TIER II SUPPLEMENTAL
ENVIRONMENTAL ASSESSMENT

WITH

FINDING OF NO SIGNIFICANT IMPACT

REMOVAL OF ROCK PINNACLES AND OUTCROPPINGS CONSIDERED TO BE NAVIGATION OBSTRUCTIONS DURING LOW-FLOW PERIODS ON THE MIDDLE MISSISSIPPI RIVER

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I. INTRODUCTION

This Environmental Assessment (EA) supplements "*Environmental Assessment: Explosive Removal of Rock Pinnacles and Outcroppings Considered to be Navigation Obstructions During Low-Flow Periods on the Middle Mississippi River*" that was distributed for agency and public review in November, 2006. The recommended plan in the 2006 EA was to use explosives (drilling and blasting) to remove rock obstructions in the Mississippi River. Although the use of alternative methods other than explosive demolition (i.e., cutter head dredge, punch holes in the rock with a chisel or ram-rod) to remove the rock were considered during planning process, they were eliminated because of the hardness of the rock and the inability to remove it with mechanical dredging, rock punching or chiseling. This conclusion was based on similar work conducted in 1988-1989. After completion of environmental compliance for this project, St. Louis District engineering staff became aware of a potential additional rock removal method using mechanical grinding. The purpose of this Supplemental Environmental Assessment is to provide the public with information concerning the alternative of using mechanical grinding for rock removal and to asses the impacts of this alternative. In accordance with 40 CFR 1502.21, the original EA (Corps of Engineers 2006) is being incorporated by reference in an effort to reduce paperwork in accordance with 40 CFR 1500.4.

II. PROJECT NEED

During 1988, an extremely low-water year, it was realized that there were a number of rock pinnacles and rock shelves that were a potential hazard to commercial navigation traffic on the Middle Mississippi River. These rock hazards were removed during 1988-1999 using explosive removal. Validation of safe elevations was done with the use of an I-beam attached to two cables. The I-beam was used to sweep the removal areas after an area was lowered. The equipment used to delineate obstructions and to verify their removal was primitive by today's standards. Recently, new state-of-the-art hydrographic surveys were conducted and a number of new rock pinnacles and rock outcroppings were found that pose a potential hazard to commercial boat traffic (safety hazard), a threat to close the navigation system during low water (economic impact), and a threat to the environment (hazardous spill) if there were a towboat grounding.

III. PROJECT PURPOSE

The purpose of the project is to provide a safe and dependable navigation channel.

IV. PROJECT SCHEDULE

If mechanical grinding is determined to be feasible (e.g., cost and engineering) then rock removal using grinding techniques could begin as early as September 2009, and continue through the fall and winter. Based on grinding rate and amount of material, it is

anticipated that the actual grinding (based on the use on only one grinder) would take approximately two months. However, this does not include mobilization and demobilization, the time required to move equipment to each new grinding site, and potential delays due to high water. Because of our inexperience with this technology it is difficult to predict the total time-line for this project.

V. ALTERNATIVES PREVIOUSLY CONSIDERED

The 2006 EA considered two basic courses of action (1) NO FEDERAL ACTION, or (2) Provide a safe and dependable navigation channel by removing potential rock obstructions. Three separate engineering solutions were evaluated for providing a save and dependable navigation channel: (1) the use of explosives rock removal (Recommended Plan), (2) removal using mechanical dredging, rock punching or chiseling (determined to be infeasible based on rock hardness), and (3) increased rock removal and increased depth of removal to remove any rock in and adjacent to the channel that could potentially pose a future navigation hazard (alternative eliminated because of increased cost and environmental impacts).

VI. ADDITIONAL ALTERNATIVE: ROCK GRINDING ("NEW" RECOMMENDED PLAN)

Rock grinding would involve the use of a hydraulic cutter boom attachment or hydraulic rotary cutter (Photo 1, see for example). In effect, the cutter would chip the rock to be removed into pieces the size of cobble or larger depending on how the rock flakes. The areas of rock removal where shown in the 2006 EA (Corps of Engineers 2006a). NO NEW ROCK REMOVAL AREAS HAVE BEEN IDENTIFIED. The estimated rate of rock removal would be 10 cubic yards/hour. The cutting equipment would be mounted on a barge and moved into position using a GPS system. Material would be chipped and left in place or moved to previously coordinated (Corps of Engineers 2006a) disposal areas. This "new" alternative is the Recommended Plan. However, if for some reason mechanical grinding is found to be ineffective then rock blasting would be utilized per previous environmental compliance reviews.

VII. IMPACT ASSESSMENT: RECOMMENDED PLAN

A. BIOLOGICAL IMPACTS

It is anticipated that the cutting head of the grinding equipment would be avoided by young-of-year, juvenile, and adult fish. The chipping action of the mechanical grinder would likely produce noise that would result in fish avoidance. Should rock removal continue into the spawning season, due to unforeseen circumstances, larval fish could potentially be injured or killed by the cutting head. However, the area of actual work

(moving cutter head) is very small and the impacts should be minimal. Some benthic invertebrates could be displaced or killed by the rock removal.

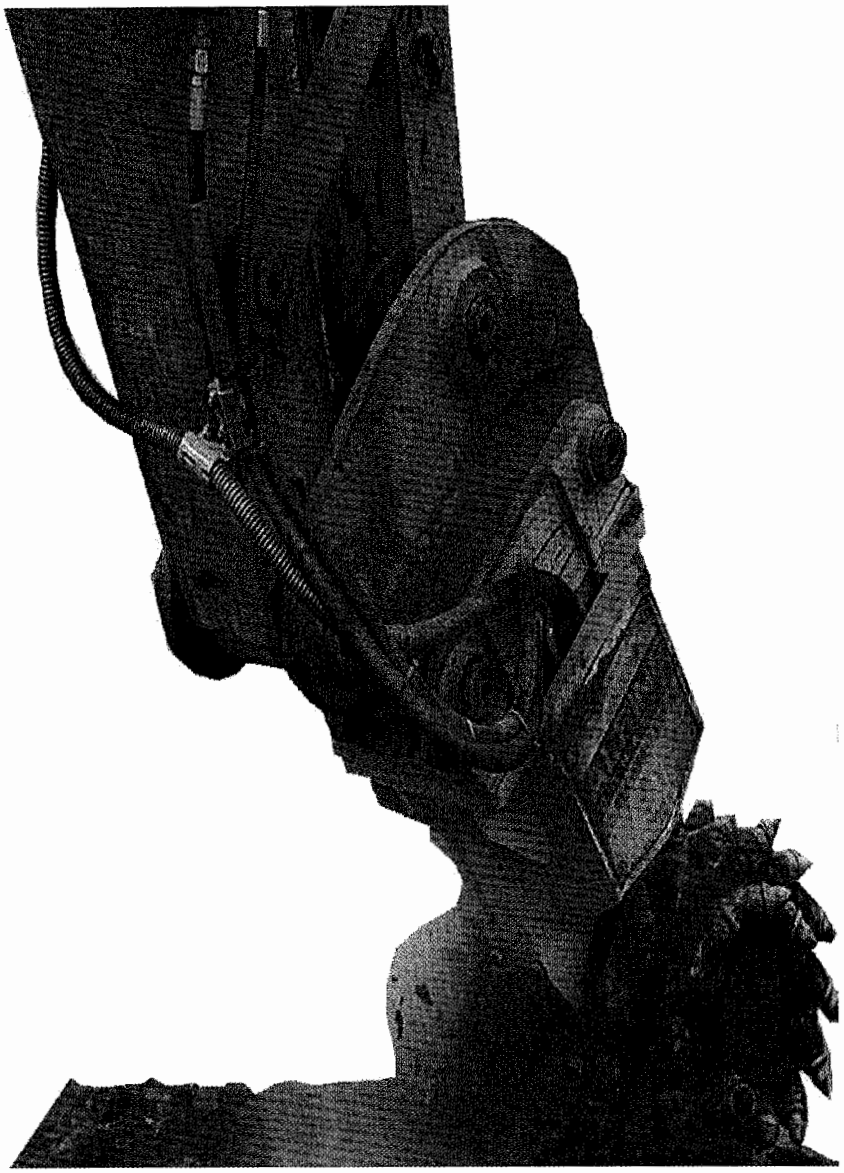

Photo 1: Photograph of Alpine's (One Potential Mechanical Grinding Equipment Company) Hydraulic Rotary Cutter

B. WATER QUALITY IMPACTS

It is anticipated that the rock to be removed will be chipped into cobble or larger pieces depending on the formation. However, some fines will result. Short-term turbidity increases would be expected. However, these increases would be small and localized considering the existing suspended sediment background levels.

C. PHYSICAL IMPACTS

The majority of the work to be conducted will involve removal of rock pinnacles and rock outcroppings. Rock chips, were practical, will be left in place. If it is not practical to leave rubble in place, it will be moved to pre-coordinated disposal areas (Corps of Engineers 2006a). The volumes of rock to be removed are small and the impacts from these actions are considered minor.

If it has to be removed, the rock from the Grand Tower reach will be used to create a gravel bar at the head of a developing sand/gravel bar. It is anticipated that this placement of rock will be beneficial in that it will provide attachment sites for aquatic invertebrates, and potential fish spawning habitat for benthic spawners.

The amount of rock being removed, including the rock/rubble/gravel run at Cottonwood Island, will not significantly change flows or flow patterns.

D. TERRESTRIAL IMPACTS

The project will be conducted entirely in the water. All work will be conducted from work barges. As such, there are no anticipated impacts to the terrestrial environment.

E. ARCHAEOLOGICAL IMPACTS

Archival review of historic shipwreck inventory survey reports suggest that the proposed Mississippi River pinnacle rock removal and off-channel lithic debris relocation will not occur near the reported locations of the structural remains any historic wreck sites. Additionally, on-site archaeological surveys of both bank line locations and in-stream bar deposits conducted during historical low water episodes during 1988 and 1989 by the St. Louis District, found no evidence of any potentially significant archaeological or historic shipwreck remains within the proposed project area boundaries. Therefore, based upon these data, it is concluded that this proposed rock removal / relocation activity will have no effect upon any potentially significant historic properties.

F. RECREATIONAL IMPACTS

Rock removal would occur in fall/winter/possibly spring. Boaters and fishermen would have to avoid the immediate area of the rock removal. Potential noise from the grinding equipment is likely to reduce fishing opportunities in the immediate vicinity of the rock removal. Impacts to recreation are anticipated to be minor and localized.

VIII. FEDERALLY ENDANGERED SPECIES: BIOLOGICAL ASSESSMENT

BACKGROUND INFORMATION

Programmatic Endangered Species Compliance: A programmatic (Tier I) consultation, conducted under Section 7 of the Endangered Act, considered the systemic impacts of the operation and maintenance of the 9-Foot Channel Navigation Project on the Upper Mississippi River System on listed species as projected 50 years into the future (U.S. Fish and Wildlife Service 2000). The consultation did not include individual, site specific project effects or new construction. It was agreed that site specific project impacts and new construction impacts would be handled under separate Tier II consultation. Although, channel maintenance dredging impacts were covered under the Tier I consultation, rock removal is not considered as a normal channel maintenance technique.

A Tier II Biological Assessment evaluating the potential impacts of the drilling and blasting (Previous Recommended Plan) on the bald eagle, least tern, and pallid sturgeon was conducted by the St. Louis District and provided to the U.S. Fish and Wildlife Service (U.S. Army Corps of Engineers 2006) . The BA provided a number of proposed mitigation measures to be employed to reduce blasting effects. A Biological Opinion with Reasonable and Prudent Measures to protect endangered species at risk was provided by the U.S. Fish and Wildlife Service.

Species Covered in this Consultation: The 2000 Biological Opinion presented the U.S. Fish and Wildlife Service's evaluated of the impacts of operation and maintenance on seven species: the decurrent false aster (*Boltonia decurrens*), the Higgins' eye pearly mussel (*Lampsilis higginsi*), the winged mapleleaf mussel (*Quadrula fragosa*), the pallid sturgeon (*Scaphirhynchus albus*), the least tern (*Sterna antillarum*), the bald eagle (*Haliaeetus leucocephalus*), and the Indiana bat (*Myotis sodalis*).

The decurrent false aster occurs in the Illinois River Valley and in counties adjacent to Mississippi River near the mouth of the Illinois River. The species' distribution is outside the project area. In addition, the species is a plant that occurs within a terrestrial habitat that will not be impacted by the project. The Higgins' eye pearly mussel and the winged mapleleaf mussel are both inhabitants of the Upper Mississippi River, but occur considerably north of the project area. It is anticipated that the Indiana bat will not be impacted. No trees or caves will be disturbed. For the above

mentioned reasons, these four species are not being considered for impact analysis. The least tern and bald eagle (no longer on the endangered species but still a protected species) were both evaluated in the Corps' Biological Assessment (2006). However, the new alternative involves rock grinding work conducted underwater rather than the use of explosives. The only potential impact to these two species would be from disturbance caused by the towboat and barge supporting the work. Minor above water noise could be produced by the grinding equipment on the barge. These impacts are considered minor and extremely localized and are not anticipated to adversely impact either species.

Pallid Sturgeon (Scaphirhynchus albus)

It is anticipated that the cutting head of the grinding equipment would be avoided by young-of-year, juvenile, and adult pallid sturgeon. The chipping action of the mechanical grinder would likely produce noise that would result in fish avoidance. The benthic impact zone, based on the size of the grinding head, is small and is measured in inches (22 to 44 inches depending on the grinding unit used).

It is anticipated that the project will be completed prior to the pallid sturgeon's spring spawning season. However, as discussed in the Schedule Section, this could change based on unforeseen circumstances (i.e., difficulty positioning grinding equipment over pinnacles, high water). Should rock removal continue into the spawning season, due to unforeseen circumstances, larval fish could potentially be injured or killed by the cutting head. However, the area of actual work (moving cutter head) is very small (22 to 44 inches depending on the grinding unit used) and the probability of impact is extremely low.

The decibel levels and frequency distribution of underwater sound produced by rock grinding are unknown. It has been shown that pallid sturgeon produce sound during the breeding season and it was suggested that sound communication may play a part in spawning aggregations (Johnson and Phillips 2003). There is a potential for impact to pallid sturgeon hearing if sound levels from rock grinding are extreme.

Popper and Hastings (2009) cautioned against extrapolating from results from one fish hearing impact study with only one sound source, one fish species, or even one size to other sources, species, or fish sizes. However, it is clear from a number of published studies that fish hearing generalists are less susceptible to hearing damage from loud underwater anthropomorphic sound (noise) than hearing specialists (i.e., Smith et al. 2004). For example Smith et al. (2004) examined the effects of increased ambient sound on hearing of two species differing in hearing capabilities: goldfish (*Carassius auratus*; a hearing specialist) and tilapia (*Oreochromis niloticus*; a hearing generalist). Fish were exposed to 1–28 days of either quiet (110 dB re 1 µPa) or continuous white noise. First, they examined the effect of noise sound pressure level (SPL; 130, 140, 160 or 170 dB re 1 µPa) on goldfish hearing thresholds after 24 h of noise exposure. Second, in a long-term experiment using 170 dB re 1 µPa white noise, they continuously exposed goldfish and tilapia for either 7 or 21–28 days. In both experiments, they measured alterations in hearing capabilities (using auditory brainstem responses) of noise-exposed fish. While

tilapia exposed to noise for 28 days showed little or no hearing loss, goldfish exhibited considerable threshold shifts that reached an asymptote of up to 25 dB after only 24 h of exposure. There was a positive linear relationship between noise-induced TTS and the sound pressure difference between the noise and the baseline hearing thresholds in the hearing specialist but not in the hearing generalist. Based on the frequency of sounds produced by pallid sturgeon (Johnson and Phillips 2003) and work with lake sturgeon (*Acipenser fulvescens*) and paddlefish (*Polyodon spathula*) (Lovell et al. 2005), acipenseriform (paddlefish and sturgeon) fish would be classified as hearing generalists and less susceptible to underwater noise damaging their hearing.

Based on preliminary coordination with the U.S. Fish and Wildlife Service (FWS), the St. Louis District proposes to monitor sound levels of the rock grinding. This monitoring will involve 4-5 grinding locations. Measurements of the existing soundscape (pre-construction activities) and grinding will be made using hydrophones. The dB re 1 µPa will be recorded and a sound level profile will be created around the grinding location as the center point. These data will be collected early in the project and provided to the FWS. Consultation on the previous Recommended Alternative (drilling and blasting) resulted in a time restriction on rock removal. This restriction was based on the larger impact zone associated with blasting. As previously noted, the project should be completed prior to sturgeon spawning. However, based on the small impact zone of rock grinding activities our current plan would call for non-stop grinding, if required. This would be changed, after consultation with the FWS, if acoustic surveys indicate a higher level of impact than currently anticipated.

Based on the best available scientific information (small impact zone, probable avoidance of the site by pallid sturgeon), it is the District's determination is that the project ***is not likely to adversely affect*** the pallid sturgeon. This determination is subject to change based on acoustic surveys. Early in the project, acoustic data will be coordinated with the FWS. Based on this coordination, re-consultation based on acoustic survey results would occur, if necessary.

IX. COMPARISON OF IMPACT OF RECOMMENDED ALTERNATIVE WITH PREVIOUS ALTERNATIVES

The No Action Alternative, because there is no construction activities associated with the project, has no direct physical or biological construction impacts associated with the alternative. However, should a towboat accident occur during low water conditions, because no actions were taken, there is a potential (however small that might be) of a catastrophic spill event.

The two blasting alternatives, including the previous Recommended Alternative or an additional blasting alternative that involved more rock removal (more areas and deeper removal) both had the largest potential biological impact associated with the use of explosives. A considerable amount of effort was involved designing a mitigation strategy to reduce impacts. Implementation involved a number of mitigation

effectiveness field studies. Even with mitigation techniques in place, blasting posed the greatest potential for damage to the aquatic environment when compared to all the alternatives, including the new Recommended Alternative of rock grinding.

The largest potential impacts from the Recommended Alternative are loss of habitat (same for all alternatives, with the exception of deeper removal) and the potential for sound impacts. All alternatives (rock removal using mechanical dredging, rock punching or chiseling (determined to be infeasible based on rock hardness)) would have had similar sound impacts as rock grinding. Blasting would have had the largest and potentially most destructive impulse noise impacts.

Based on this comparison, it would appear that rock grinding either has potentially similar or lesser impacts to the aquatic environment when all alternatives are compared.

X. INDIRECT & CUMULATIVE IMPACTS

Direct impacts were evaluated in Sections VII, VIII, and IX. Indirect (Secondary Impacts) are not anticipated. Cumulative Impacts for the Navigation Project were extensively studied (WEST Consultants, Inc. 2000), and described in U.S. Corps of Engineers (2004). The additive impacts of the rock grinding work as described and evaluated in this EA, when considering cumulative effects as previously addressed, are not considered to be significant.

XI. CLEAN WATER ACT/RIVERS & HARBORS ACT COMPLIANCE

The impact of the activity on the public interest will be evaluated in accordance with the Environmental Protection Agency guidelines pursuant to Section 404 (b)(1) of the Clean Water Act. This permit will be processed under the provisions of Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344).

XII. CONSERVATION RECOMMENDATIONS

As previously noted, based on preliminary coordination with the U.S. Fish and Wildlife Service, the St. Louis District proposes to monitor sound levels of the rock grinding. This monitoring will involve 4-5 grinding locations. Measurements of the existing soundscape (pre-construction activities) and grinding will be made using hydrophones. The dB re 1 μPa will recorded and a sound level profile will be created around the grinding location as the center point. This survey will be conducted early in the project and the acoustic data will be coordinated with the FWS. Based on this

coordination, re-consultation based on acoustic survey results would occur, if results deem it necessary.

XIII. LIST OF PREPARERS (INCLUDING 2006 PLANNING TEAM)

Name	Job Description/ Education/Registration	Area of Expertise
Edward Brauer	Hydraulic Engineer	5 Years Experience in River and Hydraulic Engineering
Robert Davinroy	Chief, River Engineering M.S.	26 Years Experience in River and Hydraulic Engineering
David Gordon	Senior Hydraulic Engineer P.E.	11 Years Experience in River and Hydraulic Engineering
Gregory Hempen	Geophysical Engineer, Ph.D, P.E., R.G.	Over 20 Years Experience Blast Design& Evaluating The Physical Effects of Explosions
Leonard Hopkins	Civil Engineer, M.S., P.E.	Project Manager, 13 Yrs. Civil Engineer Corps of Engineers
June Jeffries	Mech/Civl/Env Engineer M.S., P.E.	New Project Manager
Thomas Keevin	Fishery Biologist, Ph.D.	20 Years Experience Evaluating The Environmental Effects of Underwater Explosions; 30 NEPA Compliance
David Kelly	Regional Economist, M.S.	12 Years Experience Evaluating Economic Impacts to Navigation Industry
F. Terry Norris	Archaeologist Ph.D.	29 Years Archaeology/Historical Properties
Peter Russell	Hydraulic Engineer	5 Years Experience in River and Hydraulic Engineering

XIV. REFERENCES

Johnson, C.E., and C.T. Phillips. 2003. Sound production in sturgeon Scaphirhynchus albus and S. platorynchus (Acipenseridae). Environmental Biology of Fishes 68:59-64.

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WEST Consultants, Inc. 2000. Upper Mississippi River and Illinois Waterway Navigation Feasibility Study – Cumulative Effects Study, Volumes 1-2. Prepared by WEST Consultants, Inc. for the U.S. Army Corps of Engineers, Rock Island District, Rock Island, Illinois.

FINDING OF NO SIGNIFICANT IMPACT

TIER II SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT
REMOVAL OF ROCK PINNACLES AND OUTCROPPINGS CONSIDERED TO BE NAVIGATION OBSTRUCTIONS DURING LOW-FLOW PERIODS ON THE MIDDLE MISSISSIPPI RIVER

1. I have reviewed and evaluated the documents concerning the proposed removal of rock pinnacles and outcroppings on the Middle Mississippi River using rock grinding equipment. State-of-the-art hydrographic surveys have found a number of rock pinnacles and rock outcroppings that pose a potential hazard to commercial navigation traffic (safety hazard), a threat to close the navigation system due to low water (economic impact), and a threat to the environment (hazardous spill) if there was a towboat grounding.

2. I have also evaluated other pertinent data and information on rock removal. As part of this evaluation, I have considered the following project alternatives.

a. The use of rock grinding (Recommended Alternative). This "new" alternative is the Recommended Plan. However, if for some reason mechanical grinding is found to be ineffective then rock blasting would be utilized per previous environmental compliance reviews.

b. The use of drilling and blasting to remove rock (Previous Recommended Alternative).

c. Alternative methods of rock removal, including mechanical dredging, rock punching or chiseling.

d. A larger scale project using drilling and blasting to remove rock. This alternative would involve increased rock removal and increased depth of removal to remove any rock in and adjacent to the channel that could potentially pose a future hazard.

e. No Federal action ("No Action" Alternative).

3. The possible consequences of these alternatives have been studied for physical, environmental, cultural, social and economic effects, and engineering feasibility. Significant factors evaluated as part of my review include:

a. The total volume of rock pinnacles and shelf outcroppings to be removed amounts to approximately 4,600 to 4,700 cubic yards.

b. There are potential major economic implications should the navigation

channel close due to rock obstructions during low flow. For example, a 7 day closure in January/February would result in $8.5 million in economic losses.

c. Rock disposal methods and disposal areas have been coordinated with the U.S. Fish and Wildlife Service, Missouri Department of Conservation, and Illinois Department of Natural Resources.

d. The amount of rock being removed, including the rock/rubble/gravel run at Cottonwood Island, will not significantly change flows or flow patterns.

e. The potential impact from grinding on aquatic resources (fish and benthic invertebrates) is considered to be minimal because the actual grinding area is small. Adult, juvenile, and young-of-year fish will likely avoid the area because of the grinding noise. Larval fish could be injured or killed by the cutter head. However, the area of actual work (moving cutter head) is small and impacts should be minimal. Some benthic invertebrates could be displaced or killed by the rock removal.

f. The project will be conducted entirely in the water. All work will be conducted from work barges. As such, there are no anticipated impacts to the terrestrial environment.

g. Rock grinding will produce short-term turbidity increases. However, these increases would be small considering the background levels.

h. Rock removal and disposal activities will have no effect upon any potentially significant historic properties.

i. The impact of the activity on the public interest was evaluated in accordance with the Environmental Protection Agency guidelines pursuant to Section 404 (b)(1) of the Clean Water Act. A permit was processed under the provisions of Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344).

j. The St. Louis District made the determination that the project is *Not Likely to Adversely Affect* any listed species, species proposed for listing, or their critical habitat. This determination is subject to change based on acoustic surveys designed to determine if pallid sturgeon could by injured or killed by noise levels or disturbed at great distances. Early in the project, acoustic data will be collected, analyzed, and coordinated with the U.S. Fish and Wildlife Service. Based on this coordination, re-consultation based on acoustic survey results would occur for the pallid sturgeon, if necessary.

The least tern and pallid sturgeon both occur in or near the project area. The only potential impact to the least tern would be from disturbance caused by the physical presence of the floating work platform (barge & towboat) and above water noise created by the grinding equipment. The work area is extremely small and impacts are considered minor. It is anticipated that the cutting head of the grinding equipment would be avoided

by young-of-year, juvenile, and adult pallid sturgeon. The chipping action of the mechanical grinder would likely produce noise that would result in fish avoidance. Larval pallid sturgeon could potentially be injured or killed by the cutting head. However, the area of actual work (moving cutter head) is very small (22 to 44 inches depending on the grinding unit used) and the actual probability of impact is extremely low.

4. Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment, I have determined that the implementation of the recommended plan will not have significant effects on the quality of the environment. Therefore, an Environmental Impact Statement will not be prepared prior to proceeding with this action.

30 Sep 09
Date

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