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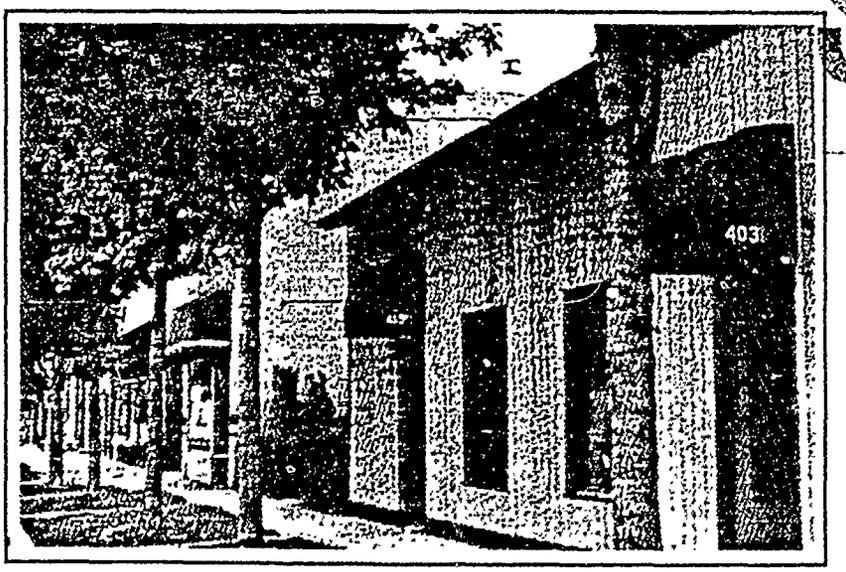
GENERAL REEVALUATION REPORT

for
FLOOD CONTROL PROJECT

RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES-DES MOINES, IOWA

WITH FINAL SUPPLEMENT NO. 1
to the
FINAL ENVIRONMENTAL IMPACT STATEMENT

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TECHNICAL CONTRIBUTORS

Primary study team personnel who are familiar with the technical aspects of this General Reevaluation Report are listed below:

STUDY MANAGEMENT: Mark Schroeder, P.E.

HYDROLOGY AND HYDRAULICS: Roger Less, P.E.

GEOTECHNICAL: for Don Bawmann

ECONOMIC ANALYSIS: Dan Fetes

ENVIRONMENTAL ANALYSIS: Bob Vanderjack

RCHEOLOGICAL INVESTIGATIONS: for Ken Barr

REAL ESTATE APPRAISAL: John Crooke for

LOCAL COOPERATION AGREEMENT: Martha Alford

US Army Corps of Engineers
Rock Island District

WE'RE PROUD TO SIGN OUR WORK

TECHNICAL CONTRIBUTORS (Cont'd)

COST ESTIMATE:

Jerry Crittenden, P.E., L.S.

Lere Busch by cds

Clarice Sundeen

SYLLABUS

A feasibility report was developed by the Rock Island District in 1975 for flood damage reduction, along with associated recreation features, for the cities of West Des Moines and Des Moines, Iowa. The project was authorized for construction by the Water Resources Development Act of 1986. The authorized project would provide a Standard Project Flood (SPF) level of protection from the Raccoon River, Walnut Creek, and Jordan Creek along with developing a city park, bicycle path, and boat launch area. The project would cost an estimated $16,220,000 (updated to 1988 price levels) and have a benefit-to cost (B/C) ratio of 1.3. → over

This 1988 General Reevaluation (GRR) of the authorized project accomplished the following:

a. Reaffirmed economic feasibility for flood control and recreation development along the Raccoon River and Walnut Creek.

b. Modified the flood control alignment to incorporate new floodplain delineation limits and developments since 1975.

c. Addressed and implemented Corps of Engineers policy changes regarding recommended levels of protection and project cost-sharing.

d. Obtained renewed statements of local sponsor support.

e. Avoided adverse environmental effects.

The plan selected for further development as a result of the GRR is a 100-year level of flood protection from the Raccoon River and Walnut Creek in the cities of West Des Moines and Des Moines, Iowa. The 100-year plan provides the greatest net benefits compared to the 50-, 200-, and 500-year and SPF levels of protection and is, therefore, designated as the NED plan. Protection would be provided to approximately 900 urban acres, including 904 residential, 227 businesses, and 11 public structures. The modified project consists of 4.0 miles of earthen levee, 900 feet of concrete floodwall, 6 mechanical closure structures, 2 sandbag closures, 2 pump stations, 4 ponding areas, 3 road ramps for access, 3 road ramps for maintenance, and 2 new access roads. The recreation portion of the project would consist of 2.8 miles of bicycle path, 5 bicycle ramps, 2 railroad crossings, 2 road crossings, 1 scenic vista, 1 parking lot, and 1 single-lane boat ramp to the Raccoon River.

The total project cost is $17,757,000, with a resulting annual cost of $1,815,300. The annual benefits are $3,253,000, and net benefits are $1,437,700. The flood control and recreation B/C ratios are 1.8 and 1.3, respectively.

Performance of the flood control project is based on ample advance warning time being provided for Walnut Creek to allow proper installation of the closure structures. Therefore, completion of the proposed flood-warning system which is currently being developed in a joint effort by the cities of

Des Moines, West Des Moines, and Clive, the National Weather Service, and the Iowa Departments of Transportation and Natural Resources is needed prior to the completion of project construction.

This GRR recommends continuation into the General Design Memorandum (GDM) phase of post-authorization planning and engineering studies. The cities of West Des Moines and Des Moines, Iowa, will be co-sponsors of the project and will have joint responsibility for operation and maintenance of the project after construction. (KT)

GENERAL REEVALUATION REPORT
FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

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GENERAL REEVALUATION REPORT
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WEST DES MOINES - DES MOINES, IOWA

SECTION 1 - INTRODUCTION

STUDY AUTHORITY

A flood protection project for the cities of West Des Moines and Des Moines, Iowa, was authorized by the Water Resources Development Act of 1986, Public Law 99-662, 99th Congress, dated November 17, 1986. Funds were appropriated in September 1987 to initiate this General Reevaluation Study, which is the first phase of the post-authorization planning and engineering studies required prior to construction.

The authorizing language contained under Title IV, Section 401, paragraph a. of the Act, is restated below:

TITLE IV-FLOOD CONTROL

SEC. 401.AUTHORIZATION OF PROJECTS

(a) AUTHORIZATION OF CONSTRUCTION.-The following works of improvement for the control of destructive floodwaters are adopted and authorized to be prosecuted by the Secretary substantially in accordance with the plans and subject to the conditions recommended in the respective reports designated in this subsection, except as otherwise provided in this subsection:

Des Moines River Basin, Iowa and Minnesota

The project for flood control, Des Moines River Basin, Iowa and Minnesota: Report of the Chief of Engineers, dated July 22, 1977, at a total cost of $15,200,000, with an estimated first Federal cost of $10,900,000 and an estimated fir on-Federal cost of $4,300,000. The Secretary shall, in consultation with appropriate Federal, State, and local agencies, study the feasibility of minimizing increased flood stages along Jordan Creek in the vicinity of the Chicago, Rock Island and Pacific Railroad Bridge and the implementation of non-structural and structural flood plain management techniques along the reach of Walnut Creek, including the improvement of channel capacity in the vicinity of Grand Avenue. In addition, the Secretary shall, in consultation with appropriate Federal, State, and local agencies, review the location of river access points and boat ramps.

STUDY PURPOSE AND SCOPE

The purpose of this General Reevaluation Study is to reaffirm the Federal interest in the authorized flood control project to include modification of the authorized plan, if necessary, to incorporate recent developments in the floodplain, current policies regarding implementation of flood control projects, and the local sponsor's needs.

The authorized project is a flood control and recreation plan for the portions of West Des Moines and Des Moines, Iowa, that receive flood damage from the Raccoon River, Walnut Creek, and Jordan Creek. The scope of this study is limited to the reevaluation of flood damage reduction measures for the general area of the authorized plan and the recreational features related to the flood control project.

STUDY AREA

The cities of West Des Moines and Des Moines have a common corporate boundary and are located in Polk County in central Iowa (see plate 1). The study area is bounded on the west by Jordan Creek, on the south by the Raccoon River, and on the east by Walnut Creek. The urbanized floodplains between these water sources form an approximate 900-acre study area.

PRIOR REPORTS

1975 FEASIBILITY STUDY

In June 1975, the Rock Island District completed a report entitled Feasibility Study for Flood Damage Reduction and Related Purposes, Des Moines River Basin, Iowa and Minnesota.

The study was requested and authorized to investigate flooding and related water resource problems of the Des Moines River Basin.

Initial solutions investigated in the 1975 feasibility study included both structural and nonstructural alternatives for the Des Moines River Basin. One plan, which provides Standard Project Flood (SPF) protection for the city of West Des Moines and a portion of the city of Des Moines, was selected for recommendation for detailed design and construction and is the subject of this General Reevaluation Report (GRR).

1977 FINAL ENVIRONMENTAL STATEMENT

In June 1977, the Rock Island District published a report entitled Final Environmental Statement, West Des Moines - Des Moines, Iowa, Des Moines River Basin, Local Flood Protection. The report addressed the environmental impacts of the flood protection plan recommended in the 1975 Feasibility Report. A supplement to the Final Environmental Statement (i.e., the Supplemental FEIS) was prepared during this general reevaluation to address modifications to the authorized plan.

1979 CONGRESSIONAL DOCUMENTS

The feasibility report was subsequently printed, in 1979, as Senate Document No. 96-36, and House Document No. 96-146, 96th Congress, 1st Session. In November 1986, Congress authorized the local flood protection project for the Raccoon River, Walnut Creek, and Jordan Creek areas of West Des Moines and Des Moines, Iowa, which is the subject of this GRR.

EXISTING FLOOD PROTECTION WITHIN STUDY AREA

WEST DES MOINES EMERGENCY LEVEE

An emergency levee was constructed by the city on July 1, 1986, in response to an impending record flood on the Raccoon River. The levee is located from First Street to 11th Street along or near Railroad Avenue. The typical cross section is 3 to 5 feet high and has an 8- to 10-foot top width, with 1V on 4H side slopes. This levee is north of the proposed project alignment. The flood that occurred was an approximate 30-year event.

PRIVATE RING LEVEE

A private ring levee approximately 10 feet high was constructed after the 1973 Raccoon River flood to protect a restaurant and parking lot. This levee is located in West Des Moines, south of Railroad Avenue between Second and Third Streets. Material for the levee was obtained from an adjacent borrow site which left a pit that is now water filled. The proposed levee alignment is riverward of this ring levee and borrow pit.

JORDAN CREEK SPOIL BANKS

Spoil banks and levees exist along both banks of Jordan Creek between Fuller Road and the Chicago and North Western (C&NW) Railroad. The existing levees are not of constant grade and do not tie into high ground and, therefore, provide only limited flood protection. The proposed levee alignment is set back from the spoil banks such that the obstruction to flood flows on Jordan Creek will be minimized.

WALNUT CREEK LEVEE

In the 1950s, a levee was constructed in the city of Des Moines along the right bank of Walnut Creek from the C&NW Railroad embankment upstream to about Grand Avenue. The typical cross section of this existing levee is 5 feet high and has an 8-foot top width, with 1V on 3H side slopes. The proposed levee alignment is centered over most of this existing levee; however, due to extensive tree growth, the existing levee will be degraded to avoid potential seepage paths from the root systems. The levee will be rebuilt to ensure proper compaction and levee integrity. Any suitable remaining material from the existing levee after tree removal will be reused as levee fill.

RELATED PROJECTS, STUDIES, AND REPORTS

AUTOMATED FLOOD-WARNING SYSTEM

An integral part of the recommended flood protection plan for West Des Moines and Des Moines will be an automated flood-warning system on the Walnut Creek watershed and the Raccoon River. In response to 1986 flooding, an automated flood-warning system orientated primarily on the Walnut Creek watershed is being developed in a joint effort by the National Weather Service, the cities of Des Moines, West Des Moines, and Clive, and the Iowa Departments of Transportation and Natural Resources with input from the Corps of Engineers.

The proposed system involves two rainfall gages in the upper basin, two rainfall and crest stage gages in the middle of the basin, and the USGS stream gaging station at 63rd Street in the lower reach of the basin. The USGS stream gage at Van Meter, Iowa, on the Raccoon River also will be linked into the flood-warning system. The data from these sites will be automatically sent by VHF radio to a base station computer which monitors the data and sets off an alarm if threshold criteria have been exceeded. The alarm notice will be relayed to the proper authorities in each of the cities. The flood-warning system is planned to be operational before construction of the proposed levee project.

The flood-warning system will be used to give advance warning of impending flooding on Walnut Creek such that proper emergency response actions can be taken, including evacuation of residents in high risk areas. A review of the planned system indicates that it can be easily adapted to meet the needs of the recommended levee project.

An emergency response plan relating to the flood-warning system is being formulated by the cities involved. The response plan will require that each city designate a city Flood Warning Coordinator and properly train that individual. Also, a city preparedness plan will be written by the cities involved describing the actions to be taken during an emergency alert. Upon local sponsor review and approval of the flood protection project, each city will develop the necessary response plan so that the project will function as it is designed. The cities have indicated that they each have the manpower and equipment to install the closure structures and to operate the outlet facilities. These local emergency response plans will be included in the next study phase.

DES MOINES RECREATIONAL RIVER AND GREENBELT

The Des Moines Recreational River and Greenbelt was authorized for the preservation of scarce river bottom timberlands and to greatly increase opportunities for recreation. Project purposes include the development of recreational, environmental, and streambank stabilization projects. The Greenbelt corridor extends from the area of Fort Dodge, Iowa, to near the Red Rock Dam and includes a portion of the city of West Des Moines.

The city of West Des Moines, along with Polk County and the Iowa Department of Natural Resources, has proposed the development of an abandoned commercial gravel pit area (Martin-Marietta) along the Raccoon River. The gravel pit project would include recreational developments and the establishment of a wildlife area. The Corps of Engineers is currently preparing a Feature Design Memorandum for the recreational portion of the project, referred to as the Raccoon River Sports Complex. This gravel pit area is outside the proposed line of protection and should not be affected by the flood control project.

FLOOD INSURANCE STUDY, CITY OF WEST DES MOINES

This study was conducted to define the 100-year floodplain and to delineate the floodway fringe. A report was published by the Federal Emergency Management Agency dated May 1979, Community Number 190231.

FLOOD INSURANCE STUDY, CITY OF DES MOINES

This study was conducted to define the 100-year floodplain and to delineate the floodway fringe. A revised report was published by the Federal Emergency Management Agency dated July 15, 1988, Community Number 190227.

63rd STREET (HIGHWAY 12) IMPROVEMENTS

In recent years, the responsibility for 63rd Street has been assumed by the Iowa Department of Transportation (IDOT) with the street designated as State Highway 12. The IDOT's plans for the street are to upgrade the reach from Army Post Road north to Grand Avenue to a four-lane roadway and to make improvements north of Grand Avenue. Tentative construction for the Army Post Road to Grand Avenue phase is scheduled for 1993, with the other improvements yet to be scheduled. The four-lane upgrading will affect two closure structures in the recommended levee alignment; one south of Grand Avenue crossing 63rd Street near Walnut Creek and another south of the C&NW Railroad on the Raccoon River. Coordination with the IDOT has been initiated, under the agreement that the Corps of Engineers will forward the recommended levee plan with closure details to the IDOT. The IDOT is scheduled to begin detailed design on the four-lane reach in 1989.

SECTION 2 - PLAN FORMULATION

DESCRIPTION OF AUTHORIZED PLAN

FLOOD CONTROL

In general, the authorized plan, as described in the 1975 Feasibility Report, would provide flood protection from the Raccoon River, Walnut Creek, and Jordan Creek for the city of West Des Moines and a portion for the city of Des Moines. The project is designed to protect 922 residences, 143 commercial firms, and 22 industries against the SPF. The authorized alignment, as shown on plate 2, extends from high ground along the left bank of Jordan Creek to the Raccoon River floodplain and then generally along the south side of the C&NW Railroad tracks to an existing levee along the right bank of Walnut Creek. The alignment was placed slightly landward of the existing levee to a point along 63rd Street south of Grand Avenue. The protection works included 5 miles of new and improved levee, 600 lineal feet of concrete floodwall, 4 ponding areas, 3 pumping stations, 8 closure structures, and 4 road ramps.

RECREATION

The 1975 recreation plan, shown on plate 3, proposed a city park, fisherman's access, and approximately 0.7 mile of bicycle path for the city of West Des Moines. Recreation plans for the city of Des Moines included approximately 2.3 miles of bicycle path, a parking lot, and a boat ramp. The bike path alignment extended from the proposed city park in West Des Moines (Fifth Street area) along the levee alignment into Des Moines. The path continued to follow the levee alignment through the city of Des Moines until the levee crossed back over 63rd street. Here the path remained on the east side of 63rd Street and extended north across Grand Avenue and under the Walnut Creek bridge. The path then again followed the levee alignment along Hoak Drive in West Des Moines. This northern segment was for a long-range plan connecting a trail to the suburbs of Clive and Windsor Heights, Iowa.

FLOOD PROBLEMS

JORDAN CREEK

To date, there is no history of damaging floods occurring on Jordan Creek. The stream is not gaged.

The Jordan Creek floodplain is concurrent with the Raccoon River floodplain up to the C&NW Railroad embankment. Between the railroad embankment and Fuller Road, major Jordan Creek flood events are predicted to overflow on the landside of the existing spoil banks. Most existing structures in this area are above the 100-year flood height. Floodplain management regulatory mapping shows that overflows would pond in a property adjacent to the railroad embankment where no structural damage would occur. Historically, these overflows have not occurred. Thus, no experienced flooding has occurred on which to calibrate projected flooding. (Note: New topographic mapping will be available during the next study phase to verify if these potential overflows are limited to the non-damaging areas.)

Upstream of Fuller Road, the Jordan Creek valley narrows with steep topography confining the floodplain between Grand Avenue and Delevan Road. Jordan Creek flooding is flashy in nature with an estimated 1- to 2-hour advance warning time.

Urbanization is occurring throughout the basin, and West Des Moines city staff have expressed that within the next 10 years the entire Jordan Creek watershed will likely become developed. With this urbanization, the threat of flooding is becoming a concern. These predicted land-use changes were considered in the project hydrology and economics. Incremental benefits for providing independent flood protection from Jordan Creek only would provide $9,000 and $21,000 supportable construction costs for the 100-year and SPF levels of

protection, respectively. Based on the low level of justification, the Raccoon River flood profiles were used as the basis for the Jordan Creek tie-off. This is consistent with the 1975 Feasibility Report.

RACCOON RIVER AND WALNUT CREEK

Flood events from the Raccoon River and Walnut Creek are usually independent, but coincident events do occur. In 1973, both cities incurred flood damages from the same storm system. Walnut Creek crested on July 1, while flows on the Raccoon River were high from July 1 to 5. Both floods were approximate 25-year events.

The most recent severe flooding occurred in May 1986 and July 1986 on the Walnut Creek and the Raccoon River, respectively. The May 1986 flood (Walnut Creek) caused in excess of $3 million in damage to 46 businesses and 220 homes. This flood was an approximate 40-year event. The July 1986 flood (Raccoon River) was an approximate 30-year event. Serious commercial and residential damages were prevented by construction of a temporary emergency levee (at West Des Moines, city cost of $45,000). It is estimated that a 100-year flood event would cause approximately $30 million in flood damages.

PUBLIC FACILITIES

In addition to the many residences and commercial and industrial buildings, numerous public facilities are affected by flooding. Public properties in the West Des Moines study area include city hall, the water works office and plant, Board of Education offices and an elementary school, two parks, Public Works and Engineering offices, community center, post office, roads, and sewers. Public property in the Des Moines study area includes a sanitary flow equalization basin, roads, and sewers.

FUTURE CONDITIONS

The most likely future condition without a project ir the West Des Moines/ Des Moines, Iowa, study area is increased flood problems and levels of damages. Both cities have a diversified and expanding economic base, with the potential for greater damageable value in the future. Also, continued upland development will likely increase future runoff and flooding severity.

RECREATIONAL OPPORTUNITIES

The city of Des Moines has existing bicycle trails along Walnut Creek and the Raccoon River, one of which is named Waterworks Bike Trail. These trails connect to the Saylorville Bicycle Trail and will connect to other proposed trails running south and east out of Des Moines.

The Central Iowa Regional Association of Local Governments has proposed a bicycle trail between the cities of Yale and Waukee, Iowa, which lie west of West Des Moines. The proposed flood control project affords the opportunity to provide a link between the two bike trail systems and to form an approximate 50-mile major east-west, off-road bicycle trail.

The levee alignment also provides the potential for access to the proposed Greenbelt project known as the Raccoon River Sports Complex.

FLOODPLAIN CHANGES/INFORMATION SINCE 1975

FLOODWAY ENCROACHMENT LIMITS

Floodway encroachment limits have been delineated along Walnut Creek by FEMA. This prompted the need to reevaluate the Walnut Creek tie-off since a portion of the authorized plan would lie inside these limits.

DEVELOPMENT ALONG PROPOSED ALIGNMENT

Construction within the floodplain along the authorized levee alignment also has caused the need to reevaluate several areas. The areas where building or development affect the authorized plan are:

a. Along Jordan Creek at Fuller Road in West Des Moines - commercial building;

b. South of North Valley Drive in Des Moines - a sanitary flow equalization basin constructed at proposed ponding area #4 site;

c. South of Grand Avenue in Des Moines - commercial development; and

d. South of Grand Avenue in West Des Moines - commercial development.

LANDFILL AND DISPOSAL AREAS

Information received from the city of West Des Moines about landfill areas required the reevaluation of the authorized alignment through the Martin-Marietta area and along Railroad Avenue. The Iowa Department of Natural Resources confirmed that the Lincoln Road area adjacent to Fifth Street was being used as a domestic waste site and also contained fly ash. (See the May 1988 telephone conversation record contained in Appendix F - Pertinent Correspondence.)

A recent city ordinance which bans dumping, burial, and burning of disposal material has mandated that any disposal required from the flood control project construction be hauled to the Des Moines landfill area located at 16th and Euclid, a distance ranging from 7 to 10 miles.

BORROW SITES

The city of West Des Moines staff indicated that current development efforts are under way in the area of the borrow site that was identified for the authorized plan. In light of this development, the city has identified a different borrow site which is located at South 50th Street and north of Grand Avenue. This is an approximate 3- to 6-mile haul distance for fill requirements. The city of Des Moines also has identified a borrow site that may be used for their portion of the fill requirements. The site is located south of the Des Moines River in the city of Des Moines, along Hartford Avenue approximately 1 mile east of East 14th Street. This area is a bluff and is referred to as Soldier's Field. The haul distance for levee construction is approximately 9 miles. Plate 4 shows the borrow site locations.

POLICY CHANGES SINCE 1975

RECOMMENDED LEVEL OF PROTECTION

New guidance on the level of protection which should be selected for recommendation is contained in ER 1105-2-10, dated December 18, 1985, entitled Planning Programs. Chapter 1, paragraph 1-6 a.2, of this regulation states "The National Economic Development (NED) Plan is selected unless there is some overriding reason for selecting another plan based on Federal, State, local, or international concerns." The NED plan is defined as the plan which maximizes net economic benefits, i.e., annualized benefits minus annualized costs.

At the time of the Board of Engineers for Rivers and Harbors' review of the feasibility report, the policy was to recommend the greatest level of protection that was economically justified. The NED plan identified in the feasibility report was the 200-year level of protection. However, a higher level of protection, the SPF, was recommended because it was the highest level of protection that was economically feasible.

For the General Reevaluation Study, a wide range of protection levels were evaluated to determine the current NED plan. The 50-, 100-, 200-, and 500-year, and SPF levels of protection were selected as appropriate alternatives for reevaluation.

COST-SHARING

The Water Resources Development Act of 1986 has changed the cost-sharing requirements for the construction of Federal flood control projects. The non-Federal local sponsor is now required to provide a minimum of 25 percent and a maximum of 50 percent of the total project costs that are allocated to flood control. This is accomplished through a combination of cash and credit given for lands, easements, rights-of-way, relocations, and dredged material placement areas (LERRD). The cash requirements are for the local sponsor to provide a minimum of 5 percent of the total flood control costs in cash up-front. Because of the minimum 25-percent required contribution, additional cash may be required if the LERRD is less than 20 percent of the project costs.

These new cost-sharing requirements were discussed and understood by both cities prior to initiation of and throughout the course of the General Reevaluation Study.

RECREATION

New guidance contained in ER 1165-2-400, dated August 9, 1988, entitled Water Resource Policies and Authorities, Recreation Planning, Development, and Management Policies, states "At non-reservoir projects, the Corps participation in recreation facility development is limited to those provided on the lands required for the basic project except on those additional lands outside the basic project boundary which may be required for access, parking, potable water, sanitation and related developments for health, safety and public access."

This new regulation would affect the city park along Railroad Avenue which was proposed in the authorized plan as part of the recreation development for the city of West Des Moines. However, the city has since decided against developing a city park at that location.

DESCRIPTION OF MODIFIED PLAN

Modifications to the original plan were developed and evaluated using a multi-disciplinary team concept which included local sponsor coordination to ensure appropriate consideration of a broad range of complex issues, such as flood-plain changes, policy changes, and local sponsor's desires; economic feasibility; environmental effects; and social consequences of plan implementation.

The levee alignment through the city of West Des Moines was developed using 1974 2-foot topographic mapping, and the alignment through the city of Des Moines was developed using 1964 2-foot topographic mapping which were provided by the respective cities. Cross sections and quantity information for both the flood control and recreation portions of the project were developed using the maps provided. The city of West Des Moines is in the process of obtaining new digitized topographic mapping which will be available for the next study phase.

Descriptions of the proposed flood control project will designate the Jordan Creek area in West Des Moines to be the beginning of the project and the Walnut Creek tie-off along Hoak Drive in West Des Moines to be the end of the project. Modifications to the original project will be described from the beginning to the end of the project.

FLOOD CONTROL MODIFICATIONS

The proposed levee and floodwall alignment, as reformulated, is shown on plate 5. The majority of alignment changes are within the city of West Des Moines.

The Raccoon River tie-off along Jordan Creek has been set back to the edge of an agricultural field to avoid costs of degrading the spoil banks, to avoid potential environmental problems associated with tree removal, and to minimize increased flood heights on the opposite bank. The Raccoon River SPF level of protection would tie off upstream of Fuller Road, whereas all other levels of protection only need to extend to the vicinity of South 18th Street. The Raccoon River levee tie-off will not provide flood protection from Jordan Creek since the damages are not significant. This deviation from the authorized plan is addressed in subsequent sections of the report.

The alignment through the Martin-Marietta area up to Railroad Avenue has been modified to run parallel to the C&NW Railroad tracks and a local access road. The actual alignment would be approximately 40 feet east of the road to maintain access, to avoid a major sewer line, and to avoid the railroad right-of-way. This area runs from approximately 425 feet north of the Jordan Creek railroad bridge at the levee/railroad crossing to approximately Sixth Street in West Des Moines. This modification mainly is due to the identified landfill areas requiring excavation of unsuitable material. The resulting increase in the incremental costs were not offset by the incremental benefits derived. Therefore, the alignment was moved to the north.

From approximately Sixth Street to Fourth Street in West Des Moines, the alignment has been changed to a more landward location. This modification is proposed because all residences that were in this area in 1975 have since been acquired and removed by the city.

The proposed alignment then follows the authorized plan as it crosses 63rd Street into the city of Des Moines and turns northward to cross and then parallel the C&NW Railroad tracks. Approximately 850 feet west of where the existing Walnut Creek levee ties into the C&NW Railroad embankment, the authorized alignment is modified to again turn north. This modification eliminates a loop in the authorized alignment of an estimated 2,000 feet which was proposed to provide protection for one single-family residence. Further investigation shows that the longer alignment is not incrementally justified and that protection of the structure would be difficult due to available physical space. A ramp over the levee will be provided for access and safety of the residents. The levee will not increase flood heights in this area.

The levee continues north toward Walnut Creek where it overrides the existing levee and follows the alignment past North Valley Drive to its termination about 730 feet south of Grand Avenue. The authorized alignment in the vicinity of North Valley Drive ran to the southwest of the existing levee, taking a slightly shorter route. However, the current proposal is to follow the existing levee through this reach to maintain the necessary land required for ponding since the recent construction of the sanitary flow equalization basin used lands formerly dedicated for ponding. It also should be noted here that the existing levee will be degraded and rebuilt to assure Corps design standards. This is a deviation from the authorized plan in which just the existing levee would have been raised.

At the point where the levee again crosses 63rd Street back into the city of West Des Moines (approximately 730 feet south of Grand Avenue), the levee alignment will remain the same as the authorized plan up to the intersection of Ashworth Road and Hoak Drive. A minor design modification will be an extension of floodwall in the Grand Avenue area due to construction of a commercial building.

The next alignment modification concerns the Hoak Drive area. The authorized alignment was placed east of Hoak Drive. However, the new floodway encroachment limits have been delineated basically down the center of Hoak Drive which requires the levee to be located over the road. With this alignment, one business would be relocated and a new southern access road would be established for two other businesses.

The tie-off for Walnut Creek also has been modified to avoid the floodway encroachment limits. Additional interior drainage costs were also a factor in the modification. The new tie-off will turn west between the Wheeler Lumber Consolidated buildings and storage yard, cross the Des Moines Union Railway main line and side track, and tie in to high ground behind the back yards of the residences on Clegg Road.

RECREATION MODIFICATIONS

Coordination with both cities' recreation and planning departments has resulted in substantial changes in the recreation plan. The major difference is that recreational development associated with the flood control project is now concentrated on the southern half of the project to develop east-west trails instead of being concentrated on the northern portion of the project to develop northern trail links.

The modified recreation plan is shown on plate 6. The bicycle trail will begin at Fuller Road (for access) in West Des Moines and follow existing ground until the beginning of the levee project. The trail will be atop the levee up to the C&NW railroad closure, at which point it will ramp down to ground level and parallel the west side of the railroad tracks to the existing railroad crossing used by the city engineering and maintenance trucks. A railroad warning signal will be required at this crossing for safety purposes. The bicycle trail will then cross Lincoln Road and ramp back up onto the levee, remaining on the levee crown until approximately Fifth Street in West Des Moines. The path is proposed to ramp down at this location, cross the C&NW Railroad tracks with another signaled crossing, and turn east to run between the tracks and Railroad Avenue. As the path crosses into the city of Des Moines, a pedestrian-type crossing signal will be required at 63rd Street. The path will continue east and ramp back up onto the levee and remain atop the levee until North Valley Drive. A small ramp will be provided here which will end this project but will provide access to additional trails.

An additional modification in the recreation features from the authorized plan will be the inclusion of a scenic vista adjacent to the bike path which will overlook the gravel pits and Greenbelt development area. The vista will provide a rest stop for the bicyclists.

Other deletions from the authorized plan are the elimination of the fishing pier and city park in the city of West Des Moines. However, the boat ramp proposed in the vicinity of 63rd Street and included in the authorized project will remain as an integral part of the current project. As required within the project authorizing language, the location of the proposed river access points and boat ramp was reviewed with the appropriate local officials and agencies to determine the best general location.

OTHER MODIFICATIONS CONSIDERED

Other changes to the authorized alignment that were considered but not selected to be part of the modified plan are listed below. Their locations are shown on plate 7.

HOAK DRIVE TIE-OFF

At the city of West Des Moines' request, a levee alignment was reexamined that would protect the businesses on the east side of Hoak Drive. This alignment also was considered in the Feasibility Report and was called alignment 1-E.

Approximately 2,100 feet north of Ashworth Road Hoak Drive, the levee would turn east and parallel Walnut Creek up to Cente. -eet. The alignment would turn west and run just south of Center Street to .. h Street, at which point it would turn south and tie off to high groun . . . the car dealership and Eighth Street.

This alignment would require 2,000 feet of levee, 500 feet of floodwall, 1 railroad closure, 1 road closure, 1 new access road, 2 gatewells, 1 pump station, and 1 ponding area. The additional incremental cost over the selected Hoak Drive tie-off is approximately $900,000. The annual costs are $81,300 and the annual benefits are $15,600, with a resulting B/C ratio of 0.019. This alignment is not incrementally justified, and it severely encroaches on the floodway limits.

EAST OF 63rd STREET AT GRAND AVENUE AREA - DES MOINES

This potential alignment change also was evaluated in the Feasibility Report, but is being reevaluated now based on both local sponsors' requests. It involves placement of protection on the Des Moines side of 63rd Street from Ashworth Road downstream to Grand Avenue. Advantages of this alignment would be better aesthetics and no access problems for the businesses on the West Des Moines side of 63rd Street.

However, this alignment creates a great amount of technical difficulties. A typical closure structure on the east side of 63rd Street at Grand Avenue is technically infeasible because of the close proximity of Walnut Creek bridge and the sight distance required for traffic. Floodwalls and channel modification would be required due to the insufficient distance available between the street and the creek. Because of both the additional cost for floodwalls and channel modifications and the technical difficulties of a specially designed closure structure, this alternative is neither cost effective nor technically feasible.

ASHWORTH ROAD TIE-OFF

A Walnut Creek tie-off along Ashworth Road in West Des Moines was considered due to the floodplain encroachment limits along Hoak Drive. Preliminary coordination with the city of West Des Moines proved this alignment to be the least desired Walnut Creek tie-off for the local sponsor because of the amount

of floodplain left unprotected. The Ashworth Road tie-off was not considered further due to sponsor support for the Hoak Drive tie-off as included in the modified plan.

ALIGNMENT AROUND GRAVEL PITS

The location of this alignment is between Fairmeadows Creek and 63rd Street in West Des Moines. This alignment was evaluated because of the new information received about landfill locations along Lincoln Road. The idea for a revised alignment was to avoid an old landfill site while accommodating the city's desire to have Lincoln Road remain intact and provide ample area for interior drainage requirements. This alignment was not selected, however, because the increased levee length and height would not be incrementally feasible. Additionally, more landfill and solid waste materials were encountered along this route, plus a greater number of large trees to be cleared.

MARTIN-MARIETTA AREA

The alignment discussed here is located from the C&NW Railroad at Jordan Creek up to Fairmeadows Creek. The city of West Des Moines requested that consideration be given to protecting all of the buildings in this Martin-Marietta area. This alignment would be farther east than the authorized plan. An incremental cost comparison completed for this option showed that the additional cost for protecting all the buildings in this area is approximately $637,000 with an associated annual cost of $57,400. The annual benefits are $12,800, which result in a BCR of 0.22. This alignment was not selected because it is not economically justified.

OTHER RECREATION CONSIDERATIONS

An additional bicycle path alignment crossing beneath 63rd Street at the Raccoon River bridge and directly connecting to the levee access parking lot was considered at the request of the city of West Des Moines (see plate 7). This alignment was not included because of technical difficulties related to the bridge underpass. The terrain is steep where the path would approach the bridge, and it is questionable whether there is ample room between the bridge abutment and the Raccoon River. Although crossing under 63rd Street, which is a State highway, would be safer, additional costs would be incurred. This stretch of bike path would not eliminate the need for the connecting link along Railroad Avenue since the city of West Des Moines desires access from Fifth Street.

During the next study phase when new topographic mapping is received and further coordination with the State about the highway improvements is accomplished, this particular modification to the recreation alignment should be reevaluated.

ALTERNATIVES TO THE MODIFIED PLAN

Separate alternatives which are complete within themselves were evaluated in addition to the main levee/floodwall alignment discussed earlier.

WALNUT CREEK NONSTRUCTURAL ALTERNATIVE

Nonstructural alternatives were evaluated in the 1975 Feasibility Report but were not recommended. Based on comments received from the State of Iowa in 1976, the authorizing language requires the reevaluation of nonstructural floodplain management techniques along Walnut Creek.

Nonstructural measures evaluated consist of permanent or temporary evacuation, floodproofing structures, and relocation of structures. Floodproofing is not applicable for flood heights greater than 3 feet because it would inhibit access for property owners and for emergency service vehicles. Also, the associated velocities with higher flood stages pose a hazard to health and safety. This leaves evacuation and relocation, which are not practical or acceptable due to the large floodplain area and density of structures within the floodplain. The costs would be excessive and would not be supported by the alleviation of average annual damages. Temporary evacuation during flood times is a viable option. However, based on the Automated Flood-Warning System that is being developed by the study sponsors, temporary evacuation is considered an existing situation with or without a project.

Nonstructural measures for the portions of Walnut Creek study area which are left out of the flood protection project were considered for three areas: the businesses between Hoak Drive and the west side of Walnut Creek, the residences on the east side of Walnut Creek just south of Center Street, and the commercial buildings and residences on the east side of Walnut Creek around Grand Avenue.

Floodproofing measures were again eliminated from further consideration due to the flashy nature of the creek and the high flood stages. Permanent evacuation is too costly for the amount of flood damages that are received in these areas and is therefore economically infeasible. Relocation of the structures is socially unacceptable to a majority of property owners and extremely costly compared to the benefits. In addition, the physical relocation of larger commercial structures is impractical, if not impossible, in most cases.

In summary, nonstructural floodplain management techniques for the Walnut Creek area are not feasible except for temporary evacuation using the proposed Automated Flood-Warning System.

WALNUT CREEK CHANNEL IMPROVEMENTS

Walnut Creek channel modifications also were evaluated in the Feasibility Report but were not recommended. Based on comments received from the State of Iowa in 1976, the authorizing language requires reevaluation of improving the Walnut Creek channel capacity along Grand Avenue.

Channel improvements would require widening the channel, since deepening the thalweg would not be effective due to the close proximity to the confluence with the Raccoon River. Past hydraulic studies indicate that a 50-foot bottom width channel with 3H on 1V side slopes would be needed to eliminate the levee-induced 100-year profile increases in the Center Street to 63rd Street reach. Extending this improvement downstream to below Grand Avenue also is estimated to eliminate the levee increases in the 63rd Street to Grand Avenue reach. This alternative would include cleaning out all existing bridge openings. These channel and bridge improvements would, however, not negate the need for levees and floodwalls to provide 100-year flood protection for the project area. A channel to carry the 50- and 100-year floods would require that the channel bottom width be enlarged to 110 feet and 150 feet, respectively. With the 3H on 1V side slopes, this makes the channel top widths 180 feet and 225 feet, respectively. All Walnut Creek bridges then would have to be replaced.

Improvements of this scope would not be justified economically due to the cost of the great amount of required excavation and the new bridges. Improving the Walnut Creek channel capacity to offset water surface profile increases from the levee project would require (in addition to the channel enlargement and two bridge cleanouts) clearing, grubbing, excavation, utility crossing relocations, and extensive maintenance. The reduction of the induced damages provided by the improvement would support only a small portion of the total cost.

Historical experience on Iowa streams, and in particular on Walnut Creek, has been that streams tend to reach a dynamic equilibrium for channel size and capacity. Any artificial increases in channel size will over time revert toward the pre-project condition due to natural accumulations of sediment within the over-sized channel. Past experience on Walnut Creek upstream in Windsor Heights and Des Moines where improvements have been made previously has shown that the channel has reverted to near pre-project conditions within a 15-year time period. Periodic maintenance, including control of brushy growth on the new channel banks and removal of debris from within the channel, will tend to slow this natural regression. Also, based on the past Walnut Creek improvements, any increased channel capacity will have an effective life of 15 years. After this 15-year time span, major remedial cleanouts will again be needed to restore the project channel sizes and capacities. Because of the aforementioned reasons, channel improvements on Walnut Creek were not considered further.

GRAND AVENUE AREA LEVEE - DES MOINES

At the city of Des Moines' request, a separate levee which would protect businesses and residences on the east side of Walnut Creek in the Grand Avenue area was analyzed. See plate 7 for the location of this flood control project alignment. This area also was considered in the Feasibility Report and was called alignment 2. The project would consist of 1,500 feet of levee, 250 feet of floodwall, and one closure structure for Grand Avenue. The line of protection extends from the back yards of the residences on 59th Street along the Des Moines Union Railway, crosses Grand Avenue, and follows Cummins Parkway and ties off at high ground behind the residences on Walnut Hill Avenue.

The cost for this protection is approximately $490,000, with an associated annual cost of $44,400. The annual flood damage reduction benefits are $2,700, with a resulting BCR of 0.06. Flood protection for the Grand Avenue area east of Walnut Creek is not economically justified and was not considered further.

EVALUATION AND COMPARISON OF FINAL PLANS

The final plans for further evaluation in this GRR are the main flood control alignment and recreation project authorized in the Water Resources Development Act of 1986, as modified in this GRR. Plate 5 shows the modified flood control project alignment and related features, and plate 6 shows the modified recreation plan. The array consists of the 50-, 100-, 200-, and 500-year and SPF levels of flood protection.

JORDAN CREEK AREA

The recommended levee alignment proposes an upstream Raccoon River flank levee tie-off into high ground located between the C&NW Railroad and Fuller Road. This tie-off location will not provide flood protection from Jordan Creek. To provide 100-year Jordan Creek flood protection with 4 feet of freeboard would require a 5-foot closure at the C&NW Railroad and at Fuller Road, additional levee height upstream of the railroad, a tie-off extension upstream of Fuller Road, and installing a flash flood warning system of the Jordan Creek watershed.

The levee extension would necessitate a sanitary sewer relocation and possibly a building relocation along with a 5-foot Fuller Road closure. Additionally, the two closure structures would be difficult to operate due to the limited 1- to 2-hour advance warning time on Jordan Creek flooding. The economic justification for these additional features does not exist based on projected Jordan Creek damage levels. Existing development in the immediate area is above the 100-year Raccoon River and Jordan Creek flood levels. Jordan Creek overflows that would enter the protected area would be shallow nuisance

flooding. These overflows are predicted to occur with Jordan Creek flood events exceeding the 25-year level of flooding flanking the levee tie-off. New topographic mapping of this area should be available during the next study phase to verify if these potential overflows are limited to non-damaging areas. The designated area of interior ponding will be as delineated in the State of Iowa 1980 Jordan Creek Flood Plain Study and as shown on plate 16.

WATER SURFACE PROFILES

Water surface profiles for project conditions were evaluated for the three streams. It was determined that increases in flood levels due to the levee encroachment on the floodplain are less than the 1-foot allowance prescribed by the State of Iowa and the cities of Des Moines and West Des Moines floodplain management criteria as participating communities in the National Flood Insurance Program. Appendix A - Hydrology and Hydraulics, contains more detailed information.

The project (with Martin-Marietta protection) would increase the Raccoon River water surface profiles by the amounts shown in table 1. The range of maximum increases are observed in the river reach immediately upstream of the levee. The proposed alignment located along the C&NW Railroad would cause lesser increases.

TABLE 1

Impacts of Levee on Raccoon River Profiles

Flood Event (Year)	Increase in Profile Elevation (Feet)
10	0.2
50	0.5
100	0.5
200	0.6
500	0.7
SPF	1.0

Water surface profile increases due to the levee along Walnut Creek are shown in table 2. These maximum increases are observed in the stream reach immediately upstream of the levee reach to Center Street.

TABLE 2

Impacts of Levee on Walnut Creek Profiles

Flood Event (Year)	Increase in Profile Elevation (Feet)
10	0.1
50	0.5
100	0.6
200	0.9
500	1.0
SPF	1.1

The levee alignment has been set back from Jordan Creek, and the existing left bank spoil bank levees would be allowed to continue to deteriorate such that their obstruction to flood flows on Jordan Creek will be minimized. This will allow for continued improvement of the hydraulic conditions between the new levee alignment and the channel. As required in the project authorizing language, the increases in water surface profiles for Jordan Creek were evaluated and are shown in table 3.

TABLE 3

Impacts of Levee on Jordan Creek Profiles

Flood Event (Year)	Increase in Profile Elevation (Feet)
10	0.0
50	0.1
100	0.1
200	0.2
500	0.3
SPF	0.6

GEOTECHNICAL

Clay borrow material suitable for levee embankment construction will be removed from remote hilltops and from onsite existing levees and ponding areas. Except for one isolated area of landfill, foundation soils directly beneath the ground surface range from 4 to 21 feet in depth and consist of clays deposited in nature by water, having suitable strength to support the levee. Excavation of unsuitable materials specifically in the form of landfill is expected near the Martin-Marietta and Railroad Avenue areas in West Des Moines. Explorations by other firms in and around the project alignment indicate that the extent of landfill may be in the order of 8 feet, more or

less. Removal of this unsuitable material will be accomplished in a variety of schemes to ensure levee integrity. Underseepage is anticipated throughout the project site. Further studies will determine what, if any, control measures are necessary for underseepage protection. Bedrock was generally found to be 40 feet beneath the ground surface. More detailed information can be found in Appendix C - Geotechnical.

ENVIRONMENTAL RESOURCES

Environmental concerns are addressed in Supplement No. 1 to the Final Environmental Impact Statement (SEIS) which accompanies this GRR. No aspects of the project which require processing under Section 404 of the Clean Water Act have been identified. Water quality certification under Section 401 of the Act is therefore not required.

The areas to be protected are developed urban areas, and natural resources remaining are wooded areas along creeks and rivers or areas set aside as parks. Natural resources which will be affected by the levee alignment, ponding areas, or borrow activities are limited. The only resource of note which has been identified is Denman Woods along Walnut Creek in the southeast portion of the study area. The proposed levee alignment will be superposed over an existing levee which borders Denman Woods for approximately 2,900 feet. Impacts are not considered to be excessive, and recreation items, landscape plantings (beneficial to wildlife), and the grass seeding of the new levee which have been incorporated into the project design are considered to offset project impacts.

No state or federally listed endangered species impacts have been identified.

CULTURAL RESOURCES

An historic properties inventory and evaluation of the proposed levee alignment, ponding areas, borrow areas, and associated construction areas determined that no significant historic properties will be impacted by the project. Furthermore, the project will have no effect on the National Register Jordan House property which is located outside the proposed levee alignment. Additional details of the historic properties evaluation can be found in the SEIS accompanying this report.

SOCIAL IMPACTS

A 100-year project will provide flood protection for up to 900 acres of developed land, including 904 residences, 11 public buildings, and 227 businesses. This will reduce anxieties and emotional stress associated with potential flooding. An added benefit will be increased recreational facilities for use by the residents of the two communities.

The project necessitates the relocation of one dwelling and two businesses. Information is not available at this time on the homeowner's ability to relocate. Regarding the business relocations, opportunities exist to relocate to acceptable locations within the cities. It is not anticipated that commercial activity in the project area will be significantly affected. The Walnut Creek tie-off will eliminate the lower half of Hoak Drive in West Des Moines which will affect access to two additional businesses. However, provisions have been made for an opening with a closure structure for northern access, and a new access road will be constructed for southern access. These provisions should sufficiently mitigate the access concerns. A new access road and ramp over the levee also will be provided for the Martin-Marietta area in West Des Moines since the levee will block northern access into the site from 11th Street.

Three businesses located between Hoak Drive and Walnut Creek in West Des Moines will remain unprotected. Both structural and nonstructural measures were analyzed for this area and are not economically feasible. A more detailed discussion of socio-economic impacts is provided in the SEIS.

ECONOMICS

Flood Control Evaluation

Costs and benefits were developed for the 50-, 100-, 200-, and 500-year and SPF levels of protection. A cost summary is included in Appendix D - Detailed Cost Estimate. The benefit analysis is contained in Appendix B - Economic and Social Analysis. Table 4 presents an economic comparison between the five levels of protection.

TABLE 4

Economic Comparison Between Levels of Protection

Economic Segment	LEVELS OF PROTECTION				
	50-yr	100-yr	200-yr	500-yr	SPF
Total Project Costs	16,560,000	17,757,000	18,933,000	20,147,000	25,339,000
Annual Charges	1,693,500	1,815,300	1,936,300	2,063,000	2,587,000
Annual Benefits	2,999,200	3,253,000	3,360,100	3,463,000	3,520,000
BCR	1.8	1.8	1.7	1.7	1.4
Net Benefits	1,305,700	1,437,700	1,423,800	1,400,000	933,000

As shown in table 4, the 100-year level of protection has the greatest net benefits and is, therefore, the NED plan. Residual damages associated with development of a 100-year flood control project are negligible (see Appendix B - Economic and Social Analysis).

The cost of the authorized plan, as contained in Public Law 99-662 and updated to FY 1988 prices, is $16,220,000. If the selected plan is more than 20 percent above this updated, authorized cost, additional congressional approval must be obtained. As shown in table 4, the 50-, 100- and 200-year levels of protection are within the 20 percent criteria. The 500-year and SPF levels of protection would require additional congressional action.

The 100-year level of flood protection including adequate freeboard will allow revision of the flood insurance flood boundary and floodway maps. Such revision will exclude the protected area from mandatory purchase of flood insurance coverage as a condition for mortgage-secured loans as well as will produce the least undesirable impacts on the adjacent unprotected areas.

Recreation Evaluation

Current Corps of Engineers criteria require that the benefits and costs of recreation must be considered incrementally. Recreation features which increase the Federal cost of the flood control project by more than 10 percent require approval by the Secretary of the Army. Table 5 presents the recreation benefit-to-cost summary for the 100-year, NED plan. The development of recreational facilities in conjunction with this flood control project will increase the Federal cost by 1.9 percent and is incrementally justified with a BCR of 1.3 to 1.

TABLE 5

Recreation Benefit-to-Cost Summary

Incremental Costs	100-year
Federal	253,500
Non-Federal	253,500
Total Recr. Costs	$507,000
Annual Costs	49,700
Annual Benefits	64,500
BCR	1.3
Net Benefits	14.800

LOCAL SPONSOR VIEWS

The two local sponsors are the cities of West Des Moines and Des Moines, Iowa. By mutual agreement, both sponsors have agreed to take financial responsibility for those portions of the project which fall within their respective city limits. The non-Federal project costs and requirements have therefore been divided accordingly.

The economic and hydraulic evaluation of the five levels of protection was provided to both local sponsors. During preliminary coordination efforts, the cities of West Des Moines and Des Moines expressed full support of the 100-year level of flood protection and desire development of related recreational opportunities.

RISK AND UNCERTAINTY - SENSITIVITY ANALYSIS

The accuracy of the calculated design flood height is dependent on the flow-frequency analysis. As a risk criterion, a flood flow-frequency analysis provides an estimate of probability for different magnitudes of flood events. A frequency curve provides a quantitative estimate of the probability of exceedence in any one year. Through statistical methods, it is possible to compute and quantify some of the uncertainty in these estimates. The 90-percent confidence limit band shown on plate A-4 (Appendix A - Hydrology and Hydraulics) indicates that the true Raccoon River flood value lies between the upper and lower limits of the band.

On Walnut and Jordan Creeks, the uncertainty of the flow-frequency values is not as quantifiable due to the limited streamflow records. On both of these tributary streams, regional regression parameters plus one standard error of estimate were used to determine the respective flow-frequency values. The inclusion on the standard error estimate takes into account the uncertainty which exists on the degree of urbanization which may take place on the basins. These flow values were verified by watershed modelling which reflected projected urbanization within each watershed.

The design flood heights also are dependent on the hydraulic computations of the HEC-2 computer backwater model. On the Raccoon River, the backwater model for this study was calibrated to experienced flood flows up to the 40,000 cubic feet per second (ft^3/s) range. With the 100-year design flow of 53,800 ft^3/s, the calculated flood heights lie above experienced events, thus introducing some uncertainty.

On Walnut Creek, the backwater model was calibrated to experienced flood flows up to the 12,500 ft^3/s of the 1986 flood. Again, 100-year design flows exceed the experienced flows. On Jordan Creek, no experienced flooding has occurred on which to calibrate design flood levels.

The upstream Raccoon River tie-off is subject to flanking from floods on Jordan Creek predicted at the 25-year flood event or greater; however, there is no safety risk or additional induced damages. Overflows would dissipate at relatively low velocities into the flat floodplain and would drain to the proposed ponding area B. Overflows from a 100-year event on Jordan Creek also would utilize land adjacent to the proposed ponding facilities. This excess ponding would be dispersed in a matter of hours due to the short duration of flooding on Jordan Creek.

On the Raccoon River, the 200- and 500-year flood events are contained within the lower one-half to two-thirds of the freeboard range for the 100-year design levee height. An SPF flood event would overtop a 100-year design levee height by approximately 3.5 feet.

The volume of Raccoon River floodwaters would be sufficient to reach equilibrium in the interior and exterior areas. If it is known that an imminent flood on the Raccoon River will overtop the project levee, it is recommended to allow the interior area to flood from the road closure at 63rd Street. This will allow the interior areas to backfill with floodwaters having nondamaging velocities. Allowing the interior area to fill will minimize the potential catastrophic results of having the project area flooded by swift-moving floodwaters from an upstream levee that overtops or breaches. Damage to the levee itself also will be minimized if this levee superiority concept is applied.

At the Van Meter gage, the rate of rise to peak is greater than 24 hours and the travel time to the project area is 15 hours. Thus, more than 1.5 days of advance warning time is usually available once heavy rainfall occurs in the Raccoon River basin. The duration of Raccoon River levee overtopping for the SPF would be 4 days. The proposed flood-warning system will provide sufficient advance warning time to reduce the safety risk, direct evacuation of the area, and direct opening of the 63rd Street closure.

On Walnut Creek, the freeboard range of the 100-year design levee height also contains the 200- and 500-year, plus the SPF flood events. With the installation of the automated flash flood-warning system on the Walnut Creek basin, an advance warning time of approximately 6 hours will be available before critical flooding occurs in the project area. The time to peak flooding will typically lag this 6-hour time period by about 2 hours. Overtopping durations on Walnut Creek would be less than 12 hours.

If an overtopping flood along Walnut Creek were to be predicted through the proposed flood-warning system, it is recommended to allow interior flooding to be initiated at the North Valley Drive ponding area. This will allow the interior areas to backfill with floodwaters having nondamaging velocities. Allowing the interior area to fill will minimize potential catastrophic results of having the project area flooded by swift-moving floodwaters from an upstream levee that overtops or breaches. Damage to the levee itself also will be minimized if this levee superiority concept is applied.

In order to ensure proper levee superiority and to allow for the many variables which influence the accuracy and stability of the design water surface profiles, the levee will be built with 4 feet of free-board at the upstream end of the Raccoon River and transitioning to 3 feet in the Fairmeadows Creek area. On the Walnut Creek levee, the Raccoon River flood level plus 3 feet of freeboard will govern up to North Valley Drive, at which point Walnut Creek flood levels plus 4 feet of freeboard will control. A sensitivity analysis was performed for the levee openings which require closure structures (see table 6). In order to assure levee superiority, all closure structures affected by Walnut Creek floodwaters need to be mechanical and able to be in place within 3 to 5 hours warning time. Raccoon River closures may be sandbagged if the required closure height is within the freeboard range.

SELECTION OF THE FINAL PLAN

Economic feasibility has been reaffirmed at several levels of protection. The 100-year level of protection is the NED plan, and it will not require additional congressional approval. The design height of the 100-year flood protection is higher than any of the experienced flood events during the period of record. This provides a sound basis for acceptable risk and uncertainty. Therefore, the 100-year level of protection from the Raccoon River and Walnut Creek using the modified alignment and recreational features as presented in this report is selected as the final plan for further development.

SUMMARY OF DEVIATIONS FROM AUTHORIZED PLAN

Deviations from the authorized plan are a result of new Corps of Engineers' policies, new floodplain delineations, and physical changes within the project. Rationale for the modifications to the authorized plan have been addressed previously under the heading entitled Description of Modified Plan. A summary of the deviations is presented below for the sake of clarity.

Level of Protection	-	Reformulated plan is 100-year, authorized plan was SPF
Jordan Creek Area	-	Set back alignment, no flood protection from Jordan Creek, added 3-acre ponding area
Martin-Marietta Area	-	Set back alignment, eliminated 10-acre ponding area
Railroad Avenue Area, WDM	-	Set back alignment
C&NW RR Area, DM	-	Set back alignment

TABLE 6
Closure Structures and Implementation Analysis

STATION	LOCATION	AFFECTED BY:	WIDTH (FT)	HEIGHT (FT)	TYPE	ALERT Stage[1] NGVD	ALERT Flow CFS	ALERT Td	MOBILIZATION Stage[1] NGVD	MOBILIZATION Flow CFS	MOBILIZATION Td	ROAD OVERTOPS Stage[2] NGVD	ROAD OVERTOPS Flow CFS	ROAD OVERTOPS Td	CLOSURE TIME (HOURS)	AVAILABLE TIME (HOURS)	SAFETY FACTOR
9+40	C&NW Railroad single track	Raccoon River	20	1.0	Sandbag	863.4	38,000	25	869.2	69,000	500	821.0	70,000	500	3	15	5.0
88+40	63rd Street two-lane	Raccoon River	40	3.4	Sandbag	863.4	38,000	25	865.2	45,000	50	815.8	46,000	50	4	15	3.7
101+45	C&NW Railroad double track	Raccoon River	40	5.4	Swing gate	863.4	38,000	25	864.7	42,000	40	813.7	43,000	40	1.5	15	10
146+00	North Valley Drive two-lane	Walnut Creek	36	0.0	None required	NWS Alert for Severe Weather (Flash Flood Adv.)			–	–	–	818.3	------	--	0	--	---
174+73	63rd Street two-four lane	Walnut Creek	50	2.4	Tilt-up panels	NWS Alert for Severe Weather (Flash Flood Adv.)			Mobilization to be Coordinated w/NWS Headwater Rainfall Tables in GDM Phase			817.8	21,000	200	1.5	~5	3.3
182+65	Grand Avenue four-lane	Walnut Creek	70	5.7	Mitered swing gate	NWS Alert for Severe Weather (Flash Flood Adv.)			Mobilization to be Coordinated w/NWS Headwater Rainfall Tables in GDM Phase			815.8	10,500	25	1.5	~4	2.7
189+60	Ashworth Road and Des Moines Union Railroad (two-lane w/diagonal track)	Walnut Creek	50	5.6	Mitered swing gate	NWS Alert for Severe Weather (Flash Flood Adv.)			Mobilization to be Coordinated w/NWS Headwater Rainfall Tables in GDM Phase			817.8	7,300	10	1	~3	3.0
214+75	Wheeler Lumber Corp single-lane, gravel	Walnut Creek	30	9.0	Swing gate	NWS Alert for Severe Weather (Flash Flood Adv.)			Mobilization to be Coordinated w/NWS Headwater Rainfall Tables in GDM Phase			821.0	8,500	15	1	~3	3.0
216+40	Des Moines Union Railroad (main line, and side track)	Walnut Creek	45	5.5	Two swing gates with common abutment	NWS Alert for Severe Weather (Flash Flood Adv.)			Mobilization to be Coordinated w/NWS Headwater Rainfall Tables in GDM Phase			822.8	13,450	50	1	~4	4.0

NOTES: 1 Raccoon River at Van Meter and USGS gage.
2 Stage at Closure.

Existing Levee, DM	-	Degrading and rebuilding instead of raising due to substantial tree growth
North Valley Drive Area	-	Moved alignment riverward
Hoak Drive Area	-	Different tie-off
Pump Stations	-	Reformulated plan has 2, authorized plan had 3 pump stations

SECTION 3 - DESCRIPTION OF THE SELECTED PLAN

GENERAL DESCRIPTION

FLOOD CONTROL

The selected plan for flood control is a combination levee/floodwall to protect the cities of West Des Moines and Des Moines, Iowa, from the 100-year flood events occurring on the Raccoon River and Walnut Creek. The plan consists of 4 miles of earthen levee, 900 feet of concrete floodwall, 4 ponding areas, 2 pump stations, 4 road closure structures (1 sandbag), 4 railroad closure structures (1 sandbag), 6 road ramps over the levee, 2 relocated access roads, 1 house relocation, and 2 business relocations. The flood control alignment is shown on plate 5. Table 7 shows a summary of the project features. Details of each plan component are described below under Plan Components.

RECREATION

The selected plan for recreational development in conjunction with the flood control project is shown on plate 6. The recreation plan consists of 2.8 miles of bicycle path (mostly atop the levee), 5 bicycle ramps, 2 railroad crossings with signals, 2 road crossings (1 signaled), 1 single-lane boat ramp to the Raccoon River, 1 adjacent parking lot, and 1 vista. (See table 7 for a summary of the project features.)

TABLE 7

Summary of Project Features

Plan Component	WDM	DM	Total
F L O O D C O N T R O L A L L O C A T I O N			
Levee	2.4 miles	1.6 miles	4.0 miles
Floodwall	0.2 mile	0	0.2 mile
Road Closures	2 swing gate 1/2 tilt-up* 1/2 sandbag*	0 1/2 tilt-up* 1/2 sandbag*	2 swing gate 1 tilt-up 1 sandbag
Railroad Closures	2 swing gate 1 sandbag	1 swing gate 0	3 swing gate 1 sandbag
Pump Stations	1 @ 10,000 gpm 1 @ 25,000 gpm	0 0	2
Ponding Areas	1 @ 40.5 ac-ft 1 @ 7.5 ac-ft 1 @ 51.0 ac-ft	1 @ 75 ac-ft	4
Road Ramps	2 access 3 maintenance	1 access 0	3 access 3 maintenance
New Access Roads	2	0	2
House Relocation	0	1	1
Business Relocation	1	1	2
R E C R E A T I O N A L L O C A T I O N			
Bicycle Path	1.8 miles	1.0 mile	2.8 miles
Bicycle Ramps	3	2	5
Railroad Crossings	2	0	2
Road Crossings	1 1/2*	1/2*	2
Boat Ramp	0	1	1
Parking Lot	1	1	1
Vista	1	0	1

* 1/2 of a closure or crossing within a city is because 63rd Street is the dividing line between the two cities.

PLAN COMPONENTS - DESIGN AND CONSTRUCTION CONSIDERATIONS

LEVEES

Levees will consist of semi-compacted clay with a 10-foot top width. Fill material is available from a West Des Moines borrow site with a 6-mile haul and from a Des Moines borrow site with a 9-mile haul. Some fill material is also available from excavation of adjacent ponding areas. Side slopes will be 1V on 3H. The levee slopes and crown will be seeded with species beneficial to wildlife. Along the levee alignment, about 6 inches of material will be stripped from the existing ground to dispose of mulchy type material unsuitable for levee embankment. An inspection trench will be excavated along the alignment to locate utility lines, possible sources of serious underseepage such as abandoned pipes, and objectional material. The inspection trench material will be replaced except where landfill is encountered. In this case, the trench material will be disposed of and replaced with clay. See plate 11 for typical levee cross sections and their approximate stationing along the levee alignment.

The total length of levee embankment is 4.0 miles, and it will be built over existing ground except where it meets and follows the existing Walnut Creek levee. This area is approximately 4,800 feet long and will first be degraded to level adjacent ground. The purpose of degrading is to eliminate potential seepage paths which may have developed from the root systems of the trees overgrowing the existing levee. Also, degrading will provide better quality control and levee integrity. After clearing and grubbing the trees and degrading the remaining embankment, any remaining material will be reused for the new levee.

The 100-year levee height averages 8 feet, ranging generally between 4 and 10 feet. However, extremes are 2.5 feet south of Grand Avenue and up to 20 feet at ditch crossings along Railroad Avenue. Both extremes are located in the city of West Des Moines. A more detailed site description of levee heights is presented below.

Levee heights from the beginning of the project along Jordan Creek to the Martin-Marietta area are an average of 4 feet high. Through the Martin-Marietta area up to Fairmeadows Creek, the levee is an average of 8 feet high. From Fairmeadows Creek along Railroad Avenue to 63rd Street, the levee is about 10 feet high. The levee will remain an average of 10 feet high through the city of Des Moines up to North Valley Drive, at which point it lowers to about 9 feet. Re-entering West Des Moines past the section of floodwall, the levee begins mid-block between Grand Avenue and Ashworth Road. From here to the end of the project, the levee will reach an average 8-foot height. See plates 8, 9, and 10 for the 100-year levee profile drawings.

FLOODWALLS

Two areas in West Des Moines will require concrete I-wall floodwalls instead of earthen levees. See plate 11 for a typical I-wall section. The first section of I-wall will be located on the west side of 63rd Street around the Grand Avenue area. South of Grand Avenue for about 480 feet, the floodwall will be an average of 3 feet high. North of Grand Avenue for approximately 300 feet, the floodwall will be an average of 6 feet high. The construction of the I-walls in the Grand Avenue area is necessary because of the restricted land space between 63rd Street and commercial establishments. The second location for I-wall is along the Walnut Creek tie-off between the Wheeler Lumber Corporation closure structure and the Des Moines Union Railway main track closure structure. The wall is needed to provide more turning room for trucks entering and exiting the lumber yard. This section of wall will be approximately 120 feet long and 8 feet high.

CLOSURE STRUCTURES

Closure structures will be integrated into the flood control alignment to allow unobstructed street and railroad traffic during non-flood times. Eight closure structures are planned, five in West Des Moines, one in Des Moines, and two shared by both cities. The flash flood nature of Walnut Creek requires that all closure structures affected by Walnut Creek be mechanical gated closures. These will be permanently mounted swinging gates with abutments and sills of reinforced concrete. The sills will be placed under and integrated with subsurface walls of steel sheet piling. For wide openings, the gates will consist of two swinging leaves or a system of stop-up panels which will remain flush with the road surface when the closure is not being used for flood control. The openings affected by the Raccoon River have a longer advance warning time and, therefore, may be sandbagged if they are in the freeboard range. The 63rd Street closure at Sta. 88+40 is 0.4 foot higher than the 3-foot freeboard range in this area. However, a sandbag closure is delineated due to the proposed widening plans of the Iowa Department of Transportation (IDOT). Coordination has been initiated with the IDOT to incorporate a slight road raise, along with the 63rd Street improvements, thus allowing the sandbag closure. The closure structure for a road or a railroad will be basically the same design. A list of the closure structures and their estimated dimensions is presented in table 7. Their general location is shown on plate 5. Plate 12 depicts the typical closure structure used.

ROAD RAMPS

Ramps over the levee will be provided at low traffic crossings and when needed for access to the other side of the levee or for operation and maintenance of the flood control project. Ramps will be constructed of compacted fill material similar to that used in the main portions of the levee, but will have more gradual slopes for motor vehicle safety. Roadway base material and surfacing will be similar to that currently used at each location.

Five ramps are proposed for the city of West Des Moines and one ramp is proposed for Des Moines. Locations are shown below in table 8 and on plate 5. All ramps are designed to have 12H on 1V side slopes and will have gravel surfacing.

TABLE 8

List of Road Ramps

Station	Location	Type	Height
10+10	Lincoln Road near K & B Company	Access	6.7
17+00	C&NW Railroad near city maintenance bldg. (existing crossing)	Maintenance	2.0
41+80	Lincoln Road at 11th St.	Access	7.2
76+00	Near pump station below 4th St.	Maintenance	11.7
126+00	East end of Winona Ave.	Access	12.2
212+00	Hoak Drive	Maintenance	10.1

INTERIOR DRAINAGE

Interior flood design for the project consists of providing drainage for the interior areas with closure facilities (gatewells) included for 11 gravity outlets. During blocked gravity conditions, these 11 gravity outlets will be collected into six interior areas. This will require four interceptor storm sewers, four excavated ponding areas, and two pump stations to provide adequate interior flood control.

Gatewells

Gatewell structures will be built over existing storm sewers whenever a sewer line crosses beneath the levee alignment. To ensure positive closure during major flood events, the sewer lines will have a sluice gate at the gatewell. In addition, due to the limited warning time for Walnut Creek flooding, those lines outletting to Walnut Creek also will have a flapgate installed on the outlet. (See plate 13 for a typical gatewell.) For storm sewer gatewell locations and sizes, see text of Appendix A - Hydrology and Hydraulics; Appendix D - Detailed Cost Estimate, or Plates 8, 9, and 10, Profile Drawings.

Ponding Areas and Pump Stations

The interior drainage analysis indicates that four ponding areas and two pump stations are necessary for operation of the project. (See plate 5 for their location.)

Ponding Area "A" is located in West Des Moines on Fairmeadows Creek. It is proposed to upgrade an existing 30-acre detention basin into a ponding area. The upgrading would involve deepening approximately 27 acres of the existing detention site by approximately 1.5 to 2 feet, berming the low spots in the perimeter of the ponding area, and constructing a gated 48-inch RCP outlet structure and overflow section. Excess excavated material would be used as borrow material in the levee construction. The ponding area would be seeded.

Ponding Area "B" is located in West Des Moines along the C&NW Railroad tracks near the Jordan Creek tie-off. The plan is to enlarge an existing low-lying area upstream of the railroad embankment to a 3-acre ponding area approximately 2.5 feet deep. The excavated material can be used as borrow in the levee construction. Drainage through the railroad embankment will be cleaned out and a 48-inch RCP gravity outlet is recommended at the levee. A downstream outlet ditch will be provided to outlet into Jordan Creek as the previous sand and gravel mining operations have restricted the natural drainage course. Both the ponding area and drainage ditch will be seeded.

Ponding Area "C" is also located in West Des Moines. The recommended plan is to excavate an 8.5-acre ponding area between the levee and Lincoln Road as shown on plate 5. A system of gatewells and a new interceptor storm sewer will be used to convey the interior drainage to the ponding area. See plate 14 for the general layout of the proposed interceptors. Proposed locally constructed storm sewer improvements along Fourth Street also will flow directly into the proposed ponding area. It is recommended that a 25,000 gpm pump station be installed at this location. Excavated material will be hauled to the disposal site in Des Moines because landfill is expected to be encountered. The ponding area will be seeded. Also, a 7-foot-high chain link fence is proposed around the perimeter of the ponding area for safety reasons due to its close proximity to a populated area and the proposed bike paths.

Ponding Area "D" will be located in the city of Des Moines south of North Valley Drive. An approximate 10-acre site will be excavated to an average depth of 7.5 feet. It also will be seeded and fenced. A system of gatewells and a new interceptor storm sewer with new manhole inlets will be used to convey the interior drainage to the ponding area. See plate 14 for the proposed interceptor location.

The second pump station is proposed to be placed at the Valhigh storm sewer in West Des Moines. This location is between Grand Avenue and Ashworth Road. A system of gatewells and a new interceptor sewer will be used to convey the interior drainage to the pump station during blocked gravity conditions. The pump station will be a 10,000 gpm capacity. Excess runoff will be temporarily ponded in the existing low-lying streets and parking lots. See plate 14 for the proposed interceptor and pump station location.

REAL ESTATE REQUIREMENTS (LER)

In general, it is estimated that permanent easements will be required for about 4 miles of levee, 900 feet of floodwall, 3 acres for recreation facilities, and about 50 acres for ponding areas. Temporary easements for permits will be needed for about 30 acres of borrow. Additionally, the sponsor must obtain permits for 8 railroad and street closures, 6 road ramps, and 2 pumping stations. Lands involved include residential, commercial, and industrial properties, with relocation of one dwelling and two businesses.

RELOCATIONS OF UTILITIES AND FACILITIES

The term "relocation" includes raising and lowering, altering, adjusting, or protecting a facility, as well as changing its location. The non-Federal sponsor shall, in general, perform or assure performance of relocations for most projects. Items to be relocated at a non-Federal expense are storm sewers, sanitary sewers, gas lines, water lines, telephone lines, a fence, power poles, and two access roads. Other relocations which are considered part of the real estate costs (LER) are one house and two businesses.

In general, sewer and water lines may cross through or beneath the levee, while gas and electrical lines run over the levee or may be buried in the freeboard zone. Utilities paralleling and beneath the levee will be relocated outside the levee right-of-way. Relocations and utility locations can be found in Appendix D - Detailed Cost Estimate.

LANDSCAPING/BEAUTIFICATION

Landscape plantings have been designed to refine or screen structural elements. Disturbed areas will be graded and seeded to harmonize with existing conditions. The design utilizes a mix of hardwood trees, flowering trees, and flowering shrubs to provide attractive highlights to the urban surroundings. The varieties of plants included in this design will augment the existing woodlands adjacent to the project and provide the food and shelter beneficial to wildlife. Fruit- and nut-producing landscape varieties used in this plan will augment wildlife near the project area. Plate 6 shows the proposed general landscaping layout.

BORROW SITES

Plate 4 shows the location of the two borrow sites. Both sites are close to major transportation facilities which are able to handle the truck traffic.

The borrow site identified for the city of West Des Moines is a 30- to 40-acre hill top and side hill that is devoid of trees. It is located at the SW1/4 SW1/4 Section 20 in Polk County. This site lies 20 to 50 feet above the grade of South 50th Street and Grand Avenue and could provide about 600,000 cubic yards of fill. The site could be improved for future commercial and/or office development by reducing grade. Haul distance to the flood control project ranges from 3 to 6 miles depending on location within the project.

The borrow site identified for the city of Des Moines is located near the intersection of Hartford Avenue and 22nd Street SE. The 2.5-acre site is part of a much larger borrow area which has been excavated in the past. This is a bluff area and is referred to as Soldier's Field.

DISPOSAL SITES

The closest available landfill disposal site is in the city of Des Moines near Euclid and 16th Streets. Haul distance from the majority of the flood control project is an average of 7 miles. Trees, shrubs, roots, mulch, and landfill are the materials to be disposed. No disposal sites are available in the city of West Des Moines.

RECREATION

Recreational features of the proposed plan include a bicycle trail, vista, parking lot, and boat ramp (plate 6).

The bicycle path, designed for two-way traffic, will have an 8-foot-wide asphalt surface. Maximum grades on the trail will be below 4 percent, except on bike ramps which will have slopes of 1V on 10H. Guard rail is planned along the path when the trail is atop the levee and adjacent to main line railroad tracks, gravel pits, or ponding areas. A guard rail is also planned for areas where the levee height is greater than 7 feet.

The vista in West Des Moines will be adjacent to the bike path and will be an extension to the levee. The 8-foot by 60-foot vista will be used as a rest area and scenic overlook. The surface will be asphalt. Four park benches also are planned.

A parking lot in the city of Des Moines has been designed to serve as a staging area for cyclists who ride as a group or to park the cars of persons using the trails. The parking lot also will serve the adjacent boat ramp. The lot will be a gravel surface approximately 1 acre in size and would accommodate at least 16 car/trailer combinations and 8 single cars.

The proposed boat ramp location has been coordinated with the city of Des Moines. It would provide access to approximately 8 miles of the Raccoon River that is currently not serviced. This portion of the river is suitable mostly for canoes and small fishing craft. The boat ramp is designed to be a single-lane launch and to have a 15-foot-wide concrete surface with a 12 percent slope. Neither riprap nor a dock will be required.

OPERATION AND MAINTENANCE CONSIDERATIONS

Following construction of the project, operation and maintenance of the flood control and recreation project will be the responsibility of the cities of West Des Moines and Des Moines, Iowa. Annual operation and maintenance costs are estimated in table 9.

TABLE 9

Annual Operation and Maintenance Costs

Item	WDM	DM
Levee, Floodwall, Gatewells, & Closures	$ 4,650	$2,900
Pump Plant Energy and Demand	650	
Pump Plant Operation and Maintenance	4,200	
Pump Plant Replacement	3,800	
Recreation Operation and Maintenance	1,400	1,300
TOTAL ANNUAL O&M COSTS	$14,700	$4,200
	$18,900	

FLOOD CONTROL

Normal operation of the line of protection will include issuing an alert through the proposed flood-warning system, closing gatewells, closing the swing gate and tilt-up panel closures, and placing sandbags at the two closures affected by the Raccoon River. The swing gate closure structures will require a 2- to 3- man crew with a truck. The tilt-up panel closure will require a 3- to 4- man crew with an end loader or industrial size wrecker. The sandbag closures will require a 2-ton truck for delivery of sandbags and personnel to place them. Pumps at the two pump stations also will have to be readied to handle the interior drainage.

Maintenance of the swing gate closures will require periodic checks and lubrication of the jack units and hinges. Maintenance of the tilt-up panel closure will require more frequent checks and clean out due to road surface dirt and salt which will settle in the joints. Levee maintenance consists of mowing the grass and keeping it free of excessive tree and brush growth. Periodic inspections will be necessary to ensure levee integrity. Ponding areas need to be regulated to ensure availability of ponding. Pump motors will have to be serviced in accordance with the manufacturer's recommendations and replaced with new pumps every 30 to 35 years. About half of the riprap along the Walnut Creek streambank will need to be replaced in about 25 years.

RECREATION

Maintenance of the recreational facilities is estimated to consist of a new slurry seal coat on the bicycle path every 7 to 8 years with a new asphalt lift after 25 years. Also, additional gravel and grading will be needed yearly on the parking lot. The vista will require trash removal.

COST ESTIMATE

FIRST COSTS

The estimate of first costs are for construction of the modified flood control alignment and recreation features as discussed in this GRR. An itemized cost estimate can be found in Appendix D - Detailed Cost Estimate. A summary cost estimate, based on September 1988 prices, and divided between the two cities is presented in table 10. A contingency allowance of 20 percent is included. Engineering and Design and Supervision and Administration costs are estimated lump sum items based on similar projects and amount to 8 and 6 percent, respectively. Please note that current cost-sharing policies and percentages have not yet been applied. See Section 4 - Plan Implementation for the Federal and non-Federal responsibilities after cost-sharing is applied.

ECONOMIC FEASIBILITY

Appendix B - Economic and Social Analysis shows that the 100-year level of flood protection maximizes net benefits providing $3,253,000 in annual flood control benefits and $64,500 in recreation benefits. The annualized cost for the flood control project is $1,815,300. The recreation features have an annualized cost of $49,700 and a BCR of 1.3. Net benefits for the entire 100-year project are $1,437,700. The BCR for the project is 1.8.

PLAN ACCOMPLISHMENTS

The selected plan will provide 100-year flood protection to the cities of West Des Moines and Des Moines, Iowa, from the Raccoon River and Walnut Creek. The plan is economically justified with a BCR of 1.8 and will provide approximately $3,253,000 in average annual flood damage reduction benefits, including the elimination of mandatory participation in the National Flood Insurance Program. After considering the project cost of $17,757,000, the net benefits are $1,437,700.

TABLE 10

Cost Estimate Summary - 100-year Plan ($)

Flood Control Category	WDM	DM	Combined Totals
Real Estate (LERR)	2,363,000	753,000	
Levees	3,935,400	1,354,800	
Floodwalls	382,500	--	
Closure Structures	451,800	113,300	
Road Ramps	58,100	16,200	
Storm Drainage	3,913,200	1,047,000	
Utilities	75,800	351,200	
Relocations	528,400	15,500	
Landscaping/Beautification	131,300	23,900	
Subtotal	11,839,500	3,674,900	
E & D	758,200	233,800	
S & A	568,400	175,200	
Total Flood Control First Costs*	13,166,100*	4,083,900*	$17,250,000
Recreation Category			
Real Estate (LERR)	17,000	7,000	
Bicycle Path	198,800	89,000	
Bicycle Ramps	25,300	7,000	
Vista	8,100		
Parking Lot		53,700	
Boat Ramp		42,000	
Subtotal	249,200	198,700	
E & D	18,500	15,250	
S & A	13,900	11,450	
Total Recreation First Costs*	281,600*	225,400*	$ 507,000
TOTAL PROJECT FIRST COSTS			$17,757,000

* This total does not reflect current cost-sharing requirements. See Section 4 - Plan Implementation for the final Federal and non-Federal costs.

The levee alignment is compatible with the State of Iowa's floodway encroachment limits, and specific project effects on flood stages are within the 1-foot criteria. Any possible adverse environmental effects associated with tree removal have been offset with the proposed landscaping features and grass plantings. The plan provides recreational opportunities for both communities, with linkage to other State trails. Identified historic and archeological resources in the city of West Des Moines' downtown area will be protected from flooding.

Both study sponsors have expressed support for the 100-year level of flood protection, including recreational development.

SECTION 4 - PLAN IMPLEMENTATION

INSTITUTIONAL REQUIREMENTS

To implement the selected plan, a number of steps will need to be completed which extend from report approval to the operation and maintenance of the project by the local sponsor. A list of project completion steps is given in table 11.

TABLE 11

Project Completion Schedule

Requirement	Date
Review of draft GRR by local sponsors, agencies, and public. Receipt of Letter of Intent from local sponsors.	Apr 89
Approval of final GRR by Corps higher authority and initiation of the General Design Memorandum (GDM)	Sep 89
Approval of final GDM by Corps higher authority and initiation of Plans and Specifications (P&S)	Aug 90
Execution of Local Cooperation Agreement	Jul 91
Approval of P&S by Corps higher authority	Mar 92
Local sponsors make rights-of-way available	Mar 92
Initiate 1st stage construction	May 92
Complete construction	Jul 95

IMPLEMENTATION RESPONSIBILITIES

FEDERAL RESPONSIBILITIES

The Federal Government will design and construct the various features of the protection works. The work generally charged as a Federal cost includes that for levees, floodwalls, and interior drainage facilities.

The preparation of the GRR, General Design Memorandum, and the Plans and Specifications is cost-shared at the same rate as the project construction with the local cost-sharing portion repaid. Project construction would be cost-shared between the Federal Government and the co-sponsors (the cities of West Des Moines and Des Moines, Iowa) in accordance with Section 103 of Public Law 99-662. The Corps of Engineers would supervise and administer the construction contracts in accordance with the local cooperation agreement and available funding.

NON-FEDERAL RESPONSIBILITIES

In compliance with the requirements of Public Law 91-611, the local sponsor(s) must enter into a Local Cooperation Agreement with the Government prior to construction of the project. A draft Local Cooperation Agreement (LCA) showing the cities of Des Moines and West Des Moines as joint sponsors is contained in appendix E. However, the cities may agree that one city will act as sole sponsor with a sub-agreement with the other city, in which case the LCA would be amended accordingly.

Prior to construction, the local sponsors must enter into a Local Cooperation Agreement with the Government in compliance with Section 221 of Public Law 91-611, whereby the sponsors pledge that they will:

a. Pay a minimum of 25 percent of the total project costs during the period of construction, with no less than 5 percent of the total project costs being in the form of a cash payment;

b. Provide without cost to the Government all lands, easements, and rights-of-way necessary for construction of the project;

c. Modify or relocate buildings, utilities, highways, railroads, bridges (other than railroad bridges and approaches), sewers, and other facilities where necessary in the construction of the project;

d. Hold and save the United States free from all damages arising from the construction, operation, and maintenance of the project, except for damages due to the fault or negligence of the Government or its contractors;

e. Operate, maintain, replace, and rehabilitate the project, or functional element thereof, in accordance with regulations prescribed by the Secretary of the Army;

f. Prevent encroachment on any of the flood protection structures, including ponding areas, and if ponding areas are impaired, provide substitute storage capacity or equivalent pumping capacity promptly without cost to the Government;

g. 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;

h. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, in acquiring lands, easements, and rights-of-way for construction and subsequent maintenance of the project, and inform affected persons of the pertinent benefits, policies, and procedures in connection with said Act;

i. 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 betwen future development and protection levels provided by the project; and

j. At least annually, notify persons in the affected area that the project will not provide complete protection.

The Agreement also will grant the Government a right to enter, at reasonable times and in a reasonable manner, upon lands which the sponsors own or control, for access to the project for the purpose of inspection. If such inspection shows that the sponsors for any reason are failing to complete, repair, and maintain the project in accordance with the assurances hereunder and have persisted in such failure after a reasonable notice in writing by the Government delivered to the sponsors, the Government shall have the further right, as stated above, to enter upon the land for the purpose of completing, operating, repairing, and maintaining the project. Completion, operation, repair, and maintenance by the Government in such event shall not operate to relieve the sponsors of responsibility to meet their obligations as set forth in the Agreement or to preclude the Government from pursuing any other remedy at law or equity.

COST APPORTIONMENT

In compliance with the Federal and non-Federal cost-sharing requirements of the Water Resources Development Act of 1986, the cost estimate is apportioned as shown in table 12.

TABLE 12

Cost Apportionment

NON-FEDERAL APPORTIONMENT	WDM	DM	TOTAL
Flood Control			
Real Estate Costs	2,363,000	753,000	3,116,000
Other Relocations and Utilities	853,800	190,400	1,044,200
Minimum 5% Cash	658,100	204,400	862,500
Subtotal Flood Control	3,874,900	1,147,800	5,022,700 1/
NON-FEDERAL APPORTIONMENT			
Recreation			
50% Local Sponsor Share	140,800	112,700	253,500 2/
Less LERR Credit	17,000	7,000	24,000
Cash Payment for Recreation	123,800	105,700	229,500
TOTAL NON-FEDERAL COSTS			
LERR	3,233,800	950,400	4,184,200
CASH	781,900	310,100	1,092,000
TOTAL	4,015,700	1,260,500	5,276,200

FEDERAL APPORTIONMENT - FLOOD CONTROL	
Total Project Cost	$17,250,000
Less Non-Federal Share (29.1%)	- 5,022,700
Total Federal Flood Control Cost	$12,227,300
FEDERAL APPORTIONMENT - RECREATION	
Total Project Cost	$507,000
Less Non-Federal Share (50%)	-253,500
Total Federal Recreation Cost	$253,500
TOTAL FEDERAL COSTS	$12,480,800

1/ $5,022,700 amounts to 29.1% of the total project cost ($17,250,000) allocated to flood control. This meets the cost-sharing requirements of 25% minimum, 50% maximum.

2/ The total recreation cost as shown in Table 10 of $507,000 is subject to 50-50 cost sharing.

ABILITY TO PAY

Section 103 of Public Law 99-662 requires that the Corps of Engineers evaluate a local sponsor's ability to pay the required non-Federal costs of a project.

Based on the provisions of Section 103 and financial data provided by West Des Moines and Des Moines, the ability to provide their normal share of project costs is affirmed. The analysis, illustrated in table 13, is based upon the 100-year project BCR and the project area per capita income. The cities do not qualify for a reduced cost-sharing formula.

TABLE 13

Ability to Pay Analysis

Annual Cost	$ 1,815,300	Costs & benefits
Annual Benefits	3,253,000	for flood control
Total Cost	17,757,000	
Local Share	5,276,200	
BCR	1.8	
State Factor	91.48	Sum of State &
County Factor	112.56	County must be less than 163.2. Sum is 204.04.

NOT QUALIFIED

Base Benefits Floor	45%	1/4 BCR
% Local Share	30%	
EF	-3.62	Eligibility Factor

The cities of West Des Moines and Des Moines are willing and able to finance their shares of the cost of constructing this local flood protection project. A Statement of Financial Capability and Financing Plan will be submitted during the General Design Memorandum phase.

SECTION 5 - SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

Coordination with the cities of West Des Moines and Des Moines was initiated soon after passage of the Water Resources Development Act of 1986 and was continued throughout the study. The plan of study was coordinated with the cities of West Des Moines and Des Moines. Their views influenced the alignment the proposed levee was to follow, possible alternatives to this alignment, and the locations of ponding areas and borrow areas. The views of the two cities also determined the recreational items which were incorporated into project plans.

During the reevaluation project, plans have been coordinated with the U.S. Environmental Protection Agency in response to the National Historic Policy Act of 1969 (as amended) and the Clean Air Act (as amended); with the U.S. Fish and Wildlife Service in response to the Fish and Wildlife Coordination Act of 1958 (as amended) and the Endangered Species Act of 1973 (as amended); with the Iowa Department of Natural Resources in response to the Fish and Wildlife Coordination Act of 1958 (as amended); and with the Iowa State Historic Preservation Officer in response to the National Historic Preservation Act of 1966 (as amended).

Correspondence from these agencies, including a Final Coordination Act Report from the U.S. Fish and Wildlife Service, can be found in Appendix F - Pertinent Correspondence. A summary of coordination highlights follows:

a. October 29, 1986 - Meeting held with cities of West Des Moines and Des Moines at which they expressed support for project.

b. October 29, 1986 - Public meeting held with 200 people in attendance. Overall reaction is that the area has a very serious flood problem and that flood protection is needed.

c. October 30, 1987 - Meeting held with cities of West Des Moines and Des Moines explaining study process and cost-sharing.

d. November 1987 - Notice of GRR initiation sent to public.

e. March 8, 1988 - Meeting held with cities of West Des Moines and Des Moines to refine the levee alignment and discuss interior drainage.

f. March 25, 1989 - Letters enclosing 25 copies of the Draft GRR and the Draft Local Cooperation Agreements were sent to the Public Works Director of Des Moines and West Des Moines.

g. April 7, 1989 - Environmental Impact Statement Notice of Availability was published in Federal Register, Volume 54, No. 661.

h. May 16, 1989 - Letter of Assurance was received from the city of West Des Moines.

i. May 18, 1989 - A joint meeting was held with city officials from Des Moines and West Des Moines. The purpose of the meeting was to discuss public comments and study sponsorship.

j. June 5, 1989 - Letter of Assurance was received from the city of Des Moines.

The GRR and SEIS have been circulated to political representatives, governmental agencies, citizen's groups, and individuals who have an interest in the project. Questions and comments have been addressed and are included in the Final Supplement to the Final Environmental Impact Statement printed on yellow paper and located before appendix A in this document. The primary local concern expressed regarded exactly how the project would impact specific

properties adjacent to the line of protection. Letters from several property owners and the Corps' responses are located in Appendix F - Pertinent Correspondence.

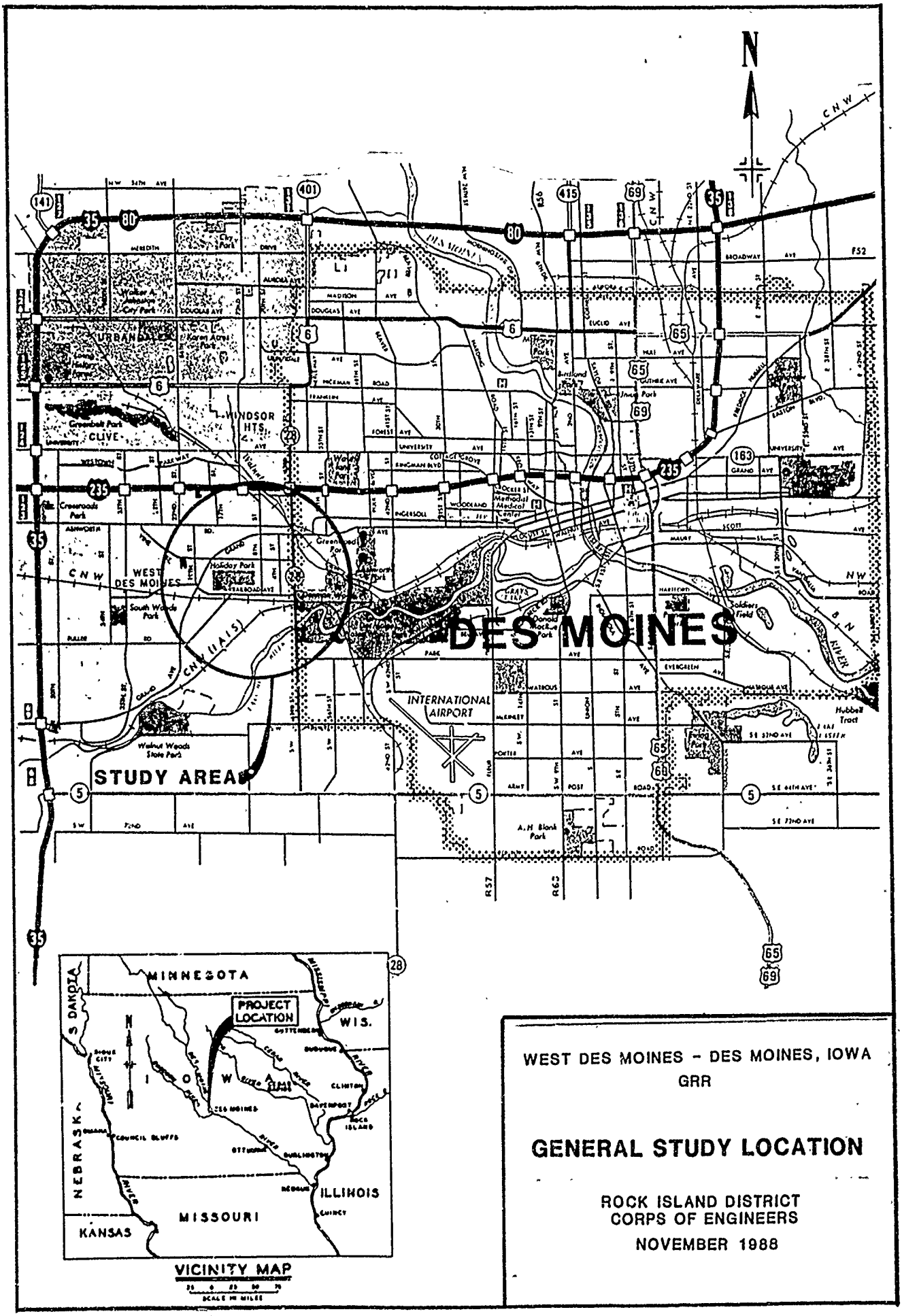
SECTION 6 - RECOMMENDATIONS

I recommend that the National Economic Development (NED) plan selected herein, which would provide a 100-year level of protection from flooding on the Raccoon River and Walnut Creek for the cities of West Des Moines and Des Moines, Iowa, be approved for implementation as a Federal project, with such modifications as in the discretion of the Chief of Engineers may be advisable. I also recommend that the related recreational developments be incorporated into the flood control project.

The first cost to the United States is presently estimated at $12,735,000. The non-Federal cost would be $5,022,000, which is comprised of credits for lands, easements, and rights-of-way, relocations, road ramps, utilities and a cash contribution. All annual operation, maintenance, and replacement costs will be the responsibility of the local sponsor and are estimated to be $18,900.

Based on the favorable endorsement from the local sponsors and the justification for the NED plan described herein, I recommend that the project be funded and constructed subject to the cost-sharing and financing arrangements which are acceptable to the Chief of Engineers and the Secretary of the Army.

Neil A. Smart
Colonel, U.S. Army
District Engineer



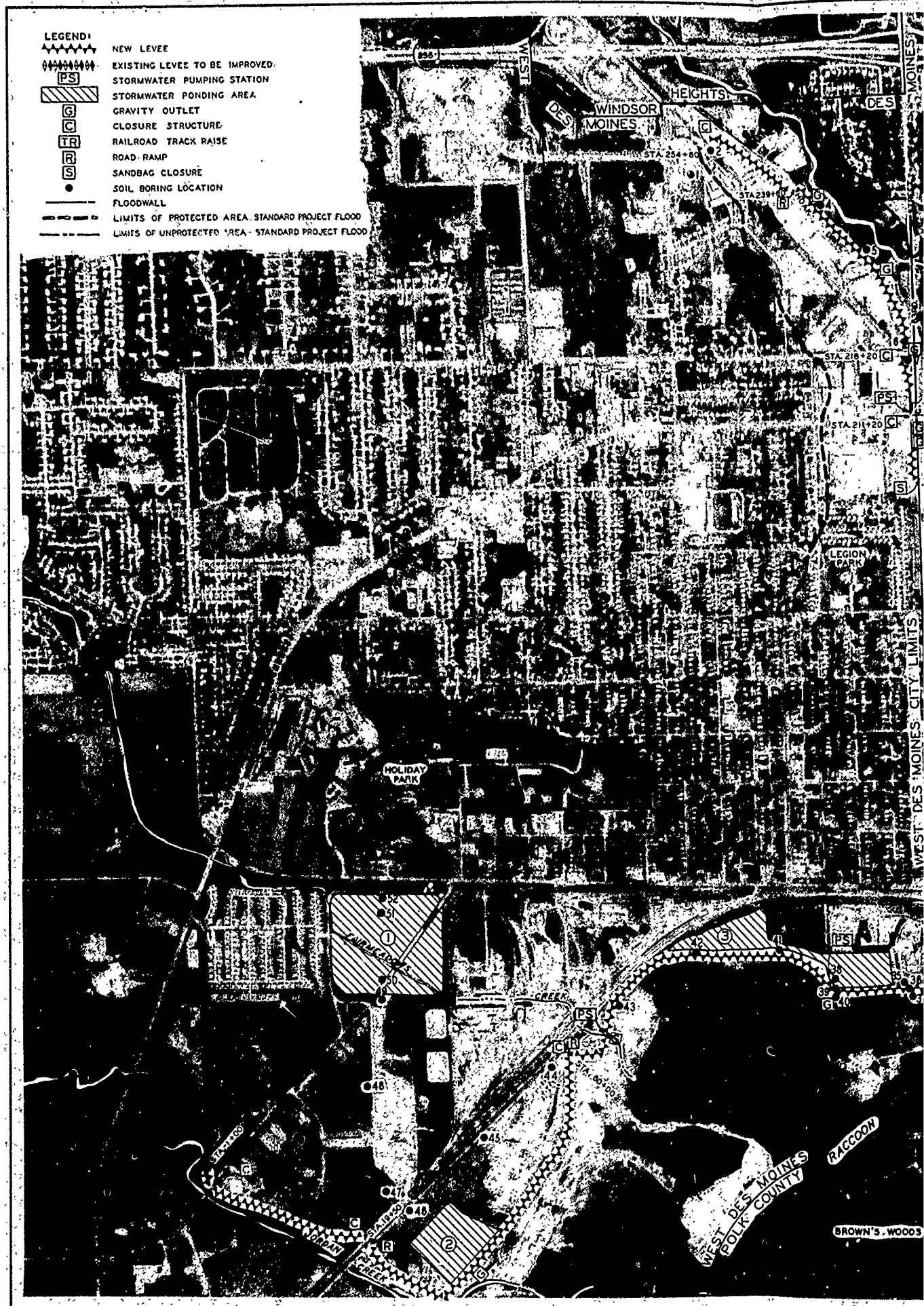
WEST DES MOINES - DES MOINES, IOWA
GRR

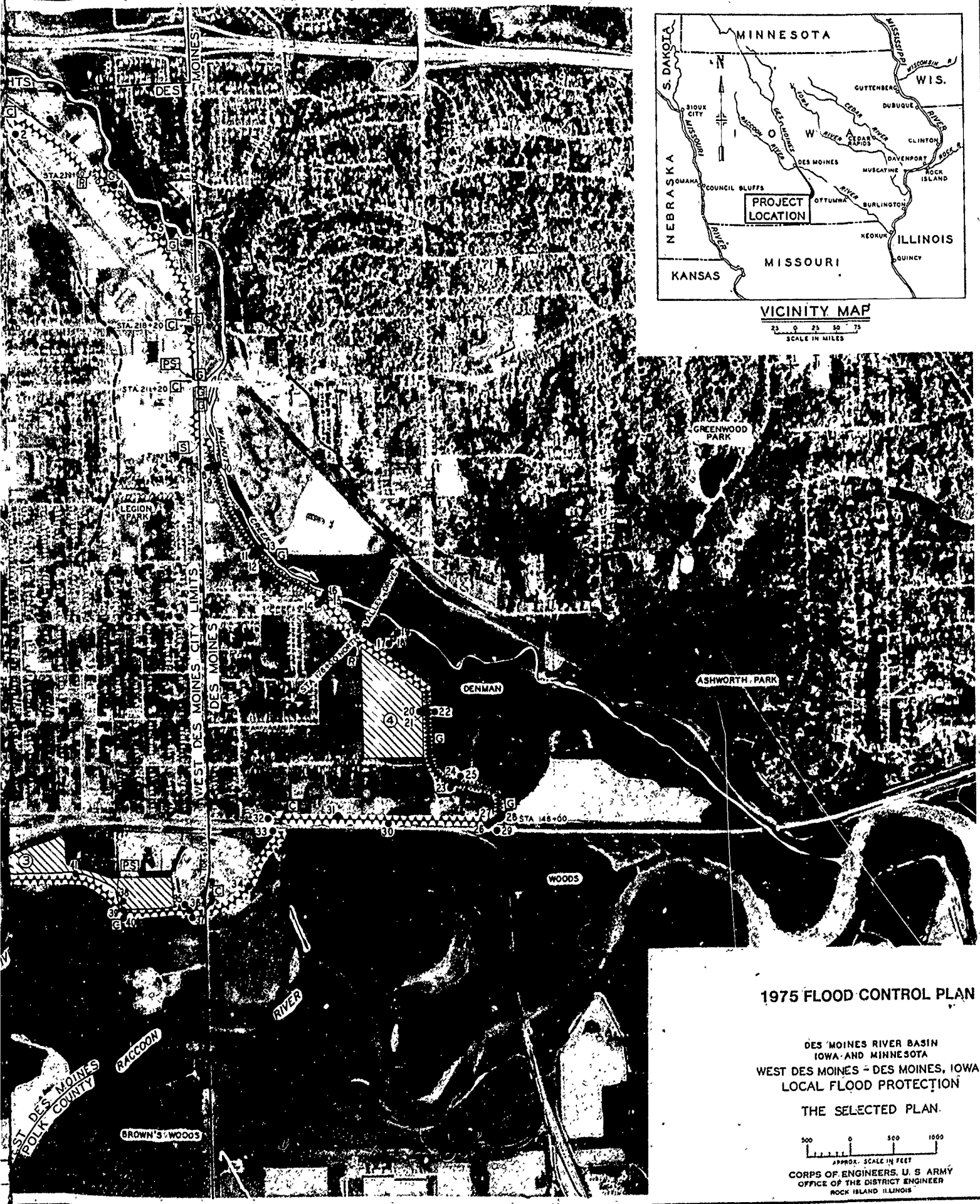
GENERAL STUDY LOCATION

ROCK ISLAND DISTRICT
CORPS OF ENGINEERS
NOVEMBER 1988

PLATE 1

CORPS OF ENGINEERS





VICINITY MAP

25 0 25 50 75
SCALE IN MILES

1975 FLOOD CONTROL PLAN

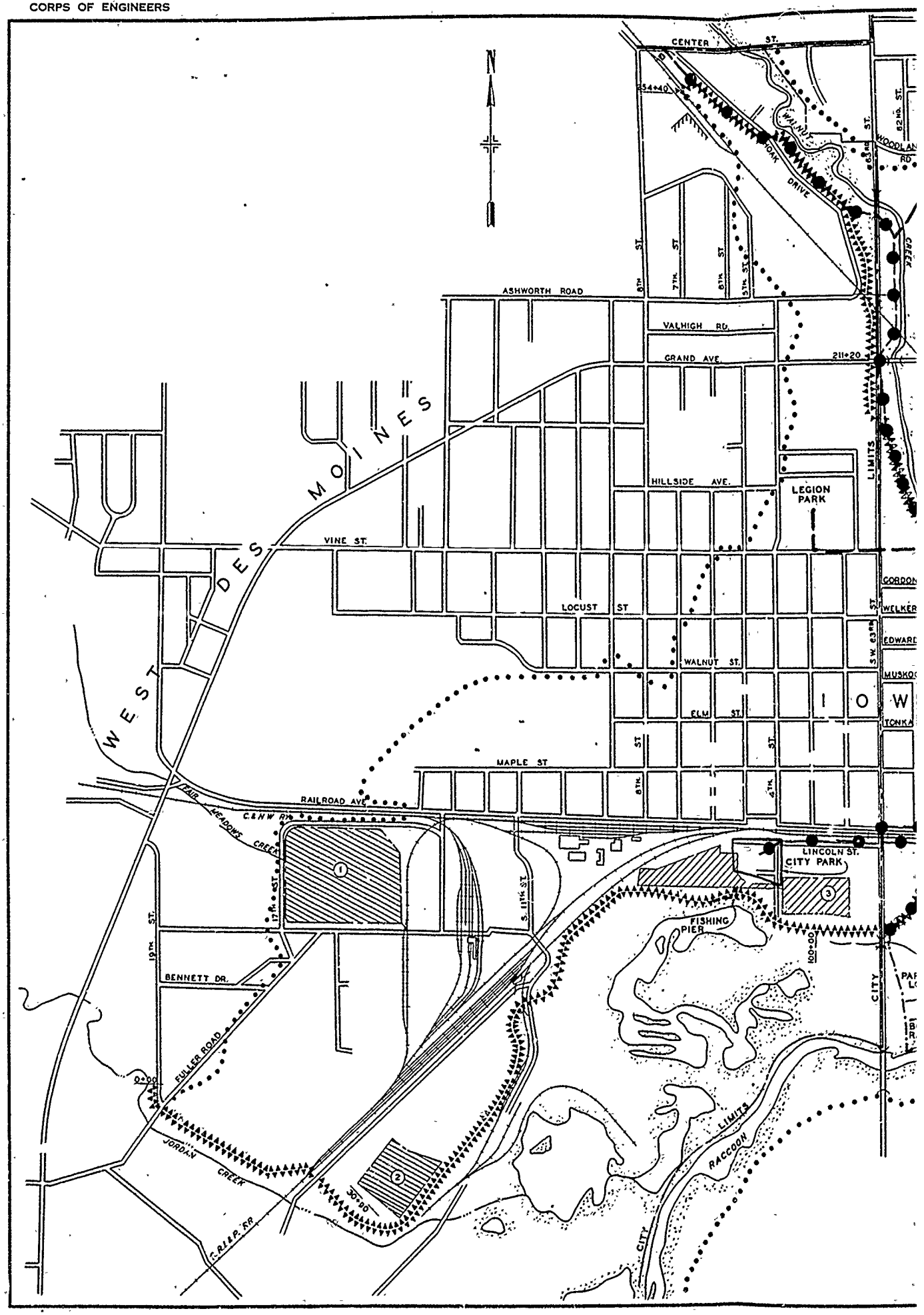
DES MOINES RIVER BASIN
IOWA AND MINNESOTA
WEST DES MOINES - DES MOINES, IOWA
LOCAL FLOOD PROTECTION

THE SELECTED PLAN

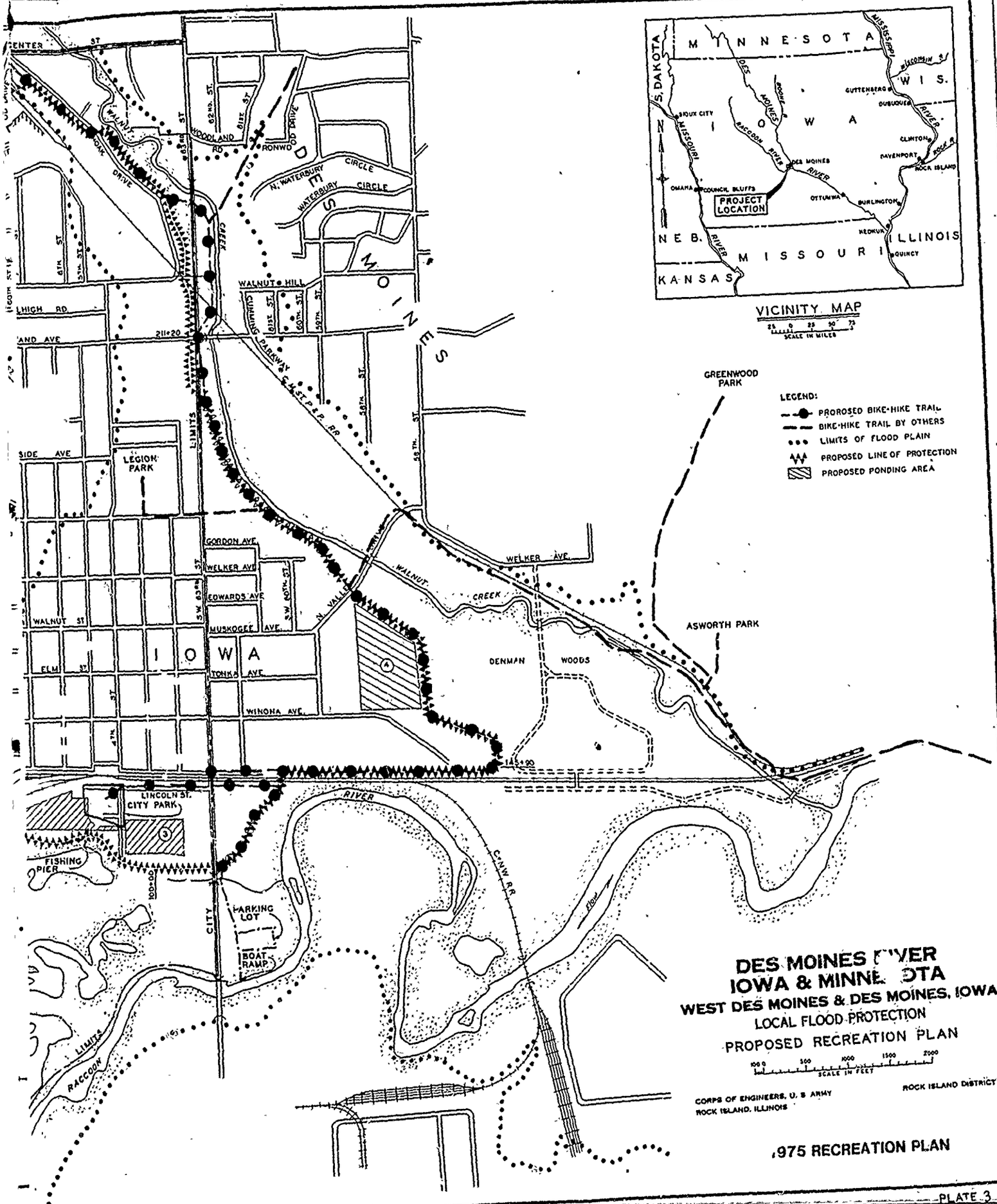
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APPROX. SCALE IN FEET

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
ROCK ISLAND, ILLINOIS

CORPS OF ENGINEERS



U. S. ARMY



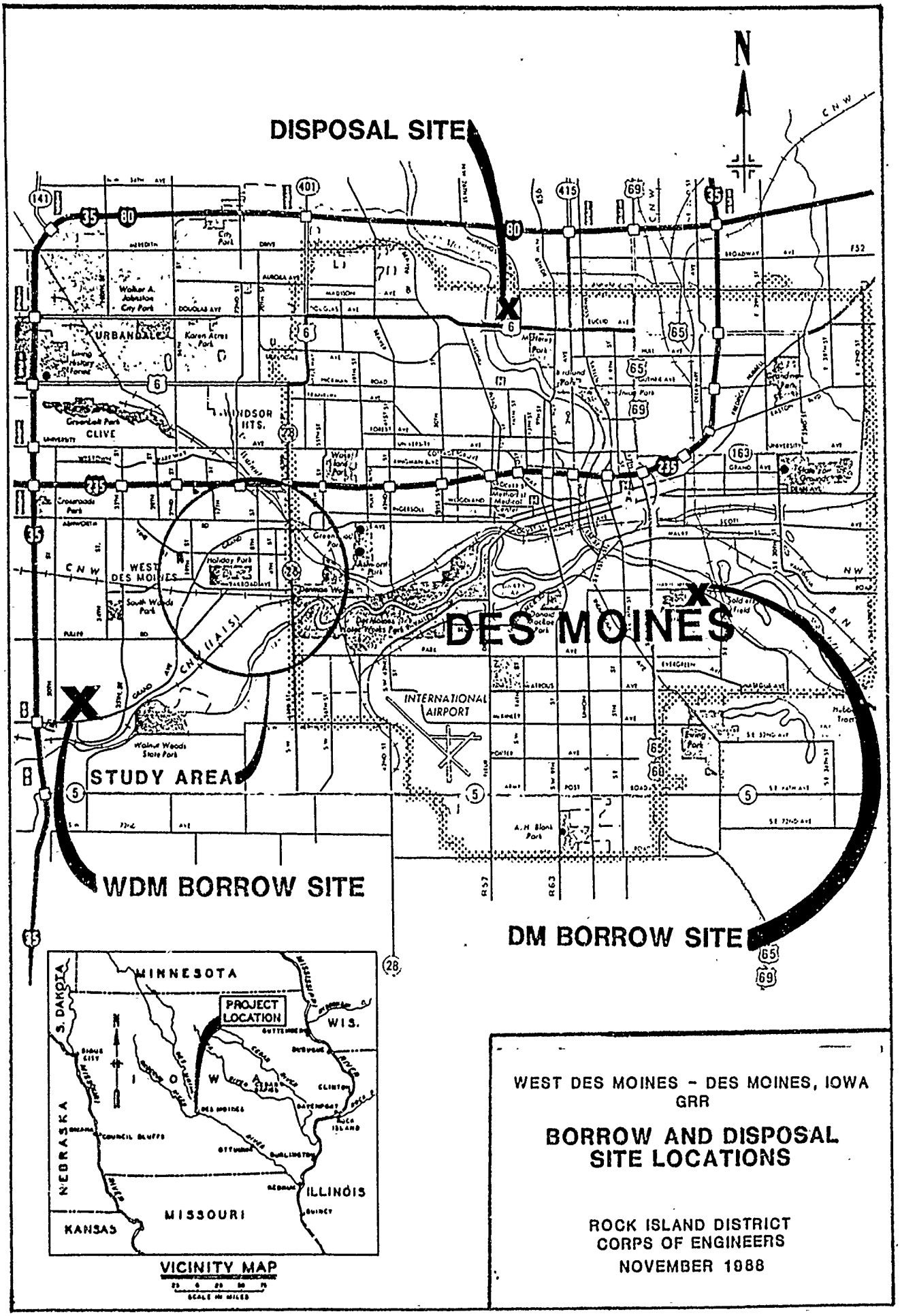
DES MOINES RIVER
IOWA & MINNESOTA
WEST DES MOINES & DES MOINES, IOWA
LOCAL FLOOD PROTECTION
PROPOSED RECREATION PLAN

CORPS OF ENGINEERS, U. S. ARMY
ROCK ISLAND, ILLINOIS

ROCK ISLAND DISTRICT

1975 RECREATION PLAN

PLATE 3

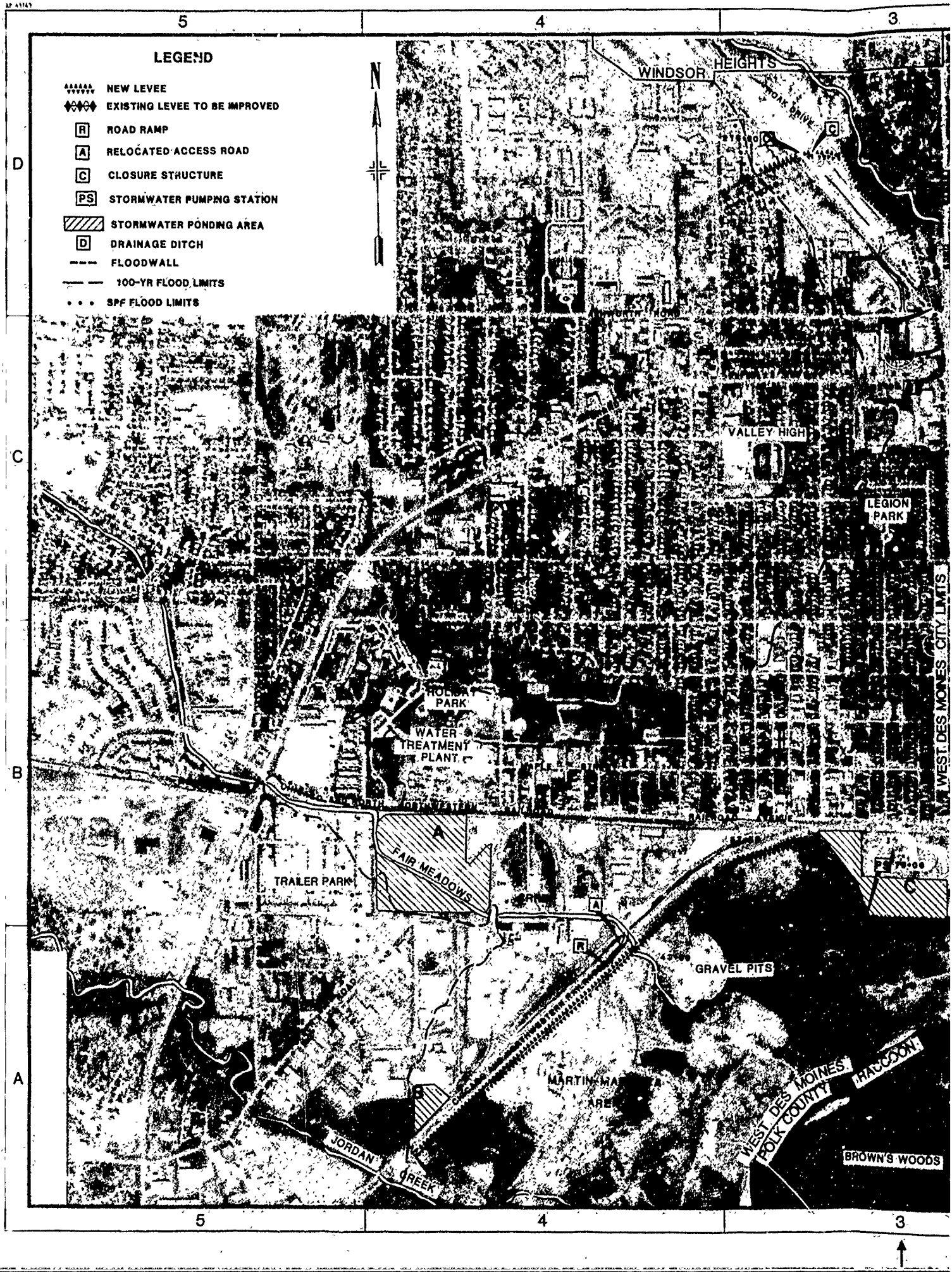


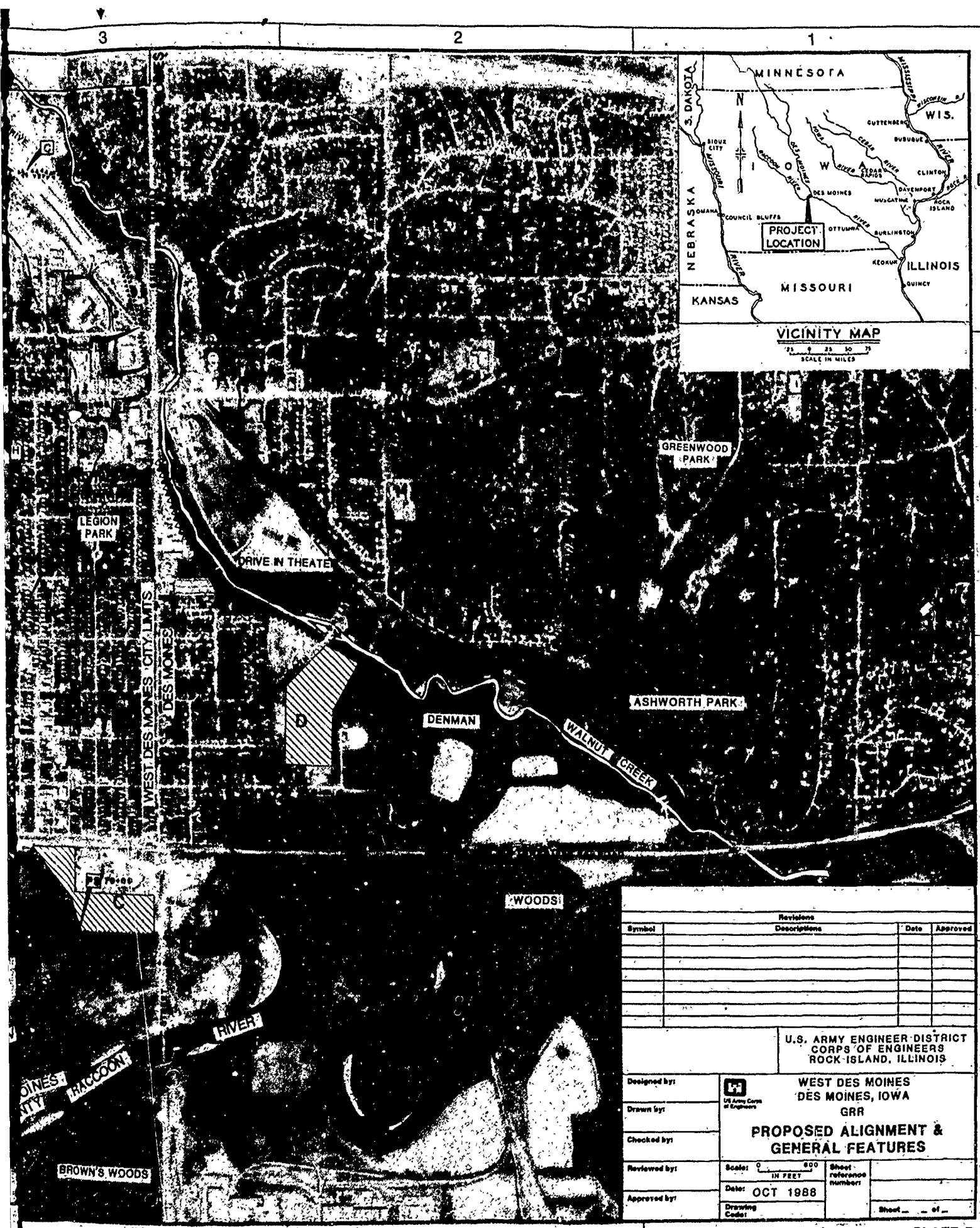
WEST DES MOINES - DES MOINES, IOWA
GRR

BORROW AND DISPOSAL SITE LOCATIONS

ROCK ISLAND DISTRICT
CORPS OF ENGINEERS
NOVEMBER 1988

PLATE 4


LEGEND
NEW LEVEE
EXISTING LEVEE TO BE IMPROVED
R ROAD RAMP
A RELOCATED ACCESS ROAD
C CLOSURE STRUCTURE
PS STORMWATER PUMPING STATION
STORMWATER PONDING AREA
D DRAINAGE DITCH
FLOODWALL
100-YR FLOOD LIMITS
SPF FLOOD LIMITS
N
5
4
3
D
C
B
A
WINDSOR HEIGHTS
VALLEY HIGH
LEGION PARK
WEST DES MOINES CITY LIMITS
WATER TREATMENT PLANT
FAIR MEADOWS
TRAILER PARK
GRAVEL PITS
JORDAN CREEK
WEST DES MOINES
POLK COUNTY
RACCOON
BROWN'S WOODS



Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

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Checked by:
Reviewed by:
Approved by:

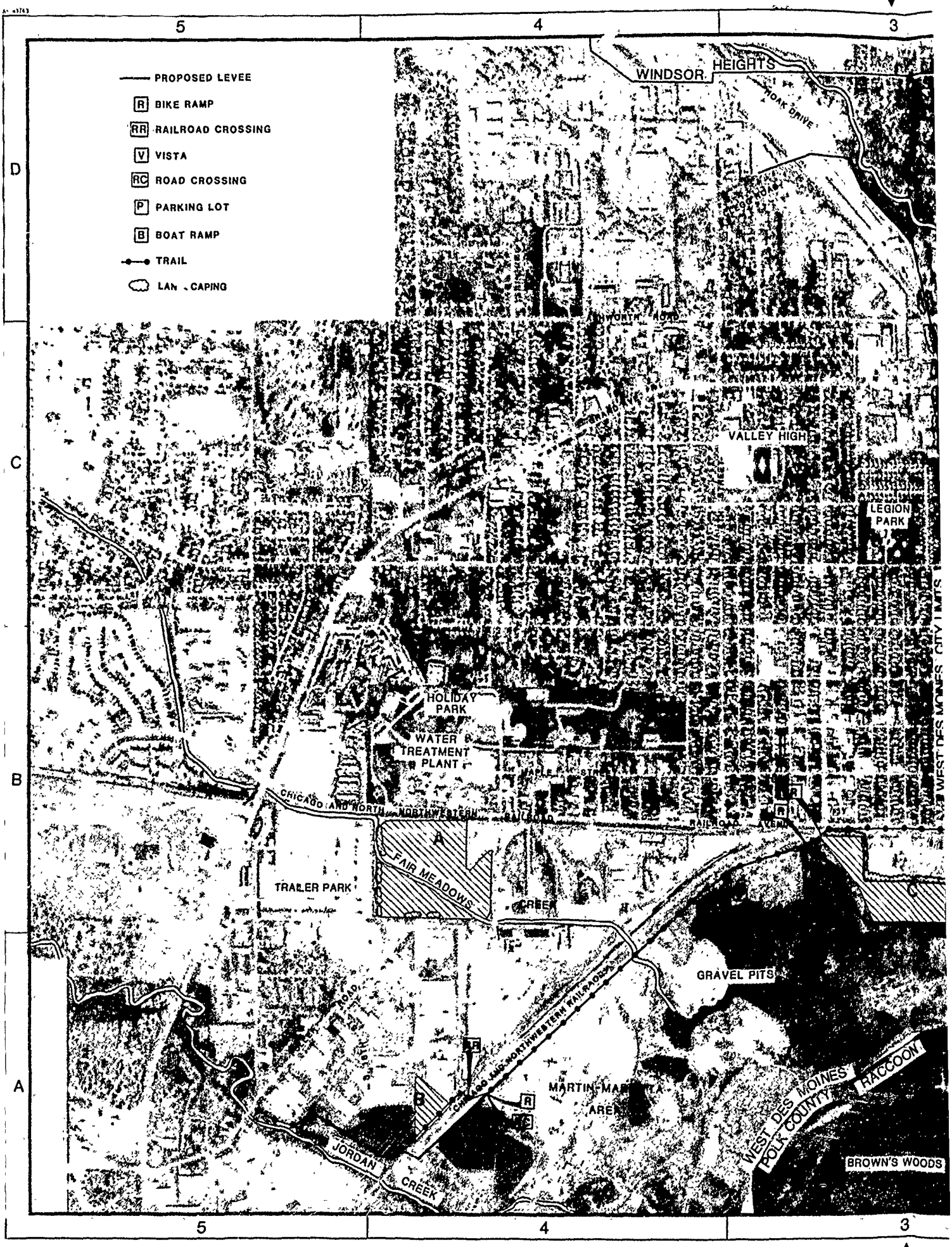
US Army Corps of Engineers

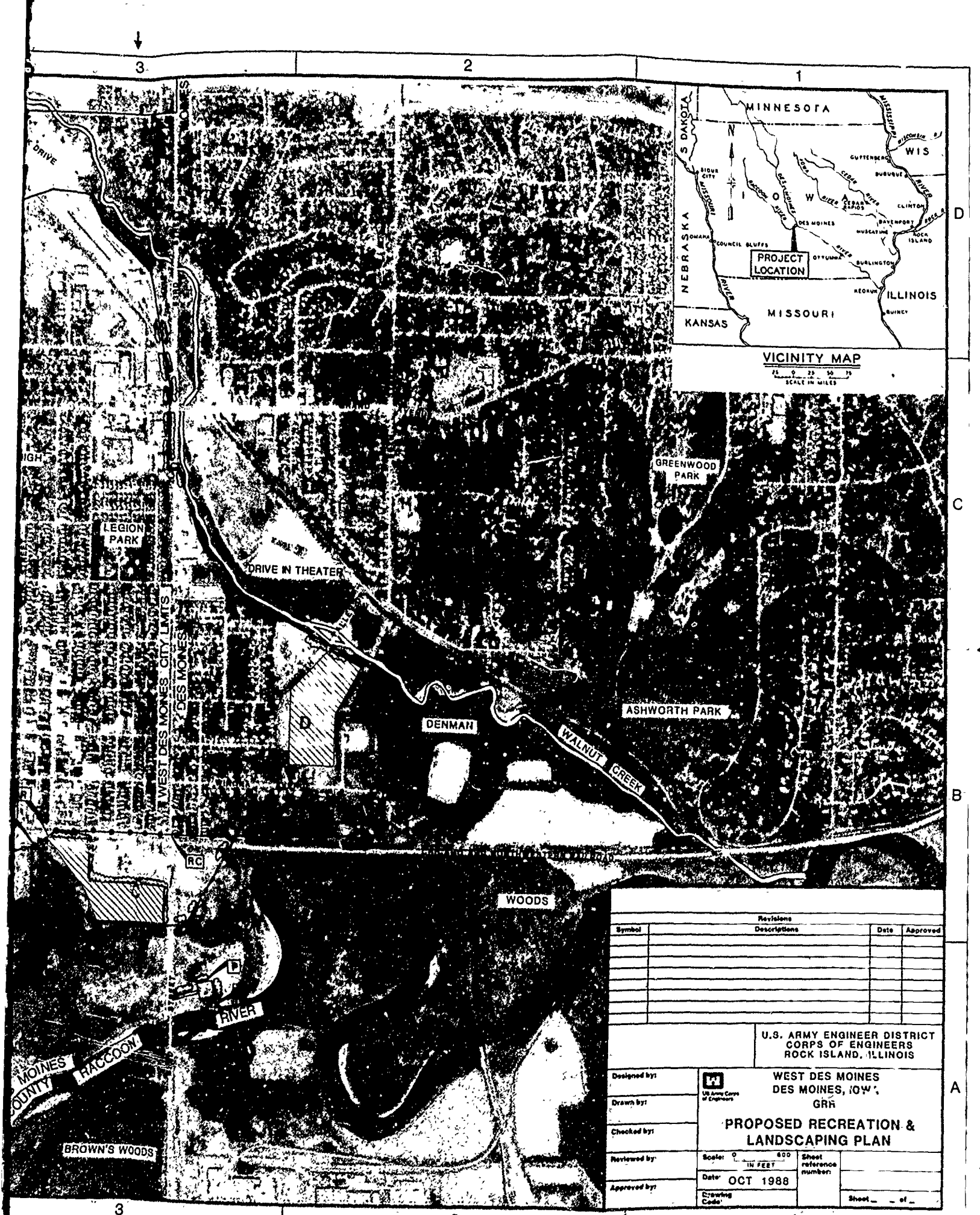
WEST DES MOINES
DES MOINES, IOWA
GRR

PROPOSED ALIGNMENT & GENERAL FEATURES

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Sheet __ of __

PLATE 5


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A
PROPOSED LEVEE
R BIKE RAMP
RR RAILROAD CROSSING
V VISTA
RC ROAD CROSSING
P PARKING LOT
B BOAT RAMP
TRAIL
LANDSCAPING
WINDSOR HEIGHTS
HOAK DRIVE
VALLEY HIGH
LEGION PARK
HOLIDAY PARK
WATER TREATMENT PLANT
CHICAGO AND NORTH WESTERN RAILROAD
FAIR MEADOWS
TRAILER PARK
CREEK
GRAVEL PITS
CHICAGO AND NORTHWESTERN RAILROAD
MARTIN-MARIETTA AREA
JORDAN CREEK
WEST DES MOINES
POLK COUNTY
RACCOON
BROWN'S WOODS



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ROCK ISLAND, ILLINOIS

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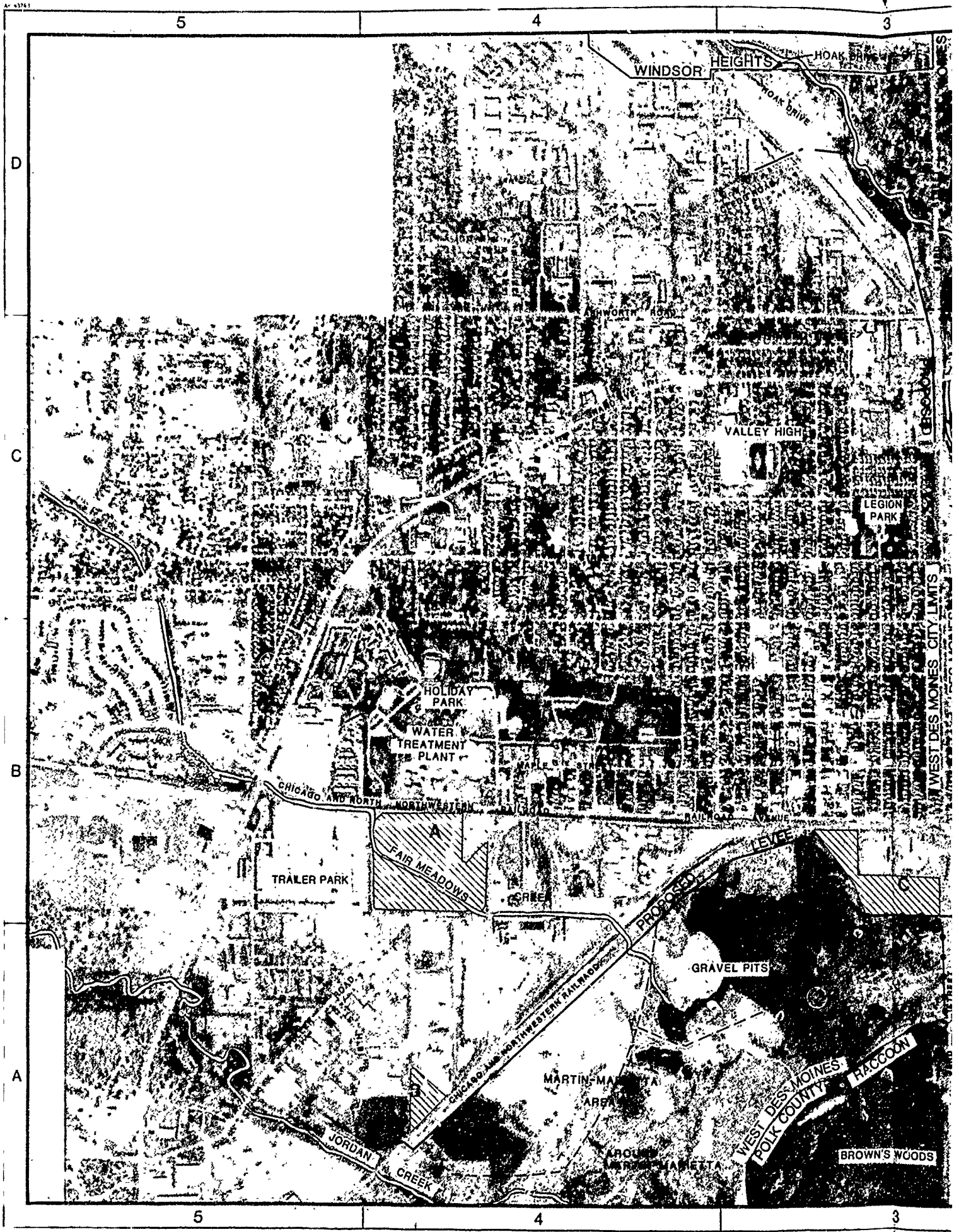
US Army Corps of Engineers

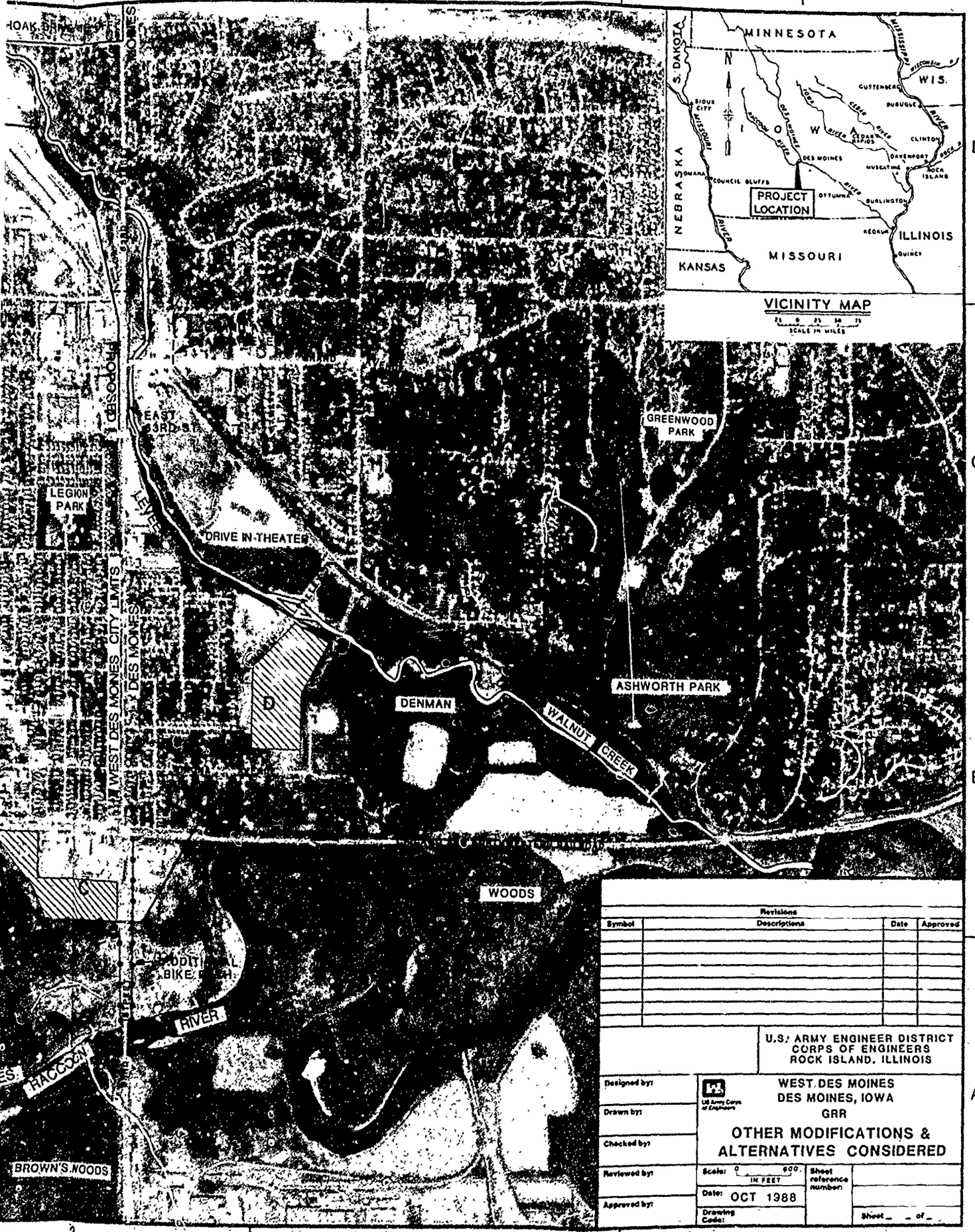
WEST DES MOINES
DES MOINES, IOWA
GRR

PROPOSED RECREATION & LANDSCAPING PLAN

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PLATE 6


5
4
3
D
C
B
A
WINDSOR HEIGHTS
HOAK DRIVE
VALLEY HIGH
LEGION PARK
WEST DES MOINES CITY LIMITS
HOLIDAY PARK
WATER TREATMENT PLANT
CHICAGO AND NORTH WESTERN RAILROAD
RAILROAD AVENUE
TRAILER PARK
FAIR MEADOWS
CREEK
LEVEE
PROPOSED
GRAVEL PITS
CHICAGO AND NORTHWESTERN RAILROAD
JORDAN CREEK
WEST DES MOINES
POLK COUNTY
RACCOON
BROWN'S WOODS



Revisions			
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ROCK ISLAND, ILLINOIS

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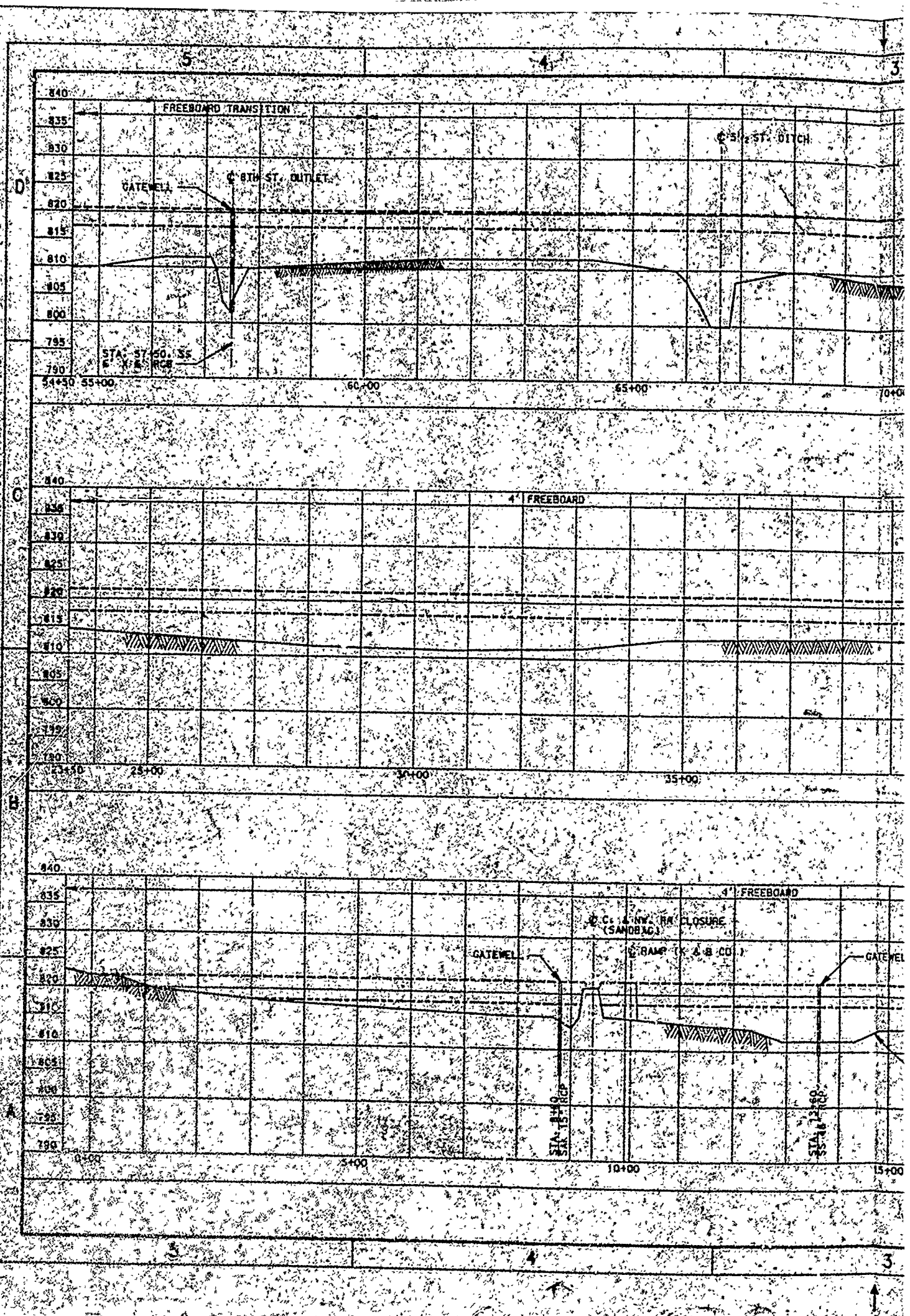
US Army Corps of Engineers

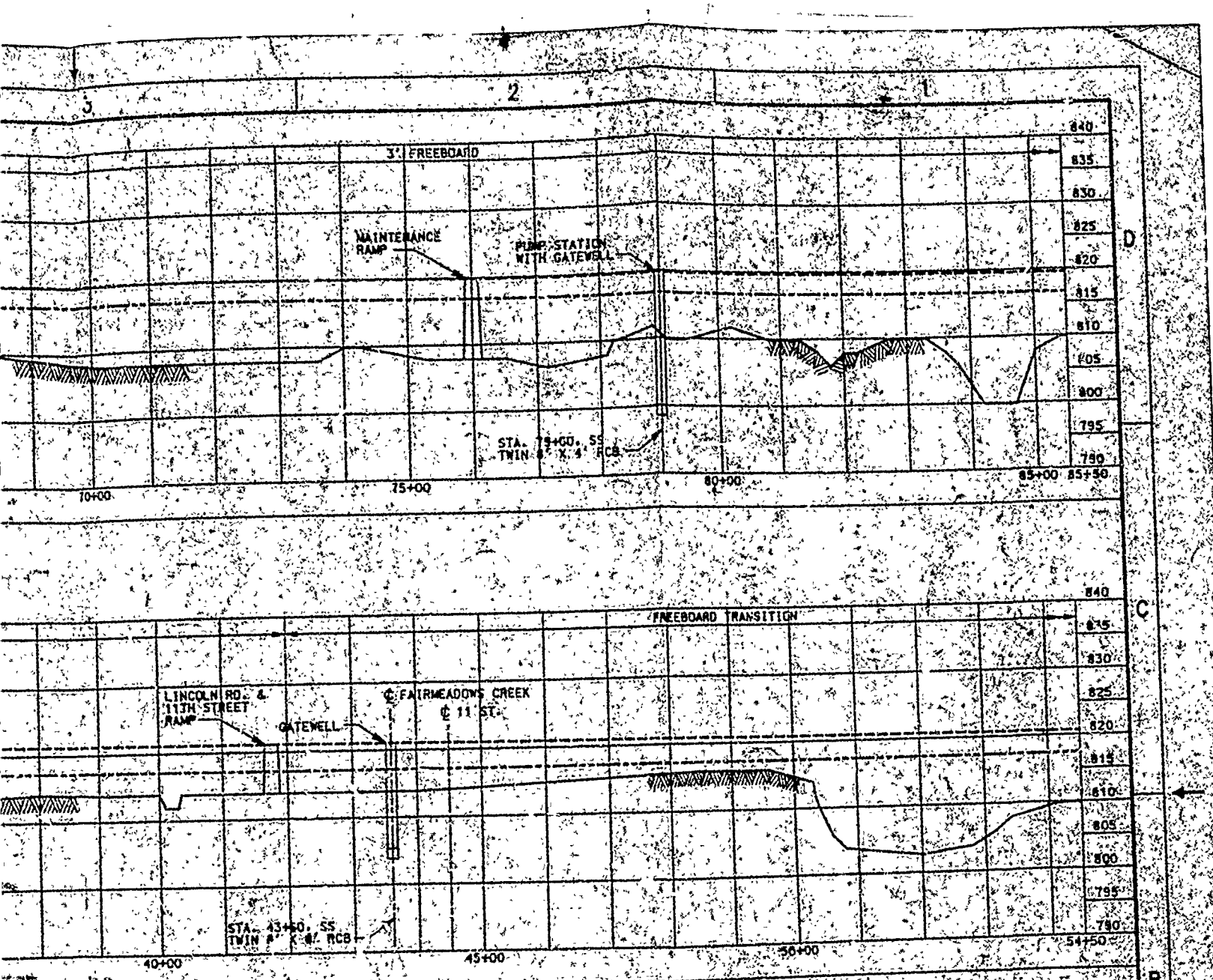
WEST DES MOINES
DES MOINES, IOWA
GRR

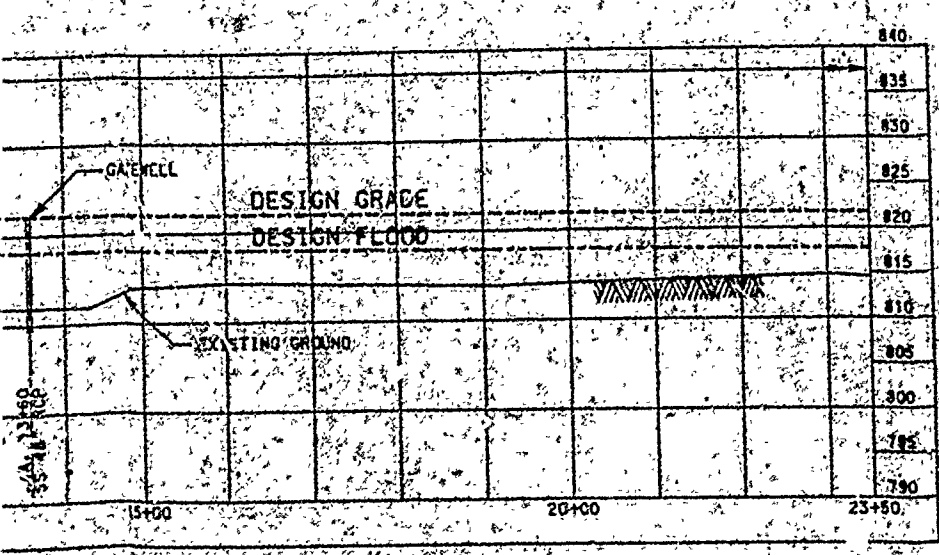
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PLATE 7


FREEBOARD TRANSITION
℄ 8TH ST. OUTLET
GATE/EL.
STA. 57+50.55
℄ X/S RCB
℄ 5TH ST. DITCH
4' FREEBOARD
4' FREEBOARD
℄ C.S. & NW. RR CLOSURE (SAND BAG)
℄ RAMP (X & B CO.)
GATE/EL.
GATE/EL.
STA. 8+40 BAK 15" RCP
STA. 12+60 SS 18" RCP
840
835
830
825
820
815
810
805
800
795
790
54+50
55+00
60+00
65+00
25+00
30+00
35+00
0+00
5+00
10+00
15+00
D
C
B
A
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3





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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

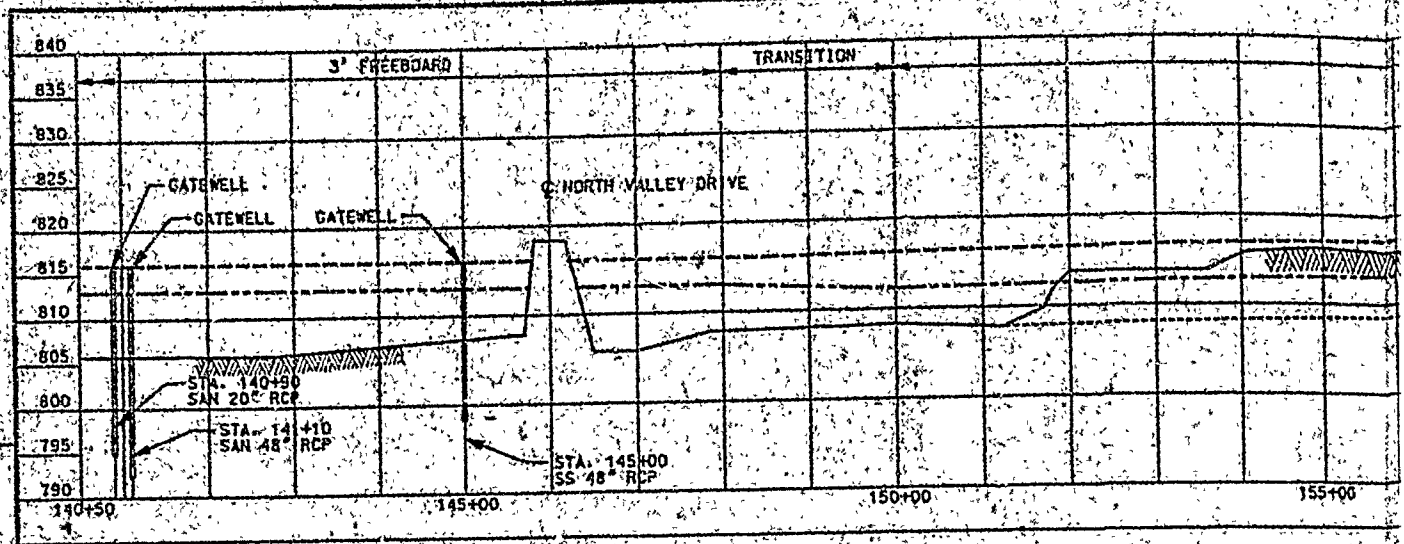
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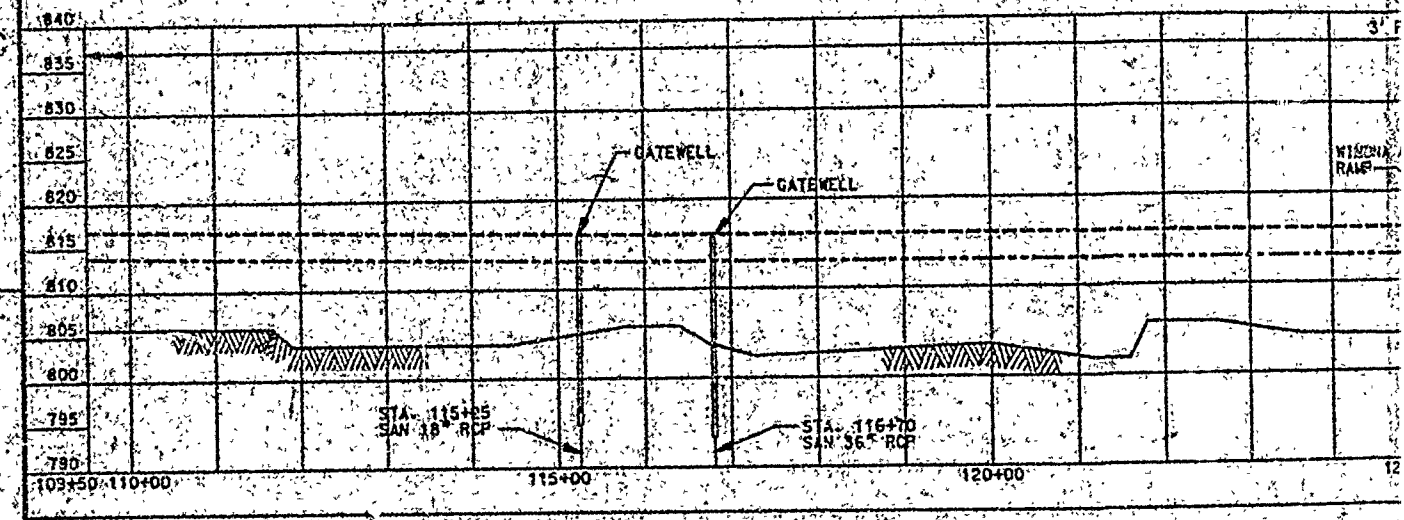
WEST DES MOINES
DES MOINES, IOWA
GRR

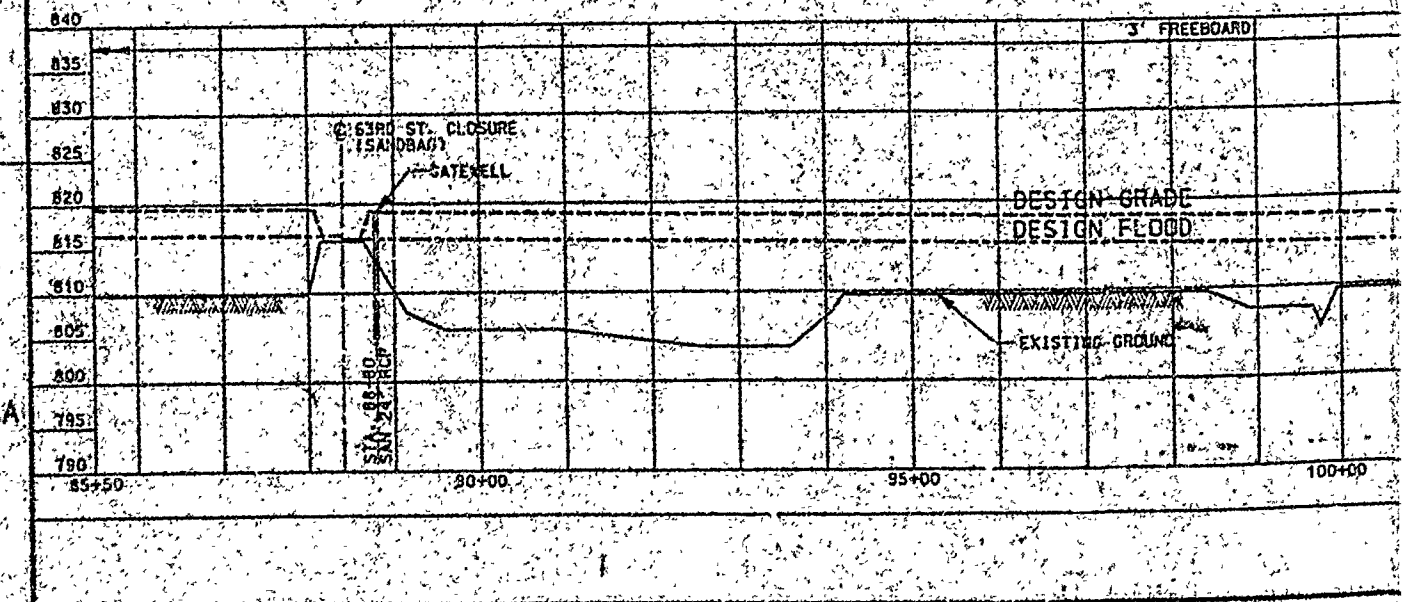
100-YR. LEVEE PROFILE
STA. 0+00 TO STA. 85+50

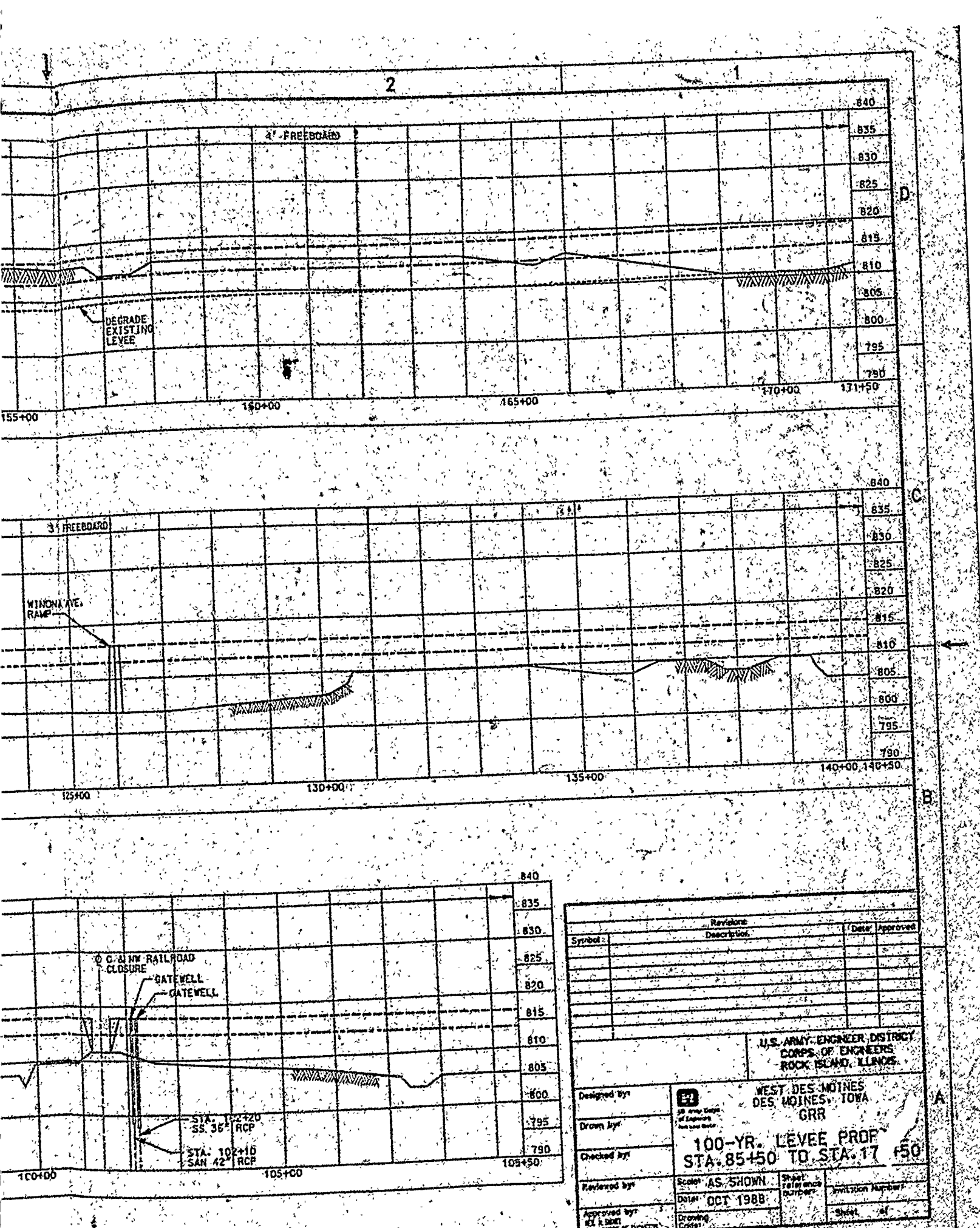
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PLATE 8


3' FREEBOARD
TRANSITION
GATEWELL
GATEWELL
GATEWELL
℄ NORTH VALLEY DRIVE
STA. 140+90
SAN 20" RCP
STA. 141+10
SAN 48" RCP
STA. 145+00
SS 48" RCP
840
835
830
825
820
815
810
805
800
795
790
140+50
145+00
150+00
155+00


GATEWELL
GATEWELL
STA. 115+25
SAN 18" RCP
STA. 116+10
SAN 36" RCP
840
835
830
825
820
815
810
805
800
795
790
110+00
115+00
120+00


3' FREEBOARD
℄ 63RD ST. CLOSURE
(SANDBAG)
GATEWELL
DESIGN GRADE
DESIGN FLOOD
EXISTING GROUND
STA. 86+00
SAN 24" RCP
840
835
830
825
820
815
810
805
800
795
790
85+50
90+00
95+00
100+00



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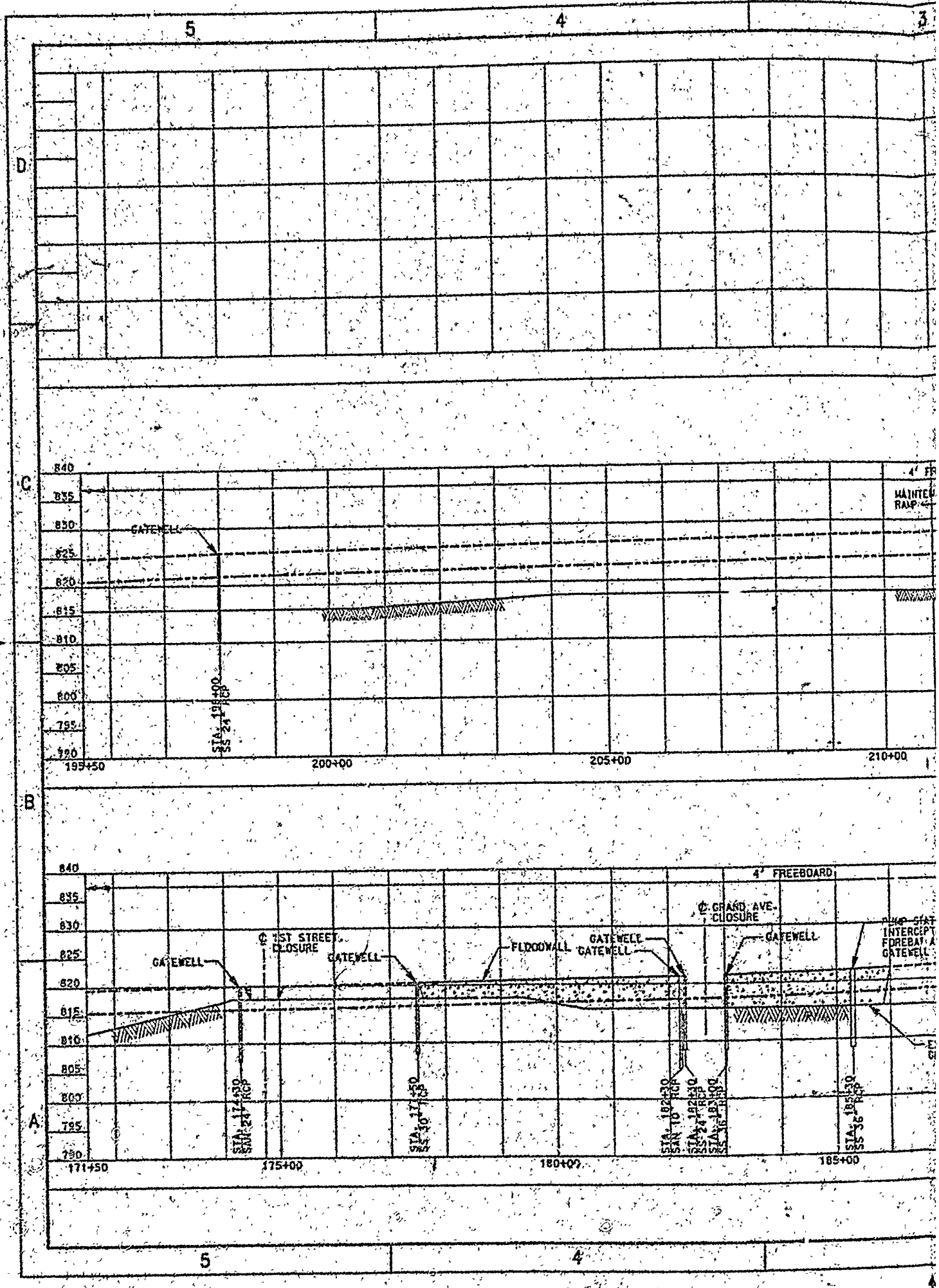
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

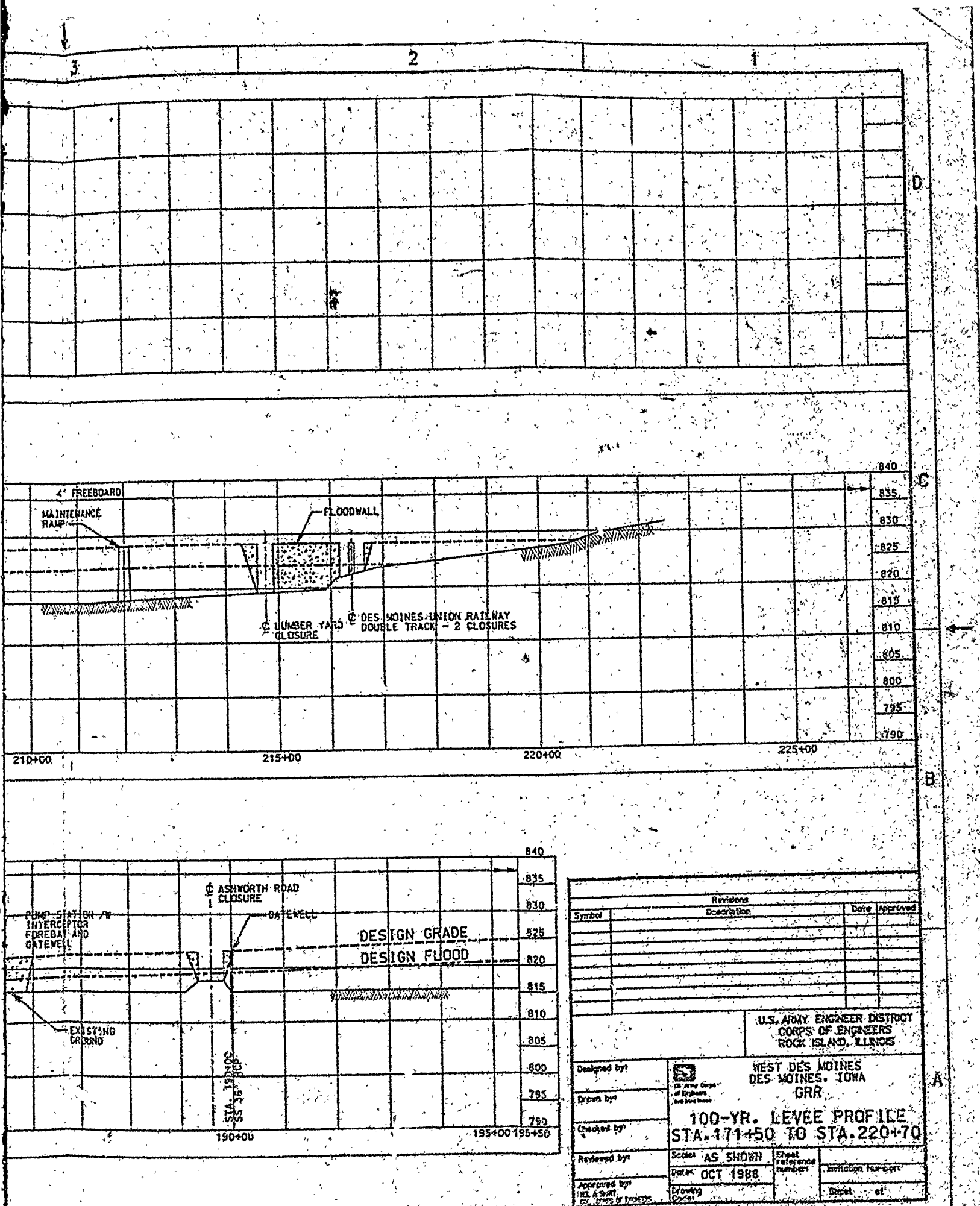
WEST DES MOINES
DES MOINES, IOWA
GRR

100-YR. LEVEE PROF
STA. 85+50 TO STA. 171+50

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PLATE 9


5
4
3
D
C
B
A
840
835
830
825
820
815
810
805
800
795
790
GATEWELL
STA. 198+00
SS 24" RCP
195+50
200+00
205+00
210+00
4' FREEBOARD
℄ 1ST STREET CLOSURE
GATEWELL
FLOODWALL
GATEWELL
℄ GRAND AVE. CLOSURE
GATEWELL
STA. 174+30
SAN 24" RCP
STA. 177+50
SS 30" RCP
STA. 182+30
SAN 10" RCP
STA. 182+30
SS 24" RCP
STA. 183+00
SS 16" RCP
STA. 185+30
SS 36" RCP
171+50
175+00
180+00
185+00



Revisions			
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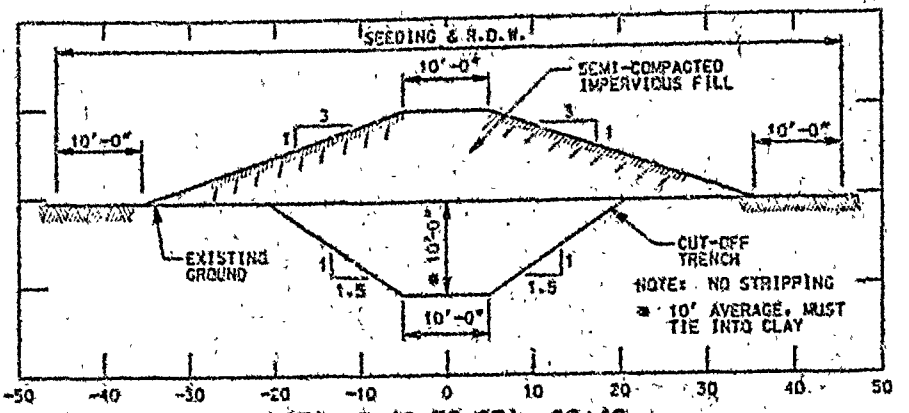
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

WEST DES MOINES
DES MOINES, IOWA
GRR

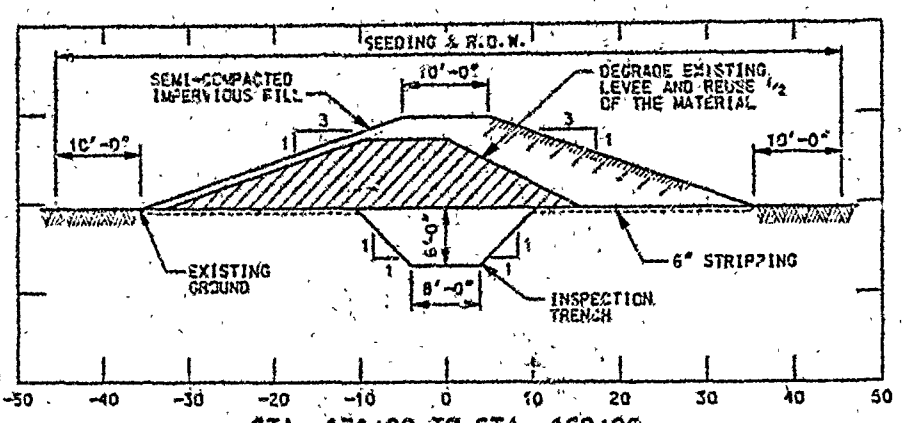
100-YR. LEVEE PROFILE
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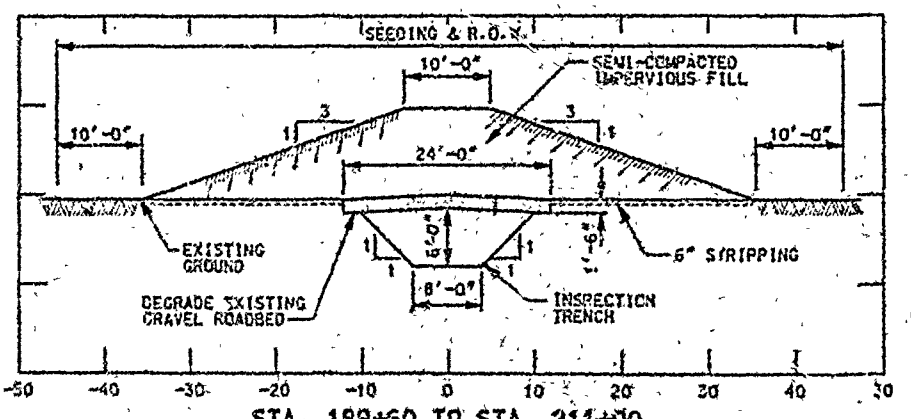
PLATE 10



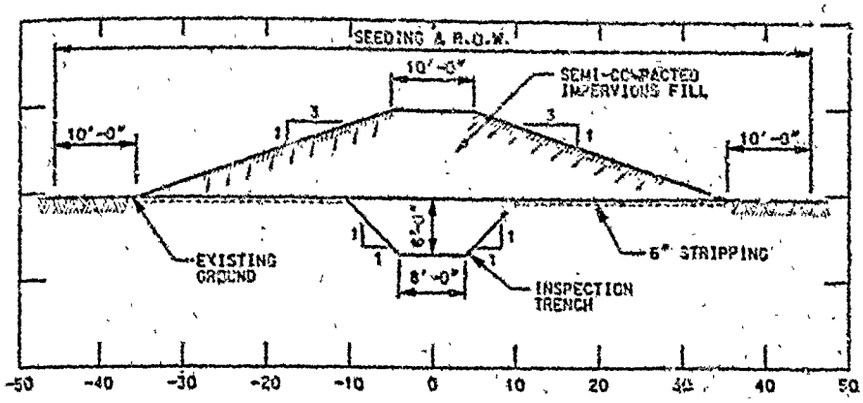
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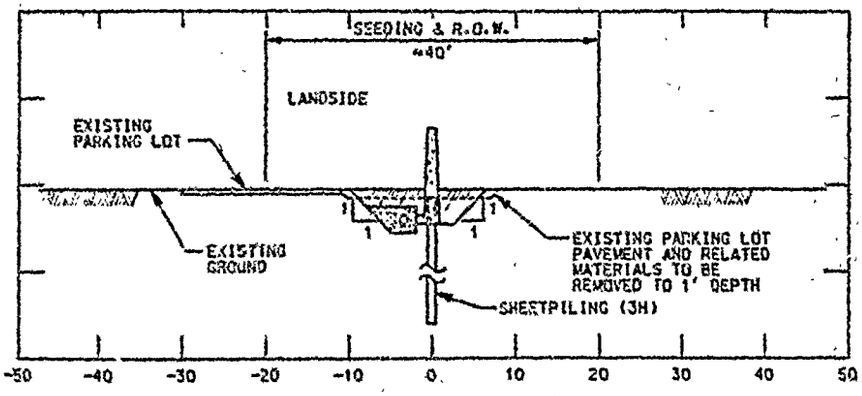
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STA. 211+00 TO STA. 214+75
STA. 216+40 TO E. O. P.



STA. 177+50 TO STA. 182+30
STA. 183+00 TO STA. 186+00
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Revisions			
Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

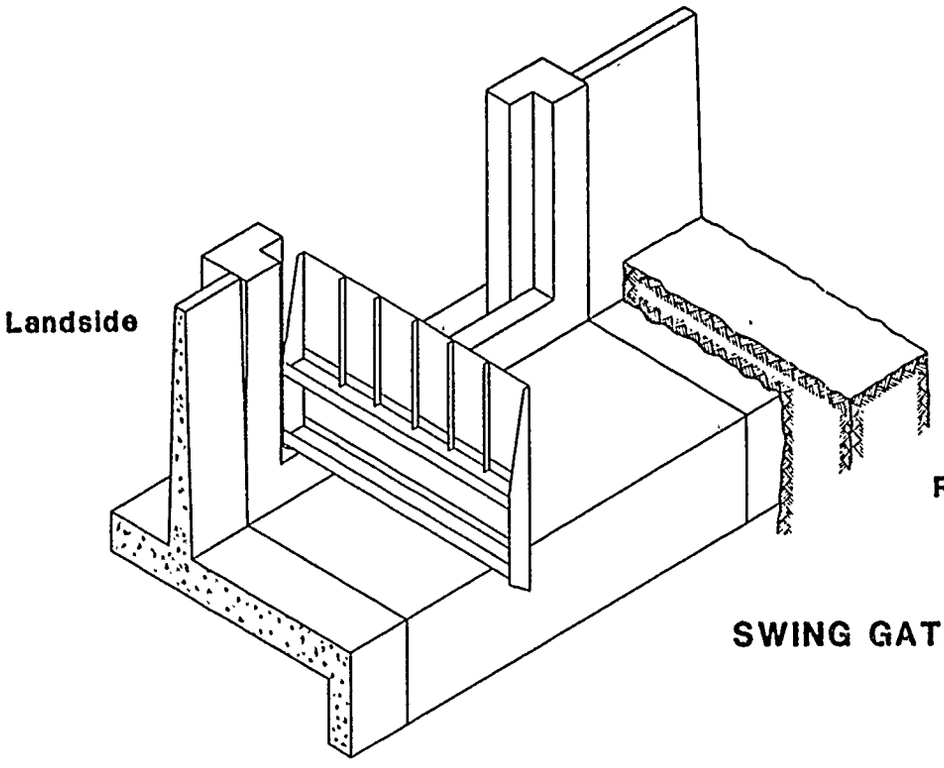
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Checked by:
Reviewed by:
Approved by:

WEST DES MOINES
DES MOINES, IOWA
GRR

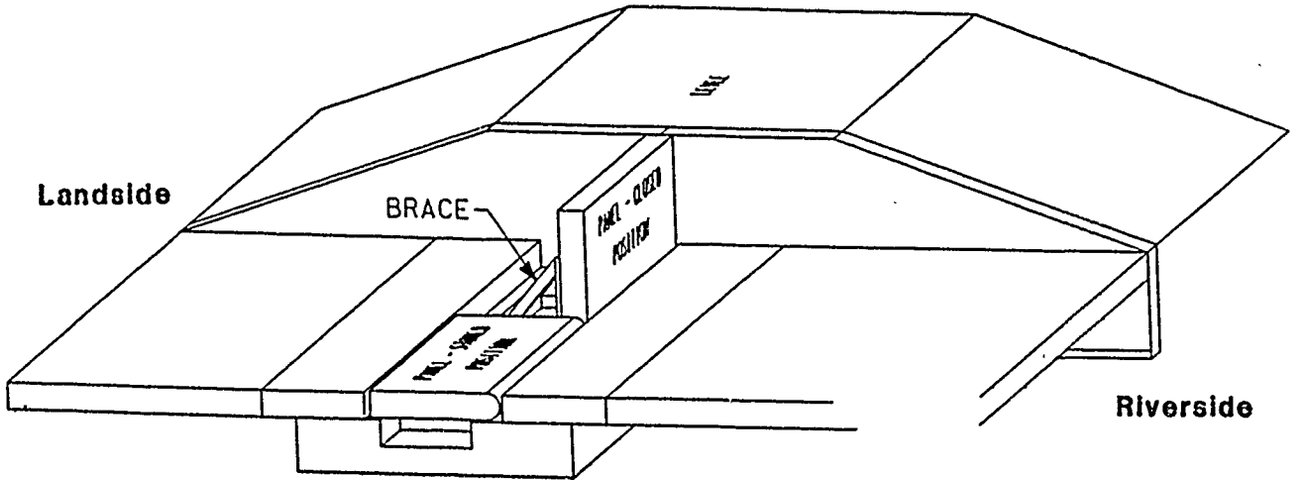
TYPICAL LEVEE & I-WALL SECTIONS

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PLATE 11



SWING GATE



TILT UP PANEL

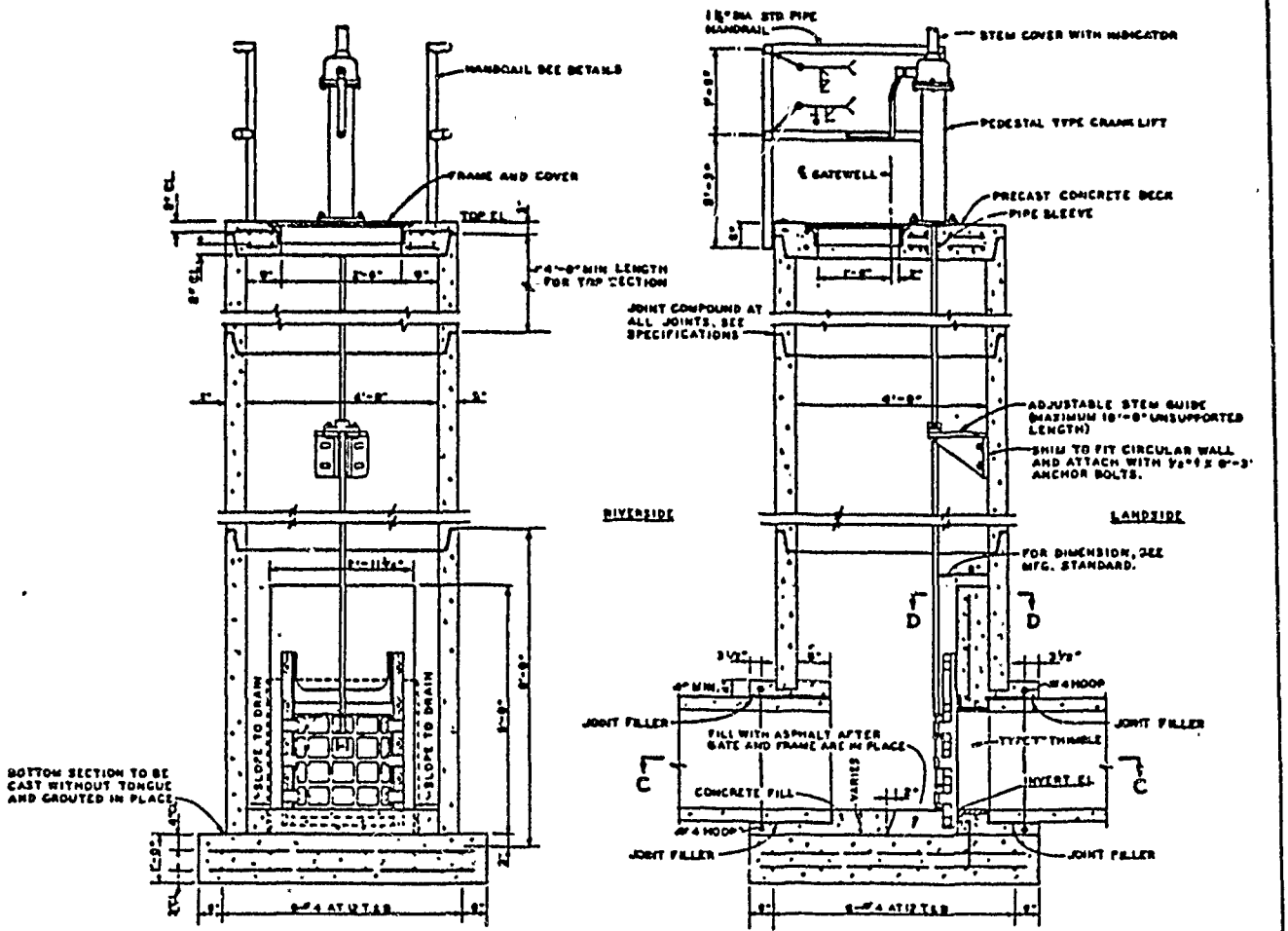
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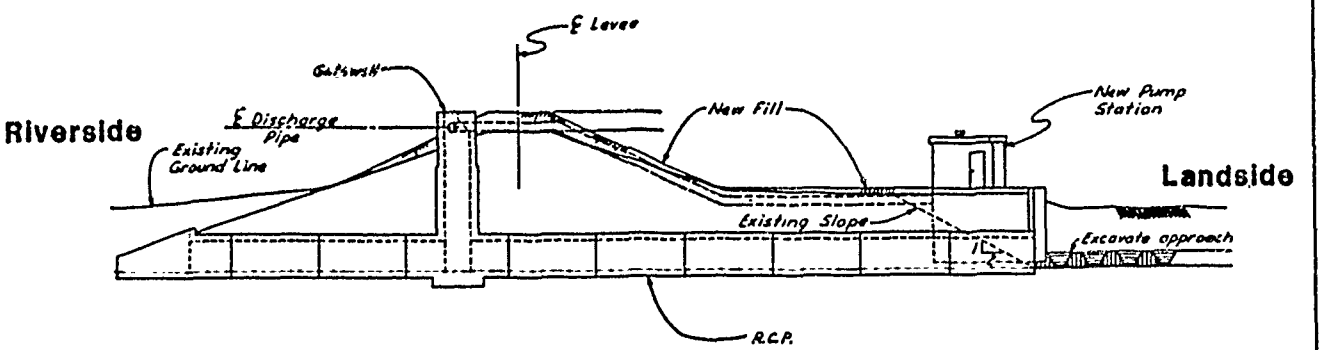
ROCK ISLAND DISTRICT
CORPS OF ENGINEERS

NOVEMBER 1988

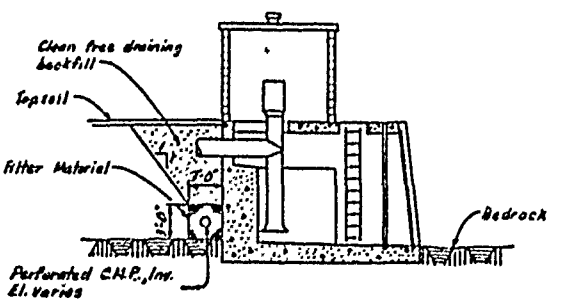
PLATE 12



GATEWELL CROSS SECTIONS



PUMP STATION PROFILE



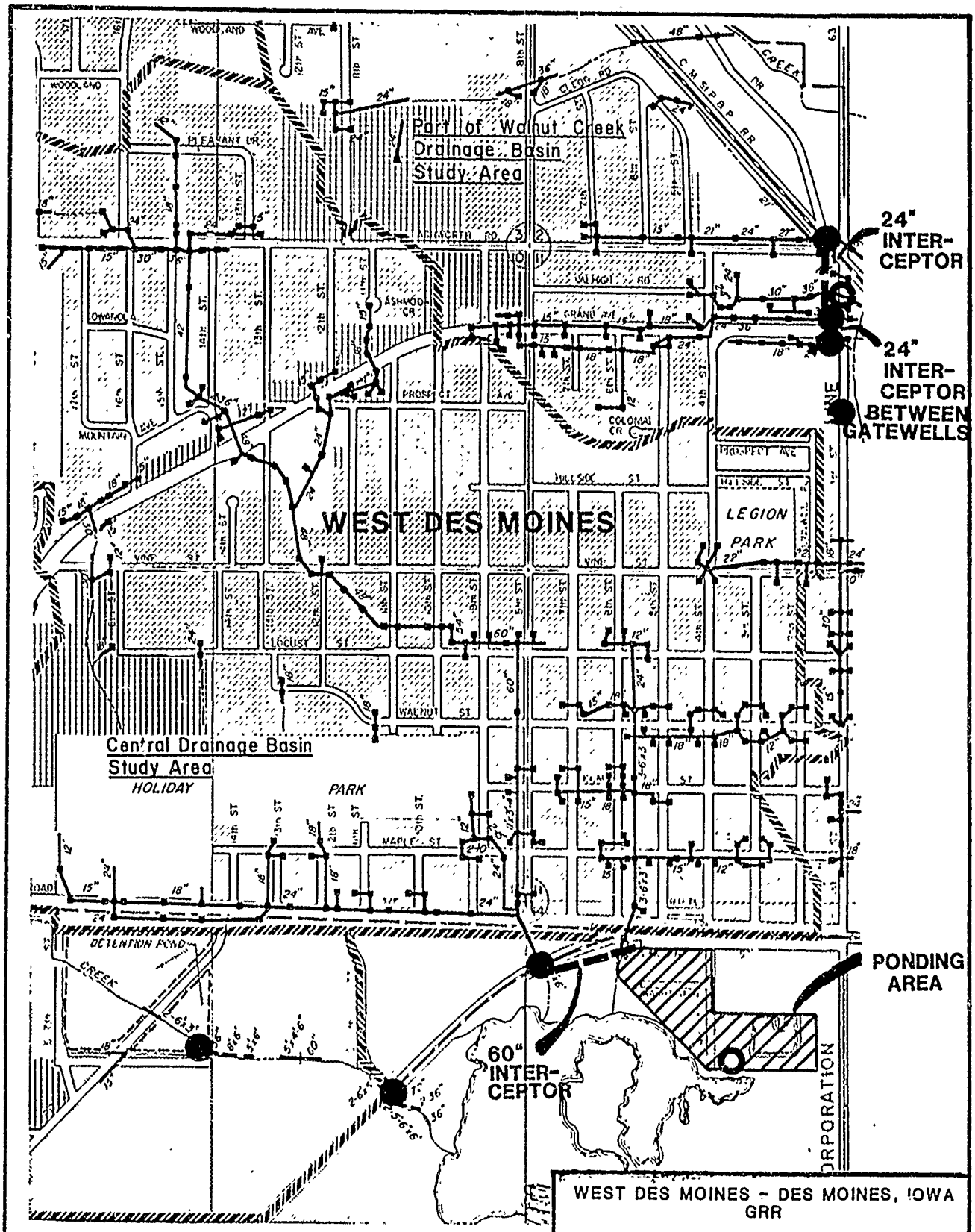
PUMP STATION DETAIL

WEST DES MOINES - DES MOINES, IOWA
GRR

TYPICAL SECTIONS - GATEWELL AND PUMP STATION

ROCK ISLAND DISTRICT
CORPS OF ENGINEERS
NOVEMBER 1988

PLATE 13

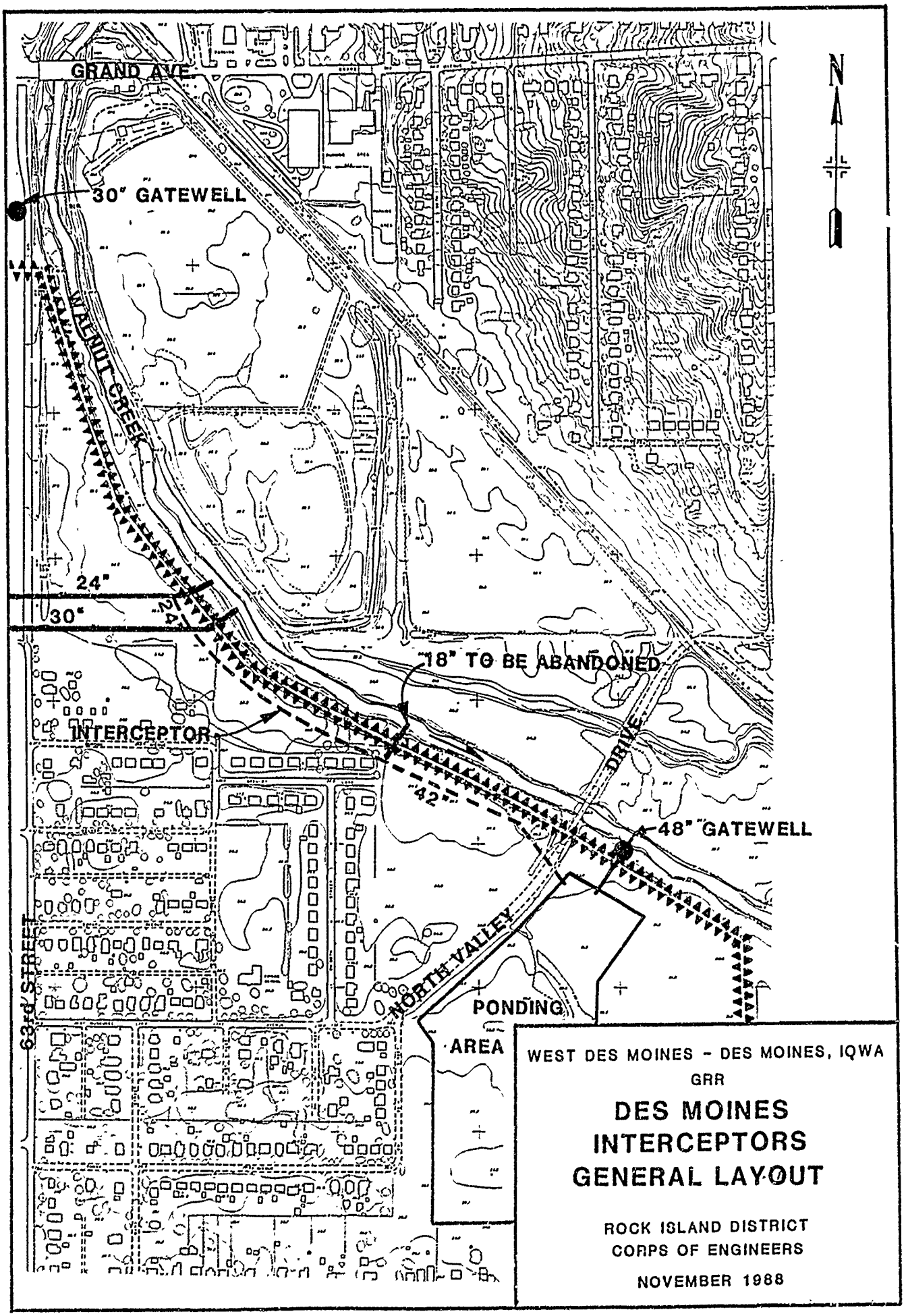


WEST DES MOINES - DES MOINES, IOWA
GRR

WEST DES MOINES INTERCEPTORS & PUMP STATIONS - GENERAL LAYOUT

ROCK ISLAND DISTRICT
CORPS OF ENGINEERS
NOVEMBER 1988

PLATE 14



WEST DES MOINES - DES MOINES, IQWA

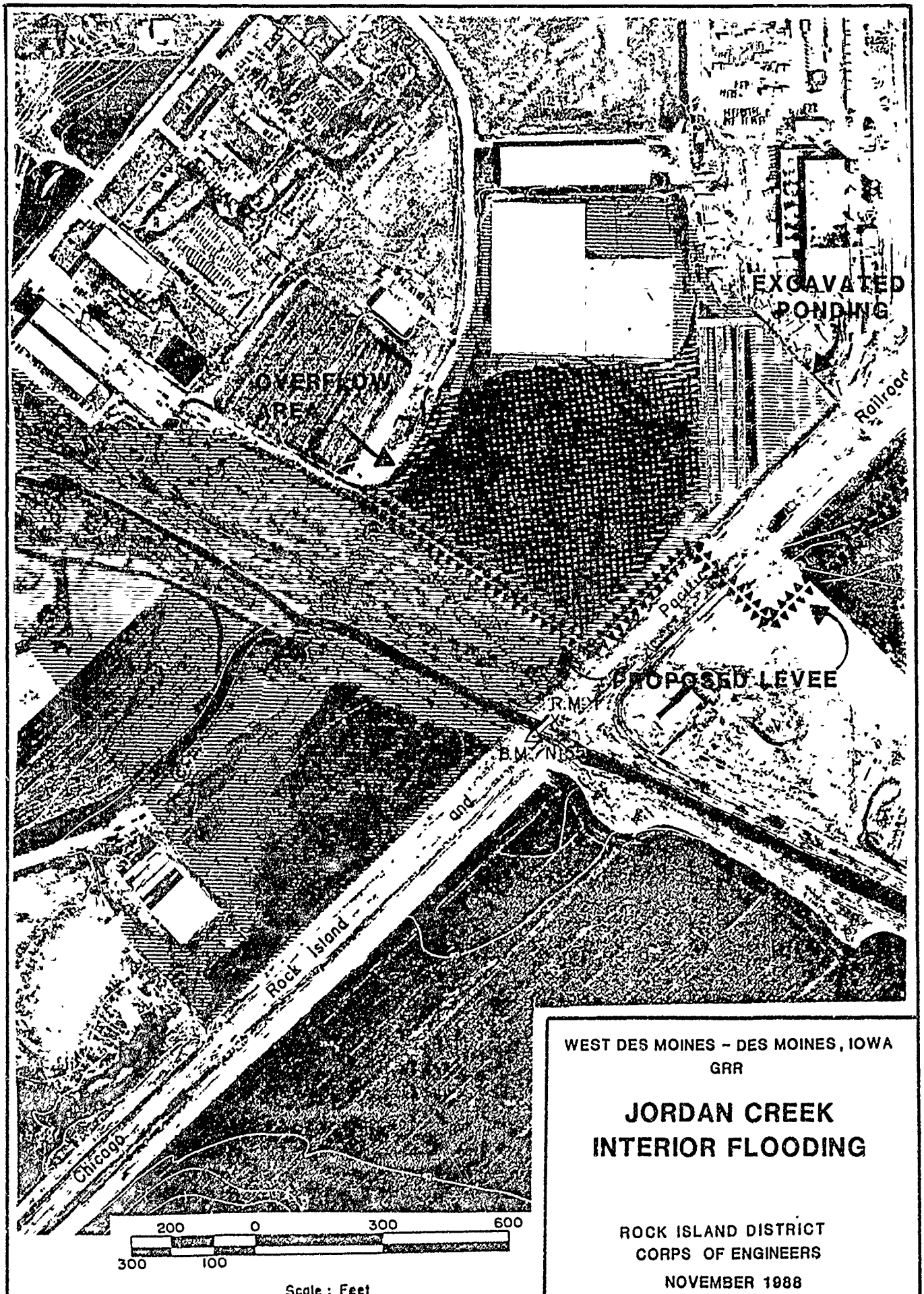
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DES MOINES INTERCEPTORS GENERAL LAYOUT

ROCK ISLAND DISTRICT
CORPS OF ENGINEERS

NOVEMBER 1988

PLATE 15



WEST DES MOINES - DES MOINES, IOWA
GRR

JORDAN CREEK
INTERIOR FLOODING

ROCK ISLAND DISTRICT
CORPS OF ENGINEERS
NOVEMBER 1988

PLATE 16

FINAL SUPPLEMENT NO. 1 TO THE
FINAL ENVIRONMENTAL IMPACT STATEMENT

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:

CENCR-PD-E

FINAL
SUPPLEMENT NO. 1 TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT

WEST DES MOINES - DES MOINES, IOWA
FLOOD CONTROL PROJECT
GENERAL REEVALUATION REPORT

JULY 1989

FINAL
SUPPLEMENT NO. 1 TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT

WEST DES MOINES - DES MOINES, IOWA
FLOOD CONTROL PROJECT
GENERAL REEVALUATION REPORT

The responsible lead agency is the U.S. Army Engineer District, Rock Island.

Abstract: The Rock Island District conducted a study of flood problems in the Des Moines River Basin and produced a report in June 1975 which recommended a local flood protection project for West Des Moines and Des Moines, Iowa, along the Raccoon River, Walnut Creek, and Jordan Creek. The cities of West Des Moines and Des Moines have a common border and are located in Polk County in central Iowa. Alternatives considered included No Additional Action; Evacuation; Floodproofing; Reservoir; Levees and Floodwalls; Various Levee Alignments; and Channel Modification. The recommended plan includes raising an existing levee and constructing new levees along the north bank of the Raccoon River (with a tie-off along the north bank of Jordan Creek) and the west bank of Walnut Creek, within the city limits of the cities being protected. Ponding areas to relieve interior drainage problems and two borrow areas also are included. The project will protect an approximate 900-acre area. A Final Environmental Statement addressing the recommended plan was produced in June 1977. The project was authorized by the U.S. Congress in the Water Resources Development Act of 1986. The current stage of the planning/design/construction process is a reevaluation of the authorized plan.

Send your comments to the following address within 30 days of the date when the notice of the availability of the Final Supplemental Environmental Impact Statement (SEIS) appears in the Federal Register:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

For additional information on this supplemental statement, please write to the above address or call Mr. Bob Vanderjack at 309/788-6361, Ext. 385.

NOTE: Information, displays, maps, etc. discussed in the West Des Moines - Des Moines, Iowa, Flood Control Project, General Reevaluation Report are incorporated by reference in the final SEIS.

SUMMARY

MAJOR CONCLUSIONS AND FINDINGS:

The June 1975 project report concluded that studies indicated that flood protection to a level of the 200-year frequency flood would provide the maximum net benefits. However, protection from the Standard Project Flood was recommended to increase the safety and well-being of the residents of the protected floodplain. Under the current reevaluation, the 100-year level of protection is being recommended.

The areas to be protected are developed urban areas. Future development within the floodplain as a result of the project is therefore anticipated to be limited. The project is thus considered to be in accordance with Executive Order 11988 (i.e., Floodplain Development). No aspects of the project will result in the discharge of dredged or fill material into waters or wetlands regulated under Section 404 of the Clean Water Act. Two non-regulated, isolated bodies of water will receive fill (i.e., approximately 1,900 and 25 cubic yards) along shorelines adjacent to the proposed levee alignment, and an approximate 27-acre ponding area (i.e., Fairmeadows) classified as a wetland may require excavating to achieve ponding capacity. No practical alternatives to these impacts have been identified. The project is therefore considered to be in compliance with Executive Order 11990 (i.e., Protection of Wetlands). Coordination with the U.S. Fish and Wildlife Service has deter-mined that the project will have no effect on the continued existence or presence in the project area of any federally listed threatened or endangered species.

AREA OF CONTROVERSY:

Review of comments received from public review of the EIS indicated that areas of controversy primarily concerned the upper end of the Walnut Creek flank levee. The controversy concerned development excluded from the area of protection and induced flood stages on the east side of Walnut Creek. The array of alternatives considered addressed these concerns, and the recommended alignment was selected for reasons of cost justification and compliance with State requirements for induced stage level changes.

UNRESOLVED ISSUES:

Some elements in the project area may still be dissatisfied with the recommended alignment along the upper part of Walnut Creek for the reasons given under the previous section on areas of controversy. If so, these may be considered unresolved issues. However, from the planning perspective, the selection of the recommended plan for the reasons given would be considered a resolution of the issue.

FINAL
SUPPLEMENT NO. 1 TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT

WEST DES MOINES - DES MOINES, IOWA
FLOOD CONTROL PROJECT
GENERAL REEVALUATION REPORT

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FINAL
SUPPLEMENT NO. 1 TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT

WEST DES MOINES - DES MOINES, IOWA
FLOOD CONTROL PROJECT
GENERAL REEVALUATION REPORT

SECTION 1 - NEED FOR AND OBJECTIVES OF ACTION

STUDY AUTHORITY

1.1 Flooding within the Des Moines River Basin prompted local interests to request congressional representatives to authorize a study of the basin's flood problems. A resolution adopted by Congress on July 10, 1945, directed the Corps of Engineers to review previous reports to find a feasible plan for flood control and related purposes. A second resolution, adopted July 1, 1958, authorized a review of an earlier report investigating feasible improvements for flood control and related purposes on the Des Moines. The recommendation for implementation of the West Des Moines - Des Moines, Iowa, Des Moines River Basin, Local Flood Protection project resulted from these authorizations.

PUBLIC CONCERNS

1.2 Relief from the hazards of flooding is the primary public concern. In addition, city administrators perceive the need for the development of recreational opportunity. The recreational items of interest are a bicycle path atop the new levee and a boat ramp on the Raccoon River. Agencies charged with managing natural resources for the public would like to see project goals accomplished in the least environmentally disruptive manner. The wooded areas along Walnut Creek in the southeastern portion of the project area were identified as the natural resource of most concern.

PLANNING OBJECTIVES

1.3 Analysis of area flooding problems, a review of public concerns, and coordination with interested agencies identified the following planning objectives: to provide a cost-effective flood damage reduction program consistent with protecting the Nation's environment for those portions of West Des Moines and Des Moines affected by flooding from the Raccoon River and Walnut Creek; and to assist the two municipalities in the development of their identified recreational needs.

SECTION 2 - ALTERNATIVES

PLANS ELIMINATED FROM FURTHER STUDY

WALNUT CREEK NONSTRUCTURAL MEASURES

2.1 Evacuation - This alternative concerns relocating people out of the floodplain. Relocation costs for the numerous residences, commercial firms, and industries would be excessive. Evacuation also would require the razing of abandoned structures for safety purposes. Any structures considered to have historic value would need to be recorded prior to destruction. Affected families would have their lives disrupted, with resultant adverse social impacts.

2.2 At the evacuation site, there would be no need for mitigation and no impacts to endangered species. At the relocation sites, a potential would exist for additional adverse environmental impacts. There also would be a potential for all or part of the evacuated floodplain to develop into a natural resource.

2.3 Temporary evacuation of the floodplain is considered a part of the existing condition.

2.4 The evacuation plan was not fully evaluated for potential impacts to historic properties. Any future consideration of this alternative would require an assessment of both the evacuation and relocation sites.

2.5 Floodproofing - This alternative concerns modifying existing structures or constructing protective works around individual structures to reduce or eliminate flood damages. Even though the individual structures might be protected, access to the structures would be limited and evacuation might still be required. The number of structures, the depths of water during flooding, and the costs involved contributed to a determination of infeasibility for this alternative.

2.6 Relocation - This alternative considers the relocation of structures. Due to the large number of structures and excessive costs, this alternative was considered infeasible and not carried forward. Environmental concerns would be similar to those expressed under the "Evacuation" alternative.

2.7 Individual structures would require an evaluation to determine if they are eligible for listing on the National Register of Historic Places. Modifications to any structures considered eligible would have to be coordinated with both the Iowa State Historic Preservation Officer and the Advisory Council on Historic Preservation.

2.8 In the reevaluation, two variations of the levee alignment were considered:

ASHWORTH ROAD TIE-OFF

2.9 This is a variation in the alignment in the upstream portion of the Walnut Creek flank levee. This alternative was not considered desirable because developments left outside the line of protection included lumber yards, and avoiding the disastrous effect of flooding on stored lumber was deemed preferable.

2.10 Natural resources in the area of the tie-off are limited and impacts would be minimal. The need for mitigation would therefore not be likely. There would be no endangered species concerns.

LEVEE AROUND GRAVEL PITS

2.11 This alternative would extend the levee around the gravel pits located between the urban developed area and the Raccoon River in the southern portion of the study area.

2.12 The alternative was considered in order to use the gravel pit areas for ponding interior drainage. The option was not pursued because the fill needed to build the levee would be considerably greater, the clearing of more trees would be required, and the suitability of the subsurface materials for a levee foundation was questionable.

2.13 The area of the gravel pits is a natural resource, but its quality has been impacted by past fill activities. Project impacts in this area would therefore be moderate, and the need for mitigation would not be anticipated. There would be no endangered species concerns.

WALNUT CREEK CHANNEL IMPROVEMENTS

2.14 Walnut Creek channel modifications were considered but were estimated to have only a 15-year life and would require extensive maintenance.

2.15 Channel modification would reduce the aquatic resource value of the affected creek by the direct impact of the dredging and st iightening and by the resultant reduction of diversity in the system. In addition, channel modification would have consequent impacts on any naturally vegetated areas which bordered the creek. However, the area of the creek considered for channel improvements is surrounded by urban development, and its natural resource value is limited. The cumulative impacts to the creek and riparian areas would thus probably not require mitigation.

2.16 The bald eagle (Haliaeetus leucocephalus) is a federally listed endangered species reported to overwinter in Polk County. Due to the urban nature of the upper Walnut Creek area, the presence of bald eagles would be unlikely. Thus, no endangered species effects would be anticipated from channel modification.

2.17 This alternative was not fully addressed to determine impacts to historic properties. Areas to be straightened and any disposal site would require an archeological survey.

WITHOUT CONDITIONS (NO ACTION)

2.18 Taking no action would not contribute to a reduction of the area's flood problems. The study area is a well developed urban environment, and remaining natural resources are wooded areas along creeks and rivers or areas set aside as parks. Water-filled gravel pits along the Raccoon River are a natural resource but are heavily impacted by past fill activities. Natural areas along the creeks and rivers are not likely to be developed because they are flood-prone and city administrators are viewing these areas as potential recreational resources. Thus, future impacts to natural resources in the area are likely to be smaller, piecemeal impacts from recreational development. The consequence or cost of taking no action is the continued incidence of flood damage and related social stresses. No impact to known historic properties would result from taking no action.

PLANS CONSIDERED IN DETAIL

2.19 Comparative impacts of alternatives considered in detail (plus the "No Action" plan) are displayed in table SEIS-1.

LEVEES AND FLOODWALLS

2.20 This is the recommended plan and is the project authorized by the U.S. Congress. The proposed alignment which encompasses almost the whole study area runs along the right bank of Walnut Creek for approximately 10,000 feet, along the left bank of the Raccoon River for approximately 11,100 feet, and then along the left bank of Jordan Creek for approximately 1,000 feet for a total length of 4.2 miles.

2.21 The proposed alignment is the same basic plan recommended in 1975 with some modifications. The modifications include six minor alterations to the levee alignment, some changes to the interior drainage ponding areas, and different borrow areas. The 1975 plan and the 1988 plan with the modifications are shown on plates 2 and 5 of the Reevaluation Report.

TABLE SEIS-1

Comparative Impacts of Alternatives

Base Condition and Alternatives	Acceptable and Implementable	Natural Resources	Endangered Species
Without Condition (No Action)	N/A	Primarily wooded areas along creeks and rivers. Future impacts likely to be small, piecemeal impacts from recreational development.	No Impacts.
PLANS CONSIDERED IN DETAIL			
Levees and Floodwalls. Recommended Plan	Acceptable and implementable.	6 acres of bottomland woods will be affected along the Walnut Creek flank levee. An additional 3 acres of natural vegetation existing as a narrow strip along the creek will also be affected.	No impacts.
Grand Avenue Area Levee - Des Moines.	Not economically feasible; thus not implementable.	Minimal natural resource impacts. Minor aesthetic impacts.	No impacts.
East of 63rd Street at Grand Avenue Area - Des Moines.	Not implementable due to technical infeasibility.	Limited natural resource impacts.	No impacts.
Hoak Drive Tie-Off.	Not implementable. Encroaches on floodway and causes flood height increases greater than allowed by State criteria. Lacks economic feasibility.	Limited natural resource impacts.	No impacts.
Martin-Marietta Area (i.e., Levee Around Martin-Marietta Property.)	Not implementable. Lacks economic feasibility plus suitability of subsurface materials as a levee foundation is questionable.	Limited natural resource impacts.	No impacts.

TABLE SEIS-1 (Cont'd)

Base Condition and Alternatives	Cultural Resources	Social and Economic Resources	Comments
Without Condition (No Action)	No impacts.	Continued threat of flood damage and related social stresses.	This alternative would not contribute to a reduction of the area's flood problems.
PLANS CONSIDERED IN DETAIL			
Levees and Floodwalls. Recommended Plan	No impacts.	2 businesses, 1 residential structure, and 1 small horse barn will be removed. A lumber products storage yard will be divided.	The proposed alignment of the recommended plan is shown on plate 5 of the reevaluation report.
Grand Avenue Area Levee - Des Moines.	Not implementable; thus, not fully evaluated.	Protection provided for 4 residences and 6 businesses on the east side of Walnut Creek.	This alternative is shown on plate 7 of the reevaluation report. This levee would be on the opposite side of Walnut Creek from the recommended levee and woud be built in addition to the recommended levee.
East of 63rd Street at Grand Avenue Area - Des Moines.	Not fully evaluated.	No additional development would be protected.	alternative is shown on [illegible] 7 of the reevaluation [illegible] This is an alternative [illegible] nt in the upstream reaches of [illegible]nut Creek.
Hoak Drive Tie-Off.	Not economically feasible; thus, not fully evaluated.	Five businesses would receive flood protection.	This alternative is shown on plate 7 of the reevaluation report. This is an alternative alignment in the upstream reaches of Walnut Creek.
Martin-Marietta Area (i.e., Levee Around Martin-Marietta Property.)	No impacts.	Buildings and storage yard for a concrete products company would be protected.	This alternative is in the southwest part of the study area and is shown on plate 7 of the reevaluation report.

2.22 The only natural resource of concern which will be affected by project activities is the wooded area along Walnut Creek in the southeast corner of the study area. The area is referred to as "Denman Woods." Approximately 2,900 linear feet of an existing levee will be rebuilt in this area. The levee base and right-of-way will be about 90 feet wide. Thus, approximately 6 acres of land within or adjacent to the woods will be affected. The U.S. Fish and Wildlife Service has performed a quantitative assessment of project impacts using urban wildlife as indicator species. Project impacts were not considered to be excessive. The U.S. Fish and Wildlife Service reviewed the proposed landscape plantings for the project and considered them, along with seeding of the levee and right-of-way with grass species beneficial to wildlife sufficient to offset project impacts. The Fish and Wildlife Coordination Act Report can be found in Appendix F - Pertinent Correspondence of the Reevaluation Report.

2.23 No state or federally listed endangered species impacts have been identified. The U.S. Fish and Wildlife Service has concurred in their Coordination Act Report that the project will have no effect on endangered species.

2.24 Social/economic concerns of the recommended plan include the relocation of two businesses, one residential structure, and a small horse barn. In addition, a lumber products storage yard will be divided. Also in the upstream part of the Walnut Creek flank the new levee will straddle Hoak Drive and cut off access to two businesses. A new access route from the west will have to be provided.

2.25 Auxiliary features of the project include 4 road closures, 4 railroad closures, 2 pump stations, 3 road ramps over the levee, 3 maintenance ramps over the levee, 2 relocated access roads, 4 ponding areas, and 2 borrow sites.

2.26 Two recreation items will be incorporated into the project. One will be a bike path atop the new levee and the other a boat ramp providing access to the Raccoon River. The bike path will be 2.8 miles long and will include 5 ramps to get on or off the levee, 2 railroad crossings, 2 road crossings and 1 vista. The single-lane boat ramp will include a parking lot and an access. Recreation items are shown on plate 6 of the Reevaluation Report.

GRAND AVENUE AREA LEVEE - DES MOINES

2.27 This alternative considered a 1,750-foot levee-floodwall combination that would have protected four residences and six businesses on the east side of Walnut Creek in the vicinity of Grand Avenue. The alternative was not found to be economically justified (benefit-to-cost ratio of 0.06) and was not incorporated into the recommended plan. The alignment of the levee-floodwall combination considered was in a developed urban area, and natural resource impacts would have been minimal. A need for mitigation would not have been likely, and there would be no endangered species concerns. This alternative was not fully evaluated for historic properties since it was not considered

economically feasible to implement. The presence of a levee in this area would have created a minor aesthetic impact. The alternative is shown on plate 7 of the Reevaluation Report.

EAST OF 63RD STREET AT GRAND AVENUE AREA - DES MOINES

2.28 This is an alternative alignment in the upstream reaches of the Walnut Creek flank levee. This alternative was considered at the city's request but was not incorporated into the recommended plan due to technical infeasibility.

2.29 The area which would be affected is a developed urban area where natural resources would be limited. There would be no endangered species concerns.

2.30 The alternative is shown on plate 7 of the Reevaluation Report.

HOAK DRIVE TIE-OFF

2.31 This is also an alternative alignment in the upstream reaches of the Walnut Creek flank levee. This alternative was considered during the current reevaluation at the city's request. The alternative considered 2,500 feet of levee and floodwall, a road closure, and a railroad closure. The alignment would have encroached into the floodway, causing flood height increases greater than allowed by State criteria, and the alternative lacked economic feasibility with a benefit-to-cost ratio of 0.19.

2.32 The area of impact has limited natural resources. Impacts would thus be limited and the need for mitigation would not be likely. Impacts to endangered species would not be a concern.

2.33 The alternative is shown on plate 7 of the Reevaluation Report.

MARTIN-MARIETTA AREA

2.34 This alternative considered extending the levee around the Martin-Marietta property in the southwest part of the study area rather than having the alignment pass landward as it does in the recommended plan. This alternative was not economically feasible (benefit-to-cost ratio of 0.1). In addition, the area considered for the alignment has been subject to extensive fill activity, and the suitability of the subsurface materials as a foundation for the levee is questionable.

2.35 The area which would be affected by this alternative is heavily disturbed with limited natural resource value. Impacts to natural resources would therefore be limited, and the need for mitigation would not be likely. There would be no endangered species concerns.

2.36 The alignment considered is shown on plate 7 of the Reevaluation Report.

SECTION 3 - AFFECTED ENVIRONMENT

3.1 Further descriptions of the project area, in addition to the following, can be found in the U.S. Fish and Wildlife Coordination Act Report in Appendix F - Pertinent Correspondence of the Reevaluation Report.

AREAS AFFECTED BY LEVEE CONSTRUCTION

3.2 West Des Moines and Des Moines are adjoining cities located in Polk County in central Iowa. Walnut Creek flows through the eastern part of West Des Moines and the western part of Des Moines and constitutes the eastern border of the study area. The study area thus consists of the city of West Des Moines and a small section of Des Moines located west of Walnut Creek. The Raccoon River borders the area on the south, and in the southwest the bordering stream is Jordan Creek. Flood-prone areas in the study area border these three streams; the proposed levee would be located between the flood-prone areas and the three streams. Plate 5 of the Reevaluation Report shows the study area, the three streams, and the proposed levee alignment (with minor alternatives to the alignment at different locations).

3.3 The portions of the study area which will be affected by levee construction can be divided into three areas for descriptive purposes:

- Walnut Creek Flank Levee
- Raccoon River Main Stem Levee
- Raccoon River Tie-Off Along Jordan Creek

WALNUT CREEK FLANK LEVEE

3.4 The upstream end of the Walnut Creek flank levee originates in a business area and parallels Walnut Creek for about 10,000 feet until it joins the Raccoon River main stem levee in the vicinity of the Chicago and Northwestern (C&NW) Railroad tracks.

3.5 At the upstream end, the alignment will be superposed over Hoak Drive, extending to Ashworth Road at the south end of the business area.

3.6 For about 1,500 feet on the creek side of the levee section to be superposed over Hoak Drive there is a wooded area between the road and the creek. The wooded area ranges from about 60 feet wide to 200 feet wide due to the meanders of the creek. Plant species observed in the wooded area include elm (Ulmus sp.), box elder (Acer negundo), cottonwood (Populus deltoides), hackberry (Celtis occidentalis), black walnut (Juglans nigra), dogwood (Cornus sp.), honeysuckle (Lonicera sp.), grape (Vitis sp.), Virginia creeper (Parthenocissus quinquefolia), gooseberry (Ribes sp.), and several forbs. The trees observed formed a dense canopy and were present in mixed age groups. A similar wooded area was present on the opposite side of the creek. The area thus exhibited a diverse plant community. The area also was disturbed, isolated within the urban area, and was surrounded on the project side of the creek by industrial and commercial development. The natural resource quality of the area was thus limited.

3.7 South of Ashworth Road the proposed alignment was situated between an area of retail establishments and the west side of 63rd Street for approximately 1,300 feet (within this stretch the levee would convert to concrete floodwalls on both sides of Grand Avenue). No natural resources of note were present along this stretch.

3.8 Proceeding downstream, the levee would cross over 63rd Street (63rd Street being the boundary between West Des Moines and Des Moines) near the southern end of the retail area, approach Walnut Creek, and then parallel the creek for approximately 3,700 feet until about 750 feet downstream from North Valley Drive the levee alignment veers southward while the creek continues its course to the southeast. The levee continues south and ties into the Raccoon River main stem levee just north of the C&NW Railroad tracks (the Raccoon River being south of the railroad tracks). Most of the levee construction in this reach (i.e., from 63rd Street to the C&NW Railroad tracks) will be over an existing levee. On the protected side of the levee in this reach there is a small stretch of commercial establishments in the north end, residential development in the middle, and some treeless fields and an equalization basin for sewage transfer lines in the southern portion. North Valley Drive is located about midway between 63rd Street and the railroad tracks. Just downstream from North Valley Drive and just north of the equalization basin, a patch of woods about 1/2 to 3/4 acre in size is located landward of the levee. On the creek side of the levee at the north end, there is a narrow, naturally vegetated area between the levee and the creek for about 1,400 feet and on the far side of the creek there is a cleared, disturbed area and an abandoned drive-in movie theater. For about 2,900 feet on the south end the levee borders Denman Woods. Denman Woods is a large wooded area that generally borders the Raccoon River with an approximate 100-acre arm that extends into the developed urban area along Walnut Creek. Denman Woods in the areas bordering the levee in general appeared to be mature woods with about a 60 percent canopy and a dense understory. Plant species observed along the levee included elm (Ulmus sp.), honey locust (Gleditsia triacanthos), hackberry (Celtis occidentalis), dogwood (Cornus sp.), Ohio buckeye (Aesculus glabra), elderberry (Sambucus canadensis), grape (Vitis sp.), honeysuckle (Lonicera sp.), green briar (Smilax sp.), moonseed (Menispermum canadense), and some forbs. Although not specifically noted, it is assumed that silver maple (Acer

saccharinum), box elder (Acer negundo), cottonwood (Populus deltoides), mulberry (Morus sp.), and possibly black walnut (Juglans nigra) are species that might typically be observed.

3.9 The Denman Woods area was the only area to be affected by project activities that the U.S. Fish and Wildlife Service determined to have a notable natural resource value. The area was viewed as providing the habitat needs of urban species, i.e., those species such as rabbits, squirrels, and non-game birds that have adapted to living in close proximity to urban areas.

3.10 Walnut Creek is primarily a sand bottom stream with some gravel substrates. No riffle areas were observed, and some channel modifications have occurred in the past. Terraces along the stream were silty.

RACCOON RIVER MAIN STEM LEVEE

3.11 The Raccoon River main stem levee roughly parallels the Raccoon River, but for most of its length is located about 1/2 mile or more from the river. The area between the levee and the river is mostly taken up by water-filled gravel pits. The gravel pits are a natural resource, but their value as such has been heavily impacted by past fill activities.

3.12 Starting at the downstream end of the main stem levee where it connects to the Walnut Creek flank levee, the proposed alignment would run west along the north side of the C&NW Railroad tracks for about 2,000 feet. Landward of this stretch of the levee there are cleared fields and residential areas. Riverward are the railroad tracks and the Raccoon River on the other side of the tracks.

3.13 The proposed alignment then turns south, crosses the railroad tracks, and runs southwest for about 1,250 feet to 63rd Street. Landward along this reach are some commercial establishments. In the northern end of the riverward area are patchy woods that appear to be disturbed by areas cleared for roads and by filling or dumping activities. In the southern end of the riverward area is an approximate 20-acre area of undeveloped bottomland. This area is being included in the project plan for development as a boat ramp (and parking lot) at the request of the city of Des Moines.

3.14 The alignment then continues west across 63rd Street and skirts the northern edge of the gravel pits for about 4,500 feet. Landward of the eastern half of this stretch of levee are a water-filled borrow pit, one or two commercial establishments, and a former residential area. The buildings in the residential area have been razed, and the area might best be described as disturbed. To the north or landward side of this area is a gravel road and the C&NW Railroad tracks which run in a southwesterly direction. In the western half of this stretch of levee the alignment approaches the gravel road and railroad tracks and runs parallel to them. On the riverside along this stretch are the gravel pits which, as stated before, are a natural resource whose value has been heavily impacted by past fill activities.

3.15 Continuing west, the proposed alignment parallels the C&NW Railroad tracks to the tie-in along Jordan Creek. Thus, the railroad tracks are landward of the levee and commercially used land is to the riverward. The commercially used land is referred to as the Martin-Marietta property. The riverward commercial uses include storage for large concrete products (e.g., road culverts) and the weigh station (i.e., scales) and accessory functions of a gravel quarry operation. An alternate alignment which was considered would have routed the levee riverward of this commercially used land along the edge of the gravel pits. However, because of economic infeasibility and past fill activities which questioned the suitability of the subsurface materials for a levee foundation, this alternative was not incorporated into the selected plan.

3.16 The Raccoon River in the project area is a wide, soft substrate river. Observed during low river stages, the substrate appeared to be primarily sand with evident shoaling.

RACCOON RIVER TIE-OFF ALONG JORDAN CREEK

3.17 The downstream end of the Raccoon River Tie-Off along Jordan Creek would originate in the vicinity of the C&NW Railroad tracks. The tie-off would be joined to the main stem levee across the railroad tracks with a sandbag closure. The tie-off would parallel Jordan Creek along its northern bank for approximately 1,000 feet. The banks of Jordan Creek are wooded. The wooded areas are bordered by farm fields with commercial/industrial development beyond them. The tie-off would be aligned through the farm fields.

3.18 Jordan Creek, in the project area, is a high-banked, narrow stream. In the upstream reaches, the banks were higher than in the downstream reaches, and the substrate tended toward rock and cobble, whereas in the downstream areas the substrate was primarily sandy.

PONDING AREAS

3.19 Four ponding areas have been identified for the project. The ponding areas are shown on plate 5 of the Reevaluation Report and are designated as Ponding Areas A, B, C, and D.

3.20 Ponding Area A is a 27-acre detention basin in the southwest portion of the study area. It is a low area, has a square shape, and is surrounded by residential, commercial, and industrial development. The ponding area traversed from northwest to southeast by Fairmeadows Creek which drains the gravel pits along the Raccoon River and from the northeast to southwest by Fuller Road. The portion of the ponding area east of Fuller Road (i.e., about 6 acres) is wooded with sapling to medium growth trees. Species observed included cottonwood (Populus deltoides), ash (Fraxinus sp.), mulberry (Morus sp.), willow (Salix sp.), black walnut (Juglans nigra), and several forb and grass species. West of Fuller Road (i.e., about 21 acres) the only tree

growth is along the banks of Fairmeadows Creek and includes medium growth to mature elm (Ulmus sp.), cottonwood, and mulberry. Most of the area west of Fuller Road is vegetated in forbs and grasses which includes smartweed (Polygonum sp.), dogbane (Apocynum sp.), giant ragweed (Ambrosia trifida), timothy (Phleum pratense) and reed canary grass (Phalaris arundinacea). The lack of mature trees east of Fuller Road and the pioneer nature of some of the species found west of the road are indicative of a disturbed area. The ponding area is considered to be a wetland of reduced quality due to these signs of disturbance and the urban encroachment that surrounds it. Ponding Area A would pond water up to about 1.5 feet deep for 2 or 3 days.

3.21 Ponding Area B is about 3 acres in size and is also located in the southwest portion of the study area. It is currently a farm field, is triangular in shape, and is bordered by more farm field on one side, by industrial development on the north side, and by railroad tracks on the east side. Ponding Area B would pond water about 2.5 feet deep for 2 to 3 days.

3.22 Ponding Area C is about 8.5 acres in size, has an irregular shape, and is located in the southern portion of the study area along the Raccoon River main stem levee. The area includes a water-filled borrow pit, some undeveloped but disturbed land, and a former residential area where the abandoned structures have been razed. Water could pond in this area up to 6 feet deep and potentially for 2 weeks.

3.23 Ponding Area D is about 10 acres in size, has a somewhat rectangular shape, and is located in the southeast portion of the study area along the Raccoon River tie-off at Walnut Creek. The area is generally located between North Valley Drive and the sanitary sewer equalization basin. The area is primarily a fenced off grassed area (i.e., pasture grasses) and may include some portions of an approximate 1/2 to 3/4 acre wooded area on the protected side of the levee. Ponding Area D could pond water up to 7.5 feet deep for a period of 18 to 24 hours.

3.24 In the southwest portion of the study area an alternative alignment was considered in the upstream end of the Raccoon River main stem levee. The alternative would have aligned the levee riverward of commercially used land (referred to as the Martin-Marietta property) along the edge of the gravel pits rather than landward of the commercially used land along the C&NW Railroad tracks. If this alternative would have been incorporated into project plans, an additional 4-acre ponding area at the southwest end of the commercially used land would have been considered. The area is roughly square in shape, is disturbed by commercial use of the land, and could pond water up to 3 feet deep for about a week's duration.

BORROW AREAS

3.25 Two borrow areas have been designated for the project:

- The West Des Moines Borrow Area.
- The Des Moines Borrow Area.

3.26 The West Des Moines Borrow Area is an approximate 30- to 40-acre agricultural field about 2 miles west of the study area near the interchange of U.S. Interstate Highway 35 and State Route 90 (i.e., Grand Avenue). The borrow site is a high knob of land just northeast of the interchange and appeared to be almost 100 percent agriculturally used. The West Des Moines borrow area is shown on plate 4 of the Reevaluation Report.

3.27 The Des Moines borrow site is an area on the eastern edge of the city of Des Moines along Hartford Avenue just south of the Des Moines River. On the Des Moines SE, Iowa, U.S.G.S., 7.5 Min. Quad Sheet, the area is just east of "Pioneer Park" and is referred to locally as "Soldiers Field." It is a large area with large central portions already disturbed by past borrow activities, western bluff areas that are wooded but disturbed by borrow activities and apparent "All Terrain Vehicle" use, and western portions that appeared to be minimally disturbed wooded areas. Borrow areas are scarce in the Des Moines area, and Soldiers Field is the city's normal source of borrow. The area is currently used as a borrow source for other projects and, if not used for the flood control project, will be used eventually for other projects. Use for the flood control project is anticipated to affect approximately 2.5 acres. The Des Moines borrow area is shown on plate 4 of the Reevaluation Report.

THREATENED AND ENDANGERED SPECIES

3.28 Coordination with the U.S. Fish and Wildlife Service has determined that there are no federally listed threatened or endangered species in the project area that would be affected by the proposed action. The U.S. Fish and Wildlife Coordination Act Report containing this determination can be found in Appendix F - Pertinent Correspondence of the Reevaluation Report.

3.29 Coordination with the Iowa Department of Natural Resources has determined that there are no records of protected species or significant natural resources in the project area. A letter from the Data Manager, Natural Areas Inventory, dated June 7, 1988, reflecting this can be found in Appendix F - Pertinent Correspondence of the Reevaluation Report. The letter, however, cautions that the lack of records does not necessarily preclude a rare species from being present. Therefore, if during subsequent stages of the project information on impacts to species of concern were to become available, coordination would be reinitiated with the Iowa Department of Natural Resources to determine if practical solutions were available to avoid the impacts.

3.30 During the preparation of the 1977 Final Environmental Statement (FES), the "showy orchis" (Orchis spectabilis) was described as a listed endangered species and was described as present in nearby Brown's Woods and Denman Woods. In response to comments on the status of the showy orchis, it was reported that the species was not found along the immediate project alignment. In addition, current listings by the Department of the Interior (October 1987) and the Iowa Department of Natural Resources (Endangered and Threatened Iowa

Vascular Plants; November 1978) do not list the showy orchis as a threatened or endangered species.

CULTURAL RESOURCES

3.31 A detailed historic properties survey and assessment of the West Des Moines study area was conducted in conjunction with the 1977 FES for the flood control project (Weichman 1974). A single significant property, the Jordan House, was determined to be in or near the proposed project area. No significant archeological sites were identified. The proposed levee alignment was reevaluated by District archeologists in May 1988. The alignment was resurveyed at this time and also included all revisions to the 1977 alignment. No significant historic properties were found in the levee alignment. Furthermore, it was determined that the proposed project would have No Effect on the Jordan House, a property listed on the National Register of Historic Places.

3.32 The revised ponding area and the proposed West Des Moines borrow area were surveyed for historic properties by Bear Creek Archeology, Inc., under contract with the Rock Island District in September 1988. Neither area contained significant historic properties. The proposed city of Des Moines borrow area had been previously surveyed in association with a different project and also found to contain no historic properties.

3.33 Based on the above investigations, it was determined that the proposed West Des Moines - Des Moines Flood Control project will have no effect on significant historic properties.

SECTION 4 - ENVIRONMENTAL EFFECTS

AREAS AFFECTED BY LEVEE CONSTRUCTION

4.1 As in Section III, Affected Environment, the portions of the study area which will be affected by levee construction can be divided into three areas for descriptive purposes:

- Walnut Creek Flank Levee
- Raccoon River Main Stem Levee
- Raccoon River Tie-Off Along Jordan Creek

WALNUT CREEK FLANK LEVEE

4.2 Project effects on natural resources along the Walnut Creek flank levee will primarily concern two areas:

- Wooded area between Hoak Drive and Walnut Creek in the upstream reaches.

- Denman Woods in the downstream reaches of the flank levee.

4.3 Wooded Area Between Hoak Drive and Walnut Creek in the Upstream Reaches - In this area, the levee will be superposed over Hoak Drive and will border the wooded area for approximately 1,500 feet. Along this 1,500-foot border there is likely to be disturbance to or a loss of woody vegetation for a nominal width. Although this wooded area exhibits a diverse plant community in both composition and age structure, it is also disturbed, isolated within the urban area, and surrounded on the project side of the creek by industrial and commercial development. The natural resource quality of the area is thus limited and impacts are not considered to be significant.

4.4 Denman Woods in the Downstream Reaches of the Flank Levee - The proposed levee alignment from 63rd Street to the C&NW Railroad tracks is about 4,800 feet long. Of this distance, about 2,900 feet actually borders Denman Woods. North of Denman Woods is a 1,400-foot stretch where naturally vegetated areas are confined to narrow bands along the banks of the creek. South of Denman Woods is a 500-foot stretch where the alignment veers away from Denman Woods and crosses fields. In the portion of the alignment bordering Denman Woods, about 1,400 feet is north of North Valley Drive and about 1,500 feet is south of North Valley Drive. For the recommended plan (i.e., the 100-year level of protection) the levee width north of North Valley Drive would be 64 feet and the width south of North Valley Drive would be 70 feet. There would be an additional 20 feet of width for right-of-way. Thus, the total area affected by levee construction in the Denman Woods area would be about 6 acres. In the 1,400 feet north of Denman Woods where natural vegetation is confined to narrow bands along the creek banks, the levee plus right-of-way will occupy about 3 acres. However, the narrow bands of vegetation along the creek banks exhibit a lesser natural resource quality than the contiguous nature of Denman Woods.

4.5 The Denman Woods area was the only natural resource in the area which would be affected by project activities that the U.S. Fish and Wildlife Service considered notable. The area was viewed as providing the habitat needs of urban wildlife, i.e., those species such as non-game birds, rabbits, and squirrels that have adapted to living in close proximity to urban areas. The Service quantitatively analyzed project impacts on the Denman Woods area over a 50-year time period and expressed the impact in terms of the change in Average Annual Habitat Units (AAHU'S). Using rabbits and squirrels as indicator species, a loss of approximately 70 percent in habitat quality was determined for the two species. However, the losses in terms of total habitat units over time were considered to be relatively small, i.e., 4 to 5 AAHU'S. The Final Fish and Wildlife Coordination Act Report which contains a more complete description of the analysis and the results can be found in Appendix F - Pertinent Correspondence of the Reevaluation Report.

4.6 No direct impacts to Walnut Creek are anticipated.

RACCOON RIVER MAIN STEM LEVEE

4.7 The main stem levee alignment passes almost entirely through developed and disturbed areas. Impacts are therefore not considered to be significant.

4.8 The alignment essentially passes along the edge of some water-filled gravel pits, leaving the gravel pits on the riverside of the levee. These gravel pits are a natural resource but have been heavily impacted by past fill activities which have adversely affected their natural resource quality.

4.9 At two places, the levee will be close enough to a gravel pit and a water-filled borrow pit to have levee construction material discharged into the edge of the pit. The water-filled borrow pit is landward of the proposed levee just west of 63rd Street. This area has been designated as Ponding Area C and is shown on plate 5 of the Reevaluation Report. Approximately 1,900 cubic yards of material will be discharged below the ordinary high water (O.H.W.) elevation along about 275 feet of the edge of the borrow pit. The second area is just west of Ponding Area C (at the bike trail vista location) and will involve a large gravel pit riverward of the levee. About 25 cubic yards of material will be discharged below the O.H.W. elevation for a linear distance of 60 feet. These gravel pits are isolated from the river system and are not regulated under Section 404 of the Clean Water Act. Thus, a Section 404 Public Notice will not be issued, a Section 404(b)(1) Evaluation will not be prepared, and application for certification under Section 401 of the Act is not required.

4.10 At the western (i.e., upstream) end of the main stem levee, the proposed alignment will pass landward of commercially used land (referred to as the Martin-Marietta property) along the C&NW Railroad tracks. There are no natural resource impacts. However, an alternative alignment around this commercially used land was considered which would place the alignment riverward of the commercially used land along the edge of the gravel pits. If this alignment would have been selected, the impacts would still not be considered significant because of the disturbed and impacted nature of the area.

4.11 No direct impacts to the Raccoon River are anticipated.

RACCOON RIVER TIE-OFF ALONG JORDAN CREEK

4.12 Starting at the C&NW Railroad tracks, the Raccoon River tie-off along Jordan Creek will extend upstream paralleling the creek for about 1,000 feet. The alignment will be through agricultural fields. This section of Jordan Creek is surrounded by urban development and agricultural land uses. The natural resource value of the creek, which is limited, will not be affected. Impacts are thus not considered to be significant.

PONDING AREAS

4.13 Four ponding areas have been identified for the recommended plan. The ponding areas are shown on plate 5 of the Re-evaluation Report and are designated Ponding Areas A, B, C, and D.

4.14 Ponding Area A is a low, square-shaped 27-acre area surrounded by residential, commercial, and industrial development. The ponding area is traversed from northwest to southeast by Fairmeadows Creek and from northeast to southwest by Fuller Road. The approximate 6 acres east of Fuller Road is vegetated with sapling to medium growth trees, and the approximate 21 acres west of Fuller Road is primarily vegetated with grasses and forbs, except for the creek banks which are wooded with medium growth to mature trees. Some additional excavation of the area may be necessary to achieve required ponding capacity. If so, excavated materials would be used in levee construction. Excavated areas would be seeded in grass species tolerant of wet conditions. After excavation and seeding, the ponding area would succeed back to a wetland of comparable or (because of the lowered elevation) possibly better quality. Water would pond in the area up to 1.5 feet deep for 2 or 3 days. Existing vegetation is expected to tolerate these periods of inundation.

4.15 Ponding Area B is about 3 acres, triangular-shaped, and bordered by more farm field on one side, by industrial development on the second side, and by railroad tracks on the third side. Some excavation of the area may be necessary. If so, excavated materials will be used for levee construction. After excavation, the area would be seeded in grass species tolerant of wet conditions and the area would not likely be farmed again. Area B would pond water 2.5 feet deep for 2 to 3 days. The grass planted in the area would be expected to tolerate this period of inundation.

4.16 Ponding Area C has an irregular shape and is about 8.5 acres in size. The area includes a water-filled borrow pit, some undeveloped, disturbed land, and a former residential area where the abandoned structures have been razed. Some preparation of the area may be required before being used for ponding. Preparatory actions could include excavation to achieve ponding capacity and grading and shaping. Suitable excavated materials would be used in levee construction, and unsuitable materials would be disposed of in an approved landfill. Disturbed areas will be seeded in grass for stabilization. Water could pond in the area up to 6 feet deep and potentially for 2 weeks. Species selected when the area is seeded for stabilization will be selected with tolerance to this period of inundation in mind.

4.17 Ponding Area D has a somewhat irregular shape and is about 10 acres in size. The area is primarily fenced and vegetated in pasture grasses. A small portion of the site may be wooded. Some excavation of the area may be required to achieve ponding capacity. Excavated materials would be used in levee construction. If it becomes necessary to remove any trees, the trees would be disposed of in an approved landfill. Disturbed areas would be seeded in grass for stabilization. This area could pond water up to 7.5 feet deep for a period of 18 to 24 hours. Grass seeded for stabilization and any trees which might be affected could be expected to tolerate this period of inundation.

4.18 At the western end (i.e., upstream end) of the Raccoon River main stem levee, an alternative alignment was considered. The alternative would have aligned the levee riverward of commercially used land (referred to as the Martin-Marietta property) rather than landward along the C&NW Railroad tracks. If this alternative had been incorporated into project plans, an additional 4-acre ponding area would have been considered. The potential ponding area is square in shape and is disturbed by commercial use of the land. Some excavation of the area might have been necessary to achieve required ponding capacity. Suitable excavated materials would have been used in levee construction, and unsuitable materials disposed of in an approved landfill. Disturbed areas would then be seeded with grass for stabilization. The area could pond water up to 3 feet deep for about a week's duration. Grass seeded for stabilization would be selected for tolerance to this period of inundation.

BORROW AREAS

4.19 Two borrow areas have been designated for the project:

- West Des Moines borrow area
- Des Moines borrow area

WEST DES MOINES BORROW AREA

4.20 The West Des Moines borrow area is an approximate 30- to 40-acre agricultural field. Use of the area for borrow will have no effect on natural resources. As a standard construction practice, the topsoil is normally removed, stockpiled, and respread over the area after borrow activities have ceased. Thus, after use for borrow, the area could probably be used again for agricultural purposes. However, current plans have this area designated for development.

DES MOINES BORROW AREA

4.21 The Des Moines borrow area is a large site with large central portions already disturbed by past borrow activities. There are western bluff areas that are wooded but disturbed by borrow activities and apparent "All Terrain Vehicle" use. Eastern portions appear to be minimally disturbed wooded areas. Borrow areas are scarce in the Des Moines area, and this site is the city's normal source of borrow. The area is currently used as a borrow source for other projects and if not used for the flood control project will be used eventually for other projects. It follows that since some areas are disturbed and others are not that the disturbed areas are currently being used for borrow and will likely be the areas used for the flood control project. Borrow use for the flood control project is anticipated to affect approximately 2.5 acres.

SOCIAL IMPACTS OF PREFERRED ACTION

NOISE

4.22 The project plans as proposed in the 1975 Feasibility Report and the 1988 General Reevaluation Report would temporarily increase noise levels during construction of the project. The proposed changes of this report would not significantly alter the amount or locations of construction and there would be essentially no change in noise levels.

DISPLACEMENT OF PEOPLE

4.23 The present plan calls for the removal of one residence and two business sites. These relocations are very minor relative to the scope of the project and the number of properties protected.

AESTHETIC VALUES

4.24 Aesthetic impacts are considered insignificant, as project alignment is often removed from general or residential view. Project alignment through commercial areas might alter aesthetic values marginally. In addition, the project landscaping plan is designed to soften aesthetic impacts.

COMMUNITY AND REGIONAL GROWTH

4.25 No long-term impacts to the growth of community would likely result from the project. Long-term impacts to the immediate project area would be more pronounced than impacts to the region as a whole. Provision of flood protection could bring an end to any migration of neighborhood residents to other parts of the city or region.

COMMUNITY COHESION

4.26 The project would be expected to solidify and improve community cohesion by reducing the incidence of flooding; floodwaters acting as a barrier separating portions of the city would be reduced, allowing for uninterrupted interaction between the various parts of the city. The proposed changes would not alter the overall effect of the previous 100-year flood protection plan.

LIFE, HEALTH, AND SAFETY

4.27 The provision of flood protection would minimize life, health, and safety risks faced by West Des Moines and Des Moines affected by Walnut Creek and the Raccoon River. In particular, the project would reduce the incidence of flood water entering basements. The project would, therefore, help eliminate the health and other risks associated with standing water in residential or other structures. The uninterrupted service of emergency vehicles would be enhanced by the project.

ECONOMIC IMPACTS OF PREFERRED ACTION

PROPERTY VALUES AND TAX REVENUES

4.28 Property values could increase following construction of the proposed flood control project. Related tax revenues could be positively affected by any change in property values.

PUBLIC FACILITIES AND SERVICES

4.29 Services to and from the affected area would improve as a result of the reduced incidence of flooding with the project. An unquantified benefit resulting from the project would be uninterrupted fire and ambulance services; during times of flooding, ambulances currently must drive at reduced speeds, slowing response times. Additional benefits would accrue from reduced damages to schools, parks, water works, city hall, and the police station.

EMPLOYMENT/LABOR FORCE

4.30 The proposed project would not significantly affect the permanent employment or labor force of the cities of West Des Moines and Des Moines. However, the project temporarily would increase area employment during the construction phase.

BUSINESS AND INDUSTRIAL ACTIVITY

4.31 Changes in business and industrial activity would be universal. The increase in business activity occurring from the temporary infusion of construction workers would be absorbed into the area without long-term effect.

4.32 Construction of the project would necessitate the relocation of two businesses. The number of relocations is not of a large enough size to have a significant effect on the population or commercial activity of the project area. Opportunities exist for these businesses to relocate to other locations within the cities of West Des Moines and Des Moines. Therefore, any adverse effects to these businesses would be minimal.

FARM DISPLACEMENT

4.33 The current project proposal would affect no farmsteads or lands zoned for agriculture.

THREATENED AND ENDANGERED SPECIES

4.34 Coordination with the U.S. Fish and Wildlife Service has determined that there are no federally listed threatened or endangered species in the project area that would be affected by the proposed action. The U.S. Fish and Wildlife Coordination Act Report containing this determination can be found in Appendix F - Pertinent Correspondence of the Reevaluation Report.

4.35 Coordination with the Iowa Department of Natural Resources has determined that there are no records of protected species or significant natural resources in the project area. A letter from the Data Manager, Natural Areas Inventory, dated June 7, 1988, reflecting this can be found in Appendix F - Pertinent Correspondence of the Reevaluation Report. The letter, however, cautions that the lack of records does not necessarily preclude a rare species from being present. Therefore, if during subsequent stages of the project information on impacts to species of concern were to become available, coordination would be reinitiated with the Iowa Department of Natural Resources to determine if practical solutions were available to avoid the impacts.

4.36 During the preparation of the 1977 Environmental Impact Statement (EIS), the "showy orchis" (Orchis spectabilis) was described as a listed endangered species and was described as present in nearby Brown's Woods and Denman Woods. In response to comments on the status of the showy orchis, it was reported that the species was not found along the immediate project alignment. In addition, current listings by the Department of the Interior (October 1987) and the Iowa Department of Natural Resources (Endangered and Threatened Iowa Vascular Plants; November 1978) do not list the showy orchis as a threatened or endangered species.

CULTURAL RESOURCES

4.37 Based on the initial evaluation of the proposed project area in conjunction with the 1977 FES (Weichman 1984) and the reevaluation of the project area by District archeologists in May 1988, it was determined that the proposed levee alignment will not impact any significant historic properties. Furthermore, the project will have No Effect on the National Register Jordan House property. In a letter dated July 14, 1988, the Iowa State Historic Preservation Officer concurred with this finding.

4.38 An historic properties survey of the revised ponding area and the West Des Moines borrow area conducted by Bear Creek Archeology, Inc., under contract with the Rock Island District failed to locate any significant historic properties. In a letter dated October 21, 1988, the Iowa State Historic Preservation Officer determined that there were no historic properties which might be affected by project construction at these locations. The proposed city of Des Moines borrow location had been previously surveyed in conjunction with the construction of a levee for the Regional Wastewater Treatment Plant. No historic properties were discovered in this area. By letter dated June 18, 1987, the Iowa State Historic Preservation Officer concurred with this finding.

4.39 Based on the above investigations, it is determined that the proposed West Des Moines - Des Moines Flood Protection project will have no effect on historic properties and may proceed in full compliance with the National Historic Preservation Act.

SECTION 5 - LIST OF PREPARERS

The following people were primarily responsible for preparing this SEIS:

Name	Discipline/Expertise	Experience	Role in Preparing SEIS
Mark Schroeder	Civil Engineer	18 years Federal planning experience	Study Manager

LIST OF PREPARERS (Cont'd)

Name	Discipline/Expertise	Experience	Role in Preparing SEIS
Lere Busch	Civil Engineering Technician	9 years Federal planning experience	Coordinated and compiled Reevaluation Report
Bob Vanderjack	Biologist/Natural Resources	9 years preparation of environmental documents	Coordinated and compiled Supplemental EIS
Ken Barr	Archaeologist/ Cultural Resources	10 years archeological consultant 3 years Federal agency archeologist	Coordinated and compiled cultural resource studies
Patti Risser	Social Science Analyst	5 years Federal socio-economic studies	Socio-economic effects

SECTION 6 - PUBLIC INVOLVEMENT, REVIEW, AND CONSULTATION

PUBLIC INVOLVEMENT PROGRAM

6.1 During the feasibility study, meetings were held with local officials, area residents, and the general public; coordination with interested Federal and State agencies was accomplished through written correspondence; and the Draft Environmental Impact Statement (EIS), a Revised Draft EIS, and the Final EIS were distributed to governmental agencies, citizen's groups, utilities, businesses, industries, and individuals.

REQUIRED COORDINATION

6.2 During the reevaluation, project plans have been coordinated with the U.S. Environmental Protection Agency in response to the National Environmental Policy Act of 1969 (as amended) and the Clean Air Act (as amended); with the U.S. Fish and Wildlife Service in response to the Fish and Wildlife Coordination Act of 1958 (as amended) and the Endangered Species Act of 1973 (as amended); with the Iowa Department of Natural Resources in response to the Fish and Wildlife Coordination Act of 1958 (as amended); and with the Iowa State Historic Preservation Officer in response to the National Historic Preservation Act of 1966 (as amended). Correspondence from these agencies, including a Final Coordination Act Report from the U.S. Fish and Wildlife Service can be found in Appendix F - Pertinent Correspondence, of the Reevaluation Report.

6.3 In response to the Clean Water Act, project plans were coordinated with regulatory elements within the U.S. Army Corps of Engineers to determine if any aspects of the project required processing under Section 404 of the Act. No project activities will occur which require Section 404 processing.

6.4 In response to the Federal Water Project Recreation Act, the recreational needs of the project area were coordinated with the cities of West Des Moines and Des Moines. As a result, a bicycle path atop the proposed levee and a boat ramp on the Raccoon River have been incorporated into project plans.

6.5 In response to the National Historic Preservation Act, the project was coordinated with the Iowa State Historic Preservation Officer. No properties listed on, or eligible for listing on, the National Register of Historic Places will be affected by the proposed project.

6.6 No "Wild and Scenic" rivers or rivers considered eligible for listing as "Wild and Scenic" will be affected. "Wild and Scenic River" coordination with the National Park Service under the Wild and Scenic River Act, as amended, was thus not required.

6.7 No farmland covered by the Farmland Protection Policy Act will be converted to other uses. Agricultural land affected by project activities has been zoned for other purposes and is thus exempted from the Act. Coordination with the U.S. Soil Conservation Service was thus not required.

STATEMENT RECIPIENTS

6.8 The project General Reevaluation Report and Final Supplemental Environmental Impact Statement are being circulated to political representatives, governmental agencies, citizen's groups, and individuals who have an interest in the project. The report distribution list can be found at the end of the project reevaluation document.

PUBLIC VIEWS AND RESPONSES

6.9 The plan of study was coordinated with the cities of West Des Moines and Des Moines. Their views influenced the alignment the proposed levee was to follow, possible alternatives to this alignment, and the locations of ponding areas and borrow areas. The views of the two cities also determined the recreational items which were incorporated into project plans.

6.10 State criteria on induced stage level changes had a strong influence on the levee alignment in the upper reaches of Walnut Creek. These criteria limit the encroachment of the levee into the floodway or alternately require additional protection for induced flooding.

6.11 Coordination with State and Federal agencies identifies natural and cultural resources of concern and influences the selection of alternatives

when feasible alternatives to avoid or minimize impacts exist. The only resource of concern identified was the Denman Woods area in the downstream reaches of the Walnut Creek flank levee.

6.12 Alternative alignments away from the Denman Woods area are not available because of existing urban development (i.e., residential areas and an equalization basin for sewage transfer lines). The alignment selected for the Denman Woods area follows an existing levee and will contribute to a minimization of impacts while providing an aesthetic natural resource setting for a bike path which will be built on top of the levee.

MITIGATION

6.13 Coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources in conjunction with the preparation of environmental documentation helps to determine the significance of natural resources and the degree of impact. The avoidance or minimization of impacts or the compensation for impacts that results from this process is referred to as "mitigation." The U.S. Fish and Wildlife Service in their Final Coordination Act Report identified the Denman Woods area as a resource of concern and provided a quantitative evaluation of project impacts in this area using urban wildlife (i.e., rabbits and squirrels) as indicator species and expressing the impacts in terms of AAHU's.

6.14 Although the analysis indicated that there would be an approximate 70-percent loss of habitat quality in the construction zone over the lifetime of the project, the total loss, over time, would be relatively small (i.e., 4 to 5 AAHU's) for each evaluation species. The Coordination Act Report concluded with recommendations that recognized benefits would be realized from recreational aspects being included in the project design along with landscape plantings beneficial to urban wildlife. Thus, although no specific mitigation plan is being recommended, the inclusion of a bike path atop part of the levee alignment (including the portion through Denman Woods), the construction of a boat ramp on the Raccoon River, an extensive landscaping plan (which includes plant species beneficial to urban wildlife), and the grass seeding of the earthen levee (for stabilization) are aspects of the project design which are considered to have benefits which offset project impacts. There also was a recommendation in the Coordination Act Report that coordination with the U.S. Fish and Wildlife Service continue through the design phase of the project. This will be done.

COMMENTS RECEIVED ON DRAFT REEVALUATION REPORT AND DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

6.15 Several letters were received commenting on aspects of the project design such as the alignment of the levee. Copies of these letters can be found in Appendix F - Pertinent Correspondence. Responses to some of the letters also can be found in appendix F. The concerns of some of the letters

were addressed in meetings. A summary of coordination and meetings on the project can be found in Section 5 of the main report, i.e., "Summary of Coordination, Public Views, and Comments."

6.16 Five comment letters were received that were more specific to the Draft Supplemental Environmental Impact Statement. These follow in a comment-response display format.

State Historical Society of Iowa

The Historical Division of the Department of Cultural Affairs

April 4, 1989

Mr. Dudley M. Hanson, P.E.
Chief, Planning Division
Rock Island District Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

RE: COE - POLK COUNTY - DRAFT GENERAL REEVALUATION REPORT FOR FLOOD CONTROL PROJECT - RACCOON RIVER AND WALNUT CREEK, WEST DES MOINES-DES MOINES, IOWA.

Dear Mr. Hanson:

We have reviewed the draft Report/EIS prepared for the above referenced project. The document adequately incorporates prior consultation with our Bureau in regard to impacts on historic resources.

If the Bureau may be of further assistance, please do not hesitate to contact me at (515) 281-8744.

Sincerely,

Kay Simpson

Kay Simpson
Archeologist, Review and Compliance Program
Bureau of Historic Preservation

SEIS-28

Corps Response:

Noted.

☐ 402 Iowa Avenue
Iowa City, Iowa 52240
(319) 335-3916

☑ Capitol Complex
Des Moines, Iowa 50319
(515) 281-5111

☐ Montauk
Box 372
Clermont, Iowa 52135
(319) 423-7173

United States Department of Agriculture | Forest Service | Eastern Region | 310 W. Wisconsin Ave. Milwaukee, WI 53203

Caring for the Land and Serving People

Reply to: 7150

Date: APR 07 1989

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

Attn: Planning Division
Mr. Mark Schroeder

Dear Mr. Schroeder:

The Flood Control Project providing protection from the Raccoon River and Walnut Creek does not affect National Forest land. We have no comment on the Draft General reevaluation report.

for Thomas A. George
DICK HATHAWAY
Director of Engineering

cc:

Dooley

SEIS-29

Corps Response:

Noted.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

May 5, 1989

Colonel Neil A. Smart, USA
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (Mr. Mark Schroeder)
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

RE: Review and Comment on The Draft General Reevaluation Report for Flood Control Project and Draft Supplemental Final Environmental Impact Statement, West Des Moines and Des Moines, Iowa

We are in receipt of the Draft General Reevaluation Report and Draft Supplemental Impact Statement (DSEIS) referenced above. In accordance with our responsibilities under Section 309 of the Clean Air Act and the National Environmental Act of 1969 (NEPA), we have reviewed the subject report and have rated the document "LO" (lack of objection). However, we offer the following comments for your consideration.

Please refer to page SEIS-12, PONDING AREAS, Sections 3.19-3.24 and to Plate No. 5. In light of the need to pond (retain) water during highflow periods, you may wish to consider installation of water control devices in ponding areas A and B. These sites would lend themselves well to the establishment of wetland sites with minimal control structure construction. Sites C and D could then remain as deepwater holding ponds. The report states that the 27 acre area A is determined to be a low quality wetland and could be substantially upgraded at low cost. This type of water management would provide storage and retention while providing a unique habitat that could be incorporated into the Des Moines area park system for observation of waterfowl and other aquatic plant and animal species.

1.

SEIS-30

Corps Response:

1. The suggestion to enhance the quality of or develop ponding areas A&B into wetlands was discussed with the city of West Des Moines. The city did not feel enthused about pursuing the suggestions for the following reasons:

A. The city has retained a consulting firm which has developed a park master plan for the area referred to as the Jordan Creek Park Master Plan. Ponding areas A&B are neither contiguous to nor relate to this Master Plan.

B. Funds available for these purposes would have been committed to the Jordan Creek Park Master Plan.

C. The operation of ponding areas A and B does not seem compatible with their use as storm detention basins. The ponding areas as they are would need to be empty to have the capacity to hold water. If water were purposely retained in them excavation (or additional excavation) would probably be required to maintain required capacity. Also the water retained for wetland maintenance would be rain water runoff and would thus not be a dependable water supply. The city was also concerned that the type of vegetation encouraged by wetland development might accelerate sedimentation problems thus requiring more frequent excavation maintenance. Thus besides the increased maintenance costs the excavation would destroy the wetland that was being created.

D. Another concern of the city was that these ponding areas are under the airport flight path and to encourage waterfowl to concentrate in the area may have inadvertent safety implications for the operation of the airport.

With proper management, the area could be utilized to grow waterfowl crops and subsequently flooded and drawndown at proper seasonal intervals to encourage the use of the area by ducks and other water/shore birds. The area could also provide mitigation for the loss of habitat due to project construction. While the mitigation would not be "in kind," the addition of a quality wetland area would offset other losses.

If you have any questions, please write to me or call Mr. Dewayne Knott at (913) 236-2823. Thank you for the opportunity to comment.

Sincerely yours,

Katherine Bigp

for Lawrence M. Cavin
Chief, Environmental Review
and Coordination Section

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
230 S. DEARBORN, SUITE 3422
CHICAGO, ILLINOIS 60604

ER-89/263

May 9, 1989

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District - Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

The Department of the Interior (Department) has reviewed the Draft General Reevaluation Report for the Flood Control Project on the Raccoon River and Walnut Creek, West Des Moines-Des Moines, Iowa, with Draft Supplement No. 1 to the Final Environmental Impact Statement. The following is provided for your consideration during future project planning.

The Fish and Wildlife Service (Service) Draft Fish and Wildlife Coordination Act Report of October 5, 1988, is incorporated in the document. The Service has no additional comments to offer at this time.

Other Department bureaus also had no comments to offer on the project or project documents at this time. We appreciate the opportunity to review the proposed project and look forward to continued involvement in the future.

Sincerely,

Sheila Minor Huff

Sheila Minor Huff
Regional Environmental Officer

Corps Response:

Noted.

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

May 23, 1989

Colonel Neil Smart
District Engineer
Corps of Engineers, Rock Island District
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

ATTENTION: Planning Division (Mark Shroeder)

Dear Col. Smart:

The Flood Plain Section of the Iowa Department of Natural Resources has reviewed the Draft General Reevaluation Report for the Raccoon River and Walnut Creek with respect to the State's flood plain management policies. The following comments are offered.

Walnut Creek Levee Impacts on Profiles

Table 2 of the Draft GRR shows the projected increases in profiles due to levee construction. These increases range from 0.1 ft. for the 10 year flood to 1.1 ft. for the Standard Project Flood. The Department's flood plain management criteria basically require that where existing high damage potential uses (e.g., residences) are affected, increases in profiles due to flood plain development shall be minimized and in no case be greater than 1.0 ft. for the 100 year flood. The Walnut Creek levee a[illegible]nt is not inconsistent with Department flood plain management criteria in that he levee does not encroach on the floodway as delineated in the Des Moines an: West Des Moines Flood Insurance Studies. However, the fact remains that construction of the Walnut Creek levee could have some degree of impact on residences and businesses on the east side of Walnut Creek. To our knowledge, there is not an accurate account of the number of structures that will remain floodprone and what impact the levee construction would have insofar as increased depth and frequency of flooding. Anticipating future comments from concerned home and business owners, we suggest that the Corps inventory those structures and provide a survey of first floor elevations, etc.

Level of Protection

A major change in levee design from the 1975 feasibility report is the reduction from the SPF level to a 100 year flood level. Although the levee freeboard would likely provide protection from larger floods, overtopping

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145

SEIS-33

Corps Response:

The concerns expressed by the state are primarily hydraulic or hydrogeological in nature and have been addressed.

However the Corps of Engineers has an obligation under the U.S. Fish and Wildlife Coordination Act to coordinate with respect to fish and wildlife concerns. Thusly the office with the Iowa Department of Natural Resources with fish and wildlife management responsibilities was contacted to see if this letter could be considered to reflect fish and wildlife concerns also. The response was that fish and wildlife concerns could be considered to have been addressed.

floods could occur. The GRR recommends that if overtopping floods were imminent, the interior areas should be allowed to backfill with floodwaters prior to levee overtopping. While this recommendation is sound from an engineering standpoint, it is questionable whether this would ever be carried out. Social, political and possibly legal considerations would likely dictate trying to "hold" the levee until the last possible moment.

Flow Separation

In the area of 63rd and Grand, experience has shown that the west overbank flows separate from the main channel flows, flowing southerly into West Des Moines and dissipating. The levee and floodwall would, of course, prevent this flow separation. It is not known how large of a flow component separates but we suggest a closer look be taken to assure that elimination of this overflow will not significantly affect Walnut Creek profiles.

Thank you for the opportunity to comment and if you should have any questions, feel free to contact our office.

Sincerely,

Brad Cage

JACK D. RIESSEN, P.E.
SUPERVISOR
FLOOD PLAIN PERMITS SECTION

JDR:JR-139A.cef

SEIS-34

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West Des Moines - Des Moines, Iowa; Flood Control Project; General Reevaluation Report.

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APPENDIX A

HYDROLOGY AND HYDRAULICS

GENERAL REEVALUATION REPORT
FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

APPENDIX A
HYDROLOGY AND HYDRAULICS

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WEST DES MOINES - DES MOINES, IOWA

APPENDIX A
HYDROLOGY AND HYDRAULICS

SECTION 1 - INTRODUCTION

GENERAL

This appendix presents the hydrologic and hydraulic analysis of the studied alternatives for the local flood protection of the Valley Junction areas of downtown West Des Moines and the surrounding floodplain areas in both Des Moines and West Des Moines, Iowa. The project area is subject to flooding from the Raccoon River, a major tributary stream of the Des Moines River, and from Walnut Creek and Jordan Creek, tributary streams to the Raccoon River. The protected project area includes 740 acres of residential, commercial, industrial, and public lands located in the 100-year floodplain. The project layout is shown on plate A-1. The Des Moines River confluence is located approximately 7 miles downstream.

A Feasibility Study for Flood Damage Reduction and Related Purposes - Des Moines River Basin (Reference A) was completed in June 1975 by the Rock Island District. The project has not progressed since then due to a lack of post-authorization funding until the 1986 Water Resources Act reactivated the project.

CLIMATOLOGY

Central Iowa has a humid continental climate; average summers are hot and humid and winters are cold and relatively dry. The seasonal distribution of average annual precipitation is highly favorable for agriculture, with over 70 percent falling during the crop growing season. Most of Iowa's precipitation, both winter and summer, comes from warm, moist air masses moving upward from the Gulf of Mexico. The prevailing southerly winds of spring and summer favor increased rainfall, while the dominance of cold polar air masses in winter often blocks the access of moist, tropical air to the region.

The average annual precipitation for central Iowa is 32 inches, with a normal annual snowfall of 31 inches. The five greatest recorded rainfalls at the nearby National Weather Service gage at the Des Moines Airport are listed in table A-1 for selected durations.

TABLE A-1

Five Greatest Recorded Rainfalls, Inches
Des Moines, Iowa
1/1/36 - 12/31/82

15-Minute		30-Minute		60-Minute		24-Hour(1878-1982)	
1.48	6-10-62	1.77	6-23-81	2.53	6-23-81	6.18	8-27-75
1.28	7- 3-73	1.74	8- 1-72	2.36	8-27-75	5.37	6-11-47
1.27	8- 1-72	1.72	7-14-42	2.36	7-14-42	5.14	7- 1-58
1.24	8-14-81	1.69	7- 3-73	2.27	8-11-49	5.14	6-19-1881
1.20	6-23-81	1.64	8-26-77	2.27	8-14-81	4.87	9-16-14

The average yearly temperature in Des Moines is 49 degrees Fahrenheit (F), with the monthly average varying from a low of 21 degrees F in January to a high of 76 degrees F in July. The annual average number of consecutive freeze-free days is 165 days.

SECTION 2 - RACCOON RIVER, WALNUT CREEK, AND JORDAN CREEK FLOODING

GENERAL

RACCOON RIVER

The study area is located on the Raccoon River and Walnut Creek floodplains approximately 7 miles upstream from the confluence with the Des Moines River. The Raccoon River has its headwaters in Buena Vista County in northwestern Iowa, and its watershed includes the 10 counties of Buena Vista, Calhoun, Carroll, Dallas, Greene, Pocahontas, Polk, Sac, and Webster. The river flows southeasterly for 210 miles, with a total watershed area of 3,640 square miles. The average slope per mile of stream is 2.6 feet.

The Raccoon River is a gaged stream. A USGS stream gage is located at Van Meter, Iowa (#054845000), with an upstream drainage area of 3,441 square miles. At Fleur Drive in Des Moines, the Des Moines Water Works has operated a staff gage since 1915. The city of Des Moines upgraded this gage in 1984 to a full service stream gage. Reliable rating curves and data are still in the process of development. The drainage area of the Raccoon River at the project site above Walnut Creek is 3,535 square miles.

WALNUT CREEK

The Walnut Creek watershed drains 82.4 square miles, with the basin lying in portions of Dallas and Polk Counties. The watershed is shown on plate A-2 with the area downstream from Interstate 35/80 being highly developed.

Currently, development has started to "jump" over Interstate 80 to the west where commercial and residential development is planned. It is anticipated that land-use changes will occur in the middle of the watershed in the near future. These anticipated changes were considered in the project hydrology for Walnut Creek. Most of the upper portion of the basin is in agricultural use. In general, the basin consists of moderately to well-drained soils which are classified in hydrologic soil group B by the U.S. Soil Conservation Service.

Walnut Creek is a gaged stream with a USGS stream gage located immediately downstream of 63rd Street in Des Moines (#05484800) with an upstream area of 78.4 square miles. This gage has been in operation since October 1971.

JORDAN CREEK

Jordan Creek, a tributary to the Raccoon River, drains about 10 square miles, as shown on plate A-2. The subbasins within the watershed exhibit a wide variety of land uses, ranging from undeveloped agricultural to highly urbanized. Nearly 70 percent of the watershed lies within the corporate limits of West Des Moines, with the remaining 30 percent in Dallas County. Continued urbanization is occurring throughout the watershed in West Des Moines. Additionally, the residential zoning of the unincorporated portion in Dallas County is an indication that the entire basin will become urbanized. West Des Moines city staff said that within the next 10 years the Jordan Creek watershed will likely become completely developed. These predicted land-use changes were considered in the project hydrology for Jordan Creek. The basin consists of moderately to well-drained soils which are classified in hydrologic soil group B.

Jordan Creek empties into the Raccoon River through a series of gravel pits. The levee alignment lies about one-half mile landward from the Jordan Creek mouth. The Raccoon River floodplain is concurrent with the Jordan Creek floodplain up to the Chicago, Rock Island, and Pacific Railroad bridge. Between the railroad bridge and Fuller Road, spoil banks and levees exist along the right and left banks of the creek. The existing levees are not of constant grade and do not tie into high ground and therefore provide only limited flood protection. The low areas adjacent to these levees and along the railroad tracks appear subject to overflow backwater flooding during major Jordan Creek events. To date, there is no history of damaging floods occurring on Jordan Creek. Also, the stream is ungaged and no highwater data marks are available.

FLOODS OF RECORD

RACCOON RIVER

In 1973, the cities of Des Moines and West Des Moines incurred flood damages from the Raccoon River and Walnut Creek. The floods on the two streams resulted from the same storm system. The Walnut Creek flood crested on July 1, while flows on the Raccoon River were high from July 1-5, with the peak occurring on July 4. The 1973 Raccoon River flood was approximately a 25-year event and the fourth greatest occurrence recorded since 1915 at the Van Meter gaging station located 15 miles upstream from Des Moines. The recorded peak discharge at Van Meter was 35,600 cubic feet per second (ft3/s).

On July 1, 1986, the Raccoon River crested at the Van Meter gage with a peak flow of 40,200 ft3/s. The river crested at 63rd Street in Des Moines the following day, about 1 foot below the 1973 flood. During the 1986 flood, lateral inflows to the Raccoon River were minimal between Van Meter and West Des Moines, thus resulting in some attenuation of the peak flows downstream of Van Meter. A temporary earthen levee was constructed along the Chicago and Northwestern Railroad in West Des Moines, thus keeping the project area from flooding. Aerial photography of the flood was taken on July 3rd, after the river had receded approximately 1.5 feet from the crest. No rainfall occurred on the interior areas when the river was flooding; however, city crews provided temporary pumping at the flapgated storm sewers to evacuate accumulated water from the interior.

A plot of the flood hydrograph at Van Meter is shown on plate A-3. This plot indicates the typical rate of rise and duration of a flood on the Raccoon River and timing of experienced rainfall near the project site. The travel time from the Van Meter gage to the project site is about 15 hours.

The flood of record at Van Meter, 41,200 ft3/s, occurred on June 12, 1947, which is approaching a 50-year peak flow. The third greatest recorded peak was a dependent crest which also occurred in June 1947 on the 25th. This secondary flood crested at 38,000 ft3/s. Table A-2 summarizes major Raccoon River floods.

TABLE A-2

Summary of Major Floods
Raccoon River at Van Meter, Iowa

Peak Flow, ft3/s	Date of Occurrence
41,200	Jun 47
40,200	Jul 86
38,000	Jun 47
35,600	Jul 73
35,200	Jun 17
35,200	Jul 58
32,300	Apr 60
32,000	Sep 26
29,900	Mar 79

WALNUT CREEK

The earliest flood data available on Walnut Creek are from a flood event that occurred in 1947. Limited historical data in the form of highwater marks are also available from minor floods that occurred in 1958, 1961, 1964, and 1965. In October 1971, the USGS installed a stream gage on Walnut Creek immediately downstream of 63rd Street on the left overbank. Thus, little, if any, flood discharge data are available for floods that occurred prior to 1971.

In July 1973, heavy rainfalls over the entire basin resulted in flooding which exceeded any past historically documented flood levels. Although the gage at 63rd Street did not record the peak discharge during the flood, the USGS did use other techniques to estimate the peak discharge. Data indicate that a flood peak of 10,500 ft3/s occurred at the 73rd Street bridge and attenuated to an estimated 9,000 ft3/s at the 63rd Street location. Extensive ground and aerial photographs are available that document the flooding which occurred.

The flood of record occurred in May 1986 resulting from extremely heavy rainfalls in the upper Walnut Creek basin. The recorded peak discharge at the 63rd Street gage was determined to be 12,500 ft3/s. Highwater marks were set in the metropolitan area by both city and USGS staffs. This flood caused extensive flooding along the stream during the nighttime hours; therefore, few photographs are available. Walnut Creek floods since the stream gage installation in 1971 are listed in table A-3.

TABLE A-3

Summary of Floods on Walnut Creek
October 1971 - Present

Peak Flow, ft3/s	Date of Occurrence
12,500	May 86
9,000	Jul 73
8,160	Jun 74
5,800	Aug 75

JORDAN CREEK

There is no record of damaging floods occurring on Jordan Creek and no available experienced flood data. Until the 1970's, the watershed had little development; thus, flooding had been of little consequence. However, now that urbanization is occurring throughout the watershed, the threat of flooding is becoming a concern.

FLOW - FREQUENCY

RACCOON RIVER

Discharges for the Raccoon River at the project site were determined by using flow data from the stream gage at Van Meter. Peak flows for various frequency floods were computed by methods outlined in the U.S. Water Resources Council Bulletin #17B (Reference B). This method uses a Pearson Type III distribution with a log transformation of the flood data. The log-Pearson Type III distribution is defined by three statistical parameters: the mean, the standard deviation, and the skew of the data. Computations were based on 72 years (1915-1986) of gaging station records with a generalized skew of 0.00 for this region and a station adopted skew of -0.20 being used in the analysis. No data on historic flood events outside the 72-year period of record are available; thus, no historic events were included in the analysis.

Discharges at Van Meter were adjusted to the West Des Moines study area on the basis of drainage area ratios raised exponentially to the area regression coefficients listed in Floods in Iowa: Technical Manual for Estimating Their Magnitude and Frequency (Reference C): $Q_{WDM} = Q_{VM} (DA_{WDM}/DA_{VM})$. The drainage area at Van Meter is 3,441 square miles and, at the study area, the drainage area of the Raccoon River has increased to 3,540 square miles. The x_t regression coefficients used for the 10-, 50-, 100-, 200-, and 500-year floods are 0.661, 0.647, 0.642, 0.640, and 0.636, respectively. This drainage area adjustment results in an approximate 2-percent increase in flow values. The Raccoon River flow frequency values are expected to remain stable with no

future increases due to changes of land use or runoff characteristics in the basin.

Basic flow frequency data contained in the 1987 City of Des Moines Flood Insurance Study (FIS, Reference D) correspond to the Corps' results, with the exception that the study discharges include expected probability. Expected probability represents a statistical average of estimated future probabilities based on the existing period of record. The flow frequency data contained in the 1979 City of West Des Moines FIS (Reference E) is somewhat lower than current values due to the 1979 computations using USWRC Bulletin #17 methodology and a shorter period of record.

Peak flows from the multiple regression equations found in Method for Estimating the Magnitude and Frequency of Floods at Ungaged Sites on Unregulated Rural Streams in Iowa (Reference P) were computed to compare with the Bulletin #17B flow frequencies. A hydrologic region 4 was used for the Raccoon River. The results compare favorably when considering that regression equations do not account for the expected probability adjustment. Discharge frequency values are listed on table A-4 and are shown on plate A-4 for the adopted values.

TABLE A-4

Raccoon River
Discharge - Frequency Values

Location	Drainage Area, Square Miles	Discharge, ft3/s Q10	Q50	Q100	Q200	Q500
Raccoon River @ Van Meter	3,441	29,800	45,100	52,000	59,300	69,400
*Raccoon River @ 63rd Street	3,540	30,400	46,000	53,000	60,400	70,700
WDM FIS @ 63rd Street	3,540	29,200	41,100	45,700	---	55,900
DM FIS @ 63rd Street	3,540	28,900	42,900	49,100	---	64,000
Regression Eq. @ 63rd Street	3,540	29,900	39,600	46,000	---	---

* Adopted discharges for the project

WALNUT CREEK

At the request of the local communities in 1975, the Iowa Natural Resources Council (INRC), the USGS and the Corps of Engineers met to discuss the differences between the discharges each agency was using for Walnut Creek and to try to establish a discharge relationship acceptable to all. From this meeting, it was concluded that flow frequency estimates for Walnut Creek which do not exceed USGS estimates (Reference C Regression Equations) by one standard error of estimate at a given frequency level would be adopted. This upward adjustment was made to account for the urban nature of the Walnut Creek watershed. Therefore, a frequency curve was computed using the sum of the original estimates of the USGS and standard error of estimate at respective frequency levels. This curve is shown on plate A-5. Table A-5.1 provides the supporting data for this frequency curve based on the Region I, Model 2 equations with a Walnut Creek main channel slope of 10.5 feet per mile. From this data, the INRC adopted a 100-year Regulatory Flood that ranges from 17,000 ft3/s at the mouth of Walnut Creek to 14,950 ft3/s above 86th Street in Clive. Discharges from this agreement also were used in the 1975 Corps of Engineers report Feasibility Study for Flood Damage Reduction and Related Purposes - Des Moines River Basin. This report outlined flood control measures for West Des Moines and Des Moines to provide protection from Raccoon River and Walnut Creek flooding. Additionally, the above discharges for Walnut Creek are officially recognized by the Federal Emergency Management Agency as the standard for future floodplain development and were used in the Des Moines, West Des Moines, Windsor Heights, and Clive Flood Insurance Studies. These discharges also were utilized in this study.

TABLE A-5.1

Walnut Creek
Discharge Determination Data, Ft3/s

Return Period	USGS	Std. Error	USGS + Std. Error	Adopted
2-Year	2,175	40%	3,050	3,000
5-Year	4,150	29%	5,350	5,300
10-Year	5,730	26%	7,220	7,300
25-Year	7,990	31%	10,460	10,500
50-Year	9,850	37%	13,490	13,450
100-Year	11,800	44%	17,000	17,000

A subsequent 1978 report, Effects of Urban Development on the Flood-Flow Characteristics of the Walnut Creek Basin, Des Moines Metropolitan Area, Iowa (Reference Q) by the USGS concluded that for the 100-year flood to achieve a 17,000 ft3/s discharge, the Walnut Creek watershed would have to experience total urbanization. Thus, the INRC adopted discharges did verify as an upper limit on which to manage future floodplain development.

Another USGS report, Flood Characteristics of Urban Watersheds in the United States, Water Supply Paper 2207 (Reference R), outlines a methodology for

urbanizing the regional regression equations. This methodology applies basin development factors to the basic equations in determining an urbanized discharge-frequency relationship. Expected urbanization of the Walnut Creek watershed would result in a basin development factor of 5. The results of this methodology compare well with the adopted values. The Water Supply Paper 2207 values are listed in table A-5.2.

TABLE A-5.2

Walnut Creek
Discharge - Frequency Values

Method	Discharge, ft3/s Q5	Q10	Q50	Q100	Q200	Q500
*Reg. Regression + 1 Std. Error	5,300	7,300	13,450	17,000	21,000	27,000
HEC-1	5,350	7,600	13,600	16,400	18,400	22,000
Bulletin #17B	4,700	7,000	14,000	17,800	22,300	29,300
WSP 2207	6,600	8,500	13,700	16,800	---	---

* Adopted discharges for Walnut Creek

Since the length of stream gage records was insufficient for any meaningful statistical analysis in 1975, synthetic procedures were utilized to estimate the above frequency curve. Presently, 17 years of systematic events is available at the USGS gage. A U.S. Water Resources Council Bulletin #17B analysis was computed of this relatively short period of record. Computations yielded a rather large standard deviation of 0.391 and a station computed skew of +0.606 in an area with a generalized skew coefficient of -0.400. As such, the Bulletin #17B method yielded results which are considered to trend high based on the hydrologic conditions which existed during the period of record and to have a rather severe expected probability adjustment. The computed Bulletin #17B values without expected probability are listed in table A-5.2. The results, however, do add additional verification to the adopted modified regression discharges as being an acceptable frequency curve for urbanized conditions on Walnut Creek.

Again, a synthetic watershed model approach was utilized as an additional means of comparison to the above modified regression values. A U.S. Army Corps of Engineers' HEC-1 - Flood Hydrographs (Reference F) model using Clark's synthetic unit hydrograph method was developed. The involved hydrologic parameters were verified by a calibration with the May 1986 flood of record. Rainfall distribution data were limited from this flood; however, a good comparison of observed peak flows versus modelled peak flows was achieved based on aggregate rainfall depths which averaged approximately 4.5

inches in the upper Walnut Creek watershed. Hydrologic parameters used in the HEC-1 model reflect urbanized conditions and include:

Time of Concentration = 7.5 hours
Drainage Area = 82.4 square miles
Attenuation Constant = 7.0 hours
Rainfall Losses: Loss Rate Based on RCN of 82

Point rainfall-depth-frequency data for the Walnut Creek watershed were determined from the National Weather Service Technical Paper No. 40 (Reference G). The discharge values from this method compare closely with the values from the modified regression equations. The regression values adopted in the 1975 were selected for continued use in the reevaluation study. Discharges estimates from the various above methods are listed in table A-5.2, and the adopted frequency curve is shown on plate A-5.

JORDAN CREEK

The Jordan Creek watershed is similar in nature to the Walnut Creek watershed, adjacent to each other, and both are undergoing urbanization. West Des Moines city staff expect the watershed to be completely urbanized within the next 10 years. For continuity in study methodology, the flow frequency methods used for Walnut Creek also were used for Jordan Creek. The method involves the regional regression equations contained in Reference C and adjusts these values upward by the standard error of estimate. From this curve (plate A-6), the adopted flow values are listed in table A-6.

As a means of comparison, a synthetic watershed model approach was developed. An HEC-1 model using Clark's unit hydrograph method was used. No flood records exist for Jordan Creek; thus, no calibration of the rainfall/runoff model with observed events could be performed. Parameters used in the HEC-1 model include:

Time of Concentration = 2.3 hours
Drainage Area = 10.3 square miles
Attenuation Constant = 1.5 hours
Rainfall Losses: Loss Rate Based on RCN of 82

Point rainfall-depth-frequency data for the Jordan Creek watershed were obtained from Reference G. The discharge values from this method compare closely with the values from the modified regression equations. Discharges for both are listed in table A-6, and the adopted frequency curve is shown on plate A-6.

In 1980, the INRC published a report, Jordan Creek Flood Plain Study (Reference H) which determined 100-year discharge estimates based on existing land-use conditions. Their values were computed using the U.S. Soil Conserva-

tion Service model TR-20. This 100-year value is listed in table A-6. As expected, the INRC value is lower due to using an existing 1980 land-use condition.

The 1975 report, Reference A, computed the Jordan Creek flow frequency from a plot of mean annual flood vs. drainage area developed from seven central Iowa streams plus the computed standard deviation. These estimates were based on a drainage area of 12.8 square miles at Jordan Creek's mouth, whereas the above estimates were based on the 10.3-square-mile drainage area at the Chicago, Rock Island, and Pacific Railroad bridge project site. The previous 1975 flow estimates are listed in table A-6 and also reflect an allowance for the future urbanization of the watershed.

TABLE A-6

Jordan Creek
Discharge - Frequency Values

Method	Discharge, Ft3/s Q5	Q10	Q50	Q100	Q200	Q500
*Reg. Regression + 1 Std. Error	2,000	3,000	5,500	7,000	8,400	11,000
HEC-1	2,150	3,100	5,400	6,400	7,400	8,600
INRC	---	---	---	5,750	---	---
Mean Ann. Flood + Std. Dev.	1,900	2,850	6,000	8,000	10,400	14,000

* Adopted discharges for Jordan Creek

STANDARD PROJECT FLOOD

RACCOON RIVER

The Standard Project Flood (SPF) is a deterministic flood based on an analysis of regional rainfall characteristics. It is the flood that may be expected from the most severe combination of weather and runoff conditions that are considered reasonably characteristic of the drainage basin, excluding extremely rare conditions. The Raccoon River watershed above Van Meter was subdivided into three basins for which unit hydrographs were published in appendix A of the Master Reservoir Regulation Manual - Red Rock Reservoir, dated 1968 (Reference I). Using these unit hydrographs and the procedures outlined in EM 1110-2-1411, Standard Project Flood Determinations (Reference J) and appropriate rainfall losses, SPF hydrographs were then routed to Van Meter to yield the combined SPF hydrograph for the entire basin, as shown on

plate A-7. The peak flow was then adjusted to the project location by the square root of the drainage area ratio. The resultant peak at 63rd Street is 143,000 ft3/s.

WALNUT CREEK

On Walnut Creek, a Standard Project Storm (SPS) was computed to determine the resultant SPF in Des Moines. The HEC-1 SPS routine was used to compute the SPF event in accordance with EM 1110-2-1411. The 24-hour, 200-square-mile index rainfall was determined to be 11.0 inches, with the average percent adjustment for area and duration of 123 percent. Storm computations indicated 13.6 inches of rain over a 96-hour period for the total SPS storm. Rainfall losses amounted to 4.1 inches, resulting in 9.5 inches of runoff. The SPF hydrograph showed a peak flow of 32,000 ft3/s and is shown on plate A-8.

JORDAN CREEK

Likewise, the HEC-1 SPS routine was used to compute the SPF event on Jordan Creek. The 24-hour, 200-square-mile index rainfall was determined to be 11.1 inches with the average percent adjustment for area and duration of 140 percent. Storm computations indicated 15.8 inches of rain over a 96-hour period for the total SPS storm. Rainfall losses amounted to 2.9 inches, resulting in 12.9 inches of runoff. The SPF hydrograph showed a peak flow of 12,600 ft3/s (plate A-9).

WATER SURFACE PROFILES

GENERAL

The hydraulic analysis for this study was conducted using the U.S. Army Corps of Engineers' HEC-2 - Water Surface Profiles computer program (Reference K). The program uses the backwater computational procedure generally known as the Standard Step Method to calculate the water surface profiles. The analysis for this project used the HEC-2 models developed in conjunction with the FIS's for Des Moines and West Des Moines. The initial channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment based on field observations. The HEC-2 models were then calibrated to experienced flood profiles on the Raccoon River and Walnut Creek. For the Raccoon River channel, an "n" value of 0.035 was used and an "n" value of 0.040 was arrived at on the Walnut Creek channel. Overbank "n" values of 0.080 - 0.100 were used on the Raccoon River floodplain and 0.070 - 0.090 on the Walnut Creek floodplain. Since no flood records exist for Jordan Creek, there is no basis for model calibration. Therefore, reasonable "n" values and conveyance characteristics were used based on previous modelling experience.

An "n" value of 0.040 to 0.045 was used on the Jordan Creek channel, and overbank "n" values ranged from 0.070 to 0.100.

The hydraulic analyses of this study are based on the effects of unobstructed flow. The flood elevations, as shown on the profiles, are therefore valid only if the hydraulic structures and conditions remain essentially the same as ascertained during this study. Historical experience is that neither ice nor debris jamming on the streams in this reach has been a conducive element in flooding. Additionally, the cities of Des Moines and West Des Moines are participating in the National Flood Insurance Program. Thus, developmental encroachment into the floodways is not expected to occur.

RACCOON RIVER

Backwater computations on the Raccoon River were run to document existing condition profiles with the adopted flow values. The HEC-2 model included the Raccoon River reach from the mouth at the Des Moines River to Walnut Woods State Park. Most runs were initiated at Fleur Drive at River Mile 205.4 and extended to the upper end at River Mile 213.7. The project levee reach lies between River Miles 208.5 and 211.5 (Profile Stations 16500 and 31500). Starting water surface elevations were obtained from a rating curve developed from the FIS profile - flow data at Section 205.4. The computed existing condition flood profiles are shown on plate A-10.

Water surface profiles for project conditions were computed by modifying the cross sections through the levee reach to reflect the alignment. All flood events were modelled such that the levee was not overtopped. These profiles are shown on plate A-11. The lower end of the proposed Raccoon River levee, Levee Station 101+00 to 120+00, lies landward of the FIS floodway. From Levee Station 78+00 to 101+00, the proposed alignment coincides with the established floodway. At the upper end, Levee Station 0+00 to 78+00, the alignment is again landward of the floodway. This ensures that the increases in flood levels due to the levee encroachment on the floodplain are less than the 1-foot allowance prescribed by the State of Iowa and the cities of Des Moines and West Des Moines floodplain management criteria as participating communities in the National Flood Insurance Program. Backwater computations indicate that the water surface elevations of the 10-, 50-, 100-, 200-, and 500-year and SPF floods would be increased by the amounts shown in table A-7. These maximum increases are observed in the river reach immediately upstream of the levee reach and are based on an alignment that protects the Martin-Marietta maintenance buildings. Any alternative levee alignments which are located landward of this will create less encroachment than the values listed.

TABLE A-7

Impacts of Levee on Raccoon River Profiles

Flood Event (Year)	Increase in Profile Elevation (Feet)
10	0.2
50	0.5
100	0.5
200	0.6
500	0.7
SPF	1.0

WALNUT CREEK

Backwater computations also were run on Walnut Creek to document existing condition profiles with the adopted flow values. The HEC-2 model included the Walnut Creek reach from the mouth to upstream of the I-235 embankment. The starting water surface elevations for Walnut Creek were based on a mid-level Raccoon River receiving stream concurrent flood elevation. The mid-level elevation is based on a bankfull Raccoon River flow (approximately 2-year event) plus the incoming Walnut Creek flood flows. This methodology was utilized to avoid a possible overstating of the Walnut Creek Flood damages on the lower reaches since, historically, flood peaks on each stream do not coincide. The 1973 pattern prevails when a typical storm system causes high water on each stream. In 1973, Walnut Creek peaked 3 days before the Raccoon River peak reached the project site. Additionally, hydraulic characteristics of the confluence area are that the Walnut Creek channel enters the Raccoon River floodplain at a skewed angle with the mouth of Walnut Creek being located almost 1 mile downstream of the levee. This results in the Raccoon River being the dominant controlling flood source for design levee elevations on the lower reaches of the Walnut Creek levee. Final levee design profiles were based on Raccoon River flooding plus 3 feet of freeboard on the Walnut Creek levee reach up to North Valley Drive. From this point, Walnut Creek flood levels plus 4 feet of freeboard control. These hydraulic characteristics result in essentially no change in final design levee elevations even if the Walnut Creek profiling was started at the mouth based on equivalent coincidental Raccoon River flooding. The existing condition profiles for Walnut Creek are shown on plate A-12.

Water surface profiles for project conditions were computed by modifying the cross sections through the levee reach to reflect the proposed Walnut Creek alignment. All flood events were modelled such that the levee was not overtopped. These profiles are shown on plate A-13. The first 600 feet of Walnut Creek levee, Levee Station 120+00 to 126+00, lies landward of the FIS floodway. From Levee Station 126+00 to the upstream end of the levee, the alignment coincides with the FIS floodways for Des Moines and West Des Moines. This ensures that the increases in flood levels due to the levee encroachment

This ensures that the increases in flood levels due to the levee encroachment on the floodplain is compatible with the 1-foot allowance prescribed by the State of Iowa and National Flood Insurance Program regulations. Backwater computations indicate that the water surface elevations of the 10-, 50-, 100-, 200-, 500-year and SPF floods would be increased by the amounts shown in table A-8. These maximum increases are observed in the stream reach immediately upstream of the levee reach to Center Street.

TABLE A-8

Impacts of Levee on Walnut Creek Profiles

Flood Event (Year)	Increase in Profile Elevation (Feet)
10	0.1
50	0.5
100	0.6
200	0.9
500	1.0
SPF	1.1

JORDAN CREEK

Backwater computations on Jordan Creek were run to establish the existing condition profiles with the adopted flow values. The previous hydraulic studies, the 1975 Corps report and the 1980 INRC report, were based on channel and overbank geometry in part obtained from the 1974 2-foot topography mapping of West Des Moines. The West Des Moines city engineering staff has since determined that this mapping was up to 4 feet off in areas in the vicinity of the Jordan Creek tie-off, and that the Fuller Road bridge opening has been improved. Therefore, new surveyed channel and immediate overbank cross sections were obtained on the Jordan Creek reach from below the Chicago and Northwestern Railroad upstream to above Fuller Road. This new survey data provided the input to the current HEC-2 backwater model. The development, which has occurred in the Fuller Road area adjacent to Jordan Creek, was considered as an existing condition.

As noted earlier, the Jordan Creek channel and overbanks below Fuller Road are congested; affected by bridges, spoil banks, irregular levees, encroachments, and flat, extensive overbank areas. The existing condition profile model was started 1,400 feet downstream of the railroad, and starting water surface elevations were based on a computed rating curve. The obtained starting elevations are slightly above the equivalent Raccoon River flood levels at this location. The HEC-2 model indicated that the Jordan Creek profiles for the tie-off reach are dictated primarily by the bridge hydraulics at the railroad and the obstructed conditions upstream to Fuller Road. For floods of the 100-year event and larger, weir flow exists over the railroad

embankment and roadgrade overflow occurs at Fuller Road. Upstream of Fuller Road, the Jordan Creek valley narrows, with steep topography confining the floodplain between Grand Avenue and Delevan Road. The computed existing condition flood profiles are shown on plate A-14.

Water surface profiles for project conditions were computed by modifying the cross sections through the levee reach to reflect the projected alignment with an upstream tie-off above Fuller Road. All flood events were modelled such that the levee was not overtopped. Additionally, project conditions assumed that the existing left bank spoil bank levees would be allowed to continue to deteriorate such that their obstruction to flood flows on Jordan Creek will be minimized. This will allow for continued improvement of the hydraulic conditions between the new levee alignment and the channel. The project profiles are shown on plate A-15. Project flood profiles were compared to the existing condition profiles to determine encroachments. These increases in profile are listed in table A-9. No regulatory floodways have been established on this reach of Jordan Creek. The increases are within the 1-foot allowance.

The potential for debris blockages at the Chicago and Northwestern Railroad bridge exists. Therefore, an analysis was performed to determine the impacts on profiles in case the bridge opening was to become 20 percent blocked. This analysis showed the profile increases to be localized at the railroad overflow section. The main increase was observed in the 10-year profile which does not overtop the railroad embankment. The assumed blockage caused the 10-year profile to increase 1.1 feet immediately upstream of the bridge. The higher frequency floods were not impacted as significantly as the 10-year event due to the extensive railroad embankment overflow minimizing the blockage impacts. It was concluded that no additional allowances are needed concerning the potential for possible debris blockages other than the normal freeboard requirements.

TABLE A-9

Impacts of Levee on Jordan Creek Profiles

Flood Event (Year)	Increase in Profile Elevation (Feet)
10	0.0
50	0.1
100	0.1
200	0.2
500	0.3
SPF	0.6

FLOW DURATION

All-year flow durations on the Raccoon River and Walnut Creek were obtained from the Van Meter and 63rd Street stream gages. These flow duration curves

are shown on plates A-16 and A-18. A Raccoon River Valley discharge rating curve at the project site is shown on plate A-17, and the Walnut Creek discharge rating curve at the 63rd Street gage is shown on plate A-19. Closure elevations for the interior drainage areas addressed later are also noted.

FREEBOARD AND LEVEE SUPERIORITY

As part of levee design heights, the effects of wind setup, ice effects, water surface profile stability, variability of hydraulic roughness factors, allowance for debris, levee settlement, inaccuracies and shifts in hydrology, and overtopping superiority were considered as outlined in ETL 1110-2-299, Overtopping of Flood Control Levees and Floodwalls (Reference L). If a flood higher than the design flood were to occur on the Raccoon River or Walnut Creek, the project levee would be in jeopardy. The result of overtopping would be widespread flooding and damages. At the Van Meter gage, the rate of rise to peak is greater than 24 hours, and the travel time to the project area is 15 hours. Thus, more than 1.5 days of advance warning time is usually available once heavy rainfall occurs in the Raccoon River basin. The duration of Raccoon River levee overtopping for the SPF would be 4 days, whereas a 500-year flood which could also threaten the levee would have a critical peak duration of less than 1 day. Overtopping durations on Walnut Creek would be less than 12 hours for all flood events including the SPF.

Volumes of Raccoon River floodwaters would be sufficient to reach equilibrium in the interior and exterior areas. If it is known that an imminent flood on the Raccoon River will overtop the project levee, it is recommended to allow the interior area to flood from the road closure at 63rd Street. Likewise on Walnut Creek, if an overtopping flood were to occur, it is recommended to allow interior flooding to be initiated at the North Valley Drive ponding area. This will allow the interior areas to backfill with floodwaters having nondamaging velocities. Allowing the interior area to fill will minimize potential catastrophic results of having the project area flooded by swift-moving floodwaters from an upstream levee overtopping or breaching. Damage to the levee itself also will be minimized if this levee superiority concept is applied.

In order to ensure proper levee superiority as discussed above and to allow for the many variables which influence the accuracy and stability of the design water surface profiles, the levee will be built with 4 feet of freeboard at the upstream end of the Raccoon River and transitioning to 3 feet between Stations 42+00 and 60+00. On the Walnut Creek levee, the Raccoon River flood level plus 3 feet of freeboard will govern up to North Valley Drive, at which point Walnut Creek flood levels plus 4 feet of freeboard will control.

SECTION 3 - INTERIOR FLOODING

GENERAL

The interior drainage area resulting from the proposed levee construction totals 2,305 acres (3.6 square miles) of residential, commercial, industrial, and public use development as shown on plate A-20. The interior area is essentially fully developed with only a few remaining parcels of undeveloped land. In general, the interior area slopes southeasterly toward the Raccoon River and Walnut Creek channels.

DESCRIPTION OF INTERIOR AREAS

The 3.6 square miles of interior area was divided into seven sub-areas which reflect unique drainage and outlet characteristics. A 105-acre watershed, Area 1, is referred to locally as the Clegg Road storm drainage. The recommended levee alignment currently leaves this area outside of the line of protection. Area 2 consists of the 155-acre drainage in the Grand Avenue and Ashworth Road area of West Des Moines. Several storm sewer outlets are located in this area which outlet under 63rd Street to Walnut Creek. Area 3 is 150 acres of mainly residential property lying in both Des Moines and West Des Moines and outlets to Walnut Creek. Area 4 is 20 acres of residential property lying mostly in Des Moines and outlets to the Raccoon River. Area 5, 880 acres, consists of the downtown Valley Junction area of West Des Moines and the residential and commercial property surrounding the downtown area. Area 6 is the Fairmeadows Creek watershed, having a drainage area of 1,000 acres. Area 7 is a 100 acres of local drainage at the upstream end of the Raccoon River levee reach which outlets into the lower Jordan Creek system. Specific design analysis on these areas will be addressed later.

INTERIOR FLOODING METHODOLOGY

The interior drainage watersheds were modelled with the HEC-1 Flood Hydrograph program. The HEC-1 model includes drainage areas, times of concentration, Clark's unit hydrograph method, and rainfall-runoff relationships in arriving at resultant runoff hydrographs for given frequency storms.

The times of concentration (Tc) for the interior areas were determined using the composite travel times method which is applicable to urban areas. The travel times method is based on watershed length, slope, and surface conditions, and uses the SCS travel velocities found in SCS Technical Release No. 55, Urban Hydrology for Small Watersheds (Reference M). Travel velocities were based on surface flow conditions.

The Clark's unit hydrographs for each area are based on the basin's drainage area, time of concentration, and Clark's basin attenuation constant, R. R can

be difficult to estimate in small, urban, ungaged watersheds. However, past experience with Rock Island District watersheds indicates that a reasonable range of R is between 0.47 and 1.00 times Tc. For the interior areas, an R value from 0.67 to 1.00 times Tc was used depending on the watershed's characteristics. Land use in the interior watersheds is essentially fully urbanized; thus, future hydrologic conditions will remain the same as base project conditions. The hydrologic values for the interior areas are listed in table A-10.

TABLE A-10

Hydrologic Values for Interior Areas

Area #	Drainage Area, Ac.	Tc, Min.	R, Min.	RCN
2	155	15	10	85
3	150	30	22	82
4	20	9	9	82
5	880	90	90	82
6	1000	66	45	82
7	100	20	15	82

Point rainfall-depth-frequency data for the Des Moines region were obtained from Reference G. Rainfall losses for infiltration were computed by the SCS Runoff Curve Number (RCN) method. The RCN is determined based on the watershed's hydrologic soil type, land use, and antecedent moisture conditions. The hydrologic soil types consist of the type B classification. The initial rainfall loss (Ia) is computed by the following:

$$S = \frac{1,000}{RCN} - 10$$

$$Ia = 0.2(S) \text{ inches.}$$

Runoff hydrographs for the interior were derived by the convolution of the unit hydrographs and rainfall/runoff values via HEC-1. Runoff hydrographs were computed for storms ranging from a 2-year to the 100-year event.

Runoff volumes from the interior drainage areas also were modeled by a second method involving the Rock Island District computer program AGDRAN (Reference N). The AGDRAN program computes the interior runoff via a volumetric computation based on historical rainfall, monthly runoff factors, daily distribution percentages, and drainage area. The analysis is a period-of-record type analysis. Also included are data on the concurrent exterior river stage and seepage factors. For this study, an AGDRAN analysis using discrete flood events was used to model blocked gravity conditions. The time period modelled was from 1947 to 1986 using a combination of historical stages and stream gage records on both the Raccoon River and Walnut Creek.

INTERIOR FLOOD ANALYSIS AND DESIGN

The interior flood analysis and design was done using the multiple discrete event method as described in EM 1110-2-1413 Hydrologic Analysis of Interior Areas (Reference 0). The multiple discrete events analysis is based on the development of interior stage-frequency functions for areas affected by coincident (interior and exterior) flooding. The method generates a composite stage-frequency function from analysis of two conditions. The first involves analysis of selected high stage exterior flood events of historic record that affect interior flooding. The second condition involves analyses of low exterior stages associated with an interior flood analysis generated by hypothetical frequency storm events. The result is a stage-frequency function for each of the two conditions. They are then combined into a composite function by the application of the joint probability theorum.

Composite interior ponding frequency curves were developed for each interior area of the levee project. A total of six areas were analyzed, two along Walnut Creek and four along the Raccoon River. The composite curves represent the residual interior ponding with the proposed gravity outlets, ponding areas, pump stations, and flood control levee in association with the existing drainage facilities. The reductions in residual damages, based on the with pumping curves, represent the supportable cost of pumping each area. Four alternatives for ponding on interior Area 6, Fairmeadows Creek, were studied: no ponding, existing ponding, 20 acres of improved ponding, and 27 acres of improved ponding. The following addresses each interior area analysis in detail.

AREA 1

This 105-acre drainage basin located at the upstream end of the Walnut Creek levee is situated outside of the recommended line of protection. The levee alignment will tie off from Hoak Drive to high ground located along Clegg Road. The 48-inch RCP storm sewer which serves as the outlet is located immediately upstream of the tie-off. Thus, no remedial interior drainage facilities are needed for this area. If the levee were to tie off further north, as proposed in the 1975 feasibility report, excess runoff from Area 1 would pond between Hoak Drive and the Des Moines Union Railway. This would necessitate an excavated ponding area to be created and possibly pumping facilities. Extending the levee further upstream also would heighten the concerns of floodplain encroachment that exist.

AREA 2

Area 2 is a 155-acre watershed tributary to Walnut Creek consisting of upland residential and commercial development and the floodplain area having exten-

sive commercial development. The area is serviced by two 24-inch RCP and three 36-inch RCP storm sewers. There is a low area in the business district along Grand Avenue which experiences ponded water in the streets and parking lots during heavy rainfalls. The recommended design includes gating the five storm sewers and connecting the lower four sewers together with a 24-inch RCP interceptor sewer landward of the proposed floodwall and levee as shown on plate 14 of the main report. A pump station will be placed at the Valhigh storm sewer adjacent to 63rd Street and where the intercepted flows are collected for pumping during blocked gravity conditions. Excess runoff will be temporarily ponded in the existing low-lying streets and parking lots. The stage versus storage curve for this existing ponding is shown on plate A-21.

The analysis for Area 2 involved computing the hypothetical frequency storm events and the discrete period-of-record runoff simulation, and routing these storms through the existing facilities and several design alternatives involving pumping capability. Pumping capacities of 5,000, 10,000 and 25,000 gpm were studied. These routings yielded the composite interior ponding curves shown on plate A-22. The ponding elevation vs. frequency curves are a composite of the gravity flow and blocked gravity analyses. The analysis computed a 100-year interior ponding elevation of 817.2 feet National Geodetic Vertical Datum (NGVD), with the three pumping rates reducing the peak elevation to 816.4, 815.1, and 813.7 feet NGVD, respectively. The pumping parameters included a closure elevation at 812.0 feet NGVD and subsequent pump activation at the 812 level and a pump off at 810.0 feet NGVD. The average annual residual damage values were computed by economics, as were the associated annual costs of each pumping capacity. The analysis of pumping capacity resulted in a justified pump station with a 10,000 gpm capacity.

AREA 3

Area 3 is a 150-acre watershed tributary to Walnut Creek. The area is primarily residential and has very little relief. Interior runoff is presently discharged into Walnut Creek via a variety of storm sewers. At Station 177+50, a 30-inch RCP outlet will be gatewelled. At Station 162+00, a 24-inch RCP storm sewer which serves the Legion Park area of West Des Moines outlets. The proposed drainage plan will abandon this outlet and intercept the sewer with a 24-inch RCP. The interceptor sewer will run southeasterly along the levee until Station 160+00, at which point it joins a 30-inch RCP storm sewer serving Des Moines and 63rd Street as shown on plate 15 of the main report. The 30-inch outlet will be abandoned and joined with the interceptor sewer with the size increasing to a 42-inch RCP. The 42-inch interceptor will continue along the levee to Station 153+00, where an 18-inch CMP storm drain which provides local drainage will be intercepted with the outlet abandoned. The 42-inch interceptor will continue on to downstream of North Valley Drive. At this location, the interceptor flows into the proposed Area 3 ponding area just above the ponding area outlet structure. The ponding area is a 10-acre site which will be excavated to 799.8 feet NGVD. The excavated material will be utilized as borrow material for the levee construction. The proposed stage versus storage for this ponding area is shown on plate A-22. The outlet is proposed to be a 48-inch RCP gravity outlet with a gatewell closure. Site

drainage along the levee will be graded so as to drain toward the ponding area. This site grading will allow for the abandonment of two CMP culverts through the existing levee which provide site drainage at Stations 130+00 and 134+00.

The analysis for Area 3 involved computing the hypothetical and discrete period-of-record storm events and routing them through the proposed ponding area and outlet. Two pumping alternatives, 5,000 and 10,000 gpm, also were evaluated. These routings yielded the composite interior ponding curves shown on plate A-24. The analysis computed a 100-year interior ponding elevation of 807.7 feet NGVD, with the two pumping rates reducing the peak elevation to 806.1 and 804.2 feet NGVD, respectively. The pumping alternatives were found to have an insufficient supportable cost; thus, pumping provisions are not recommended. The operation plan includes a closure elevation of 800.5 feet NGVD.

AREA 4

Area 4 is a 20-acre residential watershed located in Des Moines adjacent to 63rd Street. A 36 inch RCP storm sewer outlet to the Raccoon River provides drainage for the area. The outlet has an existing gatewell closure, however, it will need to be upgraded with a higher gatewell structure located at the levee intercept. The existing gatewell structure can remain since removal is not necessary. Blocked gravity conditions and excessively heavy rainfalls during gravity conditions will result in interior runoff ponding temporarily in the nearby streets. The stage versus storage curve for this existing ponding is shown on plate A-25.

The analysis for Area 4 involved computing the hypothetical and discrete storm events and routing them through the existing 36-inch outlet and street ponding. A 2,000 gpm pumping alternative was also evaluated. These routings yielded the composite interior ponding curves shown on plate A-26. The analysis computed a 100-year interior ponding elevation of 809.9 feet NGVD, with the 2,000 gpm pumping rate reducing the peak elevation to 809.3 feet NGVD. The pumping alternative was found to have an insufficient supportable cost; thus, pumping provisions are not recommended. The operation plan includes a closure elevation of 808.0 feet NGVD.

AREA 5

Area 5 is an 880-acre watershed tributary to the Raccoon River. The area consists of the central drainage basin of West Des Moines and includes the downtown area which is referred to as the Valley Junction area. Interior runoff from Area 5 is presently discharged to the Raccoon River through two storm sewer systems. A 6-foot by 6-foot RCB storm sewer outlet discharges at 8th Street (Station 57+50) and a 48-inch RCP storm sewer outlets between Fifth and Sixth Streets (Station 67+00). Direct overland flow to the river is presently blocked by the Chicago and Northwestern Railroad embankment.

The city of West Des Moines intends to upgrade the existing storm drainage for the Valley Junction area in association with the flood control project. The recommended interior drainage plan for Area 5 is to excavate an 8.5-acre ponding area between the levee and the railroad as shown on plate 5 of the main report. The proposed stage versus storage curve is shown on plate A-27. The gravity outlet structure was sized at a twin 8-foot-wide by 4-foot-high RCB. The existing 6-foot by 6-foot RCB storm outlet will be gatewelled and intercepted with a 60-inch RCP during blocked gravity conditions. During Raccoon River stages below the closure elevation of 803.5 feet NGVD, the storm sewer will outlet the same as it presently does. The existing 48-inch RCP outlet flows will be routed through the ponding area under all flow conditions. The future locally sponsored storm sewer improvements along Fourth Street also will flow directly into the proposed ponding area.

The analysis for Area 5 involved computing the hypothetical and discrete period-of-record storm events and routing them through the proposed ponding area and outlet. Two pumping alternatives, 10,000 and 25,000 gpm, also were evaluated. These routings yielded the composite interior ponding curves shown on plate A-28. The analysis computed a 100-year interior ponding elevation of 810.5 feet NGVD, with the two pumping rates reducing the peak elevation to 810.3 and 808.5 feet NGVD, respectively. The pumping parameters included a gatewell closure at 803.5 feet NGVD and subsequent pump activation at the 803.5 level and a pump off at 800.8 feet NGVD. The average annual residual damage values were computed by Economics Branch, as were the associated annual costs of each pumping capacity. The analysis of pumping capacity resulted in a justified pump station with either a 10,000 or 25,000 gpm capacity. It is recommended the larger 25,000 gpm capacity be installed to handle excessive underseepage which may be found in future detailed seepage analyses or possible reductions in ponding area size due to increased required offsets from the levee.

AREA 6

Area 6 is a 1,000-acre watershed tributary to the Raccoon River. The watershed's channel has been named Fairmeadows Creek. The watershed consists of upland residential development, and the floodplain area is commercial and industrial property. Interior runoff from the watershed flows in a southeasterly direction to the river through a complex drainage system. Fairmeadows Creek flows into an existing 30-acre detention storage area upstream of Fuller Road with the detention area divided by Fuller Road. Flows exit the detention area via an ungated 36-inch RCP outlet into a concrete trapezoidal channel which is intermittently covered between the detention area and the Chicago and Northwestern Railroad. A twin 5.5-foot by 6-foot RCB culvert exists under the railroad, and downstream is a twin 72-inch RCP culvert under an access road. Further downstream is another access road with a small restrictive culvert. The Fuller Road detention area and concrete channel were constructed by a local industry to alleviate Fairmeadows Creek from flooding their downstream facilities. This industry is no longer functional, and future use of the detention area is questionable.

The recommended interior drainage plan is to acquire the detention area and upgrade the site into a ponding area. An economic evaluation established the feasibility of acquiring 27 acres of the present detention site to ensure its continued use as a detention/ponding area. The upgrading would involve deepening the existing detention area by approximately 2 feet, berming the low spots in the perimeter of the ponding area, and constructing a gated 48-inch RCP outlet structure and overflow section. The excess excavated material would be used as borrow material in the levee construction. Detailed design of this upgrading will need to be performed in the next level of study when accurate topography mapping is available. A secondary alternative involved only acquiring the 20 acres upstream of Fuller Road for use as a ponding area. The stage vs. storage curves for the existing detention pond and the two upgraded alternatives for ponding are shown on plate A-29.

At the levee, a gravity outlet of sufficient size to accommodate future upgrading of the collection system is recommended. Thus, a twin 8-foot by 8-foot RCB outlet has been preliminarily recommended. If future studies find that collection improvements are unlikely, this outlet could be downsized to a twin 6-foot by 6-foot RCB to match the existing facilities at the railroad. The proposed outlet would replace the existing twin 72-inch CMP's under the access road. It is also recommended that the next downstream access road be abandoned and breached at the restrictive culvert crossing. A site plan for this area is shown on plate 14 of the main report. As shown, the proposed ponding area is located upstream of the levee alignment with development between. Thus, the operation plan is that under gravity flow conditions on the Raccoon River, the 48-inch ponding area outlet would be set such that outflows would match the downstream 150 ft3/s channel capacity. Upon closure of the [illegible] the levee, the ponding area outlet also would be closed. Of note is the fact that these outlets lie on the upper fringes of the Raccoon River floodplain and would have historically not required closure with pumping to date. This results in no justification for installing pumping from a period-of-record type analysis.

The analysis for Area 5 involved computing the hypothetical and discrete period-of-record storm events and routing them through four ponding area alternatives; loss of existing ponding, existing ponding, 27-acre improved ponding, and 20-acre improved ponding. No pumping alternatives were evaluated due to the lack of closure periods with runoff in the analysis. These routings yielded the composite interior ponding curves shown on plate A-30. The analysis computed a 100-year interior ponding elevation of 819.1 feet NGVD for the condition showing the loss of the existing ponding area, and the existing ponding conditions yielded a 100-year peak of 817.7 feet NGVD. The two improved ponding alternatives lowered the peak elevation to 817.0 feet NGVD for the 20-acre improved site and 816.4 feet NGVD for the 27-acre improved site. The operation plan includes a closure elevation of 814.0 feet NGVD.

AREA 7

Area 7 is a 100-acre watershed tributary to Jordan Creek. The watershed consists of commercial and industrial development and is outletted by a 36-inch RCP culvert under the Chicago and Northwestern Railroad. Immediately downstream is an 18-inch RCP culvert under an at-grade access road and then the proposed levee alignment. Downstream of the access road, a sand and gravel operation has disturbed the drainage path to Jordan Creek. The city of West Des Moines has indicated that South 11th Street may be extended through this area and that the drainage at the railroad might be improved. However, these improvements are conceptual with no definite plans.

Additionally, this interior area potentially may be subject to overflows from Jordan Creek with the recommended Raccoon River levee tie-off. These overflows are predicted to occur with Jordan Creek flood events exceeding a 25-year level of flooding flanking the levee tie-off. Past floodplain management regulatory mapping has projected these overflows to pond in the lower-lying property adjacent to the Chicago and Northwestern Railroad embankment in areas where no residual damages would occur. New mapping will be available during the next study phase to verify if these potential overflows are limited to the non-damaging areas. Historically, these overflows have not occurred. Thus, no experienced flooding has occurred on which to calibrate projected flooding. As such, if future studies determine that a problem exists, the following interior facilities may need to be enlarged to accommodate potential overflows from Jordan Creek, and the corresponding residual damages would need to be determined.

The interior drainage plan for this area is to enlarge the low-lying area upstream of the railroad embankment to a 4-acre ponding area. The proposed stage versus storage curve is shown on plate A-31. The excavated material can be used as borrow in the levee construction. Drainage through the railroad embankment will be cleaned out and an 48-inch RCP gravity outlet is recommended at the levee. A downstream outlet ditch will need to be provided to Jordan Creek, as the previous sand and gravel mining operations have restricted the natural drainage course. The recommended layout is shown on plate A-1. Again, as with Area 6, the outlet is located at the upper fringe of the Raccoon River floodplain with closure occurring only during extreme flood events.

The analysis for Area 7 involved computing the hypothetical and discrete period-of-record storm events and routing them through the proposed ponding area and the railroad culvert. Two pumping alternatives, 2,000 and 5,000 gpm, also were evaluated. These routings yielded the composite interior ponding curves shown on plate A-32. The analysis computed a 100-year interior ponding elevation of 819.9 feet NGVD, with the two pumping rates reducing the peak elevation to 819.6 and 819.4 feet NGVD, respectively. When accurate 2-foot topography mapping becomes available, these computed elevations will need to be verified. The pumping alternatives were found to have an insufficient supportable cost; thus, pumping provisions are not recommended. The operation plan includes a gatewell closure elevation of 816 feet NGVD.

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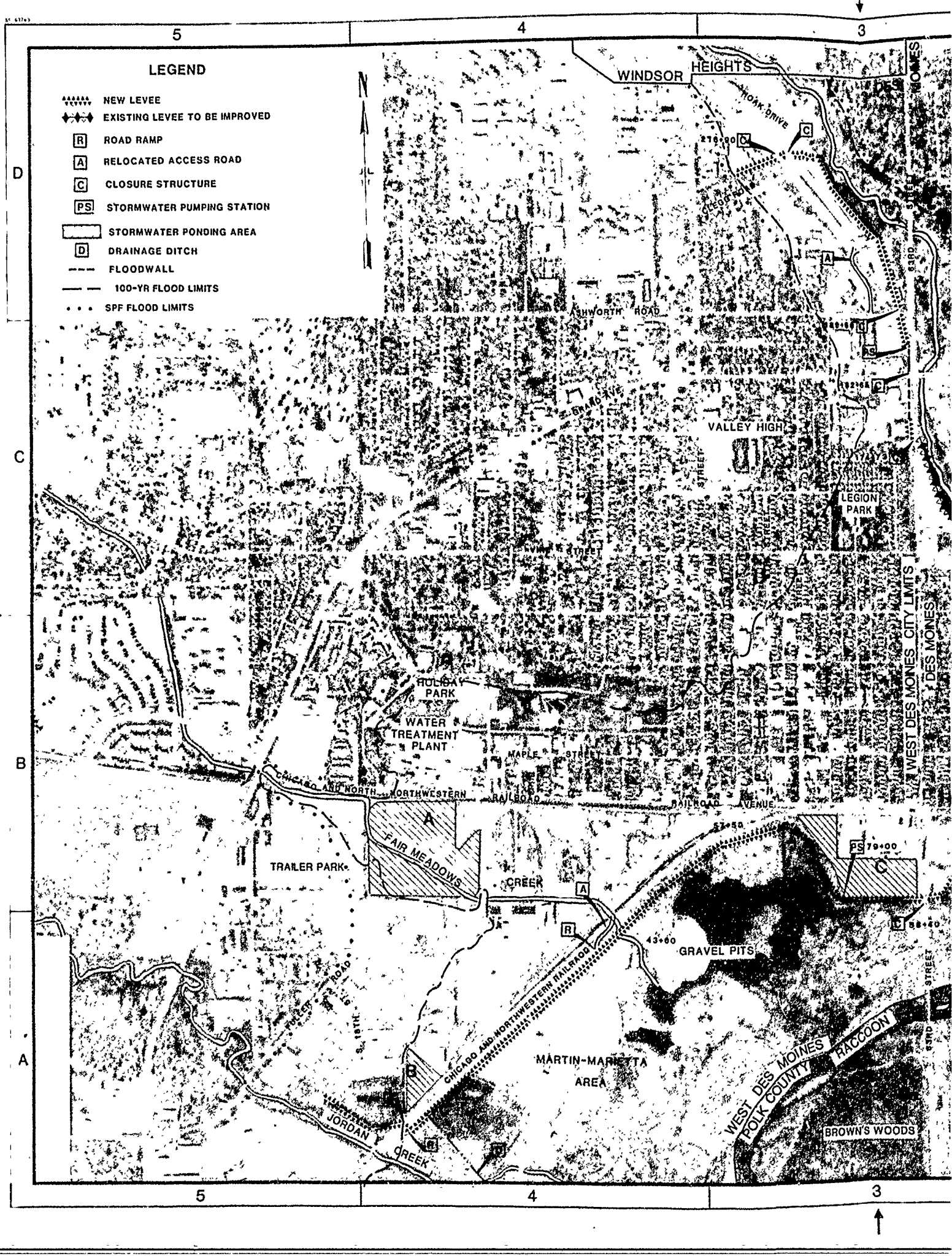
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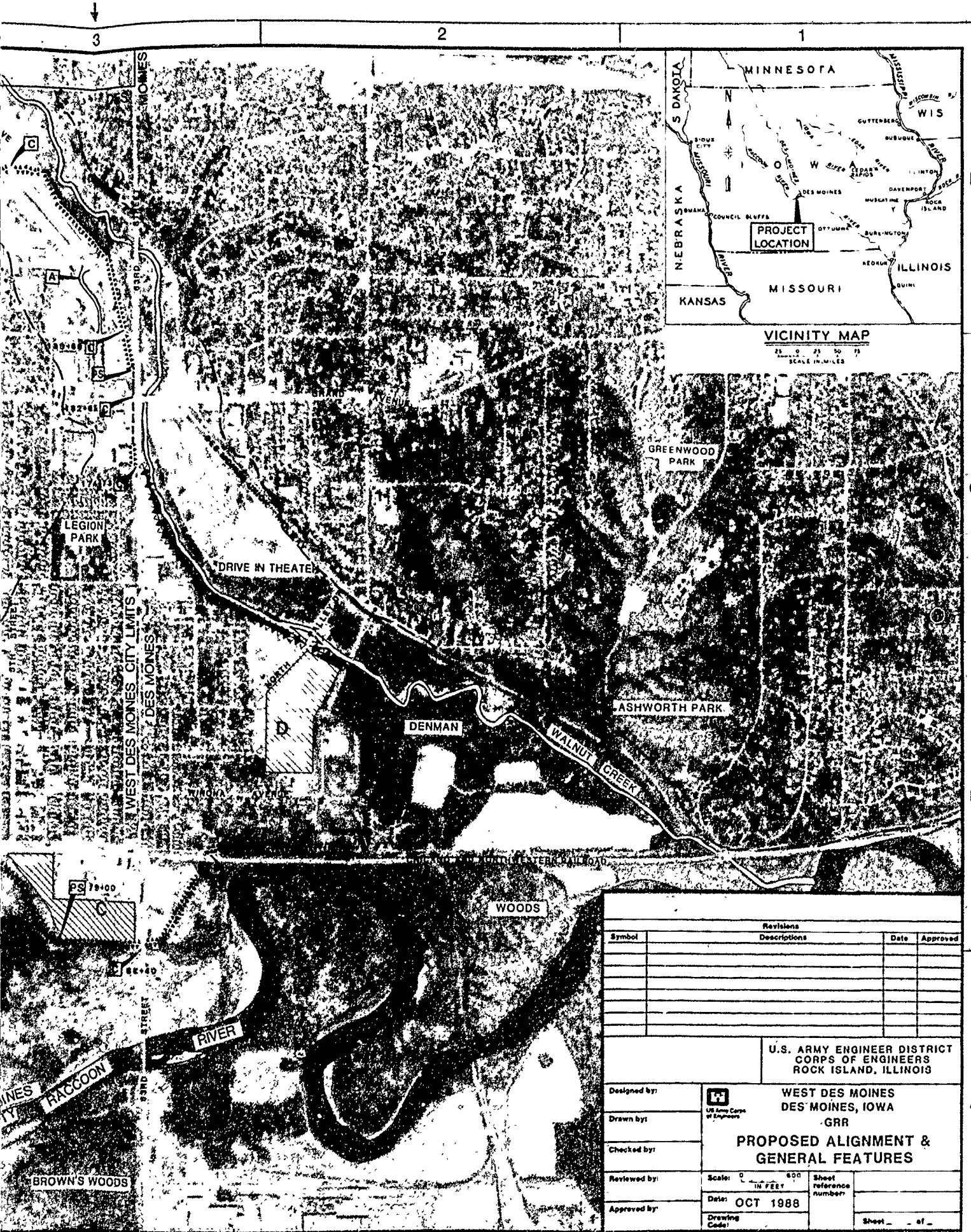
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LEGEND
NEW LEVEE
EXISTING LEVEE TO BE IMPROVED
R ROAD RAMP
A RELOCATED ACCESS ROAD
C CLOSURE STRUCTURE
PS STORMWATER PUMPING STATION
STORMWATER PONDING AREA
D DRAINAGE DITCH
FLOODWALL
100-YR FLOOD LIMITS
SPF FLOOD LIMITS
N
5
4
3
D
C
B
A
WINDSOR HEIGHTS
DES MOINES
HUNK DRIVE
270+00
CLEORA RD
ASHWORTH ROAD
BRAND AVE
VALLEY HIGH
STREET
LEGION PARK
VINE STREET
WEST DES MOINES CITY LIMITS
DES MOINES
HOLIDAY PARK
WATER TREATMENT PLANT
MAPLE STREET
CHICAGO AND NORTH WESTERN RAILROAD
RAILROAD AVENUE
TRAILER PARK
FAIR MEADOWS
CREEK
52+50
PS 79+00
88+40
43+60
GRAVEL PITS
CHICAGO AND NORTHWESTERN RAILROAD
S 18TH STREET
MARTIN-MARIETTA AREA
WEST DES MOINES
POLK COUNTY
RACCOON
63RD STREET
BROWN'S WOODS
JORDAN CREEK



Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:

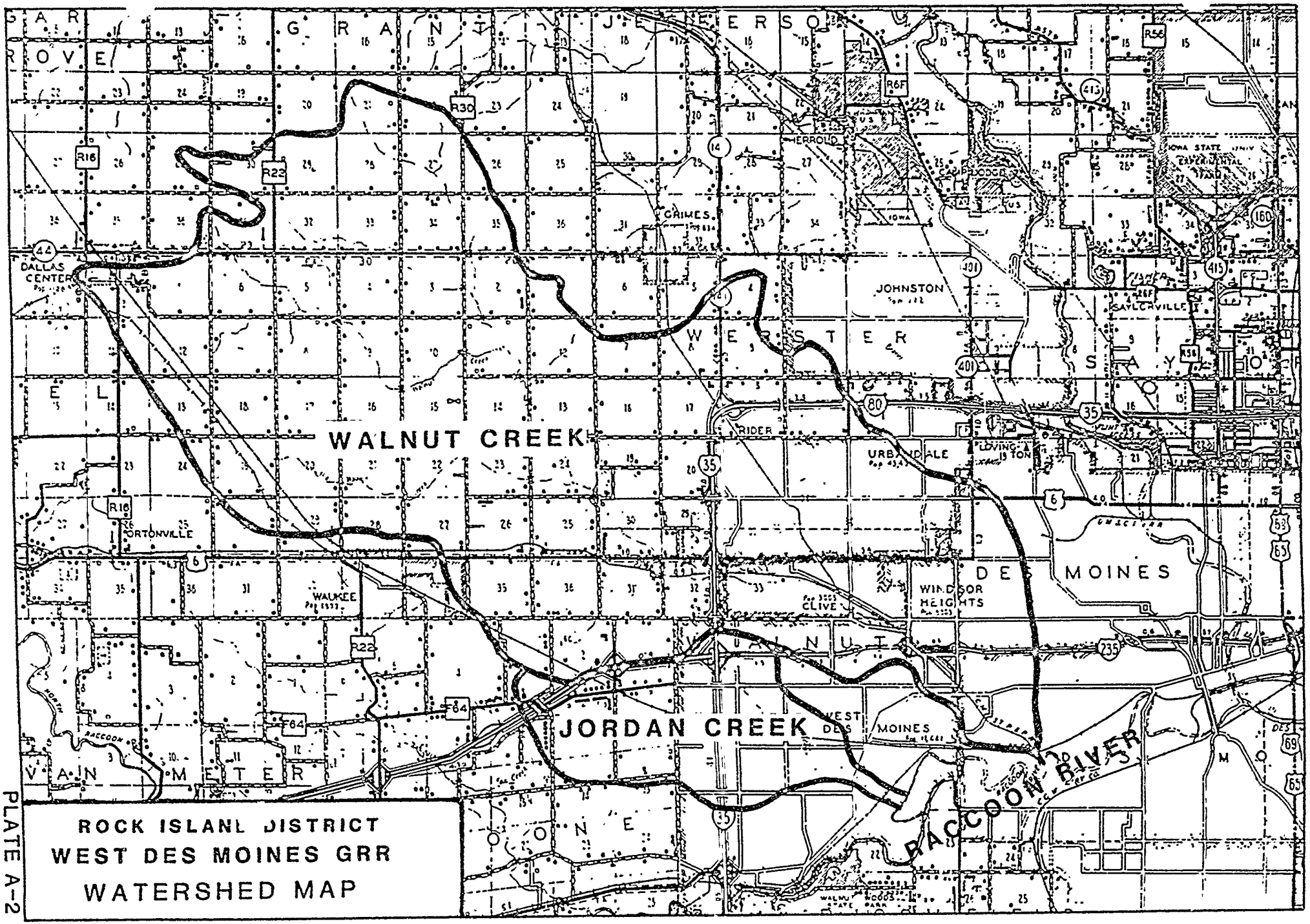
US Army Corps of Engineers

WEST DES MOINES
DES MOINES, IOWA
GRR

PROPOSED ALIGNMENT & GENERAL FEATURES

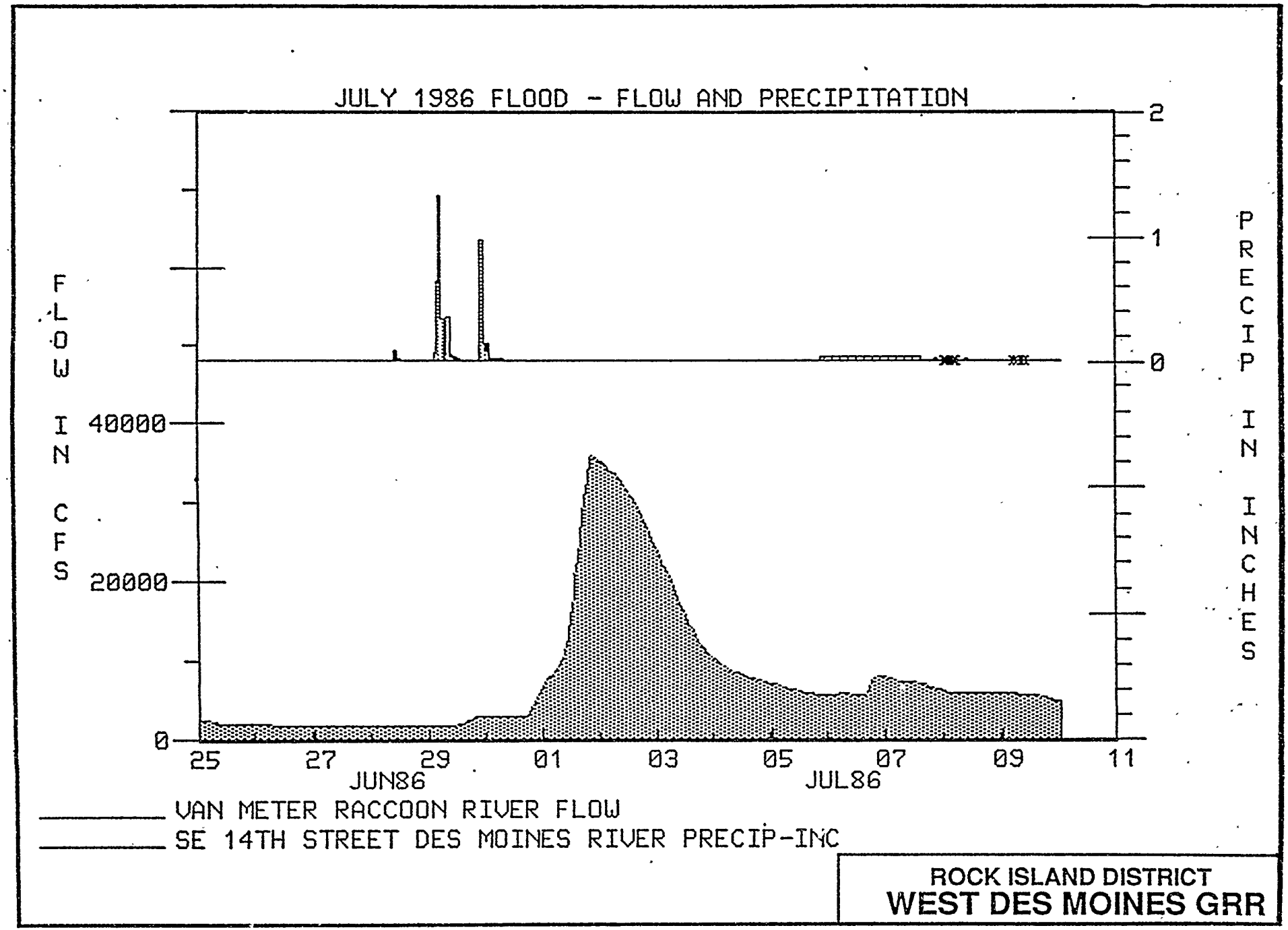
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Sheet _ of _

PLATE A-1



ROCK ISLAND DISTRICT
WEST DES MOINES GRR
WATERSHED MAP

PLATE A-2



ROCK ISLAND DISTRICT
WEST DES MOINES GRR

PLATE A-3

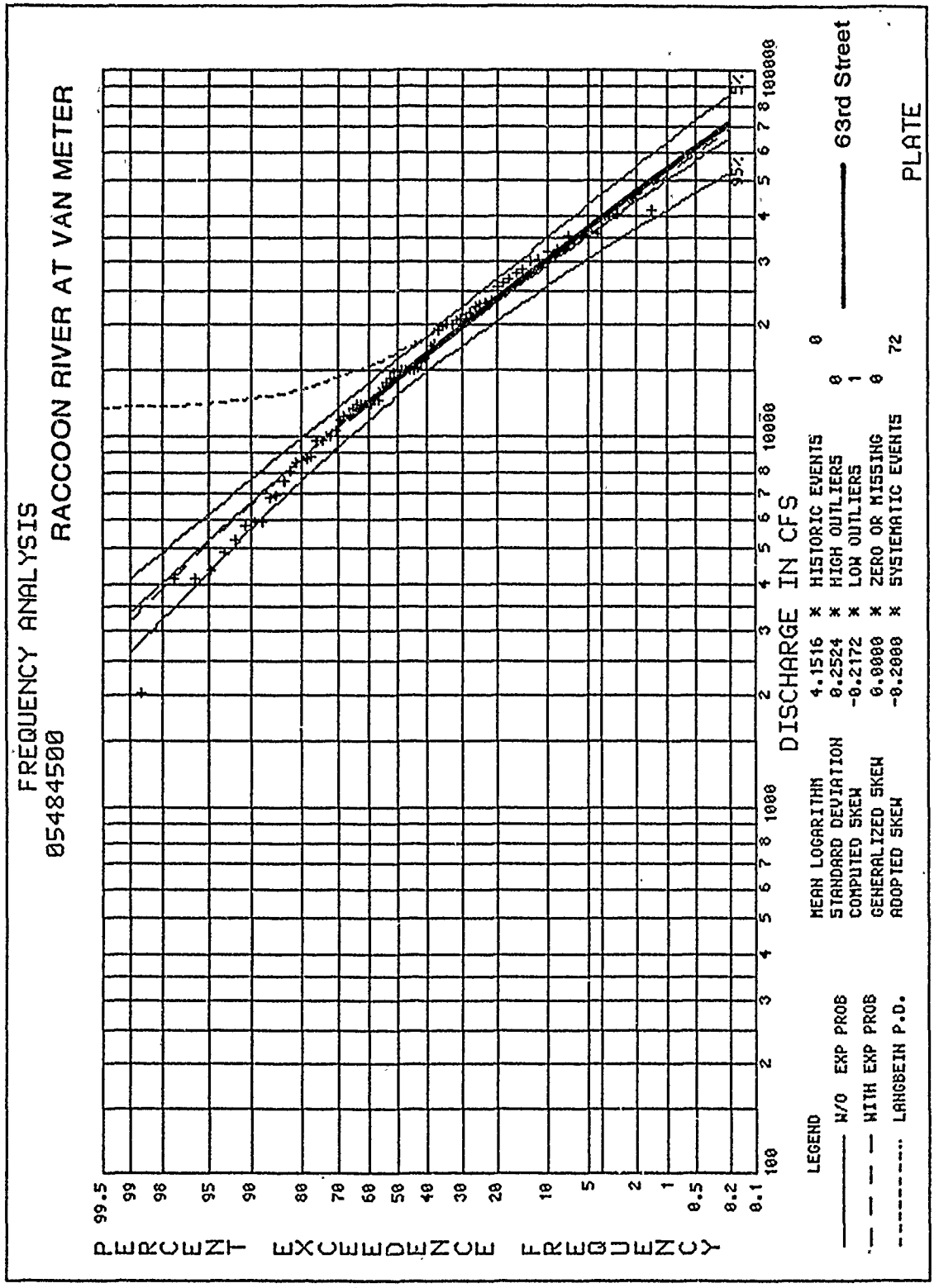
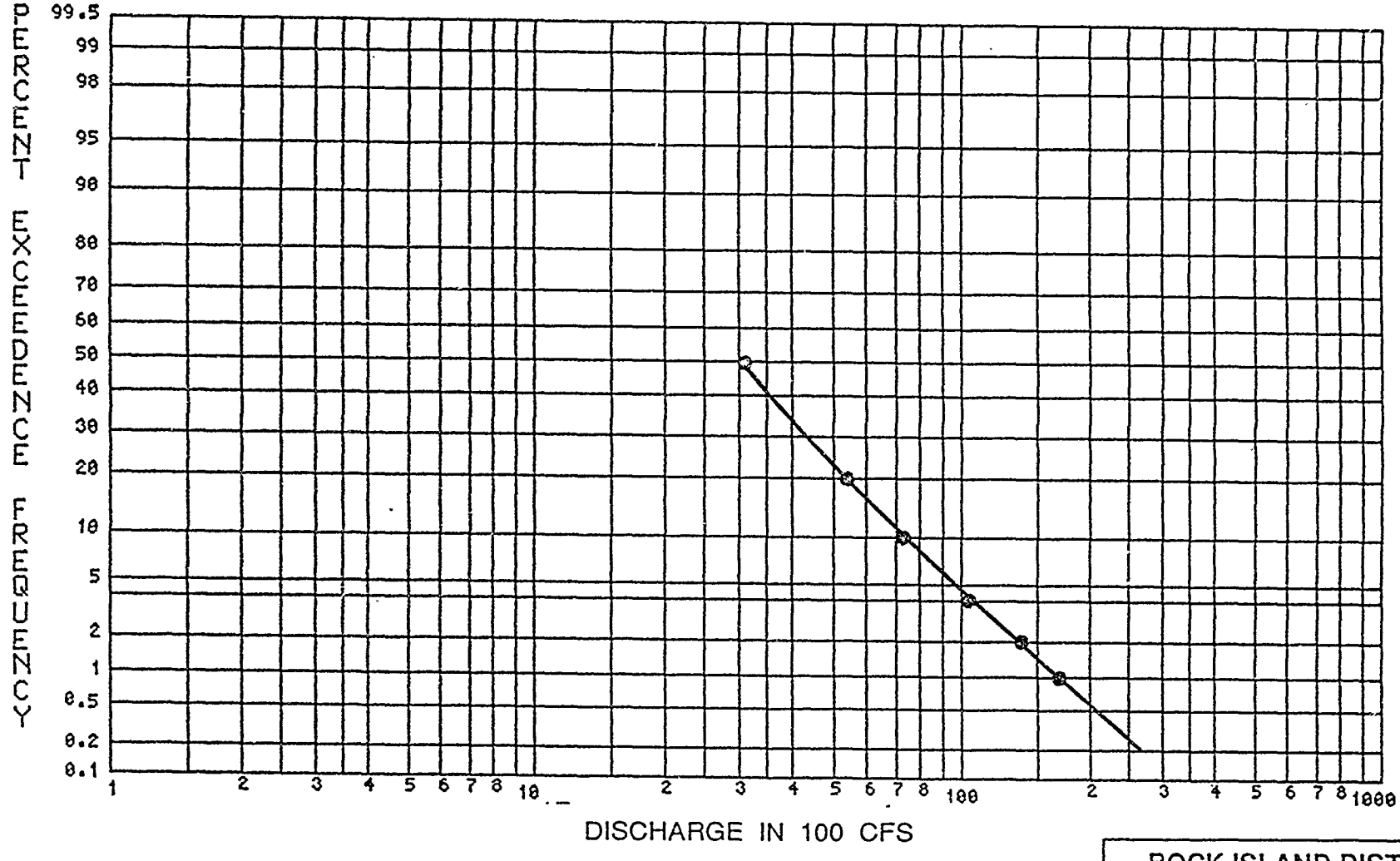

FREQUENCY ANALYSIS
05484500
RACCOON RIVER AT VAN METER
PERCENT EXCEEDANCE PROBABILITY
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
100
1000
10000
100000
DISCHARGE IN CFS
LEGEND
W/O EXP PROB
WITH EXP PROB
LANGBEIN P.D.
MEAN LOGARITHM 4.1516
STANDARD DEVIATION 0.2524
COMPUTED SKEW -0.2172
GENERALIZED SKEW 0.0000
ADOPTED SKEW -0.2000
* HISTORIC EVENTS 0
* HIGH OUTLIERS 0
* LOW OUTLIERS 1
* ZERO OR MISSING 0
* SYSTEMATIC EVENTS 72
63rd Street
95%
5%
PLATE

PLATE A-4

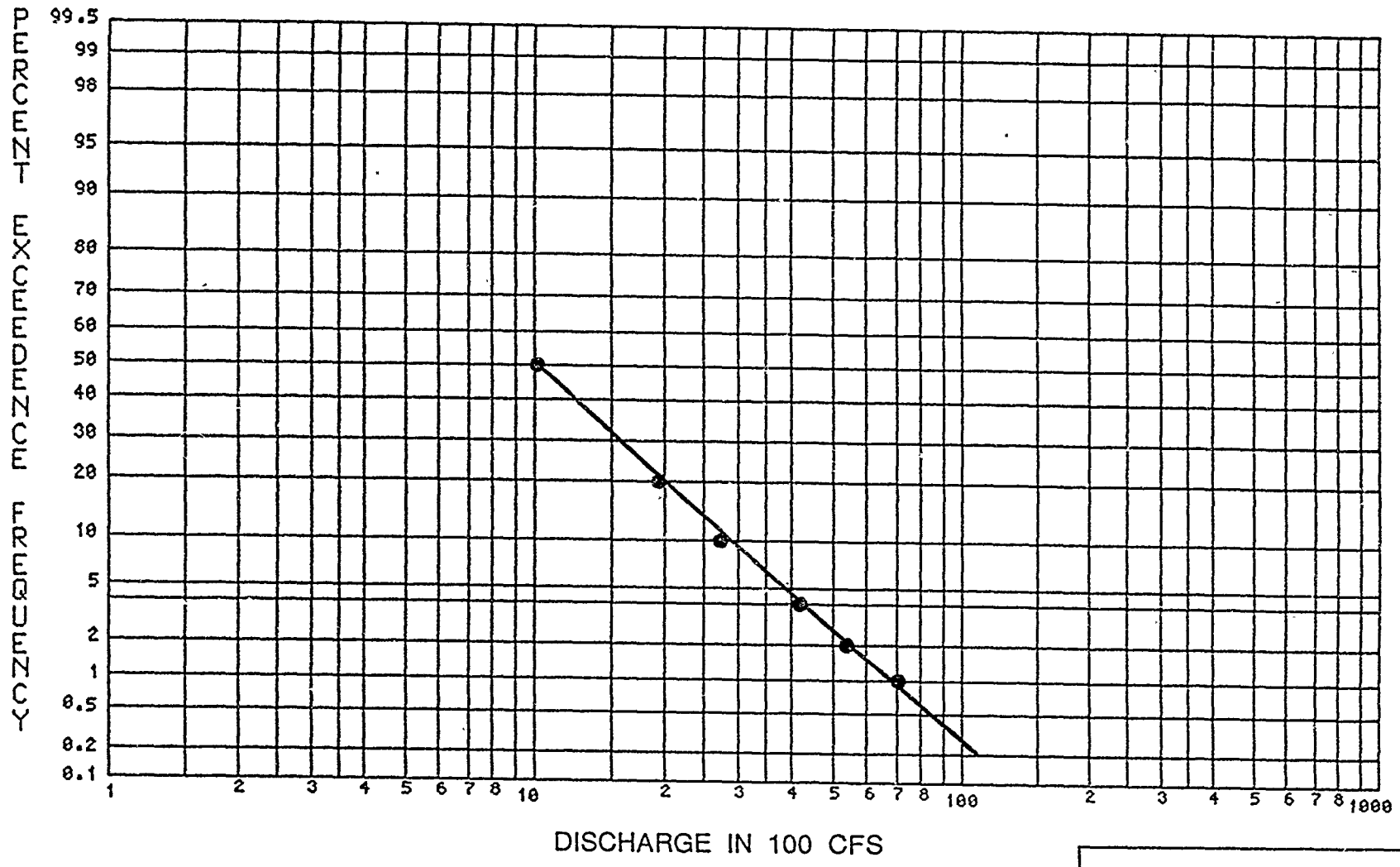


REGIONAL REGRESSION + STANADARD ERROR
(1975 COE Study, FIS's, State Of Iowa Regulatory)

ROCK ISLAND DISTRICT
WEST DES MOINES GRR

DISCHARGE vs FREQUENCY
WALNUT CREEK

PLATE A-5

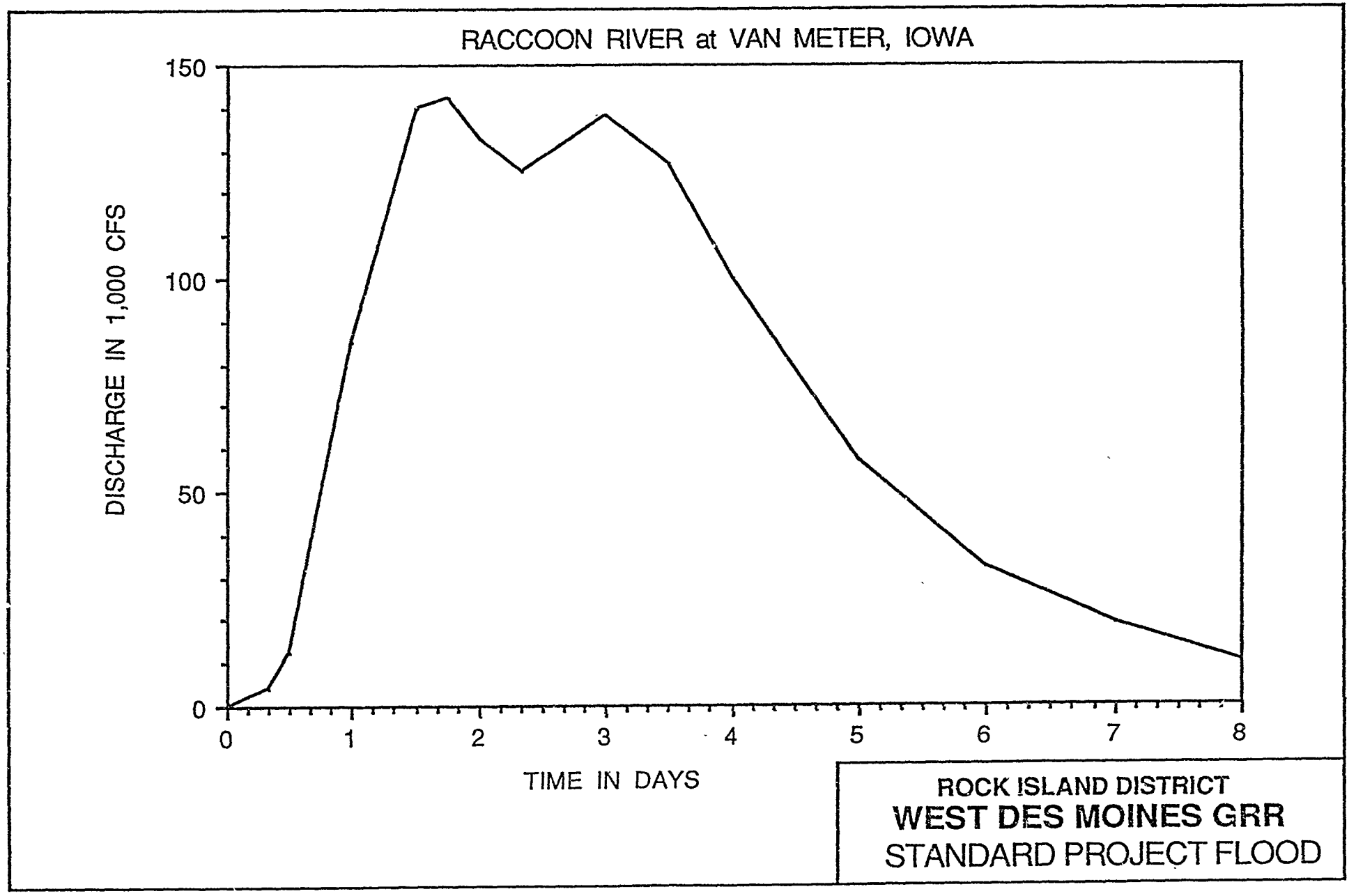


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ROCK ISLAND DISTRICT
WEST DES MOINES GRR

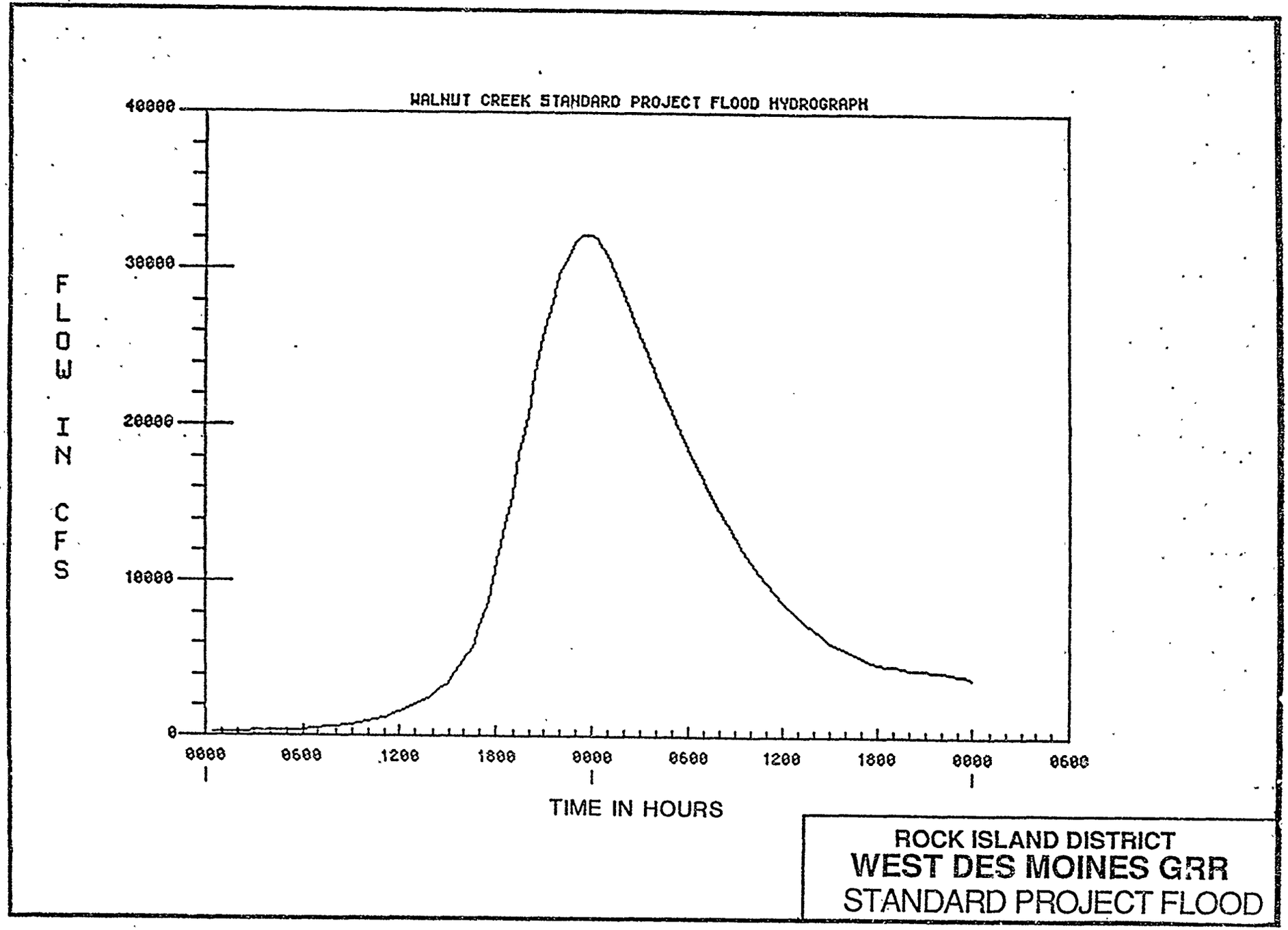
DISCHARGE vs FREQUENCY
JORDAN CREEK

PLATE A-6



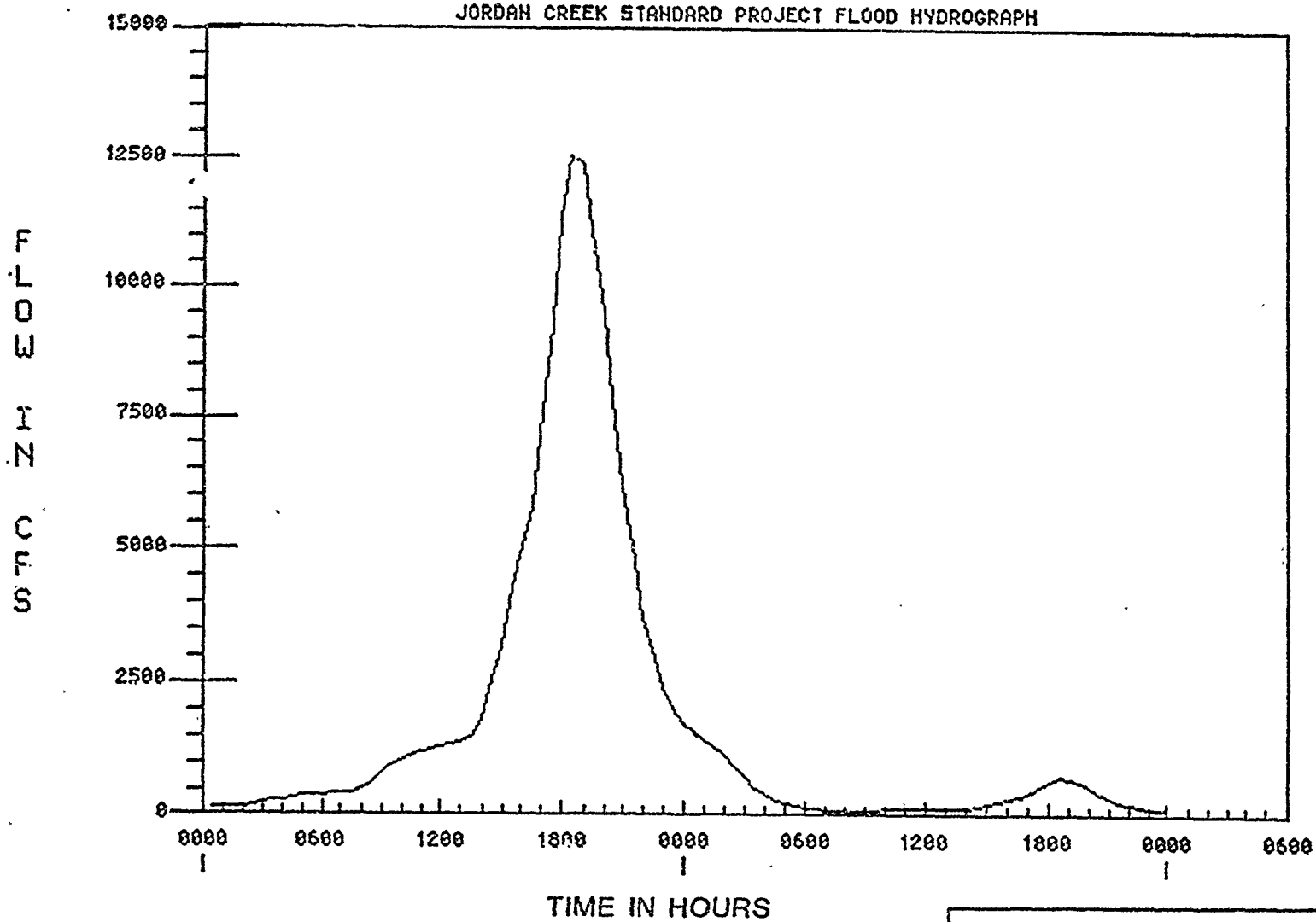
ROCK ISLAND DISTRICT
WEST DES MOINES GRR
STANDARD PROJECT FLOOD

PLATE A-7



ROCK ISLAND DISTRICT
WEST DES MOINES GRR
STANDARD PROJECT FLOOD

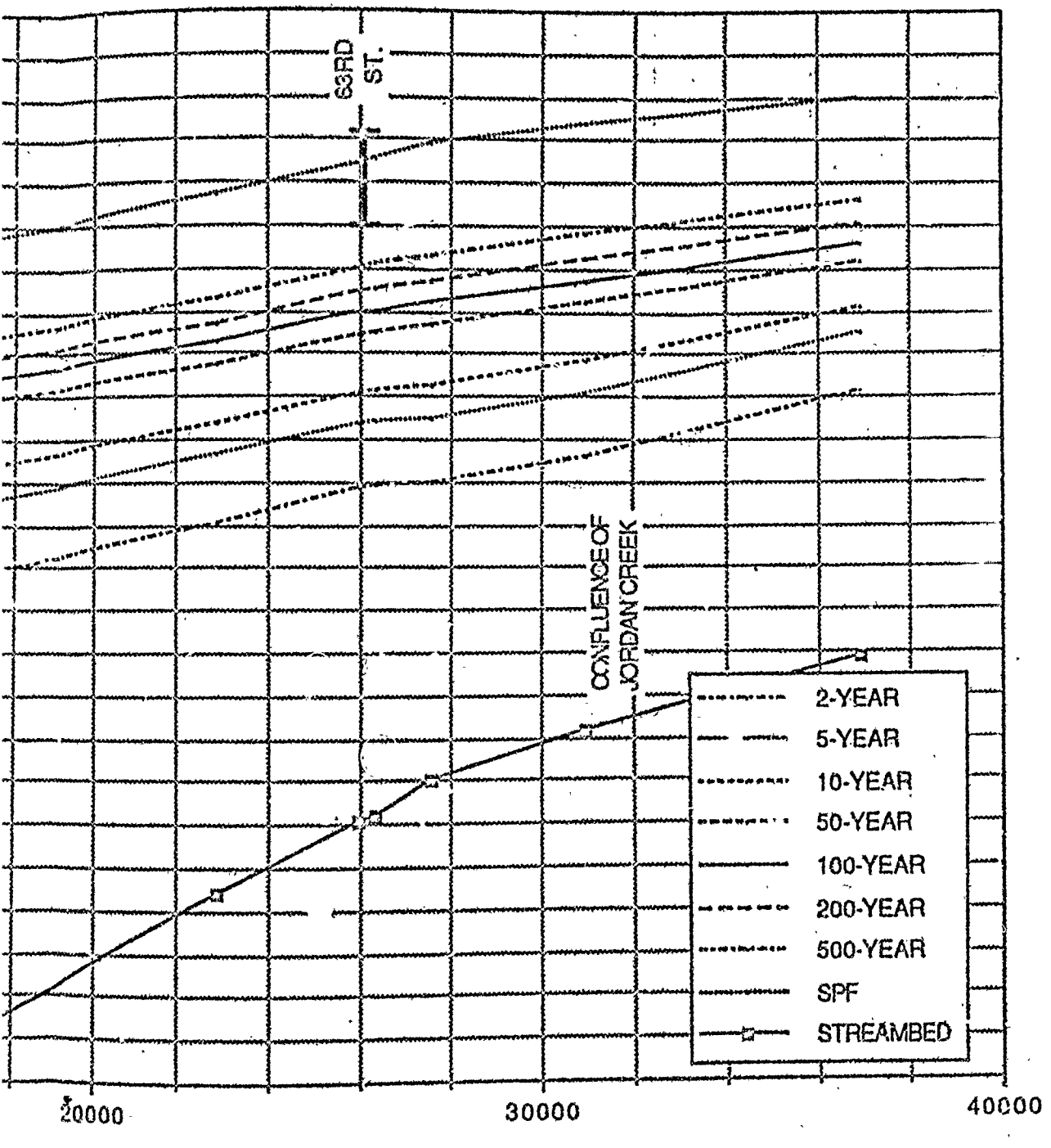
PLATE A-8



ROCK ISLAND DISTRICT
WEST DES MOINES GRR
STANDARD PROJECT FLOOD

PLATE A-9

830
820
810
800
790
780
0
10000
ELEVATION IN FEET (NGVD)
CHICAGO-NW RAILROAD
CONFLUENCE OF WALNUT CREEK
DISTAN

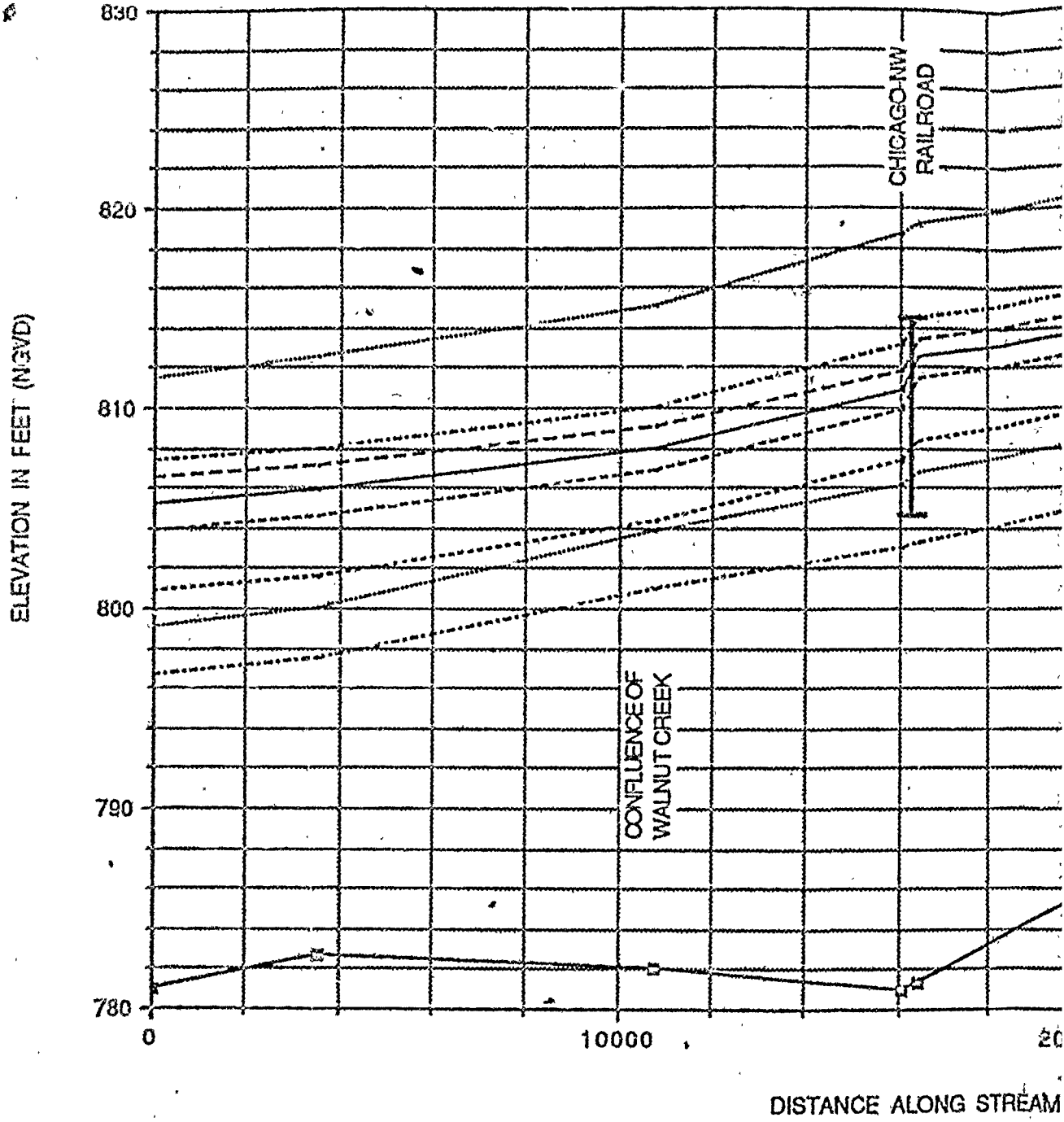


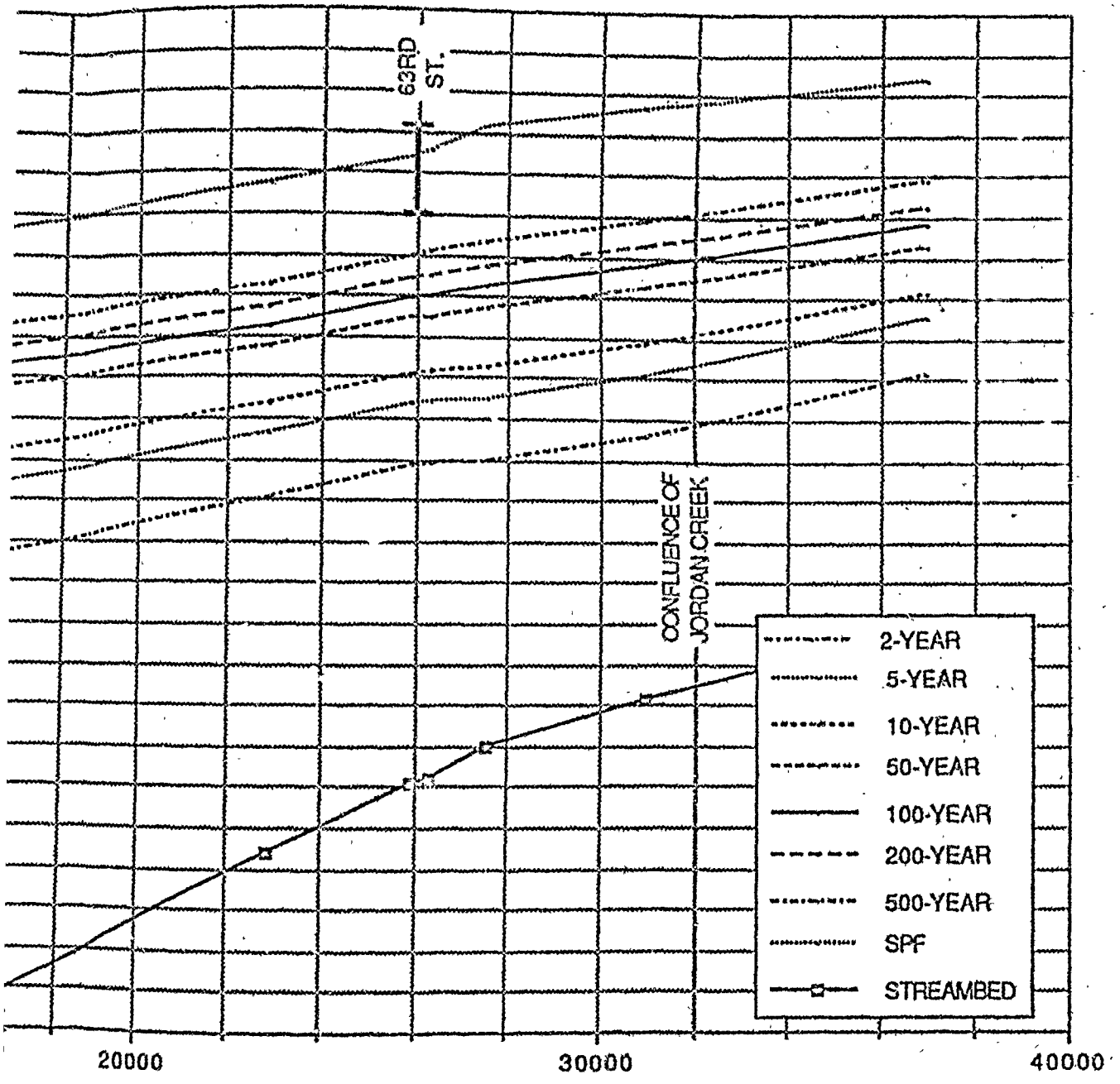
EXISTING CONDITIONS

RACCOON RIVER

WEST DES MOINES GRR

PLATE A-10


830
820
810
800
790
780
0
10000
ELEVATION IN FEET (NGVD)
DISTANCE ALONG STREAM
CHICAGO-NW RAILROAD
CONFLUENCE OF WALNUT CREEK



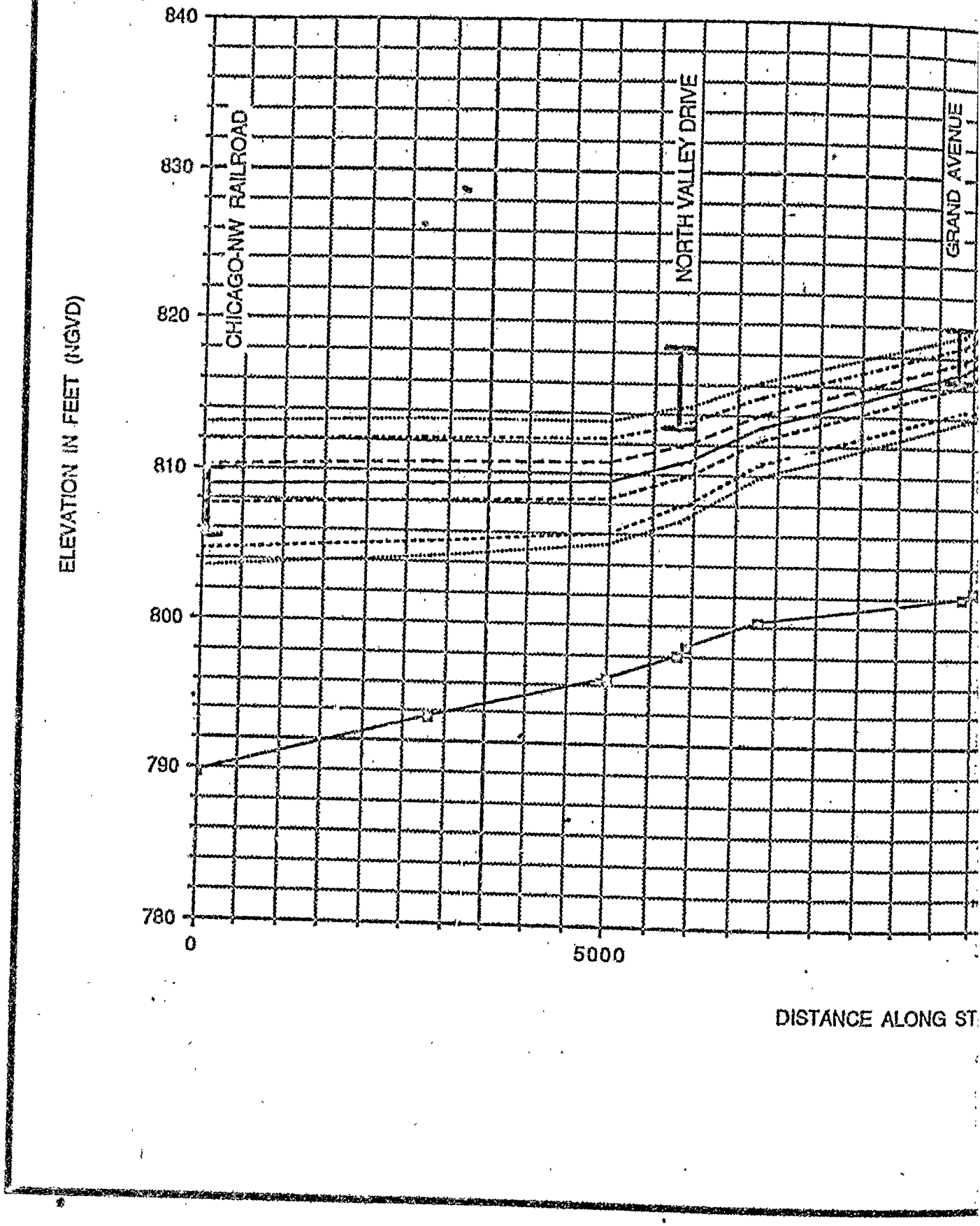
IG STREAM IN FEET

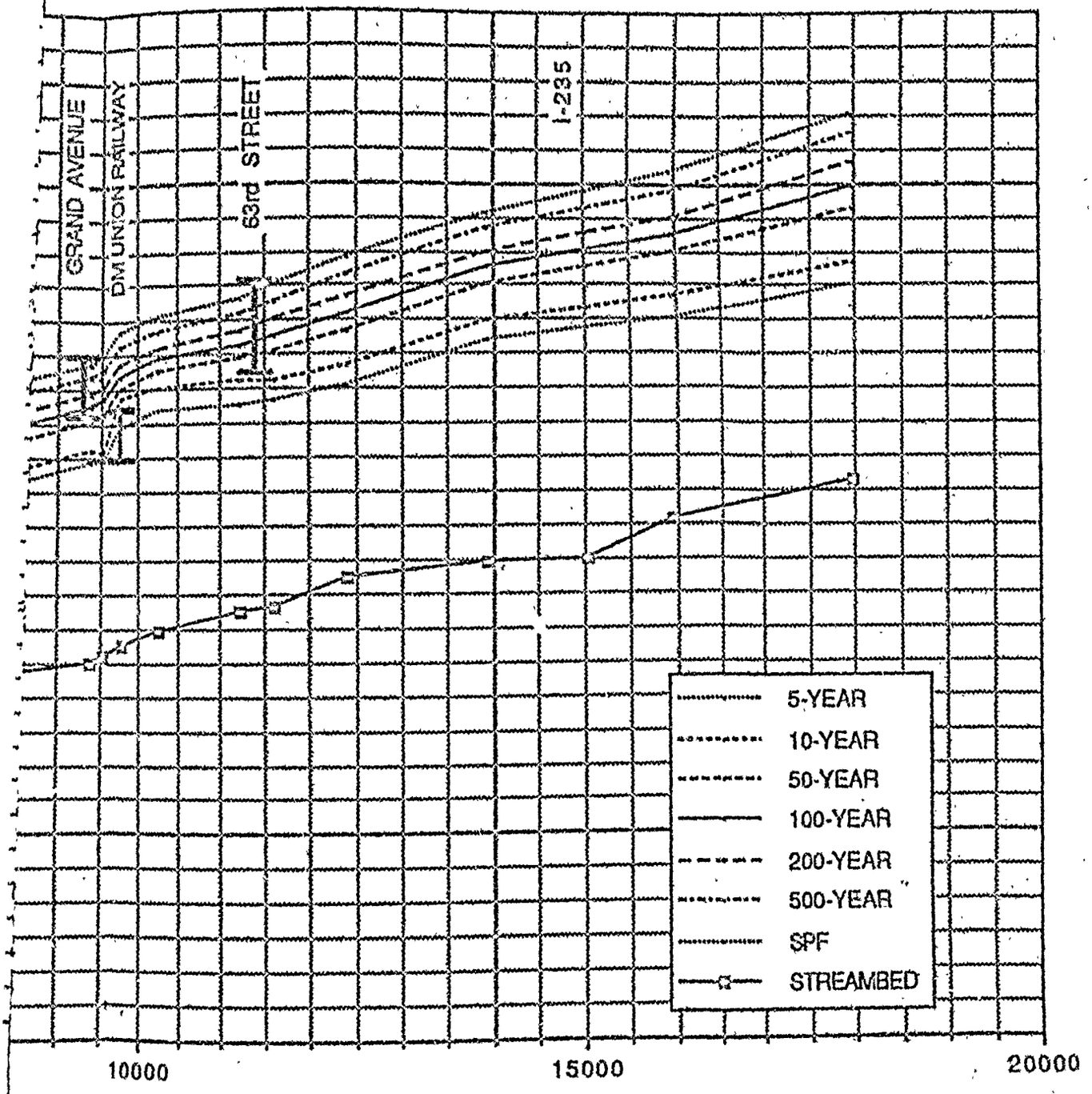
PROJECT CONDITIONS

RACCOON RIVER

WEST DES MOINES GRR

PLATE A-11


840
830
820
810
800
790
780
0
5000
ELEVATION IN FEET (NGVD)
CHICAGO-NW RAILROAD
NORTH VALLEY DRIVE
GRAND AVENUE
DISTANCE ALONG ST

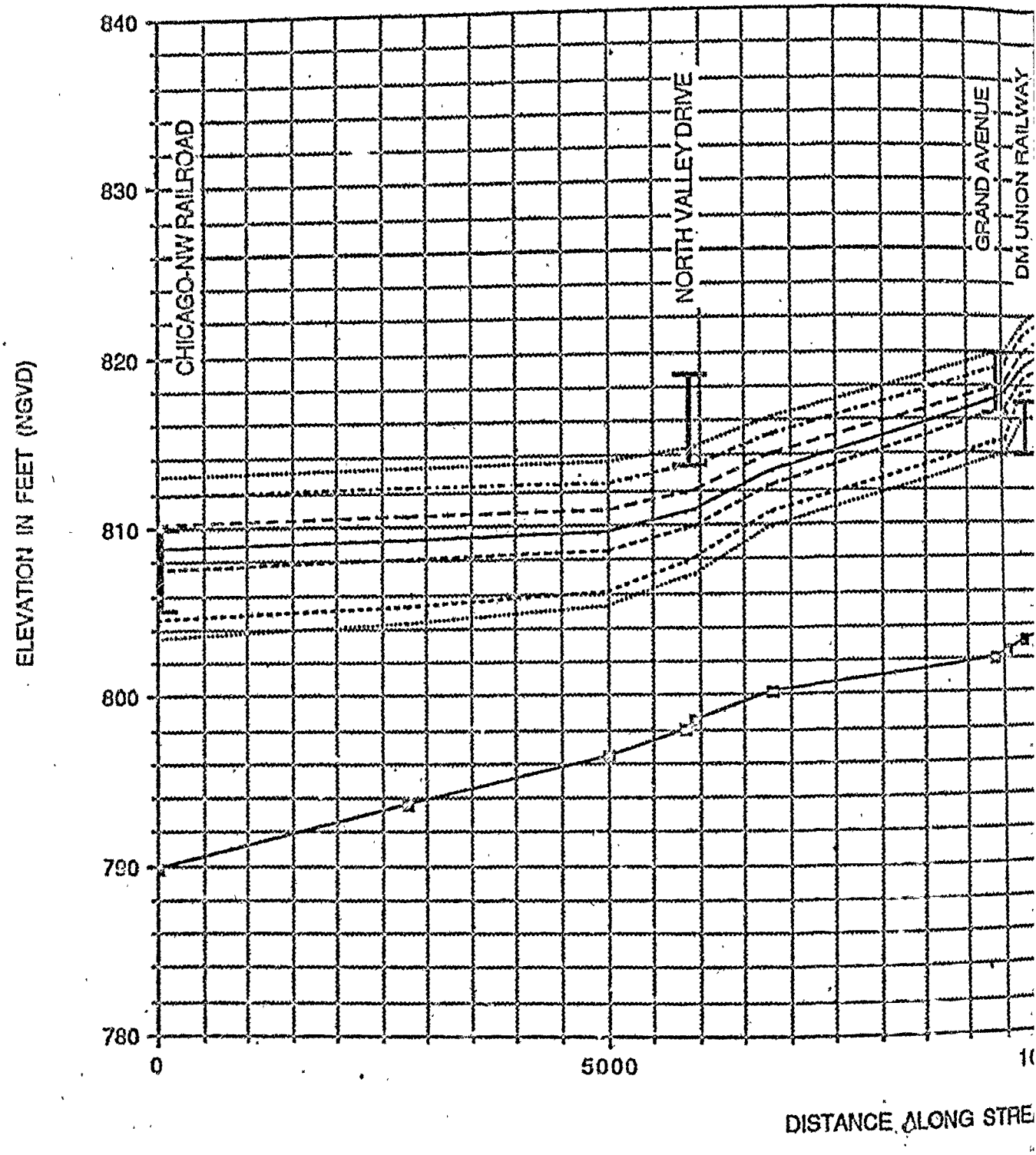


EXISTING CONDITIONS

WALNUT CREEK

WEST DES MOINES GRR

PLATE A-12


840
830
820
810
800
790
780
0
5000
ELEVATION IN FEET (NGVD)
CHICAGO-NW RAILROAD
NORTH VALLEY DRIVE
GRAND AVENUE
DM UNION RAILWAY
DISTANCE ALONG STRE

STREAM IN FEET

PROJECT CONDITIONS

WALNUT CREEK

WEST DES MOINES GRR

PLATE A-13

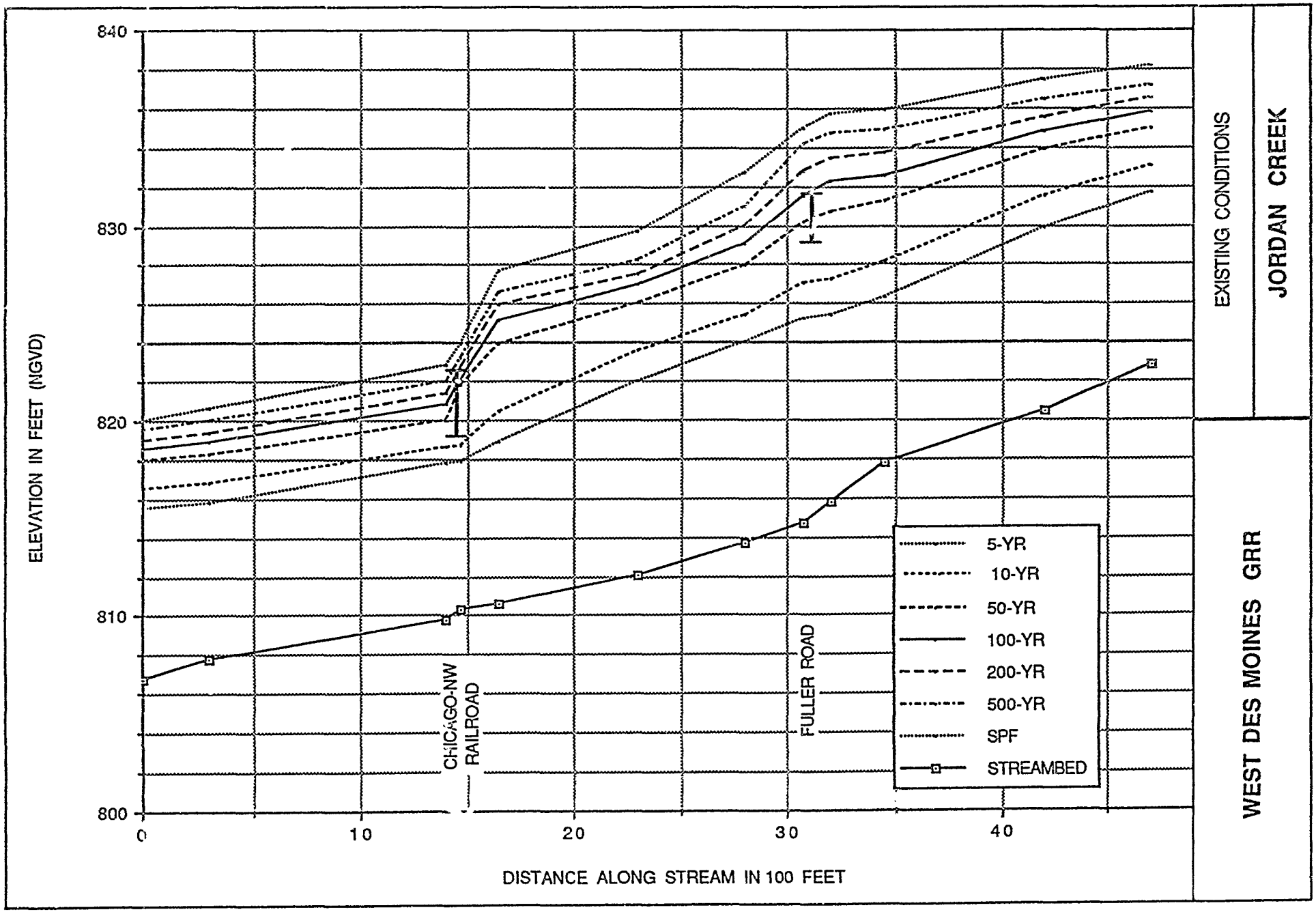

EXISTING CONDITIONS
JORDAN CREEK
WEST DES MOINES GRR
ELEVATION IN FEET (NGVD)
840
830
820
810
800
0
10
20
30
40
DISTANCE ALONG STREAM IN 100 FEET
CHICAGO-NW RAILROAD
FULLER ROAD
5-YR
10-YR
50-YR
100-YR
200-YR
500-YR
SPF
STREAMBED

PLATE A-14

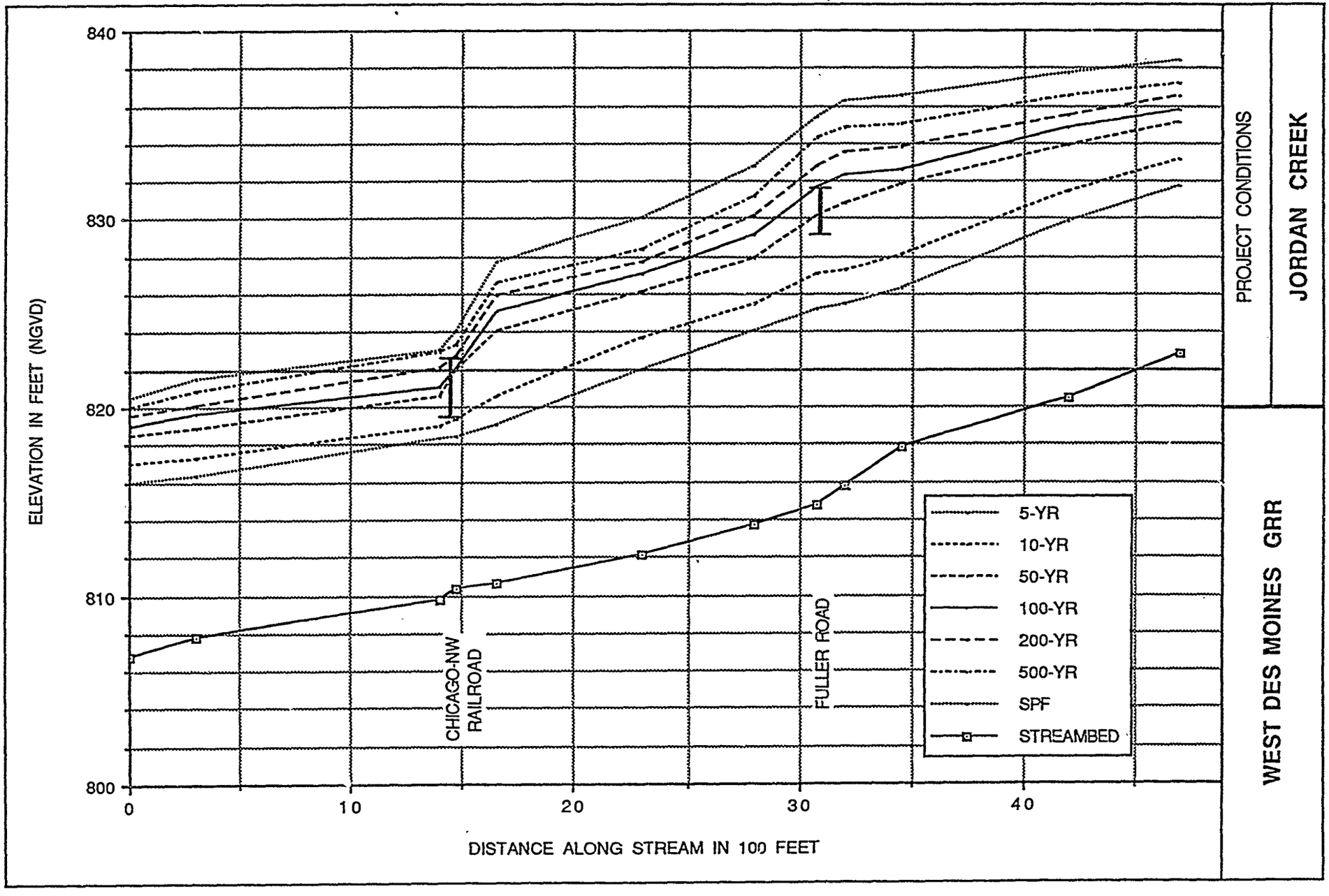
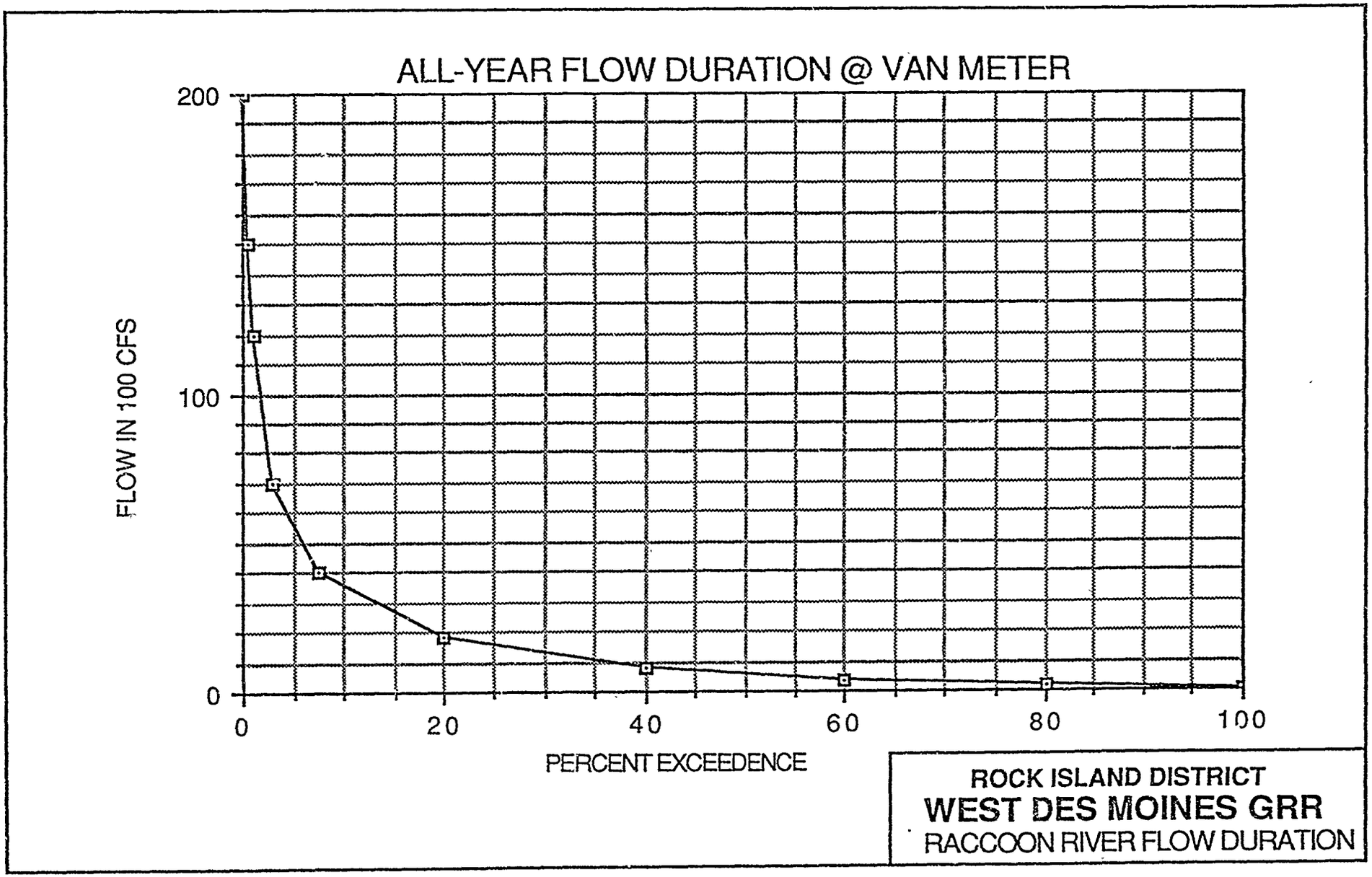
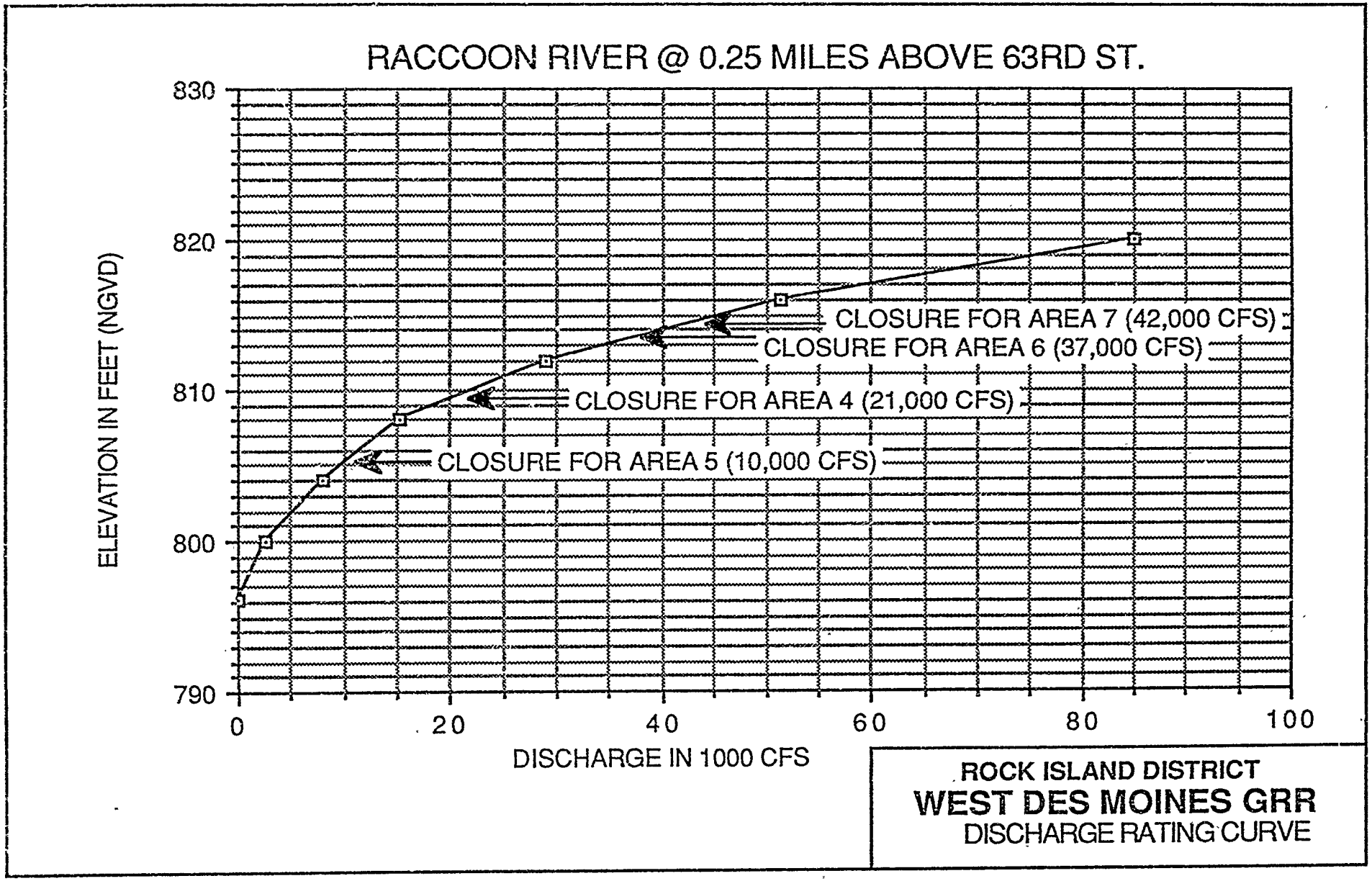

840
830
820
810
800
0
10
20
30
40
ELEVATION IN FEET (NGVD)
DISTANCE ALONG STREAM IN 100 FEET
CHICAGO-NW RAILROAD
FULLER ROAD
5-YR
10-YR
50-YR
100-YR
200-YR
500-YR
SPF
STREAMBED
PROJECT CONDITIONS
JORDAN CREEK
WEST DES MOINES GRR

PLATE A-15



ROCK ISLAND DISTRICT
WEST DES MOINES GRR
RACCOON RIVER FLOW DURATION

PLATE A-16

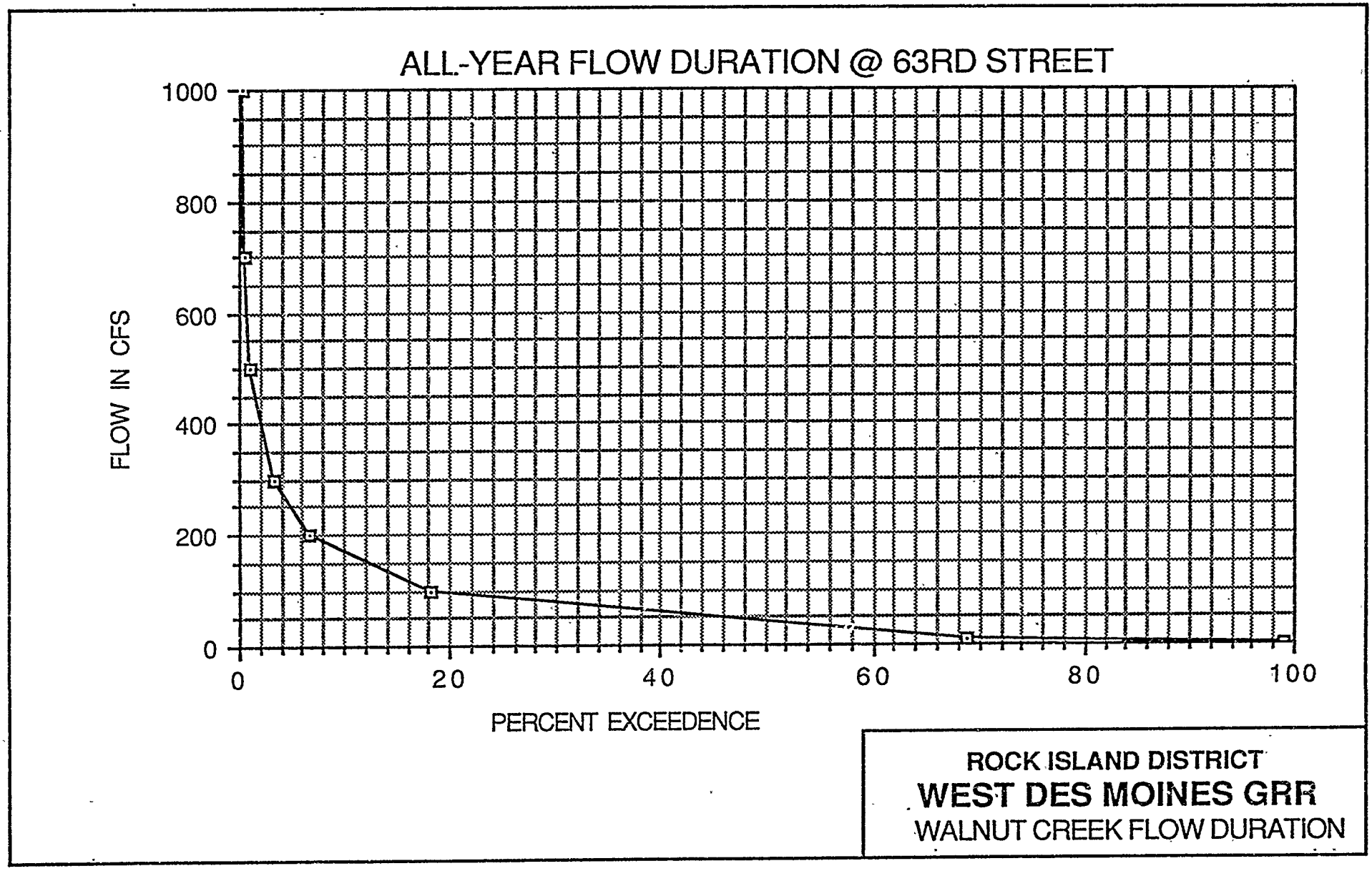


ROCK ISLAND DISTRICT

WEST DES MOINES GRR

DISCHARGE RATING CURVE

PLATE A-17

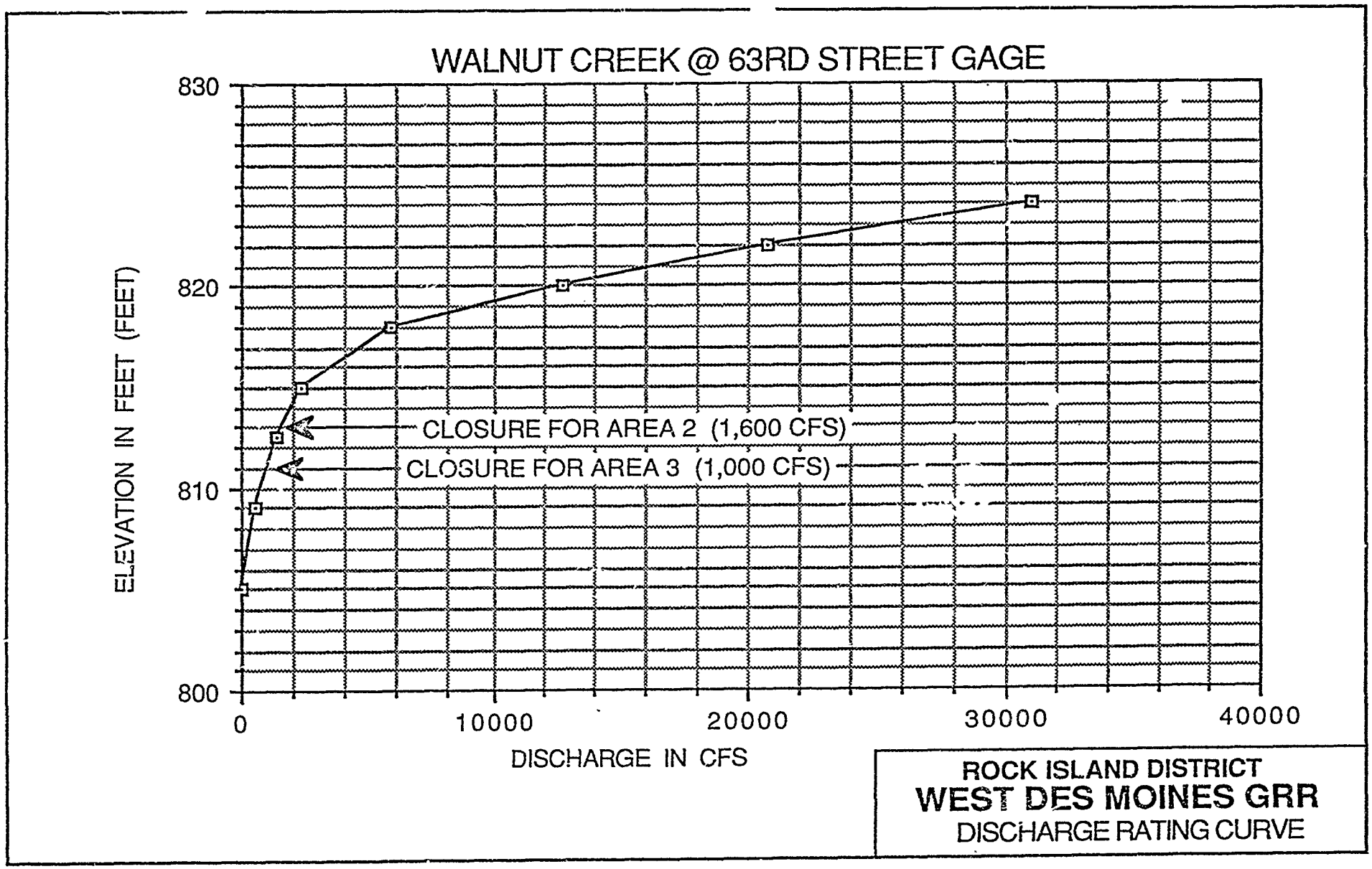


ROCK ISLAND DISTRICT

WEST DES MOINES GRR

WALNUT CREEK FLOW DURATION

PLATE A-18



ROCK ISLAND DISTRICT
WEST DES MOINES GRR
DISCHARGE RATING CURVE

PLATE A-19

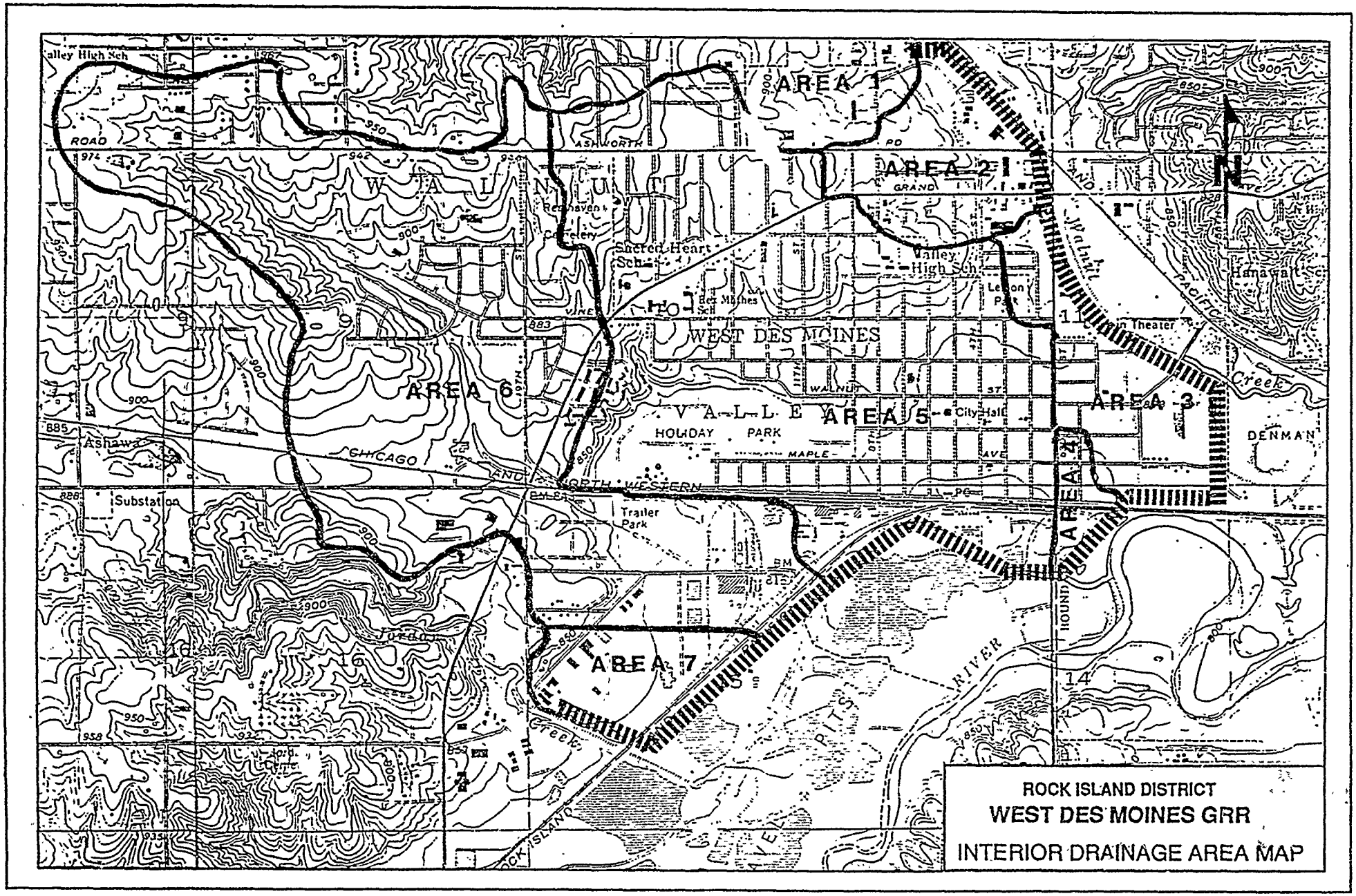
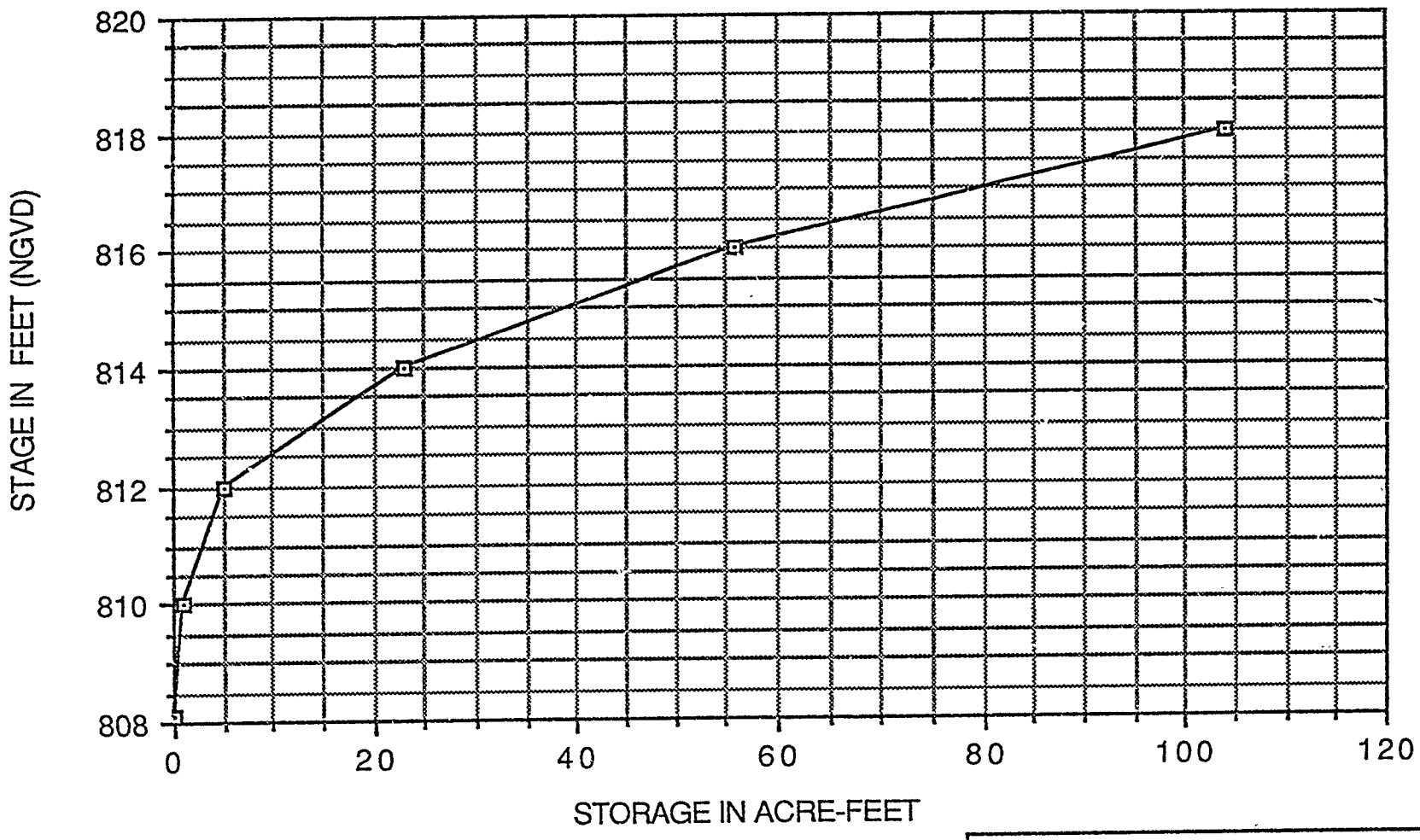
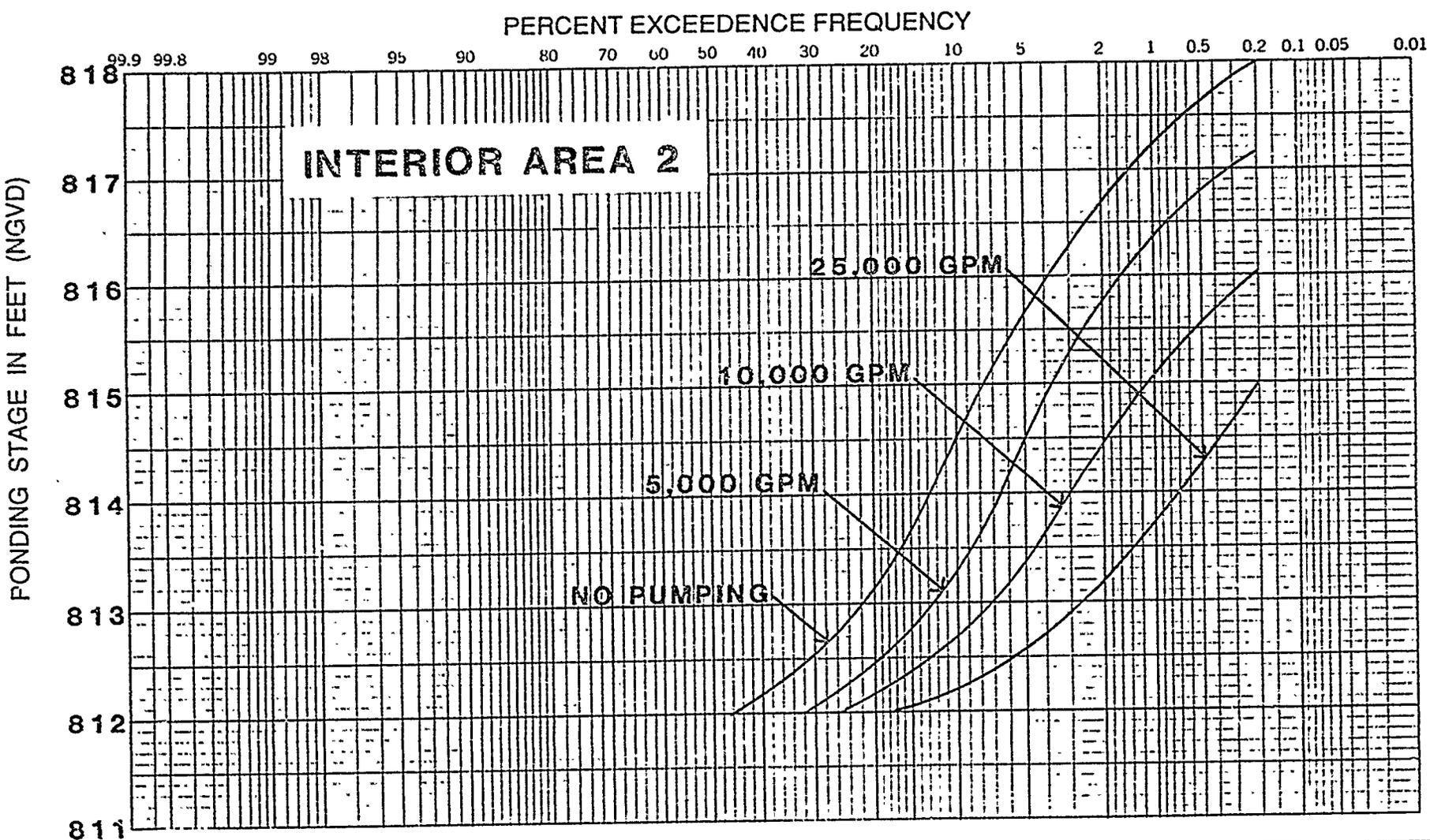

AREA 1
AREA 2
AREA 3
AREA 4
AREA 5
AREA 6
AREA 7
WEST DES MOINES
VALLEY
WALNUT
Valley High Sch
Sacred Heart Sch
Trailer Park
Substation
Ashawa
HOLIDAY PARK
City Hall
Theater
DENMAN
Hamawatha
Creek
RIVER
ROCK ISLAND
CHICAGO NORTH WESTERN
ROCK ISLAND DISTRICT
WEST DES MOINES GRR
INTERIOR DRAINAGE AREA MAP

PLATE A-20



ROCK ISLAND DISTRICT
WEST DES MOINES GRR

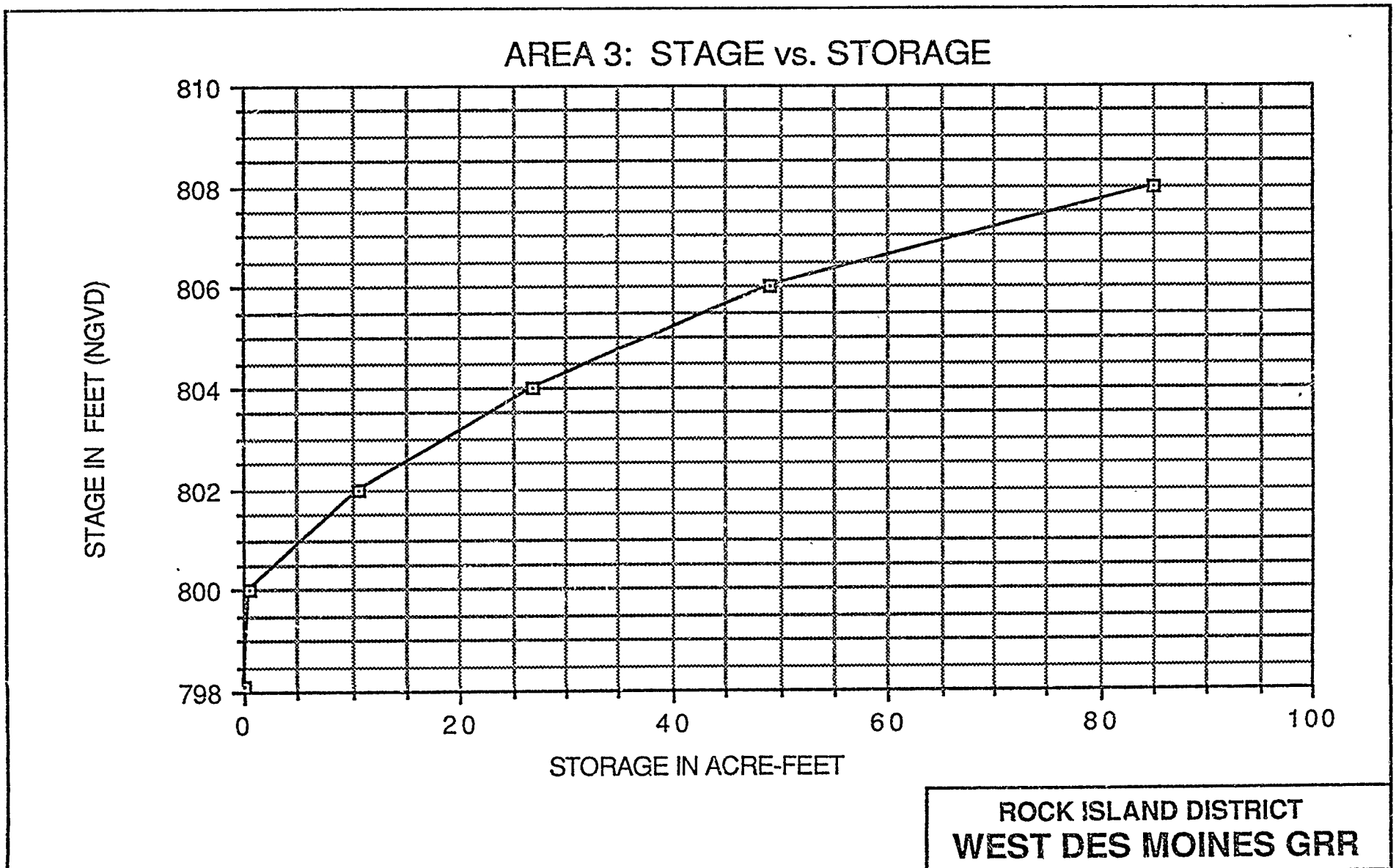
PLATE A-21



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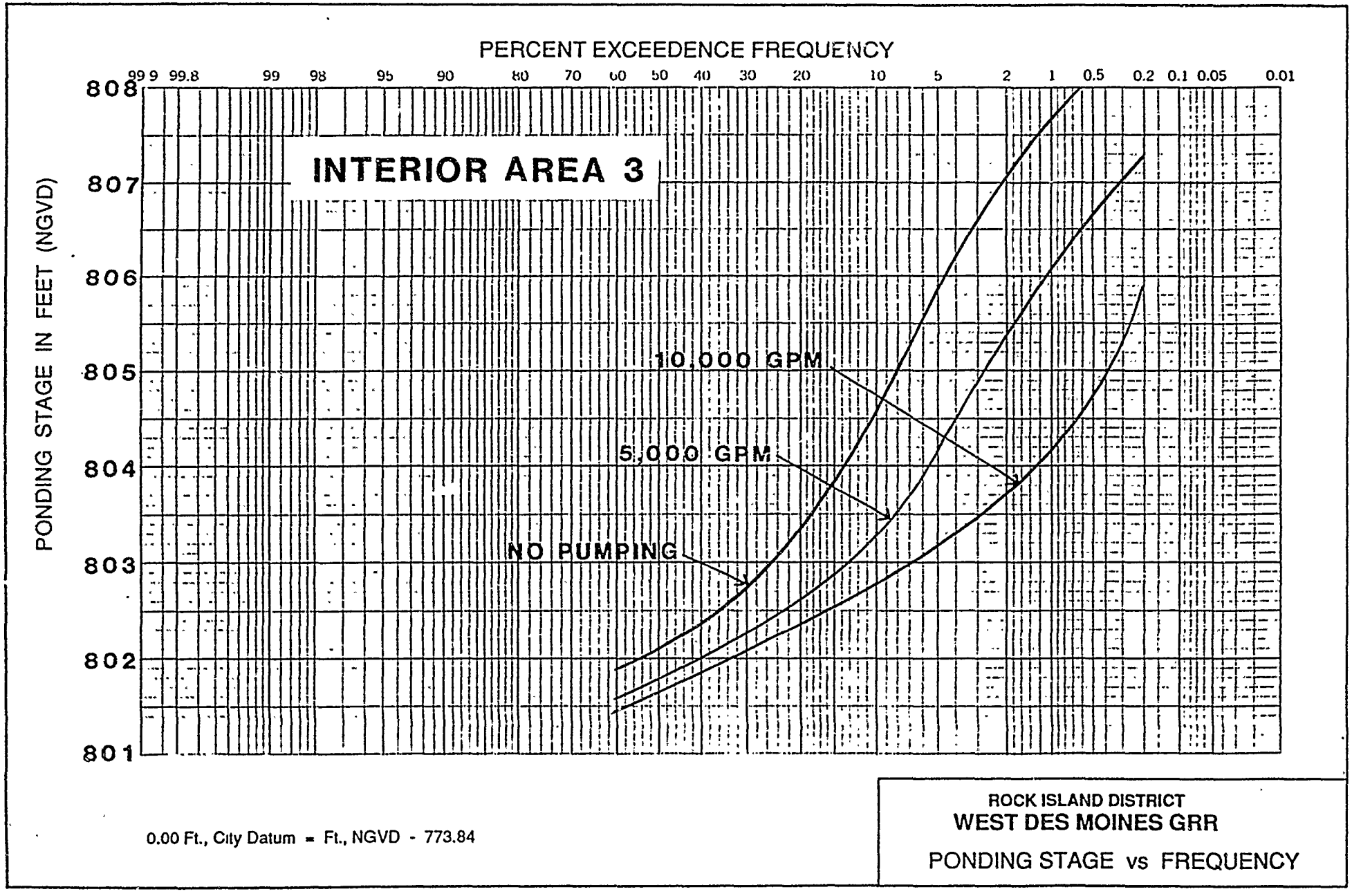
ROCK ISLAND DISTRICT
WEST DES MOINES GRR
PONDING STAGE vs FREQUENCY

PLATE A-22



ROCK ISLAND DISTRICT
WEST DES MOINES GRR

PLATE A-23

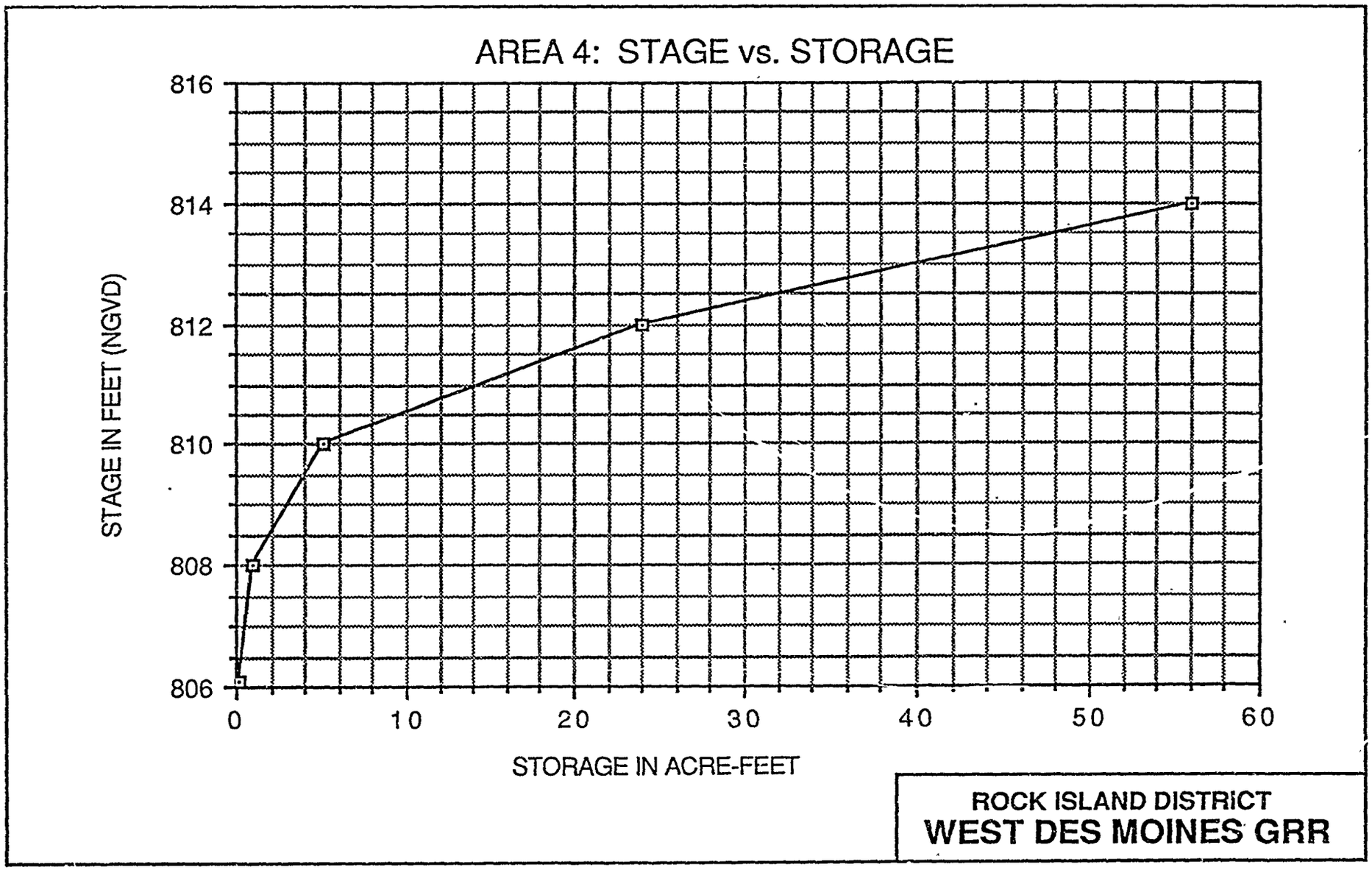


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ROCK ISLAND DISTRICT
WEST DES MOINES GRR

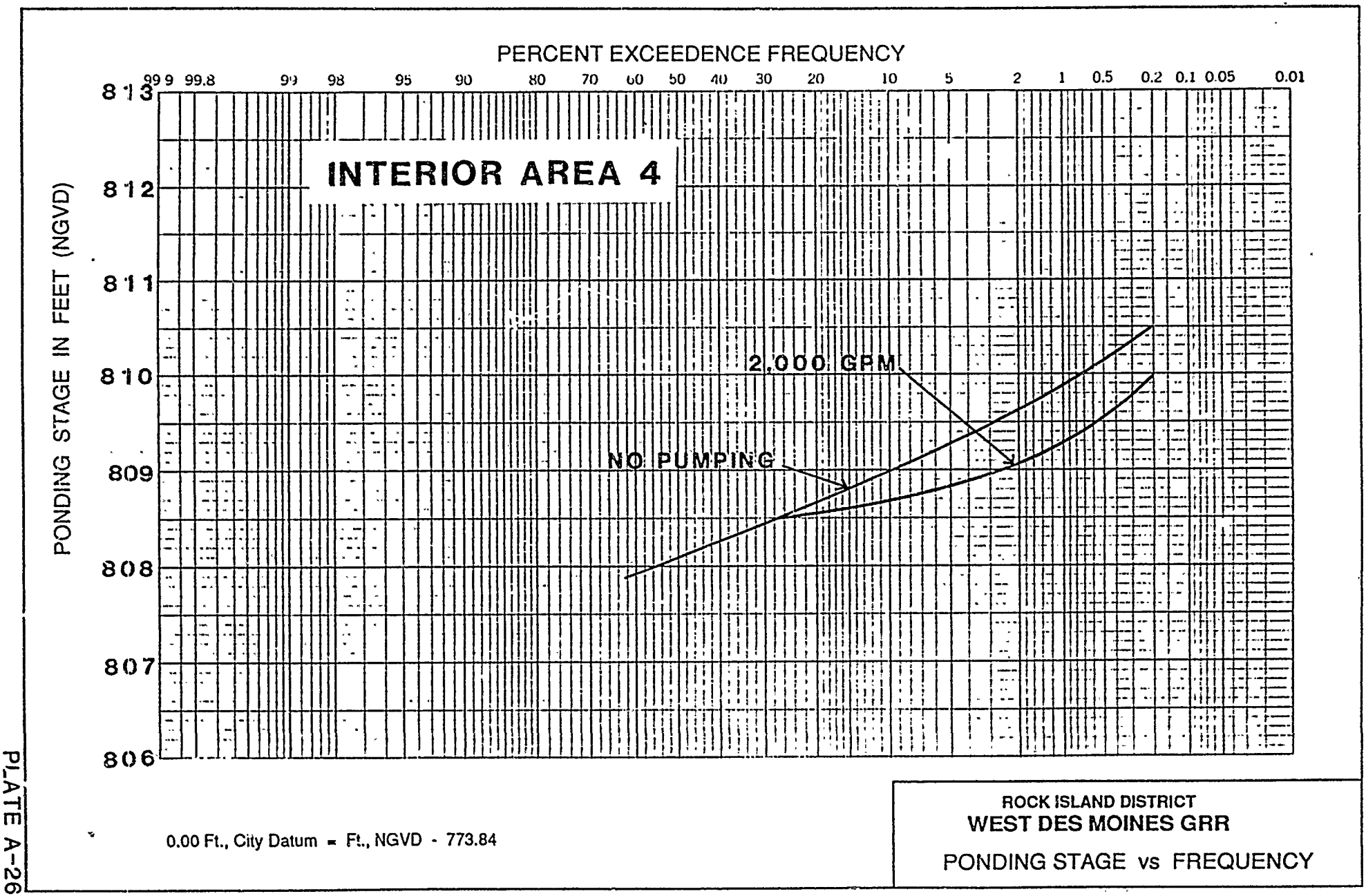
PONDING STAGE vs FREQUENCY

PLATE A-24



ROCK ISLAND DISTRICT
WEST DES MOINES GRR

PLATE A-25



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ROCK ISLAND DISTRICT
WEST DES MOINES GRR

PONDING STAGE vs FREQUENCY

PLATE A-26

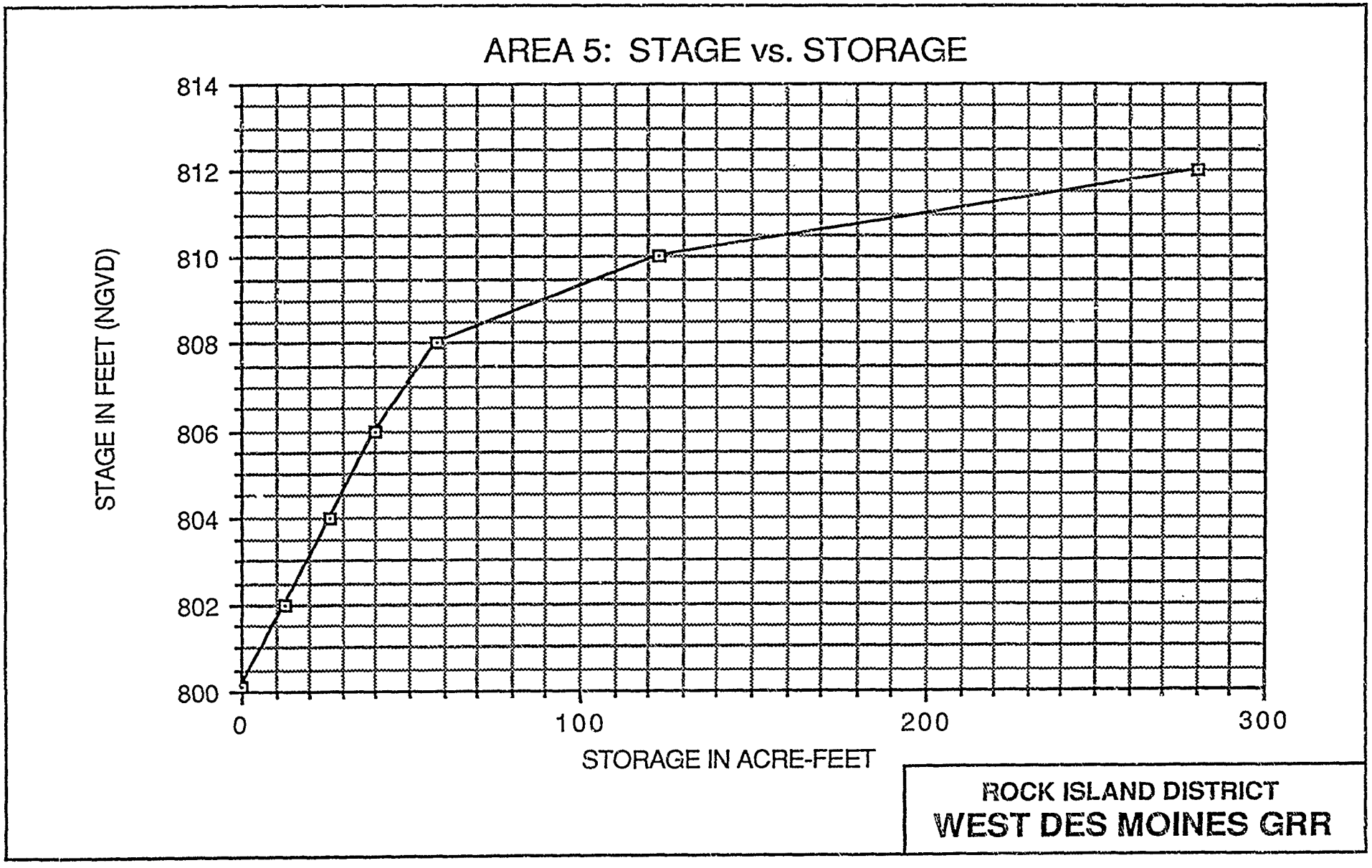
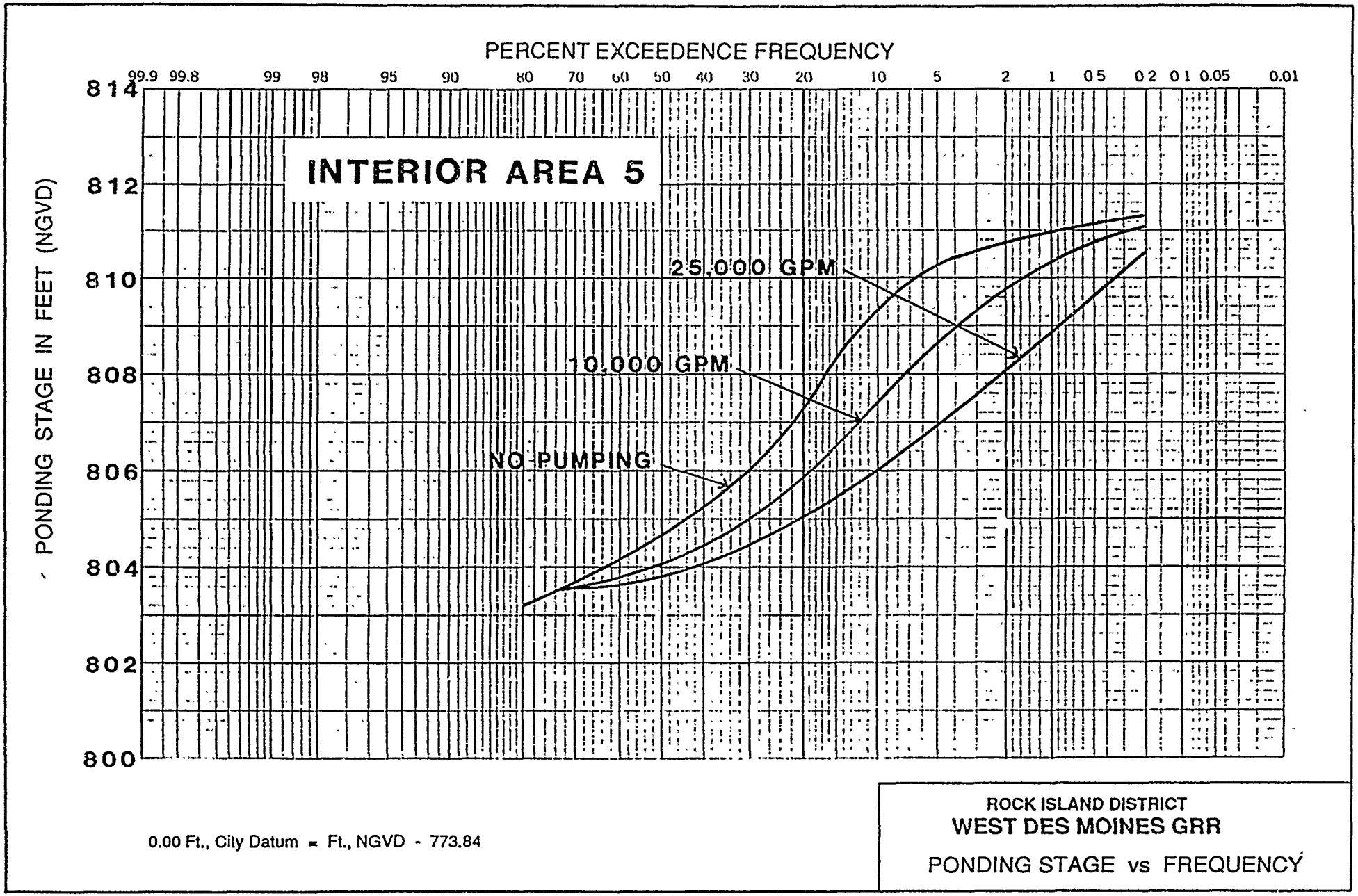

AREA 5: STAGE vs. STORAGE
814
812
810
808
806
804
802
800
STAGE IN FEET (NGVD)
0
100
200
300
STORAGE IN ACRE-FEET
ROCK ISLAND DISTRICT
WEST DES MOINES GRR

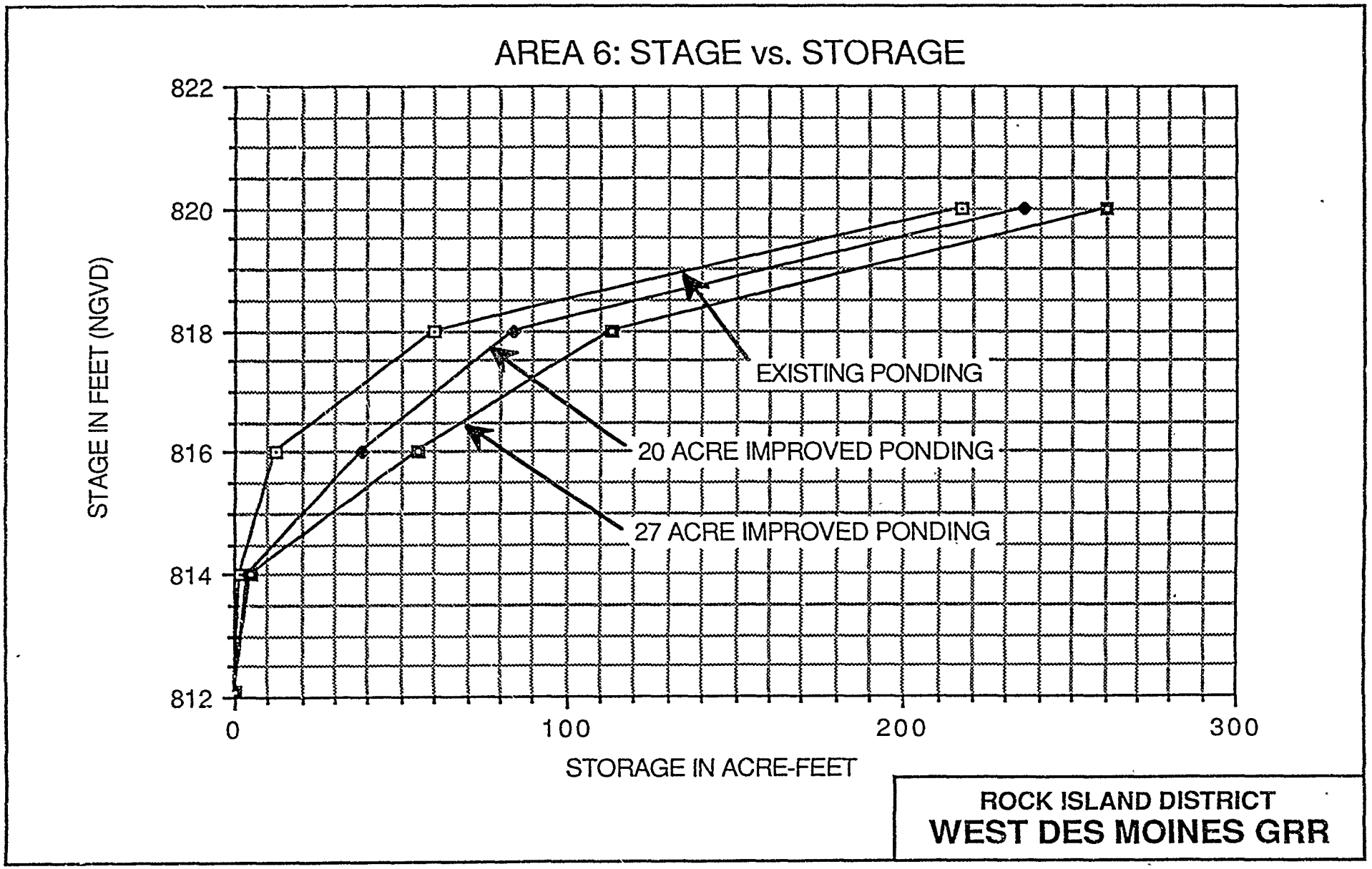
PLATE A-27



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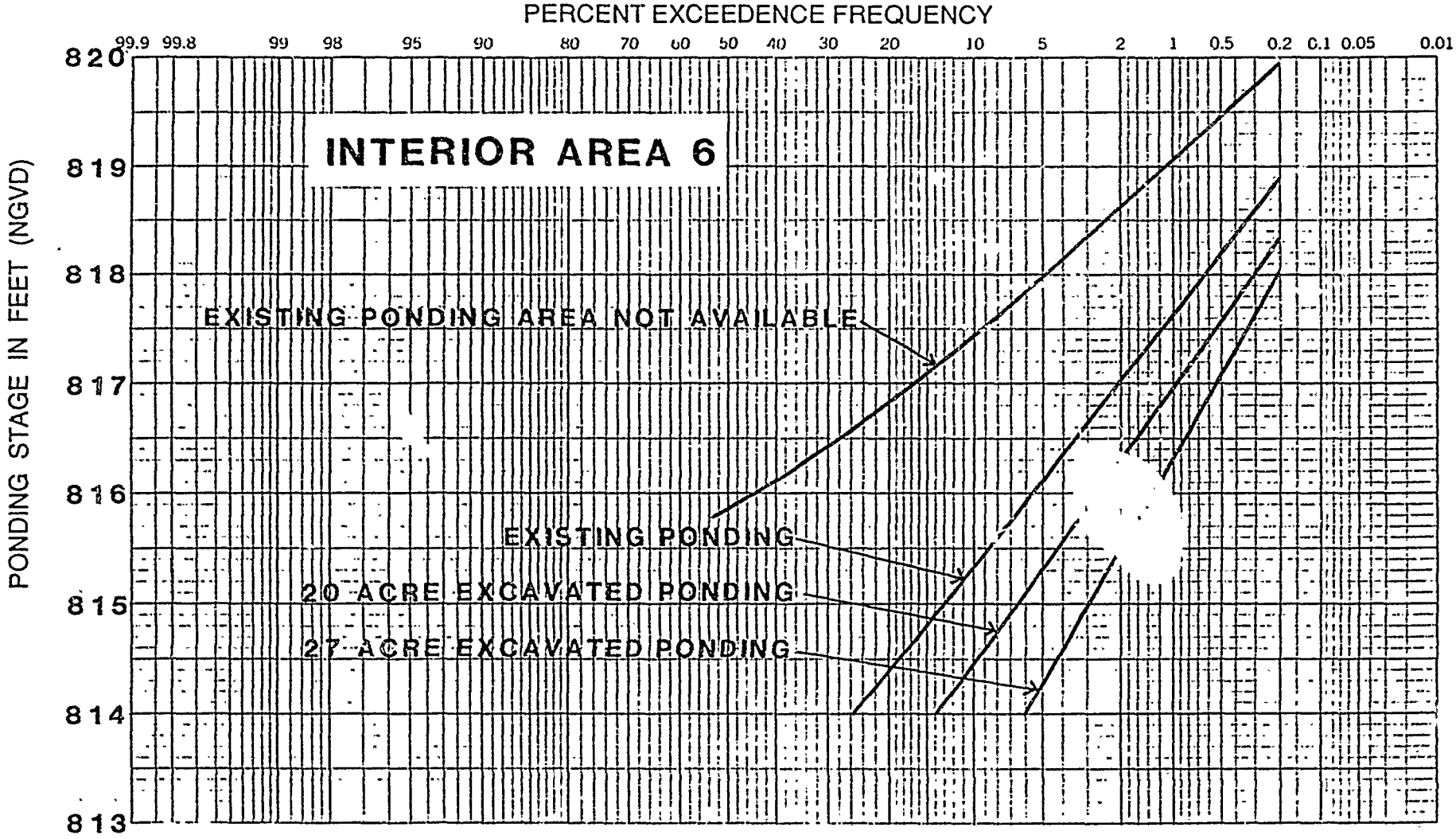
ROCK ISLAND DISTRICT
WEST DES MOINES GRR
PONDING STAGE vs FREQUENCY

PLATE A-28



ROCK ISLAND DISTRICT
WEST DES MOINES GRR

PLATE A-29



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ROCK ISLAND DISTRICT
WEST DES MOINES GRR
PONDING STAGE vs FREQUENCY

PLATE A-30

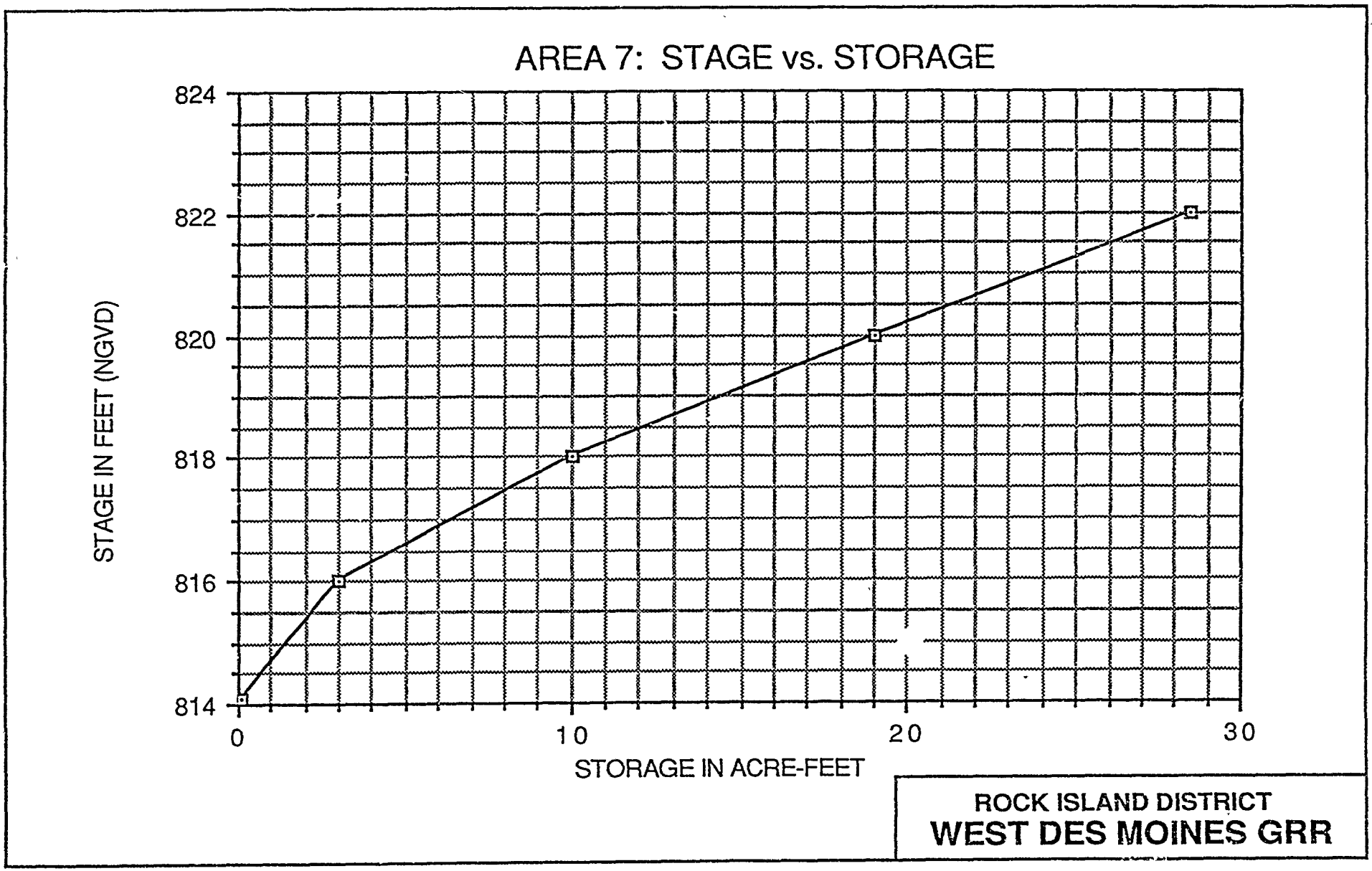
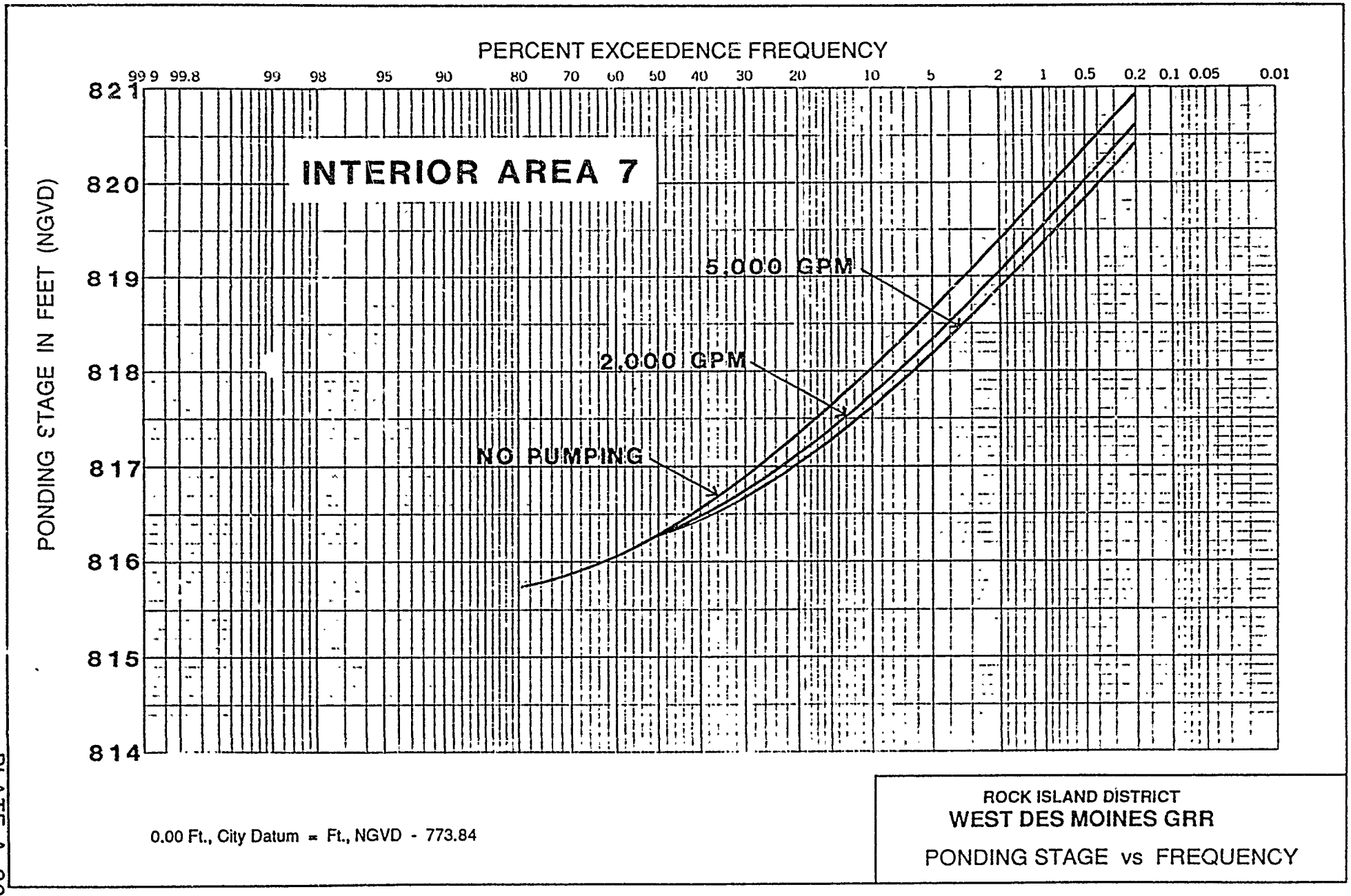

AREA 7: STAGE vs. STORAGE
824
822
820
818
816
814
STAGE IN FEET (NGVD)
0
10
20
30
STORAGE IN ACRE-FEET
ROCK ISLAND DISTRICT
WEST DES MOINES GRR

PLATE A-31



0.00 Ft., City Datum = Ft., NGVD - 773.84

ROCK ISLAND DISTRICT
WEST DES MOINES GRR
PONDING STAGE vs FREQUENCY

PLATE A-32

ECONOMIC AND SOCIAL ANALYSIS

APPENDIX B

GENERAL REEVALUATION REPORT
FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

APPENDIX B
ECONOMIC AND SOCIAL ANALYSIS

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GENERAL REEVALUATION REPORT
FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA
APPENDIX B
ECONOMIC AND SOCIAL ANALYSIS

SECTION 1 - INTRODUCTION

PURPOSE

This appendix documents the economic and social analysis undertaken to determine the feasibility of providing flood damage reduction measures for the cities of West Des Moines and Des Moines, Iowa. Current damages are caused primarily by high flows of the Raccoon River and Walnut Creek, a tributary. The six major sections of this appendix summarize the General Reevaluation Report (GRR) investigations 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 flood damages. The third section presents the procedures used to determine 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. Section six discusses the social impacts of the proposed project. Throughout this analysis, price levels are stated as of September 1988, with the Federal discount rate of 8-7/8 percent for water resource projects being used to amortize costs and to discount benefits to a a common period of time.

SECTION 2 - CHARACTERISTICS OF THE STUDY AREA

GENERAL

This section describes the study area and its existing conditions in terms of physical characteristics and flooding problems, with a brief discussion of likely future conditions.

EXISTING CONDITIONS

The cities of West Des Moines and Des Moines comprise the major portion of the Des Moines Standard Metropolitan Area (SMA), which includes sections of Polk, Dallas, and Warren Counties. This SMA had a 1985 total population of about 309,900 which is an 8.3 percent increase from the 1970 census. Interstate

Highways 35 and 80, as well as other major roadways, intersect at Des Moines. The city is served by major air and railway lines and is the hub of the State's transportation system. Des Moines is the State capitol, and the area is a well-diversified commercial and industrial center.

As shown on plate 1 of the main report, the study area is located on the north bank of the Raccoon River about 6 miles upstream from its confluence with the Des Moines River. Plate B-1 of this appendix identifies the economic reaches.

The study site (Raccoon River and Walnut Creek floodplain) is an approximate 900-acre area with concentrations of residential neighborhoods, commercial development, industrial sites, and public facilities. Table B-1 lists the types of properties in the study area, which is divided into five economic reaches. These reaches were segregated based on similarities of hydrologic impacts.

TABLE B-1

Floodplain Characteristics
Number of Properties

Reach Number	Residential	Commercial	Industrial	Public
1	2	37	1	1
2	102	8		1
3	251	2		1
4	440	145		5
5	109	25	9	3

SOCIO-ECONOMIC CONDITIONS

As shown in table B-2, 1980 census data indicate that the Des Moines area labor force is concentrated in wholesale and retail trade and professional and related services. Per capita income averaged $12,130 in the Des Moines SMA, compared to $10,480 and $10,495 in the State of Iowa and the United States, respectively. SMA income is concentrated in service industries, wholesale and retail trade, and manufacturing. Comparative populations and socio-economic trends are shown in tables B-3 and B-4.

TABLE B-2

Des Moines, Iowa, SMA Labor Force
1980 Census of Population

Employment Category	Labor Force	Percent Distribution
Manufacturing	24,168	14.3
Wholesale and Retail Trades	40,149	23.8
Professional and Related Services	34,400	20.4
Other Significant Industries (Finance, Insurance, Real Estate)	29,027	11.3
Government	26,921	16.0
Self-Employed	8,628	5.1
All Other	15,310	9.1

TABLE B-3

Population Trends
(000's)

	Pop. 1970	1980	Pop. Est. 1985	Pop. Proj. 1990	Percent 1980-1985	Percent 1985-1990
City of West Des Moines, IA	16.4	21.9	26.0	29.0	+18.7	+11.5
City of Des Moines, IA	201.4	191.0	195.5	196.7	+ 2.4	+ 0.6
Polk County, IA	286.1	303.2	309.0	316.1	+ 1.9	+ 2.3
Des Moines, IA SMA	341.5	369.2	379.2	389.8	+ 2.7	+ 2.8
State of Iowa	2825.0	2913.8	2905.4	2913.5	- 0.3	+ 0.3

TABLE B-4

1980 Comparative Socio-Economic Data

Item	West Des Moines	Des Moines	State of Iowa	United States
Median Household Income	$23,600	$16,700	$16,800	$19,900
Median Housing Unit Value	$67,300	$41,800	$40,600	$47,300
Households Below Poverty Level (%)	4.2	7.8	7.5	9.6
High School Graduates (%)	88.2	74.8	71.5	66.5
Age 65 Years or Older (%)	9.0	12.5	13.3	11.3

FLOOD HISTORY

The cities of West Des Moines and Des Moines are prone to severe flooding from the Raccoon River and Walnut Creek. Flood events are often independent, but are sometimes concurrent. To eliminate the potential for double counting, damages in reaches with possible concurrent flooding were evaluated based only on the controlling stream frequency/elevation relationship (i.e., the stream producing the greatest damage within the reach). Walnut Creek is the controlling stream for Reaches 1 and 2, while the Raccoon River controls Reaches 3, 4, and 5.

The most recent severe flooding occurred in May 1986 and July 1986 on Walnut Creek and the Raccoon River, respectively. The May 1986 flood (Walnut Creek) caused more than $3 million in damage to 46 businesses and 220 homes. This flood was an approximate 40-year event, and actual damage fits well into the project damage curve. The July 1986 flood (Raccoon River) was an approximate 30-year event. Serious commercial and residential damages were prevented by construction of an emergency levee (at a West Des Moines city-cost of $45,000).

Significant flooding has also occurred from the Raccoon River in 1947 (record flood), 1973, and 1979. Damaging floods occurred from Walnut Creek in 1973, 1974, and 1975.

MOST PROBABLE FUTURE CONDITION

The most likely future condition in the study area of Des Moines-West Des Moines, Iowa, is increased flood problems. Both cities have a diversified and expanding economic base, with the potential for greater damageable value in the future. Also, continued upland development will likely increase future runoff and flooding severity.

SECTION 3 - METHODS TO DETERMINE POTENTIAL FLOOD DAMAGE REDUCTION BENEFITS

ANALYSIS OF POTENTIAL FLOOD DAMAGE

CREDIT FOR EXISTING LEVEES

The existing levee along Walnut Creek provides no protection for Reaches 1 and 2. Reach 3 damages are controlled and evaluated based on the Raccoon River only. Therefore, no protection credit is due the existing Walnut Creek levee. Also, no credit was given to the Raccoon River emergency levee built during the 1986 flood threat, due to its temporary purpose and construction nature.

RESIDENTIAL STRUCTURES

Each home in the floodplain was surveyed by Corps of Engineers personnel to establish a ground elevation, first floor elevation, and a fair market value. This information was then analyzed using the residential damage program for the Rock Island District Content value is estimated to be 34 percent of a residential structure's value. Residential damage-frequency curves were constructed for each reach in the study area. Table B-5 depicts residential damages by reach for various flood event frequencies.

TABLE B-5

Residential Damage by Reach
Existing Conditions ($1,000's)
(Structure and Content)

Flood Frequency	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
.5					
.2	0	0	0	0	0
.1	0	28	163	2,880	558
.05	0	57	694	5,130	915
.02	0	106	1,815	6,714	1,282
.01	5	253	2,930	7,488	1,437
.005	12	472	4,046	8,060	1,574
.002	25	752	4,937	8,568	1,696
SPF	38	1,151	6,366	10,735	2,255

COMMERCIAL AND INDUSTRIAL DAMAGES

The study area of West Des Moines-Des Moines is a varied and growing site of commercial activity. Commercial businesses represented in the study area have an estimated structural and content value of $24 million and $19 million, respectively. These businesses include: retail and wholesale lumber, building products, brick and tile, realty and banking, laundering, printing, bowling lanes, supermarkets, auto service stations, restaurants, hardware, taverns, veterinary services, pharmacies, furniture, law offices, appliances, florists, clothiers, hair salons, chiropractic services, bakery distribution, paints, trucking, plumbing, electronics, optical services, wholesale foods, insulation, gifts, antiques, bookstores, pawnshops, jewelers, lawn and garden, janitorial service, tree service, and ready-mix concrete. Industrial concerns have an estimated structural and content value of $11 million and $29 million, respectively, and include: packaging, concrete products, cement plant, bulk fertilizer, metal fabrication, plating, and turbines.

To establish depth-damage relationships, interviews were conducted with business and industry representatives in the flood-prone areas. Since recent serious flooding has occurred (1986), much actual damage information was readily available. Tables B-6 and B-7 relate commercial and industrial damages by reach and flood frequency.

TABLE B-6

Commercial Damages ($1,000's)
Existing Damages

Flood Frequency	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
.5	0	0	0	0	0
.2	848	0	0	0	0
.1	1,798	0	8	4,756	746
.05	2,787	10	16	6,498	1,315
.02	3,186	30	20	7,527	1,966
.01	3,843	109	21	8,142	2,392
.005	4,518	266	23	8,634	2,656
.002	5,147	562	25	9,100	2,862
SPF	5,594	917	48	10,715	3,652

TABLE B-7

Industrial Damages ($1,000's)
Existing Conditions*

Flood Frequency	Reach 1	Reach 5
.5	0	0
.2	0	0
.1	31	220
.05	172	505
02	375	1,440
.01	1,675	2,305
.005	3,575	3,030
.002	4,975	3,629
SPF	5,600	4,923

*Reaches 2, 3, and 4 contain no industrial concerns.

PUBLIC DAMAGE

Public properties in the West Des Moines portion of the study area include the City Hall, the water works office and plant, Board of Education offices and an elementary school, two parks, Public Works and Engineering offices, a community center, U.S. Post Office, and roads and sewers. Public property damage in the Des Moines portion include an equalization basin, roads, and sewers. Table B-8 depicts public damage, by reach, over the range of possible flood events.

TABLE B-8

Public Damage by Reach ($1,000's)
Existing Conditions

Flood Frequency	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
.5	0	0	0	0	0
.2	6	0	0	0	0
.1	8	9	6	276	64
.05	10	16	10	388	107
.02	12	22	15	484	165
.01	14	27	18	552	232
.005	15	31	22	612	344
.002	16	34	26	677	413
SPF	17	39	37	920	710

EMERGENCY COSTS

During flood threats, both cities engage in emergency flood-fighting operations. Costs are incurred for sandbagging, temporary dikes and pumping, as well as associated personnel costs. During the 1986 flood events, the two cities spent approximately $42,000 and $99,000 for Walnut Creek and Raccoon River flood-fighting, respectively. These costs were projected over the full range of flood events to construct an emergency cost curve.

FUTURE CONSIDERATIONS

Residential Content

The residential affluence concept refers to an increase in accumulated housing content value over time. Based on current OBERS projections for per capita income growth, residential content value is projected to increase 1.57 percent annually to 75 percent of structural value from the present 34 percent. The content value is projected to reach its maximum (75%) after 51 years. Thus, damages to residential contents will increase over time in the without-project years.

Commercial and Industrial Expansion

Business expansion in the study area since the feasibility report is obvious, with an approximate 30 percent increase in the number of businesses in the site. New construction and greater numbers of businesses are very evident. However, establishing a growth rate projection for expansion of flood-damageable property is difficult, at best. During interviews, expansion of facilities and activity was the predominant view. Large increases in capacity were often forecast - such as 25 to 50 percent expansions in the near term. As is often the case, written or formal strategic business plans are not available (especially in small businesses). Therefore, establishing growth rates based on interviews is not realistic.

This analyst believes that the use of generalized growth projections (OBERS) presents a more reliable, reasonable, supportable, and conservative, means for incorporating future growth into the economic analysis. Based on the 1985 OBERS Regional Projections for the Des Moines SMA, commercial damageable property is expected to increase at a 2 percent annual rate for 30 years after the base year (with a no-growth scenario for project remaining life). An average of wholesale, retail, and service sector projection was used for this index. The OBERS manufacturing index (1.4 percent growth for same period) was used for industrial property expansion. The use of these generalized growth rates has no distorting effects on project evaluation.

AVERAGE ANNUAL DAMAGES

Average annual damages are the expected value of flood losses for any given year. To calculate average annual damages, depth-damage curves for study area properties were integrated with elevation-frequency relationships. sTable B-9 summarizes annual damages by major category and decade.

INTERIOR FLOODING - JORDAN CREEK

Jordan Creek, which forms the southwestern border of the study area, has the potential to cause nuisance flooding in the with- or without-project condition. During a 25-year event or greater, in the with-project condition, Jordan Creek waters could flow behind the downstream (Raccoon River) flank levee tie-off. Water could pond behind the levee and be released through a gravity outlet. Damages would be insignificant and would occur with or without the project.

DOWNSTREAM EFFECTS AND INDUCED DAMAGES

The proposed project will have no effects on downstream properties. Based on with-project hydraulic profiles, induced damages to residential properties near the left (northeast) bank of Walnut Creek are approximately $200 annually. Commercial properties on the left bank of Walnut Creek (near Grand Avenue) will realize no significant increase in annual damages.

TABLE B-9

Average Annual Damages ($1,000's)

Year	Residential Structure	Residential Content	Commercial	Industrial	Public	Total
1988	567.8	318.0	1,513.6	162.0	74.1	2,635.5
BaseYear 1994	567.8	349.2	1,704.6	176.1	74.1	2,871.8
2004	567.8	408.0	2,080.3	202.4	74.1	3,332.6
2014	567.8	476.8	2,535.9	232.5	74.1	3,887.1
2024	567.8	557.2	3,091.3	267.2	74.1	4,557.6
2034	567.8	651.1	3,091.3	267.2	74.1	4,651.5
2044	567.8	703.8	3,091.3	267.2	74.1	4,704.2
2094	567.8	703.8	3,091.3	267.2	74.1	4,704.2
Discounted at 8-7/8 Percent						
1988	567.8	318.0	1,513.6	162.0	74.1	2,635.5
1994	567.8	349.2	1,704.6	176.1	74.1	2,871.8
1994-2094	567.8	427.4	2,160.0	206.0	74.1	3,435.3

TABLE B-10

Flood Damage Reduction Benefits
By Category and Time Period
(100-Year Project, 8-7/8%, $1,000's)

Year	Residential Structure	Residential Content	Commercial	Industrial	Public	Total
1988	511.3	288.0	1,418.7	123.0	67.3	2,408.3
BaseYear 1994	511.3	316.3	1,597.7	133.7	67.3	2,626.3
2004	511.3	369.5	1,947.6	153.6	67.3	3,049.3
2014	511.3	431.8	2,374.1	176.6	67.3	3,561.1
2024	511.3	504.6	2,894.0	202.9	67.3	4,180.1
2034	511.3	589.7	2,894.0	202.9	67.3	4,265.2
2044	511.3	637.4	2,894.0	202.9	67.3	4,312.9
2094	511.3	637.4	2,894.0	202.9	67.3	4,312.9
Discounted at 8-7/8 Percent						
1988	511.3	188.0	1,418.7	123.0	67.3	2,408.3
1994	511.3	316.3	1,597.7	133.7	67.3	2,626.3
1994-2094	511.3	387.1	2,023.7	156.4	67.3	3,145.8

SECTION 4 - BENEFIT-COST ANALYSIS

Throughout this analysis, benefits and costs are stated in September 1988 price levels. A 100-year project life and a discount rate of 8-7/8 percent are used to amortize costs and discount benefits to a common time period. Interest during construction was calculated based on a 3-year construction period. Annual operation and maintenance charges were added to amortized first costs to determine total annual charges to be compared with annual benefits.

BENEFIT ANALYSIS

FLOOD DAMAGE REDUCTION

Benefits accruing to the reduction of flood damages are computed as the difference between with-project and without-project average annual damages. Table B-10 details existing and future flood damage reduction benefits by category and time period. Benefits in the freeboard range are included in the categorical totals. They are calculated as one-half the area under the damage-frequency curve between the design level of protection and the largest flood which might be carried within the freeboard. Residual damages are those damages which will occur with the proposed project in place (due to possibilities of flooding of greater than design levels). Table B-11 presents a summary of the benefits and the residual (with-project) damages for the 100-year levee and floodwall project.

TABLE B-11

Average Annual Benefits ($1,000's)
Flood Damage Reduction
100-Year Project Design

Category	Benefits			Residual Damage	Average Annual Damage
	Existing	Future	Total		
Residential	827.6	70.8	898.4	96.8	995.2
Commercial	1,597.7	426.0	2,023.7	136.3	2,160.0
Industrial	133.7	22.7	156.4	49.6	206.0
Public	67.3	-	67.3	6.8	74.1
TOTALS	2,626.3	519.5	3,145.8	289.5	3,435.3

FLOOD INSURANCE SAVINGS

The administration of the Flood Insurance Program is a national cost. Savings of this administrative cost can be credited to a project as a National Economic Development (NED) benefit if the project protects an area located in the 100-year (1 percent exceedence frequency) floodplain. It is assumed that all properties in the 100-year floodplain participate in the Flood Insurance Program and that coverage will be eliminated if flood protection is provided. Current annual administrative costs are estimated to be $56 per policy. With a total of 1,048 properties in the indicated floodplain, $58,700 in insurance cost savings would accrue to the proposed project annually.

RECREATION BENEFITS

The West Des Moines project area is located within the Des Moines Recreational River and Greenbelt boundary.

The September 1987 General Design Memorandum for the Greenbelt identified recreation amenities required to fulfill current and projected demand within the Greenbelt area. Needs were based on current visitation or useage, population projections, activity use rate projections, latent demand, and recreation planning space standards. This market analysis supported the construction of additional boat ramp launch lanes and multi-use trails.

Boat Ramps. The Greenbelt market analysis reported a need for at least 140 launch lanes within the area by 1995. Only 124 launch lanes exist in the Greenbelt boundaries, with an additional seven lanes scheduled for construction. Construction of a single-lane boat ramp, as part of the West Des Moines project, would help fulfill the latent and projected demand for launch lanes in the Greenbelt area.

Trails. The Greenbelt General Design Memorandum supported the construction of an additional 400 miles of bike trails within the 9-county area. These trails would be needed in addition to the 108 miles of existing bike trail. Construction of a 3-mile length of multi-use trail (bike, hike, jog, walk) would help fulfill the demand for bike trails. This trail would provide a safer and more enjoyable recreation experience than alternative use of city roads.

The construction of the proposed recreation facilities as part of the West Des Moines project would result in no adverse impacts to similar existing facilities; in particular, no decrease in visitation at other facilities would result.

The biking (walking, jogging, etc.) trail will be constructed on the levee crown, running approximately 15,000 feet in length. The single ramp boat launch (with parking) will be built for Raccoon River access, to accommodate small craft (fishing and canoeing). The benefits for these recreational facilities have been assessed using the Unit Day Value (UDV) method, as

prescribed by Principles and Guidelines (P&G). The following tables depict UDV assignments and the resulting use valuations. For the bicycle trail evaluation (table B-12) a comparison is made for the without-trail condition (e.g., street biking/running).

TABLE B-12

Bicycle/Activities Trail
Recreation Benefit Evaluation
Unit Day Value Method

Criteria	Point Assignments No Trail	Trail	Comments
Recreation Exposure	5	7	Several general activities. Trail provides safer, more consistent experience
Availability of Opportunity	1	2	Several within one hour; a few within 30 minutes
Carrying Capacity	2	7	Minimum facility without trail; adequate facility with trail
Accessibility	12	12	Good access to & within site
Environmental Quality	2	5	Low aesthetics without trail; average with trail
TOTAL POINTS	22	33	
1988 P&G Value	$2.59	$3.03	

Difference (Value Increase) $0.44
Estimated Annual Usage x 70,000

ANNUAL BENEFIT $30,800

As shown in table B-12, the annual benefit for the bicycle trail segment of the project is $30,800. The estimated usage of 70,000 per year is based on space and turnover standards for recreation planning. Table B-13 depicts the UDV point assignment and use valuation for the proposed boat ramp facility.

TABLE B-13

Boat Ramp Benefit Evaluation
Unit Day Value Method

Criteria	Point Assignment	Judgment Factors
Recreation Experience	5	Several general activities
Availability of Opportunity	2	Several within one hour; a few within 30 minutes
Carrying Capacity	4	Basic facility to conduct activities
Accessibility	12	Good access to and within site
Environmental Quality	5	Average aesthetic quality
TOTAL POINTS	28	
1988 P&G Value	$2.81	
Estimated Annual Use	x 12,000	
ANNUAL BENEFIT	$33,700	

The annual benefit for the proposed boat ramp is $33,700. The recreational boating demand in the study area was estimated using a regional gravity allocation model. The model is used to determine the launch distribution of various user populations to alternative destination launch sites. Based on the location and capacity of the proposed boat ramp, 12,000 annual uses are estimated (4,000 launches x 3-person average per launch).

A cost and benefit summary for recreation features is detailed in table B-14. The recreation facilities are incrementally justified with a benefit-to-cost ratio (BCR) of 1.3.

TABLE B-14

Cost and Benefit Summary
Recreational Facilities

Recreation Facilities:	
Cost Estimate (100-Year Project)	$507,000
Interest During Construction	21,900
Total First Cost	$528,900
Annual Cost, 100-Years, 8-7/8%	$ 49,700
Interest & Amortization	(47,000)
Operation, Maintenance & Replacement	(2,700)
Annual Benefits	$ 64,500
Bicycle Trail	(30,800)
Boat Ramp	(33,700)
BCR	1.3

SUMMARY OF THE BENEFIT-COST ANALYSIS

Table B-15 presents summaries of the benefit-cost analysis for various levels of protection. Table B-16 compares incremental and net benefits for several levels of protection. The 100-year design project provides for the greatest net benefit ($1,437,700) and is therefore the NED plan. This plan has a BCR of 1.8. Tables B-17 and B-18 present the calculations for interest during construction and for annualizing project costs for the recommended 100-year design project. Appendix D of this report presents a detailed cost estimate for the recommended plan.

OTHER ALTERNATIVES AND OPTIONS CONSIDERED

In addition to the project alignment and protection levels already analyzed in the appendix, three other modifications were considered. An upstream tie-off on Walnut Creek (Hoak Drive near Center Street) was assessed as a separate increment and found to be economically unjustifiable (BCR of 0.19). An alternate alignment on the Raccoon River near Jordan Creek also was considered. This alignment would have protected the southwest study area near the Martin-Marietta Company. The BCR for this option is 0.22, and will be considered no further. Finally, a levee and closures protecting a mainly commercial area of Des Moines, just east of Walnut Creek at Grand Avenue, was evaluated. The BCR for this alternative is 0.06, and will not be considered further.

TABLE B-15

Benefits and Costs Summary
for Various Project Design Levels
(8-7/8%, 100-Year Life, Septemnber 1988 Prices, $1,000's)

Item	50-Year	100-Year	200-Year
Annual Benefits-Total	2,999.2	3,253.0	3,360.1
Existing (Includes Freeboard Range)	(2,445.1)	(2,669.0)	(2,760.9)
Residential Damage Reduction 1/	746.4	807.5	844.4
Commercial 1/	1,501.9	1,583.2	1,619.0
Industrial	116.3	133.7	149.5
Public	63.2	67.3	70.1
Flood Insurance Savings	0	58.7	58.7
Emergency Costs	17.3	18.6	19.2
Future	(489.6)	(519.5)	(534.7)
Residential Affluence	65.5	70.8	74.0
Commercial Growth	404.3	426.0	435.3
Industrial Growth	19.8	22.7	25.4
Recreation Benefits	(64.5)	(64.5)	(64.5)
Cost Estimate:			
Federal	11,870.0	12,480.8	13,585.0
Non-Federal	4,690.0	5,276.2	5,348.0
Interest During Construction	2,342.0	2,510.0	2,688.0
Annual Charges-Total	1,693.5	1,815.3	1,936.3
Interest and Amortization	(1,678.0)	(1,799.1)	(1,919.3)
Operation and Maintenance	(15.5)	(16.2)	(17.0)
Net Annual Benefits - Existing Condition	751.6	853.7	824.6
BCR - Existing Condition	1.4	1.5	1.4
Net Annual Benefits - Total	1,305.7	1,437.7	1,423.8
BCR - Total	1.8	1.8	1.7

1/ Existing benefits for Residential and Commercial Properties have been reduced by $20,100 and $14,500, respectively, to reflect interior drainage residual damages due to blocked gravity conditions in the with-project condition.

TABLE B-16

Maximization of Net Benefits ($000's)

Design Frequency	Annual Benefit	Annual Charge	BCR	Incremental Benefit	Incremental Charge	Incremental BCR	Net Benefit	
50-year	2,999.2	1,693.5	1.77				1,305.7	
				253.8	121.8	2.08		
100-year	3,253.0	1,815.3	1.79				1,437.7	Max
				107.1	121.0	.89		
200-year	3,360.1	1,936.3	1.74				1,423.8	
				35.9	48.1	.75		
300-year	3,396.0	1,984.4	1.71				1,411.6	
				32.0	41.6	.77		
400-year	3,428.0	2,026.0	1.69				1,402.0	
				35.0	37.0	.95		
500-year	3,463.0	2,063.0	1.68				1,400.0	
				57.0	524.8	.11		
SPF	3,520.0	2,587.0	1.36				933.0	

TABLE B-17

Interest During Construction
100-Year Design Project - 8-7/8% Discount Rate

Fiscal Year	Expenditures (1,000's) Federal	Non-Federal	Time to Base Year (Periods)	Interest Factor of $1 Deposited to Base Year	Accumulated Interest to Base Year (1,000's) Federal	Non-Federal	Total
1992	3,580.0	1,700.0	2.5 (5)	.24246	868.0	413.0	1,281.0
1993	5,280.0	1,820.0	1.5 (3)	.13912	735.0	254.0	989.0
1994	3,620.8	1,756.2	0.5 (1)	.04437	162.0	78.0	240.0
TOTALS	12,480.8	5,276.2			1,765.0	745.0	2,510.0

TABLE B-18

Summary of Annual Charges ($)
100-Year Design Project
(8-7/8%, 100-Year Life)

Description	Amount Federal	Non-Federal	Total
Estimated Economic First Cost	12,480,800	5,276,200	17,757,000
Interest During Construction	1,765,000	745,000	2,510,000
Total Economic First Costs	14,245,800	6,021,200	20,267,000
Interest and Amortization (.08877)	1,264,600	534,500	1,799,100
Operation and Maintenance	0	16,200	16,200
Total Annual Charges	1,264,600	550,700	1,815,300

SECTION 5 - FINANCIAL ANALYSIS

COST DISTRIBUTION

Based on current cost-sharing provisions, Federal and non-Federal costs will be distributed as in table B-19.

TABLE B-19

Project Cost Distribution - 100-Year Design
West Des Moines - Des Moines Project

Total Project Cost Estimate	$17,757,000		
Federal Cost Estimate	12,480,800	West	
Non-Federal Cost Estimate		Des Moines	Des Moines
Lands, Damages, & Relocations		$3,233,800	$ 950,400
Cash Contributions		781,900	310,100
Total Non-Federal Cost Estimate (29.7% of Total Project Cost)		$4,015,700	$1,260,500

ABILITY TO PAY

Based on the provisions of Section 103 of Public Law 99-662, the cities of West Des Moines and Des Moines have the ability to provide their normal share of project costs. The analysis, illustrated in table B-20, is based upon the 100-year project BCR and the project-area per capita income. The cities do not qualify for reduced cost-sharing.

TABLE B-20

Ability to Pay Analysis

Project: West Des Moines and Des Moines, Iowa

Annual Cost	$ 1,815,300	Cost & Benefits
Annual Benefits	3,253,000	for Flood Control
Total Cost	17,757,000	
Local Share	5,276,200	
BCR	1.8	
State Factor	91.48	Sum of State &
County Factor	112.56	County Must be
		Less Than 163.2
		Sum is 204.04

NOT QUALIFIED

Base Benefits Floor	45%	1/4 BCR
% Local Share	30%	
EF	-3.62	Eligibility Factor

FINANCIAL CAPABILITY

The cities of West Des Moines and Des Moines have the willingness and capability to finance their shares of the cost of constructing this local flood protection project. A Statement of Financial Capability and Financing Plan will be submitted, along with the draft Local Cooperation Agreement, during the General Design Memorandum phase.

SECTION 6 - SOCIO-ECONOMIC IMPACTS

DISCUSSION OF IMPACTS

The socio-economic impacts associated with providing flood protection at West Des Moines and Des Moines, Iowa, generally would be positive. Affected residents would experience an increase in community cohesion and would be less likely to move to other parts of the city or region. Services to and from the affected area would be better maintained, and public facilities would benefit from reduced damages. The project would increase the economic viability of the area and could result in increased property values and related tax revenues. The community also would benefit from reduced life, health, and safety risks faced by residents during flood events.

The project would necessitate the relocation of one household. In considering the impact of relocation, knowing the number of persons to be moved is not enough to assess the socio-economic impact: the individual's income, age, and other characteristics influence his or her ability to adjust to relocation. Specific data for the residents who would be relocated with the proposed project were not available for this analysis; therefore, demographic data for the entire Des Moines area were examined for the following variables[1]:

a. Income - The 1985 median household income for residents in the Des Moines area was estimated at $23,800. Less than 29 percent of the community households were estimated to have incomes less than $15,000;

b. Age - Less than 11 percent of the Des Moines population was estimated to be over 64 years of age in 1985; and

c. Race - Approximately 8.5 percent of the 1985 population in the Des Moines area were minority members.

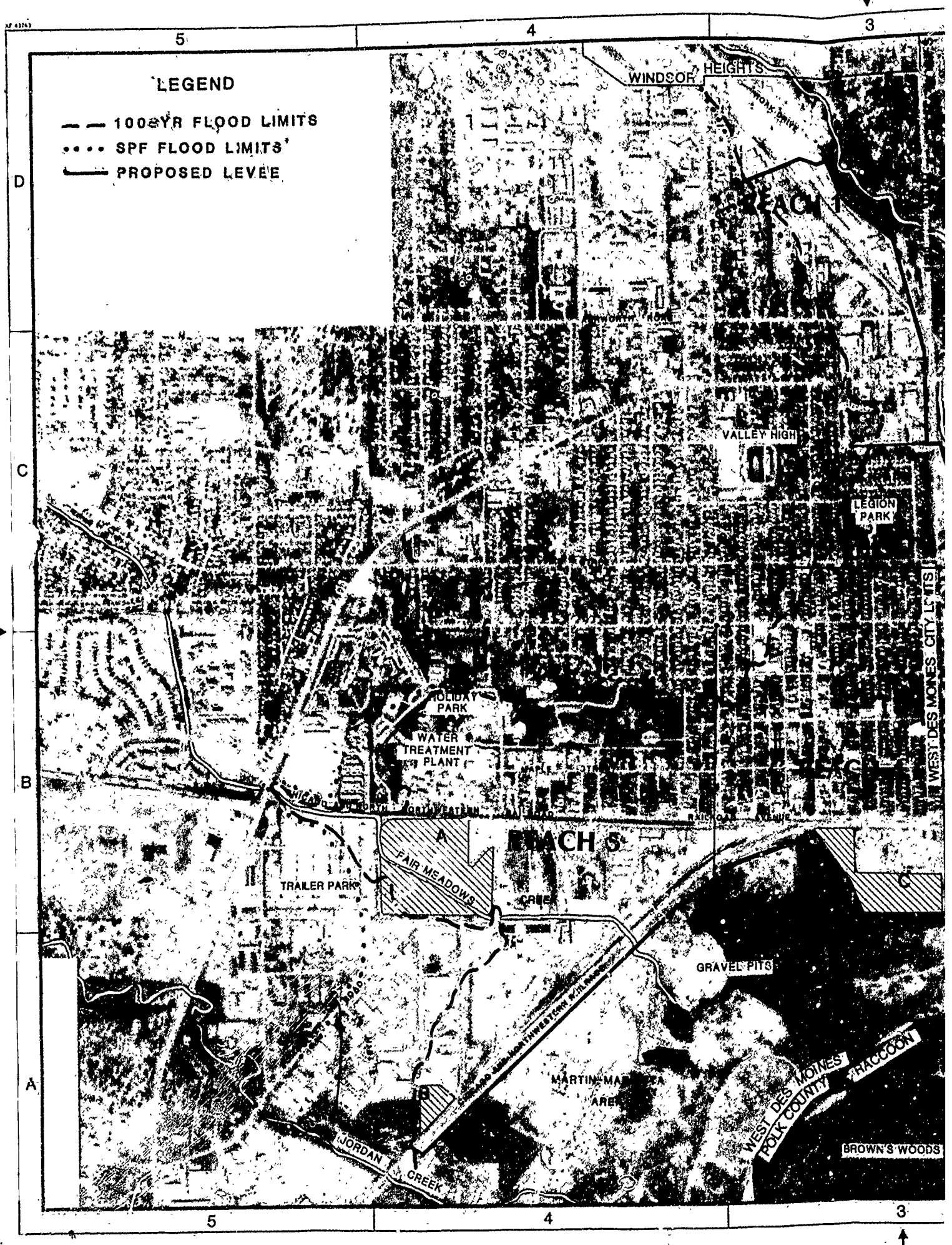
Based on these data, it is probable that residents affected by project-related relocation would be less than 65 years of age, middle class, and non-minority members. Research has shown that individuals possessing these characteristics are most able to adjust to the impact of relocation; they are unlikely to experience economic hardships due to disruption of public transportation services and facilities or to experience stress due to isolation from stress handling and social control systems (e.g., family, friends, church). Given the small number of residential relocations required (one), its effect on the population should not be significant.

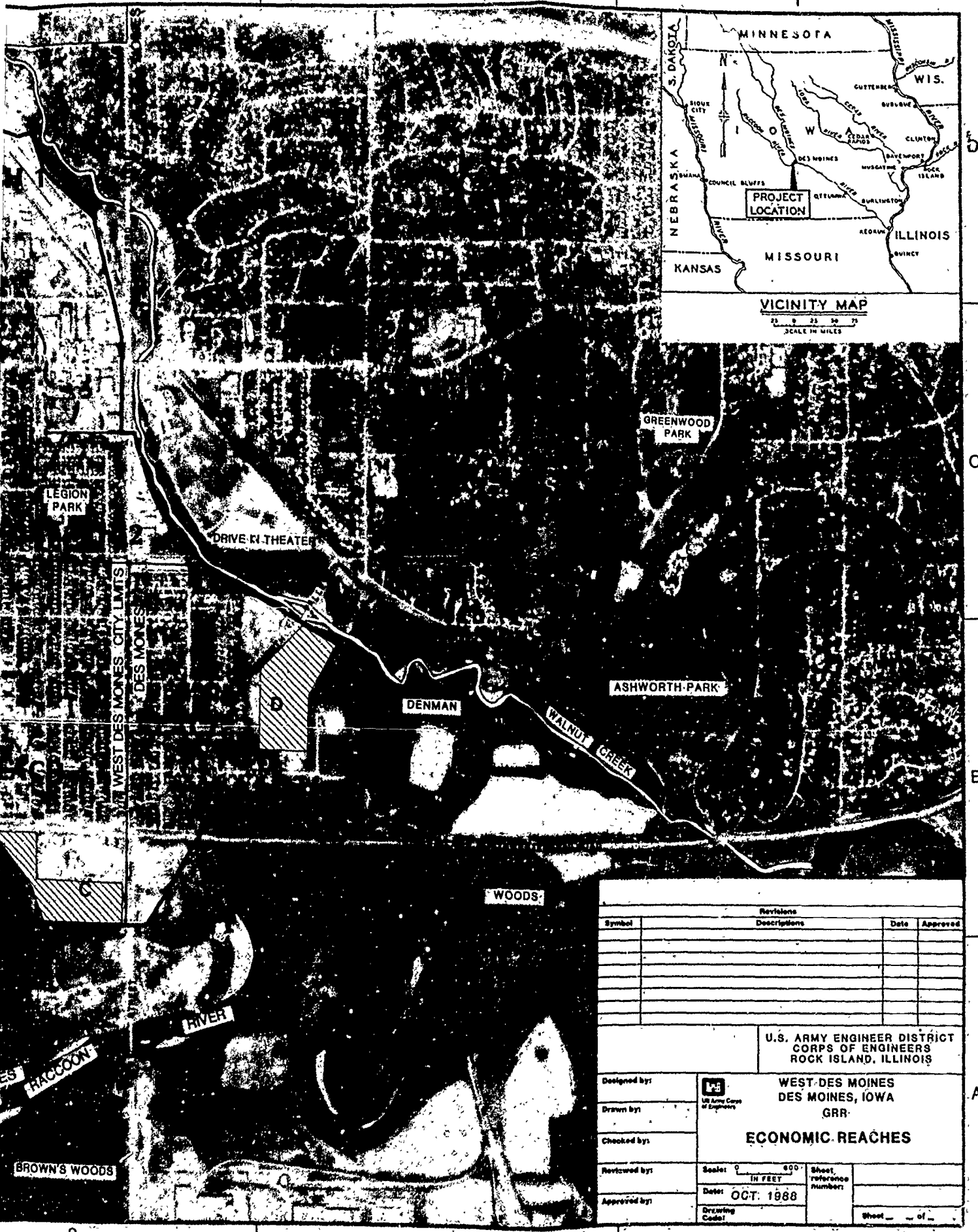
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[1] Claritas, REZIDE, The National Encyclopedia of Residential ZIP Code Demography, 1980 & 1985.

The project also would require the relocation of two businesses. Opportunities exist for these businesses to relocate to acceptable locations within the cities. The small number of commercial relocations anticipated would not significantly affect commercial activity in the project area.

A more detailed discussion of socio-economic impacts is provided in the Draft Supplemental Environmental Impact Statement.


LEGEND
100-YR FLOOD LIMITS
SPF FLOOD LIMITS
PROPOSED LEVEE
WINDSOR HEIGHTS
VALLEY HIGH
LEGION PARK
WEST DES MOINES CITY LTS
HOLIDAY PARK
WATER TREATMENT PLANT
FAIR MEADOWS
TRAILER PARK
GRAVEL PITS
MARTIN MARIETTA AREA
WEST DES MOINES
POLK COUNTY
RACCOON
BROWN'S WOODS
JORDAN CREEK
5
4
3
A
B
C
D



Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:

US Army Corps of Engineers

WEST DES MOINES
DES MOINES, IOWA
GRR

ECONOMIC REACHES

Scale: 0 600 IN FEET
Date: OCT. 1988
Drawing Code:
Sheet reference number:
Sheet _ of _

PLATE B-1

APPENDIX C

GEOTECHNICAL

GENERAL REEVALUATION REPORT
FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

APPENDIX C
GEOTECHNICAL

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GENERAL REEVALUATION REPORT
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APPENDIX C
GEOTECHNICAL

GEOLOGY AND SOILS

LOCATION

The levee project site is located in eastern West Des Moines, Walnut Township, and in western Des Moines, Des Moines Township, Polk County, Iowa. The site is situated just north of the Raccoon River and just west of Walnut Creek. Physiographically, the area lies on the border between the Des Moines Lobe and the Southern Iowa Drift Plain of the Disected Till Plain in the Central Lowland Physiographic Province (Prior 1976).

PHYSIOGRAPHY

The Raccoon River Valley is believed to have begun its development during the Aftonian interglacial period (plate C-1). At that time, the main drainage from the north passed a few miles east of the project. The Cary substage of the Wisconsinan glacial stage reached to the Raccoon River (Bain 1896) and is the youngest glacial landscape found in Iowa (Anderson 1983). The landscape in the project area was primarily produced through erosion during late Wisconsinan and post-glacial times. Some valleys are extensive, resultant of glacial stream downcutting. Evidence for the accelerated downcutting is the extensive sands and gravels.

The Des Moines lobe lacks an obscuring mantle of loess, because the ice advance took place after the period of greatest Wisconsinan loess deposition in the state. The southern margins of the Des Moines Lobe are irregular, in part owing to the short duration before glacial retreat of about 1,000 years. The resultant feature is a terminal moraine, called the Bemis moraine.

Streams in the area today are slow and sluggish, except during times of higher water levels. Elevation of the area in general ranges from 800 to 950 feet National Geodetic Vertical Datum (NGVD). Elevation of the specific project site ranges from 800 to 820 feet NGVD.

BEDROCK

The bedrock of the project area consists of Pennsylvanian age cyclothermic sandstones, siltstones, shales, limestones, and coals, with shales as the dominant rock type. These rocks set unconformably on top of Mississippian age rocks. Bedrock is possibly assigned to formations of the Marmaton group (plate C-1). Stratigraphic determinations at Saylorville Spillway, 10 miles north, are that the bedrock is composed of Floris and Swede Hollow formations of the Cherokee group. Regional dip of the bedrock is gradual and to the southwest. Thickness of the Pennsylvanian age rocks ranges up to 200 feet in some locations. The project site lies on the edge of the geologic structure called the Forest City Basin. The center of this structure is in southwest Iowa where the Pennsylvanian strata reach a maximum thickness of 1,700 feet, and confines most of the strata to southern and western parts of the state. Depth to bedrock at the project site ranges from 7.5 to 55 feet through extensive sands and a few gravels.

PLEISTOCENE AND HOLOCENE DEPOSITS - SOILS

The Pleistocene age deposits in the project area consist of alluvial and glacio-fluvial sands and gravels, resting unconformably on Pennsylvanian age bedrock. Setting on top of the Pleistocene sands and gravels are Holocene alluvial silts and clays. Thickness of the Pleistocene sands ranges from 4 to 41 feet, with gravels mixed in various layers up to a few feet thick. The sand deposits contain more silt or clay in the upper few feet and become increasingly cleaner in the lower deposits. Hydrologic conductivity should be higher in the cleaner sands and gravels in the lower deposits. Some of the lower sands and gravels are believed to have developed during the Aftonian Interglacial Stage of the pre-Illinoian glacial stage (plate C-1). The remaining sands and gravels are valley train deposits belonging to the Mackinaw member of the Henry formation of Wisconsinan age (Anderson 1983).

The Holocene alluvial silts and clays which set on top of the Pleistocene sands are called the Cahokia Alluvium. Thicknesses of the Cahokia Alluvium range from 1.5 to 15.5 feet. The principle parent materials for the soils in the project area are glacial drift, loess, and alluvium. A large part of the soils is covered by fill with mixed debris; silt, clay, blacktop, cement, sand, glass, and ceramic chips. Thickness of the fill ranges from 2.5 to 17 feet where present.

MINERAL RESOURCES

Currently the only mineral resource actively worked near the project area is sand and gravel, and will not be affected by the project. In the project area coal mining was of considerable importance between 1840 and 1930. The first large coal mining operation in Iowa was located in Des Moines, south of the

Raccoon River (Van Dorpe 1988). At present there are no coal mining operations in the area, although some attention should be given to the fact that on the northern end of the levee project, coal was mined (plate C-2). The mining operation, namely the Keystone Coal Company, terminated their operation in 1922 (Van Dorpe 1988). The coal seam mined was found 147 feet below the surface, elevation 660 feet NGVD. At that depth, the abandoned mine should not affect the project. Some consideration should be given to the fact that there may be abandoned air shafts somewhere under the project, which could lead to piping or some other problem. Presently, locations of any shafts to the surface are unknown, but can be investigated if deemed necessary.

SUBSURFACE EXPLORATIONS

The initial exploration program for this project was conducted in March and April 1965. The program's purpose was to define areas of generalized soil conditions in addition to areas of specific concern for underseepage, slope stability, and settlement. The spacing between borings varied from 600 to 1,000 feet throughout the levee alignment. At designated areas, 3 borings were taken in section to include the existing impervious levee. The soil was penetrated by manual methods. A total of 52 borings were extended by hand with 4-inch Iwan augers from 4 to 22 feet to determine alignment evaluation. Auger sampling methods were employed to obtain jar samples of the impervious top stratum at 2-foot intervals both above and below ground water level.

Below ground water level and beneath the impervious top stratum, holes were extended into the pervious substratum by pushing a 2-inch diameter thin-walled conduit. Hole extensions ranged from 1 to 7 feet. The sample from the push tube was meticulously extracted by tapping the pipe while holding it in a near vertical position and laying it out on the ground as one continuous sample. The layed-out sample was measured to ensure that the full sample length was represented, and then was described and logged indicating where strata changes occurred. Jar samples of soil were obtained representing each strata change. Locations of the hand auger holes are shown on plate C-3, and logs of borings are displayed in sequence on plates C-4 through C-6. Geologic profiles depicting hand auger borings (labeled by number) obtained by the Government along the proposed levee alignment and one drill boring (labeled by letter) obtained by a private firm in the vicinity of the proposed levee alignment are shown on plate C-7.

In addition to the above explorations, firms outside the Federal Government were contacted for further soils information. Additional subsurface information was obtained from Patzig Testing Laboratories Co., Inc., Des Moines, Iowa; West Des Moines Water Works, City of West Des Moines, Iowa; and Martin Marietta Aggregates, West Des Moines, Iowa. Explorations from each source were conducted March 1968 through April 1987, March 1988, and 1944 through 1945, respectively.

The subsurface soil was penetrated by rotary drilling methods. Hollow stem and continuous flight augers were used to extend the holes. Standard split spoon and shelby tube sampling methods were employed to obtain samples at 5-foot intervals. Standard "N" penetration (blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split spoon) were taken at each interval depth. Boring logs for the sources mentioned are not presented herein. However, the exploratory information was examined and evaluated to determine the subsurface stratigraphy to and into bedrock and to locate the areas and extent of land fill above natural ground surface.

At this time, only one site inspection has been conducted of the proposed primary and alternate flood protection alignment. The primary alignment parallels the C&NW Railroad from stations 9 to 46, whereas the alternate encompasses Martin Marietta property for this reach. The inspection was conducted in April 1988 but did not include the Jordan Creek alignment. A more intensive site inspection by Geotechnical Branch personnel is planned prior to the next level of study to explore the selected levee and floodwall alignments afoot. The purpose of this inspection will be to document geotechnical features and lay out proposed supplementary subsurface explorations. Preliminary review indicates that additional explorations will be necessary. Shallow borings will extend through encountered land fill and through the impervious top stratum to a depth of at least 5 feet into the underlying pervious substratum. Deep borings will extend through encountered land fill and through both the impervious top stratum and pervious substratum to a minimum depth of 5 feet into the underlying bedrock.

The selected alignment will entail supplementary borings to extend to depths of from 10 to 30 feet for shallow holes and 50 to 60 feet for deep holes. Where accessible, it is planned to explore the alignment by means of a truck-mounted rotary drill rig. Where access is extremely arduous, an all-terrain rotary drill rig will be used. It is contemplated that 5-inch hollow stem augers will be used to extend the holes. Both standard split spoon and auger sampling methods will be employed to obtain jar samples at 2.5- and 5-foot intervals. The purpose of the explorations will be to ensure complete identification of all unusual subsurface features prior to conducting special studies for underseepage, settlement, and slope stability. In conjunction with these investigations, explorations will be required of each borrow site to identify available soils. In addition, explorations will be required to classify the type and determine the extent of the impervious top stratum in each ponding area. Supplementing these borings, it is planned to utilize a hydraulic excavator where land fill is encountered to determine its type and extent. Location of drill holes and excavations in conjunction with logs of borings and excavations will be presented in the next level of study.

SOIL TESTS

Laboratory soil testing was performed by the formerly named Rock Island District Foundations and Materials (F&M) Branch laboratory on the soils obtained by F&M personnel in March and April 1965. The natural moisture

content was determined on all impervious soils. Visual classification was performed on all soil samples. Atterberg limits tests were run on representative samples of the Cahokia alluvium soils. Results of these tests are shown on the plasticity chart, plate C-8.

For the proposed supplementary borings planned for this project's next level of study, it is perceived that Rock Island District Geotechnical Branch personnel will perform the necessary laboratory soil tests. Recordings of standard 2-inch split spoon penetration blow counts will be taken during exploratory operations of the top stratum, pervious substratum, and bedrock. Visual classification will be performed on all soil samples, and natural moisture contents will be determined on all impervious soils. Atterberg limits and wash gradation tests will be performed on selected samples to identify soils types. Undisturbed shear strength testing will be accomplished by Division laboratories to verify strength parameters. Results of these tests will be displayed on the logs of borings. Gradation curves indicating effective grain size (D_{10}) of the pervious substratum will additionally be exhibited.

PROPOSED EMBANKMENTS

Impervious borrow materials are available for this project. Two types of flood protection design are tentatively considered for this project:

The first type of flood protection design will entail construction of new levee embankments. Impervious clay will be either trucked or hauled to the construction site, and the material will be moved and placed by scrapers and spread by bulldozers. The trucked material will come from a 30-acre hilltop borrow site located at south 50th Street and Grand Avenue in West Des Moines, Iowa. The site owned privately by Russell Boone is situated on the north side of Grand Avenue and will provide some 20 to 50 feet of material above the surrounding grade. The hauled material will come from excavating on-site ponding areas and degrading existing levees. The levees will be constructed by semi-compacted methods to oblige any less than optimum borrow soils. The slopes will be constructed to 1V on 3H riverside and 1V on 3H landside to harmonize urban space limitations and to provide stability to the structure. The crown of the levee will have a minimum width of 10 feet to serve normal maintenance and emergency flood-fighting operations with current earthmoving equipment. Existing levees and variable subsurface conditions at this site were instrumental in dictating variations in levee design preparation. Design concepts considered for this project are shown as typical sections on plates C-9 and C-10. Typical levee sections indicating each variation planned for construction are shown on plate 11 in the main report. Reaches conducive to these variations also are shown on this plate.

A standard inspection/exploration trench will be used where subsurface conditions consist totally of Cahokia alluvium; on Hoak Drive where the existing gravel roadbed will be removed; and paralleling Walnut Creek where

the existing levee is intended to be degraded. An expanded inspection/exploration trench will be used where land fill of variable depth exists. Design concepts of these trenches, shown on plate C-10, will accommodate land fill excavations in the order of 5, 10, and 20 feet thick. Inspection/exploration trench details for each variation in proposed levee design are shown on design concept typical sections, plates C-9 and C-10, and on plate 11 in the main report.

The second type of flood protection design will propose construction of concrete floodwalls (I-wall type) through the existing parking lot paralleling Walnut Creek. A typical I-wall section is shown on plate 11 in the main report.

As shown on the geologic profile, plate C-7, the new levee embankments generally will achieve heights of from 2 to 13 feet along the proposed primary and alternate alignment for the 100-year level of protection. Isolated areas indicate that levee heights could extend to as much as 18 to 20 feet for short reaches crossing ditches. Ground surface irregularities beneath the structures will be filled and compacted with impervious material. Depressions and sloughs landward of the embankments will be filled with sand to natural ground surface for 100 feet beyond the levee toe to establish ground surface uniformity and to prevent the occurrence of unrestricted underseepage. Where reaches of levee embankment require construction of landside sand seepage berms to protect against excessive underseepage, depressions and sloughs will additionally be filled with sand. The fillings will extend 100 feet beyond the landside toe of the sand berm.

New levee embankments will be constructed wholly of selected fill materials acceptable to prescribed standards. Materials classified as SC, CL, CL-CH and CH with not less than 35 percent by weight passing the No. 200 sieve will be used for embankments composed of impervious fill. Moisture control for the impervious fill will be controlled by moisture deviation and onsite inspection. A deviation of less than 2 percent from the optimum moisture content will most likely be desired for the impervious fill. Laboratory testing of the available borrow materials will fine-tune the moisture deviation. Soil conditioning (wetting or drying), either at the borrow site or at the construction site, may be necessary to achieve the desired results.

The impervious fill will be controlled by uncompacted lift thickness (not more than 9 inches with tamping roller and 12 inches with rubber-tired roller), and number of complete passes for each lift using standard compaction equipment (not less than 4 to 6 passes with tamping roller and 2 to 4 passes with rubber-tired roller). A minimum of 95 percent of maximum dry density is desired for each lift of the impervious fill.

FOUNDATION FOR EMBANKMENTS

Upon selection of the levee alignment, the entire foundation beneath the new levee embankments will be cleared, grubbed, and stripped to remove unsuitable matter. For the total project, inspection/exploration trenches will be

located at the centerline of the embankment. Any alteration to this location scheme would occur only in areas where land fill is present. The trenches will be 8 feet wide to oblige modern construction equipment. For embankment heights greater than 6 feet, the trenches will extend a minimum depth of 6 feet to unveil any significant underground features such as pipes or unsuitable materials. These materials will be penetrated to preclude the possible occurrence of serious shallow seepage. Soft foundation materials within the levee foundation extremities at or near the surface will be excavated. For embankments less than 6 feet in height, the trenches will extend to a minimum depth equal to the embankment height. Side slopes for the trenches will be 1V on 1H unless extensive land fill or slope stability studies reveal that flatter slopes are necessary. The trenches will be backfilled with impervious fill to prescribed standards with current compaction equipment. In areas of existing land fill, excavations for inspection/exploration trenches will be extended through the land fill to at least 1 foot into the underlying Cahokia alluvium top stratum (if existing). The purpose of this scheme will be to provide a positive cutoff (impervious barrier) to prevent the potential occurrence of shallow seepage through the land fill.

Where the land fill areas are 5 feet or less in thickness, excavation will encompass the entire base width of the levee. Excavated land fill will be wasted. Beneath the structure, the excavation will be backfilled with compacted impervious fill, whereas outside the structure will be random fill. In land fill areas 10 feet or less in thickness, the excavation will form a trench with 1V on 1.5 side slopes and a 10-foot bottom width. Again, land fill will be wasted and the trench backfilled with compacted impervious fill. For land fill areas 20 feet or less in thickness, the excavation also will form a trench. The trench will be offset from the riverside slope of the levee embankment. Beneath the levee, the side slope will be 1V on 3H whereas riverward will be 1V on 1H with a 15-foot bottom width. The 15-foot trench width beneath the levee will be backfilled with compacted impervious fill and the remaining excavation will entertain random backfill. Again, the land fill will be wasted. Design concepts pertinent to these subsurface conditions are shown as typical sections on plates C-9 and C-10.

Boring logs indicate that the natural top stratum is composed of impervious Cahokia alluvium (CL, CL-CH, and CH soils). In addition, isolated patches of SP, SP-SC, and SC soils, insignificant in extent, are found within the area top stratum. The Cahokia extends some 4 to 21 feet beneath the natural ground surface. Moisture contents of the Cahokia alluvium top stratum range from 13 to 40 percent for CL soils, 18 to 46 percent for CL-CH soils, and 18 to 59 percent for CH soils. Atterberg limits tests shown on plate C-8 indicate that no exceptionally weak soils were encountered.

Undisturbed shear strength correlation curves plotting cohesive shear strength versus water content for CL, CL-CH, and CH soils are shown on plates C-11 through C-13, respectively. The curves were developed from unconsolidated-undrained quick triaxial and unconfined compression tests supplied by the Rock Island District for Mississippi River alluvial soils. A summary plot of these soils is shown on plate C-14. The CL soils curve indicates a range in cohesion from 290 to more than 700 pounds per square foot (psf) with moisture contents varying from 13 to 40 percent. The CL-CH soils curve indicates a

range in cohesion from 230 to more than 1,800 psf, with moisture contents varying from 18 to 46 percent. The CH soils curve indicates a range in cohesion from 380 to more than 1,000 psf, with moisture contents varying from 18 to 59 percent.

The pervious substratum (Henry formation) consists of SP soils. The substratum was penetrated 1 to 7 feet manually by Government forces and 1 to 33 feet mechanically by other firms. Standard penetration tests obtained by other firms in the general vicinity of the alignment of from 2 to more than 54 indicate a very loose to very dense relative density.

Bedrock in the form of Pennsylvanian shale was encountered by other firms ranging from elevations 762 to 769 feet NGVD. One occurrence found a bed of sandstone and shale, some 12 feet thick, overlying the bedrock shale. At the upper end of Walnut Creek, bedrock was found to be at elevation 789 feet NGVD.

Although supplementary borings are not available at this writing, it is apparent that a relatively impervious top stratum overlies a pervious substratum and bedrock. The composition of these stratas and the extent of their thicknesses will be determined in the next level of study.

FOUNDATION FOR OTHER STRUCTURES

New structures in the fashion of I-walls and gatewell-controlled gravity outlets are planned for this project. All unsuitable material existing at structure locations will be excavated and replaced with materials harmonious with adjacent soils. The replacement materials will be placed and compacted to obtain densities equal to adjacent undisturbed foundation material. I-walls will be founded on sheet piling driven into the impervious alluvium top stratum or extended into the underlying pervious substratum sand.

SLOPE STABILITY

Maximum levee heights along the proposed primary and alternate alignments are expected to range from 2 to 13 feet for the impervious fill embankment sections except for isolated short reaches reaching heights of 18 to 20 feet. These heights are based on the condition that ground surface depressions and irregularities are filled with impervious fill prior to embankment construction. Based upon the indication that the existing top stratum is uniform, no slope stability problems are anticipated for the 1V on 3H embankment slopes.

An examination of these levee sections representing specific reaches will be conducted at the next level of study to determine which sections are critical with respect to riverside slope stability. Safety factors will be assessed in accordance with Engineer Manual 1110-2-1902, "Stability of Earth and Rock-Fill Dams," 1970. The safety criteria are based upon embankment height and

thickness and the consistency of the impervious top stratum. The purpose of the assessment is to ensure compliance with minimum safety standards. Slope stability shear strength design parameters of the impervious top stratum will be determined from both laboratory unconsolidated-undrained (quick strain) triaxial tests obtained from undisturbed samples and from cohesive shear strength curves derived from shear strength data supplied by the Rock Island District for Mississippi River alluvial soils.

SETTLEMENT AND CONSOLIDATION

For the impervious fill embankment sections, no significant amount of settlement attributed to embankment loading is expected in the impervious top stratum foundation (plate C-9). The preconsolidation load of the alluvial clay foundation is expected to be nearly 1.0 ton per square foot, based on previous consolidation tests of similar alluvial soils. The proposed impervious fill levee sections will impose a load of less than 0.8 ton per square foot. From this, it is anticipated that the maximum imposed load will be slightly less than the preconsolidation load. All soft clay encountered during construction will be removed to prevent unwanted settlement. No settlement of significance is expected at the I-walls. In areas where land fill is encountered beneath proposed impervious fill embankment sections (plate C-10), inspection trench construction schemes will vary, dependent on depth and extent of landfill, to eliminate or significantly reduce settlement. Further explorations will be necessary to determine what scheme will be considered. Should landfill be found excessive in extent, these areas will be examined by analysis to determine if the proposed scheme or a revised scheme will be implemented.

THROUGH-SEEPAGE

Through-seepage should not be a factor for new embankments constructed with semi-compacted impervious fill. New levees are expected to be composed of CL lean clay, CL-CH medium clay, and CH fat clay in mixed form.

UNDERSEEPAGE

Underseepage is anticipated at the project site. Control measures may be necessary to provide ample underseepage protection against uplift and piping. Piezometric data and seepage measurements are not available for this project. It will be necessary to perform detailed underseepage and berm analysis studies for the general design memorandum. The purpose of this will be to identify reaches of concern. The studies will be conducted in accordance with Waterways Experiment Station (WES) Manual 3-424, "Investigation of Underseepage and Its Control, Lower Mississippi River Levee," 1956; criteria contained in Engineer Manual 1110-2-1913, "Design and Construction of Levees,"

1978; and "Rock Island District Methodology," 1958, 1960, and 1976. The analysis will be based upon thickness and permeability; the characteristics of the impervious top stratum and the pervious substratum; and the extent of the riverward and landward top stratum.

Remedial treatment in the form of seepage berms will be provided where necessary. The berms will be free draining (less than 5 percent passing the No. 200 sieve) to provide relief from uplift pressures. Adjustments to the proposed levee alignment may be necessary to incorporate the prescribed remedial treatment. Additionally, the estimated quantity of underseepage infiltrating the project site will be determined at the next level of study to ensure adequate ponding and pumping capacity.

Four ponding areas are located within the protected zone of the proposed new impervious fill and I-wall sections. Excavation will be necessary to define the limits of each ponding area. Removal of the impervious top stratum will vary at each site. Existing explorations indicate that from 5 to 11 feet of the impervious top stratum will remain at three sites. At Johnnie's Vets Club Ponding Area No. 3, the top stratum will be reduced to less than 2 feet. Two pumping stations are planned for this project. The first station is planned to be located at Johnnie's Vets Club Ponding Area No. 3. Water here will be allowed to pond uncontrolled. No unusual underseepage problems are anticipated at the three other ponding area sites, whereas at Johnnie's Vets Club a thin to nonexistent impervious top stratum will remain that may induce underseepage problems and necessitate remedial control. The second station is planned for 63rd Street and Grand Avenue where temporary ponding will be permitted in the existing low-lying streets and parking lots. No unusual underseepage problems are anticipated here.

UNDERSEEPAGE CONTROL FOR PONDING AREAS

Provisions to control underseepage and prevent the formation of boils into the ponding areas will be to discourage any immediate (within 100 feet of the landside toe of levee and/or berm) landside excavations. Since landside excavations are deemed necessary, provisions were established at this level of study to keep them a minimum distance of 100 feet from the levee toe to maintain underseepage control. Due to limited space at Johnnie's Vets Club, however, the distance was reduced to 50 feet.

Designated ponding areas at Walnut Creek (No. 4), Fairmeadows Creek (No. 1), and Jordan Creek (No. 2 for both primary and alternate alignments) presently indicate that CL, CL-CH, and CH impervious top stratum soils will remain as impervious blanket. The extent of these blankets are 6 to 8 feet, 5 to 10 feet, 11 feet, and 9 feet, respectively. These thicknesses are expected to be adequate to maintain underseepage control. In contrast, the designated ponding area at Johnnie's Vets Club indicates that the remaining impervious blanket will vary from 0 to 7 feet with CL and CL-CH impervious top stratum soils. Further investigation of this site will determine whether underseepage

control in the form of inverted filter stone is necessary. Each ponding area, in addition to other areas, will have gatewell-controlled gravity outlets. A pumping station will be established at Johnnie's Vets Club in addition to one at 63rd Street and Grand Avenue.

SLOPE PROTECTION

Populated timber growth is evident along the proposed alignment. The alignment parallels Walnut Creek, Raccoon River, and Jordan Creek. The trees should afford ample protection to control severe wave wash against the embankment. Past history indicates overbank flash flood duration on Walnut and Jordan Creeks to be 12 hours and 6 hours, respectively. On the Raccoon River, overbank flood duration in the summer months is 3 days with 1 day at peak. This duration increases to 7 days when spring snowmelt dictates the flooding. It is envisioned that the entire alignment containing impervious fill levee embankment will be seeded with grass to provide slope protection. At station 175 to 171, Walnut Creek has the potential to encroach on the levee embankment. In this area, velocities have been eroding the streambank. Therefore, this reach will entertain placement of riprap and bedding to provide bank protection and to prevent undermining of the levee. Further investigation at flood intervals will be encouraged prior to the next level of study to determine additional reaches of slope protection concern.

AVAILABILITY OF CONSTRUCTION MATERIALS

Impervious borrow material for this project is sought to come from both remote and local sites. Remote impervious borrow will come from a 30-acre site devoid of trees located at south 50th Street and Grand Avenue in West Des Moines, Iowa. This hilltop site is anticipated to contain loess origin SC, CL, and CL-CH soils with limited amounts of SP. Explorations of this site are planned for the next level of study to identify available soil types and to provide construction moisture-density guidelines to ensure acceptable compaction. Guidelines will be established by moisture contents of the soils in situ and by compaction curves of various soil types. Local impervious borrow will come from proposed project ponding area excavations and from degraded existing levee embankments. For the primary alignment ponding areas, the Walnut Creek Ponding Area No. 4, a 10-acre site located from station 142 to 146, will provide 5 to 7 feet of CL, CL-CH, and CH soils. The Johnnie's Vets Club Ponding Area No. 3, an 8-acre site located from station 68 to 88, will contribute 5 to 8 feet of CL and CL-CH soils. The Fairmeadows Creek Ponding Area No. 1, a 20- to 27-acre site located upstream of station 46, will furnish 1 to 2 feet of CH soils. The Jordan Creek Ponding Area No. 2, a 3-acre site located upstream of the railroad from station 13 to 20, will supply 4 feet of CL and CL-CH soils. For the alternate alignment ponding area, the Jordan Creek Ponding Area No. 2, a 10-acre site located downstream of the railroad from station 14 to 22, will produce 2 feet of CH soils. Moisture

contents obtained from previous borings indicate conditioning (drying back) up to and exceeding 10 percent would be required to achieve maximum density for all soils removed from the proposed borrow areas. Again, compaction curves of these available soils will be necessary prior to construction to determine moisture conditioning limitations of various soil types. Additional explorations are planned for the next level of study to further verify these soils and to determine if recent land fill exists and to what extent overly these soils. For existing embankment soils also investigated during foundation explorations, impervious soils are indicated which range in moisture contents from 12 to 33 percent for CL soils, 25 percent for CL-CH soils, and 23 to 39 for CH soils.

Pervious sand borrow, if necessary for depression filling or pervious free-draining underseepage berms, can be obtained from local sources. Sand from these pits should be relatively well graded with less than 5 percent by weight passing the No. 200 sieve. The preferred sand should be coarse to fine sand with a D_{10} size (i.e., size that 10 percent of material is finer than) ranging from 0.12 to 0.55 millimeters, having a desired average of 0.25 milli-meters.

Road and protection (riprap and bedding) stone are available in the immediate area, as are concrete coarse and fine aggregates of suitable quality.

MATERIAL UTILIZATION

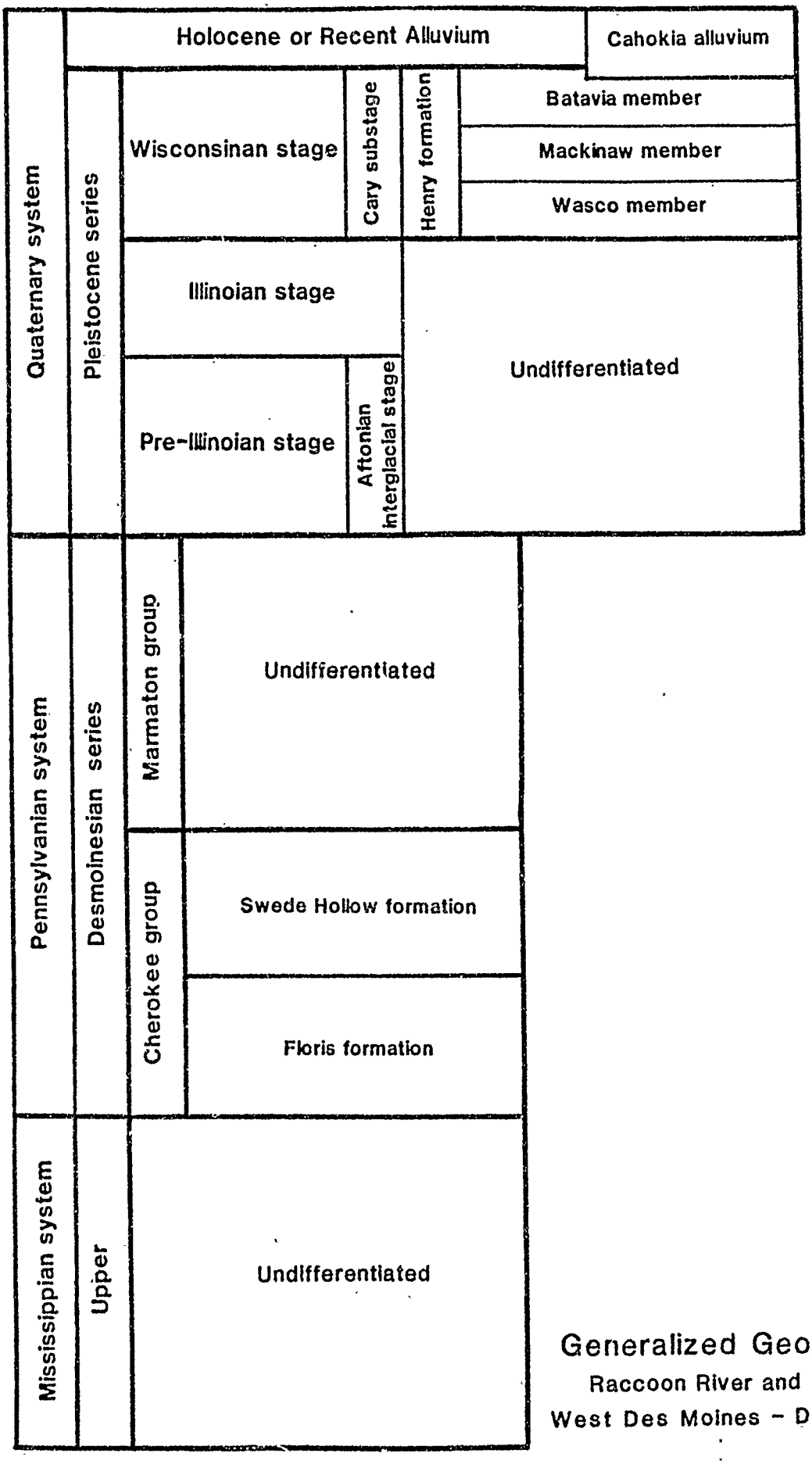
It is preconceived that excavation of unsuitable materials, specifically in the form of land fill, is expected at the project site. Exploration by other firms in and around the project alignment indicate that the extent of land fill may be in the order of 8 feet, more or less. These indications may be isolated areas of less than significant impact on the project site. Although unlikely, these materials may be reused if deemed suitable. With the concern that the land fill was placed uncontrolled, the Iowa Department of Natural Resources, at the request of the Rock Island District Environmental Analysis Branch, confirmed in May 1988 that the dump site at Lincoln and Railroad Avenues within the project alignment was being used for a normal domestic waste site and was not on the list for uncontrolled sites. In addition, it was determined that fly ash had been disposed of in this site. Removal of this material will be required in a designated off-site sanitary land fill. It is not anticipated that any of this material can be reused. On the other hand, materials proposed to be excavated from ponding areas and inspection/exploration trenches may be reused upon proper conditioning (for the most part, drying back) prior to placement and compaction. It is anticipated that on-site material utilization from the four ponding areas could provide approximately one-third of the anticipated total cubic yards of impervious fill.

FLOOD HISTORY

Records indicate that high water, significant in magnitude to cause flooding, has occurred on both the Raccoon River and Walnut Creek. Major flooding on the Raccoon River occurred in 1947, 1973, and 1986. The flood of record was a 40-year event, occurring in 1947 with peak flows of 35,000 to 40,000 cubic feet per second (cfs). Major flooding on Walnut Creek occurred in 1973 and 1986. The flood of record was a 40-year event occurring in 1986 with peak flows at 12,000 cfs. The lesser 1973 event yielded 9,000 cfs.

INSTRUMENTATION

At the present time, piezometers are nonexistent at the project site. Consideration to emplacing a line of piezometers to monitor groundwater fluctuations and underseepage pressures will be investigated prior to construction. This installation would allow the opportunity to collect and evaluate high water data for use in the design of underseepage berms, if required by analysis.

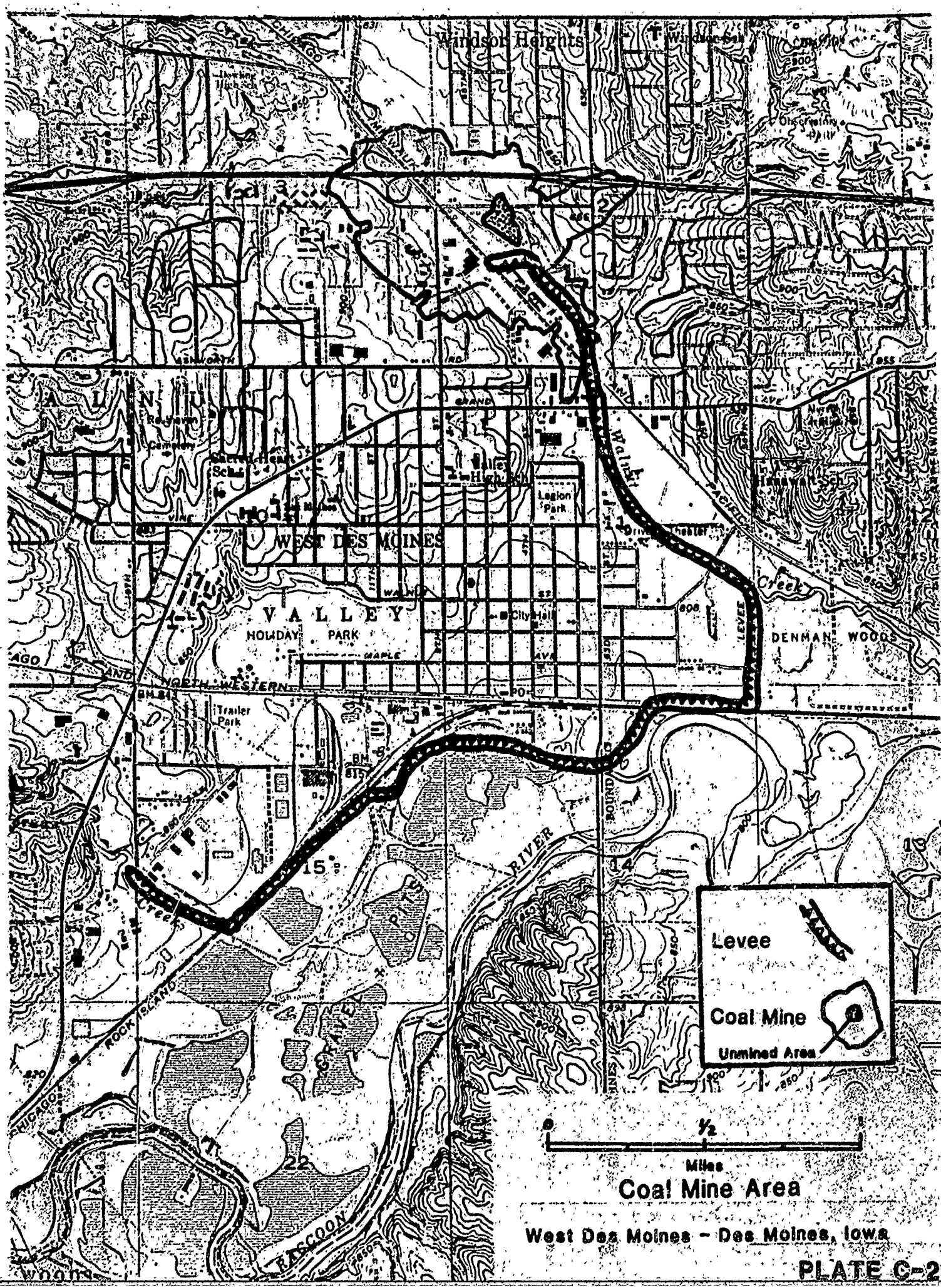


Generalized Geologic Column

Raccoon River and Walnut Creek

West Des Moines - Des Moines, Iowa

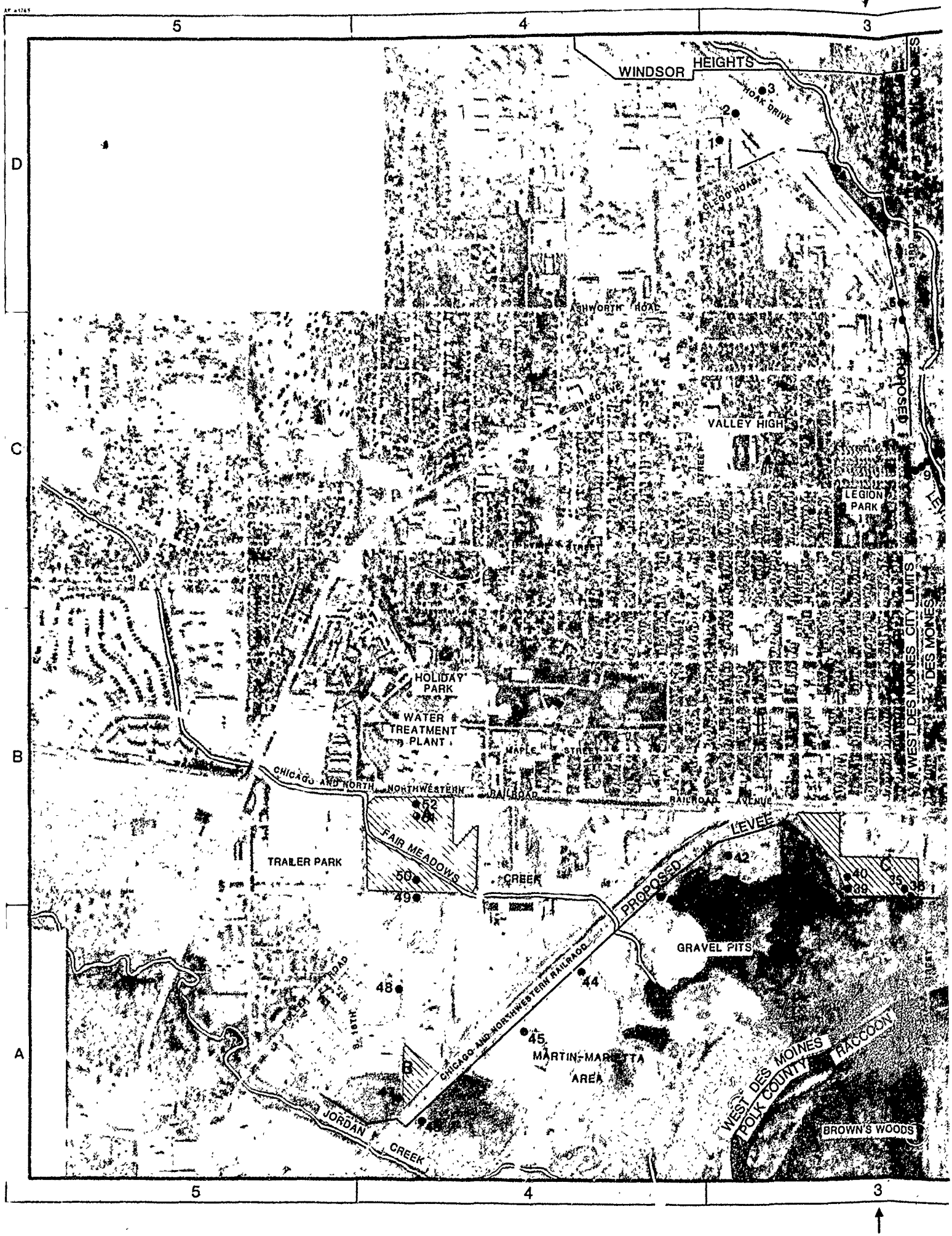
PLATE C-1

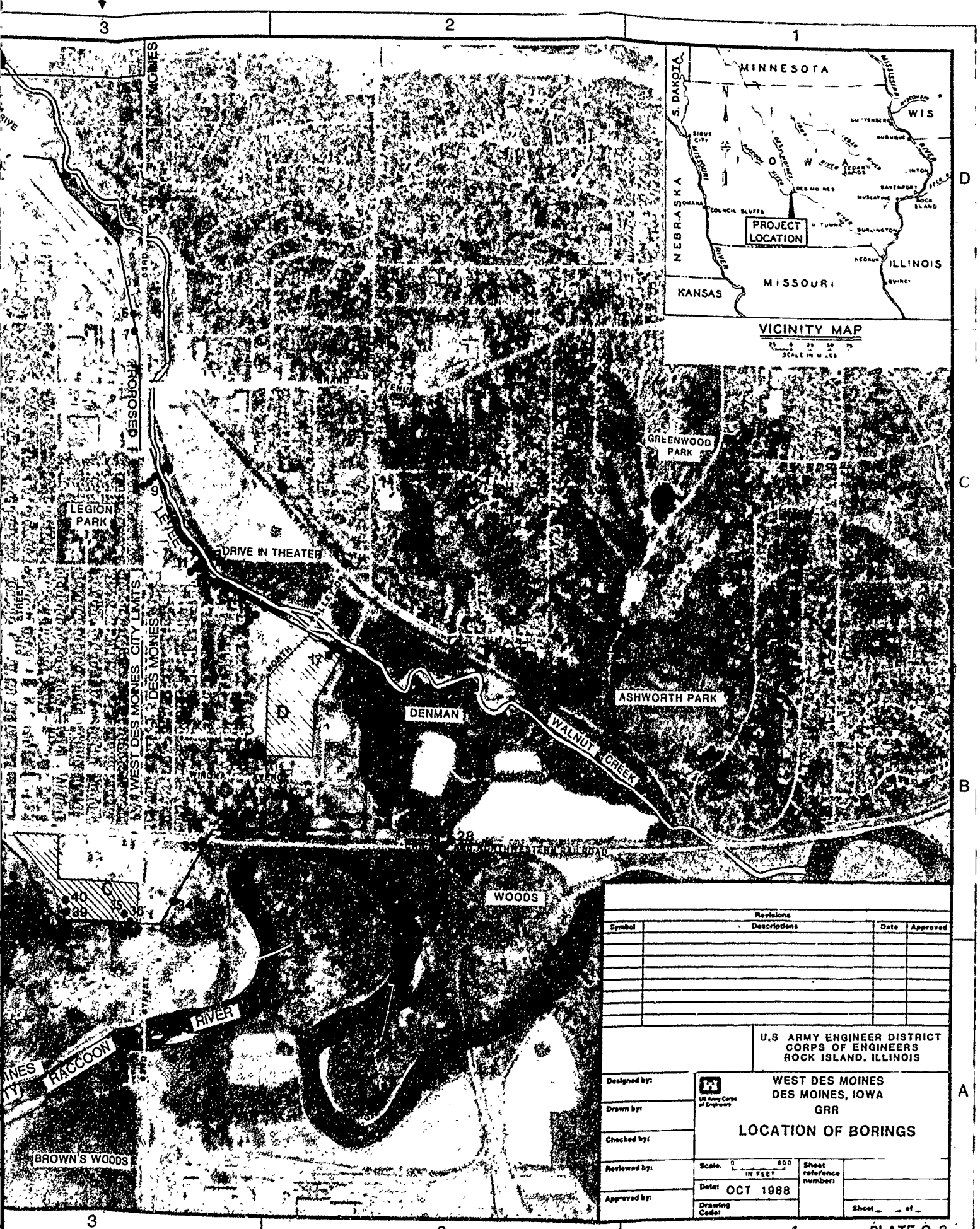


Coal Mine Area

West Des Moines – Des Moines, Iowa

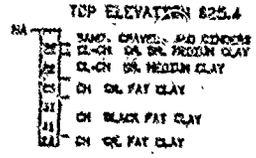
PLATE C-2


5
4
3
D
C
B
A
WINDSOR HEIGHTS
HOAK DRIVE
CLEGG ROAD
ASHWORTH ROAD
GRAND AVE.
VALLEY HIGH
PROPOSED LEVEE
LEGION PARK
DES MOINES
WEST DES MOINES CITY LIMITS
HOLIDAY PARK
WATER TREATMENT PLANT
MAPLE STREET
CHICAGO AND NORTH WESTERN RAILROAD
RAILROAD AVENUE
TRAILER PARK
FAIR MEADOWS
CREEK
GRAVEL PITS
MARTIN-MARIETTA AREA
CHICAGO AND NORTHWESTERN RAILROAD
FOREST AVENUE
9TH
JORDAN CREEK
WEST DES MOINES
POLK COUNTY
RACCOON
BROWN'S WOODS
1
2
3
38
39
40
42
44
45
48
49
50
52


3
2
1
MINNESOTA
S. DAKOTA
WIS
NEBRASKA
PROJECT LOCATION
ILLINOIS
MISSOURI
KANSAS
VICINITY MAP
SCALE IN MILES
D
C
B
A
GREENWOOD PARK
LEGION PARK
DRIVE IN THEATER
ASHWORTH PARK
DENMAN
WALNUT CREEK
WOODS
RIVER
RACCOON
BROWN'S WOODS
DES MOINES CITY LIMITS
WEST DES MOINES CITY LIMITS
PROPOSED LEVEE
Revisions
Symbol
Descriptions
Date
Approved
U.S ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS
Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:
WEST DES MOINES
DES MOINES, IOWA
GRR
LOCATION OF BORINGS
Scale: 0 800 IN FEET
Date: OCT 1988
Drawing Code:
Sheet reference numbers
Sheet _ of _
PLATE C-3

WDM-65-52

TOP ELEVATION 825.4



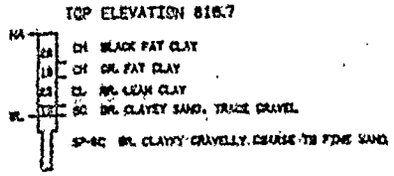
STA 74+20
@60'R
7 APRIL 1965

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-51

TOP ELEVATION 816.7

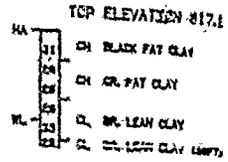


STA 72+82
67'R
7 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-50

TOP ELEVATION 817.1

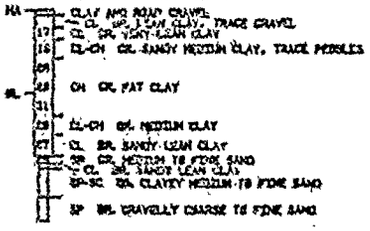


STA 69+48
42'R
7 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-47

TOP ELEVATION 817.9

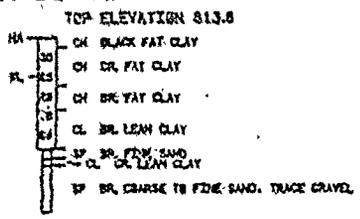


STA 45+50
CENTERLINE
7 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-46

TOP ELEVATION 813.8

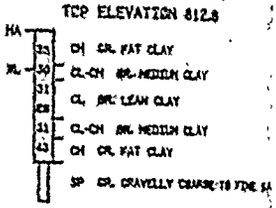


STA 253+00
133'L
7 APRIL 1965

NOTE- TRAVERSE NO. 1 STATIONING

WDM-65-45

TOP ELEVATION 812.8

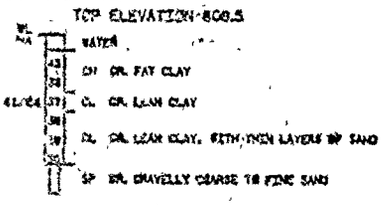


STA 243+03
135'L
7 APRIL 1965

NOTE- TRAVERSE NO. 1 STATIONING

WDM-65-42

TOP ELEVATION 808.5

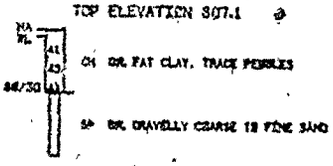


STA 2+20
CENTERLINE
9 APRIL 1965

NOTE- UNABLE TO PROBE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

WDM-65-41

TOP ELEVATION 807.1

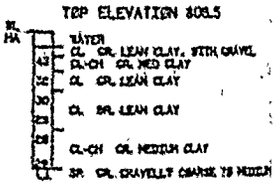


STA 10+87
CENTERLINE
9 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-40

TOP ELEVATION 808.5

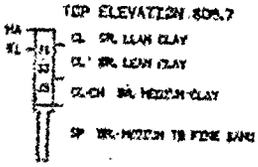


STA 21+00
100'L
7 APRIL 1965

NOTE- UNABLE TO PROBE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

WDM-65-37

TOP ELEVATION 808.7

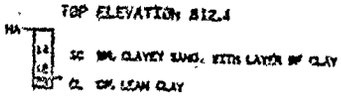


STA 23+00
50'R
2 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-36

TOP ELEVATION 812.4



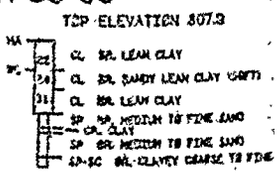
STA 25+00
4'R
2 APRIL 1965

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-35

TOP ELEVATION 807.9

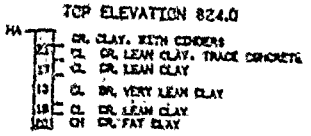


STA 29+00
50'L
2 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-49

TOP ELEVATION 824.0



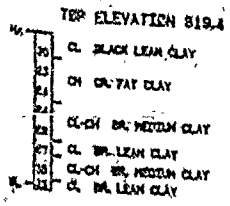
STA 63+04
38'R
7 APRIL 1965

—— NO WATER LEVEL ENCOUNTERED

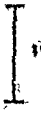
NOTE- TRAVERSE NO. 5 STATIONING

WDM-65-48

TOP ELEVATION 819.4



VERTICAL SCALE

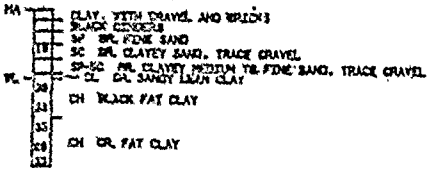


STA 33+00
25'L
7 APRIL 1965

NOTE- TRAVERSE NO. 5 STATIONING

WDM-65-44

TOP ELEVATION 814.7

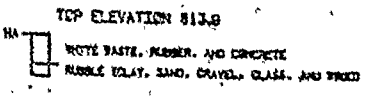


STA 233+00
135'L
8 APRIL 1965

NOTE- TRAVERSE NO. 1 STATIONING

WDM-65-43

TOP ELEVATION 813.9



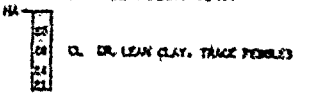
STA 223+00
100'L
8 APRIL 1965

—— NO WATER LEVEL ENCOUNTERED

NOTE- UNABLE TO AUGER FURTHER BY HAND
TRAVERSE NO. 1 STATIONING

WDM-65-39

TOP ELEVATION 814.4



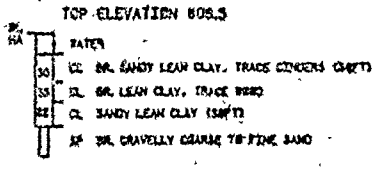
STA 21+00
CENTERLINE
7 APRIL 1965

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-38

TOP ELEVATION 805.5



STA 21+00
53'R
7 APRIL 1965

NOTE- UNABLE TO PENE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

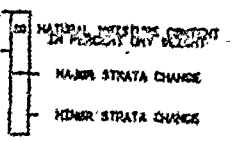
LEGEND

BORING NUMBER

HOLE ADVANCED BY LEAN HAND AUGER

WATER LEVEL

LIQUID AND PLASTIC LIMIT 45/28



LOCATION BORING
June 4, 1976 APPROXIMATE WATER OR CAVE-IN LEVEL (WHERE DATA AVAILABLE)

Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:

US Army Corps of Engineers

RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES-DES MOINES, IOWA

LOGS OF BORINGS

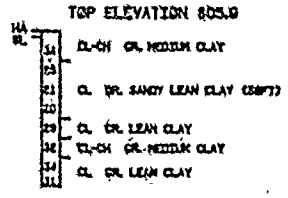
Scales
Dates
Drawing Code

PLATE 1.4

Sheet ___ of ___

WDM-65-34

TOP ELEVATION 805.9

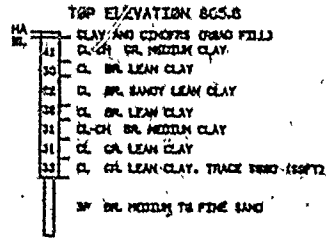


STA 34+50
CENTERLINE
2 APRIL 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-33

TOP ELEVATION 805.8

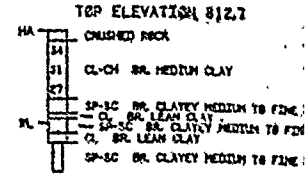


STA 42+55
CENTERLINE
2 APRIL 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-32

TOP ELEVATION 812.7

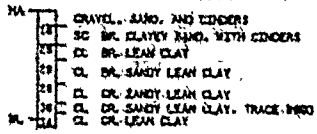


STA 45+02
CENTERLINE
2 APRIL 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-29

TOP ELEVATION 810.8

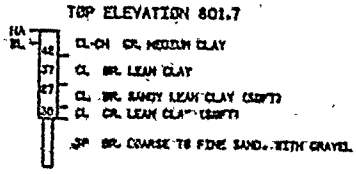


STA 71+85
CENTERLINE
31 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-28

TOP ELEVATION 801.7

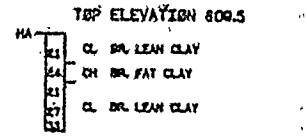


STA 72+50
50R
31 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-27

TOP ELEVATION 809.5



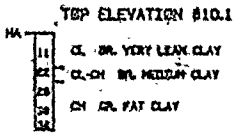
STA 72+50
CENTERLINE
31 MARCH 1985

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-24

TOP ELEVATION 810.1



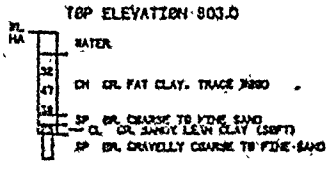
STA 80+65
CENTERLINE
31 MARCH 1985

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-23

TOP ELEVATION 803.0

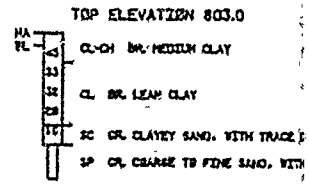


STA 80+65
50L
31 MARCH 1985

NOTE- UNABLE TO PROBE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

WDM-65-22

TOP ELEVATION 803.0

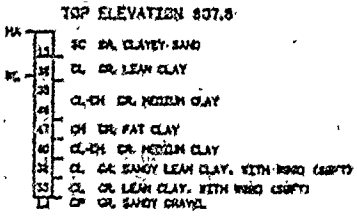


STA 91+00
60R
1 APRIL 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-19

TOP ELEVATION 837.8

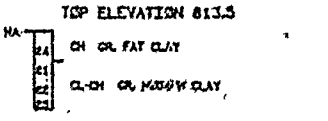


STA 101+10
35R
31 MARCH 1985

NOTE- UNABLE TO PROBE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

WDM-65-18

TOP ELEVATION 813.5



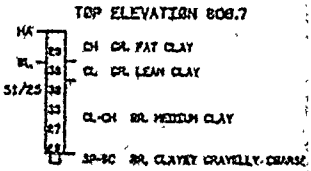
STA 101+10
CENTERLINE
31 MARCH 1985

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-17

TOP ELEVATION 808.7

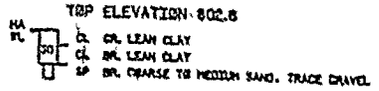


STA 101+10
30L
31 MARCH 1985

NOTE- UNABLE TO PROBE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

WDM-65-31

TOP ELEVATION 802.6

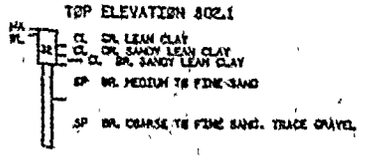


STA 53+00
50'L
1 APRIL 1965

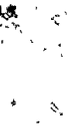
NOTE- UNABLE TO PROBE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

WDM-65-30

TOP ELEVATION 802.1



VERTICAL SCALE

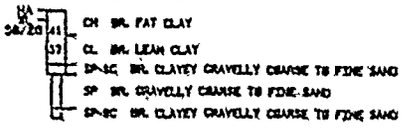


STA 52+00
50'L
1 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-26

TOP ELEVATION 802.0

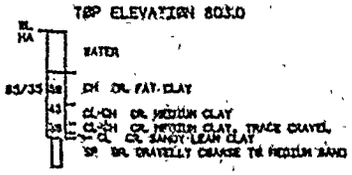


STA 72+50
55'L
1 APRIL 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-25

TOP ELEVATION 803.0

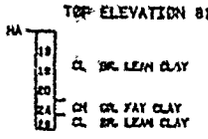


STA 80+85
55'R
31 MARCH 1965

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-21

TOP ELEVATION 811.7



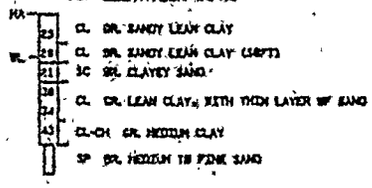
STA 91+00
CENTERLINE
31 MARCH 1965

NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-20

TOP ELEVATION 804.8



STA 91+00
55'L
31 MARCH 1965

NOTE- UNABLE TO PROBE FURTHER BY HAND
TRAVERSE NO. 3 STATIONING

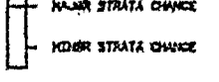
LEGEND

BORING NUMBER

HOLE ADVANCED BY 3¼in HAND AUGER

WATER LEVEL

LIQUID AND PLASTIC LIMIT 48/28



LOCATION OF BORING
JULY 4, 1978 APPROXIMATE DATE OF DRILLING
ALSO DATE WATER LEVEL TAKEN

Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:

US Army Corps of Engineers

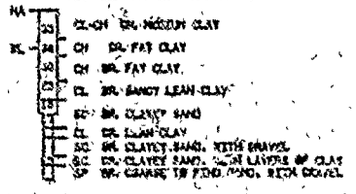
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES-DES MOINES, IOWA

LOGS OF BORINGS

Scales
Dates
Drawing Code

WDM-65-16

TOP ELEVATION 809.8

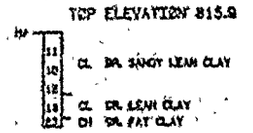


STA 111+00
85'R
31 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-15

TOP ELEVATION 815.9



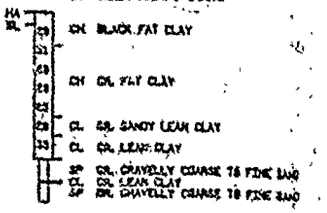
STA 111+00
CENTERLINE
30 MARCH 1985

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-14

TOP ELEVATION 808.9

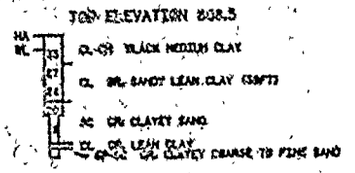


STA 111+00
35'L
30 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-11

TOP ELEVATION 808.5

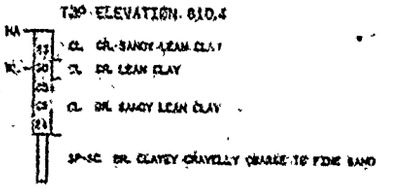


STA 121+00
35'L
31 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-10

TOP ELEVATION 810.4

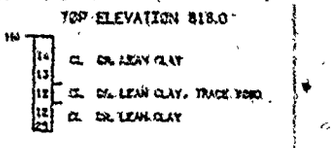


STA 131+00
135'R
30 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-9

TOP ELEVATION 818.0



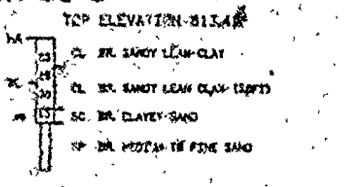
STA 131+00
103' R
30 MARCH 1985

—— NO WATER LEVEL ENCOUNTERED

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-6

TOP ELEVATION 813.4

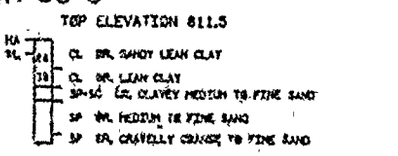


STA 147+00
CENTERLINE
30 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-5

TOP ELEVATION 811.5

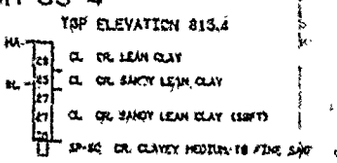


STA 159+00
85' R
30 MARCH 1985

NOTE- TRAVERSE NO. 3 STATIONING

WDM-65-4

TOP ELEVATION 813.4

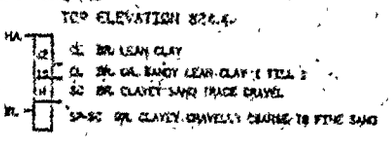


STA 168+00
135' R
1 APRIL 1985

NOTE- MATERIAL 30ft COARSE TO PROBE DEEPER
TRAVERSE NO. 3 STATIONING

WDM-65-1

TOP ELEVATION 826.4

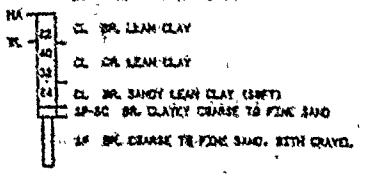


STA 124+10
350' L
1 APRIL 1985

NOTE- TRAVERSE NO. 2 STATIONING

WDM-65-13

TOP ELEVATION 810.4

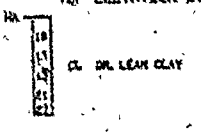


STA 121+00
40'R
30 MARCH 1983

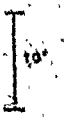
NOTE: TRAVERSE NO. 3 STATIONING

WDM-65-12

TOP ELEVATION 818.8



VERTICAL SCALE



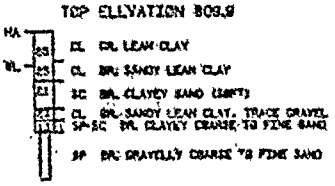
STA 121+00
CENTERLINE
30 MARCH 1983

—— NO WATER LEVEL ENCOUNTERED

NOTE: TRAVERSE NO.3 STATIONING

WDM-65-8

TOP ELEVATION 809.8

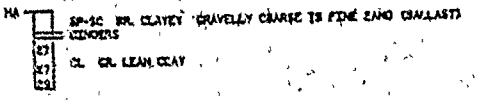


STA 131+00
50' R
30 MARCH 1983

NOTE: TRAVERSE NO. 3 STATIONING

WDM-65-7

TOP ELEVATION 817.7



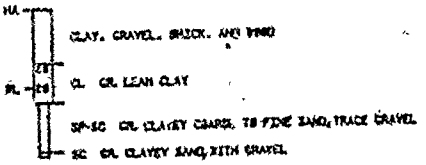
STA 145+60
CENTERLINE
30 MARCH 1983

—— NO WATER LEVEL ENCOUNTERED

NOTE: TRAVERSE NO. 3 STATIONING

WDM-65-3

TOP ELEVATION 819.4

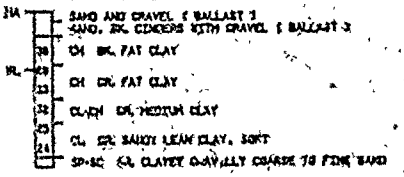


STA 178+50
10' R
1 APRIL 1983

NOTE: TRAVERSE NO. 3 STATIONING

WDM-65-2

TOP ELEVATION 822.5



STA 124+10
CENTERLINE
28 MARCH 1983

NOTE: MATERIAL TOO COARSE TO PENDE
TRAVERSE NO. 2 STATIONING

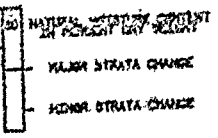
LEGEND

BORING NUMBER

HOLE ADVANCED BY 3 3/4 HAND AUGER

WATER LEVEL

LIQUID AND PLASTIC LIMIT 48/25



LOCATION OF BORING

JULY 4, 1978 APPROXIMATE DATE OF DRILLING AND DATE WATER LEVEL NOTED

Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:

RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES-DES MOINES, IOWA

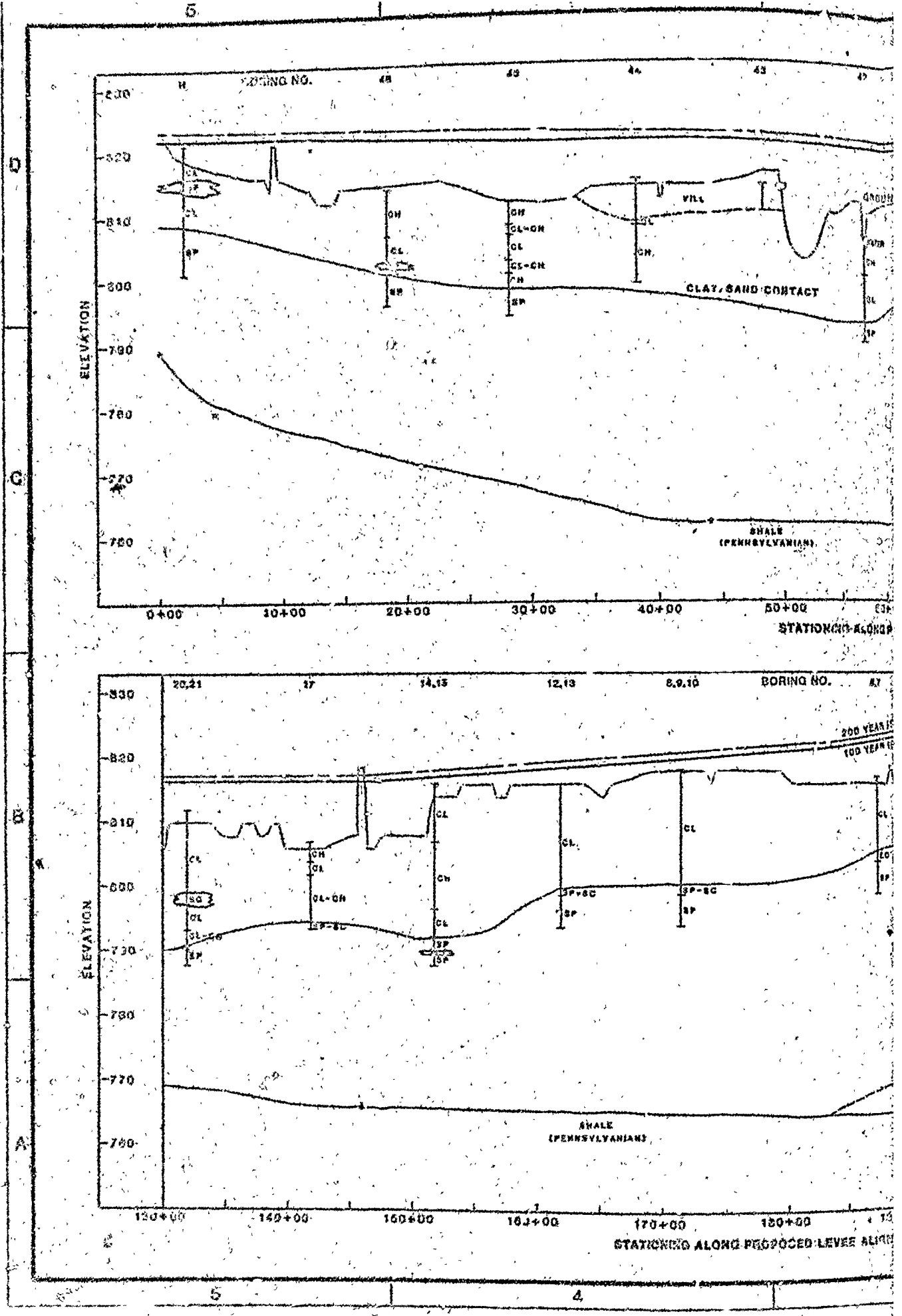
LOGS OF BORINGS

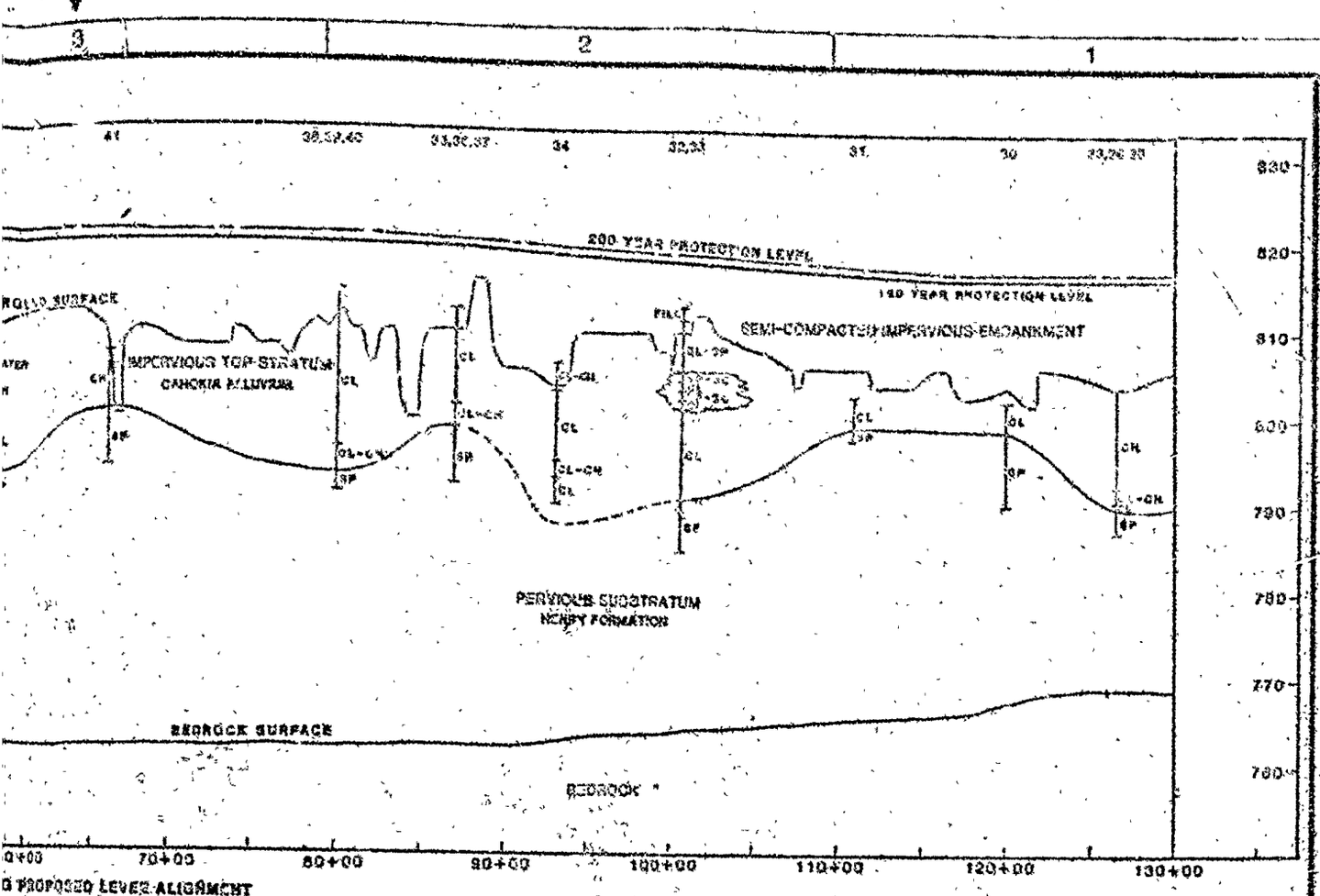
Tracing
Date
Drawing

Sheet reference number

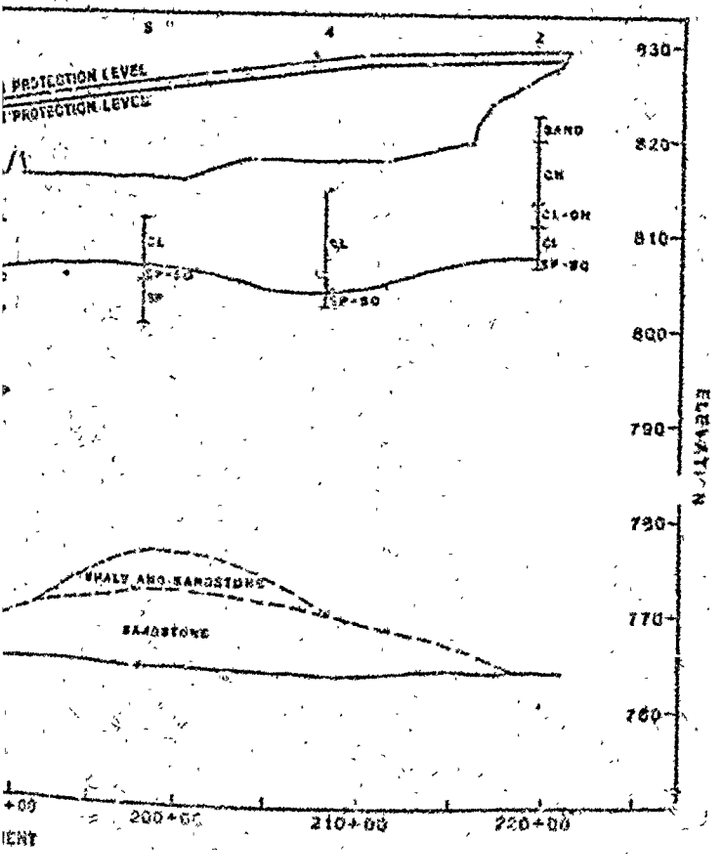
PLATE C-6

Sheet of


5
4
D
C
B
A
BORING NO.
48
49
44
43
ELEVATION
830
820
810
800
790
780
770
760
CL
SP
CH
CL-CH
SC
SP-SC
VOL
CLAY/SAND CONTACT
SHALE
(PENNSYLVANIAN)
0+00
10+00
20+00
30+00
40+00
50+00
STATIONING ALONG
20,21
17
14,15
12,13
8,9,10
BORING NO.
100 YEAR
500 YEAR
120+00
140+00
150+00
160+00
170+00
180+00
STATIONING ALONG PROPOSED LEVEE ALIGN



PROPOSED LEVEE ALIGNMENT



Revisions			
Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

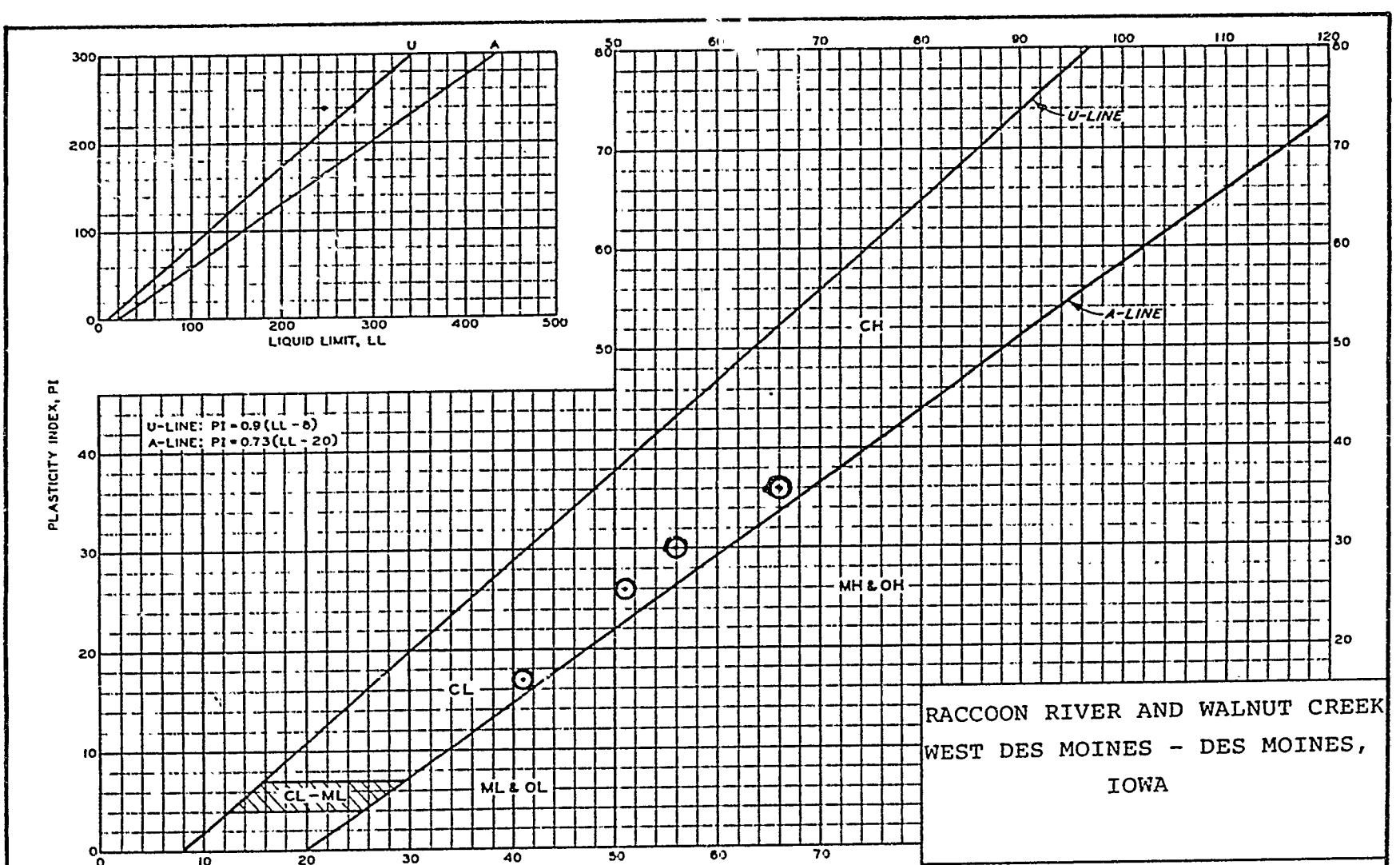
Designed by
Drawn by
Checked by
Submitted by
Approved by

RACCOON RIVER & WALNUT CREEK
WEST DES MOINES-DES MOINES, IOWA

GEOLOGIC PROFILE

Scale
Date
Contract No.
Sheet of sheets

PLATE C-7

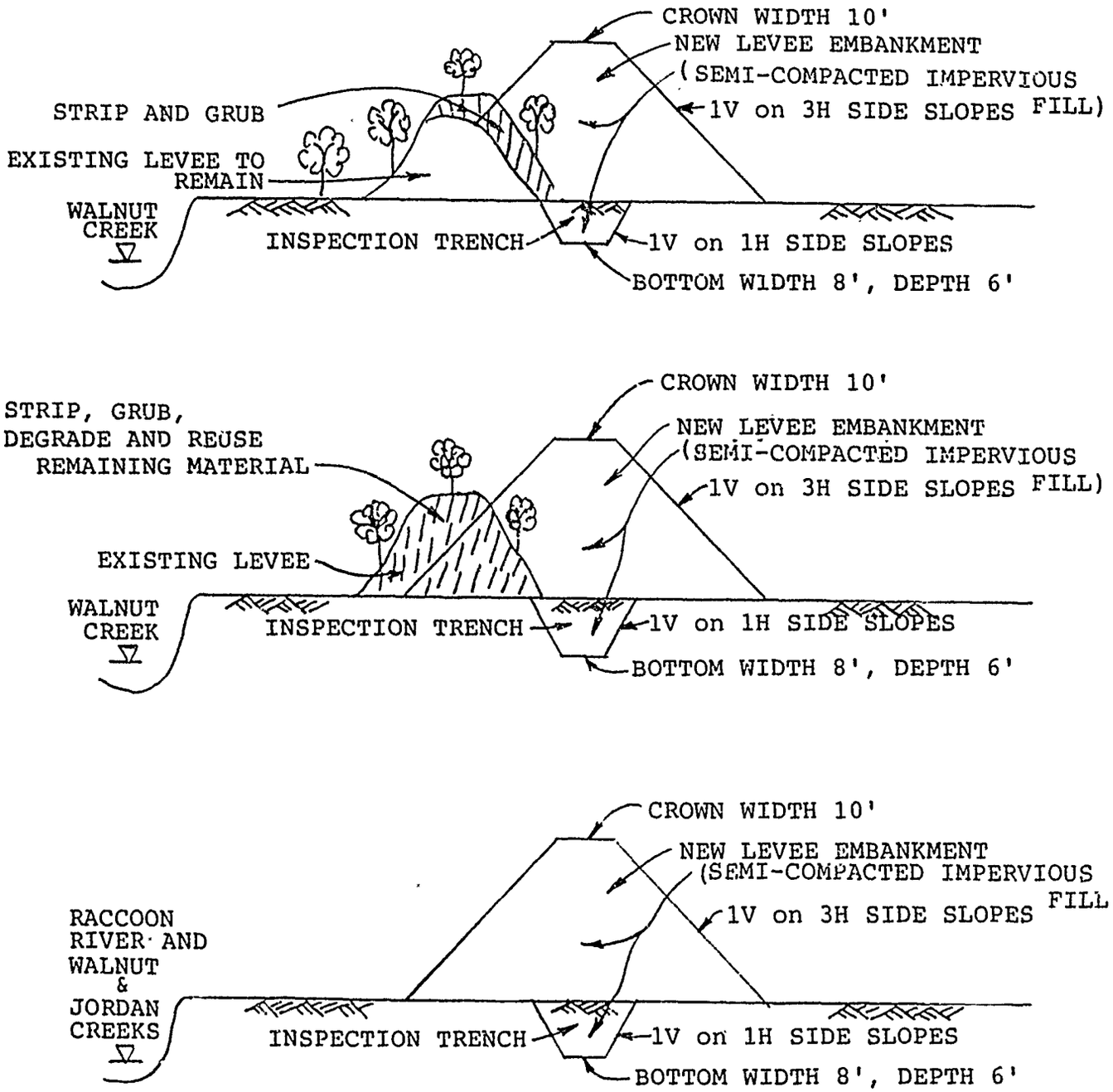


RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

PLASTICITY CHART

PLATE C-8

ENG FORM 4334 JUN 70 (EM 1110-2-1906) TRANSLUCENT

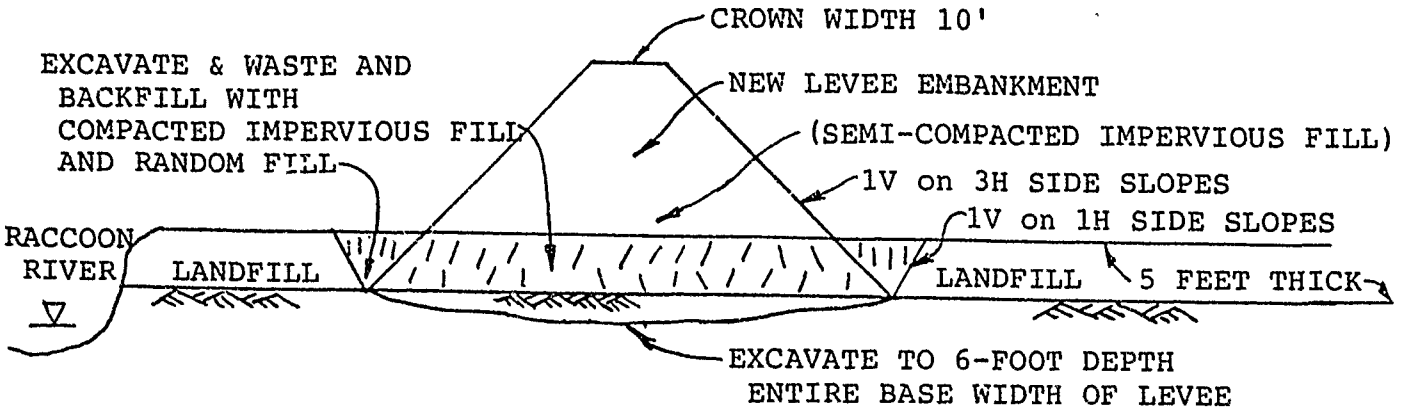


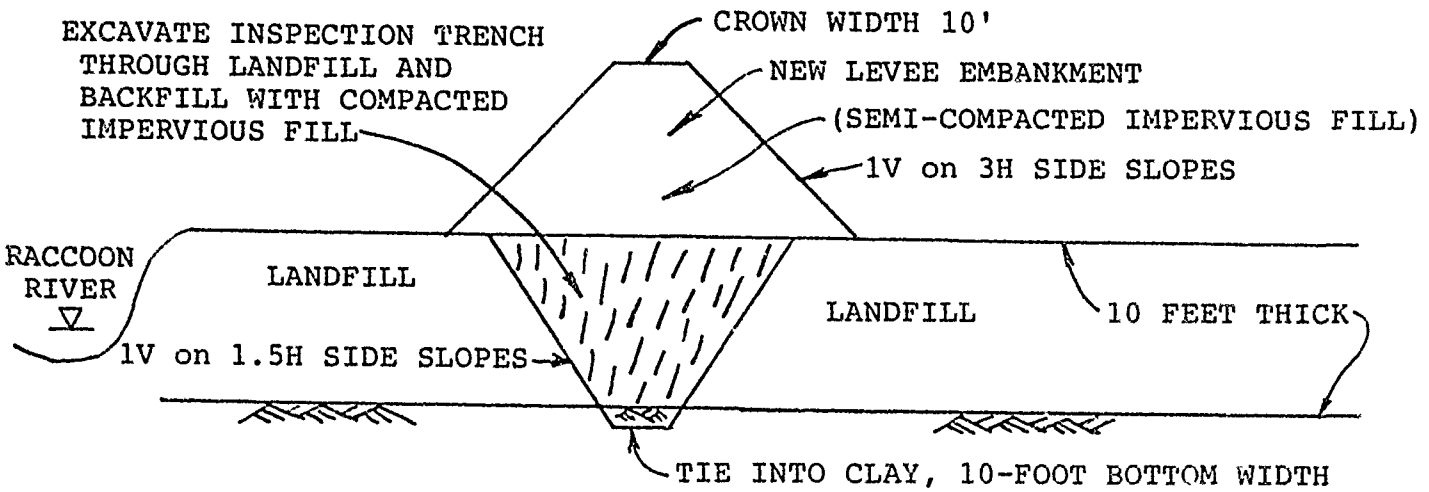
(DRAWINGS NOT TO SCALE)

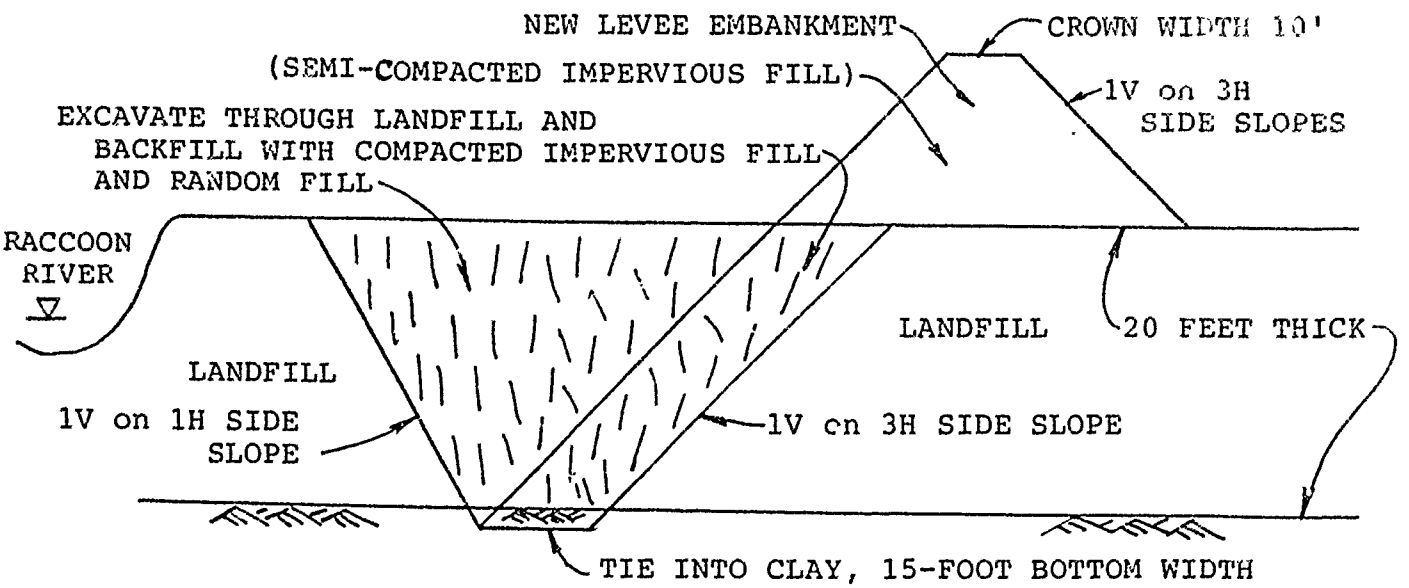
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

TYPICAL SECTIONS

PLATE C-9





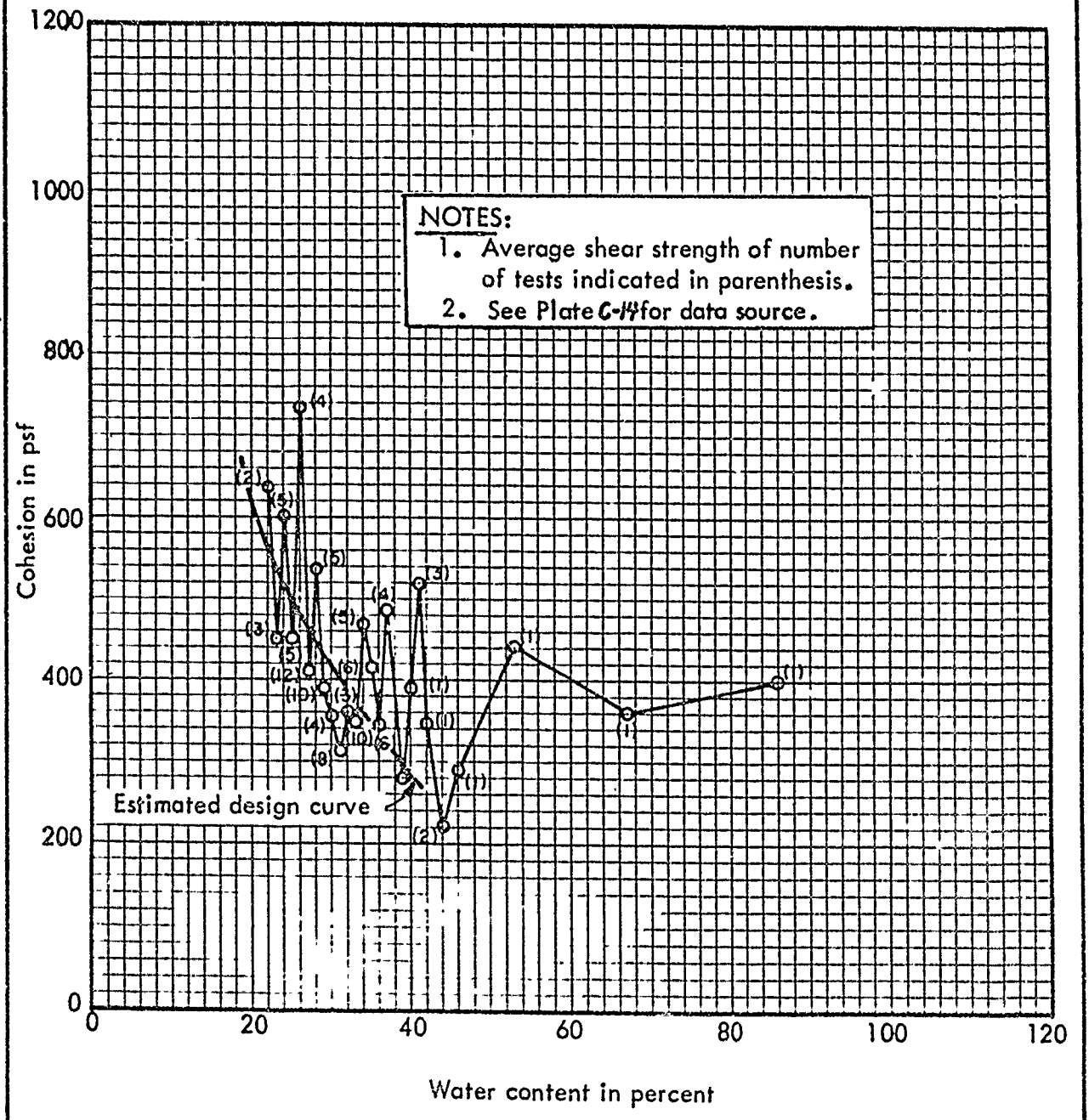


(DRAWINGS NOT TO SCALE)

RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

TYPICAL SECTIONS

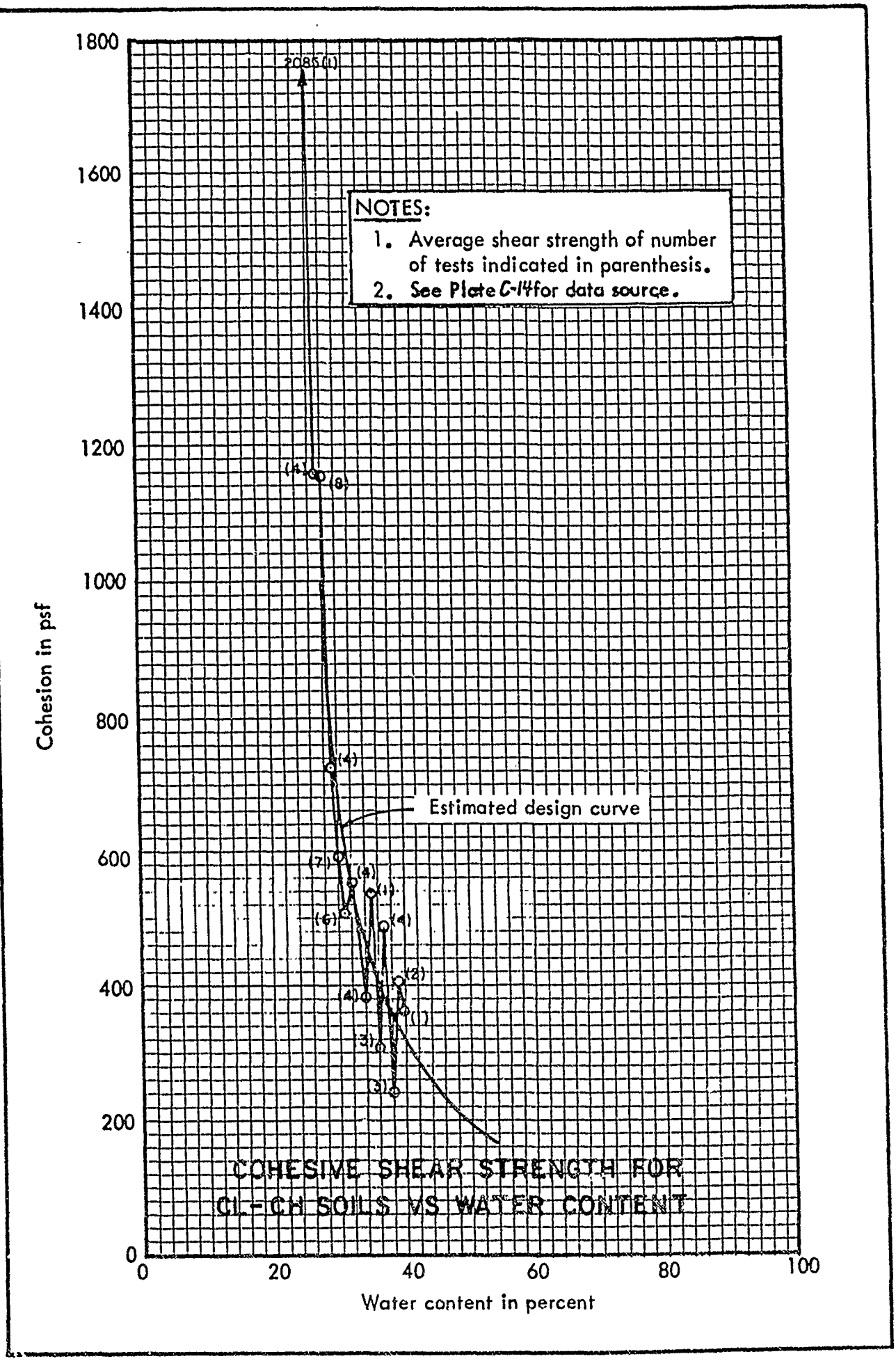
PLATE C-10



COHESIVE SHEAR STRENGTH
FOR CL SOILS VS
WATER CONTENT

PLATE C-11

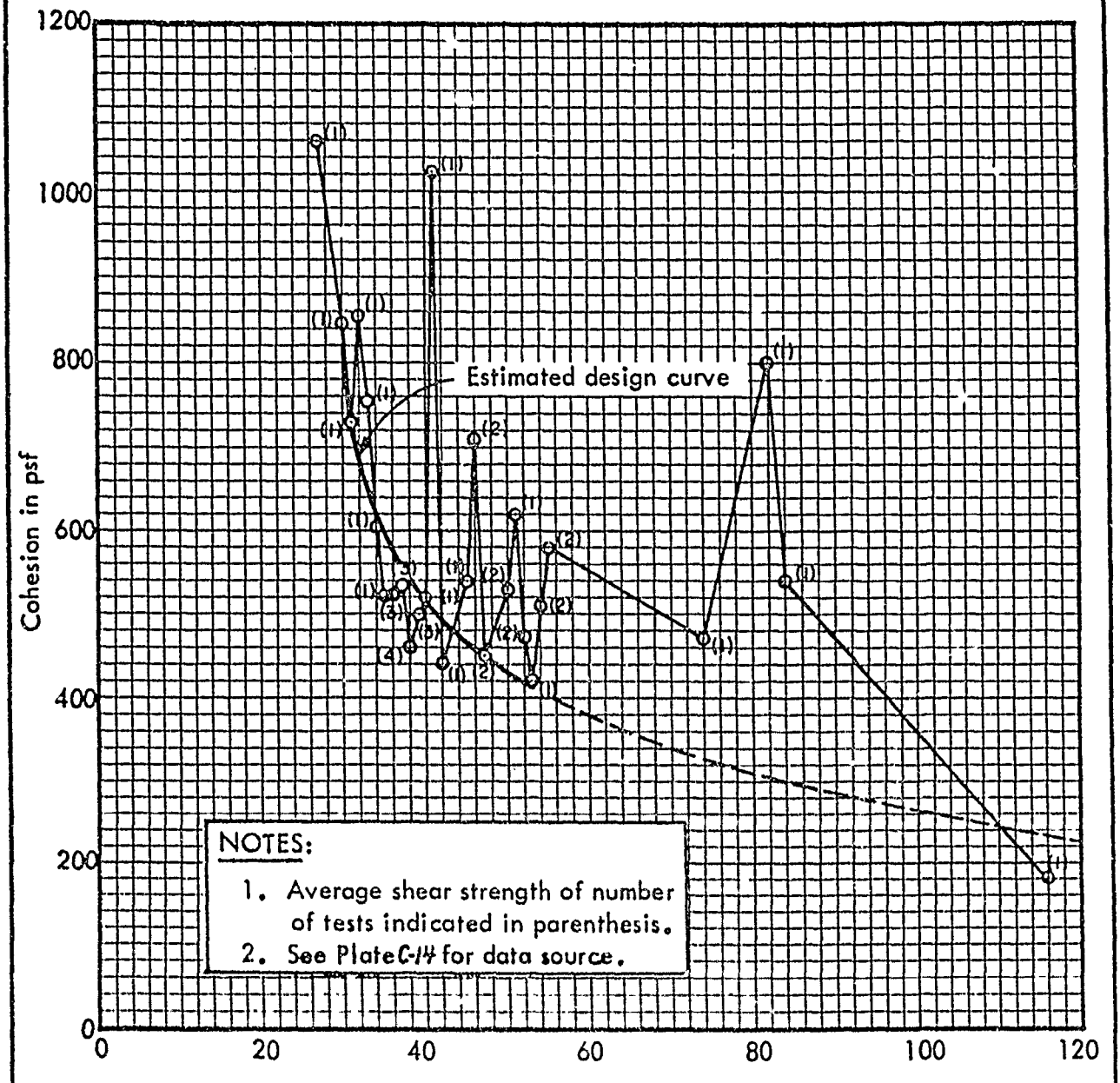
375-006



COHESIVE SHEAR STRENGTH FOR CL-CH SOILS VS WATER CONTENT

PLATE C-12

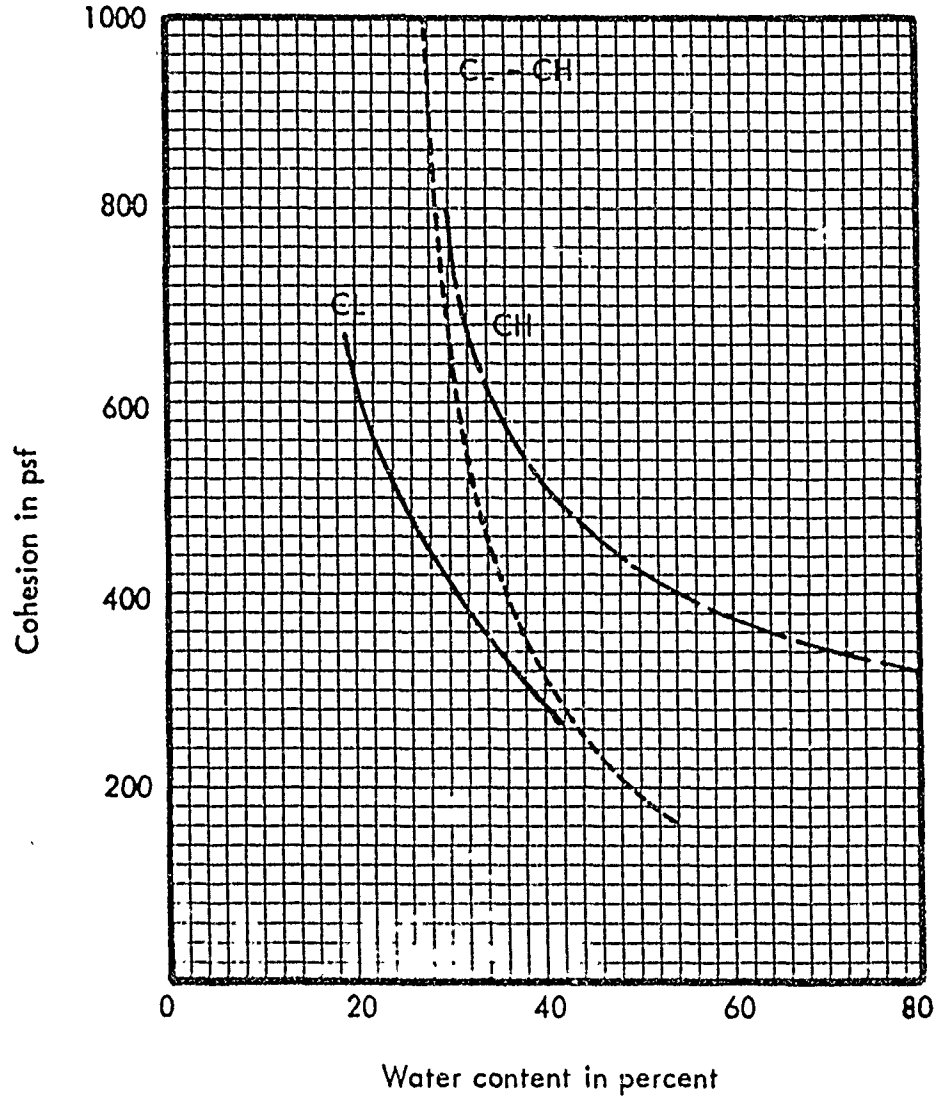
375-006



COHESIVE SHEAR STRENGTH
FOR CH SOILS VS
WATER CONTENT

PLATE C-13

375-006



NOTE:

1. Cohesive shear strength curves derived from shear strength data su lied by Rock Island District for Mississippi River alluvial soils in the D. .rict, and shown on Plates C-11, C-12 and C-13.

COHESIVE SHEAR STRENGTH VS WATER CONTENT

PLATE C-14

DETAILED COST ESTIMATE

APPENDIX D

GENERAL REEVALUATION REPORT
FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

APPENDIX D
DETAILED COST ESTIMATE 1/

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
REAL ESTATE							
Lands, easements, rights-of-way, relocation assistance (PL 91-646), cost of acquisition and contingencies for levee, borrow areas, ponding areas, recreation areas (LER)						2,380,000	760,000
TOTAL REAL ESTATE						2,380,000	760,000
LEVEES							
Embankment -							
(In-Place Semi-Compacted)							
From Ponding Area A	37,000	CY	5.90	218,300			
From Ponding Area B	8,200	CY	4.80	39,360			
From Ponding Area C	0						
From Ponding Area D	96,000	CY	4.80		460,800		
From Existing Levee	9,000	CY	3.55		31,950		
From Borrow - WDM	193,800	CY	7.30	1,414,740			
From Borrow - DM	23,300	CY	8.75		203,875		
Stripping - 6"	15,750	CY	15.50	244,125			
	11,050	CY	15.50		171,275		
Inspection Trench -							
remove and replace	13,050	CY	4.00	52,200			
	26,500	CY	4.00		106,000		
remove and waste	72,870	CY	16.00	1,165,920			
Clear and Grub - Avg. Density	7.2	AC	3,000.00	21,600			
	9.0	AC	3,000.00		27,000		
Clear and Grub - Med. Density	9.0	AC	5,000.00	45,000			
	8.7	AC	5,000.00		43,500		
Remove Roads							
Sta. 40+50 - Sta. 44+50	1,900	CY	15.50	29,450			
Sta. 189+60 - Sta. 211+00	360	CY	15.50	5,580			
Degrade Existing Levee	18,150	CY	2.00		36,300		

1/ LERRD is the acronym for Lands, Easements, Rights-of-Way, Relocations, and Dredge Disposal Areas. LERRD is a non-Federal responsibility.

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
LEVEES (Cont'd)							
Seeding	26.6	AC	1,625.00	43,225			
	18.3	AC	1,625.00		29,738		
Riprap,							
Sta. 170+00 - Sta. 174+00							
18" Riprap	750	Ton	20.00		15,000		
6" Bedding	222	Ton	16.00		3,552		
SUBTOTAL				3,279,500	1,128,990		
CONTINGENCIES				655,900	225,810		
TOTAL LEVEES				3,935,400	1,354,800		
FLOODWALLS							
Sta. 177+50 - 186+00							
Sta. 214+90 - 216+17							
Reinforced Concrete	480	CY	400.00	192,000			
Sheetpiling	5,795	SF	20.00	115,900			
Excavation	1,376	CY	1.25	1,720			
Backfill	898	CY	2.00	1,796			
12" CMP	427	LF	11.00	4,697			
Gravel Filter Material	111	CY	24.00	2,664			
SUBTOTAL				318,777			
CONTINGENCIES				63,723			
TOTAL FLOODWALLS				382,500			
CLOSURE STRUCTURES							
Sta. 9+40 (C&NW RR) - 20'							
Sandbag Closure							
Sheetpiling	200	SF	20.00	4,000			
Remove and Replace Tracks	78	LF	40.50	3,159			
Sta. 88+40 (63rd St.) - 40'							
Sandbag Closure	0	-	0	0	0		
Sta. 101+45 (C&NW RR) - 40'							
Double Leaf Swing Gate	4,720	lbs	2.80		13,216		
Paint	472	SF	3.30		1,558		
Sheetpiling	1,441	SF	20.00		28,820		
Reinforced Concrete	62	CY	400.00		24,800		
Remove and Replace Tracks	156	LF	40.50		6,318		

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
CLOSURE STRUCTURES (Cont'd)							
Sta. 174+73 (63rd St.) - 50'							
Tilt-up Panels	Job	Sum	15,533.00	7,767	7,767		
Supporting Members	Job	Sum	4,200.00	2,100	2,100		
Reinforced Concrete	47	CY	400.00	9,400	9,400		
Remove Pavement	4	CY	200.00	400	400		
Remove Subbase	4	CY	15.50	31	31		
Sta. 182+65 (Grand Ave.) - 70'							
Mitered Swing Gates	8,436	lbs	2.80	23,621			
Paint	844	SF	3.30	2,785			
Sheetpiling	1,884	SF	20.00	37,680			
Reinforced Concrete	70	CY	400.00	28,000			
Remove Pavement	13	CY	200.00	2,600			
Remove Subbase	13	CY	15.50	202			
Sta. 189+60 - 50' (Ashworth Rd. and DM Union RR)							
Mitered Swing Gate	6,048	lbs	2.80	16,934			
Paint	604	SF	3.30	1,993			
Sheetpiling	1,505	SF	20.00	30,100			
Reinforced Concrete	56	CY	400.00	22,400			
Remove and Replace Track	78	LF	40.50	3,159			
Remove Pavement	9	CY	200.00	1,800			
Remove Subbase	9	CY	15.50	140			
Sta. 214+75 (Lumber Yard) - 30'							
Single Leaf Swing Gate	5,400	lbs	2.80	15,120			
Paint	540	SF	3.30	1,782			
Sheetpiling	2,430	SF	20.00	48,600			
Reinforced Concrete	97	CY	400.00	38,800			
Remove Gravel Surface	7	CY	15.50	109			
Sta. 216+40 (DM Union RR) - 40'							
Double Closure 2-Single Leaf Swing Gates	4,400	lbs	2.80	12,320			
Paint	440	SF	3.30	1,452			
Sheetpiling	1,386	SF	20.00	27,720			
Reinforced Concrete	65	CY	400.00	26,000			
Remove and Replace Tracks	156	LF	40.50	6,318			
SUBTOTAL				376,492	94,410		
CONTINGENCIES				75,308	18,890		
TOTAL CLOSURE STRUCTURES				451,800	113,300		

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
ROAD RAMPS							
Sta. 10+10							
Remove Old Surface	103	CY	15.50			1,597	
Fill	674	CY	7.00			4,718	
New Gravel Surface	115	CY	27.50			3,163	
Sta. 17+00 (across RR)							
Stripping	12	CY	15.50			186	
Fill	30	CY	7.00			210	
New Gravel Surface	12	CY	27.50			330	
Sta. 41+80							
Fill	485	CY	7.00			3,395	
New Gravel Surface	153	CY	27.50			4,208	
Sta. 76+00 (maintenance)							
Stripping	70	CY	15.50	1,085			
Fill	2,023	CY	7.00	14,161			
New Gravel Surface	196	CY	27.50	5,390			
Sta. 126+00							
Remove Old Surface	114	CY	15.50				1,767
Fill	1,177	CY	7.00				8,239
New Gravel Surface	127	CY	27.50				3,493
Sta. 212+00 (maintenance)							
Stripping	30	CY	15.50	465			
Fill	692	CY	7.00	4,844			
New Gravel Surface	170	CY	27.50	4,675			
SUBTOTAL				30,620	0	17,807	13,499
CONTINGENCIES				6,080		3,593	2,701
TOTAL ROAD RAMPS				36,700		21,400	16,200
STORM DRAINAGE							
Gatewells (w/Sluice Gates)							
Sta. 13+60 - 48" (Pond. B)	11.0	VLF	3,000.00	33,000			
48" RCP	150	LF	92.00	13,800			
Sta. 43+60 - Twin 8x8 (Pond. A)	15.7	VLF	6,700.00	105,190			
Twin 8x8 RCB	70	LF	550.00	38,500			
Sta. 43+60 - 48" (Pond. A)	8	VLF	3,200.00	25,600			
48" RCP	50	LF	92.00	4,600			

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
STORM DRAINAGE (Cont'd)							
Gatewells (W/Sluice Gates) (Cont'd)							
Sta. 57+50 - 6x6	17	VLF	3,100.00	52,700			
6x6 RCB	120	LF	230.00	27,600			
Sta. 79+00 - Twin 8x4 (Pond. C)	19.7	VLF	6,200.00	122,140			
Twin 8x4 RCB	100	LF	445.00	44,500			
Sta. 102+20 - 36"	18.4	VLF	1,700.00		31,280		
36" RCP	50	LF	85.00		4,250		
Sta. 145+00 - 48" (Pond. D)	16.2	VLF	3,000.00		48,600		
48" Flapgate	1	ea	10,000.00		10,000		
48" RCP	80	LF	92.00		7,360		
Sta. 177+50 - 30"	11	VLF	1,900.00	20,900			
30" RCP	40	LF	70.00	2,800			
Sta. 182+30 - 24"	11.4	VLF	1,825.00	20,805			
24" Flapgate	1	ea	5,200.00	5,200			
24" RCP	40	LF	45.00	1,800			
Sta. 183+00 - 36"	11.6	VLF	2,000.00	23,200			
36" Flapgate	1	ea	7,200.00	7,200			
36" RCP	40	LF	85.00	3,400			
Sta. 185+30 - 36"	12	VLF	2,000.00	24,000			
36" Flapgate	1	ea	7,200.00	7,200			
36" RCP	40	LF	85.00	3,400			
Sta. 190+00 - 36"	13.4	VLF	2,000.00	26,800			
36" Flapgate	1	ea	7,200.00	7,200			
36" RCP	40	LF	85.00	3,400			
Sta. 198+00 - 24"	13.7	VLF	1,825.00	25,003			
24" Flapgate	1	ea	5,200.00	5,200			
24" RCP	80	LF	45.00	3,600			
Subtotal - Gatewells				658,738	101,490		
Interceptors							
Sta. 57+50 - 60" RCP	900	LF	140.00			126,000	
Sta. 153+00 - 42" RCP	790	LF	79.00				62,410
48" Precast Manhole	1	ea	1,525.00				1,525

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
STORM DRAINAGE (Cont'd)							
Interceptors (Cont'd)							
Sta. 160+00 - 42" RCP	490	LF	79.00				38,710
48" Precast Manhole	1	ea	1,525.00				1,525
Sta. 162+00 - 24" RCP	200	LF	32.00				6,400
48" Precast Manhole	1	ea	1,525.00				1,525
Sta. 183+00 - 24" RCP	265	LF	32.00			8,480	
Sta. 190+00 - 24" RCP	435	LF	32.00			13,920	
Sta. 182+30 - 18" RCP	85	LF	24.00			2,040	
Subtotal - Interceptors						150,440	112,095
Drainage Ditch							
Sta. 13+60							
Excavation	1,334	CY	4.00	5,336			
Seeding	0.3	AC	1,625.00	488			
Subtotal - Ditch				5,824			
Pipe Removal							
Sta. 13+60 - 18" RCP	100	LF	14.00	1,400			
Sta. 43+60 - 84" RCP	60	LF	118.00	7,080			
Sta. 85+50 - 24" CMP	70	LF	17.00	1,190			
Sta. 130+00 - 24" CMP	40	LF	17.00		680		
Sta. 134+00 - 24" CMP	40	LF	17.00		680		
Sta. 145+00 - 30" CMP	80	LF	22.00		1,760		
Sta. 153+00 - 24" CMP	30	LF	17.00		510		
Sta. 162+00 - 24" RCP	25	LF	17.00		425		
Sta. 177+00 - 24" CMP	40	LF	17.00	680			
Sta. 179+40 - 24" CMP	40	LF	17.00	680			
Subtotal - Pipe Removal				11,030	4,055		

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
STORM DRAINAGE (Cont'd)							
Ponding Areas							
Area #1							
Clear and Grub	27	AC	3,000.00	81,000			
Stripping - 6" Replace	21,780	CY	2.25	49,005			
Excavation - Reuse	43,560	CY	5.00	217,800			
Seeding	27	AC	1,625.00	43,875			
Area #2							
Clear and Grub	1.5	AC	3,000.00	4,500			
Stripping - 6" Replace	2,420	CY	2.25	5,445			
Excavation - Reuse	9,680	CY	5.00	48,400			
Seeding	3.1	AC	1,625.00	5,038			
Area #3							
Clear and Grub	8.5	AC	3,000.00	25,500			
Excavation - Waste	82,280	CY	15.50	1,275,340			
Seeding	9.0	AC	1,625.00	14,625			
Fence	2,450	LF	10.00	24,500			
Area #4							
Clear and Grub	5.0	AC	3,000.00		15,000		
Stripping - 6" Replace	8,067	CY	2.25		18,151		
Excavation - Reuse	112,933	CY	5.00		564,665		
Seeding	10.7	AC	1,625.00		17,388		
Fence	3,960	LF	10.00		39,600		
Subtotal - Ponding Areas				1,795,028	654,804		
Pump Stations							
Sta. 78+00 - 10,000 gpm	Job	Sum	275,000	275,000			
Sta. 186+00 - 25,000 gpm	Job	Sum	365,000	365,000			
Subtotal - Pump Stations				640,000	0		
Subtotals							
Gatewells				658,738	101,490		
Interceptors				0	0	150,440	112,095
Drainage Ditch				5,824	0		
Pipe Removal				11,030	4,055		
Ponding Areas				1,795,028	654,804		
Pump Stations				640,000	0		

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
STORM DRAINAGE (Cont'd)							
SUB-STORM DRAINAGE				3,110,620	760,349	150,440	112,095
CONTINGENCIES				622,080	152,151	30,060	22,405
TOTAL STORM DRAINAGE				3,732,700	912,500	180,500	134,500
UTILITIES (Except Storm)							
Water Lines (New Pipe and Valve)							
Sta. 10+50 - 6"	40	LF	19.00			760	
6" Valve	1	ea	555.00			555	
Sta. 27+30 - 4"	50	LF	17.50			875	
4" Valve	1	ea	400.00			400	
Sta. 35+60 - 4"	50	LF	17.50			875	
4" Valve	1	ea	400.00			400	
Sta. 182+50 - 6"	40	LF	19.00			760	
6" Valve	1	ea	555.00			555	
Sta. 182+90 - 2"	40	LF	14.00			560	
2" Valve	1	ea	120.00			120	
Sta. 184+10 - 2"	40	LF	14.00			560	
2" Valve	1	ea	120.00			120	
Sta. 184+85 - 2"	40	LF	14.00			560	
2" Valve	1	ea	120.00			120	
Sta. 211+00 - 6"	85	LF	19.00			1,615	
6" Valve	1	ea	555.00			555	
Subtotal				0	0	9,390	0
Gas Lines (New Pipe thru Freeboard)							
Sta. 39+50 - 3"	100	LF	12.00			1,200	
Sta. 41+50 - 3"	70	LF	12.00			840	
Sta. 44+00 - 3"	70	LF	12.00			840	
Sta. 88+80 - 10"	27	LF	25.25				682
Sta. 182+75 - 12"	40	LF	28.00			1,120	
Sta. 189+10 - 8"	48	LF	23.00			1,104	
Sta. 190+00 - 8"	48	LF	23.00			1,104	
Subtotal						6,208	682
Sanitary Sewer							
Sta. 8+80 - 15"							
Gatewell & Sluice Gate	Job	Sum	23,180	23,180			
15" RCP	48	LF	24.00	1,152			

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
UTILITIES (Except Storm) (Cont'd)							
Sanitary Sewer (Cont'd)							
Sta. 88+80 - 24"							
Gatewell & Sluice Gate	Job	Sum	24,820		24,820		
24" RCP	27	LF	42.00		1,134		
Sta. 102+10 - 42"							
Gatewell & Sluice Gate	Job	Sum	52,800		52,800		
42" RCP	40	LF	100.00		4,000		
Sta. 115+25 - 18"							
Gatewell & Sluice Gate	Job	Sum	30,043		30,043		
18" RCP	120	LF	31.00		3,720		
Sta. 116+70 - 36"							
Gatewell & Sluice Gate	Job	Sum	36,040		36,040		
36" RCP	80	LF	79.00		6,320		
Sta. 140+90 - 21"							
Gatewell & Sluice Gate	Job	Sum	31,028		31,028		
21" force main RCP	77	LF	26.50		2,041		
Sta. 141+10 - 48"							
Gatewell & Sluice Gate	Job	Sum	66,600		66,600		
48" RCP	77	LF	115.00		8,855		
Sta. 174+30 - 24"							
Gatewell & Sluice Gate	Job	Sum	22,265		22,265		
24" RCP	30	LF	42.00		1,260		
Sta. 182+30 - 10"							
Gatewell & Sluice Gate	Job	Sum	21,900	21,900			
10" D.I.	40	LF	34.00	1,360			
Sta. 125+50							
24" VCP - remove	75	LF	14.00		1,050		
SUBTOTAL - Sanitary Sewer				47,592	291,976	0	0
SUBTOTAL - Water Lines				0	0	9,390	0
SUBTOTAL - Gas Lines				0	0	6,208	682
SUBTOTAL UTILITIES				47,592	291,976	15,598	682
CONTINGENCIES				9,508	58,424	3,102	118
TOTAL UTILITIES				57,100	350,400	18,700	800
RELOCATIONS							
Fence							
Sta. 182+50 - Sta. 211+00	2,200	LF	8.00			17,600	
Electric Power Poles	14	ea	1,225.00			17,150	
	2	ea	1,225.00				2,450
AT&T Fiber Optics Line Sta. 101+50	Job	Sum	10,000.00				10,000

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
RELOCATIONS (Cont'd)							
Teleconnect Fiber Optics Line							
Sta. 10+50	Job	Sum	500.00			500	
Sta. 101+00	Job	Sum	500.00				500
Fire Hydrants	3	ea	1,000.00			3,000	
Access Roads							
Martin-Marietta							
Clear & Grub	0.4	AC	3,000.00			1,200	
Stripping	167	CY	15.50			2,589	
Fill	458	CY	7.00			3,206	
New Gravel Surface	250	CY	27.50			6,875	
18" CMP	40	LF	20.00			800	
Lumber Yards							
Clear & Grub	0.5	AC	3,000.00			1,500	
Stripping	667	CY	15.50			10,339	
Fill	1,326	CY	7.00			9,282	
Gravel Subbase	667	CY	27.50			18,343	
Asphalt Surface	465	Ton	50.00			23,250	
12" CMP	90	LF	12.50			1,125	
Water Line							
Sta. 185+00 - 211+50-6"	2,650	LF	19.00			50,350	
Gas Line							
Sta. 190+40 - 211+00-2"	960	LF	11.50			11,040	
Sanitary Sewer							
Sta. 182+70 - 184+70							
15" VCP	200	LF	36.00			7,200	
Sta. 190+00							
15" VCP	100	LF	36.00			3,600	
Sta. 190+00 - 211+50							
36" RCP	2,150	LF	86.50			185,975	
SUBTOTAL RELOCATIONS						374,924	12,950
CONTINGENCIES						153,476	2,550
TOTAL RELOCATIONS						528,400	15,500
LANDSCAPING							
Amur Maple	75	ea	87.00	6,525			
	10	ea	87.00		870		

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
LANDSCAPING (Cont'd)							
Hedge Maple-Queen Elizabeth	90	ea	90.00	8,100			
	10	ea	90.00		900		
Crimson King Maple	100	ea	93.00	9,300			
	15	ea	93.00		1,395		
Marshall Seedless Ash	70	ea	77.00	5,390			
	25	ea	77.00		1,925		
Ginkgo	50	ea	100.00	5,000			
	0		100.00		0		
American Sweetgum	35		63.00	2,205			
	5		63.00		315		
Selkirk Crabapple	120		94.00	11,280			
	20		94.00		1,880		
Pink Perfection Crabapple	120		94.00	11,280			
	20		94.00		1,880		
Newport Plum	90		92.00	8,280			
	10		92.00		920		
Swamp White Oak	130		100.00	13,000			
	40		100.00		4,000		
Bur Oak	100		119.00	11,900			
	20		119.00		2,380		
Littleleaf Linden	45		87.00	3,915			
	5	ea	87.00		435		
Japanese Yew, Nana	90	ea	28.00	2,520			
	0		28.00		0		
Japanese Yew, Hicks	100		28.00	2,800			
	0		28.00		0		
Waukegan Juniper	75		20.00	1,500			
	0		20.00		0		
Red Twig Dogwood	80		15.00	1,200			
	20		15.00		300		
Dwarf Burningbush	30		20.00	600			
	30		20.00		600		
Tallhedge	80		15.00	1,200			
	10		15.00		150		
Anthony Water Spirea	40		20.00	800			
	20		20.00		400		
Birkwood Viburnum	65		22.00	1,430			
	40		22.00		880		
Wayfaringtree Viburnum	50		24.00	1,200			
	30		24.00		720		
SUBTOTAL LANDSCAPING				109,425	19,950		
CONTINGENCIES				21,875	3,950		
TOTAL LANDSCAPING				131,300	23,900		

Description	Qty	Unit	Unit Price	Cost-Shared WDM	Cost-Shared DM	LERRD WDM	LERRD DM
RECREATION							
Bicycle Path							
Asphalt - 2"	1,007	tons	50.00	50,350			
	530	tons	50.00		26,500		
Gravel Base Course - 4"	963	CY	27.50	26,483			
	506	CY	27.50		13,915		
Guard Rail	11,800	LF	2.80	33,040			
	8,800	LF	2.80		24,640		
Stripping - 6"	1,426	CY	15.50	22,103			
	269	CY	15.50		4,170		
Clear & Grub	0.2	AC	3,000.00	600			
Vista							
Embankment	574	CY	7.00	4,018			
Gravel Base Course	6	CY	27.50	165			
Asphalt	12	Ton	50.00	600			
Park Benches	4	ea	500.00	2,000			
Signal Lights							
Railroad - flashing signal light w/bell	2	ea	14,000.00	28,000			
Highway - push-button traffic light	1	ea	10,000.00	5,000	5,000		
Bicycle Ramps							
Stripping - 6"	612	CY	15.50	9,486			
	157	CY	15.50		2,434		
Embankment	1,006	CY	7.00	7,042			
	235	CY	7.00		1,645		
Gravel Base Course	59	CY	27.50	1,623			
	21	CY	27.50		578		
Asphalt	60	Ton	50.00	3,000			
	23	Ton	50.00		1,150		
Boat Ramp	Job	Sum			35,000		
Parking Lot 164x140							
Clear & Grub	1.0	AC	3,000.00		3,000		
Stripping	470	CY	15.50		7,285		
Gravel Surfacing	1,252	CY	27.50		34,430		
SUBTOTAL				193,510	159,747		
CONTINGENCIES				38,690	31,953		
TOTAL RECREATION				232,200	191,700		
TOTAL				8,959,700	2,946,600	3,129,000	927,000

Cost Estimate Summary - 100-year Plan First Costs ($)

	Cost-Shared		LERRD	
	WDM	DM	WDM	DM
FLOOD CONTROL CATEGORY				
Real Estate			2,363,000	753,000
Levees	3,935,400	1,354,800		
Floodwalls	382,500			
Closure Structures	451,800	113,300		
Road Ramps	36,700		21,400	16,200
Storm Drainage	3,732,700	912,500	180,500	134,500
Utilities	57,100	350,400	18,700	800
Relocations	0	0	528,400	15,500
Landscaping/ Beautification	131,300	23,900	0	0
	8,727,500	2,754,900		
Subtotal	11,482,400		3,112,000	920,000
E & D	918,600		59,900	13,400
S & A	688,800		44,900	10,000
Total Flood Control First Costs	13,089,800		3,216,800	943,400
Combined Total	$ 17,250,000			
RECREATION CATEGORY				
Real Estate			17,000	7,000
Bicycle Path	198,800	89,000		
Bicycle Ramps	25,300	7,000		
Vista	8,100			
Parking Lot		53,700		
Boat Ramp		42,000		
Subtotal	232,200	191,700	17,000	7,000
E & D	18,500	15,250		
S & A	13,900	11,450		
Total Recreation First Costs	264,600	218,400	17,000	7,000
Combined Total	$507,000			

TOTAL PROJECT FIRST COSTS $17,250,000 (flood control) + $507,000 (recreation) = $17,757,000.

DRAFT LOCAL COOPERATION AGREEMENT

APPENDIX E

D R A F T

LOCAL COOPERATION AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE CITIES OF WEST DES MOINES, IOWA AND DES MOINES, IOWA
FOR CONSTRUCTION OF THE
FLOOD CONTROL PROJECT
RACOON RIVER AND WALNUT CREEK
AT
WEST DES MOINES, IOWA, AND DES MOINES, IOWA

THIS AGREEMENT, entered into this _____ day of _____, 19_____, by and between the DEPARTMENT OF THE ARMY (hereinafter referred to as the "Government"), acting by and through the Assistant Secretary of the Army (Civil Works), and the Cities of WEST DES MOINES, IOWA, and DES MOINES, IOWA (hereinafter referred to as the "Cities"), acting by and through their respective Mayors,

WITNESSETH, that

WHEREAS, construction of the Flood Control Project at West Des Moines - Des Moines (hereinafter referred to as the "Project" as defined in Article I.a. of this agreement), was authorized by the Water Resources Development Act of 1986 (P.L. 99-662, as amended); and

WHEREAS, Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, specifies the cost-sharing requirements applicable to the Project; and

WHEREAS, Section 221 of the Flood Control Act of 1970, Public Law 91-611, as amended, provides that the construction of any water resources project by the Secretary of the Army shall not be commenced until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project; and,

WHEREAS, the Cities do not qualify for a reduction of the maximum non-Federal cost share pursuant to the guidelines which implement Section 103(m) of the Water Resources Development Act of 1986, Public Law 99-662, published in 33 C.F.R., sections 241.1 - 6, entitled "Flood Control Cost-Sharing Requirements Under the Ability to Pay Provision"; and,

WHEREAS, the Cities agree to be held jointly and severally responsible for compliance with the terms of this Agreement; and,

WHEREAS, the Cities have the authority and capability to furnish the cooperation hereinafter set forth and are willing to participate in cost-sharing and financing in accordance with the terms of this Agreement;

NOW THEREFORE, the parties agree as follows:

ARTICLE I - DEFINITIONS AND GENERAL PROVISIONS

For purposes of this Agreement:

a. The term "Project" shall mean construction of 4.2 miles of levees and floodwalls, road and railroad closure structures, two pump stations, four ponding areas, and recreation features consisting of 2.8 miles of bike path, ramps, road and railroad crossings, one boat ramp with parking lot, and a scenic vista, along the Raccoon River and Walnut Creek in the Cities of West Des Moines and Des Moines, Iowa.

b. The term "total project costs" shall mean all costs incurred by the Cities and the Government directly related to construction of the Project. Such costs shall include, but not necessarily be limited to, continuing planning and engineering costs

incurred after October 1, 1985; costs of applicable engineering and design; actual construction costs; supervision and administration costs, costs of contract dispute settlements or awards, and the value of lands, easements, rights-of-way, utility and facility alterations or relocations, and dredged material disposal areas provided for the Project by the Cities, but shall not include any costs for betterments, operation, repair, maintenance, replacement or rehabilitation.

c. The term "period of construction" shall mean the time from the advertisement of the first construction contract to the time of acceptance of the Project by the Contracting Officer.

d. The term "Contracting Officer" shall mean the U.S. Army Engineer for the Rock Island District, or his designee.

e. The term "highway" shall mean any highway, thoroughfare, roadway, street, or other public or private road or way.

f. The term "relocations" shall mean alterations, modifications, lowering or raising in place, and/or new construction related to, but not limited to, existing: railroads, highways, bridges, railroad bridges and approaches thereto, buildings, pipelines, public utilities (such as municipal water and sanitary sewer lines, telephone lines, and storm drains), aerial utilities, cemeteries, and other facilities, structures, and improvements determined by the Government to be necessary for the construction, operation and maintenance of the Project.

g. The term "fiscal year" shall mean one fiscal year of the United States Government, unless otherwise specifically indicated. The Government fiscal year begins on October 1 and ends on September 30.

h. The term "involuntary acquisition" shall mean the acquisition of lands, easements, and rights-of-way by eminent domain.

i. The term "functional portion of the Project" shall mean a completed portion of the Project as determined by the Contracting Officer to be suitable for tender to the Cities to operate and maintain in advance of completion of construction of the entire Project.

j. The term "separable cost of recreation features" shall mean all separable costs incurred by the Cities and the Government for construction of the project recreation features (excluding betterments and operation and maintenance costs). Such recreation costs shall include, but not necessarily be limited to, continuing planning and engineering costs incurred after October 1, 1985; costs of applicable engineering and design; actual construction costs; supervision and administration costs; costs of contract dispute settlements or awards; and the value of any separable lands necessary for access, parking, public health, and safetly.

ARTICLE II - OBLIGATIONS OF THE PARTIES

a. The Government, subject to and using funds provided by the Cities and appropriated by the Congress of the United States, shall expeditiously construct the Project (including relocations of railroad bridges and approaches thereto), applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws,

regulations and policies. The Cities shall be afforded the opportunity to review and comment on all contracts, including relevant plans and specifications, prior to the issuance of invitations for bid. The Cities will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. The Government will consider the comments of the Cities, but award of contracts, modifications or change orders, and performance of all work on the Project (whether the work is performed under contract or by Government personnel), shall be exclusively within the control of the Government.

b. When the Government determines that the Project or a functional portion of the Project is complete, the Government shall turn the completed Project or functional portion over to the Cities, which shall accept the Project or functional portion and be solely responsible for operating, repairing, maintaining, replacing and rehabilitating the Project or functional portion in accordance with Article VIII hereof.

c. As further specified in Article VI hereof, the Cities shall provide, during the period of construction, a cash contribution of 5 percent of total project costs allocated to structural flood control.

d. As further specified in Article III hereof, the Cities shall provide all lands, easements, rights-of-way, and dredged material disposal areas, and perform all relocations (excluding railroad bridges and approaches thereto) determined by the Government to be necessary for construction of the Project. At its sole discretion, the Government

may perform relocations in cases where it appears that the Cities' contributions will exceed the maximum non-Federal cost share set out in Article VI.f.

e. If the value of the contributions provided under paragraphs c. and d. of this Article represents less than 25 percent of total project costs, the Cities shall provide, during the period of construction, an additional cash contribution in the amount necessary to make its total contribution equal to 25 percent of total project costs.

f. As further specified in Article VI hereof, the Cities shall provide during the period of construction, a cash contribution of 50 percent of total project costs allocated to separable recreation features.

g. No Federal funds may be used to meet the Cities' share of project costs under this Agreement unless the expenditure of such funds is expressly authorized by statute as verified in writing by the granting agency.

h. The Cities agree to participate in and comply with applicable Federal flood plain management and flood insurance programs.

i. The Cities shall prevent encroachment on any of the flood protection structures, including ponding areas, and if ponding areas are impaired, provide substitute storage capacity or equivalent pumping capacity promptly without cost to the United States.

j. No less than once each year the Cities shall inform affected interests of the limitations of the protection afforded by the

Project. The City of Des Moines shall do so by an advertisement in the local newspaper covering all areas protected by the levee. The City of West Des Moines shall do so by publishing the notice once during the month of April in the Official Notice Section of the Western Express, a newspaper in the City of West Des Moines.

k. The Cities shall publicize flood plain information in the area concerned and shall provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the Project.

ARTICLE III - LANDS, FACILITIES, AND PUBLIC LAW 91-646 RELOCATION ASSISTANCE

a. The Cities shall furnish to the Government all lands, easements, and rights-of-way, including suitable borrow and dredged material disposal areas, as may be determined by the Government to be necessary for the construction, operation, and maintenance of the Project, and shall furnish to the Government evidence supporting the Cities' legal authority to grant rights-of-entry to such lands. The necessary lands, easements, and rights-of-way may be provided incrementally, but all lands, easements, and rights-of-way determined by the Government to be necessary for work to be performed under a construction contract must be furnished prior to the advertisement of the construction contract.

b. The Cities shall provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged material disposal areas necessary for construction of the Project.

c. Upon notification from the Government, the Cities shall accomplish or arrange for accomplishment at no cost to the Government all relocations (excluding railroad bridges and approaches thereto) determined by the Government to be necessary for construction of the Project.

d. The Cities shall comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, 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.

ARTICLE IV - VALUE OF LANDS AND FACILITIES

a. The value of the lands, easements and rights-of-way to be included in total project costs and credited toward the Cities' share of total project costs will be determined in accordance with the following procedures:

1. If the lands, easements, or rights-of-way are owned by the Cities as of the date the first construction contract for the Project is awarded, the credit shall be the fair market value of the interest provided to the Government by the Cities at the time of such award. The fair market value shall be determined by an appraisal, to be obtained by the Cities, which has been prepared by a qualified appraiser who is acceptable to both the Cities and the Government. The appraisal shall be reviewed and approved by the Government.

2. If the lands, easements, or rights-of-way are to be acquired by the Cities after the date of award of the first construction contract for the Project, the credit shall be the fair market value of the interest at the time such interest is acquired. The fair market value shall be determined as specified in Article IV.a.1. of this Agreement. If a City pays an amount in excess of the appraised fair market value, it may be entitled to a credit for the excess if the City has secured prior written approval from the Government of its offer to purchase such interest.

3. If a City acquires more lands, easements, or rights-of-way than are necessary for project purposes, as determined by the Government, then only the value of such portions of those acquisitions as are necessary for project purposes shall be included in total project costs and credited towards the City's share.

4 Credit for lands, easements, and rights-of-way in the case of involuntary acquisitions which occur within a one-year period preceding the date this Agreement is signed or which occur after the

date this Agreement is signed will be based on court awards, or on stipulated settlements that have received prior Government approval.

5. Credit for lands, easements, or rights-of-way acquired by the Cities within a five-year period preceding the date this Agreement is signed, or at any time after this Agreement is signed, will also include the actual incidental costs of acquiring the interest, e.g., closing and title costs, appraisal costs, survey costs, attorney's fees, plat maps, and mapping costs, as well as the actual amounts expended for payment of any Public Law 91-646 relocation assistance benefits provided in accordance with the obligations under this Agreement.

c. The costs of relocations which will be included in total project costs and credited towards the Cities' share of total project costs shall be that portion of the actual costs as set forth below, and approved by the Government:

1. Highways and Highway Bridges: Only that portion of the cost as would be necessary to construct substitute bridges and highways to the design standard that the State of Iowa would use in constructing a new bridge or highway under similar conditions of geography and traffic loads.

2. Utilities and Facilities (including railroads): Actual relocation costs, less depreciation, less salvage value, plus the cost of removal, less the cost of betterments. With respect to betterments, new materials shall not be used in any alteration or relocation if materials of value and usability equal to those in the existing

facility are available or can be obtained as salvage from the existing facility or otherwise, unless the provision of new material is more economical. If, despite the availability of used material, new material is used, where the use of such new material represents an additional cost, such cost will not be included in total project costs.

ARTICLE V - CONSTRUCTION PHASING AND MANAGEMENT

a. To provide for consistent and effective communication between the Cities and the Government during the period of construction, the Cities and the Government shall appoint representatives to coordinate on scheduling, plans, specifications, modifications, contract costs, and other matters relating to construction of the Project. The Cities will be informed of any changes in cost estimates.

b. The representatives appointed above shall meet as necessary during the period of construction and shall make such recommendations as they deem warranted to the Contracting Officer.

c. The Contracting Officer shall consider the recommendations of the representatives in all matters relating to construction of the Project, but the Contracting Officer, having ultimate responsibility for construction of the Project, has complete discretion to accept, reject, or modify the recommendations.

ARTICLE VI - METHOD OF PAYMENT

a. The Cities shall provide, during the period of construction, the cash payments required under Article II of this Agreement. Total project costs are presently estimated to be

$17,757,000. In order to meet its share, the Cities must provide a cash contribution presently estimated to be $1,092,000. The dollar amounts set forth in this Article are based upon the Government's best estimates which will reflect projection of costs, price level changes, and anticipated inflation. Such cost estimates are subject to adjustments based upon cost actually incurred and are not to be construed as the total financial responsibilities of the Government and the Cities.

b. The Cities shall provide its required cash contribution in proportion to the rate of Federal expenditures during the period of construction in accordance with the following provisions:

1. For purposes of budget planning, the Government shall notify the Cities by December 1 of the prior budget year of the estimated funds that will be required from the Cities to meet their share of total project costs for the upcoming fiscal year.

2. No later than 60 calendar days prior to the award the first construction contract, the Government shall notify the Cities of the Cities' share of total project costs, including their share of costs attributable to the Project incurred prior to the initiation of construction, for the first fiscal year of construction. No later than 30 calendar days thereafter, the Cities shall verify to the satisfaction of the Government that it has deposited the requisite amount in an escrow account acceptable to the Government, with interest accruing to the Cities.

3. For the second and subsequent fiscal years of project construction, the Government shall, no later than 60 calendar days prior to the beginning of the fiscal year, notify the Cities of the Cities' share of total project costs for that fiscal year. No later than 30 calendar days prior to the beginning of the fiscal year, the Cities shall make the necessary funds available to the Government through the funding mechanism specified in Article VI.b.2. of this Agreement. As construction of the Project proceeds, the Government shall adjust the amounts required to be provided under this paragraph to reflect actual costs.

4. If at any time during the period of construction the Government determines that additional funds will be needed from the Cities, the Government shall so notify the Cities, and the Cities, no later than 45 calendar days from receipt of such notice, shall make the necessary funds available through the funding mechanism specified in Article VI.b.2. of this Agreement.

c. The Government will draw on the escrow account provided by the Cities such sums as the Government deems necessary to cover contractual and in-house fiscal obligations attributable to the Project as they are incurred, as well as costs incurred by the Government prior to the initiation of construction.

d. Upon completion of the Project and resolution of all relevant contract claims and appeals, the Government shall compute the total project costs and tender to the Cities a final accounting of the Cities' share of total project costs. In the event the total

contribution by the Cities is less than their minimum required share of total project costs, the Cities shall, no later than 90 calendar days after receipt of written notice, make a cash payment to the Government of whatever sum is required to meet their minimum required share of total project costs.

e. In the event the Cities have made cash contributions in excess of 5 percent of total project costs allocated to structural flood control which result in the Cities' having provided more than its required share of total project costs, the Government shall, no later than 90 calendar days after the final accounting is complete, subject to the availability of appropriations, return said excess to the Cities; however, the Cities shall not be entitled to any refund of the 5 percent cash contribution required pursuant to Article II.c. of this Agreement.

f. If the Cities' total contribution under this Agreement (including lands, easements, rights-of-way, and relocations, and dredged material disposal areas provided by the Cities) exceed 50 percent of total project costs, the Government shall, subject to the availability of appropriations for that purpose, refund the excess to the Cities no later than 90 calendar days after the final accounting is complete.

ARTICLE VII - DISPUTES

Before any party to this Agreement may bring suit in any court concerning an issue relating to this Agreement, such party must first seek in good faith to resolve the issue through negotiation or other

forms of nonbinding alternative dispute resolution mutually acceptable to the parties.

ARTICLE VIII - OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION

a. After the Government has turned the completed Project, or functional portion of the Project, over to the Cities, the Cities shall operate, maintain, repair, replace, and rehabilitate the completed Project, or functional portion of the Project, in accordance with regulations or directions prescribed by the Government.

b. The Cities hereby give the Government a right to enter, at reasonable times and in a reasonable manner, upon land which they own or control for access to the Project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. If an inspection shows that the Cities for any reason are failing to fulfill their obligations under this Agreement without receiving prior written approval from the Government, the Government will send a written notice to the Cities. If the Cities persist in such failure for 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 lands the Cities own or control for access to the Project for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Government shall operate to relieve the Cities of responsibility to meet their obligations as set forth in this Agreement, or to preclude the

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

ARTICLE IX - RELEASE OF CLAIMS

The Cities shall hold and save the Government free from all damages arising from the construction, operation, and maintenance of the Project, except for damages due to the fault or negligence of the Government or its contractors.

ARTICLE X - MAINTENANCE OF RECORDS

The Government and the Cities shall keep 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 project costs. The Government and the Cities shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the Project and resolution of all relevant claims arising therefrom, and shall make available at their offices at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the parties to this Agreement.

ARTICLE XI - GOVERNMENT AUDIT

The Government shall conduct an audit when appropriate of the Cities' records for the Project to ascertain the allowability, reasonableness, and allocability of its costs for inclusion as credit against the non-Federal share of project costs.

ARTICLE XII - FEDERAL AND STATE LAWS

In acting under its rights and obligations hereunder, the Cities 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, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto and published at 32 CFR 300 of Title 32, Code of Federal Regulations, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army".

ARTICLE XIII - RELATIONSHIP OF PARTIES

The parties to this Agreement act in an independent capacity in the performance of their respective functions under this Agreement, and neither party is to be considered the officer, agent, or employee of the other.

ARTICLE XIV - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, or resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom.

ARTICLE XV - COVENANT AGAINST CONTINGENT FEES

The Cities warrant that no person or selling agency has been employed or retained to solicit or secure this Agreement upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Cities for the purpose of securing business. For breach or violation of this warranty, the

Government shall have the right to annul this Agreement without liability, or, in its discretion, to add to the Agreement or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE XVI - TERMINATION OR SUSPENSION

a. If at any time the Cities fail to make the payments required under this Agreement, the Secretary of the Army shall terminate or suspend work on the Project until the Cities are no longer in arrears, unless the Secretary of the Army determines that continuation of work on the Project is in the interest of the United States or is necessary in order to satisfy agreements with any other non-Federal interests in connection with the Project. Any delinquent payment shall be charged interest at a rate, to be determined by the Secretary of the Treasury, equal to 150 per centum of the average bond equivalent rate of the 13-week Treasury Bills auctioned immediately prior to the date on which such payment became delinquent, or auctioned immediately prior to the beginning of each additional 3-month period if the period of delinquency exceeds 3 months.

b. If the Government fails to receive annual appropriations for the Project in amounts sufficient to meet project expenditures for the then-current or upcoming fiscal year, the Government shall so notify the Cities. After 60 calendar days any party may elect without penalty to terminate this Agreement pursuant to that Article or to defer future performance hereunder; however, deferral of future performance under this Agreement shall not affect existing obligations

or relieve the parties of liability for any obligation previously incurred. In the event that any party elects to terminate this Agreement pursuant to this Article, all parties shall conclude their activities relating to the Project and proceed to a final accounting in accordance with Article VI of this Agreement. In the event that any party elects to defer future performance under this Agreement pursuant to this Article, such deferral shall remain in effect until such time as the Government receives sufficient appropriations or until any party elects to terminate this Agreement.

ARTICLE XVII - NOTICES

a. All notices, requests, demands, and other communications required or permitted to be given under this Agreement shall be deemed to have been duly given if in writing and delivered personally, given by prepaid telegram, or mailed by first-class (postage pre-paid), registered, or certified mail, as follows:

If to the City of West Des Moines:
Honorable George M. Mills
Mayor of West Des Moines
City Hall
West Des Moines, Iowa 50265

If to the City of Des Moines:
Honorable _____
Mayor of Des Moines
City Hall
Des Moines, Iowa 50309

If to the Government:
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

b. A party may change the address to which such communications are to be directed by giving written notice to the other parties in the manner provided in this Article.

c. Any notice, request, demand, or other communication made pursuant to this Article shall be deemed to have been received by the addressee at such time as it is personally delivered or seven calendar days after it is mailed, as the case may be.

ARTICLE XVIII - CONFIDENTIALITY

To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the Assistant Secretary of the Army (Civil Works).

THE DEPARTMENT OF THE ARMY

BY: _____
ROBERT W. PAGE
Assistant Secretary
of the Army (Civil Works)

DATE: _____

THE CITY OF WEST DES MOINES, IOWA

BY: _____
Mayor

DATE: _____

THE CITY OF DES MOINES, IOWA

By _____
Mayor

DATE: _____

CERTIFICATE OF AUTHORITY

I, _____, do hereby certify that I am the principal legal officer of the City of West Des Moines, Iowa, that the City of West Des Moines is a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the Cities of West Des Moines, Iowa, and Des Moines, Iowa, for local cooperation in connection with the Project, and to pay damages, if necessary, in the event of the failure to perform, in accordance with Section 221 of Public Law 91-611, and that the person who has executed this agreement on behalf of the City of West Des Moines has acted within his statutory authority.

IN WITNESS WHEREOF, I have made and executed this Certification this _____ day of _____, 19_____.

_____
City Attorney for the City
of West Des Moines, Iowa

CERTIFICATE OF AUTHORITY

I, _____, do hereby certify that I am the principal legal officer of the City of Des Moines, Iowa, that the City of Des Moines is a legally constitued public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the Cities of West Des Moines, Iowa, and Des Moines, Iowa, for local cooperation in connection with the Project, and to pay damages, if necessary, in the event of the failure to perform, in accordance with Section 221 of Public Law 91-611, and that the person who has executed this Agreement on behalf of the City of Des Moines has acted within his stautory authority.

WITNESS WHEREOF, I have made and executed this certification this _____ day of _____ 19_____.

_____
City Attorney for the City of
Des Moines, Iowa

APPENDIX F

PERTINENT CORRESPONDENCE

GENERAL REEVALUATION REPORT
FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

APPENDIX F
PERTINENT CORRESPONDENCE

Date	Subject	Page
6-18-87	Historic properties - Letter from Iowa State Historical Department	F-1
10-29-87	West Des Moines borrow site - Letter from city of West Des Moines	F-2
3-21-88	Floodway encroachment coordination - Letter from Iowa Department of Natural Resources	F-3
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5-31-88	Borrow sites - Letter from Iowa Department of Natural Resources	F-6
6-7-88	Protected species and significant natural features - Letter from Iowa Department of Natural Resources	F-7
6-10-88	Comments from U.S. Environmental Protection Agency	F-8
7-14-88	Historic properties - Letter from State Historical Society of Iowa	F-9
9-6-88	Letter of intent from city of Des Moines	F-10
9-19-88	Recreation cost-sharing acceptance letter from city of West Des Moines	F-11
10-3-88	Letter of intent from city of West Des Moines	F-13
10-21-88	Historic properties - State Historical Society of Iowa	F-14
12-21-88	Letter from Norman J. Woolley asking questions about flood protection measures proposed or implemented for residences and businesses in the areas of Raccoon River, Walnut Creek, and Jordan Creek	F-15
1-17-89	Corps of Engineers response to Mr. Woolley's letter of 12-21-88	F-19

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Date	Subject	Page
3-24-89	Letter from Corps of Engineers to Public Works Director of Des Moines which included a draft Local Cooperation Agreement	F-21
3-24-89	Letter from Corps of Engineers to Public Works Director of West Des Moines which included a draft Local Cooperation Agreement	F-27
4-4-89	Letter from State Historical Society of Iowa, Division of the Department of Cultural Affairs, Bureau of Historic Preservation	F-33
4-7-89	Letter from United States Department of Agriculture Forest Service, Wisconsin	F-34
4-27-89	Letter from McKinney Law Offices, legal counsel for Val Lanes, Inc., a bowling alley affected by the levee alignment	F-35
5-1-89	Letter from Mr. William Ludwig, Environmental Design Group, representing eight property owners in the vicinity of 63rd Street and Grand Avenue affected by the proposed flood protection project	F-39
5-3-89	Letter from Beisser Lumber Company requesting a meeting with Corps representatives to clarify alignment. Note: A meeting took place on 5-18-89 in West Des Moines between both Beisser Lumber Co. and Wheeler Lumber Operations and the Corps project managers for Planning and Engineering	F-41
5-4-89	Letter from Wheeler Lumber Operations	F-42
5-5-89	Letter from U.S. Environmental Protection Agency, Region VII, assigning the project an "LO" (lack of objection) rating in accordance with NEPA and Section 309 of the Clean Air Act. The letter also outlines the procedure for establishing the wetland sites in ponding areas during high flow periods	F-43

List of Letters (Cont'd)

Date	Subject	Page
5-8-89	Letter from Stamatelos, Kenyon & McCandless, Attorneys at Law, on behalf of Frank and June Ferrari, objecting to the proposed levee alignment which would leave their homestead outside the protection	F-45
5-8-89	Letter from Des Moines Water Works stating their satisfaction in the proposed levee alignment	F-46
5-9-89	Letter from U.S. Department of Interior, Office of Environmental Project Review, stating that the agency has no additional comments to the U.S. Fish and Wildlife Service Coordination Act Report of 10-54-88	F-47
5-12-89	Letter from Donald J. Hewitt, Stoner McCray System, Inc. (West Des Moines officials answered these questions)	F-48
5-16-89	Letter from city of West Des Moines enclosing the Draft Local Cooperation Agreement	F-49
5-18-89	Letter from Long John Silver's, Inc., stating their review comments would be forwarded after review by their legal department	F-53
5-22-89	Corps of Engineers' response to Mr. Robert McKinney, McKinney Law Offices letter of 4-27-89	F-54
5-23-89	Letter from State of Iowa, Department of Natural Resources, which includes comments about the report with respect to the State's floodplain management policies	F-57
5-26-89	Corps of Engineers' response to Mr. Dan Stamatelos, Attorney, letter of 5-8-89	F-59
5-30-89	Corps of Engineers' response to Mr. William Ludwig, Environmental Design Group, letter of 5-1-89	F-61

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Date	Subject	Page
5-30-89	Letter from Mr. Henry Evans, Midland Brick, requesting alternative levee alignment be considered in order to protect his business	F-64
6-5-89	Letter from city of Des Moines enclosing draft Local Cooperation Agreement	F-67
6-16-89	Corps of Engineers' response to Mr. Henry Evans, Midland Brick, letter of 5-30-89	F-71
6-29-89	Final Fish and Wildlife Coordination Act Report	F-74

Iowa
State Historical Department

East 12th and Grand Avenue, Des Moines, Iowa 50319
(515) 281-5111

June 18, 1987

James H. Blanchar, P.E.
Acting Chief, Operations Division
Rock Island Corps of Engineers
Clock Tower Building
P. O. Box 2004
Rock Island, IL 61204-2004

RE: ICA REGIONAL WASTEWATER TREATMENT PLANT - DES MOINES - POLK COUNTY -

Dear Mr. Blanchar:

Based on the information you provided, we find that there are no historic properties which might be affected by the proposed undertaking. Therefore, we recommend project approval.

However, if the proposed project work uncovers an item or items which might be of archeological, historical or architectural interest, or if important new archeological, historical or architectural data come to light in the project area, you should make reasonable efforts to avoid or minimize harm to the property until the significance of the discovery can be determined.

Should you have any questions or if I can be of further assistance to you, please contact me at 515-281-8744.

Sincerely,

Kay Simpson

Kay Simpson
Compliance and Archeological Survey

/akh

cc - Harold E. Smith, City Engineer
EPA, Kansas City

CITY OF WEST DES MOINES

"CROSSROADS OF THE INTERSTATES"

318 FIFTH STREET ■ WEST DES MOINES, IOWA 50265 ■ 515-223-3241

October 21, 1987

MEMO TO: CORPS OF ENGINEER-LEVEE FILE
FROM: LON HAWBAKER, DIRECTOR PUBLIC SERVICES/CITY ENGINEER
SUBJECT: WEST DES MOINES BORROW SITE FOR LEVEE

The first re-planning, re-evaluation meeting on the Corps of Engineer's Levee Plan was held with Corps Officials on October 27, 1987. The Corps' staff emphasized as part of the City (local) effort for the project we would need to provide a borrow site for the levee and it needs identified as part of the planning effort at an early stage.

The original 1975 Plan indicated a borrow site along Delavan Drive, east of 50th Street. With current development efforts underway in the area, it is doubtful this area can be held for the next five to eight years, so another site is needed. Based upon a quick analysis of original plan it appears the West Des Moines borrow site may need to accommodate 600,000 C.Y. of earth, which is a twenty-five acre site if fifteen feet deep. (See attached calculations).

The site should be close to major transportation facilities to be able to handle the truck traffic. A site should preferably be a hill top or a site that could be lowered to improve it and preferably be out of development path for the next five to eight years. A cursory review has located a thirty acre ± site in SW¼,SW¼ Section 20, at S.50th Street and north side of Grand Avenue. This site is devoid of any trees, a hill top and side hill that lies twenty to fifty feet above grade of S.50th Street and Grand Avenue. The site could be improved for future commercial and/or office development by reducing grade. The site is owned by Russell Boone along with property to north.

There are few, <u>if any</u>, other similar sites remaining in West Des Moines' boundaries. Consideration should be given to entering into a long range option to purchase from the Boone family if the City is ready to get serious about reserving a borrow site based upon committments for the levee before the site falls under development ownership.

cc: John P. Bryan, City Manager

LH

MAYOR
GEORGE M MILLS

CITY COUNCIL
GARY C DAVIDSON ■ JAMES B FLEMING ■ G MEL HOLDSWORTH ■ JOHN J McGINN ■ JERRY D PROUDFIT

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

March 21, 1988

Roger Less
Hydraulic Section
U.S. Army Corps of Engineers
Rock Island, IL 61201

SUBJECT: West Des Moines - Des Moines Local Flood Protection Project

Dear Roger:

I am writing to you in response to questions arising from the March 8, 1988, meeting concerning the above referenced project. Jeff Simmons of our staff attended the meeting, which was held at the City of West Des Moines Engineer's office.

It is our understanding that one of the options being considered for the alignment of the flood protection levee near Hoak Dr. would place the levee in the floodway of Walnut Creek. In addition, your analysis showed that Q100 backwater exceeds 1.0 ft. for the condition of encroachment on the opposite bank and the levee located in the floodway.

Departmental Subrule 567 -- 72.4(2)"c" (455B) states that the alignment of a flood control levee shall be consistent with the rules governing the location of encroachment limits set out in 75.4 (455B). Locating the levee riverward of the encroachment limit, as proposed by the option, would violate the Department's rules. In addition, the Department could not grant a variance from these rules because the project would result in additional private damage (i.e., some existing development would not be protected and backwater exceeds 1.0 ft.).

It is conceivable that the Department could recommend approval of this option if property interests are obtained to eliminate additional private damages or if measures are taken so that the encroachment limit could be revised. However, it may not be practical to revise the floodway because it would require substantial modification of the floodplain, modification of existing structures, negative construction easements, buyouts or a combination of the preceeding.

Another option addressed at the meeting would require the relocation of Hoak Dr. and the placement of the levee along part of the existing alignment of Hoak Dr. It was noted that the riverward toe of the levee would extend into the floodway of Walnut Creek. The Department's staff concludes that this alignment is consistent with the encroachment limit and we would have no objections to this option.

P 3

Finally, there was a question regarding the location of the encroachment limit on Walnut Creek south of Grand Ave. You had found an inconsistency with the encroachment limit as published and as scaled from information contained with the City of Des Moines Flood Insurance Study. It is our position that the encroachment line coincides with the existing levee as shown on the FIS map.

I hope that this letter clarifies the position of the Department on these matters. If you should have further questions, please feel free to contact me at (515) 281-5029.

Sincerely,

JACK RIESSEN, P.E., SUPERVISOR
FLOOD PLAIN PERMITS SECTION

JR:JS-1.081/rg

CONVERSATION RECORD

TIME:

DATE: 18 MAY 88

TYPE: ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE ☐ INCOMING ☒ OUTGOING

Location of Visit/Conference:

ROUTING NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Bob Schuelzky

ORGANIZATION (Office, dept., bureau, etc.): Iowa DNR, Field Office #5

TELEPHONE NO: (515) 281-8931

SUBJECT: West Des Moines - Des Moines LFP. Levee alignment along former city dump at Lincoln and Railroad Avenues

SUMMARY:

1. I called Bob Schuelzky of Iowa DNR, Field Office #5 and asked if there was a history of what was buried at the subject dump site and if there were other dump sites in the area which we should be concerned about. Bob said he would talk to his boss, Jack Clemens, who was familiar with the area & call me back tomorrow.

2. 19 MAY 88. Bob Schuelzky called in the morning. He said the dump site at Lincoln and Railroad Avenues was used for normal domestic waste and was not on the list for uncontrolled sites. Thus hazardous waste was not a concern. When this site is opened up his department should be notified and excavated material should be disposed of in a sanitary land fill. He also said the Pen Dixie (sp?) cement company had disposed of fly ash in the area. If we stopped by the cement company's office they could probably tell us where the fly ash was buried at.

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
Bob Vanderjack	R.C. Vanderjack	20 MAY 88

ACTION TAKEN

SIGNATURE	TITLE	DATE
	F-5	

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

May 31, 1988

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division - Mr. Dudley Hansen, Chief
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

RE: Reevaluation of Proposed Plans for West Des Moines - Des Moines Flood Protection Project

Dear Mr. Hansen:

The Iowa Department of Natural Resources has reviewed your May 20, 1988 letter in regards to Rock Island Corps of Engineers reevaluation of the Proposed Plans for West Des Moines - Des Moines Local Flood Protection Project.

This agency has no objection to the proposed barrow sites or design of this facility as outlined.

Thank you for the opportunity to review this proposed project.

Sincerely,

LARRY WILSON, DIRECTOR
DEPARTMENT OF NATURAL RESOURCES

LW/mjt/M152MJT.3

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

Dudley M. Hanson
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

7 June 1988

Dear Mr. Hanson:

Thank you for inviting our comments on the West Des Moines - Des Moines Local Flood Protection project.

I have searched maps and computer records of the project area and consulted with other Bureau staff members. At this time, the Iowa Natural Areas inventory data base contains no records of protected species or significant natural features in the project area.

Please note that the lack of records from the project area does not mean that rare species or natural communities are absent from the area. Our data are not the result of thorough field surveys and should not be considered a substitute for on-site inspection.

If you have any questions about this letter cr if you require further information, please contact me.

Sincerely,

John Fleckenstein

John Fleckenstein
Data Manager
Natural Areas Inventory

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

June 10, 1988

Mr. Dudley M. Hanson
Chief, Planning Division
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Hanson:

RE: West Des Moines-Des Moines Local Flood Protection Project

I am in receipt of your May 20, 1988, letter requesting our comments for a reevaluation of the project referenced above.

Our review of your letter and enclosures suggest that the referenced project has changed little from that described in the June, 1977 Final Environmental Impact Statement (FEIS). In addition, given the limited information at hand, we believe that the new location for the borrow area is more acceptable environmentally than the site identified in the FEIS.

Based on the above, we have no specific comments to offer. We support your decision to prepare additional environmental documentation for this project in view of the fact that the FEIS is 10 years old. In this regard, we are pleased to learn that Mr. Bob Vanderjack of your staff will visit the project site with a representative of the U.S. Fish and Wildlife Service during the week of June 12 after which a decision will be made as to the need for a supplemental EIS versus an environmental assessment.

Please advise us of the outcome of this trip and your subsequent decision. We look forward to being involved in the continued planning of this project.

Sincerely yours,

Lawrence M. Cavin

Lawrence M. Cavin
Chief, Environmental Review and
Coordination Section

State Historical Society of Iowa

The Historical Division of the Department of Cultural Affairs

July 14, 1988

Mr. Dudley M. Hanson, P.E.
Chief, Planning Division
U.S. District Army Engineer District
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

RE: COE - POLK COUNTY - LEVEE ALIGNMENT - WEST DES MOINES AND DES MOINES LOCAL FLOOD PROJECT - NO EFFECT ON JORDAN HOUSE

Dear Mr. Hanson:

We have reviewed the survey report submitted to our office concerning the above referenced project and make the following recommendations.

We concur that the levee alignment project will have No Effect upon the Jordan House, a property listed in the National Register of Historic Places. We look forward to reviewing the results of the archeological survey for the proposed borrow pit and ponding area.

Should you have any questions or if the Bureau can be of further assistance to you, please contact Review & Compliance Program at 515-281-8743.

Sincerely,

Kay Simpson

Kay Simpson
Review and Compliance Program
Bureau of Historic Preservation

☐ 402 Iowa Avenue
Iowa City, Iowa 52240
(319) 335-3916

☑ Capitol Complex
Des Moines, Iowa 50319
(515) 281-5111

☐ Montauk
Box 372
Clermont, Iowa 52135
(319) 423-7173

CITY OF DES MOINES

OFFICE OF THE CITY MANAGER
CITY HALL
EAST FIRST AND LOCUST
DES MOINES, IOWA 50307
(515) 283-4141

ALL-AMERICA CITY 1949,1976,1981

September 6, 1988

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

This letter reaffirms the City of Des Moines' continued support of a Federal flood control project for the Cities of Des Moines and West Des Moines as authorized by Public Law 99-662 in November, 1986. We request the Corps of Engineers to complete the ongoing reevaluation study phase of this project and to continue with the General Design Memorandum.

The City of Des Moines would be willing to financially participate in construction of a project consistent with current cost-sharing policies. We further understand that, during the reevaluation study, the City will be furnished a more-detailed and firm cost estimate for review and further consideration. The City of Des Moines reserves the right of final review and consent prior to initiation of construction of the project.

Sincerely,

Cy Carney
City Manager

CC:MMK:bh

CITY OF WEST DES MOINES

"CROSSROADS OF THE INTERSTATES

318 FIFTH STREET ■ WEST DES MOINES IOWA 50265 ■ 515-223 3241

September 19, 1988

District Engineer
Rock Island District
U. S. Army Corps of Engineers
Attn: Bob Vanderjack, Planning Division
Clock Tower Building
P. O. Box 2004
Rock Island, IL 61204-2004

Re: Recreational Improvements Along the Raccoon River
Walnut Creek Flood Control Levee

Dear Mr. Vanderjack:

At their September 12, 1988 City Council Meeting, the West Des Moines City Council approved the concept of cost sharing 50%-50% with the Federal Government the following recreational improvements for the above project:

A. A paved bicycle path running approximately from 63rd Street to Fuller Road. From Fuller Road to Fifth Street it is expected that the trail will be on top of the proposed levee. From Fifth Street to 63rd Street, the City requests that two alternatives be studied in greater detail:

   1) Running south of Railroad Avenue in the vicinity of the Railroad R.O.W. (off the levee)

   2) Running along the top of the levee to a point west of 63rd Street then bending south leaving the levee, going under the existing Raccoon River bridge, and linking into the proposed boat ramp area in Des Moines.

No matter which of the above alternatives is selected, the bike trail linkage along the levee in West Des Moines is critical to the success of a western link for the Metropolitan Des Moines Bike Trail System. With the commitment of Des Moines to extend their trail east from 63rd Street to the Waterworks Bike Trail, the proposed bike trail along Jordan Creek in West Des Moines, and the potential bike trail along the Railroad

MAYOR
GEORGE M MILLS

CITY COUNCIL
JAMES F BOTTENFIELD ■ JAMES B FLEMING ■ JOHN J McGINN ■ JERRY D PROUDFIT ■ K E WESTERBECK

R.O.W. from West Des Moines to Waukee, a major east-west trail can be envisioned.

The potential trail not only would provide 50 miles (from downtown Des Moines to Yale) of primarily off-road bicycle trail, it would also link the western part of the Des Moines Metropolitan area to the existing Saylorville Bicycle Trail and other proposed trails running south and east out of Des Moines. In addition, the trail would provide direct access to the proposed Raccoon River Sports Complex, a major destination point.

The bike trail segment along the proposed flood control levee is a critical link in the Metropolitan Trail System. Also, because ofthe access it provides to the Raccoon River Sports Complex proposed in West Des Moines, the City intends to finance its 50% share of the above trail segment.

The City of West Des Moines looks forward to the completion of the entire flood control levee project, and emphasizes its strong commitment to all aspects of the project, including the recreational elements.

Sincerely,

George M. Mills, Mayor

cc. Mike Wille, Interim City Manager
Lon Hawbaker, Director of Public Services
Sonya Root, Director of Parks and Recreation
Gary Scott, Associate Planner/Landscape Architect

CITY OF WEST DES MOINES

CROSSROADS OF THE INTERSTATES

318 FIFTH STREET ■ WEST DES MOINES IOWA 50265 ■ 515 223 3241

October 3, 1988

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart,

This letter reaffirms the City of West Des Moines' continued support of a Federal flood control project for the Cities of West Des Moines and Des Moines as authorized by Public Law 99-662 in November 1986. We request the Corps of Engineers to complete the ongoing reevaluation study phase of this project and to continue with the General Design Memorandum.

The City of West Des Moines would be willing to financially participate in construction of a project consistent with current cost-sharing policies. We further understand that, during the reevaluation study, the City will be furnished a more-detailed and firm cost estimate for review and consideration. The City of West Des Moines reserves the right to final review and consent prior to initiation of construction of the project.

By authority of the West Des Moines City Council September 26, 1988.

Sincerely,

George M. Mills, Mayor
City of West Des Moines

GMM/vn

cc: Michael Wille, Interim City Manager
Lonnie Hawbaker, Director Public Services/City Engineer

MAYOR
GEORGE M MILLS

CITY COUNCIL
JAMES F BOTTENFIELD ■ GARY C DAVIDSON ■ JAMES B FLEMING ■ JOHN J McGINN ■ JERRY D PROUDFI

State Historical Society of Iowa

The Historical Division of the Department of Cultural Affairs

October 21, 1988

Dudley M. Hanson, P.E.
Chief, Planning Division
Rock Island District Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: COE - POLK COUNTY - WEST DES MOINES, IOWA - PROPOSED BORROW AND PONDING SITES IN WEST DES MOINES LEVEE PROJECT

Dear Mr. Hanson:

Based on the information you provided, we find that there are no historic properties which might be affected by the proposed undertaking. Therefore, we recommend project approval.

However, if the proposed project work uncovers an item or items which might be of archeological, historical or architectural interest, or if important new archeological, historical or architectural data come to light in the project area, you should make reasonable efforts to avoid or minimize harm to the property until the significance of the discovery can be determined.

Should you have any questions or if the office can be of further assistance to you, please contact Review & Compliance program at 515-281-8743.

Sincerely,

Kay Simpson

Kay Simpson
Review & Compliance Program
Bureau of Historic Preservation

/mtm

cc: David G. Stanley, Bear Creek Archeology, Inc.

December 21, 1988

Chief of Engineers
Corps of Engineer
Rock Island District
Clock Tower Building
Rock Island IL 61204

RE: Flood Protection Area/Raccoon River, Walnut Creek, Jordan Creek, Des Moines and West Des Moines, Iowa

Dear Sir:

This is a follow-up on the Clive, Windsor Heights, West Des Moines, and Des Moines flood plain project ("Project"). Enclosed is a copy of a letter from me to Des Moines city manager, Mr. Cy Carney. I have before me a letter from Congressman Neal Smith, dated April 6, 1987, stating that on March 25, 1988, the House Appropriations Committee approved, in the fiscal year 1987 Supplemental Appropriation Bill, $75,000.00 for the Corps of Engineers to initiate pre-construction engineering and design for the Project in fiscal year 1987. I am looking for additional funding in the fiscal year 1988 appropriations bill.

As of yet, I have not seen or heard of the intended use of the 1987 appropriation. May I have a copy of the plan for the use of the same?

Who is the watchdog on the Raccoon River banks in our Des Moines flood plain area, on which my home is located? The erosion area is in the Water Works Park area, so it's the Water Works' land that is being washed away, which I have marked on the enclosed map on pages 4 and 5 in red. Over the last eight years over thirty to thirty-five feet of land has been lost due to erosion.

There is a roadway on the south side of the tracks from Sixty-third Street which can be used to dump old concrete and rocks to stop the erosion of the riverbanks. That must be done before the railroad track that serves as a levee for our flood plain area now is washed away. There should be a lot of concrete and rocks on the recently widened Sixty-third Street, and that is a short haul. What department is responsible for this? Is it the city engineer?

How is the Raccoon River levee going to cross from north to south over the old Rock Island railroad track, AT&T cable and the T.V. cable,

connect with the land bought from Mr. Ferrari, and then continue on east? Have the trains stopped running on this track or is there a new plan now (see the map)?

Who are the responsible parties for the control of erosion on Walnut Creek and the clearing of that creek's channel in the Des Moines area? Specifically, I am concerned about the portion of Walnut Creek which runs just north of the Grand Avenue bridge and railroad bridge on the east side of Sixty-third Street, then south and east under the new North Valley Drive bridge, then on southeast through the Denman Woods area until it runs into the Raccoon River at the twin bridges. What department? Or is is under the city engineer?

What construction or improvements are scheduled for the Project in 1989? Does Representative Neal Smith have anything planned or in the works on this Project in the House of Representatives for 1989?

Your serious consideration of this letter, along with a response to me setting forth your position on the same is greatly appreciated.

Yours very truly,

Norman J. Woolley
5904 Winona
Des Moines, Iowa 50312
279-0760

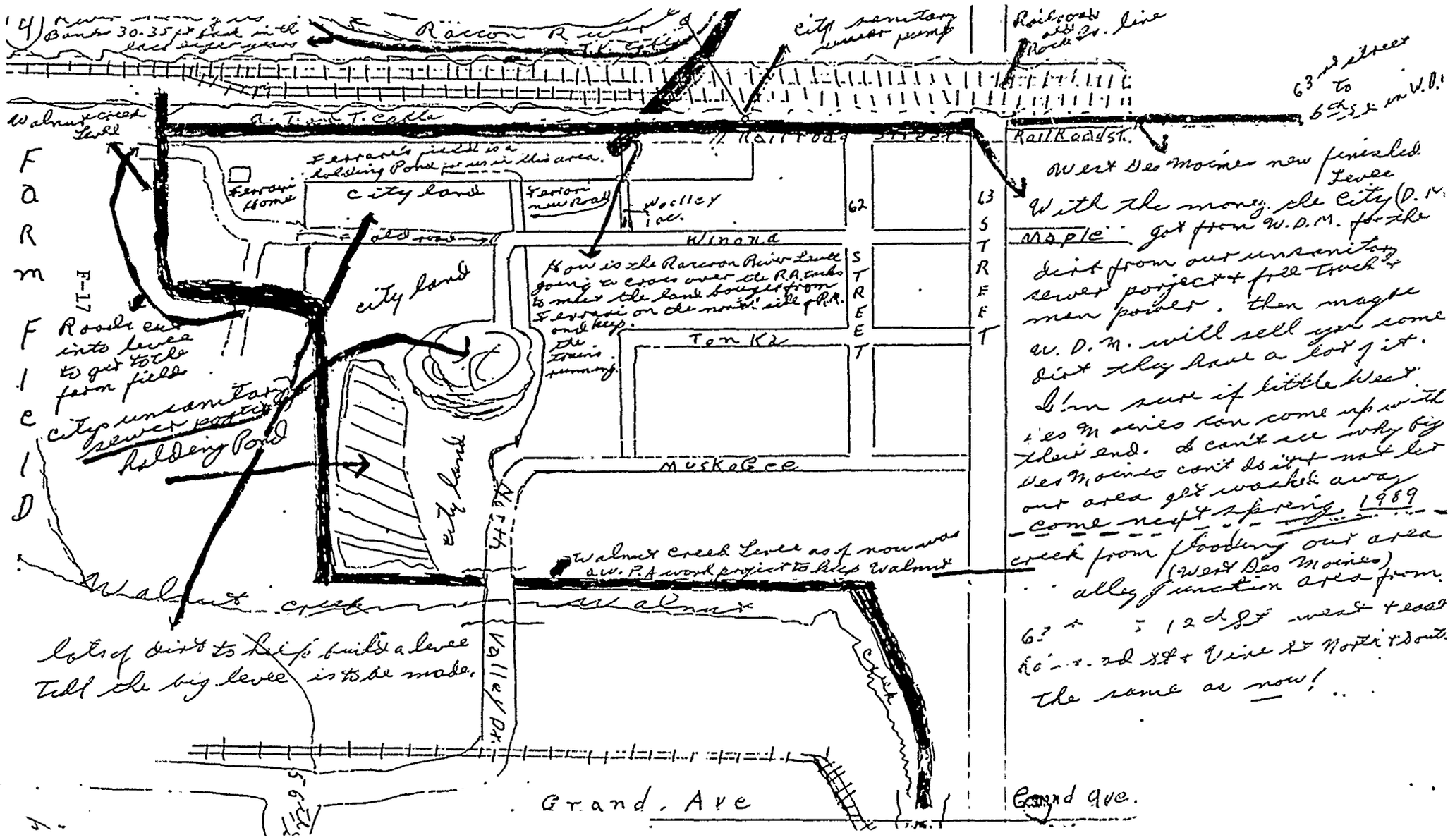
cc: Mr. Rick Jorgensen
City Councilman, Third Ward
Des Moines City Hall
East First Street & Locust
Des Moines IA 50307

Mr. Harold E. Smith
Office of City Engineers
Des Moines City Hall
East First Street & Locust
Des Moines IA 50307

Honorable Neal Smith
U.S. House of Representative
554 Insurance Exchange Bldg
Des Moines IA 50307

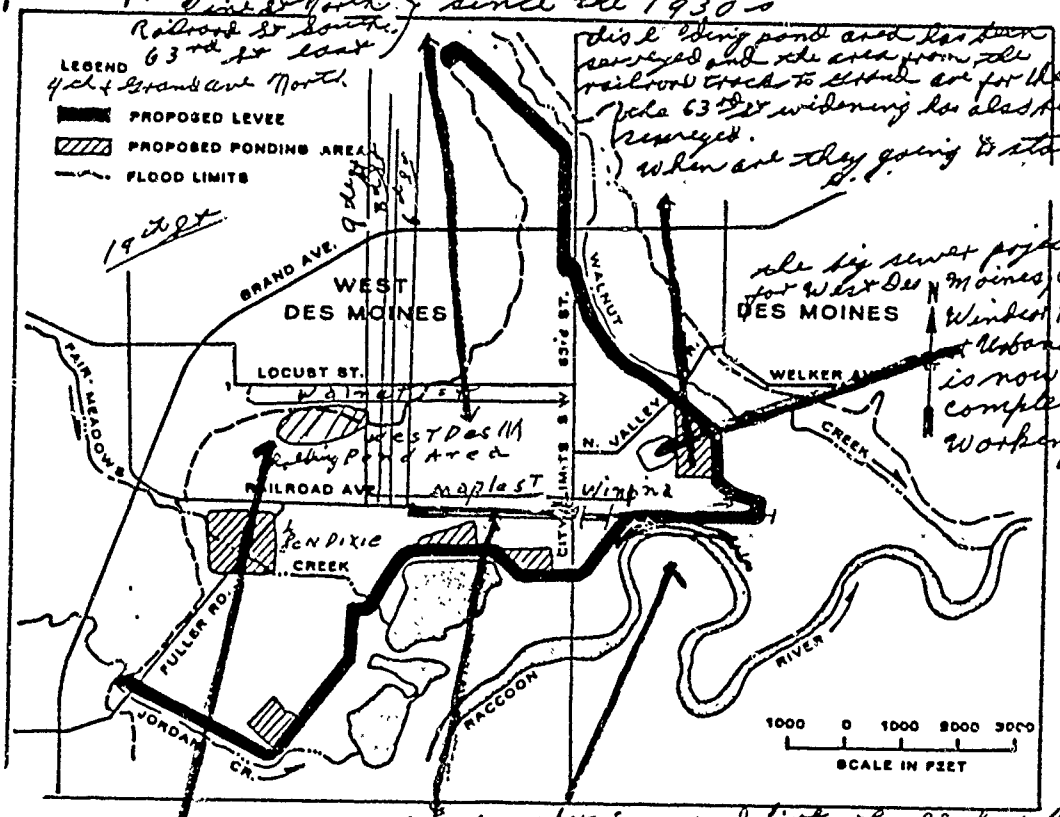
Mr Cy Irvine
City Manager
Des Moines City Hall
East First Street & Locust
Des Moines, Iowa 50307

F-16


Raccoon River
city sanitary sewer pump
Railroad mile 21. line
Rock
63rd Street to 6th St. in W.D.
Walnut creek Levee
A. T. & T. Cable
Railroad St.
Railroad Street
Ferrari's mill is a holding Pond for us in this area.
Ferrari Home
city land
Ferrari new Rail
Woolley 1 ac.
62
63
Winona
old road
How is the Raccoon River Levee going to cross over the R.R. tracks to make the land bought from Ferrari on the north side of R.R. one keep.
The trains running.
STREET
Ten Ac
city land
F-17
Roads cut into levee to get to the farm fields
city unsanitary sewer water holding Pond
Muskegee
city land
Walnut creek Levee as of now as a W.P.A. work project to keep Walnut
Walnut creek
lots of dirt to help build a levee till the big levee is to be made.
Valley Dr.
Grand Ave
Grand Ave.
FARM FIELD
Maple
West Des Moines new finished Levee
With the money the city (D. M.
got from W.D.M. for the
dirt from our unsanitary
sewer project + free truck +
man power. then maybe
W. D. M. will sell you some
dirt they have a lot of it.
I'm sure if little West
Des Moines can come up with
their end. I can't see why Big
Des Moines can't do it + not let
our area get washed away
come next spring 1989
creek from flooding our area
(West Des Moines)
alley junction area from
6th + 5 12th St west + east
6th + 5th St + Vine St North + South
the same as now!

(5) U.S. Army Corp Engineers - Des Moines R. Basin, 1975 flood control

West Des Moines sanitary sewer system for flash storm and run off from the parking areas are not adequate to take care of run off (9th St. West) these sanitary sewers are old (since the 1930's)



this ponding pond area has been surveyed and the area from the railroad track to Grand ave for the 63rd St widening has also been surveyed. When are they going to start?

the big sewer project for West Des Moines, Clive, Windsor Heights & Urbandale is now complete & working.

West Des Moines has put in a dead line Levee this fall 1988 they have put in a ponding area just south Walnut St. West of 63rd in the Kallyday Park area

The selected plan involves about 5 miles of new and improved levees and 600 feet of concrete floodwall to provide standard project flood protection, which reduces damage by 100 percent in the protected area. The average height of protection would be 14 feet with a maximum of 24 feet. Eight closure structures are planned across three streets and five railroad tracks. Three stormwater pumping stations, 3 ponding areas, and 12 gravity outlets are planned. A flood warning system is also recommended. The proposed plan will provide protection of 927 acres, including 922 residential, 143 commercial, 22 industrial, and 14 public structures. The plan includes bicycle paths, a boat ramp, fishing piers, and a small park. The proposed project will require about 142 acres for rights-of-way and ponding areas and 44 acres for borrow area. Relocations include sanitary sewer, waterline, powerline, and telephone line modifications.

This part of the Plan we do not need at all.

500 Conductible (6-7-?-? 1975 flood)

Who is the watch dog on the Raccoon River banks in our Des Moines flood Plain area back of our Home. The erosion area is in the Water Works Park area, so it's the Water Works land that is been washed away which I have marked on the aerial map in red. Over the last eight years lost in land has been over 30-35 feet due to erosion there a roadway on the south side of the track from 63rd to get to this area and dump old concrete & rock to stop this erosion of the river banks. There should be a lot of concrete & rocks when they widen 63rd Street & have a short haul.

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:
Planning Division (1105-2-10)

January 17, 1989

Mr. Norman J. Woolley
5904 Winona
Des Moines, Iowa 50312

Dear Mr. Woolley:

Thank you for your letter dated December 21, 1988, and your interest in the proposed West Des Moines/ Des Moines flood control project. Your concerns are addressed below.

The funds that were appropriated in September 1987 are being used for a General Reevaluation Report (GRR), which is the first report of the post-authorization planning and engineering studies required prior to construction. The main purposes of the GRR are to reaffirm the economic feasibility of the project and to modify the flood control alignment to accommodate new developments and findings such as the buried cables you mention. Additional funds have been received for 1989 to complete the GRR phase and initiate work on the General Design Memorandum (a more detailed design of the structural facilities of the project). No construction of the project is scheduled until approximately 1992.

We are planning to distribute a draft of the General Reevaluation Report in the near future for public review and comment. We have added your name to the mailing list to receive a copy of the report.

You will see in the report that the proposed levee alignment will still cross the Chicago and Northwestern Railroad (C&NW. RR.) tracks as your map shows. A mechanically operated swinging gate will be installed at the RR. crossing which will be closed when a flood is expected. The buried cables will be relocated.

The two erosion areas you are concerned about should be brought to the attention of the Des Moines City Engineer. The Corps of Engineers can only provide streambank protection measures to non-profit public services and facilities. If the erosion along Walnut Creek starts to affect the highway (63rd St.) or the

bridges, then the Corps may become involved at the official request of the city. We cannot become involved in protecting the area along the Raccoon River adjacent the the C&NW Railroad, however, because this railroad is not considered to be a non-profit public service.

If you have any further questions about the flood control project, please call or write to the study manager, Mr. Mark Schroeder, of our General Investigations and Special Studies Branch at 309/788-6361, Ext. 297. The GRR, which you can expect sometime in February, also should provide additional answers.

Sincerely,

ORIGINAL SIGNED BY

for Bruce

Dudley M. Hanson, P.E.
Chief, Planning Division

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:

March 24, 1989

Planning Division

Mr. Harold Smith
Director of Public Works
City of Des Moines
Des Moines City Hall
Des Moines, Iowa 50309

Dear Mr. Smith:

We have enclosed 25 copies of the report entitled Draft General Reevaluation Report for Flood Control Project, Raccoon River and Walnut Creek, West Des Moines - Des Moines, Iowa, With Draft Supplement No. 1 to the Final Environmental Impact Statement. Per your telephone conversation with Mr. Mark Schroeder of our General Investigations and Special Studies Branch, these copies are provided directly to you for distribution to the West Des Moines Mayor, city council, and appropriate staff members.

Agency representatives, city officials, affected property owners, and concerned citizens are asked to comment on the plan recommended by the draft report. A 45-day review period for the Draft General Reevaluation Report starts on the date of this letter or the date the filing notice appears in the Federal Register, whichever is later. Correspondence should be addressed:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (Mr. Mark Schroeder)
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Your comments will be taken into consideration prior to completion of the Final General Reevaluation Report, which is scheduled for September 1989. A General Design Memorandum will then be prepared, followed by the preparation of plans and specifications. Construction could begin in the spring of 1992, depending upon the availability of funds.

Before the Final General Reevaluation Report can be submitted to our higher authority for approval, we must receive from the city another Letter of Assurance (LOA) in June 1989. A draft LOA is enclosed for your use. This LOA will then be included in the Final General Reevaluation Report at the time of submittal.

Copies of the enclosed report are being sent to addresses on the distribution list located in the back of the report. Additional copies may be obtained by writing to the above address or by calling Mr. Schroeder at 309/788-6361, Ext. 297.

Sincerely,

ORIGINAL SIGNED BY

For Soyke

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosures

D R A F T

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District,
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

The City of Des Moines has reviewed the draft of the proposed Local Cooperation Agreement covering a local flood protection project on the Raccoon River and Walnut Creek in Des Moines and West Des Moines, Iowa. The Agreement includes the following obligations to be carried out by the City:

a. Provide, without cost to the Government, during the period of construction, all lands, easements, rights-of-way, and dredged material disposal areas, and perform all relocations and alteration of buildings, utilities, highways, railroads, bridges (except railroad bridges), sewers, and related and special facilities determined by the Government to be necessary for construction of the project.

b. Make a cash payment of not less than 5 percent of total project costs during the period of construction, regardless of the value of the items in a. above. If the value of the items in a. above is less than 20 percent of total project costs, the City 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 relocations, to an amount equal to 25 percent of total project costs.

c. Hold and save the Government free from all damages arising from the construction, operation, and maintenance of the project, except for damages due to the fault or negligence of the Government or its contractors.

d. Operate, maintain, replace, and rehabilitate the project or functional element thereof upon completion in accordance with regulations or directions prescribed by the Government.

e. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, 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.

f. 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, as well as Army Regulation 600-7, entitled "Non-Discrimination on the Basis of Handicap and Programs and Activities Assisted or Conducted by the Department of the Army."

g. Participate in and comply with applicable Federal flood plain management and flood insurance programs.

h. Prevent encroachment on any of the flood protection structures, including ponding areas, and if ponding areas are impaired, provide substitute storage capacity or equivalent pumping capacity promptly without cost to the United States.

i. At least annually notify persons in the affected area that the project will not provide complete protection.

j. Prior to construction, and in accordance with the provisions of Section 221 of Public Law 91-611, the City will enter into a contract with the Government whereby the City will grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the City owns or controls for access to the project for the purpose of inspection, and, if necessary, for the

purpose of completing, operating, repairing, maintaining, replacing or rehabilitating the project. If an inspection shows that the City for any reason is failing to fulfill its obligations under the Agreement without receiving prior written approval from the Government, the Government will send a written notice to the City. If the City persists in such failure for 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 lands the City owns or controls for access to the project for the purpose of completing, operating, repairing, maintaining, replacing, or rehabilitating the project. No completion, operation, repair, maintenance, replacement, or rehabilitation by the Government shall operate to relieve the City 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 is willing and able to pay its share of the total project costs. Sufficient funds are on hand or can be raised quickly, and the cash payment can be deposited directly with the Government, or in an escrow account, upon demand by the Government.

This is to advise that if the General Reevaluation Report and the Design Memorandum are approved substantially in the form as reviewed by the City and as submitted for approval by the Corps of Engineers' higher authority, the City is willing, and legally and financially able, to sign the referenced Local Cooperation Agreement which includes the obligations set forth above.

It is understood that the City of Des Moines will be a co-sponsor of this project with the City of West Des Moines. It is also understood that the City of Des Moines will furnish only those obligations listed above which fall within the boundaries of or apply to the City

of Des Moines unless the City of West Des Moines defaults on its share of responsibilities for the project, in which case the City of Des Moines will, under the terms of a local cooperation agreement, assume the obligations of the City of West Des Moines.

Sincerely,

(Mayor of Des Moines, Iowa)

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:

March 24, 1989

Planning Division

Mr. George Hollins
Director of Public Services
City of West Des Moines
1514 Fuller Road
West Des Moines, Iowa 50265

Dear Mr. Hollins:

We have enclosed 10 copies of the report entitled Draft General Reevaluation Report for Flood Control Project, Raccoon River and Walnut Creek, West Des Moines - Des Moines, Iowa, With Draft Supplement No. 1 to the Final Environmental Impact Statement. Per your telephone conversation with Mr. Mark Schroeder of our General Investigations and Special Studies Branch, these copies are provided directly to you for distribution to the West Des Moines Mayor, city council, and appropriate staff members.

Agency representatives, city officials, affected property owners, and concerned citizens are asked to comment on the plan recommended by the draft report. A 45-day review period for the Draft General Reevaluation Report starts on the date of this letter or the date the filing notice appears in the Federal Register, whichever is later. Correspondence should be addressed:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (Mr. Mark Schroeder)
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Your comments will be taken into consideration prior to completion of the Final General Reevaluation Report, which is scheduled for September 1989. A General Design Memorandum will then be prepared, followed by the preparation of plans and specifications. Construction could begin in the spring of 1992, depending upon the availability of funds.

Before the Final General Reevaluation Report can be submitted to our higher authority for approval, we must receive from the city another Letter of Assurance (LOA) in June 1989. A draft LOA is enclosed for your use. This LOA will then be included in the Final General Reevaluation Report at the time of submittal.

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Sincerely,

ORIGINAL SIGNED BY
Soyke
FOR Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosures

D R A F T

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District,
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

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b. Make a cash payment of not less than 5 percent of total project costs during the period of construction, regardless of the value of the items in a. above. If the value of the items in a. above is less than 20 percent of total project costs, the City 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 relocations, to an amount equal to 25 percent of total project costs.

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purpose of completing, operating, repairing, maintaining, replacing or rehabilitating the project. If an inspection shows that the City for any reason is failing to fulfill its obligations under the Agreement without receiving prior written approval from the Government, the Government will send a written notice to the City. If the City persists in such failure for 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 lands the City owns or controls for access to the project for the purpose of completing, operating, repairing, maintaining, replacing, or rehabilitating the project. No completion, operation, repair, maintenance, replacement, or rehabilitation by the Government shall operate to relieve the City 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.

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This is to advise that if the General Reevaluation Report and the General Design Memorandum are approved substantially as reviewed by the City and as submitted for approval by the Corps of Engineers' higher authority, the City is willing, and legally and financially able, to sign the referenced Local Cooperation Agreement which includes the obligations set forth above.

It is understood that the City of West Des Moines will be a co-sponsor of this project with the City of Des Moines. It is also understood that the City of West Des Moines will furnish only those obligations listed above which fall within the boundaries of or apply

to the City of West Des Moines unless the City of Des Moines defaults on its share of responsibilities for the project, in which case the City of West Des Moines will, under the terms of a local cooperation agreement, assume the obligations of the City of Des Moines.

Sincerely,

(Mayor of West Des Moines, Iowa)

State Historical Society of Iowa

The Historical Division of the Department of Cultural Affairs

April 4, 1989

Mr. Dudley M. Hanson, P.E.
Chief, Planning Division
Rock Island District Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

RE: COE - POLK COUNTY - DRAFT GENERAL REEVALUATION REPORT FOR FLOOD CONTROL PROJECT - RACCOON RIVER AND WALNUT CREEK, WEST DES MOINES-DES MOINES, IOWA.

Dear Mr. Hanson:

We have reviewed the draft Report/EIS prepared for the above referenced project. The document adequately incorporates prior consultation with our Bureau in regard to impacts on historic resources.

If the Bureau may be of further assistance, please do not hesitate to contact me at (515) 281-8744.

Sincerely,

Kay Simpson

Kay Simpson
Archeologist, Review and Compliance Program
Bureau of Historic Preservation

☐ 402 Iowa Avenue
Iowa City, Iowa 52240
(319) 335-3916

☑ Capitol Complex
Des Moines, Iowa 50319
(515) 281-5111

☐ Montauk
Box 372
Clermont, Iowa 52135
(319) 423-7173

United States Department of Agriculture | Forest Service | Eastern Region | 310 W. Wisconsin Ave. Milwaukee, WI 53203

Caring for the Land and Serving People

Reply to: 7150

Date: APR 07 1989

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

Attn: Planning Division
Mr. Mark Schroeder

Dear Mr. Schroeder:

The Flood Control Project providing protection from the Raccoon River and Walnut Creek does not affect National Forest land. We have no comment on the Draft General reevaluation report.

for Thomas A. George
DICK HATHAWAY
Director of Engineering

cc:

Dooley

McKINNEY LAW OFFICES
480 SIXTH STREET
P.O. BOX 209
WAUKEE, IOWA 50263-0209

WAYNE H. McKINNEY JR.
ROBERT E. McKINNEY
JAMES V. McKINNEY

(515) 987-4578

April 27, 1989

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (Mr. Mark Schroeder)
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: Flood Control Project - Raccoon River and Walnut Creek - West Des Moines/Des Moines, Iowa.

Draft - General Reevaluation Report - With Draft Supplement No. 1 to the Final ENvironmental Impact Statement - US Army Corps of Engineers - Rock Island District - March 1989

Dear Mr. Schroeder:

Our firm is legal counsel for Val Lanes, Inc., 100 Ashworth Road, West Des Moines, Iowa. At our clients request I have examined the General Reevaluation Report, as identified above, with respect to the impact the flood control project slated for the year 1992, would have on the property on which Val Lanes is located. Val Lanes is a bowling recreational establishment having been in business since 1957 at its present location.

After initially reviewing the Report, my clients and myself met with Mr. Russ Soper of the West Des Moines Public Works Department in an attempt to get a clearer understanding of the project with respect to its proximity to Val Lanes. Mr. Soper, as well as the Report itself, suggests that any concerns should be presented directly to you.

My client has several concerns and I would like to address each one separately.

Enclosed please find a copy of Plate 5 as taken from the Report. The area marked in yellow represents the property on which Val Lanes is located. Also enclosed is a copy of a plat showing an enlargement of the yellowed area in Plate 5 and for purposes of

this letter is identified as Exhibit 1. You will find on Exhibit 1 a green colored area. This represents the present location of the primary public entrance to Val Lanes. With respect to this entrance, my clients concern is the effect the levee will have on this entrance. Will the levee encroach upon the entrance? Will the entrance need to be relocated because of the levee? If relocation is necessary will the project sponsors assume the cost of constructing a new entrance?

On Exhibit 1 you will note that the property on which Val Lanes is located, as well as its parking lot abuts Ashworth Road to the North and 63rd Street to the East. Because of this my client needs to know exactly the most Westerly point the levee would extend. With this knowledge Val Lanes could then determine whether or not the levee would encroach upon their parking lot. From Plate 5 it appears that the levee will run in a diagonal direction in front of Val Lanes.

Plate 5 also shows a stormwater pumping station to be located on or near the Southeast corner of the property. My client would like to know the exact proposed location of the pump station. Plate 13 shows a pump station profile but does not indicate the dimensions. We would like to know how large of an area the station would occupy.

Plate 5 also shows the locations of the concrete floodwalls. We would like to know the exact distance of the concrete wall as it extends North of Grand Avenue. Will it extend onto Val Lanes property? It appears that most of the levee infront of Val Lanes will be constructed of earth as opposed to concrete. To achieve an aesthetically more appealing view of the levee we would request that all of that portion of the levee as it runs East of my clients property to be of earth and not concrete. We would request therefore that the concrete wall run North of Grand Avenue to the most Southern point of my clients property, then a earthen levee from that point to Ashworth Road.

Finally, please advise me as to the exact height of that portion of the levee which will run along the East line of my clients property. Will there be an unobstructed view from 63rd Street to Val Lanes?

As well as a copy of Plate 5 and Exhibit 1 being enclosed, I have also enclosed a extra copy of Exhibit 1. I would ask that on the copy of Exhibit 1 you indicate the Westerly edge of the levee, as it would be located East of Val Lanes, indicate the location of the pumping station, and also indicate the location of the concrete wall and where it will abut the earthen levee, and after doing so return the same to me.

Thank you in advance for your kind attention and consideration to this matter. I look forward to hearing from you in the near

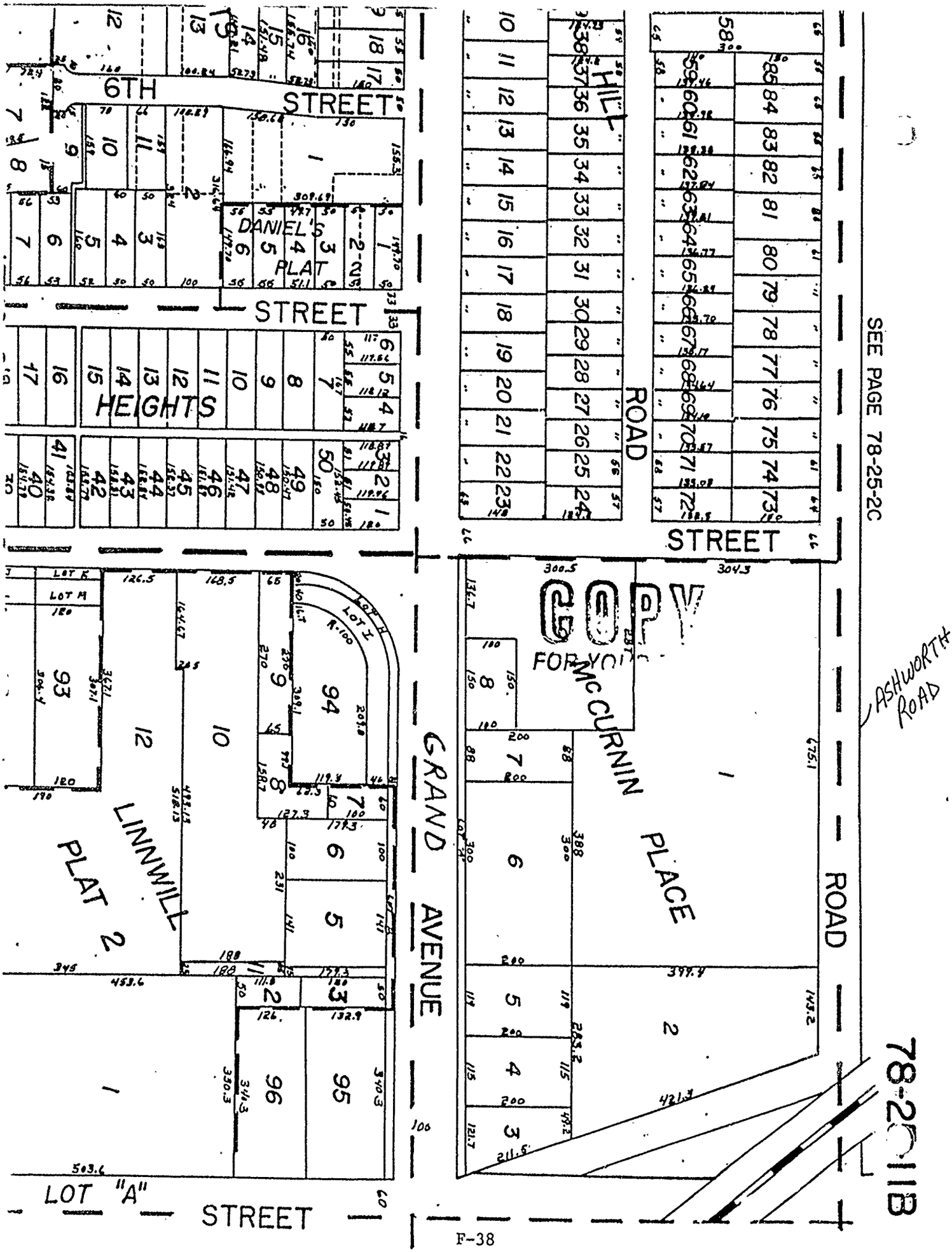
future. Please feel free to call or write should you have any questions concerning this.

Very truly yours,

Robert E. McKinney

Enclosures

Val Lanes
Wayne McKinney
Edward Essy
George Essy
Nellie McCurnnin



F-38

EXHIBIT 1

ENVIRONMENTAL DESIGN GROUP LTD., P.C.
ARCHITECTS • LANDSCAPE ARCHITECTS • PLANNERS
4090 Westown Parkway Suite E West Des Moines, Iowa 50265 (515) 224-4022
Fax (515) 224-9254

May 1, 1989

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (Mr. Mark Schroeder)
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Schroeder:

I represent property owners in the vicinity of 63rd Street and Grand Avenue affected by the Floor Control Project on Walnut Creek. In your re-evaluation report you recognize that the May 1986 flood on the Walnut Creek caused in excess of $13 million in damage to 46 businesses and 220 homes. This was a 40 year event, and you note that had it been a 100 year event, it might have caused $30 million in floor damages. I think it is clear to everyone that more damage is likely in the future because of continued upland development.

It is our feeling that closure of Hoak Drive (Plate 5, attached) up stream from the Grand Avenue properties will exaggerate flooding potential east of Walnut Creek. That closure combined with the Levee construction west of Walnut Creek south to Railroad Avenue would drastically affect the following properties amount others:

1. Pal Joey's
2. IMT Insurance
3. Phillips Service Station
4. McDonald's Restaurant
5. Pizza Hut Restaurant
6. Kentucky Fried Chicken Restaurant
7. A&D Kwik Kar Wash
8. Des Moines Seed and Nursery

By the elimination of these flooding pockets, flood cresting could occur at a more rapid rate in the Grand Avenue area east of Walnut Creek, and a general accentuation of flood will probably occur. If you feel this is <u>not</u> <u>true</u>, please provide data supporting your position.

We would like you to consider a levee around these businesses (Plate 15) and we would like to know the cost so that we might determine the feasibility, whether the Corps of Engineers or Private Owners would contribute to the construction.

Please responde to our concerns at your earliest convenience.

Sincerely,

William J. Ludwig
Architect/Urban Planner

WJL/jkd

Enclosures

Beisser Lumber Co.
1040 Hoak Drive
West Des Moines, IA 50265
May 3, 1989

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division (Mr. Mark Schroeder)
Clock Tower Building-P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Schroeder:

I have received the Draft General Reevaluation Report for the Flood Control Project in West Des Moines, Iowa. I own Beisser Lumber at 1040 Hoak Drive and have two items of concern.

1. First, why does the levee have to go directly on Hoak Drive, thus closing the road? Is it possible to move it farther east by several yards in order to keep Hoak Drive open?

2. Secondly, I am concerned about the access road which shows on plate #5 allowing my business neighbor, Wheeler Consolidated, and me access into our respective properties. We have approximately 100 trucks daily going in and out of our properties. I wonder how this access will handle this traffic volume? We currently have four access gates into our two properties and even find that congestive at times.

In closing, I would like to know if it would be possible if someone from your office might visit our West Des Moines location to discuss these concerns. I can be contacted at 515-225-2350.

Sincerely,

Kim Beisser

Kim Beisser
President, Beisser Lumber

WHEELER LUMBER OPERATIONS
A DIVISION OF WHEELER CONSOLIDATED, INC.

1100 Hoak Drive
P.O. Box 65160
West Des Moines, Iowa 50265
(515)224-1900

May 4, 1989

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (Mr. Mark Schroeder)
Clock Tower Building - P. O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Schroeder:

Having reviewed the Flood Control Project for West Des Moines, it appears that this plan is not acceptable to the operation of Wheeler Consolidated, Inc.

Closing Hoak Drive eliminates any easy access to our property and the levee to the north cuts out a considerable amount of our storage area. It also cuts access to our truss plant which eliminates our being able to transport our products.

Wheeler Consolidated is requesting a meeting with a representative of the Corps of Engineers and the West Des Moines Engineers office. We also feel Beisser Lumber should be included in this meeting.

Please reply with an early date for such a meeting.

Thank you,

Paul J. Sweeney
Sales Manager

PJS/cb

CC: Bill Westerdahl
David Hoak
Beisser Lumber

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

May 5, 1989

Colonel Neil A. Smart, USA
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division (Mr. Mark Schroeder)
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

RE: Review and Comment on The Draft General Reevaluation Report for Flood Control Project and Draft Supplemental Final Environmental Impact Statement, West Des Moines and Des Moines, Iowa

We are in receipt of the Draft General Reevaluation Report and Draft Supplemental Impact Statement (DSEIS) referenced above. In accordance with our responsibilities under Section 309 of the Clean Air Act and the National Environmental Act of 1969 (NEPA), we have reviewed the subject report and have rated the document "LO" (lack of objection). However, we offer the following comments for your consideration.

Please refer to page SEIS-12, PONDING AREAS, Sections 3.19-3.24 and to Plate No. 5. In light of the need to pond (retain) water during highflow periods, you may wish to consider installation of water control devices in ponding areas A and B. These sites would lend themselves well to the establishment of wetland sites with minimal control structure construction. Sites C and D could then remain as deepwater holding ponds. The report states that the 27 acre area A is determined to be a low quality wetland and could be substantially upgraded at low cost. This type of water management would provide storage and retention while providing a unique habitat that could be incorporated into the Des Moines area park system for observation of waterfowl and other aquatic plant and animal species.

With proper management, the area could be utilized to grow waterfowl crops and subsequently flooded and drawndown at proper seasonal intervals to encourage the use of the area by ducks and other water/shore birds. The area could also provide mitigation for the loss of habitat due to project construction. While the mitigation would not be "in kind," the addition of a quality wetland area would offset other losses.

If you have any questions, please write to me or call Mr. Dewayne Knott at (913) 236-2823. Thank you for the opportunity to comment.

Sincerely yours,

Katherine Biggs

for Lawrence M. Cavin
Chief, Environmental Review
and Coordination Section

STAMATELOS, KENYON & McCANDLESS, P.C.
ATTORNEYS AT LAW
930 GRAND AVENUE
WEST DES MOINES, IOWA 50265

DAN STAMATELOS
GREGORY L. KENYON
DEVON HINTZ-MILLER

OF COUNSEL
KIM STAMATELOS McCANDLESS

TELEPHONE 515-223-1631
FAX 515-223-0540

May 8, 1989

Department of the Army
Rock Island District Corp of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

Attn: Dudley M. Hanson, P.E.

Dear Mr. Hanson:

We are writing on behalf of Frank and June Ferrari, who own the property at 5700 Winona, Des Moines, Iowa, which is involved in the Raccoon River and Walnut Creek Flood Control Project.

The map designated as Plat 3 in the Draft General Re-evaluation Plan, shows the Ferrari property inside the proposed line of protection. The aerial map designated as Plat 6 and titled Proposed Recreation and Landscaping Plan (dated October, 1988) seems to indicate that the Ferrari property would be outside the proposed line of protection.

Mr. & Mrs. Ferrari would strenuously object to any proposal which would leave their property (which is their homestead) outside the line of protection.

For your information in locating the property in question, it is located at the east end of Winona Avenue and north of the railroad tracks.

Please let us know what configuration is correct on the protection line.

Respectfully yours,

Dan Stamatelos

Dan Stamatelos

cmm

DES MOINES WATER WORKS
Board of Water Works Trustees

2201 Valley Drive
Des Moines, Iowa 50321-1190
(515) 283-8755

L.D. McMullen, Ph.D., P.E.
Secretary and General Manager

May 8, 1989

Mr. Dudley M. Hanson, P.E.
Dept. of the Army
Rock Island District
Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

SUBJECT: Flood Control Project - Raccoon River & Walnut Creek

Dear Mr. Hanson:

The Des Moines Water Works has reviewed the plans for the above referenced project and it appears we will not be affected by the proposed new levee.

If you have any questions or desire additional information, please let me know.

Sincerely,

Randy R. Beavers, P.E.
Director of Engineering Services
(515)283-8725

RRB/clk

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
230 S. DEARBORN, SUITE 3422
CHICAGO, ILLINOIS 60604

TAKE PRIDE IN AMERICA

ER-89/263

May 9, 1989

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District - Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

The Department of the Interior (Department) has reviewed the Draft General Reevaluation Report for the Flood Control Project on the Raccoon River and Walnut Creek, West Des Moines-Des Moines, Iowa, with Draft Supplement No. 1 to the Final Environmental Impact Statement. The following is provided for your consideration during future project planning.

The Fish and Wildlife Service (Service) Draft Fish and Wildlife Coordination Act Report of October 5, 1988, is incorporated in the document. The Service has no additional comments to offer at this time.

Other Department bureaus also had no comments to offer on the project or project documents at this time. We appreciate the opportunity to review the proposed project and look forward to continued involvement in the future.

Sincerely,

Sheila Minor Huff

Sheila Minor Huff
Regional Environmental Officer

The Stoner McCray System, Inc.

1200 Office Park Road
West Des Moines, Iowa 50265
515/223-1182

Donald J. Hewitt, President

May 12, 1989

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division (Mr. Mark Schroeder)
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sir:

I have just recently been given a copy of the draft of the General Re-evaluation Report for Flood Control Project for the Raccoon River and Walnut Creek, West Des Moines - Des Moines, Iowa, from Mr. Russell S. Soper, P.E. of The West Des Moines City Engineers office.

The Stoner McCray System, Inc., a property owner in the area South of Grand and West of 63rd Street for many years was not included on your distribution list and it was only through Mr. Soper's timely efforts that we were informed of your proposed project.

Our comment concerning this project is that we feel that the plan as proposed will have a devastating effect on our commercial property and cause severe economic damage to tenants in the buildings we own along the West side of 63rd Street South of Grand in West Des Moines, Iowa.

The Stoner McCray System, Inc., shall take every available measure necessary to avoid having the proposed flood wall and levee located on the West side of 63rd Street South of Grand Avenue in West Des Moines, Iowa.

Sincerely,
The Stoner McCray System, Inc.

Donald J. Hewitt

Donald J. Hewitt, President

cc Russell Soper, P.E.
Thomas H. Stoner
David Wetsch, Atty at Law
Geo Mills, Mayor of WDM
The Honorable Neal Smith, Congressman
544 Insurance Exchange Bldg.

CITY OF WEST DES MOINES

"CROSSROADS OF THE INTERSTATES"

318 FIFTH STREET ■ WEST DES MOINES, IOWA 50265 ■ 515 223-3241

May 16, 1989

Colonel Neil A. Smart
District Engineer
U. S. Army Engineer District,
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Re: Draft of Local Cooperation Agreement

Dear Colonel Smart,

The City of West Des Moines has reviewed the draft of the proposed Local Cooperation Agreement covering a local flood protection project on the Raccoon River and Walnut Creek in West Des Moines and Des Moines, Iowa. The Agreement includes the following obligations to be carried out by the City:

a. Provide, without cost to the Government, during period of construction, all lands, easements, rights-of-way, and dredged material disposal areas, and perform all relocations and alteration of buildings, utilities, highways, railroads, bridges (except railroad bridges), sewers, and related and special facilities determined by the Government to be necessary for construction of the project.

b. Make a cash payment of not less than 5 percent of total project costs during the period of construction, regardless of the value of the items in a. above. If the value of the items in a. above is less than 20 percent of total project costs, the City 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 relocations, to an amount equal to 25 percent of total project costs.

c. Hold and save the Government free from all damages arising from the construction, operation, and maintenance of the project, except for damages due to the fault or negligence of the Government or its contractors.

MAYOR
GEORGE M MILLS

CITY COUNCIL
JAMES F BOTTENFIELD ■ JAMES B FLEMING ■ JOHN J. McGINN ■ JERRY D PROUDFIT ■ K E WESTERBECK

d. Operate, maintain, replace, and rehabilitate the project or functional element thereof upon completion in accordance with regulations or directions prescribed by the Government.

e. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, 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.

f. 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, as well as Army Regulation 600-7, entitled "Non-Discrimination on the Basis of Handicap and Programs and Activities Assisted or Conducted by the Department of the Army."

g. Participate in and comply with applicable Federal flood plain management and flood insurance programs.

h. Prevent encroachment on any of the flood protection structures, including ponding areas, and if ponding areas are impaired, provide substitute storage capacity or equivalent pumping capacity promptly without cost to the United States.

i. At least annually notify persons in the affected area that the project will not provide complete protection. Such notice shall be provided by publishing the notice once during the month of April in the Official Notice Section of the WESTERN EXPRESS, a newspaper in the City of West Des Moines whose address is P.O. Box 65640, West Des Moines, Iowa.

j. Prior to construction, and in accordance with the provisions of Section 221 of Public Law 91-611, the City will enter into a contract with the Government whereby the City will grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the City owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, repairing, maintaining, replacing or rehabilitating the project. If an inspection shows that the City for

any reason is failing to fulfill its obligations under the Agreement without receiving prior written approval from the Government, the Government will send a written notice to the City. If the City persists in such failure for 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 lands the City owns or controls for access to the project for the purpose of completing, operating, repairing, maintaining, replacing, or rehabilitating the project. No completion, operation, repair, maintenance, replacement, or rehabilitation by the Government shall operate to relieve the City of West Des Moines of the 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 West Des Moines wishes to amend the Draft Local Cooperation Agreement in the following manner:

1. Article II paragraph h - Add the following sentence:

   Such notice shall be provided by publishing the notice once during the month of April in the Official Notice Section of the Western Express, a newspaper in the City of West Des Moines whose address is P.O. Box 65640, West Des Moines, Iowa.

2. Article VI paragraph b (1), rewrite the paragraph to say:

   ... notify the Cities by December 1 of the prior budget year of the estimated .....

3. Article XVI

   The name of the Mayor of West Des Moines is George M. Mills.

The City is willing and able to pay its share of the total project costs. Sufficient funds are on hand or can be raised quickly, and the cash payment can be deposited directly with the Government, or in an escrow account, upon demand by the Government.

This is to advise that if the General Reevaluation Report and the General Design Memorandum are approved substantially as reviewed by the City and as submitted for approval by the Corps of Engineers higher authority, the City is willing and legally and financially able, to sign the referenced Local Cooperation Agreement which includes the obligations set forth above.

It is understood that the City of West Des Moines will be co-sponsor of this project with the City of Des Moines. It is also understood that the City of West Des Moines will furnish only those obligations listed above which fall within the boundaries of or apply to the City of West Des Moines unless the City of Des Moines defaults on its share of responsibilities for the project, in which case the City of West Des Moines will, under the terms of a local cooperation agreement, assume the obligations of the City of Des Moines.

Sincerely,

George M. Mills

George M. Mills
Mayor of West Des Moines

GMM/RSS/vn

RI-Smart

Long John Silver's, Inc.
A SUBSIDIARY OF JERRICO, INC.

6803 West 64th Street Suite 310 Shawnee Mission, Kansas 66202 (913) 384-5595

GREGORY B. BUSHNELL
REGIONAL PROPERTY MANAGER

May 18, 1989

District Engineer
U. S. Army Engineer District, Rock Island
Attn: Planning Division (Mr. Mark Schroeder)
Clock Tower Building - P. O. Box 2004
Rock Island, IL 61204-2004

Dear Mr. Schroeder,

We are in receipt of your request for public review of the West Des Moines and Des Moines, Iowa, Flood Control Project.

After preliminary review we believe the project has the potential of having a major impact on our business. We have forwarded the report to our legal department for thorough review. We will submit our review comments as soon as possible.

Sincerely,

Gregory B. Bushnell

GB:ks

cc: Mike Johnson
Robert Faucett
Forrest Ragsdale

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

May 22, 1989

REPLY TO ATTENTION OF:
Planning Division (1105-2-10)

Mr. Robert E. McKinney
McKinney Law Offices
480 Sixth Street
P.O. Box 209
Waukee, Iowa 50263-0209

Dear Mr. McKinney:

This letter is in response to your April 27, 1989, letter presenting the concerns of the property owners of Val Lanes, Inc., located at 100 Ashworth Road in West Des Moines, Iowa. Your client is concerned about possible impacts the flood control project proposed for Des Moines and West Des Moines, Iowa, may have on their property.

Answers to your questions follow the approximate order in which they were asked in your letter:

a. With respect to the green colored area (primary public access to Val Lanes) depicted on Exhibit 1 to your letter, the proposed levee will run to the approximate edge of the primary access road. The entrance will not require relocation; however, access could be reduced to one lane traffic during construction.

b. The most westerly point of the proposed levee does not extend any further than the edge of the existing parking lot pavement; therefore, there should be no impact to Val Lane's access or parking facilities.

c. The proposed pump station that is to be located between Grand Avenue and Ashworth Road west of 63rd Street is sized at a 10,000 gallons per minute capacity. This is a relatively small capacity pump station as it will be mainly pumping storm sewer flows during periods of gatewell closure. No primary ponding area will be excavated in this location. Facilities are expected to include a gatewell, a small pump house, and the associated electrical components, all surrounded by a security fence. The fence is expected to encompass approximately a 20-foot by 20-foot area. This facility will be located on-line with the Valhigh storm sewer at its intercept with the levee/floodwall.

d. It does not appear that the concrete floodwall will extend onto Val Lanes property. Using the edge of the pavement on Grand Avenue as a starting point, the concrete floodwall will extend 320 feet north of Grand Avenue where it will tie into the levee. This portion of the protection which parallels your client's property on the east side, will be an earthen levee.

e. The height of the earthen levee along the east property line will be approximately 6 feet; therefore, the view from 63rd Street to Val Lanes will be obstructed.

As requested, the westerly edge of the levee, the pumping station, concrete floodwall, and the earthen levee locations are drawn on Exhibit 1 enclosed with your letter.

I trust this information meets your present needs. If you or your clients have additional questions concerning the study, please call Mr. Mark Schroeder of our General Investigations and Special Studies Branch at 309/788-6361, extension 297, or you may write to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

ORIGINAL SIGNED BY

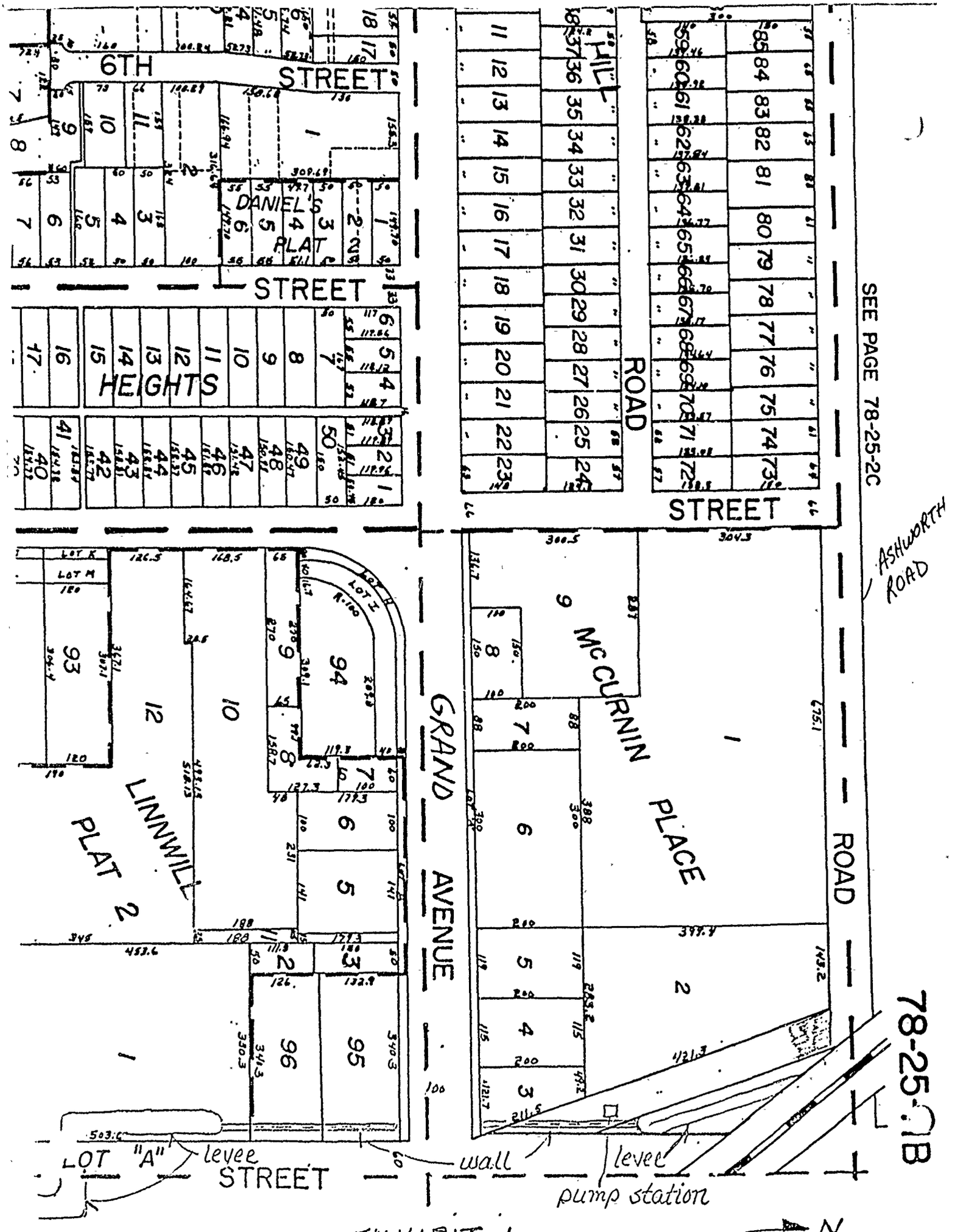
CHARLES R. SMITH

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

Copy Furnished:

Val Lanes, Inc.
100 Ashworth Road
West Des Moines, Iowa 50265



NOTE: Not to scale

EXHIBIT 1

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

May 23, 1989

Colonel Neil Smart
District Engineer
Corps of Engineers, Rock Island District
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

ATTENTION: Planning Division (Mark Shroeder)

Dear Col. Smart:

The Flood Plain Section of the Iowa Department of Natural Resources has reviewed the Draft General Reevaluation Report for the Raccoon River and Walnut Creek with respect to the State's flood plain management policies. The following comments are offered.

Walnut Creek Levee Impacts on Profiles

Table 2 of the Draft GRR shows the projected increases in profiles due to levee construction. These increases range from 0.1 ft. for the 10 year flood to 1.1 ft. for the Standard Project Flood. The Department's flood plain management criteria basically require that where existing high damage potential uses (e.g., residences) are affected, increases in profiles due to flood plain development shall be minimized and in no case be greater than 1.0 ft. for the 100 year flood. The Walnut Creek levee alignment is not inconsistent with Department flood plain management criteria in that the levee does not encroach on the floodway as delineated in the Des Moines and West Des Moines Flood Insurance Studies. However, the fact remains that construction of the Walnut Creek levee could have some degree of impact on residences and businesses on the east side of Walnut Creek. To our knowledge, there is not an accurate account of the number of structures that will remain floodprone and what impact the levee construction would have insofar as increased depth and frequency of flooding. Anticipating future comments from concerned home and business owners, we suggest that the Corps inventory those structures and provide a survey of first floor elevations, etc.

Level of Protection

A major change in levee design from the 1975 feasibility report is the reduction from the SPF level to a 100 year flood level. Although the levee freeboard would likely provide protection from larger floods, overtopping

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145

floods could occur. The GRR recommends that if overtopping floods were imminent, the interior areas should be allowed to backfill with floodwaters prior to levee overtopping. While this recommendation is sound from an engineering standpoint, it is questionable whether this would ever be carried out. Social, political and possibly legal considerations would likely dictate trying to "hold" the levee until the last possible moment.

Flow Separation

In the area of 63rd and Grand, experience has shown that the west overbank flows separate from the main channel flows, flowing southerly into West Des Moines and dissipating. The levee and floodwall would, of course, prevent this flow separation. It is not known how large of a flow component separates but we suggest a closer look be taken to assure that elimination of this overflow will not significantly affect Walnut Creek profiles.

Thank you for the opportunity to comment and if you should have any questions, feel free to contact our office.

Sincerely,

for JACK D. RIESSEN, P.E.
SUPERVISOR
FLOOD PLAIN PERMITS SECTION

JDR:JR-139A.cef

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:

May 26, 1989

Planning Division (1105-2-10)

Mr. Dan Stamatelos
Stamatelos, Kenyon and McCandless, P.C.
Attorneys at Law
930 Grand Avenue
West Des Moines, Iowa 50265

Dear Mr. Stamatelos:

This letter responds to your letter of May 8, 1989, presenting Frank and June Ferrari's concerns about the protection of their property from floods on the Raccoon River and Walnut Creek.

Let me begin by saying it is our objective to formulate a flood protection project that is acceptable to the communities of Des Moines and West Des Moines, Iowa. Public input provides valuable information to planners and design engineers in developing a recommended plan.

Plate 3 of the draft General Reevaluation Report was a proposed Recreation Plan for West Des Moines and Des Moines, Iowa, as shown in a 1975 report. The 1975 plan was subsequently authorized for construction in the Water Resources Act of 1986 (PL 99-662). Funds were allocated in 1987 to prepare the General Reevaluation Report that is currently being reviewed by the cities of Des Moines and West Des Moines, the State, agencies, and the public. The 1989 reevaluation report recommends 100-year level of protection from flooding.

The 100-year levee alignment, shown on plate 5 of the report, does not provide protection for the Ferrari home. The reasons for this decision are summarized as follows:

a. Recent studies have determined that the levee would need to be located north of a sanitary sewer and fiber optics line which run parallel to the Ferrari homestead. Relocation of the sewer system and the fiber optics line would be cost prohibitive. Relocation of the sanitary sewer and fiber optics line would encroach on the Ferrari homestead, thus requiring its relocation or acquisition. Therefore, the current plan does not propose protection of the Ferrari property.

b. Hydraulic studies show that increases in flood levels due to the proposed levee shown on plate 5 will be less than one-tenth of one foot at the 100-year flood event. This means that the flood heights at the Ferrari residence will be the same with or without the project. It should also be noted that the existing levee which currently protects the Ferrari property will remain unchanged and continue to provide current levels of protection.

If you or your clients have additional questions concerning the study, please call Mr. Mark Schroeder of our General Investigations and Special Studies Branch at 309/788-6361, extension 297, or you may write to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

ORIGINAL SIGNED BY
CHARLES R. SMITH

Dudley M. Hanson, P.E.
Chief, Planning Division

Copy Furnished:

Frank and June Ferrari
5700 Winona Avenue
Des Moines, Iowa 50312

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:

May 30, 1989

Planning Division

Mr. William J. Ludwig
Architect/Urban Planner
Environmental Design Group,
4090 Westown Parkway, Suite E
West Des Moines, Iowa 50265

Dear Mr. Ludwig:

This letter is in response to your May 1, 1989, letter presenting the concerns of property owners affected by the flood control project planned for Des Moines and West Des Moines, Iowa.

Your concern that the proposed Walnut Creek levee will affect the eight listed properties by accentuating the flood threat is a legitimate concern for any property owner lying adjacent to a levee project. As the floodplain is encroached upon, the conveyance area and valley storage is affected.

The Walnut Creek floodplain conveyance for this reach has been modelled using the U.S. Army Corps of Engineers Hydrologic Engineering Center (HEC) computer program "HEC-2 Water Surface Profiles." The HEC-2 computer model was based on the work done for the 1976 Iowa Natural Resources Council regulatory report and the 1979 City of West Des Moines Flood Insurance Study. New survey data was obtained for the Corps of Engineers General Reevaluation Report for this reach of Walnut Creek so that the hydraulic modelling would reflect the most current conditions. The water surface modelling was calibrated to the May 1986 flood event.

Subsequently, the existing condition HEC-2 model was modified to reflect project conditions with the flood protection levee in place. The floodplain hydraulics with the levee in place showed the following increases in water surface profiles in the Grand Avenue area:

Flood Event	Increase, Feet
10 year	0.1
50-year	0.2
100-year	0.3
200-year	0.5
500-year	0.7

These increases are within the limits which are established as allowable according to Federal, State, and local floodplain management regulations. These regulations allow up to 1 foot of increase in the 100-year flood level. In addition, the levee alignment runs coincident with the mapped floodway limits in both the Des Moines and West Des Moines Flood Insurance Studies. Thus, the recommended levee alignment satisfies the regulations of the National Flood Insurance Program.

The valley storage available behind the proposed Walnut Creek levee is comprised of a 100-year floodplain area of approximately 285 acres with 10 percent of this area having been filled or otherwise not available for valley storage. Average 100-year flood depths in this area range from 0 to 5 feet, or an average of 2.5 feet. This represents a valley storage volume of 640 acre-feet. Watershed modelling of the Walnut Creek basin computed 4.32 inches of basinwide runoff during a 100-year flood event. This is equivalent to 19,000 acre-feet of runoff in the 100-year flood hydrograph. Thus, the valley storage, which is eliminated by the levee project, represents 3 percent of the total 100-year design flood volume. This loss of storage volume will have a minimal effect on the timing and peak stage of the flood crest, especially when considering that the project area is located immediately upstream of the mouth of Walnut Creek.

The effects of Raccoon River and Walnut Creek floods were investigated during the reevaluation period. A possible levee alignment that would include flood protection on the east side of Walnut Creek near Grand Avenue was considered. Page 19 and plate 7 of the General Reevaluation Report provide the details of this plan. The project's benefits, compared to its cost, result in a benefit-to-cost ratio of 0.06 to 1.0. The Federal Government can only participate in a project where the benefit-to-cost ratio is greater than 1.0. Therefore, protection of this area was not considered further. It should be noted, however, the affected property owners, in cooperation with the city of Des Moines, could pursue flood protection independently from a project involving Federal participation.

I trust this information meets your present needs. If you or your clients have additional questions concerning the study, please call Mr. Mark Schroeder of our General Investigations and Special Studies Branch at 309/788-6361, extension 297, or you may write to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

ORIGINAL SIGNED BY
Cockerill
for Dudley M. Hanson, P.E.
Chief, Planning Division

Midland Brick
Division Glen-Gery Corporation
Administrative Offices
101 Ashworth Road
West Des Moines, IA 50265
515/224-4110
Fax: 515/224-4057

May 30, 1989

Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building
P O Box 2004
Rock Island, Ill 61204-2004

ATTN: MR. MARK SCHROEDER

Dear Mr. Schroeder:

Thank you for taking the time on the phone to review the flood control project and its impact on our business.

Mr. Tom Fredregill, the property owner adjacent to our Hoak Road facility on the north, prepared the enclosed petition which I signed. This was intended to be our response to your request for comments on the project. He claims it was signed by several other affected landowners and that it was submitted with those signatures to the City Manager in West Des Moines. In speaking with you and Mr. Russ Soper, the City's engineer on the project, it appears that the petition did not reach either of you with the signatures and was not understood. Without signatures, it was received as "anonymous" comment.

The basic idea was to bring the levee east from Hoak Road across the north end of Mr. Fredregill's property to 63rd St. and to straighten out the S turn under the 63rd St. bridge. From that point, the levee could proceed southward on the east side of 63rd along the creek. It was felt that would take the water head further down stream and protect the area north of Ashworth Road. Both you and Mr. Soper have explained the floodway concerns of such an idea and the potential effects on homeowners to the east. For these reasons, I understand the plan may not be viable, but I hope it has been thoroughly checked before being dismissed.

During my May 26th meeting with Mr. Soper, the idea was raised of using a flood wall around our location to the east of our building rather than a levee which would, by its size, eliminate our building. As this method is being used south of Ashworth Road to protect several other businesses, we request similar consideration to protect Midland.

While the wall may be more costly, the overall costs of real estate acquisition, business and tax base loss may more than offset the difference.

Should our building and land be taken, the impact on our business would be dramatic. This site serves as a warehouse for ceramic tile distribution throughout a several state area, a brick and tile retail/wholesale location and a regional sales office responsible for more than $10,000,000.00 in sales nationwide. Twelve people work in this facility. The location is adjacent to our divisional headquarters at 101 Ashworth and relocation to a distant site would engender major communication problems. Additionally, our 101 Ashworth site has a brick storage yard and combined shipments of brick and tile are loaded on our trucks at the two adjacent buildings.

As a retailing site, the high traffic count, convenient location and public knowledge of the business would be hard to duplicate in West Des Moines or elsewhere in the area. There are few, if any sites, where major warehousing of product can be combined with an excellent retailing location.

Having acquired the Midland Companies in December, 1988, we were not made aware of this pending project by the previous owners. Glen-Gery is very concerned about the impact of this on our business and requests that any and all alternatives be considered which might enable us to continue operations at this location.

Your attention to our request will be most appreciated.

Sincerely,

Henry J. Evans
Vice President & General Manager

HJE/kkg

Enc.

cc: R. Neuman, Esq.
R. Soper
R. Stevenson, Esq.
R. D. Beverforden
C. Carney, City Mgr. Des Moines
G. Mills, Mayor, West Des Moines
E. Eschleman
K. Schlenker
M. Longo

PETITION

COMES NOW the following affected and concerned citizens asking that the "Flood Central Project, Raccoon River and Walnut Creek, West Des Moines - Des Moines Iowa, including Draft Supplement #1" be modified for that section beginning south of Grand Avenue and continuing to Interstate 235 because of the following:

The bridge over Walnut Creek (north of Ashworth Road approximately 500 feet) was constructed in approximately 1948 and only anticipated flood waters running north from the Raccoon River at a slow rate until flood height was obtained. Developement of paved and asphalt surfaces to the north, causing flash flood conditions, were not envisioned. Thus the bridge has some water flowing west to east with the main flow coming from the north and running to the south. Directly south of the bridge, on 63rd Street, is a low spot which allows flood level water to flow only in the direction that it flowed before the installation of the Walnut Creek Bridge.

Therefore, we ask that this section of 63rd Street be replaced with directional flumes with the levee running parrallel to the flumes on the west and that the concrete levee wall be on the east side of 63rd Street from this point on southward.

We feel this will have the following benefits;

Major businesses on the west side of 63rd Street would not have to be relocated or suffer damage due to the appearance of a six to ten feet high concrete levee wall.

On page 26 of the report, ¶5 states that at this point on the levee, we will be protected from the 100, 200, 500 and SPF flood events. We believe the lesser floods of 100 year magnitude would discharge at a quicker rate with the flumes installed. The occurance rate of flooding would be substantially reduced and the dollar loss in any 100 year period would be reduced 90%.

With ponding necessary for each new construction north of the affected area, we believe the rate of discharge down this drainage basin could be significantly lessened.

In addition, page 25 ¶4, the designer mentions the limited streamflow record. We believe that the surrounding property would be unduly penalized by the conclusion of the study and the installation of concrete walls adjacent to the property.

We also believe that the entrance to West Des Moines would be depreciated by the concrete walls and gates adjacent to the property on the west side of 63rd Street.

We respectively request consideration of this alternative for this section of the plan.

Please, take a hard look at the cost benefit ratio to all West Des Moines Residents.

JUN 5 1989

June 5, 1989

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

Dear Colonel Smart:

The City of Des Moines has reviewed the draft of the proposed Local Cooperation Agreement covering a local flood protection project on the Raccoon River and Walnut Creek in Des Moines and West Des Moines, Iowa. The agreement includes the following obligations to be carried out by the City.

1. Provide, without cost to the government, during the period of construction, all lands, easements, rights-of-way, and dredged material disposal areas, and perform all relocations and alteration of buildings, utilities, highways, railroads, bridges (except railroad bridges), sewers, and related and special facilities determined by the government to be necessary for construction of the project.

2. Make a cash payment of not less than five percent of total project costs during the period of construction, regardless of the value of the items in #1 above. If the value of the items in #1 above is less than 20 percent of total project costs, the City 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 relocations, to an amount equal to 25 percent of total project costs.

3. Hold and save the government free from all damages arising from the construction, operation, and maintenance of the project, except for damages due to the fault or negligence of the government or its contractors.

4. Operate, maintain, replace, and rehabilitate the project or functional element thereof upon completion in accordance with regulations or directions prescribed by the government.

CITY OF DES MOINES

MAYOR JOHN P. DORRIAN
CITY HALL
EAST FIRST AND LOCUST
DES MOINES, IOWA 50309
(515) 283-4944

ALL-AMERICA CITY 1949,1976,1981

5. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, 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.

6. 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, as well as Army Regulation 600-7, entitled "Non-Discrimination on the Basis of Handicap and Programs and Activities Assisted or Conducted by the Department of the Army."

7. Participate in and comply with applicable federal flood plain management and flood insurance programs.

8. Prevent encroachment on any of the flood protection structures, including ponding areas, and if ponding areas are impaired, provide substitute storage capacity or equivalent pumping capacity promptly without cost to the United States.

9. At least annually notify persons in the affected area that the project will not provide complete protection. This shall be by an advertisement in the local newspaper covering all areas protected by the levee.

10. Prior to construction, and in accordance with the provisions of Section 221 of Public Law 91-611, the City will enter into a contract with the government, whereby the City will grant the government a right to enter, at reasonable times and in a reasonable manner, upon land which the City owns or controls for access to the project for the purpose of inspection, and if necessary, for the purpose of completing, operating, repairing, maintaining, replacing or rehabilitating the project. If an inspection shows that the City, for any reason, is failing to fulfill

its obligations under the agreement without receiving prior written approval from the government, the government will send a written notice to the City. If the City persists in such failure for 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 lands the City owns or controls for access to the project for the purpose of completing, operating, repairing, maintaining, replacing, or rehabilitating the project. No completion, operation, repair, maintenance, replacement, or rehabilitation by the government shall operate to relieve the City 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 is willing and able to pay its share of the total project costs. Sufficient funds are on hand or can be raised quickly, and the cash payment can be deposited directly with the government, or in an escrow account, upon demand by the government.

This is to advise that if the General Re-evaluation Report and the Design Memorandum are approved substantially in the form as reviewed by the City and as submitted for approval by the Corps of Engineers' higher authority, the City is willing, and legally and financially able, to sign the referenced Local Cooperation Agreement which includes the obligations set forth above.

It is understood that the City of Des Moines will be a co-sponsor of this project with the City of West Des Moines. It is also understood that the City of Des Moines will furnish only those obligations listed above which fall within the boundaries of or apply to the City of Des Moines, unless the City of West Des Moines defaults on its share of responsibilities for the project, in which case the City of Des Moines will, under the terms of a local cooperation agreement, assume the obligations of the City of West Des Moines.

Sincerely,

John P. Dorrian
Mayor

JPD/lf

★ Roll Call Number
89-2484

Date June 5, 1989

Agenda Item Number
95

WHEREAS the Cities of Des Moines and West Des Moines, Iowa have been planning and negotiating with the United States Army Corps of Engineers with respect to the construction of a Flood Control Project involving the Raccoon River and Walnut Creek and have progressed in such planning and negotiation to the point of local approval requiring Letters of Assurance (LOA) from the Cities of Des Moines and West Des Moines; and

WHEREAS, the project as proposed, planned and negotiated and the proposed Letter of Assurance required of the City appears to be in the best interests of the City of Des Mones, NOW THEREFORE

BE IT RESOLVED by the City Council of the City of Des Moines, Iowa that the Mayor be and is hereby authorized to sign said proposed Letter of Assurance and cause same to be transmitted forthwith to the United States Army Corps of Engineers.

(Council Letter Number 89-311 attached)

MOVED BY Jorgensen TO ADOPT.

FORM APPROVED:

M. A. Iverson
City Solicitor
Infrastructure Division

3-1-RC-FLOOD1

COUNCIL ACTION:	YEAS	NAYS	PASS	ABSENT
DORRIAN	✓			
VLASSIS	✓			
McPHERSON	✓			
JORGENSEN	✓			
BROOKS		✓		
FLAGG	✓			
COOK	✓			
TOTAL	6	1		

MOTION CARRIED APPROVED

Mayor

CERTIFICATE

I, DONNA V. BOETEL-BAKER, City Clerk of said City hereby certify that at a meeting of the City Council of said City of Des Moines, held on the above date, among other proceedings the above was adopted.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal the day and year first above written.

Donna V. Boetel-Baker
City Clerk

F-70

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

June 16, 1989

Planning Division

Mr. Henry J. Evans
Vice President and General Manager
Midland Birck Division
Glen-Gery Corporation
Administrative Offices
101 Ashworth Road
West Des Moines, Iowa 50265

Dear Mr. Evans:

This letter is in response to your May 30, 1989, letter presenting the concerns for your property and facilities affected by the flood control project planned for Des Moines and West Des Moines, Iowa, along Walnut Creek.

Your request for consideration to realign the levee to protect your Midland Brick warehouse facility, and possibly the neighboring Fredregill property, has been studied thoroughly by our office. In fact, the levee alignment in this reach has been an item of concern since the General Reevaluation Report (GRR) study process was initiated. The 1970's Corps of Engineers planning study efforts on this same flood control project recommended a levee alignment which would have placed your warehouse within the line-of-protection. However, since that study, the State of Iowa and the Federal Emergency Management Agency have performed detailed floodplain mapping efforts on Walnut Creek. These mapping efforts yielded flood elevations and floodway encroachment limits which were subsequently adopted in 1979.

The State and Federal mapping identified a floodway which placed much of your warehouse facilities within the Walnut Creek floodway. As such, restrictions regarding construction on this property were invoked; namely, any improvements or development which would obstruct the flood conveyance of Walnut Creek would be prohibited. This placed the proposed 1975 levee alignment in violation of the newly adopted floodplain management regulations.

The current GRR identified this situation early on and a levee alignment was formulated which would be in compliance with governing State and Federal floodplain management criteria. The selected alignment is located on the present Hoak Drive with a closure structure located at Ashworth Road and the Des Moines Union Railroad. With this alignment, the levee would need right-of-way which would require the relocation of the warehouse because the levee would be impacting on the access to the extent that continued use of the facility would be impractical. Therefore, the GRR identified this structure as a necessary relocation. The State has concurred with the proposed levee alignment as being consistent with their floodplain management criteria.

A recent telephone conversation with the Iowa Department of Natural Resources floodplain section confirmed that an encroachment into the mapped floodway at this location to protect Midland Brick's warehouse would require a variance to their criteria. A variance could require mitigative measures such as purchasing flood easements on the affected properties. There is a strong possibility that a variance would not be granted under any mitigative circumstance.

As discussed in our telephone conversation with you on June 5, 1989, our action at this point will be to request the Iowa Department of Natural Resources to delineate the Walnut Creek floodway on a current scaled aerial/topography map. As a first step in the upcoming General Design phase, the levee alignment will be finalized. The two issues pertaining to shifting the proposed GRR levee alignment at the Midland Brick site are as follows:

a. Will the Iowa DNR delineated floodway allow adequate area to shift the levee easterly such that the city of West Des Moines can provide continued access to the Beisser and Wheeler Lumber companies from the south on a modified Hoak Drive?

b. Will an additional realignment of the levee or a floodwall to eliminate the relocation of the Midland Brick warehouse and place it within the line-of-protection be workable? This will require a meeting with the

Corps of Engineers, the Iowa DNR, the local sponsors, and Midland Brick to discuss the viability and ramifications of making this Walnut Creek floodway encroachment.

In summary, the levee alignment as proposed in the GRR is an alignment which is in compliance with governing floodplain management regulations by which we must abide. We understand that this proposal impacts negatively on your property and this fact must be accounted for in the overall project. Your concerns are well-founded and we will continue to work with Midland Brick throughout our continuing planning and design of the Des Moines and West Des Moines flood control project.

I trust this information meets your present concerns. If you have additional questions or comments concerning the study, please call Mr. Mark Schroeder of our General Investigations and Special Studies Branch at 309/788-6361, extension 297, or you may write to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

ORIGINAL SIGNED BY

Dudley M. Hanson, P.E.
Chief, Planning Division

Copies Furnished:

Mr. Bill Cappuccio
Iowa Department of Natural Resources
Flood Plain Section
Wallace State Office Building
East 9th and Grand
Des Moines, Iowa 50319

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ROCK ISLAND FIELD OFFICE (ES)
1830 Second Avenue, Second Floor
Rock Island, Illinois 61201

IN REPLY REFER TO:
COM: 309/793-5800
FTS: 386-5800

June 29, 1989

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

This constitutes our Fish and Wildlife Coordination Act report concerning reevaluation of the West Des Moines, Iowa, Flood Control Project. The study is a part of the Des Moines River Basin project as described in the report of the Chief of Engineers dated July 22, 1977, and authorized in Section 401 of the Water Development Act of 1986 (Public Law 99-662). The authority for our report is Section 2 of the Fish and Wildlife Coordination Act of 1958, as amended (Public Law 85-624). This report and our conclusions and recommendations have been coordinated with the Iowa Department of Natural Resources.

PROJECT DESCRIPTION

The project as currently proposed would consist of a new levee along the west bank of Walnut Creek in the City of West Des Moines, and structural measures along Grand Avenue to reduce flood flows in that area. The creek enters the City of Des Moines at the intersection of Grand Avenue and 63rd Street, and the project would then consist of refurbishing of an existing levee for approximately 6,000 lineal feet downstream to the Chicago and Northwestern Railroad. New levees would also be constructed along the north bank of the Raccoon River and the north bank of Jordan Creek (see plate 5 of the General Reevaluation Report). Material needed for levee construction would be trucked from borrow sites several miles from the construction zone.

WITHOUT PROJECT CONDITIONS

The fish and wildlife resources in the study area consist of urban habitat that ranges from highly developed industrial tracts to undeveloped stream corridors. The aquatic resources of Walnut

and Jordan Creeks are not significant, and the Raccoon River aquatic system should not be affected by the proposed project features.

Terrestrial resources over most of the project area, including the off-site borrow areas, do not provide significant wildlife habitat. However, the wooded flood plain along Walnut Creek between 63rd Street and the Chicago and Northwestern Railroad right-of-way has significant value to a wide variety of urban wildlife species. A levee was constructed along the west bank of this reach a number of years ago, and little or no maintenance has occurred along this right-of-way. The lack of maintenance has resulted in a substantial growth of timber along the structure that provides habitat for migratory birds and small mammals that adapt to urban conditions. The zone of valuable urban wildlife habitat coincides with the reach identified as "existing levee to be improved" on plate 5 of the General Evaluation Report.

The timber along the old levee provides a pleasant setting for a trail system. During our field investigation it was obvious that many people use the levee path for hiking, jogging and bike riding. In many areas the canopy completely covers the levee path, resulting in a cool, shaded recreation area. Silver maple, cottonwood, locust and hickory are the dominant species, and the number of mast producing species (e.g., oaks, hickory, etc.) is limited. The low number of mast producers indicates that the habitat is not a particularly unique or diverse wildlife habitat within the ecoregion. The diversity of wildlife species within the study area is further limited by adjacent urban developments. However, the riparian corridor along Walnut Creek in the study area provides an extraordinary remnant of valuable wildlife habitat similar to the type of terrestrial resources in the area prior to human settlement and development in central Iowa.

There are no federally listed threatened or endangered species in the project area that would be affected by the proposed action. Bald eagles have been observed wintering along the major waterways in central Iowa, but the urban nature of this project precludes the need for a biological assessment.

In order to determine the quality of the riparian habitat along Walnut Creek, an analysis of existing conditions was completed for cottontail rabbit and fox squirrel, typical urban wildlife species in the area.

Conditions for cottontail rabbits along the old Walnut Creek levee were found to be within the excellent range, using variables developed for the Missouri Wildlife Habitat Appraisal Guide. Although woodland size class, canopy and vegetative cover were less than optimal for the species, the overall diversity created by interspersion of riparian habitat with residential developments (e.g., gardens and lawns) resulted in an index of

0.8 on the 0.0 to 1.0 evaluation scale. The lack of mast producing tree species resulted in a lower value index for squirrel (0.63).

We assume for the purposes of our 50-year analysis that the value index for rabbits will remain constant on the 12 acres along the old levee alinement. Squirrel habitat, however, is assumed to increase gradually over the 50-year period of analysis as the mast producing tree species increase in the maturing woodland. The results of the without project analysis are shown in the table below.

FISH AND WILDLIFE RESOURCES WITH THE PROJECT

Our analysis of the impacts of the proposed project has been hampered by a lack of engineering data, maps and drawings to delineate the new levee alinements and extent of refurbishment required for the existing Walnut Creek Levee. Land ownership maps delineating the extent of property owned by the cities has also not been available.

We have assumed that the refurbishment of the Walnut Creek portion of the levee will destroy a strip of riparian habitat 100 feet wide and 5,000 lineal feet in length (approximately 12 acres). Affected habitats upstream and downstream of the old levee alinement are of very low quality and would require no mitigation for fish and wildlife losses. The borrow areas also would require no specific mitigation features. The table indicates the resulting average annual habitat unit losses suffered by rabbits and squirrels in the area of concern. It has been assumed that the 12-acre strip would be destroyed during construction, but that some habitat values would be recovered over time as natural plant succession occurs along the levee and in the ponding areas. The analysis results in an approximately 70% loss of habitat quality in the construction zone over time for both evaluation species.

WEST DES MOINES FLOOD CONTROL PROJECT
HABITAT EVALUATION

RABBIT

HABITAT UNITS	TARGET YEAR						AV. ANNUAL
	0	1	5	10	20	50	H.U.'S
W/O PROJ.	9.60	9.60	9.60	9.60	9.60	9.60	7.00
W/ PROJ.	9.60	0.10	1.00	1.50	3.00	6.00	2.00

SQUIRREL

HABITAT UNITS							
W/O PROJ.	7.56	7.56	7.80	8.40	9.00	9.60	6.00
W/ PROJ.	7.56	0.10	0.60	1.20	3.00	3.78	2.00

DISCUSSION

The above analysis indicates that riparian habitat losses will occur along the Walnut Creek Levee, but that the losses in terms of total habitat units over time is relatively small (4-5 average annual HU's) for each evaluation species. It is assumed that the city owns, or will acquire, lands on or adjacent to the proposed project that could be suitable for specific wildlife mitigation features. However, the current recreation values of the existing Walnut Creek Levee would also indicate that urban recreation benefits could be designed into this project in the form of trails for hiking and biking. If these recreation features are properly designed to enhance urban wildlife habitat conditions the need for specific wildlife mitigation features could be eliminated.

CONCLUSIONS AND RECOMMENDATIONS

Most of the area to be impacted by the West Des Moines Flood Control Project does not have sufficient fish and wildlife values to warrant implementation of mitigation features. However, the riparian habitat along Walnut Creek does have significant wildlife values that would be disrupted by refurbishment of the existing levee. Approximately 12 acres of habitat would be adversely impacted along the old levee alinement.

Therefore we recommend that:

- provisions for recreation use be made a part of the levee feature, especially along Walnut Creek;
- landscaping of the project include plant species beneficial to urban wildlife; and,
- coordination with our agency continue through the General Design Memorandum planning phase to assure that landscaping features provide appropriate wildlife values.

We look forward to further coordination on this project. If you have any further questions please do not hesitate to contact Mr. Chuck Davis of my staff.

Sincerely,

Richard C. Nelson
Field Supervisor

CC: IA DNR

DISTRIBUTION LIST

GENERAL REEVALUATION REPORT FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

	NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
CONGRESSIONAL						
HONORABLE CHARLES E. GRASSLEY	UNITED STATES SENATOR	135 SENATE HART OFC. BLDG.		WASHINGTON, D.C. 20510	1	1
HONORABLE CHARLES E. GRASSLEY	UNITED STATES SENATOR	721 FEDERAL BUILDING	210 WALNUT ST.	DES MOINES, IA. 50309	1	1
HONORABLE TOM HARKIN	UNITED STATES SENATOR	317 SENATE HART OFC. BLDG.		WASHINGTON, D.C. 20515	1	1
HONORABLE TOM HARKIN	UNITED STATES SENATOR	733 FEDERAL BLDG.	210 WALNUT ST.	DES MOINES, IA. 50309	1	1
HONORABLE NEAL SMITH	REPRESENTATIVE IN CONGRESS		2373 RAYBURN HOUSE BLDG.	WASHINGTON, D.C. 20515	1	1
HONORABLE NEAL SMITH	REPRESENTATIVE IN CONGRESS	ROOM 344 - EXCHANGE BLDG.	505 5TH AVE.	DES MOINES, IA. 50309-2320	1	1
					0	0
FEDERAL					0	0
					0	0
ADVISORY COUNCIL ON HISTORIC PRES.	DIRECTOR	OLD P.O. BLDG. #809	1100 PENNSYLVANIA AVE. NW.	WASHINGTON, D.C. 20004	1	1

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WEST DES MOINES - DES MOINES, IOWA

	NAME		ADDRESS	CITY	REPORT & EIS	APPENDICE
CENTER FOR ENVIRONMENTAL HEALTH	CENTERS FOR DISEASE CONTROL	SPECIAL PROGRAMS	SHAMBLEE 27	ATLANTA, GA. 30333	1	
ENV. PROTECTION AGENCY-REGION VII	ATTN: MR. MORRIS KAY	ADMINISTRATOR	726 MINNESOTA AVE.	KANSAS CITY, KS. 66101	1	
FEDERAL EMERGENCY MANAGEMENT ADMIN.		500 "C" ST. ROOM 713		WASHINGTON, D.C. 20472	1	
FEDERAL EMERGENCY MANAGEMENT AGENCY	REGION VII - DIRECTOR		911 WALNUT ST. - ROOM 713	WASHINGTON, D.C. 20472	1	
FEDERAL HIGHWAY ADMINISTRATION	DIVISION ADMINISTRATOR	P.O. BOX 627	6TH & KELLOG ST.	AMES, IA. 50010	1	
NWS CENTRAL REGION HYDR.	LEE W. LARSON - W/CR2	ROOM 1836	601 E. 12TH ST.	KANSAS CITY, MO. 64106	1	
OFC. ENVIRON. PROJ. REVIEW	DEPT. OF INTERIOR	MS 4239-MIB, ROOM 4241	18TH & "C" ST. NW.	WASHINGTON, D.C. 20240	18	1
OFC. OF ENVIRON. COMPLIANCE	DIRECTOR	DEPT. OF ENERGY-ROOM 46064	1000 INDEPENDENCE AVE. SW.	WASHINGTON, D.C. 20235	1	
OFC. OF HABITAT PROTECTION	NATL. MARINE FISHERIES SERV.	DIRECTOR	NOAA	WASHINGTON, D.C. 20235	1	
U.S. DEPARTMENT OF AGRICULTURE	REGIONAL FORESTER - FOREST SERVICE	SUITE 500	310 W. WISCONSIN AVE.	MILWAUKEE, WI. 53203	2	
U.S. FISH & WILDLIFE SERVICE	ATTN: MR. JAMES C. GRITMAN	REGIONAL DIRECTOR	FED. BLDG. - FORT SNELLING	TWIN CITIES, MN. 55111	1	
U.S. FISH & WILDLIFE SERVICE	ATTN: MR. RICHARD NELSON	FIELD SUPERVISOR	1830 2ND AVE. - 2ND FLOOR	ROCK ISLAND, IL. 61201	1	

GENERAL REEVALUATION REPORT FOR
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WEST DES MOINES - DES MOINES, IOWA

	NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
USDA SOIL CONSERVATION SERVICE	ATTN: MR. BRAD HARRISON	DISTRICT CONSERVATIONIST	110 S. 8TH ST.	ADEL, IA. 50003	1	1
USDA SOIL CONSERVATION SERVICE	ATTN: STATE CONSERVATIONIST	693 FEDERAL BLDG.	210 WALNUT ST.	DES MOINES, IA. 50309	2	2

STATE						

HONORABLE TERRY BRANSTAD	GOVERNOR OF IOWA		STATE CAPITOL	DES MOINES, IA. 50319	1	1
HONORABLE DOROTHY CARPENTER	IOWA REPRESENTATIVE-82ND DISTRICT		1100 24TH ST.	W. DES MOINES, IA. 50265	1	1
HONORABLE DALE M. COCHRAN	SECRETARY OF AGRICULTURE	WALLACE STATE OFC. BLDG.	900 E. GRAND AVE.	DES MOINES, IA. 50319	1	1
HONORABLE JOHN H. CONNORS	IOWA REPRESENTATIVE-78TH DISTRICT		1316 E. 22ND ST.	DES MOINES, IA. 50317	1	1
HONORABLE JULIA B. GENTLEMAN	IOWA SENATOR-41ST DISTRICT		2814 FOREST DR.	DES MOINES, IA. 50312	1	1
HONORABLE GEORGE R. KINLEY	IOWA SENATOR-40TH DISTRICT		5006 SW. 18TH ST.	DES MOINES, IA. 50315	1	1
BUREAU OF HISTORIC PRESERVATION	ATTN: MR. JAMES JACOBSEN	STATE HISTORICAL SOCIETY	CAPITOL COMPLEX	DES MOINES, IA. 50319	1	1
IOWA DEPT. OF ECONOMIC DEVELOPMENT	ATTN: MR. STEVEN R. McCANN	DIV. OF COMMUNITY PROGRESS	200 E. GRAND	DES MOINES, IA. 50319	4	4

GENERAL REEVALUATION REPORT FOR
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RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
IOWA DEPT. OF HEALTH	DIRECTOR	THIRD FLOOR	LUCAS BUILDING	DES MOINES, IA. 50309	1	1
IOWA DEPT. OF NATURAL RESOURCES	GEOLOGICAL SURVEY BUREAU	ENERGY/GEOLOGICAL RESOURCES DIV.	123 N. CAPITOL COMPLEX	IOWA CITY, IA. 52240	1	1
IOWA DEPT. OF NATURAL RESOURCES	ATTN: DARRYL HOWELL-BUREAU CHIEF	PRESS. & ECO. SERVICE BUREAU	WALLACE STATE OFC. BLDG.	DES MOINES, IA. 50319	1	1
IOWA DEPT. OF NATURAL RESOURCES	ATTN: MR. RALPH TURKLE	SURFACE & GROUNDWATER PROTECTION	WALLACE STATE OFC. BLDG.	DES MOINES, IA. 50319-0034	1	1
IOWA DEPT. OF NATURAL RESOURCES	ATTN: MR. LARRY WILSON, DIRECTOR	WALLACE STATE OFC. BLDG.	900 E. GRAND AVE.	DES MOINES, IA. 50319	2	2
IOWA DEPT. OF SOIL CONSERVATION	DIRECTOR	WALLACE STATE OFC. BLDG.	900 E. GRAND AVE.	DES MOINES, IA. 50319	1	1
IOWA DEPT. OF TRANSPORTATION	DIRECTOR	OFFICE OF POLICY	800 LINCOLN WAY	AMES, IA. 50010	1	1
IOWA DEPT. OF TRANSPORTATION	ATTN: MR. BOB STOECKER	OFFICE OF ROAD DESIGN	800 LINCOLN WAY	AMES, IA. 50010	1	1
IOWA FARM BUREAU	ATTN: MR. JERRY SHEPLER		5400 UNIVERSITY AVE.	W. DES MOINES, IA. 50265	1	1
IOWA POWER & LIGHT CO.	ATTN: CHIEF ENGINEER		823 WALNUT	DES MOINES, IA. 50265	1	1
STATE ECOLOGIST	ATTN: MR. DEAN ROOSA	WALLACE STATE OFC. BLDG.	900 E. GRAND AVE.	DES MOINES, IA. 50319	1	1
WATER RESOURCE RESEARCH CENTER	ATTN: DR. AL AUSTIN	IOWA STATE UNIVERSITY	355 TOWN ENGINEERING BLDG.	AMES, IA. 50010	1	1

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FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
LOCAL					
AMERICAN TELEPHONE & TELEGRAPH	ATTN: MR. DON YOUNG	714 E. 2ND ST., ROOM 101	DES MOINES, IA. 50309	1	1
AMERICAN TELEPHONE & TELEGRAPH	ATTN: CHIEF ENGINEER	1401 50TH ST.	W. DES MOINES, IA. 50265	1	1
C&NW TRANSPORTATION COMPANY	ATTN: MR. J.C. DOMSKI	ASST. DIV. MANAGER-ENGR. 900 STORY ST.	BOONE, IA. 50036	1	1
C&NW TRANSPORTATION COMPANY	ATTN: MR. J.R. IWINSKI	ASST. CHIEF ENGR.-STRUCTURES 165 N. CANAL ST.	CHICAGO, IL. 60606	1	1
COUNTY ATTORNEY		POLK COUNTY COURTHOUSE	DES MOINES, IA. 50307	1	1
COUNTY CLERK		POLK COUNTY COURTHOUSE	DES MOINES, IA. 50307	1	1
DIRECTOR OF PUBLIC SERVICES	ATTN: MR. GEORGE HOLLINS	1514 FULLER ROAD	W. DES MOINES, IA. 50265	25	25
DIRECTOR OF PUBLIC WORKS	ATTN: MR. HAROLD SMITH	DES MOINES CITY HALL	DES MOINES, IA. 50309	25	25
DES MOINES RIVER CONSERVANCY DIST.		WALLACE STATE OFC. BLDG. 900 E. GRAND AVE.	DES MOINES, IA. 50319	1	1
DES MOINES WATER WORKS	ATTN: CHIEF ENGINEER	2201 VALLEY DRIVE	DES MOINES, IA. 50321	1	1

GENERAL REEVALUATION REPORT FOR
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WEST DES MOINES - DES MOINES, IOWA

	NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
LIBRARY DIRECTOR	COWLES LIBRARY	DRAKE UNIVERSITY	25TH & UNIVERSITY	DES MOINES, IA. 50311	1	1
LIBRARY DIRECTOR	DES MOINES PUBLIC LIBRARY	MID CITY	1305 UNIVERSITY	DES MOINES, IA. 50314	1	1
LIBRARY DIRECTOR	W. DES MOINES PUBLIC LIBRARY		1105 GRAND AVE.	W. DES MOINES, IA. 50265	1	1
MAYOR	CITY OF WINDSOR HEIGHTS		1133 66TH ST.	WINDSOR HEIGHTS, IA. 50311	1	1
MIDWEST GAS COMPANY	ATTN: CHIEF ENGINEER		500 E. COURT AVE.	DES MOINES, IA. 50309	1	1
NORFOLK SOUTHERN CORPORATION	ATTN: MR. G.E. DRAKE	CHIEF ENGINEER-DESIGN & CONST.	99 SPRING ST. SW.	ATLANTA, GA. 30303	1	1
POLK COUNTY BOARD OF SUPERVISORS	CHAIRMAN		POLK COUNTY COURTHOUSE	DES MOINES, IA. 50307	1	1
POLK COUNTY CONSERVATION BOARD	ATTN: EXECUTIVE DIRECTOR		JESTER PARK	GRANGER, IA. 50109	1	1
POLK COUNTY ENGINEER	ATTN: MR. R.E. VAN GURDY		5885 NE. 14TH ST.	DES MOINES, IA. 50313	1	1
POLK COUNTY ENGINEER	ATTN: MR. RICHARD DOLASH	PHYSICAL PLANNING DEPT.	5885 NE. 14TH ST.	DES MOINES, IA. 50313	1	1
SIERRA CLUB	ATTN: MS. JANE ELDER	SUITE 203	214 N. HENRY ST.	MADISON, WI. 53703	1	1
TELECONNECT	ATTN: CHIEF ENGINEER		625 E. 2ND ST.	DES MOINES, IA. 50309	1	1

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WEST DES MOINES - DES MOINES, IOWA

	NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
U.S. SPRINT	ATTN: MR. WILLIAM YOUNG	IOWA RESIDENT ENGINEER	1550 NW. 81ST ST.	DES MOINES, IA. 50311	1	1
AFFECTED PROPERTY OWNERS						
ALBAUGH BULK FERTILIZER			P.O. BOX 190	W. DES MOINES, IA. 50265	1	0
AGRA PARTNERS			1001 OFFICE PARK ROAD	W. DES MOINES, IA. 50265	1	0
BASEMENT FIXERS, INC.			1305 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
BILL BRADY & SONS			1375 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
BEISSER'S INC. LUMBER CO.			1040 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
BEISSER REALTY INVESTMENT CO.	ATTN: MS. KIM BEISSER		1040 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
BOREL FINANCIAL MANAGEMENT DIV.			1452 29TH ST.	W. DES MOINES, IA. 50265	1	0
BRODIE DOOR COMPANY	ATTN: MR. DOUG BRODIE		1321 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
CROWN REDI-MIX, INC.			1108 SE. 30TH ST.	DES MOINES, IA. 50317	1	0

GENERAL REEVALUATION REPORT FOR
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WEST DES MOINES - DES MOINES, IOWA

NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
DAVENPORT CEMENT CO.		1200 RAILROAD AVE.	W. DES MOINES, IA. 50265	1	0
DAVENPORT CEMENT CO.		DAVENPORT BANK BUILDING	DAVENPORT, IA. 52801	1	0
EASTER ENTERPRISES	ATTN: MR. PAUL EASTER	P.O. BOX 1351	W. DES MOINES, IA. 50265	1	0
FFF&H CO.	ATTN: HASKIN	1205 32ND ST.	W. DES MOINES, IA. 50265	1	0
IOWA POOL COMPANY		1375 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
IOWA REALTY	ATTN: MR. ROGER CLEVEN	63 & GRAND AVE.	DES MOINES, IA. 50309	1	0
J&J PARTNERSHIP		903 TITUS	DES MOINES, IA. 50315	1	0
JTD PARTNERSHIP		930 GRAND	W. DES MOINES, IA. 50265	1	0
JOHNNIE'S VET CLUB		3RD & LINC[illegible]	W. DES MOINES, IA. 50265	1	0
K&B ROOFING CONTRACTORS, INC.		410 13TH ST.	W. DES MOINES, IA. 50265	1	0
LONG JOHN SILVERS		850 1ST ST.	W. DES MOINES, IA. 50265	1	0
MARTIN-MARIETTA		2525 EUCLID AVE.	DES MOINES, IA. 50310	1	0
MIDLAND BRICK & TILE CO.	ATTN: MR. HENRY J. EVANS	1 ASHWORTH ROAD	W. DES MOINES, IA. 50265	1	0

GENERAL REEVALUATION REPORT FOR
FLOOD CONTROL PROJECT
RACCOON RIVER AND WALNUT CREEK
WEST DES MOINES - DES MOINES, IOWA

NAME		ADDRESS	CITY	REPORT & EIS	APPENDICES
MUFFLER CLINIC		237 63RD ST.	W. DES MOINES, IA. 50265	1	0
NAEGELE OUTDOOR ADV., INC.		1900 DELAWARE	DES MOINES, IA. 50317	1	0
PAJIS EQUITIES		600 SE. RACOON	DES MOINES, IA. 50309	1	0
DY MIX WEST		312 LINCOLN AVE.	W. DES MOINES, IA. 50265	1	1
SIX, INC.		BOX 1351	DES MOINES, IA. 50312	1	0
STONER McCRAY SYSTEM, INC.	ATTN: MR. DON HEWITT, PRESIDENT	1200 OFFICE PARK RD.	DES MOINES, IA. 50312	1	0
U-HAUL OF MINNESOTA		2721 N. CENTRAL AVE.	PHOENIX, AZ. 85004	1	0
VALLEY BANK & TRUST	ATTN: MR. DAVID McCURRIN	6TH & WALNUT	DES MOINES, IA. 50309	1	0
VAL LANES BOWL, INC.	ATTN: MR. ROBERT E. McKINNEY	100 ASHWORTH ROAD	W. DES MOINES, IA. 50265	1	0
VAL LANES BOWL, INC.	ATTN: MR. PAT ESSEY	100 ASHWORTH ROAD	W. DES MOINES, IA. 50265	1	0
WHEELER CONSOL, INC.		1[illegible] HOAK DRIVE	W. DES MOINES, IA. 50265	1	0

GENERAL REEVALUATION REPORT FOR
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WEST DES MOINES - DES MOINES, IOWA

NAME			ADDRESS	CITY	REPORT & EIS	APPENDICES
WHEELER LUMBER CO.	ATTN: MR. PAUL SWEENEY		P.O. BOX 65160	W. DES MOINES, IA. 50265	1	0
W. DES MOINES GRAIN CO.			1265 8TH ST.	W. DES MOINES, IA. 50265	1	0
BROOER	DOUG		1321 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
COLBY, JR.	CHARLES I.		RURAL ROUTE 1	W. DES MOINES, IA. 50265	1	0
COLBY	CLARK		12601 HICKMAN ROAD	W. DES MOINES, IA. 50265	1	0
DIAZ	LUPE S.		221 9TH ST.	W. DES MOINES, IA. 50265	1	0
ETAL	GARY & TERRI LEWIS		5907 GREGORY	DES MOINES, IA. 50265	1	0
FERRARI	FRANK		5700 WINONA AVE.	DES MOINES, IA. 50312	1	0
GUTHRIE	RANDOLPH & VERA		799 ROOSEVELT BLVD.	GLEN ELLYN, IL. 60137	1	0
HOAK	HARRY L.		4004 GRAND AVE., #504	DES MOINES, IA. 50312	1	0
JOHNSTON	WILLIAM E.		5907 GREGORY	DES MOINES, IA. 50306	1	0
McCURNIN	ISABELLE C.	SUITE 212	907 ASHWORTH ROAD	W. DES MOINES, IA. 50315	1	0
RHINER	MELBA & PATRICIA COLL		613 CLEGG ROAD	W. DES MOINES, IA. 50265	1	0

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	NAME	ADDRESS	CITY	REPORT & EIS	APPENDICES
RICE	ROBERT & JANET	647 13TH ST.	W. DES MOINES, IA. 50265	1	0
ROTHFUS	L.J.	205 51ST ST.	DES MOINES, IA. 50312	1	0
SCHULTZ	TERRY & BARBARA	6100 RAILROAD AVE.	DES MOINES, IA. 50312	1	0
SHARP	CHUCK	1325 HOAK DRIVE	W. DES MOINES, IA. 50265	1	0
STAMALTELOS	JOHN	P.O. BOX 65427	W. DES MOINES, IA. 50265	1	0
WAALK	GERALD & LISA	629 CLEGG ROAD	W. DSE MOINES, IA. 50265	1	0
WIESE	MERLE & JESSIE	633 CLEGG ROAD	W. DES MOINES, IA. 50265	1	0
VACAVONA	JOSEPH & CARMELLA	3116 PARK PLAZA DRIVE	DES MOINES, IA. 50315	1	0
WOOLEY	NORMAN J.	5604 WINONA AVE.	DES MOINES, IA. 50312	1	0

INTERNAL					

CENCD-PD				15	15

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WEST DES MOINES - DES MOINES, IOWA

NAME	ADDRESS	CITY	REPORT & EIS	APPENDICES
CENCR-CD			1	1
CENCD-DDPM			1	1
CENCR-DE			1	1
CENCR-ED			1	1
CENCR-ED-DM			1	1
CENCED-G			1	1
CENCR-ED-H			1	1
CENCR-IM-C			3	3
CENCR-OD			1	1
CENCR-PA			1	1
CENCR-PD			1	1
CENCR-PD-C			1	1
CENCR-PD-E			1	1

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T DES MOINES - DES MOINES, IOWA

NAME	ADDRESS	CITY	REPORT & EIS	APPENDICES
CENCR-PD-P			1	1
CENCR-PD			1	1
CENCR-RE			1	1
*** Total ***			223	169