

Appendix 7



UNITED STATES ARMY CORPS OF ENGINEERS

Environmental Assessment
for
Authorization of
Commercial Sand and Gravel Dredging
in the Waverly Segment of the
Lower Missouri River

DECEMBER 2015

Prepared by
U.S. Army Corps of Engineers
Kansas City and St. Louis Districts

Table of Contents

List of Tables v

List of Figures v

S E C T I O N	1	Project Information.....	1-6
	1.1	Proposed Action.....	1-6
	1.2	Existing Conditions.....	1-9
	1.3	Jurisdiction.....	1-9
	1.4	Project Purpose.....	1-10
	1.4.1	Overall Project Purpose.....	1-10
	1.4.2	Basic Project Purpose.....	1-11
	1.4.3	Water Dependency Determination.....	1-11
	1.5	Project Need.....	1-11
	1.6	Alternatives Considered.....	1-12
	1.6.1	Proposed Action.....	1-12
	1.6.2	No Action Alternative.....	1-13
	1.6.3	Alternative A.....	1-13
	1.6.3	Alternative B.....	1-14
	1.6.2	Alternative C.....	1-14
	1.6.4	Alternative D.....	1-14
	1.7	Rationale for Setting Alternative Dredging Amounts.....	1-15
S E C T I O N	2	Public Involvement.....	2-18
	2.1	Final EIS and ROD.....	2-18
	2.2	Public Notice.....	2-18
	2.3	Public Hearing Request.....	2-18
	2.4	Agency and Public Comments.....	2-19
	2.5	Substantive Issues, Applicant Reply and Corps Resolution.....	2-19
S E C T I O N	3	Alternatives Analysis.....	3-25
	3.1	Scope of Analysis.....	3-25
	3.1.1	NEPA.....	3-25
	3.1.2	National Historic Preservation Act.....	3-26

	3.1.3	Endangered Species Act.....	3-28
3.2		Alternatives Evaluation Criteria and Analysis of Environmental Consequences.....	3-28
	3.2.1	NEPA Analysis.....	3-28
		3.2.1.1 Geology and Geomorphology.....	3-29
		3.2.1.2 Infrastructure.....	3-39
		3.2.1.3 Navigation and Transportation.....	3-40
		3.2.1.4 Water Resources.....	3-40
		3.2.1.5 Aquatic Resources.....	3-41
		3.2.1.6 Wetlands, Floodplains, and Terrestrial Resources.....	3-42
		3.2.1.7 Federally Listed Species.....	3-42
		3.2.1.8 Land Use and Recreation.....	3-45
		3.2.1.9 Economics and Demographics.....	3-46
		3.2.1.10 Noise.....	3-47
		3.2.1.11 Visual and Aesthetic Resources.....	3-48
		3.2.1.12 Cultural Resources.....	3-48
		3.2.1.13 Air Quality and Climate Change.....	3-49
		3.2.1.6 Selection of the Preferred Alternative.....	3-50
	3.2.2	Cumulative Impacts Assessment.....	3-51
	3.2.3	Clean Water Act (CWA) Analysis.....	3-53
		3.2.3.1 Identification of the LEDPA.....	3-53
		3.2.3.1.1 Segment Limits.....	3-53
		3.2.3.1.2 Limits on Localized Dredging Intensity.....	3-54
		3.2.3.1.3 Monitoring and Adaptive Management Framework.....	3-55
S E C T I O N	4	Evaluation of the Section 404(b)(1) Guidelines.....	4-1
	4.1	Physical and Chemical Characteristics (Subpart C).....	4-1
		4.1.1 Substrate.....	4-1
		4.1.2 Water.....	4-2
		4.1.3 Current Patterns and Water Circulation.....	4-3
		4.1.4 Normal Water Fluctuations.....	4-3
		4.1.5 Salinity Gradients.....	4-4
	4.2	Biological Characteristics of the Aquatic Ecosystem (Subpart D).....	4-4
		4.2.1 Threatened and Endangered Species.....	4-4

4.2.2	Fish, Crustaceans, Mollusks, and Other Aquatic Organisms.....	4-5
4.2.2.1	Aquatic Habitat.....	4-5
4.2.2.2	Aquatic Organisms.....	4-7
4.2.3	Other Wildlife.....	4-9
4.3	Special Aquatic Sites (Subpart E).....	4-11
4.3.1	Sanctuaries and Refuges.....	4-11
4.3.2	Wetlands.....	4-11
4.3.3	Mud Flats.....	4-12
4.3.4	Vegetated Shallows.....	4-12
4.3.5	Coral Reefs.....	4-12
4.3.6	Riffle and Pool Complexes.....	4-12
4.4	Human Use Characteristics (Subpart F).....	4-13
4.4.1	Municipal and Private Water Supplies.....	4-13
4.4.2	Recreational and Commercial Fisheries.....	4-13
4.4.3	Water-related Recreation.....	4-14
4.4.4	Aesthetics.....	4-15
4.4.5	Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves.....	4-15
4.5	Contaminant Evaluation and Testing (Subpart G).....	4-16
4.5.1	Evaluation of Dredged or Fill Material.....	4-16
4.5.2	Dredge and Discharge Site Comparison:.....	4-16
4.5.3	Chemical, Biological, and Physical Evaluation.....	4-17
4.6	Actions to Minimize Adverse Effects (Subpart H).....	4-17
4.6.1	Actions Concerning the Location of the Discharge.....	4-17
4.6.2	Actions Concerning the Material to be Discharged.....	4-18
4.6.3	Actions Controlling the Material after Discharge.....	4-18
4.6.4	Actions Affecting the Method of Dispersion.....	4-18
4.6.5	Actions Related to Technology.....	4-18
4.6.6	Actions Affecting Plant and Animal Populations.....	4-19
4.6.7	Actions Affecting Human Use.....	4-19
4.6.8	Other Actions.....	4-19
4.7	Section 404(b)(1) Guideline Compliance.....	4-19
SECTION 5	Required Mitigation.....	5-1

5.1	Special Permit conditions.....	5-1
5.1.1	Operational Measures.....	5-1
5.1.2	Resource Protection Zones.....	5-2
5.1.2.1	Levees, Pipeline Crossings, Dikes, and Bridges.....	5-3
5.1.2.2	Water Supply.....	5-4
5.1.2.3	Pallid Sturgeon and Cultural Resources.....	5-4
5.1.2.4	Degraded Reaches.....	5-7
5.1.3	Compliance and Monitoring Measures.....	5-8
S E C T I O N 6	Determinations.....	6-1
6.1	Section 176(c) of the Clean Air Act General Conformity Rule Review.....	6-1
6.2	Endangered Species Act.....	6-1
6.3	Historic Properties.....	6-1
6.4	Cumulative and Secondary Impacts.....	6-2
6.5	Water Quality Certification.....	6-2
6.6	Relevant Presidential Executive Orders.....	6-2
6.6.1	EO 11990, Protection of Wetlands.....	6-2
6.6.2	EO 13175, Consultation with Indian Tribes, Alaska Natives, and Native Hawaiians.....	6-2
6.6.3	EO 11988, Floodplain Management.....	6-2
6.6.4	EO 12898, Environmental Justice.....	6-2
6.6.5	EO 13112, Invasive Species.....	6-3
6.6.6	EO 13212 and 13302, Energy Supply and Availability.....	6-3
6.6.7	EO 12630, Takings Implication Assessment.....	6-3
6.7	Significant Issues of Overriding National Importance.....	6-3
6.8	Compliance with section 404(b)(1) Guidelines.....	6-3
6.9	Public Interest Determination.....	6-3
6.10	Finding of No Significant Impact.....	6-4
S E C T I O N 7	Literature Cited.....	7-1

List of Tables

Table 1-1	Dredging Production Equipment to Be Used by the Applicants	1-8
Table 1-2	Waverly Segment Dredging Tonnages as Proposed by the Applicants.....	1-13
Table 1-3	Table Comparing 2011 Permitted Tonnages, Represented as Percentage of Bed Material Load at Below Average Flows, to Bed Surface Change Measured in 2014.....	1-16
Table 3-1	Data Sets used in Corps' 2015 Analysis of Bed Degradation.....	3-30
Table 3-2	Table Showing Average Bed Changes within Dredging Reaches	3-31
Table 3-3	Average Bed Change in Final EIS "Hot Spots".....	3-33
Table 3-4	5-mile Reaches with Degradation Greater than 2 feet from 2009 to 2014	3-34
Table 5-1	Pallid Sturgeon Habitat Areas Protected from Dredging on the LOMR.....	5-6

List of Figures

Figure 3-1	Comparison of individual cross-sectional bed change vs bed change averaged over five miles for 2009-2014. Figure also depicts the natural variability observed bed elevations from year to year which is plus/minus two feet.....	3-32
Figure 3-2	Changes since 2009 (Rolling 5-mile average): Bed Elevations, CRP-Flow Water Surface Elevations, and Cumulative Dredging.....	3-35
Figure 3-3	Changes since in Bed Material and Cumulative Dredging volume since 2009	3-36

S E C T I O N 1

Project Information

This document constitutes an Environmental Assessment (EA) for permit applications under Section 10 of the Rivers and Harbors Act of 1899 (33 United States Code (U.S.C.) § 403, hereafter the RHA)) and Section 404 of the Clean Water Act (33 U.S.C. § 1344, hereafter the CWA)). It evaluates whether a proposed increased dredging quantity in the Waverly Segment would result in impacts not analyzed and disclosed in the Environmental Impact Statement (EIS) and Record of Decision (ROD) for proposed commercial dredging in the Missouri River in the states of Kansas and Missouri finalized in 2011. In compliance with the National Environmental Policy Act (NEPA), a Final Environmental Impact Statement for Missouri River Commercial Dredging was completed and a Notice of Availability was published in the Federal Register (76 Fed. Reg. 10583 (Feb. 25, 2011)). This ROD addressed the requirements contained in Section 10 of the RHA, Section 404 of the CWA, and NEPA and was prepared in accordance with the procedures described at 33 Code of Federal Regulations (C.F.R.) Part 320-332, including Appendices B and C.

1.1 PROPOSED ACTION

The United States Army Corps of Engineers (USACE), Kansas City District (KCD), Regulatory Branch (OD-R) has received two permit applications from Holliday Sand and Gravel (Holliday) and Capital Sand Inc. (Capital), hereafter Dredgers, to cumulatively extract 1,140,000 cumulative tons of sand and gravel in 2016, 1,299,500 cumulative tons in 2017, 1,449,000 cumulative tons in 2018, 1,618,500 cumulative tons in 2019, 1,778,000 cumulative tons in 2020 from the Waverly Segment of the Lower Missouri River (LOMR), Missouri River Miles (MRM) 250-357. The applicants include companies who would:

- Own and operate dredging equipment, tug boats, and barges and who would dredge sand and gravel from within their requested dredging reaches and deliver it to their own onshore sand plants;
- Own onshore sand plants and contract with other companies to dredge sand and gravel from within their requested dredging reaches and deliver it to onshore sand plants; and

- Own dredging equipment and contract to deliver sand and gravel dredged from their requested dredging reaches to onshore plants owned by other companies.

Dredging activities to be conducted under permits issued by the USACE would include dredging of river sediments from the navigable waters of the Waverly Segment of the LOMR, extraction of suitable sand and gravel, and return (discharge) of some of the dredged material into the river. Dredging for sand and gravel in the Waverly Segment is conducted by using hydraulic suction-head or cutter-head dredges mounted on movable barges. The dredge consists of mechanical equipment mounted on a barge that can be moved into position and anchored during dredging operations. The dredge barge is held in a fixed position during dredging by deploying large, fortress-style anchors from the forward corners of the barge on the end of 1,000- to 2,000-foot-long cables. By selectively manipulating the length of each anchor cable, the dredge can be moved forward, backward, and from side to side during the dredging operation. From a single anchoring position, a dredge can operate in an area approximately 1,000–2,000 feet in length and approximately 400–500 feet in width before moving the anchors. Some dredges include piles (called “spuds”) that can be raised and lowered to the river bottom, to assist with maintaining the dredge position.

Both permit applicants use cutter head dredges and onboard processing equipment. During dredging, the dredging head (with or without a cutter head) and a suction line are mounted on a boom (called a ladder) that is lowered to the river bed. Sediment is removed from the river bottom until the suction head comes into contact with hard materials (such as bedrock, large rock substrates, or consolidated sediment layers)—at which time the suction head does not advance further into the river bottom, and the amount of bottom sediments sucked into the suction head is greatly reduced. The dredge boom is then raised, the dredge is relocated, and excavation recommences.

The characteristics of bottom sediments in the Waverly Segment vary with location. Dredging in the Segment produces material of highly variable grain size, including small stones, coarse and fine gravels, sands of various sizes, fine material, and some lignite particles. Sand and gravel suitable for commercial use in building materials must meet material specifications defined by grain size distribution and proportion of each grain size that may be included in the product. The dredged material is passed through screens and settling-sorting equipment to achieve a desired grain size distribution that meets material specifications for various commercial uses. The material ranging from 0.1 to 4.0 millimeters (mm) is typically retained, and the unwanted material is discharged into the river. Most applicants load marketable material onto barges that are tied alongside the dredge barge. The barges, typically

ranging from 120 to 200 feet long and from 30 to 45 feet wide, are pushed upstream and downstream by towboats. During loading and transport, river water drains from the loaded sand and is discharged back to the river via scuppers on the barge.

Once loaded, barges are moved upstream or downstream to a sand plant, where they are tied next to an unloading barge with conveyor transfer equipment. Earth-moving equipment is used to transfer the sand and gravel to a conveyor system that moves it ashore; following offloading at the sand plant, empty barges are returned to the dredge site for reloading. Offloaded material may be washed to remove lignite, resorted into various classifications, and stored for sale and transport. The terminal where the unloading barge is located (the sand plant) typically includes a system of overhead conveyors, stackers, and earth-moving equipment for moving and stacking bulk materials; truck loading facilities; scales; and equipment maintenance facilities.

Sand plant facilities typically have direct access to local, state, and interstate highway systems for product transport. The onshore terminal may also include moorage for dredge barges, transport barges, and towboats. To the extent practicable, vessel maintenance is performed at the onshore facility. Existing and proposed plant facilities are subject to separate permitting and review and are considered in this decision only to the extent that secondary and cumulative impacts of these facilities, resulting from dredging, has been identified.

Table 1- identifies the dredging equipment, barges, and towboats that will be used by the applicants. The location, approximate size and storage capacity, length of water frontage, and adjacent land use of each sand plant facility currently operated or proposed by the dredging applicants is shown in of the ROD.

Permit Applicant	Dredge Barges	Towboats	Barges
Capital Sand Company, Inc.	3	3	12
Holliday Sand & Gravel Company, L.L.C.	2	3	9

Table 1-1 Dredging Production Equipment to Be Used by the Applicants.

Dredging typically occurs from March through December. During the coldest periods, when ice formation may hinder operations and demand for aggregate and sand is lowest, the Dredgers typically perform annual maintenance on their equipment. Dredging operations are typically performed only during daylight hours but are capable of operating around the clock.

Seasonal flows, the configuration of river training structures and bends, and sediment transport in the river generate a pattern of sediment deposition that dredge operators can reasonably predict in some locations. Based on previous experience, dredge operators frequently return to known locations of sediment deposits that meet sand and gravel market criteria. Being able to return to specific locations minimizes the time for dredge movement, produces more consistent dredge material, maximizes yield for a given period of dredging, and reduces the cost of operation. Experience gained over time helps the dredge operators identify these prime locations. Moving to a new reach requires the dredger to search for new or other prime locations, increasing costs and reducing the certainty of supply.

Since 2008, each permitted dredge operator has been required to continuously report its dredge location using global positioning system (GPS) coordinates and its operating status. This reporting has provided a better understanding of where dredging is occurring. The applicants prefer to dredge at locations upstream of the sand plant. This allows loaded barges to travel downstream with the current and empty barges to travel back upstream. River currents in the LOMR are swift, and pushing loaded barges upstream is more costly in terms of fuel consumption. Dredging typically occurs no more than 7–10 miles upstream of a company's sand plant and typically no more than 3–9 miles downstream. This range is dictated by the travel times to move loaded barges to the plant, offload, and return to the dredging site, and by the associated fuel costs. Extending the range of dredging upstream from a sand plant would require using additional barges and tugs to maintain full-time operation of the dredge. Some companies contract for dredging and delivery of dredged sand and gravel, causing some dredging equipment to be relocated to different reaches or segments of the LOMR.

1.2 EXISTING CONDITIONS

Please refer to the Final EIS Section 3.1 for a detailed account of current conditions within the project area and a description of the River's primary uses. Additionally, Section 3.1 identifies the major channel modifications to the River in the last century, including, Reservoir and Dam Construction and Operations, Bank Stabilization and Navigation Project, and a host of Environmental Restoration and Enhancements projects.

1.3 JURISDICTION

The proposed dredging would take place in the Missouri River, Waverly Segment (MRM 250-357). One of the congressionally authorized purposes of the LOMR is navigation, and the LOMR is in fact navigated for various commercial purposes. Under Section 10 of the RHA, the USACE has authority

over dredging activities in navigable waters of the United States. The LOMR is clearly a navigable waterway and thus is regulated under Section 10.

The LOMR commercial dredging operations extract sand and gravel from the river bed using hydraulic suction dredges. The dredges operated by Holliday have onboard equipment to sort the dredged material, press the water out of the desired material, and discard unwanted excessively fine or coarse material and water back into the river in a process that takes several minutes. The desired material is discharged onto a barge and the unwanted material is discharged into the river at a point 40 feet or more from the suction dredge head. The other dredges on the LOMR do not have onboard sorting and drying equipment, and discharge the pumped material and water directly through screens onto a barge with slots or drain holes to allow the water to drain out. Dredged material is discharged back into the river in the form of cobbles and debris separated by the screens, and draining off the barges because the dredged material was not mechanically dewatered. The USACE has determined that the undesired silt, cobbles, and debris that is separated and intentionally discharged back into the river and the suspended silt and sand washed out of the barges with the draining water are discharged back into the river at a point and time that are substantially different from the point and time of extraction and are therefore regulated under Section 404 of the CWA.

1.4 PROJECT PURPOSE

Under NEPA guidelines and implementing regulations in 36 C.F.R. 1502.13 and 33 C.F.R. 320.4, the lead federal agency must state the purpose and need for the agency's proposed action when preparing an EIS, or its supplements. CWA guidelines (40 C.F.R. 230) distinguish between the basic purpose and overall project purpose, and specify that the basic purpose determines whether the proposed action is water dependent. This distinction ensures that the scope of the EIS, or its supplements, and the range of alternatives analyzed are sufficiently broad to fully inform the agency decision maker.

1.4.1 Overall Project Purpose

The overall Project purpose is to profitably extract sand and gravel from the Missouri River that meet certain specifications in order to supply the region's construction and manufacturing needs.

1.4.2 Basic Project Purpose

For purposes of the CWA, the basic (fundamental, essential, or irreducible) purpose of the Proposed Action is to supply the aggregate required to support the region's construction and manufacturing needs.

1.4.3 Water Dependency Determination

No discharges of dredged or fill material into special aquatic sites are proposed or are authorized in this decision. As such, a water dependency determination is not required.

1.5 PROJECT NEED

Sand and gravel are essential components of concrete, asphalt, brick mortar, tile grout, and landscape materials. These materials are used to construct local, regional, and interstate roads and highways; public and commercial infrastructure; public, commercial, and industrial buildings and facilities; and residential housing developments. The use of sand and gravel as a constituent of construction materials is pervasive in the economy of the region that encompasses Kansas City metropolitan area and central Missouri.

The largest use of sand and gravel in the region is for concrete and asphalt, which require material that meets specific requirements related to aggregate size, shape, parent material, hardness, and sorting. Dredging from the Waverly Segment represents one of the most cost-effective methods for supplying sand and gravel because the river provides sorted sand and gravel and does not require the removal of overlying soil called overburden. Sand from the Segment also meets the specific requirements needed for high-quality concrete and asphalt with relatively minimal additional processing.

Historically, demand for sand and gravel within the region has been almost exclusively supplied by dredging from the Missouri, Kansas, and Mississippi Rivers and supply has met or exceeded local demand. However, in 1990, USACE review of Kansas River dredging permits and preparation of an EIS resulted in a significant reduction in the amount of sand and gravel resources authorized for extraction from the Kansas River. As extraction from the Kansas River was restricted and demand for sand in the region increased with economic growth, annual extraction from the entire Missouri River increased from 4,240,000 tons in 1990 to a peak of 8,752,714 tons in 2002. With the recent economic downturn, annual extraction decreased to 4,634,311 tons in 2009.

Dredging permit applicants are commercial enterprises engaged in or planning to engage in extraction and supply of sand and gravel to meet regional construction and manufacturing needs. The existing, currently authorized Dredgers have invested in and developed land and land-based facilities (sand plants) and the capacity to dredge, barge, offload, process, and stockpile sand and gravel at specific locations along the LOMR within the Waverly Segment. Each sand plant services a geographic area or market. The potential dredging area for each operation is determined largely by the distance that the operator can effectively transport the extracted material by barge from the dredge to the sand plant without significant down time on the dredge. This distance is governed by the size and number of barges and push boats available to the operator. The market area is determined largely by the shipping costs for the finished sand and gravel, which is primarily the cost of hauling by truck.

1.6 ALTERNATIVES CONSIDERED

In accordance with 33 C.F.R. 325, Appendix B and 40 C.F.R. 1500–1508, the Final EIS (USACE 2011) evaluated the environmental consequences of the applicants' 2011 Proposed Action, the No Action Alternative, and a range of practicable alternatives that met the basic and overall purpose of the Proposed Action. To better evaluate and regulate the potential environmental consequences of dredging on a long and highly diverse river system, the Missouri River was divided into five separate and distinct river segments: St. Charles (river mile [RM] 0 – RM 130; Mississippi River to Osage River); Jefferson City (RM 130 – RM 250; Osage River to Grand River); Waverly (RM 250 – RM 357; Grand River to Blue River); Kansas City (RM 357 – RM 391; Blue River to Platte River); and St. Joseph (RM 391 – RM 498; Platte River to Rulo, Nebraska). The basis for defining the river segments is given in Section 3.3 of the Final EIS (USACE 2011). The Environmentally Preferred Alternative was a composite of the best alternative for each segment. Alternatives considered for the proposed action are described below.

1.6.1 Proposed Action

Two companies have requested approval of Department of the Army (DA) Permits (DA permits) for dredging sand and gravel from the Waverly Segment of the LOMR, generally with the existing permit conditions (e.g., exclusion zones and operating protocols). **Error! Reference source not found.**2 contains the names of each of the applicants, the annual tonnage amount requested, and the locations by river segment and general reaches for proposed dredging activities.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

Application Number	Applicant Name	River Reach Requested	Annual Tons Requested
NWK-2011-00361	Capital Sand Company, Inc. (Capital Sand)	Waverly Segment (MRM 250-357)	2016 – 370,000 2017 – 452,500 2018 – 535,000 2019 – 617,500 2020 – 700,000
NWK-2011-00363	Holliday Sand and Gravel Company (Holliday Sand)	Waverly Segment (MRM 250-357)	2016 – 770,000 2017 – 847,000 2018 – 924,000 2019 – 1,001,000 2020 – 1,078,000
Total (All Dredgers Combined)		Waverly Segment (MRM 250-357)	2016 – 1,140,000 2017 – 1,299,500 2018 – 1,459,000 2019 – 1,618,500 2020 – 1,778,000

Table 1-2 Waverly Segment Dredging Tonnages as Proposed by the Applicants.

1.6.2 No Action Alternative

NEPA requires that one of the alternatives evaluated in detail in an Environmental Assessment is the No Action Alternative. The No Action Alternative for this EA is defined as not approving any of the pending permit applications for commercial sand and gravel dredging on the LOMR. Commercial sand and gravel dredging on the LOMR would cease upon expiration of the current commercial dredging permits. This alternative was evaluated in the Final EIS and therefore was not evaluated in this document. Impacts associated with this Alternative were disclosed in Sections 3 and 4 of the Final EIS.

1.6.3 Alternative A

Allowable commercial dredging tonnages would be set at levels that represent 10% of the estimated bed material load at below-average flow conditions. Each segment would be limited to the annual

amount shown in the column for Alternative A in, with the result that total dredging in all segments combined would be 500,000 tons per year in the Waverly Segment. It was assumed that dredging locations would be limited to those river reaches shown for each applicant in subject to the existing permit conditions (e.g., exclusion zones and operating protocols) and subject to rigorous monitoring under the Adaptive Management Framework. This alternative was evaluated in the Final EIS and therefore was not evaluated in this document. Impacts associated with this Alternative were disclosed in Sections 3 and 4 of the Final EIS.

1.6.4 Alternative B

Allowable commercial dredging tonnages would be set at levels that represent 15% of the estimated bed material load at average flow conditions, i.e. 1,140,000 tons per year in the Waverly Segment. It was assumed that dredging locations would be limited to those river reaches shown for each applicant subject to the existing permit conditions (e.g., exclusion zones and operating protocols) and subject to rigorous monitoring under the Adaptive Management Framework. This alternative was evaluated in the Final EIS and therefore was not evaluated in this document. Impacts associated with this Alternative were disclosed in Sections 3 and 4 of the Final EIS.

1.6.5 Alternative C

Allowable commercial dredging tonnages would be set at levels that approximate recent dredging amounts for a five year average (2004-2008) in the Waverly Segment. Extraction in the Waverly Segment would be limited to the 820,000 tons per year. It was assumed that dredging locations would be limited to those river reaches shown for each applicant in subject to the existing permit conditions (e.g., exclusion zones and operating protocols) and subject to rigorous monitoring under the Adaptive Management Framework. This alternative was evaluated in the Final EIS and therefore was not evaluated in this document. Impacts associated with this Alternative were disclosed in Sections 3 and 4 of the Final EIS.

1.6.6 Alternative D

This is a new alternative since the finalization of the 2011 EIS and ROD. However, it is similar to the evaluated (and selected) alternative for the Jefferson City Segment where the Corps authorized the removal of up to 38% bed material load at below normal-flow conditions. Therefore, Alternative (D) would allow commercial dredging tonnages to be set at levels that represent 38% of the estimated bed

material load at below-average flow conditions, i.e. 1,900,000 tons per year, in the Waverly Segment which is near the upper end of the range of alternatives that have verifiably maintained a stable bed elevation as indicated by monitoring data in the Jefferson City Segment. It was assumed that dredging locations would be limited to those river reaches shown for each applicant in Table 1-1 subject to the existing permit conditions (e.g., exclusion zones and operating protocols) and subject to rigorous monitoring under the Adaptive Management Framework.

1.7 RATIONALE FOR SETTING ALTERNATIVE DREDGING AMOUNTS

To properly establish alternatives in the Final EIS, the USACE compared Missouri River bed material load estimates for each segment to the average annual amount of material dredged during the 2000–2009 time period for average and below-average flows.

Alternatives (A), (B), and (C)

Using the above information as guidance, dredging levels for Alternatives (A) and (B) were developed. Alternative (A) allowed 10 percent of the estimated bed material load under below-average flow conditions (represented by the period from 2000–2009) to be extracted. Alternative (B) allowed for a somewhat higher level, 15 percent of the estimated bed material load under average flow conditions (represented by the period from 1994–2009). Alternative (C) dredging limits were based on average annual dredging levels by river segment from 2004 to 2008 and ranged from approximately 9% in the St. Joseph Segment to 49% in the Kansas City Segment. Together with the Proposed Action and the No Action Alternative, these three alternatives bound the range of practicable alternatives at the time the EIS was finalized.

A thorough evaluation providing rationale for the establishment of differing dredging amounts represented by Alternatives (A – C) is located in Section 2.6 of the ROD.

Alternative (D)

A new Alternative (D) was developed to evaluate the Dredgers requests for additional tonnage in the Waverly Segment as part of the 2016 permit renewals. This Alternative, similar to Alternatives (A – C), was developed by examining the bed material loads in the Segment (USACE 2011), but capped the available tonnage at levels that have proven to maintain stable bed conditions in nearby segments, as identified by bathymetric data.

The selected Alternative (B) in the 2011 ROD for the Waverly Segment was the highest alternative (1,140,000 tons annually) evaluated in the Final EIS for that segment; it represented 15% of the bed material load during average-flow and 22.8% of bed material load at below average-flow conditions. However, the USACE analyzed and selected extraction of bed material loads much higher than this as part of our 2011 permit decision (Table 1-3). For instance, the selected Alternative (C) in the Jefferson City Segment authorized the removal of up to 38% of the bed material load at below average-flow conditions, all the while, the Segment remained stable, showing 0.28 feet of aggradation between 2011 and 2014, when comparing bathymetric data collected between 2011-2014 and compared against 2009 baseline data (Table 1-3).

Segment	Bed Material Load from EIS at Below Average-Flows (BAF)	10% of Bed Material Load at BAF	Permitted (2011) Tons	Permitted (2011) Percentage of Bed Material Load at BAF	2016 Tonnage Requested of BAF	Change in Bed Elevation since 2009*
Waverly (MRM 250-357)	5,000,000 tons	500,000 tons	1,140,000	22.8%	35.5%	0.30
Jefferson City (MRM 130-250)	4,300,000 tons	430,000 tons	1,630,000	37.9%	-	0.28
St. Charles (MRM 0-130)	3,700,000 tons	370,000 tons	1,710,000	46.2%	-	-0.04

Table 1-3 Table Comparing 2011 Permitted Tonnages, represented as percentage of bed material load at below average flows, to bed surface change measured in 2014.

*Calculations are derived from bathymetric data collected as part of the 2011 permits.

This information provides a basis for understanding sediment removal thresholds and corresponding bed trends of the River in response to dredging which ultimately led to the development of Alternative (D). Based on the above calculations, the Dredgers requested tonnages represent the removal of up to 35.5% of bed material load at below average-flow conditions in the Waverly segment. This level of dredging has been demonstrated as sustainable in other segments and will be evaluated in the Waverly Segment in this document (Table 1-3 and Section 3.2.1.4.). To remain consistent, and because the USACE has collected and analyzed data that demonstrates the River’s capability to tolerate the removal of up to 38% of bed material load at below average-flow conditions and remain stable and/or

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

aggrading in the nearby Jefferson City segment, dredging levels under Alternative (D) were set at 1,900,000 tons, or 38% of bed material load at below average-flow conditions in the Waverly Segment.

S E C T I O N 2

Public Involvement

2.1 FINAL EIS AND ROD

A public meeting was conducted on 26 August 2010 to discuss the Draft Environmental Impact Statement (EIS) on Missouri River commercial dredging. A court reporter was provided at the meeting to allow meeting attendees to submit oral comments. In addition, agencies, organizations, and interested parties provided written comments on the Draft EIS. In some cases, additional analyses were required to adequately address the issue raised. Comments received during the Draft EIS comment process were considered in the preparation of a Final EIS. The Final EIS on Missouri River Commercial Dredging was published in the Federal Register on 25 February, 2011. The USACE published its ROD on 1 April 2011 which stated the environmentally preferred alternative should not cause more than slight degradation in the short and long term and would balance all public interest facets.

2.2 PUBLIC NOTICE

A Joint Public Notice was issued by the USACE, the Kansas Department of Health and Environment, and the Missouri Department of Natural Resources on 13 March 2015 to initiate a public interest review for the renewal of commercial dredging permits. The Joint Public Notice comment period remained open beyond 21 days and closed on 3 April 2015. Comments received in response to the Joint Public Notice were incorporated into the Combined Decision Document for the 2016 permit renewals.

2.3 PUBLIC HEARING REQUEST

There was one request for the USACE to hold a public hearing. The request was submitted on 2 April 2015 by WaterOne and was subsequently denied. This topic is discussed in further detail within the USACE's Combined Decision document for the 2016 permit renewals.

2.4 AGENCY AND PUBLIC COMMENTS

Very few agencies or public comments addressed the increase in requested tonnages for the Waverly Segment. Those agency and public comments that were related specifically to dredging in the Waverly Segment are discussed in further detail within the USACE's Combined Decision document for the 2016 permit renewals and briefly below.

Comment:

The United States Environmental Protection Agency (EPA) is concerned that permitting increases above 2011 permitted levels in the Waverly Segment could alter a stable and aggrading segment into a degrading segment.

Response:

The Corps understands the EPA's concern, but the EPA has presented no data to validate their concerns or claims. With the help of KCD's Engineering Division (ED), River Engineering Branch (ED-HR), OD-R continues to monitor the bed trends of the Missouri River. Water surface profiles are collected yearly and a hydro-acoustic bed survey is conducted on the fourth year of every permitting cycle. These data are compared against baseline data from 2009 to help identify degradation or aggradation trends.

Results to date, demonstrate the ability to slow or stall localized degradation that stems from area-intensive dredging using spatial and temporal extraction limits. This was clearly indicated in ED-HR's 14 July 2015 Memo which highlighted Missouri River bed and water surface changes between 2009 to 2014 in response to dredging. Analyses conducted by the ED-HR indicated aggradation or stability within each of the River's segments since 2011, with the exception of the St. Joseph segment. The results were used to inform OD-R of the proper permitting path forward while considering the requested increases within the respective Segments. Furthermore, the preparation of this EA is specifically for the overall review and evaluation of the higher dredging alternative in the Waverly segment, Alternative (D).

2.5 SUBSTANTIVE ISSUES, APPLICANT REPLY AND CORPS RESOLUTION

One substantive issue was forwarded to the applicant pertaining to the increases in extraction totals proposed for the Waverly Segment and is listed below.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

Another substantive issue arose on 10 November 2015 when ED provided a memo to OD-R containing engineering recommendations related to increasing extraction totals in the Waverly Segment.

All other substantive issues are addressed in the USACE's Combined Decision document for the 2016 permit renewals.

Issue Forwarded to Applicant:

Issue - The cumulative extraction totals requested by Holliday Sand and Gravel Company and Capital Sand Company, Inc. exceed the highest alternative evaluated under the 2011 Final EIS and ROD. Thus, to properly evaluate these proposed actions the Corps will be evaluating a higher tonnage alternative in the Waverly Segment.

The EPA does not believe there is justification for the requested tonnage increases above those authorized in the 2011 ROD.

Applicant Responses:

(Shorr, Lathrop and Gage, LLP)

The EPA's recognition that the extraction request exceeds the highest alternative analyzed in the 2011 Final EIS and ROD is accurate. However, the EPA's claim that there is no justification for the requested tonnages is not accurate. Bed and Water Surface Profile data from 2011-2014 show that the Waverly Segment continues to accumulate additional material (sand). The Dredgers may request additional tonnage in aggrading segments under the Adaptive Management Framework (AMF).

(Odell, Holliday Sand and Gravel)

The Waverly Segment has been aggrading, has very little structural risk, and the phased incremental tonnage allocation will not contribute to degradation. We have calculated a net deposition of 1.1 million tons of sand in the upper Waverly Segment, MRM 345-357 from 2009-2013. Considering the 2011 high water event, this continuing trend of aggradation clearly shows a stable and aggrading reach under the worst conditions.

The requested tonnages in the Waverly Segment are also consistent with the AMF identified in the Final EIS and ROD.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

The Final EIS based dredging intensity on the percentage of tons dredged versus the bed material load in tons. The requested increases in the Waverly segment by Holliday represent only 22% of the average annual tons of bed material load (4,956,000 tons) calculated in the Final EIS between 2000-2009. Comparatively, the ROD approved dredging at 37% and 45% bed load in the Jefferson City and St. Charles Segments, respectively.

The EPA's claim that the increased tonnages in the Waverly Segment would lead to significant degradation of the Nation's Waters is not consistent with the analysis and interpretations found in the USACE's Final EIS.

Issue:

ED recommends that the tonnage be maintained at the currently permitted level, which represents a 183% increase over the average dredged from 2011-2015. The rationale for this recommendation is (1) Observed aggradation is very slight, (2) 1,140,000 tons/year is the upper bound of dredging analyzed in the EIS, (3) The actual dredged amount from 2011 to 2015 was 55% of the authorized amount, which provides insufficient empirical evidence to correlate the 2009 to 2014 bed response to dredging levels above (or even at) the 2011-2015 authorized levels.

Discussion: OD-R understands that the amount of tonnage requested for the Waverly Segment is higher than the highest alternative considered in the Final EIS. However, in keeping with the Adaptive Management Framework within the Final EIS OD-R will consider the additional tonnage requested in the Segment. The Waverly Segment is believed to have been aggrading since 1998 and this was affirmed by bathymetric data collected in 2014. We have prepared a Supplement EA to evaluate the effects of the requested increase in dredging and it is attached to this decision document (Appendix 7).

It is also worth noting that the 2011 ROD incentivized the Dredger's to not remove and stockpile unneeded permitted sand by allowing up to a 10% of their authorized tonnage to be carried over from the previous year. To now penalize the dredgers for not removing all their permitted tonnage between 2011 and 2014 would create regulatory uncertainty and could result in extractions and impacts above those prompted by the market demands and the public interest.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

Issue:

ED recommends that sustainable dredging levels be considered when permitting dredging amounts for this permit cycle and future permit cycles and the analysis within ED Memo "A Sediment Budget Approach to Stable Dredging Levels on the Missouri River, 1994 to 2014 –October 2015" be updated for each future permit renewal. Sustainable dredging levels will allow for an overall stable river bed and provide more certainty of permitted quantities between permit cycles by reducing the likelihood that extracted volumes cause degradation that necessitate reductions in permitted dredging levels.

The October 2015 Memo presented a river-wide analysis that suggested a stable extraction rate for the Missouri River from 1994 to 2014 was 2.4 million tons/year.

Discussion: Due to the length of the river being considered for dredging permits, a means of dividing the river into manageable units was needed for the Final EIS. The LOMR from Rulo, Nebraska to St. Louis, Missouri includes diverse environmental conditions and considerable variations in land uses encompassing rural and urban areas. In addition, there is considerable variation in historical dredging operations and in supply from major tributaries. Finally, there are limited locations where sufficient hydrologic and sediment data have been collected to allow computation of sediment bed load estimates.

Of primary importance in evaluating Missouri River commercial dredging is the potential for contributing to or exacerbating river bed degradation and how that degradation may affect various aspects of the natural and human environment. The two most important factors for segmenting the LOMR were (1) the limited number of locations where data are available to calculate sediment loads in the river; and (2) the number and location of major tributaries contributing additional sediment load to the river. Segment boundaries were established at major tributaries: Kansas River (RM 367.5), Grand River (RM 249.9), and Osage River (RM 129.9). Physical parameters such as bedrock geology, slope breaks, tributaries, width of the alluvial floodplain, and USGS gage locations were reviewed to refine the segment boundaries.

During the river segmentation process, it was recognized that the confluence of the Kansas and Missouri Rivers at Kansas City created a special circumstance. The Kansas River joins the LOMR in the heart of Kansas City, bisecting both the urbanized area and the area with the most observed channel degradation within the Project area. To better analyze issues specific to the Kansas City area, an additional segment was created by selecting tributaries upstream and downstream from the Kansas

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

River, creating the Kansas City segment. The upstream tributary is the Platte River (Missouri) at RM 391.1, and the downstream tributary is the Big Blue River at RM 356.9.

Five segments were used to compute sediment bed loads in the river, describe the existing environment in those segments when possible, and provide basis for the impact analysis. The Final EIS then used historical dredging data (1998–2009) to determine where dredging occurred and at what intensity. These patterns were then compared with observed patterns of local bed degradation by using linear regression to analyze changes in local bed elevations in relation to dredging intensities and to total dredging amount as a percent of bed material load per segment.

Based on the above information, OD-R cannot utilize the sediment budget proposed by ED within the October 2015 Memo. The analysis within the memo introduces a new, un-vetted management framework that does not account for the dynamic set of circumstances that forced OD-R to initially segment the River.

The sediment budget presented by ED suggests that approximately 2.4 million tons/year of sediment dredged from the system would be the greatest amount of sediment that could be dredged without leading to degradation. This analysis represents a worst case scenario that permits 'zero degradation'. OD-R evaluated a similar Alternative [A] (Table 4-1) in the Final EIS which would have cumulatively allowed approximately 2.2 million tons of material per year to be dredged from the Missouri River between 2011 and 2015. This level of dredging was determined to be impracticable from a public interest standpoint in four Segments (St. Joseph, Waverly, Jefferson City, and St. Charles). The 2011 Final EIS and ROD determined that authorizing dredging amounts higher than Alternative [A] in the aforementioned Segments was the environmentally preferred alternative, so long as it did not result in more than slight degradation in the short and long-term. Our determination was not based on a 'zero bed degradation' standard, rather, it was based on a public interest review that took into consideration all substantial public input factors. Because ED's approach would not be consistent with the decision making framework within the Final EIS and ROD, and because a similar alternative was already found to be impracticable in four Segments, OD-R will not be carrying this engineering recommendation forward in this document.

The model utilized in the Final EIS and ROD to predict short and long-term changes in bed elevations has been validated in the last five year. There is no apparent need to modify the Regulatory decisional framework at this time. Further, OD-R's Adaptive Management Framework appears to be adequately detecting recent changes in bed elevation and segment trends compared to baseline data. Acting in

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

concert, the Regulatory decisional framework and Adaptive Management Framework have undergone rigorous analysis, robust public interest review, and have experienced real-world use; the continued utilization of these components is an appropriate means, and appears to be the best method currently available to address the regulatory responsibilities assigned to the Corps under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

Alternatives Analysis

Analysis of the environmental consequences of the Proposed Action and other alternatives is required by the CEQ NEPA regulations (40 C.F.R. 1502.14); the Section 404(b)(1) Guidelines (40 C.F.R. 230.1(a)); USACE regulations (33 C.F.R. 320.4(a)(2)); Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. §470); and Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. §1531-1543). The type of alternatives to include, the impacts that should be analyzed, and the scope of analysis is defined differently and can vary somewhat under each authority.

3.1 SCOPE OF ANALYSIS

3.1.1 NEPA

The purpose of this Environmental Assessment is to inform USACE decision makers of the environmental effects of decisions regarding authorization of dredging to commercially extract sand and gravel from the Waverly Segment of the LOMR. The scope of the EA includes:

- Project scope – This EA directly considers those activities within the jurisdiction of the USACE under Section 10 of the RHA and Section 404 of the CWA within the Waverly Segment. This includes extraction of sand and gravel resources from the river bed using hydraulic dredging equipment. Changes to operations of vessels and barges on the river; moored off-loading barges; and land-based materials handling, stacking, and processing at sand plants are not proposed and therefore are not within the purview of this Section 10 and Section 404 permit decision. Proposed changes to these activities would be evaluated by the relevant state or federal permitting authorities. Dredging operations are evaluated in the EA to the extent that indirect impacts may be associated with these activities.
- Proposed Action and alternatives – The Final EIS scope included environmental analysis of the 2011 Proposed Action, No Action Alternative, and other action alternatives that would allow continuation of some commercial sand and gravel dredging in the Waverly Segment. Imbedded in

the No Action Alternative and each of the action alternatives (A,B,and C) is the fact that alternate sources of commercial sand and gravel would be needed to supplement sand and gravel dredged from the Missouri River in order to meet some or all of the regional demand.

The No Action Alternative and Alternatives (A), (B), and (C) were not selected as the preferred alternative in the Waverly Segment for this five-year permitting cycle. The impacts associated with each of these alternatives is thoroughly discussed in the Final EIS (Section 2.6). The 2015 proposed action was not selected because the rationale for the dredgers' desired extraction amounts did not correlate with any previous extraction levels in nearby segment(s) when comparing bed material loads. However, the proposed action does not differ substantially from the preferred alternative evaluated below. Therefore, impacts associated with the dredgers' proposed action are not anticipated to have an appreciable difference from the preferred alternative resulting in significant effects on the human environment.

- Geographic scope – The geographic scope of the Final EIS included the Waverly Segment of the LOMR. It also includes the portions of tributaries to the LOMR that are immediately adjacent to the main channel of the Missouri River. The geographic scope of the EA includes the main channel and floodplain of the Missouri River, the most downstream portions of tributaries to the Missouri River to the extent that they may be indirectly affected by river bed degradation, and the region surrounding the Project area portion of the river to the extent that specific resources may be affected by dredging or use of alternate sources of sand and gravel. For example, the broader sand and gravel market areas are included when evaluating alternate sources of sand and gravel, and some entire counties are considered when evaluating potential air quality impacts.
- Temporal scope – Dredging activities have occurred in the Waverly Segment for approximately the past 100 years, and previous dredging permits have been authorized for 5-year periods. To the extent that a specific resource analysis considers future trends, trends up to a 20-year time frame were evaluated. For the cumulative analysis, projects and programs reasonably likely to occur within a 20-year time frame were evaluated. Sufficient information on future foreseeable actions was not available to reasonably analyze future trends beyond an approximately 20-year time frame.

3.1.2 National Historic Preservation Act

Projects involving federal land, funds, review, or permitting are subject to compliance with Section 106 of the NHPA. Section 106 requires federal agencies such as the USACE to take into account the effects of their undertakings on historic properties. An "historic property" is any district, archeological

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

site, structure, sacred site, or object that is included on or eligible for inclusion in the National Register of Historic Places (NRHP). As the lead federal agency with jurisdiction over the permitting of commercial dredging along the LOMR, the USACE is responsible for ensuring compliance with Section 106 of the NHPA and other pertinent cultural resource laws and regulations. Section 106 also requires that the USACE consult with SHPOs, federally recognized Native American tribes, local governments, and other interested parties regarding the proposed undertaking. In addition, the Advisory Council on Historic Preservation (ACHP) would be consulted for projects adversely impacting historic properties.

Part of the USACE's responsibility under the NHPA is to determine scope of analysis, or the Permit Area, which should include those areas that may be affected by the undertaking. Project-related activities with the potential to directly affect historic properties include excavation and removal of sand and gravel from the main channel of the LOMR. Potential indirect effects that may result from increased river bed degradation related to dredging include erosion, induced instability, headcutting, and related channel effects from dredging activities. Areas affected by erosion induced by headcutting could include banks of the LOMR and localized areas of tributaries. Because of the above known and potential impacts, the Permit Area for this Project was determined to include the main channel of the LOMR in the Waverly segment and extending from the top of bank to approximately 50 feet below the river bottom (i.e., the greatest potential depth of dredging activities). The Permit Area also includes perennial tributaries joining the LOMR for a distance of 0.25 mile upstream or to the first upstream control point. A "control point" includes any natural streambed feature or human-made structure that provides grade control and controls or impedes the upstream progress of a headcut. Because degradation of the tributaries is not likely to extend more than 20 feet beyond the current banks of the LOMR and its tributaries, the Permit Area extends 20 feet landward of each bank.

Sand plants owned and operated by the dredging permit applicants are not included in the Permit Area as they were previously permitted by the USACE, if authorization was required. It is reasonably foreseeable that some alternatives may result in extraction of sand or gravel from new upland mining sources. These upland mining sources are not included in the Permit Area for this Project because actions related to the upland mining sources would not be subject to any of the USACE permits that would be issued under this Project. Construction and operation of proposed sand plants and alternate mining sources were considered in the indirect effects analysis in Section 4.13 of the Final EIS (USACE 2011).

3.1.3 Endangered Species Act

The ESA is the primary federal law protecting threatened and endangered species. The ESA and its subsequent amendments provide for the protection and conservation of federally listed species and the habitats upon which they depend. Under Section 7 of the ESA, federal agencies (such as the USACE) are required to consult with the USFWS to ensure that any federal undertaking, funding, permitting, or authorizing actions would not likely jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. "Critical habitat" refers to a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species, and that may require special management and protection (a more complete definition can be found in the ESA).

The scope of analysis, or Action Area, considered under ESA is defined as the geographic area within which the direct or indirect effects (physical, chemical, and/or biotic) of the proposed federal action will occur, and conforms closely to the geographic scope of the Final EIS. It includes the main channel and floodplain of the LOMR within the Waverly segment. The Action Area also includes perennial tributaries joining the LOMR for a distance of 0.25 mile upstream or to the first upstream control point. A "control point" includes any natural streambed feature or human-made structure that provides grade control and controls or impedes the upstream progress of a headcut.

3.2 ALTERNATIVES EVALUATION CRITERIA AND ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

3.2.1 NEPA Analysis

Based on those issues raised during EIS scoping and the requirements of NEPA (identified in Section 1.6 of the Final EIS), this EA describes the potential environmental consequences of Alternative (D) and the Proposed Action for the following resource areas and topics. The environmental consequences of the no action alternative, and Alternatives (A), (B), and (C) are thoroughly discussed in Section 2.6 of the Final EIS

- Geology and Geomorphology
- Infrastructure
- Navigation and Transportation
- Water Resources
- Land Use and Recreation
- Economics and Demographics
- Noise
- Visual and Aesthetic Resources

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

- Aquatic Resources
- Wetlands, Floodplains, and Terrestrial Resources
- Federally Listed Species
- Cultural Resources
- Air Quality and Climate Change
- Cumulative Impacts

To identify a preferred alternative and determine whether a significant impact will result from the proposed action, the results of the environmental consequences analysis were reviewed. This review found that, for most resource areas, impacts either did not vary substantially or they varied in direct relationship to geomorphic impacts (primarily changes in surface water levels and river bed degradation). This result is reasonable given that impacts to most resource areas are indirect impacts that arise from the direct effects of dredging on geomorphology. Resource areas with impacts that varied in direct relationship to geomorphic impacts include infrastructure, federally listed species, and cultural resources. One resource area where the results did not vary in direct relationship to geomorphic impacts was economics. Economic impacts were primarily driven by volume of authorized material and increased use of alternate sand and gravel resources to offset reduced dredging. The key resource areas that identified the Environmentally Preferred Alternative including infrastructure, federally listed species, cultural resources, and economics are discussed the sections listed below. Conversely, the proposed increases in the Waverly Segment were determined to have no appreciable effect on resources beyond those discussed in Sections 3 and 4 of the Final EIS.

3.2.1.1 Geology and Geomorphology

Section 4.2 of Final EIS exhaustively evaluated four potential impacts on the geology and geomorphology of the LOMR system that may arise from dredging. This evaluation remains applicable to the Proposed Action.

Changes in sediment loads and river bed composition are relatively local, tend to accumulate in areas with the most dredging, and therefore are considered dredging-related impacts that occur in the vicinity of the dredging operation. Tributary degradation and changes in channel geometry and water surface elevation are all tied changes in river bed elevation. Based on these reasons, this EA will focus on bed degradation as an indicator of the potential effects of dredging.

To estimate how dredging intensity influences river bed degradation, the USACE compared historical dredging data to dredging locational (dredging reach) and intensity (annual average dredging amount in tons/mile) data. This information was then compared with observed patterns of local bed degradation

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

by analyzing changes in local bed elevations in relation to dredging intensities using linear regression. The results suggest that 60,000 tons/mile/year may be the upward limit of local dredging intensity that is reasonably unlikely to result in local bed degradation. This figure was not expected to be precise but provides a guide in establishing limits within areas experiencing the most degradation.

Unlike five years ago, the USACE now has monitoring data that were designed to detect dredging induced bed degradation. These data were analyzed and summarized in the 14 July 2015 memorandum to OD-R from ED-HR (2009–2014 Degradation Assessment; USACE 2015). The analysis period of the memorandum encompasses the recent dredging permit period, and thus puts recent and proposed dredging into context with bed elevation changes. Bed elevation change was measured at cross-sections spaced every 250-500 feet (Table 3-1). Water elevation changes were based on water surface profiles collected at discharges approximating the Construction Reference Plane (Table 3-1). The memo reports and analyzes average bed elevation for the LOMR “Hot Spot” reaches identified in the Final EIS (17, 5-mile reaches centered around sand plants), and the five dredging segments.

Year	Data Type	# of Cross-sections (Spacing) / Water Surface Measurements
2008	Hydrographic survey	7326 (250 ft)
2009	Hydrographic survey	10550 (250 ft)
2012	Hydrographic survey	1302 (2000 ft)
2013	Hydrographic survey	10548 (250 ft)
2014	Hydrographic survey	5263 (500 ft)
1990	Water surface profile	180
2009	Water surface profile	164
2012	Water surface profile	174
2014	Water surface profile	174

Table 3-1 Data Sets used in Corps’ 2015 Analysis of Bed Degradation

Table 3-2 presents the average change in elevation over the larger authorized dredging reaches. These data appear to be demonstrating that the LOMR, as a whole, is experiencing no more than slight degradation as predicted in the Final EIS. It is also demonstrating the provisions set forth in the Final

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

EIS that limit extraction totals both spatially and temporally appear adequate and add stability back to certain river segments.

Segment Name	St. Joseph	Kansas City	Waverly	Jefferson City	St. Charles
River Miles	391 to 498	357 to 391	250 to 357	130 to 250	0 to 130
2009 to 2013 (ft)	-1.62	-0.41	0.13	0.08	-0.41
2009 to 2014 (ft)	-1.40	-0.36	0.30	0.28	-0.04

Table 3-2 Table showing average bed changes within Dredging Reaches

Adding to the table above, Figure 3-1 presents the bed change over 5-mile increments centered on each river mile in the LOMR. For example, the bed change shown at RM 350 is a mean of bed change values from cross-sections from river miles 352.5 to 347.5. From these data the USACE concluded that since 2009 the river bed has degraded upstream of the Kansas River (RM 366.5) but experienced slight deposition in Kansas City and Waverly Segments downstream of the Kansas River. Eighty-six percent of the reaches had a change of less than +/-1ft and ninety-nine percent of the 5-mile reaches experienced year-to-year variability of less than +/- 2 ft (Figure 3-1). This suggests that a 2 ft threshold is sufficient for determining persistent geomorphic change in a 5-mile reach; another way to state these findings is to say any observed change in the bed elevation of a 5-mile reach between +2 and -2ft, during a five-year window, is simply the natural variability in the bed forms unless a trend has been established.

ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER

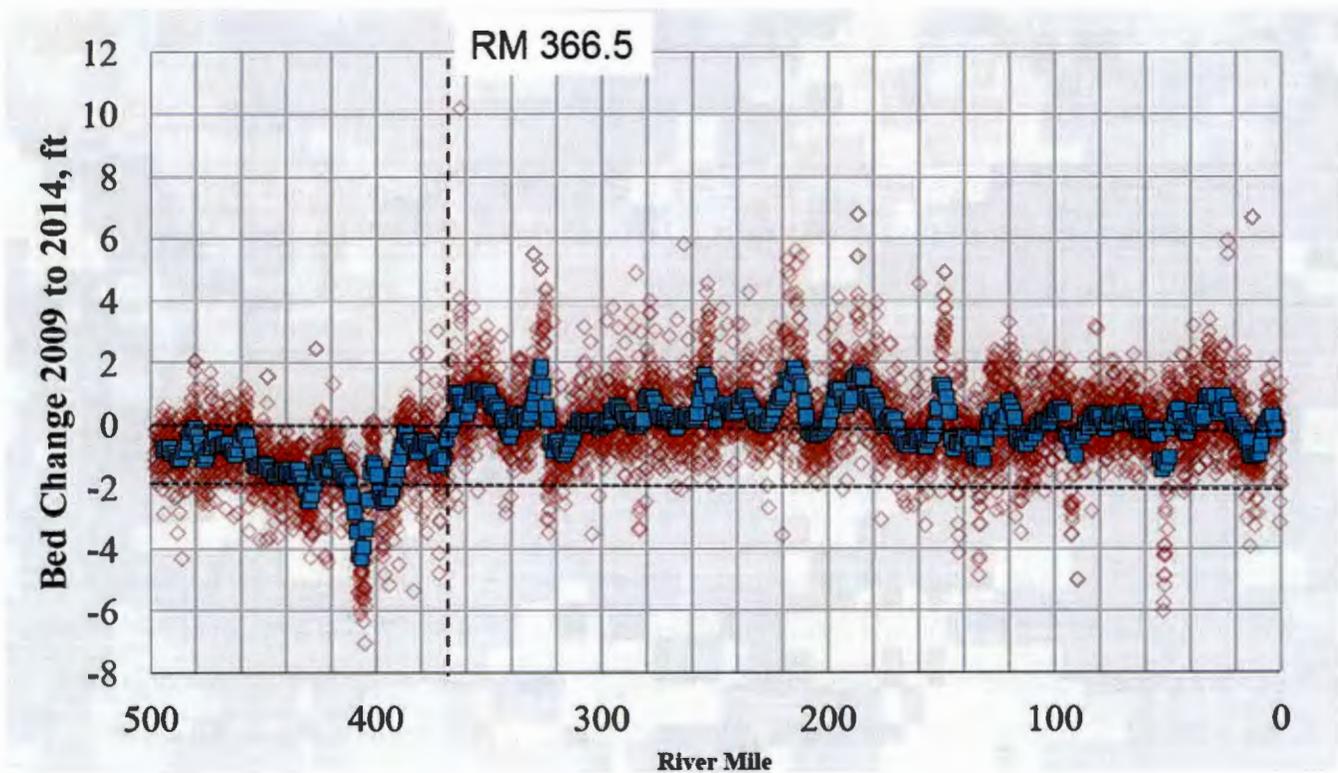


Figure 3-1 Comparison of individual cross-sectional bed change vs bed change averaged over five miles for 2009-2014. Figure also depicts the natural variability observed bed elevations from year to year which is plus/minus two feet.

In the Final EIS the USACE identified 17 reaches of the LOMR that experienced degradation as a result of localized dredging intensity. As a result, a cap was placed on the amount of material that could be extracted from these degraded 5-mile segments (300,000 tons). The 300,000 ton threshold appears to be adequate at preventing future degradation in these areas. Recent surveys have indicated no further degradation has occurred in a majority of the “Hot Spots” (Table 3-3); the exception would be within the “Hot Spots” within the St. Joseph Segment, RM 391-498 (Table 3-3).

ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER

Hotspot RMs	Bed Change 2009 to 2013 (ft)	Bed Change 2009 to 2014 (ft)
15 to 20	-0.48	-0.16
25 to 30	-0.27	0.36
30 to 35	-0.02	0.87
90 to 95	-0.40	-0.59
95 to 100	-0.48	0.54
140 to 145	-0.73	-0.61
145 to 150	0.76	0.87
355 to 360	1.09	0.97
360 to 365	1.13	0.75
365 to 370	0.41	-0.13
370 to 375	-1.58	-1.29
375 to 380	-0.86	-0.55
380 to 385	-1.25	-0.90
385 to 390	-0.71	-0.33
390 to 395	-2.89	-2.07
445 to 450	-1.76	-1.46
450 to 455	-1.55	-1.36

Table 3-3 Average bed change in Final EIS “Hot Spots”

Of the entire LOMR, the 2015 USACE memo documents (19) 5-mile reaches with degradation greater than 2 feet from 2009 to 2014 (see Table 3-4). These reaches were all located upstream of RM 390 within the St. Joseph segment and do not appear to be spatially associated with dredging (Figure 3-2). A degradation trend was believed to be occurring in the St. Joseph segment prior the interpretation of the dredgers bathymetric surveys (Jacobsen et al. 2009). The authorized dredging tonnage amounts in the St. Joseph segment were small relative to other segments, suggesting that the observed degradation greater than 2 feet in these areas is likely a result of geomorphic processes unrelated to dredging. Figure 3-2 shows that bed and water surface elevation changes had no identifiable correlation with dredging locations and quantities in the St. Joseph Segment, or throughout the remainder of the LOMR, due to the extraction restrictions set forth in the 2011 ROD.

ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
 SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
 LOWER MISSOURI RIVER

Reach RMs	Bed Change 2009 to 2014 (ft)
390 to 395	-2.07
391 to 396	-2.07
392 to 397	-2.36
393 to 398	-2.41
394 to 399	-2.48
395 to 400	-2.35
396 to 401	-2.17
401 to 406	-2.42
402 to 407	-3.34
403 to 408	-3.95
404 to 409	-4.33
405 to 410	-4.19
406 to 411	-3.46
407 to 412	-2.82
408 to 413	-2.30
426 to 431	-2.23
427 to 432	-2.45
428 to 433	-2.44
429 to 434	-2.10

Table 3-4 5-mile reaches with degradation greater than 2 feet from 2009 to 2014

ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE LOWER MISSOURI RIVER

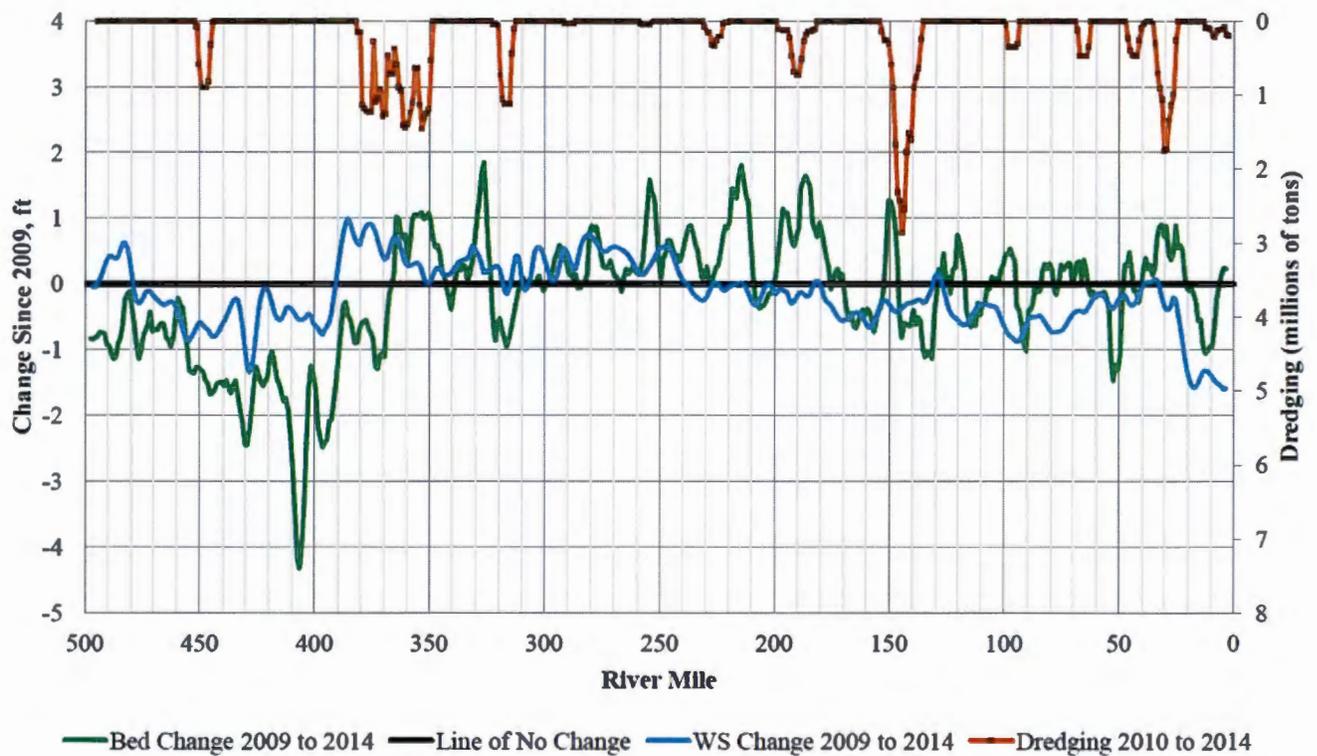


Figure 3-2 Changes since 2009 (Rolling 5-mile average): Bed Elevations, CRP-Flow Water Surface Elevations, and Cumulative Dredging

In 2011, the LOMR as a whole experienced bed degradation in immediate response to a major flood event, and then aggraded from 2012-2014 subsequently (Figure 3-3). These changes represent a major influence on bed elevation changes for the LOMR from 2009-2014, which suggests continued measurement of bed elevation change should be required to fully understand long-term sediment and bed dynamics in the LOMR as they relate to commercial dredging.

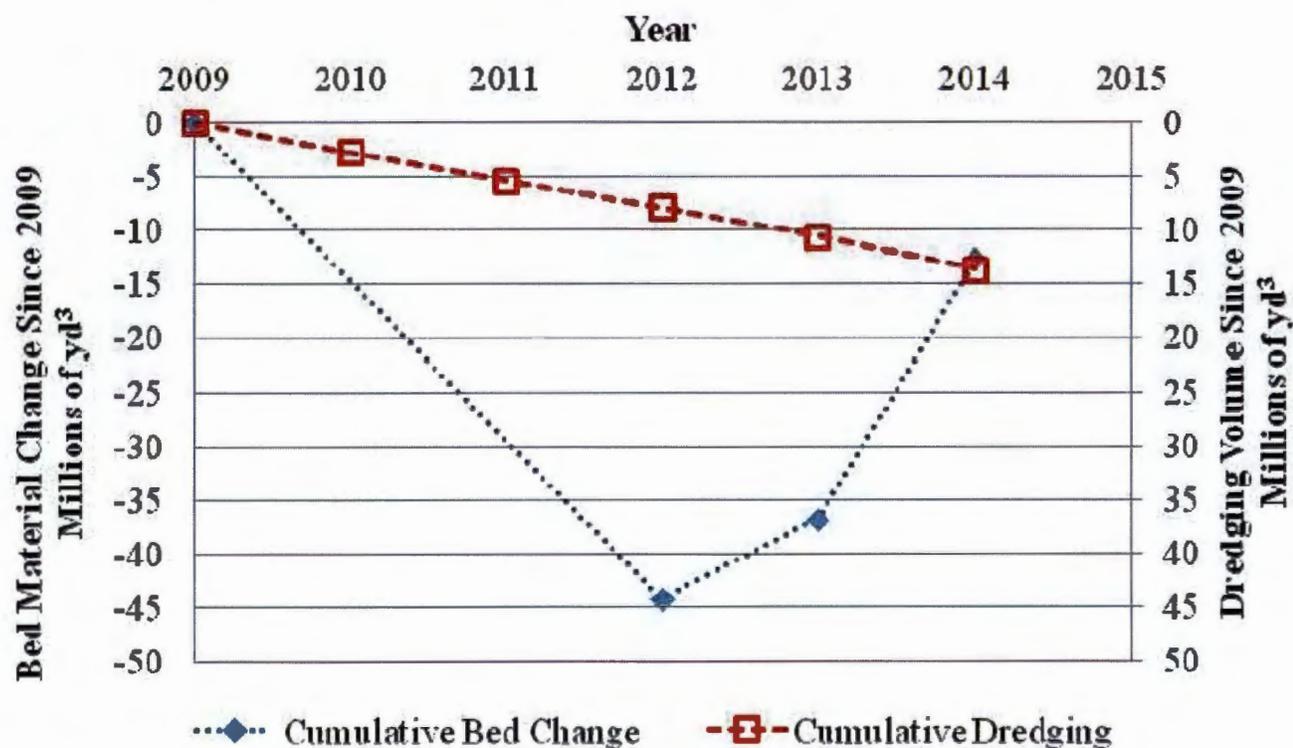


Figure 3-3 Changes since in Bed Material and Cumulative Dredging volume since 2009

Interpretation of recent data appears to demonstrate that there is no correlation between dredging and widespread Missouri River bed degradation, however, as the Final EIS concluded, there does appear to be a spatial correlation between dredging and localized, area-specific, degradation. The results to date demonstrate the ability to slow or stall localized degradation that stems from area intensive dredging using spatial and temporal extraction limits. Analyses conducted by the ED-HR indicated aggradation or stability within each of the River’s segments since 2011, with the exception of the St. Joseph segment. The St. Joseph segment continues to degrade despite limited sand and gravel extraction occurring in this reach. ED-HR concluded that the limited recovery of bed profiles in this segment can be attributed to the extreme high water event that occurred in 2011 and not dredging.

The Waverly Segment continues its aggradation trend from 1998 to present (USACE 2011, USACE 2015b) even with a substantial high flow event in 2011 that significantly flushed the system of sediment. Thus, the ability of the Waverly Segment to tolerate increased levels of dredging appears likely to result in no additional impacts. Converting the dredging tonnages into percent of bed material load, the

USACE calculated the proposed action would remove approximately 36% of the below-normal flow bed material load. The Final EIS (Section 2.6) previously determined that this level, or greater levels, of dredging would not lead to more than slight degradation in the long and short term in the Jefferson City (38% bed material load authorized) and St. Charles (46% bed material load authorized) Segments; however, it did conclude in Section 4.2.7.2 that under Alternative B, removal of 24% of bed material load at below normal-flows, slight degradation may occur in the Waverly Segment. Nonetheless, degradation in the Segment has not been observed. Therefore the removal of bed material loads in the Waverly Segment at requested levels or levels slightly above the proposed, such as those permitted in the Jefferson City Segment where bed stability has been maintained from 2011-2014, may lead to slight degradation but should not lead to moderate or severe degradation of the Segment.

The additional tonnage proposed by the Dredgers represents an approximate 64% increase in authorized extraction totals over the 2011 permits. For this reason the Dredgers requested a phased approach to reach their desired goals; 1,140,000 cumulative tons of sand and gravel in 2016, 1,299,500 cumulative tons in 2017, 1,449,000 cumulative tons in 2018, 1,618,500 cumulative tons in 2019, 1,778,000 cumulative tons in 2020. Any changes in bed profiles induced by the increased dredging activity would be observed in the water surface profiles performed by the USACE each year and/or in the hydro-acoustic bed surveys performed in the fourth year of the permit cycle. Under the Adaptive Management Framework, adjustments could be made to the permitted dredging levels if more than slight degradation is being detected at any point in the permit life cycle.

The addition of a new "Hot Spot", outlined in Section 3.2.3.1.2, in the upper reaches of the Segment will also safeguard against localized degradation stemming from the Segment's increased utilization.

Changes in Sediment Loads and River Bed Composition

Because of the additional amount of dredging required to obtain material that meets specifications, the effects of dredging on sediment availability and coarse sediment would be greater for Waverly Segments under Alternative (D). In general, the bed material in the Waverly Segment tends to be finer than the specifications for concrete sand, requiring additional material to be dredged from the river bed.

Short-term impacts in the Waverly Segment would include a local decrease in sediment availability as the dredged area captures sediment transported by the river, and erosion occurs downriver as the river replaces the captured sediment. The amount of fine sediment in the water column would increase below the active dredge location as the dredging operation discharges unusable material back into the

river. Long-term impacts in the Waverly Segment would include an increase in the concentration of coarse gravel and cobbles on or near the surface of the river bed as material is dredged from the river bed and the material that is too coarse to retain is deposited back onto the surface of the river bed

The USACE does not expect significant impacts resulting from the increased dredging in the Waverly Segment under Alternative (D), because the USACE authorized extraction of bed material loads of 38% (at below normal-flow conditions) in the Jefferson City from 2011 to 2015. Five years of monitoring data from this Segment have demonstrated that these dredging rates did not appear to lead to more than slight degradation in the short term and do not appear to be inducing a long term degradation trend. Therefore, the USACE believes identical dredging rates in the Waverly Segment during the five year permit period will not cause substantial changes to river bed loads and river bed composition.

Changes in River Bed Elevation

Alternative (D) would permit up to 1,900,000 tons of dredging per year in the Waverly segment.

Under this alternative, the amount dredged as a percent of the bed material load at below-average flows would increase from 23 to 38 percent. The amount dredged as a percent of the bed material load under average-flow conditions (as estimated from the 1994–2009 analysis period) would be approximately 25 percent.

The USGS gage at Waverly indicates that the river bed elevation has been stable since approximately the 1993 flood event. The 1998–2009 HBED cross section analysis shows areas of aggradation in the middle portion of the segment (RM 255 to RM 325). Increasing the dredging from 23 to 38 percent of the bed material load, particularly if it is spread throughout the reach, could cause slight degradation or aggradation in the short term and slight degradation in the long term. Changes in river bed elevations would also be subject to normal variability on the river, which would result in some areas with aggradation and some areas with degradation.

The USACE authorized extraction of bed material loads of 38% (at below normal-flow conditions) in the Jefferson City from 2011 to 2015. Five years of monitoring data from this Segment have demonstrated that these dredging rates do not appear to lead to more than slight degradation in the short term and do not appear to be inducing a long term degradation trend. The USACE believes identical dredging rates in the Waverly Segment, which is believed to be aggrading, will experience a similar bed elevation response. Therefore, no significant effects to the river bed elevations are anticipated as a result of the implementation of Alternative (D) during this permit cycle.

Changes in Channel Geometry and Water Surface Elevations

Dredging proposed under Alternative (D) could cause slight degradation or aggradation in the short term and slight degradation in the long term.

Water-surface elevations are closely tied to bed elevations, and as mentioned above, no significant changes in bed elevations are expected under Alternative (D) because the USACE has previously authorized extraction of bed material loads of 38% (at below normal-flow conditions) in the Jefferson City. Five years of monitoring data (2011-2015) from the Jefferson City Segment have demonstrated that these dredging rates do not lead to significant bed elevations changes, nor do they lead to significant changes in water surface elevations.

3.2.1.2 Infrastructure

Generally, the potential physical effect of dredging on infrastructure in the Waverly Segment is directly related to the changes in surface water levels and river bed degradation, but the amounts and values of infrastructure vary within the Segment. Those areas with the greatest amount and value of infrastructure that could be affected by degradation would be more adversely affected by a given amount of degradation than would those segments with a lower amount and value of infrastructure at risk. Adverse impacts that could be expected include compromised performance of water intakes that provide drinking, cooling, and industrial process water thus requiring expensive modifications to intake structures, premature pump wear, and damage that threaten the reliability of electric generation and public drinking water supply; scouring of existing bridge foundations (particularly on tributaries near the LOMR); exposure of and/or damage to petrochemical, sewer, or water pipelines (and associated accidental releases) under the river; and bank and revetment failure that could impair navigation and threaten the integrity of nearby levees. The USACE has added restrictions on dredging intensity in the Waverly Segment's most sensitive reaches (Section 3.2.3.1.2) in order to limit impacts to infrastructure.

Considering the above and because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 4.5 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions. Therefore, no significant effects to infrastructure are anticipated as a result of the implementation of Alternative (D) during this permit cycle.

3.2.1.3 Navigation and Transportation

River navigation and transportation activities will likely increase due to the additional extraction in the Waverly Segment, but, overall, this increase will not cause a significant impact to the human environment. As described in Section 3.6 of the Final EIS, the majority of traffic on the LOMR is associated with commercial dredgers (i.e., tugs and barges), and is generally limited to areas on the river within a few miles (and no more than 7 to 10 miles) upstream of the onshore sand plants. Thus, any increase in dredger-associated traffic, and resultant limitation of navigation area, would be confined to areas close to these facilities. The 300-foot width of LOMR navigation channel is assumed sufficient to allow large vessels, such as tugs, tows, or barges, as well as smaller recreational vessels to maneuver around the commercial dredging vessels if necessary.

Alternative (D) will not lead to appreciable effects outside those already identified in Section 4.4 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions because navigation and transportation-related increases will be concentrated around existing processing facilities on a river that maintains an adequately wide navigation channel. Therefore, no significant effects to navigation and transportation are anticipated as a result of the implementation of Alternative (D) during this permit cycle.

3.2.1.4 Water Resources

We have evaluated the potential effects of increased dredging in the Waverly Segment on surface water (suspended sediments and contaminants) or groundwater (alluvial aquifer levels and interactions).

Because of the natural suspended sediment background concentrations in the LOMR, Alternative (D) would result in a minor, short-term increase in suspended sediment in the Waverly segment. The rate of tributary headcutting would not increase in the Waverly segment under this alternative, which would limit the addition of sediment from tributaries as a result of dredging.

Overall, the increased dredging in the Waverly Segment could result in added contaminants, but due to quick dilution, any elevated contaminant levels would return quickly to background levels.

The deposit of coarse sediment at and downstream of the dredging sites in the Waverly Segment would increase under Alternative (D). This would result in an increase in the number or frequency of areas experiencing a local, short-term change in river bed hydraulic conductivity.

Considering the above and because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 4.5 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions..

3.2.1.5 Aquatic Resources

Slight long-term river bed degradation or aggradation would occur in the Waverly segment under Alternative (D). This may stabilize or slightly decrease the quantity of shallow-water habitat. Depending on the sediment deposition patterns, shallow-water habitat may be created in segments under this alternative. Low-flow water surface elevations are not anticipated to change significantly and may not have a potential to alter the abundance of shallow-water habitat in the Waverly segment.

Under Alternative (D), dredging levels would substantially increase in the Waverly segment (approximately 64% above current authorized levels). This increase in dredging would result in a corresponding increase in the locations and frequencies of benthic habitats subject to direct disruption, even though temporary, of habitat quality and availability.

Increased dredging would result in a corresponding increase in the potential for entrainment, noise, and elevated turbidity. Alternative (D) would result in an increase in temporary localized injury or mortality to fish by entrainment. Localized increases in suspended sediment downstream of the dredge would temporarily benefit native species that are associated with turbid environments and have the potential to adversely affect those species with greater sensitivity to increased levels of suspended sediment (such as non-natives).

We have evaluated the potential effects of increased dredging in the Waverly Segment to aquatic habitats and species. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 4.6 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions..

3.2.1.6 Wetlands, Floodplains, and Terrestrial Resources

Under Alternative (D), dredging in the Waverly and Jefferson City segments would lead to slight long-term decreases in low-flow water surface levels. This effect in turn could lead to slight potential localized indirect effects on floodplain wetlands as a result of changes in groundwater levels that support floodplain wetlands. Because only a slight long-term decrease in low-flow water surface levels is anticipated under this alternative, substantial impacts to groundwater resources and associated wetlands are not anticipated. Effects to groundwater-fed wetlands that are located nearest to the LOMR could occur during periods of prolonged drought. No changes to wetland habitats or species composition would be expected under Alternative (D).

No new facilities would be constructed in Waverly Segment under Alternative (D); therefore, no direct or indirect effects on wetland, vegetation, or wildlife resources would result from construction of sand plants in these segments

We have evaluated the potential indirect effects of increased dredging in the Waverly Segment to wetlands and wetland-dependent wildlife species from changes in groundwater levels. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 4.7 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions..

3.2.1.7 Federally Listed Species

The *2003 Amendment to the 2000 Biological Opinion on the Operation of the Missouri River Mainstem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System* (USFWS 2003) indicated that the portion of the LOMR between the Platte River, Nebraska and the LOMR confluence with the Mississippi River is lacking sediment transport and sediment availability, which is adversely affecting pallid sturgeon habitat development and maintenance (USFWS 2003). Further, the USFWS has stated that larval and juvenile pallid sturgeon are limited by the quantity of SWH that provides rearing and refugia habitat (USFWS 2003). River bed degradation, in conjunction with the local (reach-scale) removal of sand and gravel, could affect the quantity and distribution of natural or created shallow water habitat (SW/H) in the LOMR. Potential effects on

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

naturally occurring SWH could result from changes in elevation, configuration, or connectivity of the SWH to the main river channel, or could affect the performance of SWH projects relative to design specifications. The Missouri River Commercial Dredging Final Biological Assessment (updated October 2015) concluded that slight short and long term degradation is not likely to result in any substantial impacts on the abundance of SWH over and above natural year-to-year variations in the abundance of SWH. Changes on the order of moderate to substantial would likely be required for this to occur.

In response to the USACE's 13 March Public Notice the USFWS requested the USACE update their 2011 biological assessment because of recent information regarding the pallid sturgeon, particularly the larvae life stage of this species. The USACE updated our BA (USACE 2015) and concluded that when combined with the past and present effects, along with those anticipated as a result of future non-federal actions within the Action Area, the proposed action may affect, but is not likely to adversely affect pallid sturgeon. Based on the best available information reported in the literature and the specific factors on the LOMR, the potential for entrainment of adult pallid sturgeon due to dredging and towboat propellers would be extremely low and improbable and thus judged to be minor and discountable. These conclusions are supported by studies where sturgeon entrainment was found to be low, as well as by other studies that found no entrainment of pallid sturgeon.

Without considering the context of the proposed action, drifting larvae appear be susceptible to dredging entrainment while in their free drift state. However, the water being processed while dredging is underway represents a fraction of the water in the Missouri River system at any given point in time. Thus, the USACE is led to conclude the Alternative (D)'s potential to adversely affect the pallid sturgeon during the larval drift period is improbably low, thus minor and discountable.

Assuming post-drifting, age-0 pallid sturgeon utilize Missouri River habitat features in the same way as larval shovelnose sturgeon, entrainment of pallid sturgeon should not occur post-drift stage. Dredging will only be authorized within the Rectified Channel Lines of the Missouri River, outside of the habitats post-drift stage larval sturgeon have been found to be predominately utilizing. Although the thalweg was not extensively sampled as part of recent USACE age-0 sturgeon sampling efforts these data and our current understanding of sturgeon life history indicate habitat features that routinely hold post-drift stage, age-0 sturgeon do not overlap with permitted dredging zones.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

The other potential adverse effect of increased dredging in the Waverly Segment on pallid sturgeon is through indirect effects on natural or created SWH, which is thought to be an important habitat to larval and juvenile pallid sturgeon. However, the effects on SWH are estimated to be minor and insignificant; these claims are supported by the USACE's analysis of the bathymetric data presented in Section 6 of the 2015 Biological Assessment and Section 1.3 of this document. Under the Alternative (D), dredging levels for the entire LOMR, each segment, and the most degraded reaches would be kept to levels expected to result in no more than slight bed degradation and associated changes in low-flow and high-flow water surface elevations in the short term (5 years) and long term. Changes of this magnitude are not expected to result in any substantial impacts on the abundance of SWH over and above natural year-to-year variations in the abundance of SWH. Many of the SWH projects in the LOMR also have protection from the localized effects of commercial sand and gravel dredging because they are within, partially within, or adjacent to dredging exclusion areas. Additionally, annual water surface profiles and a bed elevation survey in the fourth year of each five-year permit cycle were and will be used to monitor and to ensure that bed degradation is not more than expected and that SWH is not lost.

Of the other potential effects of the Alternative (D), all were judged to be minor and discountable. These include:

- Based on the existing information, there appears to be no basis for concluding that noise from commercial sand and gravel dredging would adversely affect pallid sturgeon.
- There is little evidence of avoidance of dredging operations by pallid sturgeon (e.g., due to disturbance, noise, or turbidity), and there is little indication of effects of commercial dredging operations on spawning movements and migrations.
- Based on the current understanding of pallid sturgeon spawning habitats and resource protection zones, commercial dredging is very unlikely to result in direct disturbance of known and suspected pallid sturgeon spawning habitats.
- Increased elevated suspended sediment would have little effect on pallid sturgeon, a species adapted to high levels of turbidity; and plumes downstream of dredging activities may result in a slight temporary beneficial increase to no change in cover habitat to pallid sturgeon that are located downstream of dredging activities.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

- The effects of dredging on pallid sturgeon foraging would likely be limited and temporary, given that the proportion of the total foraging area of the river bottom dredged would be low, and the probability that alteration of the bottom substrates may produce equally productive fish and invertebrate habitats and greater substrate diversity.
- Alternative (D) would not affect the flow regime of the LOMR, which is largely controlled by flow releases from upstream reservoirs.
- The effects on dredging on water quality would be minor, and although there may be an increase in some contaminants liberated from bottom sediment, these levels would be very low and rapidly diluted in the river.

We have evaluated the potential effects of increased dredging in the Waverly Segment on endangered species. Overall, Alternative (D) is not likely to adversely affect the pallid sturgeon and their habitat and will not lead to appreciable effects outside those already identified in Section 4.8 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions..

3.2.1.8 Land Use and Recreation

No new facilities would be constructed in the Waverly Segment under Alternative (D). Existing facilities in these segments would experience an increase in processing quantities, which would not affect adjacent agricultural or industrial land use. Therefore, no change in land use or adverse impact to adjacent land use would occur in these segments under Alternative (D)

Increases in barge traffic would accompany increased dredging in the Waverly Segment under Alternative (D). Interference with recreational boating because of additional barges would be reduced to the extent that (1) alternative boating areas are available in the LOMR; (2) barges are not concentrated in one area; and (3) Condition C of the dredging restrictions is enforced. In addition, many recreational boating trips likely would occur outside of the main channel, where the dredges and barges would operate. The number of dredges on the river would not change.

Under Alternative (D), changes in river bed elevation and low-flow water surface elevations in the Waverly segment would be slight in the short term. Slight river bed degradation and decreases in low-

flow water surface elevations that would occur in the long term are not likely to result in substantial changes in the potential for scour to damage boat ramps.

Under Alternative (D), changes in groundwater levels potentially resulting in conversion or alteration of wetlands would not occur or would be slight in the Waverly Segment. Therefore, wetlands-related recreational opportunities are not expected to change in these segments because of changes in groundwater.

Under Alternative (D), high-flow water surface elevations would not change in the Waverly segment. The frequency or severity of washouts along the Katy Trail or the paved portion of the Historic Trail would not change.

Recreational fishing opportunities would decline to the extent that fish populations decline, but other localized effects to fishing may occur. Increased dredging would result in temporary localized increases in injury or mortality to fish eggs, larvae, and macroinvertebrates by entrainment. Temporary localized noise avoidance behaviors in noise-sensitive fish species also would be expected. Localized increases in suspended sediment downstream of the dredge would benefit species that are associated with turbid environments and would potentially adversely affect those species with greater sensitivity to increased levels of suspended sediment (such as non-natives).

We have evaluated the potential indirect effects of increased dredging in the Waverly Segment to changes in existing or planned land uses, boating, access to boat ramps, and wetland-related recreational opportunities. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 4.9 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

3.2.1.9 Economics and Demographics

Increasing dredging in the Waverly Segment would increase available supplies and provide more flexibility in meeting regional demands, thereby reducing costs. From a regional perspective, increases in sand and gravel production levels, whether from dredging in the LOMR or from alternate sources, would benefit local economic conditions, including increased output, income, and employment. Conversely, decreases in sand and gravel production would adversely affect the local economy. Regional economic effects associated with changes in sand and gravel production need to be considered in conjunction with the benefits and impacts associated with changes in transportation

activity and household income levels. In the long term, regional economic impacts would depend on the location, size, and production levels of new mining operations developed in the region.

Potential economic impacts associated with river bed degradation are difficult to quantify but would be proportional to the amount of degradation expected to occur under the selected alternative. Continued degradation in the LOMR could result in additional expenditures for infrastructure repair, maintenance, and replacement.

We have evaluated the potential effects of increased dredging in the Waverly Segment to regional economics and demographics. Neither a significant economic boost, nor detriment, is expected to occur as a result of the additional tonnage extracted under, Alternative (D). Therefore, no appreciable effects outside those already identified in Section 4.10 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions..

3.2.1.10 Noise

Production would increase the Waverly segment under Alternative (B). Noise-sensitive land uses that have not been exposed to dredging operation noise in recent years could become exposed to noise from these dredging operations. The dredgers utilize small segments of the river repeatedly to supply their sand needs; these areas have a tendency to consistently produce quality sand and are generally found near existing sand processing plants. Additionally, dredging vessels rarely venture extended distances from existing processing plants due to significant fuel costs associated with transporting full barges. Using this reasoning, dredging activities authorized under Alternative (D), are not expected to extend beyond areas dredged in recent years; areas potentially exposed to noise would be the same as indicated in Section 4.11 of the Final EIS.

We have evaluated the potential for increased noise resulting from additional dredging and processing activities in the Waverly Segment. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 4.11 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions. No significant effects are anticipated as a result of the implementation of Alternative (D) during this permit cycle.

3.2.1.11 Visual and Aesthetic Resources

Scenic vistas exist from bridge crossings, roadways along the river, trails, and residences and businesses with expansive views across agricultural fields. Barge trips and dredging would increase under Alternative (D). Increased dredging would adversely affect the visual quality of viewsheds. Slight aggradation or river bed degradation would occur in the short term, and slight river bed degradation would occur in the long term. Low-flow surface water elevations would increase or decrease slightly in the short term and slightly decrease in the long term. These slight changes likely would not result in substantial changes in accessing views from boat ramps and other viewing locations along the river.

The increased number of barges on the river would increase glare produced by equipment on the river. Due to the reflective nature of the river's surface and because equipment would be moving and not stationary, the incremental increase in glare related to the additional barges would not substantially increase total glare in the segment

We have evaluated the potential effects of increased dredging in the Waverly Segment on scenic vistas, scenic routes, or visual character or quality. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 4.12 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions. No significant effects to visual and aesthetic resources are anticipated as a result of the implementation of Alternative (D) during this permit cycle.

3.2.1.12 Cultural Resources

Because of the extensive history of dredging in the main channel of the LOMR, direct adverse effects of dredging on shipwrecks, Lewis and Clark sites, and bridges are not anticipated provided that dredging activities continue to occur in their historical locations and dredging exclusion zones are maintained around known shipwrecks, structures built or authorized by the U.S. Government, normal bank lines, islands, and bridges. Expansion of dredging activities to new areas would require assessment of potential cultural resource impacts as required by existing USACE permit conditions. Discovery of unidentified sites located in the main channel are also addressed through USACE permit conditions.

The principal indirect effects of dredging on cultural resources stem from tributary headcutting and erosion and scouring of the river bed near bridge abutments. These processes may (1) destroy or

damage all or part of the property; or (2) expose archaeological resources, thereby, making an entire site or part of a site vulnerable to human disturbance such as looting or vandalism. Because tributary degradation has not been well quantified on the LOMR and each tributary is different with regard to size, degree of modification, length between the main channel and control points, degradation, and other factors, impacts on the geomorphology of each tributary were not analyzed individually. Instead, the geomorphic impact assessment within the Final EIS characterizes the likelihood that tributary degradation would increase under an alternative based on the change in low-flow water surface elevations on the mainstem LOMR occurring near the tributary. In general, low-flow water surface elevations on the LOMR would need to decrease a moderate or substantial amount before tributaries would likely be affected (see Section 4.2.3.4 of the Final EIS (USACE 2011)). This level of degradation is not anticipated because of the ongoing aggradation trend observed in the Waverly Segment even with the continued presence of commercial dredging and the high flow event in 2011 that flushed the system of sediment.

We have evaluated the potential effects of increased dredging on the historic properties. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 4.13 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions. No significant effects to cultural resources are anticipated as a result of the implementation of Alternative (D) during this permit cycle.

3.2.1.13 Air Quality and Climate Change

Increased production in the Waverly Segment likely would result in elevated pollutant concentrations and greenhouse gas emissions, although the exact concentrations are unknown. Under Alternative (D), it is likely that dredging may expand to new areas to accommodate the increased amount of material permitted in this segment.

We have evaluated the potential effects of increased dredging in the Waverly Segment on air quality and climate change. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 4.14 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions. No significant effects related to air quality and climate change are anticipated as a result of the implementation of Alternative (D) during this permit cycle.

3.2.1.14 Selection of the Preferred Alternative

As discussed in Section 3.2.1 of this EA, the effects of dredging on infrastructure, federally listed species, and cultural resources are directly related to the amount of degradation that is expected to occur. If degradation is limited to no more than slight in the short and long term, then the effects on these three resource areas are expected to be minimal. On the other hand, more than slight degradation could adversely affect shallow water habitat for the endangered pallid sturgeon and cultural resources which would require additional impact assessment, consultation, and mitigation with the USFWS regarding endangered species and the Missouri State Historic Preservation Offices and National Advisory Council regarding cultural resources. Also, more than slight degradation could result in additional expenditures for infrastructure repair, maintenance, and replacement and increase the potential for levee failure. For these reasons each river segment was evaluated separately, and the alternative that would allow the largest amount of dredging while resulting in no more than slight degradation was selected. In this EA, dredging was evaluated as if it would continue to be concentrated around the existing sand plants in the Waverly Segment as it has been over the past decade. The Final EIS (USACE 2011) includes additional analysis of the effects of concentrated dredging on bed degradation. Although not expected to be precise, that analysis of the best available information suggests that 60,000 tons per mile per year may be the upper limit of local dredging intensity that is reasonably unlikely to result in local bed degradation. Based on this dredging intensity target and recent data collection and trend interpretation found in Section 3 of this document, the USACE determined Alternative (D) would be the Preferred Alternative for the Waverly Segment because it would allow the largest amount of dredging while resulting in no more than slight degradation. The USACE looked at the potential of dredging in upstream segments having an impact on downstream segments. We concluded that selecting an alternative that would result in no more than slight degradation in a given segment would not have an additive effect on downstream segments that would be greater than slight. The USACE recognizes that additional information such as a sediment budget would allow for more specific impact analysis. However, limiting dredging to amounts expected to result in no more than slight degradation in each segment creates a safeguard against additive impacts from one segment to the next. During the permit cycle, the USACE will continue to gather information by monitoring water surface profiles and bed elevations. This and other information have already proved beneficial as the USACE continues to assess segment to segment impacts.

The USACE recognizes that the current state of knowledge of the dynamics of the Missouri River system, its geomorphic processes, and river bed degradation dynamics is incomplete. Evaluation and

selection of the new Preferred Alternative (Alternative (D)) in the Waverly Segment, included the use and interpretation of the best currently available information. While the results and the interpretation of the effects of bed degradation are based on the best currently available scientific data, sediment transport and estimates of previous bed degradation are indicators rather than accurate predictors of future degradation.

As discussed in Section 6.3.1 of the Final EIS (USACE 2011), low-flow water surface elevation and hydroacoustic bed elevation data are two types of data that will continue to be gathered to help identify river bed aggradation or degradation. The results of which, will shape the USACE's current and upcoming decisions to authorize certain dredging levels during the five-year permit life cycle. This ongoing re-evaluation reduces the risk of potentially significant impacts, despite the low probability for them to occur, by addressing them as they arise.

3.2.2 Cumulative Impacts Assessment

"Cumulative impacts" are defined as the impact on the environment that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes the actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR Section 1508C.F.R Part 1508.7). The cumulative impact analysis section is intended to provide a broader, more expansive assessment of potential impacts associated with implementing the Alternative (D) considering the wide array of other activities, new and ongoing projects, and programs in the Project area and vicinity. In this way, the potential interactions between commercial dredging of sand and gravel and reasonably foreseeable projects and programs can be explored, and any significant adverse or beneficial cumulative impacts can be identified and considered. Cumulative and secondary effects are more fully discussed in Chapter 5 of the Final EIS (USACE 2011).

The Preferred Alternative for the Waverly Segment (Alternative (D)) has been selected as the LEDPA with some modifications. The resource areas most affected by dredging were discussed in Section 3.2.1 of this ROD. Impacts on infrastructure, federally listed species, and cultural resources either did not vary substantially or they varied in direct relationship to geomorphic impacts (primarily changes in surface water levels and river bed degradation). Economic impacts were primarily driven by volume of authorized material and increased use of alternate sand and gravel resources to offset reduced dredging. Increased quantities of sand and gravel extracted under Alternative (D) should produce an economic boost, and because the increases should not lead to more than slight degradation in the

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

short and long term [as described in Section 3.1.2.4], no appreciable effects to infrastructure, federally listed species, or cultural resources should occur. This is further demonstrated by bed material loads trending towards pre-2011 flood levels (Figure 3-3) in the Waverly Segment and the USACE's analysis of bed material load removal thresholds in Section 3.1.2.1 that are indicating dredging levels under Alternative (D) would not induce a more than slight degradation trend in this Segment.

The Final EIS and ROD (USACE 2011) determined that 60,000 tons per mile per year may be the upper limit of local dredging intensity that is reasonably unlikely to result in local bed degradation. The Environmentally Preferred Alternative identified for each segment in the Final EIS (USACE 2011) was conditioned on applying a target level of dredging intensity in conjunction with segment limits. The USACE has determined limiting the most heavily dredged and degraded five-mile reaches of the river to no more than 300,000 tons would effectively protect those areas at risk from more than slight additional degradation in the future. The USACE identified one of these areas in the Waverly Segment in 2011, between river miles 355 to 360. The LEDPA will continue to limit annual extraction in this five-mile portion to no more than 300,000 tons. Additionally, to safeguard the upper reaches of the Waverly Segment which are most likely to experience increased dredging activity resulting from Alternative (D), the USACE has added one reach at the upper end of the Waverly Segment where identical extraction limits will be imposed; that reach is river miles 350 to 355. Regulating extraction limits in this reach will further reduce the likelihood of localized degradation, and thus the increased extraction levels will pose a lesser risk to infrastructure in the area. The USACE has determined that this restriction, with the segment limit, and a monitoring and adaptive management framework, are expected to result in no more than slight degradation in the most heavily degraded and at risk reaches and throughout the Waverly Segment and should not result in cumulative and indirect impacts to geomorphology, infrastructure, cultural resources, or endangered species not already assessed in the Final EIS.

The restrictions should not result in any significant cumulative and indirect impacts on the regional economy not already assessed in the Final EIS because the dredgers should be able to extract their authorized amounts from their existing sand plants with their existing equipment. They can do so by dredging more in reaches they already use to a small extent that are immediately adjacent to the "Hot Spots", by shifting some production from their most heavily used plants to their nearest less heavily used plants, and transporting sand by truck when needed. The Final EIS (USACE 2011) also concluded that existing alternate sources of sand have the capacity to meet any demand not met by LOMR Dredgers.

Cumulative and secondary impacts are more fully discussed in Chapter 5 of the Final EIS (USACE 2011).

3.2.3 Clean Water Act (CWA) Analysis

The USACE responsibility under our Regulatory Program covers three primary areas of responsibility: 1.) NEPA evaluation, 2.) Public Interest Review and 3.) Section 404(b)(1) Guidelines. The NEPA evaluation comprises the information from the Final EIS (USACE 2011) and this EA. The Public Interest Review comprises the overall desires of the public as reflected in the comments of state and local agencies and the general public, which is contained and evaluated throughout this document. The Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material prohibits the authorization of a discharge of dredged or fill material if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem (Least Environmentally Damaging Practicable Alternative or LEDPA), so long as the alternative does not have other significant adverse environmental consequences. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant, which could reasonably be obtained, utilized, expanded or managed in order to fulfill the basic purpose of the proposed activity may be considered. The Section 404(b)(1) Guidelines also prohibits authorizing a discharge of dredged or fill material that will cause or contribute to significant degradation of the waters of the United States or jeopardize the continued existence of species listed as endangered or threatened under the ESA. The potential of the Alternative (D) to adversely affect waters of the United States and endangered or threatened species was considered in identifying the Preferred Alternative for the Waverly Segment. Practicability was the key consideration in identifying the LEDPA and is discussed in this section.

3.2.3.1 Identification of the LEDPA

3.2.3.1.1 Segment Limits

The Final EIS (USACE 2011) divided the LOMR into five segments for analysis and the identified Environmentally Preferred Alternative which was a composite of the best alternative for each segment. The LOMR is not homogenous throughout its length. The bed load, and therefore the dredging capacity, varies with the geomorphology of the river, the geology of the floodplain, and sediment and water input from tributaries. To be able to evaluate and regulate the potential effects of dredging on

river geomorphology, the spatial variation in bed load needed to be taken into account. Dividing the LOMR into segments based on the major sediment input from tributaries was the method that was determined to appropriately do this.

The USACE has determined that the LEDPA will include a four year transition period to the Preferred Alternative in the Waverly segment. Annual extraction in the segment would be limited to 1,140,000 cumulative tons of sand and gravel in 2016, 1,299,500 cumulative tons in 2017, 1,449,000 cumulative tons in 2018, 1,618,500 cumulative tons in 2019, 1,778,000 cumulative tons in 2020. We believe these transitional levels of extraction are practicable for Holliday, Capital, and the regional economy. The transitional period will allow the Dredgers to adjust their operation and supply the Kansas City Metropolitan area with adequate sand resources that were previously collected from the Kansas City and Saint Joseph Segments as part of the 2011 permits and allow the USACE to incrementally monitor the bed's response to phased incremental dredging. During this transition period the water surface profile will be monitored for signs of degradation and, as with any permit, permits for dredging in the Segment could be suspended, modified, or revoked if warranted. The USACE has concluded that more than slight future degradation could cause potentially significant impacts on resources including but not limited to water intakes, navigation, flood control, endangered species, and cultural resources and would be contrary to the public interest and conflicts with the 404(b)(1) Guidelines. Based on the factors described above, the USACE has determined that the four year transition period for the Waverly segment should result in no more than slight degradation over the permit period and would not be contrary to the public interest.

This EA has determined that the phased segment limit of the Preferred Alternative combined with dredging concentration limits and a monitoring and adaptive management framework should result in no more than slight degradation in the short term and long term at the sand plants or elsewhere within the Segment.

3.2.3.1.2 Limits on Localized Dredging Intensity

The Final EIS (USACE 2011) determined that 60,000 tons per mile per year may be the upper limit of local dredging intensity that is reasonably unlikely to result in local bed degradation. The Environmentally Preferred Alternative identified for each segment in the Final EIS (USACE 2011) was conditioned on applying a target level of dredging intensity in conjunction with segment limits. It is recognized that this amount is not a precise measurement and evaluation of monitoring data during the upcoming permit cycle may indicate that modifications are warranted within the framework of the EIS

and this ROD. The USACE considered applying this limit on a one-mile basis, but in evaluation of the available river bed elevation models, there was too much variability and uncertainty at the one mile level. Choosing to use a longer reach, i.e., five miles, allowed for better identification and delineation of the “Hot Spots”. Limiting the most heavily dredged and degraded five-mile reaches of the river to no more than 300,000 tons allows for better management by the USACE, provides more flexibility to the Dredgers in reaches that are not degraded and at risk, and effectively protects those areas with the higher degradation trends. In 2011 the USACE identified one “Hot Spot” (river miles 355 to 360) that required this provision and will incorporate an addition reach (river miles 350 to 355) where this condition is necessary for the 2016 permits.

The USACE has determined that based on the available information, limiting dredging to no more than 300,000 tons per year in both of the five-mile reaches in the Waverly Segment is a practicable and necessary part of the LEDPA and will comply with the Section 404(b)(1) Guidelines. Without a dredging concentration limit in these reaches, the selected alternative would not comply with the Section 404(b)(1) Guidelines. Available information indicates that it would likely result in moderate to substantial bed degradation. This level of bed degradation could cause potentially significant impacts on resources including but not limited to bridges, water intakes, navigation, flood control, endangered species, and cultural resources and would be contrary to the public interest.

3.2.3.1.3 Monitoring and Adaptive Management Framework

The Final EIS (USACE 2011) determined that a monitoring and adaptive management framework was an integral part of the Environmentally Preferred Alternative and LEDPA. The USACE has concluded that more than slight future degradation, particularly in the most degraded reaches is contrary to the public interest regardless of the cause. Moderate to severe bed degradation could cause potentially significant impacts on resources including but not limited to water intakes, navigation, flood control, endangered species, and cultural resources and would be contrary to the public interest and conflicts with the 404(b)(1) Guidelines. Therefore dredging would be contrary to the public interest when it is expected contribute to degradation in any area with trends of more than slight degradation even where a portion of that degradation is caused by other means.

Water surface profiles will be prepared annually by the USACE and a hydroacoustic bed elevation survey will be provided by the Dredgers in the fourth year of each permit cycle, unless the USACE provides one through another study or river program. The USACE will evaluate the data and meet with the Dredgers and state and federal agencies in the fall of each year to discuss the condition and trend

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

of the river as shown by the most recent water surface profiles or surveys. Permits would be issued for five-year periods. During the five-year permit cycle, if the USACE determines from new data or analysis that additional measures should be taken to protect critical resources, it may modify, suspend, or revoke the permit at any time. Renewal of the dredging permits after five years would be a new Federal action requiring assessment of the prior NEPA documentation and assessment of any new information. In 2019, the data from the previous four years will be compared with the 2009 water surface profile and bed elevation baselines to evaluate if the permit limits and special conditions adequately limited the impact of dredging to no more than slight degradation across the river as projected by the EIS and this EA. Trends of moderate to severe degradation instead of the slight degradation anticipated by the EIS and EA for the Preferred Alternatives in the Waverly Segment would require a thorough review of the permit provisions and could result in reductions in authorized dredging reaches or quantities, or implementation of other mitigation measures in the new permit decision. Likewise, aggradation trends could allow for consideration of increased quantities.

Evaluation of the Section 404(b)(1) Guidelines

The LEDPA has been evaluated in accordance with guidelines developed by the Administrator of the Environmental Protection Agency in conjunction with the Secretary of the Army, and published at 40 C.F.R. 230. The following discussion addresses adverse impacts, individually and cumulatively, for all evaluation factors identified in Subparts C through H of the subject regulation.

4.1 PHYSICAL AND CHEMICAL CHARACTERISTICS (SUBPART C)

4.1.1 Substrate

The LEDPA includes annual extraction limits for the Waverly Segment based on its estimated sediment load and recent average extraction limits, limits on localized dredging intensity for the most degraded and heavily dredged five-mile reaches, and a monitoring and adaptive management framework that will minimize changes in substrate composition and is expected to result in no more than a slight amount of degradation or aggradation in the short and long term. See Section 4.2 and 4.5 of the Final EIS and Section 5 of the ROD for additional information.

We have evaluated the potential effects of increased dredging in the Waverly Segment to changes in river substrate. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 5.1.1 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.1.2 Water

Dredging operations result in suspended sediment at and downstream of the dredge site. The size of the elevated suspended sediment plume downstream of the dredge depends on a variety of factors, including the hydrodynamic conditions of the dredging site, the type of dredge used, operational methods, and sediment type. Because coarser-grained sediment particles have a greater fall velocity, they settle out more quickly than silt and fine-grained sand particles, which typically comprise the suspended sediment plume downstream of the dredge. USACE sampling of in situ suspended solids below a cutter-head dredge in the LOMR near the confluence of the Kansas and Missouri Rivers indicated that suspended solid concentrations returned to background concentrations within approximately 1,300 feet (see Section 4.5.3.1 of Final EIS, USACE 2011). Because natural suspended sediment variations in the LOMR have been documented as exceeding the average predicted suspended sediment levels at 100 and 400 feet from the dredge head, it is likely that dredging operations would not likely result in a significant change in suspended sediment concentrations, compared to natural variation. While dredging would result in elevated suspended sediment concentrations along the suspended sediment plume during periods of low background suspended sediment levels, the levels of suspended sediments resulting from the LEDPA would not likely exceed levels that occur naturally during high runoff events.

As discussed in Section 3.7 of the Final EIS (USACE 2011), state water quality standards for turbidity and suspended sediment in the LOMR are largely qualitative, and it is important to note that sediment levels in the LOMR have decreased substantially from historical levels due to the installation of dams and the associated flow modifications, bank stabilization, and the design of the navigation channel. Any suspended sediment from the hydraulic dredge head would be limited to the bottom of the water column. Large-particle sediments from the dredge discharges would quickly settle to the bottom of the LOMR; and the fine sediments discharged, depending upon background levels at the time of discharge, may contrast with receiving waters. But fine sediment discharge would likely not be of sufficient quantity to differ substantially from the maximum natural suspended sediment levels in receiving waters.

See Section 4.5 of the Final EIS and Section 5 of the ROD for additional information.

We have evaluated the potential effects of increased dredging in the Waverly Segment to water in the Missouri River. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in

Section 5.1.2 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.1.3 Current Patterns and Water Circulation

Under the LEDPA, neither dredging nor the discharge of dredged material will cause permanent changes in circulation patterns or shoaling areas. The stockpiling of material on shore will not affect groundwater recharge, wetland areas, or other areas of nutrient and mineral cycling, or natural areas of contaminant detoxification and fixation. River bed hydraulic conductivity would continue to be slightly altered for a short period in those locations subject to dredging. Change in the composition or depth of the substrate over existing horizontal municipal drinking water collector wells along the river could negatively affect the existing permeable aquifer material and reduce the quality and quantity of this municipal drinking water source. However, by excluding dredging near horizontal collector wells under the river, the hydraulic conductivity of the river bed in those areas should not be altered. Tributary degradation is linked to low-flow water surface elevations in the main channel. In general, a moderate to substantial decrease in LOMR low-flow water surface elevations would need to occur before tributaries are likely to be affected. Because the LEDPA is expected to result in no more than a slight long term decline in low-flow water surface levels, tributary degradation is not expected to result.

See Section 4.2 and 4.5 of the Final EIS and Section 5 of the ROD for additional information.

We have evaluated the potential effects of increased dredging in the Waverly Segment to current patterns and water circulation. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 5.1.3 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions..

4.1.4 Normal Water Fluctuations

Under the LEDPA, all segments of the LOMR are expected to experience no more than slight short and long term bed degradation, no more than a slight long term rise in high-flow surface water levels, and no more than a slight long term decline in low-flow surface water levels which would likely have a slight effect on alluvial aquifer levels near the LOMR and no effect on aquifer levels farther from the river channel. Because the LEDPA includes limits on concentrated dredging, the effects of dredging on low-

flow and high-flow water surface elevations would not be distinguishable from other factors affecting water surface elevations.

See Section 4.2 and 4.5 of the Final EIS (USACE 2011) for additional information.

We have evaluated the potential effects of increased dredging in the Waverly Segment to normal water fluctuations. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 5.1.4 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.1.5 Salinity Gradients

The Missouri River contains fresh water. The dredging operation will not introduce salt bearing material or additional water so should neither increase nor decrease the normal salinity level of the river.

4.2 BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM (SUBPART D)

4.2.1 Threatened and Endangered Species

All of the proposed dredging areas in the Waverly Segment are within the known range of the threatened piping plover, endangered least tern, endangered pallid sturgeon, endangered Indiana bat, threatened Northern long-eared bat, and threatened decurrent false aster. In compliance with the ESA, the USACE has completed a Biological Assessment (USACE 2015) which concluded that the LEDPA would have no effect on the Indiana bat, Northern long-eared bat, and the decurrent false aster and is not likely to adversely affect the pallid sturgeon, least tern, and piping plover or their designated critical habitat.

When combined with the past and present effects, along with those anticipated as a result of future non-federal actions within the Action Area, the LEDPA may affect, but is not likely to adversely affect pallid sturgeon. Based on the best available information reported in the literature and the specific factors on the LOMR, the potential for entrainment of pallid sturgeon due to dredging and towboat propellers and related mortality would be extremely low and improbable and thus judged to be minor and discountable (USACE 2015). The other potential adverse effect of dredging on pallid sturgeon is through indirect effects on natural or created shallow water habitat (SVWH), which is thought to be an

important habitat to larval and young juvenile pallid sturgeon. However, the effects on SWH are estimated to be minor and discountable. This is because under the LEDPA, dredging would be kept to levels that would result in bed degradation and associated changes in low-flow and high-flow water surface elevations that would be expected to be only slight in the short term (5 years). Changes of this magnitude are not expected to result in any substantial impacts on the abundance of SWH over and above natural year-to-year variations in the abundance of SWH. All other potential effects of the LEDPA were judged to be minor and discountable.

Commercial dredging on the LOMR under the LEDPA is also not likely to adversely affect interior least tern or piping plover due to the lack of suitable nesting habitat within the Action Area, the rare occurrence and lack of breeding within the Action Area, and the absence of critical habitat in the Action Area.

The LEDPA would have no effect on Indiana and Northern long-eared bats and decurrent false aster. Terrestrial habitats for both species would not be affected by commercial dredging under the LEDPA and would not authorize the construction of any new sand plants. Therefore the LEDPA would have no effect on these species.

We have evaluated the potential effects of increased dredging in the Waverly Segment on endangered species. Overall, Alternative (D) is not likely to adversely affect the pallid sturgeon and their habitat and will not lead to appreciable effects outside those already identified in Section 4.8 of the Final EIS under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.2.2 Fish, Crustaceans, Mollusks, and Other Aquatic Organisms

4.2.2.1 Aquatic Habitat

As discussed in Section 3.4 of the Final EIS (USACE 2011), the main channel benthic habitat of the LOMR is a dynamic system in which the bed load and associated benthic habitats often are changing. Benthic fish use habitats in and adjacent to main channels, where dredging is primarily concentrated, with environmental conditions that can include bed load sediment transport and high near-bed flow velocities. Macroinvertebrate density and diversity increase with sediment stability, decreased water velocities, and increasing silt and organic matter; therefore, macroinvertebrate diversity and density are likely to be reduced in the channelized LOMR main channel, compared to unchannelized and shallow-

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

water habitats. Further, these species are typically found on hard substrates, opposed to shifting sand substrates (such as in those areas where dredging occurs).

The magnitude and duration of direct impacts on aquatic habitat at the dredge site would be determined by the time required for recovery and repopulation of the benthic areas. Typically, the more naturally variable an aquatic habitat, the less the direct effect of dredging on that habitat. Aquatic organisms common to these naturally variable areas are adapted to unstable sediment conditions and can better withstand the stresses imposed by dredging. Thus, due to the high level of variability in the benthic habitats in the LOMR, aquatic species present in these habitats are likely to be better able to withstand and recover from the localized alteration of benthic habitat due to dredging. Many areas of coarse aggregate sediments (e.g., cobble and bedrock) that substrate-spawning species (e.g., sturgeon and sauger) are known to use are found on outside bends that are constantly flushed free of fine sediment (DeLonay et al. 2009). Dredging under the LEDPA will be excluded from shallow-water habitat, in side channel areas, at many tributary junctions, and near dikes and revetments. These exclusion zones will cover most of the potential aggregate spawning habitat in the action area. The maintenance and establishment of these chutes and side channel areas that mimic historical depth and velocity patterns in the LOMR will assist in the restoration and maintenance of native fish communities. Under the LEDPA, the location and frequency of dredging in the Waverly Segment would moderating increase. This increase in dredging would result in a corresponding increase in the locations and frequencies that benthic habitats would be subject to direct disruption, even though temporary, and would affect habitat quality and availability.

Riverine habitat loss or alteration in the LOMR has been implicated in the loss of several native Missouri River fishes. As discussed in Section 3.8 of the Final EIS (USACE 2011), shallow-water habitat (SWH) is an important riverine habitat in the LOMR that provides for primary and secondary productivity, forage fish production, and early life stage development for native Missouri river fishes. SWH is recognized as a highly underrepresented aquatic habitat type that was characteristic of the historic Missouri River. Historical changes, such as flow alterations and channelization of the LOMR, likely have substantially decreased the availability of shallow, slow-moving water. Further, the LOMR has been and still is affected by reduced sediment inputs; these are important to creating and maintaining the diversity of habitats used by native fish such as the pallid sturgeon for reproduction and survival. River bed degradation also can alter the quantity of SWH in the LOMR (USACE 2009). River bed degradation can worsen the adverse biologic impacts of channelization by reducing the amount of shallow-water habitat available for primary production of plankton and invertebrates, and fish spawning

and nursery areas (USACE 2009). Continued riverbed degradation could affect the long term stability and functioning of SWH restored by the MRRP (USACE 2009). The low-flow water surface elevations caused by river bed degradation could expose some SWH, while SWH in other areas could be created. Although this response of SWH to alterations of surface water flow may be occurring, it is important to note that these effects cannot be quantified at this time, and that additional studies are needed to fully determine and quantify the impacts of river bed degradation on SWH (USACE 2009). For the purposes of the effects analysis in the Final EIS (USACE 2011), it was assumed that river bed degradation, in conjunction with the local (reach-scale) removal of sand and gravel, could affect the quantity and distribution of natural or created SWH in the LOMR. Because the linkage between river bed degradation, sediment availability, and the quantity of SWH has not been quantified, levels of potential river bed degradation were used in the Section 4.6.5 of the Final EIS (USACE 2011) as a proxy for the potential for changes in the quantities of shallow-water habitat.

The LEDPA includes annual extraction limits for each segment based on the estimated sediment load of each segment and/or recent average extraction limits, limits on localized dredging intensity for the most degraded and heavily dredged five-mile reaches, and a monitoring and adaptive management framework that are expected to result in no more than a slight amount of degradation or aggradation in the short and long term in all segments of the river. Low-flow water surface elevations are not anticipated to change significantly and may not have a potential to alter the abundance of shallow-water

See Section 4.6 of the Final EIS (USACE 2011) for additional information.

We have evaluated the potential effects of increased dredging in the Waverly Segment to aquatic habitats and species. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 5.2.1 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.2.2.2 Aquatic Organisms

Potential direct impacts on individual aquatic species include dredge entrainment, propeller entrainment, alterations of habitat from increased turbidity, and behavioral changes due to increased noise.

Benthic organisms (fish and macroinvertebrates) living near the river bottom or in the substrate in the main channel areas could be subject to entrainment during dredging. Intake water velocity and the

organism's susceptibility to entrainment in the intake water flow are the primary determinant for entrainment; but secondary variables affecting swimming behavior and performance also could influence and determine species' entrainment rates. Site-specific physical factors, such as a constricted river area, biological factors, such as habitat near the dredge, and dredge operation and type would also determine the rate of entrainment. No definitive mortality estimates are available for the potential quantity or rate of fishes or their larvae that could be subject to entrainment from dredging in the LOMR. In general, studies show that dredging would not likely be a substantial problem for many fish or shellfish species in water bodies experiencing periodic dredging; however, dredging may pose a more substantial risk to some sensitive aquatic resources.

Dredge barges and transport barges (barges used for transporting excavated material to sand plants or other terminal locations) are anticipated to be positioned or moved using towboats. Ship propellers cause abrupt changes in hydraulic patterns due to increased turbulence and water velocities, pressure changes, and shear forces that can injure fish and larvae. Ship propellers also can injure or kill fish if fish come in contact with the blades. Studies have concluded that shear stress caused by towboat traffic is probably a primary force contributing to the mortality of ichthyoplankton entrained during vessel passage, but the magnitude of mortality is dependent on the individual size of ichthyoplankton. The extent of mortality would be a function of the amount of tow traffic on a given river system, towboat speed, and traffic volumes during the period when larvae are most susceptible to shear stress.

Fishes produce and use sounds in a wide variety of behaviors. Fish detect and respond to sound, utilizing its cues to hunt for prey, to avoid predators, and for social interaction. Underwater human-caused noise has been documented to influence fish behavior in general. Exposure to sound includes a measure of both the received level and the duration of the signal. Most noise impacts to fishes have been observed in situations of intense energy flux, such as construction-related pile driving or explosions, or propeller and engine noise from high-speed boats. Dredging operations generally produce lower levels of sound energy over prolonged periods. It is expected that noise from the operation of dredges—while not as intense as pile driving or explosions—may result in avoidance of the dredging area by fish species sensitive to noise over the duration of the activity.

The individual's response to elevated suspended sediment would be determined by the size, shape, and duration of the elevated suspended sediment plume, the tolerance of the fish, and the location of the dredge areas. Native organisms that evolved and are naturally associated with turbid environments typically are highly tolerant of elevated suspended sediment. The highest suspended sediment loads in

the downstream channelized section of the LOMR are only 0.2 to 17 percent of pre-dam values. The combination of channelization and flow modifications in the LOMR has collectively resulted in a reduction of habitat and caused a substantial change in river species composition. Species that have become more abundant as turbidity has decreased include sight-feeding carnivores and pelagic planktivores, while some native big-river fishes with morphological adaptations to use high-turbidity and high-velocity main-channel habitats have declined. Native aquatic species evolved in the LOMR under historically turbid conditions, and turbid conditions that mimic the historical environment have largely been eliminated in the LOMR (see Section 3.7 of the Final EIS [USACE 2011]). Because of the historical context and role of suspended sediment in the LOMR system and the general reduction in suspended sediment in recent history, the introduction of suspended sediment, while localized to a short distance downstream of the dredge (see Section 4.5 of the Final EIS [USACE 2011]), would likely result in a temporary improvement in habitat conditions for native aquatic species.

See Section 4.6 of the Final EIS (USACE 2011) for additional information.

We have evaluated the potential effects of increased dredging in the Waverly Segment to aquatic organisms. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 5.2.2 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.2.3 Other Wildlife

Dredging can result in indirect effects on riparian and emergent wetlands within and adjacent to dredged areas because lower water surface levels affect groundwater-dependent wetlands. Indirect effects of dredging on terrestrial resources would be limited to alteration of vegetation resources in riparian and emergent wetland habitats and potential conversion of these habitats to upland habitat types. This effect would result in loss or degradation of wetland habitat and consequently would affect wetland-dependent wildlife, including dabbling ducks, songbirds, mammals, reptiles, and amphibians. As discussed in Section 4.2 of the Final EIS (USACE 2011), river bed degradation could result in localized erosion of sand bar habitat features that may be located near the dredge sites. Sand bar habitats are important to shore birds, including the piping plover and interior least tern (see Section 4.8 of the Final EIS [USACE 2011]). Erosion of these habitats would result in a decrease in available sand bar habitat for species that use sand bars for one or more of their life stages. Terrestrial habitat and wildlife that use it can also be affected in the development of on-shore sand plants or sand pits in the

floodplains. The primary impact on vegetative cover types from sand plant construction would be clearing and removal of vegetation on the sand plant parcels. The severity of impact would depend on the type of vegetation impacted and the size of the area cleared. Forested wetland habitats would be more dramatically altered by construction of sand plants than any other habitat. Because trees would be cleared from the sand plant area, species that depend on trees for food, refuge, or nesting would be displaced to nearby forested habitat. Some nesting species and tree-cavity nesting species would suffer mortality during clearing. For adult birds that are able to disperse from the construction area, nesting success may be denied or diminished for one annual breeding cycle. During construction and operation of the sand plants, mobile species present in all habitats would disperse to adjacent habitats, while small, non-mobile species could suffer mortality.

Dredging in the LOMR would not result in direct effects on wetlands because dredging activities would be limited to the areas within the channel of the LOMR. The LEDPA includes annual extraction limits for each segment based on the estimated sediment load of each segment and/or recent average extraction limits, limits on localized dredging intensity for the most degraded and heavily dredged five-mile reaches, and a monitoring and adaptive management framework that are expected to result in no more than a slight amount (less than 2 feet) of degradation or aggradation in the short and long term, no more than a slight long term rise in high-flow surface water levels, and no more than a slight long term decline in low-flow surface water levels which would likely have a slight effect on alluvial aquifer levels near the LOMR and no effect on aquifer levels farther from the river channel. This effect in turn could lead to minor localized indirect effects on floodplain wetlands as a result of changes in groundwater levels that support floodplain wetlands. Those wetlands closest to the LOMR would be most likely to be affected, particularly during prolonged dry periods. Emergent, scrub-shrub, and forested wetlands provide habitat for several state-listed species, migratory birds, and numerous common wildlife species. Loss or degradation of wetland habitats would result in displacement of the wetland-dependent species, but could provide additional upland habitat for other non-wetland-dependent species. Because the LEDPA includes limits on concentrated dredging, the effects of dredging on low-flow and high-flow water surface elevations would not be distinguishable from other factors affecting water surface elevations.

Some terrestrial vegetation was cleared during the initial construction of the unloading and stockpiling facilities years ago. Consequently, a minor loss of some wildlife habitat did occur. However, no new off-loading facilities would be authorized under the LEDPA; therefore, no direct or indirect effects on

wetland, vegetation, or terrestrial resources are anticipated to occur with reauthorization of the currently authorized dredging operations.

We have evaluated the potential effects of increased dredging in the Waverly Segment to other wildlife. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 5.2.3 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.3 SPECIAL AQUATIC SITES (SUBPART E)

4.3.1 Sanctuaries and Refuges

Numerous local, state, and federal wildlife refuges occur along the LOMR within areas proposed for dredging. Special conditions and dredge exclusion zones developed in informal consultation between the USACE, the USFWS, MDNR, MDC, and the applicants, will exclude dredging, discharging unwanted material and water, docking, unloading, and stockpiling operations from primary fish and wildlife habitat within wildlife sanctuaries and refuges. The proposed dredging operations, when in compliance with these special conditions, would have minor adverse effects on fish or wildlife habitat within wildlife sanctuaries and refuges.

We have evaluated the potential effects of increased dredging in the Waverly Segment to sanctuaries and refuges. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 5.3.1 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.3.2 Wetlands

Special conditions and dredge exclusion zones developed in informal consultation between the USACE, the USFWS, MDNR, MDC, and the applicants, will exclude dredging, discharging unwanted material and water, docking, unloading, and stockpiling operations within wetlands.

We have evaluated the potential indirect effects of increased dredging in the Waverly Segment to wetlands and wetland-dependent wildlife species from changes in groundwater levels. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not

lead to appreciable effects outside those effects already identified in Section 5.3.2 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.3.3 Mud Flats

Special conditions and dredge exclusion zones developed in informal consultation between the USACE, the USFWS, MDNR, MDC, and the applicants, will exclude dredging, discharging unwanted material and water, docking, unloading, and stockpiling operations within mudflats.

We have evaluated the potential effects of increased dredging in the Waverly Segment to mudflats. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 5.3.3 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.3.4 Vegetated Shallows

Special conditions and dredge exclusion zones developed in informal consultation between the USACE, the USFWS, MDNR, MDC, and the applicants, will exclude dredging, discharging unwanted material and water, docking, unloading, and stockpiling operations within vegetated shallows.

We have evaluated the potential effects of increased dredging in the Waverly Segment to vegetative shallows. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 5.3.4 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.3.5 Coral Reefs

Corals reefs do not occur in the LOMR.

4.3.6 Riffle and Pool Complexes

The LOMR is a deep, fast flowing navigable river without any riffle and pool complexes.

4.4 HUMAN USE CHARACTERISTICS (SUBPART F)

4.4.1 Municipal and Private Water Supplies

There is no significant reduction in the water quantity by commercial dredging operations. The materials removed are continually being drained with only a small percent of water retained. Material that has been stockpiled for one day has been shown to have a moisture content equal to three to four percent of the weight of oven dried material.

The LEDPA includes conditions negotiated with the municipal drinking water providers that exclude dredging from within 1000 feet of their collector wells.

We have evaluated the potential effects of increased dredging in the Waverly Segment to municipal and private water supplies. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 5.4.1 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions..

4.4.2 Recreational and Commercial Fisheries

Potential direct impacts on individual aquatic species important to recreational and commercial fisheries include dredge entrainment, propeller entrainment, alterations of habitat from increased turbidity, and behavioral changes due to increased noise. No definitive mortality estimates are available for the potential quantity or rate of fishes or their larvae that could be subject to entrainment from dredging in the LOMR. In general, studies show that dredging would not likely be a substantial problem for many fish or shellfish species in water bodies experiencing periodic dredging; however, dredging may pose a more substantial risk to some sensitive aquatic resources. Studies have concluded that shear stress caused by towboat propellers is probably a primary force contributing to the mortality of ichthyoplankton entrained during vessel passage, but the magnitude of mortality is dependent on the individual size of ichthyoplankton. The extent of mortality would be a function of the amount of tow traffic on a given river system, towboat speed, and traffic volumes during the period when larvae are most susceptible to shear stress. Towboat traffic associated with dredging on the LOMR is relatively low and unlikely to significantly affect game fish and commercially fished non-game species on the LOMR. Most noise impacts to fishes have been observed in situations of intense energy flux, such as construction-related pile driving or explosions, or propeller and engine noise from high-speed boats. Dredging operations

generally produce lower levels of sound energy over prolonged periods. It is expected that noise from the operation of dredges—while not as intense as pile driving or explosions—may result in avoidance of the dredging area by fish species sensitive to noise over the duration of the activity but is not expected to significantly impact those species important to recreational and commercial fishing. Because of the historical context and role of suspended sediment in the LOMR system and the general reduction in suspended sediment in recent history, the introduction of suspended sediment, while localized to a short distance downstream of the dredge, would likely result in a temporary improvement in habitat conditions for native aquatic species.

See Section 4.6 of the Final EIS (USACE 2011) for additional information.

We have evaluated the potential effects of increased dredging in the Waverly Segment to recreational and commercial fisheries. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 5.4.2 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.4.3 Water-related Recreation

The LOMR is utilized by recreational motor boaters, canoeists, kayakers, and water skiing to some extent. Water skiing is limited mostly by debris so they wait for steady flow or falling flow when the river carries less debris. Because of the fast current, it is not used for swimming. The LEDPA includes special permit conditions requiring the Dredgers to comply with all U.S. Coast guard, State of Missouri, and USACE regulations concerning the prevention of navigation obstructions in navigable waters of the United States. And to conduct operations in the LOMR such that there will be no unreasonable interference with navigation. The dredges and associated barges are well marked night and day. The dredges are anchored to the river bottom so the anchor cables are mostly under water and don't pose a significant hazard to the recreation boats or their occupants. Even when they are loading a barge to the side, there is plenty of space in the navigation channel for other recreation boats to pass.

We have evaluated the potential effects of increased dredging in the Waverly Segment to water-related recreation. Because no more than slight bed degradation in the short and long-term is expected to occur, Alternative (D) will not lead to appreciable effects outside those effects already identified in Section 5.4.3 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the

Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.4.4 Aesthetics

Under the LEDPA there would be no substantial change to the aesthetics of the LOMR from those identified in Section 4.12 of the Final EIS and Section 5.4.4 of the ROD in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.4.5 Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

The Lewis and Clark National Historic Trail retraces the path the Lewis and Clark Expedition traveled from Illinois to the Pacific Ocean and back between 1804 and 1806. It includes more than 100 sites managed by many diverse groups including the National Park Service and other federal, tribal, state, and local agencies, and public and private organizations. In Missouri and Kansas these managed sites include Arrow Rock State Historic Site, the Jefferson National Expansion Memorial, the National Frontier Trails Center, Fort Osage, The Lewis and Clark Boathouse and Nature Center, the Katy Trail State Park, and the Frontier Army Museum. There are also many marked and unmarked Lewis and Clark campsites, points of interest, and information signs, the Lewis and Clark National Historic Trail Highway, parks, research sites, and preserves. The Dredgers do not directly impact any of these sites through physical contact. The LEDPA should result in no more than slight bed degradation in the LOMR. This would prevent or minimize the direct and indirect effects on the Lewis and Clark National Historic Trail associated with tributary head cutting. USACE permit conditions would include the requirement to notify the USACE and state agencies if unidentified cultural resources are discovered; a description of existing dredging exclusion zones to avoid and/or reduce the potential for adverse effects to historic properties; and the requirement to notify the USACE and state agencies if the Dredgers propose to expand dredging into areas not previously dredged. There are several post Lewis and Clark era State Historic Sites along the river in stretches that are dredged. The historic significance of these sites is related to their role as river towns or landings in river borne exploration, commerce, and transportation. Dredging and transportation of sand and other commodities by barges and river boats has occurred in these areas for more than seventy years and is part of the cultural fabric. No adverse effects to the Lewis and Clark National Historic Trail or other parks, and historic monuments, therefore, are expected from the authorization of the LEDPA.

We have evaluated the potential effects of increased dredging in the Waverly Segment to Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and similar preserves. Overall, Alternative (D) will not lead to appreciable effects outside those already identified in Section 5.4.5 of the ROD under Alternative (B) in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.5 CONTAMINANT EVALUATION AND TESTING (SUBPART G)

4.5.1 Evaluation of Dredged or Fill Material

The draft "Total Maximum Daily Loads (TMDLS) for Chlordane and Polychlorinated Biphenyls in the Missouri River" published in public notice by MDNR in August 2006, identified chlordane and PCPs as two contaminants impairing the Missouri River. These chemicals were not noted as substantial contaminants in the Waverly Segment. Therefore, there should be no substantial change in contaminant levels resulting from the additional discharge of dredged material in the Waverly Segment.

4.5.2 Dredge and Discharge Site Comparison:

When contaminants introduced into the water column become fixed into the underlying sediments, they generally remain dissolved in the sediment interstitial or pore water, become absorbed to the sediment exchange portion as an ionized constituent, form organic complexes, and/or become involved in complex sediment oxidation-reduction reactions and precipitations. The fraction of a chemical constituent that is potentially available for release to the water column when sediments are disturbed is approximated by the interstitial water concentrations and the loosely bound (easily exchangeable) fraction in the sediment. In order to estimate the impact to the water column, an elutriate test would be used in conjunction with a mixing zone analysis.

Suspended solids or turbidity plumes data collected below a cutter-head dredge using underwater disposal near the confluence of the Kansas and Missouri rivers and in the Missouri River below Waverly, Missouri, indicated that concentrations return to background concentrations within a quarter mile or 1,300 feet. The same was true at other monitoring sites while collecting data below a baffled prop wash mechanized landing craft.

Unwanted dredged material will be discharged adjacent to the dredged site. The dredge and discharge sites are subject to the same sources of contaminants, and materials and the two sites are substantially

similar. Dredging has occurred in the same general reaches of the Missouri River for decades. The river bed is constantly changing and mixing sediments, filling in recently dredged areas with sediment washed in from above. Based on this information and the results of elutriate testing and mixing zone analysis, it can be concluded that re-dredging these same areas to the same depth and immediately discharging unwanted dredged material won't release significant levels of additional contaminants such as PCBs, chlordane, or cadmium.

See Section 4.5 of the Final EIS and Section 5.5.2 of the ROD for additional information in the Waverly Segment or those experienced in the Jefferson City Segment where the Corps has previously authorized the removal of up to 38% bed material load at below normal-flow conditions.

4.5.3 Chemical, Biological, and Physical Evaluation

Based on the dredge and discharge site comparison it is not necessary to require the commercial dredging industry to perform chemical, biological, or physical testing for contaminants. The 4,000-foot no-dredge mixing zone required above municipal water intake structures eliminates the need for site specific testing. The 4,000-foot dredge exclusion zone is in effect for all municipal water intake structures, unless the municipality/community/owner and the permitted Dredgers agree to a no impact mixing zone or reach distance, other than the minimum distance required to preserve the structural integrity of the banks and manmade structures. When such an exception is agreed to by all parties concerned, a copy of the agreement, signed by both entities, should be submitted to the KCD and an exception may be granted.

4.6 ACTIONS TO MINIMIZE ADVERSE EFFECTS (SUBPART H)

4.6.1 Actions Concerning the Location of the Discharge

The permit special conditions will limit dredging and discharging excess material to the navigation channel between the Rectified Channel Line (RCL) away from shallow water and wetland areas where vertebrate and invertebrate species mainly occur. Dredging and discharging is also excluded near municipal and industrial water intakes and lateral collector wells. The discharge will occur within areas with substrate composed of material essentially the same as that being discharged. The increased dredging activity in the Waverly Segment will not alter the location of the discharge site(s).

4.6.2 Actions Concerning the Material to be Discharged

Excess material will be discharged in essentially the same place where it was dredged and be essentially the same as the substrate where it is deposited with the exception of the sand or gravel that was retained. The permit special conditions will limit discharge to suitable material that is free from toxic pollutants in other than trace quantities, this includes the additional sand and gravel extracted under Alternative (D).

4.6.3 Actions Controlling the Material after Discharge

No action will be taken to control the material after discharge.

4.6.4 Actions Affecting the Method of Dispersion

Based on the test results and the 1990 drinking water standards, a mixing zone was calculated which would allow the greatest distance, worst case scenario, for the dilution of dissolved cadmium concentrations to become equivalent to the background concentrations. The size of the estimated mixing zone is less than the dimensions of a loading barge which indicates that the contaminant concentrations of the dredge and discharge site are not significantly different. No actions affecting the method of dispersion are necessary. However, dredging and discharging material are excluded far enough from municipal and industrial water intake structures to accommodate the estimated mixing zone needed to maintain water quality.

4.6.5 Actions Related to Technology

Special permit conditions would require that if any part of the authorized work is performed by a contractor, before starting work the permittee must discuss the terms and conditions of this permit with the contractor; and must give a copy of this entire permit to the contractor. The dredge operation must store all construction materials, equipment, and/or petroleum products that are part of the on-shore operation, when not in use, above anticipated high water levels. The dredge operation must employ measures to prevent or control spilled fuels or lubricants from entering the waters of the United States. Each dredge must record the dredge plant location (in river mile and GPS derived longitude and latitude coordinates), tons of material removed, and the locations of any gravel (in higher than normal/unusual concentrations) or hard substrates encountered while dredging. This condition will ensure that material is not dredged or discharged in excluded sensitive areas.

4.6.6 Actions Affecting Plant and Animal Populations

The permit special conditions limit the dredging operations to the main channel within the RCL and exclude dredging within 200 feet of any dike, revetment, or other structure built or authorized by the U.S. Government or within 100 feet of any normal bank line or island where plant and animal habitat primarily occurs. The dredging operations are also excluded within reaches specifically identified by the USFWS as areas critical for endangered species (pallid sturgeon) restoration efforts.

4.6.7 Actions Affecting Human Use

The permit special conditions exclude the dredging operations from the vicinity of municipal and industrial water intakes, horizontal collector wells, levees, pipelines, submerged utility crossings, bridge piers or abutments, dikes, revetments, or other structures built or authorized by the U.S. Government. The dredge operations must comply with all U.S. Coast Guard, State of Missouri, and Corps of Engineers regulations concerning the prevention of navigation obstructions in navigable waters of the United States. They also must conduct operations in the Missouri River such that there will be no unreasonable interference with navigation. The annual extraction of each dredge operation will be limited to prevent future bed degradation and its effects on various manmade structures and human uses.

4.6.8 Other Actions

The Dredgers will be required to conduct a hydrographic survey of the lower 498 miles of the LOMR in 2019 and the USACE will prepare a water surface profile each year. The USACE will meet with the Dredgers each fall to show them the results of the recent water surface profile and bed elevation survey and discuss degradation rates and trends that are shown. The hydrographic survey and water surface profiles will be compared to baseline data from 2009 to identify reaches that degraded or aggraded over the previous 5 years and to guide the adjustment of dredging in those reaches for the next 5-year permit cycle.

4.7 SECTION 404(B)(1) GUIDELINE COMPLIANCE

As required by Section 404(b)(1) of the CWA (33 U.S.C. §1344), the subject activity (LEDPA) has been evaluated in accordance with guidelines developed by the Administrator of the Environmental Protection Agency in conjunction with the Secretary of the Army, and published at 40 C.F.R. § 230. The 404(b)(1) evaluation has resulted in a conclusion that use of the discharge site is not prohibited by 40

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

C.F.R. § 230. There is no less environmentally damaging practicable alternative available to the applicant that meets the purpose and need for the project. The activity does not appear to (1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of CWA; (2) jeopardize the existence of Federally-listed endangered or threatened species or their habitat; or (3) violate requirements of any Federally designated marine sanctuary. The activity will not cause or contribute to significant degradation of waters of the United States including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

S E C T I O N 5

Required Mitigation

5.1 SPECIAL PERMIT CONDITIONS

The proposed dredging permits will include special permit conditions to ensure avoidance or minimization of impacts on environmental resources. Those special permit conditions are categorized as operational measures, resource protection zones, and compliance and monitoring measures and are not entirely specific to the Waverly Segment. The conditions below were duplicated from the USACE's Combined Decision Document for the 2016 Missouri River Commercial Dredging Permits.

5.1.1 Operational Measures

- If future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the USACE, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.
- Up to 10% of the permittee's authorized annual tonnage for each segment may be carried over each year to be extracted within that segment the following year. Annual tonnage with carryover may never exceed 110% of annual authorized tonnage of each segment. At the end of each year the permittee must notify the Regulatory Branch of the Kansas City District, USACE in his annual tonnage report of any unextracted tonnage that he intends to carryover.
- The permittee must discharge only suitable material that is free from toxic pollutants in other than trace quantities.
- The permittee must investigate for water supply intakes or other activities which may be affected by suspended solids and turbidity increases caused by work in the watercourse and give sufficient notice to the owners of affected activities to allow preparation for any changes in water quality.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

- The permittee must employ measures to prevent dredged materials stored or disposed of on shore from running off or eroding into wetlands or tributaries to the Missouri River.
- The permittee must employ measures to prevent or control spilled fuels or lubricants from entering the waters of the United States.
- The permittee must store all construction materials, equipment, and/or petroleum products that are part of the on-shore operation, when not in use, above anticipated high water levels.
- The permittee may discharge back into the Missouri River material spilled off the conveyer belts and unusable material separated out in the on-shore sand washing and handling facility. To subtract that tonnage from his annual extraction limit, the permittee must follow a plan approved in writing by the Regulatory Branch of the Kansas City District, USACE. This plan must show where and how the material will be discharged and how the amount of dredged material discharged back into the river will be measured and reported to the Regulatory Branch of the Kansas City District, USACE. The total extraction tonnage will equal the tonnage extracted and barged to shore minus that amount intentionally returned to the Missouri River.
- The permittee may return unwanted dredged material and river water (but not garbage) extracted from the Missouri River back to the Missouri River. The permittee must not dispose of waste materials, water, or garbage below the ordinary high water mark of any other water body, in a wetland area, or at any location where the materials could be introduced into the water body or an adjacent wetland as a result of runoff, flooding, wind, or other natural forces.
- The permittee must comply with all U.S. Coast Guard, State of Missouri, State of Kansas (RM 367 to 490), and USACE regulations concerning the prevention of navigation obstructions in navigable waters of the United States.
- The permittee must conduct operations in the Missouri River such that there will be no unreasonable interference with navigation.

5.1.2 Resource Protection Zones

Dredging can have a direct and immediate negative effect on various natural and manmade resources in the immediate area. To prevent or minimize these negative effects, dredging would generally be excluded in certain environmentally sensitive areas, in areas adjacent to certain infrastructure facilities, and in or near pallid sturgeon habitat. The specific resource protection zones within which dredging is prohibited are listed below. The Regulatory Branch of the Kansas City District, USACE will provide the

Dredgers with these resource protection zones in an electronic format that the dredge operator can use in the electronic dredge navigation system. This is for the ease and convenience of the Dredgers but the conditions below describing resource protection zones supersede any paper or electronic maps the USACE may provide. The dredge operator is responsible for determining that the dredge does not operate within these resource protection zones. The dredge location is documented with GPS, and compliance with the permit conditions will be documented in reports submitted to the USACE.

- In permit conditions that specify a linear distance exclusion zone adjacent to a river feature, "dredging" refers to the operation of hydraulic cutter-head suction dredging. The exclusion zone distances will apply to and be measured from the end of the cutter head, rather than from a general point on the dredge.
- The permittee must confine dredging to between the Rectified Channel Lines (RCL) with the following restrictions. Dredging must be conducted in such a manner to preserve the structural integrity of the landmass landward of the RCL. This must be accomplished by maintaining an adequate "no dredging or discharging" zone riverward of the RCL so that material will stabilize into the dredging area at its natural angle of repose. This slope will vary depending upon river location and the type of material being dredged, but it is your responsibility to ensure that this shallow water interface landward of the RCL be maintained.

5.1.2.1 Levees, Pipeline Crossings, Dikes, and Bridges

Dredging too close to levees, pipelines, submerged utility crossings, bridge piers or abutments, dikes, revetments, water intakes, boat ramps, and natural river banks or islands, even at sustainable levels, can harm these structures either through direct physical contact or by undermining, exposing, destabilizing, or weakening these structures. The following condition is necessary to ensure that adverse impacts of the authorized dredging on navigation, flood control, and water intake structures and endangered species and their habitat are minimized

- The permittee must not dredge within 500 feet of any levee centerline, pipeline or submerged utility crossing, bridge pier or abutment; nor within 200 feet of any dike, revetment, or other structure built or authorized by the U.S. Government; nor within 100 feet of any normal bank line or island, without special authorization. When dredging is performed adjacent to river stabilization structures, the dredging may be conducted only in the present streambed of the river at the authorized locations. This condition represents only the minimum distances needed between dredging and structures and natural features and does not relieve the permittee from liability for damage arising from

dredging. The permittee must be satisfied that dredging to these limits will not cause damage to public and private property.

5.1.2.2 Water supply

Dredging too close to water intake structures, even at sustainable levels, can harm these structures through direct physical contact; by undermining, exposing, destabilizing, or weakening these structures; and by negatively affecting water quality at the water intake. Dredging over horizontal collector wells can harm these wells by direct physical contact and by modifying the depth and physical characteristics of the river bed over the wells and negatively affecting the volume and quality of water pumped by the wells. The following conditions are necessary to avoid adverse impacts to existing municipal drinking water intake structures and provide a mixing zone sufficient to reestablish water quality to background conditions on the Missouri River; to preserve the existing permeable aquifer material and avoid adverse impacts to the horizontal collector wells; and to avoid adverse impacts to water intake structures and water quality of water users other than municipal drinking water providers.

- The permittee must not conduct dredging operations in a zone extending 4,000 feet upstream and 500 feet downstream from any municipal drinking water intake structures located along either bank of the river unless he obtains an exemption to this condition in writing from the Regulatory Branch of the Kansas City District, USACE.
- The permittee must not conduct dredging operations in a zone extending 1,000 feet upstream and 1,000 feet downstream from any municipal drinking water horizontal collector wells located along either bank of the river unless he obtains an exemption to this condition in writing from the Regulatory Branch of the Kansas City District, USACE.
- The permittee must not conduct dredging operations in a zone extending 500 feet upstream and 500 feet downstream from any other water intake structures other than those used for municipal drinking water unless he obtains an exemption to this condition in writing from the Regulatory Branch of the Kansas City District, USACE.

5.1.2.3 Pallid Sturgeon Habitat and Cultural Resources

Previous dredging permit evaluations have determined that dredging in the specific locations authorized by those permits would not have any direct adverse effect on any cultural resources or endangered species. The Final EIS (USACE 2011) looked at a larger area of potential effect and identified various

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

potential impacts that dredging could have on the endangered pallid sturgeon and on known and unknown but potential cultural resources throughout the Action Area if dredging caused more than slight bed degradation in the short and long term or if dredging expanded into areas not previously dredged. The first condition is a practicable measure that is necessary to ensure that adverse impacts of the authorized activity on cultural resources and the pallid sturgeon and its habitat are evaluated and minimized when dredging expands outside currently dredged reaches. The pallid sturgeon habitat protection zones listed on Table 5-1 include specific areas where monitoring has most frequently found pallid sturgeon that could be directly impacted by dredging. The protection areas also include USACE shallow water habitat project sites that could be negatively impacted by dredging through physical disturbance and by removing coarse sediment from the bed load at locations where it is needed to form the sand and gravel bars in chutes that are a vital part of shallow water habitat. Table 5-1 will be reevaluated by the USACE and discussed with the Dredgers and the state and federal agencies each fall along with degradation conditions and trends indicated by the water surface profiles. The USACE and USFWS will also reevaluate the list when Dredgers request new or expanded dredging areas. At these times, habitat protection zones may be added for newly completed shallow water habitat projects or newly identified pallid sturgeon habitat areas; habitat protection zones may also be deleted if shallow water habitat areas have matured and/or no longer need protection from adjacent dredging.

- To avoid impacting endangered species and cultural resources, the permittee must confine dredging to the specified reaches listed in their permits. If the permittee desires to expand or relocate his dredging operation outside the specified reaches, he must submit a request to the Regulatory Branch of the Kansas City District, USACE identifying the proposed new limits, in river miles, and the location of the unloading facility to be employed. Approval of the requests, if granted, will be provided in writing with modified reaches identified on the Missouri River Hydrographic Survey. Copies of the relocation requests must be furnished to the following agencies:
 1. U.S. Fish and Wildlife Service, Columbia Field Office
 2. Missouri Department of Natural Resources, Water Pollution Control Program
 3. Missouri Department of Natural Resources, State Historic Preservation Office
 4. Kansas Department of Health and Environment, Bureau of Water (for operations extending upstream of river mile 367)
 5. Kansas State Historical Society, State Historic Preservation Office (for operations extending upstream of river mile 367)
 6. Corps of Engineers, Kansas City District, Hydrologic Engineering Branch

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

- Dredging is prohibited within the reaches identified in Table 5-1 as pallid sturgeon habitat features

Missouri River Miles (including 0.25-mile buffer)		
Downstream Limit	Upstream Limit	Habitat Feature
44.25	44.85	RDB Centaur Chute
49.15	50.05	RDB Centaur Chute
56.85	59.05	LDB Chute/Island
58.55	61.25	RDB Chute/Island
89.75	91.10	RDB Island
89.90	91.45	LDB Loutre Slough
91.20	93.55	LDB Lunch Island
103.00	104.95	Both Gasconade Confluence and Dike Field
105.20	106.25	RDB Dike Field
115.20	115.95	RDB Island
118.40	119.15	RDB Dike Field
119.35	119.85	RDB St. Albert Chute
124.35	124.95	RDB St. Albert Chute
126.05	126.90	LDB Dike Field
127.50	130.20	Both Osage River Confluence and Dike Field
157.00	158.45	LDB Island
176.40	178.35	LDB Island/RDB Tadpole Island Chute
180.15	180.65	RDB Tadpole Island Chute
184.75	185.65	RDB Chute
186.90	188.20	RDB Chute and Dike Field
193.40	195.75	RDB Dike Field/Island
202.10	202.75	RDB Lamine River Confluence
210.00	219.65	Lisbon/Jameson Complex
226.95	227.55	LDB Little Chariton Confluence
238.40	239.10	LDB Chariton River Confluence
249.65	250.30	LDB Grand River Confluence
269.85	271.35	RDB Shallow/Island
280.40	282.05	RDB Island
297.90	299.05	RDB Island
300.00	301.05	LDB Island

ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE LOWER MISSOURI RIVER

Missouri River Miles (including 0.25-mile buffer)		
Downstream Limit	Upstream Limit	Habitat Feature
367.00	367.75	RDB Kansas River Confluence
390.85	391.45	LDB Platte River Confluence
456.75	457.25	LDB Worthwine Chute
458.75	459.25	LDB Worthwine Chute
462.65	463.25	LDB Nodaway River Confluence
478.55	479.15	RDB Wolf Creek Confluence
494.55	495.20	RDB Big Nemaha River Confluence

Source: USACE 2010a

Notes:

LDB = Left downstream bank.

RDB = Right downstream bank.

Table 5-1 Pallid Sturgeon Habitat Areas Protected from Dredging on the Lower Missouri River

5.1.2.4 Degraded Reaches

If dredging were not distributed more broadly and were allowed to remain concentrated around the existing sand plants, the level of future river bed degradation and associated direct and indirect impacts under these alternatives would be expected to be locally moderate to substantial. There would also likely be some loss of shallow water habitat in these areas of moderate to substantial bed degradation. The following condition is necessary to ensure that dredging results in no more than slight degradation throughout each river segment but particularly in the most severely degraded reaches near some existing sand plants.

- No more than 300,000 tons of material shall be extracted within one year from each five-mile reach of the Missouri River between river miles 15 to 20, 25 to 35, 90 to 100, 140 to 150, 350 to 395, and 445 to 455. When the dredge report database of the Regulatory Branch of the Kansas City District, USACE indicates that extraction in a five-mile reach has reached 300,000 tons, all Dredgers authorized to operate within that reach will be notified that it is closed to further dredging for the remainder of the calendar year unless a waiver is requested and received in writing from the Regulatory Branch of the Kansas City District, USACE.

5.1.3 Compliance and Monitoring Measures

The Final EIS and EA identified the Preferred Alternative which is that alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources. The USACE has concluded that the LEDPA, which is the Preferred Alternative with some adaptation due to practicability considerations, should result in no more than slight degradation throughout the LOMR in the short and long term. These conclusions were based on the use of the best available information and on interpretation of sediment transport equations and underlying data, the results of which include some level of uncertainty. While the results and the interpretation of the effects of bed degradation are based on the best currently available scientific data, sediment transport and estimates of previous bed degradation are indicators rather than precise predictors of future degradation. The following permit conditions are part of a process to monitor key variables in the LOMR system throughout the 5-year permit cycle and provide information needed to determine whether dredging levels or permit restrictions should be adjusted. Such a monitoring and reevaluation process will allow the uncertainty inherent in the modeling and analysis of bed degradation to be addressed. It also will reduce the risk of potentially significant impacts, increasing the confidence that adjustments could be made to address impacts while they are relatively small. The permit conditions are also necessary to ensure that the Dredgers comply with the conditions restricting where and how much material may be dredged.

- The permittee must implement a Dredge Monitoring Plan (DMP) approved by the Regulatory Branch of the Kansas City District, USACE. If a DMP has not been previously approved by the Regulatory Branch, USACE, Kansas City District, the permittee must provide within 30 days of execution of the permit a DMP for each individual dredge plant to the Regulatory Branch of the USACE, Kansas City District for approval. The DMP must show how the permittee will monitor, record, and report the cutter-head position, cutter-head operating status, extraction tonnage, and the presence of any hard substrates, mussel shells, or unusual concentration of gravel in an impartial, unbiased, reliable, and accurate manner. The DMP must include the specifications of the process and the Dredge Monitoring System (DMS) including sensors, hardware, software, communications devices the permittee will use to: gather data; perform quality control on those data; calibrate, test, and repair sensors when they fail; and transfer the data to the Regulatory Branch of the Kansas City District, USACE. The DMS must include automated differential Global Positioning System (DGPS) equipment (or other comparable system) operating with a minimum accuracy level of 1-3 meters horizontal Circular Error Probable with horizontal positions tied into the

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

UTM Zone 15 NAD 83 (feet) coordinate system recorded to the nearest foot. The DMS must always be on, recording cutter-head position and operating status every 5 minutes, 24-hours a day, 365 days a year, even when the dredge is not operating. The data logged each month must be submitted by email matthew.c.sailor@usace.army.mil at the Regulatory Branch of the Kansas City District, USACE by the 7th day of the following month. If the permittee does not receive an email confirmation that the report was received, the permittee must contact the Regulatory Branch of the Kansas City District, USACE at 816-389-3990 for revised instructions for filing the monthly report. The extracted material must be measured by one of the methods described in the attached Standard Operating Procedure for Hydrographic Surveying and Dredge Monitoring. If the tonnage is measured by scale at the off-loading facility, the DMP should also describe how the operation will record the date, time, river mile, coordinates, and approximate tonnage of each barge loaded in one location. If a barge is partially filled at one anchor setting then completed at a new anchor setting, the tonnage should be estimated separately for each location. This information must be provided monthly by email on the attached Missouri River Commercial Dredging Location/Volume Report spreadsheet to matthew.c.sailor@usace.army.mil at the Regulatory Branch of the Kansas City District, USACE by the 7th day of the following month. If the permittee does not receive an email confirmation that the report was received, the permittee must contact the Regulatory Branch of the Kansas City District, USACE at 816-389-3990 for revised instructions for filing the monthly report. Faulty sensors or other components identified in the DMP must be repaired within 96 hours. The DMS must not be inoperable more than 5 percent of the time. The permittee must install an approved DMS and have it inspected by the Regulatory Branch of the Kansas City District, USACE (or St. Louis District) within 120 days of execution of the permit or the permittee must cease dredging operations until it is installed and inspected or the permittee submit a justification of the delay and an installation schedule and get an extension of this deadline in writing from the Regulatory Branch of the Kansas City District, USACE (or St. Louis District).

- The USACE periodically surveys the river as part of the management and operation of the Bank Stabilization and Navigation Project. If, for any reason, the USACE has not surveyed the river in the fourth year (2014) of the five-year permit cycle, the authorized dredging companies must have the lower 498 miles of the LOMR surveyed during the summer months in accordance with the Standard Operating Procedures for Hydrographic Surveying and Dredge Monitoring. The survey shall be completed between June and September of 2019 and submitted to the USACE by November 1, 2019.

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

- If any part of the authorized work is performed by a contractor, before starting work the permittee must discuss the terms and conditions of this permit with the contractor and must give a copy of this entire permit to the contractor. After the initial 120 days of this permit, any contracted dredges or barges must also be equipped with and operate in accordance with an approved DMP as required in Special Condition "b". The DMP and system must be approved by the Regulatory Branch of the Kansas City District, USACE prior to starting work.
- Until the dredges and barges are equipped with the DMS required by Special Condition "b", the permittee must, for each dredge operated, record Global Positioning System (GPS) coordinates, tons of material removed, and the presence of any hard substrates or unusual concentration of gravel daily. If the dredge moves more than 100 feet in any one day then the amount of material removed from each location must be recorded separately. The operators may use hand-held GPS devices or automatically recording devices, but with which ever system used, must identify the device make/model and recording location. This information must be recorded on the attached Missouri River Commercial Dredging Location/Volume Report in an electronic spreadsheet. The permittee must furnish a copy of the completed monthly report by email to matthew.c.sailor@usace.army.mil at the Regulatory Branch of the Kansas City District, USACE by the 7th day of the following month. If the permittee does not receive an email confirmation that the report was received, he must contact the Regulatory Branch of the Kansas City District, USACE at 816-389-3990 for revised instructions for filing the monthly report.

S E C T I O N 6

Determinations

6.1 SECTION 176(C) OF THE CLEAN AIR ACT GENERAL CONFORMITY RULE REVIEW

Section 4.14.7.2 of the Final EIS (USACE 2011) analyzed the proposed permit action for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined that the activities proposed under this permit will not exceed *de minimis* levels of direct or indirect emissions of a criteria pollutant or its precursors and are exempted by 40 C.F.R. 93.153. Any later indirect emissions are generally not within the Corps' continuing program responsibility and generally cannot be practicably controlled by the Corps. For these reasons a conformity determination is not required for this permit action.

6.2 ENDANGERED SPECIES ACT

In compliance with the ESA, the USACE has completed a Biological Assessment (Appendix B) which concluded that the LEDPA would have no effect on the Indiana bat, Northern long-eared bat, and the decurrent false aster and is not likely to adversely affect the pallid sturgeon, least tern, and piping plover or their designated critical habitat. After informal consultation, the USFWS concurred with this determination in an email dated 20 November 2015. See discussion above and in Section 4.2.1 of this ROD.

6.3 HISTORIC PROPERTIES

The LEDPA is expected to result in only slight bed degradation in the LOMR. This would prevent or minimize the direct and indirect effects on cultural resources associated with tributary head cutting. USACE permit conditions will include the requirement to notify the USACE and state agencies if unidentified cultural resources are discovered; a description of existing dredging exclusion zones to avoid and/or reduce the potential for adverse effects to historic properties; and the requirement to notify the USACE and state agencies if the Dredgers propose to expand dredging into areas not previously dredged. No adverse effects to historic properties, therefore, are expected from authorization of the LEDPA. No Programmatic Agreement between the USACE and the National Park Service, State

Historic Preservation Offices of Kansas, Missouri, and Nebraska, tribes, and ACHP would be necessary. The LEDPA complies with the provisions of Section 106 of the NHPA.

6.4 CUMULATIVE AND SECONDARY IMPACTS

Cumulative and secondary impacts are discussed in Chapter 5 of the Final EIS and section 3.2.2 of this document. No significant cumulative, indirect or secondary impacts not already addressed in the Final EIS are expected to result from authorization of the LEDPA in this Record of Decision.

6.5 WATER QUALITY CERTIFICATION

The Missouri Department of Natural Resources and the Kansas Department of Health and Environment certified in accordance with Section 401 of the CWA (33 U.S.C. §1341), that the work would not violate applicable water quality standards. These certifications contain several conditions which address water quality concerns. The applicants will be informed by the proposed permit transmittal letters that the conditions presented in the certifications are incorporated into the special conditions of the Department of the Army permit by reference, as stated in General Condition "5" of the permit document.

6.6 RELEVANT PRESIDENTIAL EXECUTIVE ORDERS

6.6.1 EO 11990, Protection of Wetlands

The decision described in this document is consistent with this executive order.

6.6.2 EO 13175, Consultation with Indian Tribes, Alaska Natives, and Native Hawaiians

The decision described in this document is consistent with this executive order. This action has no substantial direct effect on one or more Indian tribes.

6.6.3 EO 11988, Floodplain Management

The decision described in this document is consistent with this executive order. Alternatives to location within the floodplain, minimization, and compensation of the effects were considered above.

6.6.4 EO 12898, Environmental Justice

The decision described in this document is consistent with this executive order. In accordance with Title III of the Civil Right Act of 1964 and Executive Order 12898, it has been determined that the

project would not directly or through contractual or other arrangements, use criteria, methods, or practices that discriminate on the basis of race, color, or national origin nor would it have a disproportionate effect on minority or low-income communities.

6.6.5 EO 13112, Invasive Species

The decision described in this document is consistent with this executive order. There are no invasive species issues involved.

6.6.6 EO 13212 and 13302, Energy Supply and Availability

The decision described in this document is consistent with this executive order. The project is not one that will increase the production, transmission, or conservation of energy, or strengthen pipeline safety.

6.6.7 EO 12630, Takings Implication Assessment

In compliance with the requirements of Executive Order 12630 and the Attorney General's Guidelines for the Evaluation of Risk and Avoidance of Unanticipated Takings, I have reviewed and considered the Takings Implication Assessment (TIA) prepared for these permit applications and have concluded that the action contemplated, e.g., denial of three permits does not indicate a takings implication.

6.7 SIGNIFICANT ISSUES OF OVERRIDING NATIONAL IMPORTANCE

None were identified.

6.8 COMPLIANCE WITH SECTION 404(b)(1) GUIDELINES

Having completed the evaluation in Section 4, I have determined that the activities described as the LEDPA comply with the Section 404(b)(1) Guidelines.

6.9 PUBLIC INTEREST DETERMINATION

I find that issuance of the permit actions listed below, as prescribed by regulations published in 33 C.F.R. 320-332, is based on a thorough analysis and evaluation of the various factors enumerated above; that there are no reasonable alternatives available to the applicants that will achieve the purposes for which the work is being constructed; that the proposed work is in accordance with the overall desires of the public as reflected in the comments of state and local agencies and the general public; that the proposed work is deemed to comply with established state and local laws, regulations,

**ENVIRONMENTAL ASSESSMENT FOR COMMERCIAL
SAND AND GRAVEL DREDGING IN THE WAVERLY SEGMENT OF THE
LOWER MISSOURI RIVER**

and codes; that there have been no identified, significant, adverse, environmental effects related to the work; that the issuance of these permits is consonant with national policy, statutes, and administrative directives; and that on balance the total public interest should best be served by the approval of the LEDPA.

- Re-issuance of DA permits to Capital Sand Company, Inc. (NWK 2011-361) and Holliday Sand and Gravel Company, LLC (NWK-2011-363) to extract sand and gravel from the Missouri River subject to the limitations and special conditions described above.

6.10 FINDING OF NO SIGNIFICANT IMPACT

Having reviewed the information provided by the applicants and all interested parties and an assessment of the environmental impacts, I find that this permit action will not have a significant impact on the quality of the human environment. Therefore, a Supplemental Environmental Impact Statement will not be required.

APPROVED BY:



Date: 12/10/15

Stuart R. Cook
Chief, Operations Division
Kansas City District

S E C T I O N 7

Literature Cited

USACE. (2015). *Missouri River Commercial Dredging Final Biological Assessment*.

USACE. (2015b). *Memorandum for CENWK-OD-R: Missouri River bed and water surface changes between 2009 and 2014 as they relate to Renewal of Commercial Dredging Permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act (Section 404/10 Permits)*.

USACE. (2011). *Final Environmental Impact Statement for Missouri River Commercial Dredging*.

USACE. (2011b). *Record of Decision for Missouri River Commercial Dredging*.

USACE. (2010). *Draft EIS for Missouri River Commercial Dredging*.

USACE. (2010c). *Final 2010-2011 Annual Operating Plan, Missouri River Mainstem System*. Retrieved March 7, 2011, from <http://www.nwd-mr.usace.army/cc/aop.html>

USEPA. (1999). *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*. EPA Office of Federal Activities.

USFWS. (2003). *2003 Amendment to the 2000 Biological Opinion on the Operation of the Missouri River Mainstem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System*.