8/11/2014 8:00	587.93	9/4/2014 12:00	588.11	9/28/2014 16:00	585.08	10/22/2014 16:00	586.89	11/15/2014 15:00	583.65		
8/11/2014 12:00	589.53	9/4/2014 16:00	588.32	9/28/2014 20:00	585.08	10/22/2014 20:00	586.79	11/15/2014 19:00	583.58		
8/11/2014 16:00	590.97	9/4/2014 20:00	588.58	9/29/2014 0:00	585.00	10/23/2014 0:00	586.66	11/15/2014 23:00	583.60		
8/11/2014 20:00	591.94	9/5/2014 0:00	588.78	9/29/2014 4:00	584.95	10/23/2014 4:00	586.71	11/16/2014 3:00	583.62		
8/12/2014 0:00	592.40	9/5/2014 4:00	588.87	9/29/2014 8:00	585.01	10/23/2014 8:00	586.66	11/16/2014 7:00	583.59		
8/12/2014 4:00	592.79	9/5/2014 8:00	588.73	9/29/2014 12:00	585.01	10/23/2014 12:00	586.54	11/16/2014 11:00	583.62		
8/12/2014 8:00	593.06	9/5/2014 12:00	588.65	9/29/2014 16:00	584.99	10/23/2014 16:00	586.58	11/16/2014 15:00	583.66		
8/12/2014 12:00	593.15	9/5/2014 16:00	588.63	9/29/2014 20:00	584.97	10/23/2014 20:00	586.49	11/16/2014 19:00	583.58		
8/12/2014 16:00	593.34	9/5/2014 20:00	588.40	9/30/2014 0:00	584.89	10/24/2014 0:00	586.36	11/16/2014 23:00	583.59		
8/12/2014 20:00	593.54	9/6/2014 0:00	588.26	9/30/2014 4:00	584.81	10/24/2014 4:00	586.41	11/17/2014 3:00	583.62		
8/13/2014 0:00	593.52	9/6/2014 4:00	588.26	9/30/2014 8:00	584.84	10/24/2014 8:00	586.39	11/17/2014 7:00	583.55		
8/13/2014 4:00	593.54	9/6/2014 8:00	588.11	9/30/2014 12:00	584.85	10/24/2014 12:00	586.28	11/17/2014 11:00	583.55		
8/13/2014 8:00	593.57	9/6/2014 12:00	588.02	9/30/2014 16:00	584.84	10/24/2014 16:00	586.30	11/17/2014 15:00	583.55		
8/13/2014 12:00	593.46	9/6/2014 16:00	588.04	9/30/2014 20:00	584.82	10/24/2014 20:00	586.24	11/17/2014 19:00	583.43		
8/13/2014 16:00	593.39	9/6/2014 20:00	587.90	10/1/2014 0:00	584.79	10/25/2014 0:00	586.11	11/17/2014 23:00	583.44		
8/13/2014 20:00	593.37	9/7/2014 0:00	587.75	10/1/14 0:00	584.54	10/25/2014 4:00	586.14	11/18/2014 3:00	583.50		
8/14/2014 0:00	593.19	9/7/2014 4:00	587.71	10/1/2014 4:00	584.73	10/25/2014 8:00	586.17	11/18/2014 7:00	583.42		

Groundwater Elevations – River South Bluff Parcel (RP-1D)
(Hanson Material Services – Romeoville Quarry)

Notes:

ft msl = Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)
TOC = Top of PVC Casing
ft = feet
A = as measured inside well
--- No Elevation
Cells highlighted in yellow are manual WLs
Cells in gray are drought WLs and excluded from calculations

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

Date and Time	RP-1S	RP-2D	RP-2s
9/26/05 0:00	581.11	543.99	574.34
10/11/05 0:00	580.62	552.79	574.45
10/25/05 0:00	580.52	574.06	574.36
12/19/05 0:00	580.60		
1/31/06 0:00		576.45	576.45
4/10/06 0:00	583.19	576.50	576.45
6/5/06 0:00	582.92	576.47	576.38
11/14/06 0:00	585.22	576.99	576.94
3/15/07 0:00	584.74	577.23	577.15
4/17/08 0:00	585.13	577.26	577.02
7/18/08 0:00	582.50	576.55	576.61
8/18/08 0:00	581.33	575.57	575.55
12/2/08 0:00	581.47	576.57	576.72
2/19/09 0:00	586.91	577.25	577.09
8/13/09 0:00	581.88	576.20	576.16
10/23/09 0:00	588.62	577.36	577.72
2/2/10 0:00	583.90	577.25	577.11
4/13/10 0:00	584.18	577.16	577.00
8/9/10 0:00	588.60	577.11	577.05
1/26/11 0:00	582.48	577.24	577.13
5/3/11 0:00	587.60	577.88	577.12
7/5/11 0:00	583.27	577.02	576.77
10/4/11 0:00	582.47	577.08	576.98
12/28/11 0:00	583.63	577.31	577.15
3/30/12 0:00	583.68	577.27	577.09
3/30/2012 15:35	583.68	577.28	577.09
3/30/2012 19:35	583.63	577.27	577.10
3/30/2012 23:35	583.61	577.25	577.10
3/31/2012 3:35	583.59	577.22	577.10
3/31/2012 7:35	583.56	577.20	577.10
3/31/2012 11:35	583.55	577.18	577.10
3/31/2012 15:35	583.53	577.17	577.10
3/31/2012 19:35	583.50	577.15	577.10
3/31/2012 23:35	583.49	577.13	577.11
4/1/2012 3:35	583.47	577.12	577.11
4/1/2012 7:35	583.46	577.00	577.01
4/1/2012 11:35	583.56	576.10	577.21
4/1/2012 15:35	583.65	577.09	577.21
4/1/2012 19:35	583.68	577.08	577.18
4/1/2012 23:35	583.69	577.08	577.17
4/2/2012 3:35	583.67	577.07	577.15
4/2/2012 7:35	583.64	577.06	577.14
4/2/2012 11:35	583.60	577.05	577.14
4/2/2012 15:35	583.57	577.04	577.12
4/2/2012 19:35	583.54	577.03	577.11
4/2/2012 23:35	583.51	577.02	577.11
4/3/2012 3:35	583.47	577.02	577.11
4/3/2012 7:35	583.45	577.01	577.10
4/3/2012 11:35	583.42	577.00	577.10
4/3/2012 15:35	583.39	576.99	577.10
4/3/2012 19:35	583.37	576.99	577.09
4/3/2012 23:35	583.34	576.98	577.08
4/4/2012 3:35	583.32	576.97	577.08
4/4/2012 7:35	583.29	576.97	577.09
4/4/2012 11:35	583.26	576.96	577.08
4/4/2012 15:35	583.24	576.95	577.07
4/4/2012 19:35	583.22	576.95	577.07
4/4/2012 23:35	583.20	576.94	577.07
4/5/2012 3:35	583.18	576.94	577.07
4/5/2012 7:35	583.16	576.94	577.07
4/5/2012 11:35	583.14	576.93	577.05
4/5/2012 15:35	583.12	576.92	577.06
4/5/2012 19:35	583.11	576.92	577.06
4/5/2012 23:35	583.09	576.92	577.06
4/6/2012 3:35	583.08	576.91	577.07
4/6/2012 7:35	583.06	576.91	577.07
4/6/2012 11:35	583.05	576.90	577.06
4/6/2012 15:35	583.03	576.90	577.06
4/6/2012 19:35	583.02	576.90	577.06
4/6/2012 23:35	583.01	576.89	577.06
4/7/2012 3:35	583.00	576.89	577.07
4/7/2012 7:35	582.98	576.89	577.07
4/7/2012 11:35	582.97	576.88	577.07
4/7/2012 15:35	582.95	576.88	577.05
4/7/2012 19:35	582.95	576.88	577.05
4/7/2012 23:35	582.93	576.88	577.06
4/8/2012 3:35	582.92	576.88	577.06
4/8/2012 7:35	582.91	576.87	577.07
4/8/2012 11:35	582.89	576.87	577.07
4/8/2012 15:35	582.87	576.87	577.05
4/8/2012 19:35	582.87	576.86	577.04
4/8/2012 23:35	582.86	576.86	577.05
4/9/2012 3:35	582.85	576.86	577.05
4/9/2012 7:35	582.84	576.86	577.06
4/9/2012 11:35	582.82	576.85	577.05
4/9/2012 15:35	582.81	576.85	577.03
4/9/2012 19:35	582.80	576.85	577.03
4/9/2012 23:35	582.79	576.85	577.03
4/10/2012 3:35	582.78	576.85	577.04
4/10/2012 7:35	582.77	576.85	577.04
4/10/2012 11:35	582.76	576.84	577.05
4/10/2012 15:35	582.75	576.84	577.04
4/10/2012 19:35	582.74	576.83	577.03
4/10/2012 23:35	582.73	576.84	577.03
4/11/2012 3:35	582.72	576.83	577.04
4/11/2012 7:35	582.71	576.83	577.04
4/11/2012 11:35	582.70	576.83	577.04
4/11/2012 15:35	582.69	576.82	577.05
4/11/2012 19:35	582.69	576.82	577.03
4/11/2012 23:35	582.68	576.82	577.04
4/12/2012 3:35	582.67	576.82	577.05
4/12/2012 7:35	582.66	576.82	577.05
4/12/2012 11:35	582.65	576.81	577.06
4/12/2012 15:35	582.64	576.81	577.04
4/12/2012 19:35	582.63	576.81	577.03
4/12/2012 23:35	582.62	576.81	577.03
4/13/2012 3:35	582.61	576.81	577.04
4/13/2012 7:35	582.60	576.80	577.04
4/13/2012 11:35	582.59	576.80	577.04
4/13/2012 15:35	582.58	576.80	577.03
4/13/2012 19:35	582.57	576.80	577.02
4/13/2012 23:35	582.56	576.80	577.03
4/14/2012 3:35	582.55	576.79	577.04
4/14/2012 7:35	582.54	576.79	577.04
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4/14/2012 23:35	582.52	576.79	577.05
4/15/2012 3:35	582.53	576.62	576.91
4/15/2012 7:35	582.51	576.58	576.86
4/15/2012 11:35	582.50	576.79	577.08
4/15/2012 15:35	582.49	576.79	577.06
4/15/2012 19:35	582.54	576.79	577.10
4/15/2012 23:35	582.62	576.80	577.31
4/16/2012 3:35	582.81	576.97	577.68
4/16/2012 7:35	583.13	577.06	577.22
4/16/2012 11:35	583.38	576.80	577.19
4/16/2012 15:35	583.45	576.80	577.15
4/16/2012 19:35	583.46	576.80	577.12
4/16/2012 23:35	583.42	576.80	577.11
4/17/2012 3:35	583.35	576.79	577.10
4/17/2012 7:35	583.27	576.79	577.09
4/17/2012 11:35	583.20	576.79	577.08
4/17/2012 15:35	583.13	576.79	577.07
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4/17/2012 23:35	583.03	576.79	577.05
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4/18/2012 7:35	582.95	576.79	577.05
4/18/2012 11:35	582.90	576.78	577.07
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4/19/2012 11:35	582.74	576.78	577.02
4/19/2012 15:35	582.72	576.78	577.01
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4/20/2012 19:35	582.60	576.77	577.03
4/20/2012 23:35	582.58	576.76	577.03
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4/21/2012 7:35	582.55	576.76	577.04
4/21/2012 11:35	582.54	576.76	577.03
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4/21/2012 19:35	582.52	576.76	577.01
4/21/2012 23:35	582.51	576.76	577.01
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4/22/2012 11:35	582.48	576.75	577.03
4/22/2012 15:35	582.47	576.75	576.99
4/22/2012 19:35	582.46	576.75	576.99
4/22/2012 23:35	582.46	576.75	577.00
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4/24/2012 15:35	582.38	576.74	576.97
4/24/2012 19:35	582.38	576.73	576.97
4/24/2012 23:35	582.37	576.73	576.98
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4/25/2012 15:35	582.35	576.73	576.98
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4/25/2012 23:35	582.35	576.72	576.98
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4/26/2012 7:35	582.34	576.72	577.00
4/26/2012 11:35	582.33	576.72	576.99
4/26/2012 15:35	582.32	576.72	576.97
4/26/2012 19:35	582.32	576.71	576.96
4/26/2012 23:35	582.31	576.71	576.97
4/27/2012 3:35	582.31	576.71	576.98
4/27/2012 7:35	582.30	576.71	576.99
4/27/2012 11:35	582.29	576.71	576.97
4/27/2012 15:35	582.29	576.70	576.96
4/27/2012 19:35	582.28	576.70	576.96
4/27/2012 23:35	582.28	576.70	576.96
4/28/2012 3:35	582.28	576.70	576.97
4/28/2012 7:35	582.31	576.68	576.97
4/28/2012 11:35	582.30	576.45	576.66
4/28/2012 15:35	582.30	576.70	577.06
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4/29/2012 3:35	582.31	576.70	577.04
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4/29/2012 15:35	582.29	576.70	577.00
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4/30/2012 23:35	582.79	576.47	577.20
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5/1/2012 11:35	583.00	576.02	577.13
5/1/2012 15:35	582.97	576.06	577.11
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5/2/2012 7:35	583.39	575.99	577.07
5/2/2012 11:35	583.41	575.72	577.15
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5/2/2012 19:35	583.34	576.74	577.08
5/2/2012 23:35	583.28	576.74	577.08
5/3/2012 3:35	583.20	576.74	577.08
5/3/2012 7:35	583.12	576.74	577.07
5/3/2012 11:35	583.05	576.74	577.07
5/3/2012 15:35	582.99	576.74	577.03
5/3/2012 19:35	582.93	576.74	577.00
5/3/2012 23:35	583.09	576.87	577.29
5/4/2012 3:35	583.66	577.06	577.82
5/4/2012 7:35	584.47	577.09	577.94
5/4/2012 11:35	584.74	576.44	577.37
5/4/2012 15:35	584.96	576.78	577.30
5/4/2012 19:35	585.05	576.79	577.24
5/4/2012 23:35	585.05	576.80	577.20
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5/5/2012 11:35	584.71	576.80	577.15
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5/5/2012 19:35	584.45	576.81	577.11
5/5/2012 23:35	584.33	576.81	577.10
5/6/2012 3:35	584.20	576.81	577.10
5/6/2012 7:35	584.08	576.81	577.10
5/6/2012 11:35	583.95	576.81	577.09
5/6/2012 15:35	583.95	576.54	577.20
5/6/2012 19:35	583.96	576.82	577.21
5/6/2012 23:35	583.99	576.82	577.20
5/7/2012 3:35	585.02	576.79	577.97
5/7/2012 7:35	587.24	576.84	577.79
5/7/2012 11:35	587.78	576.73	577.51
5/7/2012 15:35	588.11	576.71	577.39
5/7/2012 19:35	588.39	576.83	577.51
5/7/2012 23:35	588.52	577.14	577.47
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5/8/2012 11:35	588.64	576.94	577.30
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5/8/2012 23:35	588.41	576.94	577.18
5/9/2012 3:35	588.29	576.95	577.17
5/9/2012 7:35	588.15	576.95	577.17
5/9/2012 11:35	587.99	576.95	577.15
5/9/2012 15:35	587.81	576.95	577.17
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5/10/2012 7:35	587.19	576.95	577.15
5/10/2012 11:35	587.02	576.94	577.13
5/10/2012 15:35	586.72	576.94	577.10
5/10/2012 19:35	586.37	576.94	577.08
5/10/2012 23:35	586.11	576.94	577.08
5/11/2012 3:35	585.87	576.94	577.09
5/11/2012 7:35	585.65	576.94	577.09
5/11/2012 11:35	585.44	576.94	577.07
5/11/2012 15:35	585.26	576.93	577.05
5/11/2012 19:35	585.09	576.93	577.02
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5/12/2012 3:35	584.82	576.93	577.05
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5/12/2012 11:35	584.94	576.77	577.24
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5/12/2012 19:35	585.89	576.97	577.25
5/12/2012 23:35	586.51	576.97	577.28
5/13/2012 3:35	586.95	576.94	577.26
5/13/2012 7:35	587.05	576.93	577.23
5/13/2012 11:35	587.10	576.95	577.19
5/13/2012 15:35	587.08	576.95	577.14
5/13/2012 19:35	587.03	576.95	577.10
5/13/2012 23:35	586.96	576.95	577.10
5/14/2012 3:35	586.80	576.95	577.11
5/14/2012 7:35	586.63	576.94	577.11
5/14/2012 11:35	586.42	576.94	577.08
5/14/2012 15:35	586.23	576.94	577.05
5/14/2012 19:35	586.06	576.94	577.03
5/14/2012 23:35	585.90	576.94	577.04
5/15/2012 3:35	585.73	576.94	577.06
5/15/2012 7:35	585.56	576.94	577.07
5/15/2012 11:35	585.41	576.93	577.03
5/15/2012 15:35	585.25	576.93	577.00
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5/15/2012 23:35	585.00	576.93	577.00
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5/16/2012 11:35	584.64	576.92	577.02
5/16/2012 15:35	584.54	576.92	576.98
5/16/2012 19:35	584.45	576.92	576.97
5/16/2012 23:35	584.37	576.91	576.99
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5/17/2012 11:35	584.14	576.91	577.00
5/17/2012 15:35	584.06	576.90	576.96
5/17/2012 19:35	584.00	576.90	576.95
5/17/2012 23:35	583.94	576.90	576.97
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5/18/2012 7:35	583.83	576.89	577.01
5/18/2012 11:35	583.77	576.89	576.98
5/18/2012 15:35	583.70	576.89	576.93
5/18/2012 19:35	583.67	576.89	576.91
5/18/2012 23:35	583.64	576.88	576.94
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5/19/2012 7:35	583.57	576.88	576.99
5/19/2012 11:35	583.52	576.87	576.95
5/19/2012 15:35	583.48	576.87	576.89
5/19/2012 19:35	583.46	576.87	576.86
5/19/2012 23:35	583.43	576.86	576.90
5/20/2012 3:35	583.41	576.86	576.94
5/20/2012 7:35	583.38	576.86	576.97
5/20/2012 11:35	583.34	576.86	576.92
5/20/2012 15:35	583.30	576.85	576.85
5/20/2012 19:35	583.29	576.85	576.83
5/20/2012 23:35	583.32	576.85	576.93
5/21/2012 3:35	583.35	576.85	577.03
5/21/2012 7:35	583.46	576.84	577.04
5/21/2012 11:35	583.53	576.85	577.05
5/21/2012 15:35	583.54	576.84	577.03
5/21/2012 19:35	583.52	576.84	577.00
5/21/2012 23:35	583.49	576.84	577.01
5/22/2012 3:35	583.45	576.84	577.03
5/22/2012 7:35	583.41	576.84	577.04
5/22/2012 11:35	583.35	576.84	577.01
5/22/2012 15:35	583.31	576.83	576.96
5/22/2012 19:35	583.28	576.83	576.93
5/22/2012 23:35	583.25	576.84	576.96
5/23/2012 3:35	583.23	576.83	576.99
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5/23/2012 11:35	583.16	576.83	576.98
5/23/2012 15:35	583.13	576.82	576.91
5/23/2012 19:35	583.11	576.82	576.86
5/23/2012 23:35	583.10	576.82	576.90
5/24/2012 3:35	583.09	576.82	576.94
5/24/2012 7:35	583.07	576.81	576.96
5/24/2012 11:35	583.03	576.81	576.92
5/24/2012 15:35	583.01	576.80	576.84
5/24/2012 19:35	582.99	576.80	576.79
5/24/2012 23:35	582.98	576.80	576.83
5/25/2012 3:35	582.97	576.79	576.87
5/25/2012 7:35	582.95	576.79	576.90
5/25/2012 11:35	582.92	576.78	576.86
5/25/2012 15:35	582.90	576.78	576.78
5/25/2012 19:35	582.89	576.77	576.75
5/25/2012 23:35	582.88	576.77	576.81
5/26/2012 3:35	582.87	576.76	576.85
5/26/2012 7:35	582.85	576.76	576.88
5/26/2012 11:35	582.83	576.75	576.85
5/26/2012 15:35	582.80	576.75	576.75
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5/26/2012 23:35	582.79	576.74	576.79
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5/27/2012 7:35	582.78	576.73	576.87
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5/27/2012 19:35	582.72	576.71	576.65
5/27/2012 23:35	582.72	576.70	576.70
5/28/2012 3:35	582.71	576.70	576.75
5/28/2012 7:35	582.70	576.69	576.79
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5/28/2012 15:35	582.64	576.68	576.61
5/28/2012 19:35	582.63	576.67	576.57
5/28/2012 23:35	582.63	576.66	576.62
5/29/2012 3:35	582.63	576.65	576.69
5/29/2012 7:35	582.62	576.65	576.73
5/29/2012 11:35	582.58	576.64	576.68
5/29/2012 15:35	582.55	576.63	576.56
5/29/2012 19:35	582.55	576.63	576.52
5/29/2012 23:35	582.55	576.62	576.56
5/30/2012 3:35	582.55	576.61	576.62
5/30/2012 7:35	582.53	576.60	576.66
5/30/2012 11:35	582.50	576.59	576.63
5/30/2012 15:35	582.48	576.59	576.51
5/30/2012 19:35	582.48	576.58	576.48
5/30/2012 23:35	582.48	576.57	576.54
5/31/2012 3:35	582.48	576.56	576.60
5/31/2012 7:35	582.47	576.56	576.64
5/31/2012 11:35	582.46	576.56	576.66
5/31/2012 15:35	582.52	576.55	576.77
5/31/2012 19:35	582.58	576.59	576.92
5/31/2012 23:35	582.73	576.62	577.02
6/1/2012 3:35	582.95	576.55	576.98
6/1/2012 7:35	583.22	576.58	577.00
6/1/2012 11:35	583.34	576.59	577.09
6/1/2012 15:35	583.35	576.59	577.05
6/1/2012 19:35	583.31	576.60	577.02
6/1/2012 23:35	583.24	576.60	577.02
6/2/2012 3:35	583.18	576.60	577.03
6/2/2012 7:35	583.11	576.61	577.03
6/2/2012 11:35	583.03	576.61	576.99
6/2/2012 15:35	582.97	576.61	576.94
6/2/2012 19:35	582.92	576.61	576.90
6/2/2012 23:35	582.87	576.61	576.93
6/3/2012 3:35	582.83	576.61	576.95
6/3/2012 7:35	582.79	576.61	576.97
6/3/2012 11:35	582.74	576.60	576.94
6/3/2012 15:35	582.70	576.61	576.85
6/3/2012 19:35	582.69	576.60	576.82
6/3/2012 23:35	582.67	576.60	576.86
6/4/2012 3:35	582.65	576.60	576.89
6/4/2012 7:35	582.62	576.60	576.91
6/4/2012 11:35	582.58	576.60	576.88
6/4/2012 15:35	582.54	576.60	576.80
6/4/2012 19:35	582.54	576.59	576.75
6/4/2012 23:35	582.53	576.59	576.79
6/5/2012 3:35	582.52	576.59	576.83
6/5/2012 7:35	582.50	576.59	576.85
6/5/2012 11:35	582.47	576.58	576.82
6/5/2012 15:35	582.44	576.58	576.73
6/5/2012 19:35	582.44	576.58	576.69
6/5/2012 23:35	582.44	576.58	576.73
6/6/2012 3:35	582.43	576.57	576.77
6/6/2012 7:35	582.42	576.57	576.80
6/6/2012 11:35	582.39	576.56	576.77
6/6/2012 15:35	582.37	576.56	576.66
6/6/2012 19:35	582.37	576.56	576.60
6/6/2012 23:35	582.37	576.55	576.64
6/7/2012 3:35	582.37	576.55	576.68
6/7/2012 7:35	582.36	576.54	576.72
6/7/2012 11:35	582.33	576.54	576.66
6/7/2012 15:35	582.32	576.53	576.56
6/7/2012 19:35	582.32	576.53	576.49
6/7/2012 23:35	582.32	576.52	576.52
6/8/2012 3:35	582.32	576.52	576.57
6/8/2012 7:35	582.31	576.51	576.61
6/8/2012 11:35	582.28	576.50	576.53
6/8/2012 15:35	582.27	576.50	576.44
6/8/2012 19:35	582.27	576.49	576.38
6/8/2012 23:35	582.28	576.48	576.41
6/9/2012 3:35	582.27	576.48	576.45
6/9/2012 7:35	582.27	576.47	576.49
6/9/2012 11:35	582.24	576.46	576.40
6/9/2012 15:35	582.22	576.45	576.32
6/9/2012 19:35	582.23	576.45	576.27
6/9/2012 23:35	582.23	576.44	576.29
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6/10/2012 7:35	582.23	576.42	576.38
6/10/2012 11:35	582.19	576.42	576.29
6/10/2012 15:35	582.18	576.40	576.22
6/10/2012 19:35	582.18	576.40	576.18
6/10/2012 23:35	582.19	576.38	576.21
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6/11/2012 7:35	582.18	576.35	576.30
6/11/2012 11:35	582.16	576.35	576.23
6/11/2012 15:35	582.14	576.33	576.16
6/11/2012 19:35	582.14	576.32	576.12
6/11/2012 23:35	582.15	576.30	576.16
6/12/2012 3:35	582.15	576.29	576.21
6/12/2012 7:35	582.14	576.28	576.23
6/12/2012 11:35	582.11	576.26	576.15
6/12/2012 15:35	582.09	576.25	576.09
6/12/2012 19:35	582.10	576.24	576.05
6/12/2012 23:35	582.10	576.23	576.08
6/13/2012 3:35	582.11	576.22	576.13
6/13/2012 7:35	582.11	576.21	576.17
6/13/2012 11:35	582.08	576.19	576.13
6/13/2012 15:35	582.06	576.18	576.04
6/13/2012 19:35	582.06	576.17	576.01
6/13/2012 23:35	582.07	576.16	576.04
6/14/2012 3:35	582.08	576.15	576.09
6/14/2012 7:35	582.07	576.14	576.13
6/14/2012 11:35	582.04	576.13	576.06
6/14/2012 15:35	582.02	576.12	575.99
6/14/2012 19:35	582.03	576.11	575.95
6/14/2012 23:35	582.04	576.10	575.97
6/15/2012 3:35	582.04	576.09	576.01
6/15/2012 7:35	582.03	576.08	576.04
6/15/2012 11:35	582.00	576.07	575.97
6/15/2012 15:35	581.98	576.05	575.92
6/15/2012 19:35	581.98	576.05	575.88
6/15/2012 23:35	581.99	576.04	575.89
6/16/2012 3:35	582.00	576.03	575.92
6/16/2012 7:35	582.00	576.02	575.96
6/16/2012 11:35	581.96	576.01	575.92
6/16/2012 15:35	581.94	576.00	575.85
6/16/2012 19:35	581.94	575.99	575.82
6/16/2012 23:35	582.03	575.98	575.91
6/17/2012 3:35	582.10	575.98	576.25
6/17/2012 7:35	582.20	575.98	576.36
6/17/2012 11:35	582.32	575.98	576.50
6/17/2012 15:35	582.41	575.98	576.46
6/17/2012 19:35	582.46	575.99	576.40
6/17/2012 23:35	582.49	575.99	576.42
6/18/2012 3:35	582.49	575.99	576.45
6/18/2012 7:35	582.47	575.99	576.46
6/18/2012 11:35	582.42	575.99	576.43
6/18/2012 15:35	582.36	575.99	576.34
6/18/2012 19:35	582.33	575.99	576.26
6/18/2012 23:35	582.31	575.98	576.23
6/19/2012 3:35	582.28	575.98	576.25
6/19/2012 7:35	582.26	575.98	576.25
6/19/2012 11:35	582.21	575.98	576.20
6/19/2012 15:35	582.16	575.97	576.13
6/19/2012 19:35	582.15	575.97	576.04
6/19/2012 23:35	582.14	575.96	576.02
6/20/2012 3:35	582.13	575.96	576.04
6/20/2012 7:35	582.11	575.95	576.05
6/20/2012 11:35	582.07	575.95	575.99
6/20/2012 15:35	582.03	575.95	575.91
6/20/2012 19:35	582.03	575.93	575.84
6/20/2012 23:35	582.03	575.92	575.82
6/21/2012 3:35	582.03	575.91	575.85
6/21/2012 7:35	582.02	575.91	575.86
6/21/2012 11:35	581.99	575.90	575.81
6/21/2012 15:35	581.97	575.89	575.78
6/21/2012 19:35	581.95	575.88	575.76
6/21/2012 23:35	581.96	575.87	575.75
6/22/2012 3:35	581.96	575.86	575.79
6/22/2012 7:35	581.95	575.85	575.82
6/22/2012 11:35	581.91	575.84	575.76
6/22/2012 15:35	581.88	575.83	575.71
6/22/2012 19:35	581.88	575.82	575.67
6/22/2012 23:35	581.89	575.82	575.67
6/23/2012 3:35	581.89	575.81	575.70
6/23/2012 7:35	581.90	575.80	575.73
6/23/2012 11:35	581.85	575.79	575.68
6/23/2012 15:35	581.83	575.78	575.63
6/23/2012 19:35	581.83	575.77	575.61
6/23/2012 23:35	581.84	575.76	575.62
6/24/2012 3:35	581.84	575.75	575.66
6/24/2012 7:35	581.84	575.74	575.68
6/24/2012 11:35	581.81	575.73	575.65
6/24/2012 15:35	581.77	575.72	575.58
6/24/2012 19:35	581.77	575.72	575.55
6/24/2012 23:35	581.78	575.71	575.55
6/25/2012 3:35	581.79	575.70	575.58
6/25/2012 7:35	581.78	575.69	575.59
6/25/2012 11:35	581.74	575.68	575.54

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

6/25/2012 15:35	581.71	575.67	575.51
6/25/2012 19:35	581.71	575.67	575.48
6/25/2012 23:35	581.73	575.66	575.48
6/26/2012 3:35	581.74	575.65	575.50
6/26/2012 7:35	581.74	575.64	575.53
6/26/2012 11:35	581.70	575.63	575.48
6/26/2012 15:35	581.66	575.62	575.44
6/26/2012 19:35	581.66	575.62	575.41
6/26/2012 23:35	581.67	575.61	575.41
6/27/2012 3:35	581.68	575.60	575.44
6/27/2012 7:35	581.68	575.60	575.46
6/27/2012 11:35	581.63	575.58	575.40
6/27/2012 15:35	581.60	575.58	575.37
6/27/2012 19:35	581.59	575.57	575.34
6/27/2012 23:35	581.61	575.56	575.33
6/28/2012 3:35	581.61	575.56	575.35
6/28/2012 7:35	581.61	575.55	575.36
6/28/2012 11:35	581.57	575.54	575.32
6/28/2012 15:35	581.53	575.53	575.29
6/28/2012 19:35	581.54	575.52	575.26
6/28/2012 23:35	581.55	575.51	575.26
6/29/2012 3:35	581.56	575.51	575.28
6/29/2012 7:35	581.56	575.50	575.30
6/29/2012 11:35	581.53	575.49	575.26
6/29/2012 15:35	581.56	575.48	574.58
6/29/2012 19:35	581.55	575.48	575.26
6/29/2012 23:35	581.84	575.56	575.76
6/30/2012 3:35	582.14	575.52	576.05
6/30/2012 7:35	582.44	575.53	576.14
6/30/2012 11:35	582.74	575.51	576.31
6/30/2012 15:35	582.94	575.52	576.29
6/30/2012 19:35	582.97	575.53	576.26
6/30/2012 23:35	582.92	575.54	576.27
7/1/2012 3:35	582.85	575.55	576.29
7/1/2012 7:35	582.77	575.56	576.30
7/1/2012 11:35	582.67	575.57	576.29
7/1/2012 15:35	582.60	575.58	576.30
7/1/2012 19:35	582.52	575.59	576.26
7/1/2012 23:35	582.46	575.60	576.27
7/2/2012 3:35	582.41	575.61	576.29
7/2/2012 7:35	582.36	575.62	576.30
7/2/2012 11:35	582.29	575.62	576.27
7/2/2012 15:35	582.24	575.63	576.20
7/2/2012 19:35	582.20	575.64	576.14
7/2/2012 23:35	582.17	575.64	576.14
7/3/2012 3:35	582.14	575.64	576.16
7/3/2012 7:35	582.12	575.65	576.16
7/3/2012 11:35	582.07	575.65	576.12
7/3/2012 15:35	582.03	575.65	576.05
7/3/2012 19:35	582.02	575.65	575.99
7/3/2012 23:35	582.01	575.65	575.98
7/4/2012 3:35	581.99	575.65	576.00
7/4/2012 7:35	581.98	575.64	576.01
7/4/2012 11:35	581.93	575.64	575.96
7/4/2012 15:35	581.89	575.64	575.90
7/4/2012 19:35	581.87	575.64	575.84
7/4/2012 23:35	581.87	575.64	575.82
7/5/2012 3:35	581.86	575.64	575.83
7/5/2012 7:35	581.86	575.63	575.84
7/5/2012 11:35	581.81	575.63	575.80
7/5/2012 15:35	581.76	575.63	575.73
7/5/2012 19:35	581.75	575.62	575.67
7/5/2012 23:35	581.76	575.62	575.64
7/6/2012 3:35	581.76	575.62	575.65
7/6/2012 7:35	581.75	575.61	575.67
7/6/2012 11:35	581.71	575.61	575.63
7/6/2012 15:35	581.66	575.61	575.56
7/6/2012 19:35	581.65	575.60	575.49
7/6/2012 23:35	581.67	575.60	575.47
7/7/2012 3:35	581.67	575.59	575.48
7/7/2012 7:35	581.66	575.59	575.50
7/7/2012 11:35	581.61	575.58	575.45
7/7/2012 15:35	581.57	575.57	575.39
7/7/2012 19:35	581.57	575.57	575.33
7/7/2012 23:35	581.58	575.56	575.32
7/8/2012 3:35	581.58	575.56	575.33
7/8/2012 7:35	581.61	575.55	575.35
7/8/2012 11:35	581.58	575.54	575.36
7/8/2012 15:35	581.53	575.54	575.29
7/8/2012 19:35	581.53	575.53	575.24
7/8/2012 23:35	581.55	575.52	575.24
7/9/2012 3:35	581.56	575.51	575.25
7/9/2012 7:35	581.56	575.49	575.28
7/9/2012 11:35	581.52	575.47	575.23
7/9/2012 15:35	581.49	575.46	575.20
7/9/2012 19:35	581.49	575.44	575.17
7/9/2012 23:35	581.50	575.42	575.16
7/10/2012 3:35	581.51	575.41	575.18
7/10/2012 7:35	581.51	575.39	575.20
7/10/2012 11:35	581.49	575.38	575.17
7/10/2012 15:35	581.47	575.36	575.14
7/10/2012 19:35	581.46	575.34	575.12
7/10/2012 23:35	581.47	575.33	575.12
7/11/2012 3:35	581.48	575.32	575.14
7/11/2012 7:35	581.48	575.31	575.16
7/11/2012 11:35	581.44	575.29	575.11
7/11/2012 15:35	581.42	575.28	575.08
7/11/2012 19:35	581.42	575.27	575.05
7/11/2012 23:35	581.43	575.27	575.05
7/12/2012 3:35	581.43	575.26	575.07
7/12/2012 7:35	581.43	575.26	575.08
7/12/2012 11:35	581.40	575.25	575.04
7/12/2012 15:35	581.38	575.25	575.01
7/12/2012 19:35	581.38	575.24	574.98
7/12/2012 23:35	581.39	575.23	574.98
7/13/2012 3:35	581.40	575.22	575.00
7/13/2012 7:35	581.40	575.22	575.01
7/13/2012 11:35	581.37	575.21	574.97
7/13/2012 15:35	581.35	575.20	574.94
7/13/2012 19:35	581.36	575.20	574.93
7/13/2012 23:35	581.37	575.19	574.94
7/14/2012 3:35	581.37	575.18	574.96
7/14/2012 7:35	581.37	575.18	574.98
7/14/2012 11:35	581.34	575.17	574.93
7/14/2012 15:35	581.32	575.17	574.90
7/14/2012 19:35	581.32	575.16	574.88
7/14/2012 23:35	581.33	575.15	574.88
7/15/2012 3:35	581.34	575.14	574.90
7/15/2012 7:35	581.34	575.14	574.92
7/15/2012 11:35	581.31	575.13	574.90
7/15/2012 15:35	581.29	575.12	574.85
7/15/2012 19:35	581.29	575.12	574.82
7/15/2012 23:35	581.30	575.11	574.82
7/16/2012 3:35	581.31	575.10	574.84
7/16/2012 7:35	581.31	575.09	574.86
7/16/2012 11:35	581.28	575.08	574.81
7/16/2012 15:35	581.26	575.06	574.79
7/16/2012 19:35	581.26	575.06	574.77
7/16/2012 23:35	581.28	575.05	574.77
7/17/2012 3:35	581.28	575.04	574.78
7/17/2012 7:35	581.28	575.03	574.79
7/17/2012 11:35	581.25	575.01	574.75
7/17/2012 15:35	581.23	575.00	574.73
7/17/2012 19:35	581.23	574.99	574.71
7/17/2012 23:35	581.25	574.99	574.71
7/18/2012 3:35	581.25	574.98	574.72
7/18/2012 7:35	581.26	574.97	574.73

7/18/2012 11:35	581.23	574.96	574.70
7/18/2012 15:35	581.24	574.94	574.69
7/18/2012 19:35	581.24	574.94	574.67
7/18/2012 23:35	581.25	574.93	574.69
7/19/12 0:00	581.53	575.27	574.92
7/19/2012 3:35	581.31	574.82	574.78
7/19/2012 7:35	581.47	574.81	574.86
7/19/2012 11:35	581.69	574.95	575.02
7/19/2012 15:35	581.86	574.94	575.02
7/19/2012 19:35	581.95	574.94	575.03
7/19/2012 23:35	581.97	574.94	575.05
7/20/2012 3:35	581.95	574.94	575.08
7/20/2012 7:35	581.91	574.93	575.11
7/20/2012 11:35	581.84	574.93	575.12
7/20/2012 15:35	581.76	574.93	575.08
7/20/2012 19:35	581.72	574.93	575.03
7/20/2012 23:35	581.68	574.93	575.05
7/21/2012 3:35	581.65	574.93	575.07
7/21/2012 7:35	581.62	574.92	575.10
7/21/2012 11:35	581.56	574.92	575.08
7/21/2012 15:35	581.51	574.91	575.02
7/21/2012 19:35	581.49	574.91	574.96
7/21/2012 23:35	581.48	574.91	574.97
7/22/2012 3:35	581.47	574.91	574.99
7/22/2012 7:35	581.45	574.91	575.01
7/22/2012 11:35	581.42	574.90	574.99
7/22/2012 15:35	581.40	574.90	574.94
7/22/2012 19:35	581.39	574.90	574.89
7/22/2012 23:35	581.38	574.89	574.89
7/23/2012 3:35	581.37	574.89	574.91
7/23/2012 7:35	581.37	574.89	574.92
7/23/2012 11:35	581.33	574.88	574.86
7/23/2012 15:35	581.32	574.88	574.83
7/23/2012 19:35	581.34	574.87	574.79
7/23/2012 23:35	581.38	574.87	574.79
7/24/2012 3:35	581.40	574.86	574.81
7/24/2012 7:35	581.50	574.85	574.95
7/24/2012 11:35	581.47	574.55	574.59
7/24/2012 15:35	581.74	574.85	575.04
7/24/2012 19:35	581.90	574.86	575.05
7/24/2012 23:35	581.99	574.86	575.07
7/25/2012 3:35	582.01	574.86	575.11
7/25/2012 7:35	581.93	574.85	574.97
7/25/2012 11:35	582.00	574.86	575.16
7/25/2012 15:35	581.97	574.86	575.13
7/25/2012 19:35	581.94	574.86	575.08
7/25/2012 23:35	581.91	574.86	575.09
7/26/2012 3:35	581.89	574.86	575.11
7/26/2012 7:35	581.99	574.96	575.29
7/26/2012 11:35	582.06	574.86	575.24
7/26/2012 15:35	582.09	574.86	575.27
7/26/2012 19:35	582.47	574.86	575.30
7/26/2012 23:35	582.77	574.86	575.33
7/27/2012 3:35	582.21	574.87	575.37
7/27/2012 7:35	582.21	574.87	575.40
7/27/2012 11:35	582.18	574.87	575.42
7/27/2012 15:35	582.13	574.88	575.39
7/27/2012 19:35	582.08	574.88	575.35
7/27/2012 23:35	582.04	574.88	575.37
7/28/2012 3:35	581.99	574.89	575.40
7/28/2012 7:35	581.95	574.89	575.42
7/28/2012 11:35	581.89	574.90	575.40
7/28/2012 15:35	581.82	574.90	575.35
7/28/2012 19:35	581.78	574.90	575.31
7/28/2012 23:35	581.75	574.90	575.32
7/29/2012 3:35	581.73	574.90	575.34
7/29/2012 7:35	581.70	574.91	575.36
7/29/2012 11:35	581.65	574.90	575.34
7/29/2012 15:35	581.61	574.91	575.28
7/29/2012 19:35	581.59	574.91	575.25
7/29/2012 23:35	581.58	574.91	575.25
7/30/2012 3:35	581.56	574.91	575.27
7/30/2012 7:35	581.54	574.91	575.28
7/30/2012 11:35	581.50	574.91	575.24
7/30/2012 15:35	581.47	574.91	575.19
7/30/2012 19:35	581.46	574.91	575.14
7/30/2012 23:35	581.46	574.91	575.13
7/31/2012 3:35	581.45	574.91	575.15
7/31/2012 7:35	581.46	574.91	575.18
7/31/2012 11:35	581.46	574.91	575.16
7/31/2012 15:35	581.43	574.90	575.13
7/31/2012 19:35	581.42	574.90	575.09
7/31/2012 23:35	581.42	574.90	575.10
8/1/2012 3:35	581.42	574.90	575.12
8/1/2012 7:35	581.42	574.90	575.15
8/1/2012 11:35	581.39	574.90	575.11
8/1/2012 15:35	581.36	574.89	575.06
8/1/2012 19:35	581.36	574.89	575.02
8/1/2012 23:35	581.36	574.89	575.01
8/2/2012 3:35	581.36	574.89	575.03
8/2/2012 7:35	581.36	574.89	575.04
8/2/2012 11:35	581.33	574.88	575.00
8/2/2012 15:35	581.30	574.88	574.95
8/2/2012 19:35	581.30	574.88	574.91
8/2/2012 23:35	581.30	574.87	574.91
8/3/2012 3:35	581.31	574.87	574.92
8/3/2012 7:35	581.31	574.87	574.94
8/3/2012 11:35	581.28	574.86	574.90
8/3/2012 15:35	581.25	574.86	574.86
8/3/2012 19:35	581.25	574.86	574.82
8/3/2012 23:35	581.26	574.85	574.81
8/4/2012 3:35	581.26	574.85	574.81
8/4/2012 7:35	581.26	574.84	574.82
8/4/2012 11:35	581.24	574.83	574.80
8/4/2012 15:35	581.22	574.83	574.77
8/4/2012 19:35	581.66	574.95	575.40
8/4/2012 23:35	581.97	575.15	575.79
8/5/2012 3:35	582.37	574.84	575.88
8/5/2012 7:35	582.62	574.85	575.39
8/5/2012 11:35	582.75	574.85	575.42
8/5/2012 15:35	582.75	574.85	575.41
8/5/2012 19:35	582.70	574.86	575.39
8/5/2012 23:35	582.62	574.87	575.42
8/6/2012 3:35	582.54	574.87	575.45
8/6/2012 7:35	582.46	574.88	575.48
8/6/2012 11:35	582.37	574.88	575.47
8/6/2012 15:35	582.28	574.88	575.44
8/6/2012 19:35	582.22	574.89	575.40
8/6/2012 23:35	582.16	574.90	575.41
8/7/2012 3:35	582.11	574.90	575.44
8/7/2012 7:35	582.06	574.90	575.47
8/7/2012 11:35	581.99	574.91	575.44
8/7/2012 15:35	581.92	574.91	575.38
8/7/2012 19:35	581.88	574.91	575.32
8/7/2012 23:35	581.84	574.92	575.32
8/8/2012 3:35	581.80	574.92	575.34
8/8/2012 7:35	581.77	574.92	575.36
8/8/2012 11:35	581.73	574.92	575.34
8/8/2012 15:35	581.68	574.92	575.30
8/8/2012 19:35	581.67	574.92	575.30
8/8/2012 23:35	581.65	574.92	575.32
8/9/2012 3:35	581.63	574.92	575.35
8/9/2012 7:35	581.62	574.92	575.37
8/9/2012 11:35	581.59	574.92	575.36
8/9/2012 15:35	581.55	574.93	575.34
8/9/2012 19:35	581.53	574.93	575.31
8/9/2012 23:35	581.61	574.93	575.34

8/10/2012 3:35	581.53	574.93	575.38
8/10/2012 7:35	581.53	574.93	575.40
8/10/2012 11:35	581.52	574.93	575.40
8/10/2012 15:35	581.49	574.94	575.34
8/10/2012 19:35	581.48	574.94	575.29
8/10/2012 23:35	581.47	574.94	575.29
8/11/2012 3:35	581.47	574.94	575.30
8/11/2012 7:35	581.46	574.94	575.31
8/11/2012 11:35	581.44	574.93	575.28
8/11/2012 15:35	581.41	574.94	575.22
8/11/2012 19:35	581.40	574.93	575.17
8/11/2012 23:35	581.40	574.93	575.16
8/12/2012 3:35	581.39	574.93	575.18
8/12/2012 7:35	581.39	574.93	575.19
8/12/2012 11:35	581.38	574.93	575.18
8/12/2012 15:35	581.36	574.92	575.13
8/12/2012 19:35	581.35	574.92	575.11
8/12/2012 23:35	581.35	574.92	575.11
8/13/2012 3:35	581.36	574.92	575.13
8/13/2012 7:35	581.38	574.92	575.17
8/13/2012 11:35	581.42	574.92	575.22
8/13/2012 15:35	581.46	574.92	575.26
8/13/2012 19:35	581.54	574.92	575.34
8/13/2012 23:35	581.61	574.92	575.62
8/14/2012 3:35	581.70	574.93	575.60
8/14/2012 7:35	581.75	574.93	575.69
8/14/2012 11:35	581.76	574.93	574.19
8/14/2012 15:35	581.74	574.94	575.42
8/14/2012 19:35	581.73	574.94	575.37
8/14/2012 23:35	581.71	574.94	575.39
8/15/2012 3:35	581.68	574.94	575.41
8/15/2012 7:35	581.65	574.95	575.43
8/15/2012 11:35	581.61	574.95	575.43
8/15/2012 15:35	581.56	574.95	575.37
8/15/2012 19:35	581.54	574.95	575.31
8/15/2012 23:35	581.52	574.95	575.31
8/16/2012 3:35	581.51	574.95	575.33
8/16/2012 7:35	581.49	574.95	575.35
8/16/2012 11:35	581.51	574.95	575.17
8/16/2012 15:35	581.53	574.96	574.96
8/16/2012 19:35	581.55	574.96	575.26
8/16/2012 23:35	581.57	574.96	575.46
8/17/2012 3:35	581.58	574.97	575.48
8/17/2012 7:35	581.58	574.97	575.50
8/17/2012 11:35	581.55	574.97	575.48
8/17/2012 15:35	581.52	574.97	575.43
8/17/2012 19:35	581.51	574.98	575.38
8/17/2012 23:35	581.50	574.98	575.38
8/18/2012 3:35	581.49	574.98	575.40
8/18/2012 7:35	581.49	574.98	575.42
8/18/2012 11:35	581.46	574.98	575.39
8/18/2012 15:35	581.43	574.98	575.33
8/18/2012 19:35	581.42	574.98	575.29
8/18/2012 23:35	581.42	574.98	575.29
8/19/2012 3:35	581.41	574.98	575.30
8/19/2012 7:35	581.41	574.98	575.32
8/19/2012 11:35	581.38	574.98	575.28
8/19/2012 15:35	581.35	574.98	575.24
8/19/2012 19:35	581.35	574.98	575.19
8/19/2012 23:35	581.35	574.98	575.19
8/20/2012 3:35	581.35	574.98	575.21
8/20/2012 7:35	581.34	574.97	575.22
8/20/2012 11:35	581.32	574.97	575.19
8/20/2012 15:35	581.32	574.97	575.20
8/20/2012 19:35	581.33	574.97	575.17
8/20/2012 23:35	581.35	574.97	575.68
8/21/2012 3:35	581.36	574.97	575.25
8/21/2012 7:35	581.37	574.97	575.28
8/21/2012 11:35	581.36	574.97	575.26
8/21/2012 15:35	581.33	574.97	575.20
8/21/2012 19:35	581.33	574.97	575.16
8/21/2012 23:35	581.33	574.97	575.16
8/22/2012 3:35	581.34	574.97	575.18
8/22/2012 7:35	581.33	574.96	575.21
8/22/2012 11:35	581.31	574.96	575.17
8/22/2012 15:35	581.28	574.96	575.12
8/22/2012 19:35	581.28	574.96	575.08
8/22/2012 23:35	581.29	574.96	575.07
8/23/2012 3:35	581.29	574.95	575.09
8/23/2012 7:35	581.29	574.95	575.10
8/23/2012 11:35	581.27	574.95	575.07
8/23/2012 15:35	581.24	574.95	575.02
8/23/2012 19:35	581.24	574.94	574.98
8/23/2012 23:35	581.25	574.94	574.97
8/24/2012 3:35	581.25	574.94	574.98
8/24/2012 7:35	581.26	574.93	574.99
8/24/2012 11:35	581.24	574.93	574.96
8/24/2012 15:35	581.22	574.93	574.91
8/24/2012 19:35	581.21	574.92	574.88
8/24/2012 23:35	581.22	574.92	574.87
8/25/2012 3:35	581.22	574.92	574.87
8/25/2012 7:35	581.22	574.91	574.89
8/25/2012 11:35	581.20	574.90	574.85
8/25/2012 15:35	581.19	574.90	574.81
8/25/2012 19:35	581.19	574.89	574.79
8/25/2012 23:35	581.20	574.89	574.78
8/26/2012 3:35	581.21	574.88	574.78
8/26/2012 7:35	581.21	574.88	574.79
8/26/2012 11:35	581.24	574.85	574.75
8/26/2012 15:35	581.28	574.83	574.73
8/26/2012 19:35	581.53	574.88	574.86
8/26/2012 23:35	582.80	575.08	576.27
8/27/2012 3:35	584.02	575.15	576.54
8/27/2012 7:35	585.05	575.07	576.62
8/27/2012 11:35	585.68	575.15	575.50
8/27/2012 15:35	586.17	575.23	576.40
8/27/2012 19:35	586.44	575.31	576.36
8/27/2012 23:35	586.52	575.38	576.37
8/28/2012 3:35	586.48	575.44	576.37
8/28/2012 7:35	586.34	575.50	576.38
8/28/2012 11:35	586.08	575.55	576.35
8/28/2012 15:35	585.79	575.60	576.31
8/28/2012 19:35	585.49	575.64	576.30
8/28/2012 23:35	585.19	575.68	576.32
8/29/2012 3:35	584.89	575.72	576.34
8/29/2012 7:35	584.61	575.75	576.35
8/29/2012 11:35	584.36	575.78	576.33
8/29/2012 15:35	584.12	575.81	576.28
8/29/2012 19:35	583.92	575.83	576.27
8/29/2012 23:35	583.71	575.85	576.29
8/30/2012 3:35	583.54	575.87	576.32
8/30/2012 7:35	583.39	575.89	576.33
8/30/2012 11:35	583.25	575.91	576.30
8/30/2012 15:35	583.11	575.92	576.24
8/30/2012 19:35	583.01	575.93	576.21
8/30/2012 23:35	582.93	575.93	576.23
8/31/2012 3:35	582.85	575.94	576.26
8/31/2012 7:35	582.78	575.95	576.28
8/31/2012 11:35	582.70	575.96	576.25
8/31/2012 15:35	582.63	575.96	576.19
8/31/2012 19:35	582.59	575.96	576.18
8/31/2012 23:35	582.56	575.96	576.20
9/1/2012 3:35	582.52	575.96	576.23
9/1/2012 7:35	582.49	575.97	576.25
9/1/2012 11:35	582.47	575.97	576.26
9/1/2012 15:35	582.39	575.77	576.43
9/1/2012 19:35	582.58	576.00	576.46

9/1/2012 23:35	582.67	576.02	576.47
9/2/2012 3:35	582.75	576.03	576.48
9/2/2012 7:35	582.79	576.05	576.48
9/2/2012 11:35	582.78	576.06	576.47
9/2/2012 15:35	582.74	576.07	576.44
9/2/2012 19:35	582.69	576.08	576.42
9/2/2012 23:35	582.64	576.08	576.43
9/3/2012 3:35	582.59	576.09	576.44
9/3/2012 7:35	582.54	576.10	576.45
9/3/2012 11:35	582.49	576.10	576.42
9/3/2012 15:35	582.44	576.10	576.36
9/3/2012 19:35	582.41	576.10	576.33
9/3/2012 23:35	582.39	576.10	576.35
9/4/2012 3:35	582.37	576.10	576.37
9/4/2012 7:35	582.35	576.10	576.38
9/4/2012 11:35	582.31	576.10	576.36
9/4/2012 15:35	582.28	576.10	576.30
9/4/2012 19:35	582.27	576.10	576.26
9/4/2012 23:35	582.25	576.09	576.27
9/5/2012 3:35	582.25	576.09	576.33
9/5/2012 7:35	582.24	576.09	576.35
9/5/2012 11:35	582.27	576.08	576.46
9/5/2012 15:35	582.27	576.10	576.42
9/5/2012 19:35	582.30	576.10	576.39
9/5/2012 23:35	582.32	576.11	576.39
9/6/2012 3:35	582.32	576.11	576.41
9/6/2012 7:35	582.31	576.11	576.41
9/6/2012 11:35	582.28	576.11	576.38
9/6/2012 15:35	582.25	576.11	576.31
9/6/2012 19:35	582.23	576.10	576.27
9/6/2012 23:35	582.22	576.10	576.29
9/7/2012 3:35	582.21	576.10	576.31
9/7/2012 7:35	582.20	576.09	576.32
9/7/2012 11:35	581.93	575.68	576.43
9/7/2012 15:35	582.23	575.60	576.44
9/7/2012 19:35	582.27	575.84	576.45
9/7/2012 23:35	582.29	576.09	576.46
9/8/2012 3:35	582.30	576.11	576.46
9/8/2012 7:35	582.29	576.12	576.46
9/8/2012 11:35	582.27	576.12	576.43
9/8/2012 15:35	582.24	576.12	576.38
9/8/2012 19:35	582.22	576.12	576.35
9/8/2012 23:35	582.23	576.11	576.37
9/9/2012 3:35	582.22	576.12	576.53
9/9/2012 7:35	582.21	576.12	576.74
9/9/2012 11:35	582.20	576.12	575.76
9/9/2012 15:35	582.19	576.12	576.39
9/9/2012 19:35	582.18	576.12	576.35
9/9/2012 23:35	582.18	576.12	576.36
9/10/2012 3:35	582.17	576.12	576.37
9/10/2012 7:35	582.16	576.11	576.38
9/10/2012 11:35	582.12	576.11	576.36
9/10/2012 15:35	582.10	576.11	576.30
9/10/2012 19:35	582.08	576.11	576.27
9/10/2012 23:35	582.07	576.10	576.29
9/11/2012 3:35	582.06	576.10	576.31
9/11/2012 7:35	582.05	576.10	576.32
9/11/2012 11:35	582.02	576.10	576.29
9/11/2012 15:35	581.99	576.09	576.23
9/11/2012 19:35	581.98	576.08	576.19
9/11/2012 23:35	581.98	576.09	576.21
9/12/2012 3:35	581.97	576.08	576.23
9/12/2012 7:35	581.97	576.08	576.25
9/12/2012 11:35	581.93	576.08	576.22
9/12/2012 15:35	581.91	576.08	576.16
9/12/2012 19:35	581.91	576.07	576.12
9/12/2012 23:35	581.91	576.07	576.14
9/13/2012 3:35	581.90	576.07	576.17
9/13/2012 7:35	581.90	576.07	576.19
9/13/2012 11:35	581.88	576.06	576.16
9/13/2012 15:35	581.86	576.06	576.13
9/13/2012 19:35	581.87	576.06	576.13
9/13/2012 23:35	581.95	576.06	576.45
9/14/2012 3:35	581.93	576.06	576.49
9/14/2012 7:35	581.98	576.06	576.68
9/14/2012 11:35	581.92	576.06	575.70
9/14/2012 15:35	581.90	576.05	576.26
9/14/2012 19:35	581.90	576.05	576.23
9/14/2012 23:35	581.91	576.05	576.24
9/15/2012 3:35	581.91	576.05	576.26
9/15/2012 7:35	581.90	576.05	576.27
9/15/2012 11:35	581.87	576.05	576.25
9/15/2012 15:35	581.84	576.05	576.19
9/15/2012 19:35	581.84	576.04	576.16
9/15/2012 23:35	581.84	576.04	576.18
9/16/2012 3:35	581.84	576.04	576.20
9/16/2012 7:35	581.83	576.04	576.22
9/16/2012 11:35	581.81	576.04	576.20
9/16/2012 15:35	581.78	576.04	576.14
9/16/2012 19:35	581.78	576.04	576.11
9/16/2012 23:35	581.78	576.03	576.13
9/17/2012 3:35	581.78	576.03	576.16
9/17/2012 7:35	581.78	576.03	576.18
9/17/2012 11:35	581.77	576.03	576.18
9/17/2012 15:35	581.74	576.02	576.13
9/17/2012 19:35	581.74	576.02	576.11
9/17/2012 23:35	581.90	576.02	576.22
9/18/2012 3:35	581.94	576.02	576.27
9/18/2012 7:35	581.81	576.02	576.28
9/18/2012 11:35	581.81	576.02	576.27
9/18/2012 15:35	581.79	576.02	576.22
9/18/2012 19:35	581.80	576.01	576.19
9/18/2012 23:35	581.81	576.01	576.20
9/19/2012 3:35	581.81	576.01	576.22
9/19/2012 7:35	581.80	576.01	576.23
9/19/2012 11:35	581.78	576.01	576.21
9/19/2012 15:35	581.76	576.01	576.16
9/19/2012 19:35	581.74	576.00	576.13
9/19/2012 23:35	581.74	576.00	576.12
9/20/2012 3:35	581.73	576.00	576.13
9/20/2012 7:35	581.73	576.00	576.14
9/20/2012 11:35	581.70	575.99	576.11
9/20/2012 15:35	581.68	575.99	576.07
9/20/2012 19:35	581.68	575.99	576.04
9/20/2012 23:35	581.68	575.99	576.05
9/21/2012 3:35	581.67	575.98	576.07
9/21/2012 7:35	581.67	575.98	576.09
9/21/2012 11:35	581.66	575.98	576.09
9/21/2012 15:35	581.66	575.97	576.11
9/21/2012 19:35	581.66	575.97	576.12
9/21/2012 23:35	581.65	575.97	576.14
9/22/2012 3:35	581.65	575.97	576.15
9/22/2012 7:35	581.64	575.97	576.16
9/22/2012 11:35	581.62	575.96	576.14
9/22/2012 15:35	581.60	575.96	576.10
9/22/2012 19:35	581.59	575.96	576.08
9/22/2012 23:35	581.58	575.95	576.09
9/23/2012 3:35	581.58	575.95	576.10
9/23/2012 7:35	581.58	575.95	576.11
9/23/2012 11:35	581.56	575.95	576.09
9/23/2012 15:35	581.54	575.94	576.05
9/23/2012 19:35	581.54	575.94	576.03
9/23/2012 23:35	581.54	575.94	576.04
9/24/2012 3:35	581.54	575.93	576.06
9/24/2012 7:35	581.54	575.93	576.07
9/24/2012 11:35	581.52	575.93	576.07
9/24/2012 15:35	581.51	575.92	576.02

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

9/24/2012 19:35	581.51	575.92	576.00
9/24/2012 23:35	581.51	575.92	576.00
9/25/2012 3:35	581.51	575.91	576.01
9/25/2012 7:35	581.51	575.91	576.02
9/25/2012 11:35	581.49	575.91	576.02
9/25/2012 15:35	581.48	575.90	575.98
9/25/2012 19:35	581.48	575.90	575.97
9/25/2012 23:35	581.48	575.89	575.99
9/26/2012 3:35	581.48	575.89	576.01
9/26/2012 7:35	581.48	575.89	576.02
9/26/2012 11:35	581.46	575.89	576.01
9/26/2012 15:35	581.44	575.88	575.96
9/26/2012 19:35	581.44	575.88	575.95
9/26/2012 23:35	581.44	575.87	575.96
9/27/2012 3:35	581.44	575.87	575.97
9/27/2012 7:35	581.44	575.87	575.97
9/27/2012 11:35	581.42	575.86	575.96
9/27/2012 15:35	581.41	575.86	575.93
9/27/2012 19:35	581.41	575.85	575.92
9/27/2012 23:35	581.41	575.85	575.93
9/28/2012 3:35	581.41	575.85	575.95
9/28/2012 7:35	581.41	575.84	575.96
9/28/2012 11:35	581.39	575.83	575.95
9/28/2012 15:35	581.38	575.83	575.91
9/28/2012 19:35	581.38	575.83	575.91
9/28/2012 23:35	581.38	575.82	575.92
9/29/2012 3:35	581.38	575.82	575.94
9/29/2012 7:35	581.38	575.81	575.95
9/29/2012 11:35	581.37	575.81	575.94
9/29/2012 15:35	581.35	575.80	575.90
9/29/2012 19:35	581.35	575.80	575.88
9/29/2012 23:35	581.36	575.79	575.89
9/30/2012 3:35	581.36	575.79	575.91
9/30/2012 7:35	581.36	575.78	575.92
9/30/2012 11:35	581.34	575.78	575.91
9/30/2012 15:35	581.33	575.77	575.88
9/30/2012 19:35	581.33	575.77	575.86
9/30/2012 23:35	581.32	575.76	575.88
10/1/2012 3:35	581.33	575.76	575.89
10/1/2012 7:35	581.33	575.76	575.90
10/1/2012 11:35	581.32	575.75	575.91
10/1/2012 15:35	581.30	575.75	575.87
10/1/2012 19:35	581.30	575.74	575.86
10/1/2012 23:35	581.30	575.74	575.87
10/2/2012 3:35	581.30	575.73	575.88
10/2/2012 7:35	581.30	575.73	575.89
10/2/2012 11:35	581.28	575.72	575.87
10/2/2012 15:35	581.27	575.72	575.84
10/2/2012 19:35	581.26	575.71	575.83
10/2/2012 23:35	581.26	575.71	575.83
10/3/2012 3:35	581.26	575.71	575.85
10/3/2012 7:35	581.26	575.70	575.86
10/3/2012 11:35	581.26	575.70	575.87
10/3/2012 15:35	581.26	575.69	575.87
10/3/2012 19:35	581.25	575.69	575.88
10/3/2012 23:35	581.25	575.69	575.89
10/4/2012 3:35	581.25	575.68	575.90
10/4/2012 7:35	581.25	575.68	575.91
10/4/2012 11:35	581.24	575.68	575.91
10/4/2012 15:35	581.22	575.68	575.87
10/4/2012 19:35	581.25	575.67	575.89
10/4/2012 23:35	581.24	575.67	576.15
10/5/2012 3:35	581.24	575.67	576.29
10/5/2012 7:35	581.24	575.67	576.45
10/5/2012 11:35	581.24	575.66	576.34
10/5/2012 15:35	581.24	575.66	576.19
10/5/2012 19:35	581.24	575.66	575.97
10/5/2012 23:35	581.23	575.66	575.97
10/6/2012 3:35	581.23	575.66	575.97
10/6/2012 7:35	581.23	575.66	575.97
10/6/2012 11:35	581.23	575.66	575.96
10/6/2012 15:35	581.22	575.66	575.95
10/6/2012 19:35	581.22	575.65	575.94
10/6/2012 23:35	581.22	575.65	575.94
10/7/2012 3:35	581.21	575.65	575.94
10/7/2012 7:35	581.21	575.65	575.94
10/7/2012 11:35	581.21	575.65	575.94
10/7/2012 15:35	581.21	575.65	575.92
10/7/2012 19:35	581.20	575.65	575.91
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10/8/2012 7:35	581.20	575.64	575.92
10/8/2012 11:35	581.19	575.64	575.92
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10/8/2012 23:35	581.19	575.63	575.90
10/9/2012 3:35	581.19	575.63	575.91
10/9/2012 7:35	581.18	575.63	575.91
10/9/2012 11:35	581.18	575.63	575.91
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10/27/2012 15:35	583.08	576.55	576.90
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11/2/2012 11:35	581.87	576.48	576.65
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11/2/2012 23:35	581.83	576.47	576.64
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11/5/2012 14:35	581.69	576.43	576.60
11/5/2012 18:35	581.68	576.43	576.59
11/5/2012 22:35	581.67	576.43	576.59
11/6/2012 2:35	581.67	576.43	576.59
11/6/2012 6:35	581.66	576.42	576.59
11/6/2012 10:35	581.65	576.42	576.59
11/6/2012 14:35	581.65	576.42	576.60
11/6/2012 18:35	581.64	576.41	576.60
11/6/2012 22:35	581.64	576.41	576.63
11/7/2012 2:35	581.65	576.41	576.67
11/7/2012 6:35	581.65	576.41	576.69
11/7/2012 10:35	581.62	576.41	576.40
11/7/2012 14:35	581.63	576.41	576.68
11/7/2012 18:35	581.63	576.41	576.66
11/7/2012 22:35	581.62	576.41	576.66
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11/8/2012 6:35	581.61	576.40	576.64
11/8/2012 10:35	581.60	576.40	576.63
11/8/2012 14:35	581.60	576.40	576.62
11/8/2012 18:35	581.59	576.39	576.62
11/8/2012 22:35	581.59	576.40	576.61
11/9/2012 2:35	581.58	576.39	576.61

11/9/2012 6:35	581.58	576.39	576.60
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11/9/2012 14:35	581.57	576.38	576.59
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11/9/2012 22:35	581.56	576.38	576.58
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11/10/2012 6:35	581.55	576.38	576.58
11/10/2012 10:35	581.54	576.38	576.58
11/10/2012 14:35	581.42	576.17	576.26
11/10/2012 18:35	581.55	576.46	576.85
11/10/2012 22:35	581.56	576.45	576.87
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11/11/2012 10:35	581.55	576.37	576.26
11/11/2012 14:35	581.56	576.37	576.60
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11/12/2012 14:35	582.18	576.39	577.92
11/12/2012 18:35	582.24	576.39	578.30
11/12/2012 22:35	582.27	576.40	578.35
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11/13/2012 6:35	582.29	576.40	579.03
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11/13/2012 14:35	582.24	576.40	578.14
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11/13/2012 22:35	582.17	576.40	578.89
11/14/2012 2:35	582.13	576.40	578.83
11/14/2012 6:35	582.10	576.40	578.87
11/14/2012 10:35	582.06	576.40	578.06
11/14/2012 14:35	582.03	576.40	577.82
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11/15/2012 10:35	581.88	576.39	575.95
11/15/2012 14:35	581.86	576.39	575.79
11/15/2012 18:35	581.84	576.39	576.68
11/15/2012 22:35	581.82	576.39	576.84
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11/16/2012 22:35	581.72	576.38	576.91
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11/17/2012 14:35	581.67	576.37	575.71
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11/18/2012 6:35	581.63	576.37	576.97
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11/18/2012 22:35	581.60	576.36	576.50
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11/19/2012 10:35	581.58	576.36	575.23
11/19/2012 14:35	581.57	576.36	575.12
11/19/2012 18:35	581.57	576.35	575.74
11/19/2012 22:35	581.56	576.35	575.72
11/20/2012 2:35	581.55	576.35	575.69
11/20/2012 6:35	581.55	576.35	575.75
11/20/2012 10:35	581.54	576.35	575.18
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11/21/2012 14:35	581.51	576.33	575.79
11/21/2012 18:35	581.50	576.33	576.52
11/21/2012 22:35	581.50	576.33	576.51
11/22/2012 2:35	581.49	576.33	576.59
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11/22/2012 22:35	581.48	576.33	576.00
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11/23/2012 14:35	581.46	576.31	576.83
11/23/2012 18:35	581.45	576.31	577.36
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11/24/2012 22:35	581.43	576.30	577.02
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11/26/2012 18:35	581.38	576.27	576.56
11/26/2012 22:35	581.38	576.27	576.98
11/27/2012 2:35	581.38	576.27	576.47
11/27/2012 6:35	581.37	576.26	576.46
11/27/2012 10:35	581.37	576.26	576.45
11/27/2012 14:35	581.37	576.26	576.46
11/27/2012 18:35	581.36	576.26	576.39
11/27/2012 22:35	581.36	576.25	576.23
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11/28/2012 6:35	581.35	576.25	576.63
11/28/2012 10:35	581.34	576.25	575.90
11/28/2012 14:35	581.35	576.24	576.44
11/28/2012 18:35	581.34	576.24	577.07
11/28/2012 22:35	581.34	576.24	577.03
11/29/2012 2:35	581.33	576.24	576.91
11/29/2012 6:35	581.33	576.24	576.43
11/29/2012 10:35	581.32	576.23	576.06
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11/30/2012 6:35	581.31	576.22	576.27
11/30/2012 10:35	581.31	576.22	575.25
11/30/2012 14:35	581.30	576.22	575.52
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12/1/2012 14:35	581.29	576.21	575.28
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12/2/2012 14:35	581.26	576.20	575.29
12/2/2012 18:35	581.26	576.20	576.37
12/2/2012 22:35	581.26	576.20	576.17
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12/3/2012 6:35	581.25	576.19	575.74
12/3/2012 10:35	581.25	576.19	575.27
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12/3/2012 18:35	581.24	576.19	575.31
12/3/2012 22:35	581.24	576.19	575.36
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12/5/2012 2:35	581.22	576.17	576.39
12/5/2012 6:35	581.22	576.17	576.39
12/5/2012 10:35	581.21	576.17	576.38
12/5/2012 14:35	581.21	576.17	576.39
12/5/2012 18:35	581.21	576.16	576.38
12/5/2012 22:35	581.21	576.16	576.38
12/6/2012 2:35	581.21	576.16	576.38
12/6/2012 6:35	581.20	576.16	576.38
12/6/2012 10:35	581.20	576.15	576.38
12/6/2012 14:35	581.20	576.16	576.38
12/6/2012 18:35	581.20	576.15	576.38
12/6/2012 22:35	581.20	576.15	576.37
12/7/2012 2:35	581.19	576.15	576.37
12/7/2012 6:35	581.19	576.15	576.38
12/7/2012 10:35	581.19	576.15	576.39
12/7/2012 14:35	581.19	576.14	576.39
12/7/2012 18:35	581.19	576.14	576.39
12/7/2012 22:35	581.19	576.14	576.40
12/8/2012 2:35	581.20	576.14	576.42
12/8/2012 6:35	581.21	576.14	576.46
12/8/2012 10:35	581.21	576.14	576.47
12/8/2012 14:35	581.22	576.14	576.46
12/8/2012 18:35	581.22	576.14	576.46
12/8/2012 22:35	581.23	576.14	576.45
12/9/2012 2:35	581.23	576.14	576.45
12/9/2012 6:35	581.22	576.14	576.45
12/9/2012 10:35	581.22	576.14	576.45
12/9/2012 14:35	581.23	576.14	576.48
12/9/2012 18:35	581.24	576.14	576.50
12/9/2012 22:35	581.24	576.14	576.50
12/10/2012 2:35	581.25	576.14	576.50
12/10/2012 6:35	581.26	576.14	576.49
12/10/2012 10:35	581.26	576.14	576.47
12/10/2012 14:35	581.26	576.14	576.47
12/10/2012 18:35	581.25	576.13	576.46
12/10/2012 22:35	581.24	576.13	576.45
12/11/2012 2:35	581.24	576.13	576.44
12/11/2012 6:35	581.24	576.13	576.43
12/11/2012 10:35	581.23	576.13	576.42
12/11/2012 14:35	581.23	576.13	576.42
12/11/2012 18:35	581.22	576.13	576.41
12/11/2012 22:35	581.21	576.13	576.40
12/12/2012 2:35	581.21	576.12	576.39
12/12/2012 6:35	581.21	576.12	576.37
12/12/2012 10:35	581.20	576.12	576.36
12/12/2012 14:35	581.20	576.12	576.38
12/12/2012 18:35	581.20	576.12	576.38
12/12/2012 22:35	581.20	576.12	576.38
12/13/2012 2:35	581.19	576.11	576.37
12/13/2012 6:35	581.19	576.11	576.37
12/13/2012 10:35	581.19	576.11	576.36
12/13/2012 14:35	581.19	576.11	576.38
12/13/2012 18:35	581.18	576.11	576.37
12/13/2012 22:35	581.18	576.11	576.37
12/14/2012 2:35	581.17	576.11	576.36
12/14/2012 6:35	581.17	576.11	576.36
12/14/2012 10:35	581.17	576.10	576.35
12/14/2012 14:35	581.17	576.10	576.36
12/14/2012 18:35	581.17	576.10	576.36
12/14/2012 22:35	581.16	576.10	576.36
12/15/2012 2:35	581.16	576.10	576.37
12/15/2012 6:35	581.16	576.10	576.37
12/15/2012 10:35	581.10	576.10	576.40
12/15/2012 14:35	580.94	576.10	576.52
12/15/2012 18:35	581.02	576.11	576.56
12/15/2012 22:35	581.10	576.11	576.59
12/16/2012 2:35	581.19	576.14	576.60
12/16/2012 6:35	581.29	576.17	576.60
12/16/2012 10:35	581.42	576.24	576.61
12/16/2012 14:35	581.40	576.30	576.62
12/16/2012 18:35	581.41	576.50	576.61
12/16/2012 22:35	581.42	576.55	576.60
12/17/2012 2:35	581.42	576.42	576.59
12/17/2012 6:35	581.42	576.12	576.59
12/17/2012 10:35	581.41	576.12	576.57
12/17/2012 14:35	581.41	576.12	576.57
12/17/2012 18:35	581.40	576.13	576.56
12/17/2012 22:35	581.39	576.13	576.55
12/18/2012 2:35	581.38	576.13	576.54
12/18/2012 6:35	581.36	576.13	576.53
12/18/2012 10:35	581.36	576.13	576.53
12/18/2012 14:35	581.35	576.13	576.53
12/18/2012 18:35	581.34	576.13	576.52
12/18/2012 22:35	581.33	576.13	576.51
12/19/2012 2:35	581.32	576.13	576.49
12/19/2012 6:35	581.31	576.13	576.49
12/19/2012 10:35	581.30	576.13	576.48
12/19/2012 14:35	581.30	576.13	576.48
12/19/2012 18:35	581.29	576.12	576.47
12/19/2012 22:35	581.29	576.13	576.48
12/20/2012 2:35	581.38	576.13	576.56
12/20/2012 6:35	582.28	575.82	576.71
12/20/2012 10:35	582.40	575.53	576.65
12/20/2012 14:35	582.84	575.47	576.83
12/20/2012 18:35	583.87	576.00	577.49
12/20/2012 22:35	584.48	576.30	577.75
12/21/2012 2:35	584.36	576.34	577.99
12/21/2012 6:35	584.57	576.36	578.31
12/21/2012 10:35	584.67	576.39	578.42
12/21/2012 14:35	584.69	576.41	578.24
12/21/2012 18:35	584.63	576.43	578.35
12/21/2012 22:35	584.53	576.45	577.06
12/22/2012 2:35	584.43	576.47	577.04
12/22/2012 6:35	584.28	576.48	577.02
12/22/2012 10:35	584.12	576.50	577.00
12/22/2012 14:35	583.97	576.51	576.79
12/22/2012 18:35	583.80	576.52	577.22
12/22/2012 22:35	583.63	576.53	577.27
12/23/2012 2:35	583.50	576.55	577.33
12/23/2012 6:35	583.38	576.55	576.96
12/23/2012 10:35	583.27	576.55	576.95
12/23/2012 14:35	583.19	576.56	576.98
12/23/2012 18:35	583.11	576.57	577.37
12/23/2012 22:35	583.03	576.57	577.37
12/24/2012 2:35	582.97	576.58	577.30
12/24/2012 6:35	582.91	576.58	577.29
12/24/2012 10:35	582.85	576.58	576.98
12/24/2012 14:35	582.79	576.59	576.98

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

12/24/2012 18:35	582.73	576.59	577.28
12/24/2012 22:35	582.68	576.59	577.42
12/25/2012 2:35	582.63	576.59	576.93
12/25/2012 6:35	582.60	576.59	576.92
12/25/2012 10:35	582.55	576.59	576.92
12/25/2012 14:35	582.53	576.59	576.92
12/25/2012 18:35	582.50	576.59	576.91
12/25/2012 22:35	582.48	576.59	576.91
12/26/2012 2:35	582.45	576.59	576.91
12/26/2012 6:35	582.43	576.59	576.91
12/26/2012 10:35	582.40	576.59	576.90
12/26/2012 14:35	582.38	576.59	576.90
12/26/2012 18:35	582.35	576.59	576.89
12/26/2012 22:35	582.32	576.59	576.89
12/27/2012 2:35	582.30	576.59	576.88
12/27/2012 6:35	582.28	576.59	576.88
12/27/2012 10:35	582.26	576.58	576.87
12/27/2012 14:35	582.24	576.58	576.87
12/27/2012 18:35	582.22	576.58	576.86
12/27/2012 22:35	582.20	576.57	576.86
12/28/2012 2:35	582.18	576.58	576.86
12/28/2012 6:35	582.17	576.58	576.86
12/28/2012 10:35	582.15	576.57	576.85
12/28/2012 14:35	582.13	576.58	576.85
12/28/2012 18:35	582.11	576.58	576.85
12/28/2012 22:35	582.09	576.57	576.85
12/29/2012 2:35	582.08	576.57	576.85
12/29/2012 6:35	582.06	576.57	576.84
12/29/2012 10:35	582.05	576.57	576.83
12/29/2012 14:35	582.03	576.57	576.83
12/29/2012 18:35	582.01	576.56	576.82
12/29/2012 22:35	581.99	576.56	576.81
12/30/2012 2:35	581.98	576.56	576.80
12/30/2012 6:35	581.96	576.56	576.78
12/30/2012 10:35	581.95	576.55	576.76
12/30/2012 14:35	581.94	576.55	576.76
12/30/2012 18:35	581.93	576.55	576.76
12/30/2012 22:35	581.92	576.55	576.76
12/31/2012 2:35	581.91	576.55	576.76
12/31/2012 6:35	581.90	576.55	576.76
12/31/2012 10:35	581.88	576.54	576.76
12/31/2012 14:35	581.87	576.54	576.76
12/31/2012 18:35	581.86	576.54	576.76
12/31/2012 22:35	581.85	576.54	576.75
1/1/2013 2:35	581.84	576.53	576.74
1/1/2013 6:35	581.83	576.53	576.73
1/1/2013 10:35	581.81	576.53	576.71
1/1/2013 14:35	581.81	576.53	576.70
1/1/2013 18:35	581.80	576.53	576.69
1/1/2013 22:35	581.78	576.52	576.68
1/2/2013 2:35	581.77	576.52	576.66
1/2/2013 6:35	581.76	576.52	576.64
1/2/2013 10:35	581.75	576.51	576.62
1/2/2013 14:35	581.74	576.51	576.62
1/2/2013 18:35	581.73	576.50	576.61
1/2/2013 22:35	581.72	576.50	576.61
1/3/2013 2:35	581.71	576.50	576.60
1/3/2013 6:35	581.70	576.49	576.59
1/3/2013 10:35	581.70	576.49	576.59
1/3/2013 14:35	581.69	576.49	576.59
1/3/2013 18:35	581.68	576.48	576.59
1/3/2013 22:35	581.68	576.48	576.60
1/4/2013 2:35	581.67	576.48	576.60
1/4/2013 6:35	581.66	576.47	576.58
1/4/2013 10:35	581.65	576.47	576.57
1/4/2013 14:35	581.65	576.47	576.57
1/4/2013 18:35	581.64	576.46	576.57
1/4/2013 22:35	581.64	576.46	576.57
1/5/2013 2:35	581.63	576.46	576.57
1/5/2013 6:35	581.62	576.45	576.56
1/5/2013 10:35	581.62	576.45	576.55
1/5/2013 14:35	581.62	576.44	576.55
1/5/2013 18:35	581.61	576.44	576.56
1/5/2013 22:35	581.61	576.44	576.57
1/6/2013 2:35	581.61	576.43	576.58
1/6/2013 6:35	581.60	576.43	576.58
1/6/2013 10:35	581.60	576.43	576.58
1/6/2013 14:35	581.59	576.43	576.59
1/6/2013 18:35	581.58	576.42	576.59
1/6/2013 22:35	581.58	576.42	576.59
1/7/2013 2:35	581.57	576.42	576.58
1/7/2013 6:35	581.57	576.41	576.56
1/7/2013 10:35	581.56	576.41	576.55
1/7/2013 14:35	581.56	576.41	576.55
1/7/2013 18:35	581.56	576.41	576.55
1/7/2013 22:35	581.56	576.41	576.56
1/8/2013 2:35	581.55	576.40	576.56
1/8/2013 6:35	581.55	576.40	576.55
1/8/2013 10:35	581.54	576.40	576.54
1/8/2013 14:35	581.54	576.39	576.55
1/8/2013 18:35	581.54	576.39	576.55
1/8/2013 22:35	581.53	576.39	576.56
1/9/2013 2:35	581.53	576.39	576.57
1/9/2013 6:35	581.53	576.39	576.57
1/9/2013 10:35	581.52	576.39	576.56
1/9/2013 14:35	581.52	576.39	576.58
1/9/2013 18:35	581.52	576.39	576.59
1/9/2013 22:35	581.51	576.38	576.59
1/10/2013 2:35	581.51	576.38	576.59
1/10/2013 6:35	581.50	576.38	576.58
1/10/2013 10:35	581.50	576.38	576.58
1/10/2013 14:35	581.50	576.37	576.59
1/10/2013 18:35	581.50	576.37	576.60
1/10/2013 22:35	581.54	576.32	576.56
1/11/2013 2:35	581.76	575.93	576.37
1/11/2013 6:35	582.15	575.77	576.55
1/11/2013 10:35	582.75	575.95	576.78
1/11/2013 14:35	583.20	575.88	576.69
1/11/2013 18:35	583.90	575.97	576.95
1/11/2013 22:35	584.16	575.95	576.87
1/12/2013 2:35	584.32	576.50	576.70
1/12/2013 6:35	584.44	576.52	576.86
1/12/2013 10:35	584.46	576.53	576.86
1/12/2013 14:35	584.43	576.54	577.08
1/12/2013 18:35	584.37	576.55	577.06
1/12/2013 22:35	584.28	576.56	577.05
1/13/2013 2:35	584.18	576.56	577.06
1/13/2013 6:35	584.11	576.58	577.06
1/13/2013 10:35	584.04	576.59	577.05
1/13/2013 14:35	583.98	576.60	577.04
1/13/2013 18:35	583.92	576.60	577.02
1/13/2013 22:35	583.84	576.60	577.01
1/14/2013 2:35	583.74	576.61	577.00
1/14/2013 6:35	583.65	576.61	576.98
1/14/2013 10:35	583.55	576.61	576.98
1/14/2013 14:35	583.47	576.61	576.97
1/14/2013 18:35	583.39	576.61	576.96
1/14/2013 22:35	583.31	576.62	576.96
1/15/2013 2:35	583.23	576.62	576.95
1/15/2013 6:35	583.17	576.62	576.94
1/15/2013 10:35	583.12	576.62	576.93
1/15/2013 14:35	583.07	576.62	576.93
1/15/2013 18:35	583.01	576.62	576.94
1/15/2013 22:35	582.97	576.62	576.94
1/16/2013 2:35	582.92	576.62	576.94
1/16/2013 6:35	582.87	576.62	576.93
1/16/2013 10:35	582.84	576.62	576.92

1/16/2013 14:35	582.80	576.62	576.92
1/16/2013 18:35	582.76	576.62	576.92
1/16/2013 22:35	582.72	576.61	576.92
1/17/2013 2:35	582.68	576.61	576.92
1/17/2013 6:35	582.65	576.61	576.92
1/17/2013 10:35	582.62	576.61	576.92
1/17/2013 14:35	582.60	576.61	576.92
1/17/2013 18:35	582.57	576.61	576.91
1/17/2013 22:35	582.55	576.61	576.91
1/18/2013 2:35	582.53	576.61	576.89
1/18/2013 6:35	582.51	576.61	576.88
1/18/2013 10:35	582.49	576.61	576.88
1/18/2013 14:35	582.49	576.61	576.88
1/18/2013 18:35	582.47	576.61	576.89
1/18/2013 22:35	582.45	576.61	576.90
1/19/2013 2:35	582.43	576.61	576.90
1/19/2013 6:35	582.42	576.61	576.91
1/19/2013 10:35	582.40	576.61	576.92
1/19/2013 14:35	582.40	576.61	576.93
1/19/2013 18:35	582.38	576.61	576.94
1/19/2013 22:35	582.36	576.61	576.94
1/20/2013 2:35	582.34	576.61	576.93
1/20/2013 6:35	582.33	576.61	576.91
1/20/2013 10:35	582.31	576.61	576.90
1/20/2013 14:35	582.30	576.61	576.89
1/20/2013 18:35	582.28	576.61	576.89
1/20/2013 22:35	582.26	576.61	576.88
1/21/2013 2:35	582.25	576.61	576.86
1/21/2013 6:35	582.23	576.60	576.85
1/21/2013 10:35	582.21	576.60	576.82
1/21/2013 14:35	582.19	576.60	576.81
1/21/2013 18:35	582.17	576.60	576.80
1/21/2013 22:35	582.14	576.60	576.78
1/22/2013 2:35	582.12	576.60	576.76
1/22/2013 6:35	582.10	576.59	576.74
1/22/2013 10:35	582.08	576.59	576.72
1/22/2013 14:35	582.07	576.59	576.71
1/22/2013 18:35	582.05	576.58	576.70
1/22/2013 22:35	582.03	576.58	576.69
1/23/2013 2:35	582.02	576.58	576.68
1/23/2013 6:35	582.00	576.58	576.68
1/23/2013 10:35	581.99	576.57	576.67
1/23/2013 14:35	581.98	576.57	576.67
1/23/2013 18:35	581.97	576.57	576.67
1/23/2013 22:35	581.95	576.56	576.67
1/24/2013 2:35	581.93	576.56	576.66
1/24/2013 6:35	581.92	576.55	576.65
1/24/2013 10:35	581.91	576.55	576.63
1/24/2013 14:35	581.91	576.55	576.63
1/24/2013 18:35	581.90	576.54	576.64
1/24/2013 22:35	581.89	576.54	576.64
1/25/2013 2:35	581.89	576.54	576.65
1/25/2013 6:35	581.88	576.54	576.65
1/25/2013 10:35	581.87	576.53	576.65
1/25/2013 14:35	581.87	576.53	576.66
1/25/2013 18:35	581.86	576.53	576.66
1/25/2013 22:35	581.85	576.53	576.66
1/26/2013 2:35	581.84	576.52	576.66
1/26/2013 6:35	581.83	576.52	576.67
1/26/2013 10:35	581.82	576.52	576.66
1/26/2013 14:35	581.82	576.52	576.66
1/26/2013 18:35	581.81	576.51	576.66
1/26/2013 22:35	581.81	576.51	576.66
1/27/2013 2:35	581.80	576.51	576.67
1/27/2013 6:35	581.80	576.51	576.67
1/27/2013 10:35	581.80	576.50	576.68
1/27/2013 14:35	581.80	576.50	576.69
1/27/2013 18:35	581.80	576.50	576.70
1/27/2013 22:35	581.80	576.50	576.71
1/28/2013 2:35	581.81	576.50	576.72
1/28/2013 6:35	581.86	576.50	576.75
1/28/2013 10:35	581.95	576.50	576.78
1/28/2013 14:35	582.03	576.50	576.81
1/28/2013 18:35	582.10	576.50	576.84
1/28/2013 22:35	582.16	576.50	576.87
1/29/2013 2:35	582.29	575.98	576.33
1/29/2013 6:35	582.46	575.81	576.31
1/29/2013 10:35	582.59	575.77	576.51
1/29/2013 14:35	582.73	575.57	576.55
1/29/2013 18:35	583.25	575.72	576.86
1/29/2013 22:35	584.26	575.89	577.47
1/30/2013 2:35	585.55	575.88	577.54
1/30/2013 6:35	587.56	576.14	578.01
1/30/2013 10:35	587.97	576.02	577.63
1/30/2013 14:35	588.49	575.73	577.30
1/30/2013 18:35	588.79	576.55	578.15
1/30/2013 22:35	589.24	576.92	578.50
1/31/2013 2:35	589.21	576.80	578.71
1/31/2013 6:35	589.19	576.81	578.76
1/31/2013 10:35	589.02	576.83	578.63
1/31/2013 14:35	589.05	576.84	578.74
1/31/2013 18:35	589.01	576.85	579.29
1/31/2013 22:35	588.87	576.86	579.57
2/1/2013 2:35	588.86	576.87	577.67
2/1/2013 6:35	588.81	576.87	577.22
2/1/2013 10:35	588.72	576.88	576.95
2/1/2013 14:35	588.60	576.88	577.09
2/1/2013 18:35	588.49	576.89	577.56
2/1/2013 22:35	588.29	576.90	577.15
2/2/2013 2:35	588.12	576.91	576.82
2/2/2013 6:35	587.92	576.91	576.62
2/2/2013 10:35	587.75	576.91	576.44
2/2/2013 14:35	587.60	576.92	576.50
2/2/2013 18:35	587.45	576.92	576.93
2/2/2013 22:35	587.32	576.93	576.99
2/3/2013 2:35	587.16	576.93	576.86
2/3/2013 6:35	586.78	576.93	576.76
2/3/2013 10:35	586.55	576.93	576.40
2/3/2013 14:35	586.28	576.94	576.74
2/3/2013 18:35	586.02	576.94	577.12
2/3/2013 22:35	585.76	576.94	577.12
2/4/2013 2:35	585.51	576.94	577.12
2/4/2013 6:35	585.29	576.95	577.13
2/4/2013 10:35	585.09	576.95	577.07
2/4/2013 14:35	584.90	576.95	577.04
2/4/2013 18:35	584.74	576.95	577.22
2/4/2013 22:35	584.60	576.95	577.48
2/5/2013 2:35	584.49	576.95	577.60
2/5/2013 6:35	584.39	576.95	577.49
2/5/2013 10:35	584.29	576.95	576.96
2/5/2013 14:35	584.20	576.95	576.96
2/5/2013 18:35	584.10	576.95	577.13
2/5/2013 22:35	584.01	576.95	577.27
2/6/2013 2:35	583.93	576.95	577.41
2/6/2013 6:35	583.85	576.95	577.86
2/6/2013 10:35	583.77	576.95	577.41
2/6/2013 14:35	583.72	576.95	577.16
2/6/2013 18:35	583.66	576.95	577.32
2/6/2013 22:35	583.62	576.95	577.35
2/7/2013 2:35	583.57	576.95	577.38
2/7/2013 6:35	583.54	576.96	577.26
2/7/2013 10:35	583.51	576.96	577.14
2/7/2013 14:35	583.57	576.95	577.04
2/7/2013 18:35	584.10	577.02	577.33
2/7/2013 22:35	585.02	577.11	577.46
2/8/2013 2:35	586.23	576.99	577.57
2/8/2013 6:35	586.94	577.00	577.87

2/8/2013 10:35	587.20	577.00	577.71
2/8/2013 14:35	587.29	576.99	577.41
2/8/2013 18:35	587.33	577.01	577.40
2/8/2013 22:35	587.30	577.01	577.23
2/9/2013 2:35	587.25	577.01	577.21
2/9/2013 6:35	587.22	577.01	577.20
2/9/2013 10:35	587.13	577.01	576.95
2/9/2013 14:35	587.04	577.01	576.98
2/9/2013 18:35	586.87	577.01	577.18
2/9/2013 22:35	586.65	577.01	577.17
2/10/2013 2:35	586.46	577.01	577.08
2/10/2013 6:35	586.26	577.01	576.91
2/10/2013 10:35	586.08	577.01	576.62
2/10/2013 14:35	585.77	576.83	576.22
2/10/2013 18:35	585.95	576.71	576.19
2/10/2013 22:35	586.51	576.72	576.27
2/11/2013 2:35	587.09	577.00	576.60
2/11/2013 6:35	587.24	577.05	576.80
2/11/2013 10:35	587.35	577.05	576.79
2/11/2013 14:35	587.40	577.05	576.76
2/11/2013 18:35	587.41	577.05	577.12
2/11/2013 22:35	587.40	577.05	577.22
2/12/2013 2:35	587.34	577.05	577.34
2/12/2013 6:35	587.26	577.05	577.42
2/12/2013 10:35	587.18	577.05	577.16
2/12/2013 14:35	587.10	577.05	577.15
2/12/2013 18:35	586.97	577.05	577.15
2/12/2013 22:35	586.81	577.05	577.14
2/13/2013 2:35	586.64	577.04	577.13
2/13/2013 6:35	586.46	577.04	577.12
2/13/2013 10:35	586.28	577.04	577.12
2/13/2013 14:35	586.13	577.04	577.13
2/13/2013 18:35	585.95	577.04	577.14
2/13/2013 22:35	585.79	577.04	576.96
2/14/2013 2:35	585.63	577.04	576.86
2/14/2013 6:35	585.47	577.03	576.85
2/14/2013 10:35	585.34	577.03	576.57
2/14/2013 14:35	585.21	577.03	576.46
2/14/2013 18:35	585.08	577.03	577.12
2/14/2013 22:35	584.98	577.03	577.12
2/15/2013 2:35	584.87	577.03	577.10
2/15/2013 6:35	584.76	577.03	577.30
2/15/2013 10:35	584.67	577.02	577.11
2/15/2013 14:35	584.59	577.02	577.11
2/15/2013 18:35	584.52	577.02	577.10
2/15/2013 22:35	584.45	577.02	577.10
2/16/2013 2:35	584.39	577.02	577.10
2/16/2013 6:35	584.32	577.02	577.09
2/16/2013 10:35	584.26	577.01	577.09
2/16/2013 14:35	584.21	577.01	577.09
2/16/2013 18:35	584.14	577.01	577.08
2/16/2013 22:35	584.08	577.01	577.08
2/17/2013 2:35	584.03	577.00	577.07
2/17/2013 6:35	583.97	577.00	577.07
2/17/2013 10:35	583.92	577.00	577.08
2/17/2013 14:35	583.88	577.00	577.08
2/17/2013 18:35	583.84	577.00	577.08
2/17/2013 22:35	583.79	577.00	577.09
2/18/2013 2:35	583.76	577.00	577.00
2/18/2013 6:35	583.73	577.00	576.84
2/18/2013 10:35	583.70	577.00	576.18
2/18/2013 14:35	583.68	577.00	577.11
2/18/2013 18:35	583.66	577.00	577.12
2/18/2013 22:35	584.02	577.41	577.78
2/19/2013 2:35	583.72	577.02	577.22
2/19/2013 6:35	583.79	577.01	577.19
2/19/2013 10:35	583.86	577.02	577.17
2/19/2013 14:35	583.91	577.01	577.15
2/19/2013 18:35	583.92	577.01	577.13
2/19/2013 22:35	583.90	577.01	577.12
2/20/2013 2:35	583.86	577.01	577.12
2/20/2013 6:35	583.80	577.00	577.12
2/20/2013 10:35	583.74	577.00	577.12
2/20/2013 14:35	583.69	577.00	577.11
2/20/2013 18:35	583.64	577.00	577.11
2/20/2013 22:35	583.59	577.00	577.11
2/21/2013 2:35	583.56	577.00	577.11
2/21/2013 6:35	583.53	577.00	577.11
2/21/2013 10:35	583.51	577.00	577.11
2/21/2013 14:35	583.48	577.00	577.11
2/21/2013 18:35	583.46	577.00	577.11
2/21/2013 22:35	583.43	577.00	577.12
2/22/2013 2:35	583.42	577.00	577.11
2/22/2013 6:35	583.40	577.00	577.03
2/22/2013 10:35	583.37	577.00	576.88
2/22/2013 14:35	583.35	577.00	576.80
2/22/2013 18:35	583.33	577.00	576.94
2/22/2013 22:35	583.31	577.00	577.07
2/23/2013 2:35	583.29	577.00	577.18
2/23/2013 6:35	583.27	577.00	577.27
2/23/2013 10:35	583.25	577.00	577.00
2/23/2013 14:35	583.23	577.00	576.97
2/23/2013 18:35	583.22	577.00	577.16
2/23/2013 22:35	583.21	577.00	577.49
2/24/2013 2:35	583.19	577.00	577.12
2/24/2013 6:35	583.17	577.00	577.11
2/24/2013 10:35	583.15	576.99	577.10
2/24/2013 14:35	583.13	576.99	577.11
2/24/2013 18:35	583.12	577.00	577.13
2/24/2013 22:35	583.11	577.00	577.13
2/25/2013 2:35	583.10	576.99	577.13
2/25/2013 6:35	583.09	576.99	577.12
2/25/2013 10:35	583.08	576.99	577.11
2/25/2013 14:35	583.09	576.99	577.14
2/25/2013 18:35	583.10	576.99	577.17
2/25/2013 22:35	583.11	577.00	577.17
2/26/2013 2:35	583.16	576.99	577.17
2/26/2013 6:35	583.22	577.00	577.15
2/26/2013 10:35	583.28	577.00	577.15
2/26/2013 14:35	583.37	577.00	577.20
2/26/2013 18:35	583.48	577.00	577.22
2/26/2013 22:35	583.65	577.01	577.23
2/27/2013 2:35	583.80	577.01	577.23
2/27/2013 6:35	583.91	577.01	577.22
2/27/2013 10:35	583.97	577.01	577.21
2/27/2013 14:35	584.04	577.01	577.18
2/27/2013 18:35	584.10	577.01	577.37
2/27/2013 22:35	584.16	577.02	577.42
2/28/2013 2:35	584.21	577.02	577.45
2/28/2013 6:35	584.23	577.02	577.51
2/28/2013 10:35	584.24	577.01	577.41
2/28/2013 14:35	584.26	577.01	577.54
2/28/2013 18:35	584.29	577.02	577.81
2/28/2013 22:35	584.36	577.02	577.94
3/1/2013 2:35	584.44	577.02	577.95
3/1/2013 6:35	584.51	577.01	577.97
3/1/2013 10:35	584.56	577.01	577.73
3/1/2013 14:35	584.59	577.02	577.76
3/1/2013 18:35	584.58	577.01	577.16
3/1/2013 22:35	584.55	577.01	577.15
3/2/2013 2:35	584.50	577.01	577.14
3/2/2013 6:35	584.44	577.01	577.14
3/2/2013 10:35	584.35	577.01	577.13
3/2/2013 14:35	584.26	577.01	577.14
3/2/2013 18:35	584.19	577.01	577.15
3/2/2013 22:35	584.14	577.01	577.15
3/3/2013 2:35	584.12	577.01	577.14

3/3/2013 6:35	584.08	577.01	577.12
3/3/2013 10:35	584.04	577.01	577.11
3/3/2013 14:35	584.00	577.01	577.12
3/3/2013 18:35	583.97	577.01	577.12
3/3/2013 22:35	583.99	577.01	577.12
3/4/2013 2:35	584.01	577.01	577.11
3/4/2013 6:35	584.03	577.00	577.11
3/4/2013 10:35	584.03	577.00	577.10
3/4/2013 14:35	584.00	577.00	577.10
3/4/2013 18:35	583.96	577.00	577.11
3/4/2013 22:35	583.91	577.00	577.11
3/5/2013 2:35	583.86	577.00	577.11
3/5/2013 6:35	583.81	577.00	577.11
3/5/2013 10:35	583.77	577.00	577.11
3/5/2013 14:35	583.73	577.00	577.12
3/5/2013 18:35	583.71	577.00	577.12
3/5/2013 22:35	583.69	577.00	577.12
3/6/2013 2:35	583.67	577.00	577.12
3/6/2013 6:35	583.66	577.00	577.12
3/6/2013 10:35	583.65	577.00	577.11
3/6/2013 14:35	583.65	576.99	577.12
3/6/2013 18:35	583.65	577.00	577.12
3/6/2013 22:35	583.65	577.00	577.12
3/7/2013 2:35	583.63	576.99	577.12
3/7/2013 6:35	583.62	576.99	577.12
3/7/2013 10:35	583.60	576.99	577.12
3/7/2013 14:35	583.60	576.99	577.13
3/7/2013 18:35	583.63	576.99	577.18
3/7/2013 22:35	583.66	576.99	577.19
3/8/2013 2:35	583.67	576.99	577.18
3/8/2013 6:35	583.66	576.99	577.17
3/8/2013 10:35	583.64	576.99	577.16
3/8/2013 14:35	583.65	577.00	577.21
3/8/2013 18:35	583.68	577.00	577.28
3/8/2013 22:35	583.72	577.00	577.28
3/9/2013 2:35	583.76	577.00	577.24
3/9/2013 6:35	583.79	577.00	577.22
3/9/2013 10:35	583.82	577.00	577.20
3/9/2013 14:35	583.86	577.00	577.22
3/9/2013 18:35	583.92	577.01	577.31
3/9/2013 22:35	584.05	577.01	577.32
3/10/2013 3:35	584.50	576.97	577.34
3/10/2013 7:35	586.81	576.87	577.72
3/10/2013 11:35	588.77	576.66	577.27
3/10/2013 15:35	589.31	576.57	577.09
3/10/2013 19:35	590.03	576.49	577.15
3/10/2013 23:35	590.38	576.60	577.09
3/11/2013 3:35	590.62	576.61	577.04
3/11/2013 7:35	590.70	576.67	577.00
3/11/2013 11:35	590.80	576.76	577.10
3/11/2013 15:35	590.78	576.81	577.11
3/11/2013 19:35	590.95	577.10	577.48
3/11/2013 23:35	590.94	577.25	577.59
3/12/2013 3:35	590.63	577.36	577.68
3/12/2013 7:35	590.55	577.18	577.80
3/12/2013 11:35	590.48	577.18	577.29
3/12/2013 15:35	590.43	577.19	577.28
3/12/2013 19:35	590.39	577.20	577.27
3/12/2013 23:35	590.34	577.20	577.25
3/13/2013 3:35	590.30	577.20	577.24
3/13/2013 7:35	590.24	577.20	577.23
3/13/2013 11:35	590.13	577.21	577.22
3/13/2013 15:35	590.07	577.21	577.22
3/13/2013 19:35	590.01	577.21	577.22
3/13/2013 23:35	589.92	577.21	577.21
3/14/2013 3:35	589.84	577.21	577.20
3/14/2013 7:35	589.74	577.21	577.19
3/14/2013 11:35	589.62	577.22	577.19
3/14/2013 15:35	589.52	577.22	577.20
3/14/2013 19:35	589.42	577.22	577.21
3/14/2013 23:35	589.31	577.22	577.21
3/15/2013 3:35	589.20	577.22	577.20
3/15/2013 7:35	589.07	577.22	577.19
3/15/2013 11:35	588.95	577.22	577.19
3/15/2013 15:35	588.82	577.22	577.21
3/15/2013 19:35	588.70	577.22	577.21
3/15/2013 23:35	588.60	577.21	577.21
3/16/2013 3:35	588.48	577.22	577.20
3/16/2013 7:35	588.36	577.21	577.19
3/16/2013 11:35	588.25	577.21	577.19
3/16/2013 15:35	588.14	577.21	577.18
3/16/2013 19:35	588.04	577.21	577.18
3/16/2013 23:35	587.93	577.21	577.17
3/17/2013 3:35	587.83	577.21	577.17
3/17/2013 7:35	587.72	577.21	577.17
3/17/2013 11:35	587.62	577.21	577.17
3/17/2013 15:35	587.51	577.20	577.17
3/17/2013 19:35	587.43	577.20	577.16
3/17/2013 23:35	587.33	577.20	577.16
3/18/2013 3:35	587.24	577.20	577.16
3/18/2013 7:35	587.16	577.20	577.17
3/18/2013 11:35	587.05	577.20	577.18
3/18/2013 15:35	586.85	577.20	577.18
3/18/2013 19:35	586.66	577.20	577.18
3/18/2013 23:35	586.51	577.20	577.17
3/19/2013 3:35	586.40	577.20	577.16
3/19/2013 7:35	586.28	577.20	577.15
3/19/2013 11:35	586.17	577.19	577.14
3/19/2013 15:35	586.07	577.19	577.15
3/19/2013 19:35	585.97	577.19	577.16
3/19/2013 23:35	585.88	577.19	577.15
3/20/2013 3:35	585.80	577.19	577.15
3/20/2013 7:35	585.71	577.18	577.13
3/20/2013 11:35	585.64	577.18	577.13
3/20/2013 15:35	585.57	577.18	577.14
3/20/2013 19:35	585.47	577.18	577.14
3/20/2013 23:35	585.37	577.18	577.14
3/21/2013 3:35	585.27	577.18	577.13
3/21/2013 7:35	585.18	577.17	577.12
3/21/2013 11:35	585.12	577.17	577.12
3/21/2013 15:35	585.06	577.17	577.13
3/21/2013 19:35	585.00	577.17	577.15
3/21/2013 23:35	584.93	577.17	577.15
3/22/2013 3:35	584.87	577.17	577.14
3/22/2013 7:35	584.80	577.17	577.13
3/22/2013 11:35	584.74	577.17	577.13
3/22/2013 15:35	584.67	577.16	577.14
3/22/2013 19:35	584.61	577.16	577.16
3/22/2013 23:35	584.54	577.16	577.15
3/23/2013 3:35	584.48	577.16	577.15
3/23/2013 7:35	584.42	577.16	577.14
3/23/2013 11:35	584.37	577.16	577.14
3/23/2013 15:35	584.32	577.15	577.15
3/23/2013 19:35	584.29	577.16	577.16
3/23/2013 23:35	584.26	577.15	577.15
3/24/2013 3:35	584.22	577.16	577.15
3/24/2013 7:35	584.17	577.16	577.15
3/24/2013 11:35	584.14	577.15	577.15
3/24/2013 15:35	584.10	577.15	577.15
3/24/2013 19:35	584.06	577.15	577.15
3/24/2013 23:35	584.03	577.15	577.14
3/25/2013 3:35	584.00	577.15	577.14
3/25/2013 7:35	583.96	577.15	577.14
3/25/2013 11:35	583.93	577.14	577.14
3/25/2013 15:35	583.91	577.14	577.15
3/25/2013 19:35	583.88	577.14	577.16
3/25/2013 23:35	583.86	577.14	577.16

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

3/26/2013 3:35	583.84	577.14	577.15
3/26/2013 7:35	583.81	577.14	577.14
3/26/2013 11:35	583.79	577.14	577.14
3/26/2013 15:35	583.77	577.13	577.14
3/26/2013 19:35	583.74	577.13	577.14
3/26/2013 23:35	583.72	577.13	577.14
3/27/2013 3:35	583.70	577.13	577.13
3/27/2013 7:35	583.68	577.13	577.13
3/27/2013 11:35	583.65	577.13	577.13
3/27/2013 15:35	583.64	577.13	577.13
3/27/2013 19:35	583.62	577.13	577.13
3/27/2013 23:35	583.60	577.13	577.13
3/28/2013 3:35	583.58	577.12	577.12
3/28/2013 7:35	583.56	577.12	577.12
3/28/2013 11:35	583.55	577.12	577.12
3/28/2013 15:35	583.53	577.11	577.13
3/28/2013 19:35	583.51	577.12	577.13
3/28/2013 23:35	583.50	577.12	577.12
3/29/2013 3:35	583.48	577.12	577.12
3/29/2013 7:35	583.46	577.12	577.12
3/29/2013 11:35	583.45	577.11	577.12
3/29/2013 15:35	583.43	577.11	577.12
3/29/2013 19:35	583.42	577.11	577.12
3/29/2013 23:35	583.41	577.11	577.11
3/30/2013 3:35	583.40	577.11	577.11
3/30/2013 7:35	583.39	577.11	577.11
3/30/2013 11:35	583.38	577.10	577.12
3/30/2013 15:35	583.37	577.10	577.12
3/30/2013 19:35	583.36	577.10	577.12
3/30/2013 23:35	583.35	577.10	577.11
3/31/2013 3:35	583.34	577.10	577.12
3/31/2013 7:35	583.33	577.10	577.12
3/31/2013 11:35	583.32	577.10	577.11
3/31/2013 15:35	583.30	577.10	577.11
3/31/2013 19:35	583.29	577.09	577.11
3/31/2013 23:35	583.28	577.09	577.10
4/1/2013 3:35	583.27	577.09	577.10
4/1/2013 7:35	583.25	577.09	577.09
4/1/2013 11:35	583.24	577.09	577.10
4/1/2013 15:35	583.23	577.08	577.09
4/1/2013 19:35	583.22	577.08	577.09
4/1/2013 23:35	583.21	577.08	577.09
4/2/2013 3:35	583.20	577.08	577.09
4/2/2013 7:35	583.19	577.08	577.09
4/2/2013 11:35	583.18	577.08	577.09
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4/23/2013 7:35	590.49	578.15	577.33
4/23/2013 11:35	590.33	578.15	577.47
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4/24/2013 11:35	590.18	577.85	577.48
4/24/2013 15:35	590.12	578.11	577.45
4/24/2013 19:35	590.10	578.10	577.42
4/24/2013 23:35	590.07	578.09	577.40
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4/25/2013 7:35	589.98	578.08	577.38
4/25/2013 11:35	589.91	578.08	577.36
4/25/2013 15:35	589.89	578.07	577.35
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5/2/2013 23:35	585.13	577.59	577.14
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5/10/2013 11:35	583.97	577.31	577.57
5/10/2013 15:35	583.96	577.30	577.17

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5/19/2013 7:35	583.09	577.12	577.04
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5/23/2013 19:35	584.08	577.08	577.11
5/23/2013 23:35	584.00	577.07	577.11
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5/24/2013 15:35	583.73	577.07	577.06
5/24/2013 19:35	583.67	577.07	577.05
5/24/2013 23:35	583.63	577.06	577.05
5/25/2013 3:35	583.58	577.06	577.06
5/25/2013 7:35	583.53	577.06	577.06
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5/27/2013 23:35	583.28	577.04	577.11
5/28/2013 3:35	583.50	576.97	577.24
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5/30/2013 11:35	588.11	577.06	577.17
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5/30/2013 19:35	588.10	577.06	577.10
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5/31/2013 11:35	588.10	577.07	577.34
5/31/2013 15:35	588.09	577.07	577.26
5/31/2013 19:35	588.13	577.07	577.23
5/31/2013 23:35	588.14	577.07	577.21
6/1/2013 3:35	588.23	577.07	577.20
6/1/2013 7:35	588.12	577.07	577.19
6/1/2013 11:35	587.81	577.07	577.17
6/1/2013 15:35	587.66	577.08	577.14
6/1/2013 19:35	587.80	577.09	577.17
6/1/2013 23:35	587.86	577.10	577.22
6/2/2013 3:35	587.86	577.08	577.21

6/2/2013 7:35	587.80	577.08	577.16
6/2/2013 11:35	587.97	577.08	577.18
6/2/2013 15:35	587.97	577.08	577.17
6/2/2013 19:35	587.90	577.08	577.16
6/2/2013 23:35	587.87	577.08	577.15
6/3/2013 3:35	587.85	577.08	577.15
6/3/2013 7:35	587.45	577.08	577.15
6/3/2013 11:35	586.62	577.07	577.13
6/3/2013 15:35	586.05	577.08	577.10
6/3/2013 19:35	586.41	577.08	577.08
6/3/2013 23:35	586.57	577.07	577.08
6/4/2013 3:35	586.42	577.07	577.09
6/4/2013 7:35	586.00	577.07	577.10
6/4/2013 11:35	585.37	577.07	577.07
6/4/2013 15:35	585.22	577.07	577.03
6/4/2013 19:35	585.35	577.07	577.02
6/4/2013 23:35	585.24	577.07	577.04
6/5/2013 3:35	585.14	577.07	577.06
6/5/2013 7:35	585.05	577.07	577.07
6/5/2013 11:35	584.94	577.06	577.03
6/5/2013 15:35	584.86	577.06	577.00
6/5/2013 19:35	584.79	577.06	577.00
6/5/2013 23:35	584.71	577.06	577.03
6/6/2013 3:35	584.64	577.06	577.04
6/6/2013 7:35	584.58	577.06	577.06
6/6/2013 11:35	584.52	577.06	577.07
6/6/2013 15:35	584.44	577.06	577.05
6/6/2013 19:35	584.38	577.06	577.03
6/6/2013 23:35	584.33	577.06	577.04
6/7/2013 3:35	584.28	577.05	577.06
6/7/2013 7:35	584.22	577.05	577.07
6/7/2013 11:35	584.16	577.05	577.04
6/7/2013 15:35	584.10	577.05	576.99
6/7/2013 19:35	584.05	577.05	576.98
6/7/2013 23:35	584.01	577.05	577.00
6/8/2013 3:35	583.96	577.05	577.02
6/8/2013 7:35	583.92	577.05	577.04
6/8/2013 11:35	583.87	577.04	577.00
6/8/2013 15:35	583.83	577.04	576.96
6/8/2013 19:35	583.80	577.04	576.95
6/8/2013 23:35	583.77	577.04	576.97
6/9/2013 3:35	583.75	577.04	577.00
6/9/2013 7:35	583.72	577.03	577.02
6/9/2013 11:35	583.69	577.03	576.98
6/9/2013 15:35	583.65	577.03	576.93
6/9/2013 19:35	583.63	577.03	576.92
6/9/2013 23:35	583.61	577.03	576.96
6/10/2013 3:35	583.59	577.02	576.99
6/10/2013 7:35	583.57	577.02	577.01
6/10/2013 11:35	583.54	577.02	577.00
6/10/2013 15:35	583.51	577.02	576.96
6/10/2013 19:35	583.49	577.02	576.95
6/10/2013 23:35	583.48	577.02	576.98
6/11/2013 3:35	583.46	577.01	577.00
6/11/2013 7:35	583.44	577.01	577.02
6/11/2013 11:35	583.41	577.01	576.98
6/11/2013 15:35	583.39	577.00	576.91
6/11/2013 19:35	583.38	577.00	576.90
6/11/2013 23:35	583.36	577.00	576.94
6/12/2013 3:35	583.35	577.00	576.97
6/12/2013 7:35	583.33	577.00	576.99
6/12/2013 11:35	583.32	577.00	576.99
6/12/2013 15:35	583.29	577.00	576.94
6/12/2013 19:35	583.52	577.01	577.07
6/12/2013 23:35	584.74	577.22	577.87
6/13/2013 3:35	586.57	577.26	577.97
6/13/2013 7:35	588.08	577.46	577.54
6/13/2013 11:35	588.64	577.01	577.40
6/13/2013 15:35	588.95	577.01	577.30
6/13/2013 19:35	589.11	577.01	577.24
6/13/2013 23:35	589.23	577.02	577.22
6/14/2013 3:35	589.25	577.02	577.20
6/14/2013 7:35	589.22	577.01	577.19
6/14/2013 11:35	589.15	577.01	577.16
6/14/2013 15:35	589.01	577.01	577.11
6/14/2013 19:35	588.86	577.01	577.07
6/14/2013 23:35	588.69	577.02	577.08
6/15/2013 3:35	588.51	577.02	577.09
6/15/2013 7:35	588.33	577.01	577.10
6/15/2013 11:35	588.10	577.02	577.09
6/15/2013 15:35	587.91	577.01	577.06
6/15/2013 19:35	587.71	577.02	577.04
6/15/2013 23:35	587.50	577.01	577.06
6/16/2013 3:35	587.28	577.02	577.08
6/16/2013 7:35	587.02	577.02	577.09
6/16/2013 11:35	586.61	577.02	577.07
6/16/2013 15:35	586.21	577.01	577.01
6/16/2013 19:35	585.92	577.01	576.98
6/16/2013 23:35	585.68	577.01	577.01
6/17/2013 3:35	585.49	577.01	577.03
6/17/2013 7:35	585.31	577.01	577.05
6/17/2013 11:35	585.15	577.01	577.00
6/17/2013 15:35	585.00	577.01	576.93
6/17/2013 19:35	584.89	577.01	576.90
6/17/2013 23:35	584.79	577.00	576.95
6/18/2013 3:35	584.69	577.00	576.98
6/18/2013 7:35	584.60	577.00	577.00
6/18/2013 11:35	584.51	577.00	577.00
6/18/2013 15:35	584.42	577.00	576.95
6/18/2013 19:35	584.35	577.00	576.91
6/18/2013 23:35	584.28	577.00	576.95
6/19/2013 3:35	584.21	576.99	576.98
6/19/2013 7:35	584.13	576.99	577.00
6/19/2013 11:35	584.05	576.99	576.96
6/19/2013 15:35	583.98	576.98	576.88
6/19/2013 19:35	583.93	576.98	576.86
6/19/2013 23:35	583.89	576.98	576.91
6/20/2013 3:35	583.85	576.98	576.94
6/20/2013 7:35	583.81	576.98	576.97
6/20/2013 11:35	583.75	576.97	576.91
6/20/2013 15:35	583.71	576.97	576.84
6/20/2013 19:35	583.69	576.97	576.82
6/20/2013 23:35	583.66	576.97	576.87
6/21/2013 3:35	583.63	576.97	576.91
6/21/2013 7:35	583.60	576.96	576.94
6/21/2013 11:35	583.55	576.96	576.89
6/21/2013 15:35	583.61	576.96	576.95
6/21/2013 19:35	583.64	576.96	577.02
6/21/2013 23:35	583.72	576.96	577.05
6/22/2013 3:35	583.76	576.96	577.06
6/22/2013 7:35	583.75	576.96	577.07
6/22/2013 11:35	583.73	576.96	577.06
6/22/2013 15:35	583.69	576.96	577.04
6/22/2013 19:35	583.65	576.96	577.02
6/22/2013 23:35	583.62	576.96	577.04
6/23/2013 3:35	583.58	576.96	577.05
6/23/2013 7:35	583.55	576.96	577.06
6/23/2013 11:35	583.50	576.95	577.02
6/23/2013 15:35	583.45	576.96	576.95
6/23/2013 19:35	583.44	576.95	576.94
6/23/2013 23:35	583.42	576.95	576.97
6/24/2013 3:35	583.39	576.95	576.99
6/24/2013 7:35	583.36	576.95	577.01
6/24/2013 11:35	583.36	576.95	577.05
6/24/2013 15:35	583.32	576.95	577.00
6/24/2013 19:35	583.47	576.95	577.15
6/24/2013 23:35	583.78	576.95	577.39

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

6/25/2013 3:35	584.16	576.96	577.30
6/25/2013 7:35	584.30	576.96	577.12
6/25/2013 11:35	584.32	576.96	576.85
6/25/2013 15:35	584.26	576.96	577.10
6/25/2013 19:35	584.18	576.96	577.08
6/25/2013 23:35	584.07	576.96	577.08
6/26/2013 3:35	583.97	576.96	577.09
6/26/2013 7:35	583.87	576.96	577.09
6/26/2013 11:35	584.02	576.96	577.20
6/26/2013 15:35	584.53	576.96	576.80
6/26/2013 19:35	584.84	576.97	576.87
6/26/2013 23:35	585.01	576.97	577.26
6/27/2013 3:35	585.10	576.97	577.38
6/27/2013 7:35	585.07	576.97	577.22
6/27/2013 11:35	584.97	576.98	576.89
6/27/2013 15:35	584.85	576.97	577.06
6/27/2013 19:35	584.75	576.97	577.01
6/27/2013 23:35	584.62	576.97	577.02
6/28/2013 3:35	584.49	576.97	577.04
6/28/2013 7:35	584.35	576.97	577.05
6/28/2013 11:35	584.21	576.97	577.00
6/28/2013 15:35	584.08	576.97	576.94
6/28/2013 19:35	583.97	576.97	576.97
6/28/2013 23:35	583.89	576.97	577.00
6/29/2013 3:35	583.82	576.97	577.03
6/29/2013 7:35	583.76	576.97	577.05
6/29/2013 11:35	583.85	576.97	577.18
6/29/2013 15:35	584.29	576.82	577.26
6/29/2013 19:35	584.65	577.06	577.48
6/29/2013 23:35	584.82	577.07	577.27
6/30/2013 3:35	584.87	576.99	577.24
6/30/2013 7:35	584.84	576.99	577.22
6/30/2013 11:35	584.76	576.99	577.17
6/30/2013 15:35	584.65	576.99	577.10
6/30/2013 19:35	584.52	576.99	577.05
6/30/2013 23:35	584.39	576.99	577.06
7/1/2013 3:35	584.27	576.99	577.06
7/1/2013 7:35	584.13	576.99	577.07
7/1/2013 11:35	583.99	576.99	577.02
7/1/2013 15:35	583.88	576.99	576.95
7/1/2013 19:35	583.80	576.98	576.92
7/1/2013 23:35	583.73	576.98	576.95
7/2/2013 3:35	583.68	576.98	576.98
7/2/2013 7:35	583.62	576.98	577.00
7/2/2013 11:35	583.56	576.97	576.98
7/2/2013 15:35	583.51	576.97	576.95
7/2/2013 19:35	583.47	576.97	576.94
7/2/2013 23:35	583.44	576.97	576.98
7/3/2013 3:35	583.41	576.97	577.00
7/3/2013 7:35	583.37	576.97	577.02
7/3/2013 11:35	583.34	576.97	577.03
7/3/2013 15:35	583.31	576.97	577.01
7/3/2013 19:35	583.29	576.96	577.00
7/3/2013 23:35	583.27	576.96	577.02
7/4/2013 3:35	583.25	576.96	577.03
7/4/2013 7:35	583.23	576.96	577.04
7/4/2013 11:35	583.19	576.96	577.00
7/4/2013 15:35	583.16	576.96	576.92
7/4/2013 19:35	583.15	576.96	576.89
7/4/2013 23:35	583.14	576.95	576.93
7/5/2013 3:35	583.12	576.95	576.96
7/5/2013 7:35	583.10	576.95	576.98
7/5/2013 11:35	583.07	576.95	576.94
7/5/2013 15:35	583.04	576.94	576.85
7/5/2013 19:35	583.03	576.94	576.82
7/5/2013 23:35	583.02	576.94	576.87
7/6/2013 3:35	583.01	576.94	576.91
7/6/2013 7:35	582.99	576.93	576.93
7/6/2013 11:35	582.96	576.93	576.90
7/6/2013 15:35	582.95	576.93	576.83
7/6/2013 19:35	582.95	576.93	576.84
7/6/2013 23:35	582.94	576.92	576.88
7/7/2013 3:35	582.93	576.92	576.92
7/7/2013 7:35	582.92	576.92	576.94
7/7/2013 11:35	582.89	576.91	576.90
7/7/2013 15:35	582.87	576.91	576.80
7/7/2013 19:35	582.86	576.91	576.78
7/7/2013 23:35	582.86	576.91	576.83
7/8/2013 3:35	582.85	576.90	576.87
7/8/2013 7:35	582.85	576.90	576.90
7/8/2013 11:35	582.86	576.90	577.03
7/8/2013 15:35	582.83	576.89	576.63
7/8/2013 19:35	582.84	576.89	576.73
7/8/2013 23:35	582.85	576.89	576.93
7/9/2013 3:35	582.85	576.89	577.03
7/9/2013 7:35	582.85	576.89	576.98
7/9/2013 11:35	582.83	576.89	576.98
7/9/2013 15:35	582.82	576.89	576.94
7/9/2013 19:35	582.80	576.88	576.91
7/9/2013 23:35	582.80	576.88	576.94
7/10/2013 3:35	582.79	576.88	576.97
7/10/2013 7:35	582.78	576.88	576.99
7/10/2013 11:35	582.74	576.88	576.92
7/10/2013 15:35	582.72	576.87	576.81
7/10/2013 19:35	582.71	576.87	576.76
7/10/2013 23:35	582.71	576.87	576.81
7/11/2013 3:35	582.70	576.86	576.85
7/11/2013 7:35	582.69	576.86	576.87
7/11/2013 11:35	582.65	576.86	576.81
7/11/2013 15:35	582.62	576.85	576.72
7/11/2013 19:35	582.62	576.85	576.68
7/11/2013 23:35	582.63	576.84	576.72
7/12/2013 3:35	582.62	576.84	576.76
7/12/2013 7:35	582.61	576.83	576.79
7/12/2013 11:35	582.58	576.83	576.72
7/12/2013 15:35	582.56	576.82	576.63
7/12/2013 19:35	582.56	576.82	576.59
7/12/2013 23:35	582.57	576.81	576.62
7/13/2013 3:35	582.57	576.81	576.67
7/13/2013 7:35	582.56	576.80	576.71
7/13/2013 11:35	582.52	576.79	576.63
7/13/2013 15:35	582.50	576.79	576.54
7/13/2013 19:35	582.50	576.78	576.48
7/13/2013 23:35	582.51	576.77	576.51
7/14/2013 3:35	582.50	576.77	576.56
7/14/2013 7:35	582.49	576.76	576.61
7/14/2013 11:35	582.46	576.75	576.54
7/14/2013 15:35	582.45	576.74	576.44
7/14/2013 19:35	582.45	576.74	576.40
7/14/2013 23:35	582.46	576.73	576.44
7/15/13 0:00	582.21	576.90	576.35
7/15/2013 3:35	582.46	576.72	576.49
7/15/2013 7:35	582.45	576.72	576.53
7/15/2013 11:35	582.41	576.71	576.44
7/15/2013 15:35	582.40	576.70	576.36
7/15/2013 19:35	582.41	576.69	576.36
7/15/2013 23:35	582.41	576.68	576.42
7/16/2013 3:35	582.42	576.67	576.47
7/16/2013 7:35	582.41	576.66	576.51
7/16/2013 11:35	582.38	576.65	576.44
7/16/2013 15:35	582.36	576.64	576.31
7/16/2013 19:35	582.37	576.64	576.26
7/16/2013 23:35	582.37	576.63	576.31
7/17/2013 3:35	582.38	576.62	576.37
7/17/2013 7:35	582.37	576.61	576.41
7/17/2013 11:35	582.34	576.60	576.32
7/17/2013 15:35	582.32	576.59	576.22

7/17/2013 19:35	582.33	576.58	576.17
7/17/2013 23:35	582.34	576.57	576.21
7/18/2013 3:35	582.34	576.57	576.28
7/18/2013 7:35	582.34	576.56	576.33
7/18/2013 11:35	582.30	576.55	576.24
7/18/2013 15:35	582.28	576.54	576.13
7/18/2013 19:35	582.36	576.53	576.23
7/18/2013 23:35	582.39	576.52	576.58
7/19/2013 3:35	582.45	576.52	576.66
7/19/2013 7:35	582.50	576.52	576.69
7/19/2013 11:35	582.51	576.51	576.07
7/19/2013 15:35	582.50	576.51	576.30
7/19/2013 19:35	582.51	576.50	576.20
7/19/2013 23:35	582.51	576.49	576.23
7/20/2013 3:35	582.49	576.49	576.28
7/20/2013 7:35	582.47	576.48	576.32
7/20/2013 11:35	582.42	576.47	576.22
7/20/2013 15:35	582.39	576.47	576.11
7/20/2013 19:35	582.38	576.45	576.05
7/20/2013 23:35	582.38	576.45	576.08
7/21/2013 3:35	582.38	576.44	576.14
7/21/2013 7:35	582.37	576.43	576.18
7/21/2013 11:35	582.32	576.43	576.11
7/21/2013 15:35	582.29	576.42	576.01
7/21/2013 19:35	582.30	576.41	575.97
7/21/2013 23:35	582.31	576.40	576.02
7/22/2013 3:35	582.31	576.39	576.08
7/22/2013 7:35	582.30	576.38	576.12
7/22/2013 11:35	582.26	576.37	576.08
7/22/2013 15:35	582.24	576.36	575.96
7/22/2013 19:35	582.24	576.36	575.91
7/22/2013 23:35	582.25	576.35	575.94
7/23/2013 3:35	582.26	576.34	576.01
7/23/2013 7:35	582.26	576.33	576.05
7/23/2013 11:35	582.22	576.32	576.01
7/23/2013 15:35	582.20	576.32	575.90
7/23/2013 19:35	582.20	576.31	575.86
7/23/2013 23:35	582.22	576.30	575.89
7/24/2013 3:35	582.22	576.29	575.94
7/24/2013 7:35	582.22	576.28	575.98
7/24/2013 11:35	582.18	576.27	575.92
7/24/2013 15:35	582.16	576.26	575.84
7/24/2013 19:35	582.17	576.26	575.80
7/24/2013 23:35	582.19	576.25	575.83
7/25/2013 3:35	582.19	576.24	575.88
7/25/2013 7:35	582.19	576.23	575.92
7/25/2013 11:35	582.14	576.22	575.88
7/25/2013 15:35	582.12	576.22	575.78
7/25/2013 19:35	582.12	576.21	575.74
7/25/2013 23:35	582.14	576.20	575.77
7/26/2013 3:35	582.15	576.19	575.81
7/26/2013 7:35	582.15	576.18	575.86
7/26/2013 11:35	582.14	576.17	575.88
7/26/2013 15:35	582.13	576.16	575.87
7/26/2013 19:35	582.13	576.16	575.89
7/26/2013 23:35	582.13	576.15	575.92
7/27/2013 3:35	582.12	576.15	575.96
7/27/2013 7:35	582.12	576.14	575.99
7/27/2013 11:35	582.10	576.14	575.99
7/27/2013 15:35	582.07	576.13	575.91
7/27/2013 19:35	582.06	576.13	575.84
7/27/2013 23:35	582.07	576.12	575.86
7/28/2013 3:35	582.07	576.11	575.89
7/28/2013 7:35	582.08	576.11	575.90
7/28/2013 11:35	582.06	576.10	575.62
7/28/2013 15:35	582.03	576.10	576.03
7/28/2013 19:35	582.02	576.09	575.78
7/28/2013 23:35	582.03	576.09	575.80
7/29/2013 3:35	582.04	576.08	575.84
7/29/2013 7:35	582.03	576.07	575.87
7/29/2013 11:35	581.99	576.07	575.82
7/29/2013 15:35	581.96	576.06	575.73
7/29/2013 19:35	581.97	576.05	575.69
7/29/2013 23:35	581.98	576.04	575.70
7/30/2013 3:35	581.98	576.04	575.74
7/30/2013 7:35	581.98	576.03	575.77
7/30/2013 11:35	581.96	576.03	575.76
7/30/2013 15:35	581.95	576.02	575.74
7/30/2013 19:35	581.94	576.01	575.72
7/30/2013 23:35	581.95	576.01	575.77
7/31/2013 3:35	581.95	576.00	575.81
7/31/2013 7:35	581.95	576.00	575.85
7/31/2013 11:35	581.94	575.99	575.89
7/31/2013 15:35	581.92	575.99	575.88
7/31/2013 19:35	581.91	575.98	575.85
7/31/2013 23:35	581.94	575.98	575.94
8/1/2013 3:35	581.94	575.97	576.27
8/1/2013 7:35	581.94	575.97	576.27
8/1/2013 11:35	581.91	575.97	575.57
8/1/2013 15:35	581.88	575.96	575.84
8/1/2013 19:35	581.88	575.96	575.74
8/1/2013 23:35	581.89	575.95	575.74
8/2/2013 3:35	581.94	575.95	575.76
8/2/2013 7:35	582.00	575.94	575.91
8/2/2013 11:35	582.10	575.95	576.20
8/2/2013 15:35	582.20	575.95	576.18
8/2/2013 19:35	582.32	575.95	576.17
8/2/2013 23:35	582.57	576.10	576.80
8/3/2013 3:35	582.79	575.95	577.00
8/3/2013 7:35	583.09	575.96	576.59
8/3/2013 11:35	583.26	575.96	576.56
8/3/2013 15:35	583.27	575.96	576.48
8/3/2013 19:35	583.22	575.96	576.42
8/3/2013 23:35	583.15	575.97	576.53
8/4/2013 3:35	583.06	575.97	576.45
8/4/2013 7:35	582.97	575.97	576.46
8/4/2013 11:35	582.87	575.98	576.53
8/4/2013 15:35	582.77	575.98	576.36
8/4/2013 19:35	582.70	575.98	576.32
8/4/2013 23:35	582.66	575.98	576.34
8/5/2013 3:35	582.61	575.98	576.36
8/5/2013 7:35	582.55	575.98	576.30
8/5/2013 11:35	582.51	575.98	576.36
8/5/2013 15:35	582.46	575.99	576.54
8/5/2013 19:35	582.43	575.99	576.57
8/5/2013 23:35	582.41	575.99	576.64
8/6/2013 3:35	582.38	575.99	576.36
8/6/2013 7:35	582.39	575.99	576.39
8/6/2013 11:35	582.36	575.99	576.18
8/6/2013 15:35	582.35	575.99	576.50
8/6/2013 19:35	582.38	576.00	576.66
8/6/2013 23:35	582.40	576.00	576.48
8/7/2013 3:35	582.40	576.00	576.50
8/7/2013 7:35	582.39	576.01	576.42
8/7/2013 11:35	582.36	576.01	576.46
8/7/2013 15:35	582.36	576.01	576.52
8/7/2013 19:35	582.35	576.01	576.63
8/7/2013 23:35	582.35	576.01	576.44
8/8/2013 3:35	582.35	576.01	576.52
8/8/2013 7:35	582.35	576.02	576.50
8/8/2013 11:35	582.32	576.02	576.41
8/8/2013 15:35	582.29	576.02	576.32
8/8/2013 19:35	582.28	576.02	576.50
8/8/2013 23:35	582.27	576.02	576.30
8/9/2013 3:35	582.26	576.02	576.43
8/9/2013 7:35	582.25	576.02	576.33
8/9/2013 11:35	582.20	576.02	575.87

8/9/2013 15:35	582.17	576.02	576.17
8/9/2013 19:35	582.16	576.01	576.12
8/9/2013 23:35	582.16	576.01	576.13
8/10/2013 3:35	582.15	576.01	576.19
8/10/2013 7:35	582.14	576.01	576.23
8/10/2013 11:35	582.10	576.01	576.13
8/10/2013 15:35	582.07	576.01	576.06
8/10/2013 19:35	582.06	576.00	576.01
8/10/2013 23:35	582.06	576.00	576.11
8/11/2013 3:35	582.06	576.00	576.35
8/11/2013 7:35	582.06	576.00	576.36
8/11/2013 11:35	582.01	575.99	576.01
8/11/2013 15:35	581.98	575.99	575.94
8/11/2013 19:35	581.98	575.99	575.89
8/11/2013 23:35	581.99	575.98	575.89
8/12/2013 3:35	581.99	575.98	575.93
8/12/2013 7:35	581.99	575.98	575.94
8/12/2013 11:35	581.94	575.97	575.89
8/12/2013 15:35	581.92	575.97	575.83
8/12/2013 19:35	581.92	575.97	575.79
8/12/2013 23:35	581.93	575.96	576.17
8/13/2013 3:35	581.93	575.95	575.89
8/13/2013 7:35	581.93	575.95	575.97
8/13/2013 11:35	581.89	575.95	575.81
8/13/2013 15:35	581.86	575.94	575.75
8/13/2013 19:35	581.85	575.94	575.71
8/13/2013 23:35	581.86	575.93	575.72
8/14/2013 3:35	581.86	575.93	575.76
8/14/2013 7:35	581.86	575.92	575.79
8/14/2013 11:35	581.82	575.91	575.72
8/14/2013 15:35	581.80	575.91	575.67
8/14/2013 19:35	581.80	575.90	575.65
8/14/2013 23:35	581.80	575.90	575.66
8/15/2013 3:35	581.80	575.89	575.69
8/15/2013 7:35	581.80	575.89	575.70
8/15/2013 11:35	581.76	575.88	575.68
8/15/2013 15:35	581.74	575.87	575.62
8/15/2013 19:35	581.74	575.87	575.59
8/15/2013 23:35	581.76	575.86	575.68
8/16/2013 3:35	581.78	575.86	575.65
8/16/2013 7:35	581.78	575.85	575.67
8/16/2013 11:35	581.74	575.84	575.64
8/16/2013 15:35	581.71	575.84	575.56
8/16/2013 19:35	581.71	575.83	575.53
8/16/2013 23:35	581.71	575.82	575.53
8/17/2013 3:35	581.72	575.82	575.55
8/17/2013 7:35	581.72	575.81	575.56
8/17/2013 11:35	581.68	575.80	575.54
8/17/2013 15:35	581.65	575.79	575.49
8/17/2013 19:35	581.65	575.79	575.45
8/17/2013 23:35	581.66	575.78	575.45
8/18/2013 3:35	581.67	575.77	575.48
8/18/2013 7:35	581.66	575.76	575.44
8/18/2013 11:35	581.63	575.76	575.47
8/18/2013 15:35	581.61	575.74	575.42
8/18/2013 19:35	581.61	575.73	575.38
8/18/2013 23:35	581.62	575.73	575.39
8/19/2013 3:35	581.63	575.72	575.45
8/19/2013 7:35	581.63	575.71	575.40
8/19/2013 11:35	581.60	575.70	575.40
8/19/2013 15:35	581.57	575.69	575.35
8/19/2013 19:35	581.57	575.68	575.32
8/19/2013 23:35	581.58	575.67	575.32
8/20/2013 3:35	581.58	575.66	575.35
8/20/2013 7:35	581.58	575.65	575.24
8/20/2013 11:35	581.55	575.64	575.32
8/20/2013 15:35	581.53	575.63	575.28
8/20/2013 19:35	581.53	575.62	575.25
8/20/2013 23:35	581.54	575.60	575.24
8/21/13 0:00	581.31		
8/21/2013 3:35	581.55	575.60	575.27
8/21/2013 7:35	581.55	575.58	575.26
8/21/2013 11:35	581.52	575.57	575.25
8/21/2013 15:35	581.50	575.56	575.21
8/21/2013 19:07		575.55	575.18
8/21/2013 23:07		575.54	575.17
8/22/2013 3:07		575.53	575.21
8/22/2013 7:07		575.54	575.41
8/22/2013 11:07		575.63	575.67
8/22/2013 15:07		575.51	575.60
8/22/2013 19:07		575.51	575.84
8/22/2013 23:07		575.51	576.20
8/23/2013 3:07		575.51	576.34
8/23/2013 7:07		575.51	576.43
8/23/2013 11:07		575.51	575.52
8/23/2013 15:07		575.51	575.73
8/23/2013 19:07		575.51	575.71
8/23/2013 23:07		575.51	575.70
8/24/2013 3:07		575.51	575.79
8/24/2013 7:07		575.51	575.83
8/24/2013 11:07		575.51	575.69
8/24/2013 15:07		575.51	575.61
8/24/2013 19:07		575.50	575.55
8/24/2013 23:07		575.50	575.55
8/25/2013 3:07		575.50	575.59
8/25/2013 7:07		575.50	575.57
8/25/2013 11:07		575.49	575.53
8/25/2013 15:07		575.49	575.47
8/25/2013 19:07		575.48	575.42
8/25/2013 23:07		575.48	575.41
8/26/2013 3:07		575.48	575.45
8/26/2013 7:07		575.47	575.37
8/26/2013 11:07		575.47	575.41
8/26/2013 15:07		575.46	575.36
8/26/2013 19:07		575.45	575.31
8/26/2013 23:07		575.44	575.31
8/27/2013 3:07		575.44	575.32
8/27/2013 7:07		575.43	575.40
8/27/2013 11:07		575.43	575.31
8/27/2013 15:07		575.42	575.26
8/27/2013 19:07		575.41	575.22
8/27/2013 23:07		575.40	575.20
8/28/2013 3:07		575.39	575.20
8/28/2013 7:07		575.39	575.21
8/28/2013 11:07		575.38	575.19
8/28/2013 15:07		575.37	575.16
8/28/2013 19:07		575.36	575.13
8/28/2013 23:07		575.35	575.14
8/29/2013 3:07		575.35	575.16
8/29/2013 7:07		575.33	575.17
8/29/2013 11:07		575.33	575.16
8/29/2013 15:07		575.32	575.11
8/29/2013 19:07		575.31	575.08
8/29/2013 23:07		575.30	575.08
8/30/2013 3:07		575.29	575.09
8/30/2013 7:07		575.28	575.11
8/30/2013 11:07		575.27	575.08
8/30/2013 15:07		575.26	575.05
8/30/2013 19:07		575.26	575.02
8/30/2013 23:07		575.25	575.15
8/31/2013 3:07		575.24	575.21
8/31/2013 7:07		575.23	575.27
8/31/2013 11:07		575.23	575.24
8/31/2013 15:07		575.22	575.06
8/31/2013 19:07		575.22	575.30
8/31/2013 23:07		575.22	575.47
9/1/2013 3:07		575.22	575.67

9/1/2013 7:07		575.22	575.74
9/1/2013 11:07		575.22	575.01
9/1/2013 15:07		575.22	575.42
9/1/2013 19:07		575.22	575.42
9/1/2013 23:07		575.22	575.90
9/2/2013 3:07		575.22	576.29
9/2/2013 7:07		575.23	576.48
9/2/2013 11:07		575.23	576.01
9/2/2013 15:07		575.24	575.87
9/2/2013 19:07		575.24	576.30
9/2/2013 23:07		575.25	576.39
9/3/2013 3:07		575.25	576.29
9/3/2013 7:07		575.25	576.38
9/3/2013 11:07		575.26	575.28
9/3/2013 15:07		575.26	575.72
9/3/2013 19:07		575.27	575.98
9/3/2013 23:07		575.27	576.35
9/4/2013 3:07		575.28	576.20
9/4/2013 7:07		575.28	575.66
9/4/2013 11:07		575.28	575.20
9/4/2013 15:07		575.28	575.66
9/4/2013 19:07		575.28	575.60
9/4/2013 23:07		575.29	575.81
9/5/2013 3:07		575.29	575.83
9/5/2013 7:07		575.29	575.78
9/5/2013 11:07		575.29	575.39
9/5/2013 15:07		575.29	575.59
9/5/2013 19:07		575.29	575.63
9/5/2013 23:07		575.29	575.95
9/6/13 0:00		574.90	
9/6/2013 3:07		575.29	575.98
9/6/2013 7:07		575.29	575.97
9/6/2013 11:07		575.29	575.25
9/6/2013 15:13		575.42	575.49
9/6/2013 19:13		575.42	575.45
9/6/2013 23:13		575.42	575.45
9/7/2013 3:13		575.42	575.47
9/7/2013 7:13		575.42	575.49
9/7/2013 11:13		575.42	575.48
9/7/2013 15:13		575.42	575.41
9/7/2013 19:13		575.42	575.37
9/7/2013 23:13		575.41	575.36
9/8/2013 3:13		575.41	575.38
9/8/2013 7:13		575.41	575.39
9/8/2013 11:13		575.40	575.37
9/8/2013 15:13		575.40	575.33
9/8/2013 19:13		575.40	575.30
9/8/2013 23:13		575.40	575.30
9/9/2013 3:13		575.39	575.32
9/9/2013 7:13		575.39	575.34
9/9/2013 11:13		575.38	575.31
9/9/2013 15:13		575.38	575.26
9/9/2013 19:13		575.38	575.23
9/9/2013 23:13		575.37	575.21
9/10/2013 3:13		575.37	575.21
9/10/2013 7:13		575.36	575.22
9/10/2013 11:13		575.35	575.19
9/10/2013 15:13		575.34	575.15
9/10/2013 19:13		575.34	575.11
9/10/2013 23:13		575.33	575.09
9/11/2013 3:13		575.32	575.08
9/11/2013 7:13		575.31	575.09
9/11/2013 11:13		575.31	575.07
9/11/2013 15:13		575.30	575.04
9/11/2013 19:13		575.29	575.02
9/11/2013 23:13		575.28	575.01
9/12/2013 3:13		575.27	575.02
9/12/2013 7:13		575.26	575.04
9/12/2013 11:13		575.25	575.02
9/12/2013 15:13		575.25	574.99
9/12/2013 19:13		575.24	574.96
9/12/2013 23:13		575.23	574.95
9/13/2013 3:13		575.22	574.96
9/13/2013 7:13		575.21	574.96
9/13/2013 11:13		575.20	574.95
9/13/2013 15:13		575.19	574.93
9/13/2013 19:13		575.18	574.91
9/13/2013 23:13		575.17	574.90
9/14/2013 3:13		575.16	574.91
9/14/2013 7:13		575.15	574.92
9/14/2013 11:13		575.14	574.91
9/14/2013 15:13		575.13	574.88
9/14/2013 19:13		575.12	574.87
9/14/2013 23:13		575.12	574.86
9/15/2013 3:13		575.11	574.86
9/15/2013 7:13		575.09	574.87
9/15/2013 11:13		575.09	574.87
9/15/2013 15:13		575.09	574.89
9/15/2013 19:13		575.11	574.95
9/15/2013 23:13		575.10	575.01
9/16/2013 3:13		575.10	575.05
9/16/2013 7:13		575.10	575.08
9/16/2013 11:13		575.10	575.10
9/16/2013 15:13		575.10	575.07
9/16/2013 19:13		575.10	575.05
9/16/2013 23:13		575.09	575.07
9/17/2013 3:13		575.09	575.08
9/17/2013 7:13		575.09	575.10
9/17/2013 11:13		575.09	575.10
9/17/2013 15:13		575.09	575.06
9/17/2013 19:13		575.08	575.02
9/17/2013 23:13		575.08	575.03
9/18/2013 3:13		575.08	575.04
9/18/2013 7:13		575.08	575.06
9/18/2013 11:13		575.07	575.04
9/18/2013 15:13		575.07	574.98
9/18/2013 19:13		575.07	574.99
9/18/2013 23:13		575.07	575.01
9/19/2013 3:13		575.07	575.04
9/19/2013 7:13		575.07	575.07
9/19/2013 11:13		575.07	575.08
9/19/2013 15:13		575.06	575.04
9/19/2013 19:13		575.06	574.99
9/19/2013 23:13		575.06	574.98
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9/20/2013 11:13		575.05	575.05
9/20/2013 15:13		575.05	575.02
9/20/2013 19:13		575.05	574.99
9/20/2013 23:13		575.04	574.99
9/21/2013 3:13		575.04	575.01
9/21/2013 7:13		575.04	575.03
9/21/2013 11:13		575.04	575.02
9/21/2013 15:13		575.03	574.96
9/21/2013 19:13		575.03	574.92
9/21/2013 23:13		575.03	574.92
9/22/2013 3:13		575.02	574.93
9/22/2013 7:13		575.02	574.94
9/22/2013 11:13		575.01	574.93
9/22/2013 15:13		575.01	574.89
9/22/2013 19:13		575.00	574.87
9/22/2013 23:13		575.00	574.87
9/23/2013 3:13		575.00	574.89
9/23/2013 7:13		574.99	574.90
9/23/2013 11:13		574.99	574.88
9/23/2013 15:13		574.98	574.85
9/23/2013 19:13		574.97	574.84

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

9/23/2013 23:13		574.97	574.83
9/24/2013 3:13		574.96	574.84
9/24/2013 7:13		574.96	574.85
9/24/2013 11:13		574.95	574.83
9/24/2013 15:13		574.95	574.81
9/24/2013 19:13		574.94	574.79
9/24/2013 23:13		574.93	574.79
9/25/2013 3:13		574.93	574.79
9/25/2013 7:13		574.92	574.80
9/25/2013 11:13		574.91	574.79
9/25/2013 15:13		574.90	574.77
9/25/2013 19:13		574.90	574.75
9/25/2013 23:13		574.89	574.75
9/26/2013 3:13		574.89	574.75
9/26/2013 7:13		574.88	574.76
9/26/2013 11:13		574.88	574.75
9/26/2013 15:13		574.87	574.72
9/26/2013 19:13		574.86	574.71
9/26/2013 23:13		574.85	574.71
9/27/2013 3:13		574.85	574.71
9/27/2013 7:13		574.84	574.71
9/27/2013 11:13		574.83	574.70
9/27/2013 15:13		574.82	574.68
9/27/2013 19:13		574.82	574.67
9/27/2013 23:13		574.81	574.66
9/28/2013 3:13		574.81	574.66
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9/28/2013 11:13		574.79	574.65
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9/29/2013 7:13		574.80	574.69
9/29/2013 11:13		574.79	574.73
9/29/2013 15:13		574.79	574.73
9/29/2013 19:13		574.79	574.72
9/29/2013 23:13		574.79	574.75
9/30/2013 3:13		574.78	574.77
9/30/2013 7:13		574.78	574.79
9/30/2013 11:13		574.78	574.81
9/30/2013 15:13		574.78	574.78
9/30/2013 19:13		574.78	574.74
9/30/2013 23:13		574.78	574.75
10/1/2013 3:13		574.77	574.77
10/1/2013 7:13		574.78	574.79
10/1/2013 11:13		574.77	574.80
10/1/2013 15:13		574.77	574.78
10/1/2013 19:13		574.77	574.74
10/1/2013 23:13		574.77	574.74
10/2/2013 3:13		574.76	574.76
10/2/2013 7:13		574.76	574.78
10/2/2013 11:13		574.76	574.77
10/2/2013 15:13		574.76	574.72
10/2/2013 19:13		574.76	574.68
10/2/2013 23:13		574.75	574.68
10/3/2013 3:13		574.75	574.69
10/3/2013 7:13		574.75	574.71
10/3/2013 11:13		574.76	574.74
10/3/2013 15:13		574.76	574.76
10/3/2013 19:13		574.79	575.15
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12/23/2013 22:13		576.97	577.07

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

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2/22/2014 22:13		577.18	577.25
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2/24/2014 10:13		577.19	577.19
2/24/2014 14:13		577.19	577.18
2/24/2014 18:13		577.20	577.18
2/24/2014 22:13		577.19	577.17
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2/25/2014 6:13		577.20	577.16
2/25/2014 10:13		577.19	577.16
2/25/2014 14:13		577.20	577.16
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2/25/2014 22:13		577.20	577.15
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2/26/2014 10:13		577.20	577.16
2/26/2014 14:13		577.19	577.16
2/26/2014 18:13		577.20	577.15
2/26/2014 22:13		577.20	577.15
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2/27/2014 22:13		577.19	577.12
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2/28/2014 6:13		577.19	577.12
2/28/2014 10:13		577.19	577.12
2/28/2014 14:13		577.19	577.13
2/28/2014 18:13		577.19	577.12
2/28/2014 22:13		577.19	577.13
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3/1/2014 14:13		577.18	577.13
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3/1/2014 22:13		577.18	577.13
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3/3/2014 18:13		577.18	577.13
3/3/2014 22:13		577.18	577.13
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3/5/2014 14:13		577.17	577.12
3/5/2014 18:13		577.17	577.13
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3/7/2014 14:13		577.17	577.16
3/7/2014 18:13		577.17	577.21
3/7/2014 22:13		577.17	577.21
3/8/2014 2:13		577.18	577.20
3/8/2014 6:13		577.17	577.18
3/8/2014 10:13		577.17	577.18
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3/13/2014 19:13		577.30	577.25
3/13/2014 23:13		577.30	577.24
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3/14/2014 11:13		577.30	577.26
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3/14/2014 19:13		577.32	577.58
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3/15/2014 19:13		577.33	577.38
3/15/2014 23:13		577.34	577.34
3/16/2014 3:13		577.34	577.31
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3/16/2014 11:13		577.34	577.26
3/16/2014 15:13		577.34	577.26
3/16/2014 19:13		577.34	577.25
3/16/2014 23:13		577.34	577.24
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3/18/2014 15:13		577.34	577.24
3/18/2014 19:13		577.34	577.27
3/18/2014 23:13		577.35	577.28
3/19/2014 3:13		577.35	577.28
3/19/2014 7:13		577.36	577.34
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3/19/2014 15:13		577.39	577.56
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3/19/2014 23:13		577.39	577.41
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3/20/2014 15:13		577.39	577.30
3/20/2014 19:13		577.39	577.30
3/20/2014 23:13		577.39	577.29
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3/21/2014 11:13		577.39	577.25
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3/22/2014 23:13		577.39	577.22
3/23/2014 3:13		577.38	577.21
3/23/2014 7:13		577.38	577.20
3/23/2014 11:13		577.38	577.19
3/23/2014 15:13		577.38	577.20
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3/23/2014 23:13		577.38	577.19
3/24/2014 3:13		577.38	577.18
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3/24/2014 11:13		577.37	577.17
3/24/2014 15:13		577.38	577.19
3/24/2014 19:13		577.38	577.20
3/24/2014 23:13		577.37	577.19
3/25/2014 3:13		577.37	577.18
3/25/2014 7:13		577.37	577.18

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

3/25/2014 11:13		577.37	577.17
3/25/2014 15:13		577.37	577.18
3/25/2014 19:13		577.37	577.18
3/25/2014 23:13		577.37	577.17
3/26/2014 3:13		577.36	577.16
3/26/2014 7:13		577.36	577.15
3/26/2014 11:13		577.36	577.15
3/26/2014 15:13		577.36	577.17
3/26/2014 19:13		577.36	577.18
3/26/2014 23:13		577.36	577.19
3/27/2014 3:13		577.36	577.18
3/27/2014 7:13		577.36	577.19
3/27/2014 11:13		577.36	577.20
3/27/2014 15:13		577.36	577.21
3/27/2014 19:13		577.36	577.21
3/27/2014 23:13		577.36	577.22
3/28/2014 3:13		577.36	577.22
3/28/2014 7:13		577.36	577.20
3/28/2014 11:13		577.35	577.20
3/28/2014 15:13		577.35	577.19
3/28/2014 19:13		577.35	577.19
3/28/2014 23:13		577.35	577.18
3/29/2014 3:13		577.35	577.18
3/29/2014 7:13		577.35	577.18
3/29/2014 11:13		577.34	577.17
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3/29/2014 23:13		577.34	577.16
3/30/2014 3:13		577.34	577.16
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4/5/2014 11:13		577.34	577.21
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4/5/2014 19:13		577.34	577.20
4/5/2014 23:13		577.34	577.20
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4/7/2014 19:13		577.34	577.17
4/7/2014 23:13		577.33	577.17
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4/8/2014 15:13		577.33	577.16
4/8/2014 19:13		577.33	577.16
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4/13/2014 23:13		577.30	577.22
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4/15/2014 11:13		577.30	577.20
4/15/2014 15:13		577.30	577.18
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4/16/2014 11:13		577.29	577.15
4/16/2014 15:13		577.29	577.15
4/16/2014 19:13		577.29	577.14
4/16/2014 23:13		577.28	577.13
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4/17/2014 7:13		577.28	577.13
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4/17/2014 15:13		577.28	577.12
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4/20/2014 23:13		577.24	577.10
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4/21/2014 7:13		577.24	577.11
4/21/2014 11:13		577.24	577.11
4/21/2014 15:13		577.23	577.11
4/21/2014 19:13		577.24	577.15
4/21/2014 23:13		577.24	577.22
4/22/2014 3:13		577.24	577.22
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4/22/2014 11:13		577.24	577.19
4/22/2014 15:13		577.24	577.17
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4/23/2014 19:13		577.23	577.11
4/23/2014 23:13		577.23	577.12
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4/24/2014 7:13		577.23	577.12
4/24/2014 11:13		577.23	577.13
4/24/2014 15:13		577.23	577.12
4/24/2014 19:13		577.23	577.11
4/24/2014 23:13		577.23	577.11
4/25/2014 3:13		577.23	577.13
4/25/2014 7:13		577.22	577.15
4/25/2014 11:13		577.22	577.15
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4/25/2014 19:13		577.22	577.12
4/25/2014 23:13		577.22	577.11
4/26/2014 3:13		577.22	577.11
4/26/2014 7:13		577.22	577.11
4/26/2014 11:13		577.21	577.11
4/26/2014 15:13		577.21	577.10
4/26/2014 19:13		577.21	577.10
4/26/2014 23:13		577.21	577.09
4/27/2014 3:13		577.21	577.09
4/27/2014 7:13		577.20	577.10
4/27/2014 11:13		577.20	577.10
4/27/2014 15:13		577.20	577.09
4/27/2014 19:13		577.20	577.09
4/27/2014 23:13		577.20	577.10
4/28/2014 3:13		577.20	577.17
4/28/2014 7:13		577.20	577.23
4/28/2014 11:13		577.20	577.26
4/28/2014 15:13		577.21	577.25
4/28/2014 19:13		577.21	577.22
4/28/2014 23:13		577.21	577.30
4/29/2014 3:13		577.22	577.33
4/29/2014 7:13		577.22	577.31
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4/29/2014 15:13		577.22	577.26
4/29/2014 19:13		577.22	577.23
4/29/2014 23:13		577.22	577.22
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4/30/2014 11:13		577.22	577.18
4/30/2014 15:13		577.22	577.17
4/30/2014 19:13		577.22	577.17
4/30/2014 23:13		577.22	577.16
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5/1/2014 15:13		577.21	577.15
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5/1/2014 23:13		577.22	577.16
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5/3/2014 11:13		577.29	577.08
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5/3/2014 19:13		577.28	577.07
5/3/2014 23:13		577.28	577.05
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5/4/2014 7:13		577.28	577.04
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5/4/2014 15:13		577.28	577.02
5/4/2014 19:13		577.28	577.06
5/4/2014 23:13		577.27	577.03
5/5/2014 3:13		577.27	577.05
5/5/2014 7:13		577.27	577.02
5/5/2014 11:13		577.27	577.06
5/5/2014 15:13		577.27	576.98
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5/6/2014 3:13		577.27	577.04
5/6/2014 7:13		577.27	577.01
5/6/2014 11:13		577.26	577.07
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5/7/2014 7:13		577.25	577.00
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5/8/2014 11:13		577.25	577.04
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5/8/2014 23:13		577.24	576.99
5/9/2014 3:13		577.25	577.07
5/9/2014 7:13		577.29	577.42
5/9/2014 11:13		577.29	577.34
5/9/2014 15:13		577.29	577.33
5/9/2014 19:13		577.30	577.27
5/9/2014 23:13		577.30	577.21
5/10/2014 3:13		577.30	577.18
5/10/2014 7:13		577.30	577.14
5/10/2014 11:13		577.30	577.12
5/10/2014 15:13		577.29	577.12
5/10/2014 19:13		577.30	577.11
5/10/2014 23:13		577.30	577.07
5/11/2014 3:13		577.30	577.07
5/11/2014 7:13		577.30	577.05
5/11/2014 11:13		577.29	576.95
5/11/2014 15:13		577.29	577.07
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5/12/2014 7:13		577.36	577.31
5/12/2014 11:13		577.36	577.19
5/12/2014 15:13		577.36	577.20
5/12/2014 19:13		577.35	577.18
5/12/2014 23:13		577.36	577.16
5/13/2014 3:13		577.36	577.15
5/13/2014 7:13		577.38	577.28
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5/14/2014 11:13		577.38	577.12
5/14/2014 15:13		577.38	577.11
5/14/2014 19:13		577.38	577.10
5/14/2014 23:13		577.38	577.10
5/15/2014 3:13		577.39	577.13
5/15/2014 7:13		577.40	577.21
5/15/2014 11:13		577.40	577.18
5/15/2014 15:13		577.40	577.21
5/15/2014 19:13		577.40	577.18
5/15/2014 23:13		577.40	577.15
5/16/2014 3:13		577.40	577.14
5/16/2014 7:13		577.40	577.14
5/16/2014 11:13		577.40	577.16
5/16/2014 15:13		577.40	577.17
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5/17/2014 7:13		577.40	577.13
5/17/2014 11:13		577.40	577.15
5/17/2014 15:13		577.40	577.08
5/17/2014 19:13		577.40	577.10
5/17/2014 23:13		577.40	577.10
5/18/2014 3:13		577.40	577.06
5/18/2014 7:13		577.40	577.06
5/18/2014 11:13		577.40	577.02
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5/20/2014 23:13		577.38	577.02
5/21/2014 3:13		577.37	577.04
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5/21/2014 11:13		577.37	576.97
5/21/2014 15:13		577.37	577.00
5/21/2014 19:13		577.36	576.98
5/21/2014 23:13		577.36	576.94
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5/23/2014 11:13		577.34	577.06
5/23/2014 15:13		577.33	576.92
5/23/2014 19:13		577.33	576.95
5/23/2014 23:13		577.33	576.95
5/24/2014 3:13		577.33	576.97
5/24/2014 7:13		577.32	576.96
5/24/2014 11:13		577.32	576.97
5/24/2014 15:13		577.32	576.92
5/24/2014 19:13		577.31	576.93
5/24/2014 23:13		577.31	576.95
5/25/2014 3:13		577.31	576.97
5/25/2014 7:13		577.31	576.96
5/25/2014 11:13		577.30	576.95
5/25/2014 15:13		577.30	576.92
5/25/2014 19:13		577.30	576.90
5/25/2014 23:13		577.29	576.88
5/26/2014 3:13		577.29	576.94
5/26/2014 7:13		577.29	576.95
5/26/2014 11:13		577.28	577.00
5/26/2014 15:13		577.28	576.85
5/26/2014 19:13		577.28	576.92
5/26/2014 23:13		577.29	576.96
5/27/2014 3:13		577.28	576.98
5/27/2014 7:13		577.28	577.00
5/27/2014 11:13		577.28	576.91
5/27/2014 15:13		577.27	576.93
5/27/2014 19:13		577.31	577.07
5/27/2014 23:13		577.33	577.35
5/28/2014 3:13		577.34	577.32
5/28/2014 7:13		577.34	577.28
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5/28/2014 15:13		577.34	577.19
5/28/2014 19:13		577.34	577.13
5/28/2014 23:13		577.34	577.10
5/29/2014 3:13		577.34	577.10
5/29/2014 7:13		577.34	577.07
5/29/2014 11:13		577.34	577.08
5/29/2014 15:13		577.33	577.02
5/29/2014 19:13		577.33	577.00
5/29/2014 23:13		577.33	577.01
5/30/2014 3:13		577.33	577.00
5/30/2014 7:13		577.32	576.99
5/30/2014 11:13		577.32	576.98
5/30/2014 15:13		577.32	576.94
5/30/2014 19:13		577.31	576.92
5/30/2014 23:13		577.31	576.95
5/31/2014 3:13		577.31	576.97
5/31/2014 7:13		577.31	576.95
5/31/2014 11:13		577.30	576.98
5/31/2014 15:13		577.30	576.86
5/31/2014 19:13		577.29	576.86
5/31/2014 23:13		577.29	576.89
6/1/2014 3:13		577.28	576.91
6/1/2014 7:13		577.28	576.91
6/1/2014 11:13		577.28	576.85
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6/1/2014 19:13		577.26	576.82
6/1/2014 23:13		577.26	576.86
6/2/2014 3:13		577.26	576.89
6/2/2014 7:13		577.25	576.90
6/2/2014 11:13		577.25	576.90
6/2/2014 15:13		577.25	576.87
6/2/2014 19:13		577.25	576.88
6/2/2014 23:13		577.25	576.91
6/3/2014 3:13		577.24	576.94
6/3/2014 7:13		577.24	576.93
6/3/2014 11:13		577.24	576.84
6/3/2014 15:13		577.23	576.84
6/3/2014 19:13		577.23	576.82
6/3/2014 23:13		577.22	576.84
6/4/2014 3:13		577.22	576.88
6/4/2014 7:13		577.22	576.90
6/4/2014 11:13		577.22	576.96
6/4/2014 15:13		577.22	577.00
6/4/2014 19:13		577.22	576.99
6/4/2014 23:13		577.22	577.01
6/5/2014 3:13		577.22	577.01
6/5/2014 7:13		577.22	577.00
6/5/2014 11:13		577.21	576.98
6/5/2014 15:13		577.21	576.90
6/5/2014 19:13		577.21	576.88
6/5/2014 23:13		577.20	576.91
6/6/2014 3:13		577.20	576.92
6/6/2014 7:13		577.20	576.92
6/6/2014 11:13		577.19	576.94
6/6/2014 15:13		577.19	576.81
6/6/2014 19:13		577.18	576.79
6/6/2014 23:13		577.18	576.83
6/7/2014 3:13		577.18	576.86
6/7/2014 7:13		577.17	576.87
6/7/2014 11:13		577.16	576.85
6/7/2014 15:13		577.16	576.76
6/7/2014 19:13		577.15	576.78
6/7/2014 23:13		577.15	576.83
6/8/2014 3:13		577.15	576.93
6/8/2014 7:13		577.16	576.97
6/8/2014 11:13		577.16	576.99
6/8/2014 15:13		577.15	576.91
6/8/2014 19:13		577.15	576.90
6/8/2014 23:13		577.15	576.91
6/9/2014 3:13		577.15	576.91
6/9/2014 7:13		577.15	576.92
6/9/2014 11:13		577.14	576.85
6/9/2014 15:13		577.14	576.78
6/9/2014 19:13		577.14	576.84
6/9/2014 23:13		577.13	576.87
6/10/2014 3:13		577.13	576.88
6/10/2014 7:13		577.13	576.90
6/10/2014 11:13		577.12	576.91
6/10/2014 15:13		577.12	576.93
6/10/2014 19:13		577.14	577.06
6/10/2014 23:13		577.18	577.38
6/11/2014 3:13		577.22	577.73
6/11/2014 7:13		577.24	577.60
6/11/2014 11:13		577.24	577.46
6/11/2014 15:13		577.25	577.36
6/11/2014 19:13		577.26	577.31
6/11/2014 23:13		577.26	577.26
6/12/2014 3:13		577.27	577.23
6/12/2014 7:13		577.27	577.20
6/12/2014 11:13		577.27	577.17
6/12/2014 15:13		577.27	577.07
6/12/2014 19:13		577.27	577.08
6/12/2014 23:13		577.27	577.08
6/13/2014 3:13		577.27	577.08
6/13/2014 7:13		577.27	577.06
6/13/2014 11:13		577.27	577.02
6/13/2014 15:13		577.26	576.99
6/13/2014 19:13		577.26	576.96
6/13/2014 23:13		577.26	576.97
6/14/2014 3:13		577.26	576.98
6/14/2014 7:13		577.26	576.96
6/14/2014 11:13		577.26	576.98
6/14/2014 15:13		577.25	576.90
6/14/2014 19:13		577.25	576.88
6/14/2014 23:13		577.25	576.91
6/15/2014 3:13		577.25	576.94
6/15/2014 7:13		577.25	576.94
6/15/2014 11:13		577.24	576.91
6/15/2014 15:13		577.24	576.84
6/15/2014 19:13		577.23	576.84
6/15/2014 23:13		577.23	576.89
6/16/2014 3:13		577.23	576.91
6/16/2014 7:13		577.23	576.91
6/16/2014 11:13		577.22	576.87
6/16/2014 15:13		577.21	576.82
6/16/2014 19:13		577.21	576.80
6/16/2014 23:13		577.20	576.84
6/17/2014 3:13		577.20	576.88
6/17/2014 7:13		577.20	576.90
6/17/2014 11:13		577.20	576.83
6/17/2014 15:13		577.19	576.77
6/17/2014 19:13		577.18	576.76
6/17/2014 23:13		577.18	576.80
6/18/2014 3:13		577.18	576.84
6/18/2014 7:13		577.17	576.86
6/18/2014 11:13		577.17	576.90
6/18/2014 15:13		577.20	577.08
6/18/2014 19:13		577.20	577.09
6/18/2014 23:13		577.24	577.39
6/19/2014 3:13		577.25	577.33
6/19/2014 7:13		577.26	577.27
6/19/2014 11:13		577.26	577.19
6/19/2014 15:13		577.26	577.15
6/19/2014 19:13		577.26	577.12
6/19/2014 23:13		577.28	577.24
6/20/2014 3:13		577.29	577.28
6/20/2014 7:13		577.29	577.25
6/20/2014 11:13		577.29	577.13
6/20/2014 15:13		577.29	577.11
6/20/2014 19:13		577.29	577.09
6/20/2014 23:13		577.29	577.07
6/21/2014 3:13		577.29	577.07
6/21/2014 7:13		577.29	577.07
6/21/2014 11:13		577.29	577.02
6/21/2014 15:13		577.30	577.04
6/21/2014 19:13		577.35	577.72
6/21/2014 23:13		577.36	577.63
6/22/2014 3:13		577.36	577.48
6/22/2014 7:13		577.37	577.38
6/22/2014 11:13		577.37	577.30
6/22/2014 15:13		577.37	577.21
6/22/2014 19:13		577.37	577.16
6/22/2014 23:13		577.37	577.14
6/23/2014 3:13		577.37	577.13
6/23/2014 7:13		577.37	577.15
6/23/2014 11:13		577.38	577.15
6/23/2014 15:13		577.38	577.13
6/23/2014 19:13		577.38	577.09
6/23/2014 23:13		577.38	577.08
6/24/2014 3:13		577.38	577.09
6/24/2014 7:13		577.38	577.09

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

6/24/2014 11:13		577.37	576.99
6/24/2014 15:13		577.37	577.02
6/24/2014 19:13		577.37	576.99
6/24/2014 23:13		577.37	577.01
6/25/2014 3:13		577.37	577.03
6/25/2014 7:13		577.37	577.05
6/25/2014 11:13		577.36	577.02
6/25/2014 15:13		577.46	577.85
6/25/2014 19:13		577.47	577.63
6/25/2014 23:13		577.48	577.46
6/26/2014 3:13		577.48	577.37
6/26/2014 7:13		577.48	577.30
6/26/2014 11:13		577.48	577.20
6/26/2014 15:13		577.48	577.18
6/26/2014 19:13		577.48	577.13
6/26/2014 23:13		577.47	577.12
6/27/2014 3:13		577.47	577.12
6/27/2014 7:13		577.47	577.11
6/27/2014 11:13		577.47	577.06
6/27/2014 15:13		577.46	577.03
6/27/2014 19:13		577.46	576.99
6/27/2014 23:13		577.45	577.00
6/28/2014 3:13		577.45	577.03
6/28/2014 7:13		577.45	577.04
6/28/2014 11:13		577.45	577.00
6/28/2014 15:13		577.44	576.95
6/28/2014 19:13		577.44	576.94
6/28/2014 23:13		577.44	576.97
6/29/2014 3:13		577.43	577.00
6/29/2014 7:13		577.43	577.02
6/29/2014 11:13		577.42	576.97
6/29/2014 15:13		577.42	576.96
6/29/2014 19:13		577.42	576.94
6/29/2014 23:13		577.41	576.97
6/30/2014 3:13		577.41	577.00
6/30/2014 7:13		577.42	577.06
6/30/2014 11:13		577.42	577.06
6/30/2014 15:13		577.42	577.02
6/30/2014 19:13		577.44	577.08
6/30/2014 23:13		577.61	577.92
7/1/2014 3:13		577.67	577.75
7/1/2014 7:13		577.67	577.54
7/1/2014 11:13		577.68	577.43
7/1/2014 15:13		577.67	577.30
7/1/2014 19:13		577.67	577.22
7/1/2014 23:13		577.66	577.20
7/2/2014 3:13		577.66	577.18
7/2/2014 7:13		577.66	577.18
7/2/2014 11:13		577.65	577.24
7/2/2014 15:13		577.65	577.11
7/2/2014 19:13		577.65	577.12
7/2/2014 23:13		577.66	577.19
7/3/2014 3:13		577.66	577.24
7/3/2014 7:13		577.66	577.24
7/3/2014 11:13		577.66	577.16
7/3/2014 15:13		577.65	577.12
7/3/2014 19:13		577.65	577.10
7/3/2014 23:13		577.65	577.10
7/4/2014 3:13		577.64	577.11
7/4/2014 7:13		577.63	577.10
7/4/2014 11:13		577.63	576.89
7/4/2014 15:13		577.62	577.02
7/4/2014 19:13		577.62	577.01
7/4/2014 23:13		577.62	577.03
7/5/2014 3:13		577.61	577.05
7/5/2014 7:13		577.60	577.06
7/5/2014 11:13		577.60	577.05
7/5/2014 15:13		577.59	576.99
7/5/2014 19:13		577.58	576.99
7/5/2014 23:13		577.58	577.01
7/6/2014 3:13		577.57	577.03
7/6/2014 7:13		577.57	577.04
7/6/2014 11:13		577.56	577.08
7/6/2014 15:13		577.55	576.98
7/6/2014 19:13		577.55	576.95
7/6/2014 23:13		577.54	576.97
7/7/2014 3:13		577.57	577.15
7/7/2014 7:13		577.57	577.25
7/7/2014 11:13		577.57	577.22
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7/7/2014 19:13		577.56	577.08
7/7/2014 23:13		577.56	577.08
7/8/2014 3:13		577.55	577.09
7/8/2014 7:13		577.60	577.33
7/8/2014 11:13		577.59	577.24
7/8/2014 15:13		577.59	577.36
7/8/2014 19:13		577.59	577.19
7/8/2014 23:13		577.58	577.16
7/9/2014 3:13		577.58	577.14
7/9/2014 7:13		577.57	577.11
7/9/2014 11:13		577.57	577.35
7/9/2014 15:13		577.56	577.14
7/9/2014 19:13		577.55	577.07
7/9/2014 23:13		577.55	577.05
7/10/2014 3:13		577.54	577.04
7/10/2014 7:13		577.53	576.98
7/10/2014 11:13		577.53	576.98
7/10/2014 15:13		577.52	576.97
7/10/2014 19:13		577.52	576.94
7/10/2014 23:13		577.51	576.96
7/11/2014 3:13		577.50	576.99
7/11/2014 7:13		577.50	577.00
7/11/2014 11:13		577.49	576.97
7/11/2014 15:13		577.48	576.90
7/11/2014 19:13		577.47	576.92
7/11/2014 23:13		577.46	576.94
7/12/2014 3:13		577.46	576.97
7/12/2014 7:13		577.49	577.11
7/12/2014 11:13		577.61	577.58
7/12/2014 15:13		577.62	576.82
7/12/2014 19:13		577.62	576.84
7/12/2014 23:13		577.63	576.85
7/13/2014 3:13		578.06	577.82
7/13/2014 7:13		578.06	577.62
7/13/2014 11:13		577.84	576.01
7/13/2014 15:13		578.02	576.42
7/13/2014 19:13		578.01	576.74
7/13/2014 23:13		578.02	577.34
7/14/2014 3:13		578.00	577.56
7/14/2014 7:13		577.99	577.29
7/14/2014 11:13		577.98	575.79
7/14/2014 15:13		577.97	576.40
7/14/2014 19:13		577.95	576.84
7/14/2014 23:13		577.94	577.44
7/15/2014 3:13		577.92	577.71
7/15/2014 7:13		577.91	577.76
7/15/2014 11:13		577.89	576.50
7/15/2014 15:13		577.88	576.93
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7/15/2014 23:13		577.86	577.68
7/16/2014 3:13		577.84	577.95
7/16/2014 7:13		577.83	577.86
7/16/2014 11:13		577.82	576.28
7/16/2014 15:13		577.81	576.93
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7/17/2014 7:13		577.76	577.80
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7/19/2014 15:13		577.62	576.96
7/19/2014 19:13		577.61	576.95
7/19/2014 23:13		577.60	576.98
7/20/2014 3:13		577.58	577.01
7/20/2014 7:13		577.58	577.02
7/20/2014 11:13		577.57	576.95
7/20/2014 15:13		577.56	576.94
7/20/2014 19:13		577.55	576.93
7/20/2014 23:13		577.54	576.96
7/21/2014 3:13		577.54	576.99
7/21/2014 7:13		577.53	577.00
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7/21/2014 19:13		577.50	576.90
7/21/2014 23:13		577.50	576.93
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7/22/2014 11:13		577.47	576.92
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7/23/2014 11:13		577.43	577.00
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7/23/2014 19:13		577.42	576.89
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7/24/2014 3:13		577.41	576.96
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7/28/2014 19:13		577.26	576.81
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7/29/2014 11:13		577.24	576.88
7/29/2014 15:13		577.23	576.77
7/29/2014 19:13		577.23	576.84
7/29/2014 23:13		577.23	576.90
7/30/2014 3:13		577.22	576.92
7/30/2014 7:13		577.22	576.95
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7/30/2014 15:13		577.21	576.84
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7/30/2014 23:13		577.20	576.85
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7/31/2014 7:13		577.20	576.91
7/31/2014 11:13		577.19	576.87
7/31/2014 15:13		577.18	576.78
7/31/2014 19:13		577.18	576.77
7/31/2014 23:13		577.17	576.82
8/1/2014 3:13		577.17	576.86
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8/1/2014 11:13		577.26	577.39
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8/1/2014 23:13		577.27	577.18
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8/2/2014 11:13		577.27	577.09
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8/3/2014 19:13		577.26	576.92
8/3/2014 23:13		577.25	576.94
8/4/2014 3:13		577.25	576.96
8/4/2014 7:13		577.25	576.97
8/4/2014 11:13		577.24	577.01
8/4/2014 15:13		577.24	576.90
8/4/2014 19:13		577.24	576.89
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8/7/2014 19:13		577.30	576.97
8/7/2014 23:13		577.30	576.99
8/8/2014 3:13		577.30	577.00
8/8/2014 7:13		577.30	577.00
8/8/2014 11:13		577.29	576.97
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8/8/2014 19:13		577.29	576.91
8/8/2014 23:13		577.28	576.93
8/9/2014 3:13		577.28	576.96
8/9/2014 7:13		577.27	576.96
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8/9/2014 19:13		577.26	576.87
8/9/2014 23:13		577.25	576.89
8/10/2014 3:13		577.25	576.93
8/10/2014 7:13		577.25	576.93
8/10/2014 11:13		577.24	576.98
8/10/2014 15:13		577.24	576.94
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8/12/2014 15:13		577.64	577.25
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8/12/2014 23:13		577.63	577.22
8/13/2014 3:13		577.62	577.20
8/13/2014 7:13		577.62	577.15
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8/13/2014 15:13		577.60	577.11
8/13/2014 19:13		577.61	577.10
8/13/2014 23:13		577.61	577.13
8/14/2014 3:13		577.60	577.12
8/14/2014 7:13		577.59	577.11
8/14/2014 11:13		577.59	577.09
8/14/2014 15:13		577.58	577.07
8/14/2014 19:13		577.57	577.05
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8/16/2014 15:13		577.50	576.98
8/16/2014 19:13		577.49	577.02
8/16/2014 23:13		577.49	577.03
8/17/2014 3:13		577.48	577.05
8/17/2014 7:13		577.48	577.01
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8/20/2014 3:13		577.42	577.11
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8/20/2014 23:13		577.40	577.00
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8/21/2014 7:13		577.47	577.33
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8/21/2014 15:13		577.69	577.46
8/21/2014 19:13		577.71	577.36
8/21/2014 23:13		577.70	577.32
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8/23/2014 3:13		577.76	577.21
8/23/2014 7:13		577.75	577.18
8/23/2014 11:13		577.74	577.20
8/23/2014 15:13		578.31	578.87
8/23/2014 19:13		578.31	578.53
8/23/2014 23:13		578.30	578.60
8/24/2014 3:13		578.29	578.36
8/24/2014 7:13		578.27	578.13
8/24/2014 11:13		578.26	576.82
8/24/2014 15:13		578.24	576.89
8/24/2014 19:13		578.22	577.33
8/24/2014 23:13		578.20	577.64
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8/26/2014 7:13		578.12	578.02
8/26/2014 11:13		578.24	578.15
8/26/2014 15:13		578.24	577.60
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8/27/2014 7:13		578.17	578.18
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8/27/2014 19:13		578.11	577.85
8/27/2014 23:13		578.10	578.31
8/28/2014 3:13		578.08	578.42
8/28/2014 7:13		578.06	578.36
8/28/2014 11:13		578.05	576.66
8/28/2014 15:13		578.03	577.14
8/28/2014 19:13		578.02	577.64
8/28/2014 23:13		578.00	577.89
8/29/2014 3:13		577.99	577.84
8/29/2014 7:13		577.97	577.75
8/29/2014 11:13		577.96	576.68
8/29/2014 15:13		577.94	576.63
8/29/2014 19:13		577.93	577.19
8/29/2014 23:13		577.92	577.42
8/30/2014 3:13		577.90	577.49
8/30/2014 7:13		577.89	577.42
8/30/2014 11:13		577.88	577.16
8/30/2014 15:13		577.87	576.73
8/30/2014 19:13		577.85	577.32
8/30/2014 23:13		577.84	577.62
8/31/2014 3:13		577.83	577.88
8/31/2014 7:13		577.82	577.86
8/31/2014 11:13		577.81	577.03
8/31/2014 15:13		577.79	576.67
8/31/2014 19:13		577.78	577.29
8/31/2014 23:13		577.77	577.53
9/1/2014 3:13		577.76	577.51
9/1/2014 7:13		577.75	577.31
9/1/2014 11:13		577.74	576.68
9/1/2014 15:13		577.73	576.62
9/1/2014 19:13		577.72	577.20
9/1/2014 23:13		577.72	577.50
9/2/2014 3:13		577.71	577.77
9/2/2014 7:13		577.70	577.79
9/2/2014 11:13		577.69	576.42
9/2/2014 15:13		577.68	576.77
9/2/2014 19:13		577.67	577.58
9/2/2014 23:13		577.66	578.03
9/3/2014 3:13		577.65	578.21
9/3/2014 7:13		577.65	578.22
9/3/2014 11:13		577.64	576.38
9/3/2014 15:13		577.62	576.71
9/3/2014 19:13		577.62	577.25
9/3/2014 23:13		577.61	577.64
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9/4/2014 7:13		577.59	577.59
9/4/2014 11:13		577.60	577.80
9/4/2014 15:13		577.60	577.26
9/4/2014 19:13		577.60	577.19
9/4/2014 23:13		577.59	577.42
9/5/2014 3:13		577.59	577.36
9/5/2014 7:13		577.58	577.44
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9/7/2014 3:13		577.54	578.82
9/7/2014 7:13		577.54	578.76
9/7/2014 11:13		577.53	576.94
9/7/2014 15:13		577.53	577.31
9/7/2014 19:13		577.52	578.13
9/7/2014 23:13		577.51	578.57
9/8/2014 3:13		577.51	578.73
9/8/2014 7:13		577.50	578.68
9/8/2014 11:13		577.50	576.92
9/8/2014 15:13		577.49	577.14
9/8/2014 19:13		577.48	577.92
9/8/2014 23:13		577.48	578.11
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9/9/2014 7:13		577.47	578.14
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9/11/2014 7:13		577.77	578.95
9/11/2014 11:13		577.75	578.87
9/11/2014 15:13		577.75	578.71
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9/11/2014 23:13		577.73	579.14
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9/12/2014 11:13		577.70	578.65
9/12/2014 15:13		577.69	578.90
9/12/2014 19:13		577.69	579.33
9/12/2014 23:13		577.69	579.43
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9/13/2014 11:13		577.66	578.90
9/13/2014 15:13		577.66	578.63
9/13/2014 19:13		577.65	579.22
9/13/2014 23:13		577.64	579.50
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9/14/2014 7:13		577.63	579.53
9/14/2014 11:13		577.62	578.24
9/14/2014 15:13		577.61	578.05
9/14/2014 19:13		577.60	578.74
9/14/2014 23:13		577.60	579.09
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9/15/2014 7:13		577.58	578.88
9/15/2014 11:13		577.58	578.56
9/15/2014 15:13		577.57	578.49
9/15/2014 19:13		577.57	578.65
9/15/2014 23:13		577.56	578.93
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9/16/2014 11:13		577.55	578.00
9/16/2014 15:13		577.54	577.97
9/16/2014 19:13		577.53	578.69
9/16/2014 23:13		577.53	579.05
9/17/2014 3:13		577.52	579.18
9/17/2014 7:13		577.52	579.09
9/17/2014 11:13		577.51	577.71
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9/18/2014 7:13		577.48	578.99
9/18/2014 11:13		577.48	577.56
9/18/2014 15:13		577.47	577.66
9/18/2014 19:13		577.47	578.33
9/18/2014 23:13		577.46	578.79
9/19/2014 3:13		577.46	578.74
9/19/2014 7:13		577.45	578.81
9/19/2014 11:13		577.45	577.60
9/19/2014 15:13		577.44	577.28
9/19/2014 19:13		577.43	578.10
9/19/2014 23:13		577.43	578.08
9/20/2014 3:13		577.42	578.18
9/20/2014 7:13		577.42	578.12
9/20/2014 11:13		577.42	576.89
9/20/2014 15:13		577.41	577.03
9/20/2014 19:13		577.41	577.57
9/20/2014 23:13		577.41	577.52
9/21/2014 3:13		577.41	577.92
9/21/2014 7:13		577.41	578.32
9/21/2014 11:13		577.41	577.88
9/21/2014 15:13		577.40	577.65
9/21/2014 19:13		577.40	578.32
9/21/2014 23:13		577.39	578.90
9/22/2014 3:13		577.39	579.17
9/22/2014 7:13		577.39	579.32
9/22/2014 11:13		577.38	578.22
9/22/2014 15:13		577.38	578.00
9/22/2014 19:13		577.37	578.73
9/22/2014 23:13		577.37	579.12
9/23/2014 3:13		577.37	579.28
9/23/2014 7:13		577.36	579.32
9/23/2014 11:13		577.36	577.95
9/23/2014 15:13		577.35	577.61

Groundwater Elevations – River South Parcel (RP-1S, RP-2D, RP-2S)

(Hanson Material Services – Romeoville Quarry)

9/23/2014 19:13		577.35	578.59
9/23/2014 23:13		577.35	578.84
9/24/2014 3:13		577.35	579.07
9/24/2014 7:13		577.34	579.01
9/24/2014 11:13		577.34	577.70
9/24/2014 15:13		577.33	577.41
9/24/2014 19:13		577.33	578.32
9/24/2014 23:13		577.32	578.76
9/25/2014 3:13		577.32	578.89
9/25/2014 7:13		577.32	578.77
9/25/2014 11:13		577.32	577.62
9/25/2014 15:13		577.31	577.30
9/25/2014 19:13		577.31	577.20
9/25/2014 23:13		577.31	577.11
9/26/2014 3:13		577.31	577.08
9/26/2014 7:13		577.30	577.05
9/26/2014 11:13		577.30	575.79
9/26/2014 15:13		577.29	577.02
9/26/2014 19:13		577.29	577.08
9/26/2014 23:13		577.29	577.04
9/27/2014 3:13		577.29	577.07
9/27/2014 7:13		577.28	576.94
9/27/2014 11:13		577.28	576.21
9/27/2014 15:13		577.28	576.98
9/27/2014 19:13		577.27	577.04
9/27/2014 23:13		577.27	577.03
9/28/2014 3:13		577.27	577.04
9/28/2014 7:13		577.27	577.01
9/28/2014 11:13		577.27	577.03
9/28/2014 15:13		577.26	577.02
9/28/2014 19:13		577.26	577.04
9/28/2014 23:13		577.26	577.03
9/29/2014 3:13		577.26	577.04
9/29/2014 7:13		577.26	577.02
9/29/2014 11:13		577.25	577.01
9/29/2014 15:13		577.25	577.07
9/29/2014 19:13		577.25	577.00
9/29/2014 23:13		577.25	577.02
9/30/2014 3:13		577.24	577.03
9/30/2014 7:13		577.24	577.03
9/30/2014 11:13		577.24	577.01
9/30/2014 15:13		577.24	576.99
9/30/2014 19:13		577.23	577.03
9/30/2014 23:13		577.23	577.04
10/1/14 0:00	582.68		577.02
10/1/2014 3:13		577.23	577.05
10/1/2014 7:13		577.23	577.00
10/1/2014 11:13		577.23	577.03
10/1/2014 15:13		577.23	576.51
10/1/2014 19:13		577.22	577.15
10/1/2014 23:13		577.22	577.08
10/2/2014 3:13		577.22	577.20
10/2/2014 7:13		577.22	577.17
10/2/2014 11:13		577.22	576.70
10/2/2014 15:13		577.22	576.42
10/2/2014 19:13		577.21	576.99
10/2/2014 23:13		577.22	576.99
10/3/2014 3:13		577.60	577.78
10/3/2014 7:13		577.97	578.40
10/3/2014 11:13		577.99	577.88
10/3/2014 15:13		577.98	578.25
10/3/2014 19:13		577.97	578.42
10/3/2014 23:13		577.95	578.47
10/4/2014 3:13		577.94	578.50
10/4/2014 7:13		577.92	578.66
10/4/2014 11:13		577.91	578.39
10/4/2014 15:13		577.89	578.16
10/4/2014 19:13		577.88	578.44
10/4/2014 23:13		577.87	578.78
10/5/2014 3:13		577.85	578.54
10/5/2014 7:13		577.83	578.51
10/5/2014 11:13		577.82	577.35
10/5/2014 15:13		577.81	577.45
10/5/2014 19:13		577.79	577.84
10/5/2014 23:13		577.78	577.88
10/6/2014 3:13		577.77	578.19

10/6/2014 7:13		577.76	578.01
10/6/2014 11:13		577.75	577.03
10/6/2014 15:13		577.73	576.99
10/6/2014 19:13		577.72	578.02
10/6/2014 23:13		577.71	578.35
10/7/2014 3:13		577.70	578.19
10/7/2014 7:13		577.69	577.90
10/7/2014 11:13		577.68	576.73
10/7/2014 15:13		577.67	576.75
10/7/2014 19:13		577.66	577.89
10/7/2014 23:13		577.64	578.37
10/8/2014 3:13		577.64	578.59
10/8/2014 7:13		577.63	578.67
10/8/2014 11:13		577.61	577.28
10/8/2014 15:13		577.61	577.12
10/8/2014 19:13		577.60	578.27
10/8/2014 23:13		577.59	578.05
10/9/2014 3:13		577.58	578.23
10/9/2014 7:13		577.57	578.41
10/9/2014 11:13		577.56	577.39
10/9/2014 15:13		577.56	577.32
10/9/2014 19:13		577.55	578.36
10/9/2014 23:13		577.54	578.72
10/10/2014 3:13		577.53	578.77
10/10/2014 7:13		577.53	578.96
10/10/2014 11:13		577.52	577.41
10/10/2014 15:13		577.51	577.72
10/10/2014 19:13		577.51	578.27
10/10/2014 23:13		577.50	578.95
10/11/2014 3:13		577.49	579.15
10/11/2014 7:13		577.49	579.19
10/11/2014 11:13		577.48	577.65
10/11/2014 15:13		577.48	577.10
10/11/2014 19:13		577.47	577.23
10/11/2014 23:13		577.47	577.14
10/12/2014 3:13		577.46	577.12
10/12/2014 7:13		577.46	577.05
10/12/2014 11:13		577.45	576.06
10/12/2014 15:13		577.45	577.07
10/12/2014 19:13		577.44	577.12
10/12/2014 23:13		577.44	577.05
10/13/2014 3:13		577.43	577.00
10/13/2014 7:13		577.43	577.14
10/13/2014 11:13		577.43	576.53
10/13/2014 15:13		577.43	576.35
10/13/2014 19:13		577.45	576.48
10/13/2014 23:13		577.46	576.59
10/14/2014 3:13		577.46	576.58
10/14/2014 7:13		577.45	576.73
10/14/2014 11:13		577.46	576.15
10/14/2014 15:13		577.47	576.50
10/14/2014 19:13		577.49	576.99
10/14/2014 23:13		577.57	577.44
10/15/2014 3:13		577.59	577.55
10/15/2014 7:13		577.60	577.59
10/15/2014 11:13		577.60	577.45
10/15/2014 15:13		577.62	577.39
10/15/2014 19:13		577.62	577.44
10/15/2014 23:13		577.61	577.39
10/16/2014 3:13		577.61	577.44
10/16/2014 7:13		577.60	577.50
10/16/2014 11:13		577.59	577.20
10/16/2014 15:13		577.59	576.99
10/16/2014 19:13		577.58	577.49
10/16/2014 23:13		577.57	577.29
10/17/2014 3:13		577.57	577.39
10/17/2014 7:13		577.56	577.68
10/17/2014 11:13		577.56	576.61
10/17/2014 15:13		577.55	576.81
10/17/2014 19:13		577.54	577.18
10/17/2014 23:13		577.54	577.61
10/18/2014 3:13		577.53	577.99
10/18/2014 7:13		577.52	577.85
10/18/2014 11:13		577.52	577.63
10/18/2014 15:13		577.51	577.56
10/18/2014 19:13		577.51	578.06

10/18/2014 23:13		577.50	578.68
10/19/2014 3:13		577.50	578.81
10/19/2014 7:13		577.49	578.67
10/19/2014 11:13		577.48	577.39
10/19/2014 15:13		577.48	577.16
10/19/2014 19:13		577.48	577.51
10/19/2014 23:13		577.47	577.49
10/20/2014 3:13		577.47	577.71
10/20/2014 7:13		577.46	577.77
10/20/2014 11:13		577.46	576.43
10/20/2014 15:13		577.45	576.27
10/20/2014 19:13		577.45	577.13
10/20/2014 23:13		577.45	577.41
10/21/2014 3:13		577.44	577.76
10/21/2014 7:13		577.44	577.92
10/21/2014 11:13		577.43	577.46
10/21/2014 15:13		577.43	577.46
10/21/2014 19:13		577.43	577.82
10/21/2014 23:13		577.42	578.13
10/22/2014 3:13		577.42	578.68
10/22/2014 7:13		577.41	578.87
10/22/2014 11:13		577.41	577.24
10/22/2014 15:13		577.41	577.07
10/22/2014 19:13		577.40	577.14
10/22/2014 23:13		577.40	577.09
10/23/2014 3:13		577.40	577.10
10/23/2014 7:13		577.39	577.02
10/23/2014 11:13		577.39	576.41
10/23/2014 15:13		577.39	577.06
10/23/2014 19:13		577.38	577.04
10/23/2014 23:13		577.38	577.08
10/24/2014 3:13		577.38	577.10
10/24/2014 7:13		577.37	577.06
10/24/2014 11:13		577.37	577.08
10/24/2014 15:13		577.37	577.07
10/24/2014 19:13		577.37	577.10
10/24/2014 23:13		577.37	577.09
10/25/2014 3:13		577.36	577.12
10/25/2014 7:13		577.36	577.16
10/25/2014 11:13		577.35	577.05
10/25/2014 15:13		577.35	577.06
10/25/2014 19:13		577.35	577.11
10/25/2014 23:13		577.35	577.09
10/26/2014 3:13		577.35	577.07
10/26/2014 7:13		577.34	577.07
10/26/2014 11:13		577.34	577.00
10/26/2014 15:13		577.34	577.06
10/26/2014 19:13		577.34	577.08
10/26/2014 23:13		577.33	577.07
10/27/2014 3:13		577.33	577.08
10/27/2014 7:13		577.33	577.08
10/27/2014 11:13		577.33	576.92
10/27/2014 15:13		577.32	577.07
10/27/2014 19:13		577.32	577.07
10/27/2014 23:13		577.32	577.07
10/28/2014 3:13		577.32	577.08
10/28/2014 7:13		577.32	577.12
10/28/2014 11:13		577.32	577.07
10/28/2014 15:13		577.31	577.07
10/28/2014 19:13		577.31	577.07
10/28/2014 23:13		577.31	577.07
10/29/2014 3:13		577.31	577.04
10/29/2014 7:13		577.30	577.05
10/29/2014 11:13		577.30	577.01
10/29/2014 15:13		577.30	577.05
10/29/2014 19:13		577.30	577.06
10/29/2014 23:13		577.30	577.08
10/30/2014 3:13		577.30	577.07
10/30/2014 7:13		577.29	577.06
10/30/2014 11:13		577.29	577.10
10/30/2014 15:13		577.29	577.03
10/30/2014 19:13		577.29	577.06
10/30/2014 23:13		577.29	577.07
10/31/2014 3:13		577.28	577.12
10/31/2014 7:13		577.28	577.09
10/31/2014 11:13		577.28	577.10

10/31/2014 15:13		577.28	577.09
10/31/2014 19:13		577.28	577.05
10/31/2014 23:13		577.27	577.04
11/1/2014 3:13		577.27	577.07
11/1/2014 7:13		577.27	577.08
11/1/2014 11:13		577.27	576.83
11/1/2014 15:13		577.26	577.06
11/1/2014 19:13		577.27	577.07
11/1/2014 23:13		577.27	577.05
11/2/2014 2:13		577.26	577.06
11/2/2014 6:13		577.26	577.06
11/2/2014 10:13		577.26	576.97
11/2/2014 14:13		577.26	577.03
11/2/2014 18:13		577.26	577.04
11/2/2014 22:13		577.26	577.07
11/3/2014 2:13		577.26	577.06
11/3/2014 6:13		577.25	577.06
11/3/2014 10:13		577.25	576.90
11/3/2014 14:13		577.25	577.05
11/3/2014 18:13		577.25	577.06
11/3/2014 22:13		577.25	577.05
11/4/2014 2:13		577.25	577.05
11/4/2014 6:13		577.25	577.05
11/4/2014 10:13		577.25	577.05
11/4/2014 14:13		577.25	577.06
11/4/2014 18:13		577.25	577.07
11/4/2014 22:13		577.24	577.06
11/5/2014 2:13		577.24	577.08
11/5/2014 6:13		577.24	577.04
11/5/2014 10:13		577.24	577.02
11/5/2014 14:13		577.24	577.08
11/5/2014 18:13		577.24	577.05
11/5/2014 22:13		577.24	577.06
11/6/2014 2:13		577.24	577.05
11/6/2014 6:13		577.24	577.05
11/6/2014 10:13		577.23	577.05
11/6/2014 14:13		577.23	577.06
11/6/2014 18:13		577.23	577.05
11/6/2014 22:13		577.23	577.05
11/7/2014 2:13		577.23	577.04
11/7/2014 6:13		577.23	577.04
11/7/2014 10:13		577.22	576.97
11/7/2014 14:13		577.22	577.07
11/7/2014 18:13		577.22	577.05
11/7/2014 22:13		577.22	577.05
11/8/2014 2:13		577.22	577.05
11/8/2014 6:13		577.22	577.06
11/8/2014 10:13		577.22	577.08
11/8/2014 14:13		577.22	577.16
11/8/2014 18:13		577.22	577.07
11/8/2014 22:13		577.22	577.02
11/9/2014 2:13		577.21	577.06
11/9/2014 6:13		577.21	577.00
11/9/2014 10:13		577.21	577.04
11/9/2014 14:13		577.21	577.05
11/9/2014 18:13		577.21	577.04
11/9/2014 22:13		577.21	577.03
11/10/14 0:00	582.51	577.17	577.04
11/10/2014 2:13		577.21	577.04
11/10/2014 6:13		577.21	577.05
11/10/2014 10:13		577.21	576.87
11/20/14 0:00	582.44		
2/10/15 0:00	584.06	577.18	577.13
6/4/15 0:00	583.49	577.25	576.99
10/13/15 0:00	582.20	577.09	576.95
3/3/16 0:00	582.62	577.31	577.11
8/31/16 0:00	589.73	577.44	577.19
1/19/17 0:00	588.45	577.12	577.04
7/24/17 0:00	592.23		
10/12/17 0:00	582.94	576.38	577.03
2/28/18 0:00	590.70	577.82	577.36
5/7/18 0:00	582.76	577.35	577.11
8/6/18 0:00	582.57		
6/3/19 0:00	592.85	577.92	577.31
9/12/19 0:00	583.14	576.77	577.89

Notes:

ft msl = Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)

TOC = Top of PVC Casing

ft = feet

A = as measured inside well

--- No Elevation

Cells highlighted in yellow are manual WLs

Cells in gray are drought WLs and excluded from calculations

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

Date and Time	RP-3S East	RP-3S West
7/9/13 0:00	588.796	589.097
7/15/13 0:00	586.766	587.887
8/21/13 0:00	579.106	579.887
9/6/13 0:00	579.776	580.477
9/6/2013 16:00	579.77	580.49
9/6/2013 20:00	579.75	580.47
9/7/2013 0:00	579.70	580.43
9/7/2013 4:00	579.67	580.40
9/7/2013 8:00	579.63	580.35
9/7/2013 12:00	579.57	580.29
9/7/2013 16:00	579.51	580.25
9/7/2013 20:00	579.50	580.25
9/8/2013 0:00	579.45	580.22
9/8/2013 4:00	579.40	580.16
9/8/2013 8:00	579.35	580.11
9/8/2013 12:00	579.29	580.05
9/8/2013 16:00	579.24	580.02
9/8/2013 20:00	579.23	580.01
9/9/2013 0:00	579.19	579.97
9/9/2013 4:00	579.15	579.94
9/9/2013 8:00	579.13	579.90
9/9/2013 12:00	579.07	579.86
9/9/2013 16:00	579.05	579.84
9/9/2013 20:00	579.01	579.81
9/10/2013 0:00	578.96	579.77
9/10/2013 4:00	578.94	579.74
9/10/2013 8:00	578.88	579.70
9/10/2013 12:00	578.82	579.63
9/10/2013 16:00	578.79	579.60
9/10/2013 20:00	578.76	579.59
9/11/2013 0:00	578.73	579.55
9/11/2013 4:00	578.70	579.55
9/11/2013 8:00	578.67	579.51
9/11/2013 12:00	578.64	579.46
9/11/2013 16:00	578.63	579.47
9/11/2013 20:00	578.61	579.45
9/12/2013 0:00	578.58	579.44
9/12/2013 4:00	578.56	579.43
9/12/2013 8:00	578.53	579.41
9/12/2013 12:00	578.51	579.38
9/12/2013 16:00	578.47	579.35
9/12/2013 20:00	578.47	579.35
9/13/2013 0:00	578.43	579.34
9/13/2013 4:00	578.40	579.33
9/13/2013 8:00	578.37	579.28
9/13/2013 12:00	578.33	579.24
9/13/2013 16:00	578.28	579.20
9/13/2013 20:00	578.30	579.23
9/14/2013 0:00	578.27	579.21
9/14/2013 4:00	578.25	579.19
9/14/2013 8:00	578.22	579.16
9/14/2013 12:00	578.19	579.13
9/14/2013 16:00	578.17	579.11
9/14/2013 20:00	578.20	579.13
9/15/2013 0:00	578.20	579.11
9/15/2013 4:00	578.19	579.08
9/15/2013 8:00	578.19	579.09
9/15/2013 12:00	578.18	579.07
9/15/2013 16:00	578.19	579.07
9/15/2013 20:00	578.20	579.06
9/16/2013 0:00	578.59	579.14
9/16/2013 4:00	578.83	579.41
9/16/2013 8:00	578.92	579.67
9/16/2013 12:00	578.89	579.76
9/16/2013 16:00	578.82	579.76
9/16/2013 20:00	578.77	579.75
9/17/2013 0:00	578.72	579.70
9/17/2013 4:00	578.65	579.64
9/17/2013 8:00	578.60	579.59
9/17/2013 12:00	578.55	579.53
9/17/2013 16:00	578.51	579.50
9/17/2013 20:00	578.49	579.47
9/18/2013 0:00	578.46	579.45
9/18/2013 4:00	578.42	579.40
9/18/2013 8:00	578.38	579.35
9/18/2013 12:00	578.33	579.31
9/18/2013 16:00	578.31	579.29
9/18/2013 20:00	578.31	579.28
9/19/2013 0:00	578.29	579.26
9/19/2013 4:00	578.33	579.25
9/19/2013 8:00	578.33	579.25
9/19/2013 12:00	578.30	579.24
9/19/2013 16:00	578.31	579.24
9/19/2013 20:00	578.28	579.25
9/20/2013 0:00	578.25	579.24
9/20/2013 4:00	578.24	579.20
9/20/2013 8:00	578.22	579.18
9/20/2013 12:00	578.20	579.14
9/20/2013 16:00	578.20	579.15
9/20/2013 20:00	578.19	579.14
9/21/2013 0:00	578.19	579.12
9/21/2013 4:00	578.19	579.11
9/21/2013 8:00	578.19	579.09
9/21/2013 12:00	578.15	579.04
9/21/2013 16:00	578.17	579.03
9/21/2013 20:00	578.19	579.03
9/22/2013 0:00	578.20	579.01
9/22/2013 4:00	578.18	579.00
9/22/2013 8:00	578.19	578.98
9/22/2013 12:00	578.17	578.94
9/22/2013 16:00	578.16	578.93
9/22/2013 20:00	578.20	578.94
9/23/2013 0:00	578.19	578.93
9/23/2013 4:00	578.18	578.91
9/23/2013 8:00	578.19	578.90
9/23/2013 12:00	578.17	578.87
9/23/2013 16:00	578.15	578.84
9/23/2013 20:00	578.18	578.88
9/24/2013 0:00	578.19	578.88
9/24/2013 4:00	578.18	578.86
9/24/2013 8:00	578.17	578.85
9/24/2013 12:00	578.17	578.83
9/24/2013 16:00	578.14	578.80
9/24/2013 20:00	578.18	578.83
9/25/2013 0:00	578.17	578.82
9/25/2013 4:00	578.18	578.82
9/25/2013 8:00	578.16	578.80
9/25/2013 12:00	578.15	578.77
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12/8/2013 3:00	587.83	588.58
12/8/2013 7:00	587.82	588.57
12/8/2013 11:00	587.83	588.57
12/8/2013 15:00	587.83	588.56
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12/8/2013 23:00	587.77	588.50
12/9/2013 3:00	587.72	588.46
12/9/2013 7:00	587.65	588.41
12/9/2013 11:00	587.58	588.35
12/9/2013 15:00	587.55	588.32
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12/10/2013 19:00	587.20	588.02
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12/11/2013 15:00	586.80	587.81
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12/16/2013 3:00	584.57	585.11
12/16/2013 7:00	584.50	585.03
12/16/2013 11:00	584.48	584.99
12/16/2013 15:00	584.46	584.95
12/16/2013 19:00	584.41	584.88
12/16/2013 23:00	584.33	584.79
12/17/2013 3:00	584.29	584.74
12/17/2013 7:00	584.21	584.66
12/17/2013 11:00	584.20	584.60
12/17/2013 15:00	584.13	584.54
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12/18/2013 7:00	583.81	584.17
12/18/2013 11:00	583.78	584.14
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12/18/2013 23:00	583.73	584.07
12/19/2013 3:00	583.70	584.05
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12/20/2013 15:00	583.51	583.85
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12/20/2013 23:00	584.11	584.54
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12/23/2013 11:00	589.62	590.40
12/23/2013 15:00	589.65	590.43
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12/25/2013 7:00	589.16	589.86
12/25/2013 11:00	589.09	589.80
12/25/2013 15:00	589.03	589.74
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12/25/2013 23:00	588.92	589.64
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12/27/2013 7:00	588.48	589.22
12/27/2013 11:00	588.46	589.22
12/27/2013 15:00	588.46	589.21
12/27/2013 19:00	588.41	589.17
12/27/2013 23:00	588.39	589.15
12/28/2013 3:00	588.34	589.12
12/28/2013 7:00	588.31	589.08
12/28/2013 11:00	588.31	589.07
12/28/2013 15:00	588.30	589.07

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

12/28/2013 19:00	588.30	589.08
12/28/2013 23:00	588.29	589.08
12/29/2013 3:00	588.32	589.10
12/29/2013 7:00	588.31	589.09
12/29/2013 11:00	588.28	589.09
12/29/2013 15:00	588.28	589.09
12/29/2013 19:00	588.24	589.04
12/29/2013 23:00	588.20	589.02
12/30/2013 3:00	588.16	588.96
12/30/2013 7:00	588.10	588.89
12/30/2013 11:00	588.12	588.92
12/30/2013 15:00	588.13	588.93
12/30/2013 19:00	588.11	588.89
12/30/2013 23:00	588.07	588.85
12/31/2013 3:00	588.00	588.78
12/31/2013 7:00	587.93	588.73
12/31/2013 11:00	587.94	588.73
12/31/2013 15:00	587.95	588.75
12/31/2013 19:00	587.91	588.70
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2/12/2014 3:00	585.30	586.91
2/12/2014 7:00	585.27	586.83

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2/19/2014 19:00	583.24	583.56
2/19/2014 23:00	583.23	583.56
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2/20/2014 11:00	583.83	584.49
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2/20/2014 23:00	589.78	591.23
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2/21/2014 7:00	591.61	592.46
2/21/2014 11:00	591.94	592.74
2/21/2014 15:00	592.20	592.96
2/21/2014 19:00	592.40	593.17
2/21/2014 23:00	592.60	593.38
2/22/2014 3:00	592.78	593.55
2/22/2014 7:00	592.92	593.65
2/22/2014 11:00	593.06	593.75
2/22/2014 15:00	593.18	593.82
2/22/2014 19:00	593.27	593.85
2/22/2014 23:00	593.32	593.87
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2/23/2014 15:00	593.34	593.77
2/23/2014 19:00	593.27	593.68
2/23/2014 23:00	593.20	593.58
2/24/2014 3:00	593.10	593.50
2/24/2014 7:00	593.03	593.40
2/24/2014 11:00	592.98	593.34
2/24/2014 15:00	592.94	593.29
2/24/2014 19:00	592.84	593.18
2/24/2014 23:00	592.75	593.08
2/25/2014 3:00	592.68	592.99
2/25/2014 7:00	592.58	592.89
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2/25/2014 15:00	592.46	592.75
2/25/2014 19:00	592.32	592.61
2/25/2014 23:00	592.20	592.46
2/26/2014 3:00	592.08	592.33
2/26/2014 7:00	591.95	592.20
2/26/2014 11:00	591.89	592.13
2/26/2014 15:00	591.81	592.04
2/26/2014 19:00	591.65	591.88
2/26/2014 23:00	591.54	591.77
2/27/2014 3:00	591.37	591.61
2/27/2014 7:00	591.22	591.47
2/27/2014 11:00	591.13	591.39
2/27/2014 15:00	591.06	591.33
2/27/2014 19:00	590.92	591.19
2/27/2014 23:00	590.80	591.07
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2/28/2014 7:00	590.71	590.97
2/28/2014 11:00	590.68	590.98
2/28/2014 15:00	590.65	590.95
2/28/2014 19:00	590.58	590.87
2/28/2014 23:00	590.54	590.82
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3/3/2014 7:00	589.58	590.18
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3/9/2014 8:00	589.23	589.92
3/9/2014 12:00	589.28	589.97
3/9/2014 16:00	589.30	589.98
3/9/2014 20:00	589.38	590.03
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3/10/2014 8:00	589.81	590.59
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3/15/2014 20:00	594.19	594.50
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3/16/2014 12:00	594.24	594.50
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3/18/2014 4:00	593.81	594.04
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3/27/2014 12:00	592.13	592.46
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3/29/2014 20:00	591.62	591.96
3/30/2014 0:00	591.57	591.90

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3/30/2014 8:00	591.51	591.84
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3/30/2014 16:00	591.45	591.80
3/30/2014 20:00	591.46	591.80
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3/31/2014 8:00	591.36	591.70
3/31/2014 12:00	591.33	591.67
3/31/2014 16:00	591.30	591.65
3/31/2014 20:00	591.28	591.63
4/1/2014 0:00	591.26	591.60
4/1/2014 4:00	591.23	591.57
4/1/2014 8:00	591.17	591.52
4/1/2014 12:00	591.16	591.48
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4/2/2014 16:00	590.97	591.31
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4/3/2014 0:00	590.93	591.26
4/3/2014 4:00	590.93	591.26
4/3/2014 8:00	591.18	591.67
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4/3/2014 16:00	592.47	593.20
4/3/2014 20:00	592.85	593.52
4/4/2014 0:00	593.17	593.78
4/4/2014 4:00	593.46	593.99
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4/5/2014 16:00	594.26	594.51
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4/8/2014 16:00	593.19	593.46
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4/10/2014 20:00	592.24	592.54
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4/11/2014 4:00	592.10	592.40
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4/11/2014 16:00	591.90	592.20
4/11/2014 20:00	591.86	592.17
4/12/2014 0:00	591.81	592.12
4/12/2014 4:00	591.74	592.06
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4/12/2014 16:00	591.60	591.92
4/12/2014 20:00	591.56	591.89
4/13/2014 0:00	591.53	591.85
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4/13/2014 12:00	591.38	591.71
4/13/2014 16:00	591.36	591.69
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4/14/2014 0:00	591.42	591.75
4/14/2014 4:00	591.44	591.77
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4/16/2014 0:00	591.18	591.53
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4/16/2014 12:00	591.08	591.41
4/16/2014 16:00	591.04	591.38
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4/18/2014 12:00	590.71	591.04
4/18/2014 16:00	590.68	591.00
4/18/2014 20:00	590.68	591.00
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4/19/2014 12:00	590.57	590.88
4/19/2014 16:00	590.53	590.84
4/19/2014 20:00	590.55	590.85
4/20/2014 0:00	590.52	590.82
4/20/2014 4:00	590.48	590.80
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4/20/2014 16:00	590.35	590.70
4/20/2014 20:00	590.31	590.71
4/21/2014 0:00	590.22	590.69
4/21/2014 4:00	590.21	590.67
4/21/2014 8:00	590.18	590.64
4/21/2014 12:00	590.15	590.61
4/21/2014 16:00	590.13	590.61
4/21/2014 20:00	590.16	590.62

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

4/22/2014 0:00	590.52	590.84
4/22/2014 4:00	590.61	590.91
4/22/2014 8:00	590.55	590.86
4/22/2014 12:00	590.52	590.82
4/22/2014 16:00	590.49	590.80
4/22/2014 20:00	590.46	590.77
4/23/2014 0:00	590.33	590.72
4/23/14 0:00	590.106	590.557
4/23/2014 4:00	590.22	590.67
4/23/2014 8:00	590.19	590.65
4/23/2014 12:00	590.15	590.62
4/23/2014 16:00	590.11	590.59
4/23/2014 20:00	590.10	590.57
4/24/2014 0:00	590.09	590.55
4/24/2014 4:00	590.05	590.52
4/24/2014 8:00	590.03	590.49
4/24/2014 12:00	589.98	590.45
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4/25/2014 0:00	589.95	590.43
4/25/2014 4:00	589.92	590.40
4/25/2014 8:00	589.95	590.43
4/25/2014 12:00	589.95	590.43
4/25/2014 16:00	589.95	590.42
4/25/2014 20:00	589.92	590.40
4/26/2014 0:00	589.90	590.38
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4/26/2014 20:00	589.78	590.25
4/27/2014 0:00	589.76	590.23
4/27/2014 4:00	589.73	590.20
4/27/2014 8:00	589.73	590.19
4/27/2014 12:00	589.69	590.17
4/27/2014 16:00	589.69	590.16
4/27/2014 20:00	589.67	590.15
4/28/2014 0:00	589.65	590.13
4/28/2014 4:00	589.72	590.19
4/28/2014 8:00	589.94	590.41
4/28/2014 12:00	590.14	590.63
4/28/2014 16:00	590.28	590.71
4/28/2014 20:00	590.35	590.71
4/29/2014 0:00	590.47	590.83
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4/29/2014 20:00	590.81	591.16
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4/30/2014 8:00	590.72	591.07
4/30/2014 12:00	590.70	591.04
4/30/2014 16:00	590.67	591.00
4/30/2014 20:00	590.62	590.97
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5/1/2014 4:00	590.56	590.90
5/1/2014 8:00	590.52	590.85
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5/2/2014 0:00	590.21	590.67
5/2/14 0:00	590.096	590.547
5/2/2014 4:00	590.18	590.65
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5/2/2014 12:00	590.13	590.60
5/2/2014 16:00	590.11	590.57
5/2/2014 20:00	590.11	590.56
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5/3/2014 4:00	590.05	590.51
5/3/2014 8:00	590.03	590.47
5/3/2014 12:00	590.00	590.44
5/3/2014 16:00	589.98	590.44
5/3/2014 20:00	589.96	590.41
5/4/2014 0:00	589.94	590.39
5/4/2014 4:00	589.92	590.36
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5/4/2014 12:00	589.87	590.32
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5/4/2014 20:00	589.86	590.29
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7/19/2014 20:00	593.05	593.29
7/20/2014 0:00	592.96	593.23
7/20/2014 4:00	592.86	593.13
7/20/2014 8:00	592.80	593.06
7/20/2014 12:00	592.71	592.97
7/20/2014 16:00	592.62	592.91
7/20/2014 20:00	592.58	592.87
7/21/2014 0:00	592.51	592.80
7/21/2014 4:00	592.44	592.74
7/21/2014 8:00	592.35	592.66
7/21/2014 12:00	592.26	592.58
7/21/2014 16:00	592.17	592.51
7/21/2014 20:00	592.12	592.46

7/22/2014 0:00	592.05	592.41
7/22/2014 4:00	592.00	592.35
7/22/2014 8:00	591.94	592.31
7/22/2014 12:00	591.85	592.21
7/22/2014 16:00	591.80	592.16
7/22/2014 20:00	591.76	592.13
7/23/2014 0:00	591.73	592.09
7/23/2014 4:00	591.67	592.03
7/23/2014 8:00	591.64	592.01
7/23/2014 12:00	591.58	591.93
7/23/2014 16:00	591.53	591.90
7/23/2014 20:00	591.49	591.85
7/24/2014 0:00	591.46	591.82
7/24/2014 4:00	591.40	591.77
7/24/2014 8:00	591.38	591.75
7/24/2014 12:00	591.31	591.67
7/24/2014 16:00	591.26	591.64
7/24/2014 20:00	591.26	591.62
7/25/2014 0:00	591.22	591.57
7/25/2014 4:00	591.18	591.53
7/25/2014 8:00	591.16	591.51
7/25/2014 12:00	591.12	591.47
7/25/2014 16:00	591.07	591.43
7/25/2014 20:00	591.05	591.40
7/26/2014 0:00	591.01	591.36
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7/26/2014 8:00	590.96	591.30
7/26/2014 12:00	590.91	591.24
7/26/2014 16:00	590.88	591.23
7/26/2014 20:00	590.86	591.20
7/27/2014 0:00	590.85	591.19
7/27/2014 4:00	590.82	591.15
7/27/2014 8:00	590.80	591.12
7/27/2014 12:00	590.74	591.07
7/27/2014 16:00	590.69	591.02
7/27/2014 20:00	590.68	591.00
7/28/2014 0:00	590.65	590.97
7/28/2014 4:00	590.63	590.95
7/28/2014 8:00	590.59	590.91
7/28/2014 12:00	590.55	590.86
7/28/2014 16:00	590.52	590.84
7/28/2014 20:00	590.50	590.83
7/29/2014 0:00	590.48	590.80
7/29/2014 4:00	590.45	590.78
7/29/2014 8:00	590.44	590.75
7/29/2014 12:00	590.33	590.70
7/29/2014 16:00	590.25	590.68
7/29/2014 20:00	590.25	590.66
7/30/2014 0:00	590.23	590.65
7/30/2014 4:00	590.20	590.63
7/30/2014 8:00	590.17	590.59
7/30/2014 12:00	590.13	590.54
7/30/2014 16:00	590.10	590.51
7/30/2014 20:00	590.07	590.50
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7/31/2014 12:00	589.96	590.38
7/31/2014 16:00	589.94	590.36
7/31/2014 20:00	589.94	590.35
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8/1/2014 4:00	589.88	590.31
8/1/2014 8:00	590.08	590.61
8/1/2014 12:00	590.84	591.40
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8/1/2014 20:00	591.45	591.92
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8/2/2014 8:00	591.56	591.96
8/2/2014 12:00	591.45	591.83
8/2/2014 16:00	591.34	591.68
8/2/2014 20:00	591.25	591.58
8/3/2014 0:00	591.15	591.47
8/3/2014 4:00	591.05	591.37
8/3/2014 8:00	590.94	591.25
8/3/2014 12:00	590.83	591.14
8/3/2014 16:00	590.75	591.07
8/3/2014 20:00	590.69	591.00
8/4/2014 0:00	590.63	590.94
8/4/2014 4:00	590.55	590.87
8/4/2014 8:00	590.51	590.82
8/4/2014 12:00	590.43	590.74
8/4/2014 16:00	590.33	590.69
8/4/2014 20:00	590.26	590.68
8/5/2014 0:00	590.22	590.63
8/5/2014 4:00	591.22	591.87
8/5/2014 8:00	591.60	592.15
8/5/2014 12:00	591.86	592.43
8/5/2014 16:00	592.07	592.62
8/5/2014 20:00	592.22	592.75
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8/6/2014 4:00	592.31	592.75
8/6/2014 8:00	592.27	592.72
8/6/2014 12:00	592.22	592.64
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8/6/2014 20:00	592.11	592.50
8/7/2014 0:00	592.02	592.40
8/7/2014 4:00	591.92	592.28
8/7/2014 8:00	591.80	592.15
8/7/2014 12:00	591.66	591.99
8/7/2014 16:00	591.53	591.85
8/7/2014 20:00	591.41	591.73
8/8/2014 0:00	591.34	591.65
8/8/2014 4:00	591.24	591.57
8/8/2014 8:00	591.16	591.48
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8/9/2014 4:00	590.82	591.13
8/9/2014 8:00	590.77	591.08
8/9/2014 12:00	590.70	591.00
8/9/2014 16:00	590.63	590.95
8/9/2014 20:00	590.60	590.92
8/10/2014 0:00	590.56	590.88
8/10/2014 4:00	590.54	590.86
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8/10/2014 12:00	590.46	590.77
8/10/2014 16:00	590.43	590.74
8/10/2014 20:00	590.55	590.88
8/11/2014 0:00	590.64	590.97
8/11/2014 4:00	591.38	592.14
8/11/2014 8:00	592.18	592.96
8/11/2014 12:00	592.59	593.29
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8/11/2014 20:00	593.04	593.66
8/12/2014 0:00	593.23	593.81
8/12/2014 4:00	593.41	593.93
8/12/2014 8:00	593.63	594.10
8/12/2014 12:00	593.81	594.23
8/12/2014 16:00	593.94	594.31
8/12/2014 20:00	594.05	594.38
8/13/2014 0:00	594.11	594.42
8/13/2014 4:00	594.14	594.41
8/13/2014 8:00	594.13	594.39
8/13/2014 12:00	594.08	594.32
8/13/2014 16:00	594.03	594.28

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

8/13/2014 20:00	594.01	594.25
8/14/2014 0:00	593.96	594.20
8/14/2014 4:00	593.91	594.14
8/14/2014 8:00	593.85	594.07
8/14/2014 12:00	593.74	593.97
8/14/2014 16:00	593.67	593.89
8/14/2014 20:00	593.60	593.82
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8/15/2014 4:00	593.40	593.63
8/15/2014 8:00	593.31	593.53
8/15/2014 12:00	593.18	593.42
8/15/2014 16:00	593.06	593.30
8/15/2014 20:00	592.97	593.21
8/16/2014 0:00	592.86	593.10
8/16/2014 4:00	592.74	592.98
8/16/2014 8:00	592.64	592.88
8/16/2014 12:00	592.53	592.77
8/16/2014 16:00	592.41	592.66
8/16/2014 20:00	592.30	592.56
8/17/2014 0:00	592.21	592.48
8/17/2014 4:00	592.12	592.40
8/17/2014 8:00	592.00	592.29
8/17/2014 12:00	591.89	592.19
8/17/2014 16:00	591.79	592.09
8/17/2014 20:00	591.72	592.03
8/18/2014 0:00	591.65	591.96
8/18/2014 4:00	591.58	591.90
8/18/2014 8:00	591.52	591.85
8/18/2014 12:00	591.44	591.77
8/18/2014 16:00	591.37	591.69
8/18/2014 20:00	591.33	591.65
8/19/2014 0:00	591.28	591.60
8/19/2014 4:00	591.23	591.56
8/19/2014 8:00	591.19	591.50
8/19/2014 12:00	591.13	591.45
8/19/2014 16:00	591.14	591.48
8/19/2014 20:00	591.17	591.53
8/20/2014 0:00	591.17	591.52
8/20/2014 4:00	591.13	591.47
8/20/2014 8:00	591.10	591.43
8/20/2014 12:00	591.02	591.37
8/20/2014 16:00	590.98	591.33
8/20/2014 20:00	590.98	591.31
8/21/2014 0:00	590.92	591.27
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8/21/2014 8:00	591.16	591.62
8/21/2014 12:00	591.65	592.25
8/21/2014 16:00	591.98	592.56
8/21/2014 20:00	592.22	592.81
8/22/2014 0:00	592.41	592.98
8/22/2014 4:00	592.58	593.11
8/22/2014 8:00	592.75	593.32
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8/22/2014 20:00	593.16	593.64
8/23/2014 0:00	593.28	593.73
8/23/2014 4:00	593.37	593.78
8/23/2014 8:00	593.42	593.80
8/23/2014 12:00	593.42	593.76
8/23/2014 16:00	595.61	595.81
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8/24/2014 8:00	597.22	597.41
8/24/2014 12:00	597.27	597.44
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8/24/2014 20:00	597.21	597.37
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8/25/2014 16:00	596.58	596.73
8/25/2014 20:00	596.44	596.60
8/26/2014 0:00	596.29	596.45
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8/26/2014 16:00	595.92	596.08
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8/27/2014 0:00	595.91	596.10
8/27/2014 4:00	595.95	596.15
8/27/2014 8:00	596.00	596.20
8/27/2014 12:00	596.03	596.22
8/27/2014 16:00	596.02	596.21
8/27/2014 20:00	596.01	596.19
8/28/2014 0:00	595.93	596.12
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8/28/2014 20:00	595.41	595.57
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8/29/2014 8:00	595.11	595.25
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8/29/2014 20:00	594.79	594.94
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8/30/2014 8:00	594.49	594.66
8/30/2014 12:00	594.40	594.56
8/30/2014 16:00	594.29	594.47
8/30/2014 20:00	594.23	594.40
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8/31/2014 20:00	593.74	593.91
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9/1/2014 20:00	593.18	593.40
9/2/2014 0:00	593.08	593.31
9/2/2014 4:00	593.01	593.24
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9/2/2014 12:00	592.82	593.06
9/2/2014 16:00	592.74	592.99
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9/3/2014 0:00	592.63	592.88
9/3/2014 4:00	592.57	592.83
9/3/2014 8:00	592.50	592.77
9/3/2014 12:00	592.40	592.68
9/3/2014 16:00	592.32	592.62
9/3/2014 20:00	592.27	592.56
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9/4/2014 4:00	592.14	592.46
9/4/2014 8:00	592.06	592.38
9/4/2014 12:00	592.01	592.34
9/4/2014 16:00	592.00	592.37
9/4/2014 20:00	592.06	592.45
9/5/2014 0:00	592.07	592.46
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9/5/2014 8:00	591.99	592.36
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9/5/2014 20:00	591.85	592.20
9/6/2014 0:00	591.83	592.18
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9/6/2014 8:00	591.79	592.14
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9/7/2014 0:00	591.62	591.96
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9/7/2014 8:00	591.51	591.86
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9/10/2014 20:00	593.07	593.75
9/11/2014 0:00	593.38	593.97
9/11/2014 4:00	593.66	594.16
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9/11/2014 12:00	594.08	594.43
9/11/2014 16:00	594.18	594.48
9/11/2014 20:00	594.21	594.48
9/12/2014 0:00	594.21	594.47
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9/12/2014 16:00	594.03	594.24
9/12/2014 20:00	593.97	594.17
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9/13/2014 4:00	593.79	594.00
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9/16/2014 12:00	591.84	592.14
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9/18/2014 20:00	591.17	591.50
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9/19/2014 16:00	590.99	591.32
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9/20/2014 0:00	590.93	591.27
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9/20/2014 8:00	590.90	591.21
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9/20/2014 16:00	590.83	591.15
9/20/2014 20:00	590.81	591.12
9/21/2014 0:00	590.78	591.10
9/21/2014 4:00	590.77	591.08
9/21/2014 8:00	590.80	591.15
9/21/2014 12:00	590.77	591.10
9/21/2014 16:00	590.74	591.05
9/21/2014 20:00	590.71	591.01
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9/24/2014 16:00	590.15	590.55
9/24/2014 20:00	590.17	590.57
9/25/2014 0:00	590.15	590.55
9/25/2014 4:00	590.12	590.54
9/25/2014 8:00	590.12	590.52
9/25/2014 12:00	590.06	590.47
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9/26/2014 0:00	590.02	590.42
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9/26/2014 8:00	589.98	590.37
9/26/2014 12:00	589.93	590.34
9/26/2014 16:00	589.92	590.32
9/26/2014 20:00	589.92	590.32
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9/28/2014 0:00	589.78	590.19
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9/28/2014 8:00	589.76	590.17

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9/30/2014 8:00	589.53	589.95
9/30/2014 12:00	589.52	589.93
9/30/2014 16:00	589.50	589.92
9/30/2014 20:00	589.47	589.89
10/1/2014 0:00	589.47	589.89
10/1/14 0:00	589.456	589.847
10/1/2014 4:00	589.43	589.87
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10/1/2014 16:00	589.39	589.82
10/1/2014 20:00	589.39	589.81
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10/2/2014 8:00	589.32	589.75
10/2/2014 12:00	589.31	589.74
10/2/2014 16:00	589.30	589.72
10/2/2014 20:00	589.28	589.72
10/3/2014 0:00	589.31	589.74
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10/4/2014 8:00	594.63	594.95
10/4/2014 12:00	594.78	595.08
10/4/2014 16:00	594.89	595.13
10/4/2014 20:00	594.89	595.11
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10/6/2014 16:00	593.88	594.07
10/6/2014 20:00	593.78	593.97
10/7/2014 0:00	593.65	593.85
10/7/2014 4:00	593.57	593.76
10/7/2014 8:00	593.46	593.66
10/7/2014 12:00	593.35	593.55
10/7/2014 16:00	593.21	593.43
10/7/2014 20:00	593.11	593.32
10/8/2014 0:00	593.00	593.20
10/8/2014 4:00	592.85	593.09
10/8/2014 8:00	592.76	592.98
10/8/2014 12:00	592.64	592.87
10/8/2014 16:00	592.54	592.78
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10/9/2014 8:00	592.14	592.41
10/9/2014 12:00	592.03	592.31
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10/9/2014 20:00	591.86	592.15
10/10/2014 0:00	591.77	592.08
10/10/2014 4:00	591.71	592.01
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10/11/2014 8:00	591.28	591.61
10/11/2014 12:00	591.25	591.57
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10/11/2014 20:00	591.16	591.48
10/12/2014 0:00	591.13	591.45
10/12/2014 4:00	591.07	591.40
10/12/2014 8:00	591.04	591.37
10/12/2014 12:00	591.01	591.34
10/12/2014 16:00	590.99	591.32
10/12/2014 20:00	590.96	591.30
10/13/2014 0:00	590.92	591.25
10/13/2014 4:00	590.91	591.23
10/13/2014 8:00	590.87	591.20
10/13/2014 12:00	590.83	591.16
10/13/2014 16:00	590.83	591.15
10/13/2014 20:00	590.86	591.19
10/14/2014 0:00	591.07	591.44
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10/14/2014 8:00	591.29	591.65
10/14/2014 12:00	591.31	591.68
10/14/2014 16:00	591.34	591.72
10/14/2014 20:00	591.40	591.79
10/15/2014 0:00	591.59	592.08
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10/16/2014 16:00	592.80	593.22
10/16/2014 20:00	592.80	593.19
10/17/2014 0:00	592.77	593.15
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10/17/2014 16:00	592.62	592.96
10/17/2014 20:00	592.58	592.90
10/18/2014 0:00	592.53	592.82
10/18/2014 4:00	592.43	592.75
10/18/2014 8:00	592.35	592.67
10/18/2014 12:00	592.27	592.59
10/18/2014 16:00	592.18	592.50
10/18/2014 20:00	592.09	592.41
10/19/2014 0:00	592.00	592.31
10/19/2014 4:00	591.92	592.24
10/19/2014 8:00	591.88	592.16
10/19/2014 12:00	591.79	592.10
10/19/2014 16:00	591.73	592.05
10/19/2014 20:00	591.67	592.00
10/20/2014 0:00	591.63	591.95
10/20/2014 4:00	591.57	591.89
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10/20/2014 12:00	591.44	591.79
10/20/2014 16:00	591.42	591.74
10/20/2014 20:00	591.37	591.71
10/21/2014 0:00	591.33	591.67

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10/21/2014 8:00	591.26	591.59
10/21/2014 12:00	591.20	591.54
10/21/2014 16:00	591.18	591.52
10/21/2014 20:00	591.15	591.49
10/22/2014 0:00	591.11	591.46
10/22/2014 4:00	591.07	591.41
10/22/2014 8:00	591.03	591.37
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10/22/2014 16:00	590.97	591.31
10/22/2014 20:00	590.94	591.29
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10/24/2014 16:00	590.68	591.00
10/24/2014 20:00	590.68	591.01
10/25/2014 0:00	590.66	590.99
10/25/2014 4:00	590.63	590.96
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10/25/2014 12:00	590.56	590.89
10/25/2014 16:00	590.54	590.87
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10/26/2014 12:00	590.43	590.76
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10/27/2014 0:00	590.40	590.74
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10/29/2014 20:00	590.00	590.37
10/30/2014 0:00	589.94	590.37
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10/31/2014 20:00	589.77	590.17
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11/1/2014 20:00	589.64	590.07
11/2/2014 0:00	589.58	590.01
11/2/2014 3:00	589.50	589.93
11/2/2014 7:00	589.51	589.88
11/2/2014 11:00	589.61	589.98
11/2/2014 15:00	589.61	589.96
11/2/2014 19:00	589.58	589.99
11/2/2014 23:00	589.56	589.95
11/3/2014 3:00	589.55	589.94
11/3/2014 7:00	589.53	589.93
11/3/2014 11:00	589.53	589.91
11/3/2014 15:00	589.50	589.89
11/3/2014 19:00	589.50	589.89
11/3/2014 23:00	589.48	589.86
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11/5/2014 7:00	589.35	589.72
11/5/2014 11:00	589.33	589.74
11/5/2014 15:00	589.31	589.71
11/5/2014 19:00	589.32	589.71
11/5/2014 23:00	589.31	589.70
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11/6/2014 7:00	589.28	589.68
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11/6/2014 15:00	589.22	589.62
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11/6/2014 23:00	589.19	589.58
11/7/2014 3:00	589.17	589.56
11/7/2014 7:00	589.15	589.54
11/7/2014 11:00	589.15	589.53
11/7/2014 15:00	589.15	589.53
11/7/2014 19:00	589.13	589.52
11/7/2014 23:00	589.12	589.51
11/8/2014 3:00	589.12	589.50
11/8/2014 7:00	589.08	589.49
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11/8/2014 15:00	589.04	589.44
11/8/2014 19:00	589.03	589.41
11/8/2014 23:00	589.00	589.40
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11/9/2014 7:00	588.97	589.36
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11/10/2014 15:00	588.88	589.25
11/10/2014 19:00	588.85	589.25
11/10/2014 23:00	588.83	589.22
11/11/2014 3:00	588.79	589.20
11/11/2014 7:00	588.76	589.17
11/11/2014 11:00	588.72	589.15
11/11/2014 15:00	588.84	589.20
11/11/2014 19:00	588.87	589.25
11/11/2014 23:00	588.80	589.19
11/12/2014 3:00	588.71	589.15
11/12/2014 7:00	588.64	589.10
11/12/2014 11:00	588.65	589.08

11/12/2014 15:00	588.64	589.07
11/12/2014 19:00	588.59	589.01
11/12/2014 23:00	588.55	588.98
11/13/2014 3:00	588.49	588.96
11/13/2014 7:00	588.46	588.92
11/13/2014 11:00	588.53	588.97
11/13/2014 15:00	588.51	588.94
11/13/2014 19:00	588.47	588.92
11/13/2014 23:00	588.40	588.87
11/14/2014 3:00	588.41	588.86
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11/16/2014 15:00	588.17	588.63
11/16/2014 19:00	588.13	588.60
11/16/2014 23:00	588.10	588.58
11/17/2014 3:00	587.98	588.47
11/17/2014 7:00	587.84	588.33
11/17/2014 11:00	588.05	588.51
11/17/2014 15:00	588.01	588.51
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11/18/2014 23:00	587.80	588.33
11/19/2014 3:00	587.81	588.32
11/19/2014 7:00	587.80	588.33
11/19/2014 11:00	587.80	588.31
11/19/2014 15:00	587.76	588.29
11/19/2014 19:00	587.70	588.25
11/19/2014 23:00	587.69	588.24
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11/22/2014 16:00	587.13	587.97
11/22/2014 20:00	587.07	587.95
11/23/2014 0:00	587.01	587.93
11/23/2014 4:00	586.98	587.94
11/23/2014 8:00	586.91	587.91
11/23/2014 12:00	586.89	587.90
11/23/2014 16:00	586.87	587.90
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11/24/2014 0:00	588.31	588.75
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11/24/2014 8:00	589.42	589.85
11/24/2014 12:00	589.75	590.25
11/24/2014 16:00	590.07	590.59
11/24/2014 20:00	590.19	590.66
11/25/2014 0:00	590.20	590.65
11/25/2014 4:00	590.09	590.53
11/25/2014 8:00	590.03	590.47
11/25/2014 12:00	589.96	590.39
11/25/2014 16:00	589.85	590.26
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11/26/2014 12:00	589.36	589.82
11/26/2014 16:00	589.27	589.74
11/26/2014 20:00	589.19	589.66
11/27/2014 0:00	589.12	589.58
11/27/2014 4:00	589.04	589.52
11/27/2014 8:00	588.99	589.46
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11/28/2014 4:00	588.78	589.27
11/28/2014 8:00	588.76	589.24
11/28/2014 12:00	588.76	589.25
11/28/2014 16:00	588.76	589.25
11/28/2014 20:00	588.71	589.22
11/29/2014 0:00	588.66	589.18
11/29/2014 4:00	588.65	589.17
11/29/2014 8:00	588.63	589.14
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11/29/2014 16:00	588.59	589.12
11/29/2014 20:00	588.55	589.09
11/30/2014 0:00	588.53	589.06
11/30/2014 4:00	588.52	589.06
11/30/2014 8:00	588.47	589.02
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11/30/2014 20:00	588.37	588.93
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12/1/2014 16:00	588.27	588.82
12/1/2014 20:00	588.25	588.81
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12/2/2014 4:00	588.22	588.77
12/2/2014 8:00	588.23	588.77
12/2/2014 12:00	588.24	588.80
12/2/2014 16:00	588.22	588.77
12/2/2014 20:00	588.20	588.76
12/3/2014 0:00	588.16	588.72
12/3/2014 4:00	588.13	588.69
12/3/2014 8:00	588.09	588.66
12/3/2014 12:00	588.09	588.66
12/3/2014 16:00	588.07	588.64
12/3/2014 20:00	588.01	588.59
12/4/2014 0:00	587.99	588.57
12/4/2014 4:00	588.00	588.58
12/4/2014 8:00	587.98	588.55
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12/4/2014 16:00	587.97	588.54
12/4/2014 20:00	587.94	588.53
12/5/2014 0:00	587.93	588.51
12/5/2014 4:00	587.92	588.51

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

12/5/2014 8:00	587.90	588.48
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12/6/2014 8:00	587.75	588.37
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12/6/2014 16:00	587.71	588.32
12/6/2014 20:00	587.67	588.30
12/7/2014 0:00	587.65	588.26
12/7/2014 4:00	587.63	588.24
12/7/2014 8:00	587.61	588.24
12/7/2014 12:00	587.64	588.26
12/7/2014 16:00	587.63	588.26
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12/8/2014 4:00	587.57	588.21
12/8/2014 8:00	587.54	588.21
12/8/2014 12:00	587.53	588.17
12/8/2014 16:00	587.63	588.24
12/8/2014 20:00	587.68	588.26
12/9/2014 0:00	587.67	588.27
12/9/2014 4:00	587.66	588.25
12/9/2014 8:00	587.63	588.24
12/9/2014 12:00	587.60	588.22
12/9/2014 16:00	587.57	588.20
12/9/2014 20:00	587.53	588.18
12/10/2014 0:00	587.47	588.15
12/10/2014 4:00	587.44	588.13
12/10/2014 8:00	587.42	588.12
12/10/2014 12:00	587.39	588.10
12/10/2014 16:00	587.37	588.09
12/10/2014 20:00	587.34	588.07
12/11/2014 0:00	587.29	588.03
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12/11/2014 12:00	587.21	588.01
12/11/2014 16:00	587.17	587.97
12/11/2014 20:00	587.10	587.94
12/12/2014 0:00	587.06	587.93
12/12/2014 4:00	587.00	587.92
12/12/2014 8:00	586.96	587.92
12/12/2014 12:00	586.91	587.89
12/12/2014 16:00	586.88	587.91
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12/13/2014 12:00	586.67	587.84
12/13/2014 16:00	586.65	587.85
12/13/2014 20:00	586.61	587.84
12/14/2014 0:00	586.56	587.83
12/14/2014 4:00	586.50	587.79
12/14/2014 8:00	586.47	587.80
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12/15/2014 0:00	586.30	587.76
12/15/2014 4:00	586.25	587.75
12/15/2014 8:00	586.20	587.73
12/15/2014 12:00	586.17	587.73
12/15/2014 16:00	586.16	587.73
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2/28/2015 12:00	582.87	583.18
2/28/2015 16:00	582.83	583.15
2/28/2015 20:00	582.78	583.11
3/1/2015 0:00	582.75	583.07
3/1/2015 4:00	582.72	583.05
3/1/2015 8:00	582.71	583.03
3/1/2015 12:00	582.70	583.00
3/1/2015 16:00	582.68	582.98
3/1/2015 20:00	582.61	582.93
3/2/2015 0:00	582.55	582.86
3/2/2015 4:00	582.46	582.78
3/2/2015 8:00	582.43	582.75
3/2/2015 12:00	582.47	582.79
3/2/2015 16:00	582.45	582.75
3/2/2015 20:00	582.39	582.70
3/3/2015 0:00	582.39	582.69
3/3/2015 4:00	582.39	582.69
3/3/2015 8:00	582.40	582.70
3/3/2015 12:00	582.39	582.68
3/3/2015 16:00	582.37	582.68
3/3/2015 20:00	582.33	582.65
3/4/2015 0:00	582.29	582.59
3/4/2015 4:00	582.24	582.55
3/4/2015 8:00	582.20	582.51
3/4/2015 12:00	582.17	582.50
3/4/2015 16:00	582.15	582.47
3/4/2015 20:00	582.09	582.42
3/5/2015 0:00	582.06	582.38
3/5/2015 4:00	582.03	582.36
3/5/2015 8:00	582.02	582.34
3/5/2015 12:00	582.02	582.36
3/5/2015 16:00	581.99	582.32
3/5/2015 20:00	581.90	582.23
3/6/2015 0:00	581.85	582.18
3/6/2015 4:00	581.82	582.14
3/6/2015 8:00	581.85	582.18

3/6/2015 12:00	581.90	582.21
3/6/2015 16:00	581.90	582.22
3/6/2015 20:00	581.85	582.17
3/7/2015 0:00	581.83	582.15
3/7/2015 4:00	581.83	582.15
3/7/2015 8:00	581.82	582.14
3/7/2015 12:00	581.81	582.13
3/7/2015 16:00	581.78	582.11
3/7/2015 20:00	581.75	582.08
3/8/2015 0:00	581.76	582.11
3/8/2015 5:00	581.82	582.16
3/8/2015 9:00	581.85	582.23
3/8/2015 13:00	581.94	582.30
3/8/2015 17:00	582.00	582.37
3/8/2015 21:00	582.07	582.46
3/9/2015 1:00	582.16	582.57
3/9/2015 5:00	582.23	582.64
3/9/2015 9:00	582.31	582.71
3/9/2015 13:00	582.40	582.80
3/9/2015 17:00	582.65	583.39
3/9/2015 21:00	584.98	587.64
3/10/2015 1:00	586.36	588.09
3/10/2015 5:00	587.34	588.69
3/10/2015 9:00	588.12	589.24
3/10/2015 13:00	588.66	589.68
3/10/2015 17:00	589.53	590.44
3/10/2015 21:00	590.46	590.99
3/11/2015 1:00	590.71	591.22
3/11/2015 5:00	590.92	591.41
3/11/2015 9:00	591.08	591.58
3/11/2015 13:00	591.21	591.70
3/11/2015 17:00	591.35	591.85
3/11/2015 21:00	591.49	591.96
3/12/2015 1:00	591.58	592.06
3/12/2015 5:00	591.65	592.14
3/12/2015 9:00	591.72	592.18
3/12/2015 13:00	591.73	592.18
3/12/2015 17:00	591.77	592.20
3/12/2015 21:00	591.77	592.19
3/13/2015 1:00	591.75	592.15
3/13/2015 5:00	591.72	592.12
3/13/2015 9:00	591.70	592.09
3/13/2015 13:00	591.64	592.02
3/13/2015 17:00	591.61	591.98
3/13/2015 21:00	591.57	591.93
3/14/2015 1:00	591.52	591.87
3/14/2015 5:00	591.46	591.82
3/14/2015 9:00	591.40	591.74
3/14/2015 13:00	591.35	591.67
3/14/2015 17:00	591.27	591.59
3/14/2015 21:00	591.21	591.52
3/15/2015 1:00	591.12	591.44
3/15/2015 5:00	591.07	591.35
3/15/2015 9:00	591.01	591.30
3/15/2015 13:00	590.93	591.24
3/15/2015 17:00	590.90	591.19
3/15/2015 21:00	590.85	591.16
3/16/2015 1:00	590.78	591.09
3/16/2015 5:00	590.75	591.05
3/16/2015 9:00	590.70	590.99
3/16/2015 13:00	590.65	590.95
3/16/2015 17:00	590.63	590.92
3/16/2015 21:00	590.60	590.90
3/17/2015 1:00	590.54	590.85
3/17/2015 5:00	590.48	590.81
3/17/2015 9:00	590.45	590.76
3/17/2015 13:00	590.42	590.72
3/17/2015 17:00	590.41	590.70
3/17/2015 21:00	590.38	590.69
3/18/2015 1:00	590.27	590.67
3/18/2015 5:00	590.16	590.63
3/18/2015 9:00	590.08	590.61
3/18/2015 13:00	590.05	590.61
3/18/2015 17:00	590.06	590.60
3/18/2015 21:00	590.01	590.58
3/19/2015 1:00	589.99	590.56
3/19/2015 5:00	589.96	590.52
3/19/2015 9:00	589.95	590.52
3/19/2015 13:00	589.93	590.51
3/19/2015 17:00	589.94	590.49
3/19/2015 21:00	589.91	590.49
3/20/2015 1:00	589.90	590.48
3/20/2015 5:00	589.87	590.45
3/20/2015 9:00	589.86	590.44
3/20/2015 13:00	589.82	590.41
3/20/2015 17:00	589.81	590.40
3/20/2015 21:00	589.80	590.39
3/21/2015 1:00	589.79	590.36
3/21/2015 5:00	589.78	590.36
3/21/2015 9:00	589.74	590.33
3/21/2015 13:00	589.70	590.29
3/21/2015 17:00	589.70	590.30
3/21/2015 21:00	589.66	590.27
3/22/2015 1:00	589.65	590.25
3/22/2015 5:00	589.63	590.23
3/22/2015 9:00	589.61	590.22
3/22/2015 13:00	589.61	590.22
3/22/2015 17:00	589.60	590.20
3/22/2015 21:00	589.57	590.18
3/23/2015 1:00	589.55	590.17
3/23/2015 5:00	589.55	590.16
3/23/2015 9:00	589.53	590.14
3/23/2015 13:00	589.51	590.12
3/23/2015 17:00	589.49	590.11
3/23/2015 21:00	589.51	590.13
3/24/2015 1:00	589.51	590.13
3/24/2015 5:00	589.49	590.10
3/24/2015 9:00	589.50	590.12
3/24/2015 13:00	589.51	590.12
3/24/2015 17:00	589.51	590.12
3/24/2015 21:00	589.53	590.13
3/25/2015 1:00	589.53	590.13
3/25/2015 5:00	589.58	590.20
3/25/2015 9:00	589.70	590.32
3/25/2015 13:00	589.77	590.39
3/25/2015 17:00	589.82	590.43
3/25/2015 21:00	589.87	590.47
3/26/2015 1:00	589.87	590.48
3/26/2015 5:00	589.88	590.49
3/26/2015 9:00	589.87	590.48
3/26/2015 13:00	589.86	590.47
3/26/2015 17:00	589.86	590.46
3/26/2015 21:00	589.83	590.42
3/27/2015 1:00	589.79	590.41
3/27/2015 5:00	589.78	590.38
3/27/2015 9:00	589.75	590.37
3/27/2015 13:00	589.75	590.35
3/27/2015 17:00	589.74	590.34
3/27/2015 21:00	589.71	590.30
3/28/2015 1:00	589.67	590.26
3/28/2015 5:00	589.64	590.24
3/28/2015 9:00	589.63	590.23
3/28/2015 13:00	589.61	590.22
3/28/2015 17:00	589.61	590.22
3/28/2015 21:00	589.59	590.19
3/29/2015 1:00	589.56	590.16
3/29/2015 5:00	589.56	590.17

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

3/29/2015 9:00	589.55	590.16
3/29/2015 13:00	589.55	590.16
3/29/2015 17:00	589.55	590.14
3/29/2015 21:00	589.53	590.15
3/30/2015 1:00	589.51	590.12
3/30/2015 5:00	589.49	590.09
3/30/2015 9:00	589.48	590.09
3/30/2015 13:00	589.45	590.08
3/30/2015 17:00	589.46	590.08
3/30/2015 21:00	589.47	590.08
3/31/2015 1:00	589.48	590.08
3/31/2015 5:00	589.48	590.08
3/31/2015 9:00	589.43	590.02
3/31/2015 13:00	589.38	589.99
3/31/2015 17:00	589.38	590.00
3/31/2015 21:00	589.37	589.97
4/1/2015 1:00	589.37	589.96
4/1/2015 5:00	589.34	589.95
4/1/2015 9:00	589.31	589.93
4/1/2015 13:00	589.31	589.91
4/1/2015 17:00	589.32	589.92
4/1/2015 21:00	589.33	589.93
4/2/2015 1:00	589.30	589.92
4/2/2015 5:00	589.30	589.91
4/2/2015 9:00	589.31	589.92
4/2/2015 13:00	589.48	590.06
4/2/2015 17:00	589.61	590.19
4/2/2015 21:00	589.69	590.26
4/3/2015 1:00	589.71	590.29
4/3/2015 5:00	589.72	590.29
4/3/2015 9:00	589.70	590.27
4/3/2015 13:00	589.65	590.24
4/3/2015 17:00	589.64	590.22
4/3/2015 21:00	589.59	590.17
4/4/2015 1:00	589.54	590.14
4/4/2015 5:00	589.51	590.10
4/4/2015 9:00	589.50	590.09
4/4/2015 13:00	589.49	590.08
4/4/2015 17:00	589.51	590.09
4/4/2015 21:00	589.45	590.05
4/5/2015 1:00	589.44	590.02
4/5/2015 5:00	589.42	590.01
4/5/2015 9:00	589.38	589.98
4/5/2015 13:00	589.36	589.95
4/5/2015 17:00	589.34	589.94
4/5/2015 21:00	589.35	589.94
4/6/2015 1:00	589.33	589.91
4/6/2015 5:00	589.30	589.89
4/6/2015 9:00	589.28	589.86
4/6/2015 13:00	589.24	589.81
4/6/2015 17:00	589.26	589.86
4/6/2015 21:00	589.23	589.82
4/7/2015 1:00	589.23	589.81
4/7/2015 5:00	589.21	589.80
4/7/2015 9:00	589.21	589.78
4/7/2015 13:00	589.19	589.78
4/7/2015 17:00	589.20	589.78
4/7/2015 21:00	589.20	589.77
4/8/2015 1:00	589.19	589.77
4/8/2015 5:00	589.19	589.77
4/8/2015 9:00	589.20	589.75
4/8/2015 13:00	589.14	589.71
4/8/2015 17:00	589.14	589.72
4/8/2015 21:00	589.13	589.70
4/9/2015 1:00	589.12	589.68
4/9/2015 5:00	589.24	589.78
4/9/2015 9:00	589.41	589.96
4/9/2015 13:00	589.63	590.18
4/9/2015 17:00	589.83	590.41
4/9/2015 21:00	590.07	590.65
4/10/2015 1:00	590.42	590.80
4/10/2015 5:00	590.58	590.96
4/10/2015 9:00	590.68	591.05
4/10/2015 13:00	590.70	591.06
4/10/2015 17:00	590.72	591.09
4/10/2015 21:00	590.74	591.10
4/11/2015 1:00	590.72	591.06
4/11/2015 5:00	590.68	591.02
4/11/2015 9:00	590.69	591.00
4/11/2015 13:00	590.64	590.95
4/11/2015 17:00	590.57	590.91
4/11/2015 21:00	590.60	590.90
4/12/2015 1:00	590.55	590.86
4/12/2015 5:00	590.51	590.81
4/12/2015 9:00	590.47	590.78
4/12/2015 13:00	590.47	590.74
4/12/2015 17:00	590.42	590.73
4/12/2015 21:00	590.42	590.69
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4/13/2015 9:00	590.14	590.60
4/13/2015 13:00	590.12	590.59
4/13/2015 17:00	590.15	590.60
4/13/2015 21:00	590.19	590.63
4/14/2015 1:00	590.12	590.61
4/14/2015 5:00	590.12	590.57
4/14/2015 9:00	590.09	590.54
4/14/2015 13:00	590.04	590.48
4/14/2015 17:00	590.04	590.49
4/14/2015 21:00	590.02	590.48
4/15/2015 1:00	589.99	590.44
4/15/2015 5:00	589.94	590.41
4/15/2015 9:00	589.91	590.38
4/15/2015 13:00	589.88	590.34
4/15/2015 17:00	589.85	590.33
4/15/2015 21:00	589.85	590.31
4/16/2015 1:00	589.83	590.30
4/16/2015 5:00	589.83	590.28
4/16/2015 9:00	589.77	590.25
4/16/2015 13:00	589.78	590.24
4/16/2015 17:00	589.73	590.21
4/16/2015 21:00	589.76	590.21
4/17/2015 1:00	589.73	590.19
4/17/2015 5:00	589.70	590.17
4/17/2015 9:00	589.66	590.15
4/17/2015 13:00	589.62	590.11
4/17/2015 17:00	589.61	590.10
4/17/2015 21:00	589.61	590.11
4/18/2015 1:00	589.59	590.08
4/18/2015 5:00	589.58	590.06
4/18/2015 9:00	589.51	590.02
4/18/2015 13:00	589.50	589.99
4/18/2015 17:00	589.51	590.00
4/18/2015 21:00	589.50	589.99
4/19/2015 1:00	589.51	589.98
4/19/2015 5:00	589.49	589.98
4/19/2015 9:00	589.46	589.94
4/19/2015 13:00	589.45	589.92
4/19/2015 17:00	589.46	589.95
4/19/2015 21:00	589.54	590.00
4/20/2015 1:00	589.86	590.39
4/20/2015 5:00	590.28	590.75
4/20/2015 9:00	590.55	590.89
4/20/2015 13:00	590.57	590.92
4/20/2015 17:00	590.58	590.91
4/20/2015 21:00	590.56	590.86
4/21/2015 1:00	590.52	590.82
4/21/2015 5:00	590.48	590.79
4/21/2015 9:00	590.42	590.73
4/21/2015 13:00	590.34	590.67
4/21/2015 17:00	590.21	590.64
4/21/2015 21:00	590.13	590.60
4/22/2015 1:00	590.05	590.54
4/22/2015 5:00	590.01	590.50
4/22/2015 9:00	590.01	590.46
4/22/2015 13:00	589.98	590.44
4/22/2015 17:00	589.90	590.39
4/22/2015 21:00	589.91	590.35
4/23/2015 1:00	589.82	590.31
4/23/2015 5:00	589.82	590.27
4/23/2015 9:00	589.79	590.25
4/23/2015 13:00	589.66	590.17
4/23/2015 17:00	589.72	590.20
4/23/2015 21:00	589.72	590.18
4/24/2015 1:00	589.67	590.14
4/24/2015 5:00	589.65	590.13
4/24/2015 9:00	589.63	590.11
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4/26/2015 9:00	592.05	592.51
4/26/2015 13:00	592.14	592.59
4/26/2015 17:00	592.23	592.65
4/26/2015 21:00	592.26	592.67
4/27/2015 1:00	592.28	592.66
4/27/2015 5:00	592.27	592.63
4/27/2015 9:00	592.24	592.59
4/27/2015 13:00	592.18	592.54
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4/27/2015 21:00	592.08	592.41
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4/28/2015 13:00	591.74	592.02
4/28/2015 17:00	591.69	591.97
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4/29/2015 1:00	591.54	591.83
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4/29/2015 9:00	591.36	591.66
4/29/2015 13:00	591.30	591.59
4/29/2015 17:00	591.25	591.53
4/29/2015 21:00	591.20	591.50
4/30/2015 1:00	591.13	591.44
4/30/2015 5:00	591.08	591.38
4/30/2015 9:00	591.02	591.31
4/30/2015 13:00	590.97	591.28
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5/1/2015 5:00	590.78	591.08
5/1/2015 9:00	590.75	591.05
5/1/2015 13:00	590.68	591.00
5/1/2015 17:00	590.67	590.96
5/1/2015 21:00	590.63	590.94
5/2/2015 1:00	590.63	590.92
5/2/2015 5:00	590.57	590.88
5/2/2015 9:00	590.52	590.83
5/2/2015 13:00	590.50	590.80
5/2/2015 17:00	590.47	590.77
5/2/2015 21:00	590.44	590.75
5/3/2015 1:00	590.43	590.73
5/3/2015 5:00	590.39	590.70
5/3/2015 9:00	590.28	590.67
5/3/2015 13:00	590.21	590.66
5/3/2015 17:00	590.16	590.62
5/3/2015 21:00	590.16	590.62
5/4/2015 1:00	590.10	590.56
5/4/2015 5:00	590.11	590.58
5/4/2015 9:00	590.04	590.51
5/4/2015 13:00	590.00	590.48
5/4/2015 17:00	589.99	590.46
5/4/2015 21:00	589.98	590.45
5/5/2015 1:00	589.96	590.43
5/5/2015 5:00	589.95	590.42
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5/5/2015 13:00	590.73	591.15
5/5/2015 17:00	590.96	591.33
5/5/2015 21:00	591.04	591.41
5/6/2015 1:00	591.06	591.39
5/6/2015 5:00	591.04	591.38
5/6/2015 9:00	590.97	591.30
5/6/2015 13:00	590.90	591.23
5/6/2015 17:00	590.86	591.19
5/6/2015 21:00	590.82	591.16
5/7/2015 1:00	590.80	591.10
5/7/2015 5:00	590.74	591.05
5/7/2015 9:00	590.66	590.97
5/7/2015 13:00	590.60	590.91
5/7/2015 17:00	590.57	590.87
5/7/2015 21:00	590.54	590.83
5/8/2015 1:00	590.49	590.79
5/8/2015 5:00	590.45	590.76
5/8/2015 9:00	590.36	590.69
5/8/2015 13:00	590.25	590.65
5/8/2015 17:00	590.17	590.64
5/8/2015 21:00	590.29	590.68
5/9/2015 1:00	590.52	590.84
5/9/2015 5:00	590.65	590.96
5/9/2015 9:00	590.79	591.14
5/9/2015 13:00	590.87	591.21
5/9/2015 17:00	590.95	591.28
5/9/2015 21:00	590.94	591.27
5/10/2015 1:00	590.91	591.25
5/10/2015 5:00	590.89	591.21
5/10/2015 9:00	590.88	591.22
5/10/2015 13:00	590.92	591.25
5/10/2015 17:00	590.92	591.25
5/10/2015 21:00	590.93	591.25
5/11/2015 1:00	590.90	591.23
5/11/2015 5:00	590.88	591.21
5/11/2015 9:00	590.82	591.16
5/11/2015 13:00	590.79	591.14
5/11/2015 17:00	590.78	591.11
5/11/2015 21:00	590.84	591.19
5/12/2015 1:00	590.89	591.22
5/12/2015 5:00	590.89	591.23
5/12/2015 9:00	590.86	591.20
5/12/2015 13:00	590.82	591.16
5/12/2015 17:00	590.79	591.12
5/12/2015 21:00	590.75	591.09
5/13/2015 1:00	590.73	591.06
5/13/2015 5:00	590.68	591.01
5/13/2015 9:00	590.65	590.97
5/13/2015 13:00	590.60	590.91
5/13/2015 17:00	590.57	590.88
5/13/2015 21:00	590.54	590.86
5/14/2015 1:00	590.52	590.84
5/14/2015 5:00	590.49	590.80
5/14/2015 9:00	590.45	590.76
5/14/2015 13:00	590.41	590.72
5/14/2015 17:00	590.36	590.70
5/14/2015 21:00	590.31	590.69
5/15/2015 1:00	590.22	590.66
5/15/2015 5:00	590.18	590.65
5/15/2015 9:00	590.15	590.62
5/15/2015 13:00	590.13	590.60
5/15/2015 17:00	590.10	590.57
5/15/2015 21:00	590.11	590.57
5/16/2015 1:00	590.09	590.55
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5/16/2015 13:00	590.08	590.54
5/16/2015 17:00	590.40	590.72
5/16/2015 21:00	590.53	590.87
5/17/2015 1:00	590.57	590.90
5/17/2015 5:00	590.58	590.90
5/17/2015 9:00	590.56	590.89
5/17/2015 13:00	590.52	590.84
5/17/2015 17:00	590.47	590.79
5/17/2015 21:00	590.46	590.78
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5/18/2015 5:00	590.36	590.71
5/18/2015 9:00	590.23	590.67
5/18/2015 13:00	590.14	590.62
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5/19/2015 1:00	590.06	590.52
5/19/2015 5:00	590.03	590.51
5/19/2015 9:00	589.99	590.47
5/19/2015 13:00	589.97	590.43
5/19/2015 17:00	589.94	590.40
5/19/2015 21:00	589.94	590.40
5/20/2015 1:00	589.91	590.37
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5/20/2015 17:00	589.81	590.26
5/20/2015 21:00	589.78	590.24
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5/21/2015 9:00	589.71	590.17
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5/21/2015 17:00	589.65	590.13
5/21/2015 21:00	589.68	590.17
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5/22/2015 13:00	589.57	590.04
5/22/2015 17:00	589.57	590.04
5/22/2015 21:00	589.55	590.04
5/23/2015 1:00	589.52	590.01
5/23/2015 5:00	589.50	589.99
5/23/2015 9:00	589.45	589.93
5/23/2015 13:00	589.43	589.91
5/23/2015 17:00	589.41	589.90
5/23/2015 21:00	589.41	589.90
5/24/2015 1:00	589.39	589.89
5/24/2015 5:00	589.35	589.84
5/24/2015 9:00	589.35	589.85
5/24/2015 13:00	589.33	589.82
5/24/2015 17:00	589.34	589.83
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5/26/2015 1:00	589.95	590.40
5/26/2015 5:00	589.91	590.35
5/26/2015 9:00	589.85	590.29
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5/26/2015 17:00	590.52	591.02
5/26/2015 21:00	590.85	591.30
5/27/2015 1:00	591.08	591.50
5/27/2015 5:00	591.19	591.59
5/27/2015 9:00	591.23	591.62
5/27/2015 13:00	591.23	591.60
5/27/2015 17:00	591.16	591.52
5/27/2015 21:00	591.12	591.47
5/28/2015 1:00	591.03	591.37
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5/28/2015 13:00	590.80	591.10
5/28/2015 17:00	590.71	591.02
5/28/2015 21:00	590.66	590.95
5/29/2015 1:00	590.59	590.89
5/29/2015 5:00	590.51	590.83
5/29/2015 9:00	590.44	590.74
5/29/2015 13:00	590.35	590.68
5/29/2015 17:00	590.20	590.64
5/29/2015 21:00	590.18	590.63
5/30/2015 1:00	590.17	590.59
5/30/2015 5:00	590.14	590.58
5/30/2015 9:00	590.06	590.51
5/30/2015 13:00	590.03	590.46
5/30/2015 17:00	590.07	590.51
5/30/2015 21:00	590.38	590.78
5/31/2015 1:00	590.72	591.13
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5/31/2015 21:00	590.96	591.31
6/1/2015 1:00	590.93	591.26
6/1/2015 5:00	590.86	591.20
6/1/2015 9:00	590.81	591.14
6/1/2015 13:00	590.74	591.08
6/1/2015 17:00	590.70	591.03
6/1/2015 21:00	590.63	590.97
6/2/2015 1:00	590.57	590.89
6/2/2015 5:00	590.52	590.85
6/2/2015 9:00	590.50	590.82
6/2/2015 13:00	590.46	590.78
6/2/2015 17:00	590.40	590.72
6/2/2015 21:00	590.34	590.70
6/3/2015 1:00	590.21	590.65
6/3/2015 5:00	590.16	590.60
6/3/2015 9:00	590.12	590.56
6/3/2015 13:00	590.08	590.52
6/3/2015 17:00	590.02	590.46
6/3/2015 21:00	589.99	590.43
6/4/15 0:00	589.956	590.387
6/4/2015 1:00	589.95	590.39
6/4/2015 5:00	589.94	590.38
6/4/2015 9:00	589.91	590.34
6/4/2015 13:00	589.87	590.30
6/4/2015 17:00	589.83	590.27
6/4/2015 21:00	589.70	590.14
6/5/2015 1:00	589.63	590.08
6/5/2015 5:00	589.61	590.05
6/5/2015 9:00	589.71	590.16
6/5/2015 13:00	589.67	590.12
6/5/2015 17:00	589.65	590.10
6/5/2015 21:00	589.64	590.08
6/6/2015 1:00	589.61	590.08
6/6/2015 5:00	589.59	590.05
6/6/2015 9:00	589.54	590.00
6/6/2015 13:00	589.53	589.98
6/6/2015 17:00	589.50	589.94
6/6/2015 21:00	589.51	589.96
6/7/2015 1:00	589.49	589.93
6/7/2015 5:00	589.51	589.96
6/7/2015 9:00	589.45	589.89
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6/7/2015 21:00	591.26	591.76
6/8/2015 1:00	591.53	592.02
6/8/2015 5:00	591.65	592.13
6/8/2015 9:00	591.72	592.17
6/8/2015 13:00	591.71	592.13
6/8/2015 17:00	591.68	592.08
6/8/2015 21:00	591.62	592.01
6/9/2015 1:00	591.60	591.99
6/9/2015 5:00	591.53	591.90
6/9/2015 9:00	591.45	591.81
6/9/2015 13:00	591.34	591.68
6/9/2015 17:00	591.24	591.57
6/9/2015 21:00	591.17	591.49
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6/10/2015 13:00	590.78	591.08
6/10/2015 17:00	590.69	591.02
6/10/2015 21:00	590.76	591.13
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6/11/2015 5:00	591.29	591.73
6/11/2015 9:00	591.52	591.96
6/11/2015 13:00	591.62	592.05
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6/11/2015 21:00	591.68	592.09
6/12/2015 1:00	591.68	592.06
6/12/2015 5:00	591.60	591.97
6/12/2015 9:00	591.52	591.90
6/12/2015 13:00	591.44	591.81
6/12/2015 17:00	591.42	591.78
6/12/2015 21:00	591.41	591.76
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6/13/2015 13:00	591.18	591.53
6/13/2015 17:00	591.14	591.47
6/13/2015 21:00	591.10	591.46
6/14/2015 1:00	591.16	591.50
6/14/2015 5:00	591.68	592.29
6/14/2015 9:00	592.35	593.22
6/14/2015 13:00	593.03	593.85
6/14/2015 17:00	593.43	594.11
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6/15/2015 1:00	594.03	594.54
6/15/2015 5:00	594.26	594.72
6/15/2015 9:00	594.44	594.88
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6/17/2015 5:00	596.37	596.62
6/17/2015 9:00	596.32	596.55
6/17/2015 13:00	596.20	596.42
6/17/2015 17:00	596.07	596.31
6/17/2015 21:00	595.96	596.20
6/18/2015 1:00	595.84	596.07
6/18/2015 5:00	595.70	595.93
6/18/2015 9:00	595.56	595.77
6/18/2015 13:00	595.43	595.65
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6/18/2015 21:00	595.21	595.41
6/19/2015 1:00	595.07	595.27
6/19/2015 5:00	595.00	595.19
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6/19/2015 13:00	594.77	594.96
6/19/2015 17:00	594.66	594.87
6/19/2015 21:00	594.56	594.78
6/20/2015 1:00	594.50	594.71
6/20/2015 5:00	594.40	594.61
6/20/2015 9:00	594.30	594.52
6/20/2015 13:00	594.21	594.42
6/20/2015 17:00	594.14	594.35
6/20/2015 21:00	594.09	594.30
6/21/2015 1:00	594.02	594.24
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6/22/2015 1:00	593.63	593.89
6/22/2015 5:00	593.57	593.83
6/22/2015 9:00	593.50	593.77
6/22/2015 13:00	593.43	593.69
6/22/2015 17:00	593.35	593.63
6/22/2015 21:00	593.27	593.55
6/23/2015 1:00	593.21	593.50
6/23/2015 5:00	593.12	593.42
6/23/2015 9:00	593.04	593.33
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6/23/2015 17:00	592.87	593.18
6/23/2015 21:00	592.83	593.15
6/24/2015 1:00	592.76	593.08
6/24/2015 5:00	592.70	593.02
6/24/2015 9:00	592.65	592.97
6/24/2015 13:00	592.59	592.90
6/24/2015 17:00	592.52	592.84
6/24/2015 21:00	592.48	592.81
6/25/2015 1:00	592.44	592.76
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6/25/2015 9:00	592.32	592.65
6/25/2015 13:00	592.27	592.62
6/25/2015 17:00	592.22	592.59
6/25/2015 21:00	592.18	592.54
6/26/2015 1:00	592.16	592.51
6/26/2015 5:00	592.13	592.48
6/26/2015 9:00	592.04	592.41
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6/26/2015 21:00	591.89	592.27
6/27/2015 1:00	591.94	592.34
6/27/2015 5:00	591.99	592.42
6/27/2015 9:00	591.99	592.41
6/27/2015 13:00	591.96	592.40
6/27/2015 17:00	591.94	592.35
6/27/2015 21:00	591.93	592.35
6/28/2015 1:00	591.92	592.32
6/28/2015 5:00	591.88	592.28
6/28/2015 9:00	591.81	592.20
6/28/2015 13:00	591.76	592.16
6/28/2015 17:00	591.74	592.14
6/28/2015 21:00	591.72	592.10
6/29/2015 1:00	591.66	592.04
6/29/2015 5:00	591.63	592.02
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6/29/2015 13:00	591.63	592.02
6/29/2015 17:00	592.56	593.35
6/29/2015 21:00	593.22	593.97
6/30/2015 1:00	593.67	594.29
6/30/2015 5:00	594.02	594.54
6/30/2015 9:00	594.32	594.77
6/30/2015 13:00	594.55	594.95
6/30/2015 17:00	594.77	595.12
6/30/2015 21:00	595.01	595.29
7/1/2015 1:00	595.12	595.39
7/1/2015 5:00	595.19	595.44
7/1/2015 9:00	595.17	595.43
7/1/2015 13:00	595.14	595.36
7/1/2015 17:00	595.10	595.33
7/1/2015 21:00	595.01	595.22
7/2/2015 1:00	594.95	595.17
7/2/2015 5:00	594.89	595.08
7/2/2015 9:00	594.76	594.97
7/2/2015 13:00	594.64	594.86
7/2/2015 17:00	594.53	594.74
7/2/2015 21:00	594.46	594.66
7/3/2015 1:00	594.35	594.57
7/3/2015 5:00	594.26	594.47
7/3/2015 9:00	594.16	594.36
7/3/2015 13:00	594.05	594.25
7/3/2015 17:00	593.94	594.14
7/3/2015 21:00	593.88	594.08
7/4/2015 1:00	593.79	593.99
7/4/2015 5:00	593.68	593.89
7/4/2015 9:00	593.58	593.78
7/4/2015 13:00	593.44	593.65
7/4/2015 17:00	593.33	593.55
7/4/2015 21:00	593.23	593.46
7/5/2015 1:00	593.14	593.37
7/5/2015 5:00	593.03	593.26
7/5/2015 9:00	592.90	593.13
7/5/2015 13:00	592.79	593.04
7/5/2015 17:00	592.69	592.96
7/5/2015 21:00	592.63	592.91
7/6/2015 1:00	592.56	592.84
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7/8/2015 5:00	595.06	595.37
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7/8/2015 13:00	595.34	595.61
7/8/2015 17:00	595.38	595.64
7/8/2015 21:00	595.38	595.62
7/9/2015 1:00	595.34	595.58
7/9/2015 5:00	595.28	595.51
7/9/2015 9:00	595.20	595.42
7/9/2015 13:00	595.10	595.32
7/9/2015 17:00	594.99	595.19
7/9/2015 21:00	594.92	595.11
7/10/2015 1:00	594.81	595.00
7/10/2015 5:00	594.71	594.92
7/10/2015 9:00	594.60	594.80
7/10/2015 13:00	594.50	594.70
7/10/2015 17:00	594.38	594.58
7/10/2015 21:00	594.31	594.52
7/11/2015 1:00	594.24	594.43
7/11/2015 5:00	594.12	594.32
7/11/2015 9:00	594.02	594.22
7/11/2015 13:00	593.92	594.13
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7/11/2015 21:00	593.75	593.95
7/12/2015 1:00	593.67	593.87
7/12/2015 5:00	593.58	593.79
7/12/2015 9:00	593.47	593.67
7/12/2015 13:00	593.36	593.58
7/12/2015 17:00	593.25	593.48
7/12/2015 21:00	593.17	593.41
7/13/2015 1:00	593.07	593.33
7/13/2015 5:00	592.99	593.24
7/13/2015 9:00	592.88	593.14
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7/13/2015 21:00	592.82	593.16
7/14/2015 1:00	592.78	593.13
7/14/2015 5:00	592.74	593.10
7/14/2015 9:00	592.71	593.04
7/14/2015 13:00	592.64	592.98
7/14/2015 17:00	592.60	592.93
7/14/2015 21:00	592.57	592.90
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7/15/2015 9:00	592.35	592.69
7/15/2015 13:00	592.26	592.62
7/15/2015 17:00	592.20	592.57
7/15/2015 21:00	592.15	592.52
7/16/2015 1:00	592.08	592.46
7/16/2015 5:00	592.03	592.43
7/16/2015 9:00	591.97	592.35
7/16/2015 13:00	591.90	592.28
7/16/2015 17:00	591.85	592.23
7/16/2015 21:00	591.88	592.30
7/17/2015 1:00	591.96	592.43
7/17/2015 5:00	592.09	592.59
7/17/2015 9:00	592.16	592.65
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7/17/2015 21:00	592.27	592.71
7/18/2015 1:00	592.23	592.68
7/18/2015 5:00	592.20	592.63
7/18/2015 9:00	592.16	592.59
7/18/2015 13:00	592.11	592.55
7/18/2015 17:00	592.08	592.51
7/18/2015 21:00	592.04	592.47
7/19/2015 1:00	592.00	592.43
7/19/2015 5:00	591.95	592.37
7/19/2015 9:00	591.89	592.31
7/19/2015 13:00	591.83	592.23
7/19/2015 17:00	591.78	592.20
7/19/2015 21:00	591.75	592.16
7/20/2015 1:00	591.71	592.12
7/20/2015 5:00	591.67	592.09
7/20/2015 9:00	591.60	592.01
7/20/2015 13:00	591.55	591.97
7/20/2015 17:00	591.51	591.93
7/20/2015 21:00	591.49	591.91
7/21/2015 1:00	591.47	591.88
7/21/2015 5:00	591.44	591.83

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

7/21/2015 9:00	591.37	591.77
7/21/2015 13:00	591.31	591.72
7/21/2015 17:00	591.28	591.68
7/21/2015 21:00	591.29	591.68
7/22/2015 1:00	591.25	591.64
7/22/2015 5:00	591.21	591.62
7/22/2015 9:00	591.16	591.56
7/22/2015 13:00	591.12	591.52
7/22/2015 17:00	591.10	591.50
7/22/2015 21:00	591.08	591.48
7/23/2015 1:00	591.06	591.45
7/23/2015 5:00	591.04	591.43
7/23/2015 9:00	590.99	591.38
7/23/2015 13:00	590.94	591.33
7/23/2015 17:00	590.92	591.31
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7/24/2015 1:00	590.91	591.29
7/24/2015 5:00	590.84	591.23
7/24/2015 9:00	590.82	591.20
7/24/2015 13:00	590.79	591.17
7/24/2015 17:00	590.80	591.15
7/24/2015 21:00	590.77	591.13
7/25/2015 1:00	590.75	591.12
7/25/2015 5:00	590.75	591.11
7/25/2015 9:00	590.69	591.06
7/25/2015 13:00	590.65	591.02
7/25/2015 17:00	590.64	590.99
7/25/2015 21:00	590.63	590.99
7/26/2015 1:00	590.63	590.98
7/26/2015 5:00	590.60	590.96
7/26/2015 9:00	590.56	590.92
7/26/2015 13:00	590.54	590.90
7/26/2015 17:00	590.51	590.87
7/26/2015 21:00	590.51	590.86
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10/10/2015 13:00	588.01	588.71
10/10/2015 17:00	588.01	588.70
10/10/2015 21:00	587.99	588.68
10/11/2015 1:00	587.94	588.64
10/11/2015 5:00	587.92	588.62
10/11/2015 9:00	587.90	588.59
10/11/2015 13:00	587.86	588.55
10/11/2015 17:00	587.83	588.54
10/11/2015 21:00	587.83	588.52
10/12/2015 1:00	587.82	588.51
10/12/2015 5:00	587.80	588.50
10/12/2015 9:00	587.77	588.45
10/12/2015 13:00	587.72	588.41
10/12/2015 17:00	587.71	588.39
10/12/2015 21:00	587.66	588.37
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10/13/2015 13:00	587.47	588.24
10/13/2015 17:00	587.46	588.23
10/13/2015 21:00	587.42	588.19
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10/14/2015 5:00	587.32	588.13
10/14/2015 9:00	587.28	588.09
10/14/2015 13:00	587.19	588.02
10/14/2015 17:00	587.18	588.03
10/14/2015 21:00	587.12	588.00
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10/15/2015 5:00	586.98	587.95
10/15/2015 9:00	586.90	587.93
10/15/2015 13:00	586.79	587.88
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10/15/2015 21:00	586.58	587.85
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10/16/2015 5:00	586.38	587.80
10/16/2015 9:00	586.26	587.76
10/16/2015 13:00	586.17	587.73
10/16/2015 17:00	586.12	587.74
10/16/2015 21:00	586.02	587.72
10/17/2015 1:00	585.93	587.72
10/17/2015 5:00	585.83	587.68
10/17/2015 9:00	585.74	587.64
10/17/2015 13:00	585.67	587.42
10/17/2015 17:00	585.61	587.33
10/17/2015 21:00	585.55	587.23
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10/18/2015 9:00	585.31	586.64
10/18/2015 13:00	585.23	586.26
10/18/2015 17:00	585.20	586.04
10/18/2015 21:00	585.15	585.95
10/19/2015 1:00	585.08	585.84
10/19/2015 5:00	585.02	585.71
10/19/2015 9:00	584.96	585.63
10/19/2015 13:00	584.90	585.56
10/19/2015 17:00	584.86	585.48
10/19/2015 21:00	584.81	585.39
10/20/2015 1:00	584.74	585.28
10/20/2015 5:00	584.65	585.17
10/20/2015 9:00	584.59	585.09

10/20/2015 13:00	584.53	585.01
10/20/2015 17:00	584.49	584.96
10/20/2015 21:00	584.44	584.91
10/21/2015 1:00	584.39	584.83
10/21/2015 5:00	584.41	584.87
10/21/2015 9:00	584.35	584.79
10/21/2015 13:00	584.29	584.72
10/21/2015 17:00	584.26	584.68
10/21/2015 21:00	584.18	584.62
10/22/2015 1:00	584.12	584.53
10/22/2015 5:00	584.08	584.48
10/22/2015 9:00	584.01	584.42
10/22/2015 13:00	583.92	584.31
10/22/2015 17:00	583.90	584.28
10/22/2015 21:00	583.87	584.24
10/23/2015 1:00	583.84	584.19
10/23/2015 5:00	583.81	584.18
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10/23/2015 13:00	583.75	584.09
10/23/2015 17:00	583.73	584.07
10/23/2015 21:00	583.71	584.04
10/24/2015 1:00	583.70	584.04
10/24/2015 5:00	583.73	584.07
10/24/2015 9:00	583.71	584.06
10/24/2015 13:00	583.67	584.02
10/24/2015 17:00	583.67	584.02
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10/25/2015 9:00	583.55	583.89
10/25/2015 13:00	583.51	583.85
10/25/2015 17:00	583.48	583.81
10/25/2015 21:00	583.44	583.77
10/26/2015 1:00	583.38	583.74
10/26/2015 5:00	583.34	583.68
10/26/2015 9:00	583.28	583.62
10/26/2015 13:00	583.22	583.56
10/26/2015 17:00	583.18	583.54
10/26/2015 21:00	583.13	583.47
10/27/2015 1:00	583.08	583.41
10/27/2015 5:00	583.02	583.36
10/27/2015 9:00	582.97	583.31
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10/27/2015 17:00	582.92	583.23
10/27/2015 21:00	582.91	583.23
10/28/2015 1:00	583.29	583.61
10/28/2015 5:00	584.15	584.49
10/28/2015 9:00	584.98	585.39
10/28/2015 13:00	585.40	586.01
10/28/2015 17:00	585.59	586.56
10/28/2015 21:00	585.54	586.52
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10/29/2015 13:00	584.85	585.41
10/29/2015 17:00	584.68	585.21
10/29/2015 21:00	584.50	585.00
10/30/2015 1:00	584.34	584.78
10/30/2015 5:00	584.18	584.62
10/30/2015 9:00	584.05	584.48
10/30/2015 13:00	583.94	584.36
10/30/2015 17:00	583.89	584.30
10/30/2015 21:00	583.81	584.19
10/31/2015 1:00	583.73	584.11
10/31/2015 5:00	583.68	584.05
10/31/2015 9:00	583.63	584.00
10/31/2015 13:00	583.82	584.33
10/31/2015 17:00	586.06	587.92
10/31/2015 21:00	588.17	589.21
11/1/2015 1:00	588.84	589.57
11/1/2015 4:00	589.00	589.66
11/1/2015 8:00	589.00	589.61
11/1/2015 12:00	588.91	589.51
11/1/2015 16:00	588.82	589.42
11/1/2015 20:00	588.69	589.31
11/2/2015 0:00	588.53	589.18
11/2/2015 4:00	588.36	589.03
11/2/2015 8:00	588.20	588.90
11/2/2015 12:00	588.07	588.77
11/2/2015 16:00	587.95	588.65
11/2/2015 20:00	587.83	588.56
11/3/2015 0:00	587.73	588.48
11/3/2015 4:00	587.62	588.38
11/3/2015 8:00	587.50	588.28
11/3/2015 12:00	587.40	588.20
11/3/2015 16:00	587.33	588.15
11/3/2015 20:00	587.24	588.09
11/4/2015 0:00	587.13	588.00
11/4/2015 4:00	586.99	587.93
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11/4/2015 12:00	586.71	587.77
11/4/2015 16:00	586.63	587.75
11/4/2015 20:00	586.51	587.66
11/5/2015 0:00	586.40	587.59
11/5/2015 4:00	586.37	587.60
11/5/2015 8:00	586.38	587.64
11/5/2015 12:00	586.44	587.67
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11/6/2015 20:00	588.19	588.85
11/7/2015 0:00	588.13	588.84
11/7/2015 4:00	588.15	588.91
11/7/2015 8:00	588.17	588.96
11/7/2015 12:00	588.19	588.95
11/7/2015 16:00	588.16	588.93
11/7/2015 20:00	588.08	588.86
11/8/2015 0:00	588.00	588.76
11/8/2015 4:00	587.91	588.69
11/8/2015 8:00	587.83	588.59
11/8/2015 12:00	587.77	588.50
11/8/2015 16:00	587.70	588.45
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11/9/2015 4:00	587.43	588.21
11/9/2015 8:00	587.35	588.15
11/9/2015 12:00	587.30	588.11
11/9/2015 16:00	587.22	588.05
11/9/2015 20:00	587.14	587.97
11/10/2015 0:00	587.05	587.92
11/10/2015 4:00	586.92	587.84
11/10/2015 8:00	586.80	587.80
11/10/2015 12:00	586.71	587.75
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11/10/2015 20:00	586.48	587.57
11/11/2015 0:00	586.37	587.47
11/11/2015 4:00	586.26	587.38
11/11/2015 8:00	586.16	587.31
11/11/2015 12:00	586.07	587.29
11/11/2015 16:00	586.02	587.23
11/11/2015 20:00	585.99	587.18
11/12/2015 0:00	586.67	587.89
11/12/2015 4:00	588.13	588.88

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

11/12/2015 8:00	588.80	589.39
11/12/2015 12:00	589.00	589.57
11/12/2015 16:00	589.06	589.63
11/12/2015 20:00	589.08	589.66
11/13/2015 0:00	589.07	589.63
11/13/2015 4:00	588.93	589.56
11/13/2015 8:00	588.88	589.47
11/13/2015 12:00	588.77	589.36
11/13/2015 16:00	588.63	589.26
11/13/2015 20:00	588.54	589.16
11/14/2015 0:00	588.40	589.06
11/14/2015 4:00	588.27	588.96
11/14/2015 8:00	588.18	588.90
11/14/2015 12:00	588.13	588.84
11/14/2015 16:00	588.09	588.79
11/14/2015 20:00	588.02	588.74
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11/15/2015 8:00	587.81	588.55
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11/15/2015 16:00	587.76	588.49
11/15/2015 20:00	587.72	588.45
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11/16/2015 4:00	587.64	588.39
11/16/2015 8:00	587.59	588.35
11/16/2015 12:00	587.56	588.33
11/16/2015 16:00	587.52	588.29
11/16/2015 20:00	587.49	588.25
11/17/2015 0:00	587.44	588.23
11/17/2015 4:00	587.40	588.20
11/17/2015 8:00	587.39	588.18
11/17/2015 12:00	587.40	588.18
11/17/2015 16:00	588.10	588.95
11/17/2015 20:00	589.20	589.83
11/18/2015 0:00	589.71	590.33
11/18/2015 4:00	589.95	590.63
11/18/2015 8:00	590.50	591.06
11/18/2015 12:00	590.80	591.34
11/18/2015 16:00	591.00	591.52
11/18/2015 20:00	591.15	591.63
11/19/2015 0:00	591.22	591.68
11/19/2015 4:00	591.26	591.71
11/19/2015 8:00	591.27	591.67
11/19/2015 12:00	591.21	591.62
11/19/2015 16:00	591.15	591.55
11/19/2015 20:00	591.10	591.47
11/20/2015 0:00	591.03	591.39
11/20/2015 4:00	590.92	591.28
11/20/2015 8:00	590.81	591.15
11/20/2015 12:00	590.75	591.05
11/20/2015 16:00	590.63	590.95
11/20/2015 20:00	590.53	590.82
11/21/2015 0:00	590.39	590.70
11/21/2015 4:00	590.27	590.62
11/21/2015 8:00	590.05	590.55
11/21/2015 12:00	590.03	590.54
11/21/2015 16:00	590.10	590.61
11/21/2015 20:00	590.37	590.70
11/22/2015 0:00	590.43	590.77
11/22/2015 4:00	590.42	590.73
11/22/2015 8:00	590.39	590.71
11/22/2015 12:00	590.37	590.69
11/22/2015 16:00	590.34	590.65
11/22/2015 20:00	590.17	590.61
11/23/2015 0:00	590.08	590.58
11/23/2015 4:00	590.04	590.55
11/23/2015 8:00	589.98	590.49
11/23/2015 12:00	589.92	590.44
11/23/2015 16:00	589.88	590.41
11/23/2015 20:00	589.84	590.38
11/24/2015 0:00	589.78	590.31
11/24/2015 4:00	589.76	590.28
11/24/2015 8:00	589.72	590.24
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11/25/2015 0:00	589.66	590.21
11/25/2015 4:00	589.66	590.19
11/25/2015 8:00	589.63	590.20
11/25/2015 12:00	589.63	590.20
11/25/2015 16:00	589.67	590.24
11/25/2015 20:00	589.70	590.29
11/26/2015 0:00	589.78	590.36
11/26/2015 4:00	589.85	590.48
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11/26/2015 12:00	590.55	590.98
11/26/2015 16:00	590.91	591.43
11/26/2015 20:00	591.19	591.68
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11/27/2015 20:00	593.30	594.03
11/28/2015 0:00	593.58	594.22
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11/28/2015 8:00	593.98	594.52
11/28/2015 12:00	594.16	594.65
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11/28/2015 20:00	594.38	594.81
11/29/2015 0:00	594.41	594.83
11/29/2015 4:00	594.44	594.83
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11/29/2015 12:00	594.40	594.77
11/29/2015 16:00	594.37	594.71
11/29/2015 20:00	594.30	594.63
11/30/2015 0:00	594.24	594.57
11/30/2015 4:00	594.21	594.50
11/30/2015 8:00	594.12	594.41
11/30/2015 12:00	594.08	594.35
11/30/2015 16:00	594.00	594.28
11/30/2015 20:00	593.92	594.21
12/1/2015 0:00	593.87	594.15
12/1/2015 4:00	593.85	594.14
12/1/2015 8:00	593.85	594.16
12/1/2015 12:00	593.81	594.13
12/1/2015 16:00	593.83	594.14
12/1/2015 20:00	593.80	594.11
12/2/2015 0:00	593.79	594.11
12/2/2015 4:00	593.77	594.10
12/2/2015 8:00	593.76	594.08
12/2/2015 12:00	593.77	594.08
12/2/2015 16:00	593.77	594.09
12/2/2015 20:00	593.75	594.08
12/3/2015 0:00	593.72	594.04
12/3/2015 4:00	593.72	594.02
12/3/2015 8:00	593.69	594.00
12/3/2015 12:00	593.65	593.96
12/3/2015 16:00	593.62	593.95
12/3/2015 20:00	593.57	593.89
12/4/2015 0:00	593.54	593.86
12/4/2015 4:00	593.51	593.82
12/4/2015 8:00	593.45	593.76
12/4/2015 12:00	593.42	593.73
12/4/2015 16:00	593.37	593.68
12/4/2015 20:00	593.31	593.63
12/5/2015 0:00	593.26	593.59

12/5/2015 4:00	593.19	593.53
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12/5/2015 12:00	593.05	593.38
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12/5/2015 20:00	592.93	593.26
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12/7/2015 20:00	592.27	592.61
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12/8/2015 8:00	592.11	592.45
12/8/2015 12:00	592.05	592.40
12/8/2015 16:00	592.01	592.36
12/8/2015 20:00	591.95	592.30
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12/10/2015 0:00	591.62	591.99
12/10/2015 4:00	591.58	591.95
12/10/2015 8:00	591.57	591.93
12/10/2015 12:00	591.51	591.88
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12/11/2015 4:00	591.36	591.73
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12/14/2015 20:00	593.52	594.07
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12/16/2015 12:00	594.35	594.63
12/16/2015 16:00	594.32	594.61
12/16/2015 20:00	594.30	594.57
12/17/2015 0:00	594.24	594.51
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12/17/2015 8:00	594.14	594.39
12/17/2015 12:00	594.09	594.35
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12/19/2015 12:00	593.23	593.52
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12/20/2015 12:00	592.80	593.08
12/20/2015 16:00	592.72	593.00
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12/21/2015 0:00	592.59	592.89
12/21/2015 4:00	592.57	592.90
12/21/2015 8:00	592.69	593.10
12/21/2015 12:00	592.90	593.39
12/21/2015 16:00	593.00	593.50
12/21/2015 20:00	593.12	593.61
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12/22/2015 16:00	593.68	594.02
12/22/2015 20:00	593.71	594.04
12/23/2015 0:00	593.74	594.06
12/23/2015 4:00	593.74	594.03
12/23/2015 8:00	593.74	594.03
12/23/2015 12:00	593.78	594.07
12/23/2015 16:00	593.93	594.26
12/23/2015 20:00	594.02	594.32
12/24/2015 0:00	594.08	594.37
12/24/2015 4:00	594.14	594.42
12/24/2015 8:00	594.17	594.45
12/24/2015 12:00	594.21	594.49
12/24/2015 16:00	594.24	594.51
12/24/2015 20:00	594.26	594.52
12/25/2015 0:00	594.26	594.52
12/25/2015 4:00	594.22	594.48
12/25/2015 8:00	594.20	594.45
12/25/2015 12:00	594.18	594.41
12/25/2015 16:00	594.14	594.39
12/25/2015 20:00	594.09	594.33
12/26/2015 0:00	594.05	594.30
12/26/2015 4:00	594.00	594.24
12/26/2015 8:00	593.99	594.21
12/26/2015 12:00	593.93	594.16
12/26/2015 16:00	593.89	594.14
12/26/2015 20:00	593.85	594.09
12/27/2015 0:00	593.80	594.05
12/27/2015 4:00	593.79	594.06
12/27/2015 8:00	593.80	594.08
12/27/2015 12:00	593.80	594.07
12/27/2015 16:00	593.77	594.05
12/27/2015 20:00	593.75	594.03

12/28/2015 0:00	593.74	594.02
12/28/2015 4:00	593.73	594.01
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12/28/2015 16:00	593.76	594.04
12/28/2015 20:00	594.25	594.56
12/29/2015 0:00	594.65	594.96
12/29/2015 4:00	595.03	595.29
12/29/2015 8:00	595.29	595.57
12/29/2015 12:00	595.52	595.84
12/29/2015 16:00	595.76	596.03
12/29/2015 20:00	596.02	596.33
12/30/2015 0:00	596.25	596.51
12/30/2015 4:00	596.39	596.65
12/30/2015 8:00	596.52	596.74
12/30/2015 12:00	596.55	596.77
12/30/2015 16:00	596.54	596.76
12/30/2015 20:00	596.49	596.70
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12/31/2015 20:00	595.93	596.14
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1/3/2016 12:00	594.55	594.77
1/3/2016 16:00	594.46	594.70
1/3/2016 20:00	594.40	594.62
1/4/2016 0:00	594.33	594.55
1/4/2016 4:00	594.26	594.47
1/4/2016 8:00	594.19	594.41
1/4/2016 12:00	594.15	594.36
1/4/2016 16:00	594.09	594.31
1/4/2016 20:00	594.01	594.23
1/5/2016 0:00	593.92	594.15
1/5/2016 4:00	593.84	594.06
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1/6/2016 16:00	593.25	593.53
1/6/2016 20:00	593.18	593.47
1/7/2016 0:00	593.10	593.41
1/7/2016 4:00	593.04	593.34
1/7/2016 8:00	592.97	593.29
1/7/2016 12:00	592.93	593.24
1/7/2016 16:00	592.87	593.19
1/7/2016 20:00	592.81	593.13
1/8/2016 0:00	592.77	593.10
1/8/2016 4:00	592.75	593.07
1/8/2016 8:00	592.71	593.04
1/8/2016 12:00	592.68	593.00
1/8/2016 16:00	592.66	593.02
1/8/2016 20:00	592.69	593.08
1/9/2016 0:00	592.74	593.11
1/9/2016 4:00	592.78	593.16
1/9/2016 8:00	592.81	593.20
1/9/2016 12:00	592.86	593.26
1/9/2016 16:00	592.87	593.29
1/9/2016 20:00	592.92	593.37
1/10/2016 0:00	593.01	593.46
1/10/2016 4:00	593.07	593.50
1/10/2016 8:00	593.11	593.53
1/10/2016 12:00	593.15	593.55
1/10/2016 16:00	593.15	593.56
1/10/2016 20:00	593.13	593.52
1/11/2016 0:00	593.15	593.50
1/11/2016 4:00	593.13	593.49
1/11/2016 8:00	593.09	593.45
1/11/2016 12:00	593.13	593.49
1/11/2016 16:00	593.11	593.44
1/11/2016 20:00	593.08	593.41
1/12/2016 0:00	593.03	593.36
1/12/2016 4:00	592.98	593.31
1/12/2016 8:00	592.90	593.23
1/12/2016 12:00	592.86	593.19
1/12/2016 16:00	592.81	593.13
1/12/2016 20:00	592.71	593.05
1/13/2016 0:00	592.66	592.98
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1/14/2016 4:00	592.40	592.72
1/14/2016 8:00	592.35	592.68
1/14/2016 12:00	592.31	592.66
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1/14/2016 20:00	592.22	592.56
1/15/2016 0:00	592.19	592.55
1/15/2016 4:00	592.14	592.52
1/15/2016 8:00	592.10	592.50
1/15/2016 12:00	592.08	592.47
1/15/2016 16:00	592.05	592.45
1/15/2016 20:00	592.03	592.43
1/16/2016 0:00	592.00	592.41
1/16/2016 4:00	591.96	592.37
1/16/2016 8:00	591.92	592.32
1/16/2016 12:00	591.90	592.31
1/16/2016 16:00	591.85	592.27
1/16/2016 20:00	591.79	592.20
1/17/2016 0:00	591.76	592.18
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1/17/2016 12:00	591.67	592.06
1/17/2016 16:00	591.63	592.03
1/17/2016 20:00	591.55	591.94
1/18/2016 0:00	591.49	591.89
1/18/2016 4:00	591.46	591.86
1/18/2016 8:00	591.42	591.82
1/18/2016 12:00	591.46	591.85
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1/18/2016 20:00	591.34	591.74
1/19/2016 0:00	591.30	591.69
1/19/2016 4:00	591.25	591.65
1/19/2016 8:00	591.23	591.62
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1/19/2016 16:00	591.24	591.64

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1/20/2016 8:00	591.13	591.52
1/20/2016 12:00	591.14	591.51
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1/21/2016 0:00	591.03	591.41
1/21/2016 4:00	591.01	591.39
1/21/2016 8:00	590.99	591.36
1/21/2016 12:00	591.02	591.39
1/21/2016 16:00	590.99	591.37
1/21/2016 20:00	590.94	591.31
1/22/2016 0:00	590.92	591.31
1/22/2016 4:00	590.94	591.30
1/22/2016 8:00	590.88	591.28
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1/23/2016 8:00	590.80	591.15
1/23/2016 12:00	590.77	591.16
1/23/2016 16:00	590.75	591.11
1/23/2016 20:00	590.73	591.11
1/24/2016 0:00	590.73	591.08
1/24/2016 4:00	590.69	591.05
1/24/2016 8:00	590.68	591.02
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1/24/2016 20:00	590.60	591.00
1/25/2016 0:00	590.61	590.97
1/25/2016 4:00	590.61	590.96
1/25/2016 8:00	590.59	590.94
1/25/2016 12:00	590.55	590.94
1/25/2016 16:00	590.56	590.93
1/25/2016 20:00	590.57	590.91
1/26/2016 0:00	590.62	590.99
1/26/2016 4:00	590.65	591.04
1/26/2016 8:00	590.65	591.03
1/26/2016 12:00	590.65	591.02
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1/26/2016 20:00	590.60	590.97
1/27/2016 0:00	590.59	590.96
1/27/2016 4:00	590.53	590.93
1/27/2016 8:00	590.54	590.89
1/27/2016 12:00	590.55	590.87
1/27/2016 16:00	590.53	590.87
1/27/2016 20:00	590.48	590.84
1/28/2016 0:00	590.47	590.82
1/28/2016 4:00	590.46	590.80
1/28/2016 8:00	590.44	590.77
1/28/2016 12:00	590.41	590.76
1/28/2016 16:00	590.42	590.72
1/28/2016 20:00	590.35	590.70
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1/29/2016 12:00	590.18	590.63
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1/29/2016 20:00	590.16	590.61
1/30/2016 0:00	590.19	590.60
1/30/2016 4:00	590.15	590.58
1/30/2016 8:00	590.12	590.56
1/30/2016 12:00	590.12	590.57
1/30/2016 16:00	590.11	590.54
1/30/2016 20:00	590.09	590.53
1/31/2016 0:00	590.08	590.51
1/31/2016 4:00	590.06	590.50
1/31/2016 8:00	590.04	590.48
1/31/2016 12:00	590.04	590.48
1/31/2016 16:00	590.04	590.47
1/31/2016 20:00	590.00	590.44
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2/1/2016 4:00	589.98	590.42
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2/1/2016 16:00	589.96	590.41
2/1/2016 20:00	589.92	590.36
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2/2/2016 20:00	591.35	591.85
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2/3/2016 12:00	592.11	592.66
2/3/2016 16:00	592.20	592.74
2/3/2016 20:00	592.26	592.77
2/4/2016 0:00	592.30	592.78
2/4/2016 4:00	592.31	592.78
2/4/2016 8:00	592.30	592.74
2/4/2016 12:00	592.32	592.74
2/4/2016 16:00	592.26	592.68
2/4/2016 20:00	592.22	592.62
2/5/2016 0:00	592.16	592.55
2/5/2016 4:00	592.11	592.48
2/5/2016 8:00	592.04	592.40
2/5/2016 12:00	591.94	592.30
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2/6/2016 16:00	591.38	591.75
2/6/2016 20:00	591.36	591.70
2/7/2016 0:00	591.30	591.65
2/7/2016 4:00	591.24	591.60
2/7/2016 8:00	591.22	591.56
2/7/2016 12:00	591.18	591.53
2/7/2016 16:00	591.16	591.50
2/7/2016 20:00	591.09	591.45
2/8/2016 0:00	591.06	591.43
2/8/2016 4:00	591.03	591.39
2/8/2016 8:00	591.00	591.35
2/8/2016 12:00	590.96	591.33
2/8/2016 16:00	590.94	591.29
2/8/2016 20:00	590.90	591.26
2/9/2016 0:00	590.86	591.22
2/9/2016 4:00	590.85	591.20
2/9/2016 8:00	590.81	591.15
2/9/2016 12:00	590.79	591.13
2/9/2016 16:00	590.76	591.09
2/9/2016 20:00	590.71	591.06
2/10/2016 0:00	590.67	591.02
2/10/2016 4:00	590.62	590.99
2/10/2016 8:00	590.59	590.96
2/10/2016 12:00	590.63	590.98
2/10/2016 16:00	590.60	590.94
2/10/2016 20:00	590.54	590.88
2/11/2016 0:00	590.48	590.85
2/11/2016 4:00	590.47	590.81
2/11/2016 8:00	590.44	590.78
2/11/2016 12:00	590.46	590.81

2/11/2016 16:00	590.47	590.80
2/11/2016 20:00	590.42	590.75
2/12/2016 0:00	590.40	590.73
2/12/2016 4:00	590.38	590.72
2/12/2016 8:00	590.36	590.69
2/12/2016 12:00	590.34	590.69
2/12/2016 16:00	590.27	590.67
2/12/2016 20:00	590.17	590.62
2/13/2016 0:00	590.13	590.55
2/13/2016 4:00	590.08	590.52
2/13/2016 8:00	590.09	590.51
2/13/2016 12:00	590.10	590.54
2/13/2016 16:00	590.11	590.54
2/13/2016 20:00	590.04	590.48
2/14/2016 0:00	590.03	590.46
2/14/2016 4:00	590.02	590.46
2/14/2016 8:00	590.02	590.44
2/14/2016 12:00	590.01	590.43
2/14/2016 16:00	590.00	590.43
2/14/2016 20:00	589.99	590.41
2/15/2016 0:00	589.97	590.38
2/15/2016 4:00	589.95	590.38
2/15/2016 8:00	589.94	590.36
2/15/2016 12:00	589.93	590.36
2/15/2016 16:00	589.93	590.36
2/15/2016 20:00	589.91	590.31
2/16/2016 0:00	589.89	590.30
2/16/2016 4:00	589.86	590.29
2/16/2016 8:00	589.87	590.28
2/16/2016 12:00	589.85	590.28
2/16/2016 16:00	589.85	590.26
2/16/2016 20:00	589.82	590.24
2/17/2016 0:00	589.79	590.21
2/17/2016 4:00	589.78	590.19
2/17/2016 8:00	589.74	590.17
2/17/2016 12:00	589.75	590.20
2/17/2016 16:00	589.74	590.17
2/17/2016 20:00	589.73	590.14
2/18/2016 0:00	589.72	590.14
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2/19/2016 4:00	589.67	590.10
2/19/2016 8:00	589.69	590.10
2/19/2016 12:00	589.65	590.07
2/19/2016 16:00	589.66	590.09
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2/20/2016 8:00	589.60	590.05
2/20/2016 12:00	589.58	590.03
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2/21/2016 0:00	589.58	590.00
2/21/2016 4:00	589.56	590.00
2/21/2016 8:00	589.53	589.98
2/21/2016 12:00	589.55	589.97
2/21/2016 16:00	589.53	589.97
2/21/2016 20:00	589.51	589.95
2/22/2016 0:00	589.49	589.94
2/22/2016 4:00	589.49	589.91
2/22/2016 8:00	589.47	589.91
2/22/2016 12:00	589.46	589.89
2/22/2016 16:00	589.49	589.92
2/22/2016 20:00	589.46	589.90
2/23/2016 0:00	589.43	589.88
2/23/2016 4:00	589.42	589.86
2/23/2016 8:00	589.41	589.85
2/23/2016 12:00	589.41	589.85
2/23/2016 16:00	589.41	589.85
2/23/2016 20:00	589.41	589.86
2/24/2016 0:00	589.41	589.84
2/24/2016 4:00	589.40	589.83
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2/25/2016 0:00	589.34	589.78
2/25/2016 4:00	589.33	589.77
2/25/2016 8:00	589.30	589.76
2/25/2016 12:00	589.30	589.74
2/25/2016 16:00	589.28	589.74
2/25/2016 20:00	589.28	589.72
2/26/2016 0:00	589.27	589.71
2/26/2016 4:00	589.25	589.70
2/26/2016 8:00	589.24	589.70
2/26/2016 12:00	589.24	589.69
2/26/2016 16:00	589.25	589.68
2/26/2016 20:00	589.23	589.68
2/27/2016 0:00	589.22	589.67
2/27/2016 4:00	589.19	589.64
2/27/2016 8:00	589.20	589.64
2/27/2016 12:00	589.21	589.64
2/27/2016 16:00	589.20	589.64
2/27/2016 20:00	589.21	589.63
2/28/2016 0:00	589.19	589.64
2/28/2016 4:00	589.17	589.62
2/28/2016 8:00	589.16	589.60
2/28/2016 12:00	589.16	589.58
2/28/2016 16:00	589.15	589.60
2/28/2016 20:00	589.13	589.57
2/29/2016 0:00	589.09	589.55
2/29/2016 4:00	589.08	589.52
2/29/2016 8:00	589.06	589.50
2/29/2016 12:00	589.05	589.50
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2/29/2016 20:00	589.04	589.49
3/1/2016 0:00	589.04	589.48
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3/1/2016 8:00	589.05	589.48
3/1/2016 12:00	589.00	589.45
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3/1/2016 20:00	588.96	589.40
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3/2/2016 4:00	588.92	589.36
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3/2/2016 12:00	588.92	589.38
3/2/2016 16:00	588.94	589.39
3/2/2016 20:00	588.91	589.36
3/3/2016 0:00	588.91	589.35
3/3/16 0:00	588.906	589.317
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3/3/2016 8:00	588.88	589.33
3/3/2016 12:00	588.91	589.35
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3/4/2016 0:00	588.88	589.33
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3/4/2016 16:00	588.86	589.29
3/4/2016 20:00	588.84	589.28
3/5/2016 0:00	588.83	589.27
3/5/2016 4:00	588.82	589.25

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

3/5/2016 8:00	588.81	589.24
3/5/2016 12:00	588.79	589.23
3/5/2016 16:00	588.77	589.22
3/5/2016 20:00	588.74	589.22
3/6/2016 0:00	588.72	589.19
3/6/2016 4:00	588.71	589.18
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3/6/2016 12:00	588.69	589.15
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5/21/2016 13:00	590.78	591.13
5/21/2016 17:00	590.75	591.10
5/21/2016 21:00	590.77	591.10
5/22/2016 1:00	590.73	591.06
5/22/2016 5:00	590.70	591.03
5/22/2016 9:00	590.66	590.99
5/22/2016 13:00	590.62	590.96
5/22/2016 17:00	590.59	590.92
5/22/2016 21:00	590.58	590.91
5/23/2016 1:00	590.56	590.88
5/23/2016 5:00	590.56	590.88
5/23/2016 9:00	590.49	590.82
5/23/2016 13:00	590.45	590.77
5/23/2016 17:00	590.42	590.74
5/23/2016 21:00	590.44	590.76
5/24/2016 1:00	590.37	590.68
5/24/2016 5:00	590.37	590.70
5/24/2016 9:00	590.25	590.64
5/24/2016 13:00	590.22	590.63
5/24/2016 17:00	590.18	590.60
5/24/2016 21:00	590.20	590.60
5/25/2016 1:00	590.18	590.58
5/25/2016 5:00	590.15	590.57
5/25/2016 9:00	590.12	590.51
5/25/2016 13:00	590.10	590.48
5/25/2016 17:00	590.09	590.49
5/25/2016 21:00	590.05	590.45
5/26/2016 1:00	590.06	590.47
5/26/2016 5:00	590.06	590.48
5/26/2016 9:00	590.05	590.45
5/26/2016 13:00	590.01	590.43
5/26/2016 17:00	589.99	590.40
5/26/2016 21:00	590.00	590.40
5/27/2016 1:00	589.97	590.38
5/27/2016 5:00	589.95	590.35
5/27/2016 9:00	589.94	590.32
5/27/2016 13:00	589.90	590.30
5/27/2016 17:00	589.87	590.28
5/27/2016 21:00	589.88	590.28
5/28/2016 1:00	589.89	590.29
5/28/2016 5:00	589.89	590.28
5/28/2016 9:00	589.84	590.24
5/28/2016 13:00	589.82	590.21
5/28/2016 17:00	589.78	590.18
5/28/2016 21:00	589.78	590.19
5/29/2016 1:00	589.74	590.15
5/29/2016 5:00	589.71	590.11
5/29/2016 9:00	589.69	590.09
5/29/2016 13:00	589.64	590.07
5/29/2016 17:00	589.64	590.06
5/29/2016 21:00	589.62	590.04
5/30/2016 1:00	589.60	590.03
5/30/2016 5:00	589.60	590.03
5/30/2016 9:00	589.54	589.97
5/30/2016 13:00	589.50	589.94
5/30/2016 17:00	589.49	589.92
5/30/2016 21:00	589.48	589.91
5/31/2016 1:00	589.48	589.91
5/31/2016 5:00	589.48	589.91
5/31/2016 9:00	589.42	589.87
5/31/2016 13:00	589.39	589.83
5/31/2016 17:00	589.50	589.92
5/31/2016 21:00	589.68	590.09
6/1/2016 1:00	589.74	590.17
6/1/2016 5:00	589.79	590.22
6/1/2016 9:00	589.87	590.30
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6/1/2016 17:00	590.02	590.45
6/1/2016 21:00	590.03	590.46
6/2/2016 1:00	590.00	590.43
6/2/2016 5:00	589.96	590.37
6/2/2016 9:00	589.86	590.28
6/2/2016 13:00	589.80	590.22
6/2/2016 17:00	589.74	590.14
6/2/2016 21:00	589.70	590.13
6/3/2016 1:00	589.66	590.08
6/3/2016 5:00	589.61	590.04
6/3/2016 9:00	589.55	589.98
6/3/2016 13:00	589.49	589.92
6/3/2016 17:00	589.47	589.90
6/3/2016 21:00	589.45	589.89
6/4/2016 1:00	589.42	589.86
6/4/2016 5:00	589.42	589.85
6/4/2016 9:00	589.37	589.81
6/4/2016 13:00	589.37	589.81

6/4/2016 17:00	589.33	589.77
6/4/2016 21:00	589.32	589.75
6/5/2016 1:00	589.29	589.73
6/5/2016 5:00	589.29	589.72
6/5/2016 9:00	589.24	589.68
6/5/2016 13:00	589.20	589.64
6/5/2016 17:00	589.17	589.60
6/5/2016 21:00	589.16	589.61
6/6/2016 1:00	589.16	589.60
6/6/2016 5:00	589.13	589.59
6/6/2016 9:00	589.12	589.56
6/6/2016 13:00	589.09	589.52
6/6/2016 17:00	589.07	589.50
6/6/2016 21:00	589.06	589.52
6/7/2016 1:00	589.06	589.50
6/7/2016 5:00	589.05	589.48
6/7/2016 9:00	589.00	589.44
6/7/2016 13:00	588.98	589.43
6/7/2016 17:00	588.96	589.42
6/7/2016 21:00	588.95	589.40
6/8/2016 1:00	588.94	589.38
6/8/2016 5:00	588.91	589.36
6/8/2016 9:00	588.86	589.32
6/8/2016 13:00	588.84	589.30
6/8/2016 17:00	588.82	589.27
6/8/2016 21:00	588.82	589.27
6/9/2016 1:00	588.81	589.26
6/9/2016 5:00	588.76	589.24
6/9/2016 9:00	588.74	589.21
6/9/2016 13:00	588.71	589.20
6/9/2016 17:00	588.71	589.19
6/9/2016 21:00	588.74	589.20
6/10/2016 1:00	588.73	589.20
6/10/2016 5:00	588.70	589.18
6/10/2016 9:00	588.67	589.14
6/10/2016 13:00	588.62	589.10
6/10/2016 17:00	588.58	589.08
6/10/2016 21:00	588.55	589.06
6/11/2016 1:00	588.54	589.05
6/11/2016 5:00	588.53	589.05
6/11/2016 9:00	588.46	588.98
6/11/2016 13:00	588.45	588.95
6/11/2016 17:00	588.40	588.92
6/11/2016 21:00	588.39	588.91
6/12/2016 1:00	588.38	588.91
6/12/2016 5:00	588.34	588.87
6/12/2016 9:00	588.32	588.84
6/12/2016 13:00	588.27	588.80
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6/12/2016 21:00	588.26	588.79
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6/14/2016 5:00	588.07	588.62
6/14/2016 9:00	588.02	588.58
6/14/2016 13:00	587.96	588.53
6/14/2016 17:00	587.97	588.54
6/14/2016 21:00	587.96	588.54
6/15/2016 1:00	587.94	588.51
6/15/2016 5:00	588.04	588.57
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6/15/2016 21:00	588.83	589.31
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6/16/2016 21:00	588.43	588.94
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6/17/2016 13:00	588.18	588.70
6/17/2016 17:00	588.12	588.66
6/17/2016 21:00	588.10	588.66
6/18/2016 1:00	588.07	588.62
6/18/2016 5:00	588.03	588.59
6/18/2016 9:00	587.97	588.52
6/18/2016 13:00	587.91	588.49
6/18/2016 17:00	587.88	588.47
6/18/2016 21:00	587.87	588.45
6/19/2016 1:00	587.86	588.44
6/19/2016 5:00	587.81	588.40
6/19/2016 9:00	587.76	588.36
6/19/2016 13:00	587.74	588.33
6/19/2016 17:00	587.71	588.31
6/19/2016 21:00	587.71	588.31
6/20/2016 1:00	587.68	588.28
6/20/2016 5:00	587.66	588.26
6/20/2016 9:00	587.58	588.21
6/20/2016 13:00	587.52	588.17
6/20/2016 17:00	587.49	588.15
6/20/2016 21:00	587.45	588.15
6/21/2016 1:00	587.39	588.12
6/21/2016 5:00	587.34	588.11
6/21/2016 9:00	587.26	588.05
6/21/2016 13:00	587.20	588.00
6/21/2016 17:00	587.15	587.98
6/21/2016 21:00	587.10	587.97
6/22/2016 1:00	587.03	587.96
6/22/2016 5:00	586.96	587.93
6/22/2016 9:00	586.94	587.93
6/22/2016 13:00	587.10	587.98
6/22/2016 17:00	587.45	588.14
6/22/2016 21:00	587.78	588.36
6/23/2016 1:00	588.05	588.59
6/23/2016 5:00	588.18	588.73
6/23/2016 9:00	588.16	588.73
6/23/2016 13:00	588.12	588.69
6/23/2016 17:00	588.05	588.62
6/23/2016 21:00	587.98	588.57
6/24/2016 1:00	587.89	588.51
6/24/2016 5:00	587.82	588.44
6/24/2016 9:00	587.72	588.35
6/24/2016 13:00	587.66	588.29
6/24/2016 17:00	587.58	588.23
6/24/2016 21:00	587.52	588.20
6/25/2016 1:00	587.44	588.15
6/25/2016 5:00	587.36	588.12
6/25/2016 9:00	587.26	588.06
6/25/2016 13:00	587.17	587.97
6/25/2016 17:00	587.08	587.95
6/25/2016 21:00	587.02	587.94
6/26/2016 1:00	586.90	587.91
6/26/2016 5:00	586.84	587.93
6/26/2016 9:00	586.71	587.87
6/26/2016 13:00	586.72	587.87
6/26/2016 17:00	586.75	587.87
6/26/2016 21:00	586.74	587.88
6/27/2016 1:00	586.71	587.88
6/27/2016 5:00	586.65	587.86
6/27/2016 9:00	586.55	587.82

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

6/27/2016 13:00	586.46	587.81
6/27/2016 17:00	586.37	587.79
6/27/2016 21:00	586.26	587.77
6/28/2016 1:00	586.17	587.75
6/28/2016 5:00	586.09	587.74
6/28/2016 9:00	585.97	587.73
6/28/2016 13:00	585.87	587.71
6/28/2016 17:00	585.75	587.66
6/28/2016 21:00	585.72	587.58
6/29/2016 1:00	585.65	587.43
6/29/2016 5:00	585.59	587.27
6/29/2016 9:00	585.48	587.02
6/29/2016 13:00	585.42	586.88
6/29/2016 17:00	585.34	586.77
6/29/2016 21:00	585.27	586.39
6/30/2016 1:00	585.21	586.23
6/30/2016 5:00	585.15	586.12
6/30/2016 9:00	585.08	586.00
6/30/2016 13:00	584.99	585.84
6/30/2016 17:00	584.91	585.74
6/30/2016 21:00	584.86	585.67
7/1/2016 1:00	584.82	585.57
7/1/2016 5:00	584.76	585.48
7/1/2016 9:00	584.65	585.33
7/1/2016 13:00	584.59	585.20
7/1/2016 17:00	584.51	585.08
7/1/2016 21:00	584.46	585.02
7/2/2016 1:00	584.40	584.95
7/2/2016 5:00	584.35	584.87
7/2/2016 9:00	584.28	584.80
7/2/2016 13:00	584.21	584.72
7/2/2016 17:00	584.16	584.66
7/2/2016 21:00	584.13	584.61
7/3/2016 1:00	584.07	584.55
7/3/2016 5:00	584.02	584.49
7/3/2016 9:00	583.94	584.40
7/3/2016 13:00	583.88	584.34
7/3/2016 17:00	583.86	584.29
7/3/2016 21:00	583.82	584.25
7/4/2016 1:00	583.78	584.19
7/4/2016 5:00	583.73	584.15
7/4/2016 9:00	583.71	584.09
7/4/2016 13:00	583.65	584.06
7/4/2016 17:00	583.64	584.02
7/4/2016 21:00	583.61	583.99
7/5/2016 1:00	583.56	583.95
7/5/2016 5:00	583.53	583.93
7/5/2016 9:00	583.49	583.87
7/5/2016 13:00	583.42	583.80
7/5/2016 17:00	583.37	583.76
7/5/2016 21:00	583.32	583.71
7/6/2016 1:00	583.27	583.67
7/6/2016 5:00	583.27	583.65
7/6/2016 9:00	584.41	587.06
7/6/2016 13:00	586.65	588.22
7/6/2016 17:00	587.72	588.78
7/6/2016 21:00	588.10	588.99
7/7/2016 1:00	588.19	589.01
7/7/2016 5:00	588.11	588.89
7/7/2016 9:00	588.04	588.79
7/7/2016 13:00	587.93	588.67
7/7/2016 17:00	587.78	588.52
7/7/2016 21:00	587.72	588.46
7/8/2016 1:00	587.78	588.49
7/8/2016 5:00	587.77	588.48
7/8/2016 9:00	587.71	588.42
7/8/2016 13:00	587.63	588.35
7/8/2016 17:00	587.49	588.26
7/8/2016 21:00	587.38	588.17
7/9/2016 1:00	587.23	588.07
7/9/2016 5:00	587.08	587.96
7/9/2016 9:00	586.86	587.86
7/9/2016 13:00	586.66	587.77
7/9/2016 17:00	586.43	587.70
7/9/2016 21:00	586.25	587.59
7/10/2016 1:00	586.07	587.42
7/10/2016 5:00	585.94	587.32
7/10/2016 9:00	585.75	587.15
7/10/2016 13:00	585.61	586.98
7/10/2016 17:00	585.47	586.74
7/10/2016 21:00	585.35	586.54
7/11/2016 1:00	585.25	586.20
7/11/2016 5:00	585.13	585.95
7/11/2016 9:00	585.01	585.76
7/11/2016 13:00	584.87	585.49
7/11/2016 17:00	584.78	585.36
7/11/2016 21:00	584.69	585.25
7/12/2016 1:00	584.61	585.13
7/12/2016 5:00	584.55	585.03
7/12/2016 9:00	584.46	584.93
7/12/2016 13:00	584.35	584.82
7/12/2016 17:00	584.25	584.69
7/12/2016 21:00	584.16	584.61
7/13/2016 1:00	584.07	584.49
7/13/2016 5:00	584.01	584.42
7/13/2016 9:00	583.93	584.34
7/13/2016 13:00	583.93	584.34
7/13/2016 17:00	584.07	584.49
7/13/2016 21:00	585.44	587.86
7/14/2016 1:00	588.34	589.48
7/14/2016 5:00	589.11	589.90
7/14/2016 9:00	589.34	590.09
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7/14/2016 21:00	589.45	590.08
7/15/2016 1:00	589.34	589.93
7/15/2016 5:00	589.15	589.78
7/15/2016 9:00	589.03	589.61
7/15/2016 13:00	588.82	589.44
7/15/2016 17:00	588.67	589.28
7/15/2016 21:00	588.50	589.14
7/16/2016 1:00	588.37	589.02
7/16/2016 5:00	588.22	588.90
7/16/2016 9:00	588.07	588.76
7/16/2016 13:00	588.00	588.68
7/16/2016 17:00	587.87	588.58
7/16/2016 21:00	587.80	588.54
7/17/2016 1:00	587.75	588.49
7/17/2016 5:00	587.69	588.42
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7/17/2016 13:00	587.66	588.38
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7/18/2016 1:00	587.87	588.57
7/18/2016 5:00	588.74	589.43
7/18/2016 9:00	589.10	589.75
7/18/2016 13:00	589.26	589.90
7/18/2016 17:00	589.31	589.93
7/18/2016 21:00	589.31	589.91
7/19/2016 1:00	589.27	589.85
7/19/2016 5:00	589.18	589.76
7/19/2016 9:00	589.05	589.62
7/19/2016 13:00	588.94	589.51
7/19/2016 17:00	588.83	589.40
7/19/2016 21:00	588.72	589.32
7/20/2016 1:00	588.62	589.23
7/20/2016 5:00	588.48	589.12

7/20/2016 9:00	588.37	589.04
7/20/2016 13:00	588.27	588.96
7/20/2016 17:00	588.19	588.86
7/20/2016 21:00	588.14	588.83
7/21/2016 1:00	588.09	588.77
7/21/2016 5:00	588.01	588.73
7/21/2016 9:00	587.93	588.64
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7/21/2016 17:00	587.86	588.55
7/21/2016 21:00	587.78	588.52
7/22/2016 1:00	589.74	590.84
7/22/2016 5:00	590.67	591.34
7/22/2016 9:00	590.99	591.58
7/22/2016 13:00	591.23	591.76
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7/23/2016 1:00	591.44	591.86
7/23/2016 5:00	591.40	591.80
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7/23/2016 13:00	591.21	591.56
7/23/2016 17:00	591.10	591.43
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7/24/2016 17:00	592.73	593.36
7/24/2016 21:00	592.84	593.40
7/25/2016 1:00	592.90	593.50
7/25/2016 5:00	592.93	593.50
7/25/2016 9:00	592.94	593.43
7/25/2016 13:00	592.91	593.41
7/25/2016 17:00	592.87	593.36
7/25/2016 21:00	592.83	593.30
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7/26/2016 21:00	592.41	592.72
7/27/2016 1:00	592.35	592.69
7/27/2016 5:00	592.20	592.55
7/27/2016 9:00	592.08	592.38
7/27/2016 13:00	591.91	592.22
7/27/2016 17:00	591.76	592.04
7/27/2016 21:00	591.63	591.91
7/28/2016 1:00	591.50	591.77
7/28/2016 5:00	591.38	591.65
7/28/2016 9:00	591.24	591.52
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7/28/2016 17:00	591.04	591.33
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7/29/2016 5:00	590.85	591.15
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7/29/2016 13:00	590.72	591.02
7/29/2016 17:00	590.91	591.31
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7/30/2016 1:00	591.08	591.45
7/30/2016 5:00	591.07	591.41
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7/31/2016 17:00	590.53	590.84
7/31/2016 21:00	590.49	590.79
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8/1/2016 21:00	590.03	590.51
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8/3/2016 5:00	589.74	590.23
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10/17/2016 21:00	589.63	590.09
10/18/2016 1:00	589.56	590.05
10/18/2016 5:00	589.51	590.01
10/18/2016 9:00	589.45	589.95
10/18/2016 13:00	589.39	589.89
10/18/2016 17:00	589.33	589.82
10/18/2016 21:00	589.32	589.81
10/19/2016 1:00	589.27	589.76
10/19/2016 5:00	589.25	589.75
10/19/2016 9:00	589.20	589.71

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

10/19/2016 13:00	589.14	589.63
10/19/2016 17:00	589.13	589.63
10/19/2016 21:00	589.09	589.59
10/20/2016 1:00	589.07	589.55
10/20/2016 5:00	589.04	589.53
10/20/2016 9:00	589.01	589.50
10/20/2016 13:00	588.97	589.46
10/20/2016 17:00	588.95	589.46
10/20/2016 21:00	588.90	589.41
10/21/2016 1:00	588.89	589.38
10/21/2016 5:00	588.85	589.34
10/21/2016 9:00	588.84	589.32
10/21/2016 13:00	588.79	589.30
10/21/2016 17:00	588.76	589.27
10/21/2016 21:00	588.75	589.26
10/22/2016 1:00	588.71	589.23
10/22/2016 5:00	588.66	589.19
10/22/2016 9:00	588.63	589.15
10/22/2016 13:00	588.61	589.13
10/22/2016 17:00	588.58	589.11
10/22/2016 21:00	588.57	589.11
10/23/2016 1:00	588.54	589.09
10/23/2016 5:00	588.52	589.06
10/23/2016 9:00	588.47	589.02
10/23/2016 13:00	588.46	589.00
10/23/2016 17:00	588.39	588.94
10/23/2016 21:00	588.39	588.96
10/24/2016 1:00	588.36	588.92
10/24/2016 5:00	588.32	588.90
10/24/2016 9:00	588.30	588.87
10/24/2016 13:00	588.27	588.84
10/24/2016 17:00	588.26	588.83
10/24/2016 21:00	588.25	588.82
10/25/2016 1:00	588.23	588.78
10/25/2016 5:00	588.20	588.77
10/25/2016 9:00	588.17	588.75
10/25/2016 13:00	588.15	588.73
10/25/2016 17:00	588.15	588.72
10/25/2016 21:00	588.13	588.68
10/26/2016 1:00	588.11	588.68
10/26/2016 5:00	588.11	588.67
10/26/2016 9:00	588.12	588.68
10/26/2016 13:00	588.26	588.86
10/26/2016 17:00	588.95	589.48
10/26/2016 21:00	589.74	590.37
10/27/2016 1:00	590.00	590.57
10/27/2016 5:00	590.14	590.66
10/27/2016 9:00	590.25	590.70
10/27/2016 13:00	590.32	590.72
10/27/2016 17:00	590.26	590.68
10/27/2016 21:00	590.17	590.64
10/28/2016 1:00	590.12	590.58
10/28/2016 5:00	590.06	590.51
10/28/2016 9:00	589.98	590.42
10/28/2016 13:00	589.94	590.39
10/28/2016 17:00	589.87	590.33
10/28/2016 21:00	589.81	590.26
10/29/2016 1:00	589.75	590.20
10/29/2016 5:00	589.68	590.14
10/29/2016 9:00	589.61	590.07
10/29/2016 13:00	589.56	590.02
10/29/2016 17:00	589.49	589.96
10/29/2016 21:00	589.45	589.92
10/30/2016 1:00	589.39	589.86
10/30/2016 5:00	589.34	589.83
10/30/2016 9:00	589.45	589.95
10/30/2016 13:00	589.58	590.09
10/30/2016 17:00	589.66	590.14
10/30/2016 21:00	589.67	590.15
10/31/2016 1:00	589.68	590.15
10/31/2016 5:00	589.65	590.13
10/31/2016 9:00	589.62	590.10
10/31/2016 13:00	589.58	590.06
10/31/2016 17:00	589.58	590.05
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11/1/2016 5:00	589.47	589.94
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11/1/2016 17:00	589.32	589.80
11/1/2016 21:00	589.29	589.78
11/2/2016 1:00	589.26	589.75
11/2/2016 5:00	589.22	589.72
11/2/2016 9:00	589.18	589.68
11/2/2016 13:00	589.16	589.64
11/2/2016 17:00	589.12	589.62
11/2/2016 21:00	589.12	589.63
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11/4/2016 9:00	589.21	589.70
11/4/2016 13:00	589.18	589.66
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11/4/2016 21:00	589.13	589.62
11/5/2016 1:00	589.08	589.57
11/5/2016 5:00	589.06	589.54
11/5/2016 9:00	589.02	589.52
11/5/2016 13:00	588.99	589.47
11/5/2016 17:00	588.98	589.46
11/5/2016 21:00	588.97	589.46
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11/8/2016 20:00	588.54	589.09
11/9/2016 0:00	588.52	589.06
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11/9/2016 12:00	588.43	588.99
11/9/2016 16:00	588.43	588.97
11/9/2016 20:00	588.40	588.97
11/10/2016 0:00	588.39	588.96
11/10/2016 4:00	588.37	588.92
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11/10/2016 20:00	588.30	588.87
11/11/2016 0:00	588.28	588.84
11/11/2016 4:00	588.26	588.82

11/11/2016 8:00	588.21	588.78
11/11/2016 12:00	588.20	588.77
11/11/2016 16:00	588.17	588.75
11/11/2016 20:00	588.15	588.73
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11/12/2016 4:00	588.11	588.69
11/12/2016 8:00	588.10	588.67
11/12/2016 12:00	588.09	588.67
11/12/2016 16:00	588.09	588.68
11/12/2016 20:00	588.06	588.64
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11/15/2016 16:00	587.77	588.39
11/15/2016 20:00	587.76	588.37
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11/16/2016 8:00	587.68	588.29
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11/17/2016 8:00	587.59	588.23
11/17/2016 12:00	587.55	588.19
11/17/2016 16:00	587.54	588.18
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11/19/2016 16:00	587.24	588.01
11/19/2016 20:00	587.19	587.99
11/20/2016 0:00	587.10	587.94
11/20/2016 4:00	587.03	587.92
11/20/2016 8:00	586.95	587.91
11/20/2016 12:00	586.91	587.91
11/20/2016 16:00	586.86	587.90
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11/26/2016 20:00	585.96	587.54
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11/28/2016 8:00	587.01	588.02
11/28/2016 12:00	587.54	588.35
11/28/2016 16:00	588.50	589.45
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11/29/2016 12:00	591.52	592.02
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12/1/2016 20:00	591.44	591.81
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12/2/2016 4:00	591.23	591.59
12/2/2016 8:00	591.14	591.46
12/2/2016 12:00	591.01	591.37
12/2/2016 16:00	590.91	591.25
12/2/2016 20:00	590.79	591.12
12/3/2016 0:00	590.68	591.01
12/3/2016 4:00	590.61	590.92
12/3/2016 8:00	590.50	590.84
12/3/2016 12:00	590.43	590.75
12/3/2016 16:00	590.36	590.70
12/3/2016 20:00	590.20	590.63
12/4/2016 0:00	590.11	590.58

12/4/2016 4:00	590.06	590.53
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12/10/2016 12:00	589.21	589.76
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12/11/2016 12:00	589.17	589.66
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12/11/2016 20:00	589.11	589.64
12/12/2016 0:00	589.07	589.62
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12/12/2016 12:00	589.06	589.59
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12/13/2016 0:00	588.98	589.53
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12/13/2016 16:00	588.90	589.45
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12/15/2016 16:00	588.55	589.14
12/15/2016 20:00	588.51	589.10
12/16/2016 0:00	588.51	589.11
12/16/2016 4:00	588.48	589.09
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12/17/2016 0:00	588.44	589.04
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12/17/2016 12:00	588.32	588.97
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12/18/2016 12:00	588.13	588.79
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12/23/2016 8:00	587.74	588.38
12/23/2016 12:00	587.74	588.39
12/23/2016 16:00	587.74	588.38
12/23/2016 20:00	587.72	588.38
12/24/2016 0:00	587.70	588.36
12/24/2016 4:00	587.65	588.31
12/24/2016 8:00	587.63	588.30
12/24/2016 12:00	587.63	588.29
12/24/2016 16:00	587.59	588.28
12/24/2016 20:00	587.57	588.27
12/25/2016 0:00	587.61	588.28
12/25/2016 4:00	587.61	588.29
12/25/2016 8:00	587.60	588.29
12/25/2016 12:00	587.63	588.30
12/25/2016 16:00	587.66	588.33
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12/26/2016 12:00	590.13	590.75
12/26/2016 16:00	590.60	591.05
12/26/2016 20:00	590.90	591.36

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12/27/2016 4:00	591.36	591.84
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12/28/2016 0:00	591.76	592.19
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12/28/2016 12:00	591.70	592.12
12/28/2016 16:00	591.65	592.05
12/28/2016 20:00	591.58	591.97
12/29/2016 0:00	591.51	591.90
12/29/2016 4:00	591.43	591.79
12/29/2016 8:00	591.33	591.71
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12/29/2016 20:00	591.06	591.40
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12/30/2016 4:00	590.86	591.20
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12/30/2016 12:00	590.71	591.05
12/30/2016 16:00	590.65	590.98
12/30/2016 20:00	590.60	590.92
12/31/2016 0:00	590.54	590.88
12/31/2016 4:00	590.49	590.81
12/31/2016 8:00	590.44	590.75
12/31/2016 12:00	590.38	590.72
12/31/2016 16:00	590.26	590.64
12/31/2016 20:00	590.14	590.60
1/1/2017 0:00	590.08	590.55
1/1/2017 4:00	590.05	590.49
1/1/2017 8:00	590.01	590.46
1/1/2017 12:00	590.00	590.45
1/1/2017 16:00	589.97	590.43
1/1/2017 20:00	589.93	590.38
1/2/2017 0:00	589.89	590.35
1/2/2017 4:00	589.83	590.31
1/2/2017 8:00	589.83	590.30
1/2/2017 12:00	589.83	590.29
1/2/2017 16:00	589.80	590.26
1/2/2017 20:00	589.76	590.23
1/3/2017 0:00	589.74	590.21
1/3/2017 4:00	589.72	590.18
1/3/2017 8:00	589.68	590.17
1/3/2017 12:00	589.68	590.16
1/3/2017 16:00	589.63	590.13
1/3/2017 20:00	589.64	590.12
1/4/2017 0:00	589.57	590.07
1/4/2017 4:00	589.55	590.05
1/4/2017 8:00	589.52	590.02
1/4/2017 12:00	589.54	590.04
1/4/2017 16:00	589.53	590.02
1/4/2017 20:00	589.47	589.98
1/5/2017 0:00	589.45	589.94
1/5/2017 4:00	589.41	589.92
1/5/2017 8:00	589.39	589.90
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1/5/2017 20:00	589.33	589.82
1/6/2017 0:00	589.28	589.76
1/6/2017 4:00	589.24	589.73
1/6/2017 8:00	589.21	589.70
1/6/2017 12:00	589.22	589.71
1/6/2017 16:00	589.19	589.69
1/6/2017 20:00	589.13	589.63
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1/8/2017 0:00	588.97	589.47
1/8/2017 4:00	588.92	589.42
1/8/2017 8:00	588.89	589.40
1/8/2017 12:00	588.94	589.45
1/8/2017 16:00	588.95	589.46
1/8/2017 20:00	588.91	589.42
1/9/2017 0:00	588.90	589.40
1/9/2017 4:00	588.89	589.38
1/9/2017 8:00	588.86	589.37
1/9/2017 12:00	588.87	589.36
1/9/2017 16:00	588.84	589.34
1/9/2017 20:00	588.83	589.35
1/10/2017 0:00	588.84	589.33
1/10/2017 4:00	588.82	589.31
1/10/2017 8:00	588.82	589.30
1/10/2017 12:00	588.83	589.32
1/10/2017 16:00	588.79	589.29
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1/11/2017 4:00	588.97	589.45
1/11/2017 8:00	588.99	589.47
1/11/2017 12:00	588.98	589.46
1/11/2017 16:00	588.99	589.47
1/11/2017 20:00	588.98	589.46
1/12/2017 0:00	589.56	589.99
1/12/2017 4:00	589.78	590.22
1/12/2017 8:00	589.88	590.34
1/12/2017 12:00	590.00	590.49
1/12/2017 16:00	590.11	590.58
1/12/2017 20:00	590.12	590.60
1/13/2017 0:00	590.11	590.56
1/13/2017 4:00	590.03	590.49
1/13/2017 8:00	589.98	590.42
1/13/2017 12:00	589.93	590.35
1/13/2017 16:00	589.87	590.29
1/13/2017 20:00	589.79	590.22
1/14/2017 0:00	589.73	590.16
1/14/2017 4:00	589.66	590.10
1/14/2017 8:00	589.58	590.04
1/14/2017 12:00	589.53	589.98
1/14/2017 16:00	589.47	589.93
1/14/2017 20:00	589.40	589.87
1/15/2017 0:00	589.33	589.80
1/15/2017 4:00	589.29	589.75
1/15/2017 8:00	589.25	589.72
1/15/2017 12:00	589.25	589.73
1/15/2017 16:00	589.21	589.68
1/15/2017 20:00	589.17	589.64
1/16/2017 0:00	589.13	589.62
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1/16/2017 12:00	589.08	589.57
1/16/2017 16:00	589.43	589.84
1/16/2017 20:00	590.39	590.60
1/17/2017 0:00	591.37	591.57
1/17/2017 4:00	592.12	592.41
1/17/2017 8:00	592.47	592.89
1/17/2017 12:00	592.65	593.14
1/17/2017 16:00	592.75	593.30
1/17/2017 20:00	592.87	593.43
1/18/2017 0:00	592.95	593.51
1/18/2017 4:00	593.03	593.58
1/18/2017 8:00	593.08	593.60
1/18/2017 12:00	593.14	593.63
1/18/2017 16:00	593.16	593.62

1/18/2017 20:00	593.16	593.60
1/19/2017 0:00	593.15	593.57
1/19/17 0:00	593.036	593.387
1/19/2017 4:00	593.12	593.52
1/19/2017 8:00	593.06	593.47
1/19/2017 12:00	593.02	593.41
1/19/2017 16:00	592.96	593.34
1/19/2017 20:00	592.94	593.30
1/20/2017 0:00	593.23	593.53
1/20/2017 4:00	593.36	593.69
1/20/2017 8:00	593.44	593.80
1/20/2017 12:00	593.49	593.85
1/20/2017 16:00	593.54	593.91
1/20/2017 20:00	593.62	593.96
1/21/2017 0:00	593.66	594.02
1/21/2017 4:00	593.73	594.07
1/21/2017 8:00	593.77	594.11
1/21/2017 12:00	593.80	594.13
1/21/2017 16:00	593.83	594.15
1/21/2017 20:00	593.84	594.15
1/22/2017 0:00	593.84	594.14
1/22/2017 4:00	593.84	594.13
1/22/2017 8:00	593.82	594.11
1/22/2017 12:00	593.78	594.06
1/22/2017 16:00	593.74	594.02
1/22/2017 20:00	593.70	594.00
1/23/2017 0:00	593.66	593.95
1/23/2017 4:00	593.60	593.89
1/23/2017 8:00	593.55	593.83
1/23/2017 12:00	593.50	593.78
1/23/2017 16:00	593.45	593.73
1/23/2017 20:00	593.38	593.66
1/24/2017 0:00	593.32	593.63
1/24/2017 4:00	593.23	593.54
1/24/2017 8:00	593.17	593.47
1/24/2017 12:00	593.11	593.42
1/24/2017 16:00	593.04	593.35
1/24/2017 20:00	592.98	593.27
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1/25/2017 4:00	592.84	593.15
1/25/2017 8:00	592.80	593.10
1/25/2017 12:00	592.73	593.03
1/25/2017 16:00	592.67	592.98
1/25/2017 20:00	592.60	592.92
1/26/2017 0:00	592.54	592.85
1/26/2017 4:00	592.48	592.79
1/26/2017 8:00	592.42	592.74
1/26/2017 12:00	592.34	592.67
1/26/2017 16:00	592.31	592.62
1/26/2017 20:00	592.22	592.54
1/27/2017 0:00	592.17	592.50
1/27/2017 4:00	592.12	592.45
1/27/2017 8:00	592.05	592.40
1/27/2017 12:00	591.99	592.34
1/27/2017 16:00	591.94	592.29
1/27/2017 20:00	591.90	592.24
1/28/2017 0:00	591.84	592.19
1/28/2017 4:00	591.77	592.14
1/28/2017 8:00	591.73	592.09
1/28/2017 12:00	591.68	592.05
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1/28/2017 20:00	591.57	591.93
1/29/2017 0:00	591.54	591.89
1/29/2017 4:00	591.50	591.86
1/29/2017 8:00	591.45	591.81
1/29/2017 12:00	591.40	591.76
1/29/2017 16:00	591.35	591.72
1/29/2017 20:00	591.32	591.67
1/30/2017 0:00	591.25	591.61
1/30/2017 4:00	591.21	591.56
1/30/2017 8:00	591.18	591.53
1/30/2017 12:00	591.16	591.52
1/30/2017 16:00	591.16	591.51
1/30/2017 20:00	591.12	591.48
1/31/2017 0:00	591.10	591.45
1/31/2017 4:00	591.07	591.41
1/31/2017 8:00	591.00	591.35
1/31/2017 12:00	590.97	591.32
1/31/2017 16:00	590.94	591.29
1/31/2017 20:00	590.90	591.26
2/1/2017 0:00	590.87	591.22
2/1/2017 4:00	590.83	591.20
2/1/2017 8:00	590.81	591.16
2/1/2017 12:00	590.78	591.12
2/1/2017 16:00	590.75	591.09
2/1/2017 20:00	590.70	591.05
2/2/2017 0:00	590.67	591.01
2/2/2017 4:00	590.60	590.95
2/2/2017 8:00	590.59	590.91
2/2/2017 12:00	590.58	590.92
2/2/2017 16:00	590.57	590.90
2/2/2017 20:00	590.51	590.85
2/3/2017 0:00	590.48	590.81
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2/3/2017 20:00	590.36	590.70
2/4/2017 0:00	590.30	590.65
2/4/2017 4:00	590.20	590.60
2/4/2017 8:00	590.16	590.58
2/4/2017 12:00	590.19	590.63
2/4/2017 16:00	590.19	590.63
2/4/2017 20:00	590.17	590.59
2/5/2017 0:00	590.14	590.56
2/5/2017 4:00	590.11	590.53
2/5/2017 8:00	590.09	590.50
2/5/2017 12:00	590.07	590.49
2/5/2017 16:00	590.05	590.45
2/5/2017 20:00	590.00	590.42
2/6/2017 0:00	589.99	590.40
2/6/2017 4:00	589.96	590.38
2/6/2017 8:00	589.94	590.36
2/6/2017 12:00	589.94	590.36
2/6/2017 16:00	589.95	590.36
2/6/2017 20:00	589.94	590.34
2/7/2017 0:00	589.89	590.31
2/7/2017 4:00	589.90	590.30
2/7/2017 8:00	589.94	590.36
2/7/2017 12:00	590.12	590.60
2/7/2017 16:00	590.33	590.72
2/7/2017 20:00	590.42	590.76
2/8/2017 0:00	590.44	590.78
2/8/2017 4:00	590.45	590.78
2/8/2017 8:00	590.43	590.78
2/8/2017 12:00	590.43	590.77
2/8/2017 16:00	590.39	590.73
2/8/2017 20:00	590.35	590.69
2/9/2017 0:00	590.31	590.66
2/9/2017 4:00	590.23	590.64
2/9/2017 8:00	590.14	590.59
2/9/2017 12:00	590.18	590.61
2/9/2017 16:00	590.16	590.58
2/9/2017 20:00	590.09	590.52
2/10/2017 0:00	590.06	590.50
2/10/2017 4:00	590.06	590.48
2/10/2017 8:00	590.04	590.47

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)
(Hanson Material Services – Romeoville Quarry)

2/10/2017 12:00	590.03	590.45
2/10/2017 16:00	590.02	590.45
2/10/2017 20:00	589.98	590.41
2/11/2017 0:00	589.95	590.37
2/11/2017 4:00	589.94	590.36
2/11/2017 8:00	589.88	590.32
2/11/2017 12:00	589.87	590.30
2/11/2017 16:00	589.87	590.29
2/11/2017 20:00	589.84	590.26
2/12/2017 0:00	589.81	590.25
2/12/2017 4:00	589.80	590.23
2/12/2017 8:00	589.76	590.21
2/12/2017 12:00	589.74	590.18
2/12/2017 16:00	589.74	590.17
2/12/2017 20:00	589.69	590.13
2/13/2017 0:00	589.67	590.11
2/13/2017 4:00	589.66	590.09
2/13/2017 8:00	589.64	590.07
2/13/2017 12:00	589.64	590.07
2/13/2017 16:00	589.65	590.08
2/13/2017 20:00	589.62	590.06
2/14/2017 0:00	589.60	590.04
2/14/2017 4:00	589.59	590.05
2/14/2017 8:00	589.56	590.00
2/14/2017 12:00	589.57	590.00
2/14/2017 16:00	589.54	589.99
2/14/2017 20:00	589.54	589.95
2/15/2017 0:00	589.53	589.97
2/15/2017 4:00	589.49	589.91
2/15/2017 8:00	589.46	589.90
2/15/2017 12:00	589.46	589.89
2/15/2017 16:00	589.46	589.89
2/15/2017 20:00	589.45	589.89
2/16/2017 0:00	589.42	589.84
2/16/2017 4:00	589.40	589.83
2/16/2017 8:00	589.38	589.81
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2/16/2017 20:00	589.37	589.81
2/17/2017 0:00	589.35	589.76
2/17/2017 4:00	589.30	589.75
2/17/2017 8:00	589.30	589.76
2/17/2017 12:00	589.29	589.75
2/17/2017 16:00	589.28	589.73
2/17/2017 20:00	589.27	589.73
2/18/2017 0:00	589.24	589.72
2/18/2017 4:00	589.24	589.69
2/18/2017 8:00	589.23	589.69
2/18/2017 12:00	589.18	589.60
2/18/2017 16:00	589.16	589.62
2/18/2017 20:00	589.17	589.62
2/19/2017 0:00	589.14	589.61
2/19/2017 4:00	589.12	589.54
2/19/2017 8:00	589.09	589.57
2/19/2017 12:00	589.08	589.49
2/19/2017 16:00	589.07	589.52
2/19/2017 20:00	589.07	589.53
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2/20/2017 8:00	589.03	589.45
2/20/2017 12:00	589.01	589.42
2/20/2017 16:00	589.01	589.47
2/20/2017 20:00	589.00	589.42
2/21/2017 0:00	588.98	589.39
2/21/2017 4:00	588.97	589.39
2/21/2017 8:00	588.94	589.36
2/21/2017 12:00	588.91	589.38
2/21/2017 16:00	588.93	589.34
2/21/2017 20:00	588.92	589.39
2/22/2017 0:00	588.93	589.35
2/22/2017 4:00	588.90	589.31
2/22/2017 8:00	588.90	589.30
2/22/2017 12:00	588.87	589.29
2/22/2017 16:00	588.85	589.32
2/22/2017 20:00	588.86	589.27
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2/23/2017 8:00	588.79	589.22
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2/23/2017 16:00	588.74	589.23
2/23/2017 20:00	588.74	589.18
2/24/2017 0:00	588.83	589.23
2/24/2017 4:00	588.89	589.29
2/24/2017 8:00	588.96	589.36
2/24/2017 12:00	588.97	589.36
2/24/2017 16:00	588.93	589.34
2/24/2017 20:00	588.91	589.33
2/25/2017 0:00	588.88	589.32
2/25/2017 4:00	588.85	589.28
2/25/2017 8:00	588.80	589.26
2/25/2017 12:00	588.78	589.21
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2/26/2017 4:00	588.67	589.14
2/26/2017 8:00	588.64	589.11
2/26/2017 12:00	588.65	589.10
2/26/2017 16:00	588.64	589.11
2/26/2017 20:00	588.59	589.11
2/27/2017 0:00	588.56	589.08
2/27/2017 4:00	588.52	588.99
2/27/2017 8:00	588.52	589.04
2/27/2017 12:00	588.50	588.97
2/27/2017 16:00	588.50	588.98
2/27/2017 20:00	588.49	589.00
2/28/2017 0:00	588.48	588.96
2/28/2017 4:00	588.46	588.98
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2/28/2017 12:00	588.42	588.92
2/28/2017 16:00	588.41	588.92
2/28/2017 20:00	589.89	590.55
3/1/2017 0:00	592.87	593.07
3/1/2017 4:00	593.52	593.86
3/1/2017 8:00	593.77	594.19
3/1/2017 12:00	594.01	594.42
3/1/2017 16:00	594.21	594.60
3/1/2017 20:00	594.36	594.75
3/2/2017 0:00	594.52	594.90
3/2/2017 4:00	594.65	595.02
3/2/2017 8:00	594.79	595.13
3/2/2017 12:00	594.89	595.18
3/2/2017 16:00	594.95	595.24
3/2/2017 20:00	594.95	595.23
3/3/2017 0:00	594.94	595.20
3/3/2017 4:00	594.88	595.15
3/3/2017 8:00	594.83	595.08
3/3/2017 12:00	594.77	595.02
3/3/2017 16:00	594.70	594.94
3/3/2017 20:00	594.60	594.84
3/4/2017 0:00	594.51	594.75
3/4/2017 4:00	594.44	594.67
3/4/2017 8:00	594.34	594.58
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3/4/2017 16:00	594.18	594.41
3/4/2017 20:00	594.11	594.32
3/5/2017 0:00	594.02	594.23
3/5/2017 4:00	593.93	594.16

3/5/2017 8:00	593.86	594.08
3/5/2017 12:00	593.80	594.01
3/5/2017 16:00	593.72	593.94
3/5/2017 20:00	593.65	593.88
3/6/2017 0:00	593.57	593.80
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3/6/2017 12:00	593.33	593.58
3/6/2017 16:00	593.25	593.51
3/6/2017 20:00	593.17	593.43
3/7/2017 0:00	593.11	593.38
3/7/2017 4:00	593.03	593.34
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3/8/2017 20:00	592.61	592.94
3/9/2017 0:00	592.58	592.89
3/9/2017 4:00	592.50	592.83
3/9/2017 8:00	592.44	592.76
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3/9/2017 16:00	592.35	592.68
3/9/2017 20:00	592.27	592.61
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3/10/2017 4:00	592.14	592.48
3/10/2017 8:00	592.07	592.43
3/10/2017 12:00	592.03	592.38
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3/11/2017 0:00	591.85	592.21
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3/11/2017 8:00	591.73	592.08
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3/11/2017 20:00	591.62	591.98
3/12/2017 0:00	591.56	591.91
3/12/2017 5:00	591.50	591.85
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3/12/2017 13:00	591.44	591.81
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3/12/2017 21:00	591.38	591.74
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3/13/2017 13:00	591.23	591.58
3/13/2017 17:00	591.20	591.56
3/13/2017 21:00	591.15	591.51
3/14/2017 1:00	591.10	591.46
3/14/2017 5:00	591.08	591.43
3/14/2017 9:00	591.04	591.39
3/14/2017 13:00	591.01	591.37
3/14/2017 17:00	590.99	591.35
3/14/2017 21:00	590.93	591.30
3/15/2017 1:00	590.92	591.26
3/15/2017 5:00	590.89	591.23
3/15/2017 9:00	590.85	591.20
3/15/2017 13:00	590.87	591.21
3/15/2017 17:00	590.85	591.19
3/15/2017 21:00	590.80	591.12
3/16/2017 1:00	590.76	591.09
3/16/2017 5:00	590.71	591.05
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5/30/2017 21:00	591.36	591.71
5/31/2017 1:00	591.30	591.69
5/31/2017 5:00	591.30	591.67
5/31/2017 9:00	591.24	591.59
5/31/2017 13:00	591.19	591.56
5/31/2017 17:00	591.16	591.51
5/31/2017 21:00	591.15	591.50
6/1/2017 1:00	591.13	591.49
6/1/2017 5:00	591.10	591.45
6/1/2017 9:00	591.05	591.41
6/1/2017 13:00	591.02	591.37
6/1/2017 17:00	590.99	591.36
6/1/2017 21:00	591.00	591.35
6/2/2017 1:00	590.96	591.31
6/2/2017 5:00	590.93	591.28
6/2/2017 9:00	590.88	591.25
6/2/2017 13:00	590.84	591.19
6/2/2017 17:00	590.81	591.17
6/2/2017 21:00	590.82	591.17
6/3/2017 1:00	590.82	591.17
6/3/2017 5:00	590.79	591.12
6/3/2017 9:00	590.74	591.09
6/3/2017 13:00	590.72	591.06
6/3/2017 17:00	590.72	591.05
6/3/2017 21:00	590.69	591.02
6/4/2017 1:00	590.70	591.02
6/4/2017 5:00	590.68	591.01
6/4/2017 9:00	590.63	590.96
6/4/2017 13:00	590.60	590.94

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

6/4/2017 17:00	590.57	590.90
6/4/2017 21:00	590.57	590.89
6/5/2017 1:00	590.55	590.89
6/5/2017 5:00	590.56	590.89
6/5/2017 9:00	590.49	590.83
6/5/2017 13:00	590.55	590.84
6/5/2017 17:00	590.51	590.84
6/5/2017 21:00	590.53	590.85
6/6/2017 1:00	590.49	590.84
6/6/2017 5:00	590.48	590.79
6/6/2017 9:00	590.42	590.76
6/6/2017 13:00	590.39	590.75
6/6/2017 17:00	590.37	590.71
6/6/2017 21:00	590.35	590.71
6/7/2017 1:00	590.32	590.70
6/7/2017 5:00	590.28	590.69
6/7/2017 9:00	590.23	590.63
6/7/2017 13:00	590.19	590.59
6/7/2017 17:00	590.17	590.58
6/7/2017 21:00	590.20	590.60
6/8/2017 1:00	590.15	590.56
6/8/2017 5:00	590.15	590.56
6/8/2017 9:00	590.12	590.50
6/8/2017 13:00	590.08	590.47
6/8/2017 17:00	590.07	590.45
6/8/2017 21:00	590.09	590.46
6/9/2017 1:00	590.06	590.47
6/9/2017 5:00	590.06	590.45
6/9/2017 9:00	590.03	590.40
6/9/2017 13:00	589.97	590.36
6/9/2017 17:00	589.96	590.36
6/9/2017 21:00	589.98	590.34
6/10/2017 1:00	589.96	590.32
6/10/2017 5:00	589.93	590.33
6/10/2017 9:00	589.91	590.27
6/10/2017 13:00	589.86	590.25
6/10/2017 17:00	589.85	590.26
6/10/2017 21:00	589.85	590.23
6/11/2017 1:00	589.84	590.23
6/11/2017 5:00	589.81	590.22
6/11/2017 9:00	589.78	590.19
6/11/2017 13:00	589.73	590.14
6/11/2017 17:00	589.73	590.15
6/11/2017 21:00	589.72	590.14
6/12/2017 1:00	589.71	590.12
6/12/2017 5:00	589.69	590.11
6/12/2017 9:00	589.65	590.04
6/12/2017 13:00	589.63	590.07
6/12/2017 17:00	589.59	590.01
6/12/2017 21:00	589.62	590.02
6/13/2017 1:00	589.60	590.01
6/13/2017 5:00	589.59	590.02
6/13/2017 9:00	589.56	589.99
6/13/2017 13:00	589.53	589.93
6/13/2017 17:00	589.52	589.95
6/13/2017 21:00	589.52	589.91
6/14/2017 1:00	589.50	589.93
6/14/2017 5:00	589.50	589.94
6/14/2017 9:00	589.45	589.83
6/14/2017 13:00	589.42	589.86
6/14/2017 17:00	589.40	589.85
6/14/2017 21:00	589.43	589.86
6/15/2017 1:00	589.41	589.79
6/15/2017 5:00	589.39	589.83
6/15/2017 9:00	589.37	589.81
6/15/2017 13:00	589.33	589.77
6/15/2017 17:00	589.30	589.69
6/15/2017 21:00	589.30	589.69
6/16/2017 1:00	589.29	589.72
6/16/2017 5:00	589.28	589.71
6/16/2017 9:00	589.31	589.70
6/16/2017 13:00	589.33	589.69
6/16/2017 17:00	589.28	589.70
6/16/2017 21:00	589.28	589.70
6/17/2017 1:00	589.26	589.65
6/17/2017 5:00	589.26	589.63
6/17/2017 9:00	589.23	589.62
6/17/2017 13:00	589.19	589.62
6/17/2017 17:00	589.16	589.55
6/17/2017 21:00	589.17	589.59
6/18/2017 1:00	589.15	589.54
6/18/2017 5:00	589.12	589.52
6/18/2017 9:00	589.11	589.51
6/18/2017 13:00	589.05	589.46
6/18/2017 17:00	589.04	589.44
6/18/2017 21:00	589.02	589.42
6/19/2017 1:00	589.00	589.46
6/19/2017 5:00	589.01	589.43
6/19/2017 9:00	588.97	589.40
6/19/2017 13:00	588.93	589.38
6/19/2017 17:00	588.92	589.32
6/19/2017 21:00	588.91	589.33
6/20/2017 1:00	588.94	589.33
6/20/2017 5:00	588.89	589.32
6/20/2017 9:00	588.85	589.27
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6/20/2017 17:00	588.80	589.27
6/20/2017 21:00	588.91	589.28
6/21/2017 1:00	588.91	589.30
6/21/2017 5:00	588.91	589.32
6/21/2017 9:00	588.85	589.25
6/21/2017 13:00	588.82	589.25
6/21/2017 17:00	588.80	589.19
6/21/2017 21:00	588.79	589.23
6/22/2017 1:00	588.77	589.21
6/22/2017 5:00	588.73	589.16
6/22/2017 9:00	588.67	589.11
6/22/2017 13:00	588.65	589.11
6/22/2017 17:00	588.62	589.05
6/22/2017 21:00	588.61	589.07
6/23/2017 1:00	588.58	589.04
6/23/2017 5:00	588.55	589.03
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6/23/2017 17:00	588.82	589.24
6/23/2017 21:00	588.81	589.24
6/24/2017 1:00	588.74	589.20
6/24/2017 5:00	588.73	589.18
6/24/2017 9:00	588.68	589.13
6/24/2017 13:00	588.62	589.08
6/24/2017 17:00	588.58	589.03
6/24/2017 21:00	588.57	589.02
6/25/2017 1:00	588.51	588.98
6/25/2017 5:00	588.51	588.98
6/25/2017 9:00	588.46	588.94
6/25/2017 13:00	588.41	588.93
6/25/2017 17:00	588.39	588.90
6/25/2017 21:00	588.36	588.85
6/26/2017 1:00	588.35	588.85
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6/26/2017 9:00	588.27	588.80
6/26/2017 13:00	588.24	588.72
6/26/2017 17:00	588.22	588.70
6/26/2017 21:00	588.22	588.74
6/27/2017 1:00	588.18	588.72
6/27/2017 5:00	588.16	588.68
6/27/2017 9:00	588.12	588.62
6/27/2017 13:00	588.07	588.57
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6/27/2017 21:00	588.07	588.60
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6/28/2017 13:00	587.97	588.50
6/28/2017 17:00	587.97	588.48
6/28/2017 21:00	587.99	588.49
6/29/2017 1:00	587.97	588.49
6/29/2017 5:00	587.96	588.49
6/29/2017 9:00	587.94	588.47
6/29/2017 13:00	587.89	588.43
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6/30/2017 13:00	588.07	588.57
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7/1/2017 1:00	588.01	588.53
7/1/2017 5:00	587.98	588.50
7/1/2017 9:00	587.91	588.44
7/1/2017 13:00	587.87	588.41
7/1/2017 17:00	587.84	588.39
7/1/2017 21:00	587.82	588.37
7/2/2017 1:00	587.81	588.35
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7/2/2017 9:00	587.76	588.32
7/2/2017 13:00	587.70	588.26
7/2/2017 17:00	587.68	588.24
7/2/2017 21:00	587.67	588.25
7/3/2017 1:00	587.62	588.20
7/3/2017 5:00	587.61	588.21
7/3/2017 9:00	587.55	588.17
7/3/2017 13:00	587.51	588.14
7/3/2017 17:00	587.46	588.13
7/3/2017 21:00	587.40	588.10
7/4/2017 1:00	587.38	588.09
7/4/2017 5:00	587.33	588.07
7/4/2017 9:00	587.28	588.03
7/4/2017 13:00	587.22	588.00
7/4/2017 17:00	587.17	587.96
7/4/2017 21:00	587.12	587.97
7/5/2017 1:00	587.07	587.97
7/5/2017 5:00	587.02	587.94
7/5/2017 9:00	586.93	587.91
7/5/2017 13:00	586.82	587.88
7/5/2017 17:00	586.76	587.86
7/5/2017 21:00	586.71	587.87
7/6/2017 1:00	586.63	587.85
7/6/2017 5:00	586.57	587.85
7/6/2017 9:00	586.49	587.81
7/6/2017 13:00	586.41	587.78
7/6/2017 17:00	586.33	587.78
7/6/2017 21:00	586.29	587.78
7/7/2017 1:00	586.19	587.76
7/7/2017 5:00	586.10	587.74
7/7/2017 9:00	586.06	587.73
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7/7/2017 17:00	585.90	587.70
7/7/2017 21:00	585.82	587.70
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7/9/2017 17:00	585.08	586.03
7/9/2017 21:00	585.03	585.91
7/10/2017 1:00	584.99	585.85
7/10/2017 5:00	584.95	585.78
7/10/2017 9:00	584.95	585.76
7/10/2017 13:00	585.29	586.14
7/10/2017 17:00	585.61	586.75
7/10/2017 21:00	585.74	587.02
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7/11/2017 5:00	585.61	587.03
7/11/2017 9:00	585.60	586.93
7/11/2017 13:00	585.53	586.81
7/11/2017 17:00	585.43	586.66
7/11/2017 21:00	585.36	586.52
7/12/2017 1:00	585.27	586.36
7/12/2017 5:00	585.20	586.17
7/12/2017 9:00	585.13	586.05
7/12/2017 13:00	585.06	585.92
7/12/2017 17:00	584.98	585.84
7/12/2017 21:00	584.98	585.80
7/13/2017 1:00	584.93	585.76
7/13/2017 5:00	585.34	586.28
7/13/2017 9:00	585.67	587.12
7/13/2017 13:00	585.85	587.32
7/13/2017 17:00	585.93	587.35
7/13/2017 21:00	585.96	587.36
7/14/2017 1:00	585.96	587.31
7/14/2017 5:00	585.95	587.28
7/14/2017 9:00	585.85	587.24
7/14/2017 13:00	585.78	587.14
7/14/2017 17:00	585.71	587.03
7/14/2017 21:00	585.68	586.94
7/15/2017 1:00	585.56	586.82
7/15/2017 5:00	585.56	586.67
7/15/2017 9:00	585.41	586.54
7/15/2017 13:00	585.37	586.36
7/15/2017 17:00	585.28	586.18
7/15/2017 21:00	585.26	586.13
7/16/2017 1:00	585.24	586.04
7/16/2017 5:00	585.20	585.99
7/16/2017 9:00	585.14	585.90
7/16/2017 13:00	585.07	585.82
7/16/2017 17:00	585.00	585.70
7/16/2017 21:00	584.99	585.65
7/17/2017 1:00	584.94	585.55
7/17/2017 5:00	584.90	585.47
7/17/2017 9:00	584.80	585.38
7/17/2017 13:00	584.77	585.30
7/17/2017 17:00	584.71	585.22
7/17/2017 21:00	584.72	585.18
7/18/2017 1:00	584.67	585.14
7/18/2017 5:00	584.59	585.07
7/18/2017 9:00	584.53	584.99
7/18/2017 13:00	584.46	584.93
7/18/2017 17:00	584.41	584.86
7/18/2017 21:00	584.36	584.80
7/19/2017 1:00	584.32	584.75
7/19/2017 5:00	584.27	584.69
7/19/2017 9:00	584.20	584.61
7/19/2017 13:00	584.15	584.55
7/19/2017 17:00	584.10	584.50
7/19/2017 21:00	584.05	584.45
7/20/2017 1:00	584.30	584.71
7/20/2017 5:00	584.80	585.58
7/20/2017 9:00	585.45	587.72
7/20/2017 13:00	587.47	588.64
7/20/2017 17:00	588.17	589.02
7/20/2017 21:00	588.58	589.37
7/21/2017 1:00	588.83	589.54
7/21/2017 5:00	589.43	590.30
7/21/2017 9:00	589.75	590.52
7/21/2017 13:00	589.95	590.70
7/21/2017 17:00	590.16	590.82
7/21/2017 21:00	590.43	590.91
7/22/2017 1:00	591.54	592.81
7/22/2017 5:00	592.25	593.11
7/22/2017 9:00	592.80	593.67
7/22/2017 13:00	593.00	593.82
7/22/2017 17:00	593.26	594.01
7/22/2017 21:00	593.47	594.19
7/23/2017 1:00	593.65	594.31
7/23/2017 5:00	593.83	594.41
7/23/2017 9:00	593.93	594.48
7/23/2017 13:00	594.02	594.53
7/23/2017 17:00	594.06	594.53
7/23/2017 21:00	594.63	595.06
7/24/17 0:00	595.236	595.597
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7/24/2017 9:00	595.09	595.49
7/24/2017 13:00	595.28	595.63
7/24/2017 17:00	595.38	595.74
7/24/2017 21:00	595.50	595.83
7/25/2017 1:00	595.53	595.87
7/25/2017 5:00	595.55	595.87
7/25/2017 9:00	595.50	595.79
7/25/2017 13:00	595.40	595.70
7/25/2017 17:00	595.33	595.61
7/25/2017 21:00	595.24	595.52
7/26/2017 1:00	595.16	595.43
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7/26/2017 13:00	594.76	595.00
7/26/2017 17:00	594.64	594.88
7/26/2017 21:00	594.53	594.78
7/27/2017 1:00	594.42	594.66
7/27/2017 5:00	594.34	594.56
7/27/2017 9:00	594.24	594.46
7/27/2017 13:00	594.09	594.34
7/27/2017 17:00	593.99	594.24
7/27/2017 21:00	593.91	594.14
7/28/2017 1:00	593.84	594.07
7/28/2017 5:00	593.75	593.97
7/28/2017 9:00	593.62	593.85
7/28/2017 13:00	593.48	593.70
7/28/2017 17:00	593.38	593.60
7/28/2017 21:00	593.29	593.51
7/29/2017 1:00	593.17	593.41
7/29/2017 5:00	593.04	593.28
7/29/2017 9:00	592.90	593.16
7/29/2017 13:00	592.76	593.01
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7/29/2017 21:00	592.58	592.85
7/30/2017 1:00	592.48	592.78
7/30/2017 5:00	592.41	592.69
7/30/2017 9:00	592.31	592.58
7/30/2017 13:00	592.21	592.48
7/30/2017 17:00	592.10	592.40
7/30/2017 21:00	592.05	592.34
7/31/2017 1:00	591.96	592.27
7/31/2017 5:00	591.91	592.20
7/31/2017 9:00	591.82	592.13
7/31/2017 13:00	591.70	592.03
7/31/2017 17:00	591.64	591.97
7/31/2017 21:00	591.60	591.93
8/1/2017 1:00	591.57	591.88
8/1/2017 5:00	591.48	591.82
8/1/2017 9:00	591.39	591.74
8/1/2017 13:00	591.32	591.66
8/1/2017 17:00	591.28	591.62
8/1/2017 21:00	591.23	591.58
8/2/2017 1:00	591.21	591.55
8/2/2017 5:00	591.14	591.50
8/2/2017 9:00	591.07	591.42
8/2/2017 13:00	591.03	591.37
8/2/2017 17:00	590.98	591.34
8/2/2017 21:00	590.94	591.31
8/3/2017 1:00	590.91	591.27
8/3/2017 5:00	590.87	591.22
8/3/2017 9:00	590.83	591.18
8/3/2017 13:00	590.78	591.13
8/3/2017 17:00	590.74	591.11
8/3/2017 21:00	590.75	591.10
8/4/2017 1:00	590.86	591.25
8/4/2017 5:00	590.96	591.36
8/4/2017 9:00	591.03	591.43
8/4/2017 13:00	591.09	591.50
8/4/2017 17:00	591.10	591.49
8/4/2017 21:00	591.12	591.51
8/5/2017 1:00	591.06	591.45
8/5/2017 5:00	591.02	591.40
8/5/2017 9:00	590.95	591.32
8/5/2017 13:00	590.89	591.26
8/5/2017 17:00	590.84	591.20
8/5/2017 21:00	590.80	591.16
8/6/2017 1:00	590.74	591.10
8/6/2017 5:00	590.69	591.05
8/6/2017 9:00	590.66	591.00
8/6/2017 13:00	590.58	590.92
8/6/2017 17:00	590.53	590.86
8/6/2017 21:00	590.51	590.85
8/7/2017 1:00	590.47	590.81
8/7/2017 5:00	590.44	590.78
8/7/2017 9:00	590.39	590.73
8/7/2017 13:00	590.29	590.68
8/7/2017 17:00	590.16	590.63
8/7/2017 21:00	590.12	590.62
8/8/2017 1:00	590.08	590.60
8/8/2017 5:00	590.07	590.57
8/8/2017 9:00	590.01	590.53
8/8/2017 13:00	589.97	590.47
8/8/2017 17:00	589.93	590.45
8/8/2017 21:00	589.93	590.44
8/9/2017 1:00	589.89	590.39
8/9/2017 5:00	589.88	590.38
8/9/2017 9:00	589.87	590.35
8/9/2017 13:00	589.78	590.29
8/9/2017 17:00	589.73	590.25
8/9/2017 21:00	589.76	590.28
8/10/2017 1:00	589.70	590.25
8/10/2017 5:00	589.69	590.22
8/10/2017 9:00	589.65	590.19
8/10/2017 13:00	589.59	590.13
8/10/2017 17:00	589.57	590.12
8/10/2017 21:00	589.57	590.10
8/11/2017 1:00	589.50	590.05
8/11/2017 5:00	589.48	590.04
8/11/2017 9:00	589.45	590.00
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8/11/2017 21:00	589.37	589.91
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8/12/2017 9:00	589.27	589.81
8/12/2017 13:00	589.21	589.78
8/12/2017 17:00	589.21	589.76
8/12/2017 21:00	589.19	589.75
8/13/2017 1:00	589.17	589.72
8/13/2017 5:00	589.15	589.70
8/13/2017 9:00	589.12	589.67
8/13/2017 13:00	589.06	589.61
8/13/2017 17:00	589.03	589.60
8/13/2017 21:00	589.04	589.58
8/14/2017 1:00	589.01	589.56
8/14/2017 5:00	588.98	589.53
8/14/2017 9:00	588.97	589.51
8/14/2017 13:00	588.91	589.46
8/14/2017 17:00	588.88	589.44
8/14/2017 21:00	588.86	589.40
8/15/2017 1:00	588.83	589.37
8/15/2017 5:00	588.80	589.37
8/15/2017 9:00	588.76	589.31
8/15/2017 13:00	588.69	589.27
8/15/2017 17:00	588.66	589.24
8/15/2017 21:00	588.66	589.25
8/16/2017 1:00	588.61	589.22
8/16/2017 5:00	588.57	589.19
8/16/2017 9:00	588.52	589.15
8/16/2017 13:00	588.49	589.12
8/16/2017 17:00	588.46	589.09
8/16/2017 21:00	588.47	589.10
8/17/2017 1:00	588.48	589.10
8/17/2017 5:00	588.43	589.07
8/17/2017 9:00	588.42	589.04
8/17/2017 13:00	588.36	589.02
8/17/2017 17:00	588.32	588.96
8/17/2017 21:00	588.28	588.95
8/18/2017 1:00	588.26	588.93
8/18/2017 5:00	588.24	588.91
8/18/2017 9:00	588.21	588.87
8/18/2017 13:00	588.16	588.82
8/18/2017 17:00	588.10	588.78
8/18/2017 21:00	588.10	588.78
8/19/2017 1:00	588.08	588.77
8/19/2017 5:00	588.04	588.75
8/19/2017 9:00	588.01	588.70
8/19/2017 13:00	587.97	588.67
8/19/2017 17:00	587.95	588.64
8/19/2017 21:00	587.91	588.61
8/20/2017 1:00	587.89	588.60
8/20/2017 5:00	587.87	588.58
8/20/2017 9:00	587.86	588.55
8/20/2017 13:00	587.79	588.50
8/20/2017 17:00	587.79	588.50
8/20/2017 21:00	587.79	588.46
8/21/2017 1:00	587.75	588.43
8/21/2017 5:00	588.94	589.55
8/21/2017 9:00	589.37	589.96
8/21/2017 13:00	589.67	590.31
8/21/2017 17:00	589.93	590.60
8/21/2017 21:00	590.16	590.80
8/22/2017 1:00	590.52	591.08
8/22/2017 5:00	590.82	591.36
8/22/2017 9:00	591.00	591.50
8/22/2017 13:00	591.10	591.58
8/22/2017 17:00	591.16	591.63
8/22/2017 21:00	591.21	591.66
8/23/2017 1:00	591.20	591.62
8/23/2017 5:00	591.16	591.57
8/23/2017 9:00	591.08	591.47
8/23/2017 13:00	590.96	591.33
8/23/2017 17:00	590.83	591.19
8/23/2017 21:00	590.71	591.04
8/24/2017 1:00	590.61	590.91
8/24/2017 5:00	590.45	590.76
8/24/2017 9:00	590.27	590.64
8/24/2017 13:00	590.07	590.50
8/24/2017 17:00	589.96	590.38
8/24/2017 21:00	589.88	590.30
8/25/2017 1:00	589.79	590.23
8/25/2017 5:00	589.69	590.14
8/25/2017 9:00	589.59	590.05
8/25/2017 13:00	589.50	589.95
8/25/2017 17:00	589.42	589.90
8/25/2017 21:00	589.37	589.84
8/26/2017 1:00	589.31	589.80
8/26/2017 5:00	589.27	589.75
8/26/2017 9:00	589.21	589.69
8/26/2017 13:00	589.13	589.62
8/26/2017 17:00	589.10	589.58
8/26/2017 21:00	589.09	589.57
8/27/2017 1:00	589.04	589.52
8/27/2017 5:00	589.00	589.48
8/27/2017 9:00	588.95	589.44
8/27/2017 13:00	588.91	589.40
8/27/2017 17:00	588.88	589.37
8/27/2017 21:00	588.85	589.36
8/28/2017 1:00	588.82	589.31
8/28/2017 5:00	588.76	589.28
8/28/2017 9:00	588.72	589.24
8/28/2017 13:00	588.64	589.18
8/28/2017 17:00	588.61	589.18
8/28/2017 21:00	588.66	589.21
8/29/2017 1:00	588.65	589.20
8/29/2017 5:00	588.60	589.17
8/29/2017 9:00	588.57	589.12
8/29/2017 13:00	588.50	589.07
8/29/2017 17:00	588.49	589.06
8/29/2017 21:00	588.44	589.02
8/30/2017 1:00	588.40	589.00
8/30/2017 5:00	588.38	588.99
8/30/2017 9:00	588.34	588.95
8/30/2017 13:00	588.27	588.89
8/30/2017 17:00	588.25	588.86
8/30/2017 21:00	588.21	588.84
8/31/2017 1:00	588.20	588.82
8/31/2017 5:00	588.17	588.79
8/31/2017 9:00	588.15	588.78
8/31/2017 13:00	588.07	588.69
8/31/2017 17:00	588.04	588.67
8/31/2017 21:00	588.03	588.66
9/1/2017 1:00	588.01	588.65
9/1/2017 5:00	587.98	588.62
9/1/2017 9:00	587.93	588.58
9/1/2017 13:00	587.88	588.53
9/1/2017 17:00	587.87	588.50
9/1/2017 21:00	587.86	588.52
9/2/2017 1:00	587.82	588.48
9/2/2017 5:00	587.79	588.46
9/2/2017 9:00	587.79	588.43
9/2/2017 13:00	587.73	588.36
9/2/2017 17:00	587.71	588.36
9/2/2017 21:00	587.70	588.33
9/3/2017 1:00	587.70	588.36
9/3/2017 5:00	587.68	588.33
9/3/2017 9:00	587.67	588.30
9/3/2017 13:00	587.58	588.24
9/3/2017 17:00	587.54	588.22
9/3/2017 21:00	587.53	588.21
9/4/2017 1:00	587.50	588.19
9/4/2017 5:00	587.47	588.17
9/4/2017 9:00	587.41	588.11
9/4/2017 13:00	587.35	588.08
9/4/2017 17:00	587.31	588.06
9/4/2017 21:00	587.23	588.03
9/5/2017 1:00	587.16	588.00
9/5/2017 5:00	587.09	587.96
9/5/2017 9:00	586.98	587.94
9/5/2017 13:00	586.86	587.89
9/5/2017 17:00	586.78	587.89
9/5/2017 21:00	586.67	587.87
9/6/2017 1:00	586.56	587.86
9/6/2017 5:00	586.48	587.83
9/6/2017 9:00	586.40	587.80
9/6/2017 13:00	586.27	587.76
9/6/2017 17:00	586.20	587.76
9/6/2017 21:00	586.10	587.75
9/7/2017 1:00	586.01	587.73
9/7/2017 5:00	585.95	587.73
9/7/2017 9:00	585.85	587.69
9/7/2017 13:00	585.75	587.64
9/7/2017 17:00	585.67	587.48
9/7/2017 21:00	585.60	587.40
9/8/2017 1:00	585.53	587.26
9/8/2017 5:00	585.44	586.93
9/8/2017 9:00	585.36	586.73
9/8/2017 13:00	585.25	586.24
9/8/2017 17:00	585.18	586.05
9/8/2017 21:00	585.11	585.92
9/9/2017 1:00	585.02	585.79
9/9/2017 5:00	584.94	585.64
9/9/2017 9:00	584.87	585.53
9/9/2017 13:00	584.79	585.41
9/9/2017 17:00	584.72	585.33
9/9/2017 21:00	584.68	585.27
9/10/2017 1:00	584.61	585.17
9/10/2017 5:00	584.54	585.08
9/10/2017 9:00	584.49	584.98
9/10/2017 13:00	584.39	584.88
9/10/2017 17:00	584.36	584.84
9/10/2017 21:00	584.33	584.81
9/11/2017 1:00	584.26	584.73
9/11/2017 5:00	584.20	584.69
9/11/2017 9:00	584.14	584.61
9/11/2017 13:00	584.05	584.50
9/11/2017 17:00	584.03	584.48
9/11/2017 21:00	583.99	584.43
9/12/2017 1:00	583.94	584.36
9/12/2017 5:00	583.91	584.31
9/12/2017 9:00	583.85	584.24
9/12/2017 13:00	583.79	584.18
9/12/2017 17:00	583.77	584.14
9/12/2017 21:00	583.75	584.12
9/13/2017 1:00	583.69	584.06
9/13/2017 5:00	583.65	584.04
9/13/2017 9:00	583.62	584.01
9/13/2017 13:00	583.59	583.95
9/13/2017 17:00	583.56	583.90
9/13/2017 21:00	583.50	583.87
9/14/2017 1:00	583.47	583.82
9/14/2017 5:00	583.42	583.77
9/14/2017 9:00	583.36	583.71
9/14/2017 13:00	583.26	583.63
9/14/2017 17:00	583.23	583.59
9/14/2017 21:00	583.17	583.53
9/15/2017 1:00	583.12	583.48
9/15/2017 5:00	583.05	583.40
9/15/2017 9:00	582.97	583.31
9/15/2017 13:00	582.86	583.23
9/15/2017 17:00	582.81	583.15
9/15/2017 21:00	582.76	583.12
9/16/2017 1:00	582.71	583.06
9/16/2017 5:00	582.66	583.01
9/16/2017 9:00	582.59	582.96
9/16/2017 13:00	582.50	582.85
9/16/2017 17:00	582.43	582.81
9/16/2017 21:00	582.43	582.79
9/17/2017 1:00	582.37	582.71
9/17/2017 5:00	582.30	582.65
9/17/2017 9:00	582.24	582.58
9/17/2017 13:00	582.19	582.52
9/17/2017 17:00	582.13	582.47
9/17/2017 21:00	582.04	582.42
9/18/2017 1:00	581.99	582.35
9/18/2017 5:00	581.95	582.28
9/18/2017 9:00	581.86	582.23
9/18/2017 13:00	581.80	582.14
9/18/2017 17:00	581.72	582.12
9/18/2017 21:00	581.71	582.10
9/19/2017 1:00	581.69	582.04
9/19/2017 5:00	581.65	582.00
9/19/2017 9:00	581.65	581.99
9/19/2017 13:00	581.57	581.95
9/19/2017 17:00	581.58	581.95
9/19/2017 21:00	581.58	581.92
9/20/2017 1:00	581.53	581.88
9/20/2017 5:00	581.47	581.84
9/20/2017 9:00	581.44	581.80
9/20/2017 13:00	581.35	581.72
9/20/2017 17:00	581.33	581.70
9/20/2017 21:00	581.30	581.67
9/21/2017 1:00	581.25	581.63
9/21/2017 5:00	581.20	581.57
9/21/2017 9:00	581.14	581.52
9/21/2017 13:00	581.08	581.45
9/21/2017 17:00	581.04	581.45
9/21/2017 21:00	581.04	581.45
9/22/2017 1:00	580.99	581.43
9/22/2017 5:00	580.93	581.43
9/22/2017 9:00	580.91	581.41
9/22/2017 13:00	580.84	581.37
9/22/2017 17:00	580.81	581.38
9/22/2017 21:00	580.78	581.38
9/23/2017 1:00	580.76	581.37
9/23/2017 5:00	580.73	581.37
9/23/2017 9:00	580.69	581.35
9/23/2017 13:00	580.65	581.32
9/23/2017 17:00	580.60	581.27
9/23/2017 21:00	580.59	581.20
9/24/2017 1:00	580.57	581.11
9/24/2017 5:00	580.51	581.05
9/24/2017 9:00	580.49	580.97
9/24/2017 13:00	580.44	580.90
9/24/2017 17:00	580.41	580.87
9/24/2017 21:00	580.39	580.84
9/25/2017 1:00	580.35	580.82
9/25/2017 5:00	580.33	580.78
9/25/2017 9:00	580.29	580.74
9/25/2017 13:00	580.22	580.68
9/25/2017 17:00	580.23	580.67
9/25/2017 21:00	580.19	580.66
9/26/2017 1:00	580.17	580.64
9/26/2017 5:00	580.15	580.62
9/26/2017 9:00	580.10	580.59
9/26/2017 13:00	580.05	580.54

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

9/26/2017 17:00	580.03	580.54
9/26/2017 21:00	580.00	580.52
9/27/2017 1:00	579.98	580.51
9/27/2017 5:00	579.94	580.48
9/27/2017 9:00	579.91	580.47
9/27/2017 13:00	579.86	580.43
9/27/2017 17:00	579.84	580.43
9/27/2017 21:00	579.81	580.40
9/28/2017 1:00	579.80	580.39
9/28/2017 5:00	579.78	580.37
9/28/2017 9:00	579.76	580.35
9/28/2017 13:00	579.70	580.31
9/28/2017 17:00	579.71	580.32
9/28/2017 21:00	579.71	580.33
9/29/2017 1:00	579.69	580.32
9/29/2017 5:00	579.67	580.30
9/29/2017 9:00	579.64	580.28
9/29/2017 13:00	579.59	580.23
9/29/2017 17:00	579.60	580.25
9/29/2017 21:00	579.56	580.23
9/30/2017 1:00	579.54	580.21
9/30/2017 5:00	579.51	580.18
9/30/2017 9:00	579.49	580.16
9/30/2017 13:00	579.44	580.12
9/30/2017 17:00	579.44	580.13
9/30/2017 21:00	579.46	580.15
10/1/2017 1:00	579.43	580.12
10/1/2017 5:00	579.41	580.11
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10/1/2017 13:00	579.34	580.06
10/1/2017 17:00	579.38	580.07
10/1/2017 21:00	579.37	580.08
10/2/2017 1:00	579.36	580.08
10/2/2017 5:00	579.33	580.05
10/2/2017 9:00	579.30	580.02
10/2/2017 13:00	579.26	579.99
10/2/2017 17:00	579.24	579.97
10/2/2017 21:00	579.23	579.98
10/3/2017 1:00	579.22	579.97
10/3/2017 5:00	579.21	579.95
10/3/2017 9:00	579.17	579.91
10/3/2017 13:00	579.11	579.87
10/3/2017 17:00	579.15	579.88
10/3/2017 21:00	579.15	579.88
10/4/2017 1:00	579.14	579.87
10/4/2017 5:00	579.12	579.87
10/4/2017 9:00	579.11	579.85
10/4/2017 13:00	579.09	579.82
10/4/2017 17:00	579.09	579.84
10/4/2017 21:00	579.11	579.85
10/5/2017 1:00	579.12	579.84
10/5/2017 5:00	579.10	579.85
10/5/2017 9:00	579.10	579.84
10/5/2017 13:00	579.06	579.79
10/5/2017 17:00	579.06	579.80
10/5/2017 21:00	579.07	579.80
10/6/2017 1:00	579.05	579.80
10/6/2017 5:00	579.05	579.79
10/6/2017 9:00	579.15	579.83
10/6/2017 13:00	579.21	579.89
10/6/2017 17:00	579.25	579.94
10/6/2017 21:00	579.33	579.99
10/7/2017 1:00	579.59	580.13
10/7/2017 5:00	579.78	580.35
10/7/2017 9:00	579.82	580.47
10/7/2017 13:00	579.80	580.49
10/7/2017 17:00	579.82	580.50
10/7/2017 21:00	580.31	580.69
10/8/2017 1:00	580.70	581.13
10/8/2017 5:00	580.84	581.40
10/8/2017 9:00	580.80	581.47
10/8/2017 13:00	580.71	581.39
10/8/2017 17:00	580.63	581.35
10/8/2017 21:00	580.58	581.31
10/9/2017 1:00	580.49	581.22
10/9/2017 5:00	580.39	581.11
10/9/2017 9:00	580.31	581.02
10/9/2017 13:00	580.20	580.90
10/9/2017 17:00	580.14	580.85
10/9/2017 21:00	580.10	580.81
10/10/2017 1:00	580.04	580.74
10/10/2017 5:00	579.98	580.68
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10/10/2017 13:00	579.88	580.58
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10/10/2017 21:00	580.18	580.65
10/11/2017 1:00	580.82	581.10
10/11/2017 5:00	581.60	582.14
10/11/2017 9:00	582.58	585.63
10/11/2017 13:00	583.44	586.50
10/11/2017 17:00	583.98	586.72
10/11/2017 21:00	584.28	586.90
10/12/17 0:00	584.096	585.867
10/12/2017 1:00	584.36	586.74
10/12/2017 5:00	584.36	586.59
10/12/2017 9:00	584.24	586.24
10/12/2017 13:00	584.11	585.91
10/12/2017 17:00	583.97	585.24
10/12/2017 21:00	583.81	584.63
10/13/2017 1:00	583.65	584.39
10/13/2017 5:00	583.51	584.12
10/13/2017 9:00	583.33	583.93
10/13/2017 13:00	583.17	583.71
10/13/2017 17:00	583.00	583.52
10/13/2017 21:00	582.83	583.31
10/14/2017 1:00	582.65	583.10
10/14/2017 5:00	582.50	582.93
10/14/2017 9:00	582.35	582.78
10/14/2017 13:00	583.53	587.90
10/14/2017 17:00	589.30	591.31
10/14/2017 21:00	591.01	592.54
10/15/2017 1:00	593.31	594.39
10/15/2017 5:00	594.32	595.10
10/15/2017 9:00	595.31	595.76
10/15/2017 13:00	595.85	596.22
10/15/2017 17:00	596.20	596.54
10/15/2017 21:00	596.40	596.70
10/16/2017 1:00	596.49	596.77
10/16/2017 5:00	596.51	596.79
10/16/2017 9:00	596.49	596.76
10/16/2017 13:00	596.44	596.70
10/16/2017 17:00	596.36	596.63
10/16/2017 21:00	596.29	596.54
10/17/2017 1:00	596.15	596.40
10/17/2017 5:00	596.00	596.24
10/17/2017 9:00	595.85	596.10
10/17/2017 13:00	595.67	595.90
10/17/2017 17:00	595.53	595.76
10/17/2017 21:00	595.40	595.63
10/18/2017 1:00	595.28	595.48
10/18/2017 5:00	595.13	595.34
10/18/2017 9:00	595.00	595.21
10/18/2017 13:00	594.88	595.07
10/18/2017 17:00	594.75	594.95
10/18/2017 21:00	594.65	594.85
10/19/2017 1:00	594.51	594.72
10/19/2017 5:00	594.40	594.61

10/19/2017 9:00	594.28	594.47
10/19/2017 13:00	594.13	594.32
10/19/2017 17:00	594.02	594.22
10/19/2017 21:00	593.93	594.13
10/20/2017 1:00	593.82	594.02
10/20/2017 5:00	593.73	593.90
10/20/2017 9:00	593.60	593.79
10/20/2017 13:00	593.48	593.65
10/20/2017 17:00	593.35	593.54
10/20/2017 21:00	593.28	593.45
10/21/2017 1:00	593.15	593.32
10/21/2017 5:00	593.03	593.22
10/21/2017 9:00	592.87	593.09
10/21/2017 13:00	592.76	592.98
10/21/2017 17:00	592.66	592.89
10/21/2017 21:00	592.60	592.83
10/22/2017 1:00	592.49	592.74
10/22/2017 5:00	592.41	592.68
10/22/2017 9:00	592.32	592.61
10/22/2017 13:00	592.24	592.53
10/22/2017 17:00	592.17	592.47
10/22/2017 21:00	592.11	592.37
10/23/2017 1:00	592.05	592.33
10/23/2017 5:00	592.04	592.37
10/23/2017 9:00	592.17	592.60
10/23/2017 13:00	592.33	592.83
10/23/2017 17:00	592.47	593.00
10/23/2017 21:00	592.60	593.12
10/24/2017 1:00	592.70	593.22
10/24/2017 5:00	592.79	593.32
10/24/2017 9:00	592.87	593.42
10/24/2017 13:00	593.23	593.87
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1/7/2018 4:00	583.53	583.81
1/7/2018 8:00	583.53	583.81
1/7/2018 12:00	583.53	583.86
1/7/2018 16:00	583.53	583.83
1/7/2018 20:00	583.50	583.81
1/8/2018 0:00	583.47	583.76
1/8/2018 4:00	583.42	583.70
1/8/2018 8:00	583.37	583.67
1/8/2018 12:00	583.35	583.64
1/8/2018 16:00	583.29	583.60
1/8/2018 20:00	583.23	583.53
1/9/2018 0:00	583.17	583.47
1/9/2018 4:00	583.13	583.41
1/9/2018 8:00	583.08	583.40
1/9/2018 12:00	583.04	583.33
1/9/2018 16:00	582.99	583.27
1/9/2018 20:00	582.96	583.26
1/10/2018 0:00	582.92	583.20
1/10/2018 4:00	582.91	583.19
1/10/2018 8:00	582.88	583.17
1/10/2018 12:00	582.87	583.14
1/10/2018 16:00	582.86	583.13
1/10/2018 20:00	582.83	583.14
1/11/2018 0:00	582.93	583.32
1/11/2018 4:00	583.03	583.40
1/11/2018 8:00	583.07	583.42
1/11/2018 12:00	583.12	583.48
1/11/2018 16:00	583.37	584.13
1/11/2018 20:00	584.14	586.10
1/12/2018 0:00	585.10	587.06
1/12/2018 4:00	585.77	587.47
1/12/2018 8:00	586.11	587.65
1/12/2018 12:00	586.37	587.74
1/12/2018 16:00	586.49	587.77
1/12/2018 20:00	586.53	587.75
1/13/2018 0:00	586.47	587.70
1/13/2018 4:00	586.37	587.64
1/13/2018 8:00	586.26	587.56
1/13/2018 12:00	586.18	587.52
1/13/2018 16:00	586.07	587.43
1/13/2018 20:00	585.92	587.30
1/14/2018 0:00	585.79	587.21
1/14/2018 4:00	585.69	587.13
1/14/2018 8:00	585.59	587.06
1/14/2018 12:00	585.59	587.09
1/14/2018 16:00	585.56	587.08
1/14/2018 20:00	585.49	586.99
1/15/2018 0:00	585.41	586.89
1/15/2018 4:00	585.38	586.86
1/15/2018 8:00	585.31	586.78
1/15/2018 12:00	585.24	586.67
1/15/2018 16:00	585.15	586.47
1/15/2018 20:00	585.03	586.30
1/16/2018 0:00	584.96	586.14
1/16/2018 4:00	584.89	586.02
1/16/2018 8:00	584.82	585.94
1/16/2018 12:00	584.81	585.86
1/16/2018 16:00	584.74	585.72
1/16/2018 20:00	584.66	585.56
1/17/2018 0:00	584.59	585.45
1/17/2018 4:00	584.54	585.39
1/17/2018 8:00	584.48	585.23
1/17/2018 12:00	584.52	585.20
1/17/2018 16:00	584.54	585.23
1/17/2018 20:00	584.52	585.17
1/18/2018 0:00	584.50	585.12
1/18/2018 4:00	584.50	585.08
1/18/2018 8:00	584.46	585.04
1/18/2018 12:00	584.45	585.02

Groundwater Elevations – River South Bluff Parcel (RP-3S East and RP-3S West)

(Hanson Material Services – Romeoville Quarry)

1/18/2018 16:00	584.45	585.05
1/18/2018 20:00	584.41	584.96
1/19/2018 0:00	584.35	584.93
1/19/2018 4:00	584.33	584.90
1/19/2018 8:00	584.32	584.85
1/19/2018 12:00	584.31	584.83
1/19/2018 16:00	584.29	584.80
1/19/2018 20:00	584.28	584.81
1/20/2018 0:00	584.21	584.71
1/20/2018 4:00	584.15	584.67
1/20/2018 8:00	584.10	584.59
1/20/2018 12:00	584.06	584.52
1/20/2018 16:00	584.02	584.49
1/20/2018 20:00	583.99	584.47
1/21/2018 0:00	584.00	584.48
1/21/2018 4:00	584.02	584.60
1/21/2018 8:00	584.08	584.68
1/21/2018 12:00	584.13	584.77
1/21/2018 16:00	584.25	585.01
1/21/2018 20:00	584.35	585.32
1/22/2018 0:00	584.45	585.57
1/22/2018 4:00	584.58	585.83
1/22/2018 8:00	586.22	588.26
1/22/2018 12:00	589.34	590.01
1/22/2018 16:00	589.93	590.58
1/22/2018 20:00	590.52	591.02
1/23/2018 0:00	590.85	591.37
1/23/2018 4:00	591.12	591.63
1/23/2018 8:00	591.30	591.80
1/23/2018 12:00	591.42	591.91
1/23/2018 16:00	591.49	591.97
1/23/2018 20:00	591.54	592.00
1/24/2018 0:00	591.57	591.99
1/24/2018 4:00	591.55	591.94
1/24/2018 8:00	591.53	591.90
1/24/2018 12:00	591.45	591.82
1/24/2018 16:00	591.40	591.76
1/24/2018 20:00	591.32	591.67
1/25/2018 0:00	591.25	591.57
1/25/2018 4:00	591.18	591.49
1/25/2018 8:00	591.07	591.37
1/25/2018 12:00	591.01	591.28
1/25/2018 16:00	590.91	591.19
1/25/2018 20:00	590.78	591.05
1/26/2018 0:00	590.67	590.95
1/26/2018 4:00	590.59	590.86
1/26/2018 8:00	590.50	590.77
1/26/2018 12:00	590.46	590.74
1/26/2018 16:00	590.42	590.69
1/26/2018 20:00	590.31	590.62
1/27/2018 0:00	590.17	590.57
1/27/2018 4:00	590.11	590.51
1/27/2018 8:00	590.05	590.46
1/27/2018 12:00	590.00	590.42
1/27/2018 16:00	589.96	590.37
1/27/2018 20:00	589.90	590.34
1/28/2018 0:00	589.88	590.31
1/28/2018 4:00	589.83	590.27
1/28/2018 8:00	589.80	590.24
1/28/2018 12:00	589.80	590.24
1/28/2018 16:00	589.76	590.22
1/28/2018 20:00	589.74	590.18
1/29/2018 0:00	589.71	590.15
1/29/2018 4:00	589.68	590.13
1/29/2018 8:00	589.67	590.11
1/29/2018 12:00	589.64	590.09
1/29/2018 16:00	589.61	590.06
1/29/2018 20:00	589.58	590.04
1/30/2018 0:00	589.54	589.99
1/30/2018 4:00	589.51	589.96
1/30/2018 8:00	589.48	589.94
1/30/2018 12:00	589.51	589.96
1/30/2018 16:00	589.50	589.96
1/30/2018 20:00	589.48	589.96
1/31/2018 0:00	589.48	589.95
1/31/2018 4:00	589.47	589.93
1/31/2018 8:00	589.45	589.92
1/31/2018 12:00	589.46	589.90
1/31/2018 16:00	589.43	589.88
1/31/2018 20:00	589.37	589.83
2/1/2018 0:00	589.35	589.82
2/1/2018 4:00	589.30	589.79
2/1/2018 8:00	589.27	589.73
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2/1/2018 16:00	589.21	589.69
2/1/2018 20:00	589.14	589.64
2/2/2018 0:00	589.10	589.60
2/2/2018 4:00	589.07	589.55
2/2/2018 8:00	589.04	589.52
2/2/2018 12:00	589.10	589.58
2/2/2018 16:00	589.11	589.59
2/2/2018 20:00	589.08	589.56
2/3/2018 0:00	589.07	589.54
2/3/2018 4:00	589.06	589.51
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2/3/2018 16:00	589.09	589.53
2/3/2018 20:00	589.02	589.50
2/4/2018 0:00	589.00	589.48
2/4/2018 4:00	588.97	589.45
2/4/2018 8:00	588.92	589.40
2/4/2018 12:00	588.85	589.37
2/4/2018 16:00	588.83	589.33
2/4/2018 20:00	588.78	589.26
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2/5/2018 8:00	588.68	589.18
2/5/2018 12:00	588.73	589.23
2/5/2018 16:00	588.73	589.20
2/5/2018 20:00	588.70	589.19
2/6/2018 0:00	588.65	589.15
2/6/2018 4:00	588.56	589.07
2/6/2018 8:00	588.50	589.03
2/6/2018 12:00	588.57	589.11
2/6/2018 16:00	588.55	589.10
2/6/2018 20:00	588.50	589.06
2/7/2018 0:00	588.49	589.06
2/7/2018 4:00	588.49	589.06
2/7/2018 8:00	588.44	589.01
2/7/2018 12:00	588.44	589.02
2/7/2018 16:00	588.40	588.99
2/7/2018 20:00	588.32	588.91
2/8/2018 0:00	588.27	588.86
2/8/2018 4:00	588.29	588.88
2/8/2018 8:00	588.28	588.87
2/8/2018 12:00	588.27	588.89
2/8/2018 16:00	588.26	588.87
2/8/2018 20:00	588.25	588.85
2/9/2018 0:00	588.25	588.84
2/9/2018 4:00	588.25	588.83
2/9/2018 8:00	588.25	588.80
2/9/2018 12:00	588.23	588.80
2/9/2018 16:00	588.18	588.76
2/9/2018 20:00	588.17	588.74
2/10/2018 0:00	588.15	588.73
2/10/2018 4:00	588.12	588.70
2/10/2018 8:00	588.09	588.68
2/10/2018 12:00	588.07	588.65
2/10/2018 16:00	588.05	588.65
2/10/2018 20:00	588.05	588.63
2/11/2018 0:00	588.03	588.64
2/11/2018 4:00	588.00	588.60
2/11/2018 8:00	587.98	588.58
2/11/2018 12:00	587.98	588.57
2/11/2018 16:00	587.94	588.54
2/11/2018 20:00	587.88	588.50
2/12/2018 0:00	587.84	588.45
2/12/2018 4:00	587.82	588.43
2/12/2018 8:00	587.78	588.41
2/12/2018 12:00	587.78	588.41
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2/13/2018 0:00	587.75	588.35
2/13/2018 4:00	587.75	588.36
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2/13/2018 12:00	587.75	588.35
2/13/2018 16:00	587.75	588.35
2/13/2018 20:00	587.75	588.34
2/14/2018 0:00	587.71	588.32
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2/14/2018 12:00	587.67	588.27
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2/14/2018 20:00	587.66	588.27
2/15/2018 0:00	587.64	588.26
2/15/2018 4:00	587.65	588.26
2/15/2018 8:00	587.67	588.28
2/15/2018 12:00	587.70	588.32
2/15/2018 16:00	587.71	588.33
2/15/2018 20:00	587.78	588.43
2/16/2018 0:00	587.96	588.55
2/16/2018 4:00	588.09	588.69
2/16/2018 8:00	588.20	588.80
2/16/2018 12:00	588.29	588.90
2/16/2018 16:00	588.40	588.99
2/16/2018 20:00	588.49	589.07
2/17/2018 0:00	588.67	589.19
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2/18/2018 8:00	588.88	589.35
2/18/2018 12:00	588.89	589.35
2/18/2018 16:00	588.89	589.32
2/18/2018 20:00	588.88	589.33
2/19/2018 0:00	588.84	589.30
2/19/2018 4:00	588.82	589.28
2/19/2018 8:00	588.81	589.27
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2/19/2018 20:00	591.36	592.48
2/20/2018 0:00	592.92	593.72
2/20/2018 4:00	594.50	594.81
2/20/2018 8:00	597.19	597.27
2/20/2018 12:00	597.46	597.62
2/20/2018 16:00	598.06	598.22
2/20/2018 20:00	598.43	598.60
2/21/2018 0:00	598.65	598.81
2/21/2018 4:00	598.88	599.03
2/21/2018 8:00	598.79	598.96
2/21/2018 12:00	598.67	598.84
2/21/2018 16:00	598.54	598.70
2/21/2018 20:00	598.37	598.51
2/22/2018 0:00	598.19	598.36
2/22/2018 4:00	598.05	598.21
2/22/2018 8:00	597.89	598.06
2/22/2018 12:00	597.76	597.93
2/22/2018 16:00	597.64	597.81
2/22/2018 20:00	597.50	597.68
2/23/2018 0:00	597.38	597.55
2/23/2018 4:00	597.27	597.43
2/23/2018 8:00	597.18	597.34
2/23/2018 12:00	597.07	597.25
2/23/2018 16:00	596.97	597.15
2/23/2018 20:00	596.89	597.06
2/24/2018 0:00	596.80	597.00
2/24/2018 4:00	596.74	596.94
2/24/2018 8:00	596.67	596.86
2/24/2018 12:00	596.61	596.80
2/24/2018 16:00	596.55	596.73
2/24/2018 20:00	596.47	596.65
2/25/2018 0:00	596.40	596.58
2/25/2018 4:00	596.29	596.47
2/25/2018 8:00	596.18	596.38
2/25/2018 12:00	596.08	596.27
2/25/2018 16:00	595.99	596.18
2/25/2018 20:00	595.90	596.09
2/26/2018 0:00	595.81	595.99
2/26/2018 4:00	595.73	595.91
2/26/2018 8:00	595.65	595.83
2/26/2018 12:00	595.61	595.78
2/26/2018 16:00	595.53	595.71
2/26/2018 20:00	595.48	595.65
2/27/2018 0:00	595.41	595.57
2/27/2018 4:00	595.34	595.51
2/27/2018 8:00	595.29	595.46
2/27/2018 12:00	595.23	595.41
2/27/2018 16:00	595.19	595.37
2/27/2018 20:00	595.15	595.30
2/28/2018 0:00	595.08	595.24
2/28/18 0:00	594.976	595.107
2/28/2018 4:00	595.01	595.17
2/28/2018 8:00	594.95	595.12
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3/1/2018 4:00	594.63	594.80
3/1/2018 8:00	594.56	594.74
3/1/2018 12:00	594.64	594.83
3/1/2018 16:00	594.62	594.83
3/1/2018 20:00	594.62	594.82
3/2/2018 0:00	594.61	594.81
3/2/2018 4:00	594.58	594.79
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3/2/2018 12:00	594.58	594.79
3/2/2018 16:00	594.55	594.77
3/2/2018 20:00	594.53	594.72
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3/3/2018 12:00	594.42	594.61
3/3/2018 16:00	594.40	594.60
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3/4/2018 12:00	594.19	594.38
3/4/2018 16:00	594.17	594.36
3/4/2018 20:00	594.11	594.31
3/5/2018 0:00	594.07	594.25
3/5/2018 4:00	594.02	594.22
3/5/2018 8:00	593.96	594.15
3/5/2018 12:00	593.91	594.12
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3/6/2018 16:00	593.59	593.81
3/6/2018 20:00	593.53	593.76
3/7/2018 0:00	593.48	593.72
3/7/2018 4:00	593.41	593.65
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3/7/2018 12:00	593.32	593.58
3/7/2018 16:00	593.28	593.56
3/7/2018 20:00	593.21	593.48
3/8/2018 0:00	593.15	593.42
3/8/2018 4:00	593.09	593.38
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3/8/2018 12:00	593.02	593.31
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3/11/2018 9:00	592.23	592.54
3/11/2018 13:00	592.21	592.53
3/11/2018 17:00	592.16	592.49
3/11/2018 21:00	592.11	592.43
3/12/2018 1:00	592.04	592.38
3/12/2018 5:00	592.04	592.37
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3/12/2018 13:00	591.96	592.31
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3/12/2018 21:00	591.89	592.21
3/13/2018 1:00	591.81	592.15
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3/13/2018 13:00	591.74	592.08
3/13/2018 17:00	591.70	592.04
3/13/2018 21:00	591.65	591.99
3/14/2018 1:00	591.60	591.95
3/14/2018 5:00	591.58	591.93
3/14/2018 9:00	591.57	591.90
3/14/2018 13:00	591.55	591.91
3/14/2018 17:00	591.53	591.89
3/14/2018 21:00	591.51	591.86
3/15/2018 1:00	591.49	591.84
3/15/2018 5:00	591.44	591.80
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3/16/2018 5:00	591.26	591.61
3/16/2018 9:00	591.23	591.57
3/16/2018 13:00	591.22	591.57
3/16/2018 17:00	591.21	591.55
3/16/2018 21:00	591.18	591.52
3/17/2018 1:00	591.14	591.48
3/17/2018 5:00	591.14	591.49
3/17/2018 9:00	591.19	591.55
3/17/2018 13:00	591.27	591.61
3/17/2018 17:00	591.31	591.65
3/17/2018 21:00	591.28	591.63
3/18/2018 1:00	591.26	591.62
3/18/2018 5:00	591.24	591.62
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3/18/2018 17:00	591.21	591.55
3/18/2018 21:00	591.16	591.52
3/19/2018 1:00	591.15	591.51
3/19/2018 5:00	591.12	591.47
3/19/2018 9:00	591.10	591.44
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3/19/2018 17:00	591.05	591.39
3/19/2018 21:00	591.01	591.35
3/20/2018 1:00	590.99	591.32
3/20/2018 5:00	590.96	591.29
3/20/2018 9:00	590.94	591.27
3/20/2018 13:00	590.91	591.24
3/20/2018 17:00	590.91	591.24
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3/21/2018 5:00	590.82	591.15
3/21/2018 9:00	590.78	591.12
3/21/2018 13:00	590.78	591.10
3/21/2018 17:00	590.75	591.07
3/21/2018 21:00	590.71	591.04
3/22/2018 1:00	590.67	591.00
3/22/2018 5:00	590.63	590.97
3/22/2018 9:00	590.63	590.96
3/22/2018 13:00	590.62	590.94
3/22/2018 17:00	590.61	590.93
3/22/2018 21:00	590.58	590.91
3/23/2018 1:00	590.57	590.88
3/23/2018 5:00	590.53	590.85
3/23/2018 9:00	590.52	590.84
3/23/2018 13:00	590.50	590.84
3/23/2018 17:00	590.50	590.83
3/23/2018 21:00	590.47	590.80
3/24/2018 1:00	590.47	590.79
3/24/2018 5:00	590.46	590.78
3/24/2018 9:00	590.45	590.76
3/24/2018 13:00	590.42	590.72
3/24/2018 17:00	590.42	590.72
3/24/2018 21:00	590.36	590.70
3/25/2018 1:00	590.35	590.66
3/25/2018 5:00	590.29	590.63
3/25/2018 9:00	590.25	590.61
3/25/2018 13:00	590.25	590.61
3/25/2018 17:00	590.22	590.59
3/25/2018 21:00	590.20	590.57
3/26/2018 1:00	590.18	590.56
3/26/2018 5:00	590.15	590.54
3/26/2018 9:00	590.12	590.50
3/26/2018 13:00	590.14	590.52
3/26/2018 17:00	590.13	590.50
3/26/2018 21:00	590.12	590.49
3/27/2018 1:00	590.11	590.47
3/27/2018 5:00	590.33	590.67
3/27/2018 9:00	590.60	590.97
3/27/2018 13:00	590.82	591.19
3/27/2018 17:00	590.90	591.26
3/27/2018 21:00	590.92	591.27
3/28/2018 1:00	590.92	591.26
3/28/2018 5:00	590.91	591.25
3/28/2018 9:00	590.87	591.21
5/7/18 0:00	589.436	589.777
8/6/18 0:00	587.776	588.387
7/3/19 0:00	595.206	595.337

Notes:

ft msl = Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)

TOC = Top of PVC Casing

ft = feet

--- No Elevation

Cells highlighted in yellow are manual WLs

Cells in gray are drought WLs and excluded from calculations

Groundwater Measurements and Elevations - River South Parcels
Hanson Material Service - Romeoville Quarry

Well Number & Data	RP-4S		RP-5S WEST		RP-5S EAST		RP-6S		RP-6S OVERBURDEN		RP-8S EAST		RP-8S WEST		RP-9S NORTH		RP-9S SOUTH		RP-10S	
Ground Surface Elevation (ft msl)	602.21		604.03		600.05		606.22		606.80		601.03		601.23		599.73		599.65		607.22	
Top of PVC Casing Elevation (ft)	604.02		606.20		602.11		608.48		608.98		603.90		604.27		603.16		602.49		610.41	
Date	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)
May. 30, 2013	NI		NI		NI		NI		NI											
Jul. 09, 2013	17.43	586.59	15.43	590.77	14.00	588.11	19.04	589.44	dry											
Jul. 15, 2013	17.96	586.06	16.20	590.00	14.67	587.44	19.51	588.97	dry											
Aug. 21, 2013	25.39	578.63	19.41	586.79	17.49	584.62	23.18	585.30	dry											
Sep. 06, 2013	---		---		---		---		dry											
Nov. 19, 2013	15.94	588.08	14.83	591.37	13.88	588.23	18.55	589.93	17.23	591.75										
Apr. 23, 2014	15.44	588.58	14.30	591.90	12.83	589.28	18.18	590.30	17.08	591.90										
May. 02, 2014	---		---		---		---		---											
Oct. 01, 2014	16.96	587.06	14.87	591.33	13.49	588.62	18.69	589.79	17.09	591.89										
Oct. 24, 2014	---		---		---		---		---		NI		17.05	587.22	17.37	585.79	NI		21.95	588.46
Oct. 28, 2014	---		---		---		---		---		19.61	584.29	18.21	586.06	17.69	585.47	16.23	586.26	22.91	587.50
Nov. 10, 2014	17.37	586.65	15.38	590.82	14.00	588.11	19.11	589.37	17.14	591.84	20.17	583.73	18.92	585.35	18.30	584.86	17.21	585.28	24.28	586.13
Nov. 14, 2014	---		---		---		---		---		20.30	583.60	19.16	585.11	18.52	584.64	17.43	585.06	24.53	585.88
Nov. 20, 2014	---		---		---		---		---		20.58	583.32	---		18.88	584.28	---		---	
Feb. 10, 2015	17.66	586.36	16.84	589.36	15.13	586.98	20.21	588.27	---		20.34	583.56	19.05	585.22	18.59	584.57	17.49	585.00	22.69	587.72
Jun. 04, 2015	15.65	588.37	14.53	591.67	13.40	588.71	18.28	590.20	17.08	591.90	19.75	584.15	18.13	586.14	17.69	585.47	16.46	586.03	22.01	588.40
Oct. 13, 2015	17.41	586.61	15.83	590.37	14.42	587.69	19.3	589.18	17.08	591.90	20.62	583.28	19.51	584.76	18.82	584.34	17.64	584.85	24.88	585.53
Mar. 03, 2016	17.23	586.79	15.28	590.92	14.03	588.08	18.98	589.50	17.18	591.80	20.22	583.68	18.93	585.34	18.35	584.81	17.12	585.37	24.02	586.39
Aug. 31, 2016	13.64	590.38	12.5	593.70	11.31	590.80	16.61	591.87	17.08	591.90	18.07	585.83	13.56	590.71	14.08	589.08	12.18	590.31	13.71	596.70
Jan. 19, 2017	14.53	589.49	14.29	591.91	13.50	588.61	18.26	590.22	17.22	591.76	18.46	585.44	13.84	590.43	14.36	588.80	12.70	589.79	13.25	597.16
Jul. 24, 2017	14.36	589.66	14.01	592.19	13.69	588.42	17.81	590.67	17.12	591.86	17.49	586.41	10.67	593.60	12.08	591.08	10.71	591.78	8.82	601.59
Oct. 12, 2017	17.62	586.40	18.42	587.78	16.67	585.44	22.77	585.71	17.05	591.93	20.70	583.20	19.05	585.22	18.72	584.44	17.65	584.84	21.49	588.92
Feb. 28, 2018	11.64	592.38	10.71	595.49	9.78	592.33	13.64	594.84	14.17	594.81	17.96	585.94	12.62	591.65	13.00	590.16	11.64	590.85	13.21	597.20
May. 07, 2018	16.58	587.44	14.90	591.30	13.72	588.39	18.67	589.81	17.08	591.90	20.09	583.81	18.65	585.62	18.08	585.08	16.91	585.58	23.69	586.72
Aug. 6, 2018	17.74	586.28	16.34	589.86	14.85	587.26	19.64	588.84	17.04	591.94	20.49	583.41	18.24	586.03	18.55	584.61	17.54	584.95	23.73	586.68
Jun. 3, 2019	11.29	592.73	10.68	595.52	9.72	592.39	14.11	594.37	14.59	594.39	17.18	586.72	---	Well Destroyed	12.54	590.62	10.88	591.61	11.66	598.75
Sep. 12, 2019	---		16.01	590.19	15.23	586.88	19.42	589.06	17.06	591.92	20.55	583.35	19.38	New TOC El.	18.89	584.27	17.58	584.91	24.70	585.71
end																				

Notes:
ft msl = Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)
TOC = Top of PVC Casing
ft = feet
[A] = as measured inside well
NI = Not Installed
--- No Elevation

SUMMARY OF GROUNDWATER ELEVATIONS IN THE VICINITY OF LOCKPORT PRAIRIE NATURE PRESERVE

(Data obtained from: GRAEF, 2008, University of St. Francis unpublished data, AECOM data)

Date	MW-6A	MW-6B	MW-6C	MW-6N	MW-7C	MW-7D	MW-8A	MW-8B	MW-9A	MW-9B	MW-11A	MW-11B	MW-11C	MW-12B	MW-12C
19-Jul-01	586.98	586.49		588.8	604.07	603.68	563.99	563.09	567.59						
6-Aug-01	586.31	585.64		588.27	605.48	605.25	564.09	563.13	567.31						
9-Aug-01	586.2	585.5		588.22	605.56	605.34	563.3	562.41	567.31						
10-Sep-01	586.1	585.46		588.11	605.96	605.85	564.74	564.08	568.94						
2-Nov-01	589.79	589.61		592.42	606.92	606.91	564.62	564	569.08						
19-Dec-01	587.85	587.47		590.1	607.1	607.09	564.58	564	569.27						
28-Mar-02	589.04	588.82	587.32	591.56	608.43	608.39	564.56	563.97	568.97	568.51					
30-May-02	589.41	589.24	588.51	592.25	609.19	609.17	564.51	563.94	568.65	568.82					
15-Jul-02	587.75	587.37	588.08	590.04	608.04	608.05	564.37	563.67	568.37	568.37					
9-Aug-02	587.08	586.59	587.58	588.95	607.68	607.79	564.29	563.41	568.01	568.33					
5-Sep-02	586.4	585.71	586.95	588.31	607.93	607.93	564.21	563.46	567.7	568.31					
7-Oct-02	585.69	584.91	586.03	587.86	607.83	607.83	564.5	563.88	568.29	568.11					
7-Nov-02	585.26	584.47	585.26	587.74	608.05	608.07	564.5	563.9	568.42	568.2					
23-Jan-03	585.63	584.51	584.92	588.04	607.76	607.8	564.42	563.92	568.37	568.33					
13-Mar-03	584.91	584.12	584.29	587.69	607.77	607.8	564.87	564.41	569.32	568.69					
15-Apr-03	587.78	587.27	584.65	590.12	607.86	607.86	564.41	563.91	568.72	568.87					
23-May-03	589.3	589.1	586.27	592.01	607.55	607.56	564.43	563.89	568.64	568.86					
25-Jun-03	587.68	587.19	586.97	589.99	607.58	607.57	564.15	563.32	568.02	568.39					
22-Jul-03	589.1	588.9	587.03	592.07	607.56	607.56	564.57	563.91	569.31	568.53					
23-Aug-03	589.09	588.91	588.44	591.78	607.67	607.67	564.38	563.56	568.23	568.75					
1-Oct-03	587.79	587.4	588.19	590.04	607.12	607.12	564.48	563.86	568.72	568.75					
13-Nov-03	589.16	588.96	587.53	591.57	607.07	607.08	564.48	563.9	569.13	568.85					
29-Apr-04	588.92	588.72	588.21	591.62	607.61	607.61	564.34	563.81	569.1	568.73					
26-May-04	588.61	588.41	588.21	591.27	607.63	607.61	564.4	563.88	569.11	568.79					
8-Jul-04	588.8	588.6	588.83	591.41	607.48	607.47	564.43	563.94	568.9	568.88					
28-Jul-04	587.79	587.46		589.98	607.39	607.37	564.14	563.53	568.38	568.85					
31-Aug-04	589.95	589.77	587.84	592.95	607.13	607.09	564.42	563.9	569.48	568.92					
30-Sep-04	588.47	588.23	588.38	590.69	607.27	607.23	564.15	563.63	568.4	568.89					
25-Oct-04	587.51	587.11	587.97	589.35	607.18	607.13	564.35	563.88	569.38	568.9					
8-Dec-04	589.48	589.32	587.79	592.03	607.32	607.28	564.48	563.96	569.81	569.04					
28-Dec-04	589.01	588.8	588.28	591.42	607.55	607.5	564.33	564.07	568.57	568.89					
27-Jan-05	589.67	589.52	588.74	592.33	607.46	607.4	564.3	564.04	569.1	568.57					
23-Feb-05	589.07	588.89	588.68	591.83	607.79	607.68	564.34	563.99	569.33	568.73					
23-Mar-05	588.24	588	588.52	590.76	608.17	608.11	564.27	563.91	568.76	568.7					
21-Apr-05	588.51	588.3	588.24	591.1	608.09	608.03	564.2	563.86	568.78	568.75					
25-May-05	587.67	587.33	587.94	589.84	608.02	607.95	564.01	563.64	568.74	568.69					
23-Jun-05	587.18	586.75	587.5	589.05	607.8	607.76	562.57	562.44	567.8	568.43					
14-Jul-05	586.55	585.94	587.05	588.43	607.3	607.25	561.08	560.7	566.86	568.04					
30-Aug-05	585.75	584.99	585.89	587.97	607.43	607.36	561.98	561.79	567.29	567.69					
11-Oct-05	584.98	584.19	584.97	587.7	607.22	607.05	562.05	561.93	567.16	567.3					
8-Dec-05	584.37	583.54	583.95	587.65	606.83	606.72	563.27	563.19	568.35	567.98					
28-Jun-06	587.69	587.3	587.55	590.03	607.03	606.97	563.79	563.66	568.86	568.89					
11-Aug-06	587.29	586.77	586.96	589.3	606.89	606.85	563.96	563.8	569.44	568.8					
28-Aug-06	587.46	586.97	586.9	589.43	607.04	606.99	563.62	563.5	568.28	568.81					
13-Oct-06	590.52	590.43	587.88	593.06	607.46	607.43	564.01	563.85	569.26	569.16	563.98	564.16	564.18		
21-Feb-07	587.96	587.66	588.65	590.39	607.57	607.49	564.18	563.95	568.96	568.33		564.13	564.15		
17-Aug-07	588.06	587.79	587.68	590.07	606.44	606.38	563.85	563.68	568.7	569.01	562.18	562.32	562.32	602.81	602.51
26-Oct-07	587.34	586.94	587.99	589.18	606.88	606.86	563.87	563.74	568.5	569.1	561.35	561.47	561.5	602.7	602.44
21-Feb-08	589.53	589.38	588.21	592.34	607.07	607.02	564.27	563.94	569.33	569.18				602.61	602.49
20-Jun-08	589.72	589.61	589.5	592.4	607.92	607.89	563.94	563.71	568.68	568.93	563.09	563.37	563.57	603.14	602.89
17-Jul-08	587.97	587.73	589.38	590.27	606.79	606.76	563.75	563.55	568.38	568.56	562.2	562.43	562.48	602.82	602.63
21-Aug-08	587.03	586.58	587.68	588.78	604.85	604.56	563.33	563.1	567.84	568.05	561.24	561.43	561.51	602.57	602.36
9-Sep-08	587.47	587.09	587.22	589.73	605.35	605.15	564.12	563.83	569.59	569.44	563.47	563.73	563.79	602.45	602.22
23-Sep-08	591.44	591.31	587.78	593.74	605.61	605.43	564.06	563.85	569.09	569.13	563.64	563.97	564.06	602.48	602.28
24-Oct-08	588.42	588.21	588.28	590.68	606.34	606.2	564.16	563.87	569.09	569.08	563.6	563.89	563.93	602.89	602.65
16-Sep-09	597.66	587.78	589.18			610.93	563.26	562.62							
30-Sep-09	585.26	587.25	587.51			606.37	563.65	563.60							
7-Oct-09	585.92	587.15	587.15		605.75	606.50	563.46	563.41							
21-Oct-09	599.07	586.47	587.08		606.18	605.85	563.49	563.57							
28-Oct-09	595.79	588.50	588.10		606.44	606.54	563.56	563.70							
4-Nov-09	591.10	590.50	587.21		606.38	606.80	563.85	563.60							
11-Nov-09	586.05	589.91	588.13		606.48	606.54	564.18	563.93							
18-Nov-09	586.21	586.24	588.16		606.87	607.16	563.88	563.83							
25-Nov-09		588.70	588.06		607.00	607.26	563.92	563.70							
2-Dec-09	593.03	588.83	588.16		607.62	607.72	563.95	563.77							
3-Mar-10	587.95	587.71	588.3		607.65	607.51	564.23	563.98							
10-Mar-10	588.11	587.91	588.22		608.16	608.17	564.12	564.2							
17-Mar-10	589.3	589.16	588.2		607.65	607.61	564.03	563.88							
24-Mar-10	589.4	589.31	588.3		607.8	607.76	564.03	563.83							
31-Mar-10	589.07	588.94	588.39		608.15	608.15	564.03	563.83							
8-Apr-10	588.79	588.63	588.39		608.04	608.06	564.14	563.87							
14-Apr-10	588.62	588.42	588.41		607.84	607.82	564.02	563.87							
22-Apr-10	588.44	588.25	588.37		608.23	608.22	564.01	563.85							
28-Apr-10	588.2	588.21	588.07		608.03	608.01	563.99	563.83							
5-May-10	588.02	587.8	588.23		608.23	608.08	564.02	563.85							
14-May-10	588	587.79	588.14		607.78	607.78	564.12	563.89							
20-May-10	588.18	587.98	588.12		608.22	608	564.01	563.86							
27-May-10	588.34	588.14	588.1		608.05	608.05	563.96	563.85							
3-Jun-10	588.34	588.14	588.05		608.26	608.26	564.05	563.85							
9-Jun-10	588.76	588.55	588.04		608.18	608.21	564.12	563.89						603.65	603.56
16-Jun-10	588.87	588.73	588.08		608.1	608.11	564.13	563.89							
23-Jun-10	589.25	589.03	587.8		608.27	608.23	564.29	563.94							
30-Jun-10	590.47	590.4	588.32		607.92	607.94	564.02	563.84							
7-Jul-10	589.78	589.7	588.51		607.2	607.2	563.88	563.96							
16-Jul-10	589.09	588.94	588.57		607.31	607.23	563.84	563.63							
21-Jul-10	588.78	588.61	587.56		606.64	606.58	563.77	563.56							
28-Jul-10	588.91	588.75	588.53		606.68	606.7	563.9	563.7							
5-Aug-10	591.47	591.4	588.63		606.77	606.76	564.18	563.92							
11-Aug-10	591.28	591.25	588.9		607.82	606.82	564.06	563.88							
18-Aug-10	589.33	589.79	589.05		606.43	606.25	564.02	563.84							
3-Sep-10	588.43	588.26	588.94		606.49	606.38	564.05	563.85							
10-Sep-10	588.08	587.89	588.84		606.37	606.29	563.76	563.58							
17-Sep-10	587.72	587.53	588.64		606.32	606.25	563.72	563.57							
24-Sep-10	587.52	587.23	589.03		606.59	606.53	563.98	563.81							
1-Oct-10	587.35	587	588.35		606.53	606.44	563.75	563.61							

SUMMARY OF GROUNDWATER ELEVATIONS IN THE VICINITY OF LOCKPORT PRAIRIE NATURE PRESERVE

(Data obtained from: GRAEF, 2008, University of St. Francis unpublished data, AECOM data)

Date	MW-6A	MW-6B	MW-6C	MW-6N	MW-7C	MW-7D	MW-8A	MW-8B	MW-9A	MW-9B	MW-11A	MW-11B	MW-11C	MW-12B	MW-12C
8-Oct-10	587.31	587.95	588.33		606.47	606.39	563.71	563.57							
15-Oct-10	587.02	586.66	587.94		606.07	605.95	563.68	563.55							
22-Oct-10	586.84	586.32	587.77		605.96	605.89	563.5	563.37							
29-Oct-10	587.08	586.66	587.61		605.57	605.41	563.91	563.73							
5-Nov-10	587.57	587.21	587.53		606.06	605.9	563.92	563.76							
12-Nov-10	587.43	587.11	587.45		605.93	605.81	563.92	563.8							
19-Nov-10	587.16	586.86	587.37		606.25	606.13	563.83	563.75							
26-Nov-10	587.06	586.67	587.27		606.44	606.36	564.02	563.86							
30-Dec-10	587.2	586.82	586.99		606.99	606.99	564.28	564.04							
28-Mar-11	590	589.9	588.51		607.13	607.15	564.1	563.95							
25-Apr-11	589.62	589.47	588.63		607.57	607.58	564.16	563.9							
2-May-11	590.42	590.33	588.79		607.29	607.31	564.08	563.92							
10-May-11	589.57	589.46	588.91		607.92	607.92	564.01	563.85							
17-May-11	589.01	588.88	588.92		607.7	607.69	564.06	563.85							
27-May-11	588.71	588.55	588.81		607.06	607.07	564.15	563.9							
2-Jun-11	588.61	588.44	588.73		606.83	606.95	564.01	563.87							
14-Jun-11	591.89	591.8	589.04		607.15	607.16	564.14	564							
21-Jun-11	590.59	590.52	589.25		607.56	607.58	564.16	563.94							
28-Jun-11	590.03	589.95	589.33		607.27	607.28	564	563.88							
5-Jul-11	589.3	589.71	589.33		606.55	606.83	563.84	563.59							
12-Jul-11	588.77	588.62	589.25		606.61	606.6	563.84	563.66							
19-Jul-11	588.36	588.17	589.13		606.27	606.04	563.67	563.45							
26-Jul-11	588.21	588.03	588.98		606.11	605.97	563.97	563.83							
2-Aug-11	588.56	588.4	588.88		606.19	606.07	563.84	563.67							
9-Aug-11	588.3	588.12	588.77		606.23	606.1	564.08	563.88							
16-Aug-11	587.85	587.93	588.74		605.99	605.89	562.9	562.77							
30-Aug-11	588.2	587.21	588.44		605.99	605.8	563.71	563.53							
7-Sep-11	588.12	586.21	588.18		605.74	604.8									
13-Sep-11		587.37	588.23		605.64	605.37	563.57	563.4							
20-Sep-11		587.16	588.09		605.53	605.48	564.2	563.85							
27-Sep-11		587.01	587.95		606.05	605.92	564.23	563.92							
4-Oct-11		587.19	587.81		605.57	605.4	563.9	563.77							
11-Oct-11		587.32	587.72		606.02	605.87	563.9	563.77							
17-Oct-11		587.18	587.64		606.04		563.99	563.87							
25-Oct-11		587.06	587.54		606.06		564.04	563.89							
1-Nov-11		586.89	587.44		606.11		564.03	563.88							
15-Nov-11		587.89	587.29		606.48		564.03	563.9							
23-Nov-11		588.31	587.38		606.23		564.09	563.92							
29-Nov-11		588.41	587.43		606.58		564.1	563.87							
6-Dec-11		588.8	587.59		606.34		564.06	563.9							
13-Dec-11		588.62	587.69		606.39		564.06	563.89							
20-Dec-11		589.53	587.78		606.71		564.07	563.89							
29-Dec-11		589.34	587.97		607.26		564.08	563.9							
6-Jan-12		588.93	588.11		607.04		564.07	563.89							
7-Feb-12		589.25	588.29		606.78		564.08	563.88							
14-Feb-12		588.91	588.35		607.36		564.1	563.95							
23-Feb-12		588.51	588.38		607.45		564.1	563.9							
9-Mar-12		588.12	588.28		606.67		564.06	563.86							
13-Mar-12		588.01	588.28		607.2		564.11	563.9							
20-Mar-12		588.01	588.21		607.3		564.02	563.86							
27-Mar-12		587.98	588.17		607.19		564.06	563.89							
3-Apr-12		587.93	588.1		607.52		564.08	563.89							
17-Apr-12		587.61	588		607.09		564.08	563.88							
24-Apr-12		587.42	587.94		607.5		563.98	563.84							
15-May-12		588.57	587.75		607.04		564.01	563.86							
24-May-12		587.55	587.82		607.08		563.64								
31-May-12		588.29	587.83		606.74		563.42								
5-Jun-12		587.85	587.82		606.34		563.59	563.43							
11-Jun-12		587.49	587.79		606.35		563.28	563.04							
24-Jun-12		586.99	587.61		606		563.05	562.76							
2-Jul-12		586.76	587.49		605.87		563	563.27						602.21	602.05
9-Jul-12		586.41	587.35		605.66		561.84	561.67						602.07	601.98
12-Jul-12											560.69	561.06	561.16		
18-Jul-12		586.11	587.19		605.25		561.33	561.06						601.69	601.29
23-Jul-12		586.43	586.99		605.8		561.22	560.84						602.19	601.99
29-Jul-12		586.36	586.91		605.23		561.83	561.62			560.9	561.26	561.39	601.92	601.74
14-Aug-12		588.95	586.5		606.02		562.89	562.39			560.82	561.16	561.29		
24-Aug-12		585.75	586.18		605.8		562.35	562.17							
30-Aug-12		586.27	586.01		605.92		563.52	563.44			560.51	562.09	562.02		
6-Sep-12		587.26	586		605.92		560.59	563.49			561.38	561.6	560.84		
16-Sep-12		587.46	586.12		605.86		563.49	563.39			561.35	561.34	560.65	601.87	
20-Sep-12		587.35	586.13		605.82		563.45	563.39			561.11	560.54	561.64	602.11	
27-Sep-12		587.05	586.17		605.37		563.43	563.31						601.74	601.56
4-Oct-12		586.76	586.12		605.4		561.47	563.36			560.91	561.25	561.38	601.88	601.7
11-Oct-12		586.48	586.05		605.44		563.62	562.53			560.93	561.25	561.33	601.8	601.67
15-Oct-12		586.4	586		605.63		563.92	563.86			561.21	561.58	561.67	602	601.79
25-Oct-12														602.02	601.79
1-Nov-12		586.52	585.94		605.84		563.77	563.7			562.1	562.51	562.59		
8-Nov-12		586.61	585.78		605.72		563.84	563.81			561.93	562.27	562.32	601.72	600.99
15-Nov-12		586.55	585.75		605.71		563.88	563.77			562.33	562.8	561.94	601.62	601.49
29-Nov-12		586.3	585.66		606.16						558.76	562.17	562.26	601.89	602.69
6-Dec-12	586.21		585.67				563.73	562.65						602.26	601.79
20-Dec-12							564.22	563.86							
27-Dec-12			585.36		606		563.82	563.73			561.76	563.22	563.3	601.6	601.39
10-Mar-13	589.25		587.42		608.96		564.33	564.03			563.78	564.04	564.01	601.94	601.98
22-Mar-13	590.26		588.09		606.6		564.1	563.93			563.05				
29-Mar-13	589.45		588.17		606.38		564.1	563.9			562.92	563.45	563.53	601.61	601.79
15-Apr-13	588.65		588.27		606.61		564.03	563.87			562.51	563.14	563.23		
28-Apr-13	591.14		588.92		606.97		564.12	563.91			563.41	564	564.07	601.19	602.02
8-May-13	589.66		588.7		606.94		564.04	563.88						602.11	601.98
13-May-13			589.19		606.74	606.75	564.06	563.89						601.89	601.79
20-May-13	588.75		589.02		606.79	606.72	563.99	563.96						602.31	601.98
27-May-13	588.49		589.02		606.42		564.08	563.96						602.08	601.88
5-Jun-13	588.56		588.84		606.4		563.92	563.86			562.89	562.55	563.67		
10-Jun-13	588.57		588.87		606.61		563.84	563.73			562.38	563	563.19	602.25	602.18

SUMMARY OF GROUNDWATER ELEVATIONS IN THE VICINITY OF LOCKPORT PRAIRIE NATURE PRESERVE

(Data obtained from: GRAEF, 2008, University of St. Francis unpublished data, AECOM data)

Date	MW-6A	MW-6B	MW-6C	MW-6N	MW-7C	MW-7D	MW-8A	MW-8B	MW-9A	MW-9B	MW-11A	MW-11B	MW-11C	MW-12B	MW-12C
17-Jun-13	588.74		588.66		606.45		563.92								
24-Jun-13	588.76		588.65		606.54		564.13	563.88			563.45	563.91	564	602.14	601.97
1-Jul-13	587.57		588.58		606.16		563.77	563.79			563.05	563.59	563.75		
8-Jul-13	588.46		588.59		606.34		563.83	563.73			562.29	562.85	563.01	602.15	601.99
15-Jul-13	589.25		588.44		605.73		563.62	563.46			560.75	562.22	562.38		
22-Jul-13	587.93		588.39		606.1		563.31	563.37							
29-Jul-13	587.73		588.22		605.19		563.36	563.38			561.17	561.68	561.82	601.67	601.58
12-Aug-13	587.33		587.89		605.6		563.36	563.28			561.1	561.58	561.75		
9-Sep-13	586.73		587.2		605.52		563.31	563.24			561.04	561.48	561.63	601.91	601.75
23-Sep-13	586.56		586.87				563.29	563.26			560.87	561.27	561.42	601.66	601.47
30-Sep-13	586.08		586.69		605.18		563.29	563.19			560.77	561.15	561.31	601.83	601.69
10-Oct-13	585.94		585.34		605.14		563.71	563.62			561.34	561.75	561.91		
21-Oct-13	585.8		586.08				563.68	563.62			561.33	561.63	561.8		
28-Oct-13	585.66		585.89		605.43		563.7	563.67			560.91	561.54	561.69		
22-Nov-13	588.78		586.2				564	563.87							
2-Mar-16	588.78	587.96	586.2		607.26	607.29	563.98	563.91	568.8		563.14	562.76	563.42		
19-Jan-17	588.76	588.70			607.33	607.35			569.75			563.78	564.44		
21-Apr-17	589.56	589.57			607.94	607.96			569.22			563.98	564.13		
24-Jul-17	588.02	587.95			605.76	605.66		563.92	569.88			564.37	564.55		
12-Oct-17	586.64	586.36			605.07	605.12			568.73			563.25	563.45		
28-Feb-18	591.69	591.64			607.16	607.22		564.18	569.47			564.09	564.29	602.61	602.23
7-May-18	588.64	588.43			606.89	606.91		563.88	568.38			563.11	563.35	602.73	602.55
6-Aug-18	588.05	587.81			605.62	605.31		563.2				561.53	561.69	602.95	602.71
3-Jun-19	591.6	591.53			608.26	608.11		563.95	569.21			563.21	563.37	603.4	603.27
12-Sep-19	587.63	587.36			606.98	606.66		563.88	568.51			562.56	562.72	601.42	601.26
End															

Notes:

Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)

--- No Elevation

All water levels were collected manually

Cells in gray are drought WLs and excluded from calculations

Groundwater Measurements and Elevations
ComEd and Long Run Parcels

Hanson Material Service - Romeoville Quarry

Well Number & Data	CEP-1D	CEP-2S	CEP-2D	CEP-3S	CEP-3D	CEP-4S	CEP-4D
Ground Surface Elevation (ft msl)	586.62	587.18	587.50	591.99	591.97	584.53	584.35
Top of PVC Casing Elevation (ft)	589.73	590.29	590.32	595.05	595.07	587.40	587.73
Well Depth (Feet from TOC)[A]	52.50	22.53	55.28	20.09	52.51	22.45	55.45

Date	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)
Oct. 4-5, 2005	6.05	583.68	5.79	584.50	5.97	584.35	----		----		9.55	577.85	9.73	578.00
Oct. 10, 2005	---		---				5.53	589.52	5.55	589.52	----		---	
Oct. 25, 2005	6.25	583.48	5.68	584.61	5.85	584.47	5.43	589.62	5.36	589.71	9.56	577.84	10.06	577.67
Dec. 16-22, 2005	4.32	585.41	5.29	585.00	5.45	584.87	4.92	590.13	5.04	590.03	9.15	578.25	9.52	578.21
Jan. 31, 2006	2.75	586.98	---		---		4.3	590.75	4.48	590.59	4.4	583.00	4.80	582.93
Apr. 10, 2006	3.47	586.26	4.27	586.02	4.38	585.94	4.63	590.42	4.51	590.56	4.24	583.16	4.31	583.42
Jun. 2-5, 2006	4.13	585.60	4.81	585.48	4.95	585.37	5.27	589.78	5.21	589.86	4.93	582.47	5.32	582.41
Nov. 14, 2006	2.83	586.90	3.94	586.35	4.12	586.20	4.12	590.93	4.05	591.02	3.76	583.64	4.15	583.58
Mar. 15, 2007	2.72	587.01	3.82	586.47	3.93	586.39	3.85	591.20	3.77	591.30	3.66	583.74	4.16	583.57
Apr. 17, 2008	2.70	587.03	4.11	586.18	4.18	586.14	4.34	590.71	4.19	590.88	3.73	583.67	4.14	583.59
Jul. 18, 2008	3.15	586.58	5.64	584.65	5.70	584.62	4.92	590.13	4.55	590.52	6.33	581.07	6.72	581.01
Aug. 18, 2008	3.30	586.43	6.13	584.16	6.19	584.13	4.96	590.09	4.60	590.47	8.08	579.32	8.46	579.27
Dec. 02, 2008	2.76	586.97	4.19	586.10	4.27	586.05	4.42	590.63	4.18	590.89	4.74	582.66	5.14	582.59
Feb. 19, 2009	na		3.94	586.35	4.06	586.26	3.97	591.08	3.81	591.26	3.37	584.03	3.77	583.96
Aug. 13, 2009	3.14	586.59	5.92	584.37	5.91	584.41	4.93	590.12	4.50	590.57	7.68	579.72	8.05	579.68
Oct. 23, 2009	2.47	587.26	3.48	586.81	3.53	586.79	3.21	591.84	3.19	591.88	2.89	584.51	3.33	584.40
Feb. 02, 2010	na		4.16	586.13	4.21	586.11	4.37	590.68	4.07	591.00	3.92	583.48	4.33	583.40
Apr. 13, 2010	2.70	587.03	4.24	586.05	4.31	586.01	4.43	590.62	4.13	590.94	3.79	583.61	4.19	583.54
Aug. 09, 2010	2.73	587.00	4.14	586.15	4.21	586.11	4.75	590.30	4.36	590.71	3.78	583.62	4.18	583.55
Jan. 26, 2011	na		4.28	586.01	4.32	586.00	4.62	590.43	4.22	590.85	4.36	583.04	4.77	582.96
May. 04, 2011	2.90	586.83	4.61	585.68	4.57	585.75	4.51	590.54	4.16	590.91	3.73	583.67	4.16	583.57
May. 10, 2011	na		na		na		na		na		na		na	
May. 11, 2011	na		na		na		na		na		na		na	
May. 20, 2011	na		na		na		COMED		na		na		na	
Jul. 05, 2011	3.77	585.96	4.76	585.53	4.80	585.52	5.21	589.84	4.70	590.37	5.30	582.10	5.60	582.13
Oct. 04, 2011	3.15	586.58	4.64	585.65	4.62	585.70	4.9	590.15	4.45	590.62	4.09	583.31	4.51	583.22
Dec. 28, 2011	2.82	586.91	4.65	585.64	4.60	585.72	4.26	590.79	4.00	591.07	3.79	583.61	4.20	583.53
Mar. 30, 2012	2.92	586.81	4.62	585.67	4.58	585.74	4.29	590.76	3.97	591.10	3.83	583.57	4.25	583.48
Jul. 19, 2012	5.15	584.58	5.53	584.76	5.69	584.63	5.56	589.49	5.00	590.07	8.33	579.07	8.74	578.99
Oct. 16, 2012	2.86	586.87	5.22	585.07	5.31	585.01	4.55	590.50	4.22	590.85	7.02	580.38	7.40	580.33
Nov. 26, 2012	3.30	586.43	4.80	585.49	4.78	585.54	4.59	590.46	4.27	590.80	5.35	582.05	5.72	582.01
Apr. 22, 2013	2.63	587.10	4.54	585.75	4.49	585.83	4.26	590.79	4.02	591.05	3.31	584.09	3.70	584.03
Jul. 15, 2013	4.32	585.41	5.26	585.03	5.31	585.01	5.69	589.36	5.22	589.85	6.12	581.28	6.50	581.23
Nov. 19, 2013	2.80	586.93	4.31	585.98	4.52	585.80	na		na		na		na	
Apr. 23, 2014	2.80	586.93	4.72	585.57	4.65	585.67	4.38	590.67	4.07	591.00	3.79	583.61	4.19	583.54
Nov. 20, 2014	na		4.75	585.54	4.83	585.49	4.61	590.44	4.19	590.88	5.37	582.03	5.72	582.01
Jun. 04, 2015	3.10	586.63	4.70	585.59	4.61	585.71	4.68	590.37	4.21	590.86	3.92	583.48	4.27	583.46
Mar. 03, 2016	2.96	586.77	4.85	585.44	4.68	585.64	4.21	590.84	3.86	591.21	3.92	583.48	4.19	583.54
Aug. 31, 2016	2.96	586.77	4.69	585.60	4.50	585.82	4.35	590.70	4.02	591.05	3.81	583.59	4.18	583.55
Jan. 20, 2017	2.61	587.12	4.18	586.11	4.00	586.32	3.34	591.71	3.12	591.95				
Apr. 21, 2017	2.81	586.92	4.82	585.47	4.65	585.67	4.20	590.85	3.81	591.26	3.88	583.52	4.13	583.60
Jul. 24, 2017	2.91	586.82	4.38	585.91	4.23	586.09	4.24	590.81	3.95	591.12				
Oct. 13, 2017	2.91	586.82	5.22	585.07	4.94	585.38	4.51	590.54	4.08	590.99	7.85	579.55	8.07	579.66
Feb. 28, 2018	2.69	587.04	4.76	585.53	4.58	585.74	3.83	591.22	4.15	590.92	3.80	583.60	4.06	583.67
May. 07, 2018	4.07	585.66	4.96	585.33	4.76	585.56	4.78	590.27	4.26	590.81	4.57	582.83	4.80	582.93
Jun. 03, 2019	3.08	586.65	4.98	585.31	4.77	585.55	4.57	590.48	4.10	590.97	4.01	583.39	4.33	583.40
Sep. 12, 2019	4.61	585.12	4.99	585.30	4.78	585.54	4.75	590.30	4.29	590.78	4.49	582.91	4.71	583.02
end														

Notes:

ft msl = Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)

TOC = Top of PVC Casing

ft = feet

[A] = as measured inside well

NI = Not Installed

--- No Elevation

Groundwater Elevations – ComEd Parcel

(Hanson Material Services – Romeoville Quarry)

Date	CEP-10S	CEP-11S	CEP-11D	CEP-12S
5/11/11 12:00	584.76	584.40	584.95	587.76
5/20/11 12:00	584.78	584.30	584.25	587.68
5/23/11 12:00	584.67	584.14	584.33	587.35
5/23/11 16:00	584.64	584.07	584.13	587.31
5/23/11 20:00	584.65	584.04	584.10	587.31
5/24/11 0:00	584.67	584.06	584.10	587.33
5/24/11 4:00	584.68	584.07	584.10	587.35
5/24/11 8:00	584.69	584.07	584.10	587.35
5/24/11 12:00	584.65	584.04	584.09	587.30
5/24/11 16:00	584.62	583.99	584.04	587.26
5/24/11 20:00	584.63	583.99	584.04	587.27
5/25/11 0:00	584.65	584.01	584.05	587.30
5/25/11 4:00	584.67	584.03	584.07	587.31
5/25/11 8:00	584.80	584.19	584.11	587.43
5/25/11 12:00	584.96	584.82	584.64	586.48
5/25/11 16:00	584.94	584.76	584.64	587.76
5/25/11 20:00	585.20	584.74	584.63	587.76
5/26/11 0:00	585.37	585.18	584.91	587.97
5/26/11 4:00	585.56	585.48	585.14	588.19
5/26/11 8:00	585.79	585.70	585.35	588.38
5/26/11 12:00	585.85	585.00	585.39	588.39
5/26/11 16:00	585.89	585.07	585.27	588.20
5/26/11 20:00	586.00	585.09	585.58	588.51
5/27/11 0:00	586.21	585.02	585.00	588.83
5/27/11 4:00	586.29	584.92	584.90	588.96
5/27/11 8:00	586.04	584.87	584.82	588.26
5/27/11 12:00	584.75	584.80	584.75	587.82
5/27/11 16:00	585.21	584.73	584.69	587.79
5/27/11 20:00	585.12	584.71	584.65	587.77
5/28/11 0:00	585.07	584.69	584.63	587.76
5/28/11 4:00	585.02	584.68	584.62	587.75
5/28/11 8:00	584.98	584.66	584.59	587.74
5/28/11 12:00	584.96	584.65	584.59	587.72
5/28/11 16:00	585.11	584.90	584.75	587.85
5/28/11 20:00	585.16	584.81	584.92	588.02
5/29/11 0:00	585.30	584.77	585.09	588.21
5/29/11 4:00	585.23	584.74	584.91	588.04
5/29/11 8:00	585.01	584.72	584.60	587.72
5/29/11 12:00	585.18	584.72	584.63	587.93
5/29/11 16:00	584.98	584.52	584.34	587.78
5/29/11 20:00	585.10	584.83	584.73	587.76
5/30/11 0:00	585.41	584.84	584.76	588.02
5/30/11 4:00	585.66	584.88	584.82	588.22
5/30/11 8:00	585.39	584.88	584.82	587.36
5/30/11 12:00	585.26	584.81	584.76	586.51
5/30/11 16:00	585.21	584.74	584.72	587.41
5/30/11 20:00	585.16	584.72	584.67	587.78
5/31/11 0:00	585.11	584.70	584.64	587.77
5/31/11 4:00	585.06	584.68	584.63	587.76
5/31/11 8:00	585.02	584.66	584.60	587.75
5/31/11 12:00	584.96	584.65	584.61	587.74
5/31/11 16:00	584.93	584.58	584.55	587.71
5/31/11 20:00	584.90	584.55	584.52	587.69
6/1/11 0:00	584.89	584.54	584.50	587.68
6/1/11 4:00	584.88	584.53	584.50	587.68
6/1/11 8:00	584.87	584.50	584.47	587.67
6/1/11 12:00	584.84	584.46	584.45	587.65
6/1/11 16:00	584.81	584.40	584.42	587.62
6/1/11 20:00	584.82	584.39	584.40	587.61
6/2/11 0:00	584.82	584.40	584.39	587.61
6/2/11 4:00	584.83	584.38	584.38	587.59
6/2/11 8:00	584.82	584.37	584.37	587.59
6/2/11 12:00	584.79	584.33	584.34	587.57
6/2/11 16:00	584.78	584.31	584.34	587.55
6/2/11 20:00	584.79	584.30	584.32	587.54
6/3/11 0:00	584.81	584.35	584.35	587.55
6/3/11 4:00	584.81	584.35	584.35	587.55
6/3/11 8:00	584.81	584.34	584.34	587.55
6/3/11 12:00	584.77	584.28	584.29	587.52
6/3/11 16:00	584.74	584.24	584.29	587.48
6/3/11 20:00	584.75	584.22	584.27	587.47
6/4/11 0:00	584.77	584.23	584.25	587.48
6/4/11 4:00	584.77	584.24	584.26	587.48
6/4/11 8:00	584.77	584.24	584.26	587.48
6/4/11 12:00	584.72	584.17	584.21	587.43
6/4/11 16:00	585.31	585.12	584.90	587.91
6/4/11 20:00	585.51	584.71	584.58	587.67
6/5/11 0:00	585.85	584.65	584.55	587.66
6/5/11 4:00	586.02	584.62	584.54	587.66
6/5/11 8:00	584.89	584.59	584.53	587.65
6/5/11 12:00	584.88	584.56	584.51	587.65
6/5/11 16:00	584.84	584.50	584.48	587.62
6/5/11 20:00	584.83	584.46	584.46	587.60
6/6/11 0:00	584.84	584.45	584.46	587.61
6/6/11 4:00	584.84	584.45	584.45	587.61
6/6/11 8:00	584.84	584.45	584.45	587.60
6/6/11 12:00	584.81	584.42	584.43	587.59
6/6/11 16:00	584.77	584.35	584.39	587.54
6/6/11 20:00	584.78	584.32	584.37	587.53
6/7/11 0:00	584.80	584.33	584.36	587.54
6/7/11 4:00	584.80	584.34	584.36	587.54
6/7/11 8:00	584.80	584.34	584.36	587.54
6/7/11 12:00	584.74	584.28	584.33	587.49
6/7/11 16:00	584.70	584.19	584.26	587.43
6/7/11 20:00	584.71	584.17	584.24	587.43
6/8/11 0:00	584.74	584.19	584.24	587.45
6/8/11 4:00	584.75	584.21	584.25	587.46
6/8/11 8:00	584.75	584.20	584.25	587.45
6/8/11 12:00	584.68	584.13	584.21	587.38
6/8/11 16:00	584.64	584.06	584.15	587.31
6/8/11 20:00	584.65	584.04	584.12	587.31
6/9/11 0:00	584.78	584.23	584.22	587.37
6/9/11 4:00	585.23	585.32	584.92	588.03
6/9/11 8:00	585.84	586.07	585.49	588.54
6/9/11 12:00	586.40	586.34	585.81	588.47
6/9/11 16:00	587.21	586.88	586.60	588.87
6/9/11 20:00	587.09	586.69	586.72	588.84
6/10/11 0:00	586.85	586.49	586.64	588.77
6/10/11 4:00	586.61	586.30	586.49	588.74
6/10/11 8:00	586.46	586.14	586.30	588.61
6/10/11 12:00	586.27	585.90	586.00	588.13
6/10/11 16:00	585.95	585.56	585.57	587.23
6/10/11 20:00	586.00	585.60	585.56	588.24
6/11/11 0:00	585.97	585.61	585.62	588.41
6/11/11 4:00	585.88	585.59	585.61	588.37
6/11/11 8:00	585.86	585.57	585.57	588.22
6/11/11 12:00	585.78	585.41	585.38	588.08
6/11/11 16:00	585.64	585.27	585.16	587.95
6/11/11 20:00	585.32	585.64	584.92	588.42
6/12/11 0:00	585.27	585.84	584.84	588.70
6/12/11 4:00	585.21	585.88	584.77	588.73
6/12/11 8:00	585.17	585.51	584.70	588.33
6/12/11 12:00	585.12	584.64	584.66	587.77
6/12/11 16:00	585.07	584.49	584.64	587.75
6/12/11 20:00	585.03	585.39	584.62	587.73
6/13/11 0:00	585.00	585.52	584.60	587.72
6/13/11 4:00	584.97	585.56	584.58	587.71
6/13/11 8:00	584.94	584.88	584.55	587.70
6/13/11 12:00	584.90	584.28	584.55	587.68
6/13/11 16:00	584.85	583.78	584.51	587.65
6/13/11 20:00	584.85	584.90	584.48	587.64
6/14/11 0:00	584.85	585.25	584.46	587.64
6/14/11 4:00	584.84	585.40	584.46	587.64
6/14/11 8:00	584.83	584.79	584.43	587.63
6/14/11 12:00	584.80	583.73	584.43	587.60
6/14/11 16:00	584.77	583.45	584.40	587.57
6/14/11 20:00	584.78	584.38	584.38	587.57
6/15/11 0:00	584.80	584.45	584.38	587.57
6/15/11 4:00	584.79	584.66	584.37	587.54
6/15/11 8:00	584.81	585.02	584.44	587.57
6/15/11 12:00	584.92	584.56	584.63	587.71
6/15/11 16:00	584.93	584.31	584.00	587.62
6/15/11 20:00	584.99	584.64	584.65	587.74
6/16/11 0:00	585.08	584.98	584.64	587.74
6/16/11 4:00	585.12	585.07	584.69	587.72
6/16/11 8:00	585.14	585.02	584.50	587.57
6/16/11 12:00	585.09	583.97	584.68	586.03
6/16/11 16:00	585.06	583.50	584.64	587.72
6/16/11 20:00	585.04	584.46	584.61	587.71
6/17/11 0:00	585.02	584.92	584.60	587.70
6/17/11 4:00	584.98	585.03	584.58	587.70
6/17/11 8:00	584.94	584.02	584.56	587.67
6/17/11 12:00	584.89	583.16	584.53	587.66
6/17/11 16:00	584.84	582.84	584.48	587.63
6/17/11 20:00	584.84	584.23	584.46	587.62
6/18/11 0:00	584.84	584.55	584.44	587.62
6/18/11 4:00	584.84	584.74	584.44	587.62
6/18/11 8:00	584.84	584.15	584.43	587.61
6/18/11 12:00	584.80	583.27	584.44	587.59
6/18/11 16:00	584.77	584.40	584.37	587.55
6/18/11 20:00	584.79	585.17	584.36	587.55
6/19/11 0:00	584.80	585.44	584.36	587.56
6/19/11 4:00	584.81	585.46	584.36	587.56
6/19/11 8:00	584.81	584.91	584.36	587.56
6/19/11 12:00	584.77	583.88	584.32	587.53
6/19/11 16:00	584.75	584.04	584.29	587.49
6/19/11 20:00	584.76	584.81	584.29	587.50
6/20/11 0:00	584.78	585.28	584.29	587.50
6/20/11 4:00	584.79	585.33	584.29	587.51
6/20/11 8:00	585.08	585.84	584.71	587.85
6/20/11 12:00	584.91	585.64	584.49	587.64
6/20/11 16:00	585.25	584.73	584.70	586.73
6/20/11 20:00	585.35	585.13	584.83	587.52
6/21/11 0:00	585.40	585.34	584.95	587.63
6/21/11 4:00	585.37	585.34	585.02	587.67
6/21/11 8:00	585.25	584.74	584.84	587.02
6/21/11 12:00	585.18	584.79	584.74	586.36
6/21/11 16:00	585.11	584.60	584.66	587.76
6/21/11 20:00	585.06	584.93	584.62	587.74
6/22/11 0:00	585.52	585.63	585.38	587.96
6/22/11 4:00	585.57	585.64	585.40	588.04
6/22/11 8:00	585.56	585.29	584.72	587.66
6/22/11 12:00	585.08	585.11	584.70	587.82
6/22/11 16:00	585.04	584.82	584.66	587.75
6/22/11 20:00	585.00	585.16	584.63	588.09
6/23/11 0:00	584.98	585.23	584.62	588.18
6/23/11 4:00	584.96	585.24	584.60	588.19
6/23/11 8:00	584.94	585.17	584.50	588.06
6/23/11 12:00	584.91	584.68	584.56	587.40
6/23/11 16:00	584.91	585.01	584.42	587.93
6/23/11 20:00	584.90	585.12	584.54	588.14
6/24/11 0:00	584.89	585.25	584.53	588.30
6/24/11 4:00	584.89	585.29	584.52	588.34
6/24/11 8:00	584.88	585.33	584.50	588.33
6/24/11 12:00	584.87	584.79	584.49	588.04
6/24/11 16:00	584.86	584.67	584.45	587.97
6/24/11 20:00	584.86	584.83	584.45	588.19
6/25/11 0:00	584.86	585.01	584.45	588.39
6/25/11 4:00	584.86	585.14	584.44	588.51
6/25/11 8:00	584.86	584.30	584.41	587.64
6/25/11 12:00	584.82	584.30	584.41	587.68
6/25/11 16:00	584.80	584.58	584.38	587.65
6/25/11 20:00	584.82	584.79	584.36	587.65
6/26/11 0:00	584.82	585.00	584.36	587.65
6/26/11 4:00	584.83	585.18	584.36	587.65
6/26/11 8:00	584.82	584.33	584.35	587.65
6/26/11 12:00	584.77	584.26	584.33	587.62
6/26/11 16:00	584.74	584.29	584.29	587.57
6/26/11 20:00	584.76	584.47	584.26	587.57
6/27/11 0:00	584.78	584.70	584.26	587.58
6/27/11 4:00	584.79	584.53	584.27	587.57
6/27/11 8:00	584.83	584.50	584.23	587.60
6/27/11 12:00	584.80	584.35	584.34	587.58
6/27/11 16:00	584.76	584.23	584.31	587.55
6/27/11 20:00	584.76	584.38	584.26	587.54
6/28/11 0:00	584.77	584.61	584.24	587.56
6/28/11 4:00	584.78	585.04	584.24	587.57
6/28/11 8:00	584.77	584.38	584.23	587.58
6/28/11 12:00	584.72	584.17	584.18	587.53
6/28/11 16:00	584.68	584.08	584.16	587.47
6/28/11 20:00	584.69	584.18	584.12	587.48
6/29/11 0:00	584.72	584.53	584.12	587.49
6/29/11 4:00	584.73	584.77	584.12	587.50
6/29/11 8:00	584.74	583.83	584.11	587.50
6/29/11 12:00	584.67	584.06	584.10	587.43
6/29/11 16:00	584.62	583.97	584.06	587.36
6/29/11 20:00	584.64	583.98	584.04	587.36
6/30/11 0:00	584.67	584.12	584.04	587.39
6/30/11 4:00	584.69	584.33	584.06	587.40
6/30/11 8:00	584.70	583.33	584.06	587.41
6/30/11 12:00	584.63	583.98	584.01	587.33
6/30/11 16:00	584.57	583.89	584.00	587.25
6/30/11 20:00	584.58	583.91	583.98	587.25
7/1/11 0:00	584.61	583.90	583.97	587.28
7/1/11 4:00	584.63	583.94	583.99	587.30
7/1/11 8:00	584.63	583.92	583.99	587.28
7/1/11 12:00	584.62	583.93	583.98	587.28
7/1/11 16:00	584.59	583.91	583.97	587.24
7/1/11 20:00	584.57	583.91	583.97	587.21
7/2/11 0:00	584.60	584.02	583.97	587.24
7/2/11 4:00	584.62	584.04	583.98	587.26
7/2/11 8:00	584.64	583.20	583.99	587.27
7/2/11 12:00	584.55	583.92	583.92	587.19
7/2/11 16:00	584.49	583.89	583.91	587.12
7/2/11 20:00	584.47	583.82	583.88	587.10
7/3/11 0:00	584.51	583.96	583.87	587.15
7/3/11 4:00	584.54	584.12	583.88	587.17
7/3/11 8:00	584.56	583.20	583.88	587.18
7/3/11 12:00	584.47	583.76	583.83	587.09
7/3/11 16:00	584.41	583.69	583.78	587.01
7/3/11 20:00	584.40	583.71	583.77	587.00
7/4/11 0:00	584.43	583.76	583.77	587.03
7/4/11 4:00	584.46	583.89	583.77	587.06
7/4/11 8:00	584.48	582.94	583.77	587.07
7/4/11 12:00	584.38	583.65	583.71	586.97
7/4/11 16:00	584.31	583.61	583.65	586.88
7/4/11 20:00	584.28	583.57	583.62	586.85
7/5/11 0:00	584.30	583.55	583.60	586.89
7/5/11 4:00	584.33	583.71	583.61	586.91
7/5/11 8:00	584.35	583.70	583.58	586.93
7/5/11 12:00	584.35	583.70	583.58	587.08
7/5/11 12:00	584.27	583.75	583.55	586.83
7/5/11 16:00	584.21	583.68	583.47	586.74
7/5/11 20:00	584.18	583.67	583.44	586.71
7/6/11 0:00	584.20	583.64	583.42	586.75
7/6/11 4:00	584.22	583.64	583.41	586.77
7/6/11 8:00	584.24	583.60	583.40	586.79
7/6/11 12:00	584.18	583.72	583.41	586.70
7/6/11 16:00	584.13	583.60	583.34	586.65
7/6/11 20:00	584.11	583.50	583.28	586.63
7/7/11 0:00	584.12	583.47	583.26	586.65
7/7/11 4:00	584.22	583.56	583.43	586.78
7/7/11 8:00	584.25	583.48	582.49	586.80
7/7/11 12:00	584.28	583.64	583.40	586.77
7/7/11 16:00	584.21	582.68	583.35	586.67
7/7/11 20:00	584.17	582.63	583.30	586.61
7/8/11 0:00	584.17	582.59	583.27	586.61
7/8/11 4:00	584.18	582.58	583.25	586.62
7/8/11 8:00	584.19	582.50	583.22	586.62
7/8/11 12:00	584.12	582.49	583.21	586.55
7/8/11 16:00	584.04	582.47	583.14	586.47
7/8/11 20:00	584.01	582.43	583.10	586.41
7/9/11 0:00	584.01	582.38	583.06	586.41
7/9/11 4:00	584.02	582.36	583.04	586.41
7/9/11 8:00	584.02	582.28	583.01	586.41
7/9/11 12:00	583.97	582.36	582.99	586.36
7/9/11 16:00	583.91	582.51	582.97	586.27
7/9/11 20:00	583.88	582.50	582.92	586.21
7/10/11 0:00	583.88	582.46	582.89	586.20
7/10/11 4:00	583.88	582.45	582.88	586.18
7/10/11 8:00	583.89	582.44	582.86	586.18
7/10/11 12:00	583.84	582.39	582.84	586.14
7/10/11 16:00	583.79	582.48	582.84	586.09
7/10/11 20:00	583.78	582.42	582.80	586.04
7/11/11 0:00	583.77	582.40	582.79	586.01
7/11/11 4:00	583.78	582.41	582.79	586.00
7/11/11 8:00	583.77	582.46	582.78	585.98
7/11/11 12:00	583.93	582.60	582.92	586.13
7/11/11 16:00	583.96	582.65	582.98	586.13
7/11/11 20:00	583.90	582.64	582.96	586.08
7/12/11 0:00	583.89	582.61	582.93	586.06
7/12/11 4:00	583.89	582.60	582.92	586.04
7/12/11 8:00	583.88	582.54	582.88	586.03
7/12/11 12:00	583.82	582.51	582.84	586.00
7/12/11 16:00	583.74	582.51	582.84	585.94
7/12/11 20:00	583.71	582.47	582.84	585.91
7/13/11 0:00	583.69	582.43	583.20	585.89
7/13/11 4:00	583.69	582.40	582.74	585.87
7/13/11 8:00	583.67	582.38	582.70	585.86
7/13/11 12:00	583.63	582.27	582.62	585.82
7/13/11 16:00	583.59	582.34	582.66	585.78
7/13/11 20:00	583.56	582.32	582.65	585.74
7/14/11 0:00	583.55	582.29	582.61	585.72
7/14/11 4:00	583.55	582.29	582.61	585.69
7/14/11 8:00	583.54	582.26	582.59	585.68
7/14/11 12:00	583.50	582.24	582.57	585.65
7/14/11 16:00	583.46	582.24	582.55	585.61
7/14/11 20:00	583.43	582.22	582.55	585.57
7/15/11 0:00	583.42	582.19	582.51	585.55
7/15/11 4:00	583.41	582.18	582.51	585.52
7/15/11 8:00	583.40	582.15	582.48	585.51
7/15/11 12:00	583.37	582.15	582.46	585.48
7/15/11 16:00	583.33	582.15	582.46	585.44
7/15/11 20:00	583.30	582.11	582.44	585.41
7/16/11 0:00	583.29	582.09	582.41	585.39
7/16/11 4:00	583.28	582.08	582.40	585.37
7/16/11 8:00	583.28	582.06	582.38	585.36
7/16/11 12:00	583.26	582.04	582.36	585.35
7/16/11 16:00	583.23	582.05	582.36	585.31
7/16/11 20:00	583.20	582.02	582.34	585.29
7/17/11 0:00	583.19	582.00	582.32	585.27
7/17/11 4:00	583.18	581.99	582.31	585.26
7/17/11 8:00	583.17	581.95	582.28	585.25
7/17/11 12:00	583.14	581.96	582.25	585.22
7/17/11 16:00	583.11	582.00	582.26	585.18
7/17/11 20:00	583.09	581.98	582.25	585.15
7/18/11 0:00	583.08	581.96	582.23	585.14
7/18/11 4:00	583.07	581.95	582.22	585.12
7/18/11 8:00	583.06	581.95	581.97	585.11
7/18/11 12:00	583.04	581.94	582.13	585.10
7/18/11 16:00	583.02	581.94	582.21	585.08
7/18/11 20:00	583.00	581.93	582.20	585.05
7/19/11 0:00	582.98	581.92	582.19	585.04
7/19/11 4:00	582.97	581.91	582.17	585.03
7/19/11 8:00	582.95	581.88	582.15	585.02
7/19/11 12:00	582.92	581.84	582.14	585.00
7/19/11 16:00	582.91	581.89	582.13	584.98
7/19/11 20:00	582.88	581.87	582.13	584.97
7/20/11 0:00	582.87	581.85	582.11	584.96
7/20/11 4:00	582.85	581.85	582.10	584.95
7/20/11 8:00	582.84	581.84	582.10	584.95
7/20/11 12:00	582.82	581.82	582.06	584.93
7/20/11 16:00	582.80	581.83	582.06	584.91
7/20/11 20:00	582.77	581.81	582.05	584.89
7/21/11 0:00	582.76	581.80	582.02	584.88
7/21/11 4:00	582.74	581.79	582.01	584.88
7/21/11 8:00	582.73	581.76	581.99	584.86
7/21/11 12:00	582.70	581.76	581.97	584.85
7/21/11 16:00	582.68	581.80	581.95	584.82
7/21/11 20:00	582.65	581.81	581.94	584.81
7/22/11 0:00	582.64	581.79	581.92	584.80
7/22/11 4:00	582.62	581.78	581.90	584.80
7/22/11 8:00	582.60	581.76	581.89	584.79
7/22/11 12:00	582.52	581.84	581.49	584.45
7/22/11 16:00	582.71	581.90	582.01	584.88
7/22/11 20:00	582.73	581.91	582.02	584.89
7/23/11 0:00	582.74	581.91	582.02	584.90
7/23/11 4:00	583.61	583.45	582.87	585.31
7/23/11 8:00	583.85	583.48	583.29	585.77
7/23/11 12:00	583.72	583.35	583.38	585.97
7/23/11 16:00	583.93	583.31	583.35	586.10
7/23/11 20:00	583.95	583.25	583.29	586.22
7/24/11 0:00	583.98	583.20	583.25	586.30
7/24/11 4:00	584.41	584.18	584.06	586.78
7/24/11 8:00	584.62	584.45	584.20	587.03
7/24/11 12:00	584.86	584.61	584.17	587.29
7/24/11 16:00	585.03	584.71	584.56	586.89
7/24/11 20:00	585.49	585.25	585.17	587.65
7/25/11 0:00	585.69	585.68	585.89	587.96
7/25/11 4:00	585.62	585.65	585.90	588.00
7/25/11 8:00	585.56	585.52	585.72	587.38
7/25/11 12:00	585.11	584.77	584.76	585.46
7/25/11 16:00	584.84	585.01	584.31	587.64
7/25/11 20:00	585.10	584.89	584.90	587.69
7/26/11 0:00	585.37	584.78	584.79	587.65
7/26/11 4:00	585.30	584.69	584.70	587.65
7/26/11 8:00	585.06	584.60	584.58	587.58
7/26/11 12:00	585.02	584.55	584.55	587.59
7/26/11 16:00	584.93	584.46	584.48	587.56
7/26/11 20:00	584.88	584.40	584.43	587.55
7/27/11 0:00	584.84	584.37	584.39	587.54
7/27/11 4:00	584.82	584.34	584.37	587.54
7/27/11 8:00	584.80	584.31	584.33	587.53
7/27/11 12:00	584.78	584.28	584.30	587.52
7/27/11 16:00	584.74	584.21	584.28	587.48
7/27/11 20:00	584.74	584.20	584.25	587.47
7/28/11 0:00	584.75	584.18	584.22	587.46
7/28/11 4:00	584.83	584.53	584.59	587.67
7/28/11 8:00	584.86	584.65	584.67	587.77
7/28/11 12:00	584.83	584.42	584.19	587.35
7/28/11 16:00	584.82	584.38	584.36	587.55
7/28/11 20:00	584.83	584.33	584.32	587.53
7/29/11 0:00	584.82	584.34	584.40	587.54
7/29/11 4:00	584.83	584.33	584.62	587.55
7/29/11 8:00	584.79	584.29	584.47	587.54
7/29/11 12:00	584.80	584.27	584.26	587.53
7/29/11 16:00	584.76	584.20	584.23	587.50
7/29/11 20:00	584.76	584.17	584.20	587.49
7/30/11 0:00	584.77	584.16	584.18	587.49
7/30/11 4:00	584.77	584.16	584.31	587.50
7/30/11 8:00	584.77	584.14	583.21	587.50
7/30/11 12:00	584.72	584.10	584.13	587.45
7/30/11 16:00	584.69	584.04	584.10	587.40
7/30/11 20:00	584.70	584.00	584.07	587.40
7/31/11 0:00	584.72	584.01	584.05	587.41
7/31/11 4:00	584.73	584.01	584.18	587.42
7/31/11 8:00	584.73	584.00	583.00	587.42
7/31/11 12:00	584.68	583.98	584.02	587.37
7/31/11 16:00	584.64	583.91	583.98	587.32
7/31/11 20:00	584.65	583.88	583.96	587.31
8/1/11 0:00	584.68	583.89	583.95	587.33
8/1/11 4:00	584.69	583.90	584.10	587.33
8/1/11 8:00	584.70	583.90	583.24	587.33
8/1/11 12:00	584.66	583.88	583.93	587.30
8/1/11 16:00	584.62	583.82	583.89	587.25

Groundwater Elevations – ComEd Parcel

(Hanson Material Services – Romeoville Quarry)

8/1/11 20:00	584.64	583.83	583.90	587.25
8/2/11 0:00	584.66	583.84	583.89	587.26
8/2/11 4:00	584.67	583.85	583.92	587.28
8/2/11 8:00	584.68	583.85	582.99	587.28
8/2/11 12:00	584.64	583.83	583.88	587.23
8/2/11 16:00	584.58	583.78	583.85	587.17
8/2/11 20:00	584.57	583.73	583.81	587.14
8/3/11 0:00	584.79	584.19	584.27	587.64
8/3/11 4:00	584.73	584.22	584.33	587.63
8/3/11 8:00	584.72	584.04	584.09	587.44
8/3/11 12:00	584.70	584.00	584.04	587.31
8/3/11 16:00	584.65	583.88	583.93	587.23
8/3/11 20:00	584.64	583.86	583.91	587.21
8/4/11 0:00	584.65	583.85	583.90	587.22
8/4/11 4:00	584.65	583.84	584.08	587.22
8/4/11 8:00	584.66	583.83	583.01	587.24
8/4/11 12:00	584.61	583.80	583.85	587.18
8/4/11 16:00	584.57	583.77	583.82	587.13
8/4/11 20:00	584.57	583.73	583.79	587.12
8/5/11 0:00	584.59	583.72	583.78	587.13
8/5/11 4:00	584.60	583.72	583.89	587.15
8/5/11 8:00	584.61	583.71	582.74	587.15
8/5/11 12:00	584.57	583.66	583.72	587.10
8/5/11 16:00	584.52	583.67	583.74	587.05
8/5/11 20:00	584.52	583.61	583.67	587.03
8/6/11 0:00	584.54	583.60	583.66	587.06
8/6/11 4:00	584.77	584.14	584.09	587.40
8/6/11 8:00	584.65	583.88	583.81	587.12
8/6/11 12:00	584.00	584.16	584.13	587.37
8/6/11 16:00	583.83	584.05	584.05	587.31
8/6/11 20:00	584.32	584.00	584.02	587.29
8/7/11 0:00	584.67	583.98	583.99	587.30
8/7/11 4:00	584.76	583.97	584.00	587.31
8/7/11 8:00	584.64	583.96	583.61	587.31
8/7/11 12:00	584.69	584.02	584.01	587.33
8/7/11 16:00	584.63	583.91	583.94	587.24
8/7/11 20:00	584.61	583.86	583.89	587.23
8/8/11 0:00	584.63	583.84	583.88	587.24
8/8/11 4:00	584.65	583.84	583.87	587.25
8/8/11 8:00	584.65	583.81	582.94	587.26
8/8/11 12:00	584.61	583.79	583.83	587.21
8/8/11 16:00	584.58	583.75	583.81	587.17
8/8/11 20:00	584.91	584.61	584.70	587.84
8/9/11 0:00	584.92	584.56	584.76	587.90
8/9/11 4:00	585.09	584.75	585.00	588.24
8/9/11 8:00	585.08	584.35	584.32	587.78
8/9/11 12:00	584.25	584.32	584.25	587.53
8/9/11 16:00	584.73	584.21	584.20	587.48
8/9/11 20:00	584.73	584.16	584.15	587.48
8/10/11 0:00	584.73	584.14	584.13	587.48
8/10/11 4:00	584.74	584.13	584.12	587.49
8/10/11 8:00	584.73	584.09	584.07	587.47
8/10/11 12:00	584.69	584.06	584.07	587.44
8/10/11 16:00	584.66	583.98	584.02	587.40
8/10/11 20:00	584.66	583.95	583.99	587.40
8/11/11 0:00	584.68	583.95	583.97	587.41
8/11/11 4:00	584.68	583.94	584.02	587.41
8/11/11 8:00	584.69	583.92	582.87	587.41
8/11/11 12:00	584.64	583.90	583.93	587.36
8/11/11 16:00	584.59	583.83	583.89	587.30
8/11/11 20:00	584.59	583.80	583.86	587.31
8/12/11 0:00	584.61	583.81	583.84	587.32
8/12/11 4:00	584.63	583.81	583.94	587.33
8/12/11 8:00	584.63	583.80	583.00	587.33
8/12/11 12:00	584.59	583.78	583.83	587.28
8/12/11 16:00	584.53	583.69	583.77	587.21
8/12/11 20:00	584.53	583.70	583.76	587.21
8/13/11 0:00	584.56	583.71	583.75	587.23
8/13/11 4:00	584.58	583.72	583.76	587.25
8/13/11 8:00	584.59	583.69	583.74	587.24
8/13/11 12:00	584.54	583.73	583.79	587.20
8/13/11 16:00	584.54	583.71	583.81	587.22
8/13/11 20:00	584.72	584.15	584.59	587.44
8/14/11 0:00	584.69	584.22	584.64	587.39
8/14/11 4:00	584.68	584.39	584.83	587.49
8/14/11 8:00	584.67	584.27	584.66	587.30
8/14/11 12:00	584.67	583.91	583.92	587.34
8/14/11 16:00	584.64	583.85	583.87	587.31
8/14/11 20:00	584.63	583.84	583.87	587.30
8/15/11 0:00	584.64	583.82	583.83	587.31
8/15/11 4:00	584.64	583.82	583.86	587.31
8/15/11 8:00	584.64	583.79	582.70	587.31
8/15/11 12:00	584.60	583.77	583.79	587.26
8/15/11 16:00	584.54	583.72	583.76	587.19
8/15/11 20:00	584.53	583.67	583.72	587.18
8/16/11 0:00	584.54	583.66	583.69	587.20
8/16/11 4:00	584.56	583.64	583.66	587.20
8/16/11 8:00	584.57	583.63	582.59	587.22
8/16/11 12:00	584.51	583.60	583.64	587.15
8/16/11 16:00	584.45	583.55	583.60	587.08
8/16/11 20:00	584.44	583.51	583.56	587.07
8/17/11 0:00	584.45	583.50	583.54	587.09
8/17/11 4:00	584.47	583.49	583.64	587.10
8/17/11 8:00	584.48	583.47	582.78	587.11
8/17/11 12:00	584.43	583.46	583.51	587.05
8/17/11 16:00	584.37	583.41	583.46	586.99
8/17/11 20:00	584.36	583.38	583.43	586.99
8/18/11 0:00	584.38	583.36	583.41	587.01
8/18/11 4:00	584.40	583.36	583.40	587.03
8/18/11 8:00	584.42	583.33	582.29	587.04
8/18/11 12:00	584.37	583.31	583.36	586.97
8/18/11 16:00	584.30	583.29	583.33	586.91
8/18/11 20:00	584.29	583.24	583.29	586.90
8/19/11 0:00	584.31	583.22	583.26	586.92
8/19/11 4:00	584.33	583.20	583.21	586.95
8/19/11 8:00	584.34	583.18	582.86	586.95
8/19/11 12:00	584.29	583.20	583.24	586.88
8/19/11 16:00	584.23	583.10	583.16	586.82
8/19/11 20:00	584.21	583.07	583.13	586.80
8/20/11 0:00	584.23	583.05	583.10	586.82
8/20/11 4:00	584.24	583.03	583.12	586.84
8/20/11 8:00	584.26	583.02	582.75	586.86
8/20/11 12:00	584.60	583.41	583.12	587.06
8/20/11 16:00	584.75	584.10	584.01	587.45
8/20/11 20:00	584.72	584.01	583.98	587.38
8/21/11 0:00	584.69	583.97	584.10	587.37
8/21/11 4:00	584.66	583.94	584.14	587.36
8/21/11 8:00	584.64	583.91	583.56	587.36
8/21/11 12:00	584.62	583.87	583.87	587.31
8/21/11 16:00	584.57	583.78	583.80	587.24
8/21/11 20:00	584.56	583.72	583.74	587.23
8/22/11 0:00	584.56	583.70	583.72	587.24
8/22/11 4:00	584.57	583.67	583.69	587.24
8/22/11 8:00	584.57	583.64	582.77	587.25
8/22/11 12:00	584.53	583.61	583.63	587.20
8/22/11 16:00	584.49	583.59	583.62	587.16
8/22/11 20:00	584.47	583.54	583.57	587.15
8/23/11 0:00	584.48	583.52	583.55	587.16
8/23/11 4:00	584.50	583.51	583.61	587.18
8/23/11 8:00	584.51	583.50	583.03	587.20
8/23/11 12:00	584.94	584.47	583.79	587.63
8/23/11 16:00	584.64	583.69	583.01	586.90
8/23/11 20:00	584.67	584.63	584.45	587.37
8/24/11 0:00	584.61	584.61	584.47	587.31
8/24/11 4:00	584.65	584.58	584.46	587.45
8/24/11 8:00	584.54	584.53	584.42	587.10
8/24/11 12:00	583.72	584.49	584.41	587.65
8/24/11 16:00	584.74	584.38	584.34	587.65
8/24/11 20:00	584.75	584.32	584.30	587.66
8/25/11 0:00	584.76	584.29	584.25	588.06
8/25/11 4:00	584.76	584.26	584.23	588.01
8/25/11 8:00	584.76	584.24	584.20	587.79
8/25/11 12:00	584.73	584.19	584.17	587.58
8/25/11 16:00	584.70	584.13	584.14	587.53
8/25/11 20:00	584.71	584.10	584.12	587.53
8/26/11 0:00	584.72	584.10	584.11	587.53
8/26/11 4:00	584.73	584.10	584.18	587.53
8/26/11 8:00	584.73	584.08	583.22	587.53
8/26/11 12:00	584.69	584.07	584.08	587.49
8/26/11 16:00	584.67	584.03	584.07	587.46
8/26/11 20:00	584.69	584.03	584.06	587.47
8/27/11 0:00	584.70	584.03	584.06	587.47
8/27/11 4:00	584.70	584.04	584.13	587.47
8/27/11 8:00	584.70	584.03	583.19	587.47
8/27/11 12:00	584.67	584.03	584.08	587.43
8/27/11 16:00	584.64	583.96	584.02	587.39
8/27/11 20:00	584.64	583.94	583.99	587.38
8/28/11 0:00	584.66	583.94	583.98	587.38
8/28/11 4:00	584.66	583.95	584.02	587.39
8/28/11 8:00	584.67	583.95	583.09	587.38
8/28/11 12:00	584.63	583.91	583.94	587.34
8/28/11 16:00	584.59	583.87	583.93	587.28
8/28/11 20:00	584.60	583.86	583.91	587.29
8/29/11 0:00	584.62	583.86	583.90	587.30
8/29/11 4:00	584.62	583.86	583.94	587.30
8/29/11 8:00	584.63	583.84	582.97	587.30
8/29/11 12:00	584.59	583.82	583.87	587.25
8/29/11 16:00	584.53	583.78	583.84	587.19
8/29/11 20:00	584.54	583.76	583.82	587.18
8/30/11 0:00	584.56	583.76	583.80	587.20
8/30/11 4:00	584.57	583.76	583.98	587.20
8/30/11 8:00	584.58	583.74	583.10	587.21
8/30/11 12:00	584.55	583.74	583.79	587.16
8/30/11 16:00	584.51	583.71	583.75	587.12
8/30/11 20:00	584.51	583.70	583.75	587.12
8/31/11 0:00	584.54	583.73	583.88	587.15
8/31/11 4:00	584.65	584.00	584.12	587.32
8/31/11 8:00	584.64	583.88	583.56	587.28
8/31/11 12:00	584.59	583.84	583.86	587.22
8/31/11 16:00	584.54	583.79	583.83	587.14
8/31/11 20:00	584.52	583.75	583.80	587.13
9/1/11 0:00	584.54	583.74	583.77	587.14
9/1/11 4:00	584.55	583.75	583.77	587.16
9/1/11 8:00	584.56	583.73	582.90	587.17
9/1/11 12:00	584.51	583.70	583.74	587.10
9/1/11 16:00	584.44	583.65	583.69	587.04
9/1/11 20:00	584.43	583.62	583.67	587.03
9/2/11 0:00	584.44	583.62	583.65	587.06
9/2/11 4:00	584.45	583.61	583.64	587.06
9/2/11 8:00	584.46	583.60	583.63	587.07
9/2/11 12:00	584.41	583.57	583.62	587.01
9/2/11 16:00	584.34	583.52	583.56	586.94
9/2/11 20:00	584.33	583.48	583.53	586.94
9/3/11 0:00	584.35	583.47	583.51	586.97
9/3/11 4:00	584.37	583.46	583.54	586.99
9/3/11 8:00	584.39	583.44	582.94	586.99
9/3/11 12:00	584.34	583.41	583.47	586.93
9/3/11 16:00	584.61	584.23	584.85	587.28
9/3/11 20:00	584.61	583.84	585.07	587.24
9/4/11 0:00	584.60	583.82	585.13	587.22
9/4/11 4:00	584.59	583.81	585.24	587.22
9/4/11 8:00	584.59	583.78	585.29	587.20
9/4/11 12:00	584.55	583.75	583.78	587.18
9/4/11 16:00	584.50	583.69	583.72	587.12
9/4/11 20:00	584.46	583.63	583.66	587.09
9/5/11 0:00	584.46	583.61	583.63	587.10
9/5/11 4:00	584.46	583.59	583.61	587.11
9/5/11 8:00	584.46	583.55	583.58	587.10
9/5/11 12:00	584.43	583.59	583.65	587.06
9/5/11 16:00	584.38	583.47	583.51	587.02
9/5/11 20:00	584.36	583.45	583.48	587.01
9/6/11 0:00	584.36	583.43	583.46	587.02
9/6/11 4:00	584.37	583.40	583.44	587.03
9/6/11 8:00	584.37	583.37	583.40	587.03
9/6/11 12:00	584.34	583.36	583.39	586.99
9/6/11 16:00	584.29	583.33	583.37	586.93
9/6/11 20:00	584.27	583.28	583.32	586.92
9/7/11 0:00	584.27	583.27	583.30	586.94
9/7/11 4:00	584.29	583.25	583.28	586.95
9/7/11 8:00	584.29	583.20	582.28	586.95
9/7/11 12:00	584.25	583.20	583.24	586.90
9/7/11 16:00	584.19	583.17	583.21	586.84
9/7/11 20:00	584.17	583.13	583.16	586.82
9/8/11 0:00	584.18	583.10	583.13	586.85
9/8/11 4:00	584.19	583.09	583.12	586.86
9/8/11 8:00	584.21	583.06	583.10	586.87
9/8/11 12:00	584.19	583.07	583.10	586.84
9/8/11 16:00	584.14	583.02	583.06	586.78
9/8/11 20:00	584.13	583.00	583.04	586.78
9/9/11 0:00	584.15	582.99	582.97	586.81
9/9/11 4:00	584.21	583.01	582.97	586.90
9/9/11 8:00	584.24	583.05	582.92	586.91
9/9/11 12:00	584.26	583.05	583.05	586.90
9/9/11 16:00	584.25	583.07	583.11	586.90
9/9/11 20:00	584.24	583.05	583.28	586.88
9/10/11 0:00	584.25	583.04	583.51	586.89
9/10/11 4:00	584.26	583.04	583.85	586.89
9/10/11 8:00	584.26	583.00	583.37	586.89
9/10/11 12:00	584.24	583.01	583.05	586.88
9/10/11 16:00	584.19	582.98	583.03	586.81
9/10/11 20:00	584.18	582.95	583.00	586.80
9/11/11 0:00	584.18	582.94	582.97	586.82
9/11/11 4:00	584.19	582.93	583.03	586.83
9/11/11 8:00	584.19	582.90	582.24	586.83
9/11/11 12:00	584.16	582.90	582.94	586.79
9/11/11 16:00	584.09	582.87	582.90	586.73
9/11/11 20:00	584.07	582.85	582.90	586.70
9/12/11 0:00	584.07	582.83	582.86	586.72
9/12/11 4:00	584.08	582.81	583.01	586.74
9/12/11 8:00	584.09	582.79	582.13	586.75
9/12/11 12:00	584.06	582.79	582.81	586.71
9/12/11 16:00	584.01	582.78	582.82	586.64
9/12/11 20:00	583.98	582.75	582.80	586.62
9/13/11 0:00	583.98	582.73	582.77	586.63
9/13/11 4:00	583.99	582.72	582.77	586.64
9/13/11 8:00	583.99	582.69	582.75	586.64
9/13/11 12:00	583.96	582.67	582.72	586.60
9/13/11 16:00	583.91	582.66	582.72	586.54
9/13/11 20:00	583.89	582.63	582.68	586.52
9/14/11 0:00	583.89	582.61	582.65	586.53
9/14/11 4:00	583.90	582.58	582.49	586.54
9/14/11 8:00	583.91	582.57	582.37	586.55
9/14/11 12:00	583.92	582.56	582.62	586.54
9/14/11 16:00	583.94	582.56	582.66	586.58
9/14/11 20:00	583.94	582.57	582.62	586.56
9/15/11 0:00	583.93	582.54	582.59	586.55
9/15/11 4:00	583.93	582.54	582.58	586.53
9/15/11 8:00	583.92	582.48	582.56	586.52
9/15/11 12:00	583.89	582.49	582.54	586.49
9/15/11 16:00	583.85	582.49	582.55	586.45
9/15/11 20:00	583.83	582.49	582.54	586.43
9/16/11 0:00	583.83	582.47	582.51	586.43
9/16/11 4:00	583.84	582.46	582.51	586.43
9/16/11 8:00	583.84	582.44	582.50	586.42
9/16/11 12:00	583.83	582.44	582.50	586.42
9/16/11 16:00	583.82	582.44	582.49	586.39
9/16/11 20:00	583.81	582.44	582.49	586.38
9/17/11 0:00	583.81	582.42	582.47	586.37
9/17/11 4:00	583.82	582.43	582.47	586.38
9/17/11 8:00	583.82	582.38	582.45	586.37
9/17/11 12:00	583.79	582.39	582.43	586.35
9/17/11 16:00	583.76	582.41	582.46	586.31
9/17/11 20:00	583.74	582.40	582.44	586.28
9/18/11 0:00	583.74	582.37	582.43	586.26
9/18/11 4:00	583.74	582.38	582.42	586.26
9/18/11 8:00	583.74	582.36	582.35	586.25
9/18/11 12:00	583.80	582.38	581.97	586.32
9/18/11 16:00	583.89	582.34	581.98	586.44
9/18/11 20:00	584.02	582.26	581.90	586.57
9/19/11 0:00	584.17	582.28	581.92	586.76
9/19/11 4:00	584.46	582.72	582.29	587.10
9/19/11 8:00	584.60	583.15	582.78	587.19
9/19/11 12:00	584.57	583.51	582.42	587.14
9/19/11 16:00	584.54	583.48	583.49	587.11
9/19/11 20:00	584.51	583.46	583.47	587.10
9/20/11 0:00	584.49	583.43	583.44	587.11
9/20/11 4:00	584.48	583.41	583.51	587.12
9/20/11 8:00	584.47	583.38	583.05	587.13
9/20/11 12:00	584.46	583.37	583.37	587.13
9/20/11 16:00	584.41	583.36	583.37	587.07
9/20/11 20:00	584.39	583.31	583.32	587.06
9/21/11 0:00	584.39	583.29	583.29	587.09
9/21/11 4:00	584.39	583.27	583.16	587.10
9/21/11 8:00	584.39	583.23	582.90	587.11
9/21/11 12:00	584.36	583.23	583.24	587.07
9/21/11 16:00	584.30	583.18	583.19	587.00
9/21/11 20:00	584.27	583.13	583.15	586.99
9/22/11 0:00	584.26	583.10	583.11	587.01
9/22/11 4:00	584.27	583.09	583.16	587.03
9/22/11 8:00	584.27	583.04	582.75	587.03
9/22/11 12:00	584.25	583.01	583.02	587.01
9/22/11 16:00	584.22	583.00	583.02	586.98
9/22/11 20:00	584.21	582.98	583.00	586.97
9/23/11 0:00	584.21	582.96	582.98	586.99
9/23/11 4:00	584.22	582.94	582.98	587.00
9/23/11 8:00	584.22	582.92	582.29	587.01
9/23/11 12:00	584.22	582.91	582.93	587.01
9/23/11 16:00	584.18	582.90	582.92	586.96
9/23/11 20:00	584.17	582.87	582.90	586.95
9/24/11 0:00	584.18	582.86	582.88	586.97
9/24/11 4:00	584.19	582.85	582.88	586.99
9/24/11 8:00	584.21	582.83	582.24	587.00
9/24/11 12:00	584.19	582.83	582.85	586.99
9/24/11 16:00	584.16	582.81	582.84	586.95
9/24/11 20:00	584.16	582.80	582.83	586.95
9/25/11 0:00	584.16	582.79	582.81	586.96
9/25/11 4:00	584.17	582.79	582.82	586.98
9/25/11 8:00	584.18	582.77	582.64	586.98
9/25/11 12:00	584.19	582.73	582.04	587.00
9/25/11 16:00	584.17	582.77	582.81	586.98
9/25/11 20:00	584.17	582.76	583.22	586.97
9/26/11 0:00	584.20	582.75	583.06	587.00
9/26/11 4:00	584.57	582.81	583.03	587.39
9/26/11 8:00	584.86	584.31	584.26	587.63
9/26/11 12:00	584.80	584.10	584.06	587.45
9/26/11 16:00	584.74	584.42	584.22	587.38
9/26/11 20:00	584.73	584.44	584.21	587.79
9/27/11 0:00	584.82	584.66	584.33	587.80
9/27/11 4:00	584.88	584.63	584.35	587.75
9/27/11 8:00	584.94	584.52	584.18	587.69
9/27/11 12:00	584.89	584.67	584.49	587.04
9/27/11 16:00	584.89	584.62	584.47	587.44
9/27/11 20:00	584.89	584.56	584.43	587.81
9/28/11 0:00	584.88	584.53	584.48	587.90
9/28/11 4:00	584.86	584.52	584.48	587.85
9/28/11 8:00	584.84	584.49	584.52	587.90
9/28/11 12:00	584.83	584.46	584.37	587.28
9/28/11 16:00	584.83	584.51	584.73	587.60
9/28/11 20:00	584.82	584.49	584.89	587.77
9/29/11 0:00	584.81	584.49	585.20	588.07
9/29/11 4:00	584.81	584.47	585.33	588.18
9/29/11 8:00	584.80	584.31	585.09	587.98
9/29/11 12:00	584.80	584.40	584.34	587.10
9/29/11 16:00	584.83	584.50	583.98	587.32
9/29/11 20:00	584.81	584.44	584.38	587.68
9/30/11 0:00	584.80	584.41	584.34	587.80
9/30/11 4:00	584.80	584.39	584.31	588.03
9/30/11 8:00	584.79	584.36	584.31	588.08
9/30/11 12:00	584.78	584.34	584.28	586.91
9/30/11 16:00	584.77	584.32	584.27	587.44
9/30/11 20:00	584.77	584.30	584.26	588.28
10/1/11 0:00	584.77	584.30	584.25	588.51
10/1/11 4:00	584.77	584.28	584.24	588.66
10/1/11 8:00	584.77	584.26	584.23	588.59
10/1/11 12:00	584.76	584.27	584.27	586.93
10/1/11 16:00	584.75	584.24	584.21	587.55
10/1/11 20:00	584.75	584.24	584.21	587.54
10/2/11 0:00	584.76	584.23	584.20	587.54
10/2/11 4:00	584.76	584.22	584.35	587.53
10/2/11 8:00	584.76	584.19	583.74	587.53
10/2/11 12:00	584.74	584.21	584.19	587.52
10/2/11 16:00	584.73	584.20	584.18	587.50
10/2/11 20:00	584.74	584.20	584.18	587.49
10/3/11 0:00	584.74	584.19	584.23	587.49
10/3/11 4:00	584.75	584.19	584.31	587.49
10/3/11 8:00	584.74	584.16	583.84	587.48
10/3/11 12:00	584.73	584.18	584.16	587.47
10/3/11 16:00	584.72	584.16	584.16	587.44
10/3/11 20:00	584.73	584.15	584.14	587.44
10/4/11 0:00	584.73	584.15	584.16	587.44
10/4/11 4:00	584.73	584.15	584.35	587.44
10/4/11 8:00	584.73	584.12	583.88	587.43
10/4/11 12:00	584.75	584.25	584.13	587.59
10/4/11 12:00	584.73	584.26	584.13	587.42
10/4/11 16:00	584.71	584.24	584.12	587.40
10/4/11 20:00	584.72	584.24	584.12	587.40
10/5/11 0:00	584.73	584.24	584.21	587.40
10/5/11 4:00	584.73	584.24	584.37	587.40
10/5/11 8:00	584.73	584.22	583.87	587.39
10/5/11 12:00	584.71	584.23	584.10	587.38
10/5/11 16:00	584.70	584.22	584.12	587.36
10/5/11 20:00	584.71	584.22	584.10	587.36
10/6/11 0:00	584.71	584.22	584.10	587.36
10/6/11 4:00	584.71	584.22	584.28	587.36
10/6/11 8:00	584.72	584.19	583.79	587.36
10/6/11 12:00	584.70	584.21	584.08	587.34
10/6/11 16:00	584.68	584.19	584.08	587.32
10/6/11 20:00	584.70	584.19	584.07	587.32
10/7/11 0:00	584.70	584.20	584.07	587.32
10/7/11 4:00	584.70	584.09	584.17	587.32
10/7/11 8:00	584.70	584.06	583.62	587.32
10/7/11 12:00	584.68	584.08	584.07	587.31
10/7/11 16:00	584.67	584.06	584.07	587.28
10/7/11 20:00	584.68	584.06	584.05	587.28
10/8/11 0:00	584.69	584.06	584.05	587.29
10/8/11 4:00	584.69	584.06	584.06	587.29
10/8/11 8:00	584.69	584.04	584.02	587.29
10/8/11 12:00	584.67	584.06	584.04	587.27
10/8/11 16:00	584.65	584.04	584.04	587.25
10/8/11 20:00	584.67	584.03	584.02	587.25
10/9/11 0:00	584.67	584.03	584.02	587.26
10/9/11 4:00	584.67	584.03	584.13	587.26
10/9/11 8:00	584.67	583.99	583.68	587.26
10/9/11 12:00	584.66	584.02	584.01	587.25
10/9/11 16:00	584.64	584.01	584.02	587.22
10/9/11 20:00	584.66	584.01	584.00	587.23
10/10/11 0:00	584.66	584.01	584.00	587.24
10/10/11 4:00	584.67	584.01	584.01	587.25
10/10/11 8:00	584.67	584.01	583.85	587.25
10/10/11 12:00	584.65	584.02	584.01	587.24
10/10/11 16:00	584.63	583.99	584.00	587.21
10/10/11 20:00	584.65	583.98	583.98	587.21
10/11/11 0:00	584.65	583.99	583.97	587.23
10/11/11 4:00	584.66	583.99	584.10	587.24
10/11/11 8:00	584.66	583.97	583.77	587.23
10/11/11 12:00	584.64	583.99	583.98	587.22

Groundwater Elevations – ComEd Parcel

(Hanson Material Services – Romeoville Quarry)

10/11/11 16:00	584.63	583.97	583.98	587.20
10/11/11 20:00	584.64	583.96	583.96	587.21
10/12/11 0:00	584.65	583.97	583.95	587.22
10/12/11 4:00	584.65	583.97	583.96	587.22
10/12/11 8:00	584.66	583.94	583.95	587.22
10/12/11 12:00	584.64	583.96	583.95	587.21
10/12/11 16:00	584.62	583.95	583.96	587.19
10/12/11 20:00	584.63	583.93	583.94	587.19
10/13/11 0:00	584.64	583.94	583.93	587.20
10/13/11 4:00	584.81	584.36	584.19	587.51
10/13/11 8:00	584.80	584.39	584.26	587.53
10/13/11 16:00	584.74	584.52	584.26	587.80
10/13/11 20:00	584.70	584.48	584.87	587.82
10/14/11 0:00	584.70	584.86	584.66	587.81
10/14/11 4:00	584.67	585.17	584.63	587.80
10/14/11 8:00	584.66	584.63	584.63	587.78
10/14/11 12:00	584.65	584.60	584.62	587.77
10/14/11 16:00	584.65	584.58	584.63	587.76
10/14/11 20:00	584.65	584.58	584.59	587.75
10/15/11 0:00	584.64	584.54	584.57	587.75
10/15/11 4:00	584.64	584.52	584.56	587.74
10/15/11 8:00	584.64	584.50	584.54	587.73
10/15/11 12:00	584.64	584.46	584.53	587.72
10/15/11 16:00	584.64	584.45	584.51	587.71
10/15/11 20:00	584.63	584.43	584.50	587.71
10/16/11 0:00	584.64	584.41	584.49	587.70
10/16/11 4:00	584.64	584.41	584.49	587.71
10/16/11 8:00	584.64	584.41	584.44	587.72
10/16/11 12:00	584.65	584.44	583.99	587.72
10/16/11 16:00	584.65	584.45	584.51	587.70
10/16/11 20:00	584.64	584.42	584.48	587.69
10/17/11 0:00	584.64	584.40	584.47	587.69
10/17/11 4:00	584.64	584.39	584.47	587.69
10/17/11 8:00	584.64	584.39	584.47	587.68
10/17/11 12:00	584.64	584.35	584.45	587.67
10/17/11 16:00	584.64	584.35	584.46	587.66
10/17/11 20:00	584.63	584.35	584.45	587.66
10/18/11 0:00	584.63	584.35	584.45	587.66
10/18/11 4:00	584.64	584.36	584.45	587.66
10/18/11 8:00	584.64	584.35	584.44	587.65
10/18/11 12:00	584.64	584.33	584.45	587.65
10/18/11 16:00	584.63	584.35	584.45	587.64
10/18/11 20:00	584.63	584.35	584.52	587.64
10/19/11 0:00	584.63	584.34	584.44	587.64
10/19/11 4:00	584.64	584.34	584.44	587.64
10/19/11 8:00	584.64	584.35	584.50	587.66
10/19/11 12:00	584.64	584.40	584.32	587.67
10/19/11 16:00	584.65	584.32	584.34	587.72
10/19/11 20:00	584.69	584.36	584.52	587.76
10/20/11 0:00	584.72	584.59	584.58	587.81
10/20/11 4:00	584.74	584.65	584.64	587.80
10/20/11 8:00	584.71	584.69	584.72	587.80
10/20/11 12:00	584.71	584.75	584.52	587.78
10/20/11 16:00	584.70	584.57	584.65	587.80
10/20/11 20:00	584.69	584.60	584.63	587.76
10/21/11 0:00	584.68	584.57	584.62	587.76
10/21/11 4:00	584.68	584.56	584.61	587.75
10/21/11 8:00	584.67	584.55	584.58	587.74
10/21/11 12:00	584.67	584.48	584.59	587.74
10/21/11 16:00	584.68	584.52	584.58	587.73
10/21/11 20:00	584.68	584.50	584.56	587.72
10/22/11 0:00	584.67	584.50	584.56	587.72
10/22/11 4:00	584.68	584.48	584.56	587.71
10/22/11 8:00	584.68	584.48	584.36	587.71
10/22/11 12:00	584.67	584.44	584.55	587.70
10/22/11 16:00	584.68	584.46	584.54	587.69
10/22/11 20:00	584.68	584.45	584.53	587.69
10/23/11 0:00	584.68	584.45	584.53	587.69
10/23/11 4:00	584.68	584.45	584.53	587.68
10/23/11 8:00	584.68	584.43	584.31	587.67
10/23/11 12:00	584.68	584.40	584.51	587.67
10/23/11 16:00	584.68	584.43	584.53	587.66
10/23/11 20:00	584.68	584.42	584.50	587.66
10/24/11 0:00	584.68	584.41	584.61	587.65
10/24/11 4:00	584.71	584.55	585.11	587.76
10/24/11 8:00	584.74	584.95	585.37	587.73
10/24/11 12:00	584.72	585.15	584.61	587.72
10/24/11 16:00	584.71	584.55	584.60	587.71
10/24/11 20:00	584.70	584.52	584.58	587.70
10/25/11 0:00	584.70	584.52	584.57	587.70
10/25/11 4:00	584.70	584.49	584.48	587.70
10/25/11 8:00	584.70	584.48	584.57	587.70
10/25/11 12:00	584.70	584.48	584.57	587.69
10/25/11 16:00	584.69	584.48	584.58	587.69
10/25/11 20:00	584.69	584.48	584.57	587.68
10/26/11 0:00	584.69	584.47	584.98	587.80
10/26/11 4:00	584.78	584.82	585.29	587.81
10/26/11 8:00	584.76	585.05	585.43	587.80
10/26/11 12:00	584.74	585.18	585.41	587.79
10/26/11 16:00	584.74	584.63	584.67	587.78
10/26/11 20:00	584.73	584.61	584.65	587.77
10/27/11 0:00	584.73	584.59	584.64	587.76
10/27/11 4:00	584.72	584.58	584.64	587.75
10/27/11 8:00	584.72	584.57	584.65	587.75
10/27/11 12:00	584.72	584.58	584.62	587.75
10/27/11 16:00	584.69	584.56	584.62	587.74
10/27/11 20:00	584.71	584.54	584.61	587.73
10/28/11 0:00	584.71	584.54	584.59	587.72
10/28/11 4:00	584.70	584.52	584.59	587.72
10/28/11 8:00	584.70	584.51	584.58	587.71
10/28/11 12:00	584.70	584.48	584.56	587.71
10/28/11 16:00	584.71	584.48	584.57	587.70
10/28/11 20:00	584.70	584.47	584.57	587.70
10/29/11 0:00	584.70	584.48	584.56	587.70
10/29/11 4:00	584.70	584.48	584.56	587.69
10/29/11 8:00	584.70	584.48	584.55	587.68
10/29/11 12:00	584.70	584.44	584.55	587.68
10/29/11 16:00	584.70	584.46	584.54	587.66
10/29/11 20:00	584.69	584.45	584.53	587.66
10/30/11 0:00	584.69	584.44	584.52	587.65
10/30/11 4:00	584.69	584.44	584.52	587.65
10/30/11 8:00	584.69	584.43	584.21	587.65
10/30/11 12:00	584.69	584.43	584.55	587.64
10/30/11 16:00	584.69	584.46	584.63	587.66
10/30/11 20:00	584.70	584.51	584.77	587.68
10/31/11 0:00	584.71	584.52	584.95	587.75
10/31/11 4:00	584.76	584.64	585.09	587.71
10/31/11 8:00	584.73	584.57	585.45	587.69
10/31/11 12:00	584.71	584.55	584.60	587.68
10/31/11 16:00	584.71	584.52	584.58	587.67
10/31/11 20:00	584.71	584.50	584.57	587.67
11/1/11 0:00	584.70	584.51	584.55	587.66
11/1/11 4:00	584.70	584.48	584.54	587.66
11/1/11 8:00	584.70	584.47	584.50	587.65
11/1/11 12:00	584.70	584.45	584.54	587.65
11/1/11 16:00	584.70	584.46	584.55	587.64
11/1/11 20:00	584.70	584.46	584.53	587.64
11/2/11 0:00	584.70	584.45	584.52	587.63
11/2/11 4:00	584.70	584.44	584.52	587.63
11/2/11 8:00	584.70	584.44	584.51	587.63
11/2/11 12:00	584.69	584.43	584.53	587.62
11/2/11 16:00	584.69	584.44	584.52	587.62
11/2/11 20:00	584.73	584.43	584.52	587.61
11/3/11 0:00	584.73	584.43	584.51	587.61
11/3/11 4:00	584.73	584.42	584.51	587.61
11/3/11 8:00	584.73	584.43	584.55	587.62
11/3/11 12:00	584.75	584.54	584.67	587.69
11/3/11 16:00	584.79	584.70	584.80	587.79
11/3/11 20:00	584.78	584.78	584.93	587.97
11/4/11 0:00	584.77	584.93	584.61	588.14
11/4/11 4:00	584.76	584.56	584.60	588.61
11/4/11 8:00	584.75	584.54	584.57	587.67

11/4/11 12:00	584.74	584.50	584.58	587.67
11/4/11 16:00	584.75	584.50	584.58	587.66
11/4/11 20:00	584.74	584.50	584.56	587.66
11/5/11 0:00	584.74	584.48	584.57	587.65
11/5/11 4:00	584.74	584.48	584.43	587.65
11/5/11 8:00	584.74	584.48	584.52	587.64
11/5/11 12:00	584.74	584.46	584.54	587.64
11/5/11 16:00	584.74	584.45	584.55	587.63
11/5/11 20:00	584.74	584.46	584.55	587.63
11/6/11 0:00	584.74	584.46	584.55	587.63
11/6/11 3:00	584.74	584.47	584.53	587.62
11/6/11 7:00	584.74	584.45	584.53	587.62
11/6/11 11:00	584.73	584.44	584.54	587.61
11/6/11 15:00	584.73	584.46	584.53	587.61
11/6/11 19:00	584.73	584.44	584.52	587.60
11/6/11 23:00	584.73	584.44	584.52	587.59
11/7/11 3:00	584.73	584.44	584.52	587.59
11/7/11 7:00	584.73	584.43	584.51	587.59
11/7/11 11:00	584.73	584.42	584.51	587.59
11/7/11 15:00	584.73	584.42	584.52	587.59
11/7/11 19:00	584.73	584.43	584.57	587.59
11/7/11 23:00	584.73	584.44	584.68	587.72
11/8/11 3:00	584.81	584.66	584.82	587.80
11/8/11 7:00	584.88	584.80	584.87	587.83
11/8/11 11:00	584.81	584.79	584.58	587.60
11/8/11 15:00	584.66	584.59	584.73	587.73
11/8/11 19:00	584.70	584.65	584.98	587.97
11/8/11 23:00	585.00	584.88	584.96	587.93
11/9/11 3:00	585.08	584.89	584.86	587.80
11/9/11 7:00	584.95	584.75	584.27	587.30
11/9/11 11:00	584.52	584.25	584.53	587.48
11/9/11 15:00	584.71	585.02	585.25	588.06
11/9/11 19:00	585.17	585.03	585.57	588.05
11/9/11 23:00	585.49	585.03	585.07	588.04
11/10/11 3:00	585.64	585.00	585.05	588.02
11/10/11 7:00	585.71	584.97	585.00	588.00
11/10/11 11:00	585.69	584.91	584.96	587.98
11/10/11 15:00	585.13	584.88	584.84	587.97
11/10/11 19:00	585.08	584.87	585.09	587.95
11/10/11 23:00	585.03	584.83	585.26	587.94
11/11/11 3:00	584.98	584.81	584.85	587.93
11/11/11 7:00	584.94	584.78	584.82	587.91
11/11/11 11:00	584.91	584.73	584.80	587.90
11/11/11 15:00	584.90	584.73	584.80	587.89
11/11/11 19:00	584.88	584.72	584.78	587.88
11/11/11 23:00	584.87	584.71	584.76	587.87
11/12/11 3:00	584.86	584.70	584.75	587.86
11/12/11 7:00	584.84	584.68	584.74	587.84
11/12/11 11:00	584.84	584.65	584.71	587.83
11/12/11 15:00	584.83	584.64	584.73	587.83
11/12/11 19:00	584.83	584.65	584.72	587.82
11/12/11 23:00	584.82	584.64	584.70	587.81
11/13/11 3:00	584.82	584.63	584.71	587.80
11/13/11 7:00	584.82	584.63	584.70	587.79
11/13/11 11:00	584.81	584.62	584.70	587.79
11/13/11 15:00	584.81	584.63	584.68	587.77
11/13/11 19:00	584.81	584.61	584.66	587.75
11/13/11 23:00	584.80	584.59	584.65	587.75
11/14/11 3:00	584.79	584.58	584.65	587.75
11/14/11 7:00	584.79	584.57	584.65	587.74
11/14/11 11:00	584.79	584.55	584.64	587.74
11/14/11 15:00	584.80	584.57	584.65	587.73
11/14/11 19:00	584.79	584.57	584.64	587.72
11/14/11 23:00	584.79	584.56	584.62	587.71
11/15/11 3:00	584.78	584.55	584.62	587.70
11/15/11 7:00	584.78	584.55	584.62	587.70
11/15/11 11:00	584.78	584.54	584.62	587.70
11/15/11 15:00	584.78	584.54	584.62	587.68
11/15/11 19:00	584.78	584.53	584.60	587.67
11/15/11 23:00	584.78	584.52	584.59	587.66
11/16/11 3:00	584.77	584.52	584.58	587.66
11/16/11 7:00	584.77	584.51	584.58	587.65
11/16/11 11:00	584.77	584.50	584.58	587.64
11/16/11 15:00	584.77	584.48	584.57	587.63
11/16/11 19:00	584.77	584.48	584.57	587.63
11/16/11 23:00	584.76	584.49	584.56	587.62
11/17/11 3:00	584.76	584.47	584.55	587.61
11/17/11 7:00	584.76	584.46	584.55	587.60
11/17/11 11:00	584.76	584.45	584.55	587.60
11/17/11 15:00	584.76	584.47	584.55	587.59
11/17/11 19:00	584.76	584.46	584.54	587.59
11/17/11 23:00	584.75	584.46	584.54	587.58
11/18/11 3:00	584.75	584.44	584.53	587.57
11/18/11 7:00	584.75	584.43	584.53	587.56
11/18/11 11:00	584.75	584.42	584.56	587.59
11/18/11 15:00	584.76	584.48	584.57	587.58
11/18/11 19:00	584.76	584.48	584.55	587.56
11/18/11 23:00	584.75	584.46	584.54	587.56
11/19/11 3:00	584.75	584.43	584.54	587.56
11/19/11 7:00	584.75	584.45	584.54	587.55
11/19/11 11:00	584.75	584.45	584.55	587.56
11/19/11 15:00	584.75	584.45	584.54	587.55
11/19/11 19:00	584.75	584.45	584.54	587.55
11/19/11 23:00	584.75	584.45	584.53	587.54
11/20/11 3:00	584.75	584.44	584.51	587.53
11/20/11 7:00	584.74	584.42	584.50	587.53
11/20/11 11:00	584.74	584.42	584.50	587.52
11/20/11 15:00	584.74	584.42	584.50	587.52
11/20/11 19:00	584.74	584.42	584.50	587.52
11/20/11 23:00	584.74	584.42	584.50	587.52
11/21/11 3:00	584.74	584.42	584.51	587.52
11/21/11 7:00	584.74	584.43	584.50	587.51
11/21/11 11:00	584.74	584.41	584.50	587.51
11/21/11 15:00	584.74	584.42	584.52	587.51
11/21/11 19:00	584.74	584.42	584.50	587.50
11/21/11 23:00	584.74	584.41	584.50	587.50
11/22/11 3:00	584.74	584.40	584.52	587.52
11/22/11 7:00	584.75	584.43	584.52	587.51
11/22/11 11:00	584.75	584.43	584.54	587.53
11/22/11 15:00	584.75	584.46	584.62	587.64
11/22/11 19:00	584.81	584.50	584.88	587.70
11/22/11 23:00	584.84	584.76	585.03	587.81
11/23/11 3:00	584.82	584.83	585.35	588.19
11/23/11 7:00	584.80	585.10	585.74	587.64
11/23/11 11:00	584.79	584.59	584.63	587.64
11/23/11 15:00	584.79	584.57	584.62	587.64
11/23/11 19:00	584.78	584.56	584.60	587.63
11/23/11 23:00	584.78	584.54	584.58	587.62
11/24/11 3:00	584.78	584.52	584.60	587.62
11/24/11 7:00	584.78	584.52	584.59	587.62
11/24/11 11:00	584.78	584.51	584.58	587.62
11/24/11 15:00	584.78	584.50	584.59	587.62
11/24/11 19:00	584.78	584.51	584.59	587.61
11/24/11 23:00	584.78	584.50	584.56	587.61
11/25/11 3:00	584.78	584.50	584.58	587.61
11/25/11 7:00	584.78	584.50	584.58	587.60
11/25/11 11:00	584.78	584.49	584.57	587.61
11/25/11 15:00	584.78	584.49	584.59	587.60
11/25/11 19:00	584.78	584.50	584.57	587.59
11/25/11 23:00	584.78	584.49	584.55	587.59
11/26/11 3:00	584.78	584.48	584.56	587.59
11/26/11 7:00	584.78	584.48	584.57	587.59
11/26/11 11:00	584.78	584.48	584.58	587.61
11/26/11 15:00	584.79	584.57	584.63	587.89
11/26/11 19:00	584.87	584.67	584.60	587.88
11/26/11 23:00	584.73	584.57	585.23	588.47
11/27/11 3:00	585.10	585.02	585.35	588.58
11/27/11 7:00	585.15	585.12	585.49	588.73
11/27/11 11:00	585.35	585.26	585.66	588.87
11/27/11 15:00	585.56	585.42	585.88	589.04
11/27/11 19:00	585.71	585.62	586.06	589.21
11/27/11 23:00	585.85	585.81	584.92	589.29

11/28/11 3:00	585.90	584.87	584.90	589.28
11/28/11 7:00	585.88	584.84	584.88	589.31
11/28/11 11:00	585.88	584.82	584.87	588.30
11/28/11 15:00	584.98	584.79	584.84	587.94
11/28/11 19:00	584.95	584.77	584.82	587.93
11/28/11 23:00	584.92	584.75	584.80	587.91
11/29/11 3:00	584.91	584.73	584.79	587.91
11/29/11 7:00	584.90	584.71	584.78	587.89
11/29/11 11:00	584.88	584.70	584.76	587.88
11/29/11 15:00	584.87	584.69	584.74	587.86
11/29/11 19:00	584.86	584.67	584.73	587.85
11/29/11 23:00	584.86	584.66	584.72	587.84
11/30/11 3:00	584.85	584.66	584.70	587.83
11/30/11 7:00	584.84	584.63	584.69	587.81
11/30/11 11:00	584.84	584.60	584.69	587.81
11/30/11 15:00	584.84	584.62	584.69	587.80
11/30/11 19:00	584.83	584.62	584.68	587.79
11/30/11 23:00	584.83	584.61	584.66	587.77
12/1/11 3:00	584.82	584.60	584.42	587.77
12/1/11 7:00	584.82	584.59	584.42	587.75
12/1/11 11:00	584.81	584.56	584.01	587.75
12/1/11 15:00	584.82	584.57	584.42	587.74
12/1/11 19:00	584.82	584.57	584.41	587.73
12/1/11 23:00	584.81	584.55	584.41	587.73
12/2/11 3:00	584.81	584.55	584.39	587.72
12/2/11 7:00	584.81	584.55	584.39	587.71
12/2/11 11:00	584.81	584.55	584.40	587.71
12/2/11 15:00	584.81	584.55	584.39	587.70
12/2/11 19:00	584.81	584.55	584.38	587.69
12/2/11 23:00	584.81	584.53	584.39	587.69
12/3/11 3:00	584.81	584.54	584.39	587.69
12/3/11 7:00	584.81	584.53	584.39	587.68
12/3/11 11:00	584.81	584.55	584.12	587.70
12/3/11 15:00	584.82	584.60	583.89	587.73
12/3/11 19:00	584.83	584.64	584.44	587.56
12/3/11 23:00	584.82	584.60	584.38	587.53
12/4/11 3:00	584.86	584.73	584.25	587.40
12/4/11 7:00	584.85	584.71	584.07	587.25
12/4/11 11:00	584.84	584.67	584.47	587.60
12/4/11 15:00	584.83	584.64	584.45	587.86
12/4/11 19:00	584.83	584.61	584.43	588.10
12/4/11 23:00	584.82	584.60	584.42	587.71
12/5/11 3:00	584.82	584.59	584.43	587.70
12/5/11 7:00	584.82	584.58	584.42	587.70
12/5/11 11:00	584.82	584.58	584.41	587.69
12/5/11 15:00	584.81	584.57	584.41	587.69
12/5/11 19:00	584.81	584.56	584.39	587.68
12/5/11 23:00	584.81	584.55	584.39	587.68
12/6/11 3:00	584.81	584.55	584.40	587.68
12/6/11 7:00	584.81	584.54	584.38	587.67
12/6/11 11:00	584.81	584.53	584.38	587.67
12/6/11 15:00	584.81	584.54	584.38	587.66
12/6/11 19:00	584.81	584.53	584.37	587.65
12/6/11 23:00	584.80	584.53	584.37	587.65
12/7/11 3:00	584.80	584.51	584.38	587.65
12/7/11 7:00	584.80	584.51	584.37	587.64
12/7/11 11:00	584.80	584.52	584.38	587.64
12/7/11 15:00	584.80	584.54	584.37	587.63
12/7/11 19:00	584.80	584.51	584.34	587.62
12/7/11 23:00	584.80	584.49	584.33	587.61
12/8/11 3:00	584.79	584.47	584.34	587.60
12/8/11 7:00	584.79	584.48	584.33	587.59
12/8/11 11:00	584.79	584.46	584.33	587.60
12/8/11 15:00	584.79	584.48	584.34	587.60
12/8/11 19:00	584.79	584.49	584.33	587.59
12/8/11 23:00	584.79	584.47	584.32	587.59
12/9/11 3:00	584.79	584.47	584.34	587.59
12/9/11 7:00	584.79	584.50	584.33	587.58
12/9/11 11:00	584.79	584.48	584.30	587.58
12/9/11 15:00	584.79	584.48	584.34	587.58
12/9/11 19:00	584.79	584.49	584.30	587.56
12/9/11 23:00	584.78	584.45	584.28	587.53
12/10/11 3:00	584.77	584.41	584.27	587.51
12/10/11 7:00	584.76	584.39	584.26	587.48
12/10/11 11:00	584.74	584.36	584.25	587.47
12/10/11 15:00	584.74	584.37	584.29	587.50
12/10/11 19:00	584.76	584.45	584.27	587.48
12/10/11 23:00	584.75	584.38	584.26	587.47
12/11/11 3:00	584.75	584.41	584.25	587.46
12/11/11 7:00	584.74	584.37	584.24	587.45
12/11/11 11:00	584.74	584.34	584.25	587.46
12/11/11 15:00	584.75	584.38	584.32	587.53
12/11/11 19:00	584.78	584.50	584.31	587.53
12/11/11 23:00	584.78	584.47	584.29	587.52
12/12/11 3:00	584.78	584.44	584.27	587.50
12/12/11 7:00	584.77	584.41	584.26	587.48
12/12/11 11:00	584.76	584.39	584.25	587.49
12/12/11 15:00	584.76	584.40	584.31	587.54
12/12/11 19:00	584.78	584.47	584.31	587.54
12/12/11 23:00	584.78	584.47	584.30	587.53
12/13/11 3:00	584.78	584.45	584.30	587.54
12/13/11 7:00	584.78	584.46	584.31	587.54
12/13/11 11:00	584.78	584.46	584.30	587.54
12/13/11 15:00	584.78	584.46	584.32	587.56
12/13/11 19:00	584.79	584.47	584.31	587.55
12/13/11 23:00	584.78	584.46	584.34	587.63
12/14/11 3:00	584.83	584.64	584.35	587.76
12/14/11 7:00	584.91	584.78	584.22	587.63
12/14/11 11:00	584.70	584.59	584.08	587.52
12/14/11 15:00	584.53	584.38	583.82	587.30
12/14/11 19:00	584.32	584.12	583.77	587.42
12/14/11 23:00	584.48	584.06	583.70	587.21
12/15/11 3:00	584.53	583.95	583.87	587.06
12/15/11 7:00	584.58	584.07	584.27	587.41
12/15/11 11:00	584.70	584.36	584.47	588.10
12/15/11 15:00	584.79	584.54	584.98	588.07
12/15/11 19:00	584.99	585.12	584.90	588.05
12/15/11 23:00	585.22	585.05	584.83	588.03
12/16/11 3:00	585.43	584.98	584.77	588.01
12/16/11 7:00	585.21	584.93	584.72	587.99
12/16/11 11:00	585.16	584.88	584.70	587.98
12/16/11 15:00	585.10	584.85	584.66	587.97
12/16/11 19:00	585.05	584.82	584.62	587.95
12/16/11 23:00	585.00	584.77	584.60	587.93
12/17/11 3:00	584.96	584.75	584.58	587.92
12/17/11 7:00	584.94	584.74	584.57	587.91
12/17/11 11:00	584.92	584.73	584.56	587.90
12/17/11 15:00	584.90	584.73	584.55	587.89
12/17/11 19:00	584.89	584.73	584.53	587.88
12/17/11 23:00	584.87	584.70	584.52	587.87
12/18/11 3:00	584.86	584.68	584.50	587.86
12/18/11 7:00	584.85	584.67	584.49	587.85
12/18/11 11:00	584.85	584.66	584.48	587.85
12/18/11 15:00	584.84	584.64	584.49	587.84
12/18/11 19:00	584.84	584.65	584.47	587.83
12/18/11 23:00	584.83	584.64	584.47	587.82
12/19/11 3:00	584.83	584.62	584.47	587.81
12/19/11 7:00	584.82	584.63	584.45	587.80
12/19/11 11:00	584.82	584.61	584.44	587.79
12/19/11 15:00	584.82	584.59	584.42	587.78
12/19/11 19:00	584.81	584.59	584.41	587.77
12/19/11 23:00	584.81	584.58	584.41	587.76
12/20/11 3:00	584.81	584.57	584.41	587.76
12/20/11 7:00	584.81	584.57	584.41	587.75
12/20/11 11:00	584.81	584.57	584.41	587.74
12/20/11 15:00	584.81	584.56	584.41	587.74
12/20/11 19:00	584.80	584.57	584.41	587.74
12/20/11 23:00	584.81	584.57	584.41	587.73
12/21/11 3:00	584.81	584.57	584.42	587.73
12/21/11 7:00	584.81	584.57	584.42	587.72
12/21/11 11:00	584.81	584.57	584.41	587.72
12/21/11 15:00	584.81	584.56	584.40	587.70

Groundwater Elevations – ComEd Parcel

(Hanson Material Services – Romeoville Quarry)

12/21/11 19:00	584.81	584.55	584.38	587.69
12/21/11 23:00	584.80	584.54	584.38	587.69
12/22/11 3:00	584.80	584.54	584.38	587.68
12/22/11 7:00	584.80	584.54	584.38	587.68
12/22/11 11:00	584.80	584.52	584.37	587.67
12/22/11 15:00	584.80	584.52	584.37	587.66
12/22/11 19:00	584.80	584.53	584.44	587.69
12/22/11 23:00	584.83	584.62	584.61	587.67
12/23/11 3:00	584.81	584.59	584.41	587.66
12/23/11 7:00	584.80	584.56	584.38	587.64
12/23/11 11:00	584.80	584.53	584.37	587.65
12/23/11 15:00	584.80	584.56	584.39	587.65
12/23/11 19:00	584.80	584.55	584.37	587.64
12/23/11 23:00	584.80	584.53	584.35	587.63
12/24/11 3:00	584.79	584.51	584.35	587.62
12/24/11 7:00	584.79	584.50	584.34	587.60
12/24/11 11:00	584.78	584.47	584.33	587.60
12/24/11 15:00	584.79	584.53	584.38	587.62
12/24/11 19:00	584.80	584.55	584.36	587.61
12/24/11 23:00	584.79	584.51	584.34	587.60
12/25/11 3:00	584.79	584.49	584.35	587.60
12/25/11 7:00	584.79	584.51	584.36	587.59
12/25/11 11:00	584.79	584.49	584.34	587.59
12/25/11 15:00	584.79	584.51	584.34	587.58
12/25/11 19:00	584.79	584.49	584.32	587.57
12/25/11 23:00	584.79	584.47	584.31	587.56
12/26/11 3:00	584.78	584.46	584.30	587.55
12/26/11 7:00	584.77	584.44	584.30	587.53
12/26/11 11:00	584.77	584.42	583.91	587.55
12/26/11 15:00	584.79	584.50	584.36	587.59
12/26/11 19:00	584.80	584.52	584.36	587.58
12/26/11 23:00	584.79	584.50	584.33	587.60
12/27/11 3:00	584.80	584.56	584.29	587.74
12/27/11 7:00	584.88	584.53	584.19	587.73
12/27/11 11:00	584.86	584.30	583.81	587.71
12/27/11 15:00	584.84	583.91	584.45	587.69
12/27/11 19:00	584.83	584.63	584.43	587.67
12/27/11 23:00	584.83	584.60	584.40	587.66
12/28/11 3:00	584.82	584.58	584.39	587.65
12/28/11 7:00	584.81	584.55	584.38	587.63
12/28/11 11:00	584.80	584.53	584.38	587.63
12/28/11 12:00	584.83	584.50	584.35	587.59
12/28/11 15:00	584.82	584.55	584.40	587.65
12/28/11 19:00	584.83	584.59	584.40	587.64
12/28/11 23:00	584.82	584.57	584.39	587.64
12/29/11 3:00	584.82	584.54	584.38	587.63
12/29/11 7:00	584.82	584.54	584.40	587.64
12/29/11 11:00	584.82	584.55	584.40	587.65
12/29/11 15:00	584.83	584.58	584.39	587.63
12/29/11 19:00	584.82	584.55	584.37	587.62
12/29/11 23:00	584.82	584.52	584.36	587.62
12/30/11 3:00	584.82	584.52	584.36	587.61
12/30/11 7:00	584.82	584.53	584.32	587.80
12/30/11 11:00	584.91	584.67	583.99	587.49
12/30/11 15:00	584.59	584.28	583.93	587.43
12/30/11 19:00	584.55	584.16	584.30	587.81
12/30/11 23:00	584.85	584.46	584.60	588.08
12/31/11 3:00	585.09	584.68	584.85	588.32
12/31/11 7:00	585.29	584.89	585.36	588.64
12/31/11 11:00	585.60	584.68	584.32	588.04
12/31/11 15:00	585.38	584.67	584.14	587.88
12/31/11 19:00	585.24	584.67	584.49	587.79
12/31/11 23:00	585.15	584.66	584.49	587.75
1/1/12 3:00	585.07	584.66	584.49	587.76
1/1/12 7:00	584.81	584.66	584.46	587.73
1/1/12 11:00	584.89	584.65	584.36	587.73
1/1/12 15:00	584.78	584.63	584.43	587.71
1/1/12 19:00	584.85	584.61	584.41	587.70
1/1/12 23:00	584.85	584.59	584.41	587.70
1/2/12 3:00	584.85	584.58	584.40	587.69
1/2/12 7:00	584.84	584.56	584.38	587.67
1/2/12 11:00	584.84	584.53	584.37	587.66
1/2/12 15:00	584.83	584.54	584.36	587.64
1/2/12 19:00	584.83	584.54	584.34	587.63
1/2/12 23:00	584.82	584.51	584.33	587.60
1/3/12 3:00	584.81	584.47	584.31	587.57
1/3/12 7:00	584.79	584.43	584.28	587.54
1/3/12 11:00	584.78	584.40	584.27	587.53
1/3/12 15:00	584.78	584.41	584.31	587.55
1/3/12 19:00	584.79	584.49	584.32	587.55
1/3/12 23:00	584.79	584.49	584.31	587.53
1/4/12 3:00	584.78	584.45	584.31	587.52
1/4/12 7:00	584.78	584.43	584.30	587.51
1/4/12 11:00	584.78	584.43	584.30	587.50
1/4/12 15:00	584.78	584.45	584.34	587.56
1/4/12 19:00	584.81	584.53	584.33	587.54
1/4/12 23:00	584.81	584.51	584.32	587.53
1/5/12 3:00	584.80	584.49	584.31	587.50
1/5/12 7:00	584.79	584.45	584.30	587.49
1/5/12 11:00	584.78	584.42	583.82	587.50
1/5/12 15:00	584.79	584.44	584.36	587.57
1/5/12 19:00	584.82	584.56	584.35	587.56
1/5/12 23:00	584.82	584.51	584.35	587.56
1/6/12 3:00	584.82	584.53	584.35	587.56
1/6/12 7:00	584.82	584.51	584.34	587.55
1/6/12 11:00	584.82	584.48	584.34	587.57
1/6/12 15:00	584.82	584.54	584.38	587.60
1/6/12 19:00	584.83	584.57	584.36	587.59
1/6/12 23:00	584.83	584.53	584.35	587.58
1/7/12 3:00	584.83	584.52	584.35	587.58
1/7/12 7:00	584.83	584.50	584.33	587.55
1/7/12 11:00	584.82	584.48	584.32	587.55
1/7/12 15:00	584.82	584.49	584.33	587.56
1/7/12 19:00	584.82	584.50	584.31	587.54
1/7/12 23:00	584.82	584.47	584.30	587.52
1/8/12 3:00	584.81	584.47	584.30	587.51
1/8/12 7:00	584.81	584.44	584.29	587.48
1/8/12 11:00	584.80	584.41	584.29	587.49
1/8/12 15:00	584.81	584.48	584.34	587.55
1/8/12 19:00	584.82	584.52	584.33	587.54
1/8/12 23:00	584.82	584.50	584.31	587.52
1/9/12 3:00	584.82	584.48	584.31	587.49
1/9/12 7:00	584.80	584.45	584.30	587.47
1/9/12 11:00	584.79	584.42	584.33	587.48
1/9/12 15:00	584.81	584.53	584.36	587.55
1/9/12 19:00	584.83	584.54	584.33	587.53
1/9/12 23:00	584.82	584.48	584.32	587.52
1/10/12 3:00	584.82	584.48	584.31	587.50
1/10/12 7:00	584.81	584.45	584.30	587.47
1/10/12 11:00	584.80	584.43	584.31	587.49
1/10/12 15:00	584.81	584.50	584.36	587.53
1/10/12 19:00	584.82	584.52	584.34	587.52
1/10/12 23:00	584.82	584.49	584.33	587.51
1/11/12 3:00	584.82	584.47	584.32	587.49
1/11/12 7:00	584.81	584.46	584.32	587.48
1/11/12 11:00	584.81	584.44	584.31	587.49
1/11/12 15:00	584.81	584.49	584.35	587.53
1/11/12 19:00	584.82	584.51	584.34	587.51
1/11/12 23:00	584.82	584.49	584.33	587.50
1/12/12 3:00	584.81	584.47	584.32	587.48
1/12/12 7:00	584.81	584.46	584.32	587.49
1/12/12 11:00	584.81	584.47	584.33	587.50
1/12/12 15:00	584.82	584.49	584.33	587.49
1/12/12 19:00	584.82	584.49	584.33	587.48
1/12/12 23:00	584.81	584.49	584.32	587.47
1/13/12 3:00	584.81	584.48	584.30	587.46
1/13/12 7:00	584.80	584.47	584.30	587.45
1/13/12 11:00	584.80	584.46	584.29	587.45
1/13/12 15:00	584.81	584.45	584.29	587.45
1/13/12 19:00	584.80	584.46	584.28	587.44
1/13/12 23:00	584.81	584.46	584.29	587.44
1/14/12 3:00	584.81	584.46	584.28	587.44

1/14/12 7:00	584.81	584.46	584.29	587.43
1/14/12 11:00	584.80	584.45	584.28	587.43
1/14/12 15:00	584.80	584.45	584.30	587.44
1/14/12 19:00	584.81	584.49	584.29	587.43
1/14/12 23:00	584.80	584.47	584.28	587.42
1/15/12 3:00	584.80	584.45	584.26	587.41
1/15/12 7:00	584.79	584.43	584.26	587.41
1/15/12 11:00	584.79	584.43	584.26	587.41
1/15/12 15:00	584.79	584.43	584.29	587.44
1/15/12 19:00	584.80	584.47	584.31	587.46
1/15/12 23:00	584.80	584.48	584.30	587.46
1/16/12 3:00	584.80	584.47	584.30	587.47
1/16/12 7:00	584.81	584.46	584.29	587.47
1/16/12 11:00	584.81	584.46	584.29	587.49
1/16/12 15:00	584.82	584.48	584.40	587.66
1/16/12 19:00	584.88	584.67	584.44	587.68
1/16/12 23:00	584.88	584.70	584.49	587.72
1/17/12 3:00	584.89	584.75	584.52	587.75
1/17/12 7:00	584.91	584.77	584.56	587.81
1/17/12 11:00	584.92	584.78	585.00	587.84
1/17/12 15:00	584.93	584.80	584.53	587.82
1/17/12 19:00	584.91	584.76	584.50	587.79
1/17/12 23:00	584.89	584.73	584.49	587.76
1/18/12 3:00	584.88	584.69	584.46	587.74
1/18/12 7:00	584.87	584.64	584.43	587.70
1/18/12 11:00	584.86	584.59	584.40	587.68
1/18/12 15:00	584.85	584.57	584.44	587.69
1/18/12 19:00	584.87	584.65	584.44	587.68
1/18/12 23:00	584.90	584.62	584.42	587.65
1/19/12 3:00	584.89	584.58	584.42	587.64
1/19/12 7:00	584.88	584.57	584.41	587.62
1/19/12 11:00	584.86	584.58	584.37	587.60
1/19/12 15:00	584.85	584.54	584.38	587.58
1/19/12 19:00	584.84	584.55	584.34	587.55
1/19/12 23:00	584.82	584.50	584.31	587.52
1/20/12 3:00	584.81	584.46	584.29	587.49
1/20/12 7:00	584.79	584.42	584.28	587.47
1/20/12 11:00	584.79	584.40	584.27	587.45
1/20/12 15:00	584.78	584.41	584.28	587.45
1/20/12 19:00	584.79	584.42	584.29	587.46
1/20/12 23:00	584.79	584.44	584.29	587.46
1/21/12 3:00	584.79	584.46	584.30	587.46
1/21/12 7:00	584.80	584.46	584.30	587.46
1/21/12 11:00	584.80	584.46	584.29	587.46
1/21/12 15:00	584.80	584.46	584.31	587.47
1/21/12 19:00	584.80	584.47	584.31	587.47
1/21/12 23:00	584.81	584.48	584.32	587.48
1/22/12 3:00	584.81	584.49	584.34	587.50
1/22/12 7:00	584.81	584.50	584.34	587.50
1/22/12 11:00	584.82	584.50	584.33	587.50
1/22/12 15:00	584.81	584.51	584.36	587.51
1/22/12 19:00	584.82	584.51	584.35	587.52
1/22/12 23:00	584.82	584.52	584.45	587.74
1/23/12 3:00	584.97	584.82	584.70	588.04
1/23/12 7:00	585.02	584.96	584.64	588.06
1/23/12 11:00	585.03	585.00	585.12	588.10
1/23/12 15:00	585.52	585.05	585.08	588.36
1/23/12 19:00	585.93	585.31	585.47	588.60
1/23/12 23:00	586.21	585.66	585.60	588.66
1/24/12 3:00	586.27	585.74	585.62	588.74
1/24/12 7:00	586.24	585.69	585.04	588.98
1/24/12 11:00	586.28	585.72	584.54	588.31
1/24/12 15:00	586.06	585.24	584.85	588.60
1/24/12 19:00	586.10	585.41	584.78	589.16
1/24/12 23:00	585.23	585.83	584.71	589.27
1/25/12 3:00	585.18	585.90	584.68	589.26
1/25/12 7:00	585.13	584.84	584.65	589.21
1/25/12 11:00	585.08	584.80	584.62	588.18
1/25/12 15:00	585.05	584.80	584.62	588.20
1/25/12 19:00	585.03	584.80	584.61	588.32
1/25/12 23:00	585.00	584.77	584.57	587.94
1/26/12 3:00	584.98	584.75	584.56	587.93
1/26/12 7:00	584.97	584.73	584.56	587.92
1/26/12 11:00	584.95	584.72	584.55	587.91
1/26/12 15:00	584.95	584.72	584.57	587.92
1/26/12 19:00	584.95	584.74	584.56	587.91
1/26/12 23:00	584.94	584.72	584.54	587.91
1/27/12 3:00	584.93	584.72	584.52	587.90
1/27/12 7:00	584.93	584.70	584.52	587.89
1/27/12 11:00	584.92	584.69	584.49	587.88
1/27/12 15:00	584.92	584.66	584.51	587.90
1/27/12 19:00	584.93	584.70	584.51	587.89
1/27/12 23:00	584.92	584.68	584.51	587.89
1/28/12 3:00	584.92	584.70	584.51	587.89
1/28/12 7:00	584.91	584.69	584.49	587.87
1/28/12 11:00	584.90	584.67	584.48	587.86
1/28/12 15:00	584.90	584.66	584.49	587.86
1/28/12 19:00	584.90	584.70	584.48	587.85
1/28/12 23:00	584.89	584.65	584.47	587.84
1/29/12 3:00	584.89	584.62	584.45	587.82
1/29/12 7:00	584.88	584.60	584.44	587.81
1/29/12 11:00	584.87	584.60	584.42	587.79
1/29/12 15:00	584.87	584.60	584.44	587.80
1/29/12 19:00	584.88	584.64	584.41	587.78
1/29/12 23:00	584.86	584.59	584.40	587.76
1/30/12 3:00	584.85	584.54	584.39	587.75
1/30/12 7:00	584.85	584.54	584.39	587.74
1/30/12 11:00	584.85	584.55	584.40	587.74
1/30/12 15:00	584.86	584.59	584.46	587.80
1/30/12 19:00	584.90	584.67	584.45	587.79
1/30/12 23:00	584.89	584.63	584.45	587.79
1/31/12 3:00	584.89	584.62	584.43	587.79
1/31/12 7:00	584.88	584.60	584.43	587.78
1/31/12 11:00	584.88	584.60	584.44	587.79
1/31/12 15:00	584.88	584.60	584.45	587.79
1/31/12 19:00	584.89	584.62	584.44	587.79
1/31/12 23:00	584.89	584.62	584.44	587.78
2/1/12 3:00	584.89	584.60	584.42	587.76
2/1/12 7:00	584.88	584.59	584.41	587.75
2/1/12 11:00	584.88	584.58	584.40	587.75
2/1/12 15:00	584.88	584.53	584.40	587.74
2/1/12 19:00	584.87	584.59	584.39	587.73
2/1/12 23:00	584.87	584.56	584.39	587.72
2/2/12 3:00	584.87	584.56	584.38	587.71
2/2/12 7:00	584.86	584.54	584.37	587.70
2/2/12 11:00	584.86	584.54	584.36	587.70
2/2/12 15:00	584.86	584.53	584.37	587.69
2/2/12 19:00	584.86	584.54	584.35	587.68
2/2/12 23:00	584.86	584.52	584.35	587.68
2/3/12 3:00	584.85	584.52	584.36	587.68
2/3/12 7:00	584.85	584.52	584.35	587.66
2/3/12 11:00	584.85	584.51	584.34	587.66
2/3/12 15:00	584.85	584.50	584.35	587.66
2/3/12 19:00	584.85	584.52	584.34	587.65
2/3/12 23:00	584.85	584.51	584.43	587.70
2/4/12 3:00	584.88	584.66	584.59	587.87
2/4/12 7:00	584.97	584.86	584.52	587.86
2/4/12 11:00	584.93	584.72	584.55	587.83
2/4/12 15:00	584.92	584.58	584.54	587.82
2/4/12 19:00	584.91	584.74	584.51	587.80
2/4/12 23:00	584.90	584.71	584.50	587.79
2/5/12 3:00	584.91	584.69	584.49	587.78
2/5/12 7:00	584.90	584.66	584.47	587.75
2/5/12 11:00	584.90	584.65	584.46	587.76
2/5/12 15:00	584.90	584.59	584.47	587.75
2/5/12 19:00	584.89	584.64	584.45	587.73
2/5/12 23:00	584.88	584.63	584.44	587.72
2/6/12 3:00	584.88	584.61	584.43	587.71
2/6/12 7:00	584.88	584.59	584.43	587.71
2/6/12 11:00	584.88	584.60	584.43	587.70
2/6/12 15:00	584.87	584.59	584.43	587.70
2/6/12 19:00	584.87	584.59	584.42	587.69

2/6/12 23:00	584.87	584.58	584.40	587.68
2/7/12 3:00	584.86	584.57	584.40	587.67
2/7/12 7:00	584.86	584.56	584.40	587.65
2/7/12 11:00	584.86	584.54	584.39	587.65
2/7/12 15:00	584.86	584.55	584.39	587.65
2/7/12 19:00	584.86	584.55	584.39	587.64
2/7/12 23:00	584.86	584.54	584.38	587.63
2/8/12 3:00	584.86	584.54	584.38	587.63
2/8/12 7:00	584.85	584.54	584.38	587.61
2/8/12 11:00	584.85	584.53	584.37	587.62
2/8/12 15:00	584.85	584.52	584.38	587.61
2/8/12 19:00	584.85	584.54	584.38	587.60
2/8/12 23:00	584.84	584.52	584.35	587.58
2/9/12 3:00	584.83	584.49	584.35	587.56
2/9/12 7:00	584.83	584.48	584.34	587.54
2/9/12 11:00	584.82	584.45	584.34	587.54
2/9/12 15:00	584.82	584.52	584.39	587.60
2/9/12 19:00	584.84	584.57	584.38	587.57
2/9/12 23:00	584.84	584.51	584.36	587.57
2/10/12 3:00	584.84	584.52	584.37	587.57
2/10/12 7:00	584.84	584.52	584.38	587.57
2/10/12 11:00	584.84	584.52	584.37	587.57
2/10/12 15:00	584.84	584.52	584.39	587.58
2/10/12 19:00	584.85	584.57	584.37	587.54
2/10/12 23:00	584.83	584.52	584.34	587.52
2/11/12 3:00	584.82	584.49	584.32	587.49
2/11/12 7:00	584.81	584.46	584.30	587.45
2/11/12 11:00	584.79	584.42	584.28	587.43
2/11/12 15:00	584.79	584.44	584.32	587.47
2/11/12 19:00	584.80	584.51	584.30	587.43
2/11/12 23:00	584.78	584.44	584.28	587.41
2/12/12 3:00	584.77	584.39	584.25	587.38
2/12/12 7:00	584.76	584.37	584.23	587.36
2/12/12 11:00	584.75	584.33	584.22	587.35
2/12/12 15:00	584.75	584.34	584.29	587.41
2/12/12 19:00	584.78	584.49	584.29	587.41
2/12/12 23:00	584.78	584.45	584.28	587.39
2/13/12 3:00	584.77	584.42	584.25	587.35
2/13/12 7:00	584.75	584.36	584.22	587.32
2/13/12 11:00	584.73	584.31	584.22	587.32
2/13/12 15:00	584.74	584.36	584.26	587.34
2/13/12 19:00	584.76	584.42	584.27	587.35
2/13/12 23:00	584.77	584.43	584.29	587.37
2/14/12 3:00	584.77	584.43	584.29	587.37
2/14/12 7:00	584.77	584.44	584.29	587.38
2/14/12 11:00	584.78	584.45	584.28	587.38
2/14/12 15:00	584.78	584.44	584.33	587.43
2/14/12 19:00	584.80	584.56	584.34	587.44
2/14/12 23:00	584.80	584.53	584.33	587.44
2/15/12 3:00	584.80	584.50	584.32	587.44
2/15/12 7:00	584.80	584.50	584.31	587.43
2/15/12 11:00	584.79	584.47	584.33	587.46
2/15/12 15:00	584.80	584.56	584.35	587.51
2/15/12 19:00	584.82	584.54	584.35	587.52
2/15/12 23:00	584.83	584.55	584.43	587.65
2/16/12 3:00	584.91	584.73	584.51	587.76
2/16/12 7:00	584.93	584.77	584.51	588.03
2/16/12 11:00	584.90	584.81	584.48	587.74
2/16/12 15:00	584.89	584.69	584.48	587.72
2/16/12 19:00	584.89	584.67	584.45	587.70
2/16/12 23:00	584.88	584.65	584.45	587.68
2/17/12 3:00	584.88	584.64	584.44	587.65
2/17/12 7:00	584.87	584.61	584.42	587.63
2/17/12 11:00	584.86	584.57	584.44	587.64
2/17/12 15:00	584.87	584.63	584.45	587.67
2/17/12 19:00	584.87	584.63	584.43	587.65
2/17/12 23:00	584.87	584.59	584.42	587.63
2/18/12 3:00	584.87	584.60	584.42	587.61
2/18/12 7:00	584.86	584.57	584.40	587.58
2/18/12 11:00	584.85	584.54	584.41	587.59
2/18/12 15:00	584.85	584.57	584.40	587.59
2/18/12 19:00	584.85	584.56	584.38	587.58
2/18/12 23:00	584.84	584.55	584.37	587.56
2/19/12 3:00	584.84	584.53	584.37	587.53
2/19/12 7:00	584.83	584.51	584.36	587.50
2/19/12 11:00	584.82	584.48	584.00	587.52
2/19/12 15:00	584.84	584.58	584.39	587.57
2/19/12 19:00	584.84	584.55	584.37	587.54
2/19/12 23:00	584.84	584.52	584.35	587.50
2/20/12 3:00	584.82	584.50	584.33	587.46
2/20/12 7:00	584.81	584.47	584.31	587.43
2/20/12 11:00	584.79	584.42	583.75	587.45
2/20/12 15:00	584.81	584.54	584.38	587.53
2/20/12 19:00	584.84	584.54	584.38	587.52
2/20/12 23:00	584.83	584.53	584.38	587.52
2/21/12 3:00	584.83	584.53	584.39	587.54
2/21/12 7:00	584.84	584.55	584.42	587.55
2/21/12 11:00	584.85	584.59	584.46	587.64
2/21/12 15:00	584.89	584.66	584.45	587.61
2/21/12 19:00	584.87	584.62	584.44	587.59
2/21/12 23:00	584.86	584.61	584.42	587.58
2/22/12 3:00	584.85	584.60	584.42	587.58
2/22/12 7:00	584.85	584.57	584.42	587.57
2/22/12 11:00	584.85	584.59	584.43	587.58
2/22/12 15:00	584.86	584.60	584.44	587.58
2/22/12 19:00	584.85	584.60	584.42	587.56
2/22/12 23:00	584.85	584.56	584.40	587.55
2/23/12 3:00	584.85	584.56	584.40	587.54
2/23/12 7:00	584.84	584.57	584.39	587.52
2/23/12 11:00	584.84	584.52	584.18	587.52
2/23/12 15:00	584.84	584.56	584.11	587.60
2/23/12 19:00	584.87	584.64	584.24	587.59
2/23/12 23:00	584.87	584.62	584.23	587.60
2/24/12 3:00	584.88	584.63	584.38	587.67
2/24/12 7:00	584.91	584.72	584.54	587.71
2/24/12 11:00	585.03	584.83	584.56	587.69
2/24/12 15:00	585.11	584.93	584.52	587.72
2/24/12 19:00	584.91	584.78	584.49	587.70
2/24/12 23:00	584.89	584.69	584.47	587.67
2/25/12 3:00	584.88	584.65	584.45	587.64
2/25/12 7:00	584.87	584.62	584.41	587.60
2/25/12 11:00	584.85	584.55	584.40	587.59
2/25/12 15:00	584.85	584.64	584.43	587.62
2/25/12 19:00	584.87	584.64	584.42	587.59
2/25/12 23:00	584.86	584.60	584.40	587.56
2/26/12 3:00	584.84	584.55	584.37	587.53
2/26/12 7:00	584.83	584.52	584.36	587.51
2/26/12 11:00	584.82	584.49	584.38	587.53
2/26/12 15:00	584.83	584.60	584.42	587.59
2/26/12 19:00	584.86	584.61	584.41	587.57
2/26/12 23:00	584.86	584.58	584.41	587.56
2/27/12 3:00	584.86	584.58	584.39	587.54
2/27/12 7:00	584.85	584.53	584.37	587.52
2/27/12 11:00	584.84	584.51	584.36	587.52
2/27/12 15:00	584.84	584.51	584.37	587.51
2/27/12 19:00	584.84	584.56	584.36	587.50
2/27/12 23:00	584.84	584.52	584.36	587.48
2/28/12 3:00	584.83	584.51	584.34	587.46
2/28/12 7:00	584.82	584.48	584.35	587.45
2/28/12 11:00	584.82	584.49	584.37	587.48
2/28/12 15:00	584.84	584.60	584.40	587.53
2/28/12 19:00	584.85	584.57	584.40	587.52
2/28/12 23:00	584.85	584.56	584.28	587.58
2/29/12 3:00	584.87	584.65	584.02	587.58
2/29/12 7:00	584.60	584.33	583.54	587.46
2/29/12 11:00	584.24	583.88	584.54	587.74
2/29/12 15:00	584.91	584.72	584.52	587.71
2/29/12 19:00	584.90	584.69	584.49	587.68
2/29/12 23:00	584.91	584.69	584.50	587.67
3/1/12 3:00	584.91	584.67	584.50	587.65
3/1/12 7:00	584.91	584.67	584.49	587.64
3/1/12 11:00	584.91	584.66	584.49	587.63

Groundwater Elevations – ComEd Parcel

(Hanson Material Services – Romeoville Quarry)

3/1/12 15:00	584.90	584.65	584.49	587.63
3/1/12 19:00	584.89	584.64	584.48	587.61
3/1/12 23:00	584.89	584.65	584.48	587.61
3/2/12 3:00	584.88	584.64	584.49	587.62
3/2/12 7:00	584.89	584.65	584.48	587.60
3/2/12 11:00	584.88	584.63	584.50	587.63
3/2/12 15:00	584.89	584.71	584.58	587.68
3/2/12 19:00	584.93	584.78	585.20	587.77
3/2/12 23:00	584.95	585.07	584.56	587.75
3/3/12 3:00	584.92	584.77	584.55	587.72
3/3/12 7:00	584.91	584.73	584.52	587.70
3/3/12 11:00	584.91	584.70	584.50	587.69
3/3/12 15:00	584.90	584.67	584.51	587.68
3/3/12 19:00	584.90	584.68	584.49	587.66
3/3/12 23:00	584.90	584.67	584.49	587.65
3/4/12 3:00	584.89	584.66	584.50	587.65
3/4/12 7:00	584.89	584.65	584.49	587.63
3/4/12 11:00	584.89	584.65	584.48	587.63
3/4/12 15:00	584.89	584.64	584.47	587.62
3/4/12 19:00	584.89	584.60	584.46	587.60
3/4/12 23:00	584.88	584.63	584.45	587.59
3/5/12 3:00	584.87	584.62	584.44	587.56
3/5/12 7:00	584.86	584.59	584.42	587.53
3/5/12 11:00	584.85	584.52	584.43	587.54
3/5/12 15:00	584.86	584.62	584.46	587.57
3/5/12 19:00	584.87	584.67	584.44	587.55
3/5/12 23:00	584.87	584.61	584.44	587.54
3/6/12 3:00	584.86	584.59	584.45	587.54
3/6/12 7:00	584.86	584.59	584.44	587.53
3/6/12 11:00	584.86	584.58	584.46	587.55
3/6/12 15:00	584.87	584.61	584.45	587.52
3/6/12 19:00	584.86	584.59	584.43	587.50
3/6/12 23:00	584.85	584.58	584.42	587.49
3/7/12 3:00	584.85	584.57	584.43	587.49
3/7/12 7:00	584.85	584.57	584.42	587.48
3/7/12 11:00	584.84	584.57	584.41	587.48
3/7/12 15:00	584.84	584.56	584.44	587.48
3/7/12 19:00	584.84	584.57	584.42	587.47
3/7/12 23:00	584.84	584.57	584.42	587.47
3/8/12 3:00	584.84	584.58	584.95	587.71
3/8/12 7:00	584.97	584.86	584.57	587.66
3/8/12 11:00	584.91	584.74	584.50	587.63
3/8/12 15:00	584.89	584.69	584.48	587.61
3/8/12 19:00	584.88	584.64	584.48	587.59
3/8/12 23:00	584.87	584.65	584.46	587.58
3/9/12 3:00	584.87	584.64	584.46	587.57
3/9/12 7:00	584.86	584.62	584.44	587.54
3/9/12 11:00	584.86	584.58	584.43	587.53
3/9/12 15:00	584.86	584.59	584.43	587.53
3/9/12 19:00	584.85	584.60	584.43	587.51
3/9/12 23:00	584.85	584.58	584.42	587.50
3/10/12 3:00	584.84	584.58	584.42	587.50
3/10/12 7:00	584.84	584.58	584.42	587.48
3/10/12 11:00	584.84	584.53	584.44	587.51
3/10/12 15:00	584.85	584.59	584.43	587.49
3/10/12 19:00	584.84	584.57	584.42	587.47
3/10/12 23:00	584.84	584.57	584.42	587.46
3/11/12 4:00	584.84	584.57	584.41	587.46
3/11/12 8:00	584.84	584.56	584.40	587.45
3/11/12 12:00	584.83	584.53	584.42	587.45
3/11/12 16:00	584.84	584.57	584.41	587.45
3/11/12 20:00	584.83	584.58	584.42	587.44
3/12/12 0:00	584.83	584.56	584.44	587.45
3/12/12 4:00	584.84	584.58	584.34	587.67
3/12/12 8:00	584.78	584.79	584.22	587.67
3/12/12 12:00	584.64	584.67	584.55	587.66
3/12/12 16:00	584.91	584.73	584.52	587.63
3/12/12 20:00	584.89	584.71	584.50	587.61

3/13/12 0:00	584.88	584.68	584.49	587.60
3/13/12 4:00	584.88	584.68	584.48	587.59
3/13/12 8:00	584.87	584.65	584.46	587.57
3/13/12 12:00	584.87	584.61	584.46	587.56
3/13/12 16:00	584.87	584.63	584.46	587.55
3/13/12 20:00	584.87	584.63	584.46	587.54
3/14/12 0:00	584.87	584.62	584.46	587.54
3/14/12 4:00	584.87	584.62	584.47	587.53
3/14/12 8:00	584.87	584.62	584.45	587.53
3/14/12 12:00	584.86	584.59	584.48	587.53
3/14/12 16:00	584.87	584.67	584.45	587.51
3/14/12 20:00	584.86	584.61	584.45	587.50
3/15/12 0:00	584.86	584.61	584.45	587.50
3/15/12 4:00	584.86	584.60	584.47	587.51
3/15/12 8:00	584.87	584.62	584.42	587.50
3/15/12 12:00	584.86	584.59	584.44	587.51
3/15/12 16:00	584.87	584.62	584.44	587.49
3/15/12 20:00	584.87	584.58	584.43	587.48
3/16/12 0:00	584.86	584.58	584.44	587.48
3/16/12 4:00	584.86	584.58	584.44	587.48
3/16/12 8:00	584.86	584.58	584.42	587.47
3/16/12 12:00	584.86	584.56	584.44	587.47
3/16/12 16:00	584.86	584.59	584.43	587.46
3/16/12 20:00	584.85	584.57	584.42	587.45
3/17/12 0:00	584.85	584.56	584.42	587.46
3/17/12 4:00	584.85	584.56	584.42	587.46
3/17/12 8:00	584.85	584.56	584.42	587.45
3/17/12 12:00	584.85	584.56	584.42	587.46
3/17/12 16:00	584.85	584.56	584.43	587.44
3/17/12 20:00	584.85	584.56	584.41	587.44
3/18/12 0:00	584.85	584.55	584.41	587.44
3/18/12 4:00	584.85	584.55	584.41	587.44
3/18/12 8:00	584.85	584.55	584.41	587.44
3/18/12 12:00	584.85	584.55	584.44	587.45
3/18/12 16:00	584.86	584.57	584.40	587.44
3/18/12 20:00	584.84	584.53	584.40	587.43
3/19/12 0:00	584.84	584.54	584.39	587.44
3/19/12 4:00	584.85	584.54	584.41	587.44
3/19/12 8:00	584.85	584.54	584.40	587.43
3/19/12 12:00	584.85	584.53	584.39	587.45
3/19/12 16:00	584.85	584.57	584.45	587.48
3/19/12 20:00	584.86	584.58	584.41	587.46
3/20/12 0:00	584.85	584.55	584.40	587.45
3/20/12 4:00	584.85	584.54	584.40	587.45
3/20/12 8:00	584.85	584.54	584.40	587.44
3/20/12 12:00	584.84	584.54	584.37	587.43
3/20/12 16:00	584.83	584.53	584.37	587.41
3/20/12 20:00	584.82	584.48	584.36	587.39
3/21/12 0:00	584.82	584.48	584.35	587.40
3/21/12 4:00	584.82	584.49	584.36	587.41
3/21/12 8:00	584.83	584.50	584.34	587.40
3/21/12 12:00	584.83	584.47	584.35	587.40
3/21/12 16:00	584.82	584.48	584.34	587.38
3/21/12 20:00	584.81	584.47	584.34	587.37
3/22/12 0:00	584.81	584.46	584.33	587.38
3/22/12 4:00	584.81	584.46	584.33	587.39
3/22/12 8:00	584.82	584.47	584.33	587.38
3/22/12 12:00	584.82	584.46	584.32	587.38
3/22/12 16:00	584.81	584.45	584.36	587.40
3/22/12 20:00	584.83	584.50	584.50	587.57
3/23/12 0:00	585.03	584.87	584.71	587.87
3/23/12 4:00	585.03	584.86	584.80	587.90
3/23/12 8:00	585.02	584.84	584.48	587.70
3/23/12 12:00	585.00	584.82	584.55	587.75
3/23/12 16:00	584.94	584.22	584.67	587.95
3/23/12 20:00	584.74	584.60	584.78	587.92
3/24/12 0:00	585.04	585.20	584.94	587.90
3/24/12 4:00	585.11	585.31	585.05	587.88

3/24/12 8:00	585.16	585.41	584.74	587.86
3/24/12 12:00	585.04	585.21	584.63	587.85
3/24/12 16:00	584.83	584.88	584.62	587.83
3/24/12 20:00	584.99	584.81	584.62	587.81
3/25/12 0:00	584.98	584.79	584.60	587.80
3/25/12 4:00	584.97	584.78	584.59	587.79
3/25/12 8:00	584.97	584.77	584.58	587.77
3/25/12 12:00	584.96	584.75	584.56	587.76
3/25/12 16:00	584.95	584.74	584.57	587.75
3/25/12 20:00	584.95	584.73	584.55	587.73
3/26/12 0:00	584.94	584.71	584.54	587.72
3/26/12 4:00	584.94	584.71	584.53	587.70
3/26/12 8:00	584.93	584.69	584.52	587.69
3/26/12 12:00	584.93	584.68	584.53	587.68
3/26/12 16:00	584.93	584.67	584.52	587.66
3/26/12 20:00	584.92	584.69	584.51	587.65
3/27/12 0:00	584.92	584.66	584.51	587.65
3/27/12 4:00	584.92	584.66	584.51	587.64
3/27/12 8:00	584.92	584.65	584.51	587.63
3/27/12 12:00	584.91	584.65	584.49	587.62
3/27/12 16:00	584.91	584.63	584.51	587.61
3/27/12 20:00	584.90	584.66	584.50	587.59
3/28/12 0:00	584.90	584.63	584.50	587.59
3/28/12 4:00	584.90	584.64	584.49	587.58
3/28/12 8:00	584.90	584.63	584.47	587.57
3/28/12 12:00	584.90	584.60	584.48	587.55
3/28/12 16:00	584.89	584.61	584.44	587.52
3/28/12 20:00	584.87	584.58	584.44	587.51
3/29/12 0:00	584.87	584.57	584.44	587.51
3/29/12 4:00	584.87	584.57	584.44	587.50
3/29/12 8:00	584.87	584.57	584.44	587.49
3/29/12 12:00	584.87	584.55	584.46	587.49
3/29/12 16:00	584.87	584.59	584.42	587.47
3/29/12 20:00	584.86	584.56	584.42	587.47
3/30/12 0:00	584.86	584.55	584.43	587.47
3/30/12 4:00	584.87	584.56	584.44	587.48
3/30/12 8:00	584.87	584.57	584.44	587.47
3/30/12 12:00	584.85	584.55	584.48	587.45
3/30/12 12:00	584.87	584.58	584.46	587.83
7/19/12 12:00	580.78	580.45	580.43	584.28
10/16/12 12:00	583.63	582.30	582.29	586.59
11/26/12 12:00	584.56	584.15	584.00	587.51
4/22/13 12:00	584.94	584.63	584.46	587.82
7/15/13 12:00	583.78	582.84	582.80	586.00
11/19/13 12:00	584.93	584.62	584.46	587.80
4/23/14 12:00	584.65	584.42	584.28	587.66
11/20/14 12:00	584.55	584.05	583.93	587.07
6/4/15 12:00	584.69	584.46	584.34	587.41
3/3/16 12:00	584.61		584.23	587.62
8/31/16 12:00	584.72	584.85	584.16	587.8
1/20/17 12:00	585.21	585.14	584.48	588.07
4/21/17 12:00	584.65	584.41	584.27	587.6
7/24/17 12:00	585.03	585.01	584.34	587.95
10/13/17 12:00	584.02	583.52	582.97	587.32
2/28/18 12:00	584.72	584.8	584.12	587.83
5/7/18 12:00	584.44	584.47	583.79	588.28
6/3/19 12:00	584.48	584.74	584.01	587.44
9/12/19 12:00	584.40	584.38	583.71	587.60

Notes:

ft msl = Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)

TOC = Top of PVC Casing

ft = feet

A = as measured inside well

NI = Not Installed

--- No Elevation

Cells highlighted in yellow are manual WLs

Cells in gray are draught WLs and excluded from calculations

Groundwater Measurements and Elevations
Romeoville Prairie Nature Preserve
Hanson Material Service - Romeoville Quarry
AECOM Project No.60089629

Well Number & Data	RPNP PW-4D	MW-24	MW-25
Ground Surface Elevation (ft msl)	593.55	592.40	591.00
Top of PVC Casing Elevation (ft)	596.42	595.23	594.04
Well Depth (Feet from TOC)[A]			

Date	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)
22-Oct-09	5.84	590.58				
13-Apr-10	5.58	590.84				
9-Aug-10	5.37	591.05				
26-Jan-11	5.64	590.78				
20-May-11	4.75	591.67				
5-Jul-11	5.96	590.46				
4-Oct-11	5.68	590.74				
28-Dec-11	5.53	590.89				
30-Mar-12	5.59	590.83				
19-Jul-12	6.00	590.42	9.43	585.80	8.46	585.58
16-Oct-12	5.46	590.96				
26-Nov-12	5.77	590.65				
30-May-13	5.59	590.83				
15-Jul-13	5.88	590.54				
19-Nov-13	5.13	591.29				
4-Jun-15	5.40	591.02				
13-Oct-15	5.88	590.54				
3-Mar-16	5.61	590.81				
20-Jan-17			8.62	586.61	5.61	588.43
21-Apr-17	5.19	591.23	9.54	585.69	6.69	587.35
24-Jul-17	3.84	592.58	5.25	589.98	7.27	586.77
13-Oct-17	5.49	590.93	9.73	585.50	8.19	585.85
28-Feb-18	4.95	591.47	8.31	586.92	5.56	588.48
7-May-18			9.64	585.59	8.09	585.95
6-Aug-18	6.23	590.19	9.86	585.37	8.79	585.25
3-Jun-19	5.08	591.34	8.07	587.16	5.43	588.61
12-Sep-19	5.76	590.66	9.75	585.48	8.56	585.48
end						

Notes:
ft msl = Elevation referenced to feet above mean sea level using the North American Vertical Datum of 1988 (NAVD88)

TOC = Top of PVC Casing
ft = feet
[A] = as measured inside well
NI = Not Installed
--- No Elevation
Drought periods are shaded in gray

Groundwater Measurements and Elevations
Far North Parcel

Hanson Material Service - Romeoville Quarry

Well Number & Data	NP-2S	NP-3S	NP-5S	NP-6S
Ground Surface Elevation (ft msl)	585.2	589.3	599.2	605.4
Top of PVC Casing Elevation (ft)	587.07	591.15	601.52	607.55

Date	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)	Depth to GW from TOC (ft)	Groundwater Elevation (ft msl)
15-Jul-13	4.94	582.13	7.53	583.62	12.86	588.66	13.54	594.01
6-Sep-13	7.28	579.79	9.14	582.01	14.77	586.75	15.07	592.48
19-Nov-13	4.31	582.76	7.96	583.19	14.06	587.46	14.70	592.85
23-Apr-14	4.10	582.97	7.56	583.59	11.32	590.20	13.40	594.15
4-Jun-15	4.10	582.97	7.19	583.96	11.52	590.00	13.76	593.79
13-Oct-15	4.63	582.44	7.96	583.19	13.02	588.50	14.21	593.34
3-Mar-16	4.08	582.99	7.35	583.80	12.03	589.49	13.57	593.98
31-Aug-16	3.99	583.08	7.64	583.51	11.95	589.57	13.28	594.27
19-Jan-17	3.86	583.21	7.39	583.76	11.44	590.08	13.74	593.81
21-Apr-17	3.96	583.11	7.19	583.96	9.96	591.56	12.76	594.79
24-Jul-17	3.30	583.77	7.46	583.69	10.90	590.62	13.83	593.72
12-Oct-17	5.15	581.92	8.63	582.52	14.44	587.08	14.67	592.88
28-Feb-18	3.82	583.25	7.16	583.99	7.49	594.03	10.56	596.99
7-May-18	4.09	582.98	7.42	583.73	11.29	590.23	13.36	594.19
6-Aug-18	4.97	582.10	8.03	583.12	11.52	590.00	13.46	594.09
3-Jun-19	3.67	583.40	6.73	584.42	8.20	593.32	11.82	595.73
12-Sep-19	4.73	582.34	8.07	583.08	13.53	587.99	12.82	594.73
end								

Groundwater Levels in West (Pearce-Eich) Quarry (1995-2019)

Hanson Material Service - Romeoville Quarry, Romeoville, Illinois

Date	P-21	P-22	P-23
Outer Casing Elevation (FT NAVD):	683.11	671.51	646.95
7/31/1995	592.59	598.16	604.54
8/28/1995	589.53	596.26	594.14
9/15/1995	588.32	594.58	591.24
9/18/1995	587.10	592.90	588.34
9/28/1995	587.80	591.92	586.39
10/13/1995	587.83	590.36	583.53
10/30/1995	587.70	588.96	581.39
11/17/1995	598.90	595.91	591.35
12/1/1995	598.90	598.29	595.77
12/15/1995	596.94	597.58	592.75
1/2/1996	589.73	594.06	587.97
1/23/1996	590.90	592.60	586.81
2/19/1996	590.05	593.12	586.94
3/1/1996	589.19	591.37	586.92
3/18/1996	588.65	589.86	588.17
4/9/1996	590.04	591.00	587.75
6/12/1996	609.81	606.66	610.77
7/17/1996	589.05	596.46	603.66
8/23/1996	592.82	596.58	598.46
10/15/1996	586.60	589.60	581.68
12/17/1996	592.05	592.40	593.05
2/11/1997	596.79	597.46	599.74
4/3/1997	611.99	599.73	606.43
6/5/1997	591.09	594.18	593.93
7/11/1997	585.05	582.01	580.02
8/1/1997	579.01	582.86	578.89
9/4/1997	581.01	583.01	578.66
10/3/1997	580.91	582.19	576.83
11/17/1997	579.76	581.33	575.30
12/29/1997	580.80	580.97	577.99
3/3/1998	597.58	596.46	600.54
4/10/1998	603.05	603.82	608.37
5/22/1998	599.82	603.26	609.65
7/29/1998	587.26	593.16	586.50
09/09/1998	581.19	584.36	579.31
10/29/1998	581.30	582.11	578.00
12/03/1998	581.55	581.91	576.37
1/29/1999	598.80	589.50	585.81
3/4/1999	595.20	595.21	594.97
4/27/1999	600.02	601.12	602.21
6/3/1999	602.55	603.39	608.56
7/26/1999	598.69	597.90	604.78
9/10/1999	584.26	587.24	580.41

Groundwater Levels in West (Pearce-Eich) Quarry (1995-2019)

Hanson Material Service - Romeoville Quarry, Romeoville, Illinois

Date	P-21	P-22	P-23
Outer Casing Elevation (FT NAVD):	683.11	671.51	646.95
10/21/1999	579.11	582.94	577.54
12/1/1999	579.69	581.06	574.43
12/29/1999	581.52	581.86	574.91
3/1/2000	585.33	582.07	577.87
3/31/2000	585.26	584.11	579.93
6/29/2000	591.76	588.36	587.15
8/14/2000	594.81	598.03	596.84
9/11/2000	587.45	592.38	584.70
12/5/2000	588.92	584.83	580.55
2/6/2001	594.78	589.21	585.82
7/23/2001	582.71	585.61	577.45
9/13/2001	579.01	579.81	551.25
12/28/2001	589.79	586.89	582.91
1/25/2002	585.33	584.30	580.12
2/27/2002	594.80	588.94	587.81
3/28/2002	599.19	595.96	600.18
4/30/2002	602.34	600.12	606.44
6/6/2002	600.38	602.77	608.02
7/9/2002	593.47	597.86	595.61
7/31/2002	591.17	594.65	587.22
8/30/2002	584.20	587.82	577.73
10/11/2002	580.15	581.27	569.68
11/8/2002	579.49	580.36	564.94
12/11/2002	578.70	579.40	560.26
1/24/2003	577.49	578.37	558.04
2/19/2003	576.54	577.22	555.48
3/4/2003	576.58	576.56	555.35
4/16/2003	580.14	577.61	565.66
5/22/2003	589.52	581.70	576.77
7/25/2003	585.82	581.45	575.11
10/23/2003	587.06	587.18	575.40
6/1/2004	595.68	596.36	595.28
12/30/2004	595.13	592.90	591.32
4/29/2005	597.87	600.34	603.71
7/28/2005	576.07	579.62	562.64
8/30/2005	575.09	576.58	554.13
9/6/2005	574.80	576.03	552.15
12/24/2005	578.55	575.30	560.52
5/17/2006	593.77	593.35	589.46
8/16/2006	580.76	585.10	569.16
12/19/2006	574.34	567.47	557.20
9/16/2009	567.91	568.01	523.15
12/21/2009	574.01	569.91	547.95

Groundwater Levels in West (Pearce-Eich) Quarry (1995-2019)

Hanson Material Service - Romeoville Quarry, Romeoville, Illinois

Date	P-21	P-22	P-23
Outer Casing Elevation (FT NAVD):	683.11	671.51	646.95
3/10/2010	577.01	572.31	550.65
6/30/2010	580.31	573.91	551.35
10/14/2010	573.31	570.21	527.25
12/22/2010	565.11	562.51	516.95
6/30/2011	592.51		561.35
10/19/2011	569.61	567.81	519.95
12/9/2011	569.91	567.81	530.45
3/29/2012	579.41	573.31	546.05
5/23/2012	578.01	574.71	545.75
6/13/2012	575.81	570.71	527.55
9/6/2012	563.01	560.81	535.25
10/30/2012	592.01	559.71	508.05
5/8/2013	579.21	570.01	549.55
10/2/2013	561.91	562.41	523.85
10/7/2014	583.11	574.31	540.65
1/16/2015	569.61	562.71	516.45
4/1/2015	567.71	563.91	535.85
9/20/2016	569.71	562.81	523.55
7/6/2017	575.41	567.21	565.85
6/1/2018	571.01	561.81	557.85
6/25/2018	568.11	562.21	555.45
7/17/2019	577.91	567.01	547.65
10/25/2019	570.31	562.51	535.15

Notes:

- Data not available for blank cells.
- Trigger elevations based on previous groundwater modeling simulations. Thus, drought data have not been highlighted.

Statistical Summary of River South Monitoring Data

(Manual and Automated Water Level Monitoring Data from 2005 through 2019 - Drought WLs exluded)

Romeoville Quarry, Illinois

Monitoring Well	Statistical Summary	Winter (Dec-Jan-Feb)	Spring (Mar-Apr-May)	Summer (Jun-Jul-Aug)	Fall (Sep-Oct-Nov)	Summary of All Data per Well:	
RP-1D	n:	548	752	626	1040	# WL rdgs:	2966
	Min.:	580.20	583.28	579.79	580.00	Min. WL:	579.79
	Ave.:	586.02	587.63	589.06	585.29	**Ave. WL:**	**586.81**
	Max.:	593.77	594.76	595.97	594.17	Max. WL:	595.97
	Range:	13.57	11.48	16.18	14.17	Max. Range:	16.18
	Sta. Dev.(S):	3.10	2.93	4.04	3.52	Sta. Dev.(P):	3.73
	Sum:	321136	441897	368749	608703		
RP-1S	n:	362	753	503	10	# WL rdgs:	1628
	Min.:	581.47	582.28	581.31	582.20	Min. WL:	581.31
	Ave.:	583.77	584.97	583.37	583.81	**Ave. WL:**	**584.20**
	Max.:	590.70	592.88	592.85	588.62	Max. WL:	592.88
	Range:	9.23	10.60	11.54	6.42	Max. Range:	11.56
	Sta. Dev.(S):	2.06	2.69	1.81	2.11	Sta. Dev.(P):	2.42
	Sum:	211323	440482	293435	5838		
RP-2D	n:	902	1304	1114	978	# WL rdgs:	4298
	Min.:	575.57	576.10	575.22	574.75	Min. WL:	574.75
	Ave.:	576.92	577.21	576.96	576.62	**Ave. WL:**	**576.95**
	Max.:	577.82	578.46	578.31	577.99	Max. WL:	578.46
	Range:	2.25	2.36	3.09	3.24	Max. Range:	3.71
	Sta. Dev.(S):	0.26	0.29	0.69	0.96	Sta. Dev.(P):	0.65
	Sum:	520383	752676	642732	563932		
RP-2s	n:	902	1304	1114	978	# WL rdgs:	4298
	Min.:	576.18	576.45	575.02	574.61	Min. WL:	574.61
	Ave.:	577.04	577.17	576.75	576.76	**Ave. WL:**	**576.94**
	Max.:	579.57	578.44	578.87	579.67	Max. WL:	579.67
	Range:	3.39	1.99	3.84	5.06	Max. Range:	5.06
	Sta. Dev.(S):	0.28	0.19	0.63	1.12	Sta. Dev.(P):	0.67
	Sum:	520495	752627	642501	564070		
RP-3S East	n:	2709	2376	2216	2705	# WL rdgs:	10006
	Min.:	582.78	581.75	579.11	577.92	Min. WL:	577.92
	Ave.:	589.03	591.26	590.49	587.83	**Ave. WL:**	**589.56**
	Max.:	598.88	597.98	597.27	596.51	Max. WL:	598.88
	Range:	16.10	16.23	18.16	18.59	Max. Range:	20.96
	Sta. Dev.(S):	2.94	2.21	2.77	4.45	Sta. Dev.(P):	3.51
	Sum:	1595671	1404839	1308516	1590087		
RP-3S West	n:	2709	2376	2216	2705	# WL rdgs:	10006
	Min.:	583.11	582.08	579.89	578.61	Min. WL:	578.61
	Ave.:	589.63	591.64	590.95	588.44	**Ave. WL:**	**590.08**
	Max.:	599.03	598.14	597.44	596.79	Max. WL:	599.03
	Range:	15.92	16.06	17.55	18.18	Max. Range:	20.42
	Sta. Dev.(S):	2.77	2.15	2.61	4.31	Sta. Dev.(P):	3.35
	Sum:	1597309	1405727	1309554	1591719		

# WL rdgs:	8132	8865	7789	8416
Min. WL:	575.57	576.10	575.02	574.61
Ave. WL:	586.12	586.38	586.15	585.12
Max. WL:	599.03	598.14	597.44	596.79
Max. Range:	23.46	22.04	22.41	22.18
Ave[1] Range:	10.1	9.8	11.7	10.9
Ave[2] of Sta. Dev.(S):	1.9	1.7	2.1	2.7

Notes:

Sta. Dev.(S): Standard deviation based on the monthly sample population. This statistic is a measure of how widely values are dispersed from the mean.

Sta. Dev.(P): Standard deviation based on the entire yearly population. This statistic is a measure of how widely values are dispersed from the mean.

Ave[1]: Mean of monthly data ranges (max. water level minus min. water level) for each season.

Ave[2]: Mean of monthly standard deviation of the population for each season.

Statistical Summary of LPNP Monitoring Data

(Manual and Automated Water Level Monitoring Data from 2001 through 2019 - Drought WLs exluded)

Romeoville Quarry, Illinois

Monitoring Well	Statistical Summary	Winter (Dec-Jan-Feb)	Spring (Mar-Apr-May)	Summer (Jun-Jul-Aug)	Fall (Sep-Oct-Nov)	Summary of All Data per Well:	
MW-6A	n:	11	38	55	45	# WL rdgs:	149
	Min.:	587.20	587.67	586.20	585.26	Min. WL:	585.26
	Ave.:	589.39	588.95	588.65	588.06	Ave. WL:	588.60
	Max.:	593.03	591.14	591.89	599.07	Max. WL:	599.07
	Range:	5.83	3.47	5.69	13.81	Max. Range:	13.81
	Sta. Dev.(S):	1.69	0.75	1.24	2.94	Sta. Dev.(P):	1.90
	Sum:	6483	22380	32376	26463		
MW-6B	n:	19	37	45	50	# WL rdgs:	151
	Min.:	586.82	587.33	585.50	584.47	Min. WL:	584.47
	Ave.:	588.89	588.48	588.50	587.47	Ave. WL:	588.20
	Max.:	591.64	590.33	591.80	591.31	Max. WL:	591.80
	Range:	4.82	3.00	6.30	6.84	Max. Range:	7.33
	Sta. Dev.(S):	0.98	0.72	1.49	1.32	Sta. Dev.(P):	1.32
	Sum:	11189	21774	26483	29373		
MW-6C	n:	16	44	48	53	# WL rdgs:	161
	Min.:	586.99	586.20	586.90	585.26	Min. WL:	585.26
	Ave.:	588.10	588.25	588.41	587.59	Ave. WL:	588.06
	Max.:	588.74	589.19	589.50	589.18	Max. WL:	589.50
	Range:	1.75	2.99	2.60	3.92	Max. Range:	4.24
	Sta. Dev.(S):	0.46	0.59	0.68	0.85	Sta. Dev.(P):	0.78
	Sum:	9410	25883	28243	31142		
MW-6N	n:	7	8	18	14	# WL rdgs:	47
	Min.:	590.10	589.84	588.22	587.74	Min. WL:	587.74
	Ave.:	591.49	591.30	590.15	590.18	Ave. WL:	590.55
	Max.:	592.34	592.25	592.95	593.74	Max. WL:	593.74
	Range:	2.24	2.41	4.73	6.00	Max. Range:	6.00
	Sta. Dev.(S):	0.91	0.76	1.43	1.95	Sta. Dev.(P):	1.54
	Sum:	4140	4730	10623	8262		
MW-7C	n:	19	46	55	52	# WL rdgs:	172
	Min.:	606.34	606.38	604.07	605.07	Min. WL:	604.07
	Ave.:	607.17	607.57	606.76	606.32	Ave. WL:	606.89
	Max.:	607.79	609.19	608.27	608.05	Max. WL:	609.19
	Range:	1.45	2.81	4.20	2.98	Max. Range:	5.12
	Sta. Dev.(S):	0.40	0.64	0.93	0.70	Sta. Dev.(P):	0.89
	Sum:	11536	27948	33372	31528		
MW-7D	n:	11	32	45	44	# WL rdgs:	132
	Min.:	606.99	606.72	603.68	604.80	Min. WL:	603.68
	Ave.:	607.34	607.75	606.82	606.47	Ave. WL:	606.97
	Max.:	607.72	609.17	608.26	610.93	Max. WL:	610.93
	Range:	0.73	2.45	4.58	6.13	Max. Range:	7.25
	Sta. Dev.(S):	0.25	0.51	1.03	1.03	Sta. Dev.(P):	1.01
	Sum:	6681	19448	27307	26685		
MW-8A	n:	17	44	52	54	# WL rdgs:	167
	Min.:	563.95	563.96	562.90	563.26	Min. WL:	562.90
	Ave.:	564.20	564.12	563.92	563.93	Ave. WL:	564.00
	Max.:	564.58	564.56	564.57	564.74	Max. WL:	564.74
	Range:	0.63	0.60	1.67	1.48	Max. Range:	1.84
	Sta. Dev.(S):	0.17	0.14	0.32	0.34	Sta. Dev.(P):	0.30
	Sum:	9591	24821	29324	30452		
MW-8B	n:	18	45	54	55	# WL rdgs:	172
	Min.:	563.77	563.64	562.41	562.62	Min. WL:	562.41
	Ave.:	563.95	563.89	563.64	563.71	Ave. WL:	563.76
	Max.:	564.18	564.20	564.00	564.08	Max. WL:	564.20
	Range:	0.41	0.56	1.59	1.46	Max. Range:	1.79
	Sta. Dev.(S):	0.09	0.07	0.32	0.25	Sta. Dev.(P):	0.26
	Sum:	10151	25375	30436	31004		

Statistical Summary of LPNP Monitoring Data

(Manual and Automated Water Level Monitoring Data from 2001 through 2019 - Drought WLs exluded)

Romeoville Quarry, Illinois

Monitoring Well	Statistical Summary	Winter (Dec-Jan-Feb)	Spring (Mar-Apr-May)	Summer (Jun-Jul-Aug)	Fall (Sep-Oct-Nov)	Summary of All Data per Well:	
MW-9A	n:	9	11	20	16	# WL rdgs:	56
	Min.:	568.57	568.38	567.31	567.70	Min. WL:	567.31
	Ave.:	569.29	568.83	568.51	568.80	Ave. WL:	568.78
	Max.:	569.81	569.22	569.88	569.59	Max. WL:	569.88
	Range:	1.24	0.84	2.57	1.89	Max. Range:	2.57
	Sta. Dev.(S):	0.38	0.25	0.73	0.48	Sta. Dev.(P):	0.59
	Sum:	5124	6257	11370	9101		
MW-9B	n:	6	8	15	12	# WL rdgs:	41
	Min.:	568.33	568.51	568.05	568.11	Min. WL:	568.05
	Ave.:	568.79	568.73	568.67	568.83	Ave. WL:	568.75
	Max.:	569.18	568.86	569.01	569.44	Max. WL:	569.44
	Range:	0.85	0.35	0.96	1.33	Max. Range:	1.39
	Sta. Dev.(S):	0.31	0.11	0.28	0.42	Sta. Dev.(P):	0.31
	Sum:	3413	4550	8530	6826		
MW-11A	n:	0	6	12	11	# WL rdgs:	29
	Min.:	0.00	562.51	560.75	560.77	Min. WL:	560.75
	Ave.:	0.00	563.14	562.15	562.03	Ave. WL:	562.31
	Max.:	0.00	563.78	563.45	563.98	Max. WL:	563.98
	Range:	0.00	1.27	2.70	3.21	Max. Range:	3.23
	Sta. Dev.(S):	0.00	0.43	0.90	1.32	Sta. Dev.(P):	1.08
	Sum:	0	3379	6746	6182		
MW-11B	n:	3	7	15	13	# WL rdgs:	38
	Min.:	563.78	562.76	561.43	561.15	Min. WL:	561.15
	Ave.:	564.00	563.50	562.67	562.45	Ave. WL:	562.85
	Max.:	564.13	564.04	564.37	564.16	Max. WL:	564.37
	Range:	0.35	1.28	2.94	3.01	Max. Range:	3.22
	Sta. Dev.(S):	0.19	0.52	0.91	1.18	Sta. Dev.(P):	1.03
	Sum:	1692	3944	8440	7312		
MW-11C	n:	3	7	15	13	# WL rdgs:	38
	Min.:	564.15	563.23	561.51	561.31	Min. WL:	561.31
	Ave.:	564.29	563.68	562.87	562.57	Ave. WL:	563.03
	Max.:	564.44	564.13	564.55	564.18	Max. WL:	564.55
	Range:	0.29	0.90	3.04	2.87	Max. Range:	3.24
	Sta. Dev.(S):	0.15	0.38	0.95	1.14	Sta. Dev.(P):	1.04
	Sum:	1693	3946	8443	7313		
MW-12B	n:	2	8	11	8	# WL rdgs:	29
	Min.:	602.61	601.19	601.67	601.42	Min. WL:	601.19
	Ave.:	602.61	601.98	602.69	602.17	Ave. WL:	602.34
	Max.:	602.61	602.73	603.65	602.89	Max. WL:	603.65
	Range:	0.00	1.54	1.98	1.47	Max. Range:	2.46
	Sta. Dev.(S):	0.00	0.46	0.60	0.53	Sta. Dev.(P):	0.59
	Sum:	1205	4816	6630	4817		
MW-12C	n:	2	8	11	8	# WL rdgs:	29
	Min.:	602.23	601.79	601.58	601.26	Min. WL:	601.26
	Ave.:	602.36	602.00	602.51	601.97	Ave. WL:	602.21
	Max.:	602.49	602.55	603.56	602.65	Max. WL:	603.56
	Range:	0.26	0.76	1.98	1.39	Max. Range:	2.30
	Sta. Dev.(S):	0.18	0.24	0.59	0.50	Sta. Dev.(P):	0.52
	Sum:	1205	4816	6628	4816		

Note: Shaded cells represent wells that had insufficient data (<25 data points) to determine seasonal mean and seasonal low water levels.

Statistical Summary of ComEd Monitoring Data

(Manual and Automated Water Level Monitoring Data from 5/11/11 through 9/12/19 -Drought WLs excluded)
Romeoville Quarry, Illinois

Monitoring Well	Statistical Summary	Winter (Dec-Jan-Feb)	Spring (Mar-Apr-May)	Summer (Jun-Jul-Aug)	Fall (Sep-Oct-Nov)	Summary of All Data per Well:	
CEP-10S	n:	549	236	558	551	# WL rdgs:	1894
	Min.:	584.24	584.44	582.52	583.74	Min. WL:	582.52
	Ave.:	584.86	584.93	584.53	584.61	**Ave. WL:**	**584.70**
	Max.:	586.28	586.29	587.21	585.90	Max. WL:	587.21
	Range:	2.04	1.85	4.69	2.16	Max. Range:	4.69
	Sta. Dev.(S):	0.18	0.24	0.66	0.32	Sta. Dev.(P):	0.45
	Sum:	321087	138043	326166	322121		
CEP-11S	n:	549	235	558	551	# WL rdgs:	1893
	Min.:	583.88	583.99	581.76	582.26	Min. WL:	581.76
	Ave.:	584.57	584.63	583.88	584.07	**Ave. WL:**	**584.23**
	Max.:	585.90	585.70	586.88	585.81	Max. WL:	586.88
	Range:	2.02	1.71	5.12	3.55	Max. Range:	5.12
	Sta. Dev.(S):	0.19	0.22	0.98	0.72	Sta. Dev.(P):	0.74
	Sum:	320929	137388	325806	321823		
CEP-11D	n:	549	236	558	551	# WL rdgs:	1894
	Min.:	583.54	583.79	581.49	581.90	Min. WL:	581.49
	Ave.:	584.39	584.50	583.86	584.11	**Ave. WL:**	**584.17**
	Max.:	585.62	585.58	586.72	586.06	Max. WL:	586.72
	Range:	2.08	1.79	5.24	4.16	Max. Range:	5.24
	Sta. Dev.(S):	0.18	0.22	0.83	0.78	Sta. Dev.(P):	0.67
	Sum:	320828	137943	325795	321845		
CEP-12S	n:	549	236	558	551	# WL rdgs:	1894
	Min.:	587.06	586.48	584.45	586.25	Min. WL:	584.45
	Ave.:	587.66	587.61	587.11	587.45	**Ave. WL:**	**587.43**
	Max.:	589.27	588.96	588.87	589.31	Max. WL:	589.31
	Range:	2.21	2.48	4.42	3.06	Max. Range:	4.86
	Sta. Dev.(S):	0.24	0.26	0.83	0.47	Sta. Dev.(P):	0.58
	Sum:	322624	138676	327607	323683		

Summary of Seasonal Data:

# WL rdgs:	2196	943	2232	2204
Min. WL:	583.54	583.79	581.49	581.90
Ave. WL:	585.37	585.42	584.84	585.06
Max. WL:	589.27	588.96	588.87	589.31
Max. Range:	5.73	5.17	7.39	7.41
Ave[1] Range:	2.1	2.0	4.9	3.2
Ave[2] of Sta. Dev.(S):	0.2	0.2	0.8	0.6

Deviation of Seasonal Mean to Average WL	**CEP-10S**	0.16	0.23	-0.17	-0.09
	CEP-11D	0.34	0.40	-0.35	-0.16
	CEP-11S	0.22	0.34	-0.30	-0.05
	CEP-12S	0.23	0.18	-0.32	0.02

Notes:

Sta. Dev.(S): Standard deviation based on the monthly sample population.

Sta. Dev.(P): Standard deviation based on the entire yearly population.

Ave[1]: Mean of monthly data ranges (max. water level minus min. water level) for each season.

Ave[2]: Mean of monthly standard deviation of the population for each season.

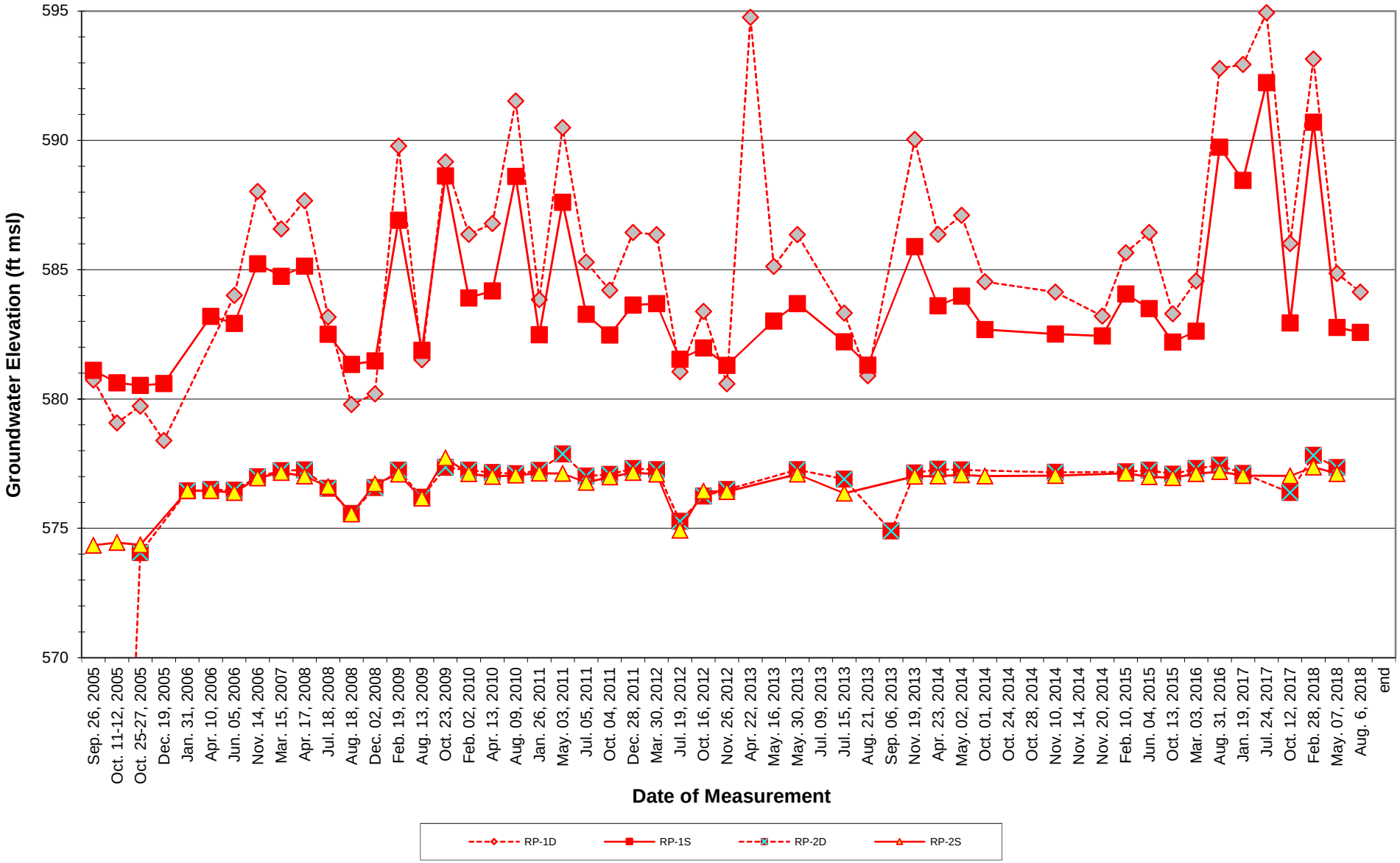
Attachment 1-B

Groundwater Level Hydrographs

Groundwater Elevation Hydrograph

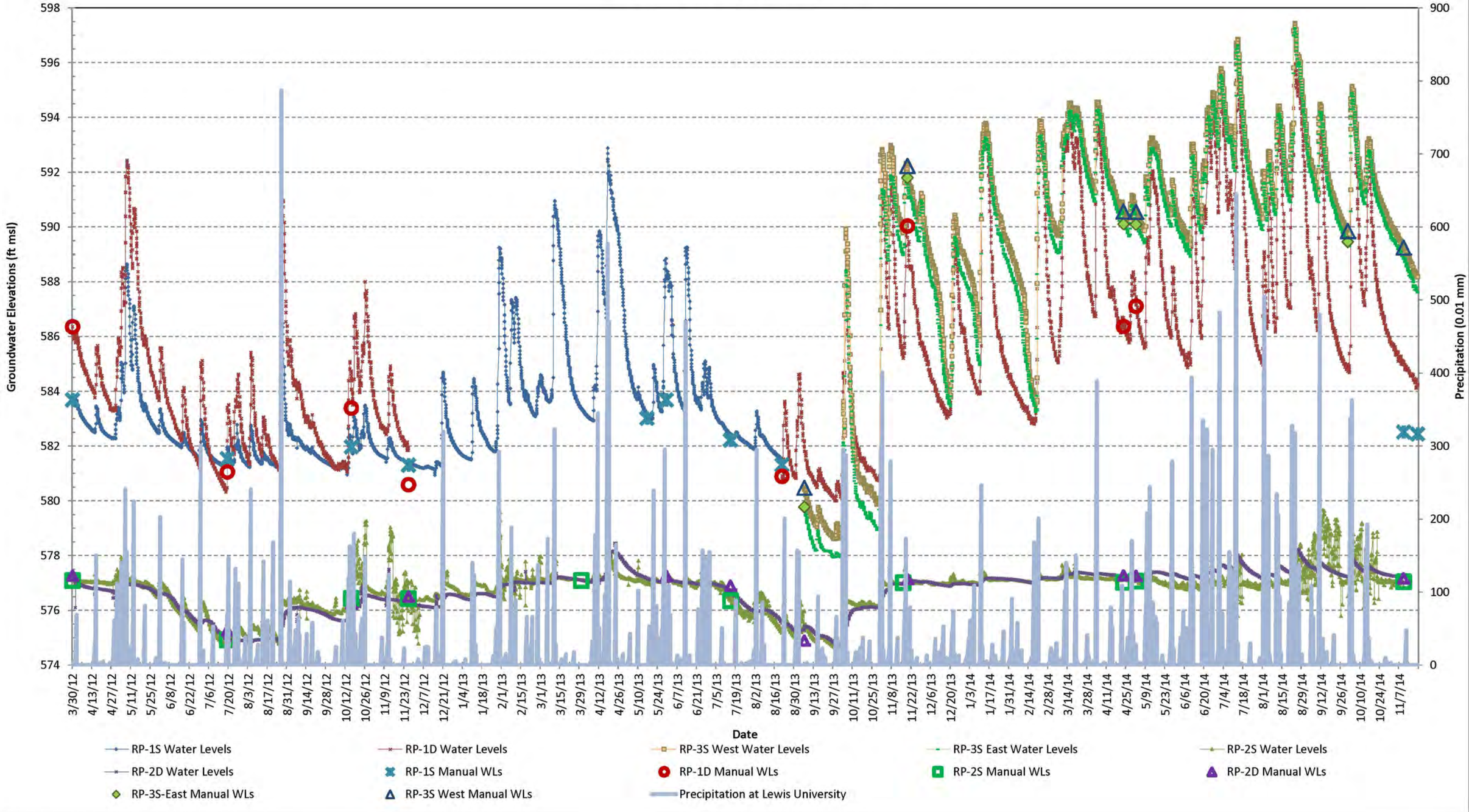
River South / River South Bluff Parcel Wells

Hanson Material Service - Romeoville Quarry



G:\60225330_HMS-Romeoville\2012_HMS_On-Going\WL Monitoring\MSC gw elevation table (thru 2018-8-6)- IN PROGRESS.xls

Ground Water Elevations and Precipitation (Mar. 2012 - Nov. 2014)
River South and River South Bluff Parcel
HMS Romeoville Quarry - Romeoville, Illinois

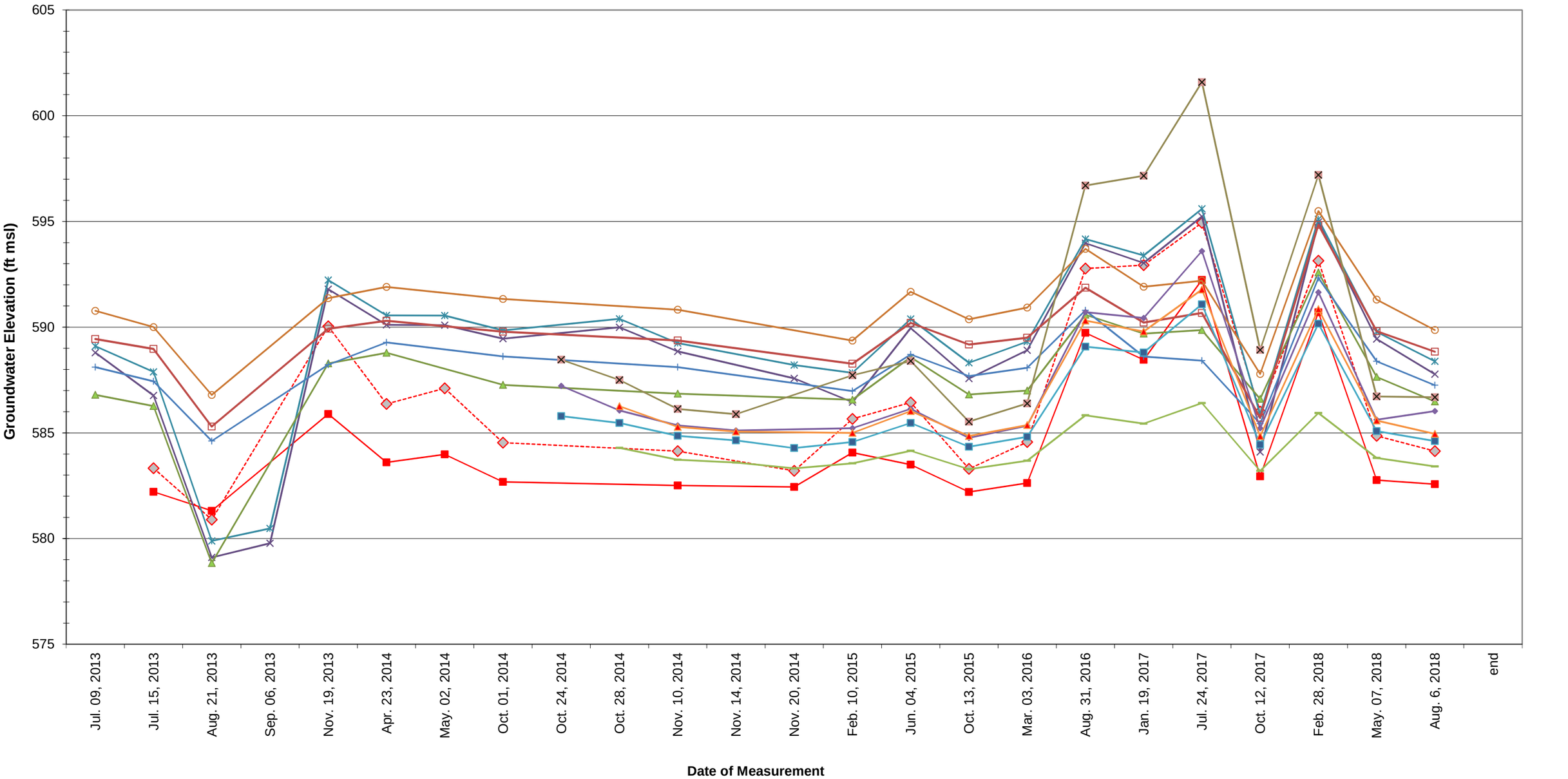


C:\2012_HMS\2015_\1\GalleryTriggers\Combined RS Data (RP-1D_1S_2D_2S) Data and Graphs_2015-01.xlsx

Groundwater Elevation Hydrograph

River South / River South Bluff Parcel Wells

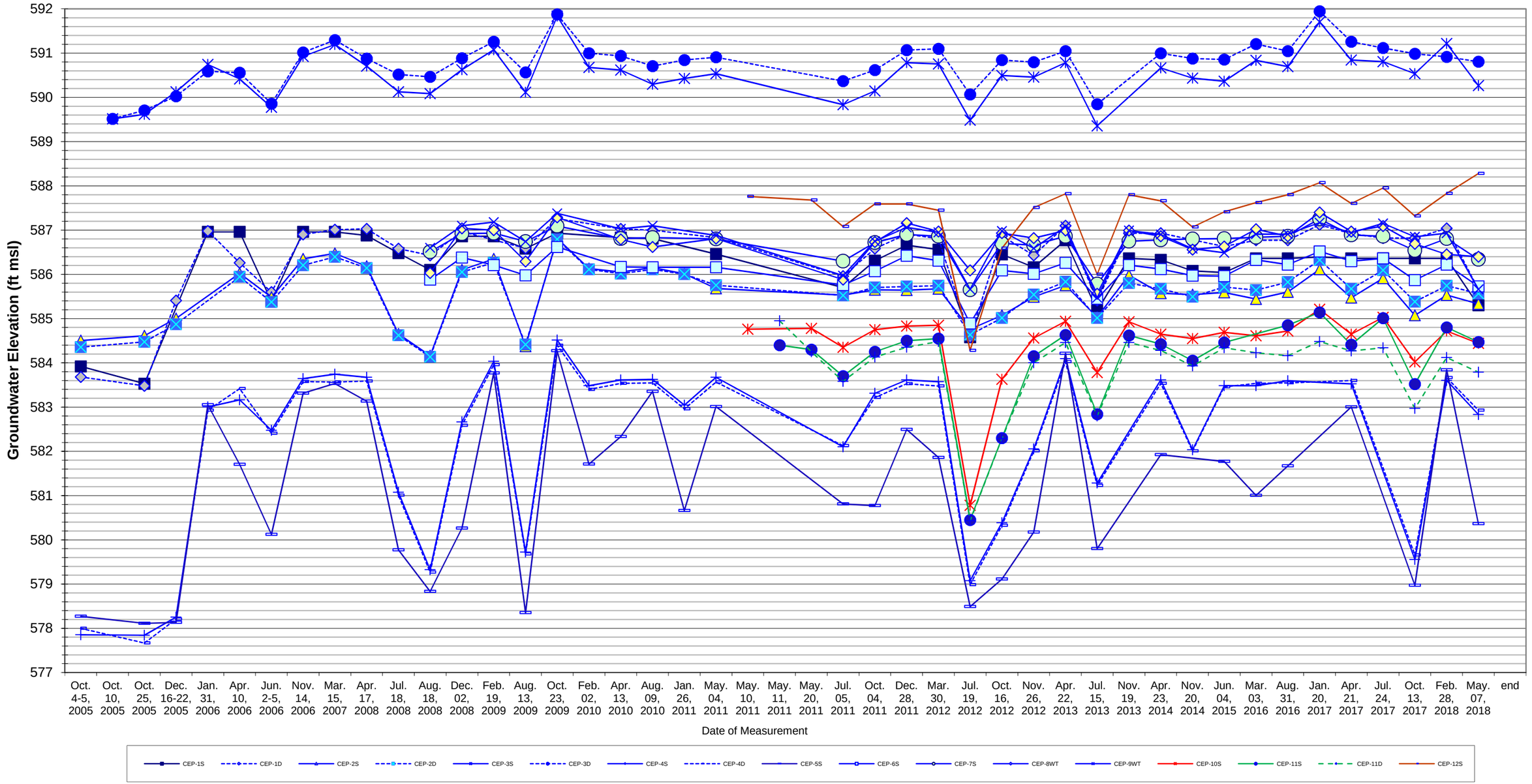
Hanson Material Service - Romeoville Quarry



Groundwater Elevation Hydrograph

ComEd and Long Run Parcels

Hanson Material Service - Romeoville Quarry



Groundwater Elevation Hydrograph

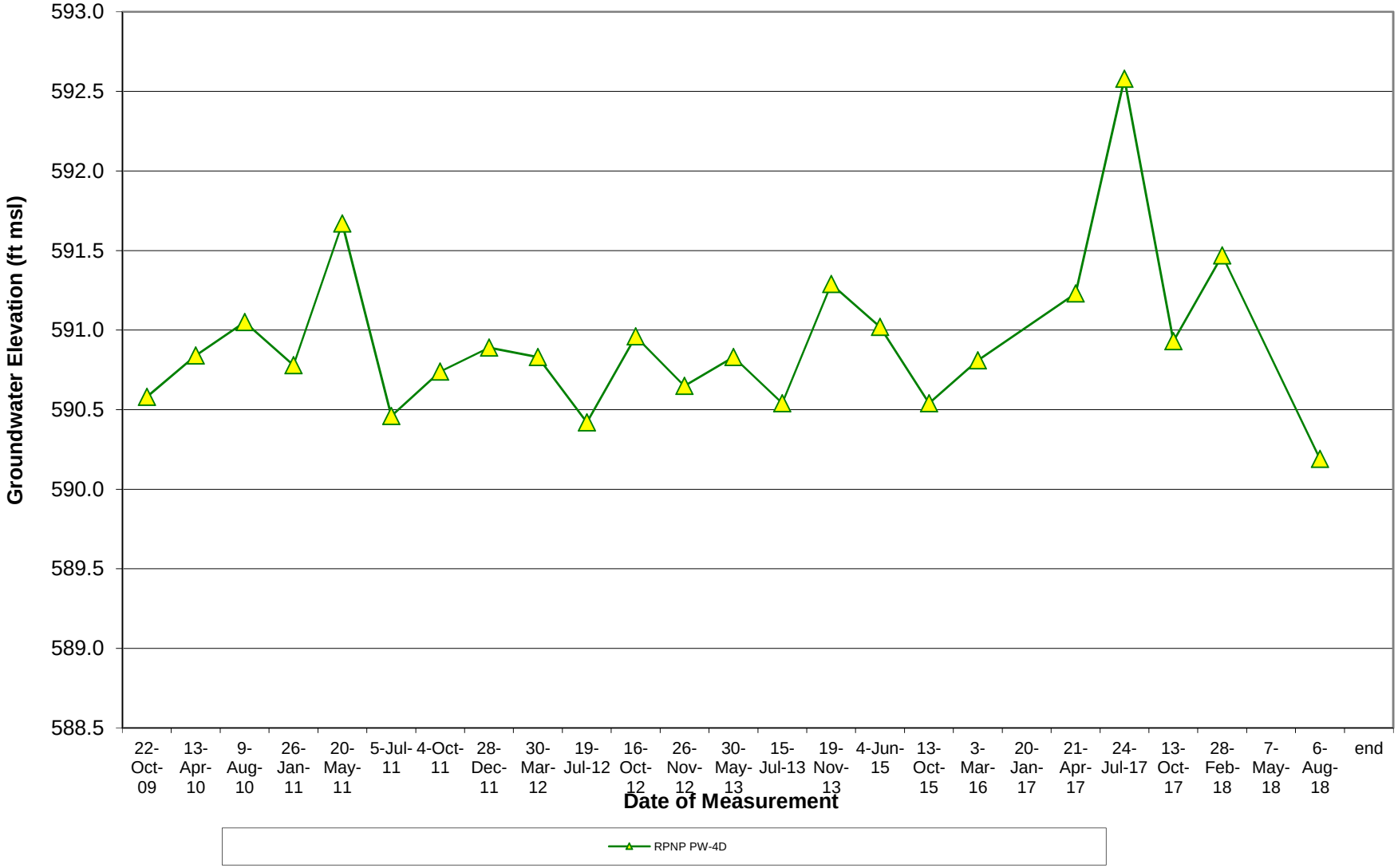
ComEd / Long Run Parcels

Hanson Material Service - Romeoville Quarry

Groundwater Elevation Hydrograph

Romeoville Prairie Nature Preserve

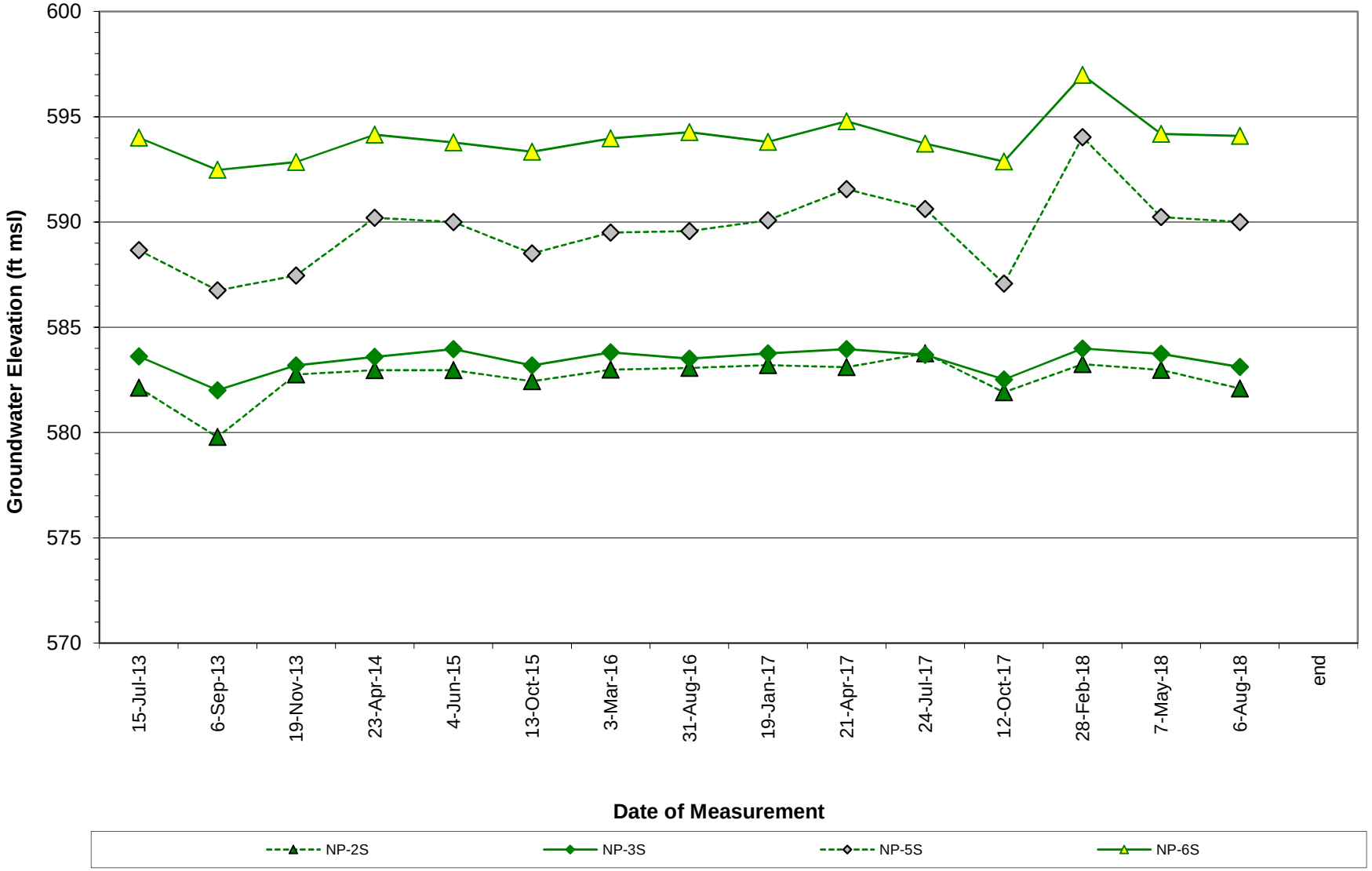
Hanson Material Service - Yard 61



Groundwater Elevation Hydrograph

Far North Parcel Wells

Hanson Material Service - Romeoville Quarry



GROUNDWATER ELEVATIONS AT MW-5, MW-6 AND MW-3 WELL NESTS

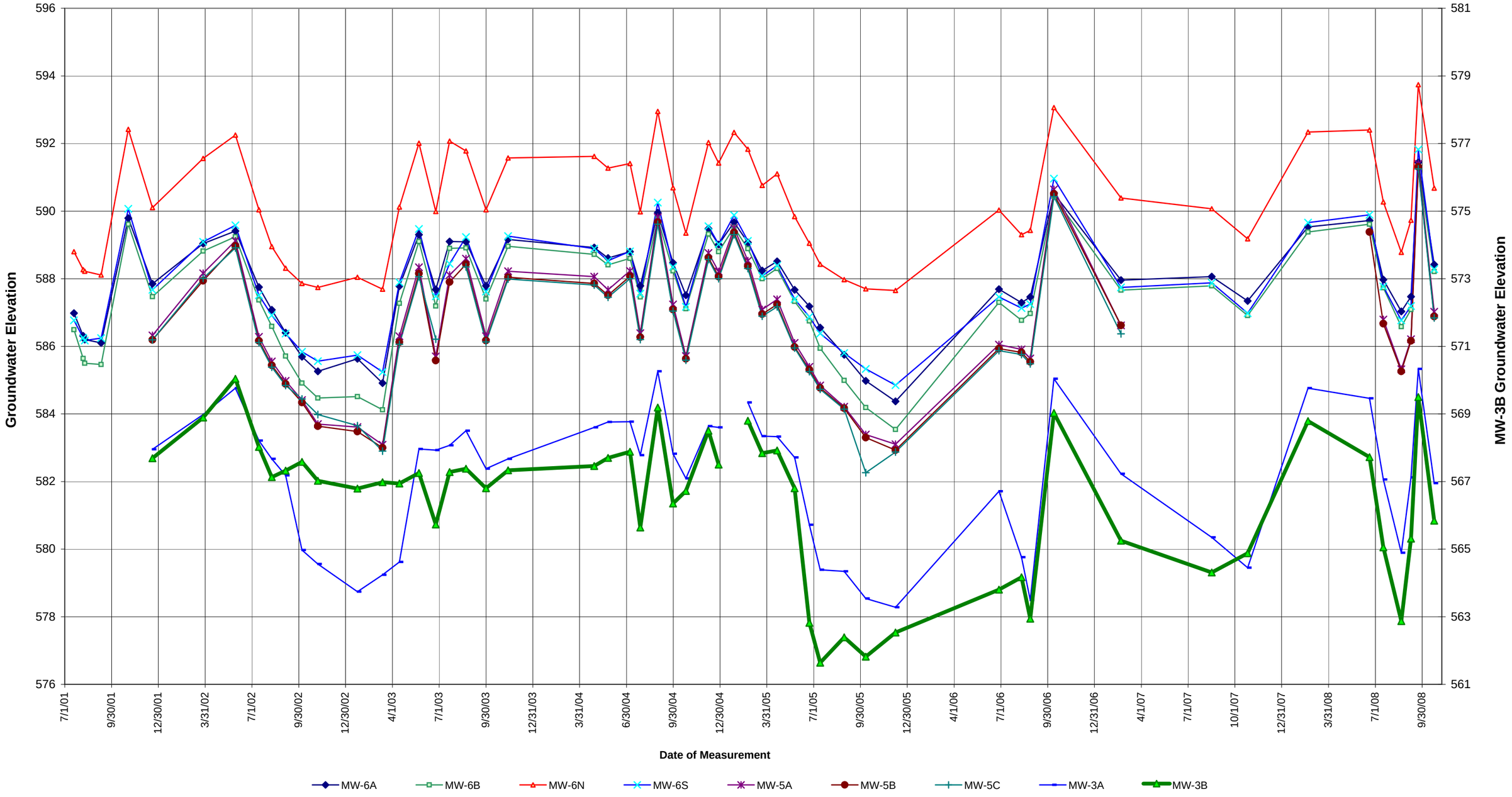


Figure 17

GROUNDWATER ELEVATIONS AT WP-5, WP-6 AND MW-8

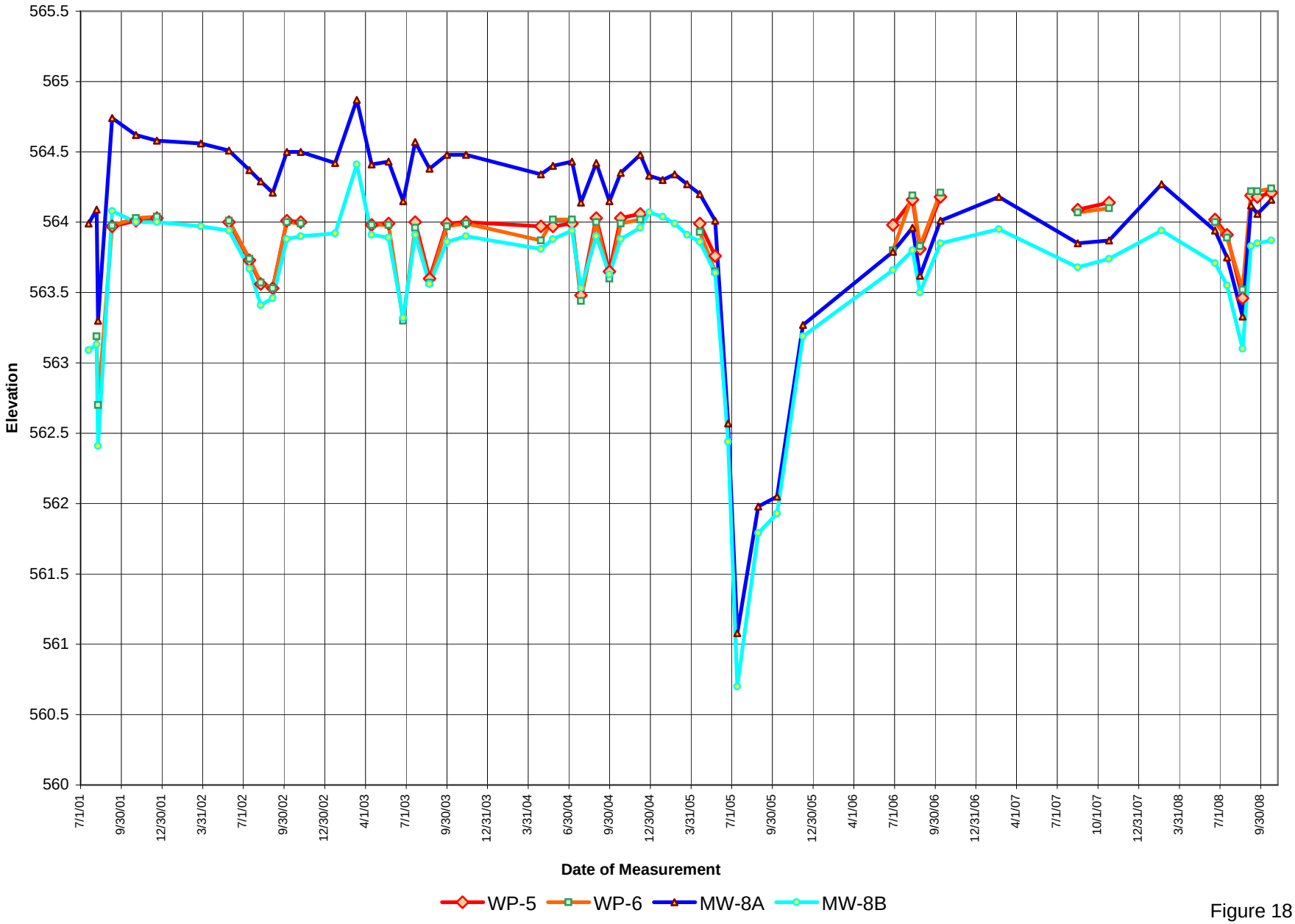


Figure 18

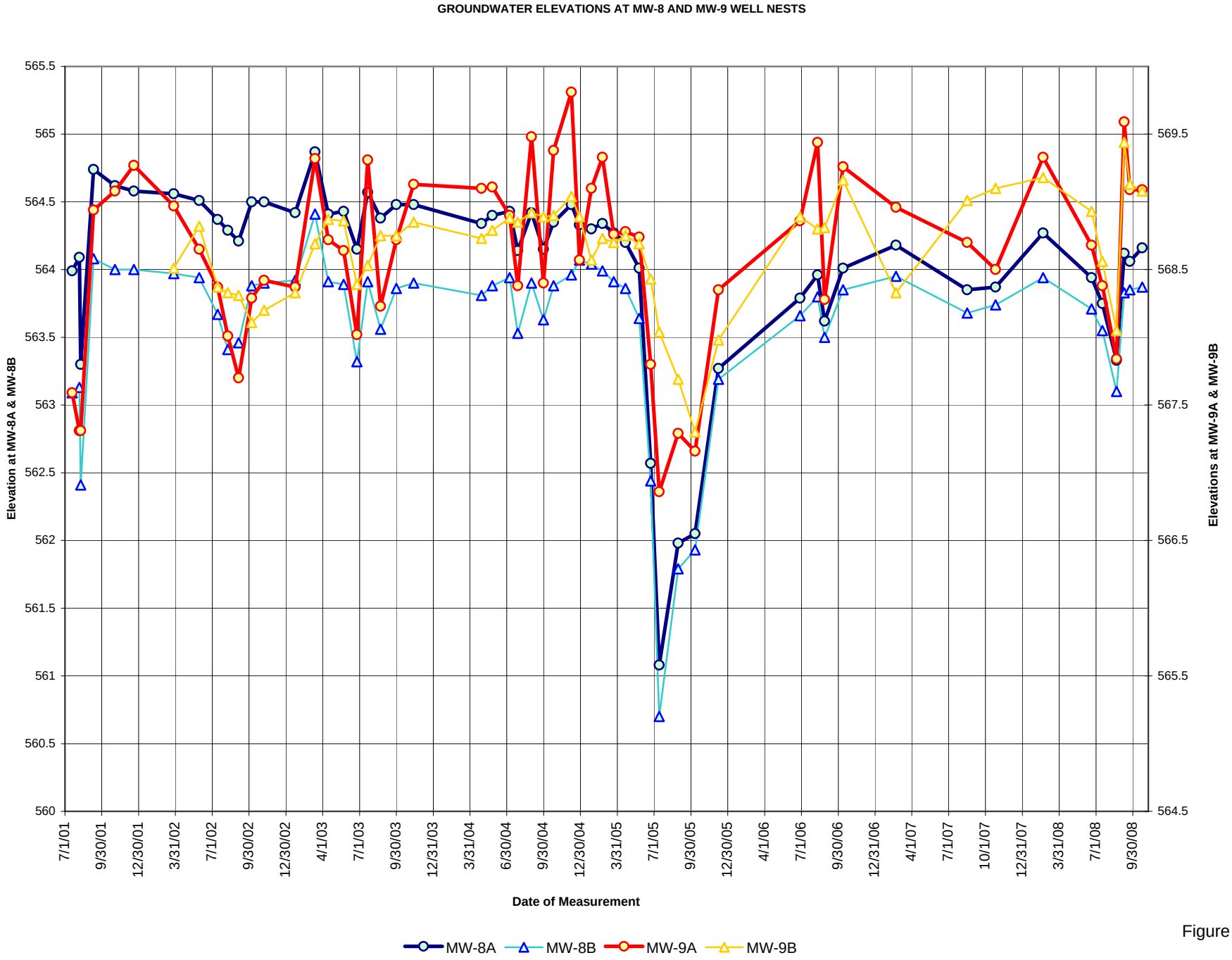
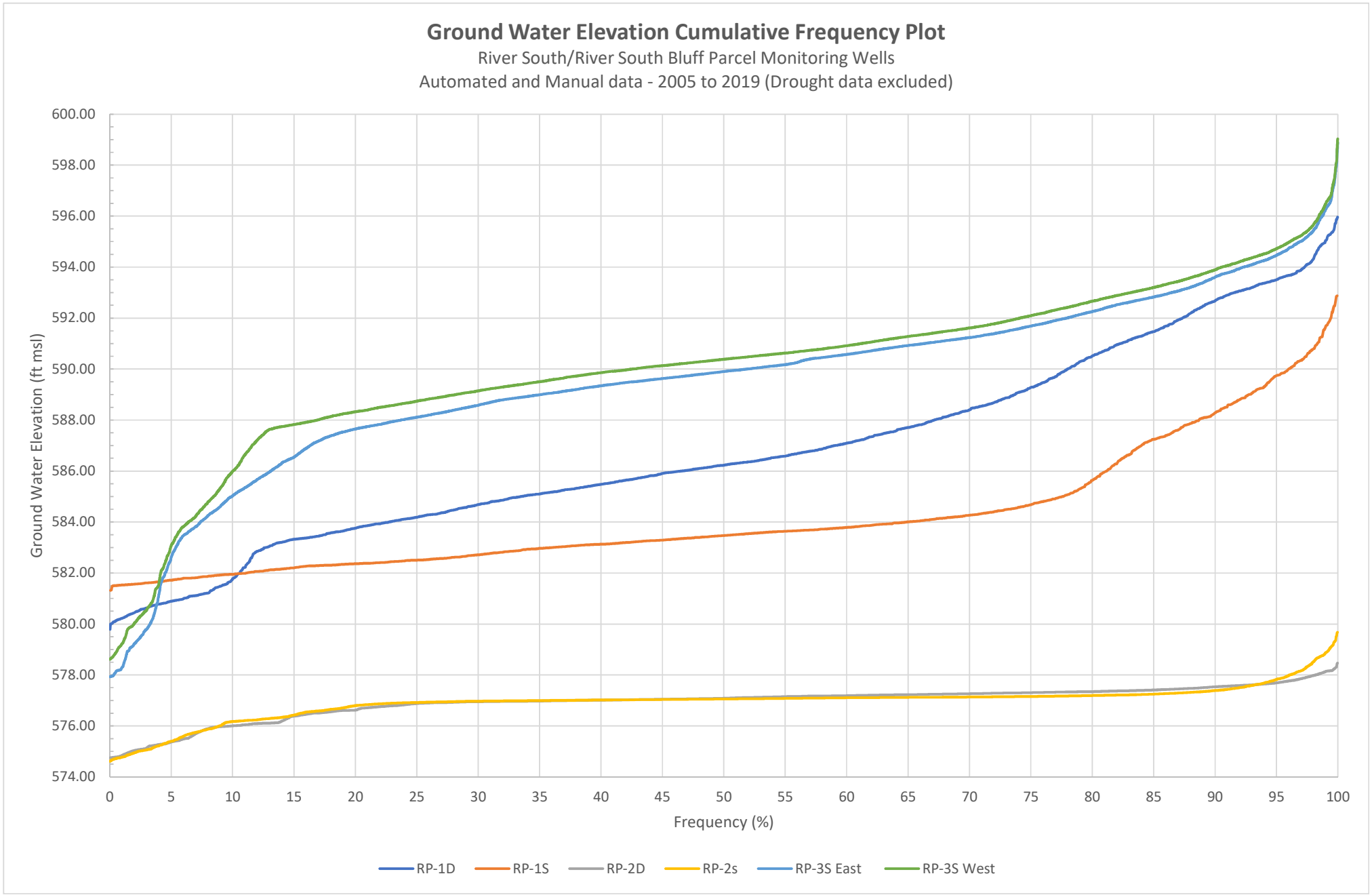

GROUNDWATER ELEVATIONS AT MW-8 AND MW-9 WELL NESTS
Elevation at MW-8A & MW-8B
Elevations at MW-9A & MW-9B
565.5
565
564.5
564
563.5
563
562.5
562
561.5
561
560.5
560
569.5
568.5
567.5
566.5
565.5
564.5
7/1/01
9/30/01
12/30/01
3/31/02
7/1/02
9/30/02
12/30/02
4/1/03
7/1/03
9/30/03
12/31/03
3/31/04
6/30/04
9/30/04
12/30/04
3/31/05
7/1/05
9/30/05
12/30/05
4/1/06
7/1/06
9/30/06
12/31/06
4/1/07
7/1/07
10/1/07
12/31/07
3/31/08
7/1/08
9/30/08
Date of Measurement
MW-8A
MW-8B
MW-9A
MW-9B

Figure 19

Attachment 1-C

Cumulative Frequency Plots

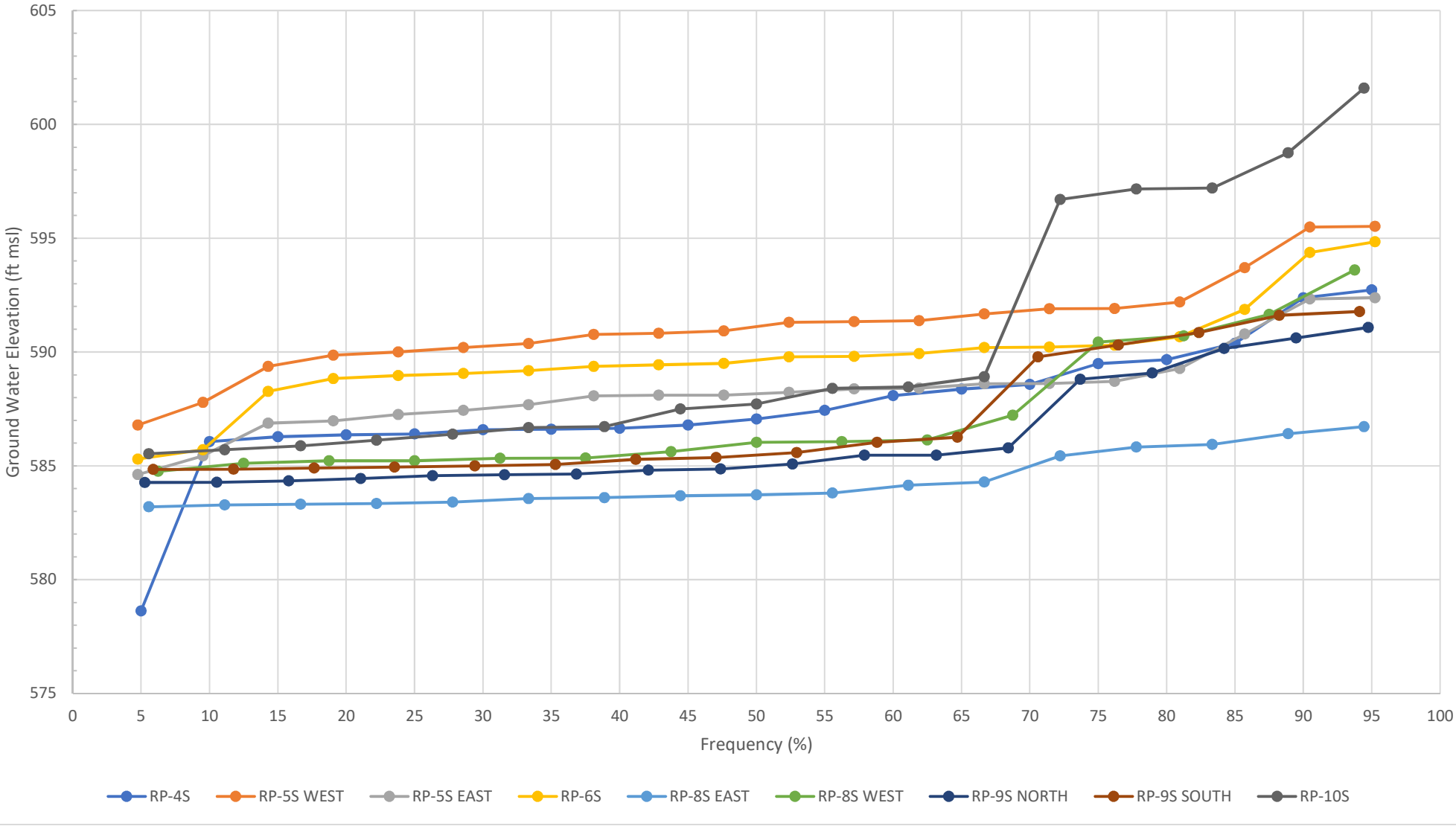


G:\60225330_HMS-Romeoville\2012_HMS\2015_\4\GWMP_Final\2020_Version\Attachment 1 Tables Updated Through Sept 2019

Ground Water Elevation Cumulative Frequency Plot

River South Parcels Monitoring Wells

Manual data - 2013 to 2019

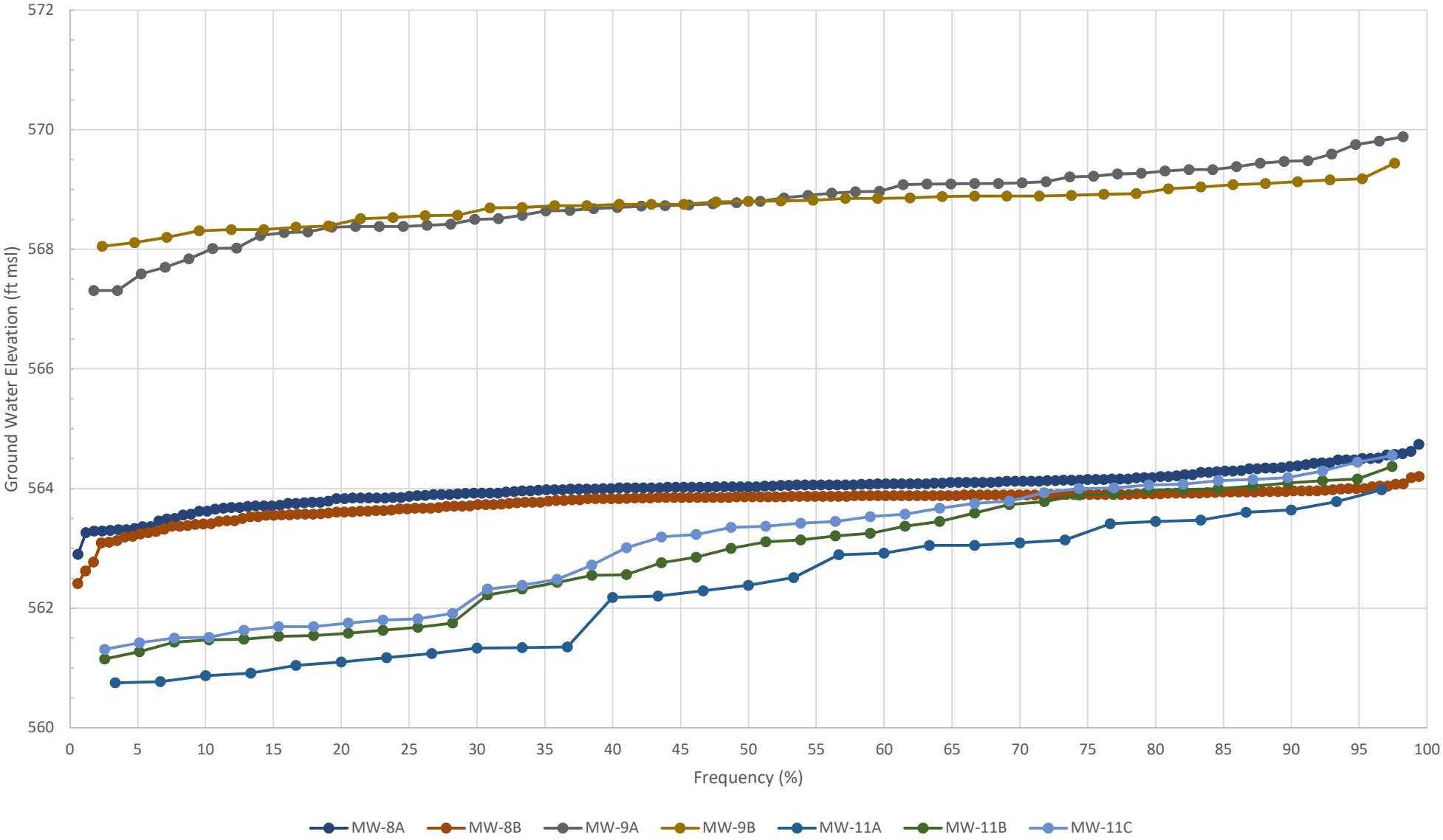


Ground Water Elevation Cumulative Frequency Plot

LPNP Monitoring Wells

Manual data - 2001 to 2019 (drought data excluded)

measurements by consultant, third party consultants and researchers

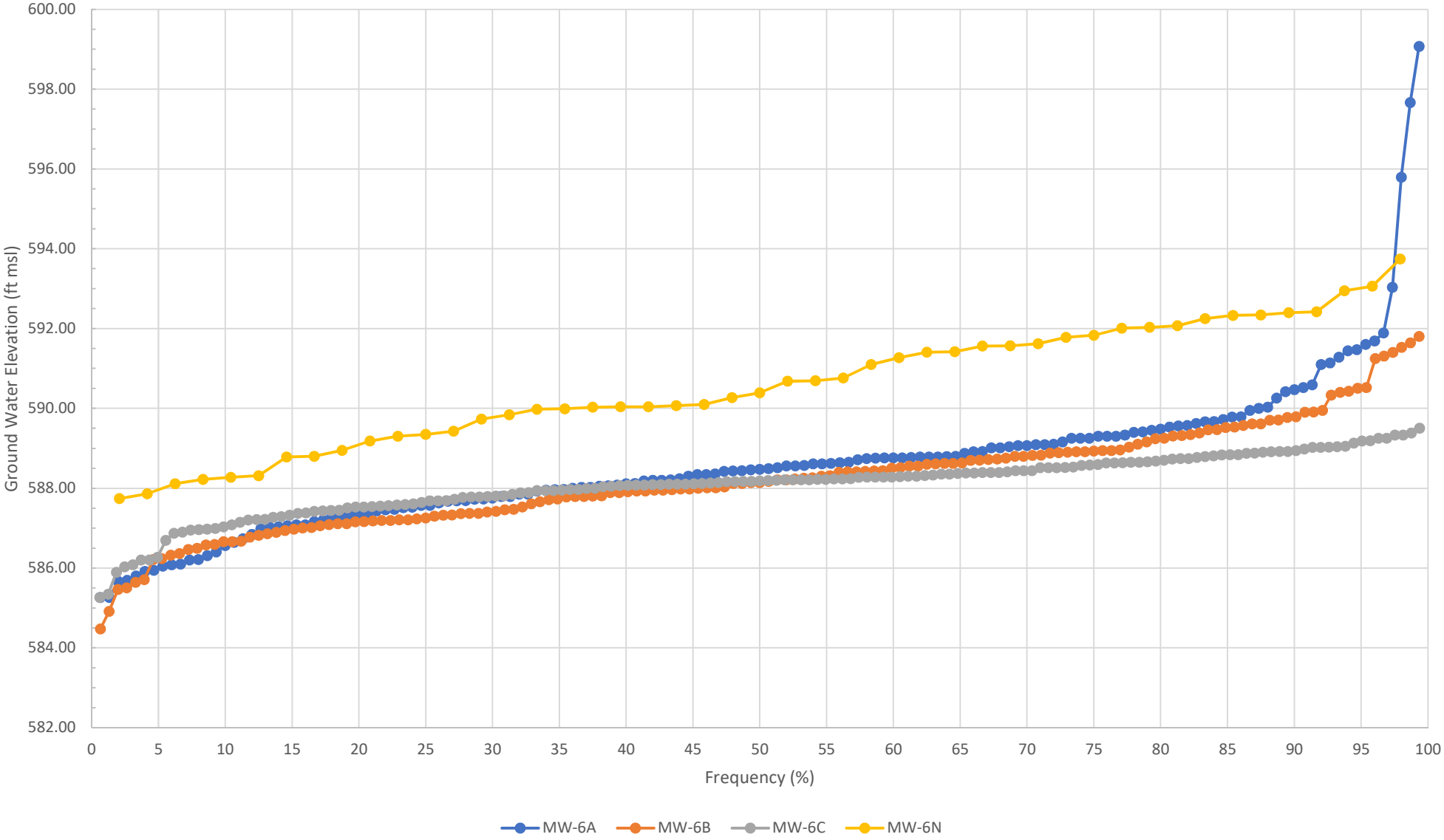


Ground Water Elevation Cumulative Frequency Plot

LPNP Monitoring Wells

Manual data - 2001 to 2019 (drought data excluded)

measurements by consultant, third party consultants and researchers

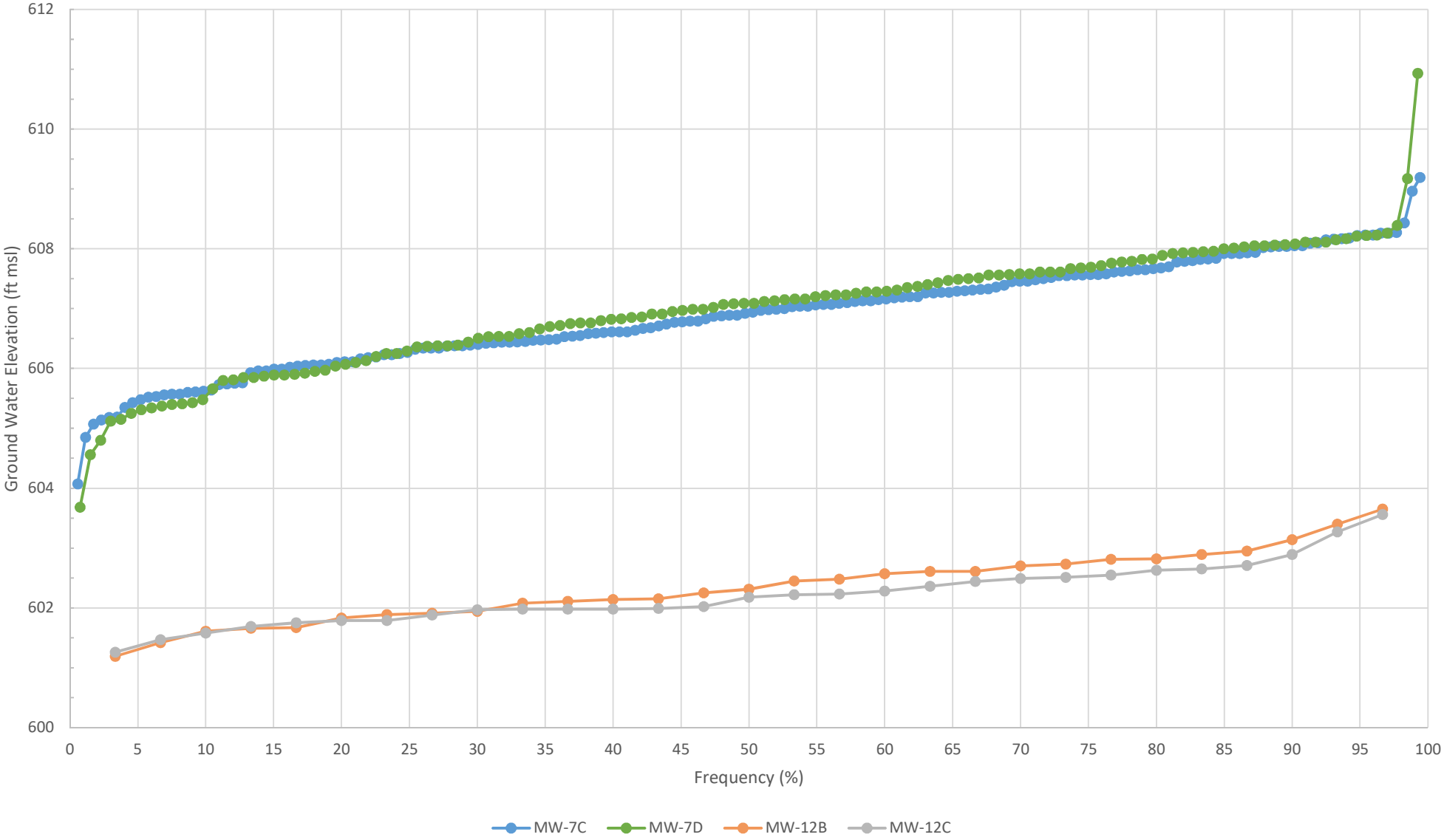


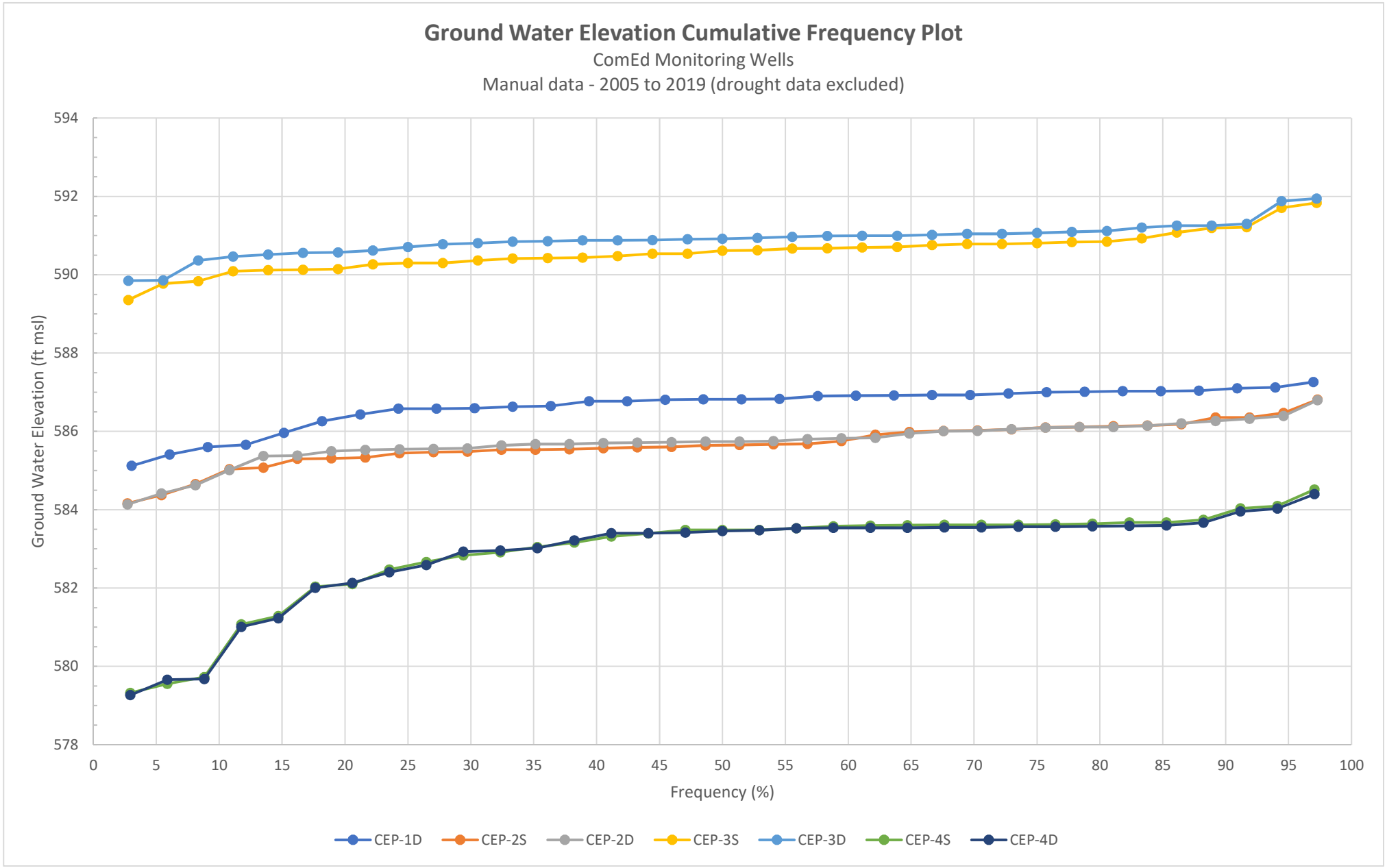
Ground Water Elevation Cumulative Frequency Plot

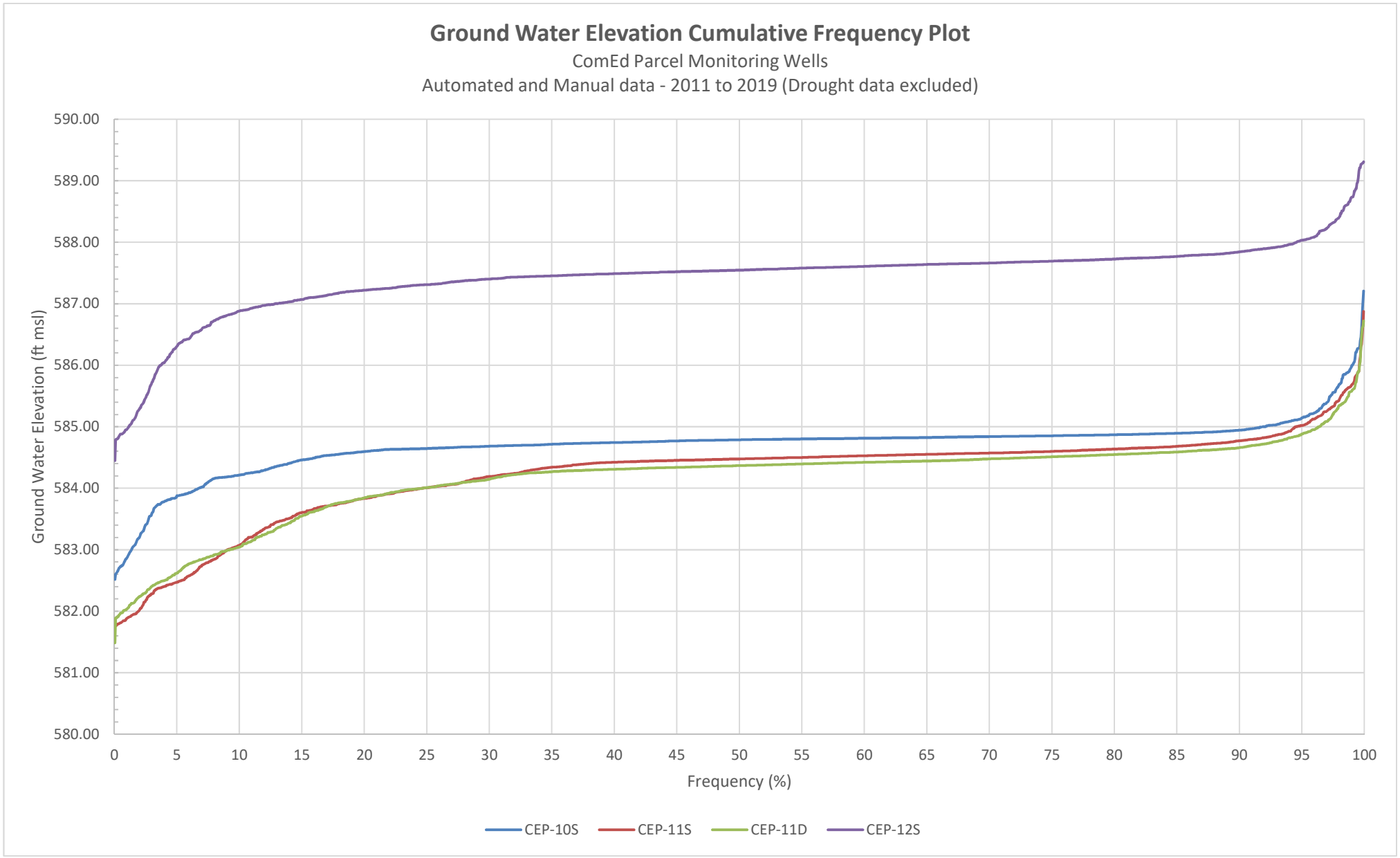
LPNP Monitoring Wells

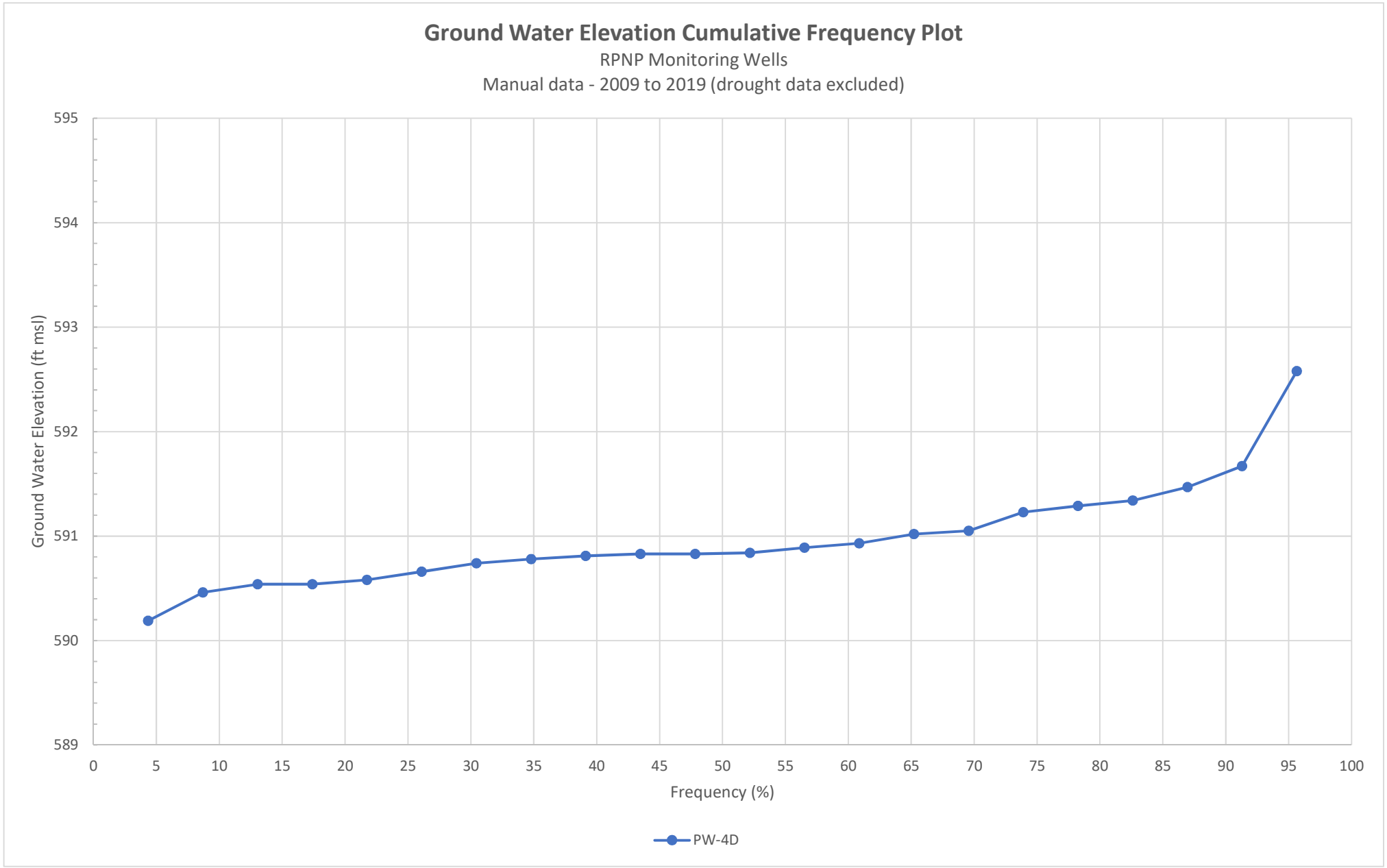
Manual data - 2001 to 2019 (drought data excluded)

measurements by consultant, third party consultants and researchers




Ground Water Elevation Cumulative Frequency Plot
ComEd Monitoring Wells
Manual data - 2005 to 2019 (drought data excluded)
Ground Water Elevation (ft msl)
594
592
590
588
586
584
582
580
578
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Frequency (%)
CEP-1D
CEP-2S
CEP-2D
CEP-3S
CEP-3D
CEP-4S
CEP-4D


Ground Water Elevation Cumulative Frequency Plot
ComEd Parcel Monitoring Wells
Automated and Manual data - 2011 to 2019 (Drought data excluded)
590.00
589.00
588.00
587.00
586.00
585.00
584.00
583.00
582.00
581.00
580.00
Ground Water Elevation (ft msl)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Frequency (%)
CEP-10S
CEP-11S
CEP-11D
CEP-12S


Ground Water Elevation Cumulative Frequency Plot
RPNP Monitoring Wells
Manual data - 2009 to 2019 (drought data excluded)
595
594
593
592
591
590
589
Ground Water Elevation (ft msl)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Frequency (%)
PW-4D

Attachment 1-D

Evaluation of “Background” Conditions in Aquifer

Groundwater Level Monitoring Criterion #3 (Three benchmarks):

3A.) Evaluate head difference and mean levels correlated at specified well pairs
3B.) Evaluate on-going normalized groundwater levels
3C.) Evaluate normalized head differences

Groundwater Level Monitoring Criterion #3A

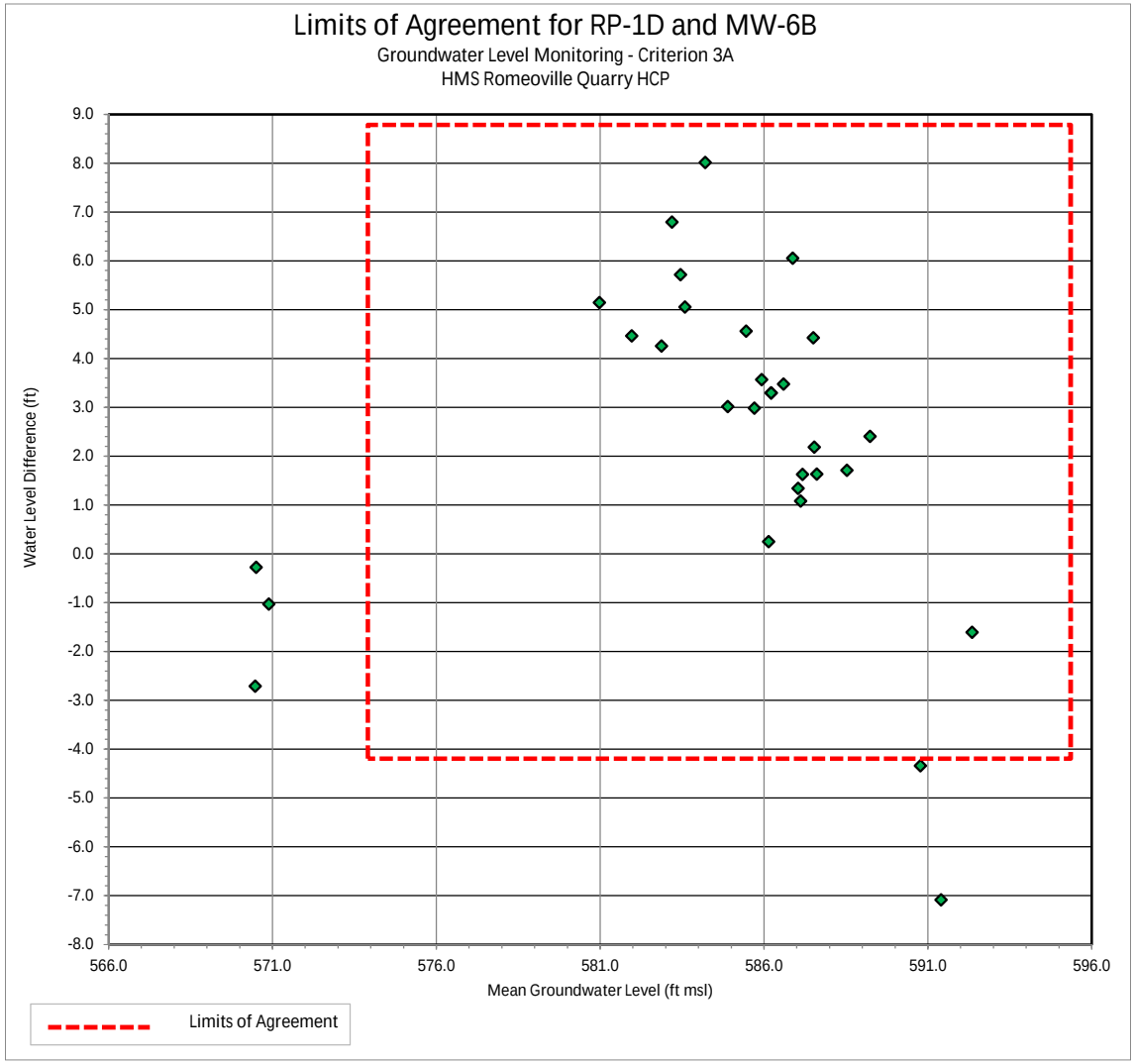
Head difference and mean levels correlated at specified well pairs

CRITERION 3a.) CORRELATED WELL PAIR DATASET

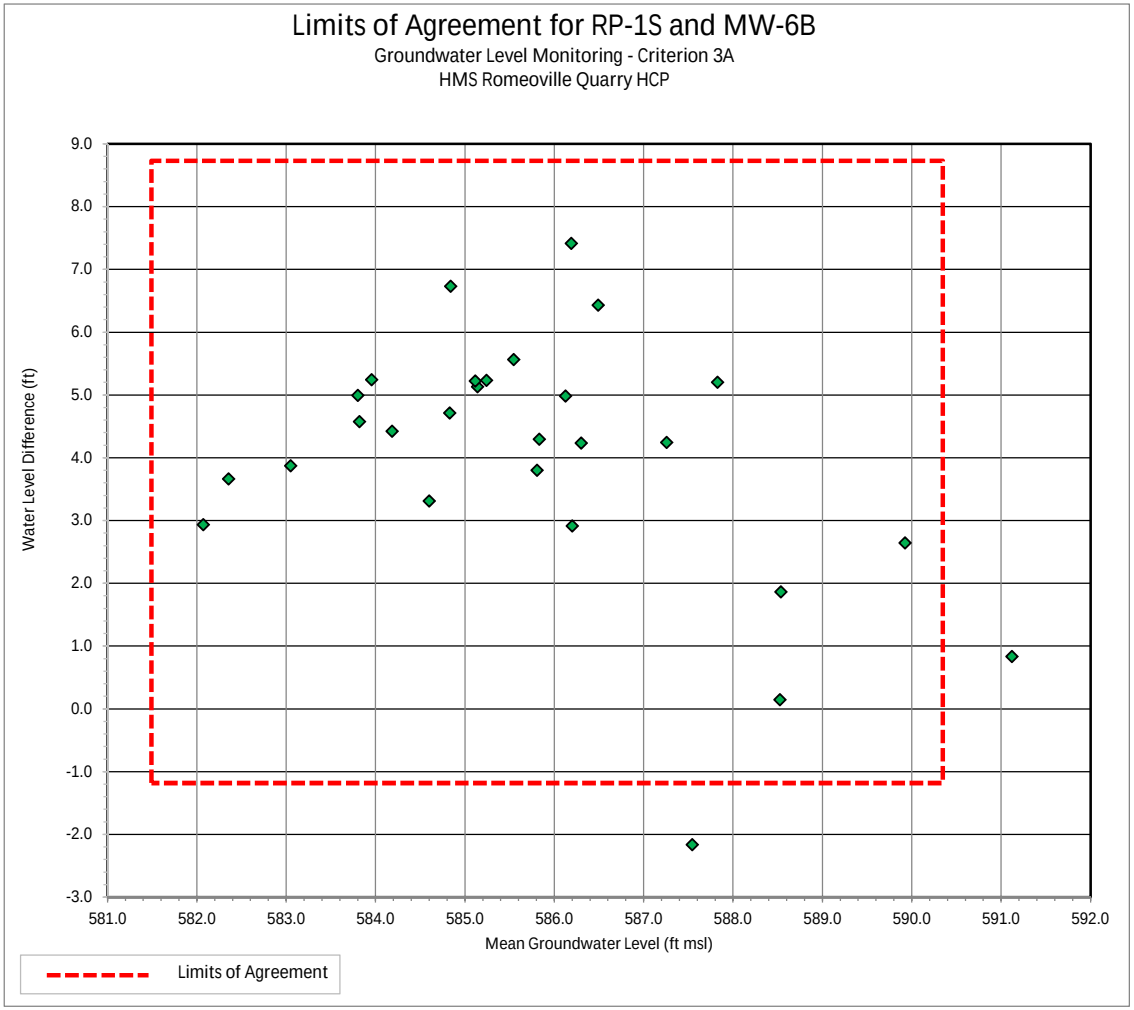
For the On-Going evaluation of head differences and mean levels correlated at specified well pairs

DATE	MW-6B	MW-6C	MW-7C	MW-8B	RP-1S	RP-1D	RP-2S	RP-2D	RP-2S - MW-8B	Mean of Both	RP-2D - MW-8B	Mean of Both	RP-1S - MW-6B	Mean of Both	RP-1D - MW-6B	Mean of Both
30-Aug-05	584.99	585.89	607.43	561.79	581.11	580.74	574.34		12.55	568.07			3.88	583.05	4.25	582.86
11-Oct-05	584.19	584.97	607.22	561.93	580.52	579.73	574.36		12.43	568.15			3.67	582.36	4.46	581.96
8-Dec-05	583.54	583.95	606.83	563.19	580.60	578.40							2.94	582.07	5.14	580.97
13-Oct-06	590.43	587.88	607.46	563.85	585.22	588.03	576.94	576.99	13.09	570.40	13.14	570.42	5.21	587.83	2.40	589.23
21-Feb-07	587.66	588.65	607.57	563.95	584.74	586.58	577.15	577.23	13.20	570.55	13.28	570.59	2.92	586.20	1.08	587.12
21-Feb-08	589.38	588.21	607.07	563.94	585.13	587.67	577.02	577.26	13.08	570.48	13.32	570.60	4.25	587.26	1.71	588.52
17-Jul-08	587.73	589.38	606.79	563.55	582.50	583.17	576.61	576.55	13.06	570.08	13.00	570.05	5.23	585.12	4.56	585.45
21-Aug-08	586.58	587.68	604.85	563.1	581.33	579.79	575.55	575.57	12.45	569.33	12.47	569.33	5.25	583.96	6.79	583.18
24-Oct-08	588.21	588.28	606.34	563.87	581.47	580.20	576.72	576.57	12.85	570.30	12.70	570.22	6.74	584.84	8.01	584.20
21-Oct-09	586.47	587.08	606.18	563.57	588.62	589.18	577.72	577.36	14.15	570.65	13.79	570.46	-2.16	587.54	-2.71	570.46
3-Mar-10	587.71	588.3	607.65	563.98	583.90	586.37	577.11	577.25	13.13	570.55	13.27	570.61	3.81	585.81	1.34	587.04
14-Apr-10	588.42	588.41	607.84	563.87	584.18	586.79	577.00	577.16	13.13	570.44	13.29	570.51	4.24	586.30	1.63	587.60
11-Aug-10	591.25	588.9	607.82	563.88	588.60	591.53	577.05	577.11	13.17	570.47	13.23	570.49	2.65	589.93	-0.28	570.49
28-Mar-11	589.9	588.51	607.13	563.95	582.48	583.85	577.13	577.24	13.18	570.54	13.29	570.59	7.42	586.19	6.05	586.87
25-Apr-11	589.47	588.63	607.57	563.9	587.60	590.50	577.12	577.88	13.22	570.51	13.98	570.89	1.87	588.54	-1.03	570.89
5-Jul-11	589.71	589.33	606.55	563.59	583.27	585.29	576.77	577.02	13.18	570.18	13.43	570.30	6.44	586.49	4.42	587.50
4-Oct-11	587.19	587.81	605.57	563.77	582.47	584.21	576.98	577.08	13.21	570.38	13.31	570.42	4.72	584.83	2.98	585.70
13-Dec-11	588.62	587.69	606.39	563.89	583.63	586.44	577.15	577.31	13.26	570.52	13.42	570.60	4.99	586.13	2.18	587.53
27-Mar-12	587.98	588.17	607.19	563.89	583.68	586.36	577.09	577.27	13.20	570.49	13.38	570.58	4.30	585.83	1.62	587.17
18-Jul-12	586.11	587.19	605.25	561.06	581.53	581.06	574.92	575.27	13.86	567.99	14.21	568.16	4.58	583.82	5.05	583.58
15-Oct-12	586.4	586	605.63	563.86	581.97	583.39	576.43	576.25	12.57	570.15	12.39	570.05	4.43	584.19	3.01	584.89
29-Nov-12	586.3	585.66	606.16		581.30	580.59	576.42	576.50					5.00	583.80	5.71	583.44
28-Apr-13		588.92	606.97	563.91		594.76										
13-May-13		589.19	606.74	563.89	583.01	585.13										
27-May-13		589.02	606.42	563.96	583.68	586.36	577.09	577.27	13.13	570.53	13.31	570.61				
15-Jul-13		588.44	605.73	563.46	582.21	583.33	576.35	576.90	12.89	569.91	13.44	570.18				
12-Aug-13		587.89	605.6	563.28	581.31	580.90										
28-Oct-13		585.89	605.43	563.67	585.89	590.04	577.01	577.14	13.34	570.34	13.47	570.40				
2-Mar-16	587.86	588.49	607.26	563.86	582.62	584.57	577.11	577.31	13.25	570.49	13.45	570.58	5.24	585.24	3.29	586.21
19-Jan-17	588.60		607.33		588.45	592.94	577.04	577.12					0.15	588.53	-4.34	590.77
21-Apr-17	589.47		607.94													
24-Jul-17	587.85		605.76	563.87	592.23	594.94							-4.38	590.04	-7.09	591.39
12-Oct-17	586.26		605.07		582.94	586.01	577.03	576.38					3.32	584.60	0.25	586.13
28-Feb-18	591.54		607.16	564.13	590.70	593.15	577.36	577.82	13.23	570.75	13.69	570.97	0.84	591.12	-1.61	592.34
7-May-18	588.33		606.89	563.83	582.76	584.86	577.11	577.35	13.28	570.47	13.52	570.59	5.57	585.55	3.47	586.59
6-Aug-18	587.71		605.62	563.15	582.57	584.14							5.14	585.14	3.57	585.92

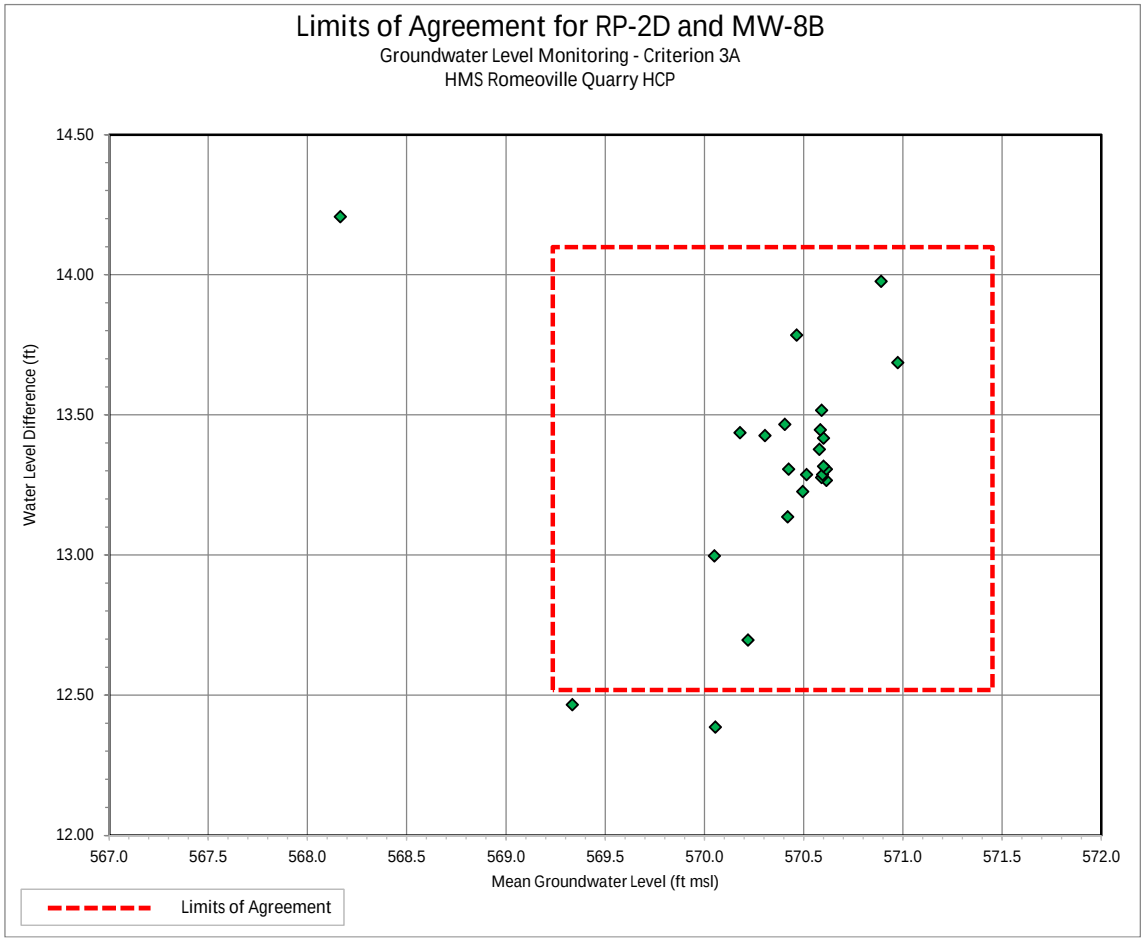
	Difference between RP-1D and MW-6B (ft)		Mean of RP-1D and MW-6B (ft msl)	
	-7.09		591.39	
	-4.34		590.77	
	-2.71		570.46	
	-1.61		592.34	
	-1.03		570.89	
	-0.28		570.49	
	0.25		586.13	
	1.08		587.12	
	1.34		587.04	
	1.62		587.17	
	1.63		587.60	
	1.71		588.52	
	2.18		587.53	
	2.40		589.23	
	2.98		585.70	
	3.01		584.89	
	3.29		586.21	
	3.29		586.21	
	3.47		586.59	
	3.57		585.92	
	4.25		582.86	
	4.42		587.50	
	4.46		581.96	
	4.56		585.45	
	5.05		583.58	
	5.14		580.97	
	5.71		583.44	
	6.05		586.87	
	6.79		583.18	
	8.01		584.20	
Mean	2.31		584.74	
Sta Dev.S	3.30		5.45	
Limits of Agreement (-)	-4.16		574.07	
Limits of Agreement (+)	8.78		595.42	
Standard Error:	2.02		3.33	
Standard Error on Limits of Agreement (-)	-6.18	-2.14	570.73	577.40
Standard Error on Limits of Agreement (+)	6.76	10.81	592.08	598.75



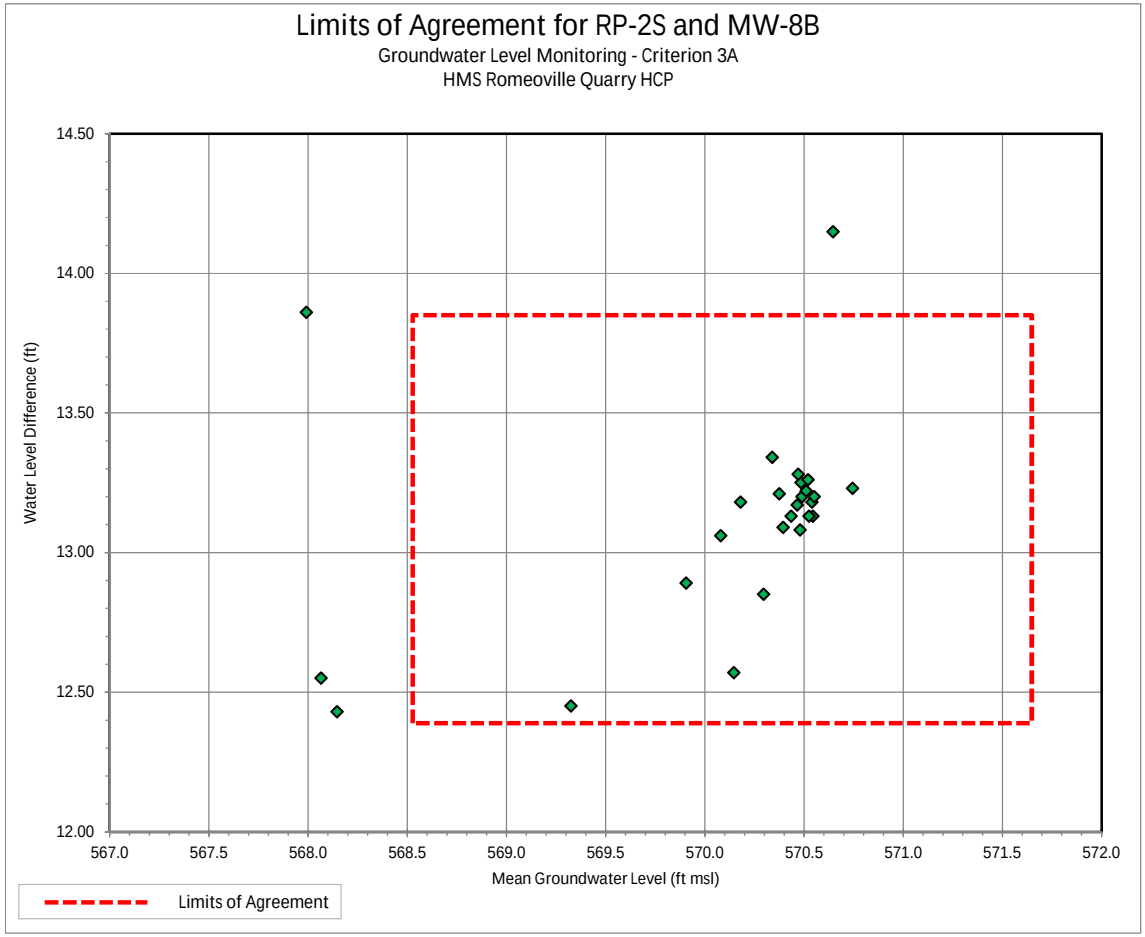
	Difference between RP-1S and MW-6B (ft)		Mean of RP-1S and MW-6B (ft msl)	
	-4.38		590.04	
	-2.16		587.54	
	0.15		588.53	
	0.84		591.12	
	1.87		588.54	
	2.65		589.93	
	2.92		586.20	
	2.94		582.07	
	3.32		584.60	
	3.67		582.36	
	3.81		585.81	
	3.88		583.05	
	4.24		586.30	
	4.25		587.26	
	4.30		585.83	
	4.43		584.19	
	4.58		583.82	
	4.72		584.83	
	4.99		586.13	
	5.00		583.80	
	5.14		585.14	
	5.21		587.83	
	5.23		585.12	
	5.24		585.24	
	5.25		583.96	
	5.57		585.55	
	6.44		586.49	
	6.74		584.84	
	7.42		586.19	
Mean	3.73		585.94	
Sta Dev.S	2.52		2.24	
Limits of Agreement (-)	-1.22		581.56	
Limits of Agreement (+)	8.68		590.32	
Standard Error:	1.57		1.39	
Standard Error on Limits of Agreement (-)	-2.79	0.35	580.17	582.95
Standard Error on Limits of Agreement (+)	7.11	10.25	588.93	591.71



	Difference between RP-2D and MW-8B (ft)		Mean of RP-2D and MW-8B (ft msl)	
	12.39		570.05	
	12.47		569.33	
	12.70		570.22	
	13.00		570.05	
	13.14		570.42	
	13.23		570.49	
	13.27		570.61	
	13.28		570.59	
	13.29		570.51	
	13.29		570.59	
	13.31		570.42	
	13.31		570.61	
	13.32		570.60	
	13.38		570.58	
	13.42		570.60	
	13.43		570.30	
	13.44		570.18	
	13.45		570.58	
	13.47		570.40	
	13.52		570.59	
	13.69		570.97	
	13.79		570.46	
	13.98		570.89	
	14.21		568.16	
Mean	13.32		570.34	
Sta Dev.S	0.41		0.56	
Limits of Agreement (-)	12.52		569.24	
Limits of Agreement (+)	14.12		571.45	
Standard Error:	0.28		0.39	
Standard Error on Limits of Agreement (-)	12.24	12.80	568.85	569.62
Standard Error on Limits of Agreement (+)	13.84	14.40	571.06	571.84



	Difference between RP-2S and MW-8B (ft)		Mean of RP-2S and MW-8B (ft msl)	
	12.43		568.15	
	12.45		569.33	
	12.55		568.07	
	12.57		570.15	
	12.85		570.30	
	12.89		569.91	
	13.06		570.08	
	13.08		570.48	
	13.09		570.40	
	13.13		570.55	
	13.13		570.44	
	13.13		570.53	
	13.17		570.47	
	13.18		570.54	
	13.18		570.18	
	13.20		570.55	
	13.20		570.49	
	13.21		570.38	
	13.22		570.51	
	13.23		570.75	
	13.25		570.49	
	13.26		570.52	
	13.28		570.47	
	13.34		570.34	
	13.86		567.99	
	14.15		570.65	
Mean	13.12		570.10	
Sta Dev.S	0.37		0.80	
Limits of Agreement (-)	12.39		568.53	
Limits of Agreement (+)	13.85		571.67	
Standard Error:	0.24		0.53	
Standard Error on Limits of Agreement (-)	12.15	12.64	568.01	569.06
Standard Error on Limits of Agreement (+)	13.60	14.09	571.14	572.19



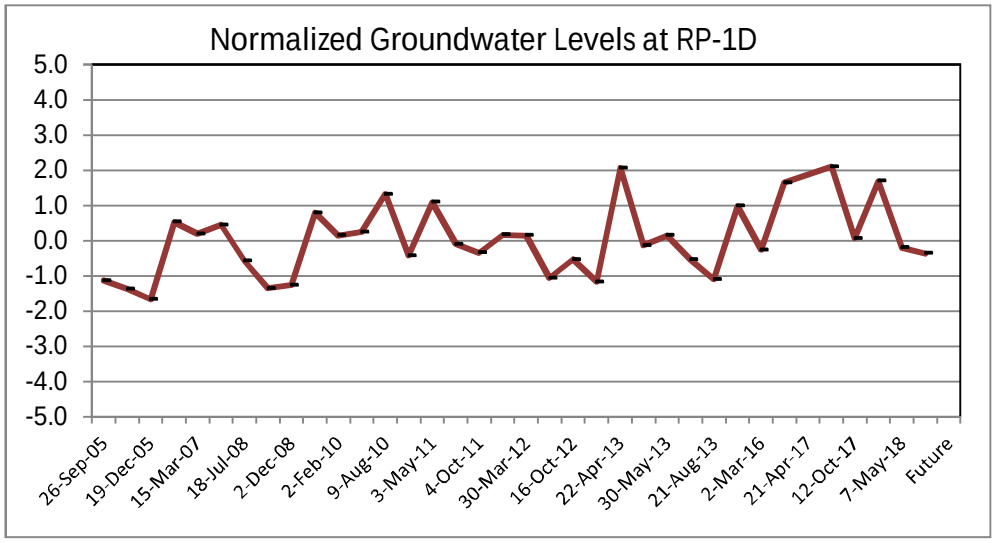
AECOM

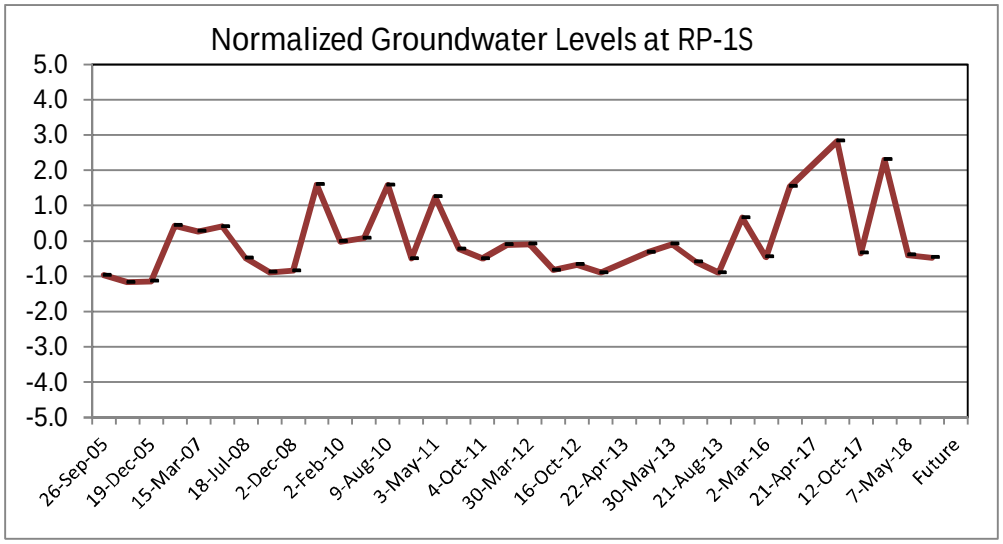
Groundwater Level Monitoring Criterion #3B

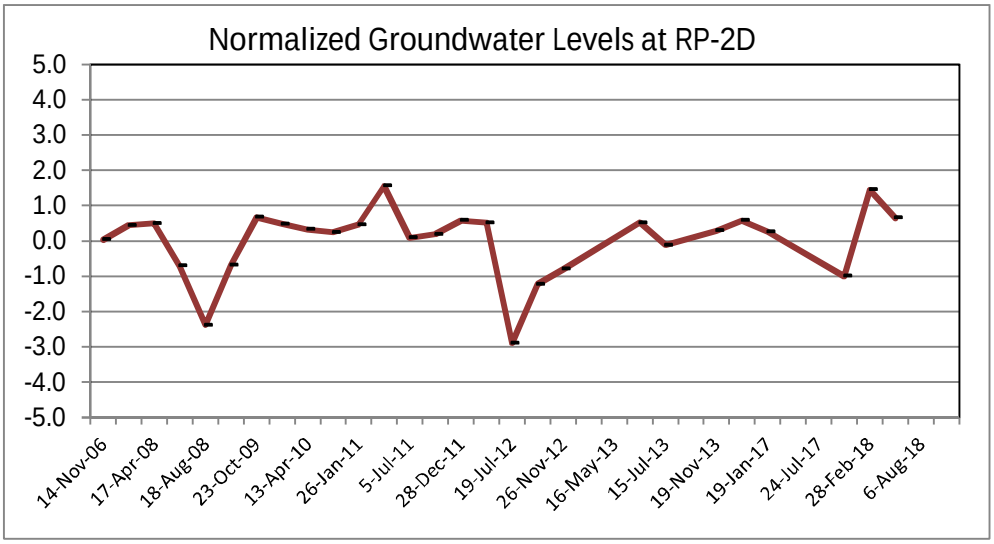
Evaluation of On-going Normalized Groundwater Levels

Evaluation of Aquifer Background Conditions

Normalized Data Plots

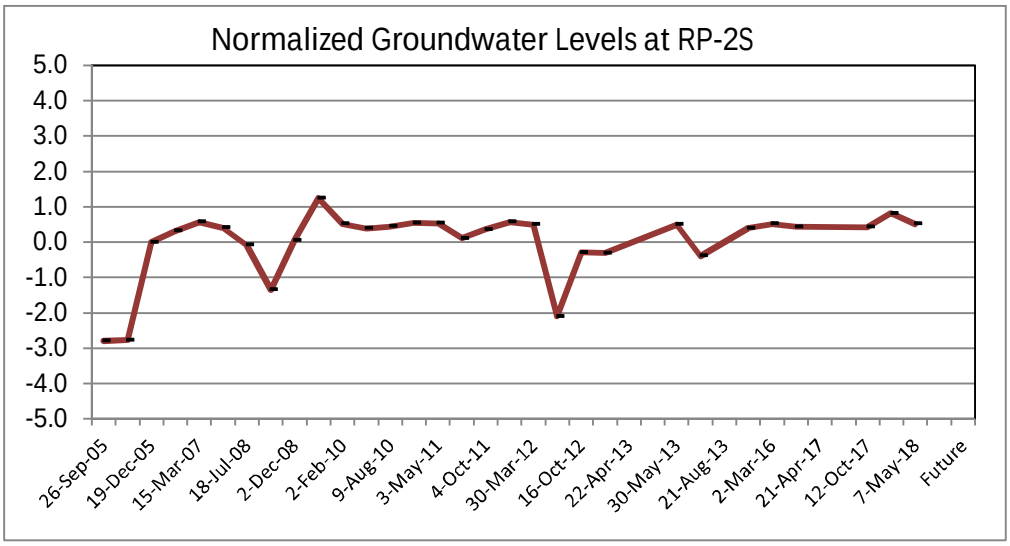


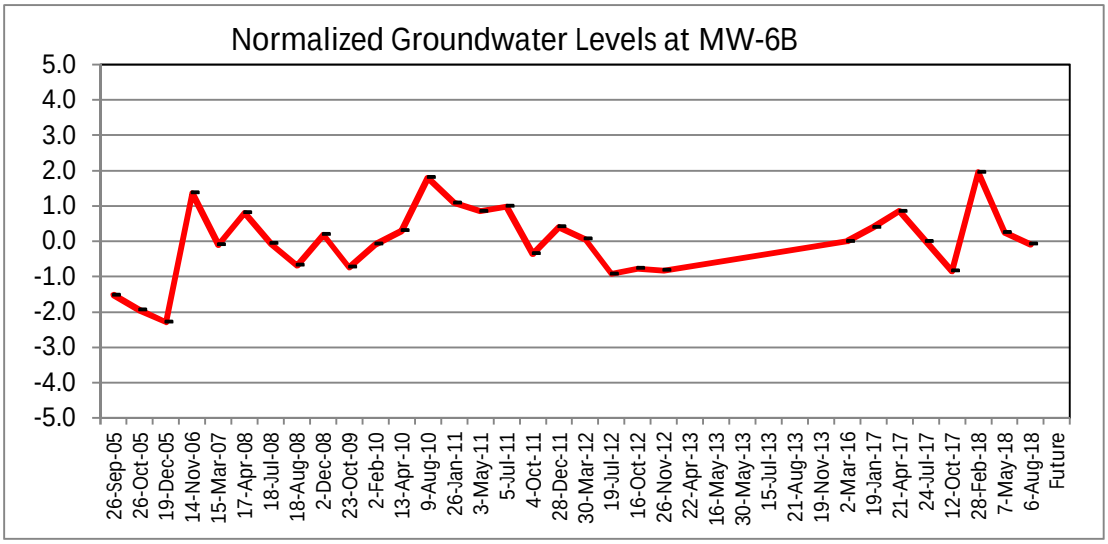


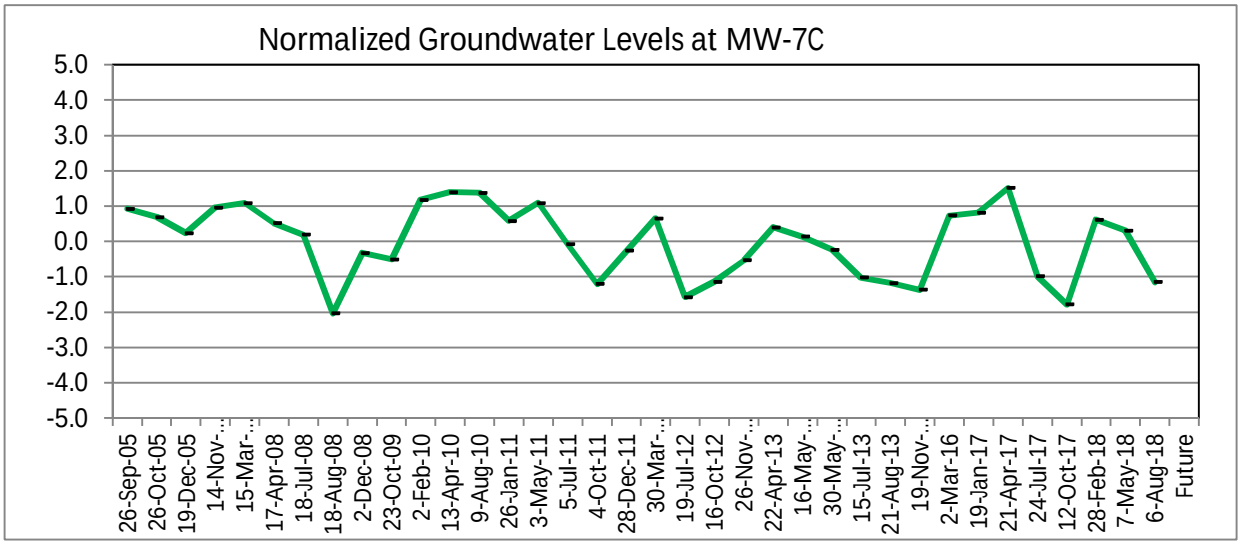


Evaluation of Aquifer Background Conditions

Normalized Data Plots

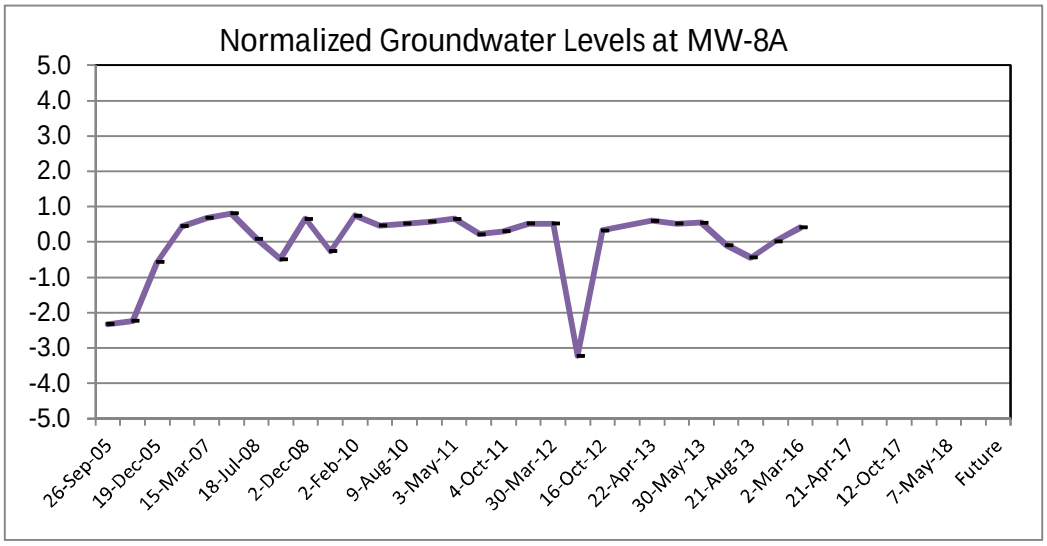


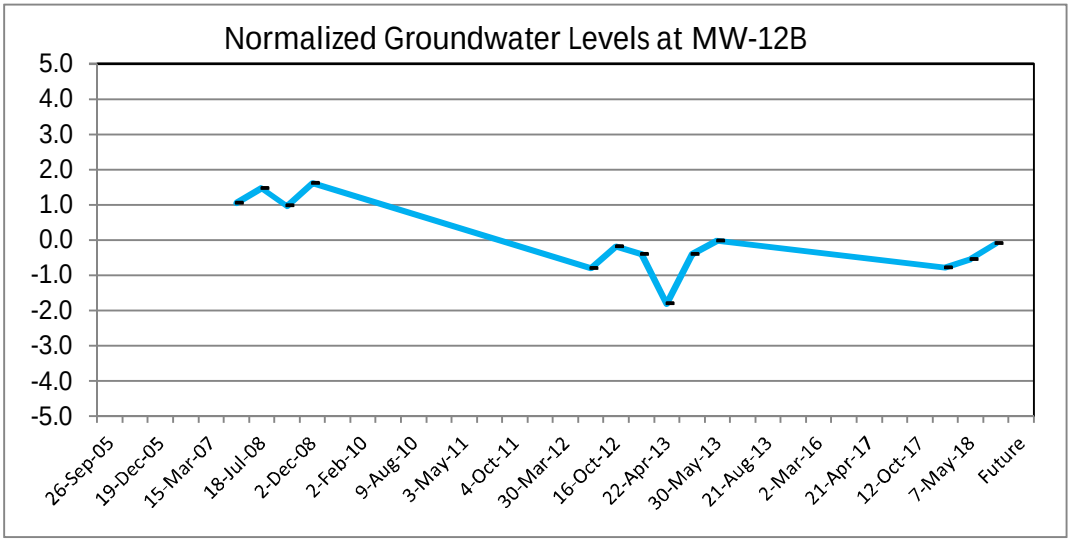


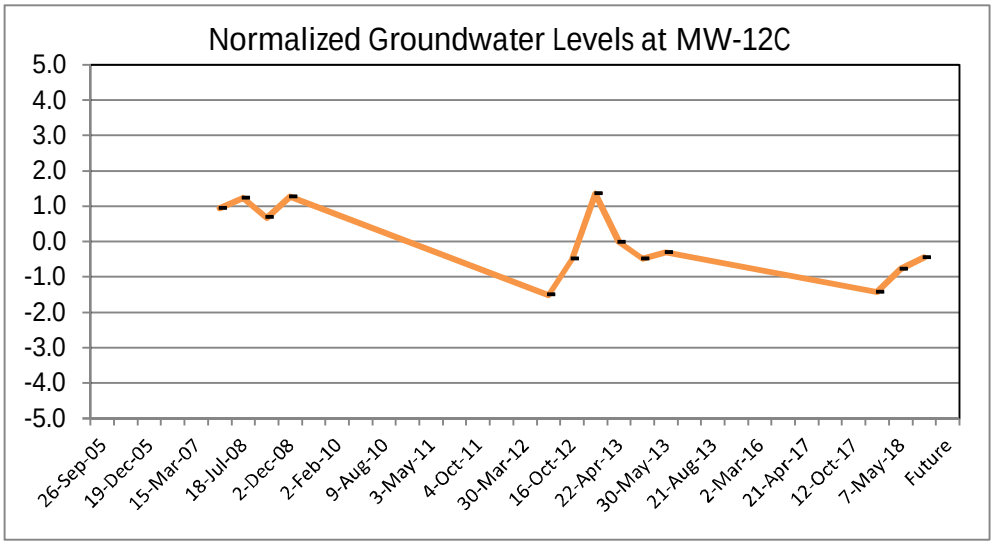


Evaluation of Aquifer Background Conditions

Normalized Data Plots







AECOM

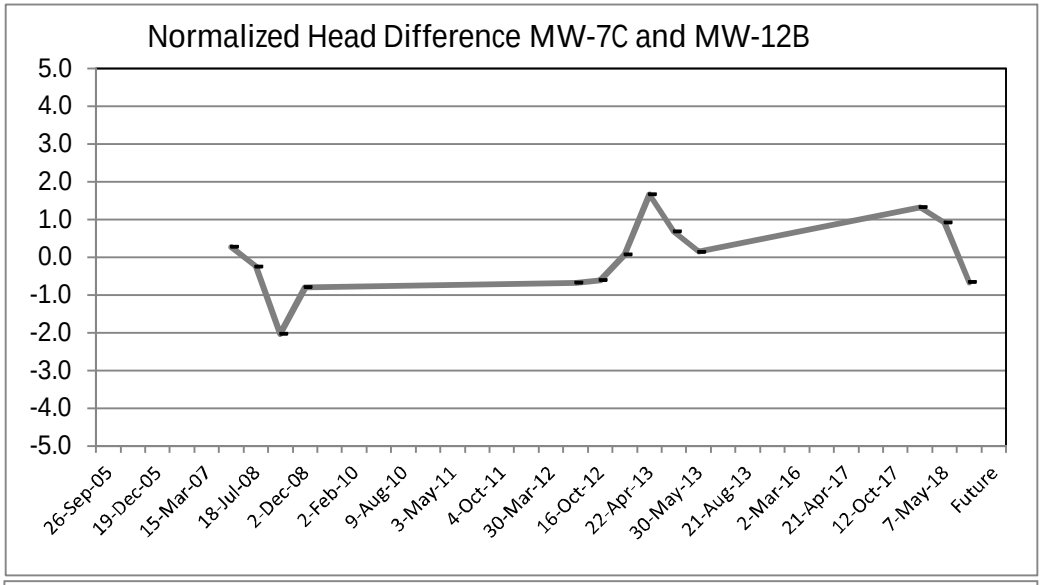
Groundwater Level Monitoring Criterion #3C

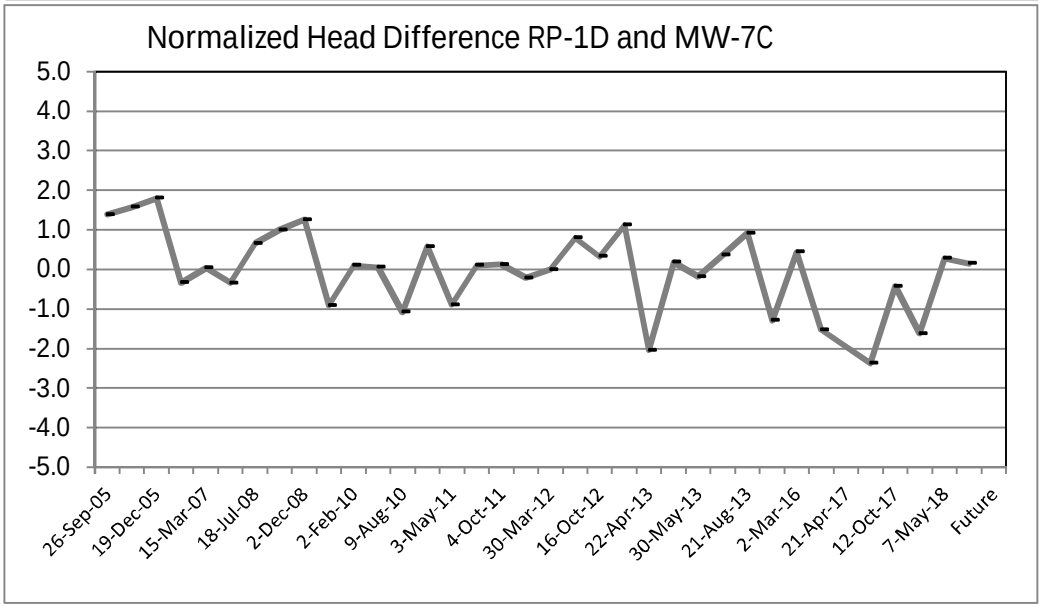
Normalized Differences in Groundwater Elevations

AECOM

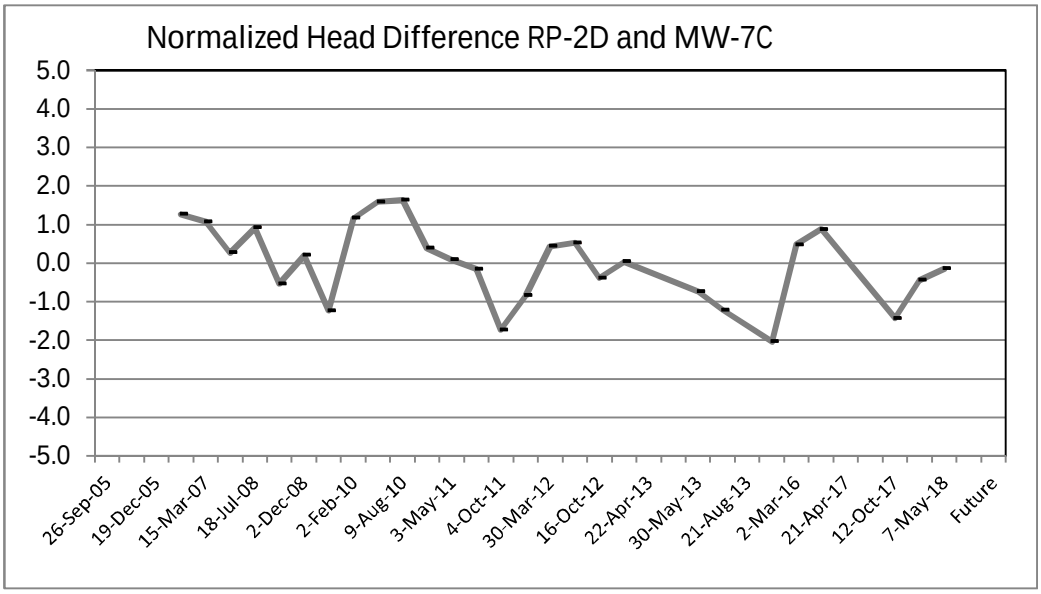
Normalized Head Differences at Well Pairs for use in Routine Monitoring

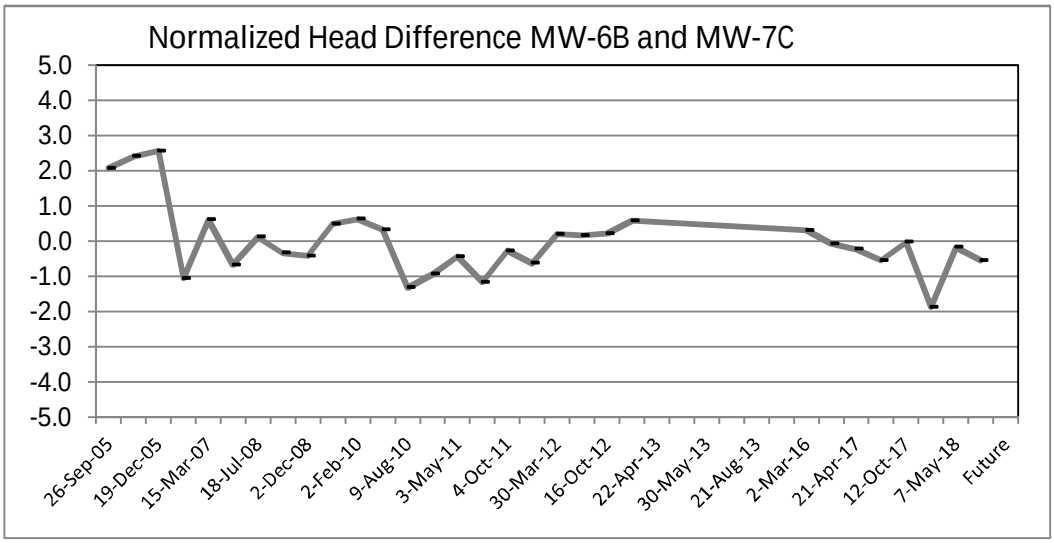
Evaluation of Aquifer Background Conditions - Groundwater Monitoring Criterion #3C: Evaluation of Normalized Head Differences for Routine Monitoring



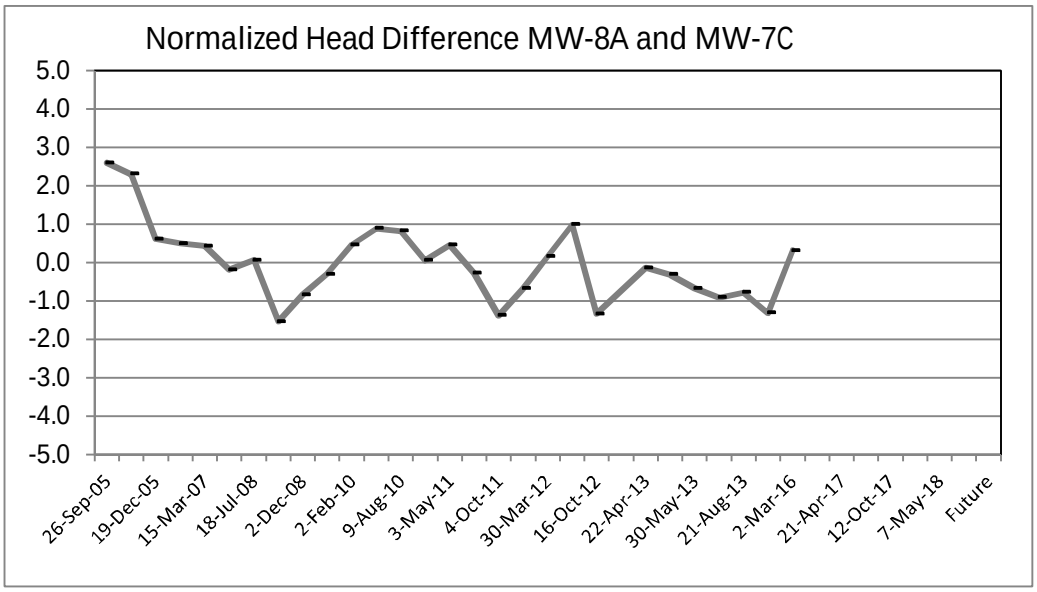


Evaluation of Aquifer Background Conditions - Groundwater Monitoring Criterion #3C: Evaluation of Normalized Head Differences for Routine Monitoring



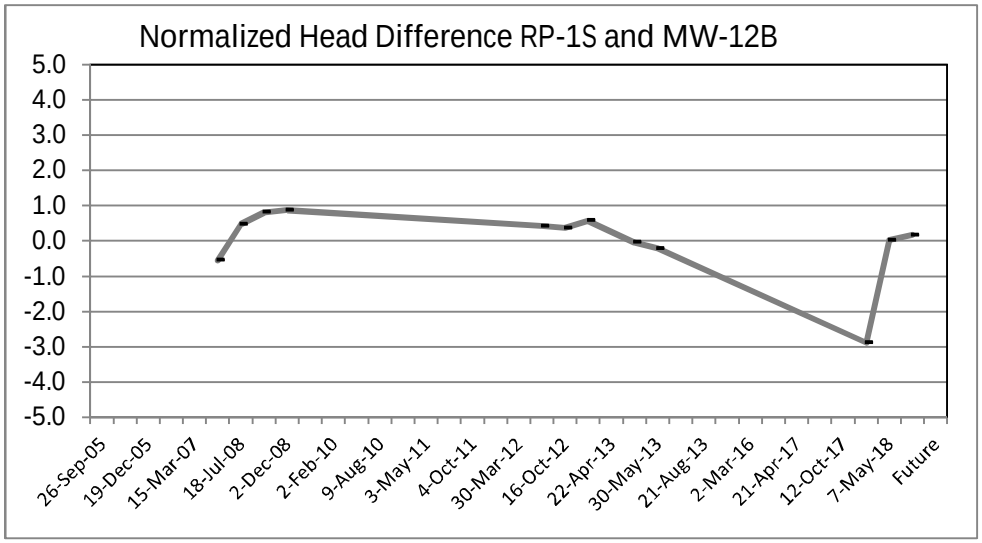


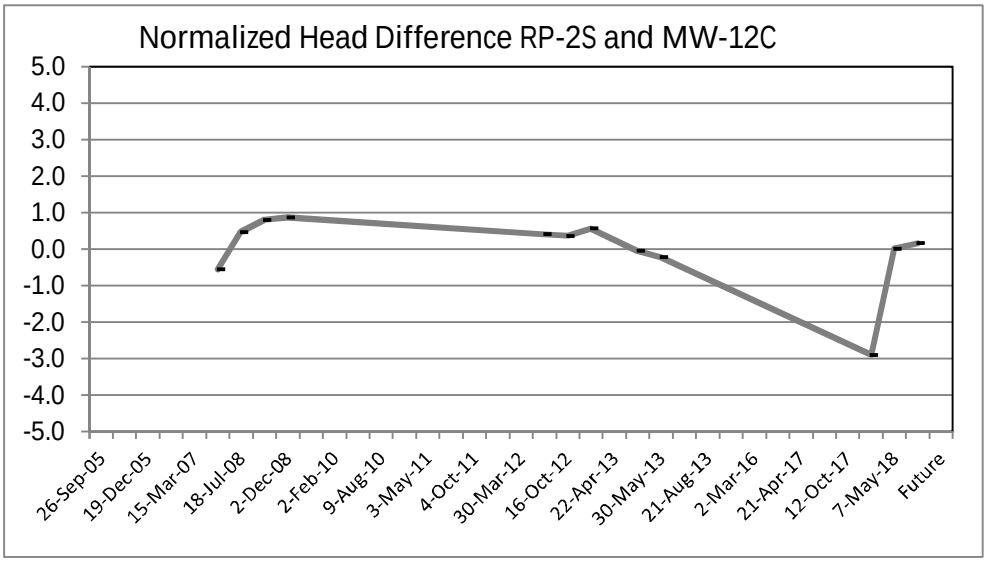
Evaluation of Aquifer Background Conditions - Groundwater Monitoring Criterion #3C: Evaluation of Normalized Head Differences for Routine Monitoring



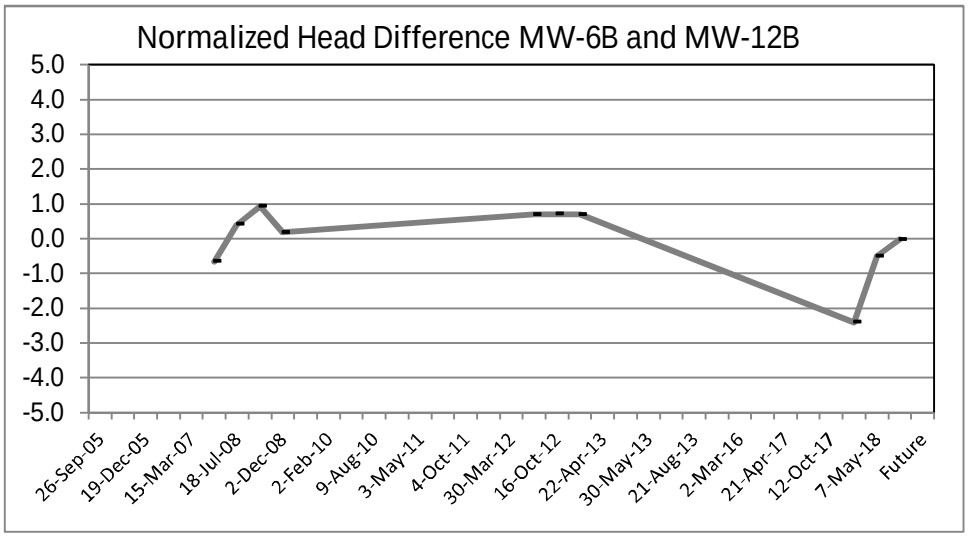
Background of Normalized Head Differences at Different Well Pairs for use in Assessment Monitoring (if needed)

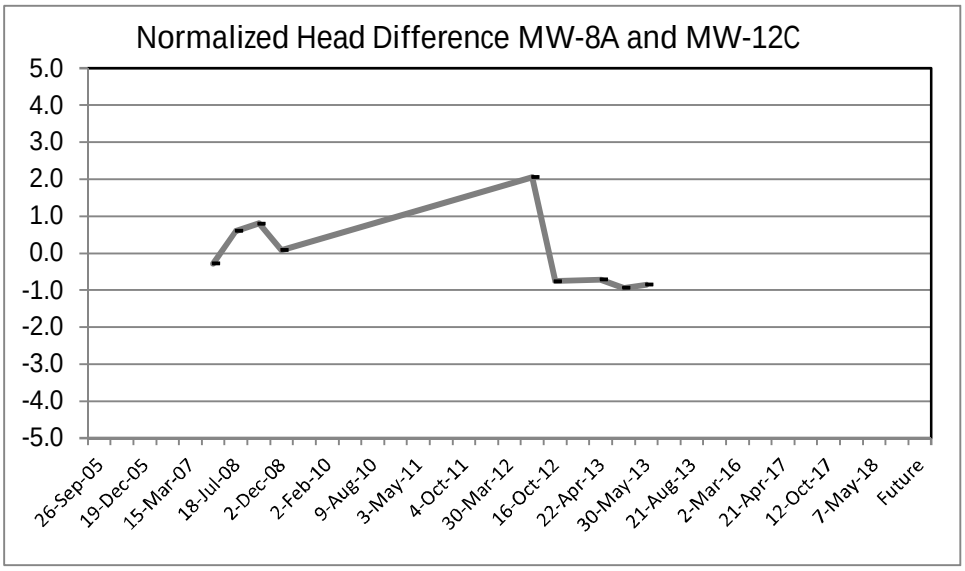
Evaluation of Aquifer Background Conditions in Assessment - Groundwater Monitoring Criterion #3C: Evaluation of Normalized Head Differences for Assessment Monitoring ***(If Needed)***





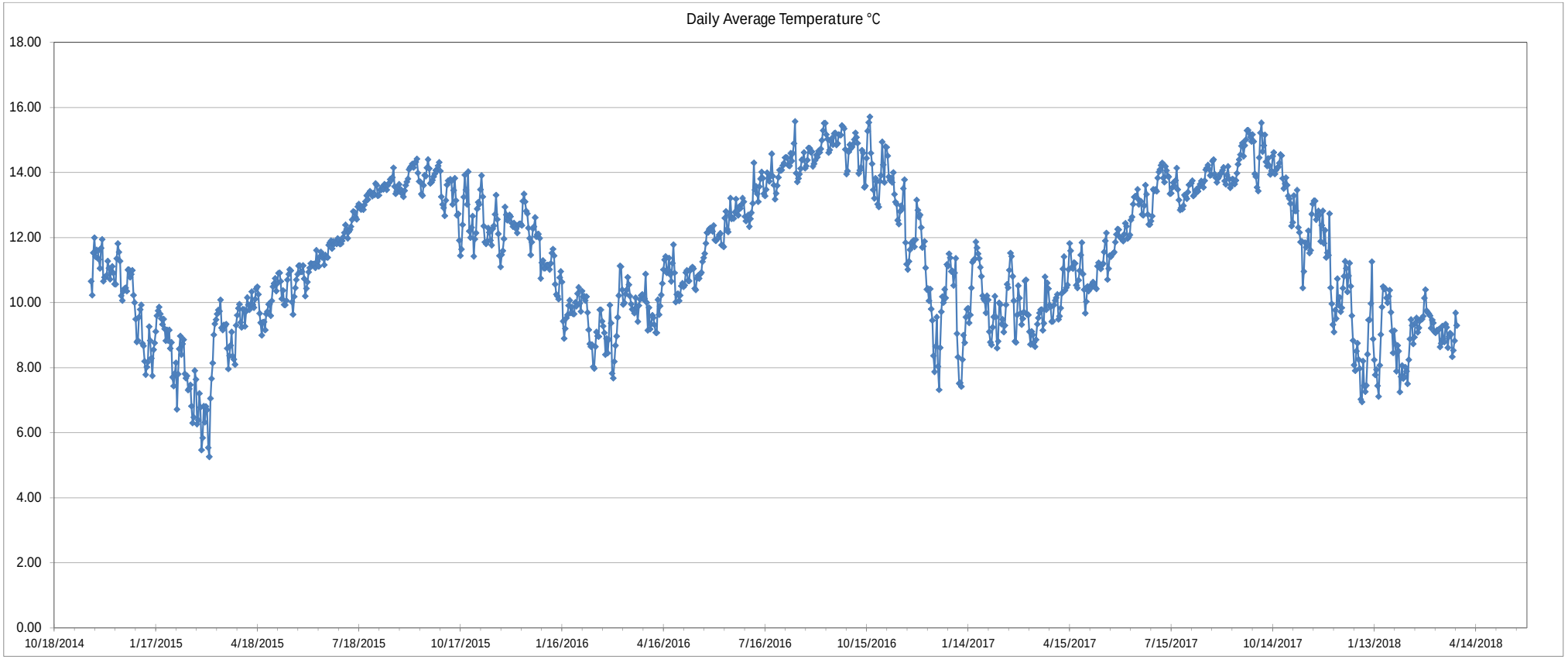
Evaluation of Aquifer Background Conditions in Assessment - Groundwater Monitoring Criterion #3C: Evaluation of Normalized Head Differences for Assessment Monitoring ***(If Needed)***





Attachment 1-E

Seep W-1 Water Temperature Data


Daily Average Temperature °C
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/18/2014
1/17/2015
4/18/2015
7/18/2015
10/17/2015
1/16/2016
4/16/2016
7/16/2016
10/15/2016
1/14/2017
4/15/2017
7/15/2017
10/14/2017
1/13/2018
4/14/2018

Summary Stats for All Data Points	
Mean	11.46498
Standard Error	0.025118
Median	11.433
Mode	13.275
Standard Deviation	2.152407
Sample Variance	4.632855
Kurtosis	-0.70818
Skewness	-0.16632
Range	12.714
Minimum	3.899
Maximum	16.613
Sum	84187.36
Count	7343
Confidence Level (95.0%)	0.049239

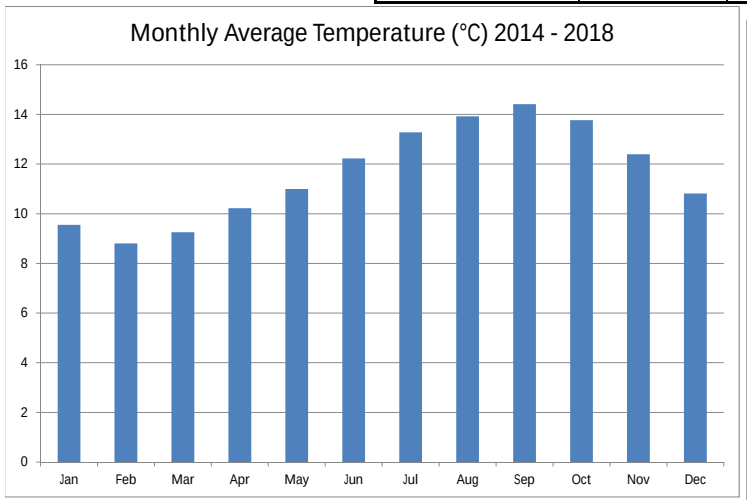
95% confidence Upper of Mean
11.51

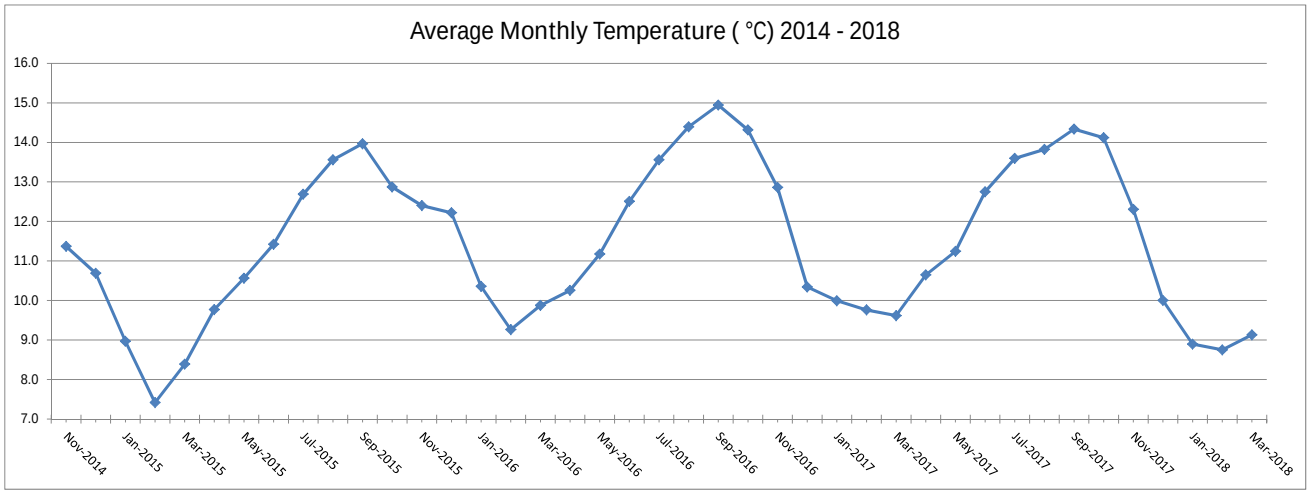
95% confidence lower of Mean
11.42

Month (2014 - 2018)	Count	Monthly Average Temperature ℃	StdDev	Standard Error	t-dist	95% Upper ℃	95%Lower ℃
Jan	744	9.55	1.24	0.045	2.58	9.67	9.44
Feb	678	8.80	1.30	0.050	2.58	8.93	8.67
Mar	723	9.26	1.20	0.045	2.58	9.37	9.14
Apr	540	10.22	1.08	0.046	2.58	10.34	10.11
May	558	10.99	0.79	0.033	2.58	11.08	10.91
Jun	540	12.23	0.84	0.036	2.58	12.32	12.13
Jul	558	13.28	0.76	0.032	2.58	13.36	13.20
Aug	558	13.93	0.56	0.024	2.58	13.99	13.86
Sep	540	14.41	0.70	0.030	2.58	14.49	14.34
Oct	558	13.77	1.05	0.045	2.58	13.88	13.65
Nov	602	12.41	0.98	0.040	2.58	12.51	12.30
Dec	744	10.81	1.35	0.049	2.58	10.94	10.69

Month (2014 - 2018)	Min of Temperature ℃	Max of Temperature ℃	Range ℃
Jan	6.3	12.3	5.9
Feb	4.5	12.5	8.0
Mar	3.9	12.7	8.8
Apr	8.1	13.3	5.2
May	8.9	13.1	4.2
Jun	10.0	14.3	4.4
Jul	11.5	16.6	5.1
Aug	12.8	16.6	3.8
Sep	12.7	16.0	3.3
Oct	10.8	16.6	5.7
Nov	9.6	15.3	5.7
Dec	6.6	13.6	7.0

Month (2014 - 2018)	Count	Average of Average of Temperature C2	StdDev of Average of Temperature C2	Standard Error	t-dist (two tailed)	95% Upper ℃	95%Lower ℃
Jan	124	9.55	1.19	0.107	1.98	9.77	9.34
Feb	113	8.80	1.19	0.112	1.98	9.02	8.58
Mar	121	9.26	1.02	0.093	1.98	9.44	9.07
Apr	90	10.22	0.72	0.076	1.987	10.38	10.07
May	93	10.99	0.65	0.068	1.987	11.13	10.86
Jun	90	12.23	0.74	0.078	1.987	12.38	12.07
Jul	93	13.28	0.64	0.066	1.987	13.41	13.15
Aug	93	13.93	0.45	0.047	1.987	14.02	13.83
Sep	90	14.41	0.61	0.064	1.987	14.54	14.29
Oct	93	13.77	0.97	0.100	1.987	13.97	13.57
Nov	101	12.40	0.90	0.090	1.984	12.57	12.22
Dec	124	10.81	1.31	0.118	1.98	11.05	10.58





Summary of Seep Temperatures at Monitoring Point W-1
(2014-2018)

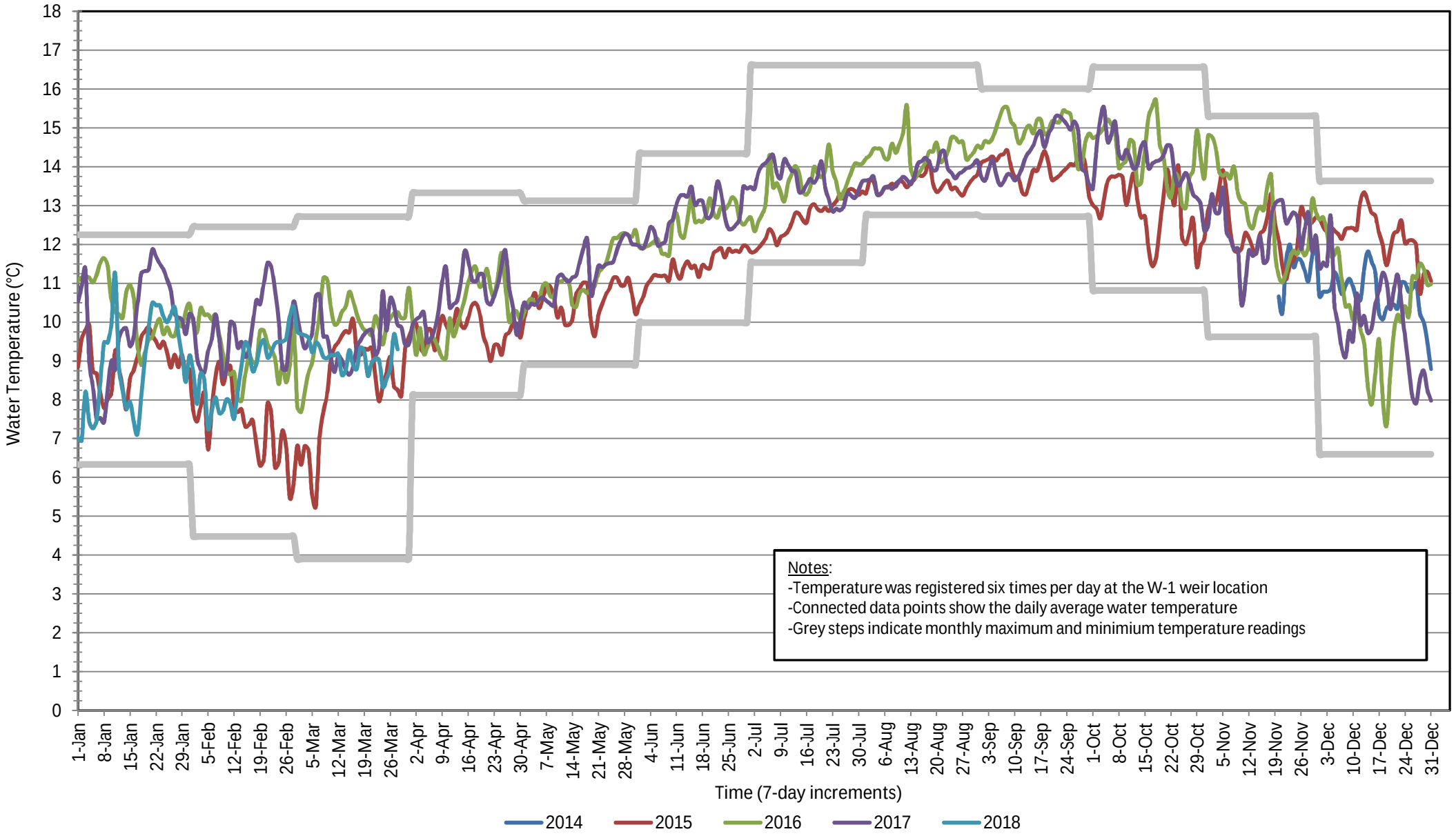
River South Parcel
Romeoville Quarry, Romeoville, IL

Month	Number of Temp. Readings (°C)	Average of Temperature Readings (°C)	Standard Deviation of Temp. Reading (°C)	Minimum Temp. Reading (°C)	Maximum Temp. Reading (°C)
Jan	744	9.55	1.24	6.34	12.25
Feb	678	8.80	1.30	4.48	12.46
Mar	723	9.26	1.20	3.90	12.71
Apr	540	10.22	1.08	8.12	13.33
May	558	10.99	0.79	8.90	13.12
Jun	540	12.23	0.84	9.99	14.34
Jul	558	13.28	0.76	11.54	16.61
Aug	558	13.93	0.56	12.77	16.61
Sep	540	14.41	0.70	12.71	16.01
Oct	558	13.77	1.05	10.82	16.56
Nov	602	12.41	0.98	9.63	15.30
Dec	744	10.81	1.35	6.60	13.63
(blank)					
Grand Total	7343	11.46	2.15	3.90	16.61

Observed Seep Temperatures at Monitoring Point W-1 (2014-2018)

River South Parcel

Romeoville Quarry, Romeoville, IL



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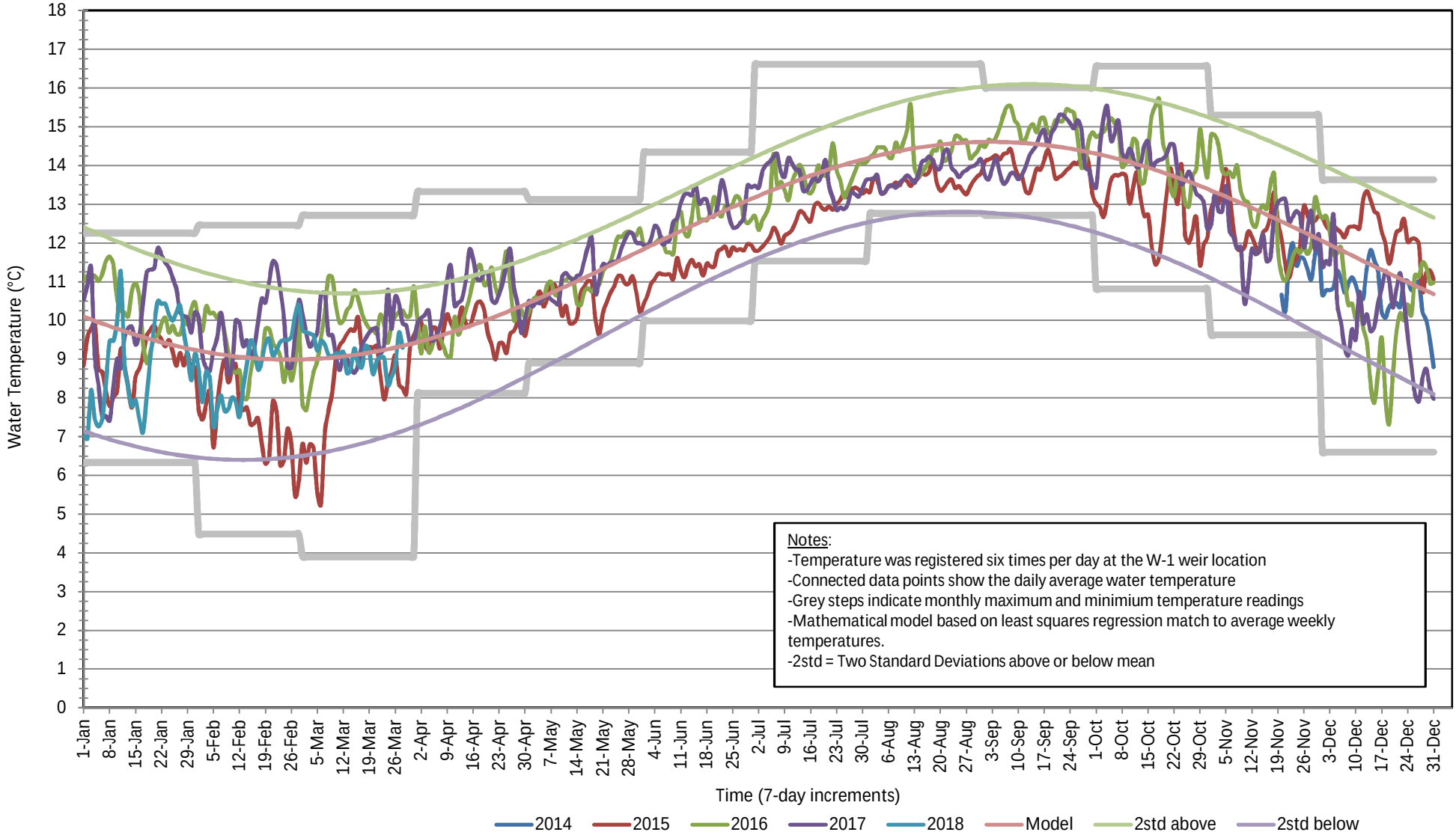
Observed Seep Temperatures at Monitoring Point W-1 (2014-2018)

River South Parcel

Romeoville Quarry, Romeoville, IL



Attachment 2

Summary of Existing Water Quality Data

Attachment 2 - Table 1

Statistical Summary of Major Water Quality Constituent Concentrations in Ground Water and Surface Water

HMS Romeoville and Nearby Vicinities

Sample Identification	Parcel	Sample Type	Date of Sample	Alkalinity, Bicarbonate	Calcium	Chloride	Magnesium	Potassium	Sodium	Sulfate	Total Dissolved Solids	Specific Conduc- tance	pH
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(umhos/cm)	(s.u.)
CEP-1S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	280	104	109	53.3	7.3	48.4	184		1110	7.52
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	310	87.6	96	45.6	4.7	44.2	172		1070	7.10
CEP-2S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	430	133	108	60.4	4.6	76	173		1340	6.92
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	380	124	118	54	3.5	45.6	189		1300	7.21
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 2	220	130	130	57	2.9	72	130	780	1030	7.04
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 4	360	110	39	57	5.2	30	180	680		
CEP-3S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	490	132	120	60.4	3.1	47.6	126		1330	7.16
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	380	121	128	53.8	2.7	45.3	148		1280	7.63
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 2	280	160	140	85	3.8	80	130	720	980	7.28
CEP-4S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	470	131	140	63.6	2.8	80	169		1250	7.59
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	230	112	130	48.5	1.5	94	203		1170	7.77
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 4	360	120	180	56	1.3	94	160	750	1190	7.48
CEP-5S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	360	102	15	45.9	0.7	12.5	82		707	7.11
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	310	80	16	35.1	0.5	9.8	73		670	7.39
CEP-10S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 2	280	98	95	47	2.9	55	110	620	836	7.24
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 4	430	120	150	53	4.2	55	45	690	1010	6.53
CEP-11S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 2	200	79	13	50	1.8	12	77	380	550	7.80
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 4	300	77	18	43	0.9	8.6	69	410		
CEP-12S-GW	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 2	270	110	77	64	2.3	55	230	690	992	7.60
	ComEd / Long Run Parcels	Ground Water - Shallow Silurian Aq	2011 Qrtr 4	360	110	69	56	1.9	74	190	720		
MP-1S-GW	Middle Parcel	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	450	116	62	77.8	6.3	20	176		1320	7.84
	Middle Parcel	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	370	112	56	70.4	6.8	43.7	309		1310	7.65
RP-1S	River South Parcels	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	420	90.7	92	58.4	7.5	31.3	71			
	River South Parcels	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	310	65.6	58	34.2	4.9	27	42		784	7.21
RP-2S	River South Parcels	Ground Water - Shallow Silurian Aq	2005 Qrtr 4	470	123	76	63.2	4.5	28.2	77		1080	7.02
	River South Parcels	Ground Water - Shallow Silurian Aq	2006 Qrtr 2	380	99.2	84	45.8	2.7	31.2	80		1020	7.76
RP-8S EAST	River South Parcels	Ground Water - Shallow Silurian Aq	2014 Qrtr 4-2	333	121	173	59.5	4.4	120	52.5	674	1287	7.05
RP-8S WEST	River South Parcels	Ground Water - Shallow Silurian Aq	2014 Qrtr 4-1	329	97.1	175	48.4	2.2	73.9	51.4	692	1221	7.07
RP-9S SOUTH	River South Parcels	Ground Water - Shallow Silurian Aq	2014 Qrtr 4-2	392	102	141	59.2	4.9	62.2	69.4	702	1270	7.16
RP-10S	River South Parcels	Ground Water - Shallow Silurian Aq	2014 Qrtr 4-1	282	77.7	55.4	38.8	1.7	25.7	28.4	466	785	7.32
CEP-1D-GW	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2005 Qrtr 4	450	148	69	70.4	6.1	27.2	188		1050	7.39
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2006 Qrtr 2	430	135	48	60.9	5.0	19.7	220		1180	7.25
CEP-2D-GW	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2005 Qrtr 4	450	116	62	58.9	5.6	49.2	178		1190	7.17
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2006 Qrtr 2	410	46.8	46	50.5	6.0	100	208		1150	7.40
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2011 Qrtr 2	260	110	38	58	5.5	31	180	630	855	7.33
CEP-3D-GW	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2005 Qrtr 4	460	131	128	61	3.4	48.5	125		1340	7.11
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2006 Qrtr 2	410	117	110	54	2.9	39.2	160		1260	7.23
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2011 Qrtr 2	310	150	100	79	3.6	51	150	700	970	7.13
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2011 Qrtr 4	390	130	110	67	3.5	42	150	750		
CEP-4D-GW	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2005 Qrtr 4	410	161	94	77.8	5.9	35.8	263		1500	7.05
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2006 Qrtr 2	430	153	88	71.5	5.8	33.3	267		1400	7.34
CEP-11D-GW	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2011 Qrtr 2	280	91	7.5	66	9.0	48	190	670	831	7.87
	ComEd / Long Run Parcels	Ground Water - Deep Silurian Aq	2011 Qrtr 4	340	110	3.7	62	6.6	23	210	590		
MP-1D-GW	Middle Parcel	Ground Water - Deep Silurian Aq	2005 Qrtr 4	350	111	97	60.2	4.5	34.2	162			
	Middle Parcel	Ground Water - Deep Silurian Aq	2006 Qrtr 2	300	87	86	46.2	4.3	29.7	152		965	7.74
MP-3D-GW	Middle Parcel	Ground Water - Deep Silurian Aq	2005 Qrtr 4	320	216	108	66.9	11.1	42.3	430			
	Middle Parcel	Ground Water - Deep Silurian Aq	2006 Qrtr 2	290	222	104	63	8.4	45.7	650		1720	7.23
RP-1D	River South Parcels	Ground Water - Deep Silurian Aq	2005 Qrtr 4	410	85.3	19	47.8	2.6	19.9	86		720	7.01
	River South Parcels	Ground Water - Deep Silurian Aq	2006 Qrtr 2	370	83.4	16	46.9	2.3	8.9	85		787	7.28

Attachment 2 - Table 1

Statistical Summary of Major Water Quality Constituent Concentrations in Ground Water and Surface Water

HMS Romeoville and Nearby Vicinities

Sample Identification	Parcel	Sample Type	Date of Sample	Alkalinity, Bicarbonate	Calcium	Chloride	Magnesium	Potassium	Sodium	Sulfate	Total Dissolved Solids	Specific Conduc- tance	pH
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(umhos/cm)	(s.u.)
RP-2D	River South Parcels	Ground Water - Deep Silurian Aq	2005 Qrtr 4	450	83.3	112	84.4	13.6	96	172		1320	7.27
	River South Parcels	Ground Water - Deep Silurian Aq	2006 Qrtr 2	410	68.6	110	74.1	12.0	96	189		1320	7.48
RPNP PW-4D	Romeoville Prairie	Ground Water - Deep Silurian Aq	2011 Qrtr 2	240	110	230	54	6.1	110	120	810	1160	7.16
	Romeoville Prairie	Ground Water - Deep Silurian Aq	2011 Qrtr 4	310	120	240	54	4.6	81	100	810		
BRA	West Quarry	Ground Water - Deep Silurian Aq	1996 Qrtr 2	330	92	44	55	11.0	16	102			
KBR	West Quarry	Ground Water - Deep Silurian Aq	1996 Qrtr 2	285	84	21	44	2.3	5	40			
Colonial	West Quarry	Ground Water - Deep Silurian Aq	1996 Qrtr 2	300	68	28	45	2.3	26	75			
Hampton AH	West Quarry	Ground Water - Deep Silurian Aq	1996 Qrtr 2	350	95	113	56	3.9	48	52			
CBA	West Quarry	Ground Water - Deep Silurian Aq	1996 Qrtr 2	350	97	61	62	2.5	29	94			
CBB	West Quarry	Ground Water - Deep Silurian Aq	1996 Qrtr 2	355	120	72	67	12.0	32	90			
CEW1	ComEd / Long Run Parcels	Soil Water*	2006 Qrtr 2	339.7	68.2	4.2	29.4	0.8	8.94	30	200		7.77
MPW1	Middle Parcel	Soil Water	2006 Qrtr 2	268.1	159	67	66.7	5.0	36.7	130	475		7.79
MPW2	Middle Parcel	Soil Water	2006 Qrtr 2	295.5	77	85	28.9	0.6	37.1	110	350		7.89
RSW2	River South Parcels	Soil Water	2006 Qrtr 2	350.8	111	210	41.9	13.7	65.2	130	575		7.73
ComEd SW6	ComEd / Long Run Parcels	Surface Water	2011 Qrtr 2	280	92	110	45	1.9	68	90	590	853	7.35
	ComEd / Long Run Parcels	Surface Water	2011 Qrtr 4	380	110	130	50	4.6	58	100	700	1000	6.59
CES1	ComEd / Long Run Parcels	Surface Water	2006 Qrtr 2	378.8	116	130	50.8	3.8	39.7	14			8.08
CES2	ComEd / Long Run Parcels	Surface Water	2006 Qrtr 2	223.4	63.4	180	29	6.8	55.9	130			7.70
Ship & Sanitary Canal (SSC-SW)	County-wide	Surface Water	2005 Qrtr 4	136	52	94	18	10.2	75	103			
	County-wide	Surface Water	2006 Qrtr 2	150	50.1	128	17.8	8.4	100	105		888	7.90
Des Plaines River (DSPR-SW)	County-wide	Surface Water	2005 Qrtr 4	188	76.1	196	32.2	22.8	138	116			
	County-wide	Surface Water	2006 Qrtr 2	190	53.3	162	22.4	8.7	112	93		1050	7.65
	County-wide	Surface Water	2011 Qrtr 2	150	69	230	32	6.1	150	120	710	962	8.38
	County-wide	Surface Water	2011 Qrtr 4	170	65	180	28	8.7	99	100	640		
IMC-SW	County-wide	Surface Water	2005 Qrtr 4	134	86.5	260	57.8	13.0	170	179			
	County-wide	Surface Water	2006 Qrtr 2	270	78.2	166	41.4	8.0	112	133		1230	7.59
MPS1	Middle Parcel	Surface Water	2006 Qrtr 2	280.4	242	420	67.8	8.7	178	10			8.00
MPS2	Middle Parcel	Surface Water	2006 Qrtr 2	246.6	357	280	84.5	12.1	80.2	10			7.67
Quarry Water	Middle Quarry	Surface Water	2014 Qrtr 4-1	251	71.9	121	53.7	8.2	58.2	109	662	990	8.14
W-1 Seep	River South Parcels	Surface Water	2014 Qrtr 4-1	327	101	179	49.9	2.9	84	52.6	736	1281	7.09
	River South Parcels	Surface Water	2014 Qrtr 4-2	353	96	171	47.5	3.1	76.2	56	608	1257	7.28
RSS1	River South Parcels	Surface Water	2006 Qrtr 2	338.4	86.8	210	39.6	22.5	74.7	97			7.79
RSS2	River South Parcels	Surface Water	2006 Qrtr 2	331.3	93.5	250	44.8	17.5	91.8	130			7.98
SR01-FPDWC-INFLOW	Forest Preserve District Will County	Surface Water	2018 Qrtr 1	173.0	58.2	146	29	2.8	70.9	36	382	853	7.67
SWG1-FPDWC-INFLOW	Forest Preserve District Will County	Surface Water	2017 Qrtr 4	138.0	22	47.9	22.4	4.1	36.2	10.7	124	418	7.85
	Forest Preserve District Will County	Surface Water	2018 Qrtr 1	214.0	82.9	212	39.4	2.4	120	34.7	446	1266	8.01
	Forest Preserve District Will County	Surface Water	2018 Qrtr 2	204.0	57.2	217	37.6	3.2	127	11	620	985	8.17
	Forest Preserve District Will County	Surface Water	2018 Qrtr 3	217.0	46	330	24.4	4.9	227	5.45	802	1395	7.55
SWG3-LPNP-RIVULET	Lockport Prairie Nature Preserve	Surface Water	2017 Qrtr 4	292.0	76.6	90.2	41.5	3.9	63.5	34.8	284	691	7.26
	Lockport Prairie Nature Preserve	Surface Water	2018 Qrtr 1	204.0	95.4	241	53.3	3.8	149	56.4	362	1327	7.73
	Lockport Prairie Nature Preserve	Surface Water	2018 Qrtr 2	191.0	59.7	131	34	2.8	72.6	33.7	444	758	7.52
			No. of Samples (n):	90	90	90	90	90	90	90	40	61	71
			Minimum:	134	22	3.7	17.8	0.5	5	5.45	124	418	6.53
			Maximum:	490	357	420	85	22.8	227	650	810	1720	8.38
			Average:	317.2	105.1	117.9	51.9	5.6	62.3	125.1	591.1	1078.9	7.5
			Standard DevS.:	88.4	45.3	76.7	15.2	4.3	41.7	91.9	172.6	251.0	0.4

Notes on data:

- Blank cells indicate that data are not available.
- Since sulfate concentrations at MPW1 & MPW2 were ND, data results were set to an assumed DL of 10 mg/L
- Total dissolved solids concentration of soil water estimated from major cation and anion concentrations.
- Results for total concentrations were substituted when dissolved fractions were not available.

* Soil water analyses from: AES, 2012a. Summary of HMS Surface and Soil Water Monitoring Program: Apr-06 to Dec-10.

Attachment 2 - Table 1

Statistical Summary of Major Water Quality Constituent Concentrations in Ground Water and Surface Water

HMS Romeoville and Nearby Vicinities

Sample Identification	Parcel	Sample Type	Date of Sample	Alkalinity, Bicarbonate	Calcium	Chloride	Magnesium	Potassium	Sodium	Sulfate	Total Dissolved Solids	Specific Conduc- tance	pH
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(umhos/cm)	(s.u.)
Will County - Minimum	County-wide	Ground Water - Average	1990-1991	121	0.6	0.3	0.2	1.3	4.3	0.9	227	N/A	7.10
Will County - Maximum	County-wide	Ground Water - Average	1990-1991	1000	351	500	226	182	404.5	1543	2515	N/A	8.80
Will County - Median	County-wide	Ground Water - Average	1990-1991	339	110.4	6.2	51.5	3.7	30.1	167.5	669.5	N/A	7.60
Will County - Average	County-wide	Ground Water - Average	1990-1991	333.7	119.9	31.3	54.3	5.5	45.5	262.9	773.4	N/A	7.70
Will County - Standard Dev	County-wide	Ground Water - Average	1990-1991	82.2	63.1	65.9	26.9	13.5	50.3	281.5	402.6	N/A	0.30
			Minimum:										
		Ground Water - Shallow Silurian Aq:		200	65.6	13	34.2	0.5	8.6	28.4	380	550	6.53
		Ground Water - Deep Silurian Aq:		240	46.8	3.7	44	2.3	5	40	590	720	7.01
		Soil Water:		268	68.2	4.2	28.9	0.6	8.94	30	200	N/A	7.73
		Surface Water:		134	22.0	47.9	17.8	1.9	36.2	5.5	124	418	6.59
			Maximum:										
		Ground Water - Shallow Silurian Aq:		490	160	180	85	7.5	120	309	780	1340	7.84
		Ground Water - Deep Silurian Aq:		460	222	240	84.4	13.6	110	650	810	1720	7.87
		Soil Water:		351	159	210	66.7	13.7	65.2	130	575	N/A	7.89
		Surface Water:		380	357	420	84.5	22.8	227	179	802	1395	8.38
			Average:										
		Ground Water - Shallow Silurian Aq:		347.9	108.2	95.4	54.8	3.5	50.1	126.6	641.0	1072.8	7.3
		Ground Water - Deep Silurian Aq:		360.3	115.2	81.6	60.8	5.9	43.7	175.4	708.6	1151.0	7.3
		Soil Water:		313.5	103.8	91.6	41.7	5.0	37.0	100.0	400.0	N/A	7.8
		Surface Water:		237.4	91.0	185.6	40.5	7.6	99.5	73.0	540.7	1012.0	7.7
			Standard DevP.:										
		Ground Water - Shallow Silurian Aq:		75.0	20.4	48.1	11.1	1.9	27.7	65.9	122.5	226.0	0.3
		Ground Water - Deep Silurian Aq:		62.8	39.0	55.3	10.4	3.2	27.0	118.0	79.4	258.3	0.2
		Soil Water:		33.4	35.7	74.7	15.3	5.3	19.9	41.2	140.3	N/A	0.1
		Surface Water:		75.5	64.5	77.8	15.2	5.6	44.9	47.9	185.0	252.3	0.4
			Upper 99% Confidence Limit:										
		Ground Water - Shallow Silurian Aq:		385	118	119	60	4	64	159	745	1213	N/A
		Ground Water - Deep Silurian Aq:		393	135	110	66	8	58	237	826	1383	N/A
		Soil Water:		381	176	242	73	16	77	183	683	N/A	N/A
		Surface Water:		277	125	227	49	11	123	98	678	1186	N/A

Notes on statistics:

- Will County water quality data obtained from Roadcap, Cravens and Smith, 1993 [Meeting the Growing Demand for Water , ISWS] not used to develop background. County-wide data to be used for secondary comparisons only.
- Applicable concentrations for future water quality comparisons have been set to be the maximum detected or upper 99% C.I. about the mean based on number of samples and variability within dataset.
- The range for future pH comparisons developed using 3 standard deviation +/- mean.
- Conductivity of soil water is assumed to be similar to results obtained from surface water.

Concentrations of Applicable Water Quality Comparisons:

Ground Water - Shallow Silurian Aq:	490	160	180	85	8	120	309	780	1340	6.4 - 8.3
Ground Water - Deep Silurian Aq:	460	222	240	84	14	110	650	826	1720	6.7 - 8.0
Soil Water:	381	176	242	73	16	77	183	683	1395	7.6 - 8.0
Surface Water:	380	357	420	85	23	227	179	802	1395	6.2 - 8.8

Histograms of Major Water Quality Constituents in Background Dataset

HMS Romeoville Quarry, Illinois

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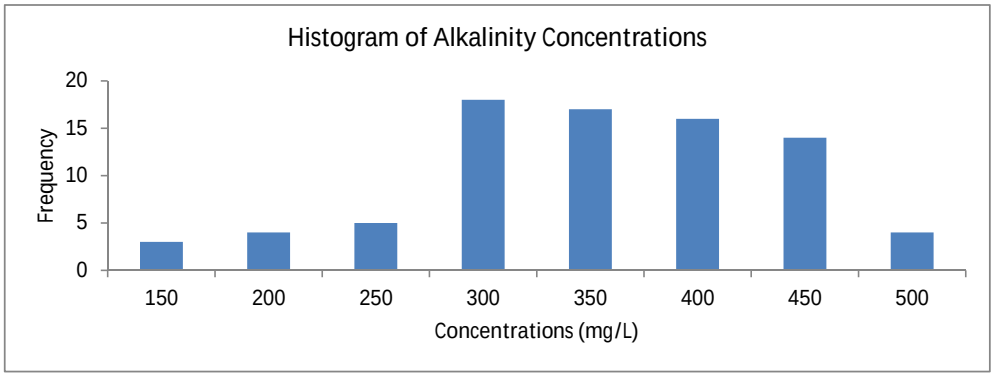
250	5
300	18
350	17
400	16
450	14
500	4



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120	23
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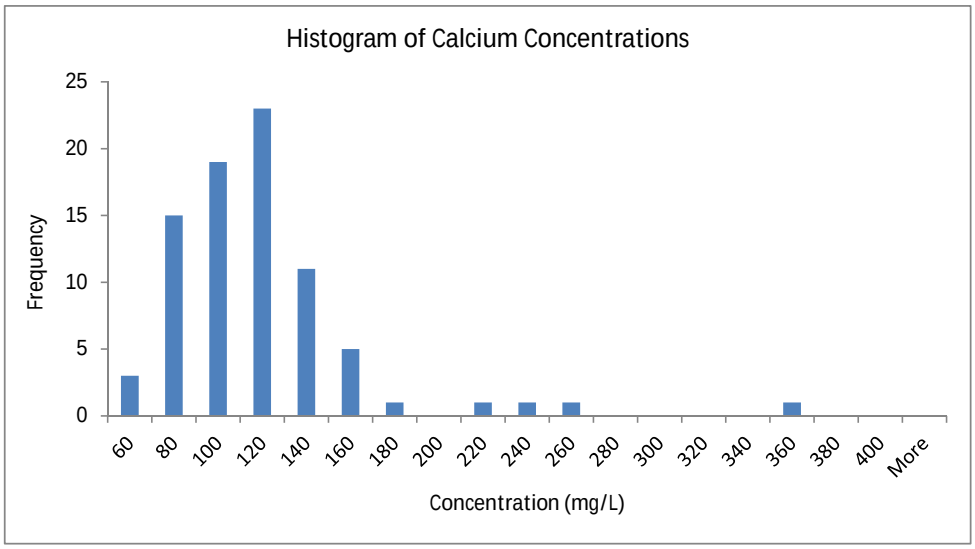

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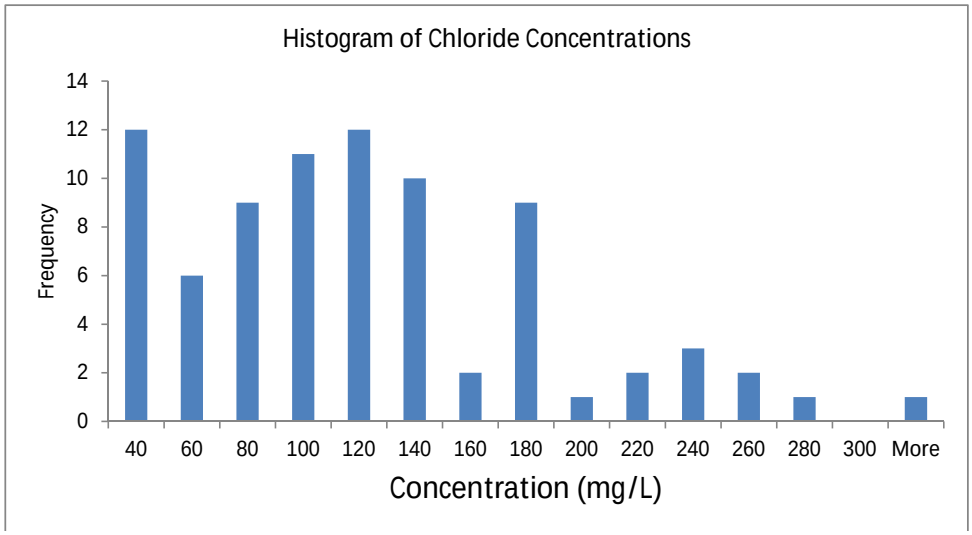

Histograms of Major Water Quality Constituents in Background Dataset

HMS Romeoville Quarry, Illinois

Interval	*Frequency*
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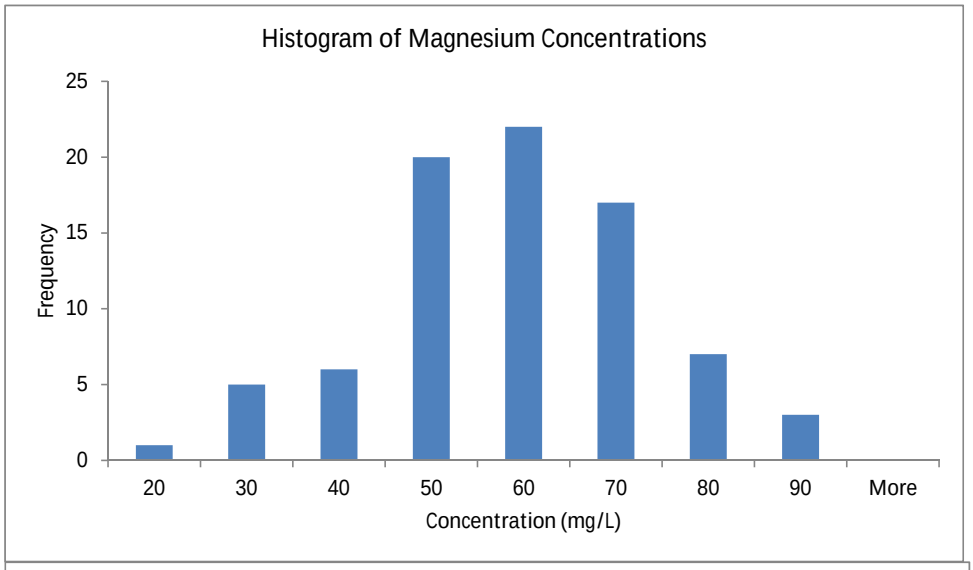

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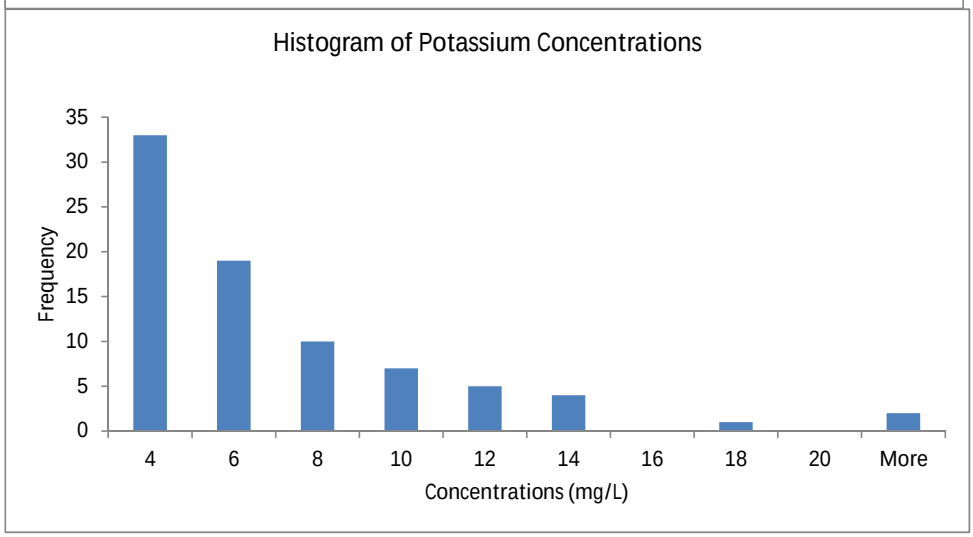

Histograms of Major Water Quality Constituents in Background Dataset

HMS Romeoville Quarry, Illinois

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160	1
180	2
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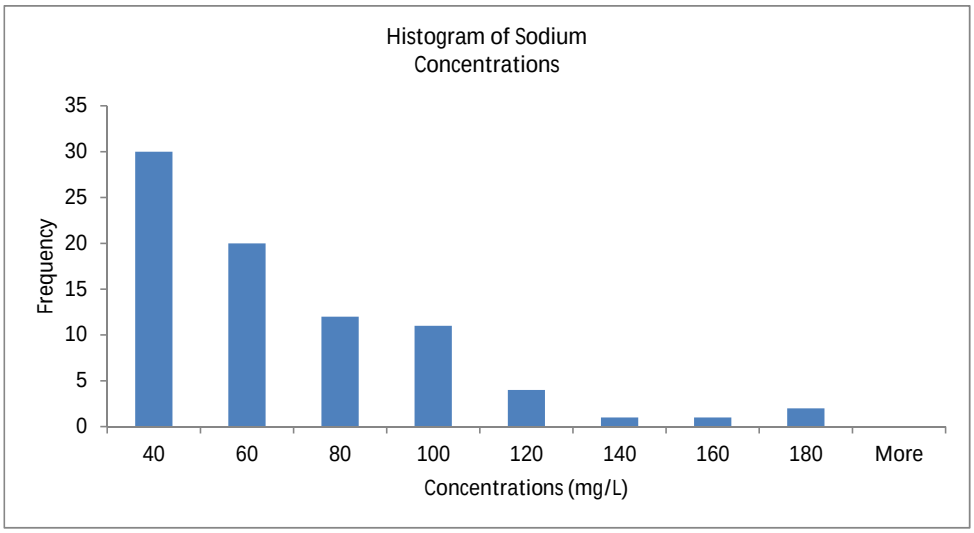

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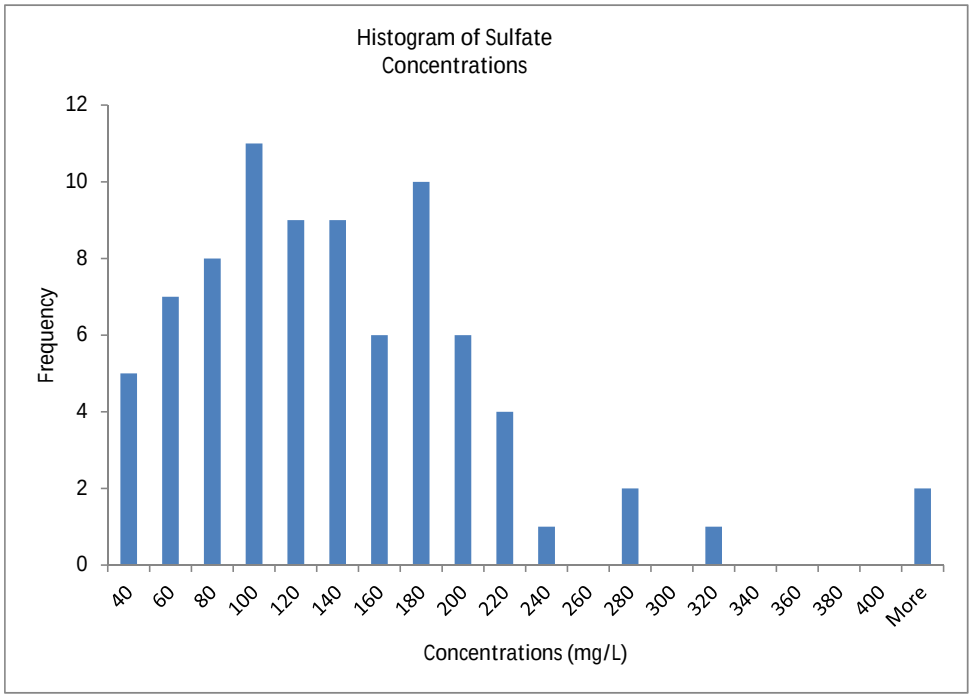
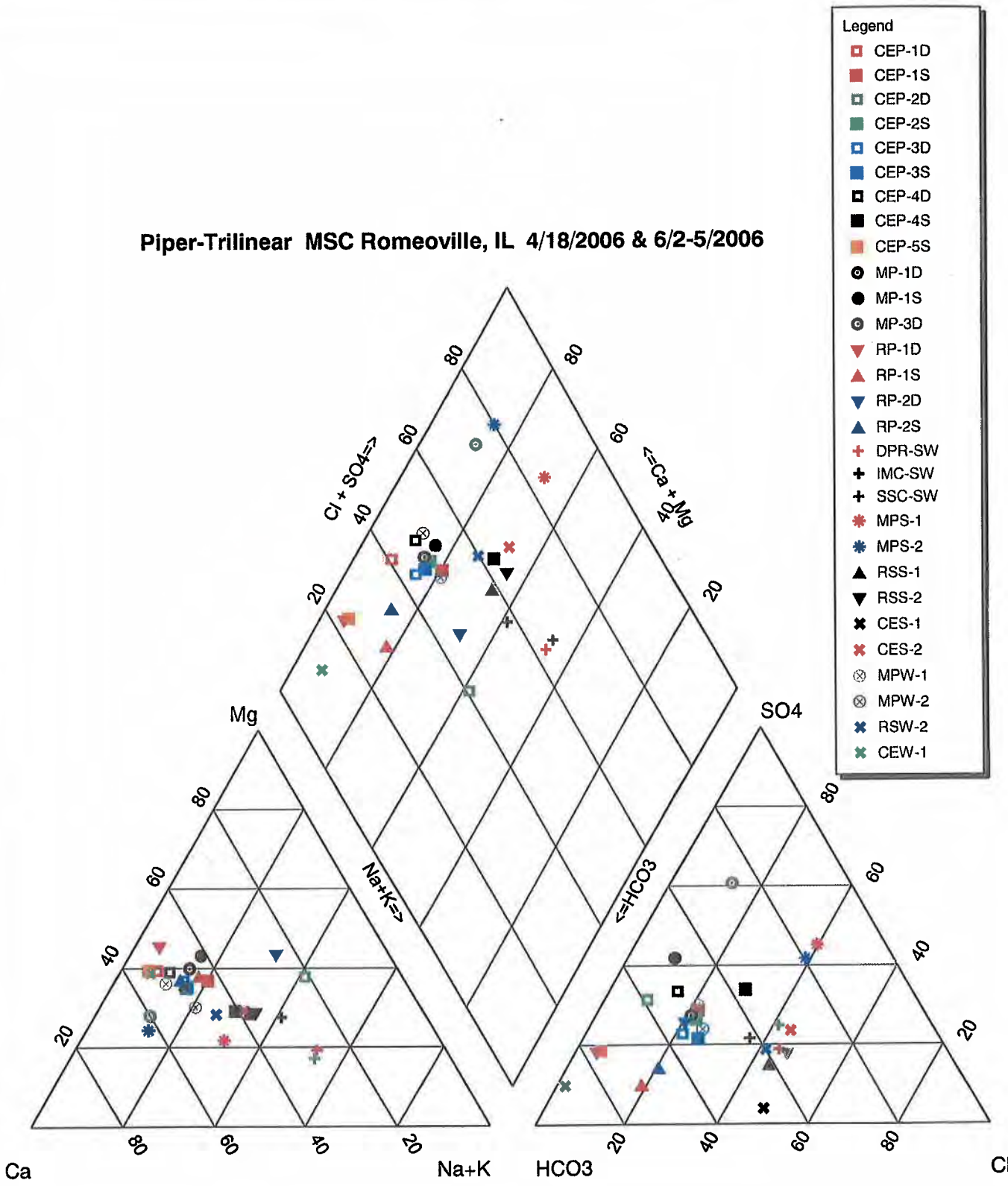


Piper-Trilinear MSC Romeoville, IL 4/18/2006 & 6/2-5/2006



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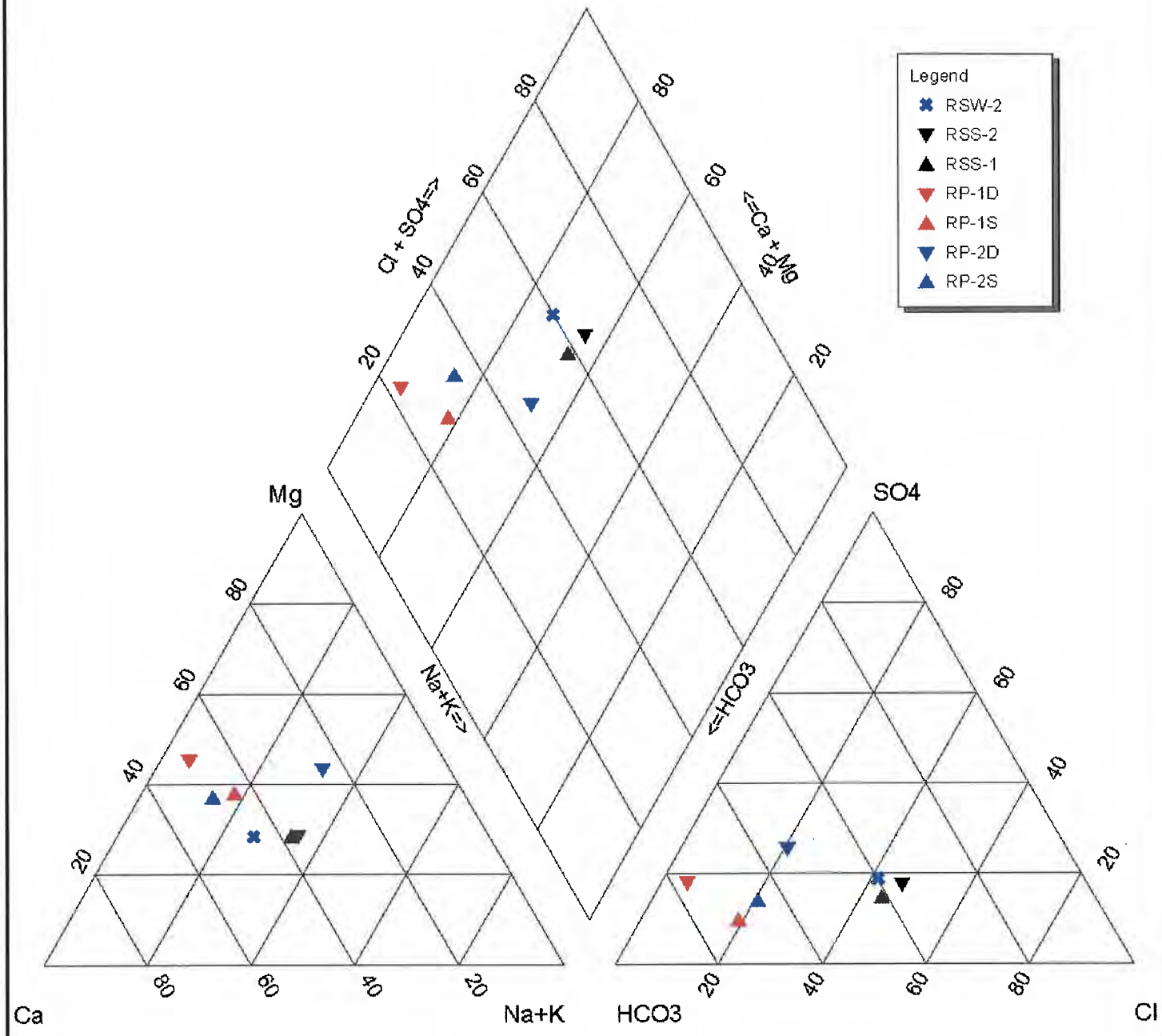
Piper Trilinear - River Parcel - MSC Romeoville



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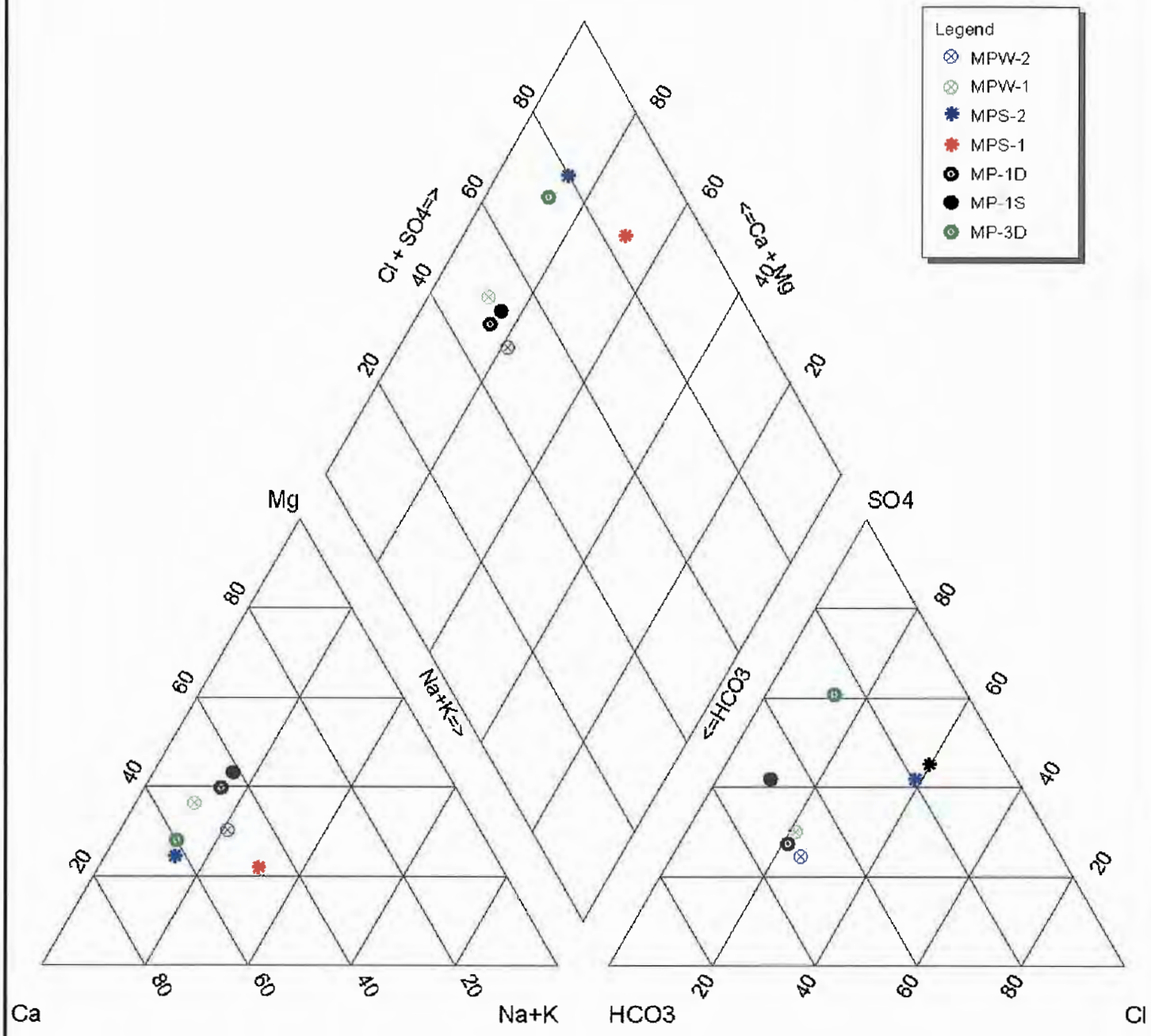
Piper Trilinear - Middle Parcel - MSC Romeoville



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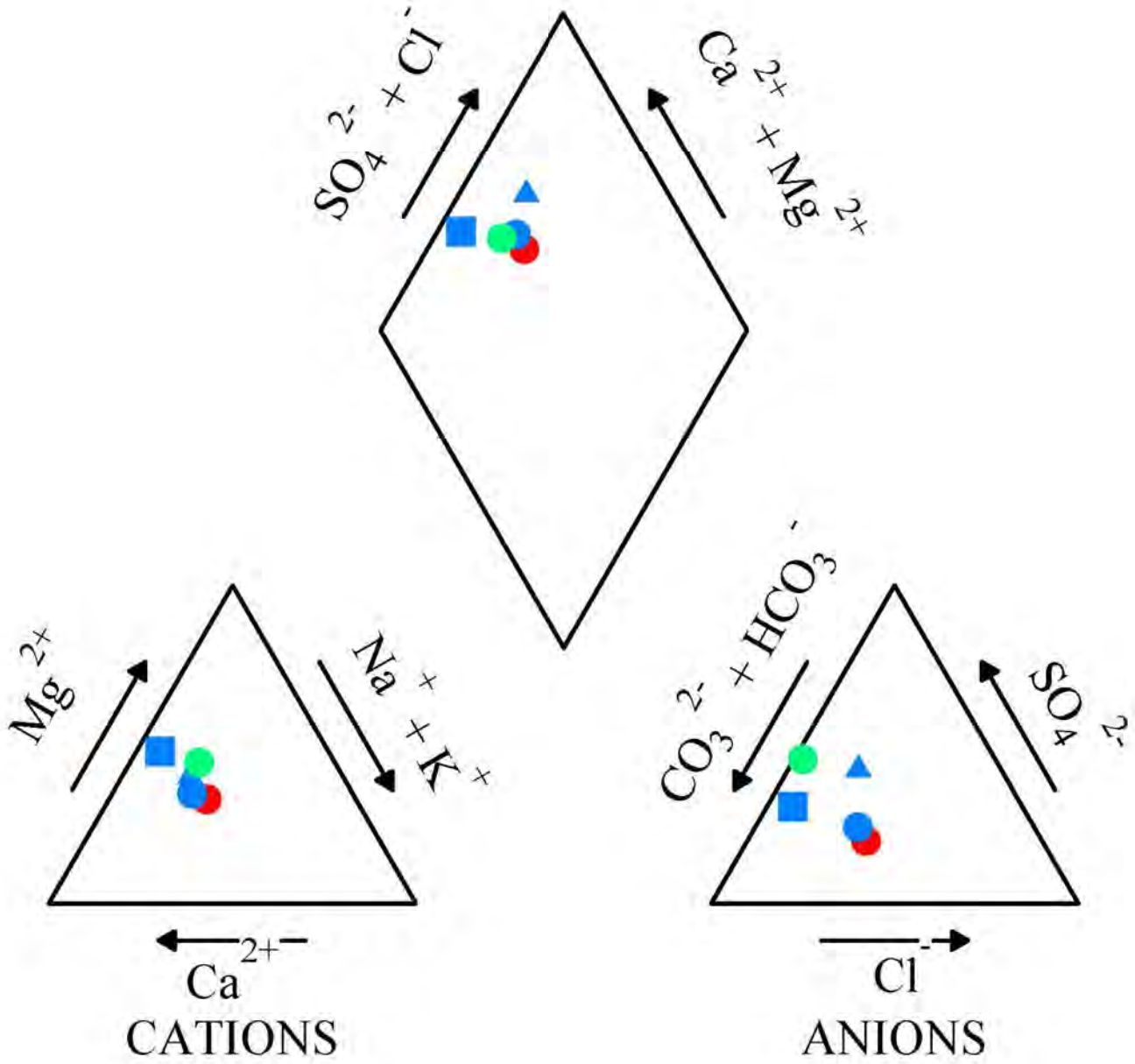

SURFACE WATER

- COMED PARCEL WL6

DEEP GROUNDWATER

- CEP-11D

SHALLOW GROUNDWATER

- CEP-10S
- CEP-11S
- CEP-12S

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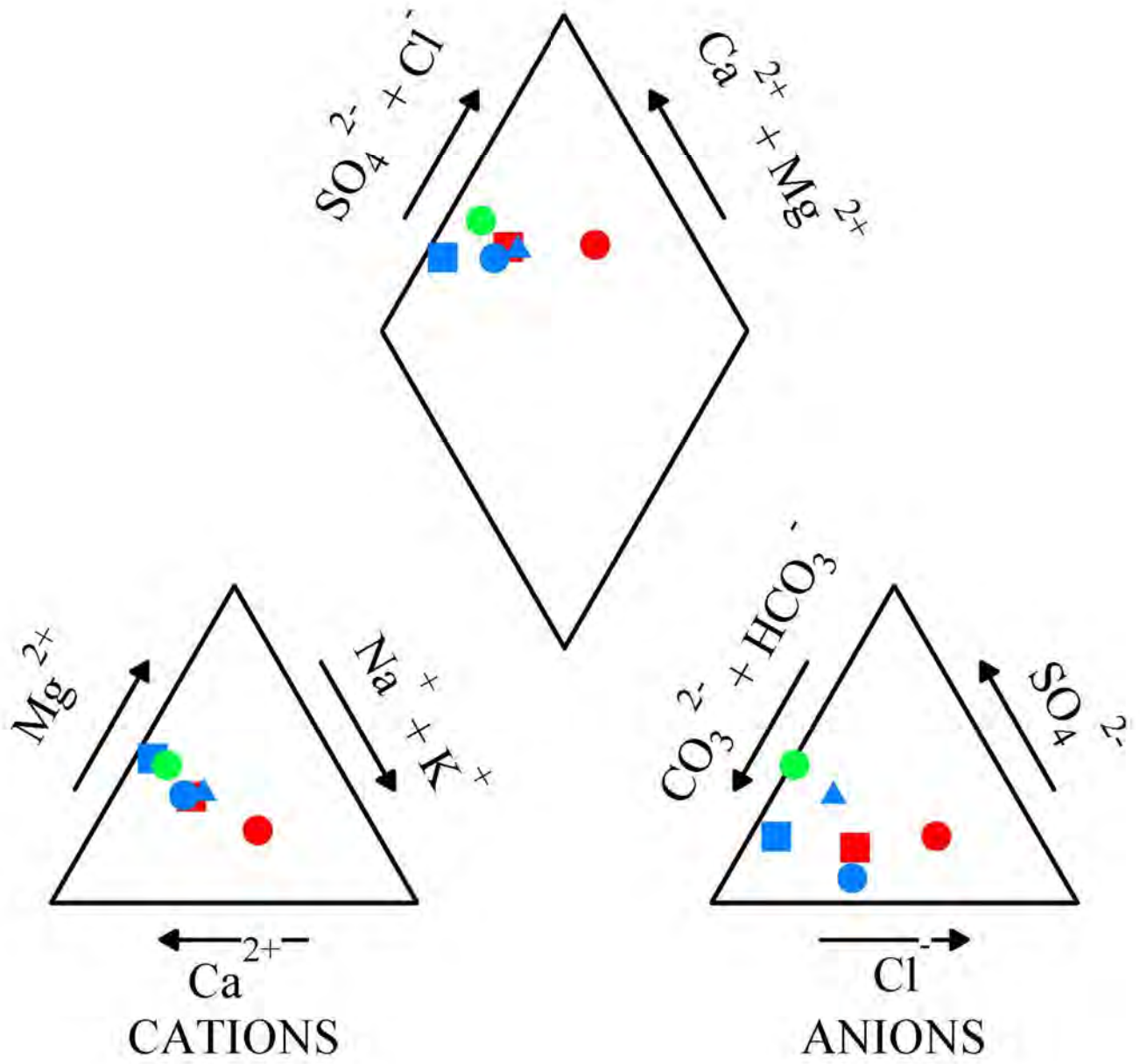
PROJECT NUMBER **60225330**

FIGURE NUMBER **3**



SURFACE WATER

- DES PLAINES RIVER
- COMED PARCEL WL6

DEEP GROUNDWATER

- CEP-11D

SHALLOW GROUNDWATER

- CEP-10S
- CEP-11S
- CEP-12S

AECOM

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HANSON MATERIAL SERVICE
ROMEOVILLE QUARRY
ROMEOVILLE, ILLINOIS
PIPER DIAGRAM - 2011 4th QUARTER

Drawn: Nauta

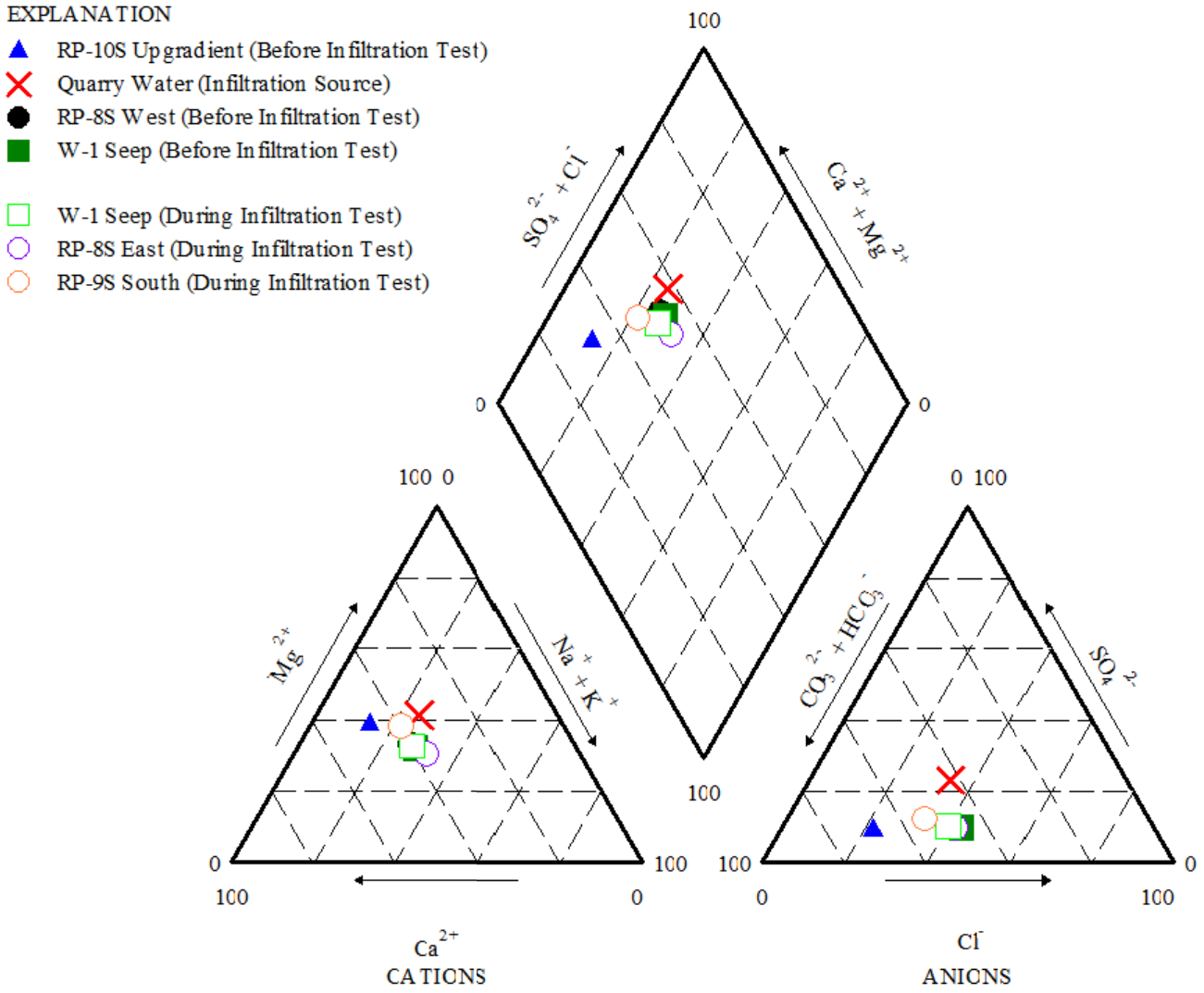
File: 4TH QTR

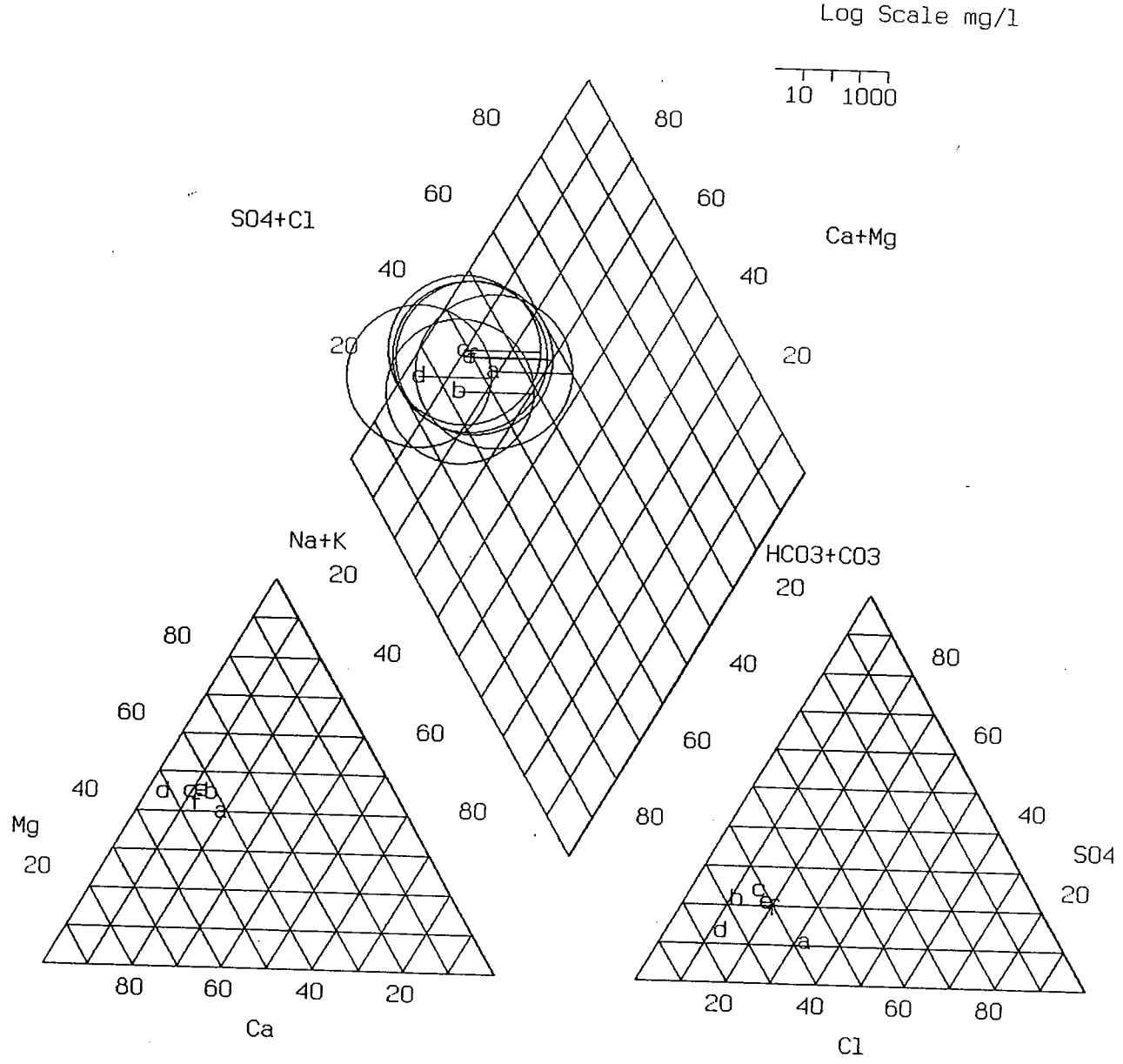
Date: 19 DEC 13

PROJECT NUMBER **60225330**

FIGURE NUMBER **4**

Figure 9 - Piper (Trilinear) Diagram of Water Quality Results





LEGEND

a = CRAWFORD BUS PARKING LOT
b = BRAASCH FARM
c = CRAWFORD BUS TOOL SHED
d = BROMBEREK FARM
e = HAMPTON PARK ANIMAL HOSPITAL
f = COLONIAL RESTAURANT

NOTE: REFER TO APPENDIX 6 FOR ANALYTICAL RESULTS.

STS Consultants Ltd.
Consulting Engineers

PIPER TRILINEAR DIAGRAM FOR PRIVATE WELL BACKGROUND CHARACTERIZATION SAMPLES MATERIAL SERVICE CORPORATION YARD 61 EXPANSION ROMEOVILLE, ILLINOIS

DRAWN BY	KKB	5-31-96
CHECKED BY		
APPROVED BY	CSR	5-31-96
CADFILE	SCALE	SHOWN
STS PROJECT NO. 15942-F	FIGURE NO.	2

Table 3

Summary of Background Groundwater Quality Monitoring Results
Material Service Corporation
Yard No. 61 Expansion
Romeoville, Illinois

Inorganic and Indicator Parameters:

Concentrations in mg/l

Well No./Residence/Business	Calcium	Magnesium	Potassium	Sodium	Alkalinity	Chloride	Sulfate	Nitrate	TOC	Toluene
1 Braasch (BRA)	92	55	11	16	330	44	102	4.9	0.655	ND
2 Bromberek (KBE)	84	44	2.3	5.0	285	21	40	10.1	1.99	ND
13 Walco Tool										
9 Colonial Restaurant	68	45	2.3	26	300	28	75	3.1		ND
11 Hampton Pk Animal Hospital	95	56	3.9	48	350	113	52	0.60	1.06	ND
14 Cowther Roofing										
15 Crawford Bus #1 (CBA)	97	62	2.5	29	350	61	94	0.61	1.51	0.016
15 Crawford Bus #2 (CBB)	120	67	12	32	355	72	90	0.27	1.14	0.024
16 Manuels Garden Center										

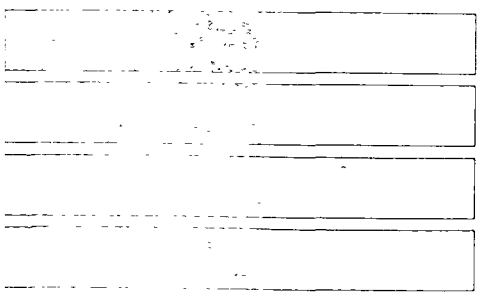
NOTES: Refer to Drawing 2 for private well locations.
ND = Not detected.

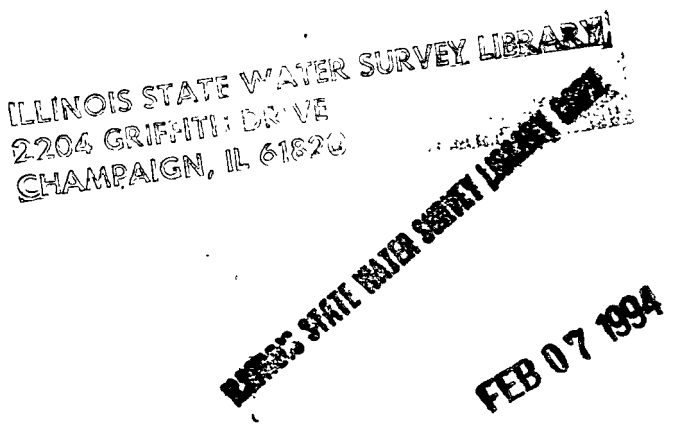
ISWS RR
123
copy 1
loan

Report 123

Meeting the Growing Demand for Water:
An Evaluation of the Shallow Ground-Water Resources in Will and Southern Cook Counties, Illinois

by
George S. Roadcap, Stuart J. Cravens,
and Edward C. Smith





ILLINOIS STATE WATER SURVEY
DEPARTMENT OF ENERGY AND NATURAL RESOURCES

1993

Table 7. Water Quality Statistics for Samples from 186 Wells Penetrating the Silurian Dolomite Aquifer, Winter 1990-1991

Major constituents (mg/L)	*Method detection limit*	*Samples below detection limit*	*Minimum*	*Maximum*	*Median*	*Average*	*Standard deviation*	*USEPA recommended limits (USEPA, 1982)*	*Illinois Water Quality Standards (IPCB. 1984a. 1984b)*	
									At point of withdrawal	*Finished water*
Alkalinity (total)[1]	2	0	121	1,000	339	333.7	82.2			
Calcium	0.03	0	0.6	351	110.4	119.9	63.1			
Chloride	0.3	0	0.3	500	6.2	31.3	65.9	250	250	
Iron	0.01	12	<0.01	7.8	0.61	1.03	1.26	0.3		1.0
Magnesium	0.04	0	0.2	226	51.5	54.3	26.9			
Potassium	1.3	12	<1.3	182	3.7	5.5	13.5			
Silica	0.02	0	3.1	13.3	6.2	6.3	1.6			
Sodium	0.50	0	4.3	404.5	30.1	45.5	50.3	250		
Sulfate	0.9	5	<0.9	1,543	167.5	262.9	281.5		250	
Miscellaneous constituents										
Total dissolved solids'	2	0	227	2,515	669.5	773.4	402.6	500		
Fluoride	0.1	0	0.1	7.3	0.40	0.53	0.69			1.8
Nitrate (NO 3-N)	0.1	139	<0.1	124.	0.1	1.9	10.37		10	10
Hardness[3]	-	-	2.4	1,401	492	522	250.2			
pH[2]	_	—	7.1	8.8	7.6	7.7	0.3	6.5-8.5		

Table 7. Concluded

Trace constituents (µg/L)	*Method detection limit*	*Samples below detection limit*	*Minimum*	*Maximum*	*Median*	*Average*	*Standard deviation*	*USEPA recommended limits (USEPA, 1982)*	*Illinois Water Quality Standards (IPCB. 1984a. 1984b)*	
									At point of withdrawal	*Finished water*
Aluminum	17	142	<17	359	<17					
Arsenic	110	183	<110	120	<110	-	-		50	50
Barium	3	4	<3	140	27	38	32		1,000	1,000
Cadmium	17	185	<17	19	<17	-	-		10	10
Chromium	7	110	<7	48	<7	-	-		50	50
Copper	6	171	<6	375	<6	-	-	1,000	-	5,000
Lead	63	186	<63	<63	<63	-	–		50	50
Manganese	4	16	<4	398	13	27	46	50	150	150
Mercury	50	186	<50	<50	<50					2
Nickel	31	178	<31	49	<31					
Strontium	1	0	7	5,240	800	1,070	910			
Zinc	20	69	8	4,986	29	160	491	5,000	-	5,000

Notes:

[1]All constituents are dissolved unless noted as total recoverable.

[2]Measured in standard units.

[3]Hardness in mg/L equivalent to CaCO, = 2.5 (mg/L Ca) + 4.1 (mg/L Mg).

Duplicate water samples were averaged prior to statistical calculations.

Attachment 3

AECOM Technical Guidance Documents

1.) Field Note Taking
2.) Photo Documentation
3.) Logging of Borings and Monitoring Well Installations
4.) Glacial Soil Classification
5.) Field Equipment Checklist
6.) Chain of Custody Instructions
7.) Lithologic Well Reporting
8.) Direct Push Rigging Form
9.) Water Level Measurement
10.) Low Flow / Limited Drawdown Field Sampling
11.) Preservation of Groundwater Samples
12.) Bailer Sampling
13.) In-Situ Hydraulic Conductivity Testing
14.) Remote Field Equipment Deployment and Verification

For Additional Technical Guidance, refer to: U.S. Geological Survey, variously dated, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A10, available online at http://pubs.water.usgs.gov/twri9A.

TG: 001 **SUBJECT:** FIELD NOTES

SUMMARY:

This TG serves as guidance for entry of field notes into a hard bound field note book. Documentation of detailed, concise and legible field notes is mandatory during all field visits.

1.0 REQUIRED EQUIPMENT

Required equipment includes:

- Survey Grade Field Notebook (Forestry Suppliers #49352 Field, #49354 Level or Rite in the Rain #49328 or #49326), or
- Field Note Book, Rite in the Rain Geological Field Book No. 540F (Helpful for Drilling and Logging Programs), or
- One Day, 8-pg Log Book (Forestry Suppliers' #49365 or comparable).
- Permanent Ultra Fine Tip Marker, Blue or Black Ink.

2.0 PROCEDURES

The following procedures are required for daily field book entries:

- Dedicate Field Book to Single Project.
- Write on cover Project Name, Client, Project Number and Beginning Field Date.
  - Example: ACME MINE, Yosemite Sam, Project No. 12345, August 2006.
- Write on Spine same as above.
- On inside cover of field book write: *If Found, Please Return to AECOM, Office Address, Phone Number. Thank You.*
- For each field event (day), include at the initial entry the Project Name, Site Location, Client, Date, Weather Synopsis (Temperature, Conditions [overcast, cloudy, sunny, rain, snow, etc], Wind Direction.
  - Example: ACME Mine, Yosemite Park, Yosemite Sam, August 28, 2006, 32 degrees F, Overcast, Freezing Rain, Wind from North.
- Provide a concise summary of Objectives.
  - On-Site to Collect Static Water Levels
  - On-Site to Repair Damaged Monitoring Wells
- List personnel on-site. Include AECOM personnel, sub-contractors, clients, regulators and visitors if applicable.
- Include summary of health and safety meeting and/or job hazard analysis.
- Include Time on and off site. Include Time on and off site for other site personnel.
- Include Description of Field Activities. Include Time for major events or tasks.

- Sign off and date at the end of each daily field entry.

Field activities are extremely varied and a discussion of field documentation procedures for site-specific tasks is beyond the scope of this TG. Consult with the project manager or technical leader for specific client requirements or level of detail required for specific projects.

The following tips are helpful and may be used at project manager's and principal field author's discretion:

- Some field books better match field activities than others. Consider purchasing geological field books for drilling projects, transit books for survey or GPS activities, graphed books for mapping jobs, or ledger books for basic field text entry.
- Ultra fine tip permanent ink or archival quality markers are ideally suited for marking on high rag stock paper used in hard bound field books. Ball point, uni-ball®, or other similar office pens are inappropriate for field use.
- Consider use of a gallon-size zip-loc or similar storage bag to protect field note book from moisture or rain in the field.
- In extreme rainfall conditions field note writing can be difficult. Consider periodically transcribing notes in a field vehicle or enclosed/covered shelter, if available.
- Graphics are extremely helpful. Include detailed site maps/sketches, stratigraphic columns, graphical logs, or other observations when applicable.

3.0 RESPONSIBILITY

Field staff members, including technicians, geologists, engineers and other scientists are required to document field procedures in a hard bound notebook. Daily entries must be dated and signed by principal field notes author. Field staff members are responsible for returning field books to project managers or technical leaders.

4.0 RELEVANT FORMS AND ATTACHMENTS

No Relevant Forms or Attachments.

5.0 REFERENCES

No References.

6.0 DOCUMENT APPROVAL AND HISTORY

Draft prepared August 28, 2006. QC October 2, 2006.

DOCUMENT AUTHOR:	Barry J. Harding, CPG
DOCUMENT ID:	TG_001
DOCUMENT DATE:	August 28, 2006 - DRAFT
DOCUMENT REVISION DATE:	October 2, 2006.
DOCUMENT APPROVAL:	October 3, 2006 FINAL

TG: 002 **SUBJECT:** DIGITAL PHOTOGRAPHY & IMAGING

SUMMARY:

Photographic documentation is an essential element on many AECOM jobs, including drilling or other sub-surface invasive investigations, construction operations and oversight projects, project kickoffs or bid-walks, and other activities. Photographic documentation is performed for several reasons, including:

- Contract Requirements
- Documentation of Significant or Unusual Features
- Documentation of Significant or Unusual Field Activities
- Allows for later observation and reconstruction of features and activities
- Provides for graphical report images
- Provides for marketing/proposal images.

This TG provides a general overview of equipment, field techniques, tips, and post-photographic imaging. The TG is not a comprehensive guide to photography or image processing.

1.0 REQUIRED EQUIPMENT

- 3 Megapixel (or better resolution) variable focus Digital Camera (preferably), or
- One use camera fitted with 200-400 speed film (if Digital is not available)
- Batteries, charger, associated cables, owners' manual for down-loading images
- Field Notebook

2.0 PROCEDURES

2.1 Photography

Two main objectives must be met: 1) focused photographs/images and 2) documentation what the photographs/images represent.

1. Consult with Project Manager or Technical Leader regarding need, scope and level of photography needed for project.
2. Determine what will be photographed. Work up agenda or list of pertinent items to be photographed. (For instance, on drilling projects, documenting specific contacts or lithological changes, or presence of stained soils or other unique features may be the primary items photographed; while on construction oversight jobs a more involved level of photographic documentation may be needed.)
3. Acquire camera for project. Coordinate with PM or administrative staff regarding use of camera (if not dedicated toward job). Check battery/charge level. Charge or replace batteries if needed.

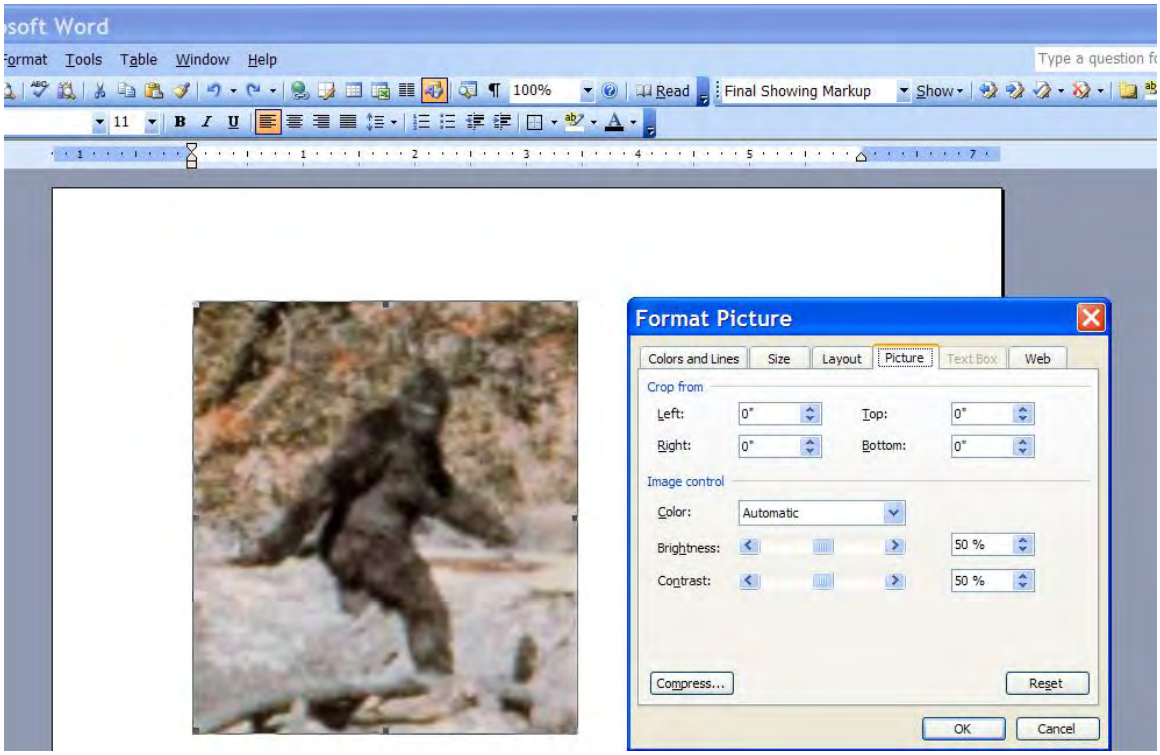
4. Set camera to display date on image (time optional).
5. Determine optimal image size for project (smallest 640, 1280, 1600, 2304 largest). Image memory sizes may typically range from 100 kb to 2 mb. For most instances smaller images are appropriate for field documentation.
6. Determine lighting and proper camera setting for lighting (refer to camera manual).
7. Determine other camera settings for image capture (i.e., close-up shots may require "macro" setting and so forth) (refer to camera manual).
8. Take photograph. Review photograph if camera is digital and has view option. Retake photograph if image quality is poor (blurry, out-of-focus, or over-exposed and so forth).
9. Document what the image represents in a hard-bound field-notebook. Example: Image #001 – 9' Tall Hairy Bipedal Cryptoid (Bigfoot?), Cascade Mountain Range, Looking North. 10:30 am September 7, 2006.
10. Upon completion of photography, download images to a laptop and eventually to respective project file under the L:\ drive. Clearly label the file for future reference (see responsibility below).
11. JPEG (**J**oint **P**hotographic **E**xperts **G**roup) file format provides good image quality vs. relative image size, and should suffice for saving most photographic images.
12. Film development should also include receiving digital images on a CD-ROM.
13. In some instances, images may be enhanced or cropped using image processing software. Imaging is discussed below.
14. For some projects and contracts, images/photographs may be transferred to a photographic log with descriptions (see **Attachment 1**).

2.2 Image Enhancement

Image enhancement is performed to improve a photographic image or bring attention to a particular feature. Enhancing or adding annotations to images is performed using various image processing software packages (e.g., Photoshop, Paint Shop, various Adobe software and so forth). In general, image enhancement includes:

- Adjusting light and contrast levels,
- Adjusting color and saturation,
- Cropping and Re-Sizing,
- Adding text, lines and other attributes to image,
- Compression of image to save space, and
- Changing or re-saving image as TIFF, JPEG, BMP EMF or other image file formats.

In general, be careful regarding overly processing images. Image quality usually diminishes or produces negative image artifacts as the image is manipulated. A quick way to enhance images is to click or highlight image (left mouse click), then right mouse click and scroll to "format picture" to perform cropping and image control functions (brightness/contrast and so forth). See below.



3.0 RESPONSIBILITY

On specific task assignments or contracts, field staff members including technicians, geologists, engineers and other scientists are required to photographically document field observations. Field staff members are responsible for labeling/annotating digital or hard photographs after the field work is complete. A brief summary log pf photos with descriptions should also be transcribed in the field notebook (e.g., Photograph 001. Soybean Oil Spill, Looking North from Benchmark).

In some instances (i.e. long duration construction oversight jobs or remote trailer project), photograph annotation may be accomplished in the field. Staff scientists/engineers are also required to upload/download images to the relevant project directory under the "L" drive (office computer filing directory). Sub-directories should be clearly labeled under the "L" Drive (Example: L:\work\12345\Projadmin\Field**DRILLING_PHOTOS SEPT 15 2006**.)

Field staff are responsible for returning digital cameras to office. Field staff are responsible for batteries and or maintaining fully-charged cameras.

Project managers are responsible for decision to use camera; however, field staff may also decide when it is appropriate to use camera or document observations.

4.0 RELEVANT FORMS AND ATTACHMENTS

Refer to digital camera specification sheet or manufacturers' manual.

See **Attachment 1** for example of photographic log.

5.0 REFERENCES

No references are included.

6.0 DOCUMENT APPROVAL AND HISTORY

Draft developed September 7, 2006.

Final September 27, 2006

DOCUMENT AUTHOR:	Barry J. Harding, CPG
DOCUMENT ID:	TG_002
DOCUMENT DATE:	September 7, 2006 - DRAFT
DOCUMENT REVISION DATE:	September 27, 2006 - FINAL
DOCUMENT APPROVAL:	October 3, 2006

ATTACHMENT 1

Photograph 1. CLIENT: ACME Publishing. October 20, 1967. Frame 352 of Patterson-Gimlin 16mm film, Six Rivers National Forest, near Bluff Creek, Northern California. Looking North. Hairy Bi-Pedal Object is 8' tall.

Photograph 2. CLIENT: ACME Publishing. Enhanced blowup of Photograph 1, showing facial features. Note sagittal crest (arrow) typical of creatures with strong jaw muscles.

TG: 003 **SUBJECT:** LOGGING OF BORINGS AND MW'S

SUMMARY:

This Technical Guidance (TG) was prepared as an aid for geologists/geotechnical engineers in the field, tasked with logging of boreholes and construction of monitoring wells or other groundwater monitoring devices (piezometers, etc.). In some instances, other specialists may also oversee drill rigs. This TG may be used in concert with TG 004 (Glacial Soil Classification Guidance). Also refer to specific TG in the 100 series for specific drilling techniques.

The purpose of this TG is to define AECOM's standard requirements for lithological logging of boreholes and well construction.

In some site-specific settings or project / contractual requirements, the manufacturer's recommendations may be followed to insure proper construction of groundwater monitoring device(s). Examples include but are not limited to specially-designed wells (e.g., Schuma-Soil well screens), pumping wells, recovery wells or devices especially suited for engineering applications.

Drilling and drill-rig oversight involves safety planning, administration and documentation. Please refer to AECOM's SH&E 403 (on Drilling, subject to modification).

Drilling techniques are extremely varied. This TG primarily covers the documentation of observations made during lithological logging and well installation using typical techniques (i.e., non-specific drilling methods). Please refer to other specific TG's for unique or other specialized drilling methods.

1.0 REQUIRED EQUIPMENT

- HASP/Environmental Health & Safety SOPs Manual
- Level D Equipment or PPE Upgrades as warranted by HASP and Site Conditions.
- Procurement Documentation/SOW/Cost Breakdown
- Utility Clearance Number
- Signed Access Agreement (if applicable or off-site work is performed)
- Field Notebook, Pen

2.0 PROCEDURES

- Prior to performing drill-rig oversight, review scope of work, project work plan and HASP with the Project Manager or Technical Leader, On-Site Personnel and Sub-Contractors (if present). Confirm the utilities are identified and clearly demarcated in the field. Confirm property access is approved and signed by the property owner.

- Document utility clearance in field book.

- Document site activity and soil descriptions in a hard-bound survey-grade field note book dedicated to the project. Tablet PCs or other portable electronic devices may be used to store lithological data/observations.

- Establish a work area. It is helpful to have a stable platform to place sample cores or samples on from which to observe and describe the sample. Stable platforms may include a truck tail-gate, portable folding table or specially-designed table for holding split-spoon soil samples or other cores.

- Inspect well construction materials, such as screens, risers, caps and other well materials. Confirm the materials meet scope requirements. Well screens should be sized to fit the formation (i.e., screen size should be less than the particle size of the formation adjacent to the screened intake). Confirm the well screen sizes are correct as specified in Request for Proposal. A discussion of well screen and sand pack selection is beyond the scope of this TG. Refer to Driscoll (1986, pg. 434-447) or your friendly neighborhood hydrogeologist regarding screen specifications.

- Proceed with drilling. Refer to TG_004 regarding description of glacial soils.

- Document depth where wet soils are first encountered, as well as subsequent lower water-bearing horizons.

- Install well or groundwater monitoring device as outlined in work plan or scope. For reference, a typical monitoring well design for a Single-Cased Well is presented (from ASTM D 5092).

- Document in writing how the well screen interval and grout intervals were selected and how they relate to observed soils. Also document how relative position (depth) of sand pack and borehole total depth was determined (i.e. through use of tape).

- Document amount of waste soil and waste water generated and how wastes were managed (i.e. where were wastes placed and disposed of).

- In many instances, site conditions will require deviation of scope of work or work plan. It is important the field staff and PMs communicate regarding unique site conditions (e.g., stratigraphy, presence of water, presence of contaminants and so forth) that could potentially affect drilling scope of work. Document communication in field log book.

- Take and document photographs if required for project.

- Document/Log the following (also refer to TG_001 and TG_004):
  - Personnel Present
  - Dates, Time, Weather Conditions
  - Drill Contractor and Drillers' names.
  - Drill Rig Make and Model
  - Drill Tooling (e.g. rods, augers, dimensions, Hammer weights and so forth)
  - Downtime

- Boring ID/Well ID, Start and Stop Times
- First indication/depth of wet conditions.
- Quantity (volume or mass) and Quality of all material placed in borehole, including Bags of Sand, Bentonite, Holeplug, Cement for each boring or well.
- Well materials and construction, including screen, riser, outer casings, covers, plugs or caps. Document joint types (e.g. PVC to Stainless/Screw, O-Ring).
- Linear Footage Driller. Note Auger/Core Diameter (e.g. "BH-1 75' using 4.24-HSA….").
- Number of Samples, Split-Spoons, Shelby Tubes and so forth.
- Blow Counts (split-spoon sampling).
- Well development method. Purge volumes. Development time. Water quality/appearance.
- Presence of DNAPL or LNAPL in well.
- Any damage to landscaping, pavement or other site features.

3.0 RESPONSIBILITY

- Staff geologists and geological engineers are required to review and become familiar with this TG.
- Field staff are responsible for collecting appropriate field notes and placing them in file.
- Field staff are responsible for noting all deviations from the original scope and stopping work if deviations and especially safety conditions are not appropriate.
- PMs and Technical Leaders are responsible for distributing or enforcing the use of this TG.

4.0 RELEVANT FORMS AND ATTACHMENTS

- Health and Safety Procedures No. 403.
- TG_001 and TG_004.
- 100 Series TG.
- See Insert Figure Attached.

5.0 REFERENCES

ASTM D1452(2000) Standard Practice for Soil Investigation and Sampling by Auger Borings

ASTM D1586-99 Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils

ASTM D5092-90(1995)e1 Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers

ASTM D5784-95(2000) Standard Guide for Use of Hollow-Stem Augers for GeoEnvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices

Groundwater and Wells, F. Driscoll. 1986: Johnson Div., St. Paul, MN.

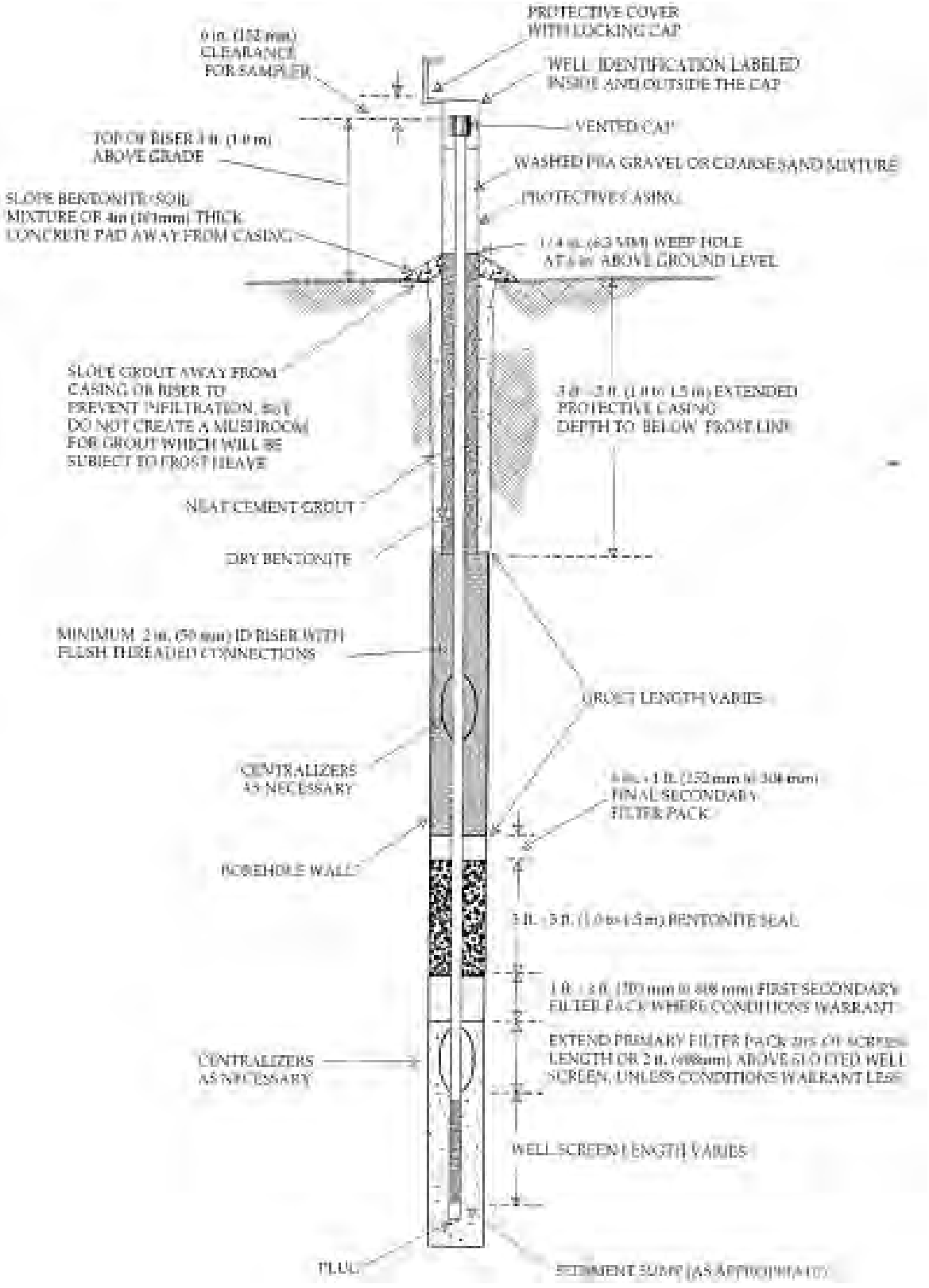
6.0 DOCUMENT APPROVAL AND HISTORY

Draft prepared August 28, 2006.

QC October 2, 2006.

DOCUMENT AUTHOR:	Barry J. Harding, CPG
DOCUMENT ID:	TG_003
DOCUMENT DATE:	August 28, 2006
DOCUMENT REVISION DATE:	October 3, 2006
DOCUMENT APPROVAL:	FINAL October 3, 2006.

Figure 1 – Typical Monitoring Well Design



TG: 004 **SUBJECT:** GLACIAL SOILS CLASSIFICATION

SUMMARY:

This Technical Guidance (TG) was prepared as an aid for geologists in the field, tasked with identifying and describing glacial soils collected through coring, split-spoon barrel or similar means. The purpose of this TG is to define AECOM's standard requirements for identification and description of glacial soils. This TG serves as a general overview of the Unified Soil Classification System (USCS), developed and later refined by the United State Army (Corps of Engineers) in the early 1960's. The USCS was developed primary for *geotechnical* applications that broadly groups soils into three divisions: 1) Coarse-grained soils, 2) Fine-grained soils, and 3) Highly Organic Soils. The USCS has been modified here to also address depositional environments and other attributes that affect or were affected by sites of environmental contamination. This includes sedimentary structure, weathering zones, depositional environment and contact information.

In some site-specific settings or project/contractual requirements, alternative soil classification systems may be more appropriate (e.g. AASHTO Standards for DOT work or USDA Classification for Agricultural Settings). Other modifications or alternative classification schemes may also apply.

1.0 REQUIRED EQUIPMENT

- Boring log forms, Field Notebook, Pen (see TG_001)
- Tape Measure and/or Slide Rule (Helpful) (Slide rule or brick-layer's rule is also helpful)
- USCS Cheat Sheet or ASTM D 2488
- Munsell® or Globe Soil Color Charts
- Dilute hydrochloric acid to determine sample carbonate status (leached or unleached)
- Spray bottle with water to aid in texture determinations
- Small Hand Lens (Helpful)
- Pocket Penetrometer (Helpful)

2.0 PROCEDURES

- Prior to performing description of soils, review scope of work, project work plan and HASP with the Project Manager or Technical Leader, On-Site Personnel and Sub-Contractors (if present).

- Drill rigs are potentially dangerous due to stored energy (e.g. hydraulic cylinders and overhead masts) and rotating/mechanized parts. Ask the driller where the emergency power shot-off "kill-switches" are located. Do not proceed further if the drill rig is not equipped with an emergency shut-off device.

- Document site activity and soil descriptions in a hard-bound survey-grade field note book dedicated to the project. In some instances, stratigraphic logging may be transcribed to a sheet log or manually loaded into a laptop, tablet PC or other portable electronic device.

- Establish a work area. It is helpful to have a stable platform to place sample cores or samples on from which to observe and describe the sample.

- Stable platforms may include a truck tail-gate, portable folding table or specially-designed table for holding split-spoon soil samples or other cores.

- In instances where in climate weather (rain or heavy snow) is occurring, it is helpful to have plastic covering or visquene available to protect cores.

- To make description easier, it best to lay the samples out sequentially, either in a core box or on a tarp. This makes recognition of the important changes with depth a whole lot easier, and consequently improves the characterization of the sequence we're dealing with. In some situations, too, a single sample may not reveal all the information you need for a particular unit, so observing sequential samples can help one make the correct interpretation.

- Depending on the project, client, regulatory requirements, one can either retain samples in core boxes for later review/use by others or just use enough boxes daily to correctly describe the sequence, then take representative sample splits at required intervals and store in sample jars as routinely done. For split spoon samples, standard NX core boxes work great. For CME and rotasonic samples, larger size core boxes (such as HX) work well.

- The TG is designed to work in concert with "Field Guide for Soil and Stratigraphic Analysis, V.2" field chart developed by AECOM personnel and the Midwest Geosciences Group.

- Describe the following Physical Attributes of the Sample (in Order Presented Below):

1. Density or Consistency. For Cohesive Soils use Pocket Penetrometer or Thumb Nail Test (Thumb Test for granular soils). Standard Penetration Test (STP), using 2-inch diameter split-spoon and 140-lb. hammer, also yields accurate "N" value. (Use middle two blows to determine density. For instance, blows of 2, 4, 6, 12, yield an N value of 10, corresponding to Stiff Cohesive soils). See summary below. (Note: 3-inch diameter split spoon and/or 300-lb hammer does not yield comparable N data).

Modified from Terzaghi & Peck, 1967

Cohesive Soils					Granular Soils	
	Blow Counts	qu (tsf)	Thumb Nail Test	Criteria		Blow Counts
Very Soft	0 to 2	<0.25	Very Soft	Thumb penetrates > 1 inch.	Very Loose	0 to 4
Soft	3 to 4	0.25 to 0.50	Soft	Thumb penetrates about 1 inch.	Loose	5 to 10
Medium	5 to 8	0.50 to 1.0	Firm	Thumb indents soil 0.25 inch.	Medium Dense	11 to 29
Stiff	9 to 15	1.0 to 2.0	No Analogue	No Criteria	Dense	30 to 49
Very Stiff	16 to 30	2.0 to 4.0	Hard	Thumbnail will indent soil	Very Dense	> 50
Hard	> 30	> 4.0	Very Hard	Thumb will not indent Soil		

2. Color. Refer to Munsell color charts or Globe Color Charts or similar. Give color designation (i.e., 10YR 5/4) and standard color name (i.e., yellowish brown).

3. Assign Lithological Description and USCS Symbol (e.g. SW)

    a. Determine if Soil is Coarse grained of Fine Grained

    b. Determine Sand vs. Gravel Content

    c. Determine Plasticity

PLASTICITY INDEX	
Description	*Criteria*
Nonplastic	A 1/8-in thread cannot be rolled.
Low	The thread can be barely rolled.
Medium	Thread is easy to roll.
High	Thread can be re-rolled several times.

    d. Determine if Organic Content Influences Soil Properties. If yes, designate as OL or OH (see chart).

4. Describe Moisture.

    Dry = Absence of Moisture, Dusty or Dry to Touch
    Moist = Damp, No Visible Water
    Wet = Water is present

    For Non-Plastic Fine use Dilatency Test.

    Water Rises to Surface of Sample Slowly = Slow Dilatency

    Water Rises Quickly to Surface of Sample = Rapid Dilatency

5. Describe Plasticity and Cohesiveness: nonplastic, low plasticity, medium plasticity, or high plasticity; cohesive or noncohesive.

6. Describe Sedimentary Structure. (For bedding, consider standard geological bedding thicknesses: very thickly bedded = >1m (>3 ft); thickly bedded = 30-100cm (1-3 ft); medium bedded = 10-30cm (4-12 inches); thinly bedded = 3-10 cm (1-4 inches); very thinly bedded = 1-3cm (1/4-1 inch); laminated = <1cm (<1/4 inch)

    a. Massive = Uniform
    b. Normally graded = fining upward
    c. Inversely graded = coarsening upward
    d. Thickly Bedded = Beds > 1 foot
    e. Bedded = Beds 1 Inch to a Foot
    f. Thinly Bedded = Beds 0.2 Inch to 1 Inch
    g. Laminated = <0.2 Inch (0.5 cm)

7. Weathering Zone Information. See Attachment 1.

    a. Mottled = M
    b. Jointed = J

c. Oxidized = O
d. Reduced = R
e. Unoxidized = U
f. Leached = L
g. Unleached = UL

8. Secondary Particle Size Information (e.g. Sand: Fine, Medium or Coarse; Gravel: Fine or Coarse).

Trace	=	Particles present estimated to be less than 5%
Few	=	6 to 15%
Little	=	16 to 30%
Some	=	31 to 50%

9. Grading (Well = Varying and Mixed Particle Sizes; Poorly = Same Particle Sizes).

10. Material; i.e., loess, alluvium, outwash, diamicton, etc.

11. Depositional Environment (Optional).

12. Stratigraphic Name (Optional – Not Formal in Michigan)

13. Stratigraphic Contact. Sharp < 10 cm or Gradational > 10cm

14. Additional Comments

    Presence of oil or other contaminant staining
    Distinct weathering zones or stark color changes.
    Bio-clasts, other inclusions, roots, or other anomalous features.
    PID Screening, Reagent Kits, Sample Intervals.
    Soft-sediment deformation, etc.

Example Description(s): (Numbers added to Show Steps)

17 to 19.5'
(1)Stiff, (2) light reddish-brown 5YR 6/3, (3) LEAN CLAY (CL), (4) moist, (5) medium plasticity, cohesive (6) thickly bedded, (7) OU, (8) few sand, trace gravel, (9) – No Information, (11) Lacustrine? Possibly Storm/Flood, (12) – Not Relevant in Michigan, (13) – Sharp Contact at 19.5'.

19.5 to 22' TD
(1)Medium dense, (2) pale yellow 5Y 8/2, (3) WELL GRADED SAND (SW), (4) wet (water rising into casing), (5) nonplastic, non-cohesive, (6) massive, (7) RU, (8-9) well-graded coarse sand, few gravel, (10) alluvium, (11) fluvial, (12) – Not Relevant in Michigan, (13) – No contact from 19.5' to terminal depth, (14) bivalve mollusk shell fragments and other bioclasts from 21-22' bg.

3.0 RESPONSIBILITY

- Geologist and geological engineers are responsible for maintaining detailed descriptions of glacial soils. Staff geologists and geological engineers are required to review and become familiar with this TG for all work and Description of Glacial Soils.

- Upon completion of borehole, geologist or geological engineer is required to contact PM or Technical leader to discuss stratigraphy, differences to other boreholes, special conditions or observations.

- At the end of the day, or sooner if necessary, geologist or geological engineer is required to contact PM or technical leader to discuss interpretation of lithologies, challenges, schedule, performance of driller, safety issues, sampling requirements and other daily activities.

- PMs and Technical Leaders are responsible for implementing use of this TG.

4.0 RELEVANT FORMS AND ATTACHMENTS

- Subject to site-specifics and PM discretion.

5.0 REFERENCES

- ASTM D2487-00 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)

- ASTM D2488-00 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

- ASTM D4083-89(2001)e1 Standard Practice for Description of Frozen Soils (Visual-Manual Procedure)

- The Unified Soil Classification System, Corps of Engineers, US Army Tech. Memo. N0 3-357, Vol. 1, March 1953.

- Standard Procedures for Evaluation of Quaternary Materials in Iowa, S. Grant, TIS No. 8, Dec. 1978, Iowa Geol. Surv.

6.0 DOCUMENT APPROVAL AND HISTORY

- Draft prepared August 28, 2006.

- Revised September 12, 2006.

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September 27, 2006 - FINAL
DOCUMENT APPROVAL: October 3, 2006.

ATTACHMENT 1 – WEATHERING ZONES

From S. Grant, 1978, pg. 76, 88-89.

INTRODUCTION

"Weathering zone" terminology refers to the shorthand phrases which are used to describe Quaternary sediments in terms of their color and the presence or absence of soluble carbonate minerals. In Iowa this terminology is used to summarize the description of material below the solum (A and B horizons). For soil descriptions, modern, relict, or buried, standard descriptive terminology and nomenclature are used (Soil Survey Staff 1951, 1975). Horizon designations such as A1, A2, B22t, B23g, etc., form a standard shorthand notation to convey to the informed reader what the properties of that horizon are, when it is not possible to present a full description. Weathering zone terminology provides a short-hand for C horizon materials.

Wherever possible, detailed descriptions should be provided. This is often not practical, especially in publications. Thus, the proper use of these shorthand descriptors is imperative. Just as it is important to standardize our methods of analyses to provide comparative laboratory data, it is perhaps more important to begin with a standard description of the material-- because all our data eventually are related to this.

It also is important to understand fully the nature of weathering zones. Very abrupt contacts between these zones may coincide with stratigraphic breaks. However, the more gradual transitions between these zones in natural progression should not be confused with stratigraphic boundaries.

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Till

Standard symbols, terms, and their defined use for till are:

First Symbol - color reference

O - oxidized; 60% of matrix has hues redder than 2.5Y (ex.- 10YR, 7.5YR); hues of 2.5Y, with values of 5 or higher, but including 2.5Y 4/4; may have segregation of secondary compounds into mottles, tubules, or nodules, etc.

R - reduced; 60% of matrix has hues of 2.5Y, with values of 3 or less, hues of 2.5Y, with value of 4, with chromas of 2 or less; hues of 5Y, N, 5GY, 5G, 5BG, and 5G, values of 4 or higher (usually values in this zone are 5 or higher). Colors in this zone are nearly always mixed as weak mottles, diffuse blends of color, or as discrete bands. Discrete vertical bands of reduced colors may occur for some distance adjacent to joints. These bands may eventually grade into uniform unoxidized material. In this zone there may be considerable segregation of secondary iron compounds (with oxidized colors) into mottles, nodules, or sheets along cleavage planes, or joints.

U - unoxidized; matrix uniform; has hues of 5Y and N, values of 5 or less, 5GY, 5G, 5BG, 5G, with values of 6 or less; with no segregation of iron compounds into mottles, nodules, etc.

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Second Symbol - if used

J - jointed, describes the presence of well-defined vertical joints in the till; joints often show oxidized and reduced colors, often have coatings or rinds of secondary iron-oxides; occasionally other secondary minerals such as calcite or gypsum.

Second or Third Symbol - leached or unleached state; same as for loess.

U - unleached.

L - leached.

L2 - leached of primary carbonates, but secondary carbonates present.

Modifier Symbols - when used precede first symbol, as with loess.

M - mottled; zones with 20-50% contrasting mottles; when used with the unoxidized zone designation it infers 20% or less mottles of reduced colors.

Examples: JRU-jointed reduced unleached-mixed olive (5Y4/4 and 5Y4/3) and very dark grayish brown (2.5Y 3/2), with common gray (5Y5/1) and light olive brown (2.5Y 5/4) mottles; prominent vertical joints, with 1 cm strong brown (7.5Y 5/8) segregations along the joint; unleached.

JUU - jointed, unoxidized, unleached-uniform dark greenish gray (5GY 4/1) matrix, with few thin vertical joints, which have mottled light olive brown (2.5Y 5/6) and olive gray (5Y 5/2) faces, and a 3 cm rind of greenish gray (5GY 5/1); unleached.

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TG: 005 **SUBJECT:** FIELD EQUIPMENT CHECKLIST

SUMMARY:

Completing an equipment checklist must be completed before the start of all field activities. The purpose of this SOP is to identify the standard equipment needed to complete certain field activities.

1.0 REQUIRED EQUIPMENT

TG_005 is broken down into five field activities:

1. Low-Flow (Minimal Drawdown) Groundwater Sampling
2. Drilling Oversight (All Drilling Techniques)
3. Construction Oversight
4. Soil Sampling
5. Groundwater Level Monitoring

2.0 PROCEDURES

1. Low-Flow (Minimal Drawdown) Groundwater Sampling Checklist
   - ☐ TG For Low-Flow MDD.
   - ☐ PPE (Personal Protective Equipment)
   - ☐ HASP (Health and Safety Plan)
   - ☐ Field Book w/ Pen
   - ☐ Field Tablet (charged) and Loaded with Groundwater Monitoring Template(s)
   - ☐ Scope of Work or Work Plan
   - ☐ Low-Flow Sampling Forms
   - ☐ Well Cap keys
   - ☐ Tools to Open Well Covers
   - ☐ Appropriate Pump; Peristaltic or Submersible (Dependent on Water Depth)
   - ☐ Poly Tubing
   - ☐ Silicone Tubing (Master flex)
   - ☐ Horiba U-22 (or appropriate water quality meter)
   - ☐ AC-DC Power Inverter/Converter
   - ☐ Hose Clamps (helpful).
   - ☐ Disposable Gloves (Nitrile)
   - ☐ Water Level Probe (Product/Water Level Probe if necessary)
   - ☐ Coolers for Samples
   - ☐ Ice for Samples
   - ☐ Appropriate Sample Containers, Chain of Custody's, Preservatives, Labels
   - ☐ List of Analytical Parameters for each Monitoring Well (if necessary)

- ☐ Monitoring Well Location Map
- ☐ PID (Photo Ionization Detector)
- ☐ Camera (if necessary)
- ☐ Labels/Paint Pen for labeling drums (if necessary)

2. Drilling Oversight Checklist
   - ☐ TG for Drilling Oversight
   - ☐ PPE
   - ☐ HASP
   - ☐ 4-Gas Meter, Draeger Tubes, Mini-Ram if dictated by HASP or JHA.
   - ☐ Scope of Work or Work Plan
   - ☐ Field Book w/ Pen
   - ☐ Camera
   - ☐ PID
   - ☐ Disposable Gloves (Nitrile)
   - ☐ Water Level Probe
   - ☐ Zip-Lock Baggies (for PID screening)
   - ☐ Ice and Coolers for Samples (if necessary)
   - ☐ Appropriate Sample Containers, Chain of Custody's, Preservatives, Labels (if necessary)
   - ☐ List of Analytical Parameters for each Boring (if necessary)
   - ☐ Boring Locations Map w/ ID's
   - ☐ Hand Lens, Munsell Color Charts, Pocket Penetrometer, Tape, USCS Guidance (if necessary).
   - ☐ Labels/Paint Pen for labeling drums (if necessary)
   - ☐ Locks (if necessary)

3. Construction Oversight Checklist
   - ☐ TG for Construction Oversight
   - ☐ PPE
   - ☐ HASP
   - ☐ Scope of Work or Work Plan
   - ☐ Field Book w/ Pen
   - ☐ Camera
   - ☐ PID
   - ☐ Disposable Gloves (Nitrile)
   - ☐ Blue Prints/Specs
   - ☐ Measuring Tape/Wheel

4. Soil Sampling Checklist
   - ☐ TG 600 Series for Soil Sampling
   - ☐ PPE (Personal Protective Equipment)

- ☐ HASP (Health and Safety Plan)
- ☐ Field Book w/ Pen
- ☐ Sampling Equipment (Hand-Auger, Stainless Steel Spoons or other)
- ☐ 1/10th Gram Accuracy Scale (for MeOH Preservation Only).
- ☐ Methanol Preservative Kits (VOC MeOH requirements only)
- ☐ Disposable Gloves (Nitrile)
- ☐ Coolers for Samples
- ☐ Ice for Samples
- ☐ Ziploc or Similar PE Bags
- ☐ Appropriate Sample Containers, Chain of Custody's, Preservatives, Labels
- ☐ List of Analytical Parameters – Sampling Scope or Work Plan
- ☐ PID (Photo Ionization Detector)
- ☐ Camera (if necessary)
- ☐ Labels/Paint Pen for labeling drums (if necessary)

5. Groundwater Level Monitoring Checklist
   - ☐ PPE (Personal Protective Equipment)
   - ☐ HASP (Health and Safety Plan)
   - ☐ Field Tablet (charged) and Loaded with Groundwater Monitoring Template(s)
   - ☐ Full set of paper versions of Forms with Field Book and Pen/Pencil (as contingency)
   - ☐ Scope of Work or Work Plan
   - ☐ Low-Flow Sampling Forms
   - ☐ Well Cap keys
   - ☐ Tools to Open Well Covers (and Troubleshoot other Potential Issues)
   - ☐ Water Level Probe
   - ☐ Alconox Anionic Detergent
   - ☐ DI Rinse Water
   - ☐ AC-DC Power Inverter/Converter
   - ☐ Disposable Gloves (Nitrile)
   - ☐ Monitoring Well Location Map
   - ☐ Cell Phone / Camera
   - ☐ Labels/Paint Pen (to improve well labels, if necessary)
   - ☐ Replacement Locks (as needed)

3.0 RESPONSIBILITY

Checklists in TG_005 are aimed at field staff. All field staff must be familiar with the electronic data recording tablet and web-based field forms. Coordinate with PM or Technical Leader regarding site-specifics or special items not presented in this TG.

Distribution of TG_005 is responsibility of PM.

4.0 RELEVANT FORMS AND ATTACHMENTS

No relevant forms.

5.0 REFERENCES

No relevant references.

6.0 DOCUMENT APPROVAL AND HISTORY

Draft prepared by Dave Bareham, June 30, 2006
Revised by Barry Harding, August 28, 2006.
Further QC September 14, 2006.
FINAL September 27, 2006.

DOCUMENT AUTHOR:	Dave Bareham
DOCUMENT ID:	TG_005
DOCUMENT DATE:	June 30, 2006
DOCUMENT REVISION DATE:	August 28, 2006 September 14, 2006 September 27, 2006 - FINAL
DOCUMENT APPROVAL:	October 3, 2006

TG: 006 **SUBJECT:** Filling out Chain-of-Custody Sample Documentation

SUMMARY:

Chain-of-Custody (COC) documentation is a protocol that provides a record of persons having control of, and access to a sample(s). The COC Record is commonly documented in a COC Form carried with samples. COC refers to both the Form and Procedure. Chain-of-Custody procedure starts when a sample is collected and ends when the sample is delivered to the designated analytical laboratory or other testing facility.

All samples must be accompanied with a COC Form 1) at the site, 2) during shipment or transaction, and 3) when delivered to analytical laboratory.

COC Forms are available from the selected laboratory of choice.

There are two general types of COC: routine and legal/evidentiary. The type of custody needed depends on project specific requirements, contracts and data quality objectives. A routine COC is used to verify the integrity of a sample by providing records that track the sample from collecting, storing, handling, shipping and analyzing. Routine COC's provides sufficient documentation for demonstrating how the sample was handled from provenance to laboratory in the event the handling of samples is questioned. Routine COCs are addressed in the TG.

Legal/Evidentiary COC includes the same general requirements as routine COC, however, are specifically designed to provide a record that may be produced as evidence in legal proceedings. As such, Legal/Evidentiary are project or contract specific, sometimes vary from State to State, and vary to level of detail and supplemental security procedures (e.g. custody seals, unique labels, second party witness, and so forth). A key difference for Legal/Evidentiary COC is samples must be recorded at the time of collection. Legal/Evidentiary COC is **not** discussed in detail within this TG. Consult with PM regarding need for Legal/Evidentiary COC on particular projects.

COC procedures consist of three phases:

1. Beginning Custody
   - Begins when sample is collected.
   - Samples will be recorded at the time they are preserved (if preserved).
   - All samples placed in a cooler must be recorded on COC at the Site.
   - COC Form is to remain with samples at all times.
2. Custody Transfer
   - Transfer occurs when samples are relinquished from one person to another.
   - Sign "Relinquished/Released By" Line.
   - Receptor Signs "Received By" Line.

- An exception to custody transfer is the releasing of COC to a secure facility (eg. A private courier or shipping company), or when samples are dropped off at a secure (locked) facility.

3. Custody Completion
   - Routine COC closes upon final receipt by lab*. When the analytical report is generated, the original COC (or exact copy of COC) is included with laboratory report.
   - Person who drops off samples also typically retains "tear offs" from COC (duplicates colored pink or yellow).

Note:

*If a primary laboratory subcontracts portion of an analytical service to another laboratory (for specialized testing or other reasons), the COC should remain with the primary laboratory. However, the primary laboratory should prepare a receipt or other written documentation providing information which samples are being delivered or split to sub-contract laboratory, when and where they are being delivered, the time and date of transfer, and parties involved with transfer.

Consult with contract manager or PM on any project you are not familiar with. Certain contracts have specific requirements for COC documentation. Examples include Michigan's Level of Effort Contract (LOE) and ACOE contracts.

1.0 REQUIRED EQUIPMENT

- HASP
- Field Note Book and Field Logs
- Laboratory COC Forms
- Ziploc® or similar bag
- Black or Blue Ink Pen
- Work Plan, Sampling Plan, Scope of Work, etc.
- Project Specifics: Project Number, Site ID Codes, Contract Numbers, Shipping Numbers, Phone Numbers, Contact Information and so forth.

2.0 PROCEDURES (ROUTINE COC)

1. Sampler discusses scope of work with PM/TL.
2. Sampler retains COC Form from analytical laboratory or PM.
3. Project Specifics, Contacts, Job Number and other items shown in top section of COC (Items 1-4 and 6, see Attachment 1) may be filled out in office prior to field work.

4. Sampling Performed. Sample is clearly labeled with Sample ID, Project Name, Date, Sampling Time, Analytical Parameter, and Preservative.
   - Sample ID: ET-MW-01.
   - Project Name: Joe's Garage
   - Date: March 3, 2006.
   - Time: 1315 Hrs.
   - Analytical Parameters: VOCs (8260)
   - Preservative: HCL, Batch #12345
5. Record Sample Information (above) in hard-bound field book.
6. Transcribe Sample Information (Items 4 or 5) to COC.
   - Sample ID, Time, Date, and Use of Preservatives must precisely match Information Scribed on Samples.
   - The COC is to be completed as samples are collected. However, some latitude is allowed to fill out COC in phases such as after a series of samples are collected and transferred to a cooler.
   - Typically the COC has space for 10 or 12 samples. For field programs with more than 10 or 12 samples, begin another COC and note COC is Page x of x (Page 2 of 2).
   - For interim time, place COC in gallon-size Ziploc® or similar bag with Samples.
7. Upon completion of Sampling. Carefully package samples (TG_401). Sign "Relinquished By" Line. Include Date and Time Samples were relinquished. Place COC in Ziploc® and place on top of samples. Do not use Duct tape or Electrical tape to secure Ziploc® to inside of cooler (tape adhesives contain MEK and Toluene, respectively). Secure Cooler by taping shut with packaging tape (if shipped).
8. Ship or transfer samples to destination. If samples are passed to another person, that person must sign "Received by" and subsequently "Released/Relinquished By" lines.
9. For hand-delivered samples (where an AECOM staff member delivers samples), stay at laboratory to verify each and every sample was accounted for at the laboratory. Retain COC "slips".
   - White Copy – Laboratory Retains
   - Light Yellow Copy – AECOM PM or Tech Lead
   - Pink – Courier/Sampler
   - Dark Yellow – File

Upon receipt of analytical report from the laboratory, verify the COC was included with analytical report. Cross-reference samples on COC versus those samples analyzed to confirm all samples were analyzed for requested target analytes.

3.0 RESPONSIBILITY

- Samplers are required to understand and competently fill out COC.
- Samplers are required to acquire blank COCs.
- Project Manager and Technical Leads are required to understand COC and discuss project specific on use of COC with samplers.
- The Sampler is required to notify PM/TL with any questions.

4.0 RELEVANT FORMS AND ATTACHMENTS

See Attachments.

5.0 REFERENCES

Environmental Forensics, Robert Morrison, 2000, CRC Press. Pg. 143-146 on Chain-of-Custody.

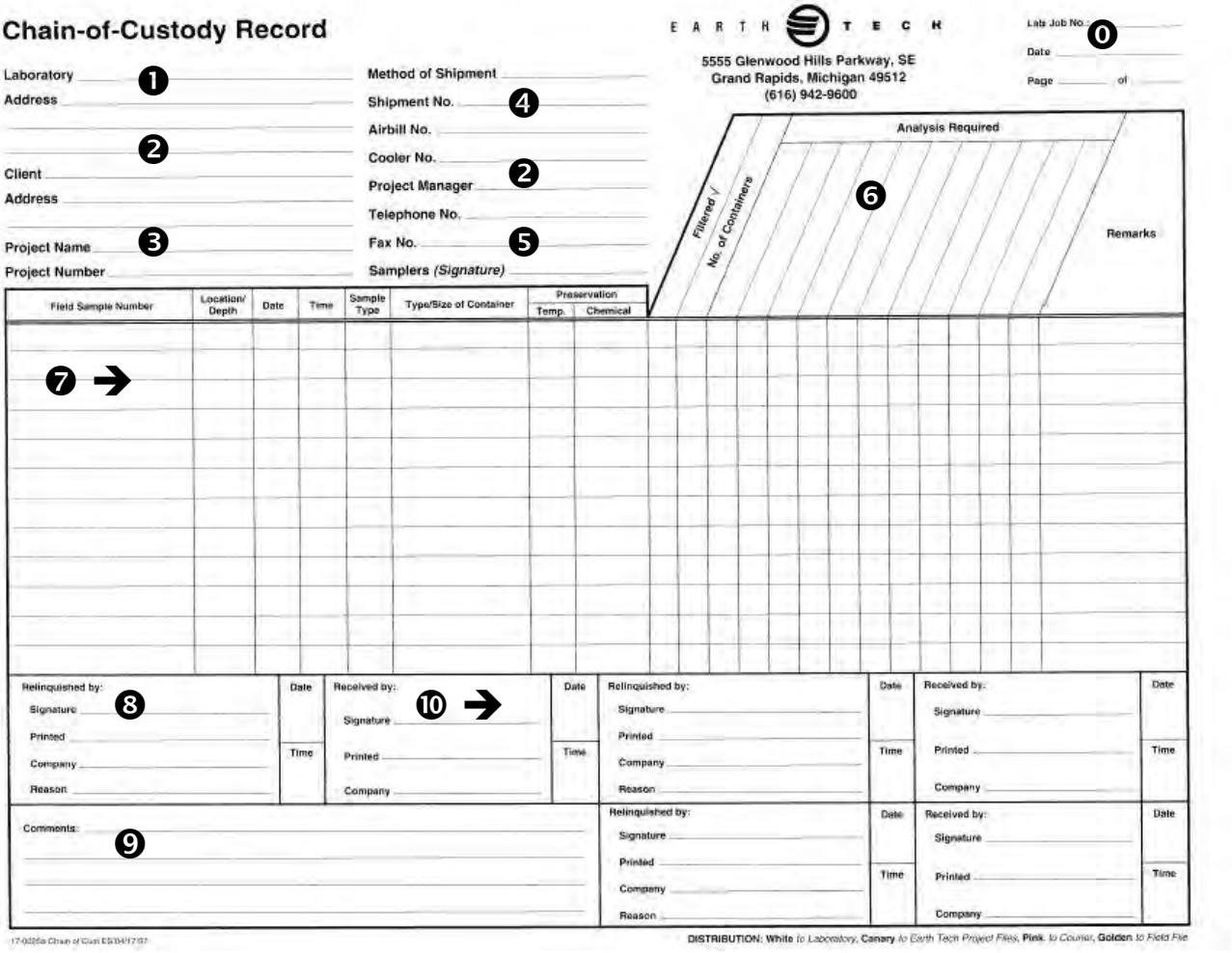
6.0 DOCUMENT APPROVAL AND HISTORY

Draft November 7, 2006.

QC 1 – November 8, 2006.

DOCUMENT AUTHOR:	Barry J. Harding, CPG
DOCUMENT ID:	TG_006
DOCUMENT DATE:	November 7, 2006
DOCUMENT REVISION DATE:	November 8, 2006.
DOCUMENT APPROVAL:	January 10, 2007.

Attachment 1 – ET COC



NOTES:

1. Fill in Analytical Laboratory Name, Address, and Phone Number.

2. Fill in AECOM Name, Office Location, and Address. Fill in AECOM PM and Phone Number. Sometimes email address is also provided.

3. Fill in Project Name and AECOM Project Number and Task.

4. Note method of Shipment (FedEx, UPS, Hand-Delivery). Include Shipping and Airbill Number, if relevant, and Cooler Number, if relevant.

5. Sampler Signs Name (Signature Line).

6. Specific Analysis Request with EPA or ASTM Analytical Methodology. Include number of containers and whether sample is filtered or not (aqueous samples only).

7. Consists of 8 Columns and 12 Rows.

    a. Field Sample Number. This is Sample ID. (e.g., ET-MW-01). The sample ID must precisely match label on sample.

    b. Location or Depth. This is descriptor for sample ID. (e.g., N = North or 0.5' = Depth, and so forth).

    c. Date. Insert Date Sample Collected.

    d. Time. Insert Time. Military Time preferable to 12-hr am/pm Time.

    e. Sample Type. Media Specific. Soil = S, Water = W, A = Air.

    f. Type/Size of Container. This is Sample Vessel Type and Volume. (e.g., Amber Boro-silicate Glass, 40 ml VOA Vial).

    g. Preservation. Note Temperature of Sample and Preservative (e.g., "Aquifer Temp 54 degree F at Sampling, HCL Preservative). Details can go under comments, item 9, below.

    h. Check each box below section 6 that correlates to Analysis Required for Sample.

8. Relinquished Box. Sign and neatly print name, affiliation (eg. AECOM) and why sample(s) are being relinquished (e.g., Shipped to Laboratory). Fill in Date and Precise Time.

9. Add any specific comments. This is important area to follow up on. Comments may include comments observed in field or directions for analytical laboratory. (e.g., "Well MW-01, sample ET-MW-01 historically high VOCs…." And so forth).

10. Laboratory or other receiving party signs and neatly prints name and affiliation. Usually this is laboratory, but may also be another currier taking custody of sample(s). Have receptor fill in date and precise time. Multiple changes in custody require multiple signatures.

Item "0". For laboratory use only.

TG: 007 **SUBJECT:** LITHOLOGICAL AND WELL LOGS FOR REPORTS

SUMMARY:

This Technical Guidance (TG) was prepared as an aid for geologists or other scientists or engineers tasked with creating lithological and well construction logs, based on field notes or logs.

Knowledge and training pertinent to relevant logging software is needed. Common logging software packages used include Rockware's LogPlot™ (http://www.rockware.com/catalog/pages/logplot.html) and gINT™ (http://www.gintsoftware.com/). Refer to licensed software training manual or co-worker for using software or program in developing logs.

This TG is based on describing soils using Unified Soil Classification System (USCS), developed and later refined by the United State Army (Corps of Engineers) in the early 1960's. The USCS was developed primary for *geotechnical* applications that broadly groups soils into three divisions: 1) Coarse-grained soils, 2) Fine-grained soils, and 3) Highly Organic Soils. The USCS has been modified here to also address depositional environments and other attributes that affect or were affected by sites of environmental contamination. This includes sedimentary structure, weathering zones, depositional environment and contact information. Refer to TG_004 (Glacial Soil Descriptions).

Consult with PM or Technical Leader regarding content of lithological and well construction logs. Content of logs may vary based on project and contract requirements.

1.0 REQUIRED EQUIPMENT

- Original Field Logs or Logs Transcribed in Field Notebook.
- USCS Cheat Sheet or ASTM D 2488 (Helpful for cross-checking soil descriptions to USCS symbol code).
- Computer terminal with relevant software.

2.0 PROCEDURES

- Prior to developing logs, review scope of work and project work plan with the Project Manager or Technical Leader to determine need for logs.
- Determine the purpose for the logs. Are they for site-specific contaminant investigation? Are they geotechnical borings? Are they borings advanced specifically for knowledge of stratigraphy? Are they blind-drilled borings advanced for placement of wells? The purpose will provide some guidance as to the degree of detail needed.
- Decide on appropriate content and outline for logs based on purpose of investigation. For example:

- Hollow-Stem Auger and Continuous Split-Spooned investigations should include a column showing blow-counts.
- Geoprobe borings should include a column for recovery percentages.
- Head-space screened soils (PID, FID or other) would warrant inclusion of field-screening column.
- If oil-in-soil test kits are taken, a column will be required.
- Borehole with multiple sampling depths would warrant column showing sampling depths.
- Boreholes or wells logged through down-hole geophysical means (eg. Gamma) would warrant inclusion of gamma log column.
- Determine need for graphics column.
- Determine style and layout pattern of log, based on templates, content and type of log (lithological versus monitoring well construction log).

- Fill in site specifics, including client, project name and number, site location, drilling contractor and crew chief, equipment, boring ID, location, coordinate data (if relevant), elevation data, weather and other comments.
- Describe the following Physical Attributes of the lithology (in Order Presented in Attachment 1): Density or Consistency, Color, Classification with USCS Symbol, Moisture, Plasticity/Cohesiveness, Sedimentary Structure, Weathering, Particle Size, Grading, Material, Depositional Environment (Optional), Stratigraphic Name (Optional), Contact (Sharp or Gradational), and other comments (presence of staining or contaminant indicators).
- Frequently save data as it is loaded to log. Also view log to verify data entry.
- Cross-reference computer-derived log to field log. Check for spelling errors, misplaced information, missed information, etc…
- Assign peer QC person to check log.
- Correct any errors on log.

3.0 RESPONSIBILITY

- Geologist and other technical staff are responsible for developing logs for reports or other deliverables. Staff geologists and geological engineers are required to review and become familiar with this TG for all work and Description of Glacial Soils.
- Upon completion of borehole, geologist or geological engineer is required to contact PM or Technical leader to discuss stratigraphy, differences to other boreholes, special conditions or observations.

- PMs and Technical Leaders are responsible for implementing use of this TG.

4.0 RELEVANT FORMS AND ATTACHMENTS

- Subject to site-specifics and PM discretion.
- See Attachments 1 and 2.

5.0 REFERENCES

- ASTM D2487-00 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- ASTM D2488-00 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
- ASTM D4083-89(2001)e1 Standard Practice for Description of Frozen Soils (Visual-Manual Procedure)
- The Unified Soil Classification System, Corps of Engineers, US Army Tech. Memo. N0 3-357, Vol. 1, March 1953.
- Standard Procedures for Evaluation of Quaternary Materials in Iowa, S. Grant, TIS No. 8, Dec. 1978, Iowa Geol. Surv.

6.0 DOCUMENT APPROVAL AND HISTORY

- Draft prepared November 27, 2006.
- Revised January 2, 2007.

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ATTACHMENT 1
TECHNICAL GUIDANCE FOR DESCRIPTON OF GLACIAL SOILS

1. Density or Consistency. For Cohesive Soils use Pocket Penetrometer or Thumb Nail Test (Thumb Test for granular soils). Standard Penetration Test (STP), using 2-inch diameter split-spoon and 140-lb. hammer, also yields accurate "N" value. (Use middle two blows to determine density. For instance, blows of 2, 4, 6, 12, yield an N value of 10, corresponding to Stiff Cohesive soils). See summary below. (Note: 3-inch diameter split spoon and/or 300-lb hammer does not yield comparable N data).

Modified from Terzaghi & Peck, 1967

Cohesive Soils					Granular Soils	
	Blow Counts	qu (tsf)	Thumb Nail Test	Criteria		Blow Counts
Very Soft	0 to 2	<0.25	Very Soft	Thumb penetrates > 1 inch.	Very Loose	0 to 4
Soft	3 to 4	0.25 to 0.50	Soft	Thumb penetrates about 1 inch.	Loose	5 to 10
Medium	5 to 8	0.50 to 1.0	Firm	Thumb indents soil 0.25 inch.	Medium Dense	11 to 29
Stiff	9 to 15	1.0 to 2.0	No Analogue	No Criteria	Dense	30 to 49
Very Stiff	16 to 30	2.0 to 4.0	Hard	Thumbnail will indent soil	Very Dense	> 50
Hard	> 30	> 4.0	Very Hard	Thumb will not indent Soil		

2. Color. Refer to Munsell color charts or Globe Color Charts or similar. Give color designation (i.e., 10YR 5/4) and standard color name (i.e., yellowish brown).
3. Assign Classification with USCS Symbol (e.g. SW)
    a. Determine if Soil is Coarse grained of Fine Grained
    b. Determine Sand vs. Gravel Content
    c. Determine Plasticity

PLASTICITY INDEX	
Description	*Criteria*
Nonplastic	A 1/8-in thread cannot be rolled.
Low	The thread can be barely rolled.
Medium	Thread is easy to roll.
High	Thread can be re-rolled several times.

    d. Determine if Organic Content Influences Soil Properties. If yes, designate as OL or OH (see chart).
4. Describe Moisture.

    Dry = Absence of Moisture, Dusty or Dry to Touch
    Moist = Damp, No Visible Water
    Wet = Water is present

    For Non-Plastic Fine use Dilatency Test.

    Water Rises to Surface of Sample Slowly = Slow Dilatency

    Water Rises Quickly to Surface of Sample = Rapid Dilatency

5. Describe Plasticity and Cohesiveness: nonplastic, low plasticity, medium plasticity, or high plasticity; cohesive or noncohesive.

6. Describe Sedimentary Structure. (For bedding, consider standard geological bedding thicknesses: very thickly bedded = >1m (>3 ft); thickly bedded = 30-100cm (1-3 ft); medium bedded = 10-30cm (4-12 inches); thinly bedded = 3-10 cm (1-4 inches); very thinly bedded = 1-3cm (1/4-1 inch); laminated = <1cm (<1/4 inch)

    a. Massive = Uniform
    b. Normally graded = fining upward
    c. Inversely graded = coarsening upward
    d. Thickly Bedded = Beds > 1 foot
    e. Bedded = Beds 1 Inch to a Foot
    f. Thinly Bedded = Beds 0.2 Inch to 1 Inch
    g. Laminated = <0.2 Inch (0.5 cm)

7. Weathering Zone Information. See Attachment 2.

    a. Mottled = M
    b. Jointed = J
    c. Oxidized = O
    d. Reduced = R
    e. Unoxidized = U
    f. Leached = L
    g. Unleached = U

8. Secondary Particle Size Information (e.g. Sand: Fine, Medium or Coarse; Gravel: Fine or Coarse).

    Trace = Particles present estimated to be less than 5%
    Few = 6 to 15%
    Little = 16 to 30%
    Some = 31 to 50%

9. Grading (Well = Varying and Mixed Particle Sizes; Poorly = Same Particle Sizes).
10. Material; i.e., loess, alluvium, outwash, diamicton, etc.
11. Depositional Environment (Optional).
12. Stratigraphic Name (Optional – Not Formal in Michigan)
13. Stratigraphic Contact. Sharp < 10 cm or Gradational > 10cm
14. Additional Comments

    Presence of oil or other contaminant staining
    Distinct weathering zones or stark color changes.
    Bio-clasts, other inclusions, roots, or other anomalous features.

PID Screening, Reagent Kits, Sample Intervals.
Soft-sediment deformation, etc.

Example Description(s): (Numbers added to Show Steps)

17 to 19.5'
(1)Stiff, (2) light reddish-brown 5YR 6/3, (3) LEAN CLAY (CL), (4) moist, (5) medium plasticity, cohesive (6) thickly bedded, (7) OU, (8) few sand, trace gravel, (9) – No Information, (11) Lacustrine? Possibly Storm/Flood, (12) – Not Relevant in Michigan, (13) – Sharp Contact at 19.5' bgs.

19.5 to 22' TD
(1)Medium dense, (2) pale yellow 5Y 8/2, (3) SAND (SW), (4) wet (water rising into casing), (5) nonplastic, non-cohesive, (6) massive, (7) RU, (8-9) well-graded coarse sand, few gravel, (10) alluvium, (11) fluvial, (12) – Not Relevant in Michigan, (13) – No contact from 19.5' to terminal depth, (14) bivalve mollusk shell fragments and other bioclasts from 21.0-22.0' bgs.

ATTACHMENT 2 – WEATHERING ZONES
From S. Grant, 1978, pg. 76, 88-89.

INTRODUCTION

"Weathering zone" terminology refers to the shorthand phrases which are used to describe Quaternary sediments in terms of their color and the presence or absence of soluble carbonate minerals. In Iowa this terminology is used to summarize the description of material below the solum (A and B horizons). For soil descriptions, modern, relict, or buried, standard descriptive terminology and nomenclature are used (Soil Survey Staff 1951, 1975). Horizon designations such as A1, A2, B22t, B23g, etc., form a standard shorthand notation to convey to the informed reader what the properties of that horizon are, when it is not possible to present a full description. Weathering zone terminology provides a short-hand for C horizon materials.

Wherever possible, detailed descriptions should be provided. This is often not practical, especially in publications. Thus, the proper use of these shorthand descriptors is imperative. Just as it is important to standardize our methods of analyses to provide comparative laboratory data, it is perhaps more important to begin with a standard description of the material-- because all our data eventually are related to this.

It also is important to understand fully the nature of weathering zones. Very abrupt contacts between these zones may coincide with stratigraphic breaks. However, the more gradual transitions between these zones in natural progression should not be confused with stratigraphic boundaries.

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Till

Standard symbols, terms, and their defined use for till are:

First Symbol - color reference

0 - oxidized; 60% of matrix has hues redder than 2.5Y (ex.- 10YR, 7.5YR); hues of 2.5Y, with values of 5 or higher, but including 2.5Y 4/4; may have segregation of secondary compounds into mottles, tubules, or nodules, etc.

R - reduced; 60% of matrix has hues of 2.5Y, with values of 3 or less, hues of 2.5Y, with value of 4, with chromas of 2 or less; hues of 5Y, N, 5GY, 5G, 5BG, and 5G, values of 4 or higher (usually values in this zone are 5 or higher). Colors in this zone are nearly always mixed as weak mottles, diffuse blends of color, or as discrete bands. Discrete vertical bands of reduced colors may occur for some distance adjacent to joints. These bands may eventually grade into uniform unoxidized material. In this zone there may be considerable segregation of secondary iron compounds (with oxidized colors) into mottles, nodules, or sheets along cleavage planes, or joints.

U - unoxidized; matrix uniform; has hues of 5Y and N, values of 5 or less, 5GY, 5G, 5BG, 5G, with values of 6 or less; with no segregation of iron compounds into mottles, nodules, etc.

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Second Symbol - if used

J - jointed, describes the presence of well-defined vertical joints in the till; joints often show oxidized and reduced colors, often have coatings or rinds of secondary iron-oxides; occasionally other secondary minerals such as calcite or gypsum.

Second or Third Symbol - leached or unleached state; same as for loess.

U - unleached.

L - leached.

L2 - leached of primary carbonates, but secondary carbonates present.

Modifier Symbols - when used precede first symbol, as with loess.

M - mottled; zones with 20-50% contrasting mottles; when used with the unoxidized zone designation it infers 20% or less mottles of reduced colors.

Examples: JRU-jointed reduced unleached-mixed olive (5Y4/4 and 5Y4/3) and very dark grayish brown (2.5Y 3/2), with common gray (5Y5/1) and light olive brown (2.5Y 5/4) mottles; prominent vertical joints, with 1 cm strong brown (7.5Y 5/8) segregations along the joint; unleached.

JUU - jointed, unoxidized, unleached-uniform dark greenish gray (5GY 4/1) matrix, with few thin vertical joints, which have mottled light olive brown (2.5Y 5/6) and olive gray (5Y 5/2) faces, and a 3 cm rind of greenish gray (5GY 5/1); unleached.

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TG: 101 **SUBJECT:** DIRECT-PUSH RIG OVERSIGHT

SUMMARY:

Direct-push soil sampling methods are limited to soils and unconsolidated materials that can be penetrated with specified equipment. In general, sampling is performed by advancing a hollow sampling vessel and tooling into soil by means of a 'direct-push' method. The ability to penetrate a soil and attain a specific depth is contingent upon several factors, including hammer energy, carrying rigs weight, compactness and density of soil, consistency of soil, and tooling. In general, direct-push methods are **not** effective for 1) solid rock, 2) weathered rock, 3) dense, cemented or coarse soils, and 4) certain cohesive soils (water can impart friction on tooling which can also lead to refusal).

Insertion methods are varied with direct-push rigs and include static hydraulic push, impact, percussion and combination/hybrid rigs.

Tooling consists of two different systems: A Two Tube System (use an outer casing and inner extension rod fitted to a sampler) and a Single Tube System (use a hollow extension or drive rod to advance and retrieve a sampler). Samplers are also varied and include:

- Split Barrel Samplers
- Solid Barrel Samplers
  - Open Solid Barrel Samplers (e.g. Macro Core Sampler)
  - Closed Barrel Samplers
  - Thin Walled Tubes
  - Barrels with Liners (e.g. Macro Core Sampler)

Familiarity with the rig specifications and tooling and site setting is essential prior to safely and effectively implementing direct-push investigations.

This TG addresses oversight of direct-push rigs for soil sampling activities.

1.0 REQUIRED EQUIPMENT

- HASP/Environmental Health & Safety SOPs Manual
- Level D equipment or PPE upgrades as dictated by site conditions and HASP.
- Procurement Documentation/SOW/Cost Breakdown
- MISS DIG or Utility Clearance Number
- Signed Access Agreement (if applicable or off-site work is performed)
- Field Notebook, Pen

2.0 PROCEDURES

- **In many instances site conditions will require deviation of scope of work or work plan. It is important that field staff and PMs communicate regarding unique site conditions (e.g. stratigraphy, presence of water, presence of contaminants and so forth) that could potentially affect drilling scope of work. Document communication in field log book.**
- Prior to performing direct-push rig oversight, review equipment and tooling specifications, scope of work, project work plan and HASP with the Project Manager or Technical Leader, On-Site Personnel and Sub-Contractors (if present). Confirm that utilities are identified and clearly demarcated in the field. Confirm that property access is approved and signed by property owner.
- Document utility clearance in field book.
- Direct-push rigs are potentially dangerous due to stored energy (e.g. hydraulic cylinders and overhead masts) and rotating/mechanized parts. Ask the driller where the emergency power shot-off "kill-switches" are located. Do not proceed further if the drill rig is not equipped with an emergency shut-off device. Proceed with drill rig inspection. Proceed with tail-gate safety meeting and HASP overview, with all site personnel reading and signing HASP.
- Document site activity and soil descriptions in a hard-bound survey-grade field note book dedicated to the project. Tablet PCs or other portable electronic devices may be used to store lithological data/observations.
- Establish a work area. It is helpful to have a stable platform to place sample cores or samples on from which to observe and describe the sample. Stable platforms may include a truck tail-gate, portable folding table or specially-designed table for holding soil sample barrels and soil samples or other cores.
- Direct-push samplers using liners will require a safe cutting tool to open liner and expose soils. Only use safety shears or curved "hook-type" blades for cutting liners. A safe example is Geoprobe DT-325 liner Cutter (shown below).

- Proceed with drilling and soil collection. Refer to TG_004 regarding description of soils.
- Document amount of waste soil and waste water generated and how wastes were managed (i.e. where were wastes placed and disposed of).

- Take and document photographs if required for project.
- Document/Log the following (also refer to TG_001 and TG_004):
  - Personnel Present
  - Dates, Time, Weather Conditions
  - Drill Contractor and Drillers' names.
  - Drill Rig Make and Model
  - Drill Tooling (e.g. rods, augers, dimensions, Hammer weights and so forth)
  - Downtime
  - Boring ID/Well ID, Start and Stop Times
  - Linear Footage Driller. Note Sampling Method.
  - Number of samples, cores and number of samples collected with notation of sampling depths.
  - Recovery amount within each core.
  - Any comments from driller regarding penetration resistance.
  - Any damage to landscaping, pavement or other site features.

3.0 RESPONSIBILITY

- Staff geologists and geological engineers are required to review and become familiar with this TG.
- Field staff are responsible for collecting appropriate field notes and placing them in file.
- Field staff are responsible for noting all deviations from the original scope and stopping work if deviations and especially safety conditions are not appropriate.
- PMs and Technical Leaders are responsible for distributing or enforcing the use of this TG
- PMs and Technical Leaders are responsible for implementing use of this TG.

4.0 RELEVANT FORMS AND ATTACHMENTS

- Health and Safety Procedures No. 35 (Well Drilling) and No. 38 (Subsurface Drilling).
- TG_001 and TG_004.

5.0 REFERENCES

D6282-98 Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations.

6.0 DOCUMENT APPROVAL AND HISTORY

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QC October 2, 2006.

DOCUMENT AUTHOR:	Barry J. Harding, CPG
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DOCUMENT APPROVAL:	FINAL October 3, 2006

TG: 500 **SUBJECT:** WATER LEVEL MEASUREMENT

SUMMARY:

This Technical Guidance was prepared guide field personnel using best practices to collect water level measurements from groundwater monitoring wells or piezometers during field investigations.

The objective of water level measurements is to gain accurate measurements (to within 0.01 ft) from a reference point to ground water for use during initial well installation, during routine monitoring, during groundwater sampling, and during various hydraulic conductivity testing activities (slug tests, packer tests, and pump tests). Accurate groundwater elevations are critical for the preparation of ground water elevation contour maps, verifying groundwater flow directions, calculating hydraulic gradients, and estimating purge volumes.

1.0 REQUIRED EQUIPMENT

The following list of equipment may be utilized for TG-500 during water level measurements. Site-specific conditions may warrant the use of additional items from this list.

- Electronic water level indicators – graduated to accuracy of 0.01 ft
- Tap Water
- Alconox, liquinox or other non-phosphate concentrated laboratory grade detergent
- Deionized Water (Triple Rinse)
- Pump Sprayer
- Pint Squeeze bottles
- Required personal protective equipment (PPE) includes; nitrile gloves, safety glasses, high visibility reflective vest, and safety boots. Additional PPE will be list in the project specific Health and Safety Plan (HASP)
- Air Monitoring instruments as required (PID, TVA 1000, etc.)
- Field laptop, logbook and/or monitoring form
- Well keys
- Previous measurement data (if available)
- Oil/water interface probe
- Spare battery for water level indicator or oil/water interface probe
- Plunker on tape (to determine well bottom)

2.0 PROCEDURES

The following procedures should be followed during water level measurements.

Procedures may vary depending on the equipment used and contaminants present at the site. Site specific conditions may warrant the use of stringent air monitoring and potentially more significant decontamination scenarios.

1. Record the condition of the well (well ID name, protective casing, concrete collar, lock in place, standing water around well, etc.).

2. Check that the water level tape has no obvious kinks or damage.

3. Don nitrile or other gloves listed in the HASP. If site conditions warrant, stand upwind of the well; unlock and open the well. If a vented cap is present, conduct well mouth air monitoring from the vent. If a non-vented well cap is present, carefully remove the cap and monitor the well mouth immediately with the appropriate monitoring instrument. Record all pertinent air monitoring results (sustained, dissipating, background, odor).

4. Identify the previous reference point marking or notch on the riser or casing (if present). Record this as cardinal direction and location in the field collection mobile device, logbook or on the water level monitoring form.

5. Using a previously decontaminated water level indicator, turn on the meter, check the audible indicator, reel the electronic probe into the well riser (with the graduation markings visible) slowly until the meter sounds, grasp the tape with hand, withdraw the tape a few inches and lower it again slowly until the sound is again audible. Check the depth to water on the tape and make a mental note of the depth to within 0.01 feet. Lower the probe again slowly and repeat the measurement for accuracy. A one-foot error is the most common measurement type during water level measurements. Be sure to read the depth correctly on the tape.

6. Record the depth to water from the measuring point in the field collection mobile device, logbook or on the water level monitoring form.

7. Procedures utilized during water level measurements where free phase petroleum products are floating on the water table should be modified to include the use of an oil/water interface probe. The procedures during the use of this probe should be implemented similarly and by manufacturers' specifications. Through the use of this probe, product thickness and water level can be determined.

8. Decontaminate the water level indicator probe and any obviously soiled tape using paper towel followed by a full decontamination after each well. Refer to TG for equipment decontamination.

3.0 RESPONSIBILITY

Checklists in TG_500 are aimed at field staff. All field staff must be familiar with the electronic data recording tablet and web-based field forms. Coordinate with PM or Technical Leader regarding site-specifics or special items not presented in this TG.

Distribution of TG_500 is responsibility of PM.

4.0 RELEVANT FORMS AND ATTACHMENTS

No relevant forms.

5.0 REFERENCES

No relevant references.

6.0 DOCUMENT APPROVAL AND HISTORY

Draft prepared by Dave Bareham, June 30, 2006
Revised by Gary Braun, March 31, 2020.
Further QC by Tory Schultz, April 2, 2020.
FINAL April 3, 2020.

TG: 501 **SUBJECT:** Low-Flow (Minimal Drawdown) Groundwater Sampling

1.0 SUMMARY:

This technical guidance document (TG) serves as guidance for collecting representative groundwater samples from groundwater monitoring wells using standard Low-Flow (or Limited Drawdown) Sampling Protocols (LFP). This TG does not cover the sampling of monitoring wells containing light or dense non-aqueous phase liquids (LNAPL or DNAPL).

This TG provides a general procedure that, when followed, will provide groundwater samples that represent the mobile organic and inorganic loads present in natural flow conditions. The following procedures are standard have been varied slightly to account for the site conditions, preferred equipment, and regulatory oversight preferences. Regardless, the procedures employed will be documented and reported for each sampling event.

2.0 REQUIRED EQUIPMENT

- **Sample Pump** –LFP purging and sampling is to be conducted with an adjustable rate submersible pump and control box. Thus, bladder pumps or submersible pumps are acceptable. Adjustable rate submersible centrifugal pumps may be used, but care should be taken to select a model that does not heat the that is groundwater being pumped. The pump and all interval parts that may contact the groundwater should be constructed of either stainless steel or Teflon ®. A poly-Vinyl Chloride (PVC) pump may be used if it is washed and rinsed (decontaminated) in between use in individual wells. An adjustable rate peristaltic pump may be used with caution, as described below.

- Care must be taken to minimize volatilization of samples within line through vigorous peristaltic agitation. Peristaltic pumps create suction on the sampling line, which may cause degassing of volatile organic compounds (VOCs) to occur in the tubing (although VOCs are not on routine parameter sampling list). Regardless, agitation of groundwater within the tube will be minimized by collecting the sample upstream of the peristaltic pump. Inertial pumps (Check valve type) and bailers are not recommended for sampling.

- **Tubing** – Teflon ® or Teflon ® lined tubing is preferred when sampling for VOCs or semi-volatile organic compounds (SVOCs). However, polyethylene tubing may be used if it is dedicated to the monitoring well being sampled and an equipment rinsate blank collected from the tubing shows the tubing does not impart VOCs to the sample. The tubing should be sized to fit the selected pump. If a peristaltic pump is used, the tubing section around the rotor should be constructed of silicon or other pharmaceutical grade material to reduce the possibility of gaseous diffusion and of proper inside and outside diameter to fit the peristaltic rotor.

- **Water Level Measuring Device** – A device capable of measuring water level to within 0.01 feet (i.e., electronic water level tape, pressure transducer). An oil/water interface probe is not recommended for use due to possible oil residue on the probe.

- **Flow Rate Measuring Device** – A graduated cylinder or other similar device calibrated in milliliters and a stop watch or other chronograph.

- **Field Parameter Measuring Device** – Field parameter measurements may be obtained by using individual meters or a multiple meter unit such as an YSI Multi-parameter Meter, Horiba U-22, or similar instrument. Field parameters measured should include pH, Conductance, Dissolved Oxygen (DO), Temperature, Oxidation Reduction Potential (ORP), and Turbidity. The field parameter measuring device should use a sealed flow-through-cell apparatus or a down borehole sonde placed at the same level as the pump intake.

- **Field Logbook** – A field logbook should be used to record all pertinent information about the purging and sampling of each well. Field purge forms may also be used, but if they are used the information recorded on the form should also be transferred into the logbook following well sampling. Field note recording technical guidance is provided in AECOM TG-001 (Field Notes).

- **Power Source** – *Battery* (and *power inverter* if necessary) for electric pumps such as peristaltic and submersibles. For compressed gas pumps, *air compressor, generator*, and/or *compressed gas cylinder*. When using compressed gas as the power source, nitrogen gas is preferred. However, any inert environmentally friendly gas maybe used. When using a gasoline power source such as a generator or air compressor, care should be taken to place the unit at least 30 feet from the well and downwind so the exhaust does not contaminate the sample.

- **Sample Bottles and Supplies** – Sample bottles appropriate to the analysis being conducted, sample labels or tags, sample cooler and ice, chain of custody form, and sample preservation supplies (if required). For sample containers not pre-preserved, add preservative after the sample has been collected.

- **Personal Protective Equipment** – The proper personal protective equipment (PPE) for the Site. At a minimum this will include disposable Nitrile gloves in addition to the standard PPE required at all AECOM field work sites.

- **Health and Safety Plan** – The site specific health and safety plan (HASP) should be kept on Site at all times during sampling.

- **Sampling Plan or Scope of Work** – The site specific sampling plan or scope of work should be available throughout sampling.

- **Well Data and Map** – A Site map showing the location of all wells to be sampled. Well construction Data including well construction material, screen depth, and constructed total depth should be available to the sampling team in the field.

- **Well Keys/Socket Set or Tool Set** – Tools to open protective casings, manholes, and unlock J-plug lock.

- **5-Gallon Bucket –** 2 or more buckets for collecting purge water.

- **PID or FID** – if well head space readings are required.

- **Decontamination Supplies** – All non-dedicated equipment (i.e., water level meter, sampling pump) **MUST** be properly decontaminated between monitoring wells.

- **Meter Calibration Supplies** – Calibration supplies should be available in the field for all measurement devices.

3.0 PROCEDURES

1. Review the Site specific HASP.

2. Review field sampling plan or scope of work.

3. Prior to conducting any well sampling or purging all meters to be used should be calibrated with the instrument's calibration solution per manufacturer instructions.

4. If not done already, decontaminate all equipment which will be placed down the monitoring well or which will come into contact with groundwater sample.

5. Open protective casing or manhole and remove the well cap or plug. If head space readings are required immediately insert the sampling tip of the PID or FID in the well head.

6. Measure the water level to ±0.01 foot. Record this reading as water level before pump placement. If a site-wide round of groundwater elevations are needed, collect water elevation data from all the wells prior to sampling.

7. Place the pump or tubing in the well so that the intake is approximate at the middle of the well screen. The pump or tubing should be lowered very slowly into position to minimize mixing of the stagnant well casing water and to minimize agitation of solids into suspension. Do not place the tubing or pump at the bottom of the well as solids will be entrained in the pump and tubing. If feasible, the pump or tubing should be placed in the well a few hours prior to purging to allow any disturbed sediment to settle.

8. Measure the water level to ±0.01 foot again and record this reading as water level after pump placement. Ensure that this reading is not significantly different than the before pump placement reading. Leave the water level probe in the well for future readings.

9. Connect pump to power source and the tubing to the inlet of the flow-thru cell. Attach a short piece of tubing to the outlet of the flow-thru cell and so that it empties into a bucket. Make sure the flow-thru cell is stable and will not easily tip over while sampling.

10. Turn on the pump and parameter meter. Start the pump at its lowest speed setting and slowly increase the speed until water begins flowing into the bucket. Place the end of the outflow tubing in the graduated cylinder and measure the flow rate for 1 minute. Adjust the flow on the pump so that the pumping rate is between 100 and 500 milliliters per minute (mL/min.) and that the groundwater drawdown does not exceed 0.3 feet. Record this rate on the sampling sheet. If pumping rates of >500 mL/min. (or drawdown is >0.3 feet) are necessary to keep water flowing, turn up the flow rate to the minimum amount to keep water flowing. Record this new flow rate in the sampling sheet with a

note describing why a higher flow rate was necessary. If purge water is very turbid (unable to see through), disconnect flow-thru cell, and continue purging until water clears then reconnect flow-thru cell. Pumping rate adjustments generally should be made within the first 15 minutes of purging and then should remain constant for the duration of purging.

11. During well purging, monitor and record the field indicator parameters (pH, temperature, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity) and groundwater level every five minutes on the low-flow purge documentation form and/or in the field logbook.

12. Stabilization will be considered to be achieved when three consecutive readings for each parameter are within the following limits:

pH	±0.1 pH units;
temperature	±3 % of average of three readings;
conductivity	±3 % average of three readings;
ORP	±10 millivolts (mV);
DO	±10 % average of three readings; and
turbidity	±10 %, or a final value of less than 10 nephelometric turbidity units (NTU).

13. Purging should be continued if the purge water remains visually turbid and appears to be clearing, or if stabilization parameters are varying outside the stabilization criteria listed above and appear to be approaching stabilization. If stabilization parameters are clearly not approaching stabilization, purging will be ceased after 10 readings.

14. In the event the groundwater recharge to the monitoring well is insufficient to conduct the LFP protocol, the well should be pumped dry and allowed to sufficiently recharge prior to sampling. Sample immediately after wells have recharged. Wells, which are purged dry, are not subject to the above purging criteria.

15. Put on new gloves prior to sampling.

16. Prior to collecting the sample, the flow-through device should be disconnected and the sample collected directly from the purge tubing and the flow rate should not be varied between collecting the final readings and the sample. All sample containers should be filled with minimal turbulence and aeration by allowing the water to flow from the tubing down the inside of the container. VOCs (if sampled) must be collected first. Filtered samples should be collected last.

17. Remove the pump and tubing after collecting the samples. Properly discard disposable tubing. If sampling with a reusable pump and tubing, properly decontaminate equipment before reusing, including water level meter.

18. Close and lock the well.

19. Dispose of the purge water in accordance with the Work Plan and/or Sampling and Analysis Plan.

4.0 RESPONSIBILITY

Employees are responsible for collecting representative groundwater samples following ethical and regulatory guidelines to client and site specifications. Deviations in sampling procedures should be noted in the site field book and relayed to the project manager.

5.0 RELEVANT FORMS AND ATTACHMENTS

Low-Flow (Minimal Draw-Down) Field Purge Form - version 2.5

6.0 REFERENCES

U.S. EPA Ground Water Issue – *Low Flow (Minimal Drawdown) Ground-Water Sampling Procedures, EPA/540/S-95/504,* April, 1996.

7.0 DOCUMENT APPROVAL AND HISTORY

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DOCUMENT APPROVAL:	February 12, 2007

TG: 502 **SUBJECT:** PRESERVATION OF GROUNDWATER SAMPLES

SUMMARY:

This TG was prepared to provide a general overview of field preservation techniques for groundwater (and surface water) samples collected in the field. Using preservation chemicals or reagents is dictated by target analyte, analytical method, and other water quality conditions (presence of sediment, colloids or other physical attributes of the sample). Chemical preservatives are used in recommended dosages, usually expressed in molar concentration, as a volume, mass per unit volume, and sometimes as a pH range.

Groundwater sample preservation procedures are grouped into two general categories: (1) Physical Preservation and (2) Chemical Preservation. Physical preservation includes Temperature, but also use of appropriate sample container construction, volume, material, protection from UV light, as well as sample container packaging and shipping (please refer to TG_401 regarding sample packaging and shipping). Chemically preserving groundwater samples involves adding one or more chemicals added on a parameter basis to protect sample integrity.

Consult with PM and/or Technical Leader regarding site specifics or the possibility of unusual preservation requirements for contaminants not addressed in this TG.

Key points are summarized as bullets below:

- Containers and preservatives must be obtained from laboratory performing analyses.
- In some instances, the laboratory will 1) have preservatives already added to bottles, or 2) preservative in separate bottle.
- Document expiration date and batch number for preservatives in field note book.
- Material Safety Data Sheets (MSDS) must be provided for shipped reagents.
- Do not store preservatives near potential cross-contamination sources.
- Chemical preservatives should not be added to soils (not addressed in this TG), except when specified for certain analyses (e.g., methanol preservation of soils).
- Never acid-preserve strongly alkaline or basic solutions (pH > 12).
- Chemical preservative should never be added to unknown or untreated liquid wastes or samples of unknown origin or media.
- Do not add preservative to fuels, separate-phase liquids or reactives/oxidants.
- Adding acids to samples containing high cyanide or sulfur compounds/derivative can liberate cyanide and sulfurous gases.
- If a sample strongly reacts when preservative is added, discard the sample. Collect a new sample without preservation. Note in chain-of-custody that sample was not preserved and notify laboratory. Document action in field log book.

- Review MSDS and HASP regarding PPE and precautions when handling all and any chemical preservatives.

1.0 REQUIRED EQUIPMENT

- HASP
- MSDS for Reagents/Chemical Preservatives
- PPE, especially ANSI-rated glasses and appropriate gloves
- Field Note Book and Field Sampling Sheets (optional)
- Lab Grade Preservative
- Pipettes, droppers or other precise liquid dispensing tools
- Sampling Gear
- Scales (optional for dry weight preservatives)

2.0 PROCEDURES

Preparatory Work

1. Review Target Analyte List with PM or TL.
2. Evaluate Target Parameters in context with regulatory requirements, client directives, work plans and proposals.
3. Once Target Parameters are identified, coordinate with Analytical Laboratory regarding required preservatives, bottle type, bottle volume and sample hold times.
4. Verify lab recommended preservatives, bottle type, bottle volume and hold time by referring to Attachment 1. Also inspect preservative expiration date and batch number.
5. Also refer to ASTM D 6517 for additional parameter specifics if needed (ASTM provides general overview).
6. For projects with SAPs or QAPs, refer to specifics addressed in documents.

Field Work

1. Collect water sample as specified through discussion with PM/TL, Work Plan, Proposal, or SAP.
2. Add preservative in field immediately after sampling as recommended. Follow recommended protocol for sample volume/preservative ratios. Too much sample or too little preservative may yield conservatively or improperly preserved samples.
3. An exception to immediate preservation are those samples requiring field preservation, which are field-filtered first then chemically preserved, if needed (filtering for metals and other parameters).
4. Document Sample ID, Sample Date/Time, Preservative Addition Time, Volume, Jar Type, Preservative Expiration Date and Batch Number in field sampling sheet and field note book.
5. Label sample accordingly.

6. Transfer sample to cooler or refrigerator under COC documentation.
7. Note preservation in COC and on sample label.
8. Ship or transport samples to designated laboratory (see TG_401).

3.0 RESPONSIBILITY

- Field staff are required to review and become familiar with this TG.
- PMs and Technical Leaders are responsible for distributing or enforcing the use of this TG.

4.0 RELEVANT FORMS AND ATTACHMENTS

See Attachment 1 (Tables adopted from Op. Memo 2, Attachment 4).

5.0 REFERENCES

- MDEQ-RRD Operational Memorandum No. 2, Attachment 4.
- ASTM D 6517 – Standard Guide for Field Preservation of Ground-Water Samples.

6.0 DOCUMENT APPROVAL AND HISTORY

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Attachment 1

(Excerpts from MDEQ-RRD, Op. Memo 2, Attachment 4)

Table 1. Sample Containers and Container Codes

Container Code	Size ml	Bottle Type
DO	250	Glass, glass stopper
GN	500	Plastic
GA	500	Plastic
GG	250	Glass, screw cap
GB	500 250	Plastic Plastic
S	250	Plastic
MA	500	Plastic
MAD	500	Plastic
MD	500	Plastic
MN	500	Plastic
OG	250	Glass, wide mouth
VOA	40	Glass Septum vial
ON	1000	Glass, amber
Sealed Vial	Varies	Laboratory Specific

Container Code	Size ml	Bottle Type
BNA	1000	Glass, amber
MS	250	Glass, wide mouth
GS	250	Glass, wide mouth
OS/BNA	250	Glass, wide mouth
VOA	40	Glass, septum vial (soils require MeOH kit)
SCD	NA	Soil coring device [1,2]
MO	250	Glass, wide mouth
OL	250	Glass, wide mouth
HW	250	Glass, wide mouth
MX	250	Glass, wide mouth
OX	250	Glass septum jar
L	500	Fluoropolymer [1,3]
M	250	Glass or HDP[1]
HDP	125	High Density Polyethylene[1]

1. SCD, L, M and HDP are not MDEQ Lab bottle codes.
2. The syringe type coring device, SCD, refers to the samplers listed in Method 5035A, or other validated samplers.
3. Contact the lab regarding availability and cleaning instructions.

Table 2. Preservatives

The following table represents the preservatives normally used for sampling and the approximate amounts to meet a targeted preservation.

Preservative	Concentration	Preservation	Approximate Amount
Sulfuric Acid (H_2SO_4)	Conc.	pH < 2	5 drops per 250 ml.
Nitric Acid (HNO_3)	1:1	pH < 2	5 ml per 250 ml.
Hydrochloric Acid (HCl)	1:1	pH < 2	5 drops per 40 ml.
Sodium Hydroxide (NaOH)	10 N	pH > 9	2 drops per 250 ml.
		pH > 12	10 drops per 250 ml.
Chloroacetic Acid	0.1 N	pH 4-5	Varies with sample
Trisodium phosphate dodecahydrate (TSP)	Powder	pH> 10	Varies with sample
MeOH	Lab Grade	1:1	10 ml per 10 gr soil.
Ascorbic Acid	Powder	Oxidizing Agents	About 0.6 gr per L.
Sodium Arsenite	0.1 N	Oxidizing Agents	5 ml per L.
Zinc Acetate (ZnAc)	2 N	Interferences	10 drops per 250 ml.
Disodium EDTA	2.5 %	Interferences	1 ml per 100 ml.
Ethylenediamine	Powder	Interferences	50 mg per L

RRD Operational Memorandum No. 2 - Attachment 4 Page 5 of 20 October 22, 2004

Table 3. Specifications for Sample Containers, Preservation, and Holding Times

Contaminants	Methods	Containers	Preservation	Holding Time
Volatiles (waters)				**Collection To Analysis**
Fuel Oxygenates	8260B	2 x VOA	no headspace, TSP to pH > 11, 4° C	180 Days
Reactive compounds [24]	8260B	2 x VOA	no headspace, 4° C	ASAP [3]
Other Compounds	8260B	2 x VOA	pH < 2 using 1:1 HCl or solid NaHSO4, no headspace, 4° C	14 Days
Volatiles (soils) [25]				
Reactive Compounds Examples include styrene, 2-Chloroethylvinylether	Low Concentration	Sealed Vial	Use reagent water (no acid preservative), freeze > -20° C , < -7° C on site	ASAP [3]
		SCD	4° C or freeze > -20° C , < -7° C on site, extruded into sealed vial without acid preservative within 48 hours	ASAP [3]
Volatile Compounds	Methanol	2 x VOA	Preserve on site using ratio 1:1 methanol to soil, 4° C	14 Days
Volatile Compounds	Methanol	SCD	4° C or freeze > -20° C , < -7° C on site and extruded into sealed vial with methanol within 48 hours	14 Days

Table 3. Specifications for Sample Containers, Preservation, and Holding Times

Contaminants [2]	Methods [3]	Container Codes [1]		Preservation [4]	Holding Time [5]
		Soil	Water		
Specific Contaminants					**Collection to Analysis**
Acidity	305.1		MN	4° C	14 Days
Alkalinity	310.1		MN	4° C	14 Days
Anions by Ion Chromatography	9056 300.1		MN	Contaminant Specific [6]	
Acetate			MN	4° C	2 Days
Formate			MN	4° C	2 Days
Bromide			MN	None Required	28 Days
Chloride			MN	None Required	28 Days
Fluoride			MN	None Required	28 Days
Nitrate or Nitrite-N			MN	4° C	48 Hours
Nitrate and Nitrite-N			MN	pH < 2 H2SO4, 4° C	28 Days
Ortho-Phosphate-P			MN	4° C	48 Hours
Sulfate			MN	4° C	28 Days
Bromate			MN	None Required	28 Days
Chlorate			MN	None Required	28 Days
Chlorite			BNA	50 mg Ethylenediamine per L, 4° C	14 Days
Asbestos	100.1		GN	4° C	48 Hours
Biochemical Oxygen Demand	405.1		GN	4° C	48 Hours [7]
Bromide	320.1	GS	MN	None Required	28 Days
Chemical Oxygen Demand	410		GA	pH < 2 H2SO4, 4° C	28 Days
Chloride	325	GS	MN	None Required	28 Days
Chlorine, Total Residual	330		GN	None Required	Immediately
Color	110		GN	4° C	48 Hours
Conductance, Specific	9050A	—	MN	4° C	28 Days
Fluoride	340.1	—	MN	None Required	28 Days
Hardness	130.2	—	MA	pH < 2 1:1 HNO3 / H2SO4, 4° C	6 Months
Hydrogen Ion, pH	9040, 9045	GS	MN	None Required	24 Hours

Table 3. Specifications for Sample Containers, Preservation, and Holding Times

Contaminants	Methods	Containers		Preservation	Holding Time
		Soil	Water		
Specific Contaminants					**Collection to Analysis**
Iodide	345.1	—	MN	4° C	28 Days
Odor	SM 2150B	—	GN	4° C	24 Hours
Total Organic Carbon (TOC)	415.1	—	GA	pH < 2 H2SO4 / HCl/NaHSO4, 4° C	28 Days
Fraction of Organic Carbon	Walkley-Black	GS	GN	4° C	28 Days
Fraction of Organic Matter	D2974	GS	GN	4° C	28 Days
Oxygen, Dissolved, Probe	360.1	—	DO	None Required	Immediately
Oxygen, Dissolved, Winkler	360.2	—	DO	Fix on site with DO Kit [10], avoid aeration, store at 10-20° C in dark.	8 Hours
Perchlorate	340.1 9058	GS	MN	None Required	28 Days
Petroleum Hydrocarbon Material[6]	1664 9071B	2xOG	2xOG	pH < 2 HCL, 4° C. For dry soils cool to 4° C. For pourable sediments and soils add 2 ml 1:1 HCl per 100g, 4° C	ASAP [3]
Phenolics	420.2	—	GG/GP	pH < 2 H2SO4, 4° C	28 Days
Phosphorus, Ortho, Dissolved	365	—	GN(D)	Filter on site immediately, 4° C	48 Hours
Phosphorus, Elemental		—	GA	4° C	48 Hours
Phosphorus, Total	365.4	—	GA	pH < 2 H2SO4, 4° C	28 Days
Residue, Total	160.3	—	GN	4° C	7 Days
Residue, Filterable (TDS)	160.1	—	GN	4° C	7 Days
Residue, Non-Filterable (TSS)	160.2	—	GN	4° C	7 Days
Residue, Settleable	160.5	—	GN	4° C	48 Hours
Residue, Volatile	160.4	—	GN	4° C	7 Days
Silica	370.1	—	GN	4° C	28 Days
Sulfate	375.1	—	MN	4° C	28 Days

Table 3. Specifications for Sample Containers, Preservation, and Holding Times

Contaminants	Methods	Containers		Preservation	Holding Time
		Soil	Water		
Specific Contaminants					**Collection to Analysis**
Sulfide	9030 376.1	GS		See Footnote 11	7 Days
			S	Cover surface of collected soil with 2 M ZnAc until moistened. No headspace.	
Sulfite	377.1	—	HDP	Avoid contact with air, cool < 50° C and add 1 ml EDTA [12] per 100 ml., < 50° C	Immediately
Temperature	170.1	—	—	Not Applicable	On site
Total Recoverable Petroleum Hydrocarbons (TRPH)	8440 [13]	GS	—	4° C	ASAP [3]
Turbidity	180.1	—	GN	4° C	48 Hours
Biological Tests					
Coliform, Fecal and Total	9131 9132	—	M	4° C	8 Hours [14]
Fecal Streptococci	SM 9230	—	M	4° C	6 Hours
Cyanides					
Cyanide, Total	9010B	GS	—	See Footnote [15]	14 Days
				Unpreserved	24 Hours
Cyanide, Available	OIA1677	GS	GB	See Footnote [15]	14 Days
				Unpreserved	24 Hours
Cyanide, Amenable (Free)	D4298-02	—	GB	pH ≥ 12 NaOH, store in dark, 4° C	24 Hours to diffusion
Nitrogen Forms					
Ammonia – N	350.1	GS	GA	pH < 2 H2SO4, 4° C	28 Days
Kjeldahl – N	351.1	GS	GA	pH < 2 H2SO4, 4° C	28 Days
(Nitrate + Nitrite) – N	353.2	GS	GA	pH < 2 H2SO4, 4° C	28 Days
(Nitrate + Nitrite) – N	353.2	GS	GA	4° C	24 Hours
Nitrate – N or Nitrite – N	353.2	GS	GN	4° C	48 Hours

Table 3. Specifications for Sample Containers, Preservation, and Holding Times

Contaminants	Methods	Containers		Preservation	Holding Time			
		Soil	Water					
Mercury					Collection to Analysis			
Mercury, Total	7470 7471	MS	MA	pH < 2 1:1 HNO3 , 4° C	28	Days		
Mercury, Low Level	1669/1631	MS	L	10 ml 1:1 Hg-free HNO3 per L, 4° C	28	Days		
Hexavalent Chromium								
Chromium VI (waters)	7199	—	HDP	Use buffer solution [16] to adjust pH 9-9.5 (check with pH paper or pH meter) 4° C	24	Hours		
	7196	—	MN	4° C	24	Hours		
					Collection To Preparation		Preparation To Analysis	
Chromium VI (soils)	3060A [17]	MS	—	4° C, Store field-moist.				
				Dry Soils:	2	Days	7	Days
				High moisture soils and sediments:	30	Days	7	Days
Low Molecular Weight Acids	5560 C	GS	GN	None Required		NA		NA
Glycols	8015C	GS	GN	None Required		NA		NA
Phosphorus, White [18]	7580	OX	VOA	Limit contact with air. No headspace, 4° C, store in dark. Tightly seal extracts and refrigerate.	5	Days		
				Extracts:				
				Ether Extract		—→	8	Hours
				Iso-Octane Extract		—→	30	Days

Table 3. Specifications for Sample Containers, Preservation, and Holding Times

Contaminants	Methods	Containers		Preservation	Holding Time	
		Soil	Water			
Metals					Collection To Analysis	
Metals, Totals	6010/6020	MS [15]	MA	pH < 2 1:1 HNO3, 4° C	6	Months
Metals, Dissolved	6010/6020	—	MD MA(D)	Filter and preserve < 24 Hours of sampling pH < 2 1:1 HNO3, 4° C	6	Months
Specific Organic Compounds						
Acetonitrile	8033	—	2 x VOA	pH < 2 H2SO4, 4° C	14	Days
Acrolein	603 8316	—	2 x VOA	pH 4-5 HCl, 4° C	14	Days
Acrolein	603	—	2 x VOA	4° C	3	Days
Acrylonitrile	603	—	2 x VOA	4° C	14	Days
Acrolein and Acrylonitrile	603	—	2 x VOA	pH 4-5 HCl, 4° C	14	Days
Acrolein and Acrylonitrile	603	—	2 x VOA	4° C	3	Days
Acrylamide	8032	—	2 x VOA	pH < 2 HCL/H2SO4, 4° C	14	Days
Specific Organic Compounds					Collection to Preparation	Preparation to Analysis
Benzidines	605 8270C	OS BNA	BNA	Adjust pH 2-7 using H2SO4 and 10 N NaOH. If 1,2-dephenylhydrazine is expected to be present, adjust pH to 3.8-4.2 H2SO4 and 10 N NaOH 4° C, store extracts in inert atmosphere in dark	W: 7 days	7 days
Carbamates	8318	OS BNA	BNA	Cool, pH 4-5 using 0.1 N Chloroacetic Acid, 4° C, store sample and extracts in dark	W: 7 days S: 7 days	40 days 40 days
Carbonyls	8315A	OS BNA	BNA	4° C	W: 3 days S: 3 days	3 days 3 days

Table 3. Specifications for Sample Containers, Preservation, and Holding Times

Contaminants	Methods	Containers		Preservation	Holding Time	
		Soil	Water			
Specific Organic Compounds					Collection To Preparation	Preparation To Analysis
Chlorinated Acids/Herbicides	8151A	OS/B NA	BNA	4° C, store samples and extracts in dark	W: 7 Days S: 14 Days	40 Days 40 Days
Dioxins and Furans	8290 1613	OS/B NA	ON	4° C, store in the dark	30 Days	45 Days
1,2-Dibromoethane (EDB) 1,2-Dibromo-3-Chloropropane. 1,2,3-Trichloropropane	8011 504.1		VOA	4° C	W: 14 Days	Immediately
Nitrosamines	8270C	OS/B NA	BNA	pH 7-10 with H2SO4 and 10 N NaOH, store extracts in sealed vials, in dark at -10° C	W: 7 Days S: 14 Days	40 Days 40 Days
Chlorinated Pesticides [20]	8081A	OS/B NA	2 x ON See 23 [23]	pH 5-9 with H2SO4 and 10 N NaOH within 72 hours, 4°C, store extracts in dark.	W: 7 Days S: 14 Days	40 Days 40 Days
Organophosphorus Pesticides [21]	8141A	OS/B NA	ON	4° C Store samples and extracts in dark	W: 7 Days S: 14 Days	40 Days 40 Days
Polychlorinated biphenyls	8082	OS/B NA	2 x ON See 23 [23]	4° C Store extracts in dark	W: 7 Days S: 14 Days	40 Days 40 Days
Semivolatiles [22]	8270C	OS/B NA	2 x BNA See 23	Store extracts in sealed vials, in dark at -10° C	W: 7 Days S: 14 Days	40 Days 40 Days

TG: 503 **SUBJECT:** Monitoring Well Sampling with a Bailer

SUMMARY:

This TG serves as guidance for manual monitoring well sampling using a bailer.

1.0 REQUIRED EQUIPMENT

- HASP.
- Field Note Book and sampling logs.
- Polypropylene rope, scissors (instrument to cut rope)
- Bailer
- Electronic water level indicator or oil-water interface probe
- Collection container (5-gallon buck or similar container)
- PPE
- Sample bottles
- Calculator

2.0 DEFINITIONS

- Technical Lead (TL)
- Project Manager (PM)
- Field Technician (FT)

3.0 PROCEDURES

Discuss bailer sampling with PM prior to performing methodology at site. Common industry practices typically now use Low-Flow (Minimum Drawdown Techniques). However, bailer sampling is used at some sites depending on regulatory setting and other factors.

FT must be OSHA trained in accordance with the requirements of 29 CFR1910.120. Check with PM or TL for Work Plan, scheduled sampling dates, number and location of monitoring wells, required analyses, site location and directions.

1. Review HASP. FT will don nitrile (or other HASP-approved gloves based on contaminants) gloves for all associated field work and sampling.

2. Open all wells to be sampled and allow equilibration time. Well caps should be placed adjacent to the monitoring wells on a clean area such as a small piece of plastic or towel.

3. Measure static water levels (see TG_303) and total depth of well using the electronic water level indicator, or other similar device, and utilizing decontamination procedures (see TG_403) to decontaminate the water level indicator before measuring water levels in the first well, between each well, and after completion of all water level measurements.

4. Calculate and record in the field book the volume of water in each well casing to be sampled. Sometimes this may be performed prior to field activity.

   Calculate borehole volume using formula: $v = \pi r^2 L$

   Where:

   v = Volume
   L = Length of well, and
   r = Radius of well

   or use Cheat Sheet:

Well Diameter (Inches)	***Gallons/Foot***	***Feet Water***	***Volume Gallons***
2	0.16	2	0.32
3	0.37	4	1.48
4	0.65	5	3.25
5	1.02	6	6.12
6	1.47	10	14.70
7	2.00	12	24.00
8	2.61	14	36.54
9	3.30	16	52.80
10	4.08	18	73.44
12	5.87	20	117.40
14	8.00	40	320.00
16	10.50	60	630.00
18	13.20	80	1056.00
20	16.30	100	1630.00
24	23.50	125	2937.50
36	52.90	150	7935.00

5. Record the required purge volume in the field book (this should be three times the calculated volume of water in the well casing) and sample log. Purge at least the required volume of water from the monitoring well using a new or dedicated bailer and a new length of polypropylene rope secured tightly to the top of the bailer.

6. Place purge water in collection container for measurement purposes. Record in the field book the total amount of water purged from the well. Place purge water on ground, in 55-gallon drum or in other storage container as specified in work plan. If the well bails dry prior to the removal of three well volumes, record the amount of water purged, allow the well to recharge. It is not necessary to remove three well volumes from wells that bail dry.

7. Lower the bailer back into the well to collect sample. Place groundwater directly into laboratory supplied sample containers with appropriate preservatives (if required). If filtering is required for analysis, place water in unpreserved bottle, and request that laboratory filter sample. If additional groundwater is required to fill all necessary sample bottles, lower bailer back into well and collect additional groundwater. Seal container.

8. Label sample bottles – date, time, project identifier, sample location, depth (if required), required analysis, preservative (if used), and sampler's initials. Place samples in cooler with ice. Complete chain-of-custody form (supplied by the laboratory) and record site activities in field log book. Pack cooler for shipping or deliver samples to laboratory. Retain copy of chain-of-custody and submit other copies with samples. Close and secure all wells. Any changes in the work plan or scope of work contact the PM.

4.0 RESPONSIBILITY

It is the responsibility of the TL or their designee to determine the monitoring well sampling locations for the project. It is the PM's responsibility to approve the monitoring well sampling locations determined by TL or their designee prior to monitoring well sampling commencing in accordance with project specifications. It is the responsibility of the FT to perform the monitoring well sampling in the field and properly conduct monitoring well sampling.

5.0 RELEVANT FORMS AND ATTACHMENTS

None.

6.0 REFERENCES

- TG-303 Measuring Static Water Levels (PENDING)
- TG-403 Decontamination Procedures (PENDING)

7.0 DOCUMENT APPROVAL AND HISTORY

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AECOM

TG 504
HYDRAULIC CONDUCTIVITY TESTING
(SLUG TESTS)

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AECOM

TG504
HYDRAULIC CONDUCTIVITY TESTING
(SLUG-TESTS)

1.0 PURPOSE

This procedure provides a general description of the technical methods and field procedures of a representative suite of hydraulic conductivity tests to approximate characteristics of a desired aquifer. Hydraulic conductivity testing (slug-testing) is commonly used to measure the aquifer parameters at an investigation site. Results of slug-testing are not to serve as a definitive calculation of the aquifer characteristics at either a point (individual well) or across an entire area (well field). Aquifer (pump) testing can be used to further define aquifer characteristics in permeable or fractured materials. Aquifer testing is discussed in field procedure F401.

The descriptions herein are general in nature and do not apply to a specific well, well-field or project. Prior to designing hydraulic conductivity tests as part of a site investigation and during execution of the tests, the project manager, site manager and project hydrogeologist must consult on the appropriate procedures; these procedures must then be recorded in the project documents.

2.0 SCOPE

The hydraulic conductivity tests apply both to consolidated and unconsolidated strata; and to confined, semi-confined and phreatic conditions. The aquifer parameters subject to evaluation and approximate calculation are the coefficient of transmissivity and the hydraulic conductivity.

3.0 DEFINITIONS

The following definitions are extracted or abstracted from standard references (Section 7.0); further discussions are available in those references.

Hydraulic Conductivity (K) - A medium has a hydraulic conductivity (K) of unit length per unit time (for example, feet per day [ft/d]) if it will transmit in unit time a unit volume of groundwater at the prevailing viscosity through a cross-section of unit area, measured at right angles to the direction of flow, under a hydraulic gradient of unit change in head through unit length of flow.

Coefficient of Transmissivity (T) - The transmissivity (T) is the rate (for example, in gallons per day per foot [gpd/ft]) at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit hydraulic gradient. The transmissivity is mathematically equivalent to the hydraulic conductivity multiplied by the saturated thickness: $T = Kb$.

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Saturated Thickness (b) - The saturated thickness (b) is the distance (for example, in feet [ft]) from the elevation of the upper groundwater surface in either a phreatic system (the water table) or a confined or semi-confined system (the lower boundary of the upper confining or semi-confining layer, but not the potentiometric surface in a well) to the elevation of the upper boundary of the lower confining or semi-confining layer for the aquifer or water-bearing layer.

Drawdown(s) - The drawdown(s) in any well affected by a hydraulic conductivity test is the differential distance, usually in feet (ft), between the static (unstressed) water level in the well measured immediately prior to the test, and the (stressed) water level at the specified time during the test.

Falling-Head Test - The falling-head test is conducted where the static water level in the subject well is nearly instantaneously displaced vertically upward at the initiation of the test; the decay of this artificially impressed head is measured against time to provide data for the calculation of conductivity or transmissivity.

Rising-Head Test - The rising-head test is conducted where the static water level in the subject well is nearly instantaneously displaced vertically downward at the initiation of the test; the decay of this artificially depressed head is measured against time to provide data for the calculation of conductivity or transmissivity.

Confined Conditions - Confined conditions in a water-bearing layer are found where the groundwater is bounded vertically by opposed surfaces or layers that are impermeable to water, and where the total head of the system at the upper surface of the groundwater is greater than atmospheric pressure. For a confined system, when a well is drilled below the bottom of the upper confining layer, the water level in the well rises to an elevation (at least) within or (possibly) above the upper confining layer.

Unconfined (Phreatic) Conditions - Unconfined conditions in a water-bearing layer are found where the groundwater is bounded vertically only by a single surface or layer at the bottom of the water-bearing layer that is impermeable or semipermeable to water, and where the total head of the system at the upper surface of the groundwater is equal to atmospheric pressure. For an unconfined or phreatic or water-table system, when a well is drilled below the upper surface of the groundwater, the water level in the well does not rise to a significantly higher elevation.

Semi-confined Conditions - Semi-confined conditions in a water-bearing layer are found where the groundwater is bounded vertically by opposed surfaces or layers that are less permeable to

water than the water-bearing layer itself, and where the total head of the system is greater than atmospheric pressure. For a semi-confined system, when a well is drilled below the bottom of the upper semi-confining layer, the water level in the well rises to an elevation within or above the upper semi-confining layer. However, one or both of the semi-confining layers will be, in some fashion, in hydraulic and hydrologic communication with the water-bearing layer, and may contribute water to or receive water from that layer.

4.0 RESPONSIBILITIES

Project Manager (PM) - The PM is responsible for ensuring that project-specific plans are in accordance with these procedures, where applicable, or that other, approved procedures are developed. The PM is responsible for development of documentation procedures which deviate from those presented herein.

Field Team Leader (FTL) - The FTL is responsible for determining the need for hydrogeologic testing and has overall responsibility for the planning and implementation of the test. It is the responsibility of the FTL to ensure that these procedures are implemented in the field and to ensure that personnel performing testing activities have been briefed and trained to execute these procedures.

Field Geologist - Responsible for executing the test. Evaluation and interpretation of the data is also the responsibility of the project hydrogeologist.

5.0 PROCEDURES

The procedures presented in this section concern the administration and execution of hydraulic conductivity tests; the technical content of a given test will be established by the project and program management for each instance according to experience and best professional practice.

5.1 Overview

Reconnaissance evaluations of saturated subsurface materials using hydraulic conductivity testing will be evaluated on a site-specific basis conforming to the objectives of the investigation and to standards of good hydrogeologic investigative practices. Hydraulic conductivity tests can be preformed as falling-head tests or rising-head tests, depending on the construction of the well, the screened units and the hydro-stratigraphic conditions. Sufficient personnel and standard and/or specific equipment will be available for the use of the well testing.

Equipment needs include:

- Stopwatch,

- Water level indicator,
- Bailer with new nylon rope, and
- TSP or Alconox and distilled water.

Optional equipment includes:

- PID, FID or other field instrument,
- Electronic data logger, and
- Transducer.

Data will be collected in conformance with typical hydrologic practice - using accurate measurements as discussed in other field procedures (Water Level, Water/Product Level Measurements and Well Depth Measurements); recorded appropriately conforming to the intent of the test. Additionally, all equipment and instrumentation will be cleaned and/or decontaminated prior to placement in the well, as described in field procedure F502. Furthermore, containment and disposal of discharged liquids will conform to the practiced described in field procedure F504 (Handling of Site Investigation Wastes).

5.2 Applications

An understanding of the well construction and flow system is required to choose the correct method for the well-testing procedures. The accuracy of the hydraulic conductivity testing method may be dependent on the method chosen. Hydraulic conductivity tests are completed using either a falling-head (raising the water level nearly instantaneous) or rising-head test (lowering the water level in the well nearly instantaneously). The rate at which the level falls or rises is controlled by the formation characteristics. Background information on the well, such as water level and yield, can be obtained prior to the hydraulic conductivity tests by reviewing the well development data.

After reviewing available data, the initial task in the hydraulic conductivity testing procedure is to collect data on static conditions prior to the tests. At the minimum, a water level reading must be taken immediately prior to the beginning of a test. If possible, static water levels should be retrieved from the test well(s) prior to testing. Often a pressure transducer and datalogger (or combination units) are useful to measure both static measurements and test levels because of the difficulty to measure and record fast dropping or rising water levels during the test. The transducer and datalogger are also effectively used in slug tests performed in highly conductive materials in which hand water level measurements are ineffective.

The duration of the hydraulic conductivity test is directly dependent on the formation characteristics. A fine grained, cohesive material will have much lower hydraulic conductivity and

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therefore much longer equilibration time. A highly conductive subsurface unit will equilibrate much quicker and thus have a shorter test. Specific applications for each method, which are often performed sequentially, are described below.

5.2.1 Falling-Head Test

The falling-head test is conducted by imposing a stress on the water-bearing unit by instantaneously introducing a solid "slug" of impermeable material (or injecting water) in the well. The rate of recovery is measured by recording the depth to water and duration of the water equilibration (falling head). The test should be planned to use between 50% and 75% of the displacement of the well, but may use between 1% and 100%, as warranted by site conditions and discretion of the FTL. Also, any water being added to a well for a falling head test should only be added with prior approval of the PM.

The rise of water level during the falling head test must rise above the top of the screen for accurate testing results. If the water level is below the top of the screen or is completed at the water table, the rising head should be used exclusively to prevent "injected water" being forced into the well's unsaturated sand pack. The falling head test is typically completed prior to the rising head test. This test is completed first, prior to the rising head test because the slug used in the falling head test will be removed for the rising head test after the water level in the well equilibrates.

5.2.2 Rising-Head Test

The rising-head test imposes a stress on the water bearing layer by instantaneously depressing the water surface and measuring the rate of water level recovery to equilibrium conditions. The water level can be depressed by either extracting a small volume of water (e.g. removing a full bailer) or removing a "slug" of known volume after the well equilibrated with the slug submerged. The rate of water recovery is typically measured using a stop watch and an electronic water level indicator or a pressure transducer and data logger. Preferably, the test should be planned to use between 50% and 75% of the available displacement in the well, but may use between 1% and 100%.

In highly transmissive aquifers, a pneumatic well manifold may be used to depress the water level in the well using inert Nitrogen gas. A transducer will be submerged in the water to record the water level recovery to the static level. Pressure gages will be used to record the pressure of the well manifold and of nitrogen supply tank. This method is only to be used if the water level is within the well casing is significantly higher than the screen. If the screen is exposed, pneumatic leakage will occur and proper drawdown will not occur.

The rising-head test is preferred to the falling head test where the well screen is completed across the water table or if any portion of the screen is exposed. By using a rising-head test in these situations, formation water is forced to flow into the well, whereas, injected water could potentially fill unsaturated areas of the screen and sand-pack causing erroneous results.

5.3 Measurements and Measurement Intervals

The measurement intervals for water levels during hydraulic conductivity tests (either falling head or rising head) should reflect a logarithmic schedule that is generalized in the following schedule suggestion:

Elapsed Time Since Start of Test (min)	Measurement Frequency (min)
0 – 2	<0.5
2 - 5	0.5
5 - 10	1
10 - 20	2
20 - 60	5
> 60	≥ 10

The actual time and the test time for each reading will be recorded, with the water level measured to a precision of 0.01 ft. The suggested measurement intervals will accurately represent the aquifer's damped response to the applied stress. The sequence of stations tested and the frequency of readings will be established by project and program management prior to the tests, and will be adjusted according to site conditions during the tests.

5.4 Calculation Methods

Calculation of the approximate values of the aquifer parameters will follow standard practice, with particular reference to resources of Section 7.0, or as otherwise noted in the calculation sequence. A computer program, such as AquiferTest Version 2.5 (Waterloo Hydrogeologic) or SuperSlug™ (Starpoint Software, 1994) that computes the hydraulic conductivity using the Bouwer and Rice method (1976) may also be used to calculate solutions to the slug-test water level recovery curves. If a computer program is used, an example that has previously been verified by traditional calculation will be run as part of the data from the subject site for quality control.

6.0 QUALITY ASSURANCE RECORDS

The readings made during the hydraulic conductivity test may be recorded in field logbooks or on separate forms, according to management decisions. The field logbooks will be stored according

to that field procedure, with photocopies of the specific pages with test data included in the file for each test. The file for each test will include the field data, the calculations and graphs and summaries with references for calculations by computer program.

7.0 REFERENCES

Freeze, R. A. and Cherry, J. A. 1979. Groundwater. Prentice-Hall, Englewood Cliffs.

Driscoll, F. G., ed. 1986. Groundwater and Wells, 2nd ed. Johnson Filtration Systems, St. Paul.

Starpoint Software, 1994-1999. SuperSlug™ . version 3.14, Documentation.

TG: 601 **SUBJECT:** REMOTE FIELD EQUIPMENT DEPLOYMENT AND VERIFICATION

SUMMARY:

The purpose of this technical guidance document (TG) is to identify and discuss procedures for the general usage, deployment, access/download, verification, and data validation of remote water level, temperature, and specific conductance loggers. This TG provides a general procedure that, when followed, will provide groundwater level, temperature and specific conductance data that represent the natural conditions of groundwater at the specified hydrostratigraphic zone in the screened interval of the monitoring well.

A variety of loggers are available in the market (e.g., In-Situ's LevelTrolls™ & AquaTrolls™, Solinst's Levellogger™, the "Diver" logger, etc.) and include vented and non-vented models. To account for the variety of products, this guidance does not specify a particular brand or reference its accompanying hardware and/or software. Rather, this guidance generally provides universal information that is applicable for use with remote monitoring equipment regardless of the logging device being utilized. One exception is the AquaTroll200, which has conductance monitoring capabilities in addition to pressure (water level) and temperature.

1.0 REQUIRED EQUIPMENT

- **Manual water level indicator** – a device capable of reading to the nearest 0.01 feet with sufficient length to extend to the water in all applicable wells**.** An oil/water interface probe is not recommended for use due to possible residual oil on the probe as a result of incomplete decontamination from previous use.

- **Mobile device, field laptop, notebook, and/or water level monitoring field sheet**

- **Water level and temperature logging device** – including applicable docking/ quick-connect communication cable and desiccant.

- **Multiple-parameter logger (if applicable)** – While multiple parameters may be measured using remote loggers (such as conductivity, pH/ORP, Dissolved Oxygen, turbidity, chlorophyll a, Rhodamine WT, ammonium, chloride, nitrate, etc.) this guidance is limited to the calibration, deployment, and data validation of specific conductance data loggers. For example, the AquaTroll200 datalogger by In-Situ, provides a reliable, all-in-one instrument, measures and records water level and pressure, conductivity and temperature. This instrument is available in vented and non-vented configurations and features a unique conductivity cell design that allows for a wide accurate-measurement range in a narrow diameter instrument applicable for placement in smaller diameter monitoring wells.

- **Personal Protective Equipment** – The proper personal protective equipment (PPE) for the Site. At a minimum this will include disposable Nitrile gloves in addition to the standard PPE required at all AECOM field work sites.

- **Health and Safety Plan** – The site-specific health and safety plan (HASP) and applicable Task Hazard Analysis (THA) Forms should be kept on hand at all times during field activities.

- **Sampling Plan or Scope of Work** – The site-specific sampling plan, scope of work, or project task sheet should be available throughout field activities.

- **Well Data and Map** – A site map showing the location of all wells. Well construction data including well construction material, screen depth, and constructed total depth should be available to the field team while on-site.

- **Well Keys/Socket Set or Tool Set** – Tools to open protective casings, manholes, and unlock J-plug lock.

2.0 PROCEDURES

1. General Procedures – The site-specific HASP, THAs, field sampling plan or project task sheet should be reviewed. All meters planned for use should be calibrated with the instrument's calibration solution per manufacturer instructions. Prior to conducting field activities, decontaminate all equipment which will be placed down the monitoring well or which will come into contact with groundwater.

   During each visit to the monitoring well (or stand pipe for surface water monitoring), the date, time, and depth to water should be recorded in the mobile device, field laptop, notebook, and/or water level monitoring field sheet. Water level measurement procedures are outlined in technical guidance in TG-500. The depth to water and depth to bottom should be recorded to the nearest 0.01 ft from referenced mark or notch on the well casing. Manual water levels are critical for verification of the remote water level data validation process.

   The protective well casing should be closed and locked after work at the well is complete. Care should be taken so vented cables are not pinched or kinked. Wash and rinsate water should be disposed of in accordance with the Work Plan and/or Sampling and Analysis Plan. Additional instructions may be provided on a project task sheet distributed by the project manager prior to field activities.

2. Deployment – Record well location, logging device serial number, and serial number of the cable. Make sure a fresh (blue) desiccant is attached to the surface end of all vented cables. Slowly lower the logging device such that the bottom of the sensor is placed near the center of the screened interval. Having the instrument near the center of screened interval will allow for several things, including: 1) keeping the logger out of sediment that may accumulate in the well sump, 2) logging reasonably accurate temperatures of groundwater within the screened hydrostratigraphic zone since stagnant water within the well casing (above the screened interval) will be avoided, and 3) the placement of the logging device in the middle of the screened interval will allow for groundwater sampling (potentially) by placing the submersible pump near the top of the well screen.

   Note that the latter may require removal of the logger prior to pumping if the cable prevents the submersible pump from reaching the desired depth.

   a. Placement of the logging device in the middle of the well screened interval should be checked against high water levels historically observed in the well and

the rating on the instrument. High water levels may need to be estimated if existing data are not available. The pressure rating of the logging device is given in pounds per square inch (psi) and is equivalent to 2.3 feet of water that can be loaded on the instrument. The rating is the general operational pressure of the logger and should be not over-loaded. Thus, logging device ratings of 5 psi, 15 psi, and 30 psi are rated for 11.5 ft, 35 ft, and 69 ft of total dynamic head, respectfully. For vented instruments, a direct pressure reading on the logging device can taken after deployment. Non-vented logging devices must also account for atmospheric pressure in addition to the head pressure of the water column.

Note that a screened stand-pipe can be utilized as a variation in deployment to allow for surface water level monitoring.

b. For both vented and non-vented logging devices that are connected to factory vented cables or braided cord, the connecting cable/cord needs to be securely affixed to the well casing to minimize movement of the instrument during deployment. Factory supplied cables may be supplied with wire-mesh grips (Kellem's® grips) that can be used to hang the logging device from the well casing with a carabiner. The remaining vented cable should be positioned so the well cover can be closed and locked without kinking the vented cable. Note the curvature threshold of the cable cannot be exceeded or the cable will kink and venting will be compromised. Non-vented logging devices should be affixed similarly using bailing cord consisting of yellow nylon, white diamond braided nylon, or coated stainless steel safety cable. Movement of the instrument should be minimized during deployment, but a secure connection to the well casing allows the logger to be placed at a very similar depth if the logging device needs to be removed to allow complete access to the well. The well may need to be accessed during sampling or the logging device may need to be access for data download. Regardless, a thorough record of well activities, including potential disturbances to the logger and manual water levels collected before and after disturbance, need to be recorded in the field notes which will allow for assessment of the data after download.

   Note that fore-thought into the well's surface completion prior to construction may allow for additional room within the head space of the monitoring well for extra cable and connection to the logging device.

c. Conductivity sensors (in the Aqua TROLL instrument, for example) will have been calibrated during manufacturing to produce a linear response across the operating range. Since standard procedures for measuring conductivity in the field typically specify that sensors shall be calibrated before use, close to the expected temperature and conductivity conditions. The accuracy of the sensor depends on the calibration solution used and the operator's technique. It is recommended that the specific conductivity reading in the solution shipped with your instrument is checked. If the device is reading the calibration solution accurately (±3% of the standard solution), there is no need to field-calibrate the instrument. The Aqua TROLL instrument can be calibrated at any point in the operating range. However, best results will be obtained in the range of approximately 100 to 60,000 micro-Siemens/cm (µS/ cm). When carbon dioxide from the air dissolves into water it increases the conductivity, sometimes by as much as one or two µS/cm. This could shift a 146.9 standard by as much as 3%.

The amount of shift is not predictable, so it should be minimized by limiting exposure to air. Fill the calibration cup to the marked fill line and close it as soon as possible. A small air bubble in the cup is acceptable, and in fact it assists mixing during the inversions. Discard remaining portions of low range calibration standards within a few days after opening the bottle.

i. Three factors are essential to a successful conductivity calibration:

1. The calibration solution is not diluted or contaminated.
2. The probe and the solution are at the same temperature.
3. The sensing cell is completely filled with solution—no air bubbles on the sensor.

To perform a conductivity calibration of the Aqua TROLL Instrument you will need the In-Situ Cal Cup supplied with your instrument and the calibration standard solution supplied, or other solution of known specific conductivity in the range 100 to 60,000 µS/cm. Specific calibration procedures will be supplied with the instrument (or can be found online).

It is recommended that the formation of bubbles on the sensor is minimized. For deployment in a monitoring well (or any location without flowing water) these steps should be followed:

1. Slowly lower the Aqua TROLL until it is below the surface of the water.
2. Allow the conductivity sensor to be thoroughly wetted (at least 30 seconds).
3. Briskly agitate up and down (<1 foot) several times, while not taking the device above the water surface.
4. When the conductivity readings stabilize, the Aqua TROLL is ready for deployment.

3. Start Logging – The data collection settings of long-term water level logging should be set to “depth to water” so it facilitates comparison to manual water readings for potential correction. This also allows for groundwater elevation data to be reserved for data that has undergone the validation process. The mobile device or field laptop should be verified that the time is correct set using time from a mobile phone or similar device with automatic time updates. To set the mobile device or field laptop to display CST, right click the Time icon at bottom right of laptop screen, unclick “auto adjust for daylight savings time.” For multiple logging devices being deployed concurrently, a uniform date and time should be used. Data collection frequency will vary based on application. However, uniform frequency should be considered when possible for ease of data evaluation. For example, data collection for long-term monitoring should have all instruments set for 4-hour intervals that are all started at the nearest even 4-hour interval during a 24-hour period (i.e., at 12:00AM, 4:00AM, 8:00AM, 12:00PM, 4:00PM, or 8:00PM). During dynamic testing (e.g., for pump testing), more frequent and differential data collection based on location of the logging devices are very much appropriate.
4. Downloading Data from Loggers - Submerged (un-vented) loggers should be downloaded first, followed by barologgers such that barometric data are available for all unvented data points. For all water level logging devices, manual water level measurements should be completed prior to moving the instrument in the well. Movement of the probe and suspended cable should be avoided if possible. Depending

on the frequency of data collection, active tests may continue to run and only the new data should be collected. This will vary depending on monitoring objectives and size of the dataset. A new test may be considered for frequently collected datasets or for those datasets with multiple channels. For tests that are recording data frequently or have multiple input channels, the active data collection test may need to be stopped and downloaded to save battery life. Furthermore, once a test dataset is backed-up to a cloud or server, the old test may be deleted from the logger to free memory space.

Each unvented level logger file must be compensated to subtract barometric pressure. Barometric corrections may be completed in the field or during the data validation process. Regardless, the raw pressure data needs to be maintained within the project files, so the data can be validated. Desiccants for all vented cables should be checked and replaced if humidity saturation has caused the indicator color to change.

If the data collection program is running properly and time synchronizes within ±1.5 minutes, then the instrument can be redeployed. If a new test is needed, the time on the mobile device or field laptop should be verified and not adjusted for daylight savings time. While the logger is plugged into the laptop, synchronize laptop and instrument times. Start a new test such that the logger will start at the nearest 4-hour interval at a future time (i.e., midnight, 4AM, 8AM, noon, 4PM, 8PM). Note the time when the logging will start and re-record the water level.

5. Data Validation – Water level data measured using transducer logging devices should be considered accurate if within ±0.3 feet of a corresponding manual water level measurement. Transducers will record water levels to a much greater accuracy, but the placement of the transducer in wells may change when the well is accessed. For example, LevelTroll accuracy is 0.1% of the full-scale. For the commonly used 30 psi transducer, this accuracy corresponds to ±0.07 ft. However, during gauging and sampling, the movement of the transducer results in an apparent change in water level, when it is actually the transducer (and corresponding head pressure relative to its reference point) that has changed. These data are subject to correction and calibration to manual water level readings. These corrections affect accuracy of the data series and not all discrepancies can be resolved.

   For temperature monitoring, the accuracy of logging devices should be at least ±0.2˚F, with a resolution of 0.02˚F. This accuracy and resolution are likely adequate for most purposes. A separate logger deployed concurrently or multiparameter probe used during water quality sampling can be used to verify accuracy of temperature readings. Average error between the probes should be less than ±0.2˚F. Verification of temperature probe accuracy should occur at least once every 18-months of deployment, which corresponds at least twice during the general 3-year warranty period.

   For conductivity sensors, accuracy of the AquaTroll instrument is ±0.5% of reading + 1 µS/cm when reading less than 80,000 µS/cm. Accuracy of the deployed logging device can be verified with a second, independent logging device that is either deployed concurrently for a short period of time or used as a flow-through cell during low-flow micro-purge groundwater sampling. To account for minor variations in equipment and calibration, remote data should be considered accurate if the average error between the conductivity datasets is less than 5%. Verification of conductivity probe accuracy should occur at least twice per year of deployment that consists of at least an hour of corresponding data collection.

3.0 RESPONSIBILITY

The procedures outlined in TG_601 are utilized to guide field staff. All field staff must be familiar with the electronic data recording mobile device and web-based field forms. Coordination with PM or Technical Leader regarding data validation of field data is critical. Site-specifics or special items not presented in this TG should also be presented to PM or Technical Leader.

Employees are responsible for collecting representative groundwater levels, as well as temperature and field parameter data following ethical and regulatory guidelines to client and site specifications. Deviations in sampling procedures should be noted in the site field book and relayed to the project manager.

Distribution of TG_601 is responsibility of PM.

4.0 RELEVANT FORMS AND ATTACHMENTS

Attachments - In-Situ Technical Specifications

- Rugged Troll 100-200 Specifications
- LevelTroll 400-500-700 Specifications
- Aqua TROLL® 100 and 200 Data Loggers

5.0 REFERENCES

No relevant references.

6.0 DOCUMENT APPROVAL AND HISTORY

Draft prepared by Dave Bareham, June 30, 2006
Revised by Gary Braun, March 31, 2020.
Further QC Tory Schultz, April 2, 2020.
FINAL April 3, 2020.

In-Situ Inc.

Innovations in
Water Monitoring

Rugged **TROLL**® 100 and 200 Data Loggers

Rugged TROLL 100 and 200 Data Loggers are designed for long- and short-term groundwater and surface water monitoring. These non-vented (absolute) water level data loggers measure and record changes in water level, pressure, and temperature. Ensure accurate results by using a Rugged BaroTROLL® Data Logger. All loggers are compatible with user-friendly Win-Situ® Software, which guides you through programming steps, automates level corrections, and accelerates report generation.

Affordable Titanium Data Loggers

- Get reliable data at a budget-friendly price.
- Use in harsh environments. Solid titanium construction offers chemical- and corrosion-resistance and outlasts specially-coated data loggers.
- Select the appropriate logging mode for your project: Linear, Fast Linear, or Event.

Flexible Deployment Options

- Deploy zero-maintenance loggers in flood-prone areas, high-humidity environments, and remote locations.
- Choose the cable length and termination type that works best for your project.
- Use suspension wire and backshell hanger for applications requiring minimal instrument access.

Simplified Setup and Data Retrieval

- Save time and reduce errors with the intuitive Win-Situ 5 and Win-Situ Mobile Software platform. Quickly program loggers, download data, graph results, and more.
- Use a Rugged TROLL Docking Station for programming and downloading data.
- Connect a cabled logger to a telemetry system, radio, controller, or a SCADA/PLC system via Modbus/RS485 or SDI-12 (only Rugged TROLL 200 and Rugged BaroTROLL).

Outstanding Service

- Receive **free**, 24/7 technical support and online resources.
- Order data loggers and accessories from the In-Situ e-store.
- Get guaranteed 7-day service for maintenance (U.S.A. only).

Applications

- Coastal wetland and estuary research
- Crest stage gaging and stream gaging
- Drilling and well development
- Flood and storm surge monitoring
- Landfill leachate monitoring

Rugged TROLL® 100 and 200 Data Loggers

General	Rugged TROLL 100 & 200	Rugged BaroTROLL
Temperature ranges[1]	Operational: 0-50° C (32-122° F) Storage: -40-80° C (-40-176° F) Calibrated: 0-50° C (32-122° F)	Operational: 0-50° C (32-122° F) Storage: -40-80° C (-40-176° F) Calibrated: 0-50° C (32-122° F)
Diameter	2.62 cm (1.03 in.)	2.62 cm (1.03 in.)
Length	14.43 cm (5.68 in.)	14.43 cm (5.68 in.)
Weight	170 g (0.37 lb)	170 g (0.37 lb)
Materials	Titanium body; Delrin® nose cone, hanger, backend	Titanium body; Delrin nose cone, hanger, backend
Output options	Rugged TROLL 100: USB or RS232 via docking station Rugged TROLL 200: USB or RS232 via docking station; Modbus/RS485 or SDI-12 via Rugged TROLL 200 Cable	USB or RS232 via docking station; Modbus/RS485 or SDI-12 via Rugged TROLL 200 Cable
Battery type & life[2]	3.6V lithium; 10 years or 2M readings	3.6V lithium; 10 years or 2M readings
External power	Rugged TROLL 100: NA Rugged TROLL 200: 8-36 VDC	8-36 VDC
Memory Data records[3] Data logs	1.0 MB 65,000 Rugged TROLL 100: 1 log Rugged TROLL 200: 2 logs	1.0 MB 65,000 2 logs
Fastest logging rate	1 per second	1 per minute
Fastest output rate	Rugged TROLL 200 only Modbus & SDI-12: 1 per second	Modbus & SDI-12: 1 per second
Log types	Linear, Fast Linear, and Event	Linear
Sensor Type/ Material	Piezoresistive; Ceramic	Piezoresistive; Ceramic
Range	9.0 m (30 ft) (Burst: 18 m; 60 ft) 30 m (100 ft) (Burst: 40 m; 134 ft) 76 m (250 ft) (Burst: 112 m; 368 ft)	7 to 30 psi; 0.5 to 2 bar
Accuracy[4]	±0.1% full scale (FS) typical ±0.3% FS max.	±0.1% FS typical ±0.3% FS max.
Resolution	±0.01% FS or better	±0.01% FS or better
Units of measure	Pressure: psi, kPa, bar, mbar, mmHg Level: in., ft, mm, cm, m	Pressure: psi, kPa, bar, mbar, mmHg, inHg
Temperature Sensor	Silicon	Silicon
Accuracy	±0.3° C	±0.3° C
Resolution	0.01° C or better	0.01° C or better
Units of measure	Celsius or Fahrenheit	Celsius or Fahrenheit
Warranty	2 years	2 years
Notes	[1] Temperature range for non-freezing liquids. [2] Typical battery life when used within the factory-calibrated temperature range. [3] 1 data record = date/time plus 2 parameters logged (no wrapping) from device within the factory-calibrated temperature range. [4] Across factory-calibrated pressure and temperature ranges. Delrin is a registered trademark of E.I. du Pont de Nemours & Co. Specifications are subject to change without notice.	

Rugged BaroTROLL® Data Logger

Use the titanium Rugged BaroTROLL with either a Rugged TROLL 100 or 200 Data Logger. Win-Situ® Baro Merge® Software simplifies post-correction of water level data for barometric pressure changes.

Rugged TROLL® 200 Cable

Access real-time data by using Rugged TROLL 200 Cable with a Rugged TROLL 200 or a Rugged BaroTROLL. Use a Cable Suspension Kit to anchor the cable in place. Available configurations:

- Modbus/RS485 stripped-and-tinned cable or SDI-12 stripped-and-tinned cable—Use with PLC, telemetry system, or logger.
- Modbus/RS485 top-of-well cable—Use with Rugged TROLL Com Device and a RuggedReader® Handheld PC or a PC.

Jacket options	TPU (thermoplastic polyurethane)
Conductors	4 conductors, 24 AWG, polypropylene insulation
Diameter	Cable: 5.1 mm (0.200 in.) Connector: 26.1 mm (1.03 in.)
Cable lengths	Modbus/RS485: Customizable up to 300 m (1,000 ft) SDI-12: Standard lengths up to 60 m (200 ft)
Minimum bend radius	5X cable diameter
Break strength	68 kg (150 lbs)

Rugged TROLL® Com Communication Device

Use the Rugged TROLL Com Device for communication between a cabled Rugged TROLL 200 or a cabled Rugged BaroTROLL and a RuggedReader Handheld PC or a laptop/PC.

Operating temp. range	0-50° C (32-122° F)
Storage temp. range	-40-80° C (-40-176° F)
Materials	Delrin, rubber, copper pins
Environmental rating	IP67 with battery cover closed
Dimensions (LxWxH)	8.9 x 2.9 x 4.8 cm (3.5 x 1.14 x 1.88 in.)
Input connection	Modbus/RS485
Output connection	Available with either USB or RS232
Power source	9V alkaline battery, user-replaceable
Cable	Black polyurethane, 91 cm (3 ft) long

Rugged TROLL® Docking Station

Use the docking station to program and download data from a Rugged TROLL 100 or 200 or from a Rugged BaroTROLL. The docking station is available with either a USB or RS232 communication interface. USB allows fast data transfer to a PC. Use the RS232 version with a laptop/PC or a RuggedReader Handheld PC.

In-Situ Inc.

Call to purchase—www.in-situ.com
221 East Lincoln Avenue, Fort Collins, Colorado, U.S.A. 80524
1-800-446-7488 (toll-free in U.S.A. and Canada)
1-970-498-1500 (U.S.A. and international)
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In-Situ™

Innovations in **Water Monitoring**

Spec Sheet

Level TROLL® 400, 500 & 700 Data Loggers

Get water level data the way you want it, when you want it with industry-leading water level/pressure and temperature data loggers. By partnering with In-Situ, you receive durable Level TROLL® Data Loggers that provide years of service, accurate results, intuitive software, and real-time functionality.

Be Effective

- **Increase productivity:** Reduce training and installation time with In-Situ intuitive software platform and integrated components. Patented twist-lock connectors, included on Level TROLL Loggers and RuggedCable® Systems, ensure error-free deployments.
- **Streamline analysis and reporting:** Automate water level corrections and post-processing, graph data, and accelerate report generation with Win-Situ® Software. Easily export data to Excel,® a web-based management service, or data analysis software.
- **Set up real-time networks:** Access data 24/7 and receive event notifications when you connect data loggers to Tube and Cube systems, radios, or other third-party data collection platforms. Get decision quality data when, where, and how you need it with HydroVu Data Services. Control gates, pumps, alarms, and other equipment by using built-in Modbus/RS485, SDI-12, or 4-20 mA communication protocols.

Be Reliable

- **Deploy in all environments:** Install loggers in fresh water, saltwater, and contaminated waters. Solid titanium and sealed construction outperforms and outlasts coated data loggers.
- **Log accurate data:** Get optimal accuracy under all operating conditions. Sensors undergo NIST®-traceable factory calibration across the full pressure and temperature range. For applications requiring the highest levels of accuracy, use a vented (gauged) system.
- **Get long-lasting operation:** Reduce trips to the field with low-power loggers that typically operate for 10 years.

Be In-Situ

- Receive **free**, 24/7 technical support and online resources.
- Order data loggers and accessories from the In-Situ website.
- Get guaranteed 7-day service for maintenance (U.S.A. only).

Applications

- **Aquifer characterization: slug tests & pumping tests**
- **Coastal: tide/harbor levels & wetland/estuary research**
- **Hydrologic events: crest stage gages, storm surge monitoring, & flood control systems**
- **Long-term, real-time groundwater & surface water monitoring**
- **Mining & remediation**

CALL OR CLICK TO PURCHASE OR RENT

1-800-446-7488 (toll-free in U.S.A. and Canada)
1-970-498-1500 (U.S.A. and international)

WWW.IN-SITU.COM

Level TROLL® 400, 500 & 700 Data Loggers

Spec Sheet

General	Level TROLL 400	Level TROLL 500	Level TROLL 700	Level BaroTROLL
Temperature ranges[1]	Operational: -20-80° C (-4-176° F) Storage: -40-80° C (-40-176° F) Calibrated: -5-50° C (23-122° F)	Operational: -20-80° C (-4-176° F) Storage: -40-80° C (-40-176° F) Calibrated: -5-50° C (23-122° F)	Operational: -20-80° C (-4-176° F) Storage: -40-80° C (-40-176° F) Calibrated: -5-50° C (23-122° F)	Operational: -20-80° C (-4-176° F) Storage: -40-80° C (-40-176° F) Calibrated: -5-50° C (23-122° F)
Diameter	1.83 cm (0.72 in.)	1.83 cm (0.72 in.)	1.83 cm (0.72 in.)	1.83 cm (0.72 in.)
Length	21.6 cm (8.5 in.)	21.6 cm (8.5 in.)	21.6 cm (8.5 in.)	21.6 cm (8.5 in.)
Weight	197 g (0.43 lb)	197 g (0.43 lb)	197 g (0.43 lb)	197 g (0.43 lb)
Materials	Titanium body; Delrin® nose cone	Titanium body; Delrin nose cone	Titanium body; Delrin nose cone	Titanium body; Delrin nose cone
Output options	Modbus/RS485, SDI-12, 4-20 mA	Modbus/RS485, SDI-12, 4-20 mA	Modbus/RS485, SDI-12, 4-20 mA	Modbus/RS485, SDI-12, 4-20 mA
Battery type & life[2]	3.6V lithium; 10 years or 2M readings	3.6V lithium; 10 years or 2M readings	3.6V lithium; 10 years or 2M readings	3.6V lithium; 10 years or 2M readings
External power	8-36 VDC	8-36 VDC	8-36 VDC	8-36 VDC
Memory *Data records*[3] *Data logs*	2.0 MB 130,000 50 logs	2.0 MB 130,000 50 logs	4.0 MB 260,000 50 logs	1.0 MB 65,000 2 logs
Fastest logging rate	2 per second	2 per second	4 per second	1 per minute
Fastest output rate	Modbus: 2 per second SDI-12 & 4-20 mA: 1 per second	Modbus: 2 per second SDI-12 & 4-20 mA: 1 per second	Modbus: 2 per second SDI-12 & 4-20 mA: 1 per second	Modbus: 2 per second SDI-12 & 4-20 mA: 1 per second
Log types	Linear, Fast Linear, and Event	Linear, Fast Linear, and Event	Linear, Fast Linear, Linear Average, Event, Step Linear, True Logarithmic	Linear
Sensor Type/Material	**Piezoresistive; titanium**	**Piezoresistive; titanium**	**Piezoresistive; titanium**	**Piezoresistive; titanium**
Range	Absolute (non-vented) 30 psia: 11 m (35 ft) 100 psia: 60 m (197 ft) 300 psia: 200 m (658 ft) 500 psia: 341 m (1120 ft)	Gauged (vented) 5 psig: 3.5 m (11.5 ft) 15 psig: 11 m (35 ft) 30 psig: 21 m (69 ft) 100 psig: 70 m (231 ft) 300 psig: 210 m (692 ft) 500 psig: 351 m (1153 ft)	Absolute (non-vented) 30 psia: 11 m (35 ft) 100 psia: 60 m (197 ft) 300 psia: 200 m (658 ft) 500 psia: 341 m (1120 ft) 1000 psia: 693 m (2273 ft) Gauged (vented) 5 psig: 3.5 m (11.5 ft) 15 psig: 11 m (35 ft) 30 psig: 21 m (69 ft) 100 psig: 70 m (231 ft) 300 psig: 210 m (692 ft) 500 psig: 351 m (1153 ft)	30 psia (usable up to 16.5 psi; 1.14 bar)
Accuracy[4]	±0.05% full scale (FS) ±0.1% FS	±0.05% FS ±0.1% FS	±0.05% FS ±0.1% FS	±0.05% FS ±0.1% FS
Resolution	±0.005% FS or better	±0.005% FS or better	±0.005% FS or better	±0.005% FS or better
Units of measure	Pressure: psi, kPa, bar, mbar, mmHg, inHg, cmH20, inH20 Level: in., ft, mm, cm, m	Pressure: psi, kPa, bar, mbar, mmHg, inHg, cmH20, inH20 Level: in., ft, mm, cm, m	Pressure: psi, kPa, bar, mbar, mmHg, inHg, cmH20, inH20 Level: in., ft, mm, cm, m	Pressure: psi, kPa, bar, mbar, mmHg, inHg, cmH20, inH20
Temperature Sensor	**Silicon**	**Silicon**	**Silicon**	**Silicon**
Accuracy	±0.1° C	±0.1° C	±0.1° C	±0.1° C
Resolution	0.01° C or better	0.01° C or better	0.01° C or better	0.01° C or better
Units of measure	Celsius or Fahrenheit	Celsius or Fahrenheit	Celsius or Fahrenheit	Celsius or Fahrenheit
Warranty	**3 years**	**3 years**	**3 years**	**3 years**
Notes	[1] Temperature range for non-freezing liquids. [2] Typical battery life when used within the factory-calibrated temperature range. [3] 1 data record = date/time plus 2 parameters logged (no wrapping) from device within the factory-calibrated temperature range. [4] Across factory-calibrated pressure range. [5] Across factory-calibrated pressure and temperature ranges. [6] Up to 5-year (total) extended warranties are available for all sensors—call for details. Delrin is a registered trademark of E.I. du Pont de Nemours and Company. Specifications are subject to change without notice.			

Every Application & Budget

Use maintenance-free, non-vented systems for long-term monitoring and at flood-prone or high-humidity sites. Pair with Tube and Cube Telemtry System and HydroVu for automtatic barometric compensation.

Use high-accuracy, vented systems to conduct aquifer tests and to view barometrically compensated water level data in real time.

Forgot to set a level reference at the beginning of a deployment? Automate level corrections by using Win-Situ Software's post-level correction Wizard.

BaroTROLL® Data Logger

When using a non-vented system, collect barometric pressure and temperature data with a titanium BaroTROLL Data Logger in order to post correct data for barometric pressure fluctuations.

Calculating barometric efficiency? Use the BaroTROLL Logger with vented systems.

CALL OR CLICK TO PURCHASE

1-800-446-7488 (toll-free in U.S.A. and Canada)
1-970-498-1500 (U.S.A. and international)

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In-Situ
YOUR EYES IN THE FIELD

Aqua TROLL® CTD Data Loggers

CONDUCTIVITY, TEMPERATURE, PLUS WATER LEVEL LOGGING

MEASURE AND RECORD WATER LEVEL, WATER PRESSURE, CONDUCTIVITY, AND TEMPERATURE WITH THE AQUA TROLL 200, OR ONLY CONDUCTIVITY AND TEMPERATURE WITH THE AQUA TROLL 100. UNIQUE CONDUCTIVITY CELL ALLOWS FOR A WIDE, ACCURATE MEASUREMENT RANGE IN A NARROW DIAMETER INSTRUMENT (SUB-1 INCH).

ACCURATE RESULTS

- **Use dynamic density compensation** to collect accurate water level data in environments where salinity values may vary.
- **Receive 3D factory calibrated instruments** that are validated with NIST®-traceable standards.
- **Deploy for long-term monitoring**. Instruments operate with very low drift.

FLEXIBLE COMMUNICATIONS

- **Streamline data management:** Use the VuSitu Mobile App to consolidate all site information on your smartphone, and tag data with site photos and GPS coordinates. Simply connect the instrument to a Wireless TROLL Com or power pack, launch the mobile app, and start reading results. Simplify instrument setup, reduce log errors and get the most out of your data with Log Setup Assistant and Panoramic Live Data. Log data to your smartphone and download results in a Universal Data File.
- **Integrate into telemetry and SCADA systems and HydroVu™ Data Services** for real-time data and automatic event alerts. Outputs include standard Modbus/RS485, SDI-12, and 4-20 mA.
- **Streamline data collection and analysis.** Simplify instrument setup, automate site management, and generate reports with user-friendly VuSitu Mobile and Win-Situ® PC Software.

RUGGED, COMPACT DESIGN

- **Use in harsh environments** such as coastal, remediation, and mine water monitoring projects. Titanium construction resists fouling and is chemical- and corrosion-resistant.
- **Sub-1 inch design** fits narrow diameter, 1-inch wells.
- **Use RuggedCable® Systems** with titanium twist-lock connectors for quick, reliable connections. Integrate with the Rugged Cable Splitter to attach multiple In-Situ Shared Ecosystem instruments in a single water column with a single connector, allowing you to measure multiple parameters at various depths and simultaneously.

TOTAL FIELD SUPPORT

- **One-stop-shop for purchasing and support.**
- **Total Field Support**
- **24/7/365 technical support is just a phone call away.**
- **Guaranteed 7-day service for maintenance (U.S.A. only).**

Applications:

- **AQUIFER STORAGE AND RECOVERY SYSTEMS**
- **COASTAL DEPLOYMENTS–SALTWATER INTRUSION MONITORING, STORM SURGE ANALYSIS, AND ESTUARY/WETLAND RESEARCH**
- **REMEDIATION SITE AND MINE WATER MONITORING**
- **STORMWATER MONITORING PROGRAMS**

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Aqua TROLL® 100 and 200 Data Loggers

VUSITU MOBILE APP

Use the VuSitu Mobile App to access and manage data on your Android™ smartphone or tablet. Intuitive, free mobile app is an all-in-one software package that provides auto-configuration, simplified calibration, guided log setup, directed data analysis, automated report creation, Panoramic Live Data, Calibration Assistant and Log Setup Assistant. Tag data with site photos and GPS coordinates. View results in the field and email data on the spot. Download through the Google Play Store.

HYDROVU DATA SERVICES

Get decision-quality data anywhere, anytime, with cloud-based HydroVu Data Services. Integrate with In-Situ instruments and telemetry systems for real-time feedback on all your remote water monitoring sites.

[1] Temperature range for non-freezing liquids
[2] Typical battery life when used within the factory-calibrated temperature range, dependent on site conditions
[3] 1 reading = date/time plus all available parameters polled or logged from device
[4] 1 data record = date/time plus 3 parameters logged (no wrapping) from device
[5] External power or battery pack is recommended when using Linear Average or Event logging modes.
[6] Parameters derived from temperature at 25° C and actual conductivity range of 0 to 100,000 µS/cm with a ±0.5% + 1 µS/cm accuracy
[7] Derived from Standard Methods 2510B
[8] Defined by the Practical Salinity Scale 1978; Standard Methods 2520B
[9] Real-time level compensation based on water density
[10] Accuracy with 4-20 mA output option: ±0.25% FS
[11] Includes linearity and hysteresis over 1 year.
[12] Temperature response varies by temperature change and environmental conditions. Under typical field conditions, T95<5 min.

Specifications are subject to change without notice. Delrin is a registered trademark of E.I. du Pont de Nemours and Company. NIST is a registered trademark of the National Institute of Standards and Technology. Android is a trademark of Google Inc.

AQUA TROLL 100 AND 200 INSTRUMENTS	
TEMPERATURE RANGES[1]	Operational: -5 to 50° C (23 to 122° F) Storage: -40 to 65° C (-40 to 149° F) Calibrated: 0 to 50° C (32 to 122° F)
DIMENSIONS & WEIGHT	Diameter (OD): 1.83 cm (0.72 in.) Length: 31.5 cm (12.4 in.) Weight: 188 g (0.41 lb)
MATERIALS	Titanium body and sensors, Delrin® nose cone, and PVC conductivity cell
OUTPUT OPTIONS	Modbus/RS485, SDI-12, and 4-20 mA
BATTERY TYPE & LIFE[2]	3.6V lithium. 5 years or 200,000 readings3
EXTERNAL POWER	8-36 VDC; Measurement current: 15 mA; Sleep current: 40 µA
MEMORY Data records[4] Data logs	4.0 MB 190,000 50
LOG TYPES[5]	Linear, Linear Average, and Event
FASTEST LOGGING RATE	Linear: 1 per minute. Linear Average: 1 per minute. Event: 1 per second
FASTEST OUTPUT RATE	1 per second
CONDUCTIVITY SENSOR - TYPE: Balanced 4-electrode cell	
METHODS	EPA Method 120.1; Standard Methods 2510
RANGE, ACCURACY, & RESOLUTION	Range: 0 to 100,000 µS/cm Accuracy: ± 0.5% of reading + 1 µS/cm when reading less than 80,000 µS/cm ± 1.0% of reading when reading above 80,000 µS/cm Resolution: 0.1 µS/cm)

PARAMETERS SUPPORTED[6]	Range	Units
Actual conductivity	0 to 100,000 µS/cm	µS/cm, mS/cm
Specific conductivity[7]	0 to 100,000 µS/cm	µS/cm, mS/cm
Salinity[8]	0 to 42 PSU	PSU
Total dissolved solids	0 to 82 ppt	ppt, ppm
Resistivity	10 to 200,000 Ohms-cm	Ohms-cm
Density (water salinity)	0.98 to 1.14 g/cm3	g/cm3

PRESSURE/LEVEL/SENSOR[9] - TYPE: Piezoresistive. Pressure/level are available only on the Aqua TROLL 200 Instrument.		
RANGE	Absolute (non-vented) 30 psia: 11 m (35 ft) 100 psia: 60 m (197 ft) 300 psia: 200 m (658 ft) 500 psia: 341 m (1,120 ft)	Gauged (vented) 5 psig: 3.5 m (11.5 ft) 15 psig: 11 m (35 ft) 30 psig: 21 m (69 ft) 100 psig: 70 m (231 ft) 300 psig: 210 m (692 ft) 500 psig: 351 m (1153 ft)
BURST PRESSURE	Maximum 2x range; burst > 3x range	
MAX PRESSURE FOR AQUA TROLL 100	500 psi (1,153 ft)	
ACCURACY & RESOLUTION[10]	Accuracy: ±0.05% FS from -5 to 50 °C	
LONG-TERM STABILITY[12]	<0.1% FS	
UNITS OF MEASURE	Pressure: psi, kPa, bar, mbar, mmHg, inHg, cmH20, inH20. Level: in, ft, mm, cm, m	
TEMPERATURE SENSOR[13]		
METHOD	EPA Method 170.1	
ACCURACY & RESOLUTION	Accuracy: ±0.1° C. Resolution: 0.01° C or better	
UNITS OF MEASURE	Celsius or Fahrenheit	
WARRANTY	2 years. Up to 5-year (total) extended warranties available.	

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Attachment 4

Standard Field Forms

1.) Water Elevation Recording Form
2.) Groundwater - Well Sampling Field Sheet
3.) Well Purging Log
4.) Field Meter Instrument Calibration Log
5.) Daily Field Report
6.) Elevation Survey - Field Data Form
7.) Field Boring Log
8.) Rock Coring - Geologic Log
9.) Well Completion Report
10.) Water Well Sealing Form
11.) Well Development Field Record
12.) Infield Hydraulic Conductivity Testing Form

AECOM

Water Elevation

Project No.: _____ Site: _____
Description of Site: _____
Weather: _____ Date: _____

Well Number	Elevation of Top of Pipe	Depth to Water	Water Elevation	Depth to Bottom	Well Integrity				Comments
					Locked	Capped	Cracked	Obstruct	

Entered on Computer: _____ Signature: _____ Date: _____

AECOM

Groundwater - Well Sampling Field Sheet

Fill out the entire form. If it does not apply, mark N/A.

Project Name: _____ Job No. _____

Location: _____ Tester: _____

Well Number: _____ Date Sampled: _____

Previous Well Sampled: _____

GENERAL CONDITIONS:

						If Missing Replaced?	
Surface Seal:	☐ Ok	☐ Damaged	☐ Missing:	Yes	No
Protector Pipe:	☐ Ok	☐ Damaged	☐ Missing:	Yes	No
Well Cap:	☐ Ok	☐ Damaged	☐ Missing:	Yes	No

Ambient Temperature: °F ☐ Clear ☐ Cloudy ☐ Rain

WELL DATA:

Measuring Device: _____

Stick Up or Down: _____ (from Ground Surface)

Depth to Water: _____ (from TPVC)

Depth to Bottom: _____ (from TPVC)

Length of Water: _____

Free Product Observed: ☐ Yes ☐ No Thickness: _____

PURGING/SAMPLING:

Well Purging Calculations: Amount to purge = 0.163 gallons/foot times height of water column in feet for one well volume in a 2-inch monitoring well.

Purging Device: _____ Sampling Device: _____

Volume Required: _____ ☐ See back of page for field readings during purge

Volume Purged: _____

Could Well Bail Dry? ☐ Yes ☐ No ☐ Low Flow Technique

Purging - Time Start: _____ Time Ended: _____

Decon Method: _____

IN-SITU TESTING:

Turbidity: _____

Odor: _____

Color: _____

pH: _____

Specific Conductivity: _____

Water Temperature: _____

Comments: _____

SAMPLES COLLECTED

VOCs -	☐	Cyanide	☐
Metals -	☐	Hexchrome	☐
SVOC	☐	Alkalinity	☐
TOC	☐	Chloride	☐
Sulfide	☐	Ammonia	☐
Phenolics	☐	PAHs	☐

Well Purging Log

Well: ________________ Date: ________________

Time	Temp (^{o}C)	pH (units)	Conductivity (ms/cm)	DO (mg/L)	ORP (units)	Depth to Water (ft. btoc)	Purging Rate (ml/min)

Comments: ____

____

____

____

AECOM

Field Meter Instrument Calibration Log

Project No.: _____ Site: _____ Date: _____

Name / Signature of personnel conducting calibration: _____

INSTRUMENT	BRAND	MODEL #	SERIAL #	LAST SERVICED
Water Level Indicator				--

INSTRUMENT	BRAND	MODEL #	SERIAL #	LAST SERVICED
pH/Cond./ORP/DO Meter				
Turbidity Meter				

CALIBRATION SOLUTION	MANUFACTURER	LOT #	STANDARD	COMMENTS
pH 4				
pH 7				
pH 10				
Specific Conductance (µs/cm˚C)				
D.O. (mg/L)	--	--	Saturated air	
ORP (mV)				

CALIBRATION		
True Value of Standard:	Actual Reading:	Corrected to:
pH 4		
pH 7		
pH 10		
Specific Conductance (µs/cm˚C)		
D.O. (mg/L)		
ORP (mV)		

Comments: Calibrated per manufactures directions.

AECOM Environment

DAILY FIELD REPORT

Sheet _____ of _____

Project: _____ Report No.: _____

Project No.: _____ Day/Date: _____

Location: _____ Weather/Temp.: _____

Contractor: _____

Hours worked: _____ Contractor personnel on-site: _____

Summary _____

By: _____

Title: _____

AECOM

ELEVATION SURVEY - FIELD DATA FORM

PROJECT NAME: _____ **PROJECT #:** _____

SURVEY CREW: _____ **DATE:** _____

SITE DESCRIPTION: _____

Location		Backsight	Height of Instrument	Foresight	BM Elevation	Elevation	Water Levels from TOC	Water Elevation
BM			100.00	-----	100.00			
	Ground Surface					100.00		
	TOC							
	Ground Surface							
	TOC							
	Ground Surface							
	TOC							
	Ground Surface							
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	Ground Surface							
	TOC							
BW								

NOTES: Bench Mark Description = _____

FIELD BORING LOG

AECOM

PAGE _____ OF _____

GEOLOGIST/ENGINEER _____ SURFACE ELEV. _____ 140 LB. HAMMER TYPE:

DRILLER _____ BORING STARTED _____ ☐ DONUT

HELPER _____ BORING COMPLETED _____ ☐ SAFETY

RIG MFG/MODEL _____ STATION _____ ☐ AUTOMATIC

OFFSET _____ CASING USED _____ SIZE ____

WATER LEVEL OBSERVATIONS

WL: _____ WS OR WD

WL: _____ BCR _____ ACR

WL: _____ AB _____ HR. AB

WL: _____ 24 HR. AB

JOB NO. _____ BORING NO. _____ CLIENT _____ WEATHER _____

TASK NO. _____ CONTRACT NO. _____

SAMPLE NO.	DEPTH OR ELEVATION FROM	DEPTH OR ELEVATION TO	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	R LENGTH RECOVERED IN FEET	QP PENETROMETER TEST IN TSF	HNU PHOTO-IONIZATION DETECTION	STRATA CHANGE	SAMPLE DESCRIPTION

ABBREVIATIONS

FT	FISH TAIL
WO	WASH OUT
ST	SHELBY TUBE
SS	SPLIT SPOON
DB	DIAMOND BIT
PA	POWER AUGER
HSA	HOLLOW STEM AUGER
HA	HAND AUGER
RB	ROCK BIT
WS	WHILE SAMPLING
WD	WHILE DRILLING
BCR	BEFORE CASING REMOVAL
ACR	AFTER CASING REMOVAL
AB	AFTER BORING

DRILLING NOTES

DRILL CREW CHECKLIST
TOPSOIL THICKNESS_____
FILL THICKNESS_____

CAVE-IN LEVEL:
WHILE DRILLING AND SAMPLING_____
AFTER BORING COMPLETION_____

WATER LOSS:
AT_____ TO_____
PERCENT LOSS
AT_____ TO _____
PERCENT LOSS_____

BOULDERS OR OBSTRUCTIONS:
AT_____ TO _____
AT_____ TO _____

ARTESIAN PRESSURE:
DEPTH_____
HEIGHT OF SOIL RISE IN CASING_____
PIEZOMETER PVC OR SS
DIAMETER_____ IN.
SCREEN DEPTH _____ FT. TO _____ FT
RISER PIPE _____ FT. TO _____ FT

GEOLOGIC LOG

DEPTH	ELEVATION	RUN NO.	Run Time Start/Stop	LITHOLOGY	DRILLING				DISCONTINUITY DESCRIPTION								COMMENTS
				DESCRIPTION Rock name, color, texture/grain size, structure (bedding or foliation), weathering, field hardness, discontinuity descriptions (spacing, type, dip, roughness, weathering, aperture, infilling), other features and geologic formation	WATER GAIN/LOSS (%)	RECOVERY (In./In.)/%	RQD (In./In.)/%	BREAKS PER FOOT	DEPTH (ft)	DIP	TYPE	APERTURE	TYPE OF INFILLING	AMOUNT OF INFILLING	SURFACE SHAPE OF DISCONTINUITY	ROUGHNESS	

PROJECT: **HMS Romeoville Quarry**

LOG OF BORING NO.

ORIGINATED BY

DATE

SURFACE ELEV.

CHECKED BY

DATE

BORING STARTED

BORING COMPLETED

RIG/FOREMAN

AECOM JOB NO. 60225330

SHEET NO. OF

CALC. NO.

REV. NO.

STRUCTURE:

DESCRIPTION	THICKNESS
MASSIVE	>10 FT.
THICKLY BEDDED	1 TO 10 FT.
MEDIUM BEDDED	4 IN. TO 12 IN.
THINLY BEDDED	1/3 IN. TO 4 IN.
LAMINATED	<1/3 IN.

TYPE:

DESCRIPTION	SYMBOL
JOINT	J
BEDDING JOINT	B
SHEAR	SH
FAULT	F
FOLIATION JOINT	FO
MECHANICAL BREAK	MB

APERTURE:

DESCRIPTION	SYMBOL	APERTURE (IN.)
HAIRLINE	HL	<0.004
TIGHT	T	0.004 - 0.010
PARTLY OPEN	PO	0.01 - 0.02
OPEN	O	0.02 - 0.10
MODERATELY WIDE	MW	0.1 - 0.4
WIDE	W	> 0.4
VERY WIDE	VW	0.4 - 4.0
EXTREMELY WIDE	EW	4.0 - 40.0
CAVERNOUS	CA	> 40

TYPE OF INFILLING:

DESCRIPTION	SYMBOL
BIOTITE	BI
CALCITE	CA
CHLORITE	CH
CLAY	CL
CHERT	CT
IRON OXIDE	FE
HEALED	H
POTASSIUM	K
MANGANESE	MN
MYLORITE	MY
NONE	NO
PYRITE	PY
QUARTZ	QZ
SAND	SD
SILT	SI
UNKNOWN	UK

AMOUNT OF FILLING:

DESCRIPTION	SYMBOL
NONE	NO
PARTIALLY FILLED	PA
FILLED	FI

SURFACE SHAPE:

DESCRIPTION	SYMBOL
PLANAR	PL
STEPPED	ST
IRREGULAR	IR
WAVY	WA

ROUGHNESS:

DESCRIPTION
ROUGH
SMOOTH
SLIKENSIDED

WELL COMPLETION REPORT

SITE #: _____ COUNTY: _____ WELL #: _____

SITE NAME: _____ BOREHOLE #: _____

STATE PLANE COORDINATE: X _____ Y _____ (OR) LATITUDE: _____° _____' _____" LONGITUDE: _____° _____' _____"

SURVEYED BY: _____ IL REGISTRATION #: _____

DRILLING CONTRACTOR: _____ DRILLER: _____

CONSULTING FIRM: _____ GEOLOGIST: _____

DRILLING METHOD: _____ DRILLING FLUIDS (TYPE): _____

LOGGED BY: _____ DATE STARTED: _____ DATE FINISHED: _____

REPORT FORM COMPLETED BY: _____ DATE: _____

ANNULAR SPACE DETAILS

TYPE OF SURFACE SEAL: _____

TYPE OF ANNULAR SEALANT: _____

INSTALLATION METHOD: _____

SETTING TIME: _____

TYPE OF BENTONITE SEAL – GRANULAR, PELLET, SLURRY (CIRCLE ONE)

INSTALLATION METHOD: _____

SETTING TIME: _____

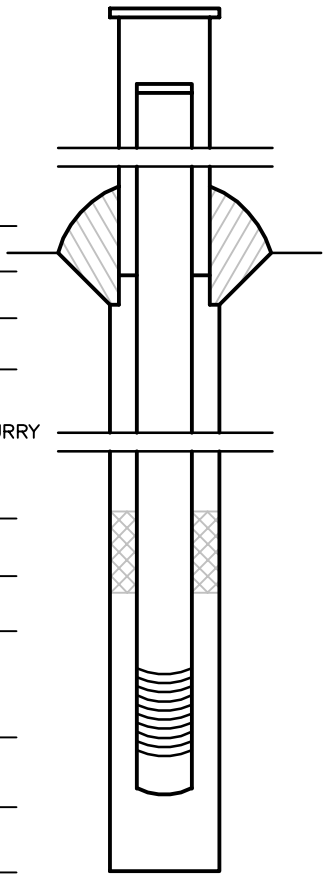
TYPE OF SAND PACK: _____

GRAIN SIZE: _____ (SIEVE SIZE)

INSTALLATION METHOD: _____

TYPE OF BACKFILL MATERIAL: _____ (IF APPLICABLE)

INSTALLATION METHOD: _____



ELEVATIONS (MSL)*	ELEVATIONS (BGS) (.01 FT.)	
_____	_____	TOP OF PROTECTIVE CASING
_____	_____	TOP OF RISER PIPE
_____	_____	GROUND SURFACE
_____	_____	TOP OF ANNULAR SEALANT
_____	_____	STATIC WATER LEVEL (AFTER COMPLETION)
_____	_____	TOP OF SEAL
_____	_____	TOP OF SANDPACK
_____	_____	TOP OF SCREEN
_____	_____	BOTTOM OF SCREEN
_____	_____	BOTTOM OF WELL
_____	_____	BOTTOM OF BOREHOLE

* REFERENCED TO A NATIONAL GEODETIC VERTICAL DATUM

WELL CONSTRUCTION MATERIALS (CIRCLE ONE)

PROTECTIVE CASING	SS304, SS316, PTFE, PVC OR OTHER:
RISER PIPE ABOVE W.T.	SS304, SS316, PTFE, PVC OR OTHER:
RISER PIPE BELOW W.T.	SS304, SS316, PTFE, PVC OR OTHER:
SCREEN	SS304, SS316, PTFE, PVC OR OTHER:

CASING MEASUREMENTS

DIAMETER OF BOREHOLE (IN)	
ID OF RISER PIPE (IN)	
PROTECTIVE CASING LENGTH (FT)	
RISER PIPE LENGTH (FT)	
BOTTOM OF SCREEN TO END CAP (FT)	
SCREEN LENGTH (1ST SLOT TO LAST SLOT) (FT)	
TOTAL LENGTH OF CASING (FT)	
SCREEN SLOT SIZE **	

** HAND-SLOTTED WELL SCREENS ARE UNACCEPTABLE

X:\LIBRARY\BLOCK\WELLFORM

5/2009 ILLINOIS DEPARTMENT OF PUBLIC HEALTH
Division of Environmental Health
525 West Jefferson St.
Springfield, IL 62761
217-782-5830 (Telephone) 217-557-1188 (Fax)

MONITORING WELL REQUIREMENTS

Construction

A water well contractor's license is not required to construct a monitoring well in Illinois.

Monitoring Wells must be constructed according to Section 920.170 of the Illinois Water Well Construction Code:
http://www.ilga.gov/commission/jcar/admincode/077/07700920sections.html

Contact the approved local health department prior to constructing a monitoring well within its jurisdiction. Bureau County Health Department requires a permit to construct a monitoring well and Winnebago County Health Department requires a registration.

Notification **prior** to constructing a monitoring well is **not required** by the Department. **Within 30 days after a monitoring well has been constructed, the owner, designer or consulting firm shall submit a report of construction to the approved local health department or the Department.** Completed construction reports must include the following location information: County, Township, Range, Section, Quarter, Quarter, Quarter Section, and GPS coordinates.

A CONSTRUCTION REPORT FORM AND INSTRUCTIONS ARE AVAILABLE ON THE DEPARTMENT'S Webpage:
http://www.idph.state.il.us/envhealth/pdf/WW_WellConstRpt.pdf; and
http://www.idph.state.il.us/envhealth/pdf/WW_WellConstRpt_Inst.pdf

Abandonment

A water well contractor's license is not required to seal an abandoned monitoring well in Illinois.

All abandoned monitoring wells must be sealed according to Section 920.120 of the Illinois Water Well Construction Code**:**
http://www.ilga.gov/commission/jcar/admincode/077/07700920sections.html

Check with the approved local health department if a permit is required to seal a monitoring well within its jurisdiction. Bureau, Douglas, Henderson, Kane, Lake, McHenry, Mercer, Ogle and Rock Island county health departments require a permit to seal a monitoring well. **A LISTING OF APPROVED LOCAL HEALTH DEPARTMENTS IS AVAILABLE ON THE DEPARTMENT'S Webpage: http://www.idph.state.il.us/local/alpha.htm**

Notification must be made to the approved local health department or the Department's regional office by telephone or in writing at least 48 hours prior to the start of the work to seal any monitoring wells. **A water well sealing form must be completed and sent to the approved local health department or Department not more than 30 days after the monitoring well is sealed. A WATER WELL SEALING FORM IS AVAILABLE ON THE DEPARTMENT'S Webpage: http://www.idph.state.il.us/envhealth/pdf/WW_WellSealingFrm.pdf**

If you have any additional questions, contact an approved local health department or the Illinois Department of Public Health.

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party)_____

2. Well Location_____
   Address - Lot Number City County

   General Description Township_____(N)(S) Range_____(E)(W) Section _____

   _____Quarter of the _____Quarter of the _____Quarter

3. Year Drilled_____

4. Drilling Permit Number (and date, if known)_____

5. Type of Well Bored_____ Drilled_____ Other_____

6. Total Depth_____ Diameter (inches)_____

7. Formation clear of obstruction _____Yes _____No

8. DETAILS OF PLUGGING

   Filled with_____from_____to_____ft.
   (cement or other materials)

   Kind of plug_____from_____to_____ft.

   Filled with_____from_____to_____ft.

   Kind of plug_____from_____to_____ft.

   Filled with_____from_____to_____ft.

   Kind of plug_____from_____to_____ft.

9. CASING RECORD Upper 2 feet of casing removed _____Yes _____No

10. Date well was sealed Month_____ Day_____ Year_____.

11. Licensed water well driller or other person approved by the Department performing well sealing.

    _____ _____
    Name Complete License Number

    _____ _____ _____
    Address City State/ZIP

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

AECOM

WELL DEVELOPMENT FIELD RECORD

Project Name _____ Project No. _____ Well No. _____

Developed by _____ Date of Installation _____

Started Development: _____ / _____ Completed Development _____ / _____

Date Time Date Time

Water Level Before Development _____ After Development _____

Total Well Depth (TOC to bottom of well in Ft) _____ Well Diameter (in) _____

Standing Water Column (ft) _____ Standing Well Volume (gal) _____

Screen Length _____ Drilling Water Loss (gal) _____

Time	**Volume Removed** (gallons)	**Spec Cond** umhos/cm	**Temp** °C	**pH** (i.u.)	**ORP**	**DO** mg/L	**Remarks**

WELL DEVELOPMENT FIELD RECORD (continued)

Time	Volume Removed (gallons)	Spec Cond umhos/cm	Temp °C	pH (i.u.)	ORP	DO mg/L	Remarks

AECOM

Infield Hydraulic Conductivity Test
(Data Logger Form)

Sheet 1 of 1

Project No.: _____ Well No.: _____
Site: _____ Station ID: _____
Date: _____ Test Performed by: _____

Diameter of Borehole (2R): _____ Total Depth of Well: _____
Diameter of Pipe (2r): _____ Static Water Level (ft): _____
Screen Length: _____ Length of Water Column in Well (D): _____
Effective Screen Length (L): _____

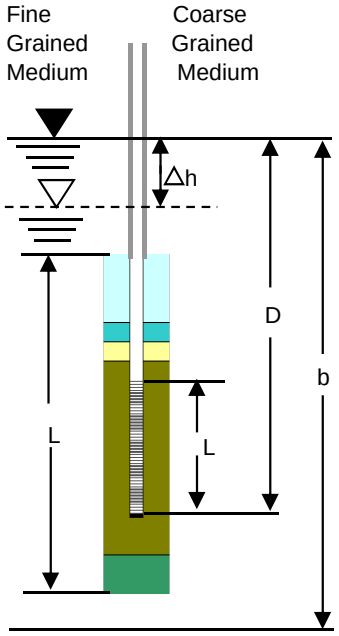
	Fall	Rise
Static Transducer Level:		
Start Time:		

Observation Well/Piezometer (circle)
Confined/Unconfined (circle)
USCS Class of Screened Fmtn: _____ Pressure Transducer (PSI): _____
Aquifer Saturated Thickness in ft. (b): _____ Slug Length and Diameter: _____

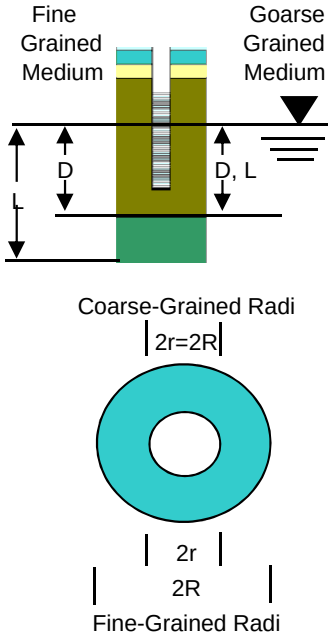
Pump Test Information Only

Pumping Rate: _____ Time Pumping Started: _____
Distance from Pumping Well: _____ Time Pumping Stopped: _____

Piezometer



Water Table Well



Infield Test Data

Segment Number	Number of Readings	Reading Interval (Seconds)	Segment Duration (Seconds)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Notes: _____

Logger Downloaded by: _____
Calculations by: _____ Date: _____
Computer File Name: _____ Date: _____
Locationof Backup Files: _____

APPENDIX G-2:
HED Monitoring

1.0 INTRODUCTION

Methods are described below for monitoring of larval and adult Hine's emerald dragonflies (*Somatochlora hineana*) at locations owned by Hanson Material Service. The objectives of the survey effort generally are to quantify the number of larvae present within defined study areas, and to estimate density of adult dragonflies over entire sites known to support populations. Specific methods are described below and are taken from annual reports of past monitoring efforts.

2.0 LARVAL MONITORING METHODS

Monitoring of larvae follows the methods described by Soluk et al. (2006) and Pintor and Soluk (2006). Sampling stations will be established and flagged at five-meter intervals along each streamlet to be sampled (Mierzwa and Webb, 2009; Soluk et al, 2006). Sampling of stations will be conducted from downstream to upstream. Each sample point location will be numbered and recorded by GPS for later mapping.

At each sample station, in-channel samples will be taken by disturbing water and substrate with a D-ring dip-net within a one-square foot (930 cm^2) area, and sweeping loose substrate into the net. Generally, three passes of the net are made at each sample location. Material captured in the dip-net is then transferred to a plastic or enamel light-colored pan and sorted. Dragonfly larvae are removed from the collected organic material, identified to species, and *S. hineana* individuals are measured (total length and head width) before being released at the point of collection. Other organisms observed in the samples will be noted, including larvae of other dragonfly species. Presence/absence of crayfish burrows will be noted.

Crayfish burrows will be identified within 1.0 m^2 plots centered on the same points used for in-channel sampling. All burrow openings within each plot will then be located by careful hand inspection, and flagged. The number of burrows at each point will be noted; adjacent openings to the same burrow system are counted as one burrow. Burrows will then be sampled by pumping with a Jabsco Amazon bilge pump. Each burrow will be pumped three times, passing water through a fine mesh net and then sorting the collected material in enamel or plastic trays. Larvae are normally measured in the field and then immediately released at point of capture; occasionally, for example if many small larvae are found or if severe weather threatens, larvae may be returned to the lab for careful measurements and then released the following morning at the same location where they were collected.

3.0 ADULT MONITORING METHODS

Line transects and distance sampling have been used since 1995 to estimate population densities of *Somatochlora hineana* on Hanson Material Service sites (Mierzwa and Webb 2011) Details of the method are described by Buckland et al. (1993). Distance sampling has been used to census primates (Whitesides et al.

1988), pronghorns (Johnson et al. 1991), lizards (Akin, 1998), gopher tortoises (Lohoefener, 1990), salamanders (Dodd, 1990), and semi-aquatic snakes (Lacki et al. 1994). In general the method is well suited for sampling animals which are conspicuous but are mobile or difficult to capture (Akin, 1998).

Accurate density estimates rest on four assumptions: 1) all animals directly on the transect line are counted; 2) animals are counted only once on a transect; 3) the distance between an observation point and the transect line is measured accurately; and 4) all observations are independent. Meeting assumptions two and three requires some care during dragonfly sampling. Observations of marked dragonflies in 1995 verified that repeat sighting are rare (Mierzwa et al. 1995), and observers are trained to verify measurements.

Randomly located transects are established each year on each study site, with up to 36 transects on a site depending on site size and intended study intensity. Baselines have previously been established along or near one boundary of most study sites, including River South and River Parcels and the Long Run/Com Ed Parcel. Transects run perpendicular to the baselines and cross all or most of the study area. At the River South and River Parcels, transects end at the Des Plaines River. Each transect is a minimum of 100 meters distant from the immediately prior or subsequent transect walked on the same day, to reduce the chance of counting the same dragonfly on more than one transect. However, past field experience indicates that dragonflies encountered on transects are as likely to move toward the observer as they are to move away.

Observers typically walk three to six transects per day depending on site size and complexity. Transects begin in late June or early July and continue to completion, usually by late July or very early August. Transects are walked between 8:00 am and 12:30 pm, to include the adult morning activity period documented during earlier studies (Mierzwa et al. 1994; Mierzwa et al. 1995). Although flight may occur during afternoon or evening periods, it tends to be more variable than during the morning hours (Mierzwa et al 2010). No transects are walked on heavily overcast, rainy, or unusually windy days, or on days with extreme temperatures, since dragonfly activity is usually suppressed under those conditions.

Observers use a compass to maintain an appropriate bearing while walking each transect. Each time a *Somatochlora hineana* is encountered, the bearing (degrees off the transect line) and distance (in meters) from the observer to the point of initial observation is recorded. Distances are paced or measured to maximize accuracy, and care is taken to avoid rounding of bearing readings. Habitat classifications and dragonfly behavior are also noted. Other dragonfly species observed are typically noted but not counted, and no attempt is made to thoroughly inventory any of the non-target species.

Multiple ecologists generally participate in monitoring each year, and rotate among sites to minimize individual bias.

Perpendicular distance from the transect to the observation point is determined by:

$$x = r * \sin(q)$$

where x = perpendicular distance from the transect, r = observer to dragonfly distance, and q = bearing.

Effective distance is calculated using the method of Whitesides et al. (1988). A histogram is constructed using frequency values of x, with distance classes varying to fit the data set but typically at 3.0 to 5.0 meters. The fall-off distance, or the point at which the number of observations decreased to below half of the previous distance class, is used to calculate the effective distance:

$$\textit{Effective distance} = \frac{N_i}{N_f} FD$$

Where N_i = total number of sightings, N_f = number of sightings at less than the fall-off distance, and FD = fall-off distance.

This estimate is checked by plotting the cumulative percentage of total sightings against the perpendicular distance from the transect, and then fitting two straight lines to the curve. The point of intersection of the two lines represents the effective distance. Typically, the angle of the upper line is close to zero because the probability of additional sightings is low beyond the effective distance (Whitesides et al., 1988).

The area sampled on each transect is double the effective distance, to account for observations on both sides of the transect, multiplied by the length of the transect. Thus, the estimate of dragonfly density is:

$$D = \frac{\textit{No. of observations}}{\textit{2(effective distance)(transect length)}}$$

Dragonfly observations are then plotted in ArcView over aerial photographs of each site. Spatial analysis is normally conducted only at a qualitative level.

6.0 LITERATURE CITED

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Whitesides, G. H., J. F. Oates, S. M. Green, and R. P. Kluberdanz. 1988. Estimating primate densities from transects in a west African rain forest: A comparison of techniques. Journal of Animal Ecology 57:345-367.

APPENDIX G-3:
Vegetation & Habitat Restoration Monitoring

Vegetation Monitoring Methods

Establishing Monitoring Transects

Permanent straight line sampling transects will be established in each mitigation parcel where habitat restoration or enhancement will be performed. Transects will be established in representative areas of each parcel to ensure that restored or enhanced communities are adequately sampled. Each transect typically will be 100 or 50 meters in length and ends will be marked with metal T-posts and surveyed with GPS. Photo points will also be established at the end points of each transect. The following number of transects will be established in the mitigation parcels: Long Run (2), ComEd (7), Fitzpatrick Seep (1), River South (5), River (3), North (2), Far North (2), and River North (1) (see Restoration Plan Set; Appendix F)

Sampling Monitoring Transects

Ground Layer

Each transect will contain a series of one square meter quadrats at 10 meter intervals used to record the ground layer (<1 meter high) vegetation. Percent cover of each plant species found within each quadrat and will be recorded. Plant sampling will be completed in August/September each year quantitative monitoring is required.

A summary analysis of the ground layer data will be created using an Excel macro adapted from the Floristic Quality Assessment and Computer Applications (USACOE, 2017). This analysis provides cover, frequency, and relative importance value (RIV) (sum of relative frequency and relative cover) for each species measured within each sampled transect, and physiognomic importance and floristic quality measures (i.e. Mean C and FQI). Absolute percent cover or relative importance value (RIV) will be used to determine species dominance. Mean C and/or FQI calculated from the quadrat data will be used to determine floristic quality. Data shall be reported by transect and summarized by plant community (i.e. restoration zone).

Woody Layer

The woody layer will be sampled by conducting tree and shrub stem counts within belted transects established along the same transects use for quadrat sampling. The belted transects will be two meters wide for shrubs (woody species <2" DBH) and one meter wide for trees (woody species >2"DBH). Size of trees (i.e. DBH) will also be recorded. All woody species >1 meter in height will be included in the counts. Stem counts will be used to calculated stem densities (i.e. stems/acre) for shrubs and basal area (m^2/acre) for trees.

APPENDIX H:

Compliance with State Conservation Plan Requirements

IDNR Conservation Plan Requirements

Title 17, Chapter I, and Section 1080 of the Illinois Administrative Code, lists all the requirements of a state Conservation Plan. This document lists where in this HCP information can be found that satisfies each requirement of a state Conservation Plan found in the Code.

Section 1080.10 a) 1)

The project description is found in Chapter 3, and the Impact of Take Analysis is found in Section 5.1.5 for the HED, Section 5.2.5 for the covered turtles, and Section 5.3.5 for the other covered species.

Section 1080.10 a) 1) A)

See Section 1.6, Chapter 3, and Figures 2, 3, 15.1, and 16.

Section 1080.10 a) 1) B)

See Section 2.2.

Section 1080.10 a) 1) C)

See Chapter 3.

Section 1080.10 a) 1) D)

See Section 5.1 for HED and Section 5.2 for the covered turtles, specifically Sections 5.1.5 – 5.1.8 and Sections 5.2.5 – 5.2.6.

Section 1080.10 a) 2)

AMMs are found in Chapter 5, and funding is discussed in Chapter 7.

Section 1080.10 a) 2) A)

See Sections 5.1.3, 5.2.3, and 5.3.3 for AMMs, and Sections 5.1.4, 5.2.4, and 5.3.4 for the estimate of take for the covered species.

*Note: Take of HED in the HCP is calculated in acres of habitat lost but not in take of individuals. However, take of individuals is required by state law, and thus is provided here. The loss of adult HED habitat in Middle Parcel (40.81 acres) is estimated to result in the take of approximately three adult HED per year (through displacement) and no HED larvae. A take of three adult individuals is about 1.8 % (3/165) of the estimated annual adult HED population in the Lower Des Plaines River Valley. The take estimate on Middle Parcel is based on current population estimates from 16 consecutive years of adult surveys (Mierzwa and Webb 2012a). The larval estimate for Middle Parcel is based on the fact that there is no evidence of successful larvae production on the property since 1997. This take will be minimized because mitigation measures designed to offset the impact of this take (i.e. habitat restoration) will start right after the permit is issued and will be completed prior to any habitat impacts on Middle Parcel. The loss of mapped adult habitat from development of the set back areas at the west end of North and Far North Parcels (8.4 acres) and the construction of an access road in ComEd Parcel (0.39 acres) is not expected to result in take of adult or larval HED.

Section 1080.10 a) 2) B)

The habitat area that will be surfaced mined under the proposed mining plan will not provide habitat for the covered species after mining is complete. Other potentially impacted habitat areas will be protected through the use of AMMs (see sections referenced above). In addition, 340 acres within the Permit Area will be restored or enhanced or maintained (see Sections 5.1.7, 5.2.6, and 5.3.6 and Table C-9).

Section 1080.10 a) 2) C)

See Sections 5.1.3, 5.2.3, and 5.3.3 and Sections 5.1.7, 5.2.6, and 5.3.6.

Section 1080.10 a) 2) D)

See Chapter 6 and Appendix G.

Section 1080.10 a) 2) E)

Adaptive Management is coved in Section 6.2.6, and Changed and Unforeseen Circumstances are covered in Chapter 8.

Section 1080.10 a) 2) F)

Funding is covered in Chapter 7.

Section 1080.10 a) 3)

The Alternative Analysis is found in Chapter 4. The Alternatives Analysis Comparison Table (Table C-7) is found in Appendix C.

Section 1080.10 a) 4)

See Sections 5.1.5, 5.1.7, and 5.1.8 for HED, Sections 5.2.5 and 5.2.6 for covered turtles, and Sections 5.3.5 and 5.3.6 for other covered species.

Section 1080.10 a) 5) A-E)

Implementing Agreement no longer required by USFWS and not included.

Section 1080.10 b-d)

This appendix is part of an HCP submitted to USFWS for approval under Section 10 of the Endangered Species Act (ESA). USFWS is preparing a biological opinion for this HCP pursuant to Section 7 of the ESA.

Section 1080.20 a & d)

These sections specify IDNR requirements for the public notice and review process.

Section 1080.20 b & c) and Section 1080.30

HMS will comply with all the requirements of the public notice and review process found in these sections of the code.

APPENDIX I:
Ecological Maintenance Easement

Ecological Maintenance Easement for development areas of North and Far North Parcels

The Property's adjacent land is being maintained as a natural area, and the Property will occasionally be impacted by smoke from prescribed burns. Grantor hereby excepts and reserves for itself, its successors and assigns an easement over, upon, through and across the Property to cause noise, dust, particulates, debris, and other materials and odors to be in the air above, descend upon, go across, or go through the Property and in general to subject the Property to all similar damages and consequences arising from the location and operation in the vicinity of the Premises of any of Grantor's (and its successors' and assigns') ecological maintenance and restoration activities, including without limitation equipment operation, prescribed burns, mowing and applying herbicides/pesticides.

APPENDIX J:

Declaration of Covenants, Conditions, and Restrictions ("Declaration")

This instrument prepared by
and should be returned to:

Gould & Ratner LLP
222 N. LaSalle St.
Suite 300
Chicago, Illinois 60601

DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS ("DECLARATION")

WHEREAS, **HANSON AGGREGATES MIDWEST, INC.**, a Kentucky corporation, successor-in-interest to Material Service Corporation, a Delaware corporation, and **CONSERVATION RESOURCES COMPANY, INC.**, an Illinois not-for-profit corporation, hereinafter collectively called "Hanson," are affiliated entities and the owners in fee simple of certain real property, hereinafter called "Restricted Property," as more particularly described herein; and

WHEREAS, the United States Fish and Wildlife Service ("Service"), an agency within the United States Department of Interior, has jurisdiction over the conservation, protection, restoration, enhancement, and management of fish, wildlife, native plants, and habitat pursuant to various federal laws, including the Endangered Species Act, 16 U.S.C. Section 1531, et seq. ("ESA"), the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-666c, the Fish and Wildlife Act of 1956, 16 U.S.C. §742(f) et seq., and other provisions of Federal law; and

WHEREAS, the United States Army Corps of Engineers, an agency within the United States Department of Army ("Corps"), and the United States Environmental Protection Agency have jurisdiction over waters of the United States under the Federal Clean Water Act, which Act is designed to restore and maintain the chemical, physical, and biological integrity of the Nation's waters, 33 U.S.C. § 1251(a) and which Act prohibits the discharge of any pollutant, including dredged or fill material, into the navigable waters of the United States without a permit, 33 U.S.C. § 1311(a); and

WHEREAS, the Illinois Department of Natural Resources ("IDNR"), an agency within the State of Illinois, has jurisdiction over the conservation, protection, restoration, enhancement, and management of fish, wildlife, native plants, and habitat pursuant to various state laws, including the Illinois Endangered Species Protection Act 520 ILCS 10 ("IESPA"); and

WHEREAS, the Restricted Property will protect and enhance the ecological, biological, and habitat values as defined in Hanson's Habitat Conservation Plan ("HCP") that benefit endangered, threatened, or other species of great importance to Hanson and the people of the

State of Illinois and the United States, including the Hines emerald dragonfly ("HED"), the Blanding's turtle, the spotted turtle, the leafy prairie clover and the Lakeside daisy (collectively, the "Covered Species") with regard to the Covered Species' needs and behaviors such as hunting, resting, foraging, breeding, etc. The Restricted Property's habitat values, as defined in the HCP, provide or will provide suitable habitat for the Covered Species; and

WHEREAS, the ecological and habitat values of the Restricted Property are documented in a Declaration Documentation Report, prepared by _____ [insert name of entity preparing report] and signed and acknowledged by the Hanson, establishing the baseline condition of the Restricted Property at the time of this Declaration and including reports, maps, photographs, and other documentation; and

WHEREAS, the purposes of this Declaration include assuring that the Restricted Property will be retained forever in a natural state, or restored, enhanced, or maintained as specified in the HCP as suitable for the Covered Species, irrespective of the federal or state listing status of the species and also protecting any other rare plants, animals, or plant communities on the Restricted Property, and to ensure the Restricted Property remains permanently in a natural, scenic, and ecologically improved or ecologically healthy condition; and also preventing any use of the Restricted Property that will significantly impair or interfere with the values or interests of the Restricted Property described herein. Hanson intends that this Declaration will confine the use of the Restricted Property to such activities as are consistent with the purpose of this Declaration; and also preserving the Restricted Property as mitigation for placing fill material into waters of the United States as described in the HCP and the 404 Permit, as defined herein; and

WHEREAS, Hanson has received an Incidental Take Permit from the Service [permit number] ("USFWS Permit") authorizing incidental take of the Covered Species with the permanent alteration of 49.6 acres of habitat for the Covered Species as described in the HCP and in consideration of the consents granted by the USFWS Permit, Hanson has agreed to place covenants, conditions, and restrictions on the Restricted Property (which approximates 531 acres and will include new Hine's emerald dragonfly habitat) and to implement specific land management practices that must be undertaken to minimize and mitigate adverse impacts to the Covered Species and their habitat. These specific land management practices are described in the USFWS Permit and associated HCP, both of which are incorporated by reference and attached to this Declaration; and

WHEREAS, Hanson has received a Department of Army Permit [permit number] ("404 Permit") to place fill in wetlands in connection with Hanson's surface mining activity, and in consideration of the authorization granted by the 404 Permit, has also agreed to establish this Declaration over portions of the Restricted Property and to implement specific land management practices that must be undertaken to mitigate impacts from the placing of fill in wetlands, including enhancing, restoring and creating wetlands per the approved wetland mitigation plan, described in the 404 Permit, the terms of which are incorporated into this Declaration by reference; and

WHEREAS, Hanson has received an Incidental Take Authorization [117] from the IDNR ("IDNR ITA") authorizing incidental take of the Covered Species. In consideration of the

consent granted by the IDNR permit, Hanson has agreed to place covenants, conditions, and restrictions on the Restricted Property and to implement specific land management practices that must be undertaken to minimize and mitigate adverse impacts to the Covered Species and their habitat. These specific land management practices are described in the IDNR permit and associated HCP, both of which are incorporated by reference and attached to this Declaration; and

WHEREAS, the Service, Corps and IDNR recognize that Hanson reserves all of its right, title and interest in and to any and all minerals (including, without limitation, limestone, oil, gas, sand, gravel, aggregates, sulfur, coal, and other hydrocarbons or their constituents) in, on, and under the Restricted; and

WHEREAS, the Service, Corps and IDNR recognize that, as part of Hanson's intended subsurface mining of those minerals contemplated over the next three hundred (300) plus years, Hanson may need to conduct underground operations on the Restricted Property which would require the construction and maintenance of access and air shafts, access roads, utility lines, staging areas, equipment and material storage, fencing, and any other improvements or facilities reasonably necessary to conduct or support underground mining (the "Access Improvements"); and

WHEREAS, Hanson agrees that the Access Improvements shall: (a) not exceed more than twelve (12) acres of the Restricted Property in total; and (b) be constructed so as to have the least amount of impact to the mitigation values established in the USFWS Permit, the 404 Permit, and the IDNR ITA (collectively, the "Permits"); and

WHEREAS, the Permits would not have been granted but for the dedication of the Restricted Property for conservation and mitigation purposes under the Permits, and Hanson specifically acknowledges as fact that said Permits are issued in consideration for the execution and recording of this document and compliance with the covenants, conditions, and restrictions herein. Hanson shall provide a copy of the recorded Declaration to the Service; and

WHEREAS, Hanson, in consideration of the terms of this Declaration, agrees to grant a perpetual restriction over the Restricted Property as set forth herein, in accordance with the Permits and with the Real Property Conservation Rights Act (765 ILCS 120). This Declaration shall be recorded in the county where the Restricted Property lies so as to affect title in the manner of other conveyances of interests in land and shall describe the land subject to or released from such conservation right by adequate legal description or by reference to a recorded plat showing its boundaries. Hanson reserves the right to convert this Declaration to a conservation easement under Illinois Law (the Real Property Conservation Rights Act (765 ILCS 120) and the Illinois Natural Areas Preservation Act (525 ILCS 30)). The Service, Corps, and IDNR will consider such future action if the holder of the future easement is qualified under the Real Property Conservation Rights Act and/or the Illinois Natural Areas Preservation Act. Hanson further agrees that the terms of this Declaration will be such that the holder of the future easement will be required to continue to carry out in perpetuity the purposes and requirements of this Declaration.

NOW, THEREFORE, in consideration of the above recitals and the mutual covenants, terms, conditions, and restrictions contained herein, together with other good and valuable consideration, the adequacy and receipt of which are hereby acknowledged as restrictions which shall run with the land and be binding upon the owner(s) of the Restricted Property, its successors, and assigns, the Parties herein agree to the following:

1. These land use covenants, conditions, and restrictions may be changed, modified, or revoked only upon express written approval of the Service, Corps, and IDNR that is witnessed, authenticated, and recorded pursuant to the law of the State of Illinois.

2. The Service, Corps, and IDNR will have the right to enforce by proceedings in law or equity the covenants, conditions, and restrictions set out herein and this right shall not be waived by one or more incidents of failure to enforce said right.

3. Employees of the Service, Corps, and IDNR will have the right to view the Restricted Property in its natural, scenic, and open condition and the right to enter Restricted Property at all reasonable times for the purpose of inspecting Restricted Property to determine if Hanson, or its successors or assigns, is complying with the covenants and deed restrictions herein, and for the purpose of assessing the Covered Species population and habitat conditions in accordance with the terms of the Permits, the ESA regulations, the Clean Water Act and related mitigation regulations, and the IESPA and associated administrative regulations.

4. Without prior express written consent from the Service, Corps and IDNR, there shall be no:

(a) dredged or fill material placed on Restricted Property except as necessary for completion of mitigation as provided pursuant to the Permits.

(b) additional utility lines placed overhead or within the Restricted Property, including but not limited to: telephone or other communication lines, electrical, gas, water or sewer. Existing lines may remain, but any maintenance work, by third parties other the Hanson or its affiliates, requiring intrusion into the Restricted Property beyond the reasonable scope of existing easement rights, shall require prior authorization by the Service and/or IDNR;

(c) modifications to the hydrology of the Restricted Property, either directly or indirectly, that would allow more water onto, or that would drain water away from, the Restricted Property. Such prohibited modifications include, but are not limited to: ditching, changes to any water control structures, surface mining infrastructure, access corridors (excepting the Access Improvements), or alterations to any naturally occurring structures except as necessary for completion of mitigation as provided pursuant to the Permits.

5. Activities that are inconsistent with preserving the Restricted Property as a mitigation site are prohibited on the Restricted Property, including, but not limited to, the following:

(a) Further commercial, industrial, agricultural, residential developments, buildings, or structures, including but not limited to signs, billboards, other advertising material, or other structures placed on Restricted Property, aside from those utility facilities presently existing on the Restricted Property. This restriction shall not apply to the Access Improvements.

(b) Removal or destruction of trees or plants, mowing, draining, plowing, quarrying or surface-mining including the removal of topsoil, sand, rock, gravel, minerals or other material, except as either necessary for the Permits, or if required pursuant to the HCP or the Corps mitigation plans. This restriction shall not apply to the Access Improvements.

(c) Operation of snowmobiles, dune buggies, motorcycles, all-terrain vehicles, or any other types of motorized vehicles, except as necessary for completion of mitigation as provided pursuant to the Permits.

(d) Application of insecticides or herbicides except as specified by the Permits.

(e) Grazing or keeping of cattle, sheep, horses or other livestock.

(f) Hunting or trapping.

6. To ensure that Access Improvements are installed to have minimal negative impact to the habitat of the Covered Species and 404 Permit mitigation acreage, prior to installation, Hanson shall conduct a search of the proposed installation area for HED larvae or Blanding's or spotted turtle nests. If HED larvae are present in the proposed installation area, then the air shaft will be placed at least two hundred (200) feet from the larval area and outside the upstream water supply of the larval area. If Blanding's or spotted turtle nests are present in the proposed installation area, then the air shaft will be relocated to an area not being used for nesting. Prior to installation, Hanson shall also notify and provide the Service and the IDNR of the written results of its search, including but not limited to, reports, maps, photographs, and other documentation, and of the final installation area for review and confirmation of the impact to the habitat of the Covered Species.

7. This Declaration does not replace, abrogate, or otherwise set aside any local, state, or federal laws, requirements, or restrictions applicable to the Restricted Property and shall not relieve Hanson of the obligation and responsibilities to obtain any and all applicable federal, state, and local governmental permits and approvals, if necessary, to exercise Hanson's retained rights and uses of the Restricted Property even if consistent with the purposes of this Declaration.

8. The terms and conditions of this Declaration shall bind Hanson (as the property owner), its successors and assigns to the extent of its legal and/or equitable interest in the Restricted Property, and these covenants, conditions, and restrictions shall run with the land in perpetuity and be binding on the Restricted Property and its owner(s) forever.

9. Notices. Any notices, consents, approvals, or other communications required in this Declaration shall be sent by registered or certified mail to the appropriate party or its successor in interest at the following address or such address as may be hereafter specified by notice in writing:

Hanson: Hanson Aggregates Midwest, Inc.
2235 Enterprise Drive
Suite 3504
Westchester, IL 60154
Attn: VP/GM

Copy to: Lehigh Hanson, Inc.
8909 Purdue Road
Suite 100
Indianapolis, IN 46268
Attn: Associate General Counsel – Midwest Region

Service: Field Supervisor, Chicago Ecological Services Field Office
230 South Dearborn St., Suite 2938
Chicago IL 60604

Corps: District Commander
ATTN: Regulatory Branch
231 S. LaSalle St., Suite 1500
Chicago, IL 60604

IDNR: Incidental Take Authorization Coordinator
Illinois Department of Natural Resources
One Natural Resources Way
Springfield, IL 62702

10. The terms, restrictions, and conditions of this Declaration shall be both explicitly included in any transfer, conveyance, or encumbrance of the Restricted Property or any part thereof, and any instrument of transfer, conveyance, or encumbrance affecting all or any part of Restricted Property shall set forth a reference to this Declaration. Hanson further agrees that it shall notify the Service, the Corps, and IDNR in writing of the names and addresses of any party to whom the Restricted Property, or any part thereof, is to be granted, conveyed, or otherwise transferred at least sixty (60) days in advance of when said transfer is to be consummated. Hanson must notify the Service, the Corps and IDNR in writing sixty (60) days in advance of any action taken to void or modify this Declaration, including transfer of title to, or establishment of any other legal claims over, the Restricted Property.

11. If any provision of this Declaration, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this Declaration, or the application of such provisions to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

12. The parties hereto acknowledge and agree that Conservation Resources Company, Inc. is joining this Declaration solely due to its status as fee simple owner of certain portions of the Restricted Property and that Conservation Resources Company, Inc. has no liabilities or obligations whatsoever under the HCP or the Permits.

13. Notwithstanding anything to the contrary herein, Hanson, the Corps, the Service, and IDNR expressly agree that the Corps shall have the authority to enforce the provisions of this Declaration with respect to those portions of the Restricted Property as described in Exhibit "A" and shown on Exhibit "B", and the Service and IDNR shall have the authority to enforce the provisions of this Declaration with respect to those portions of the Restricted Property as depicted in Exhibit "C" and shown on Exhibit "D".

[signatures and exhibit on following ___ pages]

IN WITNESS WHEREOF, Hanson has caused its name to be signed to this Declaration by its President, and attested by its Secretary, this _____ day of _____, 2021.

HANSON AGGREGATES MIDWEST, INC.,
a Kentucky corporation,
successor-in-interest to Material Service Corporation,
a Delaware corporation

_____
AXEL CONRADS, President

CONSERVATION RESOURCES COMPANY, INC.,
an Illinois not-for-profit corporation

_____
AXEL CONRADS, Vice President

ATTEST:

_____
_____, Assistant Secretary

State of Indiana
County of _____

I, the undersigned, a Notary Public in and for said County, in the State aforesaid, DO HEREBY CERTIFY, that personally known to me to be the President of the companies, and personally known to me to be the Assistant Secretary of said corporation, and personally known to me to be the same persons whose names are subscribed to the foregoing instrument, appeared before me this day in person and severally acknowledged that as such President, Vice President, and Assistant Secretary, they signed and delivered the said instrument, and caused the corporate seal of said corporation to be affixed thereto, pursuant to authority given by the Board of Directors of said corporation, as their free and voluntary act, and as the free and voluntary act and deed of said corporation, for the uses and purposes therein set forth,

Given under my hand and official seal, this ____ day of _____, A.D. 2021.

NOTARY PUBLIC

My Commission expires _____, 20___.

EXHIBIT "A"
Description of Restricted Property (Corps)

COM ED PARCEL:
PIN: 11-04-02-100-020-0000
OWNER: CONSERVATION RESOURCES COMPANY, INC.

THAT PART OF THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 2, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, THAT LIES EAST OF THE ILLINOIS AND MICHIGAN CANAL, EXCEPT A PARCEL OF LAND DESCRIBED AS FOLLOWS: BEGINNING AT THE INTERSECTION OF THE EAST LINE OF THE RIGHT OF WAY OF THE ILLINOIS AND MICHIGAN CANAL WITH THE SOUTH LINE OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SAID SECTION 2; THENCE EAST ALONG THE SOUTH LINE OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SAID SECTION 2, 480 FEET TO A POINT; THENCE SOUTH AT RIGHT ANGLES TO THE LAST DESCRIBED COURSE, 270 FEET TO A POINT; THENCE WEST PARALLEL TO THE SOUTH LINE OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SAID SECTION 2 TO THE EAST LINE OF THE RIGHT OF WAY OF THE ILLINOIS AND MICHIGAN CANAL; THENCE NORTHERLY ALONG THE EAST LINE OF THE RIGHT OF WAY OF THE ILLINOIS AND MICHIGAN CANAL TO THE POINT OF BEGINNING, IT BEING THE INTENT THAT THE ABOVE DESCRIPTION BE CONFINED TO GOVERNMENT LOT 1 OF THE NORTHWEST QUARY OF SAID SECTION, IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-0-02-200-005-0000
OWNER: CONSERVATION RESOURCES COMPANY, INC.

THAT PART OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 2, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, THAT LIES WEST OF THE RIGHT OF WAY OF THE GULF, MOBILE AND OHIO RAILROAD COMPANY, SUCCESSORS TO THE CHICAGO AND ALTON RAILROAD COMPANY (EXCEPTING THEREFROM THE WEST 5.78 FEET OF THE NORTH 270 FEET THEREOF), IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-04-02-400-006-0000
OWNER: CONSERVATION RESOURCES COMPANY, INC.

THE NORTH 660 FEET OF THE TRACT OF LAND DESCRIBED AS FOLLOWS: THAT PORTION OF THE SOUTHWEST QUARTER OF SECTION 2, LYING EASTERLY OF THE ILLINOIS AND MICHIGAN CANAL; ALSO THAT PORTION OF THE SOUTHEAST QUARTER OF SECTION 2, LYING WEST OF THE RIGHT OF WAY OF THE GULF, MOBILE AND OHIO RAILROAD COMPANY, SUCCESSORS TO THE CHICAGO AND ALTON RAILROAD COMPANY, FORMERLY KNOWN AS THE JOLIET AND CHICAGO RAILROAD COMPANY, ALL OF SAID PREMISES BEING SITUATED IN TOWNSHIP 36

NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, IN WILL COUNTY, ILLINOIS.

LONG RUN PARCEL:
PINS: 11-04-02-400-004-00010 AND 11-04-02-400-004-0020
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTH HALF OF SECTION 2 AND THE NORTH HALF OF SECTION 11, TONSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERLY RIGHT OF WAY LLINE OF THE CHICAGO AND ALTON RAILROAD; AND LYING EAST OF THE EASTERLY CANAL RESERVE LINE OF THE ILLINOIS AND MICHIGAN CANAL; AND LYING SOUTH OF THE SOUTH LINE OF THE NORTH 660.00 FEET AS MEASURED AT RIGHT ANGLES TO THE NORTH LINE OF THE SOUTH HALF OF SAID SECTION 2; AND LYING NORTH OF THE FOLLOWING DESCRIBED LINE: COMMENCING AT THE INTERSECTION OF SAID EASTERLY CANAL RESERVE LINE WITH THE SOUTH LINE OF THE NORTH HALF OF SAID SECTION 11 DISTANCE SOUTH 88 DEGREES 51 MINUTES 34 SECONDS WEST (ASSUMED BEARNG), 3,809.67 FEET FROM THE EAST QUARTER CORNER OF SAID SECTION 11; THENCE NORTH 04 DEGREES 26 MINUTES 02 SECONDS EAST ALONG SAID EASTERLY CANAL RESERVE LINE, 1,262.28 FEET TO THE BEGINNING OF THE LINE TO BE DESCRIBED; THENCE NORTH 88 DEGREES 30 MINUTES 06 SECONDS EAST, 2,398.70 FEET TO A POINT OF TERMINATION IN THE WESTERLY RIGHT OF WAY LINEOF SAID CHICAGO AND ALTON RAILROAD DISTANCE NORTH 03 DEGREES 34 MINUTES 42 SECONDS EAST, 1,275.61 FEET (AS MEASURED ALONG SAID WESTERLY RAILROAD RIGHT OF WAY LINE) FROM THE SOUTH LINE OF THE NORTH HALF OF SECTION 11, IN WILL COUNTY, ILLINOIS.

RIVER PARCEL:
PIN: PART OF 11-04-03-301-010-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 3, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERN LOW WATERMARK OF THE DES PLAINES RIVER, EXCEPTING THEREFROM THE WEST 600 FEET OF SAID QUARTER SECTION, ALSO EXCEPT THAT PART DESCRIBED AS FOLLOWS: BEGINNING 600 FEET EAST OF THE NORTHEAST CORNER; THENCE EAST 400 FEET; THENCE SOUTHWESTERLY 500.21 FEET; THENCE NORTH 300 FEET TO THE POINT OF BEGINNING, ALSO EXCEPT THAT PART DESCRIBED AS FOLLOWS: COMMENCING AT THE POINT OF INTERSECTION OF A LINE 600 FEET EAST OF AND PARALLEL WITH THE WEST LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 3, AND THE NORTH LINE OF THE SOUTH HALF OF THE SOUTH HALF OF SAID SECTION 3; THENCE SOUTH 89 DEGREES 24 MINUTES 54 SECONDS EAST, BEING AN ASSUMED BEARING ON SAID NORTH LINE OF THE SOUTH HALF OF THE SOUTH HALF OF SAID SECTION 3, A DISTANCE OF 400 FEET TO THE POINT OF BEGINNING; THENCE CONTINUING SOUTH 89 DEGREES 24 MINUTES 54 SECONDS EAST ON SAID NORTH LINE OF THE SOUTH HALF OF THE

SOUTH HALF OF SAID SECTION 3, A DISTANCE OF 285 FEET; THENCE SOUTH 2 DEGREES 22 MINUTES 10 SECONDS WEST A DISTANCE OF 1320.78 FEET TO THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 3, LYING WEST OF THE DES PLAINES RIVER; THENCE NORTH 89 DEGREES 25 MINUTES 27 SECONDS WEST ON SAID SOUTH LINE OF THE SOUTHEAST QUARTER A DISTANCE OF 645 FEET TO A LINE 600 FEET EAST OF AND PARALLEL WITH THE WEST LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 3; THENCE NORTH 00 DEGREES 38 MINUTES 02 SECONDS EAST ON SAID 600 FOOT EAST OF AND PARALLEL LINE A DISTANCE OF 1020.25 FEET TO A POINT WHICH IS 300 FEET SOUTH OF (AS MEASURED ALONG SAID SOUTH 600 FOOT EAST OF AND PARALLEL LINE) THE POINT OF COMMENCEMENT; THENCE NORTH 53 DEGREES 43 MINUTES 58 SECONDS EAST, A DISTANCE OF 500.21 FEET TO THE POINT OF BEGINNING.

AND
PINS: PART OF 11-04-10-100-009-0000 AND PART OF 11-04-10-100-010-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE NORTHEAST QUARTER OF SECTION 10, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERN LOW WATERMARK OF THE DES PLAINES RIVER, EXCEPTING THEREFROM THE WEST 600 FEET OF SAID QUARTER SECTION, IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-04-10-400-004-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTHEAST QUARTER OF SECTION 10, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERN LOW WATERMARK OF THE DES PLAINES RIVER, EXCEPTING THEREFROM THE WEST 600 FEET OF SAID QUARTER SECTION, IN WILL COUNTY, ILLINOIS.

RIVER SOUTH BLUFF PARCEL:
PIN: 11-04-15-200-012-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

LOT 1 IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, EXCEPT THAT PART FALLING WITHIN THE FOLLOWING DESCRIBED PARCEL: COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST (ASSUMED BEARING ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER), A DISTANCE OF 1660 FEET TO THE POINT OF BEGINNING; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 157.51

FEET TO A POINT ON A LINE WHICH IS 50 FEET EASTERLY OF AND PARALLEL WITH AND CONCENTRIC TO (AS MEASURED PERPENDICULARLY AND RADIALLY) THE CENTERLINE OF EXISTING S.B.I. ROUTE 4 (ILLINOIS ROUTE 53); THENCE NORTH 03 DEGREES 02 MINUTES 44 SECONDS WEST ALONG SAID LINE, A DISTANCE OF 473.31 FEET TO A POINT OF CURVATURE; THENCE CONTINUING NORTHERLY ALONG SAID WEST LINE, BEING THE ARC OF A CIRCLE WHOSE CENTER LIES EASTERLY AND HAVING A RADIUS OF 11,349.62 FEET, AN ARC DISTANCE OF 1493.41 FEET TO A POINT OF TANGENCY; THENCE CONTINUE ALONG SAID LINE NORTH 04 DEGREES 29 MINUTES 37 SECONDS EAST, A DISTANCE OF 958.09 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 279.63 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1160 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 400 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1360 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 190.91 FEET TO THE POINT OF BEGINNING, IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-04-15-200-013-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

LOT 3 IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, EXCEPT THAT PART FALLING WITHIN THE FOLLOWING DESCRIBED PARCEL: COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST (ASSUMED BEARING ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER), A DISTANCE OF 1660 FEET TO THE POINT OF BEGINNING; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 157.51 FEET TO A POINT ON A LINE WHICH IS 50 FEET EASTERLY OF AND PARALLEL WITH AND CONCENTRIC TO (AS MEASURED PERPENDICULARLY AND RADIALLY) THE CENTERLINE OF EXISTING S.B.I. ROUTE 4 (ILLINOIS ROUTE 53); THENCE NORTH 03 DEGREES 02 MINUTES 44 SECONDS WEST ALONG SAID LINE, A DISTANCE OF 473.31 FEET TO A POINT OF CURVATURE; THENCE CONTINUING NORTHERLY ALONG SAID WEST LINE, BEING THE ARC OF A CIRCLE WHOSE CENTER LIES EASTERLY AND HAVING A RADIUS OF 11,349.62 FEET, AN ARC DISTANCE OF 1493.41 FEET TO A POINT OF TANGENCY; THENCE CONTINUE ALONG SAID LINE NORTH 04 DEGREES 29 MINUTES 37 SECONDS EAST, A DISTANCE OF 958.09 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 279.63 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1160 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 400 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE

OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1360 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 190.91 FEET TO THE POINT OF BEGINNING, IN WILL COUNTY, ILLINOIS.

AND
PIN: PART OF 11-04-15-400-016-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THE EAST 259.09 FEET OF LOT 8, EXCEPT THE SOUTH 1660.00 FEET THEREOF, IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, IN WILL COUNTY ILLINOIS.

FITZPATRICK SEEP PARCEL:
PIN: PART OF 11-04-15-400-016-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE NORTH 575.00 FEET OF THE SOUTH 1660.00 FEET OF LOT 8 IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, DESCRIBED AS FOLLOWS;

COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST (ASSUMED BEARING ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER), A DISTANCE OF 1660 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 190.91 FEET TO A LINE WHICH IS 259.09 FEET WESTERLY OF AND PARALLEL WITH THE EAST LINE OF SAID LOT, AND THE POINT OF BEGINNING; THENCE SOUTHWESTERLY TO THE NORTHEAST CORNER OF THE PROPERTY DEEDED TO LEWIS UNIVERSITY RECORDED APRIL 14, 2003 PER DOCUMENT NUMBER R2003-086415; THENCE SOUTHEASTERLY ALONG THE EAST LINE OF SAID PROPERTY EXTENDED TO THE NORTH LINE OF THE SOUTH 1085.00 FEET OF SAID LOT; THENCE EAST ALONG SAID LINE TO THE EAST LINE OF SAID LOT; THENCE NORTH ALONG SAID EAST LINE TO THE NORTH LINE OF THE SOUTH 1660.00 FEET OF SAID LOT; THENCE WEST ALONG SAID LINE TO THE POINT OF BEGINNING, IN WILL COUNTY ILLINOIS.

EXCEPTING AND RESERVING from each of the aforementioned parcels, all minerals (including, without limitation, limestone, oil, gas, sand, gravel, aggregates, sulfur, coal, other hydrocarbons or their constituents of all natures and descriptions of any kind whatsoever) in, on, and under the Restricted Property and the right to access and extract all of the foregoing as allowed by applicable law.

EXHIBIT "B"
Map of Restricted Property (Corps)

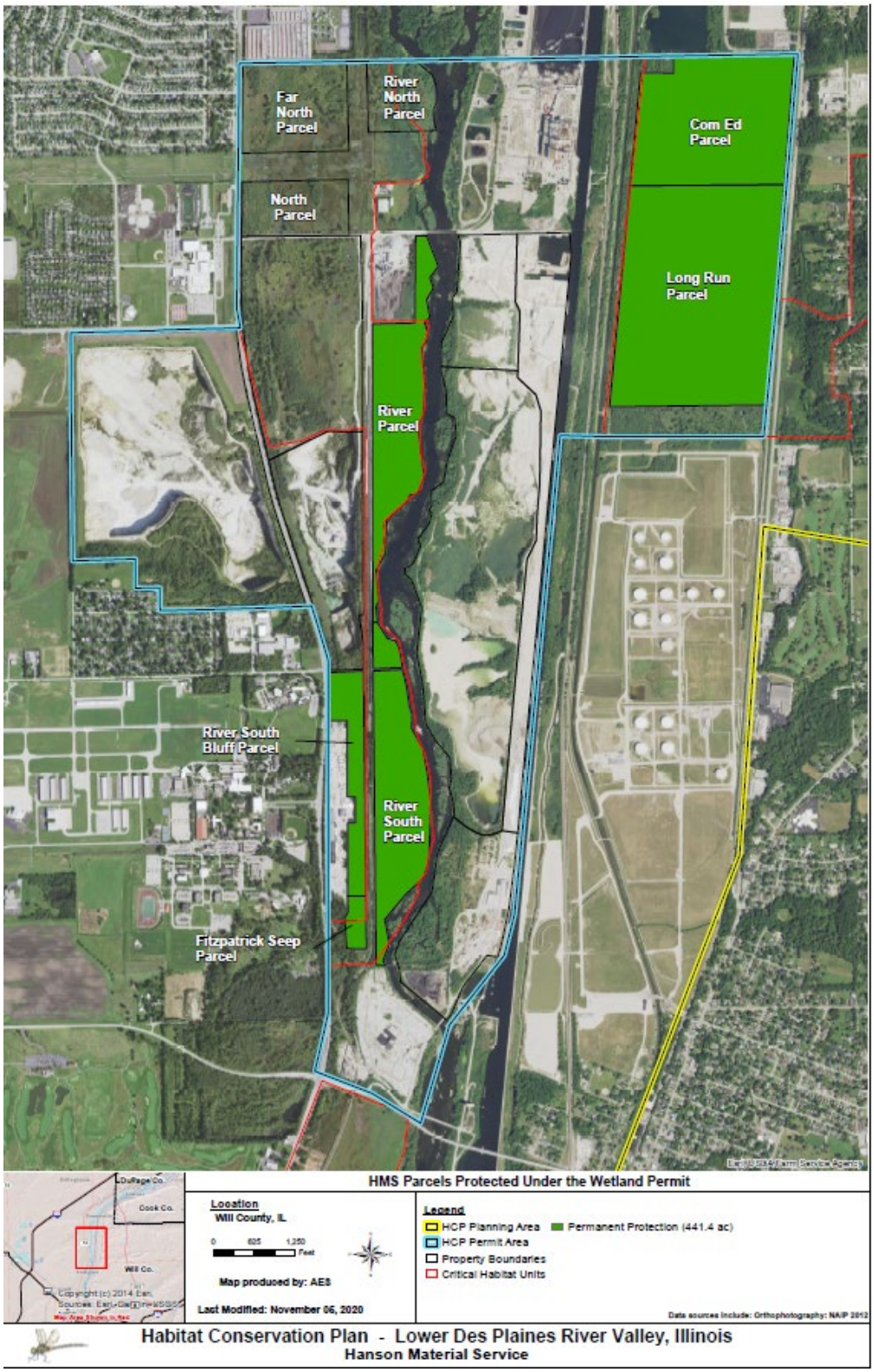


EXHIBIT "C"
Description of Restricted Property (Service and IDNR)

COM ED PARCEL:
PIN: 11-04-02-100-020-0000
OWNER: CONSERVATION RESOURCES COMPANY, INC.

THAT PART OF THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 2, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, THAT LIES EAST OF THE ILLINOIS AND MICHIGAN CANAL, EXCEPT A PARCEL OF LAND DESCRIBED AS FOLLOWS: BEGINNING AT THE INTERSECTION OF THE EAST LINE OF THE RIGHT OF WAY OF THE ILLINOIS AND MICHIGAN CANAL WITH THE SOUTH LINE OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SAID SECTION 2; THENCE EAST ALONG THE SOUTH LINE OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SAID SECTION 2, 480 FEET TO A POINT; THENCE SOUTH AT RIGHT ANGLES TO THE LAST DESCRIBED COURSE, 270 FEET TO A POINT; THENCE WEST PARALLEL TO THE SOUTH LINE OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SAID SECTION 2 TO THE EAST LINE OF THE RIGHT OF WAY OF THE ILLINOIS AND MICHIGAN CANAL; THENCE NORTHERLY ALONG THE EAST LINE OF THE RIGHT OF WAY OF THE ILLINOIS AND MICHIGAN CANAL TO THE POINT OF BEGINNING, IT BEING THE INTENT THAT THE ABOVE DESCRIPTION BE CONFINED TO GOVERNMENT LOT 1 OF THE NORTHWEST QUARY OF SAID SECTION, IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-0-02-200-005-0000
OWNER: CONSERVATION RESOURCES COMPANY, INC.

THAT PART OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 2, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, THAT LIES WEST OF THE RIGHT OF WAY OF THE GULF, MOBILE AND OHIO RAILROAD COMPANY, SUCCESSORS TO THE CHICAGO AND ALTON RAILROAD COMPANY (EXCEPTING THEREFROM THE WEST 5.78 FEET OF THE NORTH 270 FEET THEREOF), IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-04-02-400-006-0000
OWNER: CONSERVATION RESOURCES COMPANY, INC.

THE NORTH 660 FEET OF THE TRACT OF LAND DESCRIBED AS FOLLOWS: THAT PORTION OF THE SOUTHWEST QUARTER OF SECTION 2, LYING EASTERLY OF THE ILLINOIS AND MICHIGAN CANAL; ALSO THAT PORTION OF THE SOUTHEAST QUARTER OF SECTION 2, LYING WEST OF THE RIGHT OF WAY OF THE GULF, MOBILE AND OHIO RAILROAD COMPANY, SUCCESSORS TO THE CHICAGO AND ALTON RAILROAD COMPANY, FORMERLY KNOWN AS THE JOLIET AND CHICAGO RAILROAD COMPANY, ALL OF SAID PREMISES BEING SITUATED IN TOWNSHIP 36

NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, IN WILL COUNTY, ILLINOIS.

LONG RUN PARCEL:
PINS: 11-04-02-400-004-00010 AND 11-04-02-400-004-0020
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTH HALF OF SECTION 2 AND THE NORTH HALF OF SECTION 11, TONSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERLY RIGHT OF WAY LLINE OF THE CHICAGO AND ALTON RAILROAD; AND LYING EAST OF THE EASTERLY CANAL RESERVE LINE OF THE ILLINOIS AND MICHIGAN CANAL; AND LYING SOUTH OF THE SOUTH LINE OF THE NORTH 660.00 FEET AS MEASURED AT RIGHT ANGLES TO THE NORTH LINE OF THE SOUTH HALF OF SAID SECTION 2; AND LYING NORTH OF THE FOLLOWING DESCRIBED LINE: COMMENCING AT THE INTERSECTION OF SAID EASTERLY CANAL RESERVE LINE WITH THE SOUTH LINE OF THE NORTH HALF OF SAID SECTION 11 DISTANCE SOUTH 88 DEGREES 51 MINUTES 34 SECONDS WEST (ASSUMED BEARNG), 3,809.67 FEET FROM THE EAST QUARTER CORNER OF SAID SECTION 11; THENCE NORTH 04 DEGREES 26 MINUTES 02 SECONDS EAST ALONG SAID EASTERLY CANAL RESERVE LINE, 1,262.28 FEET TO THE BEGINNING OF THE LINE TO BE DESCRIBED; THENCE NORTH 88 DEGREES 30 MINUTES 06 SECONDS EAST, 2,398.70 FEET TO A POINT OF TERMINATION IN THE WESTERLY RIGHT OF WAY LINEOF SAID CHICAGO AND ALTON RAILROAD DISTANCE NORTH 03 DEGREES 34 MINUTES 42 SECONDS EAST, 1,275.61 FEET (AS MEASURED ALONG SAID WESTERLY RAILROAD RIGHT OF WAY LINE) FROM THE SOUTH LINE OF THE NORTH HALF OF SECTION 11, IN WILL COUNTY, ILLINOIS.

FAR NORTH PARCEL:
PINS: 11-04-03-102-009-0000 AND PART OF 11-04-03-200-027-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTH HALF OF THE NORTHWEST QUARTER, LYING EAST OF A LINE, 340 FEET DISTANT AND EAST OF, THE EAST RIGHT OF WAY LINE OF U.S. ROUTE 66-A DEDICATED PER DOCUMENT 528577, RECORDED IN BOOK 804, PAGE 418, IN THE OFFICE OF THE RECORDER IN WILL COUNTY, AND THE WEST 300 FEET OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, IN WILL COUNTY, ILLINOIS.

RIVER NORTH PARCEL:
PIN: PART OF 11-04-03-200-027-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 36 NORTH, RANGE 10 EAST, LYING WEST OF THE WESTERN LOW

WATERMARK OF THE DES PLAINES RIVER, LYING EAST OF THE WEST 600 FEET, AND LYING NORTH OF THE SOUTH 270 FEET, IN WILL COUNTY, ILLINOIS.

NORTH PARCEL:
PINS: 11-04-03-301-007-0000 AND 11-04-03-400-007-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER, LYING EAST OF A LINE, 340 FEET DISTANT AND EAST OF, THE EAST RIGHT OF WAY LINE OF ILLINOIS ROUTE 53 PER DOCUMENT R2013-071874, LYING SOUTH OF THE NORTH 440 FEET, LYING NORTH OF THE SOUTH 30 FEET, AND THE WEST 275 FEET OF THE SOUTHEAST QUARTER OF SECTION 3, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING SOUTH OF THE NORTH 440 FEET, LYING NORTH OF THE SOUTH 30 FEET, ALL IN WILL COUNTY, ILLINOIS.

RIVER PARCEL:
PIN: PART OF 11-04-03-301-010-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 3, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERN LOW WATERMARK OF THE DES PLAINES RIVER, EXCEPTING THEREFROM THE WEST 600 FEET OF SAID QUARTER SECTION, ALSO EXCEPT THAT PART DESCRIBED AS FOLLOWS: BEGINNING 600 FEET EAST OF THE NORTHEAST CORNER; THENCE EAST 400 FEET; THENCE SOUTHWESTERLY 500.21 FEET; THENCE NORTH 300 FEET TO THE POINT OF BEGINNING, ALSO EXCEPT THAT PART DESCRIBED AS FOLLOWS: COMMENCING AT THE POINT OF INTERSECTION OF A LINE 600 FEET EAST OF AND PARALLEL WITH THE WEST LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 3, AND THE NORTH LINE OF THE SOUTH HALF OF THE SOUTH HALF OF SAID SECTION 3; THENCE SOUTH 89 DEGREES 24 MINUTES 54 SECONDS EAST, BEING AN ASSUMED BEARING ON SAID NORTH LINE OF THE SOUTH HALF OF THE SOUTH HALF OF SAID SECTION 3, A DISTANCE OF 400 FEET TO THE POINT OF BEGINNING; THENCE CONTINUING SOUTH 89 DEGREES 24 MINUTES 54 SECONDS EAST ON SAID NORTH LINE OF THE SOUTH HALF OF THE SOUTH HALF OF SAID SECTION 3, A DISTANCE OF 285 FEET; THENCE SOUTH 2 DEGREES 22 MINUTES 10 SECONDS WEST A DISTANCE OF 1320.78 FEET TO THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 3, LYING WEST OF THE DES PLAINES RIVER; THENCE NORTH 89 DEGREES 25 MINUTES 27 SECONDS WEST ON SAID SOUTH LINE OF THE SOUTHEAST QUARTER A DISTANCE OF 645 FEET TO A LINE 600 FEET EAST OF AND PARALLEL WITH THE WEST LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 3; THENCE NORTH 00 DEGREES 38 MINUTES 02 SECONDS EAST ON SAID 600 FOOT EAST OF AND PARALLEL LINE A DISTANCE OF 1020.25 FEET TO A POINT WHICH IS 300 FEET SOUTH OF (AS MEASURED ALONG SAID SOUTH 600 FOOT EAST OF AND PARALLEL LINE) THE POINT OF COMMENCEMENT; THENCE NORTH 53 DEGREES 43 MINUTES 58 SECONDS EAST, A DISTANCE OF 500.21 FEET TO THE POINT OF BEGINNING.

AND
PINS: PART OF 11-04-10-100-009-0000 AND PART OF 11-04-10-100-010-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE NORTHEAST QUARTER OF SECTION 10, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERN LOW WATERMARK OF THE DES PLAINES RIVER, EXCEPTING THEREFROM THE WEST 600 FEET OF SAID QUARTER SECTION, IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-04-10-400-004-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE SOUTHEAST QUARTER OF SECTION 10, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, LYING WEST OF THE WESTERN LOW WATERMARK OF THE DES PLAINES RIVER, EXCEPTING THEREFROM THE WEST 600 FEET OF SAID QUARTER SECTION, IN WILL COUNTY, ILLINOIS.

RIVER SOUTH BLUFF PARCEL:
PIN: 11-04-15-200-012-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

LOT 1 IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, EXCEPT THAT PART FALLING WITHIN THE FOLLOWING DESCRIBED PARCEL: COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST (ASSUMED BEARING ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER), A DISTANCE OF 1660 FEET TO THE POINT OF BEGINNING; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 157.51 FEET TO A POINT ON A LINE WHICH IS 50 FEET EASTERLY OF AND PARALLEL WITH AND CONCENTRIC TO (AS MEASURED PERPENDICULARLY AND RADIALLY) THE CENTERLINE OF EXISTING S.B.I. ROUTE 4 (ILLINOIS ROUTE 53); THENCE NORTH 03 DEGREES 02 MINUTES 44 SECONDS WEST ALONG SAID LINE, A DISTANCE OF 473.31 FEET TO A POINT OF CURVATURE; THENCE CONTINUING NORTHERLY ALONG SAID WEST LINE, BEING THE ARC OF A CIRCLE WHOSE CENTER LIES EASTERLY AND HAVING A RADIUS OF 11,349.62 FEET, AN ARC DISTANCE OF 1493.41 FEET TO A POINT OF TANGENCY; THENCE CONTINUE ALONG SAID LINE NORTH 04 DEGREES 29 MINUTES 37 SECONDS EAST, A DISTANCE OF 958.09 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 279.63 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1160 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF

400 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1360 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 190.91 FEET TO THE POINT OF BEGINNING, IN WILL COUNTY, ILLINOIS.

AND
PIN: 11-04-15-200-013-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

LOT 3 IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, EXCEPT THAT PART FALLING WITHIN THE FOLLOWING DESCRIBED PARCEL: COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST (ASSUMED BEARING ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER), A DISTANCE OF 1660 FEET TO THE POINT OF BEGINNING; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 157.51 FEET TO A POINT ON A LINE WHICH IS 50 FEET EASTERLY OF AND PARALLEL WITH AND CONCENTRIC TO (AS MEASURED PERPENDICULARLY AND RADIALLY) THE CENTERLINE OF EXISTING S.B.I. ROUTE 4 (ILLINOIS ROUTE 53); THENCE NORTH 03 DEGREES 02 MINUTES 44 SECONDS WEST ALONG SAID LINE, A DISTANCE OF 473.31 FEET TO A POINT OF CURVATURE; THENCE CONTINUING NORTHERLY ALONG SAID WEST LINE, BEING THE ARC OF A CIRCLE WHOSE CENTER LIES EASTERLY AND HAVING A RADIUS OF 11,349.62 FEET, AN ARC DISTANCE OF 1493.41 FEET TO A POINT OF TANGENCY; THENCE CONTINUE ALONG SAID LINE NORTH 04 DEGREES 29 MINUTES 37 SECONDS EAST, A DISTANCE OF 958.09 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 279.63 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1160 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 400 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 119.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 1360 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS WEST, A DISTANCE OF 190.91 FEET TO THE POINT OF BEGINNING, IN WILL COUNTY, ILLINOIS.

AND
PIN: PART OF 11-04-15-400-016-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THE EAST 259.09 FEET OF LOT 8, EXCEPT THE SOUTH 1660.00 FEET THEREOF, IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT

THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, IN WILL COUNTY ILLINOIS.

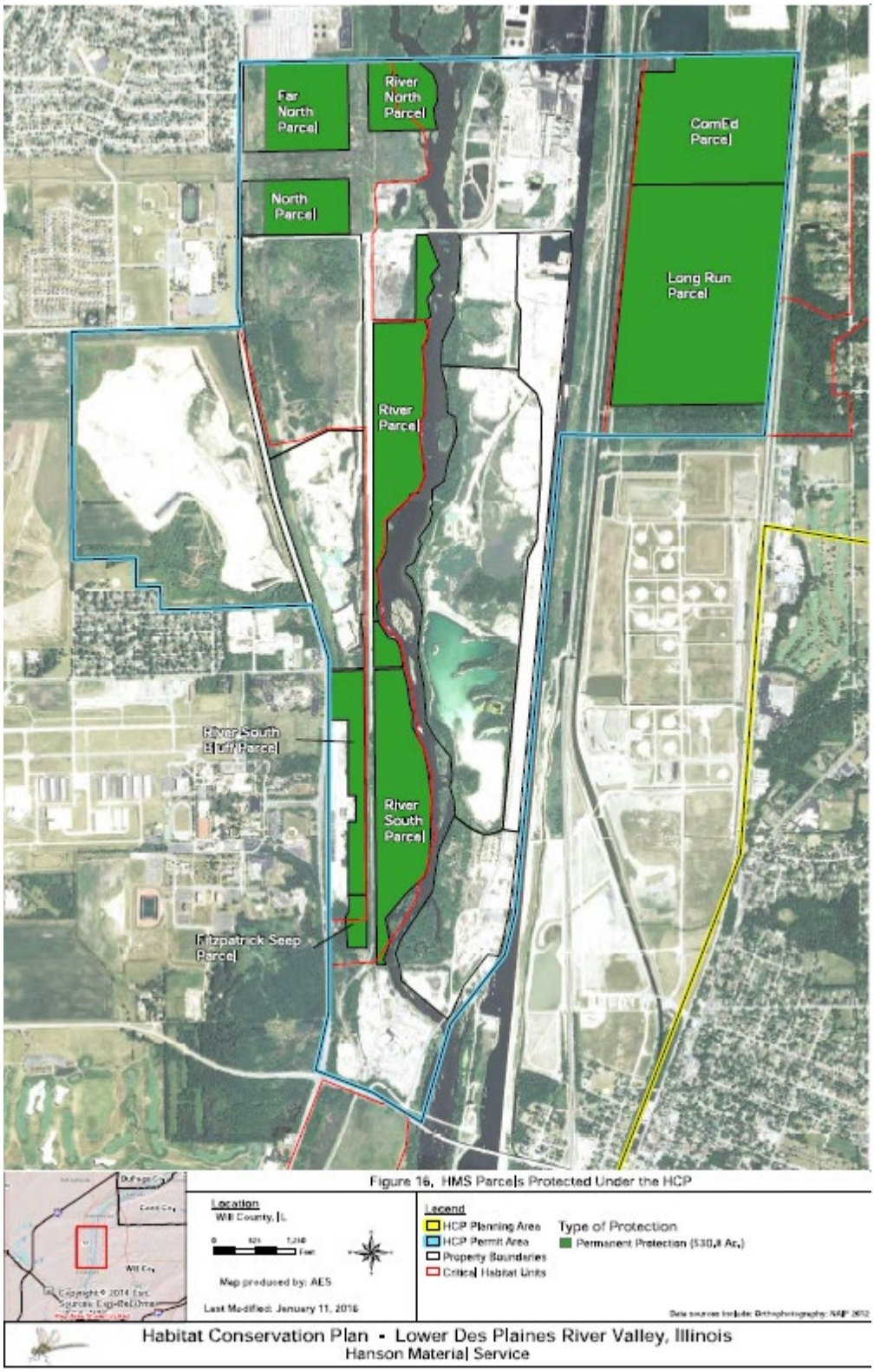
FITZPATRICK SEEP PARCEL:
PIN: PART OF 11-04-15-400-016-0000
OWNER: HANSON AGGREGATES MIDWEST, INC.

THAT PART OF THE NORTH 575.00 FEET OF THE SOUTH 1660.00 FEET OF LOT 8 IN FITZPATRICK'S SUBDIVISION OF PART OF SECTION 15, TOWNSHIP 36 NORTH, RANGE 10 EAST OF THE THIRD PRINCIPAL MERIDIAN, ACCORDING TO THE PLAT THEREOF RECORDED MAY 12, 1933 IN PLAT BOOK 23, PAGES 30 AND 31, AS DOCUMENT 464335, DESCRIBED AS FOLLOWS;

COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST (ASSUMED BEARING ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER), A DISTANCE OF 1660 FEET; THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 190.91 FEET TO A LINE WHICH IS 259.09 FEET WESTERLY OF AND PARALLEL WITH THE EAST LINE OF SAID LOT, AND THE POINT OF BEGINNING; THENCE SOUTHWESTERLY TO THE NORTHEAST CORNER OF THE PROPERTY DEEDED TO LEWIS UNIVERSITY RECORDED APRIL 14, 2003 PER DOCUMENT NUMBER R2003-086415; THENCE SOUTHEASTERLY ALONG THE EAST LINE OF SAID PROPERTY EXTENDED TO THE NORTH LINE OF THE SOUTH 1085.00 FEET OF SAID LOT; THENCE EAST ALONG SAID LINE TO THE EAST LINE OF SAID LOT; THENCE NORTH ALONG SAID EAST LINE TO THE NORTH LINE OF THE SOUTH 1660.00 FEET OF SAID LOT; THENCE WEST ALONG SAID LINE TO THE POINT OF BEGINNING, IN WILL COUNTY ILLINOIS.

EXCEPTING AND RESERVING from each of the aforementioned parcels, all minerals (including, without limitation, limestone, oil, gas, sand, gravel, aggregates, sulfur, coal, other hydrocarbons or their constituents of all natures and descriptions of any kind whatsoever) in, on, and under the Restricted Property and the right to access and extract all of the foregoing as allowed by applicable law.

EXHIBIT "D"
Map of Restricted Property (Service and IDNR)



APPENDIX K:

License Agreement With Forest Preserve District of Will County

Ordinance No. 584

AN ORDINANCE TO AUTHORIZE LICENSE AGREEMENT NO. 20-08 TO MATERIAL SERVICE CORPORATION AT PRAIRIE BLUFF PRESERVE

WHEREAS, the Forest Preserve District of Will County (District) is the owner of Tract 461A, with Parcel Identification Number 11-04-22-100-013-0000, in Prairie Bluff Preserve ("Preserve"); and

WHERAS, Material Service Corporation requires a License from the District for the purposes of installing and maintaining a groundwater infiltration pond and spillway ("Project") within the boundary of the Preserve; and,

WHEREAS, the Forest Preserve District of Will County is a body politic and corporate; and is authorized by State Statute (70 ILCS 805/6) to grant licenses, easements and rights-of-way "for the construction, operation and maintenance upon, under or across any property of such District of facilities for water, sewage, telephone, telegraph, electric, gas or other public service, subject to such terms and conditions as may be determined by such District."

WHEREAS, the Project serves a public service and benefit by enhancing groundwater infiltration throughout the District's Preserve and protecting the critical habitat of the Hines Emerald Dragonfly; and

WHEREAS, a License Agreement is necessary prior to allowing use of District property; and

WHEREAS, District Staff have recommended that the Board of Commissioners of the District approve Ordinance No. 584 authorizing the Option License Agreement for License Agreement No. 20-08 to commence, valid for valid for seven (7) years, with the option to renew for an additional five (5) years, if required upon meeting specifications as dictated by the Forest Preserve. Once commenced, License Agreement No. 20-08 is valid for a term of 40 years once.

NOW, THEREFORE, be it ordained by the Board of Commissioners of the Forest Preserve District of Will County, Illinois, as follows:

SECTION I. The President has authorization to sign Ordinance No. 584 commencing the Option License Agreement with Material Service Corporation.

SECTION II. The Board grants authorization for the Chief Operating Officer to sign License Agreement No. 20-08 upon receipt of authorization by all Federal, State and Local Agencies.

Passed this 8th day of October 2020.

(Signatures to follow on next page)

Kenneth E. Harris, President
Board of Commissioners
Forest Preserve District of Will County

ATTEST:

Mimi Cowan, Secretary
Board of Commissioners
Forest Preserve District of Will County

OPTION LICENSE AGREEMENT

This Agreement entered into this 8th day of October, 2020, (hereinafter called "Option Commencement Date") between **Forest Preserve District of Will County, Illinois** a body corporate and politic ("District"), and **Material Service Corporation**, a Delaware corporation, doing business as Hanson Material Service Corporation ("Hanson").

WITNESSETH THAT:

PART A.
OPTION AGREEMENT.

SECTION 1. Grant of Option.

In consideration of the payment by Hanson to District of the sum of Ten Dollars ($10.00) (the "Option Payment") within thirty (30) days following the Option Commencement Date, District does hereby grant unto Hanson an irrevocable option (the "Option") for a period of seven (7) years from the Option Commencement Date (the "Option Period") to license from the District approximately 14 acres of land, more or less, lying and being in Township of Lockport, County of Will, Illinois (the "Licensed Area"), as more particularly set forth on Exhibit "A" and "B" attached hereto, pursuant to the terms and conditions set forth in Part B of this License Agreement as more specifically defined and set forth below.

Hanson may request a one-time extension to the original Option Period for an additional five (5) years (the "Option Extension") by giving written notice to District on or before the expiration of the Option Period and paying to the District of Ten Dollars ($10.00) as consideration for the renewal (the "Renewal Payment"). As part of the written notice, Hanson shall provide a status report of all permits and approvals required that enable work to be performed on the Licensed Area. The District shall have the right to amend or deny the Option Extension request. Should the District deny the Option Extension request, the District will refund Hanson the Renewal Payment.

Should Hanson exercise the Option, it will install and maintain a groundwater infiltration pond and spillway within the LICENSED AREA ("PROJECT"). The District has the right to review and approve all plans and specifications for the PROJECT before Hanson exercises the Option.

If all permits that enable work to be performed on the property known as Will County Illinois Tax Map ID # 11-04-22-100-013-0000 owned by Forest Preserve District of Will County, Illinois, as more particularly set forth on Exhibit "A" and "B", are issued to Hanson during the Option Period or extensions thereto, on a final, non-appealable basis, Hanson shall exercise the Option.

SECTION 2. Exercise of Option

This Option may be exercised at any time during the Option Period or Option Extension, if applicable. To exercise this Option, Hanson shall give written notice to District at the below referenced address either by certified or registered US Mail, FedEx, UPS or other nationally recognized delivery service; or by personal delivery of Hanson's election to exercise the option prior to the expiration of the Option Period or Option Extension, if applicable. Such notice shall be deemed effectively given as of the date of delivery. Upon Hanson's notice of exercise, the License Agreement set out in Part B below shall immediately and automatically become effective, upon the terms and conditions, hereinafter set forth, without any requirement on the part of either party to execute or deliver any other documents or instruments other than this Agreement, which shall then and thereupon constitute the entire License Agreement by and between the parties hereto. If the required permits are not obtained and Hanson is unable to exercise the Option, it shall notify District by written notice, certified or registered mail, U.S. Post Office, FedEx, UPS or other nationally recognized delivery service as required in the previous paragraph and neither party shall have any further rights or claims against the other except as set forth herein.

Following such exercise of the Option or its expiration without exercise, the parties shall, upon either's request and in a form to be prepared by Hanson and reasonably acceptable to District, jointly execute a memorandum for recording purposes confirming either (i) that effective date of Hanson's exercise of the Option and commencement date of the License Agreement or (ii) that the Option expired or was terminated and is no longer in force or effect and releasing any interest of Hanson in the Licensed Area.

Written Notice shall be sent to:

Chief Operating Officer
Forest Preserve District of Will County
17540 W. Laraway Road, Joliet IL 60433

PART B
LICENSE AGREEMENT

HANSON MATERIAL SERVICES CORPORATION

CORPORATE USE LICENSE AGREEMENT

LICENSE NO. 20-08
ORDINANCE NO. 584
TRACT NO. 461A

Hanson Material Service Corporation
Prairie Bluff Preserve

This Agreement made and entered into this _____day of _____ , 20____ by and between the Forest Preserve District of Will County, Illinois ("DISTRICT") a body corporate and politic, with principal offices at 17540 West Laraway Road, Joliet, Illinois 60433, and Material Service Corporation, a Delaware corporation, doing business as Hanson Material Service Corporation ("HANSON"), with offices at 125 N. Independence Blvd., Romeoville, IL 60446.

WHEREAS, the DISTRICT is the owner of property known as Tract No. 461A, Prairie Bluff Preserve ("PRESERVE"), with Parcel Identification Number 11-04-22-100-013-0000, and is authorized by State Statute (70 ILCS 805/6) to grant licenses, easements and rights-of-way "for the construction, operation and maintenance upon, under or across any property of such District of facilities for water, sewage, telephone, telegraph, electric, gas or other public service, subject to such terms and conditions as may be determined by such District." DISTRICT's Ordinances and Policies allow the granting of various utility, transportation, and ingress/egress licenses which do not contradict its mandate, ordinances, or policies, and which provide a public benefit; and

WHEREAS, HANSON requires a LICENSE from the DISTRICT for the purposes of installing and maintaining a groundwater infiltration pond and spillway within the boundary of the PRESERVE (collectively the "PROJECT") in Lockport Township, Will County, Illinois, and

WHEREAS, the PROJECT serves a public service and benefit by enhancing groundwater infiltration throughout the DISTRICT's PRESERVE and protecting the critical habitat of the Hines Emerald Dragonfly; and

WHEREAS, for valuable consideration, the DISTRICT is willing to grant such LICENSE to HANSON upon the terms and conditions set forth as follows.

1. LICENSE. Subject to the terms and conditions of this Agreement, the DISTRICT hereby grants to HANSON a non-exclusive License ("LICENSE") for a term of forty (40) years, commencing upon Hanson's exercise of the Option, for the purpose of constructing, installing, repairing, and maintaining a groundwater infiltration pond and spillway on the property as legally

described on the attached Plat of License Area ("LICENSED AREA"), as identified within Exhibit A, with a square footage of approximately 914,339 square feet. Notwithstanding anything to the contrary herein, either prior to construction or after Hanson completes construction in accordance with all DISTRICT-approved engineering plans and specifications, HANSON shall have the right to terminate this LICENSE in its sole discretion, upon thirty (30) days' written notice to the DISTRICT.

2. LICENSE FEE. HANSON shall pay the DISTRICT a non-refundable, lump-sum License Fee of $1,008,817.08 (One million eight thousand eight hundred and seventeen dollars and eight cents) as calculated in Exhibit B – License Fee Schedule. The License Fee is due and owing upon HANSON's exercise of the Option and must be paid in full within six months, even if HANSON terminates the LICENSE after exercising the Option. Should the LICENSE be renewed, the License fee shall be based on the license fee structure in place for that renewal year.

3. (Intentionally omitted.)

4. PROJECT DESIGN. It is understood and agreed to by the parties through this Agreement that HANSON is responsible for the design, engineering, restoration, construction, maintenance, and repair of the PROJECT and its LICENSED AREA and that typically its facilities are intended to remain in place on a permanent basis. HANSON shall design the PROJECT in such a way to minimize resource and drainage impacts and prevent erosion and minimize its maintenance and repair during the term of this Agreement. HANSON shall be responsible for all the costs and expenses of the PROJECT. HANSON also will be responsible for all repair and maintenance of the groundwater infiltration pond and spillway throughout the term of this Agreement. Prior to HANSON starting work on the PROJECT, the DISTRICT has the right to review, comment on, and approve the PROJECT Plans. No work shall start without DISTRICT approval.

The DISTRICT retains the right to request HANSON to reasonably modify the PROJECT at any time to comply with amendments to federal, state, or local laws, statutes, ordinances, regulations and other requirements. If HANSON determines, in its reasonable business judgment, that it is unable to satisfactorily fulfill the terms and conditions of any requested modification, then HANSON may terminate this LICENSE upon written notice.

5. LICENSE RENEWAL. If requested by HANSON in writing at least sixty (60) days before the expiration of the LICENSE, the parties will use reasonable efforts to renegotiate this Agreement according to the policies of the DISTRICT and any LICENSE extension will be subject to the District's then current year's License Fee Structure.

6. NON-RENEWAL OF LICENSE. Should the LICENSE not be renewed, HANSON will peaceably quit and surrender the LICENSED AREA to the DISTRICT and will no longer have any interest in or responsibility for the LICENSED AREA, except as otherwise provided in this LICENSE.

7. ASSUMPTION OF RISK. HANSON shall assume all risks and liabilities for damages, injuries, death or loss to either property or persons, including to the general public which will have access to the LICENSED AREA, which may foreseeably relate to HANSON's use of the LICENSE.

8. NON-EXCLUSIVE LICENSE. This non-exclusive LICENSE as herein granted may be used by HANSON only for the purpose of maintaining and installing a groundwater infiltration pond and spillway within the LICENSED AREA. HANSON does not have the right to LICENSE or otherwise grant or sub-license rights in, on, under, or across the LICENSED AREA to any other parties subject to the General Rules of the DISTRICT. The general public will have access to and use of the LICENSED AREA.

9. NON-INTERFERENCE. HANSON shall at all times conduct its activities within the LICENSED AREA in such a manner as not to unreasonably interfere with or otherwise impede the DISTRICT's use, management, and development of the PRESERVE.

10. WATER TESTING. HANSON shall conduct water-quality testing of the groundwater infiltration pond monthly during the construction period and thereafter three times a year to determine whether such waters meet the water-quality standards set forth in all applicable federal and Illinois laws and regulations and permits/authorizations issued to HANSON and shall provide testing information and results to the DISTRICT. Except as otherwise provided herein, HANSON is solely responsible to provide any remediation necessary for the waters in the groundwater infiltration pond to meet all federal and state regulatory standards.

11. INDEMNIFICATION. In addition to, and not in lieu of, its obligation to provide insurance, HANSON agrees to indemnify and hold harmless the DISTRICT, its commissioners, officers, directors, agents, representatives, staff, consultants, and employees from and against all claims, demands, actions, or suits in law or in equity or other proceeding of any nature pursuant to statute (including paying all of the DISTRICT's costs and expenses such as attorney's fees and expert witness fees incident thereto) for, or on account of, injury, death, damage or loss to the person or property of others caused or allegedly caused, in whole or in part, by HANSON or its agents, contractors, subcontractors, and invitees and any employees of each of them within or on DISTRICT's property (not limited to the LICENSED AREA while constructing, maintaining, operating, repairing, removing, restoring, using, benefiting from, or otherwise exercising any of its rights granted under this LICENSE, or which may otherwise be related to this LICENSE, and pay any settlements, awards, or judgments. Additionally, HANSON agrees to indemnify and hold harmless the DISTRICT, its commissioners, officers, directors, agents, representatives, staff, consultants, and employees from and against all claims, demands, actions, or suits in law or in equity or pursuant to statute (including costs and expenses such as attorney's fees and expert witness fees incident thereto) for, or on account of, any mechanic's lien or claim against the LICENSED AREA or the DISTRICT's property or DISTRICT's funds brought by, on behalf of, or through HANSON or its agents, contractors, subcontractors, and any of their employees, agents, subcontractors and invitees as a result of constructing, maintaining, operating, repairing, removing, restoring, or any other activity otherwise done at the request, direction, or instruction of or for

HANSON in its exercise of the rights granted herein. This Paragraph 11 shall survive the expiration or termination of this LICENSE.

12. ENVIRONMENTAL PROTECTION. HANSON shall conduct all operations on the DISTRICT's property in compliance with all applicable Environmental Laws (as defined below) and further covenants that neither HANSON nor any of its employees, agents, representatives, invitees, contractors or subcontractors shall use, bring upon, transport, store, keep or cause or allow the discharge, spill or release (or allow a threatened release) in each case of any Hazardous Materials (as defined below) in, on, under or from the DISTRICT's property. Without limiting any other indemnification obligations of HANSON contained herein, HANSON hereby agrees to protect, indemnify, defend, and hold harmless the DISTRICT and its commissioners, officers, directors, agents, representatives, staff, consultants, and employees from and against any and all Losses and Claims (including, without limitation, (i) reasonable attorneys' fees, (ii) liability to third parties for toxic torts and/or personal injury claims, (iii) fines, penalties and/or assessments levied or raised by any governmental authority or court, and (iv) assessment, remediation and mitigation costs and expenses and natural resource damage claims) arising out of, resulting from or connected with any Hazardous Materials used, brought upon, transported, stored, kept, discharged, spilled or released by HANSON or its employees, agents, representatives, contractors or subcontractors in, on, under or from the DISTRICT's property.

For purposes of this Agreement, the term "**Hazardous Materials**" shall mean all toxic or hazardous substances, materials or waste, petroleum or petroleum products, petroleum additives or constituents or any other waste, contaminant or pollutant regulated under or for which liability may be imposed by any Environmental Law. For purposes hereof, the term "**Environmental Laws**" shall mean all federal, state and local environmental laws, statutes, ordinances, regulations and other requirements (including common law) regulating or imposing standards of care with respect to the handling, storage, use, emitting, discharge, disposal or other release of Hazardous Materials, including, but not limited to, the Resource Conservation and Recovery Act of 1976, 42 U.S.C. § 6901 et seq., the Clean Air Act, 42 U.S.C. §§7401, et seq., the Federal Water Pollution Control Act, 33 U.S.C. § 1251, et seq., the Emergency Planning and Community Right to Know Act, 42 U.S.C. § 11001, et seq., the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. § 9601 et seq., the Toxic Substances Control Act, 15 U.S.C. §2601, et seq., the Oil Pollution Control Act, 33 U.S.C. § 2701, et seq., any successor statutes to the foregoing, or any other comparable local, state or federal statute or ordinance pertaining to protection of human health, the environment or natural resources, including without limitation the preservation of wetlands, and all regulations pertaining thereto, as well as applicable judicial or administrative decrees, orders or decisions, authorizations or permits.

HANSON shall provide DISTRICT with prompt written notice upon HANSON's obtaining knowledge of the existence of any Hazardous Materials on, in or under the DISTRICT's property in violation of Environmental Laws, or of any potential or known release or threat of release of any Hazardous Materials affecting the DISTRICT's property. This Paragraph 12 shall survive the expiration or termination of this Agreement.

13. SPECIAL USE PERMITS. HANSON shall secure Special Use Permits from the DISTRICT for its contractors, subcontractors and any others doing work at the request, direction or instruction of or for HANSON prior to working within the LICENSED AREA. Proof of Certificate of Liability Insurance for no less than $1,000,000.00 that names "The Forest Preserve District of Will County" as additionally insured with respect to the General Liability policy will be required as part of the Special Use Permit. As a condition of the permit, HANSON will secure at its sole cost a payment and performance bond issued by a surety acceptable to the DISTRICT and licensed by the State of Illinois, in an amount not less than $100,000. Except in emergencies, HANSON shall provide the DISTRICT with any request involving the need to remove any tree in excess of four (4) inches diameter at four (4) feet above ground level at least three (3) business days prior to any excavation or vegetation removal conducted in connection with the construction, maintenance, operation, inspection, repair, removal, restoration, or any other work or activity within the LICENSED AREA. Advance notice shall be sent by registered mail to the Real Estate Manager of the DISTRICT at 17540 W Laraway Road, Joliet, IL 60433.

14. NOTIFICATION OF WORK. Except in emergencies, the DISTRICT shall provide HANSON with forty-eight (48) hours' advanced notice prior to any action within the LICENSED AREA or TEMPORARY CONSTRUCTION AREA which may negatively impact HANSON's rights granted herein.

15. OTHER AGREEMENTS. The provisions of any of the DISTRICT's currently existing agreements with HANSON, any and all rights, powers, privileges, duties, obligations, and liabilities created thereby, remain in full force and effect, and are not affected hereby except to the extent and in the manner set forth herein.

16. REPAIR OF DAMAGE. Should damage to the PRESERVE or to any fixture or to any tree in excess of four (4) inches diameter (when measured four (4) feet above ground level) on the LICENSED AREA or the DISTRICT's property occur due to HANSON's installation, repair, removal, maintenance, or any other work or activity in, on or around the groundwater infiltration pond and spillway, HANSON shall restore the LICENSED AREA or DISTRICT's property to the reasonable satisfaction of the DISTRICT upon completion of such maintenance, repair, removal, or other work or activities.

17. PERMITS, APPROVALS. HANSON is responsible for procuring all necessary Federal, State, County, and municipal permits, variances, signoffs, approvals, etc., required to construct, install, repair, maintain, install, inspect, etc., for the purpose of this LICENSE. Should HANSON perform any grading, leveling, digging or excavation on the LICENSED AREA, HANSON shall comply with all notice requirements of J.U.L.I.E. HANSON shall provide copies of all applications, baseline information, natural and cultural resource data reports, Environmental Impact Statements, and Environmental Assessment Reports required by the permitting agencies for the DISTRICT's review and comment. Proof of permits and signoffs will be required prior to excavation, earthwork, or clearing.

18. SPECIAL CONDITIONS

A. HANSON shall provide DISTRICT with photos of the existing conditions in and around the LICENSED AREA prior to the start of construction.

B. HANSON shall perform all work per DISTRICT approved grading, engineering, and other PROJECT specifications or plans prepared by AECOM. The DISTRICT must review and, if applicable, approve all construction and related plans.

C. HANSON shall ensure that construction warning signs and fences, if required, in addition to all erosion control measures, are installed prior to any work being performed within the LICENSED AREA.

D. HANSON shall provide for the restoration of any vegetation or damage to topography due to work or actions of HANSON, its employees, agents, contractors and/or subcontractors within the LICENSED AREA per the DISTRICT approved Construction plans and/or Special Use Permits issued by the DISTRICT.

E. HANSON shall obtain insurance coverage for the PROJECT that names the DISTRICT as an additional insured, provides primary coverage for the DISTRICT and meets all the minimum acceptable insurance requirements listed in the attached Exhibit C.

F. HANSON shall ensure that all work performed on DISTRICT property complies with the requirements of the Illinois Prevailing Wage Act, 820 ILCS 130/0.01 *et seq*.

G. To the extent applicable, HANSON shall pay the DISTRICT all real estate taxes and other assessments which are allocable or attributable to the PROJECT for all periods falling with the term of this LICENSE. Such payment shall be made within thirty (30) days of the DISTRICT's written demand for payment. The DISTRICT shall cooperate with HANSON in obtaining any tax exemptions or abatements, if applicable.

19. BINDING EFFECT. This Agreement and the covenants contained herein shall extend to and be binding upon the successors and assigns of the parties hereto. However, HANSON cannot assign any rights or benefit of this Agreement to unrelated third parties without the DISTRICT'S written approval. Notwithstanding the foregoing, HANSON may assign this Agreement, only after receiving written approval from the DISTRICT, to its related corporate affiliates including an affiliated successor-by-merger. The DISTRICT's approval will not be withheld unreasonably.

20. BREACH OF AGREEMENT. In the event of HANSON's breach of this Agreement, the DISTRICT shall give HANSON written notice specifying the covenant, condition or obligation of this Agreement claimed to be breached. HANSON shall have thirty (30) days from

receipt of such notice to reasonably cure such purported breach to the satisfaction of the DISTRICT, whose approval shall not be unreasonably withheld. If the breach is not reasonably capable of cure within thirty (30) days, then HANSON shall have thirty (30) days to diligently proceed in taking measures to cure the purported breach. If HANSON fails to cure the purported breach, the DISTRICT shall have all rights available at law or equity including but not limited to damages for breach of this agreement, and the right to terminate this LICENSE and remove HANSON from the DISTRICT's property.

In the event HANSON breaches this LICENSE by failing to complete the PROJECT within the timeframes required herein and fails to cure that breach according to the procedures above in this Paragraph 20, the LICENSE shall terminate and HANSON shall restore the LICENSE AREA to substantially the same condition as it existed immediately prior to the start of the PROJECT.

21. LEGAL FEES. In the event of any litigation for the interpretation or enforcement of this Agreement, or damages for a default, or that in any other manner relates to this Agreement, and the DISTRICT prevails on any issues in the action, the DISTRICT shall be entitled to reasonable attorney's, expert witness, and consultant fees, as well as court costs and expenses payed by HANSON.

21. NOTICES. Any notice required to be given by this Agreement shall be deemed sufficient if made in writing and sent by certified mail, return receipt requested, or by personal service, to the persons and addresses indicated below or to such other addresses as either party hereto shall notify the other party of in writing pursuant to the provisions of this paragraph:

For DISTRICT:
Chief Operating Officer
Forest Preserve District of Will County
17540 W. Laraway Road
Joliet, IL 60433

For HANSON:
Brett Whiteley
Material Service Corporation
12900 North Meridian St #195
Carmel, IN 46032
Attn: Land Manager – Midwest

With copy to:
Lehigh Hanson, Inc.
7660 Imperial Way
Allentown, PA 18195
Attn: Legal Department – North Region

22. NO AGENCY. This LICENSE does not create any agency, employment, joint employer, joint venture or partnership between HANSON and the DISTRICT. Neither party will

have the right, power or authority to act for the other in any manner or capacity. Any such attempt shall be deemed ineffective and declared null and void.

23. ENTIRE AGREEMENT. This License #20-08 and the Exhibits attached hereto and forming a part hereof, set forth all the covenants, promises, agreements, conditions and understandings between DISTRICT and HANSON concerning the premises and there are no covenants, promises, agreements, conditions or understandings, either oral or written, between them other than are herein set forth. No subsequent alteration, amendment, change or addition to this Agreement shall be binding upon DISTRICT or HANSON unless reduced to writing and signed by them.

24. SEVERABILITY. If any provision of this Agreement, or the application of such provision, shall be rendered or declared invalid by a court of competent jurisdiction, the remaining parts or portions of this Agreement shall remain in full force and effect.

25. GOVERNING LAW. This Agreement shall be governed by the laws of the State of Illinois both as to interpretation and performance without regard to its conflicts of law provisions. Venue for any dispute related to or arising out of this Agreement shall be exclusively in the Circuit Court of Will County, Illinois.

IN WITNESS WHEREOF, the parties have executed this instrument the day and year first referenced above.

HANSON: **Material** **Service Corporation**	**DISTRICT:** **Forest Preserve District** **of Will County**
Representative: Toby Breedlove Title: VP/GM Representing: Material Service Corporation	Representative: Title: Representing: Forest Preserve District of Will County
Signature: Date:	Signature: Date:
Witnessed by: Title:	Witnessed by: Title:
Signature: Date:	Signature: Date:

ACKNOWLEDGEMENT:

State of Illinois_____)
) ss.
County of Will_____)

I, the undersigned, a Notary Public in, and for said County, in the State aforesaid, DO HEREBY CERTIFY that _____ and _____, personally known to me to be the _____ and _____, respectively, of Material Service Corporation, doing business as Hanson Material Service Corporation, Lockport, Illinois and to be the same persons whose names area subscribed to the foregoing instrument as such _____ and _____, respectively, appeared before me this day in person and acknowledged that they signed, sealed, and delivered the said instrument as their free and voluntary act and as the free and voluntary act of said entity for the uses and purposes therein set forth; and on their respective oaths stated that they were duly authorized to executed said instrument, and that the seal affixed thereto is the seal of said entity.
Witness my hand and official seal, this _____ day of _____, _____ at Lockport, Will County, Illinois.

_____
Notary Public in and for said County
My Commission Expires:_____

ACKNOWLEDGEMENT:

State of _____)
) ss.
County of_____)

I, the undersigned, a Notary Public in, and for said County, in the State aforesaid, DO HEREBY CERTIFY that _____ and _____, personally known to me to be the Chief Operating Officer and _____, respectively, of the **Forest Preserve District of Will County**, and to be the same persons whose names are subscribed to the foregoing instrument as such Chief Operating Officer and _____, respectively, appeared before me this day in person and acknowledged that they signed, sealed, and delivered the said instrument as their free and voluntary act and as the free and voluntary act of said entity for the uses and purposes therein set forth; and on their respective oaths stated that they were duly authorized to executed said instrument, and that the seal affixed thereto is the seal of said entity.

Witness my hand and official seal, this _____ day of _____, _____ at Joliet, Will County, Illinois.

_____
Notary Public in and for said County

My Commission Expires:_____

After recording, return a copy of the recorded License to:

Real Estate Management Supervisor
Forest Preserve District of Will County
17540 West Laraway Road
Joliet, Illinois 60433

EXHIBIT A
LICENSED AREA

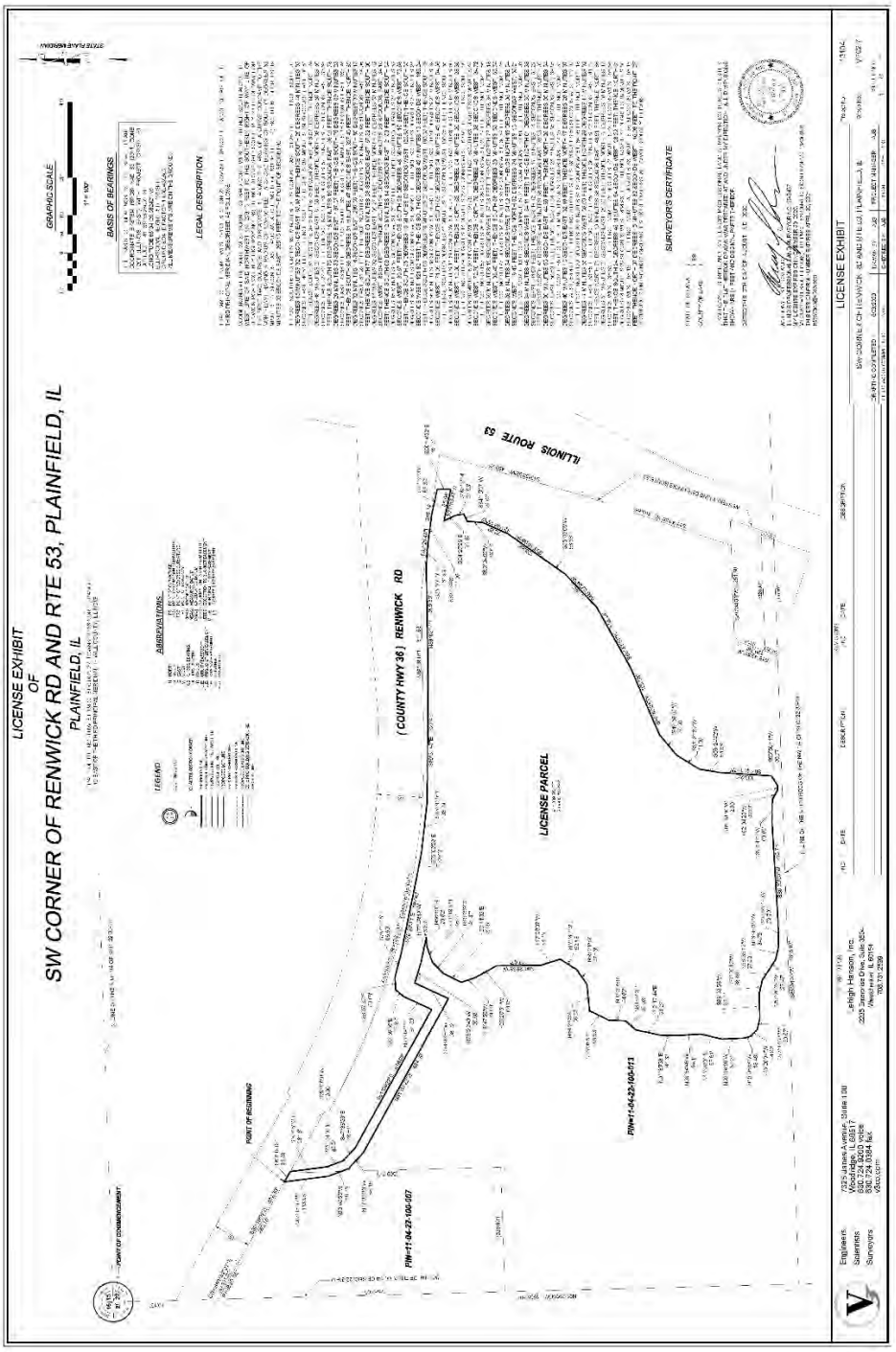


EXHIBIT B
LICENSE FEE SCHEDULE

License Fee Payment Schedule

District Ordinance: 583

District License No. 20-08

Licensee: Hanson Material Services

Preserve: Prairie Bluff Classification: Resource

License Area Value over the term of the license : $0.89 (Min Value: $1,780.00)

Year	Base License Fee	CPI	Increase Amount	Subtotal License Fee	Land Class	Land Class Increase	Administrative Fee	Total Land and Admin. Increase	Total License Fee
2020	$81,376.17	0.0%	$0.00	$81,376.17	0%	$0.00	$250.00	$250.00	$81,626.17
2021	$81,376.17	2.3%	$1,871.65	$83,247.82	0%	$0.00	$250.00	$250.00	$83,497.82
2022	$83,247.82	2.3%	$1,914.70	$85,162.52	0%	$0.00	$250.00	$250.00	$85,412.52
2023	$85,162.52	2.3%	$1,958.74	$87,121.26	0%	$0.00	$250.00	$250.00	$87,371.26
2024	$87,121.26	2.3%	$2,003.79	$89,125.05	0%	$0.00	$250.00	$250.00	$89,375.05
2025	$89,125.05	2.3%	$2,049.88	$91,174.93	0%	$0.00	$250.00	$250.00	$91,424.93
2026	$91,174.93	2.3%	$2,097.02	$93,271.95	0%	$0.00	$250.00	$250.00	$93,521.95
2027	$93,271.95	2.3%	$2,145.25	$95,417.20	0%	$0.00	$250.00	$250.00	$95,667.20
2028	$95,417.20	2.3%	$2,194.60	$97,611.80	0%	$0.00	$250.00	$250.00	$97,861.80
2029	$97,611.80	2.3%	$2,245.07	$99,856.87	0%	$0.00	$250.00	$250.00	$100,106.87
			$18,480.70	$903,365.58		$0.00	$2,500.00	$2,500.00	$905,865.58

License Area (2,000 sq minimum)___ x	914339
License duration	10
Districts Valuation of Land at $0.89/sf ($1780.00 min. License Value) for the ENTIRE license term	813761.71
Administrative Fee for annual payment i	$2,500.00
Total	$1,010,817.08

Lump Sum Payment:	
Base License Fee:	$903,365.58
Vegetation Removal/Impact Fees:	$104,951.50
Cost for Resource:	0
One time administrative fee:	$500.00
Total:	**$1,008,817.08**

EXHIBIT C
INSURANCE REQUIREMENTS

MINIMUM ACCEPTABLE INSURANCE REQUIREMENTS FOR LICENSEES

During the term of the agreement with the Forest Preserve District of Will County, Hanson ("Licensee") will, at its own expense, have in effect the coverages listed below. The Licensee shall also require the same from all of its contractors and subcontractors engaged in the work.

Commercial General Liability:

- Coverage should include premises operations, products and completed operations, broad form property damage, contractual liability, independent contractors, and personal and advertising injury with minimum limits of $10,000,000 limit per occurrence for bodily injury and property damage; $10,000,000 aggregate with defense outside the limits. Any aggregate limit must apply per project/per location and must be unimpaired.
- The policy shall include the Forest Preserve District of Will County and its affiliates, commissioners, officers, directors and employees as additional named insureds under ISO form #CG2010 (4/13) or its equivalent.
- The coverage provided by the additional insured endorsement shall be primary without right of contribution by any coverage carried by the Forest Preserve District of Will County and its affiliates, commissioners, officers, directors and employees.
- The policy shall include a waiver of subrogation endorsement in favor of the Forest Preserve District of Will County under ISO form #CG2404 or its equivalent.
- The policy shall contain a severability of interest clause for all additional insureds with no cross suits liability exclusion.
- Coverage shall not contain an exclusion for bodily injury or property damage after work is completed or is put to its intended use.
- Products and completed operations coverage must be maintained for a period of 2 years after final completion of the work.

- Including Pollution Liability coverage per endorsement LN 04 07 06 05

MINIMUM ACCEPTABLE REQUIREMENTS (Cont.)

Workers Compensation:

- Workers compensation coverage: statutory limits required by all authorities having jurisdiction in locations in which theLicensee or its contractors/subcontractors operate, and in which the work required by the contract awarded is performed.
- Employers liability coverage:
  - $10,000,000 Bodily injury by accident – each accident
  - $10,000,000 Bodily injury by disease – each employee
  - $10,000,000 Bodily injury by disease – policy limit

The Employers Liability Limits may be combined with either an Excess or Umbrella Liability policy.

- The policy shall include a waiver of subrogation endorsement in favor of the Forest Preserve District of Will County under form #WC000313 or its equivalent.
- When applicable, coverage shall be endorsed to include full coverage for Maritime obligations, Longshoremen's and Harbor Workers' Compensation Act.

Automobile Liability:

- Coverage for owned, leased, hired and non-owned vehicles with a combined single limit of $10,000,000 for bodily injury and property damage.
- The policy shall include the Forest Preserve District of Will County and its affiliates, commissioners, officers, directors and employees as additional named insureds under ISO form CA2048 or its equivalent.
- The coverage provided by the additional insured endorsement shall be primary without right of contribution by any coverage carried by the Forest Preserve District of Will County and its affiliates, commissioners, officers, directors and employees.
- The policy shall include a waiver of subrogation endorsement in favor of the Forest Preserve District of Will County.

Pollution Liability

- Licensee, its contractors and subcontractors shall maintain Pollution Liability coverage, including third party liability, for costs of cleanup, remediation and removal of any hazardous materials and for the defense of any related legal action. Limits of liability shall be no less than $2,000,000 each occurrence and $6,000,000 aggregate.
- If coverage is on a "claims made" basis, a 2-year extended reporting provision must be included.

Conditions Applying to All Coverages:

- Any self-insured retentions must be declared to and approved by the Forest Preserve District of Will County.
- Any changes to the coverages required must be authorized in advance by the Forest Preserve District of Will County and be documented in writing.
- The certificate shall provide that 30 days prior written notice of cancellation be given to the Forest Preserve District of Will County. The wording “endeavor to…but failure to do so shall impose no obligation or liability of any kind upon the insurer, its agents or representatives” should be stricken from the Acord certificate form.
- Certificates for renewal policies must be issued 10 day prior to the renewal date.
- All liability policies for injury and property damage shall be issued on the “occurrence” form.
- All coverages must be in a company approved to do business in the state and carrying a rating of at least A X by A.M. Best’s. Coverages for subcontractors must have a carrier rating of at least A-VIII by A.M. Best’s.
- Licensee shall be responsible for assuring that all contractors and subcontractors are properly insured and maintain the same coverages, terms, and conditions as required by this agreement.
- The Forest Preserve District of Will County reserves the right to reasonably increase or expand these insurance requirements from time to time throughout the term of the Agreement.
- If any of the insurance required to be maintained by this contract is written with aggregate limits, Licensee shall actively monitor all claims, incidents and occurrences that may affect such insurance to ensure that the application of the aggregate limit will not have the practical effect of reducing the minimum amount of insurance coverage that is available on a per occurrence or per claim basis. If, at any time, the full minimum per occurrence or per claim limit is not available for the payment of claims, or if the Forest Preserve District of Will County or Licensee reasonably believes that such limits may not be available, Licensee shall notify the Forest Preserve District of Will County in writing and shall take immediate steps to increase the aggregate limits as necessary to provide such coverage, , subject to the insurance requirements herein, or maintain separate insurance protection that is not subject to the aggregate limit.