FAIRLANE PARKWAY - MDDP

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

Interstate 25
Fairlane Parkway
Interchange

Preliminary Hydraulic Report

Prepared for: **SCHUCK HOLDINGS LLC.**

February 27, 1998

DMJM Project No. 3821.00/01

DMJM

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DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

I. INTRODUCTION

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FAIRLANE INTERCHANGE-PRELIMINARY DRAINAGE REPORT

I. INTRODUCTION

A. PURPOSE AND SCOPE

The purpose of this document is to provide an update to previous drainage studies to facilitate the proposed construction of Fairlane Parkway Interchange. This report is based upon the Colorado Department of Transportation Drainage Criteria developed in 1995 and the City of Colorado Springs Drainage criteria developed in October 1987, revised November 1991.

This study defines the general nature of existing historic runoff conditions and the preliminary impact of the development of the Fairlane Parkway Interchange on existing downstream drainage facilities. This report also determines proposed drainage facilities designed to accommodate both offsite and onsite runoff in the vicinity of the proposed Interchange ("Project").

More specifically this report includes determining the limits of contributory drainage basins and the major drainage facilities. The drainage basin data was established including: delineating basins, determining basin size, determining waterway geometries, and establishing vegetation cover and land use. Based on this hydrologic analysis, preliminary structure hydraulic design, structure cross sections, and a storm water management plan were produced. In the appendix; drainage basin maps, preliminary storm sewer design, structure cross sections, project design criteria, detention pond hydrographs, and numerous channel alternatives are included.

B. PROJECT LIMITS

The proposed Fairlane Interchange study area is located in north Colorado Springs in Sections 19, 20, 21, 15, 16, 17, Township12 South, Range 66, west of the Sixth Principal Meridian. The study area is displayed on Figure 1, page 3. It is bounded on the west by Interstate 25 (including its surface and proposed interchange ramps), on the north by a ridgeline that divides drainage north toward Black Squirrel Basin and south toward the Fairlane Parkway Interchange, to the east by the Kettle Creek Drainage Basin, and on the south by the proposed Fairlane Parkway. The construction of the project has been broken into two phases, with phase 1 ending at the intersection of present State Highway 83 (SH83) and existing Stout Allen Road and Phase Two ending with the future intersection of SH 83 and Fairlane Parkway. The proposed project disturbance area contains approximately 126.37 acres or .197 square miles; including ramp infield areas and a proposed detention pond site. Historically, the project area receives runoff from an area of about 227 acres to the northeast of the property. This area is currently undeveloped pasture land. A small ridge line along the southerly limits of the basin prevents this runoff from reaching Kettle Creek. An extended Powers Boulevard proposed by others may alter historic drainage patterns in offsite area O-1 (See Appendix A/Design Point 1).

The current network of roadways and development has slightly affected drainage patterns:

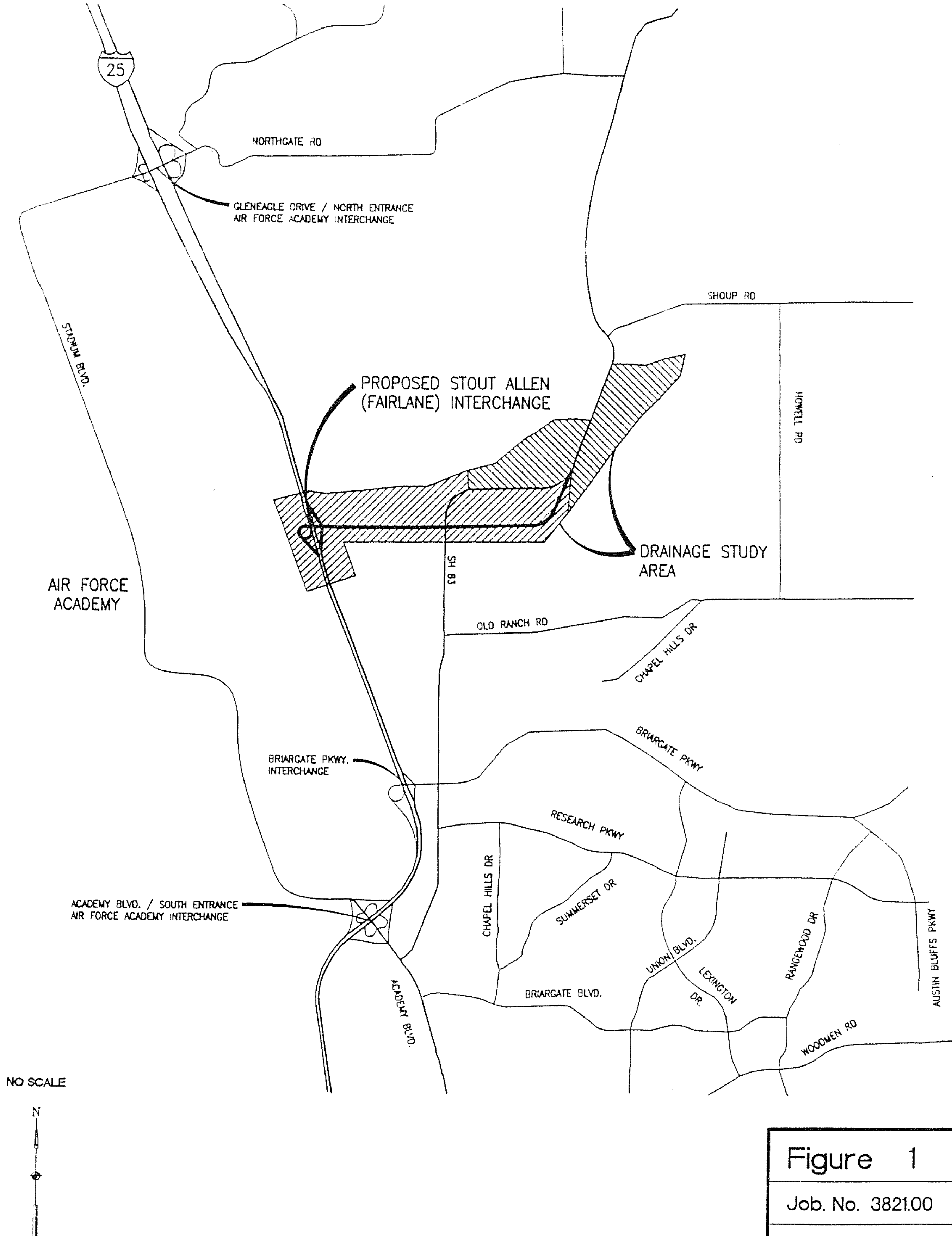
Flows traveling southwest from the northeast sector of the project run into State Highway 83 (SH83) and are channelized north of this highway until crossing into the Pikes Peak Community College (PPCC) site in an existing 24" pipe at design point 2. The community college does not recognize this historic flow in their drainage report as flowing through their property and rather shows flow routed west in a roadside ditch where it is eventually discharged at the northeast corner of SH 83 and the existing Stout Allen Road at design point 4. The remainder of the flow from the PPCC is released from the property at historic levels from an onsite detention pond (under construction/design point 3).

The New Life Church has also constructed an onsite detention facility that releases flow at historic rates from its property to the northeast side of the Stout Allen, SH 83 Intersection.

Sheet flow from O-3B (Appendix A) is intercepted by the existing Stout Allen road which runs from the Air Force Academy (AFA) boundary at the west end of existing Stout Allen road to existing Highway 83. Flow is intercepted in a road side ditch and runs down the north side of Stout Allen Road west toward I-25. There is no cross culvert east of the existing 30" CMP at SH83 and Stout Allen Road southwest to maintain historic drainage patterns.

All of the areas studied drain directly to Monument Creek to the west.

VICINITY MAP



Date Prepared: 02/18/98
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Figure 1

Job. No. 3821.00

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CITY OF COLORADO SPRINGS

II. HYDROLOGY

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II. HYDROLOGY

A. GENERAL DISCUSSION

This report includes review of the drainage limits associated with the area surrounding the proposed project. The review included previous drainage reports and plans that were available from CDOT or the City of Colorado Springs (City). These drainage reports and plans include the following:

1. "Fairlane Technology Park - Hydrology Update," Ayres Associates, November 13, 1997.

2. "Master Development Drainage Report and Plan", Fairlane Technology Park., URS Project No. 42044. October 22, 1993, Revised January 6, 1994.

3. "Preliminary and Final Drainage Report and Plan", Fairlane Technology Park Filing No. 2. URS Project No. 42044. Revised January 6, 1994.

4. "Drainage Memorandum for Pikes Peak Community College North Campus", Colorado Springs, Colorado., El Paso County. URS Project No. 67.42154, October 7, 1996

5. "New Life Church Drainage Report," KLH Engineering, INC., April, 1991.

6. "Preliminary and Final Drainage Report for International Bible Society Filing NO. 1.", URS Project NO. 48404. August, 1988.

7. "Northgate Phase 1 Drainage Plan", URS Project No. 45206, June 15, 1987, Revised August 27, 1987.

8. "Northgate Phase 1 Drainage Plan", URS Project No. 45206, June 15, 1987, Revised August 27, 1987. Addendum Date October 6, 1987.

B. DRAINAGE AREA CHARACTERISTICS

The project is surrounded by undeveloped pasture land with parcels of recently developed light industrial and commercial land. The topography of the site consists of moderately sloping hills which slope in general from northeast to southwest at an average slope of slightly greater than 2%. Existing drainage paths within the basin are not clearly defined by channels or gullies, indicating runoff travels across the site in sheet flows. Offsite flows are collected and routed under I-25 in numerous culverts which carry drainage from east to west. Most median inlets associated with these culverts are clogged severely. Offsite basins and on site sub-basins have been delineated and labeled on the "Drainage Basin Area" (DBA) sheets located in Appendix A.

Vegetation within the basin boundaries consists mostly of prairie grasses with some small stands of trees and scrub oak. In this study the undeveloped areas have been considered as pasture or range land. The majority of the soils in phase 1 of the project consist of Stapleton Sandy Loam soil type 83. This soil type generally exists in slope ranges between 3-8% and is Hydrologic Soil Group B. Phase 2 soils consist mostly of Blakeland Sandy Loam soil type 8. This soil type generally exists in slope ranges between 1-9% and is Hydrologic Soil Type A. The majority of the offsite contributory areas to the northwest are classified as Petyon Pring Complex, Pring Course Sandy Loam, Stapleton Sandy Loam or Stapleton-Bernal-Sandy-Loam. These soils have evolved from material weathered from Arkosic sedimentary rock. Arkosic sedimentary rock is considered a sandstone with granitic source for sand. The sand sized Feldspar particles are much stronger than the cementing material in the sandstone and remaining as discrete particles after loss of cementation in the rock. The result is a granular soil considered to be part of the Hydrologic Soils Group B which is easily erodible by surface water runoff.

Basin soil and land use characteristics determine the resultant level of precipitation runoff that travels over the ground or infiltrates into the soil. The U.S. Soil Conservation Service classifies soils into four hydrologic groups (A, B, C, and D) according to runoff potential. Group A soils exhibit high infiltration rates when thoroughly wetted and are considered to have low runoff potential. Group B soils exhibit moderate infiltration rates when thoroughly wetted. Group C soils exhibit slow infiltration rates when thoroughly wetted. Group D soils exhibit very slow infiltration rates when thoroughly wetted and are considered to have high runoff potential.

In the case of this study. Phase 1 consists primarily of soil type B, with low to moderate runoff potential and Phase 2 consists primarily of soil type A with low runoff potential. As a result of current City of Colorado Springs Criteria, type A soils are not allowed in runoff analysis where any grading or fill operations have or will occur. Therefore both phases of the project were analyzed with soil type B.

Soil type and treatment at the detention pond must be investigated in detail during final design to ensure that unacceptable levels of seepage through porous soil types does not occur.

C. DESIGN METHODS AND CRITERIA

Project design criteria were developed that incorporated critical elements of both CDOT and City of Colorado Springs criteria. The methods and criteria utilized are included in Appendix B. The design references used for this project are as follows:

1. "Drainage Design Manual, 1995 Draft", Colorado Department of Transportation, July 1995.

2. "Drainage Criteria Manual", City of Colorado Springs and El Paso County, October, 1987 including amendments in November, 1991 and October, 1994.

3. "Erosion Control and Stormwater Quality Guide", Colorado Department of Transportation,

June, 1995.

4. "Soil Survey of El Paso County Area, Colorado" United States Department of Agriculture Soil Conservation Service. 1975.

5. "Design of Small Dams" United States Department of the Interior, Bureau of Reclamation. Revised Reprint, 1977.

6. "NOAA Atlas 2-Precipitation-Frequency Atlas of the Western U.S.," Volume III-Colorado. National Oceanic and Atmospheric Administration, 1973.

D. HYDROLOGIC CRITERIA

The design rainfall intensity for sizing of hydraulic structures is the 100 year storm intensity. The on-site calculations of this drainage study area based upon the criteria and requirements of the State Drainage Design Manual (State Manual) and the City of Colorado Springs Design Manual (City Manual). In accordance with chapter 6 of the City Manual, the Rational Method was applied to only basins less than 100 Acres. The Rational Method was used to calculate the 5 and 100 year frequency storm runoffs for any areas that were determined by hand calculations. The Rational Method is defined as follows:

Q=CiA

Q = maximum rate of runoff in cubic feet per second

C = a runoff coefficient as a ration between the maximum rate of runoff and the average rate of rainfall intensity over a duration equal to the time of concentration

i = average intensity of rainfall in in/hr for a duration equal to the time of concentration.

A = area of basin or sub-basin in acres

The overall storm sewer system was analyzed using XPRAT storm sewer software. Information on the assumptions and methods used by this software is attached in Appendix D.

The time of concentration is defined as the time required for water to flow from the most remote point of the area to the point being investigated. The runoff coefficients are based on the subasin's historic and proposed land use. A table for these coefficients can be found in the design criteria in Appendix C. The rainfall time/intensity/frequency curve for Zone 11A was taken from the City Manual. (Appendix C).

The time of concentration for basins under with overland flows of less than 300 feet was calculated by utilizing the formula below from the City Manual.

$Tc = 1.87\,(1.1 - C_{10}) L^{.5} S^{-.33}$

Where C_{10}	= adjusted runoff coefficient for 10 year flow
L	= length of overland flow in feet
S	= slope of flow path in percent; and
Tc	= travel time in minutes

For basins over 100 acres, or for basins part of a larger analysis, the HEC-1 computer program was utilized. HEC-1 output can be viewed in Appendix C. The time of concentration used for the larger basins was calculated using the formula below with adjustments made for the project location west of the 105 meridian.

$$Tc = \left(\frac{11.9\,L^3}{H}\right)^{.385}$$

Where Tc	=	time of concentration in hours
L	=	length of longest watercourse in miles
H	=	elevation difference in feet

The adjustment table for watersheds west of the 105 meridian and mountainous timber-covered watersheds east of the 105 meridian is shown below:

CN	**T'c/Tc**
80..	1.0
70..	1.4
60..	1.8
50..	2.2

Rainfall depths of 3.0 and 4.4 inches were obtained from the NOAA Atlas 2 isopluvials for the project area for the 5-year 24-hour, 10-year 24 hour, and the 100-year 24 hour storm events respectively. Currently no analysis has been performed for the 2-hour 10 year and 2-hour 100 year storm events.

Flow capacities for the proposed road were based on the allowable capacities for major storms according to road type, major arterial and highway respectively. Design assumptions for these systems are located in the design criteria. (Appendix C).

A preliminary detention facility has been designed for this project. HEC-1 was used to determine hydrographs and flood routing for the detention pond.

E. OFFSITE HYDROLOGY

The offsite basin flows were calculated using the above hydrologic computation methods and were compared to flows established in the other studied basins. The flows generated by offsite flow analysis were then used to determine culvert crossing capacities on I-25, size proposed pipes, determine grading and other drainage related items.

Offsite Basin O-1

Offsite Basin O-1 was last studied in report reference #1. This basin is shown as containing 170 Acres and producing a 100 year 24 hour historic flow of 230 CFS directly onto the northwest quadrant of the site. Reference #2 shows almost identical data of 169.1 acres and 230 CFS historic flow.

Offsite Basin O-2 (O-2A, O-2B)

Offsite Basin O-2 was last studied in report reference #1. This basin is shown as "not contributing" to the project site. This assumption may be based on the assertion that an existing 24" CMP would be removed. In fact this CMP is undersized but does transfer some flow from approximately 55 acres of OS-2 to the project site. Reference #2 shows this relationship correctly, displaying 55 acres of contributory area and 148.5 cfs 100 year flow. However, it should be noted that only approximately 35 CFS would be able to pass through the pipe in peak flow conditions before possible road overtop of cross basin flow diversion. For clarity OS-2 is broken into 2 parts in this report; OS-2B which does contribute to the project, and OS-2A which contributes to the Black Squirrel Basin.

Offsite Basin O-3 (O-3A, O-3B, O-3C)

Offsite Basin O-3B and O-3C exist in a miscellaneous basin south of the Black Squirrel Basin. Drainage from O-3B and O-3C historically sheet flows southeast to I-25 and east under I-25 in two 24" and one 30" culverts at design points 10,11, and 12 respectively. These culverts are under designed for the present City Manual Criteria, and State Manual Criteria. O-3A is included in this report as a contributory basin to the project. Reference #1 excludes this basin; assuming that flow is carried under existing SH 83 in the existing 30" RCP and continues on the north side of existing Stout Allen Road. However, upon inspection another 30" CMP carries flow to the east under Stout Allen Road to the southeast, maintaining historic flow direction. This culvert is presently plugged with debris, but it appears that it was installed to maintain the historic flow of O-3A in the southeast direction. Reference #5 states that water can pond (at design point 5) to a depth of 4' before overtopping Stout Allen Road and flowing south.

Other Offsite Considerations

A primary drainage objective is to limit downstream flows onto the AFA to historic levels, and limit the potential number of erosion problems that could occur. As a result the routing from the detention pond to the AFA property has been carefully examined. Four alternatives exist and are examined in the "proposed design" section.

The cross culverts under I-25 are undersized for historic flows. If these culverts are not improved, criteria predicts substantial potential flooding in a 100 year event on the east side of I-25. These flows would still be historic, but the conveyance capacity would increase from those present since the development of the AFA. However, no historical data of flooding problems in this area has been found.

A summary of design point flows is included below:

DESIGN POINT SUMMARY					
DS PT	HISTORIC 100 YEAR FLOW	DEVELOPED 100 YEAR FLOW	FLOW INCREASE + FLOW DECREASE -	FLOW CHANGE %	DESCRIPTION OF DESIGN POINT LOCATION
1	230	*30	-200	-86.96%	OFFSITE AREA O-1
2	148.5	148.5	0	0.00%	CROSS CULVERT/O-2B TO B-9
3	173	60	-113	-65.32%	PIKES PEAK POND
4	178	34	-144	-80.90%	NEW LIFE POND
5	36	34	-2	-5.56%	NEW LIFE DOWNSTREAM CROSS CULVERT
6	NA	**150	NA	NA	OUTFALL OF PROPOSED STORM SEWER
7	NA	NA	NA	NA	OUTFALL OF PROPOSED POND/NEW FACILITY
8	NA	NA	NA	NA	I-25 CROSS CULVERT/BURIED
9	193	**43	-150	-77.72%	I-25 CROSS CULVERT/DOWNSTREAM OF POND
10	95	95	0	0.00%	I-25 CROSS CULVERT
11	117	117	0	0.00%	I-25 CROSS CULVERT
12	61	61	0	0.00%	I-25 CROSS CULVERT

*Preliminary Quantities-Assuming future alignment of Powers Boulevard
**Preliminary Design Quantities

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III. EXISTING STRUCTURE

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III. EXISTING STRUCTURE

A. GENERAL DISCUSSION

Existing drainage systems vary in design capacity and functionability on and around the project. As a result of the different design criteria and land use during the original construction of respective facilities, most existing systems were designed for lower flows. The following discussion will be organized by I-25 facilities, and other facilities in the project area and contributory offsite area.

B. EXISTING HIGHWAY/ROAD CROSSINGS/CHANNELS

<u>**I-25**</u>

There are five pipe crossings of I-25 in the project limits.

STATION 1423+26/DESIGN POINT 8

A median inlet connects to a 24" CMP which flows west. A pipe comes into the inlet on the east side but the pipe's inlet end cannot be located and is presumed buried. This culvert has little impact on the project.

STATION 1435+19/DESIGN POINT 9

A 24" RCP crosses under I-25. This pipe's existing capacity is 42 CFS and a historic flow of 193 CFS is estimated by reference #2 to come to this crossing in a 100 year event.

STATION 1447+21/1446+58/DESIGN POINT 10

A 24" RCP crosses perpendicular under the east lanes of I-25, connects to a median inlet and continues southwest at a skew where it outfalls on the west side of I-25. This pipe has an estimated historic flow of 95 CFS (HEC-1, Appendix E).

STATION 1455+90/DESIGN POINT 11

A 24" CMP crosses perpendicular to I-25 through a median inlet and discharges to the west. Flow to this sight is estimated at 117 CFS (HEC-1, Appendix E).

STATION 1466+91/DESIGN POINT 120

A 30" CMP crosses perpendicular to I-25 through a median inlet and discharges to the west. Flow to this sight is estimated at 61 CFS (HEC-1, Appendix E).

<u>**OTHER FACILITIES**</u>

A 24" CMP exists due north of the Pike Peak Community College at design point 2; the pipe crosses perpendicular to SH 83. As previously stated this pipe carries flow from O-2A toward the community college. The college has rerouted the historic flow in a roadside ditch created by berming around the north quadrant of their property. Flow travels toward the New Life Church's

Northern Boundary. At the New Life Church flow travels through a 24" RCP (reported as a 30" RCP in other references) and then continues to flow southwest in a roadside ditch to the intersection of existing SH 83 and existing Stout Allen Road at design point 4. The roadside ditch appears insufficient in size past the New Life Church and south to the intersection of SH 83 and existing Stout Allen Road, but was not analyzed in detail. Drainage then collects and travels through a 30" RCP perpendicular to SH 83 (design point 5) where it can pond to a level of 4' before draining to the south (Reference #5). A 30" CMP also exists at this point which at one time directed flow south from the outfall of the 30" RCP under the existing Stout Allen Road. However, the upstream end of this pipe is plugged and not functioning.

Two detention ponds exist that were designed and constructed/under construction by individual property owners. Pikes Peak Community College's pond was designed in October of 1996 and is presently under construction (design point 3) (Reference #4). It discharges at a rate of 55 CFS to the southeast which is shown as a decrease of 55.6% from the historic flow of 124 CFS. The New Life Church's pond system was designed in April 1991 and is currently operational (design point 4). This pond system discharge at a rate of 34 CFS which is just less than the capacity of the existing 30" culvert under SH 83.

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IV. DESIGN DISCUSSION

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IV. DESIGN DISCUSSION

A. GENERAL DISCUSSION

Overall, the design criteria of the state and city has been established and the project design based on its guidelines. It is evident however that a few of the systems that are undersized may have high cost associated with their improvements which has caused particular scrutiny of their necessity.

B. SITE SPECIFIC CONDITIONS AND CONSTRAINTS

I-25 cross culverts are all undersized to some degree throughout the project. Recognizing the cost of jacking pipe under I-25, or diverting traffic for trenching across the highway; CDOT involvement on this issue for final design is imperative.

ROW constraints along the proposed Fairlane Parkway limit some of the choices in transferring drainage through the project.

C. MAJOR DRAINAGE ALTERNATIVES

Overall, the major drainage alternatives at this site are based on creating a detention facility on the AFA property which will discharge flow downstream at levels at or below historic levels. The conveyance system to the pond as previously discussed will involve an underground storm sewer system and ditch sections. Other ditches will be proposed throughout the project to direct flow. In the present configuration of phase 1 construction and certainly in the ultimate design, the flow will require an underground stormsewer. Additional ROW or easements could alter this requirement.

D. PERMITTING REQUIREMENTS

A stormwater drainage permit will be prepared and submitted by CDOT.

A section 404 permit will not be submitted as there are no wetlands in the project limits.

A floodplain development permit will not be submitted as there are no designated flood plains within the project area.

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V. RECOMMENDED DESIGN

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V. RECOMMENDED DESIGN

A. GENERAL DISCUSSION

Appendix A-includes drainage basin area sheets.
Appendix B-maps and preliminary design drawings for the recommended system.
Appendix C- includes the criteria used for the recommended design.
Appendix D- pond calculations and HEC-1 results.
Appendix E- channel alternatives
Appendix F- XPRAT parameters

This section includes information related to the analysis performed for the recommended system. It is organized into I-25 facilities and Fairlane Parkway Facilities.

B. PROPOSED HYDRAULIC DESIGN

I-25

There are five pipe crossings of I-25 in the project limits.

STATION 1423+26/DESIGN POINT 8

A median inlet connects to a 24" CMP which flows east. A pipe comes into the inlet on the east side but the pipe's inlet end cannot be located and is presumed buried. On inspection it appears that any water that travels to the alleged pipe puddles and seeps into the wide flat sandy ground adjacent to I-25.

PROPOSED IMPROVEMENTS-no improvements are proposed at this location

STATION 1435+19/DESIGN POINT 9

A 24" RCP crosses under I-25. This pipe's existing capacity is 42 CFS and a historic flow of 193 CFS is estimated to come to this crossing. This location would require an estimated 54" RCP in addition to the 24" RCP to pass the flow within the standard Hw/D ratio. (Reference 2)

PROPOSED IMPROVEMENTS-the construction of a detention facility in conjunction with pipe extensions will preserve historic flow at this location.

STATION 1447+21/1446+58/DESIGN POINT 10

A 24" RCP crosses perpendicular under the east lanes of I-25, connects to a median inlet and continues southwest at a skew where it outfalls on the west side of I-25. This pipe has an estimated historic flow of 95 CFS which would require a 42" RCP or a 36" RCP in addition to the existing 24" RCP to pass the flow within the standard Hw/D ratio. Once again upsizing this pipe could increase flows downstream on AFA property; leaving the existing pipe may result in flooding. A manhole is proposed at the existing outlet connected to another 24" RCP which would turn the flow north to a proposed ditch. An alternative is jacking a new pipe under I-25 to meet the existing inlet. Upon inspection, this inlet would take only a 24" pipe or smaller. If a new pipe is selected to be jacked under the highway a size that would increase capacity should be considered.

PROPOSED IMPROVEMENTS-Install a manhole at the existing outfall and install a new 24" RCP into this manhole. This RCP would outfall at historic location and flow..

STATION 1455+90/DESIGN POINT 11

A 24" CMP crosses perpendicular to I-25 through a median inlet and discharges to the west. Flow to this site is estimated at 117 CFS and it would require a 48" RCP or an additional 42" RCP in addition to the existing 24" CMP to pass the flow within the standard Hw/D ratio. Once again upsizing the pipe may increase flow onto AFA property; leaving the existing pipe may contribute to flooding on the east side of I-25.

PROPOSED IMPROVEMENTS-Extend the existing pipe with like material to outfall at historic location and flow.

STATION 1466+91/DESIGN POINT 12

A 30" CMP crosses perpendicular to I-25 through a median inlet and discharges to the east. Flow to this site is estimated at 61 CFS and it would require a 36" RCP or an additional 24" RCP in addition to the existing 30" CMP to pass the flow within the standard Hw/D ratio.

PROPOSED IMPROVEMENTS-Extend the existing pipe with like material to outfall at historic location and flow.

Each I-25 quadrant is addressed below in terms of overall system design. Specifics culverts have been covered in the above section. Ditch sections attached to cross culverts or storm sewer sections have been designed to accommodate the 100 year flow while preventing erosion. Ditch sections adjacent to I-25 have been designed to accommodate 10 year flow. For ditch sections with velocities over 5 feet per second protective channel linings are proposed. Riprap channel linings have been selected preliminarily for such channels, however various channel linings, drop structures and alignments are possible that will reduce velocity or dissipate energy and are displayed in Appendix B.

SE QUADRANT
A durable channel design is especially important in this location as the detention pond will contribute drainage to a channel at sustained rates for substantial periods of time.

Channel Option 1 - A riprap lined channel can be constructed from the east side of the detention pond outfall to the south end of ramp C. At this location flow can be conveyed under ramp C through a culvert and travel the additional distance in a riprap lined channel to an outfall location inside the loop ramp to the west. (See Appendix E)

Channel Option 2 - A channel can be constructed with drop structures. This channel would reduce the velocities and eliminate portions of the required riprap but require additional construction of drop structures. (See Appendix E)

Channel Option 3 - The channel would be routed in such as manner as to reduce the slope by lengthening the channel with a series of winding curves. This would increase the amount of channel grading but would reduce the slope, eliminating protective channel lining or drop structures. In addition, this design would be more aesthetically valuable then the other two structural options. The amount of "meander" and length can vary. A smaller second channel would exist to collect local infield inflows. (See Appendix E)

In addition to onsite channel considerations, the AFA is concerned about the nature and quantity of discharge west onto their property. Two possible methods of addressing this problem exist.

Outfall Option 1 - All flow from the SE Quadrant can be released at one point, thereby concentrating design effort and/or energy dissipater construction to one point. This option aims to minimize the number of points drainage discharges on the AFA property. (See Appendix E)

Outfall Option 2 - Flow is divided into a series of outfalls which discharge at numerous points at reduced flows. This option is more likely as no distinctly defined channel exists to the west and multiple discharge points more closely resembles historic sheet flows. (See Appendix E)

Outfall Option 2A - Like option 2, flow is released at multiple points. However in this option the inside floor of the loop ramp D is lowered two to four feet to allow the slope of the outlet pipes to be reduced from over 2.5 % to less than 1%. This alteration would reduce the outlet velocity of the pipe(s) and eliminate some potential erosion or the need for elaborate energy dissipater systems west of the ramp. (See Appendix E)

THIS REPORT PROPOSED CHANNEL OPTION 3 AND OUTFALL OPTION 2A..

NE QUADRANT

The channel in this quadrant outfalls west onto AFA property downstream of design point 10. As previously discussed the flow to this pipe will not be increased in any way.

NW QUADRANT

A channel is proposed in the northwest diamond infield area to transport historic 100 year flow from the proposed cross culvert under ramp B to the culvert at design point 10. The cross culvert under I-25 is undersized as previously mentioned, however the proposed culvert under ramp B is sized to carry the 100 year flow. This channel requires a protective lining. (See Appendix B).

SE/SW QUADRANT

A detention pond called "Detention Pond B" (design point 7 and 9) is proposed in this quadrant to intercept flows from the project area and discharge them at or below historic rates. In an attempt to leave replacement of culverts under I-25 as an option, not a requirement, the pond has been sized large enough to allow the 100 year peak discharge to meet the 42 cfs capacity of the I-25 cross culvert. The pond was located considering key utilities, recently planted seedlings, and clearance between the pond banks and I-25. The proposed pond is currently graded to accommodate 57 acre feet of storage. The peak storage needed is 42 acre feet, or 50 acre feet with freeboard. An emergency spillway exists that will discharge at a peak rate of 40 CFS in a 100 year event with 100% clogging. More refined grading and pond design will occur during final design. Pond details and hydrographs can be found in Appendix D.

FAIRLANE PARKWAY

Phase 1 preliminary design includes two storm sewer systems. The eastern most system will collect flows from Fairlane Parkway stations 117+00 to 122+80. This system collects local sub-basin flows and transports it to an open channel and then to drainage pond B. The largest pipe in this system is a 24" RCP. The second system includes the downstream system of the Phase 2 stormsewer. As a result of offsite area contribution as well as the local sub-basin flow from the development of the Fairlane Parkway, the storm sewer system trunkline reaches 54". Flow is transferred through a system of inlets and laterals placed on the basis of street capacity. (See drainage plans sheets Appendix B). Phase 1 storm sewer systems picks up flow from the New Life Church detention pond in addition to the flow from the project area. Phase 2 systems collect flow from Pikes Peak Community College and Offsite Area O-1 in addition to the flow from the project area. Flow from Phase 2 travels into Phase 1 and coordination of trunkline construction will be detailed during final design.

DOT

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX A

DRAINAGE BASIN AREA SHEETS

DMJM

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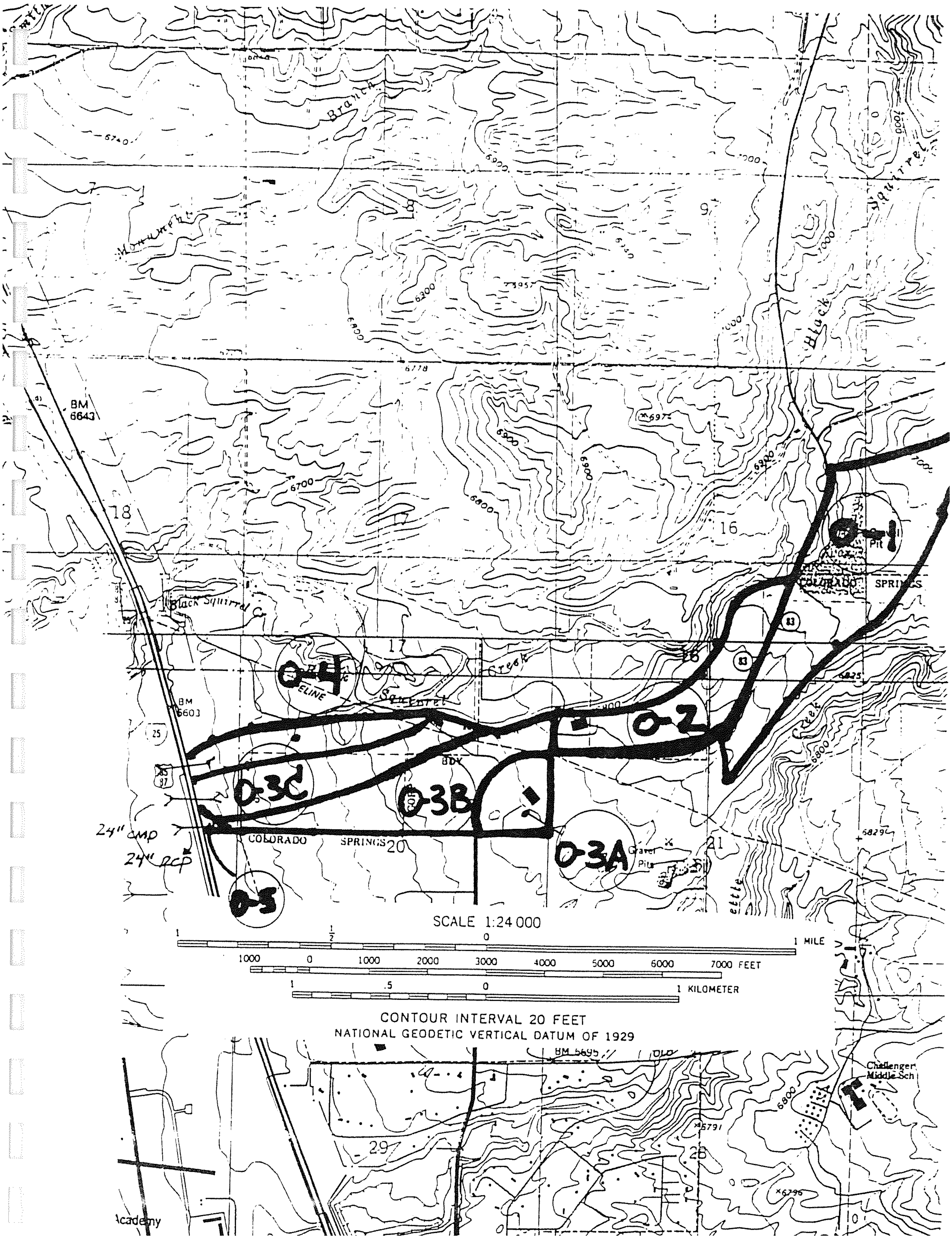
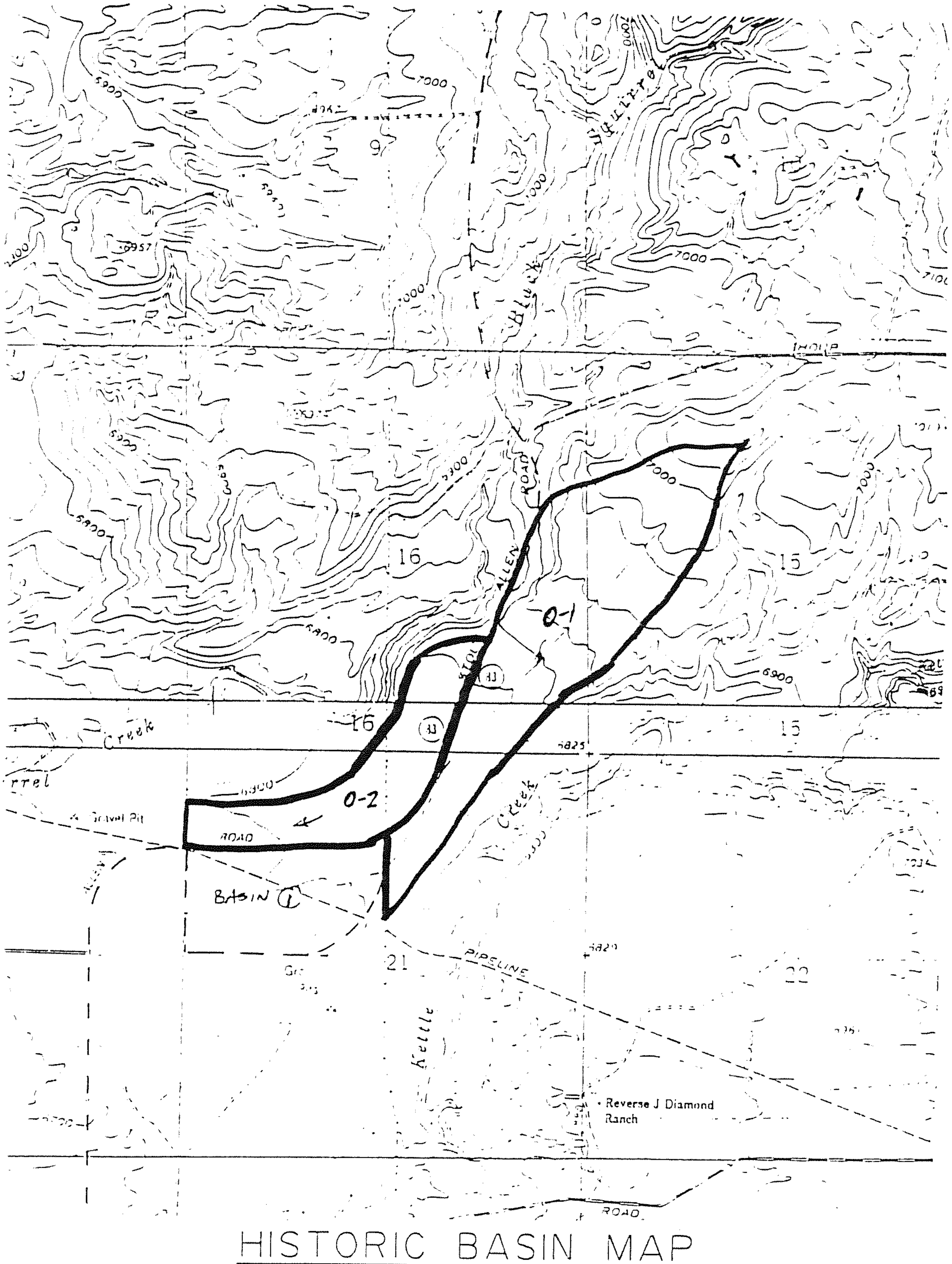


Branch
Monument
Black Squirrel
BM 6643
BM 5603
18
17
16
20
21
29
28
Black Squirrel C.
Squirrel
Creek
COLORADO SPRINGS
COLORADO SPRINGS
Gravel Pit
Pit
O-1
O-2
O-3A
O-3B
O-3C
O-4
O-5
24" CMP
24" RCP
6700
6800
6900
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
BM 5695
Challenger Middle Sch
Academy



HISTORIC BASIN MAP

FIG1.DWG RJS 09/05/96

URS CONSULTANTS, INC.
COLORADO SPRINGS, COLORADO

PROJ NO. 67.42154

PIKES PEAK COMMMUNITY COLLEGE
NORTH CAMPUS BUILDING

FIGURE
2

NOTE: This report is preliminary and Phase Two Drainage Plan Sheets are not yet complete and therefore not included.

See the overall Drainage Map Located in Appendix A for the concept of Phase 2.

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX B

DRAINAGE PLAN SHEETS

DMJM

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INDEX OF DRAINAGE SHEETS

LEGEND

- PROPOSED MANHOLE
- PROPOSED INLET
- PROPOSED CURB INLET
- PROPOSED DRAINAGE DITCH
- PROPOSED RIP RAP
- 24" RCP @ 1.00% PROPOSED STORM SEWER
- PROPOSED SWALE
- STUB-OUT PIPE
- FLARED END SECTION
- 5280.00 SPOT ELEVATION
- TEMPORARY SEEDING
- 6101.50 MANHOLE\INLET IDENTIFICATION
- UTILITY POTHOLE LOCATION
- CONCRETE SLOPE & DITCH PAVING
- EMBANKMENT PROTECTOR TYPE 5
- MOD EMBANKMENT PROTECTOR TYPE 5

GENERAL NOTES (DRAINAGE PLAN SHEETS TYPICAL)

1. THE CONTRACTOR SHALL CONDUCT POTHOLING AT LOCATIONS IDENTIFIED ON THE PLANS AND AS DIRECTED BY THE ENGINEER. ADDITIONAL POTHOLING SHALL BE PERFORMED BY THE CONTRACTOR AS NECESSARY TO CONFIRM EXISTING UTILITY LOCATIONS.
2. FOR ADDITIONAL UTILITY INFORMATION SEE UTILITY PLANS. FOR ADDITIONAL DETAIL CONCERNING SUBSURFACE FEATURES, REFER TO STRUCTURE PLANS, LIGHTING PLANS, SIGNAL PLANS AND SIGNING & PAVEMENT MARKING PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCEPTANCE AND CONTROL OF ALL SURFACE AND SUBSURFACE DRAINAGE AND GROUND WATER ENTERING THE AREA. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING DEWATERING IF NEEDED AT NO ADDITIONAL COST TO THE PROJECT. DEWATERING METHODS SHALL BE APPROVED BY THE ENGINEER. SEE SPECIFICATIONS FOR PROPER HANDLING OF DISCHARGE FROM TRENCH DEWATERING OPERATIONS.
4. STATION/OFFSET INFORMATION FOR TYPE C INLETS IS TO THE CENTER OF THE STRUCTURE.
5. ALL CURB INLETS ARE CDOT TYPE R, UNLESS OTHERWISE NOTED. STATION/OFFSET INFORMATION IS AS SHOWN ON THE DETAILS.
6. STATION/OFFSET INFORMATION FOR VANE GRATE INLET IS AS SHOWN ON THE DETAILS.
7. STATION/OFFSET INFORMATION FOR MANHOLES TO CENTER OF STRUCTURE.
8. FINAL ELEVATIONS ARE TO BE DETERMINED IN THE FIELD.
9. OMITS OR REMOVAL ITEMS SHALL BE VERIFIED BY THE ENGINEER PRIOR TO THEIR REMOVAL.
10. SEE PROJECT GENERAL NOTES FOR ADDITIONAL INFORMATION RELATING TO STORM SEWER/DRAINAGE ITEM CONSTRUCTION.
11. CORRUGATED METAL STORM SEWER CONDUIT JOINTS SHALL BE CONNECTED WITH GALVANIZED STEEL CONNECTING BANDS AND TIGHTENED SECURELY. KEEP DIRT AND GRAVEL OUT OF JOINT TO ENSURE WATERTIGHT SEAL.
12. REINFORCED CONCRETE STORM SEWER CONDUIT JOINTS SHALL BE SUPPLIED WITH O-RING OR NEOPRENE PROFILE GASKETS.
13. THE COST FOR ALL JOINT GASKETS, CRADLES, COLLARS, INLET AND MANHOLE CONNECTIONS TO STORM SEWER SHALL BE INCLUDED IN THE COST OF THE WORK.
14. SLAB BASE MANHOLE BARREL DIAMETERS SHALL CONFORM TO THE FOLLOWING TABLE:

Pipe Dia.	Manhole Barrel Dia.
30" or less	4'
33" to 42"	5'
48"	6'

15. RCP JOINT TOLERANCE IS 1/4" TO 1". JOINTS GREATER THAN 1" SHALL BE GROUTED.
16. DIMENSIONS IN FEET UNLESS OTHERWISE NOTED.
17. MANHOLE AND RIM ELEVATIONS SHOWN ON THE PLANS ARE APPROXIMATE.
18. HAY BALES SHALL BE STOCKPILED SO THAT THEY MAY BE DEPLOYED FOR EROSION PROTECTION WITHIN TWO HOURS OF NOTICE BY THE ENGINEER.
19. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION DURATION AND WILL BE IN COMPLIANCE WITH THE COLORADO DEPARTMENT OF HEALTH PERMIT REQUIREMENTS.
20. EROSION CONTROL MEASURES SHOWN ON THE EROSION CONTROL PLAN ARE CONSIDERED TEMPORARY. SEE THE ROADWAY PLANS FOR PERMANENT SOIL RETENTION STABILIZATION AND THE DRAINAGE PLANS FOR PERMANENT MEASURES ALONG THE CHANNEL/SWALE IMPROVEMENTS.
21. EROSION CONTROL DETAILS ARE INTENDED FOR USE IN EXISTING, PROPOSED, AND TEMPORARY DITCHES, DRAINAGE SWALES, AND AROUND ALL DRAINAGE FACILITIES AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
22. ALL EROSION CONTROL WORK SHALL BE DONE IN ACCORDANCE WITH C.D.O.T. M & S TEMPORARY EROSION CONTROL STANDARDS.
23. THE EXACT NUMBER OF BALES AT A PARTICULAR LOCATION OR LOCATIONS AND TYPES OF EROSION CONTROL MEASURES MAY BE ADJUSTED OR SUPPLEMENTED IN THE FIELD BY THE ENGINEER AS REQUIRED TO FIT THE CONDITIONS.
24. INSPECTIONS SHALL BE FREQUENT AND REPAIRS AND/OR REPLACEMENT OF EROSION CONTROL MEASURES SHALL BE MADE PROMPTLY AS NEEDED OR AS DIRECTED BY THE ENGINEER. ALL DITCH CHECKS AND SILT FENCES SHALL BE INSPECTED FOLLOWING EACH RAINFALL AND SILT SHALL BE CLEANED OUT WHEN THE SILT DEPTH EXCEEDS 50% OF THE BALE HEIGHT. COST OF CLEANING SHALL BE SUBSIDIARY TO EROSION BALES.
25. EROSION CONTROL MEASURES AT TEMPORARY FACILITIES SHALL BE REMOVED WHEN THEY HAVE SERVED THE USEFUL PURPOSE. EROSION CONTROL MEASURES AT PERMANENT FACILITIES SHALL REMAIN IN PLACE UNTIL PERMANENT SEEDING HAS BEEN ESTABLISHED.
26. SEEDING, SOIL PREPARATION, FERTILIZING AND MULCHING ARE TO BE ACCOMPLISHED AS SOON AS POSSIBLE AFTER PORTIONS OF EARTHWORK ARE COMPLETED. NOT MORE THAN 20 ACRES OF EMBANKMENT OR EXCAVATION ARE TO REMAIN UNTREATED AT ANY ONE TIME.

STORM WATER MANAGEMENT PLAN

TOTAL PROJECT AREA: 85.88 ACRES

TOTAL AREA TO BE DISTURBED: 85.88 ACRES

ESTIMATED 5 YR RUNOFF COEFFICIENT:

PRE-CONSTRUCTION .36

POST CONSTRUCTION .76

EXISTING DATA DESCRIBING SOIL OR QUALITY OF DISCHARGE:

GRANULAR ARKOSIC SEDIMENTARY ROCK CONSIDERED TO BE PART OF THE HYDROLOGIC SOILS GROUP B WHICH IS EASILY ERODIBLE BY SURFACE RUNOFF AND GENERALLY HAS LOW RUNOFF POTENTIAL

EXISTING VEGETATION AND COVER:

SPARSE PRAIRIE GRASSES WITH SOME SMALL STANDS OF SCRUB OAK

NAME OF RECEIVING WATERS:

MONUMENT CREEK

RELATED ENVIRONMENTAL PERMITS REQUIRED:

SECTION 404 ____YES X NO

FLOOD PLAIN DEVELOPMENT ____ YES X NO

BEST MANAGEMENT PRACTICES:

EROSION AND SEDIMENT CONTROL

X	TEMPORARY SEEDING
X	MULCHING
	SODDING
X	SOIL RETENTION BLANKETS
X	SURFACE ROUGHENING
X	EROSION BALE
X	SILT FENCE
	BERM / DIVERSION
X	SLOPE DRAIN
X	STORM DRAIN INLET PROTECTION
	CHECK DAMS
X	OUTLET PROTECTION
X	CHANNEL STABILIZATION
	SEDIMENT TRAP
	SEDIMENT BASIN
	DEWATERING STRUCTURE
	TEMPORARY STREAM CROSSING
	STABILIZED CONSTRUCTION ENTRANCE
	LEVEL SPREADER
	BRUSH BARRIER
	SANDBAG BARRIER

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FAIRLANE PARKWAY/I-25 INTERCHANGE

DRAINAGE COVER SHEET

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Detailer: LDS

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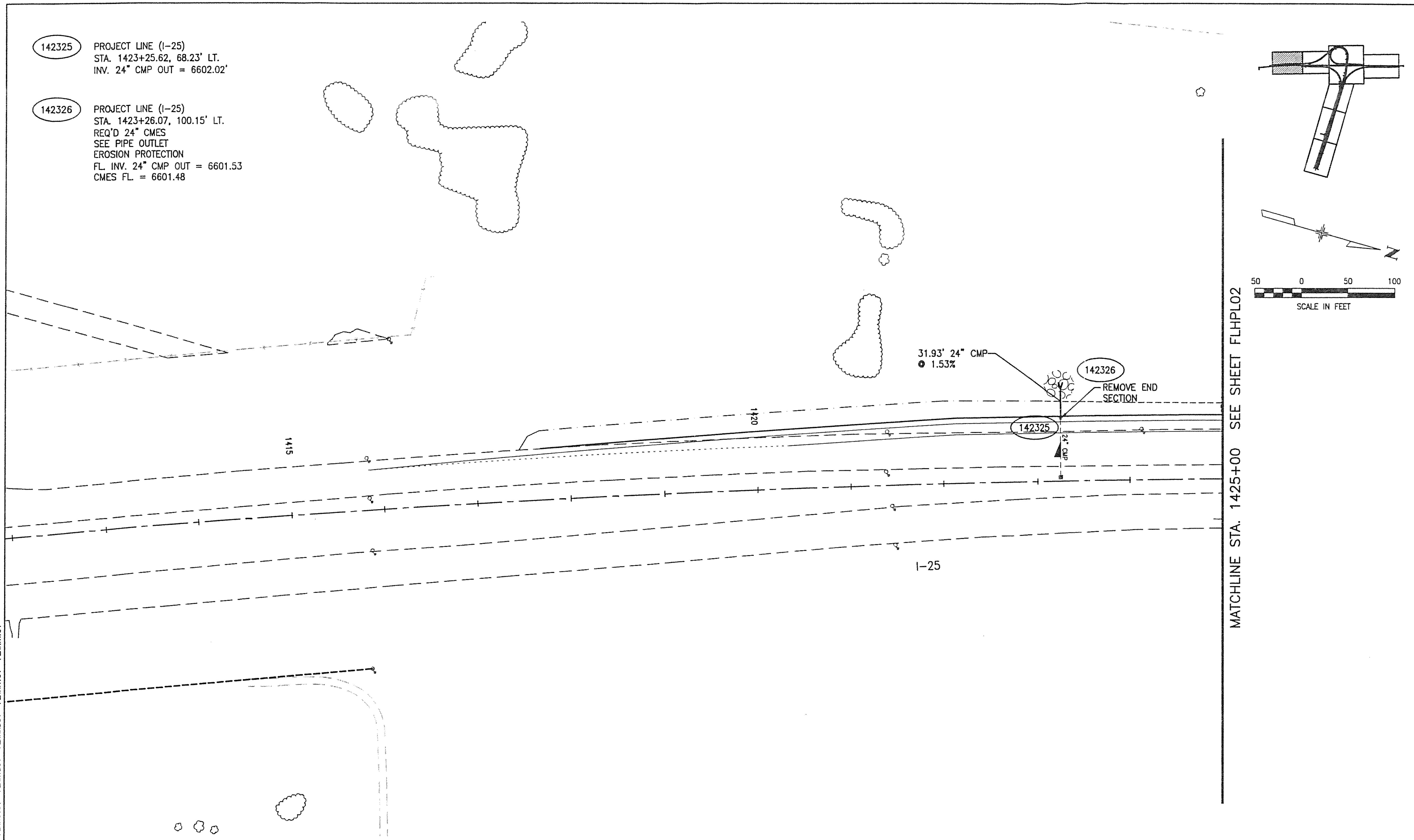

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FAIRLANE PARKWAY/I-25 INTERCHANGE

I-25
DRAINAGE PLAN

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Detailer: –
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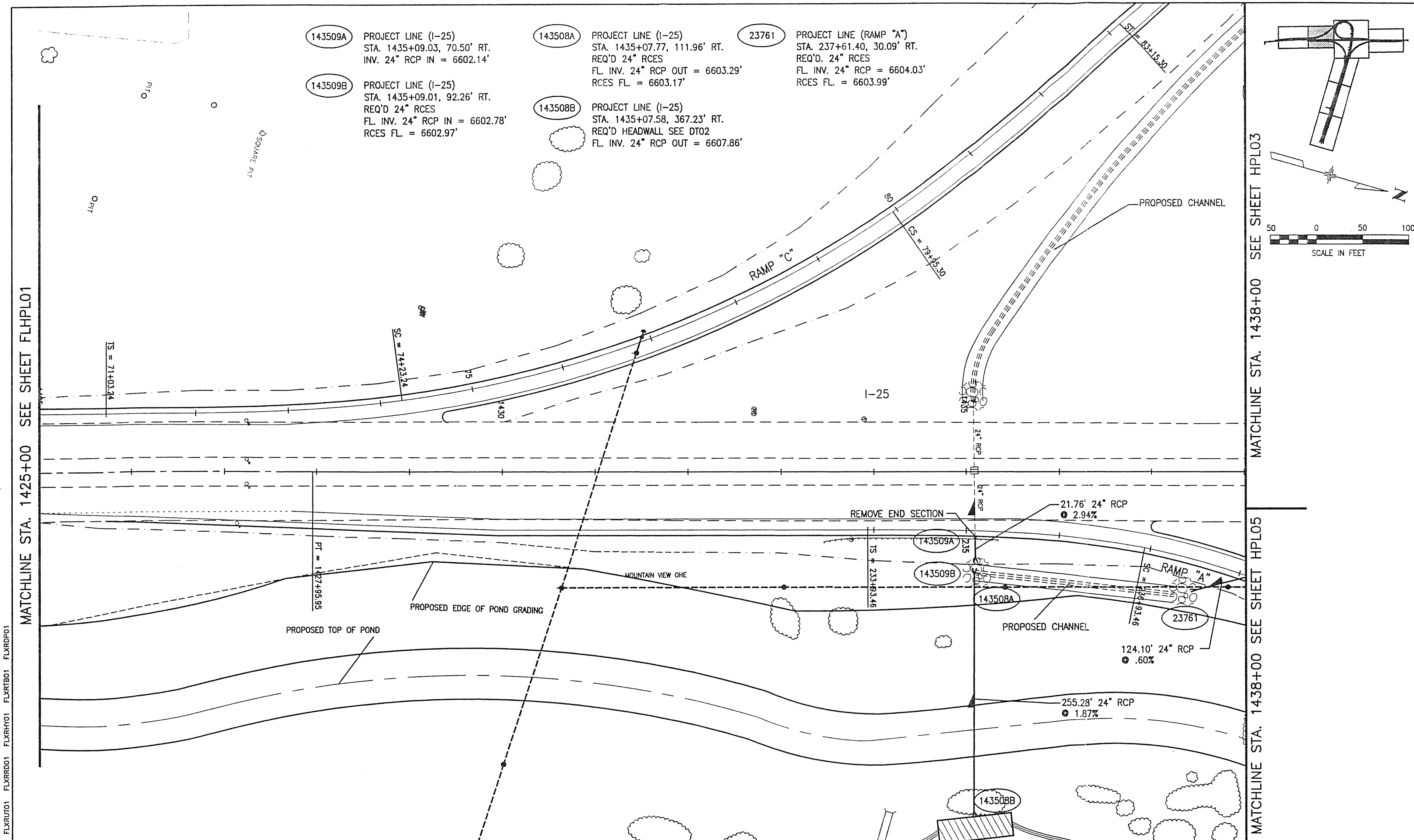

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FAIRLANE PARKWAY/I-25 INTERCHANGE

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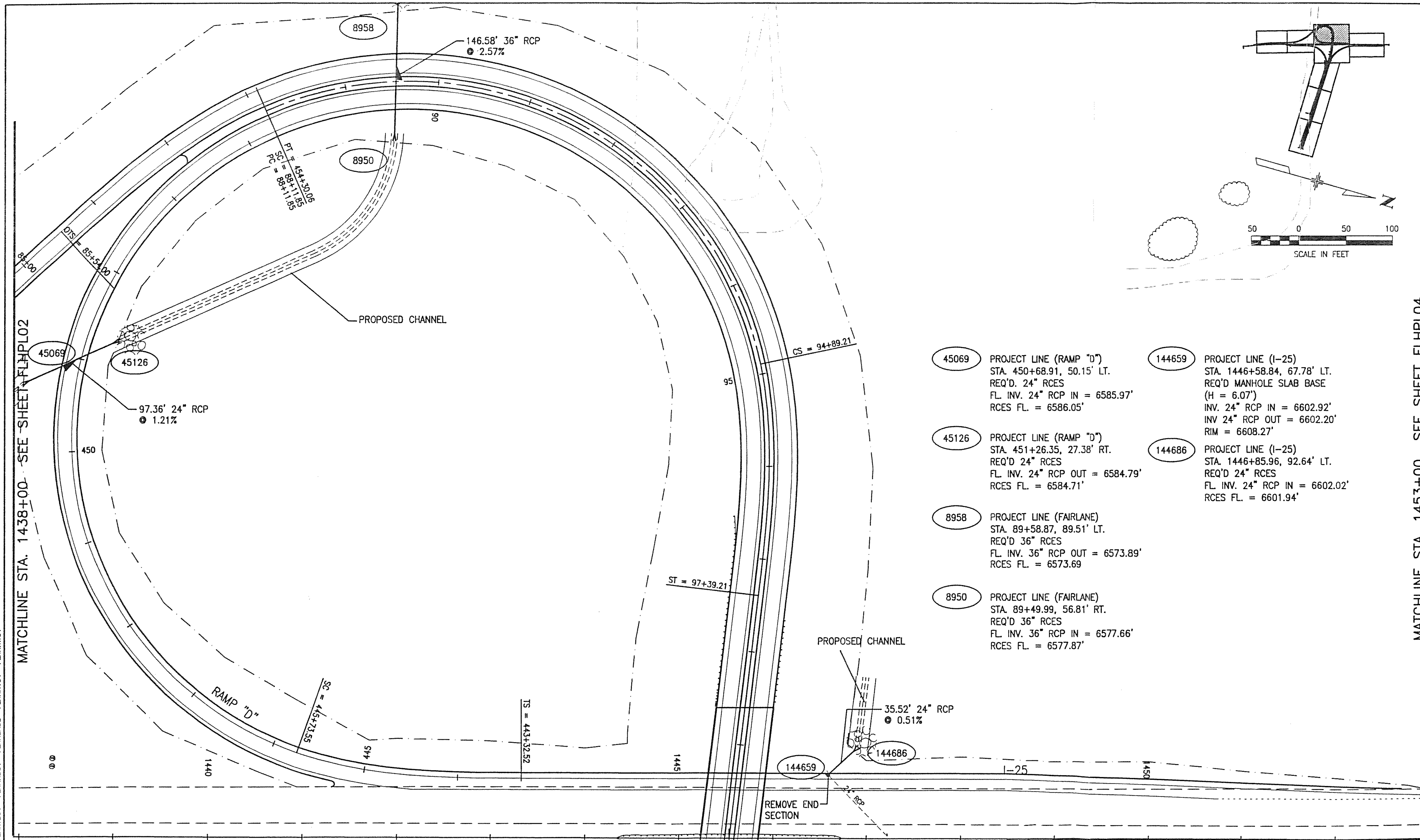

45069 PROJECT LINE (RAMP "D")
STA. 450+68.91, 50.15' LT.
REQ'D. 24" RCES
FL. INV. 24" RCP IN = 6585.97'
RCES FL. = 6586.05'

45126 PROJECT LINE (RAMP "D")
STA. 451+26.35, 27.38' RT.
REQ'D 24" RCES
FL. INV. 24" RCP OUT = 6584.79'
RCES FL. = 6584.71'

8958 PROJECT LINE (FAIRLANE)
STA. 89+58.87, 89.51' LT.
REQ'D 36" RCES
FL. INV. 36" RCP OUT = 6573.89'
RCES FL. = 6573.69

8950 PROJECT LINE (FAIRLANE)
STA. 89+49.99, 56.81' RT.
REQ'D 36" RCES
FL. INV. 36" RCP IN = 6577.66'
RCES FL. = 6577.87'

144659 PROJECT LINE (I-25)
STA. 1446+58.84, 67.78' LT.
REQ'D MANHOLE SLAB BASE
(H = 6.07')
INV. 24" RCP IN = 6602.92'
INV 24" RCP OUT = 6602.20'
RIM = 6608.27'

144686 PROJECT LINE (I-25)
STA. 1446+85.96, 92.64' LT.
REQ'D 24" RCES
FL. INV. 24" RCP IN = 6602.02'
RCES FL. = 6601.94'

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FAIRLANE PARKWAY/I-25 INTERCHANGE

I-25 RAMP-D DRAINAGE PLAN

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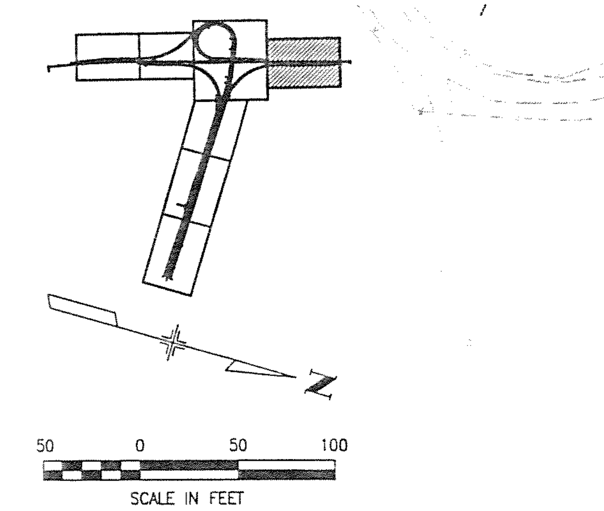
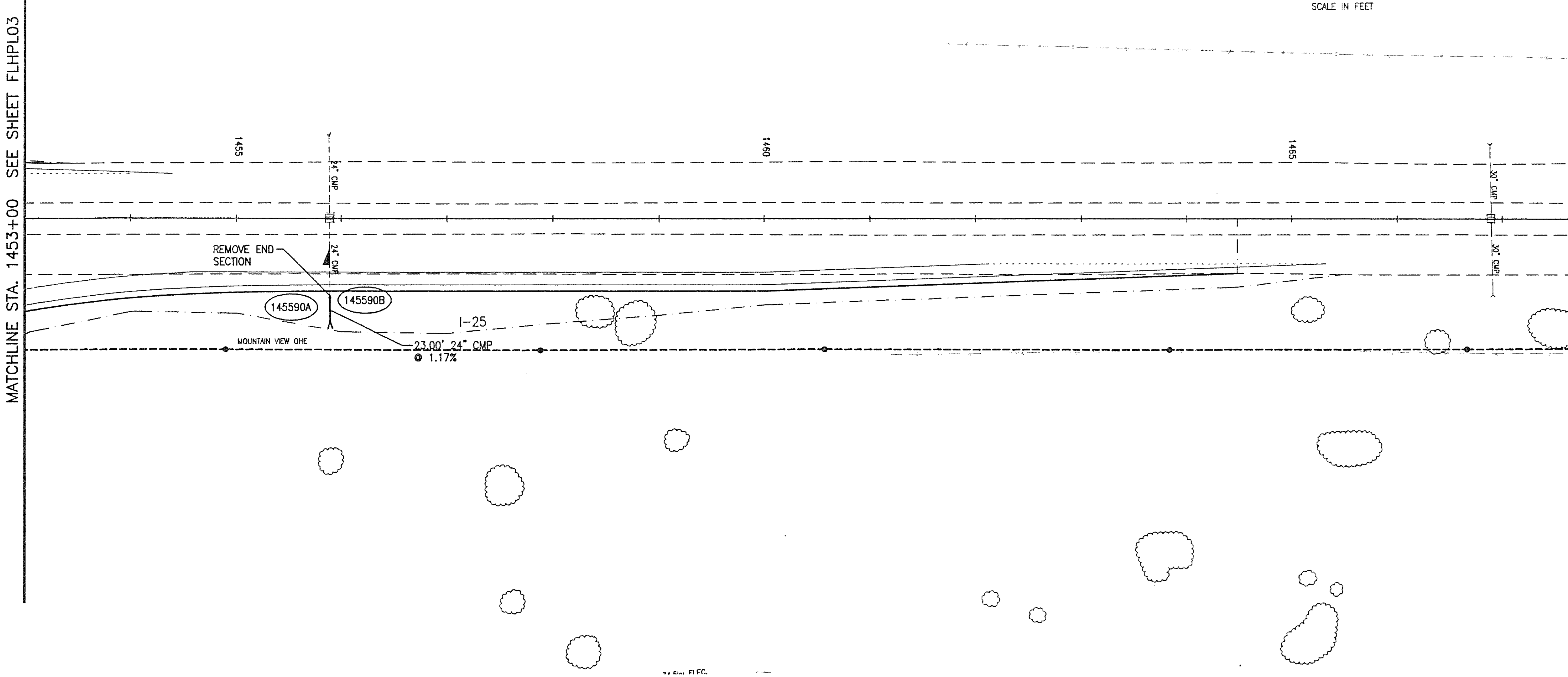
145590A PROJECT LINE (I-25)
STA. 1455+90.01, 98.22' RT.
REQ'D 24" CMES
FL. INV. 24" CMP IN = 6604.56'
CMES FL. = 6604.61'

145590B PROJECT LINE (I-25)
STA. 1455+89.81, 75.22' RT.
INV. 24" RCP OUT = 6604.29'





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I-25
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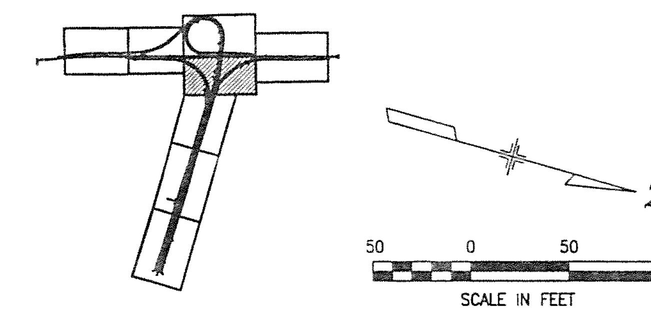
23863 PROJECT LINE (RAMP "A")
STA. 238+62.83, 40.18' LT.
REQ'D 24" RCES
FL. INV. 24" RCP IN = 6604.78'
RCES FL. = 6604.82'

10548 PROJECT LINE (FAIRLANE)
STA. 105+47.71, 51.31' RT.
REQ'D 18" RCES
FL. INV. 18" RCP OUT = 6623.64'
RCES FL. = 6623.30'

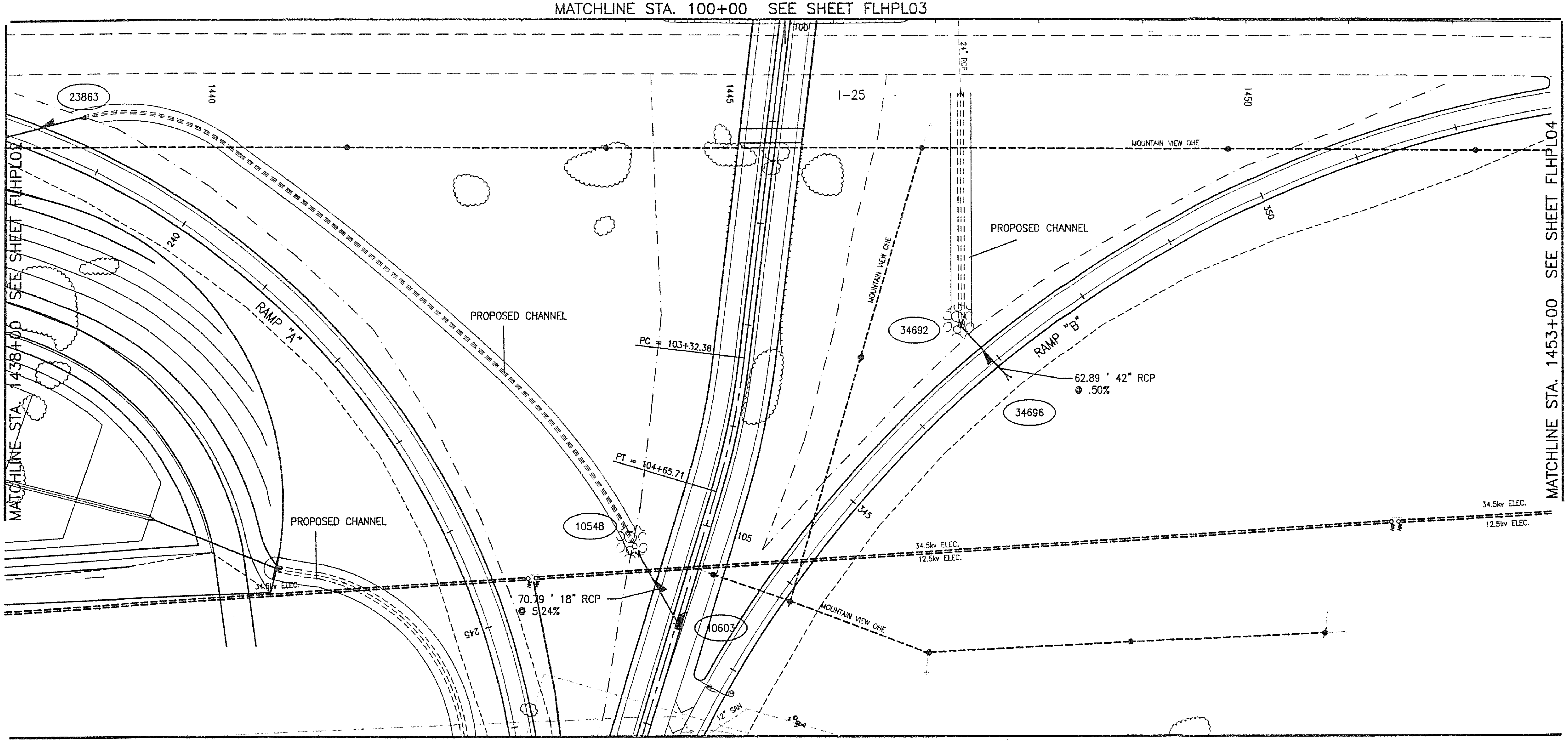
10603 PROJECT LINE (FAIRLANE)
STA. 106+02.83, 4.00 LT.
REQ'D TYPE R INLET L10
(H=4.10')
INV. 18" RCP OUT = 6627.35'
STA. PT. = 6631.45'

34696 PROJECT LINE (RAMP "B")
STA. 346+94.42, 15.83' RT.
REQ'D 42" RCES
FL. INV. 42" RCP IN = 6611.94'
RCES FL. = 6611.98'

34692 PROJECT LINE (RAMP "B")
STA. 346+91.76, 47.00 LT.
REQ'D. 42" RCES
FL. INV. 42" RCP OUT = 6612.29'
RCES FL. = 6612.33'



MATCHLINE STA. 100+00 SEE SHEET FLHPL03



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MATCHLINE STA. 1453+00 SEE SHEET FLHPL04

MATCHLINE STA. 107+00 SEE SHEET FLHPP06

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I-25 RAMPS-A & B
DRAINAGE PLAN

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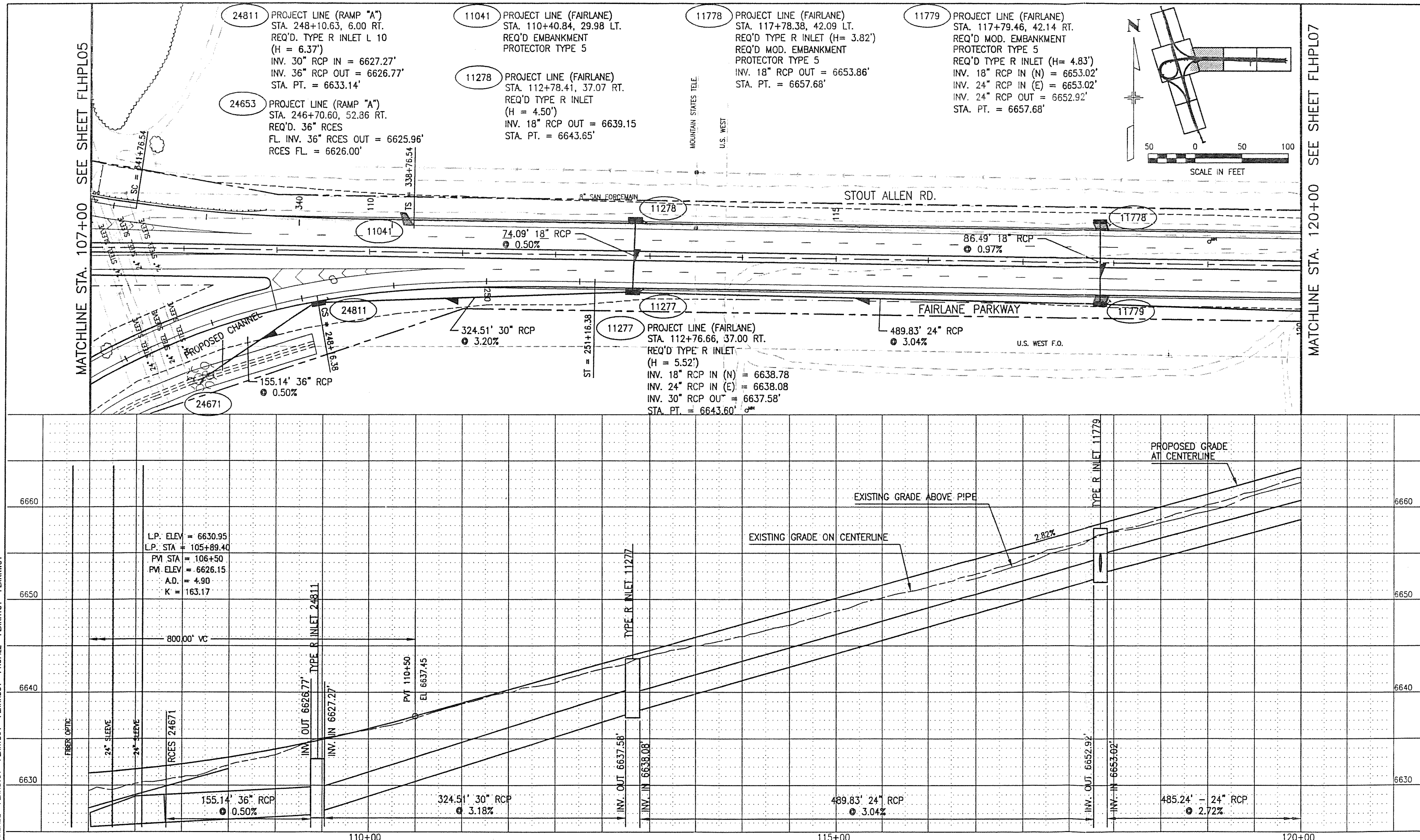

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FAIRLANE PARKWAY/I-25 INTERCHANGE

FAIRLANE PARKWAY
DRAINAGE PLAN & PROFILE

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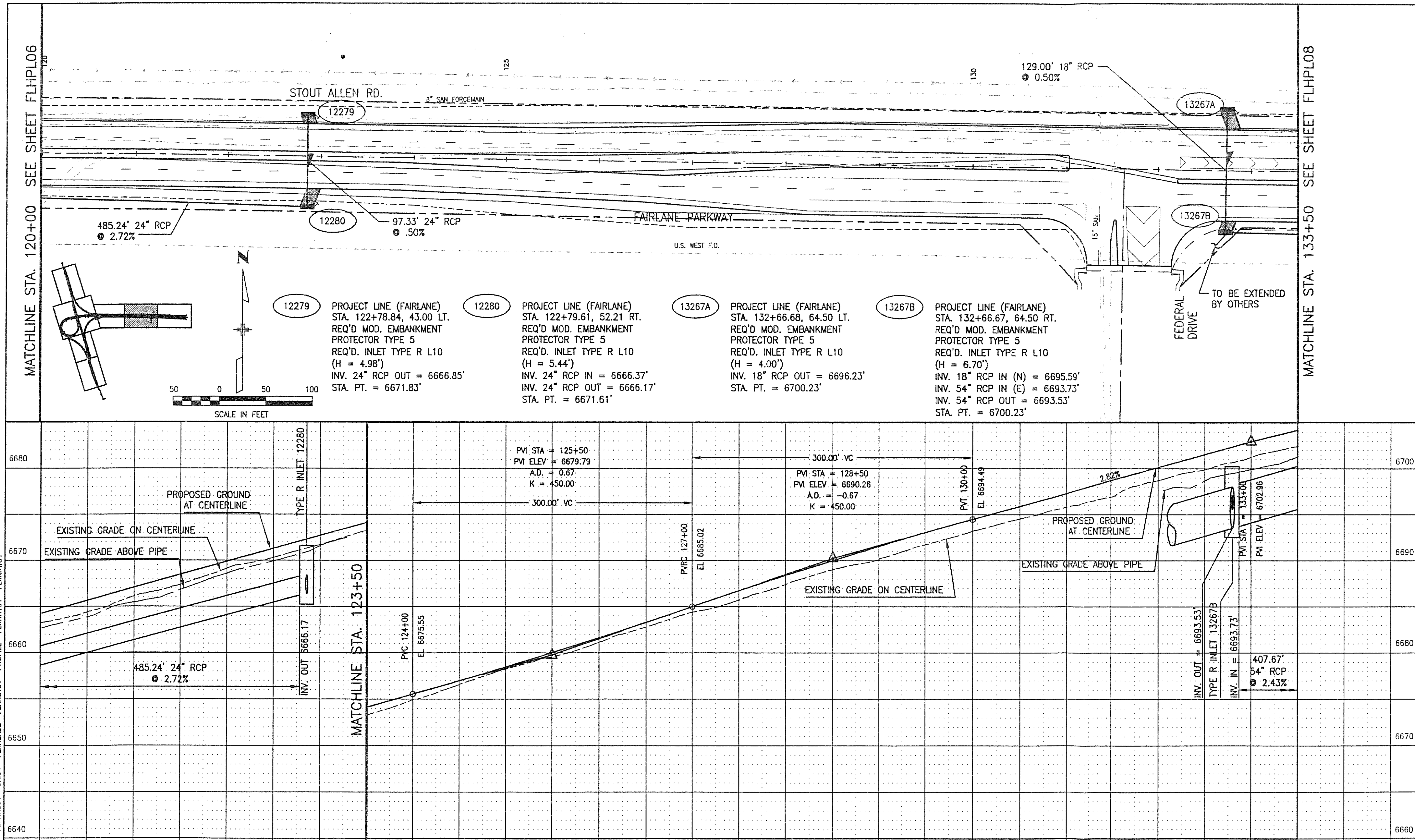

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FAIRLANE PARKWAY/I-25 INTERCHANGE

FAIRLANE PARKWAY
DRAINAGE PLAN & PROFILE

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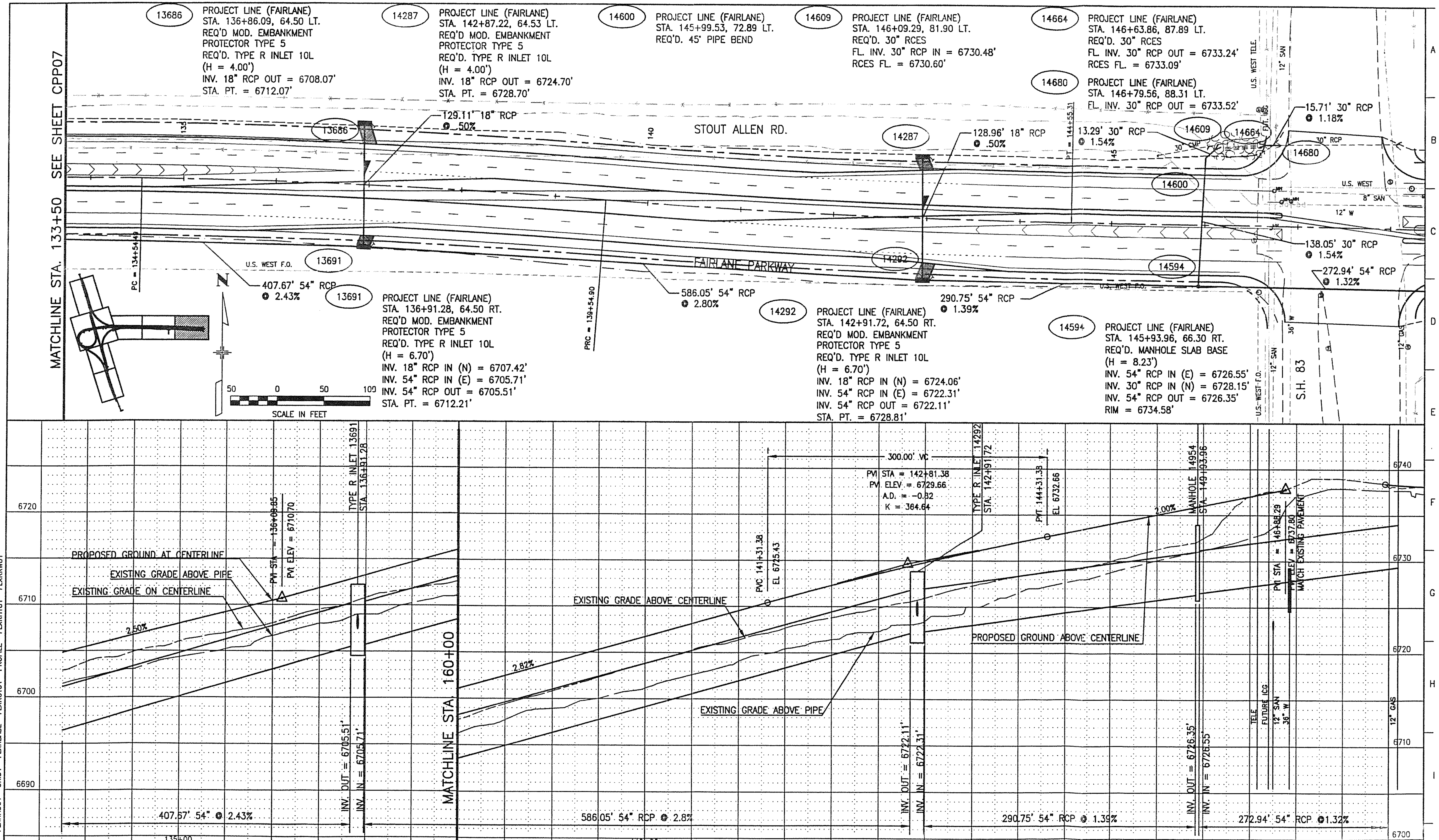

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FAIRLANE PARKWAY/I-25 INTERCHANGE

FAIRLANE PARKWAY DRAINAGE PLAN & PROFILE

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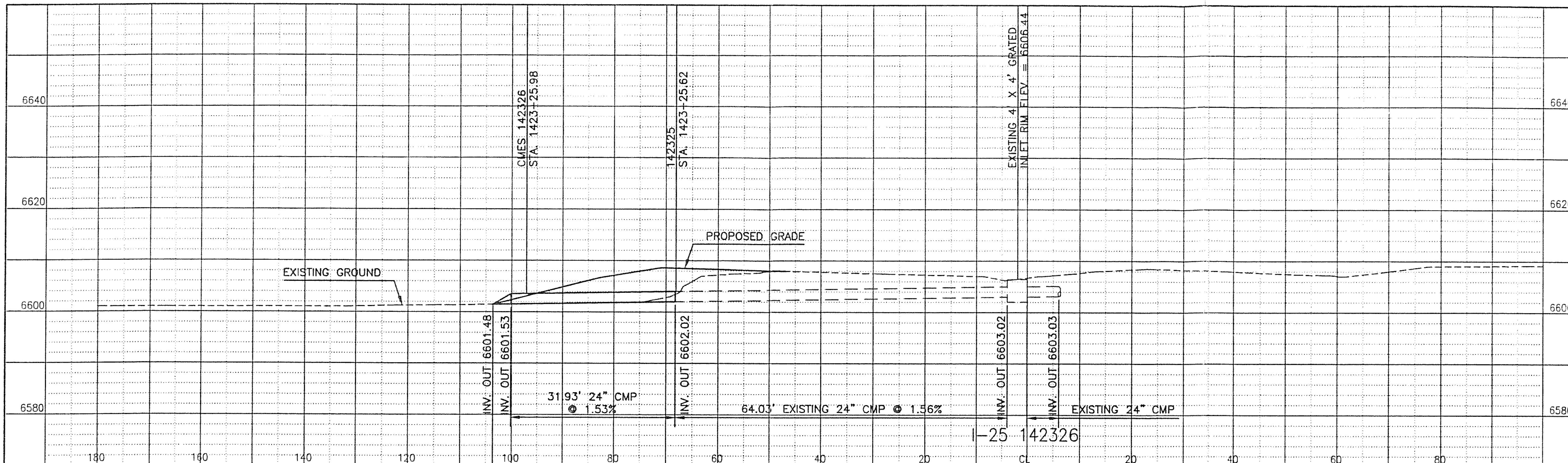

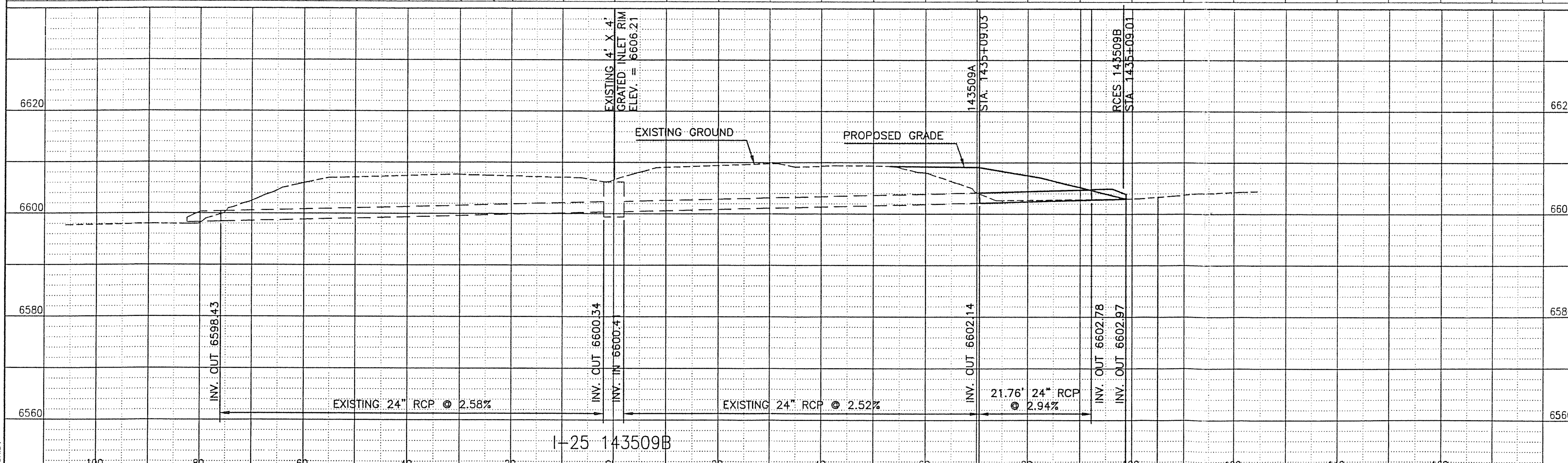

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Drawing File Name: FLXS01.DWG	
Acad Ver. R14	Scale: 1"=10' · Units: ENGLISH

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FAIRLANE PARKWAY/I-25 INTERCHANGE

STRUCTURE
CROSS SECTIONS

Sheet Subset: Drainage · Subset Sheets: FLXS01 of 9

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Detailer:
Checked:
Sheet Number of __

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J

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STRUCTURE
CROSS SECTIONS

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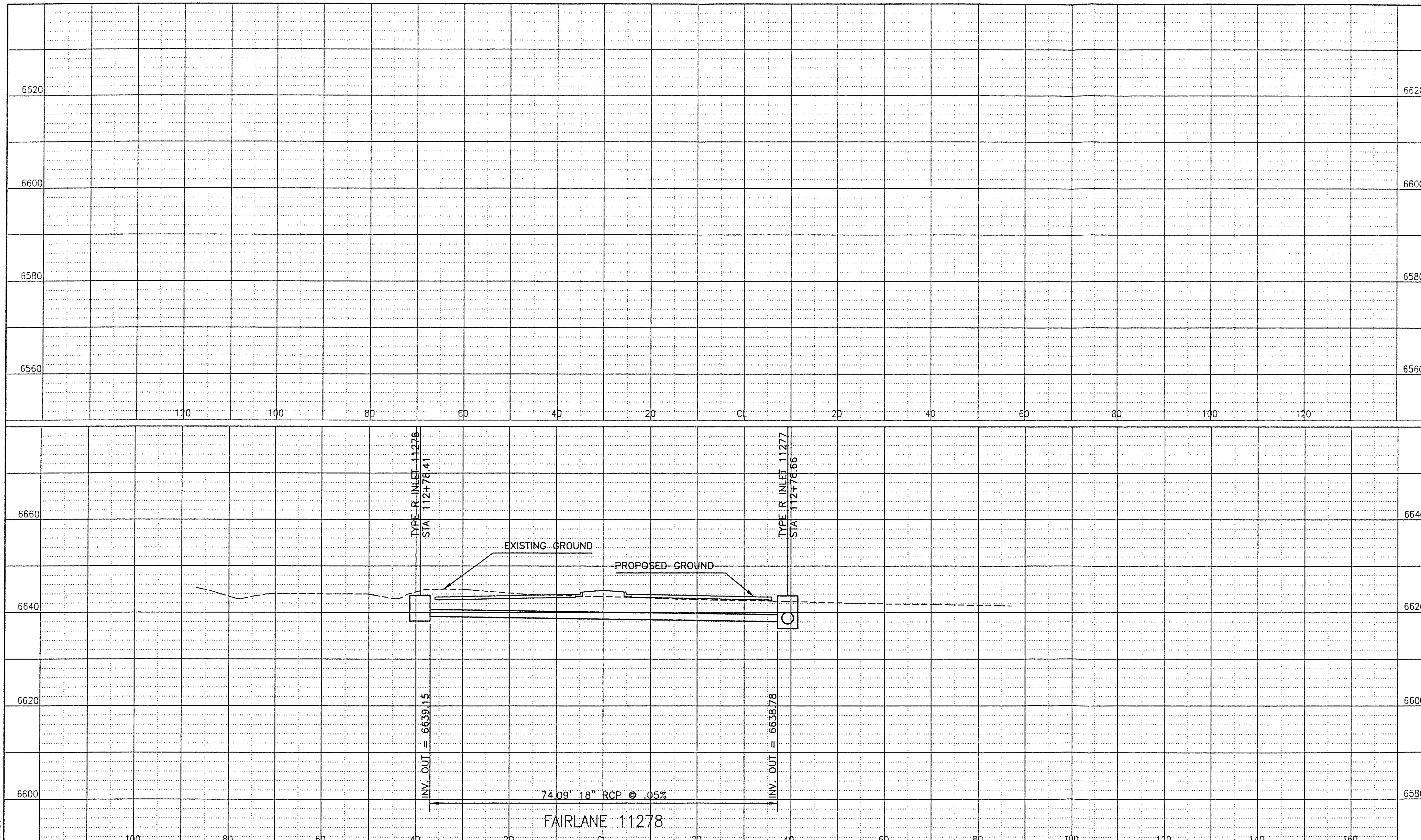

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Acad Ver. 14 · Scale: 1"=10'	Units: ENGLISH

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STRUCTURE CROSS SECTIONS

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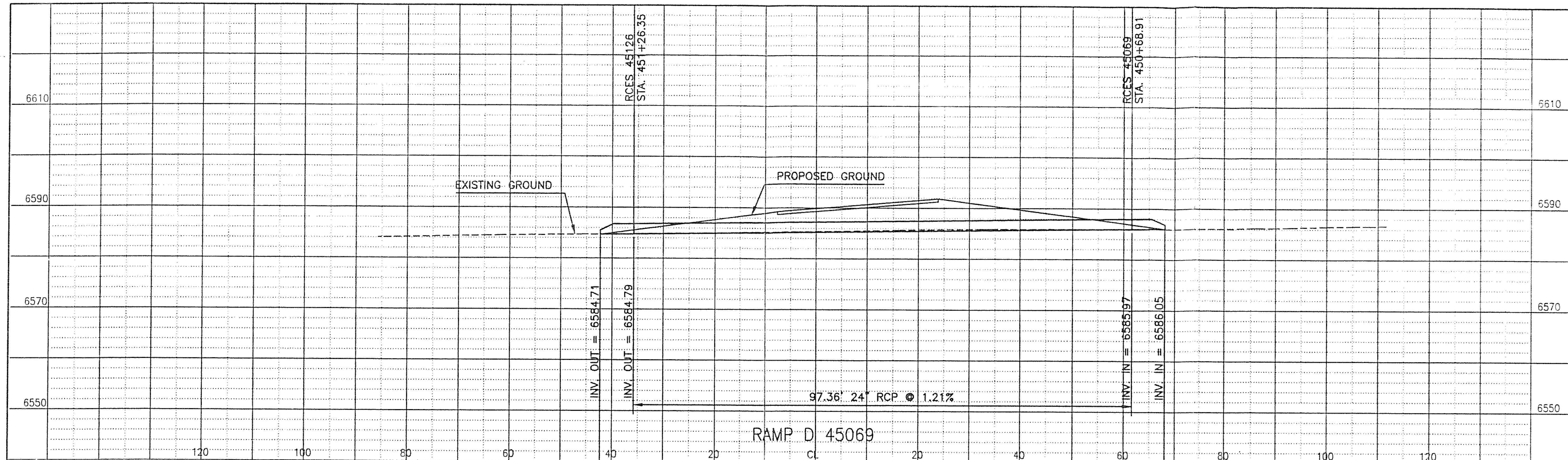

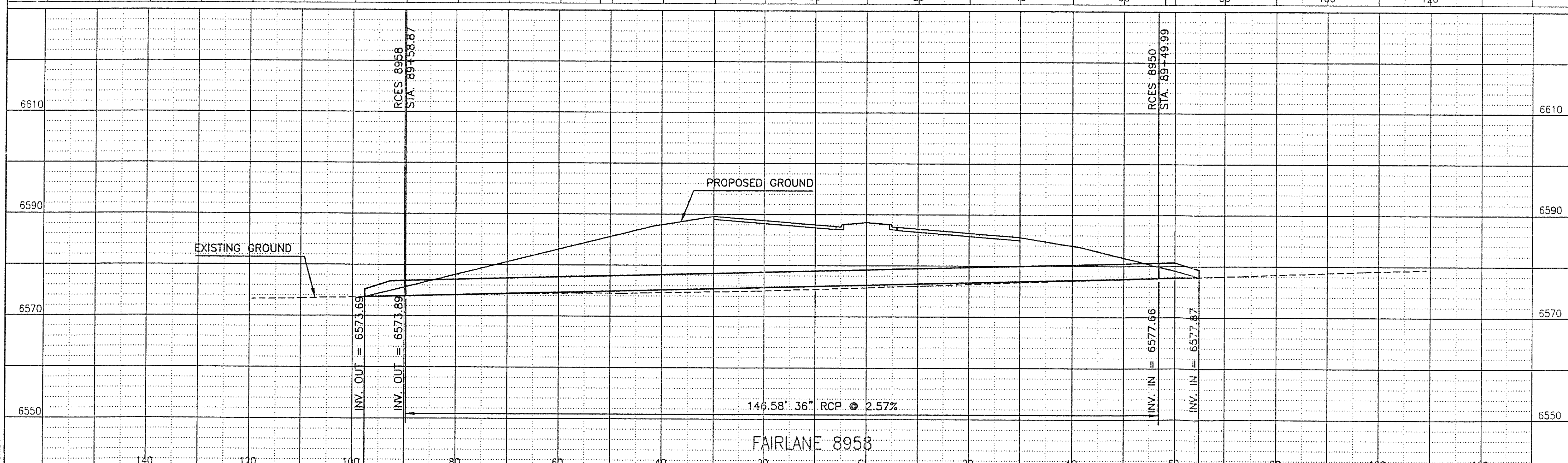

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Acad Ver. 14	Scale: 1"=10' Units: ENGLISH

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STRUCTURE CROSS SECTIONS

Sheet Subset: Drainage | Subset Sheets: FLXS04 of 9

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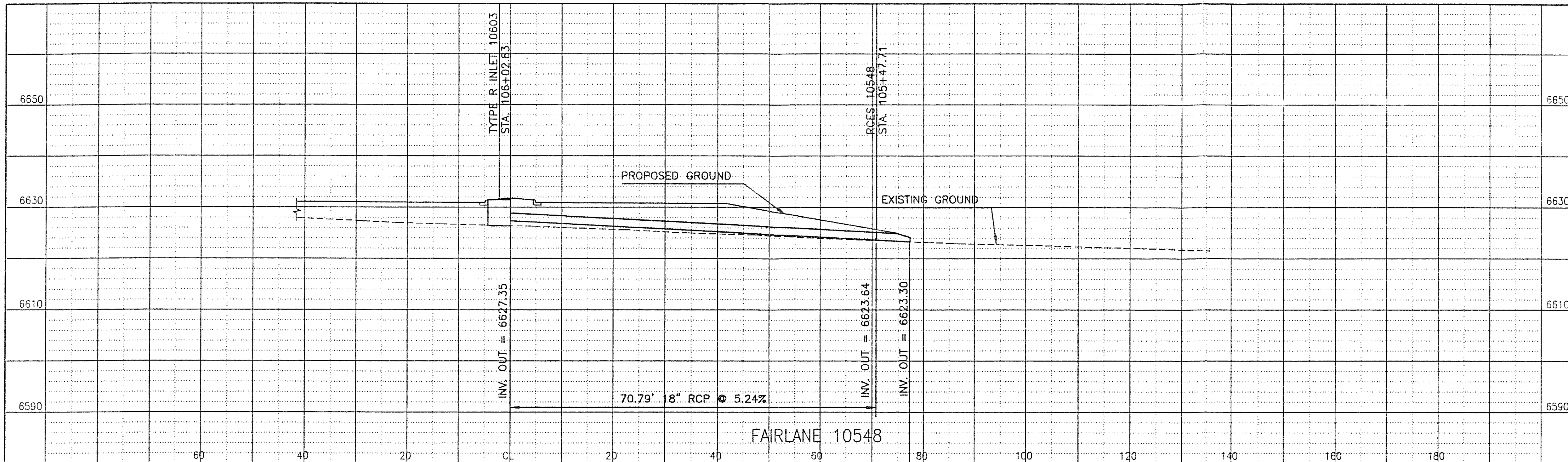

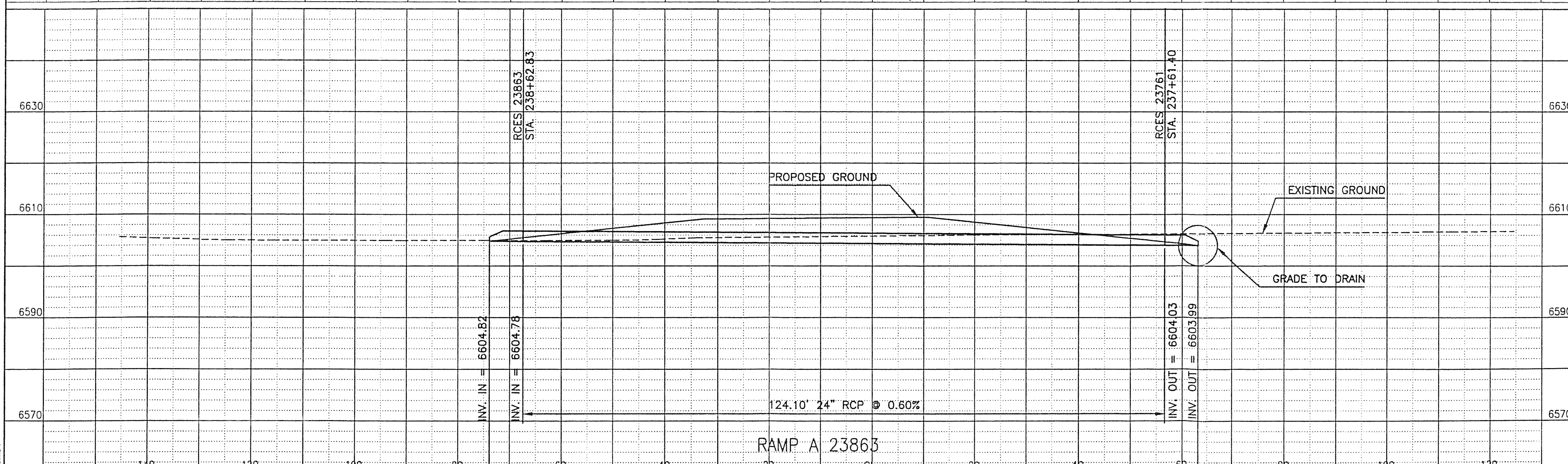

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STRUCTURE
CROSS SECTIONS

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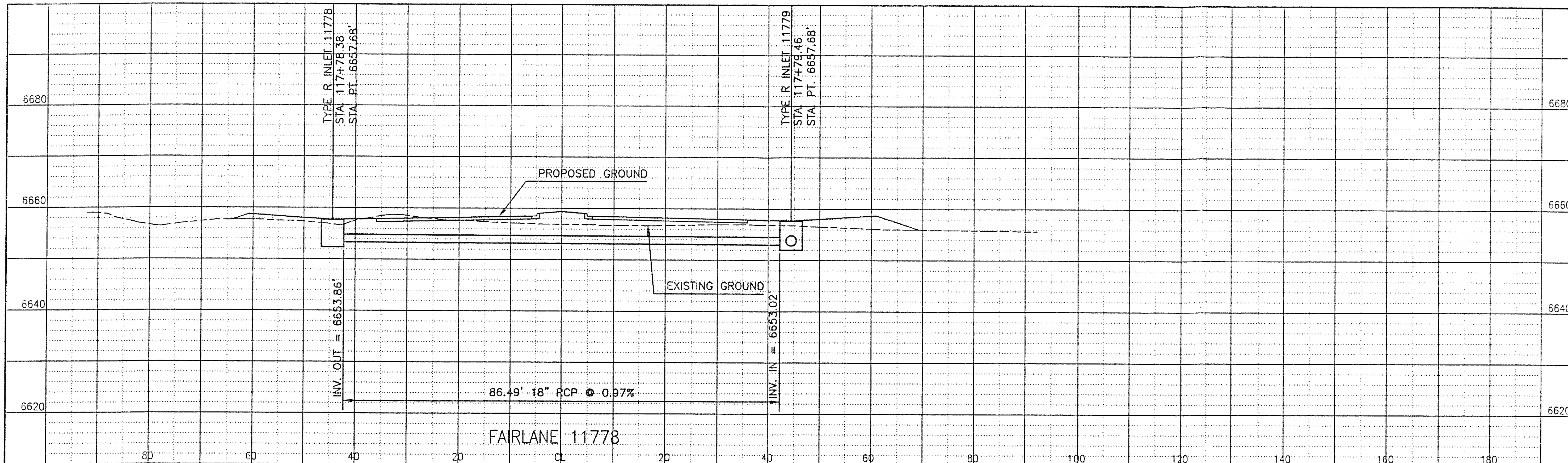

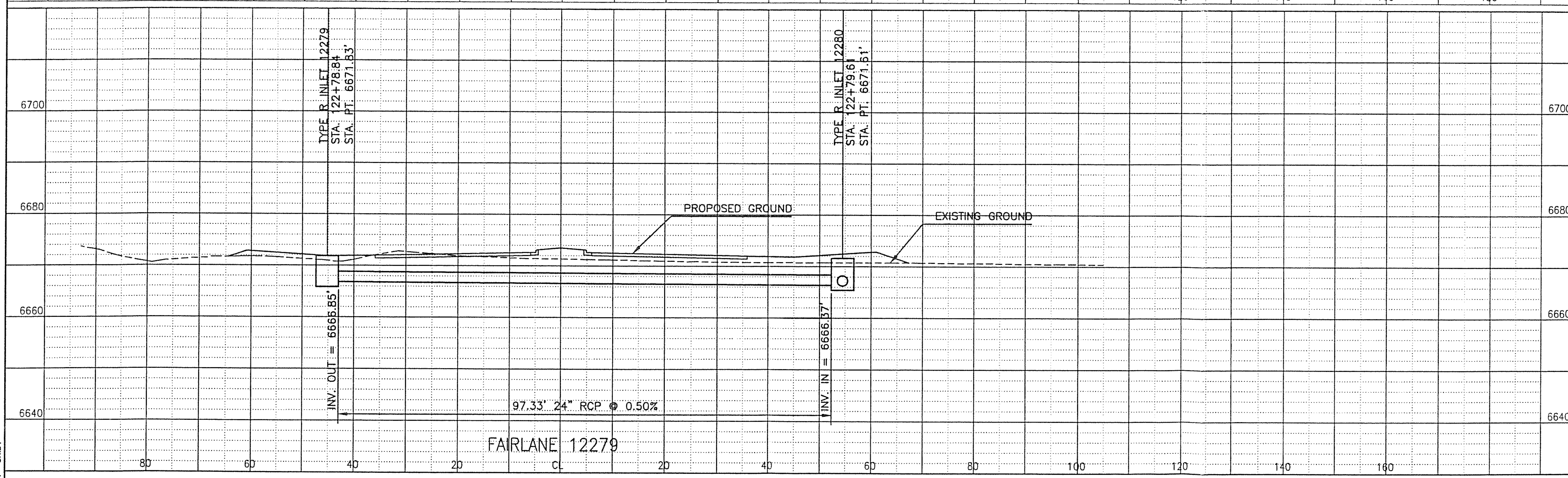

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STRUCTURE
CROSS SECTIONS

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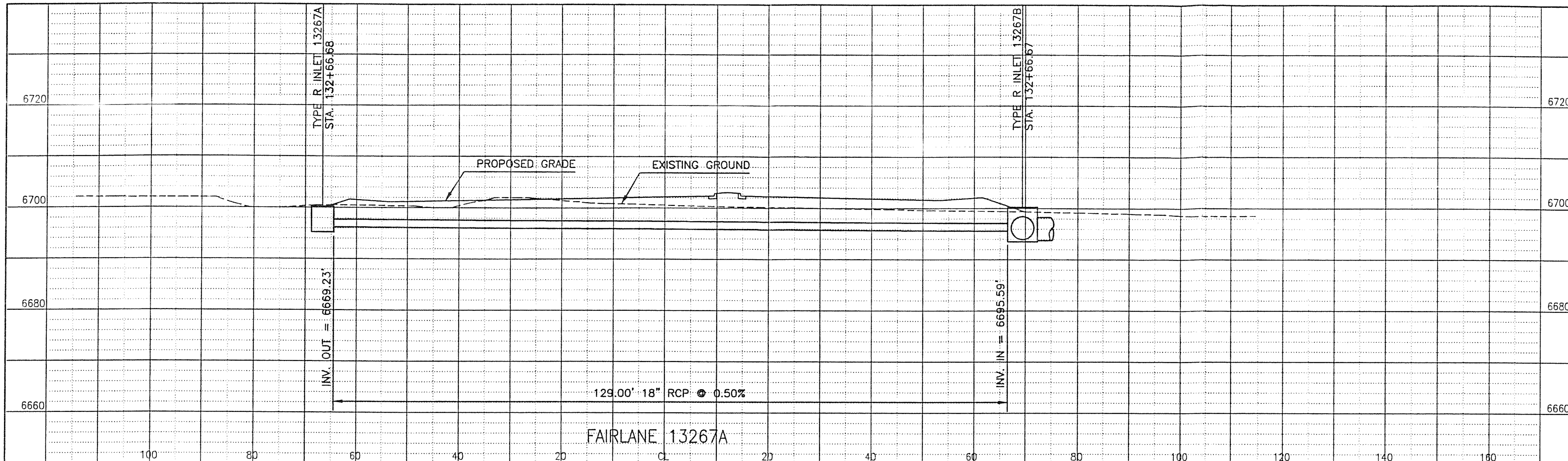

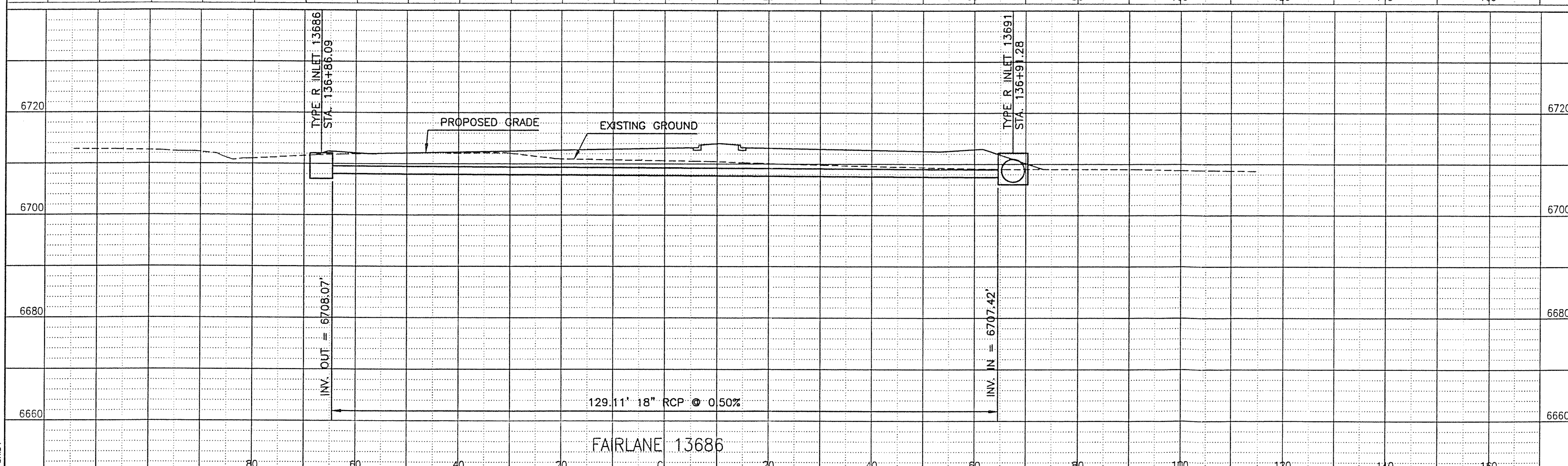

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STRUCTURE
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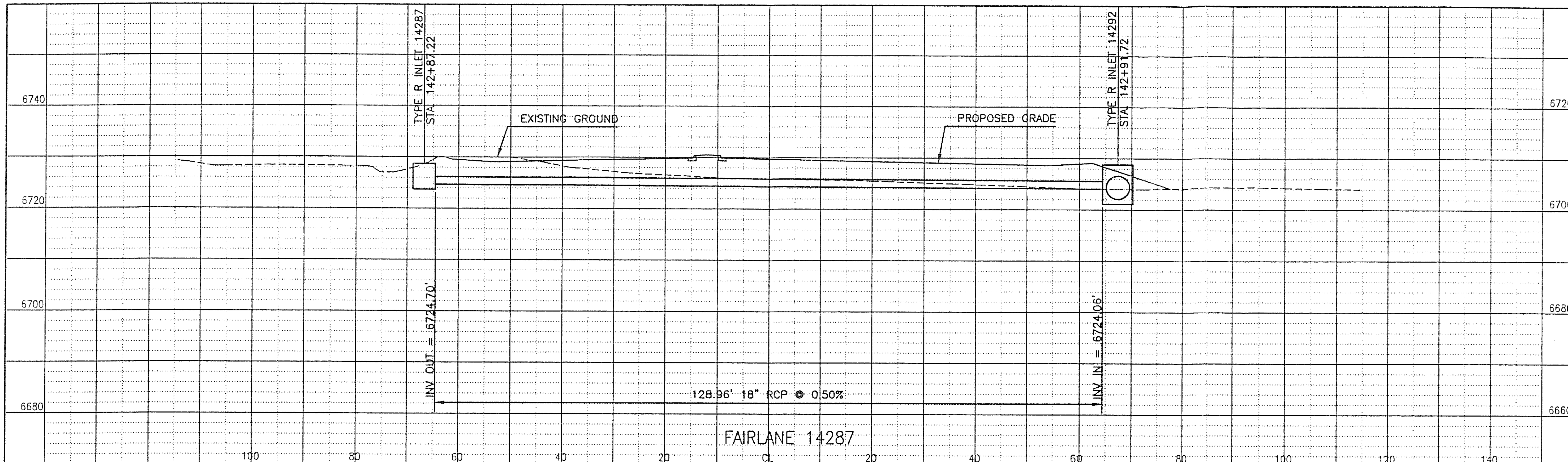

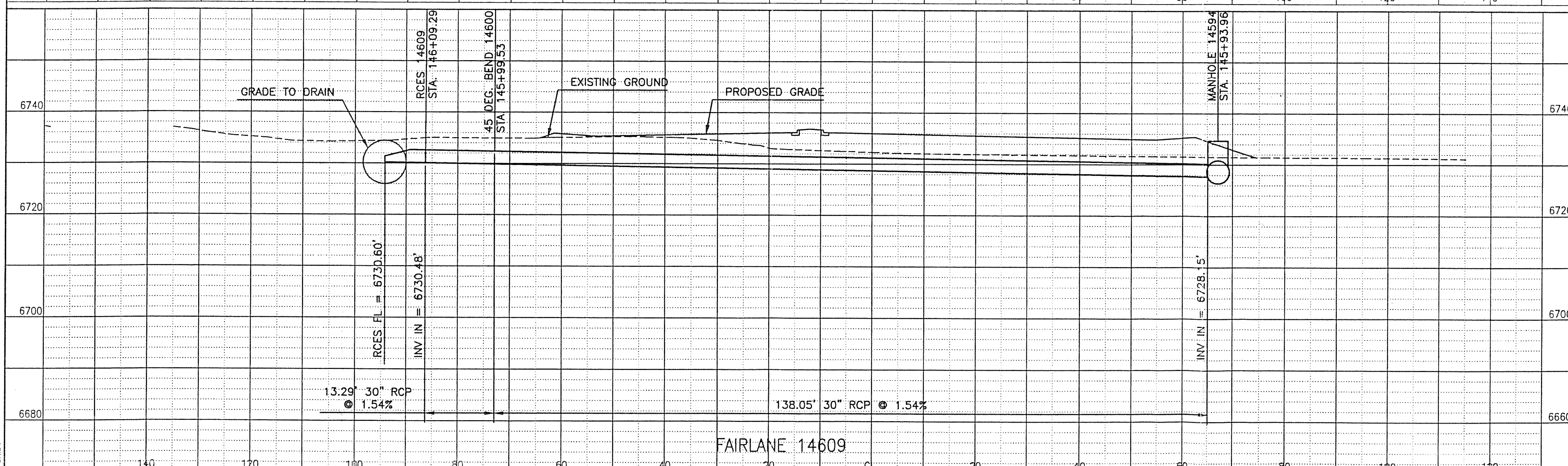

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STRUCTURE
CROSS SECTIONS

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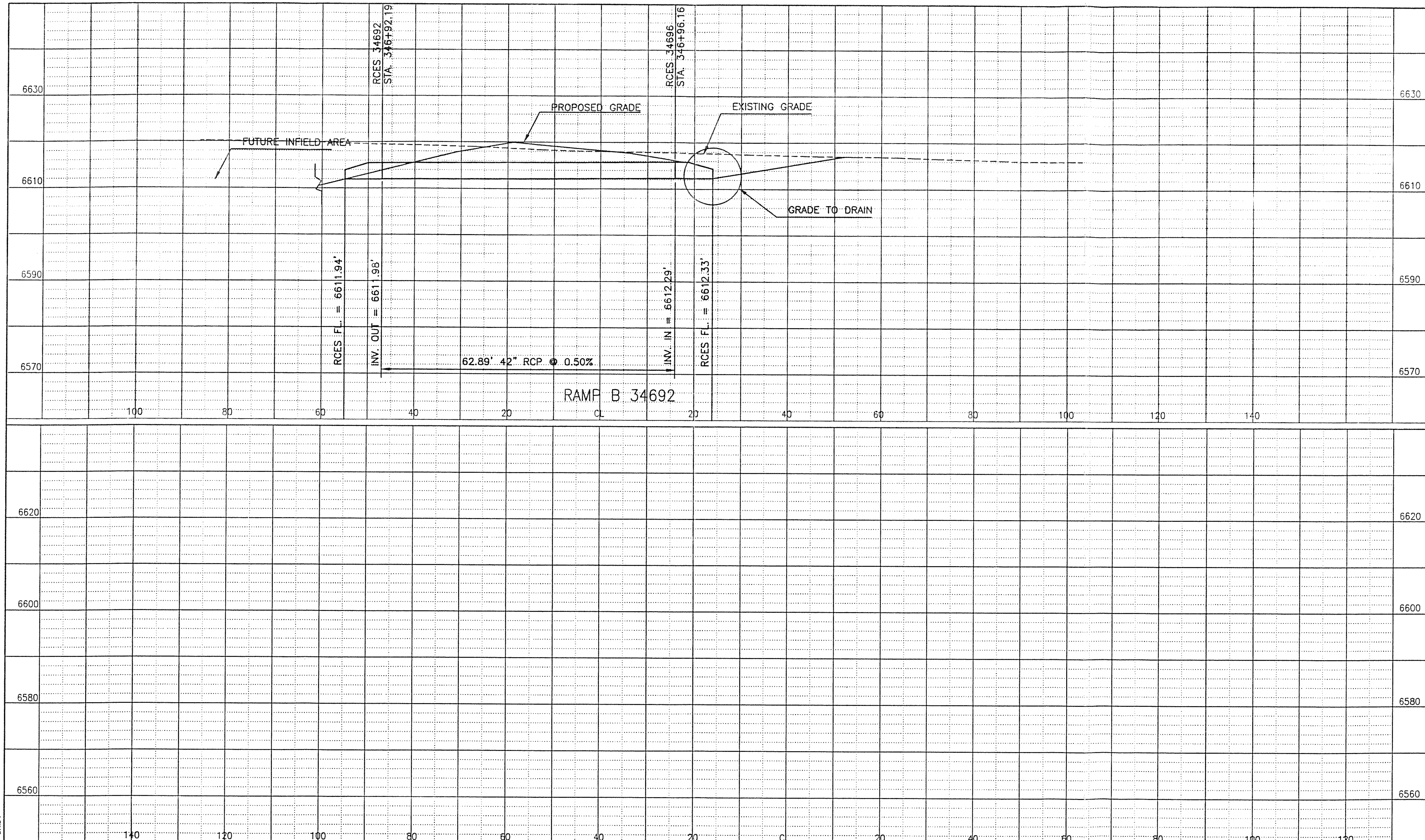

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STRUCTURE
CROSS SECTIONS

Sheet Subset: Drainage
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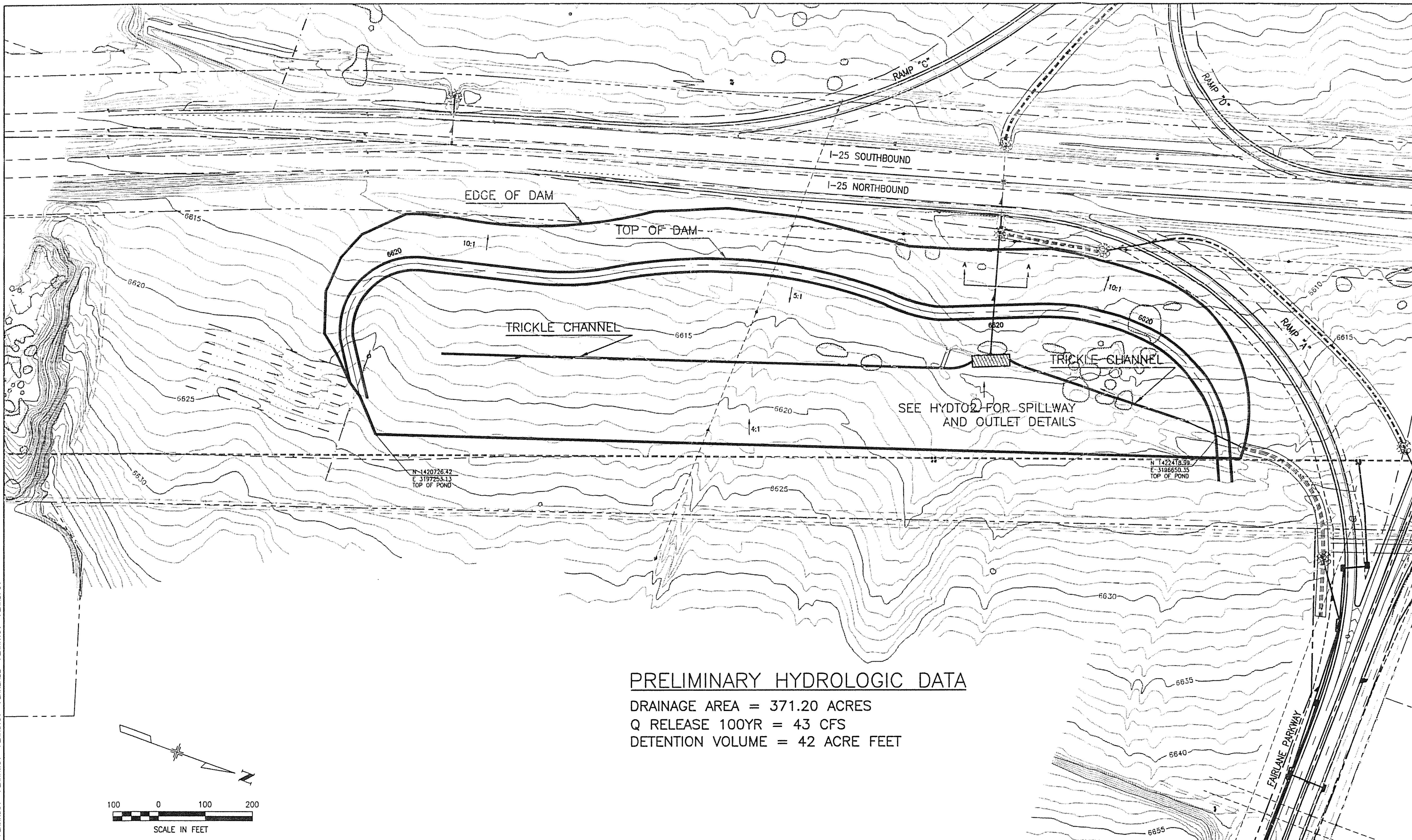

PRELIMINARY HYDROLOGIC DATA

DRAINAGE AREA = 371.20 ACRES
Q RELEASE 100YR = 43 CFS
DETENTION VOLUME = 42 ACRE FEET

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No Revisions:	DETENTION POND LAYOUT		Detailer:
Revised:			Checked:
Void:	Sheet Subset: DRAINAGE	Subset Sheets: HYDT01 of 5	Sheet Number of __

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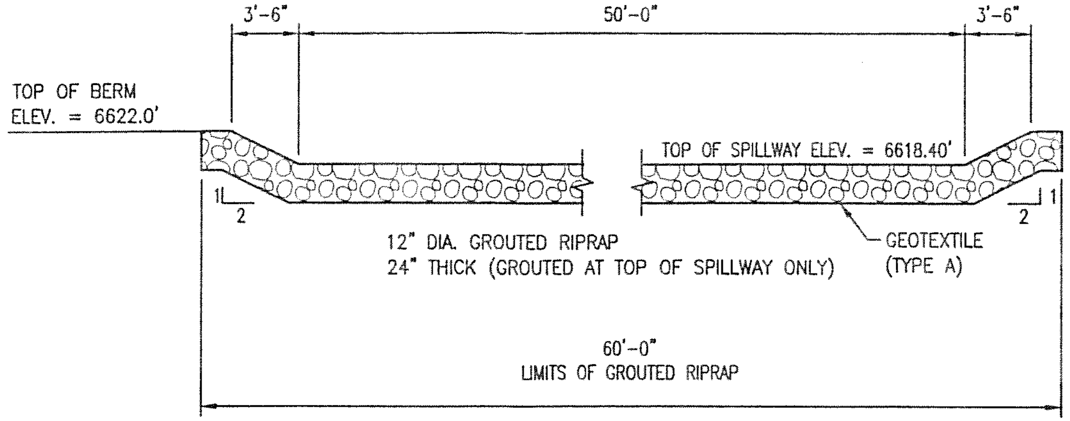
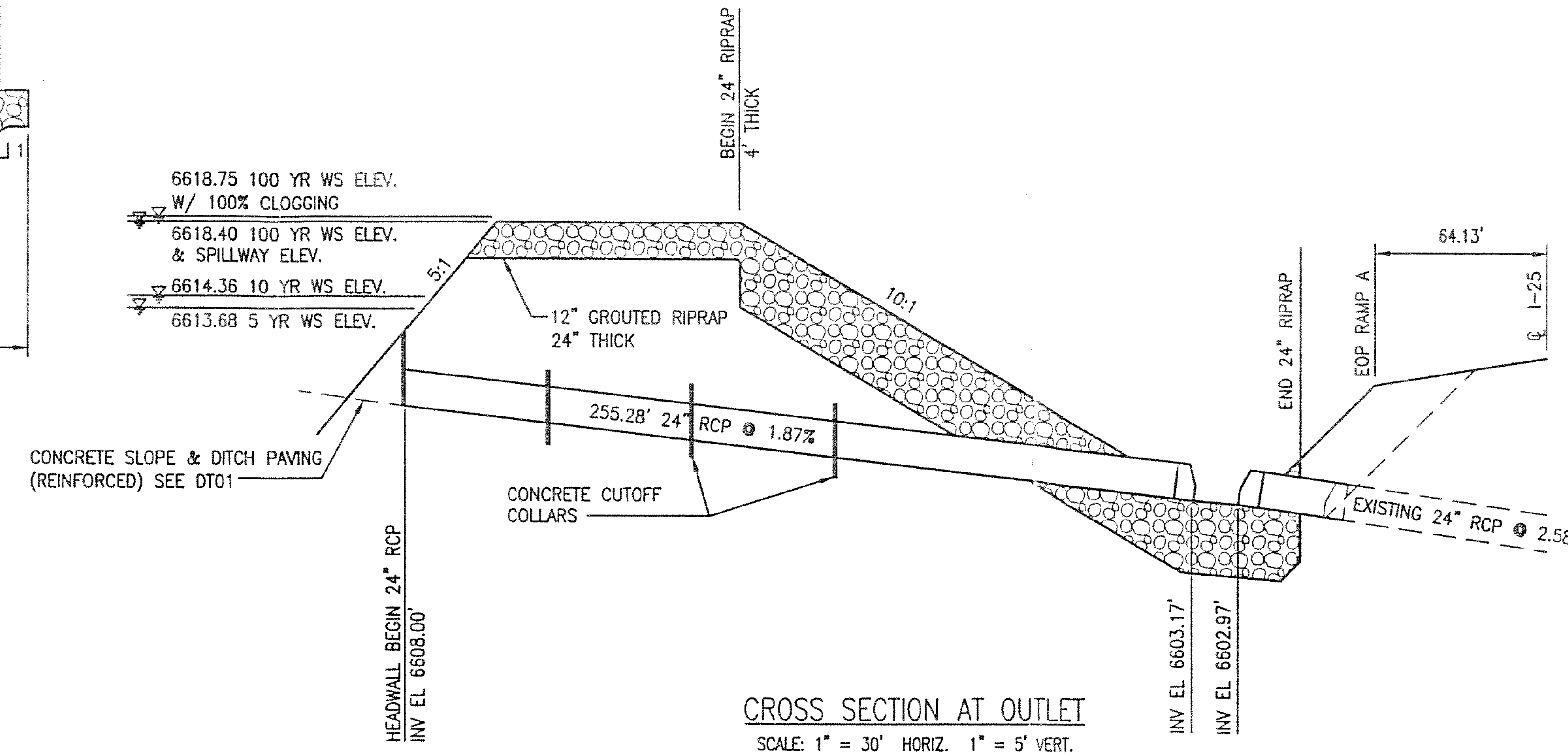


NOTE:
MAXIMUM DEPTH OF FLOW OVER SPILLWAY IS 4.2" WHEN OUTLET IS PLUGGED FROM BEGINNING OF STORM

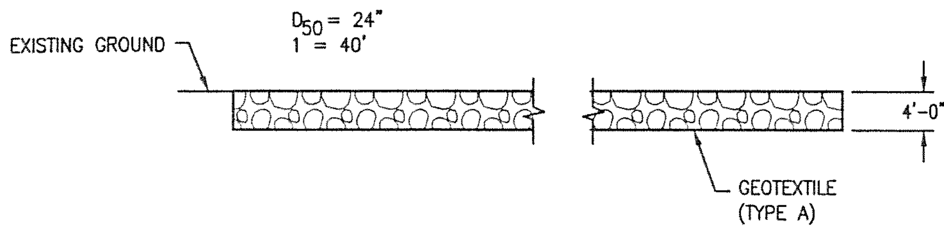
EMERGENCY SPILLWAY DETAIL

SCALE: 1" = 5'



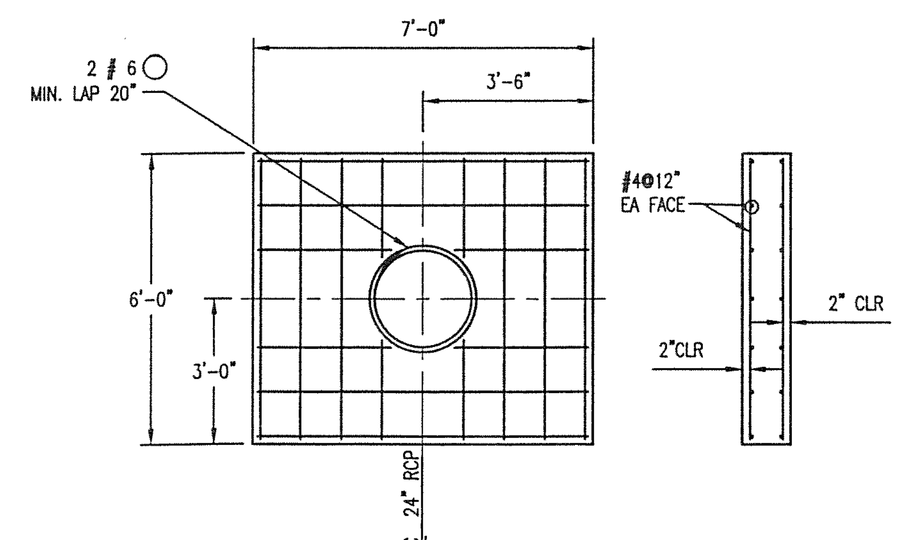
CROSS SECTION AT OUTLET

SCALE: 1" = 30' HORIZ. 1" = 5' VERT.



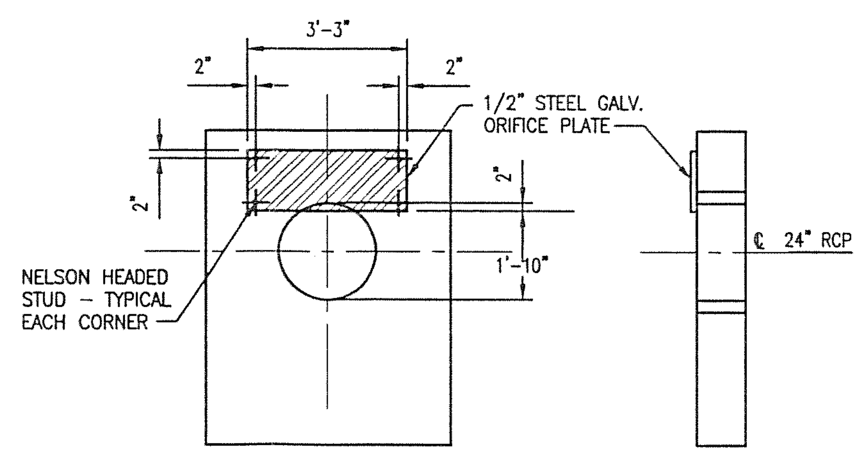
SECTION A-A (SEE HYDT01)

SCALE: 1" = 10'



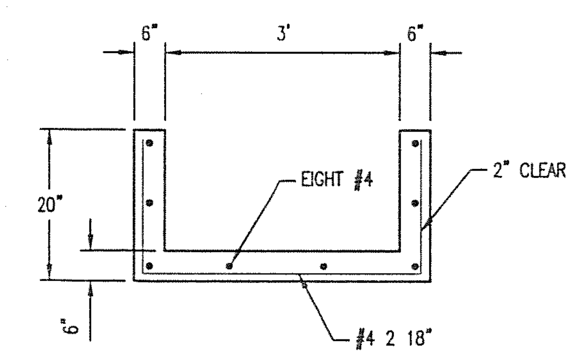
CONCRETE CUTOFF COLLAR DETAIL

SCALE: 1/2" = 1'-0"



ORIFICE PLATE DETAIL

SCALE: 1/2" = 1'-0"



CONCRETE TRICKLE CHANNEL DETAIL

SCALE: 1/2" = 1'

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Acad Ver. 14 Scale: NONE Units: ENGLISH

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DETENTION POND DETAILS

Sheet Subset: DRAINAGE Subset Sheets: HYDT02 of 5

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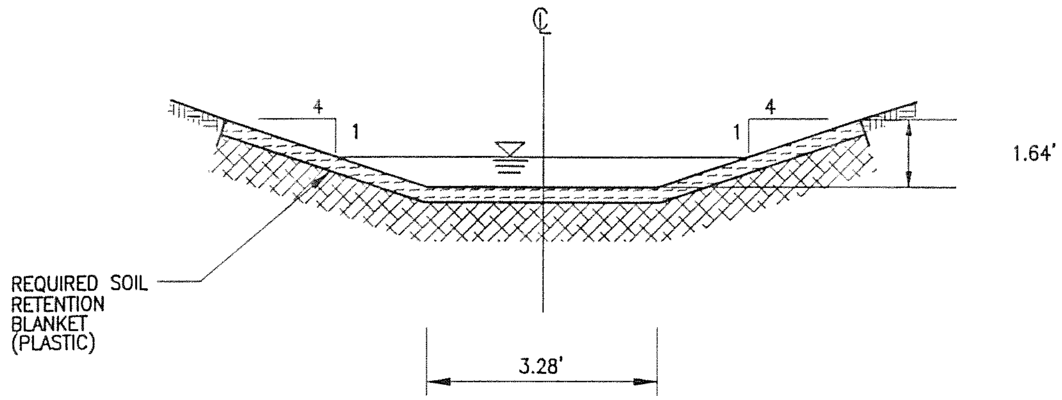
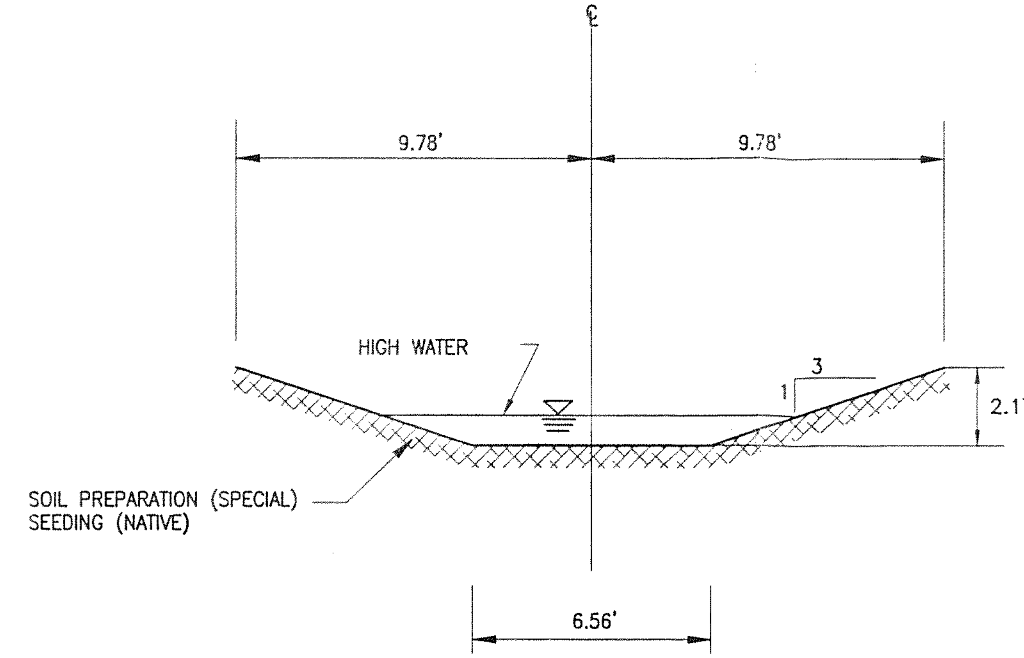
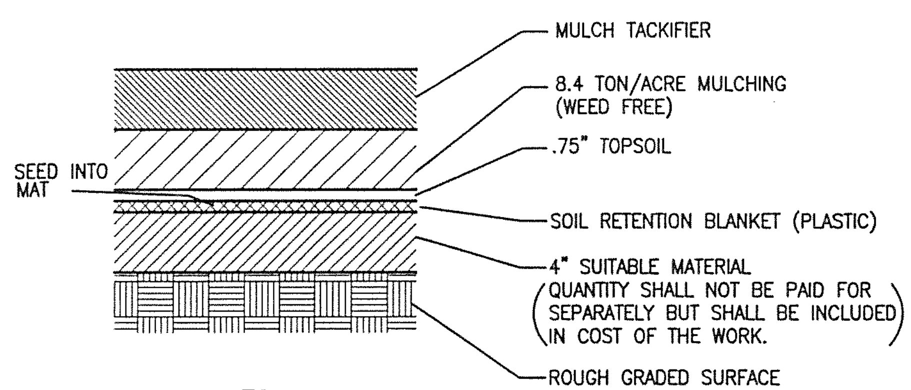


DITCH OPTION #1
PLASTIC SOIL RETENTION
EROSION PROTECTION

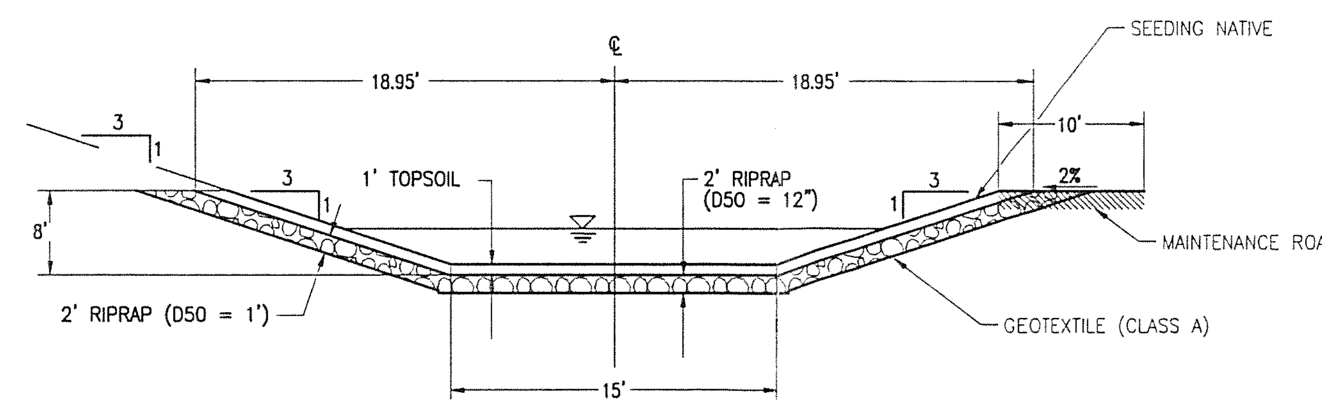


DITCH OPTION #2
NATURAL LINED GRASS CHANNEL



NTS

PLASTIC SOIL RETENTION
CHANNEL CROSS SECTION



DITCH OPTION #3
BURIED RIPRAP LINED CHANNEL

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CHANNEL SECTIONS
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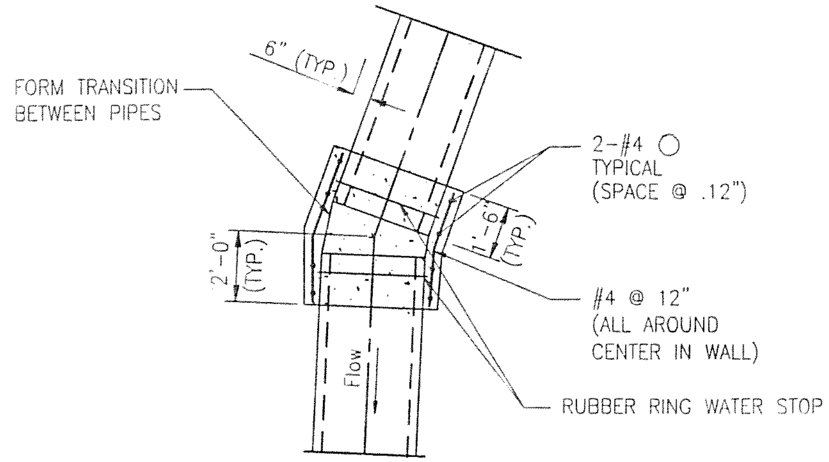
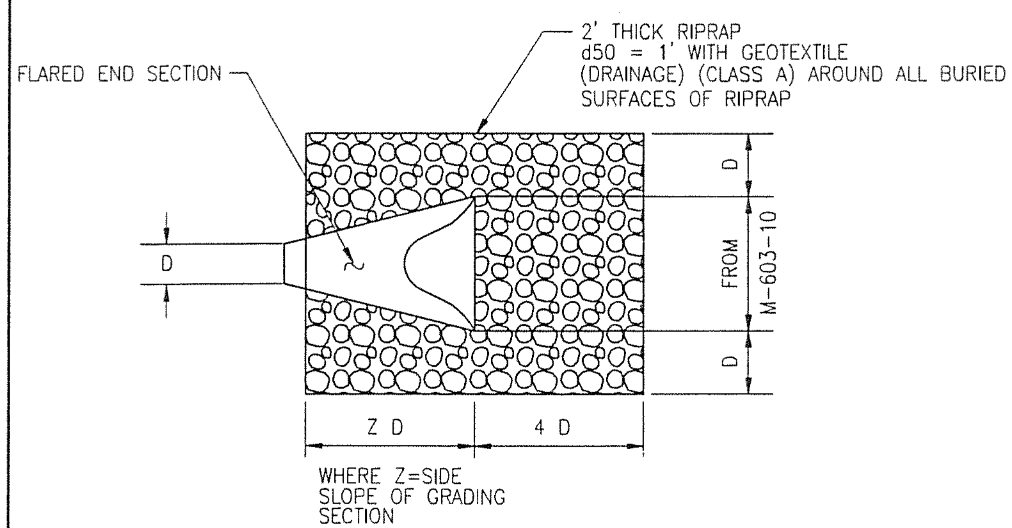


CONCRETE COLLAR DETAIL

NOTES:

1) ALL WORK TO BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.
2) CONCRETE FOR COLLAR SHALL BE CLASS A OR B.
3) PAYMENT FOR CONCRETE, RUBBER RING, REINFORCED STEEL, AND ALL INCIDENTAL MATERIALS WILL NOT BE MADE SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK.
4) PIPING MAY BE IN ANY DIRECTION.
5) REINFORCING SHALL HAVE fy=413,700 kPa



PIPE OUTLET EROSION PROTECTION

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MISC. HYDRAULIC DETAILS

Sheet Subset: DRAINAGE | Subset Sheets: HYDT04 of 5

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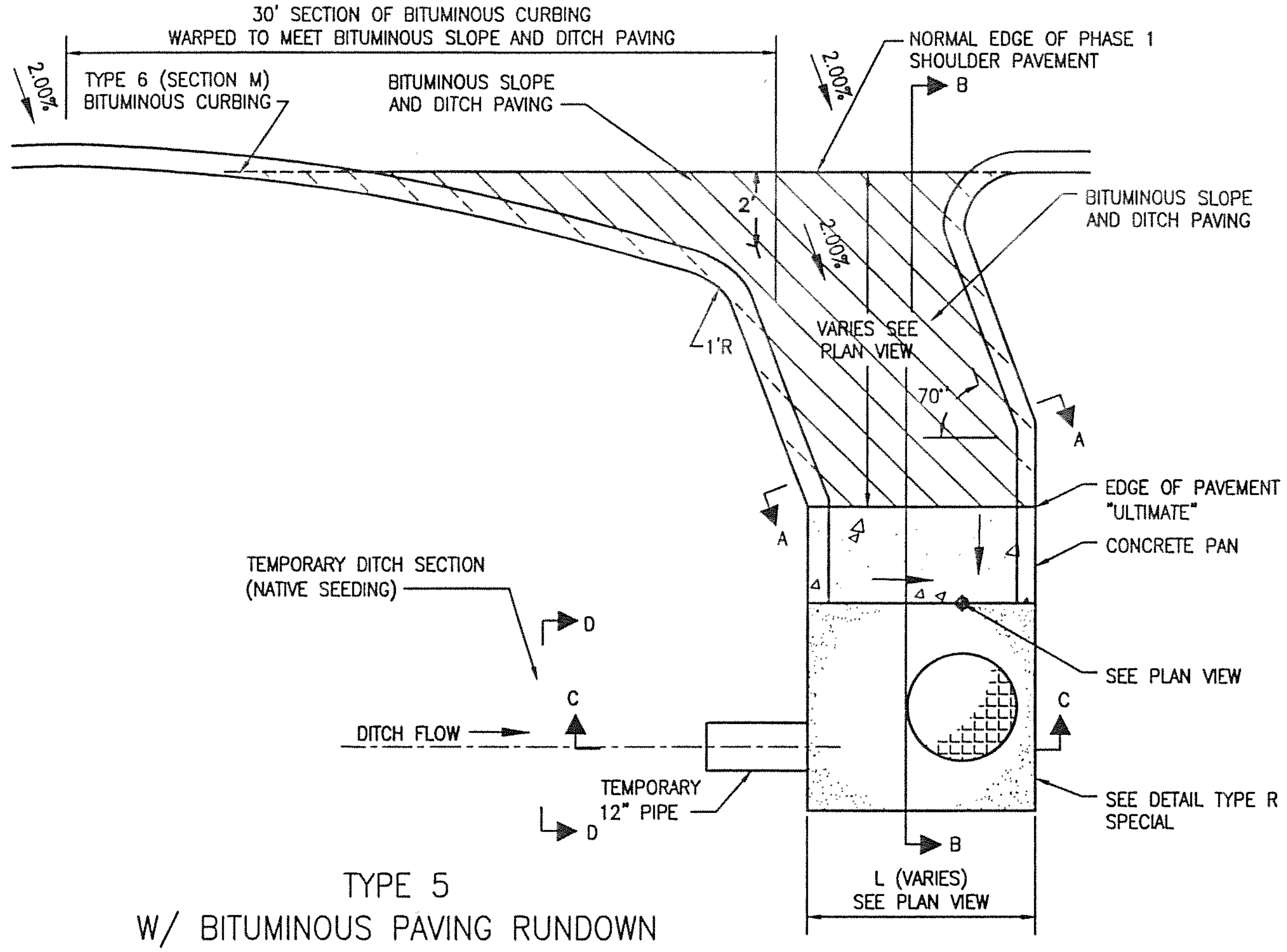


TYPE 5
W/ BITUMINOUS PAVING RUNDOWN

NOTES:

IF THE EMBANKMENT PROTECTOR IS LOCATED IN THE BOTTOM OF A SAG VERTICAL CURVE BITUMINOUS CURB ON EACH SIDE TO ALLOW FOR FLOW FROM BOTH DIRECTIONS.

DETAILS OF BITUMINOUS CURBING ARE SHOWN ELSEWHERE IN THE PLANS.

STRUCTURE BACKFILL MATERIAL SHALL NOT BE USED IN THE WORK. EMBANKMENT MATERIAL SHALL BE USED WITH CONSTRUCTION REQUIREMENTS IN ACCORDANCE WITH SECTION 203. PAYMENT FOR EMBANKMENT MATERIAL SHALL BE INCLUDED IN THE PAY ITEM FOR EMBANKMENT PROTECTOR (TYPE 5).

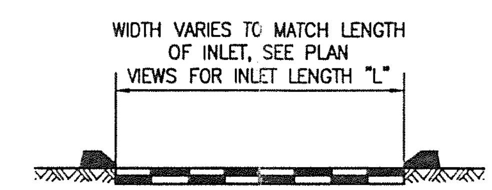
PAYMENT FOR THIS WORK SHALL BE AS FOLLOWS:

420 – GEOTEXTILE (EROSION CONTROL)(CLASS A) . . . . .SQUARE YARD
(IF SPECIFIED BY THE CONTRACT PLANS)

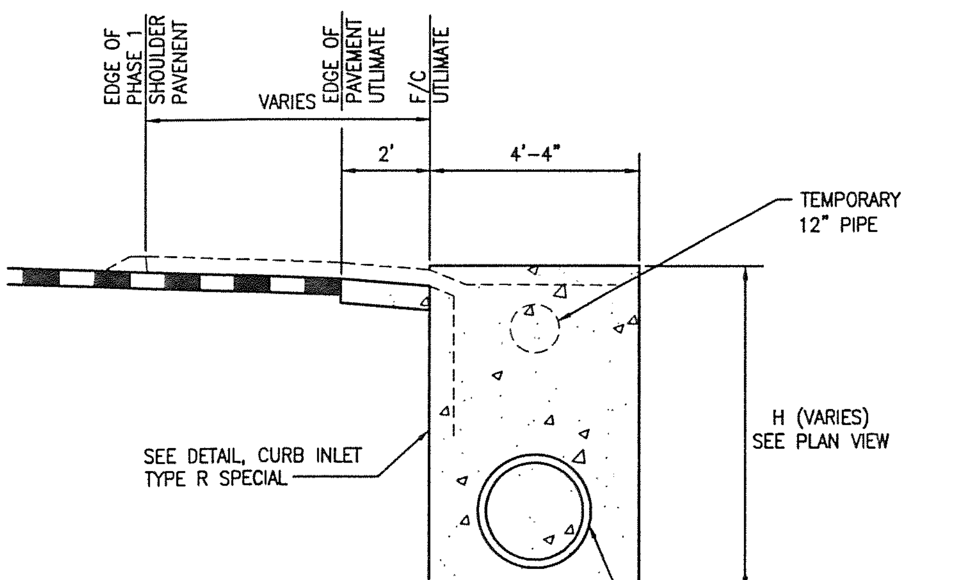
520 – BITUMINOUS SLOPE AND DITCH PAVING (ASPHALT) . . . . .TON

609 – CURB, TYPE 6 (SECTION M) . . . . .LINEAR FOOT

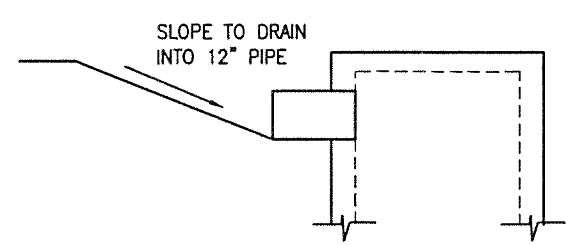
615 – EMBANKMENT PROTECTOR (TYPE 5) . . . . .EACH
(NOTE: THIS PAYMENT INCLUDES THE STRUCTURE EXCAVATION, ANY OTHER EARTHWORK, AND EXTRA WORK REQUIRED TO MODIFY OTHER PAY ITEMS).



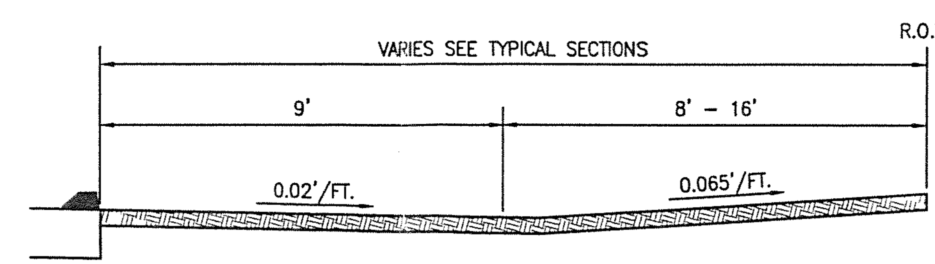
SECTION A–A
W/ 4" BITUMINOUS SLOPE
AND DITCH PAVING



SECTION B–B
WITH 4" BITUMINOUS
SLOPE AND DITCH PAVING &
CURB INLET TYPE R SPECIAL



SECTION C–C
SLOPE/STUB-OUT
SECTION



SECTION D–D
DITCH SECTION APPROACHING
TEMPORARY SECTION

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MOD. EMBANKMENT PROTECTOR
TYPE 5 / CURB INLET

Sheet Subset: DRAINAGE | Subset Sheets: HYDT05 of 5

Designer:
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J

DOT
DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX C

DESIGN CRITERIA

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

DRAINAGE - PERMITS

STORMWATER DISCHARGE PERMIT

ANY CONSTRUCTION PROJECT WHICH DISTURBS OVER 5 ACRES REQUIRES A STORMWATER DISCHARGE PERMIT FROM CDPHE. THIS PROJECT IS EXPECTED TO DISTURB OVER THIS AMOUNT. THIS WILL INVOLVE CREATING A STORM WATER MANAGEMENT PLAN FOR THE PROJECT. THE KEY ELEMENTS OF THIS ARE EROSION CONTROL MEASURES AND A LIST OF BEST MANAGEMENT PRACTICES TO BE USED DURING CONSTRUCTION OF THE PROJECT. THE PLAN WILL BE SUBMITTED BY CDOT. A COPY OF THE LIKELY GENERAL PERMIT TO BE USED ON THE PROJECT IS INCLUDED. ADDITIONAL INFORMATION IS AVAILABLE.

CDOT DRAINAGE DESIGN MANUAL
CDPHE GENERAL PERMIT FORMS

SECTION 404 PERMIT

ANY CONSTRUCTION PROJECT WHICH DISTURBS JURISDICTIONAL WETLANDS OR "WATERS OF THE U.S." REQUIRES A 404 PERMIT FROM THE CORPS OF ENGINEERS. IT IS ANTICIPATED THAT THE PROJECT WILL EITHER REQUIRE NO PERMIT OR WILL BE PERMITTED UNDER A NATIONWIDE OR REGIONAL PERMIT. THE EXISTENCE OF WETLANDS WITHIN THE PROJECT WILL BE VERIFIED BY THE EA UPDATE FOR THE PROJECT. IT APPEARS THAT THERE MAY NOT BE ANY WETLANDS AFFECTED. ADDITIONAL INFORMATION IS AVAILABLE.

CDOT DRAINAGE DESIGN MANUAL

FLOODPLAIN DEVELOPMENT PERMIT

ANY PROJECT WHICH AFFECTS AREAS DESIGNATED AS FLOODPLAINS BY THE NATIONAL FLOOD INSURANCE ACT REQUIRE A PERMIT FROM FEMA. IT IS ANTICIPATED THAT THERE ARE NO DESIGNATED FLOODPLAINS WITHIN THE PROJECT AREA. THIS WILL BE VERIFIED WITH THE REGIONAL FLOOD PLAIN ADMINISTRATOR FOR THE PIKES PEAK AREA.

CDOT DRAINAGE DESIGN MANUAL

OTHER PERMITS

IT NEEDS TO BE VERIFIED IF A FUGITIVE DUST PERMIT OR OTHER PERMITS ARE REQUIRED FOR THIS PROJECT.

DRAINAGE - DATA COLLECTION

THE FOLLOWING REPORTS HAVE BEEN OBTAIN THAT ARE RELATED TO THE PROJECT:

PROJECT SPECIFIC

"FAIRLANE TECHNOLOGY PARK -HYDROLOGY UPDATE", AYRES AND ASSOCIATES, NOVEMBER 13, 1997.

"MASTER DEVELOPMENT DRAINAGE REPORT AND PLAN", FAIRLANE TECHNOLOGY PARK FILING NO.2", URS PROJECT # 42044, OCTOBER 22, 1993. REVISED JANUARY 6, 1994.

"PRELIMINARY AND FINAL DRAINAGE REPORT AND PLAN", FAIRLANE TECHNOLOGY PARK FILING NO.2", URS PROJECT # 42044, JANUARY 6, 1994.

"DRAINAGE MEMORANDUM FOR PIKES PEAK COMMUNITY COLLEGE NORTH CAMPUS", COLORADO SPRING, COLORADO., EL PASO COUNTY, URS PROJECT NO. 67.42154., OCTOBER 7, 1996

"NEW LIFE CHURCH DRAINAGE REPORT", KLH ENGINEERING, INC. APRIL, 1991.

"PRELIMINARY AND FINAL DRAINAGE REPORT FOR INTERNATIONAL BIBLE SOCIETY FILING NO. 1", URS PROJECT NO 48404, AUGUST, 1988.

"NORTHGATE PHASE 1 DRAINAGE PLAN", URS PROJECT NO. 45206, JUNE 15, 1987., REVISED AUGUST 27, 1987

"NORTHGATE PHASE 1 DRAINAGE PLAN", URS PROJECT NO. 45206, JUNE 15, 1987., REVISED AUGUST 27, 1987. ADDENDUM DATED OCTOBER 6, 1987

DRAINAGE - HYDROLOGY

I-25 MAINLINE DESIGN STORMS

I-25 CROSS CULVERTS WILL BE DESIGNED FOR THE 100 YEAR STORM
I-25 PARALLEL STORM SEWER - INITIAL STORM IS THE 5 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD TO THE EDGE OF SHOULDER.
I-25 PARALLEL STORM SEWER - MAJOR STORM IS THE 100 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD OF 4' ONTO ANY TRAVEL LANE.

CDOT DRAINAGE DESIGN MANUAL

I-25 PERMANENT ROADSIDE DITCHES WILL BE DESIGNED FOR THE 10 YEAR STORM.

CDOT DRAINAGE DESIGN MANUAL CRITERIA MANUAL

FAIRLANE PARKWAY DESIGN STORMS

FAIRLANE PARKWAY CROSS CULVERTS WILL BE DESIGNED FOR THE 100 YEAR STORM
FAIRLANE PARKWAY PARALLEL STORM SEWER - INITIAL STORM IS THE 5 YEAR STORM WITH A MAXIMUM DEPTH OF 6" @ FLOWLINE UP TO A MAXIMUM OF 34 CFS PER SIDE.
FAIRLANE PARKWAY PARALLEL STORM SEWER - MAJOR STORM IS THE 100 YEAR

CCS DRAINAGE CRITERIA MANUAL

STORM WITH A MAXIMUM DEPTH OF 8" @ FLOWLINE WITH NO CURB OVERTOPPING. MAX SPREAD ONTO ROAD IS TO THE OUTSIDE EDGE OF THE INNER LANE IN EACH DIRECTION.

RAMP DESIGN STORMS

RAMP CROSS CULVERTS WILL BE DESIGNED FOR THE 100 YEAR STORM

RAMP PARALLEL STORM SEWER - INITIAL STORM IS THE 5 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD OF 4 FT. ONTO ONE TRAVEL LANE FOR MULTI-LANE RAMPS.

RAMP PARALLEL STORM SEWER - MAJOR STORM IS THE 100 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD OF 12 FT. (ONE TRAVEL LANE) FOR MULTI-LANE RAMPS.

CDOT DRAINAGE DESIGN MANUAL

RAMP PERMANENT ROADSIDE DITCHES WILL BE DESIGNED FOR THE 10 YEAR STORM.

CDOT DRAINAGE DESIGN MANUAL CCS DRAINAGE

RAMP PERMANENT ROADSIDE DITCHES WILL BE CHECKED FOR THE 100 YEAR STORM TO ENSURE THAT THE WATER LEVEL IS BELOW THE PAVEMENT OR BASE.

OTHER ROADS

FOR CONCEPT DESIGN, ALL OTHER ROADS WILL NOT INCLUDE STORM SEWER UNLESS IT IS NECESSARY TO PREVENT FLOW FROM CROSSING OVER INTERSECTIONS AND THERE IS A STORM SEWER LINE NEARBY TO DISCHARGE INTO.

PROJECT SPECIFIC

FOR CONCEPT DESIGN, ALL OTHER ROADS WITH PERMANENT ROADSIDE DITCHES WILL BE DESIGNED FOR THE 10 YEAR STORM. THE ROUTING OF THE 100 YEAR STORM NEEDS TO BE CHECKED TO ENSURE THAT FLOODING OF THE ROAD OR NEARBY STRUCTURES DOES NOT OCCUR.

CDOT DRAINAGE DESIGN MANUAL

THIS CRITERIA NEEDS TO BE VERIFIED PRIOR TO DESIGN OF THE PROJECT.

HYDROLOGIC METHODS

THE OFFSITE DRAINAGE ANALYSIS WILL BE DEVELOPED USING THE PREVIOUS DRAINAGE STUDIES IN THE AREA. THE STANDARD USED IS THE CITY OF COLORADO SPRINGS STANDARD FOR BASINS OVER APPROXIMATELY (100 ACRES) IN TRIBUTARY AREA. THIS METHOD IS THE SCS METHOD TYPICALLY UTILIZING EITHER THE TR-20 OR HEC-1 COMPUTER PROGRAM. THE DESIGN STORM TO BE UTILIZED IS THE 100 YEAR 24 HOUR STORM WITH ANTECEDENT MOISTURE CONDITION II.

PROJECT SPECIFIC CCS DRAINAGE CRITERIA MANUAL

THE ONSITE DRAINAGE ANALYSIS WILL BE DEVELOPED FROM PROJECT

TOPOGRAPHY AND PREVIOUS DRAINAGE STUDIES IN THE AREA. THE METHOD USED WILL BE THE RATIONAL METHOD WHICH IS AS FOLLOWS FOR SI UNITS:

CDOT DRAINAGE DESIGN MANUAL

$$Q = C\,i\,A$$

WHERE: Q = THE RUNOFF IN CUBIC METERS PER SECOND (CFS)
C = RUNOFF COEFFICIENT OF THE AREA
i = THE AVERAGE RAINFALL INTENSITY IN IN/HR
A = THE AREA IN ACRES

VALUES FOR C AND i ARE PROVIDED FROM CDOT AND THE CITY, RESPECTIVELY. THE INTENSITIES ARE BASED ON THE TIME OF CONCENTRATION FOR A BASIN. THIS IS CALCULATED BASED ON THE FOLLOWING:

CDOT DRAINAGE DESIGN MANUAL

$$T_c = T_i + T_t$$

WHERE: T_c = TIME OF CONCENTRATION IN MINUTES
T_i = OVERLAND FLOW TIME IN MINUTES
T_t = TRAVEL TIME IN MINUTES

$$T_i = \frac{1.8\,(1.1-C)\,D^{1.5}}{S^{0.33}}$$

WHERE: C = RUNOFF COEFFICIENT FROM THE RATIONAL METHOD
D = DISTANCE OF FLOW PATH IN FEET
(500 FT. MAX. NON-URBAN AREAS)
(300 FT. MAX. URBAN AREAS)
S = AVERAGE SLOPE OF BASIN IN %

VARIOUS METHODS ARE AVAILABLE TO ESTIMATE THE TRAVEL TIME BASED ON AVERAGE VELOCITIES OR EMPIRICAL FORMULAS.

DRAINAGE - CHANNELS

DESIGN OF CHANNELS AND ROADSIDE DITCHES WILL BE DONE USING MANNING'S EQUATION. IN SIMPLE CASES THIS WILL BE DONE ASSUMING UNIFORM FLOW AND DIRECT APPLICATION OF THE MANNING EQUATION TO DETERMINE THE NORMAL DEPTH. THIS IS AS FOLLOWS:

CDOT DRAINAGE DESIGN MANUAL

$$Q = (1.49/n)\,A\,R^{2/3}\,S^{1/2}$$

WHERE: Q = DISCHARGE IN CUBIC FEET PER SECOND (CFS)
n = MANNING'S ROUGHNESS COEFFICIENT
A = CROSS SECTIONAL AREA IN SQUARE FEET

R = HYDRAULIC RADIUS IN FEET
S = CHANNEL SLOPE IN FT/FT

VALUES OF MANNING'S ROUGHNESS COEFFICIENT ARE AVAILABLE IN THE CDOT MANUAL. THE INITIAL ANALYSIS SHOULD INCLUDE A CHECK OF THE FOLLOWING PARAMETERS:

CDOT DRAINAGE DESIGN MANUAL

V = Q / A

WHERE: V = AVERAGE VELOCITY IN FEET PER SECOND (FPS)

GENERALLY, THE VELOCITY SHOULD BE WITHIN THE FOLLOWING LIMITS FOR NATURAL OR GRASS LINED CHANNELS:

PROJECT SPECIFIC

V >2 FPS WHERE POSSIBLE
V < 3 FPS FOR BARE ERODIBLE SOILS
V < 5 FPS FOR BARE NON-ERODIBLE SOILS
V < 5 FPS FOR VEGETATED ERODIBLE SOILS
V < 7 FPS FOR VEGETATED NON-ERODIBLE SOILS

ADDITIONAL DETAILED INFORMATION IS AVAILABLE FOR THIS, IF NECESSARY. THE FROUDE NUMBER SHOULD ALSO BE CALCULATED FOR EACH CASE, AS FOLLOWS:

CCS DRAINAGE CRITERIA MANUAL

$$F_r = \frac{V}{(g\ d)^{0.5}}$$

WHERE: Fr = FROUDE NUMBER
g = ACCELERATION DUE TO GRAVITY (32.2 FPS^2)
d = NORMAL DEPTH IN FEET

IT SHOULD BE NOTED THAT THE FOLLOWING GUIDELINES SHOULD BE USED WHERE POSSIBLE WHEN CHECKING THE FROUDE NUMBER:

PROJECT SPECIFIC

$F_r = 1$	CRITICAL DEPTH
$F_r < 1$	SUBCRITICAL FLOW
$F_r > 1$	SUPERCRITICAL FLOW
F_r <0.9 OR F_r >1.1	DESIRABLE RANGE OF FROUDE NUMBERS SINCE THE FLOW IS GENERALLY UNSTABLE NEAR CRITICAL DEPTH.

FOR CASES WHERE GRADUALLY VARIED FLOW IS EXPECTED, THE U.S. ARMY CORPS OF ENGINEERS' HEC-2 COMPUTER PROGRAM WILL BE UTILIZED FOR THE PROJECT. CRITERIA FOR ELEMENTS OF CHANNEL PROTECTION WILL BE DEVELOPED IN MORE DETAIL AFTER THE CONCEPT LEVEL DESIGN IS DONE.

CDOT DRAINAGE DESIGN MANUAL

DRAINAGE - CROSS CULVERTS

FOR PURPOSES OF CONCEPT DESIGN, THE CROSS CULVERTS WILL BE ASSUMED TO BE REINFORCED CONCRETE PIPE (RCP) OR REINFORCED CONCRETE BOX CULVERTS (CBC). HOWEVER, SEVERAL CORRUGATED STEEL PIPES MAY BE EXTENDED WITH LIKE MATERIAL.
FOR CONCEPT DESIGN, USE A MANNING'S n VALUE OF 0.013 FOR RCP'S, 0.012 FOR CBC'S, AND .026 FOR CSP'S

PROJECT SPECIFIC

CROSS CULVERTS WILL BE INITIALLY SIZED BASED ON THE "HYDRAULIC DESIGN OF HIGHWAY CULVERTS" BY FHWA.

CDOT DRAINAGE DESIGN MANUAL

DRAINAGE - STORM SEWER

AREAS THAT REQUIRE STORM SEWER WILL BE DESIGNED WITH STORM SEWER DESIGN SOFTWARE. CONCEPTUAL DESIGN WILL ALSO UTILIZE SPREADSHEETS TO HELP ESTIMATE THE LOCATION AND NUMBER OF INLETS, PIPE SIZES AND KEY LOCATIONS.

INLETS

INLETS ARE REQUIRED 10 FT BEFORE THE POINT WHERE STREET CROSS SLOPE BEGINS TO SUPERELEVATE TOWARDS THE OPPOSITE SIDE TO PREVENT CROSS STREET FLOW.

CDOT DRAINAGE DESIGN MANUAL

SUMP INLETS REQUIRE FLANKING INLETS ON EACH SIDE OF THE SUMP INLET TO PROVIDE RELIEF FROM DEBRIS CLOGGING. SUMP INLETS ON I-25 SHOULD BE CHECKED TO ENSURE THAT THE 50 YEAR STORM DOES NOT CAUSE PONDING OF WATER OUTSIDE THE SHOULDER.

CDOT DRAINAGE DESIGN MANUAL

FOR SIMPLICITY IN CONCEPTUAL DESIGN, THE FOLLOWING FORMULAS WILL BE USED FOR DETERMINING THE APPROXIMATE INLET LOCATIONS:

THE ROAD CAPACITY IS BASED ON MANNING'S EQUATION WITH THE SIMPLIFYING ASSUMPTION THAT THE WETTED PERIMETER IS EQUAL TO THE WIDTH OF FLOW. ASSUME n=0.016.

HEC-12 FROM FHWA

THE INLETS ON FAIRLANE PARKWAY WILL BE CURB OPENING INLETS IN THE 8 INCH CURB. MODIFIED EMBANKMENT PROTECTORS TYPE 5 MAY BE USED IN THE INTERIM TO CONVEY FLOW FROM THE PHASE 1 PAVED SECTION TO THE ULTIMATE LOCATION OF THE TYPE R INLETS

CCS DESIGN MANUAL M-STANDARD

DRAINAGE - DETENTION FACILITIES

CDOT DRAINAGE

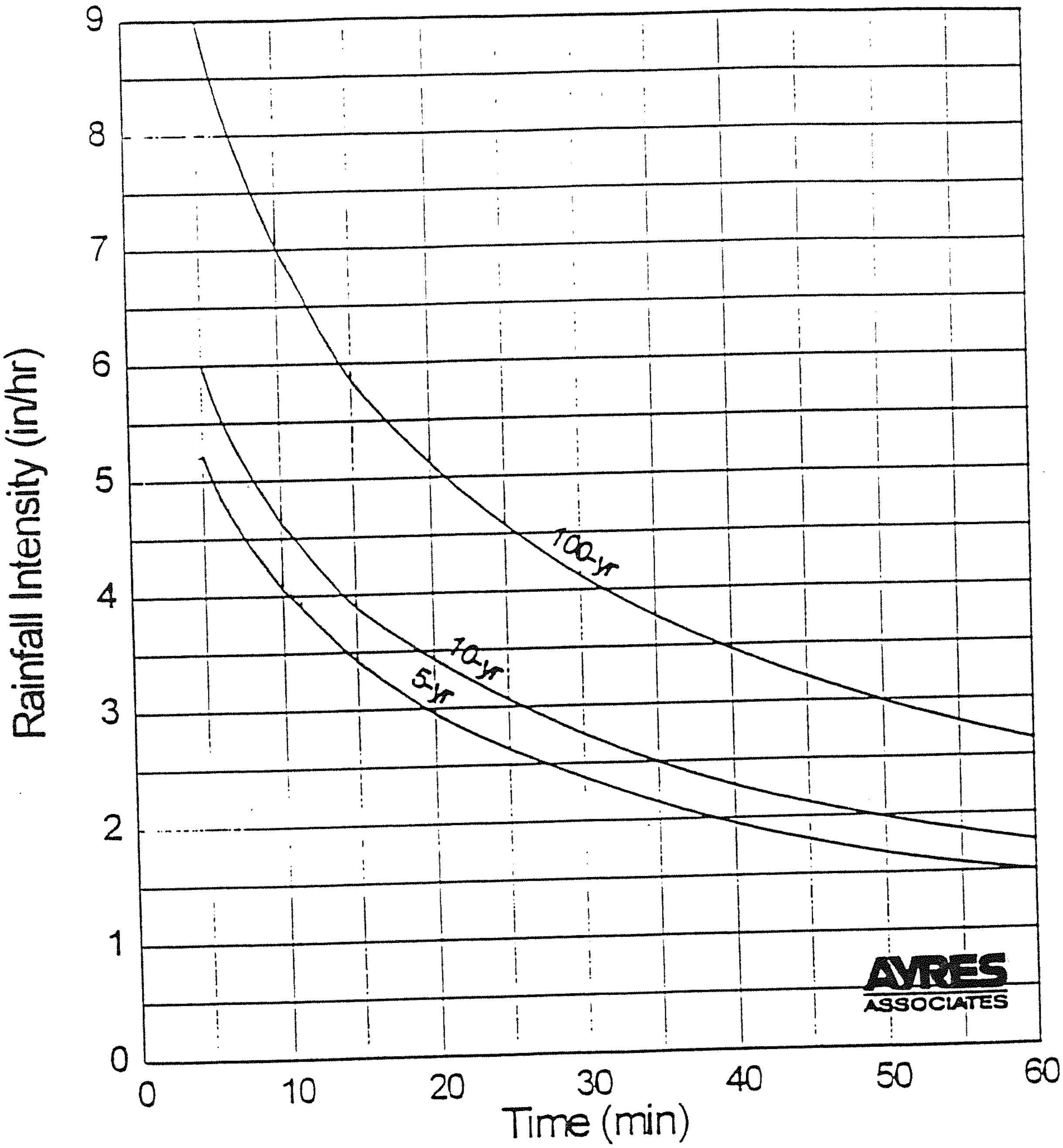
A DETENTION FACILITY HAS BEEN DESIGNED TO ACCOMMODATE DEVELOPED FLOW FROM THE PROJECT AREA. SIDE SLOPES FLATTER THAN 4:1 HAVE BEEN UTILIZED RIPRAP PROTECTED EMBANKMENTS ARE LESS THAN 2:1 A MINIMUM FREEBOARD OF ONE FOOT ABOVE THE 100 YEAR DESIGN STORM WATER ELEVATION HAS BEEN PROVIDED AT FINAL DESIGN THE IMPOUNDMENT DEPTH WILL BE LESS THAN 10 FEET. AREAS WITHIN THE STORAGE AREA HAVE BEEN SLOPED NO LESS THAN 1.5% WITH AN ATTEMPT TO GRADE AS MUCH AS THE STORAGE AREA AS POSSIBLE AT 2%. A SMALL PAVED APRON HAS BEEN PROPOSED AT THE OUTLET WORKS TO ALLOW MAINTENANCE ACCESS AND PREVENT VEGETATION FROM CLOGGING TH E RELEASE STRUCTURE. A TRICKLE CHANNEL HAS BEEN PROPOSED ACROSS THE FACILITY BOTTOM FROM INLETS AND PREDICTED FLOW ACCUMULATION POINTS TO THE OUTLET WORKS TO CONVEY LOW FLOW AND PREVENT STANDING WATER. A PRINCIPAL OUTLET PIPE AND EMERGENCY SPILLWAY HAVE BEEN PROPOSED. AT FINAL DESIGN THE DETENTION FACILITY WILL MEET STANDARDS OF THE SAFE DAMS ACT IN THE CDOT CRITERIA.	DESIGN MANUAL

TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10		100	
		A&B*	C&D*	A&B*	C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group



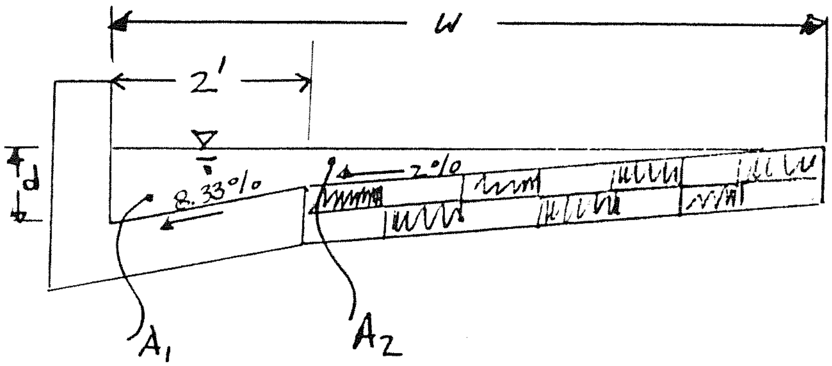
Interim Release October 12, 1994 , Rainfall Intensity Curves
City Of Colorado Springs Drainage Criteria Manual

DMJM

Planning
Architecture
Engineering
Program/Construction
Management

FAIRLANE	JOB No. 3821	SHEET No.
	DESIGNED BY RBB	DATE 27 JAN 98
	APPROVED	

SET UP BASE EQUATIONS FOR INITIAL STORM SEWER ON FAIRLANE



$$A_1 = \frac{d + d - .166}{\cancel{2}} \cancel{(2)} = 2d - .166$$

$$A_2 = \left(\frac{d - 0.166}{2}\right)\left(\frac{d - 0.166}{.02}\right) = \frac{d^2 - .332d + .028}{.04}$$

$$= 25d^2 - 8.3d + .7$$

$$A = A_1 + A_2 = \underline{\underline{25d^2 - 6.3d + .534}}$$

$$P = w = \frac{d - .166}{.02} + 2.0 = 50d - 8.3 + 2.0$$

$$P = \underline{\underline{50d - 6.3}}$$

$n = .016$

$$Q = \frac{1.49}{n} \frac{A^{5/3}}{P^{2/3}} S^{1/2}$$

FAIRLANE INTERCHANGE

INITIAL CALCULATIONS FOR STORM SEWER IN FAIRLANE PARKWAY

	Major Storm - 100 Year Storm									
	Rational Method Hydrology				Manning's Equation for Street Flow (2% Cross Slope)					
BASIN	C	A (acres)	i (in/hr)	Q (cfs)	d (FT)	W (FT)	S (%)	A (FT2)	Q (CFS)	V (FPS)
1975A	0.90	1.41	9.0	11.421	0.666	27.000	2.38%	7.427	45.131	6.08
1975B	0.90	1.32	9.0	10.692	0.666	27.000	2.38%	7.427	45.131	6.08
1930A	0.90	0.78	9.0	6.318	0.666	27.000	2.38%	7.427	45.131	6.08
1930B	0.90	0.65	9.0	5.265	0.666	27.000	2.38%	7.427	45.131	6.08
1895	0.90	0.41	9.0	3.321	0.666	27.000	2.38%	7.427	45.131	6.08
1840A	0.90	1.30	9.0	10.530	0.666	27.000	2.38%	7.427	45.131	6.08
1840B	0.90	0.77	9.0	6.237	0.666	27.000	2.38%	7.427	45.131	6.08
1760A	0.90	0.77	9.0	6.237	0.666	27.000	1.50%	7.427	35.829	4.82
1760B	0.90	0.83	9.0	6.723	0.666	27.000	1.50%	7.427	35.829	4.82
1715A	0.90	0.75	9.0	6.075	0.666	27.000	1.50%	7.427	35.829	4.82
1715B	0.90	0.46	9.0	3.726	0.666	27.000	1.50%	7.427	35.829	4.82
1655A	0.90	0.96	9.0	7.776	0.666	27.000	1.50%	7.427	35.829	4.82
1655B	0.90	0.83	9.0	6.723	0.666	27.000	1.50%	7.427	35.829	4.82
1595A	0.90	0.84	9.0	6.804	0.666	27.000	1.33%	7.427	33.738	4.54
1595B	0.90	0.81	9.0	6.561	0.666	27.000	1.33%	7.427	33.738	4.54
1535A	0.90	0.88	9.0	7.128	0.666	27.000	1.33%	7.427	33.738	4.54
1535B	0.90	0.83	9.0	6.723	0.666	27.000	1.33%	7.427	33.738	4.54
1487A	0.90	0.87	9.0	7.047	0.666	27.000	1.12%	7.427	30.960	4.17
1487B	0.90	0.67	9.0	5.427	0.666	27.000	1.12%	7.427	30.960	4.17
1429	0.90	0.69	9.0	5.589	0.666	27.000	2.82%	7.427	49.126	6.61
1428	0.90	0.72	9.0	5.832	0.666	27.000	2.82%	7.427	49.126	6.61
1369	0.90	0.95	9.0	7.695	0.666	27.000	2.82%	7.427	49.126	6.61
1368	0.90	1.01	9.0	8.181	0.666	27.000	2.82%	7.427	49.126	6.61
1327A	0.90	0.76	9.0	6.156	0.666	27.000	2.82%	7.427	49.126	6.61
1327B	0.90	0.65	9.0	5.265	0.666	27.000	2.82%	7.427	49.126	6.61
1228A	0.90	1.30	9.0	10.530	0.666	27.000	2.82%	7.427	49.126	6.61
1228B	0.90	1.36	9.0	11.016	0.666	27.000	2.82%	7.427	49.126	6.61
1178A	0.90	0.75	9.0	6.075	0.666	27.000	2.82%	7.427	49.126	6.61
1178B	0.90	0.78	9.0	6.318	0.666	27.000	2.82%	7.427	49.126	6.61

1. ASSUME Tc= 5 Minutes
2. ASSUME n=0.016
3. ASSUME MAXIMUM DEPTH OF FLOW @ GUTTER OF .666 FT OR 8 INCHES (CITY OF COLORADO SPRINGS)

ASSUME CITY STREET/MAX ENCROACHMENT ONTO LANES=MUST LEAVE ONE LANE OPEN AT ALL TIMES IN EACH DIRECTION

FAIRLANE INTERCHANGE

INITIAL CALCULATIONS FOR STORM SEWER IN FAIRLANE PARKWAY

	Major Storm - 100 Year Storm Rational Method Hydrology				Manning's Equation for Street Flow (2% Cross Slope)					
BASIN	C	A (acres)	i (in/hr)	Q (cfs)	d (FT)	W (FT)	S (%)	A (FT2)	Q (CFS)	V (FPS)
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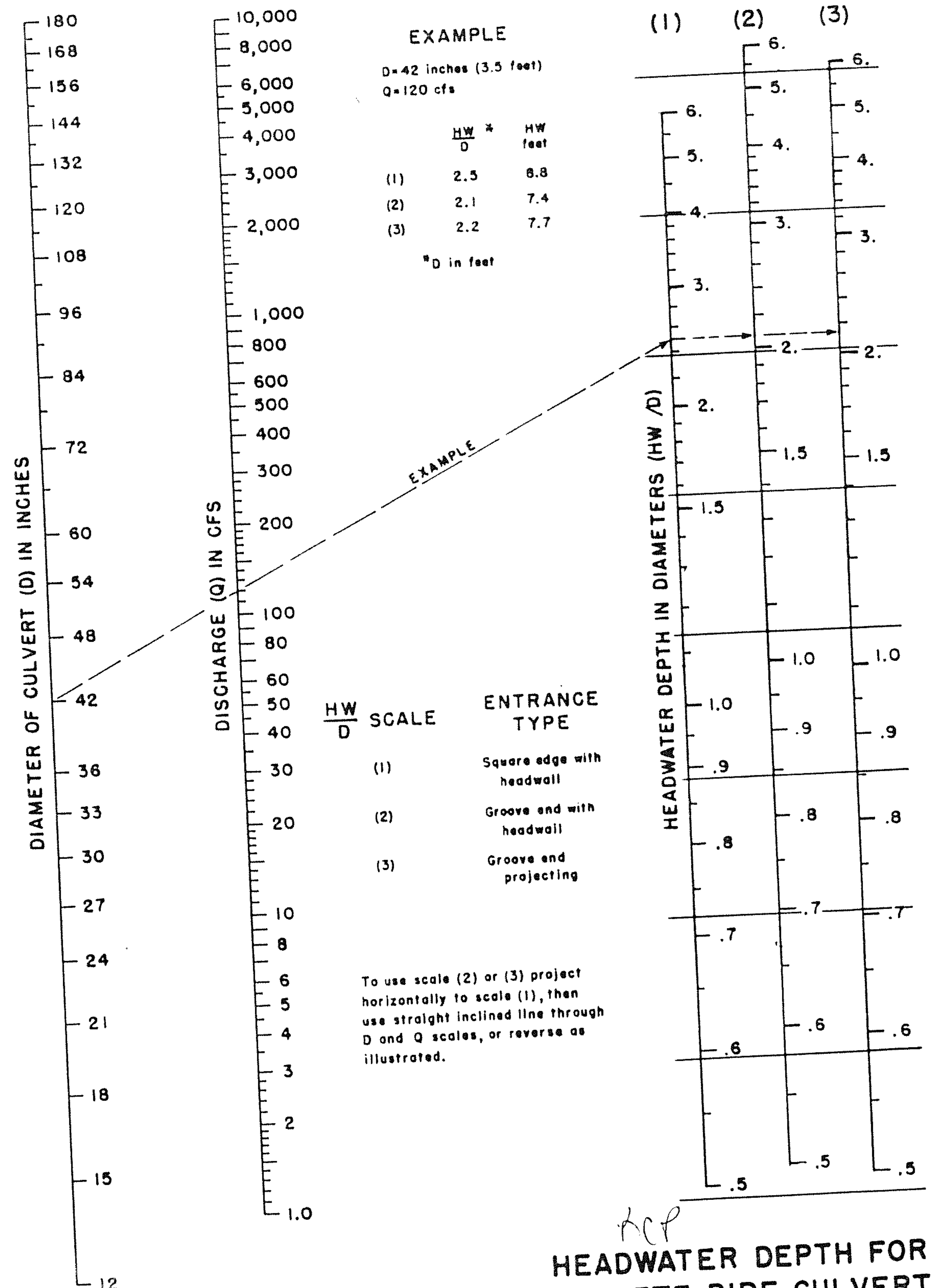
1930B	0.90	0.65	9.0	5.265	0.666	27.000	2.38%	7.427	45.131	6.08
1895	0.90	0.41	9.0	3.321	0.666	27.000	2.38%	7.427	45.131	6.08
1840A	0.90	1.30	9.0	10.530	0.666	27.000	2.38%	7.427	45.131	6.08
1840B	0.90	0.77	9.0	6.237	0.666	27.000	2.38%	7.427	45.131	6.08
1760A	0.90	0.77	9.0	6.237	0.666	27.000	1.50%	7.427	35.829	4.82
1760B	0.90	0.83	9.0	6.723	0.666	27.000	1.50%	7.427	35.829	4.82
1715A	0.90	0.75	9.0	6.075	0.666	27.000	1.50%	7.427	35.829	4.82
1715B	0.90	0.46	9.0	3.726	0.666	27.000	1.50%	7.427	35.829	4.82
1655A	0.90	0.96	9.0	7.776	0.666	27.000	1.50%	7.427	35.829	4.82
1655B	0.90	0.83	9.0	6.723	0.666	27.000	1.50%	7.427	35.829	4.82
1595A	0.90	0.84	9.0	6.804	0.666	27.000	1.33%	7.427	33.738	4.54
1595B	0.90	0.81	9.0	6.561	0.666	27.000	1.33%	7.427	33.738	4.54
1535A	0.90	0.88	9.0	7.128	0.666	27.000	1.33%	7.427	33.738	4.54
1535B	0.90	0.83	9.0	6.723	0.666	27.000	1.33%	7.427	33.738	4.54
1487A	0.90	0.87	9.0	7.047	0.666	27.000	1.12%	7.427	30.960	4.17
1487B	0.90	0.67	9.0	5.427	0.666	27.000	1.12%	7.427	30.960	4.17
1429	0.90	0.69	9.0	5.589	0.666	27.000	2.82%	7.427	49.126	6.61
1428	0.90	0.72	9.0	5.832	0.666	27.000	2.82%	7.427	49.126	6.61
1369	0.90	0.95	9.0	7.695	0.666	27.000	2.82%	7.427	49.126	6.61
1368	0.90	1.01	9.0	8.181	0.666	27.000	2.82%	7.427	49.126	6.61
1327A	0.90	0.76	9.0	6.156	0.666	27.000	2.82%	7.427	49.126	6.61
1327B	0.90	0.65	9.0	5.265	0.666	27.000	2.82%	7.427	49.126	6.61
1228A	0.90	1.30	9.0	10.530	0.666	27.000	2.82%	7.427	49.126	6.61
1228B	0.90	1.36	9.0	11.016	0.666	27.000	2.82%	7.427	49.126	6.61
1178A	0.90	0.75	9.0	6.075	0.666	27.000	2.82%	7.427	49.126	6.61
1178B	0.90	0.78	9.0	6.318	0.666	27.000	2.82%	7.427	49.126	6.61

1. ASSUME Tc= 5 Minutes
2. ASSUME n=0.016
3. ASSUME MAXIMUM DEPTH OF FLOW @ GUTTER OF .666 FT OR 8 INCHES (CITY OF COLORADO SPRINGS)
ASSUME CITY STREET/MAX ENCROACHMENT ONTO LANES=MUST LEAVE ONE LANE OPEN AT ALL TIMES
IN EACH DIRECTION

CHART 10



RCP

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX D

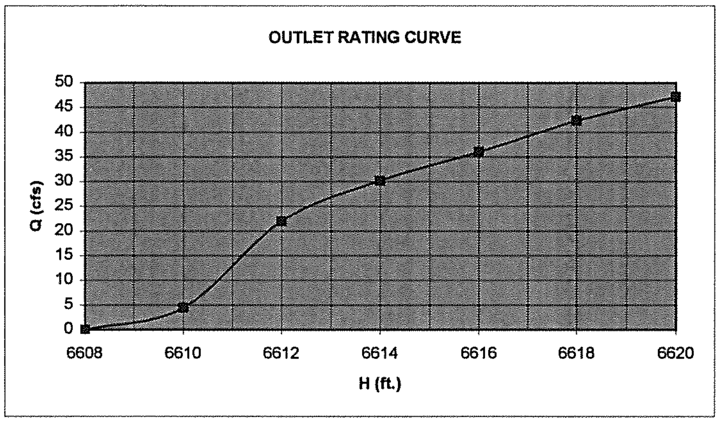
POND HYDROGRAPHS AND DETAILS

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

OUTLET RATING CURVE

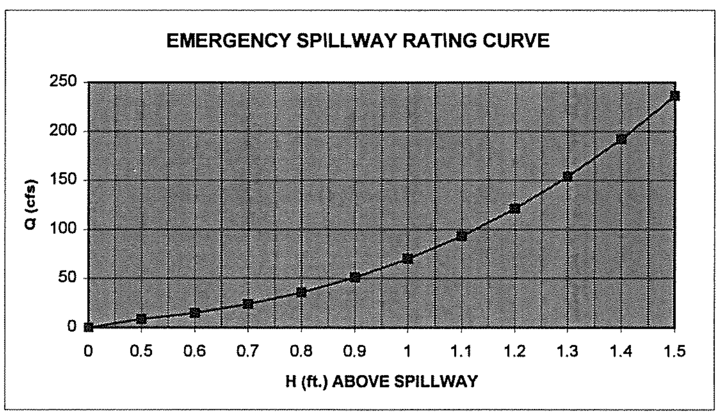
HT	Q
6608	0
6610	4.45
6612	22
6614	30.2
6616	36
6618	42.3
6620	47.15



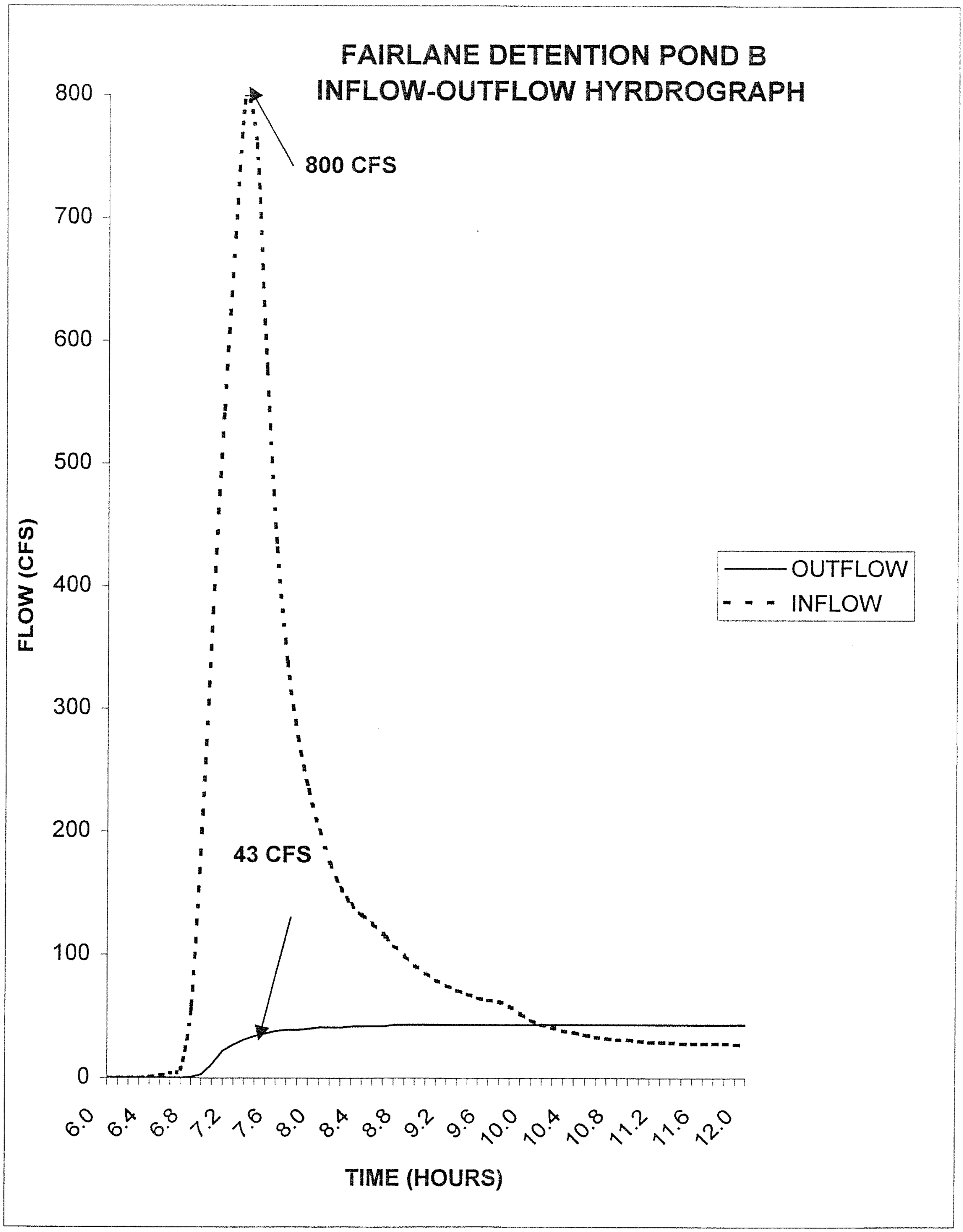
OUTLET RATING CURVE
d/D = .92
Area = 3.02 ft^2

EMERGENCY SPILLWAY RATING CURVE

HT	Q
0	0
0.5	8.75
0.6	15.12
0.7	24.01
0.8	35.84
0.9	51.03
1	70
1.1	93.17
1.2	120.96
1.3	153.79
1.4	192.08
1.5	236.25



EMERGENCY SPILLWAY RATING CURVE
$Q=CLH^{3/2}$ WHERE C=2.8


FAIRLANE DETENTION POND B
INFLOW-OUTFLOW HYRDROGRAPH
800 CFS
43 CFS
FLOW (CFS)
0
100
200
300
400
500
600
700
800
OUTFLOW
INFLOW
6.0
6.4
6.8
7.2
7.6
8.0
8.4
8.8
9.2
9.6
10.0
10.4
10.8
11.2
11.6
12.0
TIME (HOURS)

```
*****************************************                    *****************************************
*                                       *                    *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS        *
*              SEPTEMBER 1990           *                    *   HYDROLOGIC ENGINEERING CENTER       *
*               VERSION 4.0             *                    *         609 SECOND STREET             *
*                                       *                    *      DAVIS, CALIFORNIA 95616          *
*  RUN DATE  02/03/1998  TIME  14:31:20 *                    *          (916) 756-1104               *
*                                       *                    *                                       *
*****************************************                    *****************************************


                  X     X  XXXXXXX   XXXXX          X
                  X     X  X        X     X        XX
                  X     X  X        X               X
                  XXXXXXX  XXXX     X       XXXXX   X
                  X     X  X        X               X
                  X     X  X        X     X         X
                  X     X  XXXXXXX   XXXXX         XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                       HEC-1 INPUT                                                   PAGE  1

   LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

     1         ID        FAIRLANE PARKWAY/INTERCHANGE  DMJM PROJECT NO. 3821.01
     2         ID        DEVELOPED CONDITIONS - INPUT FILE BSNB.INP CALIBRATE TO PREVIOUS DRAINAGE STUDY BY AYRES
     3         ID        USING THE 100-YEAR 24-HOUR STORM
     4         ID        RUN DATE 2-03-1998
               *DIAGRAM
     5         IT       5 03FEB98     800     300
     6         IO       5

     7         KK     O-1
     8         KM        RUNOFF FROM O-1 TAKEN FROM URS MASTERPLAN, HISTORIC FLOWS
     9         BA   0.264
    10         LS       0    67.8
    11         UD   0.280
    12         KM        DESIGN POINT 1
    13         IN      15
    14         PB   4.400
    15         PC   .0000   .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143
    16         PC   .0165   .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0530
    17         PC   .0600   .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900
    18         PC   .8000   .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550
    19         PC   .8600   .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938
    20         PC   .8975   .9013   .9050   .9083   .9115   .9148   .9180   .9210   .9240   .9270
    21         PC   .9300   .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525
    22         PC   .9550   .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775
    23         PC   .9800   .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913
    24         PC   .9925   .9938   .9950   .9963   .9975   .9988   1.000

    25         KK     1-2
    26         KM      ROUTE O-1 (DESIGN POINT 1) TO DESIGN POINT 2
    27         RD    2995   .0200   .0130           CIRC     3.5

    28         KK      B9
    29         KM      RUNOFF FROM B-9 (BASIN 1-1, URS MEMO)
    30         BA   0.098
    31         LS       0    75.0
    32         UD   0.114

    33         KK     1AP
    34         KM      PIKES PEAK COLLEGE POND BY URS ENG. - CORRECTED
    35         SV       0    1.00    2.56    4.89    6.97
    36         SE    6757    6760    6762    6763    6764
    37         SQ       0    35.0    55.0    70.0   139.0
    38         RS       1    ELEV    6757

    39         KK   1AP-2
    40         KM      ROUTE 1AP (POND OUTLET) TO DESIGN POINT 2
    41         RD    1275    .020    .013           CIRC     3.5

    42         KK     B10
    43         KM      RUNOFF FROM B10 (BASIN 1-2, URS MEMO)
    44         BA   .0182
    45         LS       0    68.0
    46         UD   0.126
1                                       HEC-1 INPUT                                                   PAGE  2

   LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


    47         KK   B10-2
    48         KM      ROUTE B10 TO DESIGN POINT 2
    49         RD    1275    .020    .013           CIRC     3.5

    50         KK       2
    51         KM      COMBINE 1-2, 1AP-2 AND B10-2
    52         HC       3

    53         KK     2-3
    54         KM      ROUTE TO DESIGN POINT 3
    55         RD    3165    .020    .013           CIRC     5.0
    56         KM      DESIGN POINT 3

    57         KK     3-4
    58         KM      ROUTE TO DESIGN POINT 4
    59         RD    1000    .020    .013           CIRC     5.0

    60         KK     B-7
```

```
  61          KM     RUNOFF FROM B7
  62          BA   0.053
  63          LS       0     88.0
  64          UD   0.151

  65          KK      B6
  66          KM     RUNOFF FROM B6
  67          BA   0.015
  68          LS       0     88.0
  69          UD   0.086

  70          KK       4
  71          KM   COMBINE 3-4, B7 AND B6
  72          HC       3

  73          KK     4-5
  74          KM   ROUTE TO DESIGN POINT 5
  75          RD     450     .020     .013           CIRC      5.0

  76          KK      B5
  77          KM   RUNOFF FROM B5
  78          BA   0.024
  79          LS       0     88.0
  80          UD   0.092

  81          KK       5
  82          KM   COMBINE 4-5 AND B5
  83          HC       2

  84          KK     5-6
  85          KM   ROUTE TO DESIGN POINT 6
  86          RD    1100     .020     .013           CIRC      5.0
1                                                 HEC-1 INPUT                                          PAGE  3

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  87          KK      B4
  88          KM   RUNOFF FROM B4
  89          BA   0.056
  90          LS       0     88.0
  91          UD   0.123

  92          KK       6
  93          KM   COMBINE 5-6 AND B4
  94          HC       2

  95          KK     6-7
  96          KM   ROUTE TO DESIGN POINT 7
  97          RD     700     .020     .013           CIRC      5.0

  98          KK      B3
  99          KM   RUNOFF FROM B3
 100          BA   0.062
 101          LS       0     88.0
 102          UD   0.180

 103          KK      B2
 104          KM   RUNOFF FROM B2
 105          BA   0.023
 106          LS       0     88.0
 107          UD   0.100

 108          KK       7
 109          KM   COMBINE 6-7, B3 AND B2
 110          HC       3

 111          KK      B1
 112          KM   RUNOFF FROM B1
 113          BA   0.053
 114          LS       0     80.0
 115          UD   0.100

 116          KK       8
 117          KM   COMBINE 7 AND B1
 118          HC       2
 119          KO       1

 120          KK     DPB
 121          KM   DETENTION POND B
 122          SV       0     1.70     9.40    20.00    30.90    42.00    53.40    65.10
 123          SE    6600     6601     6602     6603     6604     6605     6606     6607
 124          SQ       0      4.5     14.0     22.0     28.0     33.0     38.0     41.0
 125          RS       1     ELEV     6600
 126          KO       1
 127          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    7        0-1
              V
              V
   25        1-2
              .
              .
   28         .           B9
              .            V
              .            V
   33         .           1AP
              .            V
              .            V
   39         .          1AP-2
              .            .
              .            .
   42         .            .          B10
              .            .            V
              .            .            V
   47         .            .          B10-2
              .            .            .
              .            .            .
```

```
    50          2.......................
                V
                V
    53        2-3
                V
                V
    57        3-4
                .
                .
    60          .          B-7
                .           .
                .           .
    65          .           .          B6
                .           .           .
                .           .           .
    70          4.......................
                V
                V
    73        4-5
                .
                .
    76          .           B5
                .           .
                .           .
    81          5...........
                V
                V
    84        5-6
                .
                .
    87          .           B4
                .           .
                .           .
    92          6...........
                V
                V
    95        6-7
                .
                .
    98          .           B3
                .           .
                .           .
   103          .           .          B2
                .           .           .
                .           .           .
   108          7.......................
                .
                .
   111          .           B1
                .           .
                .           .
   116          8...........
                V
                V
   120        DPB
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                          ***************************************
*                                         *                          *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *                          *   U.S. ARMY CORPS OF ENGINEERS      *
*            SEPTEMBER 1990               *                          *   HYDROLOGIC ENGINEERING CENTER     *
*              VERSION 4.0                *                          *        609 SECOND STREET            *
*                                         *                          *     DAVIS, CALIFORNIA 95616         *
*  RUN DATE  02/03/1998  TIME  14:31:20   *                          *        (916) 756-1104               *
*                                         *                          *                                     *
*****************************************                           ***************************************


                       FAIRLANE PARKWAY/INTERCHANGE  DMJM PROJECT NO. 3821.01
                       DEVELOPED CONDITIONS - INPUT FILE BSNB.INP
                       USING THE 100-YEAR 24-HOUR STORM
                       RUN DATE 2-03-1998

   6 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      3FEB98  STARTING DATE
                       ITIME        0800  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      4FEB98  ENDING DATE
                      NDTIME        0855  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL    .08 HOURS
                        TOTAL TIME BASE  24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
 116 KK   *      8     *
          *            *
          **************

 119 KO         OUTPUT CONTROL VARIABLES
```

```
                              IPRNT           1  PRINT CONTROL
                              IPLOT           0  PLOT CONTROL
                              QSCAL           0.  HYDROGRAPH PLOT SCALE

 118 HC           HYDROGRAPH COMBINATION
                              ICOMP              2  NUMBER OF HYDROGRAPHS TO COMBINE
```

***

HYDROGRAPH AT STATION 8
SUM OF 2 HYDROGRAPHS

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
3 FEB 0800	1	0.	3 FEB 1415	76	530.	3 FEB 2030	151	22.	4 FEB 0245	226	15.
3 FEB 0805	2	0.	3 FEB 1420	77	429.	3 FEB 2035	152	22.	4 FEB 0250	227	15.
3 FEB 0810	3	0.	3 FEB 1425	78	354.	3 FEB 2040	153	22.	4 FEB 0255	228	15.
3 FEB 0815	4	0.	3 FEB 1430	79	295.	3 FEB 2045	154	22.	4 FEB 0300	229	15.
3 FEB 0820	5	0.	3 FEB 1435	80	246.	3 FEB 2050	155	22.	4 FEB 0305	230	15.
3 FEB 0825	6	0.	3 FEB 1440	81	205.	3 FEB 2055	156	22.	4 FEB 0310	231	15.
3 FEB 0830	7	0.	3 FEB 1445	82	176.	3 FEB 2100	157	22.	4 FEB 0315	232	15.
3 FEB 0835	8	0.	3 FEB 1450	83	156.	3 FEB 2105	158	21.	4 FEB 0320	233	15.
3 FEB 0840	9	0.	3 FEB 1455	84	141.	3 FEB 2110	159	21.	4 FEB 0325	234	15.
3 FEB 0845	10	0.	3 FEB 1500	85	130.	3 FEB 2115	160	21.	4 FEB 0330	235	15.
3 FEB 0850	11	0.	3 FEB 1505	86	119.	3 FEB 2120	161	20.	4 FEB 0335	236	15.
3 FEB 0855	12	0.	3 FEB 1510	87	108.	3 FEB 2125	162	20.	4 FEB 0340	237	15.
3 FEB 0900	13	0.	3 FEB 1515	88	98.	3 FEB 2130	163	20.	4 FEB 0345	238	15.
3 FEB 0905	14	0.	3 FEB 1520	89	89.	3 FEB 2135	164	19.	4 FEB 0350	239	15.
3 FEB 0910	15	0.	3 FEB 1525	90	82.	3 FEB 2140	165	19.	4 FEB 0355	240	15.
3 FEB 0915	16	0.	3 FEB 1530	91	75.	3 FEB 2145	166	19.	4 FEB 0400	241	15.
3 FEB 0920	17	0.	3 FEB 1535	92	70.	3 FEB 2150	167	19.	4 FEB 0405	242	14.
3 FEB 0925	18	0.	3 FEB 1540	93	67.	3 FEB 2155	168	19.	4 FEB 0410	243	13.
3 FEB 0930	19	0.	3 FEB 1545	94	64.	3 FEB 2200	169	19.	4 FEB 0415	244	12.
3 FEB 0935	20	0.	3 FEB 1550	95	62.	3 FEB 2205	170	19.	4 FEB 0420	245	11.
3 FEB 0940	21	0.	3 FEB 1555	96	60.	3 FEB 2210	171	19.	4 FEB 0425	246	10.
3 FEB 0945	22	0.	3 FEB 1600	97	59.	3 FEB 2215	172	18.	4 FEB 0430	247	10.
3 FEB 0950	23	0.	3 FEB 1605	98	56.	3 FEB 2220	173	18.	4 FEB 0435	248	9.
3 FEB 0955	24	0.	3 FEB 1610	99	50.	3 FEB 2225	174	18.	4 FEB 0440	249	9.
3 FEB 1000	25	0.	3 FEB 1615	100	46.	3 FEB 2230	175	18.	4 FEB 0445	250	8.
3 FEB 1005	26	0.	3 FEB 1620	101	42.	3 FEB 2235	176	18.	4 FEB 0450	251	8.
3 FEB 1010	27	0.	3 FEB 1625	102	39.	3 FEB 2240	177	18.	4 FEB 0455	252	8.
3 FEB 1015	28	0.	3 FEB 1630	103	36.	3 FEB 2245	178	18.	4 FEB 0500	253	8.
3 FEB 1020	29	0.	3 FEB 1635	104	34.	3 FEB 2250	179	18.	4 FEB 0505	254	8.
3 FEB 1025	30	0.	3 FEB 1640	105	32.	3 FEB 2255	180	18.	4 FEB 0510	255	8.
3 FEB 1030	31	0.	3 FEB 1645	106	31.	3 FEB 2300	181	18.	4 FEB 0515	256	8.
3 FEB 1035	32	0.	3 FEB 1650	107	30.	3 FEB 2305	182	17.	4 FEB 0520	257	8.
3 FEB 1040	33	0.	3 FEB 1655	108	30.	3 FEB 2310	183	17.	4 FEB 0525	258	8.
3 FEB 1045	34	0.	3 FEB 1700	109	29.	3 FEB 2315	184	16.	4 FEB 0530	259	7.
3 FEB 1050	35	0.	3 FEB 1705	110	29.	3 FEB 2320	185	16.	4 FEB 0535	260	7.
3 FEB 1055	36	0.	3 FEB 1710	111	29.	3 FEB 2325	186	16.	4 FEB 0540	261	8.
3 FEB 1100	37	0.	3 FEB 1715	112	29.	3 FEB 2330	187	16.	4 FEB 0545	262	8.
3 FEB 1105	38	0.	3 FEB 1720	113	29.	3 FEB 2335	188	15.	4 FEB 0550	263	8.
3 FEB 1110	39	0.	3 FEB 1725	114	28.	3 FEB 2340	189	15.	4 FEB 0555	264	7.
3 FEB 1115	40	0.	3 FEB 1730	115	28.	3 FEB 2345	190	15.	4 FEB 0600	265	7.
3 FEB 1120	41	0.	3 FEB 1735	116	28.	3 FEB 2350	191	15.	4 FEB 0605	266	7.
3 FEB 1125	42	0.	3 FEB 1740	117	28.	3 FEB 2355	192	15.	4 FEB 0610	267	7.
3 FEB 1130	43	0.	3 FEB 1745	118	28.	4 FEB 0000	193	15.	4 FEB 0615	268	8.
3 FEB 1135	44	0.	3 FEB 1750	119	28.	4 FEB 0005	194	15.	4 FEB 0620	269	8.
3 FEB 1140	45	0.	3 FEB 1755	120	28.	4 FEB 0010	195	15.	4 FEB 0625	270	7.
3 FEB 1145	46	0.	3 FEB 1800	121	28.	4 FEB 0015	196	15.	4 FEB 0630	271	7.
3 FEB 1150	47	0.	3 FEB 1805	122	28.	4 FEB 0020	197	15.	4 FEB 0635	272	7.
3 FEB 1155	48	0.	3 FEB 1810	123	27.	4 FEB 0025	198	15.	4 FEB 0640	273	7.
3 FEB 1200	49	0.	3 FEB 1815	124	26.	4 FEB 0030	199	15.	4 FEB 0645	274	8.
3 FEB 1205	50	0.	3 FEB 1820	125	25.	4 FEB 0035	200	15.	4 FEB 0650	275	8.
3 FEB 1210	51	0.	3 FEB 1825	126	24.	4 FEB 0040	201	15.	4 FEB 0655	276	7.
3 FEB 1215	52	0.	3 FEB 1830	127	23.	4 FEB 0045	202	15.	4 FEB 0700	277	7.
3 FEB 1220	53	0.	3 FEB 1835	128	23.	4 FEB 0050	203	15.	4 FEB 0705	278	7.
3 FEB 1225	54	0.	3 FEB 1840	129	22.	4 FEB 0055	204	15.	4 FEB 0710	279	7.
3 FEB 1230	55	0.	3 FEB 1845	130	22.	4 FEB 0100	205	15.	4 FEB 0715	280	8.
3 FEB 1235	56	0.	3 FEB 1850	131	22.	4 FEB 0105	206	15.	4 FEB 0720	281	8.
3 FEB 1240	57	0.	3 FEB 1855	132	22.	4 FEB 0110	207	15.	4 FEB 0725	282	7.
3 FEB 1245	58	0.	3 FEB 1900	133	22.	4 FEB 0115	208	15.	4 FEB 0730	283	7.
3 FEB 1250	59	0.	3 FEB 1905	134	22.	4 FEB 0120	209	15.	4 FEB 0735	284	7.
3 FEB 1255	60	0.	3 FEB 1910	135	22.	4 FEB 0125	210	15.	4 FEB 0740	285	7.
3 FEB 1300	61	0.	3 FEB 1915	136	22.	4 FEB 0130	211	15.	4 FEB 0745	286	8.
3 FEB 1305	62	0.	3 FEB 1920	137	22.	4 FEB 0135	212	15.	4 FEB 0750	287	8.
3 FEB 1310	63	0.	3 FEB 1925	138	22.	4 FEB 0140	213	15.	4 FEB 0755	288	7.
3 FEB 1315	64	1.	3 FEB 1930	139	21.	4 FEB 0145	214	15.	4 FEB 0800	289	7.
3 FEB 1320	65	2.	3 FEB 1935	140	21.	4 FEB 0150	215	15.	4 FEB 0805	290	7.
3 FEB 1325	66	4.	3 FEB 1940	141	22.	4 FEB 0155	216	15.	4 FEB 0810	291	6.
3 FEB 1330	67	7.	3 FEB 1945	142	22.	4 FEB 0200	217	15.	4 FEB 0815	292	5.
3 FEB 1335	68	56.	3 FEB 1950	143	22.	4 FEB 0205	218	15.	4 FEB 0820	293	4.
3 FEB 1340	69	199.	3 FEB 1955	144	22.	4 FEB 0210	219	15.	4 FEB 0825	294	3.
3 FEB 1345	70	379.	3 FEB 2000	145	21.	4 FEB 0215	220	15.	4 FEB 0830	295	2.
3 FEB 1350	71	546.	3 FEB 2005	146	22.	4 FEB 0220	221	15.	4 FEB 0835	296	2.
3 FEB 1355	72	701.	3 FEB 2010	147	22.	4 FEB 0225	222	15.	4 FEB 0840	297	1.
3 FEB 1400	73	848.	3 FEB 2015	148	22.	4 FEB 0230	223	15.	4 FEB 0845	298	1.
3 FEB 1405	74	842.	3 FEB 2020	149	22.	4 FEB 0235	224	15.	4 FEB 0850	299	1.
3 FEB 1410	75	675.	3 FEB 2025	150	22.	4 FEB 0240	225	15.	4 FEB 0855	300	1.

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	848.	6.00		126.	39.	38.	38.
			(INCHES)	1.757	2.180	2.180	2.180
			(AC-FT)	62.	77.	77.	77.

CUMULATIVE AREA = .67 SQ MI

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120 KK      *       DPB  *
            *            *
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126 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

125 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC     6600.00  INITIAL CONDITION
                          X         .00  WORKING R AND D COEFFICIENT

121 SV            STORAGE          .0       1.7       9.4      20.0      30.9      42.0      53.4      65.1

123 SE          ELEVATION     6600.00   6601.00   6602.00   6603.00   6604.00   6605.00   6606.00   6607.00

124 SQ          DISCHARGE          0.        5.       14.       22.       28.       33.       38.       41.

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HYDROGRAPH AT STATION DPB

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
3	FEB	0800	1	0.	.0	6600.0	*	3	FEB	1620	101	36.	48.8	6605.6	*	4	FEB	0040	201	32.	40.1	6604.8
3	FEB	0805	2	0.	.0	6600.0	*	3	FEB	1625	102	36.	48.8	6605.6	*	4	FEB	0045	202	32.	40.0	6604.8
3	FEB	0810	3	0.	.0	6600.0	*	3	FEB	1630	103	36.	48.8	6605.6	*	4	FEB	0050	203	32.	39.8	6604.8
3	FEB	0815	4	0.	.0	6600.0	*	3	FEB	1635	104	36.	48.8	6605.6	*	4	FEB	0055	204	32.	39.7	6604.8
3	FEB	0820	5	0.	.0	6600.0	*	3	FEB	1640	105	36.	48.8	6605.6	*	4	FEB	0100	205	32.	39.6	6604.8
3	FEB	0825	6	0.	.0	6600.0	*	3	FEB	1645	106	36.	48.7	6605.6	*	4	FEB	0105	206	32.	39.5	6604.8
3	FEB	0830	7	0.	.0	6600.0	*	3	FEB	1650	107	36.	48.7	6605.6	*	4	FEB	0110	207	32.	39.4	6604.8
3	FEB	0835	8	0.	.0	6600.0	*	3	FEB	1655	108	36.	48.7	6605.6	*	4	FEB	0115	208	32.	39.2	6604.8
3	FEB	0840	9	0.	.0	6600.0	*	3	FEB	1700	109	36.	48.6	6605.6	*	4	FEB	0120	209	32.	39.1	6604.7
3	FEB	0845	10	0.	.0	6600.0	*	3	FEB	1705	110	36.	48.6	6605.6	*	4	FEB	0125	210	32.	39.0	6604.7
3	FEB	0850	11	0.	.0	6600.0	*	3	FEB	1710	111	36.	48.5	6605.6	*	4	FEB	0130	211	32.	38.9	6604.7
3	FEB	0855	12	0.	.0	6600.0	*	3	FEB	1715	112	36.	48.5	6605.6	*	4	FEB	0135	212	32.	38.8	6604.7
3	FEB	0900	13	0.	.0	6600.0	*	3	FEB	1720	113	36.	48.4	6605.6	*	4	FEB	0140	213	31.	38.7	6604.7
3	FEB	0905	14	0.	.0	6600.0	*	3	FEB	1725	114	36.	48.4	6605.6	*	4	FEB	0145	214	31.	38.5	6604.7
3	FEB	0910	15	0.	.0	6600.0	*	3	FEB	1730	115	36.	48.3	6605.6	*	4	FEB	0150	215	31.	38.4	6604.7
3	FEB	0915	16	0.	.0	6600.0	*	3	FEB	1735	116	36.	48.3	6605.6	*	4	FEB	0155	216	31.	38.3	6604.7
3	FEB	0920	17	0.	.0	6600.0	*	3	FEB	1740	117	36.	48.2	6605.5	*	4	FEB	0200	217	31.	38.2	6604.7
3	FEB	0925	18	0.	.0	6600.0	*	3	FEB	1745	118	36.	48.2	6605.5	*	4	FEB	0205	218	31.	38.1	6604.6
3	FEB	0930	19	0.	.0	6600.0	*	3	FEB	1750	119	36.	48.1	6605.5	*	4	FEB	0210	219	31.	38.0	6604.6
3	FEB	0935	20	0.	.0	6600.0	*	3	FEB	1755	120	36.	48.1	6605.5	*	4	FEB	0215	220	31.	37.9	6604.6
3	FEB	0940	21	0.	.0	6600.0	*	3	FEB	1800	121	36.	48.0	6605.5	*	4	FEB	0220	221	31.	37.8	6604.6
3	FEB	0945	22	0.	.0	6600.0	*	3	FEB	1805	122	36.	48.0	6605.5	*	4	FEB	0225	222	31.	37.6	6604.6
3	FEB	0950	23	0.	.0	6600.0	*	3	FEB	1810	123	36.	47.9	6605.5	*	4	FEB	0230	223	31.	37.5	6604.6
3	FEB	0955	24	0.	.0	6600.0	*	3	FEB	1815	124	36.	47.9	6605.5	*	4	FEB	0235	224	31.	37.4	6604.6
3	FEB	1000	25	0.	.0	6600.0	*	3	FEB	1820	125	36.	47.8	6605.5	*	4	FEB	0240	225	31.	37.3	6604.6
3	FEB	1005	26	0.	.0	6600.0	*	3	FEB	1825	126	36.	47.7	6605.5	*	4	FEB	0245	226	31.	37.2	6604.6
3	FEB	1010	27	0.	.0	6600.0	*	3	FEB	1830	127	35.	47.6	6605.5	*	4	FEB	0250	227	31.	37.1	6604.6
3	FEB	1015	28	0.	.0	6600.0	*	3	FEB	1835	128	35.	47.5	6605.5	*	4	FEB	0255	228	31.	37.0	6604.5
3	FEB	1020	29	0.	.0	6600.0	*	3	FEB	1840	129	35.	47.4	6605.5	*	4	FEB	0300	229	31.	36.9	6604.5
3	FEB	1025	30	0.	.0	6600.0	*	3	FEB	1845	130	35.	47.4	6605.5	*	4	FEB	0305	230	31.	36.8	6604.5
3	FEB	1030	31	0.	.0	6600.0	*	3	FEB	1850	131	35.	47.3	6605.5	*	4	FEB	0310	231	31.	36.6	6604.5
3	FEB	1035	32	0.	.0	6600.0	*	3	FEB	1855	132	35.	47.2	6605.5	*	4	FEB	0315	232	31.	36.5	6604.5
3	FEB	1040	33	0.	.0	6600.0	*	3	FEB	1900	133	35.	47.1	6605.4	*	4	FEB	0320	233	30.	36.4	6604.5
3	FEB	1045	34	0.	.0	6600.0	*	3	FEB	1905	134	35.	47.0	6605.4	*	4	FEB	0325	234	30.	36.3	6604.5
3	FEB	1050	35	0.	.0	6600.0	*	3	FEB	1910	135	35.	46.9	6605.4	*	4	FEB	0330	235	30.	36.2	6604.5
3	FEB	1055	36	0.	.0	6600.0	*	3	FEB	1915	136	35.	46.8	6605.4	*	4	FEB	0335	236	30.	36.1	6604.5
3	FEB	1100	37	0.	.0	6600.0	*	3	FEB	1920	137	35.	46.7	6605.4	*	4	FEB	0340	237	30.	36.0	6604.5
3	FEB	1105	38	0.	.0	6600.0	*	3	FEB	1925	138	35.	46.6	6605.4	*	4	FEB	0345	238	30.	35.9	6604.5
3	FEB	1110	39	0.	.0	6600.0	*	3	FEB	1930	139	35.	46.5	6605.4	*	4	FEB	0350	239	30.	35.8	6604.4
3	FEB	1115	40	0.	.0	6600.0	*	3	FEB	1935	140	35.	46.4	6605.4	*	4	FEB	0355	240	30.	35.7	6604.4
3	FEB	1120	41	0.	.0	6600.0	*	3	FEB	1940	141	35.	46.3	6605.4	*	4	FEB	0400	241	30.	35.6	6604.4
3	FEB	1125	42	0.	.0	6600.0	*	3	FEB	1945	142	35.	46.2	6605.4	*	4	FEB	0405	242	30.	35.5	6604.4
3	FEB	1130	43	0.	.0	6600.0	*	3	FEB	1950	143	35.	46.2	6605.4	*	4	FEB	0410	243	30.	35.4	6604.4
3	FEB	1135	44	0.	.0	6600.0	*	3	FEB	1955	144	35.	46.1	6605.4	*	4	FEB	0415	244	30.	35.2	6604.4
3	FEB	1140	45	0.	.0	6600.0	*	3	FEB	2000	145	35.	46.0	6605.3	*	4	FEB	0420	245	30.	35.1	6604.4
3	FEB	1145	46	0.	.0	6600.0	*	3	FEB	2005	146	35.	45.9	6605.3	*	4	FEB	0425	246	30.	35.0	6604.4
3	FEB	1150	47	0.	.0	6600.0	*	3	FEB	2010	147	35.	45.8	6605.3	*	4	FEB	0430	247	30.	34.8	6604.4
3	FEB	1155	48	0.	.0	6600.0	*	3	FEB	2015	148	35.	45.7	6605.3	*	4	FEB	0435	248	30.	34.7	6604.3
3	FEB	1200	49	0.	.0	6600.0	*	3	FEB	2020	149	35.	45.6	6605.3	*	4	FEB	0440	249	30.	34.6	6604.3
3	FEB	1205	50	0.	.0	6600.0	*	3	FEB	2025	150	35.	45.5	6605.3	*	4	FEB	0445	250	30.	34.4	6604.3
3	FEB	1210	51	0.	.0	6600.0	*	3	FEB	2030	151	35.	45.4	6605.3	*	4	FEB	0450	251	30.	34.3	6604.3
3	FEB	1215	52	0.	.0	6600.0	*	3	FEB	2035	152	34.	45.3	6605.3	*	4	FEB	0455	252	29.	34.1	6604.3
3	FEB	1220	53	0.	.0	6600.0	*	3	FEB	2040	153	34.	45.3	6605.3	*	4	FEB	0500	253	29.	34.0	6604.3
3	FEB	1225	54	0.	.0	6600.0	*	3	FEB	2045	154	34.	45.2	6605.3	*	4	FEB	0505	254	29.	33.8	6604.3
3	FEB	1230	55	0.	.0	6600.0	*	3	FEB	2050	155	34.	45.1	6605.3	*	4	FEB	0510	255	29.	33.7	6604.3
3	FEB	1235	56	0.	.0	6600.0	*	3	FEB	2055	156	34.	45.0	6605.3	*	4	FEB	0515	256	29.	33.5	6604.2
3	FEB	1240	57	0.	.0	6600.0	*	3	FEB	2100	157	34.	44.9	6605.3	*	4	FEB	0520	257	29.	33.4	6604.2
3	FEB	1245	58	0.	.0	6600.0	*	3	FEB	2105	158	34.	44.8	6605.2	*	4	FEB	0525	258	29.	33.2	6604.2
3	FEB	1250	59	0.	.0	6600.0	*	3	FEB	2110	159	34.	44.7	6605.2	*	4	FEB	0530	259	29.	33.1	6604.2
3	FEB	1255	60	0.	.0	6600.0	*	3	FEB	2115	160	34.	44.6	6605.2	*	4	FEB	0535	260	29.	32.9	6604.2
3	FEB	1300	61	0.	.0	6600.0	*	3	FEB	2120	161	34.	44.5	6605.2	*	4	FEB	0540	261	29.	32.8	6604.2
3	FEB	1305	62	0.	.0	6600.0	*	3	FEB	2125	162	34.	44.4	6605.2	*	4	FEB	0545	262	29.	32.6	6604.2
3	FEB	1310	63	0.	.0	6600.0	*	3	FEB	2130	163	34.	44.3	6605.2	*	4	FEB	0550	263	29.	32.5	6604.1
3	FEB	1315	64	0.	.0	6600.0	*	3	FEB	2135	164	34.	44.2	6605.2	*	4	FEB	0555	264	29.	32.4	6604.1
3	FEB	1320	65	0.	.0	6600.0	*	3	FEB	2140	165	34.	44.1	6605.2	*	4	FEB	0600	265	29.	32.2	6604.1
3	FEB	1325	66	0.	.0	6600.0	*	3	FEB	2145	166	34.	44.0	6605.2	*	4	FEB	0605	266	29.	32.1	6604.1
3	FEB	1330	67	0.	.1	6600.0	*	3	FEB	2150	167	34.	43.9	6605.2	*	4	FEB	0610	267	28.	31.9	6604.1
3	FEB	1335	68	1.	.3	6600.2	*	3	FEB	2155	168	34.	43.8	6605.2	*	4	FEB	0615	268	28.	31.8	6604.1
3	FEB	1340	69	3.	1.1	6600.7	*	3	FEB	2200	169	34.	43.7	6605.2	*	4	FEB	0620	269	28.	31.6	6604.1
3	FEB	1345	70	6.	3.1	6601.2	*	3	FEB	2205	170	34.	43.6	6605.1	*	4	FEB	0625	270	28.	31.5	6604.1
3	FEB	1350	71	10.	6.2	6601.6	*	3	FEB	2210	171	34.	43.5	6605.1	*	4	FEB	0630	271	28.	31.3	6604.0
3	FEB	1355	72	15.	10.4	6602.1	*	3	FEB	2215	172	34.	43.4	6605.1	*	4	FEB	0635	272	28.	31.2	6604.0
3	FEB	1400	73	19.	15.7	6602.6	*	3	FEB	2220	173	34.	43.3	6605.1	*	4	FEB	0640	273	28.	31.1	6604.0
3	FEB	1405	74	23.	21.3	6603.1	*	3	FEB	2225	174	34.	43.2	6605.1	*	4	FEB	0645	274	28.	30.9	6604.0
3	FEB	1410	75	26.	26.4	6603.6	*	3	FEB	2230	175	33.	43.1	6605.1	*	4	FEB	0650	275	28.	30.8	6604.0
3	FEB	1415	76	28.	30.4	6604.0	*	3	FEB	2235	176	33.	43.0	6605.1	*	4	FEB	0655	276	28.	30.6	6604.0
3	FEB	1420	77	29.	33.5	6604.2	*	3	FEB	2240	177	33.	42.9	6605.1	*	4	FEB	0700	277	28.	30.5	6604.0
3	FEB	1425	78	30.	36.0	6604.5	*	3	FEB	2245	178	33.	42.8	6605.1	*	4	FEB	0705	278	28.	30.4	6603.9
3	FEB	1430	79	31.	38.0	6604.6	*	3	FEB	2250	179	33.	42.7	6605.1	*	4	FEB	0710	279	28.	30.2	6603.9
3	FEB	1435	80	32.	39.6	6604.8	*	3	FEB	2255	180	33.	42.6	6605.1	*	4	FEB	0715	280	28.	30.1	6603.9
3	FEB	1440	81	33.	41.0	6604.9	*	3	FEB	2300	181	33.	42.5	6605.0	*	4	FEB	0720	281	27.	29.9	6603.9

3	FEB	1445	82	33.	42.0	6605.0	*	3	FEB	2305	182	33.	42.4	6605.0	*	4	FEB	0725	282	27.	29.8	6603.9
3	FEB	1450	83	33.	43.0	6605.1	*	3	FEB	2310	183	33.	42.2	6605.0	*	4	FEB	0730	283	27.	29.7	6603.9
3	FEB	1455	84	34.	43.8	6605.2	*	3	FEB	2315	184	33.	42.1	6605.0	*	4	FEB	0735	284	27.	29.5	6603.9
3	FEB	1500	85	34.	44.4	6605.2	*	3	FEB	2320	185	33.	42.0	6605.0	*	4	FEB	0740	285	27.	29.4	6603.9
3	FEB	1505	86	34.	45.1	6605.3	*	3	FEB	2325	186	33.	41.9	6605.0	*	4	FEB	0745	286	27.	29.3	6603.8
3	FEB	1510	87	35.	45.6	6605.3	*	3	FEB	2330	187	33.	41.8	6605.0	*	4	FEB	0750	287	27.	29.1	6603.8
3	FEB	1515	88	35.	46.1	6605.4	*	3	FEB	2335	188	33.	41.7	6605.0	*	4	FEB	0755	288	27.	29.0	6603.8
3	FEB	1520	89	35.	46.5	6605.4	*	3	FEB	2340	189	33.	41.5	6605.0	*	4	FEB	0800	289	27.	28.9	6603.8
3	FEB	1525	90	35.	46.8	6605.4	*	3	FEB	2345	190	33.	41.4	6604.9	*	4	FEB	0805	290	27.	28.7	6603.8
3	FEB	1530	91	35.	47.1	6605.5	*	3	FEB	2350	191	33.	41.3	6604.9	*	4	FEB	0810	291	27.	28.6	6603.8
3	FEB	1535	92	35.	47.4	6605.5	*	3	FEB	2355	192	33.	41.2	6604.9	*	4	FEB	0815	292	27.	28.4	6603.8
3	FEB	1540	93	35.	47.6	6605.5	*	4	FEB	0000	193	33.	41.0	6604.9	*	4	FEB	0820	293	27.	28.3	6603.8
3	FEB	1545	94	36.	47.8	6605.5	*	4	FEB	0005	194	33.	40.9	6604.9	*	4	FEB	0825	294	26.	28.1	6603.7
3	FEB	1550	95	36.	48.0	6605.5	*	4	FEB	0010	195	32.	40.8	6604.9	*	4	FEB	0830	295	26.	28.0	6603.7
3	FEB	1555	96	36.	48.2	6605.5	*	4	FEB	0015	196	32.	40.7	6604.9	*	4	FEB	0835	296	26.	27.8	6603.7
3	FEB	1600	97	36.	48.4	6605.6	*	4	FEB	0020	197	32.	40.6	6604.9	*	4	FEB	0840	297	26.	27.6	6603.7
3	FEB	1605	98	36.	48.5	6605.6	*	4	FEB	0025	198	32.	40.4	6604.9	*	4	FEB	0845	298	26.	27.4	6603.7
3	FEB	1610	99	36.	48.6	6605.6	*	4	FEB	0030	199	32.	40.3	6604.8	*	4	FEB	0850	299	26.	27.3	6603.7
3	FEB	1615	100	36.	48.7	6605.6	*	4	FEB	0035	200	32.	40.2	6604.8	*	4	FEB	0855	300	26.	27.1	6603.7

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 36.	8.50		35.	25.	24.	24.
		(INCHES)	.493	1.418	1.418	1.418
		(AC-FT)	18.	50.	50.	50.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
49.	8.50	47.	32.	30.	30.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
6605.60	8.50	6605.46	6603.82	6603.68	6603.68

CUMULATIVE AREA = .67 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

+	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	O-1	230.	6.17	32.	10.	10.	.26		
+	ROUTED TO	1-2	220.	6.17	32.	10.	10.	.26		
+	HYDROGRAPH AT	B9	173.	6.00	17.	5.	5.	.10		
+	ROUTED TO	1AP	60.	6.25	16.	5.	5.	.10		
+									6762.33	6.25
+	ROUTED TO	1AP-2	60.	6.25	16.	5.	5.	.10		
+	HYDROGRAPH AT	B10	22.	6.00	2.	1.	1.	.02		
+	ROUTED TO	B10-2	22.	6.08	2.	1.	1.	.02		
+	3 COMBINED AT	2	295.	6.17	50.	16.	16.	.38		
+	ROUTED TO	2-3	291.	6.25	50.	16.	16.	.38		
+	ROUTED TO	3-4	290.	6.25	50.	16.	16.	.38		
+	HYDROGRAPH AT	B-7	137.	6.00	15.	4.	4.	.05		
+	HYDROGRAPH AT	B6	43.	6.00	4.	1.	1.	.01		
+	3 COMBINED AT	4	377.	6.17	69.	22.	21.	.45		
+	ROUTED TO	4-5	377.	6.17	69.	22.	21.	.45		
+	HYDROGRAPH AT	B5	68.	6.00	7.	2.	2.	.02		
+	2 COMBINED AT	5	423.	6.08	75.	24.	23.	.47		
+	ROUTED TO	5-6	418.	6.08	75.	24.	23.	.47		
+	HYDROGRAPH AT	B4	152.	6.00	16.	5.	4.	.06		
+	2 COMBINED AT	6	550.	6.08	91.	29.	28.	.53		
+	ROUTED TO	6-7	548.	6.08	91.	29.	28.	.53		
+	HYDROGRAPH AT	B3	152.	6.08	17.	5.	5.	.06		

	HYDROGRAPH AT									
+		B2	65.	6.00	6.	2.	2.	.02		
	3 COMBINED AT									
+		7	750.	6.08	115.	36.	34.	.61		
	HYDROGRAPH AT									
+		B1	117.	6.00	11.	3.	3.	.05		
	2 COMBINED AT									
+		8	848.	6.00	126.	39.	38.	.67		
	ROUTED TO									
+		DPB	36.	8.50	35.	25.	24.	.67		
+									6605.60	8.50

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
1-2	MANE	1.75	227.18	372.75	1.45	5.00	219.82	370.00	1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2043E+02 EXCESS= .0000E+00 OUTFLOW= .2043E+02 BASIN STORAGE= .1540E-02 PERCENT ERROR= .0

1AP-2	MANE	1.29	59.90	375.41	1.97	5.00	59.86	375.00	1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1031E+02 EXCESS= .0000E+00 OUTFLOW= .1030E+02 BASIN STORAGE= .9368E-03 PERCENT ERROR= .0

B10-2	MANE	1.25	22.17	362.50	1.47	5.00	21.75	365.00	1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1422E+01 EXCESS= .0000E+00 OUTFLOW= .1422E+01 BASIN STORAGE= .1185E-03 PERCENT ERROR= .0

2-3	MANE	2.21	295.21	373.97	1.59	5.00	291.47	375.00	1.58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3215E+02 EXCESS= .0000E+00 OUTFLOW= .3215E+02 BASIN STORAGE= .4496E-02 PERCENT ERROR= .0

3-4	MANE	.70	290.68	375.61	1.58	5.00	290.05	375.00	1.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3214E+02 EXCESS= .0000E+00 OUTFLOW= .3214E+02 BASIN STORAGE= .1612E-02 PERCENT ERROR= .0

4-5	MANE	.30	377.05	369.90	1.82	5.00	376.97	370.00	1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4340E+02 EXCESS= .0000E+00 OUTFLOW= .4340E+02 BASIN STORAGE= .7605E-03 PERCENT ERROR= .0

5-6	MANE	.72	421.48	365.66	1.88	5.00	417.68	365.00	1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4738E+02 EXCESS= .0000E+00 OUTFLOW= .4738E+02 BASIN STORAGE= .1992E-02 PERCENT ERROR= .0

6-7	MANE	.43	548.23	365.47	2.01	5.00	548.01	365.00	2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5666E+02 EXCESS= .0000E+00 OUTFLOW= .5666E+02 BASIN STORAGE= .1358E-02 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

```
1**************************************                 **************************************
*                                    *                 *                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *  U.S. ARMY CORPS OF ENGINEERS      *
*          SEPTEMBER 1990              *                 *  HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.0                *                 *        609 SECOND STREET           *
*                                    *                 *      DAVIS, CALIFORNIA 95616       *
* RUN DATE  02/05/1998  TIME  11:56:16 *                 *         (916) 756-1104             *
*                                    *                 *                                    *
**************************************                 **************************************


                    X       X  XXXXXXX   XXXXX           X
                    X       X  X        X     X         XX
                    X       X  X        X                X
                    XXXXXXX  XXXX       X         XXXXX  X
                    X       X  X        X                X
                    X       X  X        X     X          X
                    X       X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
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```
1                                    HEC-1 INPUT                                          PAGE  1

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    1      ID        FAIRLANE PARKWAY/INTERCHANGE  DMJM PROJECT NO. 3821.01
    2      ID        DEVELOPED CONDITIONS - INPUT FILE BSN6.INP
    3      ID        USING THE 100-YEAR 24-HOUR STORM
    4      ID        RUN DATE 2-03-1998
           *DIAGRAM
    5      IT        5 03FEB98     800     300
    6      IO        5

    7      KK      O-1
    8      KM        RUNOFF FROM O-1 TAKEN FROM MODIFIED BASIN BOUNDARY AS A RESULT OF POWERS
    9      BA    0.025
   10      LS        0    67.8
   11      UD    0.132
   12      KM        DESIGN POINT 1
   13      IN       15
   14      PB    4.400
   15      PC    .0000   .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143
   16      PC    .0165   .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0530
   17      PC    .0600   .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900
   18      PC    .8000   .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550
   19      PC    .8600   .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938
   20      PC    .8975   .9013   .9050   .9083   .9115   .9148   .9180   .9210   .9240   .9270
   21      PC    .9300   .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525
   22      PC    .9550   .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775
   23      PC    .9800   .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913
   24      PC    .9925   .9938   .9950   .9963   .9975   .9988   1.000

   25      KK      1-2
   26      KM      ROUTE O-1 (DESIGN POINT 1) TO DESIGN POINT 2
   27      RD     2995   .0200   .0130           CIRC     4.0

   28      KK       B9
   29      KM      RUNOFF FROM B-9 (BASIN 1-1, URS MEMO)
   30      BA    0.098
   31      LS        0    75.0
   32      UD    0.114

   33      KK      1AP
   34      KM      PIKES PEAK COLLEGE POND BY URS ENG. - CORRECTED
   35      SV        0    1.00    2.56    4.89    6.97
   36      SE     6757    6760    6762    6763    6764
   37      SQ        0    35.0    55.0    70.0   139.0
   38      RS        1    ELEV    6757

   39      KK   1AP-2
   40      KM      ROUTE 1AP (POND OUTLET) TO DESIGN POINT 2
   41      RD     1275    .020    .013           CIRC     4.5

   42      KK      B10
   43      KM      RUNOFF FROM B10 (BASIN 1-2, URS MEMO)
   44      BA    .0182
   45      LS        0    68.0
   46      UD    0.126
```

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1                                    HEC-1 INPUT                                          PAGE  2

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


   47      KK   B10-2
   48      KM      ROUTE B10 TO DESIGN POINT 2
   49      RD     1275    .020    .013           CIRC     4.5

   50      KK       B8
   51      KM      RUNOFF FROM B-8 (AYERS)
   52      BA    0.065
   53      LS        0    75.0
   54      UD    0.138

   55      KK      2AP
   56      KM      NEW LIFE CHURCH POND BY KLH ENG.
   57      SV        0     .65    1.43    2.31    3.30    4.41
   58      SE     6736    6737    6738    6739    6740    6741
   59      SQ        0     4.3    14.0    22.0    28.0    33.0
   60      RS        1    ELEV    6736

   61      KK     O-2B
```

```
 62          KM     RUNOFF FROM O-2B
 63          BA   0.088
 64          LS      0    65.0
 65          UD   0.156

 66          KK   0-2B-2
 67          KM     ROUTE O-2B TO DESIGN POINT 2
 68          RD    3765    .009    .035            TRAP     3.0       3.0

 69          KK      2
 70          KM     COMBINE 1-2, 1AP-2, 2AP-2, B10-2 AND O-2B-2
 71          HC      5

 72          KK     2-3
 73          KM     ROUTE TO DESIGN POINT 3
 74          RD    3165    .020    .013            CIRC     5.0
 75          KM     DESIGN POINT 3

 76          KK     3-4
 77          KM     ROUTE TO DESIGN POINT 4
 78          RD    1000    .020    .013            CIRC     5.0

 79          KK     B-7
 80          KM     RUNOFF FROM B7
 81          BA   0.053
 82          LS      0    88.0
 83          UD   0.151

 84          KK      B6
 85          KM     RUNOFF FROM B6
 86          BA   0.015
 87          LS      0    88.0
 88          UD   0.086
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 89          KK      4
 90          KM   COMBINE 3-4, B7 AND B6
 91          HC      3

 92          KK     4-5
 93          KM   ROUTE TO DESIGN POINT 5
 94          RD     450    .020    .013            CIRC     5.0

 95          KK      B5
 96          KM   RUNOFF FROM B5
 97          BA   0.024
 98          LS      0    88.0
 99          UD   0.092

100          KK      5
101          KM   COMBINE 4-5 AND B5
102          HC      2

103          KK     5-6
104          KM   ROUTE TO DESIGN POINT 6
105          RD    1100    .020    .013            CIRC     5.0

106          KK      B4
107          KM   RUNOFF FROM B4
108          BA   0.056
109          LS      0    88.0
110          UD   0.123

111          KK      6
112          KM   COMBINE 5-6 AND B4
113          HC      2

114          KK     6-7
115          KM   ROUTE TO DESIGN POINT 7
116          RD     700    .020    .013            CIRC     5.0

117          KK      B3
118          KM   RUNOFF FROM B3
119          BA   0.062
120          LS      0    88.0
121          UD   0.180

122          KK      B2
123          KM   RUNOFF FROM B2
124          BA   0.023
125          LS      0    88.0
126          UD   0.100

127          KK      7
128          KM   COMBINE 6-7, B3 AND B2
129          HC      3
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

130          KK      B1
131          KM   RUNOFF FROM B1
132          BA   0.053
133          LS      0    80.0
134          UD   0.100

135          KK      8
136          KM   COMBINE 7 AND B1
137          HC      2
138          KO      1

139          KK     DPB
140          KM   DETENTION POND B
141          SV      0     1.59    5.80   13.13   24.02   38.61   57.14
142          SE   6608    6610    6612    6614    6616    6618    6620
143          SQ      0     04.5    22.0    30.2    36.0    42.3    47.2
144          RS      1    ELEV    6608
145          KO      1
146          ZZ
```

1

```
                    SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE       (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

 NO.        (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

   7         O-1
              V
              V
  25         1-2
              .
              .
  28          .          B9
              .           V
              .           V
  33          .          1AP
              .           V
              .           V
  39          .        1AP-2
              .           .
              .           .
  42          .           .          B10
              .           .           V
              .           .           V
  47          .           .         B10-2
              .           .           .
              .           .           .
  50          .           .           .          B8
              .           .           .           V
              .           .           .           V
  55          .           .           .          2AP
              .           .           .           .
              .           .           .           .
  61          .           .           .           .         0-2B
              .           .           .           .           V
              .           .           .           .           V
  66          .           .           .           .         0-2B-
              .           .           .           .           .
              .           .           .           .           .
  69          2................................................
              V
              V
  72         2-3
              V
              V
  76         3-4
              .
              .
  79          .         B-7
              .           .
              .           .
  84          .           .          B6
              .           .           .
              .           .           .
  89          4........................
              V
              V
  92         4-5
              .
              .
  95          .          B5
              .           .
              .           .
 100          5............
              V
              V
 103         5-6
              .
              .
 106          .          B4
              .           .
              .           .
 111          6............
              V
              V
 114         6-7
              .
              .
 117          .          B3
              .           .
              .           .
 122          .           .          B2
              .           .           .
              .           .           .
 127          7........................
              .
              .
 130          .          B1
              .           .
              .           .
 135          8............
              V
              V
 139         DPB
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
1***************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
* RUN DATE  02/05/1998  TIME  11:56:16 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*        DAVIS, CALIFORNIA 95616       *
*            (916) 756-1104            *
*                                      *
****************************************
```

```
FAIRLANE PARKWAY/INTERCHANGE  DMJM PROJECT NO. 3821.01
DEVELOPED CONDITIONS - INPUT FILE BSNB.INP
USING THE 100-YEAR 24-HOUR STORM
RUN DATE 2-03-1998
```

```
 6 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     3FEB98  STARTING DATE
                     ITIME       0800  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     4FEB98  ENDING DATE
                    NDTIME       0855  ENDING TIME
                     ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            *************
            *           *
135 KK      *      8    *
            *           *
            *************

138 KO         OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

137 HC         HYDROGRAPH COMBINATION
                     ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                         ***

***************************************************************************************************************************

                                              HYDROGRAPH AT STATION        8
                                                 SUM OF  2 HYDROGRAPHS

***************************************************************************************************************************
```

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
3 FEB 0800	1	0.	3 FEB 1415	76	431.	3 FEB 2030	151	20.	4 FEB 0245	226	13.
3 FEB 0805	2	0.	3 FEB 1420	77	338.	3 FEB 2035	152	20.	4 FEB 0250	227	13.
3 FEB 0810	3	0.	3 FEB 1425	78	277.	3 FEB 2040	153	20.	4 FEB 0255	228	13.
3 FEB 0815	4	0.	3 FEB 1430	79	234.	3 FEB 2045	154	20.	4 FEB 0300	229	13.
3 FEB 0820	5	0.	3 FEB 1435	80	201.	3 FEB 2050	155	20.	4 FEB 0305	230	13.
3 FEB 0825	6	0.	3 FEB 1440	81	174.	3 FEB 2055	156	20.	4 FEB 0310	231	13.
3 FEB 0830	7	0.	3 FEB 1445	82	154.	3 FEB 2100	157	20.	4 FEB 0315	232	13.
3 FEB 0835	8	0.	3 FEB 1450	83	141.	3 FEB 2105	158	20.	4 FEB 0320	233	13.
3 FEB 0840	9	0.	3 FEB 1455	84	132.	3 FEB 2110	159	19.	4 FEB 0325	234	13.
3 FEB 0845	10	0.	3 FEB 1500	85	125.	3 FEB 2115	160	19.	4 FEB 0330	235	13.
3 FEB 0850	11	0.	3 FEB 1505	86	117.	3 FEB 2120	161	19.	4 FEB 0335	236	13.
3 FEB 0855	12	0.	3 FEB 1510	87	107.	3 FEB 2125	162	18.	4 FEB 0340	237	13.
3 FEB 0900	13	0.	3 FEB 1515	88	99.	3 FEB 2130	163	18.	4 FEB 0345	238	13.
3 FEB 0905	14	0.	3 FEB 1520	89	91.	3 FEB 2135	164	18.	4 FEB 0350	239	13.
3 FEB 0910	15	0.	3 FEB 1525	90	85.	3 FEB 2140	165	18.	4 FEB 0355	240	13.
3 FEB 0915	16	0.	3 FEB 1530	91	79.	3 FEB 2145	166	18.	4 FEB 0400	241	13.
3 FEB 0920	17	0.	3 FEB 1535	92	75.	3 FEB 2150	167	18.	4 FEB 0405	242	13.
3 FEB 0925	18	0.	3 FEB 1540	93	71.	3 FEB 2155	168	18.	4 FEB 0410	243	12.
3 FEB 0930	19	0.	3 FEB 1545	94	68.	3 FEB 2200	169	17.	4 FEB 0415	244	11.
3 FEB 0935	20	0.	3 FEB 1550	95	65.	3 FEB 2205	170	17.	4 FEB 0420	245	10.
3 FEB 0940	21	0.	3 FEB 1555	96	63.	3 FEB 2210	171	17.	4 FEB 0425	246	9.
3 FEB 0945	22	0.	3 FEB 1600	97	62.	3 FEB 2215	172	17.	4 FEB 0430	247	9.
3 FEB 0950	23	0.	3 FEB 1605	98	58.	3 FEB 2220	173	17.	4 FEB 0435	248	9.
3 FEB 0955	24	0.	3 FEB 1610	99	52.	3 FEB 2225	174	17.	4 FEB 0440	249	8.
3 FEB 1000	25	0.	3 FEB 1615	100	47.	3 FEB 2230	175	16.	4 FEB 0445	250	8.
3 FEB 1005	26	0.	3 FEB 1620	101	43.	3 FEB 2235	176	16.	4 FEB 0450	251	8.
3 FEB 1010	27	0.	3 FEB 1625	102	41.	3 FEB 2240	177	16.	4 FEB 0455	252	8.
3 FEB 1015	28	0.	3 FEB 1630	103	38.	3 FEB 2245	178	16.	4 FEB 0500	253	7.
3 FEB 1020	29	0.	3 FEB 1635	104	37.	3 FEB 2250	179	16.	4 FEB 0505	254	7.
3 FEB 1025	30	0.	3 FEB 1640	105	35.	3 FEB 2255	180	16.	4 FEB 0510	255	7.
3 FEB 1030	31	0.	3 FEB 1645	106	33.	3 FEB 2300	181	16.	4 FEB 0515	256	7.
3 FEB 1035	32	0.	3 FEB 1650	107	32.	3 FEB 2305	182	16.	4 FEB 0520	257	7.
3 FEB 1040	33	0.	3 FEB 1655	108	31.	3 FEB 2310	183	15.	4 FEB 0525	258	7.
3 FEB 1045	34	0.	3 FEB 1700	109	31.	3 FEB 2315	184	15.	4 FEB 0530	259	7.
3 FEB 1050	35	0.	3 FEB 1705	110	30.	3 FEB 2320	185	15.	4 FEB 0535	260	7.
3 FEB 1055	36	0.	3 FEB 1710	111	29.	3 FEB 2325	186	14.	4 FEB 0540	261	7.
3 FEB 1100	37	0.	3 FEB 1715	112	29.	3 FEB 2330	187	14.	4 FEB 0545	262	7.
3 FEB 1105	38	0.	3 FEB 1720	113	29.	3 FEB 2335	188	14.	4 FEB 0550	263	7.
3 FEB 1110	39	0.	3 FEB 1725	114	28.	3 FEB 2340	189	14.	4 FEB 0555	264	7.
3 FEB 1115	40	0.	3 FEB 1730	115	28.	3 FEB 2345	190	14.	4 FEB 0600	265	7.
3 FEB 1120	41	0.	3 FEB 1735	116	28.	3 FEB 2350	191	14.	4 FEB 0605	266	7.
3 FEB 1125	42	0.	3 FEB 1740	117	28.	3 FEB 2355	192	14.	4 FEB 0610	267	7.
3 FEB 1130	43	0.	3 FEB 1745	118	28.	4 FEB 0000	193	14.	4 FEB 0615	268	7.
3 FEB 1135	44	0.	3 FEB 1750	119	27.	4 FEB 0005	194	14.	4 FEB 0620	269	7.
3 FEB 1140	45	0.	3 FEB 1755	120	27.	4 FEB 0010	195	14.	4 FEB 0625	270	7.
3 FEB 1145	46	0.	3 FEB 1800	121	27.	4 FEB 0015	196	14.	4 FEB 0630	271	7.
3 FEB 1150	47	0.	3 FEB 1805	122	27.	4 FEB 0020	197	14.	4 FEB 0635	272	7.
3 FEB 1155	48	0.	3 FEB 1810	123	25.	4 FEB 0025	198	14.	4 FEB 0640	273	7.
3 FEB 1200	49	0.	3 FEB 1815	124	24.	4 FEB 0030	199	14.	4 FEB 0645	274	7.
3 FEB 1205	50	0.	3 FEB 1820	125	24.	4 FEB 0035	200	14.	4 FEB 0650	275	7.
3 FEB 1210	51	0.	3 FEB 1825	126	23.	4 FEB 0040	201	13.	4 FEB 0655	276	7.
3 FEB 1215	52	0.	3 FEB 1830	127	22.	4 FEB 0045	202	13.	4 FEB 0700	277	7.
3 FEB 1220	53	0.	3 FEB 1835	128	22.	4 FEB 0050	203	13.	4 FEB 0705	278	7.
3 FEB 1225	54	0.	3 FEB 1840	129	22.	4 FEB 0055	204	13.	4 FEB 0710	279	7.
3 FEB 1230	55	0.	3 FEB 1845	130	22.	4 FEB 0100	205	13.	4 FEB 0715	280	7.
3 FEB 1235	56	0.	3 FEB 1850	131	21.	4 FEB 0105	206	13.	4 FEB 0720	281	7.
3 FEB 1240	57	0.	3 FEB 1855	132	21.	4 FEB 0110	207	13.	4 FEB 0725	282	7.

3 FEB 1245	58	0.	3 FEB 1900	133	21.	4 FEB 0115	208	13.	4 FEB 0730	283	7.
3 FEB 1250	59	0.	3 FEB 1905	134	21.	4 FEB 0120	209	13.	4 FEB 0735	284	7.
3 FEB 1255	60	0.	3 FEB 1910	135	21.	4 FEB 0125	210	13.	4 FEB 0740	285	7.
3 FEB 1300	61	0.	3 FEB 1915	136	21.	4 FEB 0130	211	13.	4 FEB 0745	286	7.
3 FEB 1305	62	0.	3 FEB 1920	137	21.	4 FEB 0135	212	13.	4 FEB 0750	287	7.
3 FEB 1310	63	0.	3 FEB 1925	138	20.	4 FEB 0140	213	13.	4 FEB 0755	288	7.
3 FEB 1315	64	1.	3 FEB 1930	139	20.	4 FEB 0145	214	13.	4 FEB 0800	289	7.
3 FEB 1320	65	2.	3 FEB 1935	140	20.	4 FEB 0150	215	13.	4 FEB 0805	290	6.
3 FEB 1325	66	4.	3 FEB 1940	141	20.	4 FEB 0155	216	13.	4 FEB 0810	291	5.
3 FEB 1330	67	7.	3 FEB 1945	142	20.	4 FEB 0200	217	13.	4 FEB 0815	292	4.
3 FEB 1335	68	56.	3 FEB 1950	143	20.	4 FEB 0205	218	13.	4 FEB 0820	293	3.
3 FEB 1340	69	199.	3 FEB 1955	144	20.	4 FEB 0210	219	13.	4 FEB 0825	294	3.
3 FEB 1345	70	379.	3 FEB 2000	145	20.	4 FEB 0215	220	13.	4 FEB 0830	295	2.
3 FEB 1350	71	544.	3 FEB 2005	146	20.	4 FEB 0220	221	13.	4 FEB 0835	296	2.
3 FEB 1355	72	685.	3 FEB 2010	147	20.	4 FEB 0225	222	13.	4 FEB 0840	297	2.
3 FEB 1400	73	800.	3 FEB 2015	148	20.	4 FEB 0230	223	13.	4 FEB 0845	298	1.
3 FEB 1405	74	760.	3 FEB 2020	149	20.	4 FEB 0235	224	13.	4 FEB 0850	299	1.
3 FEB 1410	75	576.	3 FEB 2025	150	20.	4 FEB 0240	225	13.	4 FEB 0855	300	1.

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 PEAK FLOW      TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR       72-HR      24.92-HR
+   (CFS)       (HR)
                             (CFS)
+    800.       6.00                  117.          36.         35.          35.
                          (INCHES)   1.869        2.317       2.317        2.317
                           (AC-FT)     58.          72.         72.          72.

                          CUMULATIVE AREA =     .58 SQ MI
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            *************
            *           *
 139 KK     *    DPB    *
            *           *
            *************

 145 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          1  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

 144 RS          STORAGE ROUTING
                       NSTPS          1  NUMBER OF SUBREACHES
                        ITYP       ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC    6608.00  INITIAL CONDITION
                           X        .00  WORKING R AND D COEFFICIENT

 140 SV          STORAGE          .0      1.6      5.8     13.1     24.0     38.6     57.1

 142 SE          ELEVATION    6608.00  6610.00  6612.00  6614.00  6616.00  6618.00  6620.00

 143 SQ          DISCHARGE        0.       5.      22.      30.      36.      42.      47.
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HYDROGRAPH AT STATION DPB

DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE
3 FEB 0800	1	0.	.0	6608.0	3 FEB 1620	101	43.	42.3	6618.4	4 FEB 0040	201	38.	28.4	6616.6
3 FEB 0805	2	0.	.0	6608.0	3 FEB 1625	102	43.	42.3	6618.4	4 FEB 0045	202	38.	28.2	6616.6
3 FEB 0810	3	0.	.0	6608.0	3 FEB 1630	103	43.	42.3	6618.4	4 FEB 0050	203	38.	28.1	6616.6
3 FEB 0815	4	0.	.0	6608.0	3 FEB 1635	104	43.	42.2	6618.4	4 FEB 0055	204	38.	27.9	6616.5
3 FEB 0820	5	0.	.0	6608.0	3 FEB 1640	105	43.	42.2	6618.4	4 FEB 0100	205	38.	27.7	6616.5
3 FEB 0825	6	0.	.0	6608.0	3 FEB 1645	106	43.	42.1	6618.4	4 FEB 0105	206	38.	27.6	6616.5
3 FEB 0830	7	0.	.0	6608.0	3 FEB 1650	107	43.	42.1	6618.4	4 FEB 0110	207	37.	27.4	6616.5
3 FEB 0835	8	0.	.0	6608.0	3 FEB 1655	108	43.	42.0	6618.4	4 FEB 0115	208	37.	27.2	6616.4
3 FEB 0840	9	0.	.0	6608.0	3 FEB 1700	109	43.	41.9	6618.4	4 FEB 0120	209	37.	27.1	6616.4
3 FEB 0845	10	0.	.0	6608.0	3 FEB 1705	110	43.	41.8	6618.3	4 FEB 0125	210	37.	26.9	6616.4
3 FEB 0850	11	0.	.0	6608.0	3 FEB 1710	111	43.	41.7	6618.3	4 FEB 0130	211	37.	26.7	6616.4
3 FEB 0855	12	0.	.0	6608.0	3 FEB 1715	112	43.	41.6	6618.3	4 FEB 0135	212	37.	26.6	6616.4
3 FEB 0900	13	0.	.0	6608.0	3 FEB 1720	113	43.	41.5	6618.3	4 FEB 0140	213	37.	26.4	6616.3
3 FEB 0905	14	0.	.0	6608.0	3 FEB 1725	114	43.	41.4	6618.3	4 FEB 0145	214	37.	26.3	6616.3
3 FEB 0910	15	0.	.0	6608.0	3 FEB 1730	115	43.	41.3	6618.3	4 FEB 0150	215	37.	26.1	6616.3
3 FEB 0915	16	0.	.0	6608.0	3 FEB 1735	116	43.	41.2	6618.3	4 FEB 0155	216	37.	25.9	6616.3
3 FEB 0920	17	0.	.0	6608.0	3 FEB 1740	117	43.	41.1	6618.3	4 FEB 0200	217	37.	25.8	6616.2
3 FEB 0925	18	0.	.0	6608.0	3 FEB 1745	118	43.	41.0	6618.3	4 FEB 0205	218	37.	25.6	6616.2
3 FEB 0930	19	0.	.0	6608.0	3 FEB 1750	119	43.	40.9	6618.2	4 FEB 0210	219	37.	25.4	6616.2
3 FEB 0935	20	0.	.0	6608.0	3 FEB 1755	120	43.	40.8	6618.2	4 FEB 0215	220	37.	25.3	6616.2
3 FEB 0940	21	0.	.0	6608.0	3 FEB 1800	121	43.	40.7	6618.2	4 FEB 0220	221	36.	25.1	6616.2
3 FEB 0945	22	0.	.0	6608.0	3 FEB 1805	122	43.	40.6	6618.2	4 FEB 0225	222	36.	25.0	6616.1
3 FEB 0950	23	0.	.0	6608.0	3 FEB 1810	123	43.	40.5	6618.2	4 FEB 0230	223	36.	24.8	6616.1
3 FEB 0955	24	0.	.0	6608.0	3 FEB 1815	124	43.	40.3	6618.2	4 FEB 0235	224	36.	24.7	6616.1
3 FEB 1000	25	0.	.0	6608.0	3 FEB 1820	125	43.	40.2	6618.2	4 FEB 0240	225	36.	24.5	6616.1
3 FEB 1005	26	0.	.0	6608.0	3 FEB 1825	126	43.	40.1	6618.2	4 FEB 0245	226	36.	24.3	6616.0
3 FEB 1010	27	0.	.0	6608.0	3 FEB 1830	127	43.	39.9	6618.1	4 FEB 0250	227	36.	24.2	6616.0
3 FEB 1015	28	0.	.0	6608.0	3 FEB 1835	128	43.	39.8	6618.1	4 FEB 0255	228	36.	24.0	6616.0
3 FEB 1020	29	0.	.0	6608.0	3 FEB 1840	129	43.	39.6	6618.1	4 FEB 0300	229	36.	23.9	6616.0
3 FEB 1025	30	0.	.0	6608.0	3 FEB 1845	130	43.	39.5	6618.1	4 FEB 0305	230	36.	23.7	6615.9
3 FEB 1030	31	0.	.0	6608.0	3 FEB 1850	131	42.	39.4	6618.1	4 FEB 0310	231	36.	23.6	6615.9
3 FEB 1035	32	0.	.0	6608.0	3 FEB 1855	132	42.	39.2	6618.1	4 FEB 0315	232	36.	23.4	6615.9
3 FEB 1040	33	0.	.0	6608.0	3 FEB 1900	133	42.	39.1	6618.0	4 FEB 0320	233	36.	23.3	6615.9
3 FEB 1045	34	0.	.0	6608.0	3 FEB 1905	134	42.	38.9	6618.0	4 FEB 0325	234	36.	23.1	6615.8
3 FEB 1050	35	0.	.0	6608.0	3 FEB 1910	135	42.	38.8	6618.0	4 FEB 0330	235	35.	22.9	6615.8
3 FEB 1055	36	0.	.0	6608.0	3 FEB 1915	136	42.	38.6	6618.0	4 FEB 0335	236	35.	22.8	6615.8
3 FEB 1100	37	0.	.0	6608.0	3 FEB 1920	137	42.	38.5	6618.0	4 FEB 0340	237	35.	22.6	6615.7
3 FEB 1105	38	0.	.0	6608.0	3 FEB 1925	138	42.	38.3	6618.0	4 FEB 0345	238	35.	22.5	6615.7
3 FEB 1110	39	0.	.0	6608.0	3 FEB 1930	139	42.	38.2	6617.9	4 FEB 0350	239	35.	22.3	6615.7
3 FEB 1115	40	0.	.0	6608.0	3 FEB 1935	140	42.	38.0	6617.9	4 FEB 0355	240	35.	22.2	6615.7
3 FEB 1120	41	0.	.0	6608.0	3 FEB 1940	141	42.	37.9	6617.9	4 FEB 0400	241	35.	22.0	6615.6
3 FEB 1125	42	0.	.0	6608.0	3 FEB 1945	142	42.	37.7	6617.9	4 FEB 0405	242	35.	21.9	6615.6

3 FEB 1130	43	0.	.0	6608.0 *	3 FEB 1950 143	42.	37.6	6617.9 *	4 FEB 0410 243	35.	21.7 6615.6
3 FEB 1135	44	0.	.0	6608.0 *	3 FEB 1955 144	42.	37.4	6617.8 *	4 FEB 0415 244	35.	21.6 6615.6
3 FEB 1140	45	0.	.0	6608.0 *	3 FEB 2000 145	42.	37.3	6617.8 *	4 FEB 0420 245	35.	21.4 6615.5
3 FEB 1145	46	0.	.0	6608.0 *	3 FEB 2005 146	42.	37.1	6617.8 *	4 FEB 0425 246	35.	21.2 6615.5
3 FEB 1150	47	0.	.0	6608.0 *	3 FEB 2010 147	42.	37.0	6617.8 *	4 FEB 0430 247	34.	21.1 6615.5
3 FEB 1155	48	0.	.0	6608.0 *	3 FEB 2015 148	42.	36.8	6617.8 *	4 FEB 0435 248	34.	20.9 6615.4
3 FEB 1200	49	0.	.0	6608.0 *	3 FEB 2020 149	41.	36.7	6617.7 *	4 FEB 0440 249	34.	20.7 6615.4
3 FEB 1205	50	0.	.0	6608.0 *	3 FEB 2025 150	41.	36.5	6617.7 *	4 FEB 0445 250	34.	20.5 6615.4
3 FEB 1210	51	0.	.0	6608.0 *	3 FEB 2030 151	41.	36.4	6617.7 *	4 FEB 0450 251	34.	20.4 6615.3
3 FEB 1215	52	0.	.0	6608.0 *	3 FEB 2035 152	41.	36.2	6617.7 *	4 FEB 0455 252	34.	20.2 6615.3
3 FEB 1220	53	0.	.0	6608.0 *	3 FEB 2040 153	41.	36.1	6617.7 *	4 FEB 0500 253	34.	20.0 6615.3
3 FEB 1225	54	0.	.0	6608.0 *	3 FEB 2045 154	41.	36.0	6617.6 *	4 FEB 0505 254	34.	19.8 6615.2
3 FEB 1230	55	0.	.0	6608.0 *	3 FEB 2050 155	41.	35.8	6617.6 *	4 FEB 0510 255	34.	19.6 6615.2
3 FEB 1235	56	0.	.0	6608.0 *	3 FEB 2055 156	41.	35.7	6617.6 *	4 FEB 0515 256	34.	19.4 6615.2
3 FEB 1240	57	0.	.0	6608.0 *	3 FEB 2100 157	41.	35.5	6617.6 *	4 FEB 0520 257	33.	19.3 6615.1
3 FEB 1245	58	0.	.0	6608.0 *	3 FEB 2105 158	41.	35.4	6617.6 *	4 FEB 0525 258	33.	19.1 6615.1
3 FEB 1250	59	0.	.0	6608.0 *	3 FEB 2110 159	41.	35.2	6617.5 *	4 FEB 0530 259	33.	18.9 6615.1
3 FEB 1255	60	0.	.0	6608.0 *	3 FEB 2115 160	41.	35.1	6617.5 *	4 FEB 0535 260	33.	18.7 6615.0
3 FEB 1300	61	0.	.0	6608.0 *	3 FEB 2120 161	41.	34.9	6617.5 *	4 FEB 0540 261	33.	18.5 6615.0
3 FEB 1305	62	0.	.0	6608.0 *	3 FEB 2125 162	41.	34.8	6617.5 *	4 FEB 0545 262	33.	18.4 6615.0
3 FEB 1310	63	0.	.0	6608.0 *	3 FEB 2130 163	41.	34.6	6617.5 *	4 FEB 0550 263	33.	18.2 6614.9
3 FEB 1315	64	0.	.0	6608.0 *	3 FEB 2135 164	41.	34.5	6617.4 *	4 FEB 0555 264	33.	18.0 6614.9
3 FEB 1320	65	0.	.0	6608.0 *	3 FEB 2140 165	40.	34.3	6617.4 *	4 FEB 0600 265	33.	17.8 6614.9
3 FEB 1325	66	0.	.0	6608.0 *	3 FEB 2145 166	40.	34.2	6617.4 *	4 FEB 0605 266	33.	17.7 6614.8
3 FEB 1330	67	0.	.1	6608.1 *	3 FEB 2150 167	40.	34.0	6617.4 *	4 FEB 0610 267	33.	17.5 6614.8
3 FEB 1335	68	1.	.3	6608.4 *	3 FEB 2155 168	40.	33.8	6617.3 *	4 FEB 0615 268	32.	17.3 6614.8
3 FEB 1340	69	3.	1.1	6609.4 *	3 FEB 2200 169	40.	33.7	6617.3 *	4 FEB 0620 269	32.	17.1 6614.7
3 FEB 1345	70	11.	3.1	6610.7 *	3 FEB 2205 170	40.	33.5	6617.3 *	4 FEB 0625 270	32.	17.0 6614.7
3 FEB 1350	71	22.	6.2	6612.1 *	3 FEB 2210 171	40.	33.4	6617.3 *	4 FEB 0630 271	32.	16.8 6614.7
3 FEB 1355	72	27.	10.2	6613.2 *	3 FEB 2215 172	40.	33.2	6617.3 *	4 FEB 0635 272	32.	16.6 6614.6
3 FEB 1400	73	31.	15.1	6614.4 *	3 FEB 2220 173	40.	33.1	6617.2 *	4 FEB 0640 273	32.	16.4 6614.6
3 FEB 1405	74	34.	20.3	6615.3 *	3 FEB 2225 174	40.	32.9	6617.2 *	4 FEB 0645 274	32.	16.3 6614.6
3 FEB 1410	75	36.	24.6	6616.1 *	3 FEB 2230 175	40.	32.7	6617.2 *	4 FEB 0650 275	32.	16.1 6614.5
3 FEB 1415	76	38.	27.9	6616.5 *	3 FEB 2235 176	40.	32.6	6617.2 *	4 FEB 0655 276	32.	15.9 6614.5
3 FEB 1420	77	39.	30.2	6616.9 *	3 FEB 2240 177	40.	32.4	6617.2 *	4 FEB 0700 277	32.	15.7 6614.5
3 FEB 1425	78	39.	32.1	6617.1 *	3 FEB 2245 178	40.	32.3	6617.1 *	4 FEB 0705 278	32.	15.6 6614.4
3 FEB 1430	79	40.	33.6	6617.3 *	3 FEB 2250 179	39.	32.1	6617.1 *	4 FEB 0710 279	31.	15.4 6614.4
3 FEB 1435	80	41.	34.8	6617.5 *	3 FEB 2255 180	39.	31.9	6617.1 *	4 FEB 0715 280	31.	15.2 6614.4
3 FEB 1440	81	41.	35.8	6617.6 *	3 FEB 2300 181	39.	31.8	6617.1 *	4 FEB 0720 281	31.	15.1 6614.4
3 FEB 1445	82	41.	36.7	6617.7 *	3 FEB 2305 182	39.	31.6	6617.0 *	4 FEB 0725 282	31.	14.9 6614.3
3 FEB 1450	83	42.	37.4	6617.8 *	3 FEB 2310 183	39.	31.4	6617.0 *	4 FEB 0730 283	31.	14.7 6614.3
3 FEB 1455	84	42.	38.0	6617.9 *	3 FEB 2315 184	39.	31.3	6617.0 *	4 FEB 0735 284	31.	14.6 6614.3
3 FEB 1500	85	42.	38.6	6618.0 *	3 FEB 2320 185	39.	31.1	6617.0 *	4 FEB 0740 285	31.	14.4 6614.2
3 FEB 1505	86	42.	39.2	6618.1 *	3 FEB 2325 186	39.	30.9	6616.9 *	4 FEB 0745 286	31.	14.2 6614.2
3 FEB 1510	87	43.	39.6	6618.1 *	3 FEB 2330 187	39.	30.8	6616.9 *	4 FEB 0750 287	31.	14.1 6614.2
3 FEB 1515	88	43.	40.1	6618.2 *	3 FEB 2335 188	39.	30.6	6616.9 *	4 FEB 0755 288	31.	13.9 6614.1
3 FEB 1520	89	43.	40.4	6618.2 *	3 FEB 2340 189	39.	30.4	6616.9 *	4 FEB 0800 289	31.	13.7 6614.1
3 FEB 1525	90	43.	40.7	6618.2 *	3 FEB 2345 190	39.	30.3	6616.9 *	4 FEB 0805 290	30.	13.6 6614.1
3 FEB 1530	91	43.	41.0	6618.3 *	3 FEB 2350 191	39.	30.1	6616.8 *	4 FEB 0810 291	30.	13.4 6614.1
3 FEB 1535	92	43.	41.2	6618.3 *	3 FEB 2355 192	39.	29.9	6616.8 *	4 FEB 0815 292	30.	13.2 6614.0
3 FEB 1540	93	43.	41.4	6618.3 *	4 FEB 0000 193	38.	29.8	6616.8 *	4 FEB 0820 293	30.	13.0 6614.0
3 FEB 1545	94	43.	41.6	6618.3 *	4 FEB 0005 194	38.	29.6	6616.8 *	4 FEB 0825 294	30.	12.9 6613.9
3 FEB 1550	95	43.	41.8	6618.3 *	4 FEB 0010 195	38.	29.4	6616.7 *	4 FEB 0830 295	30.	12.7 6613.9
3 FEB 1555	96	43.	41.9	6618.4 *	4 FEB 0015 196	38.	29.2	6616.7 *	4 FEB 0835 296	29.	12.5 6613.8
3 FEB 1600	97	43.	42.1	6618.4 *	4 FEB 0020 197	38.	29.1	6616.7 *	4 FEB 0840 297	29.	12.3 6613.8
3 FEB 1605	98	43.	42.2	6618.4 *	4 FEB 0025 198	38.	28.9	6616.7 *	4 FEB 0845 298	29.	12.1 6613.7
3 FEB 1610	99	43.	42.3	6618.4 *	4 FEB 0030 199	38.	28.7	6616.6 *	4 FEB 0850 299	29.	11.9 6613.7
3 FEB 1615	100	43.	42.3	6618.4 *	4 FEB 0035 200	38.	28.6	6616.6 *	4 FEB 0855 300	29.	11.7 6613.6

****

PEAK FLOW	TIME		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 43.	8.33		43.	30.	29.	29.
		(INCHES)	.682	1.938	1.938	1.938
		(AC-FT)	21.	60.	60.	60.

PEAK STORAGE	TIME	6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
42.	8.33	40.	23.	22.	22.

PEAK STAGE	TIME	6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
6618.40	8.33	6618.13	6614.85	6614.60	6614.60

CUMULATIVE AREA = .58 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	O-1	29.	6.08	3.	1.	1.	.03		
+	ROUTED TO	1-2	30.	6.08	3.	1.	1.	.03		
+	HYDROGRAPH AT	B9	173.	6.00	17.	5.	5.	.10		
+	ROUTED TO	1AP	60.	6.25	16.	5.	5.	.10		
+									6762.33	6.25
+	ROUTED TO	1AP-2	60.	6.25	16.	5.	5.	.10		
+	HYDROGRAPH AT	B10	22.	6.00	2.	1.	1.	.02		
+	ROUTED TO	B10-2	22.	6.08	2.	1.	1.	.02		
+	HYDROGRAPH AT	B8	107.	6.00	11.	3.	3.	.06		

+	ROUTED TO	2AP	25.	6.33	10.	3.	3.	.06		
+									6739.50	6.33
+	HYDROGRAPH AT	0-2B	87.	6.08	9.	3.	3.	.09		
+	ROUTED TO	0-2B-	83.	6.25	9.	3.	3.	.09		
+	5 COMBINED AT	2	194.	6.17	41.	13.	13.	.29		
+	ROUTED TO	2-3	194.	6.25	41.	13.	13.	.29		
+	ROUTED TO	3-4	191.	6.25	41.	13.	13.	.29		
+	HYDROGRAPH AT	B-7	137.	6.00	15.	4.	4.	.05		
+	HYDROGRAPH AT	B6	43.	6.00	4.	1.	1.	.01		
+	3 COMBINED AT	4	286.	6.08	59.	19.	18.	.36		
+	ROUTED TO	4-5	285.	6.08	59.	19.	18.	.36		
+	HYDROGRAPH AT	B5	68.	6.00	7.	2.	2.	.02		
+	2 COMBINED AT	5	334.	6.08	66.	21.	20.	.39		
+	ROUTED TO	5-6	333.	6.08	66.	21.	20.	.39		
+	HYDROGRAPH AT	B4	152.	6.00	16.	5.	4.	.06		
+	2 COMBINED AT	6	473.	6.00	82.	26.	25.	.44		
+	ROUTED TO	6-7	467.	6.00	82.	26.	25.	.44		
+	HYDROGRAPH AT	B3	152.	6.08	17.	5.	5.	.06		
+	HYDROGRAPH AT	B2	65.	6.00	6.	2.	2.	.02		
+	3 COMBINED AT	7	683.	6.00	106.	33.	32.	.53		
+	HYDROGRAPH AT	B1	117.	6.00	11.	3.	3.	.05		
+	2 COMBINED AT	8	800.	6.00	117.	36.	35.	.58		
+	ROUTED TO	DPB	43.	8.33	43.	30.	29.	.58		
+									6618.40	8.33

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SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
1-2	MANE	1.50	29.69	364.50	1.45	5.00	29.56	365.00	1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1936E+01 EXCESS= .0000E+00 OUTFLOW= .1936E+01 BASIN STORAGE= .2979E-03 PERCENT ERROR= .0

1AP-2	MANE	1.24	59.89	375.47	1.97	5.00	59.86	375.00	1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1031E+02 EXCESS= .0000E+00 OUTFLOW= .1030E+02 BASIN STORAGE= .8892E-03 PERCENT ERROR= .0

B10-2	MANE	1.25	22.17	362.50	1.47	5.00	21.76	365.00	1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1422E+01 EXCESS= .0000E+00 OUTFLOW= .1422E+01 BASIN STORAGE= .1143E-03 PERCENT ERROR= .0

0-2B-	MANE	1.50	82.88	375.00	1.27	5.00	82.88	375.00	1.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5951E+01 EXCESS= .0000E+00 OUTFLOW= .5949E+01 BASIN STORAGE= .7208E-02 PERCENT ERROR= -.1

2-3	MANE	2.00	196.24	374.00	1.68	5.00	193.71	375.00	1.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2639E+02 EXCESS= .0000E+00 OUTFLOW= .2638E+02 BASIN STORAGE= .8976E-02 PERCENT ERROR= .0

3-4	MANE	.76	192.96	375.65	1.68	5.00	191.43	375.00	1.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2638E+02 EXCESS= .0000E+00 OUTFLOW= .2637E+02 BASIN STORAGE= .2991E-02 PERCENT ERROR= .0

```
            4-5  MANE          .32    285.48    365.33      1.95      5.00    284.57    365.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3763E+02 EXCESS= .0000E+00 OUTFLOW= .3763E+02 BASIN STORAGE= .1380E-02 PERCENT ERROR=    .0

            5-6  MANE          .75    332.87    365.37      2.02      5.00    332.83    365.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4161E+02 EXCESS= .0000E+00 OUTFLOW= .4161E+02 BASIN STORAGE= .3540E-02 PERCENT ERROR=    .0

            6-7  MANE          .45    472.76    360.62      2.16      5.00    467.17    360.00        2.16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5089E+02 EXCESS= .0000E+00 OUTFLOW= .5089E+02 BASIN STORAGE= .2350E-02 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
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DOT
DEPARTMENT OF TRANSPORTATION

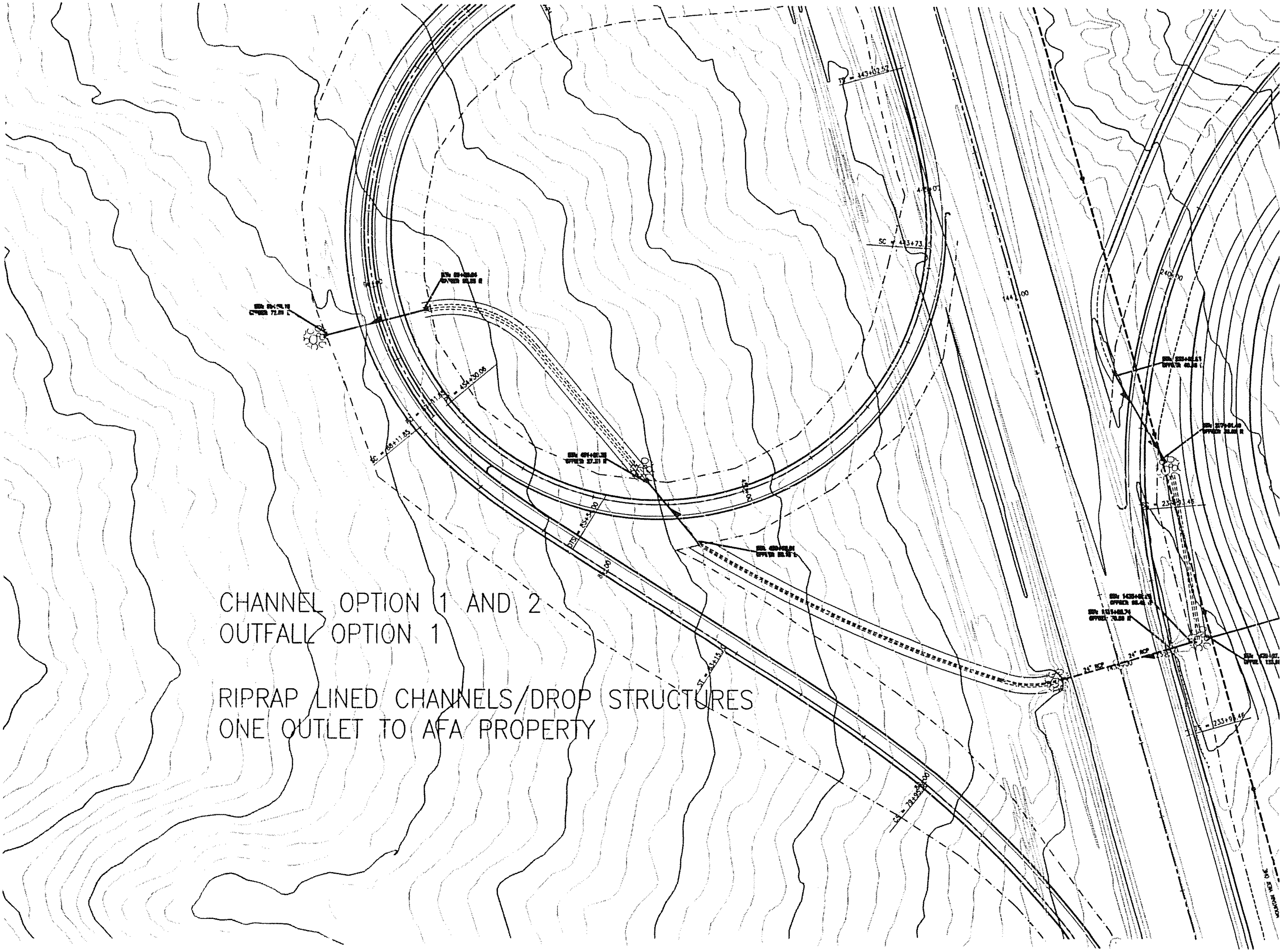
CITY OF COLORADO SPRINGS

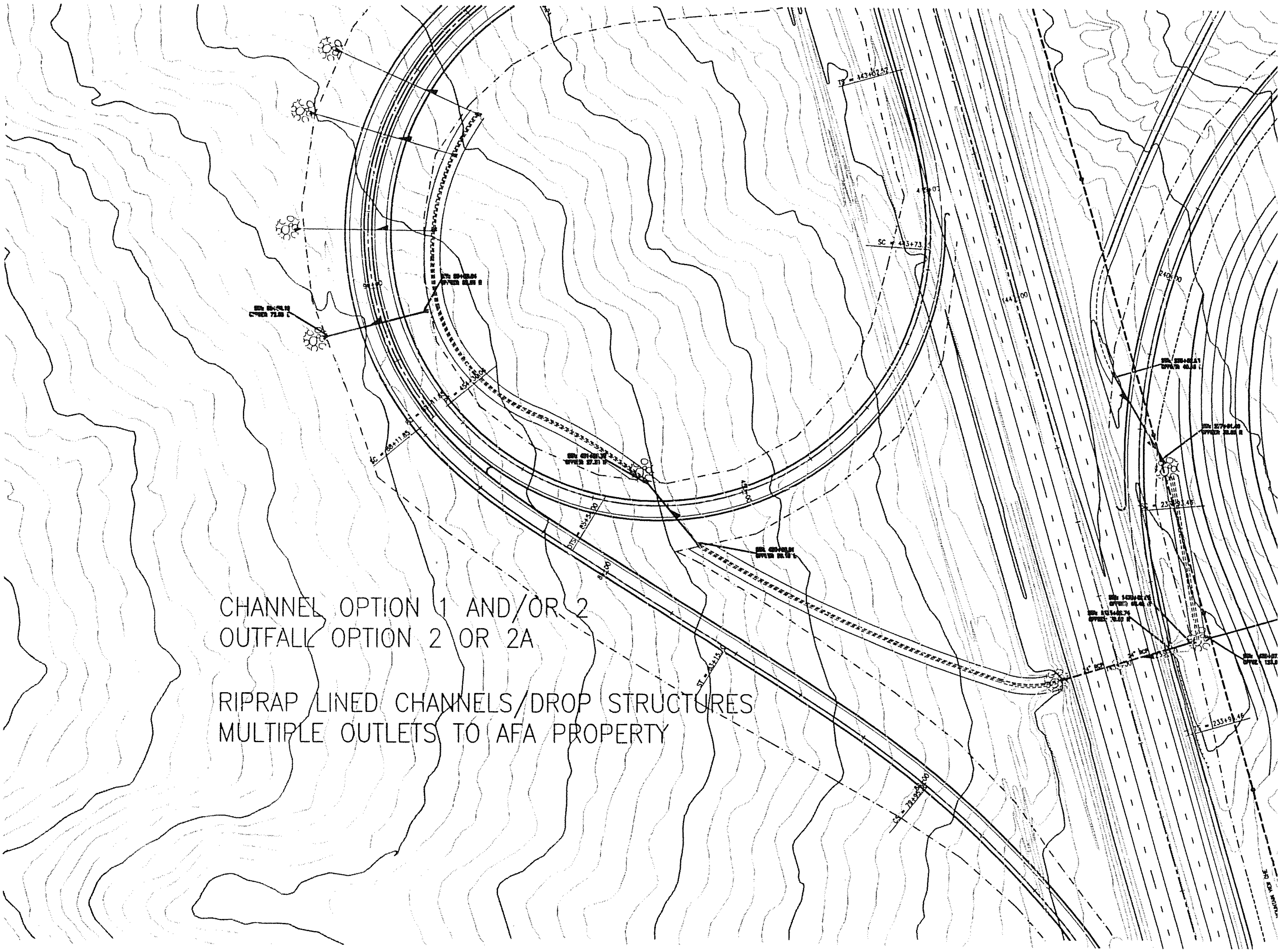
APPENDIX E

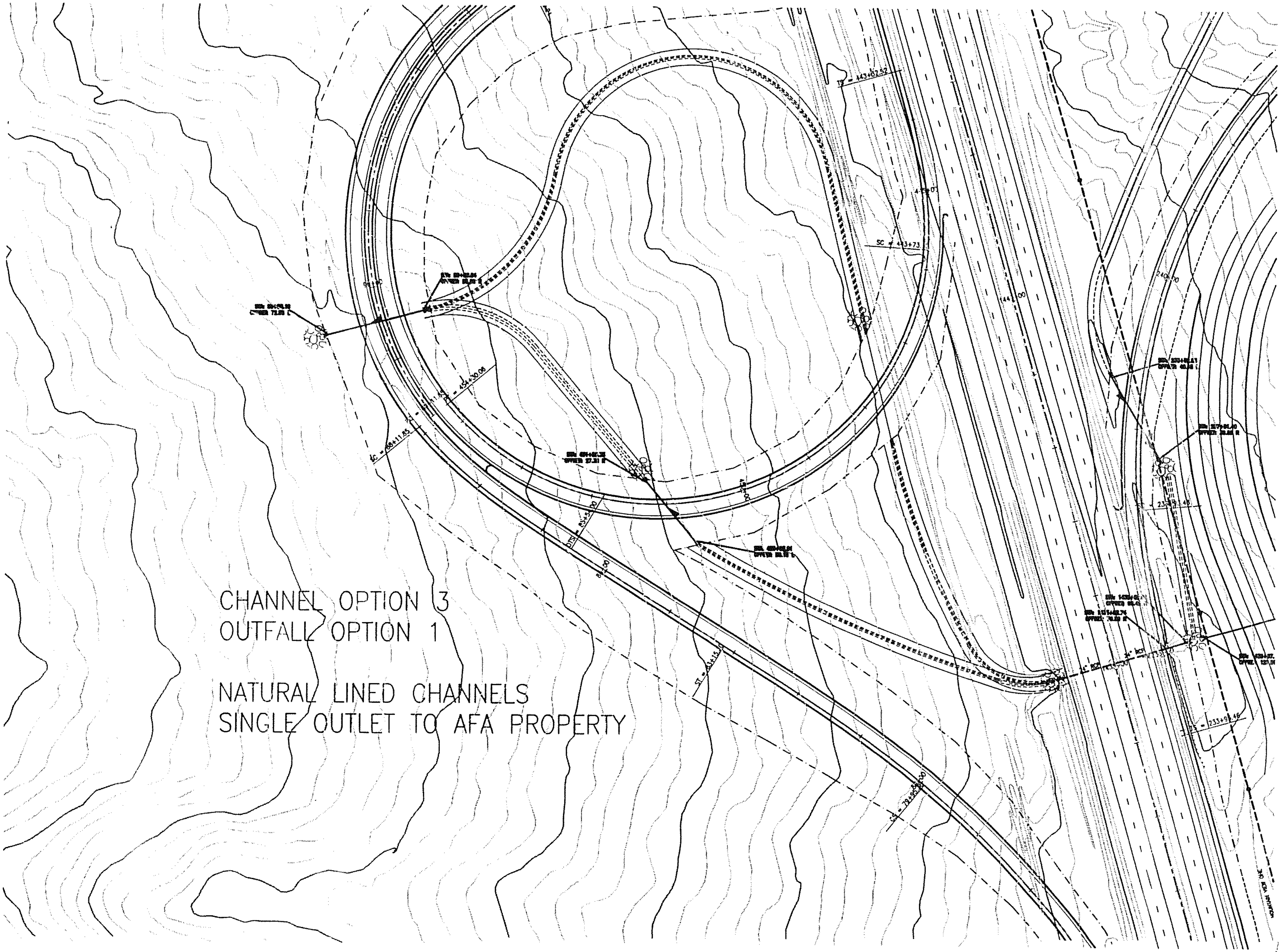
CHANNEL ALTERNATIVES SE/NE QUADRANT

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866


CHANNEL OPTION 1 AND 2
OUTFALL OPTION 1
RIPRAP LINED CHANNELS/DROP STRUCTURES
ONE OUTLET TO AFA PROPERTY
TS = 443+02.52
SC = 443+73.1
SC = 88+11.85
454+30.06
ST = 233+91.45
TS = 233+91.45
24" RCP
24" RCP


CHANNEL OPTION 1 AND/OR 2
OUTFALL OPTION 2 OR 2A
RIPRAP LINED CHANNELS/DROP STRUCTURES
MULTIPLE OUTLETS TO AFA PROPERTY



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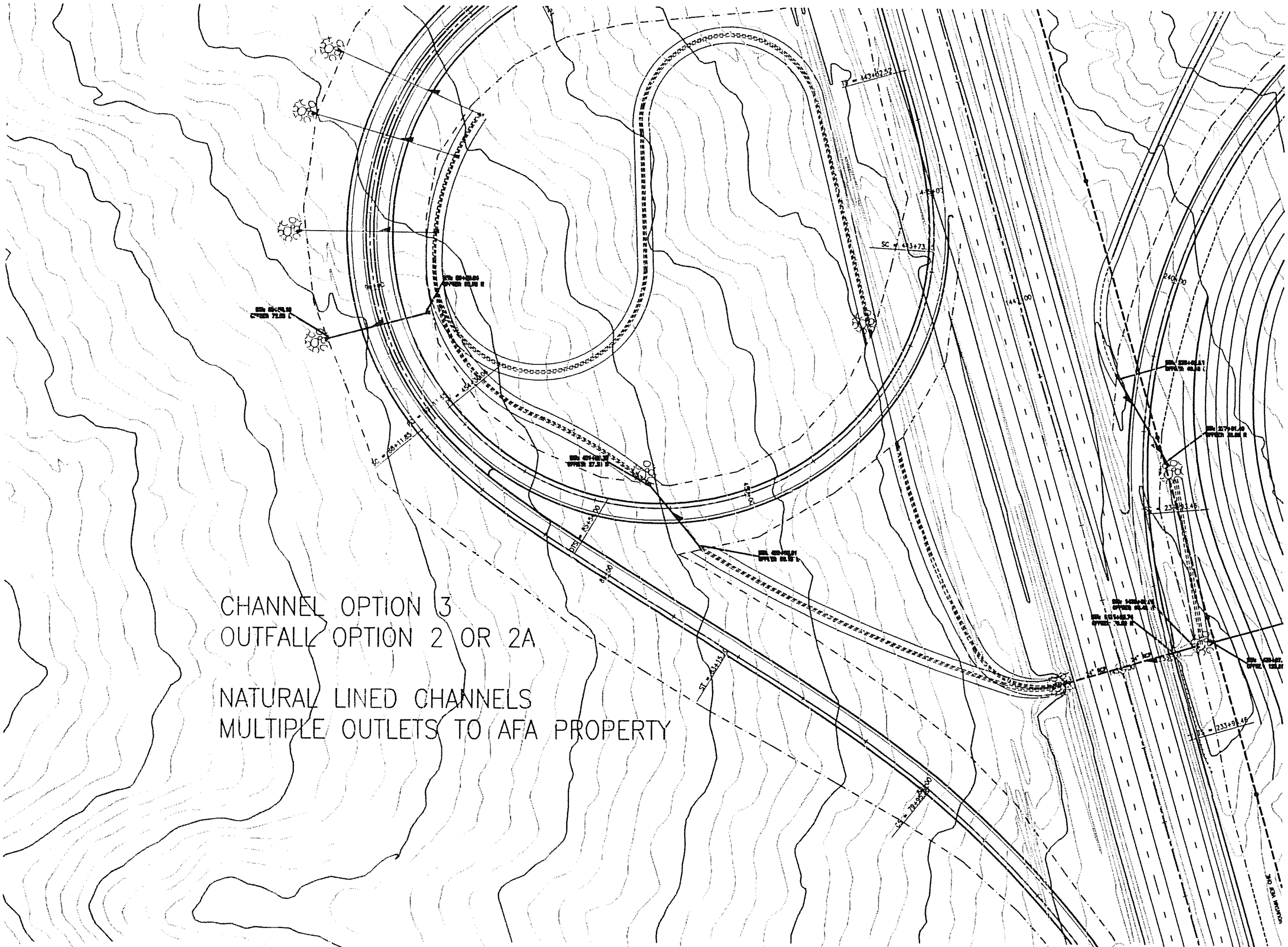
OUTFALL OPTION 1
NATURAL LINED CHANNELS
SINGLE OUTLET TO AFA PROPERTY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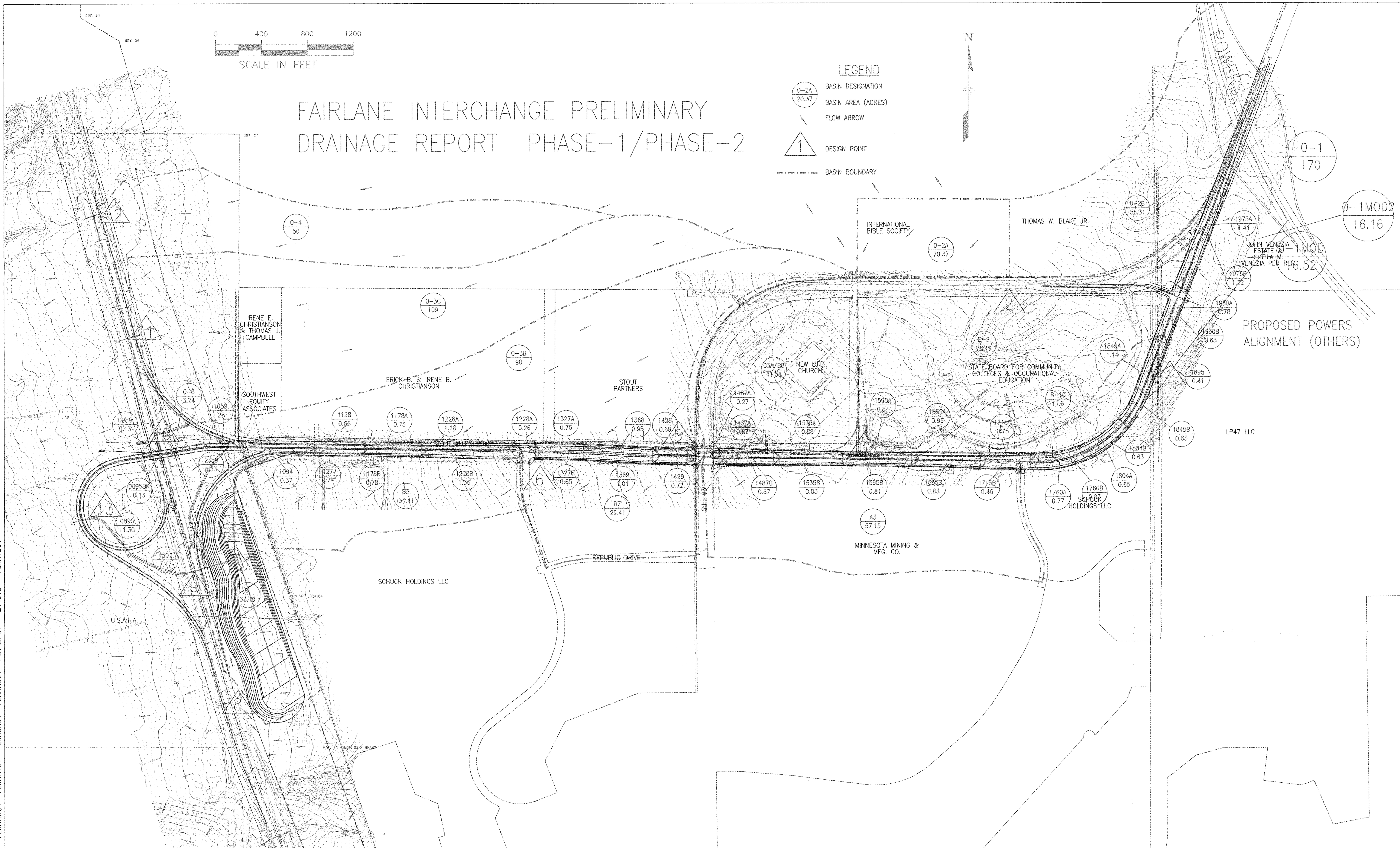
OUTFALL OPTION 2 OR 2A
NATURAL LINED CHANNELS
MULTIPLE OUTLETS TO AFA PROPERTY



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Drawing File Name: FLXRHYBN.DWG			
Acad Ver. 14	Scale: 1:400	Units: ENGLISH	

Index of Revisions

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	
No Revisions:	
Revised:	
Void:	

FAIRLANE PARKWAY/I-25 INTERCHANGE

Sheet Subset: Roadway | Subset Sheets: 1 of 1

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Detailer: RBB	
Checked:	
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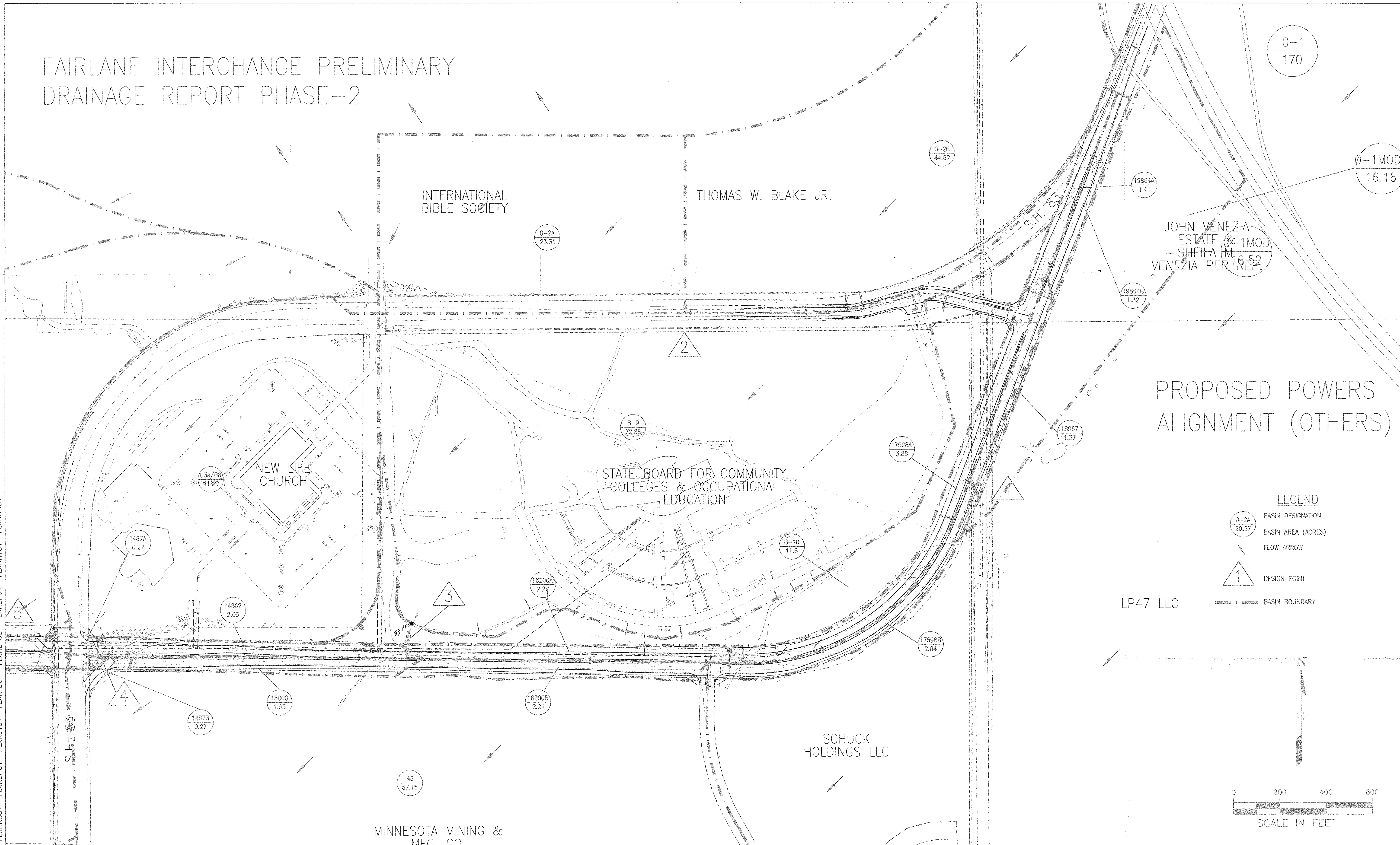
FAIRLANE INTERCHANGE PRELIMINARY DRAINAGE REPORT PHASE-2



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Acad Ver. 14 Scale: 1:200	Units: ENGLISH

Index of Revisions

DMJM

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As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

DRAINAGE BASINS PHASE II

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Detailer: RBB	
Checked:	
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