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# Comparison of Environmental Assessments of Two Proposed Harbor Expansions on the Mississippi River

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## Abstract

The National Environmental Policy Act of 1969 requires federally funded projects to be evaluated for environmental impact to determine if a complete environmental impact statement must be prepared. Such an environmental assessment must also be included in any feasibility study for harbor enlargement and bank stabilization measures under the Water Resources Development Act. Population increases, coupled with economic growth from increased agricultural and industrial productivity, have resulted in increased Mississippi River barge transportation needs for Arkansas and Missouri. We report here two such environmental assessments of planned harbor expansions of the New Madrid County and Pemiscot County ports in the Missouri bootheel along the Mississippi River. We evaluated the environmental settings, presence of wetlands, and the presence of hazardous, toxic or radioactive wastes (HTRW) at the two sites. The results of these evaluations were used to determine the possible significant resources and impacts (including endangered species) associated with harbor expansion at the two sites. No significant HTRW were present or likely to be encountered during construction at either site. However, differences in 1) the environmental settings (open high banks vs. bottomland forest), 2) significant resources (historical accounts of least tern colonies at one site), and 3) presence of wetland habitat at one site may preclude or reduce the level of one or both harbor expansions. Careful consideration of possible environmental impacts may help guide the choice of sites for similar harbor expansions in Arkansas.

## Introduction

The National Environmental Policy Act of 1969 requires federally funded projects to be evaluated for environmental impact by "providing sufficient evidence and analysis for determining whether to prepare an environmental impact statement" (Federal Register, 1969). Such an environmental assessment must also be included in any feasibility study for harbor enlargement and bank stabilization measures under the Water Resources Development Act of 1966.

Population increases, coupled with economic growth from increased agricultural and industrial productivity, have resulted in increased Mississippi River barge transportation needs for Arkansas and Missouri. Additionally, national and state socioeconomic and political forces are working to increase the use of the Arkansas portion of Mississippi River as a transportation medium (Jonesboro Sun, 1999). Most Mississippi River harbor projects are large and require federal assistance for completion. Thus, the preparation of an environmental assessment for such projects is likely.

We report here two such environmental assessments of proposed harbor expansions of the New Madrid County and Pemiscot County ports located in the bootheel region of Missouri on the Mississippi River. Our goal was to evaluate

the environmental settings to determine if significant resources were present and if they would be impacted by the expansion projects. Rather than expending time and resources on extensive evaluations of all possible resources we have focused on the few that are likely to influence decisions about the projects. This information was used to determine if the preparation of an environmental impact statement might be necessary at either site. These sites are in proximity to northeastern Arkansas and have similar climate, geology, industrial, agricultural and socioeconomic considerations. Thus, a goal of this report is to provide a single source of information, (appropriate federal and state agencies to be contacted, useful methodologies and reference sources and manuals, etc), that would be applicable to preparing an environmental assessment for similar future harbor expansion projects in Arkansas. Finally, current thinking on environmental assessments suggests that the science and practice of developing assessments will not advance unless methods and results are shared in peer-reviewed forums (Suter, 1999).

## Materials and Methods

*Environmental Setting.*—Both potential harbor expansion

sion sites were evaluated for present land use, vegetation type, geology/groundwater, soils, wildlife and aquatic resources (including endangered and threatened species), cultural resources, the existence of important farmlands, the presence/extent of wetlands and the evaluation of the presence or potential for hazardous, toxic or radioactive waste (HTRW). All inspections, surveys and data collections took place between September 1997 and February 1998.

Qualitative and semi-quantitative assessments of dominant vegetation, wildlife (including rare and endangered species) and aquatic resources were performed using site inspections and interviews. Identifications were established using the following field guides: Bull and Farrand, 1990; Little, 1991; Palmer and Fowler, 1975; Peterson and McKenny, 1968. Further information on rare and endangered species was solicited from appropriate state (Missouri Department of Conservation) or federal agencies (United States Department of the Interior). Geology/groundwater (including potential earthquake hazard) and soils were determined using on-site inspection and published sources (Saucier, 1994; Brown 1977a, 1977b; EHM 1993).

Cultural resources were evaluated using site inspection and Morse and Morse (1983). The presence of HTRW was evaluated by on-site inspection; interviews with personnel associated with each harbor (e.g. harbor masters) and documented research.

Wetland delineations were performed following the Corps of Engineers Wetlands Delineation Manual (COE, 1987) using surveys of vegetation, soil, and hydrology in circular plots established along transects. Vegetation analysis was performed using Reed (1988). The soil analysis for each sample plot was determined using guidelines by the National Technical Committee for Hydric Soils (U.S.D.A., 1987) and soil color was determined using (Munsell 1994). The hydrology at each sample plot was determined by the presence of water in the soil hole within 45 cm of the surface, surface standing water, and hydric soil indicators. At those sites where the soil and hydrology criteria were met, the site was declared wetland if more than 50% of the dominant plant species were those typically found in a wetland and were listed in Reed (1988). Both wetland evaluations were performed during the month of November 1997.

**Significant Resources and Impacts.**—All information gathered was used to describe the project areas and provide an assessment of the significant resources and impacts likely to occur from each harbor expansion. The potential for significant impact to wooded and agricultural land, wetlands, wildlife, aquatic resources, threatened or endangered species, historic properties, water and air quality, and transportation was determined. The potential for release of hazardous, toxic and radioactive wastes due to past or current storage or use practices was assessed with regard to the proposed harbor expansions.

## Results

Assessment of the two proposed harbor expansions showed similarities and differences in the environmental settings between the two proposed harbor expansion sites.

**Project Area Descriptions.**—The New Madrid County Port is located at km 549 (mile 885) on the lower Mississippi River (latitude N36° 32' 2.6", longitude W89° 34' 14.7") just south of New Madrid, MO as part of the St. Jude Industrial Park. A rice mill and grain operation utilize a general cargo dock and a grain-loading dock. The harbor extends perpendicularly from the Mississippi River, creating a year-round, ice-free slack water harbor. Current harbor size is 460 m long by 135 m wide with a three meter depth. The proposed expansion area (a rectangular shape approximately 300 m long and 90 m wide) is located at the north (upriver) side of the port (Fig. 1). The area is mostly flat with a slight (1-2°) slope from the levee to the river to improve drainage. The soil is composed of sandy fill material from the NW original harbor construction. A narrow tree line buffer strip (8-10m) occurs along the eastern edge of the site at the top of the bank of the Mississippi River. The proposed harbor expansion is extensive, involving the removal of 172,000 cubic m of material and the placement of 27,000 metric tons of rip-rap after expansion to reduce slope instability.



Fig. 1. Diagram of New Madrid County existing harbor and proposed widening site. Asterisks indicate areas with mature trees.

The Pemiscot County Port is located at km 526 (mile 849) on the lower Mississippi River (36° 13' 42.4" North latitude and 89° 41' 54.9" West longitude) just west of Caruthersville, MO on a portion of the river historically known as Gayoso Bend. This port includes a barge lid manufacturing facility with loading crane, granular fertilizer warehouse, and grain loading facilities and extends approximately 600m along Gayoso Bend. The harbor expansion

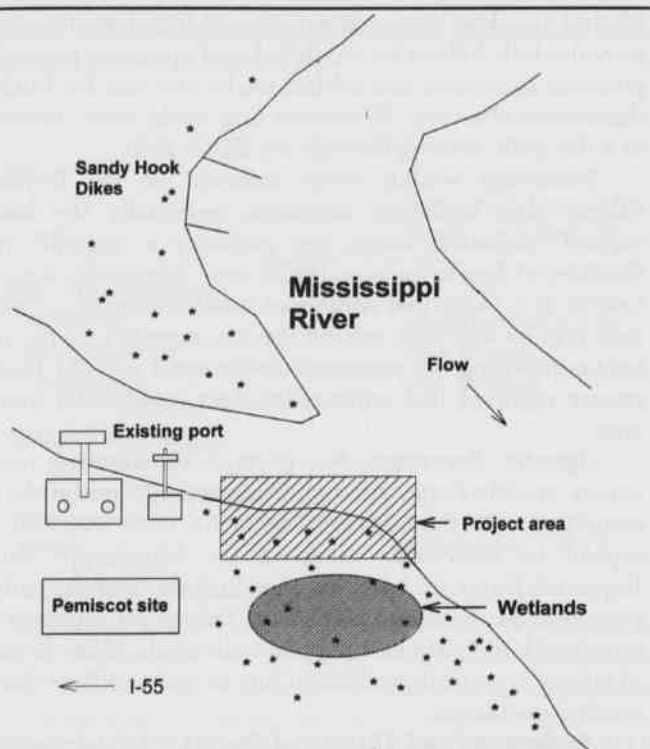


Fig. 2. Diagram of Pemiscot County existing harbor and proposed widening site. Asterisks indicate areas with mature trees

area is located near the confluence with the main channel of the Mississippi River and is separated into a lower riverbank area and an upper inter-levee area by the remains of a levee built in 1915. The riverbank area extends from the chemical warehouse easterly and southerly about 700 m in an elongated double half-moon, ending just downstream of the harbor mouth (Fig. 2). The project plan calls for removal of this half-moon shaped area to enlarge the harbor mouth. The inter-levee section lies between the 1915 levee and the current main-line levee. It is composed of a 6 ha dredge basin filled with dredged material from the harbor and a 7.3 ha willow-dominated wooded area. This wooded area is proposed to be filled by material removed from the expansion area. The amount of material to be removed would be approximately 115,000 cubic m, with 20,000 metric tons of rip-rap placed after expansion to reduce slope instability.

**Land Use.**—The primary land uses for both the New Madrid and Pemiscot study areas are rural agricultural and industrial with low density residential areas. Both expansions would occur on currently unused land partly (Pemiscot) or almost completely (New Madrid) formed by fill material. Some agriculture and manufacturing occurs immediately adjacent to the New Madrid harbor; a fleeting service (barge storage) is directly across from the Pemiscot harbor.

**Vegetation.**—The New Madrid site is composed almost entirely of little bluestem grass with scattered small cotton-

Table 1. Proportional occurrence of major flora within vegetation layer type in the New Madrid County and Pemiscot County proposed harbor expansion sites.

	% Occurrence	
	New Madrid	Pemiscot
<b>Treelayer</b>		
Cottonwood ( <i>Platanus occidentalis</i> )	98	30*
Black willow ( <i>Salix nigra</i> )	1	60*
Water locust ( <i>Gleditsia aquatic</i> )		5
Possumhaw ( <i>Ilex decidua</i> )		2
Red maple ( <i>Acer rubrum</i> )	1	2
Osage orange ( <i>Maclura pomifera</i> )		1
<b>Herbaceous layer</b>		
Little Bluestem grass ( <i>Schizachyrium scoparium</i> )	95**	0
Goldenrod ( <i>Solidago</i> spp.)	<5	
Johnson grass ( <i>Sorghum halepense</i> )	<5	5
Smartweed ( <i>Polygonium</i> spp.)		30
Pigweed ( <i>Chenopodium album</i> )		30
Aster ( <i>Aster</i> spp.)		5
Ballon bine ( <i>Cardiospermum halicacabus</i> )		5
Greenbrier ( <i>Smilax</i> spp.)		5
Cocklebur ( <i>Agrimonia</i> sp.)		15
<b>Vine layer</b>		
Green briar ( <i>Vitis</i> sp.)		>90
Wild grape ( <i>Vitis vulpina</i> )		<10

\*together comprised 60% of all vegetation in project area. \*\* comprised 95% of all vegetation in project area.

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woods and no wetland species (Table 1). The Pemiscot site is dominated by cottonwood and black willow saplings with a few mature trees and an herbaceous layer containing several wetland species. A vine layer on this site is dominated by green briar. No defined shrub layer is present at either site.

**Geology/Groundwater.**--Both proposed harbor expansion sites occur within the low relief Mississippi River alluvial valley within the upper Mississippi Embayment geologic province (Table 2). The New Madrid site sits on a Late Pleistocene terrace covered with Holocene natural levee sands/silts and fill sand from harbor construction. The Pemiscot site is composed of unconsolidated fluvial sediments of sand and clay. Both sites exhibit influent alluvial recharge into shallow alluvia aquifers; the Pemiscot site has a locally perched water table. There is a potential for significant geomorphological changes at both sites in the event of a strong earthquake from the nearby New Madrid fault.

**Soils.**--Soil types and characteristics at both harbor expansion sites are generally those expected in a large river floodplain (Table 3). At both sites the soils are characteristic of nearly level to gently sloping surfaces near the top of natural levees. However, the New Madrid natural levee is relatively old, whereas the natural levee at Pemiscot is relatively young. The New Madrid site soil was quite uniform in texture, color, and structure because it is primarily dredge material from harbor construction. The Pemiscot site soil is more variable due to the frequent flooding and sedimentation from the Mississippi River.

**Wildlife.**--The two sites exhibited differences in species richness (Table 4). The exposed, sandy soil of the New

Madrid site with its sparse covering of little bluestem grass provides little habitat for wildlife. Local observers report the presence of racoon and rabbit; tracks and scat for both of these were observed. Numerous dog tracks were observed in a dirt path running through the buffer strip.

Numerous wildlife were observed on the Pemiscot County site, including songbirds (especially the black-capped chickadee, which was probably a migrant), red-shouldered hawk, racoon tracks and numerous signs of beaver. It is likely that additional small mammals, amphibians, reptiles and birds inhabit the site, especially in the wetland comprising the proposed dredge spoil pit. The harbor master reported that white-tailed deer inhabit the project area.

**Aquatic Resources.**--No permanent standing water occurs at either site. All significant aquatic resources are associated with the adjacent harbor for both sites and are typical of slackwater areas of the Mississippi River. Reported fishes in both harbors include sunfish, catfish, carp, buffalo, drum and black bass. Fishing for catfish at the mouth of both harbors is popular with locals, likely because of enhanced catfish production due to grain spillage during loading operations.

**Endangered and Threatened Species.**--Habitats associated with the proposed projects may support the following threatened or endangered species: bald eagle (*Haliaeetus leucocephalus*), pallid sturgeon (*Scaphirynchus albus*) and interior least tern (*Sterna antillarum athalassos*). None of these species was observed at either site during a total of six visits by Arkansas State University personnel. The U.S. Fish and Wildlife Service and the Policy Coordination office of the

Table 2. Geological and ground water characteristics of potential harbor expansion sites in New Madrid County and Pemiscot County, MO. Both sites are within the upper Mississippi River Embayment.

	New Madrid	Pemiscot
Geologic province	low-relief, braided channel terrace of the Mississippi River alluvial valley	low-relief Mississippi River alluvial valley
Terrace type	Late Pleistocene	Late Pleistocene
Bank height	up to 11 m, varies by flood stage	up to 9 m, varies by flood stage
Surficial materials	Holocene natural levee sands and silts deposited over Late Pleistocene valley train sands/gravels; fill sand	unconsolidated fluvial sediments consisting of lenticular sand units within silty clays
Groundwater	influent regime recharging adjacent shallow alluvial aquifers of 50 - 70 m thickness	influent shallow recharge, alluvial aquifer 50 - 65 m thick, locally perched water table above clay
Earthquake potential	lateral spreading of banks during strong earthquakes	liquefaction of shallow saturated sands and lateral spreading

Table 3. Soil types and characteristics for general and wetland evaluations at the New Madrid County and Pemiscot County proposed harbor expansion sites.

	New Madrid	Pemiscot
Soil type series	fine sandy loam Alfisols Bosket and Broseley	silt loam Inceptisols Commerce
Soil characteristics thickness general color drainage	approximately 2 m dark brown well drained	approximately 1.5 to 2 m dark grayish poorly drained
Wetland evaluations		
horizon and depth	Ap-0 to 2 cm	Ap-0 to 4 cm
color	light brown (10YR 5/2)	dark grayish brown (2.5Y 4/2)
characteristics	very sandy loam fill material; very weak fine granular structure; few fine roots	silty loam; weak, granular structure; few fine roots
mottles	few light brown (10YR 4/6); very weak wavy boundary	brownish-red (2.5YR 2.5/3); abrupt smooth boundary
horizon and depth	A-2 to 14 cm	Al-4 to 14 cm
color	light brown (10YR 5/2)	dark grayish brown (10YR 3/2)
characteristics	very sandy loam fill material; very weak fine dry granular structure; with numerous 1/25" diameter pea gravel	silty clay loam; thin platy structure breaking into moderate, fine and granular
mottles	none	numerous, large, brownish red (2.5YR 2.5/3)

Missouri Department of Conservation were contacted regarding their opinions on impacts of the proposed projects to endangered and threatened species. The USFWS response (G. Frazer, pers. comm.) indicated that there are no known bald eagle nests in the vicinity of either proposed project area, and that pallid sturgeon preferred large, turbid, free-flowing, braided-channel riverine habitat, which is not found in either proposed project area. The USFWS indicated that least tern colonies have been observed on an island east of the Pemiscot County project area (river mile 845.2, km 524) and very near or within the New Madrid County project area.

The Missouri Department of Conservation (G. Christoff, pers. comm.) indicated that there were no sensi-

tive species or communities known to occur on the Pemiscot County site or surrounding area. However, the MDC confirmed reports by locals that nesting colonies of the threatened interior least tern were observed on the sandy soil within the New Madrid County project site in June, 1990, when Mississippi River levels were high and preferred sandbar nesting habitats were inundated.

**Cultural Resources.**--Human occupation of the Mississippi valley in the vicinity of both proposed projects areas began approximately 12,000 years ago and has been continuous ever since (Morse and Morse, 1983). The cultural succession for the region includes the Dalton (12,000 to 8000 years ago), the Archaic (8000 to 3000 years ago), the Hopewell (3000 to 1000 years ago), and the Mississippian

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Table 4. Occurrence of major wildlife species at the New Madrid County and Pemiscot County proposed harbor expansion sites.

	New Madrid	Pemiscot
beaver ( <i>Castor canadensis</i> )		*
eastern cottontail rabbit ( <i>Sylvilagus floridanus</i> )	*	*
raccoon ( <i>Procyon lotor</i> )	*	*
swamp rabbit ( <i>Sylvilagus aquaticus</i> )		*
white-tailed deer ( <i>Odocoileus virginiana</i> )		*
black-capped chickadee ( <i>Parus atricapillus</i> )		*
blue jay ( <i>Cyanocitta cristata</i> )		*
field sparrow ( <i>Spizella pusilla</i> )		*
indigo bunting ( <i>Passerina cyanea</i> )		*
interior least tern ( <i>Sterna antillarum athalassos</i> )	*†	
red-shouldered hawk ( <i>Buteo lineatus</i> )		*
red-winged blackbird ( <i>Agelaius phoeniceus</i> )		*
wood duck ( <i>Aix sponsa</i> )	*	*
mallard duck ( <i>Anas platyrhynchos</i> )		*

†nesting colonies observed in June, 1990 by harbormaster and Missouri Department of Conservation

(1000 years ago to European settlement). At the time of European contact, areas adjacent to both proposed project sites were occupied by the Pacaha chiefdom of the Mississippian culture (Morse and Morse, 1983). No cultural artifacts have been observed at either port expansion site, however, an extensive archeological clearance was not conducted as a part of this study.

**Presence/Extent of Wetlands.**--Both proposed project sites were evaluated for three characteristics that define the presence of wetland: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology.

**Vegetation.**--The New Madrid County proposed project area was dominated by a single species of grass (little bluestem grass; Table 1) which is a facultative upland plant. This proposed project area does not meet the wetland vegetation component of the wetland delineation methodology.

All vegetation on the Pemiscot County site occurred within either a tree or herbaceous strata. The tree stratum is composed of black willow (*Salix nigra*) and cottonwood (*Populus deltoides*). The tree cover is dominated (60%) by black willow. The Pemiscot County site meets the vegetation criteria for a wetland.

**Soil.**--The soil of the New Madrid County site as previously described (Table 3) had no noticeable hydric soil characteristics.

The soil of the Pemiscot County site is comprised of silty clay loam with hydric soil characteristics (mottles). This site meets the soils criteria for a wetland.

**Hydrology.**--The deep sandy fill that makes up the New

Madrid site would make ponding, or standing of water impossible. The relatively high bank above the Mississippi makes inundation unlikely for all but the highest floods. Therefore, wetland hydrology was not present on this site.

The Pemiscot County site is immediately adjacent to the river inside the old mainline levee and thus is subjected to extended periods of inundation. The soil pit had standing water approximately 30 cm below the soil surface. There were large logs and numerous other drift material strewn about the area and water marks present on the trees at a height of 1.8-3 m. Wetland hydrology is present over most of this site.

**Hazardous and Toxic Waste.**--A search for potential sources of contamination and a risk assessment from construction activities to endangered species were performed within the project area through contacts with appropriate personnel and site visits. For the New Madrid County site this included the U.S. Fish and Wildlife Service, the St. Jude Industrial Park, Noranda Aluminum, Inc., Louis Dreyfus, and Associated Electric Cooperative, Inc. These contacts revealed that no hazardous waste dumps are located on the site, no hazardous waste spills have occurred for at least 11 years, and little hazardous material is shipped by either rail or barge from or to the site. Some hazardous and radioactive material storage and disposal records have been documented by industries adjacent to the project area. A historic county landfill, located 486m south of the project area, has been officially closed, capped, and poses no risk to the project activities. Site visits indicated an absence of apparent

site-specific HTRW problems within the project area.

For the Pemiscot County site, the U.S. Fish and Wildlife Service, the Caruthersville Port Authority, and the City of Caruthersville were contacted for HTRW. These contacts indicated that no hazardous waste dumps are located on the site, no hazardous waste spills have occurred for at least five years, and little hazardous materials is shipped by either rail or barge from or to the site. An historic landfill is located approximately 300m northwest of the proposed project area. It is currently at full capacity and awaiting official closure. Site visits revealed an illegal dump within the project area containing non-hazardous residential trash. There are no apparent site-specific HTRW problems within the project area.

### Discussion

The information developed above was considered in the following assessment of the likelihood of negative impact on significant resources associated with the local environs that would be affected by the proposed harbor expansions.

**Wooded Land.**--The Federal Water Project Recreation Act and the Fish and Wildlife Coordination Act are used to protect wooded lands as a resource important to sustaining wildlife populations. There is very little woodland acreage associated with the New Madrid County proposed project. All woodland is contained in a narrow strip (8-10 m) of stream bank buffer lying parallel and immediately adjacent to the expansion site at the top of the Mississippi River stream bank. This strip should be left as undisturbed as possible after harbor expansion to continue to serve as a buffer zone for reducing non-point source runoff and providing habitat for wildlife.

Significant wooded land and associated wildlife habitat would be eliminated by the Pemiscot County proposed project, especially in the inter-levee area to be used as a dredge pit. The existence of similar habitats adjacent to the project site may provide some refugia for wildlife displaced by the expansion.

**Agricultural Land.**--Agricultural land is recognized as important by the Farmland Protection Policy Act and by the Food Security Act of 1985. The New Madrid County proposed project would not take any farmland out of production because the area is covered with 13-50 cm of sandy fill and would be poorly suited for crop production.

The Pemiscot County proposed project would not take any farmland out of production because approximately 40% of the area is located within the normal seasonal Mississippi River flood plain; 30% is comprised of wetland and the remainder is a dredge pit covered with 50-75 cms of sandy fill and would be poorly suitable for crop production.

**Wetlands.**--The Clean Water Act and its associated regulations underscore the importance of wetlands to the natural resources and the well-being of the Nation due to their capacity for providing ecosystem services such as water quality improvement, sediment-trapping, flood control and wildlife habitat. Evaluation of the New Madrid County proposed project area indicates that neither vegetation, soils nor hydrology are suggestive of the existence of any wetlands. Conversely, the Pemiscot County site has vegetation, soils and hydrology that are suggestive of the existence of substantial wetlands within the project area. Current construction plans would eliminate all wetlands within this project area.

**Wildlife.**--The level of impact on wildlife resources in the New Madrid County proposed project area is likely to be low because of the poor to very poor wildlife habitat. In contrast, the level of negative impact on wildlife resources in the Pemiscot County proposed project area is likely to be very high because of the elimination of wetland and upland forest habitat.

**Aquatic Resources.**--The Clean Water Act is designed to improve, maintain, and protect the aquatic resources of the United States. The proposed projects will enlarge the existing slackwater harbors. During excavation activities it is likely that transient negative impacts, especially on benthic organisms, will occur from increased turbidity and habitat disturbance during drag-line and dredging operations. At both sites the planned stabilization of the newly exposed riverbank with rip-rap should minimize the long-term negative impact of the projects and provide additional high quality habitat for colonizing benthic organisms.

**Threatened or Endangered Species.**--The Endangered Species Act of 1973 provides legal protection for designated species. On-site inspections, local observers and both the US Fish and Wildlife Service and Missouri Department suggest that bald eagles and pallid sturgeon will probably not be adversely impacted by either of the proposed projects.

On-site inspections at the New Madrid County site revealed no colonies of least terns, but these inspections did not occur during the breeding season (late April to early October). Evidence from three different sources indicates that the site has been used for nesting by interior least terns in the past (1990). Because 1) the preferred nesting habitat for interior least terns is barren sandbars, 2) these preferred habitat types are still common at normal river stages on the Lower Mississippi River (Frazier, pers. comm.) and 3) least tern nesting apparently occurs in the proposed project area only during periods of extreme flooding of the Mississippi, it would be reasonable to conclude that the proposed project site is not preferred by interior least terns. The reported presence of racoons and the apparent high number of visits by dogs on the project site suggests that high predation pressure would occur on this ground-nesting bird, rendering



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the site marginal breeding habitat at best.

On-site inspections, local observers and both the US Fish and Wildlife Service and Missouri Department of Conservation suggest that bald eagles, pallid sturgeon and interior least terns will probably be minimally or non-impacted by the Pemiscot County proposed project. Several large trees which may be suitable for bald eagle perches will be removed. Interior least terns have been reported to fly as far as six km from a nesting colony to forage so they are likely to occur within the harbor area. Because the planned project is a widening of an existing harbor, no reduction in the availability of foraging habitat or abundance of small forage fish should occur, and the impact on interior least terns should be minimal.

**Historic Properties.**--There are no dwellings or other structures within either project area that are on the National Register of Historic Places. Thus, no impact will occur as a result of these projects.

**Water Quality.**--The lower Mississippi River is characterized by high turbidity from suspended solids, moderately elevated levels of nutrients (phosphate, nitrate) from fertilizer, depressed levels of silicate (due to increased diatom populations from elevated nutrients; Turner and Rabalais, 1991) and seasonal extremes in flow. It is not expected that either of the proposed projects will cause long-term changes in any of these variables.

**Air Quality.**--Long-term changes in the air quality are not expected to occur at either proposed project. It is likely that transient, local air quality degradation will take place because of emissions from drag-line and dredging machinery. It is unlikely that such emissions will greatly exceed those issued by tugboats during normal loading and unloading operations.

**Transportation.**--Transportation within both proposed project areas would be temporarily impacted while construction occurs. Because a drag line will be used to excavate material from the north bank of the New Madrid County harbor, and the existing facilities are located on the south bank, the impact should be minimal. Similarly, because materials will be excavated from the mouth of the Pemiscot County harbor, and the existing harbor facilities are located further upstream in Gayoso Bend, the impact should be minimal. Overall, transportation of barge-associated goods should increase as a result of each project implementation.

**Hazardous, Toxic and Radioactive Wastes.**--Based upon site visits and information gathered during the preliminary assessment of both project areas, it is reasonable to assume that no hazardous, toxic, or radioactive wastes would be encountered during the harbor expansions at the New Madrid County or Pemiscot County ports. The illegal dump site at the Pemiscot County site (which should be removed) and the capped municipal landfill nearby should not cause HTRW problems. No additional HTRW investigations are

recommended and no further analysis is required.

### Summary

From the results of these assessments, it is clear that specific environmental impacts will probably occur as a result of harbor expansions at both the New Madrid County and Pemiscot County ports. The use of the New Madrid site by a federally endangered/threatened species, and the existence of significant forested wetlands on the Pemiscot site may warrant further investigation into the cost vs. benefit of expanding these harbors. It is possible that additional arrangements will be necessary to reduce, eliminate or mitigate the negative environmental impacts associated with the projects. This is already underway for the Pemiscot County site, where the wetlands associated with the project, including both the riverine wetland and the interlevee wetland, (a total of 75 acres) are being mitigated by construction of artificial wetlands on a lake near Kennett, MO. If suitable alternative nesting sites are available for Interior least terns then the loss of the marginal site at the New Madrid County port may not be of concern.

The link between the present projects and similar projects likely to occur in regions of Arkansas bordering the Mississippi River is clear. Economic expansion in Arkansas due to industry and agriculture is necessary and inevitable as the regional population increases and becomes more diversified and mechanized. A concomitant increase in transportation needs, including increased use of the Mississippi River waterway as a conduit will result. Careful consideration of the environmental resources and possible impacts of harbor sites should allow economically efficient expansions while minimizing negative impacts on the environment.

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