FINAL DRAINAGE REPORT
FOR
SADDLEHORN RANCH – FILING 3

Prepared For:
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July 13, 2023
Project No. 25142.05

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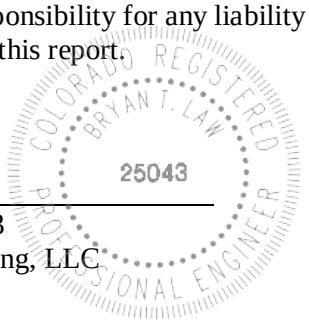
El Paso County PCD File No.:
SF234

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.



Bryan Law, Colorado P.E. # 25043
For and On Behalf of JR Engineering, LLC

8/15/23
Date

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: ROI Property Group, LLC

By: Nathan Steele

Title: Senior Vice President
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El Paso County:
Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2 and Engineering Criteria Manual, as amended.

Joshua Palmer, P.E.
County Engineer/ ECM Administrator

Date

Conditions:

CONTENTS

PURPOSE **1**

GENERAL LOCATION AND DESCRIPTION **1**

LOCATION 1
DESCRIPTION OF PROPERTY 1
FLOODPLAIN STATEMENT 2

DRAINAGE BASINS AND SUB-BASINS **2**

EXISTING MAJOR BASIN DESCRIPTIONS 2
EXISTING SUB-BASIN DRAINAGE 5
PROPOSED SUB-BASIN DRAINAGE 5
DRAINAGEWAY MS-06 6

DRAINAGE DESIGN CRITERIA **8**

DEVELOPMENT CRITERIA REFERENCE 8
HYDROLOGIC CRITERIA 8
HYDRAULIC CRITERIA 8

DRAINAGE FACILITY DESIGN **9**

GENERAL CONCEPT 9
SPECIFIC DETAILS 9
Four Step Process to Minimize Adverse Impacts of Urbanization *9*
Water Quality *10*
Erosion Control Plan *10*
Operation & Maintenance *10*
Drainage and Bridge Fees *10*
Construction Cost Opinion *11*

SUMMARY **11**

REFERENCES: **12**

APPENDICES

A. Figures and Exhibits
B. Hydrologic Calculations
C. Hydraulic Calculations
D. Detention and Water Quality Calculations
E. Reference Materials
F. Drainage Maps

LIST OF TABLES:

1. Major Drainageway Naming Convention
2. Major Drainageway - Ex. 100 Year Flow Comparison
3. Pond Summary

PURPOSE

This document is the Final Drainage report for Filing 3 of Saddlehorn Ranch. The purpose of this report is to:

1. Identify on-site and off-site drainage patterns.
2. Recommend storm water facilities to collect and convey storm runoff from the proposed development to appropriate discharge and/or detention locations.
3. Recommend water quality and detention facilities to control discharge release rates to below historic.
4. Demonstrate compliance with surrounding major drainage basin planning studies, master development drainage plans and flood insurance studies.

GENERAL LOCATION AND DESCRIPTION

Location

The proposed Saddlehorn Ranch Filing 3, known as "Filing 3" from herein, is a parcel of land located in Section 3 and 10, Township 13 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. Saddlehorn Ranch is an 824 acre, rural, single family-development. Filing 3 is 175.98 acres and is comprised of 43 lots of the overall Saddlehorn Ranch development. Saddlehorn Ranch is bound by Judge Orr Road to the North and Curtis Road to the West. To the East, Saddlehorn Ranch is bound by undeveloped land owned by Brent Houser Enterprises, LLC. To the south, Saddlehorn Ranch is bound by undeveloped properties owned by Carolyn Gudzunas and Faye Reynolds. Filing 3 is bound by future Filing 4 to the east, Filing 2 to the south, Judge Orr Road to the north, and by Curtis Road to the west. A vicinity map is presented in Appendix A.

Currently, there are two major Drainageway that will receive flows from Filing 3: Gieck Ranch (WF-R7A) and Haegler Ranch Main Stem 6 (MS-06). These Drainageways were analyzed, both hydrologically and hydraulically, in the following reports:

- Haegler Ranch Basin Drainage Basin Planning Study (DBPS), May 2009.
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision, June 2004.
- Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch, May 2020.
- Geick Ranch Drainage Basin Planning Study (DBPS), October 2007

The impact of these Drainageways and planning studies on the proposed development will be discussed later in the report.

Description of Property

Filing 3 is currently unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling range land condition. In general, Filing 3 slopes from south to southeast and the existing drainageways follows this topography.

Per a NRCS web soil survey of the area, Filing 3 is made up of Type A and D soils. Type A soils cover roughly 76% of Filing 3 while Type D soils cover 24% of Filing 3. Group A soils have a high infiltration rate when thoroughly wet. Type D soils have a very slow infiltration when thoroughly wet. A NRCS soil survey map has been presented in Appendix A.

Floodplain Statement

Based on the FEMA FIRM Map number 08041C0558G, dated December 7, 2018, Filing 3 lies within Zone AE and Zone X. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed residential development within Filing 3 will occur in Zone X. The FIRM Map has been presented in Appendix A.

DRAINAGE BASINS AND SUB-BASINS

Existing Major Basin Descriptions

Filing 3 lies within Haegler Ranch Drainage Basin based on the "*Haegler Ranch Drainage Basin Planning Study*" prepared by URS Corporation in May 2009.

The Haegler Ranch Drainage Basin covers approximately 16.6 square miles in unincorporated El Paso County, CO. The Haegler Ranch Drainage Basin is tributary to Black Squirrel Creek. In its existing condition, the basin is comprised of rolling rangeland with poor vegetative cover associated with Colorado's semi-arid climate. The natural Drainageways within the basin are typically shallow and wide with poorly defined flow paths in most areas. Anticipated land use for the basin includes residential and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

As part of its drainage research, JR Engineering reviewed the following drainage studies, reports and LOMRs:

- Haegler Ranch Drainage Basin Planning Study prepared by URS Corporation in May 2009
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision prepared by Tri-Core Engineering in June 2004.
- Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch, prepared by JR Engineering, May 2020.
- Gieck Ranch Drainage Basin Planning Study (DBPS), October 2007

The "*Haegler Ranch Drainage Basin Planning Study*" was used to establish a stormwater management plan for the existing and future stormwater infrastructure needs within the Haegler Ranch Drainage Basin. Based on provided drainage maps and analysis, in the existing condition Haegler Ranch contributes a total of 710 cfs onto the site. Of the 710 cfs, 590 cfs crosses Curtis Road in an existing 24" CMP onto the site. Major Drainageway MS-06 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. The remaining 210 cfs crosses Curtis Road in an existing 36" CMP onto the

site. Major Drainageway T-6 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. Both Curtis Road culverts are undersized for existing and future flows and overtopping occurs locally near the culvert crossings. The overtopping culvert at the intersection of MS-06 and Curtis Road is not contained within the 100-year floodplain limits.

The existing 24" CMP and 36" CMP culvert will not be upsized within the context of this report and development. The culvert is owned by El Paso County and timing of improvements, if any, will be controlled by the County.

Furthermore, the *Haegler Ranch DBPS* recommends channel improvements within Drainageway MS-06. Per the *Haegler Ranch DBPS*, all recommended channel sections are trapezoidal with side slopes of 4:1 and a maximum depth of five feet. Within the limits of the site, three (3) channel bottom widths are recommended for MS-06. The first reach, from station 0+00 – 31+34, is proposed with a 15' bottom width, the second reach from 31+34 to 74+61, MS-06 is proposed with a 30' bottom width, and the last reach from station 74+61 - 103+62 is proposed with a 20' channel bottom. The portion of the MS-06 channel improvements along Filing 3 has been analyzed with the Engineer's Certification of No Impact Letter. This letter shows the proposed Drainageway MS-06 sections and flow depths. This letter can be found in Appendix E.

Based on flood impacts, stream stability and cost effectiveness, this study recommended a sub-regional detention approach. This allows future development anywhere in the basin with the construction of an associated sub-regional pond. However, based on the *Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch,* Filing 3 will utilize three on-site full spectrum water quality and detention ponds instead. These full spectrum detention ponds will limit developed discharge into the MS-06 and WF-R7A Drainageways to less than historic rates.

The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR was executed on Haegler Ranch Tributary 2, 3, and 4. The LOMR revised the onsite effective flood zone from Zone A to Zone AE. See FIRM Map Panel 08041C0558G for limits of LOMR study and revised flood zones, presented in Appendix E.

The Gieck Ranch Drainage Basin covers approximately 22 square miles and begins approximately five miles northeast of the Town of Falcon and travels approximately 15 miles to the southeast. The Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains south to the Arkansas River near the city of Pueblo, Colorado. The majority of the area within the basin is undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates. Anticipated land use for the basin includes residential, industrial, agricultural and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

Based upon provided drainage maps and analysis, Gieck Ranch discharges a total of 1,017 cfs onto the site within Major Drainageway Gieck Ranch West Fork Reach 7A (WF-R7A). An existing 66" CMP and 36" CMP convey the offsite flow across Judge Orr Road onto the site. The existing culverts at Judge Orr Road are undersized for existing and future flows resulting in localized overtopping. The DBPS recommends the culvert be upsized to four –12' x 5' box culverts. The culvert will not be upsized within

the context of this report and development. The culvert is owned by El Paso County and timing of the recommended improvements will be controlled by the County. The overtopping at the intersection of WF-R7A is not contained within the 100-year floodplain. Therefore, at time of Final Drainage Report for Filing 4, berming will be provided that will protect proposed lots from overtopping flows.

See Table 2 for comparison of Drainageway identification and the naming convention used within the context of this report. See Table 3 for a comparison of 100-year flows as calculated in the aforementioned DBPS and LOMR. An existing conditions drainage map is presented in Appendix E.

Table 1: Major Drainageway Naming Convention

Major Drainageway Naming Conventions			
Saddlehorn Ranch MDDP/PDR:	Per Haegler Ranch DBPS:	Per Geick Ranch DBPS:	Per Sante Fe Springs LOMR:
MS-06	Main Stem (MS-06)	N/A*	Haegler Ranch Tributary 3
WF-R7A	N/A*	West Fork (Middle)/WF-R7A	N/A*

Table 2: Major Drainageway – Ex. 100-Year Flow Comparison

Major Drainageways: 100-Year Flow Comparison				
Drainageway Name	Contributing Area (sq. mi.)	Q_{100} Per Haegler Ranch DBPS:	Q_{100} Per Geick Ranch DBPS:	Q_{100} Per Sante Fe Springs LOMR:
MS-06 @ Curtis Road	1.05	590 cfs	N/A*	505 cfs
WF-R7A @ Judge Orr Road	1.50	N/A*	1,017 cfs	N/A*

*N/A: Flow regime outside limits of study.

The *Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch* proposed the overall drainage facility design for Saddlehorn Ranch. Within the context of this report, onsite drainage basins the associated full spectrum water quality pond were established. As it pertains to Filing 3, three full spectrum water quality ponds are recommended. Roadside ditches and local street culverts will be utilized to capture and convey Filing 3's runoff to the water quality ponds. Saddlehorn Filing 4 will also utilize the same three ponds. Thus, the ponds were sized for both the Filing 3 and Filing 4 improvements. Pond C and Pond E will discharge into Drainageway MS-06, while Pond D will release into Drainageway WF-R7A. All ponds are full spectrum and will release at less than historic rates.

Existing Sub-basin Drainage

On-site, existing sub-basin drainage patterns are generally from northwest to southeast by way of Drainageway MS-06 and Drainageway WF-R7A. On-site areas flow directly into these drainageways, which also bypass off-site flows through the site.

On-site, existing drainage basins were established based upon existing topography and the limits of the 100-year floodplain. These existing sub-basins were analyzed in the *Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch.* An existing drainage map has been provided in Appendix E.

Proposed Sub-basin Drainage

The proposed Filing 3 basin delineation is as follows;

Basin C consists of Sub-Basins C1-C10 combining for a total of 93.77 acres. In its existing condition, Basin C is rolling rangeland and runoff generally flows southeast towards Drainageway MS-06. In the proposed condition, Basin C will be rural 2.5 acre lots, paved roadway, and will include Pond C. Runoff from this basin will be collected in road side ditches and conveyed to Pond C located in the southeast corner of the future Filing 4 development. Pond C will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin D consists of Sub-basins D1-D7 combining for a total of 74.66 acres. In its existing condition, Basin D is rolling rangeland and runoff generally flows east to Drainageway WF-R7A. In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway, a church site and will include Pond D. Runoff from this basin will be collected in road side ditches and conveyed west to Pond D located in the northeast corner of the future Filing 4 development. Pond D is a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway WF-R7A.

Basin E consists of Sub-basins E1-E4 combining for a total of 18.37 acres. In its existing condition, Basin E is rolling rangeland and runoff generally flows south towards Drainageway MS-06. In the proposed condition, Basin E will be rural 2.5 acre lots, paved roadway, and will include Pond E. Runoff from this basin will be collected in road side ditches and conveyed to Pond E located in the southern portion of the Filing 3 development along San Isidro Trail. Pond E will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin F consists of Sub-basins F1-F4 combining for a total of 14.32 acres. In its existing condition, Basin F is rolling rangeland and paved road (Curtis Road and Benito Wells Trail). Runoff generally flows east along Benito Wells Trail. In the proposed condition, Basin F will be rural 2.5 acre lots and paved roadway. Runoff from this basin will be collected in road side ditches and conveyed to Pond F located in the southeastern portion of the Filing 2 development along Benito Wells Trail. Pond F will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin UD consists of Sub-basins UD1-UD5 combining for a total of 74.27 acres. In their existing condition, these basins are rolling rangeland. Runoff from Basins UD1-UD3 generally flows south and

Unresolved from submittal 1, 2,3: The pervious area in the basin, OS5, needs to be accounted for as well. If other exclusions will be used for that - account for them in the text and PBMP form. Note: Exclusion 7.1.B.2

east to Drainageway MS-06. Basin UD5 flows east to Drainageway MS-06. Basin UD4 represents Drainageway MS-06 and the runoff generated along the Filing 3 boundary. In the proposed condition, Basins UD1, UD2, UD3, and most of UD5 will be rural 2.5 acre lots with an Imperviousness = 6.2% and will be excluded from permanent stormwater quality management per Section I.7.1.B.5 of the ECM – Stormwater Quality Policy and Procedures. Per the MS4 Permit Exclusion Map, 0.53 acres of Basin UD5, which consists of paved roads at 45% imperviousness, will be excluded per Section I.7.1.C.1. shown in red. Additionally, the entirety of Basin UD4, which is a non-jurisdictional wetland to remain undeveloped at 2% impervious, will not be detained in PBMP per section I.7.1.B.7.

Basin OS consists of Sub-basins OS1-OS5 combining for a total of 9.35 acres of offsite area. In their existing condition, these basins are paved roadway (Curtis Road & Judge Orr Road) and undeveloped area. In the proposed condition, these basins will be improved with 8' of pavement width for both the Curtis Road and Judge Orr Road stretches. Basins OS1-OS4 will flow on-site prior to being captured in a roadside swale and conveyed to a proposed full spectrum detention pond prior to being released into Drainageway MS-06 or Drainageway WF-R7A. Basin OS5 will not be detained by a pond due to its location relative to the site. Basin OS5 adds an additional paved area 0.28 acres to the existing Curtis Road, per Appendix I Section 7.1.B.2 of the El Paso County Engineering Criteria Manual , this is allowable as less than 1 acre of paved area per mile is being added to the existing roadway.

A summary table of proposed basin parameters and flow rates are presented in Appendix B.

Basin C runoff along with runoff from Sub-Basins OS1 and OS2 will be captured in roadside swales and conveyed to the proposed Pond C. This full spectrum pond will release treated flows at less than historic rates to minimize adverse impacts downstream. Basin D along with runoff from Sub-Basins OS3 and OS4 will be captured in roadside swales and conveyed to the proposed Pond D. Basin E will be captured in roadside swales and conveyed to the proposed Pond E. Pond C and Pond E will discharge into Drainageway MS-06. Pond D will discharge into Drainageway WF-R7A.

See Table 3 below for proposed Filing 3 pond parameters.

Table 3: Pond Summary

Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	Total Detention Volume (ac-ft)	Provided Volume (ac-ft)	Maximum 100-Year Discharge (cfs)
C	POND C	96.84	0.737	3.064	4.235	41.2
D	POND D	78.02	0.673	3.026	3.127	60.9
E	POND E	18.37	0.086	0.419	0.424	9.2

Drainageway MS-06

Drainageway MS-06 was evaluated in its existing conditions as part of the Filing 2 report to analyze the existing flood plain and channel stability. The proposed improvements for the upper reach (5,300 FT) of this Filing 3 adjacent drainage way have been evaluated in this Filing 3 Drainage report. In

its current condition MS-06 is a heavily vegetated channel with weeds as tall as the typical flow depth, this would classify that channel as a channel not maintained with dense weeds as high as flow depth per the El Paso County Drainage Criteria Manual Table 10-2. Given this classification a Manning's roughness coefficient of 0.060 was used when analyzing the channel bottom and 0.045 on the sides which have less vegetation cover. The GeoHECRAS model determined that the existing channel has stable velocities ranging from 0.20 fps to 6.50 fps. These velocities are allowable based on the max stable velocity of 7 fps for erosion resistant channels, Per Table 8-1 from MHFCD. This table has been included in the appendix material. In the evaluated channel model, there are 7 instances where the Froude number exceeds the El Paso County minimum of 0.90. These are located in isolated 150' sections of the 5,300' reach, and no 2 consecutive sections exceed the maximum Froude number. These seven sections have small flow depths ranging from 6" to 23", therefore the actual risk presented by critical-supercritical flow in these areas is minor. Critical behavior with Fr near 1.0 for these abbreviated segments is not sustained in long enough stretches to achieve supercritical behavior with the accompanying lower velocities. In addition, many of the areas where the Manning's number is exceeded happen to be located at flow junctions.

Shear stresses present in the channel in its existing condition are approximately 0.75 lbs/sf on average, below the MHFCD Maximum Shear Stress of 1.2 lbs/sf per Table 8-3. In the proposed condition, the average shear stresses in the modeled sections is roughly 0.75 lbs/sf on average, though in two small sections of the channel, allow shear stress is exceeded. One of these locations is at a flow junction, while another is located at the outlet of the culvert running below San Isidro Trail. The culvert outlet is designed with Type-H riprap which will prevent soil erosion, and shear stress drops considerably at the next modeled section, which is also lined with Type H riprap. Both of the areas where maximum shear stress is exceeded are isolated, and not sustained for a long stretch within the reach. A table showing shear stresses within the channel can be found in Appendix E.

Table 4: Channel Design Parameters

Design Parameter	Erosive Soils or Poor Vegetation	Erosion Resistant Soils and Vegetation
Max Low-flow Velocity (ft/sec)	3.5 ft/sec	5.0 ft/sec
Max 100-year Velocity (ft/sec)	5.0 ft/sec	7.0 ft/sec
Froude No. Low-flow	0.5	0.7
Froude No. 100-year	0.6	0.9

As compared to the prior HECRAS model of MS-06 completed with the Haegler Ranch DBPS, this model differs with higher velocities and flow depths and a smaller top width of channel, see table 5 for a comparison on values between the models. These differences are most likely due to updated survey data for the topography of the channel that was used for the model completed with this report, showing a deeper channel than what was used in the Haegler Ranch DBPS. The analysis of the proposed conditions of Drainageway MS-06 shows that the majority of the channel is stable. Appendix E contains a No Rise Letter evaluating how the proposed channel improvements will not adversely affect the floodplain width and water surface elevation.

Table 5: Haegler Ranch Model Comparison

HEC RAS Model Comparison for MS-06 @ Judge Orr Road		
Values for 100yr Storm	Haegler Ranch DBPS	JR GeoHECRAS Model
Channel Velocity (ft/s)	3.48	8.46
Water Surface Depth in Channel (ft)	1.35	3.70
Top Width (ft)	539.34	329.3
Shear Stress (lb/sq ft)	N/A	1.67

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

Storm drainage analysis and design criteria for the project were taken from the "*City of Colorado Spring/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual"* Volumes 1 - 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual (CCSDCM), dated May 2014, as adopted by El Paso County.

Hydrologic Criteria

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Rational Method calculations were prepared, in accordance with Section 13.3.2.1. of the CCSDCM, for the sub-basins that directly impact the sizing of ditches and local street culverts. Rational method calculations are presented in Appendix B.

Urban Drainage and Flood Control District's UD-Detention, Version 4.04 workbook was used for pond sizing. Required detention volumes and allowable release rates were designed per USDCM and CCS/EPCDCM. Pond sizing spreadsheets are presented in Appendix D.

Hydraulic Criteria

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) was used for roadside ditch design. Ditches were checked for velocity and capacity per the CCS/EPCDCM Section 12.3.2.2. In order to check both capacity and velocity, a cross section analysis was performed on the roadside swales using the basin's maximum runoff Q and the proposed uniform slope of the swale. Swale cross sections have been presented in Appendix C.

CivilGeo HECRAS was used for local road crossing culvert design. Culvert size was determined based on 100-year flows and hydraulic criteria from EPCDCM Chapter 9 –Culvert Design. All local road crossing culvert design reports are presented in Appendix C.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed Filing 3 runoff to one of three full spectrum detention ponds via roadside ditches and local street culverts. These full spectrum ponds were designed to release at less than historic rates to minimize adverse impacts downstream.

Improvements to Drainageway MS-06 are proposed within the Saddlehorn Filing 3 improvements. A no rise study has been conducted on the proposed Drainageway MS-06 improvements to ensure no rises to the floodplain occur as a result of the Filing 3 development. All proposed drainageway improvements, including the San Isidro culvert crossing and channel sections can be found in Appendix E. All improvements aforementioned to Drainageway WF-R7A are proposed with the Saddlehorn Filing 4 improvements. Outfall protection from Pond D is the only improvement to Drainageway WF-R7A proposed with the Filing 3 improvements. The remaining improvements to Drainageway MS-06 shall be implemented with the Filing 5 improvements.

Specific Details

Four Step Process to Minimize Adverse Impacts of Urbanization

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes, stabilizing drainageways, treating the water quality capture volume (WQCV), and consider the need for Industrial Commercial BMP's.

Step 1, Reducing Runoff Volumes: The development of the project site is proposed single family residential lots (2.5 ac. min.) with open spaces and lawn areas interspersed within the development which helps disconnect impervious areas and reduce runoff volumes. Roadways utilize soil riprap lined roadside ditches further disconnecting impervious areas. These practices will also allow for increased infiltration and reduce runoff volume.

Step 2, Stabilize Drainageways: Filing 3 utilizes roadside ditches with culvert crossings throughout. These roadside ditches direct the on-site development flows to the proposed detention ponds within the project that releases at or below historic rates into Drainageways MS-06 and WF-R7A. Based upon the proposed reduction in released flows compared to the pre-developed flows, due to over detaining of flows in the onsite ponds, no impacts to downstream Drainageway MS-06 or Drainageway WF-R7A are anticipated, as the total flows present in the channel will be reduced compared to its current stable conditions.

Step 3, Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV in a full spectrum water quality and detention ponds that are designed per current El Paso County drainage criteria.

Step 4 Consider the need for Industrial and Commercial BMP's: No industrial or commercial uses are proposed within this development. However, a site specific storm water quality and erosion control plan and narrative are prepared in conjunction with this report. Site specific temporary source control BMPs as well as permanent BMP's are detailed in this plan and narrative to protect receiving waters.

Water Quality

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full spectrum water quality and detention are provided for all developed basins. Outlet structure release rates are limited to less than historic rates to minimize adverse impacts to downstream stormwater facilities. Complete pond and outlet structure designs are presented in Appendix D.

Erosion Control Plan

The El Paso County Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate must be submitted with each Final Drainage Report. The Erosion Control Plans for Filing 3 have been submitted concurrently with this report.

Operation & Maintenance

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. All proposed drainage structures within the any platted County ROW will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts will be owned and maintained by the Saddlehorn Ranch Metropolitan District. Vegetation in the natural and improved portions of Drainageway MS-06 with the Filing 3 improvements is the responsibility of Saddlehorn Ranch Metropolitan District. This includes all mowing, seeding and weed control activities. An Inspection & Maintenance Plan is submitted concurrently with this drainage report that details the required maintenance activities and intervals to ensure proper function of all stormwater infrastructure in the future.

Drainage and Bridge Fees

Drainage and Bridge Fees are due at time of final platting. An estimate of basin fees for the proposed development within Haegler Ranch drainage basin is provided below. Fee reduction for low density lots are applied to the overall basin fees in the next section. Additionally, reimbursable expenses are detailed below.

Total Filing 3 Platted Acres: 175.98 ac
Total Filing 3 Open Space Area: 38.77 ac
Total Filing 3 Impervious Acres = 13.72 ac ((175.98-38.77) ac x 10%)

Filing 3 Fee Totals (Prior to Reductions):

Bridge Fees
$ 1,916/ac x 13.72 ac = $26,288

Drainage Fees
$12,985/ac x 13.72 ac = $178,154

Filing 3 Drainage Fee Reduction: 25% Reduction for Low Density Lots: $178,154 x 25% = $44,539

Filing 3 Fee Totals (After Reductions):

Bridge Fees
$ 1,640/ac x 13.72 ac = $22,501

Drainage Fees
$178,154 - $44,539 = $133,615

Construction Cost Opinion

Cost opinion has been presented in Appendix A.

SUMMARY

The proposed development remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements, including ditches, culverts, detention ponds and drainage channel improvements. The proposed development will not adversely affect the offsite major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site and is in accordance with the PDR/MDDP for Saddlehorn Ranch.

REFERENCES:

1. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.

2. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.

3. Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch, JR Engineering, May 2020.

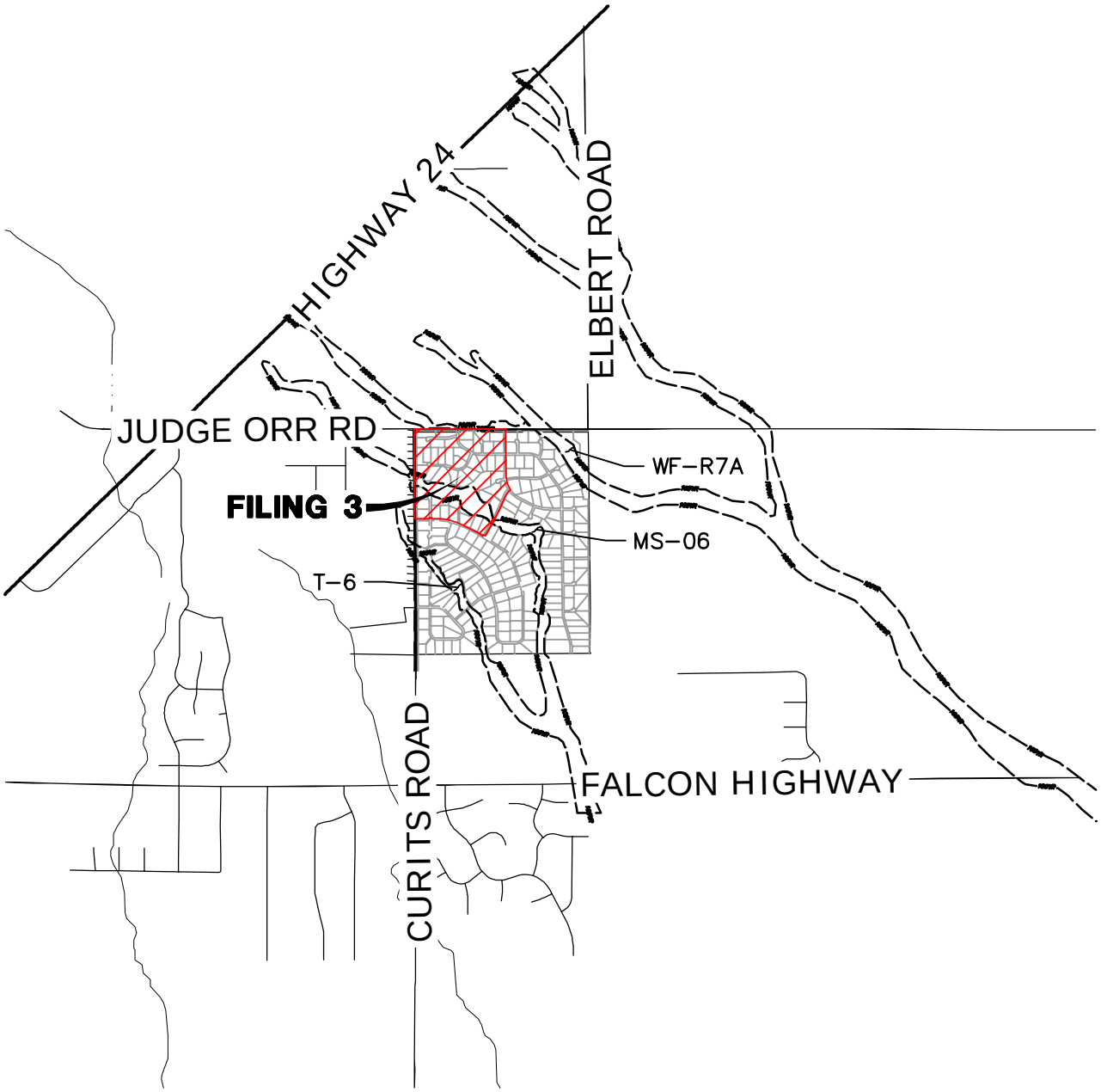
4. Haegler Ranch Drainage Basin Planning Study, URS Corporation, May 2009.

5. The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR, Federal Emergency Management Agency, October 20, 2004.

6. Final Drainage Report for Saddlehorn Ranch – Filing 2, JR Engineering, January 4, 2022

APPENDIX A

FIGURES AND EXHIBITS



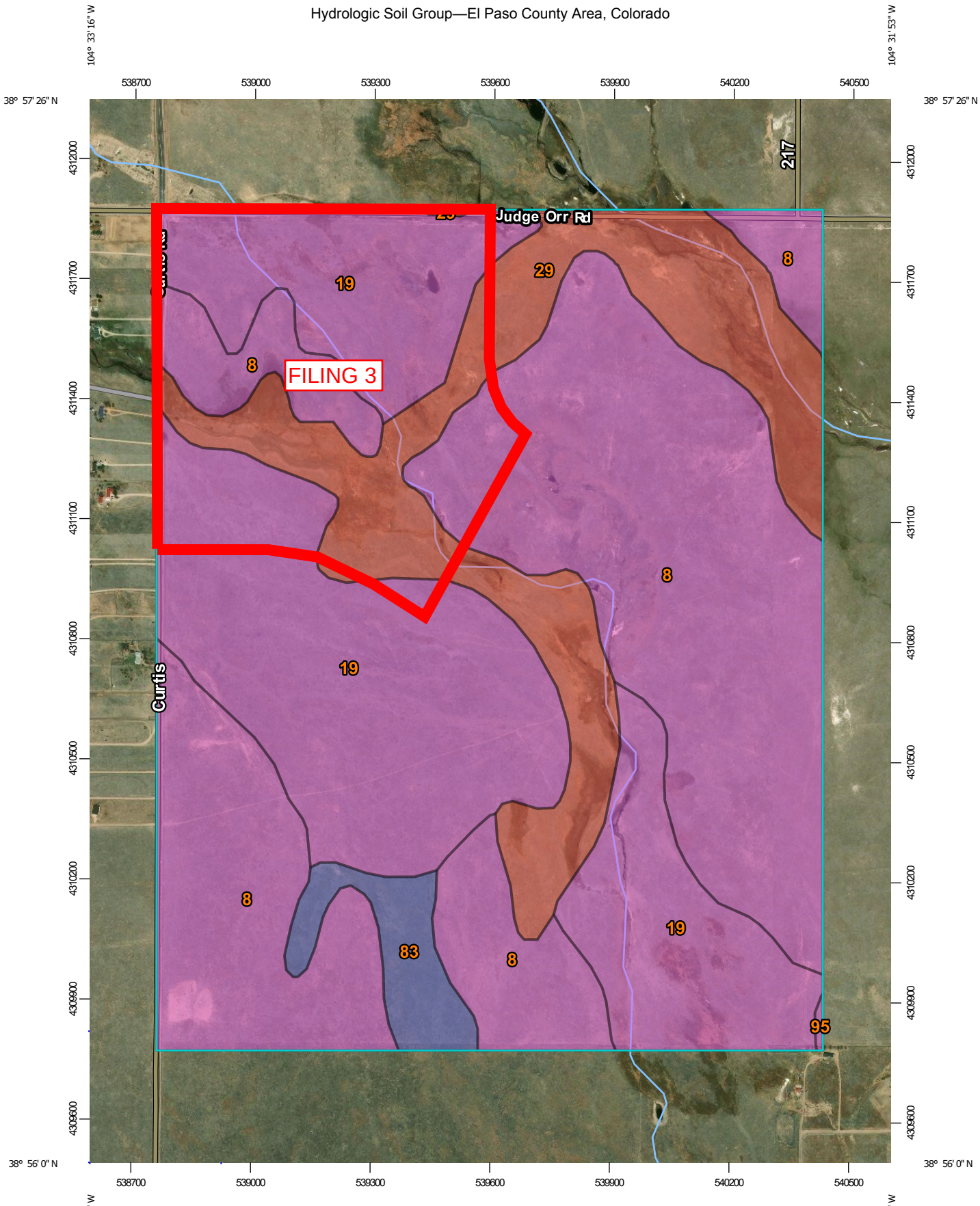
5000 2500 0 5000 10000

ORIGINAL SCALE: 1" = 5000'

VICINITY MAP
SADDLEHORN RANCH FILING 3
25142.05
12/6/21
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com



Map Scale: 1:13,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 16, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2016—Aug 17, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	388.3	44.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	307.3	35.3%
29	Fluvaquentic Haplaquolls, nearly level	D	150.0	17.2%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	24.6	2.8%
95	Truckton loamy sand, 1 to 9 percent slopes	A	0.6	0.1%
Totals for Area of Interest			**870.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

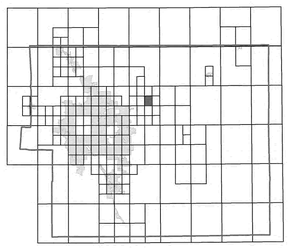
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

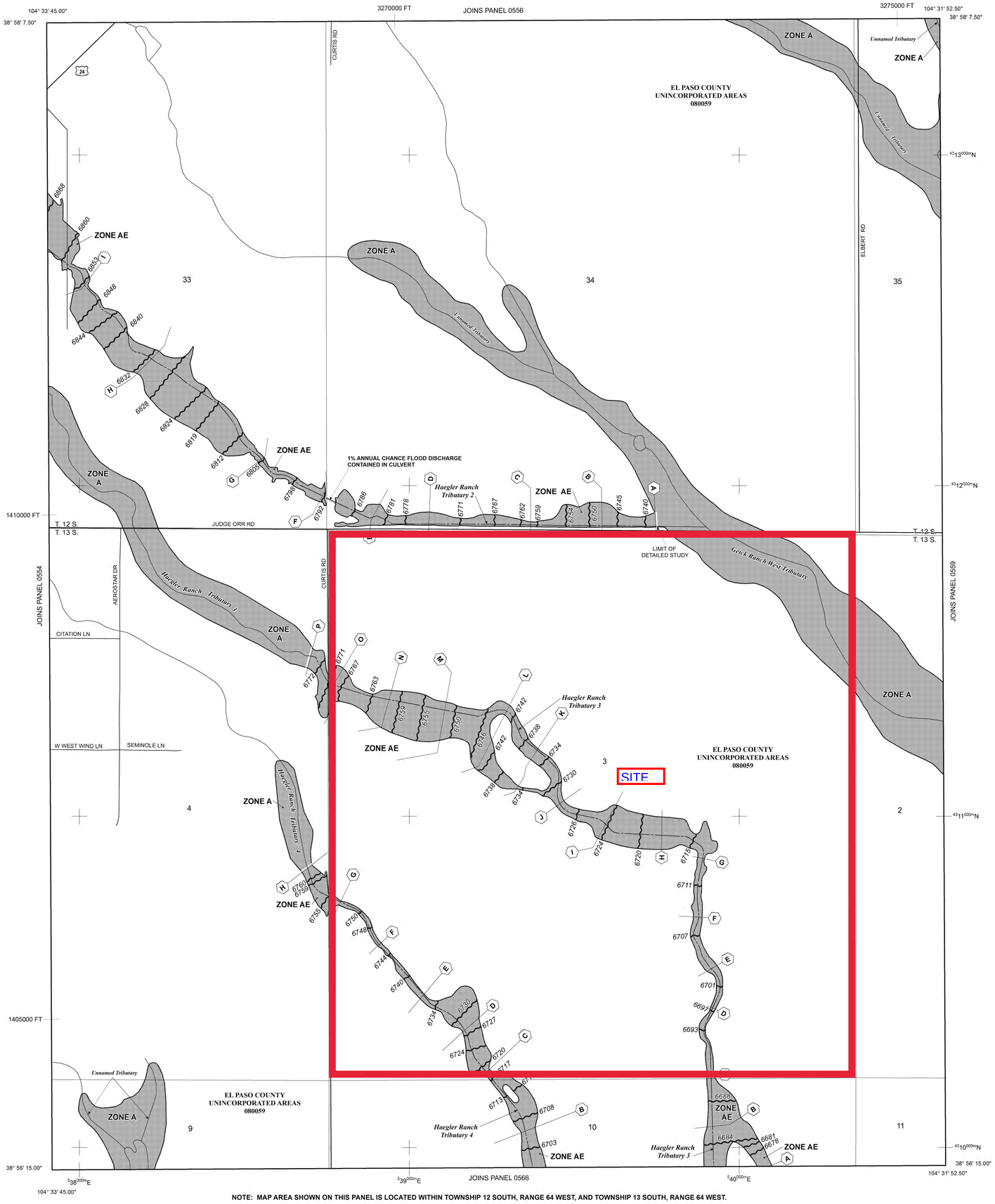
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 64 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0558G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 558 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0558	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0558G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

2023 Financial Assurance Estimate Form
(with pre-plat construction)

Updated: 12/8/2022

PROJECT INFORMATION		
Saddlehorn Filing 3	4/13/2023	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	(with Pre-Plat Construction) Remaining
SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)							
Earthwork							
less than 1,000; $5,300 min		CY	$ 8.00	=	$ -		$ -
1,000-5,000; $8,000 min		CY	$ 6.00	=	$ -		$ -
5,001-20,000; $30,000 min		CY	$ 5.00	=	$ -		$ -
20,001-50,000; $100,000 min		CY	$ 3.50	=	$ -		$ -
50,001-200,000; $175,000 min	147,182	CY	$ 2.50	=	$ 367,955.00		$ 367,955.00
greater than 200,000; $500,000 min		CY	$ 2.00	=	$ -		$ -
Permanent Erosion Control Blanket	11,656.00	SY	$ 8.00	=	$ 93,248.00		$ 93,248.00
Permanent Seeding (inc. noxious weed mgmnt.) & Mulching	26.00	AC	$ 1,875.00	=	$ 48,750.00		$ 48,750.00
Permanent Pond/BMP (provide engineer's estimate)	1	EA	$ 398,297	=	$ 398,297.00		$ 398,297.00
Concrete Washout Basin	1	EA	$ 1,089.00	=	$ 1,089.00		$ 1,089.00
Inlet Protection	19	EA	$ 202.00	=	$ 3,838.00		$ 3,838.00
Outlet Protection	19	EA	$ 202.00	=	$ 3,838.00		$ 3,838.00
Rock Check Dam	107	EA	$ 605.00	=	$ 64,735.00		$ 64,735.00
Safety Fence	11,960	LF	$ 3.00	=	$ 35,880.00		$ 35,880.00
Sediment Basin	3	EA	$ 2,132.00	=	$ 6,396.00		$ 6,396.00
Sediment Trap		EA	$ 500.00	=	$ -		$ -
Silt Fence	22,874	LF	$ 3.00	=	$ 68,622.00		$ 68,622.00
Slope Drain	266	LF	$ 40.00		$ 10,640.00		$ 10,640.00
Straw Bale		EA	$ 31.00	=	$ -		$ -
Straw Wattle/Rock Sock	1,640	LF	$ 7.00	=	$ 11,480.00		$ 11,480.00
Surface Roughening		AC	$ 250.00		$ -		$ -
Temporary Erosion Control Blanket	62,284	SY	$ 3.00	=	$ 186,852.00		$ 186,852.00
Temporary Seeding and Mulching		AC	$ 1,666.00	=	$ -		$ -
Vehicle Tracking Control	4	EA	$ 2,867.00	=	$ 11,468.00		$ 11,468.00
*Gravel Maintenance Access Road	3,486	SY	$ 50.00	=	$ 174,300.00		$ 174,300.00
[insert items not listed but part of construction plans]				=	$ -		$ -
MAINTENANCE (35% of Construction BMPs)				=	$ 202,317.15		$ 202,317.15
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)			**Section 1 Subtotal**	=	$ 1,689,705.15		$ 1,689,705.15
SECTION 2 - PUBLIC IMPROVEMENTS *							
ROADWAY IMPROVEMENTS							
Construction Traffic Control	1.0	LS	$ 50,000.00	=	$ 50,000.00		$ 50,000.00
Removal of Asphalt (Full Depth)	515	SY	$ 10.00		$ 5,150.00		$ 5,150.00
Removal of Asphalt (Planing-2")	2,354	SY	$ 5.00		$ 11,770.00		$ 11,770.00
Removal of Striping	3,117	LF	$ 1.00		$ 3,117.00		$ 3,117.00
Removal of Fencing	3,021	LF	$ 5.00		$ 15,105.00		$ 15,105.00
Aggregate Base Course (135 lbs/cf)	2,086.0	Tons	$ 34.00	=	$ 70,924.00		$ 70,924.00
Aggregate Base Course (135 lbs/cf)		CY	$ 61.00		$ -		$ -
Asphalt Pavement (3" thick)		SY	$ 17.00		$ -		$ -
Asphalt Pavement (4" thick)		SY	$ 23.00		$ -		$ -
Asphalt Pavement (6" thick)		SY	$ 35.00		$ -		$ -
Asphalt Pavement (147 lbs/cf) 7" thick	23,267.0	Tons	$ 106.00	=	$ 2,466,302.00		$ 2,466,302.00
Raised Median, Paved		SF	$ 10.00	=	$ -		$ -
Regulatory Sign/Advisory Sign	25	EA	$ 364.00	=	$ 9,100.00		$ 9,100.00
Guide/Street Name Sign	22	EA	$ 250.00	=	$ 5,500.00		$ 5,500.00
Epoxy Pavement Marking	9,005	SF	$ 16.00	=	$ 144,080.00		$ 144,080.00
Thermoplastic Pavement Marking	289	SF	$ 28.00	=	$ 8,092.00		$ 8,092.00
Barricade - Type 3	3.0	EA	$ 241.00	=	$ 723.00		$ 723.00
Delineator - Type I		EA	$ 29.00	=	$ -		$ -
Curb and Gutter, Type A (6" Vertical)		LF	$ 35.00	=	$ -		$ -
Curb and Gutter, Type B (Median)		LF	$ 35.00	=	$ -		$ -
Curb and Gutter, Type C (Ramp)		LF	$ 35.00	=	$ -		$ -
4" Sidewalk (common areas only)		SY	$ 58.00	=	$ -		$ -
5" Sidewalk		SY	$ 72.00	=	$ -		$ -
6" Sidewalk		SY	$ 87.00	=	$ -		$ -
8" Sidewalk		SY	$ 116.00		$ -		$ -
Pedestrian Ramp		EA	$ 1,390.00	=	$ -		$ -
Cross Pan, local (8" thick, 6' wide to include return)		LF	$ 73.00	=	$ -		$ -
Cross Pan, collector (9" thick, 8' wide to include return)		LF	$ 111.00		$ -		$ -
Curb Opening with Drainage Chase		EA	$ 1,790.00	=	$ -		$ -
Guardrail Type 3 (W-Beam)		LF	$ 60.00	=	$ -		$ -
Guardrail Type 7 (Concrete)		LF	$ 87.00	=	$ -		$ -
Guardrail End Anchorage		EA	$ 2,538.00	=	$ -		$ -
Guardrail Impact Attenuator		EA	$ 4,556.00	=	$ -		$ -
Sound Barrier Fence (CMU block, 6' high)		LF	$ 95.00		$ -		$ -
Sound Barrier Fence (panels, 6' high)		LF	$ 97.00	=	$ -		$ -
Electrical Conduit, Size =		LF	$ 20.00	=	$ -		$ -
Traffic Signal, (provide engineer's estimate)		EA		=	$ -		$ -

PROJECT INFORMATION		
Saddlehorn Filing 3	4/13/2023	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	(with Pre-Plat Construction) Remaining
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
STORM DRAIN IMPROVEMENTS							
Concrete Box Culvert (M Standard), Size (W x H)		LF		=	$ -		$ -
18" Reinforced Concrete Pipe	443	LF	$ 76.00	=	$ 33,668.00		$ 33,668.00
24" Reinforced Concrete Pipe	226	LF	$ 91.00	=	$ 20,566.00		$ 20,566.00
30" Reinforced Concrete Pipe	99	LF	$ 114.00	=	$ 11,286.00		$ 11,286.00
36" Reinforced Concrete Pipe	38	LF	$ 140.00	=	$ 5,320.00		$ 5,320.00
42" Reinforced Concrete Pipe		LF	$ 187.00	=	$ -		$ -
48" Reinforced Concrete Pipe		LF	$ 228.00	=	$ -		$ -
54" Reinforced Concrete Pipe		LF	$ 297.00	=	$ -		$ -
60" Reinforced Concrete Pipe		LF	$ 348.00	=	$ -		$ -
66" Reinforced Concrete Pipe		LF	$ 402.00	=	$ -		$ -
14" x 23" HERCP	36	LF	$ 76.00	=	$ 2,736.00		$ 2,736.00
19" x 30" HERCP	190	LF	$ 100.00	=	$ 19,000.00		$ 19,000.00
12' x 4' RCBC	160	LF	$ 1,100.00	=	$ 176,000.00		$ 176,000.00
18" Corrugated Steel Pipe		LF	$ 98.00	=	$ -		$ -
24" Corrugated Steel Pipe	7	LF	$ 112.00	=	$ 784.00		$ 784.00
30" Corrugated Steel Pipe		LF	$ 143.00	=	$ -		$ -
36" Corrugated Steel Pipe		LF	$ 171.00	=	$ -		$ -
42" Corrugated Steel Pipe		LF	$ 197.00	=	$ -		$ -
48" Corrugated Steel Pipe		LF	$ 207.00	=	$ -		$ -
54" Corrugated Steel Pipe		LF	$ 304.00	=	$ -		$ -
60" Corrugated Steel Pipe		LF	$ 328.00	=	$ -		$ -
66" Corrugated Steel Pipe		LF	$ 397.00	=	$ -		$ -
72" Corrugated Steel Pipe		LF	$ 467.00	=	$ -		$ -
78" Corrugated Steel Pipe		LF	$ 537.00	=	$ -		$ -
84" Corrugated Steel Pipe		LF	$ 642.00	=	$ -		$ -
Flared End Section (FES) RCP Size = 18" RCP (unit cost = 6x pipe unit cost)	16	EA	$ 402.00	=	$ 6,432.00		$ 6,432.00
Flared End Section (FES) CSP Size = 24" RCP (unit cost = 6x pipe unit cost)	10	EA	$ 486.00	=	$ 4,860.00		$ 4,860.00
Flared End Section (FES) CSP Size = 30" RCP (unit cost = 6x pipe unit cost)	5	EA	$ 600.00	=	$ 3,000.00		$ 3,000.00
Flared End Section (FES) CSP Size = 19" X 30" HERCP (unit cost = 6x pipe unit cost)	4	EA	$ 100.00	=	$ 400.00		$ 400.00
End Treatment- Headwall	2	EA	$ 10,000.00	=	$ 20,000.00		$ 20,000.00
End Treatment- Wingwall		EA		=	$ -		$ -
End Treatment - Cutoff Wall		EA		=	$ -		$ -
Curb Inlet (Type R) L=5', Depth < 5'		EA	$ 6,703.00	=	$ -		$ -
Curb Inlet (Type R) L=5', 5' ≤ Depth < 10'		EA	$ 8,715.00	=	$ -		$ -
Curb Inlet (Type R) L =5', 10' ≤ Depth < 15'		EA	$ 10,092.00	=	$ -		$ -
Curb Inlet (Type R) L =10', Depth < 5'		EA	$ 9,224.00	=	$ -		$ -
Curb Inlet (Type R) L =10', 5' ≤ Depth < 10'		EA	$ 9,507.00	=	$ -		$ -
Curb Inlet (Type R) L =10', 10' ≤ Depth < 15'		EA	$ 11,901.00	=	$ -		$ -
Curb Inlet (Type R) L =15', Depth < 5'		EA	$ 11,995.00	=	$ -		$ -
Curb Inlet (Type R) L =15', 5' ≤ Depth < 10'		EA	$ 12,858.00	=	$ -		$ -
Curb Inlet (Type R) L =15', 10' ≤ Depth < 15'		EA	$ 14,061.00	=	$ -		$ -
Curb Inlet (Type R) L =20', Depth < 5'		EA	$ 12,783.00	=	$ -		$ -
Curb Inlet (Type R) L =20', 5' ≤ Depth < 10'		EA	$ 14,109.00	=	$ -		$ -
Grated Inlet (Type C), Depth < 5'		EA	$ 5,611.00	=	$ -		$ -
Grated Inlet (Type D), Depth < 5'		EA	$ 6,931.00	=	$ -		$ -
Storm Sewer Manhole, Box Base		EA	$ 14,061.00	=	$ -		$ -
Storm Sewer Manhole, Slab Base		EA	$ 7,734.00	=	$ -		$ -
Geotextile (Erosion Control)		SY	$ 8.00	=	$ -		$ -
Rip Rap, d50 size from 6" to 24"	1,402.0	Tons	$ 97.00	=	$ 135,994.00		$ 135,994.00
Rip Rap, Grouted		Tons	$ 115.00	=	$ -		$ -
Drainage Channel Construction, Size (W x H)		LF	$ -	=	$ -		$ -
Drainage Channel Lining, Concrete		CY	$ 689.00	=	$ -		$ -
Drainage Channel Lining, Rip Rap		CY	$ 135.00	=	$ -		$ -
Drainage Channel Lining, Grass		AC	$ 1,776.00	=	$ -		$ -
Drainage Channel Lining, Other Stabilization				=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 2 Subtotal**		=	$ 3,229,909.00		$ 3,229,909.00

PROJECT INFORMATION		
Saddlehorn Filing 3	4/13/2023	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining
SECTION 3 - COMMON DEVELOPMENT IMPROVEMENTS (Private or District and NOT Maintained by EPC)**							
ROADWAY IMPROVEMENTS							
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
STORM DRAIN IMPROVEMENTS (Exception: Permanent Pond/BMP shall be itemized under Section 1)							
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
WATER SYSTEM IMPROVEMENTS							
Water Main Pipe (PVC), Size 6"	313	LF	$ 64.00	=	$ 20,032.00		$ 20,032.00
Water Main Pipe (PVC), Size 8"	10,279	LF	$ 78.00	=	$ 801,762.00		$ 801,762.00
Water Main Pipe (Ductile Iron), Size 8"		LF	$ 91.00	=	$ -		$ -
Gate Valves, 8"	35	EA	$ 2,247.00	=	$ 78,645.00		$ 78,645.00
Fire Hydrant Assembly, w/ all valves	24	EA	$ 7,978.00	=	$ 191,472.00		$ 191,472.00
Water Service Line Installation, inc. tap and valves	44	EA	$ 1,601.00	=	$ 70,444.00		$ 70,444.00
Fire Cistern Installation, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
SANITARY SEWER IMPROVEMENTS							
Sewer Main Pipe (PVC), Size 8"		LF	$ 78.00	=	$ -		$ -
Sanitary Sewer Manhole, Depth < 15 feet		EA	$ 5,305.00	=	$ -		$ -
Sanitary Service Line Installation, complete		EA	$ 1,696.00	=	$ -		$ -
Sanitary Sewer Lift Station, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
LANDSCAPING IMPROVEMENTS (For subdivision specific condition of approval, or PUD)							
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
** - Section 3 is not subject to defect warranty requirements		**Section 3 Subtotal**		=	$ 1,162,355.00		$ 1,162,355.00

PROJECT INFORMATION		
Saddlehorn Filing 3	4/13/2023	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	(with Pre-Plat Construction) Remaining
LETTERS OF MAP REVISION		LS	$ 38,000.00	=	$ 38,000.00		$ 38,000.00
AS-BUILT PLANS (Public Improvements inc. Permanent WQCV BMPs)		LS	$ 15,000.00	=	$ 15,000.00		$ 15,000.00
POND/BMP CERTIFICATION (inc. elevations and volume calculations)		LS	$ 15,000.00	=	$ 15,000.00		$ 15,000.00

Total Construction Financial Assurance $ 6,149,969.15

(Sum of all section subtotals plus as-builts and pond/BMP certification)

Total Remaining Construction Financial Assurance (with Pre-Plat Construction) $ 6,111,969.15

(Sum of all section totals less credit for items complete plus as-builts and pond/BMP certification)

Total Defect Warranty Financial Assurance $ 827,631.80

(20% of all items identified as (*). To be collateralized at time of preliminary acceptance)

Approvals

I hereby certify that this is an accurate and complete estimate of costs for the work as shown on the Grading and Erosion Control Plan and Construction Drawings associated with the Project.

Engineer (P.E. Seal Required)

Approved by Owner / Applicant — Date

Approved by El Paso County Engineer / ECM Administrator — Date

APPENDIX B

HYDROLOGIC CALCULATIONS

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

Basin ID	Total Area (ac)	Paved Roads			2.5 Acre Rural Lots			Lawns			Church Site			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
C1	6.04	45%	1.07	8.0%	6.2%	4.97	5.1%	2%	0.00	0.0%	35%	0.00	0.0%	13.1%
C2	3.35	45%	1.50	20.1%	6.2%	1.85	3.4%	2%	0.00	0.0%	35%	0.00	0.0%	23.6%
C3	23.44	45%	1.63	3.1%	6.2%	21.81	5.8%	2%	0.00	0.0%	35%	0.00	0.0%	8.9%
C4	10.94	45%	3.40	14.0%	6.2%	7.54	4.3%	2%	0.00	0.0%	35%	0.00	0.0%	18.3%
C5	2.35	45%	0.83	15.9%	6.2%	1.52	4.0%	2%	0.00	0.0%	35%	0.00	0.0%	19.9%
C6	3.95	45%	1.59	18.1%	6.2%	2.36	3.7%	2%	0.00	0.0%	35%	0.00	0.0%	21.8%
C7	2.14	45%	1.00	21.0%	6.2%	1.14	3.3%	2%	0.00	0.0%	35%	0.00	0.0%	24.3%
C8	22.55	45%	2.21	4.4%	6.2%	20.34	5.6%	2%	0.00	0.0%	35%	0.00	0.0%	10.0%
C9	2.63	45%	1.98	33.9%	6.2%	0.65	1.5%	2%	0.00	0.0%	35%	0.00	0.0%	35.4%
C10	16.38	45%	2.47	6.8%	6.2%	11.85	4.5%	2%	2.06	0.3%	35%	0.00	0.0%	11.5%
D1	9.11	45%	1.53	7.6%	6.2%	2.70	1.8%	2%	0.00	0.0%	35%	4.88	18.7%	28.1%
D2	8.49	45%	1.49	7.9%	6.2%	7.00	5.1%	2%	0.00	0.0%	35%	0.00	0.0%	13.0%
D3	3.21	45%	0.19	2.7%	6.2%	3.02	5.8%	2%	0.00	0.0%	35%	0.00	0.0%	8.5%
D4	10.01	45%	0.35	1.6%	6.2%	8.21	5.1%	2%	1.45	0.3%	35%	0.00	0.0%	6.9%
D5	9.56	45%	2.78	13.1%	6.2%	6.78	4.4%	2%	0.00	0.0%	35%	0.00	0.0%	17.5%
D6	0.34	45%	0.34	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
D7	33.94	45%	7.65	10.1%	6.2%	24.05	4.4%	2%	2.24	0.1%	35%	0.00	0.0%	14.7%
E1	17.12	45%	0.71	1.9%	6.2%	13.22	4.8%	2%	3.19	0.4%	35%	0.00	0.0%	7.0%
E2	0.37	45%	0.37	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
E3	0.20	45%	0.20	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
E4	0.68	45%	0.00	0.0%	6.2%	0.19	1.7%	2%	0.49	1.4%	35%	0.00	0.0%	3.2%
UD1	7.48	45%	0.00	0.0%	6.2%	7.48	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
UD2	9.17	45%	0.00	0.0%	6.2%	9.17	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
UD3	2.23	45%	0.00	0.0%	6.2%	2.23	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
UD4	34.90	45%	0.00	0.0%	6.2%	0.00	0.0%	2%	34.90	2.0%	35%	0.00	0.0%	2.0%
UD5	17.63	45%	0.00	0.0%	6.2%	17.63	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
OS1	2.37	100%	1.35	57.0%	6.2%	0.00	0.0%	2%	1.02	0.9%	35%	0.00	0.0%	57.8%
OS2	0.70	100%	0.21	30.0%	6.2%	0.00	0.0%	2%	0.49	1.4%	35%	0.00	0.0%	31.4%
OS3	2.28	100%	1.35	59.2%	6.2%	0.00	0.0%	2%	0.93	0.8%	35%	0.00	0.0%	60.0%
OS4	1.08	100%	0.58	53.7%	6.2%	0.00	0.0%	2%	0.50	0.9%	35%	0.00	0.0%	54.6%
OS5	2.92	100%	0.59	20.2%	6.2%	0.94	2.0%	2%	1.39	1.0%	35%	0.00	0.0%	23.2%
F1	1.35	100%	0.53	39.3%	6.2%	0.00	0.0%	2%	0.82	1.2%	35%	0.00	0.0%	40.5%
F2	7.67	45%	0.98	5.7%	6.2%	6.69	5.4%	2%	0.00	0.0%	35%	0.00	0.0%	11.2%
F3	5.44	45%	2.37	19.6%	6.2%	3.07	3.5%	2%	3.07	1.1%	35%	0.00	0.0%	24.2%
F4	2.93	45%	2.93	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
TOTAL	**284.95**													**12.9%**

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.29	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.43	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

2.5 Acre Rural Lots - Comp. % Impervious Calculation

Total Area (ac)	Area (ac) - Roofs (90%)	Area (ac)- Drives (100%)	Area (ac) - Lawns (2%)
2.50	0.068	0.046	2.39
Comp % Imperviousness	**6.20%**		

Roads w/ Roadside Ditches - Comp. % Impervious Calculation

Area* (ac)	Area - Ditch (5%)	Area - Roads (100%)
0.2124	0.1320	0.0804
Comp % Imperviousness	**0.41**	

*Area based on 250 LF roadway from CL to outside edge of roadside ditch

The above conservatively rounded to 45%.

Church Site - Comp. % Impervious Calculation

Total Area (ac)	Area (ac) - Roofs (90%)	Area (ac)- Paved (100%)	Area (ac) - Gravel (80%)	Area (ac) - Lawns (2%)
4.88	0.30	1.01	0.22	3.35
Comp % Imperviousness	**31.21%**			

*Area based on Church site comprising of lot 38 and lot 39

The above conservatively rounded to 35%.

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

bdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

Basin ID	Total Area (ac)	Basins Total Weighted % Imp.	Hydrologic Soil Group			Hydrologic Soil Group			Minor Coefficients			Major Coefficients			Basins Total Weighted C_5	Basins Total Weighted C_{100}
			Area A (ac)	Area B (ac)	Area C/D (ac)	% A (ac)	% B (ac)	% C/D (ac)	$C_{5,A}$	$C_{5,B}$	$C_{5,C/D}$	$C_{100,A}$	$C_{100,B}$	$C_{100,C/D}$		
C1	6.04	13.1%	6.04	0.00	0.00	100%	0%	0%	0.06	0.09	0.14	0.21	0.49	0.54	0.06	0.21
C2	3.35	23.6%	3.35	0.00	0.00	100%	0%	0%	0.14	0.18	0.23	0.29	0.54	0.58	0.14	0.29
C3	23.44	8.9%	23.44	0.00	0.00	100%	0%	0%	0.04	0.06	0.11	0.18	0.47	0.52	0.04	0.18
C4	10.94	18.3%	5.12	0.00	5.82	47%	0%	53%	0.10	0.14	0.19	0.25	0.51	0.56	0.14	0.42
C5	2.35	19.9%	2.35	0.00	0.00	100%	0%	0%	0.11	0.15	0.20	0.26	0.52	0.57	0.11	0.26
C6	3.95	21.8%	3.95	0.00	0.00	100%	0%	0%	0.12	0.16	0.21	0.28	0.53	0.57	0.12	0.28
C7	2.14	24.3%	1.55	0.00	0.59	72%	0%	28%	0.14	0.19	0.23	0.30	0.54	0.58	0.17	0.38
C8	22.55	10.0%	22.55	0.00	0.00	100%	0%	0%	0.05	0.07	0.12	0.19	0.47	0.52	0.05	0.19
C9	2.63	35.4%	2.63	0.00	0.00	100%	0%	0%	0.23	0.28	0.32	0.39	0.59	0.63	0.23	0.39
C10	16.38	11.5%	16.38	0.00	0.00	100%	0%	0%	0.05	0.08	0.13	0.20	0.48	0.53	0.05	0.20
D1	9.11	28.1%	9.11	0.00	0.00	100%	0%	0%	0.17	0.22	0.27	0.33	0.56	0.60	0.17	0.33
D2	8.49	13.0%	7.40	0.00	1.09	87%	0%	13%	0.06	0.09	0.14	0.21	0.49	0.54	0.07	0.25
D3	3.21	8.5%	3.21	0.00	0.00	100%	0%	0%	0.04	0.06	0.10	0.18	0.47	0.52	0.04	0.18
D4	10.01	6.9%	3.16	0.00	6.85	32%	0%	68%	0.03	0.05	0.09	0.16	0.46	0.51	0.07	0.40
D5	9.56	17.5%	3.76	0.00	5.80	39%	0%	61%	0.09	0.13	0.18	0.25	0.51	0.56	0.14	0.43
D6	0.34	45.0%	0.17	0.00	0.17	50%	0%	50%	0.31	0.36	0.40	0.46	0.64	0.67	0.36	0.57
D7	33.94	14.7%	24.82	0.00	9.12	73%	0%	27%	0.07	0.11	0.16	0.22	0.50	0.54	0.10	0.31
E1	17.12	7.0%	14.17	0.00	2.95	83%	0%	17%	0.03	0.05	0.09	0.17	0.46	0.51	0.04	0.22
E2	0.37	45.0%	0.37	0.00	0.00	100%	0%	0%	0.31	0.36	0.40	0.46	0.64	0.67	0.31	0.46
E3	0.20	45.0%	0.18	0.00	0.02	90%	0%	10%	0.31	0.36	0.40	0.46	0.64	0.67	0.32	0.48
E4	0.68	3.2%	0.67	0.00	0.01	99%	0%	1%	0.01	0.02	0.06	0.14	0.44	0.50	0.01	0.14
UD1	7.48	6.2%	7.48	0.00	0.00	100%	0%	0%	0.03	0.04	0.09	0.16	0.46	0.51	0.03	0.16
UD2	9.17	6.2%	9.14	0.00	0.03	100%	0%	0%	0.03	0.04	0.09	0.16	0.46	0.51	0.03	0.16
UD3	2.23	6.2%	1.71	0.00	0.52	77%	0%	23%	0.03	0.04	0.09	0.16	0.46	0.51	0.04	0.24
UD4	34.90	2.0%	9.50	0.00	25.40	27%	0%	73%	0.01	0.01	0.05	0.13	0.44	0.49	0.04	0.39

UD5	17.63	6.2%	12.32	0.00	5.31	70%	0%	30%	0.03	0.04	0.09	0.16	0.46	0.51	0.04	0.26
OS1	2.37	57.8%	2.37	0.00	0.00	100%	0%	0%	0.43	0.47	0.51	0.56	0.70	0.72	0.43	0.56
OS2	0.70	31.4%	0.70	0.00	0.00	100%	0%	0%	0.20	0.24	0.29	0.35	0.57	0.61	0.20	0.35
OS3	2.28	60.0%	2.28	0.00	0.00	100%	0%	0%	0.45	0.49	0.53	0.58	0.71	0.73	0.45	0.58
OS4	1.08	54.6%	0.51	0.00	0.57	47%	0%	53%	0.40	0.44	0.48	0.54	0.68	0.71	0.44	0.63
OS5	2.92	23.2%	1.61	0.00	1.31	55%	0%	45%	0.13	0.17	0.22	0.29	0.54	0.58	0.17	0.42
F1	1.35	40.5%	1.35	0.00	0.00	100%	0%	0%	0.27	0.32	0.37	0.43	0.62	0.65	0.27	0.43
F2	7.67	11.2%	7.67	0.00	0.00	100%	0%	0%	0.05	0.08	0.13	0.20	0.48	0.53	0.05	0.20
F3	5.44	24.2%	2.00	0.00	3.44	37%	0%	63%	0.14	0.18	0.23	0.30	0.54	0.58	0.20	0.48
F4	2.93	45.0%	2.12	0.00	0.81	72%	0%	28%	0.31	0.36	0.40	0.46	0.64	0.67	0.34	0.52
TOTAL	**284.95**	**12.9%**	**215.14**	**0.00**	**69.81**	**76%**	**0%**	**24%**	**---**	**---**	**---**	**---**	**---**	**---**	**0.09**	**0.29**

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

Where:

i = % imperviousness (expressed as a decimal)

C_A = Runoff coefficient for Natural Resources Conservation Service (NRCS) HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

$C_{C/D}$ = Runoff coefficient for NRCS HSG C and D soils.

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
C1	6.04	A	13%	0.06	0.21	300	2.1%	25.4	940	1.0%	15.0	1.5	10.4	35.8	1240.0	38.2	35.8
C2	3.35	A	24%	0.14	0.29	155	1.9%	17.5	1661	1.8%	15.0	2.0	14.0	31.5	1816.0	39.0	31.5
C3	23.44	A	9%	0.04	0.18	268	2.5%	23.2	1620	1.0%	15.0	1.5	18.0	41.2	1888.0	50.8	41.2
C4	10.94	D	18%	0.14	0.42	26	33.0%	2.8	3375	1.0%	15.0	1.5	37.5	40.3	3401.0	71.6	40.3
C5	2.35	A	20%	0.11	0.26	300	2.7%	22.3	190	2.1%	15.0	2.2	1.5	23.8	490.0	24.5	23.8
C6	3.95	A	22%	0.12	0.28	97	1.4%	15.5	997	1.0%	15.0	1.5	11.1	26.6	1094.0	36.1	26.6
C7	2.14	A	24%	0.17	0.38	52	7.5%	6.2	689	1.0%	15.0	1.5	7.7	13.9	741.0	31.1	13.9
C8	22.55	A	10%	0.05	0.19	300	1.9%	26.7	630	1.0%	15.0	1.5	7.0	33.7	930.0	34.4	33.7
C9	2.63	A	35%	0.23	0.39	136	1.2%	17.2	1374	1.5%	15.0	1.8	12.5	29.6	1510.0	33.4	29.6
C10	16.38	A	12%	0.05	0.20	147	3.7%	14.9	1406	1.5%	15.0	1.8	12.8	27.6	1553.0	42.1	27.6
D1	9.11	A	28%	0.17	0.33	200	2.0%	18.9	930	1.9%	15.0	2.1	7.5	26.4	1130.0	29.9	26.4
D2	8.49	A	13%	0.07	0.25	300	2.7%	23.1	1095	1.1%	15.0	1.6	11.6	34.7	1395.0	39.9	34.7
D3	3.21	A	8%	0.04	0.18	100	1.0%	19.2	170	1.0%	15.0	1.5	1.9	21.1	270.0	27.3	21.1
D4	10.01	D	7%	0.07	0.40	300	1.8%	26.5	1201	1.0%	15.0	1.5	13.3	39.8	1501.0	44.9	39.8
D5	9.56	D	17%	0.14	0.43	266	2.3%	21.4	1463	1.0%	15.0	1.5	16.3	37.6	1729.0	44.3	37.6
D6	0.34	A	45%	0.36	0.57	46	8.0%	4.6	332	1.0%	15.0	1.5	3.7	8.3	378.0	22.0	8.3
D7	33.94	A	15%	0.10	0.31	300	3.9%	20.0	1645	1.0%	15.0	1.5	18.3	38.3	1945.0	48.3	38.3
E1	17.12	A	7%	0.04	0.22	300	1.3%	30.4	1486	1.3%	7.0	0.8	31.0	61.4	1786.0	46.6	46.6
E2	0.37	A	45%	0.31	0.46	24	9.7%	3.3	402	1.0%	15.0	1.5	4.5	7.8	426.0	22.7	7.8
E3	0.20	A	45%	0.32	0.48	24	9.7%	3.3	185	1.1%	15.0	1.6	2.0	5.2	209.0	20.3	5.2
E4	0.68	A	3%	0.01	0.14	95	3.3%	12.9	97	1.8%	7.0	0.9	1.7	14.6	192.0	26.7	14.6
UD1	7.48	A	6%	0.03	0.16	300	1.9%	27.2	683	1.8%	7.0	0.9	12.1	39.3	983.0	33.5	33.5
UD2	9.17	A	6%	0.03	0.16	300	1.8%	27.7	445	1.9%	7.0	1.0	7.7	35.4	745.0	30.4	30.4
UD3	2.23	A	6%	0.04	0.24	300	2.0%	26.4	171	2.0%	7.0	1.0	2.9	29.3	471.0	27.0	27.0
UD4	34.90	D	2%	0.04	0.39	300	1.1%	32.2	2602	1.7%	15.0	2.0	22.2	54.3	2902.0	61.5	54.3
UD5	17.63	A	6%	0.04	0.26	300	1.7%	27.7	1230	1.5%	7.0	0.9	23.9	51.6	1530.0	41.9	41.9
OS1	2.37	A	58%	0.43	0.56	59	2.0%	7.4	1216	1.1%	15.0	1.6	12.9	20.3	1275.0	27.5	20.3
OS2	0.70	A	31%	0.20	0.35	59	3.3%	8.5	421	1.0%	15.0	1.5	4.7	13.1	480.0	25.9	13.1
OS3	2.28	A	60%	0.45	0.58	66	8.5%	4.7	1326	1.0%	15.0	1.5	14.7	19.5	1392.0	28.5	19.5
OS4	1.08	D	55%	0.44	0.63	66	8.5%	4.8	636	1.0%	15.0	1.5	7.1	11.8	702.0	23.1	11.8
OS5	2.92	A	23%	0.17	0.42	55	3.4%	8.3	857	1.0%	15.0	1.5	9.5	17.8	912.0	33.7	17.8

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
F1	1.35	A	40%	0.27	0.43	55	3.4%	7.4	754	2.5%	15.0	2.4	5.3	12.7	809.0	24.5	12.7
F2	7.67	A	11%	0.05	0.20	300	1.7%	27.5	690	1.0%	15.0	1.5	7.7	35.2	990.0	35.0	35.0
F3	5.44	A	24%	0.20	0.48	48	2.0%	9.0	2354	1.4%	15.0	1.8	22.1	31.1	2402.0	48.6	31.1
F4	2.93	A	45%	0.34	0.52	12	22.0%	1.7	3016	1.2%	15.0	1.6	30.6	32.3	3028.0	48.3	32.3

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Equation 6-2

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-5

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS1	OS1	2.37	0.43	20.3	1.01	3.07	3.1					3.1	1.01	2.5					114	3.2	0.6	Roadside Swale
																							Swale conveyance to DP 1.0
	1	C1	6.04	0.06	35.8	0.39	2.22	0.9					0.9	0.39	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.0
	1.0								35.8	1.40	2.22	3.1	3.1	1.40	2.1					752	2.9	4.3	Sum of DP OS1 and DP 1
																							Swale conveyance to DP 1.1
	2	C2	3.35	0.14	31.5	0.46	2.41	1.1					1.1	0.46	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	3	C3	23.44	0.04	41.2	0.91	2.01	1.8					1.8	0.91	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	OS2	OS2	0.70	0.20	13.1	0.14	3.72	0.5					0.5	0.14	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	1.1								41.2	2.91	2.01	5.8	5.8	2.91	1.0					1716	2.0	14.3	Sum of DP 1.0, DP 2, DP OS2 & DP 3
																							Swale conveyance to DP 1.2
	4	C4	10.94	0.14	40.3	1.58	2.04	3.2					3.2	1.58	0.5					0	1.4	0.0	Roadside Swale
																							Swale conveyance to DP 1.2
	1.2								55.5	4.49	1.56	7.0	7.0	4.49	1.0					344	2.0	2.9	Sum of DP 1.1 and DP 4
																							Swale conveyance to DP 1.3
	5	C5	2.35	0.11	23.8	0.26	2.83	0.7					0.7	0.26	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.3
	1.3								58.3	4.75	1.48	7.0	7.0	4.75	1.0					1147	2.0	9.6	Sum of DP 1.2 and DP 5
																							Culvert conveyance to DP 1.4
	6	C6	3.95	0.12	26.6	0.49	2.66	1.3					1.3	0.49	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.4
	1.4								58.3	5.24	1.48	7.8				7.8	5.24	1.0	24	59	6.5	0.2	Sum of DP 1.3 and DP 6
																							Culvert conveyance to DP 1.6
	7	C7	2.14	0.17	13.9	0.36	3.64	1.3					1.3	0.36	1.0					1214	2.0	10.1	Roadside Swale
																							Swale conveyance to DP 1.5
	8	C8	22.55	0.05	33.7	1.04	2.31	2.4					2.4	1.04	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.5
	1.5								33.7	1.40	2.31	3.2	3.2	1.40	1.0					278	2.0	2.3	Sum of DP 7 and DP 8
																							Swale conveyance to DP 1.6
	9	C9	2.63	0.23	29.6	0.60	2.50	1.5					1.5	0.60	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.6
	1.6								58.5	7.24	1.48	10.7	10.7	7.24	0.75					388	1.7	3.7	Sum of DP 1.4, DP 1.5, and DP 9
																							Swale/ Pond conveyance to DP 1.7
	10	C10	16.38	0.05	27.6	0.90	2.61	2.3					2.3	0.90	1.0					0	2.0	0.0	Proposed Pond C, future Filing 4 Lots, and Filing 4 roadways
																							Overland flow, future road swales, and pond conveyance to DP 1.7
	1.7								62.2	8.14	1.39	11.3											Sum of DP 1.6 and DP 10
																							Outlet structure release into Drainageway MS-06
	11	D1	9.11	0.17	26.4	1.56	2.67	4.2					4.2	1.56	1.0					682	2.0	5.7	Roadside Swale
																							Swale conveyance to DP 2.0

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	12	D2	8.49	0.07	34.7	0.63	2.26	1.4					1.4	0.63	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.0
	2.0								34.7	2.19	2.26	5.0	5.0	2.19	1.0					1492	2.0	12.4	Sum of DP 11 & DP 12 Swale conveyance to DP 2.3
	OS3	OS3	2.28	0.45	19.5	1.02	3.13	3.2					3.2	1.02	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	13	D3	3.21	0.04	21.1	0.12	3.01	0.4					0.4	0.12	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	2.1								21.1	1.14	3.01	3.4	3.4	1.14	1.0					730	2.0	6.1	Sum of DP OS3 and DP 13 Swale conveyance to DP 2.2
	OS4	OS4	1.08	0.44	11.8	0.48	3.88	1.9					1.9	0.48	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.2
	2.2								27.2	1.62	2.63	4.3	4.3	1.62	1.0					895	2.0	7.5	Sum of DP 2.1 and DP OS4 Swale conveyance to DP 2.4
	15	D5	9.56	0.14	37.6	1.38	2.14	3.0					3.0	1.38	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.3
	16	D6	0.34	0.36	8.3	0.12	4.41	0.5					0.5	0.12	1.0					59	2.0	0.5	Roadside Swale Swale conveyance to DP 2.3
	2.3								47.2	3.69	1.80	6.7	6.7	3.69	1.0					117	2.0	1.0	Sum of DP 2.0, DP 15 and DP 16 Swale conveyance to DP 2.4
	14	D4	10.01	0.07	39.8	0.72	2.06	1.5					1.5	0.72	1.0					0	2.0	0.0	Drainage Swale Swale conveyance to DP 2.4
	2.4								48.1	6.03	1.77	10.7	10.7	6.03	1.0					623	2.0	5.2	Sum of DP 14, DP 2.2 and DP 2.3 Swale/ Pond conveyance to DP 2.5
	17	D7	33.94	0.10	38.3	3.25	2.11	6.9					6.9	3.25	1.0					0	2.0	0.0	Proposed Pond D, future Filing 4 Lots, and Filing 4 roadways Overland flow, future road swales, and pond conveyance to DP 2.5
	2.5								53.3	9.28	1.62	15.0	15.0	9.28	1.0					1147	2.0	9.6	Sum of DP 2.4 and DP 17 Outlet structure release into Drainageway WF-R7A
	21	E1	17.12	0.04	46.6	0.69	1.82	1.3								1.3	0.69	1.0	24	48	3.9	0.2	Roadside Swale Culvert conveyance to DP 3.0
	22	E2	0.37	0.31	7.8	0.11	4.51	0.5					0.5	0.11	1.0					185	2.0	1.5	Roadside Swale Swale conveyance to DP 3.0
	23	E3	0.20	0.32	5.2	0.06	5.10	0.3					0.3	0.06	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 3.0
	3.0								46.8	0.86	1.82	1.6	1.6	0.86	2.1					217	2.9	1.2	Sum of DP 21, DP 22, and DP 23 Swale/ Pond conveyance to DP 3.1
	24	E4	0.68	0.01	14.6	0.01	3.56	0.04					0.04	0.01	0.5					0	1.4	0.0	Overland Flow Pond Conveyance
	3.1								48.0	0.87	1.78	1.5	1.5	0.87	1.0					1147	2.0	9.6	Sum of DP 3.0 and DP 24 Outlet structure release into Drainageway WF-R7A

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	UD1	UD1	7.48	0.03	33.5	0.19	2.31	0.4															Overland Flow Sheet flow into Drainageway MS-06
	UD2	UD2	9.17	0.03	30.4	0.23	2.46	0.6															Overland Flow Sheet flow into Drainageway MS-06
	UD3	UD3	2.23	0.04	27.0	0.09	2.64	0.2															Overland Flow Sheet flow into Drainageway MS-06
	UD4	UD4	34.90	0.04	54.3	1.35	1.59	2.1															Overland Flow Sheet flow into Drainageway MS-06
	UD5	UD5	17.63	0.04	41.9	0.76	1.98	1.5															Overland Flow Sheet flow into Drainageway MS-06
	OS5	OS5	2.92	0.17	17.8	0.51	3.26	1.7															Overland Flow Sheet flow into Drainageway MS-06
	F1	F1	1.35	0.27	12.7	0.37	3.77	1.4															Roadside Swale to Pond F See OS1 of Filing 2 Drainage Report
	F2	F2	7.67	0.05	35.0	0.40	2.25	0.9															Roadside Swale to Pond F See DP06 of Filing 2 Drainage Report
	25	F2	7.67	0.05	35.0	0.40	2.25	0.90					0.90	0.40	1.0					0	2.0	0.0	Roadside Swale Swale Conveyance for DP25
	F3	F3	5.44	0.20	31.1	1.09	2.43	2.6															Roadside Swale to Pond F See DP07 of Filing 2 Drainage Report
	F4	F4	2.93	0.34	32.3	0.98	2.37	2.3															Roadside Swale to Pond F See DP08 of Filing 2 Drainage Report

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS1	OS1	2.37	0.56	20.3	1.33	5.15	6.8					6.8	1.33	2.5					114	3.2	0.6	Roadside Swale
																							Swale conveyance to DP 1.0
	1	C1	6.04	0.21	35.8	1.28	3.72	4.8					4.8	1.28	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.0
	1.0								35.8	2.61	3.72	9.7	9.7	2.61	2.1					752	2.9	4.3	Sum of DP OS1 and DP 1
																							Swale conveyance to DP 1.1
	2	C2	3.35	0.29	31.5	0.98	4.04	4.0					4.0	0.98	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	3	C3	23.44	0.18	41.2	4.20	3.37	14.1					14.1	4.20	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	OS2	OS2	0.70	0.35	13.1	0.25	6.25	1.6					1.6	0.25	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	1.1								41.2	8.04	3.37	27.1	27.1	8.04	1.0					1716	2.0	14.3	Sum of DP 1.0, DP 2, DP OS 2 & DP 3
																							Swale conveyance to DP 1.2
	4	C4	10.94	0.42	40.3	4.54	3.42	15.5					15.5	4.54	0.5					0	1.4	0.0	Roadside Swale
																							Swale conveyance to DP 1.2
	1.2								55.5	12.58	2.61	32.9	32.9	12.58	1.0					344	2.0	2.9	Sum of DP 1.1 and DP 4
																							Swale conveyance to DP 1.3
	5	C5	2.35	0.26	23.8	0.62	4.75	2.9					2.9	0.62	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.3
	1.3								58.3	13.20	2.49	32.8	32.8	13.20	1.0					1147	2.0	9.6	Sum of DP 1.2 and DP 5
																							Culvert conveyance to DP 1.4
	6	C6	3.95	0.28	26.6	1.11	4.46	5.0					5.0	1.11	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.4
	1.4								58.3	14.31	2.49	35.6				35.6	14.31	1.0	24	59	11.3	0.1	Sum of DP 1.3 and DP 6
																							Culvert conveyance to DP 1.6
	7	C7	2.14	0.38	13.9	0.81	6.10	4.9					4.9	0.81	1.0					1214	2.0	10.1	Roadside Swale
																							Swale conveyance to DP 1.5
	8	C8	22.55	0.19	33.7	4.24	3.87	16.4					16.4	4.24	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.5
	1.5								33.7	5.05	3.87	19.6	19.6	5.05	1.0					278	2.0	2.3	Sum of DP 7 and DP 8
																							Swale conveyance to DP 1.6
	9	C9	2.63	0.39	29.6	1.02	4.19	4.3					4.3	1.02	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.6
	1.6								58.4	20.38	2.48	50.6	50.6	20.38	0.75					388	1.7	3.7	Sum of DP 1.4, DP 1.5, and DP 9
																							Swale/ Pond conveyance to DP 1.7
	10	C10	16.38	0.20	27.6	3.28	4.37	14.3					14.3	3.28	1.0					0	2.0	0.0	Proposed Pond C, future Filing 4 Lots, and Filing 4 roadways
																							Overland flow, future road swales, and pond conveyance to DP 1.7
	1.7								58.4	23.66	2.48	58.8											Sum of DP 1.6 and DP 10
																							Outlet structure release into Drainageway MS-06
	11	D1	9.11	0.33	26.4	3.01	4.49	13.5					13.5	3.01	1.0					682	2.0	5.7	Roadside Swale
																							Swale conveyance to DP 2.0

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	12	D2	8.49	0.25	34.7	2.15	3.80	8.2					8.2	2.15	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.0
	2.0								34.7	5.16	3.80	19.6	19.6	5.16	1.0					1492	2.0	12.4	Sum of DP 11 & DP 12 Swale conveyance to DP 2.3
	OS3	OS3	2.28	0.58	19.5	1.32	5.26	6.9					6.9	1.32	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	13	D3	3.21	0.18	21.1	0.56	5.05	2.8					2.8	0.56	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	2.1								21.1	1.88	5.05	9.5	9.5	1.88	1.0					730	2.0	6.1	Sum of DP OS3 and DP 13 Swale conveyance to DP 2.2
	OS4	OS4	1.08	0.63	11.8	0.68	6.51	4.4					4.4	0.68	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.2
	2.2								27.2	2.56	4.41	11.3	11.3	2.56	1.0					895	2.0	7.5	Sum of DP 2.1 and DP OS4 Swale conveyance to DP 2.4
	15	D5	9.56	0.43	37.6	4.15	3.59	14.9					14.9	4.15	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.3
	16	D6	0.34	0.57	8.3	0.19	7.41	1.4					1.4	0.19	1.0					59	2.0	0.5	Roadside Swale Swale conveyance to DP 2.3
	2.3								37.6	9.50	3.59	34.1	34.1	9.50	1.0					117	2.0	1.0	Sum of DP 2.0, DP 15 and DP 16 Swale conveyance to DP 2.4
	14	D4	10.01	0.40	39.8	4.03	3.45	13.9					13.9	4.03	1.0					0	2.0	0.0	Drainage Swale Swale conveyance to DP 2.4
	2.4								39.8	16.09	3.45	55.5	55.5	16.09	1.0					623	2.0	5.2	Sum of DP 2.2 and DP 2.3 Swale/ Pond conveyance to DP 2.5
	17	D7	33.94	0.31	38.3	10.52	3.55	37.3					37.3	10.52	1.0					0	2.0	0.0	Proposed Pond D, future Filing 4 Lots, and Filing 4 roadways Overland flow, future road swales, and pond conveyance to DP 2.5
	2.5								45.0	26.61	3.14	83.6	83.6	26.61	1.0					1147	2.0	9.6	Sum of DP 2.4 and DP 17 Outlet structure release into Drainageway WF-R7A
	21	E1	17.12	0.22	46.6	3.85	3.06	11.8								11.8	3.85	1.0	24	48	7.2	0.1	Roadside Swale Culvert conveyance to DP 3.0
	22	E2	0.37	0.46	7.8	0.17	7.57	1.3					1.3	0.17	1.0					185	2.0	1.5	Roadside Swale Swale conveyance to DP 3.0
	23	E3	0.20	0.48	5.2	0.10	8.57	0.9					0.9	0.10	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 3.0
	3.0								46.7	4.12	3.05	12.6	12.6	4.12	2.1					217	2.9	1.2	Sum of DP 21, DP 22, and DP 23 Swale/ Pond conveyance to DP 3.1
	24	E4	0.68	0.14	14.6	0.10	5.97	0.6					0.6	0.10	0.5					0	1.4	0.0	Overland Flow Pond Conveyance
	3.1								47.9	4.22	2.98	12.6	12.6	4.22	1.0					1147	2.0	9.6	Sum of DP 3.0 and DP 24 Outlet structure release into Drainageway WF-R7A

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	UD1	UD1	7.48	0.16	33.5	1.18	3.88	4.6															Overland Flow Sheet flow into Drainageway MS-06
	UD2	UD2	9.17	0.16	30.4	1.46	4.13	6.0															Overland Flow Sheet flow into Drainageway MS-06
	UD3	UD3	2.23	0.24	27.0	0.53	4.43	2.3															Overland Flow Sheet flow into Drainageway MS-06
	UD4	UD4	34.90	0.39	54.3	13.69	2.67	36.5															Overland Flow Sheet flow into Drainageway MS-06
	UD5	UD5	17.63	0.26	41.9	4.65	3.32	15.4															Overland Flow Sheet flow into Drainageway MS-06
	OS5	OS5	2.92	0.42	17.8	1.23	5.48	6.7															Overland Flow Sheet flow into Drainageway MS-06
	F1	F1	1.35	0.43	12.7	0.58	6.33	3.7															Roadside Swale to Pond F See OS1 of Filing 2 Drainage Report
	F2	F2	7.67	0.20	35.0	1.51	3.78	5.7															Roadside Swale to Pond F See DP06 of Filing 2 Drainage Report
	25	F2	7.67	0.20	35.0	1.51	3.78	5.7					5.7	1.51	1.0					0	2.0	0.0	Roadside Swale Swale Conveyance for DP25
	F3	F3	5.44	0.48	31.1	2.60	4.08	10.6															Roadside Swale to Pond F See DP07 of Filing 2 Drainage Report
	F4	F4	2.93	0.52	32.3	1.52	3.98	6.0															Roadside Swale to Pond F See DP08 of Filing 2 Drainage Report

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

Colorado Urban Hydrograph Procedure

Version 2.0.0 - Release Date: 9/9/2016

Urban Drainage and Flood Control District
Denver, Colorado
email: udfcd@udfcd.org

Purpose:	This program produces hydrographs using the Colorado Unit Hydrograph Procedure (CUHP)
Functions:	
Edit Raingages	Add/Remove Raingages and change names
Edit Subcatchments	Edit subcatchment parameters
Edit Multiple Run Options	Edit the Multiple Run options (Advanced User Features)
Import CUHP 2005 File	Import an older CUHP 2005 workbook into this updated version of CUHP
Check Subcatchments	Check whether subcatchment inputs conform to UDFCD guidelines
Check SWMM Nodes	Check whether all subcatchment target nodes are included in the SWMM .inp file
Run CUHP	Calculate effective precipitation and generate hydrographs for each subcatchment

Settings:

Fill in the blue cells to begin:

Project Title:	Saddlehorn Ranch
Project Comment:	Ex. Conditions Analysis
Time Step Between Computations:	5 Minute(s); typically 5 or 1 (peak flow rate will differ slightly).
	☐ Use Relative Path Names
Output Workbook Filename:	X:\2510000.all\2514200\CUHP-SWMM\Existing_CUHP_2002.xlsm.xlsx
CUHP/SWMM Interface Filename (Optional):	X:\2510000.all\2514200\CUHP-SWMM\Existing_CUHP_2002.xlsm.txt
EPA SWMM 5 Input Filename (Optional):	X:\2510000.all\2514200\CUHP-SWMM\Ex. Conditions Model.inp
EPA SWMM 5 Application File (Optional):	
SWMM Hydrograph Start Time (Optional):	

Acknowledgements: Thanks to Ben Urbonas, P.E., D.WRE and James C.Y.Guo, PhD, P.E., for the development of the CUHP project.

CUHP SUBCATCHMENTS

Columns with this color heading are for required user-input
Columns with this color heading are for optional override values
Columns with this color heading are for program-calculated values

								Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
CH1	CH1	EPC	0.0373438	0.210994318	0.4289773	0.01	2	0.4	0	3	0.0018	0.5	2
CH2	CH2	EPC	0.1318594	0.930530303	1.4477273	0.015	2	0.4	0	4	0.0013	0.75	2
CH3	CH3	EPC	0.0329219	0.420583333	0.7320076	0.015	2	0.4	0	4.81	0.0011	0.85	2
H1	H1	EPC	0.2601406	0.229166666	0.821917	0.01	2	0.4	0	5	0.0007	1	2
H2	H2	EPC	0.1735781	0.129545454	0.4912879	0.025	2	0.4	0	5	0.0007	1	2
H3	H3	EPC	0.18325	0.490719697	0.932197	0.015	2	0.4	0	4.64	0.0009	0.73	2
H4	H4	EPC	0.0988906	0.085984848	0.5267045	0.0225	2	0.4	0	3.82	0.0008	0.74	2
H5	H5	EPC	0.0831875	0.236931818	0.7267045	0.02	2	0.4	0	4.93	0.0009	0.94	2
H6	H6	EPC	0.1367969	0.046022727	0.4	0.04	2	0.4	0	5	0.0007	1	2
G1	G1	EPC	0.01575	0.210606061	0.3015152	0.018	2	0.4	0	5	0.00007	1	2
G2	G2	EPC	0.1368125	0.235606061	0.6857955	0.02	2	0.4	0	4.32	0.0011	0.83	2

RUN MULTIPLE CUHP AND SWMM SCENARIOS

Columns with this color heading are for required user-input
Columns with this color heading are for program-calculated values

SWMM Run Wait Time (sec)
5

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
CH1	2	2
CH2	2	2
CH3	2	2
H1	2	2
H2	2	2
H3	2	2
H4	2	2
H5	2	2
H6	2	2
G1	2	2
G2	2	2

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)
EPC	WQ	0.6	N/A
	2	1.19	2.1
	5	1.5	2.7
	10	1.75	3.2
	25	2	3.6
	50	2.25	4.2
	100	2.52	4.6

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)
X	WQ	E	WQ	0
	2-YR	E	2	1
X	5-YR	E	5	1
	10-YR	E	10	1
	25-YR	E	25	1
	50-YR	E	50	1
X	100-YR	E	100	1

(Optional) SWMM Time Series Inflow "Modification Type" (LU, RP, or LU&RP)

(Optional) SWMM Time Series Inflow Table "NAME"

Comment	El Paso County Rainfall Depths				
1Hr Depth	2.52	inches	2hr Depth	2.86	inches
6Hr Depth	3.5	inches	3hr Depth	3.11	inches
Correction Area	1	Sq. Mi.			
Return Period	100	Years			

NOAA Atlas 14 Point Precipitation Frequency

Time	Adjusted Depth	Unadjusted Depth
0:05	0.0252	0.0252
0:10	0.0756	0.0756
0:15	0.1159	0.1159
0:20	0.2016	0.2016
0:25	0.3528	0.3528
0:30	0.6300	0.6300
0:35	0.3528	0.3528
0:40	0.2016	0.2016
0:45	0.1562	0.1562
0:50	0.1260	0.1260
0:55	0.1008	0.1008
1:00	0.1008	0.1008
1:05	0.1008	0.1008
1:10	0.0504	0.0504
1:15	0.0504	0.0504
1:20	0.0302	0.0302
1:25	0.0302	0.0302
1:30	0.0302	0.0302
1:35	0.0302	0.0302
1:40	0.0302	0.0302
1:45	0.0302	0.0302
1:50	0.0302	0.0302
1:55	0.0302	0.0302
2:00	0.0302	0.0302
2:05	0.0000	0.0000
2:10	0.0000	0.0000
2:15	0.0000	0.0000
2:20	0.0000	0.0000
2:25	0.0000	0.0000
2:30	0.0000	0.0000
2:35	0.0000	0.0000
2:40	0.0000	0.0000
2:45	0.0000	0.0000
2:50	0.0000	0.0000
2:55	0.0000	0.0000
3:00	0.0000	0.0000
3:05	0.0000	0.0000
3:10	0.0000	0.0000
3:15	0.0000	0.0000
3:20	0.0000	0.0000
3:25	0.0000	0.0000
3:30	0.0000	0.0000
3:35	0.0000	0.0000
3:40	0.0000	0.0000
3:45	0.0000	0.0000
3:50	0.0000	0.0000

SADDLEHORN RANCH - EX. 5-YEAR FLOW RESULTS

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
CH1	JUNCTION	5.40	5.40	0	00:50	0.232	0.232	0.000
CH2	JUNCTION	2.58	2.58	0	01:00	0.176	0.176	0.000
CH3	JUNCTION	0.11	0.11	0	00:45	0.00701	0.00701	0.000
DP1	JUNCTION	0.00	6.79	0	00:46	0	0.268	0.000
DP2	JUNCTION	0.00	1.46	0	00:40	0	0.0359	0.000
DP3	JUNCTION	0.00	0.13	0	00:40	0	0.00379	0.000
DP4	JUNCTION	0.00	0.16	0	00:35	0	0.00252	0.000
DP5	JUNCTION	0.00	0.90	0	00:45	0	0.0334	0.000
DP6	JUNCTION	0.00	1.35	0	00:35	0	0.0209	0.000
DP7	JUNCTION	0.00	4.06	0	01:05	0	0.237	0.000
DP8	JUNCTION	0.00	0.21	0	00:30	0	0.00194	0.000
DP9	JUNCTION	0.00	0.43	0	00:40	0	0.0172	0.000
G1	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
G2	JUNCTION	1.46	1.46	0	00:40	0.0359	0.0359	0.000
H1	JUNCTION	0.13	0.13	0	00:40	0.00379	0.00379	0.000
H2	JUNCTION	0.16	0.16	0	00:35	0.00252	0.00252	0.000
H3	JUNCTION	0.90	0.90	0	00:45	0.0334	0.0334	0.000

SADDLEHORN RANCH - EX. 5-YEAR FLOW RESULTS

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
H4	JUNCTION	1.35	1.35	0	00:35	0.0209	0.0209	0.000
H5	JUNCTION	0.33	0.33	0	00:40	0.0102	0.0102	0.000
H6	JUNCTION	0.21	0.21	0	00:30	0.00194	0.00194	0.000
J13	JUNCTION	0.00	0.07	0	01:50	0	0.00485	0.000
J14	JUNCTION	0.00	0.06	0	02:28	0	0.00242	0.000
J15	JUNCTION	0.00	0.83	0	01:03	0	0.0333	0.000
J16	JUNCTION	0.00	0.09	0	00:49	0	0.00188	0.000

SADDLEHORN RANCH - EX. 100-YR FLOW RESULTS

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
CH1	JUNCTION	1038.04	1038.04	0	00:55	165	165	0.000
CH2	JUNCTION	485.11	485.11	0	01:15	75.2	75.2	0.000
CH3	JUNCTION	127.25	127.25	0	01:10	19.9	19.9	0.000
DP1	JUNCTION	0.00	1114.02	0	00:51	0	167	0.000
DP2	JUNCTION	0.00	76.38	0	00:50	0	2.23	0.000
DP3	JUNCTION	0.00	80.97	0	00:45	0	2.08	0.000
DP4	JUNCTION	0.00	91.06	0	00:40	0	1.38	0.000
DP5	JUNCTION	0.00	64.08	0	01:00	0	2.67	0.000
DP6	JUNCTION	0.00	73.15	0	00:40	0	1.47	0.000
DP7	JUNCTION	0.00	704.90	0	01:08	0	83	0.000
DP8	JUNCTION	0.00	110.05	0	00:35	0	1.06	0.000
DP9	JUNCTION	0.00	248.10	0	00:45	0	21.9	0.000
G1	JUNCTION	0.09	0.09	0	00:40	0.00364	0.00364	0.000
G2	JUNCTION	76.38	76.38	0	00:50	2.23	2.23	0.000
H1	JUNCTION	80.97	80.97	0	00:45	2.08	2.08	0.000
H2	JUNCTION	91.06	91.06	0	00:40	1.38	1.38	0.000
H3	JUNCTION	64.08	64.08	0	01:00	2.67	2.67	0.000
H4	JUNCTION	73.15	73.15	0	00:40	1.47	1.47	0.000
H5	JUNCTION	28.20	28.20	0	00:50	0.959	0.959	0.000
H6	JUNCTION	110.05	110.05	0	00:35	1.06	1.06	0.000

SADDLEHORN RANCH - EX. 100-YR FLOW RESULTS

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J13	JUNCTION	0.00	69.43	0	01:03	0	2.18	0.000
J14	JUNCTION	0.00	68.26	0	01:09	0	2.19	0.000
J15	JUNCTION	0.00	63.63	0	01:07	0	2.68	0.000
J16	JUNCTION	0.00	103.79	0	00:38	0	1.08	0.000

SADDLEHORN RANCH - EX. CONDITIONS SWMM MODEL

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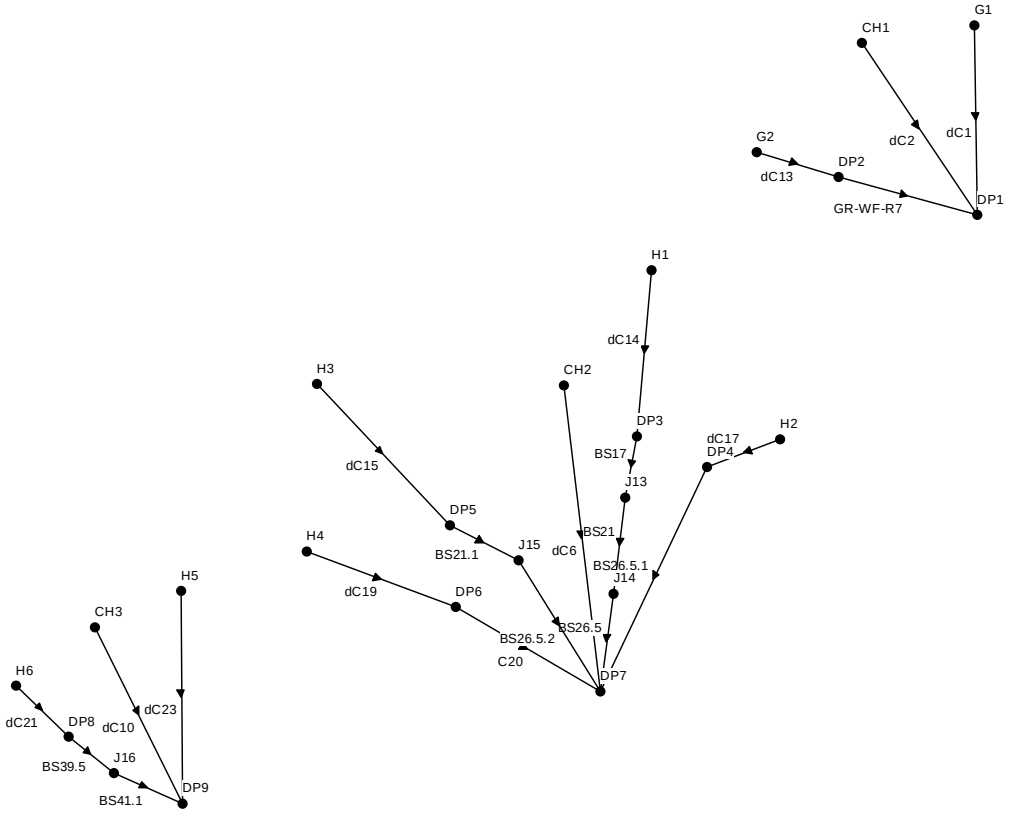


APPENDIX C

HYDRAULIC CALCULATIONS

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP1.0 Design Point 1.0 (Q5=3.1 cfs Q100=9.7 cfs)

Invert Elev Dn (ft)	=	6759.75
Pipe Length (ft)	=	62.81
Slope (%)	=	1.58
Invert Elev Up (ft)	=	6760.74
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

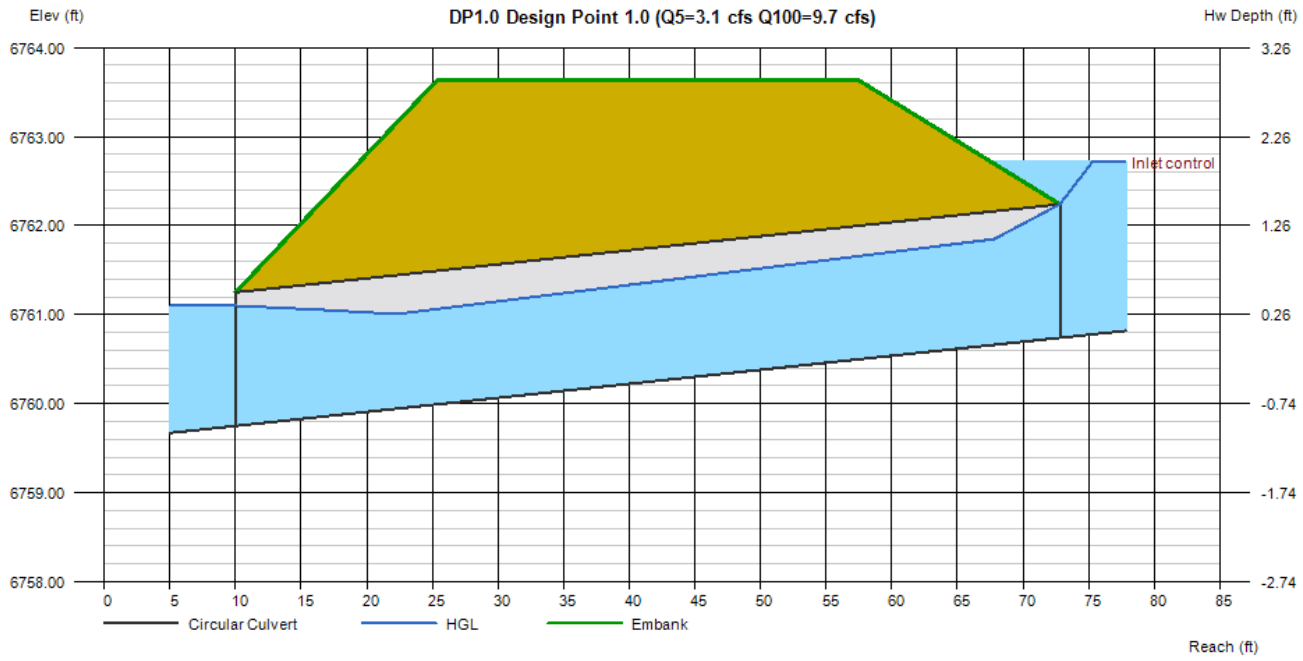
Top Elevation (ft)	=	6763.64
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	3.10
Qmax (cfs)	=	9.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.70
Qpipe (cfs)	=	9.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.79
Veloc Up (ft/s)	=	6.40
HGL Dn (ft)	=	6761.10
HGL Up (ft)	=	6761.94
Hw Elev (ft)	=	6762.72
Hw/D (ft)	=	1.32
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP1.1 Design Point 1.1 (Q5=5.6 cfs Q100=26.2 cfs)

Invert Elev Dn (ft)	=	6744.19
Pipe Length (ft)	=	56.00
Slope (%)	=	0.55
Invert Elev Up (ft)	=	6744.50
Rise (in)	=	24.0
Shape	=	Elliptical
Span (in)	=	38.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

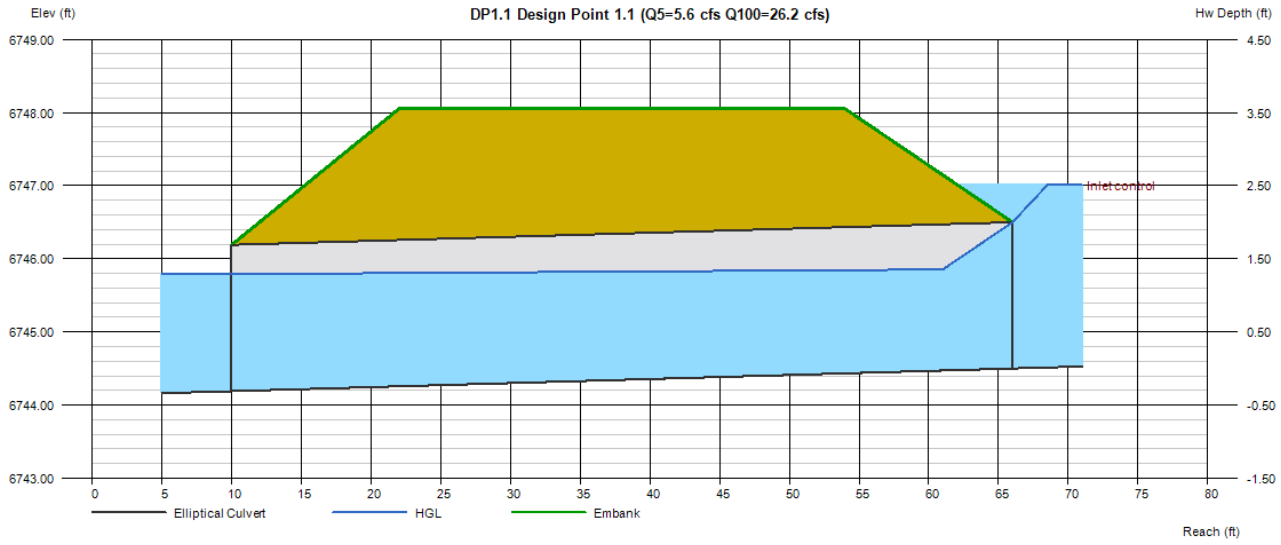
Top Elevation (ft)	=	6748.05
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	5.60
Qmax (cfs)	=	26.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	26.20
Qpipe (cfs)	=	26.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.82
Veloc Up (ft/s)	=	7.02
HGL Dn (ft)	=	6745.79
HGL Up (ft)	=	6745.86
Hw Elev (ft)	=	6747.01
Hw/D (ft)	=	1.25
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP11 Design Point 11 (Q5=4.20 cfs Q100=13.50 cfs)

Invert Elev Dn (ft)	=	6741.81
Pipe Length (ft)	=	53.00
Slope (%)	=	0.64
Invert Elev Up (ft)	=	6742.15
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	34.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

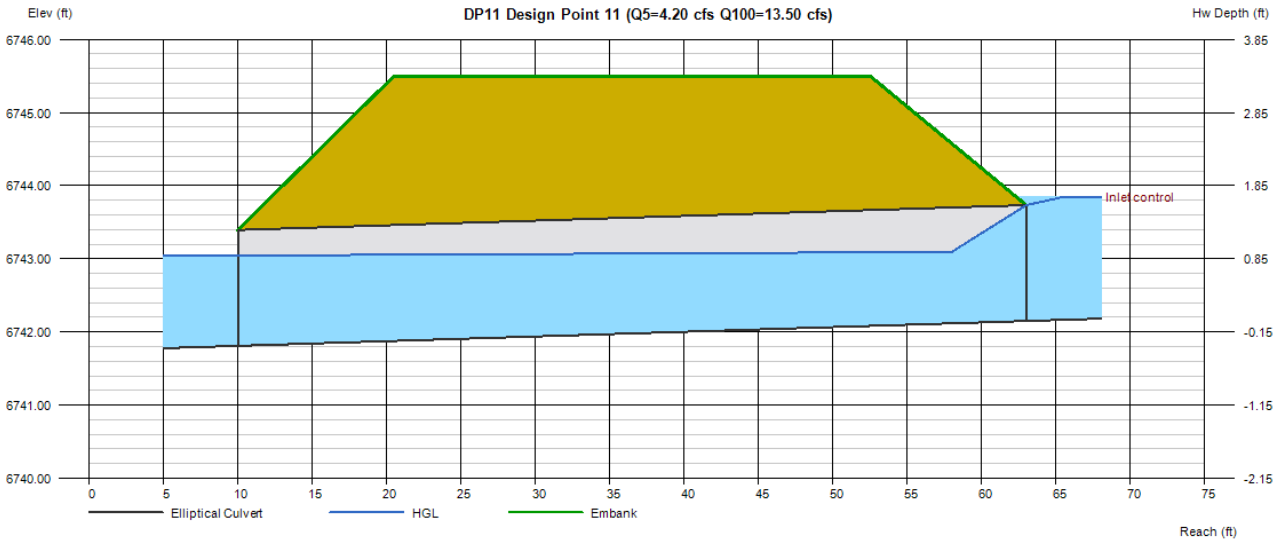
Top Elevation (ft)	=	6745.50
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	4.20
Qmax (cfs)	=	13.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	13.50
Qpipe (cfs)	=	13.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.40
Veloc Up (ft/s)	=	5.94
HGL Dn (ft)	=	6743.05
HGL Up (ft)	=	6743.10
Hw Elev (ft)	=	6743.85
Hw/D (ft)	=	1.07
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP2.0 Design Point 2.0 (Q5=5.0 cfs Q100=19.6 cfs)

Invert Elev Dn (ft)	=	6734.05
Pipe Length (ft)	=	61.00
Slope (%)	=	1.02
Invert Elev Up (ft)	=	6734.67
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

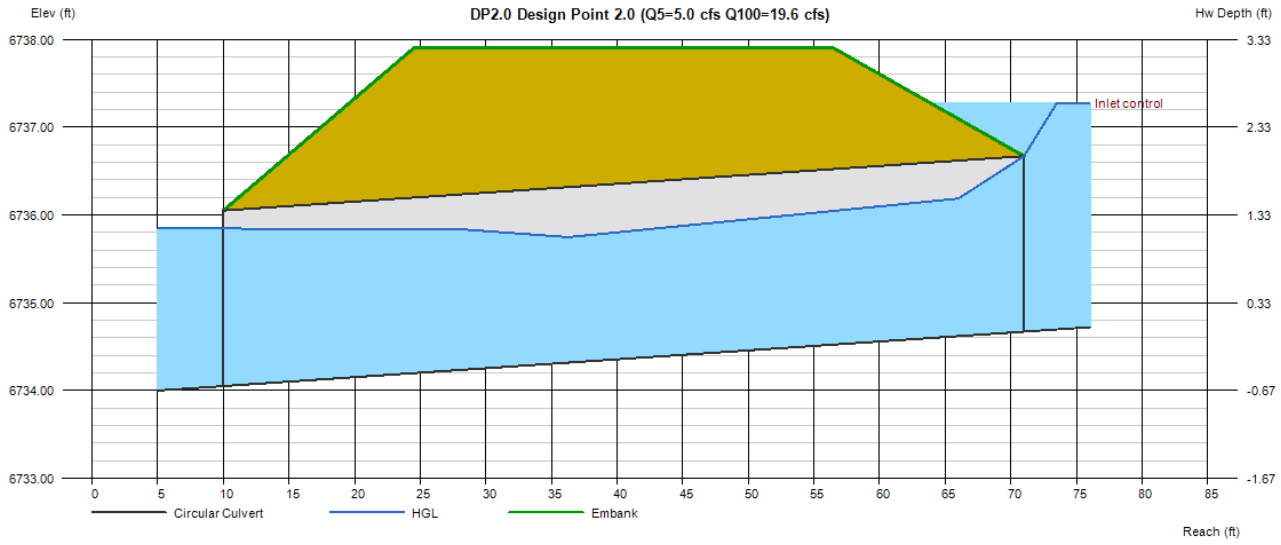
Top Elevation (ft)	=	6737.90
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	5.00
Qmax (cfs)	=	19.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	19.60
Qpipe (cfs)	=	19.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.59
Veloc Up (ft/s)	=	7.32
HGL Dn (ft)	=	6735.85
HGL Up (ft)	=	6736.26
Hw Elev (ft)	=	6737.27
Hw/D (ft)	=	1.30
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP1.2 Design Point 1.2 (Q5=6.8 cfs Q100=32.2 cfs)

Invert Elev Dn (ft)	=	6727.27
Pipe Length (ft)	=	52.98
Slope (%)	=	0.55
Invert Elev Up (ft)	=	6727.56
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	30.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

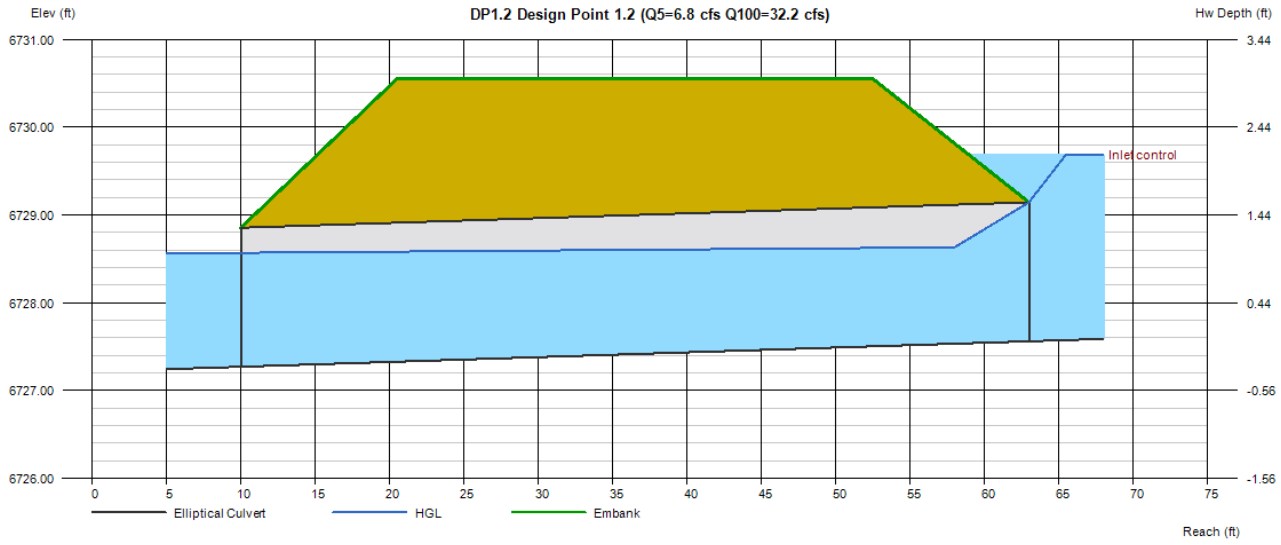
Top Elevation (ft)	=	6730.55
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	6.80
Qmax (cfs)	=	32.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	32.20
Qpipe (cfs)	=	32.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.72
Veloc Up (ft/s)	=	6.90
HGL Dn (ft)	=	6728.57
HGL Up (ft)	=	6728.64
Hw Elev (ft)	=	6729.69
Hw/D (ft)	=	1.34
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP7 Design Point 7 (Q5=1.3 cfs Q100=4.9 cfs)

Invert Elev Dn (ft)	=	6727.09
Pipe Length (ft)	=	64.87
Slope (%)	=	0.49
Invert Elev Up (ft)	=	6727.41
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

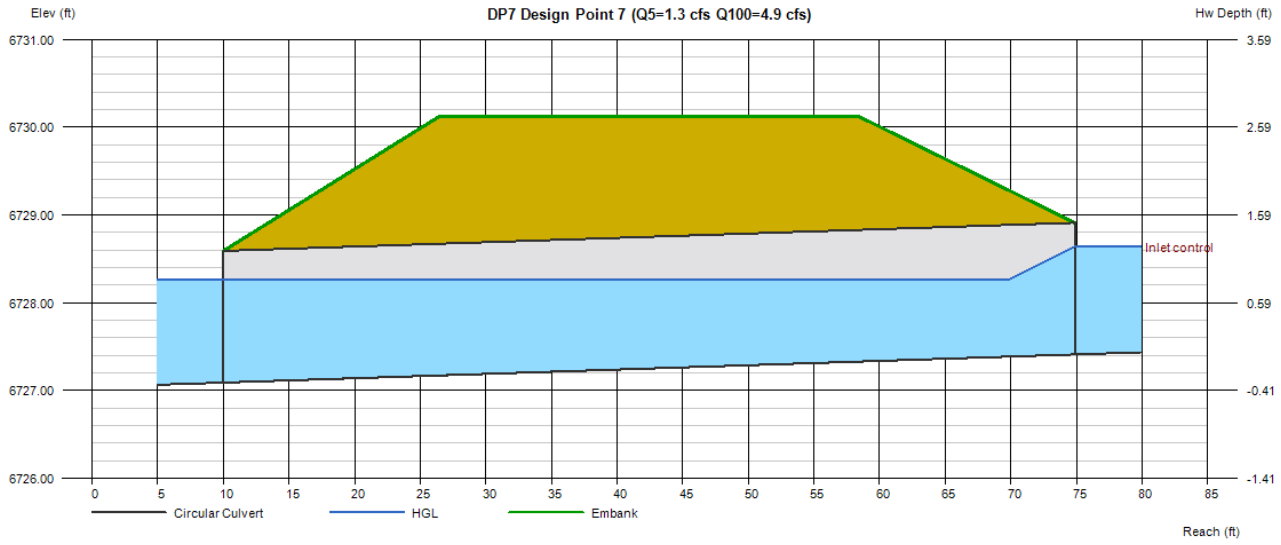
Top Elevation (ft)	=	6730.12
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	1.30
Qmax (cfs)	=	4.90
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.90
Qpipe (cfs)	=	4.90
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.30
Veloc Up (ft/s)	=	4.71
HGL Dn (ft)	=	6728.27
HGL Up (ft)	=	6728.27
Hw Elev (ft)	=	6728.64
Hw/D (ft)	=	0.82
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP1.3 Design Point 1.3 (Q5=6.8 cfs Q100=32.2 cfs)

Invert Elev Dn (ft)	=	6725.52
Pipe Length (ft)	=	58.18
Slope (%)	=	0.52
Invert Elev Up (ft)	=	6725.82
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

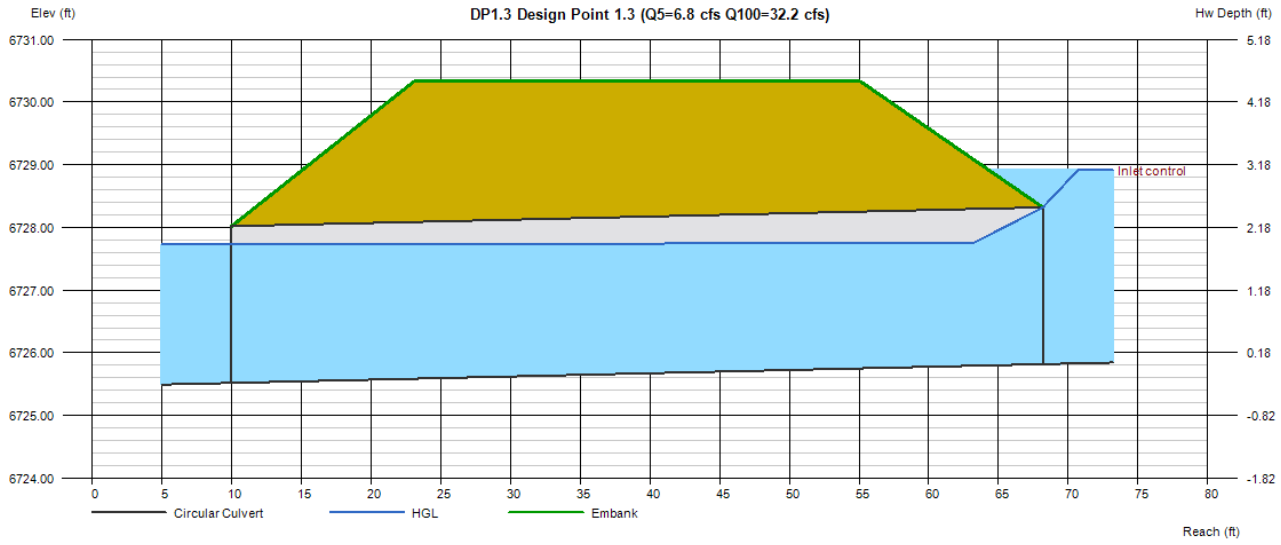
Top Elevation (ft)	=	6730.33
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	6.80
Qmax (cfs)	=	32.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	32.20
Qpipe (cfs)	=	32.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.00
Veloc Up (ft/s)	=	7.92
HGL Dn (ft)	=	6727.74
HGL Up (ft)	=	6727.75
Hw Elev (ft)	=	6728.91
Hw/D (ft)	=	1.24
Flow Regime	=	Inlet Control



Culvert Report

DP1.5 Design Point 1.5 (Q5=3.2 cfs Q100=19.6 cfs)

Invert Elev Dn (ft)	=	6717.33
Pipe Length (ft)	=	55.50
Slope (%)	=	0.65
Invert Elev Up (ft)	=	6717.69
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

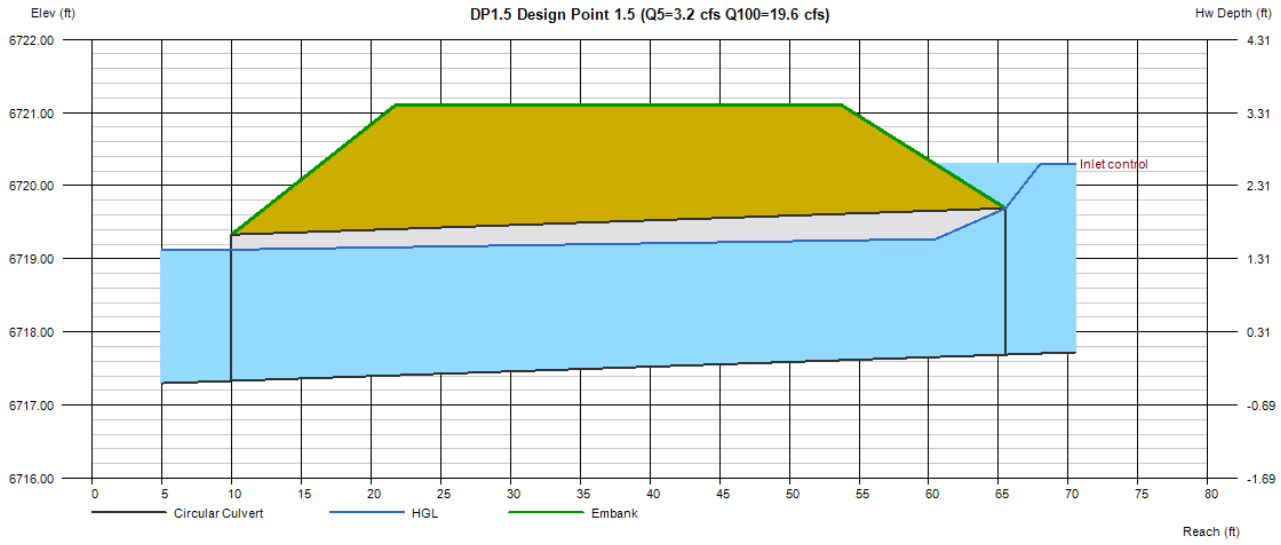
Top Elevation (ft)	=	6721.10
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	3.20
Qmax (cfs)	=	19.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	19.60
Qpipe (cfs)	=	19.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.59
Veloc Up (ft/s)	=	7.30
HGL Dn (ft)	=	6719.13
HGL Up (ft)	=	6719.28
Hw Elev (ft)	=	6720.30
Hw/D (ft)	=	1.30
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP1.4 Design Point 1.4 (Q5=7.6 cfs Q100=35.0 cfs)

Invert Elev Dn (ft)	=	6715.25
Pipe Length (ft)	=	59.38
Slope (%)	=	0.99
Invert Elev Up (ft)	=	6715.84
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	30.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

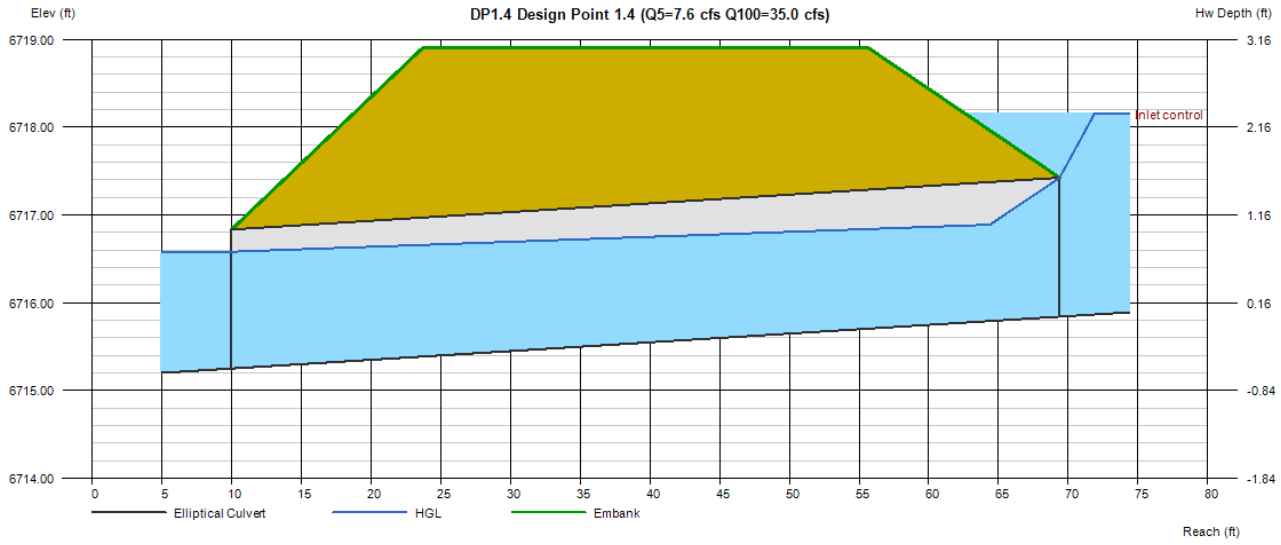
Top Elevation (ft)	=	6718.90
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	7.60
Qmax (cfs)	=	35.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	35.00
Qpipe (cfs)	=	35.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.02
Veloc Up (ft/s)	=	7.51
HGL Dn (ft)	=	6716.58
HGL Up (ft)	=	6716.92
Hw Elev (ft)	=	6718.15
Hw/D (ft)	=	1.46
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP22 Design Point 22 (Q5=0.5 cfs Q100=1.3 cfs)

Invert Elev Dn (ft)	=	6727.04
Pipe Length (ft)	=	35.77
Slope (%)	=	0.95
Invert Elev Up (ft)	=	6727.38
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

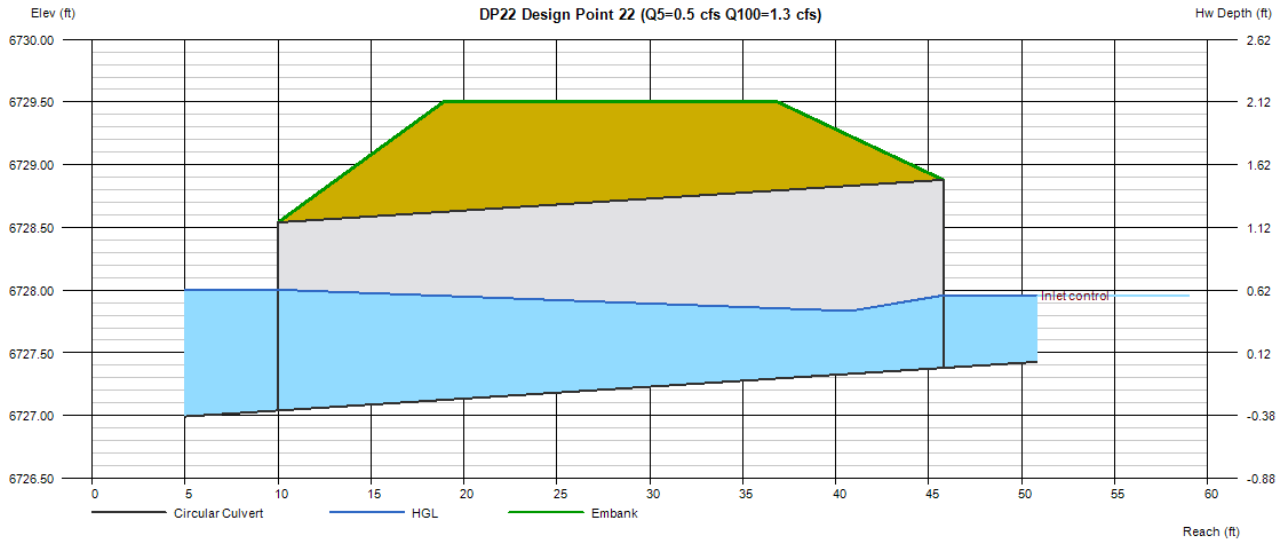
Top Elevation (ft)	=	6729.50
Top Width (ft)	=	18.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	0.50
Qmax (cfs)	=	1.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	1.30
Qpipe (cfs)	=	1.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.08
Veloc Up (ft/s)	=	3.14
HGL Dn (ft)	=	6728.00
HGL Up (ft)	=	6727.81
Hw Elev (ft)	=	6727.96
Hw/D (ft)	=	0.39
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP21 Design Point 21 (Q5=1.3 cfs Q100=11.8 cfs)

Invert Elev Dn (ft)	=	6724.11
Pipe Length (ft)	=	47.04
Slope (%)	=	1.04
Invert Elev Up (ft)	=	6724.60
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

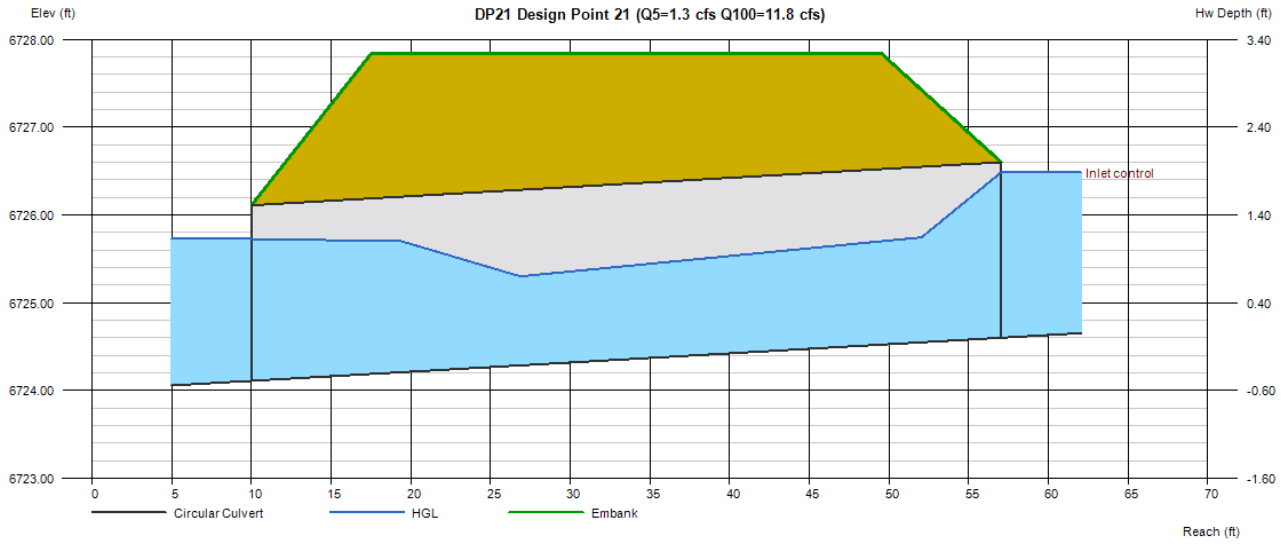
Top Elevation (ft)	=	6727.84
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	1.30
Qmax (cfs)	=	11.80
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	11.80
Qpipe (cfs)	=	11.80
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.34
Veloc Up (ft/s)	=	5.81
HGL Dn (ft)	=	6725.73
HGL Up (ft)	=	6725.83
Hw Elev (ft)	=	6726.49
Hw/D (ft)	=	0.94
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP9 Design Point 9 (Q5=1.5 cfs Q100=4.3 cfs)

Invert Elev Dn (ft)	=	6716.61
Pipe Length (ft)	=	36.00
Slope (%)	=	1.36
Invert Elev Up (ft)	=	6717.10
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

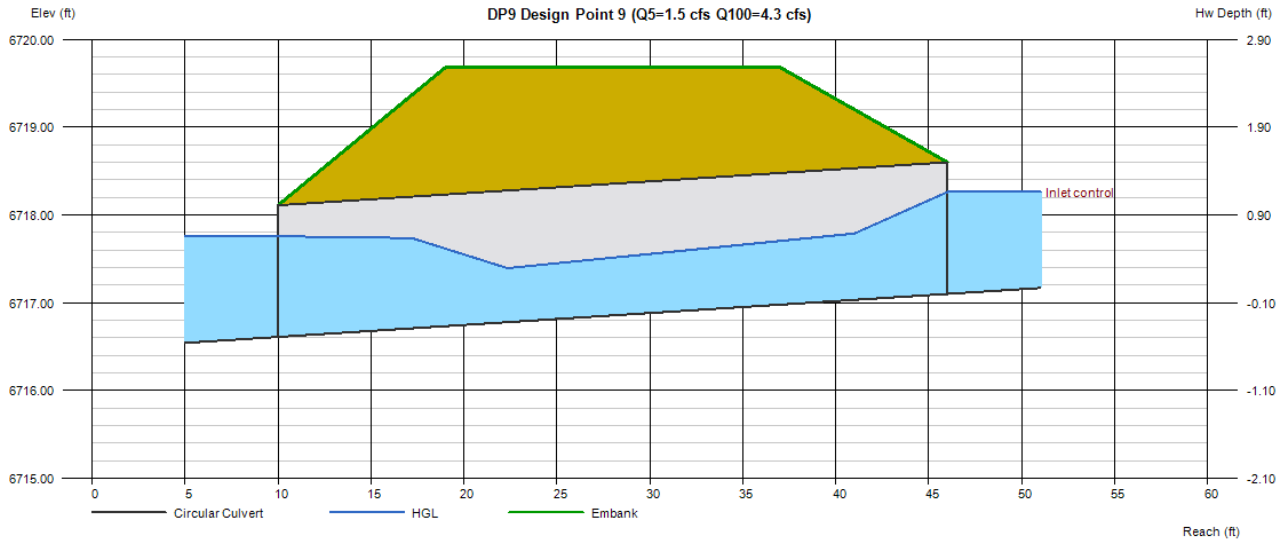
Top Elevation (ft)	=	6719.68
Top Width (ft)	=	18.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	1.50
Qmax (cfs)	=	4.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.30
Qpipe (cfs)	=	4.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.97
Veloc Up (ft/s)	=	4.53
HGL Dn (ft)	=	6717.76
HGL Up (ft)	=	6717.90
Hw Elev (ft)	=	6718.26
Hw/D (ft)	=	0.77
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP16 Design Point 16 (Q5=0.5 cfs Q100=1.4 cfs)

Invert Elev Dn (ft)	=	6715.05
Pipe Length (ft)	=	36.00
Slope (%)	=	1.97
Invert Elev Up (ft)	=	6715.76
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

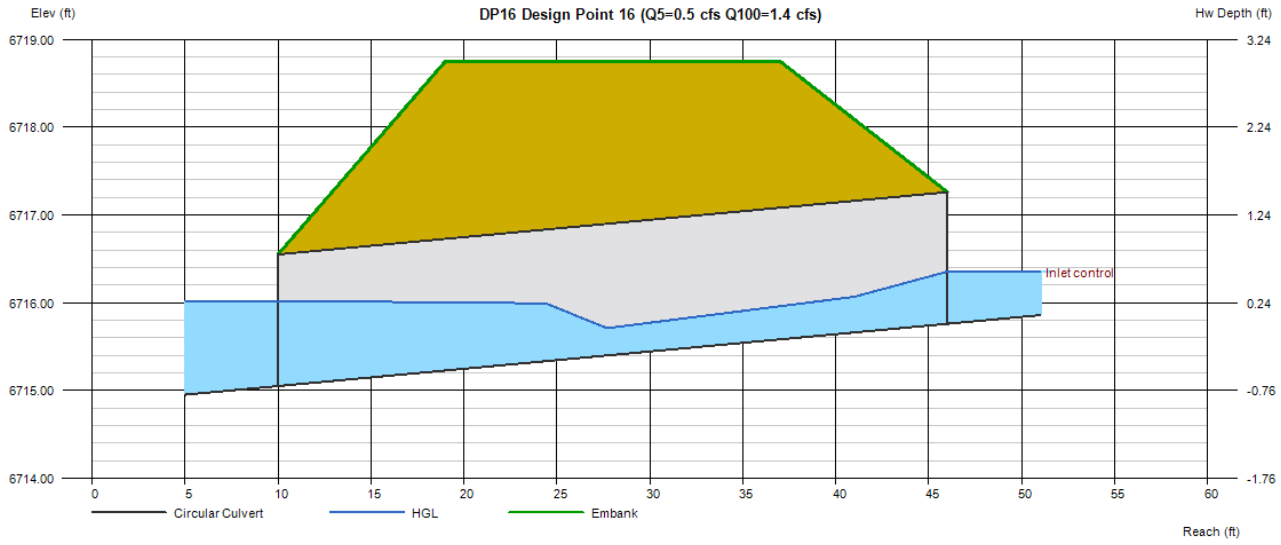
Top Elevation (ft)	=	6718.75
Top Width (ft)	=	18.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	0.50
Qmax (cfs)	=	1.40
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	1.40
Qpipe (cfs)	=	1.40
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.16
Veloc Up (ft/s)	=	3.21
HGL Dn (ft)	=	6716.02
HGL Up (ft)	=	6716.20
Hw Elev (ft)	=	6716.35
Hw/D (ft)	=	0.40
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

DP2.1 Design Point 2.1 (Q5=3.4 cfs Q100=9.5 cfs)

Invert Elev Dn (ft)	=	6739.05
Pipe Length (ft)	=	72.38
Slope (%)	=	0.70
Invert Elev Up (ft)	=	6739.56
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	34.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

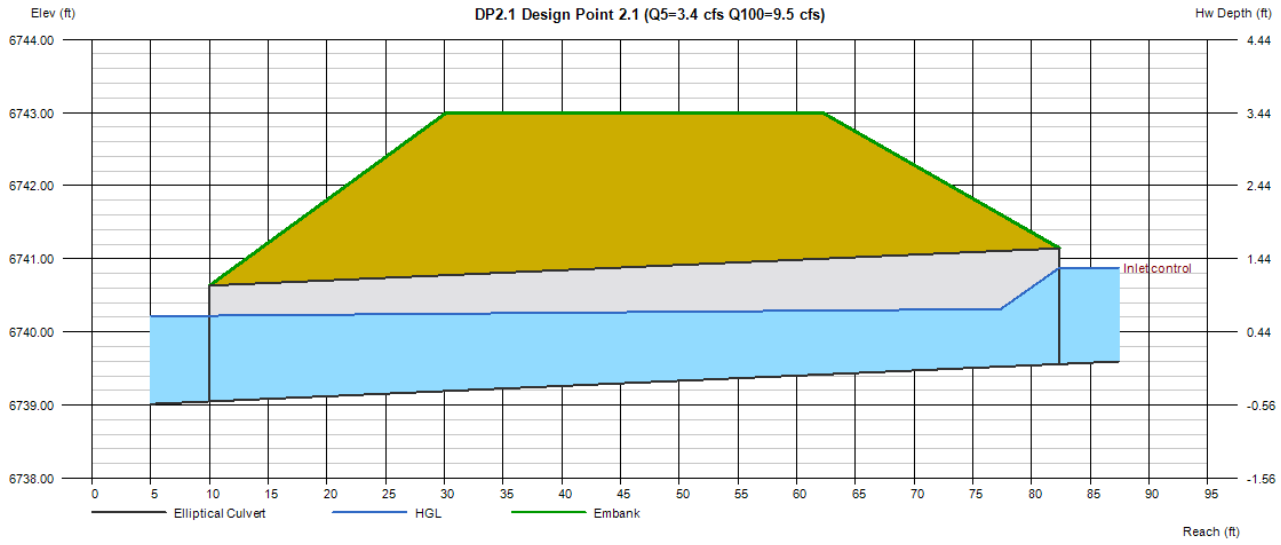
Top Elevation (ft)	=	6743.00
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	3.40
Qmax (cfs)	=	9.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.50
Qpipe (cfs)	=	9.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.23
Veloc Up (ft/s)	=	5.62
HGL Dn (ft)	=	6740.22
HGL Up (ft)	=	6740.32
Hw Elev (ft)	=	6740.88
Hw/D (ft)	=	0.83
Flow Regime	=	Inlet Control



Culvert Report

EX DP25 DESIGN POINT 25 (Q5=0.9 CFS Q100=5.7 CFS)

Invert Elev Dn (ft)	=	6750.98
Pipe Length (ft)	=	68.00
Slope (%)	=	1.40
Invert Elev Up (ft)	=	6751.93
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

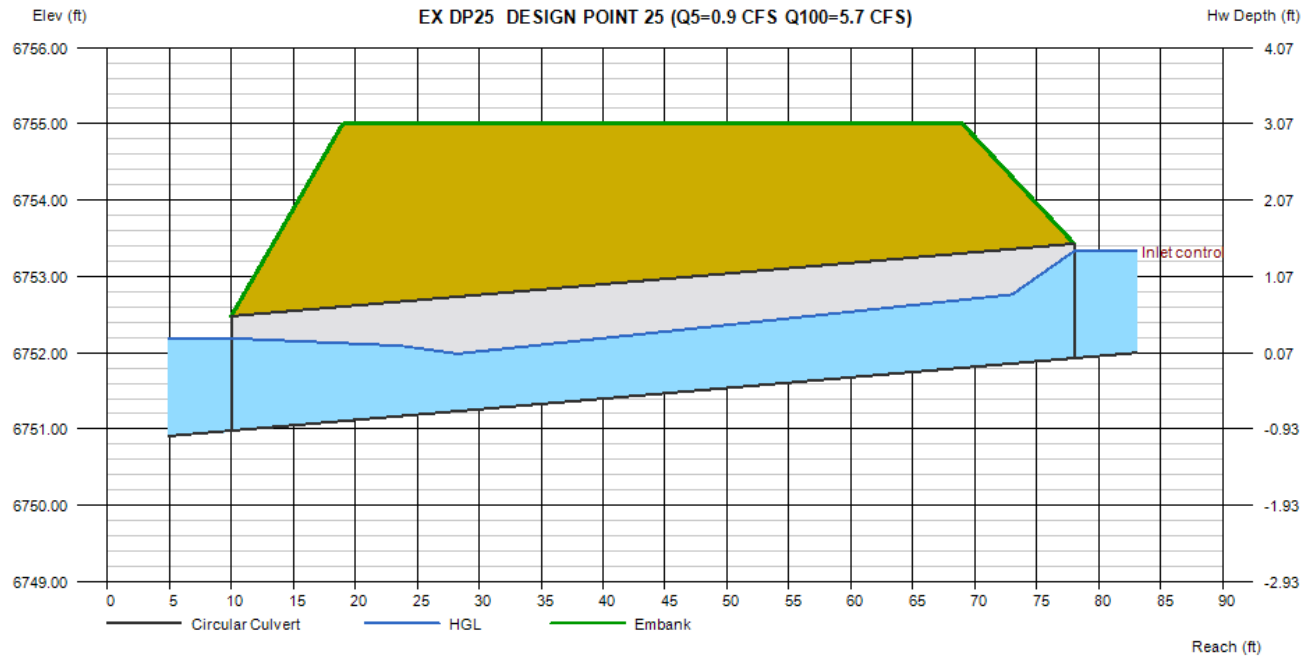
Top Elevation (ft)	=	6755.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.90
Qmax (cfs)	=	5.71
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	5.70
Qpipe (cfs)	=	5.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.73
Veloc Up (ft/s)	=	5.01
HGL Dn (ft)	=	6752.19
HGL Up (ft)	=	6752.85
Hw Elev (ft)	=	6753.33
Hw/D (ft)	=	0.94
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 30 2023

EX DPF3 DESIGN POINT F3 (Q5=2.6 CFS Q100=10.6 CFS)

Invert Elev Dn (ft)	=	6724.65
Pipe Length (ft)	=	68.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	6725.33
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

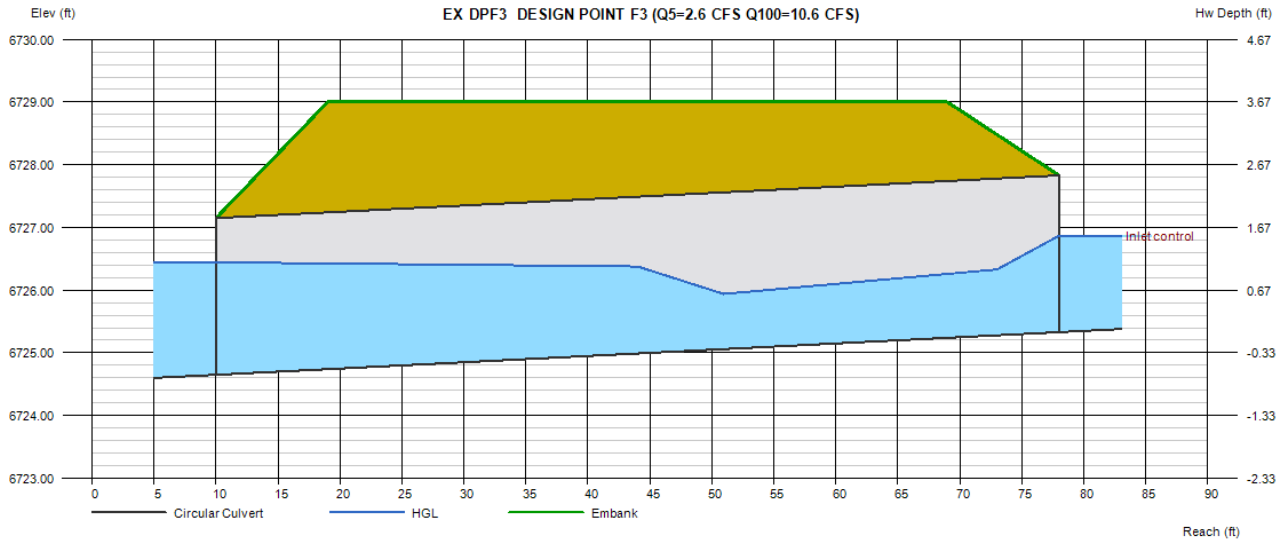
Top Elevation (ft)	=	6729.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	2.60
Qmax (cfs)	=	10.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	10.60
Qpipe (cfs)	=	10.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.81
Veloc Up (ft/s)	=	5.17
HGL Dn (ft)	=	6726.44
HGL Up (ft)	=	6726.42
Hw Elev (ft)	=	6726.87
Hw/D (ft)	=	0.61
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

Culvert CH1 (Q5=1.40 cfs, Q100=4.50 cfs)

Invert Elev Dn (ft)	=	6750.26
Pipe Length (ft)	=	58.66
Slope (%)	=	2.69
Invert Elev Up (ft)	=	6751.84
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

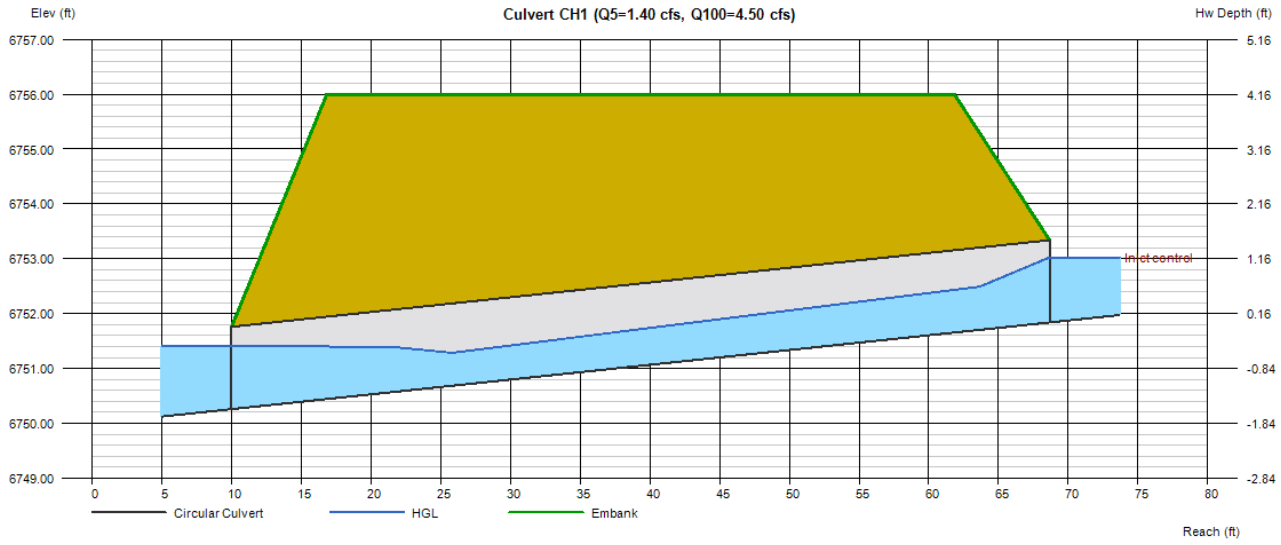
Top Elevation (ft)	=	6756.00
Top Width (ft)	=	45.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	1.40
Qmax (cfs)	=	4.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.50
Qpipe (cfs)	=	4.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.08
Veloc Up (ft/s)	=	4.60
HGL Dn (ft)	=	6751.42
HGL Up (ft)	=	6752.65
Hw Elev (ft)	=	6753.03
Hw/D (ft)	=	0.79
Flow Regime	=	Inlet Control



This culvert will be constructed by a different contractor alongside construction of the church site. The estimated flow being captured by this culvert is estimated to be 33% of the flow generated by Basin D1. This flow estimate is larger than what will actually flow to this culvert given where the culvert is placed in relation to the basin.

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

Culvert CH2 (Q5=2.81 cfs, Q100=9.05 cfs)

Invert Elev Dn (ft)	=	6755.18
Pipe Length (ft)	=	62.61
Slope (%)	=	2.78
Invert Elev Up (ft)	=	6756.92
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

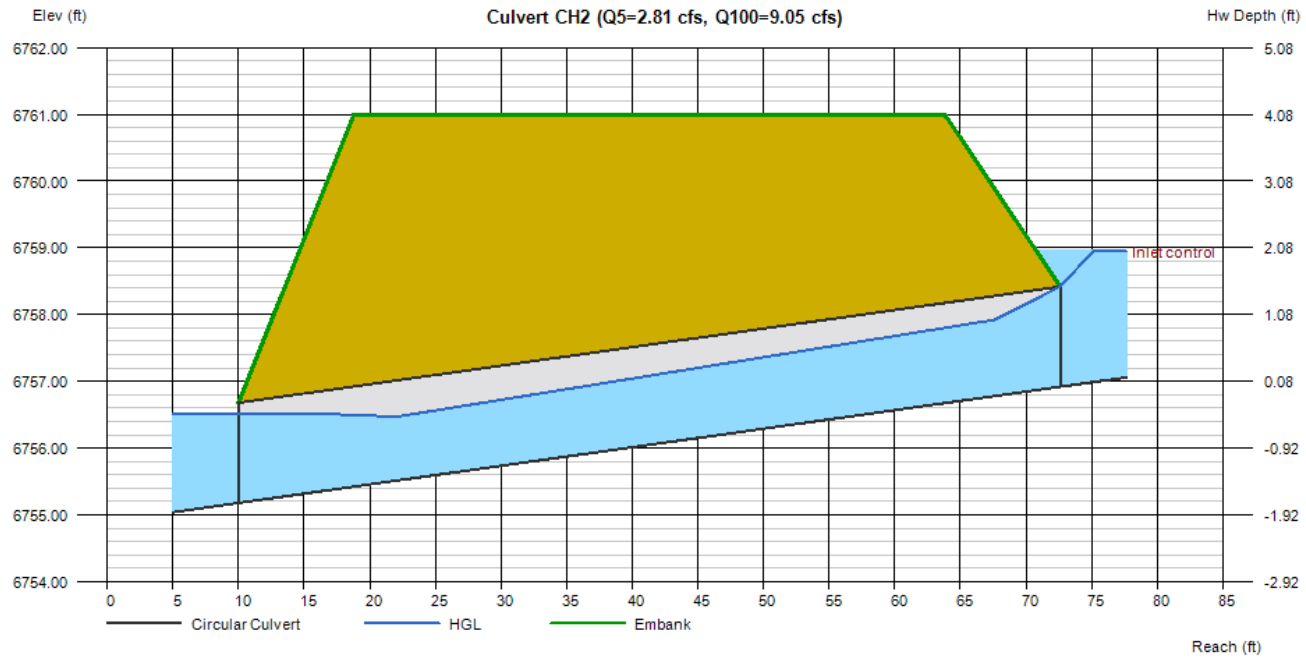
Top Elevation (ft)	=	6761.00
Top Width (ft)	=	45.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	2.81
Qmax (cfs)	=	9.05
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.05
Qpipe (cfs)	=	9.05
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.46
Veloc Up (ft/s)	=	6.16
HGL Dn (ft)	=	6756.51
HGL Up (ft)	=	6758.08
Hw Elev (ft)	=	6758.95
Hw/D (ft)	=	1.35
Flow Regime	=	Inlet Control



This culvert will be constructed by a different contractor alongside construction of the church site. The estimated flow being captured by this culvert is estimated to be 67% of the flow generated by Basin D1. This flow estimate is larger than what will actually flow to this culvert given where the culvert is placed in relation to the basin.

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

DP UD4 DESIGN POINT UD4 (Q5=N/A, Q100=541.5)

Invert Elev Dn (ft)	=	6719.29
Pipe Length (ft)	=	80.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6719.69
Rise (in)	=	48.0
Shape	=	Box
Span (in)	=	144.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

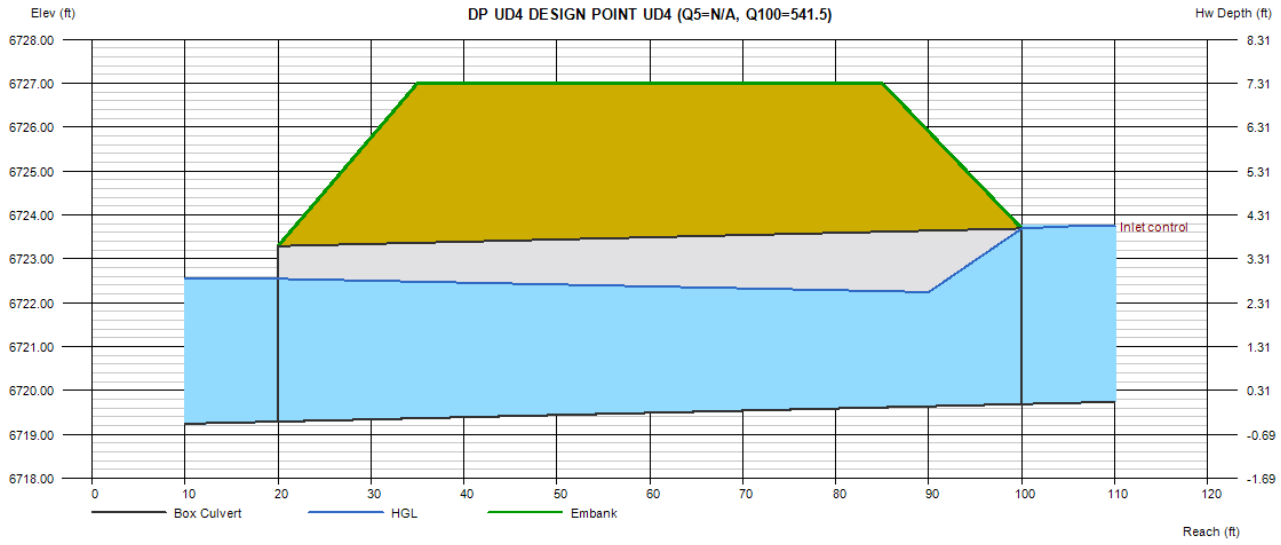
Top Elevation (ft)	=	6727.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	500.00
Qmax (cfs)	=	541.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	541.50
Qpipe (cfs)	=	541.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.93
Veloc Up (ft/s)	=	9.00
HGL Dn (ft)	=	6722.54
HGL Up (ft)	=	6722.20
Hw Elev (ft)	=	6723.74
Hw/D (ft)	=	1.01
Flow Regime	=	Inlet Control



The Q100 for Culvert UD4 was approximated by direct adding the Q100 from Design Point UD4 (representative of the runoff generated by Basin UD4), and the Q100=505 cfs of flow in Major Drainageway MS-06 per the Santa Fe Spring LOMR. This direct-added flow of 541.5 cfs being directed through Culvert UD4 is likely an overestimate of the flow that will actually be generated in the 100-year event.

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jul 6 2023

EX DP14 Design Point 14 (Q5=N/A, Q100-505 CFS)*

Invert Elev Dn (ft)	=	6762.54
Pipe Length (ft)	=	52.07
Slope (%)	=	1.67
Invert Elev Up (ft)	=	6763.41
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

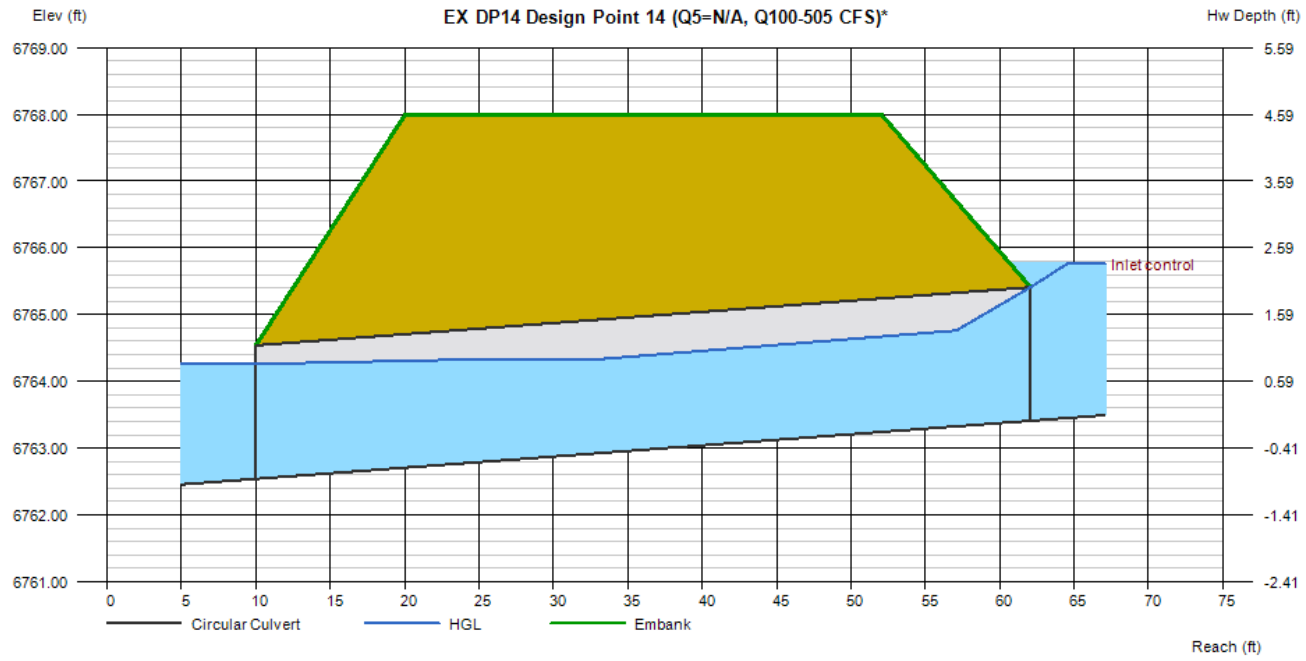
Top Elevation (ft)	=	6768.00
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	16.00
Qmax (cfs)	=	16.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	16.00
Qpipe (cfs)	=	16.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.56
Veloc Up (ft/s)	=	6.60
HGL Dn (ft)	=	6764.26
HGL Up (ft)	=	6764.85
Hw Elev (ft)	=	6765.77
Hw/D (ft)	=	1.18
Flow Regime	=	Inlet Control



*This model is solely meant to analyze full flow conditions of the culvert in order to size the proposed riprap. Existing culvert is modeled with the 100-year event flows in the GeoHECRAS map & associated table shown on page 140 of this report.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.0 Swale (5-Year) (FR:0.52)

Triangular

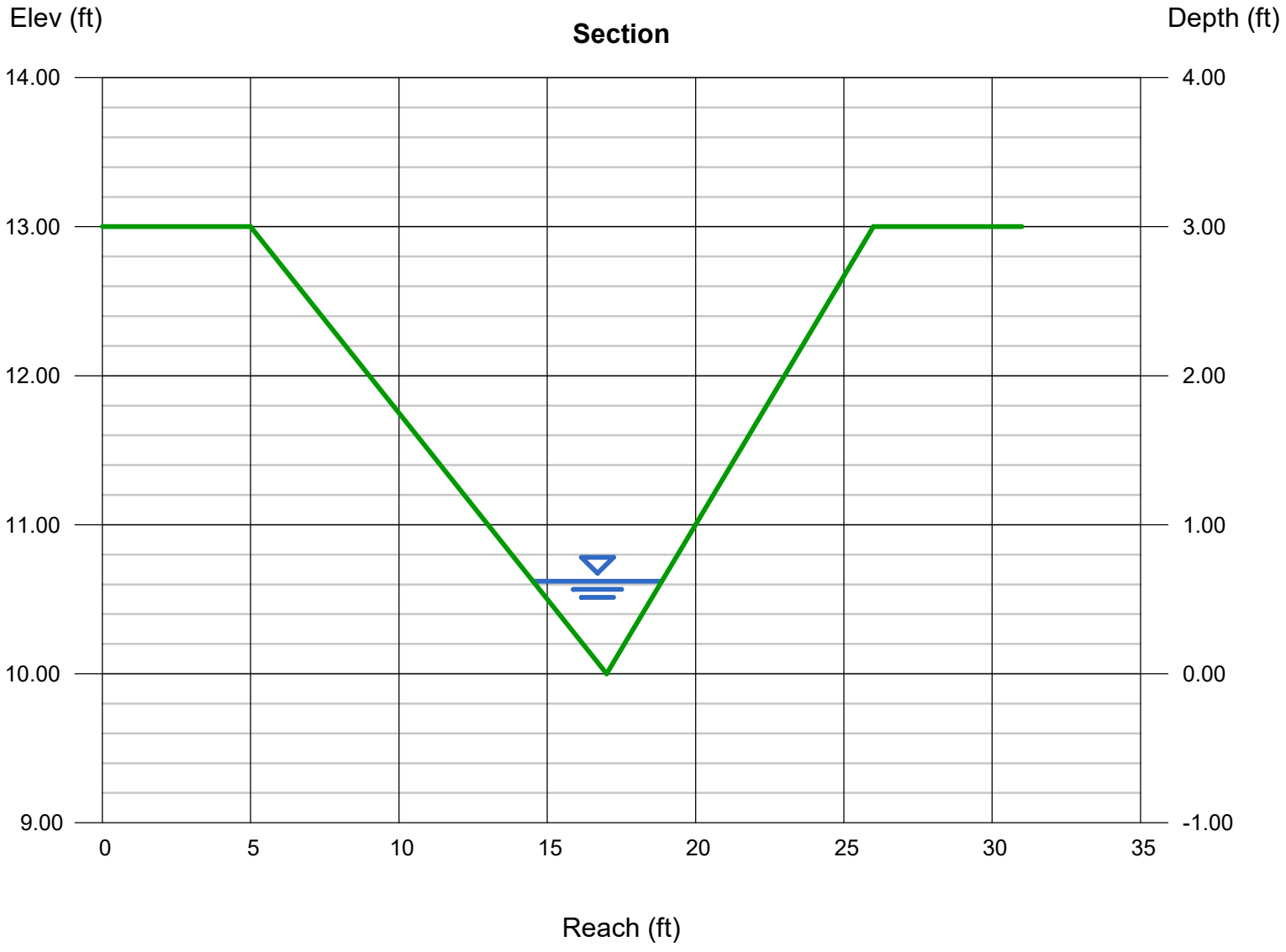
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.12
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.10

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 3.100
Area (sqft)	= 1.35
Velocity (ft/s)	= 2.30
Wetted Perim (ft)	= 4.52
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 4.34
EGL (ft)	= 0.70



Channel Report

DP 1.0 Swale (100-Year) (FR:0.56)

Triangular

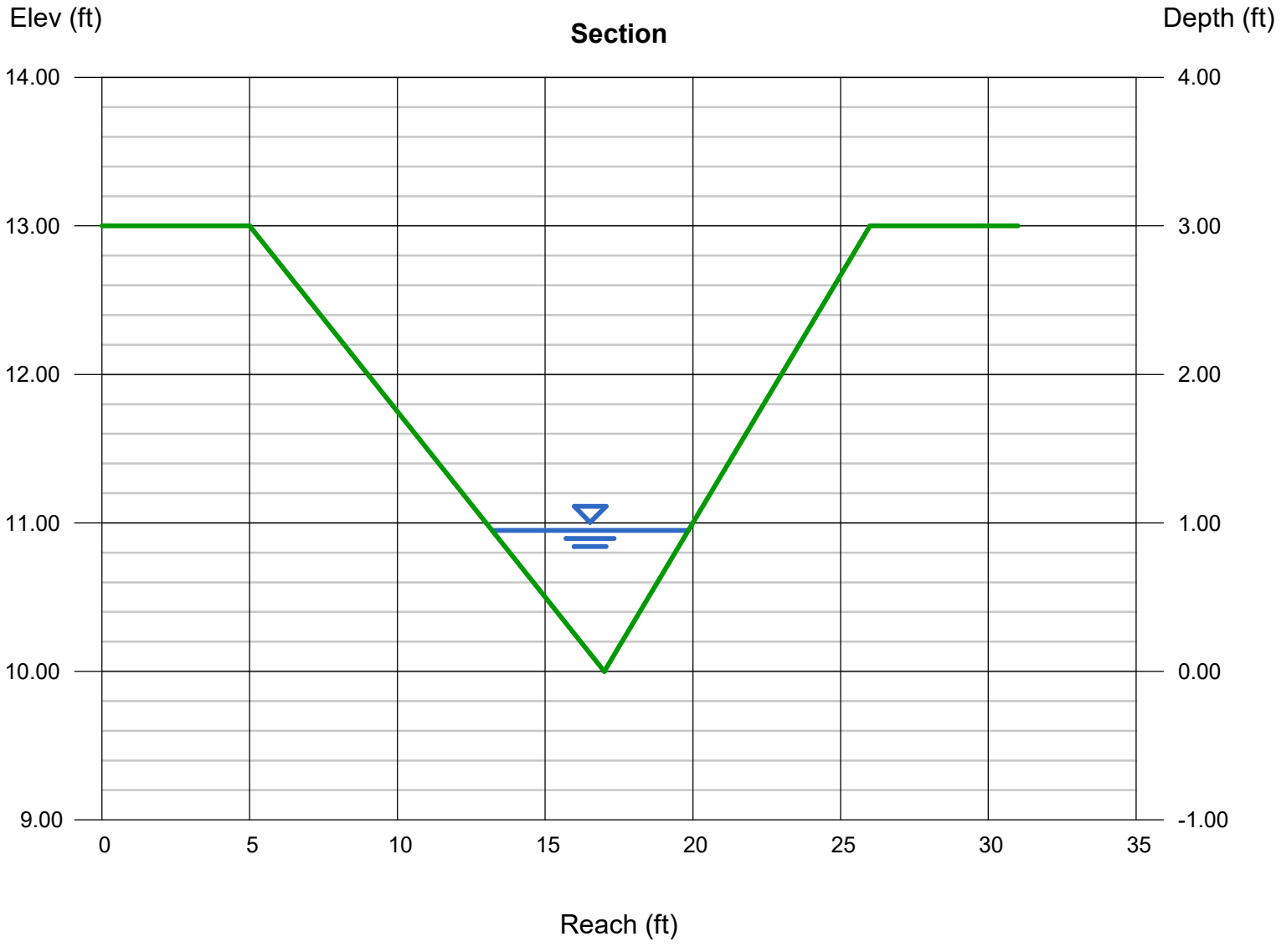
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.12
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.70

Highlighted

Depth (ft)	= 0.95
Q (cfs)	= 9.700
Area (sqft)	= 3.16
Velocity (ft/s)	= 3.07
Wetted Perim (ft)	= 6.92
Crit Depth, Yc (ft)	= 0.87
Top Width (ft)	= 6.65
EGL (ft)	= 1.10



Channel Report

DP 1.1 Swale (5-Year)(FR:0.51)

Triangular

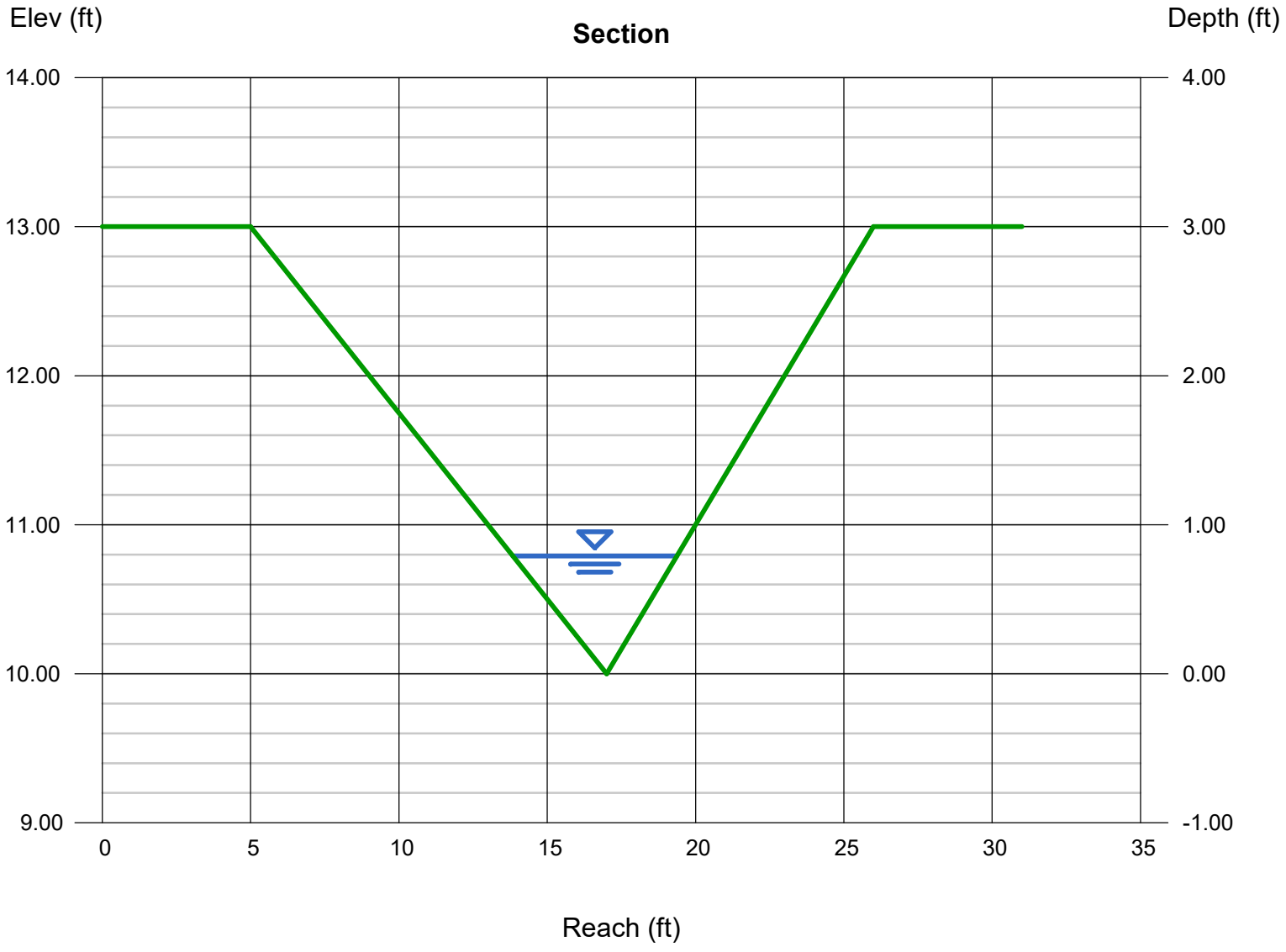
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.60

Highlighted

Depth (ft)	= 0.79
Q (cfs)	= 5.600
Area (sqft)	= 2.18
Velocity (ft/s)	= 2.56
Wetted Perim (ft)	= 5.76
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 5.53
EGL (ft)	= 0.89



Channel Report

DP 1.1 Swale (100-Year)(FR:0.56)

Triangular

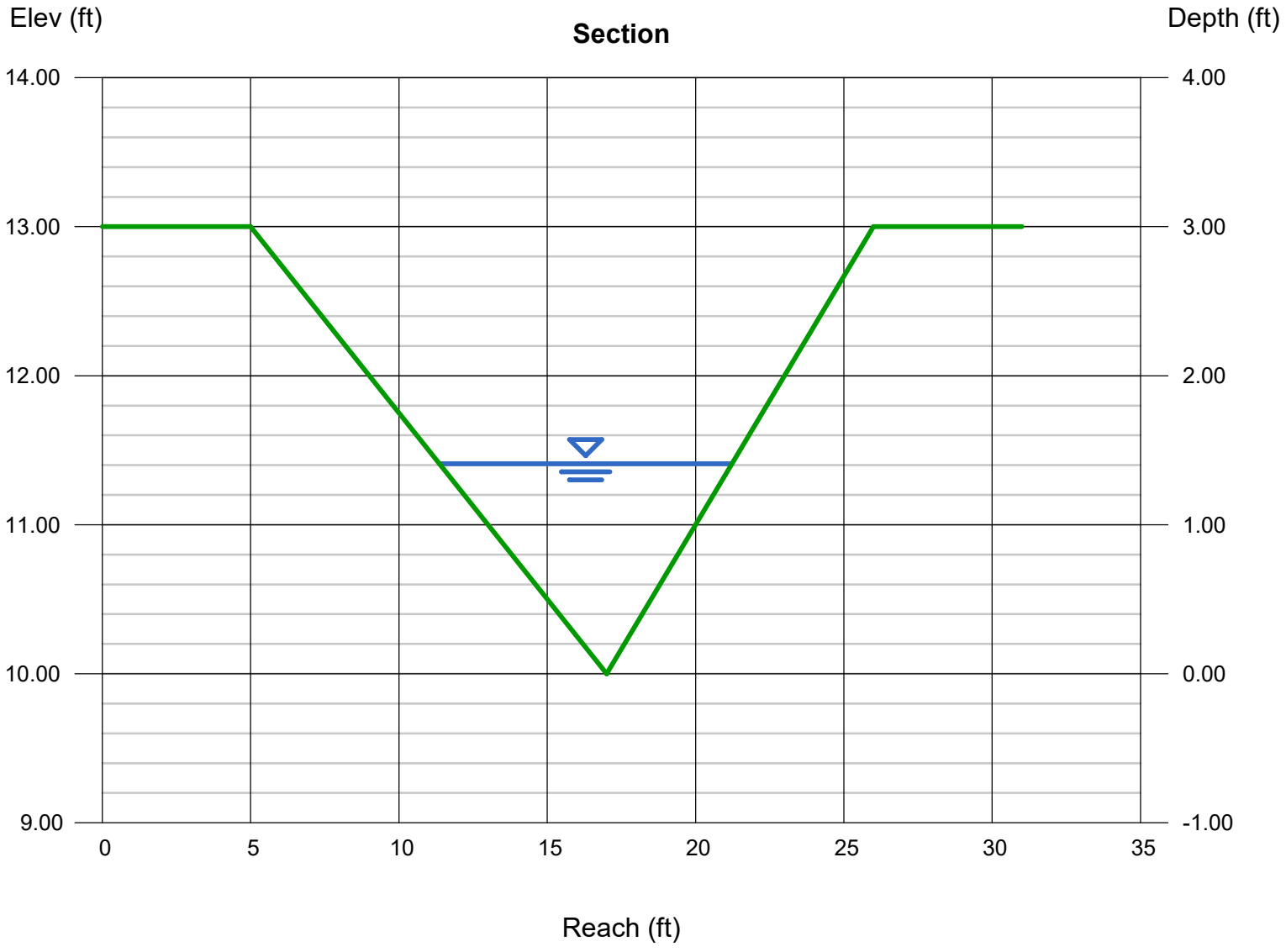
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 26.20

Highlighted

Depth (ft)	= 1.41
Q (cfs)	= 26.20
Area (sqft)	= 6.96
Velocity (ft/s)	= 3.77
Wetted Perim (ft)	= 10.27
Crit Depth, Yc (ft)	= 1.29
Top Width (ft)	= 9.87
EGL (ft)	= 1.63



Channel Report

DP 1.2 Swale (5-Year) (FR:0.51)

Triangular

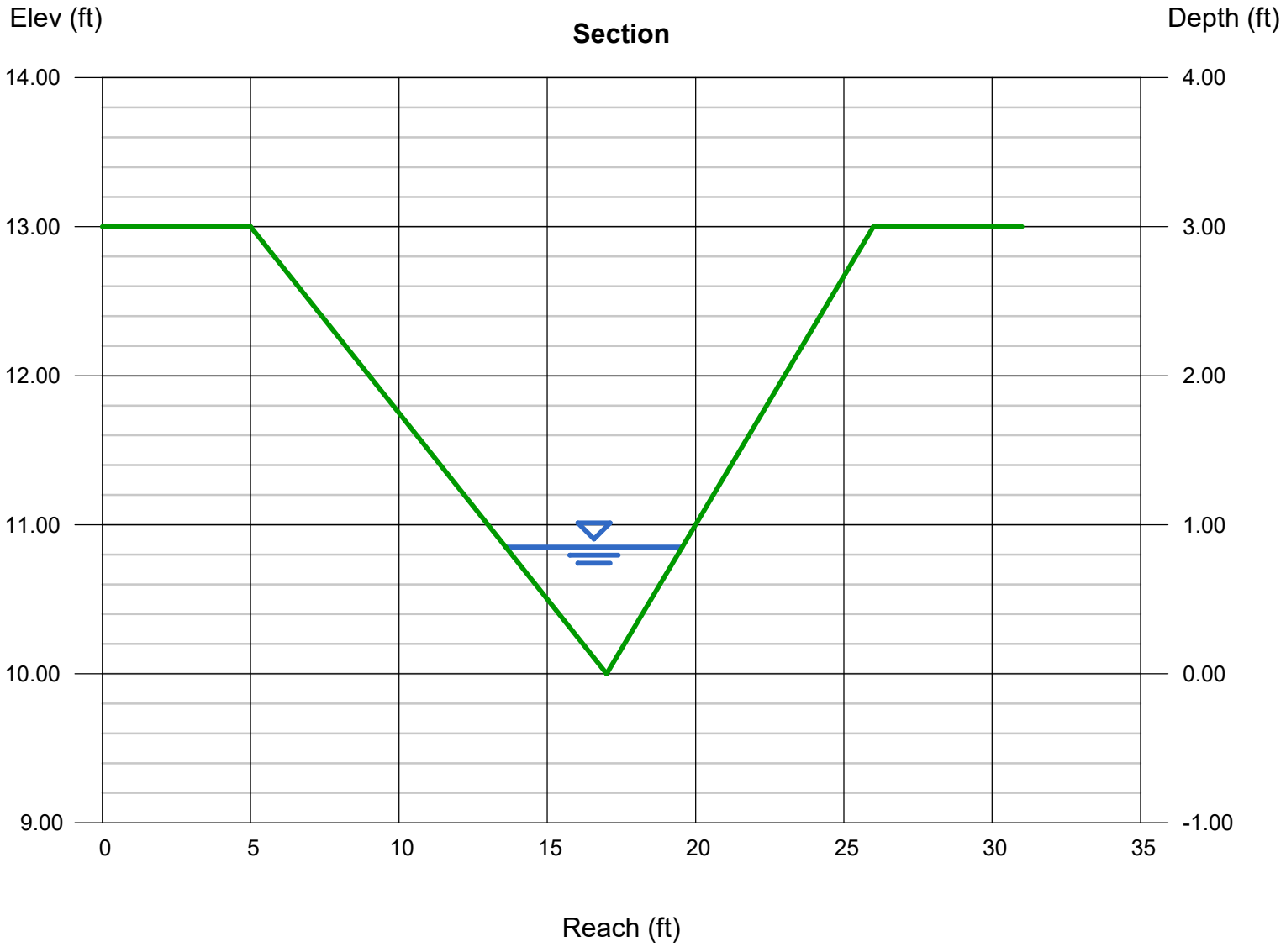
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.80

Highlighted

Depth (ft)	= 0.85
Q (cfs)	= 6.800
Area (sqft)	= 2.53
Velocity (ft/s)	= 2.69
Wetted Perim (ft)	= 6.19
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 5.95
EGL (ft)	= 0.96



Channel Report

DP 1.2 Swale (100-Year) (FR:0.57)

Triangular

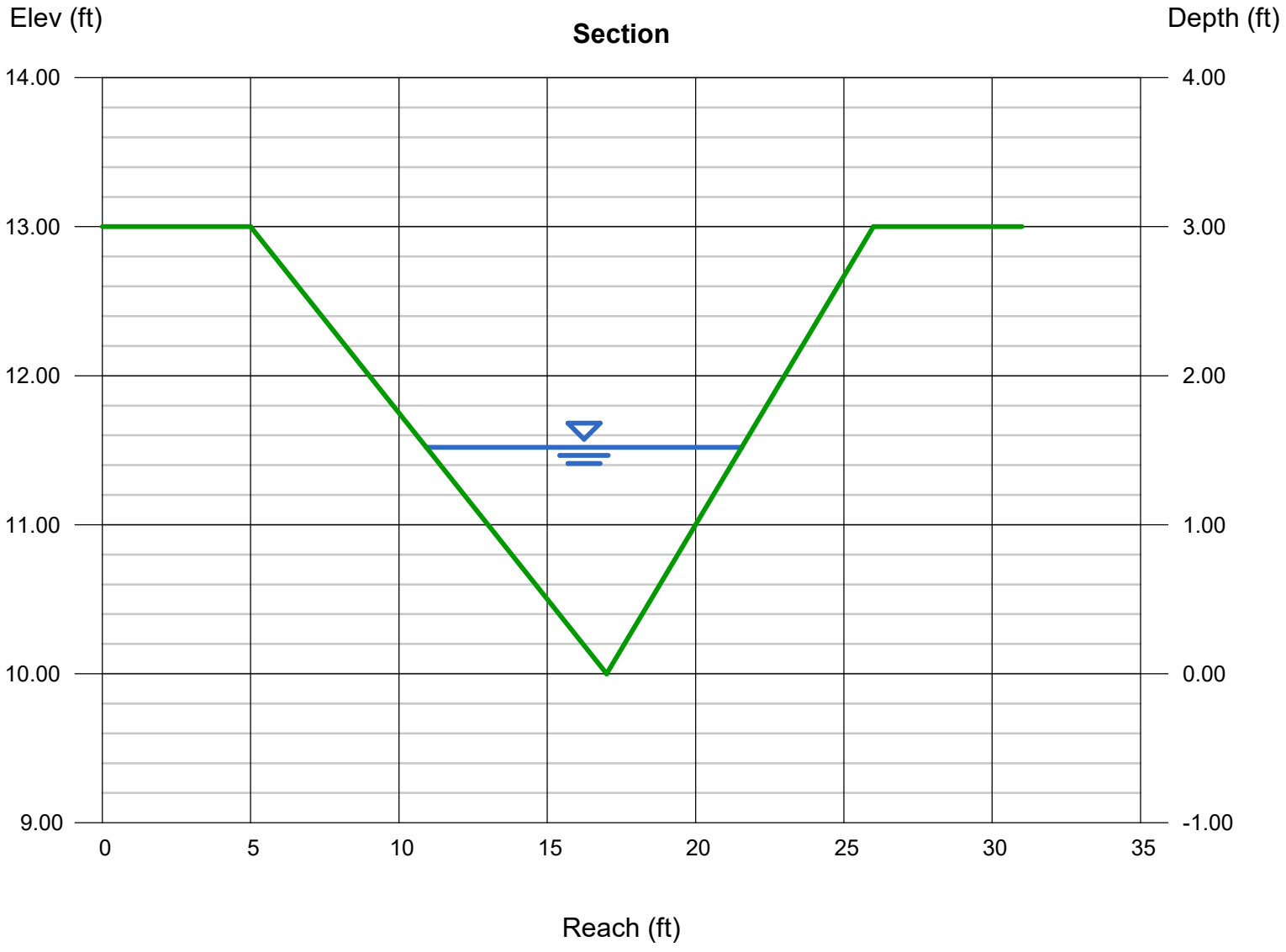
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 32.20

Highlighted

Depth (ft)	= 1.52
Q (cfs)	= 32.20
Area (sqft)	= 8.09
Velocity (ft/s)	= 3.98
Wetted Perim (ft)	= 11.07
Crit Depth, Yc (ft)	= 1.40
Top Width (ft)	= 10.64
EGL (ft)	= 1.77



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.3 Swale (5-Year) (FR:0.37)

Triangular

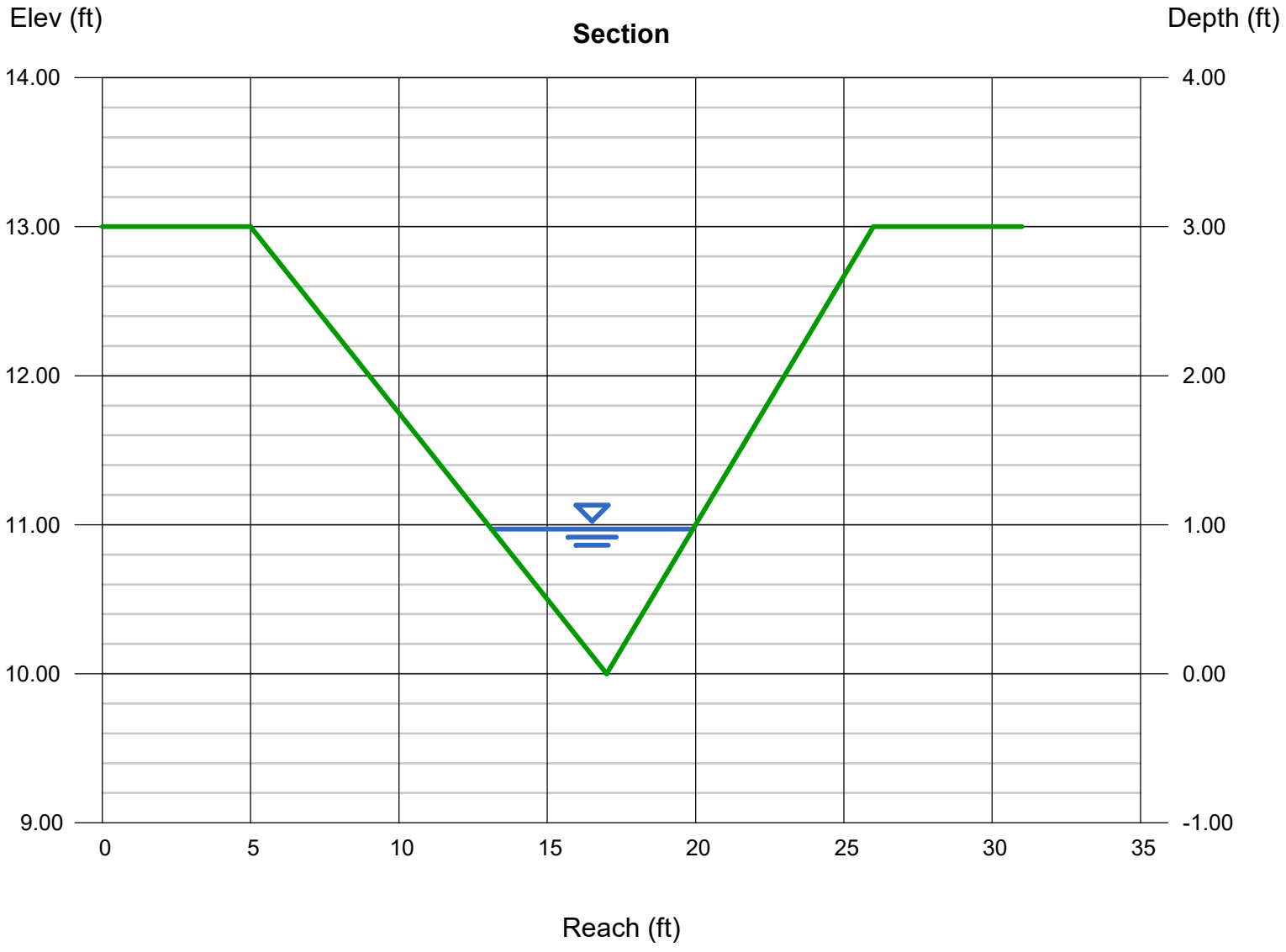
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.80

Highlighted

Depth (ft)	= 0.97
Q (cfs)	= 6.800
Area (sqft)	= 3.29
Velocity (ft/s)	= 2.06
Wetted Perim (ft)	= 7.07
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 6.79
EGL (ft)	= 1.04



Channel Report

DP 1.3 Swale (100-Year) (FR:0.41)

Triangular

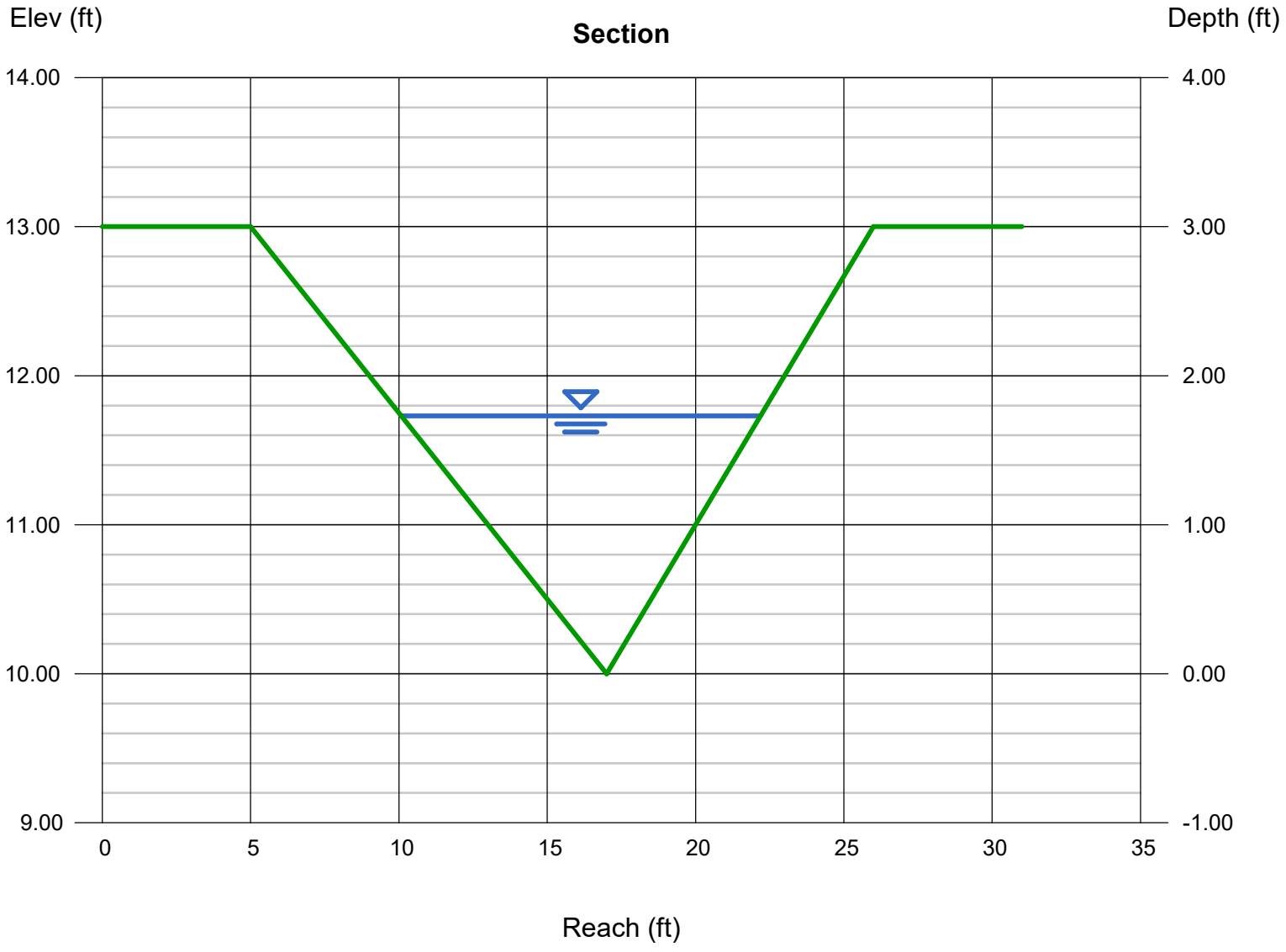
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 32.20

Highlighted

Depth (ft)	= 1.73
Q (cfs)	= 32.20
Area (sqft)	= 10.48
Velocity (ft/s)	= 3.07
Wetted Perim (ft)	= 12.60
Crit Depth, Yc (ft)	= 1.40
Top Width (ft)	= 12.11
EGL (ft)	= 1.88



Channel Report

DP 1.4 Swale (5-Year) (FR:0.51)

Triangular

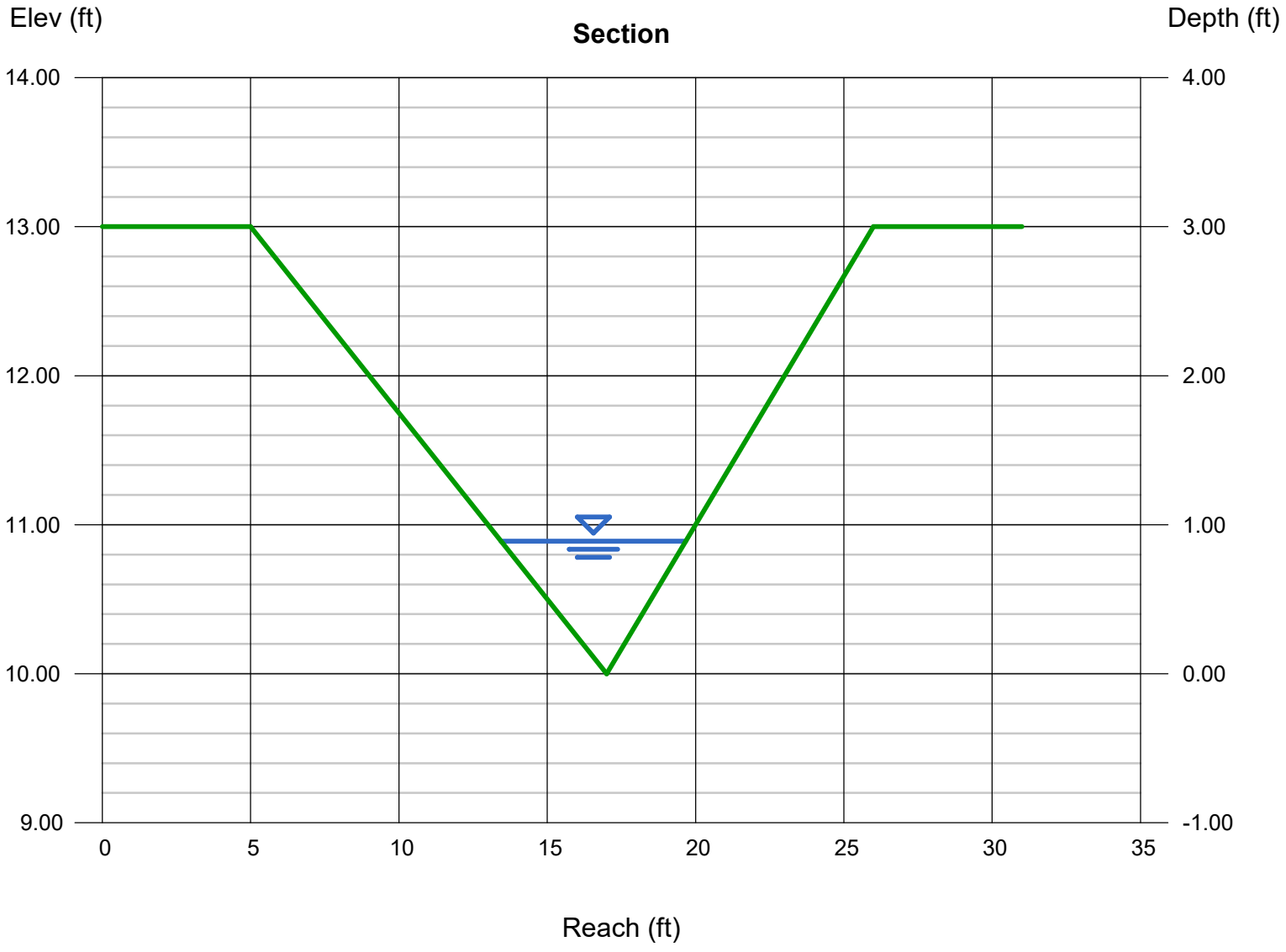
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.60

Highlighted

Depth (ft)	= 0.89
Q (cfs)	= 7.600
Area (sqft)	= 2.77
Velocity (ft/s)	= 2.74
Wetted Perim (ft)	= 6.48
Crit Depth, Yc (ft)	= 0.79
Top Width (ft)	= 6.23
EGL (ft)	= 1.01



Channel Report

DP 1.4 Swale (100-Year) (FR:0.57)

Triangular

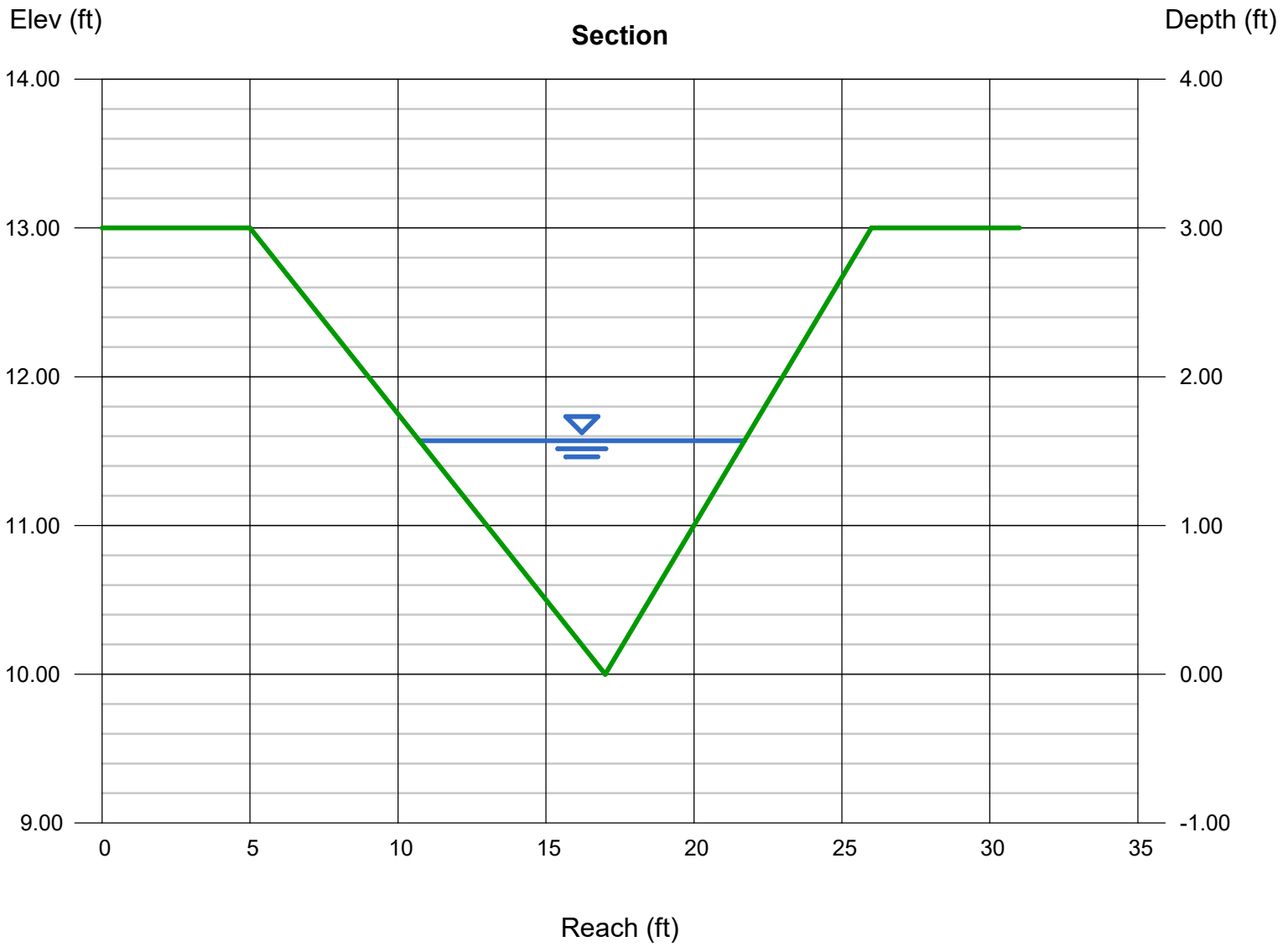
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 35.00

Highlighted

Depth (ft)	= 1.57
Q (cfs)	= 35.00
Area (sqft)	= 8.63
Velocity (ft/s)	= 4.06
Wetted Perim (ft)	= 11.44
Crit Depth, Yc (ft)	= 1.45
Top Width (ft)	= 10.99
EGL (ft)	= 1.83



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.5 Swale (5-Year) (FR:0.49)

Triangular

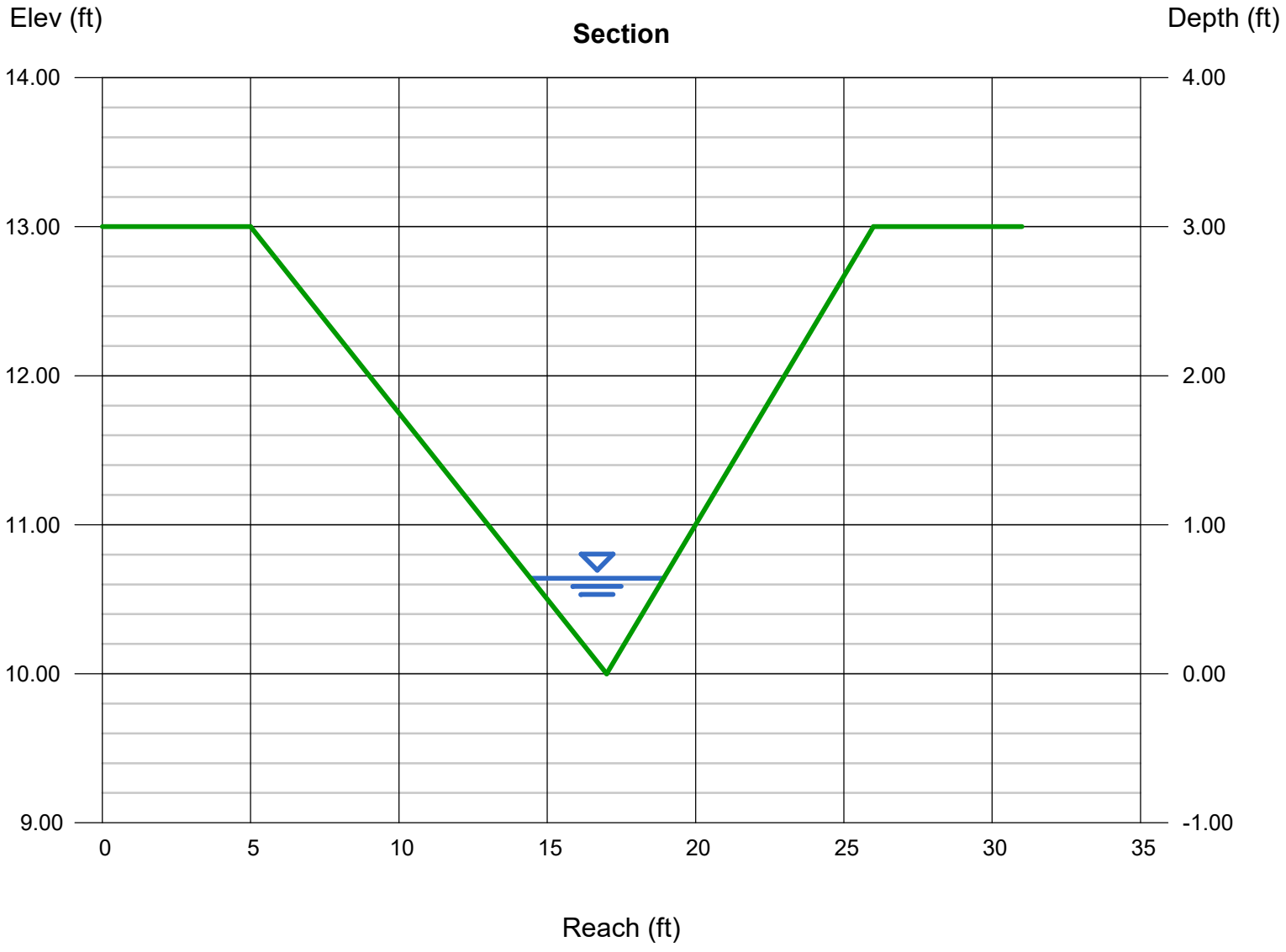
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.20

Highlighted

Depth (ft)	= 0.64
Q (cfs)	= 3.200
Area (sqft)	= 1.43
Velocity (ft/s)	= 2.23
Wetted Perim (ft)	= 4.66
Crit Depth, Yc (ft)	= 0.56
Top Width (ft)	= 4.48
EGL (ft)	= 0.72



Channel Report

DP 1.5 Swale (100-Year) (FR:0.56)

Triangular

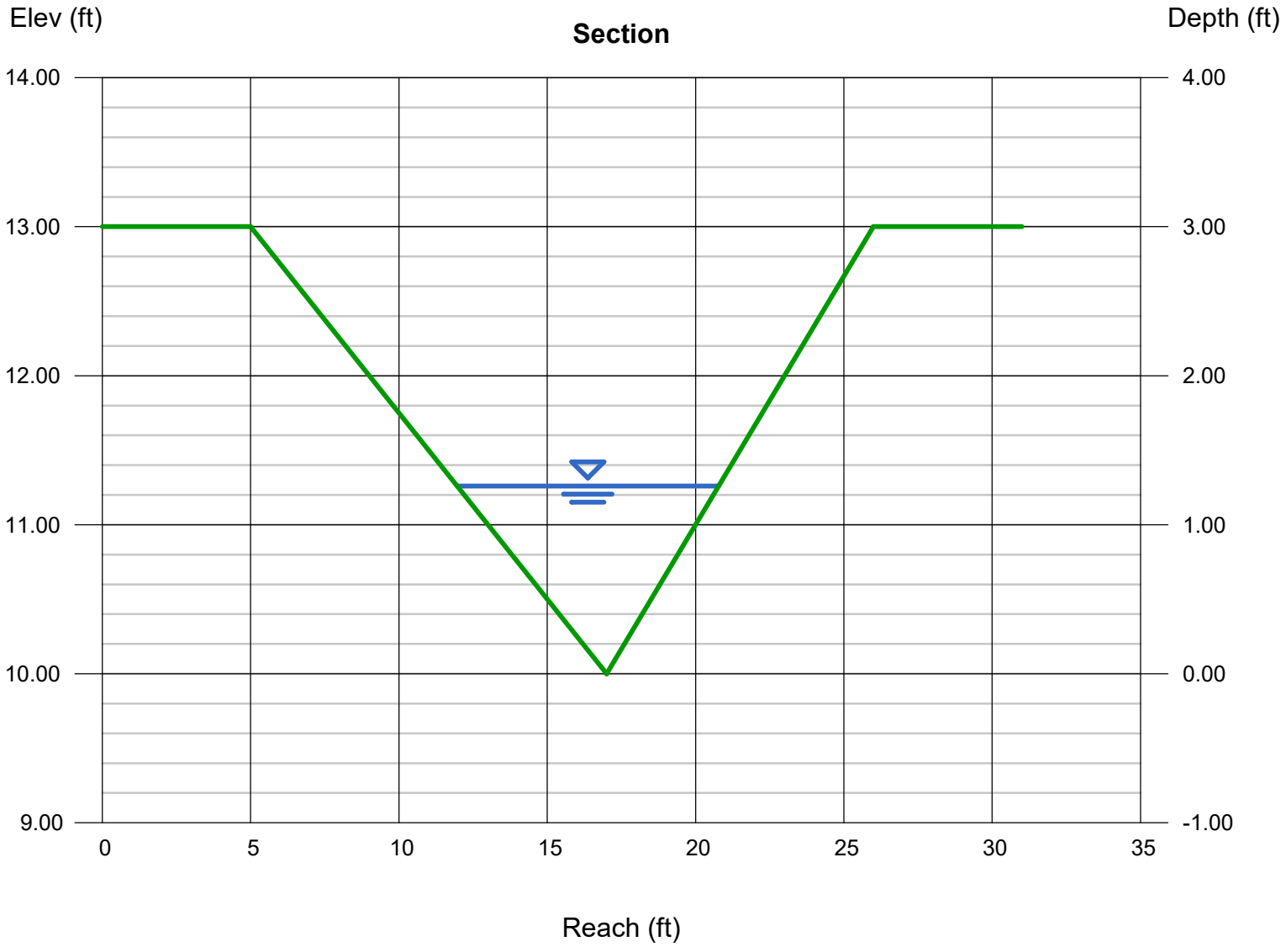
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 19.60

Highlighted

Depth (ft)	= 1.26
Q (cfs)	= 19.60
Area (sqft)	= 5.56
Velocity (ft/s)	= 3.53
Wetted Perim (ft)	= 9.18
Crit Depth, Yc (ft)	= 1.15
Top Width (ft)	= 8.82
EGL (ft)	= 1.45



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.6 Swale (5-Year) (FR:0.44)

Triangular

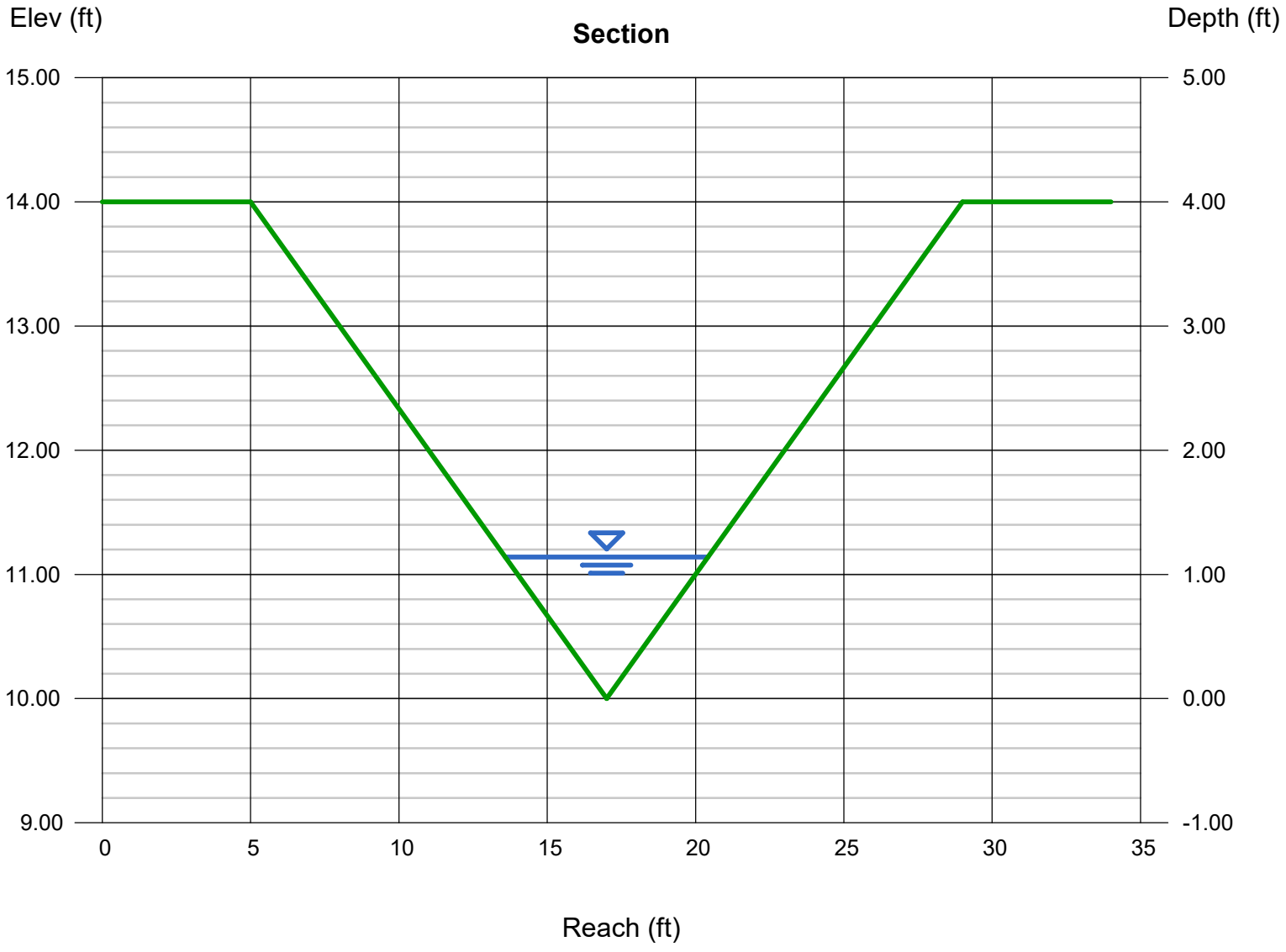
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.70
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.50

Highlighted

Depth (ft)	= 1.14
Q (cfs)	= 10.50
Area (sqft)	= 3.90
Velocity (ft/s)	= 2.69
Wetted Perim (ft)	= 7.21
Crit Depth, Yc (ft)	= 0.95
Top Width (ft)	= 6.84
EGL (ft)	= 1.25



Channel Report

DP 1.6 Swale (100-Year) (FR:0.49)

Triangular

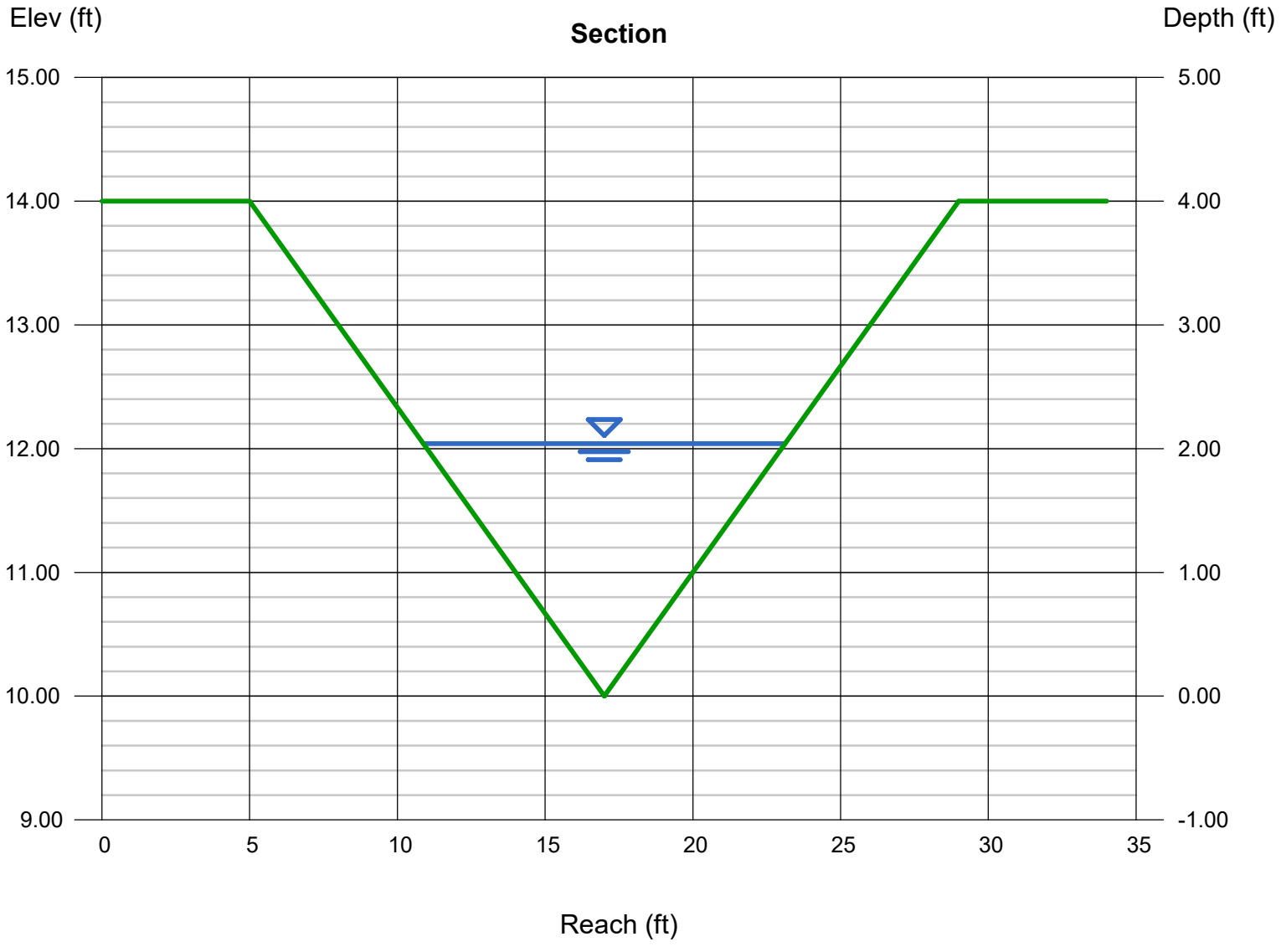
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.70
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 50.00

Highlighted

Depth (ft)	= 2.04
Q (cfs)	= 50.00
Area (sqft)	= 12.48
Velocity (ft/s)	= 4.00
Wetted Perim (ft)	= 12.90
Crit Depth, Yc (ft)	= 1.77
Top Width (ft)	= 12.24
EGL (ft)	= 2.29



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 16 2023

DP 2.0 Swale (5-Year)(FR:0.50)

Triangular

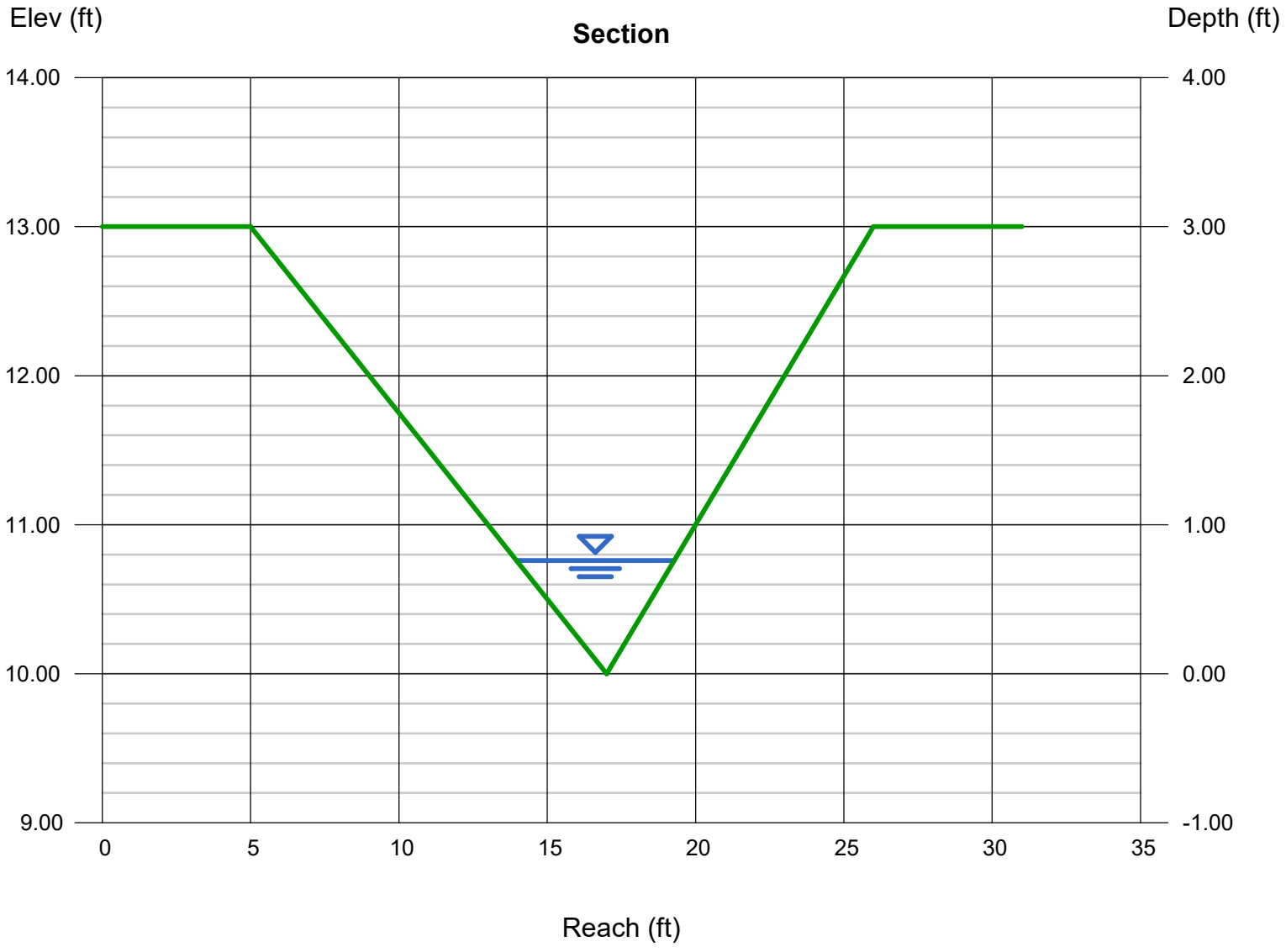
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.00

Highlighted

Depth (ft)	= 0.76
Q (cfs)	= 5.000
Area (sqft)	= 2.02
Velocity (ft/s)	= 2.47
Wetted Perim (ft)	= 5.54
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 5.32
EGL (ft)	= 0.86



Channel Report

DP 2.0 Swale (100-Year)(FR:0.55)

Triangular

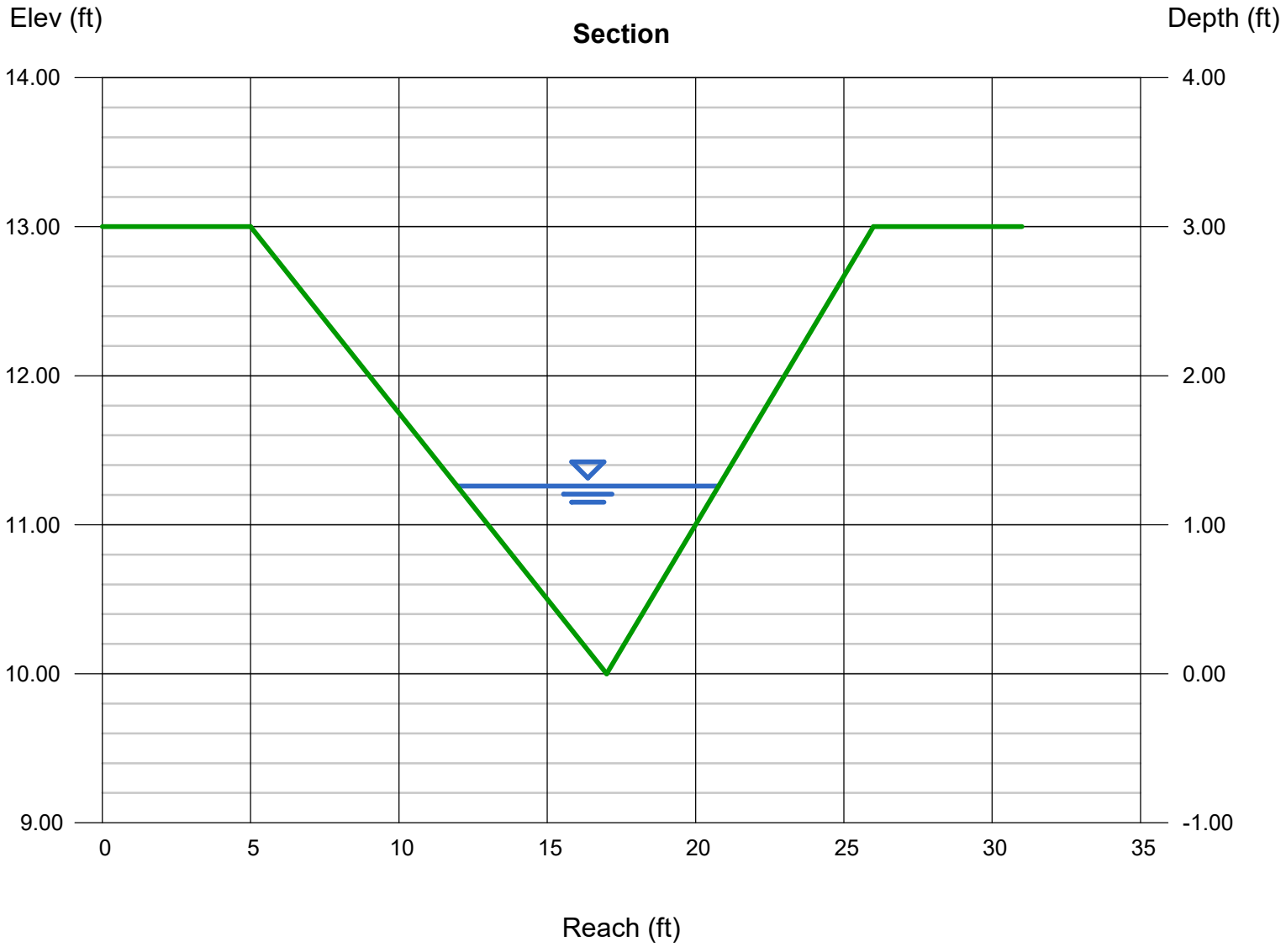
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 19.60

Highlighted

Depth (ft)	= 1.26
Q (cfs)	= 19.60
Area (sqft)	= 5.56
Velocity (ft/s)	= 3.53
Wetted Perim (ft)	= 9.18
Crit Depth, Yc (ft)	= 1.15
Top Width (ft)	= 8.82
EGL (ft)	= 1.45



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 2.1 Swale (5-Year)(FR:0.57)

Triangular

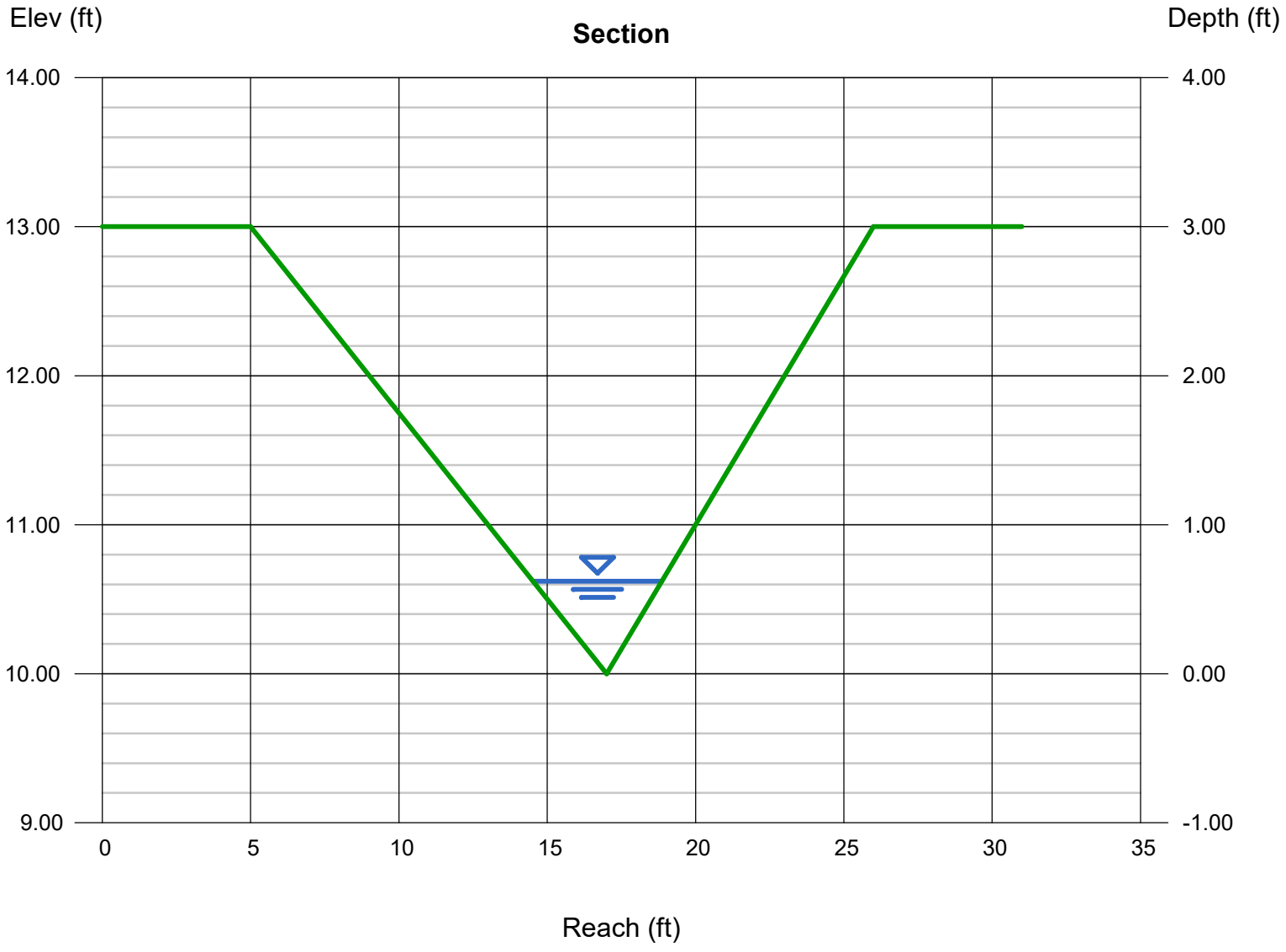
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.34
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.40

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 3.400
Area (sqft)	= 1.35
Velocity (ft/s)	= 2.53
Wetted Perim (ft)	= 4.52
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 4.34
EGL (ft)	= 0.72



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 2.1 Swale (100-Year)(FR:0.61)

Triangular

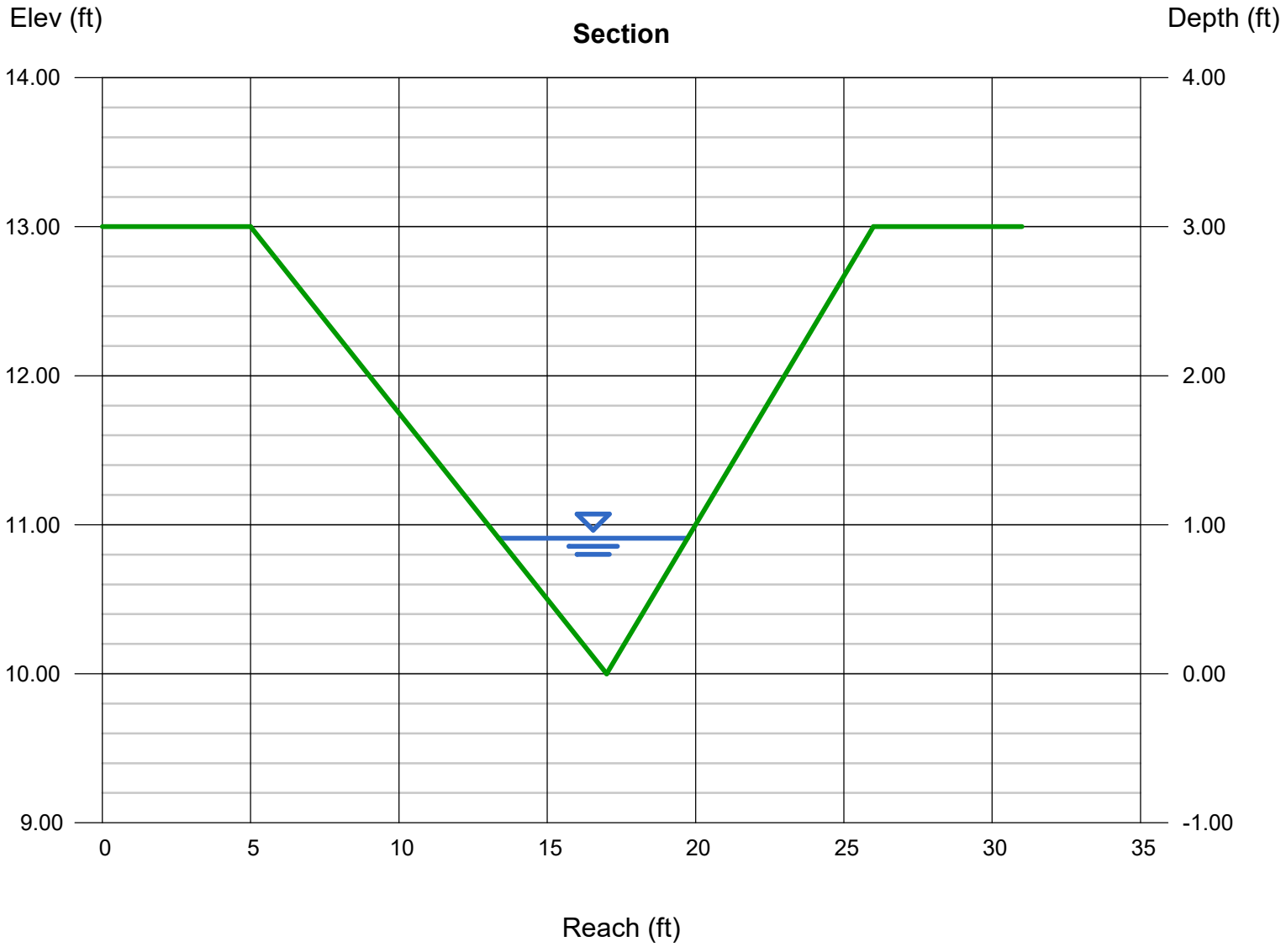
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.34
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.50

Highlighted

Depth (ft)	= 0.91
Q (cfs)	= 9.500
Area (sqft)	= 2.90
Velocity (ft/s)	= 3.28
Wetted Perim (ft)	= 6.63
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 6.37
EGL (ft)	= 1.08



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 2.2 Swale (5-Year) (FR:0.66)

Triangular

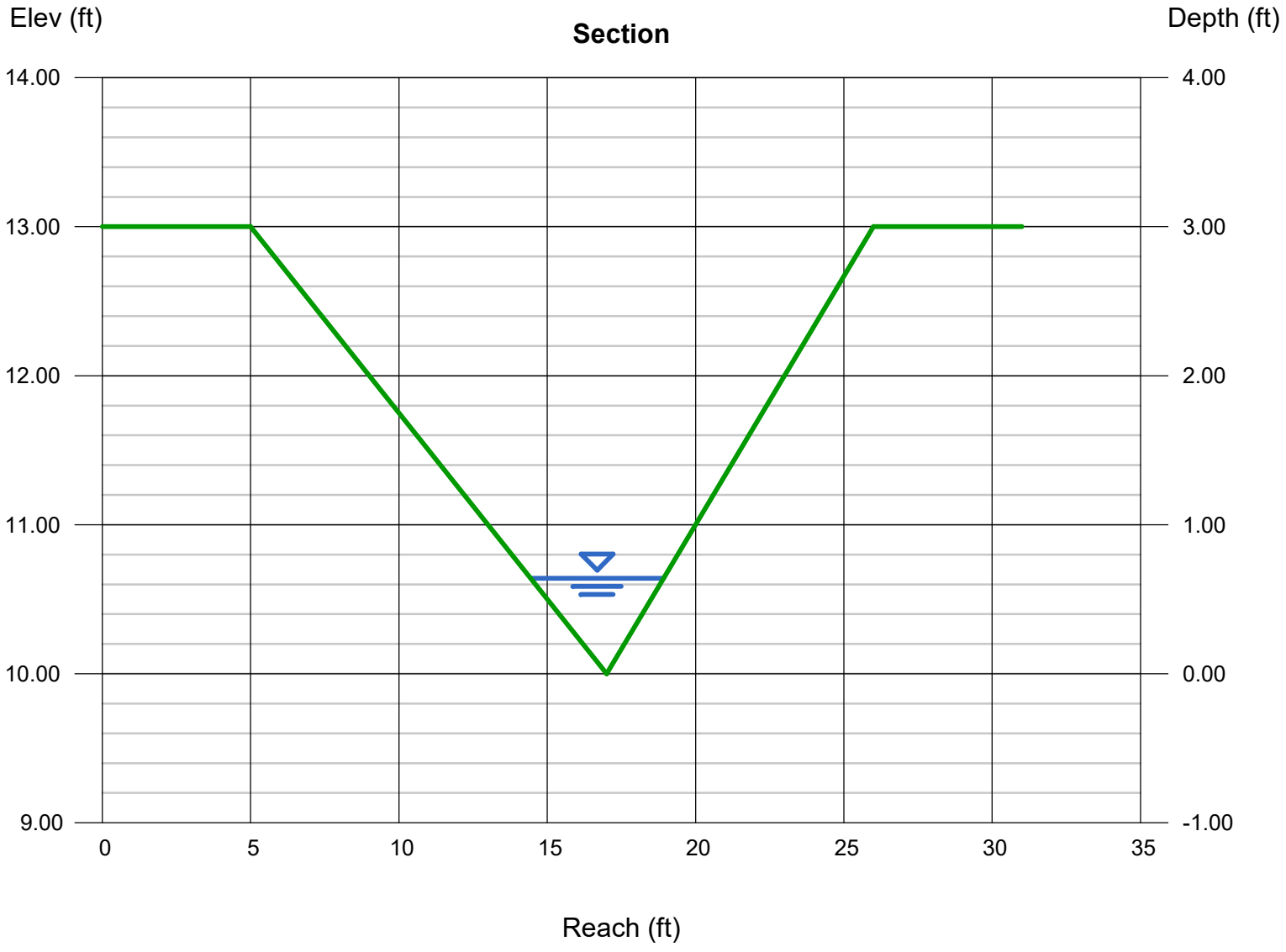
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.83
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.30

Highlighted

Depth (ft)	= 0.64
Q (cfs)	= 4.300
Area (sqft)	= 1.43
Velocity (ft/s)	= 3.00
Wetted Perim (ft)	= 4.66
Crit Depth, Yc (ft)	= 0.63
Top Width (ft)	= 4.48
EGL (ft)	= 0.78



Channel Report

DP 2.2 Swale (100-Year) (FR:0.70)

Triangular

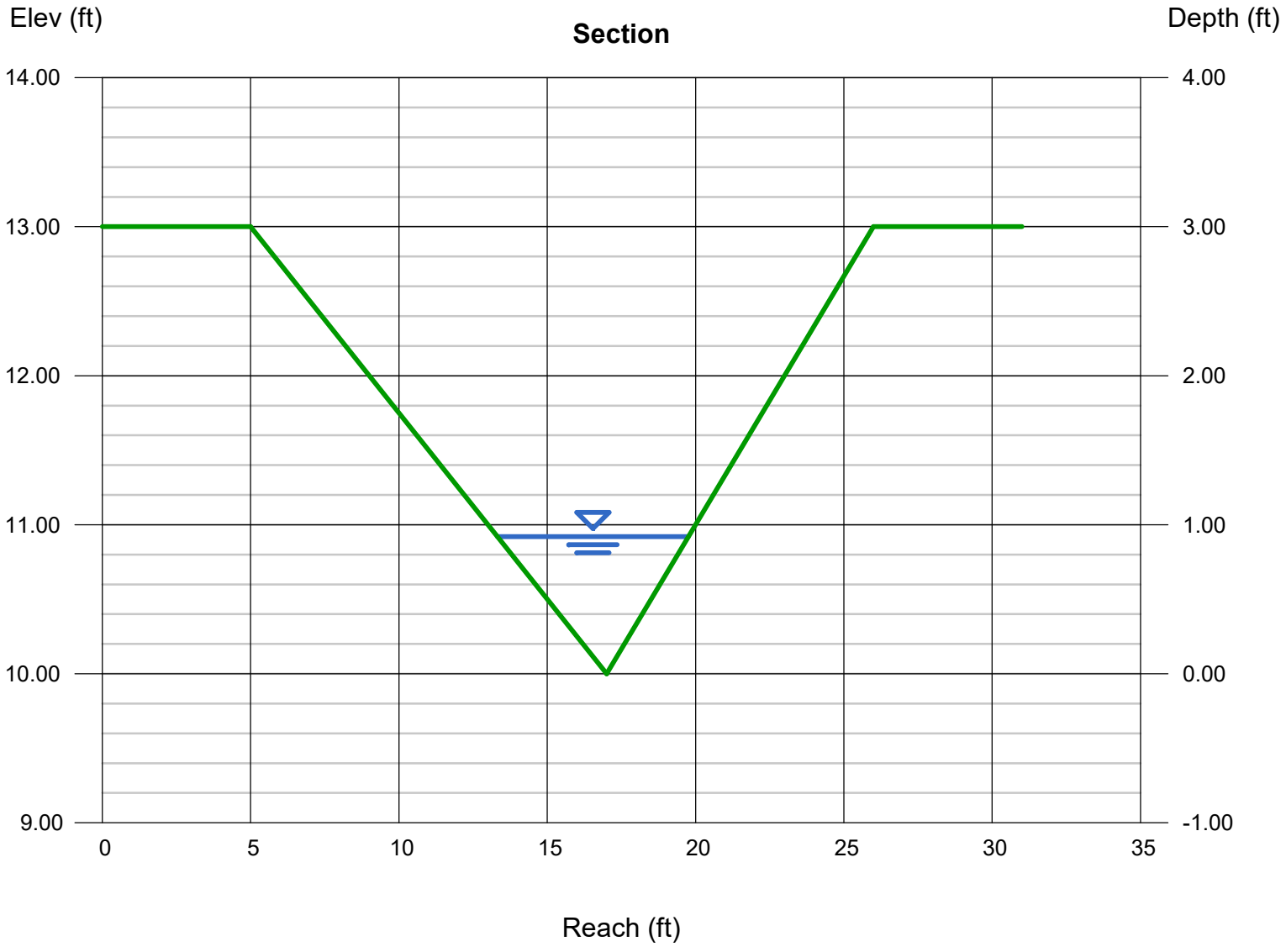
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.83
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.30

Highlighted

Depth (ft)	= 0.92
Q (cfs)	= 11.30
Area (sqft)	= 2.96
Velocity (ft/s)	= 3.81
Wetted Perim (ft)	= 6.70
Crit Depth, Yc (ft)	= 0.92
Top Width (ft)	= 6.44
EGL (ft)	= 1.15



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 16 2023

DP 2.3 Swale (5-Year)(FR:0.51)

Triangular

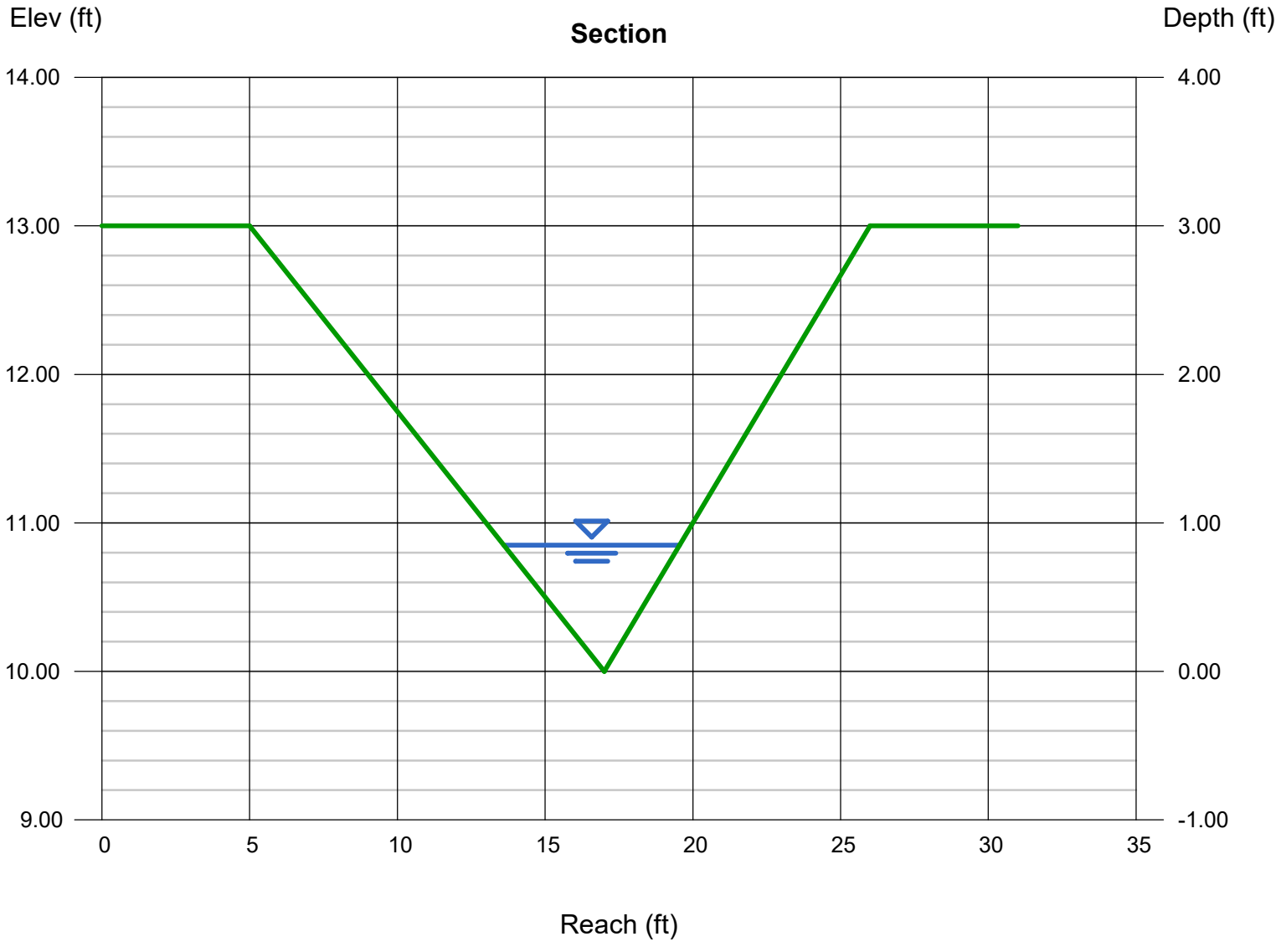
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.70

Highlighted

Depth (ft)	= 0.85
Q (cfs)	= 6.700
Area (sqft)	= 2.53
Velocity (ft/s)	= 2.65
Wetted Perim (ft)	= 6.19
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 5.95
EGL (ft)	= 0.96



Channel Report

DP 2.3 Swale (100-Year)(FR:0.57)

Triangular

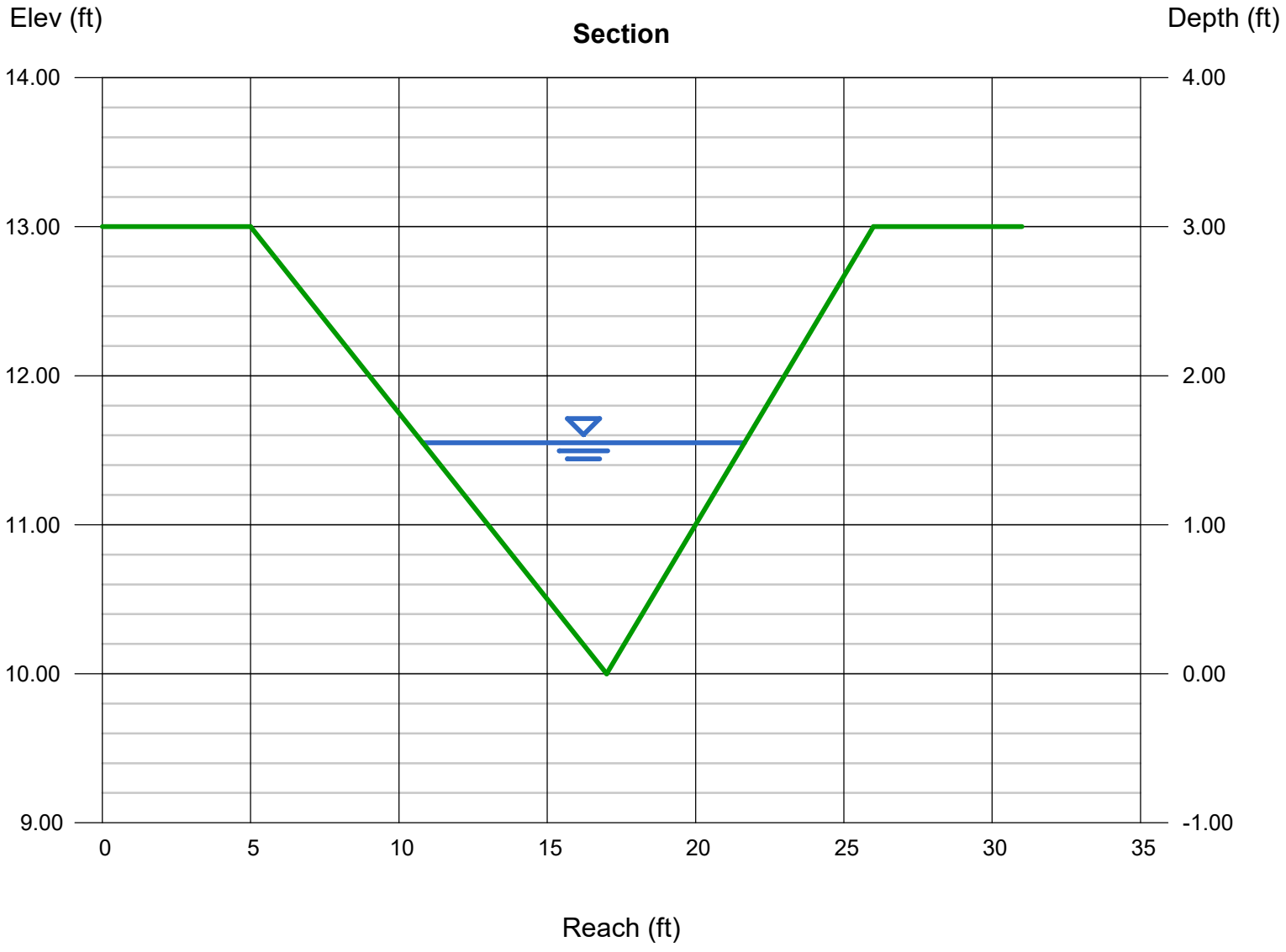
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 34.10

Highlighted

Depth (ft)	= 1.55
Q (cfs)	= 34.10
Area (sqft)	= 8.41
Velocity (ft/s)	= 4.06
Wetted Perim (ft)	= 11.29
Crit Depth, Yc (ft)	= 1.43
Top Width (ft)	= 10.85
EGL (ft)	= 1.81



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 3 Swale (5-Year) (FR:0.46)

Triangular

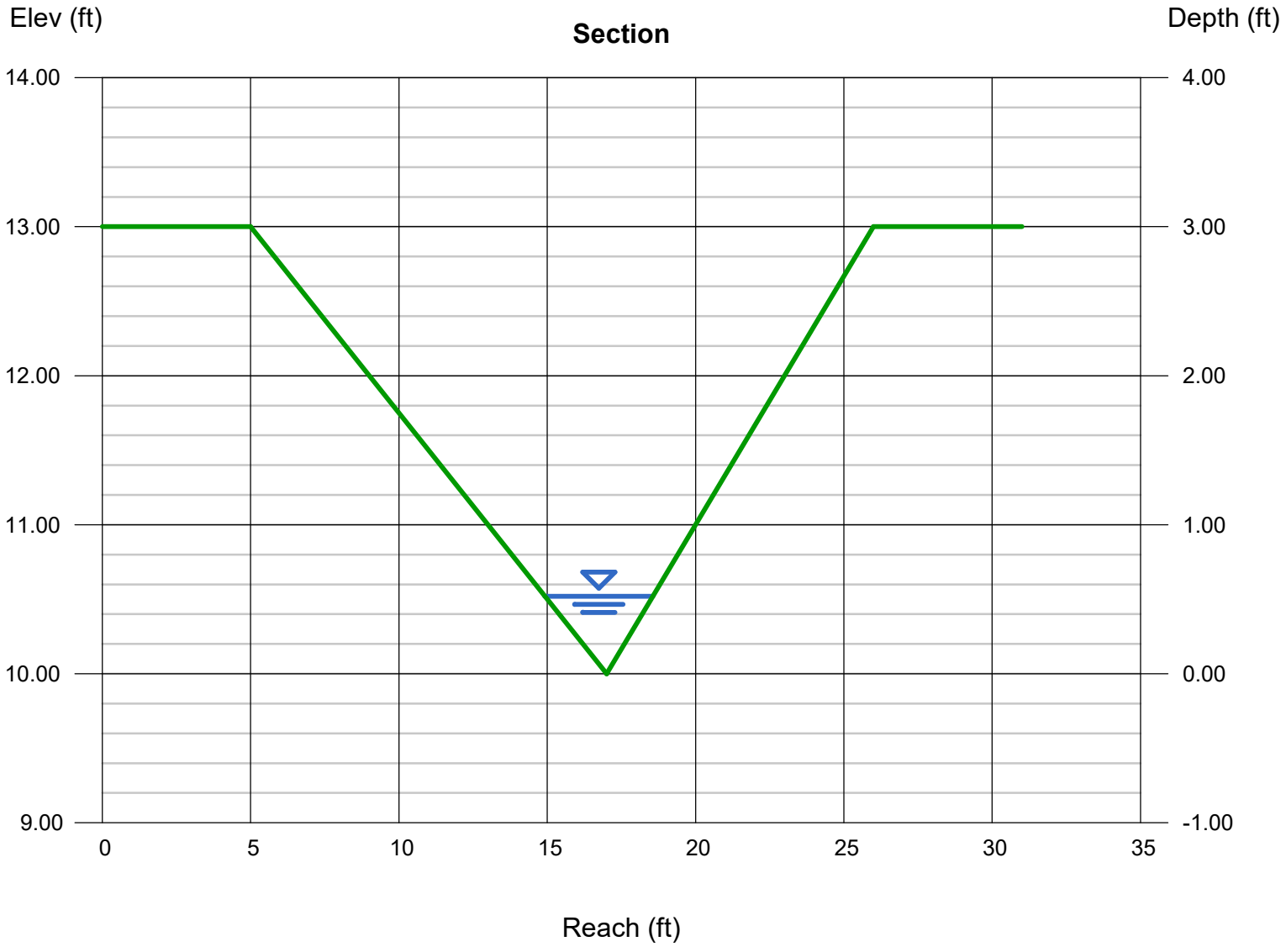
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.80

Highlighted

Depth (ft)	= 0.52
Q (cfs)	= 1.800
Area (sqft)	= 0.95
Velocity (ft/s)	= 1.90
Wetted Perim (ft)	= 3.79
Crit Depth, Yc (ft)	= 0.44
Top Width (ft)	= 3.64
EGL (ft)	= 0.58



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 3 Swale (100-Year) (FR:0.53)

Triangular

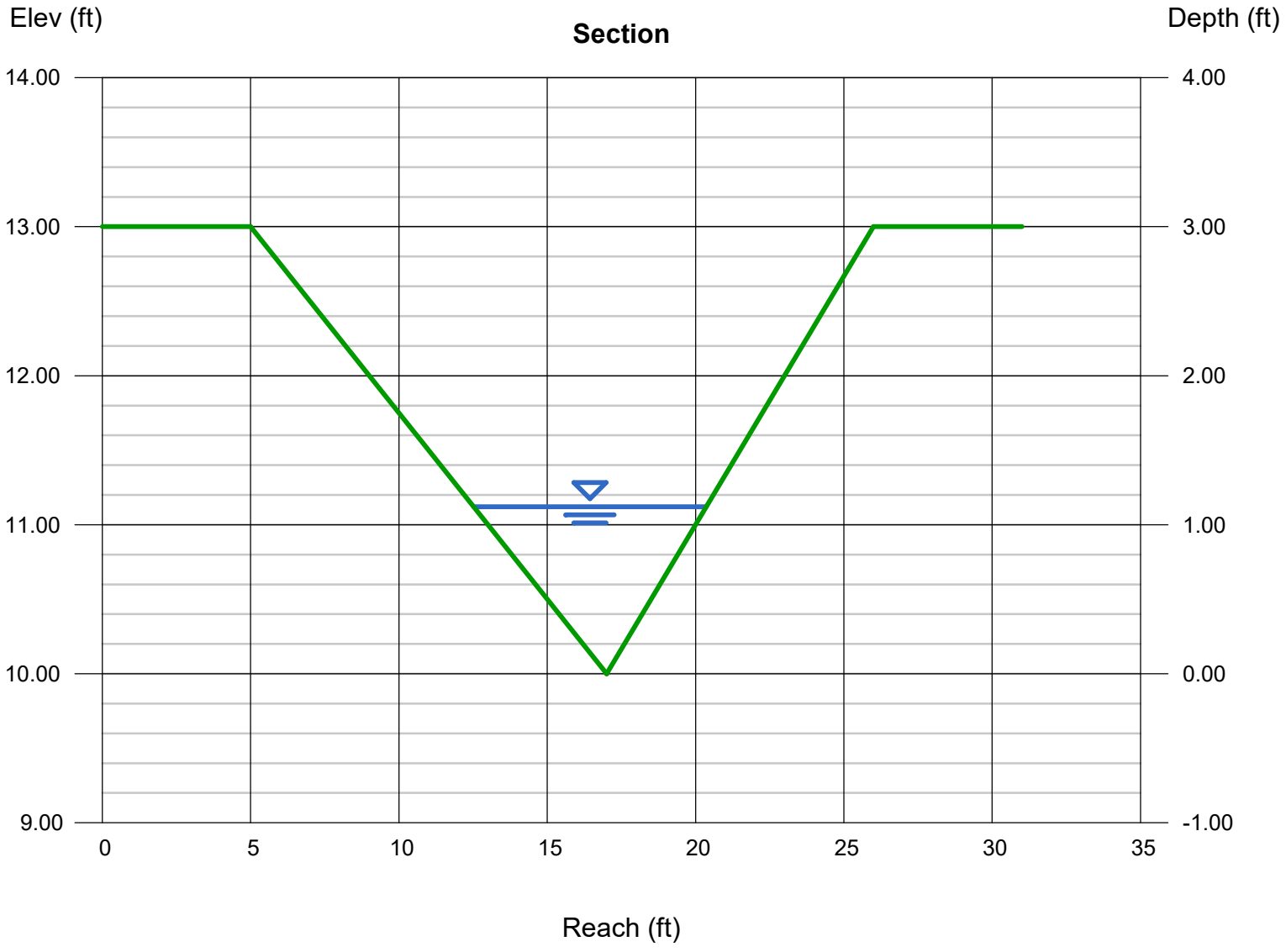
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.10

Highlighted

Depth (ft)	= 1.12
Q (cfs)	= 14.10
Area (sqft)	= 4.39
Velocity (ft/s)	= 3.21
Wetted Perim (ft)	= 8.16
Crit Depth, Yc (ft)	= 1.01
Top Width (ft)	= 7.84
EGL (ft)	= 1.28



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 7 Swale (5-Year) (FR:0.46)

Triangular

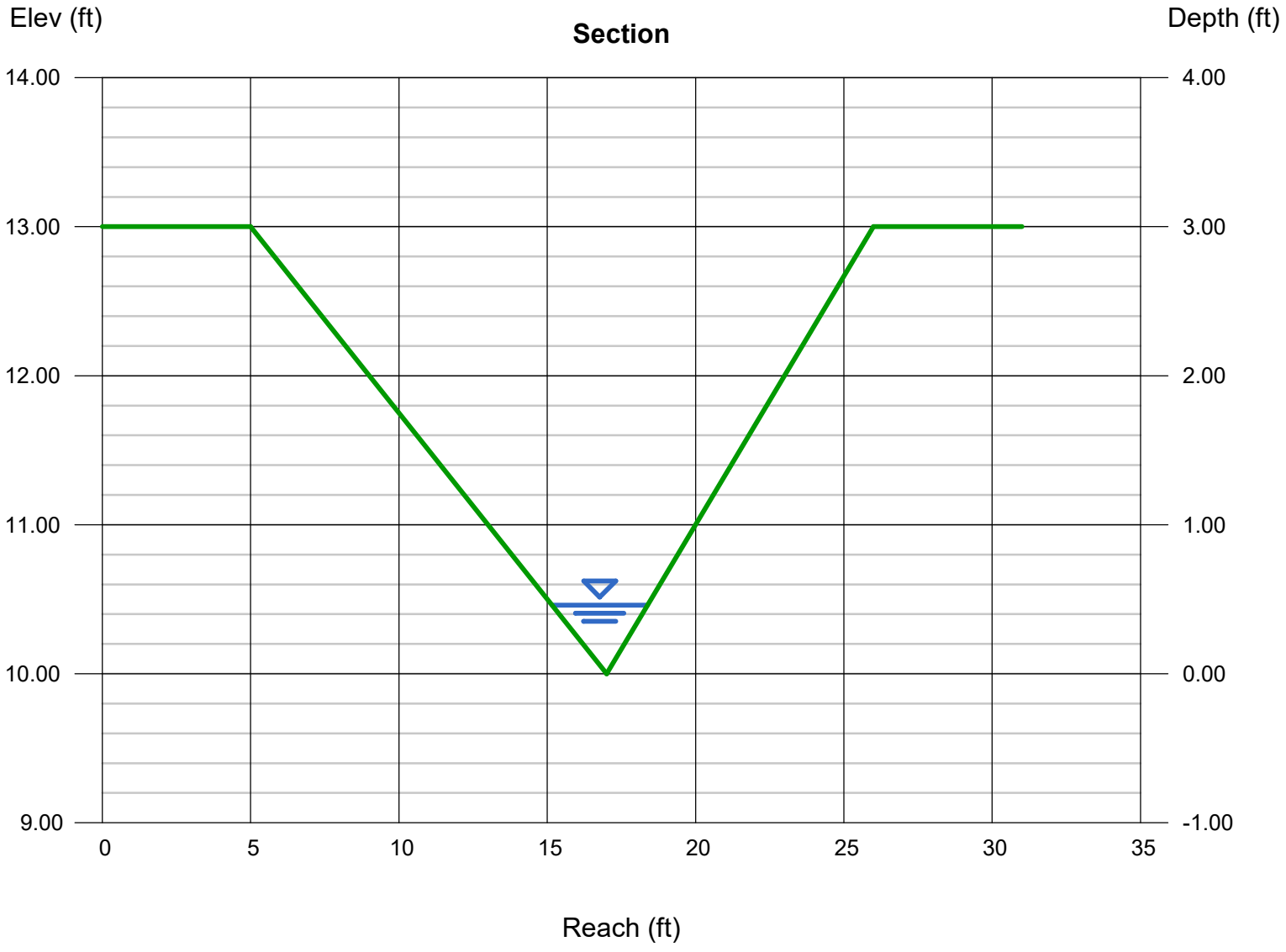
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.30

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 1.300
Area (sqft)	= 0.74
Velocity (ft/s)	= 1.76
Wetted Perim (ft)	= 3.35
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 3.22
EGL (ft)	= 0.51



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 7 Swale (100-Year) (FR:0.51)

Triangular

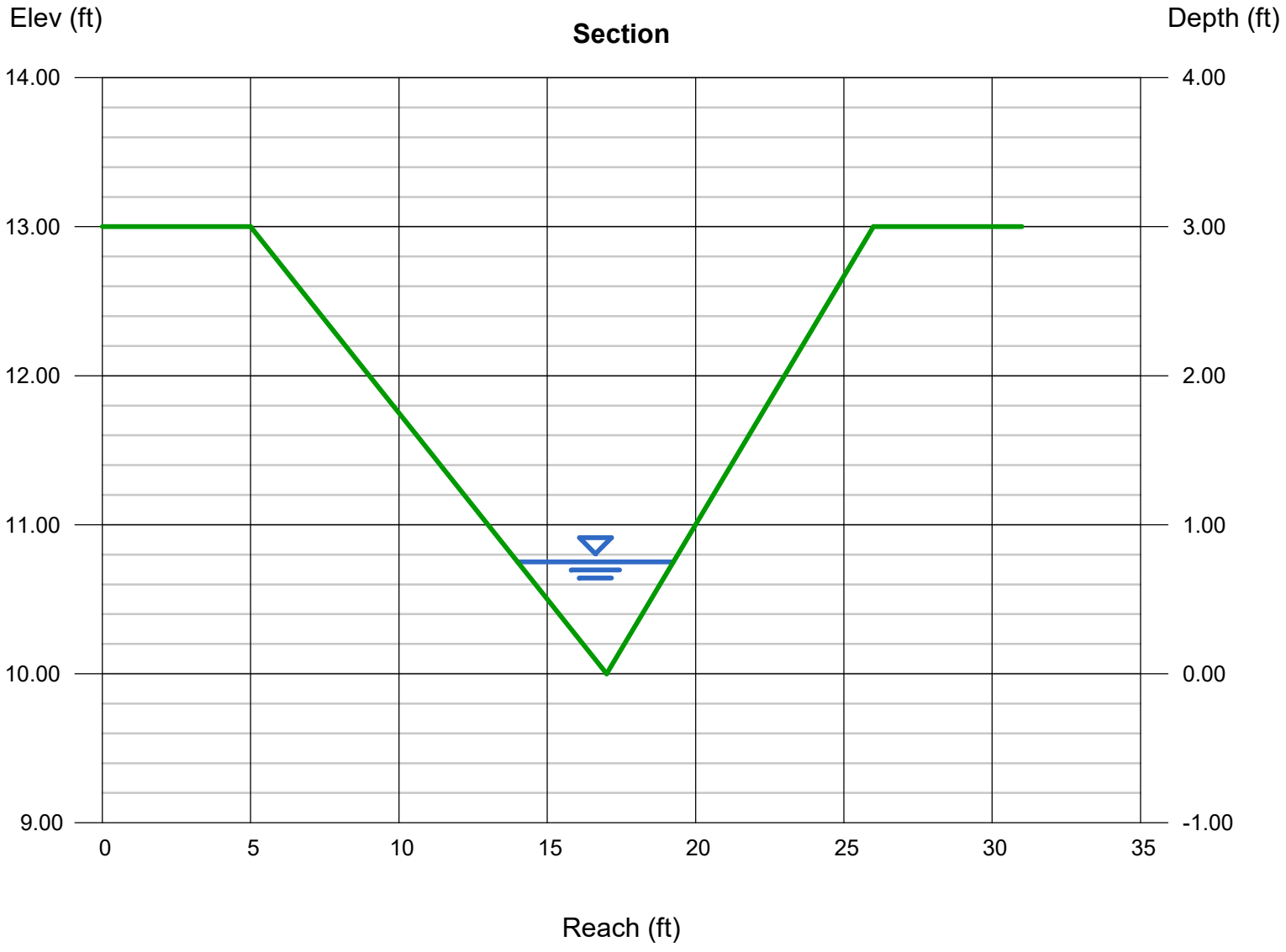
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.90

Highlighted

Depth (ft)	= 0.75
Q (cfs)	= 4.900
Area (sqft)	= 1.97
Velocity (ft/s)	= 2.49
Wetted Perim (ft)	= 5.46
Crit Depth, Yc (ft)	= 0.66
Top Width (ft)	= 5.25
EGL (ft)	= 0.85



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 16 2023

DP 11 Swale (5-Year)(FR:0.52)

Triangular

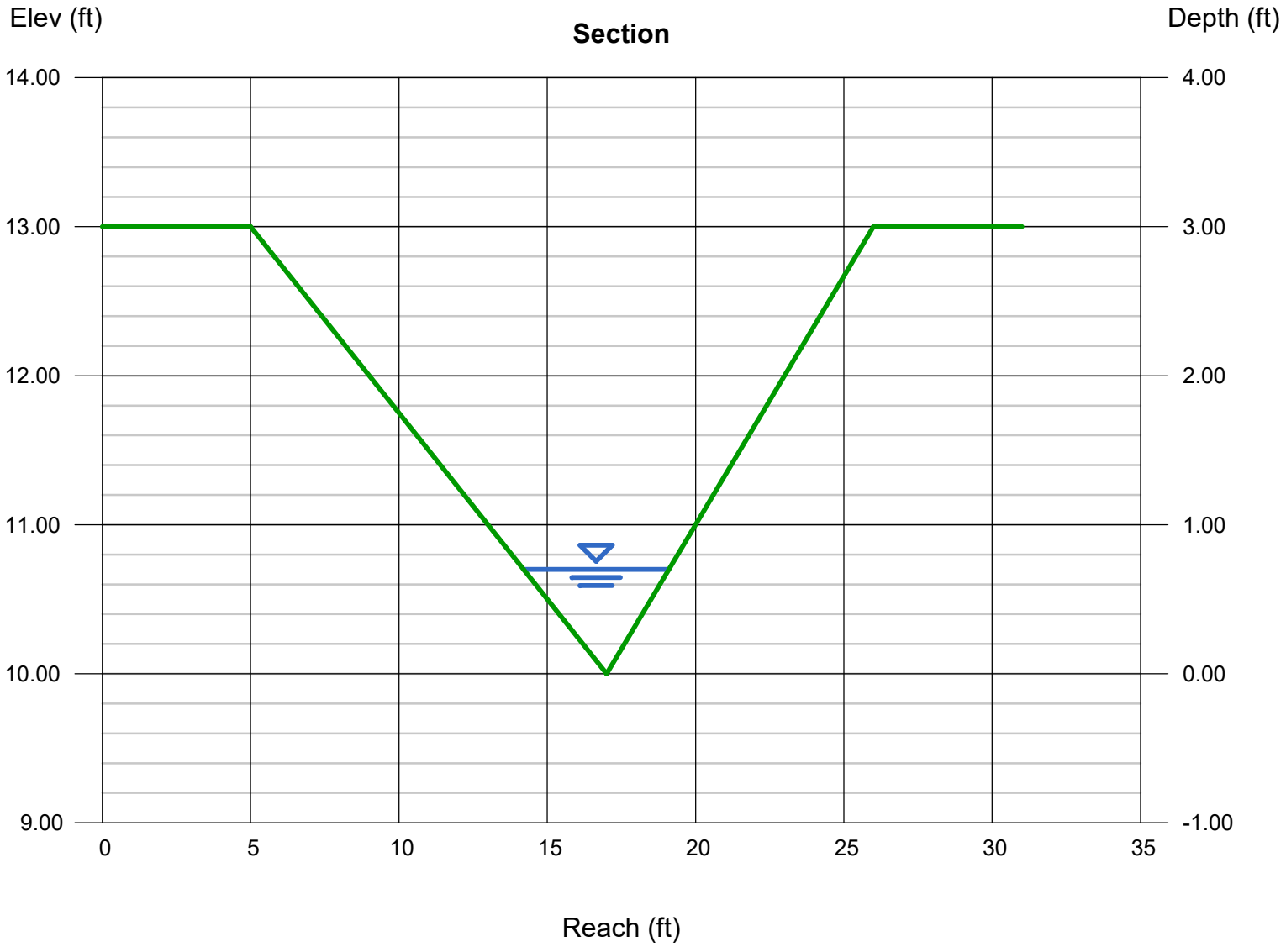
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.06
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.20

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 4.200
Area (sqft)	= 1.71
Velocity (ft/s)	= 2.45
Wetted Perim (ft)	= 5.10
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 4.90
EGL (ft)	= 0.79



Channel Report

DP 11 Swale (5-Year)(FR:0.55)

Triangular

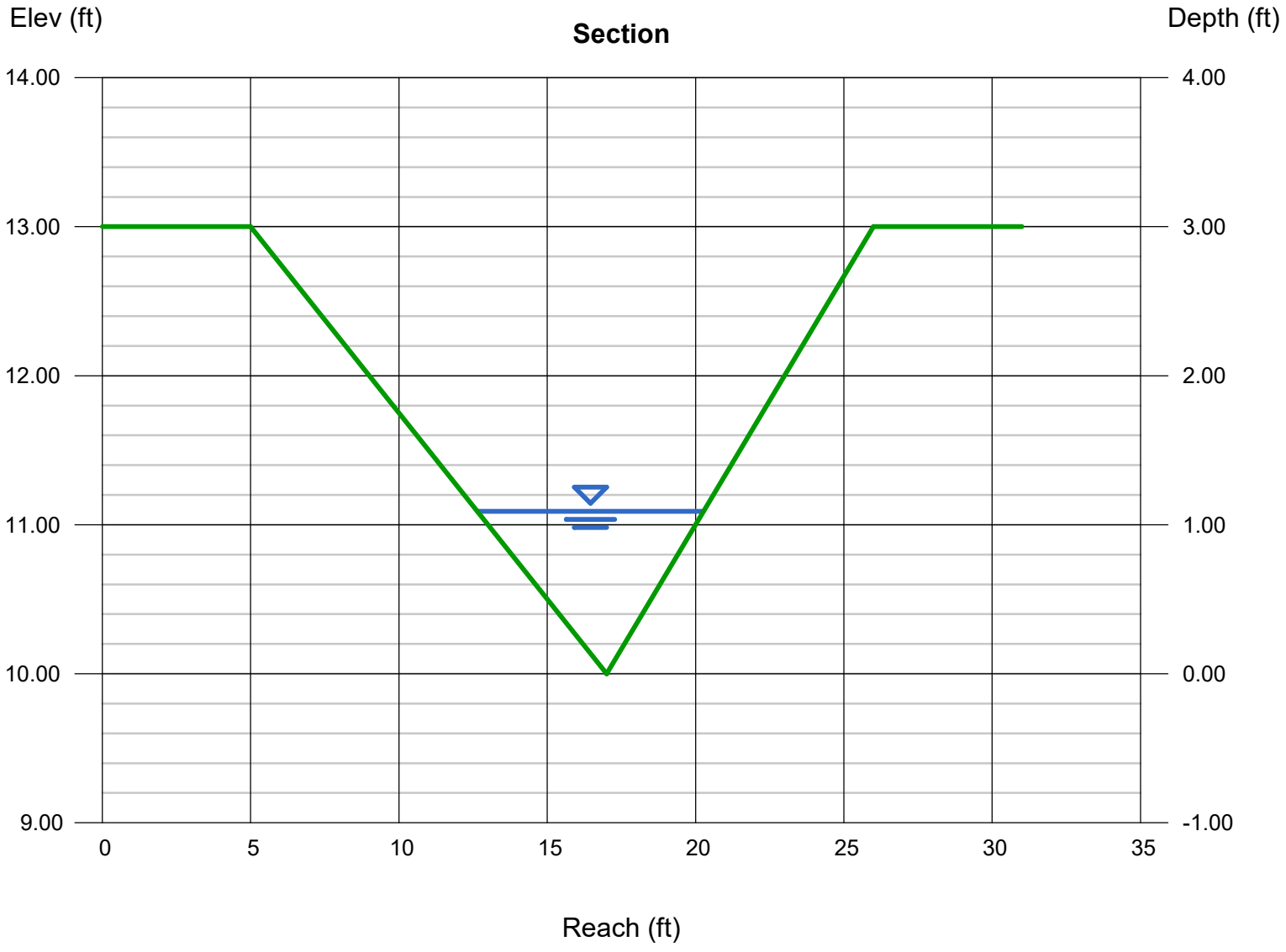
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.06
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.50

Highlighted

Depth (ft)	= 1.09
Q (cfs)	= 13.50
Area (sqft)	= 4.16
Velocity (ft/s)	= 3.25
Wetted Perim (ft)	= 7.94
Crit Depth, Yc (ft)	= 0.99
Top Width (ft)	= 7.63
EGL (ft)	= 1.25



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jun 28 2023

DP 11A Swale (5-Year)(FR:0.50)

Triangular

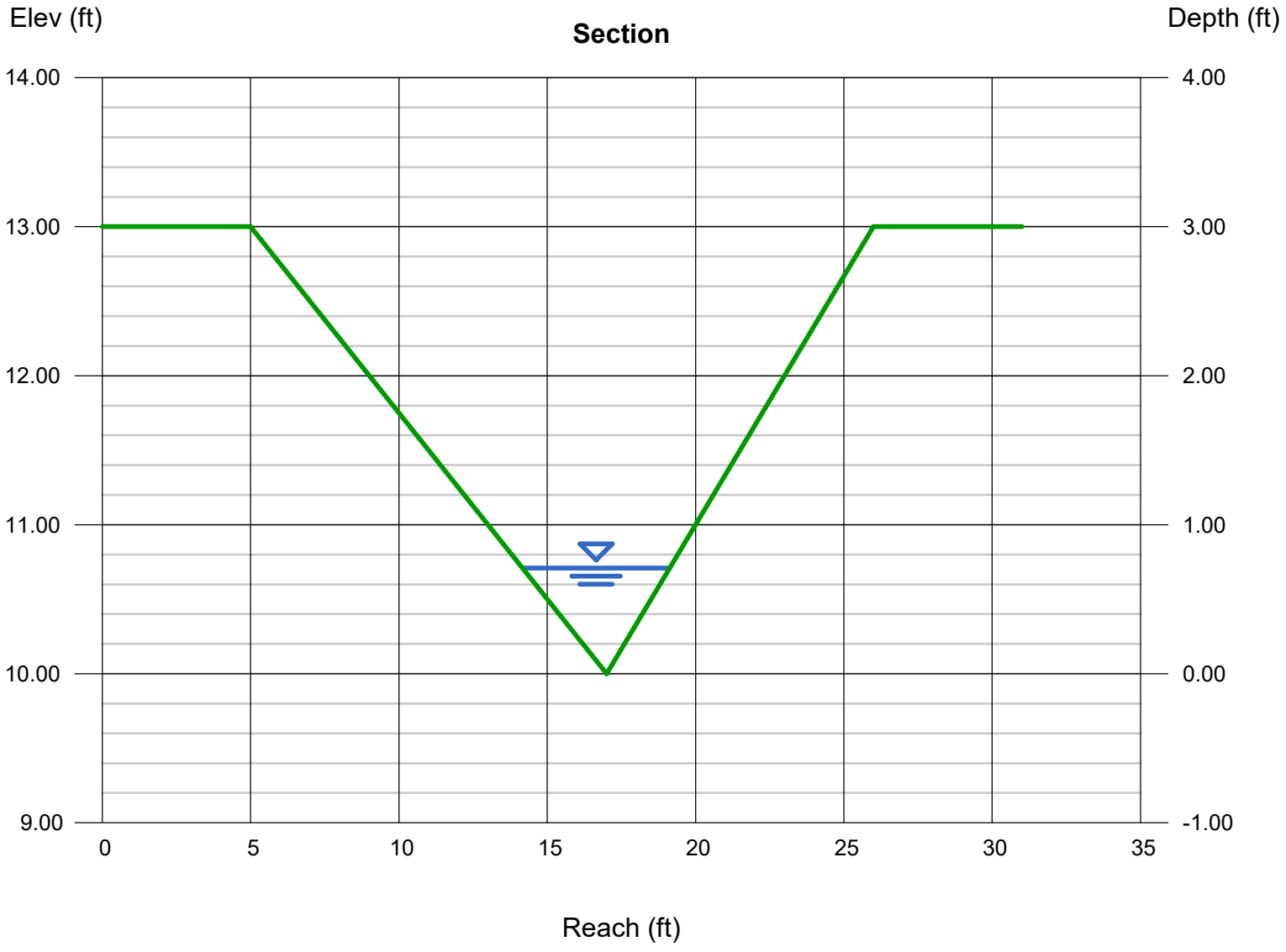
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.20

Highlighted

Depth (ft)	= 0.71
Q (cfs)	= 4.200
Area (sqft)	= 1.76
Velocity (ft/s)	= 2.38
Wetted Perim (ft)	= 5.17
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 4.97
EGL (ft)	= 0.80



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jun 28 2023

DP 11A Swale (100-Year)(FR:0.54)

Triangular

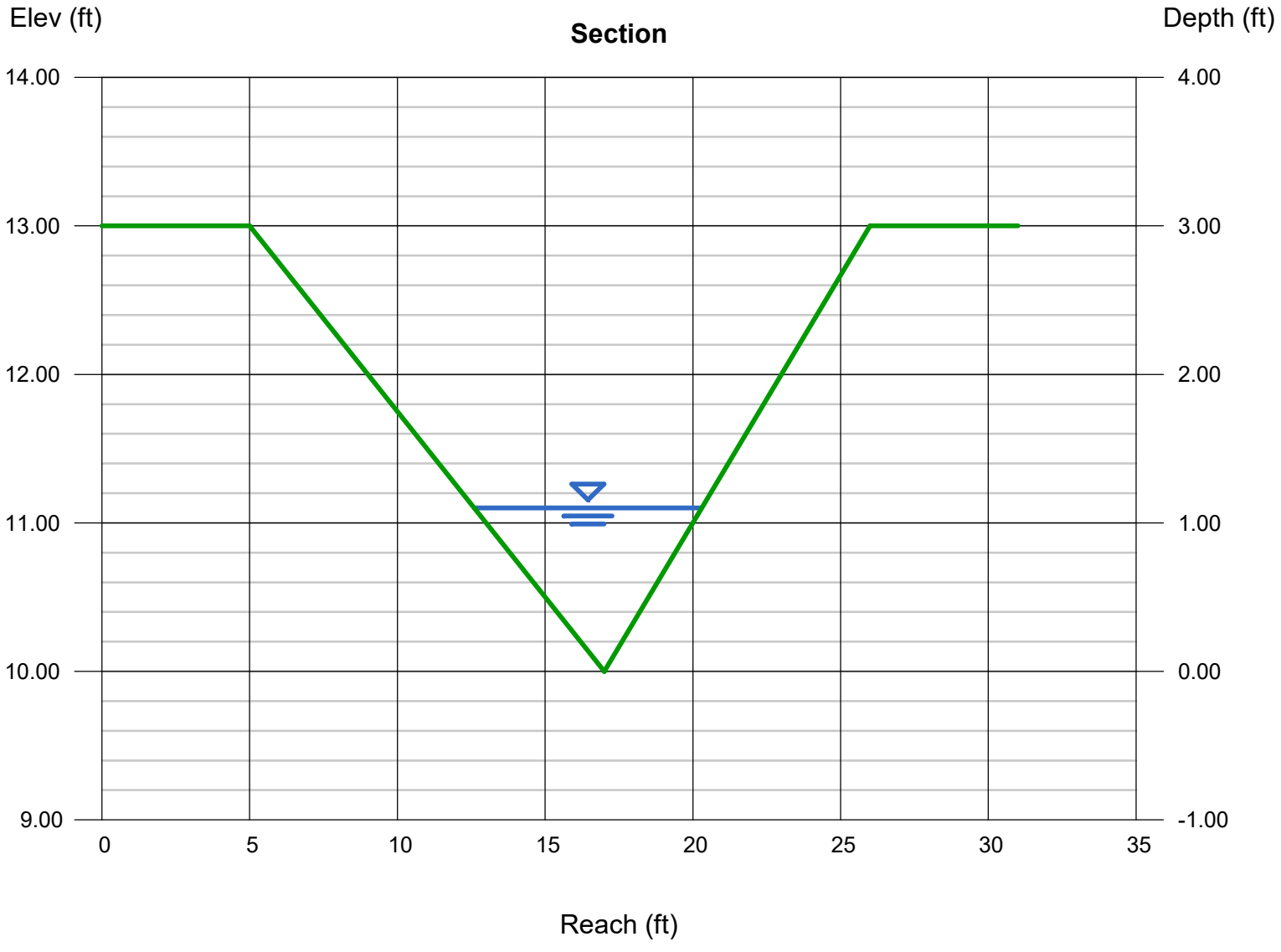
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.50

Highlighted

Depth (ft)	= 1.10
Q (cfs)	= 13.50
Area (sqft)	= 4.23
Velocity (ft/s)	= 3.19
Wetted Perim (ft)	= 8.01
Crit Depth, Yc (ft)	= 0.99
Top Width (ft)	= 7.70
EGL (ft)	= 1.26



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 16 Swale (5-Year) (FR:0.58)

Triangular

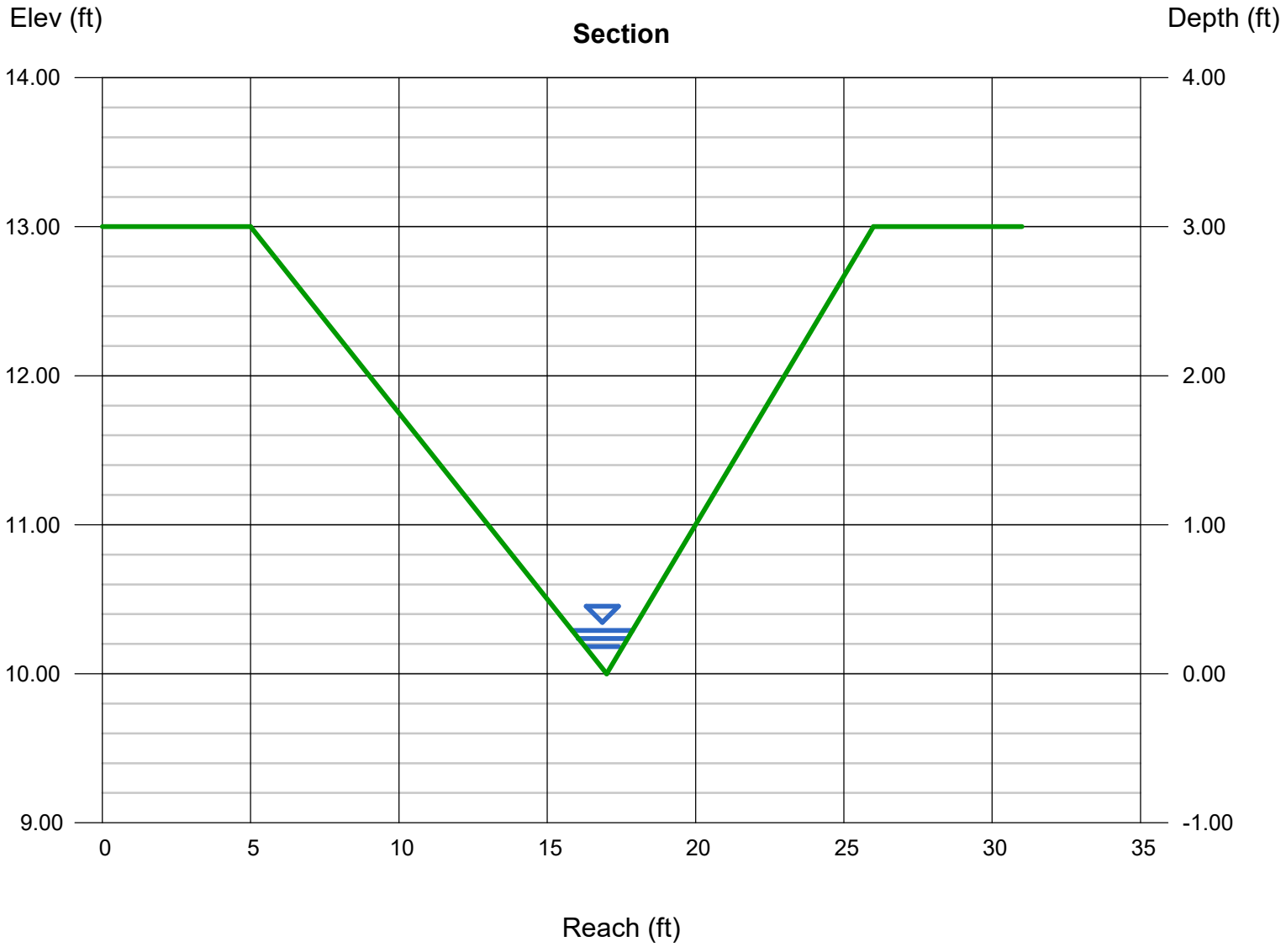
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.74
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.50

Highlighted

Depth (ft)	= 0.29
Q (cfs)	= 0.500
Area (sqft)	= 0.29
Velocity (ft/s)	= 1.70
Wetted Perim (ft)	= 2.11
Crit Depth, Yc (ft)	= 0.27
Top Width (ft)	= 2.03
EGL (ft)	= 0.33



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 16 Swale (100-Year) (FR:0.58)

Triangular

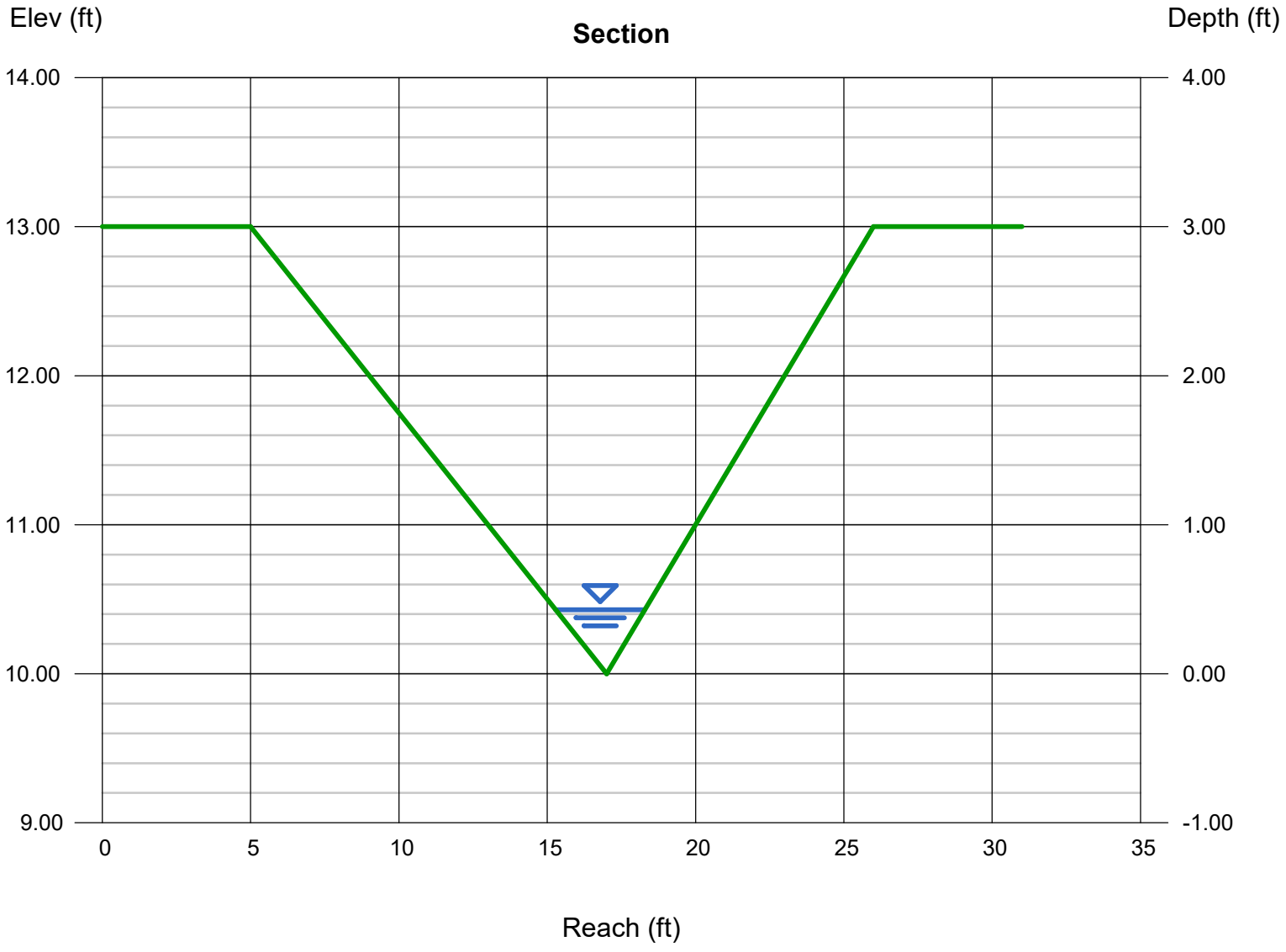
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.74
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.40

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 1.400
Area (sqft)	= 0.65
Velocity (ft/s)	= 2.16
Wetted Perim (ft)	= 3.13
Crit Depth, Yc (ft)	= 0.40
Top Width (ft)	= 3.01
EGL (ft)	= 0.50



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 25 Swale (5-Year)(FR:0.45)

Triangular

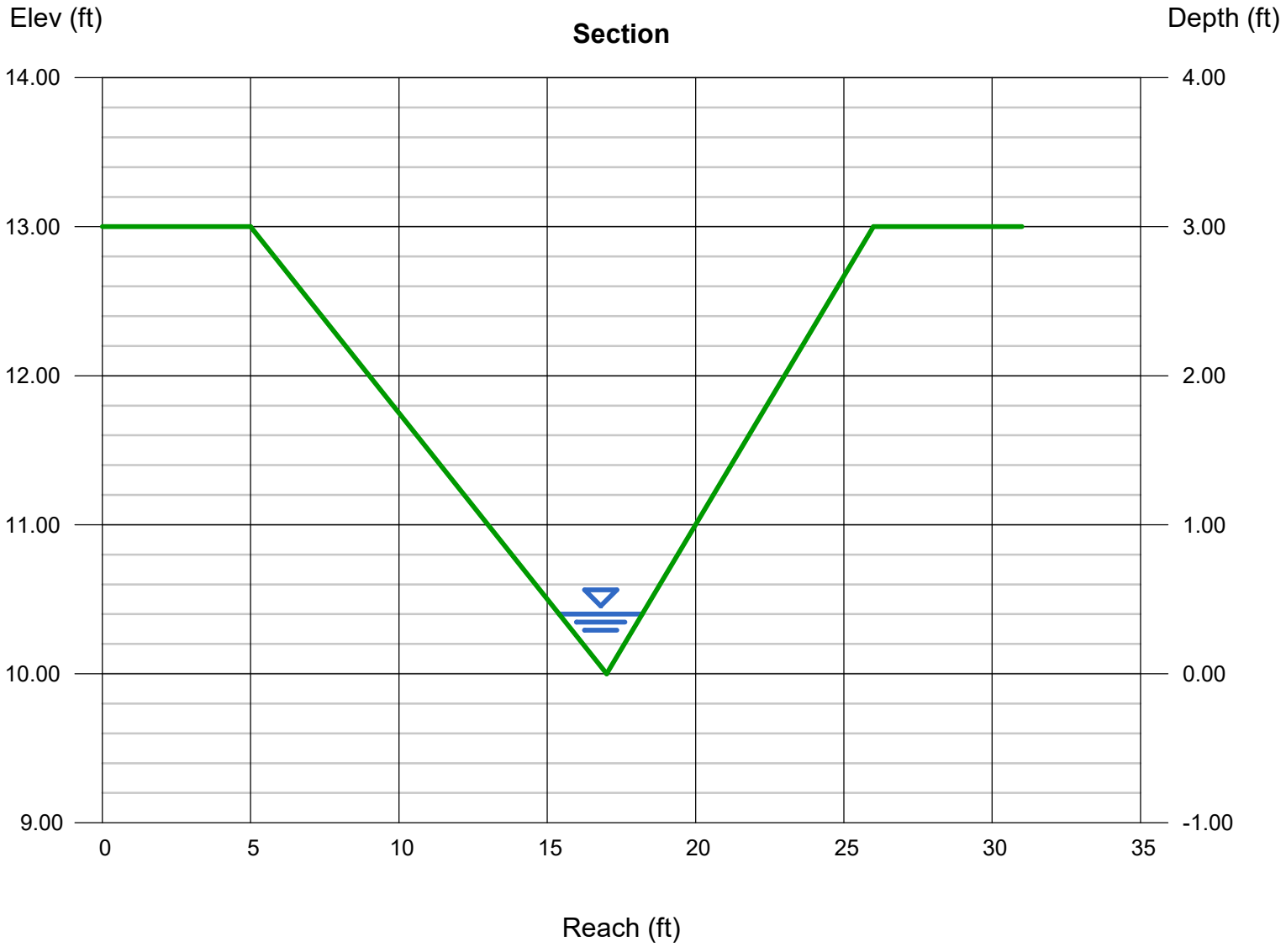
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.90

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 0.900
Area (sqft)	= 0.56
Velocity (ft/s)	= 1.61
Wetted Perim (ft)	= 2.91
Crit Depth, Yc (ft)	= 0.34
Top Width (ft)	= 2.80
EGL (ft)	= 0.44



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 25 Swale (100-Year)(FR:0.50)

Triangular

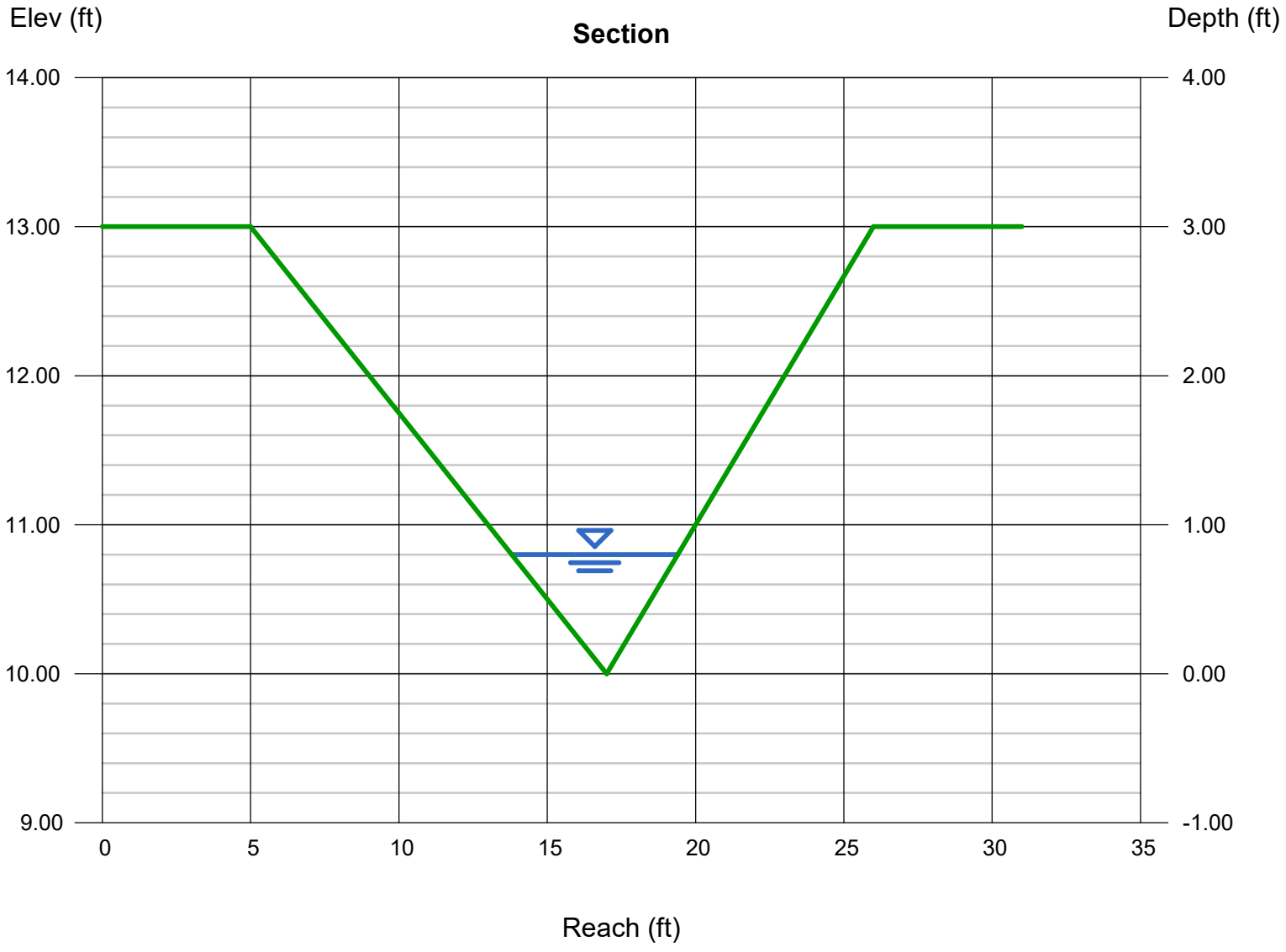
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.70

Highlighted

Depth (ft)	= 0.80
Q (cfs)	= 5.700
Area (sqft)	= 2.24
Velocity (ft/s)	= 2.54
Wetted Perim (ft)	= 5.83
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 5.60
EGL (ft)	= 0.90



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPOS1 Swale (5-Year)(FR:0.51)

Triangular

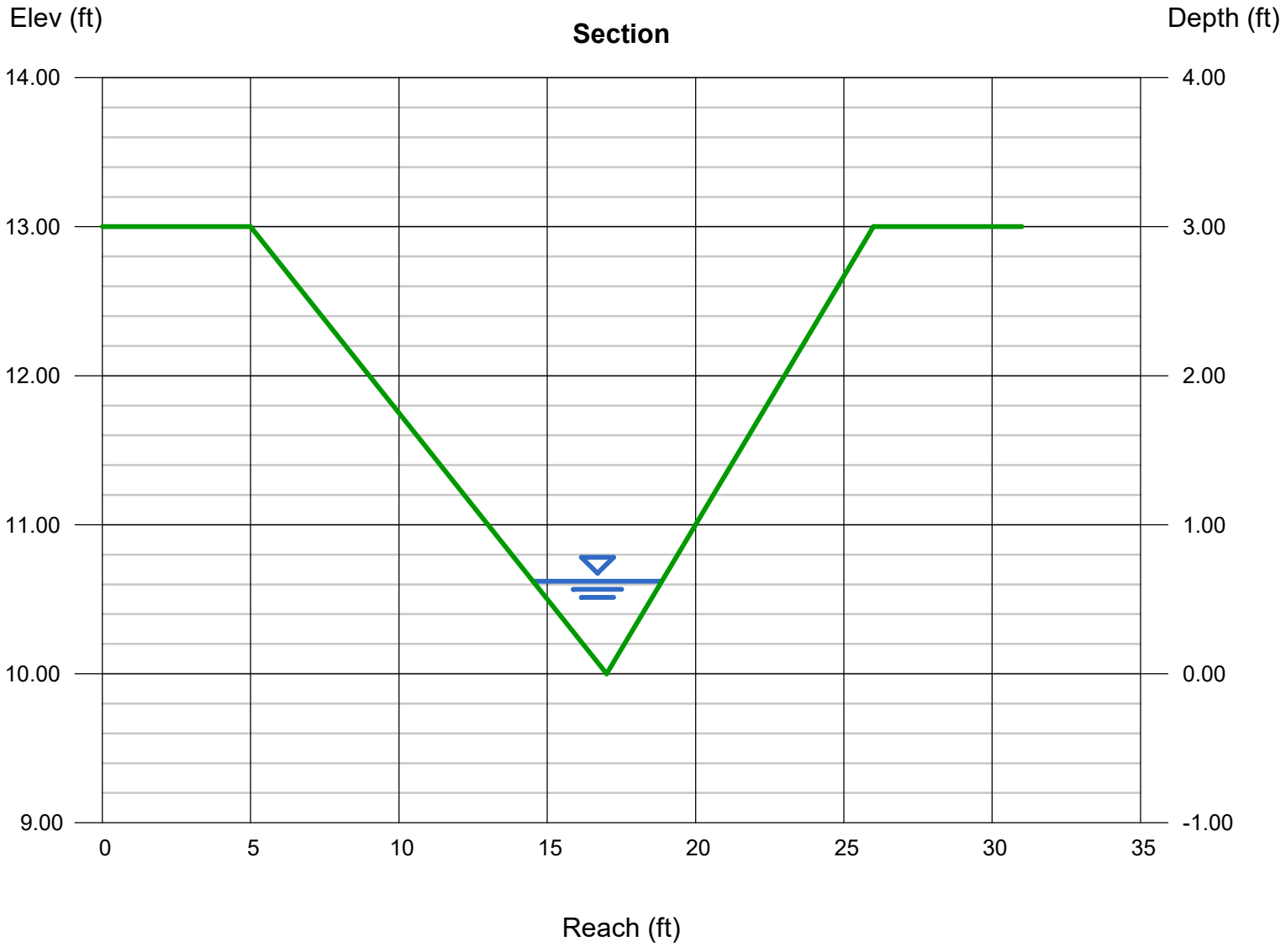
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.17
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.10

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 3.100
Area (sqft)	= 1.35
Velocity (ft/s)	= 2.30
Wetted Perim (ft)	= 4.52
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 4.34
EGL (ft)	= 0.70



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPOS1 Swale (100-Year)(FR:0.55)

Triangular

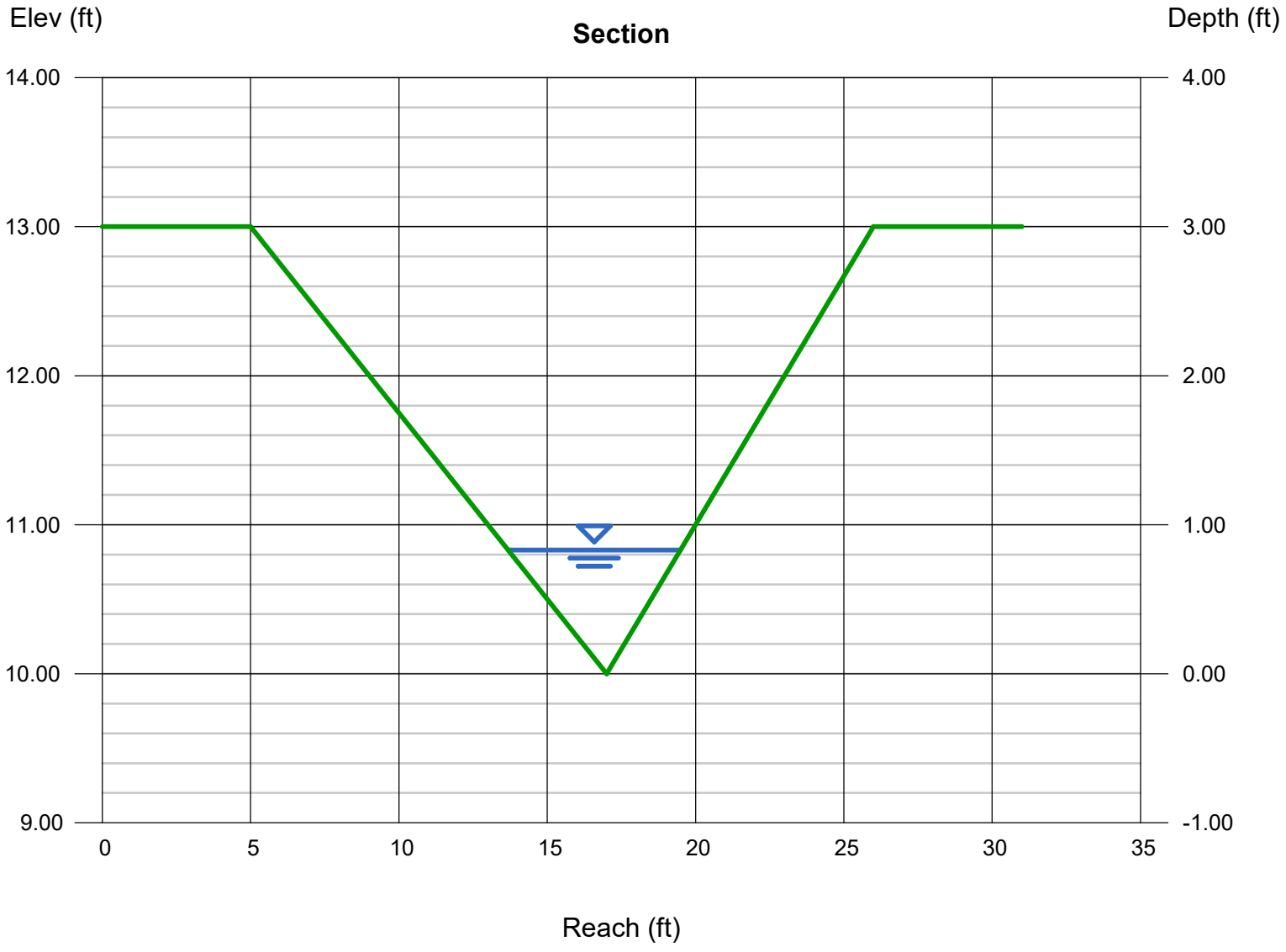
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.17
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.80

Highlighted

Depth (ft)	= 0.83
Q (cfs)	= 6.800
Area (sqft)	= 2.41
Velocity (ft/s)	= 2.82
Wetted Perim (ft)	= 6.05
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 5.81
EGL (ft)	= 0.95



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPF3 Swale (5-Year)(FR:0.49)

Triangular

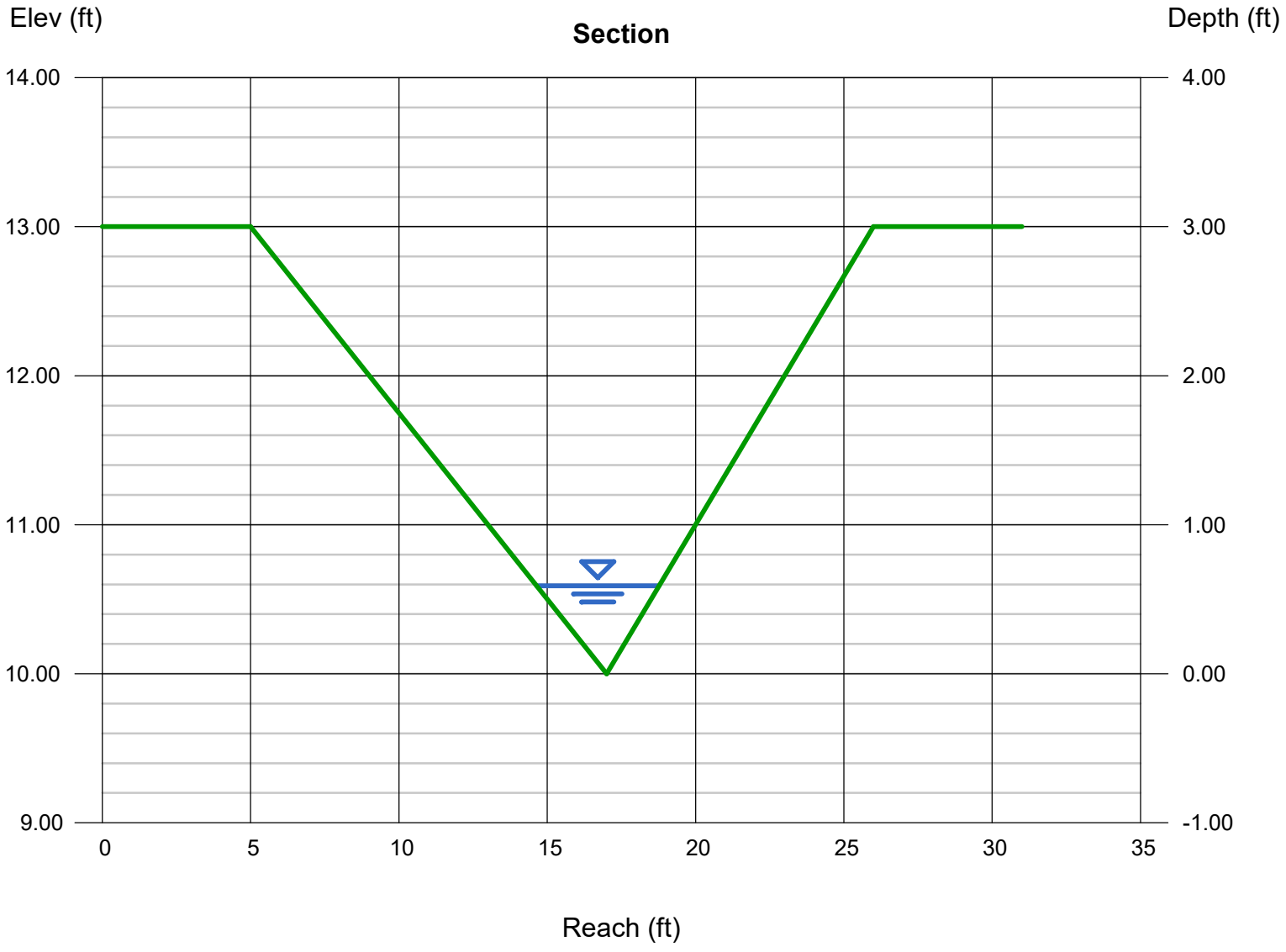
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.60

Highlighted

Depth (ft)	= 0.59
Q (cfs)	= 2.600
Area (sqft)	= 1.22
Velocity (ft/s)	= 2.13
Wetted Perim (ft)	= 4.30
Crit Depth, Yc (ft)	= 0.51
Top Width (ft)	= 4.13
EGL (ft)	= 0.66



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPF3 Swale (100-Year)(FR:0.53)

Triangular

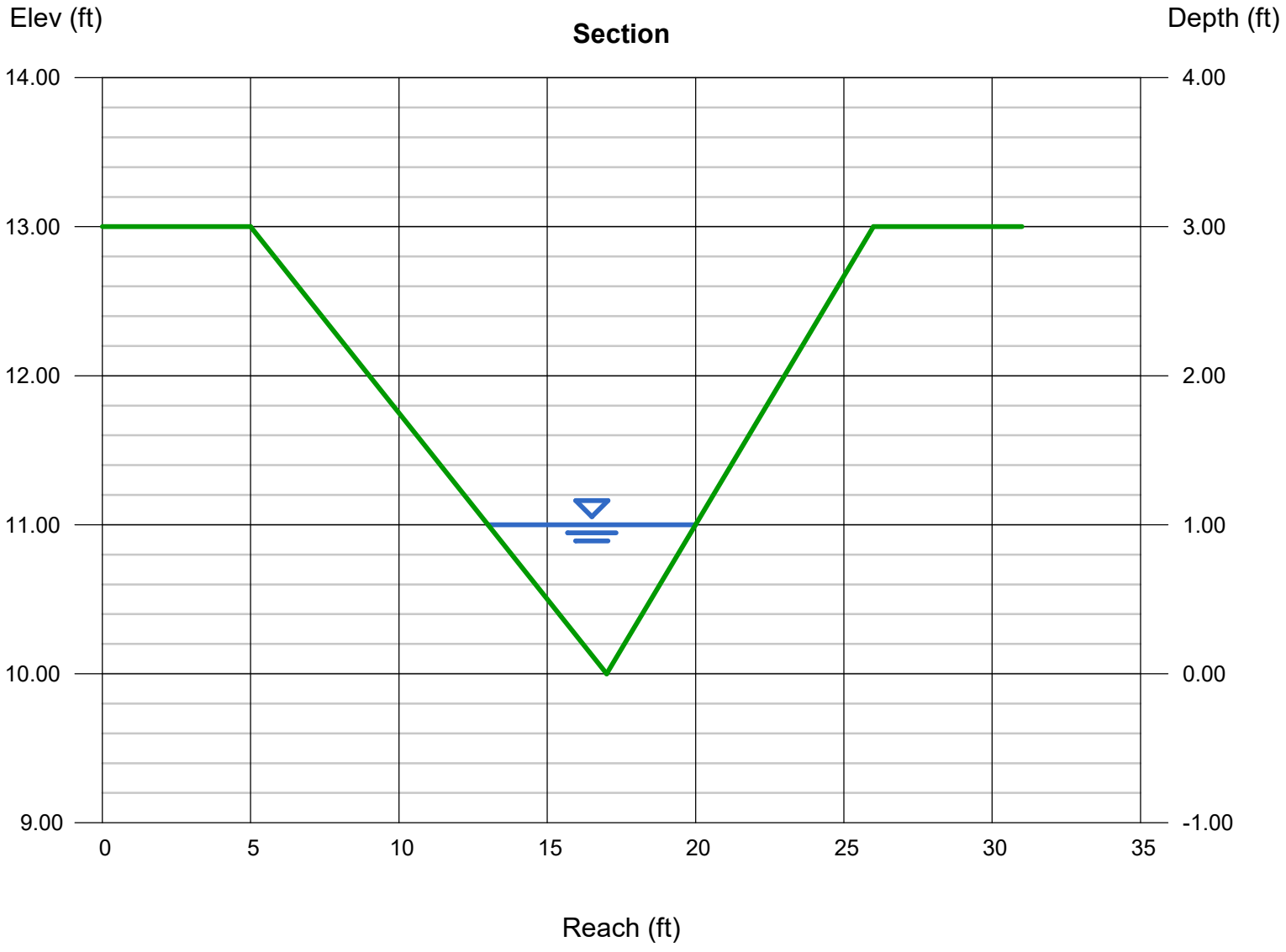
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.60

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 10.60
Area (sqft)	= 3.50
Velocity (ft/s)	= 3.03
Wetted Perim (ft)	= 7.29
Crit Depth, Yc (ft)	= 0.90
Top Width (ft)	= 7.00
EGL (ft)	= 1.14



PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

	STORM DRAIN SYSTEM			
	Culvert DP1.0 (1.0)	**Culvert DP1.1 (1.1)**	**Culvert DP11 (11)**	**Notes**
Q_{100} (cfs):	9.7	26.2	13.5	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	18	30	24	19"x34" HERCP equiv.
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	1.32	1.25	1.07	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.88	0.50	0.54	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.52	2.65	2.39	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	1.70	4.20	2.79	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	6.25	6.75	Read from Fig. 9-35 or 9-36
θ:	0.07	0.08	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	1.39	3.74	1.93	$A_t=Q/V$
Length of Protection, L_p (ft):	-3.0	3.1	-1.3	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	4.5	7.5	6.0	Min L=3D or 3H
Max Length (ft)	15.0	25.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.1	3.0	1.8	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**4.5**	**7.5**	**6.0**	
Design Width (ft)	**1.1**	**3.0**	**1.8**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

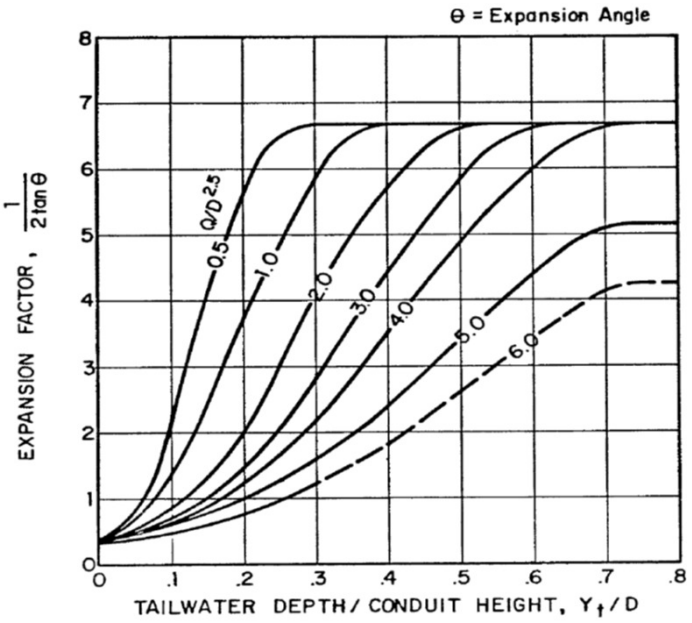


Figure 9-35. Expansion factor for circular conduits

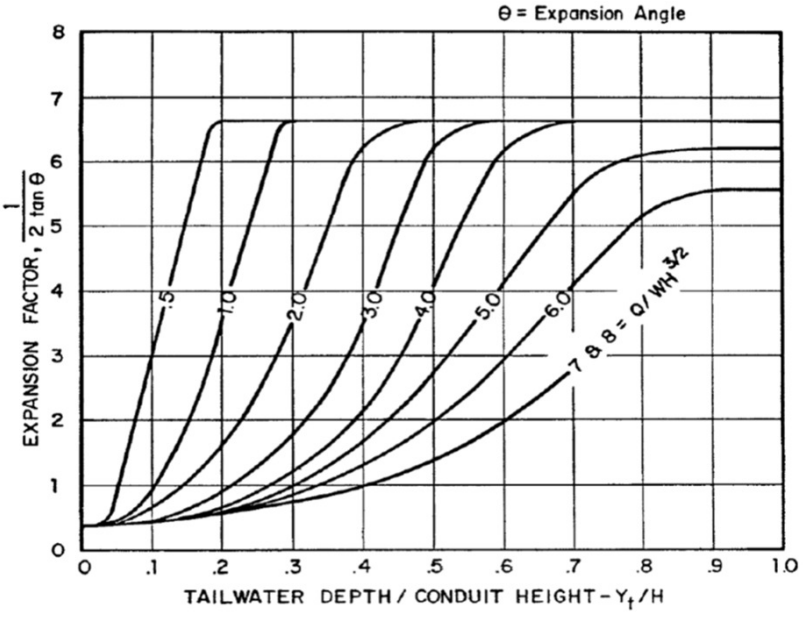


Figure 9-36. Expansion factor for rectangular conduits

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

	STORM DRAIN SYSTEM			
	Culvert DP2.0 (2.0)	**Cuvlert DP1.2 (1.2)**	**Culvert DP7 (7)**	**Notes**
Q_{100} (cfs):	19.6	32.2	4.9	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	24	24	18	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	1.30	1.34	0.82	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.65	0.67	0.55	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.46	5.69	1.78	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	3.21	5.08	1.52	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	4.25	3.50	Read from Fig. 9-35 or 9-36
θ:	0.07	0.12	0.14	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	2.80	4.60	0.70	$A_t=Q/V$
Length of Protection, L_p (ft):	1.0	6.1	-2.3	$L=(1/(2\tan\theta))(At/Yt - D)$
Min Length (ft)	6.0	6.0	4.5	Min L=3D or 3H
Max Length (ft)	20.0	20.0	15.0	Max L=10D or 10H
Min Bottom Width, T (ft):	2.2	3.4	0.9	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**6.0**	**7.0**	**4.5**	
Design Width (ft)	**2.2**	**3.4**	**0.9**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

Unresolved:
From Culvert & swale design spreadsheets, appears Y(t) should be bigger

	STORM DRAIN SYSTEM			
	Cuvlert DP1.3 (1.3)	**Culvert DP1.5 (1.5)**	**Culvert D1.4 (1.4)**	**Notes**
Q_{100} (cfs):	32.2	19.6	35.0	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	30	24	24	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	1.24	1.30	1.46	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.50	0.65	0.73	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.26	3.46	6.19	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	5.22	3.21	4.98	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	5.50	6.75	4.25	Read from Fig. 9-35 or 9-36
θ:	0.09	0.07	0.12	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	4.60	2.80	5.00	$A_t=Q/V$
Length of Protection, L_p (ft):	6.7	1.0	6.1	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	7.5	6.0	6.0	Min L=3D or 3H
Max Length (ft)	25.0	20.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	3.7	2.2	3.4	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**7.5**	**6.0**	**7.0**	
Design Width (ft)	**3.7**	**2.2**	**3.4**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

Unresolved: Where are the calcs for Culvert DP14?

Unresolved:
From Culvert design spreadsheets, appears Y(t) should be bigger

	STORM DRAIN SYSTEM			
	Culvert DP22 (22)	**Culvert DP21 (21)**	**Culvert DP9 (9)**	**Notes**
Q_{100} (cfs):	1.3	11.8	4.3	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	18	24	18	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	0.39	0.94	0.77	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.26	0.47	0.51	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	0.47	2.09	1.56	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	0.98	2.85	1.44	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	6.75	6.75	Read from Fig. 9-35 or 9-36
θ:	0.07	0.07	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	0.19	1.69	0.61	$A_t=Q/V$
Length of Protection, L_p (ft):	-6.9	-1.4	-4.7	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	4.5	6.0	4.5	Min L=3D or 3H
Max Length (ft)	15.0	20.0	15.0	Max L=10D or 10H
Min Bottom Width, T (ft):	0.5	1.8	0.8	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**4.5**	**6.0**	**4.5**	
Design Width (ft)	**0.5**	**1.8**	**0.8**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

	STORM DRAIN SYSTEM			
	Culvert DP16 (16)	**Culvert DP2.1 (2.1)**	**Pond D Outfall**	**Notes**
Q_{100} (cfs):	1.4	9.5	10.8	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	18	18	36	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	0.40	1.30	0.58	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.27	0.87	0.19	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	0.51	3.45	0.69	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	1.03	1.69	4.12	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	6.75	6.75	Read from Fig. 9-35 or 9-36
θ:	0.07	0.07	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	0.20	1.36	1.54	$A_t=Q/V$
Length of Protection, L_p (ft):	-6.8	-3.1	-2.4	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	4.5	4.5	9.0	Min L=3D or 3H
Max Length (ft)	15.0	15.0	30.0	Max L=10D or 10H
Min Bottom Width, T (ft):	0.5	1.0	2.7	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**4.5**	**4.5**	**9.0**	
Design Width (ft)	**0.5**	**1.0**	**2.7**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

	STORM DRAIN SYSTEM			
	Pond C Outfall	**Pond E Outfall**	**Culvert DP UD4**	**Notes**
Q_{100} (cfs):	1.5	0.3	541.5	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Box	
D_c, Pipe Diameter (in):	30	18	N/A	
W, Box Width (ft):	N/A	N/A	12	
H, Box Height (ft):	N/A	N/A	4	
Y_t, Tailwater Depth (ft):	0.18	0.13	1.01	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.07	0.09	0.25	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	0.15	0.11	5.64	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	2.46	0.85	15.01	
Required Riprap Size:	**L**	**L**	**H**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**15**	
Expansion Factor, $1/(2\tan\theta)$:	5.75	2.00	6.75	Read from Fig. 9-35 or 9-36
θ:	0.09	0.24	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	0.21	0.04	77.36	$A_t=Q/V$
Length of Protection, L_p (ft):	-7.5	-2.3	436.0	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	7.5	4.5	36.0	Min L=3D or 3H
Max Length (ft)	25.0	15.0	40.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.2	0.4	68.5	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**7.5**	**4.5**	**40.0**	
Design Width (ft)	**1.2**	**0.4**	**68.5**	
Riprap Depth (in)	**18**	**18**	**30**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	8	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

	STORM DRAIN SYSTEM			
	Culvert DPOS5			**Notes**
Q_{100} (cfs):	16.0			Flows are the greater of proposed vs. future
Conduit	Pipe			
D_c, Pipe Diameter (in):	24			
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y_t, Tailwater Depth (ft):	1.44			If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.72			
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	2.83			
Supercritical?	No			
Y_n, Normal Depth (ft) [Supercritical]:	0.00			
D_a, H_a (in) [Supercritical]:	N/A		N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A			
Riprap d_{50} (in) [Subcritical]:	2.32			
Required Riprap Size:	**L**			**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**			
Expansion Factor, $1/(2\tan\theta)$:	6.75			Read from Fig. 9-35 or 9-36
θ:	0.07			
Erosive Soils?	No			
Area of Flow, A_t (ft^2):	2.29			$A_t=Q/V$
Length of Protection, L_p (ft):	-2.8			L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	6.0			Min L=3D or 3H
Max Length (ft)	20.0			Max L=10D or 10H
Min Bottom Width, T (ft):	1.6			$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**6.0**			
Design Width (ft)	**1.6**			
Riprap Depth (in)	**18**			Depth=2(d_{50})
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

Pond C Outfall Channel (Q10=1.5 cfs)

Trapezoidal

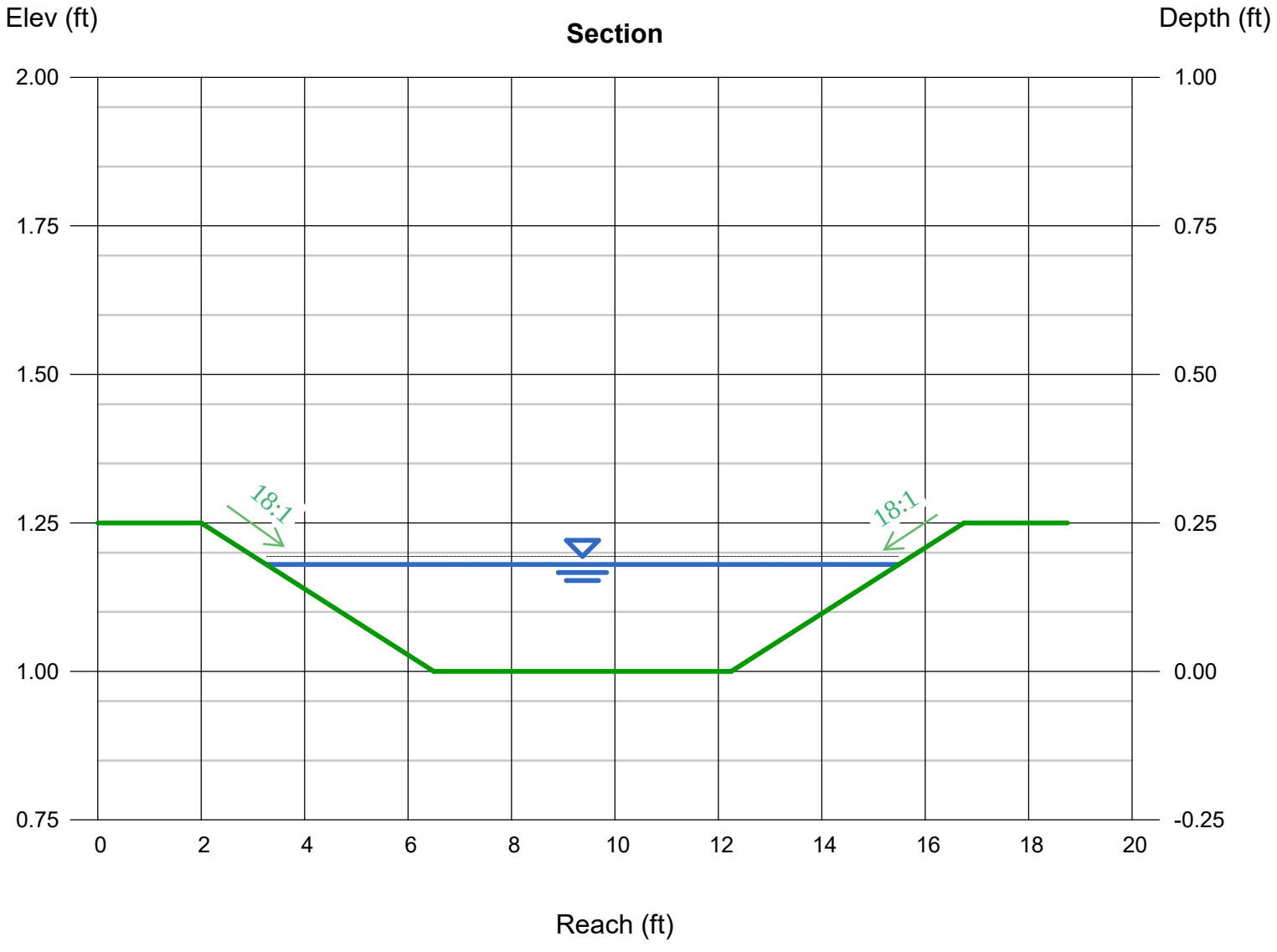
Bottom Width (ft)	= 5.75
Side Slopes (z:1)	= 18.00, 18.00
Total Depth (ft)	= 0.25
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.50

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 1.500
Area (sqft)	= 1.62
Velocity (ft/s)	= 0.93
Wetted Perim (ft)	= 12.24
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 12.23
EGL (ft)	= 0.19



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

Pond D Outfall Channel (Q10=10.8 cfs)

Trapezoidal

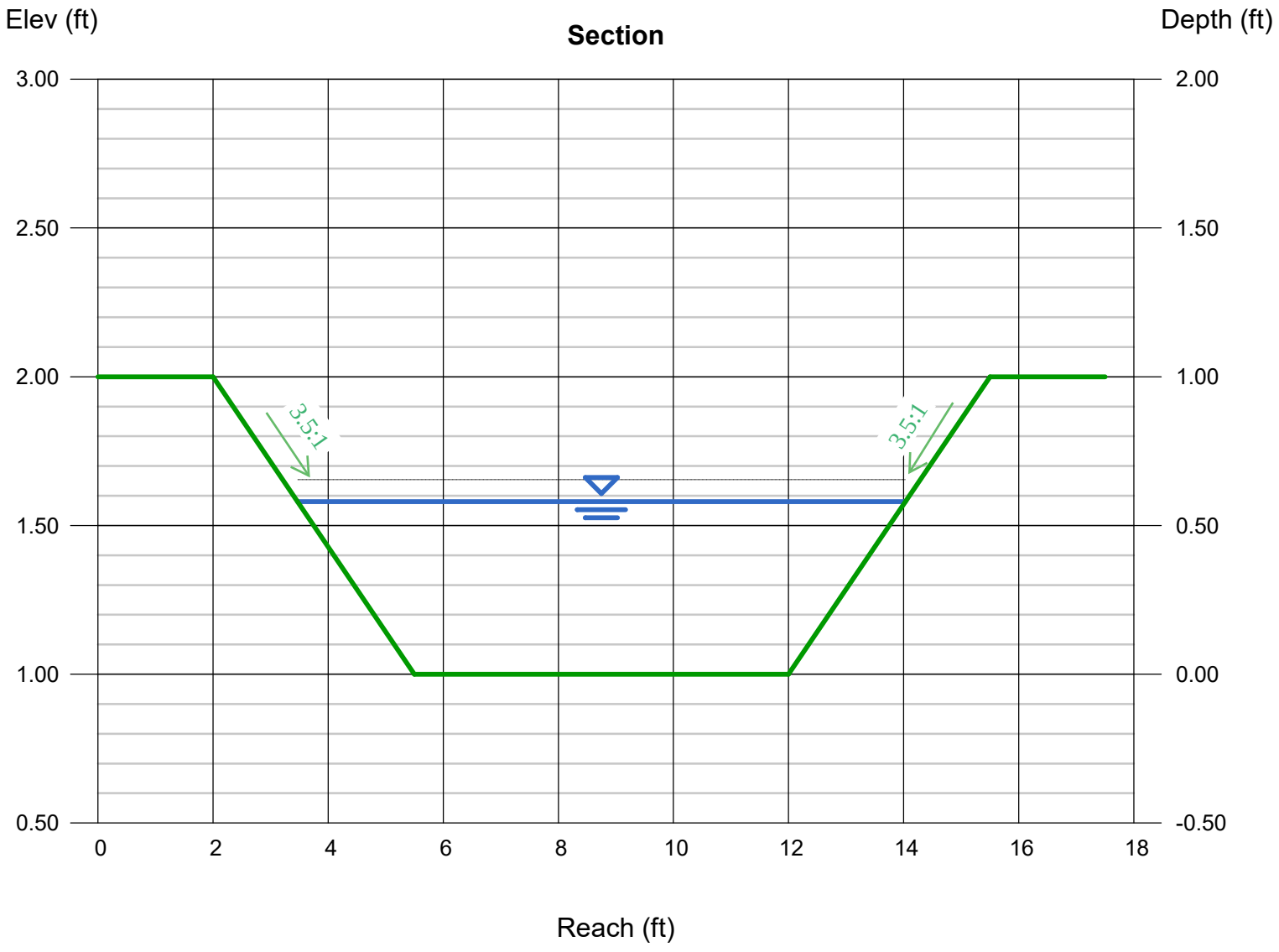
Bottom Width (ft)	= 6.50
Side Slopes (z:1)	= 3.50, 3.50
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.80

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 10.80
Area (sqft)	= 4.95
Velocity (ft/s)	= 2.18
Wetted Perim (ft)	= 10.72
Crit Depth, Yc (ft)	= 0.41
Top Width (ft)	= 10.56
EGL (ft)	= 0.65



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

Pond E Outlet Channel (Q10=0.3 cfs)

User-defined

Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.040

Calculations

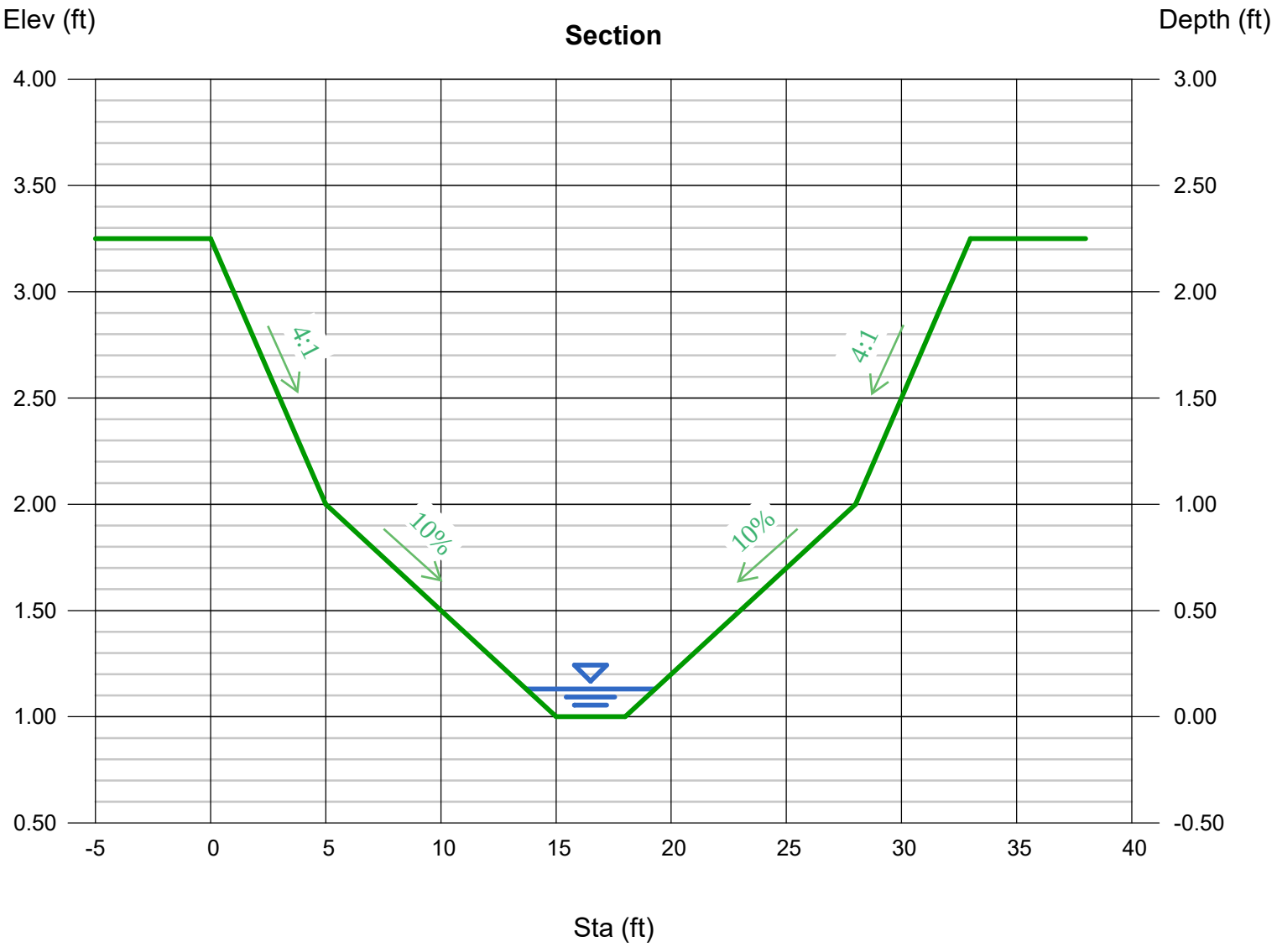
Compute by:	Known Q
Known Q (cfs)	= 0.30

Highlighted

Depth (ft)	= 0.13
Q (cfs)	= 0.300
Area (sqft)	= 0.56
Velocity (ft/s)	= 0.54
Wetted Perim (ft)	= 5.61
Crit Depth, Yc (ft)	= 0.07
Top Width (ft)	= 5.60
EGL (ft)	= 0.13

(Sta, El, n)-(Sta, El, n)...

(0.00, 3.25)-(5.00, 2.00, 0.040)-(15.00, 1.00, 0.040)-(18.00, 1.00, 0.040)-(28.00, 2.00, 0.040)-(33.00, 3.25, 0.040)



HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS Model
Project File : Future Conditions Model (Fil 2 Berm).prj
Run Date and Time: 4/24/2023 3:07:01 PM

Project in English units

Project Description:
CRS Info=<SpatialReference> <CoordinateSystem
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84",DATUM["WGS_1984",SPHEROID["WGS
84",6378137,298.257223563,AUTHORITY["EPSG","7030"]],AUT
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PLAN DATA

Plan Title: Default Scenario
Plan File : X:\2510000.all\2514204\Hecraz\Proposed Model\Future Conditions Model
(Fil 2 Berm).p01

Geometry Title: Default Geometry
Geometry File : X:\2510000.all\2514204\Hecraz\Proposed Model\Future

Unresolved:
Provide Output table

River	Reach	Profile	Upstream	Downstream
MS-06	Main Channel	100 yr	Normal S = 0.011654	
MS-06	2nd Culvert	100 yr	Normal S = 0.015093	
MS-06	Downstream Ov	100 yr	Normal S = 0.013402	Normal S = 0.013898
MS-06	Main Channel-0	100 yr		Normal S = 0.013163

GEOMETRY DATA

Geometry Title: Default Geometry
Geometry File : X:\2510000.all\2514204\Hecraz\Proposed Model\Future Conditions Model
(Fil 2 Berm).g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
MS-06	Main Channel		JS-1
MS-06	Overflow 1-DS-0		Junc-DS01
MS-06	2nd Culvert		JS-1
MS-06	Downstream Ov		
MS-06	Main Channel-0-2	JS-1	Junc-DS01
MS-06	Main Channel-0	Junc-DS01	

JUNCTION INFORMATION

Name: Junc-DS01
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
MS-06	Overflow 1-DS-0 to MS-06		Main Channel-0	0	0
MS-06	Main Channel-0-2 to MS-06		Main Channel-0	0	0

Name: JS-1
Description:
Energy computation Method

Length across Junction Tributary

Conditions Model (Fil 2 Berm).g01

Flow Title : Default Steady Flow
Flow File : X:\2510000.all\2514204\Hecraz\Proposed Model\Future
Conditions Model (Fil 2 Berm).f01

Plan Description:
Default Scenario

Plan Summary Information:

Number of: Cross Sections	= 96	Multiple Openings	= 0		
Culverts	= 3	Inline Structures	= 0		
Bridges	= 0	Lateral Structures	= 5		

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.33
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Program Selects Appropriate method
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Default Steady Flow
Flow File : X:\2510000.all\2514204\Hecraz\Proposed Model\Future Conditions Model
(Fil 2 Berm).f01

Flow Data (cfs)

River	Reach	RS	100 yr
MS-06	2nd Culvert	1000	.001
MS-06	Downstream Ov	1009	.01
MS-06	Main Channel	1000	505
MS-06	Main Channel-0	6421.55	505
MS-06	Main Channel-0-2	1007	505
MS-06	Overflow 1-DS-0	1007	.001

Boundary Conditions

River	Reach	River	Reach	Length	Angle
MS-06	Main Channel	to MS-06	Main Channel-0-2	0	0
MS-06	2nd Culvert	to MS-06	Main Channel-0-2	0	0

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 1000

INPUT
Description:
Station Elevation Data num= 92

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6773	5.07	6773	9.44	6772.9	13.81	6772.8	18.18	6772.7
22.55	6772.6	26.92	6772.5	31.29	6772.4	35.74	6772.3	40.3	6772.2
44.85	6772.1	49.41	6772	52.68	6771.9	55.95	6771.8	59.22	6771.7
62.49	6771.6	65.76	6771.5	69.03	6771.4	72.31	6771.3	75.58	6771.2
78.85	6771.1	82.12	6771	85.81	6770.9	89.5	6770.8	93.19	6770.7
96.88	6770.6	100.57	6770.5	104.26	6770.4	107.95	6770.3	111.65	6770.2
115.34	6770.1	120.32	6770	123.84	6769.9	127.35	6769.8	130.87	6769.7
134.39	6769.6	137.9	6769.5	141.42	6769.4	144.93	6769.3	148.45	6769.2
151.97	6769.1	155.52	6769	162.59	6768.9	169.66	6768.8	176.02	6768.71
176.73	6768.7	183.8	6768.6	190.87	6768.5	197.94	6768.4	205.01	6768.3
212.08	6768.2	219.15	6768.1	225.29	6768	228.2	6767.9	231.11	6767.8
234.03	6767.7	236.94	6767.6	239.86	6767.5	242.77	6767.4	245.68	6767.3
248.59	6767.2	255.28	6767.1	258.62	6767	262.57	6766.9	267.13	6766.8
273.48	6766.7	279.83	6766.6	301.05	6766.5	326.02	6766.4	326.12	6766.4
343.28	6766.3	360.45	6766.2	377.61	6766.1	394.77	6766	403.9	6765.9
404.09	6765.9	409.14	6766	423.25	6766.1	437.35	6766.2	451.46	6766.3
465.27	6766.4	476.02	6766.48	478.25	6766.5	491.24	6766.6	491.38	6766.6
498.08	6766.5	501.22	6766.4	504.36	6766.3	506.71	6766.3	510.3	6766.4
513.89	6766.5	515.85	6766.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	176.02	.045	476.02	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
176.02	476.02	24.7	24.7	.1	.3

LATERAL STRUCTURE

RIVER: MS-06
REACH: Main Channel RS: 999.9

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =

```
Deck/Roadway Width        =      10
Weir Coefficient          =      .4
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6766.7    3.63  6766.7    8.88  6766.6   14.13  6766.5   19.38  6766.4
   24.63  6766.3   29.89  6766.2   37.76 6766.45   41.85 6766.43   43.89 6766.41
   45.94  6766.1

Weir crest shape                          = Broad Crested


Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular     1.5
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                      33.9     .021     .021        0                   .5
      1
Upstream   Elevation =  6764.82
           Centerline Station =  37.8
Downstream Elevation =  6764.4
           Centerline Station =  37.17

CROSS SECTION


RIVER: MS-06
REACH: Main Channel       RS: 999

INPUT
Description:
Station Elevation Data    num=     101
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6772.9    7.59  6772.9    8.36  6772.8    9.14  6772.7    9.92  6772.6
   12.87  6772.5   19.11  6772.4   25.36  6772.3   29.88  6772.2   33.54  6772.1
   38.38    6772   41.38  6771.9   44.38  6771.8   47.27  6771.7   49.41  6771.6
   51.54  6771.5   53.67  6771.4    55.8  6771.3   57.94  6771.2   69.43  6771.1
   75.91    6771   77.26  6770.9   78.61  6770.8   79.96  6770.7   81.31  6770.6
   82.66  6770.5   84.01  6770.4   85.36  6770.3  103.38  6770.2  110.14  6770.1
  113.82    6770  116.28  6769.9  118.74  6769.8   121.2  6769.7  123.67  6769.6
  126.13  6769.5  128.59  6769.4  137.49  6769.3  141.02  6769.2  144.54  6769.1
  148.06    6769  155.14  6768.9  162.22  6768.8   169.3  6768.7  177.85 6768.65
  185.56  6768.6  214.71  6768.5  217.99  6768.4  221.28  6768.3  224.56  6768.2
  227.84  6768.1  231.13    6768  234.04  6767.9  236.48  6767.8  238.72  6767.7
  258.37  6767.6   261.7  6767.5  265.03  6767.4  268.36  6767.3   271.7  6767.2
  275.03  6767.1  278.36    6767   282.3  6766.9  286.23  6766.8  290.17  6766.7
   294.1  6766.6  298.04  6766.5  301.97  6766.4  305.91  6766.3  311.04  6766.2
  327.85 6766.11  330.42  6766.1  353.26    6766  365.94  6765.9   387.6  6765.8
  396.77  6765.7  405.94  6765.6  415.11  6765.5  424.29  6765.4  436.52  6765.4
  437.36  6765.6  440.68  6765.5  444.17  6765.6  447.65  6765.7  454.62  6765.7
  459.99  6765.8  473.34  6765.7  477.67  6765.6  477.85  6765.6  485.04  6765.5
  487.84  6765.6  496.64  6765.5  501.17  6765.6  513.39  6765.7  514.36  6765.8
  515.33  6765.9   516.3    6766  520.09  6766.1  521.81  6766.2  524.14  6766.3
  526.12  6766.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  177.85    .045  477.85    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
       177.85  477.85            .1       .3
Right Levee     Station=   459.6      Elevation= 6765.87

Downstream  Deck/Roadway Coordinates
    num=      71
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
 -185.07  6773.4       0 -184.65  6773.4       0 -179.42  6773.3       0
 -174.18  6773.2       0 -168.95  6773.1       0 -163.72    6773       0
 -158.45  6772.9       0  -153.2  6772.8       0 -147.94  6772.7       0
 -142.69  6772.6       0 -137.43  6772.5       0 -132.18  6772.4       0
 -126.92  6772.3       0 -121.67  6772.2       0 -116.41  6772.1       0
 -111.16    6772       0 -105.82  6771.9       0 -100.23  6771.8       0
  -94.64  6771.7       0  -89.04  6771.6       0  -83.45  6771.5       0
  -77.86  6771.4       0  -72.27  6771.3       0  -66.67  6771.2       0
  -61.08  6771.1       0  -55.49    6771       0  -48.29  6770.9       0
  -41.09  6770.8       0  -33.88  6770.7       0  -26.68  6770.6       0
  294.1  6766.6  298.04  6766.5  301.97  6766.4  305.91  6766.3  311.04  6766.2
 327.85 6766.11  330.42  6766.1  353.26    6766  365.94  6765.9   387.6  6765.8
 396.77  6765.7  405.94  6765.6  415.11  6765.5  424.29  6765.4  436.52  6765.4
 437.36  6765.6  440.68  6765.5  444.17  6765.6  447.65  6765.7  454.62  6765.7
 459.99  6765.8  473.34  6765.7  477.67  6765.6  477.85  6765.6  485.04  6765.5
 487.84  6765.6  496.64  6765.5  501.17  6765.6  513.39  6765.7  514.36  6765.8
 515.33  6765.9   516.3    6766  520.09  6766.1  521.81  6766.2  524.14  6766.3
 526.12  6766.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  177.85    .045  477.85    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       177.85  477.85             86.6    86.6    86.6             .1       .3
Right Levee     Station=   459.6      Elevation= 6765.87

CULVERT


RIVER: MS-06
REACH: Main Channel       RS: 998.53

INPUT
Description:
Distance from Upstream XS =      10
Deck/Roadway Width        =      24
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      71
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    1.14  6773.4       0    1.56  6773.4       0    6.79  6773.3       0
   12.03  6773.2       0   17.26  6773.1       0   22.49    6773       0
   27.76  6772.9       0   33.01  6772.8       0   38.27  6772.7       0
   43.52  6772.6       0   48.78  6772.5       0   54.03  6772.4       0
   59.29  6772.3       0   64.54  6772.2       0    69.8  6772.1       0
   75.05    6772       0   80.39  6771.9       0   85.98  6771.8       0
   91.57  6771.7       0   97.17  6771.6       0  102.76  6771.5       0
  108.35  6771.4       0  113.94  6771.3       0  119.54  6771.2       0
  125.13  6771.1       0  130.72    6771       0  137.92  6770.9       0
  145.12  6770.8       0  152.33  6770.7       0  159.53  6770.6       0
  166.74  6770.5       0  173.94  6770.4       0  181.14  6770.3       0
  188.35  6770.2       0  195.51  6770.1       0  202.63    6770       0
  218.87  6769.9       0  232.68  6769.8       0   242.1  6769.7       0
  251.53  6769.6       0  260.95  6769.5       0  270.84  6769.4       0
  281.83  6769.3       0  292.83  6769.2       0  303.82  6769.1       0
  313.71    6769       0   322.3  6768.9       0  329.99  6768.8       0
   336.9  6768.7       0  343.79  6768.6       0  350.68  6768.5       0
  357.27  6768.4       0  363.14  6768.3       0  369.01  6768.2       0
  374.88  6768.1       0  380.75    6768       0  386.62  6767.9       0
  392.49  6767.8       0  398.74  6767.7       0  405.92  6767.6       0
  413.09  6767.5       0  419.84  6767.4       0  426.55  6767.3       0
  433.27  6767.2       0  440.05  6767.1       0  449.46    6767       0
  459.02  6766.9       0  468.59  6766.8       0   478.3  6766.7       0
  497.37  6766.6       0  515.39  6766.6       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=     101
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6772.9    7.59  6772.9    8.36  6772.8    9.14  6772.7    9.92  6772.6
   12.87  6772.5   19.11  6772.4   25.36  6772.3   29.88  6772.2   33.54  6772.1
   38.38    6772   41.38  6771.9   44.38  6771.8   47.27  6771.7   49.41  6771.6
   51.54  6771.5   53.67  6771.4    55.8  6771.3   57.94  6771.2   69.43  6771.1
   75.91    6771   77.26  6770.9   78.61  6770.8   79.96  6770.7   81.31  6770.6
   82.66  6770.5   84.01  6770.4   85.36  6770.3  103.38  6770.2  110.14  6770.1
  113.82    6770  116.28  6769.9  118.74  6769.8   121.2  6769.7  123.67  6769.6
  126.13  6769.5  128.59  6769.4  137.49  6769.3  141.02  6769.2  144.54  6769.1
  148.06    6769  155.14  6768.9  162.22  6768.8   169.3  6768.7  177.85 6768.65
  185.56  6768.6  214.71  6768.5  217.99  6768.4  221.28  6768.3  224.56  6768.2
  227.84  6768.1  231.13    6768  234.04  6767.9  236.48  6767.8  238.72  6767.7
  258.37  6767.6   261.7  6767.5  265.03  6767.4  268.36  6767.3   271.7  6767.2
  275.03  6767.1  278.36    6767   282.3  6766.9  286.23  6766.8  290.17  6766.7
   294.1  6766.6  298.04  6766.5  301.97  6766.4  305.91  6766.3  311.04  6766.2
  327.85 6766.11  330.42  6766.1  353.26    6766  365.94  6765.9   387.6  6765.8
  396.77  6765.7  405.94  6765.6  415.11  6765.5  424.29  6765.4  436.52  6765.4
  437.36  6765.6  440.68  6765.5  444.17  6765.6  447.65  6765.7  454.62  6765.7
  459.99  6765.8  473.34  6765.7  477.67  6765.6  477.85  6765.6  485.04  6765.5
  487.84  6765.6  496.64  6765.5  501.17  6765.6  513.39  6765.7  514.36  6765.8
  515.33  6765.9   516.3    6766  520.09  6766.1  521.81  6766.2  524.14  6766.3
  526.12  6766.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  177.85    .045  477.85    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
       177.85  477.85            .1       .3
Right Levee     Station=   459.6      Elevation= 6765.87

Downstream  Deck/Roadway Coordinates
    num=      71
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
 -185.07  6773.4       0 -184.65  6773.4       0 -179.42  6773.3       0
 -174.18  6773.2       0 -168.95  6773.1       0 -163.72    6773       0
 -158.45  6772.9       0  -153.2  6772.8       0 -147.94  6772.7       0
 -142.69  6772.6       0 -137.43  6772.5       0 -132.18  6772.4       0
 -126.92  6772.3       0 -121.67  6772.2       0 -116.41  6772.1       0
 -111.16    6772       0 -105.82  6771.9       0 -100.23  6771.8       0
  -94.64  6771.7       0  -89.04  6771.6       0  -83.45  6771.5       0
  -77.86  6771.4       0  -72.27  6771.3       0  -66.67  6771.2       0
  -61.08  6771.1       0  -55.49    6771       0  -48.29  6770.9       0
  -41.09  6770.8       0  -33.88  6770.7       0  -26.68  6770.6       0
 -19.47  6770.5       0  -12.27  6770.4       0   -5.07  6770.3       0
   2.14  6770.2       0     9.3  6770.1       0   16.42    6770       0
  32.66  6769.9       0   46.47  6769.8       0   55.89  6769.7       0
  65.32  6769.6       0   74.74  6769.5       0   84.63  6769.4       0
  95.62  6769.3       0  106.62  6769.2       0  117.61  6769.1       0
  127.5    6769       0  136.09  6768.9       0  143.78  6768.8       0
 150.69  6768.7       0  157.58  6768.6       0  164.47  6768.5       0
 171.06  6768.4       0  176.93  6768.3       0   182.8  6768.2       0
 188.67  6768.1       0  194.54    6768       0  200.41  6767.9       0
 206.28  6767.8       0  212.53  6767.7       0  219.71  6767.6       0
 226.88  6767.5       0  233.63  6767.4       0  240.34  6767.3       0
 247.06  6767.2       0  253.84  6767.1       0  263.25    6767       0
 272.81  6766.9       0  282.38  6766.8       0  292.09  6766.7       0
 311.16  6766.6       0  329.18  6766.6       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6767.9     .47  6767.9    6.92  6767.8   14.53  6767.7   22.22  6767.6
   29.92  6767.5   36.01  6767.4   40.56  6767.3   45.11  6767.2   49.66  6767.1
   53.87    6767   58.04  6766.9   62.21  6766.8   66.38  6766.7   68.54  6766.6
   70.92  6766.5   73.93  6766.4   79.66  6766.3   91.14  6766.2   94.17  6766.1
   95.71    6766   97.15  6765.9   98.59  6765.8  100.03  6765.7  101.47  6765.6
  102.91  6765.5  104.35  6765.4  108.07  6765.3   110.6  6765.2  112.65  6765.1
  120.61    6765   125.1  6764.9  129.58  6764.8  134.07  6764.7  138.56  6764.6
  140.77 6764.55  143.05  6764.5  148.24 6764.42  149.23  6764.4   193.9  6764.4
  195.89  6764.5  197.88  6764.6  199.86  6764.7  201.85  6764.8  206.58  6764.8
  214.19  6764.7  220.58  6764.7  225.25  6764.8  229.92  6764.9  249.01  6764.9
  252.48  6764.8  255.95  6764.7  259.41  6764.6  262.88  6764.5  266.35  6764.4
  269.82  6764.3  273.28  6764.2  276.75  6764.1   293.6    6764     300    6764
  303.44    6764

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045     300    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
             0     300             .1       .3

Upstream Embankment side slope              =       3 horiz. to 1.0 vertical
Downstream Embankment side slope            =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       2
```

FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist Length   Top n Bottom n Depth Blocked Entrance Loss Coef
Exit Loss Coef
             25.33   38.29   .021   .021   0   .5
     1
Upstream   Elevation = 6766
           Centerline Station = 327.95
Downstream Elevation = 6764.9
           Centerline Station = 141.53

CROSS SECTION

RIVER: MS-06
REACH: Main Channel   RS: 998

INPUT
Description:
Station Elevation Data   num=   61
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 6767.9   .47 6767.9   6.92 6767.8   14.53 6767.7   22.22 6767.6
   29.92 6767.5   36.01 6767.4   40.56 6767.3   45.11 6767.2   49.66 6767.1
   53.87   6767   58.04 6766.9   62.21 6766.8   66.38 6766.7   68.54 6766.6
   70.92 6766.5   73.93 6766.4   79.66 6766.3   91.14 6766.2   94.17 6766.1
   95.71   6766   97.15 6765.9   98.59 6765.8 100.03 6765.7 101.47 6765.6
  102.91 6765.5 104.35 6765.4 108.07 6765.3   110.6 6765.2 112.65 6765.1
  120.61   6765   125.1 6764.9 129.58 6764.8 134.07 6764.7 138.56 6764.6
  140.77 6764.55 143.05 6764.5 148.24 6764.42 149.23 6764.4   193.9 6764.4
  195.89 6764.5 197.88 6764.6 199.86 6764.7 201.85 6764.8 206.58 6764.8
  214.19 6764.7 220.58 6764.7 225.25 6764.8 229.92 6764.9 249.01 6764.9
  252.48 6764.8 255.95 6764.7 259.41 6764.6 262.88 6764.5 266.35 6764.4
  269.82 6764.3 273.28 6764.2 276.75 6764.1   293.6   6764   300   6764
  303.44   6764

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .045   0   .045   300   .045

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
             0   300   82.74   82.74   82.74   .1   .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel   RS: 997

INPUT
Description:
Station Elevation Data   num=   62
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 6766.9   10.95 6766.9   15.5 6766.86   22.08 6766.8   28.61 6766.7
   35.13 6766.6   39.25 6766.5   43.11 6766.4   47.04 6766.3   51.19 6766.2
   55.34 6766.1   59.49   6766   63.64 6765.9   67.67 6765.8   70.52 6765.7
   73.36 6765.6   76.21 6765.5   79.05 6765.4   81.9 6765.3   84.74 6765.2
   88.26 6765.1   95.37   6765 102.48 6764.9 109.59 6764.8 121.02 6764.7
  122.56 6764.6 123.97 6764.5 125.09 6764.4 126.21 6764.3 127.33 6764.2
  128.45 6764.1 129.57   6764 130.69 6763.9 131.81 6763.8 133.11 6763.7
  197.38 6763.7 208.63 6763.8 219.08 6763.9 222.89   6764 226.69 6764.1
   230.5 6764.2 234.31 6764.3 238.12 6764.4 254.08 6764.4 257.55 6764.3
  261.02 6764.2 264.49 6764.1 267.96   6764 287.42 6763.9 295.34 6763.8
  301.58 6763.7 307.82 6763.6 314.06 6763.5   315.5 6763.48   320.3 6763.4
  336.65 6763.4 339.47 6763.3   342.3 6763.2 345.12 6763.1 346.12 6763.1
  346.12 6763.3 351.02 6763.3

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .045   15.5   .045   315.5   .045

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
            15.5   315.5   109.75 109.75 109.75   .1   .3
Left Levee   Station= 222.84   Elevation= 6763.9

CROSS SECTION

RIVER: MS-06
REACH: Main Channel   RS: 996

INPUT
Description:
Station Elevation Data   num=   33
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 6764.7   16.36 6764.7   34.07 6764.6   40.05 6764.5   46.03 6764.4
   52.01 6764.3   57.61 6764.2   62.95 6764.1   68.3   6764   73.64 6763.9
    78.9 6763.8   84.17 6763.7   89.43 6763.6   94.7 6763.5   99.96 6763.4
  105.23 6763.3 118.63 6763.2 119.82 6763.1   121   6763 122.04 6762.9
  123.06 6762.8 124.09 6762.7 125.11 6762.6 126.14 6762.5 127.16 6762.4
   167.8 6762.4 170.47 6762.5 272.66 6762.5 278.09 6762.6 283.52 6762.7
  288.95 6762.8 294.38 6762.9 298.33 6762.9

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .045   0   .045 298.33   .045

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
             0 298.33   103.04 103.04 103.04   .1   .3
Left Levee   Station= 118.39   Elevation= 6763.21
Right Levee   Station= 294.29   Elevation= 6762.9

LATERAL STRUCTURE

RIVER: MS-06
REACH: Main Channel   RS: 995.2

INPUT
Description:
Lateral structure position   = Right overbank
Distance from Upstream XS =
Deck/Roadway Width   =   10
Weir Coefficient   =   .4
Weir Flow Reference   = Water Surface
 Weir Embankment Coordinates   num =   257
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 6762.3   5.22 6762.3   13.24 6762.2   21.27 6762.1   29.3   6762
   34.32   6762   37.32 6762.1   40.33 6762.2   50.46 6762.2   55.4 6762.1
   60.35   6762   65.29 6761.9   70.23 6761.8   75.18 6761.7   79.57 6761.6
   82.72 6761.5   85.87 6761.4   87.25 6761.36   89 6761.3   92.1 6761.2
    95.2 6761.1   98.31   6761   101.41 6760.9 104.51 6760.8 107.62 6760.7
   111.8 6760.6   118.5 6760.6   143.14 6760.7 147.14 6760.7 148.78 6760.6
  150.42 6760.5 152.06 6760.4   153.71 6760.3 155.35 6760.2 156.99 6760.1
  158.63   6760 160.27 6759.9   161.91 6759.8 163.55 6759.7 165.19 6759.6
  166.83 6759.5 168.47 6759.4   177.27 6759.3 177.44 6759.3 184.39 6759.4
  191.34 6759.5 198.28 6759.6   202.05 6759.66 204.28 6759.7 209.15 6759.8
  214.02 6759.9 215.72 6759.9   217.18 6759.8 218.63 6759.7 220.08 6759.6
  221.54 6759.5 227.24 6759.5   231.51 6759.6 235.79 6759.7 236.49 6759.7
  238.58 6759.6 240.67 6759.5   242.75 6759.4 244.84 6759.3 246.93 6759.2
  249.97 6759.1 253.39   6759   262.57   6759 271.29 6759.1 284.03 6759.1
  287.05   6759 290.25 6758.9   293.46 6758.8 296.66 6758.7 299.86 6758.6
  303.07 6758.5 306.27 6758.4   309.47 6758.3 312.68 6758.2 315.88 6758.1
  315.98 6758.1 321.01   6758   328.44 6757.9 336.25 6757.8 344.05 6757.7
  351.86 6757.6 358.14 6757.5   363.1 6757.4 366.94 6757.4 401.14 6757.4
  403.68 6757.3 405.53 6757.2   407.39 6757.1 409.24   6757 411.09 6756.9
  412.95 6756.8   414.8 6756.7   416.65 6756.6 418.51 6756.5 423.83 6756.5
  425.98 6756.5 429.67 6756.6   433.36 6756.7 437.06 6756.8 440.75 6756.9
  444.44   6757 444.75   6757   447.77 6756.9 450.79 6756.8 453.45 6756.7
   455.5 6756.6 457.54 6756.5   459.59 6756.4 461.52 6756.31 461.64 6756.3
  463.74 6756.2 465.84 6756.1   467.94   6756 470.04 6755.9 472.14 6755.8
  474.24 6755.7 476.33 6755.6   478.43 6755.5 480.69 6755.4 486.25 6755.3
  491.81 6755.2 497.36 6755.1   504.64   6755 515.98 6754.9 529.23 6754.8
   547.4 6754.7 549.85 6754.6   550.02 6754.5 554.98 6754.4 560.76 6754.3
  566.72 6754.3 568.52 6754.4   570.85 6754.4 579.35 6754.3 587.84 6754.2
  596.33 6754.1 604.83   6754   610.72 6753.9 622.52 6753.8 642.15 6753.7
  659.48 6753.6 665.46 6753.53   667.89 6753.5 676.22 6753.4 684.54 6753.3
  692.16 6753.2 697.15 6753.1   702.14   6753   708.5 6752.9 716.13 6752.8
  723.76 6752.7 731.39 6752.6   737 6752.5 741.31 6752.4 745.62 6752.3
  750.25 6752.2 756.15 6752.1   762.05   6752 767.94 6751.9 773.84 6751.8
  784.47 6751.7 804.91 6751.61   806.28 6751.6 818.41 6751.5 830.53 6751.4
  837.75 6751.3 840.78 6751.2   843.82 6751.1 846.86   6751 849.89 6750.9
  852.93 6750.8 855.96 6750.7   859 6750.6 862.03 6750.5 865.07 6750.4
  879.89 6750.35 891.73 6750.3   896.53 6750.2 901.33 6750.1 906.13   6750
  910.93 6749.9 915.78 6749.8   920.68 6749.7 925.58 6749.6 930.49 6749.5
  935.49 6749.4 943.93 6749.3   952.37 6749.2 959.68 6749.1 965.44   6749
  971.21 6748.9 976.97 6748.8   982.59 6748.7 987.97 6748.6 993.35 6748.5
  998.73 6748.4 1004.19 6748.3 1010.18 6748.2 1016.18 6748.1 1022.17   6748
 1028.16 6747.9 1033.77 6747.8 1038.26 6747.7 1042.76 6747.6 1047.25 6747.5
 1051.73 6747.4 1056.16 6747.3 1060.6 6747.2 1065.03 6747.1 1069.47   6747
  1073.9 6746.9 1077.03 6746.83 1078.3 6746.8 1082.59 6746.7 1086.4 6746.6
  1090.1 6746.5 1094.83 6746.4 1103.88 6746.3 1112.93 6746.2 1121.97 6746.1
 1129.87   6746 1136.84 6745.9 1143.8 6745.8 1150.77 6745.7 1157.73 6745.6
 1166.48 6745.5 1176.34 6745.4 1181.53 6745.3 1186.72 6745.2 1191.91 6745.1
 1197.11   6745 1202.3 6744.9 1207.8 6744.8 1214.48 6744.7 1221.15 6744.6
 1239.94 6744.51 1242.93 6744.5 1247.41 6744.4 1251.9 6744.3 1256.38 6744.2
 1260.87 6744.1 1265.35   6744 1269.84 6743.9 1274.33 6743.8 1278.81 6743.7
  1283.3 6743.6 1287.78 6743.5 1293.11 6743.4 1298.89 6743.3 1304.1 6743.2
 1308.47 6743.1 1312.27 6743.1

Weir crest shape   = Broad Crested

CROSS SECTION

RIVER: MS-06
REACH: Main Channel   RS: 995

INPUT
Description:
Station Elevation Data   num=   32
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 6763.8   3.86 6763.8   11.57 6763.7   19.28 6763.6   26.99 6763.5
   34.98 6763.4   42.52 6763.3   50.06 6763.2   57.6 6763.1   65.14   6763
   72.68 6762.9   80.22 6762.8   87.76 6762.7   94.15 6762.6   99.74 6762.5
  109.53 6762.4 131.36 6762.3 133.21 6762.2 135.06 6762.1 136.79   6762
  138.52 6761.9 140.24 6761.8 141.96 6761.7 143.68 6761.6   151.3 6761.5
   162.9 6761.5 172.38 6761.6 174.05 6761.7 175.73 6761.8   177.4 6761.9
  178.31   6762 183.76   6762

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .045   0   .045 183.76   .045

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
             0 183.76   99.95   99.95   99.95   .1   .3
Left Levee   Station=   131   Elevation= 6762.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel   RS: 994

INPUT
Description:
Station Elevation Data num= 46

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6763.2	.79	6763.2	8.86	6763.1	16.93	6763	25	6762.9
32.41	6762.8	47.7	6762.7	52.94	6762.6	58.18	6762.5	63.42	6762.4
68.84	6762.3	74.42	6762.2	80	6762.1	85.57	6762	90.71	6761.9
95.33	6761.8	100.18	6761.7	105.02	6761.6	135.7	6761.5	138.8	6761.4
140.22	6761.3	141.62	6761.2	143.02	6761.1	144.41	6761	145.81	6760.9
147.02	6760.8	147.49	6760.7	147.96	6760.6	153.23	6760.5	156.17	6760.4
161.7	6760.3	171.52	6760.3	172.61	6760.4	173.69	6760.5	174.78	6760.6
175.9	6760.7	177.23	6760.8	178.55	6760.9	179.88	6761	181.21	6761.1
181.6	6761.1	182.22	6761	182.83	6760.9	183.45	6760.8	184.06	6760.7
193.95	6760.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	193.95	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	193.95	101.07	101.07	.1	.3

Left Levee Station= 135.35 Elevation= 6761.53

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 993

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6760.8	78.11	6760.8	85.48	6760.7	92.85	6760.6	99.88	6760.5
106.88	6760.4	113.87	6760.3	118.97	6760.3	125.87	6760.4	132.86	6760.5
139.98	6760.6	147.88	6760.6	149.34	6760.5	150.41	6760.4	151.47	6760.3
152.54	6760.2	153.61	6760.1	154.68	6760	155.75	6759.9	156.82	6759.8
157.88	6759.7	158.95	6759.6	160.02	6759.5	161.09	6759.4	162.98	6759.3
165.51	6759.2	168.31	6759.1	171.23	6759	174.15	6758.9	177.07	6758.8
179.99	6758.7	205.02	6758.7	206.23	6758.8	207.44	6758.9	208.65	6759
209.86	6759.1	211	6759.2	211.98	6759.3	212.97	6759.4	213.96	6759.5
214.94	6759.6	215.93	6759.7	217.99	6759.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	217.99	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	217.99	198.66	198.66	.1	.3

Left Levee Station= 139.07 Elevation= 6760.58

168.8	6754.5	171.93	6754.6	175.08	6754.7	175.6	6754.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	175.6	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	175.6	99.55	99.55	.1	.3

Left Levee Station= 105.82 Elevation= 6755.72

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 990

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6755.3	1.57	6755.3	8.45	6755.2	14.58	6755.1	19.89	6755
24.69	6754.9	29.5	6754.8	34.31	6754.7	39.12	6754.6	50.3	6754.5
64.04	6754.4	77.76	6754.3	90.87	6754.2	94.03	6754.2	98.19	6754.3
102.5	6754.4	111.3	6754.4	112.46	6754.3	113.63	6754.2	114.8	6754.1
115.96	6754	117.13	6753.9	118.29	6753.8	119.46	6753.7	120.62	6753.6
121.79	6753.5	123.18	6753.4	124.61	6753.3	130.55	6753.2	143.33	6753.1
154.83	6753.02	158.31	6753	168.16	6753	170.52	6753.1	172.87	6753.2
175.23	6753.3	177.58	6753.4	179.94	6753.5	182.29	6753.6	184.74	6753.7
190.85	6753.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	190.85	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	190.85	100.24	100.24	.1	.3

Left Levee Station= 111.87 Elevation= 6754.39

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 989

INPUT
Description:
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6753.5	2.88	6753.5	7.65	6753.4	12.43	6753.3	17.2	6753.2
21.97	6753.1	33.23	6753	45.4	6752.9	60.81	6752.8	79.75	6752.7
97.5	6752.6	126.32	6752.5	170.59	6752.5	187.83	6752.6	191.79	6752.7

Right Levee Station= 215.93 Elevation= 6759.71

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 992

INPUT
Description:
Station Elevation Data num= 59

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6759.5	12.02	6759.5	16.84	6759.4	21.66	6759.3	26.48	6759.2
31.3	6759.1	36.12	6759	40.94	6758.9	46.27	6758.8	57.73	6758.7
61.58	6758.6	65.42	6758.5	68.2	6758.4	70.92	6758.3	73.64	6758.2
76.36	6758.1	79.09	6758	81.81	6757.9	84.53	6757.8	87.26	6757.7
89.98	6757.6	92.7	6757.5	95.43	6757.4	98.15	6757.3	100.87	6757.2
102.8	6757.1	104.58	6757	106.37	6756.9	108.15	6756.8	109.93	6756.7
111.71	6756.6	115.86	6756.6	119.02	6756.7	120.53	6756.8	120.74	6756.9
120.95	6757	121.16	6757.1	121.72	6757.1	122.93	6757	124.13	6756.9
125.34	6756.8	126.54	6756.7	127.75	6756.6	128.98	6756.5	130.33	6756.4
131.68	6756.3	133.03	6756.2	152.52	6756.2	158.86	6756.1	166.54	6756.1
168.48	6756.2	170.43	6756.3	172.4	6756.4	174.37	6756.5	176.34	6756.6
178.31	6756.7	180.28	6756.8	182.25	6756.9	186.82	6756.9		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	186.82	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	186.82	100.79	100.79	.1	.3

Left Levee Station= 121.92 Elevation= 6757.11

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 991

INPUT
Description:
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6756.8	3.82	6756.8	8.54	6756.7	13.25	6756.6	17.99	6756.5
22.74	6756.4	27.48	6756.3	32.23	6756.2	36.98	6756.1	42.51	6756
50.58	6755.9	58.66	6755.8	64.91	6755.7	70.85	6755.6	76.79	6755.5
79.68	6755.5	84.26	6755.6	88.85	6755.7	90.45	6755.7	96.04	6755.6
98.75	6755.6	104.57	6755.7	106.69	6755.7	108.61	6755.6	110.54	6755.5
112.46	6755.4	114.39	6755.3	115.71	6755.2	116.8	6755.1	117.88	6755
118.97	6754.9	120.06	6754.8	121.15	6754.7	122.24	6754.6	125.43	6754.5
131.17	6754.4	153.87	6754.4	158.15	6754.3	163.28	6754.3	166.04	6754.4

195.74	6752.8	199.7	6752.9	204.8	6752.9	206.52	6752.8	208.24	6752.7
209.95	6752.6	211.67	6752.5	213.39	6752.4	215.11	6752.3	216.82	6752.2
218.52	6752.1	228.38	6752	248.2	6751.94	258.95	6751.9	262.2	6751.9
268.14	6752	270.58	6752.1	272.59	6752.2	274.6	6752.3	276.61	6752.4
278.62	6752.5	280.63	6752.6	287.87	6752.6	294.33	6752.5	298.18	6752.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	298.18	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	298.18	99.54	99.54	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	199.28	6752.9	F

Left Levee Station= 200.12 Elevation= 6752.89

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 988

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6751.7	49.17	6751.7	54.59	6751.6	59.07	6751.5	63.56	6751.4
68.04	6751.3	72.53	6751.2	76.13	6751.1	77.57	6751	79.01	6750.9
80.44	6750.8	81.88	6750.7	83.32	6750.6	85.27	6750.5	87.51	6750.4
89.74	6750.3	95.15	6750.2	109.31	6750.1	125.37	6750.1	135.09	6750.2
141.34	6750.3	147.59	6750.4	153.85	6750.5	160.1	6750.6	167.44	6750.7
168.75	6750.8	170.55	6750.9	172.35	6751	174.15	6751.1	175.95	6751.2
177.76	6751.3	179.56	6751.4	180.72	6751.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	180.72	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	180.72	99.8	99.8	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 987

INPUT
Description:
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6751.1	.09	6751.1	11.41	6751	15.04	6750.9	18.67	6750.8
22.31	6750.7	25.94	6750.6	29.57	6750.5	33.21	6750.4	36.84	6750.3
40.47	6750.2	45.65	6750.1	57.84	6750	74.78	6749.9	82.15	6749.8
87.14	6749.7	90.13	6749.6	91.77	6749.5	93.4	6749.4	95	6749.3
96.55	6749.2	98.1	6749.1	99.66	6749	101.21	6748.9	102.76	6748.8
108.12	6748.7	113.78	6748.6	119.43	6748.5	124.1	6748.4	128.76	6748.3
133.42	6748.2	147.55	6748.2	159.19	6748.3	160.57	6748.4	161.96	6748.5
163.35	6748.6	164.74	6748.7	166.13	6748.8	167.52	6748.9	169.49	6749
171.53	6749.1	173.57	6749.2	189.92	6749.3	190.56	6749.3		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	190.56	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	190.56	101.26	101.26	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 986

INPUT
Description:
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6750.5	2.48	6750.5	6.08	6750.4	9.47	6750.3	12.85	6750.2
16.23	6750.1	19.62	6750	22.95	6749.9	25.64	6749.8	28.33	6749.7
31.01	6749.6	33.7	6749.5	36.39	6749.4	39.08	6749.3	41.76	6749.2
47.35	6749.1	53.36	6749	59.36	6748.9	63.91	6748.8	66.77	6748.7
69.64	6748.6	72.5	6748.5	75.36	6748.4	78.23	6748.3	80.98	6748.2
83.39	6748.1	85.81	6748	88.15	6747.9	89.71	6747.8	91.27	6747.7
92.83	6747.6	94.4	6747.5	95.96	6747.4	97.53	6747.3	99.09	6747.2
100.66	6747.1	102.22	6747	105.47	6746.9	108.93	6746.8	112.38	6746.7
115.83	6746.6	119.37	6746.5	123.07	6746.4	126.77	6746.3	130.46	6746.2
139.96	6746.2	144.92	6746.25	150.78	6746.3	156.73	6746.4	158.62	6746.5
160.51	6746.6	162.39	6746.7	164.28	6746.8	166.16	6746.9	168.05	6747
169.94	6747.1	171.82	6747.2	173.71	6747.3	175.59	6747.4	184.94	6747.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	184.94	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	184.94	100.01	100.01	.1	.3

CROSS SECTION

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	190.58	116.52	116.52	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 983

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6742.1	48.91	6742.1	64.78	6742.2	80.6	6742.3	96.06	6742.4
157.02	6742.4	167.09	6742.5	177.16	6742.6	187.23	6742.7	197.31	6742.8
207.38	6742.9	217.67	6743	231.78	6743.1	247.73	6743.2	249.16	6743.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	249.16	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	249.16	0	0	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1007

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6746.3	4.87	6746.3	15.18	6746.2	25.49	6746.1	37.68	6746
60.48	6745.9	87.61	6745.83	100.94	6745.8	115.27	6745.7	132.4	6745.6
153.77	6745.5	178.65	6745.4	295.2	6745.3	300	6745.24	302.89	6745.2
307.2	6745.1	311.5	6745	311.72	6745				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	300	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	300	97.29	97.29	.1	.3

CROSS SECTION

RIVER: MS-06

RIVER: MS-06
REACH: Main Channel RS: 985

INPUT
Description:
Station Elevation Data num= 56

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6749	4.86	6749	9.91	6748.9	12.71	6748.8	15.52	6748.7
18.33	6748.6	21.13	6748.5	23.94	6748.4	26.75	6748.3	29.55	6748.2
32.23	6748.1	34.86	6748	37.48	6747.9	40.11	6747.8	42.73	6747.7
45.36	6747.6	47.98	6747.5	50.6	6747.4	53.23	6747.3	55.85	6747.2
59.11	6747.1	63.26	6747	67.4	6746.9	71.54	6746.8	75.69	6746.7
79.83	6746.6	83.47	6746.5	87.01	6746.4	89.82	6746.3	91.34	6746.2
92.86	6746.1	94.51	6746	96.51	6745.9	98.52	6745.8	100.52	6745.7
102.52	6745.6	104.52	6745.5	106.73	6745.4	112.95	6745.3	119.18	6745.2
124.18	6745.1	128.77	6745	133.36	6744.9	137.94	6744.8	149.43	6744.8
164.89	6744.9	166.55	6745	168.2	6745.1	169.86	6745.2	171.52	6745.3
173.13	6745.4	174.74	6745.5	176.36	6745.6	177.97	6745.7	179.58	6745.8
187.88	6745.8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	187.88	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	187.88	98.95	98.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 984

INPUT
Description:
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6746.4	4.47	6746.4	9.9	6746.3	15.92	6746.2	21.94	6746.1
27.96	6746	32.37	6745.9	35.58	6745.8	38.79	6745.7	42.01	6745.6
45.22	6745.5	48.43	6745.4	51.64	6745.3	54.85	6745.2	58.07	6745.1
61.45	6745	66.72	6744.9	71.99	6744.8	77	6744.7	81.62	6744.6
86.23	6744.5	90.85	6744.4	95.46	6744.3	100.08	6744.2	104.69	6744.1
109.31	6744	118.26	6743.9	129.43	6743.8	140.73	6743.7	152.02	6743.6
152.74	6743.59	161.7	6743.5	167.42	6743.5	168.61	6743.6	169.8	6743.7
170.99	6743.8	172.18	6743.9	173.37	6744	174.56	6744.1	175.94	6744.2
177.34	6744.3	178.74	6744.4	180.14	6744.5	181.54	6744.6	182.94	6744.7
182.99	6744.7	185.49	6744.6	187.99	6744.5	190.48	6744.4	190.58	6744.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	190.58	.045

REACH: Overflow 1-DS-0 RS: 1006.6

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-15.12	6744.7	-11.89	6744.7	-1.19	6744.6	9.51	6744.5	24.5	6744.4
44.76	6744.3	72.93	6744.2	99.26	6744.1	107.65	6744.07	124.63	6744
144.69	6744	156.94	6743.9	169.19	6743.8	181.73	6743.7	195.63	6743.6
210.79	6743.5	240.46	6743.4	243.15	6743.4	284.88	6743.47	304.48	6743.5
308.92	6743.5	319.03	6743.4	328.58	6743.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-15.12	.045	-15.12	.045	284.88	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-15.12	284.88	123.93	123.93	.1	.3

Right Levee Station= 305.46 Elevation= 6743.5

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1006

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6740.2	23.83	6740.2	33.47	6740.3	45.42	6740.4	57.38	6740.5
69.33	6740.6	81.29	6740.7	93.39	6740.8	102.49	6740.87	105.93	6740.9
118.48	6741	131.02	6741.1	143.57	6741.2	154.53	6741.3	204.64	6741.3
222.77	6741.4	252.49	6741.48	258.02	6741.5	279.06	6741.6	352.48	6741.7
376.17	6741.8	397.09	6741.9	402.49	6741.95	408.65	6742	418.27	6742.1
424.51	6742.2	430.74	6742.3	436.98	6742.4	443.22	6742.5	449.46	6742.6
457.79	6742.7	466.32	6742.8	500	6742.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	102.49	.045	402.49	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
102.49	402.49	147.13	147.13	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1005

INPUT
Description:
Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
36.82	6738.6	42.08	6738.6	61.4	6738.5	71.72	6738.4	82.04	6738.3
100	6738.28	156.36	6738.2	170.36	6738.1	184.37	6738	203.74	6737.9
223.56	6737.8	235.7	6737.8	250	6737.89	251.86	6737.9	268.02	6738
284.19	6738.1	327.55	6738.2	347.54	6738.3	356.38	6738.4	365.23	6738.5
374.07	6738.6	382.91	6738.7	391.75	6738.8	399.89	6738.9	400	6738.9
406.27	6739	411.72	6739.1	417.05	6739.2	422.37	6739.3	427.69	6739.4
433.01	6739.5	438.33	6739.6	443.66	6739.7	448.98	6739.8	454.3	6739.9
459.62	6740	468.45	6740.1	488.66	6740.2	500	6740.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
36.82	.045	100	.045	400	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	400	146.6	146.6	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1004

INPUT
Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
57.1	6737.1	70.25	6737.1	84	6737	95.26	6736.9	100	6736.86
106.52	6736.8	117.65	6736.7	126.98	6736.6	136.31	6736.5	144.58	6736.4
151.66	6736.3	158.73	6736.2	166.88	6736.1	177.61	6736	188.33	6735.9
199.06	6735.8	212.69	6735.7	231.71	6735.6	250	6735.5	256.79	6735.5
263.84	6735.6	270.89	6735.7	278.17	6735.8	288.75	6735.9	299.34	6736
309.92	6736.1	318.62	6736.2	327.1	6736.3	335.57	6736.4	344.66	6736.5
354.44	6736.6	364.22	6736.7	373.47	6736.8	382.04	6736.9	390.62	6737
400	6737.1	400.13	6737.1	414.43	6737.2	426.77	6737.3	433.37	6737.4
439.96	6737.5	446.55	6737.6	453.14	6737.7	459.73	6737.8	466.27	6737.9
470.67	6738	475.07	6738.1	479.48	6738.2	483.88	6738.3	488.46	6738.4
494.26	6738.5	500	6738.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
57.1	.045	100	.045	400	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	400	146.6	146.6	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1001

INPUT
Description:
Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
114.16	6730.5	123	6730.5	142.78	6730.4	162.57	6730.3	183.53	6730.2
199.56	6730.1	204.25	6730	206.71	6729.9	209.17	6729.8	211.64	6729.7
214.1	6729.6	216.63	6729.5	219.35	6729.4	222.06	6729.3	224.77	6729.2
227.49	6729.1	230.2	6729	232.92	6728.9	235.63	6728.8	238.34	6728.7
241.06	6728.6	243.77	6728.5	246.48	6728.4	249.2	6728.3	251.79	6728.3
257.86	6728.4	263.93	6728.5	268.24	6728.6	274.32	6728.7	280.97	6728.8
287.62	6728.9	294.26	6729	299.43	6729.1	303.93	6729.2	308.43	6729.3
312.93	6729.4	317.42	6729.5	321.92	6729.6	326.42	6729.7	330.91	6729.8
335.41	6729.9	339.91	6730	344.4	6730.1	348.9	6730.2	353.4	6730.3
357.89	6730.4	362.39	6730.5	366.89	6730.6	371.38	6730.7	375.88	6730.8
380.38	6730.9	384.88	6731	391.18	6731.1	397.48	6731.2	403.79	6731.3
410.09	6731.4	414.16	6731.46	416.4	6731.5	422.7	6731.6	430.57	6731.7
437.77	6731.8	446.73	6731.9	455.68	6732	470.73	6732.1	485.31	6732.2
497.47	6732.3	500	6732.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
114.16	.045	114.16	.045	414.16	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
114.16	414.16	148.42	148.42	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1000

INPUT
Description:
Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
188.32	6724.6	188.55	6724.6	193.54	6724.5	198.54	6724.4	203.53	6724.3
208.52	6724.2	213.48	6724.1	218.17	6724	218.81	6723.9	219.45	6723.8
220.09	6723.7	220.72	6723.6	221.35	6723.5	221.97	6723.9	221.99	6723.4
222.62	6723.3	223.26	6723.2	223.89	6723.1	224.52	6723	225.65	6722.9
226.52	6723.4	232.2	6723.1	232.79	6722.9	233.56	6723	234.34	6723.1

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1003

INPUT
Description:
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43.2	6735.9	46.4	6735.9	64.81	6735.8	79.35	6735.7	85.92	6735.6
92.5	6735.5	99.08	6735.4	100	6735.39	110.25	6735.3	122.08	6735.2
133.91	6735.1	143.08	6735	150.74	6734.9	158.41	6734.8	166.07	6734.7
171.88	6734.6	177.13	6734.5	182.39	6734.4	187.64	6734.3	193.04	6734.2
202.06	6734.1	211.08	6734	222.9	6733.9	235.17	6733.8	247.44	6733.7
256.65	6733.7	261.96	6733.8	267.28	6733.9	272.6	6734	278.53	6734.1
286.08	6734.2	293.72	6734.3	302.73	6734.4	311.73	6734.5	320.73	6734.6
329.74	6734.7	338.73	6734.8	347.65	6734.9	367.75	6735	372.21	6735
400	6734.9	401.37	6734.9	421.66	6734.9	471.27	6735	480.59	6735.1
489.91	6735.2	500	6735.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43.2	.045	100	.045	400	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	400	146.6	146.6	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1002

INPUT
Description:
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
45.32	6734	50.4	6734	59.92	6733.9	69.95	6733.8	80.98	6733.7
91.98	6733.6	99.67	6733.5	100	6733.5	107.35	6733.4	115.04	6733.3
123.32	6733.2	133.43	6733.1	139.17	6733	149.07	6732.9	158.97	6732.8
168.86	6732.7	178.3	6732.6	186.1	6732.5	193.91	6732.4	201.71	6732.3
209.52	6732.2	216.04	6732.1	220.62	6732	221.78	6731.9	222.95	6731.8
228.01	6731.7	234.5	6731.6	240.99	6731.5	244.83	6731.5	245.37	6731.6
246.87	6731.7	248.37	6731.8	249.87	6731.9	250	6731.91	251.38	6732
260.68	6732.1	273	6732.2	287.88	6732.3	305.33	6732.4	316.74	6732.5
327.85	6732.6	342.74	6732.7	352.35	6732.8	361.96	6732.9	371.57	6733
400	6733.08	408.75	6733.1	429.04	6733.2	463.3	6733.3	481.15	6733.4
500	6733.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
45.32	.045	100	.045	400	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	400	146.61	146.61	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1001

INPUT
Description:
Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
114.16	6730.5	123	6730.5	142.78	6730.4	162.57	6730.3	183.53	6730.2
199.56	6730.1	204.25	6730	206.71	6729.9	209.17	6729.8	211.64	6729.7
214.1	6729.6	216.63	6729.5	219.35	6729.4	222.06	6729.3	224.77	6729.2
227.49	6729.1	230.2	6729	232.92	6728.9	235.63	6728.8	238.34	6728.7
241.06	6728.6	243.77	6728.5	246.48	6728.4	249.2	6728.3	251.79	6728.3
257.86	6728.4	263.93	6728.5	268.24	6728.6	274.32	6728.7	280.97	6728.8
287.62	6728.9	294.26	6729	299.43	6729.1	303.93	6729.2	308.43	6729.3
312.93	6729.4	317.42	6729.5	321.92	6729.6	326.42	6729.7	330.91	6729.8
335.41	6729.9	339.91	6730	344.4	6730.1	348.9	6730.2	353.4	6730.3
357.89	6730.4	362.39	6730.5	366.89	6730.6	371.38	6730.7	375.88	6730.8
380.38	6730.9	384.88	6731	391.18	6731.1	397.48	6731.2	403.79	6731.3
410.09	6731.4	414.16	6731.46	416.4	6731.5	422.7	6731.6	430.57	6731.7
437.77	6731.8	446.73	6731.9	455.68	6732	470.73	6732.1	485.31	6732.2
497.47	6732.3	500	6732.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
114.16	.045	114.16	.045	414.16	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
114.16	414.16	148.42	148.42	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1000

INPUT
Description:
Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
188.32	6724.6	188.55	6724.6	193.54	6724.5	198.54	6724.4	203.53	6724.3
208.52	6724.2	213.48	6724.1	218.17	6724	218.81	6723.9	219.45	6723.8
220.09	6723.7	220.72	6723.6	221.35	6723.5	221.97	6723.9	221.99	6723.4
222.62	6723.3	223.26	6723.2	223.89	6723.1	224.52	6723	225.65	6722.9
226.52	6723.4	232.2	6723.1	232.79	6722.9	233.56	6723	234.34	6723.1
234.65	6723.5	235.11	6723.2	235.89	6723.3	236.66	6723.4	237.44	6723.5
238.22	6723.6	238.99	6723.7	239.86	6723.7	251.52	6723.6	252.8	6723.6
256.24	6723.57	263.3	6723.5	273.99	6723.5	275.4	6723.6	286.77	6723.6
290.07	6723.7	291.04	6723.8	291.35	6723.9	291.62	6724	291.67	6724.2
291.89	6724.1	292.86	6724.2	293.89	6724.3	295.28	6724.4	297.25	6724.5
299.22	6724.6	301.68	6724.7	304	6724.8	304.02	6725.1	306.33	6724.9
308.66	6725	310.98	6725.1	313.31	6725.2	314.89	6725.4	315.64	6725.3
317.96	6725.4	320.17	6725.8	320.29	6725.5	322.63	6725.6	324.96	6725.7
350.08	6725.7	360.39	6725.9	363.45	6726.5	364.91	6725.7	365.47	6725.8
366.02	6725.9	366.58	6726	367.02	6726.4	367.13	6726.1	367.69	6726.2
368.25	6726.3	368.8	6726.4	369.36	6726.5	369.91	6726.6	370.47	6726.7
370.99	6726.8	371.03	6726.8	371.58	6726.9	378.58	6727	386.53	6727.1
389.72	6727.1	398.24	6727.2	406.49	6727.3	414.74	6727.4	422.99	6727.5
431.24	6727.6	435.68	6727.8	436.39	6727.7	439.5	6727.7	447.75	6727.8
453.98	6727.9	459.23	6728	464.48	6728.1	469.73	6728.2	474.98	6728.3
480.23	6728.4	485.47	6728.5	488.32	6728.55	490.72	6728.6	495.97	6728.7
496.97	6728.7	496.97	6728.75	499.59	6728.8	500.01	6728.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
188.32	.045	188.32	.045	488.32	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
188.32	488.32	0	0	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: 2nd Culvert RS: 1000

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6766.5	.6	6766.5	4.17	6766.6	7.73	6766.7	10.33	6766.8
13.43	6766.8	14.83	6766.7	16.72	6766.6	18.62	6766.5	20.51	6766.4
22.41	6766.3	24.3	6766.2	26.2	6766.1	28.09	6766	31.85	6765.9
48.63	6765.8	96.65	6765.8	99.94	6765.83	106.07	6765.9	109.56	6765.9
122.48	6766	167.39	6766	179.12	6765.9	190.85	6765.8	202.58	6765.7
219.93	6765.7	221.83	6765.8	223.74	6765.9	225.64	6766	233.98	6766.1
242.31	6766.2	243.27	6766.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	243.27	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	243.27	30.51	30.51	.1	.3

Left Levee Station= 12.96 Elevation= 6766.8
Right Levee Station= 167.39 Elevation= 6766

```
CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 999

INPUT
Description:
Station Elevation Data    num=      40
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   38.25  6766.2   45.76  6766.2   46.96  6766.1   47.79    6766   48.13  6765.9
   48.47  6765.8   53.05  6765.8   57.82  6765.7   61.57  6765.6   65.33  6765.5
   69.08  6765.4   72.84  6765.3   80.57  6765.2  114.54  6765.2  125.08 6765.26
     133  6765.3  142.59  6765.3  156.69  6765.4  163.14  6765.4  167.96  6765.5
   168.6  6765.6  169.23  6765.7  169.87  6765.8  170.51  6765.9  171.14    6766
  186.85    6766  194.07  6765.9  201.28  6765.8   208.5  6765.7  215.71  6765.6
  222.93  6765.5  230.14  6765.4  240.25  6765.3  256.98  6765.3     266  6765.4
  289.63  6765.4   293.8  6765.5  295.69  6765.5  296.67  6765.6  299.79  6765.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   38.25    .045   38.25    .045  299.79    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         38.25  299.79             80.49   80.49   80.49             .1       .3
Left Levee      Station=   45.76      Elevation= 6766.21
Right Levee     Station=  171.14      Elevation= 6766.01

CULVERT


RIVER: MS-06
REACH: 2nd Culvert        RS: 998.52

INPUT
Description:
Distance from Upstream XS =      10
Deck/Roadway Width        =      24
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   26.61  6766.5       0   28.14  6766.5       0   78.13  6766.5       0
  162.64  6766.6       0  216.04  6766.7       0     242  6766.8       0
  264.14  6766.9       0  293.63    6767       0   294.8    6767       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   38.25  6766.2   45.76  6766.2   46.95  6766.1   47.78    6766   48.12  6765.9
   48.46  6765.8   53.05  6765.8   57.81  6765.7   61.57  6765.6   65.32  6765.5
   69.08  6765.4   72.83  6765.3   80.56  6765.2   90.79  6764.2  104.44 6763.84
  125.32 6763.41  136.56 6764.24  151.02 6764.58  156.69  6765.4  163.14  6765.4
  167.96  6765.5  168.59  6765.6  169.23  6765.7  169.87  6765.8   170.5  6765.9
  171.14    6766  186.85    6766  194.06  6765.9  201.28  6765.8  208.49  6765.7
  215.71  6765.6  222.92  6765.5  230.14  6765.4  240.25  6765.3  256.98  6765.3
  265.99  6765.4  289.62  6765.4  293.79  6765.5  295.69  6765.5  296.67  6765.6
  299.79  6765.6

Manning's n Values        num=       2
     Sta   n Val     Sta   n Val
   38.25    .045  299.79    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
         38.25  299.79             .1       .3
Left Levee      Station=   45.76      Elevation= 6766.21
Right Levee     Station=  171.14      Elevation= 6766.01

Downstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   37.01  6766.5       0   38.54  6766.5       0   88.53  6766.5       0
  173.04  6766.6       0  226.44  6766.7       0   252.4  6766.8       0
  274.54  6766.9       0  304.03    6767       0   305.2    6767       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6764    6.84    6764   27.93  6763.9   36.23  6763.8   42.52  6763.7
    48.8  6763.6   55.08  6763.5   71.38  6763.4    97.5  6763.4  122.71  6763.5
  134.37 6762.62  137.99 6762.84   147.7  6763.3  164.25  6763.4  178.21  6763.4
  188.51  6763.3  198.82  6763.2   213.9  6763.2  239.34  6763.3  271.73  6763.4
  276.62  6763.5  281.52  6763.6  286.42  6763.7  291.32  6763.8  296.21  6763.9
   299.6  6763.9

Manning's n Values        num=       2
     Sta   n Val     Sta   n Val
       0    .025   299.6    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
             0   299.6             .1       .3
Left Levee      Station=   129.1      Elevation=  6763.7
Right Levee     Station=  178.21      Elevation=  6763.4

Upstream Embankment side slope              =       3 horiz. to 1.0 vertical
Downstream Embankment side slope            =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       2
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
             22.18      46     .021     .021        0                  .5
      1
Upstream   Elevation =  6763.41
           Centerline Station =  125.23
Downstream Elevation =  6762.64
           Centerline Station =  135.53

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 998

INPUT
Description:
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6764    6.84    6764   27.93  6763.9   36.23  6763.8   42.52  6763.7
    48.8  6763.6   55.08  6763.5   75.35  6763.5    78.2  6763.4   81.05  6763.3
   83.89  6763.2   86.74  6763.1   89.74  6763.1   97.27  6763.2   104.8  6763.3
  112.33  6763.4  122.71  6763.5   125.9  6763.6   129.1  6763.7  132.91  6763.7
  135.48 6763.62  136.27  6763.6  139.62  6763.5  142.47  6763.4  145.15  6763.3
   147.7  6763.3  164.25  6763.4  178.21  6763.4  188.51  6763.3  198.82  6763.2
   213.9  6763.2  239.34  6763.3  271.73  6763.4  276.62  6763.5  281.52  6763.6
  286.42  6763.7  291.32  6763.8  296.21  6763.9   299.6  6763.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045   299.6    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   299.6             60.66   60.66   60.66             .1       .3
Left Levee      Station=   129.1      Elevation=  6763.7
Right Levee     Station=  178.21      Elevation=  6763.4

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 997

INPUT
Description:
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6762.1   92.16  6762.1  106.31  6762.2  120.46  6762.3  134.61  6762.4
  145.78  6762.5  149.62  6762.6  153.45  6762.7  156.81 6762.75  161.21  6762.8
  185.19  6762.9  190.05    6763  194.91  6763.1  199.78  6763.2  204.64  6763.3
   209.5  6763.4  214.36  6763.5  219.22  6763.6  224.08  6763.7  228.62  6763.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045  228.62    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0  228.62             91.43   91.43   91.43             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 996

INPUT
Description:
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -5.85  6762.1    2.61  6762.1     8.7    6762   14.19  6761.9   19.68  6761.8
   25.16  6761.7   30.65  6761.6   36.14  6761.5   41.62  6761.4   66.45  6761.3
  100.29  6761.2  133.52  6761.2  142.03  6761.3  152.87  6761.4   163.7  6761.5
  174.54  6761.6  185.38  6761.7  196.21  6761.8  207.05  6761.9  215.38    6762
  219.56  6762.1  223.75  6762.2  227.94  6762.3  232.13  6762.4  236.31  6762.5
   240.5  6762.6  244.69  6762.7  248.88  6762.8  253.06  6762.9  257.25    6763
  261.44  6763.1  265.63  6763.2  269.81  6763.3     274  6763.4   278.6  6763.5
  282.28  6763.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -5.85    .045   -5.85    .045  282.28    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -5.85  282.28             99.23   99.23   99.23             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 995

INPUT
Description:
Station Elevation Data    num=      31
```

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     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   10.57  6760.6   93.42  6760.6  104.39  6760.5  115.36  6760.4  126.33  6760.3
   137.3  6760.2  139.97  6760.2  144.69  6760.3   149.4  6760.4  154.12  6760.5
  158.83  6760.6  163.55  6760.7  168.27  6760.8  172.98  6760.9   177.7    6761
  182.42  6761.1  187.13  6761.2  191.86  6761.3  196.73  6761.4   201.6  6761.5
  206.47  6761.6  211.35  6761.7  216.22  6761.8  222.34  6761.9  230.02    6762
   238.7  6762.1  251.43  6762.2  262.29  6762.3  273.16  6762.4  284.03  6762.5
  288.34  6762.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   10.57    .045   10.57    .045  288.34    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         10.57  288.34           203.06  203.06  203.06             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 994

INPUT
Description:
Station Elevation Data    num=     164
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   17.27  6759.1   17.68  6759.1   21.18    6759   23.49  6758.9   25.81  6758.8
   28.12  6758.7   30.51  6758.6   33.15  6758.5   35.78  6758.4   38.42  6758.3
   41.05  6758.2   43.68  6758.1   55.63    6758   77.87  6757.9   88.04  6757.8
   93.39  6757.7   98.74  6757.6  104.09  6757.5  109.43  6757.4  114.78  6757.3
  119.53  6757.3   125.3  6757.4  131.07  6757.5  136.84  6757.6   142.6  6757.7
  148.37  6757.8  154.14  6757.9  159.91    6758  165.68  6758.1  171.44  6758.2
  177.21  6758.3  184.18 6758.35  186.55 6758.33  192.12  6758.3  209.53  6758.2
  226.93  6758.1  257.35    6758  299.01    6758  299.32  6758.1  299.63  6758.2
  299.93  6758.3     300 6758.32  300.26  6758.4  300.59  6758.5  300.93  6758.6
  301.26  6758.7  301.59  6758.8  301.92  6758.9  302.25    6759  302.58  6759.1
  302.92  6759.2  303.25  6759.3  303.58  6759.4  303.91  6759.5  304.25  6759.6
  304.59  6759.7  304.93  6759.8  305.27  6759.9  305.61    6760  305.95  6760.1
  306.29  6760.2  306.63  6760.3  306.97  6760.4  307.31  6760.5  307.66  6760.6
  310.35  6760.6   310.7  6760.5  311.05  6760.4   311.4  6760.3  311.76  6760.2
  312.11  6760.1  312.46    6760  312.82  6759.9  313.17  6759.8  313.53  6759.7
  313.88  6759.6  314.24  6759.5  314.59  6759.4  314.95  6759.3   315.3  6759.2
  315.66  6759.1  316.01    6759  316.37  6758.9  316.75  6758.8  317.12  6758.7
  317.19  6758.7  317.27 6758.72  317.67  6758.8  318.15  6758.9  318.63    6759
  319.11  6759.1  319.59  6759.2  320.07  6759.3  320.55  6759.4  321.02  6759.5
   321.5  6759.6  321.98  6759.7  322.46  6759.8  322.94  6759.9  323.42    6760
   323.9  6760.1  324.38  6760.2  324.86  6760.3  325.36  6760.4  325.86  6760.5
  326.37  6760.6  326.89  6760.7  329.56  6760.8  333.05  6760.8  343.92  6760.7
  350.91  6760.6  358.78  6760.5  367.82  6760.4  378.05  6760.3  388.76  6760.2
  399.27  6760.1  406.78    6760  407.67  6759.9  408.18  6759.8  408.68  6759.7
  409.19  6759.6   409.7  6759.5  410.18  6759.4  410.66  6759.3  411.14  6759.2
  411.62  6759.1   412.1    6759  412.58  6758.9  413.06  6758.8  413.54  6758.7
  414.02  6758.6   414.5  6758.5  414.97  6758.4  415.45  6758.3  415.93  6758.2
  416.41  6758.1  416.89    6758  417.44    6758   417.8  6758.1  418.15  6758.2
  418.51  6758.3  418.86  6758.4  419.22  6758.5  419.58  6758.6  419.93  6758.7
  420.29  6758.8  420.64  6758.9     421    6759  421.36  6759.1  421.71  6759.2
  422.07  6759.3  422.42  6759.4  422.78  6759.5  423.14  6759.6  423.49  6759.7
  423.85  6759.8   424.2  6759.9  425.45  6759.9  425.45 6759.09  426.05  6759.1
  435.77  6759.2  445.49  6759.3  454.57  6759.4  459.66  6759.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   17.27    .045   17.27    .045  317.27    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         17.27  317.27           297.82  297.82  297.82             .1       .3
Right Levee     Station=  184.28      Elevation= 6758.35

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 991

INPUT
Description:
Station Elevation Data    num=      27
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   17.74  6753.9   64.15  6753.9   72.88    6754   82.17  6754.1   91.46  6754.2
  100.75  6754.3  108.06  6754.4  135.37  6754.4  148.92  6754.3  215.67  6754.3
   235.4  6754.2  255.14  6754.1  274.88    6754  297.44    6754   300.5 6754.02
  317.74  6754.1  317.88  6754.1  338.23  6754.2  358.08  6754.3  369.47  6754.4
  380.86  6754.5  392.74  6754.6  404.67  6754.7  416.59  6754.8  428.52  6754.9
  440.44    6755  446.91    6755

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   17.74    .045   17.74    .045  317.74    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         17.74  317.74           100.37  100.37  100.37             .1       .3
Left Levee      Station=  135.36      Elevation= 6754.41
Right Levee     Station=  440.44      Elevation= 6755.01

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 990

INPUT
Description:
Station Elevation Data    num=      24
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   25.19  6752.6   28.13  6752.6    34.2  6752.5   43.68  6752.4      47  6752.3
   55.15  6752.2    64.8  6752.1   74.45    6752   86.68    6752  101.74  6752.1
  122.62  6752.2  150.22  6752.3  161.33 6752.37  166.17  6752.4  174.03  6752.5
   182.2  6752.6  192.26  6752.7  202.33  6752.8  269.13  6752.9  306.35    6753
  325.19 6753.06  338.25  6753.1   349.5  6753.2  350.96  6753.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   25.19    .045   25.19    .045  325.19    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.19  325.19            98.36   98.36   98.36             .1       .3
Right Levee     Station=  202.33      Elevation=  6752.8

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 989

INPUT
Description:
Station Elevation Data    num=      33
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   33.73  6750.8   44.94  6750.8   48.22  6750.7    51.5  6750.6   54.78  6750.5
   83.72  6750.4  102.65  6750.3  132.42  6750.2  168.01  6750.2  176.14  6750.3
  180.71 6750.36  184.27  6750.4  190.81  6750.5  194.52  6750.6  198.23  6750.7
  201.67  6750.8  205.06  6750.9  208.45    6751  211.85  6751.1  217.48  6751.2
  223.45  6751.3  229.43  6751.4   235.4  6751.5  241.38  6751.6  247.35  6751.7
  258.97  6751.8  288.03  6751.9  305.88    6752  321.51  6752.1  333.73 6752.15
  345.76  6752.2   353.1  6752.3  359.49  6752.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   33.73    .045   33.73    .045  333.73    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         33.73  333.73            98.35   98.35   98.35             .1       .3
Right Levee     Station=  288.03      Elevation= 6751.88

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 988

INPUT
Description:
Station Elevation Data    num=      77
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   -83.89  6748.1  -78.16  6748.1  -76.69  6748.2  -75.22  6748.3  -73.74  6748.4
   -72.27  6748.5  -70.79  6748.6  -69.32  6748.7  -67.84  6748.8  -66.37  6748.9
    -64.7    6749  -28.93    6749  -24.91  6748.9  -20.89  6748.8  -16.88  6748.7
   -12.86  6748.6   -8.85  6748.5   -4.83  6748.4    -.81  6748.3     3.2  6748.2
     7.09  6748.1   10.92    6748   13.47 6747.94   15.02  6747.9   19.67  6747.8
    29.64  6747.8   30.89 6747.82   37.51  6747.9   45.38    6748   52.86  6748.1
    59.61  6748.2   66.36  6748.3   73.69  6748.4   82.55  6748.5    91.4  6748.6
   107.42  6748.7  125.24  6748.7   138.4  6748.6  151.56  6748.5  160.28  6748.5
   170.33  6748.6  180.38  6748.7  180.89  6748.7  191.32  6748.8  194.89  6748.9
   198.46    6749  202.03  6749.1  205.61  6749.2  209.25  6749.3  212.89  6749.4
   216.53  6749.5  220.17  6749.6  223.81  6749.7  227.45  6749.8  231.09  6749.9
   234.73    6750  238.37  6750.1  242.01  6750.2  245.66  6750.3   249.3  6750.4
   252.94  6750.5  256.58  6750.6  261.28  6750.7  270.61  6750.8  279.93  6750.9
    289.1    6751  296.42  6751.1  303.75  6751.2  311.07  6751.3   318.4  6751.4
   325.72  6751.5  330.89 6751.59  331.79  6751.6  337.75  6751.7  343.71  6751.8
   349.67  6751.9   355.2  6751.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -83.89    .045   30.89    .045  330.89    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         30.89  330.89           105.21  105.21  105.21             .1       .3
Right Levee     Station=  106.98      Elevation= 6748.72

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 987

INPUT
Description:
Station Elevation Data    num=      42
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
    -83.8  6748.9  -60.67  6748.9  -56.65  6748.8  -52.64  6748.7  -48.62  6748.6
    -44.6  6748.5  -40.59  6748.4  -36.57  6748.3  -32.56  6748.2  -28.69  6748.1
   -24.86    6748   -21.3 6747.91  -20.97  6747.9  -16.33  6747.8    7.54  6747.8
    43.08  6747.8   55.96  6747.7   68.84  6747.6   82.39  6747.5  174.82  6747.5
   186.19  6747.6  191.02  6747.7  201.07  6747.8  205.99  6747.9   210.9    6748
   215.82  6748.1  220.73  6748.2  225.65  6748.3  230.56  6748.4  235.47  6748.5
   240.39  6748.6   245.3  6748.7  250.22  6748.8  255.13  6748.9  260.04    6749
   265.48  6749.1  280.14  6749.1  288.32    6749  296.49  6748.9  304.66  6748.8
   307.54  6748.8  350.35  6748.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -83.8    .045    7.54    .045  307.54    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
```

```
          7.54  307.54            197.8   197.8   197.8             .1       .3
Right Levee     Station=  264.36      Elevation= 6749.11

LATERAL STRUCTURE


RIVER: MS-06
REACH: 2nd Culvert        RS: 986.3

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =
Deck/Roadway Width        =      10
Weir Coefficient          =      .4
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6746    2.52    6746    8.22  6745.9   13.92  6745.8   19.62  6745.7
   25.33  6745.6   31.03  6745.5   36.73  6745.4   42.43  6745.3   48.08  6745.2
   53.26  6745.1   58.44    6745   63.62  6744.9    68.8  6744.8   73.99  6744.7
   79.17  6744.6   84.35  6744.5   89.53  6744.4   95.61  6744.3  100.83  6744.2
  105.59  6744.1  110.37    6744  115.32  6743.9  120.27  6743.8  125.21  6743.7
  130.16  6743.6  135.11  6743.5  140.05  6743.4     145  6743.3  149.95  6743.2
  154.09  6743.1  158.16    6743  162.24  6742.9  166.46  6742.8   169.4  6742.8
Weir crest shape                  = Broad Crested


CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 985

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -64.02  6746.1  -60.81  6746.1  -55.61    6746  -50.42  6745.9  -45.23  6745.8
  -40.03  6745.7  -34.97  6745.6  -34.84  6745.6  -27.42  6745.5  -18.81  6745.4
   -7.58  6745.3    3.65  6745.2   15.27  6745.1   42.51    6745  115.03 6744.91
  120.16  6744.9  265.03  6744.9  336.03  6744.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -64.02    .045  -34.97    .045  265.03    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -34.97  265.03            99.12   99.12   99.12             .1       .3


INPUT
Description:
Station Elevation Data    num=     128
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6687.7    1.53  6687.7    4.32  6687.6    7.11  6687.5    9.9  6687.4
   12.69  6687.3   15.61  6687.2   22.23  6687.1   28.85    6687  35.48  6686.9
    42.1  6686.8   48.72  6686.7   55.34  6686.6   61.96  6686.5  68.58  6686.4
   74.77  6686.3   78.33  6686.2   81.89  6686.1   85.44    6686  89.15  6685.9
   92.85  6685.8  100.75  6685.7  108.64  6685.6   115.4  6685.5 122.16  6685.4
  129.75  6685.3  141.75  6685.2  153.76  6685.1  165.77    6685 179.78  6684.9
   265.9  6684.9  292.53    6685     326  6685.1  339.15  6685.2    350 6685.29
  350.92  6685.3   363.1  6685.4  377.67  6685.5  391.06  6685.5 399.44  6685.4
  407.83  6685.3  419.46  6685.3  422.05  6685.2  424.63  6685.1 427.21    6685
  430.41  6684.9  433.62  6684.8  436.82  6684.7  440.02  6684.6 443.22  6684.5
  446.42  6684.4  449.62  6684.3  452.83  6684.2  456.03  6684.1 459.23    6684
  468.13  6683.9  477.95  6683.8  488.87  6683.7  511.75  6683.7 524.57  6683.8
  536.72  6683.9  548.86    6684  555.96  6684.1  563.05  6684.2 571.24  6684.2
  577.19  6684.1  583.14    6684  588.37  6683.9  593.39  6683.8 596.95  6683.7
  600.51  6683.6  604.07  6683.5  607.64  6683.4   611.2  6683.3 614.76  6683.2
  618.32  6683.1  621.88    6683  623.41  6682.9  626.55  6682.8 646.31  6682.7
  647.86  6682.7     650 6682.73  655.75  6682.8  664.75  6682.9 670.28    6683
  673.07  6683.1  675.87  6683.2  678.66  6683.3  681.46  6683.4 684.25  6683.5
  687.05  6683.6  690.11  6683.7   693.7  6683.8  697.29  6683.9 700.88    6684
  703.59  6684.1   706.3  6684.2  709.02  6684.3  711.73  6684.4 714.44  6684.5
  717.15  6684.6  721.31  6684.7  725.68  6684.8  730.05  6684.9 734.42    6685
  740.37  6685.1  746.32  6685.2  752.26  6685.3  758.21  6685.4 764.15  6685.5
  769.91  6685.6  775.54  6685.7  781.17  6685.8   786.8  6685.9 792.43    6686
  799.73  6686.1  807.26  6686.2  815.07  6686.3  822.96  6686.4 830.85  6686.5
  838.63  6686.6   846.4  6686.7  854.17  6686.8  861.94  6686.9 869.71    6687
  920.67    6687  988.74  6686.9    1000  6686.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     350     .06     650    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           350     650            151.1   151.1   151.1             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Downstream Ov      RS: 1008

INPUT
Description:
Station Elevation Data    num=      57
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6682.7     1.3  6682.7    6.72  6682.6   12.05  6682.5   17.38  6682.4
   22.71  6682.3   28.05  6682.2   33.38  6682.1   38.71    6682   44.17  6681.9

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 984

INPUT
Description:
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -62.04  6744.5  -53.65  6744.5  -19.71  6744.5  -13.47  6744.4    -6.4  6744.3
    1.66  6744.2    9.72  6744.1   17.79    6744   25.85  6743.9   33.91  6743.8
   48.27  6743.7   60.43  6743.6   72.59  6743.5   84.75  6743.4   96.35 6743.38
   153.4  6743.3  246.35  6743.3   302.2  6743.3  311.19  6743.2  320.15  6743.1
  323.64  6743.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -62.04    .045  -53.65    .045  246.35    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -53.65  246.35            101.12  101.12  101.12             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 983

INPUT
Description:
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6741.6    7.09  6741.6   23.43  6741.5   40.17  6741.4   56.91  6741.3
   73.98  6741.3   88.29 6741.36   97.57  6741.4  117.92  6741.5  129.01  6741.6
   140.1  6741.7  150.58  6741.8  160.65  6741.9  170.72    6742   180.8  6742.1
  190.87  6742.2  200.95  6742.3  209.84  6742.4  218.55  6742.5  233.06  6742.6
  245.18  6742.7   257.3  6742.8  269.42  6742.9  292.09  6742.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045  292.09    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0  292.09                 0       0       0             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Downstream Ov      RS: 1009

INPUT
Description:
Station Elevation Data    num=     128
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6687.7    1.53  6687.7    4.32  6687.6    7.11  6687.5    9.9  6687.4
   12.69  6687.3   15.61  6687.2   22.23  6687.1   28.85    6687  35.48  6686.9
    42.1  6686.8   48.72  6686.7   55.34  6686.6   61.96  6686.5  68.58  6686.4
   74.77  6686.3   78.33  6686.2   81.89  6686.1   85.44    6686  89.15  6685.9
   92.85  6685.8  100.75  6685.7  108.64  6685.6   115.4  6685.5 122.16  6685.4
  129.75  6685.3  141.75  6685.2  153.76  6685.1  165.77    6685 179.78  6684.9
   265.9  6684.9  292.53    6685     326  6685.1  339.15  6685.2    350 6685.29
  350.92  6685.3   363.1  6685.4  377.67  6685.5  391.06  6685.5 399.44  6685.4
  407.83  6685.3  419.46  6685.3  422.05  6685.2  424.63  6685.1 427.21    6685
  430.41  6684.9  433.62  6684.8  436.82  6684.7  440.02  6684.6 443.22  6684.5
  446.42  6684.4  449.62  6684.3  452.83  6684.2  456.03  6684.1 459.23    6684
  468.13  6683.9  477.95  6683.8  488.87  6683.7  511.75  6683.7 524.57  6683.8
  536.72  6683.9  548.86    6684  555.96  6684.1  563.05  6684.2 571.24  6684.2
  577.19  6684.1  583.14    6684  588.37  6683.9  593.39  6683.8 596.95  6683.7
  600.51  6683.6  604.07  6683.5  607.64  6683.4   611.2  6683.3 614.76  6683.2
  618.32  6683.1  621.88    6683  623.41  6682.9  626.55  6682.8 646.31  6682.7
  647.86  6682.7     650 6682.73  655.75  6682.8  664.75  6682.9 670.28    6683
  673.07  6683.1  675.87  6683.2  678.66  6683.3  681.46  6683.4 684.25  6683.5
  687.05  6683.6  690.11  6683.7   693.7  6683.8  697.29  6683.9 700.88    6684
  703.59  6684.1   706.3  6684.2  709.02  6684.3  711.73  6684.4 714.44  6684.5
  717.15  6684.6  721.31  6684.7  725.68  6684.8  730.05  6684.9 734.42    6685
  740.37  6685.1  746.32  6685.2  752.26  6685.3  758.21  6685.4 764.15  6685.5
  769.91  6685.6  775.54  6685.7  781.17  6685.8   786.8  6685.9 792.43    6686
  799.73  6686.1  807.26  6686.2  815.07  6686.3  822.96  6686.4 830.85  6686.5
  838.63  6686.6   846.4  6686.7  854.17  6686.8  861.94  6686.9 869.71    6687
  920.67    6687  988.74  6686.9    1000  6686.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     350     .06     650    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           350     650            151.1   151.1   151.1             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Downstream Ov      RS: 1008

INPUT
Description:
Station Elevation Data    num=      57
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6682.7     1.3  6682.7    6.72  6682.6   12.05  6682.5   17.38  6682.4
   22.71  6682.3   28.05  6682.2   33.38  6682.1   38.71    6682   44.17  6681.9
   69.17  6681.8  141.23  6681.8  159.17  6681.9  170.43    6682  177.83  6682.1
  185.23  6682.2  192.63  6682.3  200.32  6682.4  208.11  6682.5   215.9  6682.6
  223.69  6682.7  231.48  6682.8  239.16  6682.9  246.41 6682.99  247.06    6683
  255.57  6683.1  264.09  6683.2   272.6  6683.3  281.11  6683.4  289.63  6683.5
  298.51  6683.6  307.57  6683.7  316.89  6683.8  341.62  6683.8  374.98  6683.7
  380.77  6683.6  386.56  6683.5  391.81  6683.4  396.68  6683.3  401.55  6683.2
  406.43  6683.1   411.3    6683   416.1  6682.9   420.9  6682.8  425.71  6682.7
  430.51  6682.6  435.31  6682.5  440.11  6682.4  444.92  6682.3  449.72  6682.2
  454.52  6682.1  462.43  6682.1  477.69  6682.2     500 6682.27  509.57  6682.3
  528.87  6682.4  546.41  6682.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  246.41     .06  546.41    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        246.41  546.41           151.09  151.09  151.09             .1       .3
Left Levee      Station=  341.71      Elevation= 6683.81

CROSS SECTION


RIVER: MS-06
REACH: Downstream Ov      RS: 1007

INPUT
Description:
Station Elevation Data    num=      51
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6679.7    4.66  6679.7   10.03  6679.6    15.4  6679.5    20.5  6679.4
   25.51  6679.3   30.52  6679.2   35.53  6679.1   40.54    6679   45.55  6678.9
   50.56  6678.8   55.57  6678.7   60.59  6678.6   78.1  6678.6    94.7  6678.7
   138.7 6678.79  144.04  6678.8  148.99  6678.9  153.94    6679  158.89  6679.1
  163.84  6679.2  168.79  6679.3  174.21  6679.4  180.26  6679.5  186.31  6679.6
  192.36  6679.7  198.41  6679.8  204.46  6679.9  210.51    6680  219.05  6680.1
  239.63  6680.2  256.64  6680.3  267.11  6680.4  283.42  6680.5  299.24 6680.53
  330.57  6680.6  350.42 6680.63  368.32  6680.6  389.41  6680.5  410.25  6680.4
  431.08  6680.3  462.01  6680.3  470.81  6680.2  508.76  6680.2  521.21  6680.3
   531.2  6680.4  541.78  6680.5  556.34  6680.6  570.81  6680.7  585.27  6680.8
  597.67  6680.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  299.24     .06  585.27    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        299.24  585.27           151.1   151.1   151.1             .1       .3
Left Levee      Station=  349.58      Elevation= 6680.65

CROSS SECTION
```

RIVER: MS-06
REACH: Downstream Ov RS: 1006

INPUT
Description:
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6679.6	.94	6679.6	6.3	6679.5	11.67	6679.4	16.79	6679.3
21.8	6679.2	26.81	6679.1	31.82	6679	36.83	6678.9	41.84	6678.8
46.85	6678.7	51.86	6678.6	56.87	6678.5	68.72	6678.5	85.32	6678.6
101.93	6678.7	139.62	6678.7	148.23	6678.8	156.84	6678.9	165.45	6679
175.49	6679.1	185.54	6679.2	195.58	6679.3	207.97	6679.4	217.92	6679.4
239.94	6679.3	261.85	6679.2	279.27	6679.1	294.15	6679	302.68	6678.9
311.2	6678.8	319.73	6678.7	328.25	6678.6	336.78	6678.5	345.31	6678.4
350	6678.35	354.17	6678.3	364.76	6678.2	374.33	6678.1	383.66	6678
394.41	6677.9	405.17	6677.8	419.98	6677.7	431.66	6677.6	443.89	6677.5
456.29	6677.4	479.4	6677.4	496.23	6677.5	500	6677.51	550.69	6677.6
568.99	6677.7	584.13	6677.8	597.1	6677.9	617.33	6678	649.65	6678.1
650	6678.1	678.43	6678.2	708.48	6678.3	741.45	6678.4	754.77	6678.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
350 650 151.1 151.1 151.1 .1 .3

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1005

INPUT
Description:
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6678.1	1.95	6678.1	4.67	6678	7.75	6677.9	10.83	6677.8
13.9	6677.7	16.88	6677.6	19.54	6677.5	22.2	6677.4	24.86	6677.3
27.52	6677.2	30.18	6677.1	32.84	6677	35.83	6676.9	38.82	6676.8
42.08	6676.7	45.74	6676.6	63.75	6676.5	72.09	6676.4	85.73	6676.3
105.42	6676.2	111.53	6676.1	117.65	6676	122.28	6675.9	126.92	6675.8
136.39	6675.8	151.36	6675.9	166.34	6676	291.18	6676	299.94	6675.9
308.69	6675.8	322.11	6675.7	346.62	6675.6	350	6675.58	363.62	6675.5
371.05	6675.4	378.47	6675.3	385.89	6675.2	393.31	6675.1	400.74	6675
408.16	6674.9	416.99	6674.8	425.96	6674.7	449.59	6674.6	501.71	6674.6
515.13	6674.7	529.31	6674.8	537.24	6674.9	545.17	6675	553.88	6675.1
562.98	6675.2	574.45	6675.3	584.6	6675.4	594.46	6675.5	604.31	6675.6
616.65	6675.7	629.35	6675.8	642.05	6675.9	650	6675.96	654.75	6676
671.07	6676.1	687.39	6676.2	703.71	6676.3	719.18	6676.4	737.54	6676.5
762.38	6676.6	828.12	6676.7	856.43	6676.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
350 650 302.19 302.19 302.19 .1 .3
Left Levee Station= 288.99 Elevation= 6676.02

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1003

INPUT
Description:
Station Elevation Data num= 103

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6668.5	13.99	6668.5	28.93	6668.4	45.3	6668.3	55.68	6668.3
66.32	6668.4	74.67	6668.5	82.89	6668.6	90.93	6668.7	99.07	6668.8
107.76	6668.9	116.45	6669	126.15	6669.1	139.02	6669.2	149.51	6669.3
160.01	6669.4	170.5	6669.5	191.35	6669.6	209.08	6669.7	225.98	6669.8
246.45	6669.9	262.26	6670	275.05	6670.1	283.18	6670.1	302.35	6670
316.78	6670	322.43	6670.1	328.08	6670.2	333.72	6670.3	339.37	6670.4
345.02	6670.5	350	6670.5	354.93	6670.5	363.73	6670.4	372.53	6670.3
381.32	6670.2	390.12	6670.1	399.83	6670	412.15	6669.9	425.56	6669.8
469.14	6669.7	492.32	6669.6	502.69	6669.6	508.9	6669.7	515.1	6669.8
521.31	6669.9	527.52	6670	536.61	6670.1	545.7	6670.2	554.79	6670.3
563.88	6670.4	571.78	6670.5	578.64	6670.6	585.5	6670.7	592.36	6670.8
599.22	6670.9	606.08	6671	613.31	6671.1	620.54	6671.2	627.76	6671.3
634.25	6671.4	640.67	6671.5	647.08	6671.6	650	6671.65	653.5	6671.7
659.91	6671.8	666.33	6671.9	672.74	6672	678.54	6672.1	684.43	6672.2
690.33	6672.3	696.22	6672.4	702.12	6672.5	708.02	6672.6	713.96	6672.7
720.08	6672.8	726.21	6672.9	732.34	6673	738.27	6673.1	744.21	6673.2
750.15	6673.3	756.11	6673.4	762.12	6673.5	768.13	6673.6	774.14	6673.7
780.15	6673.8	786.16	6673.9	792.22	6674	801.1	6674.1	809.99	6674.2
818.88	6674.3	827.99	6674.4	837.12	6674.5	846.24	6674.6	855.37	6674.7
863.96	6674.8	871.96	6674.9	879.95	6675	891.49	6675.1	905.62	6675.2
919.57	6675.3	933.6	6675.4	950.62	6675.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
350 650 151.1 151.1 151.1 .1 .3
Left Levee Station= 335.13 Elevation= 6671.1

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1002

INPUT
Description:
Station Elevation Data num= 86

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6668.3	11.22	6668.3	21.99	6668.2	31.71	6668.1	41.44	6668
52.06	6667.9	70.11	6667.9	79.15	6668	89.8	6668.1	100.96	6668.2
110.95	6668.3	120.83	6668.4	131.14	6668.5	141.54	6668.6	151.93	6668.7
163.32	6668.8	171.69	6668.9	180.06	6669	197.26	6669.1	238.31	6669.1
273.02	6669	287.25	6668.9	294.56	6668.8	301.57	6668.7	310.58	6668.6
319.77	6668.5	328.95	6668.4	338.14	6668.3	347.33	6668.2	350	6668.17
356.51	6668.1	370.61	6668	388.09	6667.9	396.43	6667.8	402.33	6667.7
408.23	6667.6	414.13	6667.5	420.02	6667.4	425.92	6667.3	451.27	6667.3
500	6667.39	506.57	6667.4	513.55	6667.5	520.53	6667.6	527.51	6667.7
534.49	6667.8	541.47	6667.9	548.45	6668	555.22	6668.1	565.16	6668.2
574.02	6668.3	584.95	6668.4	598.02	6668.5	610.41	6668.6	623.23	6668.7
636.13	6668.8	650	6668.9	650.7	6668.9	666.36	6669	679.04	6669.1
691.1	6669.2	703.47	6669.3	715.84	6669.4	732.85	6669.5	750.32	6669.6
767.38	6669.7	783.79	6669.8	800.26	6669.9	812.97	6670	820.48	6670.1
827.02	6670.2	833.24	6670.3	839.47	6670.4	845.69	6670.5	851.91	6670.6
858.14	6670.7	864.36	6670.8	870.58	6670.9	876.81	6671	889	6671.1
903.7	6671.2	915.69	6671.3	927.67	6671.4	939.66	6671.5	957.86	6671.6
999.41	6671.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
350 650 151.09 151.09 151.09 .1 .3
Left Levee Station= 202.29 Elevation= 6669.13

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1001

INPUT
Description:
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6668	2.94	6668	9.53	6667.9	16.11	6667.8	22.7	6667.7
29.28	6667.6	41.95	6667.5	56.2	6667.4	70.44	6667.3	84.69	6667.2
98.94	6667.1	119.84	6667.1	129.23	6667.2	138.61	6667.3	148	6667.4
157.38	6667.5	166.77	6667.6	176.16	6667.7	261.62	6667.7	266.64	6667.6
271.65	6667.5	276.67	6667.4	281.69	6667.3	286.7	6667.2	291.72	6667.1
296.73	6667	301.78	6666.9	306.83	6666.8	311.87	6666.7	316.92	6666.6
322.38	6666.5	327.98	6666.4	336.09	6666.3	341.97	6666.2	347.31	6666.1
350	6666.05	352.65	6666	362.5	6665.9	372.34	6665.8	382.18	6665.7
392.02	6665.6	401.87	6665.5	493.99	6665.5	500	6665.52	528.71	6665.6
556.36	6665.7	579.05	6665.8	604.1	6665.9	624.45	6666	643.46	6666.1
650	6666.13	662.79	6666.2	681.11	6666.3	700.1	6666.4	718.82	6666.4
758.83	6666.5	784.81	6666.5	789.15	6666.6	796.15	6666.7	804.53	6666.8
812.92	6666.9	821.3	6667	831.24	6667.1	841.18	6667.2	845.91	6667.25
1000	6667.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
350 650 151.1 151.1 151.1 .1 .3

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1000

INPUT
Description:
Station Elevation Data num= 63

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6663.9	1.31	6663.9	13.03	6663.8	24.74	6663.7	36.46	6663.6
48.22	6663.5	59.96	6663.4	93.57	6663.4	133.36	6663.5	145.03	6663.6
149.81	6663.7	154.59	6663.8	159.37	6663.9	164.15	6664	169.15	6664.1
174.15	6664.2	179.15	6664.3	184.15	6664.4	189.15	6664.5	194.15	6664.6
199.34	6664.7	205.01	6664.8	210.69	6664.9	220.32	6665	297.84	6665
306.8	6664.9	315.76	6664.8	324.01	6664.7	328.77	6664.6	333.53	6664.5
338.29	6664.4	343.05	6664.3	347.8	6664.2	350	6664.15	352.56	6664.1
357.32	6664	360.97	6663.9	364.63	6663.8	368.11	6663.8	383.73	6663.9
399.35	6664	442.77	6664.1	457.83	6664.1	500	6664	510.45	6664.1
520.9	6664.2	531.34	6664.3	541.79	6664.4	552.24	6664.5	562.69	6664.6
573.14	6664.7	583.58	6664.8	594.03	6664.9	604.48	6665	614.93	6665.1
625.38	6665.2	635.83	6665.3	646.27	6665.4	650	6665.44	656.72	6665.5
667.17	6665.6	673.87	6665.66	1000	6665.66				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
350 650 0 0 0 .1 .3
Left Levee Station= 220.42 Elevation= 6665

CROSS SECTION

```
RIVER: MS-06
REACH: Main Channel-0-2   RS: 1007

INPUT
Description:
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6740.6   27.12  6740.6   66.08  6740.5   80.46 6740.47  122.02  6740.4
  169.54  6740.3   177.5  6740.2  185.46  6740.1  193.42    6740  271.01    6740
  305.83  6740.1  335.43  6740.2   348.9  6740.3  358.89  6740.4  367.68  6740.5
  376.96  6740.6  380.46 6740.63  388.54  6740.7  400.13  6740.8  411.71  6740.9
  417.66  6740.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045   80.46    .045  380.46    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         80.46  380.46             89.62   89.62   89.62             .1       .3

LATERAL STRUCTURE


RIVER: MS-06
REACH: Main Channel-0-2   RS: 1006.8

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =
Deck/Roadway Width        =      10
Weir Coefficient          =      .4
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =      128
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6740.3       3  6740.3    9.52  6740.2   16.05  6740.1   22.57    6740
   26.53 6739.94   29.13  6739.9   35.74  6739.8   42.35  6739.7   48.97  6739.6
   53.74  6739.5   57.97  6739.4   62.69  6739.3   70.01  6739.2   77.33  6739.1
   84.23    6739   89.02  6738.9   93.81  6738.8    98.6  6738.7   103.4  6738.6
  107.92  6738.6  142.95  6738.6  155.98  6738.6  165.44  6738.5  174.91  6738.4
  183.53  6738.3  191.57  6738.2  199.61  6738.1  207.65    6738  215.68  6737.9
  223.72  6737.8  234.37  6737.7  243.96  6737.6  252.63  6737.5  260.61 6737.41
  261.29  6737.4  269.74  6737.3   278.2  6737.2  286.65  6737.1  294.78    6737
   300.4 6736.92  301.45  6736.9  310.43  6736.8  319.56  6736.7  328.69  6736.6
  337.72  6736.5  345.89  6736.4  354.07  6736.3  362.25  6736.2  370.42  6736.1
  378.26    6736  383.93  6735.9  389.61  6735.8  395.29  6735.7  400.97  6735.6
  406.65  6735.5  411.32 6735.41  412.06  6735.4  417.38  6735.3  422.69  6735.2
     428  6735.1  433.32    6735  437.98  6734.9   442.6  6734.8  447.22  6734.7
  451.84  6734.6  456.47  6734.5  461.09  6734.4  465.71  6734.3  470.33  6734.2
  475.69  6734.1  487.08    6734  491.34  6733.9  495.76  6733.8  500.17  6733.7
  504.38  6733.6   508.6  6733.5  512.82  6733.4  517.04  6733.3   519.2 6733.25
  521.19  6733.2  525.26  6733.1  529.32    6733  534.13  6732.9  538.93  6732.8
  543.29  6732.7  547.63  6732.6  551.98  6732.5  556.32  6732.4  560.67  6732.3
  565.01  6732.2  569.36  6732.1   573.7    6732   578.5  6731.9   583.3  6731.8
   588.1  6731.7   592.9  6731.6  598.97  6731.5   605.6  6731.4  612.24  6731.3
  618.87  6731.2  625.51  6731.1  630.91    6731  633.97 6730.95  636.49  6730.9
   642.1  6730.8   647.7  6730.7  653.13  6730.6  658.56  6730.5  663.99  6730.4
  669.42  6730.3  674.85  6730.2  680.28  6730.1  685.71    6730  690.15  6729.9
  694.59  6729.8  699.04  6729.7  703.48  6729.6  707.58  6729.5  711.69  6729.4
   715.8  6729.3   719.9  6729.2  724.38  6729.1  730.14    6729  734.15  6728.9
  738.15  6728.8  742.15  6728.7  746.16  6728.6

Weir crest shape                          = Broad Crested


CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0-2   RS: 1006

INPUT
Description:
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6739.6   56.47  6739.6   93.48  6739.5     100 6739.47  118.69  6739.4
  150.99  6739.4     162  6739.5  200.32  6739.5  215.14  6739.4   245.2  6739.3
     250 6739.29  281.74  6739.2  297.89  6739.1  314.04    6739  333.13    6739
  349.83  6738.9  366.79  6738.8  385.08  6738.7     400  6738.7  403.54  6738.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     100    .045     400    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           100     400            137.83  137.83  137.83             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0-2   RS: 1005

INPUT
Description:
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6736.8   11.35  6736.8   33.93  6736.7   54.96  6736.6     100  6736.6
  114.89  6736.6  120.98  6736.7  127.08  6736.8  133.17  6736.9  139.27    6737
  145.37  6737.1  151.46  6737.2  157.56  6737.3  163.66  6737.4  169.39  6737.5
  174.66  6737.6  179.68  6737.6  193.37  6737.5  209.21  6737.4  225.06  6737.3
  240.85  6737.2     250 6737.12  251.92  6737.1  260.88    6737  269.85  6736.9
  278.82  6736.8  287.78  6736.7  311.56  6736.7  324.47  6736.8  337.38  6736.9
  350.28    6737  364.57  6737.1  379.76  6737.2  399.54  6737.3     400  6737.3
  440.24  6737.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     100    .045     400    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           100     400            137.83  137.83  137.83             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0-2   RS: 1004

INPUT
Description:
Station Elevation Data    num=      51
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6736.1    2.75  6736.1    7.86    6736   13.23  6735.9    18.6  6735.8
   23.97  6735.7   29.34  6735.6   34.71  6735.5   39.24  6735.4   43.35  6735.3
   47.46  6735.2   51.57  6735.1   56.91    6735   63.89  6734.9   70.87  6734.8
   77.85  6734.7   84.83  6734.6   91.81  6734.5   98.39  6734.4     100 6734.37
  103.98  6734.3  109.57  6734.2  124.57  6734.2  137.88  6734.3  151.18  6734.4
  171.67  6734.4  192.11  6734.3  212.42  6734.2   236.6  6734.1     250 6734.01
  252.14    6734  266.66  6733.9  281.18  6733.8  290.02  6733.8  294.75  6733.9
  299.48    6734  304.93  6734.1  311.71  6734.2  318.48  6734.3  325.26  6734.4
  332.04  6734.5  338.82  6734.6  345.59  6734.7  353.19  6734.8  368.68  6734.9
  381.18    6735  393.68  6735.1     400 6735.15  406.18  6735.2  418.68  6735.3
  442.09  6735.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     100    .045     400    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           100     400            137.83  137.83  137.83             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0-2   RS: 1003

INPUT
Description:
Station Elevation Data    num=      71
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6735.9    1.65  6735.9    6.25  6735.8      12  6735.7   17.88  6735.6
   23.75  6735.5   29.63  6735.4   35.51  6735.3   41.39  6735.2      47  6735.1
   52.56    6735   57.11  6734.9   61.67  6734.8   66.22  6734.7   70.63  6734.6
   75.01  6734.5   79.38  6734.4   83.75  6734.3   88.13  6734.2    92.5  6734.1
   96.87    6734     100 6733.93  101.22  6733.9   105.6  6733.8  109.98  6733.7
  114.36  6733.6  118.73  6733.5  123.11  6733.4  127.48  6733.3  131.85  6733.2
  136.65  6733.1  141.68    6733  147.29  6732.9   152.9  6732.8  158.51  6732.7
  164.12  6732.6  169.73  6732.5  175.34  6732.4  180.96  6732.3  186.57  6732.2
  192.18  6732.1  197.79    6732   203.4  6731.9  209.01  6731.8  214.63  6731.7
  220.24  6731.6  225.85  6731.5  231.46  6731.4  237.07  6731.3  242.07  6731.2
   245.2  6731.1  248.32    6731     250 6730.95  251.45  6730.9  255.18  6730.8
  260.95  6730.8   274.1  6730.9  285.82    6731   294.9  6731.1  303.98  6731.2
  313.44  6731.3  324.46  6731.4  334.52  6731.5  344.26  6731.6  355.12  6731.7
  366.94  6731.8  378.77  6731.9   389.8    6732  398.86  6732.1     400  6732.1
  419.19  6732.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     100    .045     400    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           100     400            137.82  137.82  137.82             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0-2   RS: 1002

INPUT
Description:
Station Elevation Data    num=      59
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6732.9   59.01  6732.9    63.4  6732.8    67.7  6732.7      72  6732.6
   76.29  6732.5   80.58  6732.4   84.88  6732.3   89.17  6732.2   93.47  6732.1
   97.76    6732     100 6731.95     102  6731.9  106.24  6731.8  110.48  6731.7
  114.71  6731.6  118.95  6731.5  123.19  6731.4  127.43  6731.3  131.66  6731.2
   135.9  6731.1  140.14    6731  144.38  6730.9  148.62  6730.8  152.85  6730.7
  157.09  6730.6  161.33  6730.5  165.57  6730.4  169.81  6730.3  176.46  6730.2
  180.88  6730.1  182.52    6730  185.16  6729.9   187.8  6729.8  190.44  6729.7
  193.08  6729.6  198.01  6729.5  201.28  6729.4  204.55  6729.3  257.24  6729.3
  267.54  6729.4  299.25  6729.4  305.18  6729.5  311.11  6729.6  317.04  6729.7
  322.97  6729.8   328.9  6729.9  334.83    6730     341  6730.1  347.18  6730.2
  353.36  6730.3  359.98  6730.4  370.63  6730.5  378.65  6730.6  386.63  6730.7
  394.57  6730.8     400 6730.87  402.52  6730.9  411.78  6730.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     100    .045     400    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
```

100	400		137.83	137.83	137.83		.1		.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2 RS: 1001

INPUT
Description:
Station Elevation Data num= 114

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6730.4	8.37	6730.4	10.94	6730.41	10.94	6730.9	12.27	6730.9
51.29	6730.8	92.85	6730.8	100	6730.74	104.76	6730.7	112.59	6730.6
119.53	6730.5	125.92	6730.4	132.31	6730.3	140.04	6730.2	148.78	6730.1
152.99	6730	155.29	6729.9	157.6	6729.8	159.9	6729.7	162.2	6729.6
164.51	6729.5	167.12	6729.4	169.72	6729.3	172.32	6729.2	174.93	6729.1
177.53	6729	180.13	6728.9	182.74	6728.8	185.34	6728.7	187.95	6728.6
190.55	6728.5	193.15	6728.4	195.76	6728.3	198.36	6728.2	200.96	6728.1
203.56	6728	205.29	6727.9	207.01	6727.8	208.74	6727.7	210.46	6727.6
212.19	6727.5	213.92	6727.4	215.64	6727.3	217.37	6727.2	219.09	6727.1
220.82	6727	221.54	6726.9	222.26	6726.8	222.99	6726.7	223.71	6726.6
224.43	6726.5	225.15	6726.4	225.87	6726.3	226.59	6726.2	227.3	6726.1
227.99	6726	228.75	6725.9	229.47	6725.8	230.19	6725.7	230.91	6725.6
231.62	6725.5	232.34	6725.4	233.06	6725.3	233.77	6725.2	234.49	6725.1
235.2	6725	236.17	6725	238.14	6725.1	240.12	6725.2	242.09	6725.3
244.07	6725.4	246.04	6725.5	246.9	6725.7	248.21	6725.6	250	6725.67
250.64	6725.7	253.08	6725.8	255.51	6725.9	257.94	6726	261.04	6726.1
264.14	6726.2	267.24	6726.3	270.34	6726.4	273.44	6726.5	276.54	6726.6
279.62	6726.7	282.69	6726.8	285.77	6726.9	288.85	6727	291.99	6727.1
295.14	6727.2	298.28	6727.3	301.43	6727.4	305.5	6727.5	307.96	6727.6
310.99	6727.6	316.48	6727.7	321.97	6727.8	327.46	6727.9	332.95	6728
339.34	6728.1	345.74	6728.2	352.14	6728.3	358.53	6728.4	364.56	6728.5
369.8	6728.6	375.04	6728.7	380.29	6728.8	385.53	6728.9	390.77	6729
396.51	6729.1	400	6729.16	402.24	6729.2	408.22	6729.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	100	.045	400	.045

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
100	400	137.83	137.83	137.83	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2 RS: 1000

INPUT
Description:
Station Elevation Data num= 152

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.1	4.69	6727.1	4.69	6730.1	5.7	6730.1	13.18	6730.2
18.07	6730.2	22.54	6730.1	27.01	6730	31.49	6729.9	34.42	6729.8
34.88	6729.7	35.33	6729.6	35.78	6729.5	36.24	6729.4	36.69	6729.3
37.14	6729.2	37.59	6729.1	38.05	6729	38.5	6728.9	38.97	6728.8
39.45	6728.7	39.93	6728.6	40.41	6728.5	40.89	6728.4	41.36	6728.3
41.84	6728.2	42.32	6728.1	42.8	6728	43.28	6727.9	43.79	6727.8
44.3	6727.7	44.82	6727.6	45.33	6727.5	45.84	6727.4	46.33	6727.3
46.82	6727.2	47.31	6727.1	47.79	6727	48.28	6726.9	48.76	6726.8
49.25	6726.7	49.73	6726.6	50.22	6726.5	50.43	6727.2	50.71	6726.4
51.19	6726.3	51.68	6726.2	52.16	6726.1	52.65	6726	52.98	6726
53.32	6726.1	53.66	6726.2	54	6726.3	54.34	6726.4	54.53	6726.6
54.68	6726.5	55.02	6726.6	55.35	6726.7	55.69	6726.8	56.03	6726.9
56.37	6727	56.71	6727.1	57.05	6727.3	57.39	6727.3	57.73	6727.4
58.07	6727.5	58.4	6727.6	58.74	6727.7	59.08	6727.8	59.42	6727.9
65.68	6727.91	107.18	6728	130.7	6728	138.42	6727.9	146.14	6727.8
153.16	6727.7	158.14	6727.6	163.12	6727.5	168.1	6727.4	173.08	6727.3
178.06	6727.2	183.04	6727.1	188.02	6727	190.42	6726.9	192.82	6726.8
195.21	6726.7	197.61	6726.6	200.01	6726.5	202.41	6726.4	204.81	6726.3
207.1	6726.2	209.34	6726.1	211.57	6726	213.81	6725.9	216.05	6725.8
218.28	6725.7	220.52	6725.6	222.75	6725.5	224.99	6725.4	227.22	6725.3
229.46	6725.2	231.7	6725.1	233.94	6725	235.84	6724.9	237.75	6724.8
239.65	6724.7	241.56	6724.6	243.46	6724.5	245.37	6724.4	247.27	6724.3
249.18	6724.2	249.5	6724.2	250	6724.22	252.27	6724.3	255.04	6724.4
257.81	6724.5	260.53	6724.6	263.21	6724.7	265.89	6724.8	268.57	6724.9
271.26	6725	273.96	6725.1	276.66	6725.2	279.37	6725.3	282.07	6725.4
284.77	6725.5	287.48	6725.6	290.18	6725.7	292.88	6725.8	295.59	6725.9
298.29	6726	301.26	6726.1	304.22	6726.2	307.19	6726.3	310.16	6726.4
313.12	6726.5	316.09	6726.6	319.06	6726.7	322.03	6726.8	325	6726.9
327.98	6727	331.68	6727.1	335.38	6727.2	339.08	6727.3	342.78	6727.4
346.47	6727.5	350.03	6727.6	353.6	6727.7	357.16	6727.8	360.73	6727.9
364.29	6728	365.68	6728						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	65.68	.045	365.68	.045

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
65.68	365.68	0	0	0	.1	.3

Left Levee Station= 130.04 Elevation= 6728.04

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6421.55

INPUT
Description:
Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.8	15.19	6727.8	21.62	6727.7	28.04	6727.6	34.21	6727.5
39.95	6727.4	45.69	6727.3	51.44	6727.2	57.18	6727.1	62.92	6727
65.72	6726.9	68.53	6726.8	71.24	6726.7	71.33	6726.7	74.13	6726.6
76.94	6726.5	79.74	6726.4	82.54	6726.3	85.38	6726.2	88.46	6726.1
91.55	6726	93.45	6725.9	95.35	6725.8	97.25	6725.7	99.14	6725.6
101.04	6725.5	102.94	6725.4	104.84	6725.3	106.74	6725.2	108.64	6725.1
110.54	6725	112.43	6724.9	114.33	6724.8	116.23	6724.7	118.13	6724.6
120.03	6724.5	121.93	6724.4	123.82	6724.3	125.72	6724.2	127.62	6724.1
129.52	6724	131.52	6723.9	133.6	6723.8	135.68	6723.7	137.77	6723.6
139.85	6723.5	141.93	6723.4	144.02	6723.3	146.1	6723.2	148.18	6723.1
150.27	6723	154.9	6722.9	176.56	6722.9	184.66	6722.8	190.99	6722.7
197.35	6722.6	207.07	6722.5	215.38	6722.4	215.78	6722.3	216.18	6722.2
216.59	6722.1	216.99	6722	217.39	6721.9	217.8	6721.8	218.2	6721.7
218.54	6721.62	218.6	6721.6	219.01	6721.5	221.24	6721.44	223.01	6721.4
223.51	6721.4	223.93	6721.5	224.36	6721.6	224.78	6721.7	225.21	6721.8
225.63	6721.9	226.06	6722	226.48	6722.1	226.91	6722.2	227.33	6722.3
232.61	6722.4	247.63	6722.5	250.32	6722.6	250.89	6723.1	251.25	6722.8
252.02	6722.9	253.04	6723	254.15	6723.1	255.24	6723.2	255.6	6723.5
256.33	6723.3	257.42	6723.4	258.51	6723.5	259.6	6723.6	260.69	6723.7
261.78	6723.8	262.88	6723.9	263.97	6724	265.06	6724.1	266.15	6724.2
267.24	6724.3	268.33	6724.4	268.36	6724.4	270.59	6724.5	270.97	6724.8
272.24	6724.7	272.89	6724.6	275.19	6724.7	277.49	6724.8	279.8	6724.9
280.81	6725.2	282.1	6725	284.4	6725.1	292.8	6725.2	302.67	6725.3
318.99	6725.2	320.48	6725.4	326.4	6725.3	326.55	6725.2	327.18	6725.3
327.81	6725.4	328.24	6726.2	328.44	6725.5	329.07	6725.6	329.7	6725.7
330.32	6725.8	330.95	6725.9	331.58	6726	331.64	6726.1	332.21	6726.1
332.84	6726.2	333.47	6726.3	334.1	6726.4	341.11	6726.5	342.8	6726.6
347.77	6726.6	352.46	6726.8	353.68	6726.7	359.58	6726.8	364	6726.9
367.48	6727.1	368.19	6727	371.24	6727.06	373.41	6727.1	378.63	6727.2
383.37	6727.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	71.24	.025	371.24	.045

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
71.24	371.24	100.88	100.88	100.88	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6320.67

INPUT
Description:
Station Elevation Data num= 182

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.9	7.06	6727.9	30.8	6727.8	52.38	6727.7	58.38	6727.6
64.37	6727.5	70.36	6727.4	76.35	6727.3	82.34	6727.2	88.34	6727.1
96.44	6727	100.86	6726.9	105.27	6726.8	109.69	6726.7	114.1	6726.6
115.13	6726.6	118.52	6726.5	122.94	6726.4	126.47	6726.4	127.35	6726.3
128.44	6726.28	131.81	6726.2	136.41	6726.1	140.41	6726.1	140.97	6726
143.72	6725.9	146.47	6725.8	149.22	6725.7	151.97	6725.6	154.72	6725.5
157.47	6725.4	160.22	6725.3	162.97	6725.2	165.72	6725.1	168.47	6725
171.21	6724.9	173.96	6724.8	176.71	6724.7	179.46	6724.6	182.21	6724.5
184.96	6724.4	187.71	6724.3	190.46	6724.2	193.21	6724.1	196.04	6724
197.39	6723.9	198.74	6723.8	200.09	6723.7	201.44	6723.6	202.79	6723.5
204.14	6723.4	205.49	6723.3	206.84	6723.2	207.61	6723.2	208.21	6723.1
209.92	6723	211.81	6722.9	213.69	6722.8	215.58	6722.7	217.47	6722.6
219.36	6722.5	221.25	6722.4	223.14	6722.3	224.1	6722.5	225.02	6722.2
226.91	6722.1	228.8	6722	230.76	6721.9	232.88	6721.8	235	6721.7
237.12	6721.6	239.12	6721.5	240.55	6721.6	240.6	6721.4	242.08	6721.3
243.55	6721.2	245.03	6721.1	246.51	6721	247.62	6720.9	248.53	6720.8
249.44	6720.7	250.34	6720.6	251.25	6720.5	252.16	6720.4	254.21	6720.3
256.28	6720.3	274.85	6720.2	296.5	6720.2	300.72	6720.3	301.89	6720.4
303.06	6720.5	304.23	6720.6	305.4	6720.7	306.57	6720.8	307.74	6720.9
308.91	6721	310.08	6721.1	311.24	6721.2	312.41	6721.3	313.58	6721.4
314.75	6721.5	315.5	6721.7	315.92	6721.6	317.09	6721.7	318.21	6721.8
319.07	6721.9	319.94	6722	320.43	6722.5	320.8	6722.1	321.67	6722.2
322.53	6722.3	323.4	6722.4	324.26	6722.5	324.52	6722.9	325.13	6722.6
325.99	6722.7	326.86	6722.8	327.72	6722.9	328.59	6723	330.42	6723.1
332.38	6723.2	334.34	6723.3	336.31	6723.4	338.27	6723.5	339.92	6723.8
340.23	6723.6	342.19	6723.7	344.16	6723.8	345.68	6723.9	347.16	6724
348.85	6724.1	354.44	6724.2	360.02	6724.3	362.65	6724.8	365.23	6724.4
365.31	6724.7	365.56	6724.5	365.89	6724.6	366.23	6724.7	366.56	6724.8
366.89	6724.9	367.22	6725	367.56	6725.1	367.89	6725.2	368.05	6726.3
368.22	6725.3	368.56	6725.4	368.88	6725.5	369.2	6725.6	369.53	6725.7
369.85	6725.8	370.17	6725.9	370.49	6726	370.81	6726.1	371.13	6726.2
371.45	6726.3	372.56	6726.4	374.76	6726.5	376.96	6726.6	379.17	6726.7
381.37	6726.8	383.58	6726.9	385.86	6727	389.02	6727.1	392.18	6727.2
395.34	6727.3	396.84	6727.4	398.5	6727.4	401.66	6727.5	404.82	6727.6
407.98	6727.7	411.14	6727.8	414.3	6727.9	417.46	6728	420.62	6728.1
423.78	6728.2	426.94	6728.3	428.44	6728.34	430.29	6728.4	434.29	6728.5
438.29	6728.6	440.12	6728.6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	128.44	.033	428.44	.045

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
128.44	428.44	40.18	40.18	40.18	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6280.5

INPUT
Description:

Station Elevation Data num= 223

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.7	20.09	6727.7	34.09	6727.6	40.11	6727.5	47.17	6727.4
53.85	6727.4	62.85	6727.3	78.54	6727.2	80.49	6727.2	86.39	6727.1
91.47	6727	96.55	6726.9	101.63	6726.8	113.63	6726.7	117.34	6726.7
123.01	6726.64	126.09	6726.6	135.21	6726.6	135.75	6726.5	136.58	6726.4
137.41	6726.3	137.93	6726.3	138.24	6726.2	139.07	6726.1	139.9	6726
140.73	6725.9	140.98	6725.9	141.56	6725.8	142.4	6725.7	143.23	6725.6
144.06	6725.5	144.89	6725.4	146.02	6725.3	146.15	6725.7	147.81	6725.4
148.91	6725.2	151.81	6725.1	154.71	6725	157.61	6724.9	160.51	6724.8
162.61	6724.8	163.41	6724.7	166.31	6724.6	169.21	6724.5	172.11	6724.4
175.01	6724.3	177.9	6724.2	184.88	6724.1	191.26	6724.1	191.74	6724.2
192.86	6724.2	196.86	6724.1	201.19	6724	204.53	6723.9	208.65	6723.8
211.55	6723.7	212.23	6723.8	237.66	6723.7	239.23	6723.4	239.71	6723.3
239.79	6723.4	239.83	6723.5	239.87	6723.6	239.9	6723.5	239.93	6723.4
239.96	6723.3	239.99	6723.2	240.02	6723.1	240.05	6723	240.08	6722.9
240.11	6722.8	240.14	6722.7	240.17	6722.6	240.19	6722.5	240.22	6722.4
240.25	6722.3	240.28	6722.2	240.31	6722.1	240.34	6723.2	240.37	6721.9
240.4	6721.8	240.43	6721.7	240.46	6721.6	240.49	6721.5	240.52	6721.4
240.66	6721.3	240.95	6721.2	241.25	6721.1	241.54	6721	242.43	6720.9
243.4	6720.8	244.37	6720.7	245.34	6720.6	246.31	6720.5	247.28	6720.4
248.25	6720.3	249.22	6720.2	250.19	6720.1	251.16	6720	252.14	6719.9
288.73	6719.9	289.96	6720	291.19	6720.1	292.42	6720.2	293.65	6720.3
294.88	6720.4	297.34	6720.6	298.42	6720.7	298.6	6720.8	298.74	6720.9
298.75	6721	298.77	6721.1	298.79	6721.2	298.8	6721.3	298.82	6721.4
298.83	6721.5	298.85	6721.6	298.87	6721.7	298.88	6721.8	298.9	6721.9
298.92	6724.6	298.93	6722.1	298.95	6722.2	298.96	6722.3	298.98	6722.4
299	6722.5	299.01	6722.6	299.03	6722.7	299.04	6722.8	299.06	6722.9
299.08	6723	299.09	6723.1	299.11	6723.2	299.12	6723.3	299.14	6723.4
299.16	6723.5	299.17	6723.6	299.19	6723.7	299.2	6723.8	299.22	6723.9
299.24	6724	299.25	6724.1	299.27	6724.2	299.29	6724.3	299.3	6724.4
299.32	6724.5	299.33	6724.6	299.38	6724.6	299.41	6724.5	299.43	6724.4
299.45	6724.3	300.33	6724.3	300.64	6724.5	302.53	6724.4	304.73	6724.5
306.93	6724.6	309.13	6724.7	311.32	6724.8	313.52	6724.9	315.72	6725
317.73	6725.1	317.92	6725.1	319.78	6725.5	320.12	6725.2	322.32	6725.3
324.52	6725.4	326.72	6725.5	326.94	6725.6	328.08	6725.9	328.91	6725.6
331.11	6725.7	333.42	6725.8	335.94	6725.9	338.46	6726	340.84	6726.1
341.29	6726.2	342.98	6726.2	345.12	6726.3	347.27	6726.4	349.41	6726.5
351.55	6726.6	352.64	6726.7	356.2	6726.7	356.55	6726.6	356.9	6726.5
357.24	6726.4	357.59	6726.3	357.94	6726.2	358.28	6726.1	358.63	6726
359.3	6726	361.74	6726.1	363.02	6726.3	364.18	6726.2	366.62	6726.3
369.06	6726.4	371.63	6726.5	374.25	6726.6	376.88	6726.7	379.51	6726.8
382.14	6726.9	384.77	6727	386.66	6727.1	388.73	6727.1	392.69	6727.2
396.65	6727.3	400.61	6727.4	404.57	6727.5	408.53	6727.6	412.51	6727.7
416.48	6727.8	417.22	6727.9	420.45	6727.9	423.01	6727.96	424.42	6728
428.63	6728.1	432.83	6728.2	437.03	6728.3	443.16	6728.4	448.71	6728.5
453.56	6728.6	458.42	6728.7	461.57	6728.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	123.01	.033	423.01	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
123.01 423.01 98.23 98.23 98.23 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	258.98	6723.78	F
286.2	461.57	6723.78	F

CULVERT

RIVER: MS-06
REACH: Main Channel-0 RS: 6228.06

INPUT
Description:
Distance from Upstream XS = 10
Deck/Roadway Width = 32
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 74

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-255.29	6732.1	0	-248.44	6732.1	0	-238.46	6732	0
-228.47	6731.9	0	-218.49	6731.8	0	-208.51	6731.7	0
-198.53	6731.6	0	-188.55	6731.5	0	-178.57	6731.4	0
-168.59	6731.3	0	-158.61	6731.2	0	-148.62	6731.1	0
-138.64	6731	0	-128.66	6730.9	0	-118.68	6730.8	0
-108.68	6730.7	0	-98.56	6730.6	0	-88.44	6730.5	0
-78.33	6730.4	0	-68.15	6730.3	0	-57.81	6730.2	0
-53.14	6730.15	0	-47.83	6730.1	0	-38.13	6730	0
-28.35	6729.9	0	-18.45	6729.8	0	-8.56	6729.7	0
1.34	6729.6	0	11.34	6729.5	0	21.44	6729.4	0
31.55	6729.3	0	41.65	6729.2	0	51.9	6729.1	0
62.22	6729	0	68.31	6728.94	0	72.15	6728.9	0
82.1	6728.8	0	92.05	6728.7	0	102.03	6728.6	0
112.01	6728.5	0	122	6728.4	0	135.47	6728.3	0
144.93	6728.24	0	151.67	6728.2	0	194.51	6728.2	0
209.58	6728.3	0	222.62	6728.4	0	232.68	6728.5	0
240.55	6728.58	0	242.81	6728.6	0	252.69	6728.7	0
262.58	6728.8	0	272.6	6728.9	0	282.71	6729	0
292.71	6729.1	0	302.72	6729.2	0	312.73	6729.3	0
322.74	6729.4	0	332.74	6729.5	0	342.75	6729.6	0
352.76	6729.7	0	362.77	6729.8	0	372.77	6729.9	0
382.78	6730	0	392.79	6730.1	0	402.8	6730.2	0
412.8	6730.3	0	422.81	6730.4	0	432.82	6730.5	0
442.83	6730.6	0	455.15	6730.7	0	468.49	6730.8	0
523.26	6730.8	0	524.73	6730.8	0			

Upstream Bridge Cross Section Data
Station Elevation Data num= 236

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.7	20.09	6727.7	34.09	6727.6	40.11	6727.5	47.17	6727.4
53.85	6727.4	62.85	6727.3	78.54	6727.2	80.49	6727.2	86.39	6727.1
91.47	6727	96.55	6726.9	101.63	6726.8	113.63	6726.7	117.34	6726.7
123.01	6726.64	126.09	6726.6	135.21	6726.6	135.75	6726.5	136.58	6726.4
137.41	6726.3	137.93	6726.3	138.24	6726.2	139.07	6726.1	139.9	6726
140.73	6725.9	140.98	6725.9	141.56	6725.8	142.4	6725.7	143.23	6725.6
144.06	6725.5	144.89	6725.4	146.02	6725.3	146.15	6725.7	147.81	6725.4
148.91	6725.2	151.81	6725.1	154.71	6725	157.61	6724.9	160.51	6724.8
162.61	6724.8	163.41	6724.7	166.31	6724.6	169.21	6724.5	172.11	6724.4
175.01	6724.3	177.9	6724.2	184.88	6724.1	191.26	6724.1	191.74	6724.2
192.86	6724.2	196.86	6724.1	201.19	6724	204.53	6723.9	205.42	6724.1
208.65	6723.8	210.15	6723.9	211.55	6723.7	212.23	6723.8	213.38	6723.7
215.21	6723.6	221.94	6723.5	222.52	6723.5	225.04	6723.4	227.8	6723.3
230.05	6723.6	230.55	6723.2	231.47	6723.3	234.06	6723.2	234.13	6723.1
237.66	6723.7	239.23	6723.4	239.71	6723.3	239.79	6723.4	239.83	6723.5
239.87	6723.6	239.9	6723.5	239.93	6723.4	239.96	6723.3	239.99	6723.2
240.02	6723.1	240.05	6723	240.08	6722.9	240.11	6722.8	240.14	6722.7
240.17	6722.6	240.19	6722.5	240.22	6722.4	240.25	6722.3	240.28	6722.2
240.31	6722.1	240.34	6723.2	240.37	6721.9	240.4	6721.8	240.43	6721.7
240.46	6721.6	240.49	6721.5	240.52	6721.4	240.66	6721.3	240.95	6721.2
241.25	6721.1	241.54	6721	242.43	6720.9	243.4	6720.8	244.37	6720.7
245.34	6720.6	246.31	6720.5	247.28	6720.4	248.25	6720.3	249.22	6720.2
250.19	6720.1	251.16	6720	252.14	6719.9	288.73	6719.9	289.96	6720
291.19	6720.1	292.42	6720.2	293.65	6720.3	294.88	6720.4	297.34	6720.6
298.42	6720.7	298.6	6720.8	298.74	6720.9	298.75	6721	298.77	6721.1
298.79	6721.2	298.8	6721.3	298.82	6721.4	298.83	6721.5	298.85	6721.6
298.87	6721.7	298.88	6721.8	298.9	6721.9	298.92	6724.6	298.93	6722.1
298.95	6722.2	298.96	6722.3	298.98	6722.4	299	6722.5	299.01	6722.6
299.03	6722.7	299.04	6722.8	299.06	6722.9	299.08	6723	299.09	6723.1
299.11	6723.2	299.12	6723.3	299.14	6723.4	299.16	6723.5	299.17	6723.6
299.19	6723.7	299.2	6723.8	299.22	6723.9	299.24	6724	299.25	6724.1
299.27	6724.2	299.29	6724.3	299.3	6724.4	299.32	6724.5	299.33	6724.6
299.38	6724.6	299.41	6724.5	299.43	6724.4	299.45	6724.3	300.33	6724.3
300.64	6724.5	302.53	6724.4	304.73	6724.5	306.93	6724.6	309.13	6724.7
311.32	6724.8	313.52	6724.9	315.72	6725	317.73	6725.1	317.92	6725.1
319.78	6725.5	320.12	6725.2	322.32	6725.3	324.52	6725.4	326.72	6725.5
326.94	6725.6	328.08	6725.9	328.91	6725.6	331.11	6725.7	333.42	6725.8
335.94	6725.9	338.46	6726	340.84	6726.1	341.29	6726.2	342.98	6726.2
345.12	6726.3	347.27	6726.4	349.41	6726.5	351.55	6726.6	352.64	6726.7
356.2	6726.7	356.55	6726.6	356.9	6726.5	357.24	6726.4	357.59	6726.3
357.94	6726.2	358.28	6726.1	358.63	6726	359.3	6726	361.74	6726.1
363.02	6726.3	364.18	6726.2	366.62	6726.3	369.06	6726.4	371.63	6726.5
374.25	6726.6	376.88	6726.7	379.51	6726.8	382.14	6726.9	384.77	6727
386.66	6727.1	388.73	6727.1	392.69	6727.2	396.65	6727.3	400.61	6727.4
404.57	6727.5	408.53	6727.6	412.51	6727.7	416.48	6727.8	417.22	6727.9
420.45	6727.9	423.01	6727.96	424.42	6728	428.63	6728.1	432.83	6728.2
437.03	6728.3	443.16	6728.4	448.71	6728.5	453.56	6728.6	458.42	6728.7
461.57	6728.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	123.01	.025	423.01	.045

Bank Sta: Left Right Coeff Contr. Expan.
123.01 423.01 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	258.98	6723.78	F
286.2	461.57	6723.78	F

Downstream Deck/Roadway Coordinates
num= 74

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-274.56	6732.1	0	-267.71	6732.1	0	-257.73	6732	0
-247.74	6731.9	0	-237.76	6731.8	0	-227.78	6731.7	0
-217.8	6731.6	0	-207.82	6731.5	0	-197.84	6731.4	0
-187.86	6731.3	0	-177.88	6731.2	0	-167.89	6731.1	0
-157.91	6731	0	-147.93	6730.9	0	-137.95	6730.8	0
-127.95	6730.7	0	-117.83	6730.6	0	-107.71	6730.5	0
-97.6	6730.4	0	-87.42	6730.3	0	-77.08	6730.2	0
-72.41	6730.15	0	-67.1	6730.1	0	-57.4	6730	0
-47.62	6729.9	0	-37.72	6729.8	0	-27.83	6729.7	0
-17.93	6729.6	0	-7.93	6729.5	0	2.17	6729.4	0
12.28	6729.3	0	22.38	6729.2	0	32.63	6729.1	0
42.95	6729	0	49.04	6728.94	0	52.88	6728.9	0
62.83	6728.8	0	72.78	6728.7	0	82.76	6728.6	0
92.74	6728.5	0	102.73	6728.4	0	116.2	6728.3	0
125.66	6728.24	0	132.4	6728.2	0	175.24	6728.2	0
190.31	6728.3	0	203.35	6728.4	0	213.41	6728.5	0
221.28	6728.58	0	223.54	6728.6	0	233.42	6728.7	0
243.31	6728.8	0	253.33	6728.9	0	263.44	6729	0
273.44	6729.1	0	283.45	6729.2	0	293.46	6729.3	0
303.47	6729.4	0	313.47	6729.5	0	323.48	6729.6	0
333.49	6729.7	0	343.5	6729.8	0	353.5	6729.9	0
363.51	6730	0	373.52	6730.1	0	383.53	6730.2	0
393.53	6730.3	0	403.54	6730.4	0	413.55	6730.5	0
423.56	6730.6	0	435.88	6730.7	0	449.22	6730.8	0
503.99	6730.8	0	505.46	6730.8	0			

Downstream Bridge Cross Section Data
Station Elevation Data num= 313

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6728.4	2.79	6728.4	12.53	6728.3	22.27	6728.2	25.56	6728.1
34.31	6728	43.05	6727.9	51.79	6727.8	74.15	6727.7	82.32	6727.6
90.49	6727.5	98.67	6727.4	103.73	6727.4	103.95	6727.4	114.02	6727.3
124.44	6727.2	125.11	6727.1	125.78	6727	126.45	6726.9	127.12	6726.8
127.79	6726.7	128.45	6726.6	129.12	6726.5	129.79	6726.4	130.46	6726.3
131.13	6726.2	131.8	6726.1	132.48	6726	133.23	6725.9	133.96	6725.8
134.57	6725.7	135.19	6725.6	135.79	6725.5	136.33	6725.4	136.86	6725.3
137.4	6725.2	137.93	6725.1	138.42	6725	138.9	6724.9	139.38	6724.8
139.86	6724.7	140.34	6724.6	140.81	6724.5	141.29	6724.4	141.95	6724.3
142.97	6724.2	143.99	6724.1	144.88	6724	145.55	6723.9	145.83	6723.9

146.28	6724	146.73	6724.1	147.19	6724.2	147.64	6724.3	148.09	6724.4
148.55	6724.5	149.01	6724.6	149.47	6724.7	149.93	6724.8	150.4	6724.9
150.86	6725	151.32	6725.1	151.78	6725.2	152.25	6725.3	152.71	6725.4
153.17	6725.5	153.63	6725.6	154.1	6725.7	154.56	6725.8	155.02	6725.9
155.48	6726	155.95	6726.1	156.41	6726.2	156.87	6726.3	157.33	6726.4
157.8	6726.5	158.26	6726.6	158.72	6726.7	159.18	6726.8	159.65	6726.9
160.11	6727	160.57	6727.1	161.03	6727.2	161.5	6727.3	161.96	6727.4
162.42	6727.5	162.88	6727.6	163.35	6727.7	166.36	6727.7	166.57	6727.6
166.77	6727.5	166.98	6727.4	167.19	6727.3	167.39	6727.2	167.6	6727.1
167.81	6727	168.01	6726.9	168.22	6726.8	168.43	6726.7	168.63	6726.6
168.84	6726.5	169.04	6726.4	169.23	6726.3	169.43	6726.2	169.62	6726.1
169.82	6726	170.02	6725.9	170.21	6725.8	170.41	6725.7	170.6	6725.6
170.8	6725.5	171	6725.4	171.19	6725.3	171.39	6725.2	171.58	6725.1
171.77	6725	171.96	6724.9	172.15	6724.8	172.34	6724.7	172.53	6724.6
172.72	6724.5	172.91	6724.4	173.11	6724.3	173.29	6724.2	173.48	6724.1
173.66	6724	173.85	6723.9	174.04	6723.8	174.22	6723.7	174.41	6723.6
174.67	6723.5	176.5	6723.4	178.33	6723.3	180.16	6723.2	181.96	6723.1
183.75	6723	185.55	6722.9	187.32	6722.8	189.08	6722.7	190.84	6722.6
191.78	6722.6	195.11	6722.7	198.44	6722.8	201.77	6722.9	205.1	6723
208.44	6723.1	218.27	6723.2	221.91	6723.3	225.54	6723.4	229.18	6723.5
229.68	6723.6	229.72	6723.7	229.75	6723.8	229.8	6723.9	229.84	6723.9
229.87	6723.8	229.9	6723.7	229.92	6723.6	229.95	6723.5	229.97	6723.4
230	6723.3	230.03	6723.2	230.05	6723.1	230.08	6723	230.1	6722.9
230.13	6722.8	230.16	6722.7	230.18	6722.6	230.21	6722.5	230.23	6722.4
230.26	6722.3	230.28	6722.2	230.31	6722.1	230.34	6722	230.36	6721.9
230.39	6721.8	230.41	6721.7	230.44	6721.6	230.47	6721.5	230.49	6721.4
230.52	6721.3	230.54	6721.2	230.57	6721.1	230.6	6721	230.62	6720.9
230.65	6720.8	230.67	6720.7	230.7	6720.6	230.73	6720.5	230.75	6720.4
230.78	6720.3	230.8	6720.2	230.83	6720.1	230.86	6720	230.88	6719.9
231.09	6719.8	231.49	6719.7	232.81	6719.6	234.13	6719.5	235.45	6719.4
236.77	6719.3	271.11	6719.3	272.55	6719.4	273.99	6719.5	275.43	6719.6
276.87	6719.7	278.31	6719.8	279.76	6719.9	281.2	6720	282.1	6720.1
282.42	6720.2	282.74	6720.3	282.97	6720.4	283	6720.5	283.04	6720.6
283.07	6720.7	283.1	6720.8	283.14	6720.9	283.17	6721	283.2	6721.1
283.24	6721.2	283.27	6721.3	283.3	6721.4	283.34	6721.5	283.37	6721.6
283.4	6721.7	283.43	6721.8	283.47	6721.9	283.5	6722	283.53	6722.1
283.57	6722.2	283.6	6722.3	283.63	6722.4	283.67	6722.5	283.7	6722.6
283.73	6722.7	283.77	6722.8	283.8	6722.9	283.83	6723	283.92	6722.9
283.98	6722.8	284.02	6722.7	286.31	6722.6	299.24	6722.5	302.38	6722.5
303.09	6722.6	303.81	6722.7	304.52	6722.8	305.2	6722.9	305.87	6723
306.53	6723.1	307.2	6723.2	307.86	6723.3	308.52	6723.4	309.19	6723.5
309.85	6723.6	310.52	6723.7	311.18	6723.8	311.83	6723.9	312.47	6724
313.11	6724.1	313.75	6724.2	314.39	6724.3	315.03	6724.4	315.67	6724.5
316.31	6724.6	316.95	6724.7	317.59	6724.8	318.23	6724.9	318.87	6725
319.5	6725.1	320.14	6725.2	320.78	6725.3	321.42	6725.4	322.06	6725.5
322.7	6725.6	324.04	6725.7	327.79	6725.8	331.54	6725.9	335.29	6726
338.59	6726	339.01	6725.9	339.42	6725.8	339.83	6725.7	340.25	6725.6
340.66	6725.5	341.07	6725.4	341.49	6725.3	341.9	6725.2	343.19	6725.2
345.54	6725.3	347.9	6725.4	350.26	6725.5	351.82	6725.6	353.33	6725.7
354.85	6725.8	356.37	6725.9	357.89	6726	360.84	6726.1	363.8	6726.2
366.75	6726.3	369.71	6726.4	375.23	6726.5	381.15	6726.6	387.07	6726.7
392.98	6726.8	398.9	6726.9	403.73	6726.98	404.82	6727	413.08	6727.1
424.25	6727.2	438.9	6727.3	449.55	6727.3				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	174.41	.033	302.38	.045

Bank Sta: Left Right Coeff Contr. Expan.

174.41 302.38 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	240.45	6723.23	F
266.43	449.55	6723.29	F

Upstream Embankment side slope = 6.67 horiz. to 1.0 vertical
Downstream Embankment side slope = 6.67 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 2

Culvert Name	Shape	Rise	Span
Culvert #1	Box	4	12

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
13.02	79.33	.013	.013	0	.5	1

Upstream Elevation = 6719.69
Centerline Station = 265.87
Downstream Elevation = 6719.29
Centerline Station = 246.65

Culvert Name	Shape	Rise	Span
Culvert #2	Box	4	12

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
13.35	78	.013	.013	0	.5	1

Upstream Elevation = 6719.69
Centerline Station = 279.82
Downstream Elevation = 6719.29
Centerline Station = 260.59

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6182.26

INPUT
Description:
Station Elevation Data num= 313

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6728.4	2.79	6728.4	12.53	6728.3	22.27	6728.2	25.56	6728.1
34.31	6728	43.05	6727.9	51.79	6727.8	74.15	6727.7	82.32	6727.6
90.49	6727.5	98.67	6727.4	103.73	6727.4	103.95	6727.4	114.02	6727.3
124.44	6727.2	125.11	6727.1	125.78	6727	126.45	6726.9	127.12	6726.8
127.79	6726.7	128.45	6726.6	129.12	6726.5	129.79	6726.4	130.46	6726.3
131.13	6726.2	131.8	6726.1	132.48	6726	133.23	6725.9	133.96	6725.8
134.57	6725.7	135.19	6725.6	135.79	6725.5	136.33	6725.4	136.86	6725.3
137.4	6725.2	137.93	6725.1	138.42	6725	138.9	6724.9	139.38	6724.8
139.86	6724.7	140.34	6724.6	140.81	6724.5	141.29	6724.4	141.95	6724.3
142.97	6724.2	143.99	6724.1	144.88	6724	145.55	6723.9	145.83	6723.9
146.28	6724	146.73	6724.1	147.19	6724.2	147.64	6724.3	148.09	6724.4
148.55	6724.5	149.01	6724.6	149.47	6724.7	149.93	6724.8	150.4	6724.9
150.86	6725	151.32	6725.1	151.78	6725.2	152.25	6725.3	152.71	6725.4
153.17	6725.5	153.63	6725.6	154.1	6725.7	154.56	6725.8	155.02	6725.9
155.48	6726	155.95	6726.1	156.41	6726.2	156.87	6726.3	157.33	6726.4
157.8	6726.5	158.26	6726.6	158.72	6726.7	159.18	6726.8	159.65	6726.9
160.11	6727	160.57	6727.1	161.03	6727.2	161.5	6727.3	161.96	6727.4
162.42	6727.5	162.88	6727.6	163.35	6727.7	166.36	6727.7	166.57	6727.6
166.77	6727.5	166.98	6727.4	167.19	6727.3	167.39	6727.2	167.6	6727.1
167.81	6727	168.01	6726.9	168.22	6726.8	168.43	6726.7	168.63	6726.6
168.84	6726.5	169.04	6726.4	169.23	6726.3	169.43	6726.2	169.62	6726.1
169.82	6726	170.02	6725.9	170.21	6725.8	170.41	6725.7	170.6	6725.6
170.8	6725.5	171	6725.4	171.19	6725.3	171.39	6725.2	171.58	6725.1
171.77	6725	171.96	6724.9	172.15	6724.8	172.34	6724.7	172.53	6724.6
172.72	6724.5	172.91	6724.4	173.11	6724.3	173.29	6724.2	173.48	6724.1
173.66	6724	173.85	6723.9	174.04	6723.8	174.22	6723.7	174.41	6723.6
174.67	6723.5	176.5	6723.4	178.33	6723.3	180.16	6723.2	181.96	6723.1
183.75	6723	185.55	6722.9	187.32	6722.8	189.08	6722.7	190.84	6722.6
191.78	6722.6	195.11	6722.7	198.44	6722.8	201.77	6722.9	205.1	6723
208.44	6723.1	218.27	6723.2	221.91	6723.3	225.54	6723.4	229.18	6723.5
229.68	6723.6	229.72	6723.7	229.75	6723.8	229.8	6723.9	229.84	6723.9
229.87	6723.8	229.9	6723.7	229.92	6723.6	229.95	6723.5	229.97	6723.4
230	6723.3	230.03	6723.2	230.05	6723.1	230.08	6723	230.1	6722.9
230.13	6722.8	230.16	6722.7	230.18	6722.6	230.21	6722.5	230.23	6722.4
230.26	6722.3	230.28	6722.2	230.31	6722.1	230.34	6722	230.36	6721.9
230.39	6721.8	230.41	6721.7	230.44	6721.6	230.47	6721.5	230.49	6721.4
230.52	6721.3	230.54	6721.2	230.57	6721.1	230.6	6721	230.62	6720.9
230.65	6720.8	230.67	6720.7	230.7	6720.6	230.73	6720.5	230.75	6720.4
230.78	6720.3	230.8	6720.2	230.83	6720.1	230.86	6720	230.88	6719.9
231.09	6719.8	231.49	6719.7	232.81	6719.6	234.13	6719.5	235.45	6719.4
236.77	6719.3	271.11	6719.3	272.55	6719.4	273.99	6719.5	275.43	6719.6
276.87	6719.7	278.31	6719.8	279.76	6719.9	281.2	6720	282.1	6720.1
282.42	6720.2	282.74	6720.3	282.97	6720.4	283	6720.5	283.04	6720.6
283.07	6720.7	283.1	6720.8	283.14	6720.9	283.17	6721	283.2	6721.1
283.24	6721.2	283.27	6721.3	283.3	6721.4	283.34	6721.5	283.37	6721.6
283.4	6721.7	283.43	6721.8	283.47	6721.9	283.5	6722	283.53	6722.1
283.57	6722.2	283.6	6722.3	283.63	6722.4	283.67	6722.5	283.7	6722.6
283.73	6722.7	283.77	6722.8	283.8	6722.9	283.83	6723	283.92	6722.9
283.98	6722.8	284.02	6722.7	286.31	6722.6	299.24	6722.5	302.38	6722.5
303.09	6722.6	303.81	6722.7	304.52	6722.8	305.2	6722.9	305.87	6723
306.53	6723.1	307.2	6723.2	307.86	6723.3	308.52	6723.4	309.19	6723.5
309.85	6723.6	310.52	6723.7	311.18	6723.8	311.83	6723.9	312.47	6724
313.11	6724.1	313.75	6724.2	314.39	6724.3	315.03	6724.4	315.67	6724.5
316.31	6724.6	316.95	6724.7	317.59	6724.8	318.23	6724.9	318.87	6725
319.5	6725.1	320.14	6725.2	320.78	6725.3	321.42	6725.4	322.06	6725.5
322.7	6725.6	324.04	6725.7	327.79	6725.8	331.54	6725.9	335.29	6726
338.59	6726	339.01	6725.9	339.42	6725.8	339.83	6725.7	340.25	6725.6
340.66	6725.5	341.07	6725.4	341.49	6725.3	341.9	6725.2	343.19	6725.2
345.54	6725.3	347.9	6725.4	350.26	6725.5	351.82	6725.6	353.33	6725.7
354.85	6725.8	356.37	6725.9	357.89	6726	360.84	6726.1	363.8	6726.2
366.75	6726.3	369.71	6726.4	375.23	6726.5	381.15	6726.6	387.07	6726.7
392.98	6726.8	398.9	6726.9	403.73	6726.98	404.82	6727	413.08	6727.1
424.25	6727.2	438.9	6727.3	449.55	6727.3				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	174.41	.033	302.38	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

174.41 302.38 14.45 14.45 14.45 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	240.45	6723.23	F
266.43	449.55	6723.29	F

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6167.82

INPUT
Description:
Station Elevation Data num= 256

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6726.9	2.79	6726.9	4.86	6726.8	13.48	6726.7	14.99	6726.6
17.03	6726.5	21.14	6726.4	29.03	6726.3	49.25	6726.2	77.14	6726.1
92.09	6726	96.69	6726	110.94	6726	111.61	6725.9	112.27	6725.8
112.93	6725.7	113.59	6725.6	114.25	6725.5	114.92	6725.4	115.58	6725.3
116.24	6725.2	116.9	6725.1	117.56	6725	118.23	6724.9	118.89	6724.8
119.55	6724.7	120.21	6724.6	120.87	6724.5	121.54	6724.4	122.28	6724.3

123.01	6724.2	123.74	6724.1	124.47	6724	125.2	6723.9	125.93	6723.8
126.66	6723.7	127.35	6723.7	127.77	6723.8	128.19	6723.9	128.6	6724
129.02	6724.1	129.44	6724.2	129.86	6724.3	130.29	6724.4	130.76	6724.5
131.23	6724.6	131.7	6724.7	132.17	6724.8	132.64	6724.9	133.11	6725
133.58	6725.1	134.05	6725.2	134.52	6725.3	134.99	6725.4	135.46	6725.5
135.93	6725.6	136.38	6725.7	136.83	6725.8	137.28	6725.9	137.73	6726
138.18	6726.1	138.63	6726.2	139.08	6726.3	139.53	6726.4	139.98	6726.5
140.43	6726.6	140.88	6726.7	141.34	6726.8	141.79	6726.9	142.25	6727
142.71	6727.1	143.17	6727.2	143.63	6727.3	144.09	6727.4	144.55	6727.5
145.01	6727.6	147.64	6727.6	147.85	6727.5	148.06	6727.4	148.26	6727.3
148.47	6727.2	148.68	6727.1	148.89	6727	149.1	6726.9	149.31	6726.8
149.51	6726.7	149.72	6726.6	149.93	6726.5	150.14	6726.4	150.35	6726.3
150.56	6726.2	150.76	6726.1	150.97	6726	151.18	6725.9	151.39	6725.8
151.6	6725.7	151.81	6725.6	152.01	6725.5	152.22	6725.4	152.43	6725.3
152.64	6725.2	152.85	6725.1	153.06	6725	153.26	6724.9	153.47	6724.8
153.68	6724.7	153.89	6724.6	154.1	6724.5	154.31	6724.4	154.51	6724.3
154.72	6724.2	154.93	6724.1	155.14	6724	155.35	6723.9	155.57	6723.8
155.79	6723.7	156.01	6723.6	156.66	6723.5	158.41	6723.4	160.16	6723.3
161.91	6723.2	163.66	6723.1	165.41	6723	167.16	6722.9	168.91	6722.8
170.66	6722.7	172.41	6722.6	174.16	6722.5	175.95	6722.4	177.8	6722.3
179.65	6722.2	181.51	6722.1	183.36	6722	185.22	6721.9	187.07	6721.8
188.92	6721.7	190.78	6721.6	192.63	6721.5	194.48	6721.4	196.34	6721.3
198.19	6721.2	200.05	6721.1	201.9	6721	203.75	6720.9	204.82	6721.1
205.33	6720.8	206.31	6720.7	207.62	6720.6	208.94	6720.5	210.26	6720.4
211.58	6720.3	212.89	6720.2	214.21	6720.1	215.53	6720	216.85	6719.9
218.16	6719.8	219.48	6719.7	220.8	6719.6	222.12	6719.5	223.43	6719.4
224.75	6719.3	229.25	6719.2	233.87	6719.1	259.81	6719.1	264.6	6719.2
269.3	6719.3	270.75	6719.4	272.19	6719.5	273.64	6719.6	275.09	6719.7
276.54	6719.8	277.98	6719.9	279.43	6720	280.88	6720.1	282.32	6720.2
283.77	6720.3	285.22	6720.4	286.67	6720.5	287.82	6720.6	288.29	6720.7
288.75	6720.8	289.21	6720.9	289.67	6721	290.13	6721.1	290.59	6721.2
291.33	6721.3	292.15	6721.4	292.98	6721.5	293.81	6721.6	294.64	6721.7
295.33	6721.8	296.02	6721.9	296.71	6722	297.37	6722.1	298.02	6722.2
298.67	6722.3	299.31	6722.4	299.96	6722.5	300.61	6722.6	301.25	6722.7
301.9	6722.8	302.55	6722.9	303.17	6723	303.78	6723.1	304.38	6723.2
304.98	6723.3	305.59	6723.4	306.19	6723.5	306.8	6723.6	307.4	6723.7
308	6723.8	308.61	6723.9	309.21	6724	309.82	6724.1	310.42	6724.2
311.03	6724.3	311.63	6724.4	312.23	6724.5	312.84	6724.6	313.45	6724.7
314.06	6724.8	315.05	6724.9	320.4	6725	326.09	6725.1	329.89	6725.1
330.29	6725	330.68	6724.9	331.08	6724.8	332.35	6724.8	333.86	6724.9
335.4	6725	337.48	6725.1	339	6725.2	340.52	6725.3	342.04	6725.4
343.56	6725.5	345.08	6725.6	346.6	6725.7	348.11	6725.8	349.63	6725.9
351.15	6726	355.07	6726.1	361.03	6726.2	366.99	6726.3	372.94	6726.4
378.9	6726.5	384.76	6726.6	390.42	6726.7	396.37	6726.8	396.69	6726.81
402.51	6726.9	408.7	6727	420.14	6727.1	431.58	6727.2	443.02	6727.3
446.25	6727.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	201.9	.033	289.21	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

201.9	289.21	235.74	235.74	235.74	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5932.07

INPUT
Description:
Station Elevation Data num= 118

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6722.5	19.03	6722.5	34.09	6722.4	47.95	6722.3	71.53	6722.2
80.22	6722.1	87.76	6722	96.14	6721.9	107.75	6721.8	119.76	6721.73
124.07	6721.7	137.89	6721.6	145.46	6721.5	154.84	6721.4	166.1	6721.3
178.34	6721.2	188.91	6721.1	199.09	6721	206.79	6720.9	209.82	6720.8
211	6720.7	212.18	6720.6	213.35	6720.5	214.35	6720.4	215.3	6720.3
216.25	6720.2	217.21	6720.1	218.17	6720	219.13	6719.9	220.09	6719.8
221.05	6719.7	222.01	6719.6	222.97	6719.5	223.92	6719.4	224.88	6719.3
225.84	6719.2	226.8	6719.1	227.76	6719	228.72	6718.9	233.9	6718.8
243.3	6718.7	252.6	6718.6	261.87	6718.5	263.9	6718.4	264.31	6718.3
264.71	6718.2	265.11	6718.1	265.51	6718	265.92	6717.9	266.32	6717.8
266.72	6717.7	267.12	6717.6	267.52	6717.5	271.77	6717.5	272.17	6717.6
272.58	6717.7	272.98	6717.8	273.39	6717.9	273.79	6718	274.2	6718.1
274.6	6718.2	275.01	6718.3	275.42	6718.4	278.94	6718.5	290.05	6718.6
301.17	6718.7	310.2	6718.8	310.79	6718.9	311.38	6719	311.98	6719.1
312.57	6719.2	313.16	6719.3	313.76	6719.4	314.35	6719.5	314.94	6719.6
315.54	6719.7	316.13	6719.8	316.73	6719.9	317.32	6720	317.91	6720.1
318.51	6720.2	319.11	6720.3	319.72	6720.4	320.34	6720.5	320.95	6720.6
321.6	6720.7	322.26	6720.8	322.92	6720.9	323.58	6721	324.25	6721.1
324.91	6721.2	325.57	6721.3	326.23	6721.4	326.9	6721.5	327.56	6721.6
328.23	6721.7	328.89	6721.8	329.56	6721.9	330.22	6722	334.87	6722.1
340.12	6722.2	345.36	6722.3	350.61	6722.4	355.85	6722.5	364.73	6722.6
370.38	6722.7	375.52	6722.8	380.66	6722.9	385.8	6723	392.78	6723.1
401.17	6723.2	409.28	6723.3	417.39	6723.4	419.76	6723.42	427.86	6723.5
444.77	6723.6	460.96	6723.7	472.11	6723.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	228.72	.033	310.2	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

228.72	310.2	242.15	242.15	242.15	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5689.93

INPUT
Description:
Station Elevation Data num= 82

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6720.4	.93	6720.4	10.87	6720.3	20.81	6720.2	30.75	6720.1
40.7	6720	49.09	6719.9	57.47	6719.8	65.86	6719.7	75.14	6719.6
83.31	6719.54	88.95	6719.5	96.87	6719.4	110.73	6719.3	126.5	6719.2
142.45	6719.1	159.17	6719	173.36	6718.9	174.33	6718.8	175.31	6718.7
176.28	6718.6	177.25	6718.5	178.22	6718.4	179.19	6718.3	180.16	6718.2
181.13	6718.1	182.1	6718	183.51	6717.9	185.31	6717.8	187.11	6717.7
188.91	6717.6	190.71	6717.5	192.51	6717.4	199.19	6717.3	209.23	6717.2
219.27	6717.1	227.33	6717	227.73	6716.9	228.13	6716.8	228.53	6716.7
228.93	6716.6	229.33	6716.5	229.73	6716.4	230.13	6716.3	230.53	6716.2
230.93	6716.1	235.56	6716.1	235.96	6716.2	236.36	6716.3	236.76	6716.4
237.16	6716.5	237.56	6716.6	237.96	6716.7	238.36	6716.8	238.76	6716.9
239.16	6717	247.11	6717.1	257.07	6717.2	267.03	6717.3	273.89	6717.4
275.61	6717.5	277.33	6717.6	279.06	6717.7	280.78	6717.8	282.5	6717.9
284.22	6718	285.94	6718.1	287.66	6718.2	289.38	6718.3	290.79	6718.4
292.18	6718.5	312.26	6718.6	330.8	6718.7	366.83	6718.8	383.31	6718.86
396.47	6718.9	416.77	6719	424.72	6719.1	432.66	6719.2	440.61	6719.3
448.55	6719.4	449.46	6719.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	192.51	.033	273.89	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

192.51	273.89	191.89	191.89	191.89	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5498.04

INPUT
Description:
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6717.9	6.96	6717.9	15.66	6717.8	24.36	6717.7	33.06	6717.6
41.77	6717.5	50.37	6717.4	50.47	6717.4	59.44	6717.3	68.41	6717.2
77.09	6717.1	83.93	6717	100.83	6716.98	192.01	6716.9	194.82	6716.8
197.63	6716.7	200.44	6716.6	203.2	6716.5	205.94	6716.4	208.68	6716.3
211.9	6716.2	221.83	6716.1	231.77	6716	241.7	6715.9	244.97	6715.8
245.37	6715.7	245.77	6715.6	246.17	6715.5	246.57	6715.4	246.97	6715.3
247.37	6715.2	247.77	6715.1	248.17	6715	248.57	6714.9	252.82	6714.9
253.22	6715	253.62	6715.1	254.02	6715.2	254.42	6715.3	254.82	6715.4
255.22	6715.5	255.62	6715.6	256.02	6715.7	256.42	6715.8	259.81	6715.9
269.88	6716	279.95	6716.1	290.02	6716.2	293.06	6716.3	295.94	6716.4
298.66	6716.5	301.38	6716.6	304.1	6716.7	306.82	6716.8	309.54	6716.9
317.07	6717	327.06	6717.1	337.22	6717.2	359.26	6717.3	362.2	6717.3
365.17	6717.2	367.82	6717.1	374.64	6717	384.5	6716.9	394.36	6716.8
400.83	6716.73	404.22	6716.7	414.07	6716.6	423.93	6716.5	433.79	6716.4
434.81	6716.4	434.81	6717.16	439.81	6717.2	454.81	6717.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	211.9	.033	290.02	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

211.9	290.02	180.12	180.12	180.12	.1	.3

Right Levee Station= 357.97 Elevation= 6717.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5317.92

INPUT
Description:
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6715.4	9.3	6715.4	17.63	6715.3	23.22	6715.2	28.8	6715.1
34.39	6715	41.27	6714.9	52.65	6714.8	64.23	6714.7	73.12	6714.62
75.89	6714.6	85.07	6714.6	226.15	6714.6	230.07	6714.5	230.47	6714.4
230.87	6714.3	231.27	6714.2	231.67	6714.1	232.08	6714	232.48	6713.9
232.88	6713.8	236.98	6713.8	237.38	6713.9	237.78	6714	238.18	6714.1
238.58	6714.2	238.98	6714.3	239.38	6714.4	239.78	6714.5	243.75	6714.6
268.93	6714.7	302.99	6714.8	309.01	6714.9	315.02	6715	320.77	6715.1
326.58	6715.2	333.53	6715.3	340.47	6715.4	347.42	6715.5	385.07	6715.56
408.46	6715.6	431.13	6715.6	438.84	6715.5	443.41	6715.4	447.98	6715.3
448.98	6715.3	448.98	6715.5	451.38	6715.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	226.15	.033	243.75	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

226.15	243.75	155.33	155.33	155.33	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5162.59

INPUT
Description:
Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6720.5	1.13	6720.5	4.49	6720.4	7.85	6720.3	11.21	6720.2

14.58	6720.1	17.94	6720	21.3	6719.9	24.66	6719.8	28.02	6719.7
31.4	6719.6	34.81	6719.5	38.22	6719.4	41.63	6719.3	45.04	6719.2
48.44	6719.1	51.85	6719	56.31	6718.9	60.76	6718.8	65.22	6718.7
69.68	6718.6	74.1	6718.5	78.53	6718.4	82.95	6718.3	87.37	6718.2
91.8	6718.1	96.22	6718	100.69	6717.9	105.15	6717.8	109.61	6717.7
114.08	6717.6	118.54	6717.5	123.01	6717.4	127.44	6717.3	131.74	6717.2
136.04	6717.1	140.34	6717	144.64	6716.9	148.93	6716.8	153.23	6716.7
157.53	6716.6	161.83	6716.5	166.12	6716.4	170.42	6716.3	174.72	6716.2
179.02	6716.1	183.31	6716	188.23	6715.9	193.15	6715.8	198.07	6715.7
202.93	6715.6	207.77	6715.5	212.62	6715.4	217.47	6715.3	222.32	6715.2
227.17	6715.1	232.02	6715	237.29	6714.9	242.56	6714.8	247.82	6714.7
253.09	6714.6	258.13	6714.5	262.98	6714.4	267.83	6714.3	272.68	6714.2
277.54	6714.1	282.39	6714	287.24	6713.9	292.09	6713.8	296.94	6713.7
301.79	6713.6	306.64	6713.5	311.49	6713.4	316.35	6713.3	321.2	6713.2
326.05	6713.1	330.9	6713	335	6712.94	337.62	6712.9	344.34	6712.8
353.18	6712.7	362.43	6712.6	371.68	6712.5	526.88	6712.5	555.37	6712.6
581.28	6712.7	605.45	6712.8	626.23	6712.9	635	6712.93	652.68	6713
653.68	6713	653.68	6713.03	673.83	6713.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	335	.06	635	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
335	635	154.96	154.96	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5007.63

INPUT
Description:
Station Elevation Data num= 168

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.4	5.69	6716.4	5.69	6717.3	6.78	6717.3	7.08	6717.2
7.39	6717.1	7.69	6717	8	6716.9	8.3	6716.8	8.61	6716.7
8.91	6716.6	9.21	6716.5	9.52	6716.4	9.82	6716.3	10.13	6716.2
10.43	6716.1	10.74	6716	11.04	6715.9	11.35	6715.8	11.65	6715.7
11.95	6715.6	12.26	6715.5	12.56	6715.4	12.87	6715.3	13.17	6715.2
13.48	6715.1	13.78	6715	14.09	6714.9	14.39	6714.8	14.69	6714.7
15	6714.6	15.3	6714.5	15.61	6714.4	15.91	6714.3	16.22	6714.2
16.52	6714.1	16.9	6714.1	17.2	6714.2	17.5	6714.3	17.81	6714.4
18.11	6714.5	18.42	6714.6	18.72	6714.7	19.02	6714.8	19.33	6714.9
19.63	6715	19.93	6715.1	20.24	6715.2	20.54	6715.3	20.84	6715.4
21.15	6715.5	21.45	6715.6	21.75	6715.7	22.06	6715.8	22.36	6715.9
22.66	6716	22.97	6716.1	23.27	6716.2	23.57	6716.3	23.88	6716.4
24.18	6716.5	24.48	6716.6	24.79	6716.7	25.09	6716.8	25.39	6716.9
25.7	6717	26	6717.1	26.3	6717.2	26.61	6717.3	26.95	6717.4
29.59	6717.5	34.35	6717.6	39.14	6717.7	43.93	6717.8	45.76	6717.8
51.1	6717.7	57.26	6717.6	77.63	6717.5	90.73	6717.4	103.43	6717.3
116.21	6717.2	129.97	6717.1	140.78	6717	148.01	6716.9	155.24	6716.8
162.47	6716.7	205.82	6716.7	209.18	6716.6	210.03	6716.5	210.49	6716.4
210.89	6716.3	211.29	6716.2	211.69	6716.1	212.09	6716	212.49	6715.9
212.89	6715.8	213.29	6715.7	213.69	6715.6	214.09	6715.5	214.49	6715.4
214.89	6715.3	215.29	6715.2	215.69	6715.1	216.09	6715	216.49	6714.9
216.89	6714.8	217.29	6714.7	217.69	6714.6	218.09	6714.5	218.49	6714.4
218.89	6714.3	219.29	6714.2	219.69	6714.1	220.09	6714	220.49	6713.9
224.08	6713.8	229.8	6713.7	235.51	6713.6	241.23	6713.5	246.95	6713.4
252.66	6713.3	258.38	6713.2	264.1	6713.1	269.81	6713	275.53	6712.9
281.25	6712.8	286.96	6712.7	292.68	6712.6	297.55	6712.5	302.26	6712.4
306.96	6712.3	311.66	6712.2	316.37	6712.1	321.07	6712	325.64	6711.9
330.22	6711.8	334.8	6711.7	339.37	6711.6	343.95	6711.5	348.26	6711.4
350	6711.36	352.54	6711.3	356.83	6711.2	361.11	6711.1	365.39	6711
378.62	6710.9	393.16	6710.8	410.73	6710.7	474.63	6710.6	506.62	6710.6
511.66	6710.7	516.71	6710.8	521.75	6710.9	526.79	6711	535.01	6711.1
544.74	6711.2	554.52	6711.3	563.93	6711.4	573.34	6711.5	584.6	6711.6
596.74	6711.7	609.47	6711.8	623.51	6711.9	637.32	6712	650	6712.1
650.65	6712.1	667.53	6712.2	670.86	6712.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	153.44	153.44	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4854.19

INPUT
Description:
Station Elevation Data num= 201

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6714	6.48	6714	6.48	6713.6	7.66	6713.6	17.48	6713.5
19.97	6713.4	22.45	6713.3	24.94	6713.2	27.42	6713.1	29.91	6713
32.39	6712.9	34.88	6712.8	37.36	6712.7	39.85	6712.6	42.33	6712.5
42.51	6712.4	42.61	6712.3	42.71	6712.2	42.81	6712.1	42.91	6712
48.95	6712	49.05	6712.1	49.15	6712.2	49.26	6712.3	49.36	6712.4
49.62	6712.5	52.17	6712.6	54.71	6712.7	57.26	6712.8	59.8	6712.9
62.2	6713	62.35	6713	64.89	6713.1	67.44	6713.2	69.98	6713.3
72.53	6713.4	76.37	6713.5	85.63	6713.6	94.88	6713.7	103.93	6713.8
112.96	6713.9	121.99	6714	131.01	6714.1	132.42	6714.2	133.16	6714.3
133.9	6714.4	134.65	6714.5	135.42	6714.6	136.18	6714.7	136.95	6714.8
137.72	6714.9	138.49	6715	139.26	6715.1	140.03	6715.2	140.8	6715.3
141.56	6715.4	142.33	6715.5	143.1	6715.6	143.87	6715.7	144.64	6715.8
145.41	6715.9	146.18	6716	146.94	6716.1	147.71	6716.2	148.48	6716.3
149.25	6716.4	160.64	6716.4	161.05	6716.3	161.47	6716.2	161.88	6716.1
162.29	6716	162.7	6715.9	163.11	6715.8	163.53	6715.7	163.94	6715.6
164.35	6715.5	164.76	6715.4	165.18	6715.3	165.59	6715.2	166	6715.1
166.41	6715	166.82	6714.9	167.24	6714.8	167.65	6714.7	168.06	6714.6
168.47	6714.5	168.89	6714.4	169.3	6714.3	169.71	6714.2	170.12	6714.1
170.53	6714	170.95	6713.9	171.36	6713.8	171.77	6713.7	172.18	6713.6
172.59	6713.5	173.01	6713.4	173.42	6713.3	173.84	6713.2	174.26	6713.1
174.67	6713	175.09	6712.9	175.51	6712.8	175.93	6712.7	176.34	6712.6
176.76	6712.5	177.18	6712.4	177.6	6712.3	178.01	6712.2	178.43	6712.1
178.85	6712	179.27	6711.9	179.68	6711.8	180.1	6711.7	180.52	6711.6
180.98	6711.5	183.9	6711.4	190.36	6711.3	197.35	6711.2	206.28	6711.1
215.24	6711	220.54	6710.9	225.83	6710.8	231.13	6710.7	236.42	6710.6
241.72	6710.5	246.98	6710.4	252.25	6710.3	257.52	6710.2	262.78	6710.1
268.05	6710	270.68	6709.9	273.32	6709.8	275.95	6709.7	278.59	6709.6
281.22	6709.5	283.86	6709.4	286.49	6709.3	290.13	6709.2	297.87	6709.2
301.3	6709.3	304.73	6709.4	308.37	6709.5	309.32	6709.5	314.51	6709.4
323.29	6709.4	331.18	6709.5	350	6709.56	361.28	6709.6	376.95	6709.7
380.93	6709.7	391.49	6709.6	399.78	6709.5	406.66	6709.4	415.3	6709.3
424.93	6709.2	432.13	6709.1	439.02	6709	446.51	6708.9	454	6708.8
463.21	6708.7	472.03	6708.6	480.28	6708.5	489.16	6708.4	503.79	6708.4
508.7	6708.5	514.32	6708.6	519.46	6708.7	524.57	6708.8	529.67	6708.9
534.78	6709	538.81	6709.1	542.84	6709.2	546.87	6709.3	551.38	6709.4
556.11	6709.5	560.85	6709.6	565.58	6709.7	570.32	6709.8	573.01	6709.87
574.6	6709.9	578.53	6710	583.5	6710.1	588.47	6710.2	593.44	6710.3
598.41	6710.4	603.38	6710.5	608.35	6710.6	613.32	6710.7	618.28	6710.8
623.25	6710.9	628.22	6711	637.28	6711.1	646.34	6711.2	650	6711.24
655.39	6711.3	664.45	6711.4	673.51	6711.5	682.57	6711.6	696.6	6711.7
703.79	6711.7								
88.68	6716.3	92.11	6716.2	95.53	6716.1	98.95	6716	102.37	6715.9
105.79	6715.8	109.21	6715.7	112.63	6715.6	116.05	6715.5	119.47	6715.4
122.88	6715.3	125.83	6715.2	128.78	6715.1	131.73	6715	135.86	6714.9
140.04	6714.8	144.22	6714.7	148.41	6714.6	152.59	6714.5	156.77	6714.4
160.95	6714.3	165.14	6714.2	169.32	6714.1	173.5	6714	177.8	6713.9
182.23	6713.8	186.65	6713.7	191.07	6713.6	195.5	6713.5	199.92	6713.4
204.34	6713.3	208.77	6713.2	213.19	6713.1	217.61	6713	222.29	6712.9
226.5	6712.8	230.65	6712.7	234.8	6712.6	238.94	6712.5	243.09	6712.4
247.24	6712.3	251.38	6712.2	255.53	6712.1	259.68	6712	267.52	6711.9
275.36	6711.8	282.88	6711.7	290.33	6711.6	297.79	6711.5	305.25	6711.4
312.7	6711.3	320.16	6711.2	327.62	6711.1	335.07	6711	339.75	6710.9
344.43	6710.8	349.1	6710.7	350	6710.68	353.78	6710.6	358.45	6710.5
363.13	6710.4	367.8	6710.3	372.48	6710.2	376.8	6710.1	380.8	6710
383.33	6709.9	391.62	6709.8	396.51	6709.7	401.4	6709.6	406.3	6709.5
432.02	6709.4	441.24	6709.3	450.46	6709.2	459.68	6709.1	468.9	6709
470.29	6708.9	471.68	6708.8	473.07	6708.7	474.47	6708.6	475.86	6708.5
477.25	6708.4	478.65	6708.3	480.06	6708.2	481.46	6708.1	482.86	6708
484.27	6707.9	485.67	6707.8	487.07	6707.7	488.48	6707.6	489.88	6707.5
491.28	6707.4	492.69	6707.3	494.09	6707.2	495.49	6707.1	496.9	6707
498.11	6706.9	498.89	6706.8	499.66	6706.7	501.01	6706.7	503.29	6706.8
505.13	6706.9	509.95	6707	512.02	6707.1	514.08	6707.2	516.15	6707.3
518.21	6707.4	520.28	6707.5	522.34	6707.6	524.41	6707.7	526.48	6707.8
528.54	6707.9	530.61	6708	532.67	6708.1	534.74	6708.2	536.8	6708.3
538.87	6708.4	540.93	6708.5	543	6708.6	545.07	6708.7	548.41	6708.8
553.24	6708.9	558.08	6709	565.36	6709.1	572.63	6709.2	579.76	6709.3
586.75	6709.4	593.92	6709.5	601.09	6709.6	608.01	6709.7	614.86	6709.8
620.14	6709.89	621.05	6709.9	624.98	6710	630.08	6710.1	635.05	6710.2
640.02	6710.3	644.99	6710.4	649.96	6710.5	650	6710.5	654.93	6710.6
659.9	6710.7	664.87	6710.8	669.84	6710.9	674.8	6711	683.86	6711.1
692.92	6711.2	701.98	6711.3	711.03	6711.4	720.09	6711.5	729.15	6711.6
741.28	6711.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	153.79	153.79	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4700.74

INPUT
Description:
Station Elevation Data num= 181

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6719.1	2.99	6719.1	6.53	6719	9.22	6718.9	11.9	6718.8
14.58	6718.7	17.27	6718.6	19.95	6718.5	22.64	6718.4	25.32	6718.3
28.11	6718.2	31.15	6718.1	34.18	6718	35.41	6717.96	37.15	6717.9
40.22	6717.8	43.28	6717.7	46.35	6717.6	49.41	6717.5	52.48	6717.4
55.54	6717.3	58.61	6717.2	61.67	6717.1	64.74	6717	68.16	6716.9
71.58	6716.8	75	6716.7	78.42	6716.6	81.84	6716.5	85.26	6716.4

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4546.95

INPUT
Description:
Station Elevation Data num= 211

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6720	3.75	6720	7.73	6719.9	11.72	6719.8	15.7	6719.7
19.69	6719.6	23.68	6719.5	27.66	6719.4	31.65	6719.3	35.63	6719.2

39.62	6719.1	43.33	6719	46.01	6718.9	48.69	6718.8	51.38	6718.7
54.06	6718.6	56.74	6718.5	59.43	6718.4	62.11	6718.3	64.8	6718.2
67.67	6718.1	70.71	6718	73.16	6717.91	73.53	6717.9	76.23	6717.8
78.93	6717.7	81.61	6717.6	84.25	6717.5	86.88	6717.4	89.52	6717.3
92.15	6717.2	94.79	6717.1	97.43	6717	100.4	6716.9	103.38	6716.8
106.36	6716.7	109.34	6716.6	112.32	6716.5	115.29	6716.4	118.27	6716.3
121.25	6716.2	124.23	6716.1	127.21	6716	130.39	6715.9	133.56	6715.8
136.68	6715.7	139.8	6715.6	142.91	6715.5	146.03	6715.4	149.15	6715.3
152.26	6715.2	155.38	6715.1	158.5	6715	162.3	6714.9	166.1	6714.8
169.9	6714.7	173.65	6714.6	177.36	6714.5	181.07	6714.4	184.79	6714.3
188.5	6714.2	192.21	6714.1	195.93	6714	199.95	6713.9	203.98	6713.8
208.01	6713.7	212.03	6713.6	215.88	6713.5	219.73	6713.4	223.58	6713.3
227.43	6713.2	231.28	6713.1	235.13	6713	239.7	6712.9	244.26	6712.8
248.82	6712.7	253.44	6712.6	258.06	6712.5	262.68	6712.4	267.3	6712.3
271.92	6712.2	276.54	6712.1	281.16	6712	286.3	6711.9	291.45	6711.8
296.59	6711.7	301.65	6711.6	306.62	6711.5	311.6	6711.4	316.58	6711.3
321.55	6711.2	328.55	6711.1	337.07	6711	344.19	6710.9	350	6710.82
351.31	6710.8	358.41	6710.7	365.28	6710.6	369.58	6710.5	373.87	6710.4
378.17	6710.3	382.46	6710.2	386.76	6710.1	391.05	6710	393.35	6709.9
395.64	6709.8	397.94	6709.7	400.23	6709.6	402.52	6709.5	404.82	6709.4
407.11	6709.3	409.4	6709.2	412.1	6709.1	416.58	6709	421.06	6708.9
425.54	6708.8	430.02	6708.7	434.5	6708.6	438.98	6708.5	443.38	6708.4
446.69	6708.3	450	6708.2	453.3	6708.1	456.61	6708	458.24	6707.9
459.88	6707.8	461.51	6707.7	463.14	6707.6	464.78	6707.5	466.41	6707.4
468.04	6707.3	469.68	6707.2	471.31	6707.1	472.95	6707	474.58	6706.9
476.21	6706.8	477.85	6706.7	479.48	6706.6	481.11	6706.5	482.75	6706.4
484.38	6706.3	485.27	6706.2	486.15	6706.1	487.02	6706	487.89	6705.9
488.76	6705.8	489.63	6705.7	490.5	6705.6	491.37	6705.5	492.24	6705.4
493.11	6705.3	493.98	6705.2	494.85	6705.1	495.72	6705	496.22	6704.9
501.1	6704.9	504.55	6705	505.95	6705.1	507.35	6705.2	508.75	6705.3
510.14	6705.4	511.54	6705.5	512.94	6705.6	514.34	6705.7	515.73	6705.8
517.13	6705.9	518.53	6706	519.93	6706.1	521.33	6706.2	522.72	6706.3
524.12	6706.4	525.52	6706.5	526.92	6706.6	528.31	6706.7	529.71	6706.8
531.11	6706.9	532.51	6707	533.91	6707.1	535.3	6707.2	536.7	6707.3
538.1	6707.4	539.19	6707.5	540.17	6707.6	541.15	6707.7	542.13	6707.8
543.11	6707.9	544.09	6708	548.43	6708.1	552.78	6708.2	557.34	6708.3
562.19	6708.4	567.05	6708.5	571.9	6708.6	574.66	6708.66	578.35	6708.7
590.58	6708.8	595.21	6708.9	599.84	6709	607.06	6709.1	614.28	6709.2
621.5	6709.3	628.71	6709.4	647.04	6709.4	650	6709.47	651.2	6709.5
655.37	6709.6	659.53	6709.7	663.7	6709.8	680.44	6709.9	682.54	6710
687.93	6710								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.57	151.57	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4243.45

INPUT
Description:
Station Elevation Data num= 160

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.7	1.93	6716.7	5.31	6716.6	8.68	6716.5	12.07	6716.4
15.47	6716.3	18.86	6716.2	22.25	6716.1	25.65	6716	30.34	6715.9
35.03	6715.8	39.72	6715.7	44.41	6715.6	49.11	6715.5	53.8	6715.4
58.49	6715.3	63.18	6715.2	67.87	6715.1	71.94	6715	76.51	6714.9
81.06	6714.8	85.61	6714.7	90.16	6714.6	94.7	6714.5	99.25	6714.4
103.8	6714.3	108.34	6714.2	112.89	6714.1	117.44	6714	124.59	6713.9
131.75	6713.8	138.9	6713.7	146.06	6713.6	153.21	6713.5	165.25	6713.4
179.65	6713.3	189.82	6713.2	199.99	6713.1	210.15	6713	216.59	6712.9
222.12	6712.8	227.65	6712.7	233.17	6712.6	238.68	6712.5	244.2	6712.4
249.71	6712.3	255.23	6712.2	260.74	6712.1	266.37	6712	270.6	6711.9
274.84	6711.8	279.46	6711.7	284.08	6711.6	288.7	6711.5	293.33	6711.4
297.95	6711.3	302.57	6711.2	307.19	6711.1	311.81	6711	314.48	6710.9
317.16	6710.8	319.83	6710.7	322.51	6710.6	325.18	6710.5	325.44	6710.49
327.86	6710.4	330.53	6710.3	333.2	6710.2	335.79	6710.1	338.33	6710
341.28	6709.9	344.23	6709.8	347.18	6709.7	350	6709.6	350.13	6709.6
353.09	6709.5	356.05	6709.4	359.01	6709.3	361.96	6709.2	364.92	6709.1
367.88	6709	370.49	6708.9	373.09	6708.8	375.7	6708.7	378.31	6708.6
380.91	6708.5	383.52	6708.4	386.13	6708.3	388.73	6708.2	391.3	6708.1
393.84	6708	396.04	6707.9	398.23	6707.8	400.42	6707.7	402.61	6707.6
404.81	6707.5	407	6707.4	409.19	6707.3	411.38	6707.2	413.58	6707.1
415.77	6707	417.96	6706.9	420.16	6706.8	422.35	6706.7	424.54	6706.6
426.73	6706.5	428.93	6706.4	431.12	6706.3	433.31	6706.2	435.51	6706.1
437.7	6706	439.77	6705.9	441.85	6705.8	443.92	6705.7	445.99	6705.6
448.07	6705.5	449.91	6705.4	451.59	6705.3	453.28	6705.2	454.96	6705.1
456.65	6705	460.01	6704.9	463.36	6704.8	466.72	6704.7	470.62	6704.6
477.68	6704.5	484.75	6704.4	491.81	6704.3	498.87	6704.2	500.03	6704.17
503.45	6704.1	508.63	6704.1	510.88	6704.2	512.56	6704.3	514.45	6704.4
516.4	6704.5	518.35	6704.6	520.3	6704.7	522.24	6704.8	524.19	6704.9
526.14	6705	527.43	6705.1	528.72	6705.2	530.01	6705.3	531.29	6705.4
532.58	6705.5	533.87	6705.6	535.16	6705.7	536.45	6705.8	536.94	6705.82
539	6705.9	542.33	6706	548.86	6706.1	555.96	6706.2	564.16	6706.3
572.36	6706.4	584.37	6706.5	598.57	6706.6	612.77	6706.7	625.44	6706.7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	325.44	.06	625.44	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
325.44	625.44	156.48	156.48	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4395.39

INPUT
Description:
Station Elevation Data num= 189

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6717.4	1.79	6717.4	5.49	6717.3	9.2	6717.2	12.38	6717.1
15.54	6717	19.35	6716.9	23.16	6716.8	26.97	6716.7	30.78	6716.6
34.59	6716.5	38.4	6716.4	42.21	6716.3	46.02	6716.2	49.83	6716.1
53.64	6716	57.49	6715.9	61.34	6715.8	65.19	6715.7	69.04	6715.6
72.89	6715.5	76.74	6715.4	80.59	6715.3	84.43	6715.2	88.33	6715.1
92.23	6715	96.8	6714.9	101.37	6714.8	105.94	6714.7	110.51	6714.6
115.08	6714.5	119.64	6714.4	124.21	6714.3	128.78	6714.2	133.35	6714.1
137.78	6714	142.55	6713.9	147.32	6713.8	152.09	6713.7	156.86	6713.6
161.64	6713.5	166.31	6713.4	170.9	6713.3	175.5	6713.2	180.09	6713.1
184.69	6713	193.43	6712.9	202.16	6712.8	208.8	6712.7	215.16	6712.6
221.51	6712.5	227.87	6712.4	234.22	6712.3	240.68	6712.2	247.68	6712.1
253.18	6712	258.64	6711.9	264.08	6711.8	269.53	6711.7	274.97	6711.6
280.41	6711.5	285.85	6711.4	291.29	6711.3	296.73	6711.2	302.18	6711.1
307.62	6711	312.37	6710.9	317.13	6710.8	321.88	6710.7	326.64	6710.6
331.39	6710.5	336.15	6710.4	341.49	6710.3	349.31	6710.2	350	6710.19
350.01	6710.19	357.2	6710.1	365.11	6710	373.45	6709.9	381.15	6709.8
387.85	6709.7	394.34	6709.6	399.95	6709.5	405.56	6709.4	411.17	6709.3
416.78	6709.2	422.39	6709.1	428	6709	429.3	6708.9	430.59	6708.8
431.89	6708.7	433.18	6708.6	434.48	6708.5	435.77	6708.4	437.07	6708.3
438.32	6708.2	439.57	6708.1	440.82	6708	442.07	6707.9	443.32	6707.8
444.57	6707.7	445.82	6707.6	447.07	6707.5	448.32	6707.4	449.58	6707.3
450.83	6707.2	452.08	6707.1	453.33	6707	454.58	6706.9	455.83	6706.8
457.08	6706.7	458.33	6706.6	459.58	6706.5	460.83	6706.4	462.08	6706.3
463.33	6706.2	464.58	6706.1	465.83	6706	467.09	6705.9	468.34	6705.8
469.59	6705.7	470.84	6705.6	472.09	6705.5	473.34	6705.4	474.59	6705.3
475.84	6705.2	476.89	6705.1	477.78	6705	480.12	6704.9	482.46	6704.8
484.79	6704.7	487.13	6704.6	489.47	6704.5	491.81	6704.4	494.14	6704.3
496.48	6704.2	498.82	6704.1	501.1	6704.1	502.08	6704.2	503.06	6704.3
504.49	6704.4	505.92	6704.5	507.35	6704.6	508.78	6704.7	510.22	6704.8
511.65	6704.9	513.08	6705	514.82	6705.1	516.56	6705.2	518.29	6705.3
520.03	6705.4	521.77	6705.5	523.51	6705.6	525.25	6705.7	526.98	6705.8
528.72	6705.9	530.46	6706	532.2	6706.1	533.94	6706.2	535.67	6706.3
537.41	6706.4	539.15	6706.5	540.89	6706.6	542.63	6706.7	544.36	6706.8
546.1	6706.9	547.84	6707	550.13	6707.1	552.42	6707.2	554.71	6707.3
557	6707.4	559.29	6707.5	561.58	6707.6	563.87	6707.7	566.16	6707.8
567.95	6707.9	569.68	6708	576.79	6708.1	582.52	6708.16	590.15	6708.2
604.2	6708.3	630.38	6708.4	643.05	6708.5	650.01	6708.6	650.12	6708.6
664.33	6708.7	683.08	6708.8	690.5	6708.9	695.18	6708.9		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350.01	.06	650.01	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350.01	650.01	151.93	151.93	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4086.97

INPUT
Description:
Station Elevation Data num= 247

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6717	7.43	6717	16.05	6716.9	24.66	6716.8	33.28	6716.7
41.85	6716.6	50.3	6716.5	58.75	6716.4	67.2	6716.3	75.64	6716.2
84.11	6716.1	92.54	6716	99.23	6715.9	105.92	6715.8	112.61	6715.7
119.29	6715.6	125.99	6715.5	132.95	6715.4	139.91	6715.3	146.87	6715.2
153.83	6715.1	160.79	6715	165.06	6714.9	169.33	6714.8	173.56	6714.7
177.74	6714.6	181.93	6714.5	186.11	6714.4	190.3	6714.3	194.48	6714.2
198.66	6714.1	202.85	6714	206.57	6713.9	210.34	6713.8	214.48	6713.7
218.63	6713.6	222.77	6713.5	226.92	6713.4	231.06	6713.3	235.21	6713.2
239.35	6713.1	243.5	6713	246.26	6712.9	249.02	6712.8	251.78	6712.7
255.31	6712.6	258.83	6712.5	262.36	6712.4	265.88	6712.3	269.41	6712.2
272.94	6712.1	276.46	6712	280.57	6711.9	284.67	6711.8	288.78	6711.7
292.89	6711.6	296.99	6711.5	301.1	6711.4	305.2	6711.3	309.12	6711.2
313.03	6711.1	316.93	6711	319.32	6710.9	321.72	6710.8	324.11	6710.7
326.5	6710.6	328.89	6710.5	331.28	6710.4	333.68	6710.3	336.2	6710.2
338.77	6710.1	341.33	6710	343.9	6709.9	346.47	6709.8	349.04	6709.7
350	6709.66	351.6	6709.6	354.17	6709.5	356.74	6709.4	359.3	6709.3
361.87	6709.2	364.44	6709.1	367	6709	369.55	6708.9	372.1	6708.8
374.65	6708.7	377.19	6708.6	379.74	6708.5	382.29	6708.4	384.83	6708.3
387.36	6708.2	389.9	6708.1	392.43	6708	394.84	6707.9	397.24	6707.8
399.65	6707.7	402.05	6707.6	404.46	6707.5	406.82	6707.4	408.55	6707.3
410.29	6707.2	412.03	6707.1	413.77	6707	415.5	6706.9	417.24	6706.8
418.98	6706.7	420.72	6706.6	422.45	6706.5	424.19	6706.4	425.93	6706.3
427.67	6706.2	429.4	6706.1	431.14	6706	432.88	6705.9	434.62	6705.8
436.36	6705.7	438.09	6705.6	439.83	6705.5	441.57	6705.4	443.31	6705.3
445.04	6705.2	446.78	6705.1	448.52	6705	450.26	6704.9	451.99	6704.8
453.73	6704.7	455.49	6704.6	457.25	6704.5	459.01	6704.4	460.77	6704.3
462.53	6704.2	464.3	6704.1	466.06	6704	468.1	6703.9	470.14	6703.8
472.18	6703.7	474.15	6703.6	475.44	6703.5	476.74	6703.4	478.03	6703.3
479.33	6703.2	480.62	6703.1	481.92	6703	483.14	6702.9	485.02	6702.8
487.23	6702.7	489.45	6702.6	495.52	6702.5	496.32	6702.5	497.02	6702.6
497.72	6702.7	498.41	6702.8	499.11	6702.9	500	6702.98	500.2	6703
504.58	6703.1	509.36	6703.2	514.13	6703.3	518.91	6703.4	523.68	6703.5
528.46	6703.6	533.23	6703.7	538.01	6703.8	542.78	6703.9	547.56	6704
550.69	6704.1	553.83	6704.2	556.96	6704.3	560.1	6704.4	563.23	6704.5
567.43	6704.6	573.69	6704.7	579.95	6704.8	586.22	6704.9	592.48	6705
595.5	6705.1	598.51	6705.2	601.53	6705.3	604.54	6705.4	607.55	6705.5
610.57	6705.6	613.58	6705.7	616.6	6705.8	619.61	6705.9	622.63	6706
625.64	6706.1	628.66	6706.2	632.41	6706.3	637.81	6706.4	643.22	6706.5
648.62	6706.6	650	6706.63	654.02	6706.7	658.7	6706.8	663.21	6706.9

670.22	6707	678.02	6707.1	685.82	6707.2	693.62	6707.3	699.66	6707.4
701.95	6707.5	704.25	6707.6	706.54	6707.7	708.84	6707.8	711.14	6707.9
713.43	6708	720.35	6708.1	727.27	6708.2	734.2	6708.3	741.05	6708.4
747.41	6708.5	753.78	6708.6	760.14	6708.7	766.51	6708.8	772.88	6708.9
779.24	6709	785.8	6709.1	792.36	6709.2	798.91	6709.3	805.47	6709.4
812.03	6709.5	818.58	6709.6	825.14	6709.7	831.7	6709.8	838.29	6709.9
844.93	6710	852.28	6710.1	859.39	6710.2	866.44	6710.3	873.5	6710.4
880.56	6710.5	887.61	6710.6	894.67	6710.7	901.73	6710.8	908.78	6710.9
915.84	6711	923.88	6711.1	931.91	6711.2	939.95	6711.3	947.99	6711.4
956.02	6711.5	964.06	6711.6	971.92	6711.7	979.49	6711.8	987.06	6711.9
994.64	6712	1000	6712						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	200	200	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3886.97

INPUT
Description:
Station Elevation Data num= 267

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.7	1.42	6716.7	9.95	6716.6	18.4	6716.5	26.84	6716.4
35.29	6716.3	43.74	6716.2	44.64	6716.19	55.41	6716.1	67.18	6716
76.6	6715.9	86.02	6715.8	93.41	6715.7	99.15	6715.6	104.89	6715.5
110.62	6715.4	116.36	6715.3	122.09	6715.2	127.83	6715.1	133.57	6715
137.81	6714.9	142.05	6714.8	146.3	6714.7	150.54	6714.6	154.79	6714.5
159.03	6714.4	163.28	6714.3	167.52	6714.2	171.77	6714.1	176.01	6714
179.9	6713.9	182.94	6713.8	185.97	6713.7	189.01	6713.6	192.05	6713.5
195.09	6713.4	198.12	6713.3	201.16	6713.2	204.2	6713.1	207.24	6713
209.94	6712.9	212.64	6712.8	215.22	6712.7	217.8	6712.6	220.38	6712.5
222.96	6712.4	225.54	6712.3	228.12	6712.2	230.7	6712.1	233.28	6712
235.73	6711.9	238.33	6711.8	240.93	6711.7	243.52	6711.6	246.12	6711.5
248.72	6711.4	251.32	6711.3	253.91	6711.2	256.49	6711.1	259.07	6711
261.01	6710.9	262.95	6710.8	264.89	6710.7	266.83	6710.6	268.85	6710.5
270.9	6710.4	272.94	6710.3	274.99	6710.2	277.03	6710.1	279.08	6710
281.09	6709.9	283.1	6709.8	285.11	6709.7	287.12	6709.6	289.13	6709.5
291.14	6709.4	293.15	6709.3	295.16	6709.2	297.17	6709.1	299.18	6709
301.19	6708.9	303.2	6708.8	305.21	6708.7	307.22	6708.6	309.23	6708.5
311.24	6708.4	313.25	6708.3	315.26	6708.2	317.27	6708.1	319.28	6708
321.3	6707.9	323.31	6707.8	325.32	6707.7	327.33	6707.6	329.34	6707.5
331.35	6707.4	333.36	6707.3	335.37	6707.2	337.38	6707.1	339.39	6707
342.09	6706.9	344.79	6706.8	347.49	6706.7	350	6706.61	350.3	6706.6
353.17	6706.5	356.05	6706.4	358.92	6706.3	361.25	6706.2	363.34	6706.1
365.43	6706	367.51	6705.9	369.6	6705.8	371.69	6705.7	373.77	6705.6
375.86	6705.5	377.95	6705.4	380.04	6705.3	382.12	6705.2	384.21	6705.1
386.3	6705	388.38	6704.9	390.47	6704.8	392.56	6704.7	394.64	6704.6
396.73	6704.5	398.82	6704.4	400.91	6704.3	402.99	6704.2	405.08	6704.1
407.17	6704	409.48	6703.9	411.78	6703.8	414.09	6703.7	416.4	6703.6
418.71	6703.5	421.01	6703.4	423.32	6703.3	425.63	6703.2	427.94	6703.1
430.37	6703	432.85	6702.9	435.32	6702.8	437.8	6702.7	440.28	6702.6
442.76	6702.5	445.24	6702.4	447.71	6702.3	450.19	6702.2	452.67	6702.1
455.15	6702	457.62	6701.9	460.1	6701.8	462.58	6701.7	465.06	6701.6
467.54	6701.5	470.01	6701.4	472.49	6701.3	475.66	6701.2	479.49	6701.1
483.32	6701	487.2	6700.9	491.07	6700.8	494.94	6700.7	498.82	6700.6
500.7	6700.6	503.33	6700.7	520.45	6700.8	528.84	6700.9	534.21	6701
535.6	6701.1	536.52	6701.2	537.44	6701.3	538.36	6701.4	539.27	6701.5
540.19	6701.6	541.11	6701.7	542.03	6701.8	542.95	6701.9	543.87	6702
546.3	6702.1	548.73	6702.2	551.17	6702.3	553.6	6702.4	556.04	6702.5
558.47	6702.6	560.9	6702.7	563.34	6702.8	564.73	6702.9	565.8	6703
568.59	6703.1	571.37	6703.2	574.16	6703.3	576.94	6703.4	579.35	6703.5
581.52	6703.6	583.7	6703.7	585.87	6703.8	588.04	6703.9	590.21	6704
592.34	6704.1	594.47	6704.2	596.63	6704.3	598.79	6704.4	600.95	6704.5
603.11	6704.6	605.27	6704.7	607.43	6704.8	609.59	6704.9	611.75	6705
613.9	6705.1	616.05	6705.2	618.21	6705.3	620.36	6705.4	622.52	6705.5
624.68	6705.6	626.84	6705.7	629	6705.8	631.15	6705.9	633.31	6706
637.28	6706.1	641.24	6706.2	645.2	6706.3	649.16	6706.4	650	6706.42
653.27	6706.5	659.92	6706.6	666.58	6706.7	673.23	6706.8	679.88	6706.9
686.53	6707	703.64	6707.1	745.18	6707.2	859.78	6707.2	866.93	6707.1
874.09	6707	881.25	6706.9	888.4	6706.8	895.56	6706.7	902.35	6706.6
907.34	6706.5	911.45	6706.4	915.56	6706.3	922.87	6706.2	924.61	6706.2
928.05	6706.3	931.62	6706.4	935.18	6706.5	938.75	6706.6	942.31	6706.7
945.88	6706.8	949.44	6706.9	953.01	6707	956.58	6707.1	960.14	6707.2
963.71	6707.3	967.28	6707.4	970.85	6707.5	974.42	6707.6	977.98	6707.7
981.56	6707.8	985.13	6707.9	988.71	6708	991.86	6708.1	995.01	6708.2
998.16	6708.3	1000	6708.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3735.02

INPUT
Description:
Station Elevation Data num= 267

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.7	4.55	6716.7	23.09	6716.6	41.52	6716.5	54.11	6716.4
61.31	6716.3	68.51	6716.2	75.7	6716.1	82.9	6716	87.79	6715.9
92.69	6715.8	97.58	6715.7	102.47	6715.6	107.37	6715.5	112.26	6715.4
117.15	6715.3	121.23	6715.2	124.73	6715.1	128.22	6715	132.31	6714.9
136.4	6714.8	140.49	6714.7	144.57	6714.6	148.66	6714.5	152.75	6714.4
156.72	6714.3	160.6	6714.2	164.48	6714.1	168.36	6714	171.29	6713.9
174.22	6713.8	177.16	6713.7	180.09	6713.6	183.02	6713.5	185.95	6713.4
188.88	6713.3	191.82	6713.2	194.75	6713.1	197.68	6713	200.37	6712.9
203.05	6712.8	205.73	6712.7	208.42	6712.6	211.1	6712.5	213.79	6712.4
216.47	6712.3	219.05	6712.2	221.62	6712.1	224.2	6712	226.38	6711.9
228.56	6711.8	230.74	6711.7	232.92	6711.6	235.1	6711.5	237.28	6711.4
239.46	6711.3	241.64	6711.2	243.8	6711.1	245.95	6711	247.89	6710.9
249.84	6710.8	251.78	6710.7	253.73	6710.6	255.67	6710.5	257.61	6710.4
259.56	6710.3	261.5	6710.2	263.45	6710.1	265.39	6710	267.33	6709.9
269.28	6709.8	271.22	6709.7	273.17	6709.6	275.11	6709.5	277.06	6709.4
279	6709.3	280.95	6709.2	282.89	6709.1	284.84	6709	286.78	6708.9
288.73	6708.8	290.67	6708.7	292.62	6708.6	294.57	6708.5	296.51	6708.4
298.46	6708.3	300.41	6708.2	302.36	6708.1	304.31	6708	306.27	6707.9
308.22	6707.8	310.18	6707.7	312.14	6707.6	314.09	6707.5	316.05	6707.4
318	6707.3	319.96	6707.2	321.91	6707.1	323.87	6707	325.85	6706.9
327.81	6706.8	329.76	6706.7	331.71	6706.6	333.66	6706.5	335.61	6706.4
337.53	6706.3	339.36	6706.2	341.19	6706.1	343.03	6706	344.86	6705.9
346.69	6705.8	348.53	6705.7	350	6705.62	350.36	6705.6	352.2	6705.5
354.03	6705.4	355.86	6705.3	357.7	6705.2	359.53	6705.1	361.36	6705
363.61	6704.9	365.85	6704.8	368.1	6704.7	370.34	6704.6	372.59	6704.5
374.83	6704.4	377.08	6704.3	379.31	6704.2	381.53	6704.1	383.75	6704
386.1	6703.9	388.46	6703.8	390.81	6703.7	393.16	6703.6	395.52	6703.5
397.87	6703.4	400.22	6703.3	402.58	6703.2	404.93	6703.1	407.28	6703
409.64	6702.9	411.99	6702.8	414.46	6702.7	416.96	6702.6	419.47	6702.5
421.97	6702.4	424.48	6702.3	426.98	6702.2	429.49	6702.1	431.99	6702
434.5	6701.9	437	6701.8	439.51	6701.7	442.01	6701.6	444.52	6701.5
447.02	6701.4	449.53	6701.3	452.03	6701.2	454.54	6701.1	457.04	6701
459.55	6700.9	462.05	6700.8	464.56	6700.7	467.06	6700.6	469.57	6700.5
471.62	6700.4	473.31	6700.3	475	6700.2	476.69	6700.1	478.38	6700
480.49	6699.9	482.59	6699.8	484.7	6699.7	486.81	6699.6	489.2	6699.5
491.6	6699.4	494	6699.3	496.4	6699.2	498.8	6699.1	500	6699.05
501.2	6699	510.01	6699	512.05	6699.1	514.08	6699.2	516.11	6699.3
518.15	6699.4	520.18	6699.5	522.21	6699.6	524.25	6699.7	526.28	6699.8
528.31	6699.9	530.35	6700	532.38	6700.1	534.41	6700.2	536.45	6700.3
538.48	6700.4	540.51	6700.5	542.55	6700.6	544.58	6700.7	546.61	6700.8
548.65	6700.9	550.68	6701	552.71	6701.1	554.75	6701.2	556.78	6701.3
558.81	6701.4	560.85	6701.5	562.88	6701.6	564.91	6701.7	566.95	6701.8
568.98	6701.9	571.04	6702	574.07	6702.1	577.1	6702.2	580.13	6702.3
583.16	6702.4	586.19	6702.5	589.22	6702.6	592.25	6702.7	595.28	6702.8
601.26	6702.9	610.54	6703	619.58	6703.1	628.63	6703.2	637.67	6703.3
646.71	6703.4	650	6703.44	655.75	6703.5	672.36	6703.5	681.22	6703.4
692.72	6703.3	714.11	6703.2	735.5	6703.1	754.57	6703.1	790.73	6703.2
809.89	6703.3	816.55	6703.4	836.18	6703.5	840.25	6703.6	844.31	6703.7
848.38	6703.8	852.45	6703.9	856.52	6704	860.59	6704.1	864.66	6704.2
868.73	6704.3	872.79	6704.4	876.86	6704.5	880.93	6704.6	885	6704.7
889.07	6704.8	893.14	6704.9	900.07	6705	912.16	6705.1	917.87	6705.2
923.58	6705.3	929.29	6705.4	935	6705.5	940.71	6705.6	946.42	6705.7
953.19	6705.8	960.27	6705.9	967.35	6706	974.89	6706.1	982.43	6706.2
993.16	6706.3	1000	6706.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3583.08

INPUT
Description:
Station Elevation Data num= 302

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6718.2	2.72	6718.2	9.78	6718.1	16.85	6718	25.29	6717.9
35.01	6717.8	40.49	6717.7	45.97	6717.6	51.12	6717.5	55.19	6717.4
59.26	6717.3	63.34	6717.2	67.41	6717.1	71.48	6717	75.11	6716.9
78.74	6716.8	82.37	6716.7	85.92	6716.6	89.4	6716.5	92.88	6716.4
96.37	6716.3	99.85	6716.2	103.33	6716.1	106.81	6716	109.87	6715.9
112.94	6715.8	116	6715.7	119.06	6715.6	122.13	6715.5	125.17	6715.4
128.17	6715.3	131.17	6715.2	134.17	6715.1	137.17	6715	140.17	6714.9
143.17	6714.8	146.17	6714.7	149.17	6714.6	152.17	6714.5	155.17	6714.4
158.17	6714.3	161.17	6714.2	164.17	6714.1	167.14	6714	169.53	6713.9
171.92	6713.8	174.31	6713.7	176.7	6713.6	179.09	6713.5	181.48	6713.4
183.87	6713.3	186.26	6713.2	188.65	6713.1	191.04	6713	193.43	6712.9
195.82	6712.8	198.21	6712.7	200.6	6712.6	202.99	6712.5	205.38	6712.4
207.78	6712.3	210.17	6712.2	212.56	6712.1	214.95	6712	217.34	6711.9
219.73	6711.8	222.12	6711.7	224.51	6711.6	226.9	6711.5	229.29	6711.4
231.83	6711.3	234.41	6711.2	237	6711.1	239.59	6711	241.44	6710.9
243.3	6710.8	245.15	6710.7	247.01	6710.6	248.82	6710.5	250.57	6710.4
252.33	6710.3	254.08	6710.2	255.83	6710.1	257.59	6710	259.34	6709.9
261.1	6709.8	262.85	6709.7	264.61	6709.6	266.36	6709.5	268.12	6709.4
269.87	6709.3	271.63	6709.2	273.38	6709.1	275.13	6709	277.02	6708.9
278.93	6708.8	280.85	6708.7	282.76	6708.6	284.68	6708.5	286.59	6708.4
288.51	6708.3	290.42	6708.2	292.33	6708.1	294.25	6708	296.16	6707.9
298.08	6707.8	299.99	6707.7	301.91	6707.6	303.82	6707.5	305.73	6707.4
307.65	6707.3	309.56	6707.2	311.48	6707.1	313.39	6707	314.69	6706.9
315.98	6706.8	317.27	6706.7	318.57	6706.6	319.86	6706.5	321.15	6706.4
322.44	6706.3	323.74	6706.2	325.03	6706.1	326.55	6706	327.46	6705.9
329.05	6705.8	330.84	6705.7	332.63	6705.6	334.42	6705.5	336.21	6705.4
338.01	6705.3	339.8	6705.2	341.59	6705.1	343.38	6705	345.18	6704.9
346.97	6704.8	348.76	6704.7	350	6704.63	350.55	6704.6	352.35	6704.5
354.14	6704.4	355.93	6704.3	357.72	6704.2	359.51	6704.1	361.31	6704
363.1	6703.9	364.89	6703.8	366.68	6703.7	368.48	6703.6	370.27	6703.5
372.06	6703.4	373.85	6703.3	375.65	6703.2	377.44	6703.1	379.23	6703

381.02	6702.9	382.81	6702.8	384.61	6702.7	386.4	6702.6	388.19	6702.5
389.98	6702.4	391.78	6702.3	393.57	6702.2	395.36	6702.1	397.64	6702
400.08	6701.9	402.51	6701.8	404.95	6701.7	407.38	6701.6	409.82	6701.5
412.26	6701.4	414.69	6701.3	417.13	6701.2	419.57	6701.1	422	6701
424.44	6700.9	426.87	6700.8	429.31	6700.7	431.75	6700.6	434.18	6700.5
436.62	6700.4	439.05	6700.3	441.49	6700.2	443.93	6700.1	446.36	6700
448.8	6699.9	451.24	6699.8	453.67	6699.7	456.11	6699.6	458.54	6699.5
460.98	6699.4	463.51	6699.3	466.14	6699.2	468.77	6699.1	471.4	6699
474.03	6698.9	476.66	6698.8	479.29	6698.7	481.92	6698.6	484.55	6698.5
487.18	6698.4	489.81	6698.3	492.44	6698.2	495.07	6698.1	497.47	6698
498.52	6697.9	499.57	6697.8	502.85	6697.8	504.04	6697.9	505.24	6698
507.46	6698.1	509.69	6698.2	511.91	6698.3	514.14	6698.4	516.36	6698.5
518.59	6698.6	520.81	6698.7	524.01	6698.8	529.42	6698.9	534.84	6699
540.25	6699.1	545.67	6699.2	551.09	6699.3	556.5	6699.4	561.92	6699.5
567.33	6699.6	571.19	6699.7	574.53	6699.8	577.88	6699.9	581.23	6700
585.96	6700.1	590.68	6700.2	595.3	6700.3	598.92	6700.4	602.54	6700.5
606.16	6700.6	609.78	6700.7	613.4	6700.8	617.02	6700.9	620.64	6701
623.68	6701.1	626.72	6701.2	629.77	6701.3	632.81	6701.4	635.85	6701.5
638.89	6701.6	641.93	6701.7	644.44	6701.8	646.52	6701.9	648.6	6702
650	6702	650.45	6702	658	6701.9	665.54	6701.8	673.08	6701.7
680.63	6701.6	688.17	6701.5	695.71	6701.4	703.25	6701.3	710.8	6701.2
718.34	6701.1	746.67	6701.1	755.12	6701	764.62	6700.9	774.12	6700.8
783.62	6700.7	793.12	6700.6	798.83	6700.6	807.65	6700.7	816.47	6700.8
825.29	6700.9	834.11	6701	839.51	6701.1	844.9	6701.2	850.3	6701.3
855.69	6701.4	861.09	6701.5	866.48	6701.6	871.87	6701.7	877.27	6701.8
881	6701.9	884.36	6702	890.04	6702.1	895.72	6702.2	901.4	6702.3
907.08	6702.4	912.76	6702.5	918.44	6702.6	924.12	6702.7	929.8	6702.8
935.53	6702.9	941.27	6703	945.51	6703.1	949.76	6703.2	954	6703.3
958.25	6703.4	962.49	6703.5	966.74	6703.6	974.13	6703.7	982.84	6703.8
991.55	6703.9	1000	6703.9						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

Right Levee Station= 648.79 Elevation= 6702.1

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3431.13

INPUT
Description:
Station Elevation Data num= 319

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6719.3	2.94	6719.3	6.28	6719.2	9.63	6719.1	12.97	6719
16.13	6718.9	19.29	6718.8	22.45	6718.7	25.61	6718.6	28.77	6718.5
31.93	6718.4	35.09	6718.3	38.25	6718.2	41.41	6718.1	44.57	6718
47.9	6717.9	51.23	6717.8	54.56	6717.7	57.89	6717.6	61.22	6717.5
64.55	6717.4	67.88	6717.3	71.21	6717.2	74.49	6717.1	77.76	6717
81.78	6716.9	85.86	6716.8	90.02	6716.7	94.18	6716.6	98.34	6716.5
102.49	6716.4	106.65	6716.3	110.81	6716.2	114.97	6716.1	119.13	6716
123.13	6715.9	127.14	6715.8	131.14	6715.7	135.14	6715.6	139.15	6715.5
143.15	6715.4	147.17	6715.3	151.23	6715.2	155.29	6715.1	159.34	6715
163.11	6714.9	166.87	6714.8	170.6	6714.7	174.23	6714.6	177.86	6714.5
181.48	6714.4	185.11	6714.3	188.74	6714.2	192.36	6714.1	195.99	6714
199.59	6713.9	202.79	6713.8	205.99	6713.7	209.2	6713.6	212.4	6713.5
215.6	6713.4	218.8	6713.3	222	6713.2	225.2	6713.1	228.4	6713
231.6	6712.9	234.8	6712.8	238.05	6712.7	241.36	6712.6	244.67	6712.5
247.98	6712.4	251.29	6712.3	254.6	6712.2	257.91	6712.1	261.22	6712
264.66	6711.9	268.1	6711.8	271.54	6711.7	274.98	6711.6	278.42	6711.5
281.86	6711.4	285.3	6711.3	288.74	6711.2	292.18	6711.1	295.62	6711
299.06	6710.9	302.42	6710.8	305.05	6710.7	307.68	6710.6	310.31	6710.5
312.94	6710.4	315.57	6710.3	318.2	6710.2	320.83	6710.1	323.47	6710
325.62	6709.9	327.78	6709.8	329.94	6709.7	332.09	6709.6	334.13	6709.5
336.17	6709.4	338.21	6709.3	340.25	6709.2	342.28	6709.1	344.32	6709
346.1	6708.9	347.88	6708.8	349.66	6708.7	350	6708.68	351.43	6708.6
353.21	6708.5	354.99	6708.4	356.77	6708.3	358.55	6708.2	360.32	6708.1
362.1	6708	363.88	6707.9	365.66	6707.8	367.43	6707.7	369.21	6707.6
370.99	6707.5	372.77	6707.4	374.55	6707.3	376.32	6707.2	378.1	6707.1
379.88	6707	381.66	6706.9	383.43	6706.8	385.21	6706.7	386.99	6706.6
388.77	6706.5	390.55	6706.4	392.32	6706.3	394.1	6706.2	395.88	6706.1
397.66	6706	399.54	6705.9	401.42	6705.8	403.3	6705.7	405.18	6705.6
407.06	6705.5	408.95	6705.4	410.83	6705.3	412.71	6705.2	414.49	6705.1
416.23	6705	417.27	6704.9	418.31	6704.8	419.35	6704.7	420.4	6704.6
421.39	6704.5	422.31	6704.4	423.22	6704.3	424.14	6704.2	425.06	6704.1
425.98	6704	426.89	6703.9	427.81	6703.8	428.73	6703.7	429.65	6703.6
430.56	6703.5	431.24	6703.4	431.83	6703.3	432.41	6703.2	433	6703.1
433.59	6703	434.17	6702.9	434.76	6702.8	435.34	6702.7	436.12	6702.6
437.05	6702.5	437.99	6702.4	438.93	6702.3	439.86	6702.2	440.8	6702.1
441.74	6702	442.67	6701.9	443.61	6701.8	444.55	6701.7	445.48	6701.6
446.42	6701.5	447.45	6701.4	448.73	6701.3	450.01	6701.2	451.29	6701.1
452.57	6701	453.85	6700.9	455.12	6700.8	456.4	6700.7	457.68	6700.6
458.96	6700.5	460.24	6700.4	461.52	6700.3	462.79	6700.2	464.07	6700.1
465.35	6700	466.63	6699.9	467.88	6699.8	468.79	6699.7	469.7	6699.6
470.61	6699.5	471.52	6699.4	472.43	6699.3	473.34	6699.2	474.25	6699.1
475.16	6699	476.07	6698.9	476.98	6698.8	477.89	6698.7	478.8	6698.6
479.71	6698.5	480.62	6698.4	481.53	6698.3	482.45	6698.2	483.36	6698.1
484.27	6698	485.18	6697.9	486.09	6697.8	487	6697.7	487.91	6697.6
488.82	6697.5	489.73	6697.4	490.64	6697.3	491.55	6697.2	492.46	6697.1
493.37	6697	493.88	6696.9	494.4	6696.8	494.91	6696.7	495.43	6696.6
495.94	6696.5	497.75	6696.4	504.05	6696.4	504.88	6696.5	505.7	6696.6
507.08	6696.7	509.24	6696.8	511.39	6696.9	513.54	6697	515.76	6697.1
517.98	6697.2	520.21	6697.3	522.43	6697.4	524.65	6697.5	526.88	6697.6
529.1	6697.7	531.31	6697.8	533.46	6697.9	535.61	6698	537.77	6698.1
539.92	6698.2	542.07	6698.3	544.22	6698.4	546.37	6698.5	548.53	6698.6
550.68	6698.7	552.83	6698.8	554.98	6698.9	557.14	6699	560.47	6699.1
563.81	6699.2	567.14	6699.3	570.48	6699.4	573.82	6699.5	579.1	6699.6

593.56	6699.7	630.84	6699.7	637.42	6699.6	643.99	6699.5	650	6699.41
650.56	6699.4	657.14	6699.3	663.71	6699.2	670.29	6699.1	677.1	6699
700.53	6699	707.49	6699.1	714.44	6699.2	721.39	6699.3	728.34	6699.4
735.29	6699.5	742.25	6699.6	749.2	6699.7	765.33	6699.7	777.79	6699.6
836.77	6699.6	846.66	6699.7	856.56	6699.8	866.45	6699.9	876.34	6700
888.7	6700.1	905.5	6700.1	908.67	6700.2	911.83	6700.3	915	6700.4
918.16	6700.5	921.33	6700.6	924.49	6700.7	927.66	6700.8	930.82	6700.9
933.99	6701	937.15	6701.1	940.32	6701.2	943.48	6701.3	946.65	6701.4
949.81	6701.5	952.98	6701.6	956.14	6701.7	959.31	6701.8	962.47	6701.9
965.64	6702	970.25	6702.1	974.87	6702.2	979.48	6702.3	984.1	6702.4
988.71	6702.5	993.32	6702.6	997.94	6702.7	1000	6702.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.94	151.94	.1	.3

Right Levee Station= 595.74 Elevation= 6699.71

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3279.19

INPUT
Description:
Station Elevation Data num= 270

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6710.1	.32	6710.1	2.9	6710	5.49	6709.9	8.07	6709.8
10.66	6709.7	13.25	6709.6	15.83	6709.5	18.42	6709.4	21	6709.3
23.59	6709.2	26.17	6709.1	28.76	6709	31.39	6708.9	34.02	6708.8
36.65	6708.7	39.28	6708.6	41.87	6708.5	44.43	6708.4	47	6708.3
49.56	6708.2	52.13	6708.1	54.7	6708	59.35	6707.9	64.35	6707.8
72.7	6707.7	84.38	6707.6	96.19	6707.5	108.03	6707.4	119.88	6707.3
131.71	6707.2	146.02	6707.1	160.54	6707	175	6706.9	189.45	6706.8
203.91	6706.7	247.04	6706.7	259.45	6706.8	271.85	6706.9	285.45	6706.9
287.84	6706.8	290.23	6706.7	292.61	6706.6	295	6706.5	297.39	6706.4
299.78	6706.3	302.17	6706.2	304.56	6706.1	306.95	6706	309.34	6705.9
311.72	6705.8	314.11	6705.7	316.5	6705.6	318.89	6705.5	321.28	6705.4
323.67	6705.3	326.06	6705.2	328.45	6705.1	330.83	6705	333.22	6704.9
335.61	6704.8	338	6704.7	340.39	6704.6	342.78	6704.5	345.17	6704.4
347.56	6704.3	349.94	6704.2	350	6704.2	352.33	6704.1	354.72	6704
357.11	6703.9	359.5	6703.8	361.89	6703.7	364.28	6703.6	366.67	6703.5
369.05	6703.4	371.44	6703.3	373.83	6703.2	376.22	6703.1	378.61	6703
381	6702.9	383.39	6702.8	385.78	6702.7	388.16	6702.6	390.55	6702.5
392.94	6702.4	395.33	6702.3	397.72	6702.2	400.11	6702.1	402.5	6702
404.89	6701.9	407.27	6701.8	409.66	6701.7	412.05	6701.6	414.44	6701.5
416.83	6701.4	419.22	6701.3	427.09	6701.2	428.13	6701.1	429.17	6701
430.21	6700.9	431.25	6700.8	432.29	6700.7	433.33	6700.6	434.37	6700.5
435.41	6700.4	436.46	6700.3	437.5	6700.2	438.54	6700.1	439.58	6700
440.62	6699.9	441.66	6699.8	442.7	6699.7	443.74	6699.6	444.78	6699.5
445.82	6699.4	446.86	6699.3	447.9	6699.2	448.94	6699.1	449.98	6699
451.02	6698.9	452.07	6698.8	453.11	6698.7	454.15	6698.6	455.19	6698.5
456.23	6698.4	457.27	6698.3	458.31	6698.2	459.35	6698.1	460.39	6698
461.43	6697.9	462.47	6697.8	463.51	6697.7	464.55	6697.6	465.59	6697.5
466.63	6697.4	467.67	6697.3	468.72	6697.2	469.76	6697.1	470.8	6697
471.84	6696.9	472.88	6696.8	473.92	6696.7	474.96	6696.6	476	6696.5
477.04	6696.4	478.08	6696.3	479.12	6696.2	480.16	6696.1	481.2	6696
482.24	6695.9	483.28	6695.8	484.32	6695.7	485.37	6695.6	486.41	6695.5
487.45	6695.4	488.49	6695.3	489.53	6695.2	490.57	6695.1	491.61	6695
492.68	6694.9	493.63	6694.8	494.57	6694.7	495.5	6694.6	496.43	6694.5
497.36	6694.4	498.29	6694.3	499.22	6694.2	500.66	6694.2	501.93	6694.3
503.2	6694.4	504.47	6694.5	505.74	6694.6	506.81	6694.7	507.81	6694.8
508.8	6694.9	509.8	6695	510.81	6695.1	511.82	6695.2	512.84	6695.3
513.85	6695.4	514.86	6695.5	515.87	6695.6	516.89	6695.7	517.9	6695.8
518.91	6695.9	519.92	6696	520.94	6696.1	521.95	6696.2	522.96	6696.3
523.97	6696.4	524.98	6696.5	526	6696.6	527.26	6696.7	528.76	6696.8
530.27	6696.9	531.77	6697	535.53	6697.1	539.29	6697.2	543.05	6697.3
546.81	6697.4	550.57	6697.5	554.33	6697.6	558.09	6697.7	561.86	6697.8
565.62	6697.9	569.38	6698	571.83	6698.1	574.51	6698.2	579.16	6698.3
583.81	6698.4	586.82	6698.5	589.45	6698.6	592.08	6698.7	596.57	6698.8
599.64	6698.8	608.74	6698.7	617.04	6698.6	629.81	6698.6	644.81	6698.7
650	6698.73	659.8	6698.8	667.99	6698.83	684.96	6698.9	691.91	6699
698.86	6699.1	705.82	6699.2	712.77	6699.3	719.72	6699.4	726.67	6699.5
733.62	6699.6	759.7	6699.6	772.16	6699.5	818.49	6699.5	828.38	6699.6
838.27	6699.7	848.17	6699.8	858.06	6699.9	867.95	6700	880.31	6700.1
893.41	6700.1	896.57	6700.2	899.74	6700.3	902.9	6700.4	906.07	6700.5
909.23	6700.6	912.4	6700.7	915.56	6700.8	918.73	6700.9	921.89	6701
925.06	6701.1	928.22	6701.2	931.39	6701.3	934.55	6701.4	937.72	6701.5
940.88	6701.6	944.05	6701.7	947.21	6701.8	950.38	6701.9	953.54	6702
958.16	6702.1	962.77	6702.2	967.39	6702.3	972	6702.4	976.62	6702.5
981.23	6702.6	985.84	6702.7	990.46	6702.8	995.1	6702.9	1000	6702.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3127.24

INPUT
Description:
Station Elevation Data num= 254

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	6702.1	33.16	6702.1	37.25	6702.2	41.33	6702.3	45.42	6702.4
49.5	6702.5	53.59	6702.6	57.67	6702.7	61.76	6702.8	65.84	6702.9
69.93	6703	77.35	6703.1	84.77	6703.2	92.2	6703.3	99.62	6703.4
111.21	6703.5	112.01	6703.5	122.56	6703.4	131.09	6703.3	139.62	6703.2
148.14	6703.1	151.85	6703.1	156.67	6703	161.49	6702.9	166.31	6702.8
171.13	6702.7	175.95	6702.6	180.77	6702.5	185.59	6702.4	190.41	6702.3
195.23	6702.2	199.44	6702.1	203.3	6702	207.15	6701.9	211	6701.8
214.85	6701.7	218.7	6701.6	222.55	6701.5	226.41	6701.4	230.26	6701.3
234.11	6701.2	237.96	6701.1	241.81	6701	245.66	6700.9	249.51	6700.8
253.36	6700.7	257.21	6700.6	261.06	6700.5	264.91	6700.4	268.76	6700.3
272.61	6700.2	276.46	6700.1	280.31	6700	284.75	6699.9	291.09	6699.8
297.43	6699.7	303.77	6699.6	310.11	6699.5	316.44	6699.4	322.78	6699.3
329.12	6699.2	335.46	6699.1	341.8	6699	348.29	6698.9	350	6698.87
354.78	6698.8	370.42	6698.7	373.93	6698.6	377.93	6698.5	382.2	6698.4
386.47	6698.3	391.78	6698.2	399.58	6698.1	407.39	6698	412.21	6697.9
417.02	6697.8	419.96	6697.7	421.5	6697.6	423.04	6697.5	424.58	6697.4
426.12	6697.3	427.66	6697.2	429.2	6697.1	430.74	6697	431.75	6696.9
432.76	6696.8	433.77	6696.7	434.77	6696.6	435.78	6696.5	436.79	6696.4
437.8	6696.3	438.81	6696.2	439.82	6696.1	440.83	6696	441.83	6695.9
442.84	6695.8	443.85	6695.7	444.86	6695.6	445.87	6695.5	446.88	6695.4
447.89	6695.3	448.89	6695.2	449.9	6695.1	451.24	6695	452.61	6694.9
453.98	6694.8	455.34	6694.7	456.71	6694.6	458.08	6694.5	459.44	6694.4
460.81	6694.3	462.18	6694.2	463.55	6694.1	464.91	6694	465.99	6693.9
467.06	6693.8	468.14	6693.7	469.21	6693.6	470.29	6693.5	471.36	6693.4
472.44	6693.3	473.51	6693.2	474.59	6693.1	475.66	6693	477.79	6692.9
480.78	6692.8	483.76	6692.7	486.75	6692.6	489.74	6692.5	492.73	6692.4
495.72	6692.3	496.71	6692.2	499.68	6692.2	500	6692.22	501.69	6692.3
503.8	6692.4	505.77	6692.5	507.58	6692.6	509.39	6692.7	511.02	6692.8
511.8	6692.9	512.58	6693	513.4	6693.1	514.22	6693.2	515.05	6693.3
515.87	6693.4	516.7	6693.5	517.52	6693.6	518.35	6693.7	519.17	6693.8
519.99	6693.9	520.82	6694	521.64	6694.1	522.47	6694.2	523.29	6694.3
524.12	6694.4	524.94	6694.5	525.76	6694.6	526.59	6694.7	527.41	6694.8
528.24	6694.9	529.06	6695	529.89	6695.1	530.71	6695.2	531.53	6695.3
532.36	6695.4	533.18	6695.5	534.01	6695.6	534.83	6695.7	535.72	6695.8
536.63	6695.9	537.53	6696	538.44	6696.1	539.34	6696.2	540.25	6696.3
541.15	6696.4	542.06	6696.5	542.96	6696.6	543.87	6696.7	544.78	6696.8
545.68	6696.9	546.59	6697	551.1	6697.1	555.62	6697.2	560.14	6697.3
564.66	6697.4	569.17	6697.5	573.69	6697.6	578.46	6697.7	584.24	6697.8
597.51	6697.8	618.41	6697.9	639.32	6698	650	6698.05	659.98	6698.1
680.31	6698.2	692.71	6698.3	705.1	6698.4	718.19	6698.5	730.69	6698.6
747.67	6698.7	758.68	6698.8	769.69	6698.9	778.04	6699	783.79	6699.1
789.55	6699.2	795.3	6699.3	801.05	6699.4	806.8	6699.5	812.55	6699.6
818.3	6699.7	824.06	6699.8	829.81	6699.9	830.73	6699.91	839.04	6700
851.39	6700.1	852.41	6700.1	858.74	6700	859.47	6700	862.64	6700.1
865.8	6700.2	868.97	6700.3	872.13	6700.4	875.3	6700.5	878.46	6700.6
881.63	6700.7	884.79	6700.8	887.96	6700.9	891.12	6701	894.29	6701.1
897.45	6701.2	900.62	6701.3	903.78	6701.4	906.95	6701.5	910.11	6701.6
913.28	6701.7	916.44	6701.8	919.61	6701.9	922.78	6702	927.39	6702.1
932	6702.2	936.62	6702.3	941.23	6702.4	945.85	6702.5	950.46	6702.6
955.08	6702.7	959.69	6702.8	964.31	6702.9	969.16	6703	975.06	6703.1
981.94	6703.2	988.82	6703.3	995.7	6703.4	1000	6703.4		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2975.3

INPUT
Description:
Station Elevation Data num= 252

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6700.3	5.18	6700.3	10.36	6700.4	15.54	6700.5	20.72	6700.6
49	6700.7	80.11	6700.7	83.46	6700.6	86.82	6700.5	90.17	6700.4
90.51	6700.39	94.36	6700.3	98.65	6700.2	102.93	6700.1	107.21	6700
110.75	6699.9	114.29	6699.8	117.83	6699.7	121.37	6699.6	124.84	6699.5
128.01	6699.4	131.17	6699.3	134.34	6699.2	137.51	6699.1	140.68	6699
143.85	6698.9	147.02	6698.8	150.2	6698.7	153.49	6698.6	157.3	6698.5
161.11	6698.4	164.92	6698.3	168.73	6698.2	172.54	6698.1	176.35	6698
180.16	6697.9	183.96	6697.8	187.77	6697.7	191.58	6697.6	195.39	6697.5
199.2	6697.4	203.01	6697.3	206.82	6697.2	210.63	6697.1	214.44	6697
219.62	6696.9	224.81	6696.8	230.59	6696.7	236.98	6696.6	242.85	6696.5
248.53	6696.4	254.22	6696.3	259.9	6696.2	265.59	6696.1	271.21	6696
276.62	6695.9	282.04	6695.8	287.45	6695.7	292.86	6695.6	298.27	6695.5
304.2	6695.4	309.7	6695.3	310.94	6695.3	322.85	6695.4	350	6695.47
359.47	6695.5	384.94	6695.6	399.71	6695.7	406.07	6695.8	411.64	6695.9
415.58	6696	416.3	6696.1	421.96	6696.2	447.01	6696.3	452.22	6696.3
452.65	6696.2	453.02	6696.1	453.38	6696	453.86	6695.9	454.35	6695.8
454.84	6695.7	455.34	6695.6	455.83	6695.5	456.33	6695.4	456.82	6695.3
457.31	6695.2	457.81	6695.1	458.3	6695	458.77	6694.9	459.24	6694.8
459.73	6694.7	460.22	6694.6	460.71	6694.5	461.2	6694.4	461.69	6694.3
462.18	6694.2	462.67	6694.1	463.17	6694	463.63	6693.9	464.09	6693.8
464.55	6693.7	465.03	6693.6	465.52	6693.5	466.01	6693.4	466.5	6693.3
466.99	6693.2	467.47	6693.1	467.96	6693	468.45	6692.9	468.94	6692.8
469.43	6692.7	469.92	6692.6	470.4	6692.5	470.86	6692.4	471.27	6692.3
471.68	6692.2	472.09	6692.1	472.5	6692	472.94	6691.9	473.38	6691.8
473.82	6691.7	477.05	6691.6	480.54	6691.5	482.91	6691.4	485.28	6691.3
487.65	6691.2	488.88	6691.1	489.77	6691	515.07	6691	515.85	6691.1
516.62	6691.2	517.4	6691.3	518.18	6691.4	518.95	6691.5	519.73	6691.6
520.51	6691.7	521.29	6691.8	522.06	6691.9	522.84	6692	523.62	6692.1
524.39	6692.2	525.17	6692.3	525.95	6692.4	526.73	6692.5	527.72	6692.6
528.71	6692.7	529.7	6692.8	530.7	6692.9	531.69	6693	532.68	6693.1
533.67	6693.2	534.66	6693.3	535.66	6693.4	536.65	6693.5	537.64	6693.6
538.63	6693.7	539.62	6693.8	540.62	6693.9	541.64	6694	544.39	6694.1
547.17	6694.2	549.95	6694.3	552.73	6694.4	555.51	6694.5	558.28	6694.6

561.06	6694.7	567	6694.8	578.42	6694.9	589.84	6695	605.63	6695.1
614.98	6695.2	624.14	6695.3	633.3	6695.4	642.46	6695.5	650	6695.58
651.62	6695.6	661.67	6695.7	672.26	6695.8	682.84	6695.9	693.43	6696
700.54	6696.1	707.64	6696.2	714.75	6696.3	721.86	6696.4	728.96	6696.5
736.07	6696.6	746.14	6696.6	749.46	6696.7	752.77	6696.8	756.09	6696.9
759.4	6697	763.01	6697.1	766.62	6697.2	770.23	6697.3	773.84	6697.4
777.45	6697.5	781.06	6697.6	784.68	6697.7	788.29	6697.8	791.9	6697.9
795.51	6698	798.87	6698.1	802.17	6698.2	805.27	6698.3	808.36	6698.4
811.46	6698.5	814.55	6698.6	817.65	6698.7	820.74	6698.8	823.84	6698.9
826.93	6699	830.21	6699.1	833.5	6699.2	836.78	6699.3	840.06	6699.4
843.34	6699.5	846.62	6699.6	849.95	6699.7	853.31	6699.8	856.66	6699.9
860.02	6700	863.88	6700.1	867.46	6700.2	871.04	6700.3	874.62	6700.4
878.2	6700.5	881.78	6700.6	885.36	6700.7	888.94	6700.8	892.51	6700.9
896.09	6701	900.62	6701.1	905.14	6701.2	909.67	6701.3	914.19	6701.4
918.88	6701.5	923.59	6701.6	928.3	6701.7	933.01	6701.8	937.72	6701.9
942.43	6702	947.52	6702.1	952.79	6702.2	958.3	6702.3	963.81	6702.4
969.31	6702.5	974.82	6702.6	980.33	6702.7	985.84	6702.8	991.34	6702.9
996.85	6703	1000	6703						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2823.35

INPUT
Description:
Station Elevation Data num= 296

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6700.5	3.99	6700.5	32.33	6700.6	61.01	6700.7	62.02	6700.7
65.37	6700.6	68.73	6700.5	72.09	6700.4	75.44	6700.3	75.82	6700.29
78.33	6700.2	81.17	6700.1	84	6700	86.35	6699.9	88.73	6699.8
91.11	6699.7	93.48	6699.6	95.86	6699.5	98.24	6699.4	100.62	6699.3
102.99	6699.2	105.37	6699.1	107.75	6699	109.93	6698.9	112.12	6698.8
114.3	6698.7	116.49	6698.6	118.68	6698.5	120.86	6698.4	123.05	6698.3
125.23	6698.2	127.42	6698.1	129.6	6698	131.78	6697.9	133.97	6697.8
136.17	6697.7	138.65	6697.6	141.13	6697.5	143.61	6697.4	146.09	6697.3
148.57	6697.2	151.05	6697.1	153.53	6697	156.01	6696.9	158.49	6696.8
160.97	6696.7	163.45	6696.6	165.93	6696.5	168.41	6696.4	171.39	6696.3
174.6	6696.2	177.81	6696.1	181.02	6696	185.16	6695.9	189.31	6695.8
193.45	6695.7	197.59	6695.6	201.74	6695.5	205.88	6695.4	210.02	6695.3
213.61	6695.2	217.15	6695.1	220.69	6695	224.23	6694.9	227.77	6694.8
231.32	6694.7	234.86	6694.6	238.41	6694.5	241.95	6694.4	245.49	6694.3
249.04	6694.2	257.05	6694.1	270.18	6694	337.21	6693.9	350	6693.85

363.57	6693.8	370.35	6693.7	374.33	6693.6	378.32	6693.5	382.3	6693.4
391.33	6693.3	395.9	6693.2	397.07	6693.1	398.23	6693	399.4	6692.9
400.56	6692.8	401.73	6692.7	402.89	6692.6	404.06	6692.5	405.23	6692.4
406.39	6692.3	407.56	6692.2	408.72	6692.1	409.89	6692	411.76	6691.9
414.2	6691.8	416.64	6691.7	419.08	6691.6	421.51	6691.5	423.95	6691.4
426.39	6691.3	428.83	6691.2	431.26	6691.1	433.7	6691	436.1	6690.9
438.5	6690.8	442.14	6690.7	446.55	6690.6	450.95	6690.5	454.06	6690.4
455.31	6690.3	456.57	6690.2	457.82	6690.1	459.07	6690	459.88	6689.9
460.7	6689.8	461.51	6689.7	462.32	6689.6	463.13	6689.5	463.94	6689.4
464.75	6689.3	465.57	6689.2	466.38	6689.1	467.19	6689	468	6688.9
468.81	6688.8	470.34	6688.7	472.44	6688.6	474.53	6688.5	476.63	6688.4
478.73	6688.3	480.83	6688.2	482.92	6688.1	485.02	6688	486.06	6687.9
487.09	6687.8	488.13	6687.7	491.82	6687.6	495.56	6687.5	498.09	6687.4
500	6687.32	500.55	6687.3	501.56	6687.3	505.39	6687.4	516.31	6687.4
519.35	6687.5	523.44	6687.6	526.26	6687.7	526.69	6687.8	527.13	6687.9
527.56	6688	529.16	6688.1	530.76	6688.2	532.36	6688.3	533.95	6688.4
535.4	6688.5	536.2	6688.6	537.01	6688.7	537.81	6688.8	538.62	6688.9
539.43	6689	539.89	6689.1	540.35	6689.2	540.81	6689.3	541.27	6689.4
541.74	6689.5	542.2	6689.6	542.66	6689.7	543.12	6689.8	543.59	6689.9
544.05	6690	544.51	6690.1	544.97	6690.2	545.43	6690.3	545.9	6690.4
546.36	6690.5	546.82	6690.6	547.28	6690.7	547.74	6690.8	548.21	6690.9
548.67	6691	549.13	6691.1	549.59	6691.2	550.05	6691.3	550.52	6691.4
550.98	6691.5	551.44	6691.6	551.9	6691.7	552.37	6691.8	552.83	6691.9
553.29	6692	553.75	6692.1	554.21	6692.2	554.68	6692.3	555.14	6692.4
555.6	6692.5	556.06	6692.6	556.52	6692.7	556.99	6692.8	557.45	6692.9
557.91	6693	558.37	6693.1	558.83	6693.2	559.3	6693.3	559.82	6693.4
560.34	6693.5	560.86	6693.6	561.39	6693.7	561.91	6693.8	562.43	6693.9
562.96	6694	563.47	6694.1	563.99	6694.2	564.51	6694.3	565.03	6694.4
565.55	6694.5	566.07	6694.6	566.59	6694.7	567.11	6694.8	567.64	6694.9
568.16	6695	573.96	6695.1	576.74	6695.2	578.02	6695.2	585.71	6695.1
593.39	6695	599.57	6694.9	605.74	6694.8	611.91	6694.7	618.08	6694.6
624.25	6694.5	630.42	6694.4	636.59	6694.3	642.76	6694.2	648.92	6694.1
650	6694.08	655.09	6694	665.4	6693.9	675.7	6693.8	686.01	6693.7
696.31	6693.6	705.67	6693.5	714	6693.4	722.32	6693.3	731.92	6693.2
734.96	6693.2	739.93	6693.3	744.91	6693.4	749.88	6693.5	754.86	6693.6
759.83	6693.7	764.81	6693.8	769.78	6693.9	774.76	6694	780.35	6694.1
785.95	6694.2	791.38	6694.3	796.7	6694.4	802.03	6694.5	807.35	6694.6
812.68	6694.7	818	6694.8	823.33	6694.9	828.65	6695	832.11	6695.1
835.57	6695.2	839.03	6695.3	842.49	6695.4	845.95	6695.5	849.41	6695.6
852.87	6695.7	856.33	6695.8	859.79	6695.9	862.77	6696	865.6	6696.1
868.43	6696.2	871.26	6696.3	874.09	6696.4	876.92	6696.5	879.75	6696.6
882.58	6696.7	886.34	6696.8	891.98	6696.9	897.62	6697	905.63	6697.1
913.64	6697.2	921.64	6697.3	929.65	6697.4	937.23	6697.5	943.58	6697.6
949.94	6697.7	956.29	6697.8	962.64	6697.9	975.35	6698	993.18	6698.1
1000	6698.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

```
          350     650           151.95  151.95  151.95             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 2671.4

INPUT
Description:
Station Elevation Data    num=     261
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6700    5.85    6700   13.13  6699.9   20.42  6699.8   26.8  6699.7
   32.49  6699.6   38.18  6699.5   53.23  6699.4   65.86  6699.3  78.48  6699.2
   91.36  6699.1  103.73    6699  112.58  6698.9  121.42  6698.8  126.96  6698.7
  128.93  6698.6  130.89  6698.5  132.86  6698.4  134.82  6698.3  136.78  6698.2
  138.75  6698.1  140.71    6698  142.68  6697.9  144.64  6697.8  146.61  6697.7
  148.57  6697.6  150.54  6697.5   152.5  6697.4  154.46  6697.3  156.43  6697.2
  158.39  6697.1  160.36    6697  162.32  6696.9  164.29  6696.8  166.25  6696.7
  168.22  6696.6  170.18  6696.5  172.14  6696.4  174.11  6696.3  176.07  6696.2
  178.04  6696.1     180    6696  181.97  6695.9  183.93  6695.8  185.89  6695.7
  187.86  6695.6  189.82  6695.5  191.79  6695.4  193.75  6695.3  195.72  6695.2
  197.71  6695.1  199.85    6695  203.61  6694.9  207.29  6694.8  210.81  6694.7
  214.33  6694.6  217.85  6694.5  221.37  6694.4   224.9  6694.3  228.42  6694.2
  231.94  6694.1  235.46    6694  238.97  6693.9  242.48  6693.8  245.98  6693.7
  249.47  6693.6  252.97  6693.5  256.46  6693.4  259.95  6693.3  263.45  6693.2
  266.94  6693.1  270.44    6693  276.55  6692.9  285.05  6692.8  296.89  6692.7
  308.67  6692.6  320.76  6692.5  333.07  6692.4  344.99  6692.3     350 6692.29
  386.64  6692.2  425.28  6692.1  436.53    6692  441.61  6691.9  447.41  6691.8
  456.91  6691.7  461.64  6691.6  462.97  6691.5  464.31  6691.4  465.64  6691.3
  466.97  6691.2   468.3  6691.1  469.64    6691  470.12  6690.9  470.61  6690.8
  471.09  6690.7  471.58  6690.6  472.06  6690.5  472.54  6690.4  473.03  6690.3
  473.51  6690.2     474  6690.1  474.49    6690  474.98  6689.9  475.47  6689.8
  475.95  6689.7  476.44  6689.6  476.92  6689.5  477.41  6689.4  477.89  6689.3
  478.38  6689.2  478.86  6689.1  479.35    6689  479.85  6688.9  480.33  6688.8
  480.82  6688.7   481.3  6688.6  481.79  6688.5  482.27  6688.4  482.76  6688.3
  483.25  6688.2  483.73  6688.1  484.22    6688   484.7  6687.9  485.19  6687.8
  485.67  6687.7  486.16  6687.6  486.64  6687.5  487.13  6687.4  487.61  6687.3
   488.1  6687.2  488.62  6687.1  489.19    6687  489.67  6686.9  490.16  6686.8
  490.65  6686.7  491.14  6686.6  491.62  6686.5  492.11  6686.4   492.6  6686.3
  493.08  6686.2  493.58  6686.1   494.1    6686  494.55  6685.9     495  6685.8
  495.74  6685.7   496.6  6685.6  497.46  6685.5  498.33  6685.4  500.27  6685.4
  500.32  6685.5  500.38  6685.6  500.44  6685.7  500.65  6685.8  501.41  6685.9
  502.16    6686  502.94  6686.1  503.73  6686.2  504.51  6686.3   505.3  6686.4
  506.09  6686.5  506.87  6686.6  507.66  6686.7  508.44  6686.8  509.23  6686.9
  510.03    6687  510.73  6687.1  511.49  6687.2  512.28  6687.3  513.07  6687.4
  513.86  6687.5  514.65  6687.6  515.43  6687.7  516.22  6687.8  517.01  6687.9
   517.8    6688  518.59  6688.1  519.37  6688.2  520.16  6688.3  520.95  6688.4
  521.74  6688.5  522.53  6688.6  523.32  6688.7   524.1  6688.8  524.89  6688.9
  525.66    6689  526.45  6689.1  527.24  6689.2  528.03  6689.3  528.82  6689.4
  529.61  6689.5   530.4  6689.6  531.19  6689.7  531.98  6689.8  532.76  6689.9
  533.54    6690  536.19  6690.1  538.79  6690.2   541.4  6690.3     544  6690.4
  546.61  6690.5  549.21  6690.6  551.82  6690.7  554.42  6690.8  557.03  6690.9
  559.63    6691  564.05  6691.1  568.47  6691.2  572.88  6691.3  577.37  6691.4
   582.5  6691.5  587.64  6691.6  598.85  6691.7  611.31  6691.8  629.31  6691.9
     650  6691.9  681.12  6691.9  687.73  6691.8  694.33  6691.7  706.02  6691.6
  744.56  6691.5  761.11  6691.4  772.27  6691.3  780.04  6691.2   785.6  6691.1
  791.17    6691  796.74  6690.9  802.31  6690.8  807.88  6690.7  817.16  6690.7
  825.82  6690.6  834.48  6690.5  842.84  6690.5  865.59  6690.6  881.44  6690.7
  917.21  6690.8  933.14  6690.9  940.33    6691  943.56  6691.1  946.78  6691.2
  950.01  6691.3  953.23  6691.4  956.07  6691.5  958.64  6691.6  961.22  6691.7
  963.79  6691.8  966.37  6691.9  968.94    6692  971.52  6692.1  974.09  6692.2
  976.67  6692.3  979.24  6692.4  981.82  6692.5  984.39  6692.6  986.97  6692.7
  989.54  6692.8  992.12  6692.9  994.69    6693  997.27  6693.1  999.84  6693.2
    1000  6693.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     350     .06     650    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           350     650           151.94  151.94  151.94             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 2519.46

INPUT
Description:
Station Elevation Data    num=     246
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6694.9    1.41  6694.9    6.76  6694.8   18.49  6694.7   26.22  6694.6
   33.02  6694.5   39.98  6694.4   49.24  6694.3   55.33  6694.2   61.42  6694.1
   67.51    6694    73.6  6693.9   79.41  6693.8   82.48  6693.7   85.56  6693.6
   88.64  6693.5   91.71  6693.4   94.79  6693.3   97.87  6693.2  100.95  6693.1
  104.02    6693  107.41  6692.9  110.79  6692.8  114.16  6692.7  117.52  6692.6
  120.89  6692.5  124.26  6692.4  127.62  6692.3  130.99  6692.2  134.35  6692.1
  137.72    6692  141.25  6691.9  144.78  6691.8   148.3  6691.7  151.83  6691.6
  155.55  6691.5  159.85  6691.4  164.15  6691.3  168.46  6691.2  172.76  6691.1
  177.06    6691  182.61  6690.9  188.16  6690.8  195.07  6690.7     202  6690.6
  208.79  6690.5  215.14  6690.4  221.49  6690.3  227.83  6690.2  297.17  6690.2
  319.42  6690.1  336.02    6690     350 6689.92  354.31  6689.9  372.59  6689.8
  389.97  6689.7  405.74  6689.6  421.35  6689.5  436.71  6689.4  444.48  6689.3
  451.72  6689.2  458.14  6689.1   464.4    6689  464.96  6688.9  465.51  6688.8
  466.07  6688.7  466.63  6688.6  467.18  6688.5  467.74  6688.4   468.3  6688.3
  468.85  6688.2  469.41  6688.1  469.99    6688  470.55  6687.9  471.11  6687.8
  471.67  6687.7  472.23  6687.6  472.79  6687.5  473.34  6687.4   473.9  6687.3
  474.46  6687.2  475.02  6687.1  475.57    6687  476.14  6686.9   476.7  6686.8
  477.26  6686.7  477.82  6686.6  478.38  6686.5  478.93  6686.4  479.49  6686.3
  480.05  6686.2  480.61  6686.1  481.17    6686  481.74  6685.9   482.3  6685.8
  482.86  6685.7  483.42  6685.6  483.98  6685.5  484.54  6685.4  485.09  6685.3
  485.65  6685.2  486.21  6685.1  486.77    6685  487.35  6684.9  487.92  6684.8
  488.48  6684.7  489.04  6684.6   489.6  6684.5  490.15  6684.4  490.71  6684.3
  491.27  6684.2  491.83  6684.1  492.39    6684  492.98  6683.9  493.56  6683.8
  494.15  6683.7  494.73  6683.6  495.32  6683.5  495.96  6683.5  498.28  6683.4
  501.05  6683.4  501.25  6683.5  501.45  6683.6  501.65  6683.7  501.85  6683.8
  502.05  6683.9  502.25    6684  503.31  6684.1  504.37  6684.2  505.43  6684.3
   506.5  6684.4  507.56  6684.5  508.62  6684.6  509.68  6684.7  510.74  6684.8
   511.8  6684.9  512.86    6685  513.92  6685.1  514.99  6685.2  516.05  6685.3
  517.11  6685.4  518.17  6685.5  519.23  6685.6  520.29  6685.7  521.35  6685.8
  522.42  6685.9  523.48    6686  524.54  6686.1   525.6  6686.2  526.66  6686.3
  527.72  6686.4  528.78  6686.5  529.85  6686.6  530.91  6686.7  531.97  6686.8
  533.03  6686.9  534.09    6687  535.15  6687.1  536.21  6687.2  537.28  6687.3
  538.34  6687.4   539.4  6687.5  540.46  6687.6  541.52  6687.7  542.58  6687.8
  543.64  6687.9   544.7    6688  545.72  6688.1  546.73  6688.2  547.93  6688.3
  551.05  6688.4  557.78  6688.5  560.24  6688.6   562.7  6688.7  565.16  6688.8
  569.91  6688.9  580.49    6689  589.71  6689.1  601.82  6689.2  612.73  6689.3
  623.48  6689.4  631.92  6689.4  636.78  6689.3  641.64  6689.2   646.5  6689.1
     650 6689.03  651.36    6689  656.22  6688.9  661.43  6688.8  668.53  6688.7
  675.63  6688.6  682.72  6688.5  689.82  6688.4  696.91  6688.3  704.01  6688.2
  704.88  6688.2  716.18  6688.3  750.98  6688.4  758.82  6688.4  777.66  6688.3
  779.03  6688.3  784.36  6688.4  789.68  6688.5  795.01  6688.6  800.33  6688.7
  805.66  6688.8  810.98  6688.9  816.31    6689  826.88  6689.1  837.83  6689.2
  850.46  6689.3  855.15  6689.3  861.91  6689.2  868.67  6689.1  875.43    6689
  884.33  6688.9  893.22  6688.8  899.43  6688.8  926.28  6688.9  929.98    6689
   932.8  6689.1  935.62  6689.2  938.44  6689.3  941.27  6689.4  944.09  6689.5
  946.91  6689.6  949.73  6689.7  952.55  6689.8  955.38  6689.9   958.2    6690
  960.93  6690.1  963.66  6690.2  966.39  6690.3  969.12  6690.4  971.85  6690.5
  974.58  6690.6  977.31  6690.7  980.04  6690.8  982.87  6690.9  985.71    6691
  988.09  6691.1  990.47  6691.2  992.85  6691.3  995.23  6691.4  997.61  6691.5
  999.99  6691.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     350     .06     650    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           350     650           151.95  151.95  151.95             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 2367.51

INPUT
Description:
Station Elevation Data    num=     162
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6690.8    4.47  6690.8    8.99  6690.7   13.51  6690.6   17.91  6690.5
   22.27  6690.4   26.64  6690.3      31  6690.2   35.37  6690.1   39.74    6690
   44.15  6689.9    48.6  6689.8   53.05  6689.7   57.49  6689.6   61.94  6689.5
   66.39  6689.4   70.84  6689.3   75.28  6689.2   79.73  6689.1   84.18    6689
   90.14  6688.9   98.25  6688.8  105.68  6688.7  113.96  6688.6  123.96  6688.5
  134.35  6688.4     145  6688.3  155.65  6688.2  168.69  6688.1  248.87  6688.1
     281  6688.2  311.02  6688.3  320.79  6688.3  331.43  6688.2  342.06  6688.1
     350 6688.02  352.43    6688  359.22  6687.9  366.02  6687.8  372.81  6687.7
  379.61  6687.6  386.41  6687.5   393.2  6687.4  399.48  6687.3   405.6  6687.2
  413.92  6687.1  421.06    6687  424.68  6686.9  428.31  6686.8  431.93  6686.7
   436.7  6686.6  442.56  6686.5  448.42  6686.4  454.28  6686.3  460.14  6686.2
     466  6686.1  471.86    6686  478.39    6686  479.17  6685.9  479.95  6685.8
  480.73  6685.7   481.4  6685.6     482  6685.5  482.59  6685.4  483.18  6685.3
  483.77  6685.2  484.36  6685.1  484.96    6685  485.55  6684.9  486.14  6684.8
  486.73  6684.7  487.32  6684.6  487.92  6684.5  488.51  6684.4   489.1  6684.3
  489.69  6684.2  490.29  6684.1  490.88    6684  491.47  6683.9  492.06  6683.8
  492.65  6683.7  493.25  6683.6  493.84  6683.5  494.43  6683.4  495.02  6683.3
  495.62  6683.2  496.21  6683.1   496.8    6683  506.43    6683  507.81  6683.1
  509.24  6683.2  510.67  6683.3   512.1  6683.4  513.53  6683.5  514.96  6683.6
  516.39  6683.7  517.83  6683.8  519.26  6683.9  520.69    6684  521.87  6684.1
  523.05  6684.2  524.24  6684.3  525.42  6684.4  526.61  6684.5  527.79  6684.6
  528.98  6684.7  530.16  6684.8  531.34  6684.9  532.53    6685  533.72  6685.1
  534.91  6685.2  545.53  6685.3  550.16  6685.4  554.93  6685.5  577.59  6685.6
  589.48  6685.7  591.47  6685.7  637.77  6685.6  648.73  6685.6     650 6685.61
  659.26  6685.7  669.19  6685.8  678.94  6685.9  688.69    6686  693.51  6686.1
  698.32  6686.2  703.14  6686.3  707.95  6686.4  712.77  6686.5  724.13  6686.6
  735.84  6686.7  755.44  6686.8  775.52  6686.9  788.92    6687  803.61  6687.1
  818.29  6687.2  840.27  6687.2  846.38  6687.3  851.01  6687.4  855.46  6687.5
  859.91  6687.6  864.36  6687.7  868.81  6687.8  873.27  6687.9  877.72    6688
  880.78  6688.1  883.84  6688.2  889.66  6688.3  896.32  6688.4  902.71  6688.5
  908.69  6688.6  914.68  6688.7  920.67  6688.8  926.66  6688.9  932.64    6689
  938.43  6689.1  944.21  6689.2  949.99  6689.3  961.59  6689.4  968.82  6689.5
  976.81  6689.6    1000  6689.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     350     .06     650    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           350     650           151.94  151.94  151.94             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 2215.57

INPUT
Description:
Station Elevation Data    num=     121
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6686.4    6.38  6686.4   14.83  6686.3   21.92  6686.2   28.92  6686.1
   39.26    6686   51.13  6685.9   70.11  6685.8   85.53  6685.7  198.17  6685.7
```

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  230.75  6685.8  248.38  6685.9  266.01    6686  279.47  6686.1   299.1  6686.1
  305.99    6686  309.22  6685.9  312.45  6685.8  315.67  6685.7   318.9  6685.6
  322.13  6685.5  325.35  6685.4  328.58  6685.3  331.81  6685.2  335.03  6685.1
  338.26    6685  341.49  6684.9   344.9  6684.8  349.37  6684.7     350 6684.69
  353.84  6684.6  358.31  6684.5  362.78  6684.4  367.25  6684.3  371.72  6684.2
  373.57  6684.2  380.83  6684.3  388.08  6684.4  395.34  6684.5   402.6  6684.6
  409.86  6684.7     417  6684.8  426.26  6684.8  428.48  6684.7  431.97  6684.6
  436.72  6684.5  441.48  6684.4  446.23  6684.3  450.98  6684.2  455.73  6684.1
  460.48    6684  461.73  6683.9  462.98  6683.8  464.23  6683.7  465.48  6683.6
  466.73  6683.5  467.98  6683.4  469.22  6683.3  470.47  6683.2  471.94  6683.1
  475.75    6683  512.04    6683  514.88  6683.1  517.71  6683.2  520.55  6683.3
  523.38  6683.4  526.22  6683.5  529.05  6683.6  531.88  6683.7  534.72  6683.8
  537.55  6683.9  540.39    6684  543.22  6684.1  546.05  6684.2  548.89  6684.3
  551.84  6684.4  554.86  6684.5  557.89  6684.6  560.91  6684.7  563.36  6684.8
  565.53  6684.9   567.7    6685   571.7  6685.1   575.7  6685.2   579.7  6685.3
  583.71  6685.4  587.71  6685.5  591.71  6685.6  595.71  6685.7  599.71  6685.8
  605.42  6685.9  611.59    6686   616.8  6686.1  622.02  6686.2  627.23  6686.3
  632.44  6686.4  638.54  6686.5  645.43  6686.6     650 6686.67  652.32  6686.7
  659.21  6686.8  666.33  6686.9  673.64    6687   685.4  6687.1  697.17  6687.2
  708.93  6687.3  720.69  6687.4  732.46  6687.5  744.22  6687.6  755.98  6687.7
  769.08  6687.7  835.31  6687.8  865.48  6687.9  906.02  6687.9  930.54  6687.8
  945.63  6687.7  966.77  6687.7  976.37  6687.8  985.98  6687.9  995.59    6688
    1000    6688

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045     350     .06     650    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           350     650           151.95  151.95  151.95             .1       .3

LATERAL STRUCTURE


RIVER: MS-06
REACH: Main Channel-0     RS: 2098

INPUT
Description:
Lateral structure position     = Left overbank
Distance from Upstream XS =
Deck/Roadway Width        =      10
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =      130
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6683.5    1.18  6683.5   10.41  6683.4   19.64  6683.3   28.87  6683.2
   38.09  6683.1   47.32    6683   55.22  6682.9   62.96  6682.8    70.7  6682.7
   78.44  6682.6   86.18  6682.5   93.92  6682.4  101.66  6682.3   109.4  6682.2
  117.14  6682.1  120.95 6682.05  124.76    6682  134.33  6681.9   143.9  6681.8
  153.47  6681.7  163.04  6681.6  172.79  6681.5  182.65  6681.4  192.52  6681.3
     Sta   n Val     Sta   n Val     Sta   n Val
  402.55    .045  407.45     .06  707.45    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        407.45  707.45           151.95  151.95  151.95             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 1911.67

INPUT
Description:
Station Elevation Data    num=      71
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  373.54  6681.1  379.43  6681.1   380.6  6681.1  382.67  6681.1  425.01    6681
  500.01    6681  525.56    6681  530.35  6681.1  535.13  6681.2  539.91  6681.3
  544.69  6681.4  549.47  6681.5  554.25  6681.6  559.03  6681.7  563.82  6681.8
   568.6  6681.9  573.38    6682  577.87  6682.1  582.35  6682.2  586.84  6682.3
  591.33  6682.4  595.81  6682.5   600.3  6682.6  604.79  6682.7  609.27  6682.8
  613.76  6682.9  618.25    6683  622.59  6683.1  626.94  6683.2  631.28  6683.3
  635.63  6683.4  639.98  6683.5  644.32  6683.6  648.67  6683.7  653.01  6683.8
  657.36  6683.9  661.71    6684   668.5  6684.1   675.3  6684.2   680.6 6684.28
  682.09  6684.3  688.88  6684.4  695.68  6684.5  702.47  6684.6  710.48  6684.7
  725.77  6684.8  744.29  6684.9  798.92  6684.9  826.79    6685  857.21  6685.1
  889.49  6685.2  895.44  6685.3  917.14  6685.4  920.46  6685.5  923.78  6685.6
  927.11  6685.7  930.43  6685.8  933.75  6685.9  937.08    6686  943.49  6686.1
   949.9  6686.2  956.32  6686.3  962.73  6686.4  969.14  6686.5  975.49  6686.6
  980.44  6686.7  985.39  6686.8  990.33  6686.9  995.28    6687  997.78  6687.1
 1000.01  6687.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  373.54    .045   380.6     .06   680.6    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         380.6   680.6           151.94  151.94  151.94             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 1759.73

INPUT
Description:
Station Elevation Data    num=     104
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  415.32  6679.7  420.54  6679.7  422.69  6679.7  429.97  6679.7   454.1  6679.6
  477.64  6679.5  500.01  6679.5  512.34  6679.5  519.45  6679.6  526.55  6679.7
  202.26  6681.2  211.24  6681.1   211.3  6681.1  220.62    6681  229.94  6680.9
  239.26  6680.8  248.57  6680.7  258.09  6680.6  262.77 6680.55  267.65  6680.5
  277.18  6680.4  286.71  6680.3  298.75  6680.2  311.01  6680.1  323.26    6680
  332.67  6679.9  342.08  6679.8  351.49  6679.7  366.54  6679.6  368.87 6679.58
  378.83  6679.5  390.31  6679.4  401.78  6679.3  413.26  6679.2  424.74  6679.1
  436.21    6679   448.2  6678.9   460.5  6678.8  473.22  6678.7  485.93  6678.6
  498.64  6678.5  511.36  6678.4  523.53  6678.3     524  6678.3   535.1  6678.2
  546.19  6678.1  557.28    6678  568.52  6677.9  578.71  6677.8  587.53  6677.7
  596.36  6677.6  605.18  6677.5  614.01  6677.4  622.83  6677.3  631.66  6677.2
  640.48  6677.1  649.31    6677  657.14  6676.9  664.83  6676.8  672.39  6676.7
  679.95  6676.6  687.51  6676.5  691.22 6676.45  694.86  6676.4  702.01  6676.3
  709.16  6676.2  716.31  6676.1  723.47    6676  731.02  6675.9  737.85  6675.8
  744.69  6675.7  751.52  6675.6  758.35  6675.5  765.18  6675.4  772.02  6675.3
  778.85  6675.2  785.68  6675.1  792.51    6675  799.34  6674.9  806.17  6674.8
     813  6674.7  819.82  6674.6  826.65  6674.5  829.59 6674.46  833.45  6674.4
  840.24  6674.3  847.03  6674.2  853.82  6674.1  860.61    6674  868.17  6673.9
  875.73  6673.8  883.28  6673.7  890.84  6673.6   898.4  6673.5  905.96  6673.4
  913.52  6673.3  921.05  6673.2  928.57  6673.1  936.09    6673  943.48  6672.9
  950.87  6672.8  958.26  6672.7  965.66  6672.6  973.05  6672.5  980.45  6672.4
  987.85  6672.3  995.24  6672.2 1002.64  6672.1 1010.03    6672 1015.85  6671.9
 1021.67  6671.8  1028.9  6671.7 1036.35  6671.6 1043.81  6671.5 1047.05  6671.5

Weir crest shape                        = Broad Crested

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 2063.62

INPUT
Description:
Station Elevation Data    num=      66
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  402.55  6683.1  407.45  6683.1  420.06  6683.1  441.47    6683  451.36  6682.9
  460.63  6682.8  469.91  6682.7  478.95  6682.6  486.13  6682.5  490.67  6682.4
  492.19  6682.3  499.99  6682.3  504.14  6682.3  510.31  6682.4  514.83  6682.5
  520.22  6682.6  528.22  6682.7  536.21  6682.8  544.21  6682.9   552.2    6683
  556.16  6683.1  560.83  6683.2  565.75  6683.3  570.66  6683.4  575.58  6683.5
  580.48  6683.6  585.39  6683.7   590.3  6683.8  595.23  6683.9  600.16    6684
  605.28  6684.1  610.39  6684.2   615.5  6684.3  620.62  6684.4  625.73  6684.5
  630.35  6684.6  634.67  6684.7  638.98  6684.8   643.3  6684.9  647.62    6685
  652.55  6685.1  657.48  6685.2  662.41  6685.3  667.33  6685.4  672.32  6685.5
  677.68  6685.6  683.04  6685.7   688.4  6685.8  693.76  6685.9  699.12    6686
  707.45 6686.02  747.32  6686.1  822.18  6686.2  856.42  6686.2  898.91  6686.1
  921.44  6686.1  930.78  6686.2   939.3  6686.3  947.77  6686.4  956.24  6686.5
  964.71  6686.6  973.17  6686.7  981.64  6686.8  990.11  6686.9  998.57    6687
  999.99    6687

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  533.56  6679.8   540.2  6679.9  546.85    6680   553.1  6680.1  559.35  6680.2
  565.61  6680.3  571.86  6680.4  578.12  6680.5  584.37  6680.6  590.69  6680.7
   597.2  6680.8   603.7  6680.9  610.21    6681  615.88  6681.1  621.56  6681.2
  627.23  6681.3   632.9  6681.4  638.57  6681.5  644.25  6681.6  649.92  6681.7
  655.72  6681.8  661.69  6681.9  667.66    6682  673.59  6682.1  679.51  6682.2
  685.43  6682.3  694.61  6682.4  704.85  6682.5  715.56  6682.6  722.69 6682.69
  723.54  6682.7  734.58  6682.8  754.43  6682.9  774.79    6683  792.91  6683.1
  810.69  6683.2  827.57  6683.3  838.52  6683.4  849.47  6683.5   860.4  6683.6
  871.23  6683.7     881  6683.8  886.13  6683.9  891.26    6684  893.24  6684.1
  895.23  6684.2  897.23  6684.3   899.6  6684.4  901.97  6684.5  904.35  6684.6
  906.72  6684.7  909.09  6684.8  911.46  6684.9  913.83    6685   916.2  6685.1
  918.58  6685.2  920.95  6685.3  923.32  6685.4  925.69  6685.5  928.06  6685.6
  930.44  6685.7  932.81  6685.8  935.18  6685.9  937.55    6686  939.92  6686.1
   942.3  6686.2  944.67  6686.3  947.04  6686.4  949.41  6686.5  951.78  6686.6
  954.16  6686.7  956.53  6686.8   958.9  6686.9  961.27    6687  963.22  6687.1
  965.16  6687.2  967.11  6687.3  969.05  6687.4     971  6687.5  972.95  6687.6
  974.89  6687.7  976.84  6687.8  978.78  6687.9  980.87    6688  982.93  6688.1
  984.99  6688.2  987.04  6688.3   989.1  6688.4  991.16  6688.5  993.22  6688.6
  995.27  6688.7  997.33  6688.8  999.39  6688.9 1000.01  6688.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  415.32    .045  422.69     .06  722.69    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        422.69  722.69           151.95  151.95  151.95             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 1607.78

INPUT
Description:
Station Elevation Data    num=     142
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  419.39  6678.4  423.25  6678.4  423.31  6678.4   424.6  6678.4  432.84  6678.4
  442.84  6678.3  452.83  6678.2  473.99  6678.1     500 6678.01  503.43    6678
  505.48    6678  512.11  6678.1  518.74  6678.2  525.36  6678.3  531.99  6678.4
  538.61  6678.5  545.24  6678.6  551.87  6678.7  558.46  6678.8  565.04  6678.9
  571.63    6679   577.1  6679.1  582.57  6679.2  588.04  6679.3   593.5  6679.4
  598.97  6679.5  604.44  6679.6  609.63  6679.7  614.36  6679.8  619.08  6679.9
  623.81    6680  629.01  6680.1  634.22  6680.2  639.42  6680.3  646.19  6680.4
  656.82  6680.5  667.44  6680.6  678.06  6680.7  688.07  6680.8  698.63  6680.9
  709.93    6681  721.77  6681.1   724.6 6681.12  733.61  6681.2  747.43  6681.3
  762.92  6681.4  774.63  6681.5  782.33  6681.6  789.81  6681.7  797.62  6681.8
  805.43  6681.9  813.24    6682   815.6  6682.1  817.96  6682.2  820.56  6682.3
  823.44  6682.4  826.32  6682.5  829.21  6682.6  832.09  6682.7  834.97  6682.8
  837.85  6682.9  840.74    6683  843.62  6683.1   846.5  6683.2  849.38  6683.3
  852.27  6683.4  855.15  6683.5  858.03  6683.6  860.91  6683.7   863.8  6683.8
```

866.68	6683.9	869.56	6684	872.04	6684.1	874.52	6684.2	876.99	6684.3
879.47	6684.4	881.95	6684.5	884.42	6684.6	886.9	6684.7	889.38	6684.8
891.85	6684.9	894.4	6685	896.23	6685.1	898.1	6685.2	899.98	6685.3
901.85	6685.4	903.72	6685.5	905.6	6685.6	907.47	6685.7	909.35	6685.8
911.22	6685.9	913.1	6686	914.95	6686.1	916.81	6686.2	918.66	6686.3
920.52	6686.4	922.37	6686.5	924.23	6686.6	926.08	6686.7	927.94	6686.8
929.79	6686.9	931.65	6687	933.5	6687.1	935.36	6687.2	937.21	6687.3
939.07	6687.4	940.93	6687.5	942.78	6687.6	944.64	6687.7	946.49	6687.8
948.35	6687.9	950.2	6688	952	6688.1	953.8	6688.2	955.59	6688.3
957.39	6688.4	959.19	6688.5	960.99	6688.6	962.78	6688.7	964.58	6688.8
966.52	6688.9	968.54	6689	970.17	6689.1	971.8	6689.2	973.44	6689.3
975.07	6689.4	976.71	6689.5	978.34	6689.6	979.98	6689.7	981.61	6689.8
983.25	6689.9	984.88	6690	986.52	6690.1	988.15	6690.2	989.78	6690.3
991.42	6690.4	993.05	6690.5	994.69	6690.6	996.32	6690.7	997.96	6690.8
999.59	6690.9	1000	6690.9						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
419.39	.045	424.6	.06	724.6	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
424.6	724.6	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1455.84

INPUT
Description:
Station Elevation Data num= 161

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
417.79	6676.9	420.01	6676.9	423.25	6676.9	424.81	6676.9	429.47	6676.9
444.11	6676.8	457.75	6676.7	466.4	6676.6	475.04	6676.5	483.69	6676.4
492.33	6676.3	499.99	6676.3	507.13	6676.3	515.29	6676.4	527.49	6676.5
538.32	6676.6	544.8	6676.7	551.29	6676.8	557.77	6676.9	564.26	6677
569.07	6677.1	573.88	6677.2	580.26	6677.3	587.27	6677.4	594.28	6677.5
601.29	6677.6	609.13	6677.7	618.18	6677.8	627.22	6677.9	636.27	6678
644.67	6678.1	653.06	6678.2	659.12	6678.3	664.56	6678.4	670	6678.5
675.44	6678.6	680.88	6678.7	687.01	6678.8	699.19	6678.9	711.37	6679
722.86	6679.1	724.81	6679.14	728.29	6679.2	730.53	6679.3	732.77	6679.4
735	6679.5	737.24	6679.6	739.48	6679.7	741.71	6679.8	743.95	6679.9
746.18	6680	748.42	6680.1	750.66	6680.2	752.89	6680.3	755.14	6680.4
757.38	6680.5	759.63	6680.6	761.87	6680.7	764.12	6680.8	766.36	6680.9
768.6	6681	771.82	6681.1	775.04	6681.2	778.26	6681.3	781.48	6681.4
784.7	6681.5	787.92	6681.6	791.14	6681.7	794.09	6681.8	796.76	6681.9
799.42	6682	801.86	6682.1	804.3	6682.2	806.73	6682.3	809.17	6682.4
811.61	6682.5	814.05	6682.6	816.49	6682.7	818.93	6682.8	821.37	6682.9
823.81	6683	826.24	6683.1	828.68	6683.2	831.12	6683.3	833.55	6683.4
835.99	6683.5	838.42	6683.6	840.86	6683.7	843.29	6683.8	845.73	6683.9

848.16	6684	850.6	6684.1	853.04	6684.2	855.47	6684.3	857.91	6684.4
860.26	6684.5	862.57	6684.6	864.88	6684.7	867.19	6684.8	869.51	6684.9
871.82	6685	873.86	6685.1	875.91	6685.2	877.95	6685.3	879.99	6685.4
882.04	6685.5	884.08	6685.6	886.13	6685.7	888.18	6685.8	890.22	6685.9
892.27	6686	894.29	6686.1	896.31	6686.2	898.33	6686.3	900.35	6686.4
902.38	6686.5	904.4	6686.6	906.42	6686.7	908.44	6686.8	910.46	6686.9
912.48	6687	914.51	6687.1	916.53	6687.2	918.55	6687.3	920.57	6687.4
922.59	6687.5	924.61	6687.6	926.64	6687.7	928.66	6687.8	930.68	6687.9
932.7	6688	934.82	6688.1	936.95	6688.2	939.07	6688.3	941.19	6688.4
943.32	6688.5	945.44	6688.6	947.56	6688.7	949.53	6688.8	951.45	6688.9
953.37	6689	955.72	6689.1	958.07	6689.2	960.42	6689.3	962.78	6689.4
965.13	6689.5	967.48	6689.6	969.83	6689.7	972.19	6689.8	974.54	6689.9
976.89	6690	979.24	6690.1	981.59	6690.2	983.95	6690.3	986.3	6690.4
988.66	6690.5	991.1	6690.6	993.55	6690.7	995.99	6690.8	998.43	6690.9
999.99	6690.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
417.79	.045	424.81	.06	724.81	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
424.81	724.81	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1303.89

INPUT
Description:
Station Elevation Data num= 169

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
393.13	6674.5	396.63	6674.5	400.37	6674.5	448.61	6674.5	469.15	6674.4
490.54	6674.3	500	6674.3	514.49	6674.3	528.55	6674.4	535.57	6674.5
540.87	6674.6	546.17	6674.7	551.46	6674.8	556.76	6674.9	562.06	6675
567.7	6675.1	573.52	6675.2	579.36	6675.3	585.15	6675.4	590.92	6675.5
596.69	6675.6	602.46	6675.7	608.22	6675.8	613.86	6675.9	619.5	6676
625	6676.1	630.5	6676.2	636	6676.3	641.47	6676.4	646.82	6676.5
652.17	6676.6	657.52	6676.7	662.87	6676.8	668.22	6676.9	673.57	6677
676.5	6677.1	679.43	6677.2	682.37	6677.3	685.3	6677.4	688.23	6677.5
691.16	6677.6	694.1	6677.7	697.03	6677.8	700.01	6677.9	700.37	6677.91
704.28	6678	706.67	6678.1	709.06	6678.2	711.45	6678.3	713.84	6678.4
716.23	6678.5	718.62	6678.6	721.01	6678.7	723.4	6678.8	725.79	6678.9
728.18	6679	730.4	6679.1	732.62	6679.2	734.84	6679.3	737.07	6679.4
739.34	6679.5	741.62	6679.6	743.89	6679.7	746.17	6679.8	748.44	6679.9
750.71	6680	753.39	6680.1	756.06	6680.2	758.74	6680.3	761.41	6680.4
764.09	6680.5	766.76	6680.6	769.09	6680.7	771.34	6680.8	773.59	6680.9
775.83	6681	778.7	6681.1	781.56	6681.2	784.43	6681.3	787.29	6681.4
790.16	6681.5	793.02	6681.6	795.89	6681.7	798.75	6681.8	801.62	6681.9
804.48	6682	807.08	6682.1	809.68	6682.2	812.29	6682.3	814.92	6682.4

817.55	6682.5	820.18	6682.6	822.81	6682.7	825.44	6682.8	828.07	6682.9
830.7	6683	832.81	6683.1	834.92	6683.2	837.03	6683.3	839.14	6683.4
841.25	6683.5	843.36	6683.6	845.51	6683.7	848.07	6683.8	850.62	6683.9
853.17	6684	855.2	6684.1	857.23	6684.2	859.26	6684.3	861.28	6684.4
863.31	6684.5	865.34	6684.6	867.37	6684.7	869.39	6684.8	871.42	6684.9
873.45	6685	875.5	6685.1	877.54	6685.2	879.59	6685.3	881.64	6685.4
883.69	6685.5	885.73	6685.6	887.78	6685.7	889.84	6685.8	891.9	6685.9
893.97	6686	896.06	6686.1	898.14	6686.2	900.23	6686.3	902.32	6686.4
904.41	6686.5	906.49	6686.6	908.58	6686.7	910.67	6686.8	912.75	6686.9
914.84	6687	917.4	6687.1	919.95	6687.2	922.51	6687.3	925.26	6687.4
928.08	6687.5	930.9	6687.6	933.72	6687.7	936.54	6687.8	939.35	6687.9
942.17	6688	944.88	6688.1	947.59	6688.2	950.3	6688.3	953.01	6688.4
955.71	6688.5	958.42	6688.6	961.13	6688.7	963.84	6688.8	966.54	6688.9
969.23	6689	971.6	6689.1	973.97	6689.2	976.34	6689.3	978.71	6689.4
981.08	6689.5	983.45	6689.6	985.82	6689.7	988.19	6689.8	990.55	6689.9
992.92	6690	995.45	6690.1	998.01	6690.2	1000	6690.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
393.13	.045	400.37	.06	700.37	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
400.37	700.37	151.94	151.94	.1	.3

CROSS SECTION

784.77	6680	787.57	6680.1	789.97	6680.2	792.37	6680.3	794.77	6680.4
797.17	6680.5	799.57	6680.6	801.97	6680.7	804.37	6680.8	806.77	6680.9
809.17	6681	811.02	6681.1	812.87	6681.2	814.72	6681.3	816.57	6681.4
818.42	6681.5	820.27	6681.6	822.12	6681.7	823.96	6681.8	825.81	6681.9
827.66	6682	829.51	6682.1	831.36	6682.2	833.21	6682.3	835.06	6682.4
836.91	6682.5	838.76	6682.6	840.61	6682.7	842.45	6682.8	844.3	6682.9
846.15	6683	848	6683.1	849.85	6683.2	851.7	6683.3	853.55	6683.4
855.4	6683.5	857.25	6683.6	859.1	6683.7	860.94	6683.8	862.79	6683.9
864.64	6684	866.55	6684.1	868.46	6684.2	870.37	6684.3	872.28	6684.4
874.2	6684.5	876.12	6684.6	878.04	6684.7	879.96	6684.8	881.88	6684.9
883.79	6685	886.34	6685.1	888.88	6685.2	891.42	6685.3	893.96	6685.4
896.5	6685.5	899.05	6685.6	901.59	6685.7	904.13	6685.8	906.67	6685.9
909.22	6686	911.76	6686.1	914.3	6686.2	916.84	6686.3	919.38	6686.4
921.93	6686.5	924.47	6686.6	927.01	6686.7	929.55	6686.8	932.1	6686.9
934.64	6687	937.23	6687.1	939.83	6687.2	942.43	6687.3	945.02	6687.4
947.62	6687.5	950.24	6687.6	952.89	6687.7	955.55	6687.8	958.21	6687.9
960.86	6688	965.46	6688.1	970.06	6688.2	974.65	6688.3	979.25	6688.4
983.85	6688.5	988.45	6688.6	993.04	6688.7	997.64	6688.8	1000	6688.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
374.3	.045	384.09	.06	684.09	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
384.09	684.09	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1151.95

INPUT
Description:
Station Elevation Data num= 175

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
374.3	6672.5	379.85	6672.5	384.09	6672.5	443.2	6672.5	469.56	6672.4
497.05	6672.3	500	6672.3	506.46	6672.3	518.46	6672.4	530.47	6672.5
543.73	6672.6	554.77	6672.7	563.26	6672.8	571.12	6672.9	577.94	6673
581.36	6673.1	584.78	6673.2	588.2	6673.3	591.62	6673.4	595.04	6673.5
598.46	6673.6	601.88	6673.7	605.3	6673.8	608.72	6673.9	612.14	6674
615.56	6674.1	618.98	6674.2	622.4	6674.3	625.82	6674.4	629.24	6674.5
632.66	6674.6	636.08	6674.7	639.5	6674.8	642.92	6674.9	646.34	6675
650.38	6675.1	653.18	6675.2	655.99	6675.3	658.79	6675.4	661.59	6675.5
664.4	6675.6	667.2	6675.7	670	6675.8	672.8	6675.9	675.61	6676
678.38	6676.1	681.15	6676.2	683.92	6676.3	684.09	6676.31	686.69	6676.4
689.46	6676.5	692.23	6676.6	695	6676.7	697.77	6676.8	700.54	6676.9
703.31	6677	705.95	6677.1	708.58	6677.2	711.24	6677.3	713.99	6677.4
716.75	6677.5	719.5	6677.6	722.26	6677.7	725.02	6677.8	727.77	6677.9
730.53	6678	733.24	6678.1	735.95	6678.2	738.66	6678.3	741.38	6678.4
744.09	6678.5	746.8	6678.6	749.51	6678.7	752.23	6678.8	754.94	6678.9
757.65	6679	760.36	6679.1	763.07	6679.2	765.79	6679.3	768.5	6679.4
771.21	6679.5	773.92	6679.6	776.63	6679.7	779.35	6679.8	782.06	6679.9

RIVER: MS-06
REACH: Main Channel-0 RS: 1000

INPUT
Description:
Station Elevation Data num= 204

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6666.2	8.62	6666.2	16.74	6666.3	25.11	6666.4	33.65	6666.5
42.2	6666.6	50.74	6666.7	59.28	6666.8	67.82	6666.9	76.37	6667
88.71	6667.1	101.4	6667.2	108.04	6667.3	114.44	6667.4	121.64	6667.5
130.28	6667.6	139.82	6667.7	149.35	6667.8	158.89	6667.9	168.43	6668
180.61	6668.1	187.17	6668.2	191.09	6668.3	196.07	6668.4	201.65	6668.5
208.67	6668.6	217.47	6668.7	226.47	6668.8	235.47	6668.9	244.47	6669
253.78	6669.1	262.09	6669.2	270.9	6669.3	279.71	6669.4	288.52	6669.5
296.86	6669.6	304.94	6669.7	312.97	6669.8	320.75	6669.9	329.76	6670
342.33	6670.1	350	6670.16	354.9	6670.2	370.93	6670.3	384.65	6670.4
424.78	6670.4	450.83	6670.3	467.51	6670.2	476.28	6670.1	482.66	6670
517.05	6670	521.02	6670.1	525.05	6670.2	529.35	6670.3	533.67	6670.4
537.98	6670.5	542.3	6670.6	546.68	6670.7	551.08	6670.8	555.48	6670.9
559.88	6671	564.13	6671.1	568.39	6671.2	572.64	6671.3	576.89	6671.4
581.21	6671.5	585.61	6671.6	589.59	6671.7	593.35	6671.8	597.11	6671.9
600.87	6672	603.88	6672.1	606.89	6672.2	609.9	6672.3	612.91	6672.4

615.92	6672.5	618.92	6672.6	621.93	6672.7	624.94	6672.8	627.95	6672.9
630.96	6673	633.97	6673.1	636.98	6673.2	639.99	6673.3	643	6673.4
646.01	6673.5	649.03	6673.6	650	6673.63	652.04	6673.7	655.05	6673.8
658.07	6673.9	661.08	6674	663.93	6674.1	666.78	6674.2	669.63	6674.3
672.48	6674.4	675.33	6674.5	678.18	6674.6	681.02	6674.7	683.86	6674.8
686.7	6674.9	689.54	6675	692.38	6675.1	695.21	6675.2	698.04	6675.3
700.88	6675.4	703.71	6675.5	706.55	6675.6	709.38	6675.7	712.21	6675.8
715.05	6675.9	717.88	6676	720.67	6676.1	723.15	6676.2	725.31	6676.3
727.48	6676.4	729.64	6676.5	731.81	6676.6	733.98	6676.7	736.14	6676.8
738.31	6676.9	740.48	6677	742.42	6677.1	744.36	6677.2	746.3	6677.3
748.24	6677.4	750.18	6677.5	752.12	6677.6	754.06	6677.7	756	6677.8
757.95	6677.9	759.91	6678	761.79	6678.1	763.68	6678.2	765.57	6678.3
767.46	6678.4	769.35	6678.5	771.24	6678.6	773.13	6678.7	775.02	6678.8
776.9	6678.9	778.79	6679	780.69	6679.1	782.59	6679.2	784.49	6679.3
786.39	6679.4	788.29	6679.5	790.19	6679.6	792.09	6679.7	793.99	6679.8
795.89	6679.9	797.89	6680	799.96	6680.1	802.02	6680.2	804.08	6680.3
806.14	6680.4	808.2	6680.5	810.27	6680.6	812.33	6680.7	814.39	6680.8
816.45	6680.9	818.51	6681	821.97	6681.1	825.43	6681.2	828.89	6681.3
832.35	6681.4	835.8	6681.5	839.26	6681.6	842.72	6681.7	846.18	6681.8
849.64	6681.9	853.14	6682	855.62	6682.1	858.04	6682.2	860.46	6682.3
862.87	6682.4	865.29	6682.5	867.71	6682.6	870.13	6682.7	872.55	6682.8
874.97	6682.9	877.39	6683	880.32	6683.1	883.27	6683.2	888.72	6683.3
894.16	6683.4	899.61	6683.5	905.05	6683.6	910.49	6683.7	915.94	6683.8
921.38	6683.9	926.82	6684	931.74	6684.1	936.66	6684.2	941.19	6684.3
945.36	6684.4	949.53	6684.5	953.7	6684.6	957.87	6684.7	962.04	6684.8
966.21	6684.9	979.98	6685	994.64	6685.1	1000	6685.1		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	0	0	0	.1	.3

Left Levee Station= 381.28 Elevation= 6670.45

SUMMARY OF MANNING'S N VALUES

River:MS-06

Reach	River Sta.	n1	n2	n3
Main Channel	1000	.045	.045	.045
Main Channel	999.9	Lat Struct		
Main Channel	999	.045	.045	.045
Main Channel	998.53	Culvert		
Main Channel	998	.045	.045	.045
Main Channel	997	.045	.045	.045
Main Channel	996	.045	.045	.045
Main Channel	995.2	Lat Struct		
Main Channel	995	.045	.045	.045
Main Channel	994	.045	.045	.045
Main Channel	993	.045	.045	.045
Main Channel	992	.045	.045	.045
Main Channel	991	.045	.045	.045
Main Channel	990	.045	.045	.045
Main Channel	989	.045	.045	.045
Main Channel	988	.045	.045	.045
Main Channel	987	.045	.045	.045
Main Channel	986	.045	.045	.045
Main Channel	985	.045	.045	.045
Main Channel	984	.045	.045	.045
Main Channel	983	.045	.045	.045
Overflow 1-DS-0	1007	.045	.045	.045
Overflow 1-DS-0	1006.6	.045	.045	.045
Overflow 1-DS-0	1006	.045	.045	.045
Overflow 1-DS-0	1005	.045	.045	.045
Overflow 1-DS-0	1004	.045	.045	.045
Overflow 1-DS-0	1003	.045	.045	.045
Overflow 1-DS-0	1002	.045	.045	.045
Overflow 1-DS-0	1001	.045	.045	.045
Overflow 1-DS-0	1000	.045	.045	.045
2nd Culvert	1000	.045	.045	.045
2nd Culvert	999	.045	.045	.045
2nd Culvert	998.52	Culvert		
2nd Culvert	998	.045	.045	.045
2nd Culvert	997	.045	.045	.045
2nd Culvert	996	.045	.045	.045
2nd Culvert	995	.045	.045	.045
2nd Culvert	994	.045	.045	.045
2nd Culvert	991	.045	.045	.045
2nd Culvert	990	.045	.045	.045
2nd Culvert	989	.045	.045	.045
2nd Culvert	988	.045	.045	.045
2nd Culvert	987	.045	.045	.045
2nd Culvert	986.3	Lat Struct		
2nd Culvert	985	.045	.045	.045
2nd Culvert	984	.045	.045	.045
2nd Culvert	983	.045	.045	.045
Downstream Ov	1009	.045	.06	.045
Downstream Ov	1008	.045	.06	.045
Downstream Ov	1007	.045	.06	.045
Downstream Ov	1006	.045	.06	.045
Downstream Ov	1005	.045	.06	.045
Downstream Ov	1003	.045	.06	.045
Downstream Ov	1002	.045	.06	.045
Downstream Ov	1001	.045	.06	.045
Downstream Ov	1000	.045	.06	.045
Main Channel-0-2	1007	.045	.045	.045
Main Channel-0-2	1006.8	Lat Struct		
Main Channel-0-2	1006	.045	.045	.045
Main Channel-0-2	1005	.045	.045	.045
Main Channel-0-2	1004	.045	.045	.045
Main Channel-0-2	1003	.045	.045	.045
Main Channel-0-2	1002	.045	.045	.045
Main Channel-0-2	1001	.045	.045	.045
Main Channel-0-2	1000	.045	.045	.045
Main Channel-0	6421.55	.045	.025	.045
Main Channel-0	6320.67	.045	.033	.045
Main Channel-0	6280.5	.045	.033	.045
Main Channel-0	6228.06	Culvert		
Main Channel-0	6182.26	.045	.033	.045
Main Channel-0	6167.82	.045	.033	.045
Main Channel-0	5932.07	.045	.033	.045
Main Channel-0	5689.93	.045	.033	.045
Main Channel-0	5498.04	.045	.033	.045
Main Channel-0	5317.92	.045	.033	.045
Main Channel-0	5162.59	.045	.06	.045
Main Channel-0	5007.63	.045	.06	.045
Main Channel-0	4854.19	.045	.06	.045
Main Channel-0	4700.74	.045	.06	.045
Main Channel-0	4546.95	.045	.06	.045
Main Channel-0	4395.39	.045	.06	.045
Main Channel-0	4243.45	.045	.06	.045
Main Channel-0	4086.97	.045	.06	.045
Main Channel-0	3886.97	.045	.06	.045
Main Channel-0	3735.02	.045	.06	.045
Main Channel-0	3583.08	.045	.06	.045
Main Channel-0	3431.13	.045	.06	.045
Main Channel-0	3279.19	.045	.06	.045
Main Channel-0	3127.24	.045	.06	.045
Main Channel-0	2975.3	.045	.06	.045
Main Channel-0	2823.35	.045	.06	.045
Main Channel-0	2671.4	.045	.06	.045
Main Channel-0	2519.46	.045	.06	.045
Main Channel-0	2367.51	.045	.06	.045
Main Channel-0	2215.57	.045	.06	.045
Main Channel-0	2098	Lat Struct		
Main Channel-0	2063.62	.045	.06	.045
Main Channel-0	1911.67	.045	.06	.045
Main Channel-0	1759.73	.045	.06	.045
Main Channel-0	1607.78	.045	.06	.045
Main Channel-0	1455.84	.045	.06	.045
Main Channel-0	1303.89	.045	.06	.045
Main Channel-0	1151.95	.045	.06	.045
Main Channel-0	1000	.045	.06	.045

SUMMARY OF REACH LENGTHS

River: MS-06

Reach	River Sta.	Left	Channel	Right
Main Channel	1000	24.7	24.7	24.7
Main Channel	999.9	Lat Struct		
Main Channel	999	86.6	86.6	86.6
Main Channel	998.53	Culvert		
Main Channel	998	82.74	82.74	82.74
Main Channel	997	109.75	109.75	109.75
Main Channel	996	103.04	103.04	103.04
Main Channel	995.2	Lat Struct		
Main Channel	995	99.95	99.95	99.95
Main Channel	994	101.07	101.07	101.07
Main Channel	993	198.66	198.66	198.66
Main Channel	992	100.79	100.79	100.79
Main Channel	991	99.55	99.55	99.55
Main Channel	990	100.24	100.24	100.24
Main Channel	989	99.54	99.54	99.54
Main Channel	988	99.8	99.8	99.8
Main Channel	987	101.26	101.26	101.26
Main Channel	986	100.01	100.01	100.01
Main Channel	985	98.95	98.95	98.95
Main Channel	984	116.52	116.52	116.52
Main Channel	983	0	0	0
Overflow 1-DS-0	1007	97.29	97.29	97.29
Overflow 1-DS-0	1006.6	123.93	123.93	123.93
Overflow 1-DS-0	1006	147.13	147.13	147.13
Overflow 1-DS-0	1005	146.6	146.6	146.6
Overflow 1-DS-0	1004	146.6	146.6	146.6
Overflow 1-DS-0	1003	146.6	146.6	146.6
Overflow 1-DS-0	1002	146.61	146.61	146.61
Overflow 1-DS-0	1001	148.42	148.42	148.42
Overflow 1-DS-0	1000	0	0	0
2nd Culvert	1000	30.51	30.51	30.51
2nd Culvert	999	80.49	80.49	80.49
2nd Culvert	998.52	Culvert		
2nd Culvert	998	60.66	60.66	60.66
2nd Culvert	997	91.43	91.43	91.43
2nd Culvert	996	99.23	99.23	99.23
2nd Culvert	995	203.06	203.06	203.06
2nd Culvert	994	297.82	297.82	297.82
2nd Culvert	991	100.37	100.37	100.37
2nd Culvert	990	98.36	98.36	98.36
2nd Culvert	989	98.35	98.35	98.35
2nd Culvert	988	105.21	105.21	105.21
2nd Culvert	987	197.8	197.8	197.8
2nd Culvert	986.3	Lat Struct		
2nd Culvert	985	99.12	99.12	99.12
2nd Culvert	984	101.12	101.12	101.12
2nd Culvert	983	0	0	0

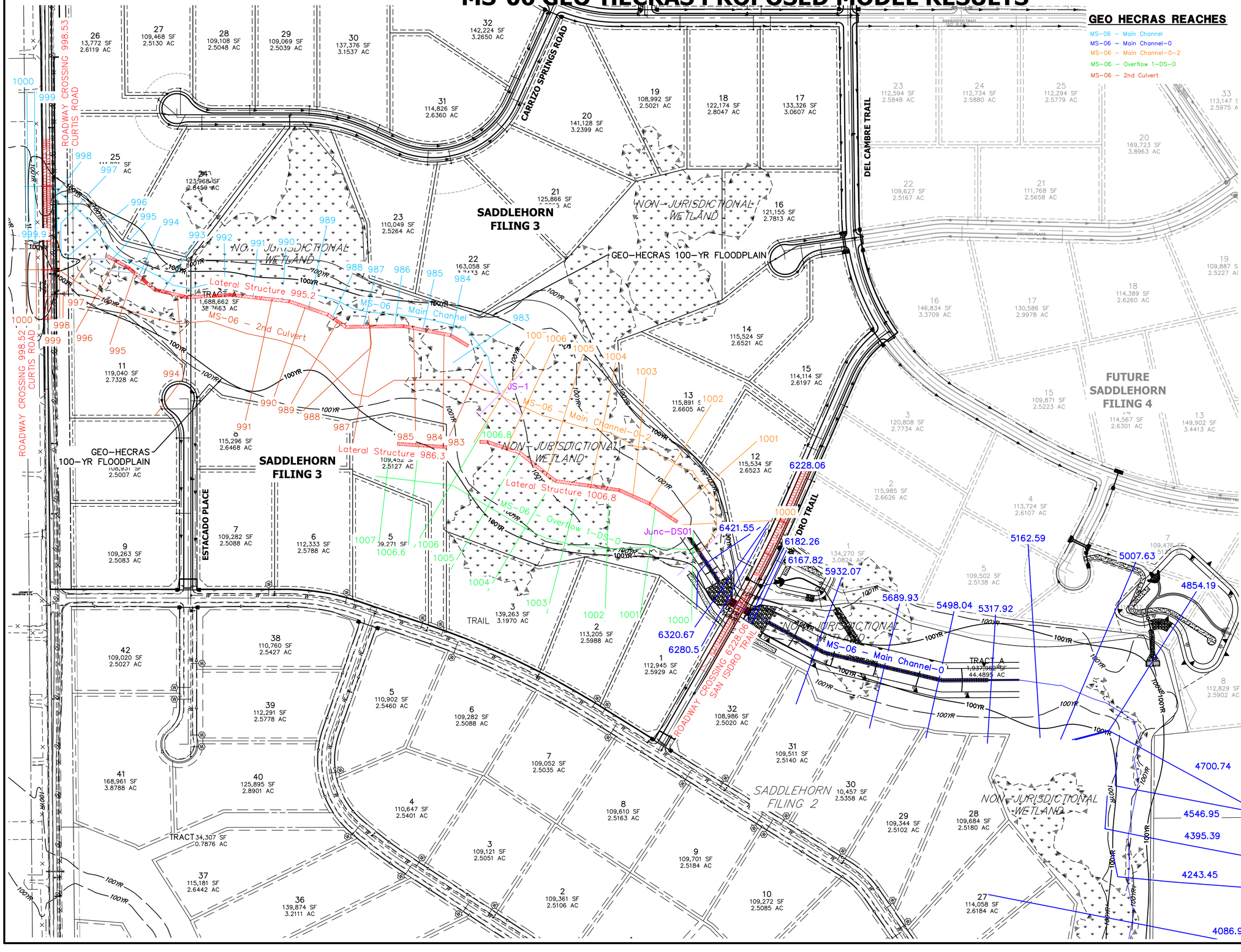
Downstream Ov	1009	151.1	151.1	151.1
Downstream Ov	1008	151.09	151.09	151.09
Downstream Ov	1007	151.1	151.1	151.1
Downstream Ov	1006	151.1	151.1	151.1
Downstream Ov	1005	302.19	302.19	302.19
Downstream Ov	1003	151.1	151.1	151.1
Downstream Ov	1002	151.09	151.09	151.09
Downstream Ov	1001	151.1	151.1	151.1
Downstream Ov	1000	0	0	0
Main Channel-0-2	1007	89.62	89.62	89.62
Main Channel-0-2	1006.8	Lat Struct		
Main Channel-0-2	1006	137.83	137.83	137.83
Main Channel-0-2	1005	137.83	137.83	137.83
Main Channel-0-2	1004	137.83	137.83	137.83
Main Channel-0-2	1003	137.82	137.82	137.82
Main Channel-0-2	1002	137.83	137.83	137.83
Main Channel-0-2	1001	137.83	137.83	137.83
Main Channel-0-2	1000	0	0	0
Main Channel-0	6421.55	100.88	100.88	100.88
Main Channel-0	6320.67	40.18	40.18	40.18
Main Channel-0	6280.5	98.23	98.23	98.23
Main Channel-0	6228.06	Culvert		
Main Channel-0	6182.26	14.45	14.45	14.45
Main Channel-0	6167.82	235.74	235.74	235.74
Main Channel-0	5932.07	242.15	242.15	242.15
Main Channel-0	5689.93	191.89	191.89	191.89
Main Channel-0	5498.04	180.12	180.12	180.12
Main Channel-0	5317.92	155.33	155.33	155.33
Main Channel-0	5162.59	154.96	154.96	154.96
Main Channel-0	5007.63	153.44	153.44	153.44
Main Channel-0	4854.19	153.44	153.44	153.44
Main Channel-0	4700.74	153.79	153.79	153.79
Main Channel-0	4546.95	151.57	151.57	151.57
Main Channel-0	4395.39	151.93	151.93	151.93
Main Channel-0	4243.45	156.48	156.48	156.48
Main Channel-0	4086.97	200	200	200
Main Channel-0	3886.97	151.95	151.95	151.95
Main Channel-0	3735.02	151.94	151.94	151.94
Main Channel-0	3583.08	151.95	151.95	151.95
Main Channel-0	3431.13	151.94	151.94	151.94
Main Channel-0	3279.19	151.95	151.95	151.95
Main Channel-0	3127.24	151.94	151.94	151.94
Main Channel-0	2975.3	151.95	151.95	151.95
Main Channel-0	2823.35	151.95	151.95	151.95
Main Channel-0	2671.4	151.94	151.94	151.94
Main Channel-0	2519.46	151.95	151.95	151.95
Main Channel-0	2367.51	151.94	151.94	151.94
Main Channel-0	2215.57	151.95	151.95	151.95
Main Channel-0	2098	Lat Struct		
Main Channel-0	2063.62	151.95	151.95	151.95
Main Channel-0	1911.67	151.94	151.94	151.94
Main Channel-0	1759.73	151.95	151.95	151.95
Main Channel-0	1607.78	151.94	151.94	151.94
Main Channel-0	1455.84	151.95	151.95	151.95
Main Channel-0	1303.89	151.94	151.94	151.94
Main Channel-0	1151.95	151.95	151.95	151.95
Main Channel-0	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: MS-06

Reach	River Sta.	Contr.	Expan.
Main Channel	1000	.1	.3
Main Channel	999.9	Lat Struct	
Main Channel	999	.1	.3
Main Channel	998.53	Culvert	
Main Channel	998	.1	.3
Main Channel	997	.1	.3
Main Channel	996	.1	.3
Main Channel	995.2	Lat Struct	
Main Channel	995	.1	.3
Main Channel	994	.1	.3
Main Channel	993	.1	.3
Main Channel	992	.1	.3
Main Channel	991	.1	.3
Main Channel	990	.1	.3
Main Channel	989	.1	.3
Main Channel	988	.1	.3
Main Channel	987	.1	.3
Main Channel	986	.1	.3
Main Channel	985	.1	.3
Main Channel	984	.1	.3
Main Channel	983	.1	.3
Overflow 1-DS-0	1007	.1	.3
Overflow 1-DS-0	1006.6	.1	.3
Overflow 1-DS-0	1006	.1	.3
Overflow 1-DS-0	1005	.1	.3
Overflow 1-DS-0	1004	.1	.3
Overflow 1-DS-0	1003	.1	.3
Overflow 1-DS-0	1002	.1	.3
Overflow 1-DS-0	1001	.1	.3
Overflow 1-DS-0	1000	.1	.3
2nd Culvert	1000	.1	.3
2nd Culvert	999	.1	.3
2nd Culvert	998.52	Culvert	
2nd Culvert	998	.1	.3
2nd Culvert	997	.1	.3
2nd Culvert	996	.1	.3
2nd Culvert	995	.1	.3
2nd Culvert	994	.1	.3
2nd Culvert	991	.1	.3
2nd Culvert	990	.1	.3
2nd Culvert	989	.1	.3
2nd Culvert	988	.1	.3
2nd Culvert	987	.1	.3
2nd Culvert	986.3	Lat Struct	
2nd Culvert	985	.1	.3
2nd Culvert	984	.1	.3
2nd Culvert	983	.1	.3
Downstream Ov	1009	.1	.3
Downstream Ov	1008	.1	.3
Downstream Ov	1007	.1	.3
Downstream Ov	1006	.1	.3
Downstream Ov	1005	.1	.3
Downstream Ov	1003	.1	.3
Downstream Ov	1002	.1	.3
Downstream Ov	1001	.1	.3
Downstream Ov	1000	.1	.3
Main Channel-0-2	1007	.1	.3
Main Channel-0-2	1006.8	Lat Struct	
Main Channel-0-2	1006	.1	.3
Main Channel-0-2	1005	.1	.3
Main Channel-0-2	1004	.1	.3
Main Channel-0-2	1003	.1	.3
Main Channel-0-2	1002	.1	.3
Main Channel-0-2	1001	.1	.3
Main Channel-0-2	1000	.1	.3
Main Channel-0	6421.55	.1	.3
Main Channel-0	6320.67	.1	.3
Main Channel-0	6280.5	.1	.3
Main Channel-0	6228.06	Culvert	
Main Channel-0	6182.26	.1	.3
Main Channel-0	6167.82	.1	.3
Main Channel-0	5932.07	.1	.3
Main Channel-0	5689.93	.1	.3
Main Channel-0	5498.04	.1	.3
Main Channel-0	5317.92	.1	.3
Main Channel-0	5162.59	.1	.3
Main Channel-0	5007.63	.1	.3
Main Channel-0	4854.19	.1	.3
Main Channel-0	4700.74	.1	.3
Main Channel-0	4546.95	.1	.3
Main Channel-0	4395.39	.1	.3
Main Channel-0	4243.45	.1	.3
Main Channel-0	4086.97	.1	.3
Main Channel-0	3886.97	.1	.3
Main Channel-0	3735.02	.1	.3
Main Channel-0	3583.08	.1	.3
Main Channel-0	3431.13	.1	.3
Main Channel-0	3279.19	.1	.3
Main Channel-0	3127.24	.1	.3
Main Channel-0	2975.3	.1	.3
Main Channel-0	2823.35	.1	.3
Main Channel-0	2671.4	.1	.3
Main Channel-0	2519.46	.1	.3
Main Channel-0	2367.51	.1	.3
Main Channel-0	2215.57	.1	.3
Main Channel-0	2098	Lat Struct	
Main Channel-0	2063.62	.1	.3
Main Channel-0	1911.67	.1	.3
Main Channel-0	1759.73	.1	.3
Main Channel-0	1607.78	.1	.3
Main Channel-0	1455.84	.1	.3
Main Channel-0	1303.89	.1	.3
Main Channel-0	1151.95	.1	.3
Main Channel-0	1000	.1	.3

SADDLEHORN FILING 3

MS-06 GEO-HECRAS PROPOSED MODEL RESULTS



GEO HECRAS REACHES

- MS-06 – Main Channel
- MS-06 – Main Channel-0
- MS-06 – Main Channel-0-2
- MS-06 – Overflow 1-DS-0
- MS-06 – 2nd Culvert

GEO HECRAS DATA

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)	Froude # Chl
Main Channel	1000	505	6765.9	6768.13	1.05	0.15
	999	486.12	6765.4	6768.12	0.81	0.1
	998	486.12	6764	6765.41	2.91	0.56
	997	486.12	6763.48	6764.56	2.56	0.56
	996	486.12	6762.4	6763.92	1.81	0.29
	995	474.21	6761.5	6763.42	3.12	0.55
	994	413.73	6760.3	6762.01	4.34	0.82
	993	353.31	6758.7	6760.31	4.27	0.68
	992	287.87	6756.1	6757.33	3.94	0.77
	991	251.38	6754.3	6755.49	4.13	0.75
	990	227.11	6753	6754.24	3.1	0.56
	989	219.27	6751.9	6752.85	3.64	0.8
	988	217.94	6750.1	6751.07	3.18	0.67
	987	218.2	6748.2	6749.27	3.67	0.8
	986	218.2	6746.2	6747.42	3.35	0.69
	985	215.7	6744.8	6745.93	3.22	0.66
	984	210.81	6743.5	6744.7	2.68	0.57
	983	202.32	6742.1	6742.63	3.3	1
Overflow 1-DS-0	1007	0	6745.24	6745.02		0
	1006.6	0	6743.4	6743.42	0	0.01
	1006	0	6740.87	6740.22		0
	1005	31.98	6737.8	6738.13	1.4	0.59
	1004	35.6	6735.5	6735.93	1.39	0.5
	1003	35.6	6733.7	6734.17	1.51	0.51
	1002	35.6	6731.5	6732.21	1.81	0.58
	1001	36.2	6728.3	6728.81	2.96	1.01
	1000	36.2	6722.9	6724.1	0.85	0.2
2nd Culvert	1000	0	6765.7	6766.02	0	0
	999	18.88	6765.2	6766.02	0.13	0.03
	998	18.88	6763.1	6763.42	1.28	0.68
	997	18.88	6762.1	6762.28	0.98	0.43
	996	38.77	6761.2	6761.59	1	0.34
	995	76.38	6760.2	6760.81	1.68	0.55
	994	164.79	6757.3	6758.35	2.17	0.53
	991	270.9	6753.9	6754.53	2.21	0.64
	990	284.89	6752	6752.94	2.38	0.62
	989	287.06	6750.2	6750.86	3.58	0.92
	988	286.8	6747.82	6749.07	1.82	0.43
	987	286.8	6747.5	6748.18	2.35	0.57
	985	288.5	6744.9	6745.31	2.27	0.68
	984	292.47	6743.3	6743.84	1.99	0.53
	983	302.68	6741.3	6741.98	3.86	1
Main Channel-0-2	1007	505	6740	6740.87	2.35	0.51
	1006	486.37	6738.7	6739.72	2.94	0.72
	1005	469.4	6736.6	6737.4	2.2	0.6
	1004	469.4	6733.8	6734.73	3.54	0.86
	1003	469.01	6730.8	6732.27	2.72	0.54
	1002	468.8	6729.3	6730.2	4.15	0.9
	1001	468.8	6725	6727.94	3.08	0.49
	1000	468.8	6724.2	6726.1	5.42	0.99
PROPOSED CROSSING SECTIONS	6421.55	505	6721.4	6723.65	3.31	0.54
	6320.67	505	6720.2	6723.61	1.49	0.17
	6280.5	505	6719.9	6723.6	2.29	0.26
	6182.26	505	6719.3	6721.6	8.46	0.98
	6167.82	505	6719.1	6720.92	4.4	0.67
	5932.07	505	6717.5	6719.68	5.08	0.87
	5689.93	505	6716.1	6718.33	4.33	0.75
Main Channel-0	5498.04	505	6714.9	6717.06	4.09	0.97
	5317.92	505	6713.8	6715.13	3.98	0.99
	5162.59	505	6712.5	6713.42	1.96	0.38
	5007.63	505	6710.6	6711.71	2.61	0.52
	4854.19	505	6708.4	6710.39	1.35	0.22
	4700.74	505	6706.7	6709.73	2.4	0.43
	4546.95	505	6704.9	6708.42	2.76	0.39
	4395.39	505	6704.1	6707.53	2.51	0.33
	4243.45	505	6704.1	6706.62	2.45	0.4
	4086.97	505	6702.5	6705	3.09	0.51

150 75 0 150 300

ORIGINAL SCALE: 1" = 150'

MS-06 GEO-HECRAS PROPOSED MODEL RESULTS
SADDLEHORN FILING 3
JOB NO. 25142.05
04/24/23
SHEET 1 OF 1

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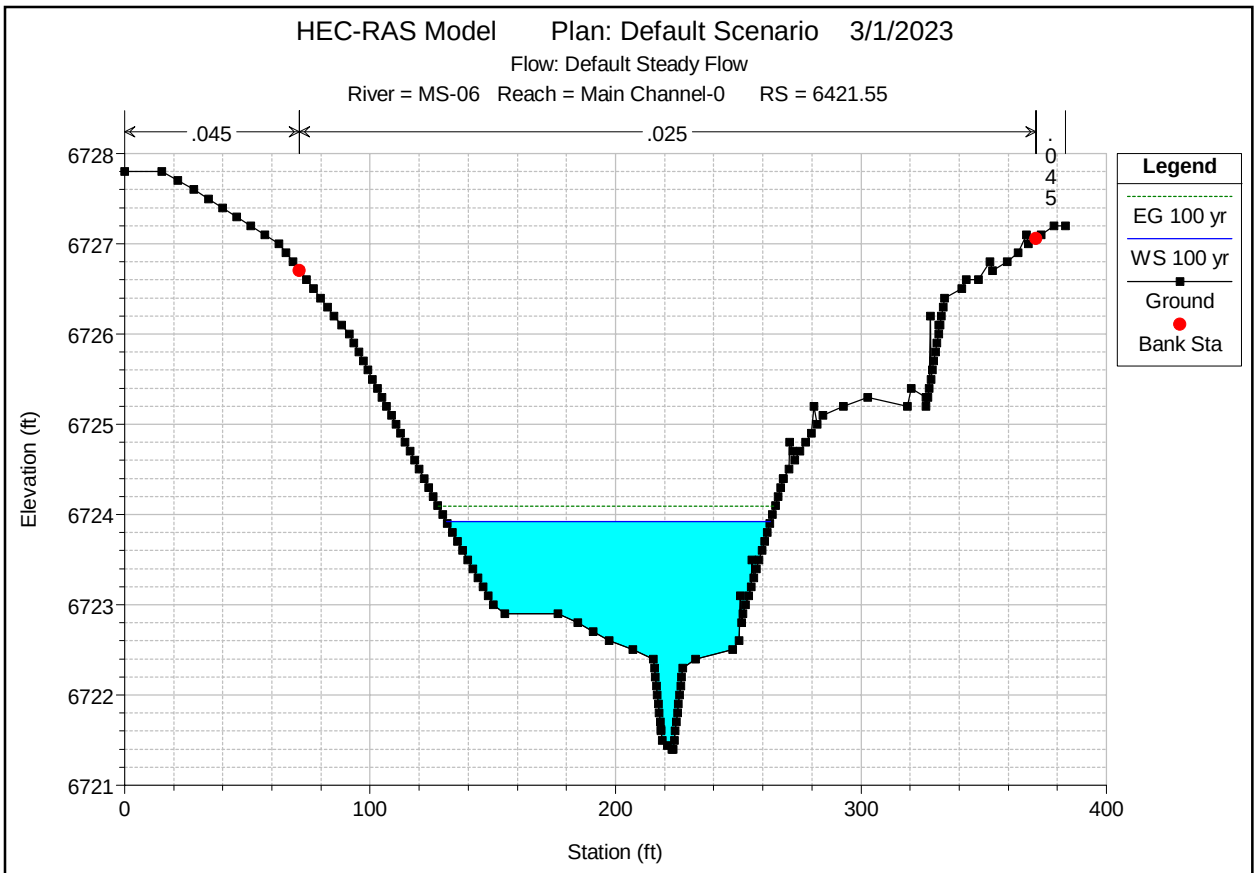
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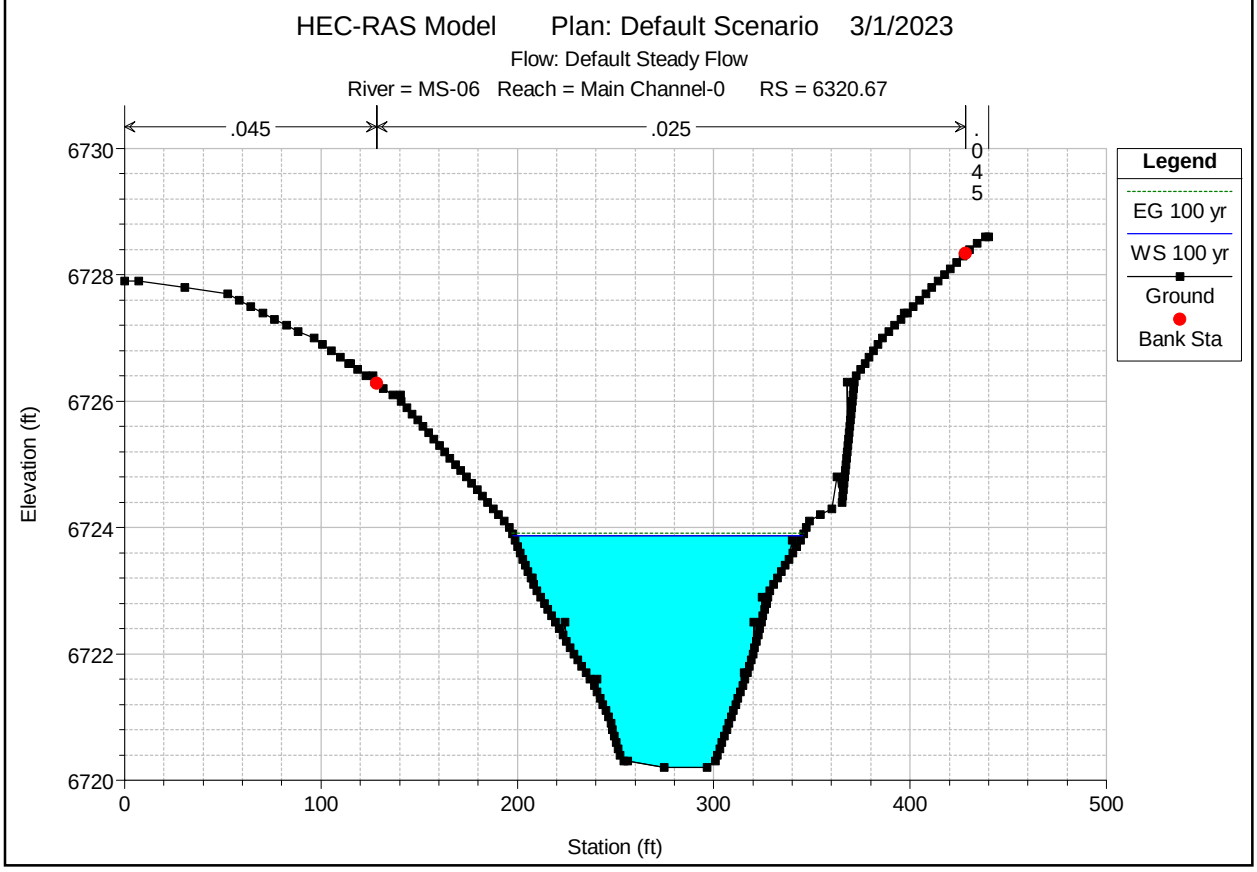
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6421.55
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
6728
6727
6726
6725
6724
6723
6722
6721
0
100
200
300
400
Station (ft)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.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
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6728
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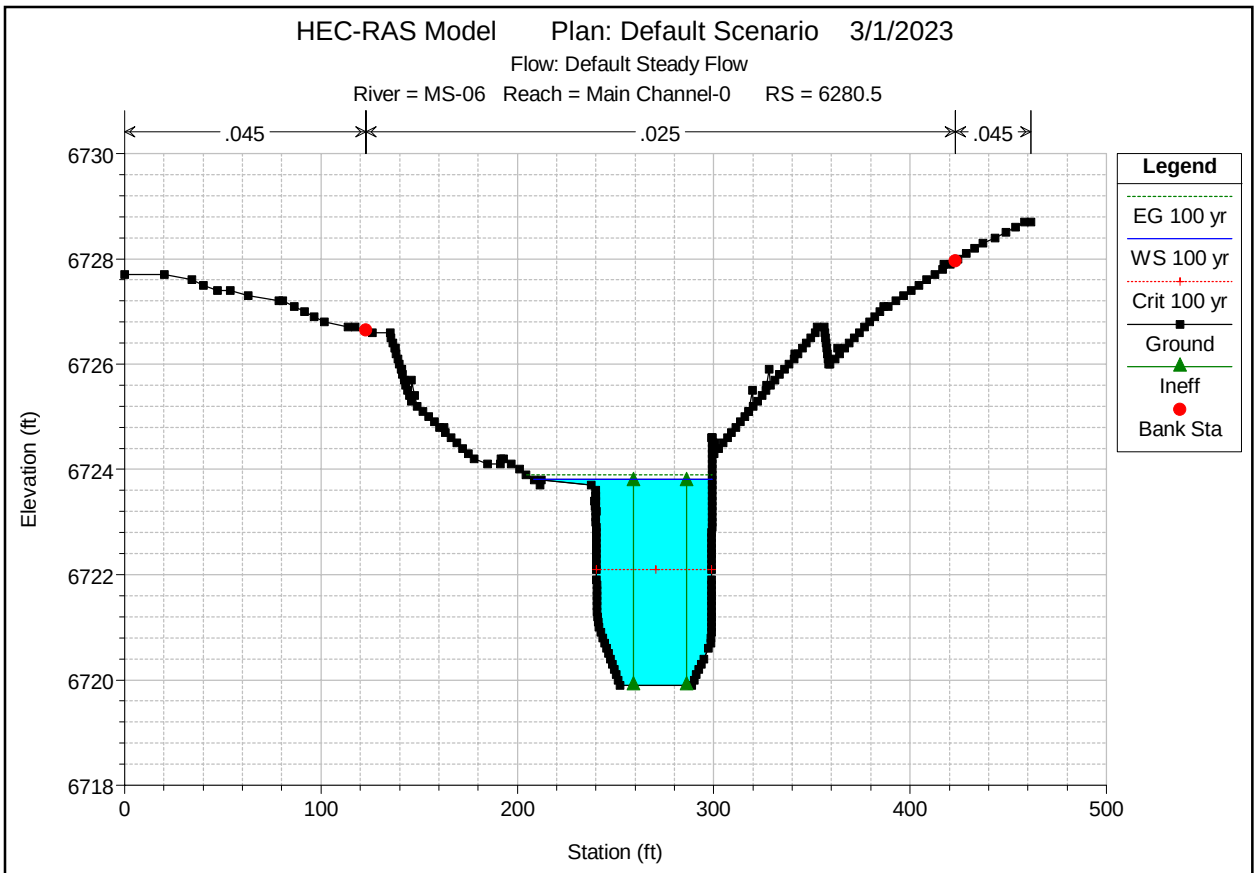
6724
6722
6720
0
100
200
300
400
500
Station (ft)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.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
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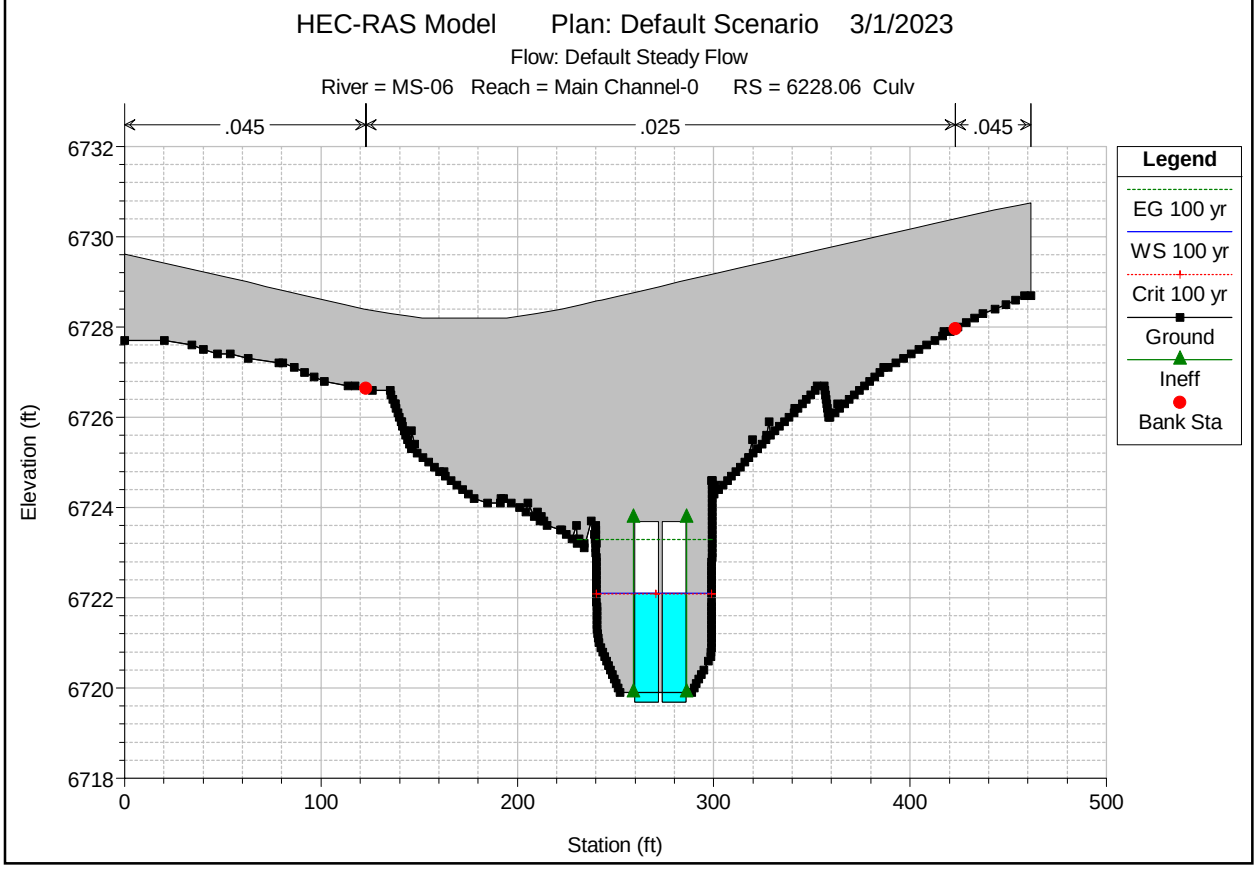
6720
6718
0
100
200
300
400
500
Station (ft)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Flow: Default Steady Flow
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.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
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6726
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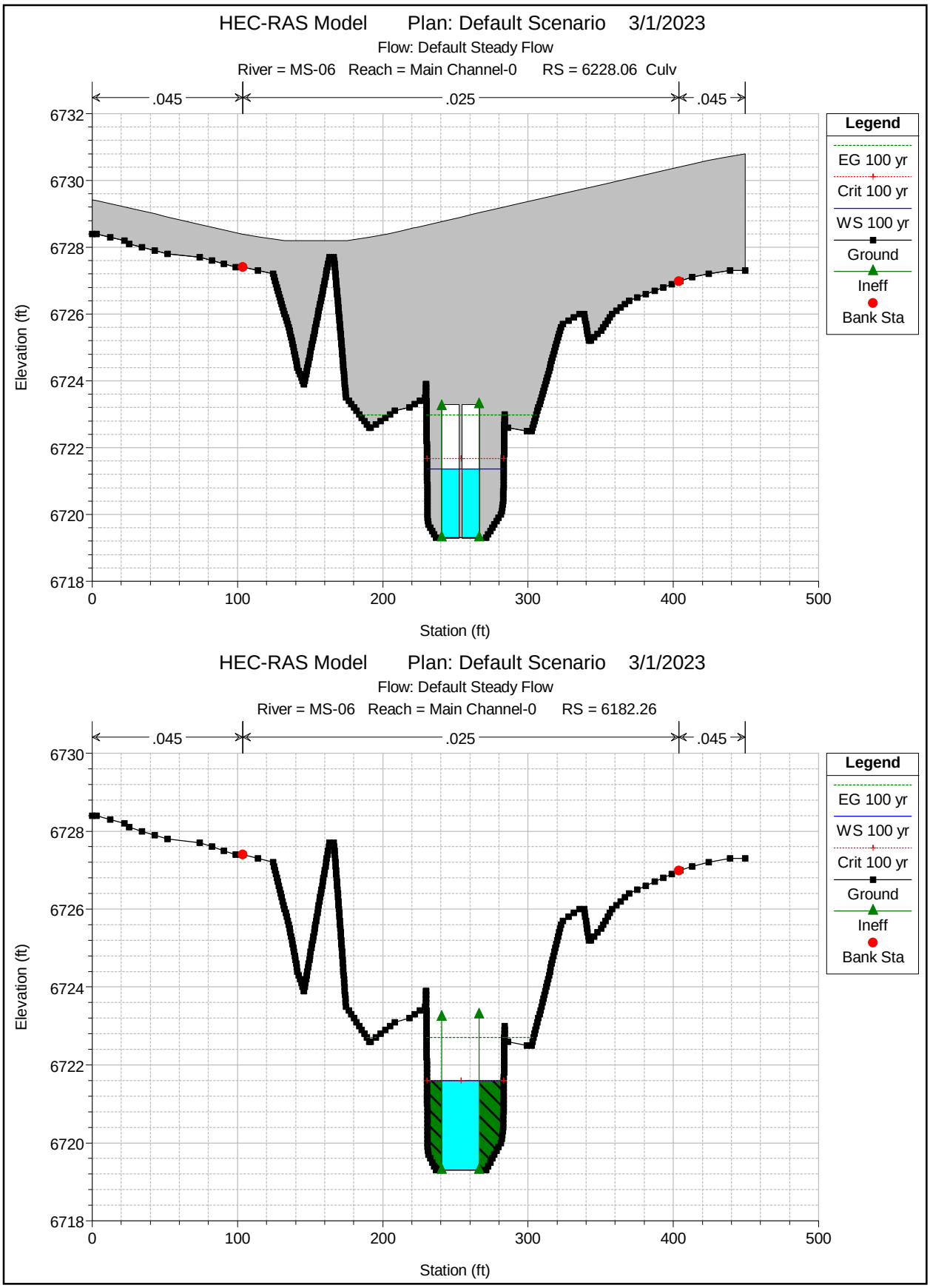
6722
6720
6718
0
100
200
300
400
500
Station (ft)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Flow: Default Steady Flow
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.025
.045
Legend
EG 100 yr
Crit 100 yr
WS 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
6732
6730
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)
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Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6182.26
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.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
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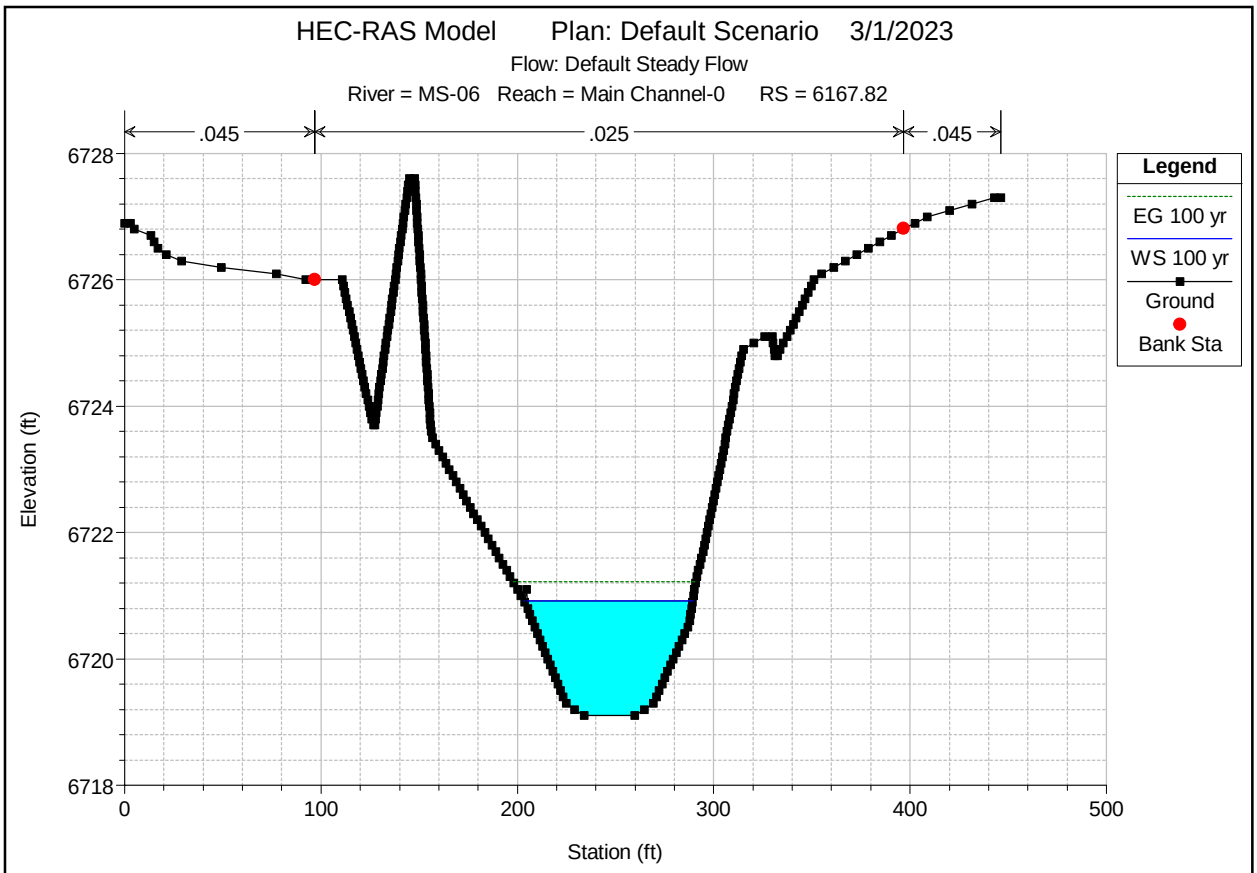
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)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.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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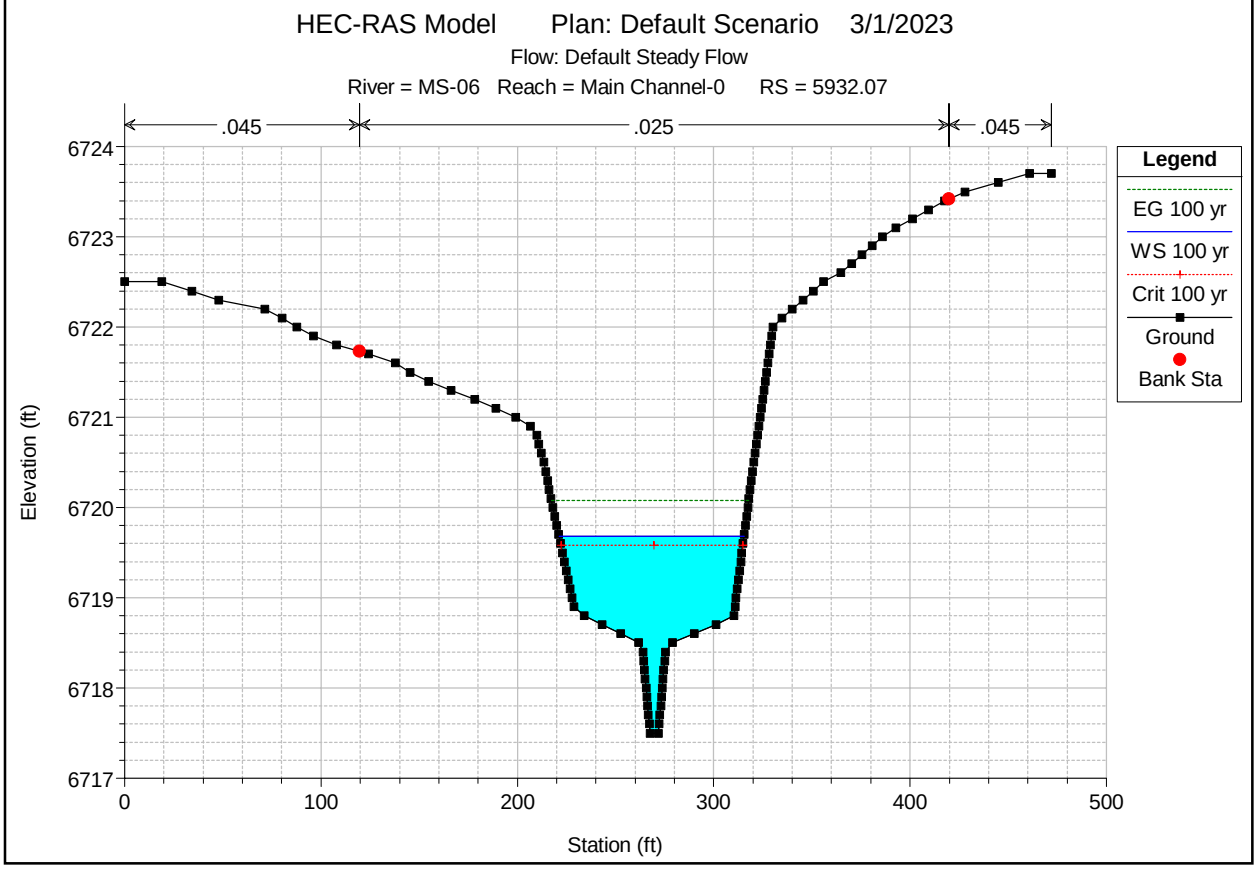
6724
6722
6720
6718
0
100
200
300
400
500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.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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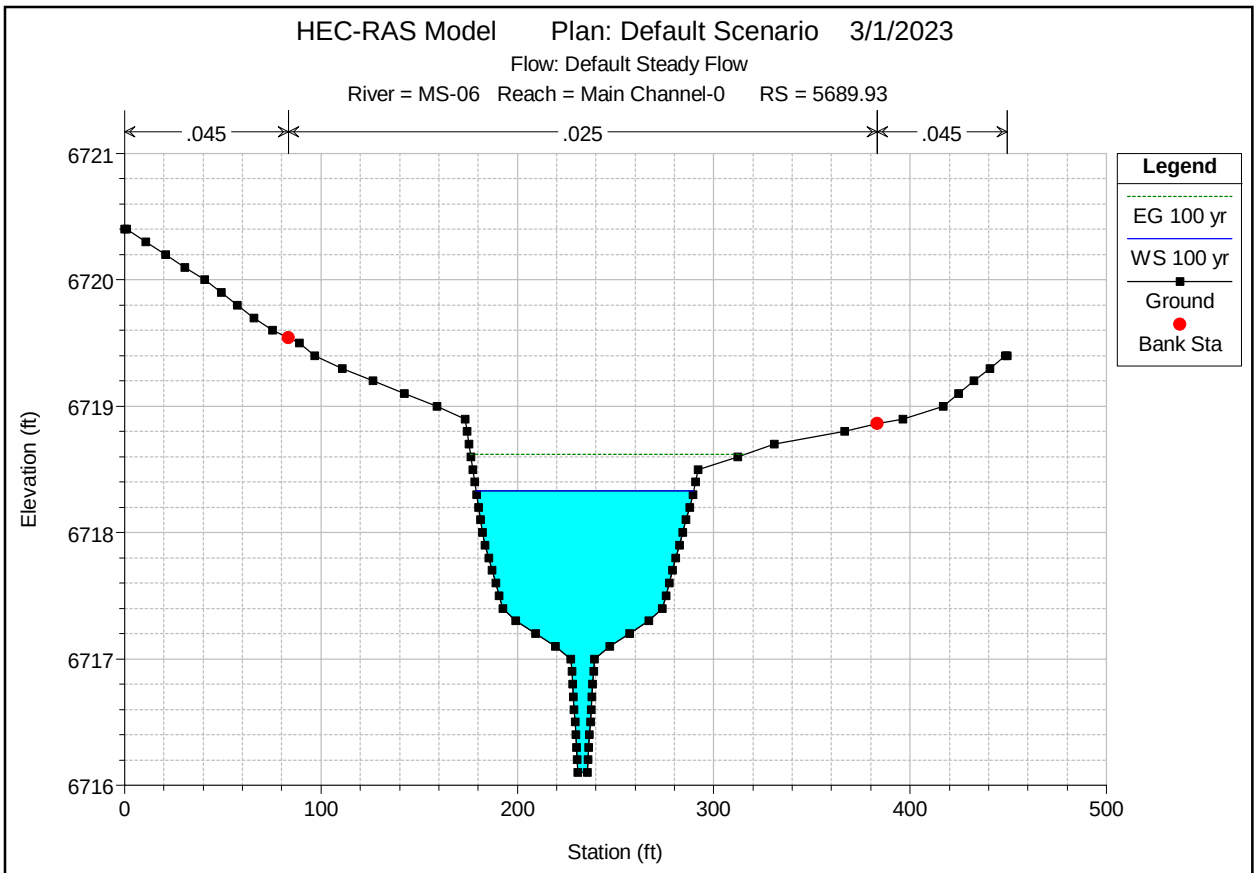
6723
6722
6721
6720
6719
6718
6717
0
100
200
300
400
500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.025
.045
Legend
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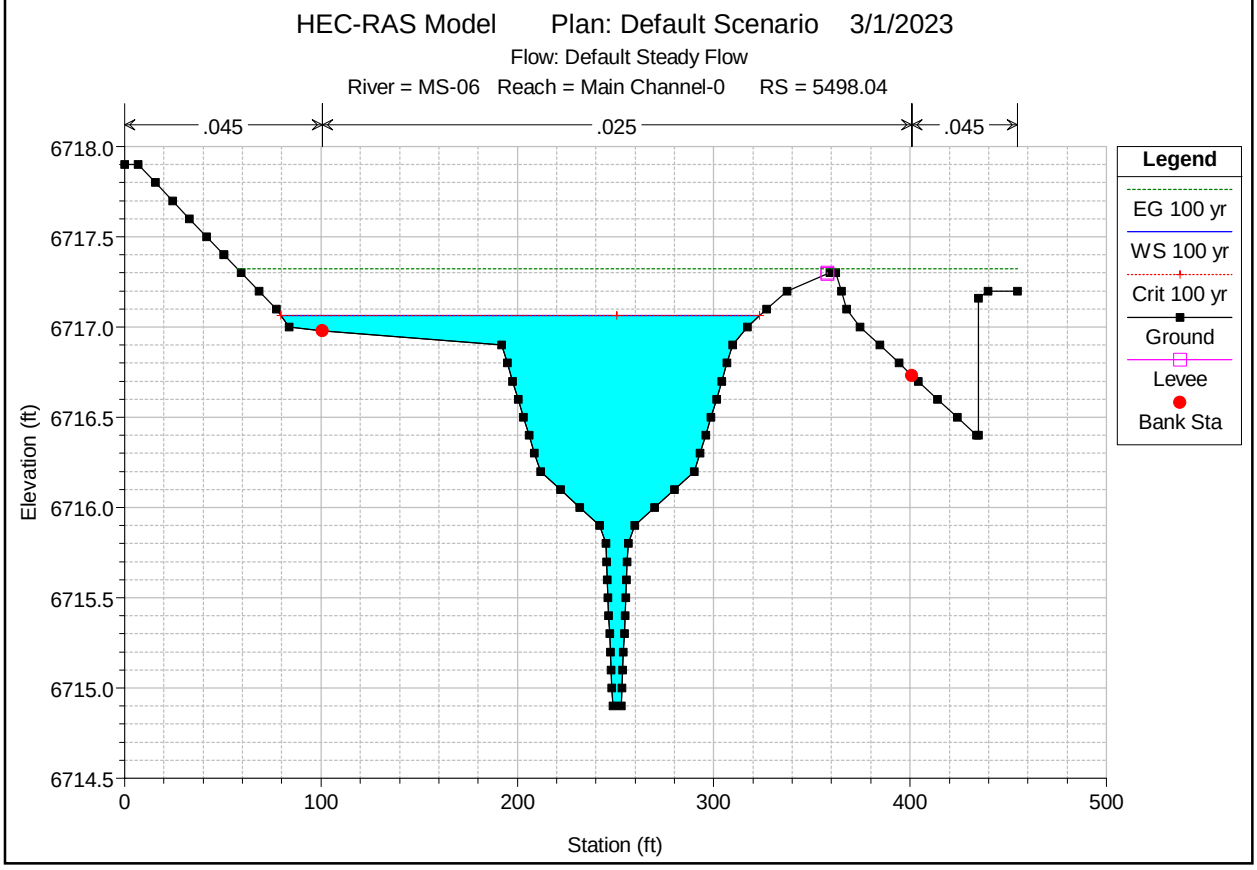
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)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Flow: Default Steady Flow
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.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX D

WATER QUALITY AND DETENTION CALCULATIONS

Pond Summary Table

Pond C

Tributary Sub-basin	Area (acres)	Percent Impervious
C1	6.04	13.1%
C2	3.35	23.6%
C3	23.44	8.9%
C4	10.94	18.3%
C5	2.35	19.9%
C6	3.95	21.8%
C7	2.14	24.3%
C8	22.55	10.0%
C9	2.63	35.4%
C10	16.38	11.5%
OS1	2.37	57.8%
OS2	0.70	31.4%
Total	96.84	14.4%

Pond D

Tributary Sub-basin	Area (acres)	Percent Impervious
D1	9.11	28.1%
D2	8.49	13.0%
D3	3.21	8.5%
D4	10.01	6.9%
D5	9.56	17.5%
D6	0.34	45.0%
D7	33.94	14.7%
OS3	2.28	60.0%
OS4	1.08	54.6%
Total	78.02	17.2%

Pond E

Tributary Sub-basin	Area (acres)	Percent Impervious
E1	17.12	7.0%
E2	0.37	45.0%
E3	0.20	45.0%
E4	0.68	3.2%
Total	18.37	8.1%

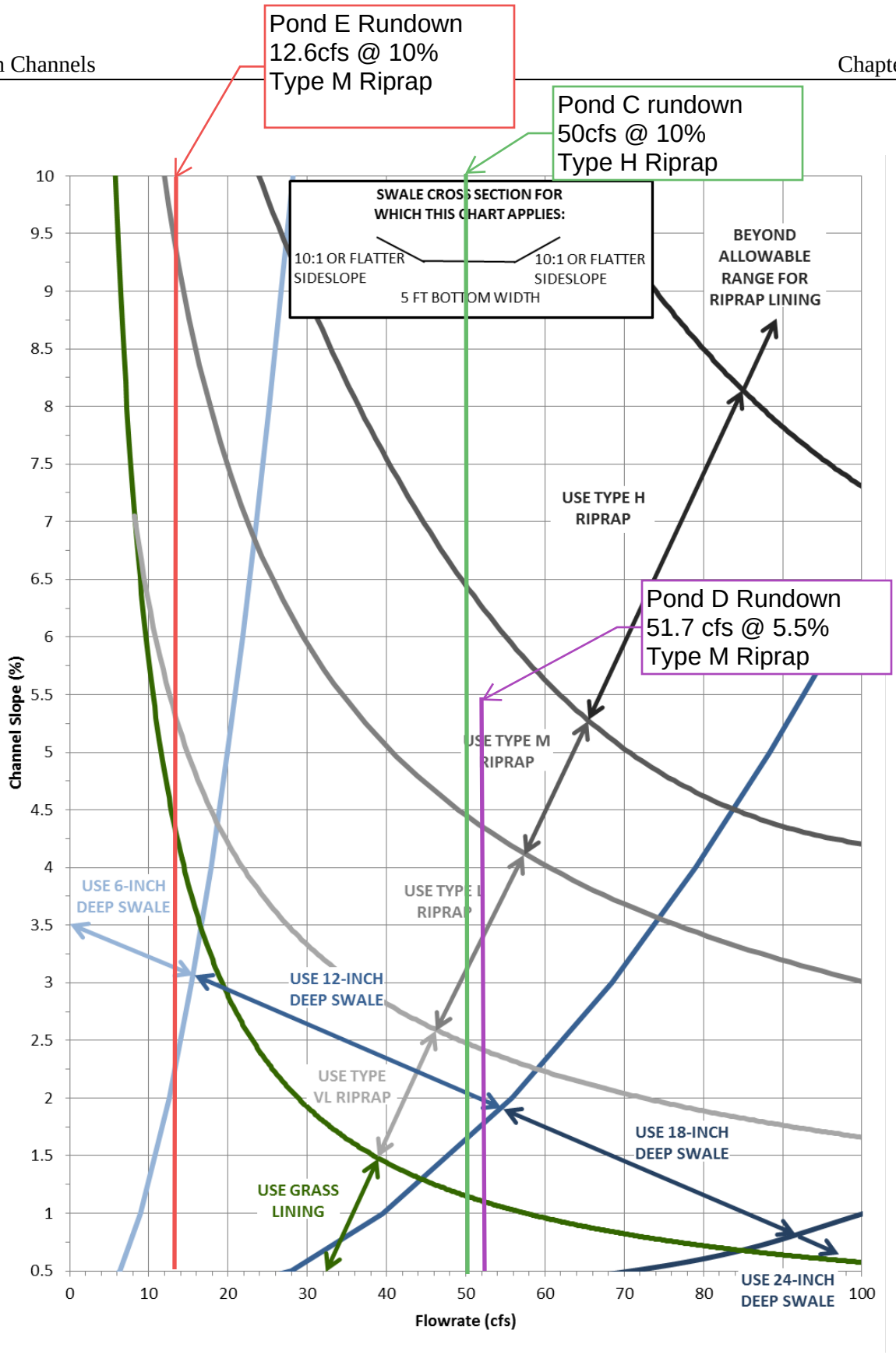


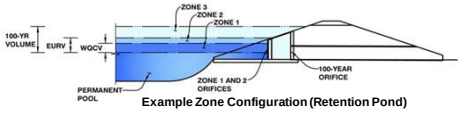
Figure 8-25. Swale stability chart: greater than 4-foot bottom width and 10:1 (or flatter) side slopes
(Note: Riprap classifications refer to gradation for riprap used in soil riprap or void-filled riprap. See Figure 8-34 for gradations.) (Source: Muller Engineering Company)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond C



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	96.84	acres
Watershed Length =	5,370	ft
Watershed Length to Centroid =	1,383	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	14.60%	percent
Percentage Hydrologic Soil Group A =	93.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	7.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.737	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.159	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.711	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.074	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.450	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	3.279	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.653	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.705	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	11.187	acre-feet	inches
Approximate 2-yr Detention Volume =	0.724	acre-feet	
Approximate 5-yr Detention Volume =	1.034	acre-feet	
Approximate 10-yr Detention Volume =	1.331	acre-feet	
Approximate 25-yr Detention Volume =	1.735	acre-feet	
Approximate 50-yr Detention Volume =	2.136	acre-feet	
Approximate 100-yr Detention Volume =	3.064	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.737	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.422	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.906	acre-feet
Total Detention Basin Volume =	3.064	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

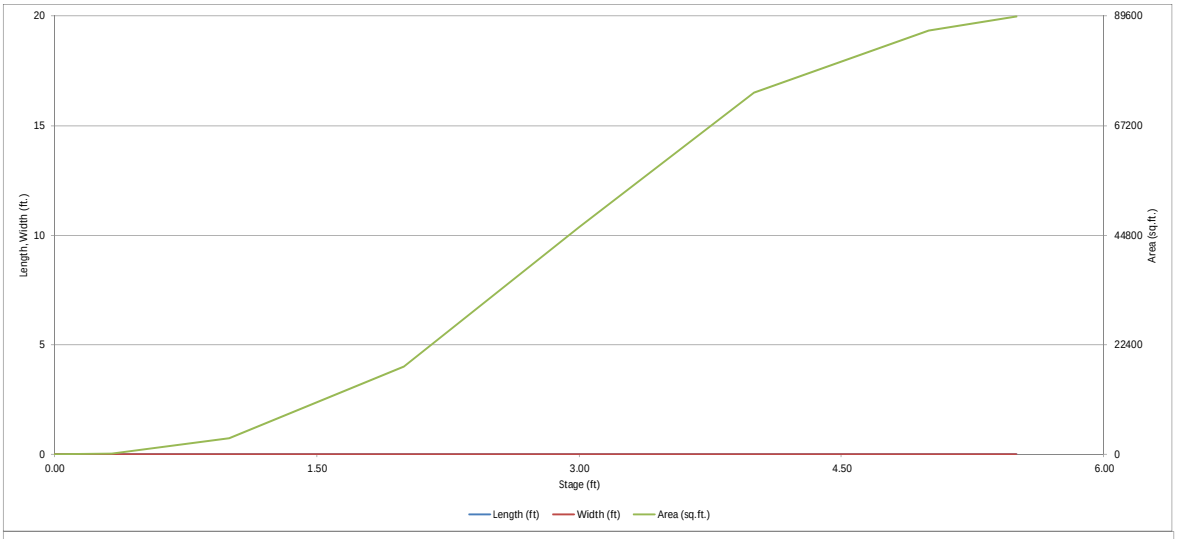
Depth Increment = ft

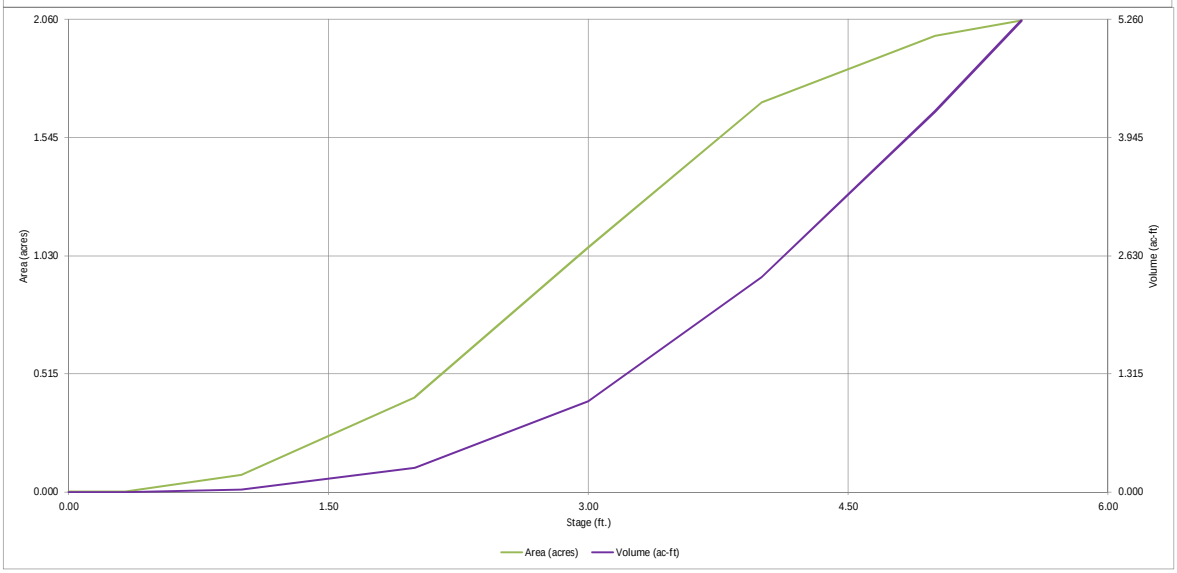
6710.67

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	32	0.001		
6711	--	0.33	--	--	--	50	0.001	14	0.000
6712	--	1.00	--	--	--	3,260	0.075	1,122	0.026
6713	--	2.00	--	--	--	17,980	0.413	11,742	0.270
6714	--	3.00	--	--	--	46,439	1.066	43,952	1.009
6715	--	4.00	--	--	--	73,964	1.698	104,153	2.391
6716	--	5.00	--	--	--	86,681	1.990	184,476	4.235
6716.5	--	5.50	--	--	--	89,520	2.055	228,526	5.246

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



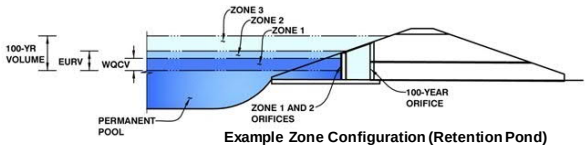


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.73	0.737	Orifice Plate
Zone 2 (EURV)	3.14	0.422	Orifice Plate
Zone 3 (100-year)	4.39	1.906	Weir&Pipe (Restrict)
Total (all zones)		3.064	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.694E-02	ft²
Depth at top of Zone using Orifice Plate =	3.14	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.44	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.91	1.82					
Orifice Area (sq. inches)	2.44	2.44	2.44					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.17	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.17	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	4.25	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	20.88	N/A	ft²
Overflow Grate Type =	Type C Grate	Type C Grate		Overflow Grate Open Area w/ Debris =	20.88	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.39	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91	N/A	ft²
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.25	N/A	feet
Restrictor Plate Height Above Pipe Invert =	30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.47	feet
Spillway Crest Length =	60.00	feet	Stage at Top of Freeboard =	5.80	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.06	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.25	acre-ft

Calculated Parameters for Spillway

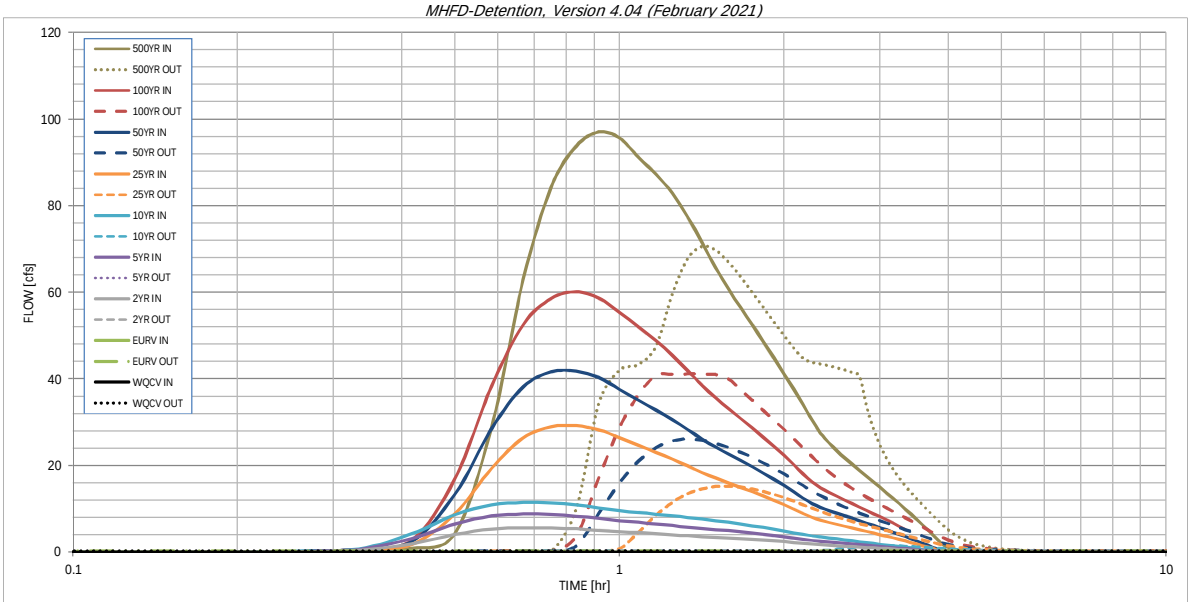
Routed Hydrograph Results

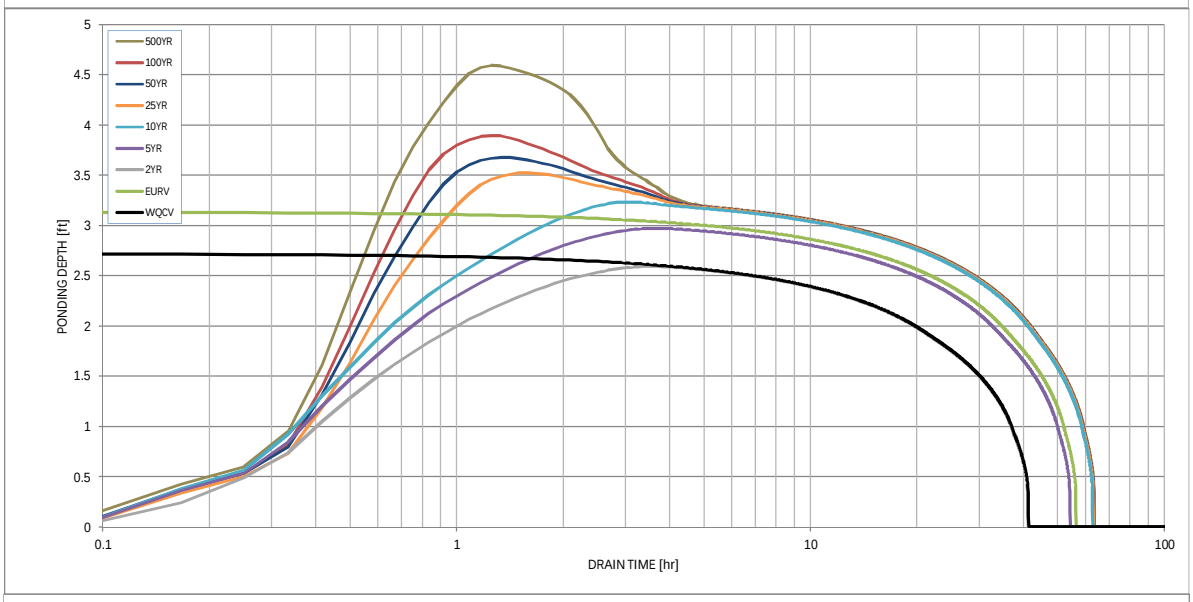
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

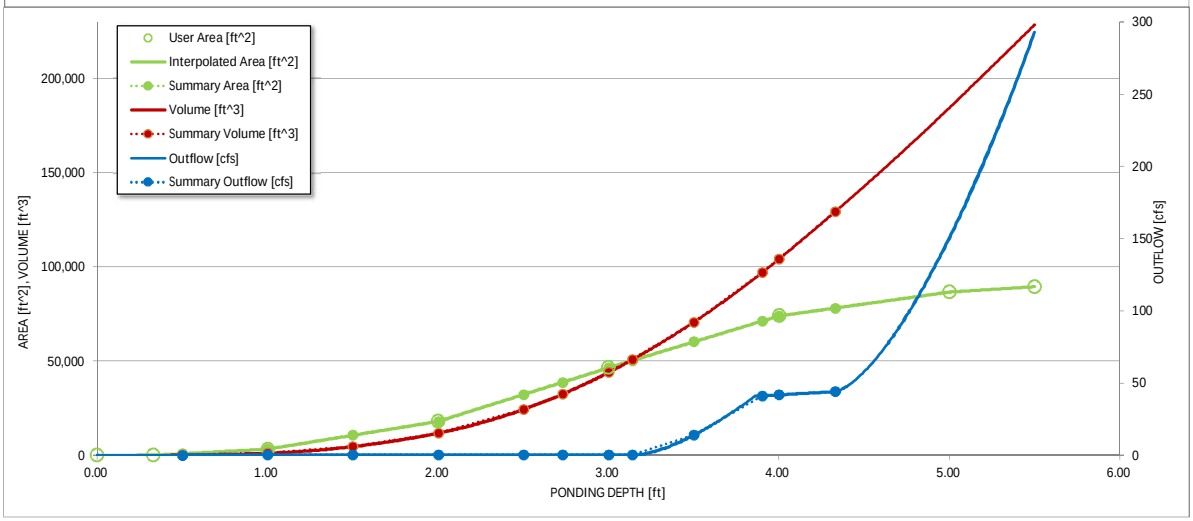
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.737	1.159	0.711	1.074	1.450	3.279	4.653	6.705	11.187
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.711	1.074	1.450	3.279	4.653	6.705	11.187
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	1.0	1.4	17.2	29.1	46.2	81.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.01	0.18	0.30	0.48	0.84
Peak Inflow Q (cfs) =	N/A	N/A	5.7	8.8	11.5	29.2	41.8	60.2	97.1
Peak Outflow Q (cfs) =	0.3	0.4	0.3	0.3	1.5	15.3	26.2	41.2	70.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.1	0.9	0.9	0.9	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.7	1.2	2.0	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	51	38	49	57	53	50	46	39
Time to Drain 99% of Inflow Volume (hours) =	40	54	40	52	60	58	57	55	52
Maximum Ponding Depth (ft) =	2.73	3.14	2.59	2.97	3.23	3.52	3.68	3.90	4.60
Area at Maximum Ponding Depth (acres) =	0.89	1.15	0.80	1.05	1.21	1.39	1.49	1.63	1.87
Maximum Volume Stored (acre-ft) =	0.745	1.164	0.627	0.977	1.271	1.649	1.865	2.208	3.444

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04
	0:15:00	0.00	0.00	0.10	0.17	0.21	0.14	0.19	0.18	0.30
	0:20:00	0.00	0.00	0.49	0.68	0.82	0.53	0.64	0.66	0.91
	0:25:00	0.00	0.00	1.97	3.17	4.25	1.80	2.42	2.78	4.35
	0:30:00	0.00	0.00	4.09	6.54	8.67	8.92	13.39	17.00	28.89
	0:35:00	0.00	0.00	5.34	8.37	10.93	19.40	28.58	38.34	63.01
	0:40:00	0.00	0.00	5.67	8.81	11.51	26.43	38.22	52.58	84.28
	0:45:00	0.00	0.00	5.63	8.71	11.43	28.97	41.67	58.62	93.78
	0:50:00	0.00	0.00	5.41	8.36	10.97	29.22	41.84	60.17	97.06
	0:55:00	0.00	0.00	5.09	7.81	10.24	28.29	40.33	58.73	95.68
	1:00:00	0.00	0.00	4.78	7.31	9.62	26.48	37.63	55.34	91.22
	1:05:00	0.00	0.00	4.53	6.90	9.18	24.70	35.08	52.05	87.27
	1:10:00	0.00	0.00	4.30	6.53	8.80	23.10	32.81	48.89	82.89
	1:15:00	0.00	0.00	4.05	6.16	8.46	21.54	30.61	45.46	77.40
	1:20:00	0.00	0.00	3.80	5.77	8.05	19.95	28.35	41.94	71.50
	1:25:00	0.00	0.00	3.60	5.48	7.67	18.40	26.11	38.52	65.69
	1:30:00	0.00	0.00	3.45	5.23	7.28	17.12	24.29	35.66	60.79
	1:35:00	0.00	0.00	3.29	4.98	6.89	16.01	22.68	33.19	56.44
	1:40:00	0.00	0.00	3.14	4.72	6.50	14.98	21.19	30.91	52.44
	1:45:00	0.00	0.00	2.98	4.45	6.11	13.97	19.72	28.72	48.62
	1:50:00	0.00	0.00	2.83	4.16	5.72	12.98	18.28	26.58	44.92
	1:55:00	0.00	0.00	2.66	3.88	5.34	12.00	16.85	24.45	41.27
	2:00:00	0.00	0.00	2.46	3.59	4.94	11.02	15.43	22.36	37.68
	2:05:00	0.00	0.00	2.25	3.28	4.51	10.01	13.99	20.25	34.12
	2:10:00	0.00	0.00	2.04	2.97	4.09	8.98	12.52	18.13	30.57
	2:15:00	0.00	0.00	1.88	2.75	3.78	8.07	11.25	16.28	27.54
	2:20:00	0.00	0.00	1.75	2.56	3.53	7.40	10.34	14.92	25.29
	2:25:00	0.00	0.00	1.63	2.39	3.28	6.89	9.63	13.86	23.44
	2:30:00	0.00	0.00	1.52	2.22	3.05	6.43	9.00	12.92	21.80
	2:35:00	0.00	0.00	1.41	2.06	2.83	6.01	8.41	12.06	20.29
	2:40:00	0.00	0.00	1.30	1.91	2.62	5.60	7.83	11.24	18.86
	2:45:00	0.00	0.00	1.20	1.77	2.41	5.20	7.27	10.44	17.49
	2:50:00	0.00	0.00	1.11	1.62	2.21	4.81	6.73	9.67	16.20
	2:55:00	0.00	0.00	1.02	1.49	2.03	4.44	6.20	8.92	14.95
	3:00:00	0.00	0.00	0.93	1.36	1.85	4.07	5.67	8.18	13.71
	3:05:00	0.00	0.00	0.84	1.23	1.67	3.70	5.16	7.44	12.48
	3:10:00	0.00	0.00	0.75	1.10	1.50	3.33	4.64	6.71	11.26
	3:15:00	0.00	0.00	0.67	0.97	1.33	2.97	4.13	5.97	10.03
	3:20:00	0.00	0.00	0.59	0.85	1.17	2.61	3.62	5.24	8.81
	3:25:00	0.00	0.00	0.51	0.73	1.00	2.25	3.11	4.51	7.60
	3:30:00	0.00	0.00	0.43	0.61	0.84	1.89	2.61	3.79	6.38
	3:35:00	0.00	0.00	0.35	0.49	0.68	1.54	2.10	3.06	5.17
	3:40:00	0.00	0.00	0.27	0.38	0.53	1.19	1.60	2.34	3.96
	3:45:00	0.00	0.00	0.20	0.27	0.39	0.85	1.12	1.63	2.78
	3:50:00	0.00	0.00	0.16	0.21	0.30	0.53	0.66	0.96	1.70
	3:55:00	0.00	0.00	0.13	0.17	0.25	0.33	0.41	0.58	1.10
	4:00:00	0.00	0.00	0.11	0.15	0.21	0.23	0.29	0.39	0.75
	4:05:00	0.00	0.00	0.10	0.13	0.18	0.18	0.22	0.27	0.52
	4:10:00	0.00	0.00	0.08	0.11	0.16	0.14	0.17	0.20	0.35
	4:15:00	0.00	0.00	0.07	0.09	0.13	0.11	0.14	0.14	0.24
	4:20:00	0.00	0.00	0.06	0.08	0.11	0.09	0.11	0.10	0.15
	4:25:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.10
	4:30:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.06	0.08
	4:35:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	4:40:00	0.00	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.05
	4:45:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	4:50:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	4:55:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	5:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	5:05:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.50	864	0.020	91	0.002	0.06
	1.00	3,260	0.075	1,122	0.026	0.11
	1.50	10,620	0.244	4,592	0.105	0.16
	2.00	17,980	0.413	11,742	0.270	0.24
	2.50	32,209	0.739	24,289	0.558	0.30
WQCV	2.73	38,755	0.890	32,450	0.745	0.32
	3.00	46,439	1.066	43,952	1.009	0.35
EURV	3.14	50,292	1.155	50,723	1.164	0.36
	3.50	60,201	1.382	70,612	1.621	13.83
100-YR	3.90	71,211	1.635	96,894	2.224	41.21
	4.00	73,964	1.698	104,153	2.391	41.88
Spillway	4.33	78,161	1.794	129,254	2.967	44.03

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

POND C FOREBAY VOLUME REQUIREMENTS

Equation 3-1 $WQCV = a(0.91I^3 - 1.19I^2 + 0.781I)$

a=1 (40 hour drain time)

PROPOSED FOREBAY	*I=.153*	*WQCV=*	0.094743
FUTURE FOREBAY	*I=.115*	*WQCV=*	0.075346

Equation 3-3 $V=(WQCV/12)A$

PROPOSED FOREBAY	A= 80.46 Acres	V=	0.611
FUTURE FOREBAY	A= 16.38 Acres	V=	0.103

3% OF WQCV

FOREBAY TOTAL VOLUME= .03(V)

VOLUME REQUIRED FOR PROPOSED FOREBAY =	0.018	AC-FT	798 CF
VOLUME REQUIRED FOR FUTURE FOREBAY=	0.003	AC-FT	134 CF
VOLUME PROVIDED FOR PROPOSED FOREBAY =	0.023	AC-FT	993 CF

Q_{100} DISCHARGES	2% OF Q_{100}
Q_{100} PROPOSED FOREBAY=	.02*50.0 CFS= 1.00 CFS
Q_{100} FUTURE FOREBAY=	.02*14.3 CFS= 0.29 CFS

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond C Forebay 1 Notch

V-Notch Weir

Crest	= Sharp
Angle (Deg)	= 15
Total Depth (ft)	= 2.50

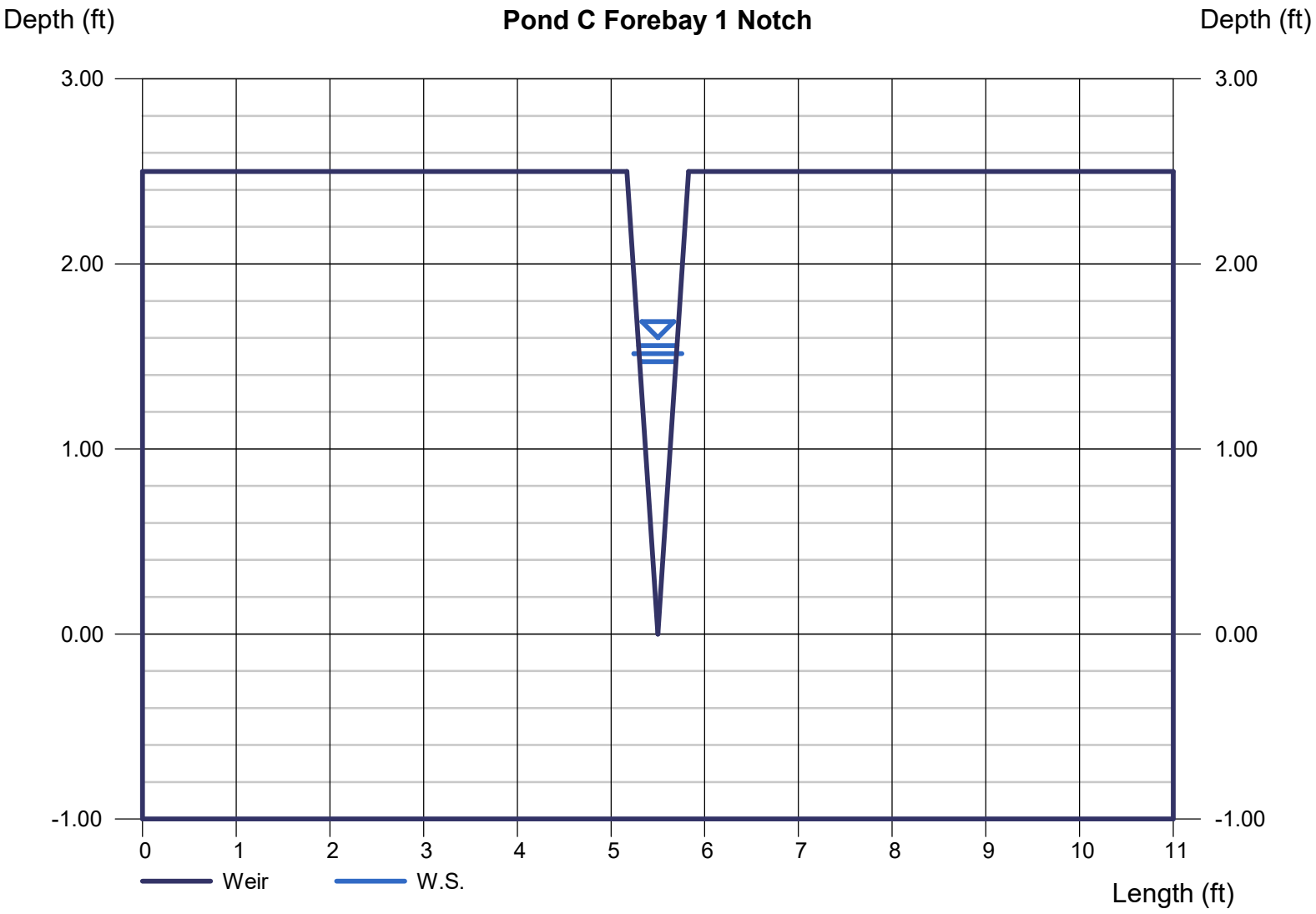
Calculations

Weir Coeff. Cw	= 0.33
Compute by:	Known Q
Known Q (cfs)	= 1.00

Highlighted

Depth (ft)	= 1.56
Q (cfs)	= 1.000
Area (sqft)	= 0.32
Velocity (ft/s)	= 3.13
Top Width (ft)	= 0.41

Unresolved:
Forebays have a max depth of 18", notch depth cannot exceed forebay depth



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond C Trickle Channel

Rectangular

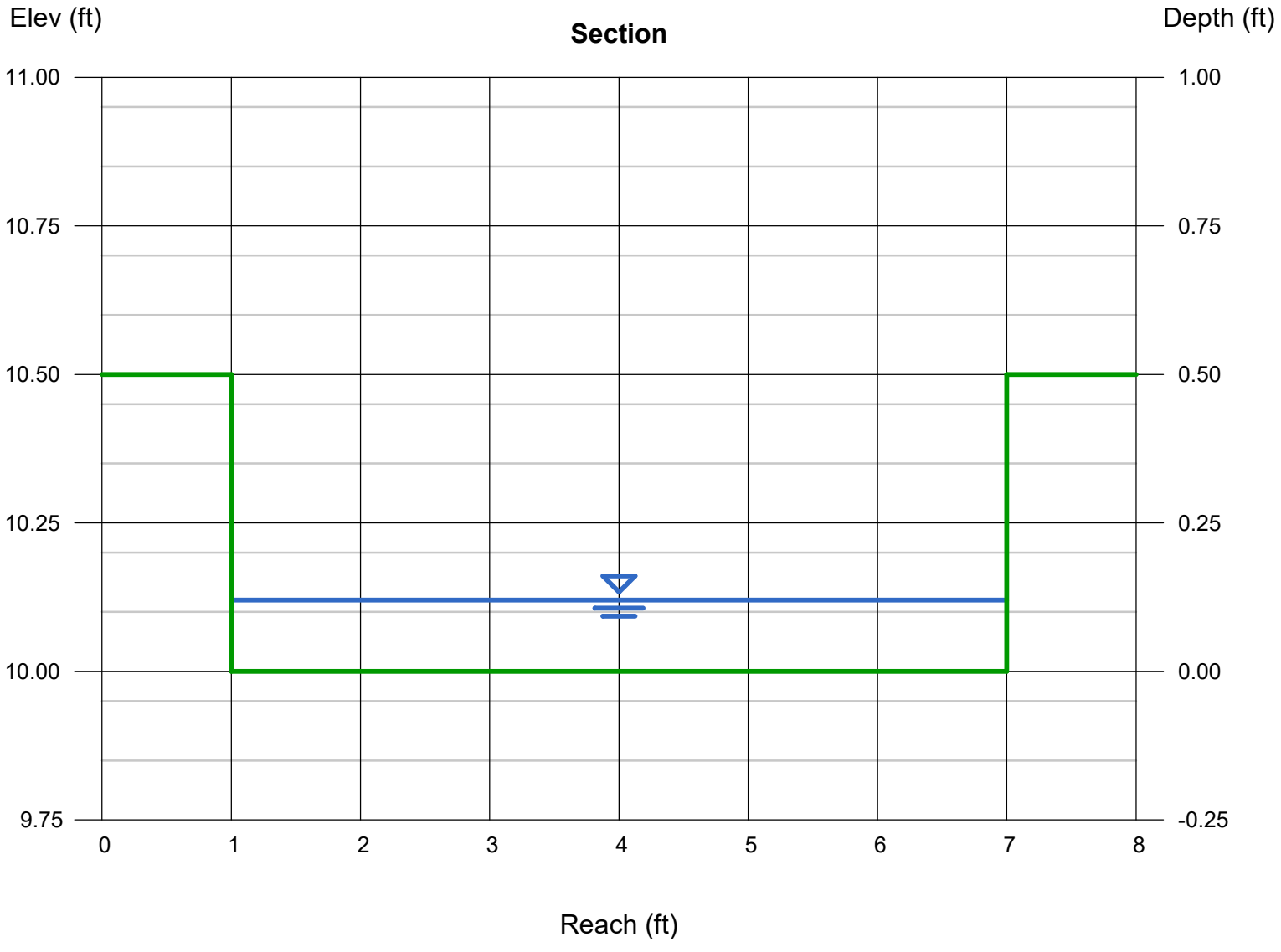
Bottom Width (ft)	= 6.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.29

Highlighted

Depth (ft)	= 0.12
Q (cfs)	= 1.290
Area (sqft)	= 0.72
Velocity (ft/s)	= 1.79
Wetted Perim (ft)	= 6.24
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 6.00
EGL (ft)	= 0.17



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

Pond C Spillway

Trapezoidal Weir

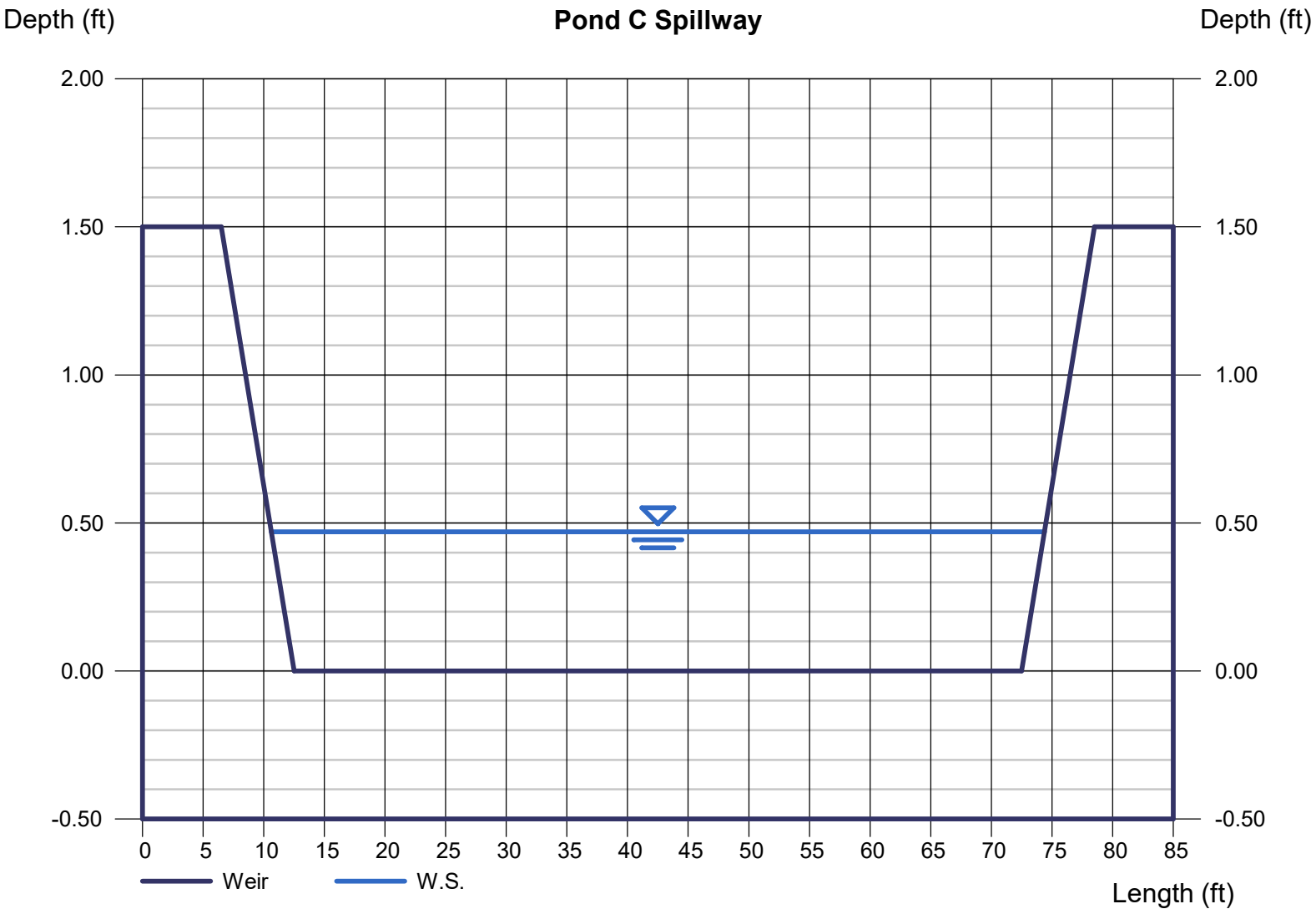
Crest	= Sharp
Bottom Length (ft)	= 60.00
Total Depth (ft)	= 1.50
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 60.20

Highlighted

Depth (ft)	= 0.47
Q (cfs)	= 60.20
Area (sqft)	= 29.08
Velocity (ft/s)	= 2.07
Top Width (ft)	= 63.76

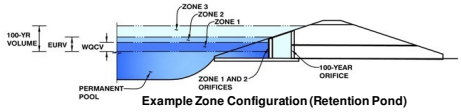


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond D



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	78.02	acres
Watershed Length =	3,473	ft
Watershed Length to Centroid =	970	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	17.20%	percent
Percentage Hydrologic Soil Group A =	70.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	30.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.673 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.153 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.875 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.354 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.302 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.114 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.422 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.551 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	11.394 acre-feet		inches
Approximate 2-yr Detention Volume =	0.784 acre-feet		
Approximate 5-yr Detention Volume =	1.236 acre-feet		
Approximate 10-yr Detention Volume =	1.554 acre-feet		
Approximate 25-yr Detention Volume =	1.939 acre-feet		
Approximate 50-yr Detention Volume =	2.232 acre-feet		
Approximate 100-yr Detention Volume =	3.026 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.673	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.480	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.873	acre-feet
Total Detention Basin Volume =	3.026	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

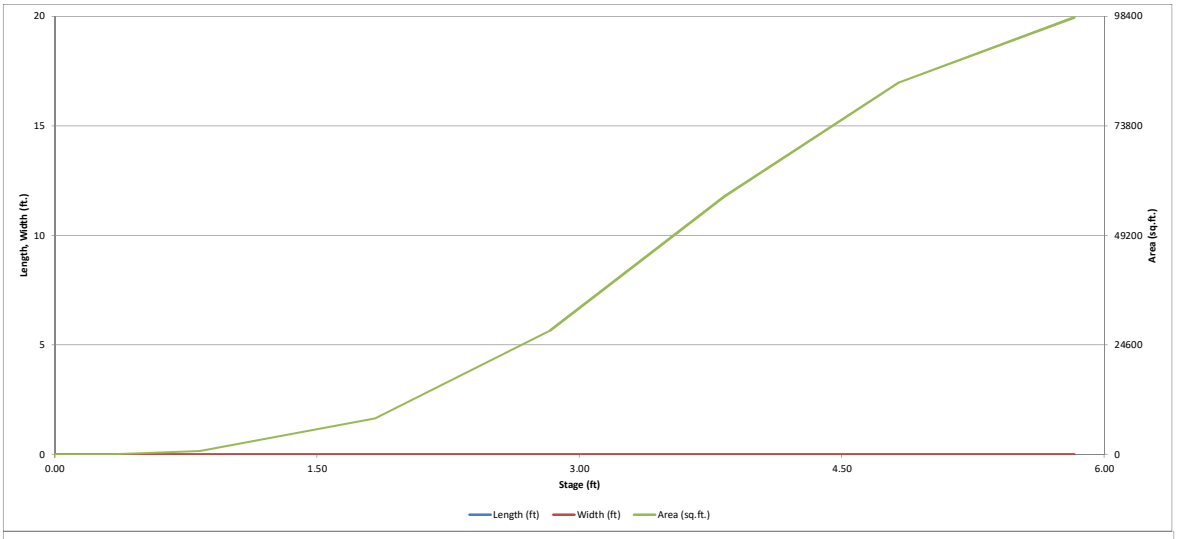
6709.17

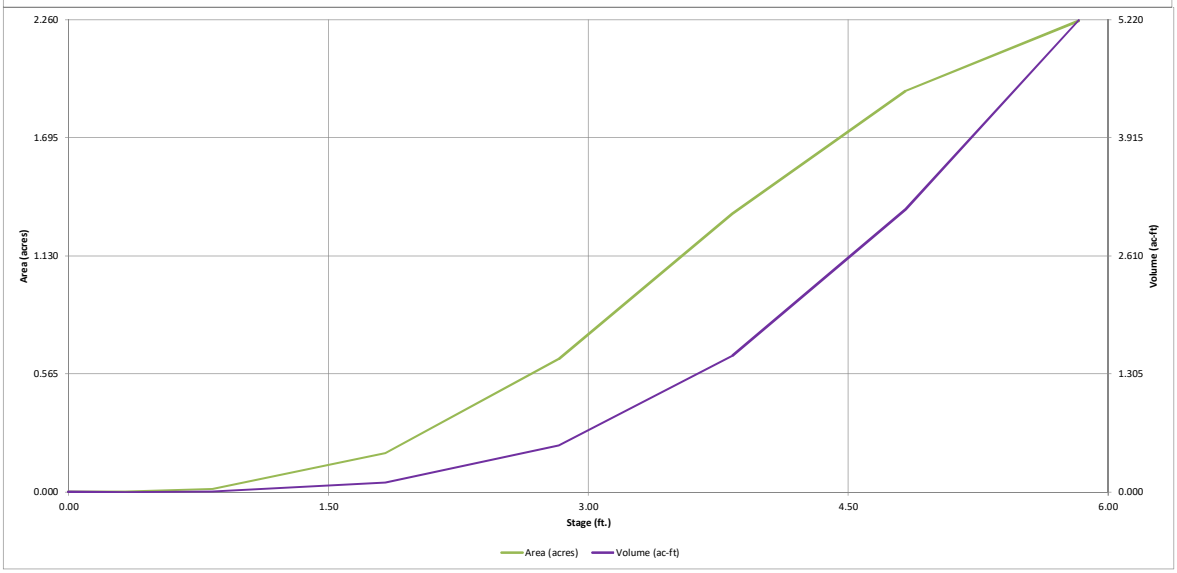
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	32	0.001		
6709.5	--	0.33	--	--	--	50	0.001	14	0.000
6710	--	0.83	--	--	--	699	0.016	201	0.005
6711	--	1.83	--	--	--	8,089	0.186	4,595	0.105
6712	--	2.83	--	--	--	27,770	0.638	22,524	0.517
6713	--	3.83	--	--	--	58,037	1.332	65,427	1.502
6714	--	4.83	--	--	--	83,546	1.918	136,219	3.127
6715	--	5.83	--	--	--	98,172	2.254	227,078	5.213

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



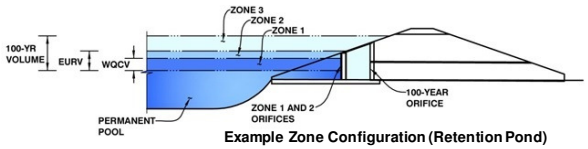


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Saddlehorn Filing 3**

Basin ID: **Pond D**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.05	0.673	Orifice Plate
Zone 2 (EURV)	3.55	0.480	Orifice Plate
Zone 3 (100-year)	4.78	1.873	Weir&Pipe (Restrict)
Total (all zones)		3.026	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.55	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.40					
Orifice Area (sq. inches)	2.25	2.25	2.25					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.55	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.55	N/A	feet
Overflow Weir Front Edge Length =	12.00	N/A	feet	Overflow Weir Slope Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.91	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	41.76	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	41.76	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.40	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.07	N/A	ft²
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.50	N/A	feet
Restrictor Plate Height Above Pipe Invert =	36.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.49	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	5.82	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.25	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.19	acre-ft

Calculated Parameters for Spillway

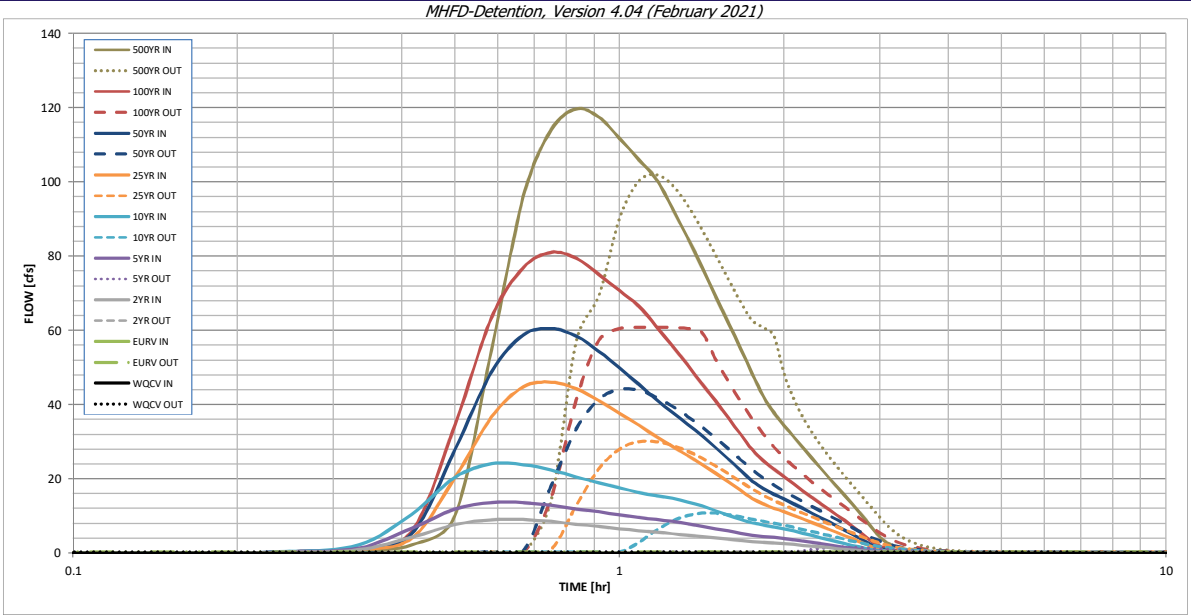
Routed Hydrograph Results

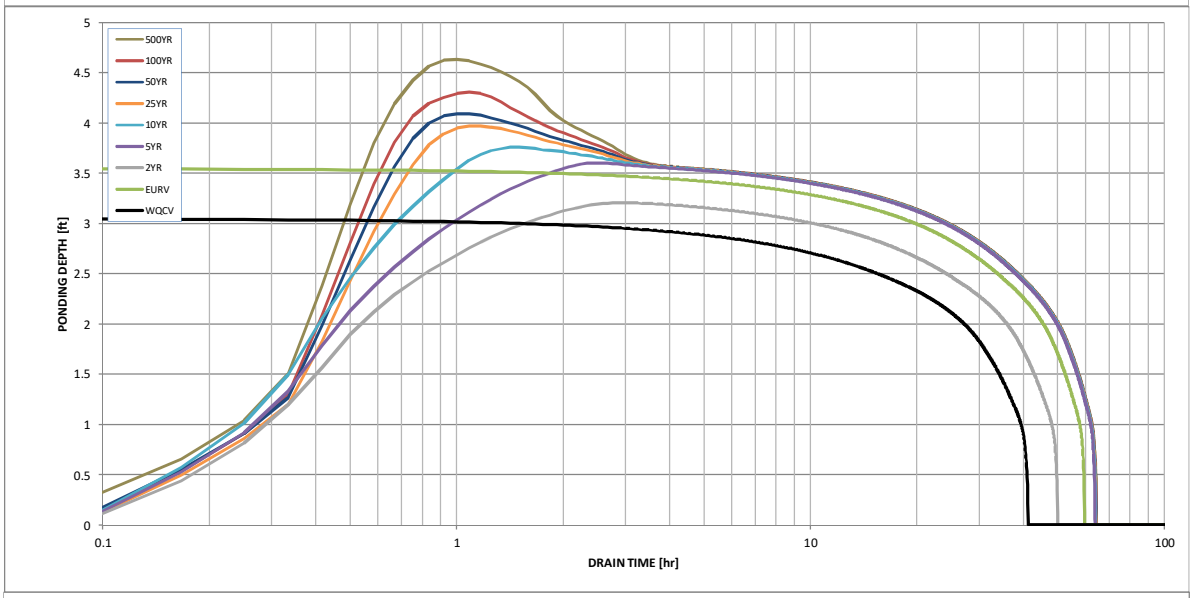
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

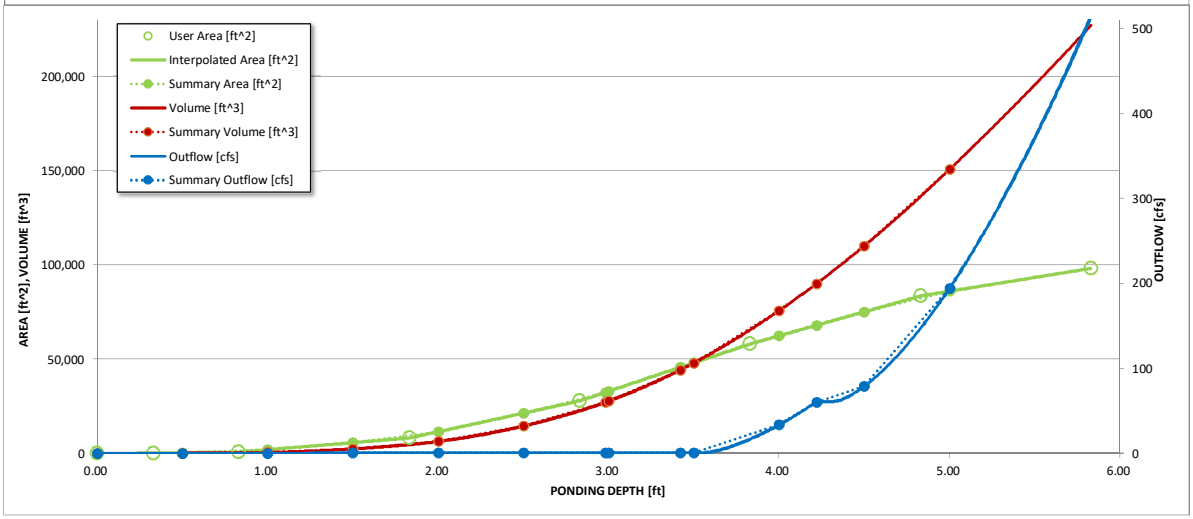
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.673	1.153	0.875	1.354	2.302	4.114	5.422	7.551	11.394
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.875	1.354	2.302	4.114	5.422	7.551	11.394
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.9	2.0	11.4	32.5	46.1	66.0	103.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.03	0.15	0.42	0.59	0.85	1.32
Peak Inflow Q (cfs) =	N/A	N/A	9.1	13.6	24.1	46.1	60.5	81.1	119.7
Peak Outflow Q (cfs) =	0.3	0.3	0.3	1.7	10.8	30.1	44.2	60.9	102.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.9	0.9	1.0	0.9	1.0
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.3	0.7	1.0	1.5	1.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	46	58	56	52	49	45	38
Time to Drain 99% of Inflow Volume (hours) =	**40**	57	48	61	60	58	57	55	52
Maximum Ponding Depth (ft) =	3.05	3.55	3.21	3.60	3.76	3.97	4.09	4.31	4.63
Area at Maximum Ponding Depth (acres) =	0.79	1.14	0.89	1.17	1.28	1.41	1.48	1.61	1.80
Maximum Volume Stored (acre-ft) =	0.674	1.156	0.801	1.214	1.398	1.680	1.868	2.193	2.755

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.09
	0:15:00	0.00	0.00	0.24	0.39	0.48	0.33	0.42	0.40	0.63
	0:20:00	0.00	0.00	0.99	1.36	2.26	1.03	1.23	1.29	2.26
	0:25:00	0.00	0.00	4.30	6.75	10.48	4.03	5.26	5.93	10.16
	0:30:00	0.00	0.00	7.70	11.88	20.49	20.41	27.93	34.66	54.89
	0:35:00	0.00	0.00	9.00	13.62	24.10	36.71	48.91	63.48	96.02
	0:40:00	0.00	0.00	9.10	13.64	23.83	44.83	58.80	76.92	114.10
	0:45:00	0.00	0.00	8.57	12.87	22.42	46.08	60.55	81.06	119.72
	0:50:00	0.00	0.00	7.84	11.98	20.57	44.30	58.51	79.50	117.49
	0:55:00	0.00	0.00	7.20	11.15	19.00	41.11	54.43	75.14	111.84
	1:00:00	0.00	0.00	6.63	10.35	17.65	37.69	49.89	70.73	106.17
	1:05:00	0.00	0.00	6.10	9.62	16.42	34.55	45.63	66.71	100.84
	1:10:00	0.00	0.00	5.67	9.10	15.49	31.42	41.44	61.25	92.94
	1:15:00	0.00	0.00	5.27	8.56	14.78	28.80	38.00	55.88	84.89
	1:20:00	0.00	0.00	4.89	7.94	13.88	26.35	34.78	50.74	77.03
	1:25:00	0.00	0.00	4.51	7.29	12.72	23.95	31.64	45.71	69.31
	1:30:00	0.00	0.00	4.13	6.64	11.46	21.57	28.48	40.97	62.06
	1:35:00	0.00	0.00	3.76	6.01	10.22	19.24	25.37	36.42	55.13
	1:40:00	0.00	0.00	3.40	5.38	9.06	16.95	22.30	32.00	48.44
	1:45:00	0.00	0.00	3.15	4.92	8.21	14.80	19.42	27.88	42.32
	1:50:00	0.00	0.00	2.99	4.58	7.64	13.28	17.44	24.93	37.97
	1:55:00	0.00	0.00	2.81	4.28	7.12	12.14	15.91	22.63	34.48
	2:00:00	0.00	0.00	2.62	3.99	6.60	11.19	14.63	20.63	31.41
	2:05:00	0.00	0.00	2.40	3.65	6.01	10.21	13.32	18.72	28.45
	2:10:00	0.00	0.00	2.16	3.28	5.39	9.25	12.06	16.88	25.61
	2:15:00	0.00	0.00	1.92	2.92	4.79	8.30	10.83	15.12	22.90
	2:20:00	0.00	0.00	1.70	2.57	4.22	7.38	9.62	13.45	20.35
	2:25:00	0.00	0.00	1.49	2.24	3.67	6.50	8.46	11.88	17.96
	2:30:00	0.00	0.00	1.28	1.93	3.14	5.63	7.32	10.34	15.61
	2:35:00	0.00	0.00	1.09	1.63	2.64	4.78	6.21	8.81	13.29
	2:40:00	0.00	0.00	0.89	1.34	2.16	3.95	5.11	7.29	10.99
	2:45:00	0.00	0.00	0.71	1.05	1.68	3.12	4.02	5.79	8.70
	2:50:00	0.00	0.00	0.53	0.79	1.24	2.31	2.95	4.30	6.45
	2:55:00	0.00	0.00	0.38	0.58	0.89	1.54	1.94	2.88	4.33
	3:00:00	0.00	0.00	0.30	0.46	0.69	0.98	1.23	1.87	2.89
	3:05:00	0.00	0.00	0.25	0.37	0.57	0.66	0.83	1.26	2.01
	3:10:00	0.00	0.00	0.21	0.31	0.47	0.48	0.60	0.87	1.40
	3:15:00	0.00	0.00	0.18	0.26	0.39	0.36	0.44	0.60	0.97
	3:20:00	0.00	0.00	0.15	0.21	0.32	0.28	0.34	0.42	0.67
	3:25:00	0.00	0.00	0.13	0.17	0.25	0.22	0.26	0.28	0.44
	3:30:00	0.00	0.00	0.11	0.14	0.20	0.17	0.20	0.19	0.29
	3:35:00	0.00	0.00	0.09	0.11	0.15	0.13	0.16	0.14	0.22
	3:40:00	0.00	0.00	0.07	0.09	0.12	0.10	0.12	0.11	0.17
	3:45:00	0.00	0.00	0.06	0.07	0.09	0.08	0.09	0.08	0.14
	3:50:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.07	0.11
	3:55:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.08
	4:00:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.06
	4:05:00	0.00	0.00	0.02	0.02	0.03	0.02	0.03	0.03	0.04
	4:10:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	4:15:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	32	0.001	0	0.000	0.00
	0.50	271	0.006	41	0.001	0.05
	1.00	1,955	0.045	426	0.010	0.08
	1.50	5,650	0.130	2,328	0.053	0.13
	2.00	11,435	0.263	6,254	0.144	0.17
	2.50	21,275	0.488	14,432	0.331	0.23
WQCV	2.98	32,310	0.742	27,030	0.621	0.29
	3.00	32,915	0.756	27,682	0.635	0.29
EURV	3.42	45,628	1.047	44,176	1.014	0.33
	3.50	48,049	1.103	47,923	1.100	0.33
	4.00	62,374	1.432	75,662	1.737	33.44
100-YR	4.22	67,986	1.561	90,002	2.066	60.12
	4.50	75,128	1.725	110,038	2.526	78.64
	5.00	86,032	1.975	150,633	3.458	194.14

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

POND D FOREBAY VOLUME REQUIREMENTS

Equation 3-1 $WQCV = a(0.91I^3 - 1.19I^2 + 0.781I)$

a=1 (40 hour drain time)

Proposed Forebay	*I=.124*	*WQCV=*	0.080158
Future Forebay	*I=.147*	*WQCV=*	0.091836

Equation 3-3 $V=(WQCV/12)A$

Proposed Forebay	A= 40.72 Acres	V=	0.272
Future Forebay	A= 33.94 Acres	V=	0.260

3% OF WQCV

FOREBAY TOTAL VOLUME= .03(V)

VOLUME REQUIRED FOR PROPOSED FOREBAY=	0.008 AC-FT	355 CF
VOLUME REQUIRED FOR FUTURE FOREBAY =	0.008 AC-FT	339 CF
VOLUME PROVIDED FOR PROPOSED FOREBAY =	0.015 AC-FT	642 CF

Q_{100} Discharges	2% OF Q_{100}
Q_{100} Proposed Forebay 1=	.02*51.7 CFS= 1.03 CFS
Q_{100} Future Forebay=	.02*37.3 CFS= 0.75 CFS

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Mar 2 2022

Pond D Forebay 1 Notch

V-Notch Weir

Crest	= Sharp
Angle (Deg)	= 15
Total Depth (ft)	= 2.50

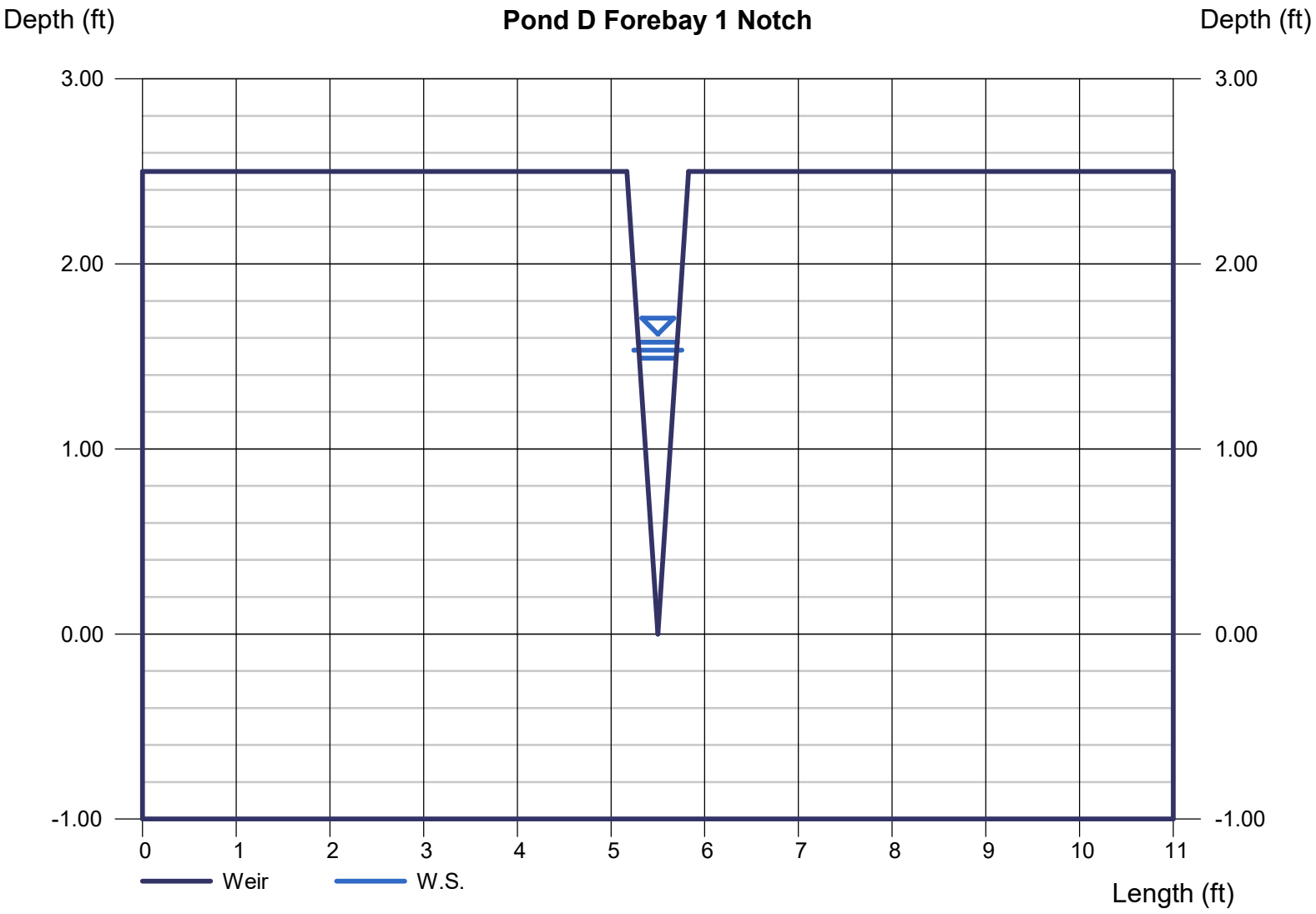
Calculations

Weir Coeff. Cw	= 0.33
Compute by:	Known Q
Known Q (cfs)	= 1.03

Highlighted

Depth (ft)	= 1.58
Q (cfs)	= 1.030
Area (sqft)	= 0.33
Velocity (ft/s)	= 3.15
Top Width (ft)	= 0.42

Unresolved:
Forebays have a max depth of 18", notch depth cannot exceed forebay depth



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond D Trickle Channel

Rectangular

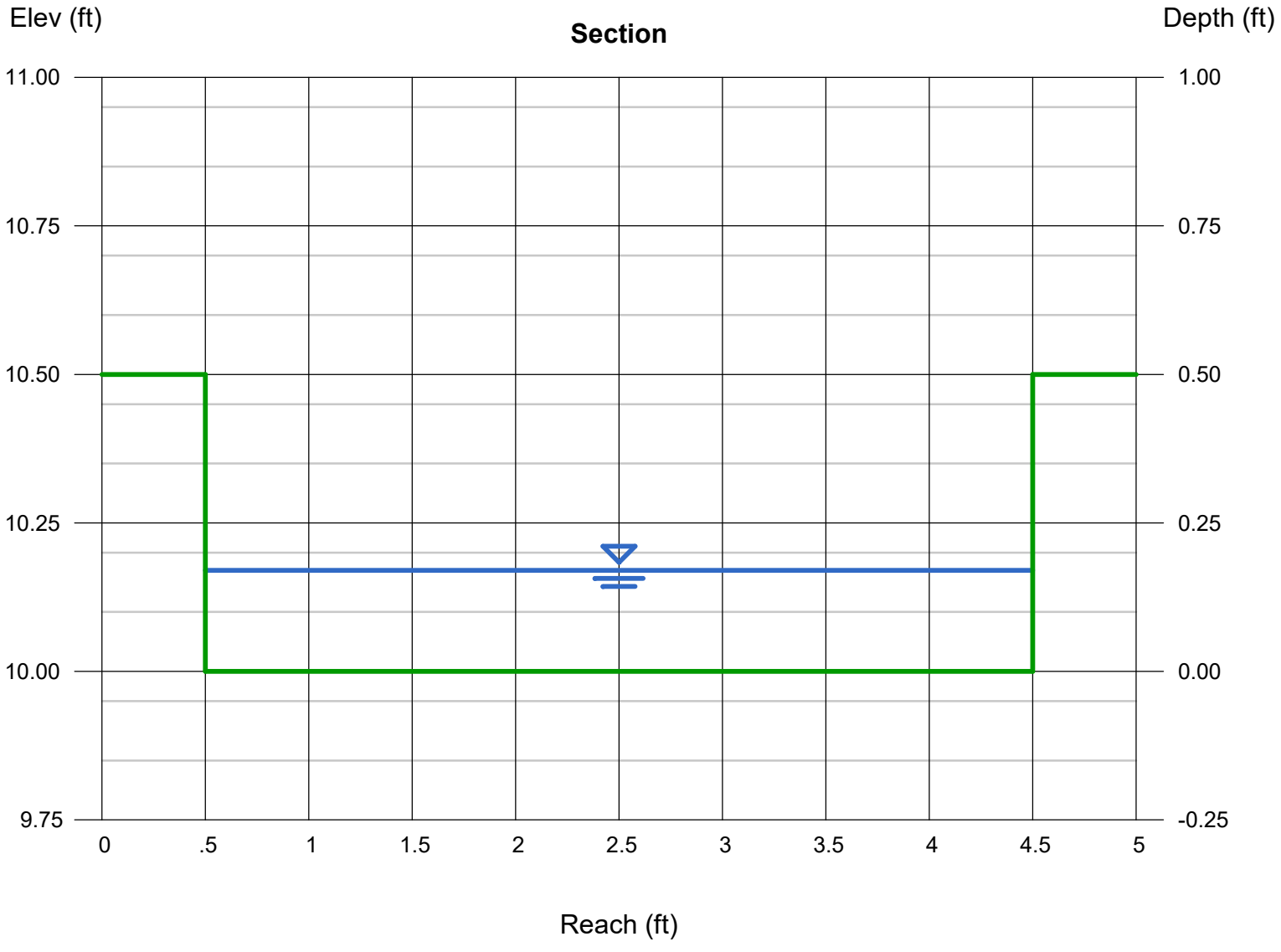
Bottom Width (ft)	= 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.52

Highlighted

Depth (ft)	= 0.17
Q (cfs)	= 1.520
Area (sqft)	= 0.68
Velocity (ft/s)	= 2.24
Wetted Perim (ft)	= 4.34
Crit Depth, Yc (ft)	= 0.17
Top Width (ft)	= 4.00
EGL (ft)	= 0.25



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jun 27 2023

Pond D Spillway

Trapezoidal Weir

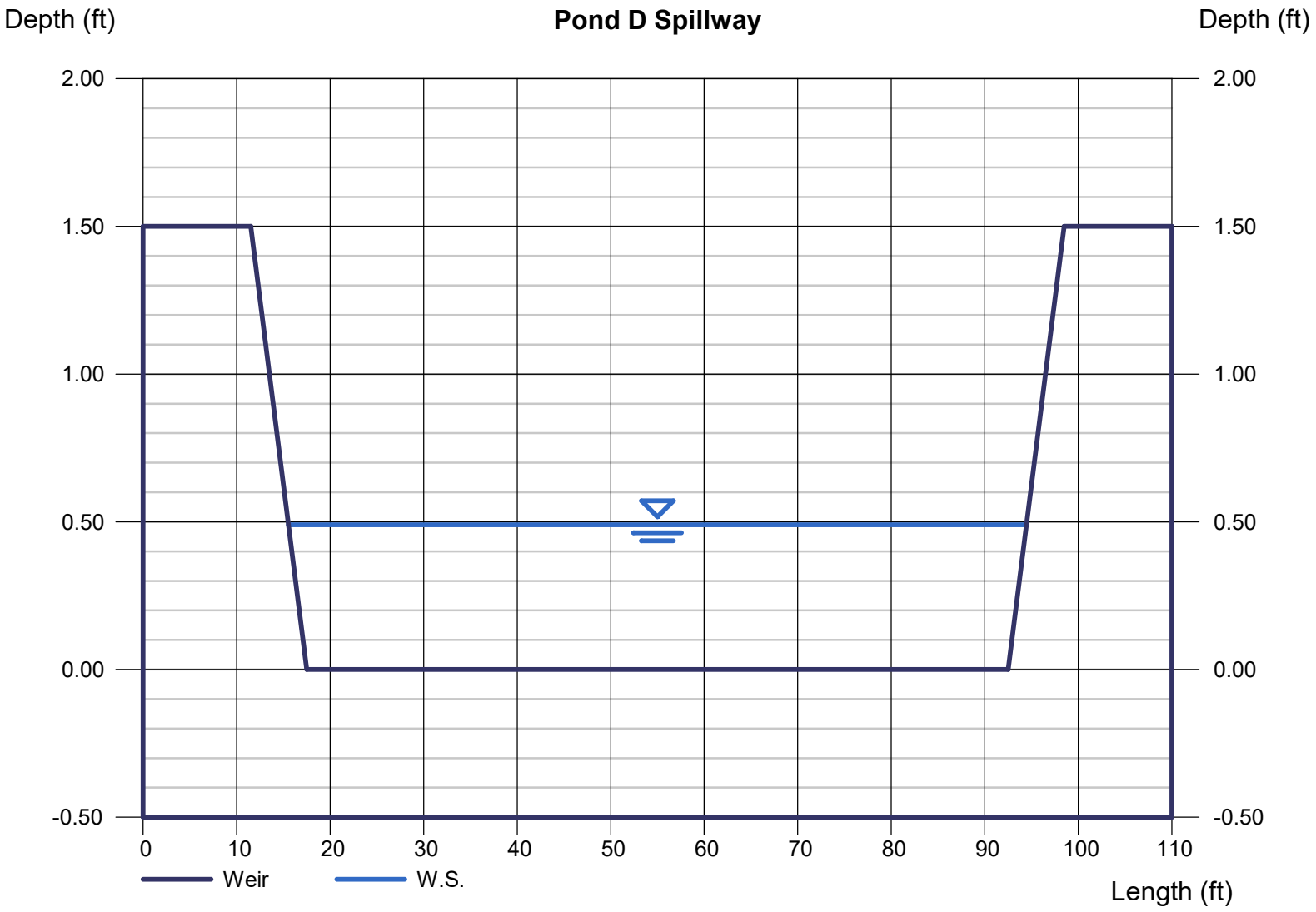
Crest	= Sharp
Bottom Length (ft)	= 75.00
Total Depth (ft)	= 1.50
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 81.10

Highlighted

Depth (ft)	= 0.49
Q (cfs)	= 81.10
Area (sqft)	= 37.71
Velocity (ft/s)	= 2.15
Top Width (ft)	= 78.92

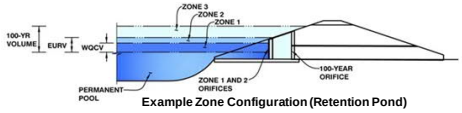


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond E



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	18.37	acres
Watershed Length =	1,810	ft
Watershed Length to Centroid =	803	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	8.10%	percent
Percentage Hydrologic Soil Group A =	83.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	17.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

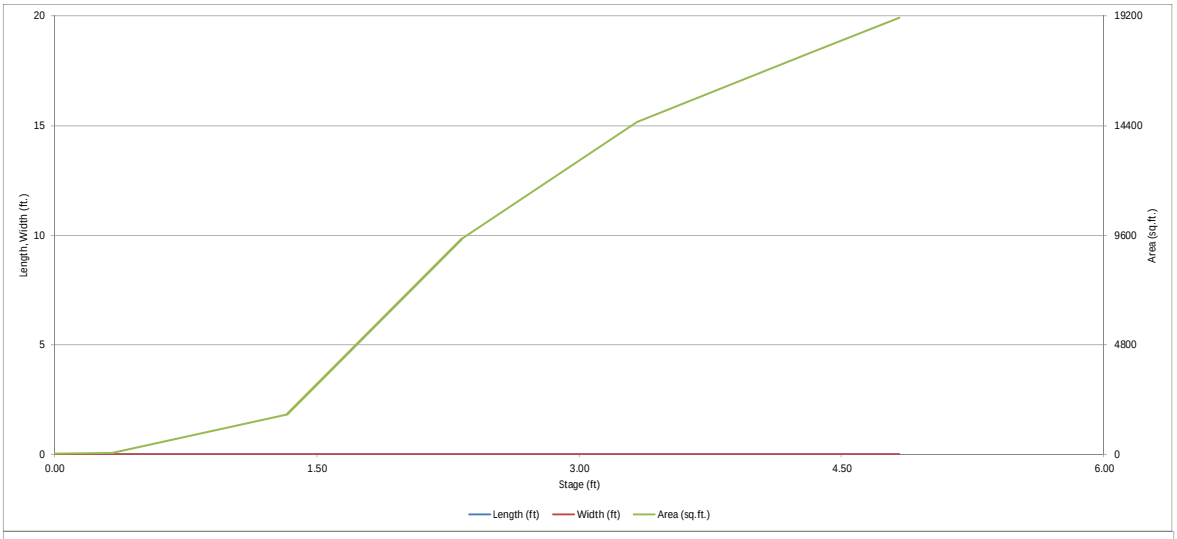
			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.086	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.106	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.065	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.106	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.204	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	0.592	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.859	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.292	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.174	acre-feet	inches
Approximate 2-yr Detention Volume =	0.067	acre-feet	
Approximate 5-yr Detention Volume =	0.113	acre-feet	
Approximate 10-yr Detention Volume =	0.153	acre-feet	
Approximate 25-yr Detention Volume =	0.199	acre-feet	
Approximate 50-yr Detention Volume =	0.254	acre-feet	
Approximate 100-yr Detention Volume =	0.419	acre-feet	

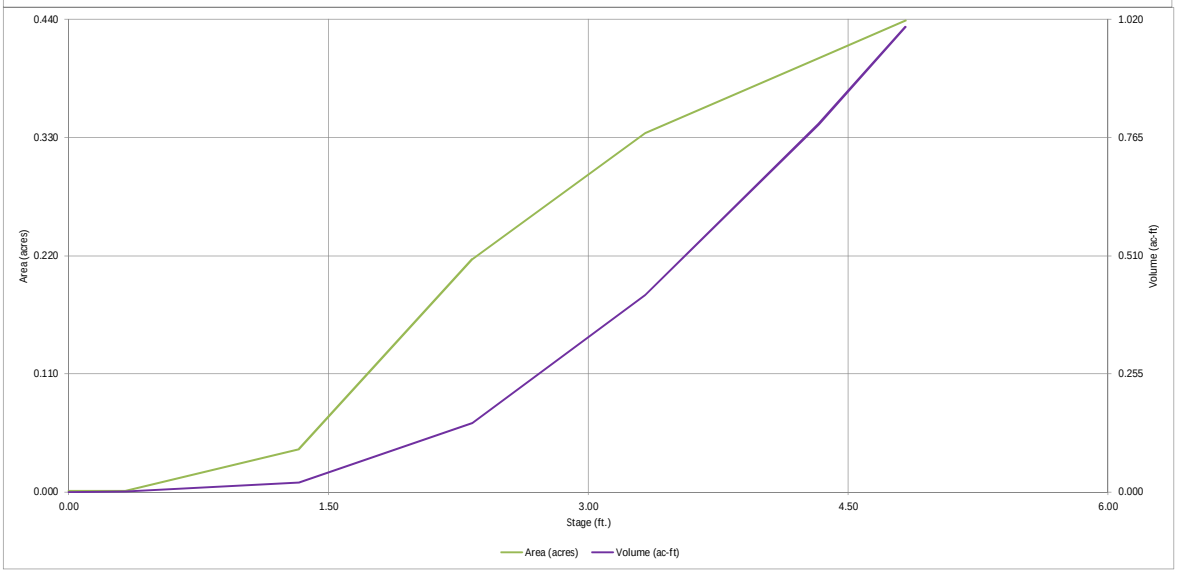
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.086	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.021	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.313	acre-feet
Total Detention Basin Volume =	0.419	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio (R_{LW}) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6720.67 Top of Micropool	--	0.00	--	--	--	32	0.001		
6721	--	0.33	--	--	--	50	0.001	14	0.000
6722	--	1.33	--	--	--	1,723	0.040	900	0.021
6723	--	2.33	--	--	--	9,446	0.217	6,484	0.149
6724	--	3.33	--	--	--	14,566	0.334	18,490	0.424
6725	--	4.33	--	--	--	17,600	0.404	34,573	0.794
6725.5	--	4.83	--	--	--	19,121	0.439	43,754	1.004


20
15
10
5
0
Length, Width (ft.)
19200
14400
9600
4800
0
Area (sq.ft.)
0.00
1.50
3.00
4.50
6.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

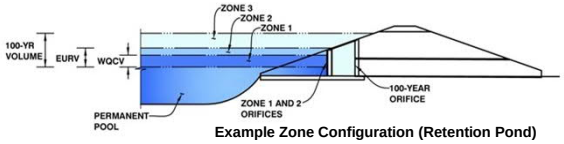

0.440
0.330
0.220
0.110
0.000
Area (acres)
1.020
0.765
0.510
0.255
0.000
Volume (ac-ft)
0.00
1.50
3.00
4.50
6.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond E



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.00	0.086	Orifice Plate
Zone 2 (EURV)	2.12	0.021	Orifice Plate
Zone 3 (100-year)	3.32	0.313	Weir&Pipe (Restrict)
Total (all zones)		0.419	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.153E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.12	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.31	sq. inches (diameter = 5/8 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.60	1.20					
Orifice Area (sq. inches)	0.31	0.31	0.31					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected				
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A feet
Vertical Orifice Diameter =	N/A	N/A	inches			

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected				
Overflow Weir Front Edge Height, Ho =	2.30	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.55	N/A feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	5.15	N/A feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	10.15	N/A
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.94	N/A ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.94	N/A ft^2
Debris Clogging % =	0%	N/A	%			

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected				
Depth to Invert of Outlet Pipe =	1.15	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.38	feet
Spillway Crest Length =	15.00	feet	Stage at Top of Freeboard =	4.71	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.43	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.95	acre-ft

Calculated Parameters for Spillway

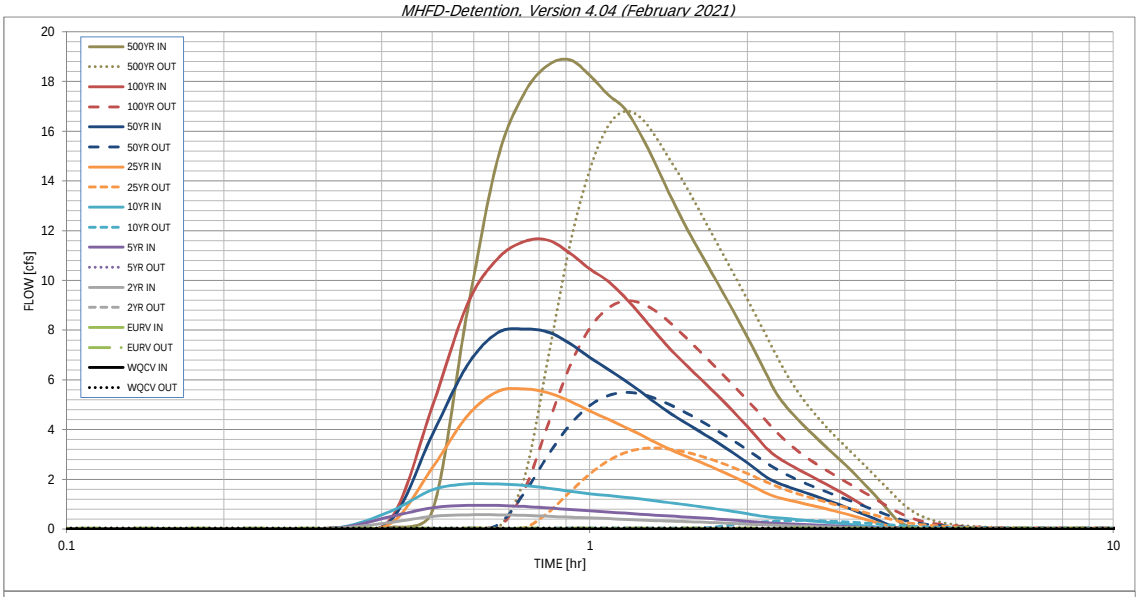
Routed Hydrograph Results

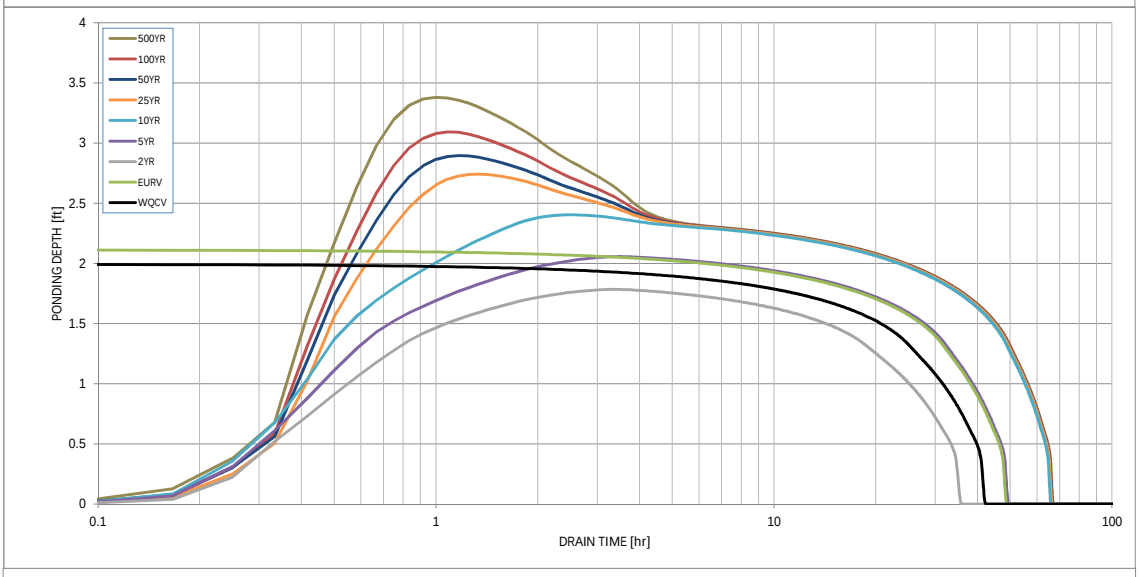
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

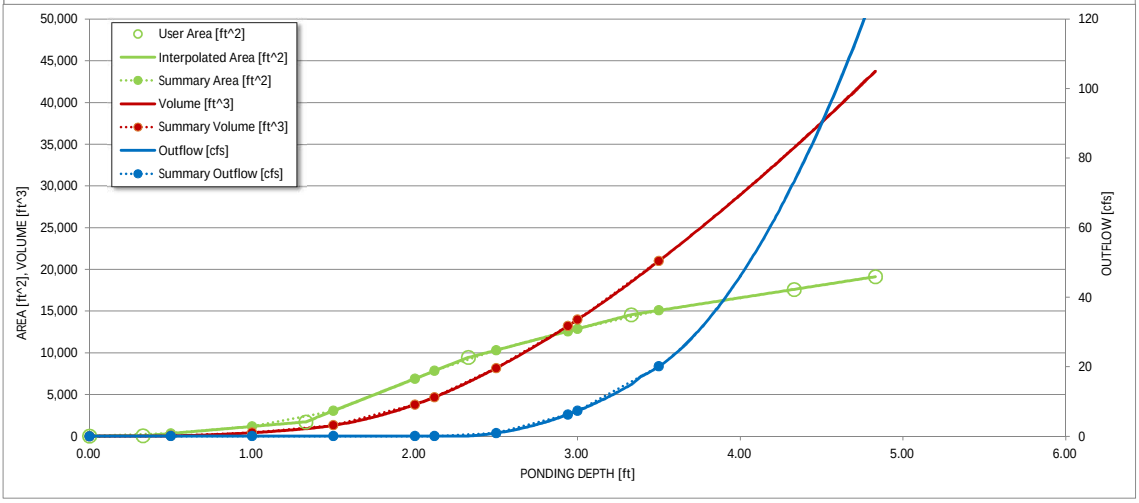
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.086	0.106	0.065	0.106	0.204	0.592	0.859	1.292	2.174
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.065	0.106	0.204	0.592	0.859	1.292	2.174
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.9	4.6	7.0	10.5	17.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.05	0.25	0.38	0.57	0.96
Peak Inflow Q (cfs) =	N/A	N/A	0.6	1.0	1.8	5.6	8.0	11.6	18.9
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.3	3.3	5.5	9.2	16.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.4	0.7	0.8	0.9	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.2	0.3	0.5	0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	44	32	44	58	51	47	42	32
Time to Drain 99% of Inflow Volume (hours) =	40	46	34	47	62	59	57	54	49
Maximum Ponding Depth (ft) =	2.00	2.12	1.78	2.06	2.40	2.74	2.90	3.09	3.38
Area at Maximum Ponding Depth (acres) =	0.16	0.18	0.12	0.17	0.23	0.27	0.28	0.31	0.34
Maximum Volume Stored (acre-ft) =	0.087	0.107	0.056	0.095	0.164	0.248	0.289	0.348	0.438

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:15:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	0:20:00	0.00	0.00	0.04	0.06	0.07	0.04	0.05	0.06	0.07
	0:25:00	0.00	0.00	0.27	0.50	0.72	0.23	0.34	0.41	0.72
	0:30:00	0.00	0.00	0.51	0.86	1.57	2.46	3.79	4.91	8.73
	0:35:00	0.00	0.00	0.57	0.95	1.81	4.55	6.58	9.03	14.87
	0:40:00	0.00	0.00	0.57	0.95	1.81	5.53	7.89	10.87	17.53
	0:45:00	0.00	0.00	0.55	0.91	1.75	5.64	8.05	11.57	18.66
	0:50:00	0.00	0.00	0.52	0.85	1.64	5.48	7.92	11.61	18.87
	0:55:00	0.00	0.00	0.48	0.78	1.52	5.14	7.46	11.09	18.24
	1:00:00	0.00	0.00	0.45	0.73	1.42	4.75	6.90	10.46	17.47
	1:05:00	0.00	0.00	0.42	0.69	1.35	4.42	6.43	9.97	16.90
	1:10:00	0.00	0.00	0.39	0.64	1.28	4.11	5.98	9.32	15.88
	1:15:00	0.00	0.00	0.37	0.60	1.21	3.80	5.54	8.62	14.71
	1:20:00	0.00	0.00	0.34	0.56	1.14	3.49	5.08	7.92	13.52
	1:25:00	0.00	0.00	0.32	0.53	1.06	3.22	4.69	7.30	12.46
	1:30:00	0.00	0.00	0.31	0.50	1.00	2.99	4.36	6.76	11.55
	1:35:00	0.00	0.00	0.29	0.47	0.93	2.79	4.06	6.28	10.72
	1:40:00	0.00	0.00	0.27	0.44	0.87	2.60	3.77	5.83	9.94
	1:45:00	0.00	0.00	0.26	0.41	0.81	2.41	3.49	5.40	9.19
	1:50:00	0.00	0.00	0.24	0.38	0.74	2.22	3.22	4.97	8.45
	1:55:00	0.00	0.00	0.22	0.35	0.68	2.03	2.94	4.54	7.72
	2:00:00	0.00	0.00	0.20	0.31	0.62	1.84	2.66	4.12	7.01
	2:05:00	0.00	0.00	0.18	0.28	0.55	1.65	2.38	3.70	6.31
	2:10:00	0.00	0.00	0.16	0.26	0.50	1.46	2.11	3.29	5.61
	2:15:00	0.00	0.00	0.15	0.24	0.47	1.32	1.92	2.99	5.12
	2:20:00	0.00	0.00	0.14	0.22	0.44	1.23	1.78	2.77	4.73
	2:25:00	0.00	0.00	0.13	0.21	0.41	1.15	1.67	2.57	4.40
	2:30:00	0.00	0.00	0.12	0.20	0.38	1.08	1.56	2.40	4.09
	2:35:00	0.00	0.00	0.12	0.18	0.35	1.01	1.46	2.24	3.81
	2:40:00	0.00	0.00	0.11	0.17	0.33	0.94	1.36	2.09	3.54
	2:45:00	0.00	0.00	0.10	0.16	0.30	0.87	1.27	1.94	3.28
	2:50:00	0.00	0.00	0.09	0.14	0.28	0.81	1.17	1.80	3.04
	2:55:00	0.00	0.00	0.08	0.13	0.25	0.74	1.07	1.65	2.80
	3:00:00	0.00	0.00	0.08	0.12	0.23	0.68	0.98	1.51	2.57
	3:05:00	0.00	0.00	0.07	0.11	0.21	0.61	0.89	1.37	2.33
	3:10:00	0.00	0.00	0.06	0.09	0.18	0.55	0.79	1.23	2.09
	3:15:00	0.00	0.00	0.05	0.08	0.16	0.48	0.70	1.09	1.85
	3:20:00	0.00	0.00	0.04	0.07	0.14	0.42	0.60	0.95	1.62
	3:25:00	0.00	0.00	0.04	0.06	0.11	0.35	0.51	0.81	1.38
	3:30:00	0.00	0.00	0.03	0.05	0.09	0.29	0.42	0.67	1.14
	3:35:00	0.00	0.00	0.02	0.03	0.07	0.22	0.32	0.53	0.91
	3:40:00	0.00	0.00	0.02	0.02	0.05	0.16	0.23	0.39	0.67
	3:45:00	0.00	0.00	0.01	0.01	0.03	0.10	0.14	0.25	0.44
	3:50:00	0.00	0.00	0.01	0.01	0.02	0.05	0.07	0.14	0.27
	3:55:00	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.08	0.17
	4:00:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.05	0.11
	4:05:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.07
	4:10:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.04
	4:15:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:20:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	32	0.001	0	0.000	0.00
	0.50	334	0.008	46	0.001	0.01
	1.00	1,171	0.027	423	0.010	0.02
	1.50	3,036	0.070	1,304	0.030	0.03
WQCV	2.00	6,897	0.158	3,788	0.087	0.04
EURV	2.12	7,824	0.180	4,671	0.107	0.04
	2.50	10,316	0.237	8,164	0.187	0.91
100-YR	2.94	12,569	0.289	13,199	0.303	6.22
	3.00	12,876	0.296	13,962	0.321	7.30
	3.50	15,082	0.346	21,011	0.482	20.07

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

POND E FOREBAY VOLUME REQUIREMENTS

Equation 3-1 $WQCV = a(0.91I^3 - 1.19I^2 + 0.781I)$

a=1 (40 hour drain time)

Forebay 1 *I=.082* *WQCV=* 0.05646

Equation 3-3 V=(WQCV/12)A

Forebay 1 A= 17.69 Acres V= 0.083

3% OF WQCV

FOREBAY TOTAL VOLUME= .03(V)

VOLUME REQUIRED FOR FOREBAY 1 = 0.002 AC-FT 109 CF

VOLUME PROVIDED FOR FOREBAY 1 = 0.005 AC-FT 230 CF

Q_{100} Discharges 2% OF Q_{100}

Q_{100} Forebay 1= .02*12.6 CFS= 0.25 CFS

Weir Report

Pond E Forebay Notch

V-Notch Weir

Crest	= Sharp
Angle (Deg)	= 10
Total Depth (ft)	= 2.50

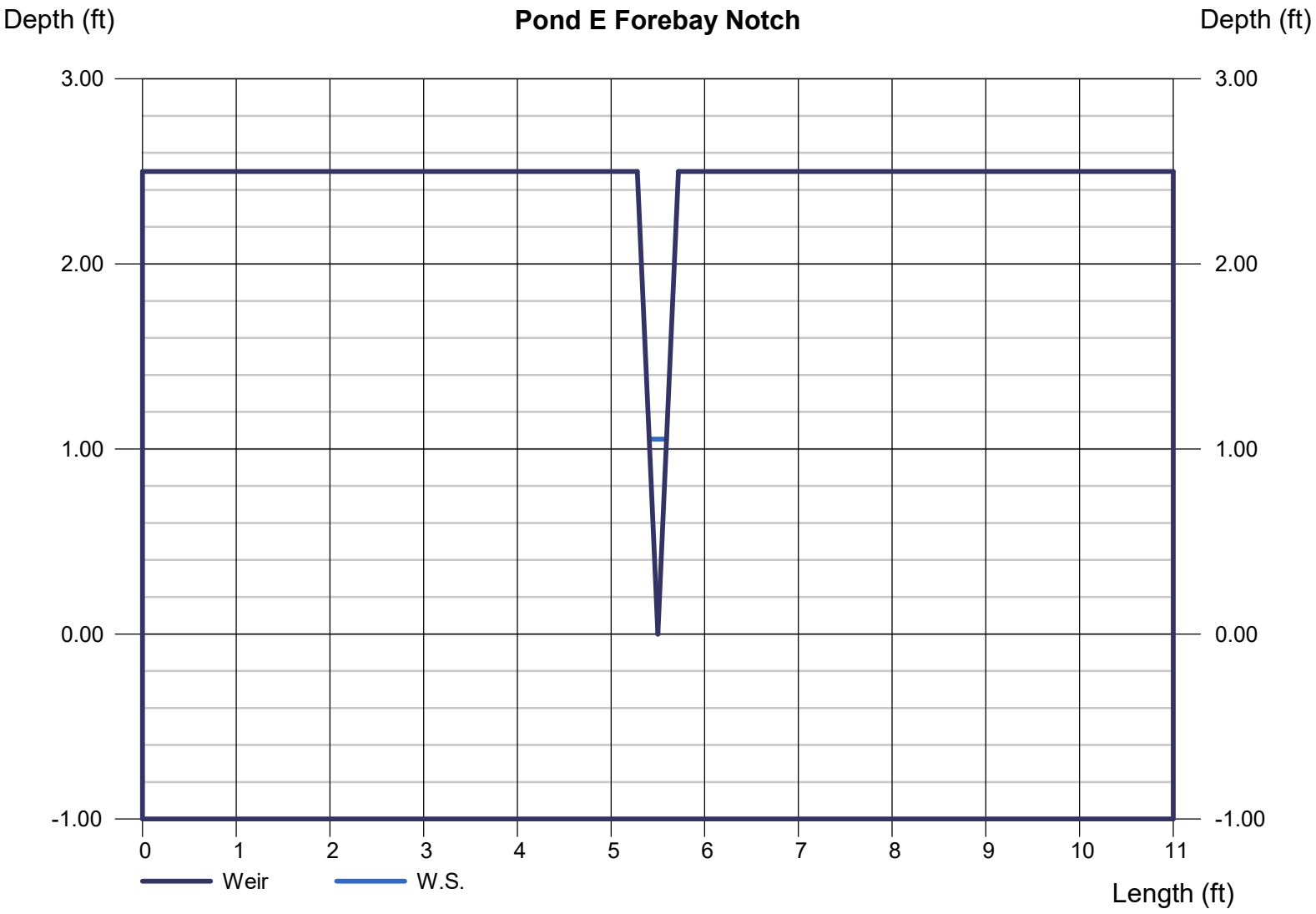
Calculations

Weir Coeff. Cw	= 0.22
Compute by:	Known Q
Known Q (cfs)	= 0.25

Highlighted

Depth (ft)	= 1.05
Q (cfs)	= 0.250
Area (sqft)	= 0.10
Velocity (ft/s)	= 2.58
Top Width (ft)	= 0.18

Unresolved:
Forebays have a max depth of 18", notch depth cannot exceed forebay depth



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond E Trickle Channel

Rectangular

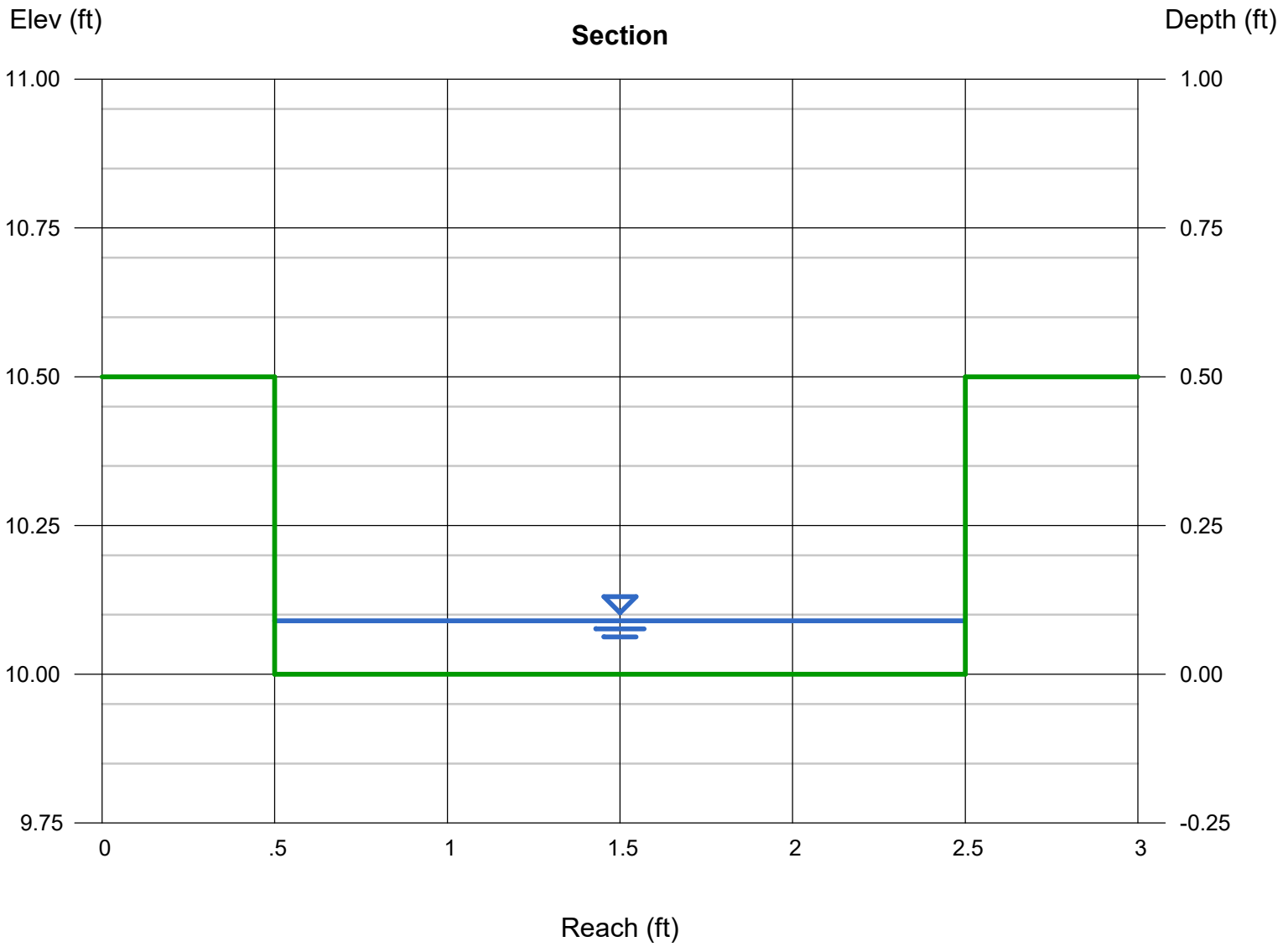
Bottom Width (ft)	= 2.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.25

Highlighted

Depth (ft)	= 0.09
Q (cfs)	= 0.250
Area (sqft)	= 0.18
Velocity (ft/s)	= 1.39
Wetted Perim (ft)	= 2.18
Crit Depth, Yc (ft)	= 0.08
Top Width (ft)	= 2.00
EGL (ft)	= 0.12



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond E Spillway

Trapezoidal Weir

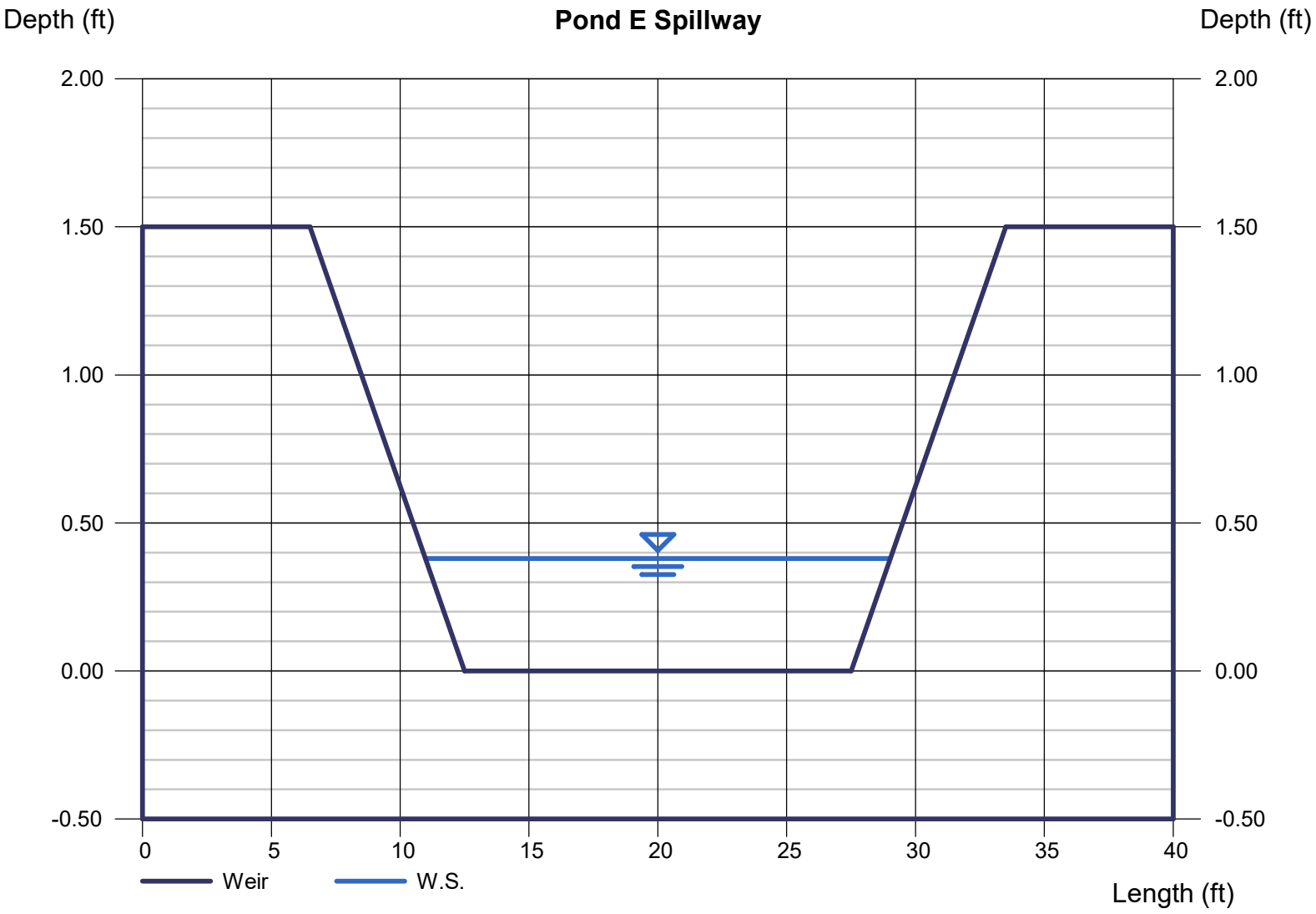
Crest	= Sharp
Bottom Length (ft)	= 15.00
Total Depth (ft)	= 1.50
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 11.60

Highlighted

Depth (ft)	= 0.38
Q (cfs)	= 11.60
Area (sqft)	= 6.28
Velocity (ft/s)	= 1.85
Top Width (ft)	= 18.04



Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Saddlehorn Filing 3 - Pond C

Facility Location & Jurisdiction: El Paso County - Saddlehorn Ranch Metropolitan District

User Input: Watershed Characteristics

Watershed Slope =	0.012	ft/ft
Watershed Length =	5370	ft
Watershed Area =	96.84	acres
Watershed Imperviousness =	14.6%	percent
Percentage Hydrologic Soil Group A =	93.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	7.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): User Input

WQCV Treatment Method = Extended Detention

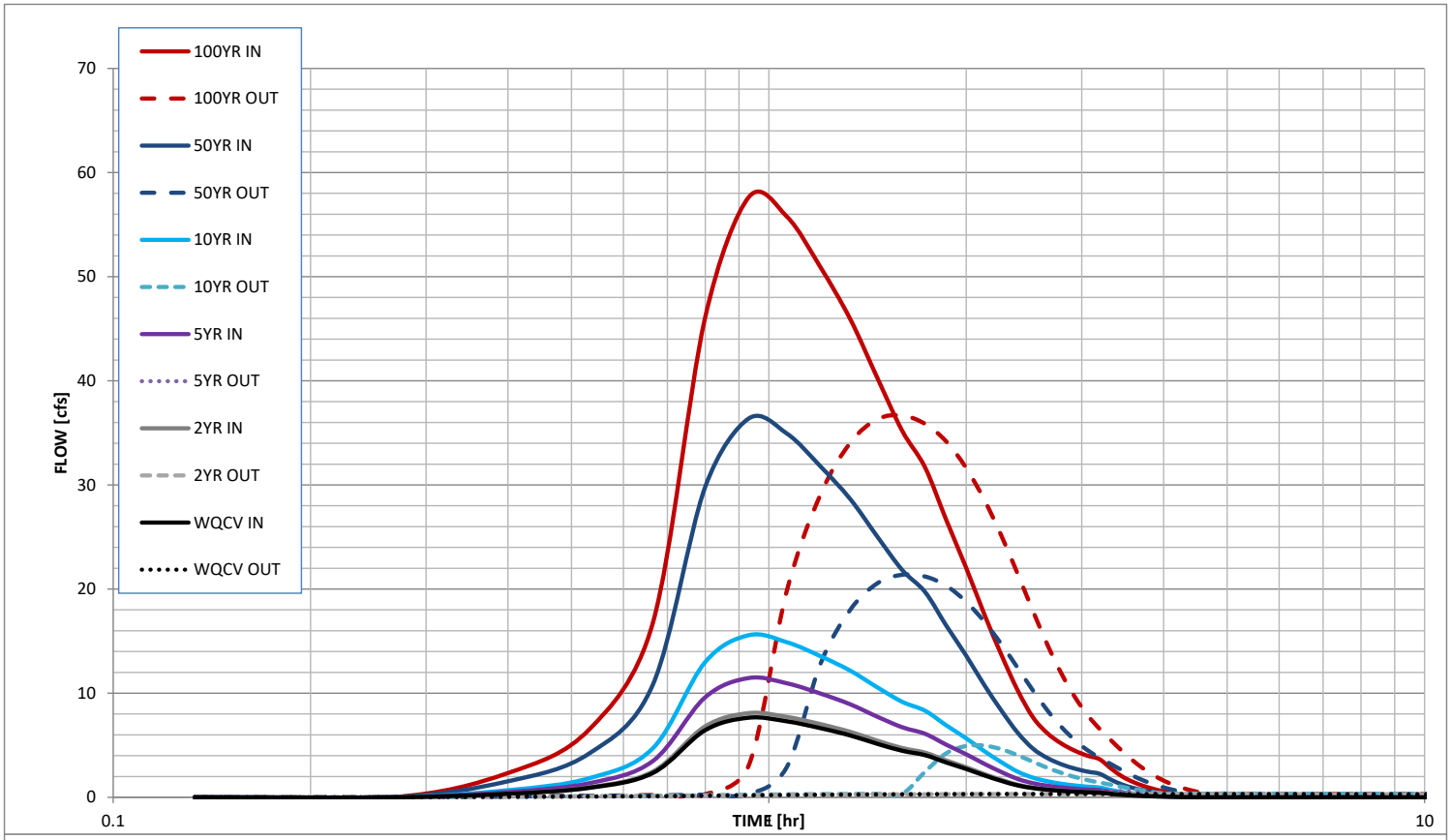
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	32	0.00	0.00
0.33	50	0.33	0.05
1.00	3,260	1.00	0.11
2.00	17,980	2.00	0.24
3.00	46,439	3.00	0.35
4.00	73,964	4.00	41.88
5.00	86,681	5.00	237.69
5.50	89,520	5.50	408.05

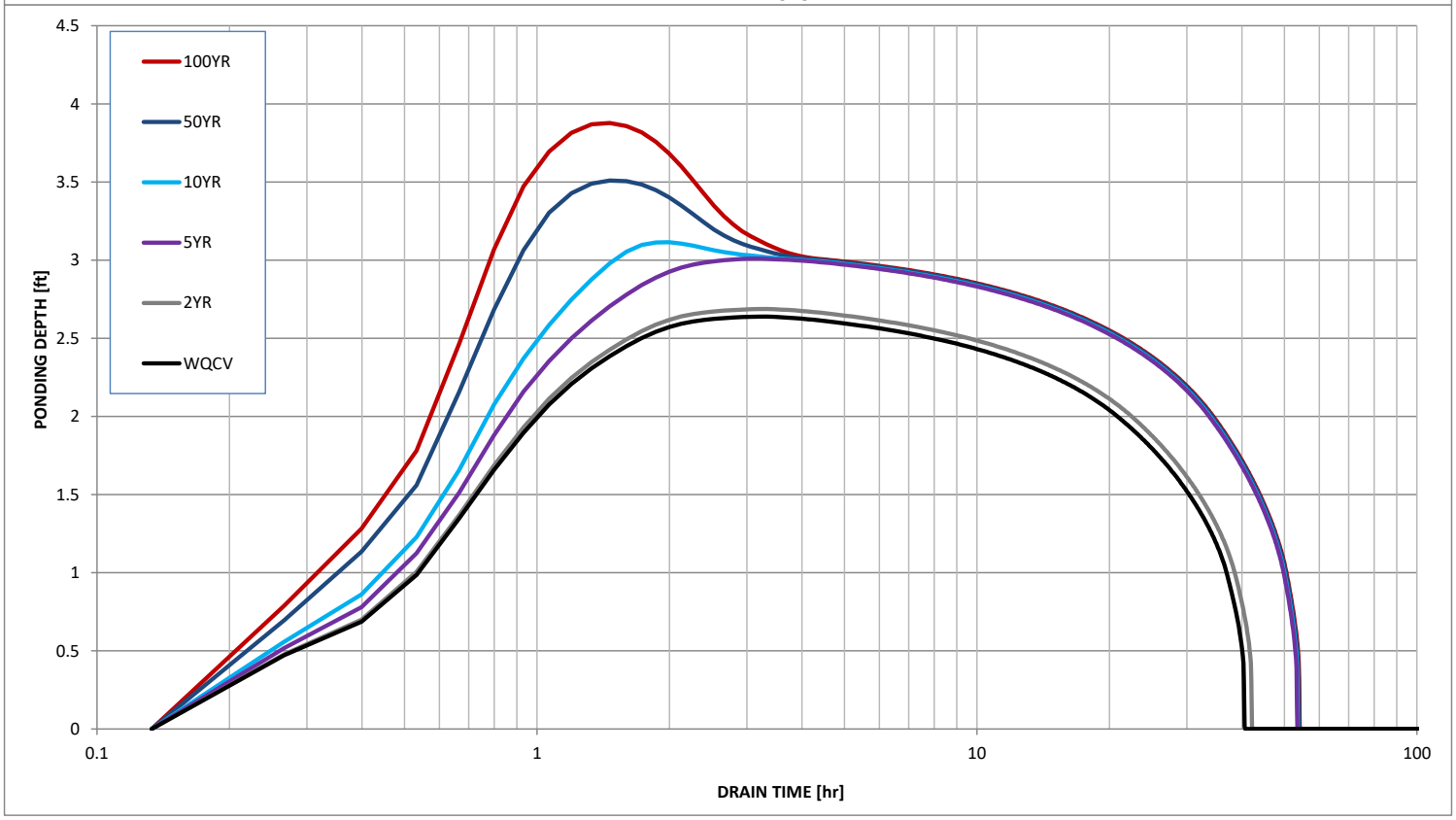
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.737	0.780	1.110	1.513	3.577	5.724	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.736	0.779	1.109	1.513	3.577	5.722	acre-ft
Time to Drain 97% of Inflow Volume =	37.4	38.9	**49.0**	48.1	43.7	39.8	hours
Time to Drain 99% of Inflow Volume =	39.3	40.9	51.6	51.2	49.4	**47.7**	hours
Maximum Ponding Depth =	2.64	2.69	3.01	3.11	3.51	3.88	ft
Maximum Ponded Area =	0.83	0.86	1.07	1.13	1.38	**1.62**	acres
Maximum Volume Stored =	0.662	0.702	1.014	1.127	1.624	2.180	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Saddlehorn Ranch Filing 3 - Pond D

Facility Location & Jurisdiction: El Paso County - Saddlehorn Ranch Metropolitan District

User Input: Watershed Characteristics

Watershed Slope =	0.012	ft/ft
Watershed Length =	3473	ft
Watershed Area =	78.02	acres
Watershed Imperviousness =	15.4%	percent
Percentage Hydrologic Soil Group A =	70.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	30.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): User Input

WQCV Treatment Method = Extended Detention

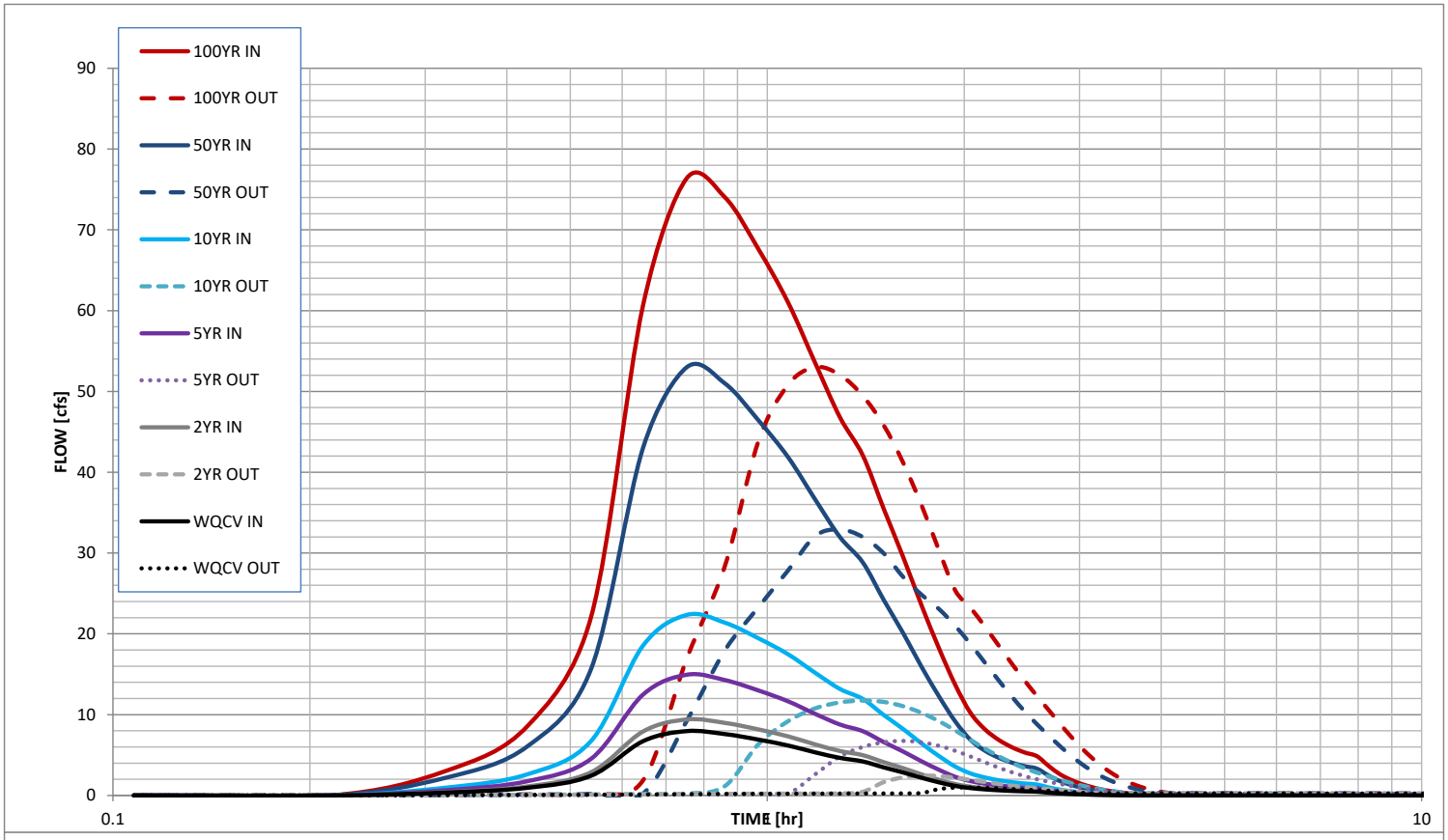
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	32	0.00	0.00
0.33	50	0.33	0.04
0.83	699	0.83	0.06
1.83	8,089	1.83	0.15
2.83	27,770	2.83	0.26
3.83	58,037	3.83	25.71
4.33	70,791	4.33	61.17
4.83	83,546	4.83	146.98
5.83	98,172	5.83	513.83

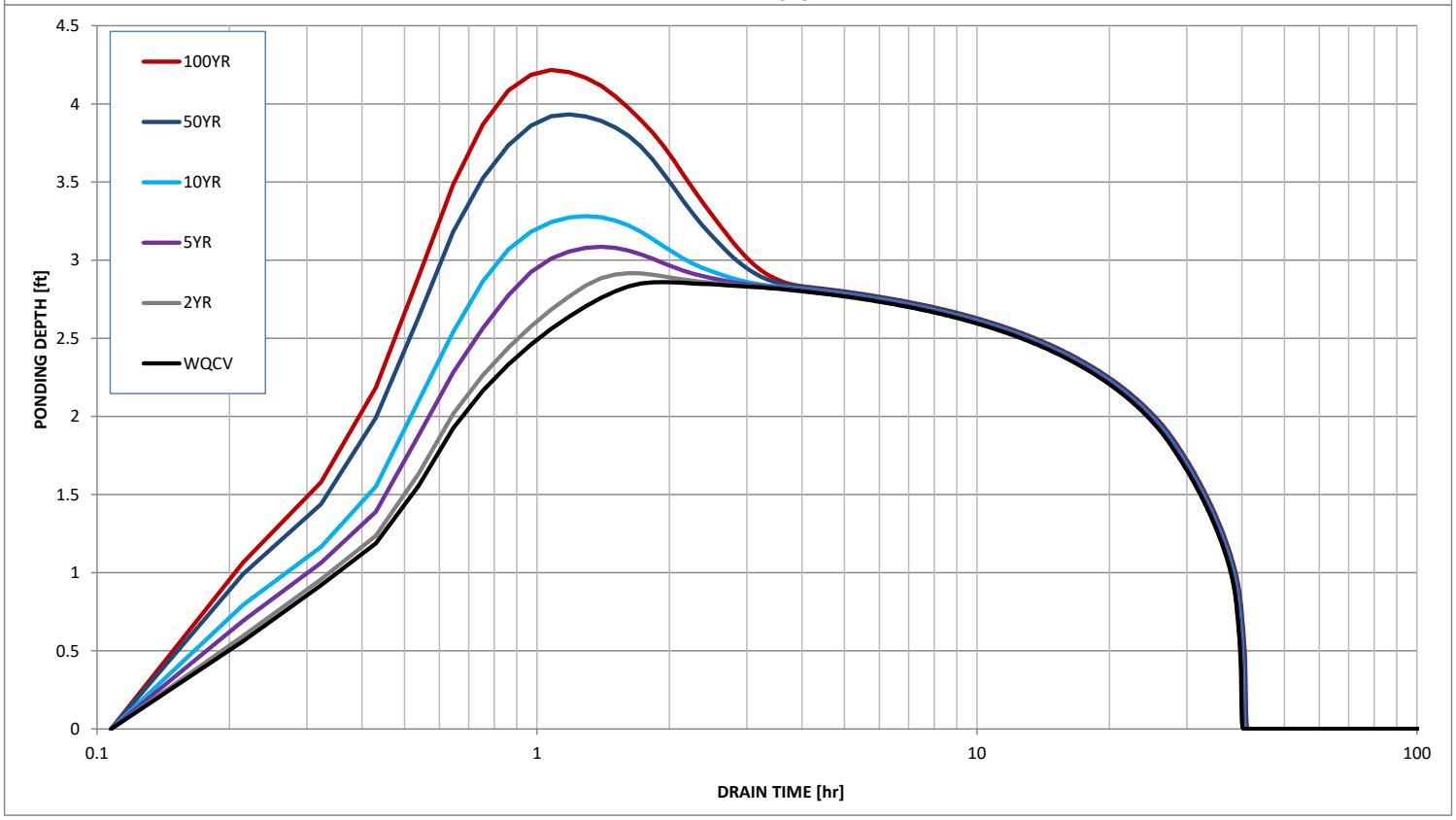
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.619	0.733	1.170	1.758	4.226	6.144	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.619	0.733	1.170	1.758	4.226	6.142	acre-ft
Time to Drain 97% of Inflow Volume =	36.5	36.0	**34.5**	32.7	26.5	22.5	hours
Time to Drain 99% of Inflow Volume =	38.5	38.3	37.8	37.0	34.2	**32.4**	hours
Maximum Ponding Depth =	2.86	2.92	3.09	3.28	3.93	4.22	ft
Maximum Ponded Area =	0.65	0.70	0.81	0.95	1.39	**1.56**	acres
Maximum Volume Stored =	0.533	0.573	0.701	0.872	1.637	2.055	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Saddlehorn Ranch Filing 3 - Pond E

Facility Location & Jurisdiction: El Paso County - Saddlehorn Ranch Metropolitan District

User Input: Watershed Characteristics

Watershed Slope =	0.012	ft/ft
Watershed Length =	1810	ft
Watershed Area =	18.37	acres
Watershed Imperviousness =	8.1%	percent
Percentage Hydrologic Soil Group A =	83.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	17.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): User Input

WQCV Treatment Method = Extended Detention

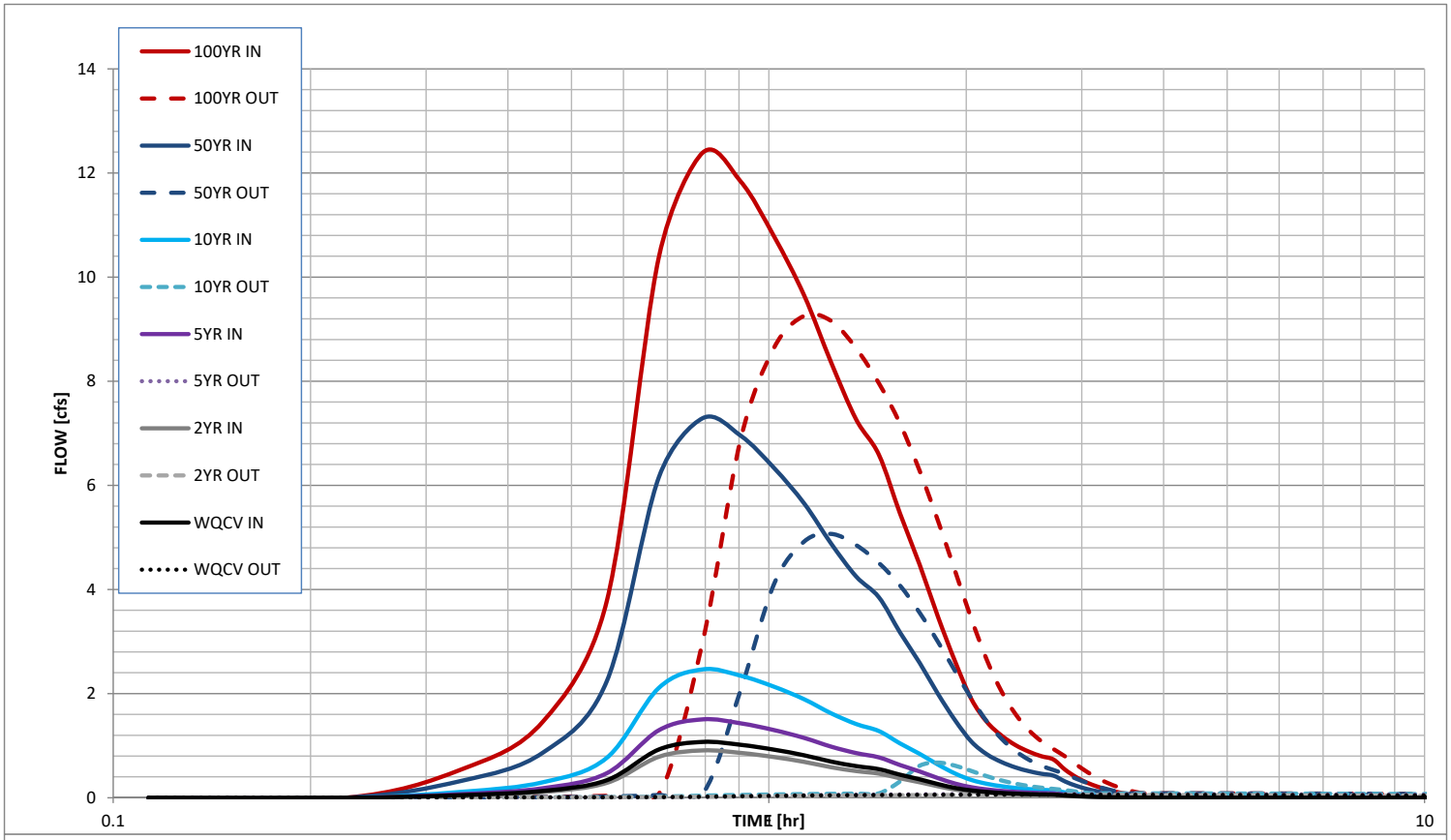
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	32	0.00	0.00
0.33	50	0.33	0.01
0.83	887	0.83	0.01
1.33	1,723	1.33	0.02
2.33	9,446	2.33	0.09
3.33	14,566	3.33	14.90
3.83	16,083	3.83	35.11
4.33	17,600	4.33	73.11
4.83	19,121	4.83	128.58

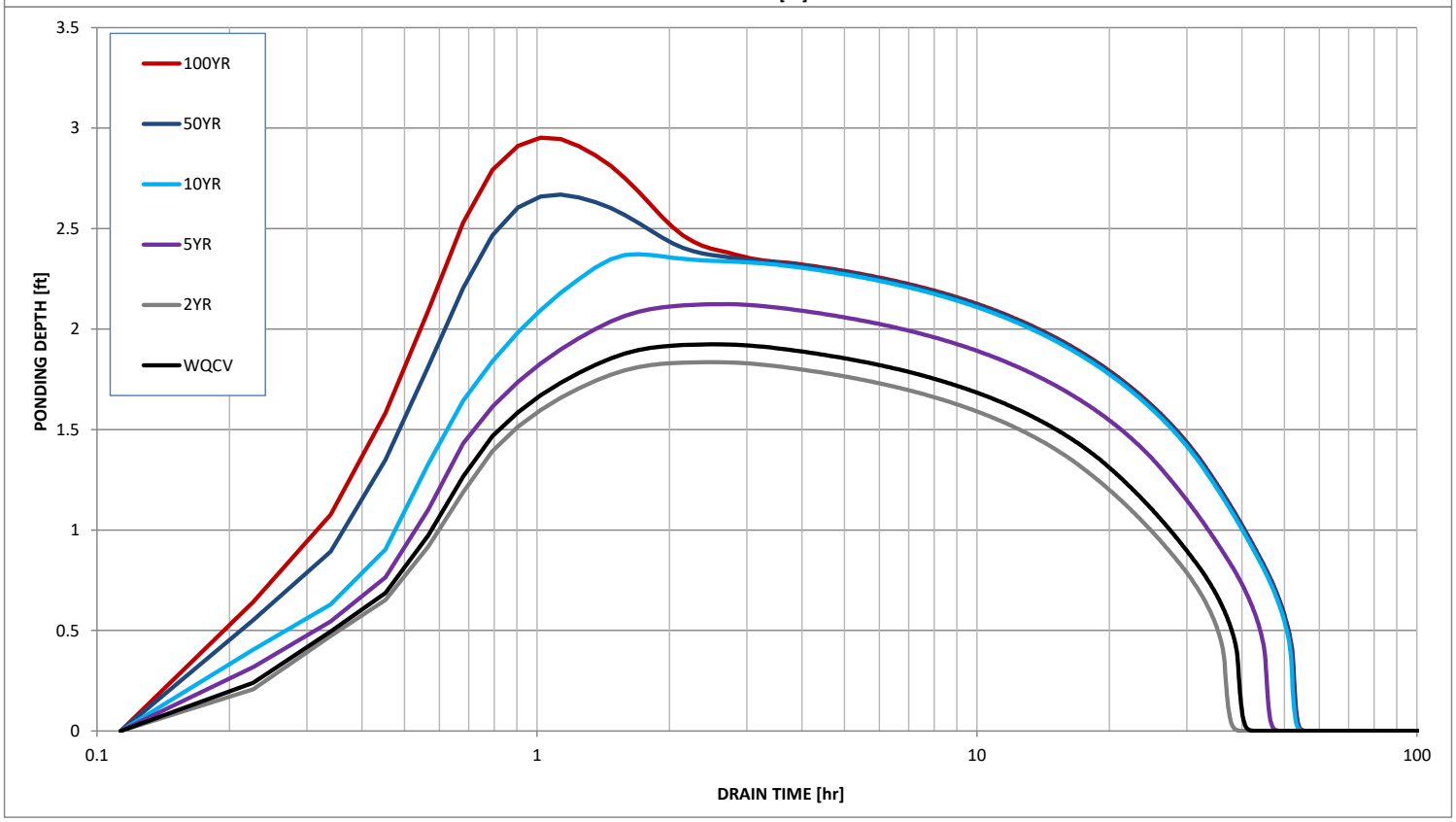
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.086	0.073	0.121	0.199	0.596	1.019	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.085	0.072	0.120	0.199	0.596	1.019	acre-ft
Time to Drain 97% of Inflow Volume =	35.7	33.6	**40.3**	43.9	34.3	28.1	hours
Time to Drain 99% of Inflow Volume =	38.3	35.9	43.8	49.1	44.3	**40.2**	hours
Maximum Ponding Depth =	1.92	1.84	2.12	2.37	2.67	2.95	ft
Maximum Ponded Area =	0.14	0.13	0.18	0.22	0.26	**0.29**	acres
Maximum Volume Stored =	0.075	0.063	0.107	0.157	0.228	0.305	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





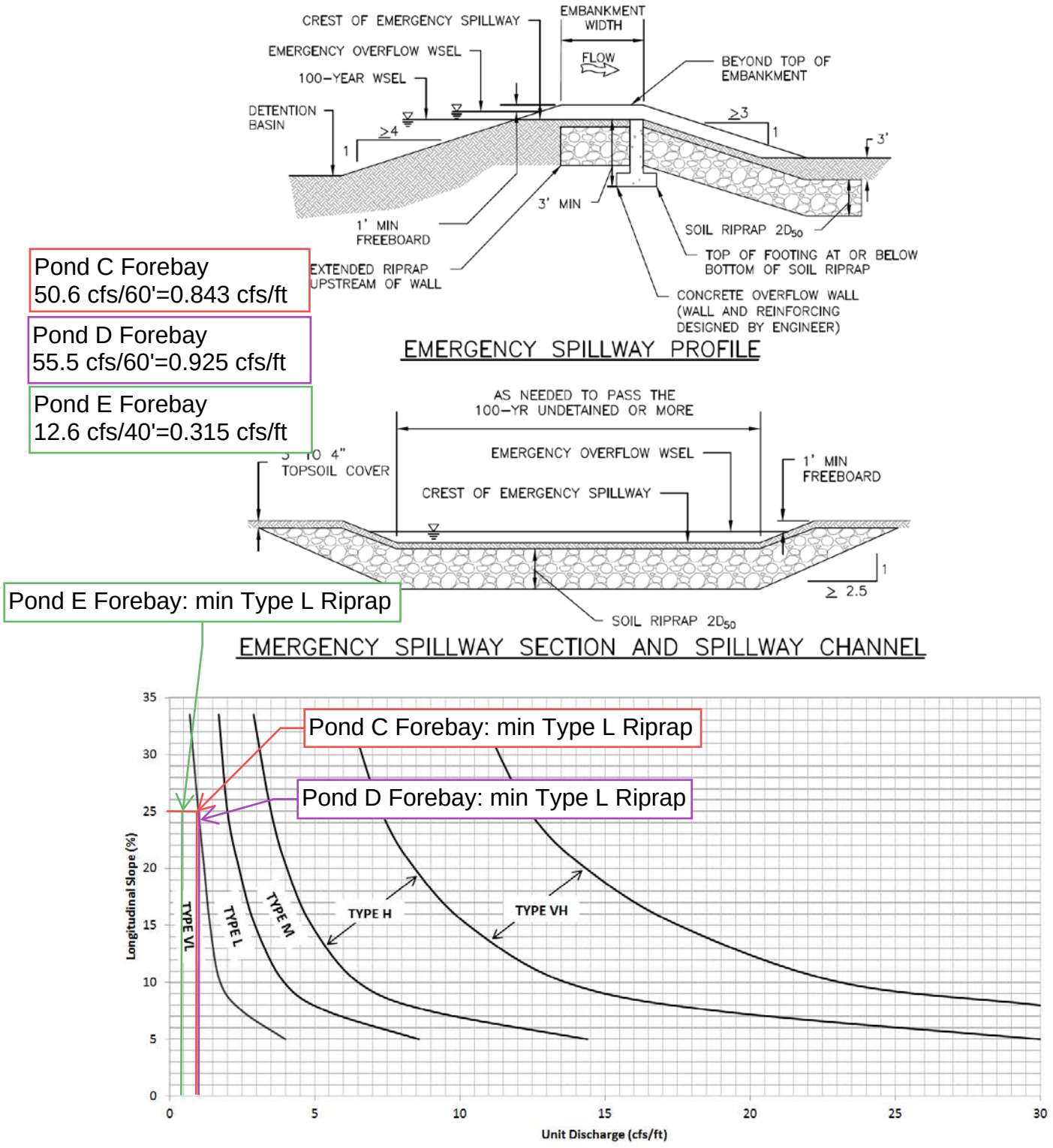


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

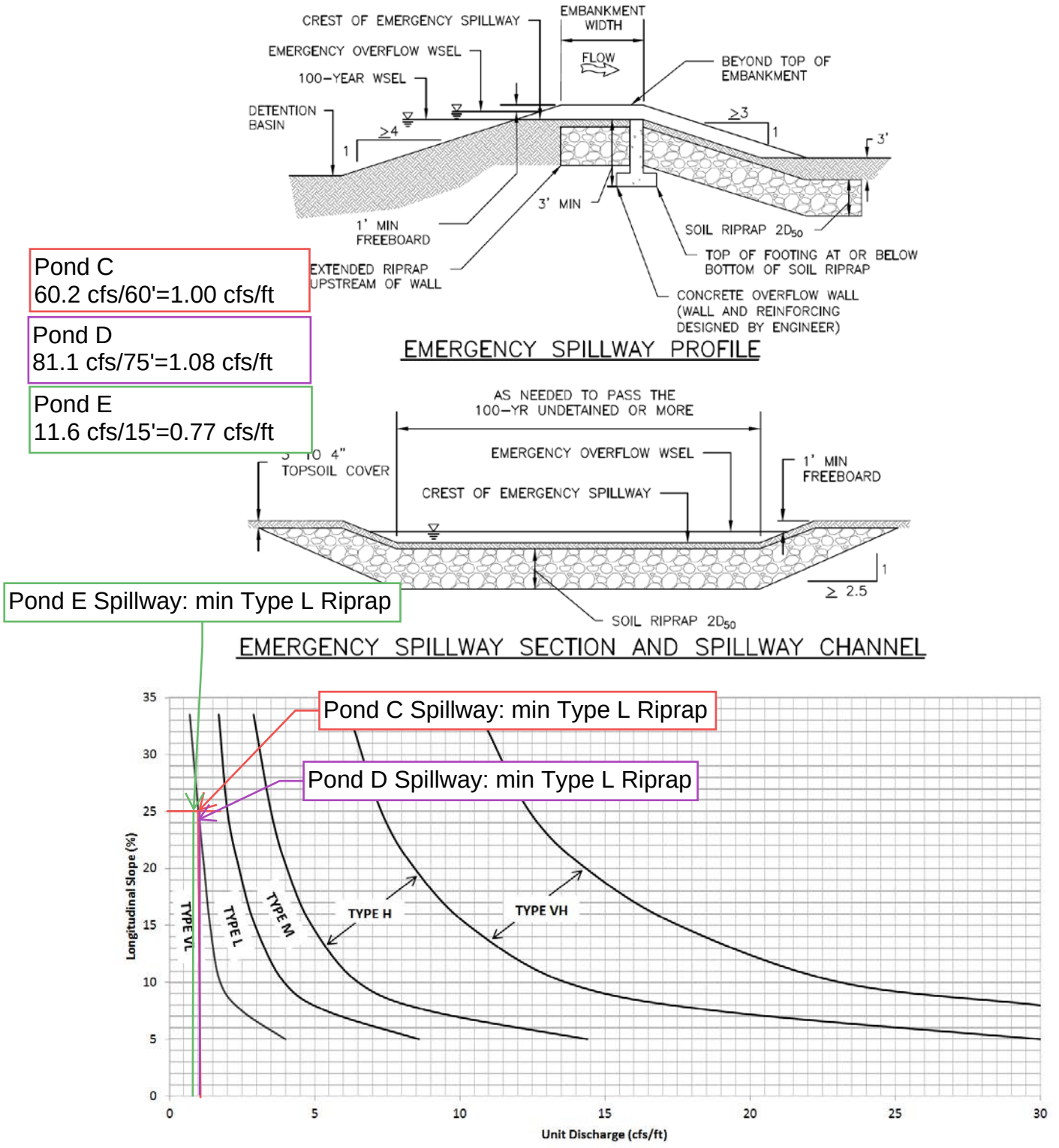


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

APPENDIX E

REFERENCE MATERIALS

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised BFEs presented in this LOMR may be changed.

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below.

LOCAL NEWSPAPER
Name: *El Paso County News*
Dates: 11/10/2004 11/17/2004

PUBLIC NOTIFICATION

FLOODING SOURCE	LOCATION OF REFERENCED ELEVATION	BFE (FEET NGVD) EFFECTIVE	BFE (FEET NGVD) REVISED	MAP PANEL NUMBER(S)
Haegler Ranch Tributary 2	Approximately 310 feet upstream of confluence with Geick Ranch West Tributary	None	6,735	08041C0575 F
	Approximately 3,140 feet upstream of confluence with Geick Ranch West Tributary	None	6,779	08041C0575 F
Haegler Ranch Tributary 3	Approximately 8,100 feet downstream of Curtis Road	None	6,672	08041C0575 F
	Approximately 300 feet upstream of Curtis Road	None	6,769	08041C0575 F
Haegler Ranch Tributary 4	Approximately 4,000 feet downstream of Curtis Road	None	6,688	08041C0575 F
	Approximately 300 feet upstream of Curtis Road	None	6,758	08041C0575 F

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C Long

Kevin C. Long, CFM, Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

102929 101104080587 102IAC

CHANGES ARE MADE IN DETERMINATIONS OF BASE FLOOD ELEVATIONS FOR THE UNINCORPORATED AREAS OF EL PASO COUNTY, COLORADO, UNDER THE NATIONAL FLOOD INSURANCE PROGRAM

On March 17, 1997, the Department of Homeland Security's Federal Emergency Management Agency identified Special Flood Hazard Areas (SFHAs) in the unincorporated areas of El Paso County, Colorado, through issuance of a Flood Insurance Rate Map (FIRM). The Mitigation Division has determined that modification of the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for certain locations in this community is appropriate. The modified Base Flood Elevations (BFEs) revise the FIRM for the community.

The changes are being made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65.

A hydraulic analysis was performed to incorporate new hydrologic, hydraulic, and topographic data for Haegler Ranch Tributary 2 from approximately 310 feet upstream to approximately 3,140 feet upstream of the confluence with Geick Ranch West Tributary; for Haegler Ranch Tributary 3 from approximately 8,100 feet downstream to approximately 400 feet upstream of Curtis Road; and for Haegler Ranch Tributary 4 from approximately 4,100 feet downstream to approximately 400 feet upstream of Curtis Road. This has resulted in increases and decreases in SFHA width and increased BFEs for the above-mentioned tributaries. The table below indicates existing and modified BFEs for selected locations along the affected lengths of the flooding source(s) cited above.

Location	Existing BFE (feet)*	Modified BFE (feet)*
Haegler Ranch Tributary 2:		
Approximately 310 feet upstream of confluence with Geick Ranch West Tributary	None	6,735
Approximately 3,140 feet upstream of confluence with Geick Ranch West Tributary	None	6,779
Haegler Ranch Tributary 3:		
Approximately 8,100 feet downstream of Curtis Road	None	6,672
Approximately 300 feet upstream of Curtis Road	None	6,769
Haegler Ranch Tributary 4:		
Approximately 4,000 feet downstream of Curtis Road	None	6,688
Approximately 300 feet upstream of Curtis Road	None	6,758

*National Geodetic Vertical Datum, rounded to nearest whole foot

Under the above-mentioned Acts of 1968 and 1973, the Mitigation Division must develop criteria for floodplain management. To participate in the National Flood Insurance Program (NFIP), the community must use the modified BFEs to administer the floodplain management measures of the NFIP. These modified BFEs will also be used to calculate the appropriate flood insurance premium rates for new buildings and their contents and for the second layer of insurance on existing buildings and contents.

Upon the second publication of notice of these changes in this newspaper, any person has 90 days in which he or she can request, through the Chief Executive Officer of the community, that the Mitigation Division reconsider the determination. Any request for reconsideration must be based on knowledge of changed conditions or new scientific or technical data. All interested parties are on notice that until the 90-day period elapses, the Mitigation Division's determination to modify the BFEs may itself be changed.

Any person having knowledge or wishing to comment on these changes should immediately notify:

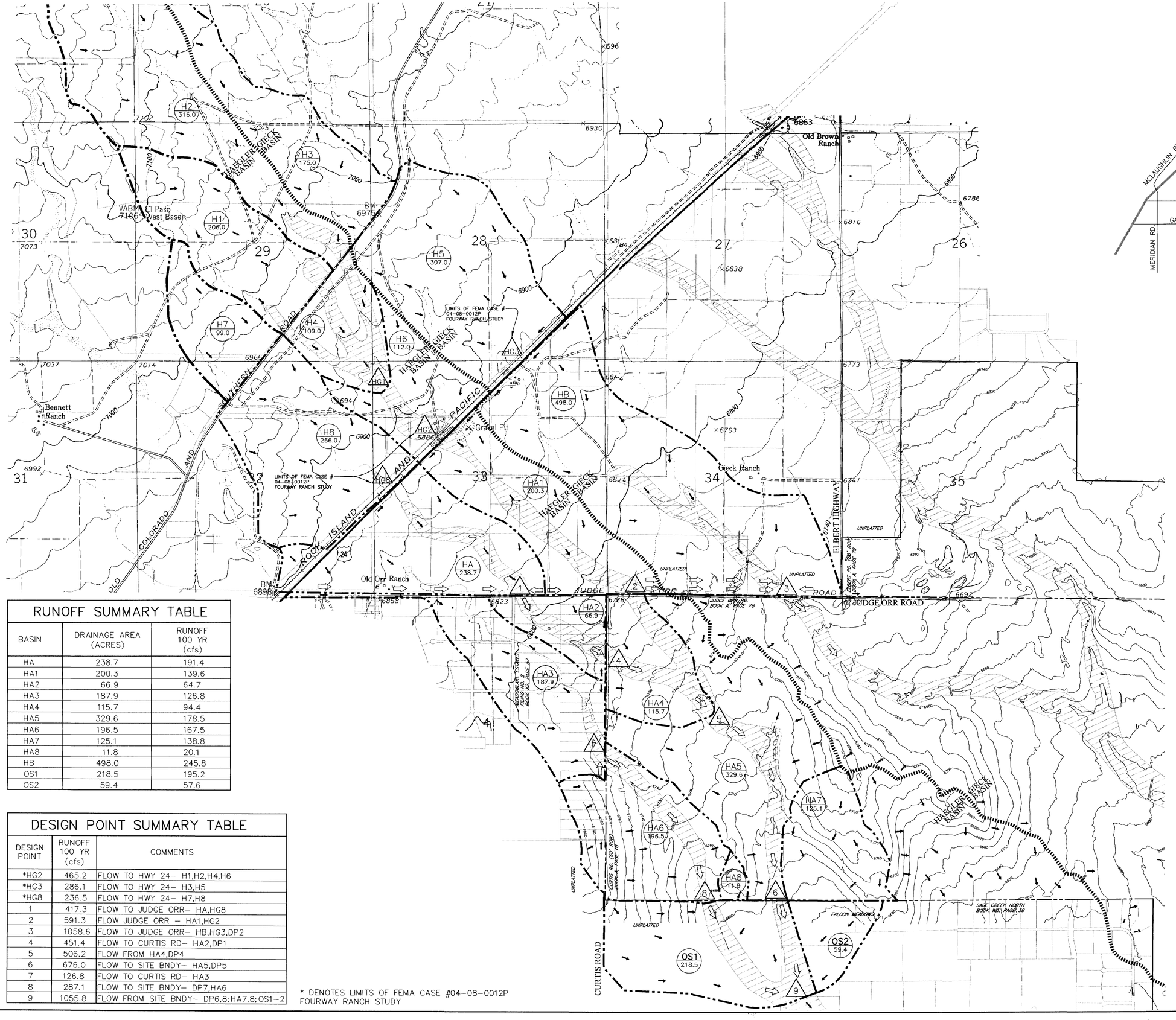
The Honorable Chuck Brown
Chairman, El Paso County
Board of Commissioners
27 Vermijo Avenue
Colorado Springs, CO 80903-2208

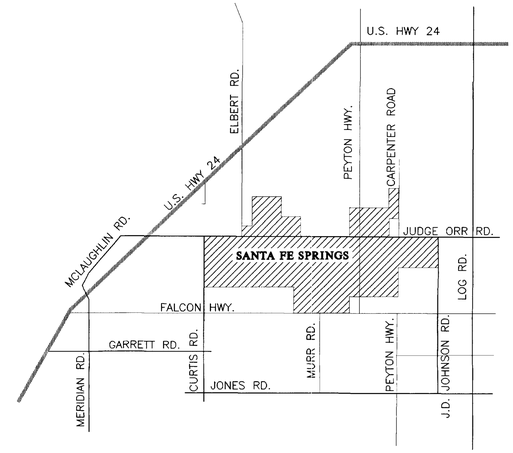
Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Haegler Ranch Tributary 2					
At the confluence with Geick Ranch West Tributary	1.47	__1	__1	592	__1
Haegler Ranch Tributary 3					
At approximately 2,300 feet upstream of the confluence with Haegler Ranch Tributary 4	1.09	__1	__1	505	__1
Haegler Ranch Tributary 4					
At approximately 3,700 feet upstream of the confluence with Haegler Ranch Tributary 3	0.60	__1	__1	130	__1

1 Data Not Available

REVISED TO
REFLECT LOMR
DATED FEB 16 2005





VICINTY MAP

1"=5000'

LEGEND

- EX. MAJOR CONTOUR 6420
- DRAINAGE BASIN BOUNDARY .....
- OVERLAND FLOW DIRECTION .....
- CHANNELIZED FLOW DIRECTION .....
- HAEGLER/GIECK BASIN BOUNDARY .....
- DESIGN POINT 1
- 100-YEAR FLOODPLAIN PER FIRM MAPS .....
- BASIN I.D. / BASIN AREA (Acres) — HA3 / 187.9

RUNOFF SUMMARY TABLE

BASIN	DRAINAGE AREA (ACRES)	RUNOFF 100 YR (cfs)
HA	238.7	191.4
HA1	200.3	139.6
HA2	66.9	64.7
HA3	187.9	126.8
HA4	115.7	94.4
HA5	329.6	178.5
HA6	196.5	167.5
HA7	125.1	138.8
HA8	11.8	20.1
HB	498.0	245.8
OS1	218.5	195.2
OS2	59.4	57.6

DESIGN POINT SUMMARY TABLE

DESIGN POINT	RUNOFF 100 YR (cfs)	COMMENTS
*HG2	465.2	FLOW TO HWY 24- H1,H2,H4,H6
*HG3	286.1	FLOW TO HWY 24- H3,H5
*HG8	236.5	FLOW TO HWY 24- H7,H8
1	417.3	FLOW TO JUDGE ORR- HA,HG8
2	591.3	FLOW JUDGE ORR - HA1,HG2
3	1058.6	FLOW TO JUDGE ORR- HB,HG3,DP2
4	451.4	FLOW TO CURTIS RD- HA2,DP1
5	506.2	FLOW FROM HA4,DP4
6	676.0	FLOW TO SITE BNDY- HA5,DP5
7	126.8	FLOW TO CURTIS RD- HA3
8	287.1	FLOW TO SITE BNDY- DP7,HA6
9	1055.8	FLOW FROM SITE BNDY- DP6,8;HA7,8;OS1-2

* DENOTES LIMITS OF FEMA CASE #04-08-0012P FOURWAY RANCH STUDY

GRAPHIC SCALE
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1 inch = 1000 ft.

NO.	DESCRIPTION	REV BY	CKD BY	DATE
	REVISION			

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=1000'
SCALE (V): N/A
DRAWN BY: DMM
DESIGNED BY: RLS
CHECKED BY: RLS
DATE: 05/21/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO, COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON
SUITE 300

EXHIBIT 1
HYDROLOGIC SUBBASIN MAP

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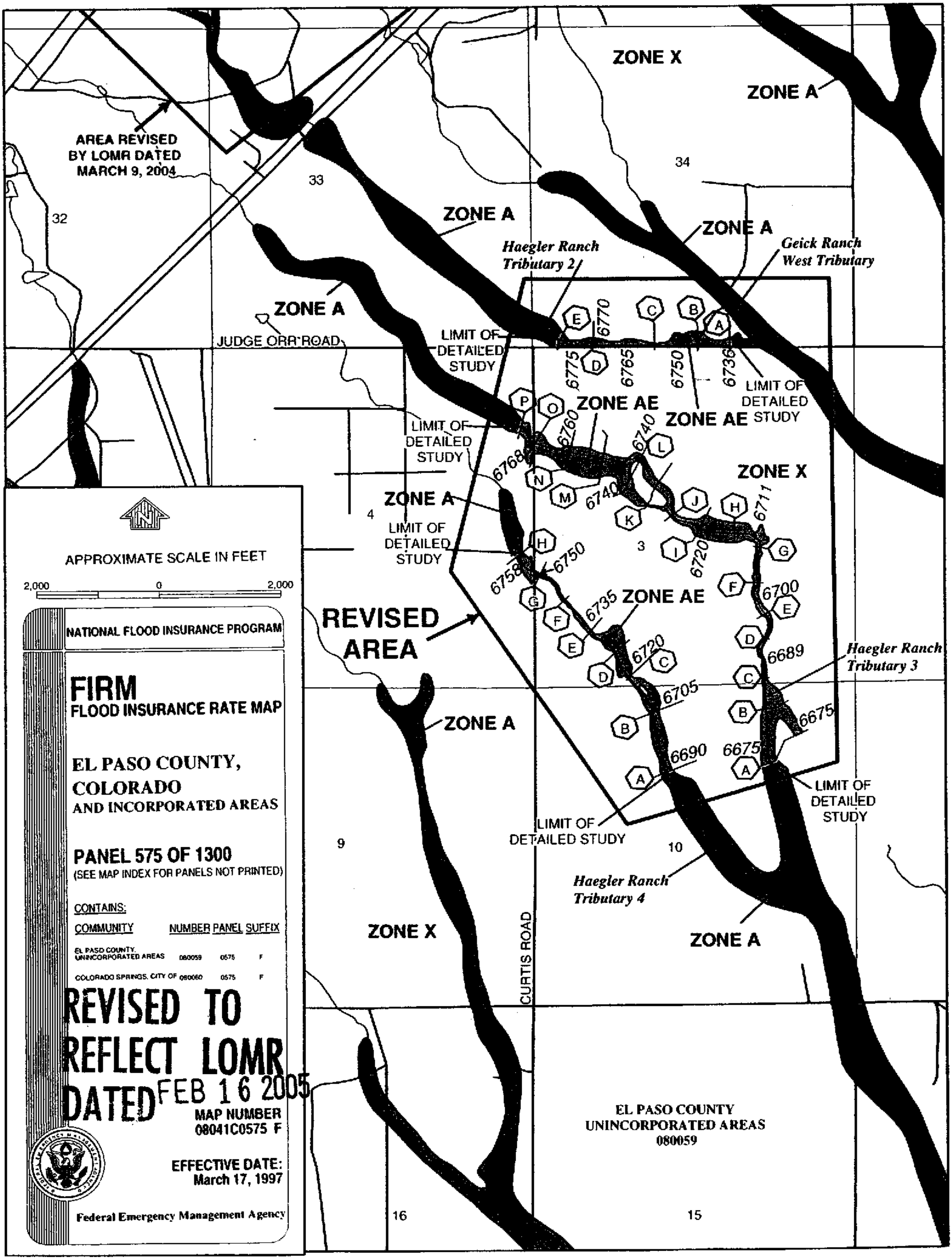
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ZONE A
AREA REVISED
BY LOMR DATED
MARCH 9, 2004
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34
32
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ZONE A
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Tributary 2
Geick Ranch
West Tributary
ZONE A
JUDGE ORR ROAD
LIMIT OF
DETAILED
STUDY
6770
6775
6765
6750
6736
LIMIT OF
DETAILED STUDY
ZONE AE
ZONE AE
LIMIT OF
DETAILED
STUDY
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ZONE A
4
LIMIT OF
DETAILED
STUDY
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6711
3
6720
6758
6750
6735
ZONE AE
6700
REVISED
AREA
6720
6689
Haegler Ranch
Tributary 3
ZONE A
6705
6675
6690
6675
LIMIT OF
DETAILED STUDY
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10
Haegler Ranch
Tributary 4
ZONE X
ZONE A
CURTIS ROAD
16
15
EL PASO COUNTY
UNINCORPORATED AREAS
080059
APPROXIMATE SCALE IN FEET
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0
2,000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO
AND INCORPORATED AREAS
PANEL 575 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY
NUMBER
PANEL
SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS
080059
0575
F
COLORADO SPRINGS, CITY OF
080060
0575
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REVISED TO
REFLECT LOMR
DATED FEB 16 2005
MAP NUMBER
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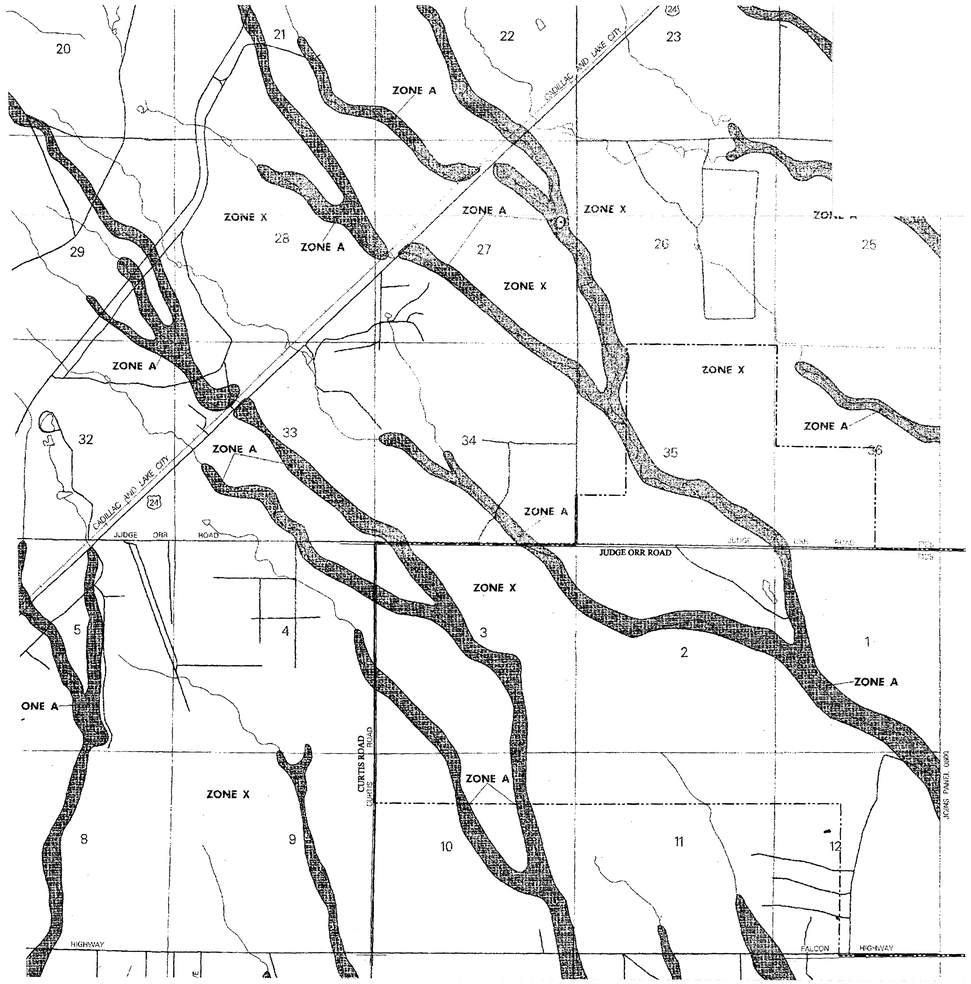
EFFECTIVE DATE:
March 17, 1997
Federal Emergency Management Agency



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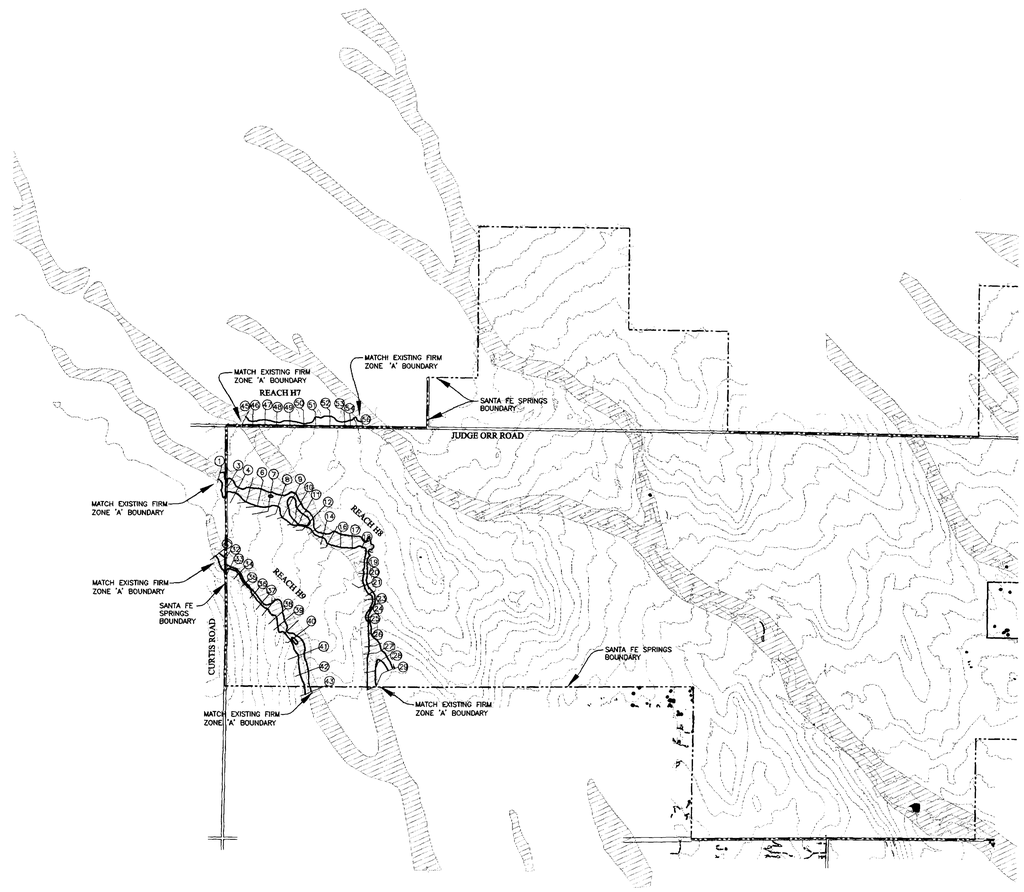

REVISED EFFECTIVE CONDITION

APPROXIMATE SCALE IN FEET
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NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 575 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0575	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0575	F

MAP NUMBER
08041C0575 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

GRAPHIC SCALE
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1 inch = 2000 ft

REVISION NO.	DESCRIPTION	REV BY	CKD BY	DATE

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=2000'
SCALE (V): N/A

DRAWN BY: DMM
DESIGNED BY: RLS
CHECKED BY: RLS

DATE: 05/21/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO, COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON
SUITE 300

EXHIBIT 2
REVISED FLOOD INSURANCE RATE MAP

PROJECT NO.
6005-0001

FILENAME
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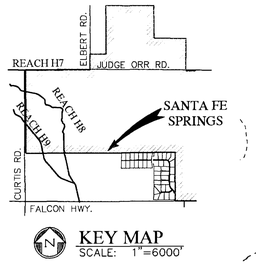
EXH. 2



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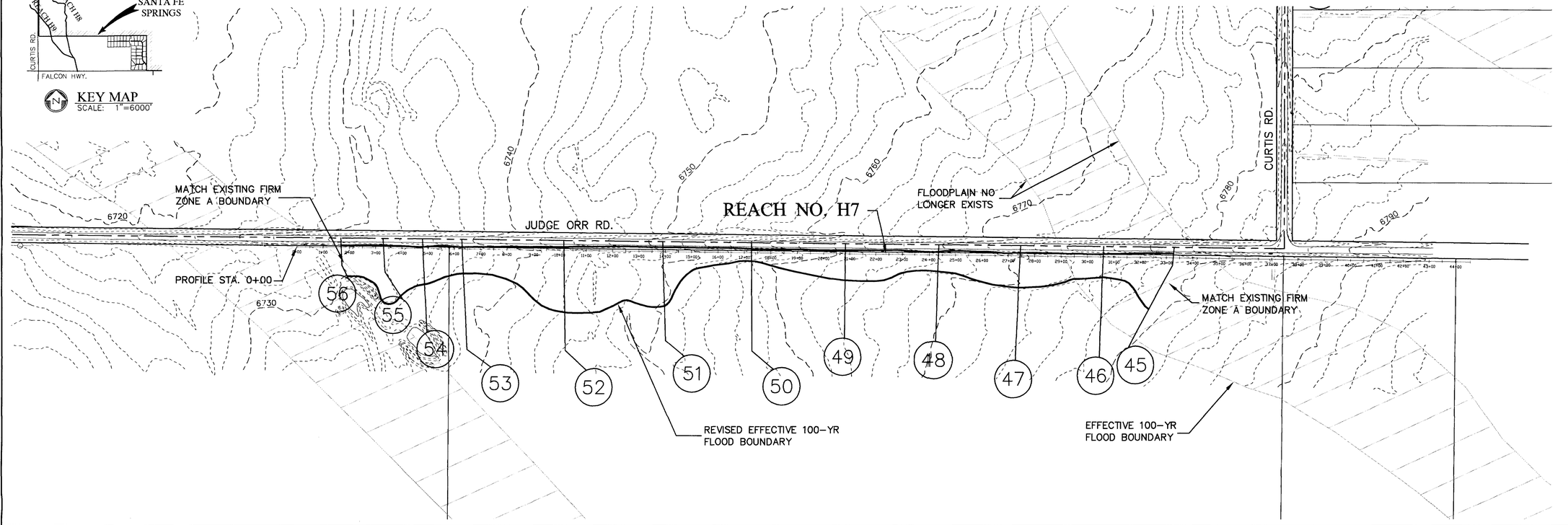

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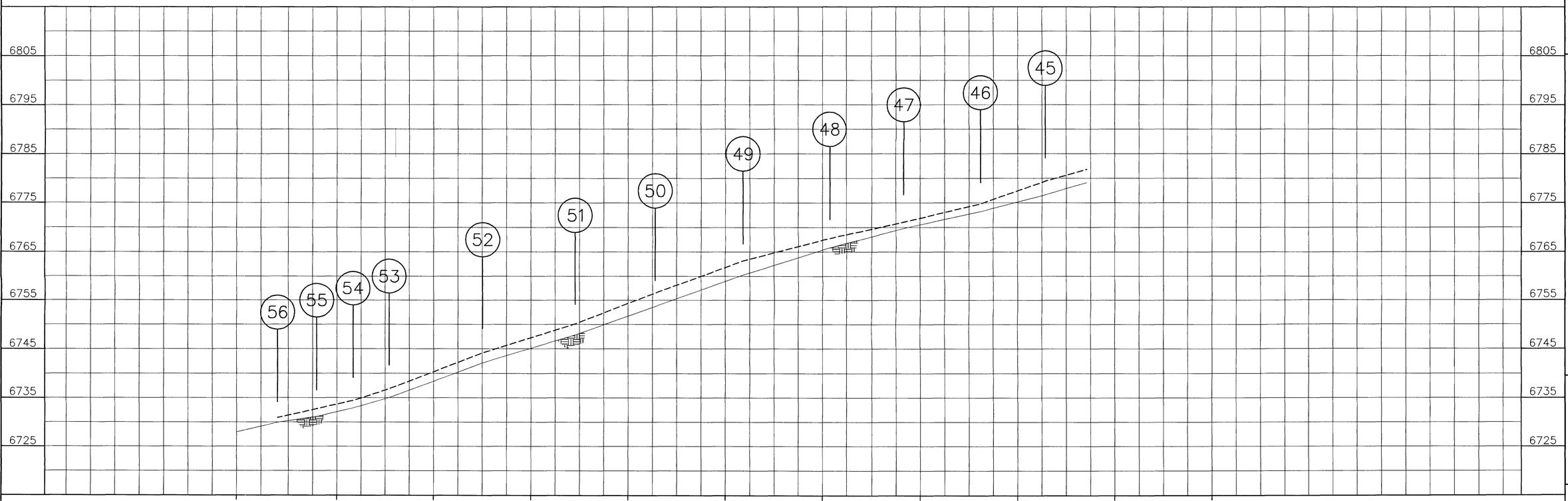

NO.	DESCRIPTION	REV BY	CKD BY	DATE
	REVISION			

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=200'
SCALE (V): 1"=10'
DRAWN BY: KMV
DESIGNED BY: RLS
CHECKED BY: RLS
DATE: 06/04/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON, SUITE 300
COLORADO SPRINGS, CO 80903

EXHIBIT 3 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
6005.0001
FILENAME
PP-LOMR.DWG
DRAWING NO.
EXH. 3

KEY MAP
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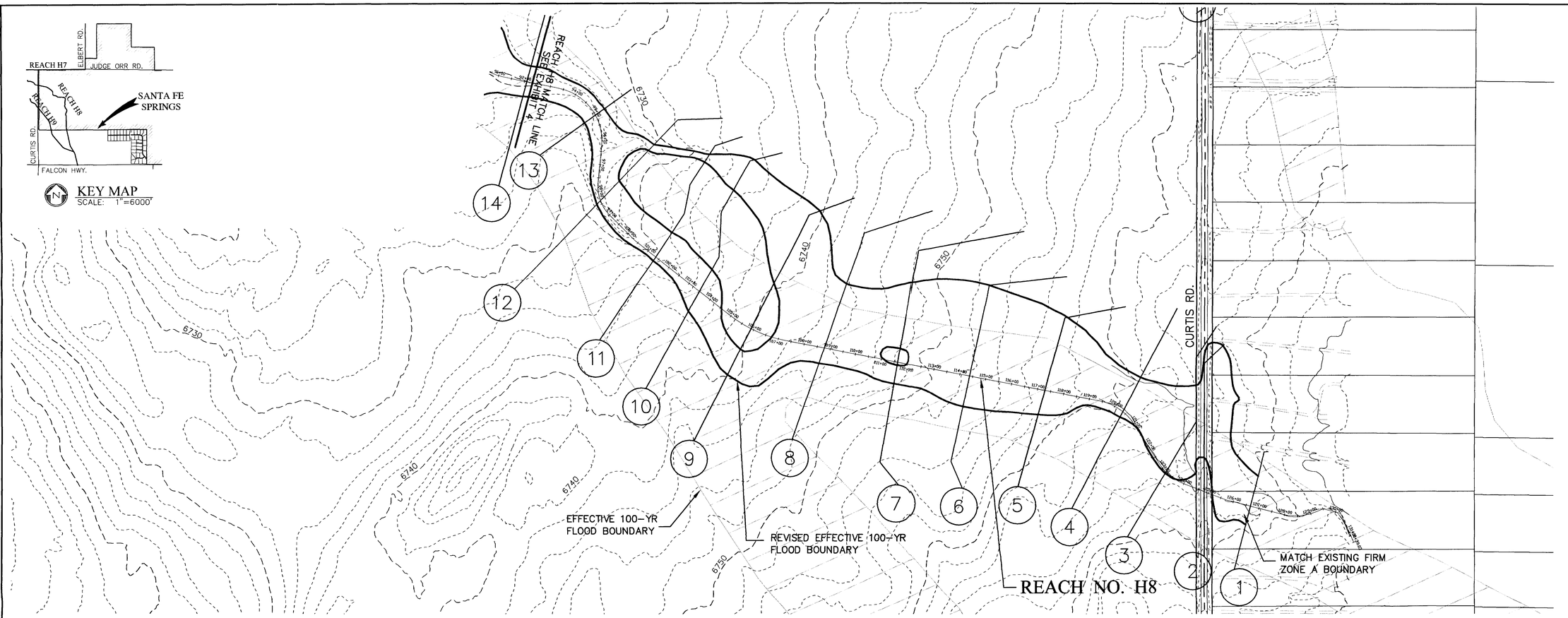

GRAPHIC SCALE
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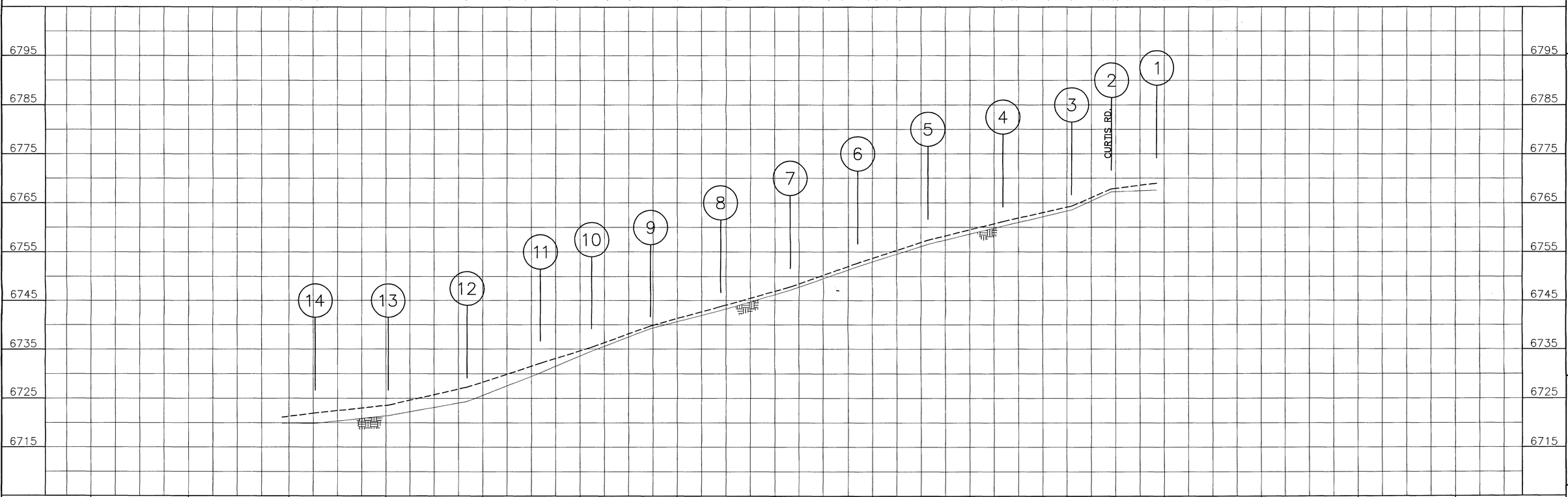
REVISION				
NO.	DESCRIPTION	REV BY	CKD BY	DATE

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193



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CHECKED BY: RLS
DATE: 06/04/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON, SUITE 300
COLORADO SPRINGS, CO 80903

EXHIBIT 4 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
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FILENAME
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DRAWING NO.
EXH. 4

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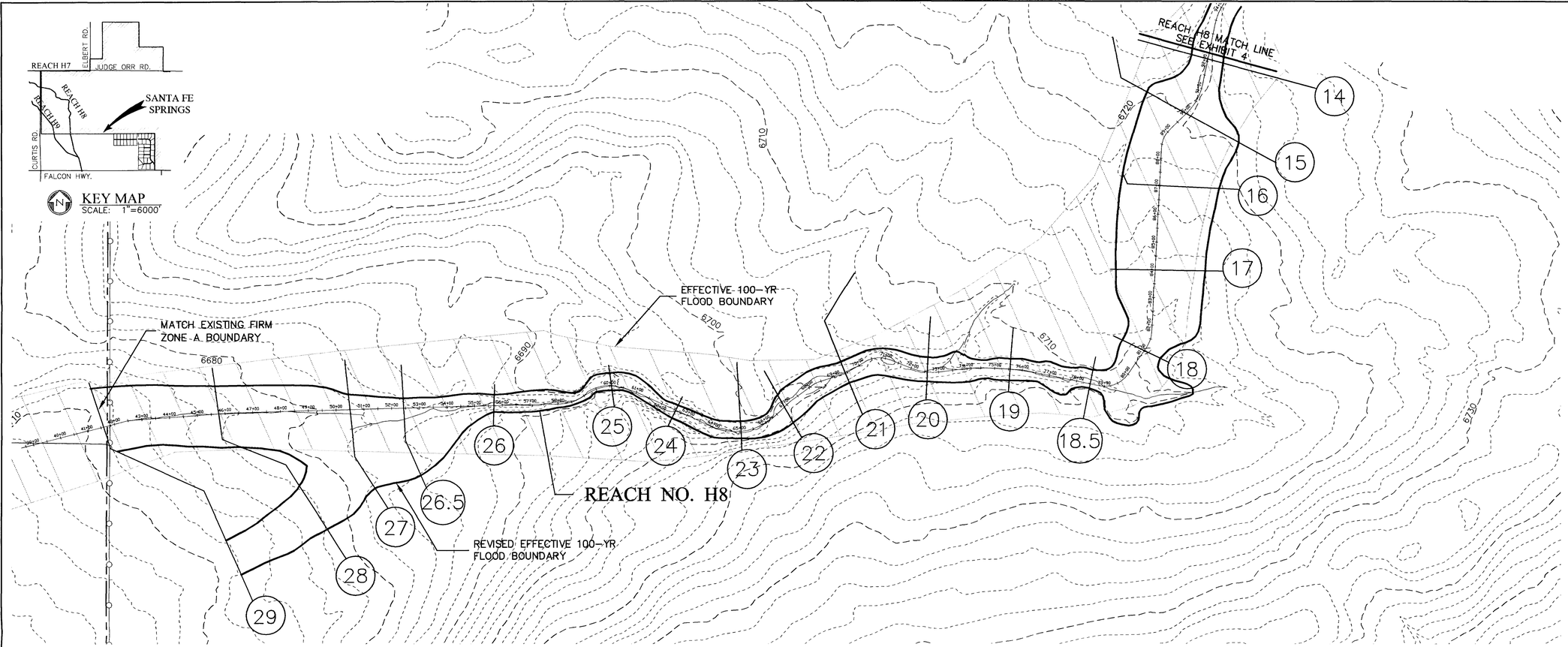

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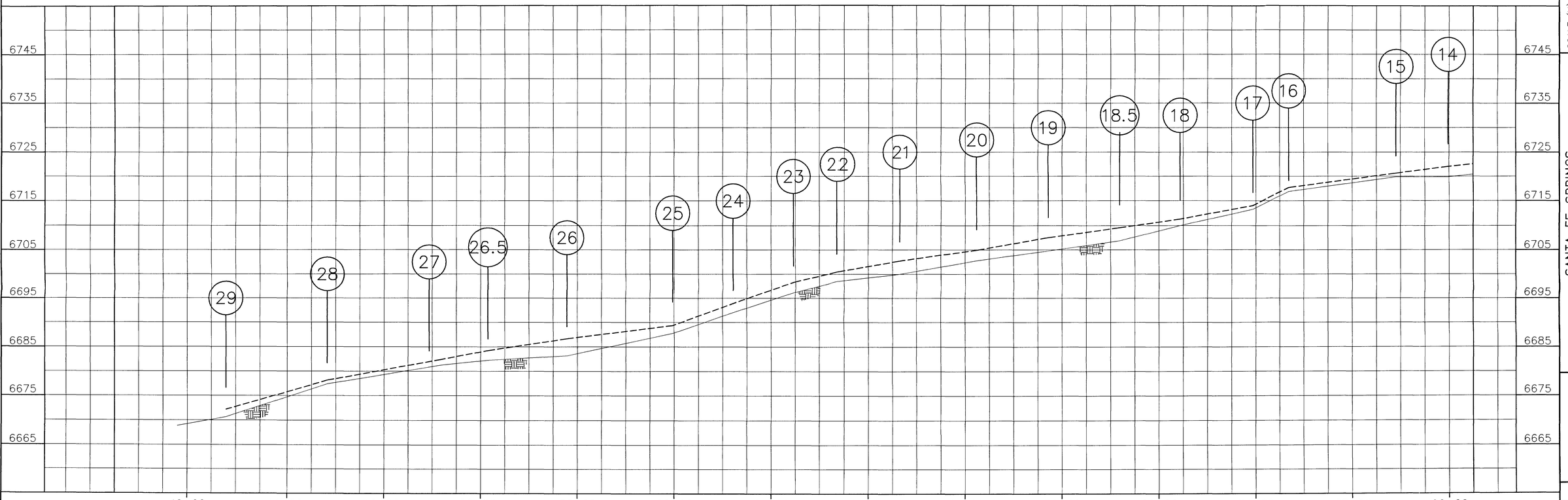


NO.	DESCRIPTION	REVISION BY	CKD BY	DATE

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=200'
SCALE (V): 1"=10'
DRAWN BY: KMV
DESIGNED BY: RLS
CHECKED BY: RLS
DATE: 06/04/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO COUNTY

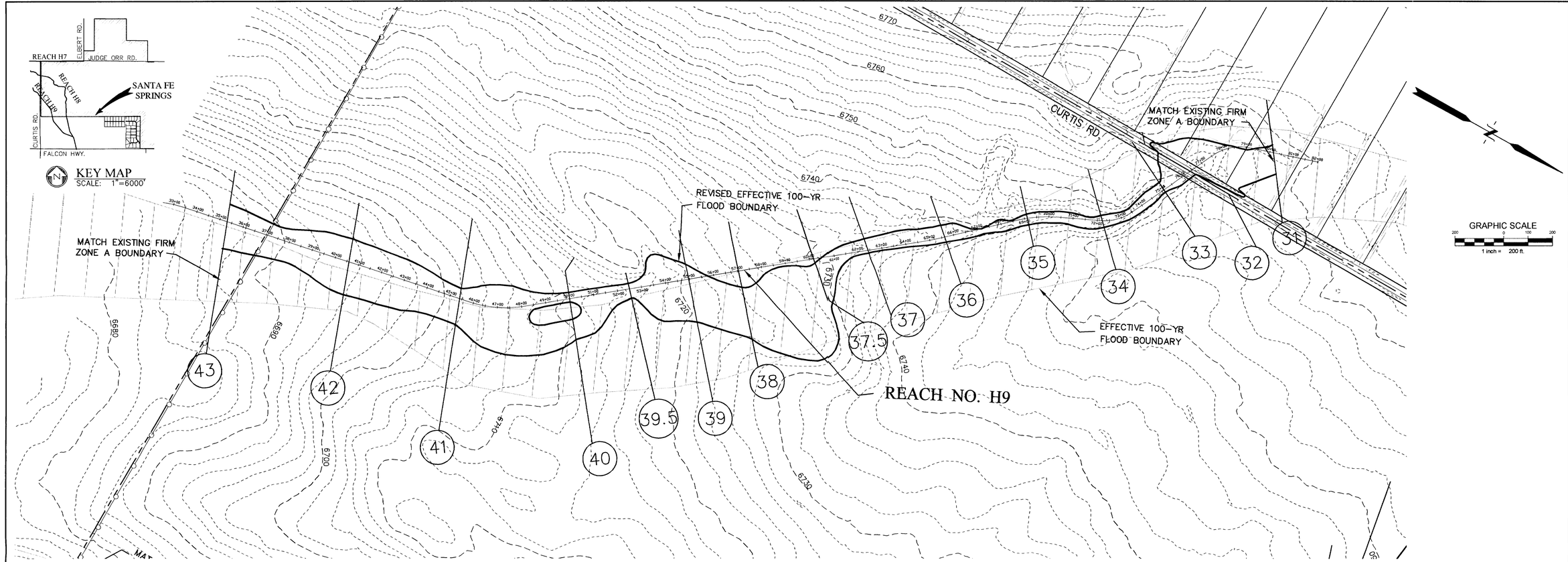
REALTY DEVELOPMENT SERVICES
25 NORTH TEJON, SUITE 300
COLORADO SPRINGS, CO 80903

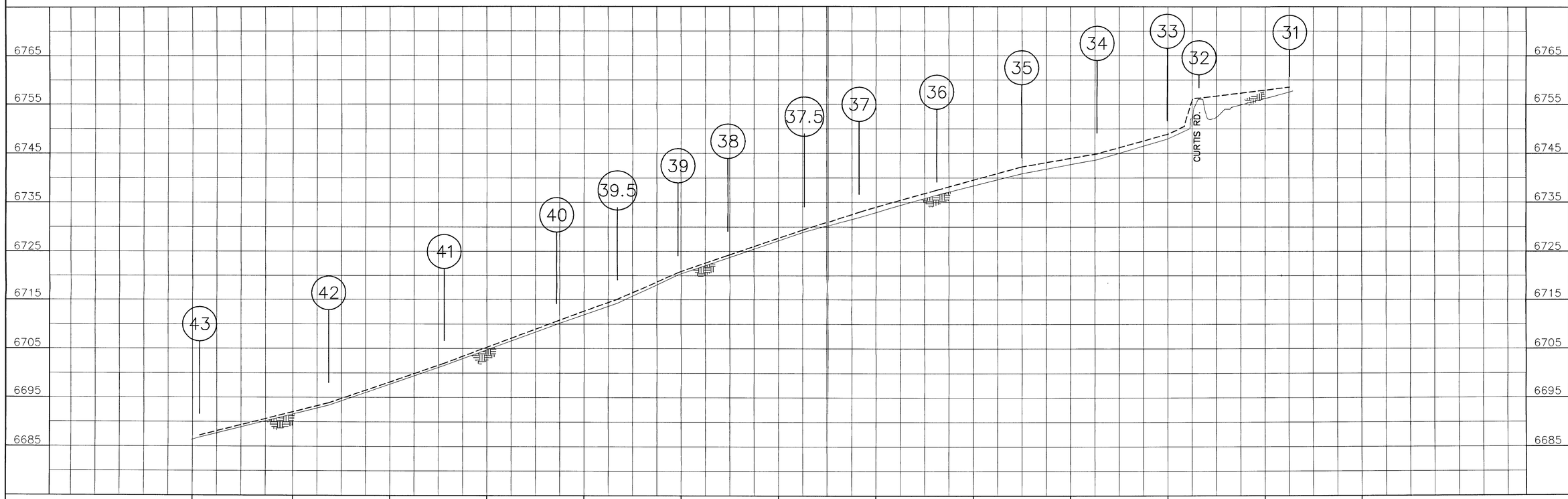
EXHIBIT 5 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
6005.0001

PP-LOMR.DWG

DRAWING NO.
EXH. 5





NO.	DESCRIPTION	REV BY	CKD BY	DATE
	REVISION			

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=200'
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DRAWN BY: KMV
DESIGNED BY: RLS
CHECKED BY: RLS

DATE: 06/04/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO COUNTY

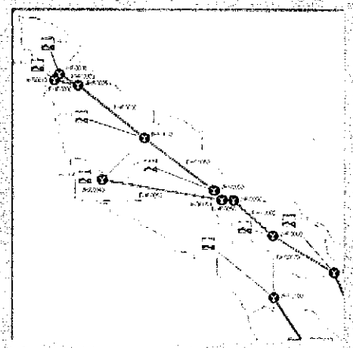
REALTY DEVELOPMENT SERVICES
25 NORTH TEJON, SUITE 300
COLORADO SPRINGS, CO 80903

EXHIBIT 6 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
6005.0001

PP-LOMR.DWG

DRAWING NO.
EXH. 6

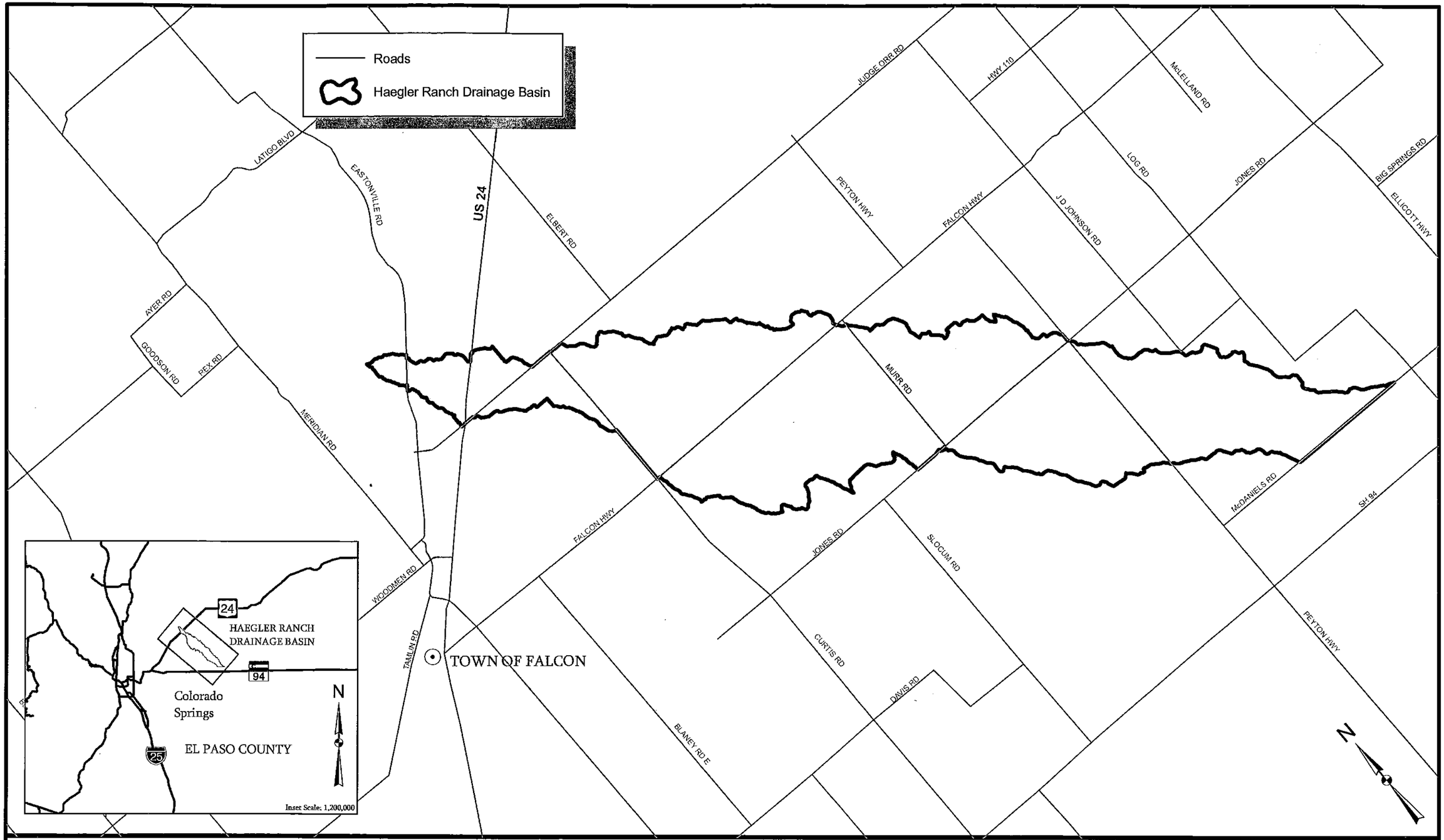


Fountain Creek Basin

Drainage Basin Planning Study

May 2009

URS



URS
9960 Federal Dr.
Suite 300
Colorado Springs, CO 80921
719.531.0001

6,000 3,000 0 6,000 Feet

1" = 6,000'

DATE: 05/08

HAEGLER RANCH DRAINAGE BASIN

VICINITY MAP
FIGURE 1-1

URS NO. 21711039

Haegler Ranch Drainage Basin Boundary
Subbasin Boundaries
Diverted to Geick
Stream Reach
Roads

LATIGO BLVD
EASTONVILLE RD
US 24
ELBERT RD
MERIDIAN RD
WOODMEN RD
TAMLIN RD
FALCON HWY
BLANEY RD E
JUDGE ORR RD
HWY 110
PEYTON HWY
McLELLAND RD
LOG RD
J D JOHNSON RD
JONES RD
ELLICOTT HWY
BIG SPRINGS RD
SLOCUM RD
CURTIS RD
DAVIS RD
SH 94

HR0010 HR0020 HR0030 HR0040 HR0050 HR0060 HR0070 HR0080 HR0090 HR0100 HR0110 HR0120 HR0130 HR0140 HR0150 HR0160 HR0170 HR0180 HR0190 HR0200 HR0210 HR0220 HR0230 HR0240 HR0250 HR0260 HR0270 HR0280 HR0290 HR0300 HR0310 HR0320 HR0330 HR0340 HR0350 HR0360 HR0370 HR0380 HR0390 HR0400 HR0410 HR0420 HR0430 HR0440 HR0450 HR0460 HR0470 HR0480 HR0490 HR0500 HR0510 HR0520 HR0530 HR0540 HR0550 HR0560 HR0570 HR0580 HR0590 HR0600 HR0610 HR0620 HR0630 HR0640 HR0650 HR0660 HR0670 HR0680

T1 T2 T3 - 01 T3 - 02 T4 T5 T6 T7

MS - 01 MS - 02 MS - 03 MS - 04 MS - 05 MS - 06 MS - 07

N

URS
9960 Federal Dr.
Suite 300
Colorado Springs, CO 80921
719.531.0001

5,000 2,500 0 5,000 Feet
1" = 5,000'

DATE: 09/08

HAEGLER RANCH DRAINAGE BASIN
SUBBASIN DELINEATION
FIGURE 4-1

URS NO. 21711039

Table 5-3 Existing Hydraulic Deficiencies

Facility Number	Road Crossing	Channel	Existing Size	Existing 100-yr Flow (cfs)	Deficiency
633	Sagecreek Road	N/A	24" CMP	N/A	N/A
634	Sagecreek Road	N/A	24" CMP	N/A	N/A
701	Curtis Road	N/A	18" CMP	N/A	N/A
702	Curtis Road	Tributary 6 (T6)	36" CMP	120	Overtops
703	Curtis Road	Main Stem (MS-06)	24" CMP	590	Overtops
704	Judge Orr Road	Main Stem (MS-06)	Blocked Culvert	540	Overtops
705	Judge Orr Road	N/A	18" CMP	N/A	N/A
706	US 24	N/A	20" Steel Pipe	N/A	N/A
707	US 24	N/A	24" CMP	N/A	N/A
801	Pedestrain Bridge	Main Stem (MS-06)	Bridge	350	Meets Capacity
802	US24	Main Stem (MS-06)	2-66" CMPs	350	Meets Capacity
803	Eastonville Road	Main Stem (MS-07)	27"X21" CMP	25	Overtops
804	Eastonville Road	Tributary 7 (T7)	18" CMP	99	Overtops

Note. 69 Structures were cataloged and located. N/A indicates that the structure was not analyzed because it was not on one of the main channels.

5.14. Results

Hydraulic conditions from the hydraulic model results are summarized in Table 5-4. This includes channel velocity, flow depth, and top width for existing conditions at key locations. Water surface profiles for Haegler Ranch Drainage Basin for the 100-year recurrence interval flood for the existing conditions are presented in Figure 5-4 the HEC-RAS model for Haegler Ranch Drainage Basin for the existing conditions is provided in Appendix B.

The approximate 100-year floodplain as seen in Figure 5-4 varies from a contained floodplain with in a defined channel to a wide floodplain with shallow flooding. Three areas were designated as flooding: 1) the approximate 100-year floodplain as delineated by HEC-RAS, 2) split flow flooding that was estimated from HEC-RAS elevation upstream and contours, and 3) shallow areas connected to the floodplain with less than 1 foot of flooding.

Table 5-4 Existing Conditions HEC-RAS Model

Key Location	Reach and Station	HEC-RAS Result	Recurrence Intervals			
			2-yr	5-yr	10-yr	100-yr
Main stem at US 24	MS-06 72276	Channel velocity (ft/sec)	1.1	1.63	1.98	2.92
		Water surface depth in channel (ft)	1.36	2.44	3.24	6.49
		Top width (ft)	18.23	24.85	29.7	255.62
Main stem at Judge Orr Road	MS-06 67666	Channel velocity (ft/sec)	3.33	4.09	1.76	3.48
		Water surface depth in channel (ft)	0.52	1.04	1.05	1.35
		Top width (ft)	174.53	534.34	535.52	569.34
Main stem at Falcon Highway	MS-05 52353	Channel velocity (ft/sec)	1.05	1.6	2.04	3.59
		Water surface depth in channel (ft)	1.79	3.69	4.96	5.74
		Top width (ft)	31.42	83.76	556.41	592.33
Main stem at Jones Road	MS-03 33189	Channel velocity (ft/sec)	2.45	3.7	1.27	2.51
		Water surface depth in channel (ft)	3.2	5.83	9.25	10.46
		Top width (ft)	47.98	105.51	580.28	667.17
Main stem at Peyton Highway	MS-02 18474	Channel velocity (ft/sec)	0.16	0.4	0.59	1.43
		Water surface depth in channel (ft)	4.14	4.35	4.51	5.15
		Top width (ft)	813.21	871.68	882.22	925.27
Southeast Tributary at Jones Road	T1 22297	Channel velocity (ft/sec)	0.62	1.02	1.47	3.2
		Water surface depth in channel (ft)	2.45	3.52	3.59	3.82
		Top width (ft)	197.35	345.68	351.74	372.17
Southeast Tributary at Peyton Highway	T1 16611	Channel velocity (ft/sec)	1.67	2.25	2.65	4.05
		Water surface depth in channel (ft)	0.08	0.17	0.24	0.51
		Top width (ft)	239.82	241.36	242.51	247.41
Southeast Tributary at Confluence with Main stem	T1 410	Channel velocity (ft/sec)	3.44	0.11	0.18	0.67
		Water surface depth in channel (ft)	1.69	2.01	2.01	2.01
		Top width (ft)	31.89	1169.3	1169.3	1169.3
At Confluence with Geick Basin	MS-01 82	Channel velocity (ft/sec)	2.68	3.85	19.89	17.33
		Water surface depth in channel (ft)	1.45	2.17	1.11	2.36
		Top width (ft)	75.88	255.32	60.67	262.84

Grass channels are designed for depths and velocities to be within the limits of allowable shear stress. Grass lined channels are limited to 1.0 psf shear stress. If calculated shear stress is above this, drop structures must be added to flatten the natural slope of the channel.

Using these criteria, several channel sections were developed to accommodate a range of future flow rates from 100 cfs to 3500 cfs, as shown in Table 6-2. The approximate channel sections were used in the alternatives to accommodate future flows as necessary,

Table 6-2 Channel Dimensions based on Flow Rates

Q (cfs)	Grass		
	Sideslope (h:v)	Bottom (ft)	Depth (ft)
300	4	6	5
500	4	8	5
600	4	15	5
800	4	20	5
900	4	25	5
1000	4	30	5
1500	4	50	5
2000	4	80	5
3000	4	120	5
3500	4	140	5

6.2.2. Culvert Design

Culvert sizes for use in alternative evaluation were estimated based on full flow capacity of reinforced concrete pipe with a minimum slope of 0.50% and concrete end sections. For flows up to 300 cfs single RC pipe culverts with a maximum of 72" diameter were used. For greater flows, multiple RC pipes or 6-foot by 6-foot concrete box culverts with headwalls and flared wingwalls were used. Proposed culverts sizes based on existing flow rates are listed in Table 6-3.

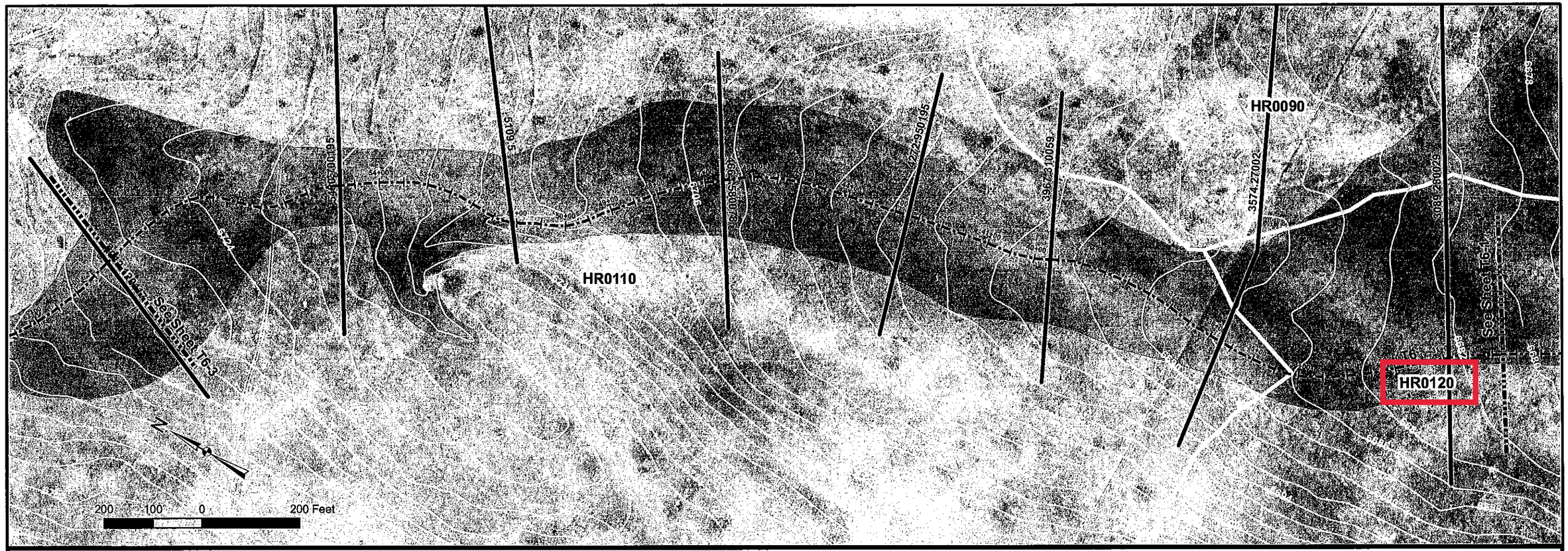
Table 6-3 Existing Conditions Culvert Design

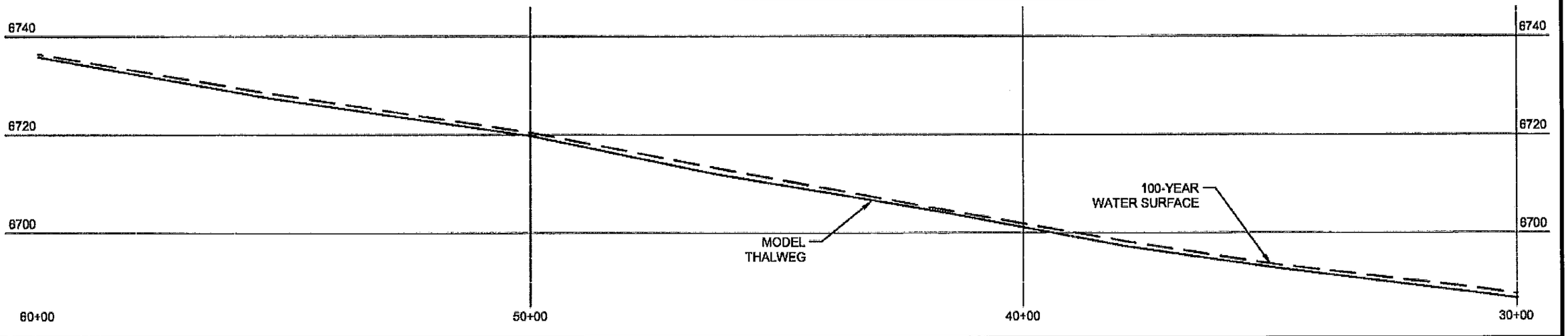
Facility Number	Road Crossing	Channel	Existing Size	Existing 100-yr Flow (cfs)	Deficiency	Necessary Facility
N/A	Peyton Highway	Tributary 1 (T1)	No Culvert	500	Overtops	2-72" RCPs
N/A	Falcon Highway	Tributary 1 (T1)	No Culvert	33	Overtops	36" RCP
301	Peyton Highway	Main Stem (MS-02)	2-33"X48" CMPs	2,500	Overtops	7-6'X6' RCBs
401	Jones Road	Tributary 1 (T1)	2-24" CMPs	370	Overtops	6'X6' RCB
403	Jones Road	Main Stem (MS-03)	3-60" CMPs	2,300	Overtops	6-6'X6' RCBs
405	Murr Road	Main Stem (MS-04)	66" RCP	1,700	Overtops	5-6'X6' RCBs
407	Murr Road	Tributary 3 (T3-01)	66" RCP	670	Overtops	2-6'X6' RCBs
507	Peerless Farms Road	Tributary 3 (T3-01)	60" CMP	600	Overtops	2-6'X6' RCBs
509	Murr Road	Tributary 1 (T1)	2-15" RCPs	220	Overtops	66" RCP
601	Whiting Way	Tributary 1 (T1)	24" CMP	220	Overtops	66" RCP
604	Max Road	Tributary 1 (T1)	18" CMP	220	Overtops	66" RCP
609	Falcon Highway	Tributary 3 (T3-02)	18" CMP	180	Overtops	66" RCP
610	Falcon Highway	Tributary 4 (T4)	24" CMP	200	Overtops	66" RCP
612	Falcon Highway	Tributary 5 (T5)	24" CMP	150	Overtops	60" RCP
628	Falcon Highway	Main Stem (MS-05)	2-60" CMPs	1,000	Overtops	3-6'X6' RCBs
702	Curtis Road	Tributary 6 (T6)	36" CMP	120	Overtops	54" RCP
703	Curtis Road	Main Stem (MS-06)	24" CMP	590	Overtops	2-6'X6' RCBs
704	Judge Orr Road	Main Stem (MS-06)	Blocked Culvert	540	Overtops	2-72" RCPs
801	Pedestrain Bridge	Main Stem (MS-06)	Bridge	350	Meets Capacity	Existing Bridge
802	US24	Main Stem (MS-06)	2-66" CMPs	350	Meets Capacity	Existing Culvert
803	Eastonville Road	Main Stem (MS-07)	27"X21" CMP	25	Overtops	30" RCP
804	Eastonville Road	Tributary 7 (T7)	18" CMP	99	Overtops	48" RCP

6.2.3. Detention Design

All detention pond design is based on Chapter 10, Storage, of the UDFCD SDCM. All ponds were assumed to be "full spectrum" per the SDCM. For final design to be performed later, some of the ponds may be separated into a water quality pond and an off-line major detention pond.

For the Regional Detention Alternative, either the simplified full spectrum sizing method or the hydrograph method was used to size the facility. If the contributing area is less than 160 acres and no





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Colorado Springs, CO 80921
719.531.0001

Subbasin Boundaries
Approximate 100-Year Floodplain
Thalweg
Cross Sections
2' Contours

DATE: 05/08

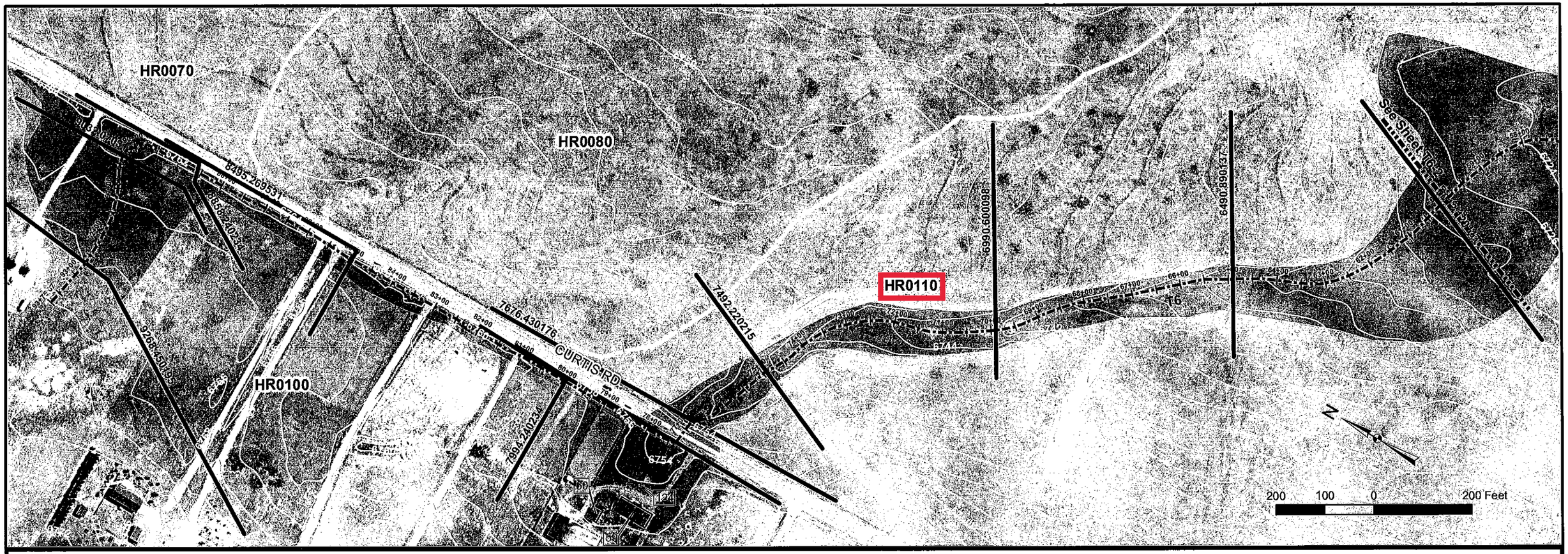
HAEGLER RANCH DRAINAGE BASIN

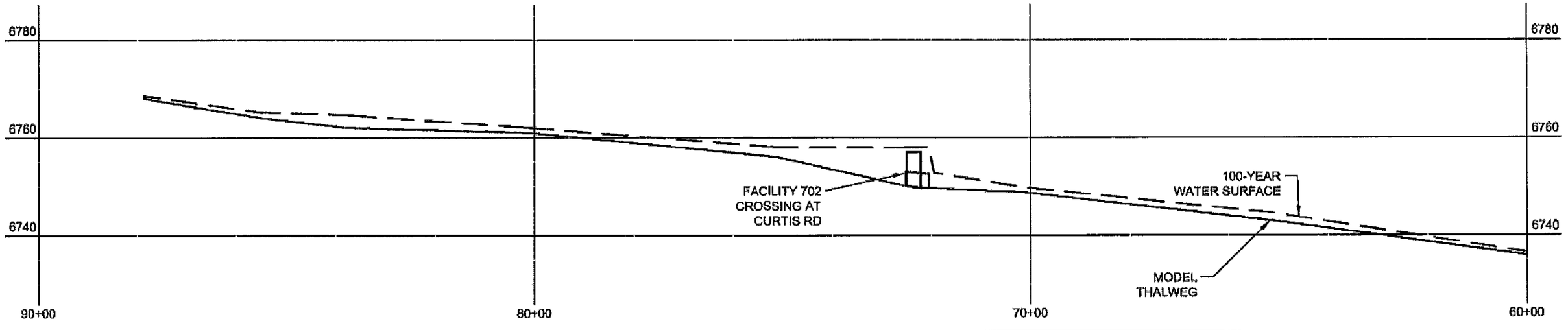
APPROXIMATE 100-YEAR FLOOD LIMITS

SHEET T6-2

FIGURE 5-4

URS NO. 21711039





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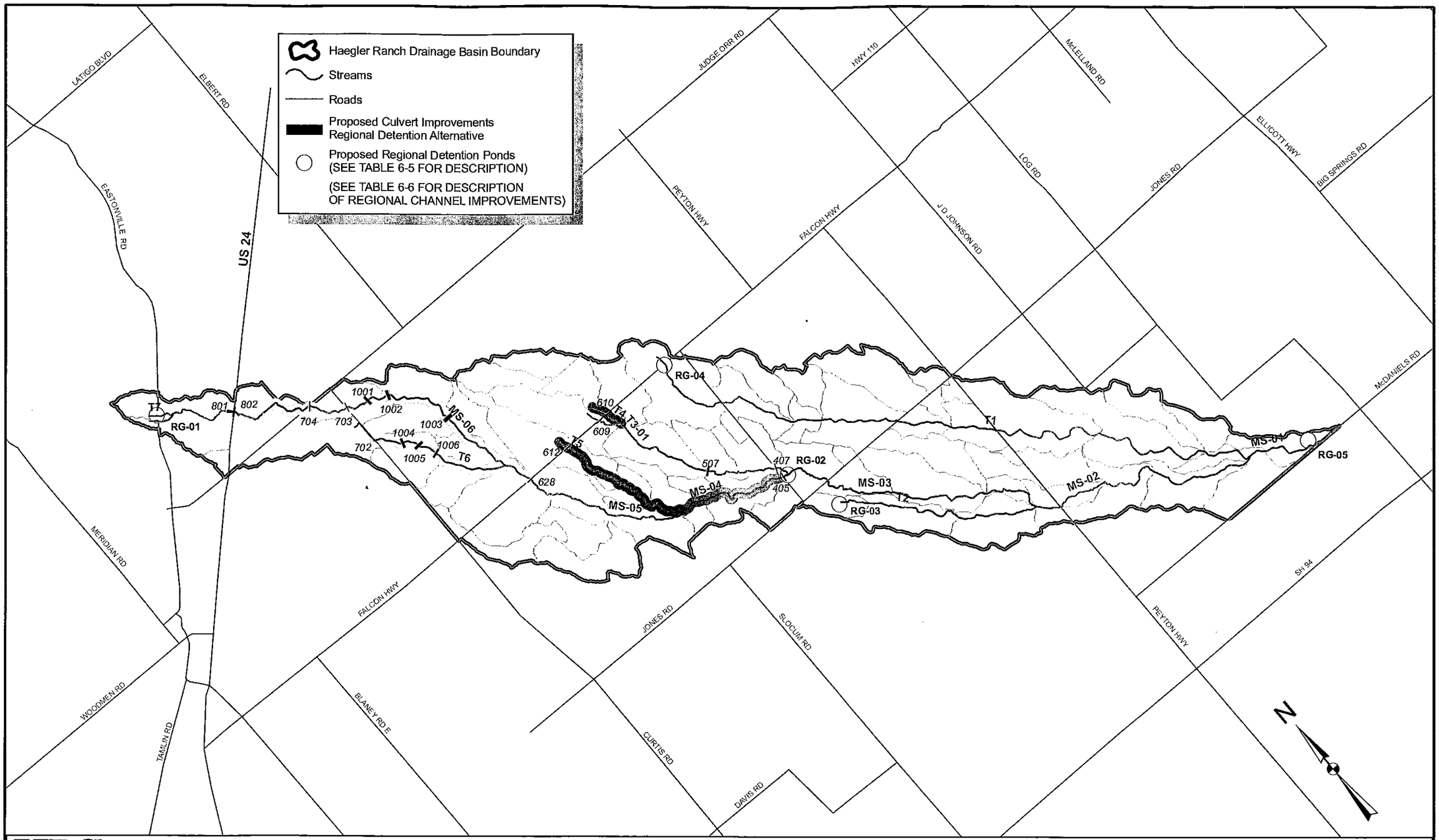
Subbasin Boundaries
Approximate 100-Year Floodplain
Thalweg
Cross Sections
2' Contours

HAEGLER RANCH DRAINAGE BASIN

APPROXIMATE 100-YEAR FLOOD LIMITS
SHEET T6-3
FIGURE 5-4

DATE: 09/08

URS NO. 21711039



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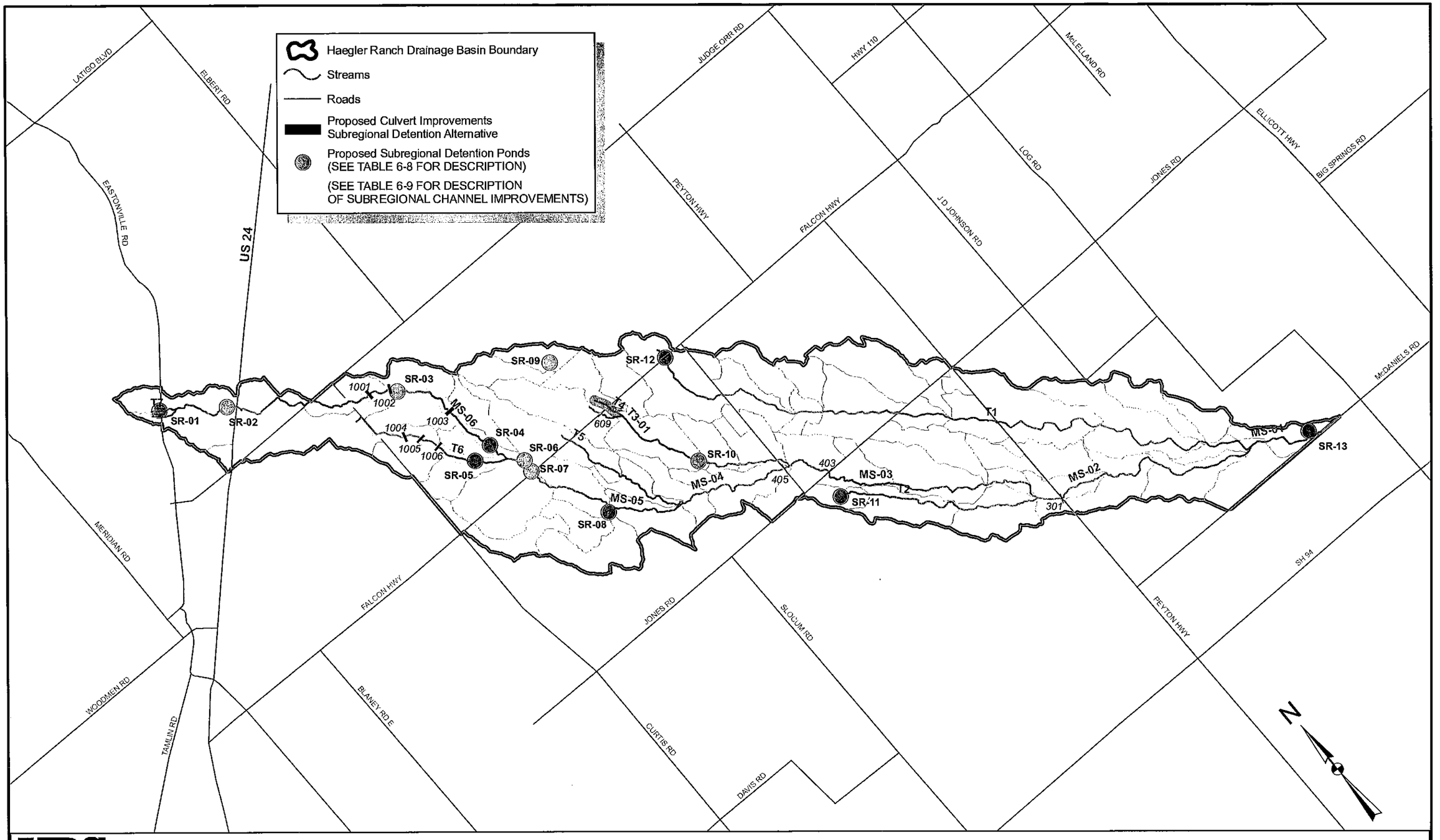
5,000 2,500 0 5,000 Feet

1" = 5,000'

DATE: 05/08

HAEGLER RANCH DRAINAGE BASIN
REGIONAL DETENTION
ALTERNATIVES
FIGURE 6-1

URS NO. 21711039



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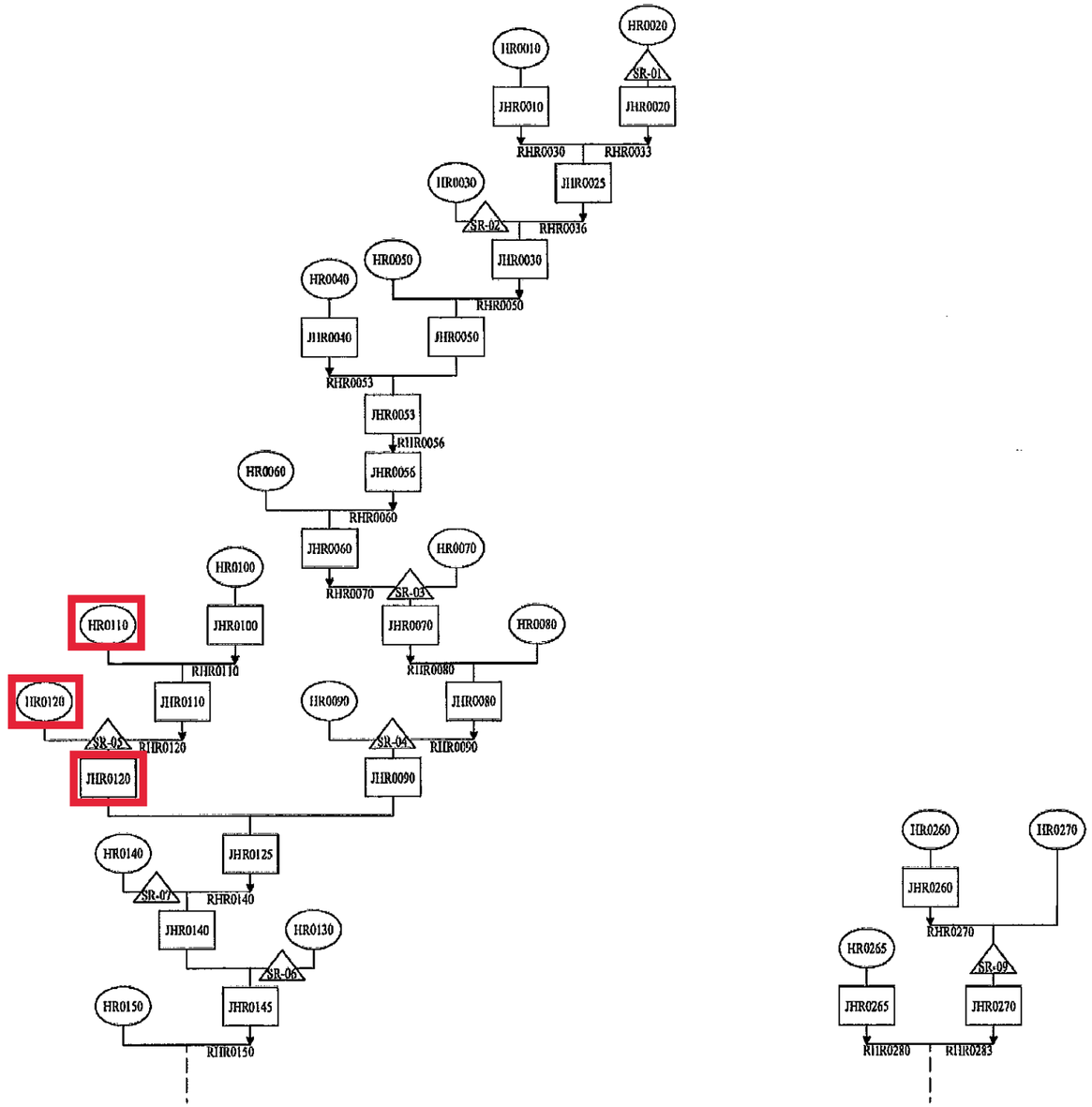
5,000 2,500 0 5,000 Feet

1" = 5,000'

DATE: 05/08

HAEGLER RANCH DRAINAGE BASIN
SUBREGIONAL DETENTION ALTERNATIVES
FIGURE 6-2

URS NO. 21711039



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DATE: 05/08

HAEGLER RANCH DRAINAGE BASIN

SUBREGIONAL DETENTION ALTERNATIVE

SHEET 1

FIGURE 6-3

6.4.1. Channel & Culvert Costs

Channel costs for each alternative are based on cubic yards of excavation, plus the cost of the channel lining and drop structures. These costs are presented in Table 6-13 and Table 6-14.

Table 6-13 Regional Detention Alternative Channel Cost Estimates

Channel	Design Flow (cfs)	Channel Length (ft)	Total Cost	Drop Structure Cost
Main Stem (MS-04)	3,500	7,140	$1,626,000	none
Main Stem (MS-05)	3,000	11,100	$2,216,000	$2,539,000
Main Stem (MS-06)	900	7,330	$482,000	$589,000
Main Stem (MS-06)	1,000	3,170	$231,000	$268,000
Main Stem (MS-06)	1,500	4,450	$450,000	$548,000
Main Stem (MS-06)	2,000	3,330	$477,000	$636,000
Tributary 3 (T3-01)	1,500	6,710	$1,082,000	$1,302,000
Tributary 4 (T4)	600	1,840	$96,000	$127,000
Tributary 5 (T5)	300	930	$37,000	$36,000
Tributary 5 (T5)	500	7,770	$325,000	$370,000
Tributary 6 (T6)	500	4,270	$179,000	$222,000
Tributary 6 (T6)	600	3,940	$204,000	$253,000
Sub-Total			$7,405,000	$6,888,000
30% Construction Contingency			$2,222,000	$2,066,000
15% Engineering Contingency			$1,110,000	$1,033,000
Total			$10,737,000	$9,988,000

(See Tables C6 and C7 in Appendix C for details)

Table 6-14 Sub-Regional Detention Alternative Channel Cost Estimates

Channel	Design Flow (cfs)	Channel Length (ft)	Total Cost	Drop Structure Cost
Main Stem (MS-05)	2,000	1,560	$224,000	$367,000
Main Stem (MS-06)	600	3,120	$162,000	$295,000
Main Stem (MS-06)	1,000	4,535	$331,000	$375,000
Main Stem (MS-06)	800	3,190	$188,000	$368,000
Tributary 3 (T3-01)	600	5,000	$259,000	$422,000
Tributary 3 (T3-02)	500	420	$18,000	$37,000
Tributary 4 (T4)	500	940	$40,000	$74,000
Tributary 6 (T6)	500	4,280	$179,000	$333,000
Tributary 6 (T6)	300	1,400	$55,000	$107,000
Sub-Total			$1,456,000	$2,374,000
30% Construction Contingency			$430,000	$712,000
15% Engineering Contingency			$218,000	$356,000
Total			$2,111,000	$3,442,000

(See Tables C6 and C8 in Appendix C for details)

Culverts costs are based on a per linear foot of pipe with two flared end sections or two wing walls, as appropriate, complete-in-place. Culvert costs for each alternative are presented in Table 6-15 and Table 6-16.

Table 6-15 Regional Detention Alternative Roadway Crossing Cost Estimate Sumary

Facility Number	Road Crossing	Channel	Existing Size	Proposed 100-yr Flow (cfs)	Necessary Facility for Proposed 100-year Flow	Estimated Cost
405	Murr Road	Main Stem (MS-04)	66" RCP	3,400	9-6'X6' RCBs	$256,000
507	Peerless Farms Road	Tributary 3 (T3-01)	60" CMP	1200	4-6'X6' RCBs	$139,000
609	Falcon Highway	Tributary 3 (T3-02)	18" CMP	460	2-66" RCPs	$51,600
610	Falcon Highway	Tributary 4 (T4)	24" CMP	570	2-72" RCPs	$51,000
612	Falcon Highway	Tributary 5 (T5)	24" CMP	240	72" RCP	$26,000
628	Falcon Highway	Main Stem (MS-05)	2-60" CMPs	2,200	6-6'X6' RCBs	$243,000
702	Curtis Road	Tributary 6 (T6)	36" CMP	140	60" RCP	$29,000
703	Curtis Road	Main Stem (MS-06)	24" CMP	890	3-6'X6' RCBs	$142,000
704	Judge Orr Road	Main Stem (MS-06)	Blocked Culvert	830	3-6'X6' RCBs	$185,000
1001	Future Pastura Street	Main Stem (MS-06)	N/A	930	3-6'X6' RCBs	$99,000
1002	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	N/A	930	3-6'X6' RCBs	$99,000
1003	Future Arroyo Hondo Blvd. N	Main Stem (MS-06)	N/A	1500	4-6'X6' RCBs	$143,000
1004	Future Pastura Strect	Tributary 6 (T6)	N/A	440	2-66" RCPs	$43,000
1005	Future El Vado Road	Tributary 6 (T6)	N/A	440	2-66" RCPs	$43,000
1006	Future Socorro Trail	Tributary 6 (T6)	N/A	440	2-66" RCPs	$43,000
Sub-Total						$1,591,000
30% Construction Contingency						$477,000
15% Engineering Contingency						$239,000
Total						$2,307,000

(See Table C4 in Appendix C for details)

Table 6-16 Sub-Regional Detention Roadway Crossing Cost Estimate Summary

Facility Number	Road Crossing	Channel	Proposed 100-yr Flow (cfs)	Necessary Facility for Proposed 100-year Flow	Estimated Cost
301	Peyton Highway	Main Stem (MS-02)	3,370	9-6'X6' RCBs	$402,000
403	Jones Road	Main Stem (MS-03)	2,970	8-6'X6' RCBs	$358,000
405	Murr Road	Main Stem (MS-04)	2,870	8-6'X6' RCBs	$283,000
609	Falcon Highway	Tributary 3 (T3-02)	460	2-6'X6' RCBs	$106,000
N/A	Falcon Highway	Tributary 1 (T1)	110	2 - 36" RCP	$20,000
1001	Future Pastura Street	Main Stem (MS-06)	610	2-6'X6' RCBs	$107,000
1002	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	610	2-6'X6' RCBs	$87,000
1003	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	530	2-6'X6' RCBs	$87,000
1004	Future Pastura Street	Tributary 6 (T6)	440	2-66" RCPs	$43,000
1005	Future El Vado Road	Tributary 6 (T6)	440	2-66" RCPs	$43,000
1006	Future Socorro Trail	Tributary 6 (T6)	440	2-66" RCPs	$43,000
Sub-Total					$1,582,000
30% Construction Contingency					$475,000
15% Engineering Contingency					$237,000
Total					$2,294,000

(See Tables C5 in Appendix C for details)

6.4.2. Detention Pond Costs

The cost of detention ponds, both regional and subregional, is based on the cubic yards of excavation, an estimated outlet structure, and the cost of the land required for the facility. These costs are presented in Table 6-17 and Table 6-18.

Table 6-17 Regional Detention Pond Cost Summary

Facility	Storage (AF)	Total Cost Including Construction and Engineering Contingencies
RG-01 9.02	9.02	$542,000
RG-02 64.52	64.52	$4,053,000
RG-03 0.04	0.04	$146,000
RG-04 1.07	1.07	$160,000
RG-05 0.03	0.03	$146,000
Total		$5,048,000

(See Tables C1 in Appendix C for details)

Table 6-18 Sub-Regional Detention Pond Cost Summary

Facility	Storage (AF)	Total Cost Including Construction and Engineering Contingencies
SR-01	10	$899,000
SR-02	5	$640,000
SR-03	16	$868,000
SR-04	25	$1,453,000
SR-05	24	$1,557,000
SR-06	9	$547,000
SR-07	5	$524,000
SR-08	5	$326,000
SR-09	20	$861,000
SR-10	23	$1,069,000
SR-11	2	$182,000
SR-12	9	$477,000
SR-13	3	$376,000
Total		$9,780,000

(See Table C1 in Appendix C for details)

6.4.3. Other Costs

Design Engineering costs are also included as 15% of the construction costs. Construction contingencies (30%) include such items as utility relocations, mobilization, temporary erosion control, and construction engineering.

6.4.4. Conceptual Alternative Costs

The total estimated capital costs for each alternative are based on the sum of the cost of the proposed facilities, plus costs for engineering and construction contingencies. These costs are listed in Table 6-19.

Table 6-19 Conceptual Alternative Costs

	Regional Alternative	Subregional Alternative
Detention Ponds	$5,048,000	$9,780,000
Channel Improvements	$10,737,000	$2,110,000
Drop Structures	$9,988,000	$3,442,000
Roadway Crossing Culverts	$2,307,000	$2,294,000
Total	$28,080,000	$17,627,000

impacted by site development, utility, roadway and landscape construction activities have in some cases negatively affected downstream areas.

El Paso County has enacted an erosion control ordinance to address these problems. In general, it is the responsibility of the entity conducting any land disturbance activity to properly control surface runoff, erosion and sedimentation during and after the activity. Technical criteria identifying measures which help mitigate the impacts of erosion and sedimentation are available and being used throughout the region. Minimum requirements must be developed to properly control erosion.

Erosion control is necessary to prevent environmental degradation caused by wind or water-borne soil. The following minimum criteria and standards are intended to prevent excessive erosion. El Paso County as well as other affected agencies will enforce the Clean Water Act standards if the planned erosion control measures fail to perform satisfactorily. Proper installation and maintenance is necessary to achieve the desired function of erosion control measures. By paying attention to quality, reinstallation can be avoided. General requirements for erosion control are as follows:

1. Any land disturbing activity shall be conducted so as to effectively reduce unacceptable erosion and resulting sedimentation.

2. All land disturbing activities shall be designed, constructed, and completed in such a manner that the exposure time of disturbed land shall be limited to the shortest possible period of time.

3. Sediment caused by accelerated soil erosion and runoff shall be intercepted by erosion control measures such as hay bales, silt fences and / or sediment ponds, and contained within the site.

4. Any facility designed and constructed to convey storm runoff shall be designed to be non-erosive.

5. Erosion control measures will be used prior to and during construction.

Temporary erosion control measures are required during construction, and permanent erosion control measures are required for all developments. Maintenance of erosion control measures is the responsibility of the property owner.

Various structures have been proposed in this plan to help control localized erosion and sedimentation problems. It is important that the erosion control plan for any land disturbing activity be strictly adhered to and maintained so that the above minimum criteria can be achieved in the Haegler Ranch Basin.

7.4. Operations and Maintenance

Maintenance of drainage way facilities is essential in preventing long term degradation of the creek and overbank areas. Along the drainageway, clearing of debris and dead vegetation should be considered within the low flow area of the creek and its tributaries. On the overbanks, limited maintenance of the existing vegetative cover is recommended. Semi-annual clearing of trash and debris at roadway crossings is also recommended to increase the effectiveness of the crossings. Sediments cleared from the channel or culvert should not be left on the overbank. This disturbs the native vegetation, creates a potential water quality concern if the dredgings are subsequently washed into the drainageway by natural erosion, and reduces the capacity of the overbank. In those reaches designated to be selectively lined and the floodplain preserved, maintenance activities should be carried out with the least disturbances to native vegetation that is practical.

Similar practices should be employed when removing sediment from detention basins. Although some channels degrade and others agrade, all detention basins will collect sediment and agrade. The use of an easily accessible concrete lined forebay in the final design of a detention facility can make the cleaning of the larger debris and trash more easily accomplished with motorized equipment. If forebays are provided, they will need clearing semi-annually and after major storm events. More frequent routine maintenance may be required depending on the type of development upstream and the access provided to the public. Plan for annual removal of sediment and debris from the detention area of a facility with a forebay.

Deposition in drainage facilities of wind-blown trash and debris, should be expected in this region. This means that regular maintenance, even without rainfall events, should be performed.

7.5. Drainage and Bridge Fee Calculations

The cost estimates and basin fee calculation for the major drainageways, tributary drainageways, roadway culverts, regional detention basins, and related improvements for the Sub-Regional Detention Facilities are presented in Table 7-2. The sub-regional detention capital construction cost estimates include the cost for the construction of the embankment, water quality, and outlet structures. Bridges in the Sub-Regional Detention Alternative are presented in Table 7-3. The cost estimates include engineering and construction costs for the entire Haegler Ranch Basin as presented on the Conceptual Design Drawings in Appendix D. These estimates do not include costs for local or initial systems, and therefore no costs attributable to local or minor drainage systems have been computed in the estimation of the drainage basin fee. These systems are expected to be provided with proposed development. Costs associated with utility relocations have not been estimated but would be included in construction contingencies. A review of utility maps indicates that the majority of the potential relocations occur at the roadway crossings. Land acquisition costs for the detention facilities were not included for calculation of fees per Appendix L of the El Paso County Criteria Manual.

Unplatted acreage within Haegler Ranch was obtained from El Paso County, and is shown in Figure 7-I. A total of 8,953 acres is estimated to be currently unplatted and subject to future development. This unplatted land is projected to have an average imperviousness of approximately 15%, corresponding to approximately 1,343 unplatted impervious acres. All drainage and bridge fees are calculated per *impervious* acre. (See Appendix D for an unplatted area breakdown by subbasin and average imperviousness calculations.)

Reimbursable costs calculated for the Haegler Ranch Basin are listed in Table 7-4. These costs are based on improvements required under existing conditions. The term "reimbursable costs" used on Table 7-4 means those costs that have been used in estimation of drainage basin fees. Costs considered "non-reimbursable" are costs for the replacement of existing, undersized culverts, or costs to rehabilitate or maintain an existing lined segment of drainageway. For the most part, all of the drainageway costs for Haegler Ranch Basin are considered reimbursable.

The calculated drainage basin fee presented in Table 7-2 is $ 7,633 per impervious acre, and the bridge fee is $1,126 per impervious acre, as shown in Table 7-3.

Table 7-2 Drainage Basin Fee Calculations

Channel Improvements					
Channel	**Basins**	**Channel Construction Cost**	**Drop Structure Construction Cost**	**Contingency Cost**	**Total Cost**
Main Stem (MS-05)	HR0200	$224,000	$363,600	$264,420	$852,020
Main Stem (MS-06)	HR0070	$162,000	$295,400	$205,830	$633,230
Main Stem (MS-06)	HR0080	$331,000	$374,500	$317,475	$1,022,975
Main Stem (MS-06)	HR0090	$188,000	$368,000	$250,200	$806,200
Tributary 3 (T3-01)	HR0330	$259,000	$422,000	$306,450	$987,450
Tributary 3 (T3-02)	HR0300	$18,000	$37,000	$24,750	$79,750
Tributary 4 (T4)	HR0300	$40,000	$74,000	$51,300	$165,300
Tributary 6 (T6)	HR0110	$179,000	$333,000	$230,400	$742,400
Tributary 6 (T6)	HR0120	$55,000	$106,500	$72,675	$234,175
Subtotal Channel Costs					$5,553,500

Culvert Improvements					
Culvert	**Road Crossing**	**Channel**	**Culvert Construction Cost**	**Contingency Cost**	**Total Cost**
609	Falcon Highway	Tributary 3 (T3-02)	$106,301	$47,836	$154,137
N/A	Falcon Highway	Tributary 1 (T1)	$19,500	$8,775	$28,275
1001	Future Pastura Street	Main Stem (MS-06)	$106,301	$47,836	$154,137
1002	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	$87,301	$39,286	$126,587
1003	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	$87,301	$39,286	$126,587
1004	Future Pasture Street	Tributary 6 (T6)	$51,000	$22,950	$73,950
1005	Future El Vado Road	Tributary 6 (T6)	$19,500	$8,775	$28,275
1006	Future Socorro Trail	Tributary 6 (T6)	$42,800	$19,260	$62,060
Subtotal Culvert Costs					$754,007

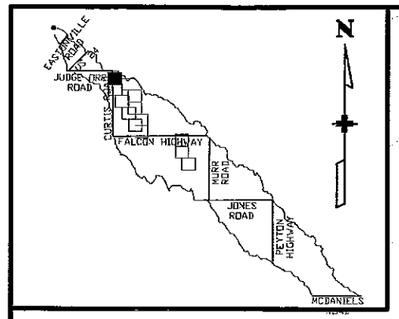
Detention Improvements					
Facility	**Storage (AF)**	**Construction Cost**		**Contingency Cost**	**Total Cost**
SR-01	10	$296,701		$133,516	$430,217
SR-02	5	$207,949		$93,577	$301,525
SR-03	16	$186,252		$83,814	$270,066
SR-04	25	$390,182		$175,582	$565,764
SR-05	24	$455,235		$204,856	$660,091
SR-06	9	$140,670		$63,301	$203,971
SR-07	5	$162,046		$72,921	$234,967
SR-08	5	$87,489		$39,370	$126,860
SR-09	20	$188,250		$84,713	$272,963
SR-10	23	$331,635		$149,236	$480,871
SR-11	2	$56,880		$25,596	$82,476
SR-12	9	$108,987		$49,044	$158,031
SR-13	3	$107,812		$48,515	$156,327
Subtotal Detention Costs					$3,944,129
Total Cost					**$10,251,636**
Total Unplatted Impervious Acres					**1,343**
Fee Per Impervious Acre					**$7,633**

Table 7-3 Bridge Fee Calculation

301	Peyton Highway	Main Stem (MS-02)	401,710	$180,770	$582,480
403	Jones Road	Main Stem (MS-03)	358,123	$161,155	$519,278
405	Murr Road	Main Stem (MS-04)	282,941	$127,323	$410,264
Subtotal Bridge Costs					$1,512,022
Total Cost					**$1,512,022**
Total Unplatted Impervious Acres					**1,343**
Bridge Fee Per Impervious Acre					**$1,126**

Table 7-4 Reimbursable Costs

Reimbursable Culvert Improvements					
Culvert	**Road Crossing**	**Channel**	**Culvert Construction Cost**	**Contingency Cost**	**Total Cost**
N/A	Peyton Highway	Tributary 1 (T1)	$51,000	$22,950	$73,950
N/A	Falcon Highway	Tributary 1 (T1)	$9,7580	$4,388	$14,138
301	Peyton Highway	Main Stem (MS-02)	$314,535	$141,541	$456,076
401	Jones Road	Tributary 1 (T1)	$53,111	$23,900	$77,011
403	Jones Road	Main Stem (MS-03)	$270,947	$121,926	$392,874
405	Murr Road	Main Stem (MS-04)	$180,371	$81,167	$261,538
407	Murr Road	Tributary 3 (T3-01)	$77,801	$35,011	$112,812
507	Peerless Farms Road	Tributary 3 (T3-01)	$115,801	$52,111	$167,912
509	Murr Road	Tributary 1 (T1)	$19,300	$8,685	$27,985
601	Whiting Way	Tributary 1 (T1)	$23,500	$10,575	$34,075
604	Max Road	Tributary 1 (T1)	$19,300	$8,685	$27,985
609	Falcon Highway	Tributary 3 (T3-02)	$25,600	$11,520	$37,120
610	Falcon Highway	Tributary 4 (T4)	$23,500	$10,575	$34,075
612	Falcon Highway	Tributary 5 (T5)	$21,200	$9,540	$30,740
628	Falcon Highway	Main Stem (MS-05)	$154,741	$69,633	$224,375
702	Curtis Road	Tributary 6 (T6)	$23,150	$10,418	$33,568
703	Curtis Road	Main Stem (MS-06)	$125,301	$56,386	$181,687
704	Judge Orr Road	Main Stem (MS-06)	$83,200	$37,440	$120,640
803	Eastonville Road	Main Stem (MS-07)	$9,680	$4,356	$14,036
804	Eastonville Road	Tributary 7 (T7)	$14,980	$6,741	$21,721
Subtotal Channel Costs					$2,344,315
Reimbursable Detention Improvements					
Facility	**Storage (AF)**	**Construction Cost**		**Contingency Cost**	**Total Cost**
SR-01	10	$296,701		$133,516	$430,217
SR-02	5	$207,949		$93,577	$301,525
SR-03	16	$186,252		$83,814	$270,066
SR-04	25	$390,182		$175,582	$565,764
SR-05	24	$455,235		$204,856	$660,091
SR-06	9	$140,670		$63,301	$203,971
SR-07	5	$162,046		$72,921	$234,967
SR-08	5	$87,489		$39,370	$126,860
SR-09	20	$188,250		$84,713	$272,963
SR-10	23	$331,635		$149,236	$480,871
SR-11	2	$56,880		$25,596	$82,476
SR-12	9	$108,987		$49,044	$158,031
SR-13	3	$107,812		$48,515	$156,327
Subtotal Detention Costs					$3,944,129
Total Reimbursable Cost					**$6,288,444**



HR0060

HR0070

HR0100

HR0070

CURTIS ROAD

BEGIN PROPOSED IMPROVEMENTS

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00

MAIN STEM MS-06
(SEE PROFILE MS-06)

6780 6770 6760 6750

MATCHLINE MS-06 PG 2

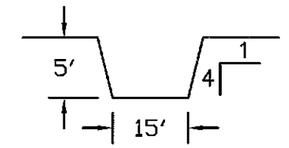
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: MAIN STEM (MS-06)
BASIN: HR0070



STA: 0+00 TO STA: 31+34

Q: 600 CFS

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
Drawing File Name: CHANNEL.DWG
Acad. Ver. 2006 Scale: 1"=200' Units: Feet

Index of Revisions

1			
2			
3			

Profiles

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Colorado Springs, CO. 80921
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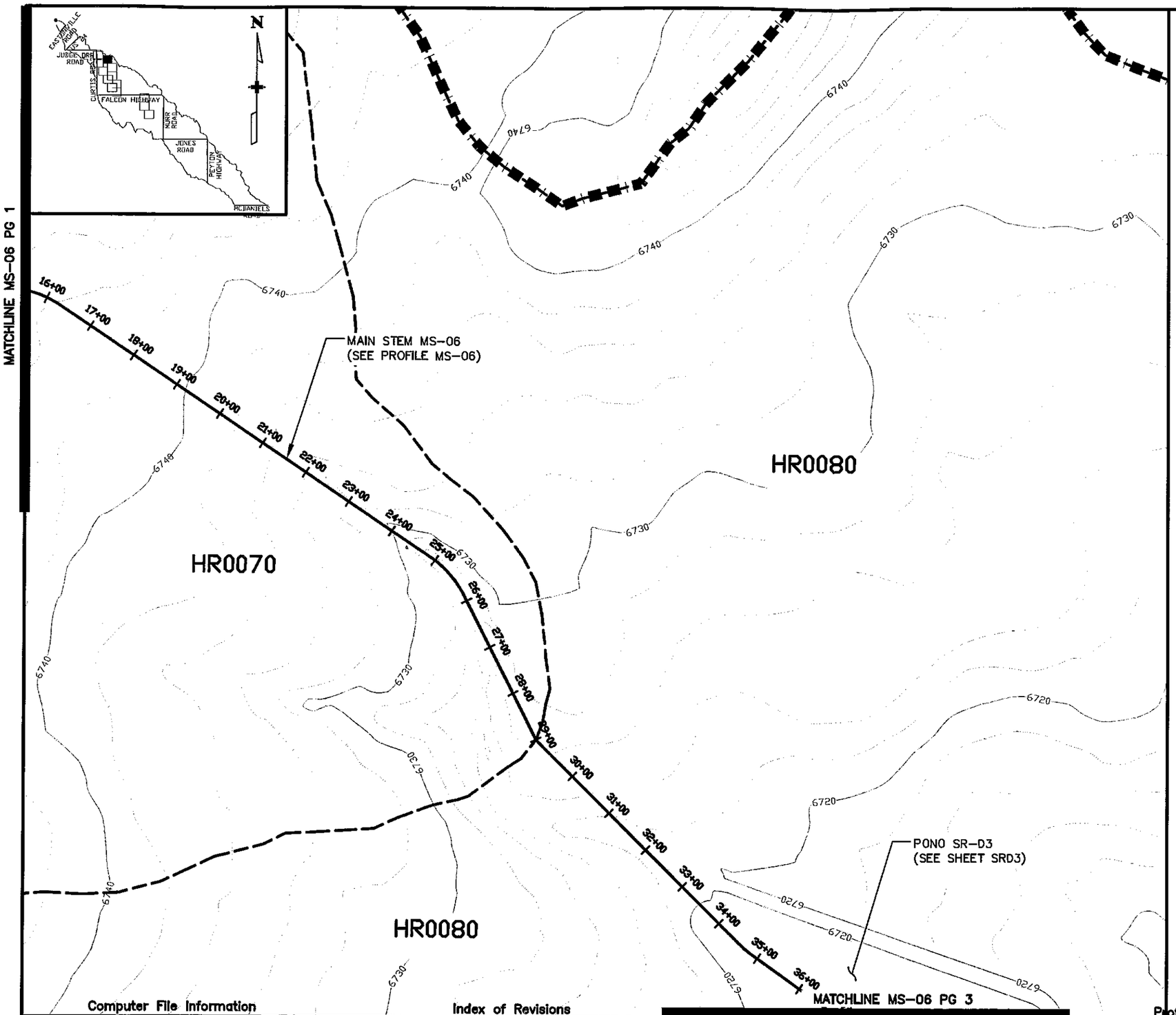
Fax (719) 531-0007

Designed by: KAP
Detailed by: DRM
Checked by: JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 1



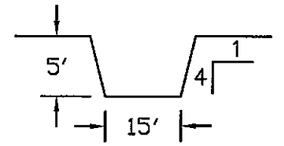
LEGEND

- CONTOURS – MAJOR ELEVATION
- CONTOURS – MINOR ELEVATION
- WATERSHED BOUNDARY
- BASIN BOUNDARY
- ROADS
- 20+00 RIVER AND ALIGNMENT

1"=200'

200 0 200 400

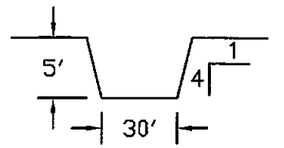
CHANNEL: MAIN STEM (MS–06)
BASIN: HR0070



STA: 0+00 TO STA: 31+34

Q: 600 CFS

CHANNEL: MAIN STEM (MS–06)
BASIN: HR0080



STA: 31+34 TO STA: 74+61

Q: 1000 CFS

Computer File Information

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Drawing File Name: CHANNEL.DWG
Acad. Ver. 2D06 Scale: 1"=2D0' Units: Feet

Index of Revisions

1			
2			
3			

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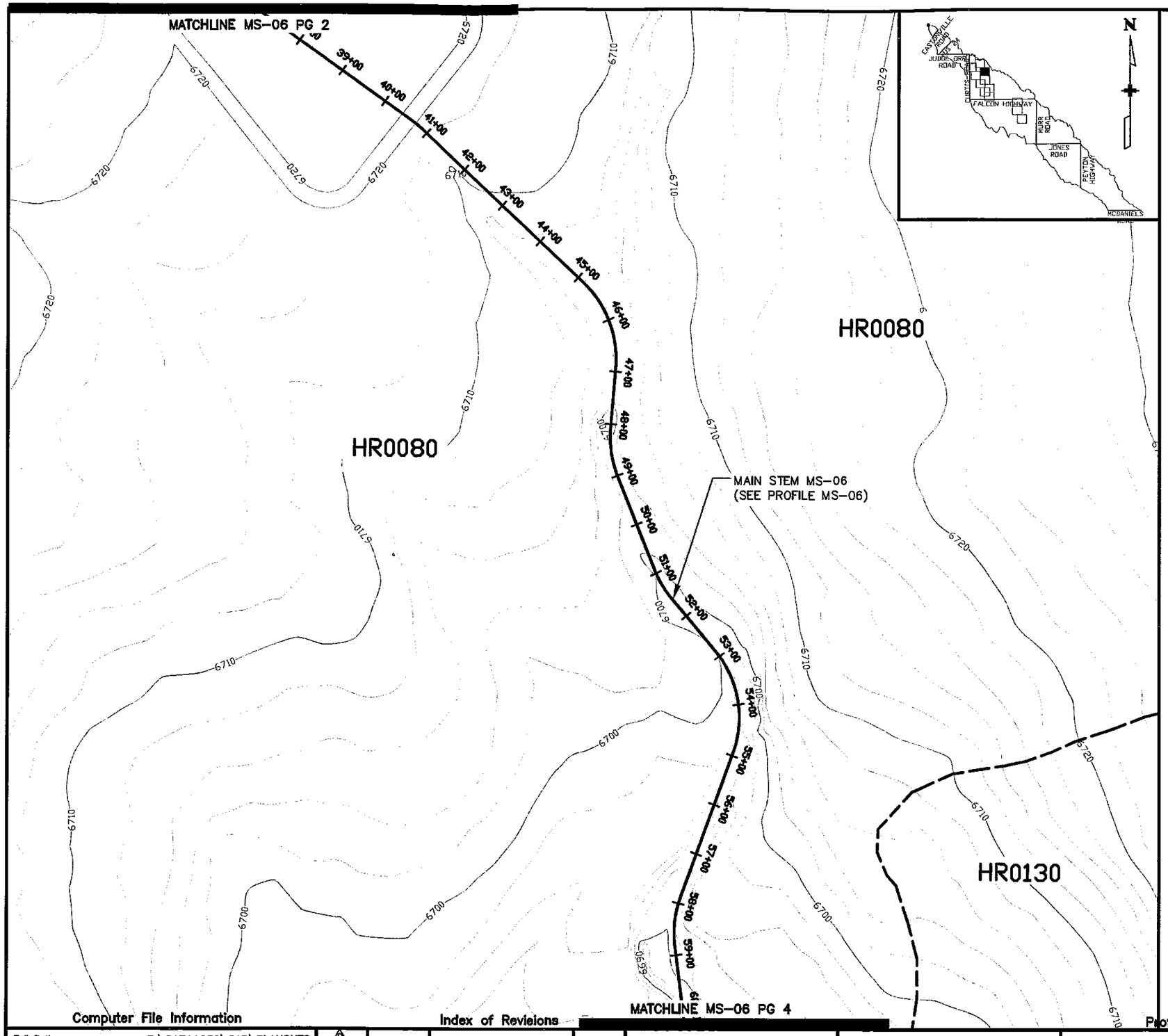
Checked by: JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 2



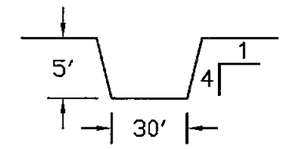
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: MAIN STEM (MS-06)
BASIN: HR0080



STA: 31+34 TO STA: 74+61

Q: 1000 CFS

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
Drawing File Name: CHANNEL.DWG
Acad. Ver. 2006 Scale: 1"=200' Units: Feet

Index of Revisions

1			
2			
3			

Profiles

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Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 3

MATCHLINE MS-06 PG 3

HR0110

HR0080

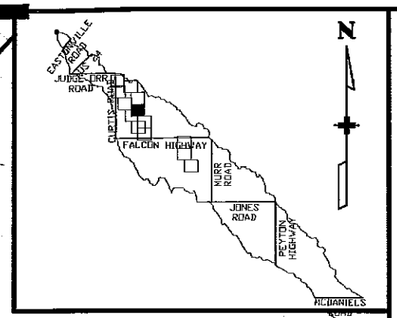
HR0130

HR0090

HR0090

MAIN STEM MS-06
(SEE PROFILE MS-06)

MATCHLINE MS-06 PG 5



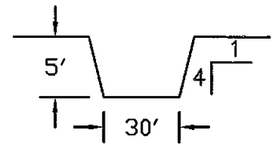
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

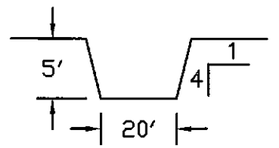
CHANNEL: MAIN STEM (MS-06)
BASIN: HR0080



STA: 31+34 TO STA: 74+61

Q: 1000 CFS

CHANNEL: MAIN STEM (MS-06)
BASIN: HR0090



STA: 74+61 TO STA: 103+62

Q: 800 CFS

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
Drawing File Name: CHANNEL.DWG
Acad. Ver. 2006 Scale: 1"=200' Units: Feet

Index of Revisions

1			
2			
3			

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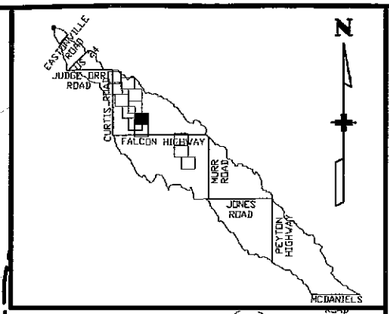
Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 4

MATCHLINE MS-06 PG 4



MAIN STEM MS-06
(SEE PROFILE MS-06)

HR0090

HR0130

HR0210

HR0140

POND SR-05
(SEE SHEET SR05)

POND SR-04
(SEE SHEET SR04)

MAIN STEM MS-06
(SEE MAINSTEM PAGE 5)

TRIBUTARY 6 (T6)
(SEE PROFILE TRIBUTARY 6)

MATCHLINE MS-06 PG 6

Index of Revisione

Profiles

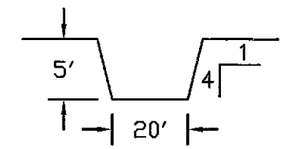
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: MAIN STEM (MS-06)
BASIN: HR0090



STA: 74+61 TO STA: 103+62

Q: 800 CFS

Computer File Information

Full Path:	P:\21711039\CAD\PLANSHTS
Drawing File Name:	CHANNEL.DWG
Acad. Ver. 2006	Scale: 1"=200' Units: Feet

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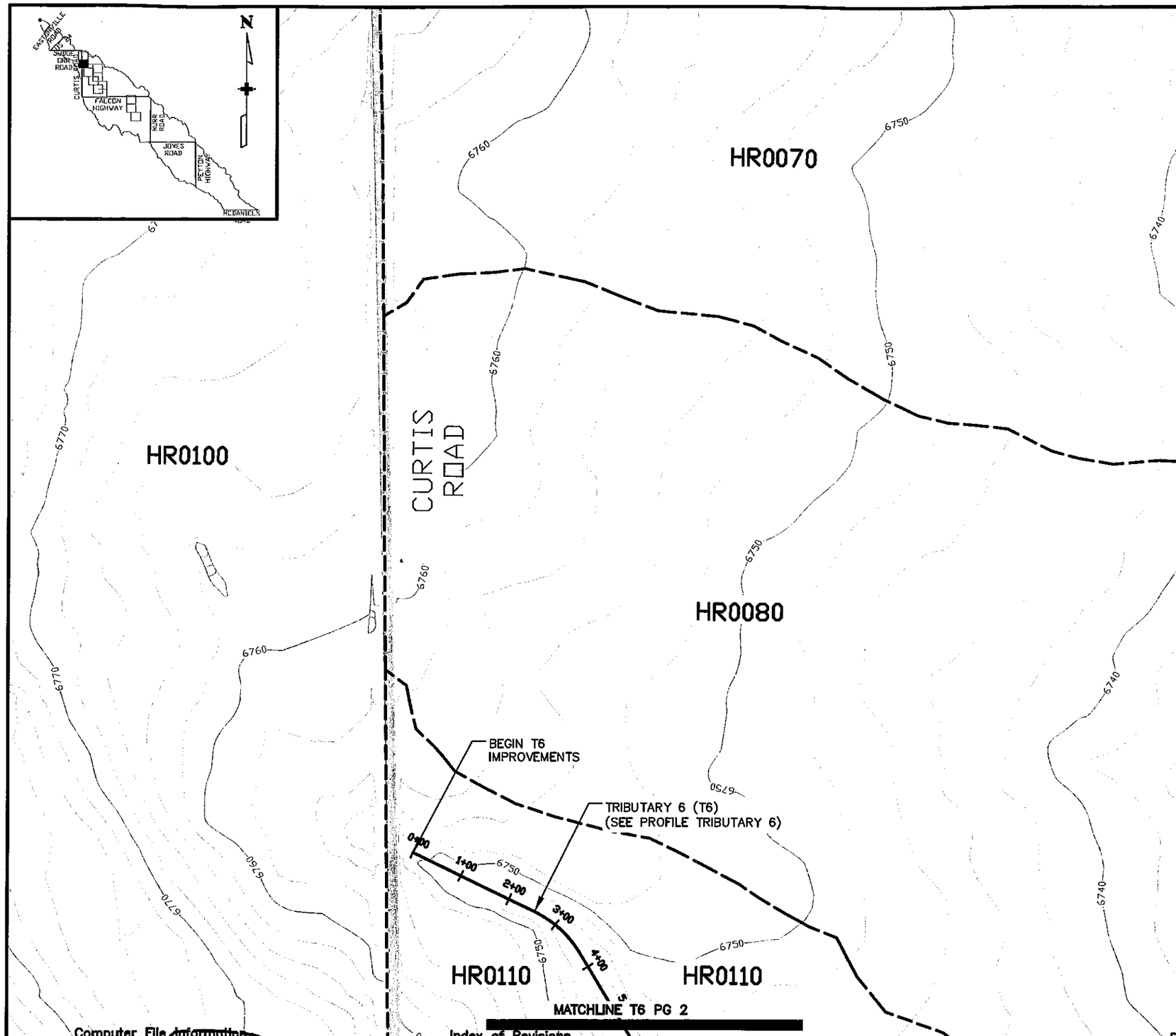
Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 5



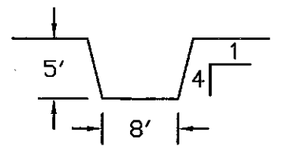
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0110



STA: 0+00 TO STA: 41+73

Q: 500 CFS

Computer File Information

Index of Revisions

Profiles

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Drawing File Name:	CHANNEL.DWG	△				Detailed by: DRM	
Acad. Ver. 2006	Scale: 1"=200' Units: Feet	△				Checked by: JAJ	

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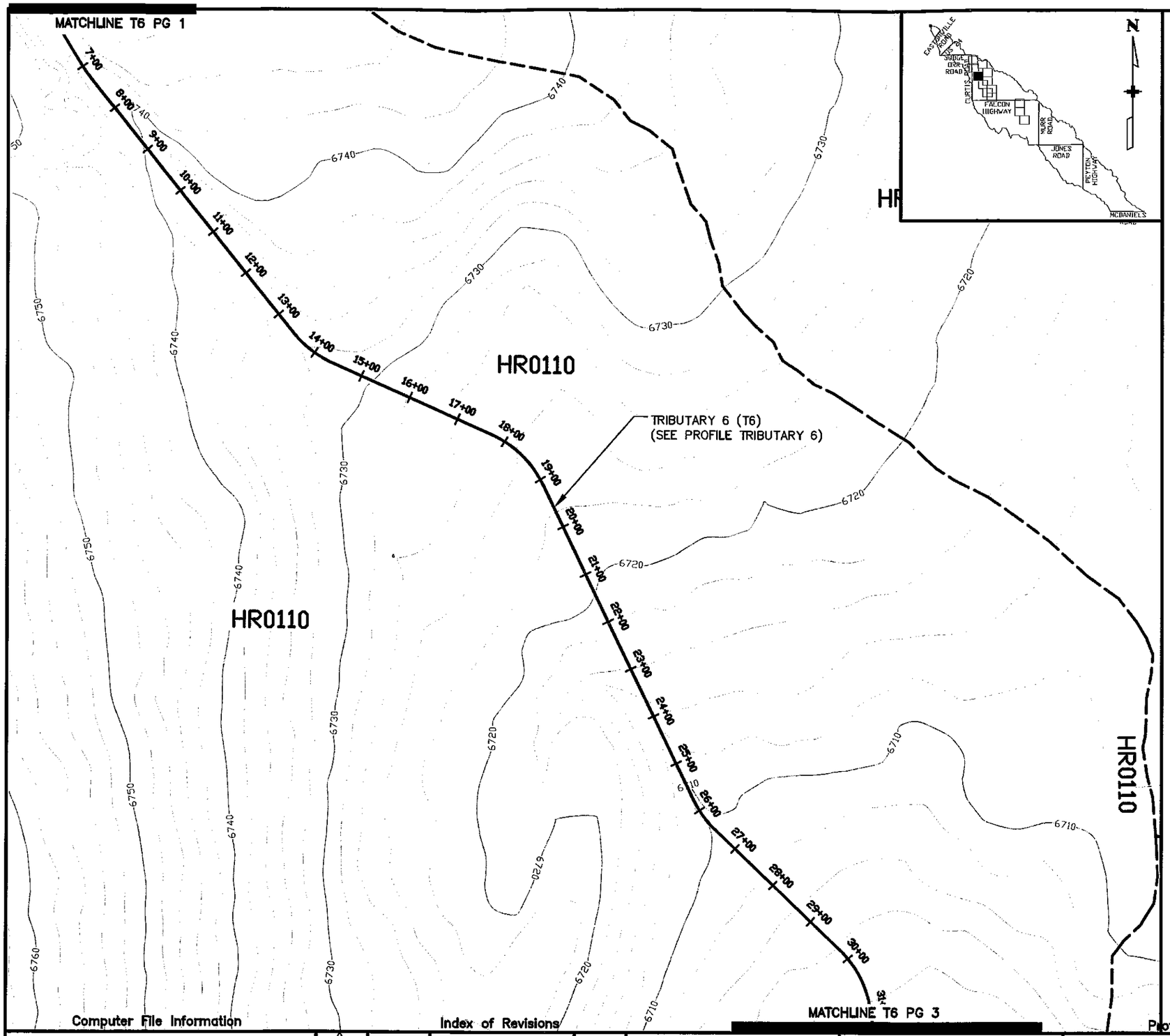
HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 1



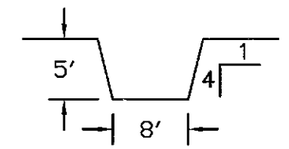
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0110



STA: 0+00 TO STA: 41+73

Q: 500 CFS

Computer File Information

Full Path:	P:\21711039\CAD\PLANSHTS
Drawing File Name:	CHANNEL.DWG
Acad. Ver. 2006	Scale: 1"=200' Units: Feet

Index of Revisions

1			
2			
3			

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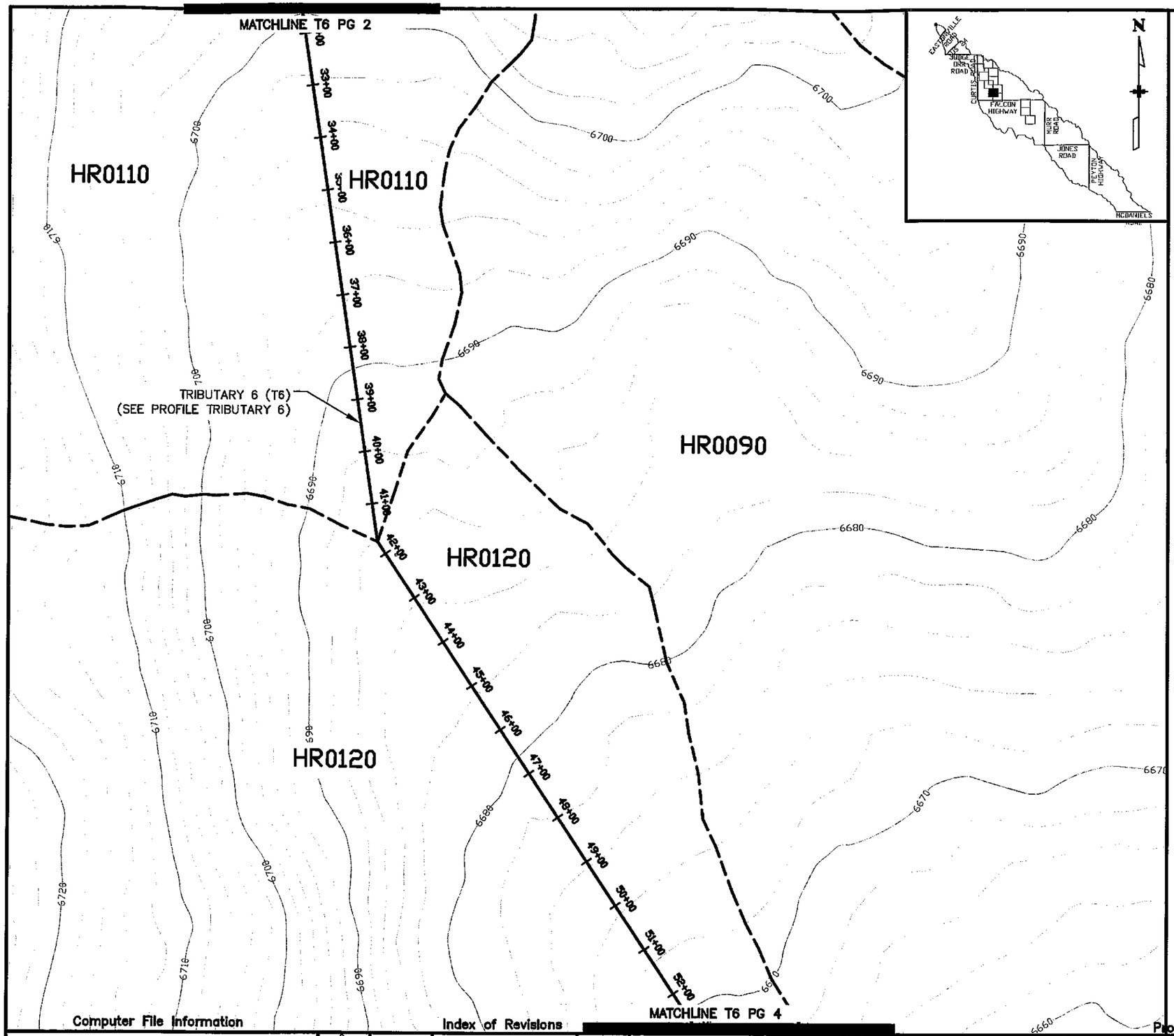
Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 2



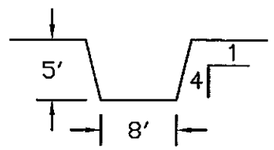
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

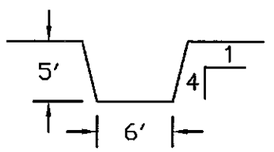
CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0110



STA: 0+00 TO STA: 41+73

Q: 500 CFS

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0120



STA: 41+73 TO STA: 75+50

Q: 300 CFS

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
Drawing File Name: CHANNEL.DWG
Acad. Ver. 2006 Scale: 1"=200' Units: Feet

Index of Revisions

Profiles

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Detailed by: DRM
Checked by: JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 3

MATCHLINE MS-06 PG 2

TRIBUTARY 6 (T6)
(SEE PROFILE TRIBUTARY 6)

HR0120

POND SR-05
(SEE SHEET SR05)

POND SR-04
(SEE SHEET SR04)

HR0090

MAIN STEM MS-06
(SEE MAINSTEM PAGE 5)

HR0120

TRIBUTARY 6 (T6)
(SEE PROFILE TRIBUTARY 6)

MATCHLINE MS-06 PG 6

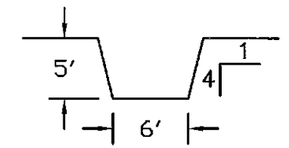
LEGEND

- 6630 — CONTOURS – MAJOR ELEVATION
- CONTOURS – MINOR ELEVATION
- WATERSHED BOUNDARY
- BASIN BOUNDARY
- ROADS
- 20+00 — RIVER AND ALIGNMENT

1"=200'

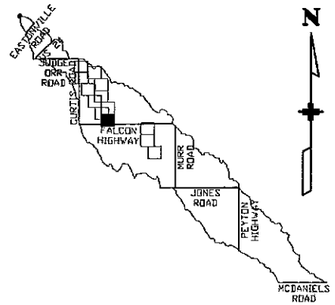
200 0 200 400

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0120



STA: 41+73 TO STA: 75+50

Q: 300 CFS



Computer File Information

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Drawing File Name:	CHANNEL.DWG
Acad. Ver. 2006	Scale: 1"=200' Units: Feet

Index of Revisions

3			
2			
1			

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Checked by:	JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 4

PROFILE MAIN STEM (MS-06 & MS-05)

MS-06 HR0070

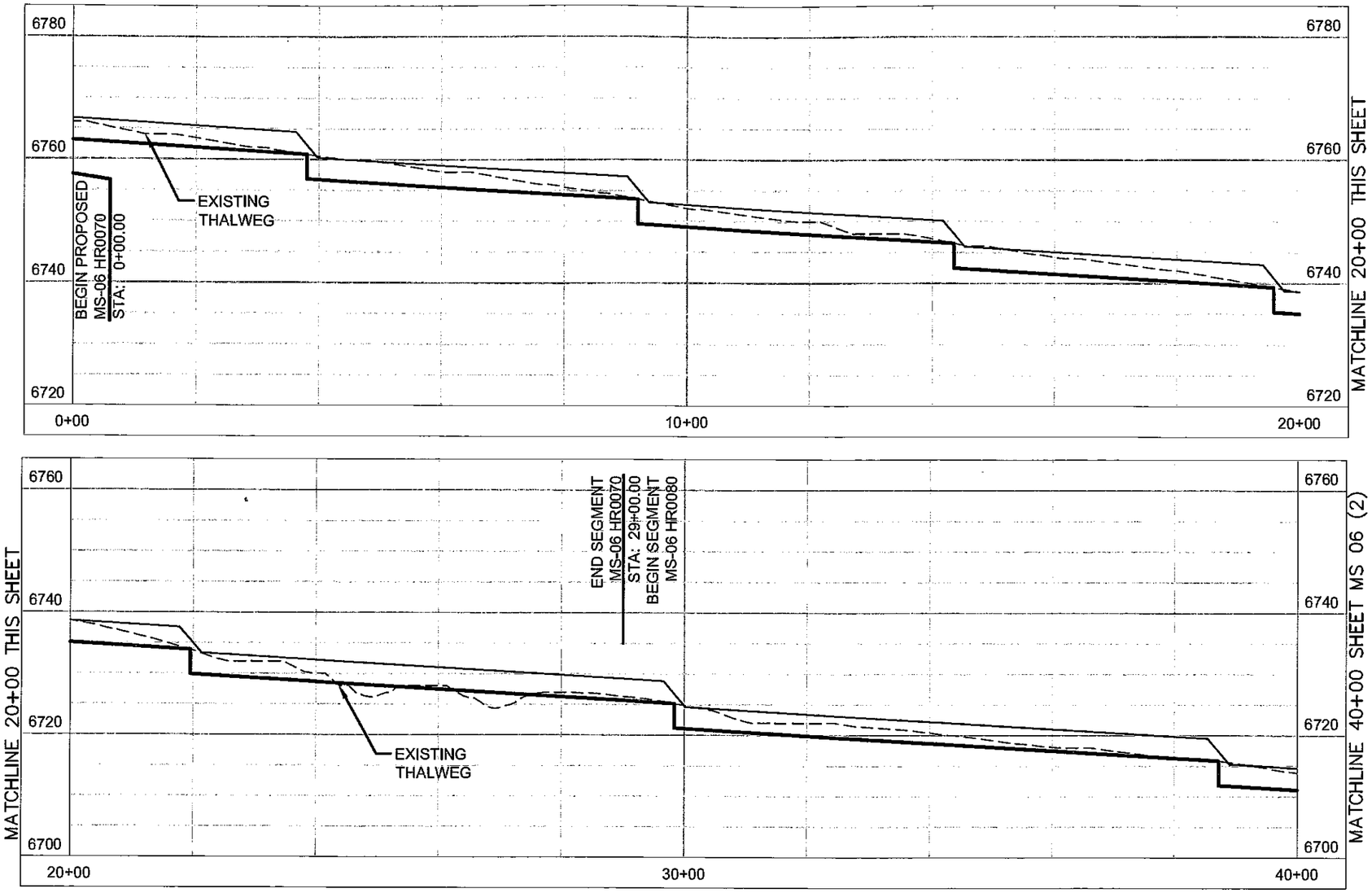
SLOPE = 0.60%

(7) 4' DROPS

MS-06 HR0080

SLOPE = 0.60%

(7) 4' DROPS



LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: MAINSTEM PROFILES_PRDPOSED.DWG

Acad. Ver. 2006 Scale: 1"=2D' Units: Feet

Index of Revisions

1			
2			
3			

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Profiles

Designed by: KAP

Detailed by: DRM

Checked by:

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number MS 06

MS–06 HR0080

SLOPE = 0.60%

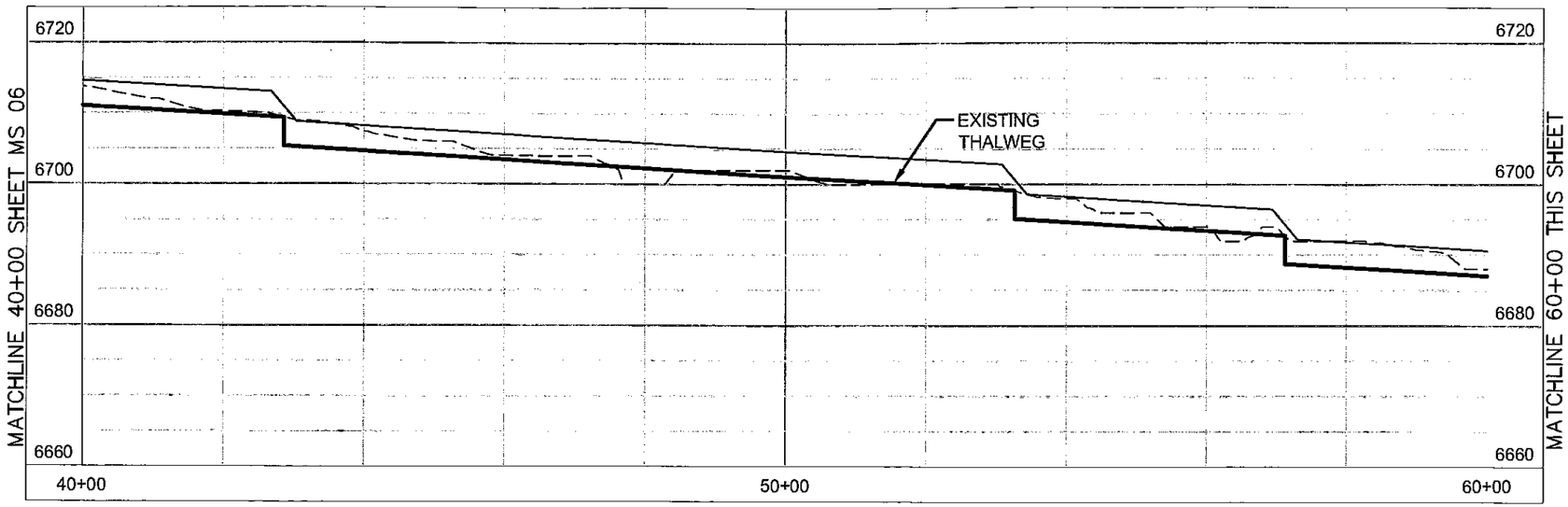
(7) 4' DROPS

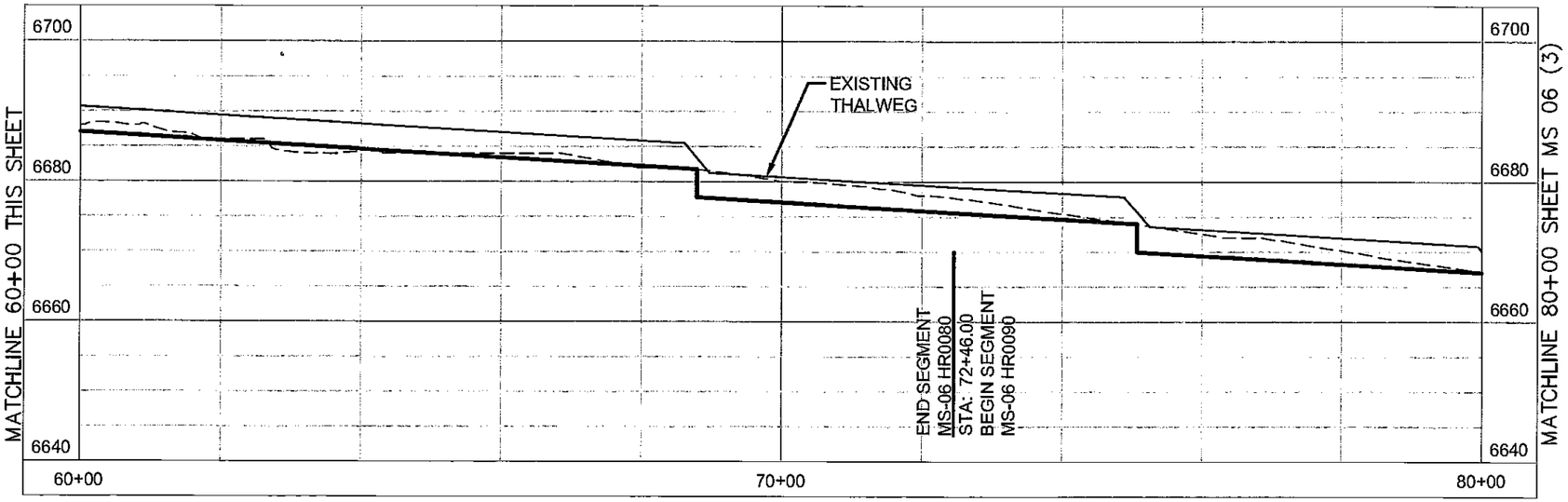
MS–06 HR0090

SLOPE = 0.60%

(8) 4' DROPS

PROFILE MAIN STEM (MS–06 & MS–05)





LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: MAINSTEM PROFILES_PROPOSED.DWG

Acad. Ver. 2006 Scale: 1"=20' Units: Feet

Index of Revisions

1			
2			
3			

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Profiles

Designed by: KAP

Detailed by: DRM

Checked by:

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number MS06 (2)

MS–06 HR0090

SLOPE = 0.60%

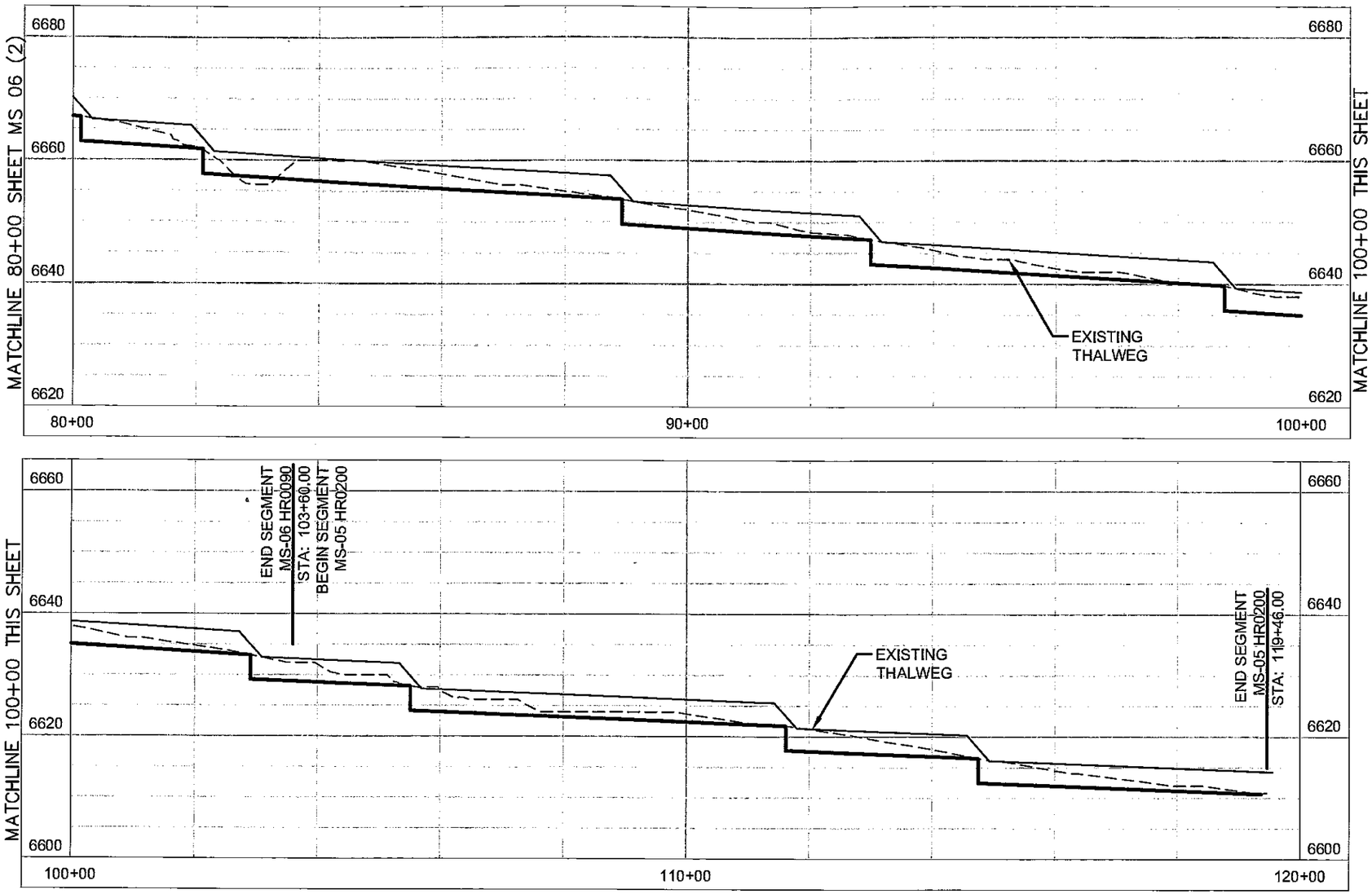
(8) 4' DROPS

MS–05 HR0200

SLOPE = 0.40%

(4) 4' DROPS

PROFILE MAIN STEM (MS–06 & MS–05)



LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: MAINSTEM PROFILES_PROPOSED.DWG

Acad. Ver. 2006 Scale: 1"=20' Units: Feet

Index of Revisions

Profiles

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Structure Numbers

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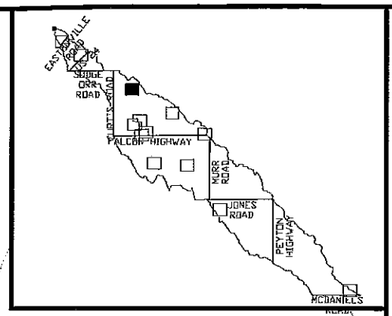
HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number MS06 & MS05 (3)

POND SR-03



MAIN STEM MS-06
(SEE MAINSTEM PG 2 & 3)
(SEE PROFILE MS-06)

TOP OF BERM
6724'

100 YEAR
WS 6721'

LOW POINT

6730 6720 6710

LEGEND

6630	PROPOSED CONTOURS – MAJOR ELEVATION
	PROPOSED CONTOURS – MINOR ELEVATION
6630	EXISTING CONTOURS – MAJOR ELEVATION
	EXISTING CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	ROADS
	RIVER
	100 YEAR WATER SURFACE ELEVATION
⊠	OUTLET

POND SR-03
DISCHARGE

Q100	530 CFS
Q2	29 CFS
POND VOLUME AC FT	16
BERM WIDTH	10'
SIDESLOPES	8:1

N

1"=200'

200 0 200 400

Computer File Information

Full Path:	P:\21711039\CAD\PLANSHTS
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Acad. Ver. 2006	Scale: 1"=20D' Units: Feet

Index of Revisions

3			
2			
1			

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Fax (719) 531-0007

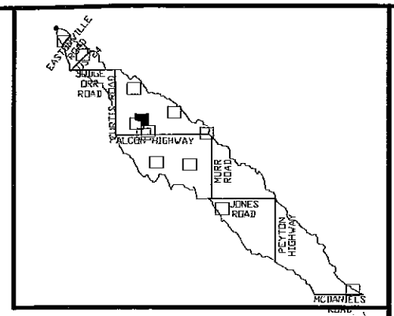
Designed by:	KAP
Detailed by:	DRM
Checked by:	JAJ

Structure Numbers

HAEGLER RANCH DRAINAGE BASIN

Sheet Number SR03

POND SR-04



MAIN STEM MS-06
(SEE MAINSTEM PG 5)
(SEE PROFILE MS-06)

100 YEAR
WS 6653.25'

TOP OF BERM
6656.25'

LOW POINT

MAIN STEM MS-06
(SEE MAINSTEM PG 5)
(SEE PROFILE MS-06)

6670 6660 6650 6640

LEGEND

- 6630 — PROPOSED CONTOURS - MAJOR ELEVATION
- PROPOSED CONTOURS - MINOR ELEVATION
- 6630 — EXISTING CONTOURS - MAJOR ELEVATION
- EXISTING CONTOURS - MINOR ELEVATION
- WATERSHED BOUNDARY
- ROADS
- RIVER
- 100 YEAR WATER SURFACE ELEVATION
- ⊠ OUTLET

POND SR-04
DISCHARGE

Q100	740 CFS
Q2	33 CFS
POND VOLUME AC FT	25
BERM WIDTH	10'
SIDESLOPES	8:1

N

1"=200'

200 0 200 400

Computer File Information

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Drawing File Name:	PONDS.DWG
Acad. Ver. 2006	Scale: 1"=200' Units: Feet

Index of Revisions

1			
2			
3			

Profiles

URS
9200 Federal Drive, Suite 300
Colorado Springs, CO. 80921
(719) 531-0001
Fax (719) 531-0007

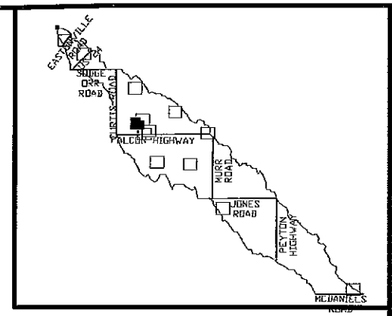
Designed by:	KAP
Detailed by:	DRM
Checked by:	JAJ

Structure Numbers

HAEGLER RANCH DRAINAGE BASIN

Sheet Number SR04

POND SR-05



TRIBUTARY 6 (T6)
(SEE TRIBUTARY 6 PG 4)
(SEE PROFILE TRIBUTARY 6)

LOW POINT

100 YEAR
WS 6655.50'

TOP OF BERM
6658.50'

TRIBUTARY 6 (T6)
(SEE TRIBUTARY 6 PG 4)
(SEE PROFILE TRIBUTARY 6)

LEGEND

6630	PROPOSED CONTOURS – MAJOR ELEVATION
	PROPOSED CONTOURS – MINOR ELEVATION
6630	EXISTING CONTOURS – MAJOR ELEVATION
	EXISTING CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	ROADS
	RIVER
	100 YEAR WATER SURFACE ELEVATION
⊠	OUTLET

POND SR-05
DISCHARGE

Q100	250 CFS
Q2	9 CFS
POND VOLUME AC FT	24
BERM WIDTH	10'
SIDESLOPES	8:1

N

1"=200'

200 0 200 400

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
Drawing File Name: PONDS.DWG
Acad. Ver. 20D6 Scale: 1"=200' Units: Feet

Index of Revisions

1			
2			
3			

Profiles

EL PASO COUNTY

URS 9960 Federal Drive, Suite 300 Colorado Springs, CO. 80921 (719) 531-5001 Fax (719) 531-0007

Designed by: KAP
Detailed by: DRM
Checked by: JAJ

Structure Numbers

HAEGLER RANCH DRAINAGE BASIN

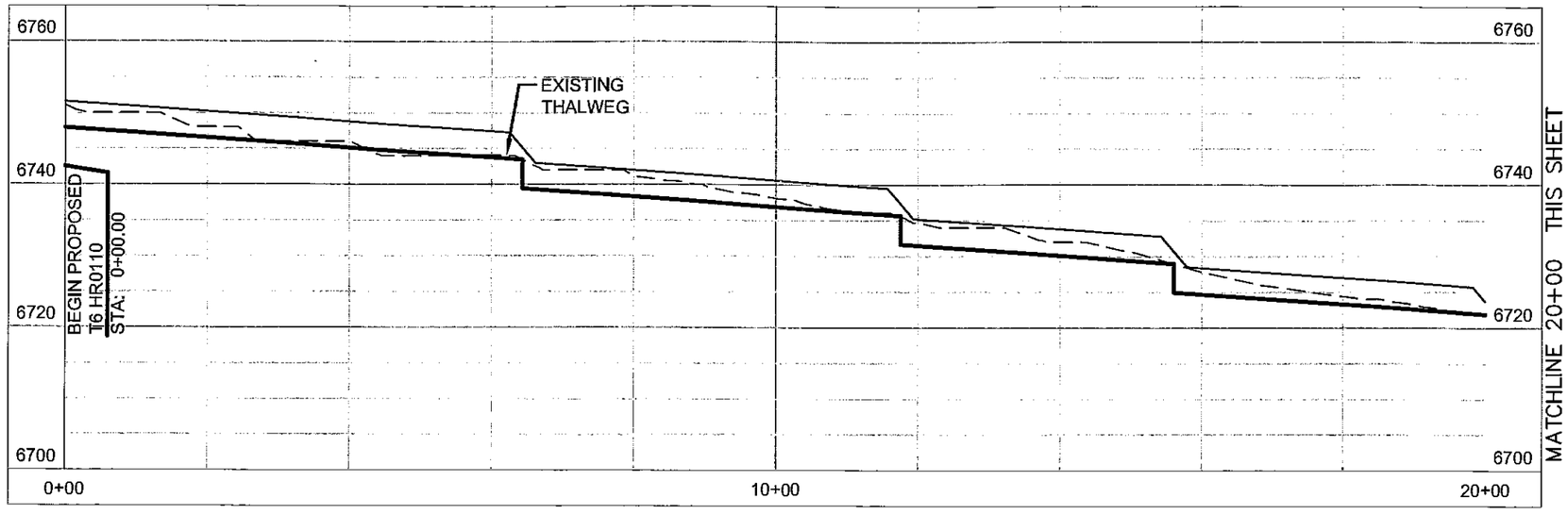
Sheet Number SR05

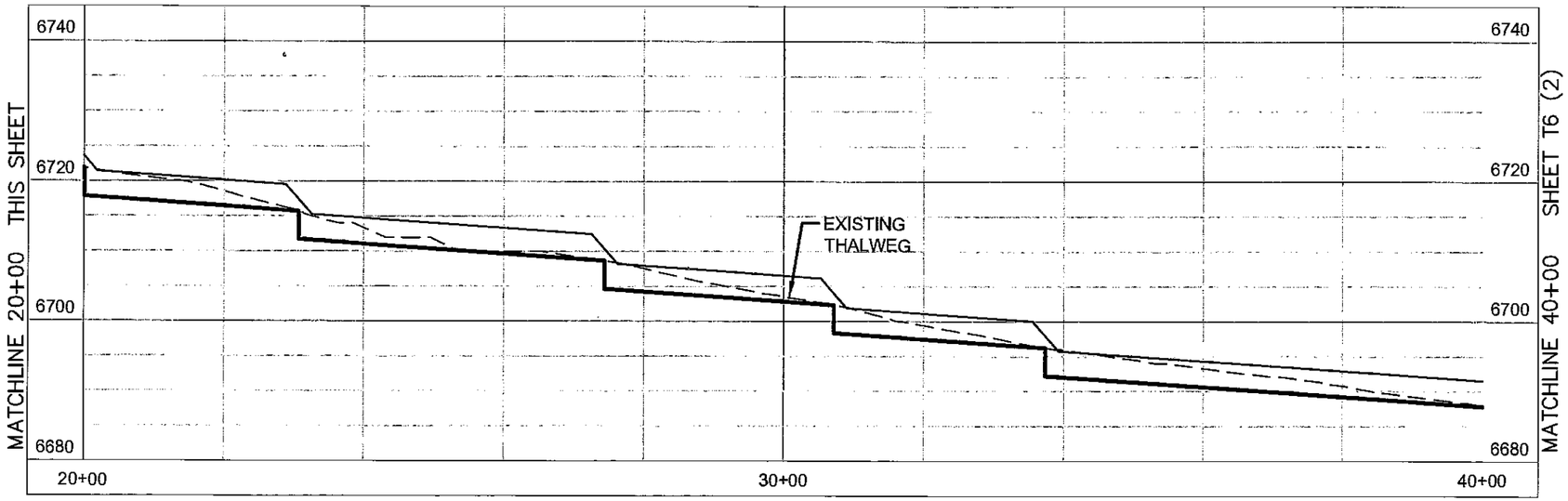
T6 HR0110

SLOPE = 0.70%

(9) 4' DROPS

PROFILE TRIBUTARY 6 (T6)





LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: T_PROFILE_SHEETS 6_PROPOSED.DWG

Acad. Ver. 2006 Scale: 1"=20' Units: Feet

Index of Revisions

1		
2		
3		

EL PASO COUNTY DEPARTMENT OF TRANSPORTATION

URS 9950 Federal Drive, Suite 300 Colorado Springs, CO. 80921 (719) 531-0001 Fax (719) 531-0007

Profiles

Designed by: KAP

Detailed by: DRM

Checked by:

Structure Numbers:

HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number T6

T6 HR0110

SLOPE = 0.70%

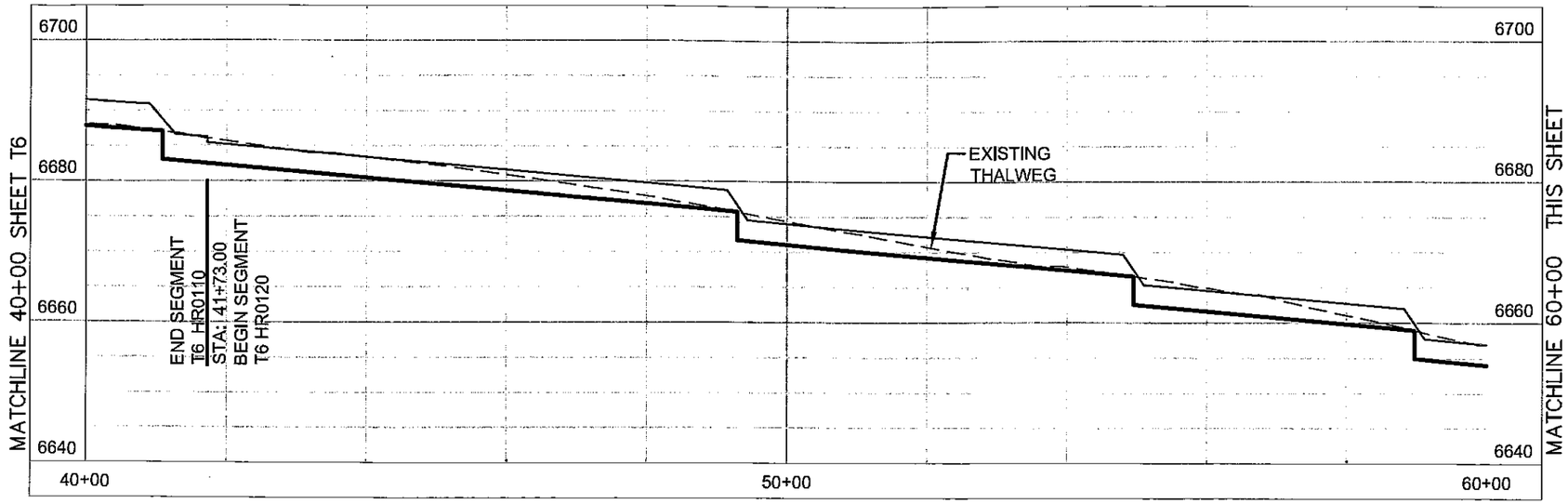
(9) 4' DROPS

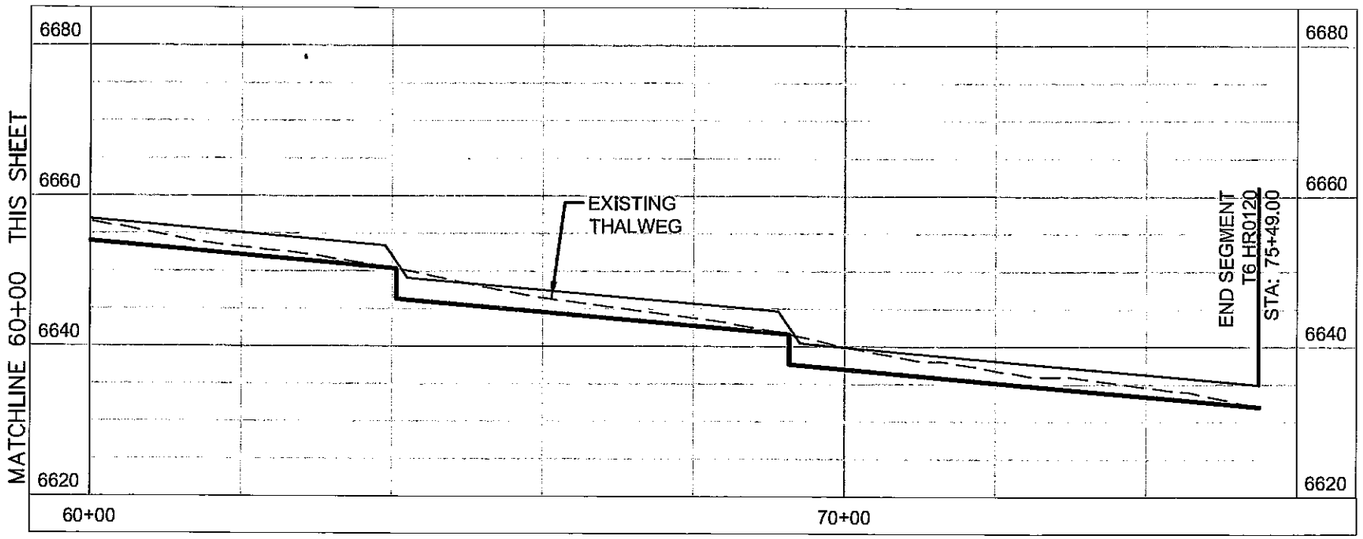
T6 HR0120

SLOPE = 0.90%

(6) 4' DROPS

PROFILE TRIBUTARY 6 (T6)





LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

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Drawing File Name: T PROFILE SHEETS 6_PROPOSED.DWG

Acad. Ver. 2006 Scale: 1"=20' Units: Feet

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Structure Numbers

EL PASO COUNTY DEPARTMENT OF TRANSPORTATION

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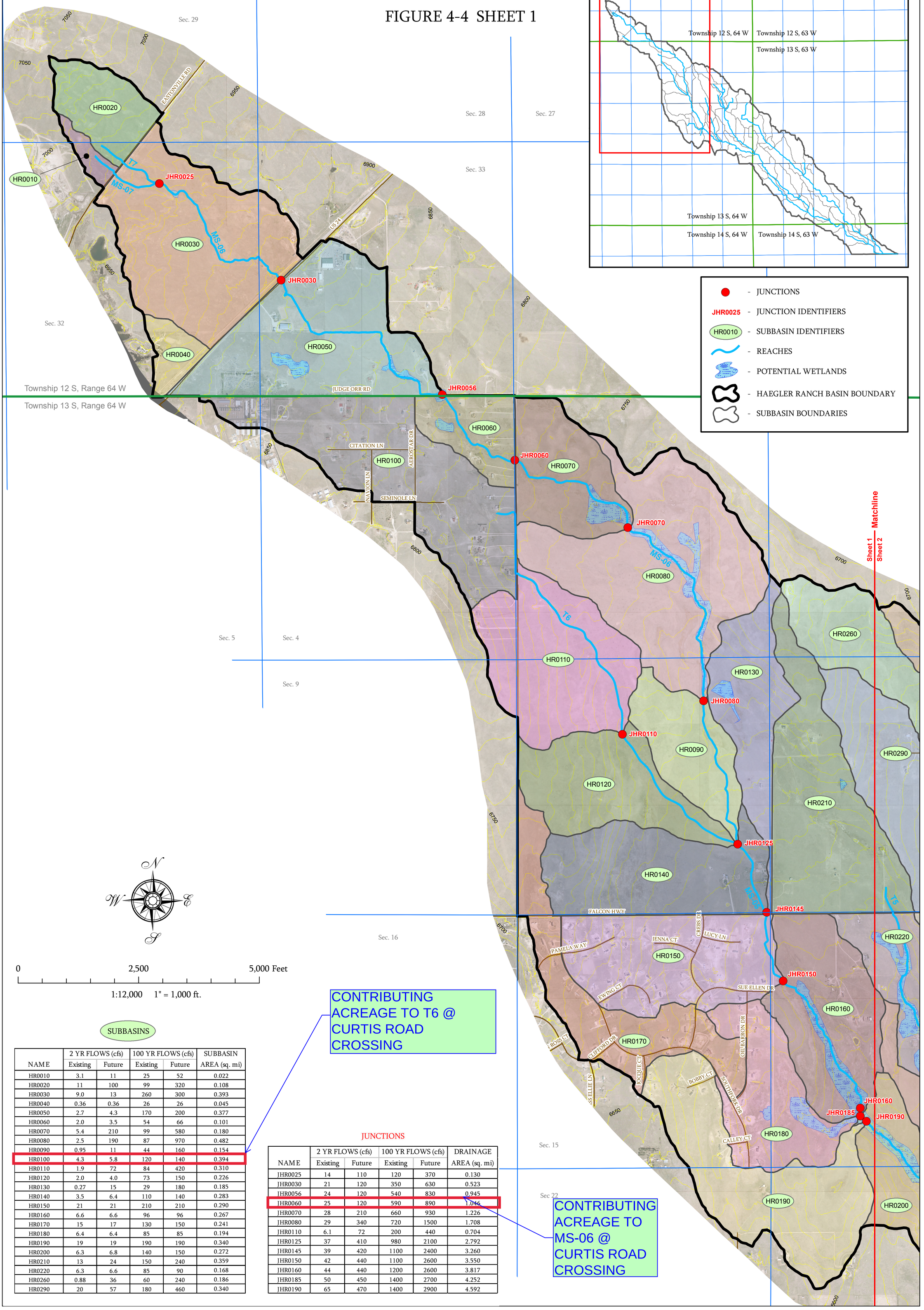
HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number T6 (2)

FIGURE 4-4 SHEET 1



0 2,500 5,000 Feet

1:12,000 1" = 1,000 ft.

SUBBASINS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	SUBBASIN AREA (sq. mi)
HR0010	3.1	11	25	52	0.022
HR0020	11	100	99	320	0.108
HR0030	9.0	13	260	300	0.393
HR0040	0.36	0.36	26	26	0.045
HR0050	2.7	4.3	170	200	0.377
HR0060	2.0	3.5	54	66	0.101
HR0070	5.4	210	99	580	0.180
HR0080	2.5	190	87	970	0.482
HR0090	0.95	11	44	160	0.154
HR0100	4.3	5.8	120	140	0.394
HR0110	1.9	72	84	420	0.310
HR0120	2.0	4.0	73	150	0.226
HR0130	0.27	15	29	180	0.185
HR0140	3.5	6.4	110	140	0.283
HR0150	21	21	210	210	0.290
HR0160	6.6	6.6	96	96	0.267
HR0170	15	17	130	150	0.241
HR0180	6.4	6.4	85	85	0.194
HR0190	19	19	190	190	0.340
HR0200	6.3	6.8	140	150	0.272
HR0210	13	24	150	240	0.359
HR0220	6.3	6.6	85	90	0.168
HR0260	0.88	36	60	240	0.186
HR0290	20	57	180	460	0.340

CONTRIBUTING ACREAGE TO T6 @ CURTIS ROAD CROSSING

JUNCTIONS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	DRAINAGE AREA (sq. mi)
JHR0025	14	110	120	370	0.130
JHR0030	21	120	350	630	0.523
JHR0056	24	120	540	830	0.945
JHR0060	25	120	590	890	1.046
JHR0070	28	210	660	930	1.226
JHR0080	29	340	720	1500	1.708
JHR0110	6.1	72	200	440	0.704
JHR0125	37	410	980	2100	2.792
JHR0145	39	420	1100	2400	3.260
JHR0150	42	440	1100	2600	3.550
JHR0160	44	440	1200	2600	3.817
JHR0185	50	450	1400	2700	4.252
JHR0190	65	470	1400	2900	4.592

CONTRIBUTING ACREAGE TO MS-06 @ CURTIS ROAD CROSSING

URS

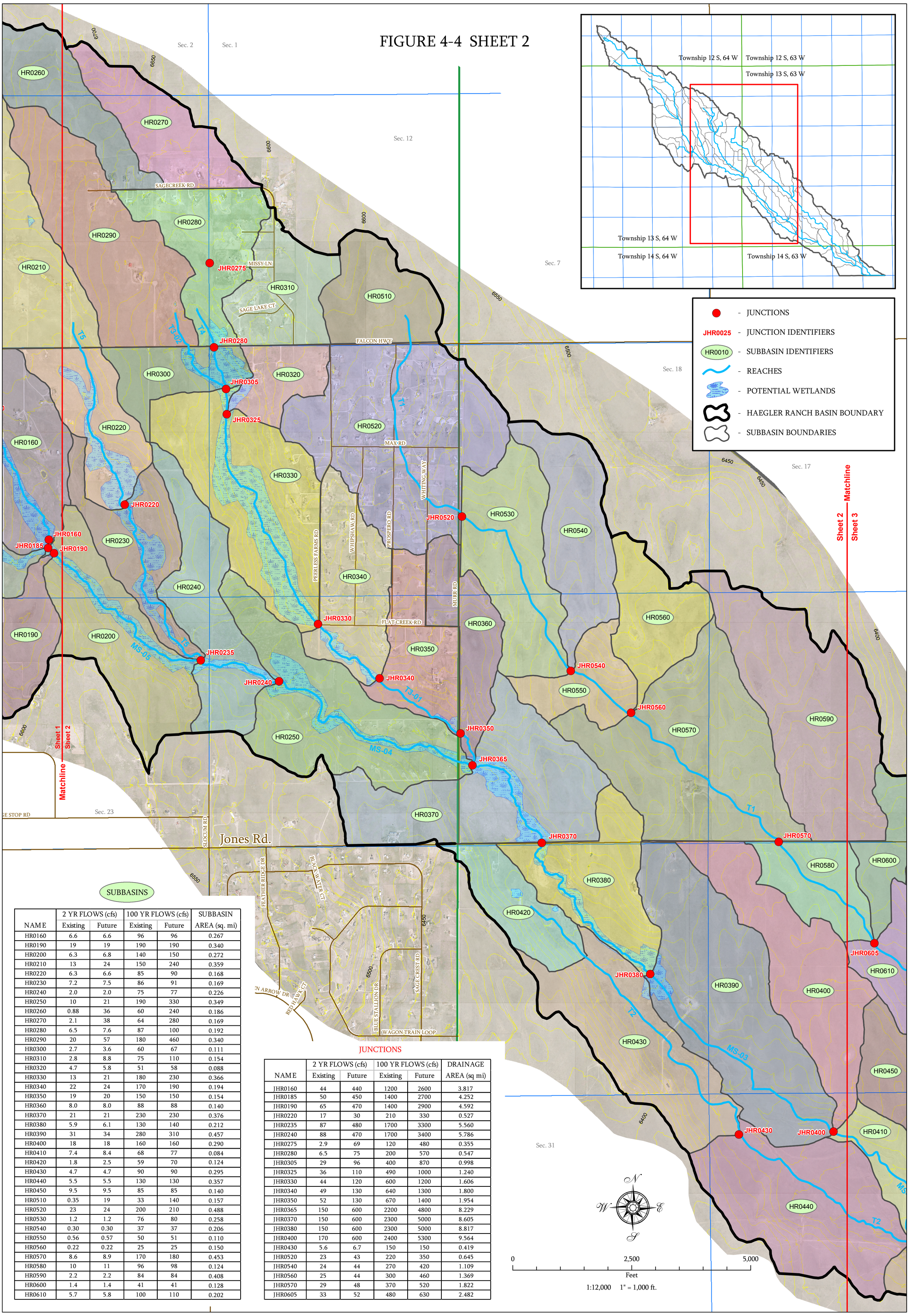
HAEGLER RANCH DRAINAGE BASIN

EXISTING AND FUTURE CONDITIONS HYDROLOGIC MODEL

URS NO. 21711039

DATE: 09/08

FIGURE 4-4 SHEET 2



SUBBASINS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	SUBBASIN AREA (sq. mi)
HR0160	6.6	6.6	96	96	0.267
HR0190	19	19	190	190	0.340
HR0200	6.3	6.8	140	150	0.272
HR0210	13	24	150	240	0.359
HR0220	6.3	6.6	85	90	0.168
HR0230	7.2	7.5	86	91	0.169
HR0240	2.0	2.0	75	77	0.226
HR0250	10	21	190	330	0.349
HR0260	0.88	36	60	240	0.186
HR0270	2.1	38	64	280	0.169
HR0280	6.5	7.6	87	100	0.192
HR0290	20	57	180	460	0.340
HR0300	2.7	3.6	60	67	0.111
HR0310	2.8	8.8	75	110	0.154
HR0320	4.7	5.8	51	58	0.088
HR0330	13	21	180	230	0.366
HR0340	22	24	170	190	0.194
HR0350	19	20	150	150	0.154
HR0360	8.0	8.0	88	88	0.140
HR0370	21	21	230	230	0.376
HR0380	5.9	6.1	130	140	0.212
HR0390	31	34	280	310	0.457
HR0400	18	18	160	160	0.290
HR0410	7.4	8.4	68	77	0.084
HR0420	1.8	2.5	59	70	0.124
HR0430	4.7	4.7	90	90	0.295
HR0440	5.5	5.5	130	130	0.357
HR0450	9.5	9.5	85	85	0.140
HR0510	0.35	19	33	140	0.157
HR0520	23	24	200	210	0.488
HR0530	1.2	1.2	76	80	0.258
HR0540	0.30	0.30	37	37	0.206
HR0550	0.56	0.57	50	51	0.110
HR0560	0.22	0.22	25	25	0.150
HR0570	8.6	8.9	170	180	0.453
HR0580	10	11	96	98	0.124
HR0590	2.2	2.2	84	84	0.408
HR0600	1.4	1.4	41	41	0.128
HR0610	5.7	5.8	100	110	0.202

JUNCTIONS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	DRAINAGE AREA (sq mi)
JHR0160	44	440	1200	2600	3.817
JHR0185	50	450	1400	2700	4.252
JHR0190	65	470	1400	2900	4.592
JHR0220	17	30	210	330	0.527
JHR0235	87	480	1700	3300	5.560
JHR0240	88	470	1700	3400	5.786
JHR0275	2.9	69	120	480	0.355
JHR0280	6.5	75	200	570	0.547
JHR0305	29	96	400	870	0.998
JHR0325	36	110	490	1000	1.240
JHR0330	44	120	600	1200	1.606
JHR0340	49	130	640	1300	1.800
JHR0350	52	130	670	1400	1.954
JHR0365	150	600	2200	4800	8.229
JHR0370	150	600	2300	5000	8.605
JHR0380	150	600	2300	5000	8.817
JHR0400	170	600	2400	5300	9.564
JHR0430	5.6	6.7	150	150	0.419
JHR0520	23	43	220	350	0.645
JHR0540	24	44	270	420	1.109
JHR0560	25	44	300	460	1.369
JHR0570	29	48	370	520	1.822
JHR0605	33	52	480	630	2.482

URS

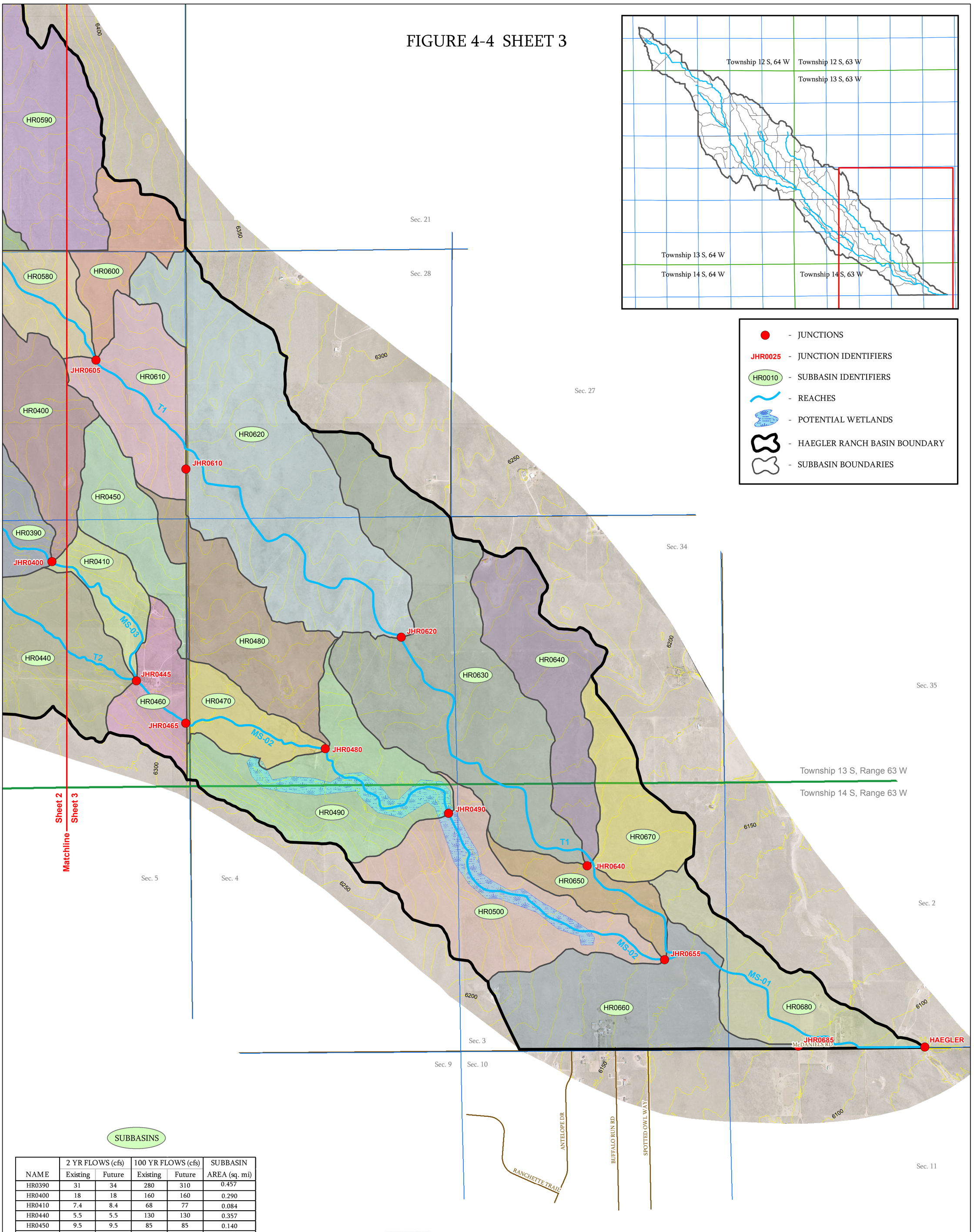
HAEGLER RANCH DRAINAGE BASIN

EXISTING AND FUTURE CONDITIONS HYDROLOGIC MODEL

URS NO. 21711039

DATE: 09/08

FIGURE 4-4 SHEET 3



SUBBASINS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	SUBBASIN AREA (sq. mi)
HR0390	31	34	280	310	0.457
HR0400	18	18	160	160	0.290
HR0410	7.4	8.4	68	77	0.084
HR0440	5.5	5.5	130	130	0.357
HR0450	9.5	9.5	85	85	0.140
HR0460	4.0	4.0	76	76	0.109
HR0470	7.3	7.6	73	77	0.102
HR0480	0.86	0.86	34	34	0.244
HR0490	9.2	9.8	210	220	0.312
HR0500	3.3	3.4	140	150	0.326
HR0580	10	11	96	98	0.124
HR0590	2.2	2.2	84	84	0.408
HR0600	1.4	1.4	41	41	0.128
HR0610	5.7	5.8	100	110	0.202
HR0620	1.9	1.9	110	120	0.647
HR0630	2.2	2.2	86	86	0.616
HR0640	0.88	0.88	37	37	0.237
HR0650	4.2	4.3	45	46	0.092
HR0660	0.87	0.87	52	52	0.296
HR0670	0.63	0.63	31	31	0.153
HR0680	11	12	110	120	0.206

JUNCTIONS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	DRAINAGE AREA (sq. mi)
JHR0400	170	600	2400	5300	9.564
JHR0445	180	590	2500	5400	10.424
JHR0465	180	570	2600	5400	10.673
JHR0480	180	570	2600	5400	11.019
JHR0490	180	570	2600	5500	11.331
JHR0605	33	52	480	630	2.482
JHR0610	34	52	500	650	2.684
JHR0620	35	53	560	700	3.331
JHR0640	38	54	670	780	4.184
JHR0655	190	570	3200	5600	15.933
JHR0685	190	550	3200	5600	16.588
HAEGLER	190	550	3200	5600	16.588

N W E S

0 2,500 5,000
Feet

1:12,000 1" = 1,000 ft.

URS

HAEGLER RANCH DRAINAGE BASIN

EXISTING AND FUTURE CONDITIONS HYDROLOGIC MODEL

URS NO. 21711039

DATE: 09/08

MASTER DEVELOPMENT DRAINAGE PLAN
and PRELIMINARY DRAINAGE REPORT
FOR
SADDLEHORN RANCH

Prepared For:
ROI Property Group, LLC
2495 Rigdon Street
Napa, CA 94558
(707) 365-6891

May 8, 2020
Project No. 25142.00

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
719-593-2593

El Paso County PCD File No.
SP-19-006

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Mike Bramlett, Colorado P.E. # 32314 Date
For and On Behalf of JR Engineering, LLC

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: ROI Property Group, LLC

By:

Title:
Address: 2495 Rigdon Street
Napa, CA 94558

El Paso County:
Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2 and Engineering Criteria Manual, as amended.

Jennifer Irvine, P.E. Date
County Engineer/ ECM Administrator

Conditions:

CONTENTS

PURPOSE **1**

GENERAL LOCATION AND DESCRIPTION **1**

LOCATION 1
DESCRIPTION OF PROPERTY 1
FLOODPLAIN STATEMENT 2

DRAINAGE BASINS AND SUBBASINS **2**

MAJOR BASIN DESCRIPTIONS 2
EXISTING SUB-BASIN DRAINAGE 5
PROPOSED SUB-BASIN DRAINAGE 8

DRAINAGE DESIGN CRITERIA **12**

DEVELOPMENT CRITERIA REFERENCE 12
HYDROLOGIC CRITERIA 12
HYDRAULIC CRITERIA 13

DRAINAGE FACILITY DESIGN **13**

GENERAL CONCEPT 13
SPECIFIC DETAILS 14
Four Step Process to Minimize Adverse Impacts of Urbanization *14*
Water Quality *15*
Erosion Control Plan *15*
Operation & Maintenance *15*
Drainage and Bridge Fees *15*
Construction Cost Opinion *17*

SUMMARY **17**

REFERENCES: **18**

APPENDICES

A. Figures and Exhibits
B. Hydrologic Calculations
C. Hydraulic Calculations
D. Detention and Water Quality Calculations
E. Reference Materials
F. Drainage Maps

LIST OF TABLES:

1. Existing Drainage Basin Summary
2. Major Drainageway Naming Conventions
3. Major Drainageway Flow Comparison
4. Pond Summary
5. Site Composite Percent Imperviousness
6. Drainage & Bridge Fees

PURPOSE

This document is the Master Development Drainage Plan (MDDP)/Preliminary Drainage Report (PDR) for the proposed Saddlehorn Ranch. The purpose of this report is to:

1. Identify on-site and off-site drainage patterns.
2. Recommend preliminary storm water facilities to collect and convey storm runoff from the proposed development to appropriate discharge and/or detention locations.
3. Recommend preliminary water quality and detention facilities to control discharge release rates to below historic.
4. Demonstrate compliance with surrounding major drainage basin planning studies, master plan and flood insurance studies.

GENERAL LOCATION AND DESCRIPTION

Location

The proposed Saddlehorn Ranch, known as "the site" from herein, is a parcel of land located in Section 3 and 10, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The proposed 824 acre, rural, single family-development is bound by Judge Orr Road to the North and Curtis Road to the West. To the East, the site is bound by undeveloped land owned by Brent Houser Enterprises, LLC. To the south, the site is bound by undeveloped properties owned by 7120 Sudiev, LLC and Faye Reyonlds. A vicinity map and property owner map is presented in Appendix A.

Currently, there are three major drainageways that run through the site: Haegler Ranch Main Stem 6 (MS-06), Haegler Ranch Tributary 6 (T-6), and Gieck Ranch West Fork – Reach 7A (WF-R7A). These drainageways were analyzed, both hydrologically and hydraulically, in the following reports:

1. Geick Ranch Drainage Basin Planning Study (DBPS), October 2007
2. Haegler Ranch Basin DBPS, May 2009
3. Sante Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision (LOMR), October 2004

The impact of these drainageways and planning studies on the proposed development will be discussed later in the report.

Description of Property

The proposed development contains approximately 824 acres and will be comprised of 227 rural 2.5 – 5 acre lots. The site is currently unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling range land condition. In general, the site slopes from northwest to southeast and the existing drainageways follow this topography.

Per a NRCS web soil survey of the area, the site is made up of Type A, B and D soils. Type A soils cover roughly 80% of the site while Type B soils cover 3% and Type D cover the remaining 17% of the site. Group A soils have a high infiltration rate when thoroughly wet. Type B soils have a moderate infiltration when thoroughly wet. Type D soils have a very slow infiltration rate when thoroughly wet and have a high shrink-swell potential. A NRCS soil survey map has been presented in Appendix A.

Two existing wells are located in the southwest corner of the site. A 12" Cherokee Metropolitan District waterline runs through the site just south of the northern property line. Approximately a mile south of the Curtis Road and Judge Orr Road intersection, a two lane dirt road proceeds from Curtis Road east towards approximate center of the site. A water tank, pond and windmill are located within Major Drainageway MS-06 at the end of the dirt road.

Floodplain Statement

Based on the FEMA FIRM Map number 08041C0558G, dated December 7, 2018, the site lies within Zone A, Zone AE, and Zone X. Zone A is defined as areas subject to inundation by the 1-percent-annual-chance flood determined using approximate methodologies because BFEs have not been established. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed development within the site will occur in Zone X.

In the northeast corner of the site, proposed development borders the Zone A boundary of the Geick Ranch West Tributary (WF-R7). At time of Final Drainage Report for this future phase of the development, a LOMR will be presented to establish base flood elevations (BFEs) for all lots that border the current Zone A boundary. The current FIRM Map has been presented in Appendix A.

DRAINAGE BASINS AND SUBBASINS

Major Basin Descriptions

The site lies within two major drainage basins: the Gieck Ranch Drainage Basin based on the "*Gieck Ranch Drainage Basin Planning Study*" (DBPS) prepared by Drexel, Barrell & Co. in October, 2007 and revised in February 2010 and the Haegler Ranch Drainage Basin based on the "*Haegler Ranch Drainage Basin Planning Study*" prepared by URS Corporation in May 2009.

The Gieck Ranch Drainage Basin covers approximately 22 square miles and begins approximately five miles northeast of the Town of Falcon and travels approximately 15 miles to the southeast. The Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains south to the Arkansas River near the city of Pueblo, Colorado. The majority of the area within the basin is undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates.

Anticipated land use for the basin includes residential, industrial, agricultural and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

The Haegler Ranch Drainage Basin covers approximately 16.6 square miles in unincorporated El Paso County, CO. The Haegler Ranch Drainage Basin is tributary to Black Squirrel Creek. In its existing condition, the basin is comprised of rolling rangeland with poor vegetative cover associated with Colorado's semi-arid climate. The natural drainageways within the basin are typically shallow and wide with poorly defined flow paths in most areas. Anticipated land use for the basin includes residential and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

As part of its drainage research, JR Engineering reviewed the following drainage studies, reports and LOMRs:

- Gieck Ranch Drainage Basin Planning Study prepared by Drexel, Barrell & Co. in October, 2007 and revised in February 2010. (Not adopted by El Paso County as of July 2019)
- Haegler Ranch Drainage Basin Planning Study prepared by URS Corporation in May 2009
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision prepared by Tri-Core Engineering in June 2004.

Existing Gieck Ranch Drainage Basin

The "*Gieck Ranch Drainage Basin Planning Study"* evaluated existing and future drainage conditions, identified future improvements, and established basin and bridge fees for the Gieck Ranch Drainage Basin. It should be noted that as of today the "*Gieck Ranch Drainage Basin Planning Study"* has not yet been approved and adopted by the County. All referenced information from the aforementioned report is presented for information purposes only.

Based upon provided drainage maps and analysis, Gieck Ranch discharges a total of 1,017 cfs onto the site within Major Drainageway Gieck Ranch West Fork Reach 7A (WF-R7A). An existing 66" CMP and 36" CMP convey the offsite flow across Judge Orr Road onto the site. The existing culverts at Judge Orr Road are undersized for existing and future flows resulting in localized overtopping. The DBPS recommends the culvert be upsized to four –12' x 5' box culverts. The culvert will not be upsized within the context of this report and development. The culvert is owned by El Paso County and timing of the recommended improvements will be controlled by the County. The overtopping at the intersection of WF-R7A is not contained within the 100-year floodplain. Therefore, at time of Final Drainage Report, berming will be provided that will protect proposed lots from overtopping flows. An overtopping analysis is presented in Appendix D and the limits of overtopping are presented on the existing and proposed drainage maps in Appendix F.

Based on existing channel analysis, the *Gieck Ranch DBPS* recommends WF-R7A channel improvements approximately 200' upstream and 300' downstream of the culvert crossing at Judge Orr Road (50' bottom width, 10:1 side slopes and vegetative augmentation). The recommended

channel improvements result from upsizing the culvert at Judge Orr Road, requiring the channel to be lowered. The channel improvements were not recommended due to existing channel instability. Existing velocities in the channel were found to be 2.19 ft/s, as presented in Appendix E. Per the MS4 permit requirements, the onsite reach of WF-R7A will be analyzed for channel stability with the corresponding Final Drainage Report for that phase of the development. At the time of Final Drainage Report, any necessary improvements to WF-R7A to satisfy the MS4 permit will be evaluated. It should be noted that the onsite reach of WF-R7A, where the aforementioned channel improvements were recommended, is comprised of jurisdictional wetlands which will limit the allowable improvements. Coordination with the Army Corps of Engineers will be required to grant permission to disturb the jurisdictional wetlands. Recommended channel improvements from the *Gieck Ranch DBPS* are presented in Appendix E.

Existing Haegler Ranch Drainage Basin

The "*Haegler Ranch Drainage Basin Planning Study*" was used to establish a stormwater management plan for the existing and future stormwater infrastructure needs within the Haegler Ranch Drainage Basin. Based on provided drainage maps and analysis, in the existing condition Haegler Ranch contributes a total of 710 cfs onto the site. Of the 710 cfs, 590 cfs crosses Curtis Road in an existing 24" CMP onto the site. Major Drainageway MS-06 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. The remaining 210 cfs crosses Curtis Road in an existing 36" CMP onto the site. Major Drainageway T-6 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. Both Curtis Road culverts are undersized for existing and future flows and overtopping occurs locally near the culvert crossings. Overtopping at the intersection of Curtis Road and T-6 is contained within the 100-year floodplain and will not affect proposed lots. The overtopping at the intersection of MS-06 and Curtis Road is not contained within the 100-year floodplain limits. Therefore, at time of Final Drainage Report, berming will be provided that will protect proposed lots from overtopping flows. An overtopping analysis is presented in Appendix D and the limits of overtopping are presented on the existing and proposed drainage maps in Appendix F.

The culverts are not proposed to be upsized within the context of this report and development. The culverts are owned by El Paso County and timing of the recommended improvements will be controlled by the County.

Furthermore, the *Haegler Ranch DBPS* recommends channel improvements within drainageways MS-06 and T-6. Per the *Haegler Ranch DBPS*, all recommended channel sections are trapezoidal with side slopes of 4:1 and a maximum depth of five feet. Within the limits of the site, three (3) channel bottom widths are recommended for MS-06. The first reach, from station 0+00 – 31+34, is proposed with a 15' bottom width, the second reach from 31+34 to 74+61, MS-06 is proposed with a 30' bottom width, and the last reach from station 74+61 - 103+62 is proposed with a 20' channel bottom. The *Haegler Ranch DBPS* recommends Major Drainageway T-6 be improved to a trapezoidal channel with an 8' bottom width, 4:1 side slopes and depth of 5'. Drop structures have

also been recommended within MS-06 and T-6. These improvements will not occur within the context of this report or development. However, due to the addition of culvert crossings within MS-06 and T-6, channel improvements are anticipated up and downstream of the proposed culverts. The extent of these channel improvements will be addressed with corresponding Final Drainage Reports for those phases of the development. At that time, channel stability will be evaluated and any necessary improvements will be proposed. Recommended channel improvements from the *Haegler Ranch DBPS* are presented in Appendix E.

Based on flood impacts, stream stability and cost effectiveness, this study recommended a sub-regional detention approach. This allows future development anywhere in the basin with the construction of an associated sub-regional pond. Within the boundary of Saddlehorn Ranch, the DBPS recommended a total of three (3) sub-regional ponds. Based on discussion with El Paso County, the site will utilize full spectrum water quality and detention ponds instead. These full spectrum detention ponds will limit developed discharge into the drainageways to less than historic rates. Future, upstream development will also require full spectrum detention in accordance with current El Paso County criteria, which is an effective alternative to the sub-regional pond approach.

The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR was executed on Haegler Ranch Tributary 2, 3, and 4. The LOMR revised the onsite effective flood zones from Zone A to Zone AE for the three drainageways. Upstream stretches of Tributary 3 and 4 are classified Zone A but those channel reaches are off site. All stretches of Tributary 3 and 4 onsite are Zone AE. See FIRM Map Panel 080059-0575G for limits of LOMR study and revised flood zones, presented in Appendix E.

Existing Sub-basin Drainage

On-site, existing drainage patterns are generally from northwest to southeast by way of existing, natural drainageways (MS-06, T-6, WF-R7A). On-site areas flow directly into these drainageways which also bypass off-site flows through the site. Offsite flows within the major drainageways that pass through the site will influence the on-site culvert designs and any channel improvements.

On-site, existing drainage basins were established based upon existing topography and the limits of 100-year floodplain. The site was divided into eleven existing sub-basins. See Table 1 below for summary of existing drainage sub-basins and corresponding peak flows. An existing drainage map is provided in Appendix F.

Table 1: Existing Drainage Basin Summary

EXISTING BASIN SUMMARY TABLE				
Tributary Sub-Basin	Area (acres)	Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	118.9	2.0%	0.9	64.1
H4	63.3	2.0%	1.4	73.2
H5	53.2	2.0%	0.3	28.2
H6	87.6	2.0%	0.2	110.1
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.1	2.0%	0.1	6.5
Total	825.4	N/A	12.7	585.4

The existing condition of the three major drainageways are discussed below;

Existing Geick Ranch West Fork Reach 7A (WF-R7A)

The first major drainageway is the Gieck Ranch West Fork Reach 7A (WF-R7A), per the *Gieck Ranch DBPS*. WF-R7A crosses onto the site along Judge Orr Road, approximately ¼ mile west of the intersection with Elbert Road. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway includes jurisdictional wetlands and the entire drainageway onsite is classified Zone A. Access to the drainage way will be provided from internal roadways and along an equestrian trail will be constructed adjacent to the drainageway. The equestrian train can be utilized for maintenance equipment as well.

Existing Haegler Ranch Main Stem (MS-06)

The second drainageway is the Haegler Ranch Main Stem (MS-06), per the *Haegler Ranch DBPS*, which crosses onto the site along Curtis Road, approximately 1,600' south of the intersection with Judge Orr Road. MS-06 flows south towards its offsite confluence with Black Squirrel Creek. MS-06 exits the site along the southern property line. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway includes non-jurisdiction wetlands and the entire drainageway is classified Zone AE. Access to the channel will be provided at the culvert crossing of MS-06 and San Isidro Trail via

a 15' wide maintenance and access road that will proceed from San Isidro trail to the channel bottom. From here, access through the channel is achievable with existing grades within the channel. Furthermore, an equestrian trail will be constructed adjacent to the drainageway that can be utilized for maintenance equipment as well. The road alignments are displayed on the proposed drainage map presented in Appendix F.

Existing Haegler Ranch Tributary 6 (T-6)

The third drainageway is the Haegler Ranch Tributary 6 (T-6), per the *Haegler Ranch DBPS*, which crosses onto the site along Curtis Road, approximately ¾ mile south of the intersection with Judge Orr Road. T-6 conveys flows south through the site and towards its off-site confluence with Black Squirrel Creek. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway is absent of any on-site wetlands and the entire drainageway is classified Zone AE. Access to the channel will be provided at the culvert crossing of T-6 and Del Cerro Trail via a 15' wide maintenance and access road that will proceed from Del Cerro Trail to the channel bottom. From here, access through the channel is achievable with existing grades within the channel. Furthermore, an equestrian trail will be constructed adjacent to the drainageway that can be utilized for maintenance equipment as well. The road alignments are displayed on the proposed drainage map presented in Appendix F.

The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR was executed on three Haegler Ranch basin drainageways. Two of the drainageways that were evaluated pass through the proposed development. These drainageways are the: Haegler Ranch Tributary 3 & 4. Within the boundary of the proposed development, Haegler Ranch Tributary 3 and 4 are synonymous with Main Stem 6 and Tributary 6 from the *Haegler Ranch DBPS*. The purpose of the LOMR was to revise the flood hazard depicted in the current Flood Insurance Study. Additionally, the LOMR provided existing, 100-year velocities within the drainageways that will be utilized in the design of any potential channel improvements. A FIRM panel with the limits of the detailed study as well as BFEs has been presented in Appendix E.

See Table 2 for comparison of drainageway identification and the naming convention used within the context of this report. See Table 3 for a comparison of 100-year flows as calculated in the aforementioned DBPS' and LOMR. An existing conditions drainage map is presented in Appendix F.

Table 2: Major Drainageways

Major Drainageway Naming Conventions			
Saddlehorn Ranch MDDP/PDR:	Per Haegler Ranch DBPS:	Per Geick Ranch DBPS:	Per Sante Fe Springs LOMR:
WF-R7A	N/A*	West Fork (Middle)/WF-R7A	N/A*
MS-06	Main Stem (MS-06)	N/A*	Haegler Ranch Tributary 3
T-6	Tributary 6 (T-6)	N/A*	Haegler Ranch Tributary 4

Table 3: Major Drainageways – Ex. 100-Year Flow Comparison

Major Drainageways: 100-Year Flow Comparison				
Drainageway Name	Contributing Area (sq. mi.)	Q_{100} Per Haegler Ranch DBPS:	Q_{100} Per Geick Ranch DBPS:	Q_{100} Per Sante Fe Springs LOMR:
WF-R7A @ Judge Orr Road	1.50	N/A*	1,017 cfs	N/A*
MS-06 @ Curtis Road	1.05	451 cfs	N/A*	505 cfs
T-6 @ Curtis Road	0.39	120 cfs	N/A*	130 cfs

*N/A: Flow regime outside limits of study.

Proposed Sub-basin Drainage

The proposed basin delineation is as follows;

Basin A is approximately 9.2 acres and in its existing condition is rolling rangeland. Runoff generally flows southeast away from Drainageway MS-06. In the proposed condition, Basin A will be rural 2.5 acre lots and roadway. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive to Pond A. Pond A, while considered temporary in this MDDP, will need to meet Full Spectrum Detention Criteria unless deviations are approved in the Final Drainage Report for this future filing. It is anticipated that Barrosito Drive will be extended south as part of the development of the adjacent parcel to the south. The most logical place for a permanent Full Spectrum pond is located approximately 1,000 feet south at the future road crossing with MS-06. When that pond is constructed, the Saddlehorn Metropolitan District No. 1 will remove Pond A. The peak flow rate for Basin A in the 5 and 100-year storm are 9.5 cfs and 20.7 cfs, respectively. However, Pond A will discharge at less than historic rates.

Basin B is approximately 60.4 acres and in its existing condition is rolling rangeland. Runoff generally flows southwest across the basin towards Drainageway MS-06. In the proposed condition, Basin B will be rural 2.5 acre lots, paved roadway and will include Pond B. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive to Pond B. The peak flow rate for Basin B in the 5 and 100-year storm are 9.9 cfs and 46.3 cfs, respectively. However, Pond B will discharge at less than historic rates. A portion of Basin B is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the revised floodplain.

Basin C is approximately 102.5 acres and in its existing condition is rolling rangeland. Runoff generally flows southwest across the basin towards Drainageway MS-06. In the proposed condition, Basin C will be rural 2.5 acre lots, paved roadway and will include Pond C. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive and Del Cambre Drive to Pond C. The peak flow rate for Basin C in the 5 and 100-year storm are 15.8 cfs and 69.4 cfs, respectively. However, Pond C will discharge at less than historic rates.

Basin D is approximately 99.2 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway WF-R7A. In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway and will include Pond D. Runoff from this basin will be collected in road side swales and conveyed east along Barrosito drive to Pond D. The peak flow rate for Basin D in the 5 and 100-year storm are 29.4 cfs and 95.4 cfs, respectively. However, Pond D will discharge at less than historic rates. A portion of Basin D is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the base flood elevations.

Basin E is approximately 11.6 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway MS-06. In the proposed condition, Basin E will be rural 2.5 acre lots, paved roadway and will include Pond E. Runoff from this basin will be collected in road side swales and conveyed southwest along San Isidro Trail to Pond E. The peak flow rate for Basin E in the 5 and 100-year storm are 2.0 cfs and 9.9 cfs, respectively. However, Pond E will discharge at less than historic rates.

Basin F is approximately 117.4 acres and in its existing condition is rolling rangeland. Runoff generally flows southeast across the basin towards Drainageway MS-06. In the proposed condition, Basin F will be rural 2.5 acre lots, paved roadway and will include Pond F. Runoff from this basin will be collected in road side swales and conveyed southwest along Benito Wells Trail to Pond F. The peak flow rate for Basin F in the 5 and 100-year storm are 17.0 cfs and 69.9 cfs, respectively. However, Pond F will discharge at less than historic rates.

Basin G is approximately 39.9 acres and in its existing condition is rolling rangeland. Runoff generally flows south across the basin towards Drainageway T-6. In the proposed condition, Basin G will be rural 2.5 acre lots, paved roadway and will include Pond G. Runoff from this basin will be collected in road side swales and conveyed southwest along El Raiceno Trail to Pond G. The peak flow rate for Basin G in the 5 and 100-year storm are 6.1 cfs and 25.3, respectively. However, Pond G will discharge at less than historic rates.

Basin H is approximately 30.7 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin H will be rural 2.5 acre lots, paved roadway and will include Pond H. Runoff from this basin will be collected in road side swales and conveyed north along Rosalia Place to Pond H. The peak flow rate for Basin H in the 5 and 100-year storm are 3.7 cfs and 17.9 cfs, respectively. However, Pond H will discharge at less than historic rates.

Basin I is approximately 46.6 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin I will be rural 2.5 acre lots, paved roadway and will include Pond I. Runoff from this basin will be collected in road side swales and conveyed south down Carrizo Springs Trail and east down Zaragoza Trail to Pond I. The peak flow rate for Basin I in the 5 and 100-year storm are 15.9 cfs and 63.1 cfs, respectively. However, Pond I will discharge at less than historic rates.

Basin J is approximately 10.1 acres and in its existing condition is rolling rangeland. This basin will not be developed and will remain in its existing condition, per Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures this basin will not be detained in a full spectrum water quality and detention pond. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin J will be an undeveloped tract. Undeveloped runoff from this basin will follow existing drainage patterns and sheet flow into Drainageway WF-R7A. The peak flow rate for Basin J in the 5 and 100-year storm are 3.0 cfs and 10.5 cfs, respectively.

Basins CH1, CH2 and CH3 are existing drainageway basins that will remain undeveloped in the proposed condition. There will be no development within Basin CH1-CH3, however; Basin CH2 & CH3 will require channel grading to accommodate proposed culverts. The scope of this grading will leave the channels in an undeveloped condition per Section I.7.1.B.7 and therefore will be excluded from permanent stormwater management. Basin CH1 contains jurisdictional wetlands. Basin CH2 contains non-jurisdictional wetlands. There are no wetlands located in Basin CH3. Peak flow rates for proposed undeveloped basins are presented in Appendix B.

Basins UD1-UD11 acre comprised of rural 2.5+ acre residential lots and will follow existing drainage patterns in the proposed condition. Development in these basins will be limited to a maximum of 10% impervious development via a plat covenant. Therefore, these basins can be excluded from permanent stormwater detention per Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures (2.5+ acre lots with imperviousness less than 10% can be excluded from

permanent stormwater management practices). Therefore, Basins UD1-UD11 will not be included in the developments permanent stormwater management facilities. A Permanent BMP applicability form is presented in Appendix D to justify these exclusions. A map detailing each development site and any exclusion is presented in Appendix F. Basin UD1 flows directly into Major Drainageway WF-R7A. Basins UD2, UD2.1, UD2.2, UD3, UD4, UD5 and UD8 flow directly into Major Drainageway MS-06. Basins UD6, UD7, UD9, and UD9.1 flow directly into Major Drainageway T-6. Basins UD8.1, UD10, and UD11 follow existing drainage patterns as well but flow directly off-site prior to being captured in major drainageways. A portion of Basin UD2.2 is inundated by the existing 100-yr floodplain. However, at time of final drainage report, lot lines will be adjusted outside floodplain limits. Furthermore, a portion of Basin UD10 is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the revised floodplain.

In addition to undeveloped lot areas, a small portion of Del Cerro Trail (portion of Basins UD9 & UD9.1) and San Isidro Trail (a portion of Basin UD5) will be allowed to directly discharge into Drainageway T-6 and MS-06, respectively, and excluded from the developments permanent stormwater management facilities. Per Section I.7.1.C.1, the County may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area from permanent stormwater management. Approximately, 16,240 ft^2 of Del Cerro Drive and 14,000 ft^2 square feet of San Isidro Trail, totaling 0.08% of the total development area, will be excluded from stormwater management, which is significantly less than the 20% limit.

A summary of all basin parameters has been presented in Appendix B.

Developed basin's runoff will be captured in roadside ditches and conveyed to a full spectrum water quality and detention pond per El Paso County DCM Volume 1. Each full spectrum pond will release treated flows at less than historic rates to minimize adverse impacts downstream. Pond D will discharge into Major Drainageway WF-7A, Pond B, C, E, and F will discharge into Major Drainageway MS-06 and Ponds G, H, and I will discharge into Major Drainageway T-6. Due to existing topography, Pond A will discharge into open space south of the site. Based on existing topography in the area, this flow will eventually be captured off-site by Major Drainageway MS-06.

See Table 4 for comparison of proposed pond parameters including a comparison of proposed basin discharge versus existing discharge.

Table 4: Pond Summary

POND SUMMARY TABLE							
Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	100-Year Volume (ac-ft)	Provided Volume (ac-ft)	100-Year Peak Discharge (cfs)	Ex. 100-Year Peak Discharge (cfs)
A	POND A	9.2	0.20	1.14	1.14	2.5	2.8
B	POND B	60.4	0.35	1.46	2.17	18.9	21.0
C	POND C	102.5	0.64	2.69	2.77	26.0	28.9
D	POND D	99.2	0.59	2.86	2.97	47.7	53.0
E	POND E	11.6	0.05	0.23	0.39	4.7	5.2
F	POND F	117.4	0.65	3.20	3.35	50.7	56.3
G	POND G	39.9	0.34	1.36	1.62	10.1	11.2
H	POND H	30.7	0.16	0.70	1.18	10.5	11.7
I	POND I	46.6	0.25	1.09	1.41	26.8	29.8

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

Storm drainage analysis and design criteria for the project were taken from the "*City of Colorado Spring/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual"* Volumes 1 - 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual (CCSDCM), dated May 2014, as adopted by El Paso County, as well as the July 2019 El Paso County Engineering Criteria Manual update.

Hydrologic Criteria

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using CUHP Version 2.0.0, developed by Urban Drainage and Flood Control District. The model utilizes the raingage classified as "a design storm by temporal distribution of one-hour rain depths with area correction factors". The following Colorado Springs rainfall depths were utilized in the model: 2.52 inches for 1-hour 100-year depth and 3.5 inches for 6-hour 100-year depth. EPA SWMM 5.1 was utilized to route runoff flow rates for the sizing of stormwater storage facilities. The CUHP calculations and SWMM model are presented in Appendix B.

Urban Drainage and Flood Control District's UD-Detention, Version 3.07 workbook was used for preliminary pond sizing. Required detention volumes and allowable release rates were designed per USDCM and CCS/EPCDCM. Pond sizing spreadsheets are presented in Appendix D.

Hydraulic Criteria

The Federal Highway Administration's HY-8 program (Volume 7.50) was used to analyze the proposed box culvert within Major Drainageways MS-06 and T-6. Per Section 14.3.2 of the CCS/EPCDCM, a maximum headwater-to-rise ratio of 1.5 was used for the sizing of box culverts. Furthermore, box culverts will be designed in conjunction with channel improvements to maintain the current floodplain and base flood elevations. Culvert sizing and corresponding channel improvements will be revised as roadway geometry becomes better defined. Preliminary culvert design sheets are presented in Appendix C.

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) was used for preliminary roadside ditch design. For the purposes of this PDR/MDDP, the maximum roadside ditch size was determined based on peak 100-year flows and minimum roadway slopes within each basin. Swales were checked for velocity and Froude number per the EPC DCM Chapter 10, Section 10-7 and Table 10-4. Swale cross sections with a 100-year velocity greater than 5 ft/s or a Froude number greater than 0.9 will be lined with erosion control blanket and native grasses, or another approved method of stabilization, to limit erosive potential. Final swale designs and cross section details will be included with the Final Drainage Report. Preliminary swale design sheets are presented in Appendix C.

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) will be used for final local road crossing culvert design with in the Final Drainage Report. All onsite, local road crossing culverts are assumed to be 18" or 24" CMP based on preliminary calculations. Culvert size was determined based on 100-year flows and hydraulic criteria from EPCDCM Chapter 9 –Culvert Design. The Final Drainage Report will provide final local road crossing culvert designs.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed Saddlehorn Ranch flows to full spectrum water quality and detention ponds. Water quality and detention ponds will be designed to release at less than historic rates to minimize adverse impacts downstream. All full spectrum water quality and detention ponds have been sized such that State Engineer review or approval is not required. Undeveloped basins are allowed to follow existing drainage patterns and discharge directly into major drainageways or off-site.

The undeveloped portion of developed lots will be allowed to discharge directly into Drainageways MS-06, T-6 and WF-R7A. Per the "Jurisdictional Determination Request for the 824 Acres Curtis Road subdivision Project" completed by Ecosystem System Services in October 2018, MS-06 and T-

6 are not waters of the state and WF-R7A is a water of the state however, any direct discharge into this drainageway will be historic, undeveloped flows. The direct discharge into drainageway situation occurs anywhere a lot naturally drains toward a drainageway rather than the street. It was determined for these lots that all development (i.e. house and driveway) will occur in the first 200' of the lot, measured from the street into the lot. The 200' developed region of the lot will drain towards the road and be conveyed to a full spectrum water quality pond, however; the remainder of the lot (undeveloped) will be allowed to follow historic drainage patterns and flow directly into the drainageways. Furthermore, at time of platting, a covenant will be established for the development that will limit imperviousness to 10% for areas draining directly to the drainageways in order to satisfy Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures.

A box culvert will be proposed within Major Drainageway MS-06 and T-6 to convey existing, off site and developed, on-site flows underneath proposed roadways and through the site, in accordance with the *Haegler Ranch DBPS*. Culverts will not be required in Major Drainageway WF-R7A to maintain the drainage patterns established in the *Gieck Ranch DBPS.*

Channel improvements will be proposed immediately up and downstream of culvert improvements in order to maintain the current floodplain. Further channel improvements may be required within the major drainageways and the need for these potential improvements will be evaluated in the Final Drainage Report for each Filing. Access roads will be provided from local roadways down into the drainageways to provide culvert and drainageway maintenance access. A proposed drainage map is presented in Appendix F showing locations of culvert improvements, approximate channel improvements and access roads.

Specific Details

Four Step Process to Minimize Adverse Impacts of Urbanization

In accordance with the El Paso County Drainage Criteria Manual, Volume 2 this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes; stabilizing drainageways, treating the water quality capture volume (WQCV), and consider the need for Industrial Commercial BMP's.

Step 1, Reducing Runoff Volumes: The development of the project site is proposed as single family residential (2.5 ac. min.) with open spaces and lawn areas interspersed within the development which helps disconnect impervious areas and reduce runoff volumes. Roadways will utilize roadside ditches further disconnecting impervious areas. These practices will also allow for increased infiltration and reduce runoff volume.

Step 2, Stabilize Drainageways: This site will utilize roadside ditches with culvert crossings throughout the site. These roadside ditches will then direct the on-site development flows to the multiple detention ponds within the project that will be designed to release at or below historic rates in the natural channels. The natural channels will be stabilized in reaches with high velocity by the

use of drop structures incorporated at each roadway culvert crossing and isolated grade control structures where warranted. Based upon the proposed reduction in released flows compared to the pre-developed flows, no impact to downstream drainageways is anticipated.

Step 3, Provide WQCV: Runoff from this development will be treated through capture and slow release of the WQCV in multiple permanent detention basins that will be designed per current El Paso County drainage criteria.

Step 4 Consider the need for Industrial and Commercial BMP's: No industrial or commercial uses are proposed within this development. However, a site specific storm water quality and erosion control plan and narrative will be prepared for each future Filing. Site specific temporary source control BMPs as well as permanent BMP's will be detailed in this plan and narrative to protect receiving waters.

Water Quality

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full spectrum water quality and detention will be provided for all of the development site not meeting exclusions present in the ECM - Stormwater Quality Policy and Procedures Section I.7.1.B and C. Any areas of the development site not being included in the site's permeant stormwater management are presented on the MS4 Development Site Map with their specific exclusion, presented in Appendix F. Outlet structure release rates will be limited to less than historic rates to minimize adverse impacts to downstream stormwater facilities. Complete pond and outlet structure designs will be provided with the Final Drainage Report. Preliminary pond design parameters are presented in Appendix D.

Erosion Control Plan

The El Paso County Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate must be submitted with each Final Drainage Report. We respectfully request that the Erosion Control Plan and Cost Estimate be submitted in conjunction with the grading and erosion control plans and construction assurances posted prior to obtaining a grading permit.

Operation & Maintenance

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. All proposed drainage structures within the any platted County ROW (roadside ditches and local road culverts) will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts (full spectrum water quality ponds, drainageway culverts and drainageway improvements) will be owned and maintained by the Saddlehorn Ranch Metropolitan District No.1. Inspection access for El Paso County will be provided through a maintenance easement.

Drainage and Bridge Fees

An estimate of total basin fees for the proposed development within Haegler Ranch Drainage Basin is provided in Table 6. A portion of Saddlehorn Ranch (Basin J and CH1) is not within an approved

drainage basin, therefore; no drainage or bridge fees will be required for this area. Drainage and Bridge fees are for informational purposes only and do not include reductions for rural lots, permanent water quality facilities or reimbursable channel improvements. Final drainage reports for each phase of development will establish official drainage and bridge fees to be paid at time of platting.

Table 5: Site Composite Percent Imperviousness

Total Site Composite % Impervious for Basin Fees			
Basin	Area (ac)	% Imperviousness	(Area) * (% Imp.)
A	9.2	67%	6.13
B	60.4	10%	6.28
C	102.5	11%	11.69
D	99.2	11%	10.71
E	11.6	12%	1.35
F	117.4	10%	11.62
G	39.9	17%	6.70
H	30.7	9%	2.89
I	46.6	9%	4.38
J	10.1	9%	0.89
UD1	12.4	2%	0.25
UD2	12.8	2%	0.26
UD2.1	14.8	2%	0.30
UD2.2	7.2	2%	0.14
UD3	13.4	2%	0.27
UD4	4.8	2%	0.10
UD5	36.4	2%	0.73
UD6	22.1	2%	0.44
UD7	9.3	2%	0.19
UD8	4.6	2%	0.09
UD8.1	5.3	2%	0.11
UD9	4.8	2%	0.10
UD9.1	6.4	2%	0.13
UD10	10.4	2%	0.21
UD11	6.0	2%	0.12
CH1	23.9	2%	0.48
CH2	84.2	2%	1.68
CH3	19.0	2%	0.38
Total	825.4	-	68.59
Comp. % Imp. = 68.59%*ac/825.4 ac = 8.31%			

Table 6: Drainage Basin Fees

El Paso County - Haegler Ranch Drainage Basin Fees						
Area (acre)	Composite % Impervious	Total Impervious Acreage	2019 Drainage Fee (per Impervious Acre)	2019 Bridge Fee (per Impervious Acre)	Saddlehorn Ranch Drainage Fee	Saddlehorn Ranch Bridge Fee
825.4	8.31%	68.59	$10,324	$1,524	$708,123	$104,531

Construction Cost Opinion

(For Information Only / Non-Reimbursable)
Cost opinion to be provided with Final Drainage Report.

SUMMARY

The proposed development remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements, including ditches, culverts, detention ponds and drainage channel improvements. The proposed development will not adversely affect the offsite major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site.

REFERENCES:

1. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.

2. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.

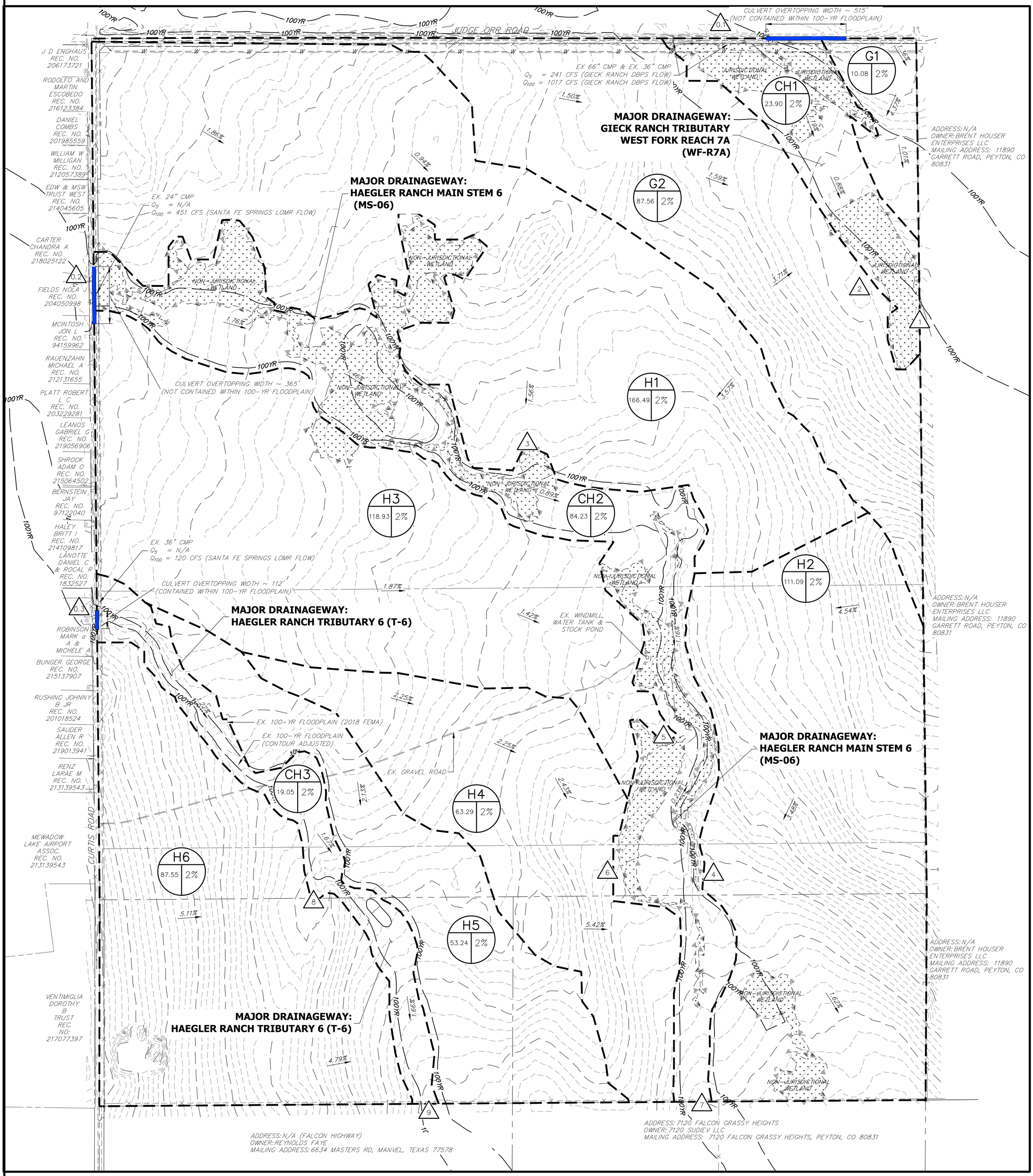
3. Gieck Ranch Drainage Basin Planning Study, Drexel, Barrell & Co., October 2007 and revised in February 2010.

4. Haegler Ranch Drainage Basin Planning Study, URS Corporation, May 2009.

5. The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR, Federal Emergency Management Agency, October 20, 2004.

824 ACRE CURTIS ROAD SUBDIVISION

EX. CONDITIONS DRAINAGE MAP



LEGEND

- I.D. (A | B): BASIN DESIGNATION
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: % IMPERVIOUS
- X: DESIGN POINT
- BASIN DELINEATION
- --6100-- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION

BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	118.9	2.0%	0.9	64.1
H4	63.3	2.0%	1.4	73.2
H5	53.2	2.0%	0.3	28.2
H6	87.6	2.0%	0.2	110.1
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.1	2.0%	0.1	6.5
Total	825.4	N/A	12.7	585.4

DESIGN POINT SUMMARY TABLE

Tributary Sub-	Q_5 (cfs)	Q_{100} (cfs)
0.1	241.00	1017.0
0.2	-	451.0
0.3	-	120.0
1	6.9	1114.0
2	1.5	76.4
3	0.1	80.9
4	0.1	91.1
5	0.9	64.1
6	1.4	73.2
7	4.1	704.9
8	0.2	110.1
9	0.4	248.1

300 150 0 300 600

ORIGINAL SCALE: 1" = 300'

EX. DRAINAGE MAP
824 CURTIS ROAD
25142.00
5/8/20
SHEET 1 OF 1

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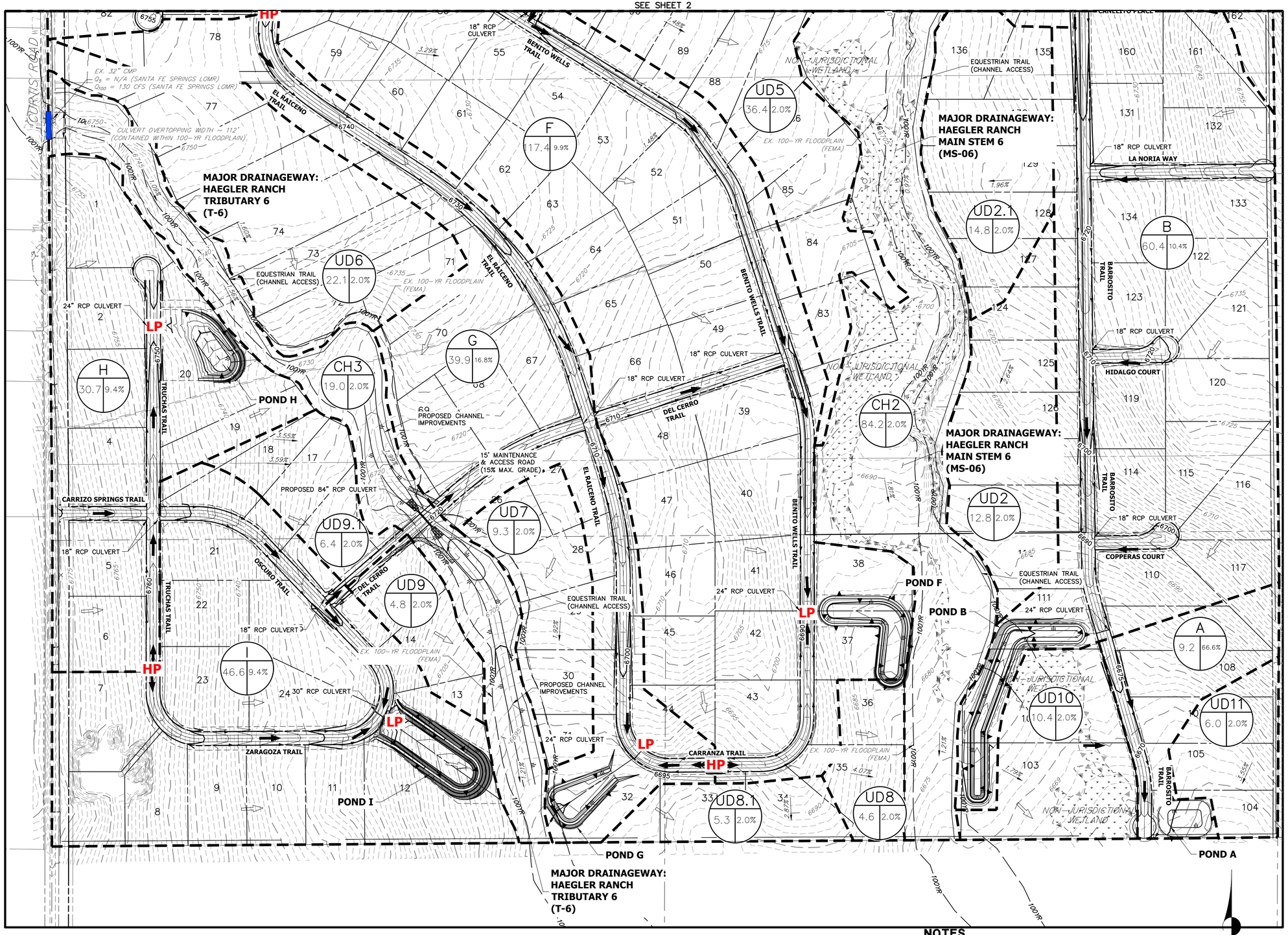
SADDLEHORN RANCH SUBDIVISION

PROPOSED DRAINAGE MAP

SEE SHEET 2



BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Composite Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
A	9.2	66.6%	9.5	20.7
B	60.4	10.4%	9.9	46.3
C	102.5	11.4%	15.8	69.4
D	99.2	10.8%	29.4	95.4
E	11.6	11.6%	2.0	9.9
F	117.4	9.9%	17.0	69.9
G	39.9	16.8%	6.1	25.3
H	30.7	9.4%	3.7	17.9
I	46.6	9.4%	15.9	63.1
J	10.1	2.0%	3.0	10.5
UD1	12.4	2.0%	0.3	13.9
UD2	12.8	2.0%	0.1	7.7
UD2.1	14.8	2.0%	0.1	14.7
UD2.2	7.2	2.0%	0.1	5.5
UD3	13.4	2.0%	0.2	13.1
UD4	4.8	2.0%	0.03	3.4
UD5	36.4	2.0%	4.1	27.4
UD6	22.1	2.0%	0.1	12.4
UD7	9.3	2.0%	0.7	7.4
UD8	4.6	2.0%	0.03	3.3
UD8.1	5.3	2.0%	0.1	5.6
UD9	4.8	2.0%	0.1	4.2
UD9.1	6.4	2.0%	0.2	8.1
UD10	10.4	2.0%	0.1	6.7
UD11	6	2.0%	0.02	4.3
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.0	2.0%	0.1	6.5
Total	825.4	N/A	126.7	627.3

POND SUMMARY TABLE

Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	100-Year Volume (ac-ft)	Provided Volume (ac-ft)	100-Year Peak Discharge (cfs)	Ex. 100-Year Peak Discharge (cfs)
A	POND A	9.2	0.20	1.14	1.14	2.5	2.8
B	POND B	60.4	0.35	1.46	2.17	18.9	21.0
C	POND C	102.5	0.64	2.69	2.77	26.0	28.9
D	POND D	99.2	0.59	2.86	2.97	47.7	53.0
E	POND E	11.6	0.05	0.23	0.39	4.7	5.2
F	POND F	117.4	0.65	3.20	3.35	50.7	56.3
G	POND G	39.9	0.34	1.36	1.62	10.1	11.2
H	POND H	30.7	0.16	0.70	1.18	10.5	11.7
I	POND I	46.6	0.25	1.09	1.41	26.8	29.8

LEGEND

- I.D. / A / B — BASIN DESIGNATION
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- 6100 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT

SADDLEHORN RANCH
SUBDIVISION
MDDP DRAINAGE MAP
25142.00
12/18/19
SHEET 1 OF 3

NOTES

1. ALL CULVERT SIZES ARE PRELIMINARY AND SUBJECT TO CHANGE WITH FINAL DRAINAGE REPORTS.

200 100 0 200 400

ORIGINAL SCALE: 1" = 200'

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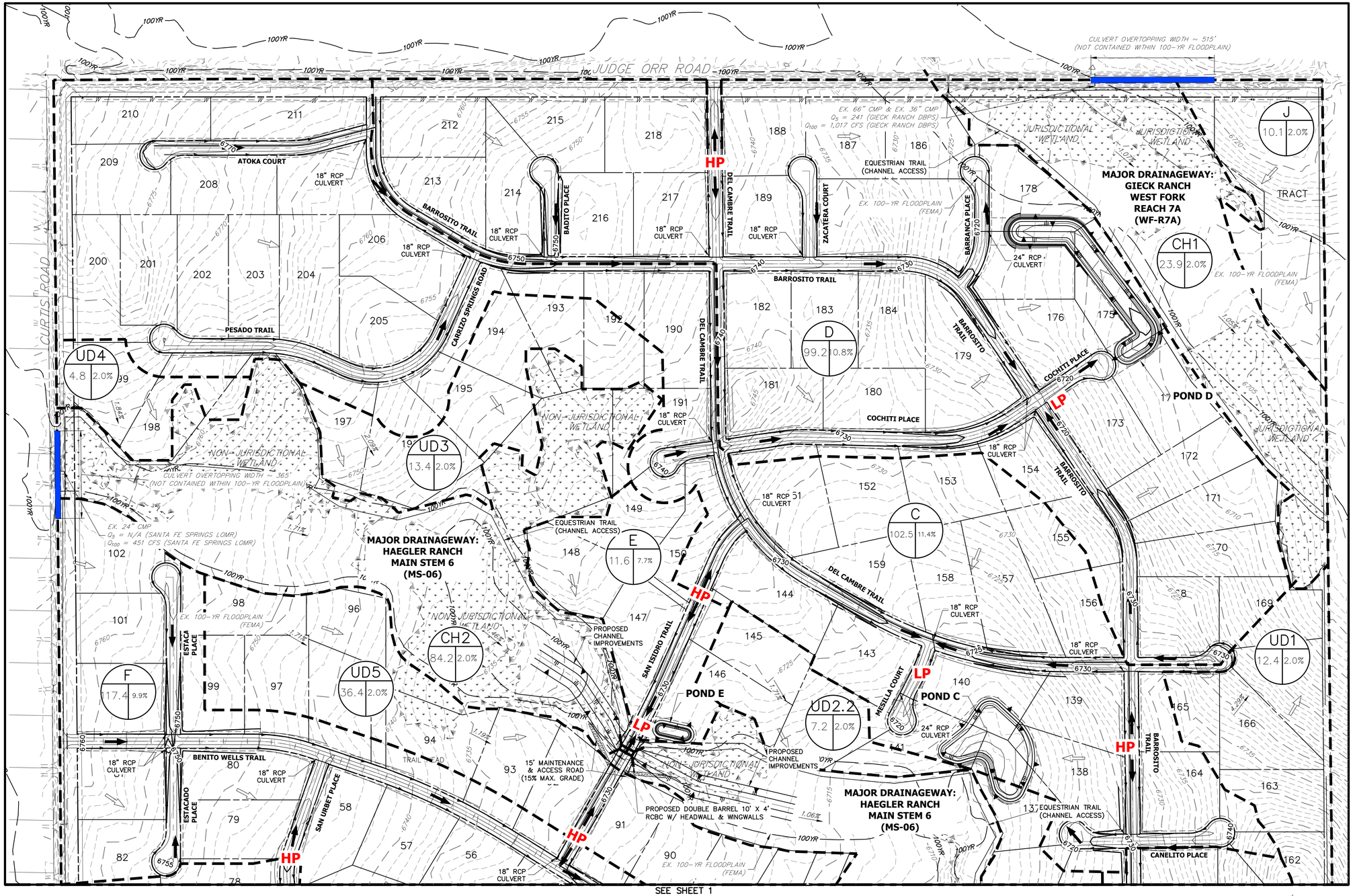
SADDLEHORN RANCH SUBDIVISION
PROPOSED DRAINAGE MAP



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C	102.5	11.4%	15.8	69.4
D	99.2	10.8%	29.4	95.4
E	11.6	11.6%	2.0	9.9
F	117.4	9.9%	17.0	69.9
G	39.9	16.8%	6.1	25.3
H	30.7	9.4%	3.7	17.9
I	46.6	9.4%	15.9	63.1
J	10.1	2.0%	3.0	10.5
UD1	12.4	2.0%	0.3	13.9
UD2	12.8	2.0%	0.1	7.7
UD2.1	14.8	2.0%	0.1	14.7
UD2.2	7.2	2.0%	0.1	5.5
UD3	13.4	2.0%	0.2	13.1
UD4	4.8	2.0%	0.03	3.4
UD5	36.4	2.0%	4.1	27.4
UD6	22.1	2.0%	0.1	12.4
UD7	9.3	2.0%	0.7	7.4
UD8	4.6	2.0%	0.03	3.3
UD8.1	5.3	2.0%	0.1	5.6
UD9	4.8	2.0%	0.1	4.2
UD9.1	6.4	2.0%	0.2	8.1
UD10	10.4	2.0%	0.1	6.7
UD11	6	2.0%	0.02	4.3
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
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B	POND B	60.4	0.35	1.46	2.17	18.9	21.0
C	POND C	102.5	0.64	2.69	2.77	26.0	28.9
D	POND D	99.2	0.59	2.86	2.97	47.7	53.0
E	POND E	11.6	0.05	0.23	0.39	4.7	5.2
F	POND F	117.4	0.65	3.20	3.35	50.7	56.3
G	POND G	39.9	0.34	1.36	1.62	10.1	11.2
H	POND H	30.7	0.16	0.70	1.18	10.5	11.7
I	POND I	46.6	0.25	1.09	1.41	26.8	29.8

LEGEND

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- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP PROPOSED HIGH POINT
- LP PROPOSED LOW POINT

NOTES

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SADDLEHORN RANCH
MDDP DRAINAGE MAP
25142.00
12/18/19
SHEET 2 OF 3

200 100 0 200 400
ORIGINAL SCALE: 1" = 200'

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J·R ENGINEERING

April 25, 2023

Keith Curtis, PE, CFM
Floodplain Administrator, PPRBD
2880 International Circle
Colorado Springs, CO 80910

Re: Engineer's Certification of No Impact
Case No. :

Dear Mr. Curtis,

This letter serves as Certification of No Impact to the Floodplain for the project entitled "Saddlehorn Ranch – Filing 3." The project is located in the unincorporated El Paso County and involves a proposed rural 2.5 acre lot subdivision.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) shows the project area located on Panel No. 08041C0558G for El Paso County, Colorado dated December 7, 2018. The project area is located along Haegler Ranch MS-06 and is within a designated Zone AE Special Flood Hazard Area (SFHA).

JR Engineering has evaluated the effects of the proposed development on the Haegler Ranch floodplain using the effective modeling as a baseline. The HEC-RAS modeling was obtained in PDF format from the "*Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision (LOMR)*" by Tri-Core Engineering, dated October 20, 2004, from the Federal Emergency Management Agency (FEMA). The effective model is the "Santa Fe Springs – Haegler DB. – Letter of Map Revision" prepared for FEMA by Tri-Core Engineering. The effective model was pared down to the stretch between Cross Sections 4 and 19 along Reach H8 (Haegler Ranch Tributary 3) for purposes of analysis within the context of this project.

JR Engineering utilized the calculated 100-year water surface from the aforementioned model to establish the existing 100-year floodplain. Proposed channel and culvert improvements were modeled utilizing the 100-year flow of 505 cfs established in the "*Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision (LOMR)".* Cross sections for the proposed channel improvements were modeled using the CivilGeo HECRAS program. The program models the projects proposed dual 12'x4' RCBC, this also took into hydraulic head built at the culvert crossing to establish an accurate base flood elevation. The computed water surface elevation at each cross section was compared to the effective model to ensure a no rise scenario.

Select results of the analysis are presented in Table 1, on the following page:

Table 1: Base Flood Elevation Comparison

	Base Flood Elevation (ft)	
Cross Section	Ex. 100-Year	Pr. 100-Year
13	6723.61	6723.60
14	6722.03	6719.68
15	6720.65	6718.33
16	6717.71	6717.56
17	6714.03	6714.03

Based on the results of the CivilGeo HECRAS Analysis, no increase to either the floodplain width or water surface elevation will result from the proposed site development.

Sincerely,

Bryan Law PE
Colorado P.E. #25043

No Rise Certification

I certify that I am a duly qualified registered Professional Engineer in the State of Colorado.

I certify the proposed project, Saddlehorn Ranch Filing No. 3, as detailed on the following sheets and calculations will result in zero rise in the FEMA designated 100 year flood heights, and no increase in the 100-year discharge and no increase in the 100-year floodplain width, at published and unpublished cross sections of the current FEMA floodplain of Haegler Ranch MS-06 as shown on FEMA map 08041C0558G. This certification is intended as proof of meeting the requirements set forth in the Pikes Peak Regional Building Code RBC313.20.1.

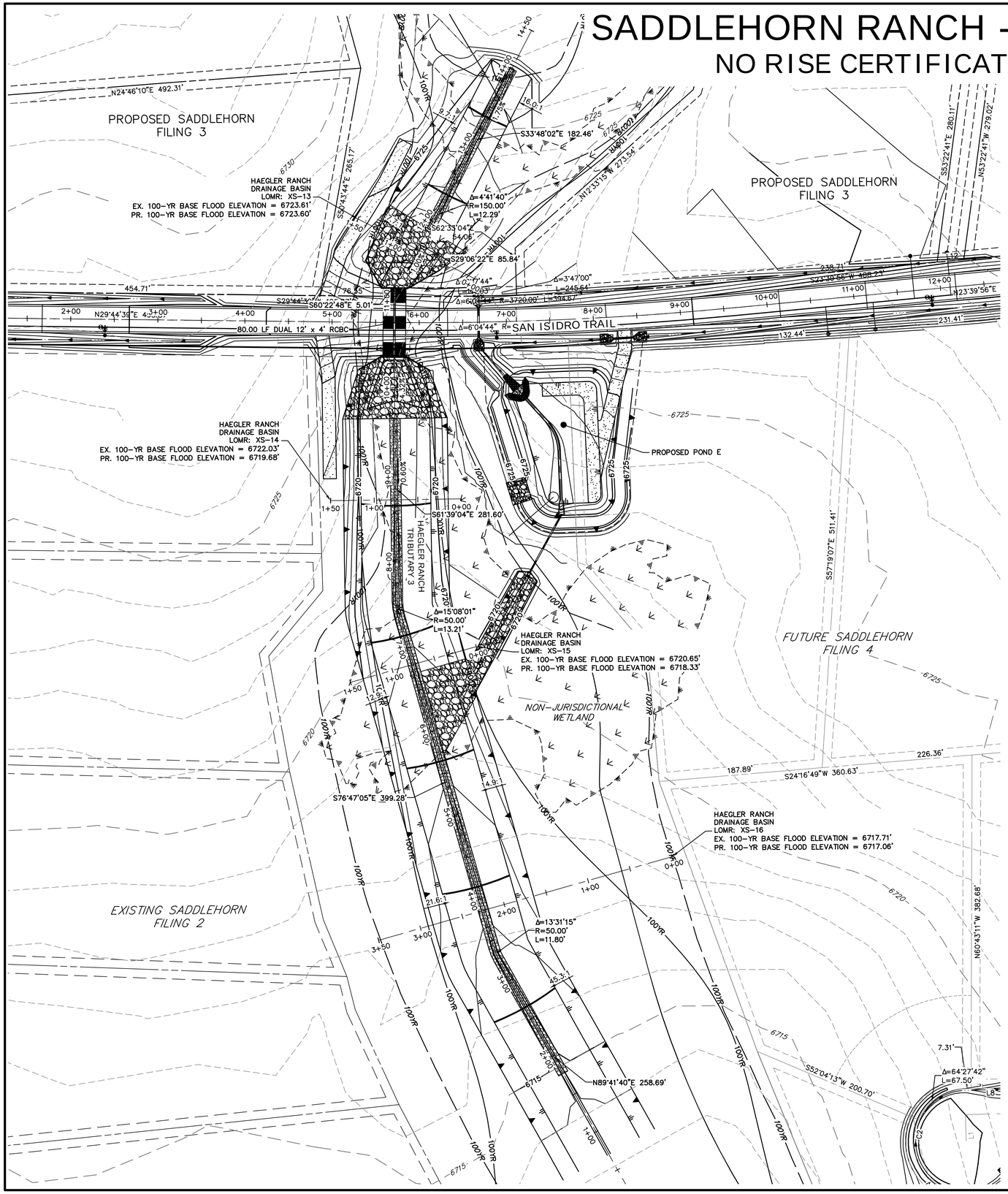
I further certify that the design conditions needed to meet the zero rise, box culvert and wing walls, are detailed in sufficient nature to allow for field confirmation and included among the supporting documentation.

I further certify that the structure in question will be securely anchored to prevent flotation, collapse or lateral movement in order to withstand the velocity of floodwaters as required by RCB313.18.1 and RBC313.21.2.

_____
Bryan Law PE
Colorado P.E. #25043

SADDLEHORN RANCH - FILING 3

NO RISE CERTIFICATION



CROSS SECTION 13 PROFILE
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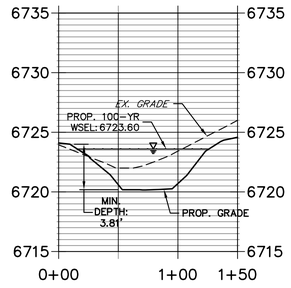

CROSS SECTION 14 PROFILE
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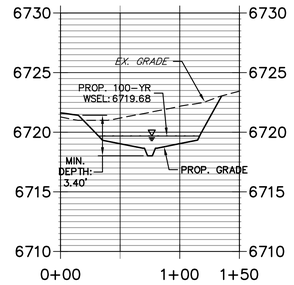

CROSS SECTION 15 PROFILE
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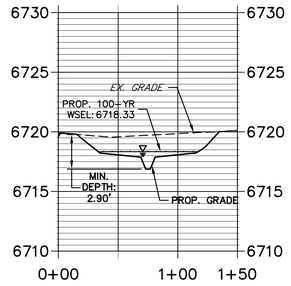

CROSS SECTION 16 PROFILE
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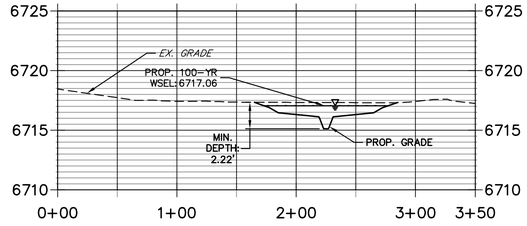

NO RISE CERTIFICATION
SADDLEHORN RANCH – FILING 3
JOB NO. 25142.05
4/24/23
SHEET 1 OF 1

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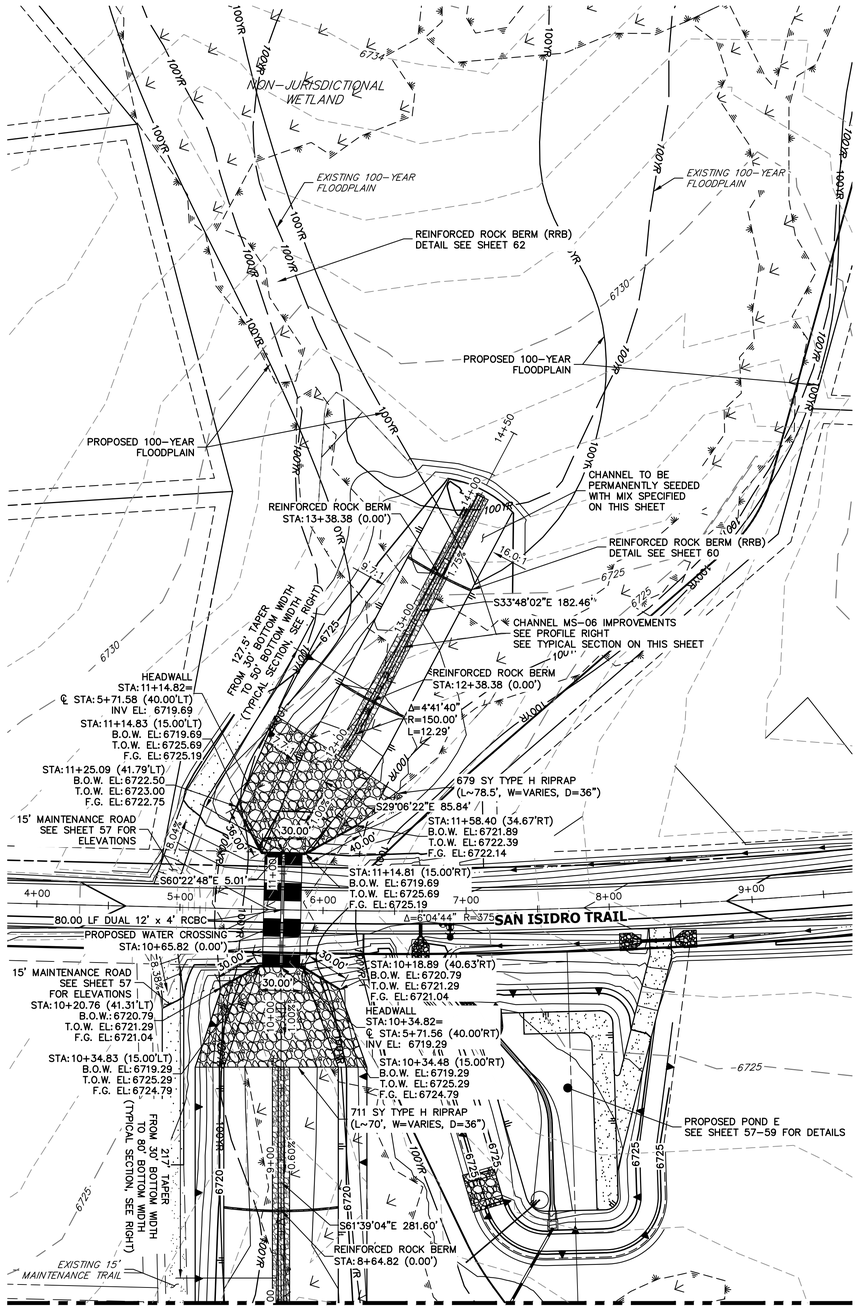
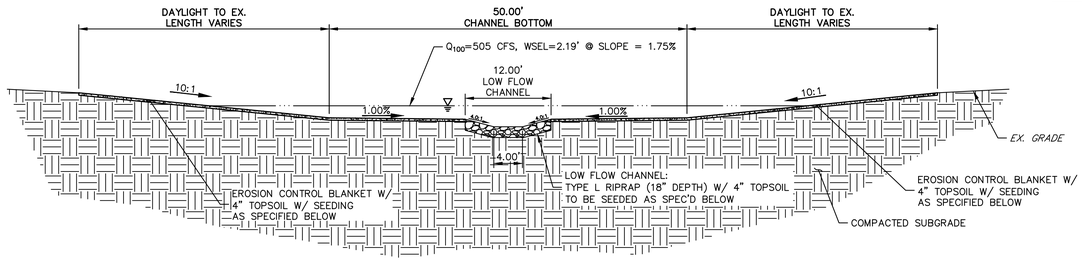




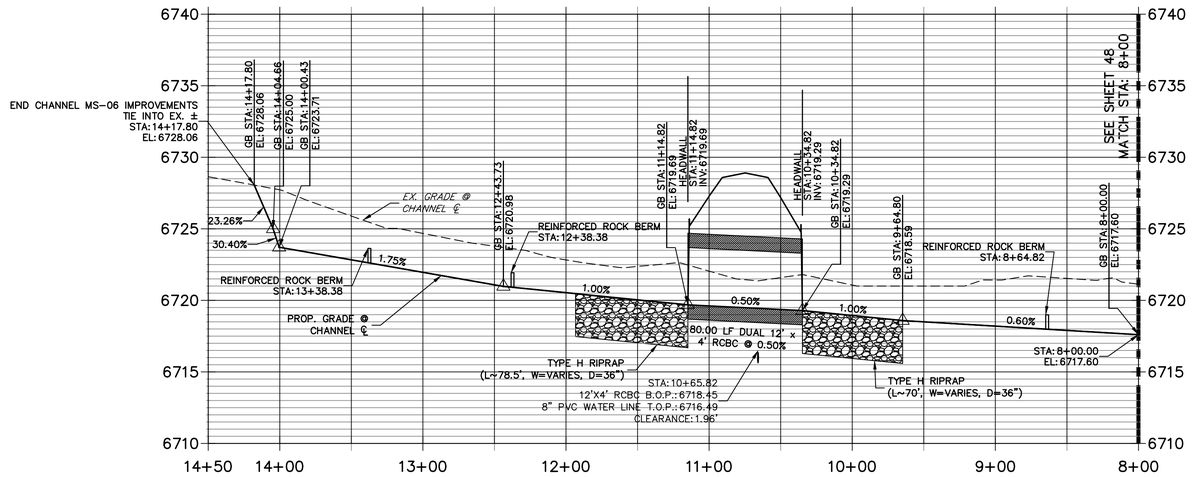
MS-06 CHANNEL IMPROVEMENTS - TYPICAL SECTION

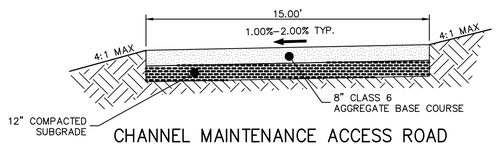
SCALE: 1"=10'

TYPICAL SECTION FOR CHANNEL WEST OF SAN ISIDRO TRAIL

CHANNEL SEED MIX: EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
- –IDAHO FESCUE
- –SANDBERG BLUEGRASS
- –ROCKY MOUNTAIN FESCUE
- –BIG BLUEGRASS

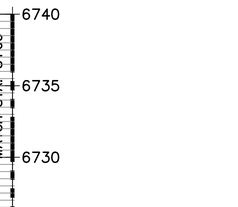
MS-06 PROFILE (1)
STA 8+00.00 TO 14+50.00





CHANNEL MAINTENANCE ACCESS ROAD TYPICAL SECTION

N.T.S.



KEY MAP
1" = 1200'

50 25 0 50 100

HORIZONTAL ORIGINAL SCALE: 1" = 50'
VERTICAL ORIGINAL SCALE: 1" = 5'

811 Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
.	.	.	.

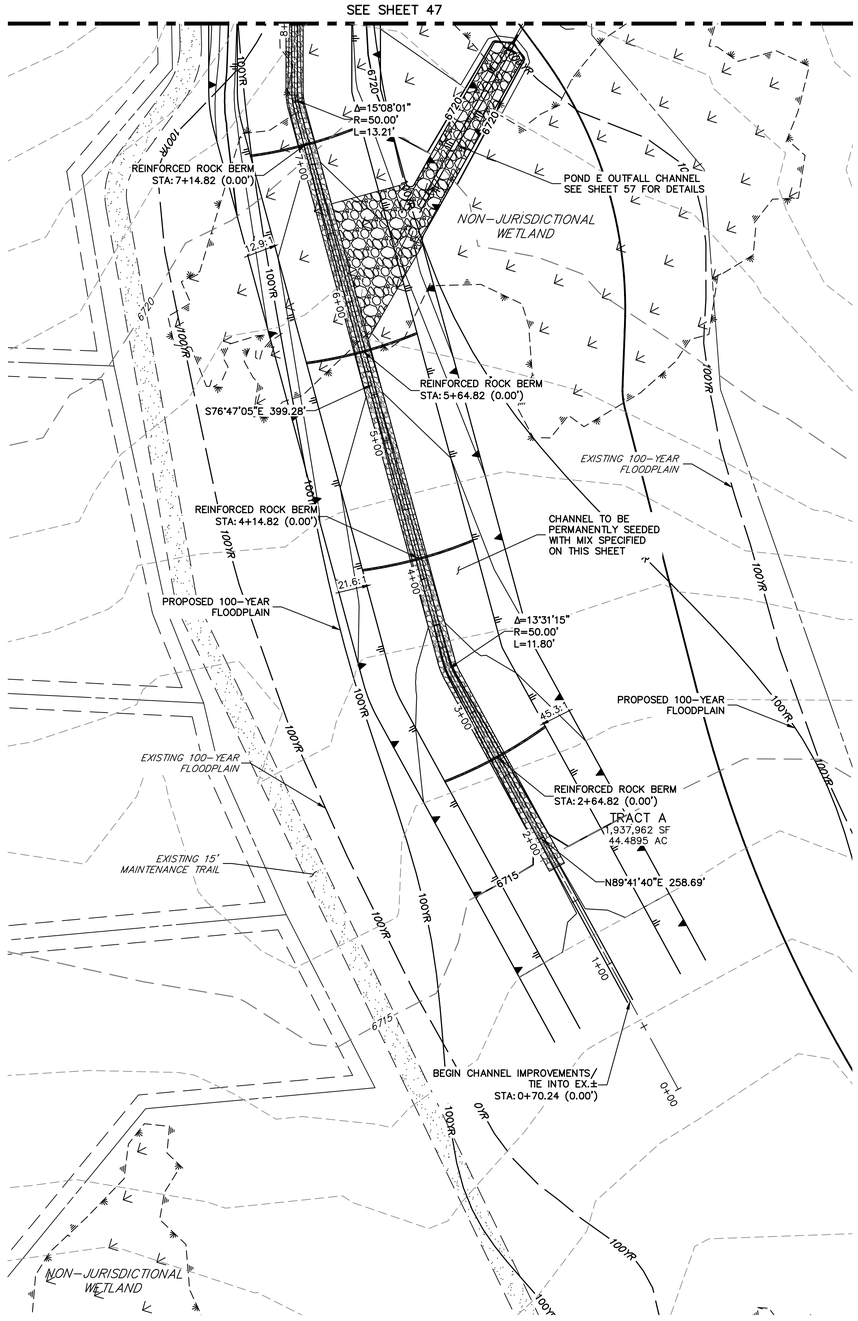
H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	4/25/23
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

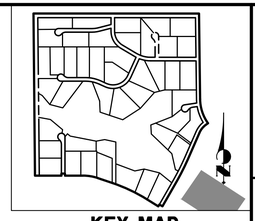
SADDLEHORN RANCH – FILING 3

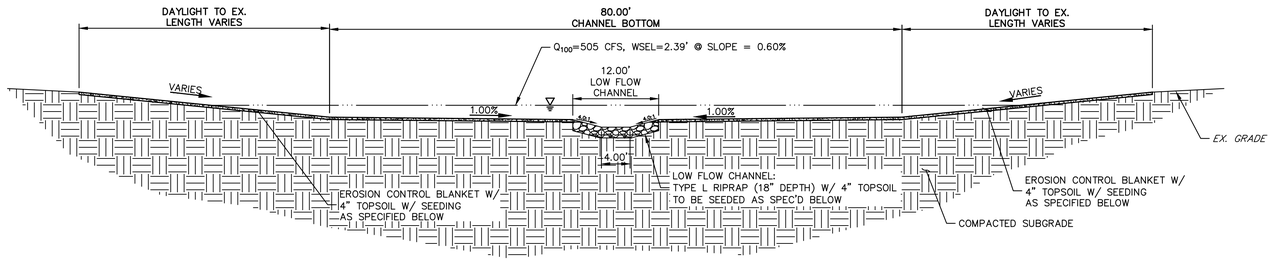
CHANNEL IMPROVEMENT PLANS

SHEET 47 OF 63

JOB NO. 21542.05







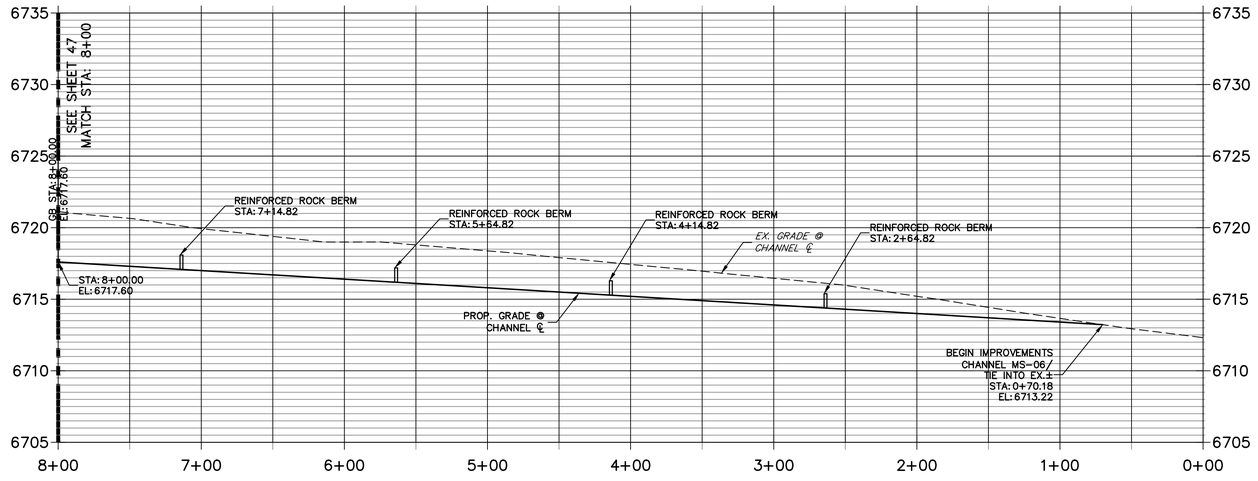
MS-06 CHANNEL IMPROVEMENTS - TYPICAL SECTION

SCALE: 1"=10'

TYPICAL SECTION FOR CHANNEL EAST OF SAN ISIDRO TRAIL

CHANNEL SEED MIX: EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
- –IDAHO FESCUE
- –SANDBERG BLUEGRASS
- –ROCKY MOUNTAIN FESCUE
- –BIG BLUEGRASS

MS-06 PROFILE
STA 0+00.00 TO 8+00.00



50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'

VERTICAL
ORIGINAL SCALE: 1" = 5'

811 Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
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A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	4/25/23
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

SADDLEHORN RANCH – FILING 3

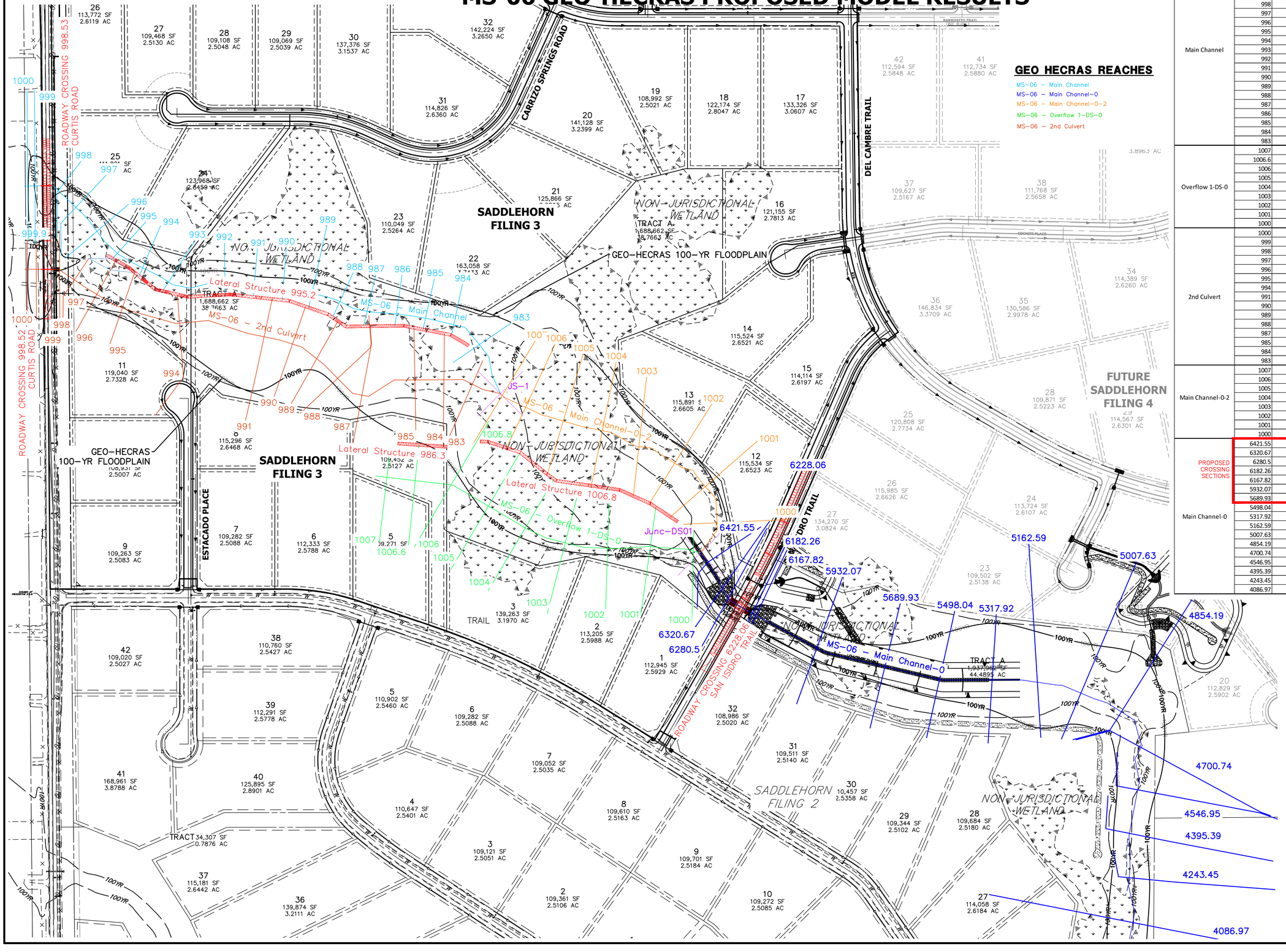
CHANNEL IMPROVEMENT PLANS

SHEET 48 OF 63

JOB NO. 21542.05

SADDLEHORN FILING 3

MS-06 GEO-HECRAS PROPOSED MODEL RESULTS



GEO HECRAS REACHES

- MS-06 – Main Channel
- MS-06 – Main Channel-0
- MS-06 – Main Channel-0-2
- MS-06 – Overflow 1-DS-0
- MS-06 – 2nd Culvert

GEO HECRAS DATA

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Vel Chnl	Froude # Chl	Shear Total
		(cfs)	(ft)	(ft)	(ft/s)		(lb/sq ft)
Main Channel	1000	505	6765.9	6768.13	1.05	0.15	0.05
	999	486.12	6765.4	6768.12	0.81	0.1	0.03
	998	486.12	6764	6765.41	2.91	0.56	0.52
	997	486.12	6763.48	6764.56	2.56	0.56	0.49
	996	486.12	6762.4	6763.92	1.81	0.29	0.18
	995	474.21	6761.5	6763.42	3.12	0.55	0.56
	994	413.73	6760.3	6762.01	4.34	0.82	1.14
	993	353.31	6758.7	6760.31	4.27	0.68	0.97
	992	287.87	6756.1	6757.33	3.94	0.77	0.95
	991	251.38	6754.3	6755.49	4.13	0.75	1
	990	227.11	6753	6754.24	3.1	0.56	0.56
	989	219.27	6751.9	6752.85	3.64	0.8	0.88
	988	217.94	6750.1	6751.07	3.18	0.67	0.65
	987	218.2	6748.2	6749.27	3.67	0.8	0.88
	986	218.2	6746.2	6747.42	3.35	0.69	0.71
	985	215.7	6744.8	6745.93	3.22	0.66	0.66
	984	210.81	6743.5	6744.7	2.68	0.57	0.47
	983	202.32	6742.1	6742.63	3.3	1	0.9
Overflow 1-DS-0	1007	0	6745.24	6745.02		0	0
	1006.6	0	6743.4	6743.42	0	0.01	0
	1006	0	6740.87	6740.22		0	0
	1005	31.98	6737.8	6738.13	1.4	0.59	0.2
	1004	35.6	6735.5	6735.93	1.39	0.5	0.18
	1003	35.6	6733.7	6734.17	1.51	0.51	0.2
	1002	35.6	6731.5	6732.21	1.81	0.58	0.28
	1001	36.2	6728.3	6728.81	2.96	1.01	0.78
	1000	36.2	6722.9	6724.11	0.83	0.2	0.05
2nd Culvert	1000	0	6765.7	6766.02	0	0	0
	999	18.88	6765.2	6766.02	0.13	0.03	0
	998	18.88	6763.1	6763.42	1.28	0.68	0.2
	997	18.88	6762.1	6762.28	0.98	0.43	0.1
	996	38.77	6761.2	6761.59	1	0.34	0.09
	995	76.38	6760.2	6760.81	1.68	0.55	0.25
	994	164.79	6757.3	6758.35	2.17	0.53	0.33
	991	270.9	6753.9	6754.53	2.21	0.64	0.37
	990	284.89	6752	6752.94	2.38	0.62	0.42
	989	287.06	6750.2	6750.86	3.58	0.92	0.94
	988	286.8	6747.82	6749.07	1.82	0.43	0.22
	987	286.8	6747.5	6748.18	2.35	0.57	0.36
	985	288.5	6744.9	6745.31	2.27	0.68	0.43
	984	292.47	6743.3	6743.84	1.99	0.53	0.32
	983	302.68	6741.3	6741.98	3.86	1	1.1
Main Channel-0-2	1007	505	6740	6740.87	2.35	0.51	0.3
	1006	486.37	6738.7	6739.72	2.94	0.72	0.51
	1005	469.4	6736.6	6737.4	2.2	0.6	0.41
	1004	469.4	6733.8	6734.73	3.54	0.86	0.84
	1003	469.01	6730.8	6732.27	2.72	0.54	0.43
	1002	468.8	6729.3	6730.2	4.15	0.9	1.13
	1001	468.8	6725	6727.95	3.08	0.49	0.51
	1000	468.8	6724.2	6726.1	5.42	0.99	1.72
PROPOSED CROSSING SECTIONS	6421.55	505	6721.4	6723.94	3.27	0.53	0.18
	6320.67	505	6720.2	6723.88	1.49	0.17	0.05
	6280.5	505	6719.9	6723.81	2.29	0.26	0.12
	6182.26	505	6719.3	6721.6	8.46	0.98	1.67
	6167.82	505	6719.1	6721.14	3.78	0.54	0.37
	5932.07	505	6717.5	6719.88	4.43	0.67	0.49
	5689.93	505	6716.1	6718.47	4.18	0.62	0.4
Main Channel-0	5498.04	505	6714.9	6717.13	4.71	0.75	0.29
	5317.92	505	6713.8	6715.23	5.6	1	0.55
	5162.59	505	6712.5	6713.42	1.96	0.38	0.38
	5007.63	505	6710.6	6711.71	2.61	0.52	0.72
	4854.19	505	6708.4	6710.39	1.35	0.22	0.16
	4700.74	505	6706.7	6709.73	2.4	0.43	0.59
	4546.95	505	6704.9	6708.42	2.76	0.39	0.67
	4395.39	505	6704.1	6707.53	2.51	0.33	0.53
	4243.45	505	6704.1	6706.62	2.45	0.4	0.58
	4086.97	505	6702.5	6705	3.09	0.51	0.93

150 75 0 150 300

ORIGINAL SCALE: 1" = 150'

MS-06 GEO-HECRAS PROPOSED MODEL RESULTS
SADDLEHORN FILING 3
JOB NO. 25142.05
04/24/23
SHEET 1 OF 1

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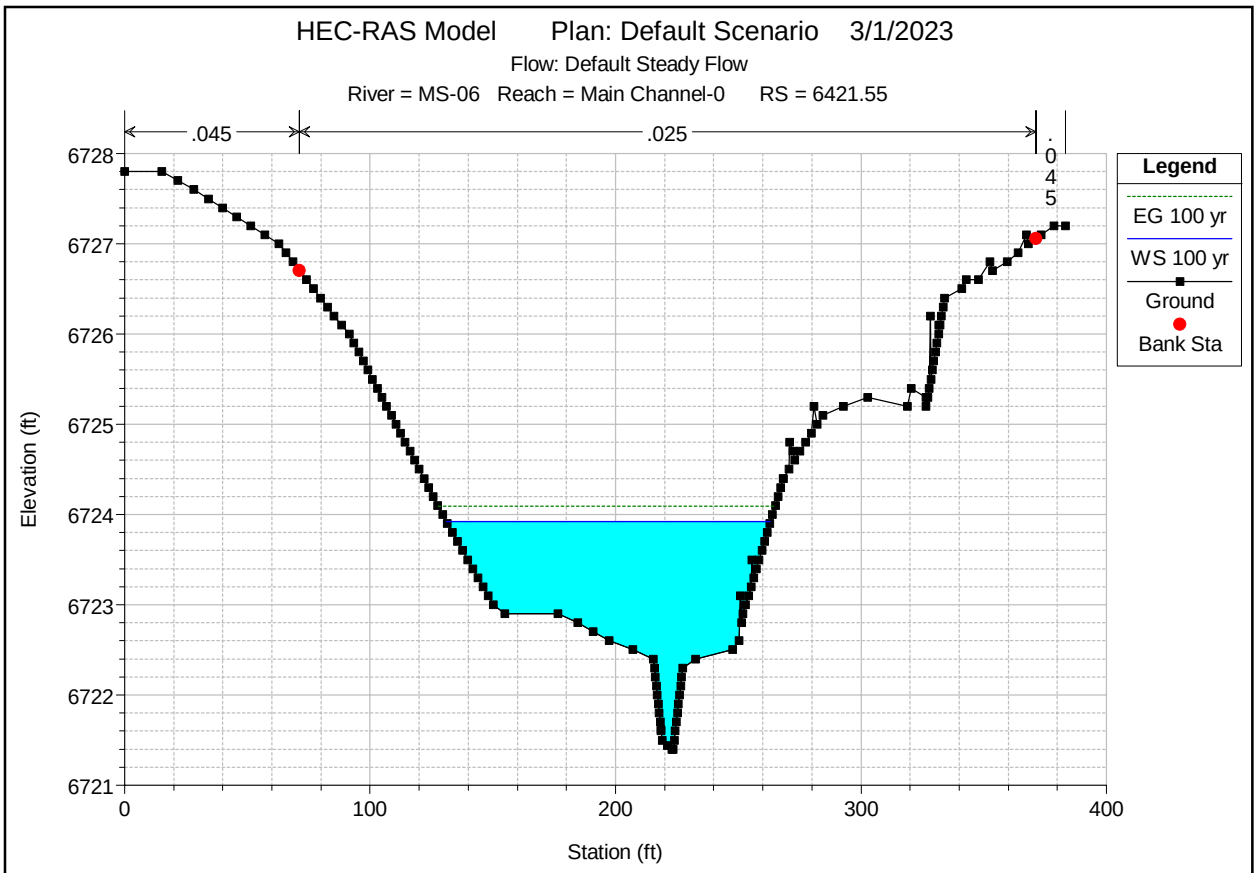
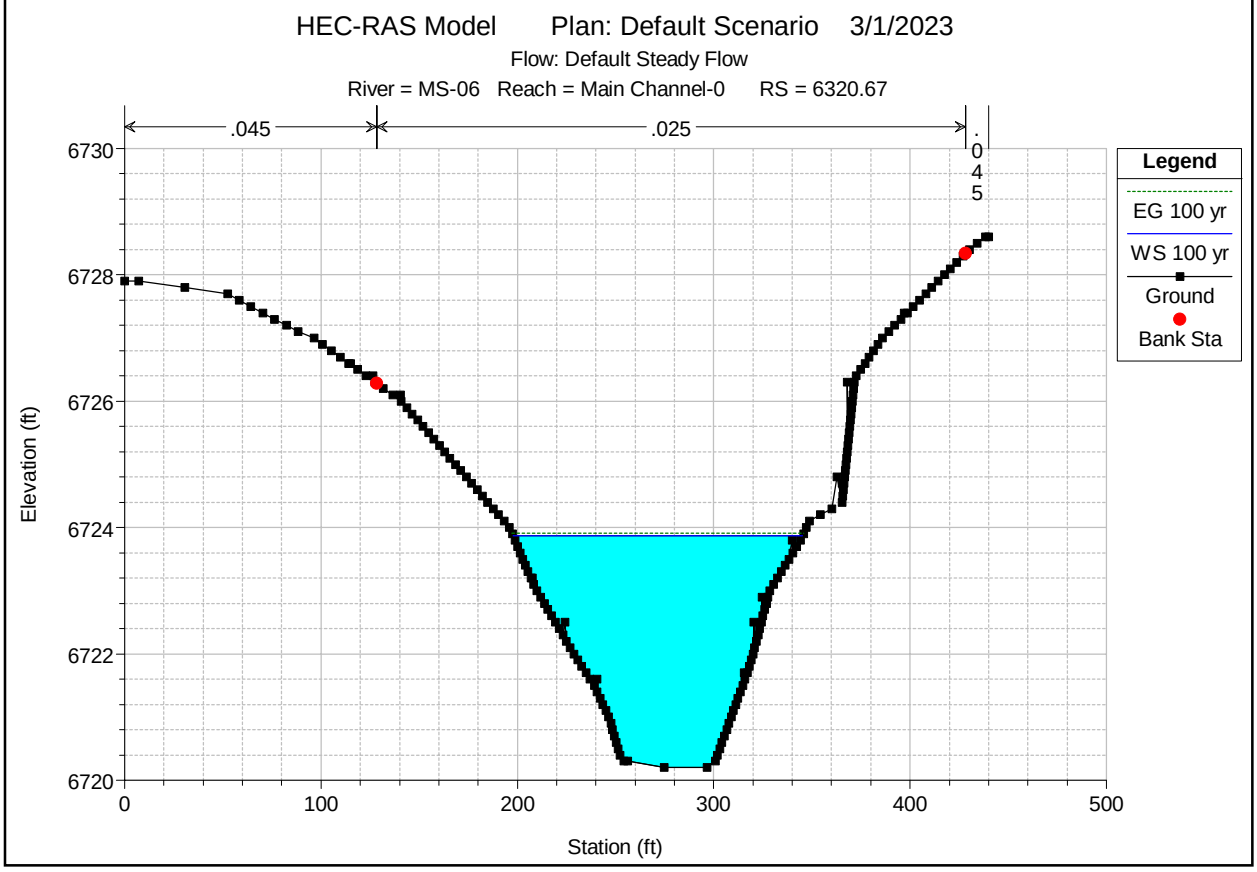

HEC-RAS Model Plan: Default Scenario 3/1/2023
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6421.55
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
6728
6727
6726
6725
6724
6723
6722
6721
0
100
200
300
400
Station (ft)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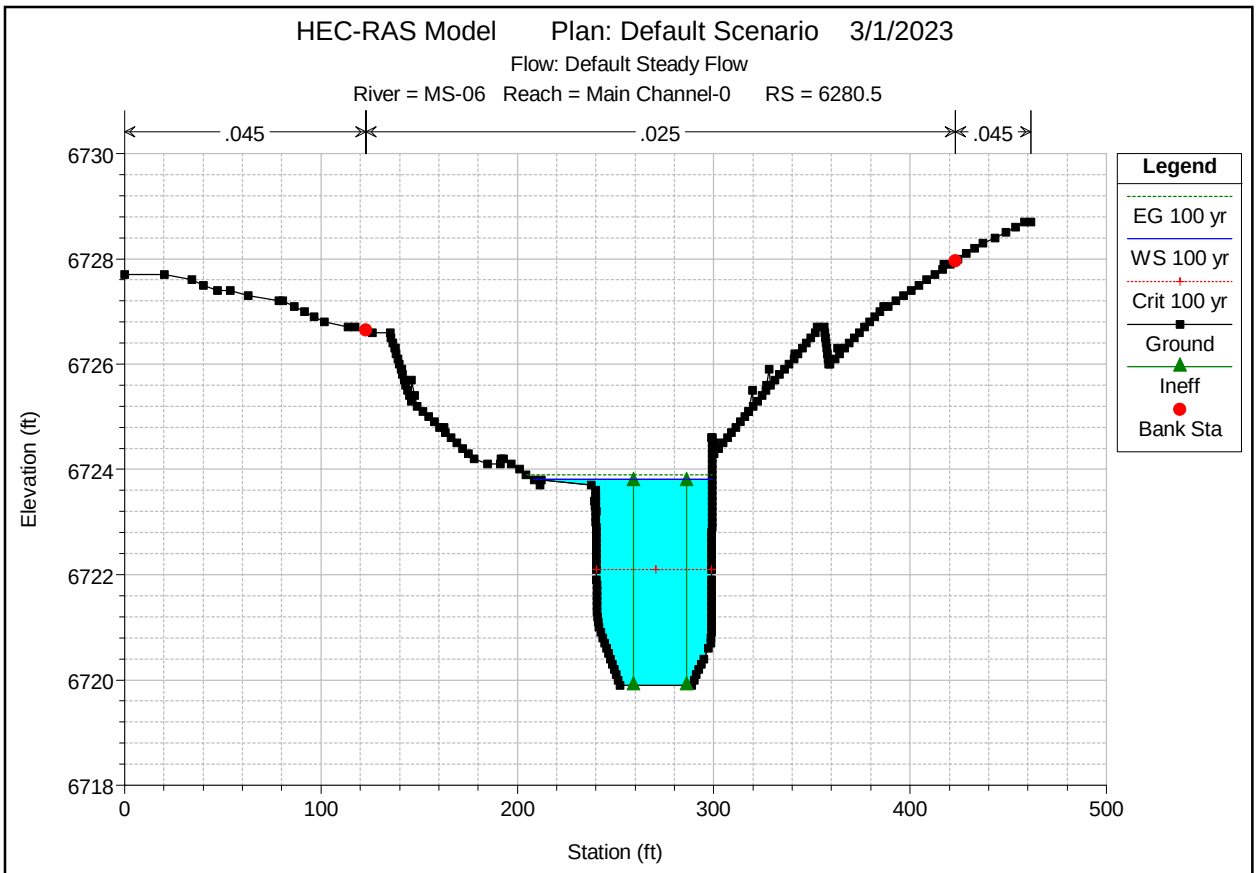
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6320.67
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
6730
6728
6726
6724
6722
6720
0
100
200
300
400
500
Station (ft)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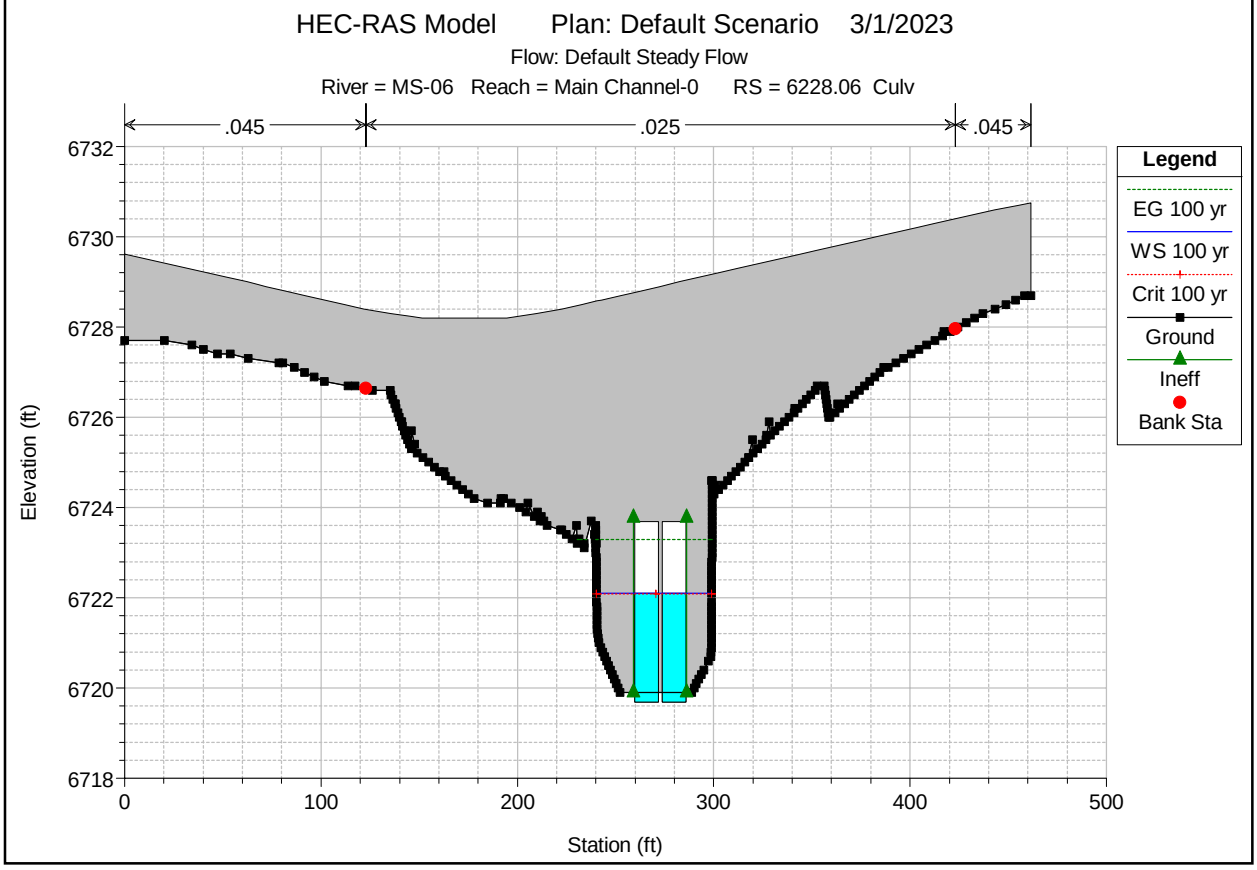
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6280.5
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
6730
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)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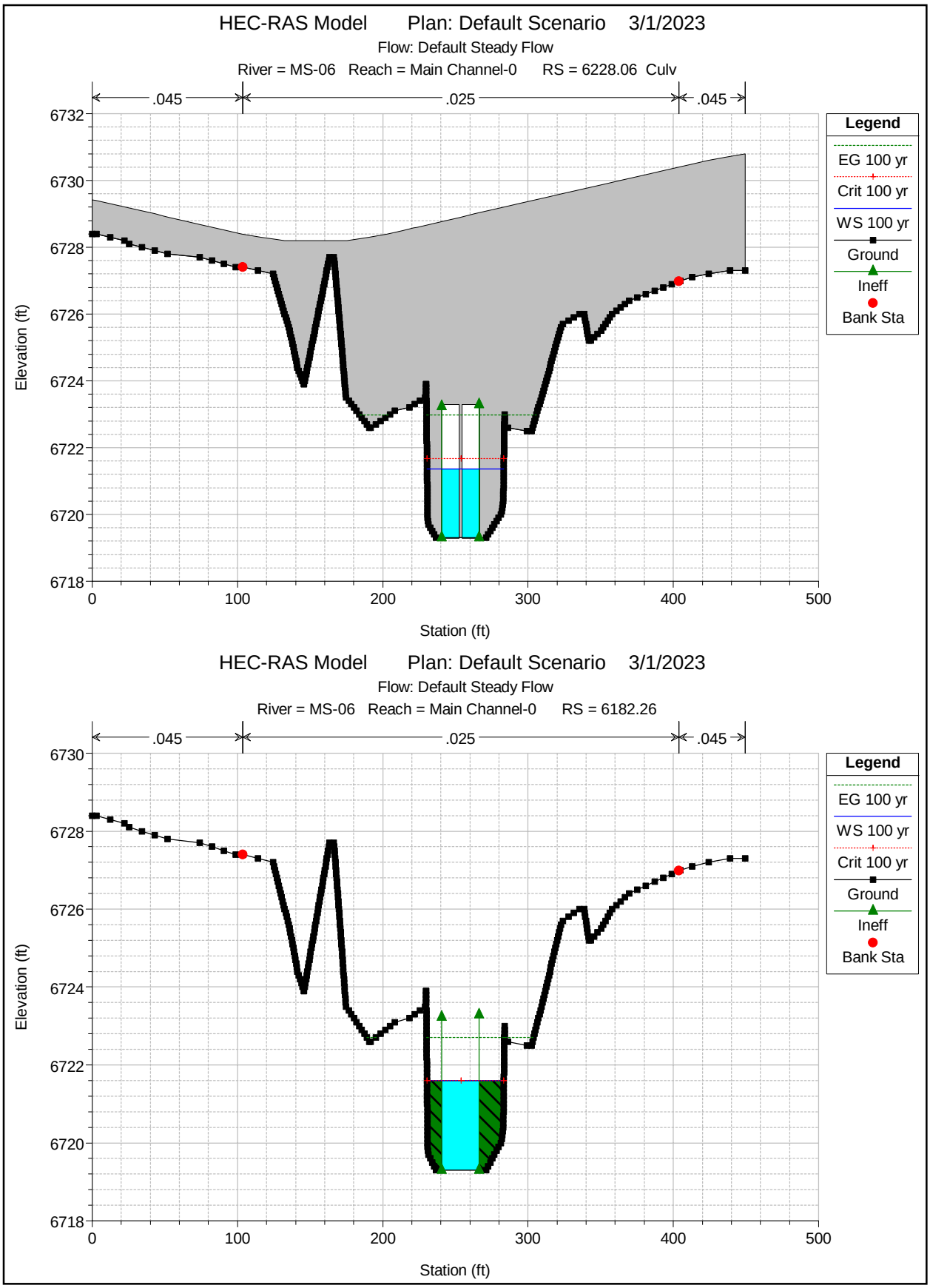
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6228.06 Culv
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
6732
6730
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)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Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6228.06 Culv
.045
.025
.045
Legend
EG 100 yr
Crit 100 yr
WS 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
6732
6730
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)
HEC-RAS Model Plan: Default Scenario 3/1/2023
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6182.26
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
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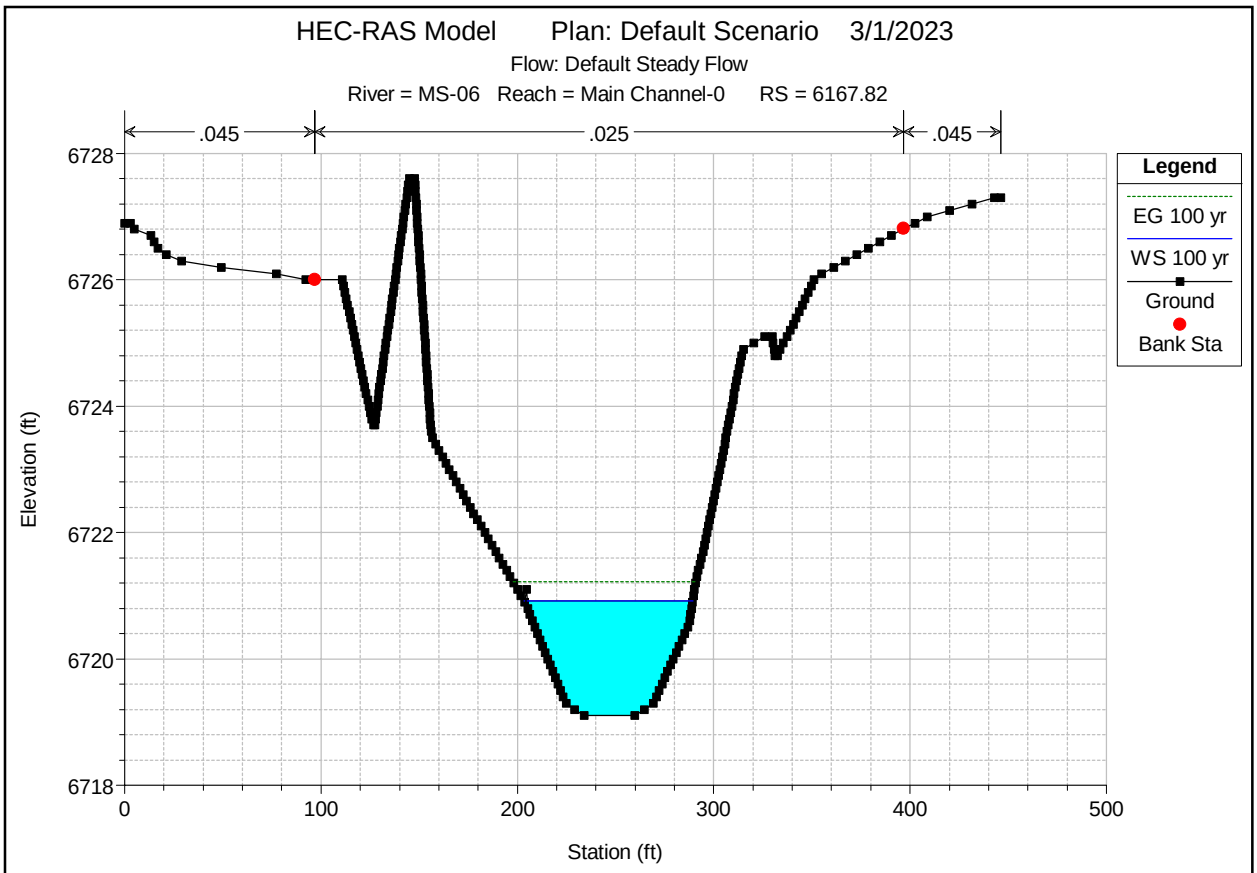
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)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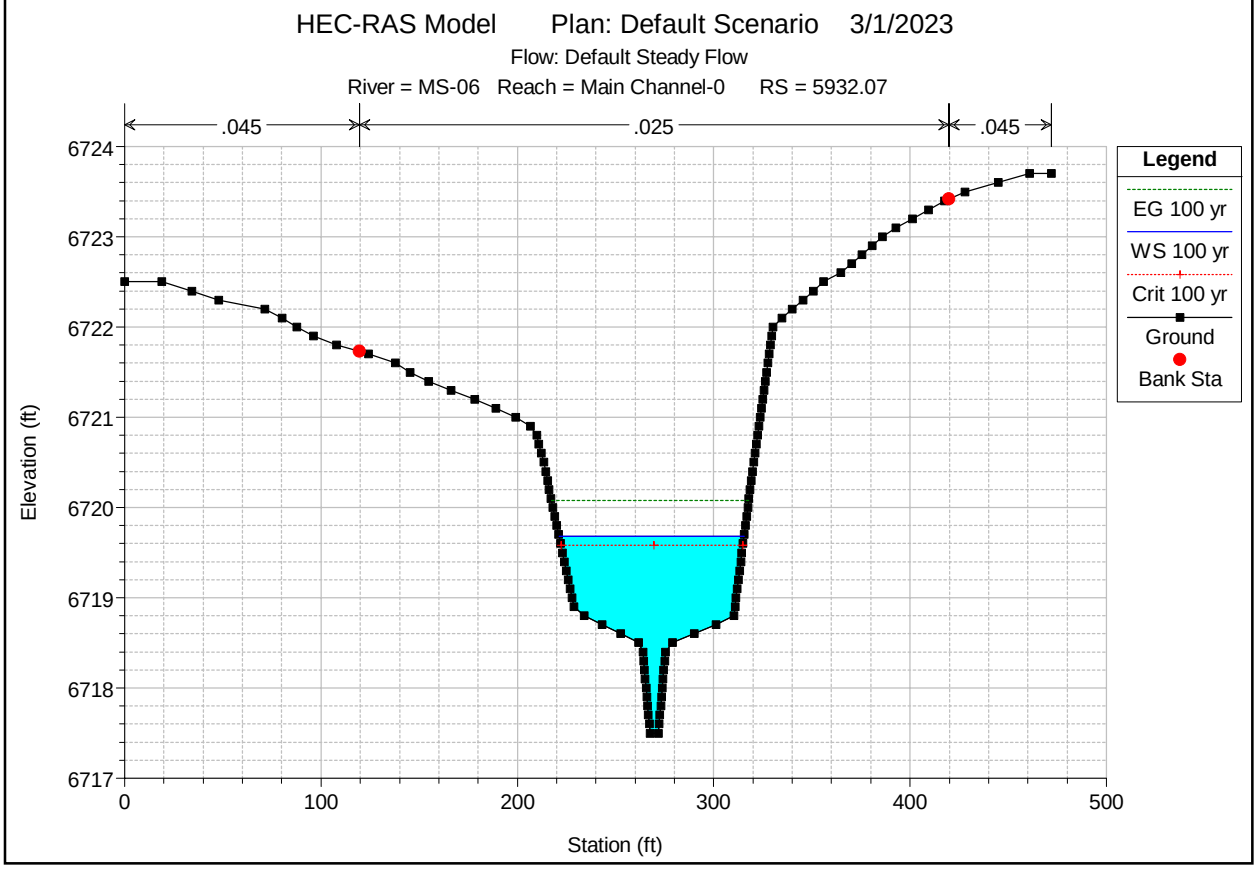
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 6167.82
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500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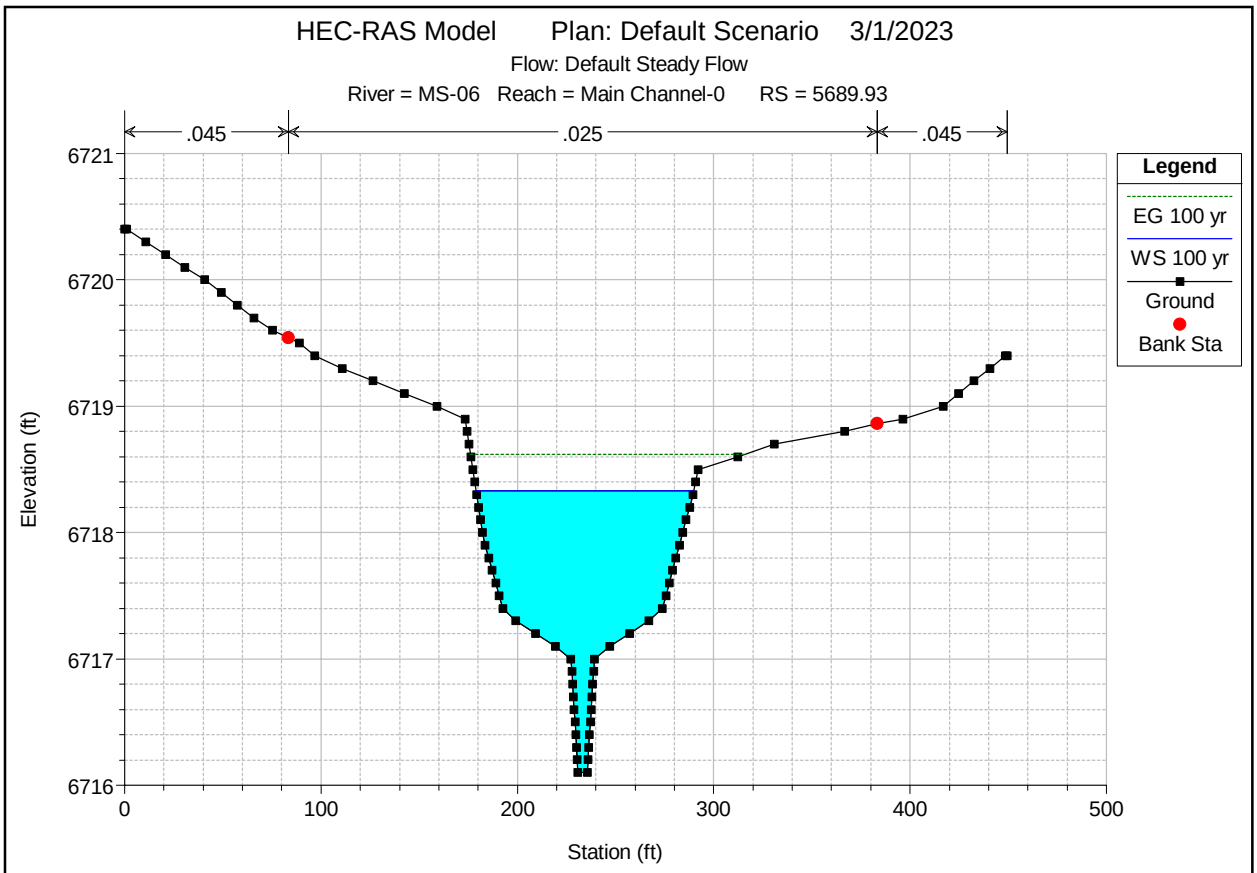
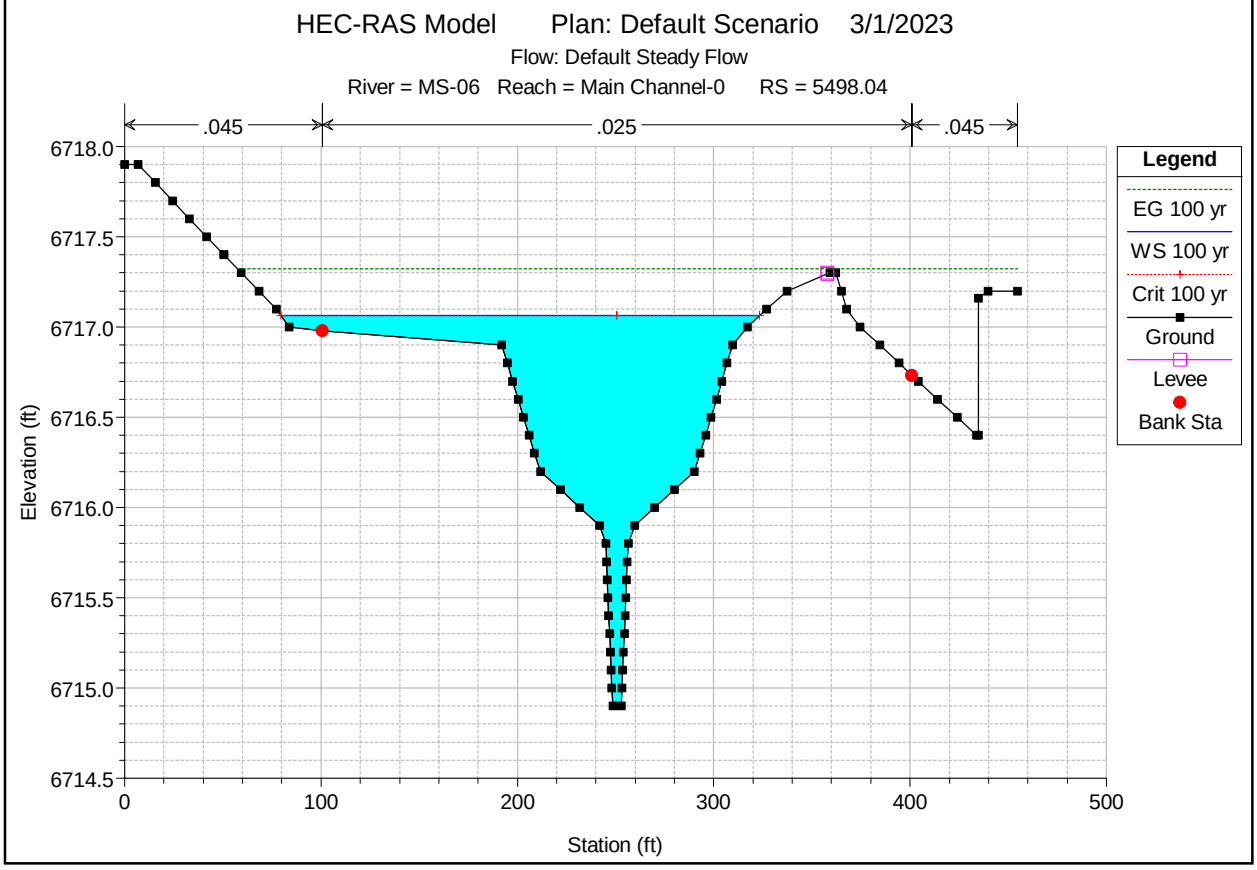
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 5932.07
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
6724
6723
6722
6721
6720
6719
6718
6717
0
100
200
300
400
500


HEC-RAS Model Plan: Default Scenario 3/1/2023
Flow: Default Steady Flow
River = MS-06 Reach = Main Channel-0 RS = 5689.93
.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)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Flow: Default Steady Flow
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.045
.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

CURTIS ROAD - NORTH CULVERT - EX 24" CMP - Q_100 = 451 CFS

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 400 cfs

Design Flow: 451 cfs

Maximum Flow: 500 cfs

Table 10 - Summary of Culvert Flows at Crossing: North Curtis Road

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6766.93	400.00	20.40	379.08	7
6766.94	410.00	20.45	389.44	3
6766.95	420.00	20.49	398.64	2
6766.96	430.00	20.54	409.36	3
6766.97	440.00	20.58	418.71	2
6766.98	450.00	20.62	429.31	3
6766.98	451.00	20.62	430.26	2
6767.00	470.00	20.70	448.42	2
6767.01	480.00	20.74	458.27	2
6767.01	490.00	20.78	468.29	2
6767.02	500.00	20.81	478.44	2
6766.00	14.84	14.84	0.00	Overtopping

Rating Curve Plot for Crossing: North Curtis Road

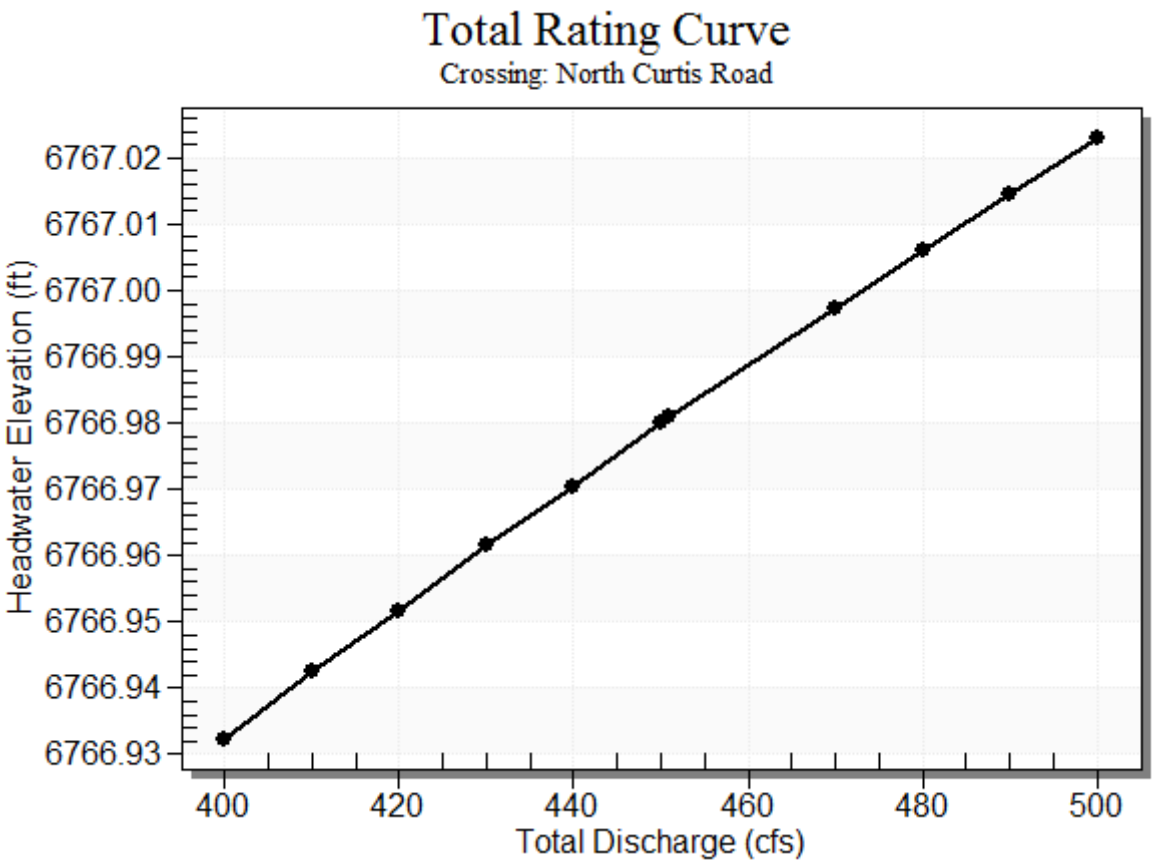
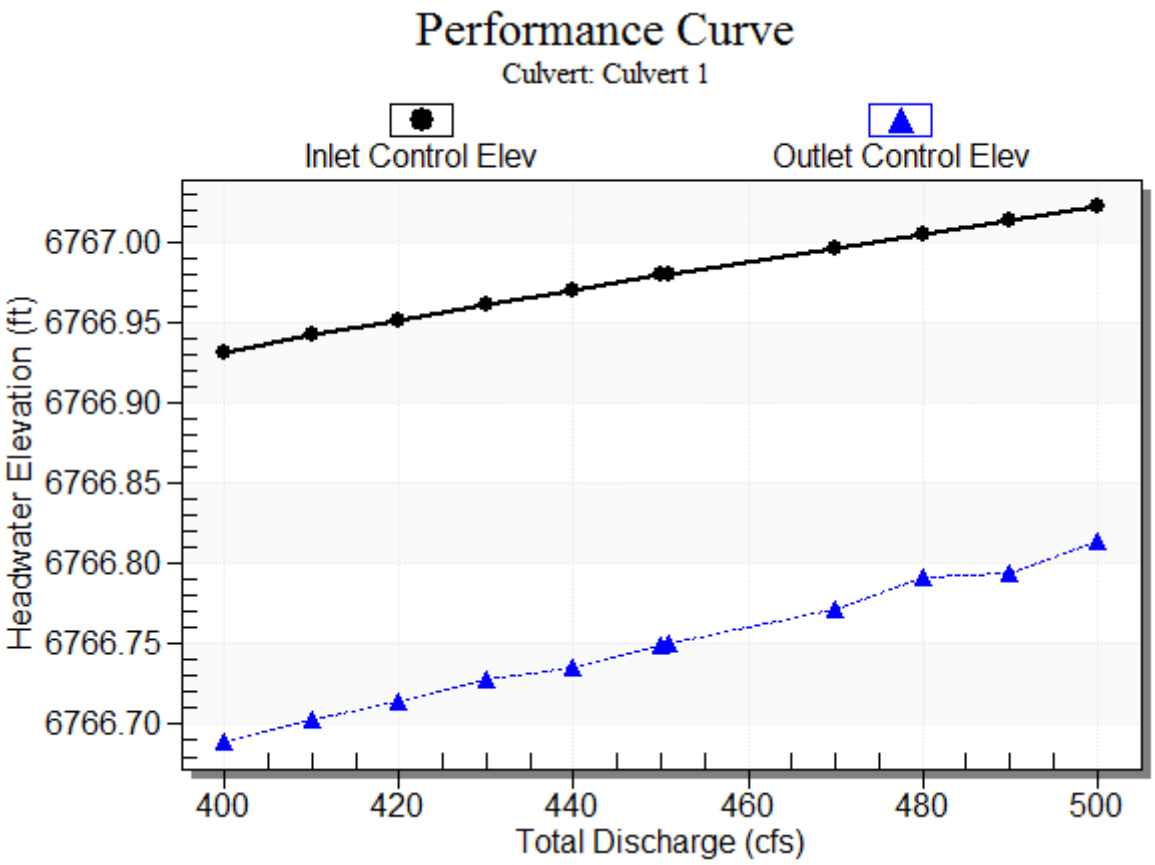


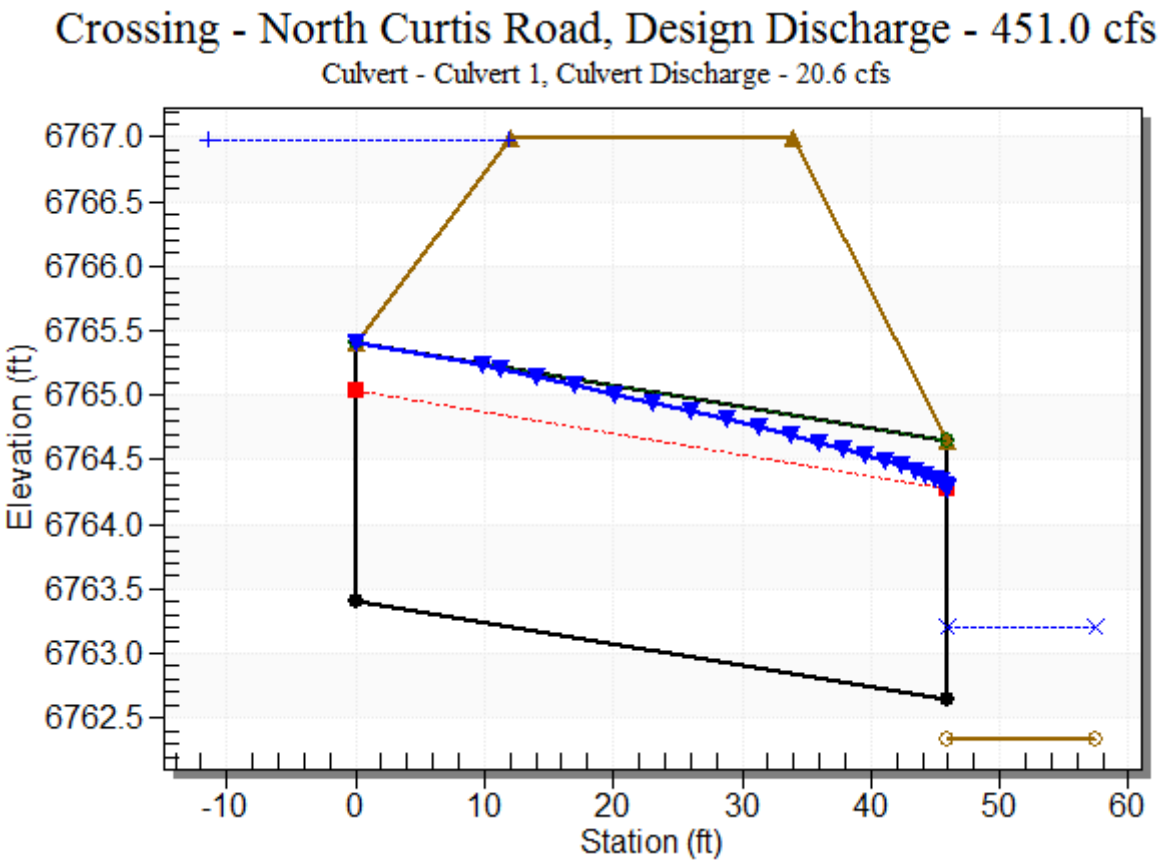
Table 11 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
400.00	20.40	6766.93	3.521	3.279	7-M2c	2.000	1.619	1.619	0.818	7.488	2.820
410.00	20.45	6766.94	3.532	3.293	7-M2c	2.000	1.621	1.621	0.827	7.498	2.843
420.00	20.49	6766.95	3.540	3.305	7-M2c	2.000	1.622	1.622	0.836	7.507	2.866
430.00	20.54	6766.96	3.551	3.318	7-M2c	2.000	1.624	1.624	0.845	7.517	2.888
440.00	20.58	6766.97	3.559	3.326	7-M2c	2.000	1.625	1.625	0.853	7.525	2.910
450.00	20.62	6766.98	3.569	3.339	7-M2c	2.000	1.627	1.627	0.862	7.535	2.932
451.00	20.62	6766.98	3.570	3.340	7-M2c	2.000	1.627	1.627	0.863	7.536	2.934
470.00	20.70	6767.00	3.586	3.362	7-M2c	2.000	1.630	1.630	0.879	7.551	2.974
480.00	20.74	6767.01	3.595	3.382	7-M2c	2.000	1.631	1.631	0.887	7.560	2.995
490.00	20.78	6767.01	3.604	3.384	7-M2c	2.000	1.632	1.632	0.895	7.568	3.015
500.00	20.81	6767.02	3.612	3.404	7-M2c	2.000	1.634	1.634	0.904	7.576	3.035

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6763.41 ft

Outlet Station: 46.00 ft

Outlet Elevation: 6762.64 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

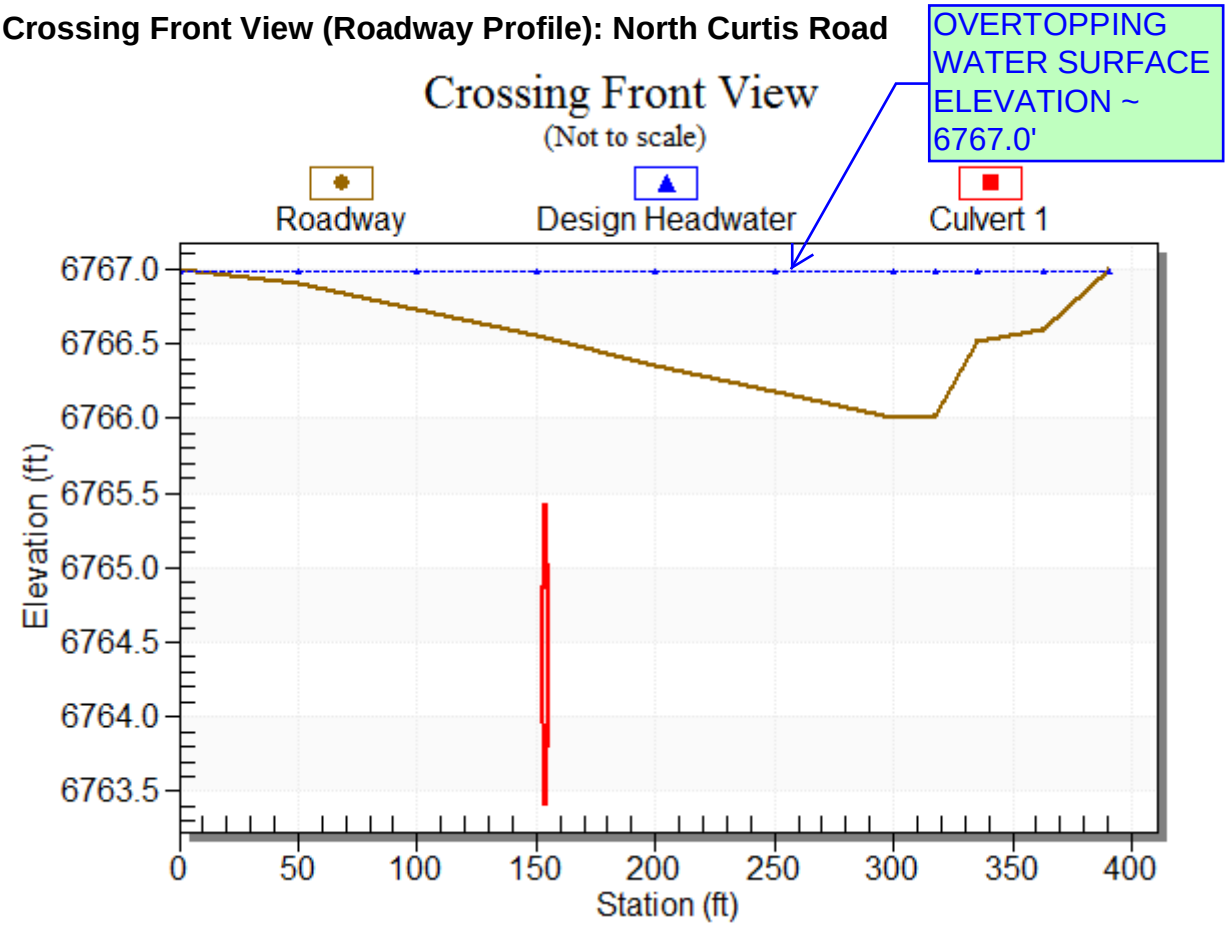
Barrel Manning's n: 0.0220

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Crossing Front View (Roadway Profile): North Curtis Road



GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
El Paso County, Colorado

Volume 1 – Final Report

October 1, 2007
Revised: February 10, 2010

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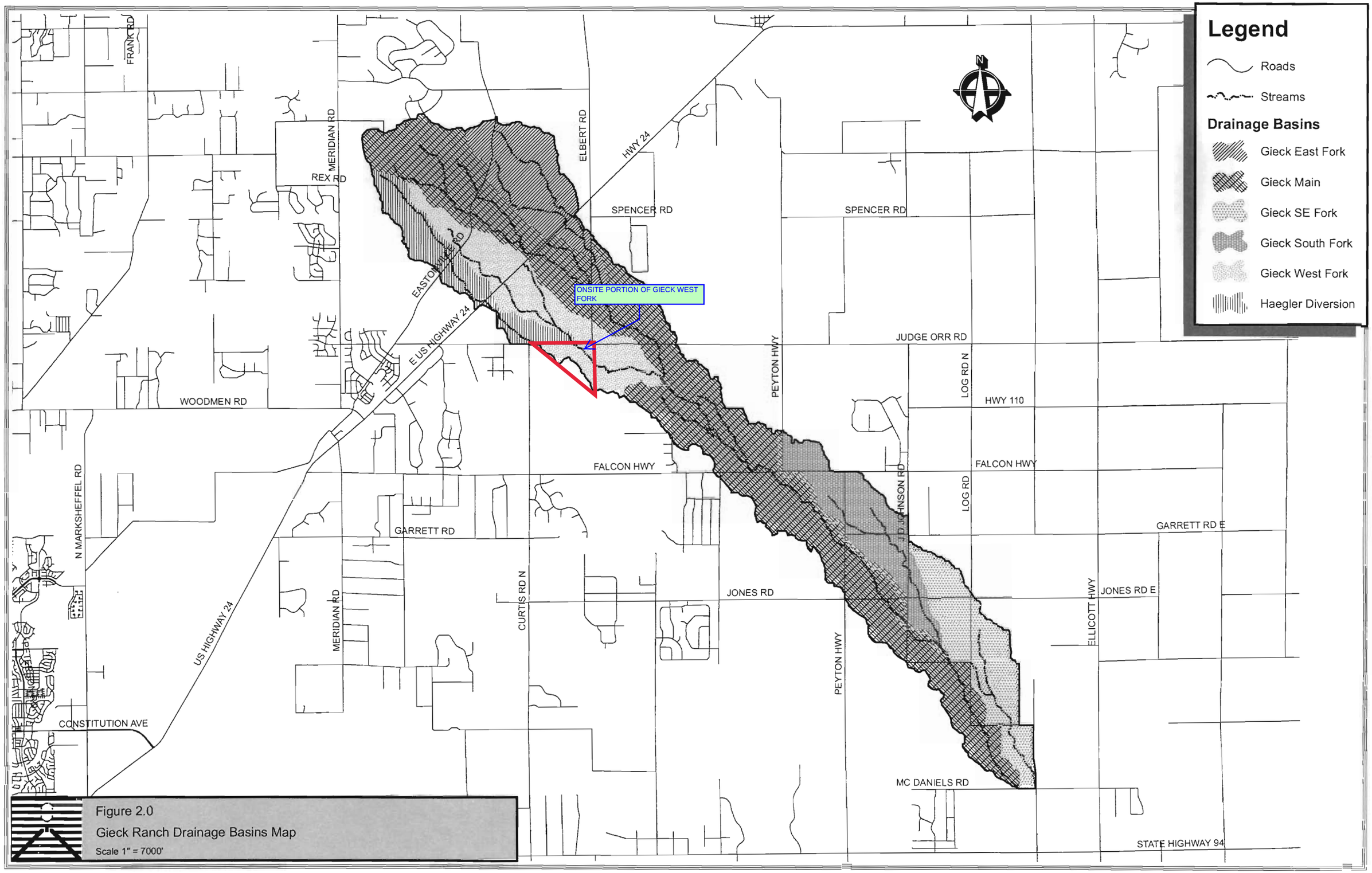


Figure 2.0
Gieck Ranch Drainage Basins Map
Scale 1" = 7000'

Table 6.4: Summary of Flows at Selected Design Points – 100-year Storm Event

Design Point ID	Design Point Location	Hydrologic Element	Accumulative Area (mi^2)	Existing Peak Flow (cfs)	Future Peak Flow (cfs)	% Difference Peak Flow	Existing Volume (ac-ft)	Future Volume (ac-ft)	% Difference Volume
1	Haegler Diversion at Eastonville Road	HD-J2	0.8	431	1060	146%	77	96	25%
2	West Fork at Eastonville Road	WF-J1	0.3	146	389	166%	29	39	33%
3	Main Channel at Eastonville Road	MS-J4	1.3	730	1233	69%	112	135	20%
4	Haegler Diversion at Highway 24	HD-J4	1.3	521	1223	135%	97	121	24%
5	West Fork at Highway 24	WF-J3	0.4	224	605	170%	49	62	26%
6	Main Channel at Highway 24	MS-J6	2.5	997	1896	90%	194	225	16%
7	East Fork at Highway 24	EF-J4	1.2	1054	1113	6%	124	126	1%
8	Main Channel at Elbert Road	MS-J7	3.0	1010	1896	88%	220	253	15%
9	East Fork at Elbert Road	EF-J6	2.1	1120	1172	5%	183	187	2%
10	West Fork at Judge Orr Road	WF-J6	1.5	1017	2213	117%	244	291	19%
11	Confluence of East Fork and Main Channel	MS-J9	5.7	1817	3068	69%	429	467	9%
12	Main Channel at Judge Orr Road	MS-J11	6.7	1968	3383	72%	487	564	16%
13	Confluence of West Fork and Main Channel	MS-J12	11.2	2732	6104	123%	805	993	23%
14	Main Channel at Falcon Highway	MS-J16	13.4	3045	6784	123%	936	1191	27%
15	Main Channel at Peyton Highway	MS-J19	15.1	3200	6946	117%	1012	1269	25%
16	Main Channel at Jones Road	MS-J20	15.6	3250	7056	117%	1040	1308	26%
17	South Fork at Jones Road	SF-J4	1.3	454	454	0%	133	133	0%
18	Confluence of South Fork and Main Channel	MS-J22	17.9	3650	7392	103%	1210	1489	23%
19	Southeast Fork at McDaniels Road	SE-J3	2.4	547	546	0%	210	210	0%
20	Main Channel at McDaniels Road	MS-J29	19.6	3791	7525	99%	1293	1597	23%
21	Total Combined Outfall	SE-J3 plus MS-J29	22.0	4326	7687	78%	1503	1807	20%

CONTRIBUTING ACREAGE TO WF-R7A @ JUDGE ORR ROAD CROSSING

The 100-year storm event future undetained peak flow is estimated to increase by 78% over the existing peak flow while the future volume of runoff is estimated to increase by 20%.

During the hydrologic analysis it was observed that the Black Squirrel Creek lies very close to the eastern boundary of the Gieck Ranch Basin from Falcon Highway downstream to Log Road. It is possible that flow from Black Squirrel Creek could spill into the Gieck Ranch Basin during extreme storm events. The flows in Black Squirrel Creek in this area are expected to be more than 5,000 cfs for the 100-year event. If the Black Squirrel Creek were to overflow its' banks and flow into the Gieck Ranch Basin it could increase the flows shown in the above tables. Possible improvements to address this potential problem include channel improvements to increase the Black Squirrel Creek conveyance in this area or constructing berms on the east bank to prevent overflow.

Table 8.0: Structure Inventory and Evaluation Summary (Cont.)

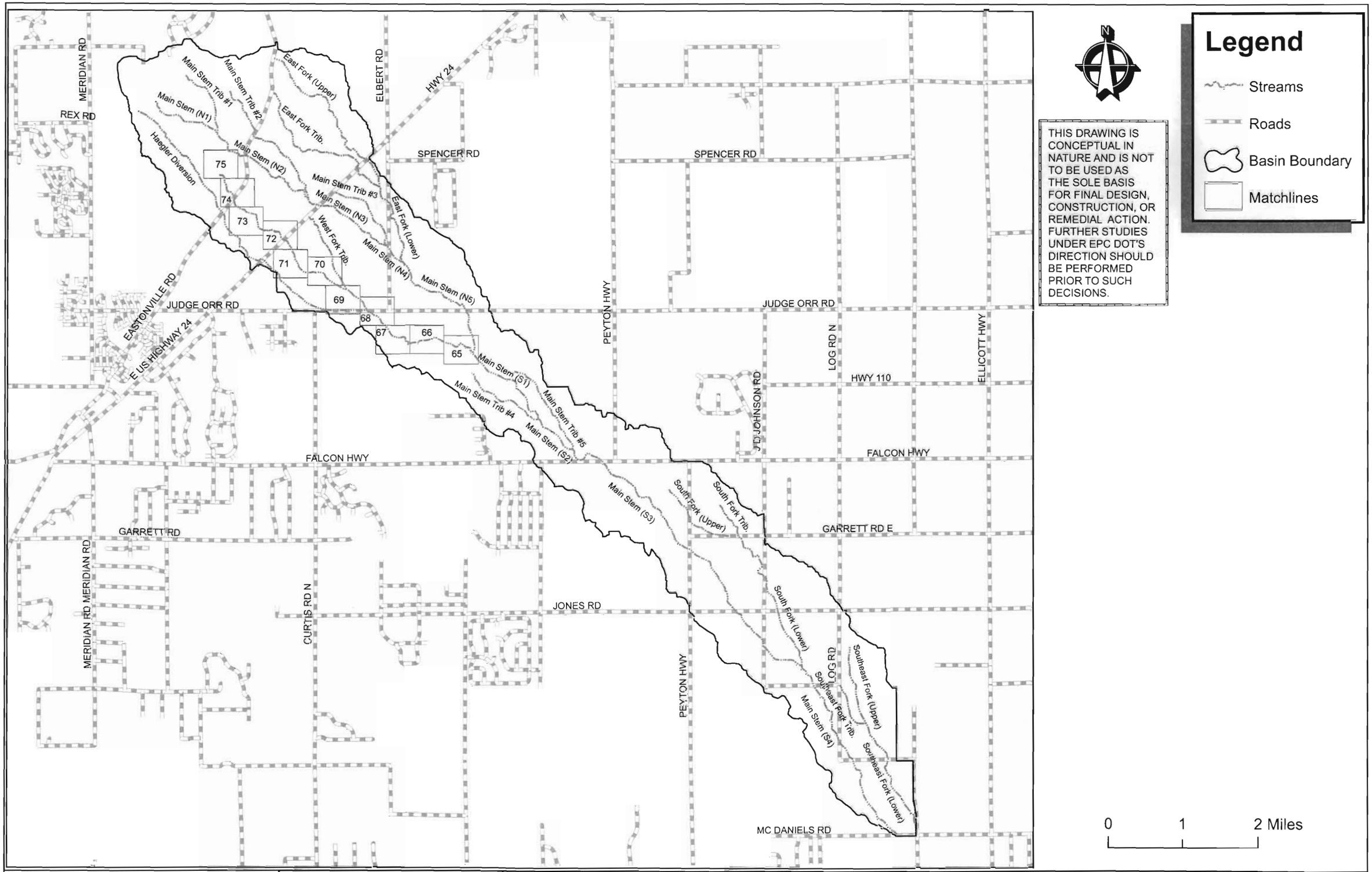
35	Elbert Road south of structure 34	24" CMP	Good	100%	Y	---
36	Elbert Road at Main Channel	2 - 48" CMP	Good	19%	N	3 - 12' x 4' CBC
37	Elbert Road south of structure 36	24" CMP	Poor	55%	Y	---
38	Judge Orr Road at West Fork	67" x 95" CMP	Good	20%	N	4 - 12' x 5' CBC
39	Judge Orr Road east of structure 38	36" CMP	Good	100%	Y	---
40	Judge Orr Road west of structure 41	24" CMP	Poor	90%	Y	---
41	Judge Orr Road at Main Channel	Bridge	Good	100%	Y	---
42	Falcon Hwy at Main Channel	Bridge	Good	57%	N	85' Span
43	Peyton Road at headwaters of South Fork	24" CMP	Fair	75%	Y	---
44	Peyton Road at Main Channel	4 - 24" RCP	Good	2%	N	5 - 12' x 7' CBC
45	Peyton Road south of structure 44	36" CMP	Poor	100%	Y	---
46	Peyton Road south of structure 45	24" CMP	Good	100%	Y	---
47	East Garrett Road west of structure 48	24" CMP	Poor	100%	Y	---
48	East Garrett Road at South Fork	48" CMP	Good	14%	N	2 - 5' x 4' CBC
49	J.D. Johnson Road at South Fork	4 - 42" RCP	Good	63%	N	2 - 12' x 4' CBC
50	J.D. Johnson Road south of structure 49	30" CMP	Fair	56%	N	36" CMP
51	J.D. Johnson Road south of structure 50	30" CMP	Fair	100%	Y	---
52	Jones Road at Main Channel	60" CMP	Fair	4%	N	6 - 12' x 7' CBC
53	J.D. Johnson Road at Jones Road	30" CMP	Fair	55%	Y	---
54	Jones Road east of J.D. Johnson Road	30" CMP	Good	73%	Y	---
55	Jones Road at South Fork	36" CMP	Good	6%	N	2 - 7' x 5' CBC
56	Jones Road east of structure 55	30" CMP	Fair	67%	Y	---
57	J.D. Johnson Road at Main Channel US of structure 58	3 - 60" RCP	Good	14%	N	85' Span
58	J.D. Johnson Road at Main Channel	30" CMP	Good	1%	N	120' Span
59	J.D. Johnson Road and Log Road	24" CMP	Fair	23%	N	2 - 6' x 3' CBC
60	Main Channel at private driveway	48" CMP (est.)	Unknown	2%	N.E.	---
61	Log Road at Main Channel	Bridge	Good	36%	N	120' Span
62	McDaniel Road at Main Channel	30" x 48" Oval CMP	Good	1%	N	120' Span
63	Log Road and McDaniels Road	24" CMP	Good	2%	N	5 - 6' x 3' CBC

* Road over-topping not included

** Allowable road over-topping included in adequacy analysis

*** Based on proposed (with selected drainage basin plan) flows

N.E. Not Evaluated, not EPCDOT responsibility



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Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

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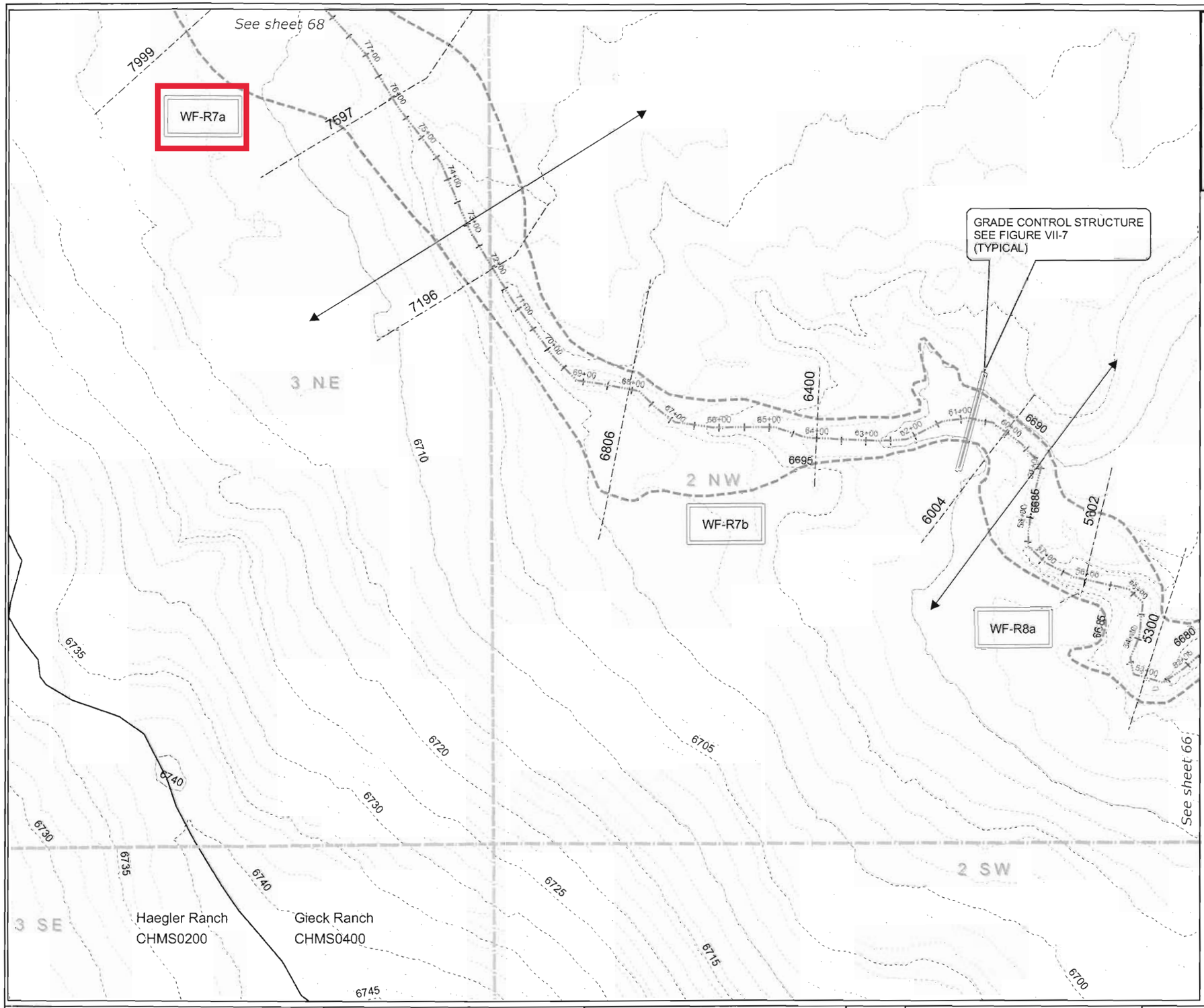
PROJECT INFO:
GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY:	RJB
DRAWN BY:	BLF
CHECKED BY:	RJB

REVISION DESCRIPTIONS	DATE

DRAWING INFO:
GIECK RANCH
KEY MAP
WEST FORK

DATE:	AUGUST 2007	JOB NO:	C7706-1	SET	PL
SCALE: H:	1" = 6000'	DRAWING NO.:	6D 038	SHEET	K8
V:					



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R7a	1.18	753	2.19
WF-R7b	1.14	753	4.21
WF-R8a	1.36	753	4.05

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R7a	Vegetation Augmentation
WF-R7b	Vegetation Augmentation
WF-R8a	Selective Stabilization

Note:
See Technical Addenda for grade control data.

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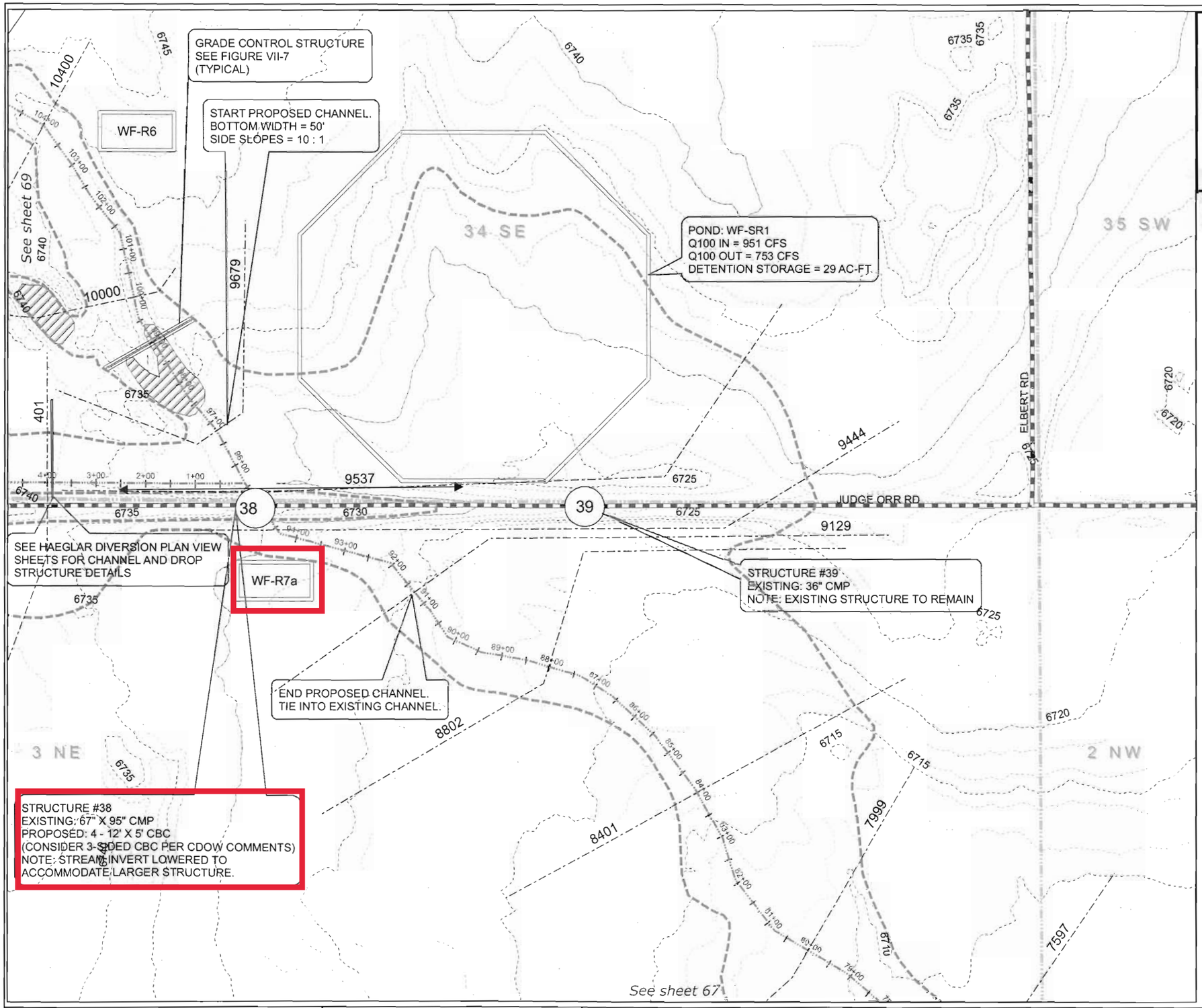
DESIGNED BY: RJB
DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #3

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET PL
SHEET 67



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R6	1.04	698	3.45
WF-R7a	1.18	753	2.19

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R6	Selective Stabilization
WF-R7a	Vegetation Augmentation

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DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #4

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET PL
SHEET 68

APPENDIX F

DRAINAGE MAPS & PLANS

SADDLEHORN RANCH FILING 3

EXISTING CONDITIONS MAP

LEGEND

- I.D. (A | B) — BASIN DESIGNATION
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: % IMPERVIOUS
- X — DESIGN POINT
- BASIN DELINEATION
- 6100 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- BASE FLOOD ELEVATION

BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	117.3	2.0%	0.9	64.1
CH1	23.9	2.0%	5.4	1038.0
CH2	84.2	2.0%	2.6	485.1
Total	600.6	N/A	10.7	1835.8

DESIGN POINT SUMMARY TABLE

Tributary Sub-	Q_5 (cfs)	Q_{100} (cfs)
0.1	241.00	1017.0
0.2	-	451.0
1	6.9	1114.0
2	1.5	76.4
3	0.1	80.9

NOTE

DESIGN POINT INFORMATION FOR DP 0.1 AND DP 0.2 WERE OBTAINED RESPECTIVELY FROM THE GEICK RANCH AND SANTA FE SPRINGS LOMR REPORTS.

N

200 100 0 200 400

ORIGINAL SCALE: 1" = 200'

EXISTING CONDITIONS MAP
SADDLEHORN RANCH FILING 3
JOB NO. 25142.05
1/7/22
SHEET 1 OF 1

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A Westrian Company

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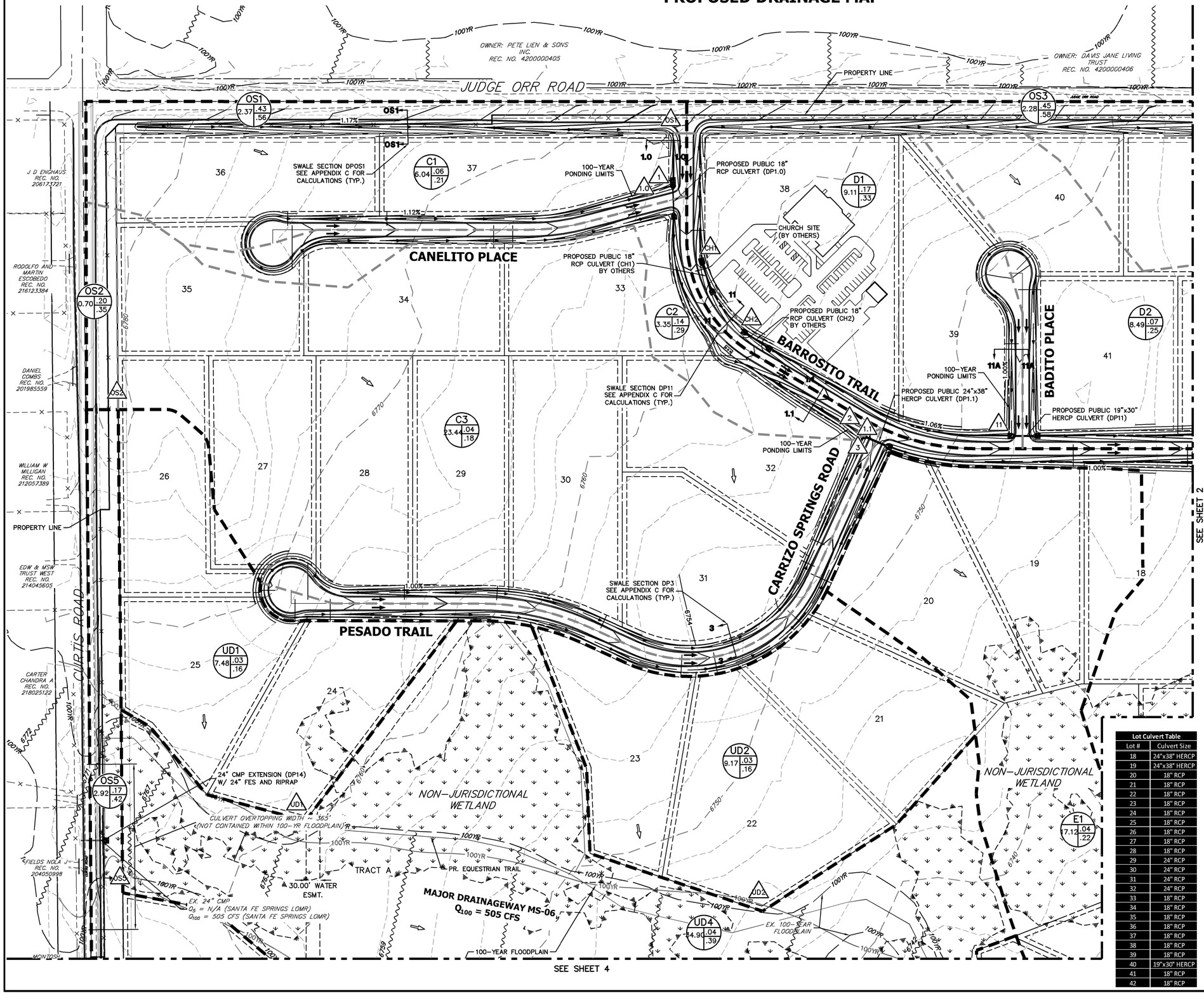
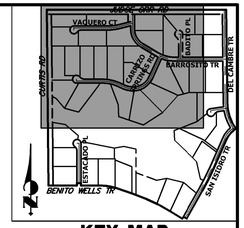
Fort Collins 970-491-9888 • www.jrengineering.com

SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP





KEY MAP
N.T.S

FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.6	26.2
1.2	6.8	32.2
1.3	6.8	32.2
1.4	7.6	35.0
1.5	3.2	19.6
1.6	10.5	50.0
1.7	11.1	58.1
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

Lot Culvert Table

Lot #	Culvert Size
18	24"x38" HERCP
19	24"x38" HERCP
20	18" RCP
21	18" RCP
22	18" RCP
23	18" RCP
24	18" RCP
25	18" RCP
26	18" RCP
27	18" RCP
28	18" RCP
29	24" RCP
30	24" RCP
31	24" RCP
32	24" RCP
33	18" RCP
34	18" RCP
35	18" RCP
36	18" RCP
37	18" RCP
38	18" RCP
39	18" RCP
40	19"x30" HERCP
41	18" RCP
42	18" RCP

LEGEND

- I.D. (A / B / C): BASIN DESIGNATION
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: C_5
  - C: C_{100}
- X: DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700: EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700: PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP: PROPOSED HIGH POINT
- LP: PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
6/16/23
SHEET 1 OF 4

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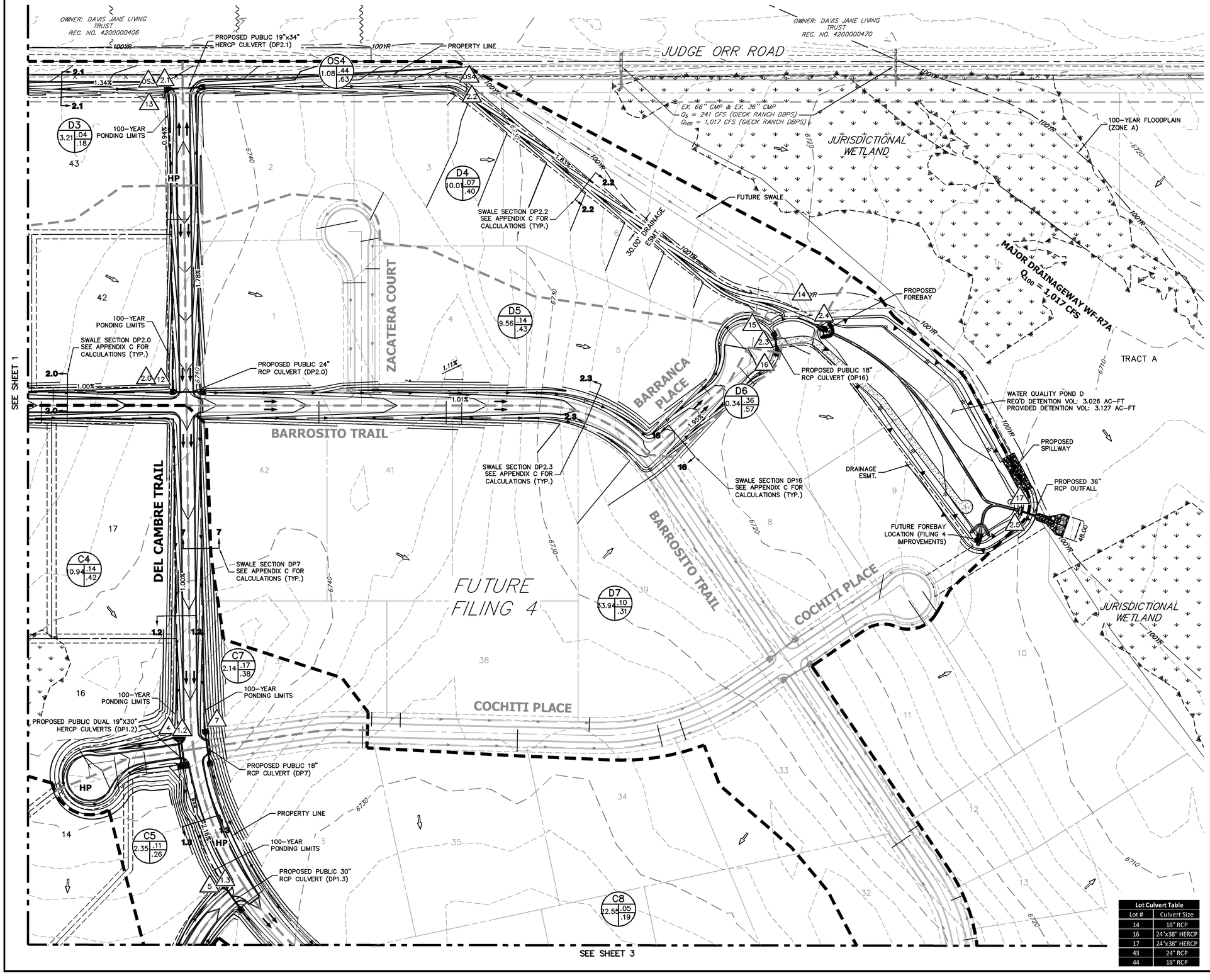
SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP



FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.6	26.2
1.2	6.8	32.2
1.3	6.8	32.2
1.4	7.6	35.0
1.5	3.2	19.6
1.6	10.5	50.0
1.7	11.1	58.1
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

Lot Culvert Table

Lot #	Culvert Size
14	18" RCP
16	24"x38" HERCP
17	24"x38" HERCP
43	24" RCP
44	18" RCP

LEGEND

- BASIN DESIGNATION (I.D.: A: BASIN AREA; B: C_5; C: C_{100})
- DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700 EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP PROPOSED HIGH POINT
- LP PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
6/16/23
SHEET 2 OF 4

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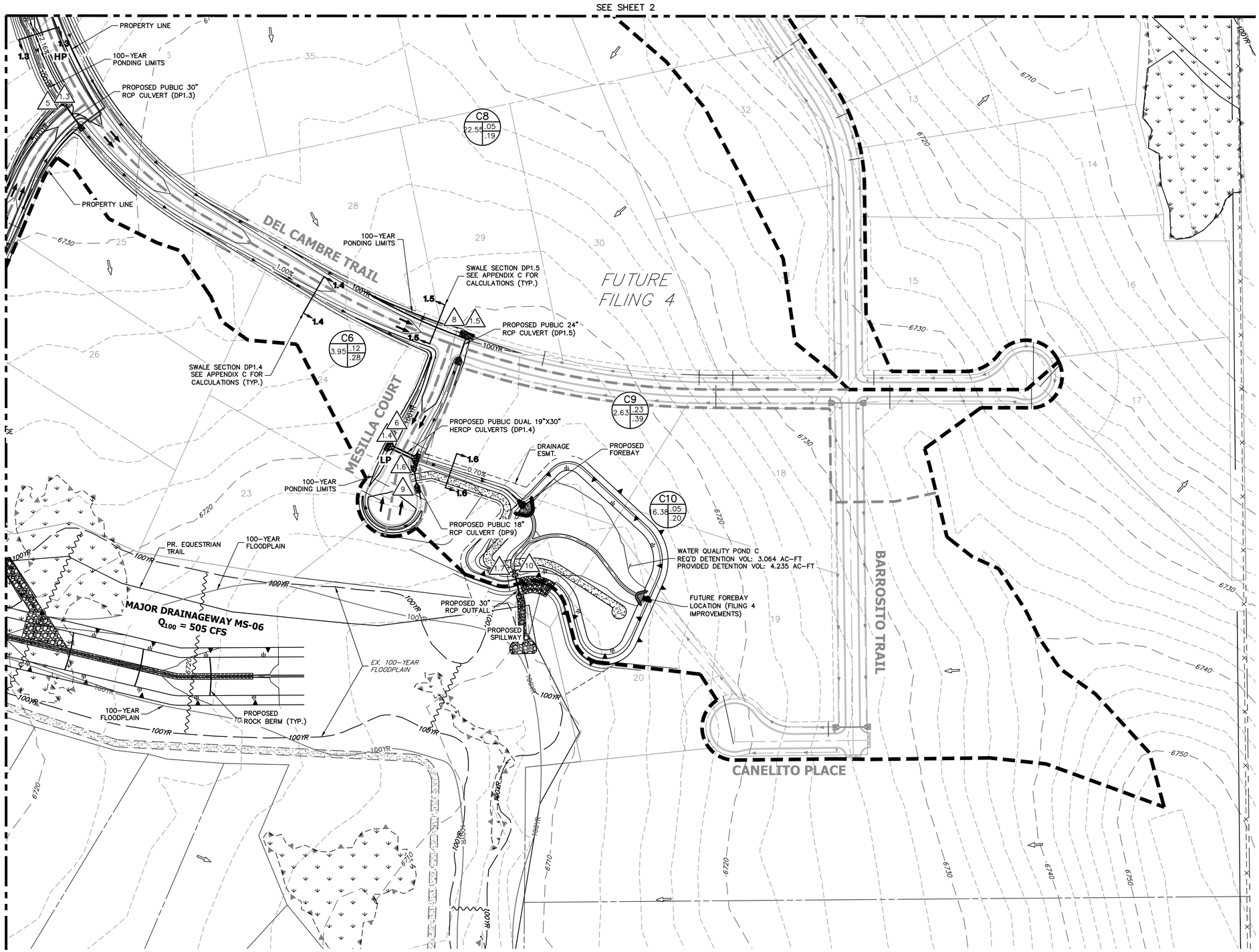
SADDLEHORN RANCH - FILING 3
PROPOSED DRAINAGE MAP



FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.6	26.2
1.2	6.8	32.2
1.3	6.8	32.2
1.4	7.6	35.0
1.5	3.2	19.6
1.6	10.5	50.0
1.7	11.1	58.1
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

LEGEND

- I.D. (A: BASIN AREA, B: C_5, C: C_{100}) — BASIN DESIGNATION
- I.D.: BASIN IDENTIFIER
- X — DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
6/16/23
SHEET 3 OF 4

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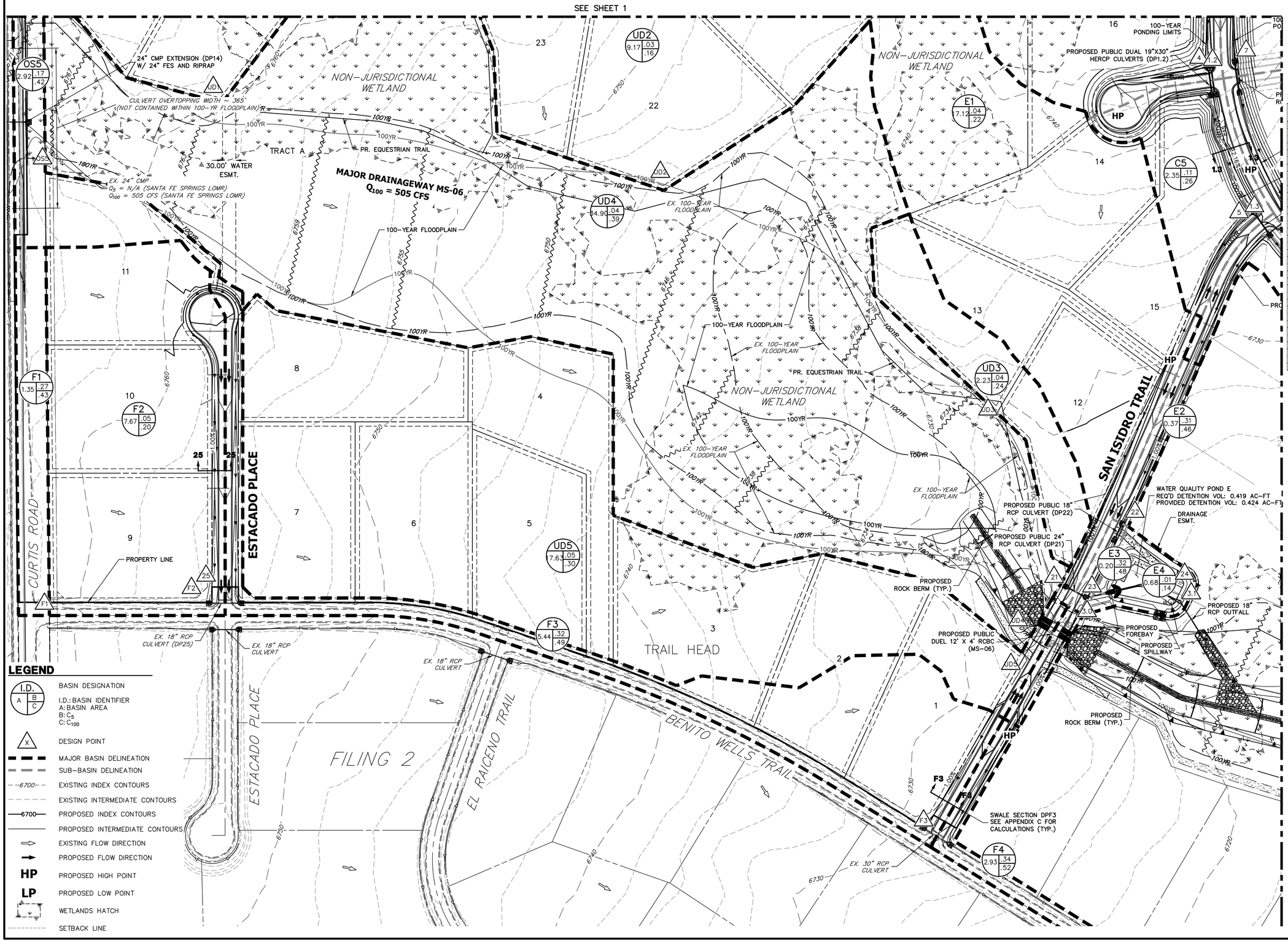
SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP



LEGEND

- I.D. (A: BASIN AREA, B: C_5, C: C_{100}) — BASIN DESIGNATION
- I.D.: BASIN IDENTIFIER
- X — DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

Lot Culvert Table

Lot #	Culvert Size
1	24" RCP
2	24" RCP
3	24" RCP
4	24" RCP
5	24" RCP
6	18" RCP
7	18" RCP
8	18" RCP
9	18" RCP
10	18" RCP
11	18" RCP
12	24" RCP
13	18" RCP
15	30" RCP

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.6	26.2
1.2	6.8	32.2
1.3	6.8	32.2
1.4	7.6	35.0
1.5	3.2	19.6
1.6	10.5	50.0
1.7	11.1	58.1
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
6/16/23
SHEET 4 OF 4

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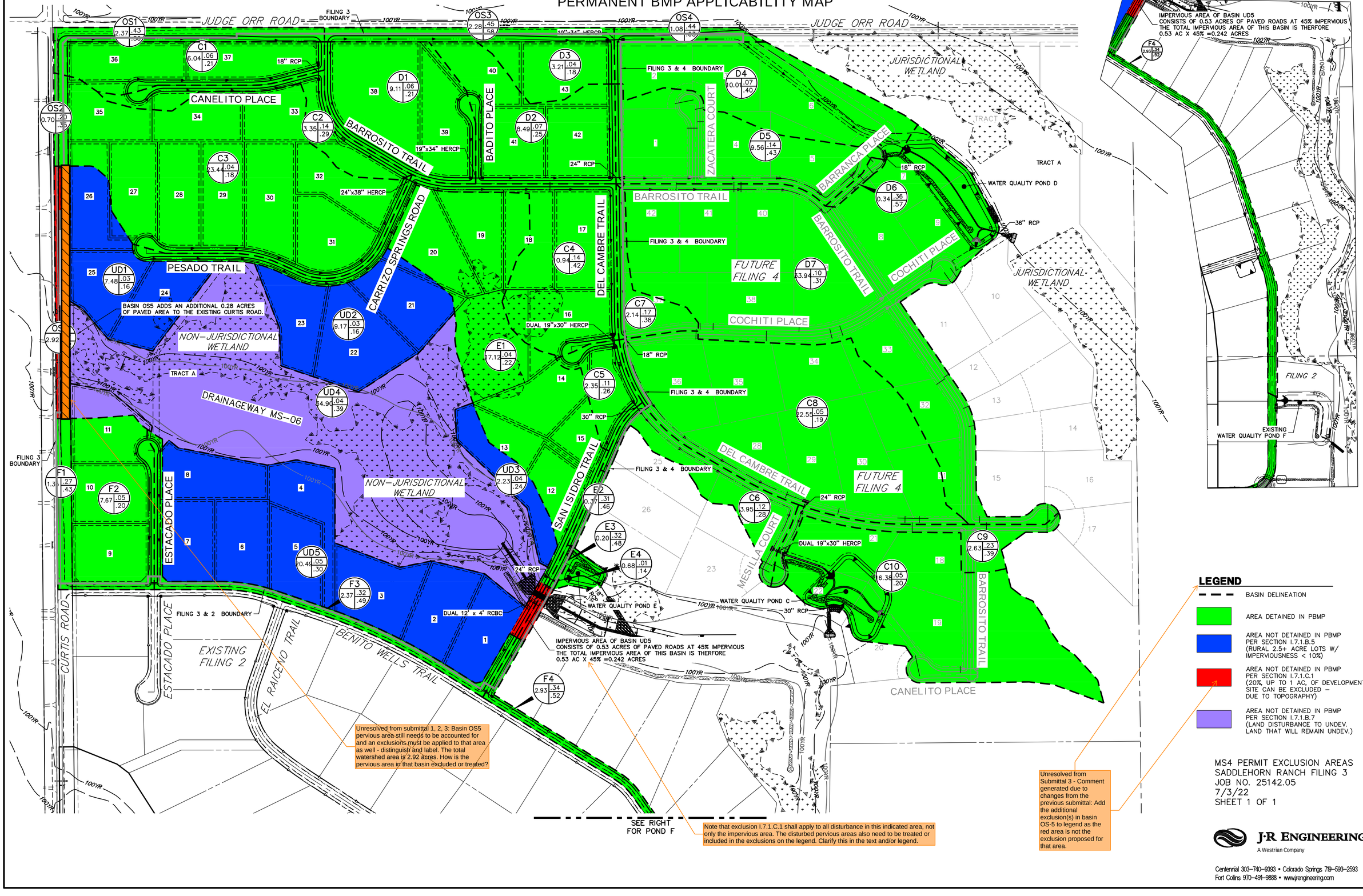
SADDLEHORN RANCH FILING - 3

PERMANENT BMP APPLICABILITY MAP



Unresolved from submittal 1, 2, 3: Basin OS5 pervious area still needs to be accounted for and an exclusions must be applied to that area as well - distinguish and label. The total watershed area is 2.92 acres. How is the pervious area in that basin excluded or treated?

Note that exclusion I.7.1.C.1 shall apply to all disturbance in this indicated area, not only the impervious area. The disturbed pervious areas also need to be treated or included in the exclusions on the legend. Clarify this in the text and/or legend.

Unresolved from Submittal 3 - Comment generated due to changes from the previous submittal: Add the additional exclusion(s) in basin OS-5 to legend as the red area is not the exclusion proposed for that area.

LEGEND

- BASIN DELINEATION
- AREA DETAINED IN PBMP
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.B.5 (RURAL 2.5+ ACRE LOTS W/ IMPERVIOUSNESS < 10%)
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.C.1 (20%, UP TO 1 AC, OF DEVELOPMENT SITE CAN BE EXCLUDED – DUE TO TOPOGRAPHY)
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.B.7 (LAND DISTURBANCE TO UNDEV. LAND THAT WILL REMAIN UNDEV.)

MS4 PERMIT EXCLUSION AREAS
SADDLEHORN RANCH FILING 3
JOB NO. 25142.05
7/3/22
SHEET 1 OF 1

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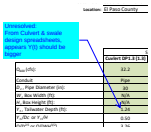
ENG-SF230041-R4_Drainage Report - Final.pdf Markup Summary

Callout (6)



Subject: Callout
Page Label: 1
Author: CDurham
Date: 1/16/2024 12:16:12 PM
Status:
Color:
Layer:
Space:

Unresolved:
From Culvert & swale design spreadsheets, appears Y(t) should be bigger

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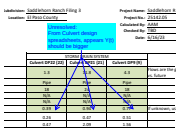

Subject: Callout
Page Label: 1
Author: CDurham
Date: 1/16/2024 12:16:53 PM
Status:
Color:
Layer:
Space:

Unresolved:
From Culvert design spreadsheets, appears Y(t) should be bigger

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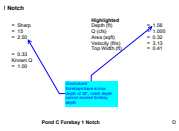

Subject: Callout
Page Label: 4
Author: CDurham
Date: 1/16/2024 12:22:27 PM
Status:
Color:
Layer:
Space:

Unresolved:
Forebays have a max depth of 18", notch depth cannot exceed forebay depth

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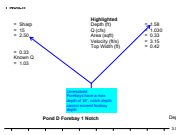
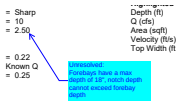


Subject: Callout
Page Label: 219
Author: CDurham
Date: 1/16/2024 12:23:31 PM
Status:
Color:
Layer:
Space:

Unresolved:
Forebays have a max depth of 18", notch depth cannot exceed forebay depth

---



Subject: Callout
Page Label: 219
Author: CDurham
Date: 1/16/2024 12:24:22 PM
Status:
Color:
Layer:
Space:

Unresolved:
Forebays have a max depth of 18", notch depth cannot exceed forebay depth

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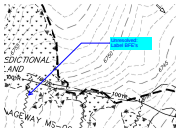


Subject: Callout
Page Label: 596
Author: CDurham
Date: 1/16/2024 12:31:40 PM
Status:
Color:
Layer:
Space:

Unresolved:
Label BFE's

SW - Highlight (1)

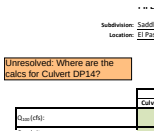
Subject: SW - Highlight
Page Label: 7
Author: Mikayla Hartford
Date: 1/18/2024 10:52:21 AM
Status:
Color:
Layer:
Space:

. Basin OS5 adds an additional paved area 0.28 acres to the existing Curtis
Road, per Appendix I Section 7.1.B.2 of the El Paso County Engineering Criteria Manual , this is allowable as less than 1 acre of paved area per mile is being added to the existing roadway.

SW - Rectangle (1)

Subject: SW - Rectangle
Page Label: 862
Author: Mikayla Hartford
Date: 1/22/2024 9:08:24 AM
Status:
Color:
Layer:
Space:

SW - Textbox (1)



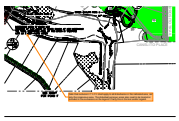
Subject: SW - Textbox
Page Label: 1
Author: Mikayla Hartford
Date: 1/22/2024 8:48:16 AM
Status:
Color:
Layer:
Space:

Unresolved: Where are the calcs for Culvert DP14?

SW - Textbox with Arrow (3)

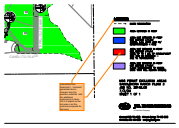
Subject: SW - Textbox with Arrow
Page Label: 862
Author: Mikayla Hartford
Date: 1/22/2024 9:01:11 AM
Status:
Color:
Layer:
Space:

Unresolved from submittal 1, 2, 3: Basin OS5 pervious area still needs to be accounted for and an exclusions must be applied to that area as well - distinguish and label. The total watershed area is 2.92 acres. How is the pervious area in that basin excluded or treated?



Subject: SW - Textbox with Arrow
Page Label: 862
Author: Mikayla Hartford
Date: 1/22/2024 8:58:58 AM
Status:
Color:
Layer:
Space:

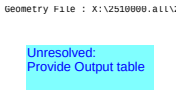
Note that exclusion I.7.1.C.1 shall apply to all disturbance in this indicated area, not only the impervious area. The disturbed pervious areas also need to be treated or included in the exclusions on the legend. Clarify this in the text and/or legend.



Subject: SW - Textbox with Arrow
Page Label: 862
Author: Mikayla Hartford
Date: 1/22/2024 8:55:05 AM
Status:
Color:
Layer:
Space:

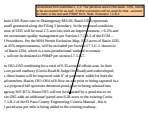
Unresolved from Submittal 3 - Comment generated due to changes from the previous submittal: Add the additional exclusion(s) in basin OS-5 to legend as the red area is not the exclusion proposed for that area.

Text Box (2)



Subject: Text Box
Page Label: 1
Author: CDurham
Date: 1/16/2024 12:19:59 PM
Status:
Color:
Layer:
Space:

Unresolved:
Provide Output table



Subject: Text Box
Page Label: 7
Author: Mikayla Hartford
Date: 1/22/2024 8:40:31 AM
Status:
Color:
Layer:
Space:

Unresolved from submittal 1, 2,3: The pervious area in the basin, OS5, needs to be accounted for as well. If other exclusions will be used for that - account for them in the text and PBMP form. Note: Exclusion 7.1.B.2