

**AMMENDED CONSERVATION PLAN**

FOR INCIDENTAL TAKING OF ENDANGERED

**FAT POCKETBOOK MUSSEL**

AND

**ADDITIONAL STATE LISTED SPECIES:**

**BLACK SANDSHELL**

**EBONY SHELL**

**PURPLE WARTYBACK**

**BUTTERFLY**

**SPIKE**

**ELEPHANTEAR**

**OHIO PIGTOE**

Lafarge Cave-In-Rock Quarry Harbor

Cave-In-Rock, IL


**TABLE OF CONTENTS:**

1. Biologic Opinion
2. Adaptive Management Practices
3. Adequate Funding
4. Implementing Agreement
5. Alternatives Analysis
6. Appendix A: Additional Mussel Species and Numbers to be Included in Take

**Biological Opinion**  
**Impacts to the Fat Pocketbook**  
**from the**  
**LaFarge Cave-In-Rock Quarry Truck to Barge Loading**  
**Terminal and Maintenance Dredging**  
**of the**  
**Loading Terminals at Ohio River Mile 879.0**  
**in Hardin County, Illinois**  
FWS Log # 04EK1000-2016-F-0049

Prepared by:  
U.S. Fish and Wildlife Service  
Kentucky Field Office  
Frankfort, Kentucky



  
\_\_\_\_\_  
Virgil Lee Andrews, Jr., Field Supervisor

  
\_\_\_\_\_  
Date

# Contents

Consultation History .....	2
1. Proposed Action .....	3
1.1 Description of the Proposed Action.....	3
1.2 Action Area.....	3
2 Fat Pocketbook ( <i>Potamilis capax</i> ).....	5
2.1 Status of the Species/Critical Habitat .....	5
2.2 Environmental Baseline.....	8
2.3 Previous Incidental Take Authorizations.....	9
2.4 Effects of the Action.....	10
2.5 Cumulative Effects .....	15
2.6 Conclusion .....	15
3. Incidental Take Statement .....	15
4. Conservation Recommendations .....	17
5. Reinitiation Notice.....	18
6. Literature Cited.....	19
<b>APPENDIX A.....</b>	<b>22</b>

## Consultation History

- July 22, 2015 Service receives a letter from the Corps requesting initiation of formal consultation regarding the Lafarge Cave-In-Rock Quarry project. The Service also received a Biological Assessment (BA) dated May 2015 that was prepared for this project.
- August 4, 2015 The Service sends a letter to the Corps agreeing that formal consultation is appropriate thus initiating formal consultation. The Service estimates the Biological Opinion should be completed no later than December 17, 2015.
- August 27, 2015 The Service receives a public notice (LRL-1961-14-C-jmb), regarding this proposed project.
- December 2, 2015 The Service sends a 'Draft' Biological Opinion to the Corps for their review.
- December 9, 2015 The Service received an email from Corps requesting the Service to include proposed annual maintenance dredging activity at the conveyor location be addressed in the BO. The Corps would like to include the annual maintenance dredging, previously approved and permitted, in the anticipated permit to be granted to Lafarge, as a result of this consultation. The previous permit is about to expire and by including a renewal in with this consultation, the Corps intends to include both dredging activities on the same permit, thereby reducing the need to consider both separately. After verbal conversations between Leroy Koch and Jarrod Bonnicks (Corps) about addressing the conveyor maintenance dredging, the Service agrees to address it.
- December 15, 2015 The Service receives and email from the Corps; and, replies to the Corps in an email agreeing to a 30 day time extension for completion of the BO.
- January 5, 2015 The Service issues the Final Biological Opinion

A complete administrative record of this consultation is on file at the Service's Kentucky Field Office in Frankfort, Kentucky.

# 1. Proposed Action

## 1.1 Description of the Proposed Action

Lafarge plans to operate, and maintain through dredging, a truck load-out facility along the right descending bank of the Ohio River at ORM 879.0 in Hardin County, Illinois. The truck load-out facility at the project location would serve as a secondary load-out area, with the primary load-out area being a currently permitted and operated conveyor load-out, to load quarried rock onto barges based on the needs of Lafarge's customers. The dredging area for the truck load-out facility is proposed to be approximately 300 feet in length and 100 feet in width. Currently, the right descending bank at approximate ORM 879.0 is being utilized as fleeting and barge loading.

Rock spillage and a minimal amount of silt and sand would be removed using a crane or backhoe, which will transfer the dredged materials to the adjacent shore. If not sold, the dredged material will be hauled to one of two disposal areas located at the east and west sides of the property. Since these sites are also used for overburden storage from the mining operation, environmental controls are maintained to prevent releases of sediment from these areas. Both dispersal areas are situated well above the ordinary high water mark of the Smithland Lock and Dam (OHWM Upper Gauge 324 feet, Lower Gauge 315.1 feet). Typically, dredge materials will be loaded directly into trucks to be transported to the final disposal areas. The staging area for temporary spoils storage and material loading into trucks is located immediately north of the barge docking facility. This area is located at an elevation of approximately 340 feet, which is above the OHWM. Lafarge will apply the above methods of dredged material disposal to the sediment extracted from the dredge area at the truck load-out facility.

As mentioned above in the Consultation History, the Corps has requested that the Service include dredging at the conveyor location, just downstream of the truck load out site described above, in the this consultation, though it was not addressed in the submitted BA. This portion of the project was previously permitted by the Corps in 2007 and consultation with the Service concluded with concurrence on a Not Likely to Adversely Affect Determination under FWS #2007-B-0004. The Corps intends to reauthorize this dredging under the anticipated permit to Lafarge for activities addressed in the BA. The maintenance dredging for the conveyor to barge loading terminal, is be performed annually. The conveyor proposed dredging area is approximately 300 feet by 100 feet, and approximately 3,500 cubic yards of material would be removed during the dredging event. Dredging would be conducted by crane or trackhoe, with a clamshell bucket, from a work barge. The dredged material would be transferred to haul trucks and transported to a previously approved disposal area.

## 1.2 Action Area

The Service considers the action area to include the lower Ohio River between Smithland Lock and Dam at Ohio River Mile 918.5 downstream to the mouth of the Ohio River at ORM 981.0. This action area also includes the Cumberland River downstream of Barkley Dam and the Tennessee River downstream of Kentucky Dam. The action area is designated in this way because: (a) it contains the entirety of the proposed project area and (b) it contains the areas upstream and downstream of the proposed project where the indirect and cumulative effects of the proposed action are likely to occur.

In the BA, the action area for the proposed project is described as consisting of all areas (directly or indirectly) affected by the project elements (construction and operation) in the water. The Service considers this BA action area to be the project footprint, within the larger action area as described in the above paragraph.

### 1.3 Mussel Conservation Measures

Lafarge has committed to a number of facility operational features to reduce and minimize impacts of the truck load-out area on native mussel habitat and federally listed species of mussels residing therein.

- Lafarge intends to perform mussel relocation in the 300 feet by 100 feet dredge zone prior to their first dredge at the truck load-out facility. A relocation plan will be developed where a suitable placement area for fat pocketbook mussels will be located and approved by the USFWS prior to the relocation effort. Details of this plan remain to be developed; however, the relocation site is anticipated to be a nearby area in which fat pocketbook mussels currently occur and is not likely to be disturbed by navigation related activities.
- Lafarge will, prior to the second dredge event at the truck load-out facility, enlist a dive crew for a maximum one day survey to search the dredge area for fat pocketbook mussels that may have colonized the river bottom between dredge events. Should any fat pocketbook mussels be found, all specimens located following a search in that area will be relocated in accordance with the approved relocation plan. These surveys will be performed every time Lafarge desires to dredge at the truck load-out facility; however, if a survey is performed and no fat pocketbook mussels are located, further surveys will be henceforth discontinued for the remainder of Lafarge's dredge permit duration at the truck load-out facility.
- Lafarge will ensure that all tow boats involved with moving barges in and out of the fleeting areas are equipped with engines of 1200 horsepower maximum in an effort to reduce the adverse effects of wheel wash on the substrate.
- Lafarge will instruct all pilots involved with moving the barges in and out of docking at the truck load-out area to attempt to orient their vessels so that any wheel wash is directed toward deeper water whenever possible.
- Lafarge has agreed to contribute to the Kentucky Waterways Alliance's (KWA) Kentucky Aquatic Resources Fund (KARF), to minimize the anticipated take of fat pocketbook mussels. These funds will be used in propagation, culture, and other recovery efforts for this species. The total contribution will be made in one payment prior to the initial dredge event to: Attention: Judith Petersen, Executive Director, Kentucky Waterways Alliance, 120 Webster Street, Suite 217, Louisville, Kentucky 40206. The KWA's office telephone number is 270-524-1774. Ms. Peterson will be contacted to determine if the contribution will be made by mail, direct deposit or a wire transfer.

The Service recognizes that, individually and/or cumulatively, these mussel conservation measures that are included in the BA contribute to the avoidance and minimization of adverse effects to these listed mussels, but that these measures do not necessarily eliminate all adverse effects that may result from the proposed action.

These conservation measures are included with more detail, along with additional minimization actions, in the Reasonable and Prudent Measures and Terms and Conditions portion of this Biological Opinion.

## 2 Fat Pocketbook (*Potamilis capax*)

### 2.1 Status of the Species/Critical Habitat

The fat pocketbook was first listed as endangered in 1976, and a recovery plan was written in 1985 and then revised in 1989 (USFWS 1985a, USFWS 1998). This species is currently undergoing a 5-year review by the Service's Mississippi Field Office to determine its current status. Critical habitat for this species has not been designated.

The following taxonomic information is taken from the recovery plan for this species (USFWS 1989). The fat pocketbook was described twice in 1832 by two authors giving it different names. It was first described by J. Green as *Unio capax* and by I. Lea as *Symphnota globosa*. A few name changes have occurred since 1832, and the current accepted name, which includes the author who first described it, is *Potamilus capax* (Green 1832).

The type locality is the upper Mississippi River at the Falls of St. Anthony in Minnesota. The fat pocketbook has a round to oblong shell that is greatly inflated and has a strong s-shaped hinge line. The beak cavity is very deep (NatureServe 2007, Cummings and Mayer 1992). The shell is thin to moderately thick and the periostracum varies in color from light brown, yellow, or olive, and becoming dark brown in older individuals. The shell is typically rayless, smooth, and very shiny. Both anterior and posterior ends of the shell are rounded. Young fat pocketbook shells may have a few faint ridges on the umbo as well as have a small posterior wing present, but these characteristics are not necessarily visible in older individuals. The umbos are greatly inflated, elevated above the hinge line, and turned inward. The fat pocketbook is known to grow to a length of 5 inches. Internal morphology includes two pseudocardinal teeth in each valve, and both are thin, compressed, and elevated. There are two lateral teeth in the left valve and one in the right valve. Lateral teeth are thin and greatly curved in both valves. The nacre is bluish white and often iridescent; however, it may include some pink or salmon color in some specimens (Cummings and Mayer 1992).

### *Life History*

The fat pocketbook is a filter-feeding species from the Unionidea family. The fat pocketbook occurs primarily in sand and mud substrates, although the species has been found in fine gravel and hard clay occasionally (Parmalee 1967, Bates and Dennis 1983, Clarke 1985). The species occurs at water depths that range from a few inches to several feet (Parmalee 1967). The life cycle of the fat pocketbook is similar to that of other freshwater mussels, in which the glochidia

(larvae) require a fish host to transform to the juvenile stage. Larval mussels must attach to a host (usually on a fish gill) where they metamorphose into free-living individuals called juveniles. The fat pocketbook is a long-term brooder, with females becoming gravid in the fall, retaining glochidia over winter, and releasing the progeny during spring and summer. The freshwater drum is the primary host fish for the species (Barnhart 1997, Watters 2007).

The fat pocketbook is a large-river species that is typically found in slow-flowing water with a mud (silt/clay), sand, or gravel substrate, at depths of a few inches to eight or more feet (USFWS 1997, Cummings and Mayer 1992, USFWS 1989, EA 2007, Parmalee 1967). In the St. Francis River in Arkansas and lower Wabash River, fat pocketbooks have been found to utilize sand, mud and fine gravel substrates (Bates and Dennis 1983, Clarke 1985). The fat pocketbook is known to exist in 200 miles of the St. Francis River watershed, which includes man-made ditches, bayous, and sloughs. These habitat types are characterized as depositional areas with slow-moving water, and surveys of the St. Francis River watershed indicate that the fat pocketbook is surviving and reproducing in these conditions (Miller and Payne 2005). The reproductive strategy of the fat pocketbook is not known, but it is suspected to be a long-term brooder (bradyctictic), which holds glochidia through the winter and releases them in the spring of the year (USFWS 1989). Several unpublished studies since the species Recovery Plan have reported that fat pocketbook glochidia successfully transformed on the freshwater drum (*Aplodinotus grunniens*) (Watters 1994, Barnhart 1996, Barnhart and Roberts 1996, Barnhart and Riusech 1997). Barnhart (1997) found that fat pocketbook transformed only on freshwater drum among 29 fish species tested.

#### *Population dynamics*

Little is known on the population dynamics of the fat pocketbook; however, relatively dense populations do occur in portions of the St. Francis River drainage in Arkansas and Missouri, and sporadically elsewhere, but extensive surveys have not been conducted. Surveys conducted within the last 5-10 years in the lower Ohio River that have recorded this species, are usually targeted at specific projects (e.g., fleeting areas, loading/unloading facilities, Corps dredging needs, and sand and gravel dredging operations), or records have been obtained from commercial mussel fishermen working that portion of the lower Ohio River near Paducah, Kentucky, and Metropolis, Illinois. Based on these more recent records, it appears the fat pocketbook may be somewhat more common than previously believed in this reach of river, but no quantitative assessment is available. Many of these records are of young individuals (i.e., <5 years), so it is apparent the species has been able to successfully recruit in recent years.

#### Population variability

Little is known on the population variability of the fat pocketbook; however, in recent years in the lower Ohio River, young individuals may comprise the majority of a population. Densities are often so low that only a few individuals of various age groups comprise the population.

#### Population stability

The stability of fat pocketbook populations is not well known; however, there have been examples of this species recolonizing areas that have been dredged in ditches in Arkansas. In most locations, the presence of fat pocketbooks is evident from occasional individuals or a few individuals recorded. In the Ohio River, the low numbers typically encountered during mussel



surveys indicate the species may be persisting in a certain areas over a relatively long period of time. In addition, there is evidence of recruitment in this short lived and fast growing species.

### *Status and distribution*

#### Reasons for listing

The primary causes for the decline of the fat pocketbook in its historic range are from activities associated with navigation (e.g., maintenance dredging) and flood control (e.g. dam construction) on the rivers where it was once found (USFWS 1989). Channel dredging is a direct impact that physically removes fat pocketbooks from their habitat. Dredging activities can affect aquatic systems both physically (e.g., accelerated erosion, decreased habitat diversity, increased bedload, and increased habitat instability) and biologically (e.g., altered behavior of host fish from changing flow patterns, decreased biomass, and altered species composition and abundance) (USEPA 2007). Construction of impoundments for flood control in the river basins in which fat pocketbook had been collected has caused a loss of fat pocketbook habitat from inundation, changes in flow distributions, and sedimentation. Reductions in water quality (metals, pesticides, and other pollutants) from point sources discharges also have likely affected mussel populations. However, with the implementation of the U.S. Environmental Protection Agency's National Pollutant Discharge Elimination System in 1972, industrial discharges have been regulated, and point source pollutants have significantly declined in the large river systems, in which the fat pocketbook is reported. Non-point source pollution (stormwater runoff that includes complex mixtures of pesticides, fecal coliform bacteria, metals, suspended solids, and pharmaceuticals) may also have had a negative impact on mussel populations downstream of agricultural and urban areas, although the possible effects have not been adequately researched. Other causative factors in the decline of the fat pocketbook include competition of food and habitat resources with the invasive zebra mussel (*Dreissena polymorpha*) in some portions of their range (NPS 2006, Hunter et al. 1996, Scholesser et al. 1996). Zebra mussels were found to be a contributing factor in the decline of unionids located downstream of the Belleville Locks and Dam (EA 2005).

#### Rangewide trend

Although the fat pocketbook was historically widespread within much of its original range, populations of this species and its range have declined in the last 50 years. The main reason for decline of the species is channelization, impoundment and dredging of rivers, but contributing factors include siltation and pollution, and possibly range reductions of fish hosts (USFWS 1989, 1997). More recently, infestations of the exotic invasive zebra mussel are contributing to the decline of all native Unionid mussels (Layzer et. al. 1996, Ricciardi et. al. 1998). Because of the severe reduction in range of the species, the fat pocketbook was listed as an endangered species on June 14, 1976. No estimate of the total population was included in the 1985 recovery plan (USFWS 1985a).

The historic range of the species includes the upper Mississippi River above St. Louis; the Ohio River; the Wabash and White Rivers in Indiana; the St. Francis, White, and Black Rivers in Arkansas; the Spoon and Illinois Rivers in Illinois; the Des Moines and Iowa Rivers in Iowa; the Cumberland River in Kentucky; and the Neosho River in Kansas. It was also reported in the Des Moines River (Missouri) and the Illinois River. Since 1970, it has been collected from the St. Francis River and Right Hand Chute Little River and drainage ditches associated with these

streams in Arkansas and Missouri, the lower Wabash and White Rivers in Indiana, the lower Ohio River, lower Tennessee River and lower Cumberland River in Kentucky, and the upper Mississippi River. Live and fresh-dead fat pocketbook specimens have been found at various locations in the Mississippi River from the mouth of the St. Francis (MRM 669), above Helena, Arkansas, downstream to just below Vicksburg, Mississippi (MRM 427). Additionally, they have been found in abandoned channels within batture lands as far south as Natchez, Mississippi (MRM 385), however, there have been no main channel searches for the species below MRM 427 (Paul Hartfield 2008). The species is present in low densities at appropriate sites in at least 300 miles of the Lower Mississippi River between Natchez, Mississippi, and Memphis, Tennessee (Hartfield 2008). A single fat pocketbook was collected in 2003 from the White River in Arkansas near river mile 11, the first collection in that river since the 1960's (Harris and Christian 2003). The largest viable population currently exists in the St. Francis River system (Arkansas); however, other viable populations likely exist in the Wabash, Ohio, or Cumberland Rivers (USFWS 1989, 1997). In 1987, during a survey of the unionid fauna of the Wabash River drainage, nine live fat pocketbooks were found in the lower part of the river. Subsequent surveys of the Wabash River detected populations of various sizes at sample sites from the confluence with the Ohio River upstream to Knox County, Indiana (Cummings et al. 1990). Based on the results of these surveys, the population of fat pocketbooks in the lower Wabash River appears to be viable and large relative to other sympatric mussels. Fresh dead specimens (e.g., surveyors collected shells from mussels that had recently died) have been found occasionally in the lower Ohio River (e.g., Ohio River miles 848 and 938) since the late 1980s. The fat pocketbook is currently known to occur in several locations in the lower Ohio River from J.T. Myers Lock and Dam (ORM 846) downstream to the mouth of the Ohio River (ORM 981), a reach of approximately 135 miles. However, in 2008 the fat pocketbook was recorded from the Ohio River near the mouth of the Green River, approximately 65 upstream of the J.T. Myers Lock and Dam. This 2008 record at Ohio River Mile 784 indicates the fat pocketbook also occurs in the J.T. Myers pool. It is not known to what extent this species is distributed in the J.T. Myers pool.

#### New threats

The zebra mussel, an exotic species that colonizes the shells of native mussels, is a relatively new threat to mussels including the fat pocketbook. It is present in the Ohio River and has been observed attached to native mussels, including the fat pocketbook, and can restrict the ability of a mussel to move, feed, respire, and reproduce, especially if large numbers are present on the shell of the native mussel.

An additional new potential threat is a fish, the black carp, *Mylopharyngodon piceus*, a mollusk predator. It has been recorded in the Mississippi River near the mouth of the Ohio River.

#### *Analysis of the species/critical habitat likely to be affected*

The fat pocketbook is a federally listed species likely to be adversely affected in the action area of this project. No critical habitat has been designated for the fat pocketbook, therefore, none will be affected.

## 2.2 Environmental Baseline

### *Status of the species within the action area*

In the Ohio River, fat pocketbooks are known to occur primarily from the mouth of the Wabash

River (ORM 848) downstream to the mouth of the Ohio River (ORM 981), a reach of approximately 133 miles; however, recent mussel surveys have extended the known distribution of this species in the Ohio River approximately 64 miles upstream of the mouth of the Wabash River to ORM 784 (Chad Lewis, 2008, personal communication). Two mussel surveys have been recently conducted in the project area (Eco-Tech 2008; Eco-Tech 2011), regarding the Lafarge project; and, fat pocketbook mussels were not found in the dredging footprint at the conveyor load out area, although they were found nearby. Throughout this portion of the Ohio River, the fat pocketbook is not evenly distributed and is likely to be found only in sites containing suitable habitat conditions. It is not known how much suitable fat pocketbook habitat exists in the lower Ohio River. Mussel surveys that have been conducted in recent years in this 135-mile reach of river occasionally record the fat pocketbook; however, these surveys do not give a complete assessment of the available habitat or the status of the species. Surveys conducted within the last 5-10 years that have recorded this species are usually targeted at specific projects (e.g., fleeting areas, loading/unloading facilities, Corps dredging needs, and sand and gravel dredging operations), or records have been obtained from commercial mussel fishermen working that portion of the lower Ohio River near Paducah, Kentucky, and Metropolis, Illinois. Considering the widespread distribution of fat pocketbooks in the Mississippi River and certain tributaries to the Mississippi River, the Ohio River distribution is in itself a small subset of the overall range of distribution of this species.

#### *Factors affecting species environment within the action area*

The habitat conditions within the action area consist primarily of sand, soft silt over sand, and small areas of gravel and/ or clay. Other factors possibly affecting the species environment in the action area include runoff from agriculture activities which can increase turbidity and add sediment, including possible contaminants from urban runoff, dams which can affect host fish movement and habitat conditions, sewer outfalls, and industrial complexes located upstream in the Ohio, Cumberland, and Tennessee Rivers. Barge traffic will continue to operate in the river channel riverward of the project footprint.

#### 2.3 Previous Incidental Take Authorizations

Eighteen prior formal consultations involving the fat pocketbook have involved the United States Army Corps of Engineers (USACE), Federal Highway Administration (FHWA) and United States Forest Service (USFS). However, the formal consultation with the USFS did not authorize any incidental take of fat pocketbooks. Of the biological opinions issued by the Service authorizing incidental take of fat pocketbooks, twelve were issued to the USACE primarily for maintenance dredging activities, barge fleeting/loading/unloading facilities, for bank stabilization, levee setback and bridge construction activities. Five biological opinions authorizing incidental take were issued to the FHWA for bridge replacement and construction and for scour repair. A summary of these formal consultations is discussed below and provided in Appendix A.

The eighteen incidental take statements have authorized the loss of about 4,021 individuals, an indeterminate number of small individuals, the relocation of more than 3,257 individuals, and the placement of nine gravid female fat pocketbooks into a propagation facility. Eight of the biological opinions authorized take of fat pocketbook from relocation. The largest relocation authorized by these biological opinions allowed the relocation of up to 3,000 individuals prior to the start of maintenance activities on Stateline Outlet Ditch in Arkansas. The actual relocation

was performed in 2002 and involved the relocation of 2,042 fat pocketbooks. Results from a 2005 post-relocation survey of this reach found the area re-populated with fat pocketbooks and at densities higher than those found during the pre-impact survey.

Service programmatic biological opinions in Regions 3 and 4 regarding section 10(a)(1)(A) permits for mussel species, including fat pocketbook, anticipate the incidental take of five individuals per year, per permit. There have been two reports of incidental take in the form of injury or death reported by two permittees in Kentucky in recent years; both were for less than five individuals.

The amount of actual take of fat pocketbook associated with these biological opinions is difficult to determine for several reasons:

- Young mussels are small and may be difficult to detect.
- Quantitative assessments of the number of mussels in a dredge pile are time-consuming and costly and are, therefore, not routinely recommended.
- Mussels are long-lived and have a complex life-cycle making assessment of indirect effects difficult (e.g. effects of water quality changes, long-term relocation effects, impacts to host species, etc.).

Despite the inherent difficulties associated with assessing the actual amount of take associated with projects impacting mussels and the uncertainties associated with the long-term impacts, the conservation status of the fat pocketbook appears to stable or increasing range-wide and within impacted reaches such as Arkansas' Stateline Outlet Ditch. This coupled with the recent discoveries of previously undocumented populations of fat pocketbook and the Service's internal analysis, the Service concludes that the aggregate effects of the activities and incidental take covered in previous biological opinions on the fat pocketbook have not degraded the overall conservation status (i.e., environmental baseline) of the fat pocketbook.

## 2.4 Effects of the Action

### *Factors to be considered*

This section includes an analysis of the direct and indirect effects of the proposed action on the species and/or critical habitat and its interrelated and interdependent activities. While analyzing direct and indirect effects of the proposed action, the Service considered the following factors:

- Proximity of the action – We describe known species locations and designated critical habitat in relation to the action area and proposed action;
- Distribution – We describe where the proposed action will occur and the likely impacts of the activities;
- Timing – We describe the likely effects in relation to sensitive periods of the species' lifecycle;
- Nature of the effects – We describe how the effects of the action may be manifested in elements of a species' lifecycle, population size or variability, or distribution, and how individual animals may be affected;
- Duration – We describe whether the effects are short-term, long-term, or permanent;
- Disturbance frequency – We describe how the proposed action will be implemented in terms of the number of events per unit of time;

- Disturbance intensity – We describe the effect of the disturbance on a population or species; and
- Disturbance severity – We describe how long we expect the adverse effects to persist and how long it would take a population to recover.

Proximity of the action:

Truck load out area - The proposed action will occur along the right descending shoreline of the Ohio River near approximately ORM 879.0. Fat pocketbook mussels are known to occur in the footprint of the project site and in the immediate area around the project footprint in the larger action area.

Conveyor load out area - The proposed action will occur along the right descending shoreline of the Ohio River near approximately ORM 879.0. Based on mussel surveys at this area, fat pocketbook mussels are not likely to occur in the proposed dredging footprint.

Distribution:

Truck load out area - Direct impacts to the fat pocketbook and its habitat will most likely occur within the project footprint and in other portions of the action area downstream and riverward of the project footprint.

Conveyor load out area – The Service does not expect any direct or indirect impacts to occur in the project footprint since it is not likely that fat pocketbook mussels occur there.

Timing:

Truck load out area - Dredging, which may occur at any time of the year, may impact the fat pocketbook mussel during sensitive periods of its life cycle, especially when females are gravid and/or when glochidia need to attach to the fish host. The fat pocketbook is thought to become gravid in the late summer or fall and brood glochidia over the winter (long-term brooders), and then release them in the spring. Sensitive periods (late summer-fall) for adults include the release of sperm into the water column and, for females, the fertilization of eggs and brooding of larvae as they transform into glochidia. Another sensitive period for female mussels is the time of release of glochidia and their attachment onto the fish host (spring-early summer). Sensitive periods for the juveniles include their attachment to excystment from the fish host as they drop to the riverbed and establish themselves in the substrate (spring-early summer). In addition, the fat pocketbook may be impacted if fish host behavior and presence are affected by the repair/construction phase of the proposed project.

Conveyor load out area – The Service does not expect any direct or indirect impacts to occur in the project footprint since it is not likely that fat pocketbook mussels occur there.

Nature of the effect:

Truck load out area - It is likely that the proposed action will have a variety of effects on the fat pocketbook mussel. Any of the periods of this species life cycle can potentially be disturbed or disrupted by dredging activities. This project could result in the:

- (a) direct and/or indirect mortality of individual adults and juveniles from repair/construction activity;
  - (b) dislodgement of adults and/or juveniles due to flow alterations and/or navigation activity;
  - (c) reduction or other modification in the availability of fish hosts that is caused by degradation/alteration of habitat and that may harm and/or harass individuals through interference with respiration, feeding, and reproduction; and
  - (d) creation of turbidity and/or deposition of sediment that may directly and/or indirectly affect adults and/or juveniles by harm and/or harassment.
- In addition, these species may be impacted if fish host behavior and presence is negatively affected by flow alterations, turbidity, or changes in sediment deposition.

Conveyor load out area – The Service does not expect any direct or indirect impacts to occur in the project footprint since it is not likely that fat pocketbook mussels occur there.

Duration:

Truck load out area - Potential impacts to the fat pocketbook will be direct and indirect, and remain for the duration of the dredging activity which is expected to be permitted for about 10 years. It is likely that continued operation of the truck load-out will require continued dredging and need for permit renewals for an undetermined period of time in the future.

Conveyor load out area – The Service does not expect any direct or indirect impacts to occur in the project footprint since it is not likely that fat pocketbook mussels occur there.

Disturbance frequency:

These disturbances (i.e., flow changes, increased turbidity, movement of sediment, etc.) are expected to occur and remain in effect over a period of time as dredging activities alter the makeup of the river's flow characteristics, sediment removal, and/or sediment transport/deposition patterns.

Disturbance intensity:

The disturbance intensity will likely be dissimilar in the action area and is expected to occasionally create habitat conditions that are unfavorable for the fat pocketbook.

Disturbance severity:

The disturbance severity of the dredging activity is expected to be severe and permanent in the footprint of the project. The recovery rate of this mussel species in this part of the action area is unknown. Taken as a whole, the overall disturbance severity is expected to be minor to the population of fat pocketbooks in the lower Ohio River and range-wide.

*Analyses for effects of the action*

Conveyor load out area - The Service does not expect any direct or indirect impacts to occur in the project footprint since it is not likely that fat pocketbook mussels occur there, based on mussel surveys.

The following analyses regard the truck load out area.

Beneficial effects:

No wholly beneficial effects have been identified or are expected to occur. The proposed action is expected to result in adverse effects on the fat pocketbook populations within the action area.

Direct effects:

Direct effects of the proposed action on the fat pocketbook, include harassment, harm, and mortality from dredging activity at the truck load-out site. Dredging activities may result in temporary increases in levels of suspended sediment in the footprint of the project and for some unknown distance downstream of the dredged area. This disturbance may also temporarily harass or scare potential host fish from the area.

Other direct effects to the fat pocketbook include, but are not limited to, habitat modifications such as changes in flow and dissolved oxygen concentrations due to increased turbidity, and sediment deposition which could bury mussels, especially juveniles, and cause injury and/or mortality. These effects could also restrict mussel respiration (e.g., suffocation due to inability to purge sediment from gills), limit feeding (e.g., starvation due to inability to eliminate sediment), and interfere with reproduction (e.g., abortion from stress, host fish absence during critical reproductive periods). In summary, the following direct effects are anticipated:

1. Mortality that is the result of dredging activity. This action could damage (e.g., damaged shell or bruised animal), bury or crush fat pocketbook mussels.
2. Harm resulting from the dredging activity may result in mussel dislodgement, increased turbidity, flow alterations, sediment removal, sediment deposition, and decreased dissolved oxygen levels. This may affect the ability of these mussel species to respire, reproduce, and feed. Direct physical harm (e.g., damaged shell or bruised animal) could result in the death of mussels.
3. Harassment in the form of induced stress including, but not limited to, displacement of mussels during dredging activities, potential degradation of remaining/adjacent habitat. This harassment could result in decreased ability of these species to respire, reproduce, and feed.

All of these direct effects can lead to reduced population levels for these mussel species in this portion of the Ohio River, which, in turn, can reduce their reproductive capacity.

Interdependent and interrelated activities occur because of, or associated with, the proposed project activities. These activities would include potential harm from substrate disturbance from propeller wash, bank erosion from wave action, spills/debris as a result of barge traffic, and sediment disturbance from tugboat and barge activity at the site.

Indirect effects:

Indirect effects of this project on the fat pocketbook include changes in fish host behavior and/or presence that could impact the ability of glochidia to attach to the fish at the proper time when released from the female mussel, and changes in flow regimes and sediment transport in the action area. Indirect effects would primarily include minor alteration of flow conditions and possibly riverbed substrate conditions at and downstream of the dredging activity. Some disturbance of the area near the proposed project may include elevated levels of suspended sediment, sedimentation, altered flow patterns. Indirect effects also may include: injury to mussels or host fishes by noise, or other construction-related disturbances, impacts to water quality and respiration, as well as effects to food sources and feeding capabilities. In summary, the following indirect effects are anticipated:

1. Mortality of adult and juvenile mussels that results from turbidity and changes in the flow regime from dredging activities involving redistributing sediments that smother mussels due to new deposition.
2. Harm in the form of decreased ability to respire, reproduce, and feed as a result of the redistribution of sediments resulting from changes in flow regimes. Dredging activity may affect turbidity, flows, dissolved oxygen levels, and the presence of host fish during the future reproductive seasons of these mussel species.

*Species' response to a proposed action*

Numbers of individuals/populations in the action area affected:

The total number of fat pocketbook mussels in the action area is not possible to accurately determine. It is not possible to accurately determine (or quantify) the indirect effects to these species in the action area.

Sensitivity to change:

The degree to which the fat pocketbook is prone to change when disturbed is unknown. This species is thought to be relatively sedentary within the substrate. As a result, they are likely unable to respond to change by moving great distances; however, it is possible they could move several meters. When disturbed, mussels, in general, tend to close their valves for a period of time; however, this response will vary depending on the disturbance. Mussels exposed to disturbance events will likely close their valves when disturbed and remain closed if continued to be disturbed. They are not likely to move out of the area of disturbance on their own because of their inability to move great distances in a short period of time and because their valves will likely remain closed.

Resilience:

Resilience relates to the characteristics of populations or a species that allow them to recover from different magnitudes of disturbance. Assuming that the flow characteristics and habitat conditions in the action area are not appreciably changed, the magnitude of disturbance is expected to be low and resilience is not expected to change from its current level. However, this can only be determined through monitoring of the population and habitat over time.



Recovery rate:

In this biological opinion, the recovery rate relates to the time required for a fat pocketbook, individual or population to return to equilibrium after exposure to a disturbance. Mussel populations are expected to continue to spawn and recruit new individuals into the population; however, the level of successful recruitment to the adult stage is unknown, especially in areas that may be subjected to repeated degradation (i.e., the shallow, near-shore areas). The recovery rate for this species is likely to vary within the action area.

### 2.5 Cumulative Effects

Cumulative effects include the effects of future, State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Private actions in the vicinity of the action area are primarily urban and agriculture-related activities. Private boating and commercial navigation activities also occur in the Ohio River and are expected to continue. We are reasonably certain these actions will continue and do not expect these activities to change appreciably in the future from current conditions. Effects from urban and agricultural activities on fat pocketbooks could include increased sediment deposition, turbidity, and herbicide/pesticide levels in localized portions of the Ohio River. However, these effects, if they are occurring, are indeterminable.

We are not aware of any other State, tribal or local actions to include under Cumulative effects.

### 2.6 Conclusion

After reviewing the current status of the fat pocketbook, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of this species, since this species continues to persist in the lower Ohio River with evidence of recruitment, and the species continues to exist elsewhere in the Mississippi River drainage (e.g., various locations in Arkansas, main-stem Mississippi River, and the Wabash river). Also, this action is not likely to destroy or adversely modify designated critical habitat since none has been designated.

## 3. Incidental Take Statement

Section 9 of the Act and regulations issued under section 4(d) of the Act prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful

activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered prohibited under the Act, provided that such taking is in compliance with the terms and conditions of an incidental take statement (ITS).

### 3.2 Effect of the Take

In the accompanying biological opinion, the Service determined that this level of expected take is not likely to result in jeopardy to the species or result in the destruction or adverse modification of critical habitat.

### 3.3 Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize take of this species.

1. The Corps must ensure that the proposed action will occur as designed, planned, and documented in the BA and this biological opinion.

### 3.4 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The Corps must agree to implement the proposed action as described in the BA. **This Term and Condition supports RPM 1.**
2. The Corps shall contribute **\$17,000.00** to the Kentucky Waterways Alliance (KWA) Kentucky Aquatic Resources Fund (KARF) following issuance of this biological opinion and prior to any dredging activity in the truck load out area as related to this project. These funds will be used in recovery efforts for the fat pocketbook mussel addressed in this biological opinion, thereby minimizing the take expected to occur on this project. This amount will provide additional funding to an already ongoing project to propagate and culture this species. Some considerations for determining this cost include: (a) the cost of facilities and staff to work on the species is low; (b) the species is sensitive to handling; (c) the species has a known host fish that is a challenge to keep alive in captivity; (d) the species has a relatively short life span; and (e) food requirements are not well understood. We expect a relatively low cost to locate adults to use for propagation and culture. **This Term and Condition supports RPM 1.**
3. The contribution shall be made using certified funds and should be made out to – “Kentucky Waterways Alliance” – with KARF and any other appropriate details in the memo section. The contribution shall be mailed to: Attention: Judith Petersen, Executive Director, Kentucky Waterways Alliance, 120 Webster Street, Suite 217, Louisville, Kentucky 40206. The Kentucky Waterways Alliance’s office telephone

number is 270-524-1774. Contact Ms. Petersen if the contribution will be made by direct deposit or a wire transfer. **This Term and Condition supports RPM 1.**

Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office at 601 W. Broadway, Suite 115A, Gene Snyder Courthouse, Louisville, Kentucky 40202 (phone 502/582-5989 extension 21). Additional notification must be made to the Fish and Wildlife Service Ecological Services Field Office at 330 West Broadway, Room 265, Frankfort, Kentucky 40601 (phone 502/695-0468). Care should be taken in handling sick or injured mussels. All federally listed mussels that are moribund or have died recently are to be preserved according to standard museum practices (preferably kept frozen and/or preserved in 95% ethyl alcohol and then frozen), properly identified or indexed (date of collection, complete scientific and common name, latitude and longitude of collection site, description of collection site), and submitted to the Kentucky Ecological Services Field Office in Frankfort, or to another location if instructed by the Service.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than 34 fat pocketbook, will be incidentally taken. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. In addition, if any other federally listed mussels are recorded during the mussel relocation activities, re-initiation of consultation and review of the reasonable and prudent measures provided is required. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

#### 4. Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

The Corps should consider implementing the following conservation recommendation:

Provide financial assistance to the Kentucky Department of Fish and Wildlife Resources Center for Mollusk Conservation to support programs that work to restore federally listed mussels and other native mussels in the lower Ohio River. Such assistance could take the form of protecting or enhancing similar habitat and/or providing funding to the CMC facility to propagate federally listed mussels and other native mussels.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, please provide notification to the Service's Kentucky Field Office of the implementation of any conservation recommendations.

## 5. Reinitiation Notice

This concludes formal consultation on the action outlined in the Corps request. As written in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Corps involvement or control over the action has been retained (or is authorized by law) and if:

- (1) the amount or extent of incidental take is exceeded;
  - (2) new information reveals effects of the Corps actions that may affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion;
  - (3) the Corps action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion; or
  - 4) a new species is listed or critical habitat designated that may be affected by the action.
- In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease until re-initiation.

For this biological opinion, the incidental take would be exceeded, when the take exceeds 34 fat pocketbooks, which is what has been exempted from the prohibitions of section 9 by this biological opinion.

This consultation was assigned FWS ID 04EK1000-2016-F-0049. Please refer to this number in any correspondence concerning this consultation.

## 6. Literature Cited

- Barnhart, M.C. 1997. Reproduction and Fish Hosts of Unionid Species of Concern. Prepared for the Missouri Department of Conservation, Columbia, Missouri. 35 pp.
- Barnhart, M.C. 1996. Fat pocketbook pearl mussel (*Potamilus capax*). *Endangered Species Bulletin*, 21(6):23.
- Barnhart, M.C., and F.A. Riusech. 1997. Re-infection of host fishes with glochidia of the fat pocketbook, *Potamilus capax*. *Triannual Unionid Report*, 13:36.
- Barnhart, M.C., and A. Roberts. 1996. Flat floater news. *Kansas Pearly Mussel Newslines*, 1:3.
- Bates, J.M. and S.D. Dennis. 1983. Mussel (Naiad) survey--St. Francis, White, and Cache Rivers, Arkansas and Missouri. Final report. Prepared for U.S. Army Corps of Engineers, Memphis District. DACW66-78-C0147. 89pp. Append. A-E, 57pp.
- Clarke, A.H. 1985. Mussel (Naiad) study; St. Francis and White Rivers; Cross, St. Francis, and Monroe Counties, Arkansas. Department of the Army, Memphis District, Corps of Engineers, Memphis, Tennessee (Order No. 84M 1666R). 28 pp. and appendices.
- Cummings K. S., M. E. Retzer, C. A. Mayer, and L. M. Page. 1990. Life history aspects and status of the federally protected fat pocketbook, *Potamilus capax* (Green, 1832) (Mollusca: Unionidea) in the Lower Wabash River, Illinois and Indiana. *Illinois Natural History Survey, Center for Biodiversity, Technical Report*. 1990(1):1-37.
- Cummings, K.S., and C.A. Mayer. 1992. *Field Guide to Freshwater Mussels of the Midwest*. Illinois Natural History Survey Manual 5. 194 pp.
- EA Engineering, Science, and Technology (EA). 2005. Ohio River Unionid Monitoring 10-Year Summary Report (RM 204.3 to 206.0). 20 pp + appendices. Prepared for Ohio Municipal Electric Generation Agency-Joint Venture No. 5.
- EA Engineering, Science, and Technology (EA). 2007. Freshwater Mussel Survey of the Ohio River at Smithland Lock and Dam (ORM 918.5). 7 pp + appendices. Prepared for AMP-Ohio, Columbus, Ohio.
- Eco-Tech Consultants. 2011. Ohio River Freshwater Mussel Survey for the Lafarge North America Cave-In-Rock Quarry, River Mile 879, Hardin County, Illinois. Prepared for Shannon and Wilson, Inc., St. Louis, Missouri, October 2011. 8 pages plus tables, figures, and appendices.
- Eco-Tech Consultants. 2008. Biological Assessment for the Fat Pocketbook (*Potamilus capax*) LaFarge Quarry Proposed Load-out facility, Ohio River, Hardin county, Illinois. Prepared for Shannon and Wilson, Inc., St. Louis, Missouri. November 2008. 11 pages and appendices.

- Green, J. 1832. Untitled note. Cabinet of Natural History and American Rural Sports 2:290.
- Harris, J.L. and A.D. Christian. 2003. Qualitative survey for mussels, White River navigation Maintenance in Arkansas, Desha, and Prairie Counties of Arkansas. Contract No. DACW 29-01-D-0016. Final report for Memphis District, U.S. Army Corps of Engineers. 10 pp.
- Hartfield, Paul 2008. E-mail on October 29, 2008 to Leroy Koch, U.S. Fish and Wildlife Service, Kentucky Field Office in Frankfort.
- Hunter, R.D., S.A. Toxzykowski, and M.G. Janech. 1996. Zebra mussels in a small river: Impact on unionids. In F. D'itri (ed). Zebra Mussels and Other Aquatic Nuisance Species. Boca Raton: Lewis Publishers. pp. 161-186.
- Layzer, J.B., L.M. Madison and C.S. Dunn. 1996. Zebra mussel impacts on endangered Unionids. Tennessee Technological University, 1996 Annual Report, Cookeville, Tennessee.
- Lewis, Chad 2008. Telephone conversation on October 3rd, 2008 with Leroy Koch, U.S. Fish and Wildlife Service, Kentucky Field Office in Frankfort.
- Miller, A.C., and B.S. Payne. 2005. The curious case of the fat pocketbook mussel, *Potamilus capax*. Endangered Species Update 22(2):1.
- Morgan, C.A., D.C. Fortenbery. 2015. Biological Assessment for a Truck Loadout Operation and Associated Maintenance Dredging Cave In Rock, Illinois ORM 879. Prepared for Lafarge Cave in Rock Quarry, R1 Box 267, Cave In Rock, IL 62919. May 2015. 28 pages and Appendix.
- National Park Service (NPS). 2006. Annual Report: Quantitative Assessment of Zebra Mussels at Native Mussel Beds in the Lower St. Croix River – 2005. Prepared for U.S. Army Corps of Engineers, St. Paul District. 16 pp + appendices.
- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: November 14 and 15, 2007).
- Parmalee, P.W. 1967. The fresh-water mussels of Illinois. Ill. State Mus., Popular Sci. Series Vol. VIII. 108 pp.
- Ricciardi, A., R.J. Neves and J.B. Rasmussen. 1998. Impending extinctions of North American freshwater mussels (Unionidae) following the zebra mussel (*Dreissena polymorpha*) invasion. *Journal of Animal Ecology*, 76, 613-619.
- Schloesser, D.W., T.F. Nalepa, and G.L. Mackie. 1996. Zebra mussel infestation of unionid bivalves (Unionidae) in North America. *Amer. Zool.* 36:300-310.

- U.S. Environmental Protection Agency (USEPA). 2007. Risks of Atrazine Use to Three Federally Listed Endangered Freshwater Mussels: Fat Pocketbook Pearly Mussel (*Potamilus capax*), Purple Cat's Paw Pearly Mussel (*Epioblasma obliquata obliquata*), and Northern Riffleshell (*Epioblasma torulosa rangiana*). Office of Pesticide Programs, Washington, DC.
- U.S. Fish and Wildlife Service (USFWS). 1997. Threatened and Endangered Species: Fat Pocketbook Fact Sheet.
- U.S. Fish and Wildlife Service (USFWS). 1989. A Recovery Plan for the Fat Pocketbook Pearly Mussel *Potamilus capax* (Greed 1832). USFWS Southeast Region, Atlanta, Georgia.
- U. S. Fish and Wildlife Service (USFWS). 1985a. Recovery Plan for the Fat Pocketbook Pearly Mussel U. S. Fish and Wildlife Service. Atlanta, Georgia. 57 pp.
- Watters, G.T. (2007). Ohio State University Mussel Host Database. Available at: <http://128.146.250.235/MusselHost/> (accessed 2007).
- Watters, G.T. 1994. An Annotated Bibliography of the Reproduction and Propagation of the Unionoidea (Primarily of North America). Ohio Biological Survey, College of Biological Sciences, The Ohio State University, Columbus. In cooperation with Ohio Division of Wildlife. 158 pp.

## APPENDIX A

Fat pocketbook biological opinions including amount and form of incidental take exempted. <b>PROJECTS</b>	<b>SERVICE OFFICE AND DATE BO ISSUED</b>	<b>INCIDENTAL TAKE (IT) FORM</b>	<b>TAKE EXEMPTED OR SURROGATE MEASURE TO MONITOR</b>
Effects of scour repair at Arkansas Highway 77 crossings of Right Hand Chute on the endangered fat pocketbook mussel ( <i>Potamilus capax</i> )	Arkansas ES Office April 27, 1999	Harm, harass or kill	Up to 50 mussels relocated and up to 5 mussels killed due to relocation. Indeterminate amount of small mussels not relocated and buried.
Potential impacts of ditch maintenance activities within Stateline Outlet Ditch, Mississippi County, Arkansas on the fat pocketbook mussel ( <i>Potamilus capax</i> )	Arkansas ES Office October 3, 2001	Harm, harass or kill	Up to 3,000 individuals relocation and up to 5 killed during the relocation. Up to 30 dead individuals in dredge disposal pile.
Bridge replacement over the St. Francis River	Arkansas ES Office November 8, 2001		2 individuals
Potential impacts of three scour repair areas in the St. Francis Floodway on the fat pocketbook mussel ( <i>Potamilus capax</i> )	Arkansas ES Office April 2002	Harm, harass or kill	Up to 200 individuals relocation and up to 2 killed during the relocation. Indeterminate amount of small mussels not relocated and buried.
Proposed maintenance dredging of the Ohio River navigation channel at Wabash Island located in Posey County, Indiana, Gallatin County, Illinois and Henderson County, Kentucky and its effects on the fat pocketbook pearly mussel ( <i>Potamilus capax</i> )	Bloomington, IN ES Office September 2002	Harm, harass, collect or kill	Undefined but discovery of more than 3 live mussels in dredged material from a single event indicates take has been exceeded
Arkansas Highway 14 bridge replacement over Ditch 10 near the city of Harrisburg, AK	Arkansas ES Office October 31, 2002		1 individual



Emergency consultation for a sewage lagoon embankment stabilization near the city of Madison, Arkansas	Arkansas ES Office June 10, 2003		6 individuals relocated, 9 gravid females taken to propagation facility
Potential effects of the construction of a Union Pacific Railroad Bridge across the St. Francis floodway on the fat pocketbook ( <i>Potamilus capax</i> )	Arkansas ES Office October 29, 2003		3 individuals
Potential impacts of ditch maintenance activities within Ditch 10 on the fat pocketbook mussel ( <i>Potamilus capax</i> )	Arkansas ES Office April 28, 2004		10 individuals
Potential impacts of constructing a pre-cast concrete bridge across Ditch 61 on the federally endangered fat pocketbook mussel ( <i>Potamilus capax</i> )	Arkansas ES Office September 2, 2007	Harm, harass or kill	3 individuals: 1 relocated and 2 killed
Potential effects of the removal and replacement of the Route 15 bridge over the Wabash River at Mount Carmel, Indiana on the fat pocketbook ( <i>Potamilus capax</i> )	Bloomington, IN ES Office October 22, 2007	Injury or direct mortality	4 individuals: 2 during relocation, 2 during construction.
Potential impacts of the proposed setback of Elk Chute Levee in Dunklin County, Missouri on the federally endangered fat pocketbook ( <i>Potamilus capax</i> )	Missouri ES Office January 10, 2008	Death or injury	5 individuals
Biological Opinion on the USDA Forest Service Application Of Fire Retardants On National Forest System Lands	Washington DC February 2008	No take provided	No take provided
Biological Opinion on the Construction of Smithland Hydroelectric Project, Livingston County, KY	Kentucky ES Office January 9, 2009	Mortality, harm or harassment	486 individuals and 40 acres of habitat
Biological Opinion on fleeting and loading facilities for the River View Coal Company, Union County, KY	Kentucky ES Office September 11, 2009	Harm, harass, or kill	61 individuals and 12.2 acres of habitat

Biological Opinion on Paducah Riverfront Project, McCracken County, KY	Kentucky ES Office December 21, 2010	Mortality, harm or harassment	546 individuals and 7.5 acres of habitat
Biological Opinion on Straight Slough Project, Arkansas	Arkansas ES Office, June 5, 2014	Mortality, harm or harassment	2,857 individuals
Biological Opinion on Tennessee Valley Authority Shawnee Fossil Plant Mooring Cell Removal/Restoration, McCracken Co., KY	Kentucky ES Office, October 2, 2015	Mortality, harm or harassment	One individual

**Adaptive management practices that will be used to deal with changed or unforeseen circumstances that affect the effectiveness of the measures instituted.**

Lafarge Holcim currently has a Storm water Pollution Prevention Plan in place and is following that plan. As part of that plan, the site includes 4 permitted NPDES outfalls that are monitored routinely to ensure compliance.

Despite the best intentions, there may be practices that are specified in the SWPPP that prove to be ineffective at controlling soil erosion and sedimentation. If this is the case, will consult with the Army Corps of Engineers and IEPA for practices that might be more effective or better suited to the site environment than the specified ones.

The Service believes that no more than 34 fat pocketbook, will be incidentally taken. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring re-initiation of consultation and review the reasonable and prudent measures provided. In addition, if any other federally listed mussels are recorded during the mussel relocation activities, re-initiation of consultation and review of the reasonable and prudent measures is required. The Federal agency must immediately provide and explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

**Verification that funding to support mitigation activities will be available for the life of the conservation plan.**

The project estimated budget will include line items for implementation of BMP's included in the SWPPP, including seeding of all disturbed areas draining to the stream. Maintenance and repair of SWPPP items, and additional measures implemented during construction will be paid for by change order or force account. By law, the erosion and sediment control measures will remain in place for the life of the project.

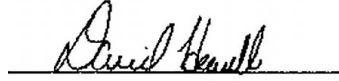
Funding for the KARF fund has already been made, and proof of this payment has been provided.

Funding for the mussel relocation has been set aside by Lafarge Holcim and must be completed prior to any dredging activity per requirements from the Army Corps of Engineers harbor permit. Once this activity has been completed, no future monitoring is required by Army Corps of Engineers or US Fish and Wildlife given continued use and regular dredging of the area. If the area is not dredged for a period of 5 years, US Fish and Wildlife may request a new mussel survey to be completed.

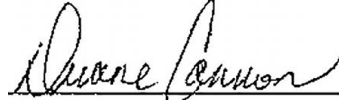
## Implementing Agreement: Lafarge Holcim ITA for Fat Pocketbook Mussel

### A. Names of all participants in the execution of the conservation plan, including public bodies, corporations, organizations, and private individuals.

David Harrell  
Quarry Manager



Duane Cannon  
Environmental Manager



### B. The obligations and responsibilities of each of the identified participants with schedules and deadlines for completion of activities in the conservation plan and a schedule for preparation of progress report to be provided to the Department

The Illinois Department of Natural Resources is responsible for the review of this conservation plan and for the subsequent issuance of the Incidental Take Authorization.

Lafarge Holcim is responsible for all biological clearance coordination and recommendations related to the project. They are also responsible for securing authorization for the incidental take; securing all permits, Section 404 and Office of Water Resources; inspection of the work and contractor compliance with the contract documents.

The activities in the conservation plan will be implemented concurrently with the contract for the harbor permit. Once the ITA is received, the mussel relocation will be scheduled will be conducted as soon as is practical. This is expected to happen late in the autumn of 2018. Reports of the relocation will be sent to the Service and IDNR at that time.

At this time, notice will be posted for dredging activities, and dredging will be conducted at the site. Prior to the second dredge event, a dive crew for a maximum one-day survey to search the dredge area for fat pocketbook mussels that may have colonized the river bottom between dredge events. Should any fat pocketbook mussels be found, all specimens located following a search in that area will be relocated in accordance with the approved relocation plan. These surveys will be performed every time Lafarge desires to dredge at the truck load-out facility; however, if a survey is performed and no fat pocketbook mussels are located, further surveys will be henceforth discontinued for the remainder of Lafarge's dredge permit duration.

### C. Assurances that each participant in the execution of the conservation plan has the legal authority to carry out their respective obligations and responsibilities under the conservation plan.

IDOT is authorized by the Illinois Highway Code to carry out its duties of providing safe and efficient highways for Illinois citizens.

The Illinois Natural History Survey (INHS) has the E&T permits to perform this work.

### D. Assurances of compliance with all other federal, state, and local regulations pertinent to the proposed action and to execution of the conservation plan.

Compliance under the federal Endangered Species Act of 1973 is required and has been granted from both the Army Corps of Engineers and US Fish and Wildlife Service. Details of that

authorization is included in the Biologic Opinion which serves as the main portion of this conservation plan. No known local regulations are pertinent to this conservation plan.

**E. Copies of any federal authorizations for taking already issued to the applicant.**

Copies of the Biologic Opinion, Biologic Assessment, and Army Corps of Engineers permit have previously been supplied to IDNR as part of this conservation plan.

**No Build Alternative:**

The existing truck loadout was constructed in the early 1990's by Martin Marietta and is in operation today. Therefore, the no build alternative is not applicable to this permit modification.

**Alternate Location:**

The entire existing harbor owned by Lafarge's Cave In Rock quarry is currently used for barge loading activities such as the original conveyor load out, truck loadout, and associated fleeting. To move the truck loadout to another location would displace either the existing conveyor loadout or fleeting. It would not be economically or operationally feasible to replace the existing fleeting or conveyor loadout.

Additionally, moving the truck loadout to another location would require significant impacts to both the river bank and bottom.

1. A new roadway and ramp would have to be constructed in order to access the truck loadout. This would require tree removal and placement of fill material below the Ordinary High Water mark.
2. New mooring blocks would have to be constructed and placed on the bank of the river to tie off the truck loadout barge. This installation would require disturbance of the river bank below the Ordinary High Water mark .
3. A previously non-impacted area of the river bottom would require dredging due to spilling of aggregate material during operation. This would have adverse impacts to threatened or endangered species living in the harbor.

**Maintain Status Quo:**

The preferred alternative is to maintain status quo. The existing truck loadout has been in operation for over 25 years. Impacts to the river bank by removing trees, placing fill, and installation of mooring blocks have already occurred. While in operation under Martin Marietta, aggregate material was spilled and the location was dredged routinely. Maintaining the current location would be the most economically and operationally feasible. It would not impose any new adverse impacts to the environment.

**No Action:**

Due to the prior operation of the truck load out facility, spillage of aggregate material has already occurred at this site. It is impossible to continue normal operations and fleeting during months when water levels are at or below normal pool.

# Appendix A

## Additional Mussel Species and Numbers to be Included in Take

During the relocation of the LafargeHolcim Cave-In-Rock, IL truck loadout proposed dredging area in 2019, a single individual of the state listed-as-threatened mussel species *Ligumia recta*, and a single individual of the state listed-as-endangered mussel species *Fusconaia ebena*, were encountered. Based on two previous mussel surveys performed within this area, these species were not expected to reside within this location. Because of these encounters with these two unexpected state listed species, it is thought that other state listed species may also reside within the truck loadout proposed dredging area and LafargeHolcim would like to include them and their estimated take numbers for coverage within this amended conservation plan for a revised ITA. All of the additional species to be added to the existing ITA include the black sandshell mussel (*Ligumia recta*), the ebonyshell mussel (*Fusconaia ebena*), the purple wartyback mussel (*Cyclonaias tuberculata*), the butterfly mussel (*Ellipsaria lineolata*), the spike mussel (*Elliptio dilatata*), the elephantear mussel (*Elliptio crassidens*), the Ohio pigtoe mussel (*Pleurobema cordatum*). Three individuals of the black sandshell mussel and three individuals of the ebonyshell mussel are estimated to be taken, and one individual of each of the five remaining species are also estimated to be taken.

### Biological Description of Additional Affected Species

#### Black Sandshell

The black sandshell (*Ligumia recta*) has been listed as threatened by the state of Illinois since April 26, 1999 (Mankowski, 2012). The black sandshell is widely distributed throughout the Mississippi River Basin from Minnesota to western New York and Pennsylvania southwest to Oklahoma and east to the Alabama River Basin, the Red River of the North, and the St. Lawrence River Basin (Parmalee and Bogan, 1998).

NatureServe (2020) states that the *Ligumia recta* is typically found in medium-sized to large rivers in locations with strong current and substrates of coarse sand and gravel with cobbles in water depths from several inches to six feet or more and may be found in silt. Reported potential fish hosts for *Ligumia recta* are many, and include rock bass (*Ambloplites rupestris*), redbreast sunfish (*Lepomis auritus*), central stoneroller (*Campostoma anomalum*), American eel (*Anguilla rostrata*), convict cichlid (*Cichlasoma nigrofasciatum*), common carp (*Cyprinus carpio*), banded killifish (*Fundulus diaphanus*), green sunfish (*Lepomis cyanellus*), pumpkinseed (*Lepomis gibbosus*), orangespotted sunfish (*Lepomis humilis*), bluegill (*Lepomis macrochirus*), longear sunfish (*Lepomis megalotis*), largemouth bass (*Micropterus salmoides*), white perch (*Morone*

*americana*), rosyface shiner (*Notropis rubellus*), yellow perch (*Perca flavescens*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), roach (*Rutilus rutilus*), sauger (*Sander canadensis*), walleye (*Sander vitreus*), and southern platyfish (*Xiphophorus maculatus*) (Watters, Hoggarth, and Stansbery, 2009).

Cummings and Mayer (1992) describe the exterior of the shell as follows:

Shell elongate, solid, and moderately compressed. Anterior end rounded, posterior end pointed in males, saber-shaped in females. Dorsal margin straight, ventral margin straight to curved. Umbos low, only slightly elevated above the hinge line. Beak sculpture, if visible, of two or three indistinct, double-looped bars. Shell smooth and shiny, dark green, brown, or black, with green rays visible on some individuals. Length to 8 inches (20.3 cm).

During the partial 2019 mussel relocation, performed at the LafargeHolcim truck loadout proposed dredging area, one individual of *Ligumia recta* was found. Given the presence of *Ligumia recta* within the proposed area of direct impact, it is possible that *Ligumia recta* occurs elsewhere within the proposed dredging area and may be affected. Given that one individual was encountered within a 30-meter by 34-meter area of the proposed dredging area, amounting to a third of the total proposed dredging area, it is estimated that two additional individuals are expected to be encountered during the relocation, for a total estimated take of three individuals of *Ligumia recta*.

### **Ebonyshell**

The ebonyshell (*Fusconaia ebena*) was listed as threatened by the state of Illinois on January 18, 1994 and was uplisted as endangered on February 21, 2014 (Mankowski, 2012). In Illinois, it is generally distributed in the Ohio River and sporadic in the Mississippi and Wabash Rivers (Cummings and Mayer, 1997 in NatureServe, 2020).

The most suitable habitat of the ebonyshell is large rivers with swift water and a coarse sand and gravel substrate, although this species also thrives in rivers composed of sand, silt, and mud (NatureServe, 2020). Reported potential host fish for *Fusconsia ebena* include skipjack herring (*Alosa chrysochloris*), largemouth bass (*Micropterus salmoides*), white crappie (*Pomoxis annularis*), and black crappie (*Pomoxis nigromaculatus*) (Watters, Hoggarth, Stansbery, 2009).

Cummings and Mayer (1992) describe the exterior of the shell as follows:

Shell solid, heavy, rounded or oval, and inflated. Anterior end rounded, posterior end rounded or bluntly pointed. Dorsal margin slightly rounded, ventral margin curved, occasionally straight. Umbos low, inflated, about even with hinge line and curved downward. Beak sculpture consists of a few very weak ridges, apparent only in extremely small shells. Shell smooth with slightly elevated ridges indicating periods of growth. Periostracum rayless, light brown in young shells, becoming dark brown to black in older individuals. Length to 4 inches (10.2 cm).



During the 2019 mussel relocation, performed at the LafargeHolcim truck loadout proposed dredging area, one individual of *Fusconaia ebena* was found. Given the presence of *Fusconaia ebena* within the proposed area of direct impact, it is possible that *Fusconaia ebena* occurs elsewhere within the proposed dredging area and may be affected. Given that one individual was encountered within a 30-meter by 34-meter area of the proposed dredging area, amounting to a third of the total proposed dredging area, it is estimated that two additional individuals are expected to be encountered during the relocation, for a total estimated take of three individuals of *Fusconaia ebena*.

### **Purple Wartyback**

The purple wartyback (*Cyclonaias tuberculata*) has been listed as threatened by the state of Illinois since April 26, 1999 (Mankowski, 2012). The general distribution of *Cyclonaias tuberculata* is, according to Parmalee and Bogan (1998):

Upper Mississippi River drainage generally; Lake St. Clair drainage, and from Pennsylvania northwest to southern Michigan and northwestern Wisconsin (Mathiak, 1979), south to Iowa, Missouri, and Arkansas. In Canada, Lake Erie and the Sydenham River in southern Ontario (Clarke, 1981a). It occurs throughout the Tennessee and Cumberland river drainages”

The habitat that the purple wartyback typically inhabits is a gravel/mud bottom, usually in areas of current at depths of less than two to up to 20 feet (NatureServe, 2020). Reported fish hosts for *Cyclonaias tuberculata* are black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), channel catfish (*Ictalurus punctatus*), and flathead catfish (*Pylodictus olivaris*) (Watters, Hoggarth, and Stansbery, 2009).

Cummings and Mayer (1992) describe the exterior of the shell as follows:

Shell round, moderately thick, and compressed to moderately inflated (large rivers). Anterior end rounded, posterior end somewhat squared off. Dorsal margin straight, a wing present behind the umbo; ventral margin curved. Umbos low, even with, or barely rising above the hinge line. Beak sculpture of numerous wavy ridges covering the surface of the umbo. Shell surface, except the anterior fourth, covered with tubercles, forming small ridges on the dorsal wing. Periostracum yellowish brown or greenish brown in young shells (rarely rayed), becoming dark brown in older shells. Length to 5 inches (12.7 cm).

During the 2019 mussel relocation, performed at the LafargeHolcim truck loadout proposed dredging area, no *Cyclonaias tuberculata* were found. Based on the historical and recent distribution records of the purple wartyback mussel, the purple wartyback mussel may be present in the Smithland pool of the Ohio River and it is possible that *Cyclonaias tuberculata* may be present, albeit in very low numbers, in the remainder of the proposed dredging area. Given that no individuals were encountered within a 30-meter by 34-meter area of the proposed

dredging area, amounting to a third of the total proposed dredging area, it is estimated that no more than one individual is expected to be encountered during the relocation, and the estimated take for this species is one individual mussel.

### **Butterfly**

The butterfly (*Ellipsaria lineolata*) has been listed as threatened by the state of Illinois since January 18, 1994 (Mankowski, 2012). The general distribution of *Ellipsaria lineolata* is the Mississippi River drainage from western Pennsylvania west to Minnesota, south to eastern Iowa, Kansas, Arkansas, and Oklahoma (Parmalee and Bogan, 1998).

The habitat that this species reaches its greatest abundance is in large rivers in stretches with pronounced current and a substrate of coarse sand and gravel (NatureServe, 2020). Reported fish hosts for *Ellipsaria lineolata* are freshwater drum (*Aplodinotus grunniens*), green sunfish (*Lepomis cyanellus*), and sauger (*Sander canadensis*) (Watters, Hoggarth, and Stansbery, 2009).

Cummings and Mayer (1992) describe the exterior of the shell as follows:

Shell somewhat triangular, thick, solid, and compressed. Anterior end broadly rounded, posterior end pointed. Umbos compressed, directed forward, and not elevated above the hinge line. Posterior ridge sharply defined. Lateral surfaces broadly flattened, less so in older females. Beak sculpture, if visible, of a few fine, double-looped ridges. Shell smooth, yellow or yellowish green, with scattered brown rays that are usually broken into V-shaped or irregular rectangular blotches. Old shells with faint brown rays or rayless. Length of 4 inches (10.2 cm).

During the 2019 mussel relocation, performed at the LafargeHolcim truck loadout proposed dredging area, no *Ellipsaria lineolata* were found. Based on the historical and recent distribution records of the butterfly mussel, the butterfly mussel may be present in the Smithland pool of the Ohio River and it is possible that *Ellipsaria lineolata* may be present, albeit in very low numbers, in the remainder of the proposed dredging area. Given that no individuals were encountered within a 30-meter by 34-meter area of the proposed dredging area, amounting to a third of the total proposed dredging area, it is estimated that no more than one individual is expected to be encountered during the relocation, and the estimated take for this species is one individual mussel.

### **Spike**

The spike (*Elliptio dilatata*) has been listed as threatened by the state of Illinois since January 18, 1994 (Mankowski, 2012). The general distribution of *Elliptio dilatata* is the entire Mississippi River drainage from the St. Lawrence River and its tributaries south to northern Louisiana and west to the tributaries of the Red River, Oklahoma (Parmalee and Bogan, 1998).

According to NatureServe (2020), the spike mussel occurs in medium streams to large rivers primarily in shoal habitat of unpounded streams and rivers but can occasionally be found in

tailwaters of dams, particularly of the Tennessee River, in water 4 to 8 meters deep and can even be found in lakes under some conditions. Reported potential fish hosts for *Elliptio dilatata* include rock bass (*Ambloplites rupestris*), banded sculpin (*Cottus carolinae*), gizzard shad (*Dorosoma cepedianum*), rainbow darter (*Etheostoma caeruleum*), yellow perch (*Perca flavescens*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), flathead catfish (*Pylodictis olivaris*), and sauger (*Sander canadensis*) (Watters, Hoggarth, and Stansbery, 2009).

Cummings and Mayer (1992) describe the exterior of the shell as follows:

Shell solid, elongate, elliptical, and compressed to moderately inflated. Anterior end rounded, posterior end rounded to slightly pointed. Dorsal margin straight to slightly curved, ventral margin straight to curved in young shells, becoming arched in older shells. Umbos low, usually not elevated above the hinge line. Beak sculpture, if visible, of three or four heavy loops. Surface smooth, greenish brown with faint green rays visible on small shells, becoming dark brown to black in adults. Length to 5 inches (12.7 cm).

During the 2019 mussel relocation, performed at the LafargeHolcim truck loadout proposed dredging area, no *Elliptio dilatata* were found. Based on the historical and recent distribution records of the spike mussel, the spike mussel may be present in the Smithland pool of the Ohio River and it is possible that *Elliptio dilatata* may be present, albeit in very low numbers, in the remainder of the proposed dredging area. Given that no individuals were encountered within a 30-meter by 34-meter area of the proposed dredging area, amounting to a third of the total proposed dredging area, it is estimated that no more than one individual is expected to be encountered during the relocation, and the estimated take for this species is one individual mussel.

### **Elephantear**

The elephantear (*Elliptio crassidens*) has been listed as threatened by the state of Illinois since March 17, 1989 (Mankowski, 2012). The general distribution of *Elliptio crassidens* is the entire Mississippi River drainage, from western Pennsylvania west to Wisconsin, south to Missouri, the Alabama River system, and Georgia and northern Florida (Parmalee and Bogan, 1998).

According to Heard (1979) in NatureServe (2020), the elephantear mussel inhabits muddy sand to sand and rocky substrates in moderate currents. The only reported potential fish host for *Elliptio crassidens* includes the skipjack herring (*Alosa chrysochloris*) (Watters, Hoggarth, and Stansbery, 2009).

Cummings and Mayer (1992) describe the exterior of the shell as follows:

Shell thick, solid, compressed to moderately inflated, triangular. Anterior end rounded, posterior end pointed. Dorsal margin slightly curved, ventral margin curved in young shells, becoming straight in older shells. Umbos low, usually not elevated above the hinge line. Beak sculpture, if visible, of two or three loops parallel to the growth lines, usually

present only in very small shells. Posterior ridge prominent and sharply angled. Surface of the shell smooth. Periostracum reddish brown with faint green rays in small shells, becoming dark brown to black in adults. Length to 9 inches (15.2 cm)

During the 2019 mussel relocation, performed at the LafargeHolcim truck loadout proposed dredging area, no *Elliptio crassidens* were found. Based on the historical and recent distribution records of the elephantear mussel, the elephantear mussel may be present in the Smithland pool of the Ohio River and it is possible that *Elliptio crassidens* may be present, albeit in very low numbers, in the remainder of the proposed dredging area. Given that no individuals were encountered within a 30-meter by 34-meter area of the proposed dredging area, amounting to a third of the total proposed dredging area, it is estimated that no more than one individual is expected to be encountered during the relocation, and the estimated take for this species is one individual mussel.

### **Ohio Pigtoe**

The Ohio pigtoe (*Pleurobema cordatum*) has been listed as threatened by the state of Illinois since January 18, 1994 (Mankowski, 2012). The general distribution of *Pleurobema cordatum* is the upper Mississippi River drainage and the St. Lawrence River drainage, from western New York west to Michigan, Wisconsin, Iowa, and Kansas, south to Arkansas and Alabama (Parmalee and Bogan, 1998).

According to Gordon and Layzer (1989) in NatureServe (2020), the Ohio pigtoe mussel inhabits large rivers but may be found in medium-sized rivers and is also tolerant of some reservoir environments; in lotic situations, it is found in or immediately above riffles in heterogeneous assemblages of gravel, cobble, and boulder, and also occurs in some habitats with greater depth and substrates of mud/sand/gravel, but seems to require flowing water. In reservoirs, it tends to occur in the sublotic areas of dam tailwaters and may be in some overbank beds. The bluegill (*Lepomis macrochirus*) and rosefin shiner (*Lythrurus ardens*) have been recorded as host fish (Parmalee and Bogan, 1998).

Cummings and Mayer (1992) describe the exterior of the shell as follows:

Shell moderately thick, triangular, and moderately inflated. Anterior end rounded, posterior end bluntly pointed. Dorsal margin straight, ventral margin curved anteriorly, straight posteriorly. Umbos moderately high and projecting forward. Beak sculpture of two or three elevated ridges. Shell smooth, a broad shallow sulcus present in front of the posterior ridge. Periostracum dark brown or chestnut, juveniles often lighter and marked with green rays, particularly near the beaks. Length to 4 inches (10.2 cm).

During the 2019 mussel relocation, performed at the LafargeHolcim truck loadout proposed dredging area, no *Pleurobema cordatum* were found. Based on the historical and recent distribution records of the Ohio pigtoe mussel, the Ohio pigtoe mussel may be present in the Smithland pool of the Ohio River and it is possible that *Pleurobema cordatum* may be present,

albeit in very low numbers, in the remainder of the proposed dredging area. Given that no individuals were encountered within a 30-meter by 34-meter area of the proposed dredging area, amounting to a third of the total proposed dredging area, it is estimated that no more than one individual is expected to be encountered during the relocation, and the estimated take for this species is one individual mussel.

## LITERATURE CITED

- Cummings, Kevin S, and Christine A. Mayer. 1992. Field Guide to Freshwater Mussels of the Midwest. Champaign: Illinois Natural History Survey. Print.
- Mankowski, A. 2012. The Illinois Endangered Species Protection Act at Forty: A Review of the Act's Provisions and the Illinois List of Endangered and Threatened Species. Illinois Endangered Species Protection Board, Springfield, Illinois. 152 pp. Published online at [https://www2.illinois.gov/dnr/espb/documents/the\\_esp\\_a\\_at\\_40\\_final\\_compressed\\_010713.pdf](https://www2.illinois.gov/dnr/espb/documents/the_esp_a_at_40_final_compressed_010713.pdf)
- NatureServe. 2020. Citing Website. NatureServe Explorer: An online encyclopedia of life [web application] Version 7.1. Retrieved March 2020 from <http://explorer.natureserve.org> Date of last data update: March 2019.
- Parmalee, Paul Woodburn, and Arthur E. Bogan. 1998. The Freshwater Mussels of Tennessee. Knoxville: University of Tennessee. Print.
- U.S. Fish and Wildlife Service (USFWS), 2009. Citing Websites. In *U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form, Rabbitsfoot (Quadrula cylindrica cylindrica)*. Retrieved 2020 from <https://www.fws.gov/northeast/pafo/pdf/rabbitfoot%20-%20species%20assessment.pdf>
- U.S. Fish and Wildlife Service (USFWS). 2012. Citing Websites. In: USFWS Endangered Species, Midwest Region. Retrieved 2020 from <http://www.fws.gov/midwest/endangered/clams/sheepnose/pdf/FRFinalListRuleSheepnoseSpecMarch2012.pdf>
- U.S. Fish and Wildlife Service (USFWS). 2013. Citing Websites. In *Federal Register: Endangered Status for the Neosho Mucket and Threatened Status for the Rabbitsfoot*. Retrieved 2017 from <https://www.gpo.gov/fdsys/pkg/FR-2013-09-17/pdf/2013-22245.pdf>

Watters, G. Thomas., Michael A. Hoggarth, and David H. Stansbery. 2009. The Freshwater Mussels of Ohio. Columbus: Ohio State UP. Print.

Williams, James D., Arthur E. Bogan, and Jeffrey T. Garner. Freshwater Mussels of Alabama and the Mobile Basin in Georgia, Mississippi, and Tennessee. Tuscaloosa: University of Alabama, 2008. Print.