

**FINAL
DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**



**US Army Corps
of Engineers** ®
Rock Island District

NOVEMBER 2002

CEMVR-PM-M

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT
SECTION 205 FLOOD DAMAGE REDUCTION STUDY
MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

NOVEMBER 2002

ACKNOWLEDGEMENT

Many members of the Rock Island District, U.S. Army Corps of Engineers assisted in the preparation of the Detailed Project Report (DPR) for Mad Creek located in the City of Muscatine, Muscatine County, Iowa. Primary team members who are familiar with the technical aspects of the project are listed below:

PROJECT MANAGER:

Dennis Hamilton, P.E

PROJECT ENGINEER:

Kirk Sunderman, P.E.

HYDROLOGY AND HYDRAULICS:

George Staley, P.E.

ECONOMIC ANALYSIS:

Dan Fetes

ENVIRONMENTAL RESOURCES:

Erika Mark

SOCIAL ANALYSIS:

Sharryn Jackson

PUBLIC INVOLVEMENT:

Suzanne Simmons

CULTURAL RESOURCES:

Jim Ross

REAL ESTATE:

Rod Hallstrom

ENGINEERING AND DESIGN:

Roger Less, P.E.

COST ENGINEERING:

David Bequeaith, P.E.

GEOTECHNICAL ENGINEERING:

Nic Davila, P.E.

ENVIRONMENTAL ENGINEERING:

Kara Mitvalsky, P.E.



**US Army Corps
of Engineers** ®
Rock Island District

**WE'RE PROUD
TO SIGN
OUR WORK**

EXECUTIVE SUMMARY

Mad Creek, Section 205 Flood Damage Reduction Study, Muscatine, Iowa Detailed Project Report with Environmental Assessment July 2002

This Detailed Project Report (DPR) presents the results of a feasibility study of flooding problems along Mad Creek in the City of Muscatine, Iowa. The Rock Island District of the U.S. Army Corps of Engineers prepared an initial appraisal dated November 16, 1998 and initiated the feasibility study in March 2000. The study is authorized under Section 205 of the 1948 Flood Control Act, as amended.

The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of the City of Muscatine and areas to the north in Muscatine County. Due to the nature of the watershed and intensive development in the downtown area, Mad Creek is prone to flash flooding, experiencing flooding events in 1990 and 1993.

Throughout a feasibility study, the U.S. Army Corps of Engineers strives to inform, educate, and involve the many groups who may have an interest in the study. This coordination is paramount to assuring that all interested parties have the opportunity to be part of the study process. A public open house was held on April 11, 2000, in the City of Muscatine, Iowa. The study team used the feedback from the open house to develop and evaluate alternatives.

Alternative plans were developed and evaluated based on appropriate engineering, economic, environmental, cultural, and social factors. The selected plan is the alternative judged to have the greatest net economic benefit while being consistent with protecting the Nation's environment.

Alternative D-2 was identified as the selected plan. Major components include raising the height of approximately 2,300 linear feet of existing levees and 1,700 linear feet of existing floodwalls by approximately 2 feet, 230 linear feet of new floodwall, a new bulkhead closure gate to replace the existing panel closure at Mississippi Drive, a new overhead closure gate to replace an existing floodgate at 2nd Street, a new swing gate to replace the panel closure across the abandoned railroad just upstream on 2nd Street and installation of a new closure structure across the railroad south of Washington Street. Minor modifications to the existing pump houses and gatewells along the Mississippi River and Mad Creek may be required due to the increase in flood protection height. The selected plan also includes improving a section of the Mad Creek channel upstream of 2nd Street to reduce flood stages and installation of an enhanced flood warning system. The project cost estimate is \$3.45 million and the estimated benefit-cost ratio is 3.4 to 1.

The selected plan is satisfactory to the public, complies with United States law including appropriate environmental requirements, and meets all Corps of Engineers criteria. A recommendation is made by the District Engineer that the selected plan be constructed under the authority of Section 205 of the 1948 Flood Control Act, as amended, with such modifications as, in the discretion of the Chief of Engineers, may be advisable.

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

CONTENTS

Subject	Page
1. INTRODUCTION.....	1
a. General.....	1
b. Study Authority.....	1
c. Study Purpose and Scope.....	1
d. Type and Detail of Investigation.....	1
e. Study Area.....	2
f. Prior Studies, Reports and Existing Water Projects.....	2
2. PLAN FORMULATION.....	4
a. Assessment of Water and Land Resource Problems and Opportunities.....	4
(1) Existing Conditions.....	4
(2) Future Conditions Without Project Alternatives.....	12
b. Specific Problems and Opportunities.....	13
c. Planning Objectives and Constraints.....	14
(1) National Objectives.....	14
(2) Specific Objectives.....	14
(3) Planning Objectives.....	14
(4) Planning Constraints.....	14
d. Development of Alternative Plans.....	14
(1) Available Measures to Address Problems and Opportunities.....	14
(2) Screening of Alternative Plans.....	15
(3) Plan Evaluation.....	16
(4) Associated Evaluation Criteria.....	18
(5) Risk-Based Analysis.....	19
(6) Residual Risks of Selected Plan.....	19
3. DESCRIPTION OF THE SELECTED PLAN.....	20
a. Plan Components.....	20
b. Design and Construction Considerations.....	22
(1) Design Considerations.....	23
(2) Utilities.....	23
(3) Construction Considerations.....	23
(4) Value Engineering.....	23

CONTENTS (Continued)

Subject	Page
c. Operation and Maintenance Considerations	23
d. Plan (Project) Cost Estimate	24
e. Plan Accomplishments	25
f. Economic Effects	25
g. Social Effects	25
(1) Community and Regional Growth	25
(2) Community Cohesion	25
(3) Displacement of People	25
(4) Property Values and Tax Revenues	26
(5) Public Facilities and Services	26
(6) Business and Industrial Activity	26
(7) Employment and Labor Force	26
(8) Farm Displacement	26
(9) Life, Health, and Safety	26
(10) Noise Levels	26
(11) Aesthetics	26
h. Environmental Effects	27
(1) Natural	27
(2) Cultural	28
(3) Hazardous, Toxic, and Radiological Waste Assessment	28
4. PLAN IMPLEMENTATION	29
a. Implementation Requirements	29
b. Implementation Responsibilities	29
(1) Federal Responsibilities	29
(2) Non-Federal Responsibilities	29
(3) Financial Analysis	31
(4) Real Estate Requirements	31
5. SUMMARY OF COORDINATION, PUBLIC VIEWS AND COMMENTS	32
a. Coordination	32
b. Public Views and Comments	32
c. Draft Detailed Project Report Released	33
d. Summary	33
6. RECOMMENDATION	34

CONTENTS (Continued)

Tables

No.	Title	Page
1	Peak stages on the Mississippi River at Muscatine, Iowa (NGVD 1929)	7
2	“Without” project HEC-HMS discharges used in the Mad Creek Study	8
3	Adopted discharges for Mouth of Mad Creek and Mouth of Geneva Creek.....	8
4	Plan costs including planning, administration, and real estate	17
5	Costs and benefits by alternative	18
6	Project cost distribution, Plan D-2, channel improvements with 2-foot levee raise Muscatine, Iowa	25
7	HEC-FDA performance statistics for proposed plan.....	25

Figures

No.	Title	Page
1	Study area	3
2	Mad Creek study reaches.....	5
3	Reach 1 - Levee upstream of 5th Street.....	6
4	Reach 4 - Floodwall adjacent to the Mississippi River	6
5	Silt buildup under 2nd Street bridge crossing	9
6	5th Street inundated during spring 2001 flooding	13
7	Existing panel closure structure at 2nd Street	21
8	Channel excavation of fill at 2nd Street bridge	27

Plates (in Appendix L)

No.	Title
X101	Cover Sheet
X102	Index of Drawings
X103	General Plan, Levee & Floodwall Improvements
X104	Borrow and Disposal Sites
C101	Boring Logs
C102	Plan and Profile, Sta. 3+00A to Sta. 13+00
C103	Plan and Profile, Sta. 13+00 to Sta.26+00
C104	Plan and Profile, Sta. 26+00 to Sta. 36+00
C105	Plan and Profile, Sta. 36+00 to Sta.42+00
C106	Typical Sections
C107	Channel Improvement
S101	Second St., Vertical Gate Closure, Plan and Profile
S201	I&M Rail Link, Railroad Closure, Plan and Profile
S202	I&M Rail Link, Railroad Closure, I-wall Details
S203	I&M Rail Link, Railroad Closure, Gate Details
S301	Mississippi Drive, Closure, Masonry Details
S302	Mississippi Drive, Closure, Bulkhead Details
S401	Miscellaneous Structures, New I-wall Details
S501	Miscellaneous Structures, Gatewell, Extension Details

CONTENTS (Continued)

Appendices

No.	Title
A	Hydrology and Hydraulics
B	Economic Analysis
C	Geotechnical Considerations
D	Environmental Assessment
E	Hazardous, Toxic, and Radiological Waste (HTRW) Assessment
F	Real Estate Plan
G	Cost Estimates – Alternatives and Selected Plan
H	Pertinent Correspondence
I	Final Programmatic Agreement
J	Structural Analysis
K	Distribution List
L	Plates

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

1. INTRODUCTION

a. General. This Detailed Project Report (DPR) presents the results of an investigation of the flooding problems along Mad Creek in the City of Muscatine, Muscatine County, Iowa. The Rock Island District of the U.S. Army Corps of Engineers (the District) received a request in November of 1996 from the City of Muscatine, Iowa, to assist in investigating flood damage reduction measures along Mad Creek. The District performed field reconnaissance, met with city officials, prepared an initial appraisal dated November 16, 1998, and an addendum dated December 15, 1998. The feasibility study was initiated in March 2000.

b. Study Authority. The Mad Creek Flood Damage Reduction Study in the City of Muscatine, Iowa, is undertaken through the U.S. Army Corps of Engineers (Corps) Continuing Authorities Program (CAP). This effort is in response to requests for Federal flood protection assistance from officials of the City of Muscatine, Iowa. The study was authorized under Section 205 of the 1948 Flood Control Act, as amended.

c. Study Purpose and Scope. The purpose of the feasibility study is to determine if there is a Federal interest in a flood damage reduction water resources project within the area and to describe the scope and scale of such a project. This DPR documents analyses performed in previous and current studies and contains the recommendation for project (plan) approval.

d. Type and Detail of Investigation. This DPR summarizes the results of analyses in the areas of planning, hydrology and hydraulics, foundations and materials, engineering, economics, and natural and cultural resources. The study was conducted in sufficient detail to determine the feasibility of an economical flood damage reduction plan (project), recommending a selected plan for implementation. An environmental analysis and gross real estate appraisal were also conducted. This DPR contains sufficient project design detail to serve as a basis for preparing construction plans and specifications.

According to the results of the project's initial appraisal, four primary alternatives were considered for reducing flood damages:

- A.** Raise the existing levee/floodwall system and improve closures along Mad Creek only.
- B.** Construct two storm water detention dams in the Mad Creek and Geneva Creek watersheds.
- C.** Combination of Alternatives A and B.

- D.** Raise the existing levee/floodwall system and improve closures along Mad Creek and the Mississippi River in combination with channel improvements immediately upstream of the 2nd Street Bridge.

Additionally, all alternatives include installing an enhanced flood warning system on Mad and Geneva Creeks.

e. Study Area. The Mad Creek study area is located in the westerly watershed of the Mississippi River in the City of Muscatine, Muscatine County, Iowa (see Figure 1 on page 3). The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of the City of Muscatine and areas to the north of the City of Muscatine in Muscatine County. The upstream portion of the Mad Creek watershed, north of the City of Muscatine, is primarily agricultural land but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of the Mad Creek watershed is located within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subjected to flash flooding.

f. Prior Studies, Reports and Existing Water Projects. Studies and reports that are pertinent to this feasibility study include:

- (1) *General Design Memorandum for Muscatine, Iowa (Mad Creek) Local Flood Protection.* Rock Island District, U.S. Army Corps of Engineers. 28 May 1956.
- (2) *Detailed Project Report for Flood Control at Muscatine, Iowa under Provisions of Section 205 of the 1948 Flood Control Act, as amended.* U.S. Army Engineer District, Rock Island, Corps of Engineers. 9 September 1970.
- (3) *Mad Creek Muscatine, Iowa Local Flood Protection. Supplement No. 1 to the Detailed Project Report.* U.S. Army Engineer District, Rock Island, Corps of Engineers. 23 February 1981.
- (4) *Mad Creek, City of Muscatine, Muscatine County, Iowa Flood Mitigation Preliminary Investigation.* U.S. Department of Agriculture, Natural Resources Conservation Service. August 1996.
- (5) *Title 10 Zoning, Chapter 4 FP Flood Plain District,* City of Muscatine. March 3, 1988.
- (6) *City of Muscatine Revised Flood Control Manual, In Draft,* City of Muscatine. July 2001.
- (7) *Flood, June 16, 1990. Chronology of Events.* Ray Childs, City of Muscatine.

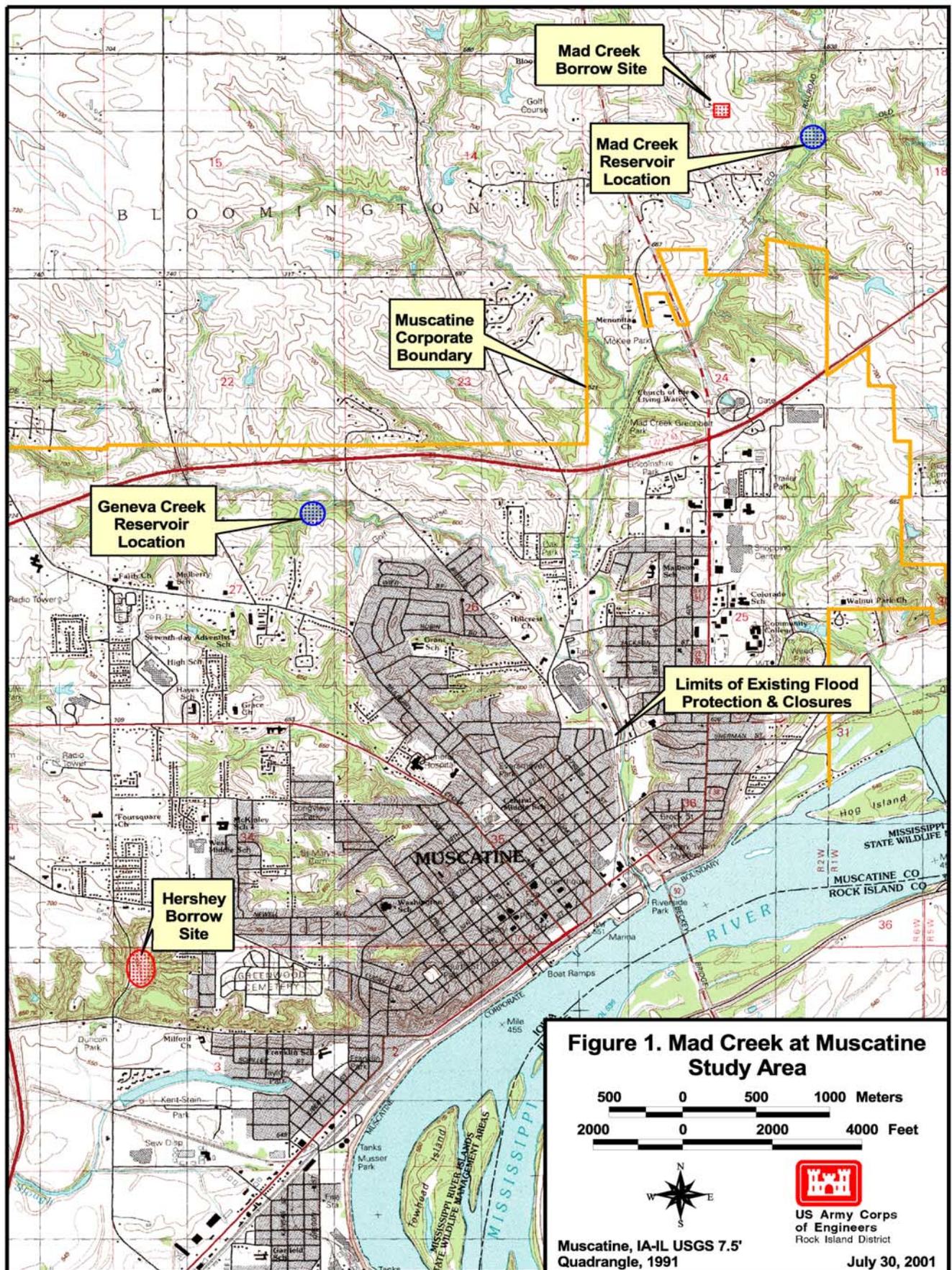


Figure 1. Study area

2. PLAN FORMULATION

a. Assessment of Water and Land Resource Problems and Opportunities.

(1) **Existing Conditions.** The Mad Creek watershed has a total drainage area of 17.3 square miles and enters the Mississippi River near river mile 546. Geneva Creek, a 3.1-square-mile tributary to Mad Creek, flows through parts of the City of Muscatine and enters Mad Creek within the city. Geneva Creek enters Mad Creek in a commercial area of the city, with Mad Creek continuing through additional commercial and residential areas until it enters the Mississippi River.

Two areas adjacent to Mad Creek are protected by previous Federal projects. In 1961, the Rock Island District completed construction of floodwalls and levees along the lower portion of Mad Creek to protect the City from Mississippi River floodwaters backing up the creek. One section of this system is along the Mississippi River (460 feet), while the other continues along the west bank of Mad Creek (3,000 feet). In 1983, the system was extended upstream and upgraded to provide further protection from Mad Creek flooding. This includes a levee and floodwall near the confluence of Geneva Creek with Mad Creek.

The project study area from Geneva Creek to the confluence of Mad Creek with the Mississippi River is composed of mixed commercial, industrial, and residential areas. Low-lying areas are subjected to flash flooding. In addition, increased commercial and industrial development in downtown Muscatine has increased the potential for flood damages since the construction of previous Federal projects. Flooding was experienced in 1990, 1993, 1997, and 2001.

(a) **Creek Study Reaches.** The project study area divided Mad Creek into four separate reaches as depicted on Figure 2 (page 5). Reach 1 includes Mad Creek from its mouth at the Mississippi River to the end of the existing levee (see Figure 3 on page 6). Reach 2 follows the railroad tracks from the end of Reach 1 to a point approximately 200 feet upstream from Washington Street, where the tracks enter the Heinz plant and high ground. Reach 3 follows the existing levee and high ground adjacent to Mad Creek and Geneva Creek to Isett Avenue. Reach 4 includes the existing Mississippi River levee and floodwall from the mouth of Mad Creek southwesterly to Mulberry Avenue (see Figure 4 on page 6).

pmsshare on 'mvgis' (G:\pms\home\lestergard\mad_creek.apr 7/30/01 raw

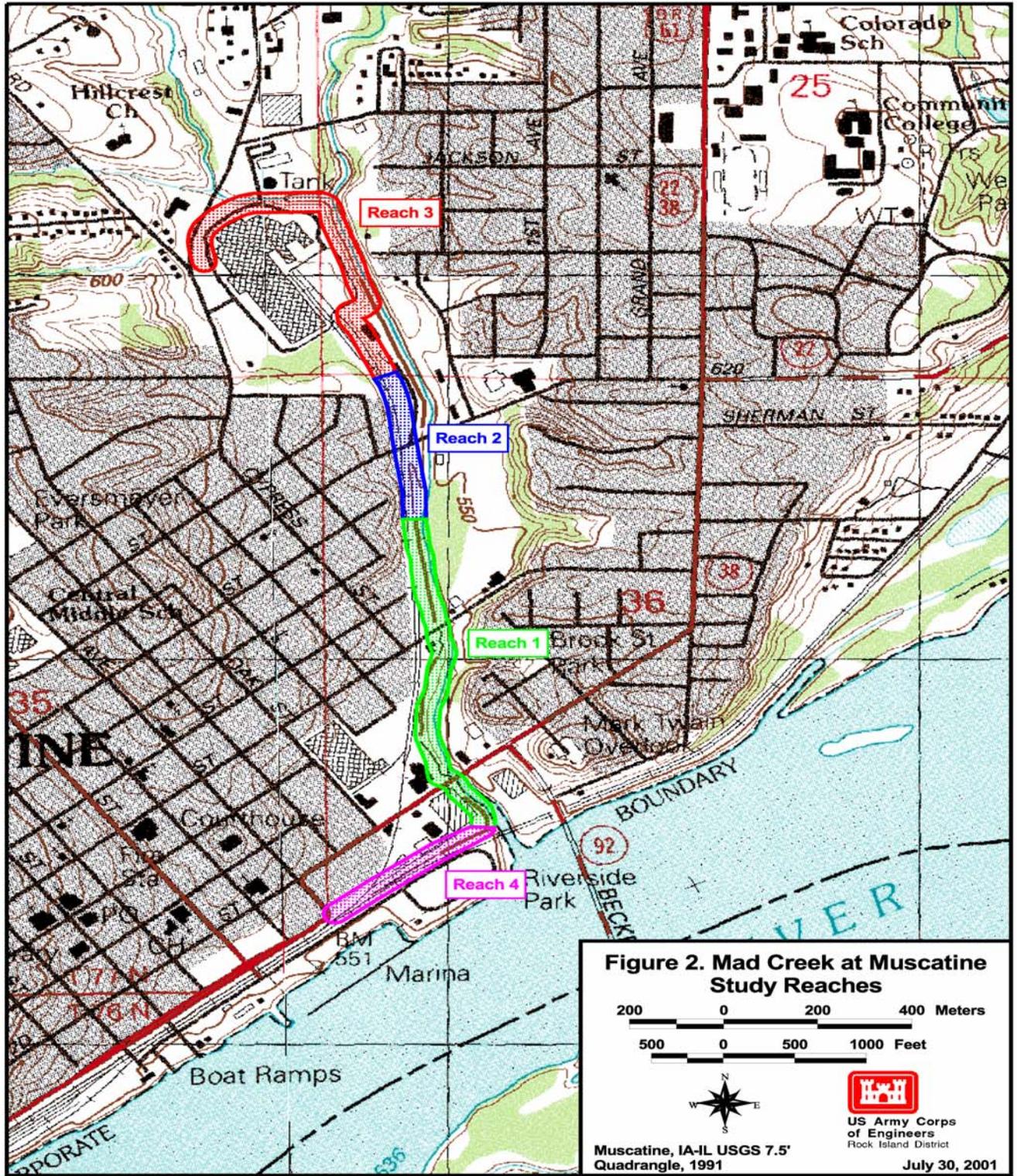


Figure 2. Mad Creek study reaches



Figure 3. Reach 1 - Levee upstream of 5th Street



Figure 4. Reach 4 - Floodwall adjacent to the Mississippi River

(b) Hydrology and Hydraulics. The hydrology and hydraulics within the study area are complex in that there are three waterways of concern—the Mississippi River, Mad Creek, and Geneva Creek. Profiles were modeled for flooding occurring on both Mad Creek and the Mississippi River.

Peak discharges are not recorded on Mad Creek, although large floods occurred on both June 30, 1961, and June 16, 1990. The gage on the Mississippi River at Muscatine is located at river mile 453. The 10 highest recorded stages at this gage since 1878 appear in Table 1. A zero gage reading corresponds to an elevation of 530.74 feet MSL (mean sea level), in 1929 datum. The City of Muscatine uses a city datum. Adding 249.1 feet to an elevation in city datum converts it to an elevation in the 1929 datum. All elevations in this report have been converted to the 1929 datum.

Table 1. Peak stages on the Mississippi River at Muscatine, Iowa (NGVD 1929)

Rank	Date	Peak Stage (Feet)	Elevation MSL (Feet)
1	07/09/1993	25.61	556.35
2	04/29/1965	24.81	555.55
3	04/25/1973	21.63	552.37
4	04/26/1969	21.20	551.94
5	04/21/1997	21.09	551.83
6	04/28/1952	21.05	551.79
7	04/26/1951	21.00	551.74
8	05/09/1975	20.96	551.70
9	10/07/1986	20.59	551.33
10	04/16/1967	19.40	550.14

Discharge data for the Mississippi River at Muscatine and river stages at the mouth of Mad Creek appear in Table A-4 in Appendix A. These data are from a report prepared by the Corps of Engineers in 1979 for the Technical Flood Plain Management Task Force of the Upper Mississippi River Basin Commission and used for studies on the Mississippi River (listed as Reference 7 on page A-22 in Appendix A). Data in the original report were converted to 1929 datum for this table. Some points were interpolated.

(c) Previous Hydrologic Studies of Mad Creek by the Corps of Engineers. Mad Creek has no recording stream gage. The District developed discharge-frequency relationships for Mad Creek using HEC-IFH computer programs.

For this study, the District developed an HEC-HMS model of Mad Creek. This model used two dams that were coordinated with the local sponsor. The loss rates in the HEC-HMS model were verified on a gaged basin, however, insufficient rainfall data prevented calibrating any unit hydrograph parameters. The “without project” discharges from the future condition (year 2020) computed by the HEC-HMS model appear in Table 2. The difference between year 2000 and year 2020 discharges was so small that year 2020 discharges were used for both existing and future conditions. The adopted discharges for the mouth of Mad and Geneva Creeks are provided in Table 3.

Table 2. “Without” project HEC-HMS discharges used in the Mad Creek Study

Discharge Probability %	Return Interval Yr.	Mouth of Mad Creek 1960's cfs	Mouth of Mad Creek HMS cfs	U/S Conf. Geneva HMS cfs
50	2	1,400	1,581	1,125
20	5	2,700	3,135	2,296
10	10	4,000	4,252	3,135
4	25	6,100	5,638	
2	50	7,900	7,613	5,480
1	100	10,200	8,733	6,525
0.4	250	14,500	12,093	
0.2	500	17,000	18,327	13,610
Mi ²		17.3	16.93	13.33

Table 3. Adopted discharges for Mouth of Mad Creek and Mouth of Geneva Creek

Probability %	Mad Cr Without Dams Yr. 2020 cfs	Mad Cr With Dams Yr. 2020 cfs	Geneva Cr Without Dams Yr. 2020 cfs	Geneva Cr With Dams Yr. 2020 cfs
50	1,580	1,240	393	286
20	2,880	2,200	797	501
10	3,974	3,000	1,188	640
4	5,636	4,300	1,798	840
2	7,089	5,400	2,356	1,069
1	8,733	6,600	3,010	1,201
0.4	11,240	8,400	4,043	1,700
0.2	13,411	10,000	4,968	2,285

(d) Human Resources, Development, and Economy. The City of Muscatine is located on the westerly bank of the Mississippi River in Muscatine County, Iowa. The City has a year 2000 population of 22,697 people according to the U.S. Census Bureau. Major state and Federal highways, railway and waterway systems serve the City of Muscatine. The interstate highway system and major airline transportation systems are also within close proximity. Data indicate that the Muscatine area labor force is concentrated in the manufacturing, retail trade, and service industries. More detailed information can be found in Appendix B - Economic Analysis.

(e) Floodplain Development. Based on observations from site visits, reviews of project area maps, and discussions with local citizens, it appears that in several locations over the past 10-20 years, areas within the Mad Creek floodplain and floodway have been filled in (see Figure 5). Many businesses and other facilities are located outside the existing flood protection system and within the area identified as floodplain and/or floodway on the Flood Boundary and Floodway Map, National Flood Insurance Program, dated January 5, 1978. The encroachment of

fill into the channel upstream of 2nd Street and subsequent sediment buildup under the easterly span of the bridge, significantly affected the Mad Creek flood profile.



Figure 5. Silt buildup under the 2nd Street bridge crossing

(f) Cultural Resources. The Office of the State Archaeologist (OSA) conducted an archeological site file search for the District under Contract DACW25-98-D-0015, Delivery Order No. 3 (Site File Search 134). By a letter dated November 20, 2000, the OSA identified 39 sites within a mile of the project feature locations; however, no sites were recorded within the area of potential effect (APE) of the undertaking. Consultation was initiated with the State Historical Society of Iowa (SHPO), relevant federally recognized tribes, and the interested public regarding the undertaking's potential effects on historic properties and particularly tribal concerns about properties that may be of religious and cultural significance (36 CFR 800.4(a)(3-4)). Responses were received from the SHPO (R&C#: 010170032), the Sac and Fox Nation, and the Iowa Tribe of Oklahoma. No additional historic properties were identified as a result of that consultation.

Subsequent to consultation, project modifications involving floodwall construction necessitated revising the APE to include two historic structures and associated limestone wall. According to *Historic Architecture of Muscatine, Iowa*, as prepared for the city of Muscatine in 1977 by Environmental Planning and Research, Incorporated, the house located at 501 East Mississippi Drive, referred to as the Judge Woodward House, was constructed in 1848 with additions built in 1874. The second house, located next door at 505 East Mississippi Drive, was built around 1846 and is referred to as the Cornelius Cadel House. It is thought that the limestone wall dates to the mid 1870's with the paving of Mississippi Drive and the construction of the Judge Woodward House improvements. A National Register of Historic Places eligibility determination has not been rendered on any of the standing structures, and the lots surrounding these structures have not been

surveyed previously for archeological remains. The revised APE was provided to the SHPO, relevant federally recognized tribes, and the interested public for comment by letter dated April 23, 2002. A draft programmatic agreement (PA) addressing the Corps compliance requirements specific to the revised APE was attached for review and comment. Responses were received from the SHPO (R&C#: 010170032) and the Peoria Tribe of Indians of Oklahoma. The SHPO comments were addressed and the draft PA was provided to the Advisory Council on Historic Preservation (Council) for comment by letter dated June 24, 2002. The Council notified the Corps by letter dated July 12, 2002, that Council participation in the execution of the PA was not required. The final PA was filed with the Council by letter dated November 25, 2002.

(g) Environmental Setting and Natural Resources.

Climate. Southeastern Iowa's climate is classified as humid continental and is characterized by cold winters and hot, humid summers. Seasonal contrasts are strong, and the area is subjected to frequent short-term fluctuations in temperature, humidity, cloud cover, and wind direction. Mean monthly temperatures range from 22.3 °F in January to 75.5 °F in July. The average annual temperature is 50.7 °F. The average annual precipitation is 31.88 inches. The mean annual snowfall for the City of Muscatine is 28.5 inches. Additional information regarding climate can be located in Appendix A - Hydrology and Hydraulics.

Air and Noise Quality. The project area is principally located in an industrial area; therefore, existing air and noise quality is fair.

Aquatic Community. Mad Creek drains approximately 17 square acres of land known as the Mad Creek watershed. The existing water quality of Mad Creek is generally poor due to runoff from agricultural fields and the highly industrialized areas surrounding the lower portion of the creek. Mad Creek has a limited fishery with a limited number of species, such as minnows, found in certain portions of the stream.

Terrestrial Habitat and Wildlife. Vegetation located within the existing levee alignment is comprised of mowed grass with limited forbs. The area bordering upper Mad Creek is comprised of typical bottomland forest species and pasture. Terrestrial wildlife is typical of that found elsewhere in the Mississippi River watershed bottomland forests.

Threatened and Endangered Species. No threatened or endangered species would be impacted by the proposed action. For specific information, see *Section VI. Affected Environment*, of the Environmental Assessment (Appendix D).

(h) Hazardous, Toxic, and Radiological Waste (HTRW) Assessment. The Corps' Engineering Regulation (ER) providing guidance for the conduct of Civil Works Planning Studies is contained in ER 1105-2-100. The policies and authorities outlined in ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects, and ER 405-1-12, Real Estate Handbook, were developed to facilitate the early identification and appropriate consideration of HTRW issues in all of the various phases of a water resources study or project. American Society for Testing and Materials (ASTM) Standards E1527-00 and E1528-00 provide a comprehensive guide for conducting Phase I Environmental Site Assessments (ESAs). When the Phase I ESA identifies potential environmental concerns, a Phase II ESA is initiated in which sampling of the project area is performed to determine the presence of any HTRW

contamination. Phase II sampling is completed in accordance with the U.S. Army Corps of Engineers Engineering Manual (EM) 200-1-3, Environmental Quality - Requirements for the Preparation of Sampling and Analysis Plan (CEMP-RT/CECW-E, February 1, 2001). The policy of the U.S. Army Corps of Engineers is to avoid construction of Civil Works projects when HTRW is located within project boundaries or may affect or be affected by such projects.

Several Phase I and Phase II ESAs were performed for this project as the scope was modified. These reports include the following:

- U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report Addendum*, June 2002.
- U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report Addendum*, August 2001.
- U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report*, December 2000.
- Daily & Associates Engineers, Inc., *Preliminary Phase IIA Environmental Site Assessment, Mad Creek Flood Damage Reduction Project*, June 2001.
- Missman Stanley & Associates, P.C., *Preliminary Phase IIA Environmental Site Assessment, Mad Creek Flood Reduction Project, Muscatine, Iowa*, December 2001.

These Phase I and Phase II ESAs covered the following areas:

- Right descending bank of Mad Creek from Isett to the confluence with the Mississippi River;
- Left descending bank of Mad Creek near 2nd Street;
- Right descending bank of the Mississippi River from the confluence with Mad Creek to Mulberry Street;
- Geneva Creek Retention Area;
- Mad Creek Retention Area;
- Mad Creek Borrow Site; and
- Geneva Creek Borrow Site.

On the right descending bank of Mad Creek from 5th Street to the Mississippi River, only the arsenic concentration exceeded the Iowa Land Recycling Plan (LRP) statewide standard. However, the concentrations were below the ingestion and inhalation standards for construction workers under the Illinois TACO standards. This would indicate that short-term exposure during construction of improvements would be well under published guidelines. These contaminants appear to be at or near natural background levels and do not appear to be associated with a specific source of contamination or a spill. No institutional controls are recommended with the conditions as known at the end of the Phase II-A ESA. The results of the sampling indicate that the properties adjacent to the right descending bank of Mad Creek may have contributed some contamination to the existing levee and banks. Contaminants found were at levels below the Iowa LRP statewide. Therefore, contamination by human activities may have occurred, but the contamination is minimal and requires no cleanup action and restricted use of the site.

On the left descending bank of Mad Creek, just upstream of 2nd Street, one Volatile Organic Carbon (VOC) constituent and several polynuclear aromatic hydrocarbon (PNA) constituents were detected on the site. Toluene, the detected VOC constituent, was detected at a concentration less than the statewide standard for soil published by the Iowa DNR. It is recommended that the remediation of toluene is not warranted. One PNA compound was detected at a concentration that

exceeded statewide standards for soil. Under a different laboratory procedure that is more precise, this PNA was less than the statewide standard. For this reason, it is recommended that further assessment or remediation of PNAs is not warranted.

The properties sampled are owned by the city of Muscatine and were owned by the city prior to initiation of this feasibility study. Under Iowa's Voluntary Land Recycling Program, the City of Muscatine may request that the Iowa DNR review the results of the Phase I and Phase II-A ESAs and issue a letter of no further action. The Iowa DNR will determine a background standard for the site pursuant to IAC 567-137.4(455H). They would also identify any special handling requirements, if required, of excavated materials if they are proposed to be removed from the site. Any removal of contaminated material or documentation to the Iowa DNR is beyond the scope of this flood protection project.

Recommendations. The HTRW due diligence process did not reveal any evidence of significant concentrations of hazardous substances, HTRW, or other regulated contaminants in connection with the Mad Creek Flood Damage Reduction Study areas. Therefore, the Mad Creek Flood Damage Reduction Project may proceed without implementing any limitations or special construction techniques commonly associated with HTRW contamination.

Disclaimer. No ESA can wholly eliminate uncertainty regarding the existence for recognized environmental conditions concerning a property. The HTRW due diligence process intends to reduce, but not eliminate, uncertainty regarding the existence of recognized environmental conditions in connection with a property within reasonable limits of time and cost. Continuing the HTRW due diligence process beyond the Phase IIA ESA may not necessarily reduce uncertainty, nor reveal unidentified environmental liabilities. If any previously unaddressed recognized environmental condition should arise, this HTRW due diligence process will be revisited and amended.

(i) Utility Crossings. There are numerous utility crossings along the levee. These utilities should be avoided during construction. If any unusual odor or discolored soil is noted during construction, all activities should cease until the environmental conditions are made known.

(j) Wastewater Treatment. Wastewater treatment lagoons are located adjacent to the proposed Mad Creek Retention Pond. The system serves Ripley's Mobile Homes (also referred to as Clear View Mobile Home Park) located at 30 Clearview Court. If these lagoons are overtopped with floodwater, there could be a release of partially treated wastewater, which, while not an HTRW concern, could be a biological pathogen concern. Impacts on sewage lagoons and future wastewater treatment activities at Ripley's Mobile Homes shall be minimized. If, during the planning process, it is determined that these wastewater facilities will be impacted, appropriate mitigation efforts shall be completed. It was recommended that actions be taken during all planning and implementation phases of the Section 205 project to avoid impacts on the wastewater treatment system at Ripley's Mobile Homes.

(2) Future Conditions without Project Alternatives. As stated previously, low-lying areas in the City of Muscatine are subjected to flooding from Geneva Creek, Mad Creek, and the Mississippi River. Levee closure structures exist on 2nd Street and 5th Street, but the lack of adequate warning time during flash flooding along Mad Creek has made maintaining operation problematic (see Figure 6). Both Isett Avenue and a nearby service entrance that crosses Geneva Creek, have sandbag closures.

The City of Muscatine plans to raise 5th Street starting in 2002. It is assumed that the bridge raise will take place in the future, and the District is providing the City with recommended parameters for the bridge span. With the preferred plan, this area will still flood. The road raise by the City of Muscatine will help traffic flow but may increase upstream water levels. Raising 5th Street in accordance with these parameters will eliminate the need for a closure structure at this location.

Future conditions without the project alternative are anticipated to be status quo, with the continued threat of flooding from Mad Creek, Geneva Creek, and the Mississippi River. Damages will continue to occur in low-lying areas along these waterways.



Figure 6. 5th Street inundated during spring 2001 flooding

b. Specific Problems and Opportunities. The water resources problem considered in this study is the potential for flash flooding from Mad Creek and Geneva Creek during intense rainfalls. In addition, flood stage elevations on the Mississippi River, which have increased since 1961, were considered in combination with the coincidental flooding of the creeks. Flooding of industrial and commercial properties in the project area has the potential to cause substantial damages to structures, loss of commercial businesses, temporary layoffs, and transportation detours. The City of Muscatine expressed its concern regarding possible damages that a significant flood might cause. The City has demonstrated its commitment to seeking additional flood protection by participating in this study, which it has cost-shared 50/50 with the Federal Government.

c. Planning Objectives and Constraints.

(1) **National Objectives.** The national objective of water and related land resources planning is to contribute to economic development consistent with protecting the Nation's environment. Contributions to National Economic Development (NED) are shown as increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct benefits and costs that accrue in the project area and the rest of the Nation.

(2) **Specific Objectives.** Specific planning objectives are derived from an analysis of the problems, needs, and opportunities of the specific study area that can be addressed to enhance the NED objective. The NED plan with the greatest net economic benefits is required to be the plan recommended for Federal action, unless an exception is deemed appropriate. The specific planning objective for this study is to reduce potential economic losses resulting from flooding while giving equal consideration to the environment.

(3) **Planning Objectives.** The following specific planning objectives have been identified based on an analysis of the problems and needs of the Mad Creek study area:

- Provide a flood damage reduction project within the study area that satisfies Corps of Engineers' criteria for net benefits.
- Preserve and enhance, when practicable, existing natural ecological systems and cultural resources in the area.
- Recreation in the form of a multipurpose trail on the top of the upgraded levee adjacent to Mad Creek was considered as a possible project feature but not pursued due to some constraints in the study area and an undefined path alignment.

(4) **Planning Constraints.** The authority under Section 205 provides for the construction of projects for flood control and related purposes. Each project is limited to a Federal investment of not more than \$7 million. This Federal investment limitation includes all project-related costs for investigations, inspections, engineering, preparation of plans and specifications, supervision and administration, and construction.

Water resources planning studies are bound by all applicable laws of the United States and of the State of Iowa, all Executive Orders of the President, the Water Resources Council's Principles and Guidelines, and all engineering regulations of the U.S. Army Corps of Engineers.

d. Development of Alternative Plans.

(1) **Available Measures to Address Problems and Opportunities.** Both nonstructural and structural measures are available to alleviate flooding.

(a) **Nonstructural Measures.** These measures are defined as those which reduce or eliminate flood damages, without significantly altering the nature or extent of flooding, by changing the use of floodplains or accommodating existing uses into the flood hazard. Examples of nonstructural measures are flood proofing, permanent evacuation, flood warning systems, and regulation of the use of the floodplains.

(b) Structural Measures. These measures are designed to prevent flood damages by altering the physical ability of flooding to produce the damages. Structural measures may include dams, channel modifications, levees, and floodwalls.

During the initial assessment and development of a Project Study Plan (PSP) for the feasibility study, several measures were considered. It was determined that structural measures (levee and floodwall raises) were likely to be technically feasible. The following measures were evaluated in the feasibility study:

- Raising the existing floodwall and levee system
- Constructing stormwater detention dams
- Enhanced early flood warning system
- Improved closure structures
- Existing channel improvements

(2) Screening of Alternative Plans. Alternatives considered in the feasibility study included the following:

(a) No Federal Action. Under the No Federal Action alternative, the Corps will not participate in efforts to provide additional flood protection to the study area. The no action plan is the “without project” alternative that serves as the basis for developing and comparing the impacts of other plans. It is assumed that under the no action plan, no project would be implemented to reduce flood damages and therefore the study area would continue to experience flood damages.

(b) Nonstructural. Some nonstructural measures are implementable for the Mad Creek study area in combination with the structural measures already in place. Regulation of floodplain use with or without a levee raise is recommended and complies with the non-Federal responsibilities outlined in Section 4 of this report. An improved flood warning system was developed for the study area and is described in detail in Appendix A - Hydrology and Hydraulics.

(c) Structural. The following structural alternatives were evaluated in detail during the feasibility study. A flood warning system may be combined with any of the alternatives.

Alternative A - Raise the existing levee/floodwall system adjacent to Mad Creek and install a positive closure structure on Geneva Creek.

Reach	Measure	Description
1	Raise Levee/Floodwall	Raise the existing levee/floodwall adjacent to Mad Creek 1, 2, or 3 feet. Install an improved closure structure at 2nd Street.
2	Railroad Raise	Raise railroad embankment 1 foot.
3	Closure Structures (Geneva Creek)	Install positive closure structures at Isett Avenue and the Heinz Service road.

Alternative B - Construct two storm water detention dams along Mad and Geneva Creeks.

Reach	Measure	Description
1,2,3	Mad Creek Dam	Construct 1% event dam on Mad Creek.
1,2,3	Geneva Creek Dam	Construct 1% event dam on Geneva Creek immediately downstream of the Highway 61 bypass.

Alternative C - This alternative is a combination of Alternative A (levee raise) and Alternative B (detention dams).

Reach	Measure	Description
1	Raise Levee/Floodwall	Raise the existing levee/floodwall adjacent to Mad Creek 1, 2, or 3 feet. Install an improved closure structure at 2nd Street.
2	Railroad Raise	Raise railroad embankment 1 foot.
3	Closure Structures (Geneva Creek)	Install positive closure structures at Isett Avenue and Heinz service road.
1,2,3	Mad Creek Dam	Construct 1% event dam on Mad Creek.
1,2,3	Geneva Creek Dam	Construct 1% event dam on Geneva Creek immediately downstream of the Highway 61 bypass.

Alternative D - Raise the existing levee and floodwall system (1, 2, or 3 feet) along Mad Creek and the Mississippi River in combination with channel improvements upstream of the 2nd Street Bridge.

Reach	Measure	Description
1	Raise Levee/Floodwall	Raise the existing levee/floodwall adjacent to Mad Creek 1, 2, or 3 feet. Install an improved closure structure at 2nd Street.
4	Raise Levee/Floodwall	Raise the existing levee/floodwall adjacent to the Mississippi River 1, 2, or 3 feet.
1	Channel Improvement	Clean out 2nd Street Bridge and improve Mad Creek channel upstream of the bridge.

(3) Plan Evaluation. The study alternatives in this report were evaluated for their ability to meet the project objective of reducing flood damages and also from an economic standpoint. The National Economic Development (NED) plan is defined as the plan with the greatest net economic benefit while being consistent with protecting the Nation’s environment, and thus contributes the most to national economic development. A detailed discussion of the economic evaluation of the project alternatives is found in Appendix B - Economic Analysis.

Table 4 summarizes the planning, administration, and real estate costs associated with each plan alternative, thereby giving a total plan cost including construction. Construction costs for the different alternatives as represented in Appendix G - Cost Estimates - Alternatives and Selected Plan, are used to establish planning and administration cost estimates. Real estate costs are then figured by the alternative’s land needs and subsequent administration, thereby giving a total plan cost. The selected plan (Alternative D-2) has a total plan cost of \$3,445,000.

Table 4. Plan costs including planning, administration, and real estate

Plan Alternatives	Construction Cost including Line Item Contingencies	* Planning, Engineering and Design (20%)	Supervision and Administration (9%)	Lands, Easements, Right-of-way, Relocations, Dredge Disposal	Federal Real Estate Administration	Total Plan Costs
A-1a Mad Creek 1 ft Levee Raise - Reach 1	\$1,072,000	\$214,000	\$96,000	\$367,000	\$26,000	\$1,775,000
A-1b Mad Creek 2 ft Levee Raise - Reach 1	\$1,314,000	\$263,000	\$118,000	\$367,000	\$26,000	\$2,088,000
A-1c Mad Creek 3 ft Levee Raise - Reach 1	\$1,879,000	\$376,000	\$169,000	\$367,000	\$26,000	\$2,817,000
A-2 Mad Creek Railroad Raise - Reach 2	\$828,000	\$166,000	\$75,000	\$130,000	\$8,000	\$1,207,000
A-3 Geneva Creek Closures - Reach 3	\$531,000	\$106,000	\$48,000	\$31,000	\$5,000	\$721,000
B Reservoirs, Mad & Geneva Creek	\$4,006,000	\$801,000	\$361,000	\$2,765,000	\$109,000	\$8,042,000
C-1 Reservoirs and 1 ft Levee Raise - Reach 1	\$4,920,000	\$984,000	\$443,000	\$3,168,000	\$140,000	\$9,655,000
C-2 Reservoirs and 1 ft Levee Raise - Reach 2	\$4,670,000	\$934,000	\$420,000	\$2,895,000	\$117,000	\$9,036,000
C-3 Reservoirs and Reach 3 Closures	\$4,373,000	\$875,000	\$394,000	\$2,796,000	\$114,000	\$8,552,000
D-1 Mad Creek Channel Improvements & 1 ft Levee Raise - Reaches 1&4	\$1,994,000	\$484,000	\$179,000	\$505,000	\$93,000	\$3,255,000
D-2 Mad Creek Channel Improvements & 2 ft Levee Raise - Reaches 1&4	\$2,141,000	\$513,000	\$193,000	\$505,000	\$93,000	\$3,445,000
D-3 Mad Creek Channel Improvements & 3 ft Levee Raise - Reaches 1&4	\$2,759,000	\$637,000	\$248,000	\$505,000	\$93,000	\$4,242,000

* Planning, Engineering and Design includes \$85k for cultural mitigation on alternatives D-1, D-2 and D-3 is above and beyond the 20% rate indicated.

Table 5 summarizes the costs and benefits of each alternative. The net benefit is the difference between the average annual economic benefit and the average annual cost of a plan. Alternative A-1's different levee elevations are all economically justified, having annual benefits exceeding annual costs. However, Alternative D-2, which includes a 2-foot levee raise, has the greatest net benefits and is therefore the selected NED plan.

Table 5. Costs and benefits by alternative
(June 2002 prices, 6-1/8% discount rate, 50-year evaluation period)

Alternative	Project Costs, \$	Total Annual Costs, \$	Total Annual Benefits, \$	Net Benefits, \$	Benefit-Cost Ratio
No Action	0	0	0	0	0
A-1. Mad Creek Levee Raise - Reach 1					
a. 1-foot raise	1,775,000	121,764	121,200	-564	0.995
b. 2-foot raise	2,088,000	143,236	265,200	121,964	1.85
c. 3-foot raise	2,817,000	193,245	397,400	204,155	2.06
A-2. Railroad Raise, 1 foot (Reach 2)	1,207,000	80,303	300	-80,003	0.00
A-3. Geneva Creek Closures (Reach 3)	721,000	47,969	11,100	-36,869	0.23
B. Mad & Geneva Creek Dams (.01)	8,042,000	584,670	456,100	-128,570	0.78
C. Dams (.01) and 1-foot Levee Raise					
C-1. Dams and Reach 1 raise (1 foot)	9,655,000	698,796	500,500	-198,296	0.72
C-2. Dams and Reach 2 raise (1 foot)	9,036,000	654,999	456,300	-198,699	0.70
C-3. Dams and Reach 3 Closures	8,552,000	620,754	456,300	-164,654	0.73
D. Raise Mad Creek/Mississippi Levee/Floodwall and Improve Mad Creek Channel					
D-1. 1-foot raise (Reaches 1 and 4)	3,255,000	227,362	691,600	464,238	3.04
D-2. 2-foot raise (Reaches 1 and 4)	3,445,000	240,426	823,000	582,574	3.42
D-3. 3-foot raise (Reaches 1 and 4)	4,242,000	295,150	828,500	533,350	2.81

(4) **Associated Evaluation Criteria.** Alternative plans were also evaluated by the following criteria:

- Completeness - Completeness is the extent to which a given alternative plan provides and accounts for all the necessary investments or other actions, to ensure the realization of the planned effects. Each of the plans evaluated are complete.
- Effectiveness - Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the recognized opportunities. The planning objective of this study was to reduce flood damages within the project area. With the exception of the “without project” alternative, each of the other alternatives reduces flood damages to some degree. Alternative D-2 provides the highest net benefit.
- Efficiency - Efficiency is the extent to which an alternative plan is considered a cost-effective means of solving the specified problems and of realizing the recognized opportunities. Alternative D-2 yields the greatest net benefits and is therefore the most cost-effective plan from an NED perspective.
- Acceptability - Acceptability is the viability of an alternative plan with respect to the desires of the state, local government, and the public. In order to be acceptable, the

plan must be in accordance with existing laws, regulations and public policies. All alternatives evaluated were considered acceptable.

(5) **Risk-Based Analysis.** Evaluation of the existing condition and proposed alternatives was conducted using a risk-based analytical framework as described in Engineering Manual 1110-2-1619, *Risk-Based Analysis for Flood Damage Reduction Studies*. The analysis is described in detail in Appendix A - Hydrology and Hydraulics and Appendix B - Economic Analysis.

(6) **Residual Risks of Selected Plan.** With memories of recent floods still fresh, risks of catastrophic events need to be visited. For any level of flood protection provided, there is a risk of an event that would overtop or breach the protection system. The probability of exceedance (flood protection system is overtopped) in any given year is very low with the recommended plan to increase the top of the existing levee (see Table 6). However, the results of an overtopping event would be disastrous (see Appendix B, Table B-5), given the huge value and diversity of the properties protected by the levee. It is important that parties concerned realize the risks and potential consequences of a structural flood damage reduction project.

3. DESCRIPTION OF THE SELECTED PLAN

a. Plan Components. Major components include raising the height of approximately 2,300 linear feet of existing levees and 1,700 linear feet of existing floodwalls by approximately 2 feet, constructing 230 linear feet of new floodwall, replacing the existing panel closure at Mississippi Drive with a new bulkhead closure gate, replacing an existing floodgate at 2nd Street with a new overhead closure gate (see Figure 7), replacing the panel closure across the abandoned railroad just upstream on 2nd Street with a new swing gate, and installing a new closure structure across the railroad south of Washington Street. Minor modifications to the existing pump houses and gatewells along the Mississippi River and Mad Creek may be required due to the increase in flood protection height. The selected plan also includes improving a section of the Mad Creek channel upstream of 2nd Street to reduce flood stages and installing an enhanced flood warning system. In a separate but supporting effort, the City of Muscatine would raise the roadway and bridge at the 5th Street crossing of Mad Creek. This would allow the removal of the existing floodgate at 5th Street, thereby eliminating a high-risk closure.

The selected plan (project) would follow the alignment of the existing flood protection system. Plate X103 in Appendix L shows the general flood damage reduction plan. Plates C102 through C105 show plans and profiles, plate C106 shows typical levee and floodwall sections, and plate C101 shows boring logs.

Additional benefit protection provided by the selected plan would accrue to small businesses and industry in the downtown area.

Minor modifications to the existing pumphouses along the Mississippi River may be required due to the increase in flood protection height. Additionally, three gatewells along Mad Creek may require increases in height due to the levee raise (see plate S501, Appendix L).

The selected plan (project) alignment D-2 would provide protection to elevation 561.5 feet NGVD. Elevation 561.5 feet would remain constant along the designated Mississippi River reach and the reach from the mouth of Mad Creek up to its termination point north of 5th Street due to the backwater effect of the Mississippi River.

The selected plan begins with a temporary earthen levee approximately 270 feet in length located halfway up the block from Mississippi Drive on Mulberry Avenue. The temporary levee would only be constructed for flood events that are projected to exceed 555.0 feet NGVD and built to a top elevation 561.5 feet NGVD. The temporary earthen levee would extend to a new floodwall that starts about mid block on the eastern side of Mulberry Avenue.

The new floodwall would replace an existing retaining wall that runs along two historic properties at the corner of Mulberry Avenue and Mississippi Drive (see plates C102 and C106). The floodwall would extend south down Mulberry Avenue to Mississippi Drive where it would turn east until it ties into the existing flood control system. The existing panel closure across Mississippi Drive would be removed and replaced with a new bulkhead gate closure (see plates C102, S301, and S302). The project would continue easterly following the existing floodwall along the Mississippi River to where it ties into an existing section of levee. The floodwall, approximately 840 feet long, would be raised 2 feet to bring it up to the 561.5 feet NGVD elevation (see plates C102 and C106).

The floodwall along the Mississippi River transitions into a levee section approximately 400 feet west of the mouth of Mad Creek. This levee section follows Mad Creek by turning north, where it transitions into a floodwall section at 2nd Street. This levee, approximately 600 feet long (total), would be raised to match the adjoining floodwall elevation, while staying within the existing levee footprint. The current levee side slope is 3 horizontal to 1 vertical (3H:1V) with an 8-foot top width. This existing impervious clay levee would be raised in height by steepening the side slopes. Final side slopes would be approximately 2.5 horizontal to 1 vertical (2.5H:1V). Although a 3 to 1 slope is preferred for a levee of this nature, a 2.5 to 1 slope is acceptable, and due to the limited site clearances, the 8-foot-wide top would be maintained.

The existing floodwalls adjacent to 2nd Street, both upstream and downstream, would be modified in similar fashion as those found along the Mississippi River. The existing floodgate at 2nd Street (Figure 7) would be removed and replaced with a vertical lift gate to facilitate quicker and more reliable closure under flash flood conditions, as is frequently experienced along Mad Creek. Vertical lift gates have been successfully installed in the Des Moines, Iowa, metro area on similar flash flood streams (see plate S101). In addition, the abandoned railroad and associated panel closure would be eliminated and replaced with a new swing gate closure to facilitate future trail plans through this opening (see plate S101).



Figure 7. Existing panel closure structure at 2nd Street

Silt buildup beneath the 2nd Street Bridge on the left descending bank has severely reduced the capacity of the bridge to pass design flows, thereby causing higher water levels during Mad Creek flooding events. This restriction would be removed as a part of the project, with continuing maintenance procedures established to ensure that any recurrence is addressed similarly (see plate C107).

The levee section between 2nd and 5th Streets would be raised to the design elevation to match the levee section found at the mouth of Mad Creek. The footprint would remain the same, thereby requiring the steeper side slope of approximately 2.5 horizontal to 1 vertical (2.5H:1V) as along the Mississippi River.

The existing floodwalls adjacent to 5th Street would be modified similar to those found along the Mississippi River. The floodgate at 5th Street would be removed and would not be replaced. The City of Muscatine is nearing a contract award to build a new 5th Street Bridge designed high enough to eliminate the need for a closure at this location. The new 5th Street Bridge is scheduled to be completed prior to the start of the selected plan outlined in this report. However, should the 5th Street Bridge project not be completed prior to the completion of the selected plan as outlined in this report, the City of Muscatine will be required to provide a temporary or permanent closure at this location that provides protection up to elevation 561.5 feet NGVD.

The levee section north of 5th Street would be raised to the design elevation to match the levee section found at the mouth of Mad Creek. The footprint would remain the same, thereby requiring the steeper side slope of approximately 2.5 horizontal to 1 vertical (2.5H:1V) as along the Mississippi River. This existing section of levee was previously constructed under two different contracts and to different design heights. The southern section of the existing levee would require more fill as it is approximately 1.5 feet lower than the more recent northern levee.

An earlier Mad Creek flood protection project included the raising of the railroad and roadway at the intersection of Mad Creek with Washington Street. Consideration was given to accomplishing an additional raise in order to provide passive closure at this location; however, it was determined that it would be impractical to raise the railroad an additional 2 feet. Therefore, it is recommended that a railroad closure be constructed at the termination point of the existing levee (see plates S201, S202, and S203).

Protection of the low-lying areas west of Mad Creek along Washington Avenue was not determined to be economically feasible; therefore, no work would be accomplished in this area.

High ground east of the Heinz plant provides natural protection to that stretch of Mad Creek from the southeast corner of the plant to a point west of the confluence of Mad Creek and Geneva Creek. A previous contract provided flood protection along the southerly descending bank of Geneva Creek north of the Heinz plant. This levee system provides adequate protection and would not be modified. Analyses of the openings at Isett Avenue and the bridge access to the Heinz plant revealed that no improvement to the current sandbag closure methodology is economically justified.

b. Design and Construction Considerations. Plans and specifications will be completed after completion of the feasibility study. A Design Documentation Report (DDR) will be completed during the plans and specifications phase.

(1) **Design Considerations.** Due to the need to raise the existing floodwall approximately 2 feet, an overturning analysis was performed to confirm the floodwall's stability caused by the additional loading. Sufficient capacity exists to resist this overturning. Confirmation of the wall's internal structural strengths and sizing of the wall extension reinforcing was checked and determined to be not adequate to support the additional loads resulting from a 2-foot raise. The existing floodwall will need to be strengthened with buttresses for earth berms on the landside of the floodwall.

Landscaping needs for the project would be minimal due to the nature of the project; however, coordination for the required landscaping may be needed to make allowances for the future recreational trail that the City of Muscatine is proposing along Mad Creek.

(2) **Utilities.** The initial construction of the levee and floodwall system during the 1970's and 1980's required the relocation of numerous utilities and structures. The criteria for current modifications show that the proposed improvements of the selected plan (project) are located within the existing levee footprint. This requirement results in minimal disruption to existing utilities and structures.

Modifications to the existing pumphouses may be required to allow for the raise in protection. It is anticipated that the three gatewells located along Mad Creek from its mouth to 5th Street would require height adjustment to match the new protection level.

(3) **Construction Considerations.** Special coordination would be required during modification of the levee and floodwalls, especially near HON Industries, in order to minimize impact to their manufacturing processes.

Additional coordination would be required for construction of the closure structure at the railroad tracks as it affects rail access into the Heinz plant. This would require close coordination with the railroad company.

(4) **Value Engineering.** Value Engineering (VE) is an organized, systematic effort to reduce project costs without sacrificing quality, function, reliability or operation and maintenance requirements. A VE study has been completed on the recommended plan. The VE study recommends several proposals for further consideration during the plans and specifications stage of the project. The proposals include: reducing the length of the 2nd Street vertical lift gate by 20 feet, using a double leaf swinging miter gate instead of the vertical lift gate at 2nd Street, using pre-cast concrete panels doweled to the existing floodwall to raise it 2 feet instead of cast-in-place concrete, using a concrete walkway and parapet wall on top of the existing levee to raise it 2 feet instead of raising the levee with clay fill, and finally eliminating gateway modifications.

c. **Operation and Maintenance Considerations.** The City of Muscatine would perform regular operation and maintenance practices after project construction. Some of the items to be addressed would include: levee gate closure during flood events, silt deposit removal from the channel of Mad Creek, placement of sandbags at the Heinz access bridge and the Isett closure, and maintenance of the flood warning system.

Levee maintenance would involve mowing the grass cover, removing brushy growth, controlling burrowing animals, and repairing the damage they may have caused to the levee. Mowing of the new 2.5H:1V levee side slopes would likely require special equipment. The City indicates they

have the capability to mow this steep of a slope. These maintenance tasks are required to preserve the integrity of the levee and to allow for periodic inspections.

The flood warning system for the Mad Creek and Geneva Creek basins would be used in conjunction with the NED Plan to provide additional response time for required operation of the levee system closures. The flood warning plan would be finalized during the construction plans and specifications phase. See pages A-18 thru A-21 of Appendix A for operation and details of the flood warning system.

The flood damage reduction project along Mad Creek includes channel modifications at and upstream of the 2nd Street Bridge to improve the hydraulic capacity of the bridge and channel through this reach. These channel improvements would result in a decrease in flood profile heights. The City of Muscatine must maintain the improved channel to at or near as-built design condition in order for the project to function as intended. The channel improvements are shown on plate C107. Periodic mowing of the improved channel reaches to inhibit brush and tree growth must be performed on an as-needed basis (1-2 times per year). Such maintenance would enhance the life of the channel/bridge improvements. Cleanout maintenance would occur when sediment deposits in the improved channel accumulate to a depth of 2 feet or more above the restored as-built channel dimensions. To facilitate the noting of silt deposition depths, paint markings on the 2nd Street Bridge pier and abutments should be placed to provide a field visual aid in recognizing when maintenance activities are required. Failure to maintain the channel improvements would result in increases in the design flood profiles, resulting in possible overtopping of the flood protection system. It is estimated that channel cleanout may be required every 2 years.

Operation and maintenance costs were not factored into the economic analysis for the selected plan or any of the alternatives. The alternatives involving detention dams (reservoirs) have very low benefit-cost ratios, so insignificant operation and maintenance costs would not change their status. The remaining alternatives are almost identical in the operation and maintenance associated with them, so operation and maintenance costs were not considered as a factor for determining the selected plan.

d. Plan (Project) Cost Estimate. The selected plan, D-2 Mad Creek Channel Improvements and 2-Foot Levee Raise - Reaches 1 & 4, has a March 2002 MCACES estimated total project cost of \$3,445,000 (see Table 6). The fully funded estimate for the selected plan, MCACES summary estimates for all alternatives, and a detailed MCACES estimate of the selected plan can be found in Appendix G - Cost Estimates - Alternatives and Selected Plan.

**Table 6. Project cost distribution
Plan D-2, channel improvements with 2-foot levee raise
Muscatine, Iowa**

<u>Total Project Cost Estimate</u>	\$3,445,000
<u>Federal Cost Estimate</u>	2,239,250
<u>Non-Federal Cost Estimate</u>	1,205,750
Lands, Damages, & Relocations	\$505,000
Cash Contributions	\$700,750
Non-Federal Share Percent of Total Cost:	35%

e. **Plan Accomplishments.** Construction of a levee/floodwall system would substantially reduce damages due to flooding from both Mad Creek and the Mississippi River. The City seeks flood protection for its central business district and its two largest employers. Table 7 shows that the selected plan would provide the following levels of protection for the proposed improvements on Reaches 1 and 4.

Table 7. HEC-FDA performance statistics for proposed plan

Reach	Term Risk			Conditional Non-Exceedance Probability by Events						Crest Feet
	Long 10-yr	25-yr	50-yr	10%	4%	2%	1%	.4%	.2%	
1	.019	.05	.09	1.00	1.00	1.00	1.00	.99	.99	561.4
4	.0028	.0071	.014	1.000	1.000	1.000	0.9996	0.996	0.993	561.5

The long-term risk gives the probability of the levee being exceeded during a 10-, 25-, or 50-year period. The conditional non-exceedance probability looks at performance by event. It gives the chance of the levee containing (not being overtopped by) the specified exceedance probability.

f. **Economic Effects.** The NED Plan will reduce annual flood damages by \$823,000 while requiring an annualized cost of \$240,426 for a benefit-to-cost ratio of 3.4. This results in a net benefit (annual benefit minus annual cost) of \$582,574. A detailed economic analysis is provided in Appendix B.

g. **Social Effects.**

(1) **Community and Regional Growth.** No adverse impacts to the growth of the community or region would be realized as a direct result of the selected plan (project).

(2) **Community Cohesion.** The project would be expected to somewhat enhance community cohesion by reducing further damages from flooding and securing the economic viability of businesses located in the floodplain/floodway.

The lower portion of Mad Creek is located within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. The city administration and area property owners have expressed support for the project. Coordination with Federal and state agencies has not revealed any objections or concerns.

(3) **Displacement of People.** The project involves raising the existing flood control levee and floodwall, plus some channel improvements. No residential displacements would occur as a result of the project.

(4) **Property Values and Tax Revenues.** The potential value of property in the project vicinity could increase as a result of the project construction.

(5) **Public Facilities and Services.** The project involves upgrading the existing levee and floodwall system, thus improving public facilities while other public facilities and infrastructure located within the protected area would benefit from reduced flood damages following project construction.

A public marina, boat ramp, and city park are located on the Mississippi River adjacent to the existing floodwall. The project would not adversely affect access to, or use of, these public facilities.

(6) **Business and Industrial Activity.** The project would positively impact existing business and industrial activity by further reducing the threat of flooding. Significant commercial/industrial expansion in the project area is not expected due to the current density of use. No business relocations would be required due to the project.

(7) **Employment and Labor Force.** The project would temporarily increase area employment during the 2-year construction phase. There would be no significant long-term effect on employment or labor force within the City of Muscatine or Muscatine County.

(8) **Farm Displacement.** The project is located in an urban area; thus, no farms would be affected.

(9) **Life, Health and Safety.** Upgrading the existing flood protection system would further reduce life, health, and safety concerns faced by area residents and business owners.

(10) **Noise Levels.** The project would temporarily increase noise levels over the 2-year construction period. The project area is primarily developed for industrial uses and no significant or long-term noise impacts to residents or sensitive receptors are expected.

(11) **Aesthetics.** The project would raise the existing levee and floodwall and clean out a portion of the existing channel. The appearance of the finished project would not be much different than what is already in place; therefore, no significant change to the aesthetic resources of the area is expected.

h. Environmental Effects.

(1) **Natural.** The existing land use in the study area is predominantly urban with some agricultural usage. The agricultural land provides food and shelter for wildlife, while the developed areas provide habitat for small mammals and birds.

The majority of the project area is contained within the urban and heavily developed city limits of Muscatine. The proposed levee and floodwall alternatives are generally confined to a within levee cross-section upgrade, thus minimizing the overall impacts to the surrounding environment. However, the proposed detention basins would likely impact existing wetlands and pasture.

The proposed channel improvements would improve hydraulics in the area around the 2nd Street Bridge, thus reducing the occurrence of flooding within the City. Following vegetation removal and excavation of the filled in area, the bankline would be graded and reseeded with native wetland vegetation (see Figure 8).

The U.S. Fish and Wildlife Service’s Fish and Wildlife Coordination Act Report (FWCAR) states that there are federally listed endangered or threatened species in Muscatine County, although none would be adversely impacted as a result of the selected plan (project). The FWCAR, along with a more detailed description of existing environmental conditions, can be found in Appendix D - Environmental Assessment.

The industrialized and residential areas within the Mad Creek levee district will be positively affected by reduced flooding impacts as a result of upgrading the levee system.

**Mad Creek Channel Improvement
Wetland Area**

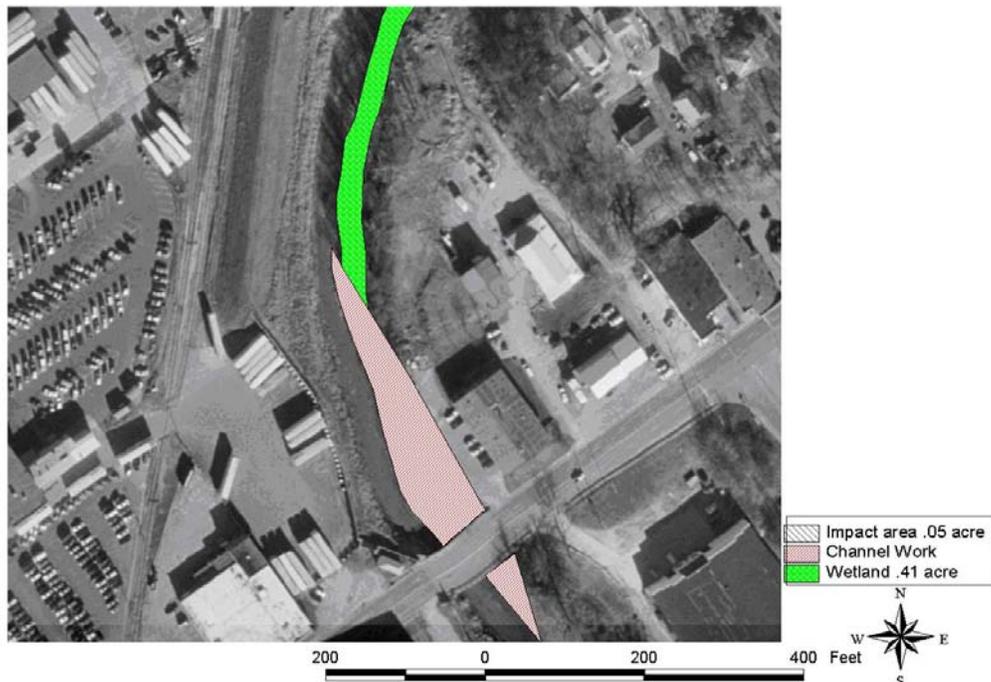


Figure 8. Channel excavation of fill at 2nd Street Bridge

(2) Cultural. Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR Part 800 require Federal agencies to take into account the effect of an undertaking on significant historic properties if that project is under the direct or indirect jurisdiction of the agency or has been licensed or assisted by that agency. The District determined that the proposed undertaking had potential to cause effects to significant historic properties (36 CFR 800.3(a)) and provided that determination along with proposed research measures to the SHPO, relevant federally recognized tribes, and the interested public for review and comment. The SHPO concurred with the District's determination by letter dated January 29, 2001 (R&C#: 010170032) and both the Sac and Fox Nation and the Iowa Tribe of Oklahoma indicated interest in the undertaking and the results of the archeological investigation.

The District contracted for an archeological survey with Bear Creek Archeology (BCA) of Cresco, Iowa, under Contract DACW25-98-D-0001, Delivery Order 25. The investigation evaluated the potential borrow areas and resulted in the documentation of four newly recorded prehistoric archeological sites. Based on recommendations presented in the BCA report, the District determined that these historic properties were not eligible for listing on the National Register for Historic Places and that further archeological investigation was not warranted. The BCA report and District determination were provided to the SHPO for review and comment. The SHPO concurred with the District's determination by letter dated June 11, 2001, with the exception that the SHPO recommended archeological survey of the potential retention basin sites. The retention basin project features, however, are not part of the preferred alternative and therefore are not part of the area of potential effect of this undertaking.

Subsequent to consultation, project modifications involving floodwall construction necessitated revising the APE to include two historic structures and associated limestone wall. A National Register of Historic Places eligibility determination has not been rendered on any of the standing structures, and the lots surrounding these structures have not been surveyed previously for archeological remains. The District and the Iowa SHPO have signed a PA (Programmatic Agreement) (Appendix I) regarding implementation of the project and the revised area of potential effect (APE). This PA is an appropriate vehicle for addressing historic property concerns for this undertaking at the historic wall and historic structure locations within the revised APE.

While the District is assured that no significant historic properties would be affected by the preferred alternative, if any undocumented historic properties are identified or encountered during the undertaking, the Corps would discontinue project activities and resume coordination with the consulting parties to identify the significance of the historic property and determine any potential effects.

(3) Hazardous, Toxic, and Radiological Waste (HTRW) Assessment. Based on the findings of the Preliminary Phase II-A Environmental Site Assessment, the Mad Creek Flood Damage Reduction Project may proceed without limitations or special construction techniques, which are associated with HTRW contamination. The HTRW Documentation Report is on file at the Rock Island District office.

4. PLAN IMPLEMENTATION

a. Implementation Requirements. To implement the selected plan (project), a number of steps would be required, starting with report approval through operation and maintenance by the project sponsor. The following milestone schedule depicts the necessary steps.

Project Completion Schedule

Task	Duration
Execute Project Cooperation Agreement	8 weeks*
Complete plans and specifications	48 weeks
Right-of-way acquisition by sponsor	48 weeks
Award construction contract	9 weeks
Complete construction	102 weeks

* Following approval of the DPR and commitment of funds

b. Implementation Responsibilities.

(1) Federal Responsibilities. The preparation of plans and specifications for construction will be financed up front 100 percent by the Federal Government, following approval and receipt of funds, with the local cost-sharing portion repaid beginning with the first fiscal year of construction. Project construction will be cost-shared 65 percent Federal/35 percent local. The Federal share is estimated to be \$2,239,250. The Corps of Engineers will supervise and administer the construction contracts in accordance with the Project Cooperation Agreement and available funding.

(2) Non-Federal Responsibilities. The Project Cooperation Agreement (PCA) is the formal assurance between the Federal and non-Federal partners. Within the PCA, the sponsor must agree to:

- Provide, without cost to the Government, during the period of construction, all lands, easements, rights-of-way, and utility and facility alterations and relocations required for construction and maintenance of the project, regardless of their value.
- Make a cash payment of not less than 5 percent of the total project costs during the period of construction, regardless of the value of the items listed above. If the value of the items listed above is less than 30 percent of total project costs, the sponsor shall, during the period of construction, make such additional cash payments as are necessary to bring its total contribution in cash and value of lands, easements, rights-of-way, and utility and facility alterations and relocation, to an amount equal to 35 percent of the total project costs.
- Contribute all project costs in excess of the Federal statutory limitation of \$7,000,000.
- Hold and save the Government free from all damages arising from the construction, operation, maintenance, and rehabilitation of the completed project, except for damages due to the fault or negligence of the Government or its contractors.

- Operate, maintain and rehabilitate the project upon completion in accordance with regulations or directions prescribed by the Secretary of the Army.
- Accomplish, without cost to the United States, all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements made necessary by construction of the project.
- Prevent encroachment on any of the flood protection structures, including ponding areas, and if ponding areas are impaired, provide substitute storage capacity or equivalent pump capacity promptly without cost to the United States.
- Prescribe and enforce regulations to prevent obstruction or encroachment on channels which will reduce their flood-carrying capacity or hinder maintenance and operation.
- Participate in and comply with applicable Federal floodplain management and flood insurance programs. Publicize floodplain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels, including ponding areas, provided by the project.
- Annually inform residents of the potential flood risks.
- Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, approved January 2, 1971, in acquiring lands, easements, and rights-of-way for construction and subsequent operation and maintenance of the project and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.
- Comply with Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations, in connection with the construction, operation, and maintenance of the project.
- Prior to construction, and in accordance with the provisions of Section 221 of Public Law 91-611, the sponsor will enter into a contract with the Government whereby the sponsor will grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the sponsor owns or controls for access to the project, for the purpose of inspection, and, if necessary, for the purpose of completing, operating, repairing, maintaining and rehabilitating the project. If an inspection shows that the sponsor, for any reason, is failing to complete, operate, repair, maintain or rehabilitate the project in accordance with the assurances hereunder, the Government will send a written notice to the sponsor. If the sponsor persists in such failure for thirty (30) calendar days after receipt of the notice, then the Government shall have a right to enter, at reasonable times and in a reasonable manner, upon the land that the sponsor owns or controls for access to the project for the purpose of completing, operating, repairing, maintaining and rehabilitating the project. No completion, operation, repair, maintenance, or rehabilitation by the Government shall operate to relieve the sponsor of responsibility to meet its obligations as set forth in the Agreement, or to preclude the

Government from pursuing any other remedy at law or equity to assure faithful performance pursuant to the Agreement.

The City of Muscatine has reviewed the draft model Section 205 PCA and has found its provisions to be acceptable, as stated in their letter dated November 20, 2002 (Appendix B).

3) Financial Analysis. The City of Muscatine, Iowa, has the willingness and capability to finance its share of the cost of constructing this local flood protection project. A Statement of Financial Capability and Financing Plan will be submitted, along with the PCA, with the final Detailed Project Report (DPR).

(4) Real Estate Requirements. The City of Muscatine is the local sponsor for the Mad Creek at Muscatine, Iowa, Section 205 Flood Damage Reduction Project. The proposed project will require 7.80 acres Temporary Work Area Easement, 4.13 acres Borrow Easement, 0.6 acre Channel Improvement Easement, 0.15 acre Floodwall Easement, 0.378 acre Flood Protection Levee Easement, and 0.9 acre Fee simple title. The estimated cost for lands, easement, rights-of-way, relocations and dredged material placement areas (LERRD) is \$598,000. A model Project Cooperation Agreement will be executed after project approval. Detailed real estate requirements are included in Appendix F - Real Estate Plan.

5. SUMMARY OF COORDINATION, PUBLIC VIEWS AND COMMENTS

a. Coordination. Throughout a feasibility study, the Corps of Engineers strives to inform, educate, and involve the many groups who may have an interest in the study. This coordination is paramount to assuring that all interested parties have the opportunity to be part of the study process.

One process used for coordination is the public involvement process. Public involvement is the exchange of information with various segments of the public. It attempts to reduce unnecessary conflict and achieve consensus by opening and maintaining channels of communication with the public in order to give full consideration to public views and information in the planning and decision-making processes. Content analysis is the method employed to identify public opinion, study concerns, and potential controversy. It ensures that the public involvement plan is responsive to the level of interest and concern expressed by the public, and it assesses the effectiveness of the public involvement techniques.

b. Public Views and Comments. In an earlier study (the Initial Assessment), the Corps of Engineers identified four primary alternatives for increasing flood protection to the areas along Mad Creek and Geneva Creek. These alternatives were further studied in the Section 205 Flood Reduction Study. The main forum for receiving comments during this study was through the study team's coordination with the non-Federal sponsor, the City of Muscatine. Meetings were held between the Corps of Engineers study team and city officials and representatives at critical stages throughout the study.

A broader forum for soliciting comments was a public open house, described in more detail below. The open house process and comments are described in more detail below. The open house attendees were offered comment sheets to express their concerns and comments. Following the open house, the comment sheet responses were documented and analyzed and the results were distributed to all study team members for use in the plan formulation process.

In March 2000, an open house invitation was mailed to a distribution list of nearly 250 addresses including congressional representatives; Federal, State, county, and city officials; businesses, media; and members of the public. The purpose of the open house was to meet with the public to exchange information about the study and potential benefits and problems that may be associated with any of the alternatives.

The open house was held on April 11, 2000, in Muscatine, Iowa. Approximately 25 members of the public attended the open house. A comment sheet was offered to the public for feedback; 9 were returned.

Overall, the majority of those who returned a comment sheet agreed:

- That they were able to discuss the alternatives with Corps of Engineers representatives on a one-to-one basis;
- That their questions about the alternatives were answered; and
- That the information provided about the alternatives was relayed in an understandable manner and that they had a better understanding of the alternatives after attending the open house.

The comment sheet also included a statement about the acceptability of the four primary alternatives for reducing flood damages.

- Respondents either agreed or were neutral that “raising the existing floodwall and levee system along Mad Creek” was acceptable.
- A strong majority agreed that “constructing stormwater detention reservoirs north of Muscatine to reduce peak flows” was acceptable.
- A majority of the respondents agreed that “a combination of floodwalls and levees and stormwater detention reservoirs” was acceptable.
- However, the majority of respondents disagreed that “an enhanced early flood-warning system to better react to flash floods” was acceptable.

Other comments received at the open house included concerns about flash flood protection, backwater flooding, storm sewer backup, and impacts of runoff. A comment about dredging and straightening some areas of Mad Creek was offered, as well as the need to keep flood plain data up to date.

The comments received at the open house were provided to the study team members for consideration and use in their analysis of the potential alternatives.

c. Draft Detailed Project Report Released. In August 2002, an announcement was mailed to a distribution list of nearly 250 addresses including congressional representatives; Federal, State, county, and city officials; businesses, media; and members of the public. The mailing announced the completion of the draft Detailed Project Report, the study findings and selected plan, and offered the public the opportunity to comment on the report. A copy of the announcement and the comments received are located in Appendix H.

d. Summary. The goals of the coordination process for the Mad Creek, Muscatine, Iowa, Flood Damage Reduction Study were to inform, educate, and involve the public and solicit feedback through open communication and to include in the plan formulation process all publics interested in and affected by the study recommendation(s). These goals were met by providing City officials and representatives and the public opportunities to become informed and educated about, and involved in, the study by providing feedback to the study team. The feedback was used by the study team to shape the plan formulation process and to develop the recommended plan. The study plan that is included in this report has been influenced by the public involvement process.

6. RECOMMENDATION

I recommend that the “selected plan” described herein be constructed under the authority of Section 205 of the 1948 Flood Control Act, as amended, with such modifications as, in the discretion of the Chief of Engineers, may be advisable, at a total cost to the United States presently estimated at \$3,445,000, with all annual operation, maintenance, and replacement costs to be the responsibility of the non-Federal sponsor.

Section 205 local flood protection projects are subject to cost sharing in accordance with Public Law 99-662, the Water Resources Development Act of 1986. The non-Federal share of the cost will be \$1,205,750, which is comprised of credits for lands, easements, rights-of-way, relocations and disposals (LERRDs), and a minimum 5 percent cash contribution.

Accordingly, I recommend that the project be funded and constructed subject to cost-sharing and financing arrangements that are acceptable to the Chief of Engineers, the Secretary of the Army, and the non-Federal sponsor.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program, nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding.

(Date)

William J. Bayles
Colonel, U.S. Army
District Engineer

APPENDIX A

HYDROLOGY AND HYDRAULICS

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX A
HYDROLOGY AND HYDRAULICS**

CONTENTS

Subject	Page
1. Purpose and Site Description.....	A-1
2. Climate, Floods of Record, and Datum	A-1
3. Existing Federal Projects	A-2
4. Proposed Federal Alternatives.....	A-2
5. Previous Hydrologic Studies of Mad Creek by the Corps of Engineers	A-3
6. Mississippi River Hydrology and Hydraulics	A-4
7. Hydrologic Modeling	A-4
a. HEC-HMS Without-Project and With-Project Modeling	A-4
b. HEC-HMS Results from Synthetic Storms and Recommended Discharges	A-9
c. HEC-HMS Results from Probable Maximum Storm.....	A-10
8. Hydraulic Modeling.....	A-10
HEC-RAS Model Results	A-11
9. Risk Based Analysis	A-12
a. Description of HEC-FDA Input	A-12
b. HEC-FDA Results	A-14
c. HEC-FDA Consequences of Failure to Close Gate	A-16
10. Flood Warning.....	A-18
a. Basin Characteristics.....	A-18
b. Flood Warning System	A-19
11. References	A-22

Tables

No.	Title	Page
A-1	Peak stages on the Mississippi River at Muscatine, Iowa.....	A-2
A-2	Comparison of discharges on Mad Creek	A-3
A-3	Comparison of discharges, mouth of Geneva Creek.....	A-4
A-4	Discharge and stage, Mississippi River at Muscatine, Iowa.....	A-4
A-5	Gimlet Creek flood flow frequency results and rainfall	A-5
A-6	Loss rates derived from Gimlet Creek for HEC-HMS models.....	A-6
A-7	Rainfall used at Muscatine for 24-hour storms.....	A-6
A-8	Mad Creek HEC-HMS subbasin parameters	A-7

CONTENTS (Continued)

Tables (Continued)

No.	Title	Page
A-9	Muskingum routing values used in HEC-HMS	A-7
A-10	Elevation-area-outflow data for the proposed reservoirs	A-9
A-11	Computed inflow, outflow, and peak water surface elevation at proposed reservoirs	A-9
A-12	Preliminary HEC-HMS discharges, mouth of Mad Creek and mouth of Geneva Creek	A-10
A-13	Adopted discharges for mouth of Mad Creek and mouth of Geneva Creek	A-10
A-14	Starting water surface elevations at the mouth of Geneva Creek	A-11
A-15	HEC-FDA performance statistics for Reach 1	A-15
A-16	HEC-FDA performance statistics for Reach 2	A-15
A-17	HEC-FDA performance statistics for Reach 3	A-16
A-18	HEC-FDA performance statistics for Reach 4, Mississippi River	A-16
A-19	Elevation-area-volume relationship for interior area at 2nd Street	A-17
A-20	Transform from exterior stage to interior stage at 2nd Street	A-17
A-21	Transform from exterior stage to interior stage at Service Road	A-18
A-22	Total 5-day antecedent rainfall in inches	A-19
A-23	Information on closures	A-19
A-24	Initial values for rainfall alarms within Mad Creek Basin	A-20
A-25	Stage alarms on Mad Creek	A-21

Figures

No.	Title	Page
A-1	Schematic diagram of with-project model	A-8
A-2	Profiles of alternatives on Mad Creek for .01 probability event	A-12

Plates

No.	Title
A-1	Mad Creek Basin Map
A-2	Discharge-Frequency Plot, Mad Creek at Mouth
A-3	Discharge-Frequency Plot, Geneva Creek at Mouth
A-4	Mad Creek Water Surface Profiles, Alternative A
A-5	Mad Creek Water Surface Profiles, Alternative B and Alternative C
A-6	Mad Creek Water Surface Profiles, Alternative D
A-7	Geneva Creek Water Surface Profiles, Alternative A and Alternative D
A-8	Geneva Creek Water Surface Profiles, Alternative B and Alternative C
A-9	HEC-RAS Cross Section Location Map for Mad and Geneva Creeks
A-10	Discharge Hydrographs for Geneva and Mad Creeks
A-11	Geneva and Mad Creeks, Rainfall-Discharge Relationship
A-12	Rating Curve for 2nd Street Bridge, Mad Creek

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX A
HYDROLOGY AND HYDRAULICS**

1. PURPOSE AND SITE DESCRIPTION

This appendix documents efforts to reduce flood damage in the City of Muscatine from flooding by the Mississippi River and by Mad Creek. The City of Muscatine is on the Mississippi River approximately 1 mile downstream from Lock and Dam 16. A location map of the study area appears on Figure 1 of the Detailed Project Report showing retention (basin) locations. A vicinity and location map along with the retention locations can be found on the plates, Appendix L. Mad Creek (drainage area about 17 square miles) starts in the hills above Muscatine, flows through the city, and enters the Mississippi River at river mile 546. Geneva Creek, a tributary to Mad Creek, has a drainage area of 3 square miles. Geneva Creek flows southwesterly into the city and enters Mad Creek; this confluence is in a commercial area of the city. Mad Creek continues downstream about 6,000 feet to its mouth. Storm water from a portion of the city, including residential and downtown areas, does not contribute flow to Mad Creek due to an existing levee system.

2. CLIMATE, FLOODS OF RECORD, AND DATUM

The temperature summary at Muscatine (National Weather Service station 5837) is based on the period from 1948 to 1999. The average monthly temperature ranges from 22 degrees Fahrenheit (January) to 76 degrees Fahrenheit (July). The mean daily temperature is 51 degrees Fahrenheit. Extremes include two days between 105 to 114 degrees Fahrenheit and one day between -40 to -31 degrees below zero.

Peak discharges are not recorded on Mad Creek. Large floods occurred on June 30, 1961, and on June 16, 1990. The gage at Muscatine on the Mississippi River is at mile 453. The 10 highest recorded stages at this gage since 1878 appear in Table A-1. The gage zero is elevation 530.74 feet MSL.

Table A-1. Peak Stages on the Mississippi River at Muscatine, Iowa

Rank	Date	Peak Stage
1	07/09/1993	25.61
2	04/29/1965	24.81
3	04/25/2001	23.50
4	04/25/1973	21.63
5	04/26/1969	21.20
6	04/21/1997	21.09
7	04/28/1952	21.05
8	04/26/1951	21.00
9	05/09/1975	20.96
10	10/07/1986	20.59

More than one datum exists at Muscatine. Measurements of stage on the Mississippi River are in MSL (1912 datum). This datum was used for earlier reports and drawing of levees along the Mississippi River. Elevations on USGS quad sheets are in NGVD (1929 datum). At Muscatine, subtracting 0.49 foot from an elevation in 1912 datum converts it to an elevation in 1929 datum. The City of Muscatine uses a city datum. Adding 249.1 feet to an elevation in city datum converts it to an elevation in 1929 datum. Elevations in this appendix are in or have been converted to 1929 datum.

3. EXISTING FEDERAL PROJECTS

Two Federal projects are located within the City of Muscatine. The design stage appears to have been 3 feet higher than the 1% probability event at the time of design for both projects. (Refer to plates X101 thru X105 in Appendix K for project maps.) The oldest system was finished in 1961 and improved in 1983; it protects downtown Muscatine from flooding by the Mississippi River and by Mad Creek. The protected area is triangular-shaped. One levee is along the Mississippi River (460 feet); the other is along the right bank of Mad Creek (3,000 feet). A second levee system was finished in 1983 and mainly protects the Heinz plant where Geneva Creek enters Mad Creek. Geneva Creek enters Mad Creek about 6,000 feet upstream from the mouth of Mad Creek. Stages for the Mississippi River have increased since the 1961 report.

4. PROPOSED FEDERAL ALTERNATIVES

Four alternatives to reduce flood damage are examined in this report. Alternative A proposes raising the existing levees along Mad Creek, improving the closure structures, and improving the flood warning system. Alternative B proposes building one storm water detention reservoir on Geneva Creek and one storm water detention reservoir on Mad Creek. The reservoirs will only store water during a flood event. Alternative C examines a combination of reservoirs and levee raise. Alternative D proposes raising levees on both Mad Creek and the Mississippi River, plus improving the channel, the closure structures, and the flood warning system.

The Corps of Engineers also plans to model several alternatives for the City of Muscatine to evaluate raising the 5th Street Bridge and the roadway within the floodway of Mad Creek.

5. PREVIOUS HYDROLOGIC STUDIES OF MAD CREEK BY THE CORPS OF ENGINEERS

Mad Creek has no recording stream gage. The Rock Island District has developed discharge-frequency relationships for Mad Creek on several occasions. The first hydrologic study by the District was made in the 1950's (reference 1). The peak discharge for the 1% chance event was 4,900 cfs. This discharge was increased during the 1960's for the existing Federal projects. The discharge-frequency relationship was based on a flood flow frequency analysis of Mill Creek in Milan, Illinois (drainage area 62.5 sq. mi.). A representative standard deviation (S) of 0.342 and the log of the mean annual flood (M) 3.142 were used to compute the discharge-frequency curve. The log of the mean annual flood for Mad Creek was based on a ratio of the drainage areas (references 2 and 3). This methodology is no longer the preferred method of the Corps of Engineers.

Discharges used in a 1977 flood insurance study (reference 4) were based on a Corps of Engineers regression analysis of bluff streams along the Mississippi River. The discharges were from "expected probability discharges" equations, which give larger values than "computed probability discharges."

In 1996, the NRCS (Natural Resources Conservation Service) made a basin model for the City of Muscatine, which evaluated many different dam sites (reference 5). However, the loss rates and unit-hydrograph parameters in this model were not verified on a similar, gaged basin. In 2000, the Corps of Engineers developed an HEC-HMS (reference 6) model of Mad Creek. This model used the two dams from the NRCS model that would be most likely to reduce flood damage. The sites were coordinated with the local sponsor. The loss rates in the HEC-HMS model were verified on a gaged basin; however, insufficient rainfall data prevented calibrating any unit hydrograph parameters. The engineers at the Corps' Hydrologic Engineering Center at Davis, California, prefer the regression analysis for computing the absolute value of discharges. HEC-HMS is good for evaluating variations in discharge, but is not recommended for determining the absolute value of discharge. The without-project discharges from the future condition (year 2020) computed by the HEC-HMS model appear in Tables A-2 and A-3. Discharge-frequency data that were available for the other methods appear in the same tables. "RI" stands for recurrence interval in years.

Table A-2. Comparison of discharges on Mad Creek

Discharge Probability %	RI Yr.	Mouth of Mad 1960's cfs	Mouth of Mad FIS cfs	Mouth of Mad HMS cfs	U/S Conf. Geneva 1960's cfs	U/S Conf. Geneva FIS cfs	U/S Conf. Geneva HMS cfs
50	2	1,400		1,581			1,125
20	5	2,700		3,135			2,296
10	10	4,000	3,140	4,252		2,780	3,135
4	25	6,100		5,638			
2	50	7,900	6,100	7,613		5,370	5,480
1	100	10,200	7,700	8,733	6,600	6,820	6,525
0.4	250	14,500		12,093			
0.2	500	17,000	12,100	18,327		10,800	13,610
Mi ²		17.3	17.50	16.93	13.8	14.00	13.33

Table A-3. Comparison of discharges, Mouth of Geneva Creek

Discharge Probability %	Geneva 1960's cfs	Geneva FIS cfs	Geneva HMS cfs
50			468
20			906
10		1,140	1,222
4			1,615
2		2,330	2,110
1	3,600	3,020	2,487
0.4			3,426
0.2		4,960	5,090
Mi ²	2.9	2.90	3.05

6. MISSISSIPPI RIVER HYDROLOGY AND HYDRAULICS

Discharge data for the Mississippi River at Muscatine and river stages at the mouth of Mad Creek appear in Table A-4. These data are from a report prepared by the Rock Island District in 1979 for the Technical Flood Plain Management Task Force of the Upper Mississippi River Basin Commission and used for studies on the Mississippi River (reference 7). Data in the original report were converted to 1929 datum for this table. Some points were interpolated.

Table A-4. Discharge and stage, Mississippi River at Muscatine, Iowa (NGVD 1929)

Probability %	Discharge cfs	Stage ft NGVD
50	153,000	548.10
20	203,000	550.46
10	235,000	552.21
4	273,000	554.65
2	308,000	556.26
1	335,000	557.50
0.4	370,000	559.20
0.2	400,000	560.36

7. HYDROLOGIC MODELING

Daily and Associates of Peoria, Illinois, prepared the HEC-HMS modeling and written summary under contract to the Corps of Engineers. The original report (reference 8) is on file at the Rock Island District office.

a. HEC-HMS Without-Project and With-Project Modeling. Two HEC-HMS (reference 6) models were prepared for this study. The first modeled the existing basin. The “without-project model” was used to evaluate the existing levees. Moreover, since raising levees does not alter the discharge-frequency relationship, it was also used to evaluate Alternatives A and D. The “with-project model” was used to evaluate Alternatives B and C (alternatives with water detention reservoirs).

All HEC-HMS models used the SCS Type II rainfall distribution with a 24-hour duration. This distribution produces the highest peak flows. The synthetic rainfall amounts came from Bulletin 71 (reference 9). Discharges were computed at the mouth of Mad Creek, the mouth of Geneva Creek, and on Mad Creek upstream of the confluence of Geneva Creek.

(1) Gimlet Creek at Sparland Used to Check Loss Rates. Since Mad Creek is ungaged, loss rates were verified using an HEC-HMS model of Gimlet Creek at Sparland, Illinois. This basin with similar soils and terrain is located approximately 41 degrees latitude along the west bank of the Illinois River. Gimlet Creek, USGS 05559000, has a drainage area of 5.66 square miles, a slope of 53.86 feet per mile, and a channel length of 4.81 miles. The gage recorded 36 annual peak discharges in years 1924, 1946, 1947, and 1950-1982. Discharges were analyzed using a flood flow frequency analysis and are summarized in Table A-5. The 24-hour rainfall for Gimlet Creek came from Bulletin 71 for the central region of Illinois (see Table A-5).

Table A-5. Gimlet Creek flood flow frequency results and rainfall

Expected Probability (%)	Peak Discharge cfs	Storm Probability	Rainfall in Inches
50	809	0.500	3.02
20	1,280	0.040	5.32
10	1,580	0.010	6.92
5	1,870		
2	2,230		
1	2,500		
0.2	3,100		

The Clark unit hydrograph transformed rainfall excess into runoff. The time of concentration was calculated for each subbasin by breaking the total channel length into parts and estimating velocity and travel time for each segment. The storage coefficient was estimated using reference 10. For the region containing Gimlet Creek, the storage coefficient equals the time of concentration.

The Muskingum method was used for channel routing. The routing has two parameters: (1) travel time (K) through the routing reach, and (2) a dimensionless constant (X). If X is 0.0, the maximum attenuation occurs; if X is 0.5, no attenuation occurs. The X value was based on experience. X approaches 0.0 if the channel has mild slopes with flows out of banks and approaches 0.5 for well-defined channels where the discharge stays within banks. The travel time was estimated with Manning's equation and typical cross-sectional geometry.

The Green and Ampt parameters used to determine rainfall losses appear in Table A-6. The moisture deficit is the antecedent moisture condition, the wetting front suction measures the ability of soil to draw water into the ground before saturation, and hydraulic conductivity measures the rate water passes through soil. Values were not from physical tests, but estimated from soil type (silt loams to silty clay loams). The computed peak at Gimlet Creek for the 100-year, 24-hour storm was 2,510 cfs. It was obtained by varying parameters within acceptable ranges so the calculated peak was nearly equal to the flood flow frequency peak. The parameters were then used for all frequency storms. The impervious area was estimated from Quad maps.

Table A-6. Loss rates derived from Gimlet Creek for HEC-HMS models

Initial Loss (Inches)	Volumetric Moisture Deficit	Wetting Front Suction (Inches)	Hydraulic Conductivity (In/Hr)
.05-.1	.22	8	.5

(2) **Mad Creek Without-Project Model.** The regional charts in Bulletin 71 show that Muscatine receives greater rainfall than the rest of its region. Regional maps, not regional tables, were used for synthetic rainfall (Table A-7). The partial-series rainfall amounts for the 50% through 10% probability events were converted to annual series for this study. Since synthetic rainfall for 99%, 0.4%, and 0.5% probability events is not published, values were extrapolated. The extrapolated data were used for informational purposes only.

Table A-7. Rainfall used at Muscatine for 24-hour storms

Probability %	Partial Series Rainfall Inches	Annual Series (Adjusted) Inches
99.9	2.9	
50	3.2	2.83
20	4.0	3.80
10	4.6	4.55
4	5.5	
2	6.8	
1	7.5	
0.4	9.6	
0.5	13.1	

(3) **Subbasin Parameters.** The basin map of Mad Creek appears on plate A-1, while the schematic of the HEC-HMS With-Project model appears in Figure A-1. The Clark time of concentration (Tc) and the Clark R-value calculated for each subbasin appear in Table A-8. The computation method was described in the paragraph on Gimlet Creek. All models used the same Green and Ampt loss parameters calibrated from Gimlet Creek (see Table A-6).

Table A-8. Mad Creek HEC-HMS subbasin parameters

Subbasin ID	Drainage Area Sq. Mi.	Clark Tc Hours	Clark R Hours	Impervious Percent Yr. 2000	Impervious Percent Yr. 2020
1	7.06	1.93	1.93	2	5
2	4.58	1.08	1.08	2	5
3	1.69	1.13	1.13	10	20
4	2.09	1.07	1.07	2	6
5	0.96	0.87	0.87	18	24
6	0.55	0.92	0.92	35	35

Initially, discharge-frequency relationships were computed for the year 2000 and for the year 2020. The city engineer predicted development adjacent to Highway 38 and the Highway 61 Bypass. The impervious percent was increased (see Table A-8) to reflect future development. The contractor did not believe Tc and R would change as a result of development. The difference in discharges was so slight that only year 2020 discharges were used in this study.

The coefficients used for Muskingum routing through sub-basins appear in Table A-9. The number of sub-reaches depends upon the computation interval, which was 15 minutes.

Table A-9. Muskingum routing values used in HEC-HMS

Reach ID	Muskingum K Hrs.	Muskingum X	Number of Sub-Reaches
Reach 1	.50	.15	1
Reach 2	.40	.15	1
Geneva 3	.45	.20	1
Mad 4	.35	.15	1

(4) Mad Creek With-Project Model. Two Modified Puls routings added to the without-project model simulated the storm water detention reservoirs in the with-project model (see Figure A-1). Dam 2 on Mad Creek is just outside the current city limit. Existing sewage disposal lagoons on one of the tributaries determined the guide for the limiting pond elevation. Since the crest of the lagoon is elevation 636.4 feet NGVD, operation would be restricted at a lower elevation. Dam 1 is on Geneva Creek (just outside of the current city limit). The elevation of Highway 61 Bypass served as the guide for limiting pond elevation.

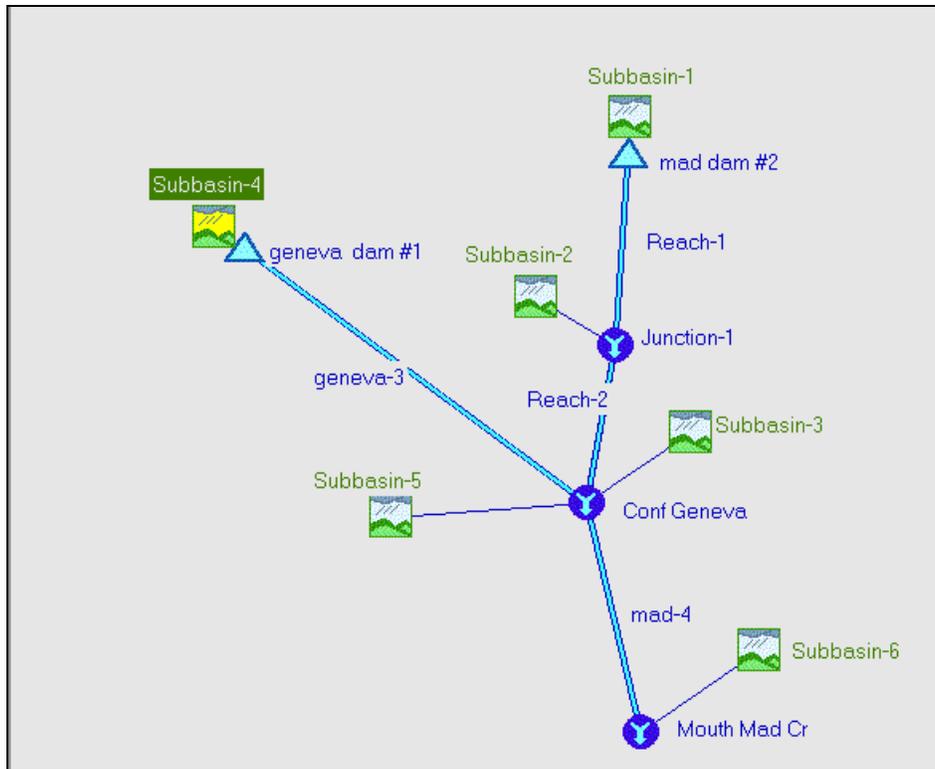


Figure A-1. Schematic diagram of with-project model

Only about half of the total area of Mad Creek is upstream of the proposed storm water detention reservoirs. To influence the discharges within the city, the peak flows at the reservoirs must decrease significantly. The selected outlet consisted of a circular culvert and an emergency spillway. The weir coefficient for the broad-crested emergency spillway was about 2.65.

The primary outlet of the Mad Creek Dam is 48 inches in diameter at the existing flowline of the creek. The crest of the emergency spillway is at elevation 636.5 feet; the weir length is 250 feet. The primary outlet of the Geneva Creek Dam is 36 inches in diameter. It is set in the flowline of the existing creek. The crest of the emergency spillway is elevation 629 feet; the weir length is 125 feet. Data (elevation, area, and outflow) used to model the reservoirs appear in Table A-10.

Table A-10. Elevation-area-outflow data for the proposed reservoirs

Elevation Ft NGVD	Mad Area Ac	Mad Outflow cfs	Elevation Ft NGVD	Geneva Area Ac	Geneva Outflow cfs
602	0	0	600	0	0
610	6.49	164.82	610	5.30	115.61
620	35.67	285.58	620	18.21	174.57
630	73.92	368.29	629	35.83	213.78
636.5	109.99	412.02	630	37.79	594.14
637	112.76	649.38	631	40.76	1,158.76
638	118.30	1,639.11	631.5	42.24	1,532.57
639	123.85	3,258.00	635	51.00	5,104.00
640	129.40	4,773.56	640	67.44	12,339.36
641	134.95	6,766.29	650	124.97	32,163.56

b. HEC-HMS Results from Synthetic Storms and Recommended Discharges.

Table A-11 summarizes the influence of the proposed reservoirs. The table lists the computed peak inflow and outflow (year 2020). The table also lists the maximum impoundment elevation calculated for each probability event. Most elevations were rounded to the nearest foot.

Table A-11. Computed inflow, outflow, and peak water surface elevation at proposed reservoirs

Storm Probability %	Mad Creek Reservoir			Geneva Creek Reservoir		
	Inflow cfs	Outflow cfs	Stage Ft NGVD	Inflow cfs	Outflow cfs	Stage Ft NGVD
50	625	204	613	320	119	611
20	1,323	286	620	674	140	614
10	1,823	302	622	928	157	617
4	2,443	324	625	1,242	176	620
2	3,331	356	629	1,682	186	622
1	3,839	371	630	1,930	192	623
0.4	5,352	398	635	2,665	209	628
0.2	8,116	2,212	638.35	3,957	1,192	631.04

The peak discharges computed at the mouth of Mad Creek and the mouth of Geneva Creek appear in Table A-12. These data produced an erratic line when plotted on discharge-frequency paper. To eliminate problems the scatter could cause when used in the HEC-FDA model, the data were fitted to a curved line. The adjusted data used in this study appear in Table A-13. A plot of discharge-frequency from Tables A-12 and A-13 for the mouth of Mad Creek appears on plate A-2. A similar plot for Geneva Creek is on plate A-3.

The difference between year 2000 and 2020 peak discharges was in the range of 1% to 5%. The larger the peak discharge, the less the percent difference. The influence of future development was so small that the future discharges were used for both present and future conditions to evaluate alternatives.

Table A-12. Preliminary HEC-HMS discharges, mouth of Mad Creek and mouth of Geneva Creek

Probability %	Mad	Mad	Geneva	Geneva
	Without Reservoirs Yr. 2020 cfs	With Reservoirs Yr. 2020 cfs	Without Reservoirs Yr. 2020 cfs	With Reservoirs Yr. 2020 cfs
50	1,580	1,240	468	286
20	3,130	2,335	910	501
10	4,250	3,100	1,220	640
4	5,638	4,053	1,615	825
2	7,613	5,388	2,173	1,069
1	8,733	6,137	2,487	1,201
0.4	12,093	8,371	3,426	1,597
0.2	18,327	12,371	5,095	2,285

Table A-13. Adopted discharges for mouth of Mad Creek and mouth of Geneva Creek

Probability %	Mad	Mad	Geneva	Geneva
	Without Reservoirs Yr. 2020 cfs	With Reservoirs Yr. 2020 cfs	Without Reservoirs Yr. 2020 cfs	With Reservoirs Yr. 2020 cfs
50	1,580	1,240	393	286
20	2,880	2,200	797	501
10	3,974	3,000	1,188	640
4	5,636	4,300	1,798	840
2	7,089	5,400	2,356	1,069
1	8,733	6,600	3,010	1,201
0.4	11,240	8,400	4,043	1,700
0.2	13,411	10,000	4,968	2,285

c. HEC-HMS Results from Probable Maximum Storm. Both proposed storm water detention reservoirs are upstream of the City of Muscatine. Since the failure of either dam could result in loss of life and property, the dams would be classed as high hazard. The State of Iowa requires such reservoirs to be evaluated using the probable maximum storm. This storm is the most extreme rainfall possible at the site. A probable maximum storm was routed through the with-project HEC-HMS model to evaluate the performance of the reservoirs under this extreme event. A point was added to the routing of Mad Creek reservoir for elevation 645 feet (200 acres and 16,888 cfs outflow). At the Geneva Creek reservoir, computations showed: inflow 7,360 cfs, outflow 6,340 cfs, and pond elevation 635.8 feet NGVD. At Mad Creek, computations showed: peak inflow 18,600 cfs, outflow 15,750 cfs, and pond elevation of 644.6 feet NGVD. For purposes of comparison to synthetic events, the peak discharge at the mouth of Mad Creek (with-project) was 32,700 cfs.

8. HYDRAULIC MODELING

Water surface profiles were computed on HEC-RAS (river analysis system, V 2.2, reference 11). The lower channel has not changed since the construction of previous projects by the Corps of Engineers. Cross sections in these areas were taken from Corps of Engineers drawings and city topographic maps. However, upper portions have re-aligned and the floodway has filled. Sixteen cross sections were surveyed between the Route 61 Bypass and Washington Street.

Manning’s N-values was based upon judgement. The N-value for the main channel ranged from .035 to .036 while the overbank N-values ranged from .04 to .07 for overbanks covered with grass to brush.

The lower Mad Creek model ran from its mouth upstream to the junction of Geneva Creek, about 6,000 feet. The model had 5 bridges, 42 cross sections, and started at normal depth. Discharges from Table A-13 were used in the HEC-RAS model.

The Geneva Creek model started at its mouth and ran upstream 3,000 feet. The model had two bridges, six cross sections, and started with known water-surface levels. The starting elevations were at the junction of Geneva Creek from the lower Mad Creek model for the equivalent frequency and alternative (see Table A-14).

Table A-14. Starting water surface elevations at the mouth of Geneva Creek

Probability %	Without Project WSEL* Feet	Without Project Discharge cfs		With Project WSEL Feet	With Project Discharge cfs
50	555.23	393		554.50	286
20	557.47	797		556.37	501
10	559.00	1,188		557.65	640
4	560.99	1,798		559.41	840
2	562.47	2,356		560.74	1,069
1	563.93	3,010		561.96	1,201
0.4	565.75	4,043		563.65	1,700
0.2	567.16	4,968		564.91	2,285
* water surface elevation					

In preparing the without-project model, engineers noticed a sandbar blocking half of the 2nd Street Bridge. At the upstream face of the bridge, the sand extended from the center pier to the north bridge abutment. Since it was not certain the sand would wash away, a third model was prepared (without-project improved channel). This model was used to evaluate Alternative D. The sand was removed from 2nd Street, and the channel upstream and downstream of the bridge was widened (bottom width of 45 feet with 1 on 3 side slopes).

HEC-RAS Model Results. The without-project profiles modeled lower Mad Creek using future condition discharges and the present channel. These profiles were used to evaluate the existing levee system and Alternative A (levee raise) (see plate A-4). The with-project profiles modeled the proposed reservoirs and the present channel. These profiles were used to evaluate Alternative B and Alternative C on Mad Creek and appear on plate A-5. Profiles for Alternative D used future condition discharges and an improved channel; profiles appear on plate A-6. Figure A-2 superimposes the 10% exceedance event for Alternatives A (no reservoirs), B (with reservoirs), and D (no reservoirs but improved channel). Alternative B eliminates the constriction at 2nd Street by lowering the discharge; Alternative D eliminates the constriction by increasing the bridge opening.

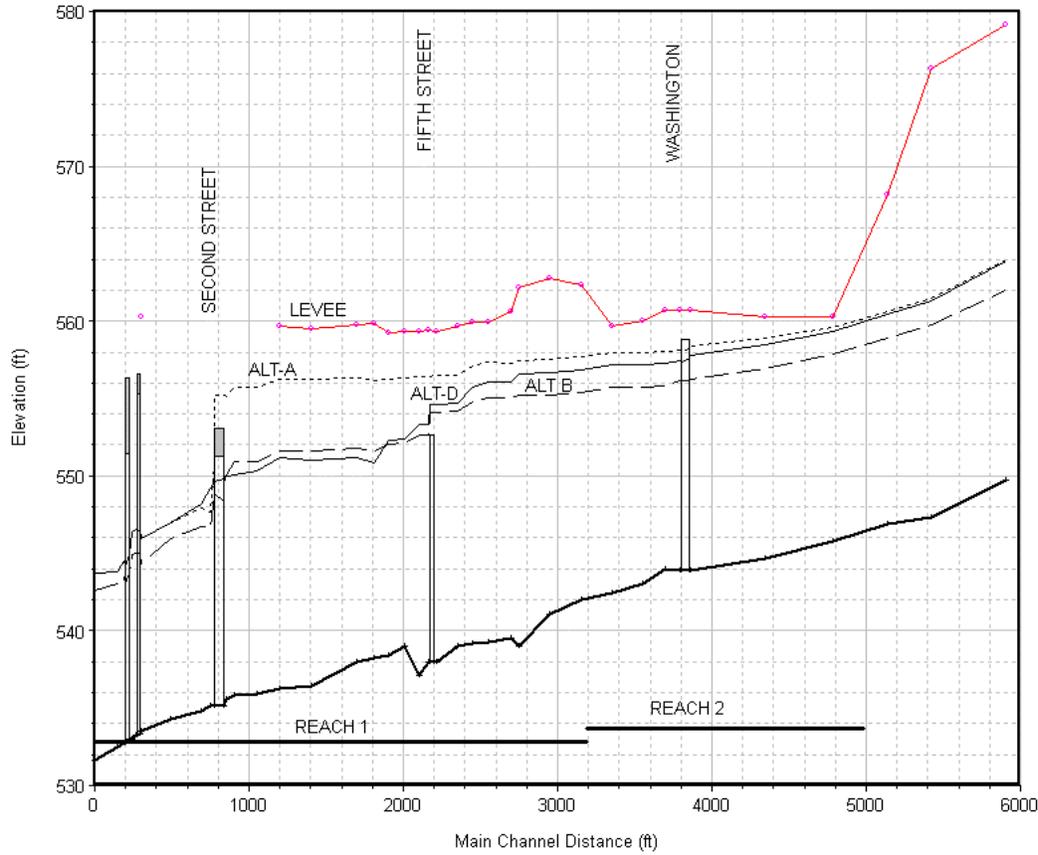


Figure A-2. Profiles of alternatives on Mad Creek for .01 probability event

The improved channel lowered the water surface profiles from 2nd Street to above Washington. While the improvement lowers the water level, it will not eliminate the sediment problem at the bridge. Maintenance cleaning will be required periodically. For purposes of estimating maintenance costs, cleaning will be required every 2 to 5 years.

The without-project profiles for Geneva Creek appear on plate A-7, and the with-project profiles appear on plate A-8. The improved channel at 2nd Street does not lower the starting water level on Geneva Creek significantly. The decrease in water levels for various events ranged from 0.00 to 0.06 foot. For a map showing the locations of HEC-RAS cross sections, refer to plate A-9.

9. RISK BASED ANALYSIS

This section discusses the hydrologic and hydraulic input used for HEC-FDA (flood damage reduction analysis program, reference 12). After a general discussion on input, the performance statistics for the alternatives are presented by economic reach.

a. Description of HEC-FDA Input.

(1) Discharge Frequency. The HEC-FDA computer program (Version 1.2, March 2000) was used to evaluate alternatives. The Rock Island District's Economic and Social Analysis Section identified four reaches at Muscatine. Reach 1 examined damages in downtown

Muscatine from flooding by Mad Creek. The reach started at the mouth and ended upstream of 5th Street. Reach 2, also on Mad Creek, started upstream of 5th Street and ended just upstream of Washington Street. Reach 3 evaluated damages behind the levees near the confluence of Geneva Creek and Mad Creek. Reach 4 also examined damages in downtown Muscatine, but this time from flooding by the Mississippi River. For a discussion of the reaches and a map, refer to Appendix B - Economic Analysis.

Hydrologic input included discharge-frequency relationships and variation in discharge for each reach. Hydraulic input consisted of a stage-discharge relationship and an estimate of the standard error of stage in feet. Levee input included the crest elevation of existing or proposed levees. Flooding on the Mississippi River and Mad Creek were analyzed as independent events. Flooding on Geneva Creek and Mad Creek were assumed to be concurrent.

The analytical option in HEC-FDA created the without-project discharge-frequency curves. Discharges for the 50%, 10% and 1% exceedance-probability events were entered to generate discharge-frequency curves. For Mad Creek and Geneva Creek, these discharges appear in Table A-12. A period of record of 20 years was used on both creeks to generate confidence limits. The equivalent record length for HEC-HMS models using regional model parameters is 10 to 30 years, so the midpoint was used (reference 13). The without-project discharge-frequency data were used for Alternatives A and D. For the Mississippi River, the appropriate discharges from Table A-4 were used with a 70-year period of record. Seventy years is the average record period of the gages used to determine the discharges at Muscatine appearing in Table A-4 from reference 7. These discharge-frequency data were used for Alternative D.

Since the with-project discharges are regulated, the graphical instead of the analytical option was required for Mad Creek. To create the with-project discharge-frequency relationship, the discharges from the without-project HEC-FDA curve (the 99.9%, 50%, 10%, 1%, 0.4% and 0.2% exceedance probability events) were entered into the graphical option. However, a period of record of 10 years instead of 20 was used to generate confidence limits. The shorter period was used so that the confidence limits from both the analytical and graphical methods produced similar economic results for the without-project alternative.

Once this was established, a transform feature in HEC-FDA converted the unregulated discharges to regulated discharges. For Mad Creek, the transform correlated each without-project discharge to a with-project discharge. The variation in with-project discharges was described with a triangular distribution that listed minimum and maximum values for each entry in the transform table. This variation quantified the error in discharge at the mouth of Mad Creek attributable to the two upstream reservoirs. Variations were determined by estimating the variation in culvert discharge and, if applicable, the variation in spillway discharge. The discharge from the culvert was varied by plus or minus 20%. The variation in spillway discharge was calculated by varying the spillway weir coefficient from 2.63 to 3.087. The without-project discharge-frequency relationship evaluated Alternatives B and C in Reaches 1 and 2.

(2) Stage Discharge. HEC-RAS profiles provided the stage-discharge data for Mad Creek and Geneva Creek. A standard error in stage of 1 foot was assigned to all stages on Mad and Geneva Creeks. This is high, but the obstruction of bridges could cause this variation. Stage-discharge data from Table A-4 were used for the Mississippi River. A standard error in stage of 0.5 foot was used for the Mississippi River.

(3) Levee Information. For each reach, the location where the levee would first overtop was identified. Since the existing levees meet Federal standards, the probable failure point equaled the levee crest elevation. For flood elevations above the crest, the exterior and interior water levels were assumed equal. If the computed damages for the reach were significant, the existing crest was increased in 1-foot increments to evaluate raising the levee. If computations revealed insignificant damage and high performance statistics, then raising the levee was not evaluated. The specific overtop locations are discussed in the paragraphs on results.

b. HEC-FDA Results. The computed results for each reach included the equivalent annual damage and the project performance for each alternative. Refer to Appendix B - Economic Analysis for information on equivalent annual damage and the economic selection of the recommended plan.

This section discusses only project performance. The long-term risk gives the probability of the levee being exceeded during a 10-, 25-, or 50-year period. Obviously, the longer the period, the greater the chance of the levee crest being exceeded. The conditional non-exceedance probability looks at performance by event. It gives the chance of the levee containing (not being overtopped by) the specified exceedance probability. Remember that with risk-based analysis, the .01 probability event is not one clearly defined stage; instead, it consists of a family of stages. In order for the Corps of Engineers to certify a levee for the Federal Emergency Management Agency, the 1% event must have conditional non-exceedance probability larger than .95. Levees can be certified without using risk if the levee crest is 3 feet above the water surface profile for the 1% event. This may appear confusing, but with risk-based analysis, each of the plotted profiles in the HEC-RAS section has a conditional non-exceedance of about 50%.

(1) Results for Reach 1: From Mouth to Upstream of 5th Street. The failure point for the existing levee is at the floodwall immediately downstream of the closure structure at 5th Street. The floodwall crest is elevation 559.4 feet NGVD. The stage discharge data were from the cross section 50 feet downstream of the 5th Street Bridge (ID#2158). After evaluating Alternative A (without-project), Alternative C (reservoirs or with-project), and Alternative D (without project but improved channel), the levee crest was increased in 1-foot increments. The first increment (crest elevation 560.4 feet NGVD) would require raising 1,000 linear feet of levee. The second increment (crest elevation 561.4 feet NGVD) would require raising the entire length of the levee. This is also true of the third increment (crest elevation 562.4 feet NGVD). The performance statistics for the alternatives appear in Table A-15. Alternatives B and C evaluate the reservoirs using the existing channel.

Table A-15. HEC-FDA performance statistics for Reach 1

Alt	Long Term Risk			Conditional Non-Exceedance Probability by Events						Crest Feet
	10-yr	25-yr	50-yr	10%	4%	2%	1%	.4%	.2%	
A+0	.059	.14	.26	.9999	.98	.93	.81	.58	.41	559.4
A+1	.044	.11	.20	1.00	.99	.96	.87	.69	.54	560.4
A+2	.032	.08	.15	1.00	1.00	.98	.93	.82	.72	561.4
A+3	.020	.05	.10	1.00	1.00	.99	.98	.94	.90	562.4
D+0	.024	.06	.11	1.00	1.00	.99	.96	.89	.83	559.4
D+1	.020	.05	.09	1.00	1.00	1.00	.99	.97	.96	560.4
D+2	.019	.05	.09	1.00	1.00	1.00	1.00	.99	.99	561.4
D+3	.019	.05	.09	1.00	1.00	1.00	1.00	1.00	1.00	562.4
B	.005	.01	.03	1.00	1.00	.99	.98	.93	.88	559.4
C B+1	.002	.005	.01	1.00	1.00	1.00	.99	.98	.97	560.4

(2) Results for Reach 2: From Upstream of 5th Street to Upstream of Washington Street. The failure point for the existing levee is the elevation of the railroad where it crosses Washington Street—at elevation 560.5 feet NGVD. The stage-discharge data were from the HEC-RAS model at the upstream face of the Washington Street Bridge. The performance statistics appear in Table A-16. The alternatives are identical to and defined in the Reach 1 section.

Table A-16. HEC-FDA performance statistics for Reach 2

Alt	Long Term Risk			Conditional Non-Exceedance Probability by Events						Crest Feet
	10-yr	25-yr	50-yr	10%	4%	2%	1%	.4%	.2%	
A+0	.08	.19	.34	.999	.97	.88	.72	.47	.31	560.5
A+1	.06	.14	.26	.999	.99	.93	.81	.60	.43	561.5
A+2	.04	.10	.19	1.000	.99	.96	.89	.73	.60	562.5
A+3	.03	.07	.13	1.000	.998	.98	.95	.88	.81	563.5
D+0	.05	.13	.25	.999	.99	.93	.82	.62	.46	560.5
D+1	.04	.09	.17	1.000	.99	.97	.91	.78	.67	561.5
D+2	.02	.05	.10	1.000	.998	.99	.97	.92	.87	562.5
D+3	.02	.05	.09	1.000	.999	.998	.99	.98	.97	563.5
B	.02	.04	.08	1.000	.998	.98	.95	.84	.74	560.5
C B+1	.005	.01	.03	1.000	.999	.99	.98	.93	.88	561.5

(3) Results for Reach 3: Mad and Geneva Creeks at Existing Heinz Plant. The failure point of the existing system is immediately downstream of the Heinz access road closure. This point, 485 feet upstream from the mouth of Geneva Creek, is 10 feet downstream of the access road bridge (cross section 0.6) and has a crest at elevation 572.35 feet NGVD. The performance statistics for the existing levee appear in Table A-17. Since the conditional non-exceedance probability is 99.9% for the 1% event with little damage, no alternatives were examined.

Table A-17. HEC-FDA performance statistics for Reach 3

Alt	Long Term Risk			Conditional Non-Exceedance Probability by Events						Crest Feet
	10-yr	25-yr	50-yr	10%	4%	2%	1%	.4%	.2%	
A+0	.019	.048	.932	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	572.35

(4) Results for Reach 4: Mississippi River. The top of the levee and flood wall along the Mississippi River are at elevation 559.5 feet NGVD and will be overtopped at the same time. The performance statistics for the existing levee (D+0) appear in Table A-18. Since the conditional non-exceedance probability is 89% for the 1% event, the levee crest was increased in 1-foot increments. Unfortunately, increasing the crest 3 feet produced so little damage that the model became unstable. For this reason, the third increment increased the crest only 2.3 feet.

Table A-18. HEC-FDA performance statistics for Reach 4, Mississippi River

Alt	Long Term Risk			Conditional Non-Exceedance Probability by Events						Crest Feet
	10-yr	25-yr	50-yr	10%	4%	2%	1%	.4%	.2%	
D+0	.05	.12	.22	1.000	0.999	0.991	0.89	0.51	0.23	559.5
D+1	.02	.04	.09	1.000	1.000	0.999	0.98	0.86	0.73	560.5
D+2	.0028	.0071	.014	1.000	1.000	1.000	0.9996	0.996	0.993	561.5
D+2.3	.0028	.0069	.013	1.000	1.000	1.000	0.9997	0.998	0.997	561.8

c. HEC-FDA Consequences of Failure to Close Gate. The consequences of failing to close an opening were analyzed by correlating the exterior river stage to the interior flood stage (reference 14). Where there was a choice, assumptions that would produce the highest interior stage were adopted. The relationship between exterior and interior stage was used to estimate damage. This section discusses how the exterior versus interior relationship was developed. There are no risk performance statistics for this section.

(1) Reach 1, 2nd Street Bridge. During a storm in 1990, water entered through 5th Street before the opening could be blocked. This was the only time this has happened along Mad Creek since the project was completed. This event was used to compute the probability of the closure not being made (1/30=.03). The consequence of not closing the opening at 2nd Street was analyzed by relating the exterior stage of Mad Creek to an interior water level if the gate was left open. The interior stage was determined by estimating the volume of water flowing through the opening. Damages were estimated assuming closure would be completed 97% of the time.

Inflow starts at zero when Mad Creek rises to the sill elevation, increases until the exterior stage peaks, and then returns to zero as the exterior stage falls below the sill elevation. The sill is at elevation 553 feet NGVD and the levee crest is at elevation 559.5 feet NGVD. The width between abutments is 59.3 feet. From an examination of the rating curve at the bridge, a discharge of 10,000 cfs produces a stage of 553 feet NGVD. The amount of time the discharge is above 10,000 cfs was obtained from the hydrograph of the .002% chance storm. Inflow will occur for about 3 hours. To simplify the computations, a triangular stage hydrograph was used for various exterior elevations. The exterior stage started at elevation 553 feet, reached a peak in 1.5 hours, and then returned to elevation 553 feet in 3 hours. The interior stage was computed by routing the

inflow into the elevation-volume curve for the protected area. Unfortunately, the elevation-volume had to be estimated using just a few known points.

Table A-19. Elevation-area-volume relationship for interior area at 2nd Street

Interior Elevation Feet NGVD	Estimated Area Acres	Estimated Volume Ac-ft
550	0	0
551	5.0	1.2
552	10.7	9.1
553	20.0	24.4
554	25.0	16.9
555	28.5	73.7
556	31.5	103.7
557	34.0	136.4
558	36.0	171.4
559	37.2	208.0
560	38.4	245.8

A spreadsheet developed to compute the time required to fill a protected area if the levee failed was used to estimate interior stage. The program used the weir equation to compute flow into the protected area using 5-minute computation intervals to compute the increase in interior stage. Computations used a weir length of 59.3 feet and a weir coefficient of 2.75. The highest interior water level always occurred after the exterior water level had peaked. The maximum interior level occurred when the falling exterior stage equaled the rising interior stage. The relationship between exterior and interior stage appears in Table A-20.

Table A-20. Transform from exterior stage to interior stage at 2nd Street

Exterior Elevation Feet NGVD	Interior Elevation Feet NGVD
553	550.0
554	552.4
555	553.8
556	554.9
557	555.8
558	556.8
559.5	558.2

(2) Reach 3, Isett and Service Road Openings. Over the life of the project, water has entered the openings on Geneva Creek twice. In 1990, a fence blocked the service road bridge and water entered both openings. In 1993, the Mississippi River was high when another storm overtopped both sills. Because the ground slopes from Geneva to Mad Creek within the interior, the water was not trapped. Instead, it flowed at shallow depth toward Washington Street, re-entered Mad Creek, and caused slight damage.

Because of the brief response time and the unlikelihood that sandbags would be placed in time, the closures were analyzed under the assumption that both openings always would be open. The

estimate of interior water levels assumed that all inflow was trapped. Even so, because the sills are high and small, the computed interior water level is significantly lower than the exterior water level.

The sill of the service road is elevation 567.8 feet NGVD with a width of 42 feet, which increases to 63 feet at the levee crest (elevation 572.35 feet NGVD). The sill of Isett Avenue is elevation 586.5 feet NGVD with a width of about 60 feet. Under normal depth conditions on Geneva Creek, a discharge of 4,000 cfs overtops both sills. The duration of an overtopping event is about 1 hour based on the hydrograph of the 0.2% chance storm. In relating exterior to interior water levels, it was assumed that for all exterior stages above 567.7 feet, the inflow peaked in .5 hour and returned to zero after 1 hour. The interior is about 1,800,000 square feet (41 acres). The inflow volume was estimated by using twice the calculated inflow through the service road. The discharge was computed using the weir equation with a coefficient of 2.75 and a length of 63 feet. The relationship between exterior and interior levels used in HEC-FDA appears in Table A-21.

Table A-21. Transform from exterior stage to interior stage at Service Road

Exterior Elevation Feet NGVD	Interior Elevation Feet NGVD
567.7	567
568.7	567.3
569.7	568.0
570.7	568.8
571.7	569.8
572.3	570.4

10. FLOOD WARNING

a. Basin Characteristics. Discharge hydrographs for both Geneva and Mad Creek appear on plate A-10. These HEC-HMS plots were produced by applying 4 inches of rain during 1 hour. Since the time between the center of mass of rainfall and the peak discharge is only 1 to 2 hours, the largest warning time will probably be about a half hour. If the time between bursts of rainfall is longer than 6 to 8 hours, the runoff will form two separate events and will not be additive. Applying the synthetic rainfall in 1 hour produces higher peaks than periods of 2 or 3 hours. However, in real life the total of the past 3 hours will probably be the most important period to monitor for the Mouth of Mad Creek.

In an effort to define a relationship between rainfall and peak discharge, the without-project HEC-HMS model was used to compute peak discharges. It was produced by applying a series of 1-hour storms for rainfall amounts ranging from 1 to 4 inches. This information appears on plate A-11 for the mouth of Geneva and Mad Creeks. Unfortunately, the relationship between rainfall and runoff is complicated by the ability of the soil to absorb moisture. The Soil Conservation Service addresses this problem by totaling the rainfall falling in the 5 days before the storm (reference 15). This is then used to adjust the amount of rainfall absorbed by the soil. Table A-22 is based upon this approach; it arbitrarily creates three classes of antecedent moisture conditions. A curve for each class appears on plate A-11.

Table A-22. Total 5-day antecedent rainfall in inches

Condition	Dormant Season	Growing Season
Dry	Less than 0.5 inches	Less than 1.4 inches
Average	0.5 to 1.1 inches	1.4 to 2.1 inches
Saturated	Over 1.1 inches	Over 2.1 inches

Low temperatures prevent evaporation and prolong saturated conditions; this introduces error into Table A-22. There is no precise adjustment for temperature. Nevertheless, one should be aware of the temperature during the previous 5 days to evaluate the flood threat.

The plots on plate A-11 can be used with target discharges at various damage centers to determine preliminary alarm stages. The information can also be used to trigger alert, mobilization, and closure actions. Table A-23 lists information on closures for the project. The information came from reference 16 or recent surveys.

Table A-23. Information on closures

Location	Closure Type	Sill Elevation Ft NGVD	Approx. Discharge cfs	Approx. Frequency Exceedance
RR Closure 600 ft south of Washington Avenue Mad Cr.	Sandbag	559.55		
2nd Street closure Mad Cr.	Gate	553.0	10,000	See text
Isett Ave closure on Geneva Cr.	Sandbag	568.5	4,250	Below .002
Heinz service road closure on Geneva Cr.	Sandbag	567.8	4,500	Below .002

Given the short response time on Geneva Creek, it is unlikely that any type of closure, let alone sandbags, could be placed in time. However, sandbags could be used on Geneva Creek in situations where a high Mississippi River could make overtopping the sill elevation more likely.

Most of the time, the peak discharge on Mad Creek will determine when to close 2nd Street. The low steel of the bridge varies from elevation 549.7 to 551.7 feet NGVD. Under most conditions, a discharge of 9,000 cfs will pass under the bridge. However, when the water level at the mouth of Mad Creek is higher than elevation 547 feet NGVD, the discharge required to touch the low steel decreases. Plate A-12 shows a family of rating curves at 2nd Street Bridge for various starting water levels. Stage duration data for the Mississippi River show that 95% of the days of the year (on average) the water surface will be below elevation 546.5 feet NGVD (547 feet 1912 datum) at the mouth of Mad Creek. Between a starting water level of 547 feet NGVD and 550.5 feet NGVD, the target discharge decreases from 9,000 to 4,000 cfs.

b. Flood Warning System. A replacement flood warning system for Mad Creek was designed under contract; it is estimated to cost \$72,000. The system uses three recording rainfall gages equipped with programmable logic controllers and data transmission devices that convey a UHF signal to the Public Safety Building. There a computer stores and monitors data and signals warnings. The system was to facilitate the frequent closure of 5th Street. The report, drawings, and specifications are on file at the Rock Island District office (reference 8). It now appears that 5th Street will be raised, eliminating the closure. A Value Engineering Team will reevaluate the design prior to the completion of the final Detailed Project Report.

(1) Description of System Components. The flood potential is evaluated from real time precipitation at the three sites (see plate A-1). Two gages are in the upper Mad Creek basin. Gage 1 is off Route 38, near the Municipal Golf Course. Gage 2 is near 2900 180th Street, just west of Route 61. Gage 3 is in the Geneva Creek basin, near the water tower, southeast of the intersection of Bypass 61 and Bidwell Avenue. A tipping bucket style gage is recommended with a collector diameter of 8.625 inches. This gage has resolution of .01 inch (0.25 mm) and an accuracy of 0.5% at 0.5 inch (12.50 mm) per hour. The gage can be heated to record the water equivalent of snowmelt if year-round operation is chosen.

A programmable logic controller near the rain gage receives a signal from the tipping bucket rain gage for each 0.01 inch of rainfall at the gage. The controller calculates the precipitation for the previous 0.5-hour, 1-hour, 2-hour, 3-hour, and 6-hour periods. The controller attaches a time increment (preferred setting of 1 minute) to the incremental precipitation and calculates total rainfall, as well as daily rainfall.

The logic controller sends the information by radio modem to a proposed supervisory control and data access system (SCADA) located at the Public Safety Building. A new computer will compare real time precipitation with trigger values and send alerts when the values are exceeded. Interface software on the computer manages the precipitation record and other control data. It maintains quarter-hour records of precipitation for each gage on a daily basis using military time. The recommended length of record is 18 months. The format of the recorded data will be such that it can be loaded directly into a standard spreadsheet program.

The new computer also receives data from an ultrasonic level detector located on the 5th Street Bridge. The stage data will provide an alert for high water at the 5th Street Bridge. The unit has a resolution 0.01 foot with an accuracy of 0.5% of its calibrated span. The maximum span is 60 feet. The gage will be zeroed at 545.0 MSL. A stage gage should also be installed on the bridge to make annual calibration easier. The stage gage has a programmable logic controller and transmitter as part of the electronics package.

(2) Computer Handling of Precipitation Data and Generation of Alarms. The computer will maintain a real time record of precipitation depth for each gage. It will also compute the total basin rainfall using Thesian polygons for the same time increments, compare totals to preset rainfall depths, and generate an alarm signal, if appropriate. The computer will make comparative analysis of the rainfall intensity for the gages to the following data and signal an alarm when any value is exceeded. The comparable values can be set through the computer interface and keyboard. Initial values recommended by the contractor appear in Table A-24.

Table A-24. Initial values for rainfall alarms within Mad Creek basin

0.5 hour:	2 inches per hour
1 hour:	1.5 inches per hour
2 hour:	0.75 inches per hour
3 hour:	0.5 inches per hour
6 hour:	0.25 inches per hour

The computer will indicate real time stage data for Mad Creek. The stage gage data will be stored in 15-minute increments for at least 18 months. The record form will include date and military time. The storage data format will be loadable to standard spreadsheet programs. The computer analyzes the stage data and signals the central alarm if values in Table A-25 are exceeded. The two stage values recommended by the contractor are intended to provide approximate 90-minute and 60-minute warnings of a flood level on Mad Creek.

Table A-25. Stage alarms on Mad Creek

Stage	Elevation	Comment
3.5	548.5 MSL	14-Year Freq.
5.9	550.9 MSL	45-Year Freq.

(3) **Maintenance for Flood Warning System.** Maintenance of the rain gages includes annual cleaning and re-zeroing of the precipitation accumulator. The local sponsor should also plan on inspecting each gage once every 3 months during flood season. Maintenance of the stage gage includes re-zeroing and periodic discharge measurements to calibrate discharge to stage. This is not essential, but it would allow the collection of annual peak stage and discharge for Mad Creek that will decrease the uncertainty of the rainfall-runoff relationship.

Maintenance of the data transmission system will be minimal. The system should be checked annually for damage.

Maintenance of the computer records requires periodically backing up files.

After an emergency, as conditions permit, the superintendent will initiate a general cleanup of all flood control facilities, make a general inspection of the project, and repair all damage to the project works. Demobilization of flood control activities will include the release of emergency personnel, an inventory of equipment and supplies, and cleaning, storing, and replenishing equipment and supplies. Procedures will then revert to ordinary inspection and maintenance.

In addition to the semi-annual reports, the superintendent will prepare post-flood reports after significant floods and forward one copy to the District Engineer. The report will be a complete flood history and will include a log of operations, a daily tabulation of river stages, a discussion of pertinent factors in operating and maintaining the project, and any other useful information. Operation and maintenance factors will include problems encountered, weather conditions encountered (including effects of ice on operation), damage incurred, repairs required, and other significant factors which occurred during the operation and maintenance of the project during the flood period. The report will also include a summary of the numbers, time, and cost of manpower and the quantities and costs of supplies and equipment that the protective effort required. The flood report can be useful in future flood fights.

11. REFERENCES

1. *Muscatine, Iowa (Mad Creek) Local Flood Protection General Design Memorandum*, Corps of Engineers, Rock Island, Illinois, 28 May 1956.
2. *Muscatine, Iowa (Mad Creek) Local Flood Protection Design Memorandum for Repair of Damage Resulting from Flood of 30 June 1961*, Corps of Engineers, Rock Island, Illinois, 22 September 1966.
3. *Detailed Project Report for Flood Control at Muscatine, Iowa*, Corps of Engineers, Rock Island, Illinois, 9 September 1970.
4. *Flood Insurance Study, City of Muscatine, Iowa*, U.S. Department of Housing and Urban Development, Federal Insurance Administration, July 1977.
5. *Mad Creek, City of Muscatine, Flood Mitigation Preliminary Investigation*, U.S. Department of Agriculture, Natural Resources Conservation Service, August 1996.
6. *HEC-HMS Hydrologic Modeling System, Users Manual and Technical Reference Manual*, Corps of Engineers, Hydrologic Engineering Center, Davis, California, January 2000.
7. *Upper Mississippi River Water Surface Profiles River Mile 0.0 to River Mile 847.5*, Corps of Engineers, Rock Island, Illinois, November 1979.
8. *Hydrology and Hydraulics for Mad Creek at Muscatine, Iowa*, Daily and Associates, September 2000.
9. *Bulletin 71 Rainfall Frequency Atlas of the Midwest*, Huff and Angel, Illinois State Water Survey, 1992.
10. *Time of Concentration and Storage Coefficient Values for Illinois Streams*, J. Graf, U.S. Geological Survey, Urbana, Illinois, March 1982.
11. *HEC-RAS River Analysis System Hydraulic Reference Manual Version 3.0*, Corps of Engineers, Hydrologic Engineering Center, Davis, California, January 2001.
12. *HEC-FDA Flood Damage Reduction Analysis User's Manual Version 1.0*, Corps of Engineers, Hydrologic Engineering Center, Davis, California, January 1998.
13. *EM 1110-2-1619 Risk-Based Analysis for Flood Damage Reduction Studies*, Corps of Engineers, Washington, DC, 1 August 1996, Table 4-5, page 4-5.
14. *Closure and Interior Facilities for Levee Projects: Principles, Case Examples, and Risk Based Analysis Concepts Version 1.0*, Corps of Engineers, Hydrologic Engineering Center, Davis, California, September 1996.
15. *A Guide to Hydrologic Analysis Using SCS Methods*, by Richard McCuen, Prentice Hall, Englewood Cliffs, New Jersey, 1982.
16. *Mad Creek Muscatine, Iowa, Local Flood Protection Manual for Operation and Maintenance*, Corps of Engineers, Rock Island, Illinois, November 1982.

LEGEND

- ▲ PROPOSED RAIN GAGE
- ▣ PROPOSED DAM
- ① SUB-BASIN

↑
NORTH

MAD CREEK BASIN MAP

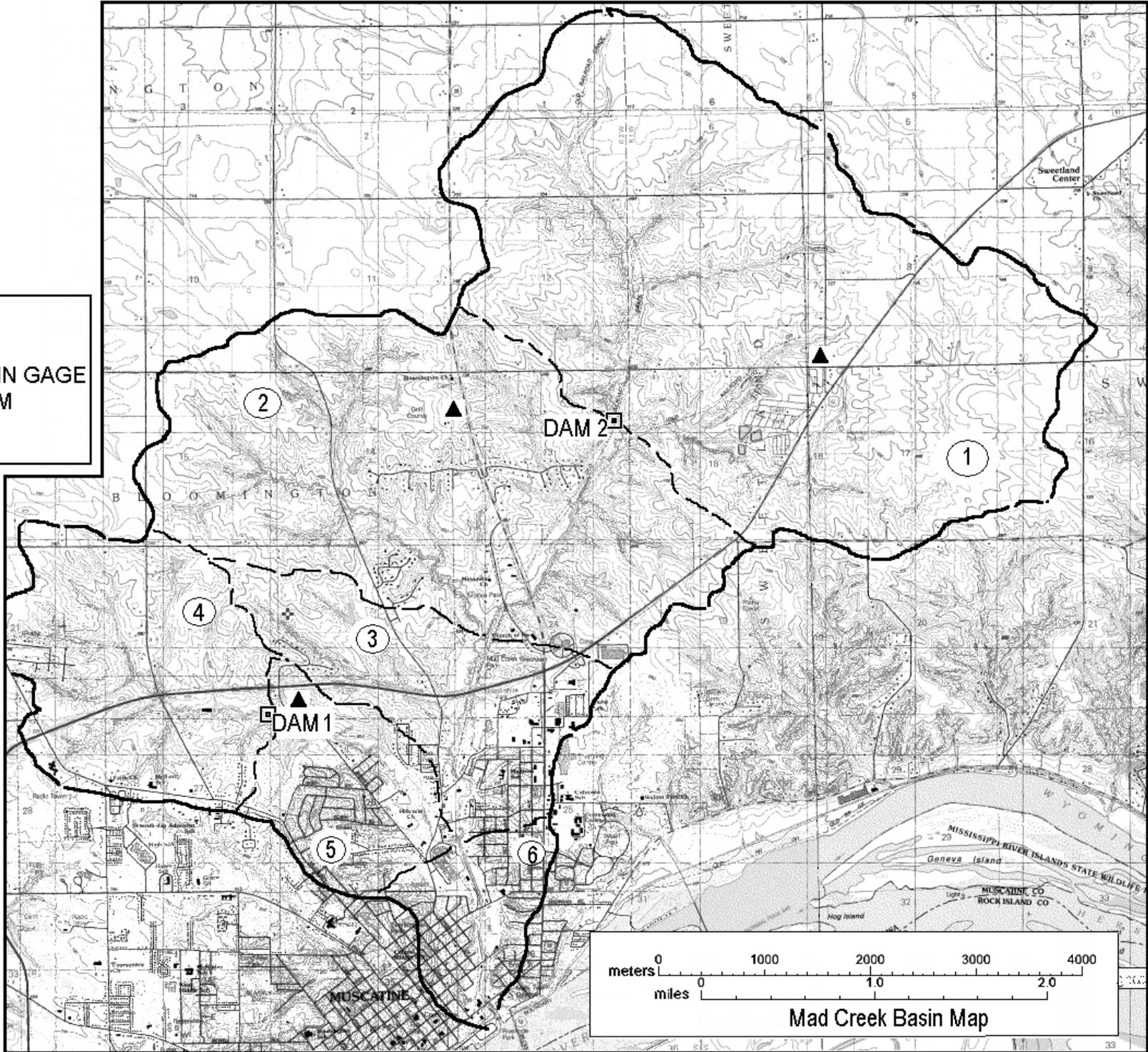
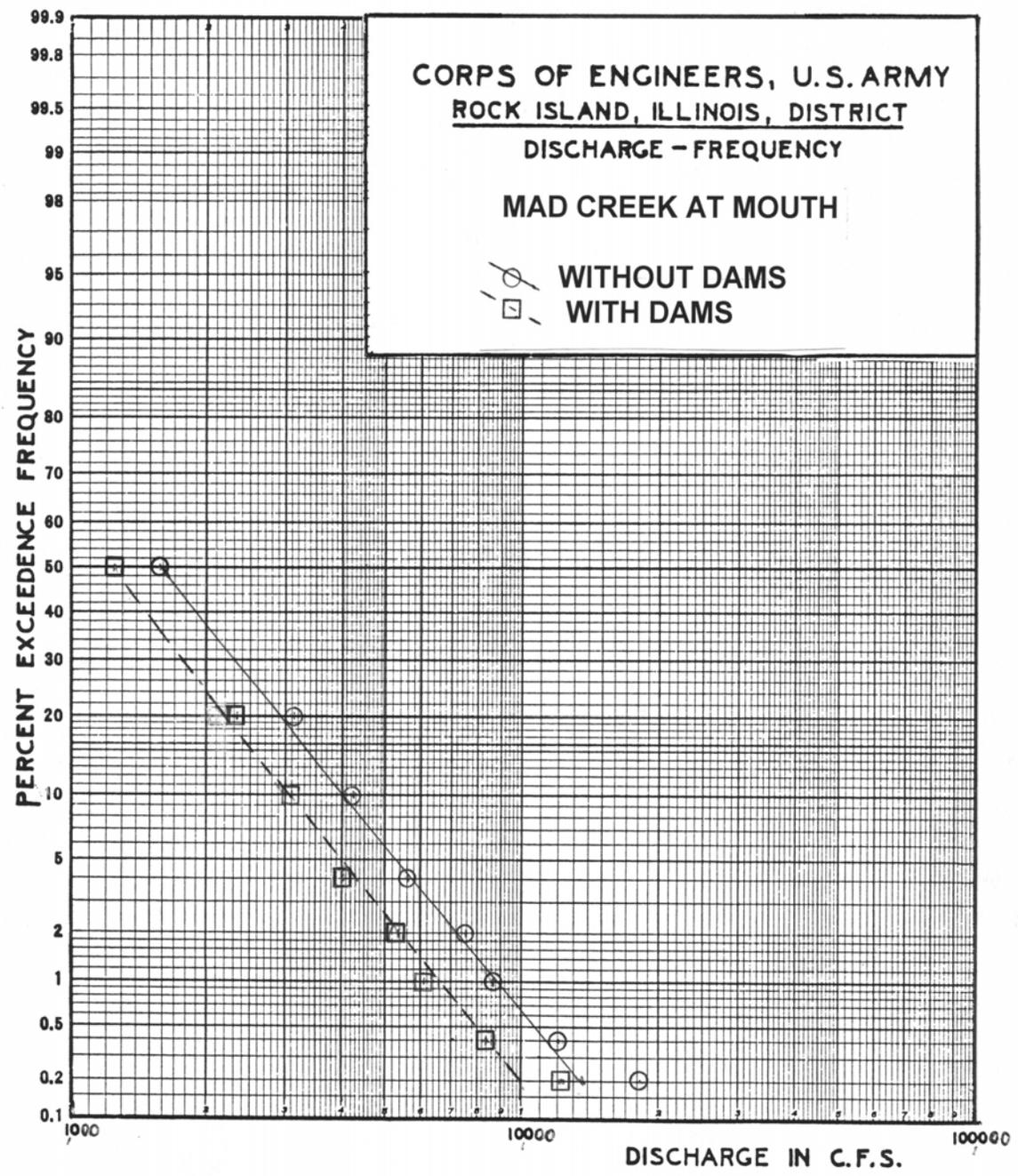
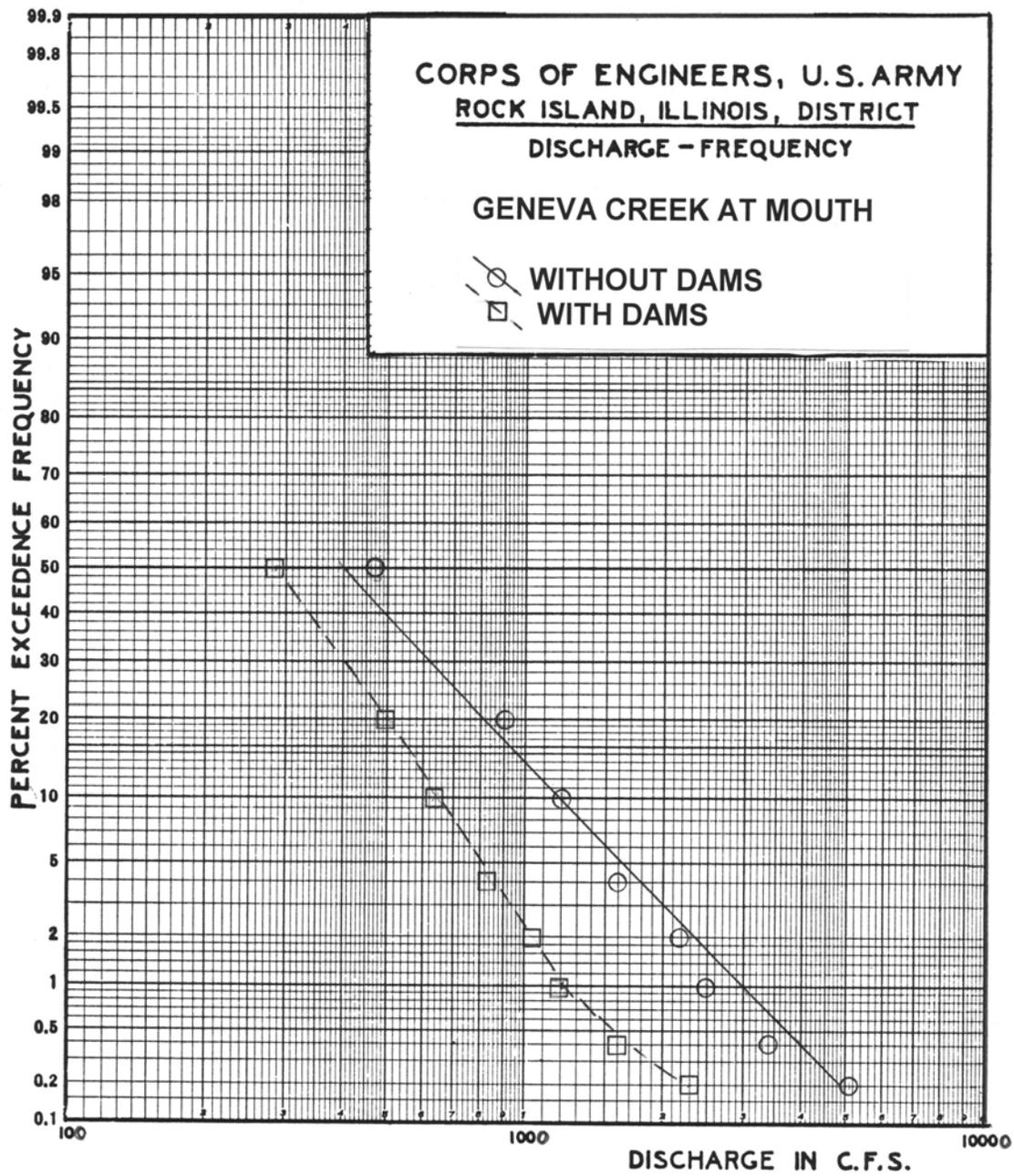


PLATE A-1

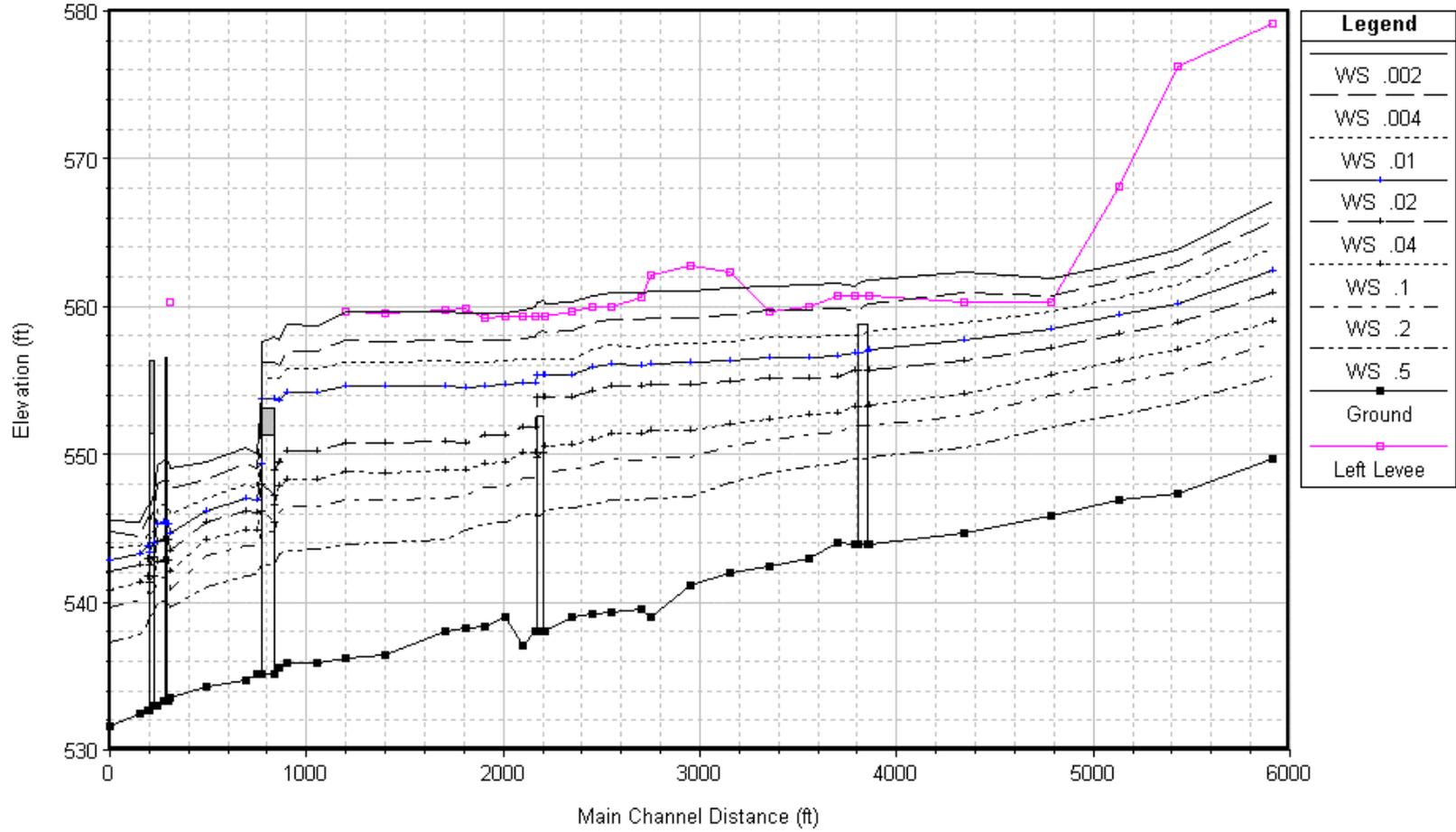
CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
MAD CREEK AT MOUTH

○ WITHOUT DAMS
□ WITH DAMS

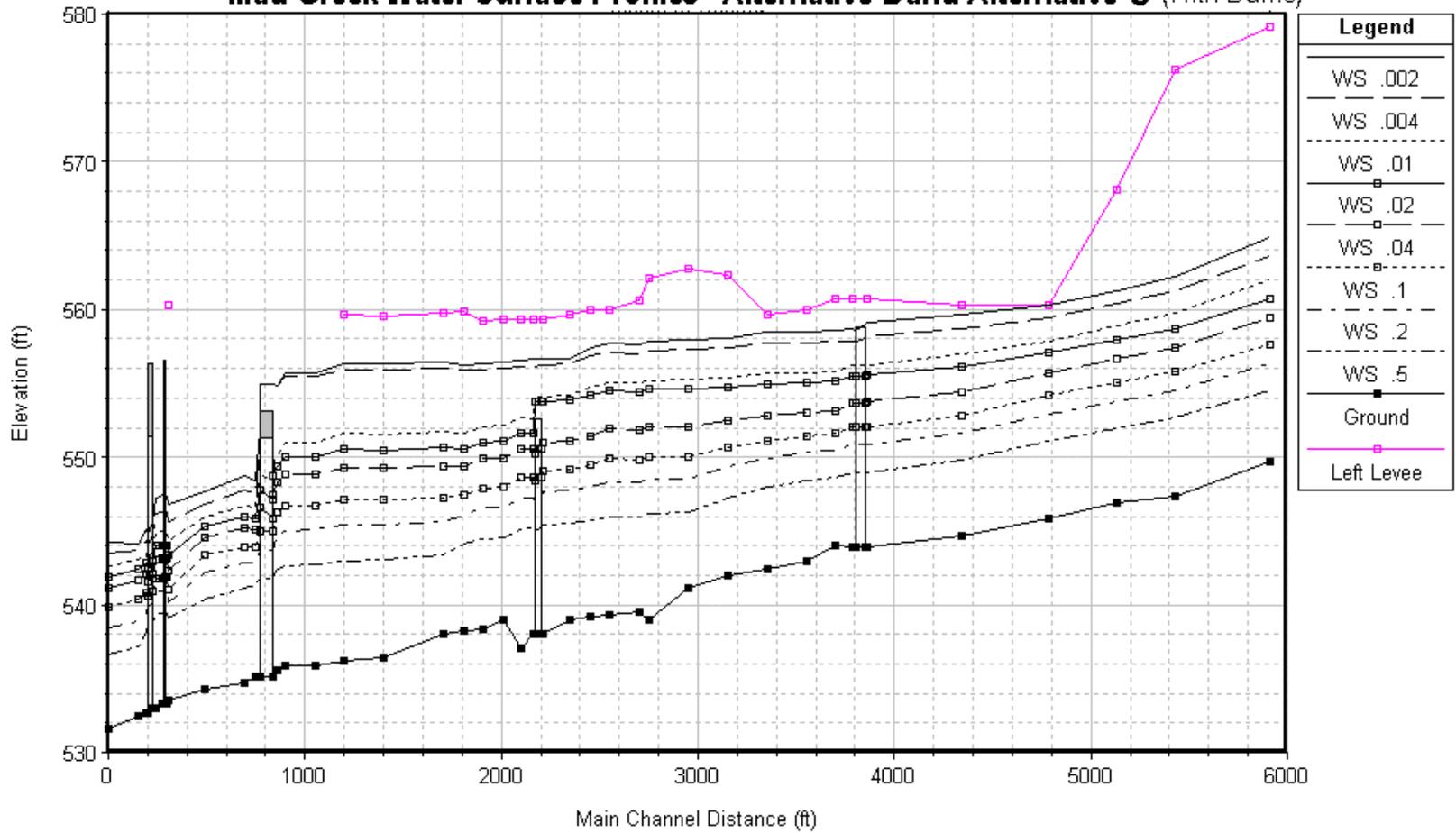




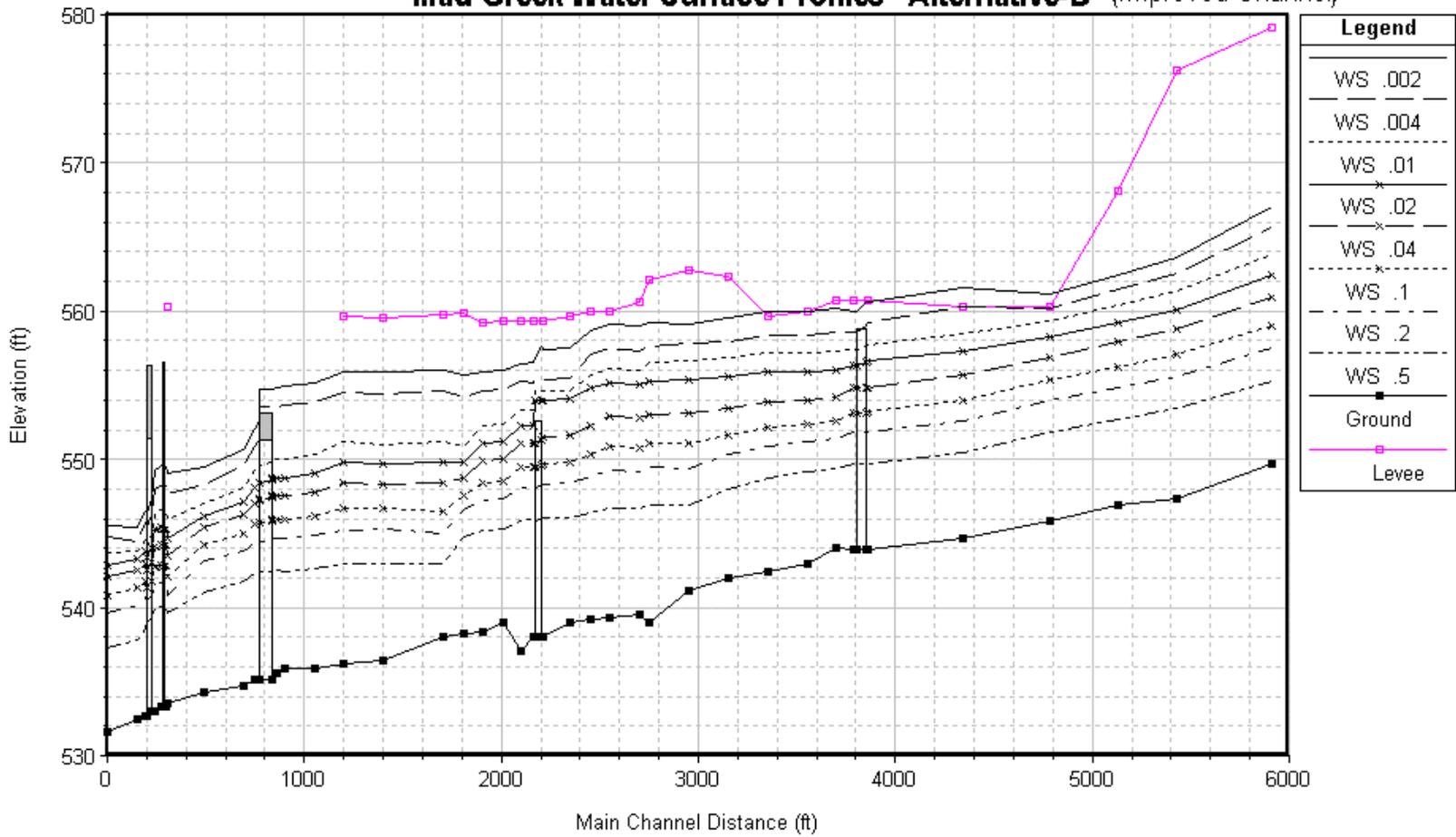
Mad Creek Water Surface Profiles Alternative-A (Existing)



Mad Creek Water Surface Profiles Alternative-B and Alternative-C (With Dams)



Mad Creek Water Surface Profiles Alternative-D (Improved Channel)



4/06/01

Geneva Creek Water Surface Profiles Alternative-A and Alternative-D (Existing)

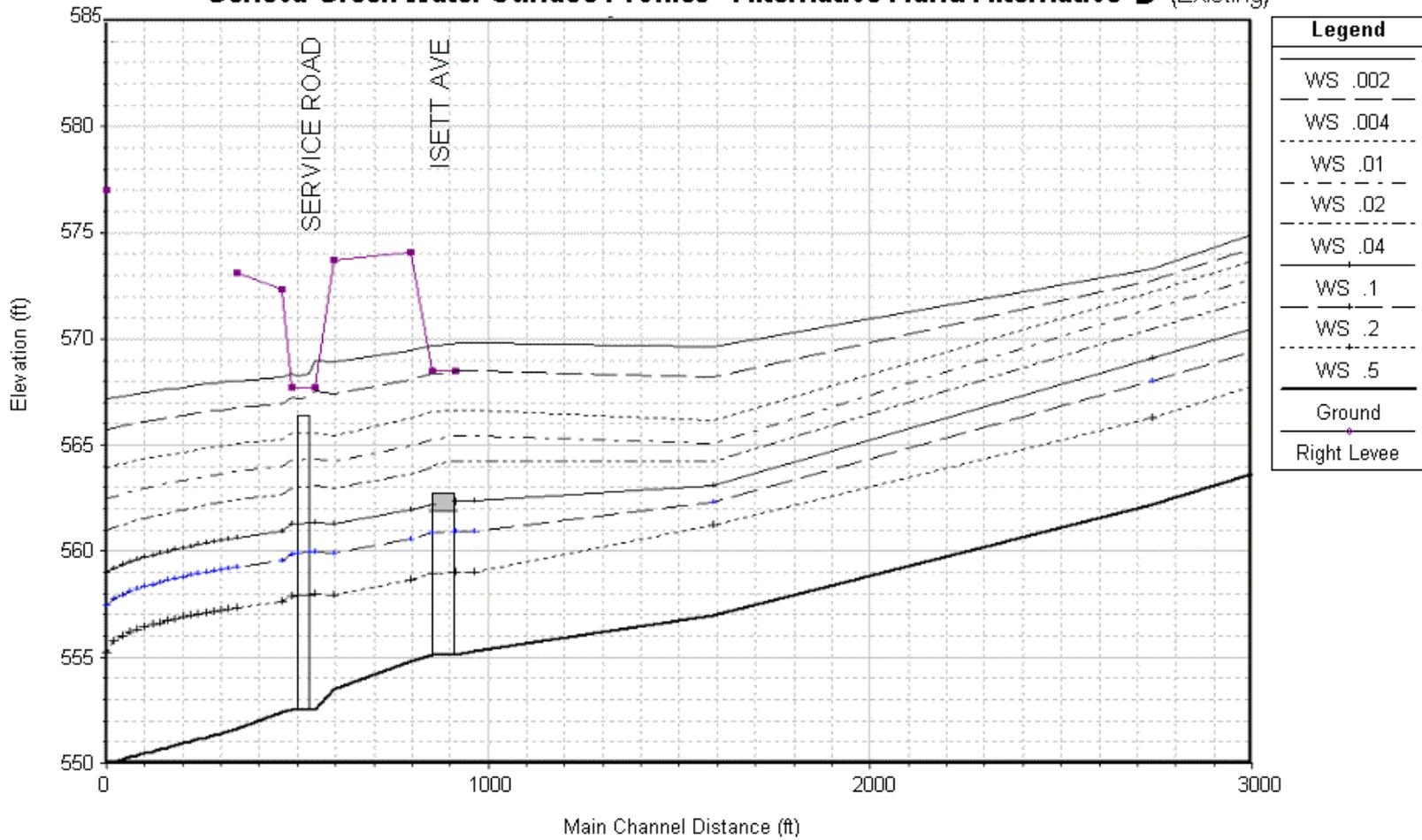


PLATE A-7

Geneva Creek Water Surface Profiles Alternative-B and Alternative-C (With Dams)

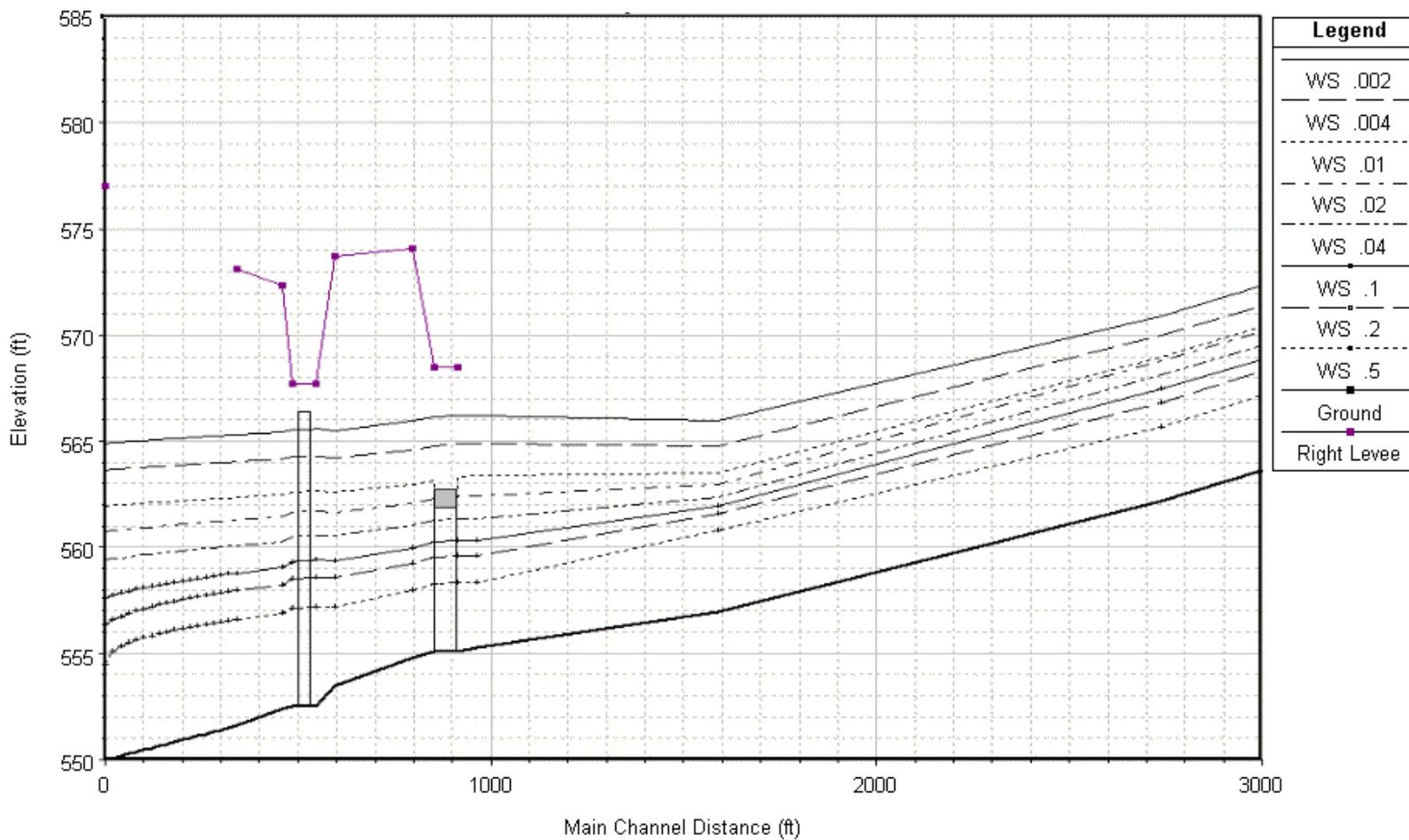


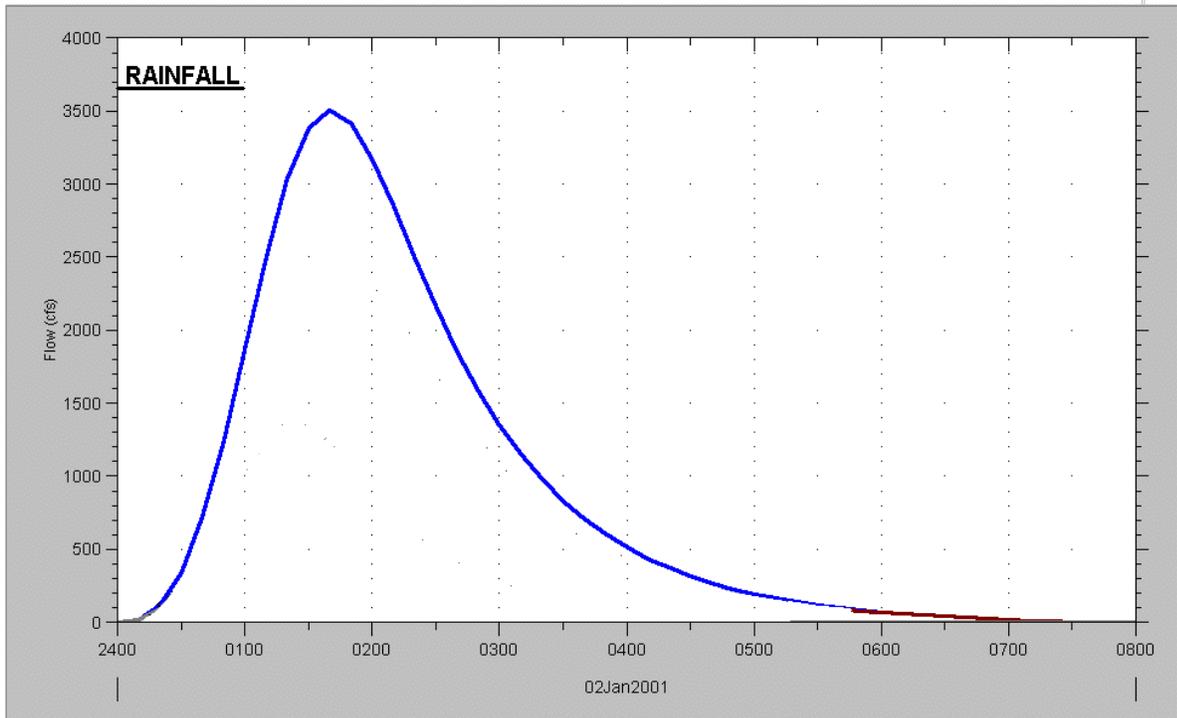
PLATE A-8



HEC-RAS
CROSS-SECTION
LOCATION MAP
MAD AND GENEVA CREEKS

1000 0
FEET

PLATE A-9

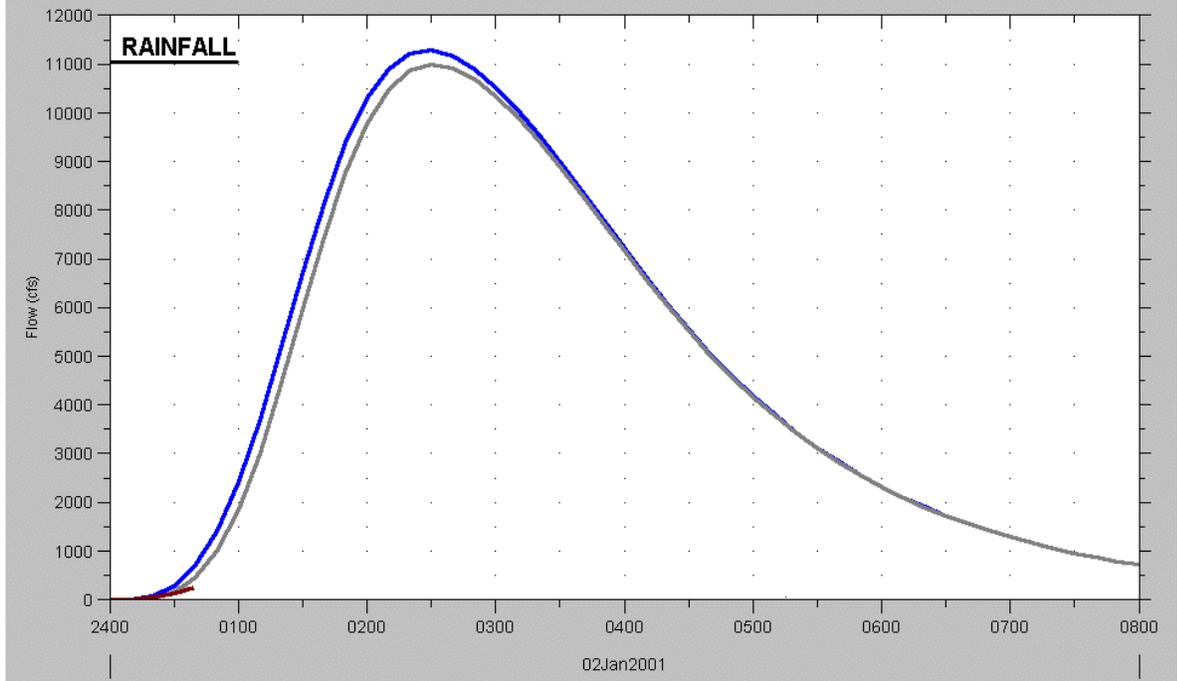


HEC
HMS

— geneva u/s cont.

GENEVA CR AT MOUTH

Basin: flood warning 10mi
Run: fldwarning
Time: 22Mar01, 13:06



HEC
HMS

— Mad at Mouth

— Reach - 4

MAD CREEK AT MOUTH

Basin: flood warning 10mi
Run: fldwarning
Time: 22Mar01, 13:06

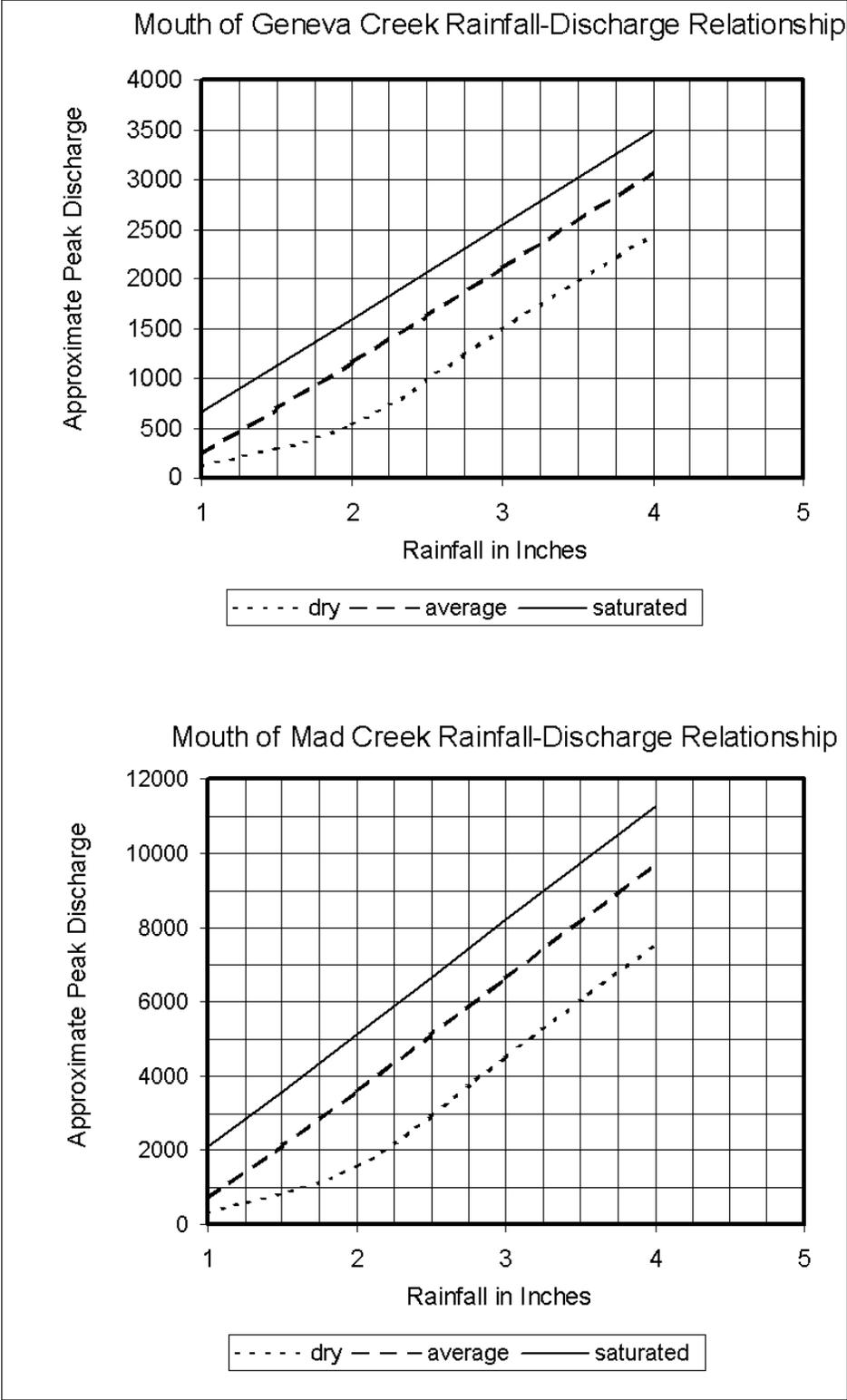
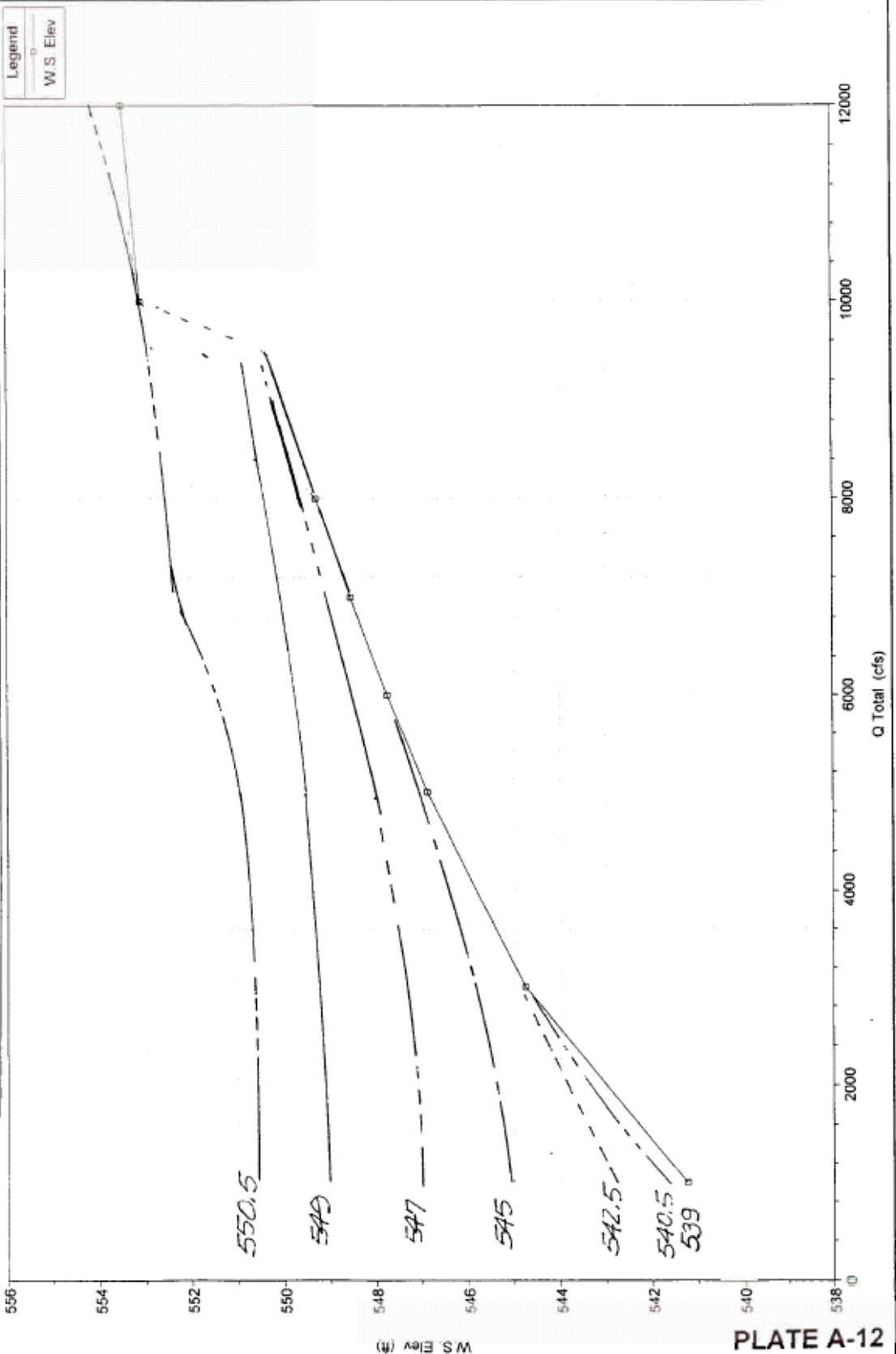


Plate A-11

**MAD CREEK RATING CURVE FOR SECOND STREET BRIDGE
FOR VARIOUS MISSISSIPPI RIVER STAGES**



APPENDIX B

ECONOMIC ANALYSIS

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX B
ECONOMIC ANALYSIS**

CONTENTS

Subject	Page
1. INTRODUCTION	B-1
2. CHARACTERISTICS OF THE STUDY AREA	B-1
a. General	B-1
b. Study Area	B-1
c. Labor Force Data	B-2
d. Historical Flooding	B-2
3. METHODOLOGY	B-3
a. General Conditions	B-3
b. Flood Damage Data Collection	B-3
c. Risk and Uncertainty	B-4
4. BENEFIT-COST ANALYSIS	B-7
a. General	B-7
b. Economic Summary	B-7
5. FINANCIAL ANALYSIS	B-9
a. Cost Distribution	B-9
b. Ability to Pay	B-9
c. Financial Capability	B-9

CONTENTS (Continued)

Tables

No.	Title	Page
B-1	Muscatine, Iowa, population trends	B-1
B-2	Study area properties by category	B-2
B-3	Muscatine County, Iowa, labor force	B-2
B-4	Reach alternatives analyzed	B-3
B-5 - B-8	Existing damages by reach	B-4
B-9	Annual damages and benefits by alternative	B-6
B-10	Interest during construction, Plan D-2	B-7
B-11	Summary of annual charges, Plan D-2	B-7
B-12	Costs and benefits by alternative	B-8
B-13	Project cost distribution, Plan D-2	B-9
B-14	Ability to pay analysis, Plan D-2.....	B-9

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX B
ECONOMIC ANALYSIS**

1. INTRODUCTION

This appendix describes the economic analysis of project alternatives for providing flood damage reduction measures for the City of Muscatine, Iowa. Current damages are caused primarily by high flows of Geneva Creek, Mad Creek, and the Mississippi River. The five major sections of this appendix summarize the Detailed Project Report analysis conducted by the Rock Island District, U.S. Army Corps of Engineers.

Following the introductory section, the second section describes the general characteristics of the study area and summarizes historical flooding. The third section presents the procedures used to quantify flood damages and the potential benefits which would accrue to a flood damage reduction project. The fourth section presents the benefit and cost analysis for the recommended plan. The fifth section summarizes the non-Federal financial analysis. Throughout this analysis, price levels are stated as of June 2002, with the required Federal discount rate of 6-1/8 percent for water resources project being used to amortize costs for comparison with annualized benefits.

2. CHARACTERISTICS OF THE STUDY AREA

a. General. The City of Muscatine is located on the right bank of the Mississippi River in Muscatine County, Iowa. The City of Muscatine has an estimated year 2000 population of 23,100. Table B-1 depicts historical population trends. The city is served by major state and Federal highway, railway and waterway systems. The interstate highway system and major airline transportation are also within close proximity.

Table B-1. Muscatine, Iowa, population trends

Year	1950	1960	1970	1980	1990	2000
Population	19,041	19,813	22,405	23,467	22,881	23,100

b. Study Area. As shown on Figure 1 of the main report, the study area is the floodplain impacted by Geneva Creek, Mad Creek, and the Mississippi River (at the confluence with Mad Creek). Separate reaches are delineated on Figure 2. The study area is centrally located within the City of Muscatine. The area is predominantly industrial and commercial, with a few residential and public properties. Table B-3 lists numbers of properties by category. Reaches 1 and 4 are

geographically identical, but impacted by independent Mad Creek and Mississippi River flows, respectively. Reach 2 is impacted by Mad Creek flows, and Reach 3 is impacted by Geneva Creek flows.

The following types of properties are included in the area to be protected: office furnishings manufacturing, auto and cycle repair and service, taverns, energy services, retail furniture, chiropractic services, freight services, door/awning services, button manufacturing, and public roads and sewers. The study area exhibits fairly dense usage. Significant growth trends are not apparent.

Table B-2. Study area properties by category

Type	Reaches 1 & 4	Reach 2	Reach 3	Areas Outside of Reaches
Commercial	13	5		13
Industrial	2		1	
Residential				7
Public				1

c. Labor Force Data. As shown in Table B-2, 1990 data indicate that the Muscatine area labor force is concentrated in the manufacturing, retail trade, and service industries. Median household income was \$40,800 for the Muscatine area, compared to \$35,400 for the State of Iowa.

Table B-3. Muscatine County, Iowa, labor force 2000 projected statistics (Woods & Poole Economics, Inc.)

Employment Category	2000 Labor Force	Percent Distribution
Construction & Mining	1,080	4.0
Manufacturing	8,910	33.0
Wholesale & Retail Trade	4,710	17.4
Service Industries	6,090	22.5
Finance, Insurance, Real Estate	840	3.1
Transportation & Utilities	990	3.7
Farm and Farm Services	1,130	4.2
Other	3,270	12.1
Total	27,020	100.0

d. Historical Flooding. Mad Creek, Geneva Creek, and the Mississippi River have experienced significant flooding in the past several decades. Mad Creek and Geneva Creek are ungedged streams, which had serious recent flash flooding in 1990 and 1993. The Mississippi River has had severe recent flooding in 1993, 1997, and 2001 (see Appendix A, Table A-1). The existing levees protecting Reach 1 (& 4) and Reach 3 prevented significant damages from occurring during the flood events. Seepage pumping, sandbagging, and levee patrol costs were incurred during these events.

3. METHODOLOGY

a. General Conditions. This study area was evaluated under the Corps of Engineers' requirements for "Risk and Uncertainty" analysis.

Portions of the project study area are currently protected by a Federal levee/floodwall system. The area has been analyzed as a 4-reach study. Table B-4 lists reaches, affecting streams, top-of-levee elevations, and alternatives analyzed.

Table B-4. Reach alternatives analyzed

Reach	Affecting Stream	Top-of-Levee Elevation (existing)	Alternatives Analyzed
1	Mad Creek	559.4	1-, 2-, 3-foot levee raise; Upstream dams; Dams and levee raise; Channel work & levee raise
4	Mississippi	559.5	1-, 2-, 3-foot raise
2	Mad Creek	560.5	1-foot raise Upstream dams; Dams and levee raise
3	Geneva Creek	572.4	Positive closures Upstream dams; Dams and closures
Areas Outside Reaches	Geneva Creek & Mad Creek	No-levee areas	Upstream dams

b. Flood Damage Data Collection. Structure and content values and depth-damage estimates were collected for all properties in the study area. For industrial, commercial, and public properties, on-site interviews were used to determine damageable values and depth-damage relationships for affected properties (to include structural and content damages, emergency preparedness, and cleanup costs). Ground and floor elevations were determined from property records and topographic mapping. The Mad Creek Reach 1 (Mississippi Reach 4) area contains a large, well-maintained manufacturing facility in addition to the many other occupants. This manufacturer has a very significant investment in plant, inventory, and equipment at this location. The equipment for manufacture and assembly is generally located on the ground floor of several building sites and is permanently placed. It is not mobile and could not be removed during a flood threat. Inventory is stored at varying heights in several buildings and is at risk during flood threats. Therefore, it is assumed that any breach or overtopping of the existing levee during flooding would cause immediate and severe damage to this industrial facility, as well as other levee district occupants. Information from study area occupants was used to estimate the range of potential damages resulting from an overtopping flood event.

For residential structures, ground and floor elevations, structure type, age, size (square footage), condition and repair/replacement values were estimated from field survey. Using this information and the Rock Island District's standard residential depth-damage computer program, elevation-damage relationships were estimated for the residential properties.

c. Risk and Uncertainty. Tables B-5 through B-8 present mean damage estimates and standard deviation of damage by category for various flood elevations. The accepted approach with limited data and funding was used to arrive at standard deviations of stage/damage relationships (reference IWR Risk/Uncertainty guidance). Total mean damage and standard deviation information was then entered to the Hydraulic Engineering Center - Flood Damage Assessment (HEC-FDA) computer model for risk and uncertainty. The HEC-FDA model was then run, sampling various hydraulic and economic variables, resulting in existing and proposed levee-height reliability statistics and annual damage/benefit information.

Table B-5. Reach 1/4 (two independent stream flows)

Elevation (NGVD)	Approx. Freq.	Industrial/ Commercial	Standard Deviation
<i>Mad Creek Reach 1 (Miss. Reach 4) Existing Damages by Category (\$000's)</i>			
559.0	.0033	0	0
560.0	.0027	69,270	18,680
561.0	.0023	74,680	18,670
562.0	.0020	80,090	18,450
563.0	.0017	85,190	18,340
564.0	.0015	90,970	18,530
<i>Mississippi Reach 4 (Mad Creek Reach 1) Existing Damages by Category (\$000's)</i>			
559.0	.004	0	0
560.0	.0028	69,270	18,680
561.0	.0015	74,680	18,670
562.0	.0008	80,090	18,450
563.0	.0005	85,190	18,340
564.0	.0002	90,970	18,530

Table B-6. Reach 2 existing damages by category (\$000's)

Elevation (NGVD)	Approx. Freq.	Commercial	Standard Deviation
560.0	.004	0	0
561.0	.0032	110	28
562.0	.0027	162	37
563.0	.002	209	45
564.0	.0017	242	49

Table B-7. Reach 3 existing damages by category (\$000's)

Elevation (NGVD)	Approx. Freq.	Industrial	Standard Deviation
572.0	.0013	0	0
573.0	.001	53,330	13,333

Table B-8. Area outside of reaches existing damages by category (\$000's)

Approx. Freq.	Residential	Commercial	Public
.5	0	0	0
.1	14	17	13
.02	35	219	58
.01	60	472	76
.002	111	974	242

(1) Existing Condition Annual Damages and Benefits. Average annual damages are the expected value of flood losses for any given year. The calculation for existing condition average annual damages, under the Hydraulic Engineering Center - Flood Damage Assessment (HEC-FDA) model involves using Monte Carlo simulation for computing expected annual flood damages (mean damage obtained by integrating the damage exceedance probability curve for the study area). Uncertain parameters (error distributions around the mean) such as flow-frequency, flow-stage, and stage-damage are sampled when a simulated overtopping event occurs. HEC-FDA output includes best estimate (mean) of expected annual damage and a distribution of possible values about the mean.

That portion of annual damages which can be prevented by construction of a project are the benefits accruing to the project. Residual (with-project) damages are damages that could occur due to the possibility of flood events that would overtop the proposed levee improvement.

Table B-9 lists annual damages and benefits information for the existing condition and alternatives considered.

Table B-9. Annual damages and benefits by alternative

<u>Existing Condition</u>	<u>Geneva</u>	<u>Annual Damages</u>		<u>Total Annual Damage</u>
		<u>Mad</u>	<u>Miss.</u>	
Reach 1/4		469,500	349,300	818,800
Reach 2		1,500		1,500
Reach 3	11,200			11,200
Outside Specific Reaches	200	44,000		44,200
<u>With-Project Conditions</u>	<u>Geneva</u>	<u>Annual Benefits</u>		<u>Total Annual Benefits</u>
		<u>Mad</u>	<u>Miss.</u>	
A. Mad Creek/Geneva Creek Levee Raises				
A-1. Mad Creek Levee Raise - Reach 1				
A-1-a. One-foot raise		121,200		121,200
A-1-b. Two-foot raise		265,200		265,200
A-1-c. Three-foot raise		397,400		397,400
A-2. Mad Creek Railroad Raise - Reach 2		300		300
A-3. Geneva Creek Closures - Reach 3	11,100			11,100
B. Dams (.01 design) Mad & Geneva Creek				456,100
Reach 1		409,700		
Reach 2		1,200		
Reach 3	11,200			
Outside Specific Reaches		34,000		
C. Dams (.01) and 1-ft Levee Raise				
C-1. Dams and Reach 1 raise				
Reach 2 benefit		1,200		
Reach 3 benefit	11,200			
Outside Specific Reaches		34,000		
C-2. Dams and Reach 2 raise				456,300
Reach 1 benefit		409,700		
Reach 3 benefit	11,200			
Outside Specific Reaches		34,000		
C-3. Dams and Reach 3 Closures				456,100
Reach 1 benefit		409,700		
Reach 2 benefit		1,200		
Outside Specific Reaches		34,000		
D. Improve Mad Channel w/Mad/Miss Raise Reach 1/4				
D-1. 1-foot raise		441,800	239,300	691,600
D-2. 2-foot raise		466,200	346,300	823,000
D-3. 3-foot raise		469,300	348,700	828,500
Reach 2 benefit for all D plans		700		
Outside Specific Reaches		9,800		

(2) **Future Condition.** The existing project-protected floodplain along Mad Creek, Geneva Creek, and the Mississippi River is densely developed, with significant growth not being apparent. The unprotected areas of the floodplain are regulated, so that at-risk structures are not expected to increase. Therefore, future economic conditions are not expected to change significantly.

4. BENEFIT-COST ANALYSIS

a. **General.** Construction and operation and maintenance costs detailed in this report are in June 2002 price levels. Interest during construction and annualized costs are computed using a 6-1/8 percent rate as mandated for Federal water resources projects. A 50-year project life has been used for the period of analysis. Tables B-10 and B-11 summarize the calculations for interest during construction and annual charges for Alternative D-2, Channel Improvements with 2-Foot Levee Raise for Mad Creek and Mississippi River (Reach 1, 4).

**Table B-10. Interest during construction (\$000's)
Plan D-2, channel improvements with 2-foot levee raise
(6-1/8% discount rate)**

Year	Project Expenditures (\$000's)		Time to Base Year (Period)	Interest Factor of \$1 Deposited to Base Year	Accumulated Interest to Base Year (\$000's)		
	Federal	Non-Federal			Federal	Non-Federal	Total
1	1,119.7	602.8	3	.09472	106.0	57.0	163.0
2	1,119.6	602.9	1	.0306	34.3	18.6	52.9
Totals	2,239.3	1,205.7			140.3	75.6	215.9

**Table B-11. Summary of annual charges (\$)
Plan D-2, channel improvements with 2-foot levee raise
(6-1/8%, 50-year evaluation period)**

Description	Federal	Non-Federal	Total
Estimated Construction Cost	2,239,300	1,205,700	3,445,000
Interest During Construction	140,300	75,600	215,900
Total Economic Costs	2,379,600	1,281,300	3,660,900
Interest and Amortization (.06455)	153,600	82,700	236,300
Operation and Maintenance	0	4,100	4,100
Total Annual Charges	153,600	86,800	240,400

b. **Economic Summary.** Table B-12 presents a summary economic analysis for the alternatives considered. As indicated, NED (National Economic Development) benefits are maximized with Alternative D-2, Channel Improvements with 2-Foot Levee Raise for Mad Creek and Mississippi River (Reach 1, 4). This alternative provides net NED benefits of \$582,600 and a benefit-to-cost ratio of 3.4 to 1.0.

Table B-12
Costs and benefits by alternative
 (June 2002 prices, 6-1/8% discount rate, 50-year evaluation period)

<u>Alternative</u>	<u>Total Annual Benefits</u>	<u>Project Cost Estimate</u>	<u>Interest During Const.</u>	<u>Total First Costs</u>	<u>Annual First Costs</u>	<u>Annual O & M Costs</u>	<u>Total Annual Costs</u>	<u>Benefit Cost Ratio</u>
A. Mad Creek/Geneva Creek Levee Raises								
A-1. Mad Creek Levee Raise - Reach 1								
a. 1-foot raise	121,200	1,775,000	111,241	1,886,241	121,764	0	121,764	0.995
b. 2-foot raise	265,200	2,088,000	130,857	2,218,857	143,236	0	143,236	1.85
c. 3-foot raise	397,400	2,817,000	176,545	2,993,545	193,245	0	193,245	2.06
A-2. Mad Creek Railroad Raise - Reach 2	300	1,207,000	36,964	1,243,964	80,303	0	80,303	0.00
A-3. Geneva Creek Closures - Reach 3	11,100	721,000	22,081	743,081	47,969	0	47,969	0.23
B. Dams (.01 design) Mad & Geneva Creek	456,100	8,042,000	772,402	8,814,402	569,005	15,665	584,670	0.78
C. Dams (.01) and 1-ft Levee Raise								
C-1. Dams and Reach 1 raise	500,500	9,655,000	927,324	10,582,324	683,131	15,665	698,796	0.72
C-2. Dams and Reach 2 raise	456,300	9,036,000	867,872	9,903,872	639,334	15,665	654,999	0.70
C-3. Dams and Reach 3 Closures	456,100	8,552,000	821,385	9,373,385	605,089	15,665	620,754	0.73
D. Improve Mad Channel w/Mad/Miss Raise Reach 1/4								
D-1. 1-foot raise	691,600	3,255,000	203,995	3,458,995	223,292	4,070	227,362	3.04
D-2. 2-foot raise	823,000	3,445,000	215,902	3,660,902	236,326	4,100	240,426	3.42
D-3. 3-foot raise	828,500	4,242,000	265,851	4,507,851	291,000	4,150	295,150	2.81

Notes:

1. D-1, D-2, D-3 Levee Raise alternatives have O & M costs for siltation removal and temporary tie-off construction.
2. Dam alternatives cost estimates include \$15,700 for access road construction.
3. Interest During Construction was calculated for mid-year expenditure and appropriate construction period.

5. FINANCIAL ANALYSIS

a. Cost Distribution. Based on current cost-sharing provisions, Federal and non-Federal costs will be distributed as shown in Table B-13.

**Table B-13. Project cost distribution
Plan D-2, channel improvements with 2-foot levee raise
Muscatine, Iowa**

<u>Total Project Cost Estimate</u>	\$3,445,000
<u>Federal Cost Estimate</u>	2,239,250
<u>Non-Federal Cost Estimate</u>	1,205,750
Lands, Damages, & Relocations	\$505,000
Cash Contributions	\$700,750
Non-Federal Share Percent of Total Cost:	35%

b. Ability to Pay. Based on the provisions of Section 103 of Public Law 99-662, Muscatine, Iowa, has the ability to provide the normal share percentage of project costs. This Public Law considers the magnitude of a project benefit-to-cost ratio and the per capita income of the state and county of the non-Federal sponsor. Muscatine does not qualify for reduced cost sharing. Table B-14 summarizes the required calculation.

**Table B-14. Ability to pay analysis
Plan D-2, channel improvements with 2-foot levee raise**

Annual Cost	\$240,400	Cost & Benefits
Annual Benefits	823,000	for Flood Control
Total Cost	\$3,445,000	
Local Share	\$1,205,700	
Benefit/Cost Ratio (BCR)	3.4	
Base Benefits Floor	85%	BCR multiplied by 25%
Standard Non-Federal Share	35%	

NOT QUALIFIED for reduced cost sharing, as the Benefit-to-Cost Ratio multiplied by 25%, and stated as a percentage, is greater than the standard cost-sharing percentage (based upon the benefits test per Section 103 of Public Law 99-662, and ER 1165-2-121).

c. Financial Capability. The City of Muscatine, Iowa, has the willingness and capability to finance its share of the cost of constructing this local flood protection project. The City’s Statement of Financial Capability and Financing Plan are included as Attachment 1 to this appendix.



City Hall, 215 Sycamore St.
Muscatine, IA 52761-3840
(563) 264-1550 Voice/TT
Fax (563) 264-0750

MAYOR

November 20, 2002

Colonel William J. Bayles
U.S. Army Engineer District
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: STATEMENT OF FINANCIAL CAPABILITY, Section 205 Flood Control Project, Mad
Creek, Muscatine, Iowa

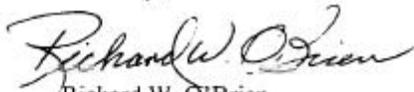
Dear Colonel Bayles:

The City of Muscatine, Iowa has the legal authority to enter into the Project Cooperation Agreement and to fulfill all financial obligations for completion of the project. The City understands that the current cost estimate for the entire project is \$3,445,000. Of this, the City's share is \$1,205,750 (\$700,750 cash and \$505,000 for rights-of-way and relocation costs).

It is the City's intention to finance its share of project costs through bond issuance and the levee tax levy. These funding sources will be available to meet the City's requirements as shown on the attached schedule of Estimated Funding Requirements. Enclosed also is a copy of the City's latest Annual Financial Report for the year ended June 30, 2001. The June 30, 2002 report will be available in December.

The City of Muscatine has reviewed the Project Cooperation Agreement (PCA) and has found its provisions acceptable. The City strongly desires to proceed with this flood damage reduction project. If further information is needed, please do not hesitate to contact our office.

Sincerely,


Richard W. O'Brien
Mayor

Enclosure

Attachment 1

Mad Creek, Muscatine, IA Section 205

ESTIMATED FUNDING SCHEDULE

<u>Fiscal Year</u>	<u>Total Project Impl. Cost</u>	<u>Non-Federal LERRD</u>	<u>Constr. Cash</u>	<u>Percent of Total</u>	<u>Non-Fed 5% Min. Cash</u>	<u>Add'l Non-Fed Cash</u>	<u>Total Non-Fed Cash</u>	<u>Federal Cash</u>
Prior FYs	0.0	0.0	0.0	0%				0.0
2003	955.0	505.0	450.0	0%	0.0	0.0	0.0	450.0
2004	1,220.0	0.0	1,220.0	57%	97.8	300.2	398.0	822.0
2005	1,245.0	0.0	1,245.0	42%	72.9	223.8	296.7	948.3
2006	<u>25.0</u>	<u>0.0</u>	<u>25.0</u>	<u>1%</u>	<u>1.5</u>	<u>4.5</u>	<u>6.0</u>	<u>19.0</u>
Totals	3,445.0	505.0	2,940.0	100%	172.3	528.5	700.8	2,239.3

Notes:

1. Fiscal year refers to U.S. Government Fiscal Year 1 October thru 30 September
2. LERRD refers to lands, easements, relocations, rights-of-way, and damages.

MAD CREEK, MUSCATINE, IOWA
SECTION 205 LOCAL FLOOD PROTECTION PROJECT
FINANCING PLAN OUTLINE

The City of Muscatine, Iowa, non-Federal sponsor of this Local Flood Protection Project, is capable of meeting its cost-sharing obligation as required under the terms of the Project Cooperation Agreement.

<u>Uses of Funds</u>	<u>Amounts</u>	<u>Comment</u>
Land Acquisition	\$ 505,000	Required real estate acquisition and associated costs.
Cash Contribution	700,750	Non-Federal cash requirements during construction.
Annual Operation and Maintenance	4,100	Periodic channel silt removal.

Sources of Funds

Annual Budget Appropriations	\$1,205,750	Normal budget appropriations financed from General Obligation Bond issuance and taxing authority. 1.
Annual Budget Appropriations (O&M)	4,100	

1. The City of Muscatine has ample remaining bonding capacity (\$19,800,000). Bond issuances to meet financing requirements appear to pose no fiscal difficulty. The Flood Control Project portion of the Capital Improvements Program budget will be funded from General Obligation Bond issuance and taxing authority.

MUSCATINE, IOWA
 LOCAL FLOOD PROTECTION PROJECT
 SCHEDULE OF SOURCES AND USES OF NON-FEDERAL FUNDS

	<u>Project Funding Sources</u>	<u>Estimated Cash Requirements</u>	<u>Year-End Funding Balance</u>
		<u>LERRD</u> <u>Cash</u> <u>Contribution</u>	
FY 2003 Funding Sources:			
Annual Budget Appropriations	\$ 505,000	\$ 505,000 0	0
FY 2004 Funding Sources:			
Annual Budget Appropriations	340,000	0 340,000	0
FY 2005 Funding Sources:			
Annual Budget Appropriations	355,750	0 355,750	0
FY 2006 Funding Sources:			
Annual Budget Appropriations	5,000	0 5,000	0
	-----	-----	
TOTALS	\$1,205,750	\$ 505,000 \$ 700,750	

Credit-worthiness notes:

Based on the City Comprehensive Annual Financial Report (June 30, 2001), the following factors indicate strong capability for financing cost-sharing requirements.

1. Stable population.
2. Increasing assessed and actual property values.
3. Very strong ratio of tax collections to tax levee (consistently above 99%).
4. Significant legal debt margin (debt limit \$41,900,000; outstanding debt \$22,000,000)
5. Reasonable bonded debt per capita (\$398).
6. Strong history of debt issue/debt service (current A-1 rating by Moody's Services).
7. Low unemployment rate (2.8%).

DISTRICT COMMANDER'S ASSESSMENT OF
NON-FEDERAL SPONSOR'S FINANCING CAPABILITY

SECTION 205 FLOOD CONTROL PROJECT
MAD CREEK, MUSCATINE, IOWA

The Financing Plan presented by the City of Muscatine, Iowa has been reviewed and is considered appropriate to participate in the construction of this Local Flood Protection Project. Based upon information received from the non-Federal sponsors, it is reasonable to expect that sufficient funds will be available to satisfy the non-Federal sponsor's financial obligations for the project.



William J. Bayles
Colonel, U.S. Army
District Engineer

APPENDIX C

GEOTECHNICAL CONSIDERATIONS

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX C
GEOTECHNICAL CONSIDERATIONS**

CONTENTS

<u>Subject</u>	<u>Page</u>
1. Purpose and Scope.....	C-1
2. Location and Geology	C-1
3. Physiography	C-2
4. Subsurface Explorations	C-2
5. Bedrock	C-3
6. Proposed Embankments	C-3
7. Foundation for Embankments	C-3
8. Foundation for Other Structures	C-4
9. Groundwater	C-5
10. Slope Stability	C-5
11. Underseepage and Berm Analyses	C-6
12. Through-Seepage Analysis.....	C-6
13. Settlement.....	C-6
14. Material at Proposed Borrow Sites.....	C-6

Plates

No.	Title
C-1	Slope Stability Analyses
C-2	Slope Stability Analyses
C-3	Slope Stability Analyses

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX C
GEOTECHNICAL CONSIDERATIONS**

1. PURPOSE AND SCOPE

This appendix presents the general geology and specific geotechnical analyses pertinent to the project. Geological information contained in this report has been obtained and condensed from the Iowa Geological Survey reports, bulletins, and circulars. The scope of the study included a review of the *Detailed Project Report for Flood Control at Muscatine*, dated September 9, 1970. The geotechnical information has been determined from soil borings obtained for the Mad Creek Local Flood Control Project during 1948, 1955, 1956, 1968, and 1970; and from additional soil borings obtained at the Mad Creek borrow site, on top of the existing levee at the proposed construction site, and the Hershey Avenue borrow site during December 2000 and January 2001.

The proposed project includes raising the existing levees, 2,300 linear feet, and floodwalls, 1,700 linear feet, adjacent to Mad Creek and the Mississippi River; and vertically extending one existing floodgate at Mulberry Avenue, replacing one existing floodgate at 2nd Street, and installing one new closure structure across the railroad south of Washington Street. The project also requires channel sediment removal underneath and upstream of the 2nd Street Bridge. The project plans and profiles are shown on plates C102 through C105 in Appendix L.

2. LOCATION AND GEOLOGY

The Mad Creek study area is located along the Mississippi River in Muscatine, Iowa. The location of the project is shown on Figure 2 of the main report. The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of Muscatine and areas north of Muscatine in Muscatine County. The upstream portion of the watershed north of Muscatine is primarily agricultural land, but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. Low-lying areas are subject to flash flooding.

The terrain is a maturely dissected area of Illinoian glacial till, covered with loess on the uplands. Much of the upland is cultivated for crops. The steep valley slopes are usually timbered pasture. Maximum relief is about 230 feet.

3. PHYSIOGRAPHY

The Mad Creek Valley complex is located in the Southern Iowa Drift Plain physiographic province, in an area of Illinoian age (132-300k years BP) glacial till. This till was deposited by an ice sheet entering Iowa from the east and northeast, and in Iowa, extends only along the western edge of the Mississippi Valley from roughly the Quad Cities to Keokuk. The average thickness of this drift is approximately 30 feet. In some areas, this till overlies a more ancient soil complex which may express itself as a weathered, iron rich zone on the flanks of valleys. This area has been relieved of ice for a sufficiently long time that most glacial features have been lost or greatly modified by erosion and deposition. During the most recent glacial event of Wisconsinan age, ending 10,000 years ago, at the same time that the dissected landscape was developing, wind-blown deposits of silt, known as loess, were being deposited over the till. In some locations, the loess mantle is thick enough to provide additional relief and alter slope angles. This leads to topography of steeply rolling hills interspersed with areas of uniformly level upland divides and level alluvial lowlands. Individual hillslopes often display a texture of finely etched rills or drainageways, which give a furrowed appearance to the terrain. The Mad Creek Valley complex is composed of a 3.5-mile upper section, with a steeper gradient; and a lower section of 2.5 miles which begins to flatten out downstream of the juncture of Mad Creek and its western branch below McKee Park. The upper section drops from a divide elevation of roughly 730 feet MSL to approximately 600 feet near the juncture. From here, it flows to the Mississippi, discharging at 540 feet elevation, depending on river stage. In the past, this relatively modest gradient was exploited by railroad companies that aligned their roadbeds along the valleys to gain elevation to the uplands. Several abandoned roadbeds remain throughout the complex.

4. SUBSURFACE EXPLORATIONS

Numerous borings were taken for the construction of the Mad Creek Local Flood Control Project during 1948, 1955, and 1956. During 1968 and 1970, additional borings were taken to make improvements to the existing project. To further determine subsurface conditions for this report, the Rock Island District's Geotechnical Branch took four 4-inch-diameter hand augers along the existing levee, sampling every 1 to 2 feet. These are Borings MC-01-1 through MC-01-4 that were taken January 17, 2001. The plans and profiles of the preferred plan are shown on plates C102 through C105 in Appendix L. Boring logs are shown on plate C101 in Appendix L.

Both Mad Creek borrow site and Hershey Avenue borrow site borings were taken by Terracon, Inc., of Cedar Rapids, Iowa. A CME 850 all-terrain rotary drill rig was used. Either a flight auger or a hollow stem auger with SPT tests (split spoon) taken every 2-1/2 feet was used to obtain samples.

Three borings were taken at the Mad Creek borrow site, each between 25 and 30 feet deep. The borings are MCB-00-1, MCB-00-2, and MCB-00-3. Two borings were taken at the Hershey Avenue borrow site, one about 45 feet deep and the other about 20 feet deep. The borings are MCB-00-4 and MCB-00-5, with these boring logs also shown on plate C101 in Appendix L. All borrow site borings were taken December 20, 2000.

Laboratory testing was performed at the Rock Island District Geotechnical Branch soil laboratory. Natural moisture content, percent passing the #200 sieve, and Atterberg (liquid and plastic) limits were taken as needed from the soil samples.

5. BEDROCK

The bedrock of the project area consists of the Pennsylvanian rocks. These Pennsylvanian rocks for the most part consist of cyclic deposits of shale, siltstone, and sandstone with some limestone. Outcrops of Pennsylvanian rocks occur at a few places along Mad Creek. Bedrock was encountered in numerous borings. The depth of the bedrock encountered along the existing project varies approximately from elevation 504 feet MSL to 539 feet MSL.

6. PROPOSED EMBANKMENTS

The Rock Island District built the original Mad Creek Local Flood Control Project in 1961. In 1983, the District extended and upgraded the project, which included a levee and floodwall near the confluence of Geneva Creek with Mad Creek. The levees along the Mississippi River and Mad Creek are composed of semi-compacted impervious sandy lean clay (CL). (See Appendix L for the project plans and profiles.)

Rock Island District Geotechnical Branch personnel inspected the existing levee during May 2001 high-water periods. The entire levee was found to be in satisfactory condition. No evidence of underseepage or through-seepage distress was observed landward or on the side slopes of the entire levee alignment, respectively, during the field inspections. The levee embankments were also noted to be in satisfactory condition with regards to slope stability.

The levee would be raised from 1 to 2 feet above the existing design grade using compacted impervious fill. The compacted impervious fill would be placed on the 1 vertical on 2.5 horizontal landside and riverside slopes of the levee, and slopes would be seeded. The crown of the levee would be a minimum 8 feet wide. (See Appendix L for the plans and profiles and typical cross sections of the levee.) Impervious fill would require moisture and dry density control for the proposed levee to ensure that through-seepage would be eliminated. For moisture control, a range of plus 2 to minus 2 percentage points deviation from the optimum moisture content would be used. For required density, the maximum dry density of 95% would be achieved by controlling the uncompacted lift thickness using standard compaction equipment.

7. FOUNDATIONS FOR EMBANKMENTS

The existing levee landside and riverside slopes levee foundation, and the crown (where the levee will be raised), will be cleared, grubbed, and stripped to remove unsuitable materials. All tap roots, lateral roots, or other projections over 1.5 inches in diameter within the improved levee foundation area will be removed to a depth of 3 feet below natural ground surface. In order to maintain the integrity of the levee, a marginal strip from the slope of the levee would be cleared.

An extensive subsurface investigation was made to ascertain the levee foundation conditions during 1948, 1955, 1956, 1968, and 1970. Four additional hand auger borings, MC-01-1 through MC01-4, were taken during January 2001 on top of the existing levee to ascertain the existing levee composition. According to borings, which were pertinent to the levee raise study, the foundation material consists of alluvial deposits. Atterberg limits, moisture contents, and shear strength tests indicate no exceptionally weak soils. (See Appendix L for boring logs.) The top stratum varies in thickness from 7 feet to more than 34 feet and consists of normally consolidated impervious and semi-impervious alluvial deposits. A few borings show a top layer of 2 to 6 feet consisting of rubble that is underlain by layers of impervious and semi-impervious alluvial

deposits. One exception to this is boring 75 obtained in February 1956. It indicates a rubble thickness of approximately 30 feet underlain by bedrock.

Impervious and semi-impervious alluvial deposits are underlain by pervious alluvial deposits, varying in thickness from 2 to 19 feet deep. Detailed descriptions of the encountered materials are shown on the boring logs on plate C101 in Appendix L. In borings 33, 63, and 45, a 2-foot-thick layer of sand (SP) was found interbedded between impervious and semi-impervious alluvial deposits.

An inspection trench will be not required for increasing the flood protection height since the U.S. Army Corps of Engineers, Rock Island District, originally built the project. Original construction of the system required an inspection trench excavated along the entire length of the project.

8. FOUNDATION FOR OTHER STRUCTURES

Raising of the Existing Retaining Wall. The existing retaining wall is to be raised by a maximum of 2 feet at several locations as indicated by their stationing. Borings at these locations indicate the following foundation soils under the base of the wall:

a. Station 0+10 to Station 8+39. A predominantly lean clay (CL) layer of 0 to 11 feet lays directly below the wall base. Beneath this is a mixture of poorly graded sand (SP) and silty sand (SM) until bedrock is encountered about 30 feet below the wall base.

b. Station 14+87 to Station 15+42. The soil beneath the wall base is a 12-foot layer of predominantly lean clay (CL) with some rubble. Beneath this layer is well-graded sand (SW). Bedrock is encountered about 20 feet below the wall base.

c. Station 17+01 to Station 17+26. An 8-foot layer of lean clay (CL) lies beneath the wall base. Beneath this layer is a silty sand (SM). Bedrock is encountered 20 feet below the wall base.

d. Station 17+55 to Station 20+78. A lean clay (CL) layer 2 to 3 feet thick lies directly beneath the wall base. Predominantly silty sand (SM) underlays the clay. Bedrock is encountered 33 feet below the wall base.

e. Station 28+20 to 30+46. A layer 3 to 8 feet thick of lean clay (CL) lies directly beneath the wall base. A silty sand (SM) underlays the clay. Bedrock is encountered about 28 feet below the wall base.

f. Existing Structure at Mulberry Street (Station 0+25N). The soil beneath the bottom of the structure is predominantly a silty sand (SM). Bedrock is encountered 25 feet below the bottom of the structure.

g. New Wall and Closure Structure at 2nd Street (Station 15+40 to Station 17+55). A layer 6 to 12 feet thick of predominantly lean clay (CL) underlays the bottom of the structure and wall. Silty sand (SM) lays beneath the clay. Bedrock is encountered about 17 feet below the wall base.

h. I&M Rail Link Railroad Closure (Station 5+70S). The borings in the vicinity indicate a layer of lean clay (CL) beneath the bottom of the structure that is about 10 feet thick. Predominantly silty sand (SM) lays beneath this. Bedrock is encountered about 45 feet beneath the bottom of the structure.

9. GROUNDWATER

Water levels were measured during the boring operation. The groundwater levels are noted in the borings shown on boring logs in Appendix K, plate C101. They are noted with a “wt” on each boring.

The water table was found to be consistent throughout the project area (Station 0+00 to Station 36+00), ranging between elevations 539 feet MSL to 543 feet MSL. This put the water table between 3 and 10 feet below the base of the existing levee.

The water tables noted were at one specific point in time. However, groundwater tables tend to fluctuate during different seasons in the year.

10. SLOPE STABILITY

A detailed study of all existing embankment and channel improvement sections and soil profiles along the embankment alignment indicated that the existing embankment near Stations 12+00 and 21+50 and channel improvement at the existing parking lot are the most critical with respect to slope stability. The sections were determined to be in those reaches where the existing levee will be raised and the existing channel is needed to be improved. The selected critical sections were analyzed to check the integrity of the existing levee, with UTEXAS4 software program, Spencer methods, in accordance with EM 110-2-1902, *Engineering Design Stability of Earth and Rockfill Dams*, dated 1 April 1970.

The maximum height of the embankment at these selected sections is approximately 16 feet. The typical cross sections are shown on plate C106 in Appendix L. The maximum height of the channel at the selected section is 23 feet, and is shown on plate C106.

To estimate the stability of the embankment, a range of conservative undrained shear strengths (Q) was assumed for the most severe configuration of compacted embankment and foundation. The Undrained shear strength of the compacted impervious embankment is estimated to be at least 800 psf with no friction angle; this estimate is based on test results of similar soils from construction of similar projects. The embankment in these reaches was constructed and will be raised with compacted sandy lean clay (till). The foundation along these reaches consists generally of sandy lean clay (CL), clayey silt (ML-CL), and silty sand (SM). Shear strength estimates for sandy lean clay (CL) and clayey silt (ML-CL) vary from 450 psf to 600 psf. For silty sand (SM), shear strength is estimated to be 200 psf and a friction angle of 20 degrees based on several soils properties, undisturbed soil samples test results of similar soils, and engineering judgment. The selected shear strength values are shown on plates C-1, C-2, and C-3. It should also be noted that the project has not experienced any slope stability problems since the construction of the project during 1961 and after upgrading the project during 1983.

Successive trials of various sliding surfaces were analyzed, and determination of the critical failure arc having the lowest safety factor was made. The summary of the slope stability analyses for critical sections and the solutions of the most critical arcs appear on plates C-1, C-2, and C-3. The

computed minimum safety factors were found to be 1.83 at Station 12+00, 1.92 at Station 21+50, and 1.63 for the channel improvement. These exceed the 1.3 that is required by EM 1110-2-1913, *Design and Construction of Levees*, dated March 31, 1978. Therefore, no slope stability problems are expected. A sudden draw down loading and seepage conditions were not evaluated since high water levels will be of such short duration that saturation of compacted embankment cannot occur.

11. UNDERSEEPAGE AND BERM ANALYSES

The underseepage and berm analyses for the Mad Creek Flood Damage Reduction project are based on a study of thickness and permeability, and characteristics of the impervious stratum and pervious substratum, in addition to the extent of the riverward and landward top strata. Based on geotechnical investigations, which were performed during 1948, 1955, and 1956, and additional borings which were taken during 1968 and 1970 to upgrade the existing project during 1983, the top stratum varies in thickness from 7 feet to more than 34 feet and consists of normally consolidated impervious and semi-impervious alluvial deposits. The *Detailed Project Report for Flood Control at Muscatine*, dated September 9, 1970, was also reviewed. It was determined that underseepage is not considered to be a problem since the foundation materials are impervious or semi-impervious and the duration of flooding is very short. It should also be noted that the project has not experienced any underseepage problems since the construction of the project during 1961 and after upgrading the project during 1983.

12. THROUGH-SEEPAGE ANALYSIS

The Mad Creek Flood Damage Reduction project will not be subjected to high water loading for a long enough time to cause through-seepage in its impervious compacted materials. Therefore, seepage is not expected through the levee.

13. SETTLEMENT

The relatively small amount of additional material (1 to 2 feet) to improve the levee will not add an appreciable load to the foundation. Due to the existing load that has been imposed for some 40 years on the foundation, no significant amounts of settlement are anticipated for the improved levee. Therefore, an overbuild will not be required.

14. MATERIAL AT PROPOSED BORROW SITES

Two borrow sites were investigated. Mad Creek borrow site was investigated as a possible source of fill for the once proposed Mad Creek and Geneva Creek detention reservoirs (non-selected alternative). No borings were taken at the proposed detention reservoir locations.

Hershey borrow site was investigated as a source of fill for the proposed raising of the existing levees along Station 0+00 to Station 36+00. Both borrow sites were investigated on December 20, 2000. The drilling of the borings was performed by Terracon, Inc., of Cedar Rapids, Iowa, using a CME 850 all-terrain rotary drill rig. Three borings were taken at the Mad Creek borrow site (MCB-00-1, MCB-00-2, MCB-00-3) and two borings were taken at the Hershey borrow site (MCB-00-4, MCB-00-5). The boring logs are shown on plate C101 in Appendix L.

a. Mad Creek Borrow Site. This site is about 45 acres in size and is located at the crest of a shallowly sloping hill in the middle of a horse ranch pasture off 180th Street just north of Muscatine, Iowa. It is about 0.5 mile from the once proposed Mad Creek detention reservoir and about 4.5 miles from the proposed Geneva Creek detention pond.

All three borings taken were about 27 feet deep. The top 14 feet is predominantly a clayey sand (SC) with moisture contents ranging from 8% to 17%, averaging about 10%. Percent of fine materials (silts or clays) in the sand ranged from 8% to 33%.

The sand layer is underlain by a predominantly lean clay (CL) with moisture contents of 16% to 22%, averaging about 17%. Percent of fine materials was between 65% and 90% in the lean clay.

The overall soil in the area can generally be considered a glacial till. The groundwater table was only encountered at boring MCB-00-1. It was encountered at elevation 658 feet NGVD, about 25 feet below the top of the boring.

b. Hershey Borrow Site. This site is about 8.5 acres in size and is located just off Hershey Street near downtown Muscatine. It is a working borrow site in that it has been used in the recent past. Access to the site is at the base of a partially excavated embankment with slopes of about 1H:2.5V. The top of the embankment is about 50 feet. The site is about 2-1/4 miles from the proposed construction site at Mad Creek.

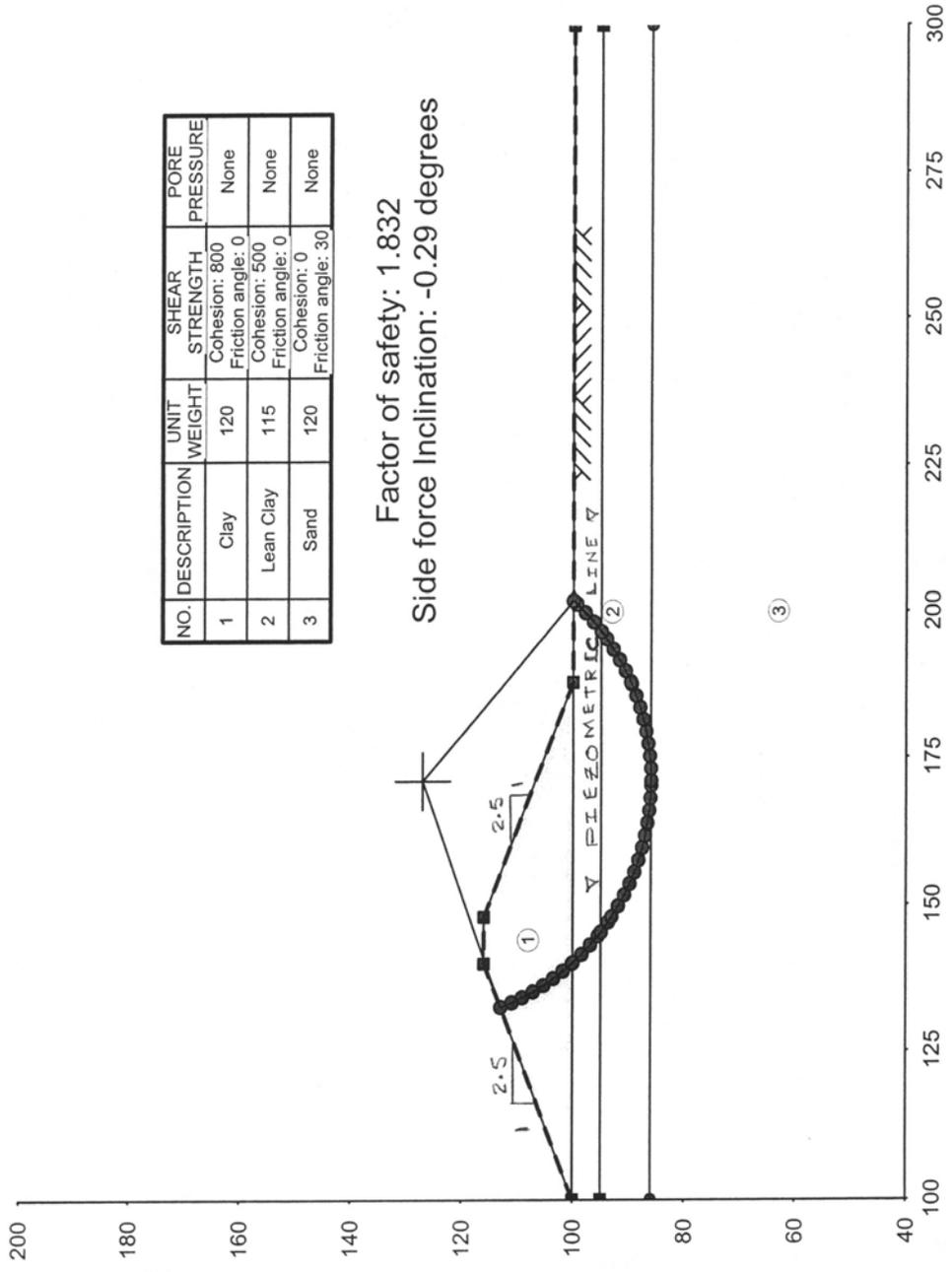
Boring MCB-00-4 was taken near the top of the embankment and is 46 feet deep. Boring MCB-00-5 was taken at a bench about a third of the way up the embankment and is 17 feet deep. No groundwater table was encountered.

The soil encountered was predominantly a sandy lean clay (CL) with lenses of clayey sand (SC), essentially a glacial till. The sandy lean clay has moisture contents between 14% and 24%. Its fine soil percentage is between 52% and 83%.

The clayey sand encountered has moisture contents between 5% and 14%. Its fine soil percentage is between 15% and 48%.

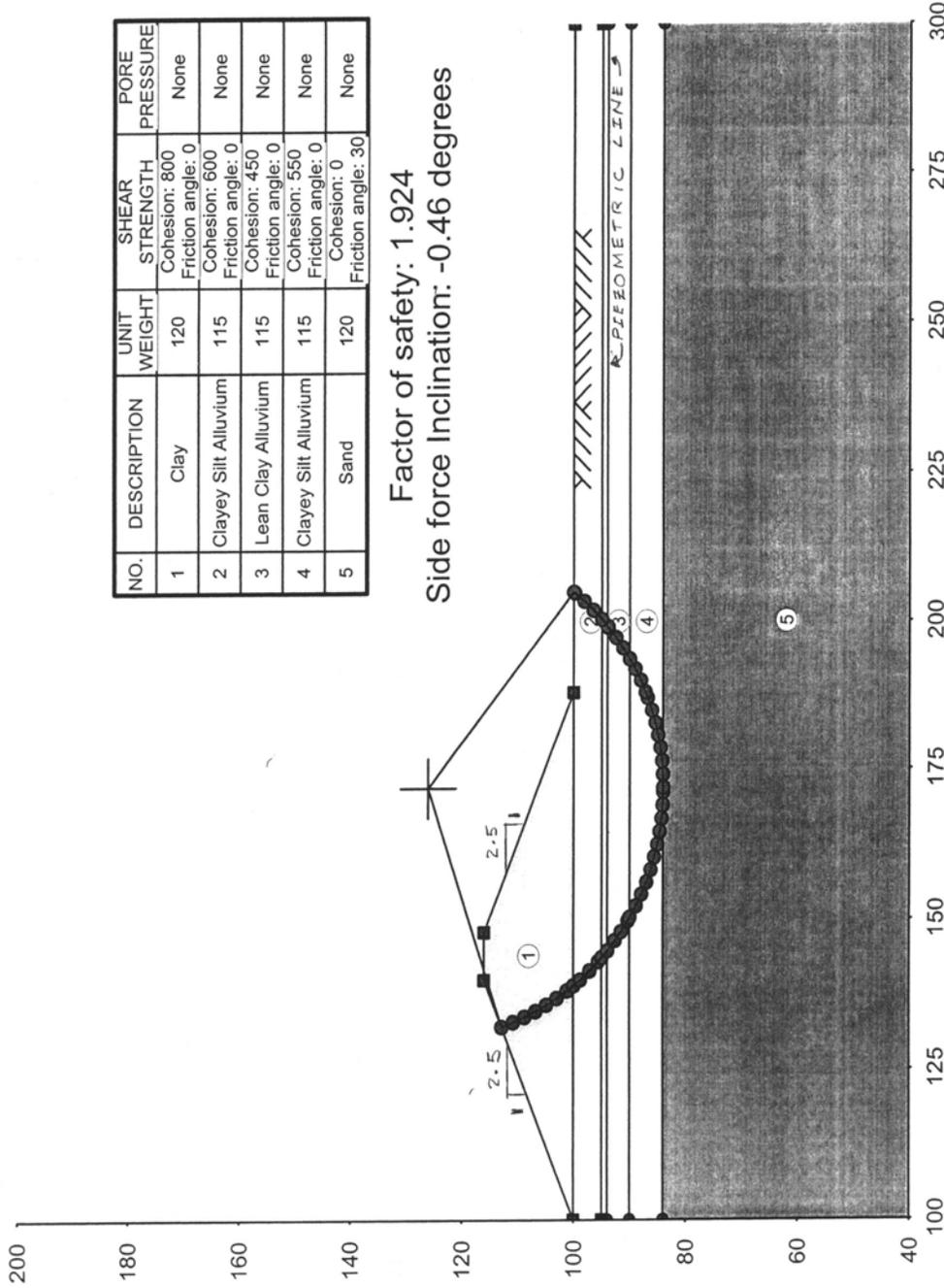
Mixing the soil would create a very acceptable lean clay (CL) that could be used for the proposed raising of the existing levees at Mad Creek.

Mad Creek LFP - Section 205 - Stewart



Date: Wed Aug 08 2001
 Filename: C:\WINUT4\MadCreek.UT4
 Time: 06:25:11

Mad Creek LFP - Section 205 - Stewart



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH Cohesion: 800 Friction angle: 0	PORE PRESSURE
1	Clay	120	Friction angle: 0	None
2	Clayey Silt Alluvium	115	Friction angle: 0	None
3	Lean Clay Alluvium	115	Friction angle: 450 Friction angle: 0	None
4	Clayey Silt Alluvium	115	Friction angle: 550 Friction angle: 0	None
5	Sand	120	Cohesion: 0 Friction angle: 30	None

Date: Wed Aug 08 2001

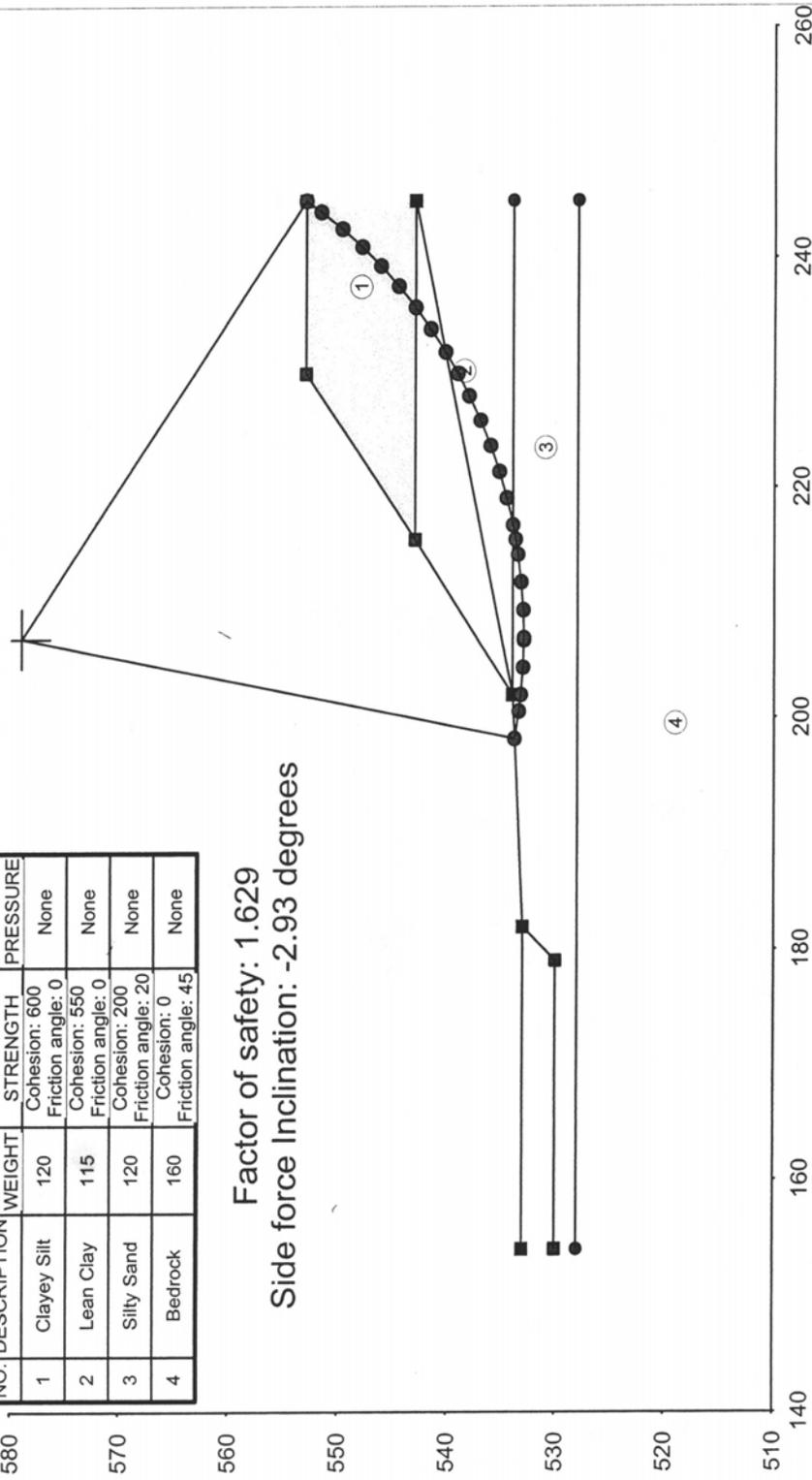
Filename: C:\WINUT4\MadCrk.UT4

Time: 07:01:52

Mad Creek LFP - Section 205 - Stewart

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Clayey Silt	120	Cohesion: 600 Friction angle: 0	None
2	Lean Clay	115	Cohesion: 550 Friction angle: 0	None
3	Silty Sand	120	Cohesion: 200 Friction angle: 20	None
4	Bedrock	160	Cohesion: 0 Friction angle: 45	None

Factor of safety: 1.629
Side force Inclination: -2.93 degrees



APPENDIX D

ENVIRONMENTAL ASSESSMENT

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX D
ENVIRONMENTAL ASSESSMENT**

CONTENTS

Subject	Page
I. Introduction	D-1
II. Purpose and Need for Action	D-1
III. Authority	D-1
IV. Project Description	D-2
V. Alternatives	D-2
VI. Affected Environment	D-3
VII. Environmental Impacts of the Preferred Alternative.....	D-4
VIII. Social and Economic Effects of Proposed Action.....	D-6
IX. Compliance with Environmental Quality Statutes	D-7
X. Environmental Impacts of Nonpreferred Alternatives	D-10
XI. Probable Adverse Environmental Effects Which Cannot Be Avoided	D-10
XII. Any Irreversible or Irrecoverable Commitments of Resources Which Would Be Involved if the Proposed Action Should Be Implemented.....	D-10
XIII. Relationship of the Proposed Project to Land-Use Plans	D-10
XIV. Relationship Between Short-Term Use of Man's Environment and the Maintenance of Long-Term Productivity	D-10
XV. Conclusions	D-11
XVI. Coordination.....	D-11
Finding of No Significant Impact (FONSI)	

CONTENTS (Continued)

Tables

No.	Title	Page
D-1	Effects of the proposed action on natural and cultural resources.....	D-6
D-2	Relationship of plans to environmental protection statutes and other environmental requirements.....	D-9

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX D
ENVIRONMENTAL ASSESSMENT**

I. INTRODUCTION

The purpose of this Environmental Assessment (EA) is to investigate flood damage reduction measures along Mad Creek in the City of Muscatine, Iowa. This effort is in response to requests from Muscatine city officials for Federal flood protection assistance.

The Mad Creek study area is located along the Mississippi River in Muscatine, Iowa. The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of Muscatine and areas north of Muscatine in Muscatine County. The upstream portion of the watershed north of Muscatine is primarily agricultural land, but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subject to flash flooding.

II. PURPOSE AND NEED FOR ACTION

The purpose of this project is to increase flood protection levels in the Mad Creek floodplain. The Rock Island District (the District) of the U.S. Army Corps of Engineers performed field reconnaissance, met with city officials, and prepared an Initial Appraisal, dated November 16, 1998, and addendum, dated December 15, 1998. The initial appraisal indicated that there appeared to be a Federal interest in a flood damage reduction project at the Mad Creek Drainage and Levee District. Therefore, the District entered into a cost-sharing agreement with the City of Muscatine to complete a feasibility study under Section 205 of the 1948 Flood Control Act, as amended.

In order to comply with the NEPA (National Environmental Policy Act) of 1969, this EA was prepared to address potential impacts associated with the levee/floodwall raise, stormwater reservoirs, channel improvements, and upgraded early flood warning system.

III. AUTHORITY

The Mad Creek Flood Damage Reduction Study is undertaken through the Corps of Engineers Continuing Authorities Program. The study is authorized by Section 205 of the 1948 Flood Control Act, as amended.

IV. PROJECT DESCRIPTION

The Muscatine Local Flood Protection Project, located in Muscatine County, Iowa, is being reevaluated under Section 205 of the 1948 Flood Control Act, as amended. Mad Creek drains an area of 17.3 square miles and enters the Mississippi River at River Mile (RM) 455.8. Approximately 2.3 miles of the downstream end of the creek is within the Muscatine city limits.

The project is located along the lower reaches of Mad Creek. The plan of protection provides for raising the existing earthen levees and floodwalls, as well as enhancing an early flood-warning system.

V. ALTERNATIVES

Alternatives to the proposed action include:

A. No Federal Action. Under the No Federal Action alternative, the Corps of Engineers would not participate in efforts to provide additional flood protection to the study area. The No Action plan is the “without project” condition that serves as the basis for developing and comparing the impacts of other plans. It is assumed that under the No Action plan, no project would be constructed to reduce flood damages and therefore the study area would continue to experience damages.

B. Raising the Existing Floodwall and Levee System. This alternative would involve raising the existing levees and floodwalls while constructing railroad closures at several sites along Mad Creek, and installing a positive closure structure on Geneva Creek.

C. Constructing Stormwater Detention Reservoirs. This alternative would involve constructing two stormwater detention reservoirs within Mad Creek and Geneva Creek. The detention reservoirs would each require the construction of a dam with an elevation of 640.0 feet. This would create an approximate 129-acre detention pond. The creation of the reservoirs also would involve relocating existing sewage lagoons.

D. Combination of Alternative A (Levee Raise) and Alternative B (Reservoirs). This alternative would involve raising the levees and floodwalls, constructing railroad closures at several sites along Mad Creek, and constructing two stormwater detention reservoirs within Mad Creek and Geneva Creek.

E. Raise the Existing Levee/Floodwall System on Mad Creek in Combination with Channel Improvements Immediately Upstream of 2nd Street Bridge and Raising the Mississippi River Floodwall. This is the preferred alternative. This alternative would involve improvement of approximately 2,300 linear feet of existing levees and 1,700 linear feet of existing floodwalls, 230 linear feet of a new floodwall, a new bulkhead closure gate to replace the existing panel closure at Mississippi Drive, a new overhead closure gate to replace an existing floodgate at 2nd Street, a new swing gate to replace the panel closure across the abandoned railroad just upstream of 2nd Street and installation of a new closure structure across the railroad south of Washington Street. In a separate but supporting effort, the City of Muscatine, Iowa, would raise the roadway and bridge at 5th Street at Mad Creek. This would allow the removal of the existing floodgate and the elimination of a high-risk closure.

Channel clearing and excavation would restore hydraulic capacity of Mad Creek through this reach, including the opening underneath the 2nd Street Bridge. Clearing and grubbing of the trees and brush is proposed, along with excavation from approximately 100 feet downstream of the 2nd Street Bridge, as well as approximately 365 feet upstream of the bridge. The width of excavation would be approximately 20 feet. The estimated volume of excavated material is 4,000 cubic yards. Excavated material is unsuitable for fill, so would be placed off site in an upland location.

VI. AFFECTED ENVIRONMENT

A. Natural Resources. The project extends through a highly developed and industrialized environment with few remaining natural floodplain characteristics. Vegetation in the area is limited to a band of cottonwood, willow, and silver maple, as well as riverbank grape, jewel weed, white mulberry, poison ivy, and Virginia creeper. Wildlife species in the area are typical of those found in urban areas such as squirrels, rabbits, songbirds, and non-game birds.

Two borrow sites are proposed for this project. The Hershey borrow site (Figure 1, main report) has historically been used for non-industrial and agricultural purposes and is considered to be a disturbed area. This historic site would provide the material for the levee raise/improvements only. The Mad Creek borrow site (Figure 1, main report) is not a historic site, but would only be needed for the construction of the sediment detention basins. The stormwater reservoirs are not economically feasible for this study and are not included in the preferred alternative plans. Therefore, there would be no impacts to this borrow site.

The two proposed reservoir areas are located on Mad Creek and Geneva Creek within ravines. The borrow sites are in areas either on or near agricultural fields. The levee enhancement areas are located within city limits with industrial, residential, and commercial areas near or adjacent to the levee.

Silt buildup beneath the 2nd Street Bridge (left descending bank) has severely reduced the capacity of the bridge to pass design flows, thereby causing higher water levels during Mad Creek flood events. Removal of this blockage would be accomplished as a part of the project, with continuing maintenance procedures ensuring that any recurrence is addressed similarly.

A portion of this area has been designated as wetland. The channel clearing would involve removing sediment, fill, and vegetation. The project has been modified to reduce the impacts to less than one tenth (.10) of an acre of wetland (the minimal disturbance to the wetland will not require mitigation as it is covered under Nationwide Permit 27, Wetland and Riparian Restoration and Creation Activities (see Appendix H - Pertinent Correspondence). Excavation of fill material in the channel will return this area to a more natural state before fill and sedimentation created this severe encroachment into Mad Creek.

B. Endangered Species. Federally listed species which may be present in the area include: bald eagle (*Haliaeetus leucocephalus*), Higgins' eye pearly mussel (*Lampsilis higginsii*), and Indiana bat (*Myotis sodalis*).

Bald eagles winter along the Mississippi River, including Pool 17. If necessary, clearing and other construction activity would be scheduled for periods when eagles are not present. The proposed project would not adversely affect bald eagles or their habitats.

The endangered Higgins' eye pearly mussel prefers sand/gravel substrates with a swift current and are most often found in the main channel border or an open, flowing side channel. Higgins' eye pearly mussels are not likely to be found in Mad Creek; therefore, no adverse effect is anticipated for this species.

The endangered Indiana bat is listed as occurring in Muscatine County, Iowa. During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods and mature upland forests. It roosts beneath the loose bark of dead or dying trees. Any tree clearing necessary for this project would not be performed during the April 1 - September 30 timeframe. Restricting tree clearing around this window of time would avoid potential adverse impacts to summer-roosting Indiana bats.

According to the U.S. Fish and Wildlife Service Coordination Act Report, dated June 26, 2001, "the proposed flood damage reduction measures should have no long-term impacts on threatened or endangered species" (see Appendix H).

C. Cultural Resources. Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR Part 800, require Federal agencies to take into account the effect of an undertaking on significant historic properties if that project is under the direct or indirect jurisdiction of the agency or has been licensed or assisted by that agency. The District determined that the proposed undertaking had potential to cause effects to significant historic properties (36 CFR 800.3(a)) and provided that determination along with proposed research measures to the SHPO (State Historic Preservation Officer), relevant federally recognized tribes, and the interested public for review and comment. The SHPO concurred with the District's determination by letter dated January 29, 2001 (R&C#: 010170032) and both the Sac and Fox Nation and the Iowa Tribe of Oklahoma indicated interest in the undertaking and the results of the archeological investigation (see Appendix H).

Subsequent to consultation, project modifications involving floodwall construction necessitated revising the APE to include two historic structures and associated limestone wall. According to *Historic Architecture of Muscatine, Iowa*, as prepared for the city of Muscatine in 1977 by Environmental Planning and Research, Incorporated, the house located at 501 East Mississippi Drive, referred to as the Judge Woodward House, was constructed in 1848 with additions built in 1874. The second house, located next door at 505 East Mississippi Drive, was built around 1846 and is referred to as the Cornelius Cadel House. It is thought that the limestone wall dates to the mid 1870's with the paving of Mississippi Drive and the construction of the Judge Woodward House improvements. A National Register of Historic Places eligibility determination has not been rendered on any of the standing structures, and the lots surrounding these structures have not been surveyed previously for archeological remains.

The revised APE was provided to the SHPO, relevant federally recognized tribes, and the interested public for comment by letter dated April 23, 2002. A draft programmatic agreement (PA) addressing the Corps compliance requirements specific to the revised APE was attached for review and comment. Responses were received from the SHPO (R&C#: 010170032) and the Peoria Tribe of Indians of Oklahoma. The SHPO comments were addressed and the draft PA was provided to the Advisory Council on Historic Preservation (Council) for comment by letter dated June 24, 2002. The Council notified the Corps by letter dated July 12, 2002, that Council participation in the execution of the PA was not required. The final PA was filed with the Council by letter dated November 25, 2002.

VII. ENVIRONMENTAL IMPACTS OF THE PREFERRED ALTERNATIVE

Table D-1 on page D-6 summarizes environmental effects.

A. Created Resources. The majority of the project extends through a created environment. Human activities are principally related to industrial, commercial, and transportation developments.

B. Natural Resources. The project area occurs in a predominantly urban area with few remaining natural floodplain characteristics. Vegetation in the area is limited to narrow bands of trees, weedy vegetation, and scrub shrub which provides habitat for wildlife species such as squirrels, rabbits, songbirds, and non-game birds. Normal flow of Mad Creek is insufficient to support use of the creek by migratory waterfowl or shorebirds. Likewise, a fishery resource is essentially nonexistent. The aquatic ecosystem is considered as typical of a low-flow stream. No significant adverse impacts would result from implementation of the proposed project.

C. Historic Properties. The OSA (Office of the State Archaeologist) conducted an archeological site file search for the Corps under Contract DACW25-98-D-0015, Delivery Order No. 3 (Site File Search 134). The OSA, by letter dated November 20, 2000, identified 39 sites within a mile of the project feature locations; however, no sites were recorded within the APE (area of potential effect) of the undertaking (Appendix H). Consultation was initiated with the SHPO (State Historic Preservation Officer) of Iowa, relevant federally recognized tribes, and the interested public regarding the undertaking's potential effects on historic properties and particularly tribal concerns about properties that may be of religious and cultural significance (36 CFR 800.4(a)(3-4)). Responses were received from the SHPO (R&C#: 010170032), the Sac and Fox Nation, and the Iowa Tribe of Oklahoma. No additional historic properties were identified as a result of that consultation.

The District contracted for an archeological survey with BCA (Bear Creek Archeology) of Cresco, Iowa, under Contract DACW25-98-D-0001, Delivery Order 25. The investigation evaluated the potential borrow areas and resulted in the documentation of four newly recorded prehistoric archeological sites. Based on recommendations presented in the BCA report, the District determined that these historic properties were not eligible for listing on the National Register of Historic Places and that further archeological investigation was not warranted. The BCA report and District determination were provided to the SHPO for review and comment. The SHPO concurred with the District's determination by letter dated June 11, 2001, with the exception that the SHPO recommended archeological survey of the potential retention basin sites (Appendix H). The retention basin project features, however, are not part of the preferred alternative and therefore are not part of the APE of this undertaking.

Subsequent to consultation, project modifications involving floodwall construction necessitated revising the APE to include two historic structures and associated limestone wall. A National Register of Historic Places eligibility determination has not been rendered on any of the standing structures, and the lots surrounding these structures have not been surveyed previously for archeological remains. The District and the Iowa SHPO have signed a PA (Programmatic Agreement) (Appendix I) regarding implementation of the project and revisions to the APE. This PA is an appropriate vehicle for addressing historic property concerns for this undertaking at the historic wall and historic structure locations within the revised APE.

While the District is assured that no significant historic properties would be affected by the preferred alternative, if any undocumented historic properties are identified or encountered during

the undertaking, the District would discontinue project activities and resume coordination with the consulting parties to identify the significance of the historic property and determine any potential effects.

D. Noise Levels and Air Quality. The project is principally located in an industrial area where a temporary increase in construction would have a minimal effect on existing air and noise levels. Minor impacts to the air quality within the project vicinity are common during construction.

E. Hazardous, Toxic, and Radiological Waste. Investigations and sampling at the Mad Creek project area discovered that there were arsenic concentrations in excess of the Iowa Land Recycling Program statewide standard. However, the concentrations were below the ingestion and inhalation standards for construction workers under the Illinois TACO (Tiered Approach to Clean up Objectives) standards. Based on these findings, the Mad Creek flood damage reduction project may proceed without limitations or special construction techniques, which are associated with HTRW (Hazardous, Toxic, and Radiological Waste) contamination. Refer to Appendix E for further details. No mining activity is present in the study area, and no mineral resources would be affected by the proposed action.

F. Water Quality. The water quality in Mad Creek is generally poor due to high runoff rates in the upper reaches of the watershed and the heavy industrial areas surrounding it within the Muscatine city limits. The proposed project features would not adversely impact the present condition of Mad Creek.

Table D-1. Effects of the proposed action on natural and cultural resources

Types of Resources	Authorities	Evaluation of Effects
Air Quality	Clean Air Act, as amended (42 U.S.C. 1857h-7, et seq.)	No significant impacts
Endangered and Threatened Species Critical Habitat	Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.)	No significant impacts
Floodplains	Executive Order 11988, Flood Plain Management	No significant impacts
Historic and Cultural Properties	National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.)	No significant impacts
Prime and Unique Farmland	CEQ Memorandum of August 1980; Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act. Farm-land Protection Policy Act.	No significant impacts
Water Quality	Clean Water Act of 1977, as amended (33 U.S.C. 1251, et seq.)	No significant impacts
Wetlands	Executive Order 11990, Protection of Wetlands, May 24, 1977	No significant impacts
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271, et seq.)	Not present in planning area

G. Cumulative Impacts. The District identified floodplain levee and bankline habit as the primary resources impacted by the proposed project. Mad Creek is a tributary to Pool 17 of the Mississippi River, and Pool 17 has been virtually lined by levees on both sides of the pool for its 20-mile length.

Past levee construction in Pool 17 has been mainly for protection of agricultural lands. However, the Mad Creek Levee on the Iowa side combines with the Muscatine Levee to protect the City of Muscatine, Iowa, while the downstream reaches of the Muscatine Levee combine with the Odessa levee to protect agricultural land and the large Lake Odessa natural resource complex adjacent to Lock and Dam 17. The Drury Drainage District levee in Illinois begins just above Lock and Dam 16 and runs south to roughly RM 451. At that point, the levee for the Sub-District No. 1 of Drainage Union No. 1 starts and continues downstream to the Bay Island Drainage and Levee District No. 1 levee, which continues past Lock and Dam 17.

The present actions proposed for the improvement of the Mad Creek levee would improve protection of a portion of the City of Muscatine from flash flooding. This is in line with the recent improvements to the mainstem river levee. Within the reasonably foreseeable future, there is no

additional levee construction proposed within Pool 17. Associated actions in Pool 17 would include the recent upgrade of the Muscatine Levee and some minor levee repair to other agricultural levees resulting from flood damage within the last 10 years.

The proposed project has identified and taken into account cumulative impacts; considered alternative actions that could lessen such adverse impacts, and is, to the extent practicable, compatible with state, unit of local government, and private programs and policies to protect floodplain urban, agricultural field, and bankline habitats. Also, since the current levee is only being modified and no new levee construction is proposed, and because this construction activity only affects an insignificant portion (less than 2%) of the total levee structures found in Pool 17, the District finds that the proposed project would not cumulatively exceed any known biological or social thresholds.

VIII. SOCIAL AND ECONOMIC EFFECTS OF PROPOSED ACTION

A. Community and Regional Growth. No adverse impacts to the growth of the community or region would be realized as a direct result of the proposed project. The area would benefit due to continued economic growth with reduced threat of flooding at major employment areas within the city.

B. Community Cohesion. The project would be expected to somewhat enhance community cohesion by further reducing the threat of damages from flooding and securing the economic viability of businesses located in the area to be protected.

The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. The city administration and property owners in the area have expressed support for the project. Coordination with Federal and State agencies has not revealed any objections or concerns.

C. Displacement of People. The proposed project involves raising the existing flood control levee and floodwall within the protected area, plus some channel improvements. The project would necessitate no residential displacements.

D. Property Values and Tax Revenues. The potential value of property in the project vicinity could increase as a result of the project construction.

E. Public Facilities and Services. The project involves upgrading an existing levee and floodwall, thus improving this public facility. Other public facilities and infrastructure located within the protected area would benefit from reduced flood damages following project construction.

A public marina, boat ramp, and city park are located on the Mississippi River and adjacent to the existing floodwall. The proposed project would not adversely affect access to, or use of, these public facilities.

F. Business and Industrial Activity. The proposed project would positively impact existing business and industrial activity by further reducing the threat of flooding. Significant commercial/industrial expansion in the project area is not expected due to the current density of use. No business relocations would be required for the proposed project.

G. Executive Order 11990 (Protection of Wetlands). No fill would be placed in any wetlands or waters of the United States. Excavation within a wetland will be necessary as a component of the channel improvements for Mad Creek. However, the impacted area would be less than a tenth (.10) of an acre; this is in compliance with Nationwide Permit 27 (see Appendix H, pages H-73 and H-74).

H. Clean Water Act of 1977 (Sections 401 and 404), as amended. Minor increases in turbidity as a result of construction may occur during periods of rapid rainfall runoff. Standard erosion protection practices will be used. These increases would be temporary with no anticipated violations to water quality standards.

The project is covered under Nationwide Permit 27. This permit allows activities in waters of the U.S. associated with the restoration of former waters of the U.S. For this project, the water depth around the 2nd Street Bridge would be restored where it has silted in.

I. Life, Health, and Safety. Upgrading the existing flood protection system would further reduce life, health, and safety threats faced by area residents and business owners.

J. Noise Levels. The project would temporarily increase noise levels over the 3-year construction period. The project area is primarily developed for industrial uses, and no significant or long-term noise impacts to residents or sensitive receptors are expected.

K. Aesthetics. The project would raise the existing levee and floodwall and clean out a portion of the existing channel. The appearance of the finished project would not be much different than what is already in place; therefore, no significant change to the aesthetic resources of the area would be expected.

IX. COMPLIANCE WITH ENVIRONMENTAL QUALITY STATUTES. Tabular summation of compliance can be found in Table D-2 on page D-9.

A. Endangered Species Act of 1973, as amended. Coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources has not resulted in the identification of adverse impacts to any state or federally listed species. However, tree clearing will be limited to the September 30 - April 1 timeframe to avoid potential disruption to the Indiana bat.

B. National Historic Preservation Act of 1966, as amended. The preferred alternative, as presented herein, would have No Effect on significant historic properties. This determination has been provided to the State Historical Society of Iowa, who concurred by letters dated January 29, 2001, and June 11, 2001 (R&C# 010170032) (see Appendix H).

C. Federal Water Project Recreation Act. The proposed project would have no impact on provisions of this Act.

D. Fish and Wildlife Coordination Act. The project has been coordinated with the U.S. Fish and Wildlife Service, the Iowa Department of Natural Resources, the U.S. Environmental Protection Agency, and other interested agencies, organizations, and individuals. No significant impacts to fish or wildlife would occur as a result of the proposed modifications.

E. Wild and Scenic Rivers Act of 1968, as amended. No wild or scenic rivers are located in the study area.

F. Executive Order 11988 (Flood Plain Management). The proposed project would take place within a developed urban area which is heavily industrialized. Space is limited for increased development within the existing levee. The project, therefore, would not directly or indirectly induce growth (construction of structures and/or facilities) in the floodplain. The project, as proposed, is the best practicable alternative and is therefore judged to be in full compliance.

G. Executive Order 11990 (Protection of Wetlands). No fill would be placed in any wetlands or waters of the United States. Excavation within a wetland will be necessary as a component of the channel improvements for Mad Creek. However, the impacted area would be less than a tenth (.10) of an acre; this is in compliance with Nationwide Permit 27 (see Appendix H).

H. Clean Water Act of 1977 (Sections 401 and 404), as amended. Minor increases in turbidity as a result of construction may occur during periods of rapid rainfall runoff. Standard erosion protection practices will be used. These increases would be temporary with no anticipated violations to water quality standards.

I. Clean Air Act, as amended. Minor, temporary impacts to air quality would occur from increased dust and exhaust during construction. No air quality standards would be violated.

J. Farmland Protection Policy Act of 1981. The project would be located in an intensive urban area. No farmlands would be affected.

K. National Environmental Policy Act of 1970, as amended. The completion of this EA fulfills NEPA compliance.

L. National Economic Development (NED) Plan. The NED Plan is that which best satisfies the Federal planning objectives of increasing the Nation's output of goods and services and produces the most improvement to the national economic efficiency. The proposed plan is considered the best to fulfill the NED objective.

Table D-2. Relationship of plans to environmental protection statutes and other environmental requirements

Federal Policies	Compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Full compliance
Endangered Species Act, 16 U.S.C. 1531, et seq.	Full compliance
Federal Water Project Recreation Act, 16 U.S.C. 460-1(12), et seq.	Full compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 601, et seq.	Full compliance
Land and Water Conservation Fund Act, 16 U.S.C. 460/-460/-11, et seq.	Not applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Full compliance
National Historic Preservation Act, 16 U.S.C. 470a, et seq.	Full compliance
Rivers and Harbors Act, 33 U.S.C. 403, et seq.	Full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Full compliance
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	Not applicable
Flood Plain Management (Executive Order 11988)	Full compliance
Protection of Wetlands (Executive Order 11990)	Full compliance
Environmental Effects of Major Federal Actions (Executive Order 12114)	Not applicable
Farmland Protection Act	Not applicable
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)	Not applicable

NOTES:

- a. Full compliance. Having met all requirements of the statute for the current stage of planning (either preauthorization or postauthorization).
- b. Partial compliance. Not having met some of the requirements that normally are met in the current stage of planning.
- c. Noncompliance. Violation of a requirement of the statute.
- d. Not applicable. No requirements for the statute required; compliance for the current stage of planning.

X. ENVIRONMENTAL IMPACTS OF NONPREFERRED ALTERNATIVES

A. No Federal Action. This alternative would result in virtually no alteration of existing conditions throughout the project area, barring state or municipal action. Occasionally, heavy precipitation and resultant ponding would continue to damage crops and urban property.

B. Raising the Existing Floodwall and Levee System. This alternative would involve raising the levees, floodwalls, and constructing railroad closures at several sites along Mad Creek.

C. Constructing Stormwater Detention Reservoirs. This alternative would involve constructing two stormwater detention reservoirs within Mad Creek and Geneva Creek. The creation of the reservoirs also would involve relocating existing sewage lagoons. This alternative was not selected due to the high cost/low benefit ratio.

XI. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

In order to upgrade the levee, the vegetation and trees that have grown up along the slope would be cleared.

Trees and vegetation within the area of the 2nd Street Bridge also would be cleared in order to remove material that has accumulated and is constricting flows. The disturbed bankline would be graded and reseeded.

These areas are not considered to be highly productive habitat for fish and or wildlife due to the urban areas in which this vegetation removal would take place. The impacts would be temporary and would likely revegetate over time.

XII. ANY IRREVERSIBLE OR IRRETREVALE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IF THE PROPOSED ACTION SHOULD BE IMPEMENTED

Fuel consumed, manpower expended, and the commitment of construction materials are considered to be irretrievable.

XIII. RELATIONSHIP OF THE PROPOSED PROJECT TO LAND-USE PLANS

The project area is zoned for various urban uses such as residential, business-commercial, and industrial. The purpose of this project is to enhance such uses by providing flood protection and is therefore compatible with the existing zoning.

XIV. RELATIONSHIP BETWEEN SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE OF LONG-TERM PRODUCTIVITY

Local flood protection is necessary to reduce the flash flood hazard to Muscatine businesses and residences along Mad Creek. Implementation of the proposed features would provide improved flood protection and flood warnings in the future.

XV. CONCLUSIONS

Environmental effects are not considered to be significant. The project design would incorporate features to minimize or avoid impacts to natural and cultural resources. The preferred alternative provides for levee raises. This raise would not extend beyond the existing footprint of the levee.

XVI. COORDINATION

Coordination has been made throughout the planning and design process with the following Federal and State agencies:

- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- Iowa Department of Natural Resources
- Iowa State Historical Society
- State Historic Preservation Officer

Appendix H - Pertinent Correspondence contains comment letters regarding this action.

FINDING OF NO SIGNIFICANT IMPACT
SECTION 205 FLOOD DAMAGE REDUCTION STUDY
MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA

I have reviewed the information provided by this Environmental Assessment (EA), along with data obtained from cooperating Federal, State, and local agencies and from the interested public. Based on this review, I find that the preferred alternative for the proposed flood control improvements, to improve the levee along Mad Creek in Muscatine, Iowa, and restore a portion of the channel and bankline near the Second Street Bridge, as proposed in this EA, will not significantly affect the quality of the environment. Therefore, it is my determination that an Environmental Impact Statement (EIS) is not required. This determination will be reevaluated if warranted by later developments.

Alternatives considered along with the preferred action were:

- No Federal action;
- Constructing stormwater detention reservoirs;
- Raising existing floodwall and levee system;
- A combination of floodwalls and levees and stormwater detention reservoirs; and an enhanced early flood-warning system to better react to flash floods.

Preferred Alternative.

Factors considered in making a determination that an EIS was not required are as follows:

- a. The project involves a within-levee upgrade.
- b. Impacts to local wildlife and aquatic communities will be minimal and temporary.
- c. No endangered species, either State or Federal, will be affected by the project action.
- d. No significant environmental, social, economic, or cultural impacts are anticipated as a result of implementing the proposed project.

Date

William J. Bayles
Colonel, U.S. Army
District Engineer

APPENDIX E

HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE (HTRW) ASSESSMENT

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX E
HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE (HTRW) ASSESSMENT**

Executive Summary

The Corps of Engineers' Engineering Regulation (ER) providing guidance for the conduct of Civil Works Planning Studies is contained in ER 1105-2-100. The policies and authorities outlined in ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects, and ER 405-1-12, Real Estate Handbook, were developed to facilitate the early identification and appropriate consideration of HTRW issues in all of the various phases of a water resources study or project. American Society for Testing and Materials (ASTM) Standards E1527-00 and E1528-00 provide a comprehensive guide for conducting Phase I Environmental Site Assessments (ESAs). When the Phase I ESA identifies potential environmental concerns, a Phase II ESA is initiated in which sampling of the project area is performed to determine the presence of any HTRW contamination. Phase II Sampling is completed in accordance with the U.S. Army Corps of Engineers Engineering Manual EM 200-1-3, *Environmental Quality – Requirements for the Preparation of Sampling and Analysis Plan* (CEMP-RT/CECW-E, February 1, 2001). The policy of the U.S. Army Corps of Engineers is to avoid construction of Civil Works projects when HTRW is located within project boundaries or may affect or be affected by such projects.

Several Phase I and Phase II ESAs were performed for this project as the scope was modified. These reports include the following:

- U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report Addendum*, June 2002.
- U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report Addendum*, August 2001.
- U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report*, December 2000.
- Daily & Associates Engineers, Inc., *Preliminary Phase IIA Environmental Site Assessment, Mad Creek Flood Damage Reduction Project*, June 2001.
- Missman Stanley & Associates, P.C., *Preliminary Phase IIA Environmental Site Assessment, Mad Creek Flood Reduction Project*, Muscatine, Iowa, December 2001.

These Phase I and Phase II ESAs covered the following areas:

- Right descending bank of Mad Creek from Isett to the confluence with the Mississippi River;
- Left descending bank of Mad Creek near 2nd Street;
- Right descending bank of the Mississippi River from the confluence with Mad Creek to Mulberry Street;
- Geneva Creek Retention Area;
- Mad Creek Retention Area;
- Mad Creek Borrow Site; and
- Geneva Creek Borrow Site.

On the right descending bank of Mad Creek from 5th Street to the Mississippi River, only the arsenic concentration exceeded the Iowa Land Recycling Plan (LRP) statewide standard. However, the concentrations were below the ingestion and inhalation standards for construction workers under the Illinois Tiered Approach to Corrective Action Objectives (TACO) standards. This would indicate that short-term exposure during construction of improvements would be well under published guidelines. These contaminants appear to be at or near natural background levels and do not appear to be associated with a specific source of contamination or a spill. No institutional controls are recommended with the conditions as known at the end of the Phase II-A ESA. The results of the sampling indicate that the properties adjacent to the right descending bank of Mad Creek may have contributed some contamination to the existing levee and banks. Contaminants found were at levels below the Iowa LRP statewide. Therefore, contamination by human activities may have occurred, but the contamination is minimal and requires no cleanup action and restricted use of the site.

On the left descending bank of Mad Creek, just upstream of 2nd Street, one Volatile Organic Carbon (VOC) constituent and several polynuclear aromatic hydrocarbon (PNA) constituents were detected on the site. Toluene, the detected VOC constituent, was detected at a concentration less than the statewide standard for soil published by the Iowa DNR. It is recommended that the remediation of toluene is not warranted. One PNA compound was detected at a concentration that exceeded statewide standards for soil. Under a different laboratory procedure that is more precise, this PNA was less than the statewide standard. For this reason, it is recommended that further assessment or remediation of PNAs is not warranted.

The properties sampled are owned by the City of Muscatine and were owned by the City prior to initiation of this feasibility study. Under Iowa's Voluntary Land Recycling Program, the City of Muscatine may request that the Iowa DNR review the results of the Phase I and Phase II-A ESAs and issue a letter of no further action. The Iowa DNR will determine a background standard for the site pursuant to IAC 567-137.4(455H). They would also identify any special handling requirements, if required, of excavated materials if they are proposed to be removed from the site. Any removal of contaminated material or documentation to the Iowa DNR is beyond the scope of this flood protection project.

Recommendations. The HTRW due diligence process did not reveal any evidence of significant concentrations of hazardous substances, HTRW, or other regulated contaminants in connection with the Mad Creek Flood Damage Reduction Study areas. Therefore, the Mad Creek Flood Damage Reduction Project may proceed without implementing any limitations or special construction techniques commonly associated with HTRW contamination.

Disclaimer. No ESA can wholly eliminate uncertainty regarding the existence for recognized environmental conditions concerning a property. The HTRW due diligence process intends to reduce, but not eliminate, uncertainty regarding the existence of recognized environmental conditions in connection with a property within reasonable limits of time and cost. Continuing the HTRW due diligence process beyond the Phase IIA ESA may not necessarily reduce uncertainty, nor reveal unidentified environmental liabilities. If any previously unaddressed recognized environmental condition should arise, this HTRW due diligence process will be revisited and amended.

CONTENTS

Subject	Page
1. Phase I Investigation.....	E-1
2. Phase II-A Environmental Site Assessment (ESA) – Spring 2001	E-1
a. Background.....	E-1
b. Maximum Contamination Levels (MCLs)	E-2
c. Sample Results.....	E-3
d. Initial Phase II-A Conclusions.....	E-5
3. Phase II-A Environmental Site Assessment – Fall 2001	E-5
a. Background.....	E-5
b. Arsenic.....	E-6
c. Toluene	E-6
d. Polynuclear Aromatic Hydrocarbons	E-6
e. Conclusions	E-6
4. June 2002 Phase I Environmental Site Assessment	E-7
5. Wastewater Treatment	E-7
6. HTRW References and Abstracts.....	E-7

Tables

No.	Title	Page
E-1	HTRW sample locations.....	E-2
E-2	HTRW sample results.....	E-4

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX E
HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE (HTRW) ASSESSMENT**

1. PHASE I INVESTIGATION

A Hazardous Toxic and Radioactive Waste (HTRW) Documentation Report was completed in December of 2001 and documents the Phase I HTRW Environmental Site Assessment (ESA) for the Mad Creek Flood Damage Reduction Project Plan in accordance with Engineering Regulation (ER) 1165-2-132, HTRW Guidance for Civil Works Projects, and ER 405-1-12, Real Estate Handbook. The Phase I Environmental Site Assessment was performed in general conformance with the scope and limitations of the American Society for Testing and Materials Standards E 1527-00 and E 1528-00. The information was obtained through site reconnaissance, informal interviews, a review of maps and aerial photographs, U.S. Army Corps of Engineers records, and a search of Federal and State environmental databases. These screening methods were selected based on the particular nature of the flood damage reduction project.

A review of the environmental databases for areas surrounding the project sites discovered several facilities with various HTRW type permits within the downtown Muscatine area. Upon further review, it was determined that none of these permitted areas would adversely impact the project area. The detention areas and the borrow sites were in areas either on or near agricultural fields. It is assumed that pesticides and herbicides were applied in order to control pests and weeds in a manner consistent with normal agricultural activities. No pesticide or herbicide mixing or cleaning platforms were observed at these sites. Pesticides and herbicides applied to lands during the course of normal agricultural activities are exempt from the CERCLA or RCRA regulations, and are not considered to be an HTRW concern.

The site reconnaissance revealed that there was some evidence of recognized environmental conditions concerning the chosen properties, including unidentified substance containers, storage tanks, and indications of solid waste disposal along the current Mad Creek levee. It was recommended that further investigation be conducted along the right descending bank in four locations to determine any presence of HTRW. Photographs and maps indicating these four areas are included in the HTRW Documentation Report on the following pages.

2. PHASE II-A ENVIRONMENTAL SITE ASSESSMENT (ESA) – SPRING 2001

a. Background. A Phase II-A Environmental Site Assessment (ESA) was initiated to determine the presence of any actual HTRW contamination in the areas shown in Table E-1. The Phase II-A ESA was conducted by Daily & Associates, Engineers, Inc., under contract to the U.S. Army Corps of Engineers. This report is available upon request from CEMVR-ED-DN. The four areas identified below were sampled at a depth of around 5 feet, as this is the depth which

would be impacted during construction activities. In areas where surface runoff appeared to be a concern from site visits, a surface soil sample was also obtained. Samples were obtained on April 11, 2001, at the following locations and depths.

Table E-1. HTRW sample locations

Sample Number	Location	Depths
B-1	Right descending bank of Mad Creek in the vicinity of HON Industries, 600 East 2nd Street.	Samples were taken from a depth of 4 to 6 feet on the existing levee.
B-2	Right descending bank of Mad Creek downstream from 5th Street and adjacent to JUST, 1004 5th Street.	Samples were taken from a depth of 3.5 feet to 5.5 feet on the existing levee and in the vicinity of a drum storage area located on the adjacent JUST property.
B-3	Right descending bank of Mad Creek in the vicinity of a concrete slab located south of 9th Street.	Two samples were taken at a depth of 6 inches to 2 feet and one sample taken from a depth of 4.5 feet to 6.5 feet adjacent to the concrete slab.
B-4	Right descending bank of Mad Creek, north of 9th Street and adjacent to D.W. Welding.	Samples were taken at a depth of 6 inches to 2 feet and on from a depth of 4.5 feet to 6.5 feet adjacent to deteriorated steel drums.

Soil samples were collected in accordance with the instructions provided by Severn Trent Laboratories, the testing laboratory. The laboratory also provided sample containers. The samples were logged, and continuous custody was maintained by Daily & Associates, Engineers, Inc., until the samples were shipped by Federal Express to Severn Trent Laboratories. The samples were received by Severn Trent Laboratories on April 12, 2001, and were analyzed for numerous contaminants of concern. The concentrations were compared to maximum contamination levels (MCLs) specified for the Phase II-A ESA.

b. Maximum Contamination Levels (MCLs). The MCLs specified for the Phase II-A ESA were established using the Iowa Land Recycling Program (LRP) rules contained in the Iowa Administrative Code (IAC) 567-137.4(455H), referred to as Chapter 137. The Iowa LRP was enacted by the Iowa Legislature as part of the “Iowa Land Recycling Program and Remediation Standards Act” in 1997. The purpose of the Iowa LRP was to promote the wiser use of land resources by encouraging the clean up of contaminated property to prevent the unnecessary development of the farmland or open space. In late 1998, the Iowa Environmental Protection Commission adopted the Iowa Statewide Standard for Soil (Statewide Standard). The Statewide Standard is based upon incidental ingestion of soil and dust only and by definition do not establish universally safe levels of contamination. Iowa uses the Statewide Standard as a starting point for evaluation and remediation of a site. If met, a classification of no further action required, free of institutional controls, could be established for a cleanup site.

The Statewide Standard was used as the MCL for this Phase II-A. Other site-specific standards exist in the Iowa LRP but must be supported by “appropriate institutional controls” like land use restrictions. Therefore, the Statewide Standard tends to be the most stringent and is normally considered as the permissible exposure limit in the calculation of site-specific standards.

Iowa does not publish separate standards for short-term exposure limits for construction workers as part of the LRP. Illinois, as part of the Illinois regulations titled “Tiered Approach to Corrective Action Objectives (TACO)” located in Title 35 Section 742 of the Illinois Administrative Code, provides remediation objectives based on short-term exposure of construction workers via ingestion and inhalation. TACO is a risk-based procedure that takes land use and site conditions into account when establishing remediation objectives for a site. The soil sample results were compared to the to the industrial/commercial construction worker objectives from the TACO to observe any impacts during on-site construction activities.

c. Sample Results. While samples were taken at all four locations, the final results of this feasibility study determined that construction activities will only occur at sites B1 and B2, as labeled in the Phase II-A report. (This conclusion was made after the Phase I report had been completed and the Phase II-A report had been initiated). Table E-2 shows the sample results for areas B-1 and B-2 compared to the MCLs of a number of contaminants. Individual concentrations that were observed to exceed the statewide standard of the LRP are as follows:

Arsenic: All sample results exceeded the LRP statewide standard. B-3 samples had the highest concentrations, with the shallow sample having the highest concentration. Note that the Standards for Soils, Iowa Land Recycling Program, Table 2, footnotes the standard as follows: “Chemicals at these concentrations may be at or below background levels. The department may be contacted to determine the need for determining a background standards pursuant to IAC 567-137.4(455H).”

Beryllium: Selected samples exceeded the LRP statewide standard. All B-3 samples exceeded the MCL and the shallow sample at B-4 exceeded the standard. Note that the Standards for Soils, Iowa Land Recycling Program, Table 2, footnotes the standard as follows: “Chemicals at these concentrations may be at or below background levels. The department may be contacted to determine the need for determining a background standard pursuant to IAC 567-137.4(455H).”

Organic compounds and organic pesticide compounds were detected at levels below the statewide standards. PCB compounds were not detected in all samples.

Table E-2. HTRW sample results

Contaminant		Standards (MCLs)				Test Results	
Chemical Name	CAS No.	Iowa Non-Residential Standard	Illinois Industrial/Commercial Construction Worker Standard		Units	B-1	B-2
			Ingestion	Inhalation		4-6 feet	3.5-5.5 feet
Inorganics							
Arsenic	7440-38-2	1.4	61	25,000	mg/kg	4.9	3.3
Barium	7440-39-3	5,500	14,000	870,000	mg/kg	41.6	39.5
Beryllium	7440-41-7	0.48	29	44,000	mg/kg	0.43	0.45
Cadmium	7440-43-9	39	200	59,000	mg/kg	0.042	0.048
Chromium	7440-47-3		4,100	8,800	mg/kg	13.1	11.8
Cobalt	7440-48-4		12,000		mg/kg	6	6.4
Copper	7440-50-8	2900	8200		mg/kg	10.5	46.7
Lead	7439-92-1	400	400		mg/kg	7.3	8
Manganese	7439-92-1	11,000	9,600	8,700	mg/kg	293	336
Mercury	7439-97-6	23	61	52,000	mg/kg		
Nickel	7440-02-0	1,600	4,000	440,000	mg/kg	14.8	16.8
Selenium	7782-49-2	390	1,000		mg/kg	0.34	
Vanadium	7440-62-2	550	1,400		mg/kg	21.7	18.1
Zinc	7440-66-6	23,000	61,000		mg/kg	35.2	33.3
Organics							
1,1 Dichloroethane	0075-34-3	7,800	200,000	130	mg/kg		
1,1,1 Trichloroethane	0071-55-6	2,700		1,200	mg/kg		
Acetone	0067-64-1	7,800	200,000	100,000	mg/kg		
Anthracene	0120-12-7	23,000	610,000		mg/kg		
Benzo(a)anthracene	0056-55-3	3	170		mg/kg		
Benzo(b)flouranthene	0205-99-2	2.9	170		mg/kg		
Benzo(k)flouranthene	0207-08-9	29	1,700		mg/kg		
Benzo(a)pyrene	0050-32-8	0.29	17		mg/kg		
Carbon Disulfide	0075-15-0	7,800	20,000	9	mg/kg		
Chrysene	0218-01-9	290	17000		mg/kg		
Dibenzo(a,h)anthracene	0053-70-3	0.29	17		mg/kg		
Fluoranthene	0206-44-0	3,100	82,000		mg/kg		0.011
Indeno(1,2,3-cd)pyrene	0193-39-5	2.9	170		mg/kg		
Pyrene	0129-00-0	2,300	61,000		mg/kg		
Toluene	0108-88-3	16,000	410,000	42	mg/kg		
Organic Pesticides							
Aldrin	0309-00-2	0.13	6.1	9.3	mg/kg		
4,4 DDE, Solid	0072-55-9	6.3	370		mg/kg		
4,4 DDT, Solid	0050-29-3	6.3	100	2100	mg/kg		0.0016
Notes: 1. Blank spaces in test results columns are non-detects (ND) 2. Blanks spaces in the standards are where no standard is published in the reference documents. 3. Illinois Standards are referenced to TACO Tier 1 Section742, Table B. 4. Iowa Standards are referenced to ILRP, Table 2. 5. NDs are not included in this summary.							

d. Initial Phase II-A Conclusions. For areas B1 and B2, only the arsenic concentration exceeded the Iowa LRP statewide standard. However, the concentrations were below the ingestion and inhalation standards for construction workers under the Illinois TACO standards. This would indicate that short-term exposure during construction of improvements would be well under published guidelines. These contaminants (arsenic and beryllium) appear to be at or near natural background levels and do not appear to be associated with a specific source of contamination or a spill. No institutional controls are recommended with the conditions as known at the end of the Phase II-A ESA.

The results of the sampling indicate that the properties adjacent to the right descending bank of Mad Creek may have contributed some contamination to the existing levee and banks. Contaminants found were at levels below the Iowa LRP statewide standards at all four sites except as noted above. Therefore, contamination by human activities may have occurred, but the contamination is minimal and requires no cleanup action and restricted use of the site.

The properties sampled are owned by the City of Muscatine and were owned by the City prior to initiation of this feasibility study. Under Iowa's Voluntary Land Recycling Program, the City of Muscatine may request that the Iowa DNR review the results of the Phase I and Phase II-A ESAs and issue a letter of no further action. The Iowa DNR will determine a background standard for the site pursuant to IAC 567-137.4(455H). They would also identify any special handling requirements, if required, of excavated materials if they are proposed to be removed from the site. Any removal of contaminated material or documentation to the Iowa DNR is beyond the scope of this flood protection project.

Based on the findings of the Preliminary Phase II-A Environmental Site Assessment, the Mad Creek Flood Damage Reduction Project may proceed without limitations or special construction techniques, which are associated with HTRW contamination.

3. PHASE II-A ENVIRONMENTAL SITE ASSESSMENT – FALL 2001

a. Background. After the initial Phase II-A investigation was completed, it was noted that some excavation might occur on the left descending bank of Mad Creek, immediately upstream of the 2nd Street Bridge in Muscatine, Iowa. The site currently includes a parking lot associated with a residential complex and a vegetated bank line. The site once contained a warehouse and paint factory. That structure caught fire in the 1940's and burned for several days. Afterwards, the site was filled and possibly not remediated. To the north of the apartment property, there was a gas station. Underground storage tanks were supposed to have been removed after the station closed. A railroad corridor and possible sidings were also located in this general area. A second Phase II-A investigation was initiated to assess this site.

Phase II-A sampling and analysis was contracted to Missman Stanley & Associates, P.C., Bettendorf, Iowa. Their work included the advancement of two soil borings, the collection of soil samples, and a comprehensive laboratory analysis of those soil samples. The intent of the assessment was to determine if historic activities on the property have impacted the environmental quality of site soils.

Fieldwork for this project was conducted on October 25, 2001. Soil sampling, analysis, and evaluation under this project were completed in accordance with the U.S. Army Corps of Engineers Engineering Manual (EM) 200-1-3, *Environmental Quality – Requirements for the Preparation of Sampling and Analysis Plan* (CEMP-RT/CECW-E, February 1, 2001).

Sample analyses were compared to Iowa Statewide Standards for Soil (Statewide Standards) published under the Iowa Land-Recycling Program (Iowa Administrative Code 567-137.4(455H), also referred to as Chapter 137). The Statewide Standards represent concentrations of contaminants in these media at which normal exposure via ingestion is considered unlikely to pose a threat to human health.

b. Arsenic. Arsenic was detected in the upstream collected soil samples. Concentrations ranged from 2.6 to 4.2 mg/kg. The statewide standard for arsenic is 1.4 mg/kg. Arsenic is a naturally occurring substance. A published background standard for arsenic in soil does not exist in Iowa. Surrounding states, such as Illinois, do have published standards for arsenic. The Illinois EPA has published a background arsenic concentration of 11.3 mg/kg for counties outside of metropolitan areas. Although the Illinois value does not have any regulatory relevance in Iowa, this concentration is valuable from a comparative standpoint. Based on the arsenic concentrations detected at the site, it appears that these concentrations are not the result of on-site contamination, but rather the result of naturally occurring arsenic in soil.

c. Toluene. Toluene was the only volatile organic compound detected; however, each of the detected concentrations was significantly less than the statewide standard. Toluene is a petroleum-based solvent that is used in petroleum fuels and solvents.

d. Polynuclear Aromatic Hydrocarbons. Polynuclear aromatic hydrocarbon (PNA) compounds were analyzed under two methods: the 8270 method and the 8310 method. The 8310 method allows the analyst to detect PNA constituents at lower detection levels and with greater precision than the 8270 method. PNAs are a compound of over 100 different chemicals that are formed during the incomplete burning of coal, oil, gas, garbage, or other organic substances like tobacco or charbroiled meat. PNAs are usually found as a mixture containing two or more of these compounds, such as soot. Some PNAs are manufactured. These pure PNAs exist as colorless, white, or pale yellow-green solids. PNAs are found in coal tar, crude oil, diesel fuel, creosote, and roofing tar. The detected PNA constituents on the site are likely a result of the historic fire on the site in the 1940's.

Benzo(a)pyrene, a PNA compound, was detected at levels above the statewide standard using the 8270 method, but at levels below the statewide standard using the 8310 method. Several other PNAs were detected using the 8270 method, but were not detected using the 8310 method. Since the more precise procedure showed that benzo(a)pyrene was beneath the Statewide Standard, further assessment or remediation of PNA is not recommended.

e. Conclusions. As a result of the Phase IIA Assessment, one VOC constituent and several PNA constituents were detected on the site. Toluene, the detected VOC constituent, was detected at a concentration less than the statewide standard for soil published by the Iowa DNR. It is recommended that the remediation of toluene is not warranted.

One PNA compound was detected at a concentration that exceeded statewide standards for soil. Under a different laboratory procedure that is more precise, this PNA was less than the statewide standard. For this reason, it is recommended that further assessment or remediation of PNAs is not warranted.

Based on the findings of the Second Preliminary Phase II-A Environmental Site Assessment, the Mad Creek Flood Damage Reduction Project may proceed without limitations or special construction techniques, which are associated with HTRW contamination.

4. JUNE 2002 PHASE I ENVIRONMENTAL SITE ASSESSMENT

In April 2002, CEMVR-ED-DN was informed that a new project site was added to the Mad Creek Section 205 project. Specifically, the site involved extending the floodwall west along Mississippi Drive, and along Mulberry Street. The proposed work activity would include some excavation, construction of a floodwall, and the erection of temporary berms during flood conditions.

The current uses of the target property include two homes constructed over a century ago. The adjoining property includes a service station entitled Matt's Downtown Service. This service station had several Leaking Underground Storage Tanks (LUST), which were removed in the early 1990's. The LUST site had received a "No Action Required Letter" on January 11, 2000, and received a "No Action Required Certificate" on May 19, 2000, from the Iowa Department of Natural Resources.

Based on the findings of this Phase I addendum, there was no evidence of hazardous substances, HTRW, or other regulated contaminants in connection with the project study area.

5. WASTEWATER TREATMENT

Wastewater treatment lagoons are located adjacent to the proposed Mad Creek Retention Pond. The system serves Ripley's Mobile Homes (also referred to as Clear View Mobile Home Park) located at 30 Clearview Court. If these lagoons are overtopped with floodwater, there could be a release of partially treated wastewater, which, while not an HRRW concern, could be a biological pathogen concern. Impacts on sewage lagoons and future wastewater treatment activities at Ripley's Mobile Home shall be minimized. If, during the planning process, it is determined that these wastewater facilities will be impacted, appropriate mitigation efforts shall be completed. It was recommended that actions be taken during all planning and implementation phases of the Section 205 project to avoid impacts on the wastewater treatment system at Ripley's Mobile Homes.

6. HTRW REFERENCES AND ABSTRACTS

- a. U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report Addendum*, June 2002.
- b. U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report Addendum*, August 2001.
- c. U.S. Army Corps of Engineers, *Mad Creek Flood Damage Reduction Project Hazardous, Toxic, and Radioactive Waste Documentation Report*, December 2000.
- d. Daily & Associates Engineers, Inc., *Preliminary Phase IIA Environmental Site Assessment, Mad Creek Flood Damage Reduction Project*, June 2001.
- e. Missman Stanley & Associates, P.C., *Preliminary Phase IIA Environmental Site Assessment, Mad Creek Flood Reduction Project*, Muscatine, Iowa, December 2001.

- f. Black & Veach Waste Science Incorporation, *Final Report for Contaminated Soil Removal, Muscatine, Iowa, Former Manufactured Gas Plant Site and Underground Storage Tank Aromatic Solvent Release Site*, September 1995.
- g. Illinois Administrative Code, Title 35, Section 742.
- h. Iowa Administrative Code 567-137.4(455H).
- i. U. S. Army Corps of Engineers, Lower Mississippi Valley Division, ER 1165-2-9, *Hazardous, Toxic, and Radioactive Waste Policy for Civil Works Projects*, 14 June 1996.
- j. U.S. Army Corps of Engineers, Rock Island District, ER 1165-2-132, *Hazardous, Toxic, and Radioactive Waste Guidance for Civil Works Projects*, 26 June 1992.
- k. U. S. Army Corps of Engineers, Policy Guidance Letter ER 1105-2-100 No. 34, CECW-PA, *Non-CERCLA Regulated Contaminated Materials at Civil Works Projects*, 5 May 1992.
- l. U.S. Army Corps of Engineers, ER 385-1-92, *Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OEW) Activities*, 18 March 1994.
- m. U.S. Army Corps of Engineers, ER 405-1-12, *Real Estate Handbook, Chapter 8*.
- n. U.S. Army Corps of Engineers, ER 500-1-1, *Natural Disaster Procedures*.
- o. ASTM E 1527-97, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*.
- p. ASTM E 1528-98, *Standard Practice for Environmental Site Assessments: Transaction Screen Process*.
- q. U.S. Army Corps of Engineers, Project Study Plan Draft, *Mad Creek at Muscatine, Iowa Feasibility Study*, October 1999.
- r. U.S. Army Corps of Engineers, Memorandum for Commander, U.S. Army Engineer Division, Mississippi Valley, *Mad Creek at Muscatine, Iowa, Section 205 Flood Control Study*, November 1998.
- s. U.S. Army Corps of Engineers, Rock Island District, *Upper Mississippi River Ortho Photo, Pool 17, Sheet No. 77*, 1991.
- t. U.S. Army Corps of Engineers, Rock Island District, *Upper Mississippi River Aerial Photo, Pool 17, Sheet No. 77*, 1930's.

Websites Referenced:

www.terraserver.com

www.epa.gov/enviro/

www.nrc.uscg.mil/foia.htm

www.osmre.gov/osm.htm

<http://www.epa.state.il.us/land/seids/>

<http://www.state.ia.us/government/dnr/index.htm>

<http://www.osmre.gov/aml/ziadmap.htm>

[http://www.state.ia.us/dnr/organiza/wmad/lqbureau/ust/siteListing/rptUSTByTankCity\(Modale-Osterdock\)Website.pdf](http://www.state.ia.us/dnr/organiza/wmad/lqbureau/ust/siteListing/rptUSTByTankCity(Modale-Osterdock)Website.pdf).

APPENDIX F

REAL ESTATE PLAN

**REAL ESTATE PLAN
MAD CREEK AT MUSCATINE, IOWA
SECTION 205
FLOOD DAMAGE REDUCTION PROJECT**

I. Purpose

The Mad Creek Flood Damage Reduction Project is a Section 205 Project. The authorization for this project is Section 205 of the 1948 Flood Control Act, as amended. The proposed project is located in the City of Muscatine, in Muscatine County, Iowa. The purpose of the Real Estate Plan (REP) is to support the Detailed Project Report (DPR) dated November 2002. The project area is commonly referred to as the Mad Creek Section 205 Flood Damage Reduction Project. The City of Muscatine, Iowa, is the sponsor for this project.

II. Description of Lands, Easements, and Right-of-Way (LER) Required for Construction, Operation and Maintenance of the Project

a. Description of Lands, Easements and Right-of-Way (LER)

The Mad Creek study area is located along the Mississippi River. Mad Creek is within the Muscatine city limits. The creek flows through an area of mixed commercial, industrial, and residential uses near the City's downtown area before emptying into the Mississippi River.

Four alternatives were considered and evaluated in the feasibility study. The Recommended Plan, identified as Alternative D in the DPR, includes a 2-foot levee raise affecting the raising of approximately 2,300 linear feet of existing levees and 1,700 linear feet of existing floodwalls; vertical extension of one existing floodgate (at Mulberry Avenue); replacement of one existing floodgate (at 2nd Street); and installation of one new closure structure across the railroad south of Washington Street. The proposed project also includes channel improvements to Mad Creek upstream of 2nd Street, which will include clearing and excavating an area for approximately 900 linear feet by 20 feet wide and removing sediment from under the 2nd Street Bridge. Also included is the construction of a new floodwall at Mulberry Avenue and Mississippi Drive. A temporary levee will be built during high flood events on Mulberry Avenue.

A map of the project area is included as Exhibit A – Project Location Map. Detail Maps of the Project Area are also included as Exhibit B – Borrow Area Detail, Exhibit C – Levee Area Detail, Exhibit D – Apartment and Bridge at 2nd Street Detail, Exhibit E – Greenwood Cemetery Disposal Area Detail, Exhibit F– Sponsor-Owned Lands, and Exhibit G – Floodwall Easement/Flood Protection Levee Easement Detail.

b. Number of Owners/Acres, Type of Estate and Estimated Value

<u>Number of Owners</u>	<u>Acres</u>	<u>Type of Estate</u>	<u>Estimated Value</u>
1	4.13	Borrow Easement	\$46,900
7	7.80	Temporary Work Area Easement	\$131,900
2	0.6	Channel Improvement Easement	\$58,800
1	0.9	Fee	\$112,400
2	0.15	Floodwall Easement	\$59,695
4	0.378	Flood Protection Levee Easement	\$10,305

c. Gross Appraisal/Cost Estimate

The total gross appraisal and cost estimate that includes severance damages and contingencies for the lands required for the proposed project is \$420,000.

d. Estates To Be Acquired

The following standard estates set forth in ER 405-1-12 will be used for this project:

FEE

The fee simple title to (the land described in Schedule A) 1/ (Tracts Nos. ____, ____, and ____), subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

The Fee area is outlined in *yellow* on **Exhibit D** – Apartment and Bridge at 2nd Street Detail Map.

BORROW EASEMENT

A perpetual and assignable right and easement to clear, borrow, excavate and remove soil, dirt, and other materials from (the land described in Schedule A) (Tracts Nos. ____, ____, and ____); subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the land-owners, their heirs and assigns, all such rights and privileges in said land as may be used without interfering with or abridging the rights and easement hereby acquired.

The borrow easement area is outlined in *blue* on **Exhibit B** – Borrow Area Detail Map.

TEMPORARY WORK AREA EASEMENT

A temporary easement and right-of-way in, on, over and across (the land described in Schedule A) (Tracts Nos. ____, ____, and ____), for a period not to exceed _____, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a (borrow area) (work area), including the right to (borrow and/or deposit fill, spoil and waste material thereon) (move, store and remove equipment

and supplies, and erect and remove temporary _____). The term of the temporary work area easement will be 3 years.

The temporary work area easements are shown colored/outlined in green on the attached **Exhibit C** - Levee Area Detail Map, **Exhibit D** - Apartment and Bridge at 2nd Street Detail Map, and **Exhibit E** – Greenwood Cemetery Disposal Area Map.

CHANNEL IMPROVEMENT EASEMENT

A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over and across (the land described in Schedule A) (Tracts Nos. _____, _____ and _____ for the purposes as authorized by the Act of Congress approved including the right to clear, cut, fell, remove and dispose of any and all timber, trees, underbrush, buildings, improvements and/or other obstructions therefrom; to excavate: dredge, cut away, and remove any or all of said land and to place thereon dredged or excavated material; and for such other purposes as may be required in connection with said work or improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

The channel improvement easement area is shown outlined in red on the attached **Exhibit D** - Apartment and Bridge at 2nd Street Detail.

e. Ownerships Affected:

The project affects 12 ownerships. It is estimated that 17 tracts will be acquired.

III. Lands Required That Are Owned By Sponsor

a. The sponsor, the City of Muscatine, Iowa, currently has an interest in lands acquired for the Muscatine Mad Creek Flood Control Project. The project was authorized by the 1953 Flood Control Act. These lands are shown colored in purple on the Attached Exhibit F – Sponsor-Owned Land Map. In accordance with ER 405-1-12, Chapter 12, paragraph 12-38a, the Non-Federal sponsor shall not receive credit for the value of any LER, including incidental costs, that have been provided previously as an item of cooperation for another Federal Project.

b. Additional sponsor-owned right-of-way that is required for the proposed project, approximately three (3) acres, is colored in red on the attached Exhibit F– Sponsor-Owned Lands.

IV. Non-Standard Estate Discussion

The following non-standard estates will be required for the project. Both of the estates follow the language of the standard Levee Easement found in ER 405-1-12, Chapter 5. Chapter 12, paragraph 12-10c states “The District Chief of Real Estate may approve non-standard estates if they serve the intended project purpose, substantially conform with and do not materially deviate from the corresponding standard estate contained in Chapter 5, and do not increase the costs nor potential liability of the Government.” The District Chief of Real Estate, Rock Island District, has approved the following non-standard estates for the subject project.

a. The following is the Floodwall Easement that will be acquired from two landowners over 0.15 acres. This estate has been approved for use in this project by the Chief, Real Estate, Rock Island District.

FLOODWALL EASEMENT

A perpetual and assignable right and easement in (the land described in Schedule A) (Tracts Nos. _____, _____ and _____) to construct, maintain, repair, operate, patrol and replace a floodwall, including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

The Easement for Floodwall area is outlined in *purple* on **Exhibit G – Floodwall Easement/Flood Protection Levee Easement Detail Map**.

b. The following Flood Protection Levee Easement estate will be acquired over approximately 0.378 acres and will affect four owners. This estate has been approved for use in this project by the Chief, Real Estate, Rock Island District.

FLOOD PROTECTION LEVEE EASEMENT

A perpetual and assignable right and easement in (the land described in Schedule A) (Tracts Nos. _____, _____ and _____), to erect, construct, maintain, repair, operate, patrol, replace or remove a temporary flood protection levee, during periods of critical high water including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public utilities, railroads and pipelines.

The Easement for Flood Protection Levee Easement area is outlined in *olive green* on **Exhibit G – Floodwall Easement/Flood Protection Levee Easement Detail Map**.

V. Federal Project within the LER Required for the Project

The following Federal project is located within the proposed project area:

<u>Project</u> Muscatine Iowa Mad Creek Local Flood Protection Project	<u>Authorized By</u> Flood Control Act of 1954
--	---

The project, which was completed in 1960, included construction of a system of floodwalls and levees beginning at Mulberry Street and extending northward for about 1,500 feet along the Mississippi River, and then up the right bank of Mad Creek for about 2,700 feet to high ground north of East 6th Street. The federal project lands are colored in purple on Exhibit F – Sponsor Owned Lands.

VI. Federally Owned land required for Project

The Mad Creek Section 205 Project requires no federally owned lands.

VII. Navigational Servitude

Navigational servitude is not applicable to this project.

VIII. Map Depicting the Area

Maps depicting the project area are included as Exhibits B, C, D, E, F and G.

IX. Possibility of Induced Flooding Due to Project

It is not anticipated that the project will cause induced flooding.

X. Baseline Cost Estimate

	Non-Federal	Federal
01 <i>Lands & Damages</i>	\$420,000	
01 <i>Incidental Acquisition Costs</i>		
a. Monitoring LS Acquisition/ Project Administration Including crediting	\$17,000	\$80,000
b. Survey	\$17,000	
c. Title Evidence	\$8,500	
d. Negotiation/Closing	\$25,500	
e. Appraisal	\$17,000	\$8,000
f. Attorney's Opinion of Compensability	_____	<u>\$5,000</u>
Total	\$505,000	\$93,000

Total Non Federal and Federal LERRD - \$598,000

XI. Relocation Assistance Benefits

The project does not require any relocation of persons, farms, or businesses; therefore, there are no anticipated Public Law 91-646 Relocation Assistance Benefit payments.

XII. Mineral Activity/Timber Harvesting in Project Area

No mineral activity is known to exist in the area of the project. There is no known timber harvesting in the project area that may affect the project.

XIII. Sponsor's Legal and Professional Capability to Acquire LER

The sponsor signed a letter of intent in November 1996, which stated they are willing to cost share 35%, or approximately \$3,445,000.00 of the proposed project cost. The sponsor, the City of Muscatine, has also agreed to be responsible for operation and maintenance of the completed project. The City of Muscatine has previously been a sponsor on a Federal project. The assessment of the sponsor's Capability is included as Exhibit H. The sponsor has been advised of the PL 91-646 responsibilities in acquiring the right-of-way for the project and has been advised of their responsibilities for documenting expenses for credit on the project. The model Project Cooperation Agreement (PCA) will be executed before the construction contract is advertised.

XIV. Zoning Ordinances Proposed

No known zoning ordinances are proposed.

XV. Schedule of Land Acquisition Milestones

A detailed schedule will be developed when the final right-of-way (ROW) limits have been determined. The sponsor will need a minimum of one year to acquire the necessary ROW. Additional time may be required if condemnation is necessary. The following schedule will be completed after project approval.

Acquisition Schedule

ROW Drawings Completed	12	Weeks
Initiate Acquisition	8	Weeks
Acquisition Complete	56	Weeks
ROW Certificate	4	Weeks

XVI. Facility or Utility Relocations

There are no facility or utility relocations.

XVII. Impacts of Suspected or Known Contaminants

HTRW investigations have been completed and there are no known impacts of suspected or known contaminants.

XVIII. Landowner's Support or Opposition to the Project

The landowner's attitude toward the project is positive at this time.

XIX. Risks of Acquiring Lands before Execution of the PCA

The sponsor has been informed of the risk involved in acquiring lands before the execution of the Project Cooperation Agreement. The sponsor has not indicated intent to initiate early acquisition on this project.

XX. Other Real Estate Issues Relevant to the Project

Parking at Apartment Building Issue

As shown on **Exhibit D**, Apartment and Bridge at 2nd Street Detail, there is an apartment building located at 2nd Street. The parking for the apartment complex will be affected by the project. The acquisition plan is for the sponsor to acquire fee simple title to the lands outlined in yellow on the **Exhibit D** Map. After these lands are acquired and the area is surfaced to accommodate parking, the sponsor will then acquire the temporary work area easement and the channel improvement. The construction contract will reflect that the tenants and emergency personnel will be allowed access to the new parking area. In addition, the period of construction will be minimized to reduce the impact on the tenants.

Original Signed

Rod Hallstrom
Realty Specialist
Acquisition Branch

DATE: 22 November 2002

Muscatine Mad Creek Section 205 Project Location Map

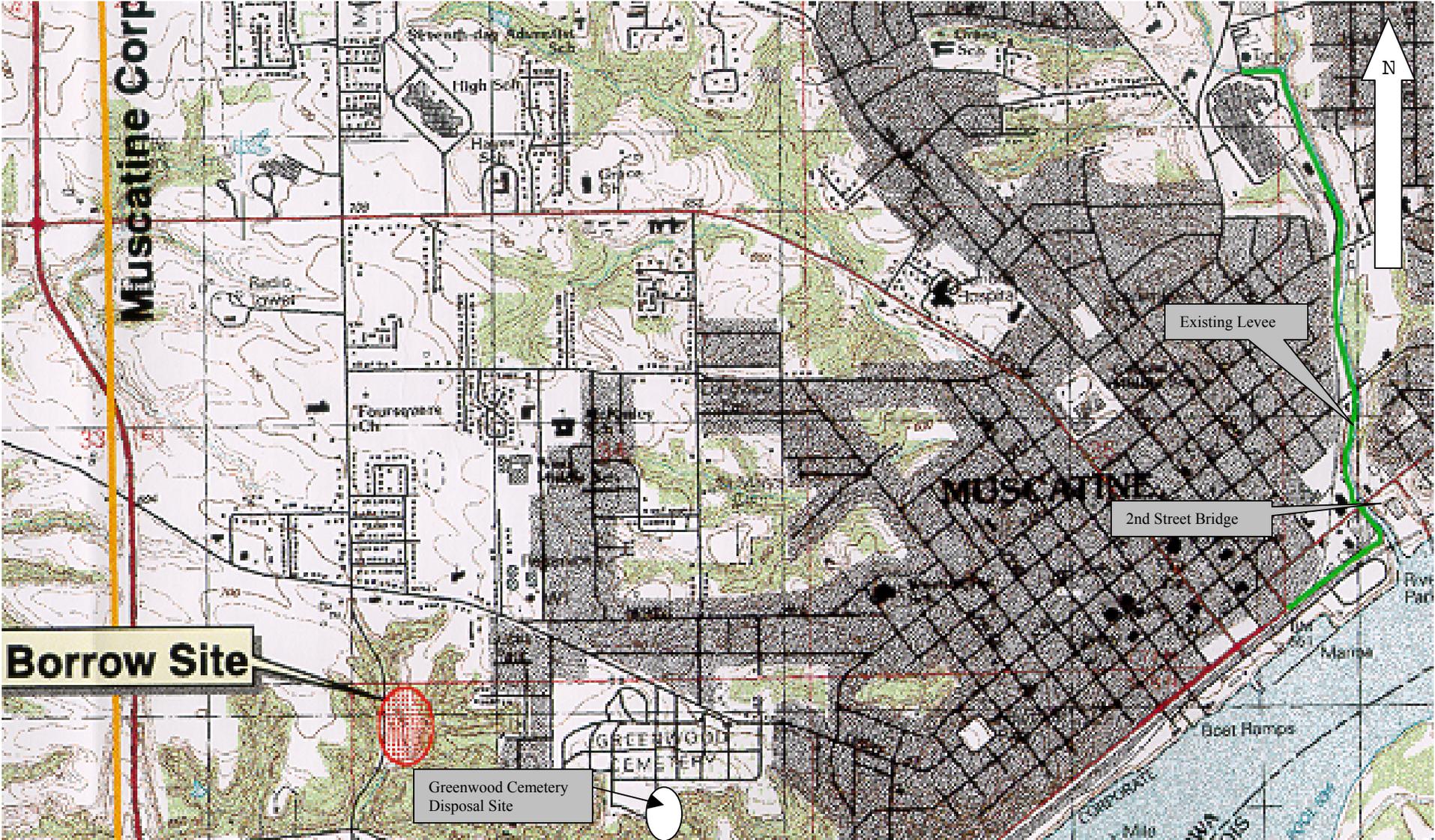


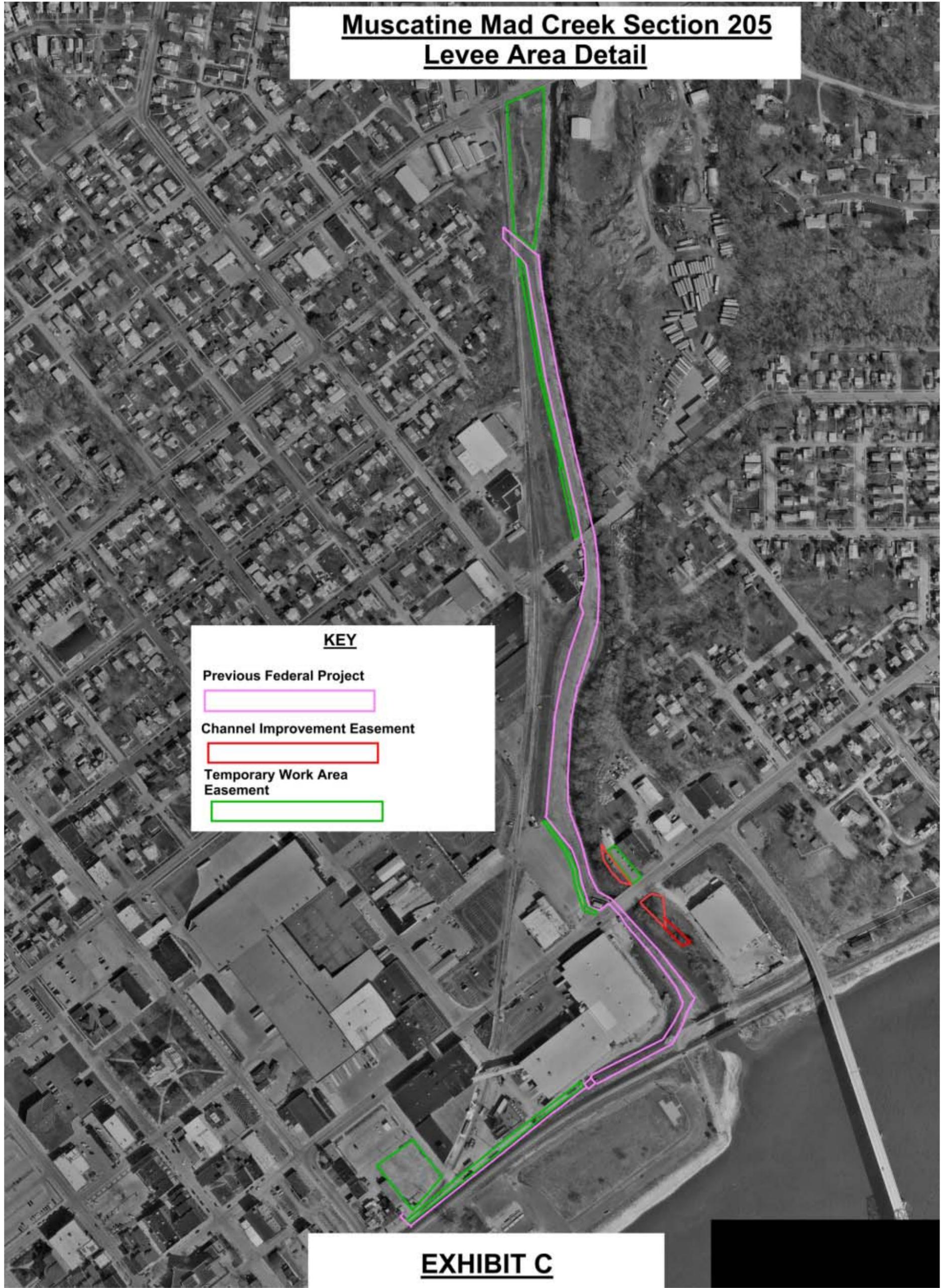
EXHIBIT A

**Muscatine Mad Creek Section 205
Borrow Area Detail**



EXHIBIT B

Muscatine Mad Creek Section 205
Levee Area Detail



KEY

Previous Federal Project
[Pink line]

Channel Improvement Easement
[Red line]

Temporary Work Area Easement
[Green line]

EXHIBIT C

Muscatine Mad Creek Section 205 Apartment and Bridge at 2nd Street Detail

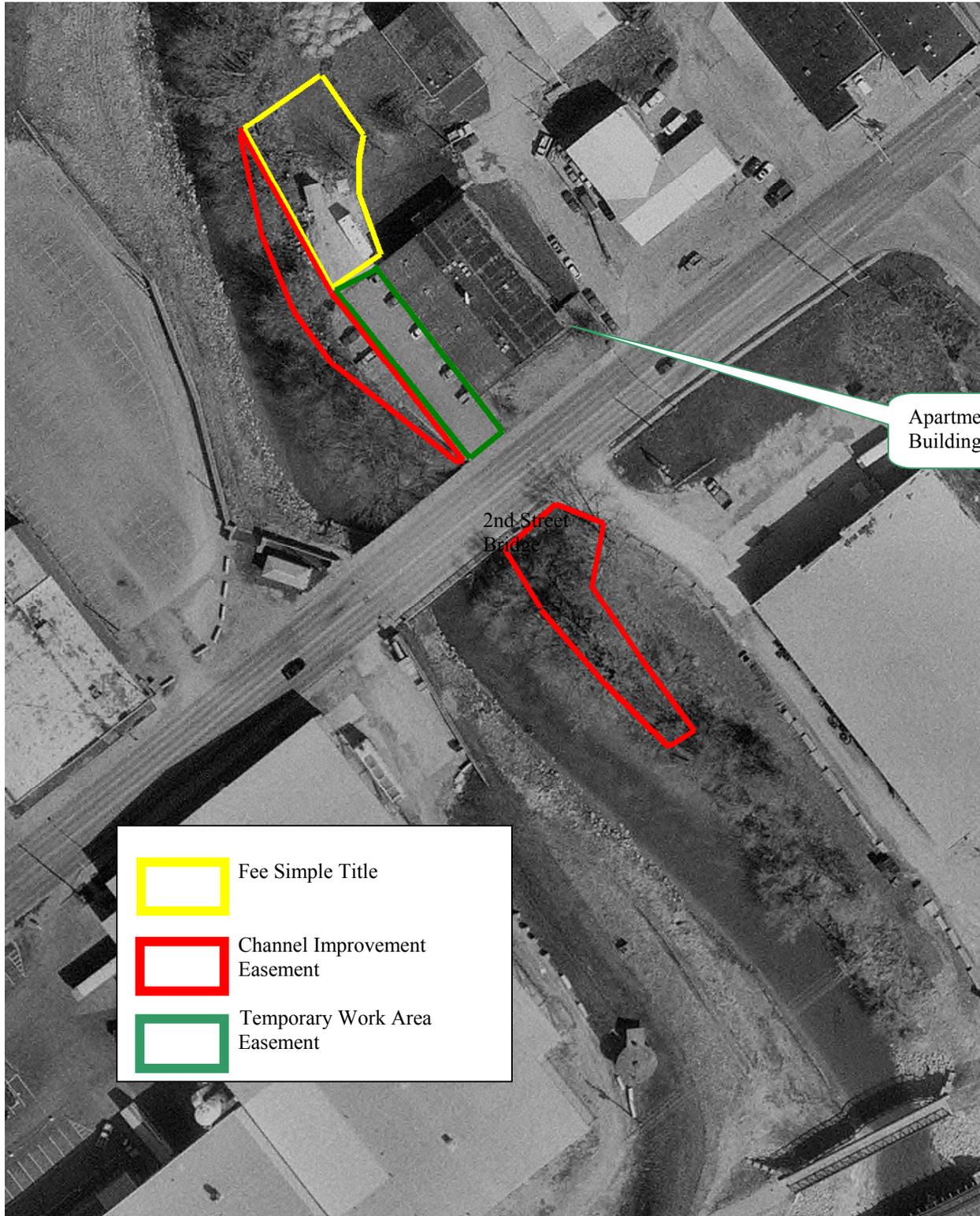


EXHIBIT D

**Muscatine Mad Creek Section 205
Greenwood Cemetery Disposal Site Detail**



EXHIBIT E

Muscatine Mad Creek Section 205 Sponsor Owned Lands



KEY
Previous Federal Project
Sponsor Owned Lands
Required for Project

Exhibit F

Muscatine Mad Creek Section 205 Floodwall Easement/Flood Protection Levee Easement Detail Map

EXHIBIT G

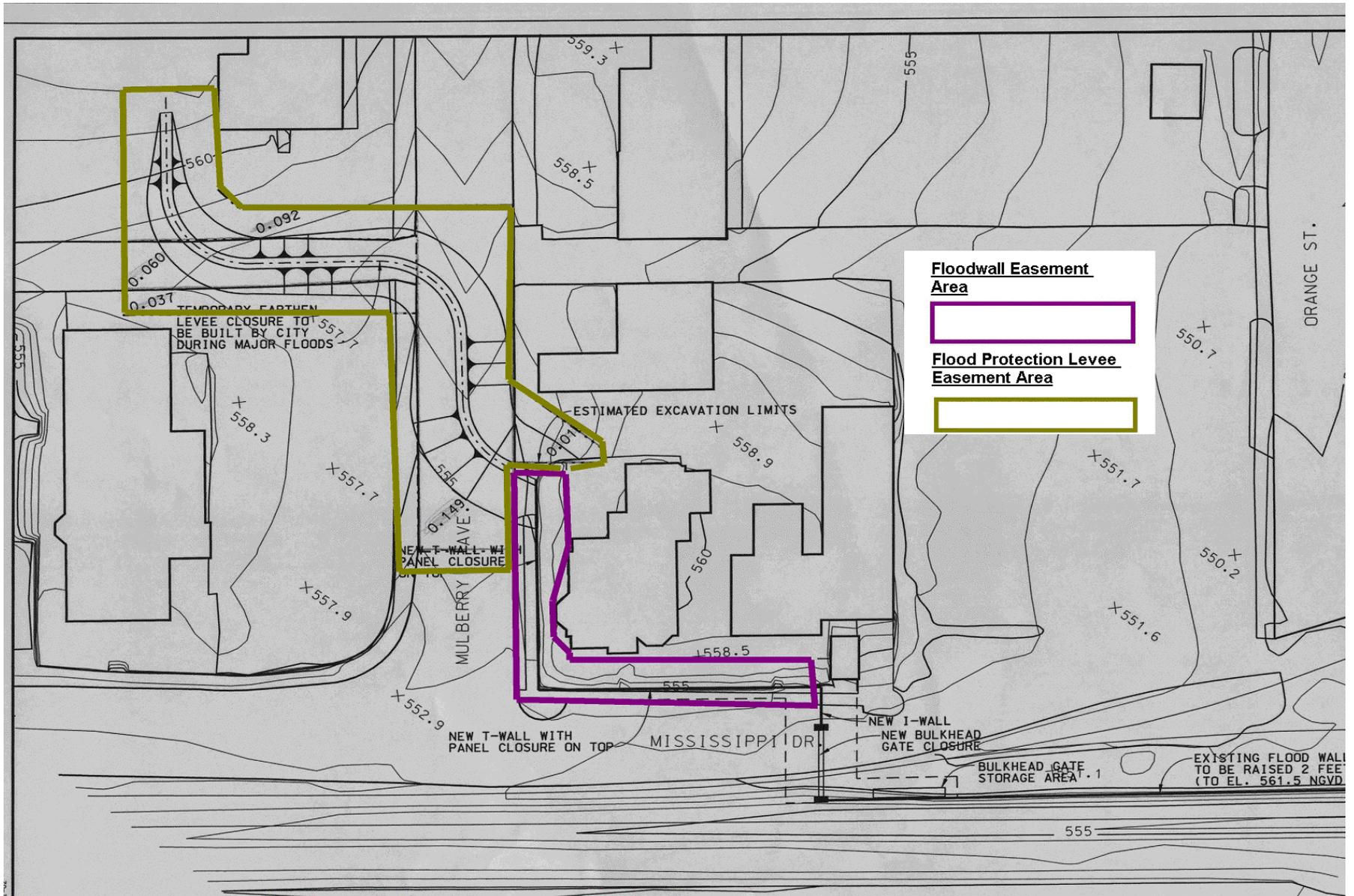


EXHIBIT H
Mad Creek Section 205 Flood Damage Reduction Project
SPONSOR: City of Muscatine, Iowa

ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE CAPABILITY
(Per Appendix 12E, ER 405-1-12)

I. Legal Authority

- a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? Yes
- b. Does the sponsor have the power of eminent domain for this project? Yes
- c. Does sponsor have "quick take" authority for this project? Yes
- d. Are any of the land/interests in land required for the project located outside the sponsor's political boundary? No
- e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? No

II. Human Resource Requirements

- a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of federal projects including P.L. 91-646, as amended? No
- b. If the answer to II.a is "yes," has a reasonable plan been developed to provide such training?
- c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? Yes
- d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? Yes
- e. Can the sponsor obtain contractor support, if required in a timely fashion? Yes
- f. Will the sponsor likely request USACE assistance in acquiring real estate? (If "yes," provide description). No

III. Other Project Variables

- a. Will the sponsor's staff be located within reasonable proximity to the project site? Yes
- b. Has the sponsor approved the project/real estate schedule/milestones? Yes

IV. Overall Assessment

- a. Has the sponsor performed satisfactorily on other USACE projects? Yes
- b. With regard to this project, the sponsor is anticipated to be: highly capable/fully capable/moderately capable/marginally capable/insufficiently capable. (If sponsor is believed to be "insufficiently capable," provide explanation.) Highly Capable

V. Coordination

- a. Has this assessment been coordinated with the sponsor? Yes, this assessment was discussed and agreed upon with the sponsor on 16 May 01.
- b. Does the sponsor concur with this assessment? (If "no", provide explanation). Yes, conferred with sponsor, The City of Muscatine, Iowa.

Original Signed
Rod Hallstrom Dtd: 16 May 01
Realty Specialist
Acquisition Branch

Mad Creek Section 205 Flood Damage Reduction Project
SPONSOR: City of Muscatine, Iowa

EXHIBIT H

APPENDIX G

COST ESTIMATES – ALTERNATIVES AND SELECTED PLAN

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX G
COST ESTIMATES – ALTERNATIVES AND SELECTED PLAN**

CONTENTS

Subject	Page
1. General	G-1
2. Price Level.....	G-1
3. Contingency Discussion	G-1
4. Selected Plan – MCACES Estimate	G-15

Tables

No.	Title	Page
G-1	Summary of Cost Alternatives	G-2
G-2	Project Cost for Alternative A-1a.....	G-3
G-3	Project Cost for Alternative A-1b	G-4
G-4	Project Cost for Alternative A-1c.....	G-5
G-5	Project Cost for Alternative A-2	G-6
G-6	Project Cost for Alternative A-3	G-7
G-7	Project Cost for Alternative B.....	G-8
G-8	Project Cost for Alternative C-1.....	G-9
G-9	Project Cost for Alternative C-2.....	G-10
G-10	Project Cost for Alternative C-3.....	G-11
G-11	Project Cost for Alternative D-1	G-12
G-12	Project Cost for Alternative D-2	G-13
G-13	Project Cost for Alternative D-3	G-14

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX G
COST ESTIMATES – ALTERNATIVES AND SELECTED PLAN**

1. GENERAL

Table G-1 summarizes the project costs for each alternative studied for the Mad Creek Section 205 Flood Reduction Study. For each alternative, a preliminary unit cost estimate was prepared to determine the project cost (Tables G-2 through G-13). For the preliminary estimates, the level of detail is consistent with the level of design. A detailed estimate was developed for the National Economic Development (NED) plan using the Micro Computer Aided Cost Estimating System (MCACES) (see pages G-15 through G-19). This detailed estimate was prepared using preliminary project plans, information gathered from site visits and discussions with design team members and the local sponsor, and review of similar construction projects. The MCACES estimate incorporated local wage and equipment rates. Costs, including appropriate contingencies, are presented in accordance with EC 1110-2-1302, Civil Works Cost Engineering and EC 1110-2-538, Civil Works Project Cost Estimating – Code of Accounts.

2. PRICE LEVEL

The estimates are prepared to a June 2002 price level. These costs are considered to be fair and reasonable to a well-equipped and capable contractor and include overhead and profit. Calculation of the Fully Funded Estimate (FFE) was done in accordance with guidance from EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS), updated March 2002. The project will be constructed in one stage. The midpoint of construction was used to determine the FFE.

3. CONTINGENCY DISCUSSION

After review of project documents and discussion with engineering and construction personnel involved in the project, cost contingencies were developed which reflect the uncertainty associated with each cost item. These contingencies are based on qualified cost engineering judgment of the available design data, type of work involved, and uncertainties associated with the work and schedule. The overall contingency for the cost estimate is about 25%. The basis for the selection of the contingency factor is primarily due to the conceptual design of a project feature, unknown quantities, and unknown site conditions. Many of the project features can be constructed using conventional methods and are similar to previous Rock Island District projects.

TABLE G-1. SUMMARY OF COST ALTERNATIVES

Alternative Designation	Alternative Description	Alternative Project Cost *
A-1a	Mad Creek - 1 ft Levee Raise - Reach 1	\$1,775,000.00
A-1b	Mad Creek 2 ft Levee Raise - Reach 1	\$2,088,000.00
A-1c	Mad Creek 3 ft Levee Raise - Reach 1	\$2,817,000.00
A-2	Mad Creek Railroad Raise - Reach 2	\$1,207,000.00
A-3	Geneva Creek Closures - Reach 3	\$721,000.00
B	Mad Creek and Geneva Creek Dams	\$8,042,000.00
C-1	Mad Creek and Geneva Creek Dams and 1 ft Levee Raise -Reach 1/4	\$9,655,000.00
C-2	Mad Creek and Geneva Creek Dams and 1 ft Levee Raise -Reach 2	\$9,036,000.00
C-3	Mad Creek and Geneva Creek Dams and Reach 3 Closures	\$8,552,000.00
D-1	Mad Creek Channel Improvements and 1 ft Levee Raise - Reach 1/4	\$3,255,000.00
D-2	Mad Creek Channel Improvements and 2 ft Levee Raise - Reach 1/4	\$3,445,000.00
D-3	Mad Creek Channel Improvements and 3 ft Levee Raise - Reach 1/4	\$4,242,000.00

* Total Project Cost includes Real Estate, Relocations, Construction Costs (w/overhead and profit and contingency), Planning, Engineering and Design, and Construction Management. Price level of estimates - June 2002

TABLE G-2. PROJECT COST FOR ALTERNATIVE A-1a

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$393,000.00	\$393,000.00
2	Relocations	\$62,500.00	\$62,500.00
11	Levees and Floodwalls		
11.0.A	Mob/Demob	\$23,562.00	
11.0.1	Raise levee elevation from 2nd to Sta 19+46- 1 ft raise	\$31,968.00	
11.0.1	Raise elevation from Miss Rvr to 2nd Str - 1 ft raise	\$12,417.00	
11.0.2	Extend height of flood wall at 2nd /5th St-1 ft raise	\$203,961.00	
11.0.2	2nd St Closure Structure	\$590,477.00	
11.0.G	3 Gatewells at Mad Creek	\$74,935.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$1,009,420.00
30	Planning, Engineering and Design	\$214,000.00	\$214,000.00
31	Construction Management	\$96,000.00	\$96,000.00
	Total Project Cost - Alternative A-1a		\$1,774,920.00
	* All construction costs include overhead and profit and contingency.		

TABLE G-3. PROJECT COST FOR ALTERNATIVE A-1b

G-4

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$393,000.00	\$393,000.00
2	Relocations	\$62,500.00	\$62,500.00
11	Levees and Floodwalls		
11.0.A	Mob/Demob	\$23,562.00	
11.0.1	Raise levee elevation from 2nd to Sta 19+46- 2 ft raise	\$59,115.00	
11.0.1	Raise elevation from Miss Rvr to 2nd Str - 2 ft raise	\$16,091.00	
11.0.2	Extend height of flood wall at 2nd /5th St-2 ft raise	\$263,559.00	
11.0.2	Railroad Closure Structure	\$151,470.00	
11.0.2	2nd St Closure Structure	\$590,446.00	
11.0.G	3 Gatewells at Mad Creek	\$75,580.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$1,251,923.00
30	Planning, Engineering and Design	\$263,000.00	\$263,000.00
31	Construction Management	\$118,000.00	\$118,000.00
Total Cost - Alternative A-1b			\$2,088,423.00

* All construction costs include overhead and profit and contingency.

TABLE G-4. PROJECT COST FOR ALTERNATIVE A-1c

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$393,000.00	\$393,000.00
2	Relocations	\$62,500.00	\$62,500.00
11	Levees and Floodwalls		
11.0.A	Mob/Demob	\$23,562.00	
11.0.1	Raise levee elevation from 2nd to Sta 19+46- 3 ft raise	\$221,744.00	
11.0.1	Raise elevation from Miss Rvr to 2nd Str - 3 ft raise	\$78,823.00	
11.0.2	Extend height of flood wall at 2nd /5th St-3 ft raise	\$587,455.00	
11.0.2	Railroad Closure Structure	\$166,210.00	
11.0.2	2nd St Closure Structure	\$590,446.00	
11.0.G	3 Gatewells at Mad Creek	\$76,226.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$1,816,566.00
30	Planning, Engineering and Design	\$376,000.00	\$376,000.00
31	Construction Management	\$169,000.00	\$169,000.00
Total Cost - Alternative A-1c			\$2,817,066.00

* All construction costs include overhead and profit and contingency.

TABLE G-5. PROJECT COST FOR ALTERNATIVE A-2

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$138,000.00	\$138,000.00
2	Relocations	\$62,500.00	\$62,500.00
11	Levees and Floodwalls		
11.0.A	Mob/Demob	\$29,453.00	
11.0.2	Construct closure at 9th St/extend levee from 19+46-9th St and extend levee from 9th St to Sta 40+00	\$343,710.00	
11.0.2	Raise RR Track and Road at Washington St	\$187,694.00	
11.0.2	Railroad Closure at Sta 19+46	\$132,907.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$765,864.00
30	Planning, Engineering and Design	\$166,000.00	\$166,000.00
31	Construction Management	\$75,000.00	\$75,000.00
	Total Cost - Alternative A-2		\$1,207,364.00

* All construction costs include overhead and profit and contingency.

TABLE G-6. PROJECT COST FOR ALTERNATIVE A-3

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$36,000.00	\$36,000.00
2	Relocations	\$62,500.00	\$62,500.00
11	Levees and Floodwalls		
11.0.A	Mob/Demob	\$29,453.00	
11.0.2	Isett Avenue Gate Closure	\$223,555.00	
11.0.2	Gate Closure Structure at Heinz Bridge	\$143,375.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$468,483.00
30	Planning, Engineering and Design	\$106,000.00	\$106,000.00
31	Construction Management	\$48,000.00	\$48,000.00
Total Cost - Alternative A-3			\$720,983.00

* All construction costs include overhead and profit and contingency.

TABLE G-7. PROJECT COST FOR ALTERNATIVE B

G-8

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$2,874,000.00	\$2,874,000.00
4	Dams		
4.1.6	Geneva Creek Earthen Fill Dam	\$1,339,691.00	
4.1.6	Mad Creek Earthen Fill Dam	\$1,493,791.00	
4.1.R	Geneva Creek Seeding	\$19,250.00	
4.1.R	Mad Creek Seeding	\$27,108.00	
4.1.R	Mad Creek Access Road	\$60,893.00	
4.2	Geneva Creek Spillway	\$71,351.00	
4.2	Mad Creek Spillway	\$71,351.00	
4.3	Geneva Outlet Structure	\$37,225.00	
4.2	Mad Creek Outlet Structure	\$50,456.00	
4	Total Cost -Dam		\$3,171,116.00
11	Levees and Floodwalls		
11.0.R	Flood Warning System	\$72,100.00	\$72,100.00
19	Buildings, Grounds, and Utilities		
19.0.4	Lagoons	\$762,789.00	\$762,789.00
30	Planning, Engineering and Design	\$801,000.00	\$801,000.00
31	Construction Management	\$361,000.00	\$361,000.00
Total Cost - Alternative B			\$8,042,005.00

* All construction costs include overhead and profit and contingency.

TABLE G-8. PROJECT COST FOR ALTERNATIVE C-1

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$3,308,000.00	\$3,308,000.00
4	Dams		
4.1.6	Geneva Creek Earthen Fill Dam	\$1,339,691.00	
4.1.6	Mad Creek Earthen Fill Dam	\$1,493,791.00	
4.1.R	Geneva Creek Seeding	\$19,251.00	
4.1.R	Mad Creek Seeding	\$27,108.00	
4.1.R	Mad Creek Access Road	\$60,893.00	
4.2	Geneva Creek Spillway	\$71,351.00	
4.2	Mad Creek Spillway	\$71,351.00	
4.3	Geneva Outlet Structure	\$37,225.00	
4.2	Mad Creek Outlet Structure	\$50,456.00	
4	Total Cost -Dam		\$3,171,117.00
11	Levees and Floodwalls		
11.0.1	Extend height of flood wall at 2nd /5th St-1 ft raise	\$203,961.00	
11.0.1	Raise elevation from 2nd Sta 19+46- 1 ft raise	\$31,968.00	
11.0.1	Raise levee elevation from Miss R to 2nd St - 1 ft	\$12,417.00	
11.0.2	2nd St Closure Structure	\$590,466.00	
11.0.G	3 Gatewells at Mad Creek	\$74,935.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total-Levees and Floodwalls		\$985,847.00
19	Buildings, Grounds, and Utilities		
19.0.4	Lagoons	\$762,788.00	\$762,788.00
30	Planning, Engineering and Design	\$984,000.00	\$984,000.00
31	Construction Management	\$443,000.00	\$443,000.00
Total Cost - Alternative C-1			\$9,654,752.00

* All construction costs include overhead and profit and contingency.

G-9

TABLE G-9. PROJECT COST FOR ALTERNATIVE C-2

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$3,012,000.00	\$3,012,000.00
4	Dams		
4.1.6	Geneva Creek Earthen Fill Dam	\$1,339,691.00	
4.1.6	Mad Creek Earthen Fill Dam	\$1,493,791.00	
4.1.R	Geneva Creek Seeding	\$19,251.00	
4.1.R	Mad Creek Seeding	\$27,108.00	
4.1.R	Mad Creek Access Road	\$60,893.00	
4.2	Geneva Creek Spillway	\$71,351.00	
4.2	Mad Creek Spillway	\$71,351.00	
4.3	Geneva Outlet Structure	\$37,225.00	
4.2	Mad Creek Outlet Structure	\$50,456.00	
4	Total Cost -Dam		\$3,171,117.00
G-10	Levees and Floodwalls		
11.0.C	Raise RR Track and Road at Washington Street	\$187,694.00	
11.0.1	Extend levee from 19+46 to 9th St, construct a closure at 9th Street and extend levee from 9th St to Sta 40+00	\$343,710.00	
11.0.2	Construct RR closure structure at Sta 19+46	\$132,907.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total-Levees and Floodwalls		\$736,411.00
19	Buildings, Grounds, and Utilities		
19.0.4	Lagoons	\$762,788.00	\$762,788.00
30	Planning, Engineering and Design	\$934,000.00	\$934,000.00
31	Construction Management	\$420,000.00	\$420,000.00
	Total Cost - Alternative C-2		\$9,036,316.00

* All construction costs include overhead and profit and contingency.

TABLE G-10. PROJECT COST FOR ALTERNATIVE C-3

G-11

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$2,910,000.00	\$2,910,000.00
4	Dams		
4.1.6	Geneva Creek Earthen Fill Dam	\$1,339,691.00	
4.1.6	Mad Creek Earthen Fill Dam	\$1,493,791.00	
4.1.R	Geneva Creek Seeding	\$19,251.00	
4.1.R	Mad Creek Seeding	\$27,108.00	
4.1.R	Mad Creek Access Road	\$60,893.00	
4.2	Geneva Creek Spillway	\$71,351.00	
4.2	Mad Creek Spillway	\$71,351.00	
4.3	Geneva Outlet Structure	\$37,225.00	
4.2	Mad Creek Outlet Structure	\$50,456.00	
4	Total Cost -Dam		\$3,171,117.00
11	Levees and Floodwalls		
11.0.2	Isett Avenue Gate Closure	\$223,555.00	
11.0.2	Gate Closure Structure at Heinz Bridge	\$143,376.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total-Levees and Floodwalls		\$439,031.00
19	Buildings, Grounds, and Utilities		
19.0.4	Lagoons	\$762,788.00	\$762,788.00
30	Planning, Engineering and Design	\$875,000.00	\$875,000.00
31	Construction Management	\$394,000.00	\$394,000.00
Total Cost - Alternative C-3			\$8,551,936.00

* All construction costs include overhead and profit and contingency.

TABLE G-11. PROJECT COST FOR ALTERNATIVE D-1

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$598,000.00	\$598,000.00
2	Relocations	\$62,500.00	\$62,500.00
9	Channels and Canals		
9.0.A	Site Access	\$14,416.00	
9.0.A	Mob/Demobilization-Channel Improvements	\$4,475.00	
9.0.A	Mob/Demobilization-2nd St Bridge Cleanout	\$29,453.00	
9.0.A	Access Maintenance During Const-Channel Improvements	\$7,389.00	
9.0.2.B	Channel Clearing and Grubbing	\$26,390.00	
9.0.2.B	Removal of Debris/Piles	\$51,004.00	
9.0.2.B	Shaping	\$17,448.00	
9.0.2.B	2nd Street Bridge Cleanout	\$15,462.00	
9	Total Cost - Channels and Canals		\$166,037.00
11	Levees and Floodwalls		
11.0.1	Raise levee elevation from 2nd to Sta 19+46- 1 ft raise	\$31,968.00	
11.0.1	Raise elevation from Miss Rvr to 2nd Str - 1 ft raise	\$12,416.00	
11.0.1	Raise levee elev from end of Miss Rvr floodwall to Mad Creek - 1 ft	\$11,553.00	
11.0.2	Extend height of flood wall at 2nd /5th St-1 ft raise	\$203,961.00	
11.0.2	Extend height of flood wall Mulberry to Levee-1 ft	\$203,068.00	
11.0.2	New T-wall - Mississippi Dr Closure Wall	\$188,179.00	
11.0.2	New I-wall - Mississippi Dr Closure Wall	\$6,578.00	
11.0.2	Bulkhead - Mississippi Dr Closure Wall	\$70,625.00	
11.0.2	2nd St Closure Structure	\$590,446.00	
11.0.2	Railroad Closure Structure	\$151,278.00	
11.0.2	Closure Structure at Bike Trail	\$110,000.00	
11.0.G	3 Gatewells at Mad Creek	\$74,935.00	
11.0.R	Seeding - Mississippi Closure Wall	\$915.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$1,728,022.00
13	Pumping Plant		
13.0.2	Pumping Plant Superstructure	\$37,500.00	\$37,500.00
30	Planning, Engineering and Design	\$484,000.00	\$484,000.00
31	Construction Management	\$179,000.00	\$179,000.00
	Total Cost - Alternative D-1		\$3,255,059.00

* All construction costs include overhead and profit and contingency.

TABLE G-12. PROJECT COST FOR ALTERNATIVE D-2

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$598,000.00	\$598,000.00
2	Relocations	\$62,500.00	\$62,500.00
9	Channels and Canals		
9.0.A	Site Access	\$14,416.00	
9.0.A	Mob/Demobilization-Channel Improvements	\$4,475.00	
9.0.A	Mob/Demobilization-2nd St Bridge Cleanout	\$29,453.00	
9.0.A	Access Maintenance During Const-Channel Improvements	\$7,389.00	
9.0.2.B	Channel Clearing and Grubbing	\$26,390.00	
9.0.2.B	Removal of Debris/Piles	\$51,004.00	
9.0.2.B	Shaping	\$17,448.00	
9.0.2.B	2nd Street Bridge Cleanout	\$15,462.00	
9	Total Cost - Channels and Canals		\$166,037.00
11	Levees and Floodwalls		
11.0.1	Raise levee elevation from 2nd to Sta 19+46- 2 ft raise	\$59,115.00	
11.0.1	Raise elevation from Miss Rvr to 2nd Str - 2 ft raise	\$16,090.00	
11.0.1	Raise levee elev from end of Miss Rvr floodwall to Mad Creek - 2 ft	\$13,530.00	
11.0.2	Extend height of flood wall at 2nd /5th St-2 ft raise	\$263,559.00	
11.0.2	Extend height of flood wall Mulberry to Levee-2 ft	\$256,771.00	
11.0.2	New T-wall - Mississippi Dr Closure Wall	\$188,179.00	
11.0.2	New I-wall - Mississippi Dr Closure Wall	\$6,578.00	
11.0.2	Bulkhead - Mississippi Dr Closure Wall	\$70,625.00	
11.0.2	2nd St Closure Structure	\$590,150.00	
11.0.2	Railroad Closure Structure	\$151,278.00	
11.0.2	Closure Structure at Bike Trail	\$110,000.00	
11.0.G	3 Gatewells at Mad Creek	\$75,580.00	
11.0.R	Seeding - Mississippi Closure Wall	\$915.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$1,874,470.00
13	Pumping Plant		
13.0.2	Pumping Plant Superstructure	\$37,500.00	\$37,500.00
30	Planning, Engineering and Design	\$513,000.00	\$513,000.00
31	Construction Management	\$193,000.00	\$193,000.00
	Total Cost - Alternative D-2		\$3,444,507.00

* All construction costs include overhead and profit and contingency.

TABLE G-13. PROJECT COST FOR ALTERNATIVE D-3

Account Code	Item	Feature Cost*	Sub-Total Cost by Feature
1	Lands and Damages	\$598,000.00	\$598,000.00
2	Relocations	\$62,500.00	\$62,500.00
9	Channels and Canals		
9.0.A	Site Access	\$14,416.00	
9.0.A	Mob/Demobilization-Channel Improvements	\$4,475.00	
9.0.A	Mob/Demobilization-2nd St Bridge Cleanout	\$29,453.00	
9.0.A	Access Maintenance During Const-Channel Improvements	\$7,389.00	
9.0.2.B	Channel Clearing and Grubbing	\$26,390.00	
9.0.2.B	Removal of Debris/Piles	\$51,004.00	
9.0.2.B	Shaping	\$17,448.00	
9.0.2.B	2nd Street Bridge Cleanout	\$15,462.00	
9	Total Cost - Channels and Canals		\$166,037.00
11	Levees and Floodwalls		
11.0.1	Raise levee elevation from 2nd to Sta 19+46- 3 ft raise	\$221,744.00	
11.0.1	Raise elevation from Miss Rvr to 2nd Str - 3 ft raise	\$78,823.00	
11.0.1	Raise levee elev from end of Miss Rvr floodwall to Mad Creek - 2 ft	\$79,235.00	
11.0.2	Extend height of flood wall at 2nd /5th St-3 ft raise	\$587,455.00	
11.0.2	Extend height of flood wall Mulberry to Levee-3 ft	\$244,298.00	
11.0.2	New T-wall - Mississippi Dr Closure Wall	\$188,179.00	
11.0.2	New I-wall - Mississippi Dr Closure Wall	\$6,578.00	
11.0.2	Bulkhead - Mississippi Dr Closure Wall	\$70,625.00	
11.0.2	2nd St Closure Structure	\$590,446.00	
11.0.2	Railroad Closure Structure	\$166,210.00	
11.0.2	Closure Structure at Bike Trail	\$110,000.00	
11.0.G	3 Gatewells at Mad Creek	\$76,226.00	
11.0.R	Seeding - Mississippi Closure Wall	\$915.00	
11.0.R	Flood Warning System	\$72,100.00	
11	Total Cost - Levees and Floodwalls		\$2,492,834.00
13	Pumping Plant		
13.0.2	Pumping Plant Superstructure	\$37,500.00	\$37,500.00
30	Planning, Engineering and Design	\$637,000.00	\$637,000.00
31	Construction Management	\$248,000.00	\$248,000.00
	Total Cost - Alternative D-3		\$4,241,871.00

* All construction costs include overhead and profit and contingency.

Mon 16 Dec 2002
Eff. Date 03/01/02

Tri-Service Automated Cost Engineering System (TRACES)
PROJECT MADDEC: Mad Creek LFP - Muscatine County, IA
Rock Island District

TIME 13:01:27
TITLE PAGE 1

Mad Creek LFP
Muscatine County, IA

Designed By: CEMVR-ED-D
Estimated By: David A. Bequeaith

Prepared By: CEMVR-ED-C

Preparation Date: 06/14/02
Effective Date of Pricing: 03/01/02

Sales Tax: 7.0%

This report is not copyrighted, but the information
contained herein is For Official Use Only.

M C A C E S f o r W i n d o w s
Software Copyright (c) 1985-1997
by Building Systems Design, Inc.
Release 1.2

LABOR ID: MADCRK EQUIP ID: RG0599

Currency in DOLLARS

CREW ID: NAT00A UPB ID: UP01EA

G-15

Mon 16 Dec 2002
Eff. Date 03/01/02
PROJECT NOTES

Tri-Service Automated Cost Engineering System (TRACES)
PROJECT MADDEC: Mad Creek LFP - Muscatine County, IA
Rock Island District

TIME 13:01:27
TITLE PAGE 2

This estimate was prepared for the Section 205 Flood Damage Reduction Study, Mad Creek, Muscatine, Muscatine County, IA. This estimate was prepared using preliminary plans. This construction project is anticipated to be awarded in June 2004 and completed in June 2006.

G-16

LABOR ID: MADCRK EQUIP ID: RG0599

Currency in DOLLARS

CREW ID: NAT00A UPB ID: UP01EA

Mon 16 Dec 2002
Eff. Date 03/01/02
CONTINGENCIES

Tri-Service Automated Cost Engineering System (TRACES)
PROJECT MADDEC: Mad Creek LFP - Muscatine County, IA
Rock Island District

TIME 13:01:27
TITLE PAGE 3

-
1. Conceptual design only
 2. Uncertainty in quantity
 3. Unknown Site Conditions

G-17

LABOR ID: MADCRK EQUIP ID: RG0599

Currency in DOLLARS

CREW ID: NAT00A UPB ID: UP01EA

Mon 16 Dec 2002
Eff. Date 03/01/02

Tri-Service Automated Cost Engineering System (TRACES)
PROJECT MADDEC: Mad Creek LFP - Muscatine County, IA
Rock Island District
** PROJECT OWNER SUMMARY - Contract **

TIME 13:01:27
SUMMARY PAGE 1

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT	NOTES
01 D-2 Imp Mad Chnl w/2ft Raise Rea	1.00	EA	3,047,329	397,178	221,513	3,666,020	3666020	
TOTAL Mad Creek LFP	1.00	EA	3,047,329	397,178	221,513	3,666,020	3666020	

G-18

LABOR ID: MADCRK EQUIP ID: RG0599

Currency in DOLLARS

CREW ID: NAT00A UPB ID: UP01EA

Mon 16 Dec 2002
 Eff. Date 03/01/02

Tri-Service Automated Cost Engineering System (TRACES)
 PROJECT MADDEC: Mad Creek LFP - Muscatine County, IA
 Rock Island District
 ** PROJECT OWNER SUMMARY - Feature **

TIME 13:01:27
 SUMMARY PAGE 2

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT	NOTES

01	D-2 Imp Mad Chnl w/2ft Raise Rea								
01_	01 Lands and Damages	1.00	EA	598,000	0	0	598,000	598000	
01_	02 Relocations	1.00	EA	50,000	12,500	5,147	67,647	67647	
01_	09 Channels and Canals	1.00	EA	132,830	33,207	13,663	179,700	179700	
01_	11 Levees and Floodwalls	1.00	EA	1,530,499	343,971	152,394	2,026,864	2026864	1,2,3
01_	13 Pumping Plant Superstr	1.00	EA	30,000	7,500	3,040	40,540	40540	
01_	30 PED	1.00	EA	513,000	0	31,683	544,683	544683	
01_	31 Construction Management	1.00	EA	193,000	0	15,586	208,586	208586	
	TOTAL D-2 Imp Mad Chnl w/2ft Raise Rea	1.00	EA	3,047,329	397,178	221,513	3,666,020	3666020	
	TOTAL Mad Creek LFP	1.00	EA	3,047,329	397,178	221,513	3,666,020	3666020	

G-19

LABOR ID: MADCRK EQUIP ID: RG0599

Currency in DOLLARS

CREW ID: NAT00A UPB ID: UP01EA

APPENDIX H

PERTINENT CORRESPONDENCE

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX H
PERTINENT CORRESPONDENCE**

CONTENTS

Item	Page
Project information summary	H-1
Letter from Colonel Albert J. Kraus, District Engineer, U.S. Army Corps of Engineers, Rock Island District, to U.S. Senator Tom Harkin, dated September 21, 1992, responding to letter dated September 8, 1992, on behalf of Mr. Vernon Wilson.....	H-2
Letter from Colonel Albert J. Kraus, District Engineer, U.S. Army Corps of Engineers, Rock Island District, to U.S. Senator Charles Grassley, dated January 11, 1993, responding to letter dated December 29, 1992, on behalf of Mr. Vernon Wilson	H-7
Letter from Mr. Dudley M. Hanson, U.S. Army Corps of Engineers, Rock Island District, to Mr. A. J. Johnson, Muscatine City Administrator, dated April 18, 1997, responding to letter dated November 25, 1996.....	H-12
Letter from Mr. Dudley M. Hanson, U.S. Army Corps of Engineers, Rock Island District, to Mr. A. J. Johnson, Muscatine City Administrator, dated March 23, 1998, enclosing a summary of March 13, 1988 meeting.....	H-14
CEMVR-PM-MF Memorandum, dated 16 November 1998, subject: Mad Creek at Muscatine, Iowa, Section 205 Flood Control Study (PWI 150096), to Commander, Mississippi Valley Division	H-17
Addendum, dated 15 December 1998, to CEMVR-PM-MF Memorandum, dated 16 November 1998	H-21
Letter from Dudley M. Hanson, U.S. Army Corps of Engineers, Rock Island District, to Mr. A. J. Johnson, Muscatine City Administrator, dated February 24, 1999, providing Initial Assessment and Addendum.....	H-25
Quality Control Plan for Muscatine, Iowa, Section 205 Project, dated July 6, 1999	H-26
Letter from Mr. Perry Hubert, U.S. Army Corps of Engineers, Rock Island District, to Mr. A. J. Johnson, Muscatine City Administrator, dated October 25, 1999, enclosing Feasibility Cost Sharing Agreement.....	H-30

Item	Page
Letter from Mr. Perry Hubert, U.S. Army Corps of Engineers, Rock Island District, to Mr. A. J. Johnson, Muscatine City Administrator, dated October 27, 1999, enclosing two original executed copies of the Feasibility Cost Sharing Agreement.....	H-39
Letter from Mr. Perry Hubert, U.S. Army Corps of Engineers, Rock Island District, to Distribution List, dated January 10, 2000, regarding meeting to be held on January 19, 2000.....	H-40
Letter from Mr. R. L. Childs, Muscatine City Engineer, to Mr. Perry Hubert, U.S. Army Corps of Engineers, Rock Island District, dated March 20, 2000, regarding project planning suggestion.....	H-41
Letter from Mr. Gary Loss, U.S. Army Corps of Engineers, Rock Island District, to Mr. Jeff Fick, HON INDUSTRIES, dated April 20, 2000, requesting information to assist in the Mad Creek study process.....	H-44
Letter from Mr. Gary Loss, U.S. Army Corps of Engineers, Rock Island District, to Mr. Dick Stone, H. J. Heinz Company, dated April 20, 2000, requesting information to assist in the Mad Creek study process.....	H-46
Letter from Mr. Dennis Hamilton, U.S. Army Corps of Engineers, Rock Island District, to Mr. A. J. Johnson, Muscatine City Administrator, dated October 25, 2000, requesting cost share funds from the City of Muscatine.....	H-48
Letter from John F. Doershuk, Ph.D., University of Iowa, to Mr. Jim Ross, U.S. Army Corps of Engineers, Rock Island District, dated November 20, 2000, regarding archeological site file search	H-49
Letter from Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, to Distribution List, dated January 3, 2001, requesting comments from consulting parties regarding historic properties	H-50
Letter from Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, to Distribution List, dated January 22, 2001, requesting comments on any significant resources that might be impacted by proposed Mad Creek project	H-54
Letter from Mr. Daniel Higginbottom, State Historical Society of Iowa, to Mr. Jim Ross, U.S. Army Corps of Engineers, Rock Island District, dated January 29, 2001, providing comments and recommendations on proposed undertaking	H-56
Letter from Mr. Glenn Burrows, La Porte City, Iowa, to Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, dated January 30, 2001, commenting on proposed project.....	H-58
Letter from Ms. Deanne Bahr, Sac and Fox Nation of Missouri, to Mr. James Ross, U.S. Army Corps of Engineers, Rock Island District, dated January 31, 2001, providing point of contact for the Muscatine project	H-59

Item	Page
Letter from Mr. Richard Nelson, U.S. Fish and Wildlife Service, to Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, dated February 22, 2001, providing list of species which may be present in concerned area	H-60
Letter from Mr. Stephen Smith, Region VII, U.S. EPA, to Ms. Erika Mark, U.S. Army Corps of Engineers, Rock Island District, dated March 13, 2001, commenting on proposed Muscatine project.....	H-63
Letter from Ms. Marianne Long, Iowa Tribe of Oklahoma, to Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, dated March 15, 2001, requesting that the Tribe be included in the consultation process for historic properties	H-64
Letter from Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, to Ms. Maria Pandullo, State Historical Society of Iowa, dated May 10, 2001, forwarding draft Phase I cultural resource survey report	H-65
Letter from Mr. Daniel K. Higginbottom, State Historical Society of Iowa, to Mr. Jim Ross, U.S. Army Corps of Engineers, Rock Island District, dated June 11, 2001, providing concurrence and recommendations on the proposed Muscatine project	H-67
Letter from Mr. Richard Nelson, U.S. Fish and Wildlife Service, Rock Island Field Office, to Colonel William Bayles, Commander, U.S. Army Engineer District, Rock Island, dated June 26, 2001, providing draft Fish and Wildlife Coordination Act report.....	H-69
CEMVR-OD-PE Memorandum, dated 26 July 2001, subject: CEMVR-OD-P-413850, regarding permit for the Mad Creek channel improvement	H-73
Letter from Mr. Ronald Pulcher, U.S. Army Corps of Engineers, Rock Island District, to Mr. David Stanley, Bear Creek Archeology, Inc., dated August 7, 2001, regarding draft report prepared under Contract DACW25-98-D-0001, Work Order No. 25.....	H-75
Letter from Mr. Gary Loss, U.S. Army Corps of Engineers, Rock Island District, to Mr. A. J. Johnson, Muscatine City Administrator, dated January 9, 2002, regarding the city's contribution of funds to complete the Mad Creek Feasibility Study	H-76
CEMVR-ED-DM Memorandum to File, dated 10 January 2002, subject: Mad Creek channel improvement and associated parking lot impacts to adjacent apartment building.....	H-78
Letter from Mr. R. L. Childs, Muscatine City Engineer, to Mr. Dennis Hamilton, U.S. Army Corps of Engineers, Rock Island District, dated February 22, 2002, commenting on Muscatine DPR.....	H-80
Letter from Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, to See Distribution List, dated April 23, 2002, requesting comments from consulting parties regarding historic properties	H-83
Letter from Mr. John P. Froman, Chief, Peoria Tribe of Indians of Oklahoma, to Mr. Kenneth Barr, U.S. Army Corps of Engineers, Rock Island District, dated May 7, 2002, stating that the Tribe has no objection to the proposed project and requesting notification under NAGPRA.....	H-86

Item	Page
Letter from Mr. Daniel K. Higginbottom, State Historical Society of Iowa, to Mr. Jim Ross, U.S. Army Corps of Engineers, Rock Island District, dated June 11, 2002, commenting on Phase I Cultural Resource Survey draft report.....	H-87
Letter from Mr. Raymond V. Wallace, Advisory Council on Historic Preservation, to Mr. Gary Loss, U.S. Army Corps of Engineers, Rock Island District, dated July 12, 2002, stating that Council participation in the execution of the PA was not required	H-88
Letter from Ms. Teresa A. Kincaid, U.S. Army Corps of Engineers, Rock Island District, To All Interested Parties, dated August 19, 2002, announcing completion of the draft DPR, the study findings and selected plan, and requesting comments	H-89
Letter from Ms. Dorene A. Bollman, U.S. Army Corps of Engineers, Rock Island District, To All Interested Parties, dated November 18, 2002, enclosing the Statement of Findings and the FONSI for the Mad Creek, Muscatine, Iowa, DPR.....	H-91
Letter from Mayor Richard W. O'Brien, City of Muscatine, Iowa, to Colonel William J. Bayles, U.S. Army Corps of Engineers, Rock Island District, dated November 20, 2002 providing Statement of Financial Capability for the Muscatine Section 205 Flood Control Project	H-102

Muscatine, Mad Creek
Completed Project, Local Protection
(Rock Island District)

The city of Muscatine lies on the west bank of the Mississippi River in Muscatine County. Mad Creek, a small tributary of the Mississippi River with a drainage area of about 17 square miles, bisects the city. Parts of 17 city blocks, in a roughly triangular area, mainly industrial, lie between the right bank of Mad Creek and the Mississippi River and have been flooded frequently during periods of moderately high water on the latter stream.

A project for flood protection along Mad Creek at Muscatine was authorized in the Flood Control Act of 1954. The plan of improvement consisted of the construction of a system of floodwalls and levees beginning at Mulberry Street and extending northward for about 1,600 feet along the Mississippi River, and then up the right bank of Mad Creek for about 2,700 feet to high ground north of East 6th Street. Appurtenant works included an intercepting sewer and pumping plant.

Construction of the project began in 1958 and was completed in 1960. The federal cost of the project was \$1,169,000; non-federal cost was \$32,000.

The project is operated and maintained by local interests. Since it was completed, it has prevented an estimated \$11,684,700 in damages.

Muscatine, Mad Creek
Completed Project, Section 205
(Rock Island District)

The project is located on the right bank of Mad Creek, a short distance upstream from the confluence of that stream with the Mississippi River at mile 455.8 above the mouth of the Ohio River, in the city of Muscatine, Iowa.

The project provides local protection to a 75-acre industrial area in Muscatine from coincidental floods on Mad Creek and the Mississippi River. The site is upstream from a previous federal flood control project on Mad Creek completed in 1961. The project consists of 1,010 feet of earth levees, 240 feet of concrete flood walls, a ponding area, a street closure, gatewalls, a bridge raise and railroad track modifications. Construction was started in 1977.

Completed in 1983, federal costs for the project were \$1,129,800; non-federal costs, \$50,000.



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004
September 21, 1992

Planning Division

Honorable Tom Harkin
United States Senator
Box 74884
Lindale Mall
Cedar Rapids, Iowa 52407-4884

Dear Senator Harkin:

I am writing in reference to your letter of September 8, 1992, regarding correspondence you received from Mr. Vernon Wilson of Muscatine, Iowa. Mr. Wilson requested assistance in dredging of Mad Creek in Muscatine, Iowa, to reduce the threat of flooding on the creek.

A local flood protection project on Mad Creek was authorized by a resolution of the House of Representatives Committee on Public Works on August 15, 1961. The project was completed in 1982, under authority of Section 205 of the 1948 Flood Control Act, as amended. The completed project consists of levees and floodwalls, which provide a 100-year level of protection from floods on Mad Creek and the Mississippi River.

Based on the Federal Emergency Management Agency floodplain map for the area, Mr. Wilson's home is located in the Mad Creek 100-year floodplain. His home is located slightly upstream of the area protected by the Mad Creek Flood Control Project. The city of Muscatine's operation and maintenance requirements for the Mad Creek Project include only the portion of Mad Creek within the project boundary.

Our records indicate that Mad Creek has experienced flood stages several times during the past five years, due primarily to heavy rainfalls and saturated soil conditions. Measures which could reduce the damages associated with these flood events include: prudent floodplain management; relocation or floodproofing of affected structures; construction of levees or floodwalls; and channel cleanout or modification (e.g., dredging or reshaping the affected stream).

The city of Muscatine also can request the Rock Island District to initiate a Section 205 reconnaissance study for the upstream reaches of Mad Creek in Muscatine, Iowa. Section 205 of the 1948 Flood Control Act, as amended, provides authority for the Corps of Engineers (Corps) to investigate small flood control projects at the request of a prospective sponsoring agency. This authority allows the Corps to develop and construct small flood control projects, if detailed investigation and study clearly show the engineering and environmental feasibility and economic justification of the improvement.

Each project is limited to a Federal cost of not more than \$5 million and requires a local sponsor, who must be fully empowered under State law, to provide local cooperation in the form of cost-sharing; operation and maintenance; and lands, easements, and rights-of-way. In addition, the local sponsor assumes full responsibility for all project costs in excess of the Federal cost limitation.

The initial study would be completed with 100 percent Federal funding. The purpose of the study would be to determine Federal interest in providing additional flood damage reduction measures along Mad Creek. Federal interest primarily is based on the economic costs and benefits, environmental impacts, and engineering feasibility of a proposal.

Subsequent stages of planning and construction, including feasibility phase study, preconstruction engineering and design, and construction, all require cost-sharing by the non-Federal sponsor.

Additional detail regarding non-Federal sponsor cost-sharing requirements is provided in the enclosed Sponsor's Partnership Kit, on pages F1 through F2. This brochure provides general information about the Corps and more detailed information about the Civil Works program. The Continuing Authorities Program brochure, also enclosed, provides additional information about the Section 205 process on pages 4 through 6, including a sample study request letter.

Flood damage reduction projects may require Department of the Army authorization. Therefore, if Mr. Wilson or another party wishes to pursue a project, a permit application should be filed with both the Corps and the State of Iowa. A copy of the permit application form is enclosed for your information.

I trust this information satisfies your present needs. If your staff members have further questions, they may call Mr. Dave Tipple, Chief of our Flood Control and Special Studies Branch, Planning Division, telephone 309/788-6361, extension 6341.

Sincerely,

ORIGINAL SIGNED BY

J. Ayers Fsr

Albert J. Kraus
Colonel, U.S. Army
District Engineer

Enclosures

MFR: Draft letter coordinated with OD-S, ED-HW, and ED-DM.

Copy Furnished:

Honorable Tom Harkin
United States Senate
Washington, DC 20510-1502 ((wo/enclosures))

TOM HARKIN
IOWA

(202) 224-3254
TTY (202) 224-4633
COMMITTEES
AGRICULTURE
APPROPRIATIONS
SMALL BUSINESS
LABOR AND HUMAN
RESOURCES

United States Senate
WASHINGTON, DC 20510-1502

September 8, 1992

Col Albert Kraus, District Engineer
Army Corps of Engineers
Clock Tower Building
Rock Island, IL 61204-2004

Dear Col. Kraus:

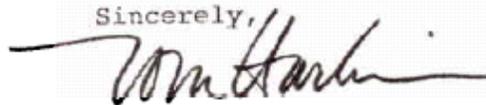
Enclosed is a letter I recently received from Vernon Wilson of Muscatine, IA.

Mr. Wilson is concerned about Mad Creek which flows near his home. Apparently the creek is badly silted in, causing it to flood more frequently. Is it possible to dredge the creek? And if so, whose responsibility is it to take care of the creek?

I would like to express my interest on behalf of Mr. Wilson. Please address the concerns raised in the letter and send your response to me through my Cedar Rapids office at the address listed below.

Thank you, in advance, for your assistance.

Sincerely,



Tom Harkin
United States Senator

TH/baf
Enclosure

210 WALNUT ST.
733 FEDERAL BLDG.
DES MOINES, IA 50309
(515) 284-4574

350 WEST 6TH ST.
315 FEDERAL BLDG.
DUBUQUE, IA 52001
(319) 582-2130

6TH AND BROADWAY, BOX H
317 FEDERAL BLDG.
COUNCIL BLUFFS, IA 51502
(712) 328-0036

BOX 74884
LINDALE MALL
CEDAR RAPIDS, IA 52407-4884
(319) 393-6374

131 E. 4TH ST.
314B FEDERAL BLDG.
DAVENPORT, IA 52801
(319) 322-1338

320 6TH ST.
110 FEDERAL BLDG.
SIOUX CITY, IA 51101
(712) 252-1550

92 SEP -8 AM 8:39

July 27, 1992
Muscatine, Iowa 5276.

Senator Tom Harkin,

Senator, I am writing to both you and
Senator Bradley - I need help!

I live in Muscatine, Iowa - my home
is located next to a creek, which floods
in heavy rains. and my house floods, also.

The city of Muscatine says it cannot do
any thing because it is the Corp of Engineers
responsibility, the Corp doesn't seem to want to
get involved.

The creek needs dredged out, bad,
it is slowly sitting in each rain and
it takes less and less of a rain storm to
bring it out of it's bank.

I realize that I'm a poor citizen and
requests for the pool are probably
discarded as ~~unimportant~~ ^{unimportant}, but please look
in to the matter, and possibly take some
action to help.

Thank you

VERNON WILCO
727 LAKE PARK
MUSCATINE, IOWA



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004
January 11, 1993

Planning Division

Honorable Charles E. Grassley
United States Senator
116 Federal Building
131 East 4th Street
Davenport, Iowa 52801

Dear Senator Grassley:

I am writing in reference to your letter of December 29, 1992, regarding correspondence you received from Mr. Vernon Wilson of Muscatine, Iowa. Mr. Wilson requested assistance in dredging of Mad Creek in Muscatine, Iowa, to reduce the threat of flooding on the creek.

A local flood protection project on Mad Creek was authorized by a resolution of the House of Representatives Committee on Public Works on August 15, 1961. The project was completed in 1982, under authority of Section 205 of the 1948 Flood Control Act, as amended. The completed project consists of levees and floodwalls, which provide a 100-year level of protection from floods on Mad Creek and the Mississippi River. Based on the Federal Emergency Management Agency floodplain map for the area, Mr. Wilson's home is located slightly upstream of the area protected by the Mad Creek Flood Control Project.

Our records indicate that Mad Creek has experienced flood stages several times during the past five years, due primarily to heavy rainfalls and saturated soil conditions. Measures which could reduce the damages associated with these flood events include: prudent floodplain management; relocation or floodproofing of affected structures; construction of levees or floodwalls; and channel cleanout or modification (e.g., dredging or reshaping the affected stream). However, the Rock Island District cannot take any further action in this area unless a request is received from a sponsoring agency empowered under State law to provide local cooperation. For example, the city of Muscatine can ask the Rock Island District to initiate a Section 205 reconnaissance study for the upstream reaches of Mad Creek in Muscatine, Iowa.

Section 205 of the 1948 Flood Control Act, as amended, provides authority for the Corps of Engineers (Corps) to investigate small flood control projects at the request of a prospective sponsoring agency. This authority allows the Corps to develop and construct small flood control projects, if detailed investigation and study clearly show the engineering and environmental feasibility and economic justification of the improvement.

Each project is limited to a Federal cost of not more than \$5 million and requires a local sponsor, who must be fully empowered under State law, to provide local cooperation in the form of cost-sharing; operation and maintenance; and lands, easements, and rights-of-way. In addition, the local sponsor assumes full responsibility for all project costs in excess of the Federal cost limitation.

The initial study would be completed with 100 percent Federal funding. The purpose of the study would be to determine Federal interest in providing additional flood damage reduction measures along Mad Creek. Federal interest primarily is based on the economic costs and benefits, environmental impacts, and engineering feasibility of a proposal.

Subsequent stages of planning and construction, including feasibility phase study, preconstruction engineering and design, and construction, all require cost-sharing by the non-Federal sponsor.

Additional detail regarding non-Federal sponsor cost-sharing requirements is provided in the enclosed Sponsor's Partnership Kit, on pages F1 through F2. This brochure provides general information about the Corps and more detailed information about the Civil Works program. The Continuing Authorities Program brochure, also enclosed, provides additional information about the Section 205 process on pages 4 through 6, including a sample study request letter.

Flood damage reduction projects may require Department of the Army authorization. Therefore, if anyone wishes to pursue a project, a permit application should be filed with both the Corps and the State of Iowa. A copy of the permit application form is enclosed for your information.

I trust this information satisfies your present needs. If your staff members have further questions, they may call Mr. Dave Tipple, Chief of our Flood Control and Special Studies Branch, Planning Division, telephone 309/788-6361, extension 6341.

Sincerely,


Albert J. Kraus
Colonel, U.S. Army
District Engineer

Enclosures

Copy Furnished:

Honorable Charles E. Grassley
United States Senate
135 Hart Senate Office Building
Washington, DC 20510 (wo/enclosures)

MFR: This same letter,
previously sent to Senator
Tom Harkin, dtd 9-21-92,
was coordinated with OD-S,
ED-HW, and ED-DM.

REPLY TO:

- 135 HART SENATE OFFICE BUILDING
WASHINGTON, DC 20510
(202) 224-3744
TTY: (202) 224-4479
- 721 FEDERAL BUILDING
210 WALNUT STREET
DES MOINES, IA 50309
(515) 284-4890
- 206 FEDERAL BUILDING
101 1ST STREET S.E.
CEDAR RAPIDS, IA 52401
(319) 399-2555

United States Senate

CHARLES E. GRASSLEY

REPLY TO:

- 103 FEDERAL COURTHOUSE BUILDING
320 6TH STREET
SIOUX CITY, IA 51101
(712) 233-3331
- 210 WATERLOO BUILDING
531 COMMERCIAL STREET
WATERLOO, IA 50701
(319) 232-6657
- 116 FEDERAL BUILDING
131 E. 4TH STREET
DAVENPORT, IA 52801
(319) 322-4331

December 29, 1992

U.S. Army Corp of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Director:

Enclosed please find a letter from Mr. Vernon Wilson regarding his concerns about a creek he believes needs to be dredged near Muscatine, Iowa.

I would appreciate any information you could provide me pertaining to this matter. You may address your return correspondence to the attention of Penny Horstmann in my Davenport office.

Thank you for your prompt attention to my request.

Sincerely,


CHARLES E. GRASSLEY
United States Senator

CEG/plh

Enclosure

APPROPRIATIONS
BUDGET

Committee Assignments:

JUDICIARY
SMALL BUSINESS

SPECIAL COMMITTEE ON AGING
OFFICE OF TECHNOLOGY ASSESSMENT

July 27, 1992
MUSCATINE, Iowa 52761

92 JUL 30 PM 3:13

Senator Charles Grassley.

Senator, my name is Vernon Wilson I live in Muscatine, Iowa - and I need help. (please)
My home is located next to Mack Creek here in Muscatine, and each heavy rain the creek floods and so does my home.

The city says it is the Corp of Engineers problem and the Corp refuses to do anything.

There must be something that you and Senator Harbun can do to help.

please don't write me off as just another poor fat piggy who shouldn't have bought his home by a creek.

The creek needs dredged, (bad) it is slowly silting in each rain.

Thank you

Vernon Wilson
727 LAKE PARK
MUSCATINE, Iowa
52761



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004
April 18, 1997

Planning Division

A. J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, Iowa 52761-3899

Dear A. Johnson:

We are writing in regard to your letter of November 25, 1996, addressed to Mr. Roger Less of our Engineering Division, requesting an update on your previous request for a reconnaissance study on Mad Creek as it flows through the city of Muscatine.

We are sorry we did not respond sooner, but after some research, we believe that your request could be handled under the authority of Section 205 of the U.S. Army Corps of Engineers' Continuing Authorities Program.

Please contact Mr. Martin Hudson of our Flood Control and Special Studies Branch to arrange a meeting to discuss this matter further. You may reach Mr. Hudson by telephoning 309/794/5341, or by writing to our address above, ATTN: Planning Division (Martin Hudson).

Sincerely,

**ORIGINAL SIGNED BY
PATRICK T. BURKE, P.E.**

Dudley M. Hanson, P.E.
Chief, Planning Division

City of Muscatine

City Hall, 215 Sycamore St.
Muscatine, IA 52761-3899
(319)264-1550 Voice/TT
Fax (319)264-0750

CITY ADMINISTRATOR

November 25, 1996

Roger Less
U.S. Army Engineering District
Rock Island Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

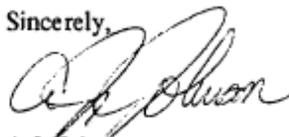
Dear Roger,

Several months ago the Mayor sent you a letter concerning the official request for the City of Muscatine for the Corps of Engineers to do a reconnaissance study on Mad Creek as it flows through the City of Muscatine. Since that letter, we have not received any additional information or update from you. At the request of the Mayor, I am forwarding that request on to you for an update on that project and how we would proceed if Council would choose to do so.

Please let me know at your earliest convenience as to what other action is necessary from the City of Muscatine to initiate this reconnaissance review and study of Mad Creek.

Thank you for your attention on this matter.

Sincerely,



A.J. Johnson
City Administrator

AJJ/fad



REPLY TO
ATTENTION OF:

Planning Division

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004
March 23, 1998

Mr. A. J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, Iowa 52761-3899

Dear Mr. Johnson:

The Rock Island District of the U.S. Army Corps of Engineers has attached a summary of the March 13, 1998, meeting with you and Messrs. Martin Hudson and Dennis Hamilton of our Planning Division's Flood Control and Special Studies Branch.

We are very pleased to be working with you on this feasibility study of the Mad Creek flood control facilities. If you have any questions concerning this study, please call Mr. Hamilton at 309/794-5634.

Sincerely,

ORIGINAL SIGNED BY

Dudley M. Hanson, P.E.
Chief, Planning Division

MEMORANDUM FOR RECORD

SUBJECT: Mad Creek Section 205 Study, Muscatine, Iowa

1. **PURPOSE:** A meeting was held on 13 March 1998 in Muscatine, Iowa, with the City Administrator, Mr. A. J. Johnson, and Rock Island District, Corps of Engineers (CEMVR) representatives to discuss initiation of the Mad Creek Flood Control Facilities Feasibility Study. A copy of the meeting handout is enclosed. The following were in attendance at the meeting:

<u>Name</u>	<u>Organization</u>	<u>Phone</u>
Martin Hudson	CEMVR-PD-F	309-794-5341
Dennis Hamilton	CEMVR-PD-F	309-794-5634
Leo Foley	CEMVR-PP-M	309-794-5791
A. J. Johnson	City of Muscatine	319-264-1550

2. The businesses located within the affected area include Hon Industries, H. J. Heinz, IES and a lumber company. Mr. Johnson will provide names of individuals to contact from each of these companies. The city plans to construct a new crossing of Mad Creek at 5th Street. This will be outside the scope of study. Mr. Johnson said that the Natural Resources Conservation Service is working on a preliminary design for retention ponds in the Mad Creek basin which could affect the flood control facilities. Mr. Ray Childs, the City Engineer, can provide information on this.

3. Mr. Hudson explained the planning process for Continuing Authorities Program projects. Before any project can be constructed, planning studies must be conducted to determine the project's feasibility. In a Section 205 Feasibility Study, the first \$100,000 is fully funded by the Federal Government. All remaining costs of the study are equally shared between the Federal Government and the sponsor.

4. The first phase of the Feasibility Study is usually completed in 12 months or less and accomplishes the following purposes:

- Defines the problems and opportunities and identifies potential solutions;
- Determines whether or not planning should proceed, based on a preliminary appraisal of the Federal interest, costs, benefits, and environmental impacts of the identified potential solutions;
- Estimates the costs of further study and develops a Project Study Plan (PSP) to determine the actual work items to be included in the Detailed Project Report (DPR); and,
- Assesses the support of local interests for continued planning and eventual construction of a project.

CEMVR-PD-F

SUBJECT: Mad Creek Section 205 Study, Muscatine, Iowa

5. A Feasibility Cost-Sharing Agreement (FCSA) must be in place prior to expenditures of funds beyond the first \$100,000 of Federal funds. At least 50 percent of the non-Federal share will be in cash; the remaining 50 percent of the non-Federal or sponsor's share may be contributed as in-kind products or services. The Feasibility Study results in a DPR which provides recommendations to Congress for or against Federal participation in solutions to the water resource problems and opportunities identified in the study.

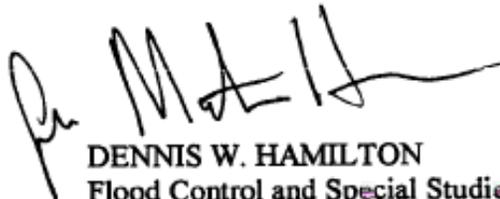
6. A tentative time line of completion dates is as follows:

Initiate Feasibility Study	April 1998
Complete initial planning and PSP	April 1999
Sign FCSA and initiate DPR (when non-Federal cost-share funds are necessary)	May 1999
Complete Feasibility Study and DPR	May 2001

7. After completion of the Feasibility Study, preparation of plans and specifications (P&S) for the selected plan or plans will take approximately 2 years. After P&S are complete, construction contracts are bid. The non-Federal sponsor is responsible for a 35-percent share of the cost of P&S and construction.

8. The point of contact from CEMVR for this study will be Mr. Dennis Hamilton, telephone: 309/794-5634; email address: dennis.w.hamilton@usace.army.mil.

Encl



DENNIS W. HAMILTON
Flood Control and Special Studies Branch
Planning Division



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

CEMVR-PM-MF (1105-2-10b)

16 November 1998

MEMORANDUM FOR Commander, U.S. Army Engineer Division, Mississippi Valley
ATTN: CEMVD-PM-E (Lexine Cool) 1400 Walnut Street,
P.O. Box 80, Vicksburg, Mississippi 39180-0080

SUBJECT: Mad Creek at Muscatine, Iowa, Section 205 Flood Control Study (PWI 150096)

1. Reference Engineer Circular 1105-2-211, 15 February 1996, subject: Continuing Authorities Program Procedures, which requires that for studies conducted under the Continuing Authorities Program an early milestone be established "to assess the scope of the study to determine if further study appears warranted, and, if so, whether study will require cost sharing." The purpose of this memorandum is to fulfill that requirement.
2. Study Area Description:
 - a. The Mad Creek study area is located along the Mississippi River in Muscatine, Iowa. The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of Muscatine and areas north of Muscatine in Muscatine County. The upstream portion of the watershed north of Muscatine is primarily agricultural land, but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before entering into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subject to flash flooding.
 - b. In 1960 the Corps of Engineers completed construction of floodwalls and levees along the lower portion of Mad Creek to protect the city from Mississippi River floodwaters backing up the creek. This system was improved and extended in 1983 to protect the city from Mad Creek flooding. The recent commercial and residential development in the upper portion of the watershed, however, appears to have increased the rate of runoff into Mad Creek and the frequency of flooding. In addition, increased commercial and industrial development in downtown Muscatine, and particularly near Mad Creek, has greatly increased the potential for flood damages.
 - c. In 1996, the city of Muscatine requested the assistance of the Corps of Engineers to perform a feasibility study to assess the existing flood control measures along Mad Creek to determine if additional measures are warranted to prevent damages from flooding. We are conducting this study in response to that request. The feasibility study was initiated in July 1998.

3. Study Findings:

a. A 1996 preliminary investigation by the Natural Resources Conservation Service (NRCS) estimated the 100-year discharge in Mad Creek to be 10,300 cubic feet per second at the mouth of the stream. This is approximately the same discharge used for design of the 1983 project at Mad Creek, but is 34 percent above the discharge developed for the July 1977 Flood Insurance Study. The hydraulic model developed for design of the 1983 project, however, does not accurately reflect current conditions and does not appear to provide reliable results. Actual flood levels have appeared to be higher than predicted by the hydraulic modeling. Additional hydraulic modeling using updated topographic and hydrologic data is needed to accurately determine the projected flood profiles.

b. A site tour of the study area has revealed a large degree of industrial development near Mad Creek and a large increase in potential flood damages since the construction of Federal flood protection projects in 1960 and 1983.

c. Preliminary study findings indicate that raising portions of the existing levees and floodwalls and extending the existing flood protection system further upstream is technically feasible and is likely the best alternative to reduce the potential flood damages. Four primary alternatives have been considered for reducing the flooding hazard: 1) raising and extending the existing floodwall and levee system, 2) constructing storm water detention reservoirs, 3) a combination of floodwalls and levees and storm water detention reservoirs, and 4) an enhanced early flood warning system to better react to flash floods.

4. We recommend the subject study be completed as scheduled. Our initial assessment indicates that a viable and implementable plan can be developed that will meet the necessary Federal interest criteria. Local flood protection is necessary to reduce the flash flood hazard to Muscatine businesses and residences along Mad Creek. Implementation of a successful project in Muscatine is likely, and the local sponsor strongly supports this study.

5. The local sponsor for the project is the city of Muscatine, Iowa. They have sponsored previous Corps of Engineers projects and are financially sound and fully capable of fulfilling required cost sharing for project implementation. We anticipate no difficulties in executing a Project Cooperation Agreement with the sponsor should improvements be recommended and approved.

6. We request your concurrence in completing the subject study. We anticipate that cost sharing will be required to complete the study. The total estimated cost of the feasibility study is \$540,000; however a detailed project study plan will be prepared to more accurately determine the study cost. A Quality Control Plan that includes a proposed study schedule is enclosed for your information (See Enclosure 1).

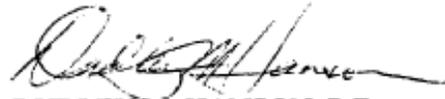
CEMVR-PM-MF

SUBJECT: Mad Creek at Muscatine, Iowa, Section 205 Flood Control Study (PWI 150096)

7. A project location map also is enclosed (See Enclosure 2). An electronic version of this map will be e:mailed to you.

FOR THE COMMANDER:

2 Encls



DUDLEY M. HANSON, P.E.
Chief, Planning, Programs, and
Project Management Division

CEMVD-PM-E (CEMVR-PM-MF/16 Nov 98) (1105-2-10c) 1st End
Mrs. Cool/cdl/5830
SUBJECT: Mad Creek at Muscatine, Iowa, Section 205 Flood
Control Study (PWI 150096)

CDR, Mississippi Valley Division, Vicksburg, MS 39181-0080

04 JAN 1999

For Commander, Rock Island District, ATTN: CEMVR-PM-MF

Based on additional economic information provided by E-mail on
15 Dec 98, concur in continuing subject study. Every effort
should be made to hold study costs down as much as possible.
Keep the level of detail only to that which is necessary.

FOR THE COMMANDER:

Encls
wd

For *Michael R. Hande*
GEORGE H. RHODES, JR.
Chief, Programs Execution
Division

CF: HUDSON/HAMILTON
DAN JOHNSON



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

CEMVR-PM-MF (1105-2-10b)

6 November 1998
(Revised 15 Dec 98)

MEMORANDUM FOR Commander, U.S. Army Engineer Division, Mississippi Valley
ATTN: CEMVD-PM-E (Lexine Cool) 1400 Walnut Street,
P.O. Box 80, Vicksburg, Mississippi 39180-0080

SUBJECT: Mad Creek at Muscatine, Iowa, Section 205 Flood Control Study (PWI 150096)

1. Reference Engineer Circular 1105-2-211, 15 February 1996, subject: Continuing Authorities Program Procedures, which requires that for studies conducted under the Continuing Authorities Program an early milestone be established "to assess the scope of the study to determine if further study appears warranted, and, if so, whether study will require cost sharing." The purpose of this memorandum is to fulfill that requirement.

2. Study Area Description:

a. The Mad Creek study area is located along the Mississippi River in Muscatine, Iowa. The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of Muscatine and areas north of Muscatine in Muscatine County. The upstream portion of the watershed north of Muscatine is primarily agricultural land, but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before entering into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subject to flash flooding.

b. In 1960 the Corps of Engineers completed construction of floodwalls and levees along the lower portion of Mad Creek to protect the city from Mississippi River floodwaters backing up the creek. This system was improved and extended in 1983 to protect the city from Mad Creek flooding. The recent commercial and residential development in the upper portion of the watershed, however, appears to have increased the rate of runoff into Mad Creek and the frequency of flooding. In addition, increased commercial and industrial development in downtown Muscatine, and particularly near Mad Creek, has greatly increased the potential for flood damages.

c. In 1996, the city of Muscatine requested the assistance of the Corps of Engineers to perform a feasibility study to assess the existing flood control measures along Mad Creek to determine if additional measures are warranted to prevent damages from flooding. We are conducting this study in response to that request. The feasibility study was initiated in July 1998.

3. Study Findings:

a. A 1996 preliminary investigation by the Natural Resources Conservation Service (NRCS) estimated the 100-year discharge in Mad Creek to be 10,300 cubic feet per second at the mouth of the stream. This is approximately the same discharge used for design of the 1983 project at Mad Creek, but is 34 percent above the discharge developed for the July 1977 Flood Insurance Study. The hydraulic model developed for design of the 1983 project, however, does not accurately reflect current conditions and does not appear to provide reliable results. Actual flood levels have appeared to be higher than predicted by the hydraulic modeling. Additional hydraulic modeling using updated topographic and hydrologic data is needed to accurately determine the projected flood profiles.

b. A site tour of the study area has revealed a large degree of industrial development near Mad Creek and a large increase in potential flood damages since the construction of Federal flood protection projects in 1960 and 1983.

c. Preliminary study findings indicate that raising portions of the existing levees and floodwalls and extending the existing flood protection system further upstream is technically feasible and is likely the best alternative to reduce the potential flood damages. Four primary alternatives have been considered for reducing the flooding hazard: 1) raising and extending the existing floodwall and levee system, 2) constructing storm water detention reservoirs, 3) a combination of floodwalls and levees and storm water detention reservoirs, and 4) an enhanced early flood warning system to better react to flash floods.

4. We recommend the subject study be completed as scheduled. Our initial assessment indicates that a viable and implementable plan can be developed that will meet the necessary Federal interest criteria. Local flood protection is necessary to reduce the flash flood hazard to Muscatine businesses and residences along Mad Creek. Implementation of a successful project in Muscatine is likely, and the local sponsor strongly supports this study.

5. The local sponsor for the project is the city of Muscatine, Iowa. They have sponsored previous Corps of Engineers projects and are financially sound and fully capable of fulfilling required cost sharing for project implementation. We anticipate no difficulties in executing a Project Cooperation Agreement with the sponsor should improvements be recommended and approved.

6. We request your concurrence in completing the subject study. We anticipate that cost sharing will be required to complete the study. The total estimated cost of the feasibility study is \$540,000; however a detailed project study plan will be prepared to more accurately determine the study cost. A Quality Control Plan that includes a proposed study schedule is enclosed for your information (See Enclosure 1).

CEMVR-PM-MF

SUBJECT: Mad Creek at Muscatine, Iowa, Section 205 Flood Control Study (PWI 150096)

7. A project location map also is enclosed (See Enclosure 2). An electronic version of this map will be e:mailed to you.

FOR THE COMMANDER:

2 Encls



DUDLEY M. HANSON, P.E.
Chief, Planning, Programs, and
Project Management Division

ADDENDUM
TO
16 NOVEMBER 1998 MEMORANDUM
FOR
CORPS OF ENGINEERS' MISSISSIPPI VALLEY DIVISION (CEMVD)

SUBJECT: MAD CREEK AT MUSCATINE, IOWA

Insert the following paragraph in "3. Study Findings":

"d. Preliminary economic investigation indicates that considerable dollars have been invested in new and renovated properties within the Mad Creek watershed. One major industry has invested \$5-6 million in construction activity, some of which is still underway. This activity includes a major plant expansion and a new distribution center. There has also been commercial development in downtown Muscatine since the system was improved and extended in 1983. This increase in capital investments significantly increases the value of the property protected by the existing levee system.

Commercial and residential development has occurred in the upper portion of the watershed, increasing the rate of runoff into Mad Creek and the frequency of flooding. Preliminary hydraulic analysis indicates that the stage-frequency data used in the 1983 assessment does not reflect current conditions and that the existing levee offers a lower level of protection than the original design, placing properties in the protected area at greater risk.

An existing-condition property inventory is not available. Based on information from the 1981 study report (updated to 1998 price levels), damage associated with a Standard Project Flood would be approximately \$22,500,000. The addition of \$6,000,000 for industrial expansion would increase this damage estimate by 27 percent to nearly \$28,500,000. A preliminary cost estimate of the most likely alternative, raising levees and floodwalls, is \$2,000,000. The moderate estimated cost of project improvements, coupled with the additional floodplain capital investment and an increase in risk of flooding, will likely result in a positive benefit-to-cost relationship.

Based upon these preliminary findings, there appears to be a Federal interest in performing a feasibility study to determine if additional flood control measures are warranted."



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

February 24, 1999

Planning, Programs, and
Project Management Division

Mr. A. J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, Iowa 52761-3899

Dear Mr. Johnson:

The Rock Island District of the U.S. Army Corps of Engineers has completed the Initial Assessment of the Mad Creek Section 205 Flood Control Study. This Initial Assessment indicates that further study is warranted. We are enclosing a copy of the approved Initial Assessment memorandum which includes an Addendum dated December 15, 1998 (Enclosure 1).

We are now preparing a draft Project Study Plan that will describe the scope of work and estimated costs for the feasibility study. Feasibility study costs in excess of \$100,000 require a 50-50 cost share between the local sponsor and the Government. The Project Study Plan will be the basis for development of a Feasibility Cost-Sharing Agreement. We are providing a draft copy of the Feasibility Cost-Sharing Agreement for your review (Enclosure 2).

We will be contacting you soon to schedule a meeting to discuss development of the Project Study Plan and the Feasibility Cost-Sharing Agreement.

If you have any questions concerning this study, please call Mr. Dennis Hamilton of this office at 309/794-5634.

Sincerely,

ORIGINAL SIGNED BY

Dudley M. Hanson

Dudley M. Hanson, P.E.
Chief, Planning, Programs and
Project Management Division

Enclosures

QUALITY CONTROL PLAN

Continuing Authorities Program Section 205 of the 1946 Flood Control Act Flood Damage Reduction Project

1. **Date:** 6 July 1999
2. **Reference:** Rock Island District (CEMVR) Quality Management Plan (QMP) dated 30 May 1997.
3. **Project Title:** Mad Creek Section 205 Project, Muscatine, Iowa, PWI 150096
4. **Project Description:** The city of Muscatine is located in eastern Iowa along the Mississippi River. The Mad Creek watershed drains approximately 17.5 square miles. The upstream portion of the watershed north of Muscatine is primarily agricultural land, but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial and residential uses before entering into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subject to flash flooding.

The Corps of Engineers (Corps) constructed floodwalls and levees along the lower portion of Mad Creek in 1961 to protect the city from Mississippi River floodwaters backing up the creek. This system was improved and extended in 1983. The city of Muscatine has requested the assistance of the Corps to perform a feasibility study to assess the existing flood control measures along Mad Creek to determine if additional measures are warranted. This study will be conducted by the Corps' Rock Island District staff.

5. **Product:** The product of the feasibility study is a Detailed Project Report (DPR) currently estimated to cost \$560,000. This product is cost-shared 50% Federal, 50% non-Federal.

6. **Labor Charge Codes:**

Planning, Programs, and Project Management Division (PM)	L07201
Engineering Division (ED)	L07202
Real Estate (RE)	L07461

7. **Product Development Team Members:**

<u>Name</u>	<u>Discipline</u>	<u>Organization</u>
Perry Hubert	Project Manager	PM-M
Clarice Sundeen	Plan Formulation	PM-M
Roger Less	Engineering	ED-DM
George Staley	Hydrology & Hydraulics	ED-HH
Sibte Zaidi	Geotechnical	ED-G
Erika Mark	Environmental Analysis	PM-R
Jim Ross	Cultural Resources	PM-R
Sharryn Jackson	Economic Analysis	PM-A
Karen Grizzle	Real Estate	RE-A

8. **Site Visits:** Product development team members and reviewers will coordinate with the Project Manager to make site visits during preparation of the Detailed Project Report as needed.

9. **Coordination/Communication:** Coordination will be made with Engineering Division for hydraulic and hydrologic data, surveys, geotechnical engineering, environmental engineering, project design, cost engineering, and technical engineering components. Coordination also will be made with Real Estate Division for development of a Real Estate Plan. Within the Planning, Programs, and Project Management Division, coordination will be made for plan formulation, social economic analysis and environmental compliance considerations. External coordination will be maintained with the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the State Historic Preservation Office, and other appropriate Federal, State and local agencies, and special interest groups as necessary. Communication will be maintained via meetings, telephone contact, postal and electronic mail.

Product team members and reviewers are responsible for reading all written documents related to the project and for attending project meetings as appropriate. Regularly scheduled project meetings will be held and used as a forum for discussing issues related to product quality. Individual team members and reviewers are responsible for communicating issues, concerns and problems, especially related to the project schedule and costs, to the Project Manager as soon as they are recognized, so that appropriate solutions can be developed in a timely fashion.

10. **Design Tools:** Pertinent regulations include, but are not limited to, ER 5-1-11, Program and Project Management; ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies; ER 1110-2-1150, Engineering and Design for Civil Works Projects; Chapter 12 of ER 405-1-12 for Real Estate Plans, and EC 1105-2-211, Continuing Authorities Program Procedures, as well as appropriate Engineering Manuals. Plates and drawings will be prepared using CADD. Cost estimates will be prepared using MCACES. The feasibility study will be completed using English units of measure. Use of Metric units is not cost effective for this project since it would require conversion of existing hydrologic and survey data and modeling.

11. **Reviews:**

a. **Environmental:** Coordination with CEMVR's Environmental Analysis Branch (PM-R) regarding environmental statute compliance (i.e., National Environmental Policy Act, Endangered Species Act, Fish and Wildlife Coordination Act, National Historic Preservation Act) and with Engineering Division, Design Branch, Environmental Engineering Section (ED-DN) regarding environmental hazard, safety analysis, and pollution control compliance (i.e., Comprehensive Environmental Response, Compensation, and Liability Act; Resource Conservation and Recovery Act; Clean Air Act; and Clean Water Act) will be initiated as appropriate. The Project Manager will provide such project information to allow appropriate documentation and coordination as necessary.

b. **Internal Product Review:** The product development team is responsible for producing a high quality product to meet the needs of the customer. Technical supervisors will assure that each team member's technical work is checked for completeness, accuracy, and clarity by other experienced technical persons who have been involved with similar work. Internal reviews will be documented through certification of a product development team checklist. Further reviews will not proceed before all checks have been accomplished.

c. Independent Technical Review (ITR). The ITR team will consist of appropriate personnel from the following organizations in the Rock Island District:

Planning, Programs, and Project Management Division:

Project Management Branch	PM-M
Environmental Analysis Branch	PM-R
Economics & Social Analysis Branch	PM-A

Engineering Division:

Cost Engineering Branch	ED-C
Design Branch, Project Management Section	ED-DM
Design Branch, Environmental Engineering Section	ED-DN
Geotechnical Branch	ED-G
Hydrology and Hydraulics Branch	ED-H

Real Estate Division: RE

The ITR Team members will not have been directly involved with development of the DPR. The expertise and technical backgrounds of the team members will qualify the team to provide a comprehensive technical review of this project. An interim ITR will be performed at the 70-percent-complete level and a final ITR will be scheduled at the 95-percent-complete level. All comments resulting from their review will be resolved in accordance with the QMP.

d. Review Documentation. Copies of documentation of all review comments and responses, along with the signed QCP and Technical, and Policy Compliance Checklist will be provided to the Chief of the Project Management Branch and the Assistant Chief of Design Branch.

12. **Approval:** Final approval of the product is accomplished when the Technical and Compliance Checklist is signed by the District Engineer.

13. **Quality Control:** Quality control will be assured by resolution of comments received at the above-listed product reviews.

14. **Schedule:** The timeframe for completing this feasibility study is 3 years from the date of receipt of the initial expenditure of the Headquarters, U.S. Army Corps of Engineers' work allowance. The Project Manager will monitor schedule and costs during formulation and design. Following is a detailed schedule of significant milestones and reviews:

<u>Event:</u>	<u>Date:</u>
Received Initial Work Allowance	1 May 1998
Complete Initial Assessment/CAP Fact Sheet	6 November 1998
Begin Project Study Plan (PSP)	1 December 1998
Complete Preliminary design and cost estimates	1 February 1999
Begin negotiating FCSA	24 February 1999
Complete PSP	15 April 1999
Execute FCSA	1 August 1999
Interim ITR	1 July 2000

Event:

Date:

Draft DPR	15 September 2000
Complete NEPA Coordination and Public Review	20 October 2000
Letter of Assurance from Sponsor	15 November 2000
Final ITR	10 December 2000
Comment Resolution	1 February 2001
Submit DPR and Draft PCA to Mississippi Valley Division	1 April 2001

15. **Cost Monitoring and Control:** Schedule and costs during the feasibility study will be monitored by the Project Manager. The Project Manager will be promptly notified of significant cost variations and funding needs.

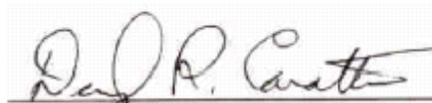
SIGNATURES:

SUBMITTED BY:


Project Manager

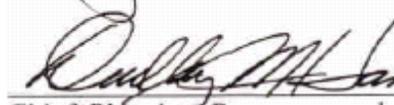
7/9/99
Date

REVIEWED BY:


Chief, Project Management Branch

7/27/99
Date

APPROVED BY:


Chief, Planning, Programs, and
Project Management Division

7/23/99
Date


Chief, Real Estate Division

7/16/99
Date


Chief, Engineering Division

7/22/99
Date

CF:
Dist File (PM)
PM-M
Product Development Team Members
ED
ED-D
RE



REPLY TO
ATTENTION OF:

Planning, Programs, and
Project Management Division

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

October 25, 1999

Mr. A. J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, Iowa 52761-3899

Dear Mr. Johnson:

I am writing to request the City of Muscatine to sign the final version of the Feasibility Cost Sharing Agreement (Agreement) for the Mad Creek Section 205 Flood Damage Reduction Feasibility Study, Muscatine, Iowa (Enclosure 1). The Agreement has been revised in accordance with the City's comments furnished during our telephone conversation earlier today.

It is my understanding that Mayor Richard W. O'Brien will be in attendance to sign the Agreement on October 26, 1999, when we meet in your office at 10 a.m. After signature by Mayor O'Brien, I will ask Colonel James Mudd, District Engineer, to sign the Agreement for the Department of the Army, and I will return a fully executed copy of the Agreement to you for your files.

Immediately after the Agreement is fully executed, I will be requesting the initial non-Federal funds from you to allow us to begin the study.

If you have any questions, please feel free to call me at 309/794-5554, or you may write me at the following address:

ATTN: Project Management Branch (Perry Hubert)
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

ORIGINAL SIGNED BY

Perry A. Hubert, P.E.
Project Manager

Enclosure

**AGREEMENT
BETWEEN THE DEPARTMENT OF THE ARMY
AND
THE CITY OF MUSCATINE, IOWA
FOR THE MAD CREEK SECTION 205 FLOOD CONTROL STUDY**

THIS AGREEMENT is entered into this 26TH day, of OCTOBER, 1999, by and between the Department of the Army (hereinafter the "Government"), represented by the District Engineer executing this Agreement, and the City of Muscatine, Iowa (hereinafter the "Sponsor"),

WITNESSETH, that

WHEREAS, the Congress has authorized the U.S. Army Corps of Engineers, Rock Island District, to conduct studies of Mad Creek at Muscatine, Iowa, pursuant to the authority provided by Section 205, Flood Control Act of 1948 (Public Law [PL] 80-858), as amended; and

WHEREAS, the U.S. Army Corps of Engineers has conducted a reconnaissance study of flooding at Mad Creek in Muscatine, Iowa, pursuant to this authority, and has determined that further study in the nature of a "Feasibility Phase Study" (hereinafter the "Study") is required to fulfill the intent of the study authority and to assess the extent of the Federal interest in participating in a solution to the identified problem; and

WHEREAS, Section 105 of the Water Resources Development Act of 1986 (PL 99-662, as amended) specifies the cost-sharing requirements applicable to the Study; and

WHEREAS, the Sponsor has the authority and capability to furnish the cooperation hereinafter set forth and is willing to participate in study cost sharing and financing in accordance with the terms of this Agreement; and

WHEREAS, the Sponsor and the Government understand that entering into this Agreement in no way obligates either party to implement a project and that whether the Government supports a project authorization and budgets it for implementation depends upon, among other things, the outcome of the Study and whether the proposed solution is consistent with the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and with the budget priorities of the Administration;

NOW THEREFORE, the parties agree as follows:

ARTICLE I - DEFINITIONS

For the purposes of this Agreement:

A. The term "Study Costs" shall mean all disbursements by the Government pursuant to this Agreement, from Federal appropriations or from funds made available to the Government by the Sponsor, and all negotiated costs of work performed by the Sponsor pursuant to this Agreement. Study Costs shall include, but not be limited to: labor charges; direct costs; overhead expenses; supervision and administration costs; the costs of participation in Study Management and Coordination in accordance with Article IV of this Agreement; the costs of contracts with third parties, including termination or suspension charges; and any termination or suspension costs associated with this Agreement (ordinarily defined as those costs necessary to terminate ongoing contracts or obligations and to properly safeguard the work already accomplished).

B. The term "estimated Study Costs" shall mean the estimated cost of performing the Study as of the effective date of this Agreement, as specified in Article III.A. of this Agreement.

C. The term "excess Study Costs" shall mean Study Costs that exceed the estimated Study Costs and that do not result from mutual agreement of the parties, a change in Federal law that increases the cost of the Study, or a change in the scope of the Study requested by the Sponsor.

D. The term "study period" shall mean the time period for conducting the Study, commencing with the release to the U.S. Army Corps of Engineers, Rock Island District, of initial Federal feasibility funds following the execution of this Agreement and ending with the Chief of Engineers' acceptance of the Study.

E. The term "PSP" shall mean the Project Study Plan, which is attached to this Agreement and which shall not be considered binding on either party and is subject to change by the Government, in consultation with the Sponsor.

F. The term "negotiated costs" shall mean the costs of in-kind services to be provided by the Sponsor in accordance with the PSP.

G. The term "fiscal year" shall mean one fiscal year of the Government. The Government fiscal year begins on October 1 and ends on September 30.

ARTICLE II - OBLIGATIONS OF PARTIES

A. The Government, using funds and in-kind services provided by the Sponsor and funds appropriated by the Congress of the United States, shall expeditiously prosecute and complete the Study, in accordance with the provisions of this Agreement and Federal laws, regulations, and policies.

B. In accordance with this Article and Article III.A., III.B. and III.C. of this Agreement, the Sponsor shall contribute cash and in-kind services equal to 50 percent of Study Costs other than excess Study Costs. The Sponsor may, consistent with applicable laws and regulations, contribute up to 25 percent of Study Costs through the provision of in-kind services. The in-kind services to be provided by the Sponsor, the estimated negotiated costs for those services, and the estimated schedule under which those services are to be provided are specified in the PSP. Negotiated costs shall be subject to an audit by the Government to determine reasonableness, allocability, and allowability.

C. The Sponsor shall pay a 50-percent share of excess Study Costs in accordance with Article III.D. of this Agreement.

D. The Sponsor understands that the schedule of work may require the Sponsor to provide cash or in-kind services at a rate that may result in the Sponsor temporarily diverging from the obligations concerning cash and in-kind services specified in paragraph B. of this Article. Such temporary divergences shall be identified in the quarterly reports provided for in Article III.A. of this Agreement and shall not alter the obligations concerning costs and services specified in paragraph B. of this Article or the obligations concerning payment specified in Article III of this Agreement.

E. If, upon the award of any contract or the performance of any in-house work for the Study by the Government or the Sponsor, cumulative financial obligations of the Government and the Sponsor would result in excess Study Costs, the Government and the Sponsor agree to defer award of that and all subsequent contracts, and performance of that and all subsequent in-house work for the Study until the Government and the Sponsor agree to proceed. Should the Government and the sponsor require time to arrive at a decision, the Agreement will be suspended in accordance with Article X., for a period of not to exceed 6 months. In the event the Government and the sponsor have not reached an agreement to proceed by the end of their 6-month period, the Agreement may be subject to termination in accordance with Article X.

F. No Federal funds may be used to meet the Sponsor's share of Study Costs unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

G. The award and management of any contract with a third party in furtherance of this Agreement which obligates Federal appropriations shall be exclusively within the control of the Government. The award and management of any contract by the Sponsor with a third party in furtherance of this Agreement which obligates funds of the Sponsor and does not obligate Federal appropriations shall be exclusively within the control of the Sponsor, but shall be subject to applicable Federal laws and regulations.

ARTICLE III - METHOD OF PAYMENT

A. The Government shall maintain current records of contributions provided by the parties, current projections of Study Costs, current projections of each party's share of Study Costs, and current projections of the amount of Study Costs that will result in excess Study Costs. At least quarterly, the Government shall provide the Sponsor a report setting forth this information. As of the effective date of this Agreement, estimated Study Costs are \$556,000, and the Sponsor's share of estimated Study Costs is \$270,000. In order to meet the Sponsor's cash payment requirements for its share of estimated Study Costs, the Sponsor must provide a cash contribution currently estimated to be \$270,000. The dollar amounts set forth in this Article are based upon the Government's best estimates, which reflect the scope of the study described in the PSP, projected costs, price-level changes, and anticipated inflation. Such cost estimates are subject to adjustment by the Government and are not to be construed as the total financial responsibilities of the Government and the Sponsor.

B. The Sponsor shall provide its cash contribution required under Article II.B. of this Agreement in accordance with the following provisions:

1. For purposes of budget planning, the Government shall notify the Sponsor by January 1 of each year of the estimated funds that will be required from the Sponsor to meet the Sponsor's share of Study Costs for the upcoming fiscal year.

2. No later than 30 calendar days prior to the scheduled date for the Government's issuance of the solicitation for the first contract for the Study or for the Government's anticipated first significant in-house expenditure for the Study, the Government shall notify the Sponsor in writing of the funds the Government determines to be required from the Sponsor to meet its required share of Study Costs for the first fiscal year of the Study. No later than 21 calendar days thereafter, the Sponsor shall provide the Government the full amount of the required funds by delivering a check payable to "FAO, USAED, Rock Island District" to the District Engineer.

3. For the second and subsequent fiscal years of the Study, the Government shall, no later than 60 calendar days prior to the beginning of the fiscal year, notify the Sponsor in writing of the funds the Government determines to be required from the Sponsor to meet its required share of Study Costs for that fiscal year, taking into account any temporary divergences identified under Article II.C. of this Agreement. No later than 30 calendar days prior to the beginning of the fiscal year, the Sponsor shall make the full amount of the required funds available to the Government through the funding mechanism specified in paragraph B.2. of this Article.

4. The Government shall draw from the funds provided by the Sponsor such sums as the Government deems necessary to cover the Sponsor's share of contractual and in-house fiscal obligations attributable to the Study as they are incurred.

5. In the event the Government determines that the Sponsor must provide additional funds to meet its share of Study Costs, the Government shall so notify the Sponsor in writing. No later than 60 calendar days after receipt of such notice, the Sponsor shall make the full amount of the additional required funds available through the funding mechanism specified in paragraph B.2. of this Article.

C. Within 90 days after the conclusion of the Study Period or termination of this Agreement, the Government shall conduct a final accounting of Study Costs, including disbursements by the Government of Federal funds, cash contributions by the Sponsor, the amount of any excess Study Costs, and credits for the negotiated costs of the Sponsor, and shall furnish the Sponsor with the results of this accounting. Within 30 days thereafter, the Government, subject to the availability of funds, shall reimburse the Sponsor for the excess, if any, of cash contributions and credits given over its required share of Study Costs, other than excess Study Costs, or the Sponsor shall provide the Government any cash contributions required for the Sponsor to meet its required share of Study Costs other than excess Study Costs.

D. The Sponsor shall provide its cash contribution for excess Study Costs as required under Article II.C. of this Agreement by delivering a check payable to "FAO, USAED, Rock Island District" to the District Engineer as follows:

1. After the project that is the subject of this Study has been authorized for construction, no later than the date on which a Project Cooperation Agreement is entered into for the project; or

2. In the event the project that is the subject of this Study is not authorized for construction by a date that is no later than 5 years of the date of the final report of the Chief of Engineers concerning the project, or by a date that is no later than 2 years after the date of the termination of the study, the Sponsor shall pay its share of excess costs on that date (5 years after the date of the Chief of Engineers or 2 years after the date of the termination of the study).

ARTICLE IV - STUDY MANAGEMENT AND COORDINATION

A. To provide for consistent and effective communication, the Sponsor and the Government shall appoint named senior representatives to an Executive Committee. Thereafter, the Executive Committee shall meet regularly until the end of the Study Period.

B. Until the end of the Study Period, the Executive Committee shall generally oversee the Study consistently with the PSP.

C. The Executive Committee may make recommendations that it deems warranted to the District Engineer on matters that it oversees, including suggestions to avoid potential sources of dispute. The Government in good faith shall consider such recommendations. The Government has the discretion to accept, reject, or modify the Executive Committee's recommendations.

D. The Executive Committee shall appoint representatives to serve on a Study Management Team. The Study Management Team shall keep the Executive Committee informed of the progress of the Study and of significant pending issues and actions, and shall prepare periodic reports on the progress of all work items identified in the PSP.

E. The costs of participation in the Executive Committee (including the cost to serve on the Study Management Team) shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

ARTICLE V - DISPUTES

As a condition precedent to a party bringing any suit for breach of this Agreement, that party must first notify the other party in writing of the nature of the purported breach and seek in good faith to resolve the dispute through negotiation. If the parties cannot resolve the dispute through negotiation, they may agree to a mutually acceptable method of non-binding alternative dispute resolution with a qualified third party acceptable to both parties. The parties shall each pay 50 percent of any costs for the services provided by such a third party as such costs are incurred. Such costs shall not be included in Study Costs. The existence of a dispute shall not excuse the parties from performance pursuant to this Agreement.

ARTICLE VI - MAINTENANCE OF RECORDS

A. Within 60 days of the effective date of this Agreement, the Government and the Sponsor shall develop procedures for keeping books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to this Agreement to the extent and in such detail as will properly reflect total Study Costs. These procedures shall incorporate, and apply as appropriate, the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to state and local governments at 32 C.F.R. Section 33.20. The Government and the Sponsor shall maintain such books, records, documents, and other evidence in accordance with these procedures for a minimum of 3 years after completion of the Study and resolution of all relevant claims arising therefrom. To the extent permitted under applicable Federal laws and regulations, the Government and the Sponsor shall each allow the other to inspect such books, documents, records, and other evidence.

B. In accordance with 31 U.S.C. Section 7503, the Government may conduct audits in addition to any audit that the Sponsor is required to conduct under the Single Audit Act of 1984, 31 U.S.C. Sections 7501-7507. Any such Government audits shall be conducted in accordance with Government Auditing Standards and the cost principles in OMB Circular No. A-87 and other applicable cost principles and regulations. The costs of Government audits shall be included in total Study Costs and shared in accordance with the provisions of this Agreement.

ARTICLE VII - RELATIONSHIP OF PARTIES

The Government and the Sponsor act in independent capacities in the performance of their respective rights and obligations under this Agreement, and neither is to be considered the officer, agent, or employee of the other.

ARTICLE VIII - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, nor any resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom.

ARTICLE IX - FEDERAL AND STATE LAWS

In the exercise of the Sponsor's rights and obligations under this Agreement, the Sponsor agrees to comply with all applicable Federal and State laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964 (PL 88-352) and Department of Defense Directive 5500.11 issued pursuant thereto and published in 32 C.F.R. Part 195, as well as Army Regulations 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

ARTICLE X - TERMINATION OR SUSPENSION

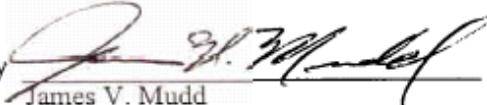
A. This Agreement shall terminate at the conclusion of the Study period, and neither the Government nor the Sponsor shall have any further obligations hereunder, except as provided in Article III.C.; provided, that prior to such time and upon 30 days written notice, either party may terminate or suspend this Agreement. In addition, the Government shall terminate this Agreement immediately upon any failure of the parties to agree to extend the Study under Article II.E. of this agreement, or upon the failure of the sponsor to fulfill its obligation under Article III. of this Agreement. In the event that either party elects to terminate this Agreement, both parties shall conclude their activities relating to the Study and proceed to a final accounting in accordance with Article III.C. and III.D. of this Agreement. Upon termination of this Agreement, all data and information generated as part of the Study shall be made available to both parties.

B. Any termination of this Agreement shall not relieve the parties of liability for any obligations previously incurred, including the costs of closing out or transferring any existing contracts.

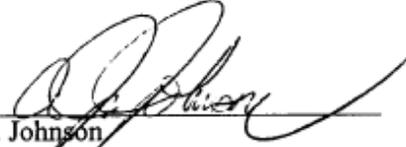
IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the District Engineer for the U.S. Army Corps of Engineers, Rock Island District.

DEPARTMENT OF THE ARMY

CITY OF MUSCATINE, IOWA

By 
James V. Mudd
Colonel, U.S. Army Corps of Engineers
District Engineer
Rock Island District

By 
Richard W. O'Brien
Mayor, City of Muscatine

Attest: 
A. J. Johnson
City Clerk



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004
October 27, 1999

Planning, Programs, and
Project Management Division

Mr. A. J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, Iowa 52761-3899

Dear Mr. Johnson:

The Rock Island District of the U.S. Army Corps of Engineers has enclosed for your use two original executed copies of the Feasibility Cost Sharing Agreement for the Mad Creek Section 205 Flood Damage Reduction Feasibility Study, Muscatine, Iowa (Enclosure 1). In accordance with Article III of the Agreement, you are hereby notified that the amount of the initial cash contribution required to meet your share of study costs for Fiscal Year 2000 is \$100,000. Please provide payment in accordance with Article IIIB.2. of the Agreement.

In accordance with Article IVA of the Agreement, the undersigned is appointed as the Government's senior representative to the Executive Committee. Please let us know who will represent the City of Muscatine on the Executive Committee. Also, please appoint representatives to serve on the Study Management Team. Please refer to pages 50-52 of the Project Study Plan for information regarding the role of the Executive Committee and Study Management Team.

If you have any questions, please feel free to call me at 309/794-5554.

Sincerely,

ORIGINAL SIGNED BY

Perry A. Hubert, P.E.
Project Manager



REPLY TO
ATTENTION GF

**DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004**

January 10, 2000

Planning, Programs, and
Project Management Division

SEE DISTRIBUTION LIST

This letter is to confirm my invitation for you to attend a joint meeting between the U.S. Army Corps of Engineers, the city of Muscatine, Muscatine County, and interested parties on Wednesday, January 19, 2000, at 9 a.m. in the lower level conference room at Muscatine City Hall, 215 Sycamore Street, Muscatine, Iowa. The purpose of the meeting is to discuss the Mad Creek at Muscatine, Iowa, Flood Damage Reduction project. A tentative agenda follows:

0900-0910	Introductions	Attendees
0910-0920	Genesis of the Project	Perry Hubert, Corps of Engineers
0920-0930	Sponsor's Role	A.J. Johnson, City of Muscatine
0930-0945	Feasibility Study Process/Plan of Study	Clarice Sundeen, Corps of Engineers
0945-1000	Discussion on Study Areas	Ray Childs, City Engineer
1000-1015	Discussion on Potential Alternatives	Perry Hubert and A.J. Johnson
1015-1025	Questions	Attendees
1025-1030	Set Next Meeting Date	Perry Hubert, Corps of Engineers
1030-1200	Site Visit to Study Area for those interested (weather permitting)	

The meeting on January 19 will constitute the first meeting of the Executive Committee and Study Management Team for the Feasibility Study for the Mad Creek Flood Damage Reduction project.

Questions can be directed to me at telephone 309/794-5554 or Ms. Clarice Sundeen, Community Planner, at telephone 309/794-5447.

Sincerely,


Perry A. Hubert
Project Manager



1459 Washington St.
Muscatine, IA 52761-5040
(319) 263-8933 Voice/TT
Fax (319) 263-2127

PUBLIC WORKS

City Transit Landfill
263-8152 264-5215

Equipment Maintenance
Roadway Maintenance
Collection & Drainage
Building & Grounds
Refuse Collection
Engineering

March 20, 2000

Mr. Perry Hubert
Project Management Division
U.S. Army, Corps of Engineers
Clock Tower Building - PO Box 2004
Rock Island, IL 61204-2004

RE: Mad and Geneva Creeks
Flood Damage Reduction
Feasibility Study
Muscatine, Iowa

Dear Perry:

Talking recently with Rich Todd, the Project Engineer for the study now underway tripped something that was a blip on the radar and has grown to screaming for attention.

Last year while we were going through the permit process with one of the myriad sections of the Iowa DNR where they insisted on a computer model for a pedestrian/utility bridge we were installing at the mouth of Mad Creek, a point of interest occurred.

Focus of attention was on showing no backwater effect above the new bridge during 100-year storm events on Mad Creek with the Mississippi River in normal, 10 year and 100 year stages.

The Rock Island District's hydraulic folks had just acquired HEC-RAS software and were kind enough to run the program for us. Background data from the old flood insurance program had to be used. (The new study may be quite different).

Anyhow, the blip on the radar was the E. 2nd Street bridge immediately upstream from the subject at hand. Considering the 560 M.S.L. levee crown on Mad Creek and the backwater affect of the E. 2nd Street bridge, it certainly needs a serious look. It may be we are missing an opportunity to eliminate a closure structure at that location.

"I remember Muscatine for its sunsets. I have never seen any on either side of the ocean that equaled them" — Mark Twain

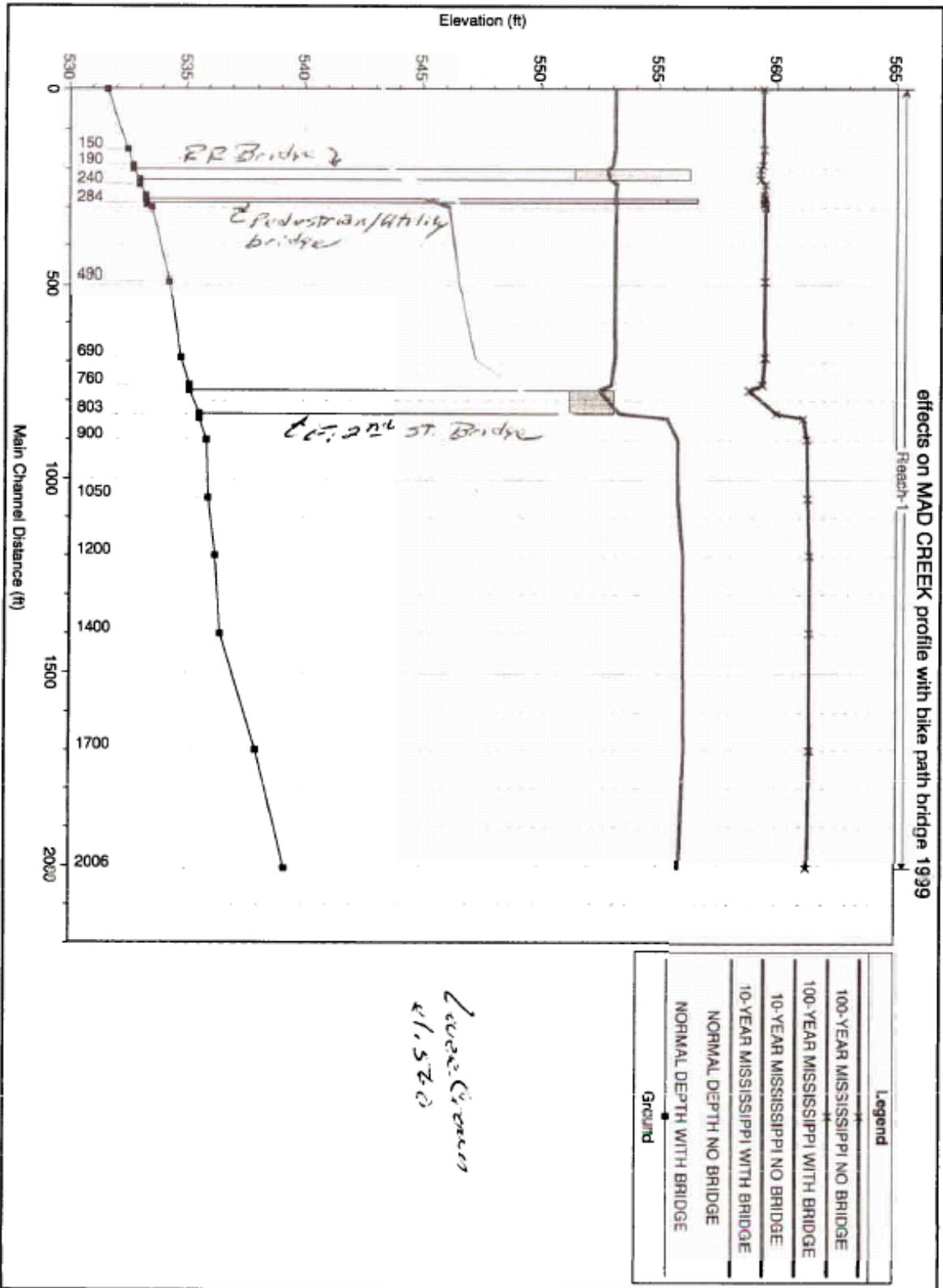
Presently, we are waiting for the study results on the hydraulic portion in order to finalize bridge deck elevations on raising the E. 5th Street bridge. It may very well turn out that a similar approach on E. 2nd Street will become a “no brainer” remedy.

By this correspondence, I want to make sure the idea doesn't get lost, especially since some segments of the study are being contracted out. Room for options is easily lost in implementing the scope in contracting services.

Respectfully yours,

A handwritten signature in black ink, appearing to read 'R. Childs', written in a cursive style.

R. L. Childs, P.E.
City Engineer





REPLY TO
ATTENTION OF

Planning, Programs, and
Project Management Division

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

April 20, 2000

Mr. Jeff Fick
HON INDUSTRIES
414 East Third Street
Muscatine, Iowa 52761

Dear Mr. Fick:

Thank you for your interest in the Mad Creek Study process. As discussed briefly by telephone on Monday, April 17, 2000, your assistance in gathering information concerning potential flood impacts on the HON INDUSTRIES operations will be very valuable.

In general, the Corps of Engineers needs to assess the impact of flood events which would breach or overtop the existing levees and floodwalls protecting the west bank of Mad Creek. In order to evaluate this potential situation, much information is needed, including the following:

- a. Listing of all HON INDUSTRIES buildings within the currently protected area to include:
 - Ground and floor elevations (if readily available).
 - Building area (square footage).
 - Age and replacement value of buildings.
 - Equipment, materials, and inventory values.
- b. Type of flood preparation measures taken during high water threat, and associated costs (including labor costs) such as sandbagging, pumping, and removal of inventory.
- c. Estimated business impacts of shutdown due to potential flooding:
 - Extent and duration of production losses.
 - Number of employees idled and amount of lost wages.
 - Indirect associated costs, for example, impact on HON INDUSTRIES facilities which might depend on the Muscatine plant production.

d. Summary of expansion plans within the protected floodplain area to include cost estimate and implementation schedule.

I hope this letter serves as a general guideline for your information gathering. If you have any questions concerning this request, please call Mr. Dan Fetes of our Economic Analysis Section, telephone 309/794-5569. Mr. Fetes will be in contact with you to arrange an on-site visit and to discuss the above information.

Thank you for your cooperation.

Sincerely,

ORIGINAL SIGNED BY

Gary L. Loss, P. E.
Chief, Planning, Programs, and
Project Management Division



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

April 20, 2000

Planning, Programs, and
Project Management Division

Mr. Dick Stone
Engineering Manager
H. J. Heinz Company
1357 Isett Avenue
Muscatine, Iowa 52761

Dear Mr. Stone:

Thank you for attending the Mad Creek Study Open House on Tuesday, April 11, 2000. As discussed briefly during the Open House, your assistance in gathering information concerning potential flood impacts on the H. J. Heinz Company operations will be very valuable.

In general, the Corps of Engineers needs to assess the impact of flood events which would breach or overtop the existing levees and floodwalls protecting the west bank of Mad Creek. In order to evaluate this potential situation, much information is needed, including the following:

- a. Listing of all Heinz Company buildings within the currently protected area to include:
 - Ground and floor elevations (if readily available).
 - Building area (square footage).
 - Age and replacement value of buildings.
 - Equipment, materials, and inventory values.
- b. Type of flood preparation measures taken during high water threat, and associated costs (including labor costs) such as sandbagging, pumping, and removal of inventory.
- c. Estimated business impacts of shutdown due to potential flooding:
 - Extent and duration of production losses.
 - Number of employees idled and amount of lost wages.
 - Indirect associated costs, for example, impact on other Heinz facilities which might depend on the Muscatine plant production.

d. Summary of expansion plans within the protected floodplain area to include cost estimate and implementation schedule.

I hope this letter serves as a general guideline for your information gathering. If you have any questions concerning this request, please call Mr. Dan Fetes of our Economic Analysis Section, telephone 309/794-5569. Mr. Fetes will be in contact with you to arrange an on-site visit and to discuss the above information.

Thank you for your cooperation.

Sincerely,

ORIGINAL SIGNED BY

Gary L. Loss, P. E.
Chief, Planning, Programs, and
Project Management Division

Copy Furnished:

Mr. Dan Poland
Plant Manager
H. J. Heinz Company
1357 Isett Avenue
Muscatine, Iowa 52761



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

October 25, 2000

Planning, Programs, and
Project Management Division

Mr. A. J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, Iowa 52761-3899

Dear Mr. Johnson:

This letter is to provide formal notification that the Rock Island District of the U.S. Army Corps of Engineers requires cost-share funds for the Mad Creek Section 205 Flood Damage Reduction Feasibility Study.

In accordance with Article III of the Feasibility Cost Sharing Agreement for the subject study, you are hereby notified that the amount of cash contribution to meet your share of study costs for Fiscal Year 2001 is \$170,000. Please provide payment in accordance with Article IIIB.2 of the Agreement by delivering a check to the District Engineer made payable to "FAO, USAED, Rock Island District."

If there are any questions, please feel free to contact me or Mr. Scott Estergard of our Project Management Branch, telephone 309/794-5634 and 309/794-5697, respectively.

Sincerely,

ORIGINAL SIGNED BY

Dennis W. Hamilton, P.E.
Project Manager

THE UNIVERSITY OF IOWA



FAXED
JF 3/11/00

November 20, 2000

Jim Ross, Archaeologist
Environmental Analysis Branch
U.S. Army Corps of Engineers
Clock Tower Building, P.O. Box 2004
Rock Island, IL 61201

Via fax: 309/794-5157 (3 pages)
[Original will be mailed]

Re: DACW25-98-D-0015, Delivery Order No. 3
Site File Search 134
COE Permit Application n/a
Sections 13, 25, 26, 27, 34, 35, 36, T77N-R2W
Section 3, T76N-R2W

Dear Jim:

This search request corresponds to an area in Muscatine County, Iowa. It involves flood protection and closures along Mad Creek in the City of Muscatine with a Mad Creek borrow and retention pond to the north in Section 13, a Geneva Creek pond to the west in Section 27, and the Hershey borrow to the southwest in Section 3 (T76N-R2W).

No previously recorded site locations correspond directly to the above listed project areas or in fact any of the listed sections with the exception of Section 3 (T76N-R2W), where previously recorded sites are very close to the specified Hershey borrow. The attached map and list provide details on the local area site distribution. Note the Mad Creek borrow and pond area was excluded as no sites are known in Section 13 or adjoining sections to the east, west or north. In general, a variety of site types are present—these sites were mostly recorded as a result of Hwy 61-related improvements. As this sample shows, the Muscatine area is generally site rich.

Sincerely,

John F. Doershuk, Ph.D., RPA
Director, General Contracts Program



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P. O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

January 3, 2001

Planning, Programs, and
Project Management Division

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers (Corps) and the City of Muscatine, Iowa, are proposing flood damage reduction measures along Mad Creek in Muscatine County. This flood damage reduction study has been authorized under Section 205 of the 1948 Flood Control Act, as amended (Section 205).

Federal Undertaking

Potential Section 205 project features include levee improvement, floodwall construction, and retention basin construction. The general project location is identified in Exhibit 1.

Area of Potential Effects (APE)

The APE for this undertaking includes the levee improvement and floodwall construction areas, sediment retention basin construction areas, and all associated access, staging, disposal, and borrow areas as identified within the general project area (Exhibit 1). The APE is not on tribal lands [reference 36 CFR 800.15(d); 36 CFR 800.4(a)(1); and 36 CFR 800.4(c)].

Levee improvement and floodwall construction impacts will be limited to the existing levee footprint (Exhibit 2). Sediment retention basin construction impacts will result from dam construction and periodic inundation, as well as from associated access, staging, and disposal. Two potential retention basin sites are identified in Exhibit 3. Borrow excavation impacts will be limited to the excavation area and associated mechanical access and staging areas, if necessary. Two potential borrow sites are identified in Exhibits 4 and 5.

Consulting Parties

The Corps finds the following organizations entitled to be consulting parties as set out in 36 CFR 800.2 and invites them by copy of this letter to participate in the Section 106 consultation process:

- Ho-Chunk Nation
- Governor's Liaison for Indian Affairs
- Iowa of Kansas Executive Committee
- Iowa of Oklahoma Business Committee
- Iowa Tribe of Nebraska and Kansas
- Iowa Tribe of Oklahoma
- Sac and Fox of Oklahoma Business Committee
- Sac and Fox of the Mississippi Tribal Council
- Sac and Fox of the Missouri Tribal Council
- Otoe-Missouria Tribal Council
- Winnebago Tribal Council
- Peoria Indian Tribe of Oklahoma
- Kickapoo Traditional Tribe of Texas
- Kickapoo of Kansas Tribal Council
- Muscatine County Board of Supervisors
- Muscatine County Historical Society
- Iowa State Historic Preservation Officer (SHPO) at the Iowa State Historical Society
- Office of the State Archaeologist Indian Advisory Committee

SHPO Invitation

The Corps invites the SHPO to:

- Identify any other consulting parties as per 36 CFR 800.3(f);
- Comment as per 36 CFR 800.2(d)(3) on the Corps plan to involve the public by utilizing the Corps normal procedures for public involvement under the National Environmental Policy Act; and,
- Comment on or contribute to identification efforts including definition of the APE, all as per 36 CFR 800.4(a-b).

Identification of Historic Properties

Review of Existing Information and Level of Future Identification Efforts:

Pursuant to the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR Part 800, the Corps has determined that this Section 205 project has potential to cause effects to historic properties (36CFR800.3(a)(1)). A review of the archeological site file records by the Office of the State Archaeologist failed to identify any previously recorded sites within the APE; however, numerous sites were documented in proximity to the undertaking (Exhibit 6).

The opinion of the Corps is that levee improvement and floodwall construction will not have the potential to impact significant historic properties, because work will be limited to the existing levee footprint, floodwall, and previously disturbed ground. In addition, the Corps has determined that the retention basin alternatives are unlikely to prove economically feasible. Therefore, the Corps has determined that these project features will not require archeological field investigation.

A determination of effect to undocumented historic properties will be necessary at the potential borrow sites. This determination will require a field investigation consisting of a combination of archival research, surface survey, and shovel test excavations. Deep testing will not be necessary because both borrow sites are situated in upland settings.

Request for Information from Consulting Parties:

The Corps is seeking information from all consulting parties regarding their concerns with issues relating to this undertaking's potential effects on historic properties and, particularly, the tribes' concerns with identifying properties that may be of religious and cultural significance to them and may be eligible for the National Register [36 CFR 800.4(a)(3-4)]. Concerns about confidentiality [36 CFR 800.11(c)] regarding locations of properties can be addressed under Section 304 of the National Historic Preservation Act, which provides withholding from public disclosure the location of properties under several circumstances, including in cases where it would cause a significant invasion of privacy, impede the use of a traditional religious site by practitioners, endanger the site, etc.

We request your written comments on this project within 30 days pursuant to 36 CFR 800.3(c)(4). The Corps has identified the consulting parties for this undertaking as set out in 36 CFR 800.2 and invites them by copy of this letter to participate in the Section 106 process (See Distribution List). Results of all consultation and determination shall be included in an Environmental Assessment for additional public review in 2001.

If you have any questions regarding this matter, please call Mr. Jim Ross of our Environmental Analysis Section, telephone 309/794-5540, or you may write to our address above, ATTN: Planning, Programs, and Project Management Division (Jim Ross).

Sincerely,

A handwritten signature in black ink that reads "Kenneth A. Barr". The signature is written in a cursive style with a large, prominent initial "K".

Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

Enclosures



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

January 22, 2001

Planning, Programs, and
Project Management Division

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers is preparing a Definite Project Report (DPR) with Environmental Assessment (EA) to assist in investigating flood damage reduction measures along Mad Creek in Muscatine, Iowa. The Mad Creek at Muscatine, Iowa, flood damage reduction study is undertaken through the Corps of Engineers Continuing Authorities Program. This effort is in response to requests from officials of the City of Muscatine, Iowa, for Federal flood protection assistance. The study is authorized by Section 205 of the 1948 Flood Control Act, as amended.

The Mad Creek study area is located along the Mississippi River in Muscatine, Iowa (see enclosed map). The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of Muscatine and areas north of Muscatine in Muscatine County. The upstream portion of the watershed north of Muscatine is primarily agricultural land but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subject to flash flooding.

The DPR and subsequent EA will summarize the results of analyses in the areas of planning, hydrology and hydraulics, foundations and materials, engineering, economics, and natural and cultural resources. The study will be conducted in sufficient detail to determine the economic feasibility of a flood damage reduction plan and will recommend a plan for implementation.

Four primary alternatives have been considered for reducing the flooding hazard:

- a. Raise the existing floodwall and levee system;
- b. Construct stormwater detention reservoirs;
- c. A combination of alternatives a & b, including stormwater detention reservoirs; and,
- d. An enhanced early flood-warning system to better react to flash floods.

At this time, we are requesting your comments regarding any significant resources that might be impacted by the proposed action. Federally endangered species and/or other natural resources are of particular concern.

Please provide your comments and information regarding this proposed action within 30 days of the date of this letter. A timely review of this information and a written response will be greatly appreciated.

Should you have any questions regarding this project, please call Ms. Erika Mark of our Environmental Analysis Section, telephone 309/794-5171. Written responses may be sent to our address above, ATTN: Planning, Programs, and Project Management Division (Erika Mark).

Sincerely,

A handwritten signature in black ink that reads "Kenneth A. Barr". The signature is written in a cursive style with a large, prominent initial "K".

Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

Enclosure

STATE HISTORICAL SOCIETY OF IOWA

Where past meets future

January 29, 2001

In reply refer to:
R&C#: 010170032

American Gothic House
Eldon

Mr. Jim Ross, Archeologist
Environmental Analysis Branch
Rock Island Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

Blair Run NHL
Larchwood

RE: COE – MUSCATINE COUNTY – CITY OF MUSCATINE – PROPOSED FLOOD DAMAGE
REDUCTION MEASURES ALONG MAD CREEK UNDER SECTION 205 OF THE 1948
FLOOD CONTROL ACT – MULTIPLE LOCATIONS

Centennial Building
Iowa City

Dear Mr. Ross,

Matthew Edell Blacksmith Shop
Haverhill

By this letter, the Iowa State Historic Preservation Office (henceforth SHPO) accepts the Corp's (Rock Island District) invitation to consult on this undertaking. Our comments and recommendations are presented below in the order of their occurrence within the letter dated January 3, 2001 under the heading SEE DISTRIBUTION LIST.

Abbie Gardner Cabin
Arnolds Park

Federal Undertaking

1. The SHPO agrees that the proposed action constitutes a Federal undertaking eliciting review under section 106 of the National Historic Preservation Act of 1966 and its implementing regulations, 36 CFR part 800.

Iowa Historical Building
Des Moines

Consulting Parties

1. At this time, the SHPO knows of no other party with a demonstrated interest in historic properties that may be affected by this undertaking. However, if others do come forward during the review process, the SHPO encourages the Corp to consider their interests and invite their consultation when deemed appropriate per 36 CFR part 800.3(f).
2. In accordance with section 101 (b) (3) the SHPO agrees to assist the Corp in carrying out their section 106 responsibilities for this undertaking.
3. In doing so, the SHPO will act in the best interests of the State of Iowa and its citizens in the preservation of their cultural heritage as mandated by 36 CFR 800.2 (c) (1).

Montauk Governor's Home
Union Sunday School
Clermont Museum
Clermont

Plum Grove Governor's Home
Iowa City

Toolesboro Indian Mounds
Toolesboro

Western Historic Trails Center
Council Bluffs

Area of Potential Effects (APE)

1. The SHPO agrees to comment on and contribute to identification efforts including definition of the project APE as per 36 CFR 800.4(a-b) and stipulates that the APEs defined for the various activities proposed by this undertaking must be defined in three-dimensional terms.

Identification of Historic Properties (Agency Evaluation of Historic Significance, etc.)

1. Upon reviewing the available project documentation, it is the opinion of this office that the project area has high potential to contain significant historic properties that may be eligible for listing on the National Register of Historic Places.
2. The SHPO agrees with the Corp's determination that no historic properties investigations will be necessary at the locations of the existing levee footprints, floodwalls, and previously disturbed

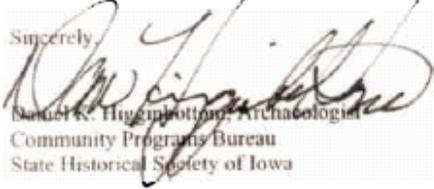
IOWA HISTORICAL BUILDING

600 East Locust • Des Moines, Iowa 50319-0290
Phone: (515) 281-6412 • Fax: (515) 242-6498 or (515) 282-0502
www.state.ia.us/government/dca

grounds situated within the project area of potential effects. The SHPO also concurs that historic properties investigations should be performed at the proposed Mad Creek and Hershey Borrow sites, and that deep site testing will probably not be necessary because of their upland character. *Moreover, it is the opinion of this office that landforms within the Geneva Creek and Mad Creek Retention Basins that will be subject to intermittent inundation and the effects thereof have the potential to contain cultural resources that may be eligible for listing on the National Register. Therefore, the SHPO recommends that the Corp require surface, subsurface, and deep site testing in those areas prior to project implementation.*

Thank you for inviting our consultation on this undertaking. At this time we have no further comments or recommendations. Please forward those stated above to the other consulting parties identified for this undertaking. I look forward to receiving future correspondences from you and await the opportunity to review the results of the proposed historic properties investigations. If you have any questions, or if I can be of further assistance please feel free to contact me at (515) 281-8744.

Sincerely,



Daniel K. Higginbottom, Archaeologist
Community Programs Bureau
State Historical Society of Iowa

La Porte City Ia
Jan 30, 2001

Department of Army
Kenneth A. Barr
Chief Economic + Environmental
Analysis Branch

Dear Sir
Thank you for sending me the map of the Mal
Creek Area in Muscatine in Muscatine Co. I would like
to have come down to visually see the Area, but just
got home from the Hospital.

Of the four primary alternatives, that have been
considered, I would recommend.

- A. Raise the existing flood wall & levy system
- B. Construct storm water detention reservoirs.

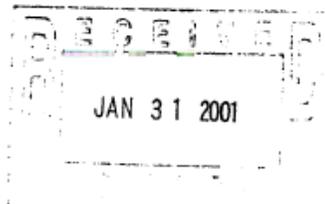
I believe "B" is very important, because of the
agriculture land, that is being converted into residential,
and commercial developments, will prevent the soil
from absorbing rainfall, resulting in more flash floods.

I would also recommend building more detention
reservoirs, to take care of future development.

It is ironic that here in La Porte City, we have a
large creek area that causes 80% of the City, to be
in a flood plain. When I get the watershed size and
other information, I will send it to you.

Sincerely
Glenn Burson
405 Iowa St.
La Porte City, Ia
50651

New address



SAC AND FOX NAGPRA CONFEDERACY



"MESKWAKI"

**Sac and Fox of the
Mississippi in Iowa**
349 Meskwaki Rd
Tama, IA 52339-9629
515-484-4678
Fax: 515-484-5358
Contact:
Johnathan L. Buffalo

January 31, 2001

Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Ross:

Thank you for your letter, which is in compliance with Section 106 of the National Historic Preservation Act, and Section 110.

The main contact group of the Sac and Fox in issues pertaining to the flood damage reduction measures along Mad Creek in Muscatine County project will be Johnathan Buffalo of the Sac and Fox Tribe of Mississippi in Iowa. Mr. Buffalo's number is listed on this letterhead.

Sincerely,

Deanne Bahr
Sac and Fox Nation of Missouri
NAGPRA Contact Representative



**Sac and Fox Nation
of Missouri
in Kansas and Nebraska**
305 N Main
Reserve, KS 66434
785-742-7471
Fax: 785-742-2979
Contact: Deanne Bahr



**Sac and Fox Nation of
Oklahoma**
Rt. 2 Box 246
Stroud, OK 74079
918-968-2353
Fax: 918-968-2353
Contact: Sandra Massey



IN REPLY REFER
TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Rock Island Field Office
4469 48th Avenue Court
Rock Island, Illinois 61201
Tel: 309/793-5800 Fax: 309/793-5804

February 22, 2001

Kenneth A. Barr
Attn: Planning, Programs, and Project
Management Division (Erika Mark)
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Barr:

We have reviewed your January 22, 2001, request for comments on the proposed flood damage reduction measures along Mad Creek in Muscatine, Iowa.

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action. Therefore, we are furnishing you the following list of species which may be present in the concerned area:

<u>Classification</u>	<u>Common Name (Scientific Name)</u>	<u>Habitat</u>
Threatened	Bald eagle (<i>Haliaeetus leucocephalus</i>)	Breeding, wintering
Endangered	Indiana bat (<i>Myotis sodalis</i>)	Caves, mines (hibernacula); small stream corridors with well developed riparian woods; upland forests (foraging)
Endangered	Higgins' eye pearly mussel (<i>Lampsilis higginsii</i>)	Mississippi River

The threatened bald eagle (*Haliaeetus leucocephalus*) is listed as breeding and wintering in Muscatine County, Illinois. The eagle winters along large rivers, lakes and reservoirs. We recommend that a survey of the site be performed prior to placement of the riprap. If eagles are present they may not be harassed, harmed, or disturbed when present nor may nest trees be cleared.

The endangered Indiana bat (*Myotis sodalis*) is listed as occurring in Muscatine County. During the summer, the Indiana bat frequents the corridors of small streams with well developed riparian woods as well as mature upland forests. It forages for insects along the stream corridor, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds and in pastures. It has been shown that the foraging range for the bats varies by season, age, and sex and ranges up to 81 acres (33ha). It roosts and rears its young beneath the loose bark of large dead or dying trees. It winters in caves and abandoned mines.

An Indiana bat maternity colony typically consists of a primary roost tree and several alternate roost trees. The use of a particular tree appears to be influenced by weather conditions (temperature and precipitation). For example, dead trees found in more open situations were utilized more often during cooler or drier days while interior live and dead trees were selected during periods of high temperature and/or precipitation. It has been shown that pregnant and neonatal bats do not thermoregulate well and the selection of the roost tree with the appropriate microclimate may be a matter of their survival. The primary roost tree, however, appears to be utilized on all days and during all weather conditions by at least some bats. Indiana bats tend to be philopatric, i.e. they return to the same roosting area year after year.

Suitable summer habitat in Iowa and Illinois is considered to have the following characteristics within a ½ mile radius of the project site:

- 1) forest cover of 15% or greater;
- 2) permanent water;
- 3) one or more of the following tree species 9 inches diameter at breast height (dbh) or greater: shagbark and shellbark hickory that may be dead or alive, and dead bitternut hickory, American elm, slippery elm, eastern cottonwood, silver maple, white oak, red oak, post oak, and shingle oak with slabs or plates of loose bark;
- 4) at least 1 potential roost tree per 2.5 acres;
- 5) potential roost trees must have greater than 10% coverage of loose bark (by visual estimation of peeling bark on trunks and main limbs).

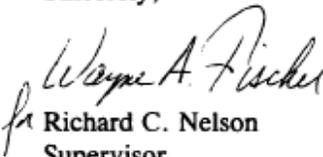
If the project site contains any habitat that fits the above description, it may be necessary to conduct a survey to determine whether the bat is present. If Indiana bats are known to be present, they must not be harmed, harassed, or disturbed when present. [for small tree clearing projects...] Indiana bat habitat may be altered (i.e trees cleared) only between the dates of October 1 and March 31.

The endangered Higgins' eye pearly mussel (*Lampsilis higginsii*) is listed for the Mississippi River north of Lock and Dam 20 which includes Muscatine County, Iowa. This species prefers sand/gravel substrates with a swift current and is most often found in the main channel border or an open, flowing side channel.

This letter provides comments under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); and the Endangered Species Act of 1973, as amended.

If you have any additional questions or concerns, please contact Heidi Woeber of my staff at (309) 793-5800 X517.

Sincerely,


for Richard C. Nelson
Supervisor



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

MAR 13 2001

Erika Mark
Department of the Army
Rock Island District, Corps of Engineers
ATTN: Planning, Programs, and Project Management Division
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

SUBJECT: Flood Damage Reduction Along Mad Creek, Muscatine, Iowa

Dear Ms. Mark:

This is to inform you that EPA has received your letter dated January 22, 2001 concerning the flood control project mentioned above.

Thank you for keeping us informed early on the proposed project. Your letter suggests that you will be preparing an Environmental Assessment in the near future; we hope to have the opportunity to comment on that document as well.

The USEPA has a great deal of catalogued information that may be of use in preparing the Environmental Assessment. On the world wide web,

<http://www.epa.gov/surf3/locate/index.html>

is a web site of environmental information organized by watershed.

http://www.epa.gov/enviro/index_java.html

Is a web site containing extensive information collected by the USEPA from most departments within the Agency, including hazardous waste sites, superfund sites, toxic release and water discharge permits, and others. We encourage you to access the above sites during the preparation of the Environmental Assessment.

Again, thank you for the opportunity to comment on this project. If you have any questions or require further technical assistance you may contact Stephen Smith of my staff at 913-551-7656.

Sincerely,

Stephen Smith
NEPA REVIEWER
U.S. EPA, Region VII





Iowa Tribe of Oklahoma

R R. 1, Box 721
Perkins, Oklahoma 74059
(405) 547-2402
Fax: (405) 547-5294

March 15, 2001

Kenneth A. Barr, Chief
Economic and Environmental Analysis Branch
Department of the Army
Corps of Engineers, Rock Island District
P.O. Box 2004
Rock Island, IL 61204-2004

Re: Levee Improvement/Flood wall Construction
Mad Creek, Muscatine County, IA

Dear Mr. Barr,

The Iowa Tribe of Oklahoma is in receipt of your letter of 3 January 2001 regarding the proposed levee improvement and floodwall construction along Mad Creek in Muscatine County, Iowa. The Historic Preservation Office has determined that the site falls within the historic lands of the Iowa Tribe, and we wish to enter into the consultation process. If the activity along the creek does not go beyond the zones of previous ground disturbance, an archeological survey is not necessary. However, an archeological survey should be conducted on other sites, such as the borrow areas, prior to any ground disturbance activities. The Iowa Tribe requests that it be provided with copies of these surveys.

Thank you.

Sincerely,

Marianne Long, Director
Tribal Operations



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

May 10, 2001

Planning, Programs, and
Project Management Division

Ms. Maria Pandullo
R&C Coordinator
State Historical Society of Iowa
600 East Locust Street
Des Moines, Iowa 50319-0290

Dear Ms. Pandullo:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) is forwarding a draft report entitled Phase I Cultural Resource Survey of the Proposed Mad Creek Borrow and the Hershey Borrow for the Mad Creek Section 205 Project, Muscatine County, Iowa, dated April 2001. Jeff Straka of Bear Creek Archeology, Inc. of Cresco, Iowa, authored the report. The report was prepared under Contract DACW25-98-D-0001, Delivery Order Number 0025.

The State Historical Society of Iowa (SHSI) commented on the Mad Creek Section 205 Flood Control project by letter dated January 29, 2001 (R&C#: 010170032). In that letter the SHSI concurred with the Corps' determination that historic properties investigations would be necessary at the proposed borrow sites and that these investigations would not require deep testing due to their upland location. In addition, the SHSI identified potential retention basin sites as locations in need of surface, subsurface, and deep site testing. These sites were not included as part of the present investigation; however, they will be evaluated in the event that the retention basin feature is selected as part of a preferred alternative for the Mad Creek Section 205 project.

We concur with the Contractor's observations and recommendations, as presented on Pages 33 through 35 of the draft report. A total of four newly recorded prehistoric archeological sites were documented by this investigation. The Corps has determined that these historic properties are not eligible for listing on the National Register of Historic Places and that further archeological investigation at the Mad Creek and Hershey borrow sites is not warranted.

We request your written comments on this project within 30 days of the date of this letter. If you have any questions, please call Mr. Jim Ross of our Environmental Analysis Section, telephone 309/794-5540, or write to our address above, ATTN: Planning, Programs, and Project Management Division (Jim Ross).

Sincerely,

ORIGINAL SIGNED BY

Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

Enclosure

STATE HISTORICAL SOCIETY OF IOWA

Where past meets future

June 11, 2001

In reply refer to:
R&C#: 010170032

American Gothic House
Eldon

Blood Run NHL
Larchwood

Centennial Building
Iowa City

Matthew Edel Blacksmith Shop
Haverhill

Abbie Gardner Cabin
Arnolds Park

Iowa Historical Building
Des Moines

Montauk Governor's Home
Union Sunday School
Clermont Museum
Clermont

Plum Grove Governor's Home
Iowa City

Toolesboro Indian Mounds
Toolesboro

Western Historic Trails Center
Council Bluffs

Jim Ross, Archeologist
Environmental Analysis Branch
Rock Island Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

RE: COE – MUSCATINE COUNTY – CITY OF MUSCATINE – USACE ROCK ISLAND DISTRICT AND CITY OF MUSCATINE – PROPOSED FLOOD DAMAGE REDUCTION MEASURES ALONG MAD CREEK UNDER SECTION 205 OF THE 1948 FLOOD CONTROL ACT – MULTIPLE LOCATIONS -- BCA#902 – PHASE I CULTURAL RESOURCE SURVEY – DRAFT

Dear Mr. Ross,

We have received the draft report entitled *Phase I Cultural Resource Survey of the Proposed Mad Creek Borrow and the Hershey Borrow for the Mad Creek Section 205 Project Muscatine County, Iowa* prepared by Messrs. Jeff Straka and David Benn of Bear Creek Archeology, Inc., Cresco, Iowa. We make the following comment and recommendations based on the results of this investigation and in accordance with section 106 of the National Historic Preservation Act of 1966 and its implementing regulations 36 CFR part 800 (revised, effective January 11, 2001).

We understand from the report that four archaeological sites were identified during field investigations of the Mad Creek and Hershey Borrow sites. Site 13MC225, interpreted as an unaffiliated prehistoric lithic scatter, was encountered within the plowzone during subsurface testing at the Mad Creek Borrow location. The consultant has recommended the site as not eligible for listing on the National Register citing poor integrity. The consultant also recommended that no further historic properties investigation should be pursued. We agree with this assessment.

Sites 13MC222, 13MC223, and 13MC224 were identified at the Hershey Borrow site and all are characterized as prehistoric lithic scatters situated along an upland ridge or shoulder slope within the borrow area. Diagnostic artifacts recovered from 13MC222 suggest multiple Early Archaic occupational episodes at that location, while sites 13MC223 and 13MC224 are interpreted as single occupation bivouacs of unknown cultural affiliation. The consultant has recommended that all three be considered as not eligible for listing on the National Register citing poor contextual integrity, absence of sub-plowzone features, and low research potential. No further historic properties investigation is recommended for all three. We agree with this assessment.

Therefore, based on the results of this investigation, the Iowa SHPO concurs that the use of the Mad Creek and Hershey Borrow sites will have no effect on historic properties. However, we recommend that archaeological surveys be conducted of the retention basins that are under consideration, and that further investigation precede construction activities and inundation through impoundment. Refer to our initial comments in the January 29, 2001 letter. We look forward to receiving and reviewing the archaeological reports for the impoundment basins.

If design changes are made for this project which would involve undisturbed new rights-of-way, easements, or undisturbed borrow areas please forward additional information to our office for further comment along

IOWA HISTORICAL BUILDING

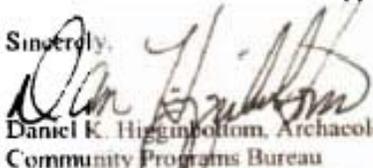
600 East Locust • Des Moines, Iowa 50319-0000

Phone: (515) 281-6412 • Fax: (515) 281-6998 or (515) 281-0511

WWW.SHPO.IA.GOV

with the Agency Official's determination of effect. If project activities uncover an item(s) that might be of archeological, historical or architectural interest, or if important new archeological, historical or architectural data should be encountered in the project APE, you should make reasonable efforts to avoid or minimize impacts to the property until an assessment can be made by a qualified archaeologist.

Sincerely,



Daniel K. Higginbottom, Archaeologist
Community Programs Bureau
State Historical Society of Iowa

Cc: David Stanley, Project Manager, Bear Creek Archeology



IN REPLY REFER
TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Rock Island Field Office
4469 48th Avenue Court
Rock Island, Illinois 61201
Phone: (309) 793-5800 Fax: (309) 793-5804



June 26, 2001

Colonel William J. Bayles
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

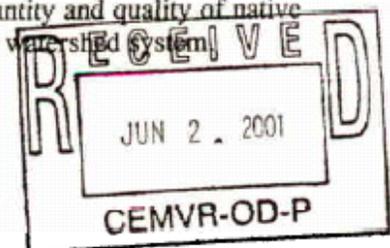
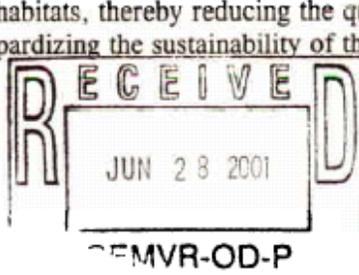
Dear Colonel Bayles:

This letter constitutes our draft Fish and Wildlife Coordination Act (FWCA) report for the Mad Creek flood damage reduction study undertaken through the Corps of Engineer Continuing Authorities Program and authorized by Section 205 of the 1948 Flood Control Act, as amended. It has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat.401, as amended; 16 U.S.C. 661 et seq.); the Endangered Species Act of 1973, as amended; and in accordance with the Fish and Wildlife Service's Mitigation Policy.

DESCRIPTION OF THE PROJECT AREA

The Mad Creek study area is located along the Mississippi River in Muscatine, Muscatine County, Iowa. The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of Muscatine and areas north of Muscatine in Muscatine County. The upstream portion of the watershed north of Muscatine is primarily agricultural land but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subject to flash flooding.

Development in the watershed and floodplain has altered floodplain hydrology, increasing stormwater runoff and flood stages. The resulting increases in sedimentation have caused degraded aquatic and terrestrial habitats, thereby reducing the quantity and quality of native vegetative communities, and jeopardizing the sustainability of the watershed system.



PROJECT OBJECTIVES

The goals of the Mad Creek flood damage reduction study are to determine the economic feasibility of a flood damage reduction plan and will recommend a plan for implementation. Four primary alternatives have been considered for reducing the flooding hazard:

- a. Raise the existing floodwall and levee system;
- b. Construct stormwater detention reservoirs;
- c. A combination of alternatives a & b, including stormwater detention reservoirs; and,
- d. An enhanced early flood-warning system to better react to flash floods.

FISH AND WILDLIFE RESOURCES

Development of the flood plain for agriculture, commercial and residential purposes is a limiting factor for wildlife resources. Although the project area includes some pasture and several open grassy areas, the vegetation is dominated by introduced grasses. These areas are either mowed or grazed regularly. Wildlife species in the area are a common assemblage of birds and mammals found in agricultural and urban habitats.

We have no site specific information on the fishery resource in the project area, but would expect that the fish community would be composed of species common to eastern Iowa creeks and streams, such as shiners, darters, dace, common stoneroller, and possibly sunfish.

THREATENED AND ENDANGERED SPECIES

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action.

Therefore, we are furnishing you the following list of species which may be present in the concerned area:

<u>Classification</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Habitat</u>
Threatened	Bald eagle	<i>Haliaeetus leucocephalus</i>	Breeding, Winters along major rivers and reservoirs
Endangered	Higgins' eye pearly mussel	<i>Lampsilis higginsii</i>	Mississippi River

Endangered	Indiana bat	<i>Myotis sodalis</i>	Caves, mines; small stream corridors with well developed riparian woods; upland forests
------------	-------------	-----------------------	---

Bald eagles winter along the Mississippi River, including Pool 17. The proposed project would not affect bald eagles or their habitats.

The endangered Higgins' eye pearly mussel (*Lampsilis higginsii*) prefers sand/gravel substrates with a swift current and are most often found in the main channel border or an open, flowing side channel. The project occurs in Muscatine County, but these species are not likely to occur in the project area.

The endangered Indiana bat (*Myotis sodalis*) is listed as occurring in Muscatine County, Iowa. During the summer, the Indiana bat frequents the corridors of small streams with well developed riparian woods as well as mature upland forests. It forages for insects along the stream corridor, and within the canopy of floodplain and upland forests. It has been shown that the foraging range for the bats varies by season, age and sex and ranges up to 81 acres (33ha). It roosts and rears its young beneath the loose bark of large dead or dying trees. Tree clearing for this project should not be conducted during the April 1 - September 30 timeframe. Prohibiting clearing activity during this 6-month time window would avoid potential impacts to summer roosting Indiana bats. If Indiana bats are known to be present, they must not be harmed, harassed, or disturbed when present.

The proposed flood damage reduction measures will not adversely affect endangered species or their habitats. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified or new information indicate endangered species may be affected, consultation should be initiated.

FUTURE WITHOUT PROJECT

The No Federal Action alternative is considered the future without the project condition allowing the area to continue to function as is. Without flood reduction measures such as detention basins the area will continue as is, and sedimentation will result in continued degradation of any existing fisheries habitat.

FUTURE WITH PROJECT

Enhancement options for Mad Creek included increasing the quality of existing floodwall and levee protection, constructing stormwater detention systems, thereby reducing flooding potential, as well as, sedimentation levels. Reducing the potential for flooding on Mad Creek would also result in a decrease in property damage. Raising the levee on Mad Creek would have little or no impact on wildlife. The area adjacent to Mad Creek in the area of the levee is commercially developed urban property. Construction of the stormwater detention systems

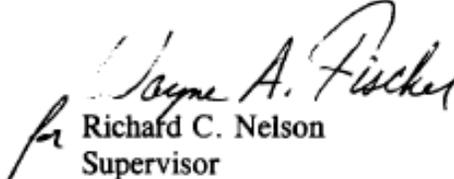
would lower the stormwater related sediment load for Mad Creek and may also reduce the amount of erosion resulting from current agricultural uses and rapid commercial and residential development of the upstream area of Mad Creek.

CONCLUSIONS AND RECOMMENDATIONS

The flood damage reduction measures proposed for Mad Creek, Muscatine, Muscatine County, Iowa, should have no long-term impacts on threatened or endangered species. Although there will be short term loss of habitat and displacement of some wildlife species, the net effect of the project should be beneficial. Any impacts to wetland areas would require a compensatory mitigation plan.

We appreciate the opportunity to provide these comments and look forward to continued coordination on this project. If you have any questions, please contact Ms. Heidi Woeber of my staff at (309) 793-5800, ext. 517.

Sincerely,


Richard C. Nelson
Supervisor

cc: IADNR (Schonhoff)

G:\WP_Docs\HEID\madcreek



DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

CEMVR-OD-PE (1145b)

26 July 2001

MEMORANDUM THRU OD-PE

FOR PM-AR (Erika Mark)

SUBJECT: CEMVR-OD-P-413850

1. Our office reviewed all information provided to us concerning the proposed Mad Creek channel improvement in Section 36, Township 77 North, Range 2 West, Muscatine County, Iowa.

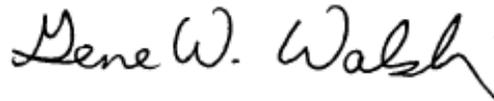
2. Your project is covered under Item 27 of the enclosed Fact Sheet No. 4A(IA), provided you meet the permit conditions for the nationwide permits which are also included in the Fact Sheet. The Corps has also made a determination of no impact on federally threatened and endangered species. We based these determinations on the information furnished us. The Iowa Department of Natural Resources (IDNR) also issued Section 401 Water Quality Certification for this nationwide permit.

3. This verification is valid for two years from the date of this letter, unless the nationwide permit is modified, reissued, or revoked. It is your responsibility to remain informed of changes to the nationwide permit program. We will issue a public notice announcing any changes if and when they occur. Furthermore, if you commence or are under contract to commence this activity before the date the nationwide permit is modified or revoked, you will have twelve months from this date to complete the activity under the present terms and conditions of this nationwide permit.

4. Although an individual Department of the Army permit and individual IDNR 401 Water Quality Certification will not be required for the project, this does not eliminate the requirement that you must still acquire other applicable Federal, state, and local permits. Please contact the Iowa Department of Natural Resources in writing or telephone 515/281-8693 to determine if any other State permits are required.

5. You are required to complete and return the enclosed "Completed Work Certification" upon completion of your project, in accordance with General Condition No. 14 of the enclosed Fact Sheet.

6. Should you have any questions, please contact our Regulatory Branch by letter, or telephone me at 309/794-5674.



GENE W. WALSH
Project Manager
Enforcement Section

Enclosures

Copy Furnished:

Mr. Kelly Stone (2)
Iowa Department of Natural Resources
Flood Plain Section
Henry A. Wallace Building
900 East Grand Avenue
Des Moines, Iowa 50319-0034 (w/o enclosures)



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

August 7, 2001

Planning, Programs, and
Project Management Division

Mr. David G. Stanley
Bear Creek Archeology, Inc.
P.O. Box 347
Cresco, Iowa 52136

Dear Mr. Stanley:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has reviewed your draft report prepared under Contract DACW25-98-D-0001, Work Order No. 25.

The State Historical Society of Iowa (SHSI) reviewed the draft report and concurred with the findings by letter dated June 11, 2001 (R&C#: 010170032). The SHSI recommended archeological survey of the potential retention basin sites; however, this project feature is not part of this work order and shall not be considered further at this time. Please include an appendix for correspondence that will include this letter and the SHSI letter in the final report.

If you have any questions regarding this matter, please call Mr. Jim Ross of our Economic and Environmental Analysis Branch, telephone 309/794-5540 (FAX 309/794-5157), or write to our address above, ATTN: Planning, Programs, and Project Management Division (Jim Ross).

Sincerely,

ORIGINAL SIGNED BY

Ronald E. Pulcher
Authorized Representative
of the Contracting Officer



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

January 9, 2002

Planning, Programs and
Project Management Division

Mr. A. J. Johnson
City Administrator
City Hall
215 Sycamore Street
Muscatine, Iowa 52761-3899

Dear Mr. Johnson:

I am writing to ask that you please disregard our letter dated December 21, 2001, requesting additional funds to complete the Mad Creek Section 205 Flood Damage Reduction Feasibility Study in Muscatine, Muscatine County, Iowa.

After further review of actual expenditures to date, the City of Muscatine has contributed adequate non-Federal funds needed to complete the feasibility study. Therefore, no additional funds are required.

I am providing you copies of the updated Fiscal Year Expenditures Summary, updated pages 66-68 of the Mad Creek Project Study Plan (PSP), and the Preliminary Phase IIA Environmental Site Assessment prepared by Missman Stanley & Associates, P.C. (Enclosures 1-3, respectively).

If you have any questions or comments, please call Mr. Dennis Hamilton of our Project Management Branch at 309/794-5634.

Sincerely,

ORIGINAL SIGNED BY

Gary L. Loss, P.E.
Chief, Planning, Programs, and
Project Management Division

Enclosures

Fiscal Year Expenditures Summary
Mad Creek, Muscatine, Muscatine County, Iowa (CWIS 150096)

12/21/2001

Feasibility Study Cost

CEFMS DATA	W#	Estimate	FY98	FY99	FY00	FY01	Est. FY02	TOTALS
Planning, Engr. & Design	001XP6 3121	\$ 100,000.00	\$ 10,170.77	\$ 51,636.21	\$ 38,176.95	\$ 2,656.59		\$ 102,840.52
	001XP6 8862	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Project Management	002NF5 3122	\$ 74,710.00	\$ -	\$ -	\$ 27,328.15	\$ 27,415.87	\$ 7,242.48	\$ 61,986.59
	002NF5 8862	\$ -	\$ -	\$ -	\$ 6,053.78	\$ 44,872.50	\$ 757.52	\$ 51,683.89
PM-A-Support	6KGC73 3122	\$ 147,630.00	\$ -	\$ -	\$ -	\$ -	\$ 9,500.00	\$ 9,500.00
	6KGC73 8862	\$ -	\$ -	\$ -	\$ -	\$ 58,979.66	\$ 1,500.00	\$ 60,479.66
Design Management	H62KGC 3122	\$ 92,100.00	\$ -	\$ -	\$ -	\$ 56,972.08	\$ -	\$ 56,972.08
	H62KGC 8862	\$ -	\$ -	\$ -	\$ -	\$ 17,727.71	\$ 23,722.00	\$ 41,449.71
Hydrology and Hydraulics	002NFV 3122	\$ 94,100.00	\$ -	\$ -	\$ 45,613.73	\$ 9,916.26	\$ -	\$ 55,529.99
	002NFV 8862	\$ -	\$ -	\$ -	\$ 63,205.01	\$ 31,221.10	\$ 3,000.00	\$ 97,426.19
Geotech	581JFB 3122	\$ 56,780.00	\$ -	\$ -	\$ -	\$ 24,739.51	\$ -	\$ 24,739.51
	581JFB 8862	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,000.00	\$ 2,000.00
Cost Estimating	FB62KF 3122	\$ 13,730.00	\$ -	\$ -	\$ -	\$ 11,779.17	\$ -	\$ 11,779.17
	FB62KF 8862	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,000.00	\$ 2,000.00
Real Estate	002NHF 3122	\$ 37,550.00	\$ -	\$ -	\$ 11,824.94	\$ 19,266.75	\$ 4,000.00	\$ 35,181.69
	002NHF 8862	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,500.00	\$ 3,500.00
CEFMS Totals	ALL	\$ 616,600.00	\$ 10,170.77	\$ 51,636.21	\$ 192,302.56	\$ 305,747.37	\$ 57,222.00	\$ 617,076.91

Total Federal	\$ 10,170.77	\$ 51,636.21	\$ 123,043.77	\$ 152,946.23	\$ 20,742.48	\$ 359,539.46
Total Non-Fed	\$ -	\$ -	\$ 69,258.79	\$ 152,801.14	\$ 36,479.52	\$ 258,539.45
Total	\$ 10,170.77	\$ 51,636.21	\$ 192,302.56	\$ 305,747.37	\$ 57,222.00	\$ 617,076.91

Feasibility Cost Sharing Agreement

3121 = Federal	% =	50%
8862 = Non-Federal	% =	50%

20% Contingency on Remaining FY02 Expenditures	\$ 11,444.40
Less \$100k Fed	\$ 100,000.00
	\$ 528,523.31

An HTRW Phase II analysis was performed at a cost of \$14,722, which was added to the FY 02 estimate of expenditures, cost shared 50/50.

Federal	\$ 284,261.68
Non-Fed	\$ 284,261.68

All other FY 02 estimates of expenditures are based on completing the DPR.

MEMORANDUM TO FILE

PROJECT: Mad Creek Section 205 Flood Damage Reduction Study
Muscatine, Iowa

SUBJECT: Mad Creek channel improvement and associated parking lot impacts
to adjacent apartment building

1. This memorandum outlines the feasibility phase "planning and design intent" for mitigating the real estate impacts associated with the Mad Creek channel improvement. The recommended alternative for flood damage reduction improvements on the subject project include a Mad Creek channel improvement and bridge cleanout at Second Street immediately north of the downtown area of Muscatine. Current conditions result in a significant hydraulic constriction as flood flows pass through this reach. The channel improvements will require project rights-of-way to be acquired by the local sponsor, the City of Muscatine.
2. The additional rights-of-way required will impact on an adjacent apartment building's parking lot located in Lot 007, see attached sketch. The channel improvements will permanently take the parking lot spaces that front the Mad Creek channel, approximately 6 spaces. Additionally, during construction, the access to the apartment building and the parking lot spaces that front to the building will have temporary interference. The planning and design intent is to restrict the construction contractor's operations to approximately a 2-week period of construction. During this 2-week period, access into the construction site will be concurrent with the access to the existing parking spaces. The parking spaces fronting the building can still be used, but short duration access interruptions will likely occur. Immediate access will be provide if any emergency conditions arise at the apartment building.
3. In addition, the planning and design intent is to have the city of Muscatine acquire the interest in Lots 9 and 10 as a part of the project rights-of-way. The portions of Lots 9 and 10 that front the Mad Creek channel will be required for project construction of the channel improvements, approximately a 25-foot width along the existing Mad Creek. The remainder of Lots 9 and 10 along with the platted alleyway adjacent to Lots 9 and 10 will be transferred to the apartment building owner for use as replacement parking for the lost spaces that front the Mad Creek channel in Lot 007. Preliminary estimates indicate that sufficient property will be available to provide in excess of the 6 spaces that will be lost. The city of Muscatine will be responsible for providing the parking lot surfacing improvements to Lots 9 and 10 and the alleyway prior to the construction of the channel improvement work.

4. The rights-of-way costs associated with Lots 9 and 10 and the parking lot improvements thereon will be considered as project costs provided for by the local sponsor. If the city decides that parking lot improvements are best accomplished by the project construction contract, the work will be included under a separate bid item with associated costs provided 100% from the city's cash-contributions to the project. Construction damages repairs (or repaving) of the existing remaining parking lot areas will be paid as a normal project cost.
5. If there are any questions concerning these issues or the planning and design intent, please contact Roger Less, ED-DM, at ext. 5664.



Roger A. Less, P.E.
Project Engineer
Chief, Project Engineering Section

Attachment: Site sketch

- Yellow = Lots 9 and 10
- Green = Lot 007
- Red = Permanent R-O-W required for project



1459 Washington St.
Muscatine, IA 52761-5040
(563) 263-8933 Voice/TT
Fax (563) 263-2127

PUBLIC WORKS

City Transit
263-8152

February 22, 2002

Equipment Maintenance
Roadway Maintenance
Collection & Drainage
Building & Grounds
Engineering

Mr. Dennis Hamilton, Project Manager
Planning, Programs and Project Management Division
Rock Island District, U.S. Army Corps of Engineers
Clock Tower Building – P.O. Box 2004
Rock Island, IL 61204-2004

RE: Mad Creek at Muscatine, Section 205
DPR – Draft Review

Dear Dennis:

Review of the Draft DPR yields four areas for comment. One in particular is very significant operationally. The others are more on the line of proofreading.

1. The abandoned railroad closure adjacent to the proposed vertical lift closure on E. 2nd Street has somehow slipped into removal.

With the replacement of the E. 5th Street bridge completed, the abandoned RR closure becomes the one and only point where equipment and material deliveries can occur at times of need to access the creek side of Mad Creek flood protection works for the entire reach above E. 2nd Street.

Also, at this time, a recreational trail is proposed to be installed along the creek side toe of levee from E. 2nd St. upstream to Washington Street. The panel closure structure will need to be programmed for modifications to accommodate a swing gate. The gate would be closed within minutes during flash floods on Mad Creek. Modifications are also open to raising the sill 1-2 feet to reduce risks.

Please note page 22 of the text, sheet numbers X103, S101, and S402 of the DPR for revision.

"I remember Muscatine for its sunsets. I have never seen any on either side of the ocean that equaled them" — Mark Twain

2. Page 25 of the text, para D-6, Economic Benefits:
"... reduce flood damages by \$820,100 while requiring an annualized cost of only \$190,700. This contributes a net of \$820,100 to the National Economic Development."

The \$820,100 vs. \$820,100 does not agree with Page B-10 where \$823,000 vs. \$636,140 yields the B/C = 4.40.

3. Page C-3, Para 7, last sentence, refers to 30' of rubble fill on Boring 75. Interpretation of that log was 20' of rubble below base of levee and would have been reduced with the 8' inspection trench during original construction. Personal observations of the several floods over the past two decades confirms no adverse seepage at that location. How rubble that deep occurred is lost in history.
4. At our meeting in Muscatine on February 7th last, I alerted you to our operational personnel's desire to convert the panel closure located on Mississippi Drive near Mulberry Ave. to a swing gate by salvage. The existing swing gate will be removed on E. 5th Street during calendar year 2003 following completion of the west abutment on the new bridge.

Modifications to the existing gate height will be necessary, most likely by attaching an I-beam to the bottom. The landside abutment will need to be extended also to accommodate the narrower closure.

Inclusion of a statement in the DPR indicating the above option will give the detailed design phase opportunity to work out the economics.

That is about all I have on the DPR. My thanks to the roster of district staff that have put together an excellent report.

Respectfully yours,



R. L. Childs, P.E.
City Engineer

cc: A. J. Johnson



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P. O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

April 23, 2002

Planning, Programs, and
Project Management Division

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers (Corps) and the City of Muscatine, Iowa, are proposing flood damage reduction measures along Mad Creek. This flood damage reduction study has been authorized under Section 205 of the 1948 Flood Control Act, as amended (Section 205).

Federal Undertaking

The project was originally coordinated with parties on the Distribution List by letter dated January 3, 2001 (R&C#: 010170032). However, the Corps has modified the preferred alternative to include new floodwall construction at the location identified in Exhibits 1 and 2. In addition, the retention basins feature as originally coordinated with the Distribution List is no longer part of the preferred alternative. The remaining features of the preferred alternative are unchanged as originally coordinated and will not be discussed further.

Area of Potential Effect (APE)

The revised APE for this undertaking includes the addition of floodwall construction footprint, adjacent historic structures, and associated construction staging and access areas as identified on Exhibits 1 and 2. Other features of the APE remain unchanged as originally coordinated with those on the Distribution List, with the exception that retention basins are no longer included. The APE is not on tribal lands [reference 36 CFR 800.15(d); 36 CFR 800.4(a)(1); and 36 CFR 800.4(c)].

Floodwall construction will result in the destruction of a historic limestone wall and will require ground disturbance over an area measuring 15 feet by 240 feet. Ground disturbance will extend up to, or very close to, the foundations of two 19th-century homes (Exhibit 2). Photographic documentation of the APE is provided in Exhibits 3-10.

Consulting Parties

The Corps finds the organizations identified on the Distribution List entitled to be consulting parties, as set out in 36 CFR 800.2, and invites them by copy of this letter to participate in the Section 106 process.

SHPO Invitation

The Corps invites the SHPO to:

- Identify any other consulting parties as per 36 CFR 800.3(f);
- Comment as per 36 CFR 800.2(d)(3) on the Corps' plan to involve the public by utilizing the Corps' normal procedures for public involvement under the National Environmental Policy Act;
- Comment on or contribute to identification efforts including definition of the APE, all as per 36 CFR 800.4(a-b).

Identification of Historic Properties

Review of Existing Information and Level of Future Identification Efforts:

Two historic structures and associated limestone wall are located in the APE. According to Historic Architecture of Muscatine, Iowa as prepared for the City of Muscatine in 1977 by Environmental Planning and Research, Incorporated, the house located at 501 East Mississippi Drive, referred to as the Judge Woodward House, was constructed in 1848, with additions built in 1874. The second house, located next door at 505 East Mississippi Drive, was built around 1846 and is referred to as the Cornelius Cadel House. It is thought that the limestone wall dates to the mid 1870s with the paving of Mississippi Drive and the construction of the Judge Woodward House improvements. A National Register of Historic Places eligibility determination has not been rendered on any of the standing structures, and the lots surrounding these structures have not been surveyed previously for archeological remains.

Pursuant to the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR Part 800, the Corps has determined that floodwall construction as proposed for this Section 205 project has potential to cause effects to significant historic properties [36 CFR 800.3(a)(1)] and as a consequence will require a determination of effect to the limestone wall, the Judge Woodward House, the Cornelius Cadel House, and to undocumented archeological historical properties within the area of proposed ground disturbance (Exhibit 2).

The Corps proposes compliance with the National Historic Preservation Act through implementation of a Programmatic Agreement (PA) pursuant to 36 CFR 800.14(b)(1)(ii). The Corps has scheduled to submit a Definite Project Report (DPR), with integrated Environmental Assessment, for public review this summer. Due to the complexity of potential adverse effects to both archeological and architectural historic properties, it is not possible for the Corps to fully determine effects prior to submission of the DPR. With that in mind, the Corps requests your review of the enclosed draft PA (Exhibit 11).

Request for Information from Consulting Parties:

The Corps is seeking information from all consulting parties regarding their concerns with issues relating to this undertaking's potential effects on historic properties and, particularly, the tribes' concerns with identifying properties that may be of religious and cultural significance to them and may be eligible for the National Register [36 CFR 800.4(a)(3-4)]. Concerns about confidentiality [36 CFR 800.11(c)] regarding locations of properties can be addressed under Section 304 of the National Historic Preservation Act, which provides withholding from public disclosure the location of properties under several circumstances, including in cases where it would cause a significant invasion of privacy, impede the use of a traditional religious site by practitioners, endanger the site, etc.

The Corps has identified the consulting parties for this undertaking as set out in 36 CFR 800.2 and invites them by copy of this letter to participate in the Section 106 process (See Distribution List). We request your written comments on this project and draft PA within 30 days pursuant to 36 CFR 800.3(c)(4). Results of all consultation and determination shall be included in the DPR, with integrated Environmental Assessment, for additional public review this summer.

If you have any questions regarding this matter, please call Mr. Jim Ross of our Economic and Environmental Analysis Branch at 309/794-5540, or you may write to our address above, ATTN: Planning, Programs, and Project Management Division (Jim Ross).

Sincerely,



Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

Enclosures

DISTRIBUTION LIST

Ho-Chunk Nation
Historic Preservation Department
P.O. Box 667
Highway 54 East
Black River Falls, WI 54615

Mr. Leon Campbell
Chairman
Iowa of Kansas Executive Committee
Route 1, Box 58A
White Cloud, KS 66094

Mr. Donald L. Robidoux
NAGPRA Coordinator
Iowa Tribe of Nebraska and Kansas
Route 1, Box 210
Hiawatha, KS 66434

Chairman
Iowa of Oklahoma Business Committee
Iowa Veterans Hall
P.O. Box 190
Perkins, OK 74059

Ms. Marianne Long
Cultural Preservationist
Iowa Tribe of Oklahoma
Rural Route 1, Box 721
Perkins, OK 74059

Mr. Johnathan Buffalo
Chairman - Meskwaki Tribal Historical
Preservation Coordinator
Sac and Fox Tribal Council
349 Meskwaki Road
Tama, IA 52339-9629

Chairman
Sac and Fox of the Missouri Tribal Council
305 North Main
Reserve, KS 66434-9723

Chairman
Sac and Fox of Oklahoma Business Committee
Route 2, Box 246
Stroud, OK 74079

Chairman
Otoe-Missouria Tribal Council
P.O. Box 68
Red Rock, OK 74651

Ms. Mildred Hudson
NAGPRA Coordinator
Otoe-Missouria Tribe of Oklahoma
Otoe-Missouria Tribal Office
Route 1, Box 62
Red Rock, OK 74651

Mr. David Lee Smith
Cultural Preservation Officer
Winnebago Tribe of Nebraska
P.O. Box 687
Winnebago, NE 68071

Mr. Don E. Giles
Chief
Peoria Indian Tribe of Oklahoma
P.O. Box 1527
Miami, OK 74355

Mr. Raul Garza
Chairman
Kickapoo Traditional Tribe of Texas
P.O. Box 972
Eagle Pass, TX 78853

Ms. Carol Anske
Chairperson
Kickapoo of Kansas Tribal Council
Route 1, Box 157
Horton, KS 66349

Ms. Maria Pearson
Governor's Liaison for Indian Affairs
1001 North Dakota Avenue
Ames, IA 50010

Ms. Maria Pandullo
State Historical Society of Iowa
R&C Coordinator
600 East Locust
Des Moines, IA 50319-0290

Mr. A.J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, IA 52761

Muscatine Area Heritage Association
2918 Bonnie Drive
Muscatine, IA 52761

Board of Supervisors
Muscatine County Courthouse
401 East 3rd Street
Muscatine, IA 52761



PEORIA TRIBE OF INDIANS OF OKLAHOMA

118 S. Eight Tribes Trail (918) 540-2535 FAX (918) 540-2538
P.O. Box 1527
MIAMI, OKLAHOMA 74355

CHIEF
John P. Froman

SECOND CHIEF
Joe Goforth

May 7, 2002

Kenneth A Barr,
U.S. Army Corps of Engineers
Rock Island District
Clock Tower Building P.O. Box 2004
Rock Island, IL 61204-2004

RE: Modifications to flood damage reduction measures along Mad Creek.

Thank you for notice of the referenced project. The Peoria Tribe of Indians of Oklahoma is currently unaware of any documentation directly linking Indian Religious Sites to the proposed construction. In the event any items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during construction, the Peoria Tribe request notification and further consultation.

The Peoria Tribe has no objection to the proposed construction. However, if any human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, the construction should stop immediately, and the appropriate persons, including state and tribal NAGPRA representatives contacted.

A handwritten signature in blue ink, appearing to read "John P. Froman".

John P. Froman
Chief

xc: Bud Ellis, Repatriation/NAGPRA Committee Chairman

STATE HISTORICAL SOCIETY OF IOWA

Where past meets future

June 11, 2002

In reply refer to:
R&C#: 010170032

American Gothic House
Eldon

Blount Run NHL
Larchwood

Centennial Building
Iowa City

Matthew Edel Blacksmith Shop
Marshalltown

Abbie Gardner Cabin
Arnolds Park

Iowa Historical Building
Des Moines

Montauk Governor's Home
Union Sunday School
Clermont Museum
Clermont

Plum Grove Governor's Home
Iowa City

Toolesboro Indian Mounds
Toolesboro

Western Historic Trails Center
Council Bluffs

Jim Ross, Archeologist
Environmental Analysis Branch
Rock Island Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

RE: COE - MUSCATINE COUNTY - CITY OF MUSCATINE - USACE ROCK ISLAND DISTRICT AND CITY OF MUSCATINE - PROPOSED FLOOD DAMAGE REDUCTION MEASURES ALONG MAD CREEK UNDER SECTION 205 OF THE 1948 FLOOD CONTROL ACT - MULTIPLE LOCATIONS -- BCA#902 - PHASE I CULTURAL RESOURCE SURVEY - DRAFT

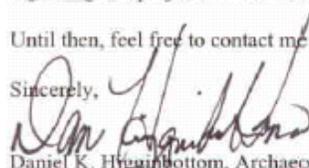
Dear Mr. Ross,

We have received and reviewed the draft programmatic agreement for the above referenced project. Thank you for providing the Iowa State Historic Preservation Office with the opportunity to consult on this matter. We make the following comments and recommendations in accordance with Section 106 of the National Historic Preservation Act of 1966 and its implementing regulations 36 CFR part 800 (revised, effective January 11, 2001).

Apart from the few red line revisions that were returned to you via email on June 10, 2002, we recommend no additional changes. Please forward the finalized draft for our signature and any additional information regarding this project as it comes available.

Until then, feel free to contact me at (515) 281-8744 if you have any questions or require further assistance.

Sincerely,

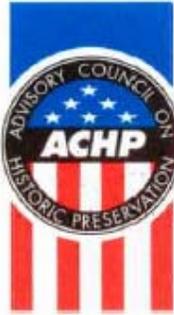

Daniel K. Hugginbottom, Archaeologist
Iowa State Historic Preservation Office
Community Programs Bureau
State Historical Society of Iowa

IOWA HISTORICAL BUILDING

600 East Locust • Des Moines, Iowa 50319-0290

Phone: (515) 281-6412 • Fax: (515) 242-6498 or (515) 282-0502

www.uiowa.edu/~shsi/index.htm



JUL 12 2002

Mr. Gary L. Loss, P.E.
Chief, Planning, Programs, and Project Management Division
Rock Island District, Corps of Engineers
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

REF: Proposed Mad Creek Flood Protection Project
Muscatine County, Iowa

Dear Mr. Loss:

On July 1, 2002, the Council received your notification and supporting documentation regarding the adverse effects of the referenced project on properties listed on and eligible for listing on the National Register of Historic Places. Based upon the information you provided, we do not believe that our participation in consultation to resolve adverse effects is needed. However, should circumstances change and you determine that our participation is required, please notify us. Pursuant to 36 CFR 800.6(b)(iv), you will need to file the final Memorandum of Agreement and related documentation at the conclusion of the consultation process. The filing of the Agreement with the Council is required in order to complete the requirements of Section 106 of the National Historic Preservation Act.

Thank you for providing us with your notification of adverse effect. If you have any questions or require the further assistance of the Council, please contact us at 202-606-8505.

Sincerely,

Raymond V. Wallace
Historic Preservation Technician
Office of Federal Agency Programs

ADVISORY COUNCIL ON HISTORIC PRESERVATION

1100 Pennsylvania Avenue NW, Suite 809 • Washington, DC 20004
Phone: 202-606-8503 • Fax: 202-606-8647 • achp@achp.gov • www.achp.gov



REPLY TO
ATTENTION OF

Planning, Programs, and
Project Management Division

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P. O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

August 19, 2002

TO ALL INTERESTED PARTIES

A draft Detailed Project Report (DPR) presenting the results of a feasibility study of flooding problems along Mad Creek in the City of Muscatine, Iowa, has been released for public review. The Rock Island District of the U.S. Army Corps of Engineers prepared the report under the authority of Section 205 of the 1948 Flood Control Act, as amended.

The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of the City of Muscatine and areas to the north in Muscatine County. Due to the nature of the watershed and intensive development in the downtown area, Mad Creek is prone to flash flooding, experiencing flooding events in 1991, 1993, and 1998.

Alternative plans were developed and evaluated based on appropriate engineering, economic, environmental, cultural, and social factors. Major components of the selected plan include raising the height of approximately 2,300 linear feet of existing levees and 1,700 linear feet of existing floodwalls by approximately 2 feet, 230 linear feet of new floodwall, a new bulkhead closure gate to replace the existing panel closure at Mississippi Drive, a new overhead closure gate to replace an existing floodgate at 2nd Street, a new swing gate to replace the panel closure across the abandoned railroad just upstream on 2nd Street and installation of a new closure structure across the railroad south of Washington Street. The selected plan also includes improving a section of the Mad Creek channel upstream of 2nd Street to reduce flood stages and installation of an enhanced flood warning system. The project cost estimate is \$3.45 million and the estimated benefit-cost ratio is 3.4 to 1.

The selected plan complies with United States law including appropriate environmental requirements and meets all Corps of Engineers criteria. Following successful completion of the public review, the District Engineer is expected to recommend that the selected plan be constructed under the authority of Section 205 of the 1948 Flood Control Act, as amended, with such modifications as, in the discretion of the Chief of Engineers, may be advisable.

The draft DPR will be available for public review for 30 days. Copies are available for review at the Muscatine Public Library, Muscatine City Hall, and at the Rock Island District Corps of Engineers office. The document can also be viewed on the internet at www.mvr.usace.army.mil. Comments regarding the draft DPR may be submitted to our address above, ATTN: Planning, Programs, and Project Management Division (Mr. Dennis Hamilton).

Sincerely,

ORIGINAL SIGNED BY

Teresa A. Kincaid, P.E.
Acting Chief, Planning, Programs,
and Project Management Division



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P. O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

November 18, 2002

Planning, Programs, and
Project Management Division

TO ALL INTERESTED PARTIES

— The Rock Island District of the U.S. Army Corps of Engineers has enclosed for your information a copy of the Statement of Findings (SOF) and the Finding of No Significant Impact (FONSI) for the Detailed Project Report (DPR) with Environmental Assessment (EA) for the feasibility study of flooding problems along Mad Creek in the City of Muscatine, Iowa.

The DPR with EA for the Section 205 Flood Damage Reduction Study, dated July 2002, was circulated for public review on August 9, 2002. On August 19, 2002, a notice of document availability and web site (<http://www.mvr.usace.army.mil/MadCreek/>) was also sent to the general public and interested parties. Comments received during the review period for these documents and the Rock Island District's response to those comments have been compiled in the SOF. We determined that no comments were received that altered the determination that no significant environmental impact would result, and the SOF and FONSI were signed on October 31, 2002. All documents are on file at the Rock Island District office.

We thank you for your interest. For additional information about the Rock Island District, please visit our home page at: <http://www.mvr.usace.army.mil>. If you have any questions regarding this project, you may contact Mr. Randy Kraciun by telephoning 309/794-5174, or by writing to our address above, ATTN: Planning, Programs, and Project Management Division (Randy Kraciun).

Sincerely,

Dorene A. Bollman

Dorene A. Bollman
Acting Chief, Economic and
Environmental Analysis Branch

— Enclosure

**Detailed Project Report with
Environmental Assessment**

**Section 205 Flood Damage Reduction Study
Mad Creek
Muscatine, Muscatine County, Iowa**

STATEMENT OF FINDINGS

I. Project Description.

A. This statement concerns a proposal by the Rock Island District of the U.S. Army Corps of Engineers (Corps) to improve the levee along Mad Creek in Muscatine, Iowa and restore a portion of the channel and bankline near the 2nd Street Bridge.

B. A Detailed Project Report (DPR) with Environmental Assessment (EA), Section 205 Flood Damage Reduction Study, Mad Creek, Muscatine County, Iowa, dated July 2002, addressing the results of a feasibility study of flooding problems along Mad Creek in Muscatine, Iowa and probable impacts resulting of the proposed project has been prepared and circulated for public review.

II. Public Interest Review.

A Joint Public Notice was not required for this project, it complies with nationwide permits item 27. Item 27 covers stream and wetland restoration and allows activities in waters of the US associated with the restoration of former waters and riparian areas.

III. Public Review Comments.

The following is a summarized list of the comments received during the public review period. Each is followed by the Rock Island District's response where appropriate. A copy of our coordination letter and response letters follow the SOF, FONSI, and FOC.

Response to EA:

A. The US Fish and Wildlife Service (FWS) responded to the public review by letter dated September 10, 2002. They stated that the proposed project "will not adversely affect endangered species or their habitats. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended." They also stated that while there would "be short term loss of habitat and displacement of some wildlife species, the net effect of the project should be beneficial."

(Enclosure)

B. An e-mail from Mr. Doug White of Lake Park Blvd., Muscatine, Iowa, was received on September 3, 2002. He stated that he had "had problems with the creek in the past." He wanted to know if the project would complicate his problems by backing up the creek. He also asked if we were "going to address the problems" in his neighborhood.

Response: Corps analysis shows that the project would have no appreciable affect on flood levels, either positive or negative, in the vicinity of Lake Park Blvd. While the proposed flood warning system will be of value to all those along Mad Creek by providing earlier warning of impending flood events, there are currently no plans that would "address the problems" of the Lake Park neighborhood.

IV. Summary of Environmental Impact Review.

A. An EA was been prepared for this project. This review has not identified any potentially significant adverse effects resulting from the implementation of the project as proposed. Thus, a Finding of No Significant Impact was prepared and is included in the EA.

B. The activity will comply with the conditions stated in Item 27 of the Nationwide Permits as put forth in Fact Sheet No. 5(IA), Nationwide Permits in Iowa, effective date March 18, 2002, and the guidelines set forth in 40 CFR 230.

V. Summary of Findings.

I find that the implementation of the project, as proposed, and under the conditions set forth and as prescribed by applicable regulations published in 33 CFR Part 230 (Appendix B), 33 CFR Parts 320 to 340, 40 CFR Part 230 (if applicable), and 33 CFR Part 250 (Implementation of Executive Order 11988, Flood Plain Management) is in the public interest.

31 Oct 2002

Date


William J. Bayles
Colonel, U.S. Army
District Engineer

FINDING OF NO SIGNIFICANT IMPACT
SECTION 205 FLOOD DAMAGE REDUCTION STUDY
MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA

I have reviewed the information provided by this Environmental Assessment (EA), along with data obtained from cooperating Federal, State, and local agencies and from the interested public. Based on this review, I find that the preferred alternative for the proposed flood control improvements, to improve the levee along Mad Creek in Muscatine, Iowa, and restore a portion of the channel and bankline near the Second Street Bridge, as proposed in this EA, will not significantly affect the quality of the environment. Therefore, it is my determination that an Environmental Impact Statement (EIS) is not required. This determination will be reevaluated if warranted by later developments.

Alternatives considered along with the preferred action were:

- No Federal action;
- Constructing stormwater detention reservoirs;
- Raising existing floodwall and levee system;
- A combination of floodwalls and levees and stormwater detention reservoirs; and an enhanced early flood-warning system to better react to flash floods.

Preferred Alternative.

Factors considered in making a determination that an EIS was not required are as follows:

- a. The project involves a within-levee upgrade.
- b. Impacts to local wildlife and aquatic communities will be minimal and temporary.
- c. No endangered species, either State or Federal, will be affected by the project action.
- d. No significant environmental, social, economic, or cultural impacts are anticipated as a result of implementing the proposed project.

31 OCT 02

Date



William J. Bayles
Colonel, U.S. Army
District Engineer



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

August 19, 2002

Planning, Programs, and
Project Management Division

TO ALL INTERESTED PARTIES

A draft Detailed Project Report (DPR) presenting the results of a feasibility study of flooding problems along Mad Creek in the City of Muscatine, Iowa, has been released for public review. The Rock Island District of the U.S. Army Corps of Engineers prepared the report under the authority of Section 205 of the 1948 Flood Control Act, as amended.

The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of the City of Muscatine and areas to the north in Muscatine County. Due to the nature of the watershed and intensive development in the downtown area, Mad Creek is prone to flash flooding, experiencing flooding events in 1991, 1993, and 1998.

Alternative plans were developed and evaluated based on appropriate engineering, economic, environmental, cultural, and social factors. Major components of the selected plan include raising the height of approximately 2,300 linear feet of existing levees and 1,700 linear feet of existing floodwalls by approximately 2 feet, 230 linear feet of new floodwall, a new bulkhead closure gate to replace the existing panel closure at Mississippi Drive, a new overhead closure gate to replace an existing floodgate at 2nd Street, a new swing gate to replace the panel closure across the abandoned railroad just upstream on 2nd Street and installation of a new closure structure across the railroad south of Washington Street. The selected plan also includes improving a section of the Mad Creek channel upstream of 2nd Street to reduce flood stages and installation of an enhanced flood warning system. The project cost estimate is \$3.45 million and the estimated benefit-cost ratio is 3.4 to 1.

The selected plan complies with United States law including appropriate environmental requirements and meets all Corps of Engineers criteria. Following successful completion of the public review, the District Engineer is expected to recommend that the selected plan be constructed under the authority of Section 205 of the 1948 Flood Control Act, as amended, with such modifications as, in the discretion of the Chief of Engineers, may be advisable.

The draft DPR will be available for public review for 30 days. Copies are available for review at the Muscatine Public Library, Muscatine City Hall, and at the Rock Island District Corps of Engineers office. The document can also be viewed on the internet at www.mvr.usace.army.mil. Comments regarding the draft DPR may be submitted to our address above, ATTN: Planning, Programs, and Project Management Division (Mr. Dennis Hamilton).

Sincerely,

ORIGINAL SIGNED BY

Teresa A. Kincaid, P.E.
Acting Chief, Planning, Programs,
and Project Management Division



IN REPLY REFER
TO:

FWS/RIFO

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office
4469 48th Avenue Court
Rock Island, Illinois 61201
Phone: (309) 793-5800 Fax: (309) 793-5804



September 10, 2002

Colonel William J. Bayles
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

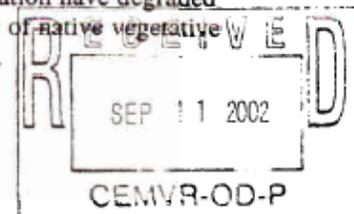
Dear Colonel Bayles:

This letter constitutes our Final Fish and Wildlife Coordination Act (FWCA) report for the Mad Creek flood damage reduction study undertaken through the Corps of Engineer Continuing Authorities Program and authorized by Section 205 of the 1948 Flood Control Act, as amended. It has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat.401, as amended; 16 U.S.C. 661 et seq.); the Endangered Species Act of 1973, as amended; and in accordance with the Fish and Wildlife Service's Mitigation Policy.

DESCRIPTION OF THE PROJECT AREA

The Mad Creek study area is located along the Mississippi River in Muscatine, Muscatine County, Iowa. The Mad Creek watershed drains approximately 17.3 square miles in the eastern portion of Muscatine and areas north of Muscatine in Muscatine County. The upstream portion of the watershed north of Muscatine is primarily agricultural land but is rapidly being converted into residential subdivisions and commercial developments. The lower portion of Mad Creek is within the Muscatine city limits, flowing through an area of mixed commercial, industrial, and residential uses near the downtown area before emptying into the Mississippi River. Low-lying areas along Mad Creek and Geneva Creek, its main tributary, are subject to flash flooding.

Development in the watershed and floodplain has altered floodplain hydrology, increasing stormwater runoff and flood stages. The resulting increases in sedimentation have degraded aquatic and terrestrial habitats, thereby reducing the quantity and quality of native vegetative communities and jeopardizing the sustainability of the watershed system.



PROJECT OBJECTIVES

The goals of the Mad Creek flood damage reduction study are to determine the economic feasibility of a flood damage reduction plan and to recommend a plan for implementation. Four primary alternatives have been considered for reducing the flooding hazard:

- a. Raise the existing floodwall and levee system;
- b. Construct stormwater detention reservoirs;
- c. A combination of alternatives a & b, including stormwater detention reservoirs; and,
- d. An enhanced early flood-warning system to better react to flash floods.

FISH AND WILDLIFE RESOURCES

Development of the flood plain for agriculture, commercial and residential purposes is a limiting factor for wildlife resources. Although the project area includes some pasture and several open grassy areas, the vegetation is dominated by introduced grasses. These areas are either mowed or grazed regularly. Wildlife species in the area are a common assemblage of birds and mammals found in agricultural and urban habitats.

We have no site specific information on the fishery resource in the project area, but would expect that the fish community would be composed of species common to eastern Iowa creeks and streams, such as shiners, darters, dace, common stoneroller, and possibly sunfish.

THREATENED AND ENDANGERED SPECIES

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action.

Therefore, we are furnishing you the following list of species which may be present in the concerned area:

<u>Classification</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Habitat</u>
Threatened	Bald eagle	<i>Haliaeetus leucocephalus</i>	Breeding, Winters along major rivers and reservoirs
Endangered	Higgins' eye pearly mussel	<i>Lampsilis higginsii</i>	Mississippi River

Endangered	Indiana bat	<i>Myotis sodalis</i>	Caves, mines; small stream corridors with well developed riparian woods; upland forests
------------	-------------	-----------------------	---

Bald eagles winter along the Mississippi River, including Pool 17. The proposed project would not affect bald eagles or their habitats.

The endangered Higgins' eye pearly mussel (*Lampsilis higginsii*) prefers sand/gravel substrates with a swift current and are most often found in the main channel border or an open, flowing side channel. The species is found in the Mississippi River in Muscatine County, but it is not likely to occur in the project area.

The endangered Indiana bat (*Myotis sodalis*) is listed as occurring in Muscatine County, Iowa. During the summer, the Indiana bat frequents the corridors of small streams with well developed riparian woods as well as mature upland forests. It forages for insects along the stream corridor, and within the canopy of floodplain and upland forests. It has been shown that the foraging range for the bats varies by season, age and sex and ranges up to 81 acres (33ha). It roosts and rears its young beneath the loose bark of large dead or dying trees. Tree clearing for this project should not be conducted during the April 1 - September 30 timeframe. Prohibiting clearing activity during this 6-month time window would avoid potential impacts to summer roosting Indiana bats. If Indiana bats are known to be present, they must not be harmed, harassed, or disturbed when present.

The proposed flood damage reduction measures will not adversely affect endangered species or their habitats. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified or new information indicate endangered species may be affected, consultation should be initiated.

FUTURE WITHOUT PROJECT

The No Federal Action alternative is considered the future without the project condition allowing the area to continue to function as is. Without flood reduction measures such as detention basins, sedimentation will continue in the area and will result in continued degradation of fisheries habitat.

FUTURE WITH PROJECT

Enhancement options for Mad Creek include increasing the quality of existing floodwall and levee protection, constructing stormwater detention systems, thereby reducing flooding potential and sedimentation. Reducing the potential for flooding on Mad Creek would also result in a decrease in property damage. Raising the levee on Mad Creek would have little or no impact on wildlife. The area adjacent to Mad Creek in the area of the levee is commercially developed urban property. Construction of the stormwater detention systems

would lower the stormwater related sediment load for Mad Creek and may also reduce the amount of erosion resulting from current agricultural uses and rapid commercial and residential development of the upstream area of Mad Creek.

CONCLUSIONS AND RECOMMENDATIONS

The flood damage reduction measures proposed for Mad Creek, Muscatine, Muscatine County, Iowa, should have no long-term impacts on threatened or endangered species. Although there will be short term loss of habitat and displacement of some wildlife species, the net effect of the project should be beneficial. Any impacts to wetland areas would require a compensatory mitigation plan.

We appreciate the opportunity to provide these comments and look forward to continued coordination on this project. If you have any questions, please contact Ms. Heidi Woerber of my staff at (309) 793-5800, ext. 517.

Sincerely,



Richard C. Nelson
Supervisor

cc: IADNR (Schonhoff)

G:\WP_Docs\HEID\madcreek.wpd

Hamilton, Dennis W MVR

From: Hamilton, Dennis W MVR
Sent: Friday, September 06, 2002 10:52 AM
To: 'Doug White'
Subject: RE: Mad Creek

I have been out of the office for a few days and apologize for the delay in responding.

The draft selected alternative includes modifications to the channel of Mad Creek and an enhanced flood warning system, in addition to raising the existing levee. The channel modifications will substantially lower expected flood levels at the lower end of Mad Creek, but will have no appreciable affect on flood levels, either positive or negative, in the vicinity of Lake Park Blvd. The proposed levee modifications will also have no appreciable affects on flood levels at Lake Park Blvd.

Although flood damages to the Lake Park Blvd area can be substantial, because of the relatively small number of residences affected and the high cost of any potential alternatives, there is not an economic justification for providing flood protection to this area. The proposed flood warning system will be of value to all those along Mad Creek by providing earlier warning of impending flood events, although the time available to respond will still be relatively short. I am available to discuss this further by telephone if you wish. Thank you for your interest in this study.

Dennis Hamilton
Project Manager
309-794-5634

-----Original Message-----

From: Doug White [<mailto:dougwhite@machlink.com>]
Sent: Tuesday, September 03, 2002 11:57 AM
To: Hamilton, Dennis W
Subject: Mad Creek

I live at 715 Lake Park Blvd. As you know we have had problems with the creek in the past. The improvements you propose seem to be concerned with raising the levee in the lower section of the creek. Will this complicate our problems by backing up the creek? Are you going to address the problems in my neighborhood?

Please feel free to contact me at

563-263-9219
Doug White 715 Lake Park Blvd.



City Hall, 215 Sycamore St.
Muscatine, IA 52761-3840
(563) 264-1550 Voice/TT
Fax (563) 264-0750

MAYOR

November 20, 2002

Colonel William J. Bayles
U.S. Army Engineer District
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: STATEMENT OF FINANCIAL CAPABILITY, Section 205 Flood Control Project, Mad
Creek, Muscatine, Iowa

Dear Colonel Bayles:

The City of Muscatine, Iowa has the legal authority to enter into the Project Cooperation Agreement and to fulfill all financial obligations for completion of the project. The City understands that the current cost estimate for the entire project is \$3,445,000. Of this, the City's share is \$1,205,750 (\$700,750 cash and \$505,000 for rights-of-way and relocation costs).

It is the City's intention to finance its share of project costs through bond issuance and the levee tax levy. These funding sources will be available to meet the City's requirements as shown on the attached schedule of Estimated Funding Requirements. Enclosed also is a copy of the City's latest Annual Financial Report for the year ended June 30, 2001. The June 30, 2002 report will be available in December.

The City of Muscatine has reviewed the Project Cooperation Agreement (PCA) and has found its provisions acceptable. The City strongly desires to proceed with this flood damage reduction project. If further information is needed, please do not hesitate to contact our office.

Sincerely,

Richard W. O'Brien
Mayor

Enclosure

APPENDIX I

FINAL PROGRAMMATIC AGREEMENT

PROGRAMMATIC AGREEMENT

AMONG
THE ROCK ISLAND DISTRICT U.S. ARMY CORPS OF ENGINEERS
AND THE IOWA STATE HISTORIC PRESERVATION OFFICE
REGARDING THE PROPOSED FLOODWALL FEATURE
OF THE MAD CREEK SECTION 205 FLOOD PROTECTION PROJECT
CITY OF MUSCATINE, MUSCATINE COUNTY, IOWA

WHEREAS, the U.S. Army Corps of Engineers (Corps) proposes construction of a floodwall feature as part of the Mad Creek Flood Protection Project under Section 205 of the 1948 Flood Control Act, herein the Mad Creek project, and,

WHEREAS, floodwall construction proposed for the Mad Creek project includes the destruction of an existing historic limestone wall and associated excavation, landscaping, and machinery staging areas immediately adjacent to two nineteenth century homes at the corner of Mississippi Drive and Mulberry Avenue in Muscatine, Iowa; and

WHEREAS, the area of potential effects (APE) has been determined but the determination of effects has not been fully finalized, and

WHEREAS, the Corps has determined that the Mad Creek project may have an effect upon properties potentially eligible for inclusion in the National Register of Historic Places, and has consulted with the Advisory Council on Historic Preservation (Council) and the Iowa State Historic Preservation Officer (SHPO) pursuant to Section 800.14(b) of the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act; (16 U.S.C. 470f); [and Section 110(f) of the same Act (16 U.S.C. 470h-2(f)), and

WHEREAS, the Council has been notified and invited to participate as a signatory to the agreement, and, after due consideration, has determined that their participation in executing the general terms of the agreement is not necessary, and

WHEREAS, pursuant to Section 800.3 of the Council's regulations and to meet the Corps' responsibilities under the National Environmental Policy Act of 1969 the Corps has contacted the Indian Tribes (Tribes) and other consulting parties (**INTERESTED PARTY LIST**) that may have an interest in the effects of this project on historic properties, and whether any other traditional cultural properties or sacred sites may be potentially affected by this undertaking. Those on the **INTERESTED PARTY LIST (PA Attachment 1)** will be provided with public meeting announcements, special releases, and notifications of the availability of report(s), including all draft agreement documentation, as stipulated by 36 CFR Part 800.14(b)(ii) of the NHPA; and such comments received by the Corps will be distributed to the consulting parties to this agreement and taken into account in finalizing plans for the undertaking, and

NOW, THEREFORE, the Corps and the SHPO/Tribal Historic Preservation Officers (THPO) agree that subsequent to completion of National Environmental Policy Act

documentation requirements, the project shall be implemented in accordance with the following stipulations to satisfy the Corp's Section 106 responsibility for all individual aspects of the project.

I. HISTORIC PROPERTY SURVEYS AND TESTING

A. The Corps will take all measures necessary to discover, preserve, and avoid significant historic properties, listed on, or eligible for, inclusion in the National Register of Historic Places, burials, cemeteries, or sites likely to contain human skeletal remains/ artifacts and objects associated with interments or religious activities, and provide this information, studies, and/or reports to the SHPO/THPO(s) through the implementation of historic property surveys and testing, and the treatments of historic properties. The Corps will ensure that the following measures are implemented:

1. The Corps has defined the area of potential effects in consultation with the SHPO and will conduct a historic property visual (reconnaissance) survey with archaeological subsurface testing and an architectural assessment of all standing structures.

2. The Corps will ensure that all reconnaissance surveys, subsurface testing, and architectural assessments are conducted in a manner consistent with the Guidelines for Archaeological Investigations in Iowa, the Secretary of the Interior's Standards and Guidelines for Identification and Evaluation (48 FR 44720-23), and take into account the National Park Service publication The Archaeological Survey: Methods and Uses (1978) and any extant or most recent version of SHPO guidelines for historic properties reconnaissance surveys/reports, related guidance, and etc. These investigations will be implemented by the Corps and reviewed by the SHPO/THPO(S).

3. In consultation with the SHPO/THPO(s), and as appropriate, the Tribes and other consulting parties, the Corps will evaluate for eligibility all significant historic properties by applying the National Register criteria (36 CFR Part 60.4).

a. For those properties that the Corps and SHPO/THPOs agree are not eligible for inclusion in the National Register, no further historic properties investigations will be required, and the project may proceed in those areas.

b. If the survey results in the identification of properties that the Corps and the SHPO/THPO(s) agree are eligible for, or inclusion on, the National Register, the Corps shall treat such properties in accordance with Part II below.

c. If the Corps and the SHPO/THPO(s) do not agree on National Register eligibility, or if the Council or the National Park Service so request, the Corps will request a formal determination of eligibility from the Keeper of the National Register, National Park Service, whose determination shall be final.

II. TREATMENT OF HISTORIC PROPERTIES

Those individual historic properties that the Corps and the SHPO/THPO(s) agree are eligible for nomination to, or that the Keeper has determined eligible for inclusion in, the National Register will be treated by the Corps in the following manner:

A. ARCHAEOLOGICAL AND ARCHITECTURAL DOCUMENTATION:

1. If the Corps determines, in consultation with the SHPO/THPO(s), that no other actions are feasible to avoid and minimize effects to properties, then the Corps will develop a treatment plan, which may include data recovery, site avoidance and active protection measures. The Corps will implement the treatment plan in consultation with the SHPO/THPO(s).

2. If archeological data recovery is the agreed upon treatment, the data recovery plan will address substantive research questions developed in consultation with the SHPO/THPO(s). The treatment plan shall be consistent with the Guidelines for Archaeological Investigations in Iowa, the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (48 FR 44734-37), and take into account the Council's publication, Treatment of Archaeological Properties (Advisory Council on Historic Preservation, 1980) and SHPO/THPO(s) guidance. It shall specify, at a minimum, the following:

- a. the property, properties, or portions of properties where the treatment plan is to be carried out,
- b. the research questions to be addressed, with an explanation of research relevance and importance,
- c. the methods to be used, with an explanation of methodological relevance to the research questions,
- d. proposed methods of disseminating results of the work to the interested public, and,
- e. a proposed schedule for the submission of progress reports to the SHPO/THPO(s).

3. If architectural recordation is an agreed upon treatment, the data recovery plan will be developed in consultation with the SHPO/THPO(s) and consistent with the Secretary of the Interior's Standards and Guidelines for Architectural and Engineering Documentation. Prior to demolition of any standing structure determined eligible for inclusion on the NRHP, the Corps shall contact the National Park Service Midwest Region Chief of Cultural Resources to determine what level and kind of recordation is required for the property when avoidance is not a feasible or prudent alternative. Unless otherwise agreed to by the National Park Service, the Corps shall ensure that all documentation is completed and accepted by HABS/HAER prior to demolition and that all copies of this documentation are made available to the SHPO and appropriate local archives recommended by the SHPO.

4. The Corps shall ensure that the project design for new construction is compatible with the historic and architectural qualities of the NRHP eligible standing structures in terms of scale, massing, color, and materials, and is responsive to the recommended approaches to new construction set forth in the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings, and that the design and specifications for the project are developed in consultation with the SHPO and submitted to the SHPO for review and comment.

5. The Corps shall ensure that all NRHP eligible standing structures within the APE that will not require demolition as part of this undertaking shall be protected from both direct and indirect affects as a result of project activities. Protection measures shall be developed in consultation with the SHPO and shall be included in the archeological and/or architectural treatment plan.

6. The Corps shall submit the treatment plan to the SHPO/THPO(s) for 30 days review and comment. The Corps will take into account SHPO/THPO comment, and shall ensure that the treatment plan is implemented. The SHPO/THPO(s) may monitor this implementation.

7. The Corps will ensure that the treatment plan is carried out by or under the direct supervision of an archaeologist(s), architectural historian(s) and/or other appropriate cultural resource specialist that meets, at minimum, the Secretary of the Interior's Professional Qualifications Standards (48 FR 44738-9).

8. The Corps will ensure that adequate provisions, including personnel, time, and laboratory space, are available for the analysis and curation of recovered materials from historic properties.

9. The Corps will develop and implement an adequate program in consultation with the SHPO/THPO(s) to secure historic properties from vandalism during data recovery.

B. ADDITIONAL SITE-SPECIFIC TREATMENT MEASURES: Prior to the implementation of any of the treatment measures outlined above, the Corps shall consult with the SHPO/THPO(s) to determine whether these measures are sufficient to avoid, reduce, or mitigate adverse effects to historic properties. Should there be a disagreement between the Corps and a SHPO/THPO(s) that cannot be resolved, the Corps shall seek the consultation of the Council for resolution. The Corps shall take into account the comments of the Council in making decisions about the adequacy of such measures. The Corps shall provide to the Council and the SHPO/THPO(s) a written response to the comment of the Council.

III. CURATED ITEMS

In consultation with the SHPO/THPO(s), the Corps will ensure that all materials and records resulting from the historic properties studies are curated at a repository within the State of Iowa in accordance with 36 CFR Part 79.

IV. TREATMENT OF HUMAN REMAINS AND ITEMS OF RELIGIOUS AND CULTURAL SIGNIFICANCE

A. If human remains are encountered either during the data recovery or during any project construction activities, the Corps will comply with all provisions outlined in the appropriate state acts, statutes, guidance, provisions, etc., and any decisions regarding the treatment of human remains will be made under consultation with the SHPO/THPO(s) and the Iowa Office of the State Archaeologist (Iowa Code Chapter 263B.7-9, 566, 716.5, and Iowa Administrative Code 685-11, as appropriate).

B. If items of religious and cultural importance to Tribes are encountered or collected, the Corps will comply with all provisions outlined in the appropriate state acts, statutes, guidance, provisions, etc., and any decisions regarding the treatment of human remains will be made in consultation with the SHPO/THPO(s), Tribe(s), and the Iowa Office of the State Archaeologist (Iowa Code Chapter 263B.7-9, 566, 716.5, and Iowa Administrative Code 685-11, as appropriate).

V. REPORTS

The Corps will ensure that all final historic property reports resulting from the actions pursuant to this Agreement will be provided in a format that is consistent with contemporary professional standards including the Guidelines for Archaeological Investigations in Iowa, and to the Department of the Interior's Format Standards for Final Reports of Data Recovery (42 FR 5377-79). Precise locations of significant historic properties may be provided only in a separate appendix if it appears that the release of this data could jeopardize historic properties. Precise locational data of traditional cultural properties or sacred sites, consisting of architectural, landscapes, objects, or surface or buried archaeological sites, identified in coordination with Tribe(s), will be considered to be sensitive information and pursuant to Section 304 of the NHPA the Corps will not make this information available for public disclosure. The Corps will make available for publication and public dissemination the reports and associated data, minus precise aforementioned locational data and sensitive information.

VI. PROVISION FOR POST-REVIEW DISCOVERIES

In accordance with 36 CFR Section 800.13, if previously undetected or undocumented historic properties are discovered during project activities, the Corps will cease, or cause to stop, any activity having an effect and consult with the SHPO/THPO(s) to determine if additional investigation is required. If further archaeological investigations are warranted or required, any treatment plan will be performed by the Corps in accordance with Part II TREATMENT OF HISTORIC PROPERTIES, Part III CURATION, Part IV TREATMENT OF HUMAN REMAINS AND ITEMS OF RELIGIOUS AND CULTURAL SIGNIFICANCE, and V REPORTS, all of this Agreement. If both the Corps and the SHPO/THPO(s) determine that further investigation is not necessary or warranted, activities may resume with no further action required. Any disagreement between the Corps and the SHPO/THPO(s) concerning the need for further investigations will be handled pursuant to Part VII DISPUTE RESOLUTION of this Agreement.

VII. DISPUTE RESOLUTION

Should the SHPO/THPO(s) or the Council object within 30 days to any plans or actions provided for review pursuant to this Agreement, the Corps will consult with the objecting party to resolve the objection. If the Corps determines that the disagreement cannot be resolved, the Corps will request further comment from the Council in accordance with the applicable provisions of 36 CFR Part 800.7. The Corps in accordance with 36 CFR Part 800.7(c)(4) will take any Council comment provided in response into account, with reference only to the subject of the dispute. The Corps' responsibility to carry out all actions under this Agreement that are not the subjects of the dispute will remain unchanged.

VIII. TERMINATION

Any of the signatories to this Agreement may request a reconsideration of its terms or revoke the relevant portions of this Agreement upon written notification to the other signatories, by providing thirty (30) days notice to the other signatories, provided that these signatories will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the advent of termination, the Corps will comply with 36 CFR Parts 800.3 through 800.7 with regard to individual undertakings covered by this Agreement.

IX. AMENDMENTS

Any signatories to this Agreement may request that it be amended, whereupon the other signatories parties will consult in accordance with 36 CFR Part 800.13, to consider such amendment.

X. PERIODIC REVIEW

A. The Corps will provide the SHPO/THPO(s) with evidence of compliance with this Agreement by letter on January 1, 2003, and once every year thereafter said date. This documentation shall contain the name of the project, title of the documents which contained the Agreement, historic properties identified, determinations of effect, avoidance procedures, level of investigation(s) and/or mitigation(s) conducted with titles of all project reports related to such investigation(s) and/or mitigation(s) which have been completed.

B. The Corps shall review the necessity of this PA after a period of five years from the date of Corps signature in order to determine whether it should be reissued or allowed to expire. If the PA requires reissue, the Corps shall consult with the SHPO/THPO(s) in order to insure compliance with the most current version of the federal regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act; (16 U.S.C. 470f); [and Section 110(f) of the same Act (16 U.S.C. 470h-2(f)].

XI. EXECUTION AND IMPLEMENTATION

A. Nothing in this Agreement is intended to prevent the Corps from consulting more frequently with the SHPO/THPO(s) or the Council concerning any questions that may arise or on the progress of any actions falling under or executed by this Agreement. Any resulting modifications to this Agreement will be coordinated in accordance with Section 800.5(e)(5).

B. The undersigned concur that the Corps has satisfied its Section 106 responsibilities for all individual undertakings through this Agreement regarding the implementation of the floodwall construction plans as a result of the Mad Creek Section 205 Flood Protection Study.

XII. SIGNATORIES TO THIS AGREEMENT

A. ROCK ISLAND DISTRICT, U.S. ARMY CORPS OF ENGINEERS:

BY:  Date: 10 October 2002
Colonel William J. Boes
District Engineer
U. S. Army Corps of Engineers
Rock Island District

B. IOWA STATE HISTORIC PRESERVATION OFFICER:

BY:  Date: October 24, 2002
Lowell Soike
Iowa Deputy State Historic Preservation Officer
State Historical Society of Iowa

PA ATTACHMENT 1. Interested Parties List.

INTERESTED PARTIES LIST

Ho-Chunk Nation
Historic Preservation Department
P.O. Box 667
Highway 54 East
Black River Falls, WI 54615

Mr. Leon Campbell
Chairman
Iowa of Kansas Executive Committee
Route 1, Box 58A
White Cloud, KS 66094

Mr. Donald L. Robidoux
NAGPRA Coordinator
Iowa Tribe of Nebraska and Kansas
Route 1, Box 210
Hiawatha, KS 66434

Chairman
Iowa of Oklahoma Business Committee
Iowa Veterans Hall
P.O. Box 190
Perkins, OK 74059

Ms. Marianne Long
Cultural Preservationist
Iowa Tribe of Oklahoma
Rural Route 1, Box 721
Perkins, OK 74059

Mr. Johnathan Buffalo
Chairman - Meskwaki Tribal Historical
Preservation Coordinator
Sac and Fox Tribal Council
349 Meskwaki Road
Tama, IA 52339-9629

Chairman
Sac and Fox of the Missouri Tribal Council
305 North Main
Reserve, KS 66434-9723

Chairman
Sac and Fox of Oklahoma Business
Committee
Route 2, Box 246
Stroud, OK 74079

Chairman
Otoe-Missouria Tribal Council
P.O. Box 68
Red Rock, OK 74651

Ms. Mildred Hudson
NAGPRA Coordinator
Otoe-Missouria Tribe of Oklahoma
Otoe-Missouria Tribal Office
Route 1, Box 62
Red Rock, OK 74651

Mr. David Lee Smith
Cultural Preservation Officer
Winnebago Tribe of Nebraska
P.O. Box 687
Winnebago, NE 68071

Mr. Don E. Giles
Chief
Peoria Indian Tribe of Oklahoma
P.O. Box 1527
Miami, OK 74355

Mr. Raul Garza
Chairman
Kickapoo Traditional Tribe of Texas
P.O. Box 972
Eagle Pass, TX 78853

Ms. Carol Anske
Chairperson
Kickapoo of Kansas Tribal Council
Route 1, Box 157
Horton, KS 66349

Ms. Maria Pearson
Governor's Liaison for Indian Affairs
1001 North Dakota Avenue
Ames, IA 50010

Ms. Lavon Grimes
State Historical Society of Iowa
R&C Coordinator
600 East Locust
Des Moines, IA 50319-0290

Mr. A.J. Johnson
City Administrator
City of Muscatine
City Hall
215 Sycamore Street
Muscatine, IA 52761

Muscatine Area Heritage Association
2918 Bonnie Drive
Muscatine, IA 52761

Board of Supervisors
Muscatine County Courthouse
401 East 3rd Street
Muscatine, IA 52761

APPENDIX J

STRUCTURAL ANALYSIS

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX J
STRUCTURAL ANALYSIS**

CONTENTS

Subject	Page
1. General	J-1
2. Structural Computations	J-2

**DETAILED PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT**

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

**MAD CREEK
MUSCATINE, MUSCATINE COUNTY, IOWA**

**APPENDIX J
STRUCTURAL ANALYSIS**

1. GENERAL

Preliminary structural analysis was performed on the existing floodwall to determine its adequacy to raise its height by 2 feet. Overturning and internal structural strength analyses were performed on sections of floodwall that exhibited the greatest potential for failure. Conservative values for soil properties were utilized in the calculations. Calculations completed on the existing floodwall are provided on the following pages in this appendix.

The analysis found that the internal structural strength at the interface of the sheet pile and concrete wall did not meet the EM guidelines. The use of a combined load factor of 2.21 is required, however, calculations at the probable worse case location indicate only a load factor of 1.7 can be supported when a 2-foot raise is added to the top of the existing floodwall. An earth berm or concrete buttresses will be added as needed along the landside of the floodwall to provide the required additional strength. The additional support is considered to be minimal in cost and should be more than covered by the 25% contingency placed on the floodwall line item.

All other preliminary computations indicated that the existing floodwall strength is adequate to support the addition of 2 feet to its height.

2. STRUCTURAL COMPUTATIONS

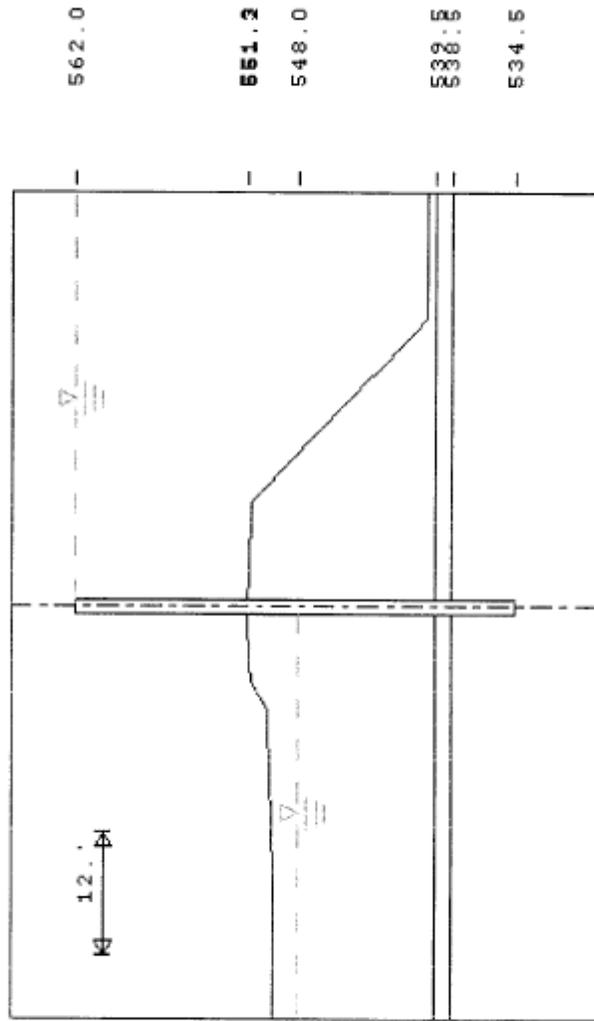
MADIWALL.IN2

10 12FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
20 FLOOD CONTROL PROJECT MUSCATINE IOWA
30 WATER TO TOP OF WALL
40 CONTROL CANTILEVER ANALYSIS
50 WALL 562.0 534.5 30000000.0 184.20
60 SURFACE RIGHTSIDE 3 0.0 551.25 10.0 551.0 28.0 540.0
70 SURFACE LEFTSIDE 4 0.0 551.175 7.0 551.0 10.0 550.0 25.0 548.5
80 SOIL BOTH STRENGTHS 3
90 130.0 120.0 35.0 0.001 17.0 0.0001 539.5 0.0 rubble
100 130.0 115.0 0.001 400.0 0.001 0.0001 538.5 0.0 CL lean clay
110 125.0 115.0 35.0 0.001 14.0 0.0001 SM silty clay
150 WATER ELEVATIONS 62.4 562.0 548.0 551.25 Automatic
180 FINISH

no floodwater adjacent

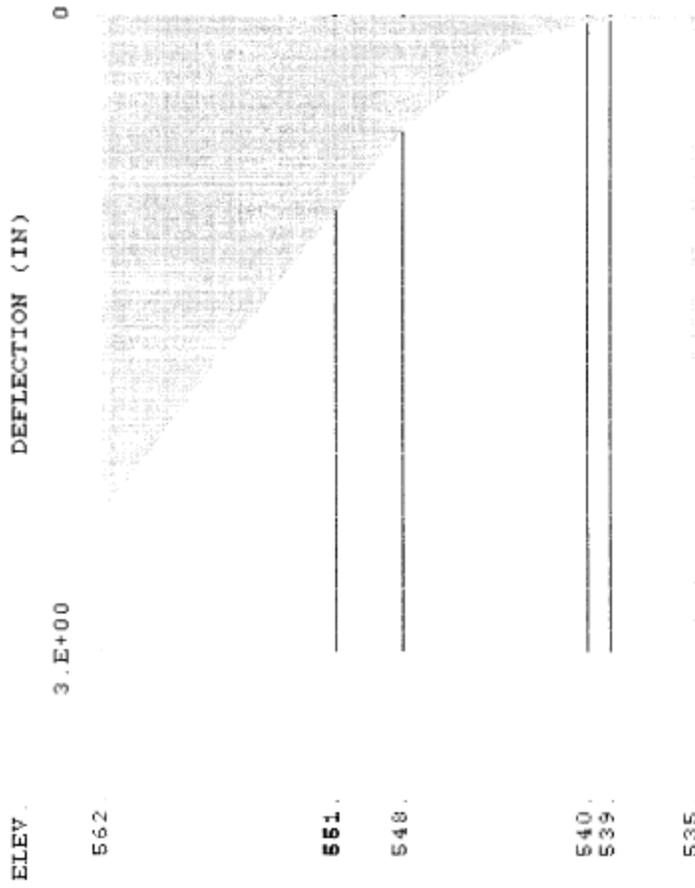
'2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
'FLOOD CONTROL PROJECT MUSCATINE IOWA

ELEV.



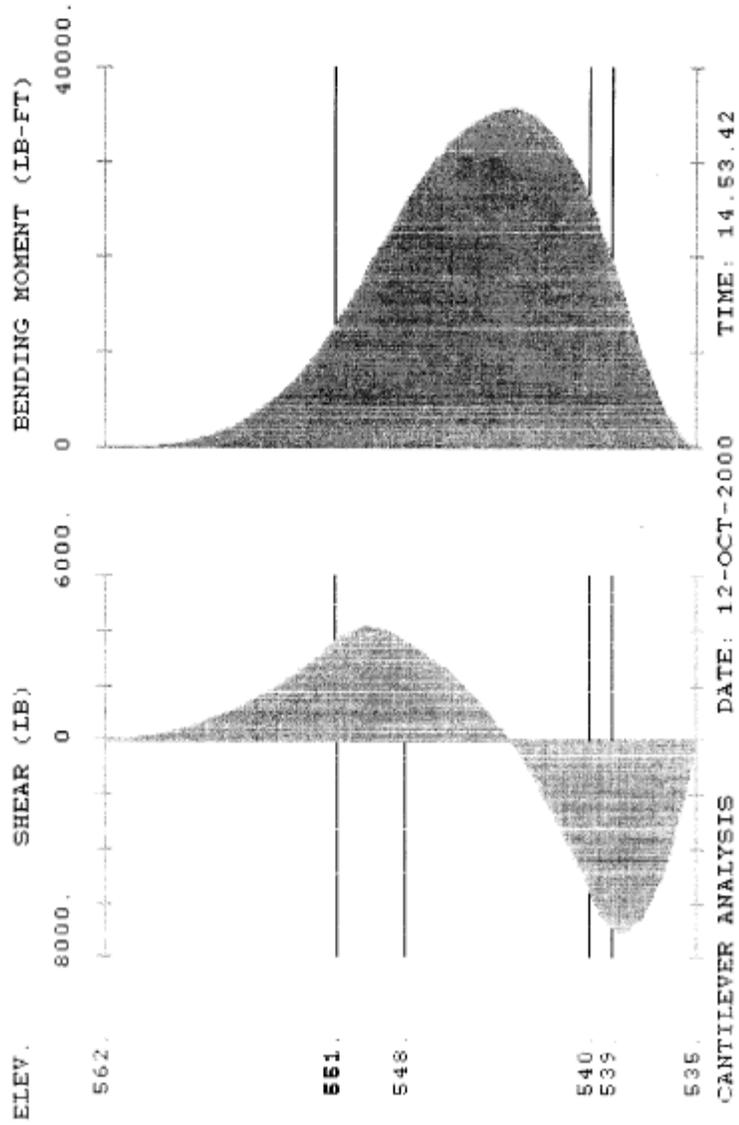
***** INPUT GEOMETRY *****
DATE: 12-OCT-2000 TIME: 14.52.23

'2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
'FLOOD CONTROL PROJECT MUSCATINE IOWA

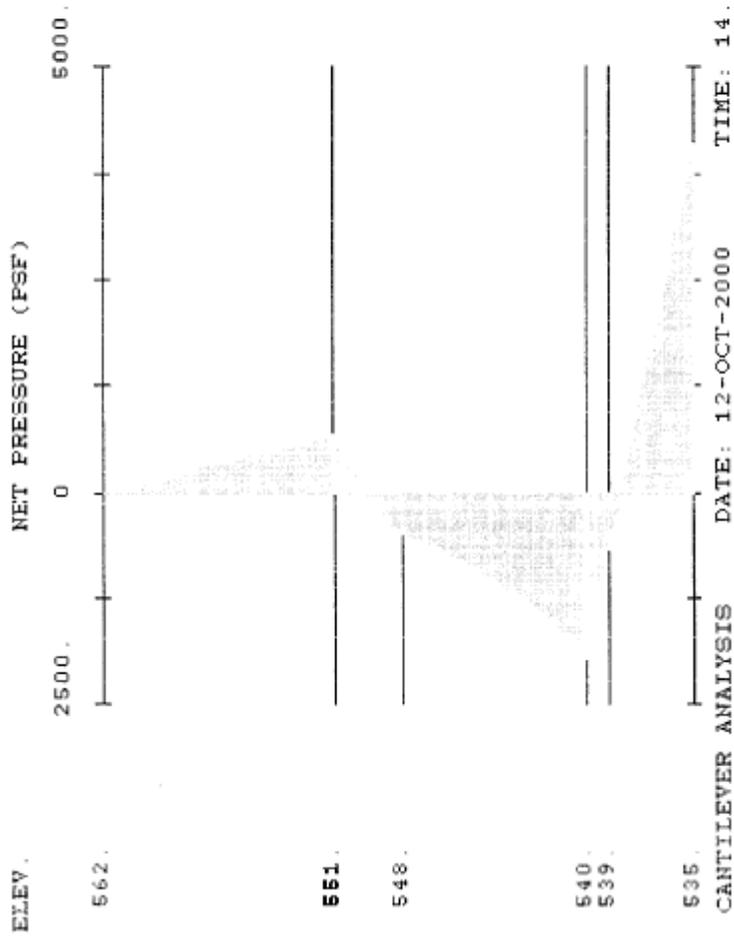


CANTILEVER ANALYSIS DATE: 12-OCT-2000 TIME: 14.53.42

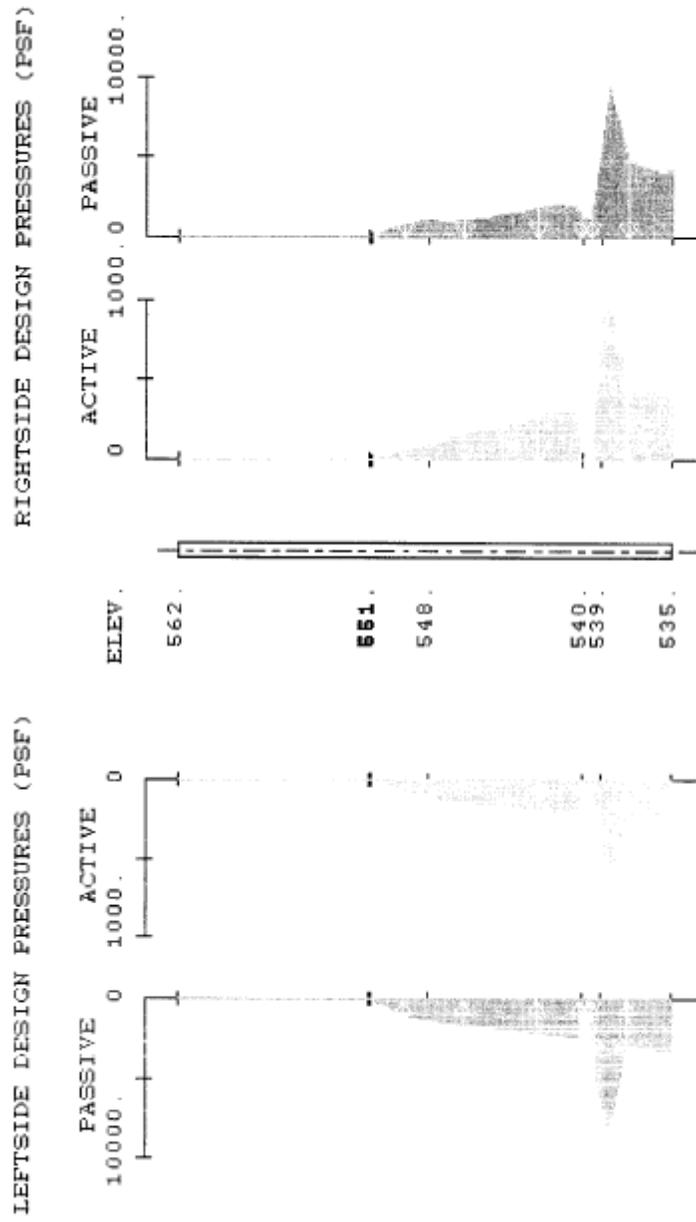
'2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
'FLOOD CONTROL PROJECT MUSCATINE IOWA



'2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
'FLOOD CONTROL PROJECT MUSCATINE IOWA



'2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
'FLOOD CONTROL PROJECT MUSCATINE IOWA



CANTILEVER ANALYSIS DATE: 12-OCT-2000 TIME: 14.53.42

MADIWALL EX2

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
 BY CLASSICAL METHODS
 DATE: 12-OCT-2000 TIME: 14.51.52

 * INPUT DATA *
 #####

I.-HEADING:
 *2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
 *FLOOD CONTROL PROJECT MUSCATINE IOWA
 *WATER TO TOP OF WALL

II.-CONTROL
 CANTILEVER WALL ANALYSIS
 SAME FACTOR OF SAFETY APPLIED TO ACTIVE AND PASSIVE PRESSURES.

III.-WALL DATA
 ELEVATION AT TOP OF WALL = 562.00 (FT)
 ELEVATION AT BOTTOM OF WALL = 534.50 (FT)
 WALL MODULUS OF ELASTICITY = 3.00E+07 (PSI)
 WALL MOMENT OF INERTIA = 184.20 (IN**4/FT)

IV.-SURFACE POINT DATA

IV.A--RIGHTSIDE
 DIST. FROM ELEVATION
 WALL (FT) (FT)
 .00 551.25
 10.00 551.00
 28.00 540.00

IV.B-- LEFTSIDE
 DIST. FROM ELEVATION
 WALL (FT) (FT)
 .00 551.18
 7.00 551.00
 10.00 550.00
 25.00 549.50

V.-SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA

		ANGLE OF	ANGLE OF	<-SAFETY->			
SAT. MOIST	INTERNAL COH-	WALL	ADH-	<-BOTTOM->	<-FACTOR->		
WGHT.	WGHT.	FRICION	ESION	FRICION	ESION	ELEV.	SLOPE ACT. PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)
130.00	120.00	35.00	.0	17.00	.0	539.50	.00
130.00	115.00	.00	400.0	.00	.0	538.50	.00
125.00	115.00	35.00	.0	14.00	.0		

V.B -- LEFTSIDE LAYER DATA

		ANGLE OF	ANGLE OF	<-SAFETY->			
SAT. MOIST	INTERNAL COH-	WALL	ADH-	<-BOTTOM->	<-FACTOR->		
WGHT.	WGHT.	FRICION	ESION	FRICION	ESION	ELEV.	SLOPE ACT. PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)
130.00	120.00	35.00	.0	17.00	.0	539.50	.00
130.00	115.00	.00	400.0	.00	.0	538.50	.00
125.00	115.00	35.00	.0	14.00	.0		

VI.-WATER DATA

MADIWALL.EX2

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 562.00 (FT)
LEFTSIDE ELEVATION = 548.00 (FT)
SEEPAGE ELEVATION = 551.25 (FT)
SEEPAGE GRADIENT = AUTOMATIC

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 12-OCT-2000 TIME: 14.53.42

* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL ANALYSIS *

I.--HEADING

'2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
'FLOOD CONTROL PROJECT MUSCATINE IOWA
'WATER TO TOP OF WALL

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

FACTOR OF SAFETY : 1.28 > 1.25 *unacceptable*

MAX. BEND. MOMENT (LB-FT) : 35725.
AT ELEVATION (FT) : 543.25

MAXIMUM DEFLECTION (IN) : 2.3182E+00
AT ELEVATION (FT) : 562.00

SEEPAGE GRADIENT : .4628

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 12-OCT-2000 TIME: 14.53.42

* COMPLETE RESULTS FOR *
* CANTILEVER WALL ANALYSIS *

I.--HEADING

MADIWALLEX2

2FT RAISE OF TYPICAL I-WALL SECTION AT MAD CREEK
 FLOOD CONTROL PROJECT MUSCATINE IOWA
 WATER TO TOP OF WALL

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT		SHEAR (IN)	NET DEFLECTION		PRESSURE
	(LB-FT)	(LB)		(IN)	(PSF)	
562.00	0.	0.	2.3182E+00	.00		
561.00	10.	31.	2.1847E+00	62.40		
560.00	83.	125.	2.0512E+00	124.80		
559.00	281.	281.	1.9178E+00	187.20		
558.00	666.	499.	1.7844E+00	249.60		
557.00	1300.	780.	1.6512E+00	312.00		
556.00	2246.	1123.	1.5185E+00	374.40		
555.00	3567.	1529.	1.3864E+00	436.80		
554.00	5325.	1997.	1.2555E+00	499.20		
553.00	7582.	2527.	1.1263E+00	561.60		
552.00	10400.	3120.	9.9946E-01	624.00		
551.25	12920.	3608.	9.0642E-01	670.80		
551.18	13192.	3656.	8.9723E-01	675.46		
551.18	13182.	3656.	8.9723E-01	675.45		
551.00	13842.	3767.	8.7588E-01	682.67		
550.18	17107.	4095.	7.7715E-01	202.38		
550.00	17826.	4123.	7.5685E-01	119.60		
549.71	19021.	-4140.	7.2318E-01	.00		
549.36	20490.	4114.	6.8288E-01	-147.12		
549.00	21940.	4036.	6.4300E-01	-294.25		
548.00	25800.	3854.	5.3819E-01	-469.90		
547.00	29201.	3132.	4.3745E-01	-572.70		
546.00	32028.	2496.	3.4782E-01	-899.94		
545.00	34148.	1723.	2.6819E-01	-846.73		
544.00	35921.	798.	1.9921E-01	-1003.52		
543.00	35889.	-290.	1.4128E-01	-1170.99		
542.00	34785.	-1544.	9.4488E-02	-1338.05		
541.00	32542.	-2975.	5.8534E-02	-1523.72		
540.00	28769.	-4607.	3.2716E-02	-1740.06		
539.65	27042.	-5274.	2.5866E-02	-2070.17		
539.56	26553.	-5458.	2.4257E-02	-1959.81		
539.50	26230.	-5571.	2.3258E-02	-1886.79		
539.43	25853.	-5694.	2.2154E-02	-1807.79		
539.15	24168.	-6159.	1.7859E-02	-1463.92		
539.03	23450.	-6319.	1.6292E-02	-1324.38		
539.00	23234.	-6364.	1.5848E-02	-1283.15		
538.50	19917.	-6854.	1.0252E-02	-677.51		
538.00	16430.	-7041.	6.2120E-03	-71.87		
537.00	9555.	-6507.	1.7119E-03	1139.42		
536.00	3620.	-4762.	2.2939E-04	2350.70		
535.00	435.	-1806.	2.5479E-06	3561.98		
534.53	0.	0.	0.0000E+00	4130.70		

III.--SOIL PRESSURES

ELEVATION (FT)	< LEFTSIDE PRESSURE (PSF)>			<RIGHTSIDE PRESSURE (PSF)>
	PASSIVE	ACTIVE	ACTIVE	
562.00	0.	0.	0.	0.
561.00	0.	0.	0.	0.
560.00	0.	0.	0.	0.
559.00	0.	0.	0.	0.
558.00	0.	0.	0.	0.
557.00	0.	0.	0.	0.
556.00	0.	0.	0.	0.
555.00	0.	0.	0.	0.
554.00	0.	0.	0.	0.
553.00	0.	0.	0.	0.
552.00	0.	0.	0.	0.
551.25+	0.	0.	0.	0.
551.25-	0.	0.	0.	0.
551.18+	0.	0.	2.	32.
551.18-	0.	0.	2.	32.
551.00	94.	6.	7.	108.
550.18	535.	36.	31.	483.
550.00	629.	42.	36.	538.
549.71	766.	52.	44.	662.

MADIWALL.EX2

549.36	936.	65.	54.	815.
549.00	1105.	77.	64.	968.*
548.00	1343.	107.	93.	1022.*
547.00	1416.	124.	122.	902.*
546.00	1514.	135.	150.	1024.*
545.00	1632.	146.	179.	1192.*
544.00	1760.	157.	207.	1377.*
543.00	1898.	168.	236.	1582.*
542.00	2036.	179.	265.	1809.*
541.00	2192.	190.	293.	2082.*
540.00	2380.	200.	322.	1980.*
539.65	2445.	202.	66.	1304.
539.56	2463.	203.	0.	1128.
539.50	710.	50.	0.	1134.
539.43	713.	0.	0.	1140.
539.15	724.	0.	0.	1167.
539.03+	1031.	0.	14.	1179.
539.03-	728.	0.	14.	1179.
539.00	1031.	63.	18.	1182.
538.50	8218.	445.	865.	5794.
538.00	8464.	618.	985.	9315.
537.00	2766.	217.	410.	4797.
536.00	3010.	221.	433.	4197.
535.00	3039.	226.	453.	4038.
534.53	3061.	232.	465.	4061.
534.00	3204.	240.	476.	3949.

Mad Creek - Two foot raise of I-wall, hydraulic load starts at top of 2 foot raise. Moments and shears were determined with CWALSHT, filename MADIWALL.IN2. Soil properties were chosen from typical values found in text books and borings from the area. A wall section with the least embankment on the unprotected side was used.

Internal Stress Checks (Bending and Shear of Concrete and Sheet Pile)

Given :

$$\text{psf} = \frac{\text{lbf}}{\text{ft}^2} \quad \text{psi} = \frac{\text{lbf}}{\text{in}^2} \quad \text{kip} = 1000\text{lbf} \quad \text{ksi} = 1000 \frac{\text{lbf}}{\text{in}^2} \quad \text{pcf} := \frac{\text{lbf}}{\text{ft}^3} \quad \text{Global conversions}$$

$$f_c := 4\text{ksi} \quad \text{Concrete compressive strength}$$

$$\gamma_w := 62.5\text{pcf} \quad \text{Unit weight of water}$$

$$E_s := 29500\text{ksi} \quad \text{Modulus of elasticity for steel}$$

$$f_y := 60\text{ksi} \quad \text{Yield strength reinforcing bars}$$

$$d_{5\text{bar}} := \frac{5}{8}\text{in} \quad \text{Diameter of vertical reinforcing bars}$$

$$h_{\text{barspace}} := 9\text{in} \quad \text{Horizontal spacing of wall tension reinforcing}$$

$$t_{\text{tow}} := 10\text{in} \quad \text{Top of wall thickness}$$

$$EL_{\text{tow}} := 562\text{ft} \quad \text{Elevation of top of wall}$$

$$EL_{\text{momconc}} := 549\text{ft} \quad \text{Concrete wall elevation to calculate section properties for moment capacity}$$

$$s_{\text{wall}} := \frac{1}{24} \quad \text{Slope of wall side}$$

$$t_{\text{cover}} := 2.5\text{in} \quad \text{Clear concrete cover over reinforcing}$$

$$d_{\text{moment}} := \left[t_{\text{tow}} + 2 \cdot s_{\text{wall}} (EL_{\text{tow}} - EL_{\text{momconc}}) - t_{\text{cover}} - \frac{d_{5\text{bar}}}{2} \right]$$

$$d_{\text{moment}} = 20.188 \text{ in}$$

Depth of concrete wall from center of tension reinforcement to outermost compression fiber of concrete

$$b := 12 \text{ in}$$

Longitudinal length considered for analysis

Check Moment Capacity of Concrete Portion of I-Wall

$$M_{\text{conc}} := 21940 \text{ ft-lbf}$$

Moment at base of concrete wall - from CWALSHT

$$L_f := 1.7$$

Live load factor

$$H_f := 1.3$$

Hydraulic load factor

$$M_u := L_f \cdot H_f \cdot M_{\text{conc}}$$

$$M_u = 48487.4 \text{ ft-lbf}$$

$$\phi_{\text{mom}} := 0.9$$

$$M_n := \frac{M_u}{\phi_{\text{mom}}}$$

$$M_n = 646.499 \text{ kip-in}$$

Factored Moment

$$d_{\text{req}} := \text{if } f_c = 3 \text{ ksi, } \left[\sqrt{\frac{3.3274 \cdot \frac{M_n}{\text{kip-in}}}{\frac{b}{\text{in}}}} \cdot \text{in, } \sqrt{\frac{2.4956 \cdot \frac{M_n}{\text{kip-in}}}{\frac{b}{\text{in}}}} \cdot \text{in} \right]$$

Required depth of wall for moment.
Equation good for 3ksi and 4ksi
concrete and grade 60 reinforcing bars.

$$d_{\text{req}} = 11.595 \text{ in}$$

$$K_u := 1 - \sqrt{1 - \frac{M_n}{0.425 \cdot f_c \cdot b \cdot d_{\text{moment}}^2}}$$

$$K_u = 0.04$$

$$A_{\text{sreq}} := \frac{0.85 \cdot f_c \cdot K_u \cdot b \cdot d_{\text{moment}}}{f_y}$$

Required area of moment reinforcement

$$A_{\text{sreq}} = 0.545 \text{ in}^2$$

$$A_{sprov} := \frac{b}{h_{barspace}} \cdot \frac{\pi \cdot d_{5bar}^2}{4} \quad A_{sprov} = 0.409 \text{ in}^2 \quad \text{Existing area of moment reinforcement}$$

$$CK_{momconc} := \text{if}(A_{sreq} < A_{sprov}, \text{"GOOD FOR MOMENT"}, \text{"NO GOOD FOR MOMENT"})$$

$$CK_{momconc} = \text{"NO GOOD FOR MOMENT"}$$

Check Shear Capacity of Concrete Portion of I-Wall

$$\phi_{shear} := 0.85$$

$$EL_{shearconc} := 549.71 \text{ ft}$$

Concrete wall elevation to calculate section properties for shear capacity

$$d_{shear} := \left[t_{tow} + 2 \cdot s_{wall} (EL_{tow} - EL_{shearconc}) - t_{cover} - \frac{d_{5bar}}{2} \right]$$

$$d_{shear} = 19.478 \text{ in}$$

Depth of concrete wall from center of tension reinforcement to outermost compression fiber of concrete

$$V_c := 2 \cdot \sqrt{\frac{f_c}{\text{psi}}} \cdot b \cdot d_{shear} \cdot \frac{\text{lb} \cdot \text{ft}}{\text{in}^2} \quad V_c = 29.565 \text{ kip}$$

$$V_{conc} := 4140 \text{ lbf}$$

Shear force at EL 549.71
from CWALSHT output

$$V_u := L_F \cdot H_F \cdot V_{conc} \quad V_u = 9.149 \text{ kip}$$

Factored shear force at EL 549.71

$$CK_{shearconc} := \text{if}(V_u < \phi_{shear} \cdot V_c, \text{"GOOD FOR SHEAR"}, \text{"NO GOOD FOR SHEAR"})$$

$$CK_{shearconc} = \text{"GOOD FOR SHEAR"}$$

Check Moment Capacity of Sheet Pile Portion of I-Wall

$$M_{steel} := 35689 \cdot \text{ft} \cdot \text{lbf}$$

Maximum moment in sheet pile at EL 543
from CWALSHT output

$$c_{\text{steel}} := 6 \text{ in}$$

Distance from NA to outermost tension fiber

$$I_{\text{steel}} := 184.2 \cdot \text{in}^4$$

Moment of inertia of PZ27 on a per foot basis

$$\sigma_{\text{steel}} := \frac{M_{\text{steel}} \cdot c_{\text{steel}}}{I_{\text{steel}}}$$

$$\sigma_{\text{steel}} = 13.95 \text{ ksi}$$

$$\sigma_{\text{allow}} := 25 \cdot \text{ksi}$$

Allowable tensile strength of A328 sheet piling

$$CK_{\text{momsteel}} := \text{if}(\sigma_{\text{steel}} < \sigma_{\text{allow}}, \text{"GOOD FOR MOMENT"}, \text{"NO GOOD FOR MOMENT"})$$

$$CK_{\text{momsteel}} = \text{"GOOD FOR MOMENT"}$$

Check Moment Capacity of Sheet Pile Portion of I-Wall

$$V_{\text{steel}} := 7041 \text{ lbf}$$

Maximum shear in sheet pile at EL 538 from
CWALSHT output

$$A_{\text{shear}} := \frac{3}{8} \text{ in} \cdot 12 \text{ in}$$

Approximate web area of sheet pile

$$\sigma_v := \frac{V_{\text{steel}}}{A_{\text{shear}}} \quad \sigma_v = 1.565 \text{ ksi}$$

Shear stress in web of sheet pile

$$F_y := 39 \text{ ksi}$$

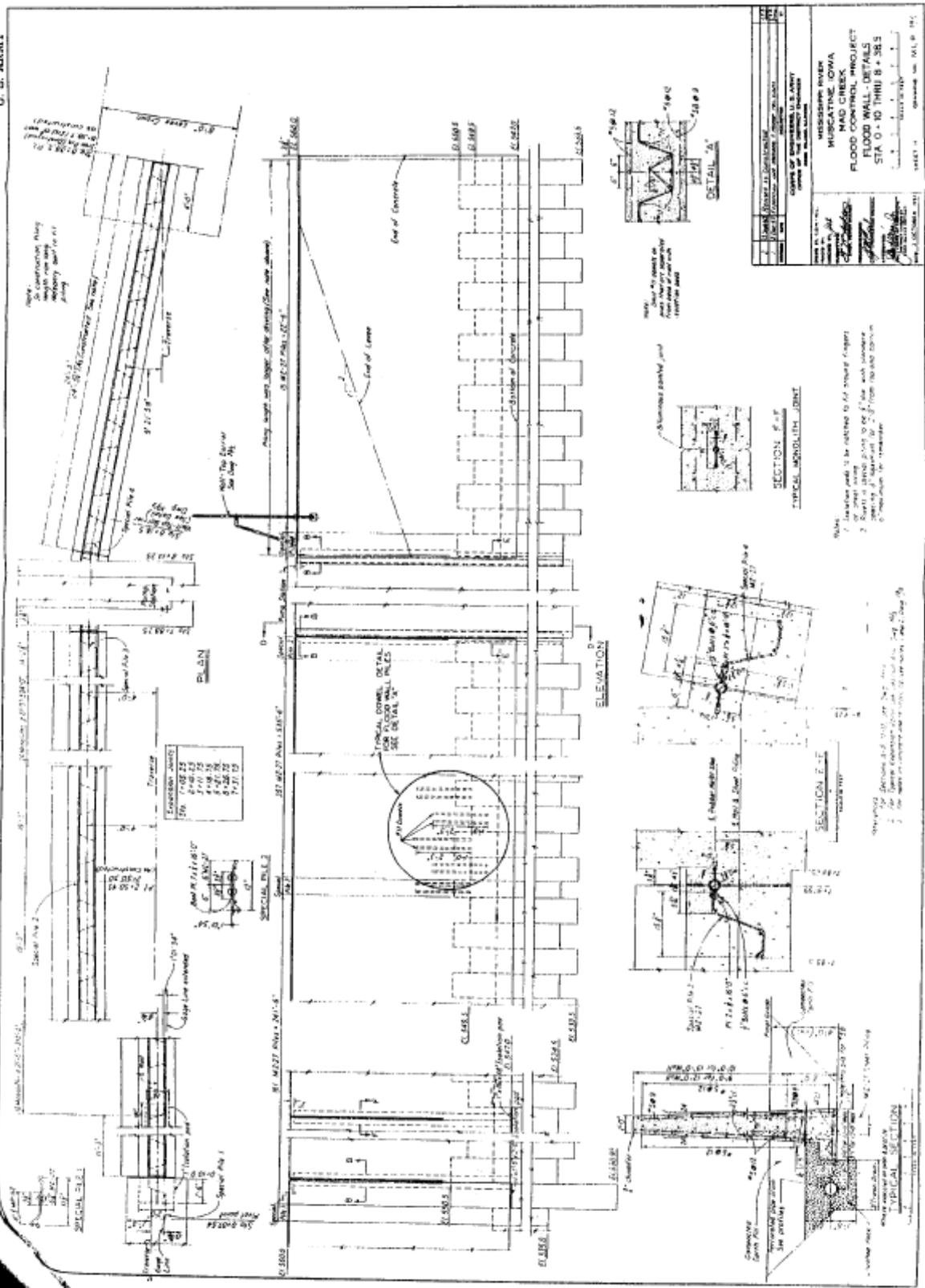
Yield stress of A328 steel

$$\sigma_{\text{vallow}} := 0.4 \cdot F_y \quad \sigma_{\text{vallow}} = 15.6 \text{ ksi}$$

Allowable shear stress of A328 steel

$$CK_{\text{vsteel}} := \text{if}(\sigma_v < \sigma_{\text{vallow}}, \text{"GOOD FOR SHEAR"}, \text{"NO GOOD FOR SHEAR"})$$

$$CK_{\text{vsteel}} = \text{"GOOD FOR SHEAR"}$$



APPENDIX K

DISTRIBUTION LIST

STEVEN GARVIN
505 E MISSISSIPPI DR
MUSCATINE IA 52761

HONORABLE CHARLES GRASSLEY
UNITED STATES SENATOR
116 FEDERAL BLDG 131 E 4TH ST
DAVENPORT IA 52801

HONORABLE TOM HARKIN
UNITED STATES SENATOR
314B FEDERAL BLDG 131 E 4TH ST
DAVENPORT IA 52801

HONORABLE JIM LEACH
REPRESENTATIVE IN CONGRESS-1ST DIST
209 W 4TH ST
DAVENPORT IA 52801

DIRECTOR
FEDERAL EMERGENCY MGMT AGENCY - REG 7
2323 GRAND BLVD STE 900
KANSAS CITY MO 64108

LEROY SOWL
IOWA AUDUBON COUNCIL
2515 CROW CREEK RD
BETTENDORF IA 52722

JAMES GULLIFORD
REGIONAL ADMINISTRATOR
ATTN: U. GALE HUTTON
US ENVIRON PROTECTION AGENCY - REG 7
901 N 5TH ST
KANSAS CITY KS 66101-2907

RICHARD NELSON
FIELD SUPERVISOR
US FISH AND WILDLIFE SERVICE
4469 48TH AVE CT
ROCK ISLAND IL 61201

PAUL VINER
DISTRICT CONSERVATIONIST
NATURAL RESOURCES CONSERVATION SVC
US DEPT OF AGRICULTURE
8370 HILLDALE RD
DAVENPORT IA 52806

HONORABLE TOM VILSACK
GOVERNOR OF IOWA
STATE CAPITOL
DES MOINES IA 50319

MIKE BRANDRUP
ADMINISTRATOR
CONSERVATION AND RECREATION DIVISION
IA DEPT OF NATURAL RESOURCES
502 E 9TH ST WALLACE STATE OFFICE BLDG
DES MOINES IA 50319

HAROLD HOMMES
IA DEPT OF AG AND LAND STEWARDSHIP
900 E GRAND AVE WALLACE STATE OFC BLDG
DES MOINES IA 50319

BILL OHDE
WILDLIFE BIOLOGIST
IA DEPT OF NATURAL RESOURCES
515 TOWNSEND AVE
WAPELLO IA 52653

TOM MORAIN
STATE HISTORIC PRESERVATION OFFICER
STATE HISTORICAL SOCIETY OF IOWA
600 E LOCUST ST
DES MOINES IA 50319

BERNIE SCHONHOFF
FAIRPORT FISH HATCHERY
IA DEPT OF NATURAL RESOURCES
3390 HIGHWAY 22
MUSCATINE IA 52761

JEFF PORTER
NAT RES CONSV SERVICE
US DEPT OF AGRICULTURE
210 WALNUT ST STE 6913
DES MOINES IA 50309

DENNIS HARPER
IOWA EMERGENCY MANAGEMENT DIVISION
HOOVER STATE OFFICE BLDG - LEVEL A
DES MOINES IA 50319

HONORABLE RICHARD DRAKE
IOWA SENATOR-28TH DIST
420 PARKINGTON DR
MUSCATINE IA 52761

HONORABLE JAMES HAHN
IOWA REPRESENTATIVE-48TH DIST
CHAIRMAN - FLOOD CONTROL COMMISSION
MUSCATINE CITY-MUSCATINE ISLAND
805 W 4TH ST
MUSCATINE IA 52761

GAILEY WANATEE
ACTING CHIEF
SAC AND FOX TRIBAL COUNCIL
3137 F AVE
TAMA IA 52339

MONA ELK SHOULDER
DELEGATE
WINNEBAGO TRIBE OF NEBRASKA
PO BOX AE
SLOAN IA 51055

EXECUTIVE DIRECTOR
SAC & FOX NATION OF THE MISSI IN IOWA
349 MESKWAKI RD
TAMA IA 52339-9629

MARY D SCHAVE
SIERRA CLUB
2108 W 75TH ST
DAVENPORT IA 52806

DONALD PASSMORE
IOWA DIVISION
IZAAK WALTON LEAGUE OF AMERICA
PO BOX 101
ATALISSA IA 52720

JOE WILKINSON
PRESIDENT
IA WILDLIFE FEDERATION
116 LAKESIDE DR NE
SOLON IA 52333

JEFF YOUNG
EDITOR
MUSCATINE JOURNAL
301 E 3RD
MUSCATINE IA 52761

NEWS ROOM
KWPC/KWCC RADIO
3218 MULBERRY AVE
MUSCATINE IA 52761

INTERNAL DISTRIBUTION:

Commander, U.S. Army Engineer District, Rock Island, Clock Tower Building,
P.O. Box 2004, Rock Island, IL 61204-2004

ATTN: CEMVR-PM-M (Dist File) (2)
* CEMVR-PM-M (Hamilton)
* CEMVR-PM-A
* CEMVR-ED-DM (Sunderman)
* CEMVR-ED-DM (Less)
* CEMVR-ED-DN (Mitvalsky)
* CEMVR-ED-C
* CEMVR-ED-G
* CEMVR-RE-A
CEMVR-IM-CL (2)

* Received document on CD.

APPENDIX L

PLATES

27-JUN-2002 08:54
e:\projects\mu05\mu05x101.dgn
RTR 6-21-02

MAD CREEK MUSCATINE, IOWA SECTION 205 LOCAL FLOOD PROTECTION



Symbol	Description	Date	Appr.
	Revisions		
Chief	Design Branch	Date	Recommended by:
Chief	Hydraulics Branch	Date	Chief: Engineering Division
Chief	Geotechnical Branch	Date	Approved by:
			Col., Corps of Engineers

Designed By:	RET	Date:	XX XXX 01
Drawn By:	RTR	Scale:	AS SHOWN
Checked By:	XYZ	Project Code:	MU05
Reviewed By:	RAL	Solicitation Number:	DAK05-XX-E-XXX

MAD CREEK IOWA
SECTION 205
LOCAL FLOOD PROTECTION
COVER SHEET

Sheet Reference Number:
X101
Sheet 1 of 19

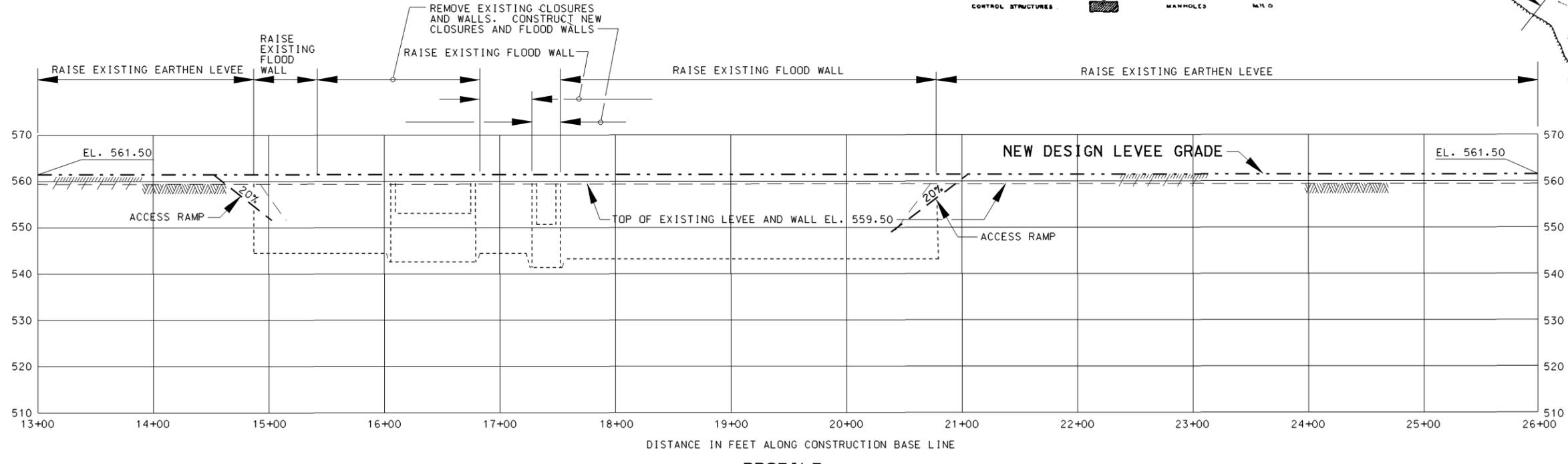
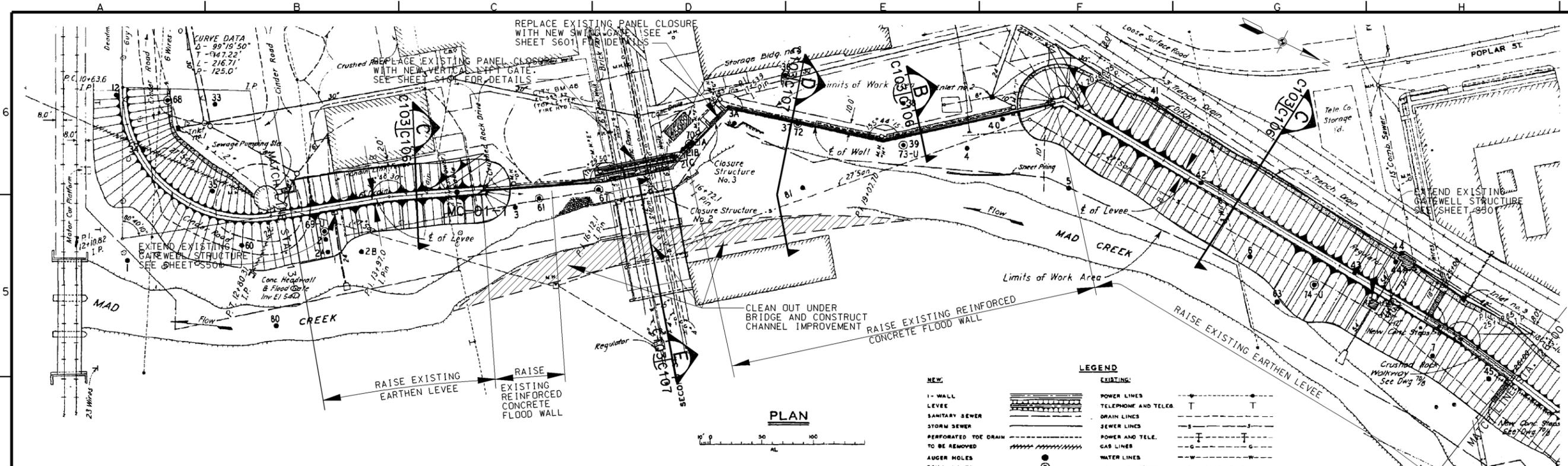
Symbol	Description	Date	Approved

Designed By: RET	Date: XX XXX 01
Drawn By: RTR	Scale: AS SHOWN
Checked By: XYZ	Project Code: MUDS
Reviewed By: RAL	Specification Number: DACW25-X-8-XXXX

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

**PLAN AND PROFILE
STA. 13+00 TO
STA. 26+00**

Sheet Reference Number:
C103
Sheet 7 of 19



- REFERENCES:
- FOR BORING LOGS, SEE SHEET C101.
 - FOR DETAILS OF SECOND ST. CLOSURE STRUCTURE, SEE SHEETS S101.

- NOTES:
- ELEVATIONS OF NEW WORK ON THESE DRAWINGS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.

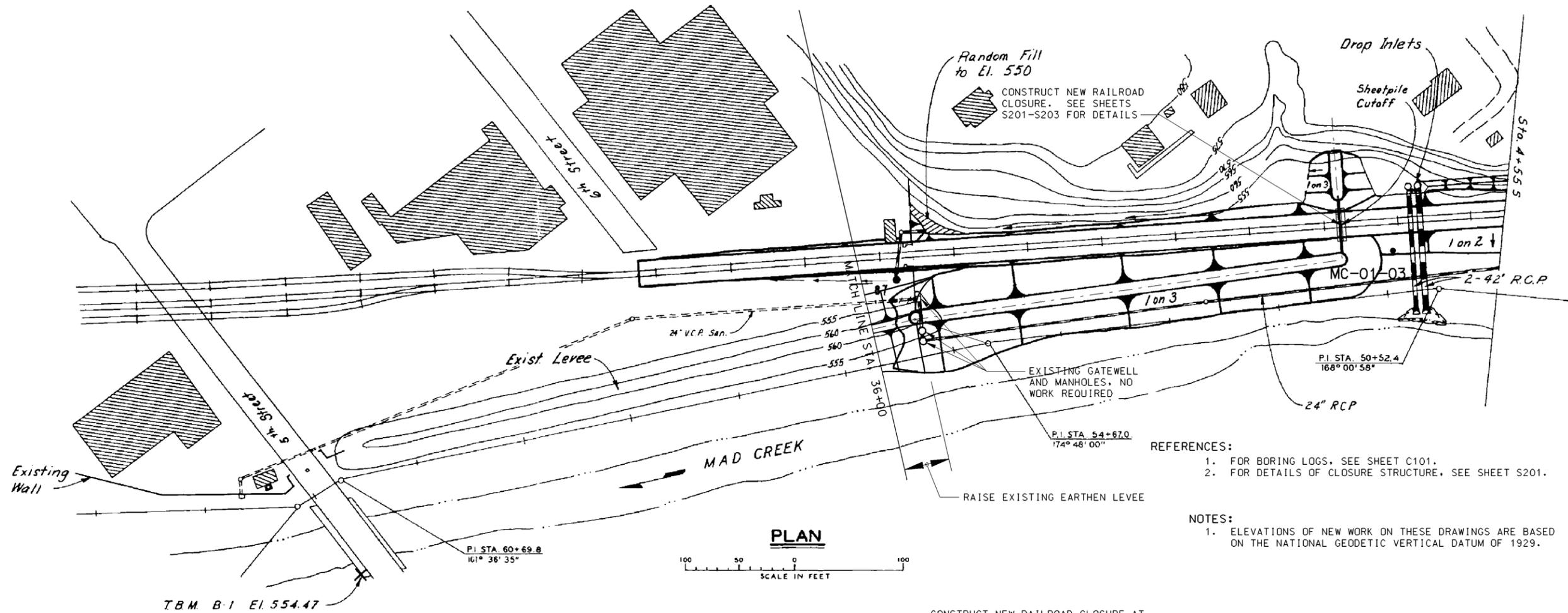
Symbol	Description	Date	Approved

Designed By:	RET	Date:	XX XXX 01
Drawn By:	RTR	Scale:	AS SHOWN
Checked By:	XYZ	Project Code:	MUOS
Reviewed By:	RAL	Specification Number:	DACW25-X-4-XXXX

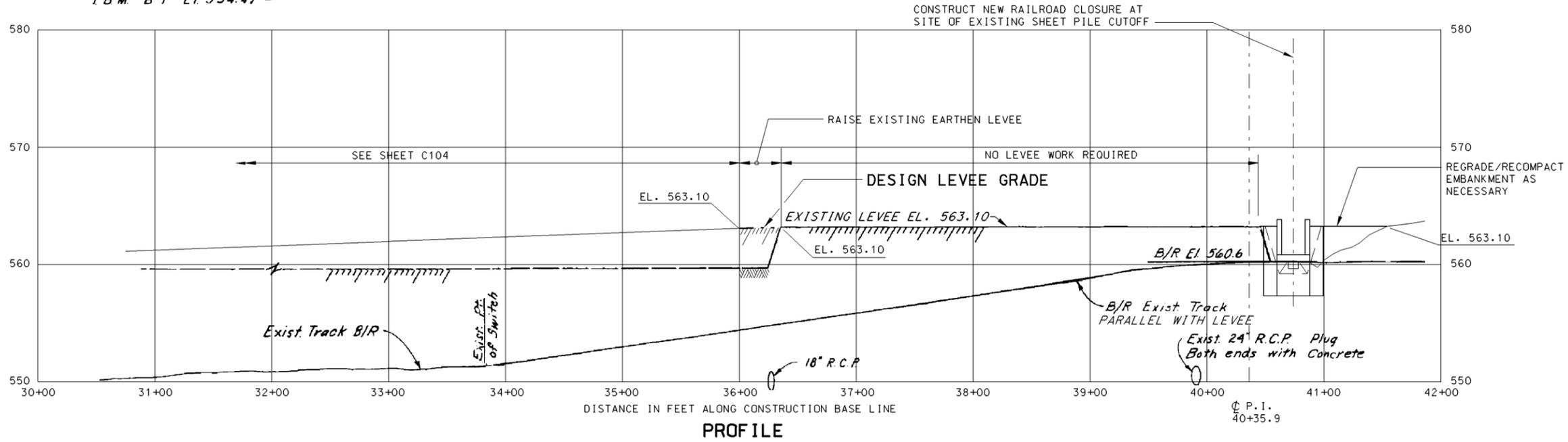
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

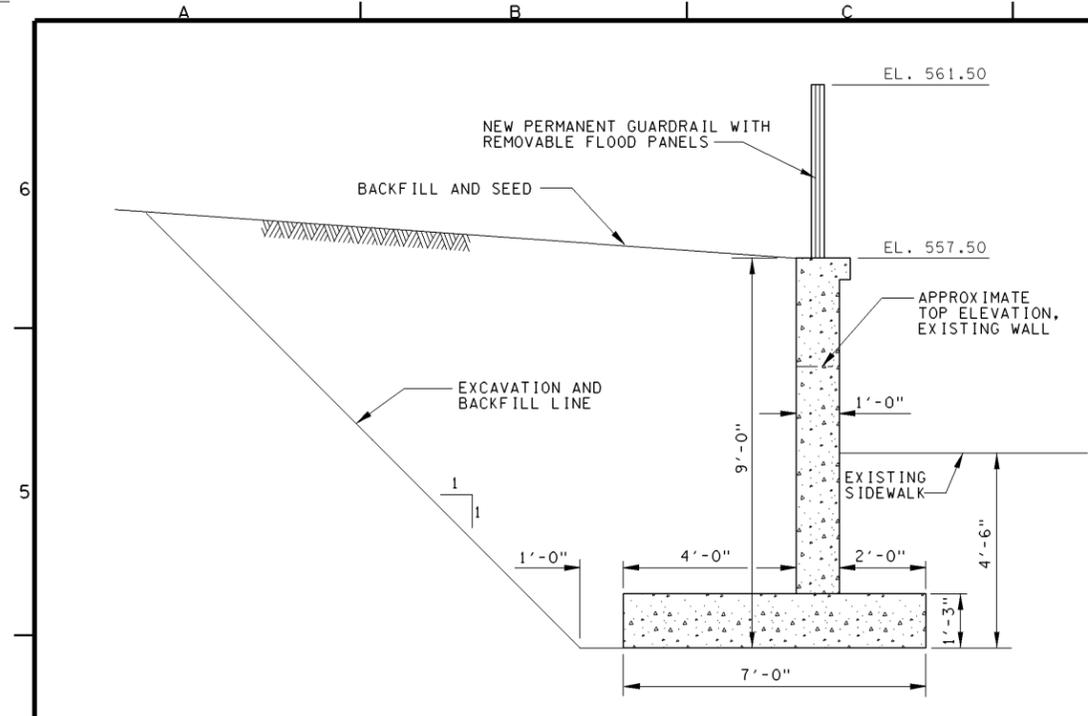
MAD CREEK
MUSCATINE, IOWA
LOCAL FLOOD PROTECTION
**PLAN AND PROFILE
STA. 36+00 TO
STA. 42+00**

Sheet Reference Number:
C105
Sheet 9 of 19

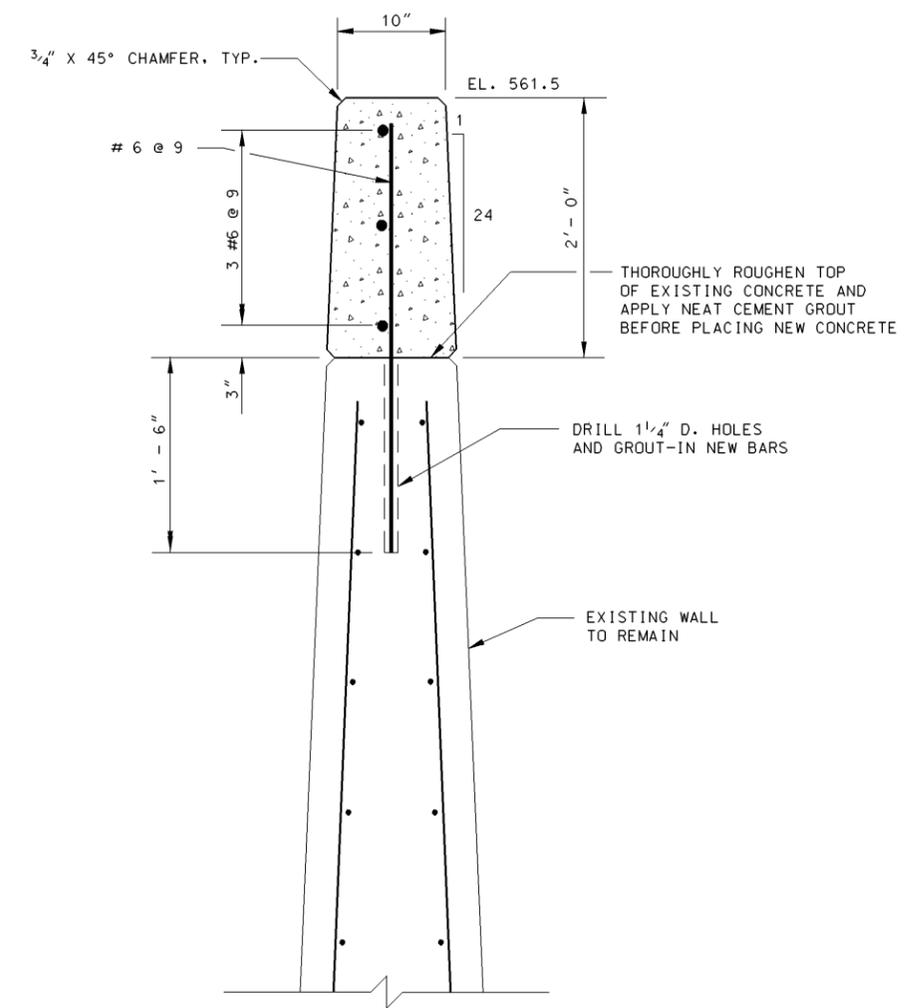


- REFERENCES:**
- FOR BORING LOGS, SEE SHEET C101.
 - FOR DETAILS OF CLOSURE STRUCTURE, SEE SHEET S201.
- NOTES:**
- ELEVATIONS OF NEW WORK ON THESE DRAWINGS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.

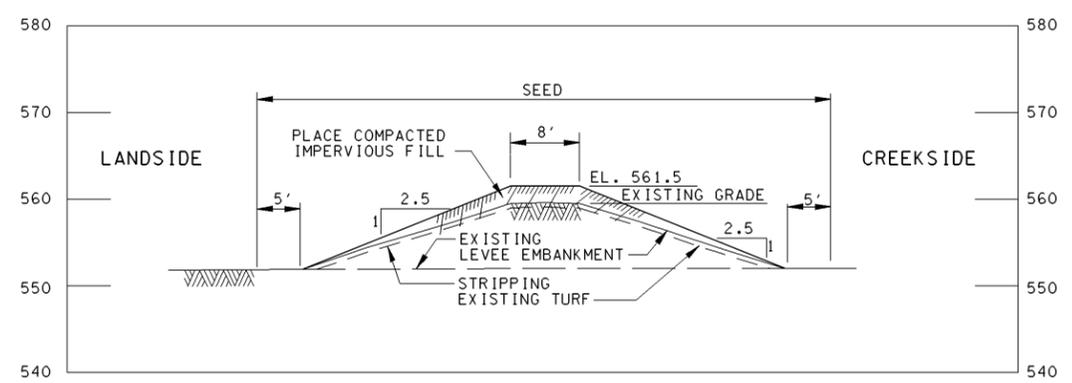




TYPICAL T-WALL WITH PANELS
 STA. 0+53A TO STA. 2+85A



TYPICAL I-WALL RAISE
 STA. 0+10 TO STA. 8+39
 STA. 14+87 TO STA. 15+42
 STA. 17+01 TO STA. 17+26
 STA. 17+55 TO STA. 20+78
 STA. 28+20 TO STA. 30+46



TYPICAL LEVEE RAISE
 STA. 8+35 TO STA. 14+91
 STA. 20+75 TO STA. 28+24
 STA. 30+80 TO STA. 36+40



NOTES:

- ELEVATIONS OF NEW WORK ON THESE DRAWINGS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
- THE METHOD OF ATTACHING CONCRETE FORMS TO THE EXISTING WALL SHALL BE APPROVED BY THE CORPS OF ENGINEERS. ANY RESULTING HOLES SHALL BE FILLED AND THE WALL SURFACE FULLY RESTORED TO PRE-CONSTRUCTION CONDITIONS.
- WATERSTOPS AT EXISTING MONOLITH JOINTS SHALL BE SPLICED AND EXTENDED TO THE TOP OF THE WALL EXTENSION. THE CONTRACTOR SHALL SUBMIT DETAILS FOR APPROVAL.

Symbol	Description	Date	Approved

Designed By: RET	Date: XX XXX 01
Drawn By: RTR	Scale: AS SHOWN
Checked By: XYZ	Project Code: MUDS
Reviewed By: RAL	Specification Number: DACW25-XX-B-XXXX

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MAD CREEK
MUSCATINE, IOWA
LOCAL FLOOD PROTECTION

TYPICAL SECTIONS

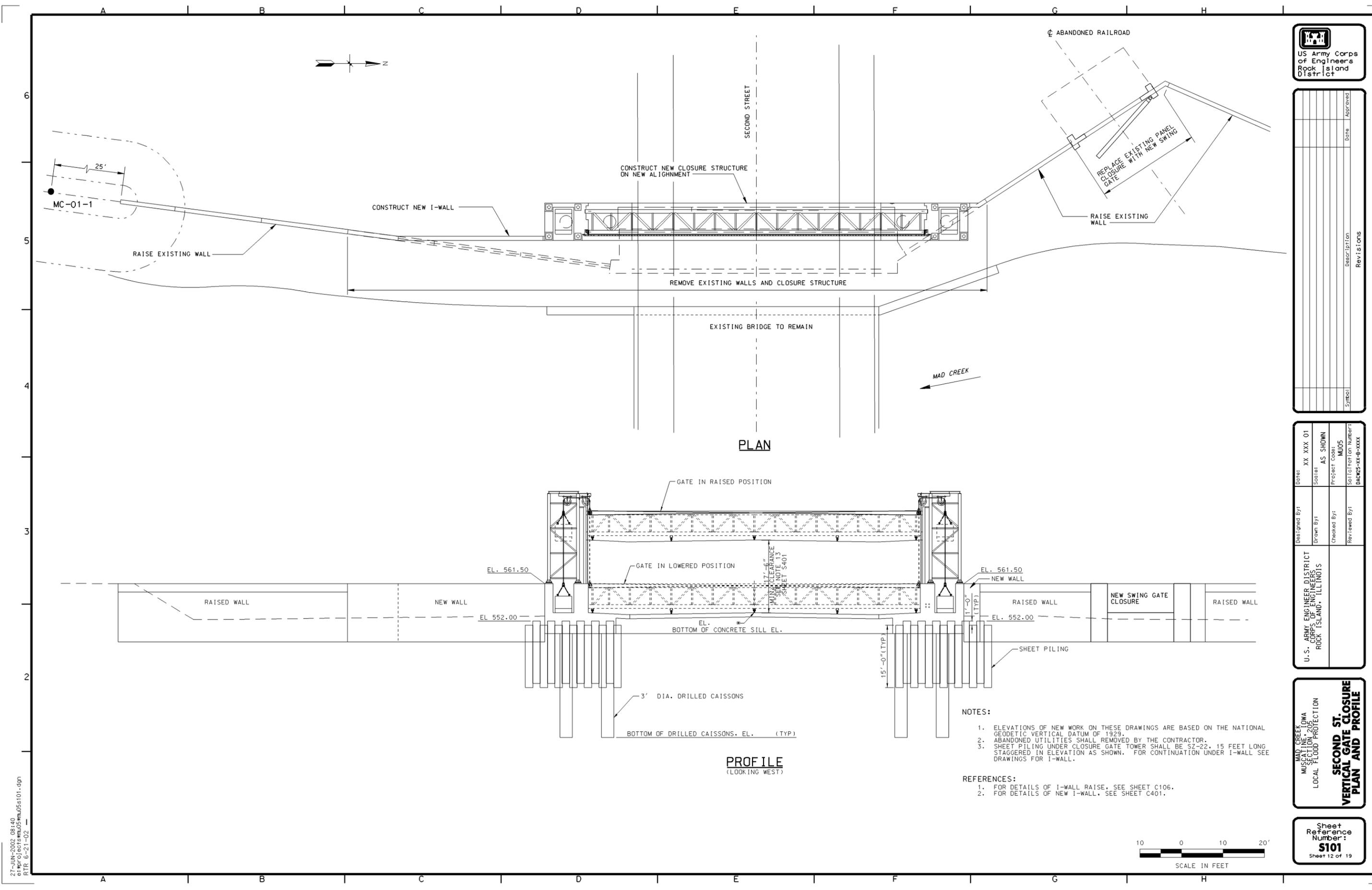
Sheet Reference Number:
C106
Sheet 10 of 19

Symbol	Description	Date	Approved

Designed By:	XX XXX 01
Drawn By:	AS SHOWN
Checked By:	MJOS
Reviewed By:	DA025-XX-B-XXXX
Date:	XX XXX 01
Scale:	AS SHOWN
Project Code:	MJOS
Sheet Number:	DA025-XX-B-XXXX

MAD CREEK
MUSCATINE, IOWA
LOCAL FLOOD PROTECTION
SECOND ST. VERTICAL GATE CLOSURE PLAN AND PROFILE

Sheet Reference Number:
S101
Sheet 12 of 19



PLAN

PROFILE
(LOOKING WEST)

NOTES:

1. ELEVATIONS OF NEW WORK ON THESE DRAWINGS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. ABANDONED UTILITIES SHALL BE REMOVED BY THE CONTRACTOR.
3. SHEET PILING UNDER CLOSURE GATE TOWER SHALL BE S2-22, 15 FEET LONG STAGGERED IN ELEVATION AS SHOWN. FOR CONTINUATION UNDER I-WALL SEE DRAWINGS FOR I-WALL.

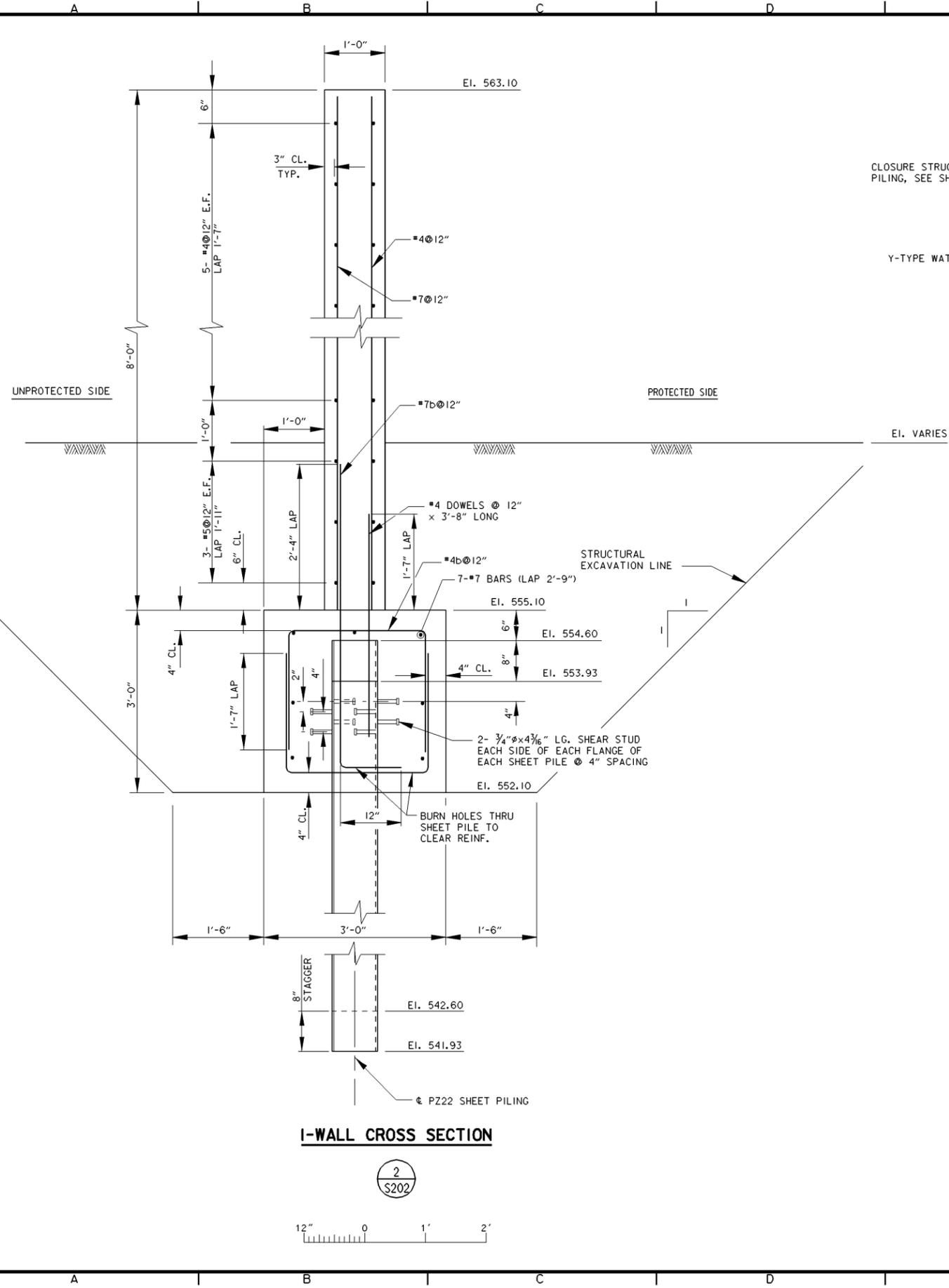
REFERENCES:

1. FOR DETAILS OF I-WALL RAISE, SEE SHEET C106.
2. FOR DETAILS OF NEW I-WALL, SEE SHEET C401.



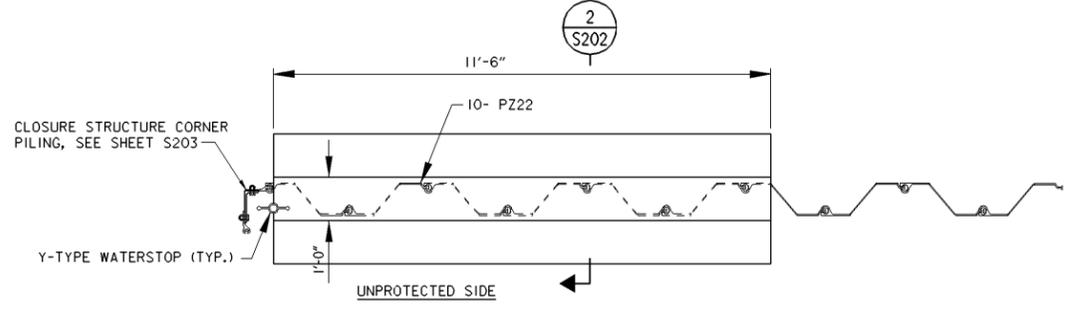
27-JUN-2002 08:40
61:projects\m05\m05s101.dgn
RTR 6-21-02

27-JUN-2002 08:38
 61:proj\jects\m05\m05s202.dgn
 RTR 6-21-02



I-WALL CROSS SECTION

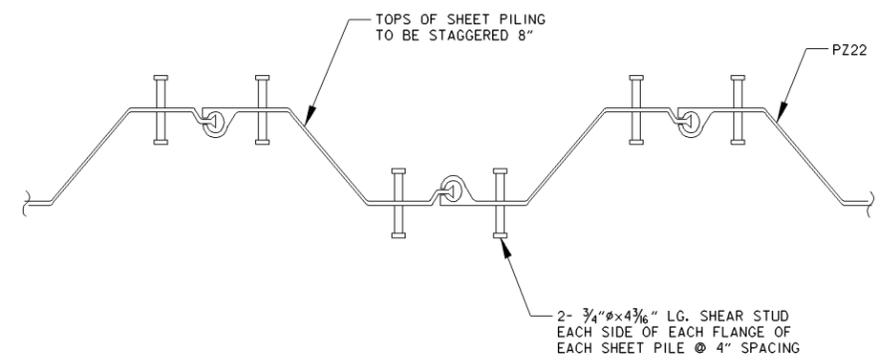
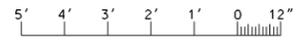
2
S202



I-WALL MONOLITH II

NOTE: MONOLITH I IS SIMILAR EXCEPT OPPOSITE HAND

1
S202



TYPICAL SHEAR STUD PLACEMENT

3
S202



- NOTES**
1. ALL SHEET PILING IS PZ22.
 2. 1/2" PREFORMED EXPANSION JOINT FILLER WILL BE PLACED BETWEEN ALL MONOLITHS.

- REFERENCES**
1. FOR LOCATION OF I-WALL MONOLITHS SEE SHEETS S201.



Symbol	Description	Date	Approved

Designed By:	RET	Date:	XX XXX 01
Drawn By:	RTR	Scale:	AS SHOWN
Checked By:	XYZ	Project Code:	MU05
Reviewed By:	RAL	Specification Number:	DACW25-X-8-XXXX

U.S. ARMY ENGINEER DISTRICT
 CORPS OF ENGINEERS
 ROCK ISLAND, ILLINOIS

MAD CREEK
 MUSCATINE, IOWA
 LOCAL FLOOD PROTECTION
**I & M RAIL LINK
 RAILROAD CLOSURE
 I - WALL DETAILS**

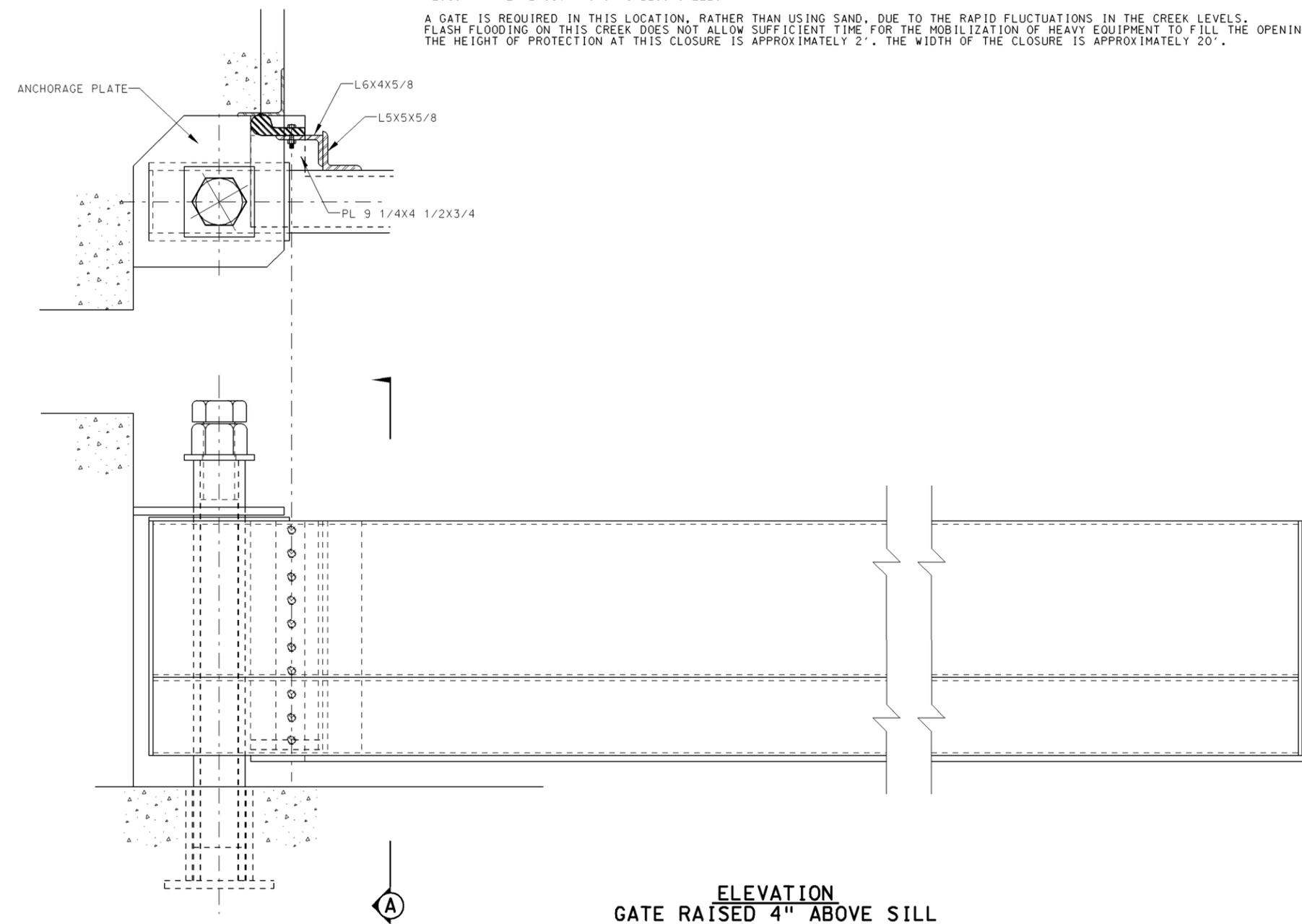
Sheet Reference Number:
S202
 Sheet 14 of 19



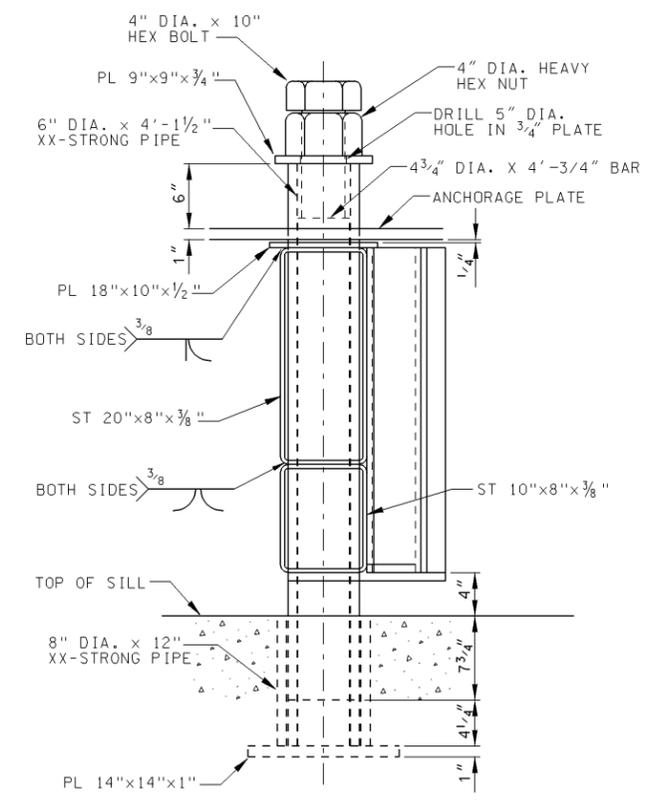
NOTES:

THIS RAILROAD CLOSURE GATE IS TO BE CONSTRUCTED OF RECTANGULAR STRUCTURAL TUBING (A500, GRADE B). THIS DESIGN WAS CHOSEN DUE TO ITS SIMPLICITY, RATHER THAN OUT OF NECESSITY TO RESIST THE APPLIED HYDRAULIC LOAD. THE 4" DIAMETER HEX BOLT IS EXPECTED TO BE USED FOR RAISING AND LOWERING THE GATE. HOWEVER, IF THE GATE TENDS TO RACK DURING OPERATION, A FLOOR JACK CAN BE USED TO AID IN THE OPERATION. THE 4 3/4" DIAMETER INTERIOR BAR AND THE EMBEDDED FLOOR RECEPTACLE SHOULD BE MADE OUT OF A CORROSION RESISTANT METAL SUCH AS STAINLESS STEEL.

A GATE IS REQUIRED IN THIS LOCATION, RATHER THAN USING SAND, DUE TO THE RAPID FLUCTUATIONS IN THE CREEK LEVELS. FLASH FLOODING ON THIS CREEK DOES NOT ALLOW SUFFICIENT TIME FOR THE MOBILIZATION OF HEAVY EQUIPMENT TO FILL THE OPENING WITH SOIL. THE HEIGHT OF PROTECTION AT THIS CLOSURE IS APPROXIMATELY 2'. THE WIDTH OF THE CLOSURE IS APPROXIMATELY 20'.



**ELEVATION
GATE RAISED 4" ABOVE SILL**



SECTION A

Symbol	Description	Date	Approved

Designed By: CDD	Date: XX XXX 01
Drawn By: GLW	Scale: AS SHOWN
Checked By: ?	Project Code: MU05
Reviewed By: ?	Specification Number: DACW25-XX-B-XXXX

MAD CREEK
LOWA
MUSCATINE, IOWA
LOCAL FLOOD PROTECTION
**I & M RAIL LINK
RAILROAD CLOSURE
GATE DETAILS**

Sheet Reference Number:
S203
Sheet 15 of 19



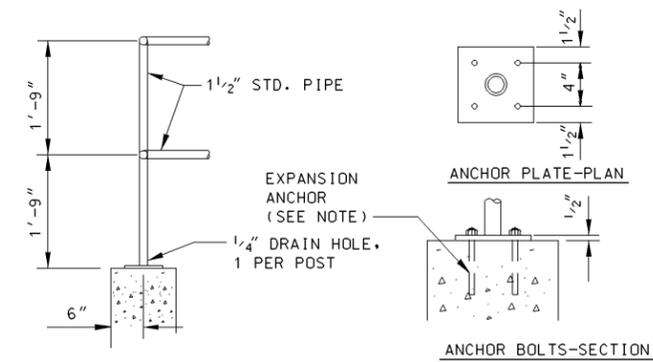
27-JUN-2002 08:37
61-Apr01jects\m05\m05s203.dgn
PRR 6-21-02

Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: RET	Date: XX XXX 01
	Drawn By: RTR	Scale: AS SHOWN
	Checked By: XYZ	Project Code: MU05
	Reviewed By: RAL	Specification Number: DACW25-XX-E-XXXX

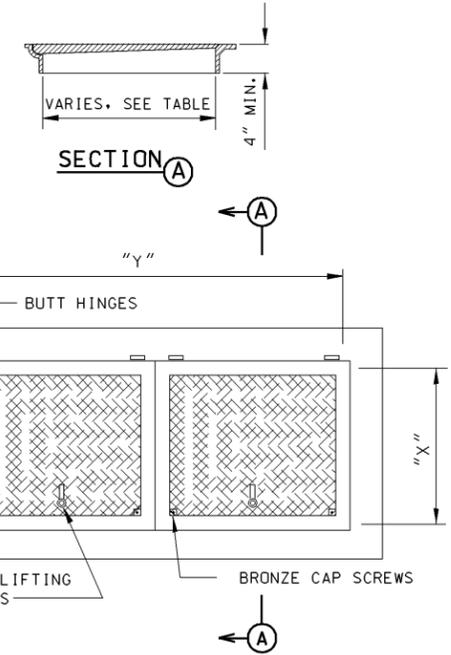
MAD CREEK
MUSCATINE, IOWA
LOCAL FLOOD PROTECTION
**MISCELLANEOUS STRUCTURES
GATEWELL
EXTENSION DETAILS**

Sheet Reference Number:
5501
Sheet 19 of 19



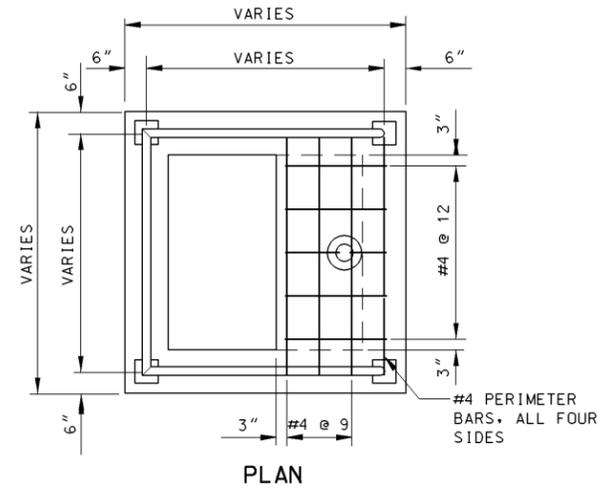
- HANDRAIL NOTES:**
- EXPANSION ANCHOR BOLTS SHALL BE 1/2" DIA., HAVE AT LEAST 5" EMBEDMENT, 4000 LB. ULTIMATE PULLOUT AND 6000 LB. ULTIMATE SHEAR. ALL ANCHOR BOLTS AND FASTENERS ARE TO BE GALVANIZED.
 - WELD ALL PIPE JOINTS WITH CONTINUOUS BEAD, SIZE EQUAL TO PIPE WALL THICKNESS, AND DRESS SMOOTH.
 - HANDRAIL WILL BE GALVANIZED AFTER FABRICATION.

HANDRAIL DETAILS

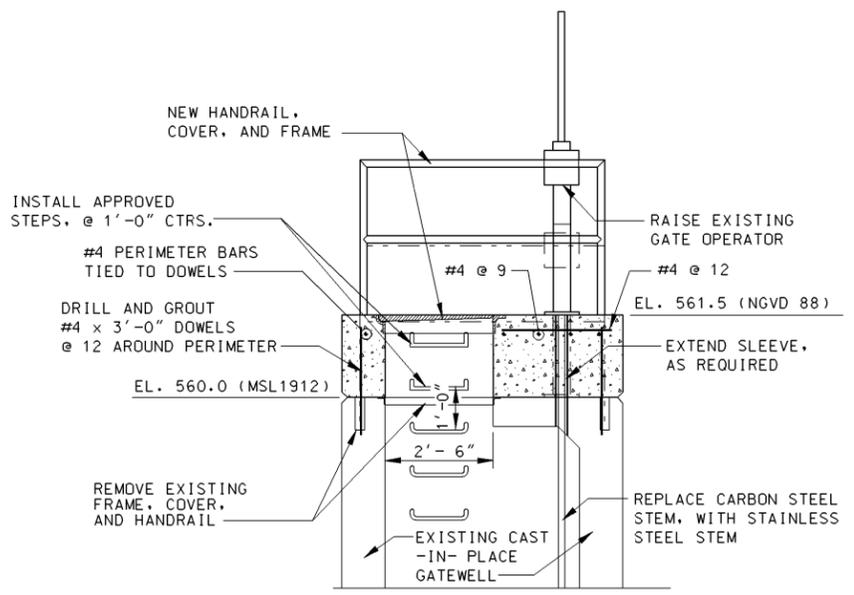


FRAME AND COVER DETAILS
(NOT TO SCALE)

EXISTING GATEWELL DATA					
IDENT.	STATION	OVERALL SIZE	OPENING SIZE	COVER TYPE	REMARKS
NO. 1	13+40	6'-0" X 7'-0"	2'-6" X 4'-8"	SINGLE	TWO LIFTS
NO. 2	24+50	6'-0" X 8'-0"	2'-6" X 6'-0"	DOUBLE	ONE LIFT
NO. 3	29+98	4'-6" X 6'-0"	2'-6" X 4'-0"	SINGLE	INTEGRAL W/WALL



PLAN



SECTION

TYPICAL GATEWELL DETAILS

27-JUN-2002 08:33
61Apr01lectsrmu5mm05s501.dgn
PTR 6-21-02