Missouri River Recovery Program Sandy Point Bend Shallow Water Habitat Construction Project Draft Project Implementation Report May 2010
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Sandy Point Bend
Shallow Water Habitat Construction Project
Draft Project Implementation Report
May 2010
Responsible Agency and Lead Federal Agency: U.S. Army Corps of Engineers (Corps)

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<th>Definition</th>
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<tr>
<td>ACHP</td>
<td>Advisory Council on Historic Properties</td>
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<tr>
<td>ACT</td>
<td>Agency Coordination Team</td>
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<tr>
<td>AMSL</td>
<td>Above Mean Sea Level</td>
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<tr>
<td>APE</td>
<td>Area of Potential Effect</td>
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<tr>
<td>BEA</td>
<td>Bureau of Economic Analysis</td>
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<tr>
<td>BSNP</td>
<td>Bank Stabilization and Navigation Project</td>
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<tr>
<td>C</td>
<td>Celsius</td>
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<tr>
<td>CA</td>
<td>Conservation Area</td>
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<td>Corps</td>
<td>U.S. Army Corps of Engineers</td>
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<td>CRP</td>
<td>Construction Reference Plane</td>
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<td>CWA</td>
<td>Clean Water Act</td>
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<td>EA</td>
<td>Environmental Assessment</td>
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<td>Environmental Protection Agency</td>
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<td>ESA</td>
<td>Endangered Species Act</td>
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<tr>
<td>FONSI</td>
<td>Finding of No Significant Impact</td>
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<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
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<td>Iowa Department of Natural Resources</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
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<tr>
<td>mg/l</td>
<td>Milligrams per liter</td>
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<tr>
<td>NAAQS</td>
<td>National Ambient Air Quality Standards</td>
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<td>NASS</td>
<td>National Agricultural Statistics Service</td>
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<td>National Environmental Policy Act</td>
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<td>Nebraska Game and Parks Commission</td>
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<td>NLCD</td>
<td>National Land Cover Data Set</td>
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<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
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<td>Nebraska State Historical Society</td>
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<tr>
<td>SRA</td>
<td>State Recreation Area</td>
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<tr>
<td>Abbreviation</td>
<td>Full Name</td>
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<tr>
<td>SWPPP</td>
<td>Storm Water Pollution Prevention Plan</td>
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<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
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<tr>
<td>USFWS</td>
<td>United States Fish and Wildlife Service</td>
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<tr>
<td>USGS</td>
<td>United States Geological Survey</td>
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<tr>
<td>WMA</td>
<td>Wildlife Management Area</td>
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<tr>
<td>WRDA86</td>
<td>Water Resources Development Act of 1986</td>
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<tr>
<td>WRDA99</td>
<td>Water Resources Development Act of 1999</td>
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Chapter 1  INTRODUCTION

1.1 INTRODUCTION

The Missouri River Recovery Program (MRRP) was developed by the U.S. Army Corps of Engineers, Omaha District (Corps) to address actions included in the 2000 and 2003 Amended Biological Opinions (BiOp) on the Operation of the Missouri River System and the Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project (Mitigation Project) authorized by the Water Resources Development Acts of 1986 and 1999 (WRDA86 and WRDA99). The BiOp and Mitigation Project provide direction and authority to complete projects that provide fish and wildlife habitat along Missouri River. These actions are being undertaken to address endangered species needs and mitigate for the loss of habitat that resulted from construction, operation, and maintenance of the Missouri River Mainstem Reservoir System and the Bank Stabilization and Navigation Project (BSNP).

The Sandy Point Bend project site consists of 251.6 acres and is situated on the Nebraska side of the Missouri River in Harrison County, Iowa. This tract of land is located in parts of Sections 8, 16, 17, 20, and 21 in Township 79N, Range 45W of the 5th Principal Meridian. This parcel is owned and managed by the U.S. Army Corps of Engineers, Omaha District (Corps). This Project Implementation Report (PIR) focuses on potential habitat development activities at Sandy Point Bend, generally located between River Miles (RM) 656.3 and 657.9 (See Figure 1-1 and 1-2). Specifically, this report focuses on the construction of shallow water habitat (SWH).

This PIR includes an Environmental Assessment (EA) consistent with the National Environmental Policy Act (NEPA). It provides an analysis of alternatives and a detailed description of the recommended plan for a flow-through chute complex at Sandy Point Bend. This PIR also contains an evaluation of environmental impacts consistent with the requirements of pertinent Federal regulations including NEPA, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and Section 404 of the Clean Water Act (CWA).

1.2 BACKGROUND

Historically, the dynamic nature of the Missouri River created an environment of braided, sinuous channels, sloughs, chutes, oxbows, sand and gravel bars, alluvial islands, deep pools, and marshlands. Since the early 20th century, the natural fluvial processes of predictable seasonal flooding into overbank areas,
cut-and-fill alluviation associated with river meandering, and channel avulsion have been interrupted by efforts to redirect the energy of the river under the
Figure 1-1. Sandy Point Bend Regional Project Location
Figure 1-2. Sandy Point Bend Project Site, Local Reference.
auspices of the BSNP and to control the flows through the construction and operation of a system of six large dams. The Rivers and Harbors Act of 1912, 1925, 1927, and 1945 authorized the BSNP. The existing BSNP extends 735 miles from Sioux City, Iowa to the mouth near St. Louis, Missouri and maintains a nine-foot deep by 300-foot wide channel. The BSNP consists mainly of revetments along the outsides of bends and transverse dikes along the insides of bends to force the river into a single active channel that is self-maintaining.

This has resulted in a river with a single channel that is maintained along a predetermined design alignment and flows that are suppressed in the spring and augmented in late summer. The original channel that once ranged from 1,200 feet to 2 miles wide is now 600 to 1,100 feet wide, with a majority of the water consisting of a deep main channel. This narrowing, along with controlled flows, resulted in the loss of approximately 100,200 acres of shallow, open water habitat and has greatly homogenized the habitat available to riverine species.

The Sandy Point Bend Site was acquired by the Corps and is proposed to be developed as part of the Recovery Program.

1.3 PROJECT AUTHORITY

With the Corps’ 2005 appropriation from Congress, the Corps combined the Missouri River Mitigation Project with the implementation of the Missouri River Biological Opinion to form the Missouri River Recovery Program.

The proposed Sandy Point Bend project is intended to help meet the shallow water habitat acreage goal of the U.S. Fish and Wildlife Service’s (USFWS) Biological Opinion for the Missouri River (BiOp) (USFWS 2000, 2003) and thus provide habitat for the endangered pallid sturgeon (*Scaphirhynchus albus*) and other native fish and aquatic species. The BiOp set forth the Reasonable and Prudent Alternative (RPA) requirements for habitat restoration/creation/acquisition related to restoration of submerged in-channel shallow water habitat (SWH) in the channelized Missouri River. SWH may be restored through flow management, increasing the top width of the channel (widening), restoring chutes and side channels, manipulation of summer flows, or a combination thereof (USFWS, 2003, pg. 193).

The Missouri River Bank Stabilization and Navigation Project (BSNP) Fish and Wildlife Mitigation Project of Missouri, Kansas, Iowa, and Nebraska was authorized by Section 601 (a) of the Water Resources Development Act of 1986 [Public Law (PL) 99-662]. The authorization included the acquisition and development of 29,900 acres of land, and habitat development on an additional 18,200 acres of existing public land in the states of Iowa, Kansas, Missouri, and Nebraska. The total amount of land authorized for mitigation by WRDA86 was 48,100 acres. Section 334(a) of WRDA99 (PL 106-53) modified the Mitigation Project by increasing the amount of acreage to be acquired and/or mitigated by...
118,650 acres. As a result, the total amount of land authorized for mitigation is currently 166,750 acres.

The Corps prepared a Feasibility Report and Environmental Impact Statement (Corps 1981) on the original Mitigation Program of 48,100 acres. After Congress modified the Mitigation Project in WRDA99, the Corps initiated a Supplemental Environmental Impact Statement (SEIS; Corps 2003a) in September 2001 for the additional 118,650 acres. The SEIS was completed in early 2003 and the Record of Decision (ROD) was signed in June 2003. The development of 7,000 to 20,000 acres of shallow water habitat was included in the preferred alternative.

Section 3176(a) of WRDA 2007 further amended the Mitigation Project authorization allowing funds made available for recovery or mitigation activities in the lower basin of the Missouri River to be used for recovery or mitigation activities in the upper basin of the Missouri River, including the states of Montana, Nebraska, North Dakota, and South Dakota.

1.4 PROJECT DESCRIPTION AND LOCATION

The proposed project would develop fish and wildlife habitat at Sandy Point Bend. The focus of habitat development would be construction of a complex of flow-through chutes to create shallow water habitat. The proposed project is described in more detail in Chapter 2.

This PIR will focus on the portion of Sandy Point Bend located in parts of Sections 8, 16, 17, 20, and 21, Township 79 North, Range 45 West, along the right descending bank of the Missouri River, between river miles 656.00 – 658.00, in Harrison County, Iowa.

1.5 SCOPE OF STUDY

The scope of this study is confined to the project area shown in Figure 1-1. Alternatives considered in this study included backwaters, topwidth widening through structure modification, and flow-through chutes. An amendment to this PIR would be needed if significant changes to the preferred alternative or additional features are proposed in the future. All permanent project features would be constructed on government-owned lands.

1.6 SITE SELECTION

Real estate Design Memorandum No. 1 (1990) and Supplement No. 1 to Real Estate Design Memorandum No. 1 (2002) established site selection criteria for the Mitigation project. Further criteria resulted from the Joint real Estate Project Management Plan (2002), the SEIS (2003), and the Program Management Plan (PGMP; 2005). The criteria included the following:

- Land in private ownership could be acquired from willing sellers.
• Size of the area was greater than 100 acres.

• Area would not adversely affect navigation, carrying capacity of existing levees, or flood-carrying capacity of the existing floodway.

• Area was a large contiguous tract suitable for terrestrial woodland, grassland, and wetland development, with a remnant chute and backwater that could be restored.

• Emphasis is given to acquiring the remaining larger contiguous tracts of bottomland timber, areas of wetland or former wetland that can be restored, areas that can be developed to provide terrestrial forest and grassland habitat, and areas where chutes or backwaters can be restored.

• Acquisition of agricultural land should be limited except where the area has high potential for development or where a willing seller is available.

• Consideration will be given to the establishment or preservation of native riparian habitats.

• The area was part of the meander belt of the Missouri river.

• Public access areas will not be a determining factor in acquisition.

• Sites chosen for establishment of wetlands will include enough adjacent land so that excessive sedimentation can be prevented and appropriate terrestrial non-forested habitat can be provided.

• Sites chosen for acquisition or development will be based on state and Federal agency input and support.

• Projected operation and maintenance costs will be considered in the selection of acquisition and development sites.

Sandy Point was selected as a potential habitat development site when the IDNR identified the site as a potential SWH construction site to the Corps during one of the Corps’ quarterly coordination meetings with the IDNR. The land consisted of Iowa Land on the Nebraska side of the Missouri River that had been purchased from the state of Iowa by the Papio-Missouri River Natural Resources District (NRD). The Corps then acquired fee title ownership of the land from the NRD. The Sandy Point Bend site meets nearly all of the selection criteria listed above. Some of the key criteria being met include; the tract is over 100 acres in size (250 acres), it was purchased from willing sellers, there was state and Federal support for acquiring and developing this property, and the site is suitable for terrestrial woodland, grassland, wetland, and chute or backwater development.
Chapter 2  PROJECT GOALS AND OBJECTIVES

2.1  PROJECT GOALS AND OBJECTIVES

The specific goals for Sandy Point were developed to meet the BiOp elements and Mitigation Program authorization. The site-specific goals identified are:

1) Construction of shallow water habitat that provides improved aquatic habitat diversity; and
2) Maximize native terrestrial, riparian, and aquatic habitat on site.

2.2  PURPOSE AND NEED FOR ACTION

The purpose of site-specific Recovery Program projects such as Sandy Point Bend is to restore critical habitat for the pallid sturgeon and to mitigate the loss of fish and wildlife habitat due to the BSNP. The project will specifically address the BiOp Reasonable and Prudent Alternative element calling for the creation of 20-30 acres of shallow water habitat per river mile.

The need for the site-specific Recovery Program projects such as Sandy Point Bend, rests in the loss of a unique floodplain ecosystem that included diverse fish and wildlife habitat and species, and the changing public values that have placed significant importance on reestablishing these important fish and wildlife species and ecological resources. The historic variety and quality of aquatic habitats have been eliminated or altered by construction of the navigation channel and reservoir system, resulting in the Federal listing of three threatened and endangered species. Dikes and revetments have greatly reduced the meandering of the river, and flooding of the river has resulted in accretion of lands that have allowed for expansion of agricultural practices into the historic floodplain. The Bank Stabilization and Navigation Project affected 735 miles of river, and shortened it by approximately 72 miles. The USACE has estimated that approximately 522,000 acres of fish and wildlife habitat in the natural channel and meander belt of the Missouri River have been lost along this stretch of the river, including 354,000 acres of meander belt habitat and 168,000 acres of riverine habitat. In straightening, channelizing and adding levees, oxbow lakes, chutes, meandering river, islands and mudflats were eliminated. It is estimated that for each linear mile of channel, one square mile of habitat was lost. (USACE 1981; USACE 2005 and USFWS 2000, citing others).

Habitat loss and resultant adverse impacts to fish and wildlife resources, including threatened and endangered species needs to be addressed and mitigated as authorized by Congress through WRDA86 and amended in WRDA99 and WRDA07. Acquisition and development of lands along the Missouri River need to occur to benefit endangered species and mitigate the resources lost to channelization and bank stabilization. The Recovery Program was established to accomplish these needs. Development of Sandy Point Bend
for fish and wildlife habitat would contribute to achieving the goals and purpose of benefiting endangered species and mitigating for the loss of habitat that resulted from the BSNP.

2.3 CONSTRAINTS

The following constraints have been identified for the system and individual projects:

Navigation Channel: Avoid actions that would adversely effect the Navigation Channel including requiring excessive maintenance activities.

Flood Elevations: Avoid increases in flood elevations that would require mitigation of adverse effects. Because of the potential high cost associated with mitigation actions, efforts will be made to avoid this threshold.

Legal Compliance: All efforts conducted in the implementation of the BiOp and the Mitigation Project shall comply with all Federal regulations pertaining to the activities undertaken by the Corps of Engineers.

2.4 RESOURCE SIGNIFICANCE

The importance of completing the proposed action is emphasized by the significance of the Missouri River, shallow water habitat, and endangered species to the region and the nation. The Missouri River the longest river in the United States flows 2,341 miles from the Rock Mountains in Montana to the Mississippi River near St. Louis Missouri. The basin encompasses 560,000 square miles, approximately 1/6th of the continental US and portions of 10 states and 2 Canadian provinces. The following sections clearly identify the significance of the environmental resources that are associated with the Missouri River and proposed project. The Army Corps of Engineers’ Principles and Guidelines defines significance in terms of institutional, public, and technical recognition of the resources.

2.4.1 Institutional Recognition

Institutional recognition is based on the significance of resources acknowledged in laws, adopted plans and other policy statements by agencies both public and private. The formal recognition of the Missouri River basin by Congress and the following agencies and private groups illustrates the significance of the basin to these institutions.

U.S. Congress has repeatedly recognized the significance of the Missouri River Basin through continued authorizations and appropriations for study and implementation of water resources projects. Recent authorizations include Section 108 of the Omnibus Appropriations Act of 2009 establishing the Missouri River Authorized Purposes Study (MRAPS), Section 5018 of WRDA 2007.
authorizing the Missouri River Ecosystem Restoration Plan (MRERP) and establishing the Missouri River Recovery Implementation Committee, and Section 3176 of WRDA expanding the BSNP authorization to cover upper basin Recovery Activities, and continued funding and support for the MRRP. The Missouri River currently has two segments designated as National Wild and Scenic Rivers including a total of 34,159 acres.

The creation of the Missouri River Recovery Implementation Committee (MRRIC) established a formal institutional framework at the direction of Congress and as chartered by the Assistant Secretary of the Army for Civil Works (ASA(CW)). MRRIC was established under the provisions of Section 5018 of the Water Resources Development Act of 2007 to provide guidance to the Secretary with respect to the Missouri River Recovery and Mitigation Plan in existence on the date of enactment of the act (November 9, 2007) and to provide guidance to the Secretary and any affected Federal agency, State agency, or Indian tribe with respect to a study of the Missouri River and its tributaries, to be conducted in consultation with the MRRIC, to determine actions required to mitigate losses of aquatic and terrestrial habitat; recover federally listed species protected under the Endangered Species Act (ESA); and restore the ecosystem to prevent further declines among other native species. Membership currently includes representatives from eight basin states, 16 basin tribes, 15 federal agencies, and 28 stakeholder categories. Commencing in 2005, the USACE, USFWS, Environmental Protection Agency (EPA) and other federal agencies enlisted the assistance of the U.S. Institute for Environmental Conflict Resolution (USIECR) to develop a process for establishing MRRIC and currently oversees facilitation.

2.4.2 Public Recognition

Public recognition means that some segment of the public either individual or group recognizes some importance of an environmental resource. In the Missouri River Basin the public widely acknowledges the importance of the river, its associated activities, uses, resources and ecosystem services as something that provides benefits to people and their well-being. The Missouri River has strong and vocal support of its uses and activities including navigation, flood risk management, agriculture, hydropower, thermal power, water supply for municipal and industrial use, public use, and irrigation, water quality, fish and wildlife, recreation, commercial fishing, plant gathering, and cultural resources, among others.

2.4.3 Technical Recognition

Technical Recognition is based on the consultation of the importance of the environmental resource by reviewing relevant published and non-published literature and documents. Numerous scientific analyses and long-term evaluations of the Missouri River basin have documented many of these significant resources.
In a 1995 report, the U.S. Department of the Interior (DOI) listed large streams and rivers as endangered ecosystems in the United States. The DOI documented an 85 to 98 percent decline in this ecosystem type since European settlement. In particular, large floodplain-river ecosystems have become increasingly rare worldwide. In 2002, the National Academy of Sciences Water Science and Technology Board (WSTB) published Missouri River Ecosystem: Exploring the Prospects for Recovery that describes the Missouri River ecosystem—the Missouri River’s main channel and its flood-plain—as having experienced significant reductions in natural habitat and in the abundance of native species and communities.

The historic Missouri River aquatic and terrestrial habitats provided a unique large-river ecosystem including braided channels and chutes, backwaters, oxbow lakes, wetlands, islands, sand bars, riparian forests, and prairie grasses (NRC, 2002). The natural hydrology of the river maintained connectivity between and the terrestrial and aquatic habitats, and sustained the natural floodplain communities. Channels and backwater areas provided slower-moving waters critical for the reproduction, shelter, and feeding of fish species. The Missouri river with its ephemeral sand bars, islands, chutes, wetland, and incredibly diverse riparian zone once served as a major migration corridor for nearly 90 species of water birds, or 40 percent of all those in North America. Many of these reproduced in great numbers along the river.

The significance of the Missouri River is also emphasized by its provision of critical habitat for three listed species the endangered Interior least tern (*Sterna antillarum*), threatened Northern Great Plains piping plover (*Charadrius melodus*), and the endangered pallid sturgeon (*Scaphirhynchus albus*).

Modifications to the system have resulted in significant impacts to the Missouri River ecosystem such as, alteration of three million acres of natural river habitat; 51 of 67 native fish species now listed as rare, uncommon or decreasing; reproduction of cottonwoods has largely ceased; and aquatic insects, a key link in the food chain, have been reduced by an estimated 70 percent. The Natural Resource Council concluded their 2002 report stating “this report recommends the use of an adaptive management approach to reverse the ecological decline of the Missouri River.”

### 2.5 PRIOR REPORTS

The following previous reports are related to this PIR:


2.6 AGENCY COORDINATION

Representatives from the USFWS, U.S. Environmental Protection Agency (EPA), Natural Resource Conservation Service (NRCS), Iowa Department of Natural Resources (IDNR), Kansas Department of Wildlife and Parks (KDWP), and the
Nebraska Game and Parks Commission (NGPC) along with the Kansas City and Omaha Districts of the Corps comprise the ACT. The initial responsibility of the ACT was to develop selection criteria for screening and prioritizing general areas to identify willing sellers for potential mitigation sites. The ACT also meets to discuss future activities, priorities, funding, and other issues related to implementing, managing, and monitoring the Mitigation Program. The representatives to the ACT worked with the Omaha District Corps to identify Sandy Point as an area for potential acquisition and habitat development.

Coordination among the Kansas City and Omaha District Corps, USFWS, NGPC, and the IDNR has been occurring throughout the planning process for development of the Sandy Point Bend Project. Agency coordination letters were sent to the appropriate Federal and state resource agencies requesting information and their comment regarding the Proposed Action. The agencies provided information on federally listed and candidate threatened and endangered species, state species of special concern, and natural communities (See Appendix A).

2.7 EXISTING AND FUTURE WITHOUT PROJECT CONDITION

Without construction of a shallow water habitat project at the Sandy Point Bend Site, the site would continue to consist primarily of terrestrial habitat with limited amounts of relatively low quality wetland habitat. The Corps would manage the area primarily for terrestrial species. The natural establishment and success of shallow water habitat would be marginal due to the fact that the existing channel training structures are designed to cause accretion along the river bank. By taking no action, the mitigation of the aquatic and wetland habitats lost over the years due to the BSNP would not occur. A detailed account of the existing conditions at Sandy Point Bend is available in Chapter 4, Affected environment.
Chapter 3  ALTERNATIVES

3.1 INTRODUCTION

This chapter presents the alternatives considered for the development of fish and wildlife habitat at Sandy Point Bend. The Corps considered four alternative approaches including development of a backwater, river control structure modification, chute construction, and the no action alternative. Backwater development, river control structure modification, and chute construction represent the development alternatives. These alternatives were evaluated against their ability to fulfill the site objectives as previously defined in Section 1.1.4. This chapter includes a description of each measure, each alternative, an evaluation of the alternatives, and a detailed description of the recommended alternative.

3.2 PRELIMINARY MEASURES AND ALTERNATIVES CONSIDERED

3.2.1 Backwater Development

This measure would involve the construction of a backwater at Sandy Point Bend. Construction of a backwater would include the excavation of off-channel aquatic habitat with one connection to the Missouri River and relatively still water. Backwaters provide habitats protected from flow with emergent vegetation along the shoreline and high primary and secondary productivity.

3.2.2 River Control Structure Modification

This measure would involve the modification of the river control structures along the shoreline at Sandy Point Bend. Modifying the structures by creating notches or lowering the structures encourages erosion of the river bank causing the topwidth of the river to increase. These erosional areas create shallow, low-velocity benches adjacent to the main channel of the river that provide habitat for the pallid sturgeon and other native Missouri River fish.

3.2.3 Chute Construction

This measure would involve the excavation of flow through side channels with possible multiple connections to the Missouri River in addition to the entrance and exit. The multiple connections are referred to as secondary connections or tie channels. Chutes provide a dynamic environment with active bank and bar building processes. A properly formulated chute will function in both normal and high flow events. Chutes typically include one or more grade control structures to limit degradation within the chute and maintain the proper flow split between
the chute and the main channel. Chutes provide highly productive SWH that benefits the pallid sturgeon and other native Missouri River fish species.

3.2.4 No Action Alternative
Under the no action alternative, no activities to develop fish and wildlife habitat at Sandy Point Bend would occur. This alternative could also be considered the natural succession alternative because the habitat that would develop at the site over the long-term would be solely dependent on the processes of natural succession acting on the area. There would be no increases in shallow water habitat with this alternative because there would be no excavation on site to convert the high ground to shallow water habitat and existing channel training structures limit the potential for any channel migration. This alternative would not increase connectivity of the river with the floodplain.

3.3 PRELIMINARY SCREENING

This chapter will discuss the measures and alternatives that were considered but eliminated from further consideration. The backwater development, river control structure modification, and no action alternatives were eliminated from further consideration. The goals of this project as stated in section 2.1 above are 1) construction of shallow water habitat that provides improved aquatic habitat diversity and 2) maximize native terrestrial, riparian, and aquatic habitat on site.

3.3.1 Backwater Development

The backwater development measure was eliminated from further consideration at this site because backwaters are not self-maintaining habitats, and therefore, would have greater Operation and Maintenance costs than some of the other alternatives. While backwaters provide valuable and much needed habitat to the Missouri River, they are most appropriately placed in areas where there are not opportunities for more self-sustaining features or in locations where site conditions would limit rates of sedimentation. Experience has shown that over time a bar consisting of heavier Missouri River sediments forms near the entrance of backwaters. Deposition will also occur within the entire backwater, although at a slower rate, due to natural river turbidity. For these reasons, the backwater measure was eliminated from further consideration.

3.3.2 River Control Structure Modification

The river control structure modification measure was eliminated from further consideration because Sandy Point Bend provides one of the limited opportunities along the Missouri River to develop highly valued, dynamic chute habitat. Chute construction requires a relatively large tract of land with favorable bend geometry. Ideally, the distance across the land portion of the bend should be shorter than the length of the main channel to optimize the dynamics of the chute. Both of the above conditions exist at Sandy Point Bend. Limited river control structure modifications have already occurred in this location. Additional
modifications could be constructed as a part of this project, however, it would be more beneficial to take advantage of the chute construction alternative at this site in terms of restoring natural river processes and habitat diversity. However, additional structure modifications could be constructed in the future.

3.3.3 No Action

The no action alternative was eliminated from further consideration because it does not meet the stated goals of the proposed project, the Mitigation authority, or the BiOp RPA elements, which include construction of shallow water habitat that provides improved aquatic habitat diversity, and maximizing native terrestrial, riparian, and aquatic habitat on site.

3.4 FINAL ALTERNATIVES

The chute construction measure was carried forward for further development of final alternatives. In an effort to maximize the dynamic nature of the proposed chute construction and maximize the biological outputs, three different chute alternatives were considered. A Hydraulic Engineering Center River Analysis System (HEC-RAS) analysis was then performed on all three alternatives to determine which alternatives are sustainable. The alternative that provides the greatest amount of and most dynamic shallow water habitat that is sustainable will be chosen as the preferred alternative.

3.4.1 Alternative 1 (Single chute)

Under this alternative, a chute would be excavated along the right descending bank of the Missouri River for a distance of 7,500 feet with a bottom width of 60-feet. The chute would connect to the navigation channel at the upstream and downstream ends to establish a side channel. In this restored channel, flows would be slower than in the navigation channel, depths would be shallower, and substrate would be more stable, making the chute attractive to native fish species. Construction of this alternative would initially restore approximately 10 acres of chute habitat, with potential for up to 30 acres as the chute naturally widens to its expected maximum width of 200 feet (See Figure 3-1 for a drawing of this alternative).

3.4.2 Alternative 2 (Multiple Chutes)

This alternative is similar to Alternative one but would add a second chute about 500 feet riverward of the first chute to create a side channel complex. The inlet of the second chute would be approximately 500 feet downstream of the inlet for the first chute and would re-enter the river 500 feet upstream of the outlet for the first chute. The second chute would be approximately 5,100 feet long with a 60-foot bottom width. Construction of this alternative would initially restore approximately 17 acres of chute habitat, with potential for up to 42 acres as the
chutes naturally widen to their expected maximum widths of 150 feet (See Figure 3-2 for a drawing of this alternative).

3.4.3 Alternative 3 (Multiple Chutes With River Tie-Backs)

This alternative would modify Alternative 2 by adding three additional chutes (tie channels) that would connect the most riverward chute to the river in three locations. There would also be a tie channel; between the two main chutes. The tie channels would greatly increase the flow diversity within the chutes and would likely also increase the depth diversity. Construction of this complex would initially restore approximately 25 acres of chute habitat, with potential for up to 63 acres as the chutes naturally widen to their expected maximum widths of 150 feet (See Figure 3-3 for a drawing of this alternative).
Figure 3-1. Alternative 1 (Single Chute)
Figure 3-2. Alternative 2 (Multiple Chutes)
Figure 3-3. Alternative 3 (Multiple Chutes with River Tie-Backs), Recommended Alternative.
3.5 COMPARISON OF ALTERNATIVES

All three alternatives would fulfill the overall MRRP program goal of providing fish and wildlife habitat; however each alternative would provide varying degrees of habitat diversity and habitat quantity. All three alternatives would result in similar environmental consequences, varying primarily in magnitude of benefits. Beneficial impacts to fisheries, including the endangered pallid sturgeon, resulting from shallow water and other aquatic habitat development would be greatest for Alternative 3. Alternative 3 would immediately produce 25 acres of SWH with the potential for up to 63 acres as the chutes widen out naturally. Alternatives 1 and 2 would produce 10 -30 acres and 17 - 42 acres of SWH respectively. In addition, the two chutes with multiple tie-back channels in Alternative 3 would provide the most dynamic and diverse habitat of the three proposed alternatives. The habitat produced by this alternative would most closely restore key historic river conditions including shallow water habitat. Key physical components of shallow water habitats are their dynamic nature with depositional and erosive areas, predominance of shallow depths intermixed with deeper holes and secondary side channels, lower velocities and higher water temperatures than main-channel habitats. This project incorporates secondary side-channels and river tie-back channels that seek to improve habitat quality by providing a greater variety of depths and velocities than a single channel with only one inlet. The cost per acre of construction is very similar between the three alternatives, however, Alternative 3 does have the lowest cost per acre at $50,793 per acre.
### Table 3-1
Comparison of Alternatives

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Acres SWH</th>
<th>Relative Cost</th>
<th>Cost Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1 (Single chute)</td>
<td>10 - 30</td>
<td>$1,600,000</td>
<td>$53,333</td>
</tr>
<tr>
<td>Alternative 2 (Multiple Chute)</td>
<td>17 - 42</td>
<td>$2,500,000</td>
<td>$59,523</td>
</tr>
<tr>
<td>Alternative 3 (Multiple Chutes With River Tie-Backs)</td>
<td>25 - 63</td>
<td>$3,200,000</td>
<td>$50,793</td>
</tr>
</tbody>
</table>

Note: Some of the costs associated with the alternatives are to provide features that produce qualitative rather than quantitative habitat benefits. While acreage numbers shown are for the created habitat, additional benefits are anticipated for areas upstream and downstream of the project.

### 3.6 DESCRIPTION OF RECOMMENDED ALTERNATIVE

Alternative 3 (Multiple Chutes with River Tie-Backs) is the recommended alternative for implementation at Sandy Point Bend. The following features would be part of the recommended alternative.

The recommended alternative consists of six excavated chutes that are 60 feet wide with 2:1 side slopes. Two of the chutes run the length of the site, three serve as short connections to the river, and one serves as a connection between the longer chutes. The longer chute’s entrance is located at RM 658.9, and the length of the chute is 7,410 feet. It exits back into the river at RM 656.4. The shorter chute is 5,606 feet long and its upstream entrance is located at RM 657.75. The exit back into the river is located at RM 657. The three tie channels between the shorter chute and the river would be excavated within the dike field at RM’s 657.45, 657.25, and 657.05 respectively. The lengths of the three tie channels starting with the most upstream channel are 630 feet, 783 feet, and 441 feet respectively. The tie channel between the two longer chutes would be 573 feet long. The purpose of this tie channel would be to divert some of the flows contributed by the other three tie channels into the longer chute. The inlets to the two main chutes would be excavated through the existing revetment. This would require the lowering of 400 linear feet of revetment at each chute entrance and the placement of 3,400 tons of riprap to create a grade control structure in each of the chutes. The chutes would flow across eleven dike structures that would need to be lowered. A 150 foot section of each dike would be lowered to a depth of five feet below construction reference plane for each of the constructed chutes. The chutes would be excavated with a hydraulic dredge, and the spoil material would be discharged into the Missouri River. This project would initially produce approximately 25 acres of shallow water habitat. Over time, the two main chutes are expected to widen to a maximum width of 150 feet and eventually provide up to 63 acres of shallow water habitat. The flow energy within the tie channels is expected to be relatively low, so they are not expected to widen to any significant degree (See Appendix B for plates of the Recommended Alternative).
3.6.1 Design and Construction Considerations

The selected plan design was performed with standard modeling procedures typical for similar sites using available survey data. Construction of the project will likely be performed in a single construction season with dredge discharge to the Missouri River. Construction specifications and requirements will address issues such as river shoaling and site management during construction.

3.6.2 Risk and Uncertainty

Risk and uncertainty for this project is derived from three main areas: risks that restoration efforts may not be fully successful, modifications may adversely effect the navigation channel requiring subsequent modifications, and uncertainty associated with modeling as well as the implementation. Underlying all the factors, however, is the greater risk associated with not enhancing the environment in compliance with BiOp RPA elements and providing habitat to mitigate the fish and wildlife impacts of the BSNP. The risk of doing nothing far outweighs all risks posed by implementing this project. An adaptive management approach is discussed in chapter 7 and is included to address these risks.
Chapter 4  AFFECTED ENVIRONMENT

4.1 PHYSIOGRAPHY/TOPOGRAPHY

The Sandy Point Bend site is located in the Missouri River floodplain within the Dissected Till Plains section of the Central Lowland physiographic province (USDA 1976). The proposed project area consists of recently accreted river sediments and is relatively level.

4.2 BIOLOGICAL RESOURCES

The Missouri River has historically been a turbid river, but the placement of dams has reduced the sediment load by creating depositional zones in the reservoir basins. The lowered sediment load and turbidity in the modern river have made fish species that evolved in dark turbid environments more vulnerable to predation and competition from sight-feeding predators.

The historic flood plain habitat of the Missouri River also provided important habitat features and functions for riverine fishes. Cottonwoods and other trees washed into the river during floods and collected in side channels along inside bends or behind sandbars and islands. As the trees decomposed, food and substrate areas were provided for insects and other organisms, which were in turn consumed by fish. The trees also created a complex habitat used by fish for cover. The main channel border areas and available side channels provided a diversity of depths and flows and probably served as nursery and feeding areas for many species of fish (Funk and Robinson 1974). Specifically, depth and flow diversity in the main channel border area are thought to be important habitat elements to endangered pallid sturgeon.

4.2.1 Fish

About 100 species regularly use the main channel or flood plain habitats downstream from Gavins Point Dam; about 35 native species are thought to be declining, whereas some 23 species (including 9 introduced species) are thought to be increasing (Hesse 1996). Studies of the benthic fishes within the Missouri River were conducted between 1995 and 1999 (Corps 2001). The study indicates that overall, the diversity of species is greatest in the unchannelized reaches of the Missouri River. This reflects the greater number of microhabitats and available niches that are indicative of a more natural river channel. Table 4-1 lists many of the fish species common to the project area.
### Table 4-1: Fish Species (Mayhew, 1987)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Bullhead</td>
<td><em>Ameiurus melas</em></td>
<td>Iowa Darter</td>
<td><em>Etheostoma exile</em></td>
</tr>
<tr>
<td>Blue Catfish</td>
<td><em>Ictalurus furcatus</em></td>
<td>Sauger</td>
<td><em>Stizostedion canadensis</em></td>
</tr>
<tr>
<td>Brown Bullhead</td>
<td><em>Ameiurus nebulosus</em></td>
<td>Walleye</td>
<td><em>Stizostedion vitreum</em></td>
</tr>
<tr>
<td>Channel Catfish</td>
<td><em>Ictalurus punctatus</em></td>
<td>Yellow Perch</td>
<td><em>Perca flavescens</em></td>
</tr>
<tr>
<td>Flathead Catfish</td>
<td><em>Pylodictus olivaris</em></td>
<td>Pallid Sturgeon</td>
<td><em>Scaphirhynchus albus</em></td>
</tr>
<tr>
<td>Yellow Bullhead</td>
<td><em>Ameiurus natalis</em></td>
<td>Shovelnose Sturgeon</td>
<td><em>Scaphirhynchus platyrynchus</em></td>
</tr>
<tr>
<td>Gizzard Shad</td>
<td><em>Dorosoma cepedianum</em></td>
<td>Longnose Gar</td>
<td><em>Lepisosteus osseus</em></td>
</tr>
<tr>
<td>Goldeye</td>
<td><em>Hiodon alosoides</em></td>
<td>Shortnose Gar</td>
<td><em>Lepisosteus platystomus</em></td>
</tr>
<tr>
<td>Emerald Shiner</td>
<td><em>Notropis atherinoides</em></td>
<td>Paddlefish</td>
<td><em>Polyodon spathula</em></td>
</tr>
<tr>
<td>Red Shiner</td>
<td><em>Cyprinella lutrensis</em></td>
<td>Bigmouth Buffalo</td>
<td><em>Ictiobus cyprinellus</em></td>
</tr>
<tr>
<td>Bigmouth Shiner</td>
<td><em>Notropis dorsalis</em></td>
<td>Blue Sucker</td>
<td><em>Cycleptus elongatus</em></td>
</tr>
<tr>
<td>Common Carp</td>
<td><em>Cyprinus carpio</em></td>
<td>Quillback Carpsucker</td>
<td><em>Carpiodes Cyprinus</em></td>
</tr>
<tr>
<td>Fathead Minnow</td>
<td><em>Pimephales promelas</em></td>
<td>River Carpsucker</td>
<td><em>Carpiodes carpio</em></td>
</tr>
<tr>
<td>Suckermouth Minnow</td>
<td><em>Phenacobius mirabilis</em></td>
<td>Shorthead Redhorse</td>
<td><em>Moxostoma macrolepidotum</em></td>
</tr>
<tr>
<td>Grass Carp</td>
<td><em>Ctenopharyngodon idella</em></td>
<td>Smallmouth Buffalo</td>
<td><em>Ictiobus bubalus</em></td>
</tr>
<tr>
<td>Flathead Chub</td>
<td><em>Hybopsis gracilis</em></td>
<td>White Sucker</td>
<td><em>Catostomus commersoni</em></td>
</tr>
<tr>
<td>Creek Chub</td>
<td><em>Semotilus atromaculatus</em></td>
<td>Bluegill</td>
<td><em>Lepomis macrochirus</em></td>
</tr>
<tr>
<td>Silver Chub</td>
<td><em>Hybopsis storeriata</em></td>
<td>Green Sunfish</td>
<td><em>Lepomis cyanellus</em></td>
</tr>
<tr>
<td>Burbot</td>
<td><em>Lota lota</em></td>
<td>Largemouth Bass</td>
<td><em>Micropterus salmoides</em></td>
</tr>
<tr>
<td>Freshwater Drum</td>
<td><em>Aplodinotus grunniens</em></td>
<td>White Crappie</td>
<td><em>Pomoxis annularis</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>White Bass</td>
<td><em>Morone chrysops</em></td>
</tr>
</tbody>
</table>

#### 4.2.2 Wetlands

A National Wetlands Inventory (NWI) map was checked for information regarding potential wetlands in the proposed project area. According to the NWI map (Figure 4-1), the majority of the site is classified as palustrine scrub shrub wetland or palustrine forested wetland. There is a small pocket of palustrine emergent wetland located southwest of the proposed chute alignment. A site visit on May 29, 2009 revealed that the low areas where the proposed chute alignments would be constructed are almost entirely covered with reed canary grass and there was no standing water identified on the site.

A forest dominated by plains cottonwood borders the low areas along the proposed chute alignments. The understory of this forest consists of willows, gray dogwood, ironwood, green ash, mulberry, and box elder.

#### 4.2.3. Wildlife

The lands near the project site are likely inhabited by a variety of wildlife species typical to lowlands adjacent to the Missouri River. Common mammals in this area include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern cottontail rabbit (*Sylvilagus floridanus*), fox squirrel (*Sciurus niger*), beaver (*Castor canadensis*), and muskrats (*Ondatra zibethicus*) (Corps, 2003).
Figure 4-1. National Wetlands Inventory Map for Sandy Point Bend.
The project area lies within the Central Flyway and serves as a major forested corridor for migrating waterfowl, shorebirds, and Neotropical migrants during their annual migrations. Table 3 lists bird species observed in the proposed project area during a site visit on May 29, 2009.

**Table 4-2. Observed Bird Species**

<table>
<thead>
<tr>
<th>Species</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Jay</td>
<td>Cyanocitta cristata</td>
</tr>
<tr>
<td>Mourning Dove</td>
<td>Zenaida macroura</td>
</tr>
<tr>
<td>American Goldfinch</td>
<td>Carduelis tristis</td>
</tr>
<tr>
<td>Northern Oriole</td>
<td>Icterus galbula</td>
</tr>
<tr>
<td>Yellow Warbler</td>
<td>Dendroica petechia</td>
</tr>
<tr>
<td>Rose-Breasted Grosbeak</td>
<td>Pheucticus ludovicianus</td>
</tr>
<tr>
<td>Blue Grosbeak</td>
<td>Guiraca caerulea</td>
</tr>
<tr>
<td>Red-Wing Blackbird</td>
<td>Agelaius phoeniceus</td>
</tr>
<tr>
<td>American Robin</td>
<td>Turdus migratorius</td>
</tr>
<tr>
<td>Red Headed Woodpecker</td>
<td>Melanerpes erythrocephalus</td>
</tr>
<tr>
<td>Cedar Wax Wing</td>
<td>Bombycilla cedrorum</td>
</tr>
<tr>
<td>Yellow Throat</td>
<td>Dendroica dominica</td>
</tr>
<tr>
<td>Eastern Kingbird</td>
<td>Tyrannus tyrannus</td>
</tr>
<tr>
<td>Killdeer</td>
<td>Charadrius vociferus</td>
</tr>
<tr>
<td>Chipping Sparrow</td>
<td>Spizella passerina</td>
</tr>
<tr>
<td>Tree Swallows</td>
<td>Tachycineta bicolor</td>
</tr>
</tbody>
</table>

Waterfowl and shorebirds commonly seen along the river bank within the dike field include mallards, blue-winged teal, Canada geese, spotted sandpipers, and great blue herons.

Raptor species likely to be observed within and near the project area include red-tailed hawks (Buteo jamaicensis), bald eagles (Haliaeetus leucocephalus), American kestrels (Falco sparverius), Swainson's hawks (Buteo swainsoni) and peregrine falcons (Falco peregrinus) (Corps 2003).

Several species of reptiles and amphibians may be found at the site or in the adjacent Missouri River. These include northern leopard frogs (*Rana pipiens*), bullfrogs (*Rana catesbeiana*), northern cricket frogs (*Acris crepitans*), American toads (*Bufo americanus*), western painted turtles (*Chrysemys picta belli*), snapping turtles (*Chelydra serpentina*), spiny softshell turtles (*Trionyx spiniferus*), false map turtles (*Graptemys pseudogeographica*), garter snakes (*Thamnophis sirtalis sirtalis*), and bull snakes (*Pituophis catenifer sayi*) (Corps 2003).

### 4.3 Federally Threatened and Endangered Species

The USFWS has already considered the biological effects of the construction of shallow water habitat in the development of the RPA for the BiOp and determined that it is an integral component to avoid jeopardy to the listed species. Therefore, the Corps is not required to prepare a Biological Assessment (BA) for this action. However, for the purposes of the National Environmental Policy Act (NEPA), this environmental assessment discloses the effects/benefits of the project on threatened and endangered species.
email dated June 16, 2009 (Appendix A), the U.S. Fish and Wildlife Service identified the pallid sturgeon as a Federally listed endangered species likely to be found within the vicinity of the proposed project.

4.3.1 Pallid Sturgeon, *Scaphirhynchus albus* (Endangered)

The pallid sturgeon was listed as an endangered species on September 6, 1990. It inhabits the Missouri River and the Mississippi River below the mouth of the Missouri. Pallid sturgeon abundance has declined throughout the Missouri River since construction of the BSNP (Carlson and Pflieger 1981). Over fishing, pollution, and hybridization that have occurred due to habitat alterations have also contributed to the population decline of the species (USFWS 1993). Destruction and alteration of habitats by human modification of the river system is believed to be the primary cause of declines in reproduction, growth and survival of pallid sturgeon, and the recovery of the species is unlikely if habitat elements of the Missouri and Mississippi River are not restored (USFWS 1993). This project proposes to restore shallow water habitat in the Sioux City to Omaha reach, thus helping to restore a portion of the natural habitat elements of the Missouri River, which are thought to benefit pallid sturgeon. The species is well adapted to turbid waters and would not be impacted by the short-term construction related activities.

Very little is known about the status of the pallid sturgeon in the Missouri River below Gavins Point Dam (USFWS 2000). Capture/recapture data are infrequent. Hatchery-raised juvenile pallid sturgeon were stocked below Gavins Point Dam and in the lower Platte River during the 1990s. Rough estimates of 1 to 5 pallid sturgeon per kilometer in the channelized river have been made to provide a total estimate of between 1,303 and 6,516 in this river section (Duffy et al. 1996). In a study conducted in the lower 200 miles of the Missouri River, it was noted the ratio of pallid sturgeon to all river sturgeon (including shovelnose, pallid, hybrid, and lake sturgeon) decreased from 1:311 in 1996 to 2000 to 1:387 in 2002 (USFWS 2003b).

In the Middle Missouri River, pallid sturgeon has been shown to prefer main channel border, downstream island tips, areas between wing dams, and scour areas off wing-dam tips (Sheehan et al. 2000). On the Platte River, observations of hatchery reared pallid sturgeon usually occurred in areas downstream of sandbars where currents converge (Snook and Peters 2000). The range of water depths shown to be used by pallid sturgeon varies across studies; for example, an average of 12.5 and 20 feet in Missouri River studies by the Missouri Department of Conservation and the Corps’ Research and Development Center, respectively, and 1 to 3 feet in the Platte River (Snook and Peters 2000).
4.3.2 Interior least tern, *Sternula antillarum* (Endangered), and piping plover, *Charadrius melodus* (Threatened)

The least tern and piping plover nest on unvegetated or sparsely vegetated sandbars in river channels and occasionally along the shorelines of sandpits. The nesting season for the least tern and piping plover is from April 15 through September 15. Channel constrictions and obstructions that disrupt natural flows in the river and influence sandbar complexes in the river limit potential habitat for these birds. Human activity near feeding and nesting habitats can disturb least terns and piping plovers. Due to the fact that the river is channelized in the proposed project area, and there is no available nesting habitat, least terns and piping plovers may pass through the project area, but have not been observed nor are they expected to nest in this reach.

4.4 STATE THREATENED AND ENDANGERED SPECIES

In an email dated May 26, 2009 (Appendix A) the IDNR reported that there are no site-specific records of rare species or significant natural communities that would be impacted by the project. However, they noted that since the data reviewed was not the result of thorough surveys, additional studies and/or mitigation may be required if listed species or rare communities are found during the planning or construction phases.

In a letter dated June 26, 2009 (Appendix A), the Nebraska Game and Parks Commission (NGPC) indicated that the proposed project area is located within the ranges of four state listed threatened and endangered species. The list included the western prairie fringed orchid (*Platanthera praecilera*), pallid sturgeon (*Scaphirhynchus albus*), lake sturgeon (*Acipenser fulvescens*), and sturgeon chub (*Macrhybopsis gelida*). Because the pallid sturgeon was addressed in the federally threatened and endangered species section, it is not addressed here.

4.4.1 Western Prairie Fringed Orchid (Federally Threatened and Nebraska Threatened)

The western prairie fringed orchid is a species of the North American tallgrass prairie community. Western prairie fringed orchid populations have declined significantly throughout their range due to conversion of most of their habitats to cropland, overgrazing, intensive hay mowing, and drainage. Potential habitat typical of the project’s ecoregion includes high quality, unbroken prairie with transition zones between sedge meadows and tallgrass prairie (U.S. Fish and Wildlife Service, 1996). No potential orchid habitat of this type is known to occur in the proposed project area. Sandy Point Bend consists of riparian forest, and
recently accreted ground that is dominated by reed canary grass, which is an invasive species.

4.4.2 Sturgeon Chub (Nebraska Endangered)

Sturgeon chubs are associated with fast flowing water and a gravel riverbed. The species has been collected in side chutes and backwaters. It is thought these kinds of areas provide spawning habitat to the fish. Sturgeon chub feed on invertebrates. Similar to lake and pallid sturgeons, alterations to the natural hydrograph, depletions, and river channelization have caused the decline of the sturgeon chub.

4.4.3 Lake Sturgeon (Nebraska Threatened)

It is believed the lake sturgeon occupies similar habitats as the pallid sturgeon and both species spend a greater proportion of time in the Missouri River than the Platte River. Lake sturgeon feed on invertebrates and small fish and can be found at the downstream margins of islands and river confluences. Alterations to the natural hydrograph, river channelization, and flow depletions also have caused the decline of this species.

4.5 MIGRATORY BIRDS

All federal agencies are subject to the provisions of the Migratory Bird Treaty Act (16 U.S.C. 703-711) which regulates the take of any migratory bird species. If a Corps project is expected to impact any migratory bird species, coordination with the Service is typically initiated in order to minimize any impacts to these species. According to the USFWS, most migratory songbirds along the Missouri River in Nebraska and Iowa nest between April 1 and July 15. Raptors generally nest earlier than other birds, and their primary nesting period is between February 1 and July 15. Some other birds nest later in the year such as sedge wrens which nest between July 15 and September 10.

On August 9, 2007, the bald eagle (Haliaeetus leucocephalus) was removed from the federal list of threatened and endangered species but continues to be protected under the Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, and Lacey Act -16 U.S.C. § 701, May 25, 1900. Bald eagles are known to inhabit forested areas along the Missouri River. These birds tend to construct their nests in mature trees near aquatic habitats, especially in cottonwood trees. Bald eagle nests are typically easily identified due to their large size (they can be eight feet or more in diameter) and their height (up to twelve feet or more). They feed primarily on fish and crippled waterfowl, but may feed on upland game birds and other birds, carrion, and small rodents. No bald eagle nests are known to exist within the proposed project area, however, prior to any construction activity, the project area would be surveyed for eagle nests or nesting behavior.
4.6 PRIME FARMLAND

The U.S. Department of Agriculture considers prime farmland to be land that has the best combination of physical and chemical characteristics that is readily available for producing crops. Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods. Prime farmlands are not excessively erodible or saturated with water for a long period, and they either do not flood frequently or are protected from flooding. According to an NRCS farmland classification map for Harrison County, Iowa, and Washington County, Nebraska, the soils in the proposed project area are classified as Albaton and Sarpy soils (See Figure 4-2 and 4-3). Albaton and Sarpy soils are considered to be farmland of statewide importance in the state of Iowa. The map did not indicate any prime farmland within the proposed project area.

4.7 WATER QUALITY

Prior to dam construction, the Missouri River was a dynamic, free-flowing river. Continuous bank erosion was common, and the Missouri River naturally tended to be a turbid river. Many of the native fish species in the Missouri River, such as
Figure 4-2. Farmland classification map.
Figure 4-3. Map Legend for farmland classification in Harrison County, Iowa.
the pallid sturgeon, are specially adapted for life in turbid waters like those that were present in the historic river. Because of the upstream reservoirs being constructed in the mid-20th century, currently turbidity is lower than the natural condition. The suspended sediment load has decreased by 69 to 99 percent, depending on location and proximity to the main stem dams. Releases from Gavins Point Dam tend to be cooler than the historic river temperature, free of sediment, low in nutrients, and saturated with dissolved oxygen. With increasing distance from Gavins Point Dam, the water temperature, turbidity, and nutrients tend to increase due to tributary inputs.

Since the implementation of the Clean Water Act over the last 30 years, water quality has improved with regard to pollutant levels in the Missouri River. Primary sources of pollution in the river include runoff of fertilizer, pesticides, and herbicides from the predominantly agricultural watershed, as well as discharges from municipal wastewater treatment facilities and other urban industrial operations. A few reports are cited below to highlight the main pollutants that are known to occur in the Missouri River; however, the reports do not suggest any major impairment to the river due to pollution.

Water quality management of the Missouri River is under the jurisdiction of the states. As required by Section 303(d) of the Clean Water Act, in even numbered years the Nebraska Department of Environmental Quality (NDEQ) and the Iowa Department of Natural Resources (IDNR) must submit a list of lakes, wetlands, streams, rivers, and portions of rivers that do not meet state water quality standards (40 CFR 130.7). These are considered “impaired waterbodies” and states are required to calculate total maximum daily loads (TMDLs) for pollutants causing impairments in these waters. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards (EPA 2007).

The IDNR has placed the segment of the Missouri River between the Boyer River and the Little Sioux River, which includes the proposed project, on the state’s draft 303(d) list for 2006 (IDNR 2006). This portion of the river is considered impaired for primary contact recreation because of indicator bacteria (IDNR 2006). This segment was not on the 2004 303(d) list (IDNR 2004).

The IDNR has also placed the segment of the Missouri River between the water supply intake at Council Bluffs (RM 619) to the confluence with the Boyer River on the state’s 303(d) list for 2006 (IDNR 2006). This segment of the river is considered impaired for drinking water use because of arsenic levels and impaired for primary contact recreation because of indicator bacteria (IDNR 2006). The segment was listed on the 303(d) list in 2004 for the same reasons (IDNR 2004).

The NDEQ uses a different system for breaking the Missouri River into segments than the IDNR. The NDEQ has placed the segment of the Missouri River
between the Big Sioux River and the Platte River on the state’s 303(d) list for 2006. In 2006, this segment was listed as impaired for aquatic life because of PCBs (polychlorinated biphenyl, an environmental pollutant) and dieldrin (a highly toxic insecticide) and impaired for public drinking water because of chlorodibromomethane (a chemical formed during the chlorination of water) (NDEQ 2006). In 2004, the NDEQ placed the same segment on the state’s 303(d) list for primary contact recreation and aquatic life use because of fecal coliforms, dieldrin, and PCBs (NDEQ 2004). A fish tissue advisory was issued for the segment in both years (NDEQ 2004).

4.8 AIR QUALITY

Sources of suspended particulate matter and air pollutants in the project area include agricultural and recreational boating activities near the project area. Harrison County complies with the National Ambient Air Quality Standards (NAAQS), based on air quality monitoring conducted by the IDNR (Russell 2006). Washington County is also in compliance with NAAQS (Hetzler 2006).

4.9 NOISE

Sources of noise in and around the project site include recreational boating, commercial barges, hunting, and agricultural activities. These activities are seasonal. In the spring and fall, tractor and truck use increases on farms near the project site. Waterfowl are hunted along the river from September through January. Recreational boating on the Missouri River primarily occurs during the summer months. Background noise levels are generally low.

4.10 HISTORIC PROPERTIES AND CULTURAL RESOURCES

According to a letter from the Nebraska State Historical Society dated March 16, 2010 (Appendix A), a review of their files indicates that there are no recorded historic resources in the project area.

4.11 SOCIOECONOMIC RESOURCES

Sandy Point Bend is located in Harrison County, Iowa. The population of Harrison County was 15,745 in 2006, a 0.5 percent increase over the 2000 population of 15,666 (U.S. Census Bureau 2006a). In 2006, 99.0 percent of Harrison County residents reported their race as Caucasian alone, while the remaining 1.0 percent consisted of other races or a mixture of races (U.S. Census Bureau 2006a). Sandy Point Bend is near the town of Modale, which had a population of 293 in 2006 (U.S. Census Bureau 2006b).

In 1999, Harrison County had a per capita income of $17,662 and in 2004 had a median household income of $42,627, compared to $19,674 and $42,865 respectively for the State of Iowa (U.S. Census Bureau 2000, 2006a). In 2004,
the percent of persons below poverty level was 9.9 percent in Harrison County, compared to 10.5 percent for the State of Iowa (U.S. Census Bureau 2006a). The major sources of employment in Harrison County in 2000 were: services, 34.9 percent; wholesale and retail trade, 15.2 percent; manufacturing, 13.6 percent; government (including military), 13.1 percent; transportation and utilities, 7.0 percent; and agriculture, forestry, fishing, hunting, and mining, 7.0 percent (U.S. Census Bureau 2000). The unemployment rate for Harrison County was the same as the statewide unemployment rate of 2.8 percent in 2000 (U.S. Census Bureau 2000). In 2002, 95 percent of the land in Harrison County was farmland; the average farm size was about 517 acres; and 85.8 percent of the farmland was planted with crops (NASS 2002, ISU 2006).

4.12 NAVIGATION

Missouri River flows are managed in part, for commercial navigation on the Missouri River. Navigation on the Missouri River is limited to the normal ice-free season, with a full-length flow support season of 8 months (Corps 2001). At Sioux City, the full-length support season extends from March 23 to November 22 and at St. Louis the full-length support season extends from April 1 to December 1 (Corps 2001). In 1994, approximately 50 percent of the commercial tonnage moved on the Missouri River was in the Omaha to Kansas City reach. This reach was also the origin or destination for about 40 percent of Missouri River commercial tonnage (Corps 2001).
Project Implementation Report

Chapter 5  ENVIRONMENTAL CONSEQUENCES

5.1 SUMMARY OF EFFECT

With the no action alternative, the future environment at the proposed project site would consist of a continuation of current existing conditions. The following sections describe what the future environment of the site would be if the proposed project were implemented.

5.2 PHYSIOGRAPHY/TOPOGRAPHY

Excavation of material at Sandy Point Bend would change the local relief by adding chutes to the landscape. Excavation of the chutes would result in 25 acres with the potential to increase to approximately 63 acres that would be lower in elevation, enabling shallow water habitat to form at relatively low stages of the Missouri River.

The excavated material from the chutes would be discharged into the Missouri River, so the elevation of the surrounding land would not be affected by the placement of spoil material. Therefore, the proposed changes to the topography of the site would have no significant impacts on the surrounding land.

5.3 BIOLOGICAL RESOURCES

Shallow water habitat has become very rare along the channelized portion of the Missouri River, and remains crucial to a number of fish species. Many species, including pallid sturgeon, utilize the shelter from the high velocity main channel and the high abundance of food provided by shallow water habitat during one or more stages of their life cycles. It is expected that creating areas of varying depths and velocities within the Missouri River, such as those that would be provided by the proposed chute complex, would provide beneficial fish spawning and nursery habitat.

5.3.1 Fish

While it is certain that habitat influences the fish communities that make up the Missouri River, it should be mentioned that little is known about exactly what factors actually control fish production in this reach of the river. It is anticipated that many of the benefits attributable to the proposed project are because it will provide a more natural diversity of habitats not found in the main channel/main channel border area, which in turn provides increased potential for production, rearing, and refuge for invertebrates and fish. The larval stage is a bottleneck in the life cycle of many native fishes, including pallid sturgeon. The river’s sandbars and the slow-moving, shallow water associated with them have
historically provided larval fish with the habitat necessary for survival. By providing more of this currently lacking habitat, this project should benefit many species of fish. Aquatic vegetation along the tie channels and trees that erode into the chutes and/or are carried into the chutes by high flows would add carbon to the river system and provide areas of complex habitat, substrate for invertebrates, shelter from current, and hiding places for forage fish. Although the proposed project does not include deep scour holes for over wintering fish, deep scour holes providing refuge from harsh winter conditions can be readily found in the Missouri River, especially in association with dike fields.

Use of a dredge to excavate the area may impact invertebrates in the soil within the dredged area. It may also cover invertebrates located at or just downstream of the location of the dredge discharge pipe. Fish have also been known to be entrained into dredges. When comparing the acres dredged to the habitat available for these species, however, these impacts are considered insignificant at the regional level. For these reasons, the net impact to the fishery is considered a positive one. For detailed information on benefits of the project to pallid sturgeon, please refer to the Federally Threatened and Endangered Species section of this PIR.

5.3.2 Wetlands

Although the NWI map classifies the majority of the project area as either palustrine scrub shrub or palustrine forested wetland, a site visit during the spring of 2009 revealed that the land was relatively high in elevation and dry, and what remained of wetland habitat was in a highly degraded state. It appeared that most of the wetland had transitioned to terrestrial habitat due to sediment deposition. No standing water was identified and the ground cover was dominated by invasive reed canary grass. The proposed project would lower the elevation of 25 to 63 acres of land at Sandy point to convert it back to aquatic habitat and restore some connectivity to the Missouri River.

Wooded riparian habitats support valuable resources for fish and wildlife. They are dependent on imported water, nutrients, and sediments and are vulnerable to alteration when deprived of these materials (Brinson 1990). The proposed project would not decrease, but would likely increase the ability of the woodlands to receive any of these resources. Thus, the project is expected to have no adverse impacts on the adjacent riparian systems of the Missouri River or on the remnant secondary channels.
5.3.3 Wildlife

Some animals may be diverted or displaced during construction; however, this would be temporary and of minor impact. The proposed project would result in a net increase in habitat diversity and quality which would benefit the wildlife that use the area.

Some mammals may be disturbed or displaced during construction. However, due to the temporary nature of the activity and the availability of similar habitat surrounding the project area, mammals would not be adversely impacted by the proposed project. In fact, the addition of aquatic habitat to the site would likely attract semi aquatic furbearers such as beavers, muskrats, mink, and raccoons and increase the diversity of mammals using the site once the project is complete.

Wading and shoreline birds should benefit from the proposed habitat change. Birds such as sandpipers and other shorebirds would benefit from the increased wetted shoreline habitat along the chutes at least during their migratory period. They would also utilize sandbars and mudflats that may develop within the chutes and tie channels during some seasons, depending on flow conditions.

Avian predators of fish and amphibians, including waders and divers, would be likely to utilize the chutes for feeding.

Songbirds nest in the forested areas adjacent to the proposed chute alignments. Many songbirds are migratory and are nationally and internationally significant due to their protection by the Migratory Bird Treaty Act. Songbirds typically concentrate nesting activity between April 1 and July 15. All tree and shrub removal activities would be scheduled to take place outside of the nesting period.

After construction, Sandy Point would continue to provide raptors such as hawks and owls with rodent prey species as well as introduce new food sources. Migrating eagles and ospreys may also utilize the chutes for capturing fish.

The existing project area, in its current condition, provides minimal, low quality habitat for amphibians and reptiles. The absence of flood effects and channel migration due to upstream impoundments and hard bank stabilization has reduced wetlands within the floodplain upon which amphibians and reptiles depend for reproduction, hibernation, and food. Construction of the proposed project would result in the re-establishment of aquatic habitat diversity including slower moving, shallow water and riparian wetlands. These features are beneficial to amphibians and reptiles and therefore the overall affect of the proposed project is considered positive.
5.4 THREATENED AND ENDANGERED SPECIES

5.4.1 Pallid Sturgeon, *Scaphirhynchus albus* (Endangered)

The Sandy Point Bend site currently contains no aquatic habitat outside of the main channel of the Missouri River; therefore, it contains no pallid sturgeon that could be directly affected by the cutter head of the dredge during construction. Pallid sturgeon are known to inhabit the Missouri River in the Sandy Point Bend area. Because pallid sturgeon are adapted to areas of high turbidity, the short-term discharge of a total of 800,000 cubic yards of dredged material over a 7 or 8 month construction season into the entrained bed load of the Missouri River would not be expected to adversely affect pallid sturgeon using the area.

The creation of 25-63 acres of shallow water habitat <5 feet deep with velocities <2 fps would be expected to benefit the pallid sturgeon (USFWS 2000, 2003a). Adult pallid sturgeon have been found at depths of 3 feet in the Missouri River by the Nebraska Game and Parks Commission (Mestl 2004), and at depths of 1 to 3 feet in the Platte River (Snook and Peters 2000). The shallow water habitat is expected to be suitable for use by the pallid sturgeon, even if its depth is shallower than that generally preferred by adult pallids. This project would provide habitat needed to support components of the ecosystem that are thought to be very important to pallids. For example, the primary food eaten by the pallid sturgeon includes mostly aquatic invertebrates (principally early life stages of insects) but also some fish (USFWS 1993). The shallow water habitat would constitute a good foraging area for various life history stages of Missouri River fish and their predators, including pallid sturgeon. The shallow water habitat is also thought to provide a suitable nursery and rearing habitat, where free swimming and drifting fish larvae (including larval pallids) and juvenile fish can find refuge from high water velocities, accumulations of organic materials, and good foraging, facilitating their recruitment into later developmental stages. Therefore, the proposed chute complex at Sandy Point Bend is anticipated to improve habitat found along the Missouri River for pallid sturgeon, and this action, along with other activities currently being planned to create shallow water habitat would be expected to have a beneficial cumulative impact on pallid sturgeon populations.

5.4.2 Interior least tern, *Sternula antillarum* (Endangered), and piping plover, *Charadrius melodus* (Threatened)

Due to the fact that the river is channelized in the proposed project area, and there is no available nesting habitat, least terns and piping plovers may pass through the project area, but have not been observed nor are they expected to nest in this reach. Therefore, the proposed project is not likely to adversely effect least terns or piping plovers.
5.5 STATE THREATENED AND ENDANGERED SPECIES

5.5.1 Western Prairie Fringed Orchid (Federally Threatened and Nebraska Threatened)

Potential western prairie fringed orchid habitat typical of the project’s ecoregion includes high quality, unbroken prairie with transition zones between sedge meadows and tallgrass prairie (U.S. Fish and Wildlife Service, 1996). No potential orchid habitat of this type is known to occur in the proposed project area. Sandy Point Bend consists of riparian forest, and recently accreted ground that is dominated by reed canary grass, which is an invasive species.

5.5.2 Sturgeon Chub (Nebraska Endangered)

The Sandy Point Bend site currently contains no aquatic habitat outside of the Missouri River channel, therefore sturgeon chubs would not be impacted by the cutter head of the dredge during excavation. However, sturgeon chubs may use the river channel in the vicinity of the dredge discharge pipe. Sturgeon chubs are adapted to turbid conditions and they are highly mobile, so they are not likely to be adversely impacted by the temporary and localized turbid conditions that would occur near the discharge pipe during construction. Sturgeon chubs have been collected in side chutes and backwaters of the Missouri River and it is thought these kinds of areas provide spawning, nursery, and forage habitat to the fish. Therefore, the proposed creation of a chute complex at Sandy Point Bend is likely to benefit the sturgeon chub.

5.5.3 Lake Sturgeon (Nebraska Threatened)

The Sandy Point Bend site currently contains no aquatic habitat outside of the Missouri River channel, therefore lake sturgeon would not be impacted by the cutter head of the dredge during excavation of the chutes. However, lake sturgeon may use the river channel in the vicinity of the dredge discharge pipe. Lake sturgeon are adapted to turbid conditions, and they are highly mobile, so they are not likely to be adversely impacted by the temporary and localized turbid conditions that would occur near the end of the discharge pipe during construction. The created shallow water habitat would accumulate organic materials that would increase the production of aquatic invertebrates and provide food for small fish. Since lake sturgeon feed on small fish and invertebrates, the proposed chute complex may provide a good foraging area for the lake sturgeon.

5.6 MIGRATORY BIRDS

Although the provisions of MBTA are applicable year-round, most migratory bird nesting activity in Nebraska occurs during the period of April 1 to July 15. However, some migratory birds are known to nest outside of the aforementioned primary nesting period. Clearing and grubbing would be scheduled to occur outside the primary nesting period. If construction of the project has to occur
during the primary nesting season or at any other time that may result in the take of nesting migratory birds, a qualified biologist would conduct a field survey of the affected habitats to determine the absence or presence of nesting migratory birds. Surveys would be conducted during the nesting season and immediately preceding the proposed construction activities. The USFWS’s Iowa Ecological Services Field Office would be contacted immediately for further guidance and assistance in project modification if a field survey identifies the existence of one or more active bird nests.

Under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712: Ch. 128 as amended), construction activities in rivers, wetlands, streams, riparian forest, woodland, and grassland habitats that would otherwise result in the taking of migratory birds, eggs, young, and/or active nests should be avoided and completed outside the primary nesting season. Construction activities involved with this restoration project would have the potential to result in disturbing migratory birds.

5.7 PRIME FARMLAND

According to an NRCS farmland classification map for Harrison County, Iowa, and Washington County, Nebraska, there are no prime farmland soils located within the proposed project area. For this reason, the proposed project is not likely to adversely impact prime farmland.

5.8 WATER QUALITY

Up to approximately 800,000 cubic yards of silty sand would be directly discharged into the Missouri River by hydraulic dredge. Sediment loads were historically much higher than today and native Missouri River fish including the pallid sturgeon have evolved to thrive in these conditions. The increased turbidity associated with the dredge discharge would be temporary, localized, and virtually undetectable within a few hundred yards downstream of the dredge discharge pipe. Increases in the turbidity of the Missouri River are considered to be beneficial to native riverine species that evolved to live in these naturally turbid conditions.

Section 401 of the CWA allows states to grant or deny water quality certification for any activity that results in a discharge to waters of the United States. Certification requires a finding by the state that the activities permitted will comply with all water quality standards individually or cumulatively over the term of the permit. There were no elevated levels of contaminants, including Dieldrin or PCBs in the elutriate samples taken at the Sandy Point Bend project site. The letters from the IDNR and NDEQ are enclosed in Appendix C. Section 401 water quality certification was obtained from the IDNR and NDEQ for the proposed project.
General Conditions outlined in the Section 401 water quality certification require dredging to occur only when Missouri River discharges are greater than 25,000 c.f.s., which corresponds to a Blair, Nebraska gage reading of 12.85 feet. Discharges are typically greater than 25,000 c.f.s. from April 1 to November 30. The end of the discharge pipe would be submerged at a location in the water column where mixing and integration into the bed load would occur quickly. Studies and construction experience from other projects (California Bend, Nebraska and Hidden Lake/Great Marsh, Nebraska) indicate that suspending the discharge pipe 4 to 6-feet off the bottom of the river will provide for adequate entrainment of the dredge material. The dredge discharge schedule would be proportional to the river discharge as shown in Table 4. This would minimize the potential for sediment build-up near the discharge pipe.

Table 5-1. Relationship of Dredge Discharge to Missouri River Discharge.

<table>
<thead>
<tr>
<th>Dredge Discharge, GPM (water and sediment)</th>
<th>Missouri River at Blair, Nebraska</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Discharge (cfs)</td>
</tr>
<tr>
<td>8,000</td>
<td>22,300</td>
</tr>
<tr>
<td>12,000</td>
<td>33,450</td>
</tr>
<tr>
<td>16,000</td>
<td>44,600</td>
</tr>
<tr>
<td>20,000</td>
<td>55,750</td>
</tr>
<tr>
<td>24,000</td>
<td>66,850</td>
</tr>
</tbody>
</table>

Discharging a total of 800,000 cubic yards of dredged material from the project site over a 6 to 8 month period of time is not expected to significantly impact existing water quality or exceed any standard set by the IDNR or the NDEQ for the Missouri River.

5.9 AIR QUALITY

Minor increases in dust and equipment exhaust are expected during construction. These increases would be temporary and would not be expected to be high enough to result in Harrison County or Washington County becoming a non-attainment area for any NAAQS parameters. Therefore, the proposed project would have no significant impacts on air quality.

5.10 NOISE

Minor increases in noise from construction equipment are expected at the project during construction. The expected increases in noise would be minor, temporary, and similar to those already occurring in the area from farm machinery. Therefore, the expected increases in noise levels from project construction would not be significant. Increases in recreation may be expected after project construction. Increases in the number of hunting days may result in increased rifle noise, and increases in boat use by hunters and fishermen may result in increases in noise from boat
engines. The expected increases in noise after project construction would not be significant.

5.11 HISTORIC PROPERTIES AND CULTURAL RESOURCES

The likelihood of significant adverse impacts to any historic or archaeological resources resulting from construction of the proposed project is minimal. All construction activities are expected to occur on lands that have previously been disturbed by historic shifting of the Missouri River channel across the flood plain and where the land consists of recently accreted sediment. Investigation into the locations of steamboat wrecks indicates there are no such wrecks in the project area. In a letter dated March 16, 2010, the Nebraska State Historical Society stated that the proposed project will have no effect for archaeological, architectural, or historic properties (Appendix A). For these reasons, the proposed project is not likely to adversely impact cultural resources.

If a discovery is made during construction, all activity would be halted around the discovery site and a Corps archaeologist would inform the Nebraska SHPO of the discovery. The Corps archaeologist would examine the discovery area as soon as possible and then consult with the Nebraska SHPO about the nature and National Register of Historic Places eligibility of the area prior to resumption of any activity near the site. Construction would resume at the discovery site only if all parties agree it is appropriate. For these reasons, the proposed project is not likely to adversely impact cultural resources.

5.12 SOCIOECONOMIC RESOURCES

The proposed project at Sandy Point Bend would not adversely impact the socioeconomics in the area. The project would provide no increase in permanent employment, so no impacts to the local population would be expected. It is expected that the project would provide some temporary increase in employment in Harrison County, but this effect would not be significant compared with the county’s civilian labor force of over 7,000. The project would have no disproportionate impact on minority or socio-economically disadvantaged populations because 99 percent of Harrison County residents are white, median incomes are high, and only a few farmers live near the project area. There is currently no land access to the site so it would only provide increased hunting, fishing, and wildlife viewing opportunities to people that can access the site by boat.

5.13 NAVIGATION

No adverse impacts to navigation are expected from construction and operation of the proposed chute complex at Sandy Point Bend. The U.S. Congress requires the Corps to maintain a 9 feet deep by 300 feet wide navigation channel that would not be adversely affected by the proposed project.
5.14 CUMULATIVE IMPACTS

Cumulative effects are those that result from the incremental effects of an action when added to past, present, and reasonably foreseeable future actions within a region. Analysis of cumulative effects for the proposed project requires evaluation of actions that have occurred throughout the Missouri River.

The cumulative effects of Missouri River Mitigation activities were previously addressed in the 2003 SEIS for the Missouri River Mitigation Project. The SEIS evaluated cumulative effects on the following topics:

- Land Acquisition
- Economic Impacts
- Recreation
- Navigation
- Water Resources (including water quality)
- Flood Control

Cumulative effects associated with these resource categories do not need to be evaluated in the PIR because there are no extraordinary site-specific circumstances that necessitate an additional cumulative impacts analysis. However, there are other cumulative effects not addressed in the SEIS that would result from the construction and operation of the Sandy Point Bend project. These include the following:

- Regional increases in fish and wildlife populations resulting from site-specific habitat development activities and land use at Sandy Point. Increases in regional habitat quality should positively correlate to increases in fish and wildlife resources in terms of species diversity and abundance.

- Continued regional benefits from increased floodwater retention capacity on the Missouri River floodplain would provide incremental flood protection for residences and properties downstream of the project area.

- Overall beneficial increases in terrestrial and aquatic habitat that support the pallid sturgeon, sturgeon chub, lake sturgeon, and bald eagle by providing breeding, feeding, and sheltering habitat.

- Regional increases in availability of public lands for recreational opportunities.

As discussed previously, significant cumulative effects have already occurred throughout the Missouri River, which have caused or contributed to the decline of listed species known to occur in the project area. Anthropogenic alteration of river hydrographs and dynamic processes has resulted in the dramatic loss of natural ecosystem functions.

Overall, the proposed project would create approximately 25-63 acres of new shallow water habitat at Sandy Point bend consisting of a complex of two chutes.
with three tieback channels, and a channel connecting the two main chutes. Although this project may not fully restore natural processes, halt the decline of species, or significantly improve habitat along the entire Missouri River Bank Stabilization and Navigation Project as a whole, it does have the potential to provide some incremental cumulative benefits to the Missouri River ecosystem. When the benefits of this project are combined with other ongoing restoration efforts along the river, this project is planned to contribute 25-63 acres of SWH to the total acreage of SWH (20-30 acres per river mile) required in the BiOp. This would provide cumulative beneficial impacts to species along the river and incrementally reduce the adverse cumulative effects that have already occurred.

5.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments due to construction and operation of the Sandy Point Bend Project include expenditure of Federal funds, labor, energy, and construction materials used to plan, design, construct, and monitor the project. Some soils would be lost as a result of the proposed project.
Chapter 6    COMPLIANCE WITH ENVIRONMENTAL STATUTES

6.1 INTRODUCTION

This section summarizes the statutory and regulatory environmental compliance requirements and discusses the major Federal and state permits and clearances that would be required for the approval and implementation process for Sandy Point Bend. The applicability and status of these environmental requirements is presented in Table 6-1 and a discussion of the most important follows.
Table 6-1: Compliance of Preferred Alternative with Environmental Protection Statutes and Other Environmental Requirements

<table>
<thead>
<tr>
<th>Federal Environmental Requirements</th>
<th>Applicability</th>
<th>Status a, b, c, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archeological Resources Protection Act, 16 U.S.C. 470, et. seq.</td>
<td>Applicable</td>
<td>Full Compliance b</td>
</tr>
<tr>
<td>Clean Air Act, as amended, 42 U.S.C. 7401-7671g, and et. seq.</td>
<td>Applicable</td>
<td>Full Compliance a</td>
</tr>
<tr>
<td>Clean Water Act (Federal Water Pollution Control Act),</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Federal Water Project Recreation Act, 16 U.S.C. 4601-12, et. seq.</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Fish and Wildlife Coordination Act, 16 U.S.C. 661, et. seq.</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>National Environmental Policy Act, 42 U.S.C. 4321, et. seq.</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Rivers and Harbors Act, 33 U.S.C. 403, et. seq.</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Protection &amp; Enhancement of the Cultural Environment (Executive Order 11593)</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Floodplain Management (Executive Order 11988)</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Protection of Wetlands (Executive Order 11990)</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Environmental Justice (Executive Order 12898)</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
<tr>
<td>Migratory Bird Conservation (Executive Order 13186)</td>
<td>Applicable</td>
<td>Full Compliance</td>
</tr>
</tbody>
</table>

a. Full Compliance. Having met all requirements for the statute for the current stage of planning.
c. Not Applicable. No requirements for the statute required; compliance for the current stage of planning.
6.2 AIR QUALITY

The Federal policy to protect and enhance the quality of the air to protect human health and the environment is established under the Clean Air Act [42 USC 7401 et seq., as amended]. The expected impacts to air quality due to the proposed project are considered insignificant. Therefore, no additional actions would be required for full compliance.

6.3 WATER RESOURCES

Federal limits on the amounts of specific pollutants that may be discharged to surface waters in order to restore and maintain the chemical, physical, and biological integrity of the water are governed by CWA [33 USC 1251 et seq., as amended], National Pollutant Discharge Elimination System (NPDES). Discharge of stormwater resulting from construction activities that would disturb more than one acre of surface area requires an NPDES permit under Section 402 of the CWA. The IDNR and NDEQ authorize NPDES permits in the state of Iowa and Nebraska. The construction contractor for this project will be required to obtain a NPDES permit prior to beginning construction.

The objective of the Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq. is to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters (33 U.S.C. 1251). The Corps regulates discharges of dredge or fill material into waters of the United States pursuant to Section 404 of the Clean Water Act. This permitting authority applies to all waters of the United States including navigable waters and wetlands. The selection of disposal sites for dredged or fill material is done in accordance with the Section 404(b)(1) guidelines, which were developed by the U.S. Environmental Protection Agency (see 40 CFR Part 230). The dredging activity for this project will be covered under a type of Section 404 permit called an Individual permit. Individual permits are issued following a full public interest review of an individual application for a Department of Army permit. After evaluating all comments and information received, a final decision on the application is made. The permit decision is generally based on the outcome of a public interest balancing process where the benefits of the project are balanced against the detriments. A permit will be granted unless the proposal is found to be contrary to the public interest. Section 401 of the Clean Water Act allows states to grant or deny water quality certification for any activity that results in a discharge into waters of the United States and requires a Federal permit or license. Certification requires a finding by the effected states that the activities permitted would comply with all water quality standards individually or cumulatively over the term of the permit. The Nebraska Department of Environmental Quality and the Iowa Department of Natural Resources have both granted 401 water quality certification for the proposed project.
6.4 BIOLOGICAL RESOURCES

Federal agencies are required to determine the effects of their actions on federally listed endangered or threatened species and their critical habitats under ESA [16 USC 1531 et seq.]. Steps must be taken by the Federal agency to conserve and protect these species and their habitat, and to avoid or mitigate any potentially adverse impacts resulting from the implementation of the proposed project.

6.4.1 Fish and Wildlife

The Fish and Wildlife Coordination Act (16 U.S.C. 661, et seq.) provides the basic authority for USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It also requires that Federal agencies that construct, license or permit water resource development projects must first consult with USFWS (and the National Marine Fisheries Service in some instances) and state fish and wildlife agency regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Full consideration is to be given to USFWS recommendations and recommendations have been agreed to in the Supplemental Missouri River Fish and Wildlife Mitigation Project Environmental impact Statement dated March 2003. Coordination under this act was conducted by meetings, letter, and email exchange. The USFWS, IDNR, and NGPC all provided responses in favor of the proposed project, and provided information on state and Federally listed threatened and endangered species (Appendix A).

6.5 ENVIRONMENTAL POLICY

The Corps is preparing a PIR for each Missouri River Recovery habitat development site. The PIR would document the planning for the project and would provide the information needed to ensure compliance with respect to environmental considerations.

Federal agencies use NEPA [42 USC 4321 et seq.] to evaluate the environmental impacts of a proposed project. Through the NEPA process, public officials and citizens are given opportunity to be involved in the environmental review and receive information about environmental impacts before any decisions are made on Federal actions regarding the proposed projects. This PIR is intended to serve as the documentation necessary to incorporate the NEPA process into the MRRP planning and implementation. If no significant impacts are determined, a Finding of No Significant Impact (FONSI) would be prepared and NEPA compliance would be fulfilled.
6.6 CULTURAL RESOURCES

Section 106 of NHPA of 1966 (amended June 17, 1999) requires Federal agencies to take into account the effects of their undertakings on historic properties. By definition, historic properties are properties eligible for or listed on the NRHP. Federal undertakings refer to any Federal involvement including funding, permitting, licensing, or approval. Federal agencies are required to define and document the APE for undertakings. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist.

The Advisory Council on Historic Preservation (ACHP) issues regulations that implement Section 106 of NHPA at 36 CFR Part 800, Protection of the Historic Properties. Section 106 sets up the review process whereby a Federal agency consults with the SHPO, Native American tribes, and other interested parties including the public to identify, evaluate, assess effects, and mitigate adverse impacts on any historic properties affected by their undertaking. The proposed project was coordinated with the Nebraska State Historical Society which stated in a letter dated March 16, 2010 (Appendix A), that a review of their files indicates that there are no recorded historic resources in the project area, and it was determined that there would be no adverse effects to cultural resources.

6.7 PRIME FARMLANDS

The Farmland Protection Act [7 CFR 658] minimizes the extent to which Federal actions contribute to the unnecessary conversion of prime farmlands to nonagricultural use. The NRCS takes steps to ensure that prime farmlands lost to development are documented and provided to congress in a yearly report. According to an NRCS prime farmland map, no prime farmland soils exist within the Sandy Point Bend project area.

6.8 SHORT TERM VERSUS LONG-TERM PRODUCTIVITY

Farming is currently the primary activity of the Missouri River floodplain where MRRP Project sites may be acquired. Intensive agricultural use of the floodplain has occurred within the last 60 to 90 years. This represents a relatively short period. Land acquisition activities would result in the removal of land from agricultural production. MRRP projects would result in an increase in the long-term productivity of fish and wildlife habitat and populations. There would be a long-term decrease in the agricultural production of the Lower Missouri River floodplain. This decline in agriculture may result in a corresponding decline in the sale of farm equipment and supplies within the region. These indirect effects are considered as less than significant. There would also be positive economic
impacts from the reduction of government expenditures for disaster relief. However, the development of MRRP sites would result in a long-term increase in recreational use of the area and, consequently, an increase in the economic benefits resulting from recreational activities, such as hunting, fishing, bird watching, and other outdoor activities. A long-term increase in wetland acres would result in a corresponding increase in wetland function. Restored habitat would also increase the habitat value of the Missouri River floodplain ecosystem. The natural ecosystem benefits offered by the MRRP are considered as a significant beneficial impact that would provide a long-term enhancement to the fish and wildlife resources of the Lower Missouri River ecosystem.

6.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Changes to the project site resulting from the preferred alternative would be reversible but would require extensive labor and budget. The time, labor, materials, and Federal funds expended on the project construction should be considered irretrievable.
Chapter 7  OTHER CONSIDERATIONS

7.1 INTRODUCTION

The recommended alternative for Sandy Point Bend includes various activities, primarily construction of a flow-through chute complex, to develop fish and wildlife habitat. This section describes the monitoring and evaluation plan, operations and maintenance plan, real estate considerations, implementation responsibilities and views, cost estimate, schedule, and conclusions and recommendations for Sandy Point Bend’s recommended alternative.

7.2 MONITORING AND ADAPTIVE MANAGEMENT

In order to ensure project success, an Adaptive Management (AM) strategy will be implemented which addresses project uncertainties through monitoring of physical and biological responses to management actions, assessment of progress towards project objectives and implementation of potential subsequent actions to improve project performance. A program-level AM strategy is currently under development that will address the objectives, uncertainties, metrics, monitoring, assessment and potential management actions for sites constructed under the SWH program. As this site does not incorporate any unique features and is not a pilot project, it is anticipated that it will be fully covered under the forthcoming program-level SWH AM strategy. As such, the following discussion will reference the objectives described in the BiOp and subsequent correspondence, existing metrics, ongoing monitoring and potential future actions relevant to this project.

7.2.1 Objectives

The objective of this program is to provide the necessary quantity and quality of SWH to benefit pallid sturgeon and other native fish species. This would involve the restoration of a certain quantity of aquatic habitat that is generally < 5 feet deep with velocities < 2 feet per second including “side channels, backwaters, depositional sandbars detached from the bank, and low-lying depositional areas adjacent to shorelines.” (FWS, 2009) This project in particular involves restoration of a complex of side channels, or chutes, and is anticipated to contribute 25-63 acres of SWH to the system which is currently measured by the depth and velocity of water in the channel.

In addition to the quantity of habitat to be restored, habitat quality is also an objective of the program. A 2009 letter from the USFWS to the Corps describes habitat quality parameters of SWH as follows: “Key physical components of SWHs are their dynamic nature with depositional and erosive areas,
predominance of shallow depths intermixed with deeper holes and secondary side channels, lower velocities and higher water temperatures than main-channel habitats.” This project incorporates a secondary side-channel and river tie-back structures that seek to improve habitat quality by providing a greater variety of depths and velocities than a single channel with only one inlet.

In order to comply with congressional mandates and the current Master Manual on the Missouri River Mainstem System, a third objective involves maintaining other congressionally authorized purposes of the system, including navigation. This project was designed with this objective in mind with the length, width and configuration of the features placed in a manner that is anticipated to preserve navigation depth in the adjacent main channel.

### 7.2.2 Monitoring

Currently there are numerous ongoing monitoring efforts at the program level. The following efforts and costs are for the entire program and not this specific site. These efforts are conducted on representative sites within the river, so this specific site may or may not be monitored depending on which sites are selected for the representative sample.

The quantity of SWH is monitored on a semi-regular basis through a combination of field measurement and estimates from aerial photography. A SWH accounting effort is currently underway for 2010 with an estimated cost of approximately $50,000, however this cost may increase in the future as additional factors of habitat quality are incorporated into the accounting of SWH. This effort does not include any data collection efforts.

Currently, habitat quality, as well as the benefits to pallid sturgeon and other native fish species, is being monitored through a number of different programs. The Pallid Sturgeon Population Assessment addresses long-term trends in pallid sturgeon and other native fish species on the majority of the Missouri River system. The annual cost for this effort is approximately $3 million. The Habitat Assessment and Monitoring Program (HAMP) was previously focused on assessing impacts to pallid sturgeon and other native fish species at the bend level as well as assessing physical habitat changes over time. Previously the cost for this program was approximately $1.8 million per year; however this program is currently being re-designed in concert with the program-level SWH AM strategy. A separate effort is looking at water quality in the river segments where SWH is being restored. The cost for this effort is approximately $400,000 per year.

As the main channel of the Missouri River is self-sustaining, meaning it does not require annual dredging to maintain depth, there are no annual efforts to survey channel depth. However, a survey of main channel depth profiles may be initiated if problems are reported by navigators on the system.
7.2.3 Assessment

The quantity of habitat constructed annually is used to measure progress towards the overall BiOp SWH goal as part of the annual GAP analysis. This data is tracked over time and is reported in the BiOp Annual Report. Data from the Pallid Sturgeon Population Assessment, HAMP, and the Water Quality monitoring program is typically captured in annual monitoring reports and analyzed semi-annually in multi-year reports. In the event that reports of navigation problems in the vicinity of the chute is received, existing and newly collected data would be analyzed to assess whether or not a depth problem existed and if the project was responsible.

As part of the program-level AM strategy, it is anticipated that a predictive model would be developed to analyze data on an annual basis. This model would assist in assessing the extent to which the program is meeting its stated objectives and aid the team in providing recommendations on management actions to decision-makers.

7.2.4 Adaptive Management

While potential adaptive management actions will be identified as part of the forthcoming program-level AM strategy, one potential action is currently known. If depths in the main channel are found to be insufficient to meet navigation flows and an assessment is made that the project is responsible, a management action such as, but not limited to, a modification of inlet structures to Chutes A and/or B may be recommended to limit the amount of flow that passes through this complex. The anticipated cost for the specific action listed would be approximately $100,000 to $400,000 per inlet structure.

7.2.5 Implementation

The Executive Steering Committee (ESC), as informed by the Integrated Science Program Management team, would be responsible for deciding which monitoring efforts are funded within a given year. Data analysis and assessment would be conducted by the Adaptive Management Work Group, in conjunction with the Aquatic Habitat Work Group and SWH Project Delivery Teams. The decision to implement a subsequent adaptive management action at this site would be made by the SWH program manager and approved by the ESC.
7.3 OPERATIONS AND MAINTENANCE PLAN

The Corps is responsible for O&M activities at Sandy Point Bend. O&M activities would include the maintenance of developed habitats and additional management activities at the site. Because Sandy Point Bend is located within the state of Iowa, the IDNR will be given the option to carry out the O&M activities on the site for the Corps. If they choose to manage the site for the Corps, the IDNR will submit an Annual Management Plan to the Corps for approval. The Omaha District would negotiate the costs of implementing the Annual Management Plan prior to each Federal fiscal year. Individual management and maintenance features required at Sandy Point Bend would be described in the plan. The Corps would be responsible for all costs required to implement the approved Annual Management Plan by the IDNR. The Corps will prepare an O&M Manual for Sandy Point Bend. It is anticipated that the IDNR will conduct certain aspects of O&M as part of its normal management activities at the site. These final arrangements would be outlined in the O&M Manual.

7.4 REAL ESTATE CONSIDERATIONS

All lands required for the proposed project at Sandy Point Bend were purchased by the Corps in 2009. A construction staging area would be established on site by the contractor subject to approval of the contracting officer. There currently is no land access to the site, so all access during construction would have to occur from the river.

7.5 IMPLEMENTATION RESPONSIBILITIES

The Corps is responsible for study management and coordination with USFWS, and other affected/interested agencies. The Corps will prepare and submit the subject PIR and complete all environmental review and coordination requirements. The Corps will then prepare any design plans that may be required, finalize any plans and specifications, prepare and implement a monitoring and evaluation plan, advertise and award a construction contract, perform construction contract supervision and administration, develop an O&M manual, and ensure O&M is carried out in accordance with the O&M manual. The Corps will maintain the flow-through chute complex for all project purposes including fisheries and navigation. In the event of flood damages to the project, the Corps would evaluate and complete the work necessary to reestablish project features.

The Corps is ultimately responsible for all O&M activities at Sandy Point Bend. However, the IDNR will be given the option to carry out the O&M activities on the terrestrial portion of the project for the Corps because Sandy Point Bend is located within the state of Iowa. The accomplishment of all O&M activities would be subject to available funding.
The ACT meets quarterly to discuss the status of the MRRP. As part of the meetings, an O&M update is given at which time the ACT ensures that site O&M is appropriate and reasonable.

7.6 COST ESTIMATE

The total estimated construction cost of Sandy Point Bend ranges from $2 to $4 million depending on construction method (i.e. dredge or mechanical excavation). This estimate includes clearing and grubbing, chute excavation, excavation for grade control, rock fill for structures, excavation at the chute inlets, seeding and mulching, and excavation and transport of rock.

The Sandy Point Bend project would be federally funded in its entirety. If Federal funds are not available to accomplish general operations, management and maintenance at the site, such work could be deferred or not accomplished. Additionally, the dynamics of the Missouri River adjacent to the site could deem a deferment or “no action” decision about operations, management and maintenance at the site. Annual O&M costs will be estimated as part of the Corps’ MCACES estimate. The cost estimate would be updated throughout the life of the project.

7.7 SCHEDULE

The following is an estimated schedule

Table 7-1 Estimated Schedule

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Scheduled</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIR Started</td>
<td>1/2009</td>
</tr>
<tr>
<td>PIR Approved</td>
<td>7/2010</td>
</tr>
<tr>
<td>Plans &amp; Specifications Started</td>
<td>6/2009</td>
</tr>
<tr>
<td>Plans &amp; Specifications Reviewed</td>
<td>6/2010</td>
</tr>
<tr>
<td>Plans &amp; Specifications Approved</td>
<td>6/2010</td>
</tr>
<tr>
<td>Construction Contract Advertised</td>
<td>July 2010</td>
</tr>
<tr>
<td>Construction Contract Awarded</td>
<td>August 2010</td>
</tr>
<tr>
<td>Construction Contract Completed</td>
<td>Not Scheduled</td>
</tr>
</tbody>
</table>

7.8 CONCLUSIONS AND RECOMMENDATIONS

The development of 25-63 acres of SWH in the form of a chute complex at Sandy Point Bend at an estimated cost of $3,200,000 has been identified as a priority project for inclusion into the Missouri River Recovery Program. The value of the area as fish and wildlife habitat prior to acquisition was limited due to the lack of aquatic habitat on the site. Construction of the chute complex would provide valuable aquatic habitat that would benefit the pallid sturgeon and other native aquatic and semi-aquatic species. The construction of the aquatic habitat
at Sandy Point Bend would also enhance the value of the adjacent terrestrial habitat to wildlife.

It is recommended that the Multiple Chutes with River Tiebacks alternative be constructed as described in this PIR. The Multiple Chutes with River Tiebacks alternative would result in the greatest beneficial impacts to fish and wildlife without adversely impacting navigation, flood damage reduction systems, or causing increased erosion on adjacent private property. This alternative would not significantly adversely affect the human environment.
Chapter 8 REFERENCES


Mestl, Gerald. 2004. Personal communication to Eric Laux, USACE. Nebraska Game and Parks Commission, Lincoln, NE.


APPENDIX A

Public and Agency Coordination
Wallace, A Luke NWO

From: Jane_Ledwin@fws.gov
Sent: Monday, March 15, 2010 10:22 AM
To: Wallace, A Luke NWO
Cc: Jane_Ledwin@fws.gov, Robert_Harms@fws.gov
Subject: Fw: Sandy Point Ecosystem Restoration Project, Harrison County, IA

Attachments: Picture1.jpg

Here you go Luke -

This is the last communication I have on this project. Give me a call if you have questions.

Chears -

Jane Ledwin
----- Forwarded by Jane Ledwin/R3/FWS/DOI on 03/15/2010 10:19 AM -----
"Reed, Margaret K NWO" <Margaret.K.Reed@usace.army.mil>
06/18/2009 08:20 AM To
Jane_Ledwin@fws.gov

Subject: Sandy Point Ecosystem Restoration Project, Harrison County, IA

Hi Jane:

The meeting was good and your suggestion to increase the bottom with to 75' was well received! I don’t see a problem will incorporation it into the project. I will investigate more into the timing of the project and pass that information on to you as soon as I get it. I will provide you with plan development updates as they come down the pipe. Recently, we (Dan Fridsel, Luke Wallace, and myself) were discussing adding multiple inlets to the project, similar to California Bend 1135 on the Nebraska side. The 3rd inlet at California Bend has filled in a bit since construction but the result was a low backwater/wetland. I believe that pallids were found in the chute during a NPS survey.

Anyway, that is all I know for the moment but I will definitely keep you posted!

M. Katie Reed
(402) 995-2607

-----Original Message-----
From: Jane_Ledwin@fws.gov [mailto:Jane_Ledwin@fws.gov]
Sent: Tuesday, June 16, 2009 10:57 AM
To: Reed, Margaret K NWO
Cc: Carol_Halv@fws.gov
Subject: Sandy Point Ecosystem Restoration Project, Harrison County, IA
El Katie -

Good speaking with you last week regarding the Sandy Point Project. How did the Friday meeting go?

In an effort to streamline correspondence, I'm providing this email in lieu of a letter as a response to the Corps May 26, 2009, letter, requesting Service input regarding information on fish, wildlife, and federally listed species. As I mentioned in our June 6, 2009, phone conversation, the Service supports these projects, particularly in areas of the river that has lost so much off-channel aquatic habitat. It appears the project is trying to incorporate multiple depths and structure to increase habitat diversity. Good! According to the information in the letter, the proposed bottom widths are between 10 and 60 feet. In Missouri we've found that anything less than 75 feet tends to clog up with debris. I understand your section of the river differs from the lower portions, but I would strongly recommend the design of the chute accommodate large debris that may accumulate.

We also support river discharge of the dredged material. At the same time, Nebraska Game and Parks biologists have tracked female pallid sturgeon near the project reach of the river. While the long-term effects of spoil disposal in the river are likely insignificant, I think it would be wise to consider potential effects to sturgeon that may be migrating or spawning in the area of the outfall. More information on the expected timing, duration, and materials discharged would help to assess what, if any effect, it may have on pallids in the area in spring. If necessary, we may want to consider a "window" within which there would be no disposal if that could be accommodated into project construction. Please keep me posted as project planning proceeds and the above information becomes available.

Thanks for your coordination,

Jane Ledwin

*******************************************************************************

Jane Ledwin
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
101 Park DeWille Drive
Columbia, Missouri  65203
Phone 573/234-2132, extension 109
e-mail jane.leedwin@fws.gov
*******************************************************************************
June 26, 2009

Brad Thompson
U.S. Army Corps of Engineers, Omaha District
Economics, Environmental, and Cultural Resource Section
1616 Capital Avenue
Omaha, NE 68102-4901

Re: Threatened and endangered species data request for the Sandy Point Ecosystem Restoration Project

Dear Mr. Thompson,

Please make reference to your letter dated May 26, 2009 requesting information about threatened and endangered species that may be impacted by the Sandy Point Ecosystem Restoration Project. This project is located along the right descending bank of the Missouri River between river miles 656.00 and 658.00, and is bordered by Washington County, Nebraska and Harrison County, Iowa.

The Nebraska Natural Heritage Program tracks occurrences of "at-risk" species and native plant communities within the state and bordering rivers. "At-risk" species and communities are defined as those which are declining in Nebraska, declining globally or unique to Nebraska. State listed threatened and endangered species are among those tracked by the Natural Heritage Program. All at-risk species and communities are considered a valuable state resource worthy of ensuring continued existence in Nebraska.

The proposed restoration site identified on the map you sent is within the ranges of the following state and federally listed threatened and endangered species and other at-risk species:

- western prairie fringed orchid (Platanthera praeclara) – state and federal threatened
- pallid sturgeon (Scaphirhynchus albus) – state and federal endangered
- sturgeon chub (Moxostoma gelidum) – state endangered
- lake sturgeon (Acipenser fulvescens) – state threatened
- blue sucker (Catostomus clupeaformis) – Tier 1 at-risk species
- sicklefin chub (Moxostoma mckeei) – Tier 1 at-risk species

Western Prairie Fringed Orchid
Western prairie fringed orchid occurs in native tall or mixed-grass prairies that are associated with wet meadows. Although the plant can be a colonizer species and grow on disturbed areas, it is found in greatest abundance in established wet meadows and high quality tallgrass prairie.

It does not appear that there is any tallgrass prairie within the construction site, but there is potential for western prairie fringed orchid to be growing in established wet meadows existing in the flood plain. If there are wet meadows that will be affected, surveys for western prairie fringed orchid should be conducted.
Palid Sturgeon
Palid sturgeon feed on small fish and invertebrates and are known to use sites with sharp slopes associated with downstream edges of submerged riverine sandbars. Most occurrence records of the fish are near confluences, islands, and at the downstream margins of sandbars. It is believed that this fish species spends some time in the Missouri River, and returns to the Platte River where it may spawn or possibly over-winter. The palid sturgeon spawns between February 1 and July 31, dependent on river conditions.

Lake Sturgeon
It is believed that the lake sturgeon occupies similar habitats as the palid sturgeon, but spends a greater proportion of its time in the Missouri than the Platte River. Lake sturgeon feed on invertebrates and small fish and can be found at the downstream margins of island and river confluences. This fish spawns between February 1 and July 31, depending on river conditions.

Sturgeon Chub
Sturgeon chub (Hybophyes gelida) are associated with fast flowing, turbid water and gravel substrate. The species has been collected in side chutes and backwaters—it is thought that these kinds of areas provide spawning habitat to the fish. Sturgeon chub feed on invertebrates. This fish spawns between February 1 and July 31, dependent on river conditions.

Blue Sucker
Blue sucker inhabit main channels of large rivers, such as the Missouri River and the lower reaches of its major tributaries. They are benthic in habit, meaning they live along the bottom of the river. They feed on aquatic insects and their larvae, algae, and other small aquatic plants. They are declining through most of their range due to habitat modification and water pollution.

Sicklenfin Chub
Sicklenfin chub prefer large, turbid rivers, such as the Missouri River. Channelization and modified water flows have eliminated the diversity of depths and velocities these fish rely on for habitat formation. Although the population has declined due to changes in the river system, they have managed to adapt and survive in sections of the river that are still turbid and have adequate flows to provide habitat.

We have determined that the proposed project area is not located in an officially designated Nebraska Game and Parks Commission (Commission) property or property managed by the Commission.

Construction that occurs within and alongside waterways has potential to negatively impact aquatic species. However, restoration projects, such as this one, will ultimately improve habitat for a variety of species, including some of those listed above. Therefore, the Commission generally supports these types of projects, since the long-term benefits will outweigh the short-term impacts that could occur due to construction activities.

All federally listed threatened and endangered species are also state listed. However, for assessment of potential impacts on federally listed, candidate or proposed threatened or endangered species, please contact John Cochran, Nebraska Field Office, U.S. Fish and Wildlife Service, 203 W. Second St., Grand Island, NE 68801.

Please note that this correspondence does not satisfy requirements of the Nongame and Endangered Species Conservation Act. Under the authority Neb. Rev. Stat., §37-807 (3) of the Nebraska Nongame and Endangered Species Conservation Act, all Nebraska state agencies are required to consult with the Nebraska Game and Parks Commission to ensure that any actions authorized, funded or carried out by
them do not jeopardize the continued existence of a state listed species. This requirement would extend to any state permit issued. Please contact me if you need additional assistance with determining the potential of an action to affect listed species.

If you have any questions or need additional information on this site or on the jurisdiction of the Commission under the authorities listed above, please feel free to contact me.

Sincerely,

Michelle R. Koch
Environmental Analyst Supervisor
Nebraska Natural Heritage Program
Nebraska Game and Parks Commission
(402) 471-5438, michelle.koch@nebraska.gov

CC: John Cochran, USFWS
Carey Grell, NGPC
March 30, 2010

Brad Thompson, Chief
Environmental, Economics and
Cultural Resources Section
Planning Branch
USACE, Omaha District
1616 Capital Avenue
Omaha, NE 68102

Dear Mr. Thompson;

I am responding to your request regarding the proposed chute development on Sandy Point Bend. We have reviewed the plans and there are no threatened and endangered species concerns. We also view all the impacts to fish and wildlife to be positive. We are excited about the project and look forward to seeing the area once completed.

Please let me know if you need anything else.

Sincerely,
Angi Bruce
SW District Wildlife Supervisor
PUBLIC NOTICE

US Army Corps of Engineers
Omaha District

Application No: 2009-00537
Applicant: USACE, Omaha District
Waterway: Missouri River
Issue Date: April 6, 2009
Expiration Date: April 27, 2009

Reply To:
NEBRASKA REGULATORY OFFICE – WEHRSPANN
8901 SOUTH 154TH STREET, SUITE 1, OMAHA, NEBRASKA 68138-3621

21 DAY NOTICE

JOINT PUBLIC NOTICE: This public notice is issued jointly by the U.S. Army Corps of Engineers, Omaha District, and the Nebraska Department of Environmental Quality (NDEQ), P.O. Box 98922, State House Station, Lincoln, Nebraska 68509 and the Iowa Department of Natural Resources, 502 E 9th Street, Des Moines, Iowa 50319. They will review the proposed project for state certification in accordance with the provisions of Section 401 of the Clean Water Act. NDEQ and IDNR hereby incorporate this public notice as its own public notice and procedures by reference thereto. For the purposes of the NDEQ and IDNR, their public notice will expire 30 days from the issue date shown above.

AUTHORITY: Section 401 of the Clean Water Act (33 USC 1344).

APPLICANT: U.S. Army Corps of Engineers, c/o Katie Reed, 1616 Capitol Ave., Omaha, Nebraska 68102.

PROJECT LOCATION: This project is located in portions Sections 8, 16, 17, and 21, Township 79 North, Range 45 West, Harrison County, Iowa. The project is located at Missouri River mile 658 to 656 right descending bank.

PROJECT DESCRIPTION: The project will consist of hydrological dredging 1,800-feet of chutes, with a bottom width varying from 40ft-60ft, which will require 800,000 CY of excavation discharged into the Missouri River. This material will be hydrologically discharged into the Missouri River. 5000 linear feet of dike removal is planned within the Bend and 1,200 linear feet of existing revetment structure will lowered. Approximately, 10,000 tons of riprap will be required to create grade control structures for each chute entrance. Existing grade control structures (11X125 linear feet) will be lowered to allow flow over them. Approximately, 15,500 tons of new rootless rock structures will be placed within the channel.
PROJECT PURPOSE: The purpose of this project is to increase shallow water habitat and increase top width and depth diversity. The project will contribute to the number of acres necessary for the Corps to comply with the U.S. Fish and Wildlife Service's 2000 Biological Opinion and 2003 Amended Biological Opinion pursuant to Section 7 of the Endangered Species Act.

SPECIAL AQUATIC SITES: 85 acres of wetlands dominated by the invasive Reed Canary Grass will be excavated by this project. These wetlands are located in old river chutes that have been disconnected from the Missouri River by past actions of the U.S. Army Corps of Engineers. This project would reconnect these former chutes.

CULTURAL RESOURCES: The Corps of Engineers, Omaha District will comply with the National Historic Preservation Act of 1966 and 36 CFR 800. We have checked the National Register of Historic Places and its current supplements and no property listed or proposed for listing in the Register is located in the project area. This is the extent of our knowledge about historic properties in the permit area at this time. However, we will evaluate input by the State Historic Preservation Officer and the public in response to this public notice, and may require a reconnaissance survey of the project area to check for unknown historic or prehistoric properties, if warranted.

ENDANGERED SPECIES: This activity is being performed for compliance with the 2000 Biological Opinion and 2003 Amended Biological Opinion pursuant to Section 7 of the Endangered Species Act. Pursuant to the Endangered Species Act, a preliminary determination has been made that the described work will not affect species designated as threatened or endangered or adversely affect critical habitat. In order to complete our evaluation of this activity, comments are solicited from the U.S. Fish and Wildlife Service and other interested agencies and individuals. This project will contribute to the number of acres necessary for the Corps to comply with the Missouri River Biological Opinion.

FLOODPLAIN: This activity is being reviewed in accordance with Executive Order 11988, Floodplain Management, which discourages direct or indirect support of floodplain development whenever there is a practicable alternative. By this notice, comments are requested from individuals and agencies that believe the described work will adversely impact the floodplain.

WATER QUALITY CERTIFICATION: Section 401 of the Clean Water Act (33 USC 1341) requires that all discharges of fill material must be certified by the appropriate state agency as complying with applicable effluent limitations and water quality standards. This public notice serves as an application to the state in which the discharge site is located for certification of the discharge. The discharge must be certified before a Department of the Army permit can be issued. Certification, if issued, expresses the state's opinion that the discharge will not violate applicable water quality standards.

PUBLIC INTEREST REVIEW: The decision whether to issue the Corps' permit will be based on
an evaluation of the probable impacts including cumulative impacts of the proposed/completed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against their reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people. In addition, the evaluation of the impact of the work on the public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under authority of Section 404(b) of the Clean Water Act (40 C.F.R. Part 230).

COMMENTS: The Corps of Engineers is soliciting comments from the public, Federal, State, and Local agencies and officials, Indian Tribes and other interested parties in order to consider and evaluate the impacts of this activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this project. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the activity.

Anyone whose interests may be affected by the proposed/completed work is invited to submit favorable or unfavorable written comments to the Nebraska Regulatory Office – Wehrspann, 8901 South 154th Street, Suite 1, Omaha, NE 68138-3621. The District Engineer is particularly interested in receiving comments related to the proposal’s probable impacts on the affected aquatic system’s functional values, cumulative and secondary effects and endangered species. All comments received will be considered public information; copies of all comments, including names and addresses of commentors, may be provided to the applicant unless confidentiality is requested. Comments must be submitted on or before the expiration date (located at the top of the first page) of this notice to be considered in the subsequent actions on this application.

PUBLIC HEARING: Before the expiration date of this notice, anyone may request, in writing, that a public hearing be held to consider this application. Requests shall specifically state the reason(s) for holding a public hearing. If the District Engineer determines that the information received in response to this notice is inadequate for thorough evaluation, a public hearing may be warranted. If a public hearing is warranted, interested parties will be notified of the time, date, and location.

ADDITIONAL INFORMATION: Additional information about this application may be obtained by writing to Matt Wray at the address shown on page one or by calling him at (402) 896-0896. You can also e-mail him at matt.t.wray@usace.army.mil.

REQUEST TO POSTMASTERS: Please post this notice conspicuously and continuously until the
expiration date specified at the top of page one.

NOTICE TO EDITORS: This notice is provided as background information for your use in formatting news stories. This notice is not a contract for classified display advertising.
TRANSMITTAL FORM

TO:  Ms. Katie Reed  
U.S. Army Corps of Engineers  
1616 Capitol Avenue  
Omaha, NE 68102

FROM:  Christine Schwake  
Water Resources Section  

PHONE:  (515) 281-6615  
DATE:  April 13, 2009

Enclosed or attached is the following:

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<td>Department of Natural Resources Public Notice</td>
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For your information and use

REMARKS:  This public notice will be printed one time in the Missouri Valley Times-News.  State Section 401 Certification is required for the issuance of the Department of the Army Corps of Engineers (DA) Section 404 permit.  Section 401 certification is the Department's concurrence that a project is consistent with Iowa's Water Quality Standards.

All projects requiring 401 certification are put out on public notice in a local newspaper close to the proposed project; there are no costs to the applicant associated with the review or the public notice.  The public notice allows the public to comment on the water quality aspects of the project that is affecting a water of the state.  The public comment period will expire on April 27, 2009.

The Department can waive, certify, certify with conditions or deny projects depending on the extent of the water quality impacts of the project.  Some projects that have minimal impacts can be approved if mitigation to replace the affected wetland habitat or water of the state is provided. Mitigation is considered and developed for projects based on the Department's Antidegradation Policy, set forth in Chapter 61, Iowa Administrative Code.
PUBLIC NOTICE OF INTENT TO CONSIDER ISSUANCE OF SECTION 401 WATER QUALITY CERTIFICATION

The Iowa Department of Natural Resources (IDNR) proposes to evaluate Section 401 Certification for the following project. The Section 401 Certification is the statement that a project will not cause a violation of Iowa’s Water Quality Standards.

PROJECT DESCRIPTION: The U.S. Army Corps of Engineers Omaha District, Corps #2009-00037, proposes to hydraulically dredge 1,800 feet of chutes, remove 5,000 linear feet of dike, 1,200 linear feet of existing revetment structure will be lowered, approximately 10,000 tons of riprap will be required to create grade control structures for each chute entrance, existing grade control structures will be lowered and approximately 15,500 tons of new rootless rock structures will be placed within the channel. The project is located in S8, 16, 17, 21, T79N, R45W, Harrison County. Project application material is available for review at www.iwoclark.army.mil/html/ed-rme/pn/pn.html or copies of this information may be requested by calling Chris Schwake at (515) 281-6615.

Anyone wishing to comment on the intent to proceed with Section 401 Certification review must do so in writing by April 27, 2009. All relevant comments will be considered in the review process. Written requests for the IDNR to hold a public hearing must cite specific reasons, including a proposed list of topics to be covered, and must be submitted to the IDNR, Chris Schwake, Wallace State Office Building, Des Moines, IA 50319-0054 by April 27, 2009. A request may be denied if substantive reasons for holding a hearing are not provided. If a public hearing is warranted, interested parties will be notified of the time, date, and location.
TRANSMITTAL FORM

TO:      Ms. Katie Reed  
U.S. Army Corps of Engineers  
1616 Capitol Avenue  
Omaha, NE 68102

FROM:    Christine Schwake  
Water Resources Section

PHONE:   (515) 281-6615  
DATE:    April 13, 2009

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All projects requiring 401 certification are put out on public notice in a local newspaper close to the proposed project. The public has a right to comment on the project before a decision is made. The public notice allows the public to comment on the water quality aspects of the project that is affecting a river of the state. The public comment period will expire on April 27, 2009.

The Department can waive, certify, certify with conditions or deny projects depending on the extent of the water quality impacts of the project. Some projects that have minimal impacts can be approved if mitigation to replace the affected wetland habitat or water of the state is provided. Mitigation is considered and developed for projects based on the Department's Antidegradation Policy, set forth in Chapter 61, Iowa Administrative Code.
July 7, 2009

Ms. Katie Reed
U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, NE 68102

Dear Ms. Reed:

After reviewing your request for State 401 Water Quality Certification, the Iowa Department of Natural Resources has issued the enclosed Certification. Please read the attached conditions carefully before beginning work on the project.

If you have any questions or comments about the certification or any conditions contained therein, please contact me at the address shown below or call (515) 281-6615.

Sincerely,

Christine M. Schwake
Environmental Specialist

cc: Mr. Matt Wray, Nebraska Regulatory Office – Wehrspann, 8901 South 154th Street, Suite 1, Omaha, NE 68138-3621
IOWA DEPARTMENT OF NATURAL RESOURCES

SECTION 401 WATER QUALITY CERTIFICATION

Certification issued to: U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, NE 68102

State 401 Water Quality Certification, Application Log No.: 09-W-085-00-01-5

Effective: July 7, 2009

Project description: Sandy Point Bend Chute Project (S8, 16-17, 21, T79N, R45W, Harrison County, IA): The project will consist of hydrological dredging 1,800’ of chutes, with a bottom width varying from 40’-60’, which will require 800,000 cubic yards of excavation discharged into the Missouri River. This material will be hydrologically discharged into the Missouri River and 5,000 linear feet of dike removal is planned within the Bend and 1,200 linear feet of existing revetment structure will be lowered. Approximately 10,000 tons of riprap will be required to create grade control structures for each chute entrance. Existing grade control structures (11x125 linear feet) will be lowered to allow flow over them. Approximately 15,500 tons of new rock structures will be placed within the channel.

Water quality use designation:

This reach of the Missouri River is designated as Class A1 Primary contact recreational use. These are waters in which recreational or other uses may result in prolonged and direct contact with the water, involving considerable risk of ingesting water in quantities sufficient to pose a health hazard. This reach of the Missouri River is also designated as Class B(WW-1) which are waters in which temperature, flow and other habitat characteristics are suitable to maintain warm water game fish populations along with a resident aquatic community that includes a variety of native non-game fish and invertebrate species. This reach of the Missouri River is also designated as Class HI, human health, which are waters in which fish are routinely harvested for human consumption or waters both designated as a drinking water supply and in which fish are routinely harvested for human consumption. All surface waters in Iowa, including wetlands and those designated for Class "A", "B", and/or "C" are classified for the following general uses: livestock and wildlife watering, noncontact recreation, crop irrigation, and industrial, agricultural, domestic, and other incidental withdrawal uses.

The Iowa Department of Natural Resources (IDNR) has issued this State 401 Water Quality Certification pursuant to Section 401 of the Clean Water Act. The Army Corps of Engineers (Corps) requires state Certification before a Section 404 permit can be issued. Section 401 Certification represents the IDNR's concurrence that the project certified is consistent with the Water Quality Standards of the state of Iowa as set forth in Chapter 81, Iowa Administrative Code.

Subject to the attached conditions, incorporated by reference herein, the IDNR has determined that there is reasonable assurance the proposed activities will be conducted in a manner that will not violate water quality standards of the state of Iowa.

Prepared By: Christine M. Schmitke, IDNR, Wallace State Office Building, Des Moines, IA 50319-0084 (515) 281-6413
Date Executed: July 7, 2009
GENERAL CONDITIONS

1. Permittee is responsible for securing and for compliance with such other permits or approvals as may be required by the IDNR, federal, state, or local governmental agencies for the project activities described.

2. Clearing of vegetation, including trees located in or immediately adjacent to waters of the state, shall be limited to that which is absolutely necessary for construction of the project. If not used as part of the project, all vegetative clearing material shall be removed to an upland, non-wetland disposal site.

3. All construction debris shall be disposed of on land in such a manner that it cannot enter a waterway or wetland. Construction equipment, activities, and materials shall be kept out of the water to the maximum extent possible. Equipment for handling and conveying materials during construction shall be operated to prevent dumping or spilling the material into waterbodies, streams or wetlands except as approved herein. Care shall be taken to prevent any petroleum products, chemicals, or other deleterious materials from entering waterbodies, streams or wetlands.

4. All disturbed areas not covered with riprap shall be seeded with native grasses, excluding Reed Canarygrass (Phalaris arundinacea) or any other invasive species, during an optimal seeding period. If excavation and construction are completed outside an optimal seeding period, temporary erosion control protection shall be implemented immediately upon completion of excavation and construction and shall be maintained until such time as seeding can be completed during an optimal period. The applicant shall monitor revegetated areas continuously to assure success of revegetation. If rye is initially planted to stabilise the soil then native grasses shall be planted during the following growing season.

5. Riprap shall consist of the existing revetment, clean native fieldstone, clean quarry run rock or clean broken concrete. If broken concrete is used all reinforcement material shall be completely removed from it; if removal is not possible, said reinforcement material shall be cut flush with the flat surface of the concrete. It shall be the applicant’s responsibility to maintain the riprap such that any reinforcement material that becomes exposed in the future is removed. The concrete pieces shall be approximately graded and no piece shall be larger than 3 feet across the longest flat surface. No asphalt or petroleum based material shall be used as or included in riprap material.

6. The hydraulic dredging shall occur during elevated river flows, preferably at 24,000 cubic feet per second or greater.

7. The hydraulic dredge discharge pipe should be submerged at least 3’ below the surface of the water and shall be at least 20’ into the free flowing portion of the river.

8. The operation and maintenance of this shallow water habitat area will be the responsibility of the U.S. Army Corps of Engineers.
Katie Reed
U.S. Army Corps of Engineers
1616 Capitol Ave.
Omaha, NE 68102

RE: State Water Quality Certification for Section 404
Application 2009-00537-WEH, Chute restoration project,
Missouri River Mile 658 - 656, Harrison County, IA.

Dear Ms. Reed:

We have reviewed the information received regarding the above-referenced application. We feel the activity will comply with the Clean Water Act of 1977, as amended by the Water Quality Act of 1987, subject to meeting the following conditions:

Condition 1. In order to establish certainty of compliance, an elutriate test must be conducted first on appropriate samples of the sediment which will be discharged to the waterway. The test should cover the following contaminants:

- Heavy metals: lead, arsenic, mercury, chromium, zinc, copper
- Ammonia
- Persistent pesticides such as:
  - Chlordane
  - Dieldrin
  - Aldrin
  - DDT and its metabolites

If the concentration of any of these pollutants is sufficient to cause violation of Title 117 - Nebraska Surface Water Quality Standards when the sediments are discharged into the river, the applicant must make arrangements for disposal elsewhere or revise the discharge schedule and/or volume to bring it into compliance. (See "Title 117 online at "Rules and Regulations,” http://www.deq.state.ne.us/.)
If the concentration of none of the potential pollutants as listed above poses a threat to water quality standards, the discharge may go forward as described in the Public Notice.

Condition 2. Construction activities should employ controls to reduce the sediment concentration of any water returning to the stream or river. This includes revegetating the banks and maintaining this condition.

Condition 3. If the area of disturbance will be greater than 1.0 acre, then the applicant will comply with National Pollution Discharge Elimination System permit conditions.

We, therefore, by this letter, provide Section 401 Water Quality Certification. This certification does not constitute authorization to conduct your project. It is a statement of compliance with Surface Water Quality Standards only, which is one requirement to gain authorization from the U.S. Army Corps of Engineers in the form of a Section 404 permit. If you have any questions, please feel free to call Terry Hickman on my staff, at (402) 471-2875.

Sincerely,

Marty Link
Associate Director,
Water Quality Division

cc: Matt Wray, US Army Corps of Engineers
    John Cochran, US Fish & Wildlife Service
    Carey Greil, Nebraska Game & Parks Commission
    Elidora Chamberlain, US Environmental Protection Agency
18 March 2010

David L Brandon
Planning Branch
Corps of Engineers
1016 Capitol Ave.
Omaha, NE 68102-4801

Re: Sandy Point Bend
Dike Removal
Harrison Co., Iowa
State of Nebraska Trust Lands
H.P. #2010-744-01

Dear Mr. Brandon:

A review of our files indicates that the referenced project does not contain recorded historic resources. It is our opinion that no survey for unrecorded cultural resources will be required. Your undertaking, in our opinion, will have no effect for archaeological, architectural, or historic properties. This review does not constitute the opinions of any Native American Tribes that may have an interest in Traditional Cultural Properties potentially affected by this project.

There is, however, always the possibility that previously unsuspected archaeological remains may be uncovered during the process of project construction. We therefore request that this office be notified immediately under such circumstances so that an evaluation of the remains may be made, along with recommendations for future action.

Sincerely,

Terry Steinacker
H.P. Archaeologist

Concurrence:

L. Robert Puschendorf
Deputy NeSHPO
July 29, 2009

U. S. Army Corps of Engineers, Omaha District
ATTN: M. Katie Reed, CENWO-PM-AE
Economics, Environmental, and Cultural Resource Section
1616 Capitol Avenue
Omaha, NE 68102-4901

RE: Sandy Point Ecosystem Restoration project along the right descending bank of the Missouri River, Harrison County, IA

Dear Ms. Reed,

The Nebraska Department of Environmental Quality (NDEQ) has reviewed the above referenced project. We have no comments regarding this project that would fall under the jurisdiction of our programs.

If you have questions about the permitting process, or any other questions, feel free to contact me at (402) 471-8697. For more information, please visit our website at www.deq.state.ne.us.

Sincerely,

Hugh Stirts, PhD
NEPA Coordinator
Mr. Brad Thompson  
Department of the Army  
Corps of Engineers, Omaha District  
1618 Capitol Avenue  
Omaha, NE  68102-4901  

Dear Mr. Thompson:  

Thank you for the opportunity to comment on the Sandy Point Ecosystem Restoration project along the right descending bank of the Missouri River in Harrison County, Iowa. The Natural Resources Conservation Service (NRCS) requests that you document the conversion of prime farmland due to the project on the enclosed Form AD-1066, “Farmland Conversion Impact Rating.”  

If we can be of any further assistance, feel free to contact Russell Kurth, District Conservationist, Logan, Iowa, at 712-644-2210, or me at 515-323-2223, or by email at john.myers@ia.usda.gov.  

Sincerely,  

John Myers  
State Resource Conservationist  

Enclosure  

cc: Russell Kurth, District Conservationist, NRCS, Logan, IA  
Jeff Zimprich, ASTC-FO, NRCS, Atlantic, IA
APPENDIX B

Plates
APPENDIX C

Engineering Analysis
OFFICE REPORT
Sandy Point SWH
Design and Hydraulic Analysis
CENWO-ED-HF
30 OCTOBER 2009
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<td>FIGURE 6 – CRP FLOW VELOCITIES IN SANDY POINT CHUTE B .........................</td>
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<td>FIGURE 7 – CRP FLOW VELOCITIES IN SANDY POINT CHUTE C .........................</td>
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<td>FIGURE 10 - CRP FLOW VELOCITIES IN SANDY POINT CHUTE F .........................</td>
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Chapter 9  INTRODUCTION
A technical analysis was performed to evaluate potential projects for the creation of shallow water habitat at Sandy Point bend. A wide range of potential projects were evaluated. This summary report discusses the projects evaluated and hydrologic analysis performed.

Chapter 10  SITE INVESTIGATION
The site investigation looked at the potential for the creation of Missouri River shallow water habitat (SWH) in the Sandy Point bend reach, extending from Missouri River Mile (RM) 658 to 656.4 in Washington County, NE. Available real estate provides an excellent opportunity to use government-owned property that could be excavated to create aquatic habitat and enhance the riparian zone. Opportunities were explored from a reach-wide perspective to develop a complementary project for the area of interest.

Project Formulation
Project formulation considered numerous types of projects while also evaluating site constraints. A number of projects were considered for the project reach, stated as follows.

Chutes
The typical chute layout comprises one or more channels with possible multiple connections to the Missouri River in addition to the entrance and exit. The multiple connections are referred to as secondary connections or tie channels. Chutes are desired to provide a dynamic environment with active bank and bar building processes. River energy limits the location of successful chute alignments. A properly formulated chute will function in both normal and high flow events. Chutes typically include one or more grade control structures to limit degradation within the chute and maintain the proper flow split between the chute and main channel. Past experience has indicated that the chute flow should be about 6-8% of the main channel flow at CRP. Chute alignment and the ratio of the chute length to the main channel length is a good indicator of chute dynamics and sustainability. Due to the sediment load within the chute, it is critical to maintain minimum chute flow velocities to prevent chute aggradation and possible disconnection from the river. Chutes may incorporate variable side slopes to promote depth diversity and woody debris.

Backwater Areas
Backwater areas consist of a single connection to the Missouri River. The connection is located and includes design feature to minimize sediment deposition. However,
experience has shown that a bar forms near the backwater entrance point from heavier Missouri River sediments. Deposition also occurs within the entire backwater, although at a slower rate, due to the natural river turbidity. Existing backwater projects have shown that the river connection bar sediments form within 3 to 5 years. General backwater deposition occurs at a slower rate with a backwater life in most locations estimated as 20 to 30 years. Backwaters may also be vulnerable to sediment deposition during high flood events. Backwater areas may incorporate variable side slopes to promote depth diversity and woody debris.

**Channel Widening**

Channel widening is desirable to create SWH within the main Missouri River by increasing the river top width. Generally, the river top width is about 700 feet. Projects are formulated with a goal of adding several hundred more feet of top width. Channel widening projects require the modification of the existing dikes to allow bank erosion. River structure modifications are intended to create SWH both directly, by causing deposition within the structure vicinity, and indirectly, by redirecting currents in the near bank erosion with a resulting increased bank erosion rate. The predominant structures used with channel widening consist of reverse sills, rootless dikes, dike notching, dike lowering, and chevrons.

**Revetment Modifications**

Revetment modifications refer to the action of lowering the revetment along the outside of river bend to create a SWH shelf. Shelf width typically varies from 50 to over 150 feet. The shelf may be sloping with a bottom elevation that is typically constructed 3 to 5 feet below CRP. The shelf may incorporate variable side slopes and woody debris.

**Inclusion of Woody Debris**

Recent additional guidance to the definition of optimum SWH has stressed the significance of including woody debris. Woody debris structures are a feature suitable for use with all of the stated project types, and can be included during detailed design. The inclusion of woody debris structures was not a part of this evaluation.

**Project Constraints**

Project formulation requires the consideration of constraints that limit the optimum creation of effective SWH within the project reach.

**Authorized Project Purposes**

All authorized project purposes must be maintained. The authorized 300-foot wide by 9-foot deep navigation channel must be maintained along a reliable sailing line. The authorized streambank stabilization function must be maintained to the point that general channel meandering and channel avulsions are prevented. The capacity of the
Federal Flood Control Projects must be maintained, as well as water supply and water quality. Although recreation is not a specific objective of the program, the recreation value of the river will likely be enhanced. However, public safety concerns must be addressed in the development of individual project sites.

**Site Location and Construction Methods**

Natural low ground within the property boundaries set practical limits on the proposed work. Critical infrastructure such as roads and consideration to limit tree removal also constrain the extent of development. Cost effective project construction is typically performed with a dredge. Physical size of the dredge is an important consideration for establishing the constructed width of project features. Dredge size has varied from 10” to 18” in previous Missouri River projects. Larger dredges require a greater minimum bottom width for access. Larger dredges may provide more efficient material removal rates but that is often offset by the requirement for greater water depth for access. This requirement may lead to overdepth dredging where the constructed depth exceeds desirable design depth.

**Sediment**

The Missouri River transports a significant quantity of sediment. The degree of impact of this sediment varies with project type and location. Design options are impacted by sediment with a goal to construct sustainable projects with minimized maintenance.

**Typical Dimensions**

Typical dimensions are based on past project experience and construction method. In areas without tight lateral constraints, a large dredge may be favored for economical construction. The large dredge typically can cut a swath as narrow as 75 feet. Smaller design bottom width channels would use a smaller dredge with a practical minimum bottom width of 30 feet. Past project construction has proven successful at a depth of five feet below the Construction Reference Plane. This would be the standard excavation depth for these proposed projects, but a few areas will be cut as high as 3.5’ below CRP to provide added diversity and enhance SWH function. Dimensions for each project will be evaluated and developed on a project specific basis. Hydraulic evaluation is a critical factor when evaluating stable chute alignment and geometry. The typical dimensions are suitable for the purposes of preliminary project formulation and evaluation.

**SWH Metrics**

The Missouri River Biological Opinion (2000) and the Amended Biological Opinion (2003) (BiOp) set forth the RPA requirements for habitat restoration/creation/acquisition related to restoration of submerged in-channel shallow water habitat (SWH) in the channelized river. Total acreage goals are 20-30 acres/mile in the channelized Missouri River (USFWS, 2003, pg. 193). SWH may be restored through flow management,
increasing the top width of the channel (widening), restoring chutes and side channels, manipulation of summer flows, or combination thereof (USFWS, 2003, pg. 193).

For the purposes of assessing habitat creation, the effective discharge is defined as the 50% exceedance discharge from the August flow duration curve(s) (USFWS, 2003, pg. 193). In summary, defined shallow water habitat acreage refers to the following conditions:

- 50% exceedance August flow
- Flow depth less than 5 feet (1.5 meters)
- Flow velocity less than 2 ft/sec (0.6 m/s)

**SWH Profile**

Project design employs the shallow water habitat elevation. An analysis was conducted to determine the Missouri River shallow water habitat profile from Gavins Point Dam (RM 811) to Rulo, NE (RM 498) and is available within the report Missouri River, Gavins Point Dam to Rulo, NE, Shallow Water Habitat Profile, August Flow Duration (USACE, 2007). The performed analysis determined the August flow duration and the corresponding Missouri River elevation throughout the reach. The results provide the basis to evaluate both the depth and velocity SWH criteria at any location along the channelized river in Omaha District.

**SWH Elevation Related to CRP**

The basic reference elevation used for construction and maintenance of the Bank Stabilization and Navigation Project features including dikes and revetments is the Construction Reference Plane (CRP). CRP is a water surface plane that corresponds to the 75% exceedance flow for the navigation season from 1 April through 30 November. CRP is updated frequently with the most recent revision occurring in 2006. Condition of river structures (revetments, dikes) and the extent of repairing those structures are referenced according to river flow depth above or below CRP. The SWH acreage flow elevations, which are determined using the August 50% exceedance flow, are not the same as CRP. The difference between CRP and the SWH elevation varies by location and is usually about 1 foot. In order to maintain consistency, project design elevations stated in this report are related to CRP. The SWH elevation is used in the design process and to estimate created acres.

**Chapter 11 SITE LAYOUT ALTERNATIVES**

The topography of the Sandy Point bend site was found to lend itself to the creation of excavated chutes. This option was chosen over backwater creation and top width
widening due to the sustainability of an excavated chute, as opposed to a backwater, and the availability of additional habitat gains as opposed to top width widening.

With the creation of a shallow water chute in mind, three alternatives were considered: (1) single inlet/chute alternative, (2) two chute alternative; and (3) two chutes with river tie-backs alternative.

**Single Chute**
The project would excavate sediments on the right descending bank of the river for a distance of 7500 feet (bottom width 60 feet) and connect it to the navigation channel at the upstream and downstream ends, to establish a side channel complex. In this restored channel, flows would be slower than in the navigation channel, depths would be shallower, substrate more stable, all being conditions more suitable for native fish species. Some of the resulting islands would succeed back to flood plain forest. The project construction would instantly restore approximately 10 acres of chute habitat, with potential for greater gains if the chute were to widen naturally.

**Multiple Chutes**
The project is similar to Alternative one but would add a second chute about 500 feet riverward of the first chute. The inlet would be approximately 500 feet downstream of the first and would re-enter the river 500 feet upstream of the first chute. The second chute would be approximately 5,100 feet long (60 foot bottom width). The project construction would instantly restore approximately 17 acres of chute habitat, with potential for greater gains if the chute were to widen naturally.

**Multiple Chutes with River Tie-Backs**
This alternative would modify Alternative 2 by adding three additional chutes that would connect the most riverward chute to the river, as well as a connection between the chutes in alternative two that would increase flow diversity. This complex could instantly restore approximately 25 acres of chute habitat, with potential for greater gains if the chute were to widen naturally.

**Recommended Alternative**
All alternatives were deemed technically feasible. However, Alternative 3 maximizes benefits for fish and wildlife habitat development at Sandy Point Bend while maintaining Missouri River authorized projects purposes and considering concerns of adjacent private property owners. The development of sustainable chutes with the inclusion of the tie-back channels is not available for many sites and represents a unique opportunity for Sandy Point Bend.

**Chapter 12 Detailed project description**
The proposed SWH site is located on the right bank of the Missouri River between RM 658 and RM 656.4, in Washington County, NE.
The proposed project consists of six excavated chutes of 60 foot width with 2:1 sideslopes. Two of the chutes run the length of the site, three serve as short connections to the river, and one serves as a connection between the longer chutes.

Figure 1 - Plan View Schematic of Proposed Sandy Point SWH Chute Complex

Chute A’s upstream entrance is located at RM 658.9, has a length of 7,410.4 feet, a slope of .000167 ft/ft, and exits at RM 656.4. Chute B’s upstream entrance is located at...
RM 657.75 has a length of 5,606.8 feet, a slope of .000171 ft/ft, and exits at RM 656.65. These two chutes will account for 85-90% of the total flow diverted from the Missouri River under most flow conditions for the project.

Chutes C, D, and F consist of short excavations within the dike field to augment the shallow water constructed for the site. The upstream entrances for the excavations will occur at RM’s 657.45, 657.25, and 657.05 respectively. Chute C is 630.3 feet in length with a slope of .00028 ft/ft, chute D is 782.9 feet in length with a slope of .00026 ft/ft, and chute F is 444.1 feet in length with a slope of .00021 ft/ft. All three chutes contribute flows to Chute B.

Chute E serves as a connection between chutes A and B. Its purpose is to divert some of the flows contributed by chutes C and D to chute B over into chute A. It is 573 feet in length and has a slope of .00009 ft/ft.

Chapter 13 hec – ras Analysis

Analysis was performed to evaluate the effectiveness of a network of channel chutes for the creation of shallow water habitat at Sandy Point Bend on the Missouri River. The proposed chutes were incorporated into an existing calibrated model of the Missouri River. The model was created using the one-dimensional Hydrologic Engineering Center’s River Analysis System Version 4.0 Beta (HEC-RAS) and calibrated to measured flows. The side channels were designed and included in the analysis at Sandy Point Bend utilizing split flow analysis, and the effects of the chutes on the river were evaluated.

The existing, calibrated Missouri River model was revised to incorporate the proposed SWH project at Sandy Point Bend. Two chute geometries were evaluated for proposed additions; 1) The design dimension of 60’ bottom width; and 2) a widening scenario where the proposed additions have widened to the estimated maximum widths. Chute design characteristics are listed in Table 1. Chute design geometries were added to the model and simulation results were compared to the existing model results and to each other. The resulting water surface profiles and velocities for the chutes and river produced by the simulations were compared to determine the effect of each chute on the Missouri River.

Flows
The chute simulations were run with multiple discharges ranging from 22,600 to 54,800 cubic feet per second (cfs), representing the August 10, 30, 50, 70, 90 percent exceedance and CRP profiles. The resulting water surface elevations for the Missouri River for the flow results are summarized in Figure 2. The basic model geometry did not take into account non-linear flows and possible flow control structures that may be needed to define the inlet and outlet of the chute.
CRP Data
The CRP is a water surface profile developed by the Army Corps of Engineers to serve as a reference for a 75% exceedance discharge between April 1st and November 30th each year. The CRP flow at Decatur, located near RM 691, is 31,000 cfs. CRP flow increases to 33,400 cfs at Omaha, NE, near RM 616. Prorated by drainage area, this results in an approximate CRP flow of 32,080. At the project site, the CRP elevation is estimated as 1001.6 at RM 658 and 1000.1 at RM 656.4.

Model Simulation Results
The model was calibrated using known water surface elevations and the simulation optimized the split flow between the river and the chute. The proposed chute additions were incorporated with split flow optimizations used to determine the flow distribution in the system. Three geometries for the shallow water complex were incorporated in the model. The first consisted of a simulation of the proposed project hydraulics as it will be constructed. The other two geometries simulate scenarios of significant widening and degradation of the chute. The resulting effects, including velocity, flow and water surface elevation of each chute on the river, were compared and evaluated.

Utilizing the split flow optimization to simulate the flow divergence from the Missouri River to the Sandy Point Chute, HEC-RAS computed flow diversions from the Missouri River into the chutes. Results yielded flow diversion ranges for the designed chute, widened chute and the widened and degraded chute of 1.4% to 9.5%, 3.7% to 21.1% and 25.8% to 35.8% of the flow from the river, respectively. Tables 3 and 4 list the flows and corresponding percentages of flow entering each chute for seven flow scenarios.

The velocity of the Missouri River was evaluated with respect to the added side channel. The design chute yielded a velocity decrease of as much as 0.18 feet per second (fps) while the 160 foot wide chute resulted in a maximum decrease of 0.44 fps and the 160 foot wide chute with 5 feet of degradation resulting in a maximum decrease of 1.14 fps. The velocities are compared in Figure 1. The velocity decrease is attributed to the decrease of flow in the main river channel resulting from the addition of the side channels.

Evaluation of the water surface elevation in the Missouri River indicated that the addition of the Wide Chute and Narrow Chute yielded slight elevation decreases of as much as 0.10 feet, 0.24 feet and 0.64 feet, respectively, for cross sections upstream of the chutes. The decrease in water surface elevation is depicted in Figure 2.

In addition, the resulting water surface elevations and velocities of the Sandy Point chutes are listed with respect to Missouri River flows in Table 2. Low channel velocities have the potential for sediment deposition, reducing the flow depth and lowering the effectiveness of the channel while high velocities can cause scouring. Velocities
between 1.8 and 2.5 fps have been shown historically to deposit fine sands with a $D_{50}$ (diameter of particle with 50% finer particles in the particle distribution) commonly found in the main channel of the Missouri River. The designed chute has computed velocities consistently lower than 2.5 fps for normal flows. The degraded chutes A and B have velocities consistently near 2.5 fps, but Chutes C, D, E and F have velocities much lower than that.

**Chapter 14  Project performance**

Evaluation of the modeling results was performed to reach conclusions regarding project performance. These are summarized as follows:

- Primary chutes A and B appear stable with flow velocities in excess of 2.2 ft/sec through the majority of the chute for CRP and higher flow rates.

- The tie-back chutes C, D, E, and F have minimal flow velocity. The function of these chutes is to provide alternative main channel connection and slack water areas. Modeling suggests that these chutes are likely to experience deposition.

- Simulations of widening and degradation of the proposed chutes at Sandy Point suggest that efforts should be made to keep the chute from increasing its conveyance. Without control structures or other measures, there is potential for almost 40% of the Missouri’s flows to be in the chutes.

- If properly designed, constructed, and maintained, the designed Sandy Point side channels would have minimal impact on the Missouri River flow velocity and sediment transport. As a result, all authorized Missouri River project purposes should be maintained.

- Modeling results determined that utilization of a chute at Sandy Point is feasible. The estimated flow splits are summarized in table 3.
Figure 2 - Missouri River Average Velocity at Sandy Point Bend. CRP Flows.
Figure 3 – Missouri River Water Surface Elevation at Sandy Point Bend. CRP Flows.
Figure 4 – Missouri River Water Surface Elevation upstream of Sandy Point Bend. CRP Flows.

Figure 5 – CRP Flow Velocities in Sandy Point Chute A.
Figure 6 – CRP Flow Velocities in Sandy Point Chute B

STATION 2+350: Chute E intersects Chute A

STATION 3+750: Chute C intersects with Chute B

STATION 2+375: Chute D intersects with Chute B

STATION 1+603.63: Chute E takes flow from Chute B

STATION 1+310: Chute F intersects with Chute B
Figure 7 – CRP Flow Velocities in Sandy Point Chute C

Figure 8 - CRP Flow Velocities in Sandy Point Chute D
Figure 9 - CRP Flow Velocities in Sandy Point Chute E
Figure 10 - CRP Flow Velocities in Sandy Point Chute F
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<th>Chute A</th>
<th>Chute B</th>
<th>Chute C</th>
<th>Chute D</th>
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## Water Surface Elevation and Velocity of Sandy Point Chute B

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## Water Surface Elevation and Velocity of Sandy Point Chute C

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<td>1001.03</td>
<td>1001.42</td>
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### Water Surface Elevation and Velocity of Sandy Point Chute D

<table>
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<tr>
<th>Flow Description</th>
<th>Inlet W.S. Elevation (ft)</th>
<th>Outlet W.S. Elevation (ft)</th>
<th>Inlet Velocity (ft/s)</th>
<th>Outlet Velocity (ft/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60' chute</td>
<td>160' chute</td>
<td>160' chute, 5' deg</td>
<td>60' chute</td>
</tr>
<tr>
<td>August 10% Exceedance</td>
<td>1006.27</td>
<td>1006.22</td>
<td>1006.02</td>
<td>1006.27</td>
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<tr>
<td>August 30% Exceedance</td>
<td>1003.46</td>
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<td>1003.22</td>
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<tr>
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<td>1001.91</td>
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<tr>
<td>August 70% Exceedance</td>
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### Water Surface Elevation and Velocity of Sandy Point Chute E

<table>
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<tr>
<th>Flow Description</th>
<th>Inlet W.S. Elevation (ft)</th>
<th>Outlet W.S. Elevation (ft)</th>
<th>Inlet Velocity (ft/s)</th>
<th>Outlet Velocity (ft/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60' chute</td>
<td>160' chute</td>
<td>160' chute, 5' deg</td>
<td>60' chute</td>
</tr>
<tr>
<td>August 10% Exceedance</td>
<td>1006.13</td>
<td>1006.07</td>
<td>1005.93</td>
<td>1006.13</td>
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<tr>
<td>August 30% Exceedance</td>
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<td>1003.12</td>
<td>1003.32</td>
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<tr>
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<td>1001.55</td>
<td>1001.77</td>
</tr>
<tr>
<td>August 70% Exceedance</td>
<td>1001.16</td>
<td>1001.09</td>
<td>1000.93</td>
<td>1001.16</td>
</tr>
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<td>August 90% Exceedance</td>
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<td>999.86</td>
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## Water Surface Elevation and Velocity of Sandy Point Chute F

<table>
<thead>
<tr>
<th>Flow Description</th>
<th>Chute A</th>
<th>Chute B</th>
<th>Chute C</th>
<th>Chute D</th>
<th>Chute F</th>
<th>Missouri River</th>
<th>Downstream</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flow (cfs)</td>
<td>Total % of Flow</td>
<td>Flow (cfs)</td>
<td>Total % of Flow</td>
<td>Flow (cfs)</td>
<td>Total % of Flow</td>
<td>Flow (cfs)</td>
</tr>
<tr>
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<td>2770</td>
<td>4.8%</td>
<td>2404.86</td>
<td>4.2%</td>
<td>71.24</td>
<td>0.1%</td>
<td>110.82</td>
</tr>
<tr>
<td>August 30% Exceedance</td>
<td>1452</td>
<td>3.4%</td>
<td>1375.38</td>
<td>3.2%</td>
<td>46.69</td>
<td>0.1%</td>
<td>80.86</td>
</tr>
<tr>
<td>August 50% Exceedance</td>
<td>958.4</td>
<td>2.7%</td>
<td>918.22</td>
<td>2.6%</td>
<td>24.68</td>
<td>0.1%</td>
<td>105.78</td>
</tr>
<tr>
<td>August 70% Exceedance</td>
<td>792.4</td>
<td>2.4%</td>
<td>765.69</td>
<td>2.3%</td>
<td>22.59</td>
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<td>88.26</td>
</tr>
<tr>
<td>August 90% Exceedance</td>
<td>476.7</td>
<td>1.7%</td>
<td>457.42</td>
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<td>14.98</td>
<td>0.1%</td>
<td>70.67</td>
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<tr>
<td>.85 x August 99% Exceedance</td>
<td>155.8</td>
<td>0.7%</td>
<td>150.24</td>
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<td>1.89</td>
<td>0.0%</td>
<td>8.73</td>
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<td>2.3%</td>
<td>717.49</td>
<td>2.2%</td>
<td>32.18</td>
<td>0.1%</td>
<td>48.62</td>
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</table>

**CRP:** Construction Reference Plane
Table 4 - Simulated Flows for Sandy Point SWH Complex – 160’ Bottom Width

<table>
<thead>
<tr>
<th>Flow Description</th>
<th>Chute A Flow (cfs)</th>
<th>Total % of Flow</th>
<th>Chute B Flow (cfs)</th>
<th>Total % of Flow</th>
<th>Chute C Flow (cfs)</th>
<th>Total % of Flow</th>
<th>Chute D Flow (cfs)</th>
<th>Total % of Flow</th>
<th>Chute E Flow (cfs)</th>
<th>Total % of Flow</th>
<th>Missouri River Flow (cfs)</th>
<th>Total % of Flow</th>
<th>Downstream Flow (cfs)</th>
<th>Total % of Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 10% Exceedance</td>
<td>5951.74</td>
<td>10.3%</td>
<td>5167.3</td>
<td>9.0%</td>
<td>343.68</td>
<td>0.6%</td>
<td>361.62</td>
<td>0.6%</td>
<td>350</td>
<td>0.6%</td>
<td>603.1</td>
<td>1.0%</td>
<td>45537</td>
<td>78.9%</td>
</tr>
<tr>
<td>August 30% Exceedance</td>
<td>3513.49</td>
<td>8.1%</td>
<td>3116.11</td>
<td>7.2%</td>
<td>250.85</td>
<td>0.6%</td>
<td>341.16</td>
<td>0.8%</td>
<td>250</td>
<td>0.6%</td>
<td>302.34</td>
<td>0.7%</td>
<td>35662</td>
<td>82.7%</td>
</tr>
<tr>
<td>August 50% Exceedance</td>
<td>2364.26</td>
<td>6.6%</td>
<td>2176.86</td>
<td>6.1%</td>
<td>163.83</td>
<td>0.5%</td>
<td>241.25</td>
<td>0.7%</td>
<td>95.67</td>
<td>0.3%</td>
<td>206.44</td>
<td>0.6%</td>
<td>30586</td>
<td>85.8%</td>
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<tr>
<td>August 70% Exceedance</td>
<td>1862.38</td>
<td>5.6%</td>
<td>1729.57</td>
<td>5.2%</td>
<td>93</td>
<td>0.3%</td>
<td>240.68</td>
<td>0.7%</td>
<td>93</td>
<td>0.3%</td>
<td>178.46</td>
<td>0.5%</td>
<td>29272</td>
<td>87.9%</td>
</tr>
<tr>
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<td>1162.48</td>
<td>4.1%</td>
<td>1063.57</td>
<td>3.7%</td>
<td>46.07</td>
<td>0.2%</td>
<td>117.7</td>
<td>0.4%</td>
<td>46.28</td>
<td>0.2%</td>
<td>141.17</td>
<td>0.5%</td>
<td>26122</td>
<td>91.5%</td>
</tr>
<tr>
<td>.85 x August 99% Exceedance</td>
<td>399.77</td>
<td>1.7%</td>
<td>415.9</td>
<td>1.8%</td>
<td>3.72</td>
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<td>9.9</td>
<td>0.0%</td>
<td>16.61</td>
<td>0.1%</td>
<td>49.36</td>
<td>0.2%</td>
<td>22118</td>
<td>96.3%</td>
</tr>
<tr>
<td>CRP</td>
<td>1837.03</td>
<td>5.6%</td>
<td>1647.94</td>
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<td>95</td>
<td>0.3%</td>
<td>231.83</td>
<td>0.7%</td>
<td>95</td>
<td>0.3%</td>
<td>211.67</td>
<td>0.6%</td>
<td>28904</td>
<td>88.1%</td>
</tr>
</tbody>
</table>

CRP: Construction Reference Plane

NOTE: Simulated flows are from the Sandy Point from RM 658 to RM 656.4 for a chute with a 160 ft bottom width.
| Flow Description | Chute A | | | Chute B | | | Chute C | | | Chute D | | | Chute E | | | Missouri River | | | Downstream |
|------------------|--------|------|------|--------|------|------|--------|------|------|--------|------|------|--------|------|------|-----------------|------|------|
| Flow (cfs)       | Total % of Flows | Flow (cfs) | Total % of Flows | Flow (cfs) | Total % of Flows | Flow (cfs) | Total % of Flows | Flow (cfs) | Total % of Flows | Flow (cfs) | Total % of Flows | Flow (cfs) | Total % of Flows | Flow (cfs) | Total % of Flows | Flow (cfs) | Total % of Flows |
| August 10% Exceedance | 10260.3 | 17.8% | 9287.9 | 16.1% | 360 | 0.6% | 370 | 0.6% | 389.84 | 0.7% | 500 | 0.9% | 37043 | 64.2% | 57711 | 100.0% |
| August 30% Exceedance | 7104.73 | 16.5% | 6785.5 | 15.7% | 250 | 0.6% | 260 | 0.6% | 255.08 | 0.6% | 470 | 1.1% | 28479 | 66.0% | 43134 | 100.0% |
| August 50% Exceedance | 5635.29 | 15.8% | 5225 | 14.7% | 220 | 0.6% | 230 | 0.6% | 225.74 | 0.6% | 420 | 1.2% | 24092 | 67.6% | 35628 | 100.0% |
| August 70% Exceedance | 5112.47 | 15.4% | 4581.3 | 13.8% | 170.9 | 0.5% | 242.33 | 0.7% | 200 | 0.6% | 227.3 | 0.7% | 22984 | 69.0% | 33291 | 100.0% |
| August 90% Exceedance | 4047.94 | 14.2% | 3697.7 | 12.9% | 120.5 | 0.4% | 176.47 | 0.6% | 155 | 0.5% | 158.3 | 0.6% | 20360 | 71.3% | 28558 | 100.0% |
| .85 x August 99% Exceedance | 2832.69 | 12.3% | 2724.8 | 11.9% | 100.1 | 0.4% | 127.25 | 0.6% | 142 | 0.6% | 94.36 | 0.4% | 17037 | 74.2% | 22964 | 100.0% |
| CRP | 5007.63 | 15.3% | 4560.8 | 13.9% | 133.6 | 0.4% | 187.33 | 0.6% | 178 | 0.5% | 211.6 | 0.6% | 22744 | 69.3% | 32811 | 100.0% |

CRP: Construction Reference Plane

NOTE: Simulated flows are from Sandy Point from RM 658 to RM 656.4 for a chute with a 160 ft bottom width and 5 feet of degradation.
Chapter 15  References