



US Army Corps  
of Engineers  
Rock Island District

# DES MOINES RECREATIONAL RIVER AND GREENBELT

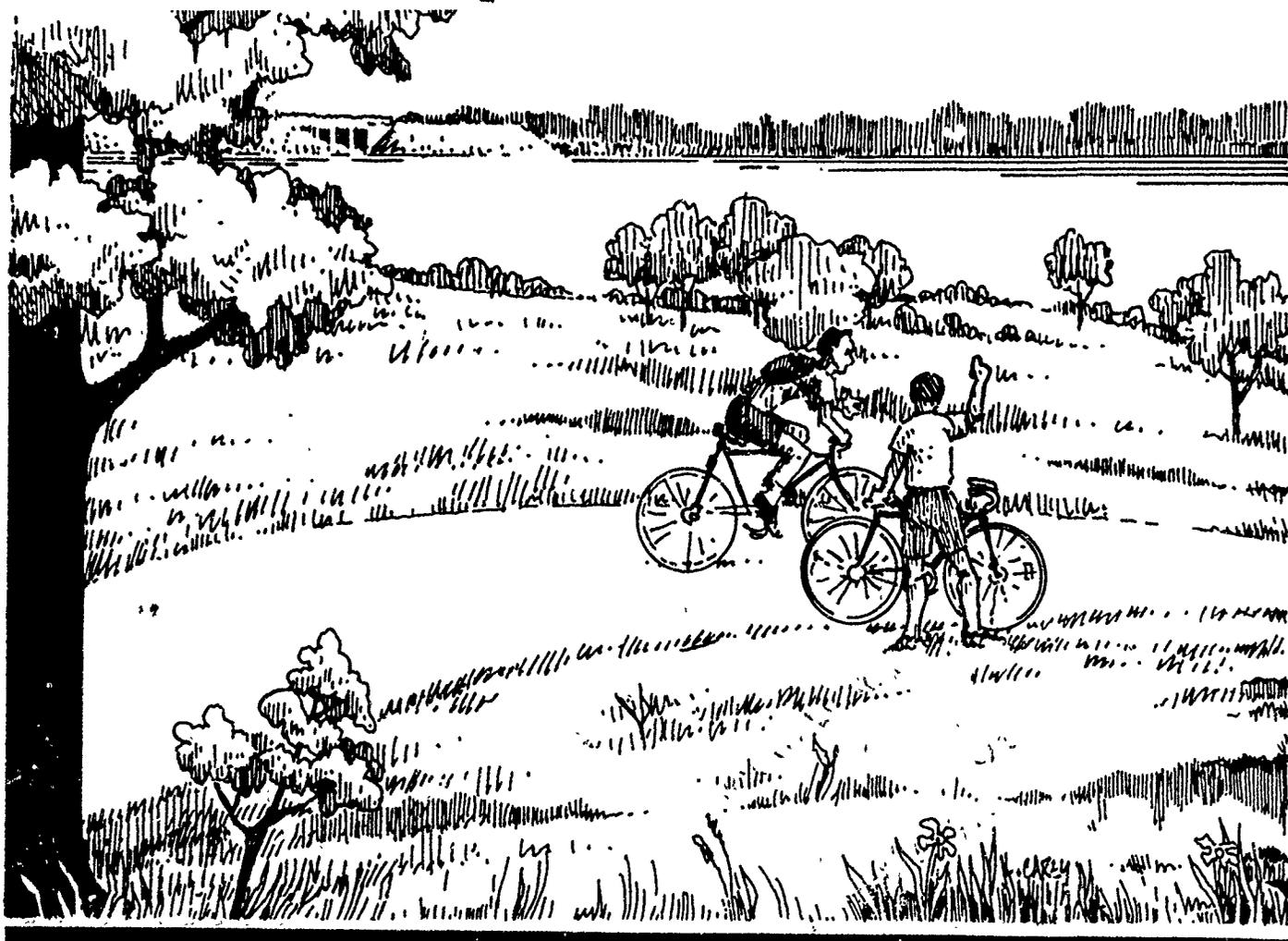
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ELECTE  
SEP 17 1991

## FEATURE DESIGN MEMORANDUM #6 WITH ENVIRONMENTAL ASSESSMENT

AD-A240 547



MULTI-PURPOSE TRAIL  
RED ROCK, SEGMENT II



MARCH 1991

91-10700



91 9 15 26



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
ROCK ISLAND DISTRICT CORPS OF ENGINEERS  
CLOCK TOWER BUILDING - P O BOX 2004  
ROCK ISLAND ILLINOIS 61204-2004

Engineering Division  
General Engineering Section

SEE DISTRIBUTION LIST

Enclosed is a copy of the final approved Feature Design Memorandum (FDM) with Environmental Assessment (EA) for the Des Moines Recreational River and Greenbelt, Multi-Purpose Trail, Red Rock, Segment II.

Final plans and specifications for Multi-Purpose Trail, Red Rock, Segment II are being prepared. The construction of Segment II will involve two contracts, Segment IIA and Segment IIB. Construction of Segment IIA is scheduled to begin in Fall 1991 and be complete in Fall 1992. Construction for Segment IIB is scheduled to begin in Spring 1992 and be complete in Fall 1992. Questions concerning the FDM or final plans should be directed to Mr. Perry Hubert, telephone (309)788-6361, ext. 6554.

Sincerely,

*John R. Brown*  
John R. Brown  
Colonel, U.S. Army  
District Engineer

Enclosure

Accession For	
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TYPED 13 Aug 91 JI 8/13/91  
DOC: DESMOINES

CECW-EP-E (CENCE-PE-ED-TM/8 May 1991) 1st End SMITH/tf/272-8951  
SUBJECT: Des Moines Recreational River and Greenbelt, FDM #6,  
Multipurpose Trail, Red Rock, Segment II

18 AUG 1991

HQ, U.S. Army Corps of Engineers, Washington, DC 20314-1000

FOR Commander, North Central Division, ATTN: CENCE-PE-ED-TM

FDM #6 has been reviewed and is approved. The responses to  
comments provided in an informal exchange between this HQ and your  
office are satisfactory and should be included in the permanent  
project documentation.

FOR THE DIRECTOR OF CIVIL WORKS:

SIGNED

3 Encls  
wd all encls

JOHN A. MCPHERSON  
Acting Chief, Engineering Division  
Directorate of Civil Works



REPLY TO  
ATTENTION OF

ED-DG

DEPARTMENT OF THE ARMY  
ROCK ISLAND DISTRICT CORPS OF ENGINEERS  
CLOCK TOWER BUILDING - P O BOX 2004  
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DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK SEGMENT II

MARCH 1991

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FEATURE DESIGN MEMORANDUM #6  
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DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK SEGMENT II

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FEATURE DESIGN MEMORANDUM #6  
WITH ENVIRONMENTAL ASSESSMENT  
DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK SEGMENT II

I. INTRODUCTION → This

A. Project Authority

The Des Moines Recreational River and Greenbelt (hereinafter referred to as the Greenbelt) was funded and authorized by Public Law 99-88 as approved on August 15, 1985. The project calls for the development, operation, and maintenance of a recreational area on, and along, the Des Moines River from U.S. Highway 20 in Fort Dodge, Iowa, downstream to relocated U.S. Highway 92 in the vicinity of the Red Rock Dam.

→ Red Rock Multi-Purpose Trail, Segment II is one of several Greenbelt projects. Segment II involves the construction of 10,700 feet of asphalt surfaced bike trail along the north shore of Lake Red Rock. Segment II begins at Howell Station Campground and ends halfway between North Overlook and Wallashuck Recreation Area Campgrounds (See Figure 1). Segment II will connect Segments I and III. → Segment I involves the construction of a bridge over the Des Moines River in the vicinity of Howell Station Campground. Segment III begins where Segment II ends and runs along the north shore of Lake Red Rock to State Highway 14.

B. Purpose and Scope

→ The purpose of this report is to establish the project requirements and to evaluate the project on the basis of engineering, economic, and environmental viability. The report includes a project description, engineering consideration, economic analysis, and environmental assessment. ←

C. General Design Memorandum

The General Design Memorandum (GDM) for Greenbelt covers the administration, comprehensive plan, plan for initial development and coordination of this project, and discusses the conditions for Federal participation. The comprehensive plan addresses the entire Greenbelt. The Red Rock Multi-Purpose Trail, Segment II project is one of the projects included in the comprehensive plan.

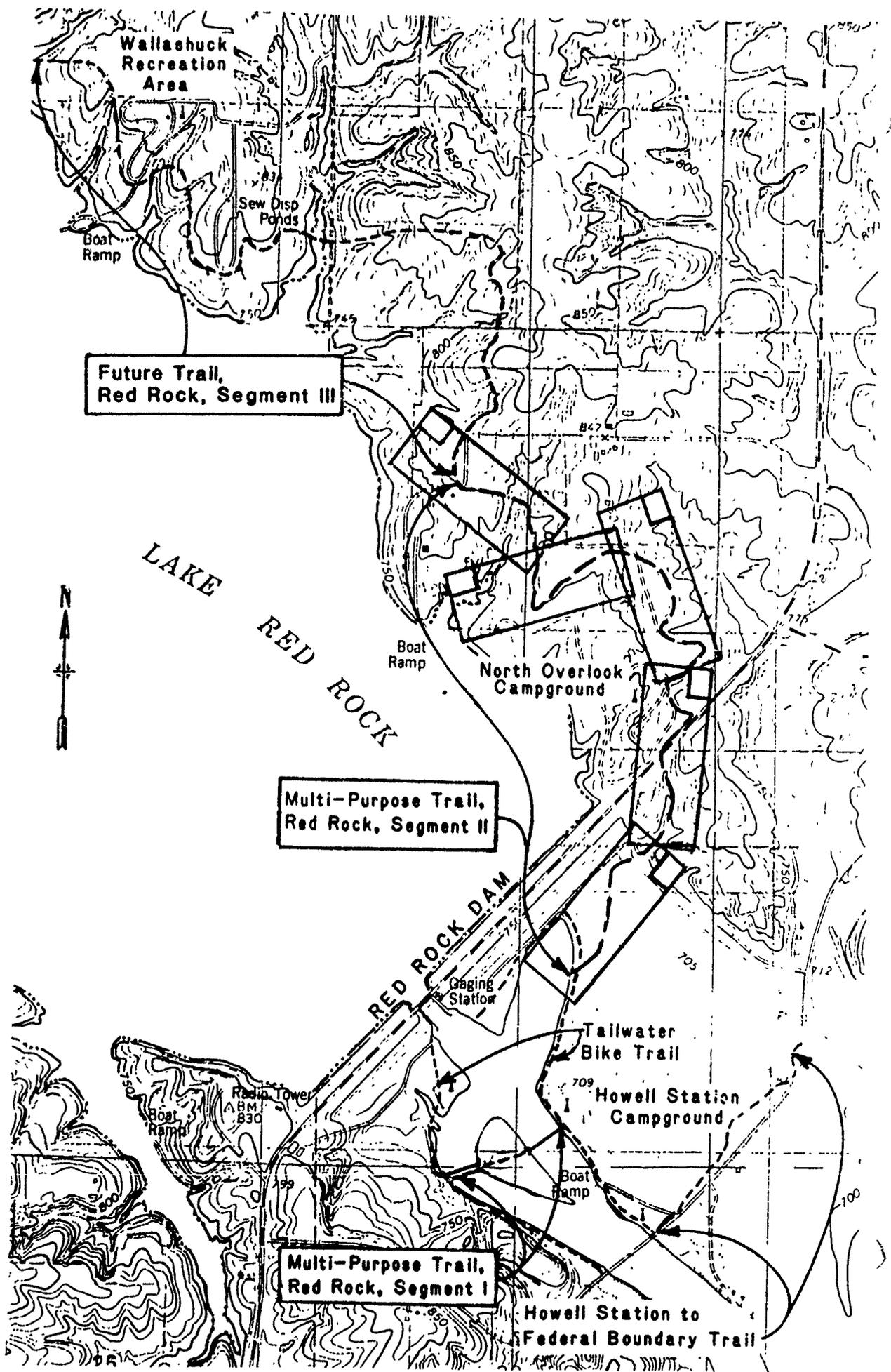


FIGURE 1: TRAIL LOCATION MAP

#### D. Advisory Committee

An advisory committee was established in accordance with the Conference Report on H.R. 2577, dated July 29, 1985. This committee is composed of local officials from the cities, counties, and state governments in the Greenbelt project areas as well as from the Corps of Engineers. At the September 4, 1987 meeting, the advisory committee recommended nine separable projects, including the Red Rock Multi-Purpose Trail, Segment II project, to the Corps of Engineers for construction.

#### E. Principles and Guidelines

Principles and Guidelines activities were accomplished by a combination of activities documented in the September 1987 General Design Memorandum (GDM) and Programmatic Environmental Impact Statement (PEIS), in the workings of the Advisory Committee, and in this report. A number of alternatives for the overall project were addressed in the PEIS and the plans were formulated in the GDM for each separable element in coordination with the local sponsors and the Advisory Committee. Extensive public involvement activities and public meetings have been conducted on a continuing basis under the guidance of the Advisory Committee.

#### F. Local Sponsor

The Red Rock Multi-Purpose Trail, Segment II, is not cost-shared with a local sponsor. The project is funded entirely by the Federal government. The Corps of Engineers is the project sponsor.

#### G. Other Feature Design Memorandums

<u>No.</u>	<u>Title</u>	<u>Draft FDM to NCD COE for Approval</u>	<u>Final FDM Approved</u>
FDM #1	- Bennington Bridge Access	May 1986	Jun 1986
FDM #2	- Jester Park Campground Improvements	Feb 1989	Jun 1989
FDM #3	- Multi-Purpose Trail, Red Rock, Segment I	May 1989	Aug 1989
FDM #4	- Lutheran Hospital Bike Trail Segment	Jan 1990	Jul 1990
FDM #5	- Dragoon Trail Scenic Road Route	Jan 1990	-

## II. DESCRIPTION OF PROJECT

### A. Project Location and Description

1. Project Location: The project is located in the tailwater area and along the north shore of Lake Red Rock in Marion County, Iowa.

2. Project Description: The trail in this project is 10,700 feet in length. It has an asphalt paved width of 10 feet with 2-foot granular surfaced shoulders on each side of the trail. The trail will cross beneath Marion County Highway T-15 via a 12'Wx10'Hx200'L concrete underpass. It will cross one stream via a 360 foot-long bridge. The terrain the trail passes through is hilly and includes both forested and grassland areas.

#### B. Design and Construction Considerations

1. General Considerations: The proposed alignment was selected because it minimized alterations of the natural terrain and vegetative cover and maintained gradients and curves that would not be too difficult for the users to negotiate. Several different alignments were considered.

Geometrics to include horizontal alignment, vertical alignment and cross sections are based on 1981 American Association of State Highway and Transportation Officials (AASHTO) criteria for the development of new bicycle facilities. Grades on the trail are kept below or close to five percent. All of the horizontal curves have a design speed between 20 and 30 miles per hour. The trail is 10-foot wide to accommodate both bicycle and pedestrian traffic.

The proposed trail was selected because it provides a recreational facility that best meets both the operational and environmental requirements.

2. Hydrology and Hydraulics: Pool Stage Hydrographs were developed for Lake Red Rock (See Plate 2). The full flood control pool elevation is 780 feet msl. As shown on plate 2, the duration of elevation 780 is less than 1 percent. The frequency of the reservoir reaching elevation 780 msl has a probability of less than 1 percent or on an average less than once every 100 years. No part of the proposed primary alignment lies below elevation 780 msl. An alternate alignment involves constructing a portion of the trail below elevation 780 msl. This alternate alignment is discussed in more detail in Section II.G.

The trail crosses one significant stream and many small drainages. Culvert sizes were selected based on data obtained from watershed areas and runoff predictions.

The trail crosses over a stream at Station 97+80. The stream has a drainage area of 0.11 square miles. Using Iowa Regression Equations for Hydrologic Region 3, culvert sizes were selected based on a 100-year discharge of 260 cubic feet per second coincident with a 5-year Lake Red Rock Pool tailwater elevation of 760.0 msl. It was determined that two 54 inch diameter reinforced concrete pipe culverts would accommodate the design discharge. The culverts will be 260 feet in length and have a maximum ponding inlet elevation of 770.0 msl. Crossing the stream via culvert and embankment was compared to crossing the stream via a bridge. A bridge crossing was determined to be economically and environmentally a better alternative. A more detailed discussion of each alternative is found in Section II F.

3. Geotechnical: The topsoil will be stripped along the entire trail alignment to a minimum 6 inch depth and the subgrade will be compacted. Slopes from cuts and embankments will be 3 horizontal to 1 vertical.

Soil borings are being taken at the underpass site and at the bridge site. The borings will be taken to a depth of 25 feet or until bedrock is encountered. The subsurface information obtained from the borings will be used to verify the proposed designs. Specifically pile depths and footing sizes will be verified. Hand augered borings are being taken along the proposed alignment in areas other than the underpass and bridge sites. These samples will be analyzed to give an estimate of soil conditions along the trail alignment.

#### 4. Structural:

a. Highway T-15 Underpass: A design analysis was made for the concrete tunnel underpass below Highway T-15. The tunnel will be constructed in an open-faced cut through the existing highway embankment. The underpass will be 200 feet long, 12 feet wide and 10 feet high. Width and height dimensions meet AASHTO guidelines for bicycle facilities. During construction, traffic will be allowed to pass along one-lane and the shoulder so the highway will not have to be closed or traffic detoured. A detailed analysis of the underpass is found in Appendix A.

b. Bridge at Station 97+80: The trail crosses over a stream and large ravine at Station 97+80. As discussed in Section II-F a bridge crossing was determined to be the best means of crossing the stream. Two different types of bridges are being considered. Following is a brief discussion of each.

A timber bridge at the site would be 360 feet in length and 12 feet wide. The bridge would have fifteen 24-foot-long spans supported by fourteen 3-pile timber trestles and two timber abutments. The bridge riding surface would be 40 feet above the stream at its highest point and have 4.5 foot high timber railings on each side. The preliminary design for the bridge has the piles being driven to a below surface depth of 20 feet. When subsurface exploration and analysis is complete the pile depth will be verified.

A steel bridge at this site would also be 360 feet in length and 12 feet wide. A steel bridge would have three 120-foot-long spans supported by two concrete piers and two concrete abutments. A steel bridge would also be 40 feet above the stream at its highest point and would have 4.5 foot high steel railings on each side. The bridge spans would be preengineered, prefabricated steel truss spans. Once subsurface exploration and analysis at the bridge site is complete preliminary designs for the bridge abutments and two concrete piers will be completed. Cost estimates will then be calculated for the steel bridge.

The cost of a timber bridge is estimated at \$ 250,000. When the estimated cost of the steel bridge is determined it will be compared to the estimated cost of the timber bridge. Since environmental and other considerations are generally the same for each bridge the most economical bridge will be selected to cross the stream.

### C. Real Estate Requirements

1. Purchase of Private Land: The proposed trail will require the purchase of approximately 1.5 acres of privately-owned property. The trail alignment crosses the U.S. Government property boundary at station 98+00, traverses across 830 feet of private property then crosses back to U.S. Government owned property at station 106+30.

2. Private Land Owners: On July 12, 1990 and again on September 25, 1990, meetings were held between the owners of the subject property and Corps of Engineers personnel. The owners are willing to sell the property to the U.S. Government for the construction of a multi-purpose trail.

3. Alternative to Purchase of Private Property: The alternative to the purchase of private property is to stay within government boundaries by following the government property line down to the edge of Lake Red Rock and around a peninsula. The alternative trail alignment will cost approximately \$242,000 more than the proposed alignment and will have 2,400 feet of trail below the flood pool elevation of 780 feet. A detailed discussion of the proposed and alternative alignments is found in Section II G.

### D. Operation and Maintenance Considerations

1. Operation: The project will be operated by the Federal government. Operation will include enforcing applicable load limits, vehicle restrictions, and closure devices required to maintain the safe operation of the facility.

2. Maintenance: The project maintenance will be the responsibility of the Federal government. Maintenance activities will include shoulder and pavement inspection and repair, culvert inspection, culvert cleanout and repair, bridge inspection and repair, pavement markings, traffic control sign replacements, and mowing adjacent to grassed areas as required.

### E. Highway T-15 Crossing Considerations

Between Howell Station Campground and North Overlook Campground the trail must cross Highway T-15, an asphalt-surfaced, two-lane highway. The area where the highway and trail intersect is a 55 mph zone in a rural area. According to a count taken by the Iowa Department of Transportation, the average number of vehicles per day for this section of highway is 3,010. The traffic is composed mainly of commuter and truck traffic between the towns of Pella and Knoxville. Several alternatives for crossing the highway were considered. Following is a brief summary of each alternative.

1. At-Grade Crossing: An at-grade crossing with a push button stop light was considered. Criteria from the U.S. Department of Transportation as presented in the 1988 Manual on Uniform Traffic Control Devices was used to determine the necessity for a traffic signal at the subject intersection. An analysis of the factors contained in eleven different warrants was conducted. Because of the volume and spacing of the traffic at the intersection, none of the warrants investigated warranted the installation of a traffic signal.

Since a traffic signal is not warranted at the intersection, a stop sign crossing was considered. Individuals using the bike trail include both children and adults and will be either pedestrians or bicyclists. Because of the nature of the highway (Rural, 55 mph zone, large trucks and heavy use) at the trail crossing and the nature of the trail users, a stop sign intersection poses an unacceptable safety risk.

An at-grade crossing using either a traffic signal or stop sign was determined to be an unacceptable alternative for crossing Highway T-15.

2. Bridge Crossing: A bridge crossing is an acceptable alternative in terms of safety, aesthetics, and usability. However, because of the terrain at the crossing site, a bridge crossing would require an alignment of 3,100 lineal feet through a natural hardwood forest. Since it is desirable to minimize disturbance to this forest, an alternative which required less alignment would be better. Also a bridge would require periodic maintenance and inspections throughout its design life. An alternative that requires less maintenance and inspections would also be a better alternative.

3. Tunnel Crossing: A tunnel crossing was considered and compared to the only other viable option, a bridge crossing. The tunnel crossing would require an alignment through the hardwood forest (mentioned above) of only 1,800 lineal feet as opposed to 3,100 lineal feet for the bridge. The proposed tunnel would be a 12'W X 10'H X 200'L reinforced concrete box culvert. The maintenance of the box culvert will be substantially less than that required for the bridge. The cost of a 200 foot reinforced concrete box culvert is \$215,000. This estimate includes the cost of the culvert, excavation, route detour, and associated trail leading from the base of the hill to the crossing site. The cost of a 200 foot three-span bridge is \$254,000. This estimate includes the cost of the bridge, two piers, abutments, site work, and associated trail leading from the base of the hill to the crossing site.

After considering initial cost, cost of maintenance, and disturbance to existing natural resources, the tunnel crossing option was selected. Crossing the road via a tunnel will offer a cost effective, safe, low maintenance, and environmentally desirable solution.

#### F. Stream Crossing Considerations

The trail crosses over a stream at station 97+80. Two alternatives were considered for crossing the stream. Following is a brief summary of each alternative.

1. Culvert and Embankment Crossing: Crossing the stream via culvert and embankment would require 20,700 cubic yards of fill material, the clearing of approximately one acre of hardwood forest and the construction of two 54 inch diameter by 260-foot-long reinforced concrete pipe culverts. The top of the embankment would be approximately 35 feet above the streambed and the embankment would cover a one-acre area. The construction of such a large embankment would require the purchase of land beyond that which adjoining property owners are willing to sell. An advantage of a culvert and embankment crossing would be low operation and maintenance costs. Disadvantages of a culvert and embankment crossing would be environmental impacts, lack of aesthetics, land acquisition and high initial cost. The cost of two culverts, 18,000 cubic yards of embankment, and associated clearing and grubbing is \$279,000.

2. Bridge Crossing: Crossing the stream via a bridge would require the construction of the bridge abutments and piers, the bridge superstructure, and the bridge approach and exit. The construction of a bridge would require no clearing other than that in the immediate vicinity of the bridge. Adjoining land owners are willing to sell the property required for the construction of a bridge. Disadvantages of a bridge crossing would be high maintenance costs in relation to a culvert. Advantages of a bridge crossing would be aesthetics, minimal alteration of existing natural terrain and lower cost in relation to the culvert crossing. The cost of a 360-foot-long timber bridge to include abutments, trestles, superstructure and associated site work is \$250,000.

After considering initial cost, maintenance cost, aesthetics, alteration to existing natural terrain, land acquisition and environmental impacts, the bridge crossing was determined to be the preferred alternative. A bridge will blend in nicely with the forested area on both sides. It is an environmentally desirable as well as cost effective solution.

#### G. Alternative to Purchase of Private Property Considerations

The proposed alignment requires the purchase of approximately 1.5 acres of private property. The alternative to the purchase of private property is to stay within government property boundaries by following the government property line down to the edge of Lake Red Rock and around a peninsula as shown in Figure 2.

The proposed alignment, hereafter referred to as the primary alignment is 2,500 feet in length from its intersection with the alternate alignment at station 82+00 and station 107+00. The primary alignment involves the clearing

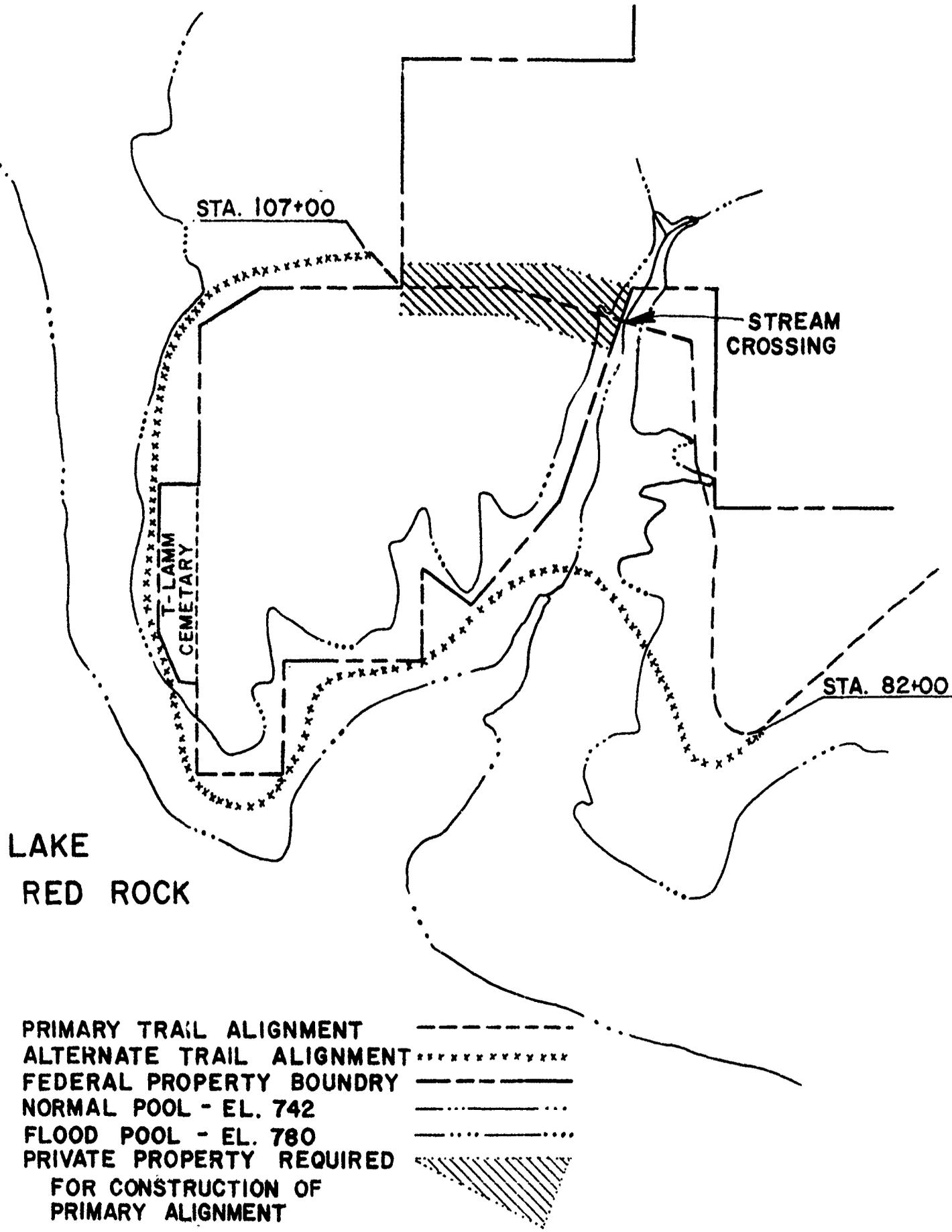


FIGURE 2: ALTERNATE AND PRIMARY ALIGNMENTS

of approximately one acre of forest, the construction of 2,500 cubic yards of embankment, a 360 foot-long bridge, 2,500 lineal feet of asphalt trail, and the purchase of approximately 1.5 acres of private property. The estimated cost of the primary alignment to include land acquisition is \$332,000.

The alternative to purchasing private property is to stay within government boundaries, this alignment will be referred to as the alternate alignment. The alternate alignment is 4,800 feet in length from its beginning at station 82+00 to its end at station 107+00 (See Figure 2). The alternate alignment will involve the clearing of approximately one acre of forest, the construction of 27,000 cubic yards of embankment, two 54 inch diameter concrete culverts, 4,800 linear feet of asphalt trail and 9,700 tons of rock slope protection. The estimated cost of the alternate alignment is \$574,000.

The primary alignment has a minimum trail surface elevation of 785 feet. Since the full flood control pool elevation at Lake Red Rock is 780 feet, the trail will not be inundated during times of high water. The alternate alignment, however, is below the flood pool elevation of 780 feet for 2,400 of its length. The lowest elevation of the alternate trail alignment is 755 feet resulting in a percent time underwater of 5 percent. As shown in Plate 2 - Hydrologic Data, the time the trail would be underwater would most likely be during the spring and summer months, a high use time for the trail.

The alternate alignment will require the construction of embankment and slope protection below the calculated ordinary high water elevation of 743.5 feet. Approximately 1,000 cubic yards of earth fill and 500 cubic yards of rock slope protection will be placed below ordinary high water. Water quality certification has been requested from the state of Iowa. A copy of this request is in Appendix C.

After considering costs, impacts to the environment, and the amount of time the trail would be unusable because of flood pool levels, it was determined that the primary alignment is the best alternative. The primary alignment will cost \$242,000 less than the alternate alignment, will not be inundated during times of flooding, and is environmentally a more desirable solution.

H. Cost Estimate

The project construction cost estimate is shown in Table 1.

TABLE 1  
PROJECT CONSTRUCTION COST ESTIMATE  
OCTOBER 1990 PRICE LEVEL

Account Code	Item	Quantity	Unit	Price	Amnt	Cont	Con%	Reasons
14.	RECREATION FACILITIES							
14.0.3.-	Bicycle Trail							
14.0.3.B	Mobilization and Demobilization	1	JOB	SUM	10,047	1,047	10%	1,2,3
14.0.3.B	Clearing and Grubbing	5.3	ACR	2,670.00	14,151	1,415	10%	1,2,3
14.0.3.B	Stripping	6,200	CY	1.35	8,370	1,674	20%	1,2,3
14.0.3.B	Embankment, Compacted, Imperv.	20,200	CY	3.00	60,600	12,120	20%	1,2,3
14.0.3.B	Crushed Stone Base/Shoulders	2,800	CY	27.00	75,600	3,780	5%	1,2,3
14.0.3.B	Prime Coat	6,200	GAL	1.08	6,696	670	10%	1,2,3,4
14.0.3.B	ACC Pavement, 2" Lift	1,405	TON	33.00	46,365	2,318	5%	1,2,3
14.0.3.B	Paint Striping	10,700	LF	0.25	2,675	134	5%	1,2,3
14.0.3.B	Guard Rails, Timber	1,000	LF	8.25	8,850	1,770	20%	1,2,3,4
14.0.3.B	Guard Rails, Steel	1,400	LF	12.60	17,640	3,534	20%	1,2,3,4
14.0.3.B	Signage	1	JOB	SUM	4,000	800	20%	1,2,3
14.0.3.B	Seeding	11.2	ACR	1,140.00	12,768	1,915	15%	1,2,3
14.0.3.B	Underpass, Cast In Place	200	LF	575.00	115,000	11,500	10%	1,2,3
14.0.3.B	RCP Culverts	1	JOB	SUM	29,729	7,432	25%	1,2,3
14.0.3.F	Timber Trestle Bent Bridge	360	LF	660.00	237,600	11,934	5%	1,2,3
14.0.3.B	Bedding Stone	105	TON	19.10	2,006	401	20%	1,2,3,4
14.0.3.B	Riprap	300	TON	22.60	6,780	1,356	20%	1,2,3,4
14.0.3.-	SUBTOTAL, Bicycle Trail				659,300			
	Contingencies, Average of	9.7%				63,800		
14.	TOTAL, RECREATION FACILITIES				723,100			

14.0.3.- SUBTOTAL, Bicycle Trail

659,300

Contingencies, Average of 9.7%

63,800

14. TOTAL, RECREATION FACILITIES

723,100

REASONS FOR CONTINGENCIES

1 - QUANTITY UNKNOWNNS    2 - UNKNOWN SITE CONDITIONS    3 - UNKNOWN HAUL DISTANCE    4-UNIT PRICE UNKNOWNNS

The project cost summary is shown in Table 2.

TABLE 2

PROJECT COST SUMMARY  
DIVISION OF COST

OCTOBER 1990 PRICE LEVEL

ACCOUNT	FEATURE	CURRENT WORKING ESTIMATE (CWE)	FULLY FUNDED ESTIMATE (FFE)
01-	Lands and Damages	11,000	11,000
14-	Recreation Facilities	723,100	761,400
30-	Planning, Engineering and Design	190,100	190,100
31-	Construction Management	65,800	65,800
	TOTAL PROJECT COST	\$ 990,000	\$1,028,300

Notes: Construction scheduled for March 1991 - October 1992. Fully Funded Estimate (FFE) is based on midpoint of construction date of 1 January 1992, resulting in inflation factor of 1.053, per CECW-B memorandum dated 12 February 1990, subject: Factors for Updating Study/- Project Cost Estimates for the FY 1992 Budget Submission. Factor only applied to construction costs.

## I. Economic Analysis

**Introduction.** This analysis examines the economic feasibility of constructing an additional 2.0 miles of multi-purpose trail to connect existing recreation facilities at Lake Red Rock, Marion County, Iowa. The proposed trail would enhance the recreation experience afforded at the Federally owned and managed park complex. In addition, the trail segment would help fulfill current and future demand for trail facilities in central Iowa.

**Existing Conditions.** Existing facilities at Lake Red Rock include 3.5 miles of multipurpose trail.<sup>1/</sup> The existing trail system is located near the tailwater recreation areas, and crosses the Des Moines River at Howell Station Recreation Area. The trail connects four day use and overnight recreation areas, and is heavily used by walkers, cyclists, and others.

**Trail System Improvements.** The project proposes construction of 10,700 feet of additional multi-purpose trail at Lake Red Rock. The new trail would connect to the existing trail at Howell Station, and would follow a northwesterly path to the North Overlook Recreation Area (see Figure 1 of page 2 of this report).

Construction of the new trail would help fulfill current and forecasted public demand for recreation trails suitable for hiking, walking, cycling, and cross country skiing. The need for additional miles of trail is supported by the market analysis provided in the Des Moines Recreational River and Greenbelt General Design Memorandum (GDM). The GDM reported that over 500 additional miles of trail would be required to fulfill Greenbelt market area demand through 1995, due to the increasing popularity of trail recreation. The proposed multi-purpose trail would enhance recreation opportunities for trail users at Lake Red Rock and within the Des Moines Recreational River and Greenbelt boundaries.

1/ The trail bridge proposed in the Des Moines Recreational River and Greenbelt Feature Design Memorandum No. 3 is assumed constructed and functionally complete.

**Benefit Computation.** The criteria to be used for selecting an appropriate procedure for evaluating recreation projects is detailed in Figure 2.8.2 of the Principles and Guidelines, p. 69 (ER 105-2-40). The steps indicated in the Principles and Guidelines result in selection of the Unit Day Value Method for determining the benefits associated with the proposed trail at Lake Red Rock (see Table 3).

Table 3  
 Criteria for Selecting an Appropriate Procedure  
 for Evaluating Recreation Improvements at Lake Red Rock

Criteria	Answer
Is a regional model available?	No
If "No," do uses affected involve specialized recreation activities?	No
If "No," do estimated annual visits affected exceed 750,000?	No
If "No," do expected recreation costs exceed 25 percent of expended total project costs?	Yes
If "Yes," do specific annual Federal recreation costs exceed \$1,700,000 FY 90 (\$1,000,000 FY 82)?	No
If "No," then use Unit Day Values for evaluating recreation benefits resulting from the proposed project.	

The selection criteria detailed in Table 3 allow consideration for the size of the recreation benefit created and the nature of the activities affected. Selection of a specific evaluation procedure is based on these components as well as the relative importance of any specialized recreation activity, the advantages of the respective methods, and cost considerations. Following the Principles and Guidelines decision criteria and considering the small scale of the proposed project, the Unit Day Value Method was the preferred evaluation procedure for this analysis.

A summary of the Unit Day Value Method assessment is provided in Tables 4 and 5. Table 4 provides an assessment of the trail for bicycle, hiking, and jogging use, while Table 5 provides an assessment of the trail for cross country skiing. As indicated in these tables, the proposed trail improvement would provide an enhanced recreation experience, increased opportunity for use of a longer multi-purpose trail, increased trail carrying capacity, improved accessibility to and between Lake Red Rock recreation amenities, and increased opportunity to view the environmental features of the area. These benefits are detailed in the Principles and Guidelines, Appendix 3 to Section VIII - Unit Day Value Method.

Based on ER 1105-2-100, Revised Table 6-28 (FY90), the Unit Day Value of one bicyclist/hiker or cross country skier using the existing trail network at Lake Red Rock is \$3.86 and \$2.51, respectively. Following completion of the proposed 2.0 mile trail linking the North Overlook and Howell Station

Recreation Areas, this value for bicyclists/hikers would increase by 61 cents, to \$4.47 per recreationist; the value for cross country skiers would increase by 1.17 cents, to \$3.68 per recreationist.

Anticipated Use of New Trail. The Des Moines Recreational River and Greenbelt General Design Memorandum (GDM) reported that a minimum of 500 additional miles of multi-purpose trail within the Greenbelt boundaries would be required to fulfill demand through 1995. Based on the GDM market analysis, it was assumed that the proposed 10,700-foot segment of trail at Lake Red Rock would be fully utilized during the peak summer months of the bicycling/hiking recreation season, and during the winter months of the cross country skiing season. Using the design criteria detailed in the GDM, a total of 5,421 walkers, hikers, and cyclists and 129 cross country skiers would use the trail on a prime weekend day without overcrowding.

Table 4  
 Unit Day Value Assessment for Recreation Experience on Multi-Purpose Trail at  
 Lake Red Rock, With and Without Project Conditions  
 for  
 Bicyclists and Hikers

Criteria	Judgement		Comments
	Without Project	Factor Points With Project	
Recreation Experience	10.0	10.5	New trail would enhance recreation experience for bikers and other trail users, by linking recreation areas and providing a longer, continuous trail experience.
Availability of Opportunity	5.0	9.0	New trail would provide a unique recreation experience in central Iowa, based on length of total trail network, connections to high quality recreation areas, and safety afforded by trail versus highway travel.
Carrying Capacity	8.0	10.0	New trail would be 10,700 feet long and would connect to an existing segment of trail at the reservoir. The new trail would allow increased use of existing recreation amenities at the park complex, and would fulfill a portion of latent demand for multi-purpose trails.
Accessibility	12.0	13.5	New trail would provide safe pedestrian/bicycle access between recreation amenities at the eastern edge of the reservoir. The new trail would access link Howell Station and North Overlook recreation areas.
Environmental	7.0	10.5	New trail would provide enhanced viewing of the reservoir and surrounding wildlife habitat. Trail would provide viewing from an elevated position on the bluffline overlooking the lake.
Total Points	42.0	53.5	
Point Value	\$3.86	\$4.47	

Net increase in value per bicyclist/hiker using trail = \$0.61

Table 5  
 Unit Day Value Assessment for Recreation Experience on Multi-Purpose Trail at Lake Red Rock, With and Without Project Conditions  
 for  
 Cross Country Skiers

Criteria	Judgement Factor Points		Comments
	Without Project	With Project	
Recreation Experience	0	3.5	New trail would provide an ideal opportunity for cross country skiing and other non-motorized winter trail use, by linking recreation areas and providing a longer, continuous trail experience.
Availability of Opportunity	1.0	4.0	New trail would provide a unique cross country skiing experience in central Iowa, based on length of the total trail network, connections to high quality recreation areas, and safety.
Carrying Capacity	1.0	9.0	New trail would be 10,700 feet long and would connect to an existing segment of trail at the reservoir. The new trail would allow increased winter use of existing recreation amenities at the park complex, and would fulfill a portion of latent demand for cross country skiing trails.
Accessibility	6.0	13.5	New trail would provide safe access between recreation amenities at the eastern edge of the reservoir. The new trail would link the North Overlook and Howell Station recreation areas.
Environmental	5.0	10.5	New trail would provide enhanced viewing of the reservoir and surrounding wildlife habitat. Trail would provide viewing from an elevated position on the bluffline overlooking the lake.
Total Points	13.0	40.5	
Point Value	\$2.51	\$3.68	

Net increase in value per cross country skier using trail = \$1.17

Survey data for Rock Island District managed recreation areas indicate that 80 percent of all recreation takes place on weekends. Following the methodology in the GDM, the maximum daily recreation use of the proposed new trail segment (without overcrowding) was converted to peak monthly use:

Bicyclists/Hikers:

5,421	-:-	0.4	x	4.3	-	58,276
peak daily use of new trail		percent of recreation occurring on one weekend day		weeks per month		peak monthly use of proposed trail

Cross Country Skiers:

129	-:-	0.4	x	4.3	-	1,384
peak daily use of new trail		percent of recreation occurring on one weekend day		weeks per month		peak monthly use of proposed trail

Peak monthly use was converted to estimated annual new trail use by applying monthly recreation attendance trends at the Lake Red Rock complex. A summary of recreation data for the Lake Red Rock recreation complex is provided in Table 6.

Based on the data, the annual bicyclist/hiker recreation days of use for the proposed 10,700-foot new trail would total approximately 154,800. Snow cover was assumed sufficient to allow cross country skiing for 7 weeks each year, based on consultation with CENCR geographers and Geographic Information Services staff. Given snow coverage and attendance trends at Lake Red Rock, the annual cross country skier recreation days of use for the new trail segment would be about 2,300. These figures represents a conservative estimate of annual use, as they assume no overcrowding of facilities.

A summary of monthly trail use for the proposed 10 700-foot segment of trail is provided in Table 7. It should be noted that winter use of the trail would include hiking, sightseeing, and general winter activities, in addition to cross country skiing.

Table 6  
Summary of Annual Recreation Data, Lake Red Rock  
Fiscal Year 1990

<u>FY 90</u> <u>Month</u>	<u>Recreation Days</u>	<u>Percent</u>
October	335,200	8.8
November	204,900	5.4
December	101,300	2.6
January	41,000	1.1
February	48,300	1.3
March	116,500	3.0
April	141,300	3.7

Table 6 (continued)

May	556,000	14.6
June	603,000	15.8
July	729,900	19.1
August	491,600	12.9
September	447,900	11.7
	-----	-----
Total	3,816,900	100.0

Table 7  
Expected Monthly Use of the Proposed  
Red Rock Trail Segment II

<u>Month</u>	<u>Recreation Days</u>	<u>Percent</u>
January	3,356	1.1
February	3,967	1.3
March	9,153	3.0
April	11,289	3.7
May	44,546	14.6
June	48,207	15.8
July	58,276	19.1
August	39,359	12.9
September	35,698	11.7
October	26,850	8.8
November	16,476	5.4
December	7,933	2.6
	-----	-----
Total	305,110	100.0

Average Annual Benefit. Assuming no change in annual visitation or use of the new trail, 154,800 hikers/bicyclists and 2,300 cross country skiers would benefit from the 10,700-foot trail addition for the life of the project (50 years). Therefore, the average annual benefits for the trail improvement would amount to \$97,100 ( $154,800 \times \$0.61 + 2,300 \times \$1.17 = \$97,100$ ).

Safety Improvements. The new trail would improve safety conditions for pedestrians and bikers who currently utilize busy roadways and highways at the reservoir to travel from one site to another. The proposed 10,700-foot trail segment would connect existing recreation areas and provide a grade separation crossing (i.e., underpass or tunnel) at Highway T15 for use by recreationists. Highway T15 is a two lane, paved U.S. Highway, featuring a 55 mile per hour speed limit and 3,010 vehicle average daily traffic count.

The high speed of heavy vehicular traffic, combined with short sight distance and numerous intersections with access roads makes the highway extremely dangerous for recreationists to travel or cross. With the provision of a grade separation crossing (i.e., underpass or tunnel), the trail would effectively eliminate conflicts between motorists, bicyclists, and pedestrians at the northern portion of highway T15, which crosses the dam.

Data from the Marion County, Iowa Sheriff's Department and Lake Red Rock Reservoir indicate that four traffic accidents have occurred on Highway T15 in 1990, all of these within 1.5 miles of the proposed trail grade separation crossing. Two of the 1990 accidents took place at the approximate location of the trail underpass structure.

None of the accidents in 1990 involved fatalities; however, each resulted in personal injuries and property damages. The estimated cost of the accidents was \$9,500 on average, based on American Association of State Highway and Transportation Officials (AASHTO) data. The total annual accident cost for the affected highway in 1990 was, therefore, \$38,000.

This analysis assumes that the annual accident rate would remain at current levels (four accidents per year) without the Segment II trail project. Construction of the trail and grade separation crossing would improve safety levels for the Highway T15 motorists, by reducing/removing pedestrians and non-motorized recreation traffic. It is estimated that a 10 percent reduction in Highway T15 accident costs would be realized following construction of the proposed trail and grade separation crossing. Therefore, the average annual benefit resulting from accident reductions following construction of the new trail segment would total \$3,800.

Average Annual Cost. Construction, operation, and maintenance costs detailed in this report are presented at August 1990 price levels. Interest during construction was not calculated as project benefits would accrue as each phase of the trail construction is completed. A detailed cost estimate is shown on Tables 1 and 2 and average annual costs computed at an 8-7/8 percent discount rate are shown on Table 8.

**Table 8**  
**Summary of Annual Costs**  
**Red Rock Trail Segment II**  
 (8-7/8 Percent Discount Rate, August 1990 Price Levels, 50 Year Project Life)

	Cost in \$1,000s	Cost in \$1,000s
Estimated Project Cost	990.0	
Annualized First Cost		89.1
Annual Operation and Maintenance		3.0
		92.1
Total Annual Cost		

Economic Summary. Table 9 presents a summary economic analysis for the proposed recreation enhancement project. As indicated, the project is economically justified, with net annual benefits totaling \$8,800 and a benefit-to-cost ratio of 1.10.

Table 9  
Benefits and Cost Summary, Red Rock Trail Segment II  
(8-7/8 Percent Discount Rate, August 1990 Price Levels, 50  
Year Project Life)

Annual Benefit	100.9
Total First Cost	990.0
Annual Cost	92.1
Annualize First Cost	(89.1)
Annual Operation and Maintenance	( 3.0)
Net Annual Benefit	8.8
Benefit-to-Cost Ratio	1.10

Sensitivity Analysis. This assessment measures only those benefits realized by current recreationists traveling the proposed multi-purpose trail. These benefits were based on recreationists pursuing cycling, hiking, walking, and jogging, and cross country skiing.

Additional benefits would be realized. The new trail segment would likely result in increased use of affected camping, picnic, and other recreation amenities at the reservoir complex. Provision of a trail connecting the affected recreation areas would also reduce the travel distance and inconvenience associated with traveling between these recreation areas by the existing roadway and trail system. These benefits and others were not included in this analysis in order to simplify the calculations; however, with their inclusion, the resulting project benefits would be even greater.

## J. Environmental Assessment

Purpose and Alternatives - The purpose of this environmental assessment is to address the effects of construction of the trail segment as described in Section II of this report. Alternatives to the proposed action include the no Federal action alternative, and trail construction following other alignments. Alternative alignments were evaluated for the portion of the trail which crosses the dam access road and for the portion which traverses the northwest quarter of Section 18. These alternatives are described in detail in Section II.

The selected design will traverse a variety of landscapes and will provide nonmotorized access between Howell Station and North Overlook recreation areas on the north side of Lake Red Rock. With no Federal action, no project impacts would occur; however, no long-term benefits to recreation would be expected.

Preliminary review of alternative trail alignments showed that development of a bridge crossing over County Highway T-15, and locating the trail within the flood control pool area, would increase the total length of recreational trail provided by the project. However, these alternatives would involve greater losses or disturbance of aquatic and terrestrial habitat and existing recreational facilities. While this would result in greater impacts to natural and recreation resources and would be less economically feasible, long-term overall impacts are not anticipated to be significant for any of the alternatives evaluated in this study.

Major Findings and Conclusions - The project is expected to be beneficial to recreation resources with no significant impacts to natural, cultural, economic or social resources. For this reason, an Environmental Impact Statement (EIS) will not be prepared for this action. Because the nonpreferred alignment is subject to the provisions of the Clean Water Act, a 404(b)(1) Evaluation has been prepared for this alternative (see Appendix B). Section 401 certification has been requested from the Iowa Department of Natural Resources in a letter dated 17 August 1990. A copy of this letter is included in Appendix D.

Relationship to Environmental Requirements - The project will comply with Federal environmental laws, Executive orders and policies, and State and local policies including the Clean Air Act, as amended; the Clean Water Act, as amended; the Endangered Species Act of 1973, as amended; the Federal Water Project Recreation Act; the Fish and Wildlife Coordination Act of 1958, as amended; the Land and Water Conservation Fund Act of 1966, as amended; the National Environmental Policy Act of 1969, as amended; and the National Historic Preservation Act of 1966, as amended.

The preferred alignment is located primarily on Federally owned land. Acquisition of private property as described in Section II(c)(1) will not result in the conversion of prime farmland to other uses. This

segment of the Des Moines River is not a Federally recognized wild or scenic river. The project will not result in any significant change in floodplain storage, and no loss of wetlands will occur from project construction or operation. Therefore, this action will not conflict with the provisions of the Farmland Protection Policy Act of 1981, Executive Order 11988, Floodplain Management, Executive Order 11990, Protection of Wetlands, or the Wild and Scenic Rivers Act of 1968.

Affected Environment - The site of the proposed trail construction is located in sections 18 and 19, T76N, R18W, Marion County, Iowa. The trail segment begins just downstream of Red Rock Dam at the Howell Station Campground and runs in a generally northeasterly direction through the tailwater area. The alignment crosses County Road T15 at the North Overlook Campground in section 18. Within section 18, the nonpreferred alignment runs from the upland areas down to the flood control pool of the reservoir, and back into the upland areas on its way to Wallashuck Recreation Area. The preferred alignment traverses a tract of privately owned upland currently in agricultural use.

The preferred alignment is located almost entirely within the Federal boundary. Most of this land is zoned for high density recreational use, with the exception of a tract of reserve forest land in section 18. The alignment traverses a variety of land use and habitat types. These include former borrow areas, developed recreation areas, plantations of trees and prairie grasses, and natural areas with herbaceous, shrub or deciduous forest cover. Borrow material to be used for trail construction will be obtained from a previously used borrow/disposal area located near the beginning of Segment II at the Howell Station recreation area, a previously used borrow area adjacent to the sewage lagoons near North Overlook recreation area, and from a site located in the flood control pool. Borrow activity will not affect significant cultural resources or other environmental concerns.

The compartment report for the Natural Resource Inventory System for Lake Red Rock lists the upland forest tract in Section 18 as notable in maturity and diversity of woody vegetation. Dominant species include white oak (Quercus alba), red oak (Quercus rubra), and shagbark hickory (Carya ovata). Other notable species include American basswood (Tilia americana), bur oak (Quercus macrocarpa), black cherry (Prunus serotina), and slippery elm (Ulmus rubra). Understory species include slippery elm, shagbark hickory, and rough-leaved dogwood (Cornus drummondii).

Wildlife species found in the project area include songbirds and small mammals such as mice, shrews, voles, squirrels, rabbits, opossums, raccoons, and skunks. Game species such as white-tailed deer, bobwhite quail, ringnecked pheasant, and wild turkey also may utilize this area. The mature forest also provides habitat for the northern flicker and other woodpecker species, as well as nesting cavities for owls and small mammals.

District staff conducted a field reconnaissance of the upland forest areas on September 26, 1988, accompanied by biologists Rick Trine of the Iowa Department of Natural Resources (IDNR) and Dr. John Bowles of Central College in Pella, Iowa. Field observations revealed that the majority of trees in the area are sapling to medium sized. However, a noticeable minority of mature aged and cavity trees were found which could be utilized as roosting or nesting habitat.

Environmental Effects - Construction of the trail segment will result in the loss of some herbaceous and woody vegetation. The preferred alignment was designed to avoid or minimize adverse effects on natural vegetation where possible. Because the area of direct impact is relatively small, no loss of overall habitat value is expected. For this reason, no significant impacts are anticipated to result from this action.

The long-term effect of the project is expected to be beneficial to man-made resources in the area with no adverse effect on natural resources. Some benefits to existing recreational resources would be expected from improving access between the intensively used Howell Station and North Overlook recreation areas. Wildlife species which may currently utilize the project area will not be significantly affected by the action. The U.S. Fish and Wildlife Service concurred with this determination in a letter dated July 5, 1990 (see Appendix B).

There are two federally listed threatened and endangered species listed for Marion County. These are the bald eagle (Haliaeetus leucocephalus) and the Indiana bat (Myotis sodalis). Bald eagles utilize large trees along the shoreline of the Des Moines River as resting and feeding perches during winter months. No such trees would need to be removed for construction of the trail segment. Use of the trail is not expected to disrupt eagle feeding habits. For these reasons, no significant impacts to the bald eagle are anticipated at this time. The U.S. Fish and Wildlife Service concurred with this determination in a letter dated July 5, 1990 (see appendix B).

The Indiana bat uses large trees with cavities or loose bark as summer roosts, and uses caves as winter hibernacula. The presence of this species in the project area was documented by Dr. Bowles during surveys conducted from 1980 through 1983. Consultations with Dr. Bowles and Rick Trine of the IDNR indicated that, provided the trail segment will be aligned to avoid the removal of potential roost trees where possible and to minimize impacts to vegetation as a whole, no direct impacts to the bat are expected to result from construction.

Minor, temporary impacts to noise levels and air quality may occur as a result of construction and transportation of materials. This may have temporary adverse effects on users of nearby recreational sites. No long-term significant impacts are anticipated and no air quality standards should be violated.

Minor temporary increases in turbidity and levels of suspended sediments would occur during construction activity. No long-term adverse effects to water quality are anticipated. A Section 404(b)(1) Evaluation has been prepared and is attached to this document. Section 401 certification has been requested from the State of Iowa by letter dated 17 August 1990, and will be obtained prior to construction.

An archaeological survey of the proposed trail alignment was conducted by American Resources Group, Ltd. under contract with the Rock Island District. The survey determined that no significant historic properties will be impacted by the proposed project. The Iowa State Historic Preservation Office concurred with this determination in a letter to the District dated August 14, 1990. The proposed project may proceed in full compliance with the National Historic Preservation Act.

Socioeconomic impacts associated with the Red Rock Trails Segment II trail construction would be positive. The proposed trail segment would connect to existing trails and link recreation and other public facilities. The project would require no residential relocations, and would result in no significant impacts to community or regional growth, or community cohesion.

Public facilities and services would benefit from improved facilities and greater accessibility. Construction of the trail segment would help fulfill the current and projected public demand for recreation trails within the Des Moines Recreational River and Greenbelt boundaries, and would provide for a more enjoyable recreation experience. The new trail would provide safe passage between the affected recreation amenities, reducing potential life, health, and safety threats associated with the road route trail users currently travel to access the affected recreation areas.

The project would be primarily on Federal lands, and therefore, would result in no significant impacts to property values or related tax revenues. Project construction would result in no noticeable impacts to employment or the labor force in Marion County, Iowa. No changes in industrial activity would be noticed during or after construction, and no business or farm relocations would be required. Aesthetic values will not be significantly affected by this action.

The proposed alignment is expected to provide an aesthetically pleasing view to trail users. Reservoir lands located between North Overlook and Wallashuck recreation areas are currently open to public hunting. Use of this portion of trail which traverses these lands may need to be restricted at seasonal periods during late fall and winter, to avoid conflicts in use. Because trail use is expected to be low at these times and because the trail will remain open in areas where hunting is not currently allowed, no significant reduction in trail use

is anticipated. For these reason, no changes in existing land-use plans should be required for this action.

With no Federal action, no adverse effects would occur from construction; however, no long-term benefits to recreation would be expected. Alternative locations for the bridge and trail segment would be anticipated to have impacts similar to or greater than the preferred alternative.

Coordination - Coordination has been maintained throughout the planning and design process with the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the Iowa Department of Natural Resources, and the State Historic Preservation Officer (SHPO). Copies of coordination letters and telephone conversation records are contained in Appendix D. Development of multi-purpose trails at Lake Red Rock was proposed and coordinated in the Resource Master Plan, Design Memorandum No. 24b for Red Rock Dam and Lake Red Rock (December 1976).

The Greenbelt Multi-Purpose Trail project was documented and coordinated in the programmatic EIS for the Greenbelt General Design Memorandum, dated September 1987. This action was not selected for review by the State of Iowa under Executive Order 12372, State Single Point of Contact; therefore, the project is being coordinated with the Governor's Representative for Civil Works, which is the Department of Natural Resources.

### III. Plan Implementation

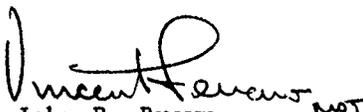
A. Schedule for Design and Construction: The project is scheduled to be designed and construction initiated in FY91. Construction should be completed in FY92.

B. Implementation Responsibilities: The Corps of Engineers is responsible for design, construction, and operation and maintenance of this project.

C. Coordination Meetings: Close coordination has been maintained between planning, engineering, and operation personnel within the Rock Island District. Government officials from the State of Iowa, Marion County, City of Pella and the City of Knoxville have been kept informed of the projects status through the Greenbelt Advisory Committee meetings and news letters. There is strong local support for the project.

IV. Recommendation

I recommend the construction of the Multi-Purpose Trail, Red Rock Segment II, under the authority of the Des Moines Recreational Greenbelt, IA, at a Federal cost of \$1,028,000. This project would be operated and maintained by the Federal government. Use of portions of the trail segment which pass through public hunting areas will be restricted at seasonal periods during late fall and winter to avoid conflicts in use.

  
John R. Brown  
Colonel, U.S. Army  
District Engineer

FINDING OF NO SIGNIFICANT IMPACT

DES MOINES RECREATIONAL RIVER AND GREENBELT  
FEATURE DESIGN MEMORANDUM NO. 5  
MULTI-PURPOSE TRAIL  
RED ROCK - SEGMENT II  
MARION COUNTY, IOWA

I have reviewed the information provided by this Environmental Assessment, along with data obtained from cooperating Federal, State and local agencies and from the interested public. Based on this review, I find that construction of the proposed trail segment will not significantly affect the quality of the environment. Therefore, it is my determination that an Environmental Impact Statement is not required. This determination will be reevaluated if warranted by later developments.

Alternatives considered along with the preferred action were:

- No Federal Action
- Other trail alignments

Factors considered in making a determination that an Environmental Impact Statement was not required are as follows:

- a. The action is expected to enhance low-density recreational use on land zoned for that purpose.
- b. The preferred alignment was designed to minimize impacts to natural resources and to avoid placement of fill material below the Ordinary High Water elevation.
- c. No significant social, economic, environmental or cultural impacts are anticipated as a result of this action.

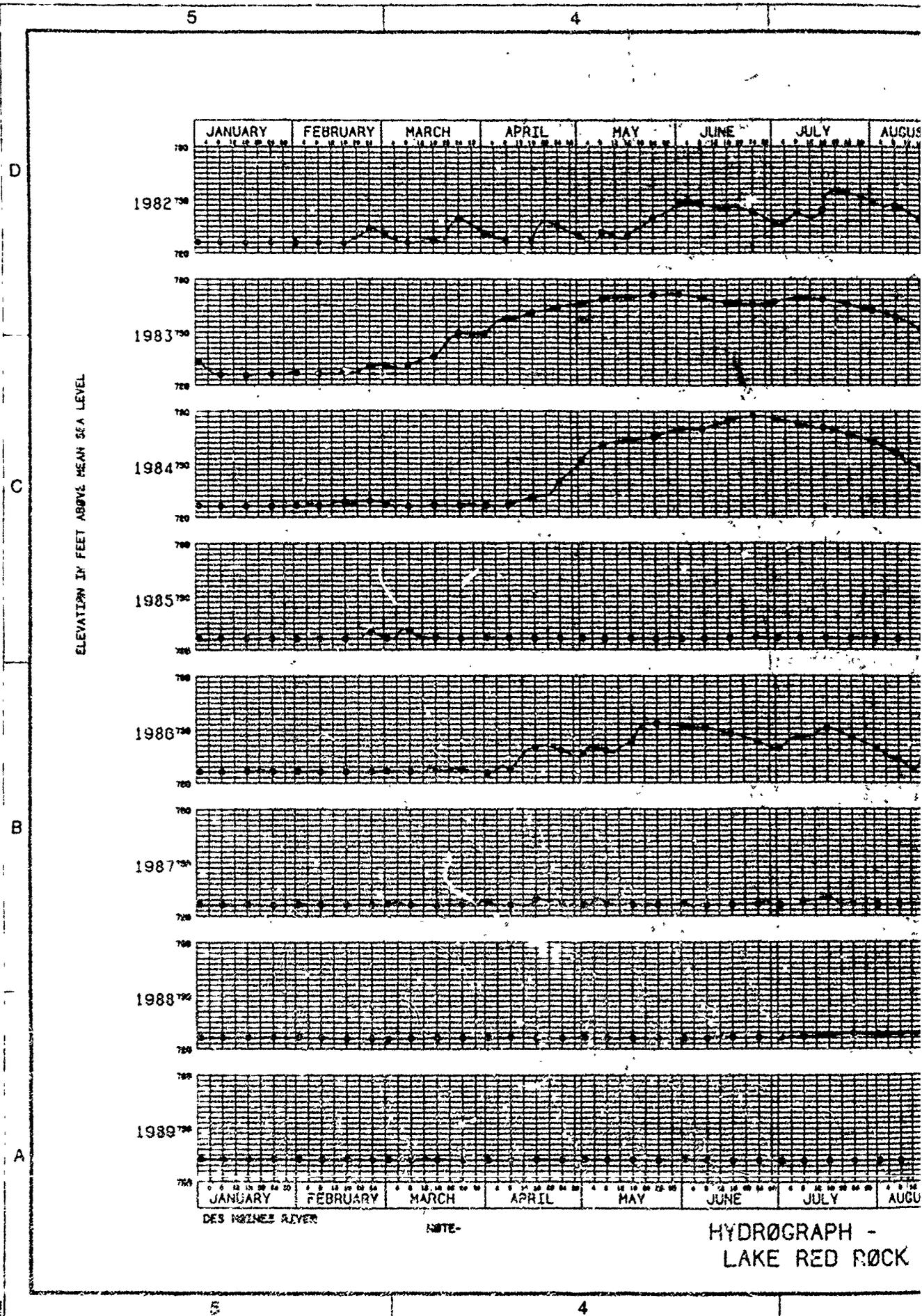
5 MAR 91  
Date

*for*    
John R. Brown <sup>MSJ</sup>  
Colonel, U.S. Army  
District Engineer









ELEVATION IN FEET ABOVE MEAN SEA LEVEL

D

C

B

A

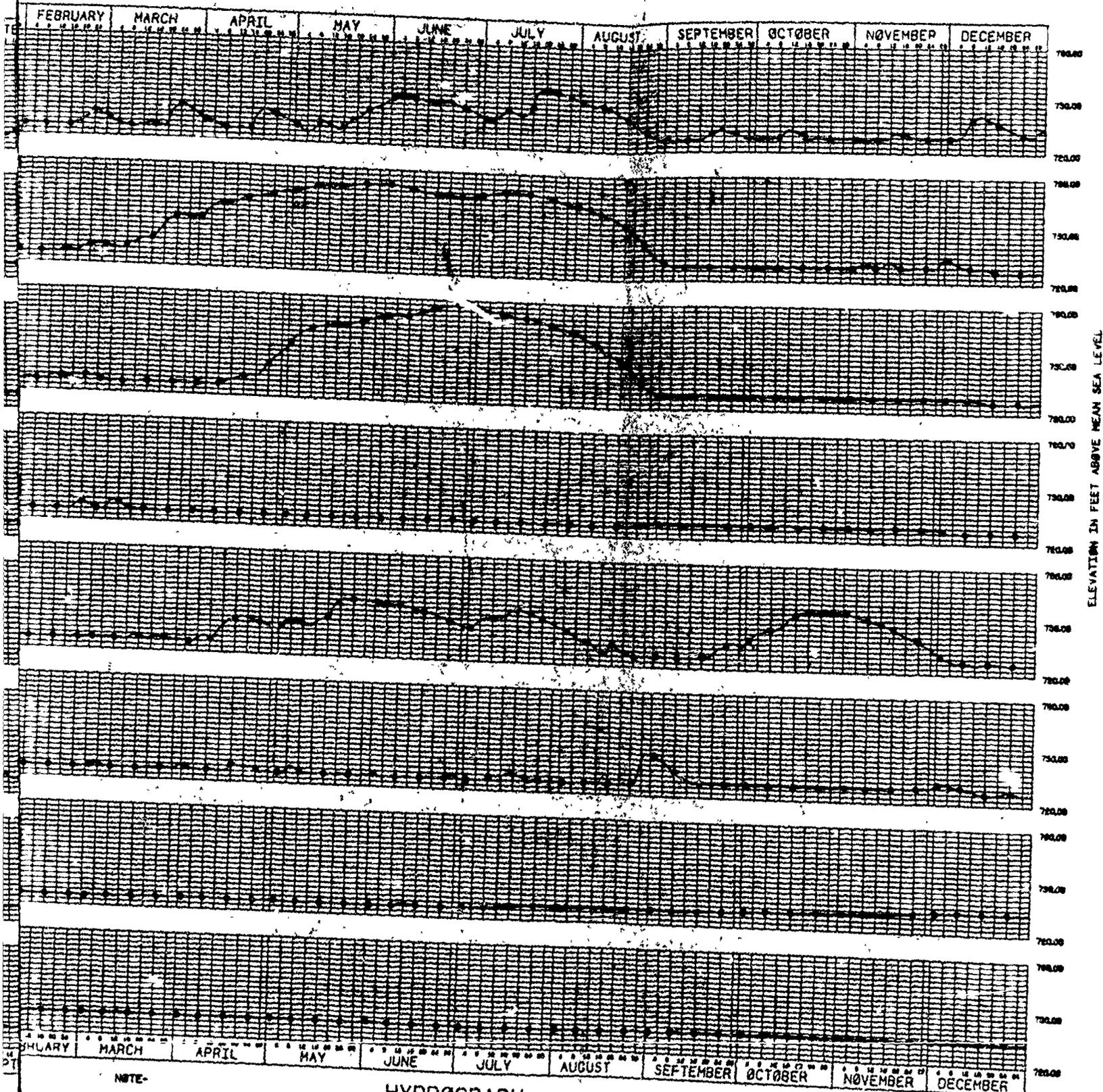
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST

DES MOINES RIVER

NOTE-

HYDROGRAPH - LAKE RED ROCK

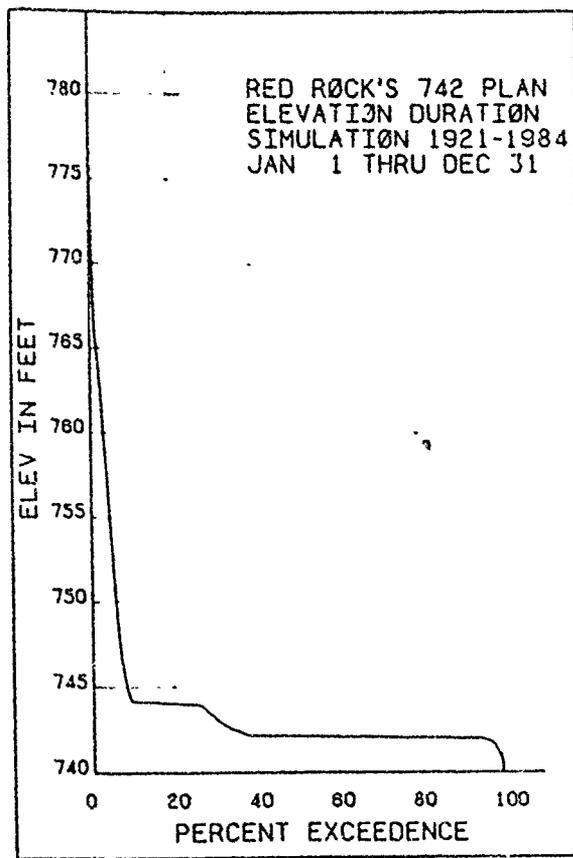
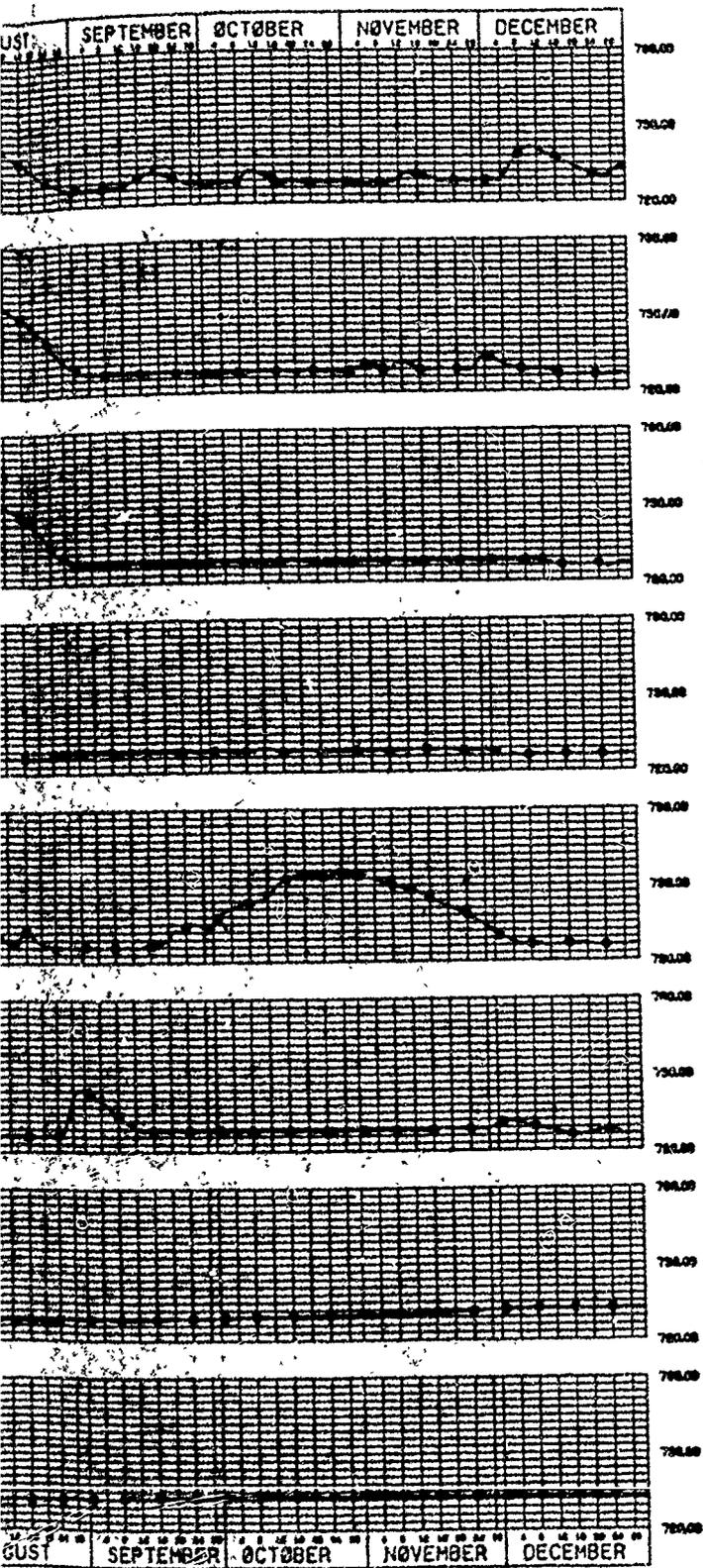


ELEVATION IN FEET ABOVE MEAN SEA LEVEL

NOTE-

HYDROGRAPH -  
LAKE RED ROCK POOL





ELEVATION IN FEET ABOVE MEAN SEA LEVEL

Revisions			
Symbol	Description	Date	Approved

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

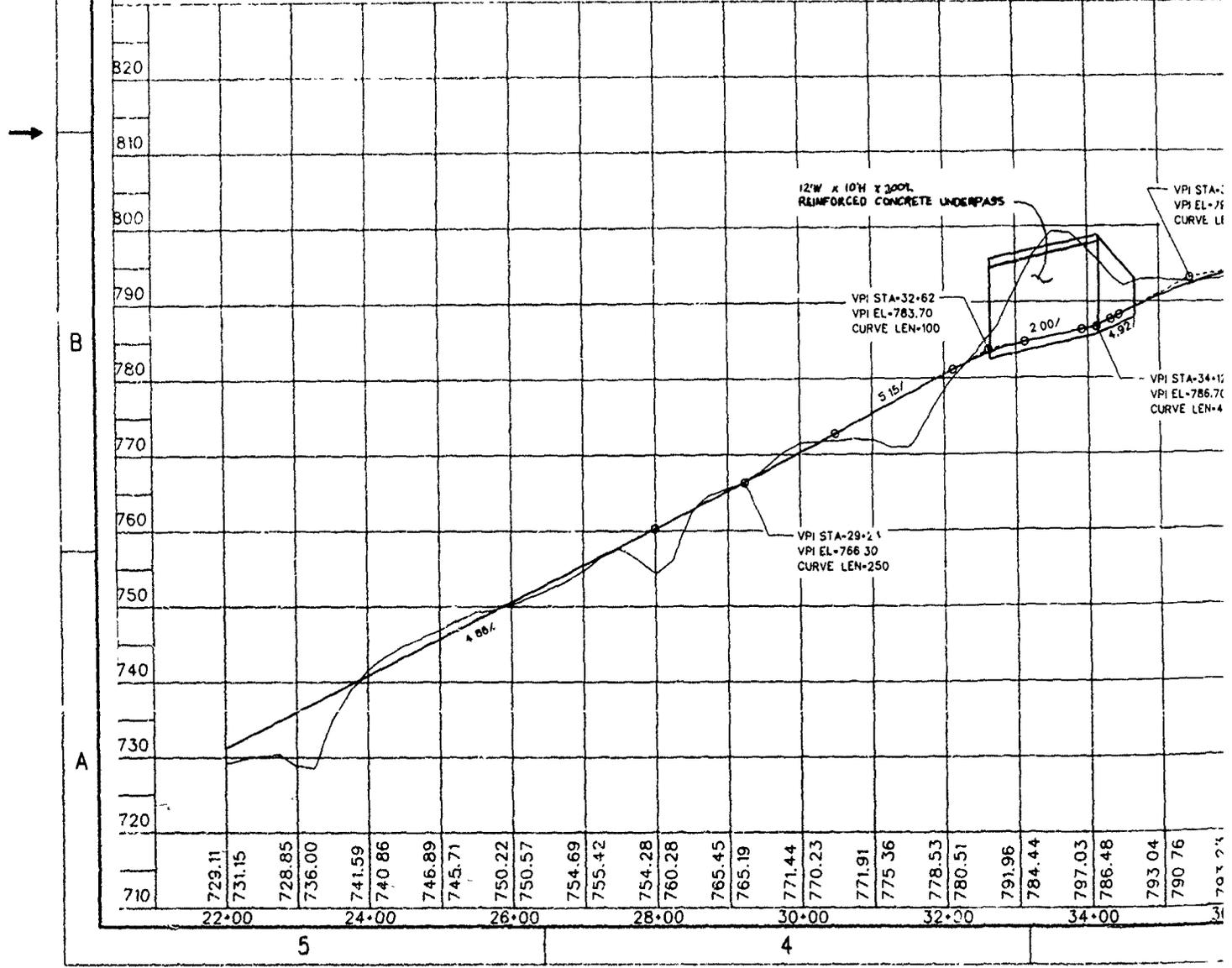
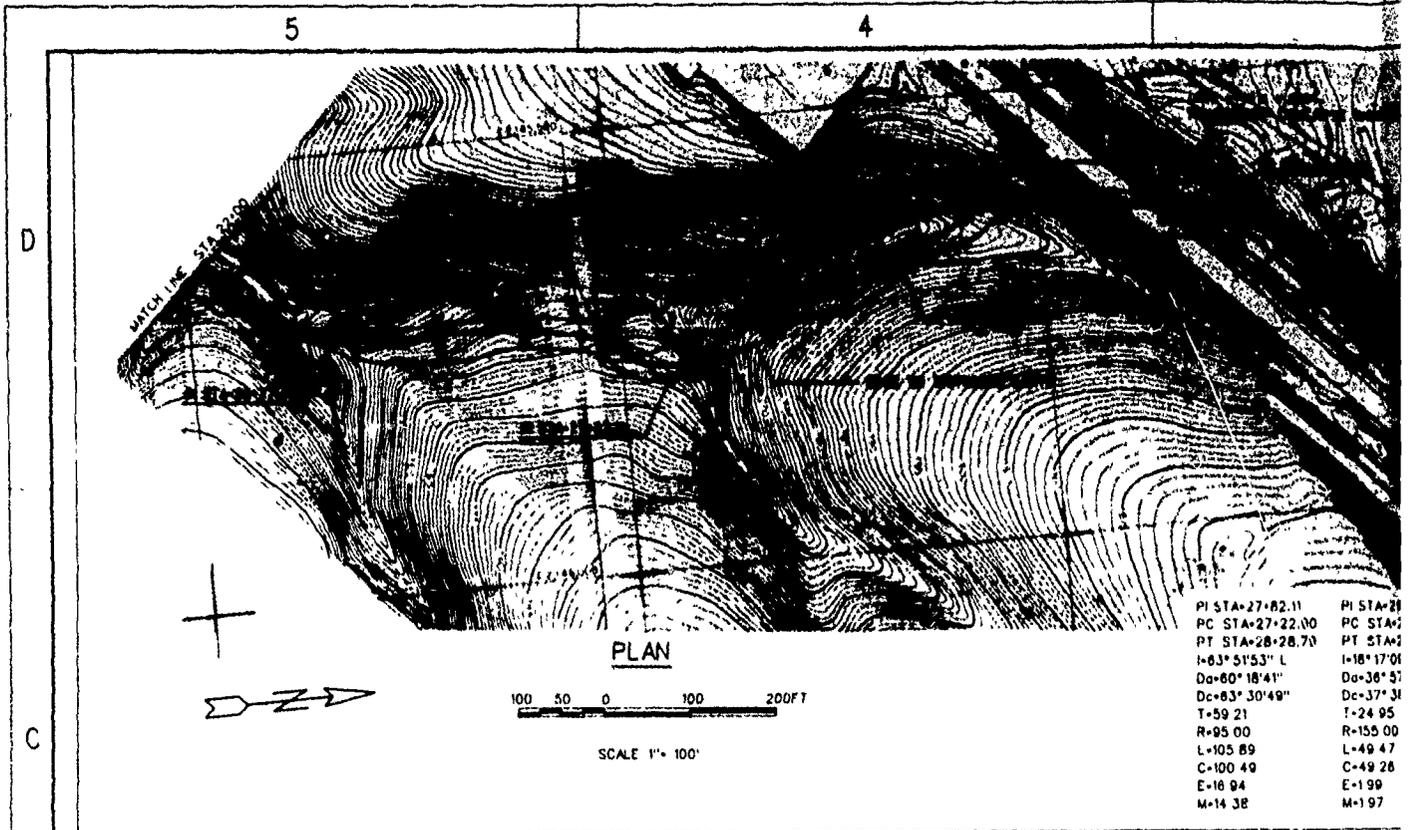
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Approved by:		Scale: <b>As shown</b>		Sheet reference number:
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POOL



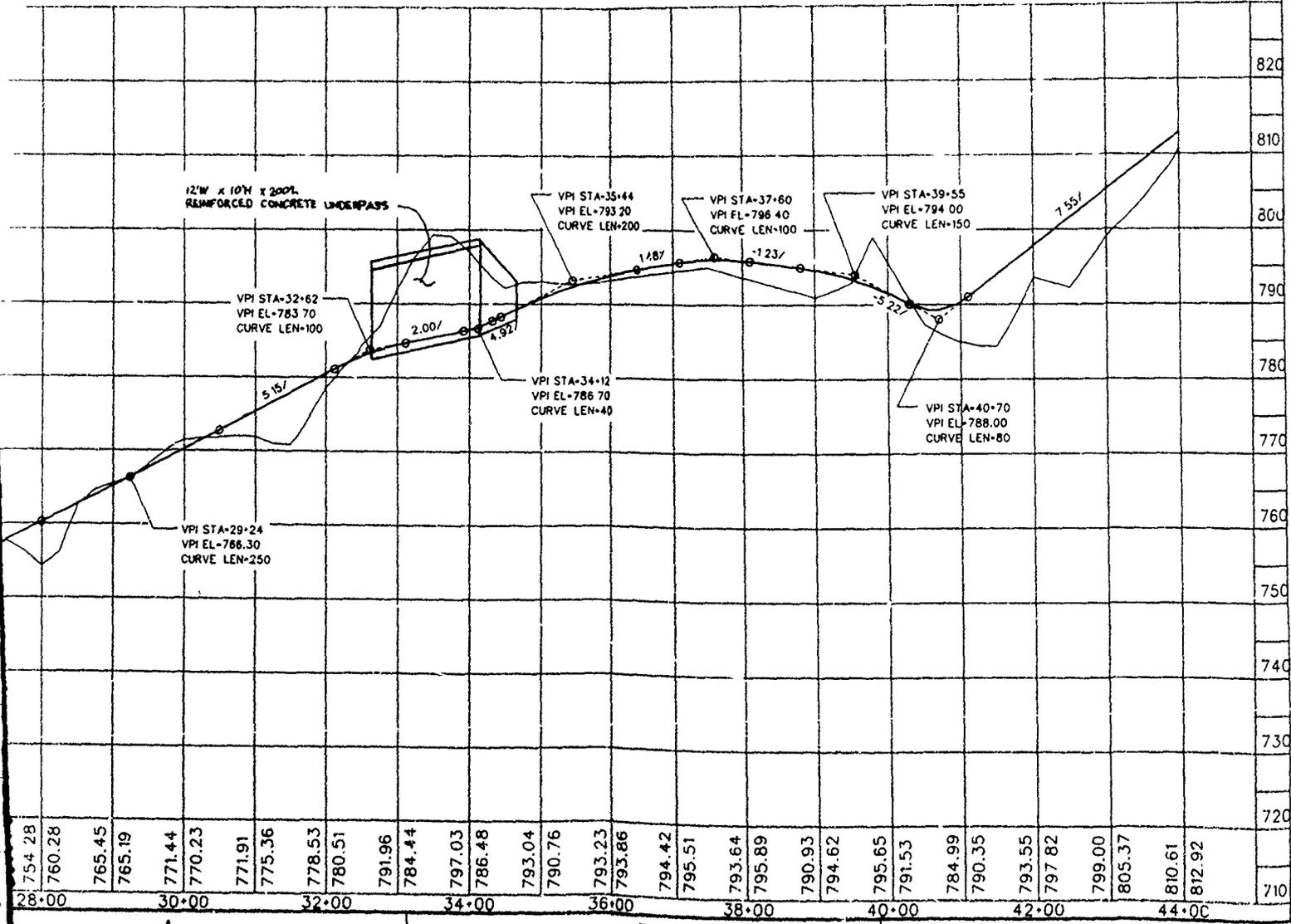




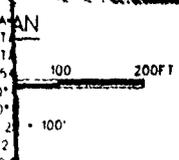




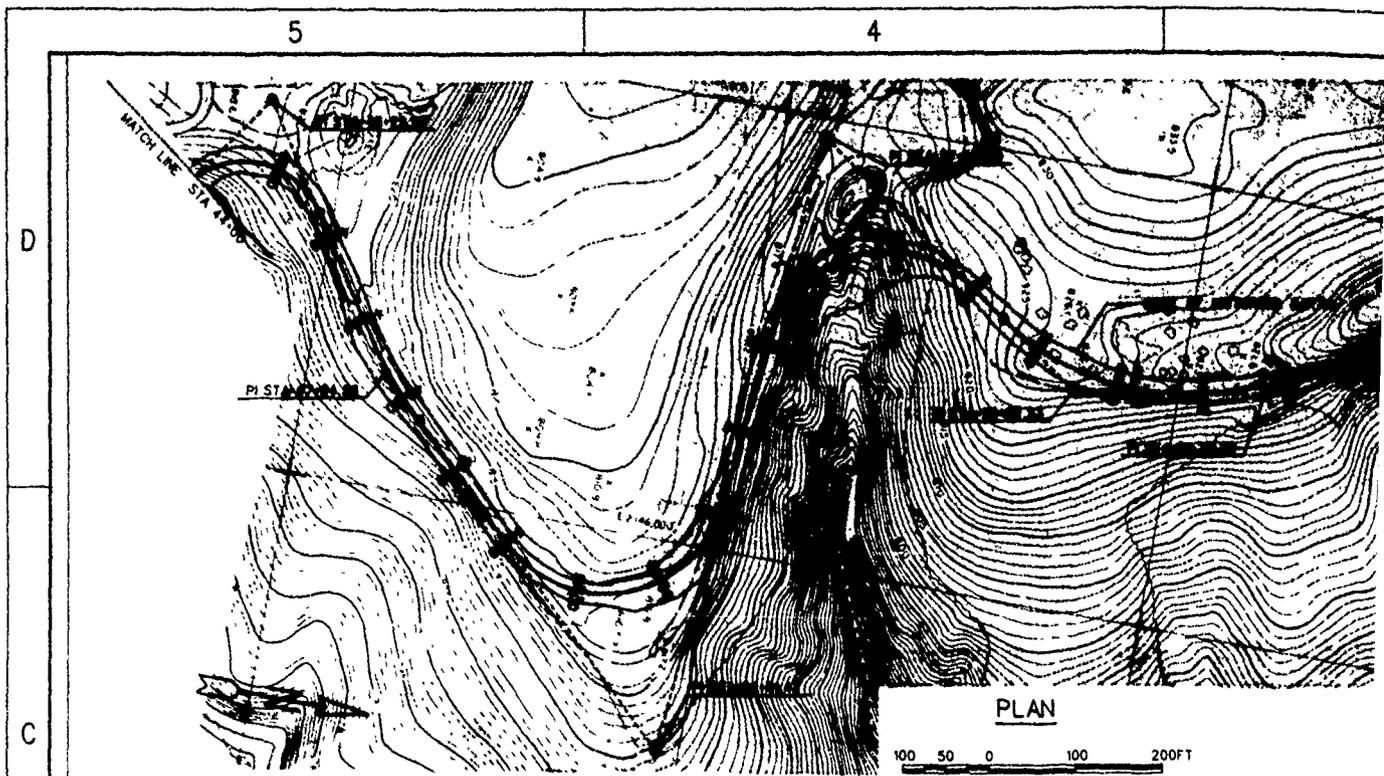
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PT STA-22-84.58	PT STA-24-52.81								
I=26° 27' 32" L	I=30° 49' 59" L								
Da=20° 00' 00"	Da=20° 00' 00"								
Dc=20° 08' 11"	Dc=20° 08' 11"								
T=67.35	T=79.00								
R=288.48	R=288.48								
L=152.29	L=154.16								
C=131.12	C=152.31								
E=7.81	E=10.89								
M=7.60	M=10.31								
PI STA-25-84.61	PI STA-26-88.41								
PL STA-25-56.24	PC STA-26-88.81								
PT STA-26-12.78	PT STA-27-05.84								
I=11° 18' 36" R	I=23° 32' 09" R								
Da=20° 00' 00"	Da=60° 18' 41"								
Dc=20° 08' 11"	Dc=63° 30' 49"								
T=28.37	T=19.79								
R=288.48	R=95.00								
L=58.53	L=39.02								
C=56.46	C=38.75								
E=1.40	E=2.04								
M=1.39	M=2.00								
PI STA-27-82.11	PI STA-28-78.25	PI STA-29-78.25	PI STA-30-70.21	PI STA-31-61.73	PI STA-32-45.08	PI STA-33-14.64	PI STA-34-83.08	PI STA-35-41.60	PI STA-36-01.86
PC STA-27-22.90	PC STA-28-01.31	PC STA-28-79.86	PC STA-29-79.86	PC STA-31-81.73	PC STA-32-45.08	PC STA-34-32.53	PC STA-34-32.53	PC STA-38-96.25	PC STA-42-85.71
PT STA-28-26.79	PT STA-29-50.78	PT STA-31-58.99	PT STA-31-58.99	PT STA-32-45.08	PT STA-34-91.65	PT STA-34-91.65	PT STA-34-91.65	PT STA-41-29.84	PT STA-43-17.89
I=63° 51' 53" L	I=18° 17' 08" R	I=17° 54' 13" L	I=17° 54' 13" L	I=38° 12' 25" R	I=35° 39' 22" R	I=35° 39' 22" R	I=35° 39' 22" R	I=11° 31' 51" L	I=12° 17' 38" R
Da=60° 18' 41"	Da=38° 57' 54"	Da=10° 00' 00"	Da=10° 00' 46"	Da=60° 18' 41"	Da=60° 18' 41"	Da=60° 18' 41"	Da=60° 18' 41"	Da=47° 44' 47"	Da=38° 11' 50"
Dc=63° 30' 49"	Dc=37° 38' 17"	Dc=10° 00' 46"	Dc=10° 00' 46"	Dc=63° 30' 49"	Dc=63° 30' 49"	Dc=63° 30' 49"	Dc=63° 30' 49"	Dc=49° 14' 55"	Dc=38° 58' 33"
T=59.21	T=24.95	T=90.25	T=90.25	T=32.90	T=32.90	T=30.55	T=30.55	T=176.35	T=16.15
R=95.00	R=155.00	R=572.96	R=572.96	R=95.00	R=95.00	R=95.00	R=95.00	R=120.00	R=150.00
L=105.89	L=49.47	L=179.04	L=179.04	L=63.55	L=63.55	L=59.12	L=59.12	L=233.59	L=32.19
C=100.49	C=49.26	C=178.31	C=178.31	C=62.18	C=62.18	C=58.17	C=58.17	C=198.42	C=32.12
E=16.94	E=1.99	E=7.06	E=7.06	E=5.54	E=5.54	E=4.79	E=4.79	E=93.30	E=0.87
M=14.38	M=1.97	M=6.98	M=6.98	M=5.23	M=5.23	M=4.56	M=4.56	M=52.49	M=0.86



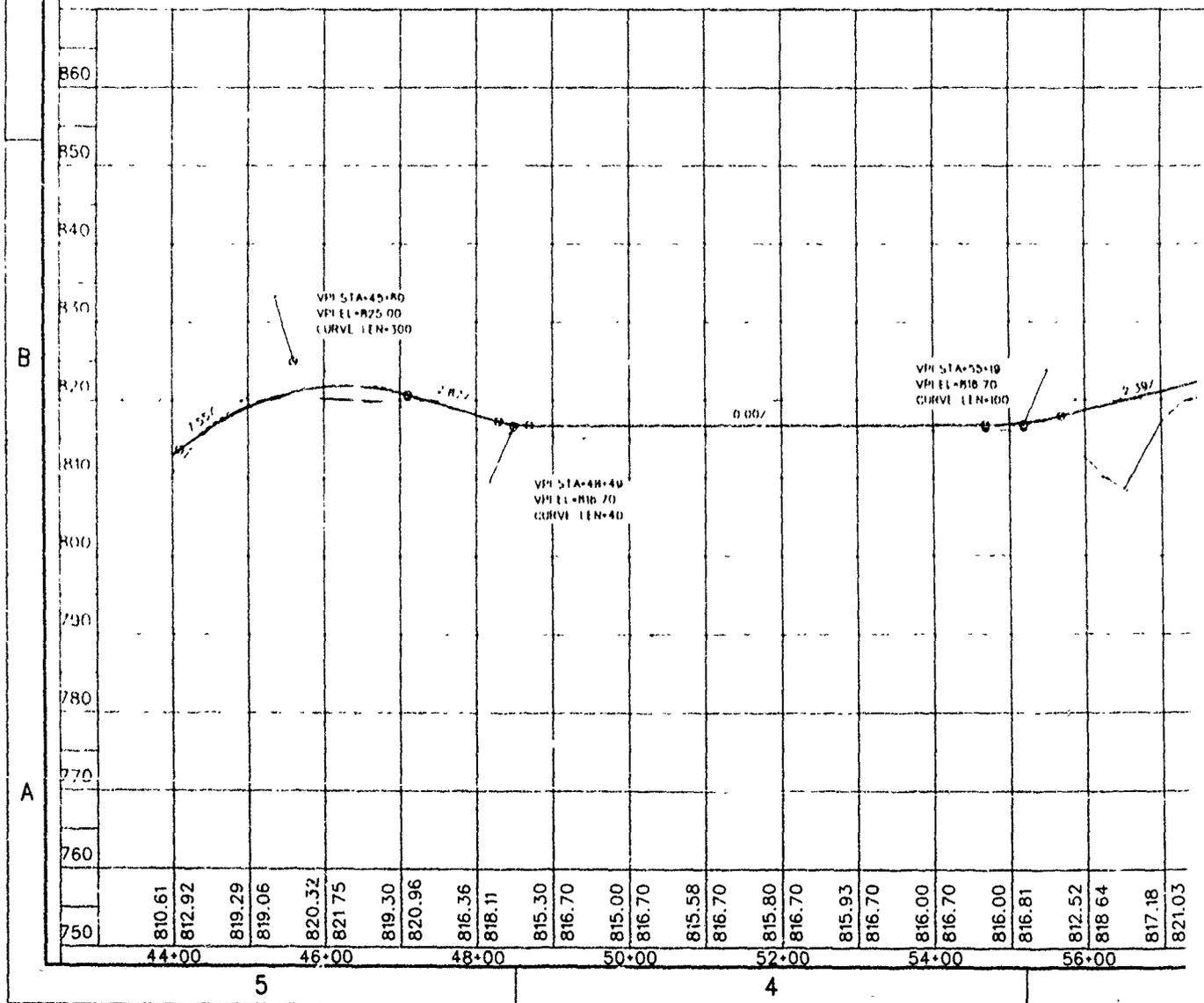
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720	Check
730	Draw
740	Design
750	
760	
770	
780	
790	
800	
810	
820	







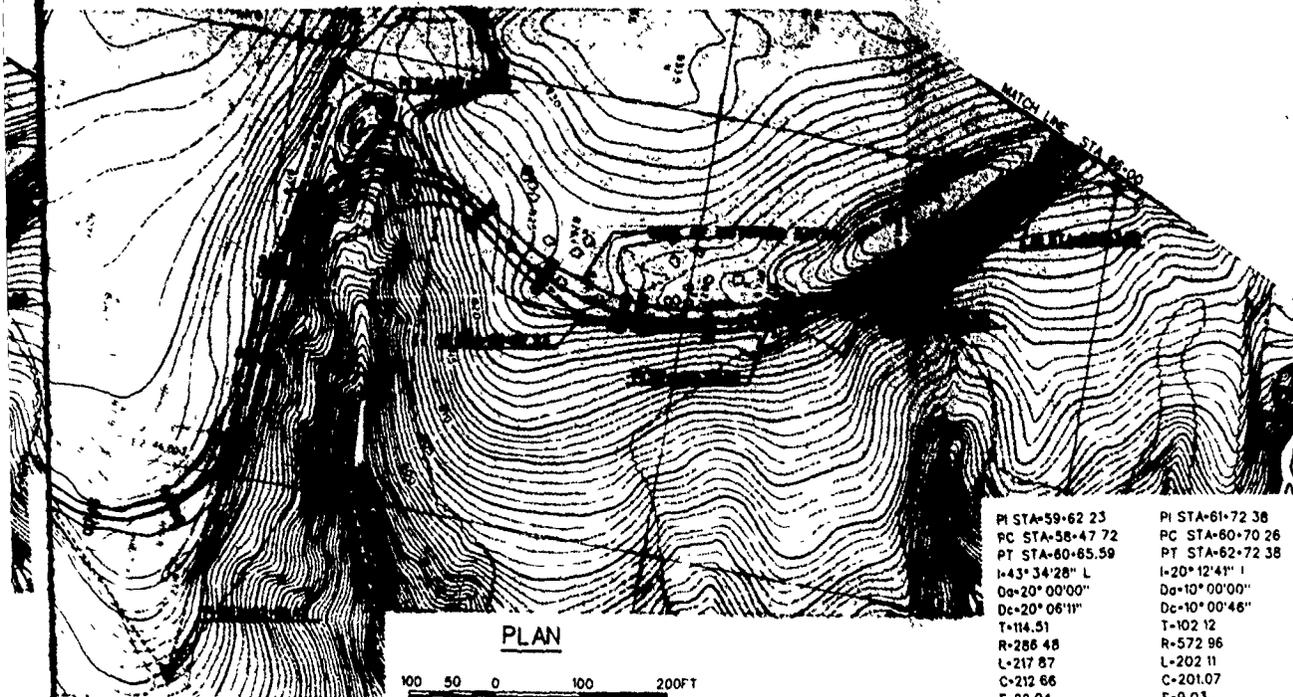
SCALE: 1" = 100'



4

3

2



PLAN

100 50 0 100 200FT

SCALE: 1" = 100'

PI STA=45+22.97  
 PC STA=43+85.08  
 PT STA=45+88.91  
 I=10° 52' 12" R  
 Da=60° 18' 41"  
 Dc=63° 30' 49"  
 T=137.89  
 R=95.00  
 L=183.83  
 C=158.46  
 E=72.45  
 M=41.10

PI STA=47+64.58  
 PC STA=46+98.15  
 PT STA=48+30.37  
 I=13° 13' 21" L  
 Da=10° 00' 00"  
 Dc=10° 00' 48"  
 T=66.41  
 R=572.96  
 L=132.23  
 C=131.93  
 E=3.84  
 M=3.81

PI STA=52+91.47  
 PC STA=49+99.55  
 PT STA=53+18.86  
 I=127° 43' 39" L  
 Da=40° 00' 00"  
 Dc=40° 51' 37"  
 T=291.92  
 R=143.24  
 L=319.32  
 C=257.19  
 E=181.93  
 M=80.14

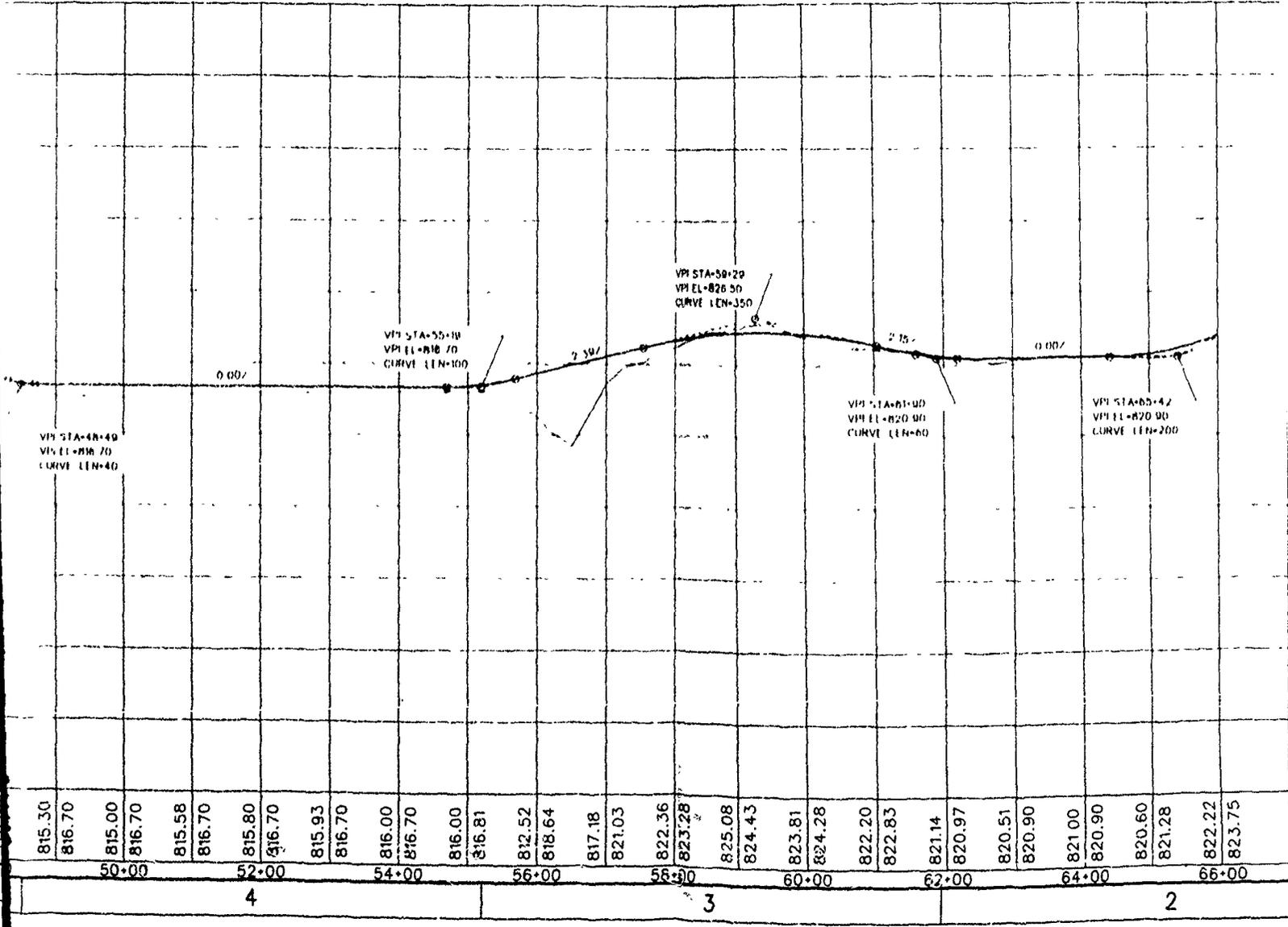
PI STA=57+44.59  
 PC STA=55+01.68  
 PT STA=57+99.04  
 I=118° 56' 51" R  
 Da=40° 00' 00"  
 Dc=40° 51' 37"  
 T=242.92  
 R=143.24  
 L=297.37  
 C=246.77  
 E=138.77  
 M=70.48

PI STA=59+62.23  
 PC STA=58+47.72  
 PT STA=60+85.59  
 I=43° 34' 28" L  
 Da=20° 00' 00"  
 Dc=20° 06' 11"  
 T=114.51  
 R=288.48  
 L=217.87  
 C=212.66  
 E=22.04  
 M=20.46

PI STA=61+72.38  
 PC STA=60+70.26  
 PT STA=62+72.38  
 I=20° 12' 41" L  
 Da=10° 00' 00"  
 Dc=10° 00' 46"  
 T=102.12  
 R=572.96  
 L=202.11  
 C=201.07  
 E=9.03  
 M=8.89

PI STA=63+43.95  
 PC STA=62+97.33  
 PT STA=63+90.37  
 I=9° 18' 17" L  
 Da=10° 00' 00"  
 Dc=10° 00' 46"  
 T=46.63  
 R=572.96  
 L=93.05  
 C=92.94  
 E=1.89  
 M=1.89

PI STA=65+53.81  
 PC STA=64+76.49  
 PT STA=66+27.53  
 I=30° 12' 30" L  
 Da=20° 00' 00"  
 Dc=20° 06' 11"  
 T=77.32  
 R=288.48  
 L=151.04  
 C=149.30  
 E=10.25  
 M=9.90



3

4

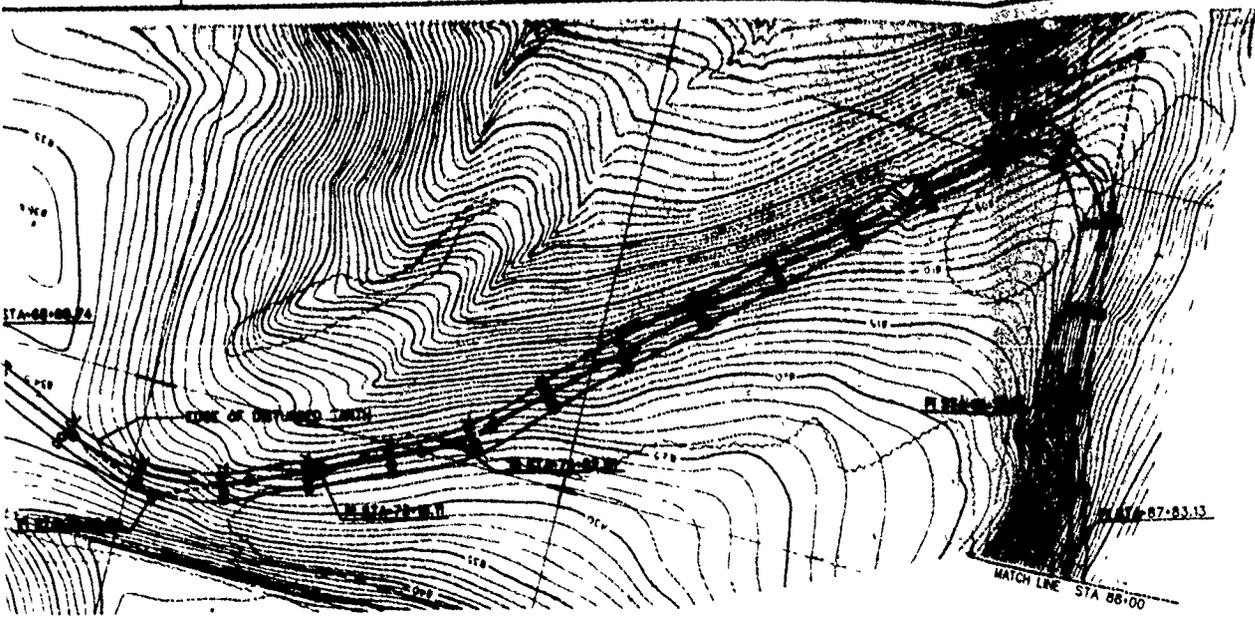
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PLAN



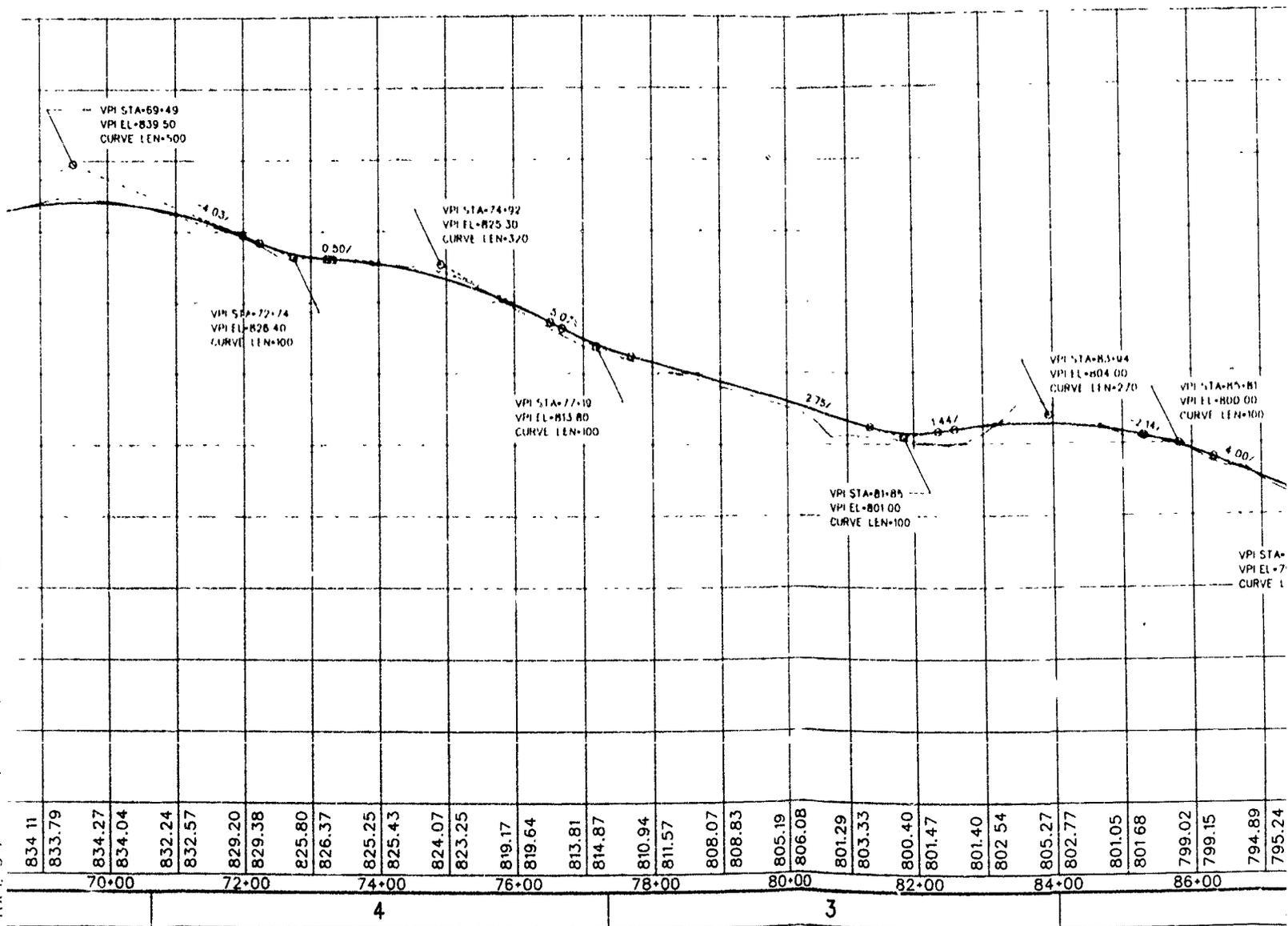
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 PC STA-68-59.78  
 PT STA-68-61.71  
 I=0° 23' 09" L  
 Da=20° 00' 00"  
 Dc=20° 06' 11"  
 T=0.96  
 R=286.48  
 L=1.93  
 C=1.93  
 E=0.00  
 M=0.00

PI STA-73-15.11  
 PC STA-73-11.04  
 PT STA-73-19.18  
 I=1° 37' 43" L  
 Da=20° 00' 00"  
 Dc=20° 06' 11"  
 T=4.07  
 R=286.48  
 L=8.14  
 C=8.14  
 E=0.03  
 M=0.03

PI STA-84+15.74  
 PC STA-81-98.00  
 PT STA-84-26.05  
 I=130° 39' 57" R  
 Da=57° 17' 45"  
 Dc=60° 00' 00"  
 T=217.75  
 R=100.00  
 L=228.06  
 C=161.75  
 E=139.61  
 M=58.27

PI STA-85-72.42  
 PC STA-85-48.55  
 PT STA-85-96.14  
 I=10° 54' 22" L  
 Da=22° 55' 06"  
 Dc=23° 04' 26"  
 T=23.87  
 R=250.00  
 L=47.59  
 C=47.52  
 E=1.14  
 M=1.13



834.11	833.79	834.27	834.04	832.24	832.57	829.20	829.38	825.80	826.37	825.25	825.43	824.07	823.25	819.17	819.64	813.81	814.87	810.94	811.57	808.07	808.83	805.19	806.08	801.29	803.33	800.40	801.47	801.40	802.54	805.27	802.77	801.05	801.68	799.02	799.15	794.89	795.24
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4

3

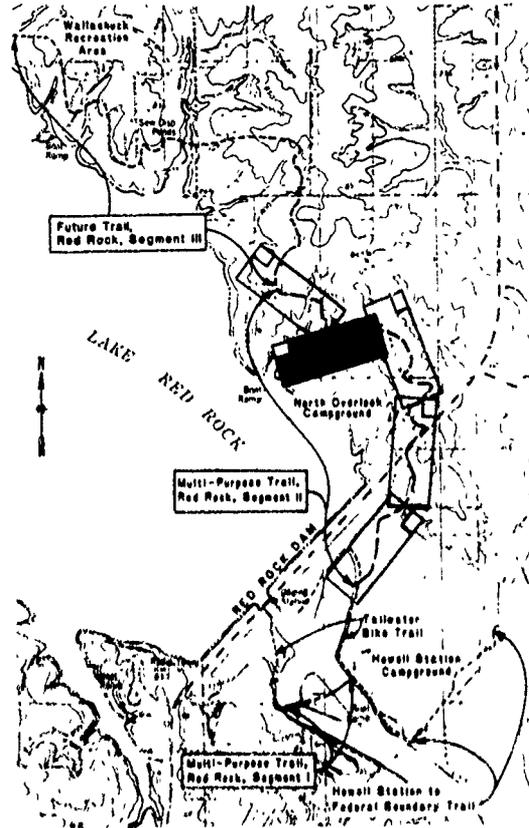
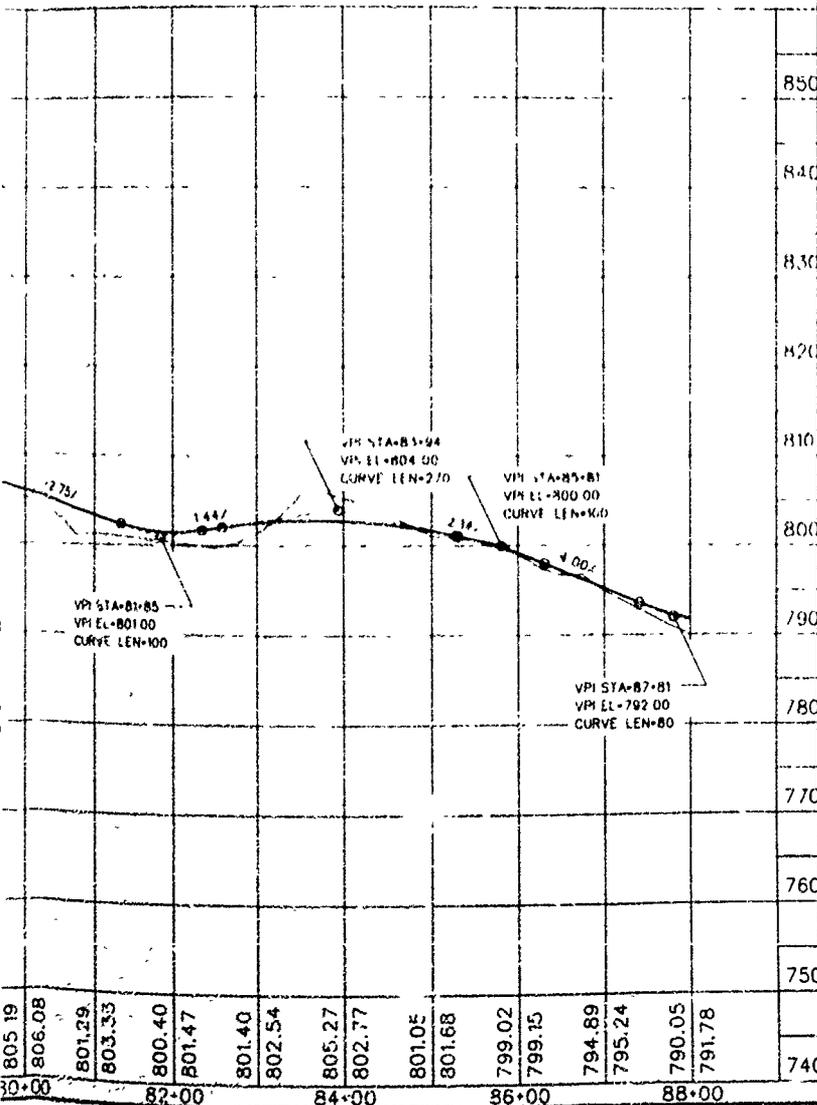




PI STA=68+60.74	PI STA=71+25.84
PC STA=68+59.78	PC STA=70+10.66
PT STA=68+61.71	PT STA=72+29.69
I=0° 23' 09" L	I=4° 48' 23" L
Da=20° 00' 00"	Da=20° 00' 00"
Dc=20° 06' 11"	Dc=20° 06' 11"
T=7.96	T=115.18
R=286.48	R=286.48
L=1.93	L=219.03
C=1.93	C=213.74
E=0.00	E=22.29
M=0.00	M=20.68

PI STA=73+15.11	PI STA=74+82.81
PC STA=73+11.04	PC STA=74+37.90
PT STA=73+19.18	PT STA=75+27.00
I=1° 37' 43" L	I=17° 49' 10" L
Da=20° 00' 00"	Da=20° 00' 00"
Dc=20° 06' 11"	Dc=20° 06' 11"
T=4.07	T=44.91
R=286.48	R=286.48
L=8.14	L=89.10
C=8.14	C=88.74
E=0.03	E=3.50
M=0.03	M=3.46

PI STA=84+15.74	PI STA=85+72.42	PI STA=87+83.13
PC STA=81+98.00	PC STA=85+48.55	PC STA=87+65.67
PT STA=84+26.05	PT STA=85+95.14	PT STA=88+00.54
I=130° 39' 57" R	I=10° 54' 22" L	I=7° 59' 25" R
Da=57° 17' 45"	Da=22° 55' 06"	Da=22° 55' 06"
Dc=60° 00' 00"	Dc=23° 04' 26"	Dc=23° 04' 26"
T=217.75	T=23.87	T=17.46
R=20.00	R=250.00	R=250.00
L=220.06	L=47.59	L=34.86
C=181.75	C=47.52	C=34.84
E=139.61	E=1.14	E=0.61
M=38.27	M=1.13	M=0.61



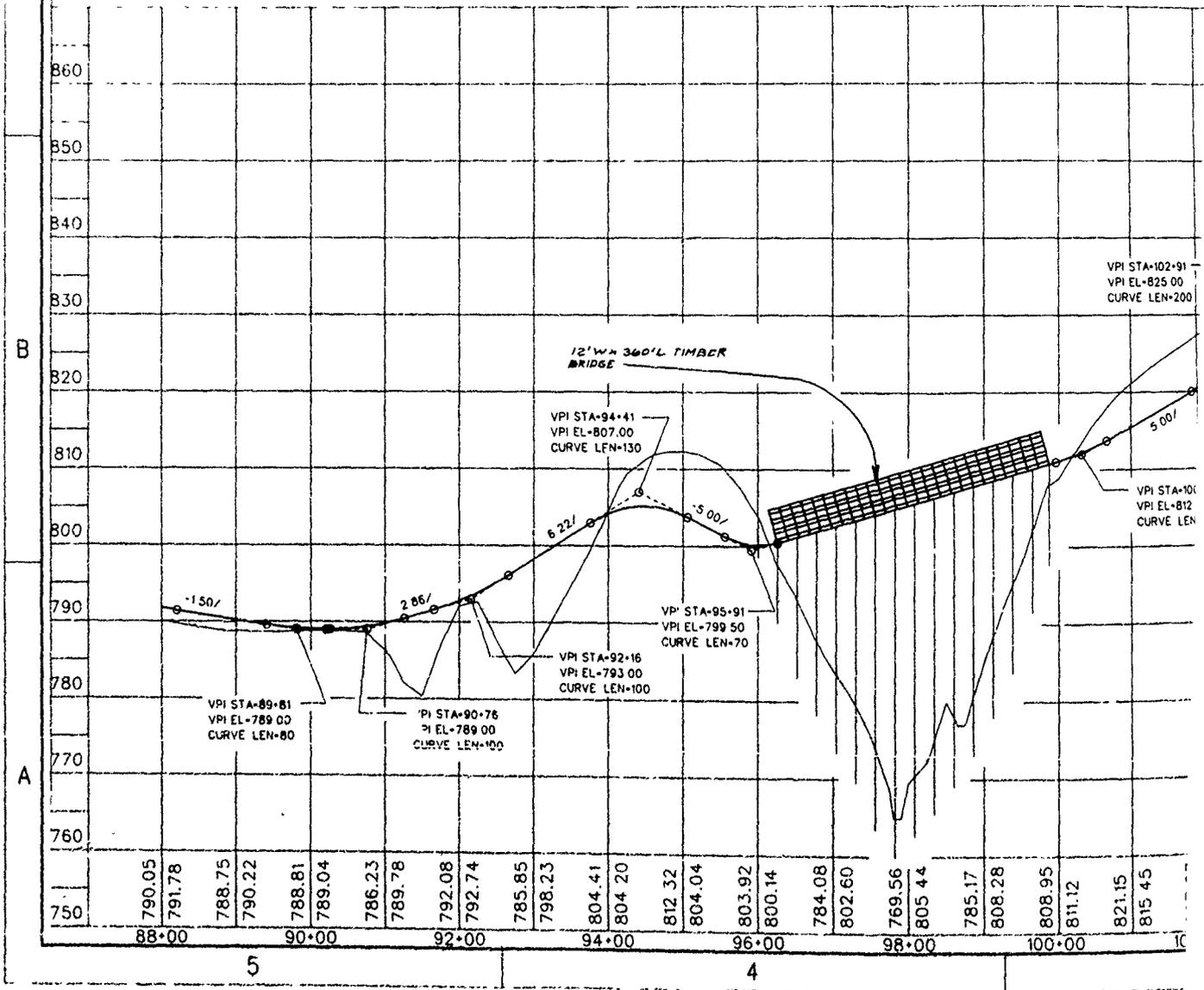
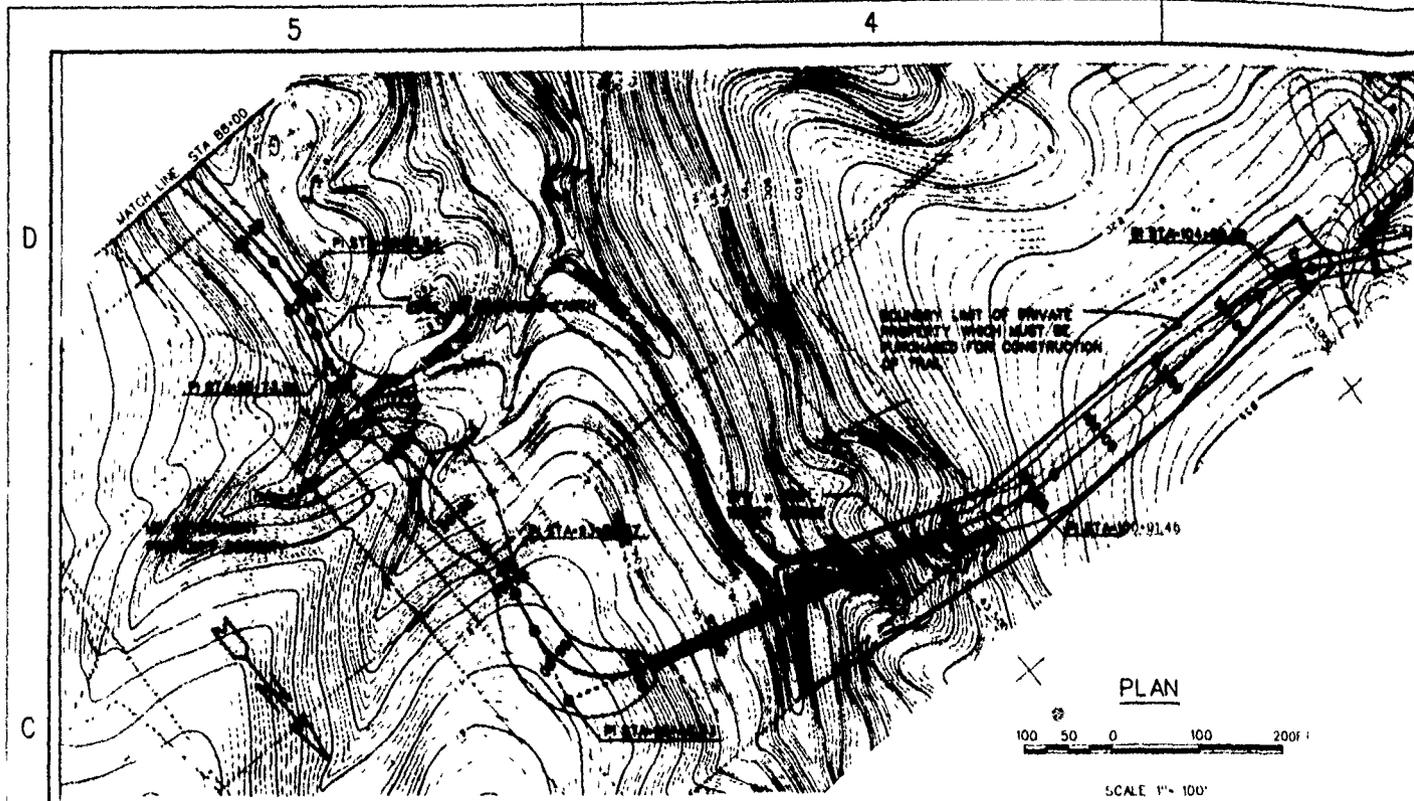
Revisions			
Symbol	Description	Date	Approved

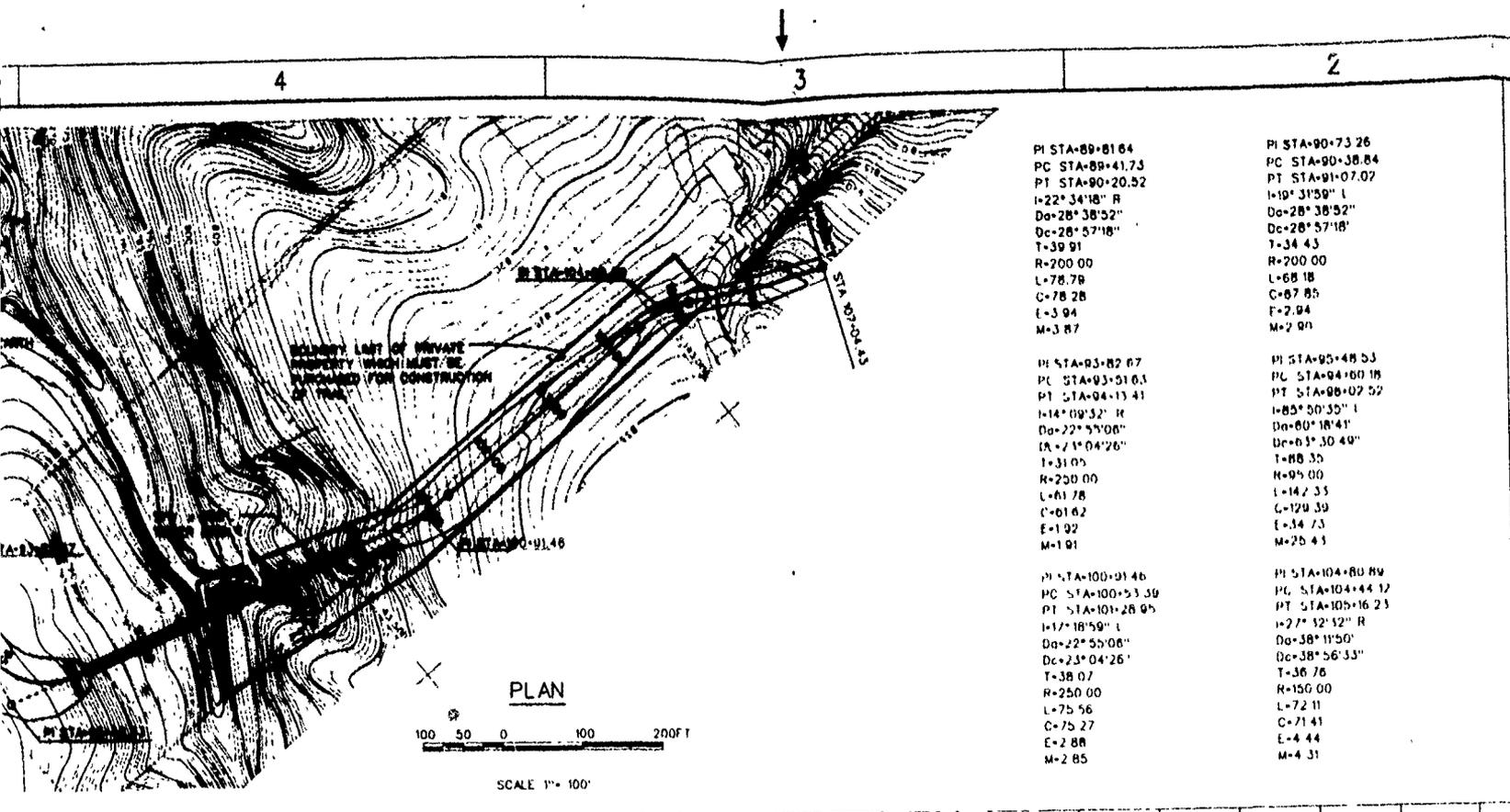
U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

Designed by:	DES MONES RECREATIONAL RIVER AND GREENBELT MULTI-PURPOSE TRAIL RED ROCK SEGMENT II
Drawn by:	
Checked by:	

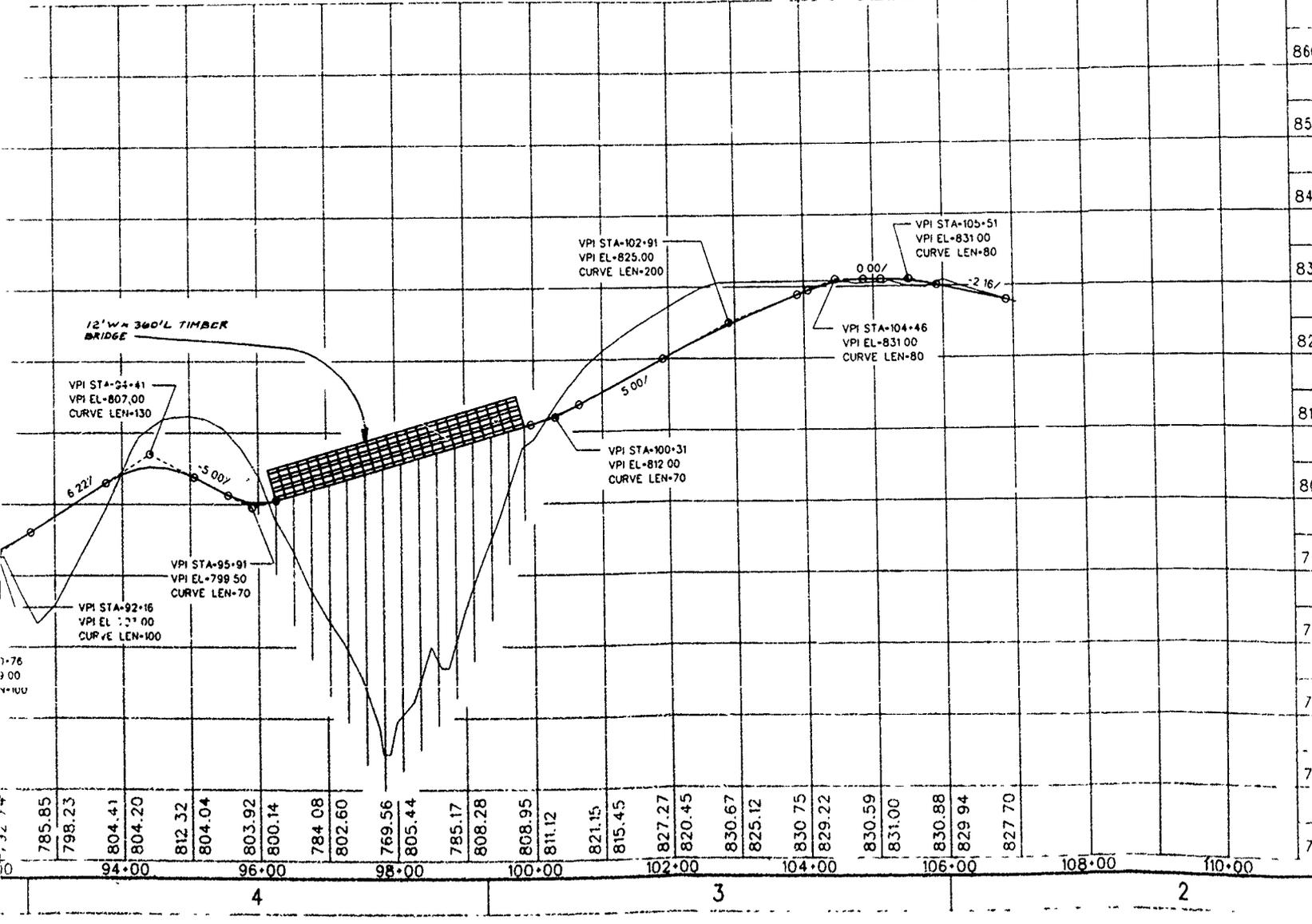
**Plan and Profile,  
Sta. 66+00 to Sta. 88+00**

Reviewed by:	Scale:	Sheet reference number:	Solicitation Number
Approved by:	Date:		
	Drawing Code:		Sheet of





PI STA-89-81.64 PC STA-89-41.73 PT STA-90-20.52 I=22° 34' 18" R Dc=28° 38' 52" Dc=28° 57' 18" T=39.91 R=200.00 L=78.78 C=78.28 E=3.94 M=3.87	PI STA-93-82.67 PC STA-93-51.63 PT STA-94-13.41 I=14° 09' 32" R Dc=22° 57' 08" Dc=23° 04' 26" T=31.05 R=250.00 L=61.78 C=61.62 E=1.92 M=1.91	PI STA-95-48.53 PC STA-94-60.18 PT STA-96-02.52 I=85° 50' 35" L Dc=60° 18' 41" Dc=63° 30' 49" T=88.35 R=95.00 L=142.35 C=129.39 E=34.73 M=25.43
PI STA-100-91.46 PC STA-100-51.39 PT STA-101-28.95 I=1° 18' 59" L Dc=23° 55' 08" Dc=23° 04' 26" T=38.07 R=250.00 L=75.56 C=75.27 E=2.88 M=2.85	PI STA-104-80.89 PC STA-104-44.12 PT STA-105-16.23 I=27° 12' 52" R Dc=38° 11' 50" Dc=38° 56' 33" T=36.76 R=150.00 L=72.11 C=71.41 E=4.44 M=4.31	



12' W x 360' L TIMBER BRIDGE

VPI STA-94-41  
VPI EL=807.00  
CURVE LEN=130

VPI STA-95-91  
VPI EL=798.50  
CURVE LEN=70

VPI STA-92-16  
VPI EL=792.00  
CURVE LEN=100

VPI STA-102-91  
VPI EL=825.00  
CURVE LEN=200

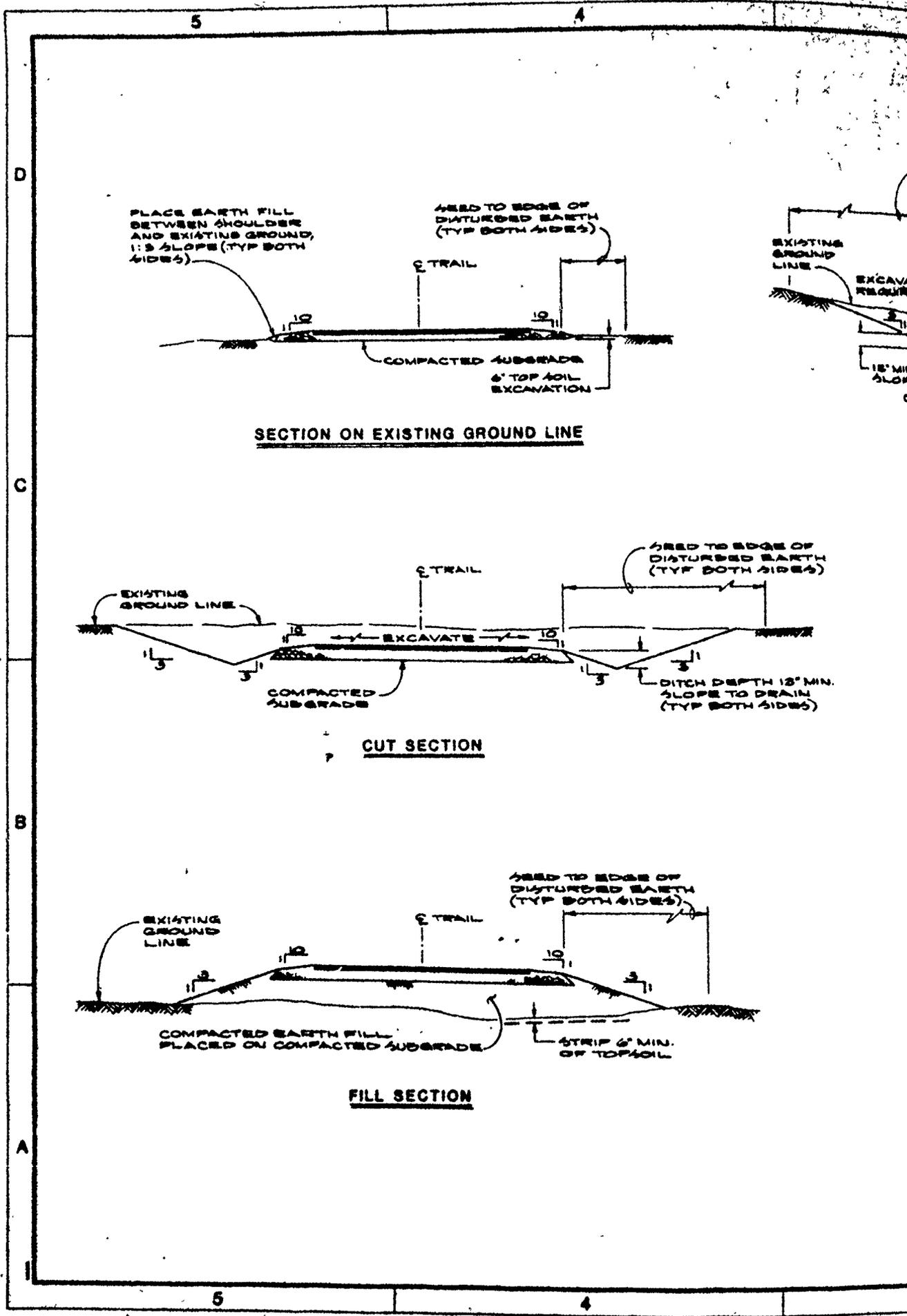
VPI STA-100-31  
VPI EL=812.00  
CURVE LEN=70

VPI STA-105-51  
VPI EL=831.00  
CURVE LEN=80

VPI STA-104-46  
VPI EL=831.00  
CURVE LEN=80

785.85	798.23	804.41	804.20	812.32	804.04	803.92	800.14	784.08	802.60	769.56	805.44	785.17	808.28	808.95	811.12	821.15	815.45	827.27	820.45	830.67	825.12	830.75	829.22	830.59	831.00	830.88	829.94	827.70
94+00	94+00	94+00	94+00	94+00	94+00	94+00	96+00	96+00	96+00	98+00	98+00	98+00	98+00	100+00	100+00	102+00	102+00	102+00	102+00	104+00	104+00	104+00	104+00	106+00	106+00	106+00	106+00	110+00

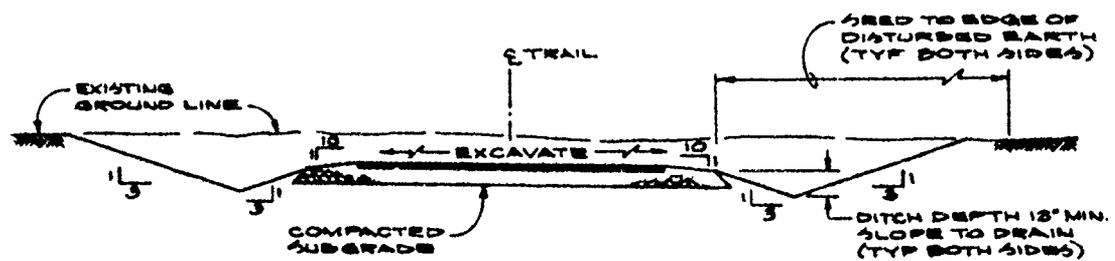




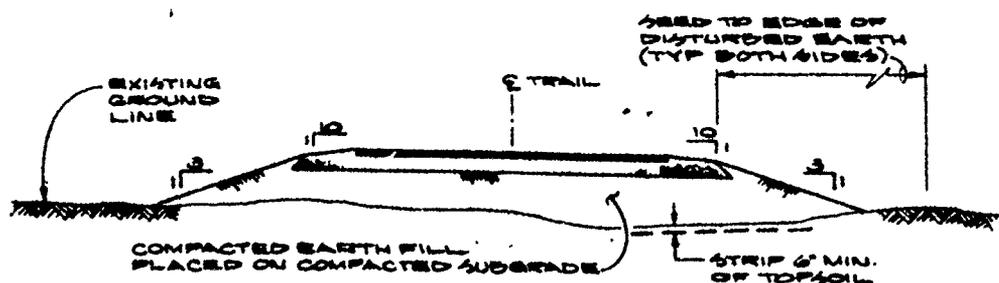
PLACE EARTH FILL  
BETWEEN SHOULDER  
AND EXISTING GROUND,  
1:3 SLOPE (TYP BOTH  
SIDES)

SEED TO EDGE OF  
DISTURBED EARTH  
(TYP BOTH SIDES)

SECTION ON EXISTING GROUND LINE



CUT SECTION

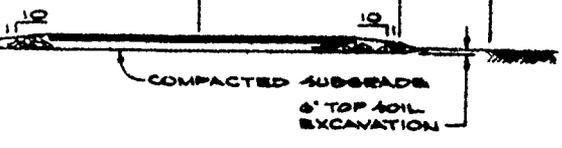


FILL SECTION

LL  
100  
1000  
10000  
100000  
1000000

NEED TO EDGE OF DISTURBED EARTH (TYP BOTH SIDES)

TRAIL



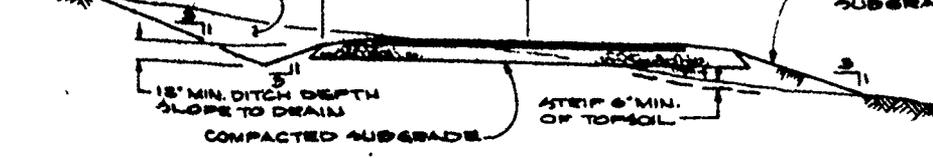
SECTION ON EXISTING GROUND LINE

NEED TO EDGE OF DISTURBED EARTH (TYP BOTH SIDES)

EXISTING GROUND LINE

EXCAVATE AS REQUIRED

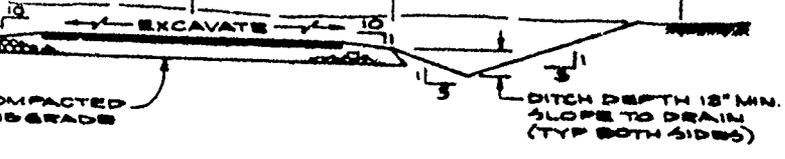
TRAIL



CUT AND FILL SECTION

NEED TO EDGE OF DISTURBED EARTH (TYP BOTH SIDES)

TRAIL



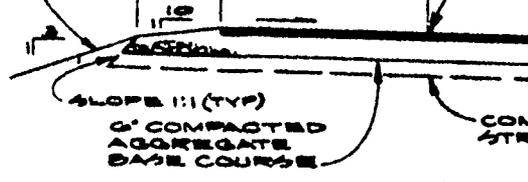
CUT SECTION

2'-0" SHOULDER

10'-0"

SLOPE TO EXISTING GROUND LINE OR FINISHED GRADE LINE (TYP BOTH SIDES)

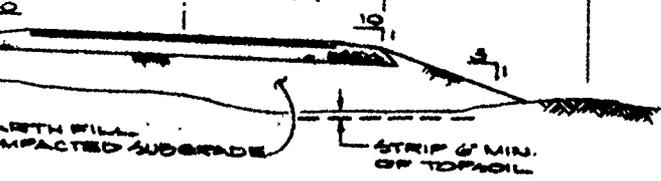
TRAIL



TRAIL SURFACING D

NEED TO EDGE OF DISTURBED EARTH (TYP BOTH SIDES)

TRAIL



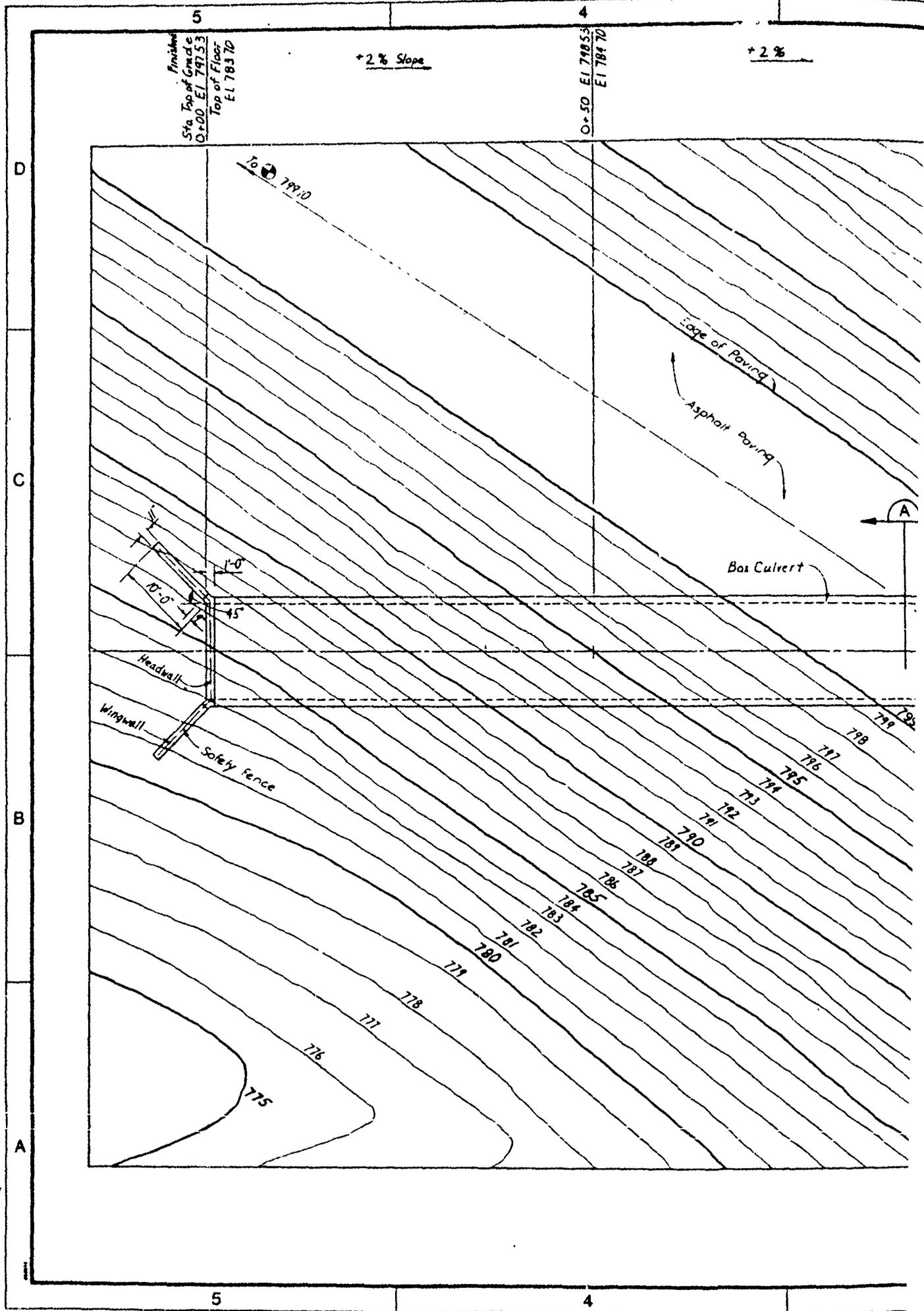
FILL SECTION

3

2



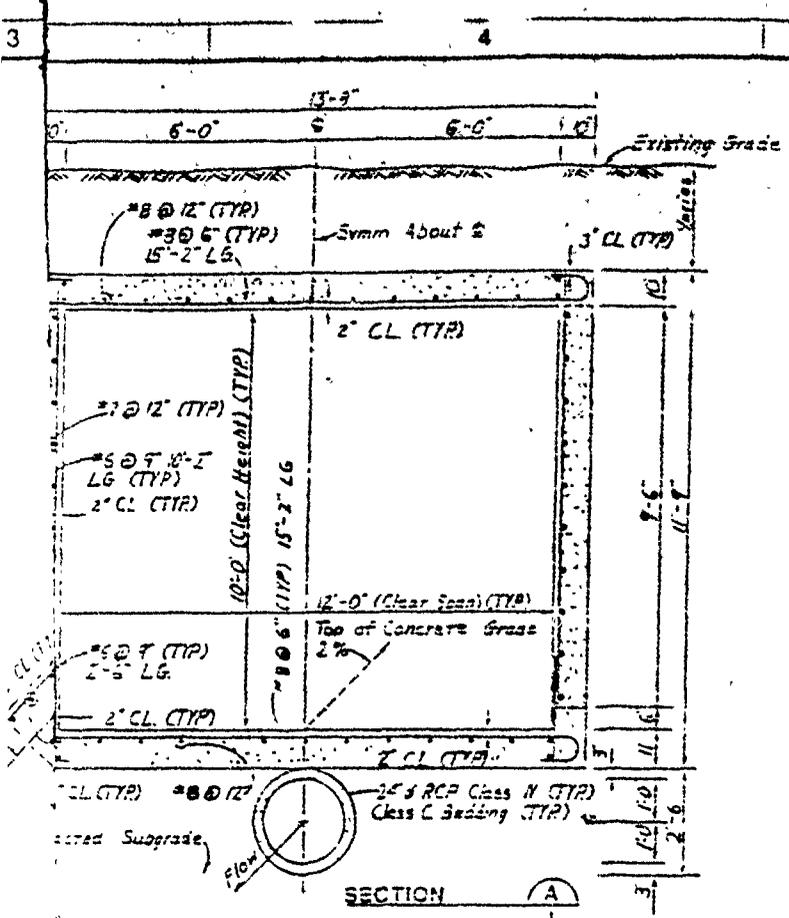




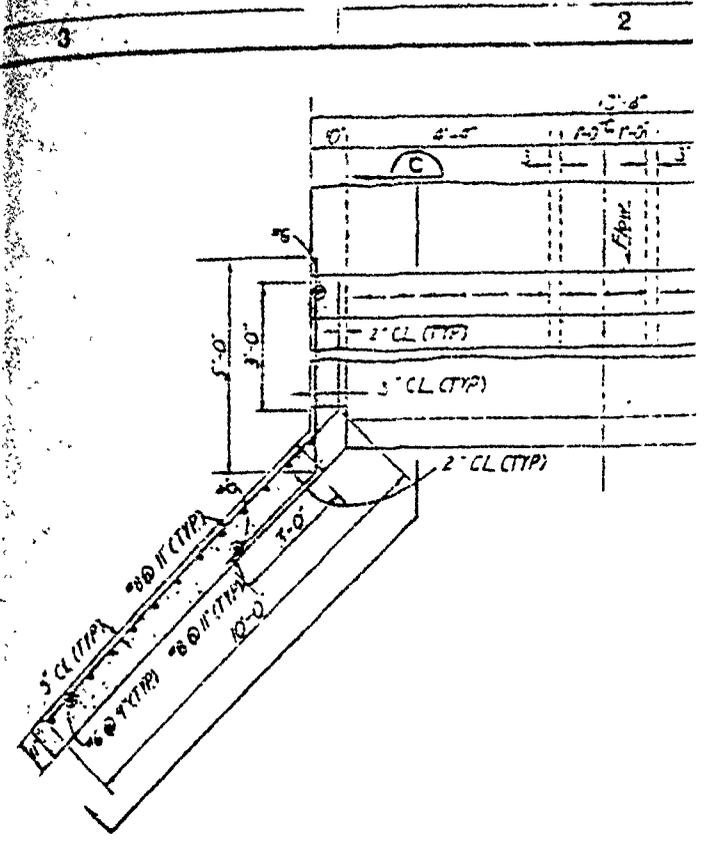




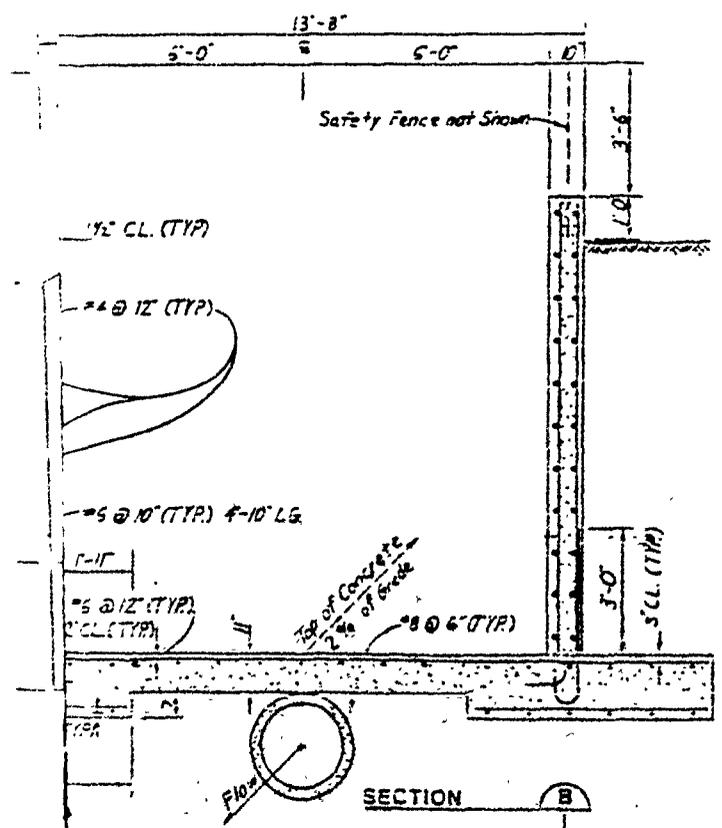




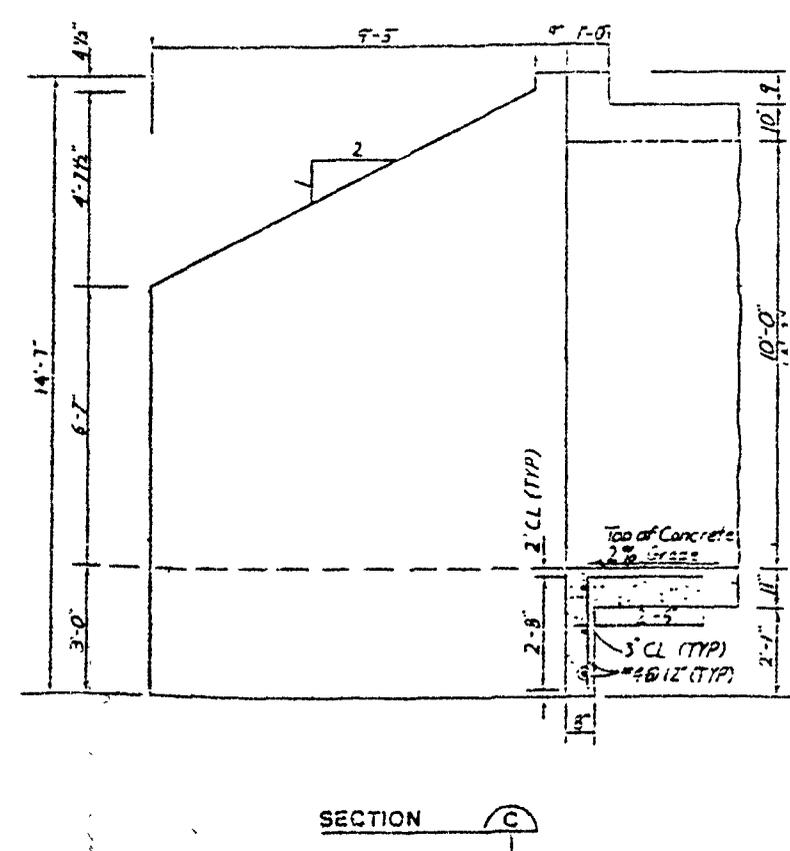
SECTION A



CULVERT & WINGW.

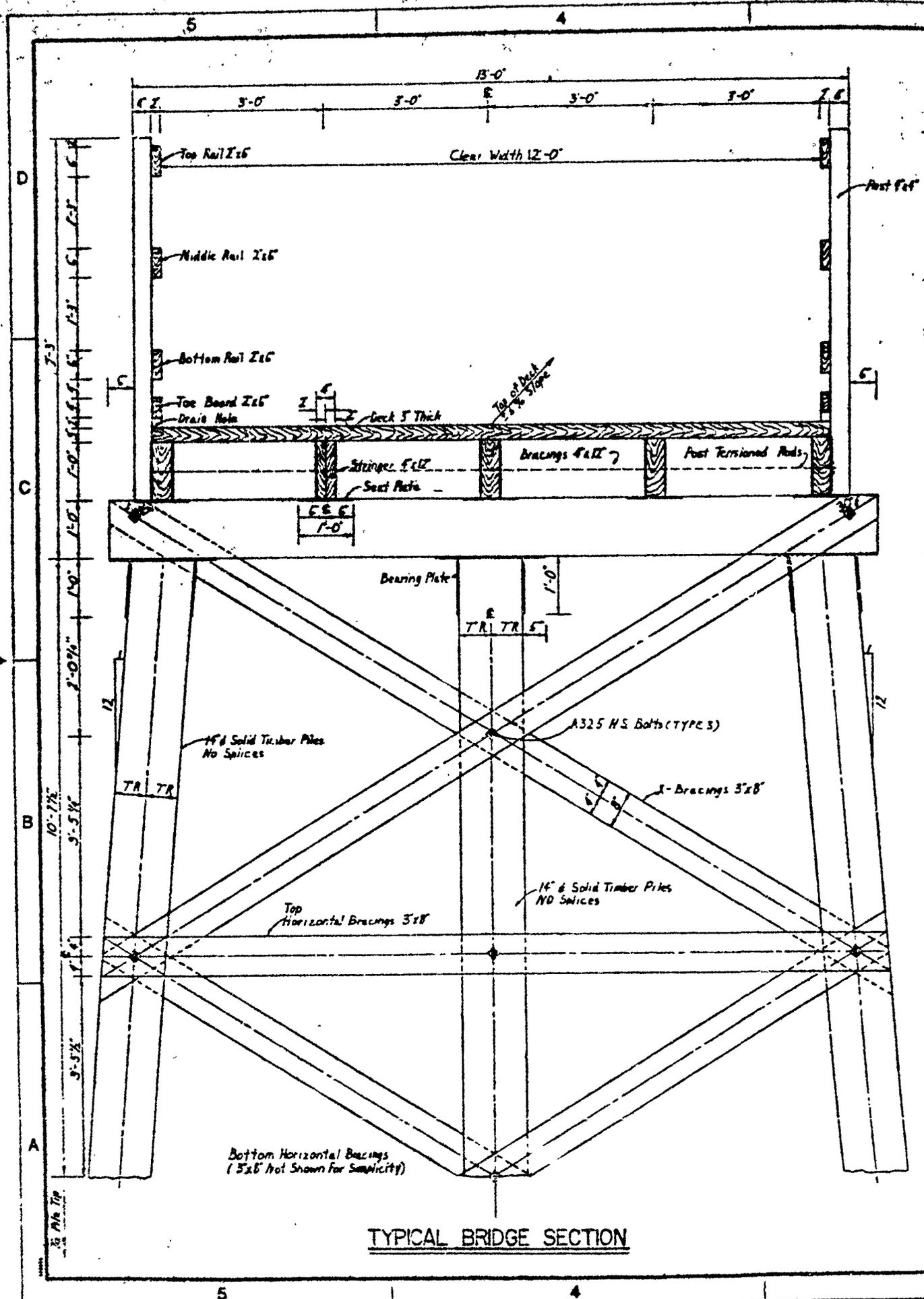


SECTION B



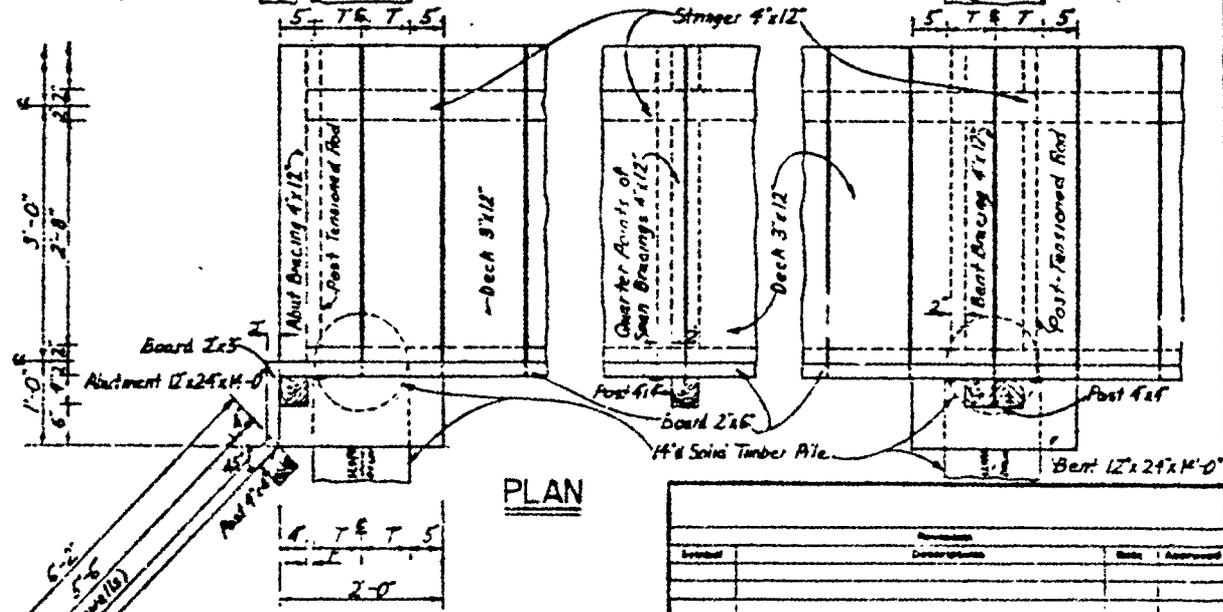
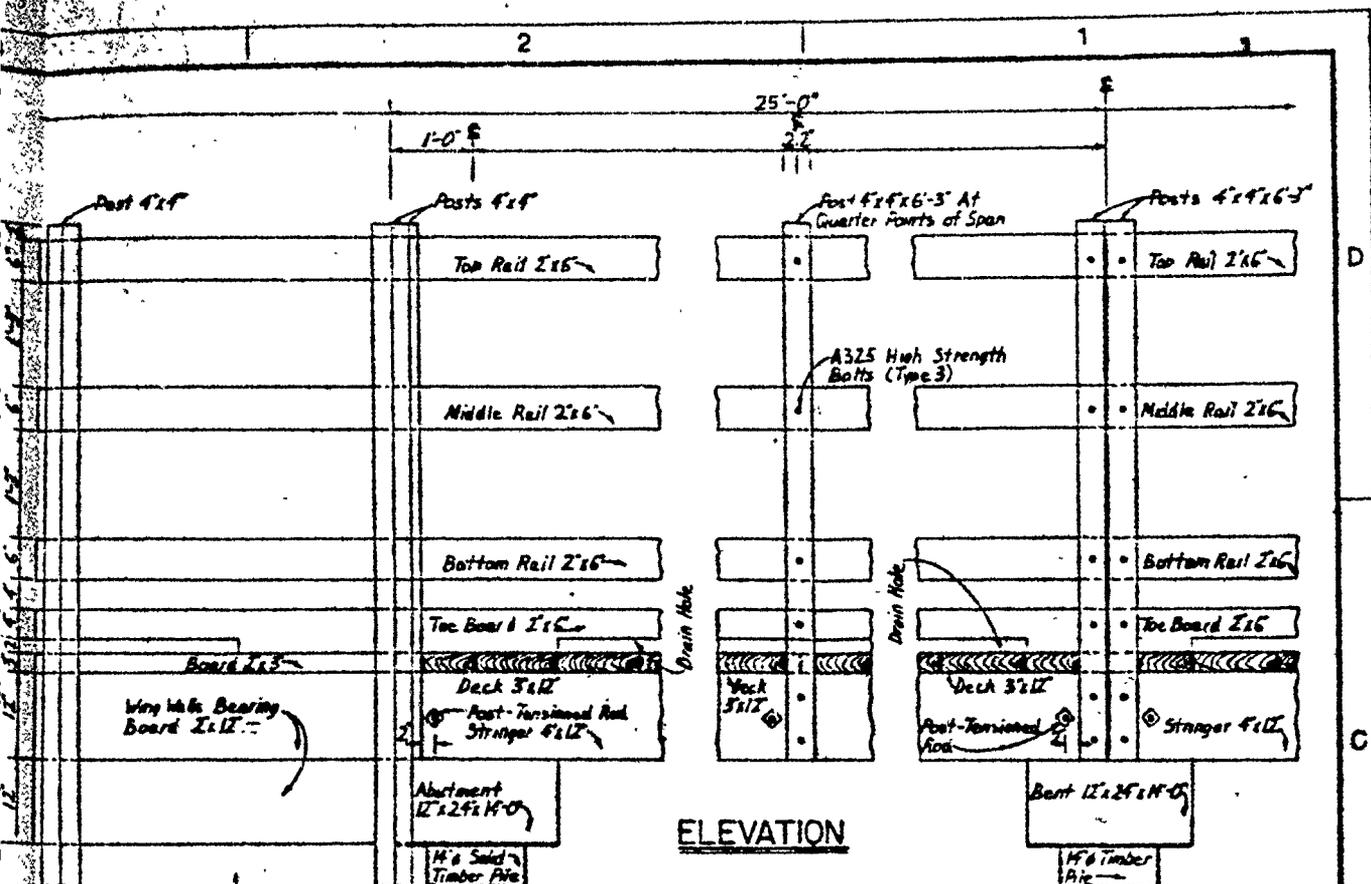
SECTION C





TYPICAL BRIDGE SECTION





- GENERAL NOTES:**
1. TIMBER BRIDGES SHALL BE PRESTRESS-TENSIONED TYPE BY THE CONTRACTOR, AND SUBMIT ALL CALCULATIONS FOR APPROVAL.
  2. TOTAL LENGTH 360'-0" WITH 12 SPANS AT 30'-0" LONG. ALSO INCLUDE 2 TIMBER ABUTMENTS & TIMBER TRESTLES.
  3. 1 1/2" x 3" SOLID TIMBER PILES (NO SPICING) SHALL BE DRIVEN INTO ORIGINAL EXISTING GROUND AT LEAST 15'-0".
  4. THE BRIDGE DESIGN LOADING FOR THE BRIDGE SHALL BE:
    - A. UNIFORM LIVE LOAD - 40 PSF.
    - B. VEHICLE LOAD - 10,000 POUNDS FIVE 101 IMPACT AS IF ENCLOSED.
    - C. WIND LOAD 35 - PSI ON THE VERTICAL PROJECTED SURFACE AS IF ENCLOSED.
 THE LIVE LOAD AND VEHICLE LOAD NEED NOT BE APPLIED AT THE SAME TIME.
  5. MAXIMUM LIVE LOAD DEFLECTION SHALL BE THE SPAN LENGTH DIVIDED BY 48".
  6. THE BRIDGE DESIGN SHALL ALSO CONFORM TO THE PROVISIONS OF ALSD'S SECTION 18.16.13 OF THE "STANDARD SPECS. FOR HIGHWAY BRIDGES."

Reviewed by:	DESIGNED BY:	NO SCALE
Checked by:	DRAWN BY:	DATE:
Approved by:	DATE:	SCALE:
	DRAWING:	DATE:
	LOG:	DATE:

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

DESIGNED BY: WST  
DRAWN BY: JDL  
CHECKED BY: TGM  
REVIEWED BY: DLL

DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK SEGMENT II  
Stream Crossing  
Timber Bridge

DESIGN ANALYSIS

A

P

P

E

N

D

I

X

A

FEATURE DESIGN MEMORANDUM #6  
WITH ENVIRONMENTAL ASSESSMENT  
DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK SEGMENT II

APPENDIX A  
DESIGN ANALYSIS

TABLE OF CONTENTS

<u>Subject</u>	<u>Page</u>
Box Culvert Design	A-1

Subject **RED ROCK TRAILS SEQ. II.**

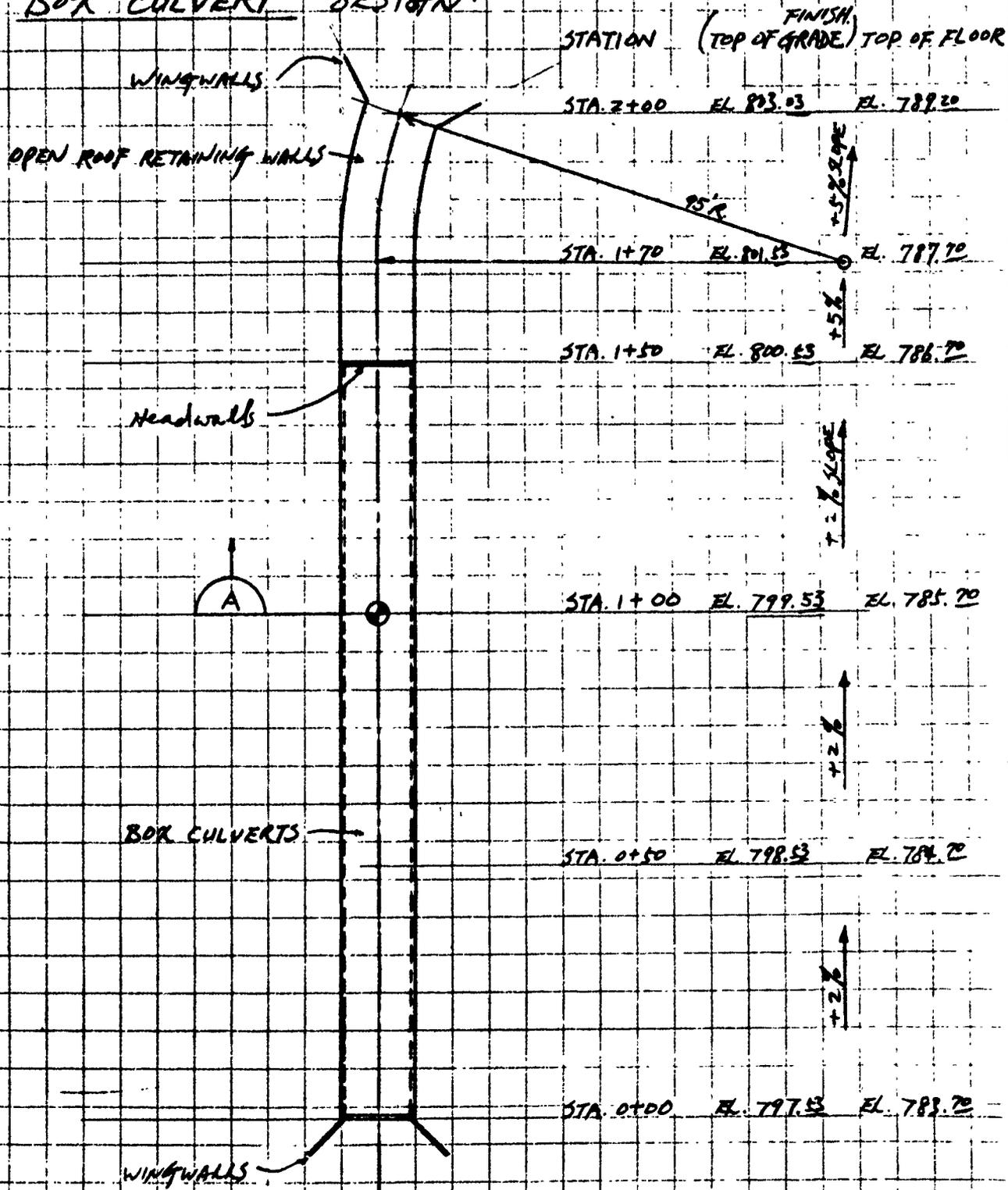
Date **27 JUL 1990**

Computed by **WST**

Checked by **TGH**

Sheet **1** of **7**

### 1. BOX CULVERT DESIGN:



Subject	RED ROCK TRAILS SECT. II.	Date	27 JUL 1990
Computed by	WST.	Checked by	TGH
		Sheet	2. of 7

REFERENCES:

(1) "ACI 318-89/318R-89 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE AND COMMENTARY"

BY AMERICAN CONCRETE INSTITUTE  
BOX 19150, REDFORD STATION  
DETROIT, MI. 48219

(2) "CULVERT MANUAL" & "CHANGE LETTERS"

BY STATE OF ILLINOIS  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF BRIDGES AND STRUCTURES

(3) "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" 14<sup>TH</sup> EDITION  
1989 BY AASHTO (American Association of State Highway  
and Transportation Officials)

Subject	RED ROCK TRAILS SEQ. II.	Date	30 JUL 1990
Computed by	WST.	Checked by	TGH
		Sheet	3 of 7.

FROM WESTERN AIR MAPS, INC.  
LENEXA, KANSAS 66215

$$799.6 - (799.6 - 799.1)(7.5/54) = 799.5306 \approx 799.53$$

@  $\frac{1}{2}$  OF EXISTING ASPHALT PAVEMENT.

BOX CULVERTS FROM STA. 0+00 ~ STA. 1+50 TOTAL 150' LG.

2% SLOPE FOR DRAINAGE

ASSUME STA. 1+00 TOP OF GRADE EL. 799.53 TOP OF FLOOR EL. 785.70

$$EL. 799.53 - (3') - (10''/12) - (10') = EL. 785.70$$

$$50' (2\%) = 1'$$

$$100' (2\%) = 2'$$

$$\left. \begin{array}{l} 799.53 + 1 = EL. 800.53 \\ 785.70 + 1 = EL. 786.70 \end{array} \right\} @ STA. 1+50 \left\{ \begin{array}{l} \text{TOP OF GRADE} \\ \text{TOP OF FLOOR} \end{array} \right.$$

$$\left. \begin{array}{l} 799.53 - 1 = EL. 798.53 \\ 785.70 - 1 = EL. 784.70 \end{array} \right\} @ STA. 0+50 \left\{ \begin{array}{l} \text{TOP OF GRADE} \\ \text{TOP OF FLOOR} \end{array} \right.$$

$$\left. \begin{array}{l} 799.53 - 2 = EL. 797.53 \\ 785.70 - 2 = EL. 783.70 \end{array} \right\} @ STA. 0+00 \left\{ \begin{array}{l} \text{TOP OF GRADE} \\ \text{TOP OF FLOOR} \end{array} \right.$$

Subject	RED ROCK TRAILS SEQ. II.	Date	30 JUL 1990
Computed by	W.S.T.	Checked by	TGH
		Sheet	4 of 7

BOX CULVERTS SIZE: 12' CLEAR SPAN BY 10' CLEAR HEIGHT  
SIMPLE SPAN

$f'_c = 4 \text{ KSI @ 28 days}$   
 $f_y = 60 \text{ KSI (ASTM A615)}$

ASSUME Min. Fill 3', MAX. Fill 10'

FROM Table SS-49:

TOP SLAB THICKNESS  $T = 10''$

BOTTOM SLAB THICKNESS  $= T + 1 = 10'' + 1'' = 11''$

SIDEWALL THICKNESS  $W = 10''$

a. bars (transverse bars - bottom of top slab & top of slab)

$*8 @ 6'' = 1.57 \text{ m}^2$

Total length  $15'-2''$

Hook dimension  $A = 11''$  (From Design Aids, Plate 4/1.2)

Out to Out dimensions  $= (15'-2'') - 2(11'') = 13'-4''$

b. bars (longitudinal bars - bottom of top slab when  $T < 12''$ )  
 $(15 - *8 @ 12'') > (11 - *8 @ 18'')$  (OK)

b1. bars (longitudinal bars - top of bottom slab)  
 $(15 - *6 @ 12'') > (18 - *6 @ 18'')$  (OK)

$15 \times 0.44 \text{ m}^2$        $18 \times 0.2933 \text{ m}^2$   
 $6.6 \text{ m}^2$        $5.28 \text{ m}^2$

1/2 bare (longitudinal bare - inside face of sidewalls only  
when  $w < 12''$ )

$$\frac{2 \times 10 - \#7 @ 12''}{2 \times 10 \times 0.60''} = 12'' \quad (\text{in } 2 \text{ sidewalls})$$

V bare (vertical reinforcement in sidewalls)

$$\#6 @ 9'' = 0.59''$$

$$\text{Total length} = 10'-2''$$

V1 bare (dowel bar at lower construction joint of sidewalls)

$$\#6 @ 9'' = 0.59''$$

$$\text{Total length} = 2'-6''$$

CONCRETES:  $1.5031 \text{ cy/}$

TOP SLAB:  $(13'-8'')(10'')(1') / 27 \text{ ft}^3 = 0.4218 \text{ cy/}$

BOTTOM SLAB:  $(13'-8'')(11'')(1') / 27 \text{ ft}^3 = 0.464 \text{ cy/}$

SIDEWALLS:  $2(10' \times 10' \times 1') / 27 \text{ ft}^3 = 0.6173 \text{ cy/}$

$\Sigma 0.4218 + 0.464 + 0.6173 = 1.5031 \text{ cy/}$

Subject RED ROCK TRAILS SEQ. II.

Date JUL 1990

Computed by WST.

Checked by TGH

Sheet 6 of 7

## 2. OPEN ROOF RETAINING WALLS DESIGN:

FROM "CULVERT MANUAL" TABLE T-6: DESIGN HEIGHT  $H_D = 11'$

VERTICAL CANTILEVER (T-TYPE) WINGWALLS DESIGN:

ASSUME MAX. FILL  $10'$

STEM THICKNESS @ TOP  $T = 10''$

BOTTOM  $T_1 = 10''$

FOOTING THICKNESS  $T_f = 1'-6''$

FOOTING WIDTH  $b = 5'-11''$

TOE DIMENSION  $x = 1'-11''$

$\pi$  bars: #6 @ 10"

LENGTH =  $8'' + (4'-2'') = 4'-10''$

STEM REINFORCEMENT:

$V_j$  bars: #4 @ 12"

FOOTING REINFORCEMENT:

$\pi$  bars: #4 @ 12" HEEL (TOP) } (5'-8'') LG.  
#4 @ 12" TOE (BOTTOM) } (5'-8'') LG.

$W_j$  bars: #5 @ 12" TOP & BOTTOM LAYERS

MAX. SOIL PRESSURE @ TOE = 2,756 PSF

Subject	RED ROCK TRAILS SEQ. II.	Date	31 JUL 1990
Computed by	WST.	Checked by	TGH
		Sheet	7 of 7.

3. WINGWALLS DESIGN:

FROM "CULVERT MANUAL" HORIZONTAL CANTILEVER WINGWALLS

DESIGN CHART:

ASSUME MAX. FILL 10'

LENGTH OF WALL  $L = 10' < 14'$  MAX. (O.K.)

$h = 10'$

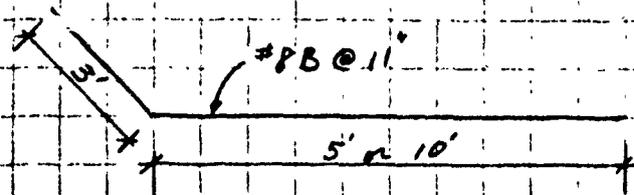
WALL THICKNESS = 11"

11" > 8" (Min.) (O.K.)

11" - 10" = 1" < 2" (O.K.)

$A_s = 0.99 \text{ in}^2$

∴ USE #8 @ 11"



$V_u$  bars: #6 @ 9" = 0.59 in<sup>2</sup>

$L/2 = 10'/2 = 5' < 6'$

\* AT LEAST 6' OF THE BARREL SHALL BE POURED MONOLITHICALLY W/ THE WINGWALLS.

TOE WALLS: 8" WIDE, 3' DEEP BELOW FLOW LINE (TOP OF CONCRETE FLOOR).

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404(b)(1) EVALUATION

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B

FEATURE DESIGN MEMORANDUM NO. 6  
WITH ENVIRONMENTAL ASSESSMENT  
FOR  
DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK - SEGMENT II  
LAKE RED ROCK, IOWA

CLEAN WATER ACT  
SECTION 404(b)(1) EVALUATION

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FEATURE DESIGN MEMORANDUM NO. 6  
WITH ENVIRONMENTAL ASSESSMENT  
FOR  
DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK - SEGMENT II  
LAKE RED ROCK, IOWA

CLEAN WATER ACT  
SECTION 404(b)(1) EVALUATION

I. PROJECT DESCRIPTION

A. Location. The project site is located along the northeast shore of Lake Red Rock, about 4 miles southwest of the town of Pella in Marion County, Iowa.

B. General Description. The project is a 4,800-foot multi-purpose trail. The trail discussed in this appendix is referred to as the alternate alignment in the main report. This alignment will follow the Red Rock shoreline within the NW 1/4 of Section 18, T. 76 N., R. 18 W., Marion County, Iowa. Approximately 27,000 cubic yards of earth fill and 5,000 cubic yards of riprap will be placed along the alignment to support the trail and protect against erosion.

C. Authority and Purpose. The Des Moines Recreational River and Greenbelt was funded and authorized by Public Law 99-88 as approved on August 15, 1985. The project is for the development, operation and maintenance of a recreational and greenbelt area on and along the Des Moines River in Iowa from U.S. Highway 20 in Fort Dodge, downstream to relocated U.S. Highway 92 in the vicinity of the Red Rock Dam. Development of multi-purpose trails is one of the projects included in the comprehensive plan for the Greenbelt.

D. General Description of Dredged and Fill Material. Earth fill will be obtained from a site within the flood pool in the southeast quarter of the northwest quarter of Section 18. Riprap material will consist of clean quarry run rock obtained from a local quarry. The nearest potential source is a commercial quarry located approximately 3 miles southeast of the project area near the town of Harvey, Iowa.

E. Description of the Proposed Discharge Site. The placement of riprap and earth fill will be along 2,400 linear feet of the northeast shoreline of the lake. Approximately 1,000 cubic yards of earth fill and 500 cubic yards of riprap will be placed below the Ordinary High Water elevation of 743.5. Aquatic habitat at the site is unvegetated sand and gravel.

F. Description of Disposal Method. The fill material will be placed at the construction site by mechanical means.

## II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations. The substrate of the Des Moines River at the project site is generally composed of sand, silt and gravel. The riverbank under the embankment site contains varying layers of modern alluvium of mixed sand and silt layers.

B. Water Circulation, Fluctuation, and Salinity Determinations. Water chemistry, clarity, color, odor, taste, dissolved gas levels, nutrients, and eutrophication will not be affected by the project. Salinity determinations are not applicable to the area. Circulation, flow, velocity, stratification and hydrologic regime will not be significantly affected. Water level fluctuations are influenced by Red Rock Reservoir which both stores and releases water in conduction with its flood control purpose. The proposed project would cause no noticeable change in water level fluctuations. Current pattern may be slightly altered near the fill area.

C. Suspended Particulate/Turbidity Determinations. There will be a minor temporary increase in suspended particulates and turbidity during construction. Following project completion, these factors should return to pre-construction levels.

D. Contaminant Determinations. Construction materials will be chemically stable and noncontaminating. Construction will take place in a non-industrial, non-commercial area where the soil is unlikely to be contaminated. Neither the fill nor its placement will cause relocation or increases of contaminants in the aquatic system. Certification of the project under Section 401 of the Clean Water Act has been requested from the Iowa Department of Natural Resources in a letter dated 17 August 1990 (see Correspondence appendix), and all requirements will be met prior to construction.

E. Aquatic Ecosystem and Organism Determinations. The proposed action should have no noticeable effect on the aquatic ecosystem. No significant impacts to benthos, plankton, or nekton are anticipated. Two Federally listed endangered or threatened species, the bald eagle (*Haliaeetus leucocephalus*), and the Indiana bat (*Myotis sodalis*) are listed for Marion County. Threatened and endangered species are discussed in the preceding Environmental Assessment. It was determined that there would be no significant impacts to either species. No State listed threatened or endangered species are known to occur within the project area, and no impacts are anticipated.

F. Proposed Disposal Site Determinations. The proposed project may cause minor, temporary increases in turbidity during construction; however, no violations to water quality standards should occur. Riprap will be obtained from an approved quarry site near the project area. The

proposed actions will have no adverse effect on municipal or private water supplies; recreational or commercial fisheries; or water-related recreation, aesthetics, parks, national historic monuments, or similar preserves.

G. Determination of Cumulative Effects on the Aquatic Ecosystem. Impacts from construction would be temporary. The riprap which would be permanent would be composed of chemically stable, noncontaminating material. Therefore, no detrimental cumulative or secondary impacts are expected to occur. Implementation of the project could increase fisheries habitat through the placement of riprap.

H. Determination of Secondary Effects on the Aquatic Ecosystem. No adverse secondary effects are expected. Implementation of the project could increase fisheries habitat due to the placement of riprap.

III. FINDINGS OF COMPLIANCE WITH THE RESTRICTION ON DISCHARGE.

1. No significant adaptations to the guidelines were made relating to this evaluation.
2. The alternative of No Federal Action was not feasible because it did not provide access to surrounding recreational areas.
3. Certification under Section 401 of the Clean Water Act has been applied for from the Iowa Department of Natural Resources. Certification will be obtained before construction begins.
4. The project would not introduce toxic substances into hereby waters or result in appreciable increases in existing levels of toxic materials.
5. No significant impacts to Federal or State-listed endangered or threatened species will result from the project.
6. The project is located in an inland freshwater system. No marine sanctuaries are involved.
7. No municipal or private water supplies would be affected. Minor impacts would results from construction. No sensitive or critical habitats would be affected, and no long-term adverse impacts would occur.
8. Project construction materials will be physically and chemically stable.
9. The proposed actions will not significantly affect water quality or the aquatic ecosystem and are in compliance with the requirements of guidelines for Section 404(b)(1) of the Clean Water Act, as amended.

\_\_\_\_\_  
Date

John R. Brown  
Colonel, U.S. Army  
District Engineer

CORRESPONDENCE

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FEATURE DESIGN MEMORANDUM #6  
WITH ENVIRONMENTAL ASSESSMENT  
DES MOINES RECREATIONAL RIVER AND GREENBELT  
MULTI-PURPOSE TRAIL  
RED ROCK SEGMENT II

APPENDIX C  
CORRESPONDENCE

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Letter from Lawrence M. Covin, United States Environmental Protection Agency, dated June 22, 1990	C-7
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Letter from Richard C. Nelson, U.S. Fish and Wildlife Service, dated July 5, 1990	C-9
Letter to James E. Jacobsen, State Historical Society of Iowa, dated July 18, 1990	C-11
Letter from James E. Jacobsen, State Historical Society of Iowa, dated August 14, 1990	C-12
Letter to Ralph Turkle, Iowa Department of Natural Resources, requesting State 401 Water Quality Certification, dated August 17, 1990	C-13
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5 October 1988

MEMORANDUM FOR RECORD

SUBJECT: Meeting at Red Rock Reservoir to discuss potential impacts to Indiana bat from proposed bike trail construction from Howell Station to Wallashuck Campground.

DISCUSSION

1. On 26 September 1988 Joe Slater and I met at Red Rock Reservoir with park manager Jerry Dowell, IDNR biologist (Red Rock Unit manager) Rick Trine, and Dr. John Bowles of Central College in Pella. Dr. Bowles has conducted studies for the Iowa Conservation Commission (IDNR) to determine the status and distribution of the federally endangered Indiana bat in the Red Rock vicinity and throughout the state.
2. We inspected marked portions of the proposed trail alignment located in two separate tracts of woodland. These are secondary-successional upland forest areas which were disturbed in past decades by grazing and clearcutting activities, but have been left relatively untouched since the development of the reservoir. The majority of trees are sapling to medium sized. However, there are also a small number of mature aged shagbark hickories and standing dead trees with cavities or loose bark which could be utilized by the bats as summer roosts.
3. Dr. Bowles reported that he had collected Indiana bats in one of the tracts during surveys conducted from 1980 to 1983. He noted that the results of his studies suggested that the bats use a wider range of habitats than was previously believed, including the disturbed upland forest lands within the project area. Dr. Bowles also cautioned that the species could be expected to utilize any areas around the reservoir where suitable habitat is found, and could not be assumed to be absent from areas where it has not yet been collected.
4. Dr. Bowles indicated that he does not anticipate significant direct effects on the bat from trail construction, provided that the trail is aligned to avoid removal of trees with loose bark or cavities which could be utilized by bats, and to minimize impacts to the forest as a whole. He did express concerns about the effects of trail use on the overall habitat value of the woodlands, if trail use indirectly results in increased traffic into the forested areas on either side of the trail.
5. Rick Trine expressed general agreement with Dr. Bowles regarding potential effects of trail development on the

Indiana bat and other natural resources in the area. He also indicated that careful monitoring of construction activities, particularly tree clearing, could help to reduce or eliminate adverse effects on environmental resources.

6. On 27 September, Joe and I met with Jerry Dowell in his office to summarize the discussions of the previous day and to talk about environmental requirements for the trails project. We agreed that close coordination between District and reservoir personnel throughout project design and construction is essential to avoid and minimize adverse impacts to the Indiana bat and other environmental resources. We discussed the need for monitoring of construction activity by reservoir and PD-E staff, and scheduling of construction in wooded areas to avoid periods when bats are likely to be present. Jerry recommended that pre-construction clearing in wooded tracts be accomplished by reservoir staff, and I agreed that this would help to ensure that adverse effects are minimized. I informed Jerry that I would prepare a memorandum of our meetings and forward copies to all participants.

CHARLENE CARMACK  
Community Planner

CF:  
Dist File (PD)  
PD(Hanson)  
ED-DG  
PD-C  
PD-P  
PD-E  
OD-RR (Dowell)

CONVERSATION RECORD		TIME	DATE
		0916	5 April 90
TYPE <input type="checkbox"/> VISIT <input type="checkbox"/> CONFERENCE <input checked="" type="checkbox"/> TELEPHONE		<input type="checkbox"/> INCOMING <input checked="" type="checkbox"/> OUTGOING	
Location of Visit/Conference:			
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU		ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
Mr. Abie Davis		Marron County Engr.	515-828-2225
SUBJECT			
Red Rock Trail - Segment II, Trail Crossing with Highway T-15.			
SUMMARY			

I told Mr. Davis that the Corps of Engineers will be constructing a bike trail across County Highway T-15 on the northeast side of Red Rock Dam. I told him we are considering an underpass or a bridge crossing. He said that the 1986 count of traffic on this road was 3010 vehicles per day. However during the summer he thought the traffic volume was greater than this figure. The location of the crossing site is a 55 mph zone. Most of the traffic is commuter traffic and trucks between Pella and Knoxville.

**ACTION REQUIRED**

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
Tim Hess	<i>Tim Hess</i>	4-5-90

**ACTION TAKEN**

SIGNATURE	TITLE	DATE

MAY 29, 1990

Planning Division (1165-2-26a)

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers (Corps) is preparing plans to construct a segment of bike trail on the north side of Lake Red Rock. The trail segment will be located in sections 7, 18, and 19, T. 76 N., R. 18 W., and section 12, T. 76 N., R. 19 W., Marion County, Iowa (see attached map).

This action represents one component of the Des Moines Recreational River and Greenbelt, Multi-Purpose Trail project. The Multi-Purpose Trail project was included in the Greenbelt General Design Memorandum and programmatic Environmental Impact Statement (GDM/EIS), prepared by Rock Island District in September 1987. This component will be referred to in future correspondence as Red Rock, Segment 2.

The proposed action involves construction of an asphalt surfaced bike trail approximately 4.1 miles long. This trail will provide access by foot and bicycle traffic between the Howell Station, North Overlook and Wallashuck campgrounds on the north side of the reservoir. The trail will be located entirely on federally owned property zoned for recreation, wildlife management, and project operations.

The trail alignment traverses a variety of land use and habitat types. These include former borrow areas for construction of Red Rock Dam, lake shoreline areas, developed recreation areas, plantations of trees and prairie grasses, and natural areas with herbaceous, shrub, or deciduous forest cover. The alignment will be refined to minimize disturbance to natural areas and to be compatible with existing recreation uses.

A Feature Design Memorandum with Environmental Assessment is being prepared for this action and, when completed, will be provided to your office for review. We request your comments on this action concerning your agency's area of legislative interest. Comments received in response to this letter will be incorporated into the Environmental Assessment.

Please provide us with your comments on this action within 30 days of the date of this letter. If you have any questions, please call Ms. Charlene Carmack at 309/788-6361, Ext. 6570, 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  
PATRICK T. BURKE, P.E.**

Dudley M. Hanson, P.E.  
Chief, Planning Division

Attachment

DISTRIBUTION LIST

Mr. Richard Nelson  
U.S. Fish and Wildlife Service  
1830 Second Avenue  
Rock Island, Illinois 61201 (w/enclosure)

Mr. Larry Wilson  
Iowa Department of Natural Resources  
Wallace State Office Building  
Des Moines, Iowa 50319 (w/enclosure)

Mr. Morris Kay  
U.S. Environmental Protection Agency  
726 Minnesota Avenue  
Kansas City, Kansas 66101 (w/enclosure)

Chairman  
Marion County Board of Supervisors  
Marion County Courthouse  
Knoxville, Iowa 50138 (w/enclosure)

Director  
Marion County Conservation Board  
Box 106  
Pella, Iowa 50219 (w/enclosure)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII  
726 MINNESOTA AVENUE  
KANSAS CITY, KANSAS 66101

June 22, 1990

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

Dear Colonel Brown:

RE: Bicycle Trail Construction, Howell Station Campground, Lake  
Red Rock, Marion County, Iowa

In accordance with our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act, we have reviewed the draft Environmental Assessment and Finding of No Significant Impact (FNSI) for the project referenced above. We concur with your intent to issue a FNSI for this project.

Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in cursive script that reads "Lawrence M. Cavin".

Lawrence M. Cavin  
Chief, Environmental Review  
and Coordination Section



TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

LARRY J. WILSON, DIRECTOR

July 2, 1990

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

RE: Comments on Red Rock Trails  
Segment II Proposed Alignment

Dear Sir:

The Iowa Department of Natural Resources has reviewed the proposed alignment of a Multi-Purpose Trail between Howell Station, North Overlook and Wallashuck Campgrounds on the north side of Lake Red Rock. This would be approximately 4.1 miles long trail located entirely on federally owned property zoned for recreation, wildlife management and project operations.

It is anticipated that a trail of this type will eventually be linked with Des Moines and the Saylorville trail system. This type of a trail system will have tremendous recreation benefits to the entire state but all area users must be considered. The question of hunter/trail user conflict should be resolved prior to these developments on land now managed for wildlife and open to public hunting.

Our staff would like to be involved in the input on the final resolution to this problem.

Please keep us informed as a Feature Design Memorandum with Environmental Assessment is completed.

Thank you for coordinating this preliminary planning with this agency.

Sincerely,

LARRY J. WILSON  
DIRECTOR

cc - Richard Bishop - IDNR  
Robert Walker - IDNR

kh(A:clock.dh)



## United States Department of the Interior

Fish and Wildlife Service  
Rock Island Field Office (ES)  
1830 Second Avenue, Second Floor  
Rock Island, Illinois 61201



COM: 309/793-5800  
FTS: 782-5800

In Reply Refer to:

July 5, 1990

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

Dear Colonel Brown:

This constitutes our Fish and Wildlife Coordination Act report concerning the proposed bike trail segment at Lake Red Rock in Marion County, Iowa (Red Rock Segment 2). The proposal, as described in Mr. Hanson's letter of May 29, 1990, is a component of the Des Moines Recreational River and Greenbelt, Multi-Purpose Trail project.

The project would involve construction of an asphalt surfaced 4.1-mile-long bike trail along a portion of the north shore of Lake Red Rock. The trail would be entirely on Federal property currently zoned for wildlife management, recreation and operations. We have visited the proposed construction site, and have concluded that a bike trail would have no significant impacts on existing fish and wildlife habitat. Approximately 12 feet of right-of-way will be required for the trail, and careful design of the alignment should preclude the need for clearing any large trees.

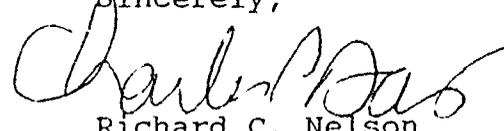
The reservoir project lands outside the public use and operations areas are open to public hunting, and provide habitat for several species of game, including ring-necked pheasants, white-tailed deer, cottontail rabbits, fox squirrel, and bobwhite quail. A potential hazard to trail users could occur during the shotgun deer season. It is our understanding that trail access during the season will be restricted to public use area segments.

The Indiana bat, a federally listed endangered species, is known to utilize timber on the north shore of Lake Red Rock for roosting activities. The construction of a narrow multiple purpose trail should have no affect on the use of the area by the bats. This precludes the need for further action on this project

as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified or new information indicate endangered species may be affected, consultation should be initiated.

We appreciate the opportunity to work with your staff on this project. If you have any questions or comments on this report please do not hesitate to contact Mr. Chuck Davis of my staff.

Sincerely,

  
Richard C. Nelson  
Field Supervisor

cc: IADNR Des Moines (Don Cummings)  
IADNR Indianola (Chuck Kakac)

CD:hw

July 18, 1990

Planning Division (11-2-240a)

Mr. James Jacobsen  
Bureau of Historic Preservation  
ATTN: Review and Compliance Program  
State Historical Society of Iowa  
Capitol Complex  
Des Moines, Iowa 50319

Dear Mr. Jacobsen:

The Rock Island District of the U.S. Army Corps of Engineers is considering plans to construct a 4.6-mile multipurpose recreational trail at Lake Red Rock, Marion County, Iowa.

In order to assess the potential of the proposed action to impact significant historic properties, American Resources Group, Ltd., under contract to the Rock Island District, conducted an archeological survey of the proposed alignment. The enclosed report entitled Phase I Archaeological Reconnaissance for Red Rock Multi-Purpose Trail Segment II details the results of the investigation.

The archeological survey failed to identify any significant historic properties that could be impacted by the proposed trail construction. The survey encompassed approximately 5.6 total acres. Based on the results of this survey, it is our opinion that the proposed project will have No Effect on significant historic properties.

We request your written comments on these actions within 30 days. If you have any questions, please call Mr. Kenneth Barr of our Environmental Analysis Branch at 309/788-6361, Ext. 6349, or 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**  
**PATRICK T. BURKE, P.F**

Dudley M. Hanson, P.E.  
Chief, Planning Division

Enclosure



# State Historical Society of Iowa

The Historical Division of the Department of Cultural Affairs

August 14, 1990

In reply refer to:  
RC# 900463018

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 - MARION COUNTY - LAKE RED ROCK - CONSTRUCT 4.6 MILES  
OF MULTIPURPOSE RECREATIONAL TRAIL

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 the Review & Compliance program at 515-281-8743.

Sincerely,

for James E. Jacobsen  
Deputy State Historic Preservation Officer  
Bureau of Historic Preservation

/akh

C-12

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



REPLY TO  
ATTENTION OF

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

August 17, 1990

Engineering Division  
General Engineering Section

Mr. Ralph Turkle, Chief  
Water Quality Planning Section  
Iowa Department of Natural Resources  
Wallace State Office Building  
900 East Grand Street  
Des Moines, Iowa 50319-0034

Dear Mr. Turkle:

The Corps of Engineers, Rock Island District, is constructing a "Des Moines Recreational River and Greenbelt" project called "Multi-Purpose Trail, Red Rock - Segment II". This project will connect to an existing Federal trail just downstream from Red Rock Dam and run north along the shore of Lake Red Rock to the Wallashuck Recreation Area.

The trail in this project is approximately 4 miles in length. The trail has an asphalt paved width of 10 feet with 2-foot shoulders on each side. The trail will cross two streams via concrete culvert and fill and will pass beneath County Highway T15 via a 12'W x 10'H x 200'L concrete tunnel.

The construction of the trail will involve placing approximately 27,000 cubic yards of earth fill and 5,000 yards of riprap bank protection along the north shore of Lake Red Rock.

The total estimated volume of materials to be placed below the calculated Ordinary High Water (O.H.W.) elevation of 743.5 is 1,500 cubic yards. Approximately 1,000 cubic yards of the fill will be earth fill excavated from a nearby borrow site. Approximately 500 cubic yards of the fill will be clean quarry run rock.

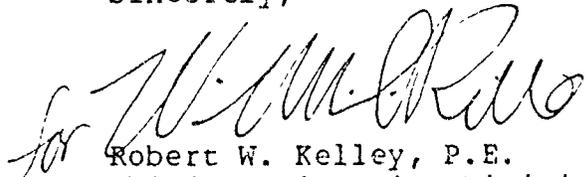
An Environmental Assessment (EA) will be prepared by the Rock Island District. Aspects requiring processing under Section 404 of the Clean Water Act are in progress. A copy of our report will be forwarded to your office for review. We are requesting your expedient review and issuance of 401 Water Quality Certification for the proposed project. Enclosed is an application packet containing the forms and project information.

-2-

If you have any questions regarding the project, please call Mr. Tim Hess of my staff at 309/788-6361, extension 6554, or you may write to the following address:

District Engineer  
U.S. Army Engineer District, Rock Island  
ATTN: Engineering Division (Tim Hess)  
Clock Tower Building, P.O. Box 2004  
Rock Island, Illinois 61204-2004

Sincerely,

  
Robert W. Kelley, P.E.  
Chief, Engineering Division

Enclosure



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

August 23, 1990

Engineering Division  
General Engineering Section

Mr. Abie Davis  
Marion County Engineer  
R.R. #5, Box 2  
Knoxville, IA 50138

Dear Mr. Davis:

The Corps of Engineers, Rock Island District, is constructing a "Des Moines Recreational River and Greenbelt" project called "Multi-Purpose Trail, Red Rock-Segment II." This project will connect to an existing Federal trail downstream of Red Rock Dam and run north to the Wallashuck Recreation Area. The trail has an asphalt paved width of 10 feet with 2-foot shoulders on each side and is approximately 4.0 miles in length.

The trail will cross Marion County Highway T-15 just north of Red Rock Dam. Where the trail and highway intersect a concrete underpass for the trail will be constructed. The underpass will be a 12'W x 10'H x 150'L cast-in-place reinforced concrete box culvert. Two 50-foot-long retaining walls will extend from the north end of the tunnel giving the underpass a total length of 200 feet.

The underpass will be constructed in an open face cut through the existing Highway T-15 embankment. The underpass will be built in two phases so the highway can remain open and traffic will not need to be detoured. After construction of each phase the underpass will be covered and the affected highway pavement repaired.

Enclosed are two preliminary drawings which show the underpass location and general features. The underpass is currently programmed for construction in spring 1991. We will furnish you with a copy of the Design Memorandum and plans as they become available.

-2-

Please provide us with your comments on this action. If you have any questions or require additional information, please call Mr. Tim Hess at 309/788-6361, ext. 6554, or you may write to the following address:

District Engineer  
U.S. Army Engineer District, Rock Island  
. TTN: ED-DG (Tim Hess)  
Clock Tower Building - P.O. Box 2004  
Rock Island, Illinois 61204-2004

Sincerely,

  
Robert W. Kelley, P.E.  
Chief, Engineering Division

Enclosure

DISTRIBUTION

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DISTRIBUTION LIST FOR  
 RED ROCK TRAIL (SEGMENT II) - FDM #6, MARCH 1991  
 DES MOINES RECREATIONAL RIVER AND GREENBELT  
 DES MOINES RIVER, IOWA (CONTINUED)

PAGE NO. 2  
 10 MAY 91

<u>LAST NAME</u>	<u>FIRST NAME</u>	<u>ADDRESS</u>	<u>CITY, STATE</u>	<u>ZIP</u>	<u>REPORT</u>	<u>NOTICE</u>
10. SCHEUERMAN	LINDA	RURAL ROUTE 1	STRATFORD, IA.	50249	1	0
11. HOLT	BRIAN	RR #1	WEBSTER CITY, IA.	50595	1	0
12. BOARD OF SUPERVISORS	CHAIRMAN	JASPER COUNTY COURTHOUSE	NEWTON, IA.	50208	1	0
13. KEUING	MAX	808 W. SECOND STREET	PRAIRIE CITY, IA	50228	1	0
14. WARRICK	JOE	RURAL ROUTE 3, BOX 225	OSKALOOSA, IA.	52577	1	0
15. BOARD OF SUPERVISORS	CHAIRMAN	MAHASKA CO. COURTHOUSE	OSKALOOSA, IA	52577	1	0
16. PRATHER	WILL	MARION COUNTY COURTHOUSE	KNOXVILLE, IA.	50138	1	0
17. FORD	EDWIN J.	RURAL ROUTE	OTLEY, IA	50214	1	0
18. BRANNAN, RICHARD	TWO RUAN CENTER	601 LOCUST ST.	DES MOINES, IA.	50309	1	0
19. BOARD OF SUPERVISORS	POLK CO. OFFICE BLDG.	2ND & COURT AVE.	DES MOINES, IA	50309	1	0
20. RICHARDS	IVAN	349-228TH AVE.	HARTFORD, IA.	50118	1	0
21. GOODHUE	JIM	RURAL ROUTE 2	CARLISLE, IA	50047	1	0
22. SANDHOLM	SID	23 S. MAIN	DAYTON, IA.	50530	2	0
23. GROAT	MYRON	2735 20TH AVE. N.	FORT DOGGE, IA.	50501	1	0
24. JORGENSEN, RIC	CITY HALL	E. 1ST & LOGUST	DES MOINES, IA.	50307	1	0
25. FOSTER	TOM	RR #4, BOX 89	OGDEN, IA.	50212	1	0
26. MAYOR	CITY OF CARLISLE	CITY HALL	CARLISLE, IA.	50047	1	0
27. MCCARVILLE	HONORABLE MICHAEL D.	819 1ST AVE. SOUTH	FORT DOGGE, IA.	50501	1	0
28. PARIS	MIKE	RURAL ROUTE 4	BOONE, IA.	50036	1	0
29. SIMERSON	HONORABLE FOREST	CITY HALL	HARTFORD, IA.	50118	1	0
30. MAYOR	CITY OF HARVEY	CITY HALL	HARVEY, IA	50119	1	0
31. PAEZ	MARY JANE	6165 CRABAPPLE LANE	JOHNSTON, IA.	50131	1	0
32. CUNNINGHAM	MIKE	1102 E. COMPETINE	KNOXVILLE, IA	50138	1	0
33. LARSON	LARRY	425 E. HILL ST.	LEHIGH, IA.	50557	1	0
34. MAYOR	CITY OF MADRID	CITY HALL	MADRID, IA.	50156	1	0
35. BELL	STEVEN	P.O. BOX 345	PELLA, IA	50219	1	0
36. STARK	HONORABLE A.P.: H.	CITY HALL	PILOT MOUND, IA.	50223	1	0

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RED ROCK TRAIL (SEGMENT II) - FDM #6, MARCH 1991  
DES MOINES RECREATIONAL RIVER AND GREENBELT  
DES MOINES RIVER, IOWA (CONTINUED)

PAGE NO. 3  
10 MAY 91

<u>LAST NAME</u>	<u>FIRST NAME</u>	<u>ADDRESS</u>	<u>CITY, STATE</u>	<u>ZIP</u>	<u>REPORT</u>	<u>NOTICE</u>
37. FORBES	HONORABLE KENT M.	4450 OAKWOOD DR.	DES MOINES, IA.	50317	1	0
38. BURCH	WILLIAM	1201 BROADWAY, RR 1	POLK CITY, IA.	50226	1	0
39. HERRING	JACK	304 PERSON ST.	RUNNELLS, IA.	50237	1	0
40. CONKLIN	GERALDINE	CITY HALL	STRATFORD, IA	50249	1	0
41. MAYOR	CITY OF SWAN	CITY HALL	SWAN, IA	50252	1	0
42. DUNHAM	JAMES	920 DES MOINES ST.	WEBSTER CITY, IA.	50595	1	0
43. ORHART	TED	1026 31ST ST.	WEST DES MOINES, IA.	50265	1	0
DE					1	0
ED-C					1	0
ED-G					1	0
ED-H					1	0
ED-S					1	0
ED-DG					4	0
ED-DS					1	0
PD-C					1	0
PD-E					1	0
OO-R					1	0
OO-RR					1	0
RE					2	0
PA					1	0
IM-CL					3	0