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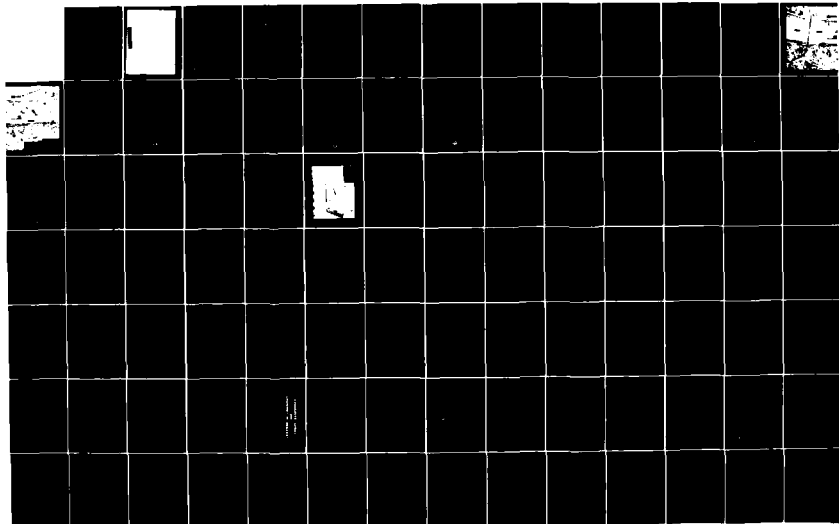
FINAL ENVIRONMENTAL IMPACT STATEMENT REHABILITATION OF
LOCKS AND DAM NUMBER 1 MINNEAPOLIS MINNESOTA(U) CORPS
OF ENGINEERS ST PAUL MN ST PAUL DISTRICT JUL 78

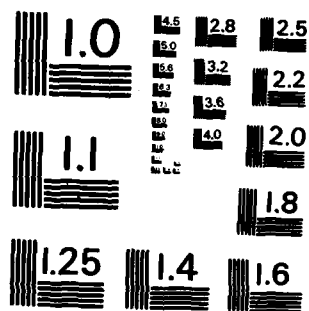
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The project would involve the rehabilitation of Locks and Dam No. 1, which would include the work necessary to extend the life of the structure for 50 years without increasing the depth, width or length of the locks. This requires the complete rehabilitation of the landward lock and the partial rehabilitation of the riverward lock without interruption of navigation. The lock walls would be resurfaced and new machinery and associated equipment installed. Construction waste water would be pumped into the Minneapolis sewer system while solid wastes would go in sanitary landfills. Construction would affect wildlife.		

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FINAL
 ENVIRONMENTAL IMPACT STATEMENT
 REHABILITATION OF LOCKS AND DAM NO. 1
 MINNEAPOLIS, MINNESOTA

U.S. ARMY CORPS OF ENGINEERS
 St. Paul District
 1135 U.S. Post Office and
 Custom House
 St. Paul, Minnesota 55101
 JULY 1978

FOREWORD

The authority to study a replacement program for Mississippi River Locks and Dam No. 1 was granted by the Office, Chief of Engineers in 1963. Interim reports concluded that the present lock size was adequate, and the preparation of a Design Memorandum for the Rehabilitation of Locks and Dam No. 1 was authorized in 1973. A preliminary Phase A report was prepared in 1976.

The National Environmental Policy Act of 1969 (NEPA) stated, in part, that it is the continuing responsibility of the Federal Government to use all practicable means consistent with other essential considerations of national policy to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may:

Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

Assure for all Americans safe, healthful, productive and aesthetically and culturally pleasing surroundings.

Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.

Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice.

Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.

Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Further, with respect to major Federal actions significantly affecting the quality of the human environment, Section 102 (2)(c) of the NEPA calls for preparation of a detailed statement on:

the environmental impact of the proposed action,

any adverse environmental effects which cannot be avoided should the proposal be implemented,

alternatives to the proposed action,

the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity, and

any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

This environmental impact statement attempts to identify the associated environmental, economic and social impacts in accordance with the requirements of the NEPA. In January 1978, a draft environmental impact statement was furnished to all known interests in an effort to gain their comments. It was furnished simultaneously to the U.S. Environmental Protection Agency. A notice of availability was published in the 27 January 1978 Federal Register, after which a 45-day review period began.

After receipt and consideration of comments on the draft EIS, the Corps prepared this final EIS, which includes responses to the questions and objections raised by the comments, and a final analysis of the project's environmental effects and the alternatives available. When this final statement is filed with the United States Environmental Protection Agency, a 30-day review period will ensue. During this period, all interests are invited to review the statement and submit written comments.

Coordination in planning with all known interests is a continuing process and attempts to maintain this coordination are being made. (See Section 9 of this report for more detailed information.) Single copies of this report are available at the Corps of Engineers, St. Paul District Office, 1135 U.S. Post Office and Custom House, St. Paul, Minnesota 55101.

**SUMMARY
REHABILITATION OF LOCKS AND DAM
NO. 1.
MINNEAPOLIS, MINNESOTA**

() Draft Environmental Statement (X) Final Environmental Statement

Responsible Office: U.S. Army Engineer District, St. Paul
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101
Telephone: (612) 725-7505

1. Name of Action: (X) Administrative () Legislative

2. Description of Action: The project would involve the rehabilitation of Locks and Dam No. 1, which would include the work necessary to extend the life of the structure for 50 years without increasing the depth, width or length of the locks. The plan involves the complete rehabilitation of the landward lock and the partial rehabilitation of the riverward lock without interruption of navigation. The lock walls would be resurfaced and new machinery and associated equipment installed.

3. a. Environmental Impacts: The proposed project would extend the life of the existing structure 50 years, thereby providing continued navigation in the St. Paul-Minneapolis area. The rehabilitation of both locks would enable the more efficient lockage of both recreational and commercial craft.

b. Adverse Environmental Effects: The construction activities would produce some impacts on water quality, such as increases in turbidity due to placement and removal of cofferdams. Construction waste water would be pumped into the Minneapolis sewer system while solid wastes would be disposed of in sanitary landfills. Some noise pollution and vehicle traffic impacts would result from 24-hour construction activities. Wildlife would be affected during construction activities.

4. Alternatives to the Proposed Action

The following alternatives to the rehabilitation were considered:

- a. No action
- b. Lock replacement at alternate location
- c. Lock replacement at existing location
- d. Lock replacement at existing location without interruption of navigation
- e. Lock replacement at existing location with temporary use of river
- f. Lock replacement at existing location with temporary use of river and temporary use of alternate route

Cofferdam Placement Alternatives

- a. Use of island for cofferdam placement
- b. Use of barges for cofferdam placement

5. Coordination: For a list of those who have been sent copies of the draft statement and from whom comments were requested see pages 54-55. A list of those who commented is found on pages 55-56.

6. a. Draft Statement to EPA 27 January 1978 .
b. Final Statement to EPA .

FINAL
ENVIRONMENTAL IMPACT STATEMENT
REHABILITATION OF LOCKS AND DAM NO. 1
MINNEAPOLIS, MINNESOTA

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FINAL
ENVIRONMENTAL IMPACT STATEMENT
REHABILITATION OF LOCKS AND DAM NO. 1
MINNEAPOLIS, MINNESOTA

1.00 PROJECT LOCATION AND DESCRIPTION

LOCATION

1.01 Locks and Dam No. 1 is located in the Minneapolis-St. Paul reach of the Mississippi River at mile 847.6 above the mouth of the Ohio River (figure 1). The original structure was completed and placed in operation in 1917. It included a 152-foot-long hydroplant adjacent to the left bank, an Ambursen-type dam having a 574-foot crest length, surmounted by 2-foot high automatic release flashboards and eight sluiceways (of which only three sluice gates are operated and maintained at the present time); and an 80-by-360-foot navigation lock. In 1929 the lock failed, cutting off all barge traffic to Minneapolis. To insure against future interruption to barge traffic, it was decided to build twin locks, each 56 by 400 feet, at this site. The first lock (riverward lock) was completed in 1930 and the second lock was placed in operation in 1932 (figures 2 and 3).

PROJECT AUTHORIZATION

1.02 The authority for this project is granted in the River and Harbor Act of 1884, as amended. The authority to study a replacement program for Mississippi River Locks and Dam No. 1 was granted by the Office, Chief of Engineers in 1963. Interim reports concluded that the present lock size is adequate. Preparation of a Design Memorandum for the Rehabilitation of Locks and Dam No. 1 was authorized in 1972. A preliminary Phase A report was prepared in 1976. A Design Memorandum for Rehabilitation of Lock and Dam No. 1 was prepared in February 1978.¹

PROJECT DESCRIPTION

1.03 The proposed project involves the rehabilitation of both locks without interrupting the normal navigation season. The locks will be dewatered and closed to navigation for a 5-month period, from 1 December to 1 May. Both locks will be rehabilitated at the same time to make maximum use of the cofferdam. The project would completely rehabilitate the landward lock. The riverward lock would be partially rehabilitated to the extent justified by the benefits. Deferment of repairs to the riverward lock would require construction of a new cofferdam at some future date. At present, the riverward lock is rarely used. Its rehabilitation would enable increased lockages by recreational craft and empty barges.

1.04 A construction schedule is shown in figure 4. The project is anticipated to begin in July 1979 and to end in May 1981. Cofferdams would be constructed and locks would be dewatered and closed from 1 December 1979 to 1 May 1980 and from 1 December 1980 to 1 May 1981. In addition, from 1 December 1978 to 1 April 1979 the locks would be dewatered using the maintenance bulkheads.

¹Additional information on this project may be found in the Design Memorandum on file at St. Paul District Office

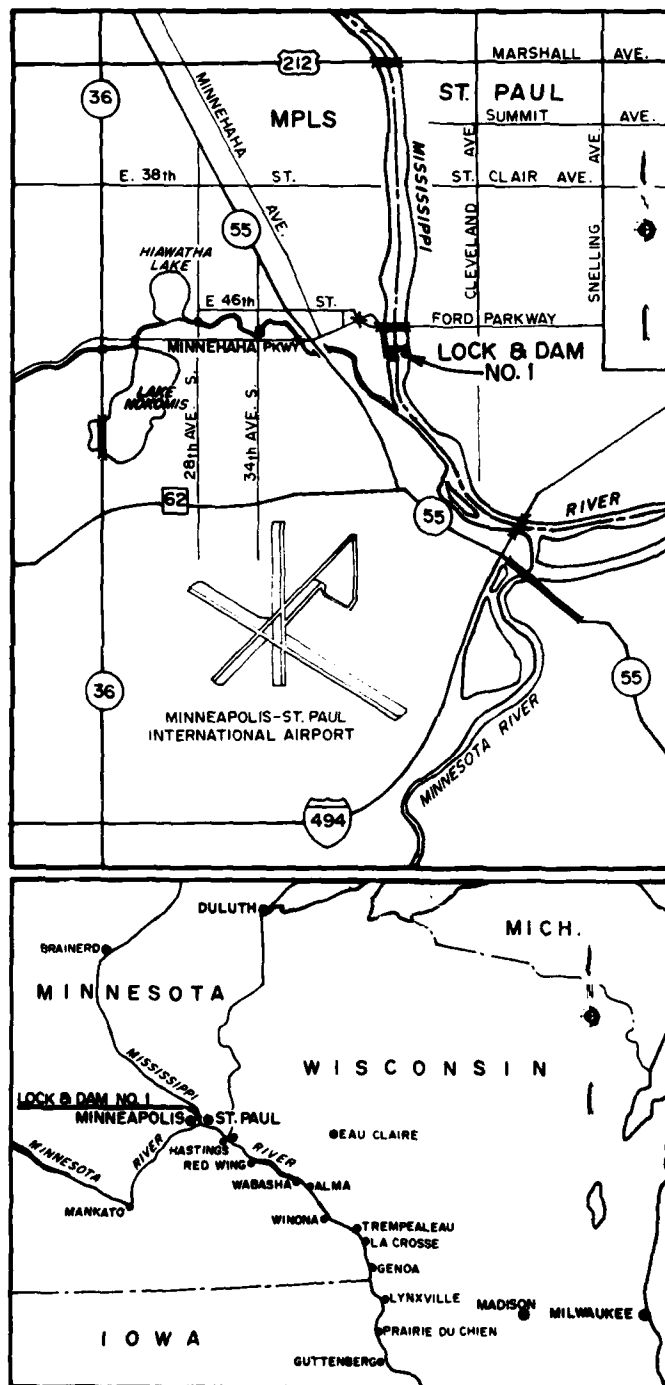
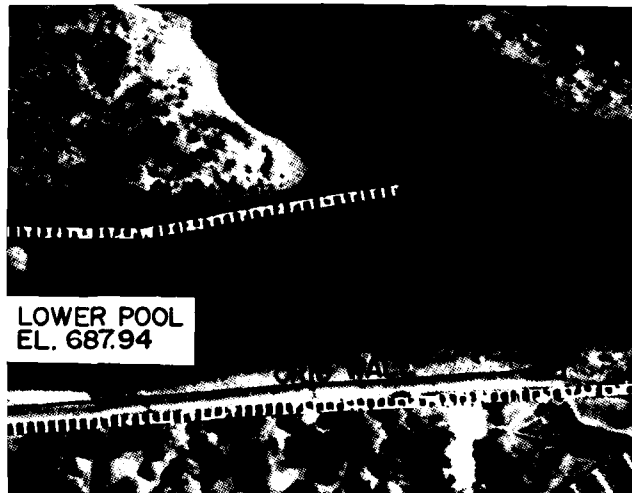
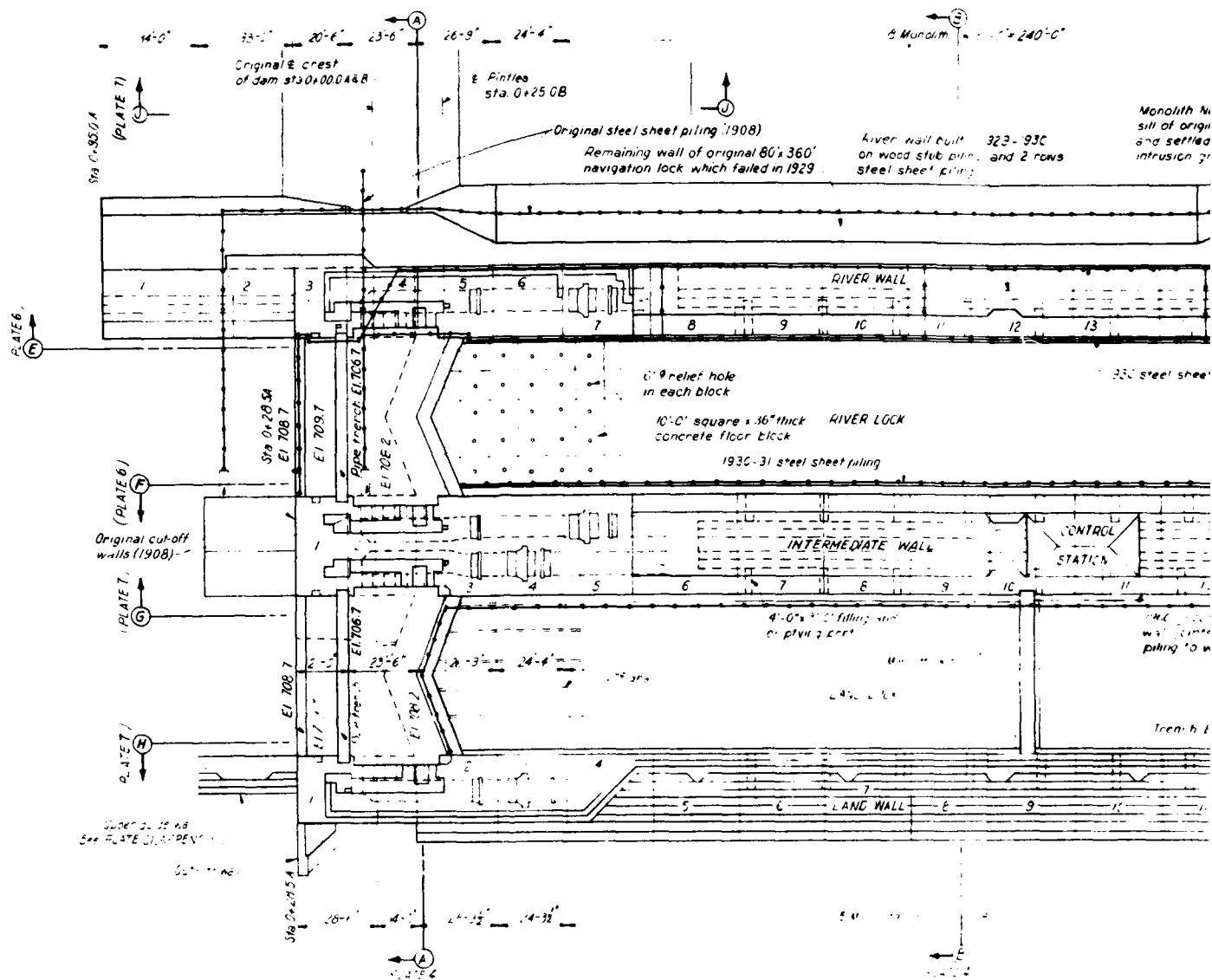
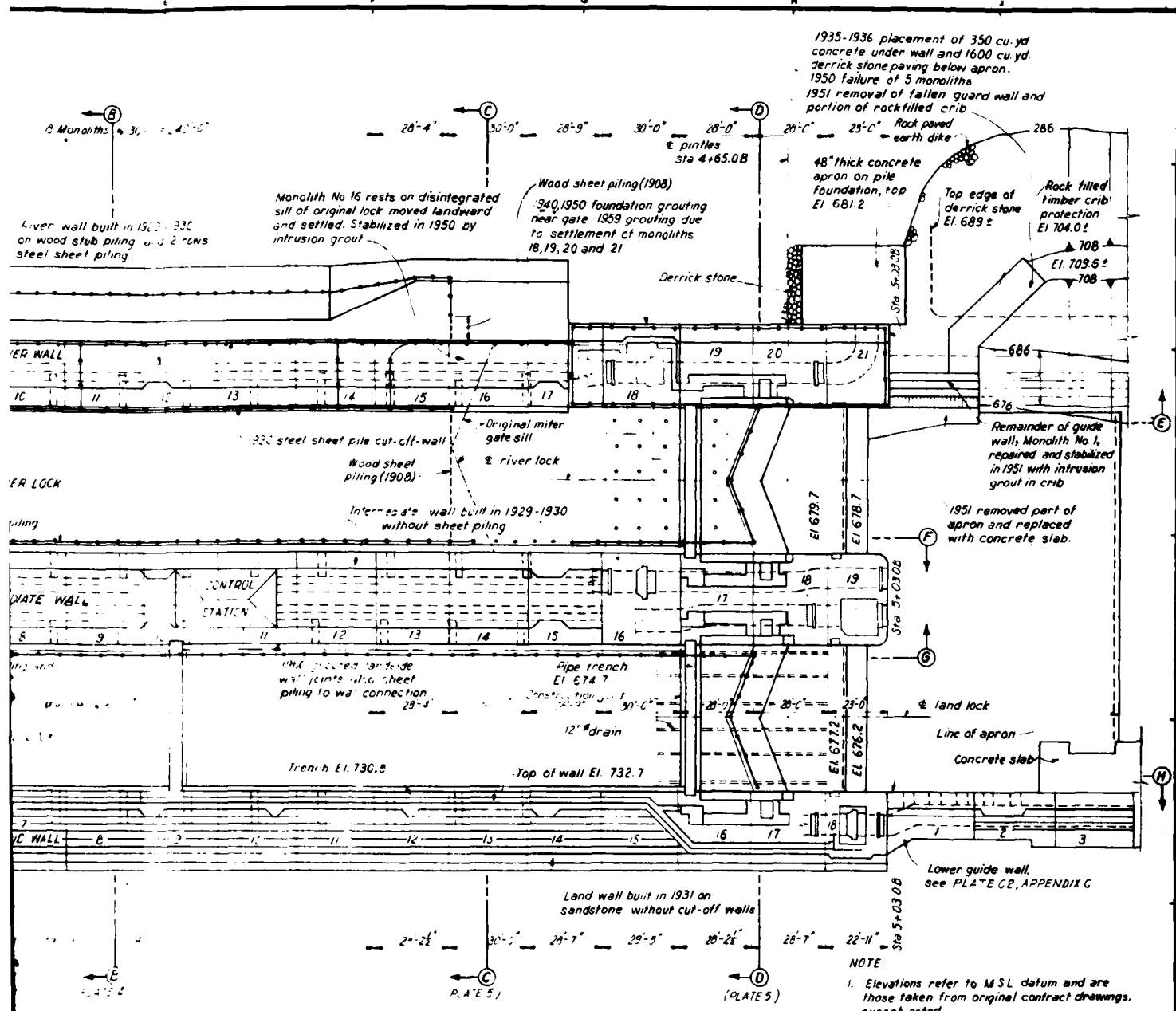


Figure 1. Location of Locks and Dam No. 1









SCALE 1" = 20'
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SYMBOL		DESCRIPTION	DATE	APPROVAL
HARZA ENGINEERING COMPANY CHICAGO, ILLINOIS		DEPARTMENT OF THE ARMY ST PAUL DISTRICT CORPS OF ENGINEERS ST PAUL, MINNESOTA		
DESIGNED BY E. J. M. CHECKED BY R. N. M.		DESIGN MEMORANDUM FOR REHABILITATION MISSISSIPPI RIVER LOCK & DAM NO. 1 EXISTING LOCK STRUCTURES PLAN		
APPROVED BY [Signature]		DATE: FEBRUARY 1978		
AS SHOWN		DRAWING NUMBER M-RI-5/52		

Figure 3

1.05 Rehabilitation of Locks and Dam No. 1 would entail a variety of activities, some requiring unwatered locks and peripheral areas, and others that can be accomplished without navigation interruption and lock dewatering. With the exception of cofferdams¹ and construction access roads into the cofferdam area, all other features constructed would be permanent. (Refer to figures 4 and 5 for locations of construction activities.)

1.06 The following rehabilitation activities would be conducted.

To improve the hydraulic operation of the locks:

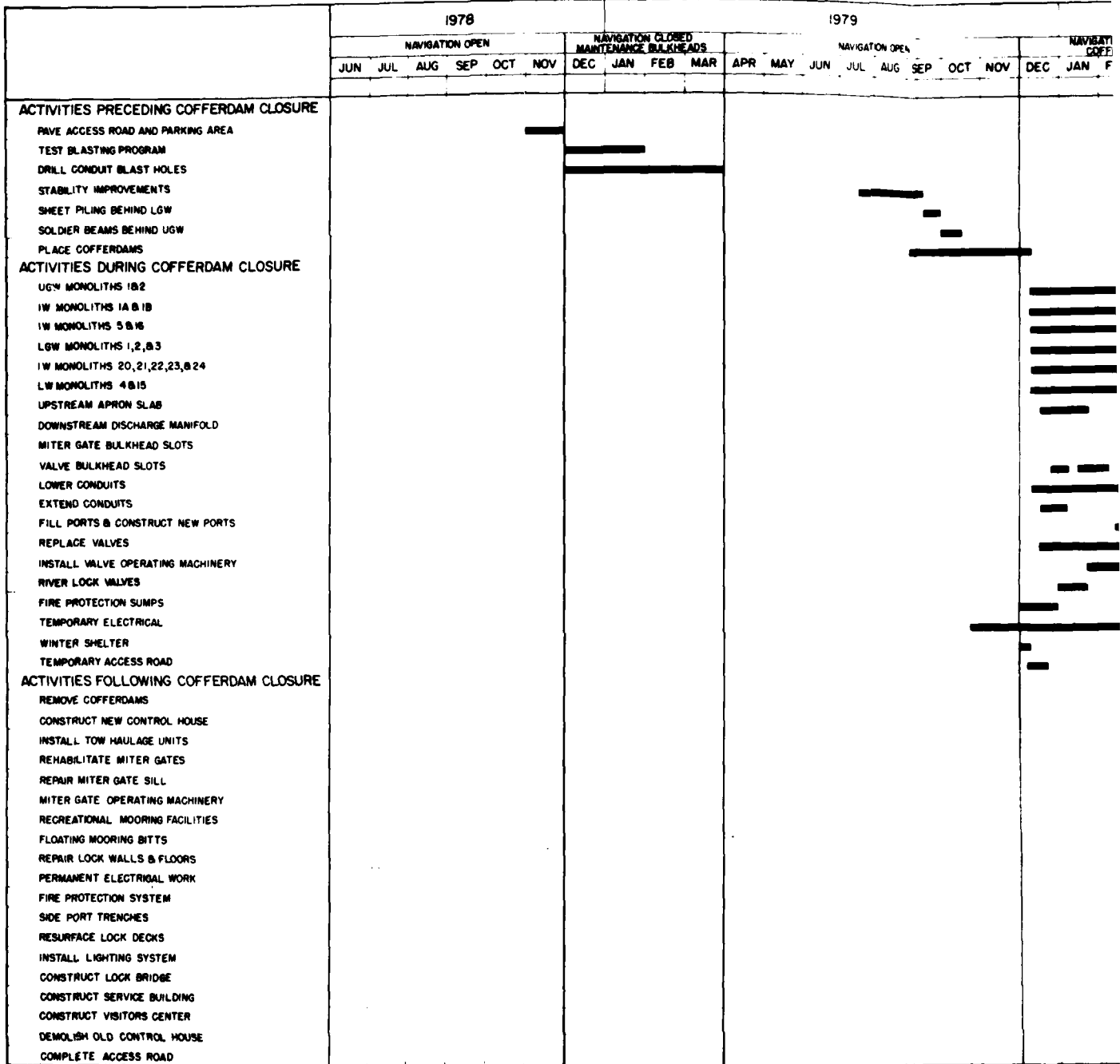
1. New intake manifolds will be constructed for the land and intermediate walls, involving demolition of some existing monoliths and construction of new monoliths.
2. The filling and emptying conduits of the land lock will be lowered 2.5 feet in elevation and be modified from 9.5 feet diameter openings to rectangular openings 7.5 feet high and 9.5 feet wide.
3. New discharge ports will be constructed from the conduits through the land and intermediate walls to reduce turbulence in the land lock chamber. New trenches will be constructed only in the land lock floor to prevent premature dissipation of port discharge velocity.
4. A new discharge manifold and downstream lateral will be constructed for the land lock. A new discharge manifold will be constructed in the intermediate wall for the river lock.
5. New reversed tainter filling and emptying valves will be installed for the land lock. Filling valves will be located in land wall monolith 4 and intermediate wall monolith 5.
6. The stoney valves removed from the land lock will be used for spare parts to keep the stoney valves of the river lock operational.

To improve the stability of the lock structures and the Ambursen dam:

1. Post-tensioned anchors will be installed in the land wall and intermediate wall monoliths, and the intermediate wall gate monolith to raise the factor of safety against sliding to 2.0 or greater with the resultant of forces within the middle third of the base.

¹ See Glossary.

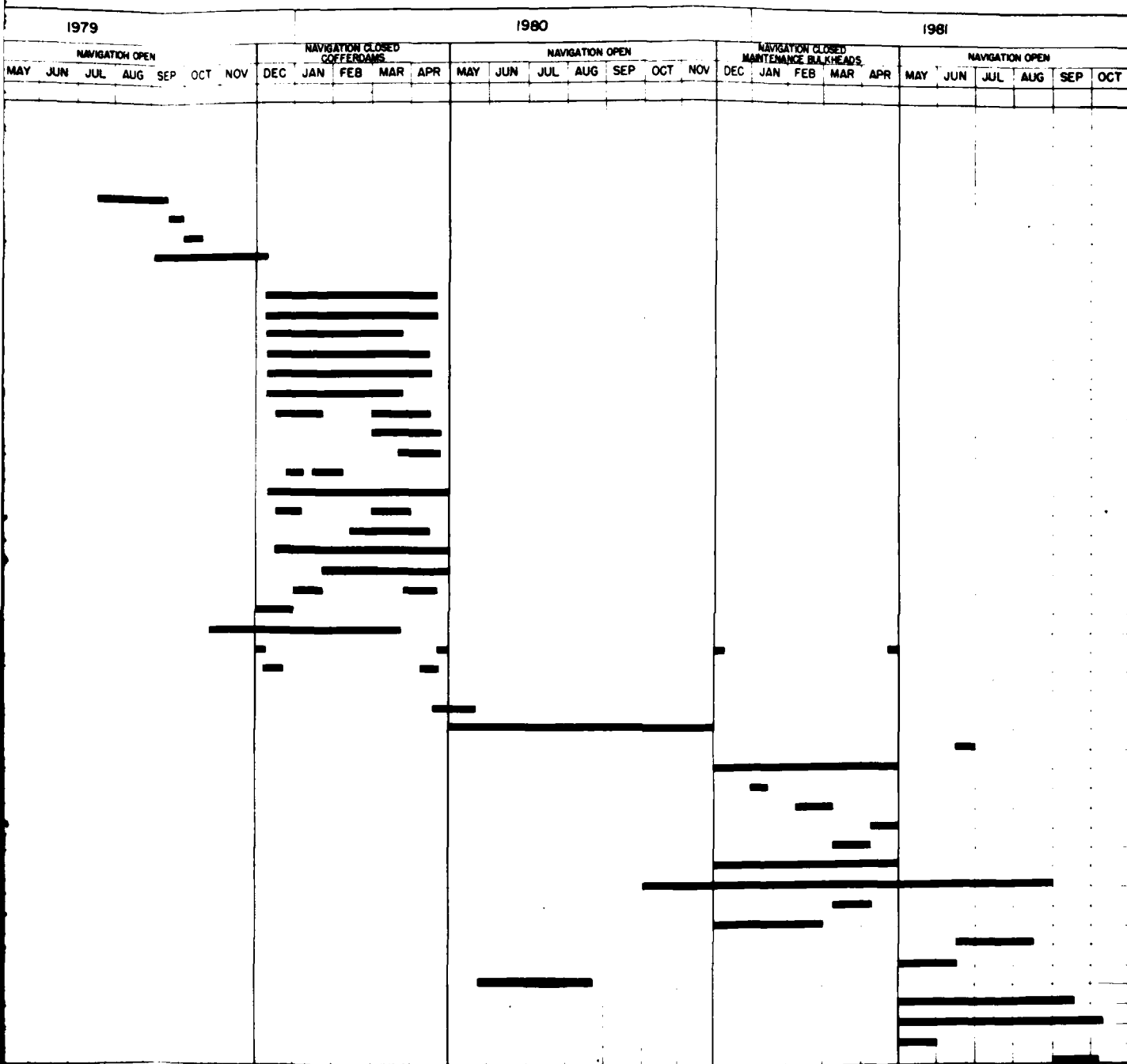
SUMMARY BAR GRAPH LOCK & DAM NO. 1 REHABILITATION PROJ



NOTE

1 SCHEME SHOWN ASSUMES THE USE OF TANKER EMPTYING AND FILLING VALVES

LOCK & DAM NO. 1 REHABILITATION PROJECT



2



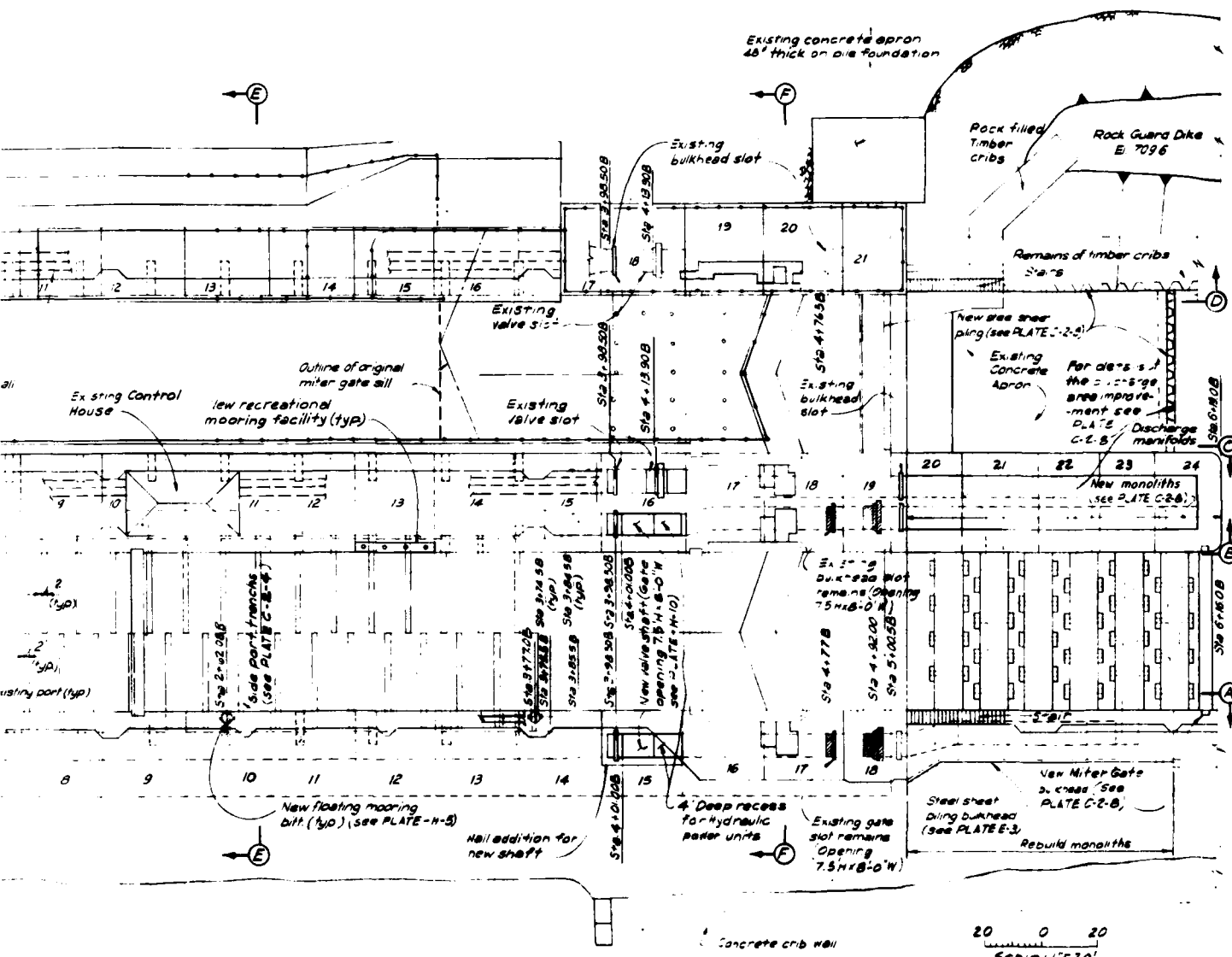
DESIGNED BY: <i>RLW</i> CHECKED BY: <i>RLW</i> DRAWN BY: <i>RLW</i> SUBMITTED BY: <i>RLW</i> APPROVED: <i>[Signature]</i>		HARGA ENGINEERING COMPANY CHICAGO, ILLINOIS		DEPARTMENT OF THE ARMY ST. PAUL DISTRICT CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGN MEMORANDUM FOR REHABILITATION MISSISSIPPI RIVER LOCK & DAM NO. 1					
CONSTRUCTION BAR GRAPH SUMMARY					
DATE: FEBRUARY 1979				SHEET 13	

figure 4

DRAWING NUMBER
M-R1-5/62



AG
12
25



PLAN

NOTES:

1. Buildings, Trenches and Access
Bridges are not shown, see PLATE 7 for
schematic location.



DESIGNED BY R.M.N.	DEPARTMENT OF THE ARMY ST. PAUL DISTRICT CORPS OF ENGINEERS ST. PAUL, MINNESOTA
CHECKED BY R.M.N.	DESIGN MEMORANDUM FOR REHABILITATION MISSISSIPPI RIVER LOCK & DAM NO. 1
APPROVED BY R.M.N.	HYDRAULIC IMPROVEMENTS PLAN
DATE FEBRUARY 1978	DRAWING NUMBER M-R-5/54

figure 5

2. Shear keys will be constructed between the gate monoliths of the intermediate and river walls and their adjacent monoliths in order to more uniformly distribute gate thrust forces acting on the gate monoliths.
3. The dam apron slab for portions of the overflow and all of the sluiceway monoliths will be stabilized with post-tensioned anchors.
4. Steel sheet piling will be driven into the foundation where lower guide wall monoliths are to be removed to provide a shoring against which the new discharge manifold will be constructed.

To extend the service life of the locks and improve operating efficiency:

1. New miter gate operating machinery will be installed and the miter gates will be rehabilitated for both locks. More rehabilitation will be done to the land lock miter gates than to the river lock.
2. New valve operating machinery will be installed for both the land and river locks.
3. New valve bulkheads will be constructed for the land lock.
4. New jib cranes, tow haulage units, floating mooring bitts, fire protection system and compressed air systems will be installed for the land lock.
5. The electrical power supply and distribution system for both locks will be rehabilitated.
6. New electrical controls for the valves and miter gates of the land lock will be provided. Control of river lock miter gates and valves will be from the control stands located on the intermediate walls. Each control stand on the intermediate wall will contain four 3-position (open-stop-close) spring return bat levers, one for each miter gate and valve hydraulic pump unit.
7. A new signal and communication system, lighting, and grounding system will be provided.
8. Electrical cables and wiring will be replaced.
9. A new control house will be constructed on the downstream end of the intermediate wall.
10. A new service building will be constructed at the downstream end of the land wall.
11. An elevated access bridge connecting the three lock walls and the service and control buildings will be constructed.
12. The lock access road will be widened and resurfaced.

To extend the service life of the concrete surfaces:

1. The vertical walls of the land lock will be resurfaced.
2. The tops of the land and river lock walls and guidewalls will be resurfaced.
3. Leaky and spalled concrete joints will be repaired.

To provide added protection to the foundation and ample indication of changing conditions beneath the lock structures and dam:

1. Additional piezometers will be installed beneath the land and river lock floors and walls.
2. Flap valves will be installed in the drain holes through the river lock floor to prevent foundation erosion due to fluctuating lock water levels.

To improve the recreational and aesthetic resources at the lock:

1. An access bridge over the locks will be made available for public use on a controlled basis.
2. The lock area will be landscaped.
3. New floating mooring facilities for recreational boat traffic will be installed in the land lock. A floating boom will be placed in the upper pool to protect pleasure boats using the river lock from being swept over the dam.

1.07 The depths of the river and land locks will remain unchanged at 7 feet and 9 feet, respectively. In addition, the elevations of the upper and lower sills will also remain unchanged. The proposed lock modifications are shown in figure 5.

1.08 Project fuels may be stored in the vicinity of the visitor overlook parking lot at the top of the bluff adjacent to Godfrey Road. This site is less convenient than at the lock, but would present less of a safety hazard. Also, there is a scarcity of available space at the lock. Precautions will be taken to prevent vandalism and entry by unauthorized personnel. As plans are finalized, the use of park lands or other city lands for parking or the storage of fuels will be coordinated with the appropriate authorities.

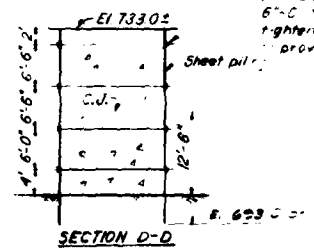
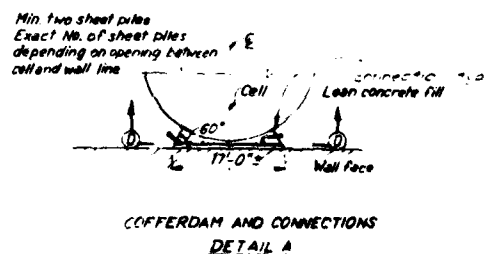
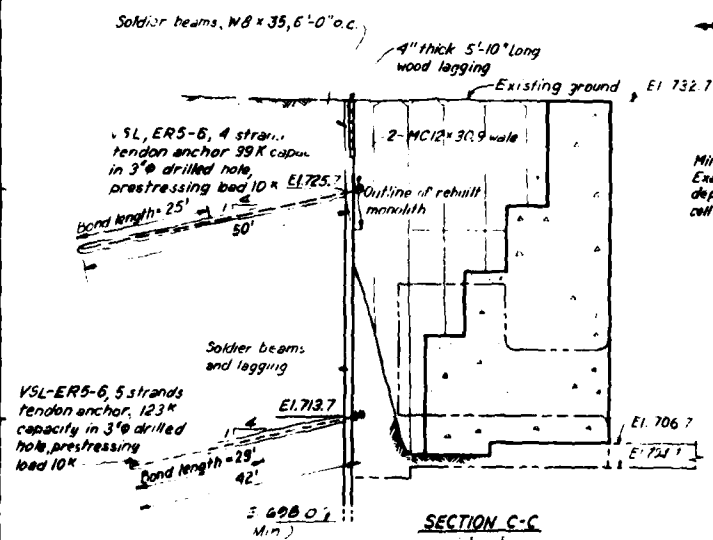
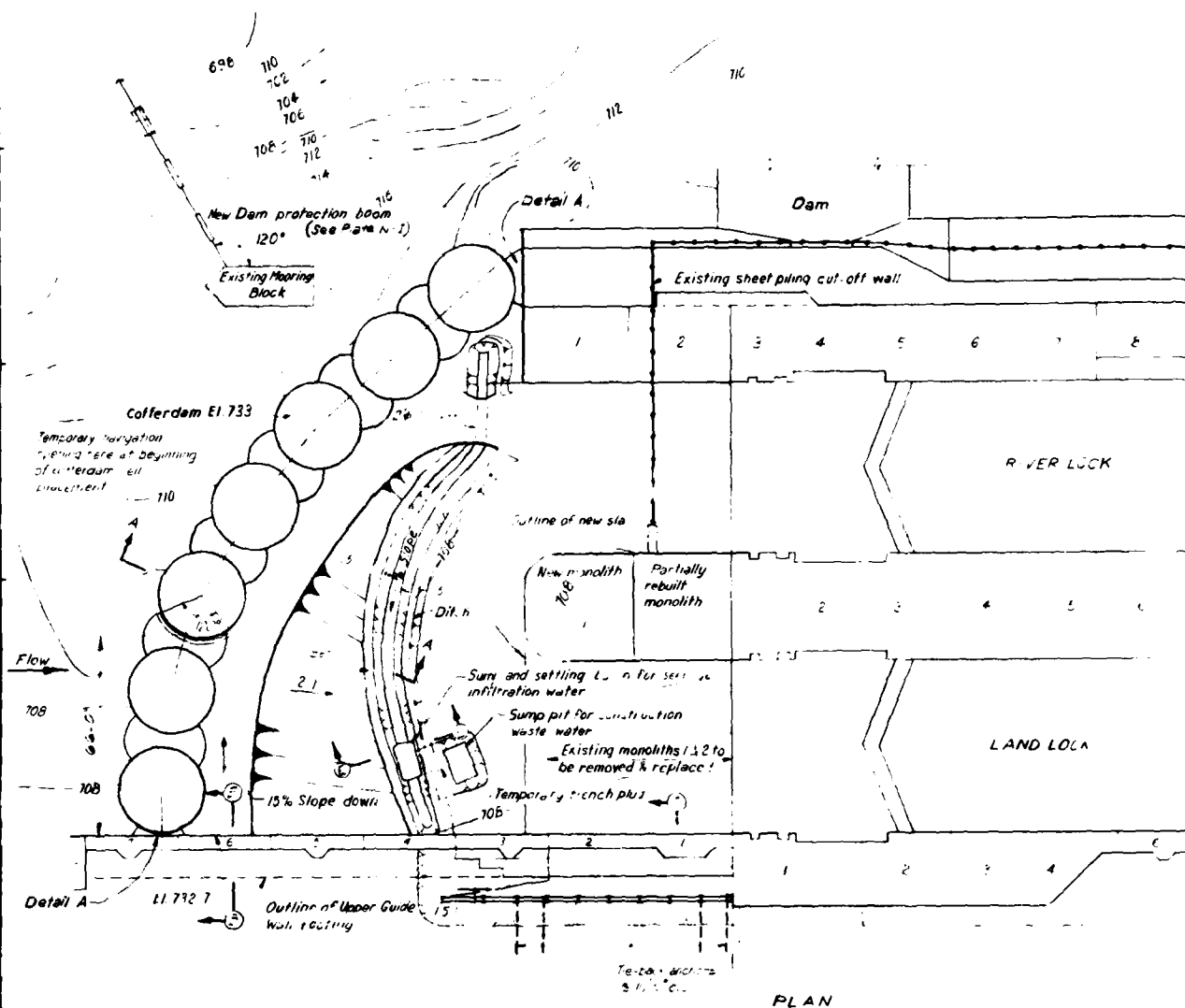
Cofferdam Placement and Removal

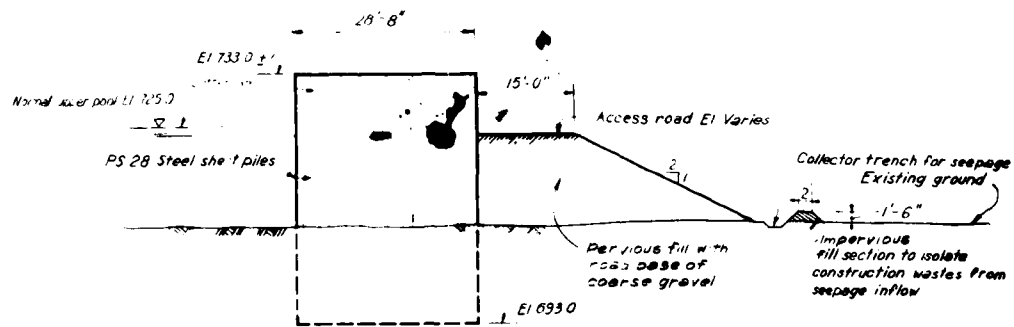
1.09 The steel sheet pile cellular cofferdam would be constructed to the lines and grades shown on figures 6 and 7. The cells themselves would be approximately 28 feet in diameter with an earthen berm constructed against the cells on the inside of the cofferdam perimeter. Cells would be driven throughout the summer preceding the unwatering for the actual rehabilitation work. Complete cofferdam closure, however, would not be achieved until about December, when navigation ceases. Prior to the close of the river navigation season, barge traffic into the landward lock would be unobstructed, and would pass through an opening left in the cofferdam.

1.10 Cofferdams would be constructed in both the upper and lower pools, probably in sequence, utilizing the same equipment. The cells upstream and downstream of the intermediate wall would be the first cells constructed. These initial cells would be constructed utilizing a barge-mounted pile driver. When the initial cells are completed, they would be hydraulically filled with commercially purchased sand and gravel. The total volume of fill required is estimated to be 9,700 cubic yards.

1.11 Sheet piling would be delivered by and stored in barges moored in the riverward lock during the summer pile driving operations. Fill delivery by barge tows would probably be required weekly. Fill material would be transported from the barges to the cofferdam in a water slurry form, utilizing pipelines, and would be removed by similar methods at the conclusion of the project for barge transport from the site and ultimate salvage. Sheetpile would not be washed on removal, since to do so would introduce any attached mud into the river. Barge landings, roads, and storage space on the island and on the mainland of the east shore are not expected to be required.

1.12 At the present time, the rehabilitation is expected to be completed over two winter seasons. Portions of the cofferdam would be removed in the summer following its initial construction.

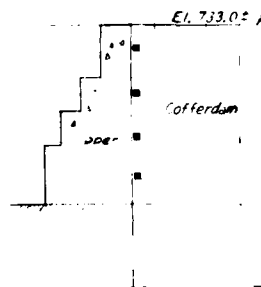




SECTION A-A

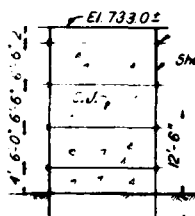


SECTION E-E



SECTION B-B

SCALE 1"=10'



SECTION D-D

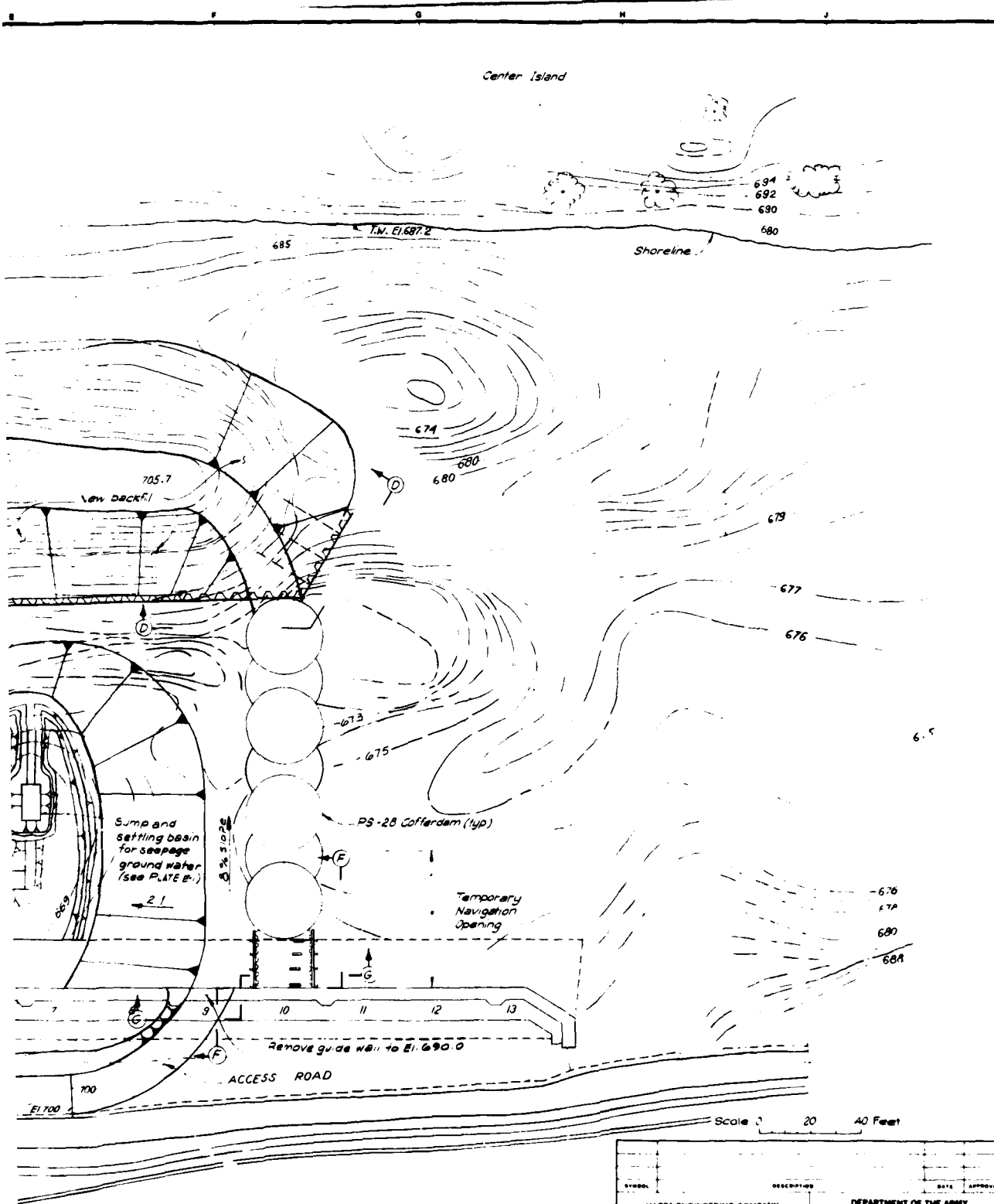
1" dia rods / wedge nut
6"-0" threaded ends,
tighten against wall face
provide seal prior to placement

Scale 1"=20'-0"



SYMBOL		DESCRIPTION		DATE	APPROVAL
HARZA ENGINEERING COMPANY CHICAGO, ILLINOIS		DEPARTMENT OF THE ARMY ST PAUL DISTRICT CORPS OF ENGINEERS ST PAUL, MINNESOTA			
DESIGNED BY R W	CHECKED BY W A	DESIGN MEMORANDUM FOR REHABILITATION MISSISSIPPI RIVER LOOK & DAM NO. 1 UPSTREAM COFFERDAM			
APPROVED BY R W	APPROVED BY R W	DATE FEBRUARY 1978			
APPROVED BY R W		AS SHOWN			
APPROVED BY R W		DRAWING NUMBER M-R1-5/113			
APPROVED BY R W		SHEET 44			

Figure 6



NOTE

1 River topography is from data collected in 1974.



☆ U.S.GPO:1978-765-137/20 Region No. 6

HARZA ENGINEERING COMPANY CHICAGO, ILL. 60601		DEPARTMENT OF THE ARMY ST. PAUL DISTRICT CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGNED BY <i>RMN</i>	DESIGN MEMORANDUM FOR REHABILITATION MISSISSIPPI RIVER		
CHECKED BY <i>RMN</i>	LOCK & DAM NO. 1		
SUBMITTED BY <i>RMN</i>	DOWNSTREAM COFFERDAM PLAN		
APPROVED BY <i>RMN</i>	DATE: FEBRUARY 1978		
SCALE AS SHOWN	DRAWING NUMBER M-RI-5/114		
SHEET 65			

Figure 7

Borrow Areas and Disposal Sites

1.13 At present, it is anticipated that all fill materials and aggregates would be commercially purchased and transported to the site by barge. No on-site borrow areas would be developed. Any spoil materials resulting from the construction activities, expected to consist primarily of concrete rubble, would be removed from the site by barge once the river reopens for navigation in the spring. Arrangements would be made prior to construction to deposit construction debris at a sanitary landfill site.

Cofferdam Construction

1.14 The cofferdam would consist of steel sheet pile cells (see figures 6 and 7) and an interior weighting berm to increase the stability of the cofferdam structure and provide vehicular access to the unwatered area. The weighting berm would be constructed after dewatering and would require about 11,000 cubic yards of material. Seepage collection ditches leading to sumps directly downstream of the landward lock lower miter gates would be constructed at the toe of the weighting berm. A similar system would be constructed within the upstream cofferdam perimeter.

1.15 The collection sumps would be excavated into the alluvial material and made watertight with a concrete liner. This will prevent seepage of sump water into the ground. A submersible pump would be available at each sump to pump the water into the river or to the sewage lift station, as required. Cofferdam seepage water (water that seeps through the cofferdam cells) would be pumped directly back into the river. Construction waste water, which would be kept separate from the seepage water, would be pumped into the city sanitary sewer system. Solid wastes would be disposed of at sanitary landfills. The sewage line will be connected to Nawadaha Boulevard and 47th Street with a 4-inch line. The sewer at this location is a 9-inch line with an unused capacity of 1.35 cfs, more than adequate to handle the construction wastewater.

Visitor Center

1.16 Construction of a regional visitor center on the bluff overlooking the locks has been proposed. Proposed access to the lock area would be by elevator from the top of the bluff, with catwalks running along the side of the landward lock and above the locks at the downstream end. A report -- Upper Mississippi Regional Visitor Center, Site Selection Conceptual Plan, 20 September 1977 -- has been prepared for this proposal.¹ An observation platform is also proposed in conjunction with the rehabilitation project. The visitor center/observation platform concept will be further evaluated in future studies.

¹ On file at the St. Paul District, Corps of Engineers.

1.17 Landscaping with trees, shrubs and grass will be conducted in the area impacted by the project. This includes the immediate area around the locks. The landscaping plan will utilize species suitable to the area.

ECONOMIC ANALYSIS

1.18 The rehabilitation would result in average annual benefits of \$2,682,200 and related average annual costs of \$1,582,200, yielding a benefit/cost ratio of 1.7 to 1, based on October 1977 price levels, 6 5/8 percent interest rate, and a 50-year period of amortization. Total cost of the project would be \$17,486,000. Maintenance, operation and major replacement costs are estimated to be \$375,000 annually.

2.00 ENVIRONMENTAL SETTING

2.01 Locks and Dam No. 1 is located at mile 847.6 of the Mississippi River. At that point, the river is 850 feet wide, with the elevation of pool 1 at 725 feet, mean sea level (msl), and pool 2 at 687 feet. The floodplain is narrow or nonexistent and is backed by bluffs averaging 810 to 820 feet high. The distance between bluff tops in the region of the dam is 1000 to 2000 feet.

2.02 Locks and Dam No. 1 is situated in the lower gorge region of the Upper Mississippi River basin. This gorge, formed by glacial pressure and the retreating St. Anthony Falls, confines the river to a channel position similar to that which existed prior to human impact. However, substantial successional changes have since occurred in this region as a result of river impoundment and area-wide urbanization. The existing aquatic environment, therefore, is that of a river far removed from its natural condition.

2.03 The landward lock is separated from the base of the bluff by a level area 70 feet in width, containing a maintenance building, visitors' platform, and parking area for lock staff. Additional parking for visitors is provided at the entrance to the site, at West River Road.

2.04 The sandstone and limestone bluff that separates the locks from the higher ground is unmodified in the immediate region of the locks, but 1155 feet of bluff extending downstream from the lower end of the lock have been stabilized by a crib wall of concrete.

2.05 The area at the top of the bluff is occupied by Minnehaha Park and by the Minnesota Old Soldiers Home. The northern boundary of the latter facility is roughly in line with Locks and Dam No. 1. On the south it extends to the mouth of Minnehaha Creek, at mile 844.

2.06 Above the dam, the bluffs are somewhat less steep than in the area of the lock. These upstream areas are densely wooded and provide some recreational space for hikers and bicyclists.

2.07 On the east shore of the river below the dam, the floodplain has been filled, providing two artificial benches. The heating plant for the Ford Assembly Plant is located on the lower bench. Cooling water from the heating plant is discharged to the river, entering 1,000 feet below the dam.

2.08 The wide section of the river below Locks and Dam No. 1 is occupied by a gravel and sand island that varies in extent from about 2 to 8 acres, depending upon the water level in the river. During most of the year, the entire flow over the dam passes to the east of the island, whereas the navigation channel passes to the west. During periods of high flow, the low area connecting the island to the riverward lock wall is inundated and a considerable portion of the flow passes to the west of the island.

~~2~~

2.09 Below the island, the river narrows to 200 feet and remains narrow up to its junction with the Minnesota River, 3.5 miles below Locks and Dam No. 1. The floodplain in this reach is about 800 feet wide, depending upon the bends in the river (figure 8).

2.10 The following description is summarized from the Phase A report and General Design Memorandum for the Rehabilitation of Locks and Dam No. 1.¹ A more complete description of the locks and dam -- soils, geology, structural stability, etc.-- is found in those documents. To avoid unnecessary repetition of some of the description of the project and the setting of the existing locks, problems with the equipment and proposed solutions are described more closely in Section 4, which discusses impacts of the proposed plan.

LOCKS AND DAM

2.11 The dam is an Ambursen-type concrete structure which is supported for the greater part on an alluvial fill consisting primarily of sand, gravel, and limestone slabs. A portion of the dam and apron, however, is supported on timber piling. Along the upstream face of the dam is a steel sheet pile cutoff wall. There is also a row of steel sheet piling along the toe of the apron as a preventative measure against scour. The crest and the downstream face have been resurfaced (1949-53). A major portion of the apron has been replaced and a baffle wall was constructed on the apron to induce a hydraulic jump to overcome serious scour below the dam. This work was completed in 1953. In 1952 the dam was stabilized by placing sand fill in the interior to reduce the possibility of failure by sliding. Three of the eight sluice gates in the dam were rehabilitated and hydraulic machinery to operate them was installed in 1954. Under present pool conditions, the dam maintains a normal head of about 38 feet during the navigation season and about 36 feet during the winter season. In general, the dam is in good condition.

2.12 The present riverward lock was built in 1929 and 1930 to replace the original lock, which failed on 19 August 1929. The plan was to provide a structure suitable for 9-foot draft navigation based on the design pool level for Lock and Dam No. 2 which was then under construction. However, due to probable seepage damages, interests in the South St. Paul stockyards area pool 2 obtained a court order limiting the elevation to which the pool could be raised to 685.6 msl. Later, in 1934, the court approved the raising of the pool to elevation 687.2, 1.9 feet less than its designed height. As a result, there is a depth of only 7.5 feet over the lower sill at flat pool or about 8 feet at normal tailwater elevation; hence the lock has had little use except for an occasional locking of pleasure boats, empty barges, or shallow-draft towboats. The instability of the lock walls,

¹ On file at the St. Paul District office, Army Corps of Engineers.

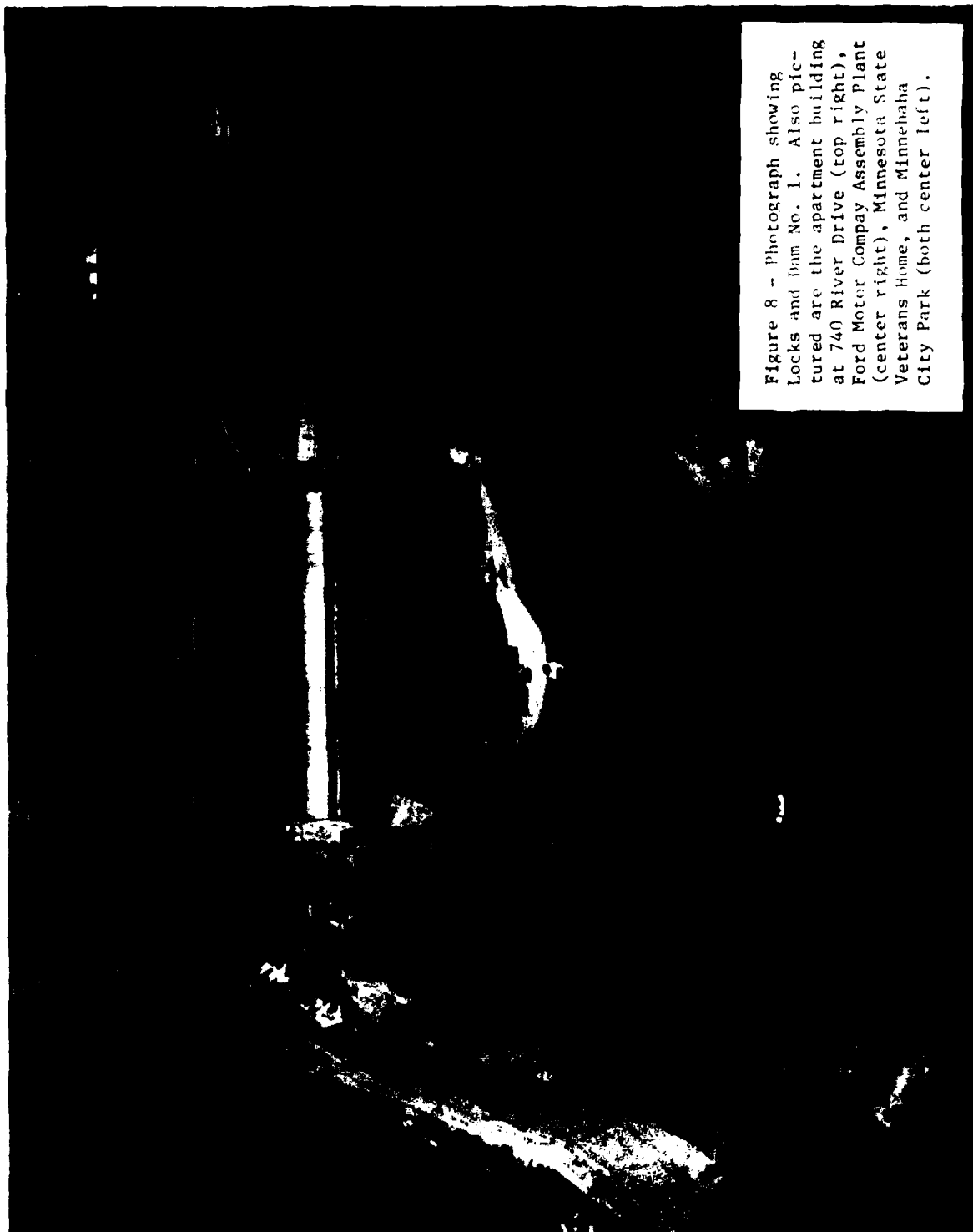


Figure 8 - Photograph showing Locks and Dam No. 1. Also pictured are the apartment building at 740 River Drive (top right), Ford Motor Company Assembly Plant (center right), Minnesota State Veterans Home, and Minnehaha City Park (both center left).

the poor condition of the operating machinery and the lack of guide walls, making approach difficult, have also been factors in limiting use of the riverward lock. In building this riverward lock, its landward wall was constructed with two emptying and filling tunnels, and was wide enough to serve as the intermediate wall of the twin locks when the second lock was constructed.

2.13 The present landward lock was built in 1931-32 as a safeguard to maintain river traffic to and from Minneapolis. Minneapolis, as a result of the failure of the original lock, was without barge line service for over a year, and it was determined that a recurrence should be avoided if at all possible. The downstream sill of this lock has a top elevation of 677.2, providing a depth of flat lower pool of 10.0 feet or about 10.8 feet at normal tailwater elevation; hence, this landward lock handles practically all traffic through this facility (see figure 3, Existing Lock Structures).

2.14 The hydroelectric plant, located at the east end of the dam, and flashboards on the crest of the dam are maintained by the Ford Motor Company, under Federal Power Commission License No. 362. Ford Motor Company, the owner of the hydro plant, has been considering abandonment of the power plant. Recently, however, an application was filed with the Federal Power Commission for relicensing the power plant for a period of 10 to 15 years.

GEOLOGY AND SOILS

2.15 Locks and Dam No. 1 is situated in a post-glacial valley of the Mississippi River at Minneapolis-St. Paul, Minnesota. Topography at the site is dominated by the broad, essentially flat, valley floor, bounded by steep bluffs. The locks and dam is located near the center of a broad structural basin.

2.16 Numerous borings drilled by the Corps of Engineers and 44 core holes completed during the present study provide the detailed stratigraphic framework of the site. Geologic formations cored and sampled include the Platteville Limestone, the St. Peter Sandstone, and a short interval of the Shakopee Dolomite. The concrete of the lock structures, river alluvium and backfill material were also cored and sampled.

2.17 The locks and dam is built partly on St. Peter Sandstone and partly on river alluvium. The St. Peter Sandstone has been arbitrarily divided into two zones. The upper zone is a fine-grained, friable, poorly cemented sandstone and is the foundation material for the upper and lower guidewalls, the river wall, the river lock and the center wall. The lower zone consists of alternating beds of very fine-grained silty sandstone, and moderately to well cemented sandstone. Included in the lower zone is an approximately 6-foot siltstone interbed which locally contains soft, variably plastic silt/clay seams up to 0.3 foot thick. River alluvium is the foundation for the dam and for most of the river lock. The remaining

portions of the river lock rest on St. Peter Sandstone. The river wall is founded on friction piles driven into river alluvium. The alluvium consists of sand and gravel, with limestone slabs, and minor amounts of nonplastic fines.

RIVER CHARACTERISTICS

2.18 Locks and Dam No. 1 is located at mile 847.6 (above the Ohio River) on the Mississippi River, approximately 2 miles upstream of its confluence with the Minnesota River. The drainage area at the project site is approximately 19,500 square miles. Long-term average discharge is about 7,200 cfs. The highest discharge of record, 91,000 cfs, occurred on 17 April 1965. The minimum discharge, about 529 cfs, was recorded on 29 August 1976 near Anoka, upstream of the site.

2.19 Lower pool elevation at the site is controlled by Dam No. 2 near Hastings and it is also influenced by discharges from the Minnesota River. From 1951 through 1972, the average tailwater elevation was about 690 and the minimum elevation was as low as 686.2. The highest water level downstream of the dam was recorded at 719 on 17 April 1965.

2.20 Upper pool elevation at the site is controlled by the overflow dam and by discharges through the low level sluices and through the Ford power plant. During the navigation season, when flashboards on top of the dam are at raised position, the headwater is normally kept at 725. The flashboards on the dam contain shear pins which can fail due to ice pressure or high spring flows. During the winter months the water surface in the upper pool will thus be lowered to approximately elevation 723. The highest headwater elevation ever recorded was 734.5, occurring on 17 April 1965.

CLIMATE

2.21 The average mean annual temperature at the site is 45° F. The lowest average monthly temperature of 13° F occurs during January, and the highest average monthly temperature of 73° F occurs during July. Extreme temperatures recorded were a low of -34° F in January 1936 and a high of 108° F in July 1936.

2.22 Total annual precipitation at the site has ranged from a minimum of 11.59 inches in 1910 to a maximum of 41.64 inches in 1968. The average annual precipitation is 24.78 inches. Average monthly precipitation varies from 0.70 inch in January to 4.00 inches in June. The greatest precipitation recorded in any one month was 12.68 inches in September 1942. About 73 percent of the annual precipitation falls during the months of April through September, which coincide with the growing season. Annual snowfall averages about 44 inches, or about 16 percent of the total annual precipitation. The maximum 24-hour precipitation recorded at Locks and Dam No. 1 was 7.80 inches on 26 July 1892.

STREAMFLOW DATA

Elevation Duration Curves and Stage Hydrographs

2.23 Elevation duration curves were developed for the Mississippi River at Locks and Dam No. 1 for each month and for the ice-free period, April to December, based on gage height records for the period 1930-1972. The curves indicate the percentage of time a specified elevation is exceeded, based on the period of record. Stage hydrographs were developed for the upper and lower pools of Locks and Dam No. 1 for minimum, average, and maximum flow conditions, based on the period 1951-1972. The stage hydrographs and elevation-duration curves are contained in the General Design Memorandum.¹

Floods of Record

2.24 Floods on the Mississippi River at Locks and Dam No. 1 generally occur from spring snowmelt following a heavy accumulation of snow or from late winter rainfall on frozen ground. The larger floods have generally been produced by melting snow or a combination of melting snow and spring rains. The maximum flood of record, which occurred on 17 April 1965, had an instantaneous peak discharge of 91,000 cfs. Other large recent floods have occurred on 13 April 1969 - 73,900 cfs; 14 April 1952 - 73,900 cfs; 15 April 1951 - 62,700 cfs; and 3 May 1975 - 57,500 cfs.

VEGETATION

2.25 The flora of the project area have been previously described by North Star Research Institute² (under contract with the Corps of Engineers) and the Corps of Engineers.³ In addition, supplementary data have been collected by Harza Engineering Company on field surveys conducted in conjunction with this study. The terrestrial areas within the project area include the island below Locks and Dam No. 1 and the eastern and western river slopes and bluffs immediately adjacent to the lock and dam complex.

¹ On file at the St. Paul District, Corps of Engineers.

² North Star Research Institute. 1973. Final Report. Environmental Impact Assessment Study of the North Section of the Upper Mississippi River. Pool 1. St. Paul.

North Star Research Institute. 1973. Final Report. Environmental Impact Assessment Study of the Northern Section of the Upper Mississippi River Pool 2. St. Paul.

On file at the St. Paul District, Corps of Engineers.

³ U.S. Army Corps of Engineers. 1974. Final Environmental Impact Statement. Operation and Maintenance 9-foot Navigation Channel. Upper Mississippi River Head of Navigation to Guttenberg, Iowa. Vol. 1&2. Vegetation Study at Lock and Dam No. 1. 1975. Corps of Engineers Memorandum No. 1. Anfang/gij/7233. 2 pp and photo.

2.26 The slope and bluff vegetation in the project area is composed of a mixture of typical river slope and upland woody species. Open grassy slopes, interspersed with trees and shrubs, occur on the west bank immediately adjacent to Locks and Dam No. 1. The prevalent tree species are American elm (Ulmus americana) and cottonwood (Populus deltoides). Other representative species include silver maple (Acer saccharinum), sugar maple (Acer saccharum), green ash (Fraxinus pennsylvanica) and sumac (Rhus sp.).

2.27 The island below the dam supports the remnant of a young flood-plain forest stand which is representative of early bottomland woody successional stages in central Minnesota. Significant amounts of sandy silt have been deposited at the downstream end of the island. It appears that periodic high river flows, with concomitant recurring cycles of deposition and erosion, will maintain the present species composition of the island. However, changes in the relative abundance and age groupings of species will occur in response to fluctuations in annual flows.

2.28 The southern half of the island is largely covered with trees and shrubs, including green ash, cottonwood and willow (Salix sp.). Some trees are about 5 to 6 inches in diameter and approximately 28 years old. The northern half of the island is covered mostly by grasses and wildflowers.

WILDLIFE

Reptiles and Amphibians

2.29 The only member of these groups which is relatively common in the area is the painted turtle (Chrysemys picta), individuals of which can be seen on rocks on the east shore of the island. Tracks believed to be made by newly hatched young of this species can be seen in the sand at the south end of the island. Backwater areas of pool 2 support several species of frogs, turtles and snakes, but there is little suitable habitat for these forms in the immediate vicinity of the dam.

Birds

2.30 Bird use of the Mississippi River corridor in the Twin Cities is of two types: breeding and nonbreeding. The latter category includes migrants that pass through the city in spring and fall, winter visitors, and casual or accidental visitors. The mobility of birds is such that an alert observer at a single location may see a very large number of bird species over a number of years, but many of them will be single observations. Nearly all of the 286 bird species recorded in the Twin Cities¹ could occur in the

¹ Dodge, A.W., et al. 1971 The birds of the Minneapolis-St. Paul Region, Univ. Minn. 29 pp.

immediate area of Locks and Dam No. 1, but the species breeding in the area number only a few dozen. The majority of these breeders utilize the varied woodland and brush habitats along the banks.

2.31 Several species of birds use the project area. Birds such as the mallard duck and spotted sandpiper, which nest on the ground, use the island as a nesting area.¹ The island probably affords a certain amount of protection from land predators, although the sighting of a dog on the island and of a woodchuck crossing the river suggests that this protection may not be complete. Other species that nest on the island are red-winged blackbird and common grackle (nests of both species were found), mourning dove and killdeer (distraction displays), and probably northern yellowthroat and song sparrow (singing males of both species were seen). Migrants using the island in passage probably include most of the warblers that feed in the lower canopy; yellow warbler, Tennessee warbler, and American redstart were seen. The woodland thrushes might also be found there, although only the Swainson's thrush was present during visits. The veery, hermit, and gray-cheeked thrushes, all less abundant than the Swainson's, could also be expected on occasion. Likewise, a number of other scrub woodland songbirds probably use the island occasionally to rest and feed. Baltimore orioles and robins, both common nesters in the larger trees on the mainland, were observed foraging on the island. A high concentration of mourning doves was observed in September, which suggests that the island provides a relatively protected feeding area which may be quite influential in the survival of juvenile doves in the area.

2.32 All of the species seen are common in similar habitat throughout the northern Mississippi Valley. Only the spotted sandpiper appears to be present on the island in unusually high numbers.

2.33 Several species of birds use the water below the dam for fishing, including black-crowned night heron, common and black terns, and belted kingfisher. The night herons may nest in the large trees near the power plant, but the other species must come some distance because there is no suitable nesting habitat in this part of the river.

Mammals

2.34 The most common mammals found on or near the island are the woodchuck (Marmota monax) and the muskrat (Ondatra zibethica). Other mammals of the floodplain (e.g., white-tailed deer (Odocoileus virginianus), raccoon (Procyon lotor)) probably are occasional visitors, but the small area and low vegetation of the island, as well as spring flooding, would tend to discourage colonization.

¹ Scientific names are not included for birds because they are the only group of vertebrates in which standardized common names are officially recognized.

2.35 Tracks in the sand at the south end of the island and direct observations indicated that the domestic dog is the island's most frequent mammalian visitor (after man). Most dogs probably reach the island by boat, being frequent passengers in fishermen's boats on the river. A canine occasionally may destroy a clutch of duck eggs, but in general these visitors have little effect on the island's wildlife.

AQUATIC ECOSYSTEMS

Physical Properties of Pool 2

2.36 General Description Pool 2 extends from mile 815.3 (Lock and Dam No. 2) to mile 847.6 (Locks and Dam No. 1). The elevation of the pool is maintained at 687.2 feet at the primary control point (mile 833.9) by regulating the discharge of Lock and Dam No. 2. In association with selective dredging, this allows the Corps of Engineers to maintain a 9-foot channel, 200 feet wide, throughout the length of the pool.

2.37 The first major tributary below Locks and Dam No. 1 is the Minnesota River, which joins the Mississippi at river mile 844. The flow of the Minnesota River represents approximately 30 percent of that of the Mississippi and carries significantly higher sediment and bacterial loads (U.S. Geological Survey, in Water Resources Data for Minnesota, Volume 2, Water Quality). The main effect of the Minnesota River, therefore, is to double the turbidity and total coliform organisms, while depositing substantial organic sludge on the mixed sand and rock substrate.¹

2.38 Farther downstream, a severe degradation of environmental quality results from numerous point source organic waste discharges, the largest of which enters from the Metropolitan Wastewater Treatment Plant at river mile 833. These organic pollutants require substantial oxidation for breakdown. This results in a significant dissolved oxygen demand, with concurrent deleterious impacts on aquatic species.

2.39 For purposes of the present project, therefore, the area of most critical concern is the 3.5-mile section of pool 2 from Locks and Dam No. 1 to the mouth of the Minnesota River. As the major effects of construction activities would tend to be increased turbidity and sediment loads, these impacts would be most evident in the upper section of pool 2.

¹ Federal Water Pollution Control Federation. 1966. A report on pollution of the upper Mississippi River and its major tributaries, U.S. Dept of the Interior FWPCA, Great Lakes Region, Chicago, Ill. 236 pp.

2.40 Since the effects of lock and dam rehabilitation would have little impact on upstream sections, pool 1 is not specifically discussed in this report.

2.41 Channel Maintenance The Corps of Engineers has selectively dredged in pool 2 since 1934 to maintain the navigation channel. In the 39-year period from 1934 to 1972, an annual average of 179,931 cubic yards of material was dredged from this pool.

2.42 Little dredging has taken place within the upper 3.5 miles of the pool. During the years 1935 to 1958, however, 49,000 cubic yards of material was dredged from the navigation channel in the 0.5-mile section below Locks and Dam No. 1. The last such dredging occurred in 1956, when 1,000 cubic yards were removed.

Biological Aspects

2.43 Aquatic Macrophytes Due to river morphology, no aquatic macrophytes (higher plants) are found in or near the navigation channel. Aquatic macrophytes may be found in off-channel areas. Representatives of the pondweed genus Potamogeton may be found near the mouth of Minnehaha Creek.

2.44 Phytoplankton Significant amounts of green and blue-green algae are found throughout the region. Although algal populations are substantially larger in the downstream sections, where pool 2 widens and includes eight off-river lakes, algal blooms may occur in the area during warm periods of low flow.

2.45 Fish In the upper Mississippi River basin 134 species of fishes have been reported.¹ Of these, approximately 50 may be found in pools 1 and 2. The highest concentration of sport fishes in pool 2 is found in the upper 3.5 miles. In a 1964 netting survey from Locks and Dam No. 1 to the Minnesota River, the Minnesota Department of Natural Resources (MDNR) took 14 species, seven of which were sport or game fish.² Some of the more common species present are carp (Cyprinus carpio), white bass (Morone chrysops), and channel catfish (Ictalurus punctatus). In a recent (1976) creel census in the project area, the MDNR found 11 species in fishermen's creels. (Species lists of fish present in the area are on file in the St. Paul District Office, Corps of Engineers.)

¹ Smith, P.W., et. al., A distributional atlas of upper Mississippi River fishes. Illinois Natural History Survey, Biological Note No. 73, May 1971.

² Skrypek, J. 1969. Difference in the Composition of the Fish Populations in Pool 2 and Other Areas of the Mississippi River as Related to Waste from the Twin Cities Metropolitan Area MDNR. Invest Report No. 307.

2.46 Macroinvertebrates The relative abundance of invertebrates at any particular site is dependent primarily on substrate type, which is basically determined by current velocity. The most important habitats for aquatic invertebrates are backwater sloughs, main channel borders, and tailwaters.

2.47 In a full-width transect survey at river mile 847.4 during the spring and summer of 1973, five families of aquatic invertebrates were found.¹ These included common mayflies, caddis flies, midges and leeches. The west branch transect section, through the navigation channel to the island, was remarkably depauperate, with only one species of midge represented, in a rock scraping. This condition was also apparent in Corps of Engineers grab samples taken on 4 April 1975. At that time 16 Ponar dredge samples taken within 100 yards upstream and downstream of the locks failed to obtain any benthic macroinvertebrates. Successful collections were made in the navigation channel at river miles 851.6 and 837.5, but consisted entirely of Tubificidae (sludge worms) and Chironomidae (midges). In neither sample were mollusks found.

2.48 Endangered or Threatened Species The Federal list of Endangered and Threatened Wildlife and Plants (5 May 1976 and amendments) provides a guide to species whose populations might be seriously affected by a project. The only listed species which might occur in the project area is the mussel Lampsilis higginsii. Once widely distributed in the Mississippi, Minnesota, and St. Croix Rivers, this mussel has not been reported in the area for 26 years. During 1977, the Corps contracted with the Philadelphia Academy of Natural Sciences to survey the upper Mississippi River for the presence of mussels. Lampsilis higginsii was not found in the project area.

2.49 Examination of the MDNR's list of animals and plants which merit special consideration and management² indicates several aquatic species which must be considered in analyzing the impacts of this project. None of the species on this list has been recorded in pools 1 or 2. It is extremely unlikely, therefore, that any plant or animal on the Federal or State threatened or endangered lists occurs in the project area.

Fish Spawning

2.50 For those species known to occur in pools 1 and 2, the most important spawning locations are gravelly shallows and areas of submerged or emergent macrophytes.³ Thus, the navigation channel,

¹ North Star Research Institute, 1976 Environmental Impact Assessment of the Northern Section of the Upper Mississippi River. Pool 2. Report under Contract DACW 37-73-0059.

² The Uncommon Ones, MDNR, October 1975.

³ Breder, C.M., and D.E. Rosen, Modes of Reproduction in Fishes, T.F.H., 1966.

especially the area immediately below the locks, is poor spawning habitat. Some spawning, however, undoubtedly occurs on east-channel gravel bars and perimeters of the island. The extensive sand substrate immediately downstream from the island, however, is poor spawning habitat due to its shifting nature. Downstream from Locks and Dam No. 1 the major potential spawning areas appear to be restricted to the east bank, with the exception of the mouth of Minnehaha Creek.

WATER QUALITY

2.51 In general terms the water quality of pool 2 is good from Locks and Dam No. 1 to the Metropolitan Sanitary District's outfall. However, problems of organic pollution (especially fecal coliforms) have arisen in the area due to urban runoff following storms. In addition, biomagnification of heavy metals, polychlorinated biphenyls (PCB's) and chlorinated hydrocarbons have recently led the MDNR to issue recommendations that residents restrict their consumption of fish from this area to one meal per week.¹

Existing Water Quality

2.52 Area water quality data are available from several sources. The most complete records have been compiled by the Metropolitan Sewer Board in conjunction with the U.S. Geological Survey. (Water quality monitoring records are on file in the St. Paul District Office, Corps of Engineers.)

2.53 The water quality is good, except for bacterial levels. Following storms, urban runoff and sewer discharges increase bacteria loads to levels which present a possible health hazard.

2.54 Dissolved oxygen levels are high, often exceeding saturation. This condition is localized, however, and results from reaeration at St. Anthony Falls and Locks and Dam No. 1. Turbidity is low, and dependent upon the amount of bank runoff and erosion, increasing during periods of high flow.

2.55 Downstream from the project area, water quality is considerably degraded due to the turbidity and bacteria brought in from the Minnesota River, and due to the treated sewage effluents.

Water Quality Criteria

2.56 Minnesota water quality regulations, as approved by the USEPA, are administered by the Minnesota Pollution Control Agency (MPCA) which has classified the river section from St. Anthony Falls to the Metropolitan Wastewater Treatment Plant as suitable for fisheries and recreation (category 2B)

¹ MDNR. Personal Communication.

and industrial consumption (category 3B). Water quality in the project area is in compliance with all listed requirements except for bacterial levels. Bacteria loads, which are frequently high due to previously described reasons, are of sufficient concern to warrant restricting contact recreation (e.g., swimming) in this area.

Sediment Analyses

2.57 During the months of April and June, 1975, three bottom sediment samples were taken in pool 1, just above Locks and Dam No. 1. Sediment sieve analysis determined that 80 percent of the sampled particles ranged in size from 0.1 to 0.5 mm (fine to medium sand). Only 14 percent, by weight, of the sample consisted of silt or clay.

2.58 Chemical analyses have been performed on these samples and the results are presented in table 1. Although the concentrations of chemical contaminants (i.e., heavy metals and chlorinated hydrocarbons) are significant, they are not unreasonable for an urban river section. Urban river sediments have been reported to contain at least 10 times these concentrations of chemical contaminants.¹

SOCIAL SETTING

2.59 The lock and dam system and associated pools provide the means for commercial and recreational navigation on the Mississippi River. Lands on the west bank of the river are part of the Minnesota Old Soldiers Home and Minnehaha City Park. The veterans building on the top of the bluff overlooking the locks houses ambulatory patients. Individuals requiring medical care are located in a building near the mouth of Minnehaha Creek. Residents of the Veterans Home often view activities on the river from the top of the bluff. The park has been designated a National Historic District. East bank lands above the bluffs are occupied by a Ford Motor Company automobile assembly plant.

2.60 Commercial and pleasure boat lockages through Locks and Dam No. 1 are summarized in table 2 below.

2.61 Secondary uses of the river corridor take place in adjacent parks, in the navigation pools, and on the riverbanks. A 1975 survey by the Corps of Engineers estimated that approximately 2500 to 3200 visitor days are spent each summer season by pleasure boaters and fishermen in the immediate vicinity of Locks and Dam No. 1. A similar survey by the Minnesota Department of Natural Resources indicated that, in the reach of river stretching from the Locks and Dam No. 1 to the Minnesota River, approximately 6,900 visitor days during the summer season are spent in canoeing, boating, and fishing.

¹ Dredged Material Research Program 1975. Research Study for the Development of Dredged Material Disposal Criteria. Environment Effects Laboratory, Waterways Experiment Station, U.S. Army Corps of Engineers. DACW39-73-0024

Table 1

Bottom Sediment Analyses from Locks and Dam No.1

<u>Parameter</u>	<u>Sample</u>		
	<u>1</u>	<u>2</u>	<u>3</u>
Total Solids (dry weight)	83.2	92.1	99.8
Volatile Solids (dry weight)	11.0	2.9	1.5
<u>mg/kg</u>			
Chemical Oxygen Demand	91600	26344	4430
Total Kjeldahl Nitrogen	58.2	10.4	4.2
Ammonia Nitrogen	1.98	0.50	0.01
<u>ug/gm</u>			
Oil/Grease	3160	1147	647
Total Phosphorus	1.10	0.90	0.56
Mercury	0.40	0.09	<0.01
Lead	118	<0.1	<0.1
Zinc	158	40.9	16
Arsenic	2.2	1.6	0.43
Cadmium	4.3	<0.1	1.1
Total Chromium	37.5	9.6	2.2
Copper	39.7	24.0	-
<u>Chlorinated Hydrocarbon (ug/gm)</u>			
2,4, D Methyl Ester	-	-	< 0.2
BHC	-	-	3.9
Lindane	-	-	0.3
Methyl Parathion	-	-	0.6
Heptachlor	-	-	0.4
Aldrin	-	-	0.8
Heptachlor Epoxide	-	-	5.7
MDE	-	-	10.5
pp' DDE	-	-	<0.2
Dieldrin	-	-	20
pp' DDT	-	-	<0.2
PCB's	-	-	< 2.0

Table 2
Lockages at Locks and Dam No.1

<u>Lockage</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
Commercial Craft						
Lockages	1965	2193	2099	2854	3587	3432
No. of barges	3548	3761	4155	4676	4829	4834
Pleasure Boat						
Lockages	1793	1568	3056	1822	1242	1502
No. of Boats	3455	2798	4229	4014	3344	4007

Fishing Pressure

2.62 Commercial Fishing Very little commercial fishing is still practiced in pool 2. This is primarily the result of pollution from the Twin Cities, resulting in fish kills and flesh tainting. What commercial fishing is done is restricted to the lower end of the pool.

2.63 Sport Fishing Substantial recreation fishing occurs in the area. Fishing is done from both boat and shore and fishermen tend to congregate on the east river bank, thus avoiding the navigation channel and locks. White bass, channel catfish, and carp comprise the vast majority of the catch, although significant amounts of smallmouth bass (Micropterus dolomieu), freshwater drum (Aplodinotus grunniens), and walleye (Stizostedion vitreum) are taken.

RECREATION

2.64 Current recreational use of the project area consists of general boating, fishing (mainly downstream), day use activities on the island, and sightseeing, particularly at the visitor platform adjacent to the landward lock.

CULTURAL RESOURCES

2.65 In compliance with Section 106 of the National Historic Preservation Act of 1966 and Executive Order 11593, the latest listing of the National Register of Historic Places has been consulted (5 July 1978). The Nationally Registered Minnehaha Park is located adjacent to the project area, but will not be affected by the project. The Minnesota Veterans Home, which has been determined eligible for inclusion on the National Register, will also not be affected. The State Historic Preservation Officer has reviewed the project and his response is included as exhibit 2 in the technical appendix.

2.66 There are no known cultural resources in the project area. The rehabilitation of the locks and dam should not affect the historic character of the site. There is a possibility that presently unknown prehistoric or historic remains may be located on the island immediately downstream from the locks and dam. The portion of the island that will be required for construction of the cofferdam will be surveyed for presently unknown cultural remains. If any cultural remains are located, the procedures established by the National Park Service and the Advisory Council on Historic Preservation regarding the preservation of significant cultural resources will be followed. The access road improvements have been inspected in the field by a professional archaeologist and have extremely low potential for containing unknown remains.

3.00 RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

3.01 The proposed project involves the renovation of an existing structure. No new structures would be constructed. Letters have been sent to the Minnesota State Planning Agency and the Metropolitan Council concerning the proposed rehabilitation (see Section 9.00). The project has been coordinated with these agencies. Land use plans applicable to the project area include the Critical Area Plan for the Mississippi River in St. Paul, a Comprehensive Plan for the city of Minneapolis, city park plans, and a coal transportation study.

3.02 The Minnesota Environmental Quality Council has also been contacted regarding any possible conflicts with the Critical Area designation of the Mississippi River. The proposed project does not conflict with the Critical Area and results in some enhancement to recreation, primarily for recreational craft, through the rehabilitation of the riverward lock. The proposed project does not conflict with any known land use plans.

4.00 IMPACT OF THE PROPOSED ACTION

4.01 Impacts from the rehabilitation would occur primarily during the placement and removal of the cofferdams. These impacts would be associated with water quality parameters such as turbidity. Other impacts concern the loss of island vegetation, noise pollution and increased traffic due to construction activities. Other impacts on water quality are not expected. Interior drainage facilities and water quality are discussed in the following paragraphs.

INTERIOR DRAINAGE FACILITIES

4.02 The interior drainage facilities will be designed as shown in figures 6 and 7, which show cofferdam placement, and as described earlier in this statement. The seepage water coming through the cofferdam would be kept separate from the construction waste water by means of earth berms and dikes. Seepage into each of the four sump systems under flood conditions is estimated to be:

upper cofferdam area	250 gpm (gallons per minute)
lower cofferdam area	500 gpm
land lock sump	30 gpm
river lock sump	50 gpm
Total	830 gpm

The seepage water from the river would be pumped directly back into the river. If the seepage water accumulates fine materials while flowing in the collector trenches, approved flocculants would be added manually according to the manufacturer's specifications.

4.03 Standard practices for controlling and removing drainage water will be employed. Dual sump pits will be used to facilitate cleaning. The collection sumps will be excavated into the alluvial material and made watertight with a concrete liner. This will prevent seepage of sump water into the ground. A submersible pump will be available at each sump. Solid waste material will be hauled to a sanitary land fill.

4.04 The construction waste water could conceivably contain a wide variety of pollutants including bentonite, cement, minor amounts of fuel oils, gasoline, lubricants, epoxy resins, hydraulic fluids, small quantities of concrete or grout additives, and probably some road salt. The Occupational Safety and Health Administration (OSHA) and State requirements for fuel storage and equipment inspection would be relied upon to control leakages. The construction waste water would be separated from the cofferdam seepage water and would be collected in sumps located in the construction area. At the present time it is proposed that the construction waste be pumped from the lock to the top of the bluff and then into the Minneapolis

sanitary sewer system at Nawadaha Boulevard and 47th Street by means of a 4-inch pipe. The lift station has a maximum design capacity of approximately 500 gpm. The sewer at this point consists of a 9-inch pipe and has an unused capacity of 1.35 cfs which is adequate to handle the anticipated construction wastes.

4.05 To provide auxiliary handling facilities for seepage water flowing into the drainage system during flocculation and sump clearing operations, a secondary sump and drainage system would be constructed to collect unpolluted seepage water for direct pumping into the river. Oils and other liquids could be removed from the sump water surface by floating straw (or other absorbant material) on the surface and skimming it off after the straw had absorbed the liquid.

IMPACTS ON AQUATIC ECOSYSTEMS AND WATER QUALITY

4.06 Local disturbance of the aquatic biota in the construction area is not expected to have serious ramifications. The major impacts of lock and dam rehabilitation, therefore, would be felt downstream and would result from short-term increases in turbidity and the sediment load.

4.07 The placement and, more especially, the removal of cofferdam cells would cause increases in turbidity and sediment loads. Additional sources are seepage from cells, placement and removal of earthen dike closures, construction barge operation, and stabilizing sand fill leaked from the dam. The impact of these operations will depend on the magnitude and dispersal area of the turbidity/sediment plume which, in turn, is dependent on the physical characteristics (e.g., flow) of the river. The vast majority of rehabilitation activities will result in a turbidity/sediment plume restricted to the less biologically productive navigation channel, leaving the more productive east channel unaffected. In addition, this impact should be confined to the 3.5-mile section from Locks and Dam No. 1 to the mouth of the Minnesota River. Below this point, the limited increases in turbidity from lock and dam rehabilitation are insignificant compared to that contributed by the Minnesota River. These increases are not expected to have major impacts upon the existing aquatic organisms. The cofferdam may be aesthetically undesirable to some people.

4.08 In the report on environmental impacts of the 9-foot channel¹, results are presented from a program of turbidity monitoring 100 feet downstream from a clamshell dredge. Results of this study are presented in table 3 and indicate a 200 to 300 percent increase in turbidity immediately below the dredge.

¹ North Star Research Institute, 1976 Environmental Impact Assessment of the Northern Section of the Upper Mississippi River. Pool 2. Report under Contract DACW37-73-0059.

Table 3

EFFECT OF DREDGING ON DOWNSTREAM
TURBIDITY (IN FTU) IN THE MINNESOTA RIVER^a

Location	<u>Left Bank</u>		<u>Mid-Channel</u>		<u>Right Bank</u>	
	<u>Depth^b</u>	<u>Turbidity</u>	<u>Depth</u>	<u>Turbidity</u>	<u>Depth</u>	<u>Turbidity</u>
Upstream from dredge	0	25	0	21	0	25
	4	31	2	27	2	30
100 ft downstream of dredge	0	23	0	57	0	49
	6	31	5	86	5	60
4200 ft downstream of dredge	0	27	0	26	0	19
	0	41	11	45	2	26

^a Study conducted during low flow period, 25 September 1973.

^b Depth sampled, below surface, in feet.

4.09 Of equal interest, however, is the parallel study of the effects of barge traffic on turbidity. These results are presented in Table 4 and indicate an approximate 200 percent increase with a settling time greater than a half hour.

Table 4
EFFECT OF BARGE TRAFFIC ON
TURBIDITY (FTU) IN THE MINNESOTA RIVER

<u>Time</u>	<u>Left Bank</u>		<u>Mid-Channel</u>		<u>Right Bank</u>	
	<u>Depth^a</u>	<u>Turbidity</u>	<u>Depth</u>	<u>Turbidity</u>	<u>Depth</u>	<u>Turbidity</u>
Before barge passage	0	27	0	26	0	16
	6	41	11	45	2	26
0.5 min after barge	0	29	0	67	0	53
	2	42	11	80	3	59
10. min after barge	0	36	0	71	0	37
	2	45	10	74	5	62
32.5 min after barge	0	30	0	29	0	29
	2	48	11	64	3	44

^a depth sampled, in feet

4.10 Turbidity increases resulting from the rehabilitation of Locks and Dam No. 1 will not be as dramatic as those resulting from dredging, since cofferdam cell removal, the principal cause of silt disturbance, will take place during periods of high flow, when dilution and transport factors are greatest. Because the cofferdam will be constructed in an area close to the locks, the bottom sediments are fairly clean of fine materials, having been washed through by normal lock operations. Therefore, cofferdam placement and removal will not result in turbidity levels comparable to those generated by intra-pool dredging operations. The increase is not expected to be appreciably greater than that caused by normal barge activity through the locks.

4.11 Examination of the chemical contaminants present in the disturbed sediments (immediately upstream from the locks) also has been considered in terms of potential environmental hazard. Three primary factors combine to limit the potential deleterious impacts of these disturbances.

1. Appreciable sediment quantities in the construction area are found only above the locks and dam.

2. Timing of maximum sediment disturbance will coincide with periods of high flow, and maximum dilution. The relatively slow rate of introduction of the sediments will further reduce their effects.

3. The quantities of chemical contaminants, and their projected behavior upon release by substrate disturbance, do not represent a significant threat to the existing aquatic system.

4.12 Of these three factors, the last deserves further discussion. Three categories of chemicals have the greatest potential for deleterious actions: nutrients, heavy metals, and chlorinated hydrocarbons. All categories were sampled during the sediment analyses, which were conducted by the Corps of Engineers (see table 1).

Nutrients

4.13 Compared to the overlying water, sediments in natural water bodies are generally rich in nitrogen and phosphorus compounds. It appears likely, therefore, that the mixing of sediments with overlying waters will result in the release of these compounds, which would be expected to cause an increase in localized algal blooms at the site.

4.14 Ammonia and organic nitrogen are the two nitrogen compounds of greatest potential significance. Of these, organic nitrogen is generally found in particulate form in sediments and would be expected to settle out of the water column rapidly. Ammonia, however, may be almost totally released in linear relationship to the amount of sediment sink disturbed. Although the toxicity of ammonia is

well documented¹, local toxic buildup due to sediment disruption should be expected only in lentic (standing water) systems.

4.15 Phosphorus occurs in natural waters almost solely in the form of various types of phosphate (PO_4). The release of phosphorus from sediments to overlying water is determined primarily by ion chemistry and is enhanced by reducing (electron acceptance) conditions. Any phosphorus released during sediment disturbance, therefore, should be sorbed or particulated back to sediments.

4.16 A study done by the Corps of Engineers² showed that significant quantities of toxic materials would not be released into solution during dredging and disposal operations. Nitrogen and phosphorus compounds are found below the parts per million range. Phosphorus is either adsorbed, used in the growth of algae, or suspended. The proportions and rate of utilization vary.

Heavy Metals

4.17 Transport of metals to and from bottom sediments is a complex phenomenon influenced by a number of conditions. Various kinds of reactions may be involved, including precipitation, ion-exchange, complexation, redox, and sorption-desorption. In general terms, however, when conditions are aerobic and organic matter is present (as in the present case), heavy metals released by substrate disturbance are bound or scavenged to a precipitate stage where they then resettle with little apparent effect. Experiments by Krauskopf³ showed that zinc, lead, and copper strongly adsorb to surfaces composed of ferric oxide, manganese oxides, clays, etc. Nickel is also removed from the marine environment by the scavenging action of iron and manganese oxides and hydroxides.

Chlorinated Hydrocarbons

4.18 Previous studies have shown that chlorinated hydrocarbons tend to be strongly sorbed by sediment.⁴ Most are only poorly water soluble and little release would therefore occur because of the strong sorption tendency for both organic and inorganic solid materials present in the sediments. The Corps dredged material disposal study² detected no appreciable amounts of soluble chlorinated hydrocarbons. Pesticides and heavy metals can be absorbed on suspended clay particles and attach themselves strongly to them. Because of this, muddy waters have a large capacity to assimilate these contaminants.

¹ Water Quality Criteria. 1972 USEPA R3-73-033

² Corps of Engineers. Waterways Experiment Station. 1976. Research study on the effect of dispersion, settling, and resedimentation on migration of chemical constituents during open-water disposal of dredged materials.

³ Contract Report D-76-1.

Krauskopf, K. B. Factors controlling the concentration of thirteen rare metals in seawater. *Geochimica et Cosmochimica Acta*, Vol. 9, 1956, pp. 1-32 (cited by Corps of Engineers WES contract report D-76-1).

⁴ Research Study for the Development of Dredged Material Disposal Criteria, Institute for Environmental Sciences, University of Texas at Dallas, 1975.

Summary of Aquatic Impacts

4.19 The potential for impacts on aquatic ecosystems appears to exist only in the removal of cofferdam cells and associated earth structures. The placement of these structures is not expected to have adverse aquatic effects, since placement will occur on the west side of the river, where there is very little flow.

4.20 Removal of cofferdam structures will certainly introduce some sediments into the water column as the sheet pile sections are withdrawn. The high rate of flow, the relatively slow rate of removal of sheet piles, the coarse fill material, and the lack of fine materials on the channel bottom will combine to reduce the physical impact of this activity. Most of the toxic organic compounds found in the sediments are adsorbed on inorganic particles and may be expected to be carried and to settle with the particles, rather than going into solutions; thus, they are less available to aquatic ecosystems.

IMPACTS ON TERRESTRIAL ECOSYSTEMS

Flora

4.21 The lock rehabilitation would have little, if any effect on terrestrial vegetation. A few elm trees and grassy areas would be destroyed due to construction activities. Landscaping and the planting of trees, shrubs, and grasses following the construction would offset these losses.

Fauna

4.22 Birds nesting on the northern part of the island (mallards, redwings, grackles, spotted sandpipers, song sparrows) would be forced to seek new areas in the spring depending on the amount of ongoing construction activities. Failure to breed may result, since these species, abundant residents of the floodplain, can be assumed to have saturated the habitat. Individuals inhabiting the more wooded south end of the island would probably be unaffected.

4.23 The removal of one or two elms from the area adjacent to the landward lockwall will deprive a pair of Baltimore orioles of nesting spaces, but the orioles have abundant nesting areas elsewhere in the river corridor and in Minnehaha Park. (The elms may have to be removed before this project is initiated due to Dutch elm disease.) The trees and shrubs planted to replace the elms would provide nesting and feeding areas for other birds. As noted in paragraphs 2.48 and 2.49, there are no known threatened or endangered species of plant or animals in the area.

AIR QUALITY

4.24 Impacts on air quality would result from equipment at the construction site and from trucks carrying materials and supplies to the site. These impacts would include dust particles resulting from construction and exhaust fumes.

4.25 The rehabilitation of the locks would create additional noise from the movement of trucks and other vehicles and from equipment used to remove deteriorated concrete and to place and remove cofferdam cells. Much of this work would take place during the winter months. Blasting will be used to remove deteriorated concrete and some existing monoliths. The amount of blasting and size of charges cannot be determined until some testing is conducted; however, it would probably result in noise quality impacts. The blasting would be conducted during the winter of the main construction season. It has not been determined if blasting would occur on a 24-hour basis. The extent of noise quality impacts cannot be determined at this time.

4.26 A portion of the Minnesota State Veterans Home is located on the bluff directly above the locks. This building houses 540 retired residents. These people are not bedridden. Those residents requiring nursing and medical care are housed in a building about 1500 feet downstream, near the mouth of the Minnehaha Creek.

4.27 An apartment building is located at 740 River Drive, upriver of the Ford Bridge. At the present time, complaints occasionally arise about the noise from the normal lock operations. Other residences are about one-half mile away from the locks.

4.28 Minnehaha Park is located on the bluff above the locks. Truck routes have not yet been established but some park streets may be used by trucks bringing materials to the construction site. This may create some impacts on aesthetics and the safety of park visitors.

4.29 Some construction activities would occur on a 24-hour basis. These would include pile driving, hauling supplies (by truck), removing concrete at the locks, and removing seepage and construction water by pump. Some of this work would take place under the shelter to be built over the locks. Other activities would take place in both the summer and winter over a 24-hour period.

NOISE IMPACTS

4.30 The Corps has conducted a survey¹ of the existing noise levels in the project area under the guidance and supervision of the Minnesota Pollution Control Agency (MPCA). The following is an excerpt from this study by the MPCA and an assessment of the impact of the proposed construction.

"For the area in question, three sources (in addition to Locks and Dam No. 1) dominate the present noise environment:

- traffic noise, particularly the Ford Parkway,
- Wold-Chamberlain Field,
- Ford Motor Company Assembly Plant.

"The impact of traffic noise is obvious in all tests conducted, and it is felt by all sensitive sites chosen for the study. The 740 River Drive surveys (ground level vs. roof) show the highest floors are exposed to higher noise

¹ The survey results are on file at the St. Paul District Office, Corps of Engineers.

levels than the lower floors. This apparent incongruity is due to the natural shielding existing between the lower floors and the highway; it provides greater noise reduction than the greater distance to the highway from the higher floors. Correction for this shielding should be applied to any estimates of the potential noise impacts from construction work at Locks and Dam No. 1 on 740 River Drive. Furthermore, any analysis of impact on 740 River Drive should consider whether this building meets the requirements of Minnesota Regulation NPC-2(i).

"The impact of Wold-Chamberlain Field is evident in two of the ten surveys conducted. The acceptability of the noise impact of Wold-Chamberlain on the area surrounding Locks and Dam No. 1 is judged to be borderline by the Minnesota Pollution Control Agency.

"Building 6 of the Veterans Home is being impacted unacceptably (50 ± 1 dBA) by the Ford Motor Company Assembly Plant during the nighttime period. This steady noise level produced by air moving devices at the plant has been verified by further surveys conducted by Ford...and will be corrected in the future.

"All surveys show high background noise levels in the area.

"The surveys at 740 River Drive, ground level, show a significant nearby source making the L_{10} - L_{50} difference much greater than at the other sites. The April 12 (7:05-8:08 a.m.) survey at the Veterans Home site shows an unexplained high L_{10} level [probably due to aircraft].

Impact of Proposed Work at Locks and Dam No. 1

"...[According to discussions with Corps of Engineers personnel], any impact analysis for the proposed work at Locks and Dam No. 1 should address:

"-Pile drivers.¹ ...The differences that one could expect in this particular case (due to the partial underwater operation of the pile drivers) will be difficult to document... . [It is suggested] that any analysis assume a conservative approach...[The MPCA would] be glad to conduct any further tests in this area if...[the Corps] can identify any applicable test projects.

¹ Further information on pile drivers collected by the MPCA is on file at St. Paul District Office, Corps of Engineers.

"- Effectiveness of winter inclosure. From the picture submitted,¹ the winter inclosure also appears to be acoustically effective; however, its ultimate performance will depend on the elimination of any openings during construction.

"- Close proximity of the Veterans Home to the construction site. This site, without a doubt, will be the most affected by the proposed work. Present high background noise levels produced by the Ford Motor Company Assembly Plant should be corrected by the start of construction at Locks and Dam No. 1.

"- Clear definition of working hours. Possibilities of noisy equipment used on an around-the-clock basis (e.g., compressors) should be discussed."

BENEFITS OF PROJECT CONSTRUCTION

4.31 The lock walls and dam at Locks and Dam No. 1 require rehabilitation for three basic reasons:

1. The lock walls and dam do not meet current stability standards for these types of structures.

2. Hydraulic problems with accumulations of ice and debris at the intakes, air entrapment in the culverts of the filling and emptying system (this creates problems with the downstream emptying valves), excessive turbulence in the lock chamber during the filling operation, and hazardous conditions downstream of the locks during emptying operations.

3. The existing hydraulic machinery has an estimated life expectancy of 1 to 5 years.

4.32 Significant modifications are required to extend the useful life of the locks for an additional 50 years. Previous reports addressed the issue of constructing a new lock at the same location. Economics, however, do not justify such action at the present time, since rehabilitating the existing structure would serve anticipated future needs while costing substantially less.

4.33 The landward lock will be complete rehabilitated. The riverward lock will be partially rehabilitated to the extent that benefits justify. The following discussions on reducing turbulence and on filling and emptying times do not apply to the riverward lock because the project would not modify these existing conditions.

4.34 Presently, Corps of Engineers regulations require that all lock walls and gravity dams possess sliding factors of safety of 4.0. The sliding factor of safety for the lock walls at Locks and Dam No. 1 is around 1.5. In order to comply with current stability regulations, the existing lock walls must be structurally modified to yield a rehabilitated structure as stable as if a new lock structure were constructed at the site.

¹ Information on file at the St. Paul District Office, Corps of Engineers.

4.35 Rehabilitation activities would require complete construction access to the locks, and thus the construction of a cofferdam would be necessary. To conserve space and reduce the potential for stream contamination, a cellular sheetpile cofferdam would be constructed.

4.36 Cofferdam construction, lock dewatering, and lock wall stability improvement would be accomplished by modifications to the filling, venting, and emptying systems. Presently, the emptying conduits discharge directly into the channel downstream of the locks and waves are generated by lock emptying that are hazardous to both commercial river traffic and smaller private pleasure craft. To control turbulence, a new discharge baffling system would be installed.

4.37 Turbulence in the lockchamber is hazardous during filling operations. Lockchamber turbulence is primarily due to the high entrained air concentrations in the water discharge from the filling ports, and the fact that the filling ports on opposing lock wall faces are directly across the lock floor from one another. To reduce lockchamber turbulence and hawser forces on barge tows, the side port manifold ports will be staggered, the filling conduits lowered, and trenches would be constructed in the chamber floor of each port. Lowering the conduits would tend to reduce the volume of entrained air in the water discharged from the lock floor filling ports and decrease the magnitude of pressure fluctuations on the emptying valves. The existing filling conduit crowns are above normal tailwater. When the filling valves are opened, air in the conduit crowns is trapped in the conduit due to the inadequacy of the vent system. The trapped air may then be either entrained in the flow into the lock, or become compressed and cause pressure surges on the emptying valves. The proposed work would, therefore, alleviate the air entrainment and pressure problems currently associated with lockchamber filling and lead to improved hydraulic operations.

4.38 Since the elevation of the filling and emptying conduits would be changed, the existing machinery must be removed. New valves and bulkheads would be placed in the new machinery locations. The old, complex valves which require frequent maintenance would be replaced with more reliable equipment that can be more safely controlled from a central location. New electrical controls would prevent operator error by eliminating the possibility of miter gate movement and differential head, and the possibility of simultaneous opening of both the filling and emptying valves.

4.39 Filling and emptying system hydraulics, miter gate operations, and barge movement into the riverward lock would all be improved by the construction of new filling intake manifolds and the construction of the upstream and downstream intermediate wall extensions.

The existing filling ports are located in the miter gate recesses. Vortices presently form at the intakes during filling operations, floating debris collects on the intake trashracks, and miter gate movement is occasionally restricted. Such conditions sometimes result in trashrack damage. By relocating the intake ports farther upstream and streamlining the intake monolith, debris accumulation in the miter gate recesses should cease to be a problem.

4.40 By constructing new upstream and downstream intake and discharge manifolds, the ease of barge passage from the upper and lower pools into the riverward lock would increase. One of the principal difficulties encountered by barges when attempting to enter the riverward lock is that the present riverward lock guide wall system is of insufficient length. By constructing new intermediate monolith extensions, therefore, several operating problems may be solved; i.e., the filling and emptying systems, miter gate operation, and riverward lock barge access would be improved.

4.41 Other new lock features to be constructed include a new central control station which would provide a better point from which to conduct operation, a permanent access bridge to assure continuity of access routes regardless of lock operations (current pedestrian traffic from wall to wall is routed over the miter gates), automatic navigation warning lights triggered by miter gate operations, tow haulage units to facilitate the movement of barges without a towboat, thereby enabling the lockage of large barges, and a number of other systems designed to make the rehabilitated Locks and Dam No. 1 function as safely and efficiently as would a newly designed and constructed lock system.

SOCIAL IMPACTS

4.42 The proposed lock and dam rehabilitation would exert certain short term negative impacts during the construction period. These would result principally from the increased traffic from the construction force and from trucks transporting construction materials to the site. The use of barges to transport sheet pile and cofferdam fill would reduce vehicle traffic. Local residents, highway users, and park users will experience additional traffic hazards and minor inconvenience in the immediate vicinity of the locks and dam access road. Prudent selection of routes for construction traffic and effective traffic control systems would reduce these impacts. Other potential impacts of construction are the glare of lights during periods of 24-hour activity, smoke, odor, and dust.

4.43 Facilities in Minnehaha Park exist for family and group picnicking, field games, and hiking. Support facilities include concessions and comfort stations. Relatively few users of the park are anticipated during the scheduled main (winter) construction period, and disturbance of park users would almost entirely be limited to noise discomfort.

4.44 Certain positive social effects would result from the lock and dam rehabilitation. Residents of the area and park users already spend a considerable amount of time observing river activities, especially those at the lock. The construction, at least those parts of it conducted during the warmer months, will provide additional viewing interest for the general public and for residents of the Veterans Home.

4.45 The construction activities would cause some interruption of tourism at the lock, but most of this interruption would come at a time when visits are minimal. River recreation use would be interrupted only minimally, since the closure of the lock would take place at a time of year when pleasure boats cannot lock through. Work at the lock during the warmer months would somewhat degrade the recreational experience of picnickers and fishermen using the island, but the rehabilitation project, by rejecting the construction alternative that would have used the island as a staging area, has restricted most of this degradation to the two spring seasons and one summer and fall of actual work.

RECREATIONAL IMPACTS

4.46 The proposed rehabilitation would benefit recreation in that the delay time for locking through would be decreased. This decreased delay time would result in a greater number of recreational craft using the locks and an increase in boating activity both up- and downstream. There would also be an increase in sightseeing due to the improved visitor facilities and interpretive program.

4.47 Impacts on area parks would be minor or non-existent. The increases in turbidity would have a minimal effect on the parks. Although the increased capacity of the locks (in terms of lockages per time period) will cause increased recreational use in pool 1, the river gorge area, the majority of the publicly-owned land will not be seriously affected. The steepness of the gorge will confine river users to the river and the sand flats along the shore. Noise levels would increase due to the increased recreational boating use. There would be increased conflict between recreational and commercial users of the river. However, the conflict will not be so great as might be expected since the two uses generally occur at different times of the day and of the week.

CULTURAL RESOURCES IMPACTS

4.48 There are no known prehistoric or historic remains that will be affected by the proposed rehabilitation of the locks and dam. Should any cultural remains be identified during the archaeological survey of the impact areas, their significance will be evaluated according to the National Register of Historic Places Criteria. Any located sites eligible for the National Register will either be avoided or mitigated, following consultation with the Advisory Council on Historic Preservation. Should previously undetected cultural remains be encountered during construction, work will be stopped immediately and the St. Paul District Archaeologist notified.

WETLAND IMPACTS

4.49 The only part of the project area that may be classified as wetland is the island adjacent to the locks. The proposed plan has been modified to eliminate use of the island. Pursuant to the requirements of Section 2(a) of Executive Order 11990 concerning wetlands, wetlands in the project area would not be affected.

4.50 An evaluation according to the requirements of Section 404(b) of P.L. 92-500 is presented in the technical appendix.

5.00 UNAVOIDABLE ADVERSE IMPACTS OF THE PROPOSED ACTION

5.01 Unavoidable adverse impacts of the proposed project include the effects on water quality, caused predominantly by the placement and removal of the cofferdam. These impacts would be reflected mostly in a temporary increase in turbidity and siltation and are not expected to result in major impacts upon aquatic organisms or other resources in the area.

5.02 The construction would remove a few elm trees near the lock (due to Dutch elm disease the elms may have to be removed before this project is initiated). Construction activities would have adverse impacts on recreation involving fishing, boating, and use of the island.

5.03 Other impacts associated with the construction activities are increased traffic, noise pollution, and dust.

6.00 ALTERNATIVES TO THE PROPOSED ACTION

6.01 A large number of alternatives were evaluated in arriving at the selected plan. These included complete replacement of the entire lock and dam complex, construction of a new lock structure within the existing lock and dam complex, rehabilitation of the existing locks, and the course of no action. Within the selected alternative, decisions were made concerning whether or not navigation is to be interrupted; whether both locks are to be rehabilitated or only one; and how the cofferdam is to be constructed, with particular reference to the use of the island and the east bank as staging areas.

6.02 The need for rehabilitation has been discussed in various other sections of this statement. The alternative of continuing the existing conditions will be summarized here (further details can be found in the General Design Memorandum).

6.03 The "no action" or "continued maintenance and repair" alternative would mean that the current undesirable pattern would continue--periodic emergencies as deteriorated structural elements and worn-out machinery fail. Both structural and mechanical components have essentially outlived their originally designed project lives. Continued maintenance and repair efforts have kept the lock in operation with great effort and at great cost, but the continually deteriorating condition increases the possibility of a failure which would halt all waterborne transportation to and from Minneapolis. The average annual maintenance cost above and beyond the normal daily operation and maintenance is approximately \$50,000. There would be few environmental impacts associated with this alternative.

6.04 Lack of future dependable service and of a government commitment to such service would alter the future use of the facility and local development plans in the Twin Cities area. Continued deterioration of service to the users of Locks and Dam No. 1 will discourage the expenditure of private capital to maintain and expand facilities and traffic movement in and out of Minneapolis. Shifts of traffic and eventual phasing out of existing facilities would result. More and more developmental pressure will be brought to bear in the pool 2 areas, particularly on the Minnesota River and at the port of St. Paul. The formal adoption of the "no action" alternative would demonstrate a lack of commitment to the navigation system above Locks and Dam No. 1 and would accelerate the process outlined above.

6.05 The initial decision to rehabilitate the existing locks, rather than replace the entire lock and dam system or to construct new locks, was made on purely economic grounds, but the environmental impacts of such construction would be far more severe and widespread than the relatively small impacts anticipated from the proposed rehabilitation. Construction of a new lock and dam complex at another location would cost more than 200 million (1970) dollars and would involve massive alteration of river flows, interruption of commercial and recreational boat traffic, and substantial alteration of downstream ecosystems, both terrestrial

and aquatic. A new lock structure at the present site would cost between 29 and 38 million (1970) dollars to construct, depending on lock dimensions. Although it would have substantially lower environmental impacts than the construction of a new lock and dam at a different site, the ecological and sociological impacts of a new lock still would be considerable. Therefore, the decision was made to rehabilitate the existing locks and dam rather than to build a new lock and dam at the same or another location.

6.06 The alternative of "no action" would mean continuing the existing maintenance of the lock structures. Failure of the lock through collapse of the lock wall or failure of the miter gates is considered unlikely, but increased equipment breakdown with attendant expense and lock outages may be expected.

6.07 Without rehabilitation and the maintenance of navigation pools, flat water recreation opportunities would be adversely affected. It is doubtful that the change to flat water recreation would affect the use of Minnehaha Park or other parks along the river. These parks primarily provide city-wide recreation opportunities where the river is an open space corridor.

6.08 Removal of the locks would have a dramatic effect on the commercial uses of the river corridor. The Upper and Lower St. Anthony pools have eight commercial docks. Pool 1 has four docks where commodities such as coal, cement, concrete aggregate, and grain are moved. Maintenance of industries which are already dependent on river transportation in the short run would require maintenance of navigation. In the long run, adjustments would likely be made through relocating industry or shifting to different modes of transportation.

6.09 Turbulence in the lock chamber on filling is considered a hazard to small boats locking through, but to date no serious accident has occurred. Small boat use of the lock has decreased in recent years, due to the long waiting times imposed on recreational craft by the heavy commercial use of the lock. Few recreational boat owners are willing to wait several hours to lock through. Without rehabilitation of the riverward lock, the pleasure boat use of the lock probably will continue to decrease. Turbulence in the lock chamber, therefore, would become less of a hazard to the public.

ALTERNATIVE REHABILITATION PLANS

6.10 After lock rehabilitation was selected as the preferred alternative, various plans involving one or both locks and various times of construction were developed. The primary benefit attributable to the rehabilitation of the locks at Locks and Dam No. 1 is the extension of the Mississippi River 9-foot channel to Minneapolis, Minnesota. Traffic moving to and from Minneapolis through Locks and Dam No. 1 has averaged about 2.0 million tons annually for the last 10 years. Traffic in 1976 totaled 3,087,000 tons. In 1976, movement of western coal to utility plants situated in the pool 2 Twin Cities area decreased substantially. It appears that some level of coal shipment traffic can be sustained in the future — on a decreasing basis, however, since a large coal transshipment facility is no longer expected to be built in the Twin Cities area.

6.11 By 1980-1981 annual sustainable traffic moving through Locks and Dam No. 1 is expected to be approximately 3.6 million tons. Additional traffic or extra transportation benefits are not anticipated solely because of lock rehabilitation. Current price levels (October 1977), an interest rate change to 6 5/8 percent, and current rate savings have been used to reevaluate transportation cost-savings benefits. Average annual navigation benefits on an incremental pool basis and on a system-wide basis presently are \$2,592,000 and \$19,056,000, respectively. The cost of disrupting navigation during the rehabilitation construction phase was evaluated for the various plans of improvement. The additional costs to users during construction have been included as a portion of project-incurred costs. The recommended plan has no user disbenefits associated with rehabilitation. Additional recreation craft benefits and commercial costs savings accrue incrementally to the riverward lock. The proposed rehabilitation would benefit recreation in that the delay time for locking through would be decreased. This would result in a greater number of recreational craft using the locks and an increase in boating activity in the area.

6.12 Basically four possible plans for lock rehabilitation were investigated in order to determine the best construction procedure. For each of the following plans, the primary benefits stemming from transportation costs savings are identical. All the plans have identical average annual benefits; they vary only in time or method of rehabilitation. However, the interruptions due to construction and the associated disbenefits to users of the port of Minneapolis vary with each plan. In all four plans, the position of the outlet structure would remain unchanged. Similar environmental impacts are associated with all of the rehabilitation plans. Cofferdams and fill material would be needed for each plan. Plans 1 and 4 would not interrupt navigation, and therefore would require partial cofferdam removal in the spring and replacement in late fall. The aquatic impacts associated with this process are not significant. Recreational aspects would vary slightly between plans, depending on whether or not the riverward lock is rehabilitated, making it available to recreational craft. Air, noise, water quality, and other environmental impacts are similar for each plan.

Plan 1 - Rehabilitation of Landward Lock without Interruption of Navigation

6.13 With this plan most of the repair work would be implemented in the 5-month winter season of November through March. During the remaining months, i.e., during the navigation season, only such work that would not interfere with boat traffic would be carried out. Thus, no disbenefits to navigation system users would result. The total cost for this plan is \$17,000,000, with a benefit-cost ratio of 1.7 to 1.

Plan 2 - Rehabilitation of Landward Lock with Temporary Use of Riverward Lock for Navigation

6.14 Under this plan necessary repairs would be made in the riverward lock so that it could be used for navigation while the landward lock was being repaired for permanent use. Users indicated that the reduced 7-foot draft available in the riverward lock during the period of reconstruction of the landward lock would prevent this alternative from being an economically viable one. Average annual disbenefits associated with this construction plan are estimated at \$793,300. The total cost for this plan would be \$15,350,000, with a benefit-cost ratio of 1.13 to 1.

Plan 3 - Rehabilitation of Landward Lock with Navigation Closed During Construction

6.15 All boat traffic would be shut off during the navigation season while the landward lock is being rehabilitated. This plan is the most economically harmful. Direct disbenefits to Locks and Dam No. 1 users would amount to \$1,273,100 on an average annual basis. In addition, the secondary economic impact upon firms currently dependent upon river transportation could be even more severe. Some diverted traffic and future traffic growth would be permanently lost to more expensive modes presumed to be more reliable. The total cost of this alternative is \$14,500,000, with a benefit-cost ratio of 0.96 to 1.

Plan 4 (the selected plan) - Rehabilitation of Both Locks without Interruption of Navigation

6.16 The plan would completely rehabilitate the landward lock. The riverward lock would be partially rehabilitated to the extent justified by the benefits. Most of the repair work on both locks would be carried out during the winter season. Work that does not interfere with navigation would be done during the remaining months. No disbenefits or user losses result from this construction procedure. Some local employment benefits would occur since many laborers would otherwise be laid off or unemployed during the winter season. See paragraph 1.19 for economic analysis.

6.17 Meetings with companies that use the river indicated that they prefer lock closure to take place during the winter season (December through April). This would result in only limited interruption to river navigation.

6.18 The river lock would be rehabilitated also, for the following reasons: (1) the river lock would have to be repaired or made inoperative to eliminate maintenance costs; (2) there would be less economic and environmental cost if the river lock were rehabilitated now rather than at a later date, because the same cofferdam could be used; (3) the riverward lock can be used for empty barges or recreational craft; (4) recreation use is increasing¹ and could be enhanced by use of the riverward lock; (5) delay times for lockages through the landward lock would be reduced; and (6) the rehabilitation of both locks would be compatible with the purpose of the Upper Mississippi River Recreational Craft Locks Study which is intended to improve methods of recreational lockages in the Upper Mississippi River area.

¹ User survey on file at St. Paul District, Corps of Engineers.

ALTERNATIVE METHODS OF COFFERDAM PLACEMENT

Alternative A - Use of Island for Cofferdam Placement

6.19 Sheet pile for the cofferdam cells would be trucked to a loading area on the east bank of the river, downstream of the Ford Company heating plant. From there, the sheet pile would be transported by barge to the southeast side of the island below the dam, then by truck to the north end of the island. It would then be driven by conventional pile driver to form the downstream cofferdam.

6.20 This alternative would require construction of barge landings on the mainland and the island, in addition to a construction road the length of the island. An area of about an acre would be cleared at the south end of the island for storing sheet pile. Thus, this alternative would destroy much of the developing woodland on the island. Even with replanting, this growth would require at least 20 years to return to the present condition.

6.21 Barge traffic on the east channel of the river would essentially prevent pleasure craft from using the channel during the period of cofferdam placement and removal.

Alternative B - Cofferdam Placement from Barges

6.22 With this method, the proposed alternative, the cofferdam cells would be constructed first by a barge-mounted crane, then by successive movements of the crane to cells already constructed. Fill would be brought in by barge. Cofferdam removal would employ the reverse process.

6.23 Environmental impacts of Alternative B are substantially less than in Alternative A, since the island and mainland staging areas are largely spared the impact of construction.

6.24 In addition to exerting less severe environmental impacts, the proposed alternative (B) is considerably less expensive.

6.25 The proposed plan involves the complete rehabilitation of the landward lock and partial rehabilitation of the riverward lock. The National Economic Development (NED) Plan optimizes economics while the Environmental Quality (EQ) Plan stresses environmental considerations. For the rehabilitation of Locks and Dam No. 1, the proposed plan is also the NED plan and the EQ plan.

7.00 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.01 The short-term aspects of this project include the temporary closure of the locks during the winter season, temporary increases in turbidity due to placement and removal of the cofferdam, noise and air pollution during construction, loss of some vegetation, increased traffic and some delays and inconvenience to navigation during construction.

7.02 The long-term aspects include the more efficient use of the locks, use of the riverward lock for recreational craft, and economic benefits associated with future uses of the locks.

8.00 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH
WOULD BE INVOLVED IN THE PROPOSED ACTION

8.01 Most of the aspects associated with the project involve short-term impacts. The rehabilitation would involve a future commitment to the maintenance and operation of the locks. The natural resources (gasoline, etc.) used to construct and maintain the project would be irretrievable.

9.00 COORDINATION

9.01 Meetings were held with shippers and users on 2 May 1975, and with environmental agencies on 5 June 1975 and 8 July 1975, to explain rehabilitation study plans and gather input. Results from these meetings have been used in the preparation of this document. In addition, an abridged Phase A report was distributed to Federal, State, and local agencies; environmental and citizen groups; shippers and users; marina owners; yacht clubs; etc., for their review and comment.

9.02 Letters requesting comments on the proposed method of disposing of waste water have been sent to the Metropolitan Waste Control Commission, the Minnesota Pollution Control Agency and the city of Minneapolis. The Metropolitan Waste Control Commission's response is exhibit 3 in the technical appendix.

9.03 Letters have also been sent to the State Planning Agency and the Metropolitan Council concerning any possible conflicts with land-use plans.

9.04 A preliminary recreation use study was conducted in the summers of 1975, 1976, and 1977 to determine the number and type of recreation craft that used the lock on weekdays and holidays. Observers were stationed at upstream and downstream vantage points to observe approaching pleasure craft to see if they used the lock. The observers reported that boats would wait two or three hours to use the lock and would then decide not to wait longer for lockage due to the line of barges ahead of them waiting passage through the lock. Rehabilitation of the riverward lock, with its reduced draft, would ideally serve the recreation craft, keep them separated from the commercial traffic, and reduce the waiting period for lockage for both commercial and recreation craft. Many craft used the island downstream of the lock while waiting for passage through the lock.

9.05 Letters have been sent to the following entities regarding the existence of any known archaeological, historic, or prehistoric sites in the project area: the National Park Service, the State Historic Preservation Officer (Historical Society), the State Archaeologist, and the Office of Archaeological and Historic Preservation.

9.06 In cooperation with Mr. Alfonso Perez of the Minnesota Pollution Control Agency, the Corps conducted a survey to determine the background noise levels in the project area and Mr. Perez has summarized these data. His assistance and that of the MPCA is gratefully acknowledged.

9.07 During Phase A, navigation traffic and benefit studies were made to determine the economic impact on navigation interests by interrupting the lockage service for the four alternative plans of rehabilitation. Major shippers using pool 1 were consulted and interviewed by a St. Paul District staff economist from 2 to 11 October 1974. Additional office information obtained during previous studies unrelated to Locks and Dam No. 1 was also utilized in evaluating user disadvantages. A total of five corporations were contacted. The corporations included

the present lease holder of the Minneapolis Municipal Terminal, which handles most of the general cargo in pool 1; the principal Twin City handle-generating utility; a Twin City metro sand and gravel operator; and the two largest grain movers in pool 1--one of which specializes in transportation for smaller grain movers and custom houses. Two letters were also received in confidence from pool 1 users for consideration in selecting an alternative and in the decision making process. The participants agreed unanimously that Locks and Dam No. 1 is in need of repair and should be rehabilitated to prevent the interruption of navigation due to a breakdown of equipment or failure of a portion of the lock. A public meeting describing the proposed rehabilitation was held on 12 January 1978 in Minneapolis.

9.08 The requirement of the Fish and Wildlife Coordination Act Report has been fulfilled by the U.S. Fish and Wildlife Service (see page 66a).

9.09 This final environmental impact statement was written using an environmental assessment prepared by Harza Engineering, Co., Chicago, under contract with the St. Paul District, Corps of Engineers.

9.10 Copies of the draft environmental impact statement were furnished to the following known interests for review and comment:

- U.S. Environmental Protection Agency
- U.S. Department of Agriculture
- U.S. Department of Commerce
- U.S. Department of Health, Education and Welfare
- U.S. Department of Housing and Urban Development
- U.S. Department of the Interior
- U.S. Department of Transportation
- Advisory Council on Historic Preservation

- Minnesota Department of Agriculture
- Minnesota Department of Business
- Minnesota Department of Economic Development
- Minnesota Department of Health
- Minnesota Highway Department
- Minnesota Department of Manpower
- Minnesota Department of Natural Resources
- Minnesota State Park Commission
- Minnesota State Planning Agency
- Minnesota Environmental Quality Board
- Minnesota Pollution Control Agency
- Minnesota Recreation and Park Administration Department
- Minnesota Department of Taxation
- Minnesota State Archaeologist
- Minnesota Historical Society
- Minnesota Water Resources Board

- Environmental Quality Council, Citizens Advisory Committee,
Minnesota
- Friends of the Earth, Minnesota Branch
- Izaak Walton League of America, Minnesota Division
- League of Minnesota Cities
- Minnesota Environmental Control Citizens Association

Minnesota League of Women Voters
Minnesota Public Interest Research Group
National Audubon Society, North Midwest Regional Office
The Nature Conservancy, Minnesota Chapter
Minnesota Waterfowl Association
Soil Conservation Society of America
Wildlife of America
Northern Environmental Council
Sierra Club, Northstar Chapter

9.11 Copies of the draft statement were also sent to the following libraries, to be held as reference material available to the general public for review:

Legislative Library
State Capitol
St. Paul, Minnesota

Minneapolis Public Library
Environmental Conservation Library
and Document Division
300 Nicollet Mall
Minneapolis, Minnesota

University of Minnesota
Government Publications Division - M
409 Wilson Library
Minneapolis, Minnesota

University of Minnesota
Agricultural Library
Documents Division
St. Paul Campus
St. Paul, Minnesota

Document Collection
St. Paul Public Library
St. Paul, Minnesota

9.12 Comments on the draft statement were received from the following:

U.S. Environmental Protection Agency
U.S. Department of Agriculture-Forest Service
U.S. Department of the Interior

U.S. Department of Transportation
U.S. Coast Guard
Federal Highway Administration
U.S. Federal Energy Regulatory Commission

Minnesota Department of Natural Resources
Minnesota Environmental Quality Board
Minnesota Pollution Control Agency

Metropolitan Council

9.13 Single copies of this final environmental impact statement are available upon request from the St. Paul District Office, Corps of Engineers, 1135 U.S. Post Office and Custom House, St. Paul, Minnesota 55101.

GLOSSARY

Cofferdam:	a temporary inclosure built in water to enable the interior area to be pumped dry to expose the bottom so that construction can be undertaken.
Disbenefits:	additional costs to users, in this case due to temporary closure of the locks during construction activities.
Jackhammer:	a pneumatically operated hammer used to break up concrete.
Monoliths:	sections of the lock walls built as a unit.
Steel Sheet Pile:	a length of steel that is driven into the ground and interlocks with adjacent piles to create a continuous wall.
Crib Wall:	a wall constructed of interlocking structural members to form a rectangular frame filled with earth. The finished crib wall resembles a log cabin filled with earth.
Hawser:	a large line or rope used to move barges or boats.
Grout:	a thick mortar (usually a cement mix) used to fill cracks and voids in rock or soil.
Flocculent:	a substance used to cause fine particles suspended in water to clump together and settle to the bottom.
dBA:	a unit of sound level.
L ₁₀ :	a sound level, expressed in dBA, which is exceeded 10 percent of the time for a one hour survey.
L ₅₀ :	a sound level, expressed in dBA, which is exceeded 50 percent of the time for a one hour survey.

**LETTERS of COMMENT
and
CORPS RESPONSES**



UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

MAR 2 1978

Colonel Forrest T. Gay, III
District Engineer
Department of the Army
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

RE: 78-006-194
D-COE-F36054-MN

Dear Colonel Gay:

We have completed our review of the Draft Environmental Impact Statement (EIS) for the Rehabilitation of Locks and Dam No. 1 in Minneapolis, Minnesota. Colonel Hene's letter of January 5, 1978 requested our views and comments on the proposed rehabilitation project. The information provided in the EIS did not provide an adequate discussion to determine if the impacts of the project will be significant. Our comments follow:

The major concern we have with this rehabilitation project is the potential increase in sediment loads. The construction and removal of the cofferdams will cause increased turbidity. In order to minimize the amount of turbidity, a silt curtain or some other measures should be investigated to minimize the amount of sediment discharged into the Mississippi River. The EIS has said that during the period of removal of the cofferdam, the sand will be removed hydraulically. The EIS should address the issue of the effect of dredge overflows upon water quality and what steps will be taken to minimize such impacts.

The EIS said that the rehabilitation work will take place during two winter periods. This method of construction was chosen since there would be no interference with navigation. Some clarification needs to be made in regard to this construction method and the cofferdams. The EIS should clarify whether or not there will be any removal of the cofferdams after the first phase of rehabilitation work. If portions of the sheet pile and cofferdams must be removed, the impacts upon the water environment will occur twice. To minimize these impacts, consideration should be given to doing the entire rehabilitation work at one time. This may interfere with navigation to some extent but the time needed for the rehabilitation may not take as long as estimated. If the work takes place as it appears to be described in the EIS, some duplicative work would seem to be involved.

CORPS RESPONSES TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY

1. The cofferdams would be placed in an area where the channel bottom has very little fine material. The fill material would consist of sand and gravel (see paragraph 1.10). A silt curtain works best in areas where there is very little current. Since a silt curtain does not trap suspended material, but merely allows it to settle to the bottom of the channel, the material would undoubtedly be pushed downstream the first time the locks were used for navigation. Therefore, the use of a silt curtain would not be very practical. (The use of a silt curtain is also discussed in the Corps response to the Department of the Interior's letter, comment number 5.)

The fill material would be removed by hydraulic dredge and placed in barges. It would be removed slowly to allow the water to drain off and as much as possible would be removed to minimize the amount that could be deposited in the river. (See also the Corps response to the Minnesota Pollution Control Agency letter, comment number 1.)

2. The Corps anticipates that the cofferdam would be used, and the locks dewatered for two consecutive winters. Portions of the cofferdams would be removed in the spring after the first closure to allow summer navigation. The Corps anticipates that two 5-month winter seasons would be needed to complete the rehabilitation. Closing the locks from 1 December to 1 May would not seriously impact navigation; however, closing the locks for a longer period would seriously interfere with navigation and be undesirable to shippers.

The effects of removing and replacing portions of the cofferdams are not expected to be significant since the area provides poor habitat for spawning and has relatively low water quality.

3 The EIS should also address the water quality impacts which would occur between May 1980 and December 1980. This is the period when rehabilitation work will not take place at Locks and Dam No. 1. Erosion control and methods at the site should be described.

4 Since fuel oil will be stored at the site, spill prevention and control methods should be described. The size and type of storage containers should be provided.

5 The EIS said that water seepage from inside the locks would either be discharged directly to the river or to the sewage lift station. The factors which determine where the water seepage will be discharged should be discussed.

6 Adverse noise impacts will result from truck noise. Since there is the potential for 24-hour construction, noise impacts may be significant. The exact route should be provided along with the number of trucks per day and a description of the impact neighborhood.

Based upon our review and the comments made, we have environmental reservations on the proposed project. These reservations can be satisfied if the information requested indicates that the impacts will not be significant. The date and classification of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of other agencies' projects.

We appreciate the opportunity to review this Draft EIS. When the Final EIS is filed with the Environmental Protection Agency, Office of Federal Activities in Washington, D.C., please forward three copies to us. If you or your staff have any questions in regard to our comments, please contact Mr. William D. Franz at 8/353-2307.

Sincerely,


Susan P. Walker, Chief
Environmental Impact Review Staff
Office of Federal Activities

3. While the locks are in operation, other work would continue: a new control house would be built, machinery would be replaced and new electrical systems would be installed. Due to the level topography and hard surfaced roads, erosion is not expected to be a problem during the summer. If erosion problems do arise, however, measures would be taken to control them.

4. Paragraph 1.08 discusses fuel storage. The storage location has not been finalized, but when a decision has been made, it will be discussed with the landowner. Measures to prevent unauthorized use of fuels and vandalism would be implemented. Care would be taken to prevent spills. During the Specifications stage of project planning, the amount of fuel needed would be determined. If the amount of fuel stored is in excess of the quantity allowed in 40 CFR Sec. 112, Oil Pollution Prevention, a "Spill Prevention Control and Countermeasure Plan" will be developed.

5. The cofferdam seepage water and the construction wastewater would be separated by berms and collection ditches. The seepage water would collect in a sump that is separate from the construction area and would be pumped into the river. If contamination should occur, the water would be analyzed to determine if it should be disposed of in the river or pumped directly into the sanitary sewer system.

6. The exact truck routes have not been selected. Most of the construction materials would be brought in by barge, but some supplies would be brought in by truck. Some streets in Minnehaha Park would be used for supply routes and for parking cars. When supply routes are selected, existing truck routes would be used wherever possible and residential areas would be avoided wherever possible. As decisions are made about using park property, the proper officials will be notified.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

NORTHEASTERN AREA STATE AND PRIVATE FORESTRY
578 REED ROAD - BRIDGEMAN, PA. 19008
(215) 596-1672

1950
March 8, 1978



Walter L. Heme, Lieutenant Colonel, CE
Acting District Engineer
Dept. of the Army
St. Paul District, COE
U. S. Post Office & Custom House
St. Paul, MN 55101

Refer to: MCSSED, ER
Draft Environmental Statement
Rehabilitation of Locks and Dam No. 1

Dear Colonel Heme:

We believe that the Final Statement should include a description of measures to mitigate loss of vegetation on the island below the dam, and on the shoreline. Certain vetches, willows, clovers, and grasses can be planted, or sowed, and mulched to control erosion and improve aesthetics. Local Department of Natural Resources, Soil Conservation Service or County Agent staff naturalists could help to select a revegetation plan.

Thank you for the opportunity to review this statement.

Sincerely,

A. O. Vandenberg
DALE O. VANDENBERG
Staff Director

Environmental Quality Evaluation

CORPS RESPONSES TO THE U.S. DEPARTMENT OF AGRICULTURE

1. The proposed action no longer includes the use (or excavation) of the island. Therefore, the existing island vegetation would not be affected. The east bank of the river would not be affected. The vegetation around the locks, consisting of six American elm trees and grass, would be removed. A landscaping plan involving planting trees, shrubs, forbs, and grass is included in the proposed action.

FEDERAL ENERGY REGULATORY COMMISSION

REGIONAL OFFICE

Federal Building - Room 3130
230 South Dearborn Street
Chicago, Illinois 60604

CORPS RESPONSES TO THE FEDERAL ENERGY REGULATORY COMMISSION

1. A meeting with shippers and users was held on 2 May 1975 to describe the proposed activities. The closure of the locks from 1 December through 1 May was the period selected as having the lowest adverse effects. Users will be notified of work schedules for the rehabilitation of locks and Dam No. 1 and the times of lock closures.

February 21, 1978

Your Reference: NCSED-ER

District Engineer
St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Sir:

We have reviewed the Draft Environmental Impact Statement dated January 1978 for the "Rehabilitation of Locks and Dam No. 1, Minneapolis, Minnesota" on the Mississippi River furnished us with a letter dated January 5, 1978, for which our comments were requested.

Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our principal concern with developments affecting land and water resources is the possible effect of such developments on bulk electric power facilities including potential hydroelectric developments and on natural gas pipeline facilities.

We have reviewed the draft statement to determine if coal deliveries to any steam electric plants will be affected because of the proposed closing of the locks for rehabilitation during the periods December 1, 1979 through May 1, 1980, and December 1, 1980 through May 1, 1981. Only two steam electric plants will be affected by the proposed closing of the locks. One plant is the "Southeast Plant" of the University of Minnesota, recently purchased from the Northern States Power Company. Currently this plant is out of service and operation is planned to start in 1980 or 1981. The second plant is the "Black Dog Plant" of Northern States Power Company, located on the Minnesota River, receiving coal by barge through the locks from a rail-barge transfer dock above the dam.

In our discussions with personnel responsible for fuel planning for each of these plants, concern was expressed that they be informed continuously on schedules for the closing of the locks. In each case,

2. We have added these names to our mailing list.

1 it was emphasized that fuel contracts must be planned far enough in
(cont.) advances to provide for alternate transportation, if necessary, to
ensure adequate and continuous fuel supply.

2 In view of the concern of personnel at each plant, we suggest that
your office add the following names to the mailing list for all sub-
sequent material releases on the subject program:

Mr. Warren Soderberg
Director of Physical Plant
University of Minnesota
Room 200 Shops Bldg.
319 - 15th Avenue S.E.
Minneapolis, Minnesota 55455

Phone: (612) 373-4521
FIS : 8-786-4521

Administrator Fuel Procurement Dept.
Northern States Power Company
414 Nicollet Mall - 8th Floor
Minneapolis, Minnesota 55401

(Note: Our contact was Mr. David Peterson, (612) 330-6121.
However, because of current changes in personnel,
no name is given).

Thank you for the opportunity to comment on the Draft Environmental
Impact Statement.

Very truly yours,

Bernard D. Murphy
Bernard D. Murphy
Regional Engineer



United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
2310 DEMAREST STREET
DES PLAINES, ILLINOIS 60018

ER 78/35

March 6, 1978

Colonel Forrest T. Gay, III
District Engineer
U.S. Army Engineer District,
St. Paul
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Gay:

This responds to Lt. Colonel Heme's letter of January 5, 1978 requesting our review of the draft environmental impact statement for Rehabilitation of Locks and Dam No. 1, Minneapolis, Minnesota.

It should be noted that these comments are provided considering a modification to the proposed project described in a meeting on February 10, 1978 between Mr. Robert Anfang of the U.S. Army Corps of Engineers, St. Paul District Office, and Mr. John Wolf of the U.S. Fish and Wildlife Service. The modifications noted involve the change in location of the cofferdam below the locks. It is understood that the cofferdam is now proposed to transect the lower approach to the locks from the shoreward guide wall to the rock guard dike. This modification eliminates encroachment upon aquatic and terrestrial (island) habitat riverward of the rock guard dike.

The U.S. Department of the Interior finds the draft environmental statement inadequate and provides the following comments for your consideration in the preparation of the final environmental impact statement:

Page 12, Paragraph 1.17 - Cofferdam Construction --
It is noted that cofferdam sewage water would be pumped directly back into the river. However, figure 7 notes that a settling basin is in the project design. The narrative does not describe the settling basin or predict the degree of settling that is likely to occur. It is suggested the settling basin be further addressed in the final environmental statement

1. As now proposed, the project would not affect the island. The new location of the lower cofferdam is shown in Figure 7.

2. The conceptual design of the seepage and construction water disposal facilities is described in paragraphs 1.13 and 1.15 and shown in Figures 6 and 7. Detailed design of the facilities would be developed during the Plans and Specifications stage of the project. As noted earlier, the seepage water and construction waste water would be kept separate. The amount of settling is not known, but some would take place in both sumps. This material would be removed manually and disposed of.

CORPS RESPONSES TO THE U.S. DEPARTMENT OF THE INTERIOR

Page 24, Paragraph 2.48 - Rare, Endangered or Threatened Species -- The endangered species Lampsilis higginsii is noted as a species which might occur in the project area. It is the responsibility of the Corps of Engineers to ascertain if an endangered species or their habitats will be affected by the proposed activity. This issue should be addressed in the Final EIS. If it is determined that the proposed project could adversely affect Lampsilis higginsii, the District should initiate the formal consultation process through the Regional Director, U.S. Fish and Wildlife Service, to insure compliance with the provisions of Section 7 of the Endangered Species Act of 1973. These comments do not constitute a request for formal consultation procedure.

Page 28, Paragraph 2.63 - Sport Fishing -- This section references a "critical area" without defining the extent of the area. It is suggested that the critical area be described.

Page 30, Paragraph 4.02 - Interior Drainage Facilities -- This section states that flocculants may be used in the sewage water. It should be noted that many flocculants are highly toxic to aquatic organisms. Therefore, care should be used in both selection and use of a flocculant. Further consideration should be given to the use of silt curtains to minimize an extensive turbidity/sediment plume.

Page 30, Paragraph 4.03 - Interior Drainage Facilities -- It is stated that construction wastewater will be pumped into the Minneapolis sewer system at Normandale Boulevard and 47th Street. However, the type of sewer system is not noted. Since sanitary, storm and combined sewer systems exist in the Twin Cities Metropolitan Area, the type of sewer collection system should be noted. Also, the effects of the pollutants in the wastewater on the processing capacity of the sewer facilities should be addressed.

Page 30, Paragraph 4.05, 4.06, 4.07 - Impacts on Aquatic Ecosystems and Water Quality -- As noted, the major biological impact of the project will be the disturbance of aquatic biota. This impact will be the result of increases in turbidity and sediment load. The document provides little concrete information to determine the extent to which this impact will occur. The construction schedule indicates that construction activities, particularly removal of the cofferdam, will occur during the spring. This period coincides with the primary spawning

3. Paragraph 2.48 has been modified. The Corps has conducted a mollusk study of the Upper Mississippi River and no specimens of Lampsilis higginsii were found in the area of Locks and Dam No. 1.
4. The use of the word "critical" was not appropriate and has been eliminated.
5. Only approved flocculants would be used and the manufacturer's specifications would be followed. Silt curtains are most effective when used where there is little current. In addition to problems with the culvert, the silt curtain would just deposit the material on the channel bottom downstream of the lock gates where it would be subject to lock discharges which would push the material further downstream. As much of the fill material as possible would be removed from the cofferdam cells, thereby reducing turbidity problems. Also, the fill material is clean sand and gravel and the channel bottom is relatively free of fine material in the cofferdam area. (See also the response to comment number 1 in the Environmental Protection Agency letter.)
6. Sanitary sewer systems would be utilized. The proposed construction wastewater disposal method utilizing the sanitary sewer system has been coordinated with the city of Minneapolis and the Waste Control Commission (see also paragraph 9.02).
7. The cofferdams must be removed by 1 May to open the locks for shipping. The winter construction schedule is very tight and all of the 3-month period of closure would probably be needed. Turbidity is expected to increase when cofferdams are removed but the increase is not expected to be great. The fill material would consist of sand and gravel, thereby reducing turbidity. The adult fish species would not be affected by the turbidity while some of the eggs could be destroyed. However, since the project area is poor spawning habitat (paragraph 2.50), impacts to the fishery are not expected to be large.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

IN REPLY REFER TO:
LMR

ER--78/35

OCT 18 1978

Colonel Forrest T. Gay III
District Engineer
U.S. Army Engineer District
St. Paul
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Colonel Gay:

This is in regard to the rehabilitation of Lock and Dam 1, Minneapolis, Minnesota.

As noted in a telephone conversation between Mr. Robert Anfang of the St. Paul District Corps of Engineers and Mr. John Wolfelin of the U.S. Fish and Wildlife Service on October 3, 1978, the Corps requires notification from the Service that the project has been developed in accordance with the Fish and Wildlife Coordination Act. Fish and Wildlife Service comments set forth in the Department of the Interior letter of March 6, 1978, represent this intent.

Therefore, Department of the Interior comments dated March 6, 1978, can be referenced as submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Sincerely yours,

Acting Assistant Director
Director of Environment

Attachment



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

WALTON, JAMES (Jpl/015)
COMMANDER, ST. LOUIS DISTRICT
SECOND CLASS, U.S. COAST GUARD
1000 CHATELAIN STREET
ST. LOUIS, MO 63101

16475
Ser 103
1 February 1978

District Engineer
St. Paul District, Corps of Engineers
ATTN: NCSED-ER
1135 U.S. Post Office and Custom House
St. Paul, MN 55101

Gentlemen:

We have reviewed the draft environmental impact statement for Rehabilitation of Locks and Dam No. 1, Minneapolis, Minnesota. We have no comment to offer on this document.

Thank you for the opportunity to review this environmental impact statement.

Sincerely,

C. B. JOHNSON, JR.

Environmental Protection Specialist
By direction of the District Commander

Copy to:
COMDT (G-WEP-7)
DOT SECREP Region V
DOT (tes), Office of Environmental Affairs



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

REGION 3
18209 DIXIE HIGHWAY
HOMERWOOD ILLINOIS 60430
February 2, 1978

IN REPLY REFER TO
HED-05

U.S. Army Engineer District, St. Paul
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Gentlemen:

The draft environmental statement for the rehabilitation of Locks and Dam No. 1, Minneapolis, Minnesota, has been reviewed and we find the proposed action will not affect the highway system. We, therefore, have no comments to offer.

Sincerely yours,

Donald E. Trull
Regional Administrator

By:

W. G. Emrich

W. G. Emrich, Director
Office of Environment and Design



STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES
CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

DNR INFORMATION
(612) 296-4157

March 7, 1978

Forrest T. Gay III, Colonel
Corps of Engineers
District Engineer, St. Paul Dist.
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Re: ECHSD-RE-DEIS for Rehabilitation
of Locks and Dam #1, Minneapolis,
Minnesota

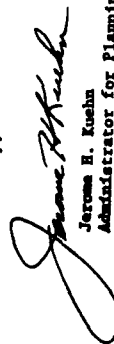
Dear Colonel Gay:

The Department of Natural Resources (DNR) has reviewed the
above cited document and offers the following comments.

Since the proposed project involves renovation of the existing
structure only, we foresee no significant impacts on natural re-
sources. Recreation potential of the site will most likely improve
if the proposed construction of a regional visitor center in the
vicinity will be implemented.

A DNR waters permit will be required. For specific infor-
mation regarding the permit application please contact Ron Harnack,
Regional Hydrologist at (612) 296-7523.

Sincerely,


Jerome H. Kushn
Administrator for Planning

JH/lc

cc. Larry Seymour
Al Wald
Don Carlson
Barb Clark

CORPS RESPONSES TO THE MINNESOTA DEPARTMENT OF NATURAL RESOURCES

1. The Corps has prepared an analysis pursuant to Section 404 of
the 1972 Federal Water Pollution Control Act Amendments. It is also
our intention to seek a State water quality certification. Because
the project does not involve maintenance dredging, no other State
permits are considered necessary.



Minnesota Pollution Control Agency

APR 27 1978

Colonel Forest T. Gay, III
U.S. Army Corps of Engineers
St. Paul District
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Re: Rehabilitation of Lock and Dam No. 1

Dear Colonel Gay:

The Minnesota Pollution Control Agency (Agency) has reviewed the draft Environmental Impact Statement (EIS) on the Rehabilitation of Lock and Dam No. 1 dated January, 1978 and we have the following concerns regarding the EIS and the rehabilitation work which has been proposed. Our concerns have been listed in relative order of importance to our Agency.

1. We question the use of a hydraulic dredge to fill and empty the cofferdams. We feel that the use of a clamshell, in this instance, would have less water quality impacts than would a hydraulic dredge. It seems that the use of a clamshell would not result in the creation of a turbidity plume and resuspension and redissolution of pollutants, that may be present in the sediment, to the same extent as would occur with the use of a hydraulic dredge.

2. Seepage water and water from the initial dewatering behind the cofferdams will probably not require permits unless the discharge is affected by construction activities. Dewatering should be performed using well points where feasible and practical. Dewatering should be performed so as not to result in increased pollutant levels in the receiving waters. This may require the use of desilting ponds and flocculants to assure that adequate settling and treatment will be provided. Seepage water that will not meet the 28 classification requirements for this section of the Mississippi River should be treated or discharged to the sanitary sewer.

3. The draft EIS was not sent to our Agency with the January mailing which went to other Agencies for comment. We were informed of the existence of the EIS by copy of the comments you received from the U.S. Environmental Protection Agency (EPA). We hope you will include the Agency in all future mailings.

4. The 404(b) evaluation appears to be inadequate from the viewpoint of the guidelines established in the 404(b) implementation guidelines or in 40 CFR 230.

1936 West County Road B2, Roseville, Minnesota 55113
Regional Offices - Duluth / Brainerd /ergus Falls / Marshall / Rochester / Roseville
Local Community Engineer

CORPS RESPONSES TO THE MINNESOTA POLLUTION CONTROL AGENCY

1. The fill material would consist of commercially purchased sand and gravel (paragraphs 1.10 and 1.11). The material would be placed in the cells in slurry form. The fill would be removed by hydraulic dredge and placed in barges. Because the fill material would consist of clean sand and gravel and because it would be removed by placement in barges, the water quality impacts are not expected to be significant. (See also the Corps response to the Environmental Protection Agency, comment number 1.)
2. The interior drainage facilities are described in paragraphs 1.14, 1.15, 4.02, and 4.03. Collection ditches and lined sumps will be used to collect the seepage and construction water. Flocculants will be used when necessary. During the plans and specifications stage of project design, details of the interior drainage system will be formulated. At that time, noise, air, and water monitoring programs will be formulated. The use of well points and desilting ponds will be investigated. Construction wastewater and polluted seepage water will be pumped into the sanitary sewer system.
3. We regret that the Minnesota Pollution Control Agency was inadvertently omitted from the draft EIS mailing list. The MPCA will be included on all future mailings.
4. The 404(b) evaluation has been revised (see appendix).

Colonel Gay
Page Two

CORPS RESPONSES TO THE MINNESOTA POLLUTION CONTROL AGENCY

5. The need for oil and gasoline storage will be determined during the Plans and Specifications stage of project design. If storage is required, it will be done in compliance with MPCA regulation WPC 4 and 40 CFR Part 112. (See response number 4 to the U.S. EPA.)

5 | 5. Oil and gasoline should be stored in compliance with Agency regulation WPC 4.

Thank you for this opportunity to comment. If you have questions, please feel free to contact me or Mr. Louis Flynn of my staff at (612) 296-7225.

Yours truly,

Louis J. Breimhurst

Louis J. Breimhurst, P.E.
Director
Division of Water Quality

LJB/LLF:pa



Metropolitan Council
300 Metro Square Building
Seventh Street and Fifth Street
Saint Paul, Minnesota 55101
Telephone (612) 291-6453
Office of the Chairman

March 15, 1978

Mr. Peter Vanderpoel
Chairman, Minnesota Environmental
Quality Board
Capitol Square Building
550 Cedar Street
Saint Paul, Minnesota 55101

RE: Critical Area Review of Department of U.S. Army (Corps
of Engineers) - Draft EIS on Rehabilitation of Lock and
Dam No. 1, Minneapolis, MN. Metropolitan Council
Referral File Number 5435.

Dear Mr. Vanderpoel:

The Metropolitan Council has reviewed the above referenced project for consistency with the Mississippi River Corridor Critical Area Interim Development Regulations and Standards and Guidelines for Preparing Plans and Regulations as contained in the Governor's Executive Order Number 130 (as amended).

The Saint Paul District, U.S. Army Corps of Engineers has indicated to us that the proposed rehabilitation plan for Lock and Dam No. 1 has been amended since the publication of the draft EIS. A detailed study of the major rehabilitation program for the riverward lock indicates that the benefits would not justify the costs. The program for the riverward lock will be reduced to include only minor physical repairs. This change will be addressed as part of an amendment to the EIS to be published in a few months. The revised rehabilitation program will include a major rehabilitation of the landward lock which will reduce the present 20 minutes filling time in half and reduce lock chamber turbulence. This improvement will increase the operating capacity of the lock and reduce delays for commercial and recreational boat locking.

We find the proposed project is not inconsistent with the Critical Area Interim Development Regulations.

The Standards and Guidelines for Preparing Plans and Regulations require state and regional agencies and local communities to plan for the total river corridor within the Metropolitan Area rather than on a project-by-project basis. As we have indicated in our previous reviews of two other Corps projects along the river corridor, we would like to take

Mr. Peter Vanderpoel
March 15, 1978
Page Two

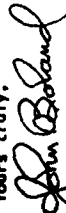
CORPS RESPONSES TO THE METROPOLITAN COUNCIL

1 this opportunity to suggest that the Army Corps of Engineers consider and address the impact of the Critical Area plan standards and guidelines on all of its lands along the Mississippi River within the Metropolitan Area. This would be consistent with the objectives and spirit of the Critical Area and with similar actions to be taken by other state and regional agencies.

The Standards and Guidelines for Plans require that state and local governments enact appropriate water surface use regulations where there is potential conflict among uses.

2 The increased operating capacity of lock and Dam No. 1 would permit increased commercial and recreational boating activity on the upriver pools. The proposed development of the Minneapolis Riverfront Regional Park at the St. Anthony Falls as a recreational destination and expansion of the marina/slip facilities in the Saint Paul reach could generate some of this increase. The draft EIS does not address the impact of the increased lock capacity in terms of the increased potential for conflicts among the various river surface uses, particularly recreation boating and barge transportation. What will be the impact of the increased river use on the scenic and recreational value of proposed and existing public open space areas such as the River Gorge? The Council recommends that these potential conflicts be addressed in the final EIS.

Yours truly,


John Boland,
Chairman

cc: Mr. Clifton Alchinger, Minnesota Environmental Quality Board
Colonel Forest T. Gay III, U.S. Army Corps of Engineers

JB/cjd

1. We concur with the desirability of addressing the Critical Area plan standards and guidelines on lands under our jurisdiction. That review will be accomplished as part of our efforts to update our Master Plan for the Mississippi River Navigation Pools currently scheduled for fiscal year 1979.

2. Although the increased capacity of the locks (in terms of lockages per period of time) will increase recreational use in Pool 1, the River Gorge area, there will be limited impact to the majority of the publicly-owned land areas. Due to the steepness of the gorge, river users will be confined to the river and the various sand flats along shore areas. There would be an increase in noise levels from the increased recreational boating use. This would be an adverse impact to those recreational users seeking quiet.

There also would be increased conflicts between recreational and commercial users of the river. Because the two uses generally occur at different time of the day and on weekends versus weekdays, the potential for conflicts will not be as great as the potential increase in use due to lock rehabilitation.

TECHNICAL

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**ST. PAUL DISTRICT, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY**

**FINAL
ENVIRONMENTAL IMPACT STATEMENT
REHABILITATION OF LOCKS & DAM NO. 1**

TECHNICAL APPENDIX

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Letter from Minnesota State Historic Preservation Officer	A-4
Letter from Metropolitan Waste Control Commission	A-5
404(b) Evaluation	A-6

MCSRD-ER

29 December 1976

ANFANG/jn/5936

Mr. Peter Vanderpool, Director
Minnesota State Planning Agency
101 Capitol Square Building
550 Cedar Street
St. Paul, MN 55101

Dear Mr. Vanderpool:

We are now in the process of preparing a draft environmental impact statement on the rehabilitation of Locks and Dam Number 1, on the Mississippi River, in Minneapolis-St. Paul, Minnesota. The inclosed leaflet provides location and general information on Locks and Dam Number 1.

The statement will discuss the proposed construction activities and the associated environmental impacts. The rehabilitation would involve the resurfacing of the existing lock chambers and replacement of the machinery. Both the riverward and landward locks would be repaired but the rehabilitation would not involve the widening, deepening or lengthening of the existing locks. In order to dewater the locks and provide work space, cofferdams will be constructed in the river adjacent to the locks.

The rehabilitation of the locks would require about 1 1/2 years to complete; however, the locks would only be closed to traffic during a 5-month period from November through March. Construction is anticipated to begin in 1979.

We are asking your cooperation in the identification of any possible conflicts with existing or future land use plans, policies or controls. Please describe any possible conflicts that may result from the proposed action.

Sincerely,

1 Incl
Leaflet

NORMAN C. HINTZ
Lieutenant Colonel, CE
Acting District Engineer

NCSD-ER

29 December 1975

AMFANG/jn/5936

Metropolitan Council
Metro Square Building
7th and Robert Streets
St. Paul, MN 55101

Dear Sir:

We are now in the process of preparing a draft environmental impact statement on the rehabilitation of Locks and Dam Number 1, on the Mississippi River, in Minneapolis-St. Paul, Minnesota. The inclosed leaflet provides location and general information on Locks and Dam Number 1.

The statement will discuss the proposed construction activities and the associated environmental impacts. The rehabilitation would involve the resurfacing of the existing lock chambers and replacement of the machinery. Both the riverward and landward locks would be repaired but the rehabilitation would not involve the widening, deepening or lengthening of the existing locks. In order to dewater the locks and provide work space, cofferdams will be constructed in the river adjacent to the locks.

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We are asking your cooperation in the identification of any possible conflicts with existing or future land use plans, policies or controls. Please describe any possible conflicts that may result from the proposed action.

Sincerely,

1 Incl
Leaflet

NORMAN C. HILTZ
Lieutenant Colonel, GS
Acting District Engineer



IN REPLY REFER TO:

L7619 MWR PE

United States Department of the Interior

NATIONAL PARK SERVICE

MIDWEST REGION
1709 JACKSON STREET
OMAHA, NEBRASKA 68102

JAN 11 1977

Lieutenant Colonel Norman C. Hintz
Acting District Engineer
Corps of Engineers
1135 U.S. Post Office
St. Paul, Minnesota 55101

Dear Colonel Hintz:

We are pleased to note in your letter of December 27, 1976 (your reference NCSED-ER) that a cultural resource review is being conducted of the area that would be affected by the rehabilitation of Lock and Dam Number 1 at Minneapolis, Minnesota.

No existing or proposed unit of the National Park System or any National Landmark would be affected by the proposed action.

Any cultural resources encountered during project development should be evaluated in accordance with the Procedures for the Protection of Historic and Cultural Properties set forth in 36 CFR Part 800.

Sincerely yours,

Merrill D. Beal
Regional Director





MINNESOTA HISTORICAL SOCIETY

690 Cedar Street, St. Paul, Minnesota 55101 • 612-296-2747

15 February 1977

Mr. Norman C. Hintz
Lieutenant Colonel, CE
Acting District Engineer
Department of the Army
St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

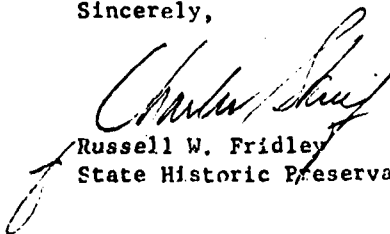
Dear Mr. Hintz:

RE: NCSED-ER
Rehabilitation of Lock and Dam
Number 1, Mississippi River
Minneapolis-St. Paul, Minnesota

Thank you for your letter of December 27, 1976, in which you ask for the State Historic Preservation Officer's comments on the proposed rehabilitation of Lock Dam Number 1 on the Mississippi River in Minneapolis-St. Paul. The lock and dam have contributed greatly to the commercial and transportation life of the Upper Midwest. This is a fact of which the Corps of Engineers, more than any other government agency, is well aware. The work that is proposed for the lock and dam which is described very briefly in your letter should not affect the historic character of the site. Moreover, the work will not have any effect on any other sites of historic, archaeological, architectural, or cultural value.

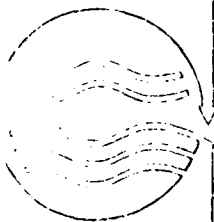
I hope that this letter is sufficient for your purposes. If not please do not hesitate to contact this office.

Sincerely,


Russell W. Fridley
State Historic Preservation Officer

RWF/fr

MINNEAPOLIS
WASTE
CONTROL
COMMISSION



July 21, 1977

Mr. Forest T. Gay, III
Colonel, Corps of Engineers
District Engineer
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Re: Comments on Draft Environmental Impact Statement on the
Disposal of Construction Wastewater at Ford Dam

Dear Mr. Gay:

This is in response to your letter of July 6, 1977 for comments on the draft statement and the interior drainage water, cofferdam seepage water and construction wastewater at the Ford Dam.

We have no objections to your proposed discharge of the interior drainage and cofferdam seepage water back into the river unless it is in substantial quantities which could affect our sampling program for monitoring the river. We do not have the necessary quantity of discharges to evaluate the possible effects and expect to find such information in the draft environmental impact statement.

The discharge of the construction wastewater to the Minneapolis sanitary collection system is a viable alternative providing the contract documents require good construction housekeeping practice and is enforced by construction inspection. The facilities at your Locks and Dam are presently served by an on-site disposal system. Since it is proposed to construct a sanitary line from the dam to the Minneapolis sanitary collection system, it would seem to be prudent planning to construct this sanitary line as a permanent line and connect the dam's sanitary facilities to the Minneapolis system.

Our comments are made without the benefit of viewing the specifications and are, therefore, preliminary at this time. We request the future submission of final plans and specifications to us for our review and approval.

Very truly yours,


Richard J. Dougherty
Chief Administrator

RJD:CRP:hw

10 METRO/OUNRE BLDG.
7TH & ROBERT/1ST FL
MINNAPOLIS, MINN 55401
612 222-4425

A-5

EXHIBIT 5

404b Evaluation of
Rehabilitation of Locks and Dam No. 1

The information in this evaluation is summarized from the environmental impact statement (EIS) on the project.

1. Project description

a. Description of the proposed discharge of dredged or fill materials.

1) General characteristics of material - Clean sand and gravel would be used as fill. Clean sand contains less than 1 percent (#200 sieve) of fine material. Gravel contains 0.3 percent particles that pass a #50 standard sieve.

2) Quantity of material proposed for discharge - Approximately 9,700 cubic yards will be required for cofferdam fill and 11,000 cubic yards will be needed for weighting berms.

3) Source of material - Fill material will be commercially purchased from local sources.

b. Description of the proposed disposal site(s) for dredged or fill material.

1) Location (include map) - Both cofferdams and fill material will be placed in the immediate vicinity of the locks within 200 feet of the lock gates. (See figures 6 and 7 in the EIS.)

2) Type of disposal site(s) - The fill will be placed in 28-foot diameter steel sheet pile cells. The locks would then be unwatered and weighting berms placed near the foot of the cofferdam on the channel bottom. Sites for the disposal of material used for the cofferdam fill and the weighting berm have not been selected. Areas considered for disposal include sanitary landfills and upland areas. Disposal sites would be coordinated with affected interests.

3) Method of discharge - The cofferdam fill will be placed and removed in slurry form by the use of a hydraulic dredge. The weighting berm will be placed and removed by clamshell dredge or similar method.

4) When will disposal occur? - At the present time, it is anticipated that sheet pile will be driven starting about June 1979. Portions of the cofferdam will be removed to allow for 1980 river navigation. The locks will be dewatered by use of cofferdams from 1 December 1979 to 1 May 1980 and 1 December 1980 to 1 May 1981. All cofferdam fill material will be removed in the summer of 1981. (See figure 8 in the EIS.)

5) Projected life of disposal site(s) - The cofferdams and disposal sites will not be utilized after the project is completed.

6) Bathymetry (if open water disposal) - The fill material will be placed in an area that is relatively flat and consists mostly of a level rock substrate.

AD-A121 183

FINAL ENVIRONMENTAL IMPACT STATEMENT REHABILITATION OF
LOCKS AND DAM NUMBER 1 MINNEAPOLIS MINNESOTA(U) CORPS
OF ENGINEERS ST PAUL MN ST PAUL DISTRICT JUL 78

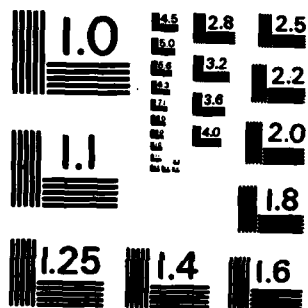
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

2. Physical effects (40 CFR 230.4-1 (a)).

a. Potential destruction of wetlands - Effects on (40 CFR 230.4-1 (a) (i-vi)):

1) Food chain production - Not significant. High quality productive habitat would not be affected and destruction of aquatic organisms will be minor.

2) General habitat - Not significant. The area affected is low value aquatic habitat.

3) Nesting, spawning, rearing, and resting sites for aquatic or land species - Local disturbance of the aquatic biota in the construction area is not expected to be serious. The major effects would be felt downstream (within 3.5 miles of the locks) and would result from short-term increases in turbidity. Some local disturbance of terrestrial organisms is expected due to equipment placing and removing the fill material.

4) Those areas set aside for aquatic environment study, sanctuaries, or refuges - Not applicable. These areas are not present in the project area.

5) Natural drainage characteristics - Not applicable. Drainage characteristics of the area would not be affected.

6) Sedimentation patterns - Turbidity increases are not expected to be as dramatic as those resulting from dredging activities. The cofferdam fill and cofferdam will be removed during periods of high flow when dilution is greatest. The construction area is close to the locks, and the bottom sediments are fairly clean of fine materials. The placement of fill material will result in some sedimentation; however, major sedimentation patterns in the area would not be affected.

7) Salinity distribution - Not applicable. Salt water systems would not be affected.

8) Flushing characteristics - Not applicable. The fill would not affect the flushing characteristics of wetlands.

9) Current patterns - Not significant. The majority of the river flow is in the main channel which will not be affected by the project.

10) Wave action, erosion or storm damage protection - Not significant. Placement of fill material would not affect these factors.

11) Storage areas for storm and floodwater - Not applicable. Wetland storage areas are not present in the area.

12) Prime natural recharge areas - Not applicable. Prime natural recharge areas are not present.

b. Impact on water column (40 CFR 230.4-1 (a) (2)).

1) Reduction in light transmission - Increased turbidity would have minor effects on light transmission.

2) Aesthetic values - The fill material would have short-term aesthetic impacts. Since aesthetics is a matter of personal preference, the presence of cofferdam and fill material could be undesirable to some people.

3) Direct destructive effects on nektonic and planktonic populations - Direct destruction of these populations will be minor. Due to the lack of fine sediments, the existing water quality, and the poor spawning habitat in the construction area, these impacts would not be significant.

c. Covering of benthic communities (40 CFR 230.4-1 (a) (3)).

1) Actual covering of benthic communities - Benthic studies show that the construction area is remarkably devoid of macroinvertebrates. Covering of benthic communities would be minor.

2) Changes in community structure or function - Not significant. The fill material is temporary and is not conducive to habitation by organisms.

d. Other effects (40 CFR 230.4-1 (a)).

1) Changes in bottom geometry and substrate composition - The cofferdams and fill material would be temporarily placed in the channel. Upon removal, the bottom geometry essentially would be the existing conditions.

2) Water circulation - The construction activities would be restricted to the navigation channel and would not affect water circulation in the main channel which is located on the other side of an adjacent island. In addition, the cofferdams would be in place during the winter season when the locks are normally closed.

3) Salinity gradients - Not applicable. Salt water systems are not affected by the project.

4) Exchange of constituents between sediments and overlying water with alterations of biological communities - The material, consisting of sand and gravel, would not be conducive to habitation by organisms and thus the impacts would not be significant. Therefore, alteration of biological communities would not occur.

3. Chemical-biological interactive effects (40 CFR 230.4-1 (b)).

a. Does the material meet the exclusion criteria? - Yes. The material meets the criteria specified in 40 CFR 230.4-1 (b) (1) (i) in that it is composed of sand and gravel with particle size larger than silt.

b. Water column effects of chemical constituents (Elutriate test optional but recommended) (40 CFR 230.4-1 (b) (2)). Are contaminants released? If so, at what levels? - The fill material would consist of sand and gravel free of contaminants. The process of placing the steel sheet pile cells would disturb some sediments. Localized algal blooms at the site may result from the release of nitrogen and phosphorus. Organic nitrogen is expected to settle out of the water column and toxic levels of ammonia are usually found only in lentic systems. Significant quantities of toxic materials would not be released into solution during dredging and disposal operations. In general terms, when conditions are aerobic and organic matter is present (as in the present case), heavy metals released by substrate disturbance are bound or scavenged to a precipitate

stage where they then resettle with little apparent effect. Chlorinated hydrocarbons tend to be strongly sorbed by sediment. Muddy waters have a large capacity to assimilate these contaminants. Therefore, these impacts are not expected to be significant.

c. Effects of chemical constituents on benthos (40 CFR 230.4-1 (b) (3)) - Removal of the cofferdam structures will introduce some sediments into the water column. The high rate of flow, the relatively slow rate of removal of sheet piles, the coarse fill material, and the lack of fine materials on the channel bottom will combine to reduce the physical impact of this activity. Most of the toxic organic compounds found in the sediments are adsorbed and settle out rather than going into solution; thus, they are less available to aquatic ecosystems.

4. Description of site comparison (40 CFR 230.4-1 (c)).

a. Total sediment analysis (40 CFR 230.4-1 (c) (1)) - Sediment sieve analysis determined that 80 percent of the particles ranged in size from 0.1 mm to 0.5 mm (fine to medium sand). Only 14 percent, by weight, consisted of silt or clay. Although chemical analysis showed high concentrations of heavy metals and chlorinated hydrocarbons, the concentrations were not unreasonable for urban river segments.

b. Biological community structure analysis (40 CFR 230.4-1 (c) (2)) - The fill material would have no effect on terrestrial organisms. Aquatic organisms are relatively scarce in the area. Some macroinvertebrates would be buried by the fill material but recolonization would take place following construction. The impacts of fill placement on aquatic or terrestrial organisms would not be significant.

5. Review applicable water quality standards.

a. Compare constituent concentrations - In general terms, the water quality of pool 2 is good from Locks and Dam No. 1 to the Metropolitan Sanitary District's outfall. Bacteria loads are frequently high, due to urban runoff and sewer discharges, and are of sufficient concern to warrant restricting water contact recreation in the area. Dissolved oxygen levels are high, often exceeding saturation. The Mississippi River in the project area has been classified into Category 2B for Fisheries and Recreation, and Category 3B for Industrial Consumption by the Minnesota Pollution Control Agency.

b. Consider mixing zone - Seepage into the interior drainage facilities is estimated to be about 830 gallons per minute. Based on formulas presented in "Biological methods for the assessment of water quality" (American Society for Testing and Materials. Tech. Pub. 528. 1973. 256 p.), the mixing zone would be within about 1000 feet of the discharge. The discharge will take place during periods of high flow, when dilution and transport factors are greatest. The construction waste water and cofferdam seepage water will be kept separate by the use of collection ditches and berms. The seepage water will be pumped back into the river. The construction waste water will be pumped into the Minneapolis sewer system. Large debris will be removed to a sanitary landfill.

c. Based on a and b above, will disposal operation be in conformance with applicable standards? - Turbidity levels will probably temporarily exceed State standards during the placement and removal of the cofferdam and fill material. This effect will be temporary and will be confined to within 3.5 miles (probably much closer) of the construction area.

6. Selection of disposal sites (40 CFR 230.5) for dredged or fill material.

a. Need for the proposed activity - The rehabilitation of the locks requires access to and work space in the lock area. This would have to be accomplished by constructing cofferdams and dewatering the locks.

b. Alternatives considered - The locks must be dewatered to allow for access and work space. Various sizes and locations of cofferdams and fill material were analyzed based on the anticipated construction needs and impacts.

c. Objectives to be considered in discharge determination (40 CFR 230.5 (a)).

1) Impacts on chemical, physical, and biological integrity of aquatic ecosystem (40 CFR 230.5 (a) (1)) - Impacts on these parameters would not be significant.

2) Impact on food chain - There would be none or minor temporary impacts on the diversity or abundance of plant and animal species.

3) Impact on diversity of plant and animal species - The project would have minor temporary impacts on the diversity of plant or animal species. Localized algal blooms may develop, and some aquatic organisms may be temporarily affected.

4) Impact on movement into and out of feeding, spawning, breeding, and nursery areas - The area where construction activities will take place is relatively poor spawning habitat. The east channel and further downstream provide better habitat. Turbidity would result in some impacts to young fish downstream. Considering the species of fish present and the existing water quality, these impacts are not expected to be significant.

5) Impact on wetland areas having significant functions of water quality maintenance - Not applicable. No wetlands will be affected.

6) Impact on areas that serve to retain natural high waters or floodwaters - Not applicable. No water storage areas would be affected.

7) Methods to minimize turbidity - The use of clean sand and gravel as cofferdam fill material and weighting berms will minimize impacts on aquatic organisms and reduce effects on water quality parameters such as turbidity.

8) Methods to minimize degradation of aesthetic, recreational, and economic values - The use of sand and gravel as fill material will result in less turbidity and therefore fewer aesthetic and recreational (fishery) impacts. The use of separate sump systems for construction and seepage water will minimize water quality impacts.

9) Threatened and endangered species - No Federal or State threatened or endangered species of plants or animals are in the project area.

10) Investigate other measures that avoid degradation of aesthetic, recreational, and economic values of navigable waters - The proposed project minimizes impacts and does not result in significant adverse impacts to the environment.

d. Impacts on water uses at proposed disposal site (40 CFR 230.5 (b) (1-10)).

1) Municipal water supply intakes - The proposed project does not impact municipal water supplies.

2) Shellfish - Not significant. Few shellfish are present in the area. Impacts to shellfish would not be significant.

3) Fisheries - The direct impacts of fill placement will not be significant. Some minor indirect impacts will result from turbidity.

4) Wildlife - The construction equipment associated with the placement of fill would temporarily disturb some wildlife.

5) Recreation activities - The cofferdam, fill material, and associated equipment would affect some of the recreational activities (fishing and camping) and aesthetic qualities of the area. These impacts would be temporary.

6) Threatened and endangered species - No Federal or State threatened or endangered species of plants or animals are in the project area.

7) Benthic life - The fill material will be placed in an area that is essentially devoid of benthic life and as such would not result in any impacts.

8) Wetlands - Wetlands would not be affected.

9) Submersed vegetation - Submersed vegetation is not present at the location of the cofferdam or fill material. Turbidity may have minor impacts on vegetation near the mouth of Minnehaha Creek.

10) Size of disposal site - The size of the disposal site either by itself or in combination with other disposal sites would have minor environmental impacts in the project area.

11) River Basin Plans (40CFR 230.3 (e)) - The disposal material would not affect any river basin plan. The proposed rehabilitation would maintain the existing conditions.

e. Considerations to minimize harmful effects (40 CFR 230.5 (c) (1-7)).

1) Water quality criteria - It is necessary to locate the disposal sites at the locks. Water quality criteria would not affect this.

2) Investigate alternatives to open water disposal - The cofferdam and fill material must be located in this general area. Dewatering of the locks is necessary for construction.

3) Investigate physical characteristics of alternative disposal sites - The selected disposal site is the most appropriate alternative for the type of construction proposed and environmental characteristics of the area.

4) Ocean dumping - Not applicable. Ocean dumping will not occur.

5) Where possible, investigate covering contaminated dredged material with cleaner material - Not applicable. The fill material consists of clean sand and gravel.

6) Investigate methods to minimize effect of runoff from confined areas on the aquatic environment - Collection ditches and sumps will be used to gather seepage water. Runoff from fill material should be minor but will be collected and discharged into the river or sanitary sewer system as appropriate.

7) Coordinate potential monitoring activities at disposal site with EPA - A water quality monitoring program will be developed during the Plans and Specifications stage of the project.

7. Statement as to contamination of fill material if from a land source (40 CFR 230.5 (d)) - The fill material will be commercially purchased and will consist of clean sand and gravel. (See section 1.a. of this evaluation.)

8. Determine mixing zone - The discharge area would be linear in shape and would consist of cellular sheet pile cells about 28 feet in diameter. The total volumes of the cofferdam fill and the weighting berm are approximately 9,700 and 11,000 cubic yards, respectively. The fill material contains less than 1 percent fine material, and the cofferdam will be located in an area relatively free of fine material. (See sections 1.a. and 1.b.6) of this evaluation.) These factors would combine to minimize the amount of fine material and to reduce the size of the mixing zone. The

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cofferdam would be utilized at a time when the locks are normally closed; therefore, little river flow will be affected or present at the fill site. Most of the normal river flow follows the east channel next to the construction area. (See photographs of area in the EIS.) Based on the formulas referenced in section 5.b. of this evaluation, the mixing zone will be within 1000 feet of the discharge area. The discharge will take place during periods of high flow, when dilution and transport factors are greatest.

9. Conclusion and determination - The rehabilitation project would maintain river navigation and commerce in the St. Paul-Minneapolis area. There are no alternatives to the placement of the cofferdams and fill material. The locks must be dewatered and work space provided. The proposed method for placement and removal of the cofferdam fill material is in slurry form by hydraulic dredge. Using a clamshell dredge would result in less turbidity and some reduction in sedimentation. However, the impacts associated with either method of disposal are not significant. In addition, the clamshell dredge method is more expensive. Therefore, the cofferdam fill will be placed in slurry form by hydraulic dredge. After the cofferdams are in place, the locks will be dewatered and the weighting berms will be constructed. These weighting berms will be placed and removed by clamshell dredge or similar method. Fill material will consist of clean sand and gravel with less than 1 percent fine material. In addition, the disposal location is relatively free of fine material. These combine to reduce turbidity. The impacts of the project on aquatic ecosystems are not unacceptable. The discharge of fill material will minimize, to the extent practicable, adverse environmental impacts. The discharge methods and impacts of the project are discussed in the EIS and this evaluation.

10. Findings - The adverse impacts of the project are not expected to be significant. The type of fill material being used and the location of the disposal sites will not create unacceptable impacts. Therefore, the proposed location, type of fill material, and method of fill placement and removal will be utilized.

22 Aug 1978
DATE

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