Draft

ENVIRONMENTAL ASSESSMENT
WHITE ROCK DAM
DAM SAFETY EVALUATION
WHEATON, MINNESOTA

March 2004

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Dam Safety Evaluation
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1.00 SUMMARY

The St. Paul District has assessed the environmental effects resulting from the implementation of a dam safety project at the White Rock Dam, Lake Traverse Reservoir, Wheaton, Minnesota. The purpose of the dam safety project is to provide greater protection from additional flooding caused by dam failure to downstream people and property. This assessment fulfills the requirements of the National Environmental Policy Act of 1969 (NEPA), Council on Environmental Quality Regulations (40 CFR 1500-1508), and Corps of Engineers regulation ER 200-2-2.

The project area is located south of the South Dakota-North Dakota border near the town of Wheaton, Minnesota. Lake Traverse Reservoir empties into Mud Lake, which is controlled by the White Rock Dam. These reservoirs form the headwaters of the Bois de Sioux River, which forms the border between Minnesota and South Dakota in this area. The Bois de Sioux River joins the Ottertail River at Breckenridge, Minnesota, to form the Red River of the North. Breckenridge is located about 200 miles northwest of Minneapolis, Minnesota. This Environmental Assessment identifies alternatives to address the dam safety issue and discusses the effects associated with the proposed action. The project consists of covering the downstream face of the dam with articulated concrete block (ACB) to protect the dam from failure in the event that it is overtopped. The dam is approximately 14,400 feet in length. More information on project design is contained in the Dam Safety Assurance Program Evaluation Report.

After the NEPA process has been completed and the Dam Safety Assurance Program Evaluation Report has been approved, the Plans and Specifications would be prepared. When they have been completed, the work could be conducted. The timing of construction is dependent on funding. It is anticipated that construction could begin in 2005.

An environmental review of the proposed action indicates the project would not result in significant effects on the environment. The probable effects in the area would be minor and short-term. Therefore, an Environmental Impact Statement will not be prepared. If public review reveals unidentified impacts, a revised document may be prepared to comply with the National Environmental Policy Act.

The proposed action would involve the placement of fill in waters of the United States, as defined by the Clean Water Act, as amended. The amount of fill is the minimum required to anchor the concrete block mat at the toe of the dam. State certifications required for the proposed action have been requested from Minnesota and South Dakota. A supplemental Section 404(b)(1) evaluation addressing the placement of riprap for erosion control is attached to this Environmental Assessment.

Construction activities would be guided by best management practices, State certification conditions, specifications stated in any other required permits, and other State and Federal laws and regulations. Impacts are minimized through good project design, where possible. The proposed action is not in conflict with any State air quality implementation plan. No agricultural land currently in crop production would be affected by the work proposed in this assessment.

Relationship to Environmental Requirements

The proposed action would comply with Federal environmental laws, executive orders, and policies; including the Clean Air Act, as amended; the Clean Water Act of 1977, as amended; the Endangered Species Act of 1973, as amended; the National Environmental Policy Act, as amended; the Land and Water Conservation Fund Act of 1965, as amended; the National Historic Preservation Act of 1966, as amended; the Fish and Wildlife Coordination Act of 1958, as amended; the Farmland Protection Policy Act; Executive Order 11988, Floodplain Management; Executive Order 12898, Environmental Justice; Executive Order 13112, Invasive Species; and Executive Order 11990, Protection of Wetlands. The project is in compliance with all applicable Federal and State laws and policies.

2.00 NEED FOR AND OBJECTIVES OF ACTION

The purpose of the project features addressed in this assessment is to reduce the public safety risk associated with a potential failure of the White Rock Dam located on the Bois de Sioux River near the South Dakota-North Dakota border where it intersects the border with Minnesota.

This Lake Traverse Project was authorized under the Flood Control Act of June 22, 1936 (Public Law 74-738), as amended. The Dam Safety Evaluation Report was prepared in accordance with the Dam Safety Assurance Program, ER 1110-2-1155.

3.00 ALTERNATIVES

The purpose of the proposed action is to reduce the risk of catastrophic failure of the dam structure. The purpose of this assessment is to describe the evaluation of the potential effects of various alternatives to reduce the risk of dam failure. Further discussion of the alternatives is contained in the Dam Safety Assurance Program Evaluation Report for the project.

Alternative 1: Do Nothing

This alternative would maintain the existing embankment and control structure with no modification. The “Do Nothing” alternative is unacceptable from a risk standpoint. There is significant potential for loss of life and property damage downstream of the dam if the dam were to fail as a result of overtopping. The risk assessment indicates the dam will be overtopped for a flood of approximately 25% of the Probable Maximum Flood (PMF). Current Corps of Engineers guidelines suggest that White Rock Dam should be capable of safely accommodating an Inflow Design Flood (IDF) between ½ PMF and full PMF based on the downstream risk identified. The do nothing alternative does not meet the Base Safety Condition (BSC) and is not considered a prudent solution to the hydrologic deficiency at White Rock Dam.

Alternative 2: Embankment Modification

This alternative consists of raising the embankment without increasing spillway capacity. The maximum pool elevation will exceed the current top-of-dam elevation of 986 feet for floods greater than about 25% of the PMF. An embankment raise to prevent overtopping does not address the spillway inadequacy and will increase the head differential between the pool and the tailwater, which will increase the downstream risk. The dam would require a raise in excess of 10 feet to prevent overtopping without an increase in spillway capacity. This alternative is not a viable solution to the dam safety concerns at Lake Traverse. This increased risk would warrant full PMF as an inflow design flood, and the embankment raise would also require a raise of the Browns Valley dike (see project map, **Plate 2**) on the south end of Lake Traverse to prevent flooding south of the continental divide. Since the existing spillway does not meet stability criteria with the pool at the current top of dam elevation of 986 feet, the additional loads applied by an embankment raise would likely require spillway replacement. The excessive cost for raising the height of these long embankments and the excessive cost of obtaining real estate for flowage easements clearly make the projected costs of this alternative far higher than the other alternatives.

Alternative 3: Increased Gated Spillway Capacity

This alternative consists of increasing the gated spillway capacity to reduce the potential for overtopping of the embankment. Increasing spillway capacity will reduce the required surcharge at high discharges and limit maximum pool elevations, thereby reducing the differential between the pool and the tailwater. Reduction of the pool/tailwater differential reduces the risk posed to downstream areas by the impounded water above the dam. Spillway capacity can be increased by expanding or supplementing existing spillway capacity or replacing the existing spillway altogether. Increasing gated spillway capacity with three additional gates to maintain maximum pool elevations below 982 feet would only achieve an increase in the inflow design flood up to about 25% of the PMF. The tailwater elevation approaches elevation 978 to 980 feet in the range of discharges necessary to reduce downstream risk. This 2- to 4-foot differential between the pool and the tailwater significantly affects spillway performance for a design pool elevation of 982 feet. The number of additional gates required to go beyond 25% PMF capacity for lower design pool elevations becomes excessive as a result of this submergence.

Alternative 4: Combined Gated and Uncontrolled Spillway Modifications

This alternative looks at various combinations of gated spillway modifications and additional uncontrolled emergency spillway capacity. The existing spillway will require modifications to ensure required factors of safety are met for the higher reservoir levels that could be experienced for this alternative. The spillway capacity must be sufficiently large such that all requirements for the currently authorized operating plan can be met. The main feature of this alternative is the lowering of a section of the crest of the main embankment from approximate elevation 986 feet to an elevation between 982 and 984 feet. This portion of the embankment would be designed for overtopping by placement of roller compacted concrete (RCC) on the downstream embankment of the lowered portion to facilitate overtopping during large flood events. This alternative, when coupled with the existing gated spillway or a proposed new-gated spillway, could be effective for floods up to the full PMF. Most of the options evaluated for this

alternative would require a 5-foot parapet to meet the freeboard requirements. After it was determined that the cost for the parapet would be exceptionally high, two other options were evaluated, placing RCC along the entire length of the downstream embankment or placing class 40 articulated concrete block (ACB) mattresses along the portion of the downstream embankment that is not lowered for the emergency spillway. No additional real estate would be required for these alternatives.

Alternative 5: Embankment Overtopping Design

During the independent technical review (ITR) and the final technical review (FTR) of the report, the issue of lowering the embankment to elevation 983 for the emergency spillway alternatives was identified as having the potential to reduce the level of flood protection to downstream communities. Therefore, alternative 5 was added to look at armoring the entire embankment for overtopping with ACB mattress when the inflow flood volume exceeds the capacity of the existing spillway and reservoir storage below elevation 986 feet. This condition will occur for flood events exceeding about 21% of the PMF. The existing spillway will require modifications to ensure required factors of safety are met for the higher reservoir levels that will be experienced for this alternative. The maximum reservoir elevation for the BSC 50% PMF is elevation 987.8 feet. This assumes no changes are made to the existing embankment profile, which varies in elevation from 986.2 feet to about 987.5 feet at its highest point. The maximum elevation for the full PMF flood event for the overtopping design is elevation 988.3 feet.

Alternative 6: Nonstructural Alternatives

Guidance states that planning for dam safety modifications will consider combinations of structural and nonstructural modifications. Nonstructural alternatives include permanent relocation, development of flood warning and evacuation plans, flood proofing, downstream levees, and land acquisition. The nonstructural alternatives considered are described below.

a. Land Acquisition. Land purchases and buyouts are not feasible because the wide, flat floodplain downstream of White Rock Dam and the extent of urbanization in the Wahpeton-Breckenridge area would require major relocations and extensive land purchases with associated substantial real estate costs. Development would be restricted in the downstream floodway identified for the dam failure conditions.

b. Flood Proofing. Flood proofing would consist of sealing or raising structures so that inundation damages would be negligible. This would not be a cost effective alternative because of the hundreds of residential and commercial structures that would be affected by a dam failure. More importantly, it would be ineffective at reducing the loss of life potential.

c. Flood Warning System. A flood warning system would consist of alarms that would sound when flooding threatened the integrity of the dam with risk of failure. This system would not be considered in lieu of structural modifications, as the population downstream is located too close to the dam to provide adequate response time to evacuate 100 percent of the large population that would be affected. The breach flood wave travel time of about 27 hours from the dam to Wahpeton-Breckenridge may afford time for emergency evacuation when word reaches these communities that the dam has failed. This could reduce the potential loss of life significantly. However, with the large number of people affected, the potential for loss of life

remains high at the 25% PMF failure condition. A flood warning system could be implemented in conjunction with structural modifications if deemed necessary.

d. Evacuation Plans. Evacuation plans for emergencies are the responsibility of local governmental units. The Corps of Engineers develops Emergency Action Plans for all Corps dams. These plans are updated periodically and provide guidance to authorities downstream of the dams on appropriate actions in the unlikely event of an emergency at the dam. An evacuation plan can play a significant part in reducing risks below White Rock Dam, but the substantial development and population at risk below the dam would make it very difficult to effectively notify and evacuate such a large area. An evacuation plan should be developed as an interim solution to minimizing the risk associated with emergencies at White Rock Dam; however, it is not considered a solution to the hydrologic deficiencies at White Rock Dam. Coordination will be done as time and funds become available for development of this interim Emergency Action Plan.

Alternative 7: Removal of White Rock Dam

The "remove structure" alternative is required by Draft ER 1110-2-1156. Removal of White Rock Dam would require modifications to the control structure to eliminate the ability to surcharge water on the embankment for flood events up to the BSC (base safety condition, ½ PMF). The existing control structure would require replacement with a large bridge opening to safely pass the BSC without overtopping the roadway. The embankment is part of the Minnesota/South Dakota highway system and must remain. The roadway or a portion of it could also be lowered to lower the consequences of a failure from overtopping. However, the cost of modifications to remove the risk from failure of the roadway in conjunction with the lost flood control benefits for a dam removal alternative will exceed the costs of the recommended alternative to modify White Rock Dam for dam safety.

In addition to the lost flood control benefits with removal of White Rock Dam, the dam removal does not eliminate the dam safety threat posed by Lake Traverse. The removal of the control capability at White Rock Dam shifts control of the storage in Lake Traverse to Reservation Dam. Reservation Dam is 5 feet lower than White Rock Dam and would normally be inundated by backwater from White Rock Dam during large floods. Without the downstream control at White Rock Dam, Reservation Dam has the potential for overtopping during inflow design floods required by dam safety standards and will likely fail during such an event. The risks downstream from a failure have not been quantified. Because of the anticipated high cost of this alternative, the loss of flood control benefits, and the transfer of the dam safety concerns to Reservation Dam, this alternative was not considered further.

BORROW AND DISPOSAL AREAS

The construction of the project requires topsoil for covering the articulated concrete block, but no impervious fill would be required. Riprap covers the toe of the dam; if additional material is needed, it would be obtained from fieldstone or existing quarries.

There would be no disposal of material associated with the construction.

PROJECT DESCRIPTION

Location

The Lake Traverse Flood Control Project is located on the boundaries of Minnesota, North Dakota, and South Dakota. The project lies within Traverse and Wilkin Counties, Minnesota, Richland County, North Dakota, and Roberts County, South Dakota. Lake Traverse forms the headwaters of the Bois de Sioux River. The project extends from the continental divide at Browns Valley, Minnesota, to a point along the Bois de Sioux River 6 miles south of Wahpeton, North Dakota, and Breckenridge, Minnesota. See **Plate 1** for a project location map and **Plate 2** for a map of the watershed.

Physical Components

The Lake Traverse Project consists of the Browns Valley Dike, the Reservation and White Rock Dams and associated reservoirs, and the Bois de Sioux River channel. The Browns Valley Dike, at the head of Lake Traverse, was originally built to prevent interbasin flow to/from the reservoir across the continental divide. The reservoir behind Reservation Dam is named Lake Traverse. Reservation Dam is controlled to a maximum elevation of 978.3 feet. Mud Lake is the reservoir behind White Rock Dam and immediately downstream of Reservation Dam. When Mud Lake reaches an elevation of 976.8 feet, the conservation level of Lake Traverse, Mud Lake and Lake Traverse become one pool and the control shifts to White Rock Dam. The Bois de Sioux River channel provides the necessary channel capacity for the drawdown of the Lake Traverse Project. All of the above items are called the Lake Traverse Project.

a. White Rock Dam. The dam is a 14,400-foot-long rolled-earth fill embankment. This length includes the concrete control structure, which is 47 feet long. The embankment has a total volume of 329,200 cubic yards and a top elevation of 986.0 feet. The upstream and downstream embankment side slopes are 1 on 2.5 and 1 on 2, respectively. The entire upstream slope is covered with a 6-inch gravel blanket topped with 12 inches of riprap. Only the base of the downstream slope is covered with riprap, which is also 12 inches deep. The top width of the dam is 26 feet and carries a roadway connecting U.S. Highway 81 in South Dakota and Traverse County Highway 10 in Minnesota.

b. White Rock Dam Outlet Structure. The outlet structure is a reinforced concrete section topped with a bridge deck. The structure contains three reversed tainter gates. Each gate is 13 feet wide by 16 feet high with a sill elevation of 965.0 feet. The two middle piers are each 4 feet wide, making the total distance between the abutments 47 feet. The tainter gates are supported by trunnions attached to the 4-foot-wide middle piers and the abutments. The manually operated gate machinery is located on top of the piers and contains a worm gear drive system with speed reducers, which use a 42 to 1 reduction. In the closed position, the top of the gates is at elevation 981.0 feet or 9 feet above the normal conservation pool elevation of 972 feet. The maximum flow capacity of the structure with the gates out of the water is 4,000 cubic feet per second (cfs) and 6,400 cfs at pool elevations 981.0 and 982.0 feet, respectively. During periods of low flow and winter operation, the center and west bay tainter gates are closed and a bulkhead is installed in the east bay, which is left open 4 feet.

c. White Rock Dam Stilling Basin. The stilling basin is 34.07 feet long and 47 feet wide. The floor of the basin is at elevation 960.0 feet. Baffles, with a top elevation of 964.0 feet, are arranged in two rows approximately 8.0 feet apart and extend across the entire width. A stepped sill, with a top elevation of 963.0 feet, is provided at the downstream end of the basin to stabilize the jump. Flared wing walls extend out from the downstream end. The basin is designed to produce a hydraulic jump for the dissipation of energy. A general plan and section views are shown on **Plate 3.**

d. White Rock Dam Approach Channel. The approach channel to the control structure is approximately 2 miles long with a bottom elevation of 966.0 feet. The channel was originally excavated to provide a free flow from the open water portion of Mud Lake to the dam. The approach channel silted in, however, following completion of the project. It was excavated again in 1989 as part of the Mud Lake Waterfowl Habitat Management Plan to allow the lake/marsh to be drawn down for vegetation management. Material removed from the channel was used to build a series of islands for waterfowl nesting.

e. Bois de Sioux River Channelization. The Bois de Sioux River was straightened and enlarged to form an outlet channel for White Rock Dam. The channelized reach stretches for approximately 24 miles from the dam to about 5 miles south of the sister cities of Wahpeton, North Dakota, and Breckenridge, Minnesota.

4.00 AFFECTED ENVIRONMENT

The affected environment of the project area includes the socioeconomic, cultural, and natural resources of the area.

The Bois de Sioux River watershed represents an area of about 1,420 square miles, including areas of Traverse County (38% of the watershed), Grant County (27%), Wilkin County (14%), Stevens County (10%), Big Stone County (7%), and Ottertail County (4%). The watershed includes the drainage basins of Lake Traverse and the Bois de Sioux River. Where the Bois de Sioux River and the Ottertail River join is considered the headwaters of the Red River basin. The major tributaries of the watershed include the Mustinka River, numerous creeks in the south and east portions of the watershed, and the Rabbit River in the northern portion of the watershed.

Three different ecoregions are included in the watershed: The Red River Valley ecoregion, the Northern Glaciated Plains ecoregion and the North Central Hardwood Forests ecoregion.

The Red River Valley ecoregion encompasses most of the watershed in the north, central, and western portions of the watershed. The Northern Glaciated Plains ecoregion is found in the southern and eastern portions of the watershed. The northeastern portion of the watershed includes a small area of the North Central Hardwood Forests ecoregion.

The majority of glacial deposits in the watershed are till, made up of clay, silt, sand, and gravel. Soils are predominantly black, limey, and clayey in the central portion of the watershed, with black, loamy soils in the southwest and eastern portions of the watershed.

Historically, the watershed land cover was dominated by prairie/grassland (78%) and wetland (17%). As a result of the fertile soils present, land use and cover in the watershed are now dominated by cropland (88%), while prairie/grassland and wetlands provide only 2% and 4% of the current land cover, respectively. Land cover in the riparian areas (1,000 feet on either side of rivers) of the watershed is mainly cultivated land (78%) and wetland (12%). Primarily to accommodate agriculture, the central portion of the watershed has been extensively drained.

Much of the watershed, primarily in the southwest and central portions, is underlain by a buried aquifer. Wells able to yield small quantities of groundwater can be developed throughout the watershed. Wells able to yield larger amounts of water can be developed in areas of alluvial and outwash deposits. The moraine areas in the eastern and southern portions of the watershed are groundwater recharge areas, while the glacial lake plain is a discharge area. Groundwater use for water works and crop irrigation averages 1,125 acre-feet per year.

The Bois de Sioux River is one of the headwater rivers, along with the Ottertail River, that form the Red River of the North. The Red River is a valuable natural resource to eastern North Dakota and northwestern Minnesota. On its meandering northerly path to Lake Winnipeg, it provides the region with fertile agricultural lands, wildlife and fisheries habitat, and a source of potable surface water.

The remaining wooded riparian areas are an important wildlife and aesthetic resource. The riparian woodlands are essentially the only wooded habitat remaining in this predominantly agricultural area. Woodland was probably never very common in the prairie environment, but it is extremely important as nesting, breeding, and overwintering habitat for a number of birds, mammals, and reptiles.

The project area is rural. Land not in the reservoir project is agricultural. There are seasonal and permanent dwellings around Lake Traverse. Downstream, the area near the river is more natural with riparian vegetation. Riverbanks range from vegetated to eroded.

Agricultural activities, rural development, and the construction of flood control projects have altered the terrestrial and aquatic ecology of the area. Agricultural activities have resulted in the conversion of primarily grassland and wetland. The construction of flood control projects including levees, diversions, clearing and snagging, and erosion protection have changed many areas of the river and riparian zone and resulted in the loss of riparian woodland habitat.

Water Quality

Lake Traverse and Mud Lake are shallow, windswept lakes located in one of the uppermost reaches of the Red River of the North watershed. Geomorphic characteristics, long hydraulic retention times, and high annual evaporation rates have resulted in a lake with an extremely high mineral content (dissolved solids, especially sulfate). Its mineral characteristics render the water almost useless as a source of municipal and industrial supply because softening is too expensive and often ineffectual. In addition, nutrient-laden runoff into Lake Traverse and Mud Lake from their mostly agricultural watersheds promotes the excessive growth of blue-green algae and high levels of dissolved organics.

Winding through the lake plain of glacial Lake Agassiz, the Red River of the North is a meandering river with a very flat stream gradient, dropping only 200 feet in its 394-mile course from the confluence on the Ottertail and Bois de Sioux Rivers at Breckenridge, Minnesota, to the United States-Canada border. At Breckenridge, the stream gradient is just over 1 foot per mile, flattening to 0.2 foot per mile near the Canadian border.

Threatened and Endangered Species

The presence of any threatened or endangered species at the site has been coordinated with the U.S. Fish and Wildlife Service. The Service indicated that the bald eagle (*Haliaeetus leucocephalus*), which is listed by the Department of the Interior as threatened, is found in the project area.

The bald eagle is a permanent inhabitant of the region. The bald eagle nests and roosts within the reservoir project area but not near the project site. Known nest sites are a sufficient distance from the dam that the construction activity would not be considered an activity that would adversely affect the bald eagle.

SOCIOECONOMIC RESOURCES

Population

As of the 2000 census, Wahpeton, North Dakota, had a population of 8,586 residents and Breckenridge, Minnesota, had 3,559 residents.

Agriculture

Of the total land in the Red River of the North Valley, 82.4 percent is used as cropland. The types of crops grown include wheat and other small grains, sugar beets, sunflowers, corn, and potatoes. Pasture and rangeland account for the next largest land use at 5.4 percent.

Industry

The major industries in the region are found in Wahpeton, North Dakota, and Breckenridge, Minnesota. The chief industries in Wahpeton include retail trade, educational services, manufacturing of nondurable/durable goods, and construction. The labor force in Wahpeton numbered 4,670 in 2000, with an unemployment rate of 5.0 percent. Important industries in Breckenridge include the aforementioned at Wahpeton in addition to health services and transportation. The labor force in Breckenridge numbered 1,752 in 2000, with an unemployment rate of 1.6 percent. Agriculture is also a major industry for the two cities and the surrounding area.

Flood Damages

The primary authorized purpose for the Lake Traverse Project is flood damage reduction for the agricultural and urban damage centers along the Bois de Sioux and Red Rivers. Flood damages also occur within the reservoir during high stages, due to encroachment on Government flood easements by cottages and resorts near the reservoir.

The major agricultural reaches affected by the project include lands along the Bois de Sioux River from White Rock Dam to the end of the Bois de Sioux River channel, which ends 5 miles south of Wahpeton. Major urban damage centers affected by the project include the cities of Wahpeton, North Dakota, and Breckenridge, Minnesota. The urban areas of Fargo, North Dakota, and Moorhead, Minnesota, are also affected by the project, but to a lesser extent than the Wahpeton-Breckenridge area. The National Weather Service flood stage at Wahpeton and Breckenridge is 10 feet as measured by the U.S. Geological Survey gage number 05051500, on the Red River of the North at Wahpeton, North Dakota. High reservoir stages, wave action, and ice movement can cause damage to reservoir shoreline, permanent residences, summer homes, resorts, roads, bridges, and farmlands around the Lake Traverse Project. Because high-water damages occur most frequently during the June 1 to September 30 peak resort period, many commercial establishments experience a decline in net income.

CULTURAL RESOURCES

The Lake Traverse-Bois de Sioux Project is considered eligible for listing in the National Register of Historic Places as a historic district. Authorized under the Flood Control Act of 1936, construction of the project was completed between 1939 and 1941. Project features include the White Rock Dam, the Reservation Highway Dam, the Browns Valley Dike, and the channeled portion of the Bois de Sioux River. These project features are contributing elements to the Lake Traverse-Bois de Sioux Historic District. Together, they form the Lake Traverse and Mud Lake reservoirs. Their waters flow north through the channeled portion of the Bois de Sioux River to join with the Ottertail River, forming the Red River of the North at Wahpeton, North Dakota, and Breckenridge, Minnesota.

5.00 ENVIRONMENTAL EFFECTS

An environmental analysis has been conducted for the proposed action, and a discussion of the impacts is presented in the following paragraphs. The parameters listed in the Environmental Impact Assessment matrix have been reviewed and considered in arriving at the final determinations. Section 122 of the 1970 Rivers and Harbors Act requires a variety of factors to be considered. Any factors not discussed in this assessment would not be appreciably affected.

NATURAL RESOURCES

The project would have minimal effect on natural resources in the project area. There would be a minor disturbance of aquatic habitat of the toe drain when riprap is temporarily removed for the placement of ACB. After the riprap is replaced, the minimal habitat in the toe drain would quickly recover.

The downstream dam face is kept mowed to prevent woody vegetation from causing instability on the dam and, as such, provides minimal habitat.

It is not anticipated that the construction would have any effects on the aquatic resources of the Bois de Sioux River. Construction on the gates would be for improving stability and would not

disturb aquatic habitat, so there would be no effect on fish, mussels, or other invertebrates. The fishery value in the river at the site is limited due to water quality, urban development, and instability of the site. No effects to mussels are anticipated.

The project would not result in any long-term effects to the hydraulics of the river.

There would be no long-term effects on recreational resources.

The project would not affect the biodiversity of the area or fragmentation of the habitat. Impacts are minimized through good project design and landscaping. The project does not conflict with any State of Minnesota air quality implementation plan.

THREATENED AND ENDANGERED SPECIES

The threatened bald eagle (*Haliaeetus leucocephalus*) is known to nest within the Lake Traverse project. However, there are no nest sites within ½ mile of the construction area. Because of the distance and the minimal nature of the modification, no adverse effect on the bald eagle would be expected.

SOCIOECONOMIC RESOURCES

The potential for loss of life "without" dam failure is assumed to be zero for all events analyzed. The rate of rise under the natural flood condition is measured in terms of feet per day and allows time for evacuations to occur both in areas unprotected by levees and in Wahpeton and Breckenridge. In flood scenarios where the levee systems are overtopped by the non-failure condition, it is assumed people behind the levees will have been evacuated prior to the levees being overtopped. Only the scenario where the levees are not overtopped prior to a failure condition but are overtopped during a failure condition will result in loss of life potential. The incremental depths are not life threatening except in the Wahpeton-Breckenridge reach where the levees are overtopped by this sudden surge at about the 25% with failure probable maximum flood (PMF) condition.

There are three communities below the dam and upstream of the Wahpeton-Breckenridge project limits: White Rock – 4 miles, Fairmont – 14 miles, and Tyler – 21 miles downstream of the dam. In addition to the communities of White Rock, Fairmont, and Tyler in the reaches below the dam, there are also numerous farmsteads and clusters of homes that are affected by floods. The location of this population with respect to the dam places these populations at risk for dam failure scenarios from the threshold flood condition up to about the 50% PMF condition, at which point incremental flood elevations are less than 0.5 foot. It is therefore necessary that the extent of modifications to the dam for hydrologic deficiency should reduce the incremental impacts to levels less than 1 foot to avoid threat to lives in these rural areas.

Since the incremental difference between the non-failure and failure condition for all floods is less than 2 feet, there will be no loss of life assumed for the population between the dam and Wahpeton and Breckenridge. Although there may be isolated cases where flood fighting may result in ring levees being overtopped as the result of the dam failure condition, it is beyond the scope of this

analysis to determine where these efforts may occur and to what extent flood fighting is practicable. In most cases, these ring levees would be relatively low (2 to 4 feet) and, if overtopped, would result in low probability of loss of life. The significant population centers of Wahpeton and Breckenridge and threat of loss of life due to a major levee system being overtopped by a breach flood wave will be used as the population at risk (PAR) to loss of life relationship to assess the inflow design flood (IDF) required to reduce the risk below White Rock Dam to acceptable levels.

The loss of life is projected to be about 766 people for the worst case considered at the 25% PMF with failure flood condition. The 25% PMF with failure event will overtop the downstream portion of the levee system, and it is assumed this overtopping will result in failure of the levee and rapid inundation of certain areas of the communities protected by this lower levee reach. The loss of life of 766 people represents about 10 percent of the total population affected by the 25% PMF breach condition.

Flood warning time is not factored into this loss of life estimate. The breach flood wave travel time of about 27 hours from the dam to Wahpeton-Breckenridge may afford time for emergency evacuation when word reaches these communities that the dam has failed. This could reduce the potential loss of life significantly. However, with the large number of people affected, the potential for loss of life remains high at the 25% PMF failure condition. The water surface elevation increases by over 0.1 foot per hour for the failure condition. This rate of rise from a non-levee overtopping condition to an overtopping condition offers little time for evacuation of residents who have chosen to ignore warnings of the dam failure.

The incremental loss of life as a result of dam failure is less severe as the hydrologic event gets larger and assumed dam modifications will increase spillway capacity. Increases in spillway capacity will prevent breached conditions by preventing failure of the dam for the 50% PMF and full PMF flood scenarios. These spillway releases will exceed the design level of protection and overtop the levees. It is assumed adequate warning will have preceded these large flood releases whereby an orderly evacuation of downstream communities will have removed all risk to loss of life. Therefore, loss of life for the 50% PMF and PMF conditions is assumed to be zero.

Transportation Routes at Risk

Several roads cross the Bois de Sioux River downstream of White Rock Dam: Minnesota Highway 55/North Dakota Highway 11 at river mile 13.3; County Highway 16 near White Rock at river mile 4.3; and County Highway 6 near Tyler at river mile 21.4 are the main crossings. There are also seven low water crossings below the dam. These low water crossings are inaccessible during flood releases from White Rock Dam and should pose no threat to population for the floods being addressed in this risk assessment. The main highway crossings are all under water and likely barricaded prior to any of the dam failure scenarios described herein. It is not likely there is a threat for loss of life should these bridges be washed out as a result of the flood surge from the dam failure. The damage to transportation routes related to the potential bridge and road washouts is not quantified.

CULTURAL RESOURCES

The Corps' cultural resource staff has determined that the extensive changes proposed for the

dike at the White Rock Dam will change the historic character of this structure, constituting an adverse effect on the Lake Traverse-Bois de Sioux Historic District. The Corps' cultural resource staff in consultation with the Minnesota State Historic Preservation Office (SHPO) will reach a resolution of adverse effect. Once agreement is reached on the resolution of adverse effect, the Corps will enter into a memorandum of agreement with the SHPO.

OTHER CONSIDERATIONS

Cumulative Effects. The cumulative effects of the proposed action combined with the effects of other similar actions are additive. The significant resources identified are social, wetland, wildlife, fishery, recreation, cultural, and water quality. There have been significant effects to these resources as a result of past actions. These include urban development, road construction, agricultural practices, and flood control projects. Other reasonably foreseeable future actions in the area or region include construction of temporary emergency or permanent flood damage reduction measures, urban residential development, commercial development, and road construction. The impacts associated with the proposed action discussed in this assessment would result in minor adverse and beneficial effects to resources in the area. Actions taken to minimize adverse effects include use of best management practices and reseeding of construction sites. Future flood damage reduction projects could be additive and result in higher flood levels in other locations and induced damages. Future actions should take this into consideration.

HTRW. There will be no disturbance of land, only of the constructed dam. No HTRW effects would be expected.

Air Quality. The site does not conflict with any known air quality implementation plans.

Wetlands. Other than the dam toe drain, wetlands would not be encountered in the project area. Temporary disturbance of the area is unavoidable if the dam is to be stabilized. A Section 404(b)(1) evaluation has been prepared for the fill activities, and State Water Quality Certification will be obtained from Minnesota and South Dakota prior to construction.

Floodplain. There are no practical alternatives to the proposed action that are less costly and socially, engineeringly, and environmentally acceptable. The modification is necessary because of increased population and development in the communities downstream of the dam.

6.00 COORDINATION

Coordination with Federal, State, and local agencies, interest groups, and the public is being undertaken as part of the Environmental Assessment.

The U.S. Fish and Wildlife Service has been contacted regarding this study. A letter addressing coordination with the U.S. Fish and Wildlife Service is included with this assessment (see Attachments).

Coordination in compliance with Section 7c of the Endangered Species Act of 1973, as amended, was undertaken. This assessment addresses the impacts associated with the proposed

action.
The Service has indicated that the federally listed threatened bald eagle is present in the project area and that, because of the distance from the construction area, the project would not have any effects on it or any other listed species.

The South Dakota Game and Fish Department, the North Dakota Game and Fish Department, and the Minnesota Department of Natural Resources have also been contacted (see Attachments). None had any major concerns associated with the project.

The Corps' cultural resource staff will continue consultation with the Minnesota State Historic Preservation Office to resolve adverse effect. Before construction of the project can take place, a memorandum of agreement stipulating appropriate mitigation measures to resolve this adverse effect must be executed with the Minnesota State Historic Preservation Officer and the necessary funds for satisfaction of the memorandum of agreement must be allocated from project funds.

ENVIRONMENTAL ASSESSMENT MATRIX
Section 122 of the River and Harbor and Flood Control Act of 1970 (Public Law 91-611)

PARAMETER	MAGNITUDE OF PROBABLE IMPACTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise					X		
2. Aesthetic Values				X			
3. Recreational Opportunities				X			
4. Transportation				X			
5. Public Health and Safety		X					
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth and Development				X			
8. Business and Home Relocation				X			
9. Existing and Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Water Supply				X			
9. Flooding Effects		X					
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat				X			
3. Wetlands				X			
4. Aquatic Habitat				X			
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity				X			
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Prehistoric and Historic				X			

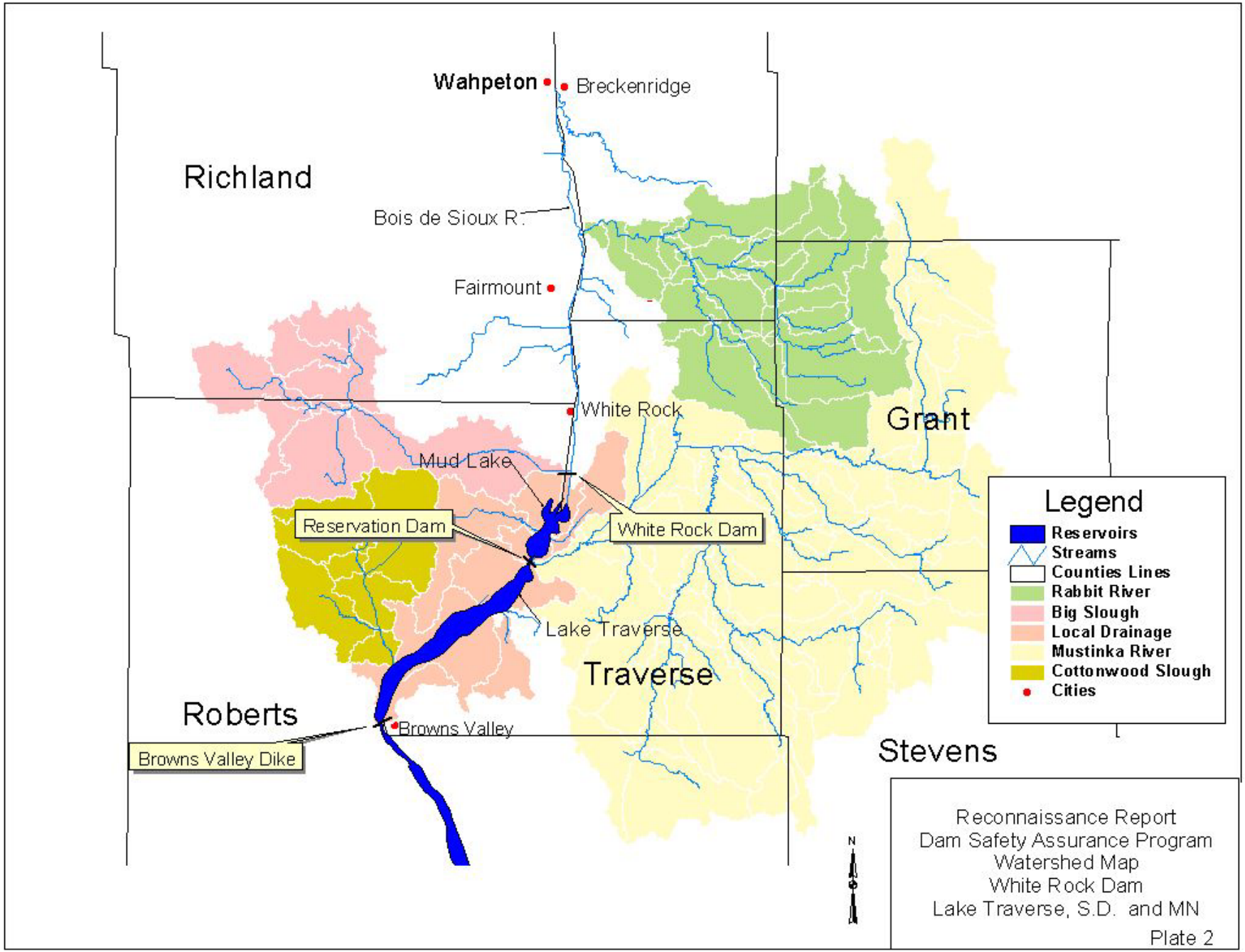
ATTACHMENTS

Plates – Project Plans
Correspondence
Section 404(b)(1) Evaluation

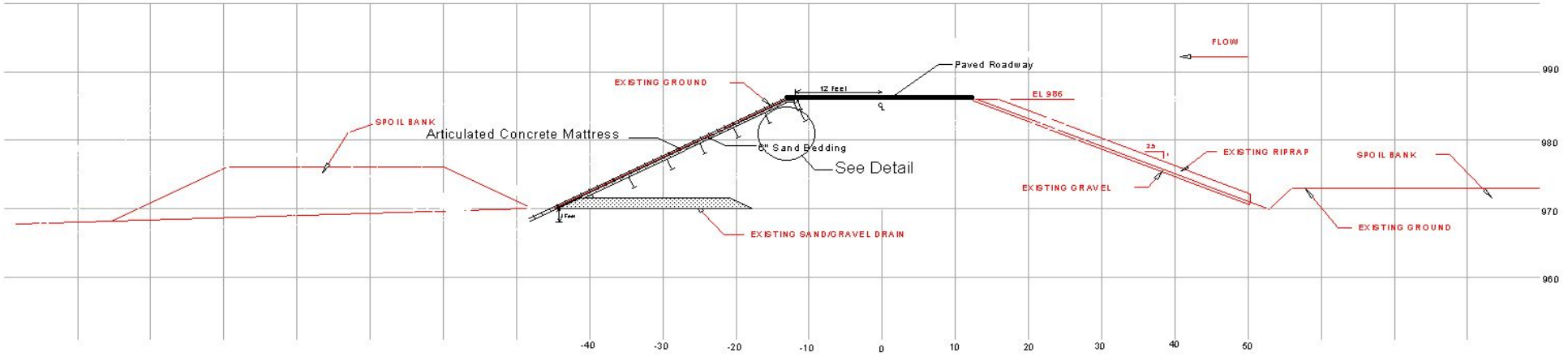
Reconnaissance Report
Dam Safety assurance Program

Location Map

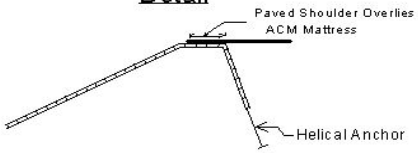
White Rock Dam
Lake Traverse, N.D./MN


Wahpeton
Breckenridge
Richland
Bois de Sioux R.
Fairmount
White Rock
Grant
Mud Lake
Reservation Dam
White Rock Dam
Lake Traverse
Traverse
Roberts
Browns Valley
Browns Valley Dike
Stevens
Legend
Reservoirs
Streams
Counties Lines
Rabbit River
Big Slough
Local Drainage
Mustinka River
Cottonwood Slough
Cities
N
Reconnaissance Report
Dam Safety Assurance Program
Watershed Map
White Rock Dam
Lake Traverse, S.D. and MN
Plate 2

Typical Section - Alternative 5
Articulated Concrete Mattress
Overtopping Erosion Protection



Detail



Reconnaissance Report
Dam Safety Assurance Program

ACM - Erosion Protection

White Rock Dam
Lake Traverse, N.D. / MN.

Plate 17

From: Luther Aadland [luther.aadland@dnr.state.mn.us]
Sent: Thursday, January 29, 2004 8:16 AM
To: Shyne, John T
Subject: Re: White Rock Dam

Hi John,
Doesn't sound like a big deal in terms of environmental impacts if the dam armoring approach is chosen.

> "Shyne, John T MVP" <john.t.shyne@mvp02.usace.army.mil> 1/28/2004 3:39:57 PM <

Hi Luther,

I am presently preparing an EA for proposed modifications to the White Rock Dam. A recent dam safety analysis showed that increases in population density and the improvement of flood protection at Wahpeton/Breckenridge have caused an increase in the predicted loss of human life that would occur if the dam failed. Our regulations require us to correct this condition.

An array of alternatives have been examined including no action, non-structural, raising or lowering the pool and dam removal. A solution that included increasing spillway capacity was selected, but further independent review showed that a substantial cost saving could be achieved with no compromise of safety by armoring the dam embankment with articulated concrete block. This would reduce the likelihood of dam failure if overtopping occurred. The chance of overtopping is less than 0.4% (250-year) but this approach allows greater freeboard and would spread any overtopping flow over a much greater area at lower head. No change in operation is contemplated. The block voids would be filled with topsoil and the embankment planted with native grasses.

Some minor modifications to the outlet structure are proposed to increase its stability. Otherwise, the proposed protection is only for the downstream face of the earthen dam, which would fail, if overtopped. It is not normally an overflow section and would not lend itself to some of the things that have been done on dams downstream. The appearance of the dam will not be appreciably different once vegetation is reestablished.

My purpose here is to coordinate with the DNR to determine if you have any concerns that should be addressed in the EA. You will be given the opportunity to review and comment on the EA when it is completed. I have also been coordinating with the Fish and Wildlife Service.

I would appreciate a reply, even if you have no specific comments at this time.

Thanks,

John

John T. Shyne
Fishery Biologist
St. Paul District, US Army Corps of Engineers
190 Fifth Street East
St. Paul, MN 55101-1638
Phone: 651.290.5270

Fax: 651.290.5258

From: Terry Lejcher [terry.lejcher@dnr.state.mn.us]
Sent: Tuesday, January 27, 2004 1:44 PM
To: Shyne, John T
Subject: Re: White Rock Dam

The C of E will require a permit from the DNR Div. of Waters, and I will be reviewing that permit, so I am one of the right persons. I will look forward to the EAW.

From: John.C.Kirk@state.sd.us
Sent: Tuesday, February 03, 2004 10:21 AM
To: Shyne, John T
Cc: John.Cooper@state.sd.us; Doug.Hansen@state.sd.us;
George.Vandel@state.sd.us; Doug.Alvine@state.sd.us
Subject: RE: White Rock Dam Safety Environmental Assessment

Sorry this has taken so long but I had to check this out with our regional office and the Conservation Officers etc. I have now received their thoughts in this matter and as a result we have no adverse comment to make or objection to raise relative to the project. Keep me informed however as the project proceeds as we wish to remain involved.

-----Original Message-----
From: Shyne, John T MVP [mailto:john.t.shyne@mvp02.usace.army.mil]
Sent: Thursday, January 22, 2004 5:52 PM
To: 'john.c.kirk@state.sd.us'; Paul. Coughlin (E-mail)
Subject: White Rock Dam Safety Environmental Assessment

Paul and John,
I am preparing an Environmental Assessment (EA) for the proposed dam safety modifications, and will include your names on the mailing list for the review. As part of the NEPA process I am coordinating with the various interested agencies to determine if there are any concerns that we should be aware of before completing our analysis. Please contact me with any specific information on the project area that should be considered, or questions that we may resolve prior to public review of the EA. I have completed a description of the environmental setting of the project area so I am not asking for general information.

It was determined in a recent analysis that, because of changed conditions, in the event of a dam failure, there could be considerable loss of human life. To remedy this problem, a number of alternatives were studied including dam removal, non-structural, raising or lowering the pool and the selected plan, protect the dam from failure in the event of overtopping.

This would be accomplished by covering the downstream face of the dam with articulated concrete blocks from the road surface to the toe. The voids in the blocks would be filled with soil and seeded. Some minor work on the control structure would improve its stability.

I have contacted the Fish and Wildlife Service for their input, as well.

Thank you,

John Shyne

John T. Shyne
Fishery Biologist, PM-E
St. Paul District, US Army Corps of Engineers
190 Fifth Street East
St. Paul, MN 55101-1638
Phone: 651.290.5270
Fax: 651.290.5258

White Rock Dam
From: Dyke, Steve R. [sdyke@state.nd.us]
Sent: Friday, January 23, 2004 8:06 AM
To: 'Shyne, John T MVP'
Subject: RE: White Rock Dam

John:

Thanks for the heads up. Please put me on the mailing list for the EA.

Steve

-----Original Message-----
From: Shyne, John T MVP [mailto:john.t.shyne@mvp02.usace.army.mil]
Sent: Thursday, January 22, 2004 10:59 AM
To: Steve Dyke (E-mail)
Subject: White Rock Dam

Hi Steve, The White Rock Dam on the Bois de Sioux River is not in ND but the downstream channel is part of the overall Lake Traverse project so I thought that I would let you know about this proposed action. Of course, if we do nothing, there could be effects in ND.

I am working on a dam safety investigation of the White Rock Dam and preparing an EA on proposed changes to increase the safety of the dam. Because of changes in population and in flood protection downstream, the risk to human life from a dam failure has increased substantially.

A number of alternatives were studied including dam removal, non-structural, raising or lowering the pool and the selected plan, protect the dam from failure in the event of overtopping. This would be accomplished by covering the downstream face of the dam with articulated concrete blocks from the road surface to the toe. The voids in the blocks would be filled with soil and seeded. Some minor work on the control structure would improve its stability. No change in operation or water levels is contemplated.

I have contacted the Fish and Wildlife Service, MDNR and SDG&F for their input. If you would like to be on the mailing list for the EA, or if you have any comments, please let me know.

Otherwise, I hope things are going well for you.

Thanks for your time,

John

John T. Shyne
Fishery Biologist, PM-E
St. Paul District, US Army Corps of Engineers
190 Fifth Street East
St. Paul, MN 55101-1638
Phone: 651.290.5270
Fax: 651.290.5258

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
4101 East 80th Street
Bloomington, Minnesota 55425-1665

JAN 26 2004

John T. Shyne
Fishery Biologist
St. Paul District, US Army Corps of Engineers
190 Fifth Street East
St. Paul, MN 55101-1638

Dear Mr. Shyne:

This letter responds to your December 10, 2003, request for threatened and endangered species information for planned improvements to White Rock Dam, located on the Bois de Sioux River. The project would potentially affect habitat in South Dakota, North Dakota, and Minnesota. The following information presents a coordinated response from Ecological Services offices in these three states.

Bald eagles are known to nest in the Mud Lake area of Roberts County, South Dakota. Three nest locations are known for the Mud Lake area, two are no longer active and have been destroyed and one was active during 2003. Nest locations are as follows:

Roberts #2 T128N, R48W, Section 35, SE 1/2; last active 1998, destroyed 2002
Roberts #3 T127N, R48W, center of Section 11, active 1999-2001, destroyed 2002
Roberts #6 T127N, R48W, Section 11, N 1/2; active in 2003

Bald eagles can return to rebuild nests in former locations so it is possible that the destroyed nest sites may host new nests and active pairs in 2004. In addition, foraging and roosting locations are present throughout the area. Construction activities should not occur within 0.25 mile of any known active bald eagle nest. The nesting season is January to August and it may be necessary to delay construction activities until after this period. Any nests found should be reported to Mr. Michael Broschart, South Dakota Ecological Services Field Office at (605) 224-8693, extension 30.

There are no known federally listed threatened or endangered species, candidate species, or critical habitat within proximity to the proposed project in North Dakota or Minnesota.

We appreciate the opportunity to provide technical assistance on the proposed project. If you have questions regarding these comments, please contact staff biologist Ms. Laurie Fairchild, at (612) 725-3548, extension 214.

Sincerely,

Dan P. Stinnett
Field Supervisor

cc: Michael Broschart, South Dakota Ecological Services Field Office
Terry Ellsworth, North Dakota Ecological Services Field Office

MINNESOTA HISTORICAL SOCIETY

January 16, 2004

Mr. Terry J. Birkenstock
Chief, Environmental & Economic Analysis Branch
U.S. Army Corps of Engineers
190 5th Street East
St. Paul, MN 55101-1638

Re: White Rock Dam, Dam Safety Assurance Program
Traverse County
SHPO Number: 2004-0777

Dear Mr. Birkenstock:

Thank you for the opportunity to review and comment on the above project. It has been reviewed pursuant to the responsibilities given the State Historic Preservation Officer by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council on Historic Preservation (36CFR800).

As you point out, the Lake Traverse-Bois de Sioux Historic District meets National Register criteria.

We concur with your determination that the proposed project work has a potential adverse effect on the district, and we look forward to working with you through the consultation process to consider ways to avoid, reduce, and/or mitigate the effects.

Contact our office at 651-296-5462 with questions or concerns.

Sincerely,

Dennis A. Gimmestad
Government Programs & Compliance Officer