FINAL DESIGN REPORT FOR SAND CREEK RESTORATION

Prepared For:

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Prepared By:

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October 21, 2021

ENGINEER'S STATEMENT:
The attached design report was prepared under my direction and supervision and is correct to the best of my knowledge and belief. Said design report has been prepared according to the criteria established by El Paso County for drainage plans 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: _____

By: _____

Title: _____
Address: _____
_____

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:

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APPENDICES

INTRODUCTION

A. Project Background

JR Engineering has contracted to provide professional services for the design of the Sand Creek Restoration in El Paso County, Colorado. This project is part of the larger Sterling Ranch development that is occurring across multiple phases and filings adjacent to the channel. Improvements to the channel will include a re-alignment of the channel with a new high-performance, low maintenance design utilizing a meandering bankfull section with a wide flood terrace. Due to the grades on-site, 5 grouted boulder drop structures are also being proposed. The design also includes the construction of the Regional Pond W-3 as proposed in the *2021 Sterling Ranch MDDP* by JR Engineering, and improvements to two existing on-site stock ponds.

B. Purpose of Study

This *Final Design Report for the Sand Creek Restoration* was prepared to provide a final design for the proposed Sand Creek channel within the Sterling Ranch development. The design will include proposed infrastructure plans; hydrologic and hydraulic modeling; channel hydraulic calculations for Sand Creek, design calculations for the on-line detention and retention ponds; and all relevant figures and reference information.

II. GENERAL LOCATION AND DESCRIPTION

A. Site Location

Sterling Ranch, known as "the site" from herein, is a parcel of land located in Section 27, 28, 33 and 34, Township 12 South, and Section 4, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. To the west the site is bound by Vollmer Road. To the north and east, the site is bounded by undeveloped land and the Retreat at Timber Ridge. To the south, the site is bound by the Pawnee Rancheros and Woodmen Heights developments. A vicinity map can be see below and is presented in Appendix A.

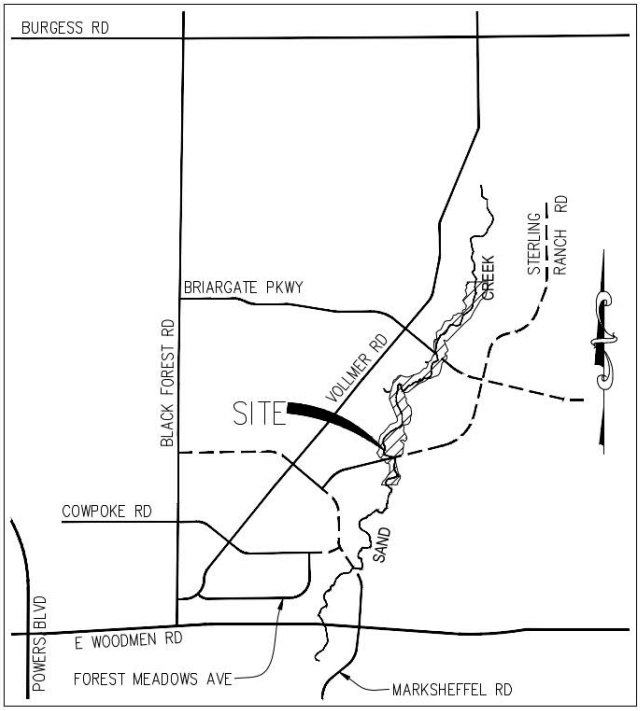


Figure 1 – Vicinity Map

B. Description of Property

Sterling Ranch is 1444 acres and is a Planned Unit Development to be built in multiple phases. The site is currently in various stages of development, with portions already in construction, with others 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 north to south and the existing drainageways follow this topography.

Per a NRCS web soil survey of the area, the site is made up of Type A and B soils. Type A soils cover roughly 65% of the site while Type B soils cover the remaining 35% 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.

III. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

The site lies completely the Sand Creek Drainage Basin. The basin has been previously studied firstly in the 1996 Drainage Basin Planning Study (DBPS) by Kiowa, again in the 2018 Sterling Ranch MDDP by M&S, in the 2021 DBPS by Stantec (Not adopted by El Paso County), and finally in the 2022 MDDP Amendment by JR Engineering.

The Sand Creek 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. While the majority of the

area within the basin is still undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates, development is actively occurring along multiple stretches of Sand Creek both upstream and downstream of the Sterling Ranch development. The proposed improvements to Sand Creek will cover approximately 66 acres beginning at the southern property line of Sterling Ranch, approximately 800 feet south of Sterling Ranch Road and continue north approximately 1.67 miles to the north property line at Poco Road.

developed?

B. Previous Studies

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

- Upper Sand Creek Drainage Basin Study prepared by Wilson in 2011
- Sand Creek Drainage Basin Study prepared by Kiowa in 1996
- Sand Creek Drainage Basin Study prepared by Stantec in 2021
- Sterling Ranch Master Development Drainage Plan prepared by M&S in 2018
- Sterling Ranch Master Development Drainage Plan Amendment prepared by JR Engineering in 2021

This Final Design Report builds upon the sub-basin delineation and design point convention from the 2021 MDDP Amendment modeling with no changes to the sub-basin hydrology or routed flow rates.

C. Irrigation Facilities

There are no existing irrigation facilities within the site. However, the Sterling Ranch Metropolitan District (SRMD) has been granted a water right to store surface flows along Sand Creek in two existing stock ponds located on Sand Creek, one just north of Sterling Ranch Road and the other north of Briargate Parkway. These surface flows will be comprised of Lawn Irrigated Return Flows from excess irrigation in the developments adjacent to Sand Creek.

D. Floodplain

Based on the FEMA FIRM Map numbers 08041C0533G and 08041C0535G, dated December 7, 2018, the site lies within Zone AE and Zone X of the Sand Creek floodplain. 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. The current FIRM Map has been presented in Appendix A.

IV. DRAINAGE DESIGN CRITERIA

A. Regulations

Storm Drainage analysis and design criteria for this project was taken from "El Paso County Drainage Criteria Manual" and the Colorado Springs Drainage Criteria Manual. The deviations taken with the proposed design are discussed in the Specific Details section of the report.

B. Hydrologic Criteria

The baseline report for this Final Design Report is the 2021 Sand Creek MDDP Amendment, referenced in Section III of this report. No changes to the MDDP sub-basin hydrology are proposed herein.

All hydrologic data was obtained from the aforementioned MDDP Amendment by JR Engineering, October 2021,

which was prepared in conformance with the El Paso County Drainage Criteria Manual. The MDDP states:

> "Previously, the MDDP used HEC-HMS to model hydrologic conditions. With all of the on- and off-line detention present along Sand Creek, it was decided that CUHP-SWMM would be a more appropriate way to model the hydrologic conditions. All hydrologic data was obtained from NOAA Atlas 2 isopluvial maps found in the EPCDCM. Runoff was calculated using CUHP Version 2.0.0, developed by Urban Drainage and Flood Control District. The model utilizes the raingauge classified as "a 24-Hr Type II Storm" to simulate a long duration front storm common to the area, which is the same rain gauge used in the original MDDP. The following rainfall depths were utilized in the model: 2.1 inches for the 2 year storm, 2.5 inches for the 5 year storm, 3.0 inches for the 10 year storm, 3.6 inches for the 25 year storm, 4.1 inches for the 50 year storm, and 4.6 inches for the 100 year storm, which are the same point precipitation values used in the original MDDP. Using Table 5.2 from the EPCDCM, a distribution curve was created for each of the design storms to be used in CUHP. 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 Appendices B and C. "

The flow rates used in the design and hydraulic analysis originated from the MDDP report and SWMM modeling files. **Table 3**, below, presents a summary of design flows for the major design storms at various design points.

Table 3: Sand Creek Flow Rates

SAND CREEK FLOW RATES			
Location	Station	Flow Rate (cfs)	
		100-YR Design	100-YR FIS
Northern Bndy	STA: 87+96	1643.0	2600
SRMD Pond 2	STA:73+50	1665.9	2600
Briargate Pkwy	STA:61+00	1795.1	2600
	STA:36+05	1904.0	2600
SRMD Pond 1	STA:16+80	1874.9	2600
Sterling Ranch Road	STA:09+05	1486.6	2600

C. Hydraulic Criteria

The Federal Highway Administration's (FHA) HY-8 Culvert Analysis Program (Build 7.50 July 28, 2016) was utilized to size the proposed outfall culvert for Pond W-3. The culvert analysis uses a trapezoidal channel section as tailwater to generate a tailwater depth for the analysis, the results of which are imported into SWMM as stage-discharge inputs for the Pond W-3 outfall ratings curve.

To size the outlet structures for the stock ponds, a calculation was done to iteratively determine weir and orifice capacity of various sizes of structure. Once it was determined whether the structure was weir or orifice controlled at each stage, a ratings curve based on head was modeled in SWMM to verify that the structure was large enough to prevent overtopping while still providing the static water surface necessary to maintain the water right for the stock ponds. StormCAD Version 10.03 by Bentley Software was used to size the outfall pipes from the ponds. The impact stilling basins were sized using calculations found in Hydraulic Engineering Circular No. 14, Third Edition, "Hydraulic Design of Energy Dissipators for Culverts and Channels" by the FHA.

The U.S. Army Corps of Engineers HEC-RAS program, version 5.0.3 (September 2016) was used to perform the hydraulic analysis. The final design of the Sand Creek channel and proposed culverts at Sterling Ranch Road and Briargate Parkway are modeled in HEC-RAS to evaluate flow conditions, shear stresses, and velocities for the range of flood events for the purposes of assessing drainageway stability.

For the hydraulic modeling, the flows at the various design points shown in above in Table 3. Each flow change location represents a design point from the MDDP. As shown, flows accumulate further down the stream as more developed area is included in the basin area. During the major storm event flows pass through the stock pond outlet structures undetained so no additional flow change was needed at the stock pond outlets. Pond W-3 has a release rate to keep flows downstream of the pond lower than existing conditions. The HEC-RAS modeling uses these steady flows, taken from the MDDP.

For the 100-year flood event, two different scenarios were analyzed. One scenario was evaluated using higher Manning's n values (0.05/Native Grasses; 0.07/Gravel or Cobble Bed; 0.12/Herbaceous Wetlands) in order to calculate the extents of the respective water surfaces and show them on the plans. A second scenario, with lower Manning's n values (0.032 Native Grasses; 0.035/Gravel or Cobble Bed; 0.06/Herbaceous Wetlands) was also used to more conservatively analyze velocities and shear stresses. These Manning's *n* values are taken from Table 8-5 of the USDCM.

The downstream boundary for Sand Creek is Section CU approximately 250 feet downstream of the southern property boundary of Sterling Ranch. The downstream boundary condition is taken as normal depth with a channel slope of 0.017 percent for all design storms except the FIS scenario, which uses a known water surface of 6990.04 from the 1996 DBPS at Section CU. The upstream boundary condition for Sand Creek at the southern property boundary of Sterling Ranch is taken as normal depth with a channel slope of 0.018 percent.

Topographic mapping of the area used in the hydraulic model was done by JR Engineering on the NAD 83 Projection and NAVD88 vertical datum. The survey was used to generate a 1-foot contour interval map. The project is designed on a modified State Plane coordinate system (NAD83 Colorado State Plane, Southern Zone, U.S. Foot) and is on the North American Vertical Datum of 1988 (NAVD88 datum).

All hydraulic calculations and applicable charts and graphs are included in **Appendix E** of this report.

V. DRAINAGE FACILITY DESIGN

A. General Concept

As development has occurred along Sand Creek within Sterling Ranch, the need to stabilize the creek has increased. The additional development brings additional runoff, further degrading the conditions previously mentioned in the 1996 DBPS. All along the creek there are unstable slopes that left unattended will continue to degrade with the potential to cause damage the surrounding properties. As development continues in the future, the degradation will accelerate as more runoff is added to the creek. Stabilizing the creek now will avoid any future damage to development and ensure the long term health of the creek. Successfully mitigating this portion of stream will ensure it functions hydraulically in the future.

There are 3 main criteria that determined the initial concept. The first was the Preliminary Stream Geomorphology Report performed by 5 Smooth Stones Restoration (5SSR), PLLC in April 2021. The second was our previous experience working with the Army Corps of Engineers (ACOE) and their approval process with regards to wetlands disturbances. The third main determinant was El Paso County criteria, and particularly with regards to the previous design done by Kiowa.

The previous DBPS was completed in 1996. In that span of time the concepts in stream design have evolved. A simple riprap lined trapezoidal channel, as previously suggested would prove to be far more intrusive than the meandering bankfull design that has been adopted along the Front Range in the last decade, and such as design was rejected by the ACOE previously for this portion of Sand Creek. The meandering bankfull design is a high performance, low maintenance design. It will allow for improved vegetation along the channel while still

providing proper flood control. The previous DBPS referred to UDFCD for its recommendation of check structures to aid in longitudinal stabilization and prevent headcutting. In the preceding years, UDFCD has moved away from the use of vertical check structures in favor of grouted boulder or sculped concrete drop structures as grade control structures. These structures provide a more aesthetic and long term solution.

For the purposes of being able to work on portions of the design separately, the channel has been broken up into three separate reaches. Reach 1 is the portion of channel south of Sterling Ranch Road to the southern property line, Reach 2 is the portion of channel between Briargate Parkway and Sterling Ranch Road, and Reach 3 is the portion of channel between the northern property line and Briargate Parkway. The general concept of the channel design is to design a low maintenance, high performance channel with a meandering bankfull channel. Along each of the three reaches, the design will cut in a new bankfull section offset to the east from the existing thalweg, grade up to the existing thalweg so that it can remain hydraulically connected to the new thalweg, and then extend a 1% flood terrace to the east between 80 and 120 ft. depending on shear stresses and velocities. The below table provides a summary of the rest of the bankfull design criteria, which was based on the preliminary geomorphology report. Once a preliminary design has been completed, an in-depth geomorphic report will discuss any variances recommended from county criteria.

The purpose of trying to keep the existing channel hydraulically connected to the new thalweg is to maintain as many existing wetlands as possible and satisfy the ACOE. The previous design by Kiowa made no attempt to preserve wetlands in order to satisfy the County's design criteria, and was rejected by the ACOE. While the County's criteria are certainly a determining factor, we consider the need to satisfy the ACOE the highest priority, because without their approval we won't be granted a 404 permit.

The County review of the previous design by Kiowa states that the maximum stable longitudinal slope of the channel is 0.17%. Using this longitudinal slope will require the use of at least 10 and possibly 15 GSB drop structures. This channel slope will also ensure the destruction of more wetlands by taking the existing ones offline due to large changes in elevation. It is our intent to prove that a steeper slope can remain stable long term, thus allowing us to preserve more wetlands and appease the ACOE.

B. Specific Details

Sand Creek Channel

Based on the Geomorphic Report, a bankfull area of 14 sq.ft., a bankfull width of 17 ft., and a mean depth of 0.71 ft. was used for all the channel sections with a new bankfull section. This bankfull section was determined by using a regional curve, with a design capacity of 29 cfs. This is smaller than a bankfull based on county criteria which would have a required capacity of approximately 180 cfs based on 10% of the 100-year design storm. The straight riffle sections of channel will have a maximum grade of 5%, while the curved sections with the pools will be flat from invert in to invert out. Maximum velocities in the channel were limited to 9 ft/s during the 100-year storm and 7 ft/s during the 10-year storm, with a few exceptions described below. The maximum shear stress allowed is 1.2 lb-ft, and any area above that will require armoring. While modeling the channel, excessive velocities and shears within the riffle sections were ignored since those areas will already be armored with void-filled riprap. The areas with excessive velocities and shears that will require armament are the flood terrace and curve sections of the bankfull section. Permanent geotextile solutions are proposed in these areas as a cost effective way to permanently armor large areas while achieving sheer stresses up to 6 lb/sq.ft, which is high enough to adequately protect any areas of the overbanks that are above 1.2 lb-ft. Ultimately, the goal is to have vegetation re-established within the bankfull section and out in the flood terrace to provide vegetative resistance to reduce velocities and shear stresses within the channel and ensure a permanently stable, albeit steeper channel.

There are 6 grouted boulder drop structures proposed within the channel. There is a 5' drop and a 2.5' drop

proposed in Reach 1 at station 3+89 and 8+56, respectively. Along Reach 2 there is a 3' drop at station 50+31 and a 5' drop at station 55+12. Along Reach 3 there is a 6' drop at station 72+91 and a 6' drop at station 75+76. The use of drops larger than 4' was done in order to maintain grades close to existing so that the existing thalweg could remain connected. Around the GSB all slopes great than 10% will have armored with 36 inch grouted boulders. Sheet piling has been extended across the crest of the drop the full width of the FIS floodplain. Weep drains will be used to prevent any uplift or groundwater migration. The proposed design calls for 61 riffle drops; 8 along Reach 1, 34 along Reach 2, and 19 along Reach 3. The riffles vary in length and slope in order to minimize wetlands disturbances created by grade changes. The geomorphic report called for 100 – 1 foot drop riffle pools in lieu of drop structures. The use of riffles to make up grade differences rather than more drop structures is preferable because it allows for flatter slopes to tie the riffle sections to the existing ground. JR limited ourselves to a maximum of 6 or 7 drop structures throughout the project and were able to keep the number at the proposed 6 we have now because going beyond that number would prove to be prohibitively expensive as well as destroying a larger amount of wetlands.

Per County criteria, maintenance access has been provided along the entire stretch. A 15' wide gravel trail will serve as the main access along both sides of the channel. At key infrastructure such as drop structures and ponds, spur trails have been provided to gain access to both the upstream and downstream areas of the structures. Since development is occurring on both sides of the stream, construction of the trails will occur along with different developments. The portions of the trail that will be built with this project are along the entire east side of the creek from the southern property line to the northern property line, as well as along the western side of the creek between Sterling Ranch Road and Briargate Parkway.

Table 1. Bankfull Design Criteria

Bankfull Channel	Width; ft		17.0	
	Mean Depth; ft		0.71	
	Max Depth; ft		2.0	
	Area; sqft		14.0	
	Bend to Bend Spacing; ft	4.5 -6 times Bankfull Width	77	102
	Radius of Curvature (ROC); ft	2.5 - 3.5 times Bankfull Width	43	60
	Tangent Lengths; ft	1.5 - 2.5 times Bankfull Width	26	43
	Meander Wavelength; ft	9- 12 times Bankfull Width	153	204
	Meander Beltwidth; ft	2 - 3.5 times Bankfull Width	34	60

0.5%?

Provide additional columns or rows for low flow and overbanks

Table 2. Sand Creek Design Matrix

Sand Creek Design Matrix		
	Required	Proposed
Maximum Depth outside of Bankfull Channel	5 ft	4.88 ft
Maximum Longitudinal Slope	0.17%	5%
Maximum Velocity 100-YR excluding drops	9 ft/s	4.69 ft/s
Maximum Velocity 5-YR excluding drops	7 ft/s	3.66 ft/s
Froude No 100-YR - main channel	0.8	0.87
Froude No 5-YR - main channel	0.7	1.03
Maximum Shear Stress, 100-YR main channel	1.2 lb/sf	4.65 lb/sf
Permissible Shear Stress – Vegetated		1.2 lb/sf
Permissible Shear Stress – Coir Mat		4.5 lb/sf
Permissible Shear Stress – Geotextile		6.0 lb/sf
Minimum Bankfull Capacity	180 cfs	29 cfs
Maximum Side slopes - grass lined	4:1	4:1
Maximum Side slopes - grouted boulder	2.5:1	4:1
Minimum Bottom Width	8 ft	11.3 ft
Centerline radius - Bankfull	2.5x BF Width	2.5-3.5x BF Width
Centerline radius - Flood Terrace	2.5x BF Width	2-4x BF Width
Non-Juridictional Maximum Ponding Height	10'	10'
15' Maintenance Trail	Yes	Yes
Maintenance access provided	Yes	Yes
Maintenance access spacing	500'	500-1000'
Maintenance acces points	45	23
Maximum GSB Drop Height	4'	6'
Maximum GSP Drop Height with add't testing and seepage	12'	6'
Mannings N value - water surface evaluation		0.05/0.07/0.12
Mannings N value - shear evaluation		0.032/0.035/.06

exceeded in model?

Provide deviation requests for all parameters not meeting County criteria.

In the existing conditions, Reach 1 has velocities ranging from 7.33 ft/s to 10.06 ft/s, Reach 2 has velocities ranging from 2.23 ft/s to 10.53 ft/s, and Reach 3 has velocities ranging from 2.33 ft/s to 10.52 ft/s. Shear stresses along Reach 1 range from 1.06 lb/sq ft to 2.03 lb/sq ft, along Reach 2 range from 0.12 lb/sq ft to 2.33 lb/sq ft, and along Reach 3 range from 0.10 lb/ sq ft to 2.65 lb/sq ft.

In the proposed conditions, Reach 1 has velocities ranging from 2.85 ft/s to 10.10 ft/s. Outside of the drop structures, no cross section had velocities above 4 ft/s. Shear stresses along Reach 1 range from 0.01 lb/sq ft to 10.35 lb/sq ft. The shear stresses along Reach 1 are consistently higher than the 1.2 lb/sq ft as suggested in the geomorphology report within the bankfull section and around the drop structures, but these areas are going to be armored already. There are no areas within the overbanks that have high shear stresses, so no areas in this

reach will require additional armoring in the overbank sections.

In the proposed conditions, Reach 2 has velocities ranging from 0.99 ft/s to 13.80 ft/s. There are no areas of high velocities outside of the drop structures. Shear stresses along Reach 2 range from 0.77 lb/sq ft to 3.32 lb/sq ft. The shear stresses along Reach 2 are consistently higher than the 1.2 lb/sq ft as suggested in the geomorphology report within the bankfull section, around the drop structures, and out in the overbank areas. Approximately 1650 feet of channel from stations 33+00 to 50+50 will require geotextile matting in the overbanks in order to protect against shear stresses higher than 1.2 lb/sq.ft.

typo?

In the proposed conditions, Reach 3 has velocities ranging from 0.04 ft/s to 13.11 ft/s. The areas of high velocities occur at the drop structuresShear stresses along Reach 3 range from 0.01 lb/sq ft to 34.47 lb/sq ft. The shear stresses along Reach 3 are consistently higher than the 1.2 lb/sq ft as suggested in the geomorphology report within the bankfull section and around the drop structures, as well as out into the overbank areas. Approximately 1000 feet of channel from stations 16+35 to 26+50 will require geotextile matting in the overbanks in order to protect against shear stresses higher than 1.2 lb/sq.ft.

Pond W-3

The MDDP Amendment hydrology confirmed that a Regional Detention Pond (Pond W-3) at Sterling Ranch Road will be required to reduce 100-year flows to less than existing conditions. The pond is approximately 51.27 ac-ft., which is a considerable reduction in size from the previously proposed 76 ac-ft. pond in the MDDP. Conceptually, the pond will function similarly to how it was proposed in the MDDP. The county prohibits ponding at roadways, so the pond has to outfall before it reaches the proposed conspan arch culvert at Sterling Ranch Road. The proposed outfall will consist of a 3-barrel (2-13'x4', 1-13'x2') box culvert approximately 40 feet north of the road, with an overflow spillway that extends to the wingwalls of the road culvert, essentially creating one contiguous structure, while still avoiding ponding along the road and allowing flows to pass through the road culvert with freeboard. The smaller center barrel has an invert 0.5' lower than the outer barrels to maintain a low flow channel, while the outer barrels will be used in higher flow events. The overflow weir is approximately 288 feet long. In order to avoid being classified as a jurisdictional dam the overflow weir was set at 10 feet above the invert with a crest elevation of 7012.00. A sheet pile wall with a concrete cap will provide reinforcement for the berm. At the invert of the culvert a 1.5' deep plunge pool will help dissipate energy before entering the culvert at Sterling Ranch Road.

SRMD Pond 1

The large stock pond approximately 700 feet north of Sterling Ranch Road will remain in place with the stream improvements and is now defined as SRMD Pond 1. Previously, the pond was designated as "Waters of the U.S." and Sterling Ranch Metropolitan District was granted a water right to use the pond as storage for irrigation runoff, so it was decided that the best design would be to include the pond in the channel, rather than trying to modify its dimensions or route flows around it. The water right for the stock pond was previously determined to be a volume of 12.25 ac-ft with a surface area of 109,612 sq.ft. Since the pond's dimensions are not proposed to be modified, the water right will remain intact.

The existing stock pond has a berm elevation of 7040, which is 39 feet above the proposed invert of the culvert at Sterling Ranch Road. Using a series of drop structures would require, at a minimum, 4-10' tall drops to achieve this grade and more likely would require a series of 7 drops to get to the toe of slope. Stepping the drops would require a longer longitudinal profile which would in turn take away area from Pond W-3. The existing channel flows around the west side of the pond downstream to Sterling Ranch Road. Given the proposed development west of Sand Creek, there is no possibility to expand the channel west in this area, and so this would end up being the most constricted portion of channel

The most feasible solution to conveying water through the stock pond and also making up 39' of vertical drop was to design an outlet structure for water to discharge out of the stock pond and into Pond W-3. Using an outlet structure allows for a static water surface in the pond that maintains SRMD's water right to the pond. In minor and major storm events, water ponds up to the static WSEL of 7036, where it will outfall into a 25'x25' square orifice. Water flows through the 12'x10' RCBC outfall pipe and discharges into a USBR Type VI impact basin. Flows leave the impact basin and are conveyed to the Pond W-3 outfall via low flow channel. In the event of flows above the 100-year design storm or an emergency situation, flows will overtop the existing berm and down an emergency spillway to Pond W-3. The overflow spillway will be approximately 300 feet long. To reinforce the spillway, a sheetpile cutoff wall with a concrete cap will be incorporated into the design. Due to the fact that this spillway will be an online feature within the channel, it will be armored using a geotextile fabric able to withstand the FIS flow rate.

SRMD Pond 2

Upstream of Briargate Parkway there are two existing stock ponds. The smaller of the two ponds will be removed with the stream restoration, while the larger pond will remain and is now referred to as SRMD Pond 2. Previously, the larger pond was designated as "Waters of the U.S." and Sterling Ranch Metropolitan District was granted a water right to use the pond as storage for irrigation runoff, so it was decided that the best design would be to include the pond in the channel, rather than trying to route flows around it. The water right for the stock pond was previously determined to be a volume of 4.29 ac-ft with a surface area of 53,720 sq.ft. While the pond's grading will be modified, the volume and surface area of the pond will not change, so the water right will remain intact.

The existing stock pond has a berm elevation of 7121, which is 20 feet above the toe of slope. Using a series of drop structures would require, at a minimum, 4-10' tall drops to achieve this grade and more likely would require a series of 7 drops to get to the toe of slope. Stepping the drops would require a longer longitudinal profile which would in turn take away area from Pond W-3. The existing channel discharges from the pond using a 24" RCP culvert. Given the proposed development west of Sand Creek, there is no possibility to expand the channel west in this area, and so this would end up being the most constricted portion of channel

Similar to Existing Stock Pond 1, the most feasible solution to conveying water through the stock pond and also making up 20' of vertical drop was to design an outlet structure for water to discharge out of the stock pond and into the downstream channel. Using an outlet structure allows for a static water surface in the pond that maintains SRMD's water right to the pond. In minor and major storm events, water ponds up to the static WSEL of 7117.75, where it will outfall into a 25'x25' square orifice. Water flows through the 10'x10' RCBC outfall pipe and discharges into a USBR Type VI impact basin. Flows leave the impact basin and are conveyed south via the Sand Creek Channel. In the event of flows above the 100-year design storm or an emergency situation, flows will overtop the existing berm and down an emergency spillway to the downstream channel. The overflow spillway will be approximately 200 feet long. To reinforce the spillway, a sheetpile cutoff wall with a concrete cap will be incorporated into the design. Due to the fact that this spillway will be an online feature within the channel, it will be armored using a geotextile fabric able to withstand the FIS flow rate.

C. Wetlands

The existing Sand Creek channel has wetlands present along the entire portion within Sterling Ranch. With Sand Creek being an ephemeral stream, and development on both sides of it incomplete, there are not base flows present for many parts of the year. Wetlands are confined to areas mostly within the existing bankfull channel and around the existing stock ponds. With the goal of the proposed channel design to keep the existing thalweg intact wherever possible, it is anticipated that portions of these wetlands will remain intact.

The wetlands along Sand Creek were previously delineated with a total area of 16.29 acres, which does not

include areas that will be disturbed from the proposed roadway culverts at Sterling Ranch Road and Briargate Parkway. Of these 16.29 acres, 8.49 acres will be permanently disturbed. Permanently disturbed wetlands are described as any area where improvements occur that causes change in finished grade of the wetland or where vegetation cannot be re-established. Of the 16.29 acres of on-site wetlands, 7.43 acres will be preserved. Preserved wetlands are defined as areas that may or may not have been improved, but who's finished grade has not changed.

Please clarify

There are no designated mitigation areas in the project. With the design of a wide, 1% grade flood terrace, it is expected that all of the proposed flood terrace will be mitigated. Areas where existing wetlands are impacted, but will remain will either be enhanced or re-established. The only areas not expected to be mitigated are areas of steep slopes. As development occurs and runoff increases, groundwater migration will be able to support wetland vegetation across the flood terrace, while runoff from adjacent developments will also aid in the support of wetlands in the channel. Mitigation is currently proposed on-site along the entire stretch of the channel with a total area of 29.67 acres, giving a mitigation to permanent loss ratio of 3.49. Aiming for a ratio above 1 to 1 allows for the possibility that not all the flood terrace will be able to establish wetlands, or that some of the existing ones could become disconnected over time. If the Sand Creek restoration is unable to re-establish wetlands to offset those permanently lost during construction after a set period of time, then the owner will buy credits from a wetland bank to be determined later.

The anticipated 404 permitting approach is an Individual Permit for just the Sand Creek Restoration plans, independent of the permits obtained by Kiowa for the culverts at Sterling Ranch Road and Briargate Parkway. Section 404 permitting will be accomplished as an independent process with the U.S. Army Corps of Engineers.

D. Future Considerations

Within the Sterling Ranch development there will be more full-spectrum detention ponds constructed as development progresses. All of these ponds are expected to contribute base flows to Sand Creek within Sterling Ranch. Of those currently proposed, Pond FSD14A, which is located along Sterling Ranch Road just east of Pond W-3 and FSD11B, which is located east of Sand Creek along the southern property line are expected to outfall directly into the channel. Future pond outfalls will need to ensure the invert of the pipes are higher than the proposed 100-year WSEL.

E. Permitting

The anticipated 404 permitting approach is an Individual Permit for just the Sand Creek Restoration plans, independent of the permits obtained by Kiowa for the culverts at Sterling Ranch Road and Briargate Parkway. Section 404 permitting will be accomplished as an independent process with the U.S. Army Corps of Engineers. Portions of the channel will be constructed along with the culverts in order to mitigate the disturbances caused by the culverts immediately after construction is concluded.

VI. CONCLUSION

The purpose of this report is to present the final design for the proposed Sand Creek Restoration. The design proposed herein meets the requirements of El Paso County and the city of Colorado Springs unless where stated otherwise. The design proposed in this report complies with the El Paso County Drainage Manual, City of Colorado Springs Drainage Criteria Manual, and the proposed Sand Creek MDDP Amendment, unless where stated otherwise. The proposed Pond W-3 and the revised existing stock ponds will have no adverse effect on stormwater quality, quantity, or timing and will meet the requirements of CRS §37-92-602 (8) for drain time.

The implementation of drainage concepts presented within this report will assure proper conveyance and

attenuation of stormwater discharges with no anticipated adverse impacts to Sand Creek downstream infrastructure. The proposed improvements to the channel will not be injurious to water rights and will be in conformance with established decrees.

Any future off-line water quality or detention ponds shall be final-designed under separate drainage studies occurring with each specific development project or capital improvement project, and shall meet all applicable design criteria at the time of final design.

VII. REFERENCES

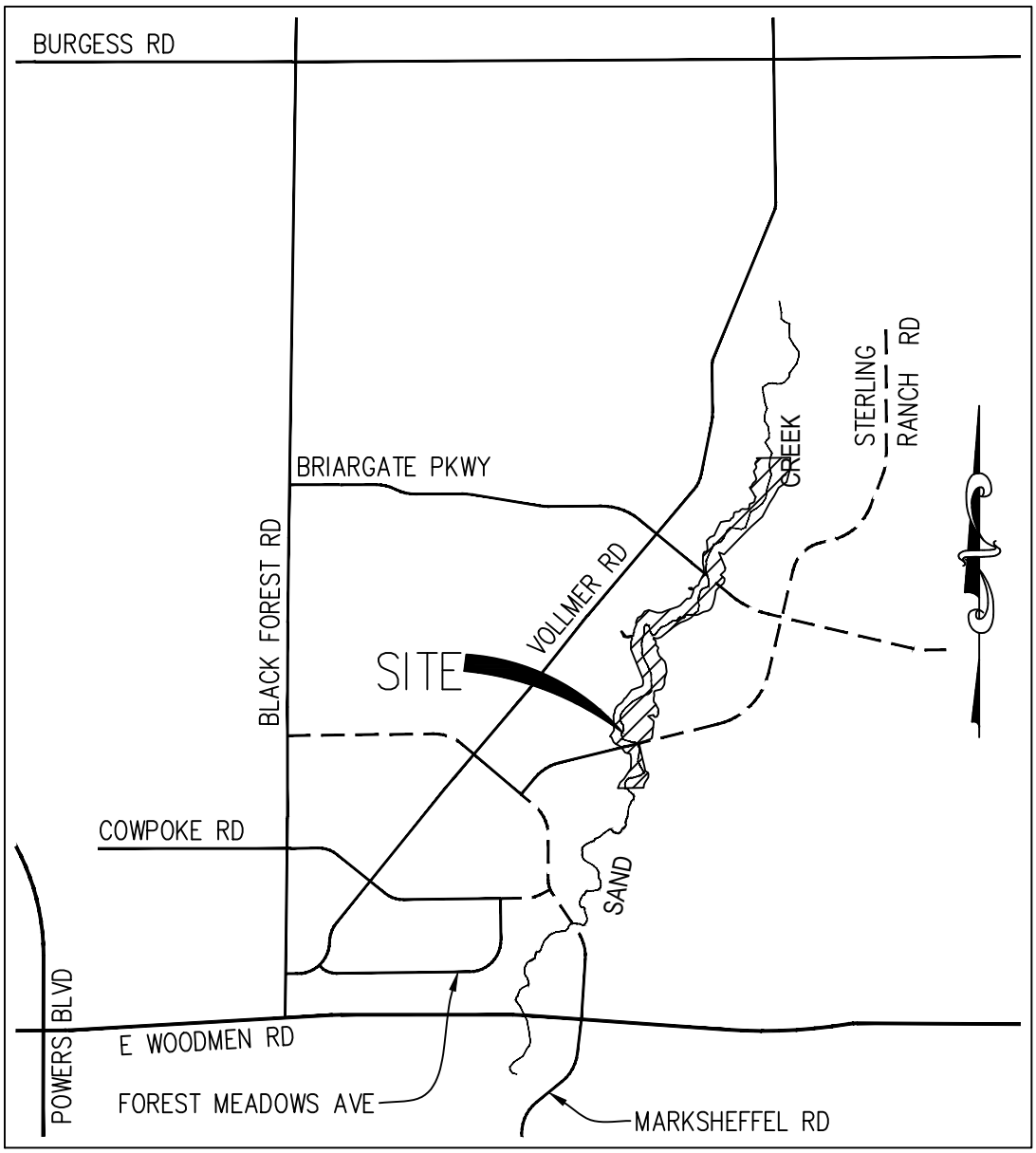
1. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.

2. El Paso County Drainage Criteria Manual Volume 1, El Paso County, CO, October 1994.

3. Sand Creek Drainage Basin Planning Study, Stantec, January 2021.

4. Sand Creek MDDP Amendment, JR Engineering, October 2021.

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



KEY MAP

N.T.S.

VICINITY MAP
STERLING RANCH
JOB NO. 25188.03
10/21/2021
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

NOTES TO USERS

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National Geodetic Survey
SSMC-3, #9202
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Silver Spring, MD 20910-3282

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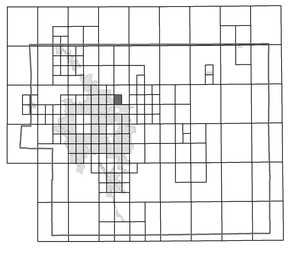
El Paso County Vertical Datum Offset Table

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



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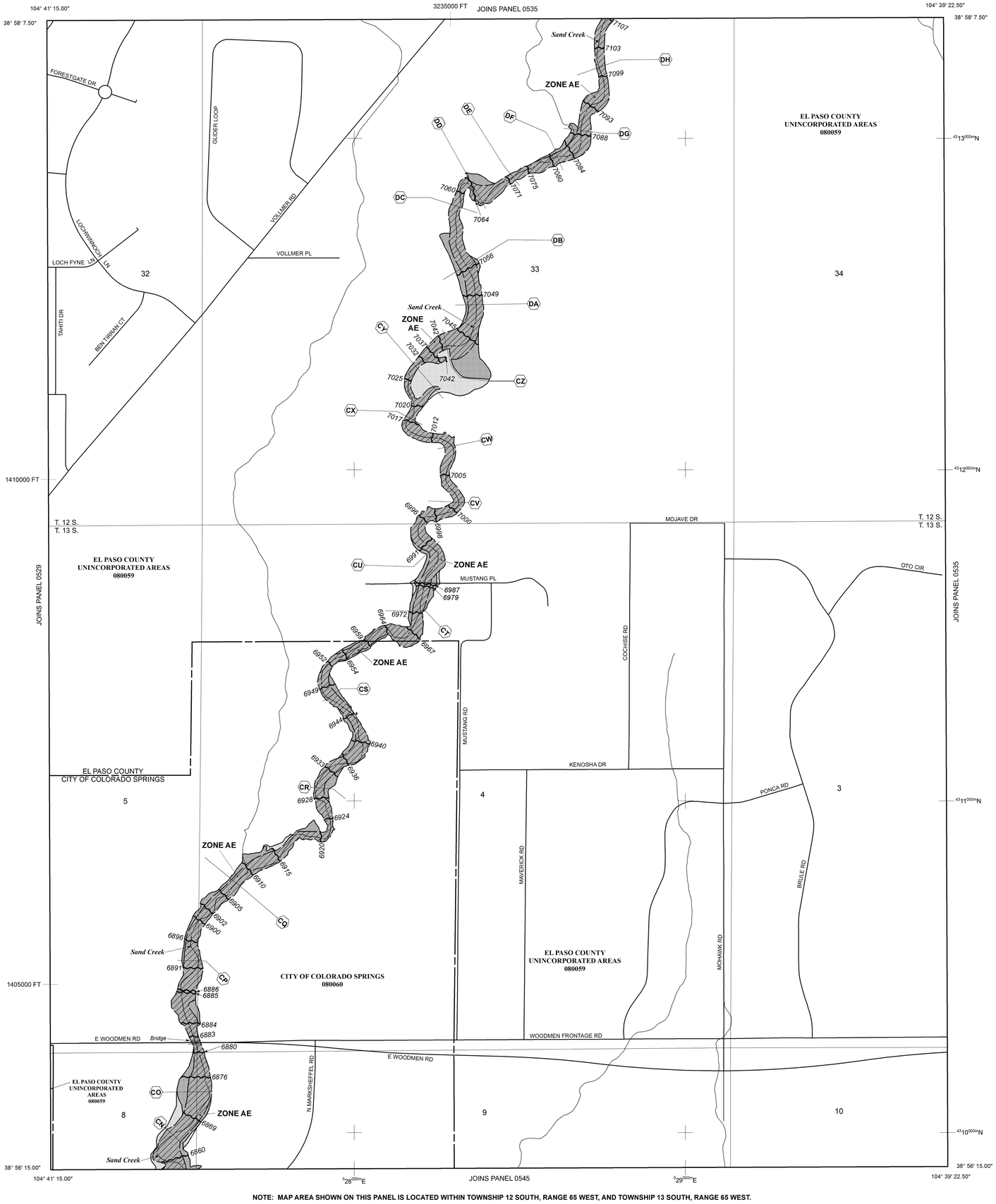

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

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

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

A — A	Cross section line
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MARCH 17, 1997

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0533G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 533 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0533	G
EL PASO COUNTY	080059	0533	G

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MAP NUMBER
08041C0533G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

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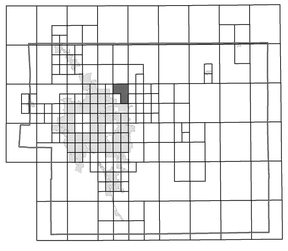

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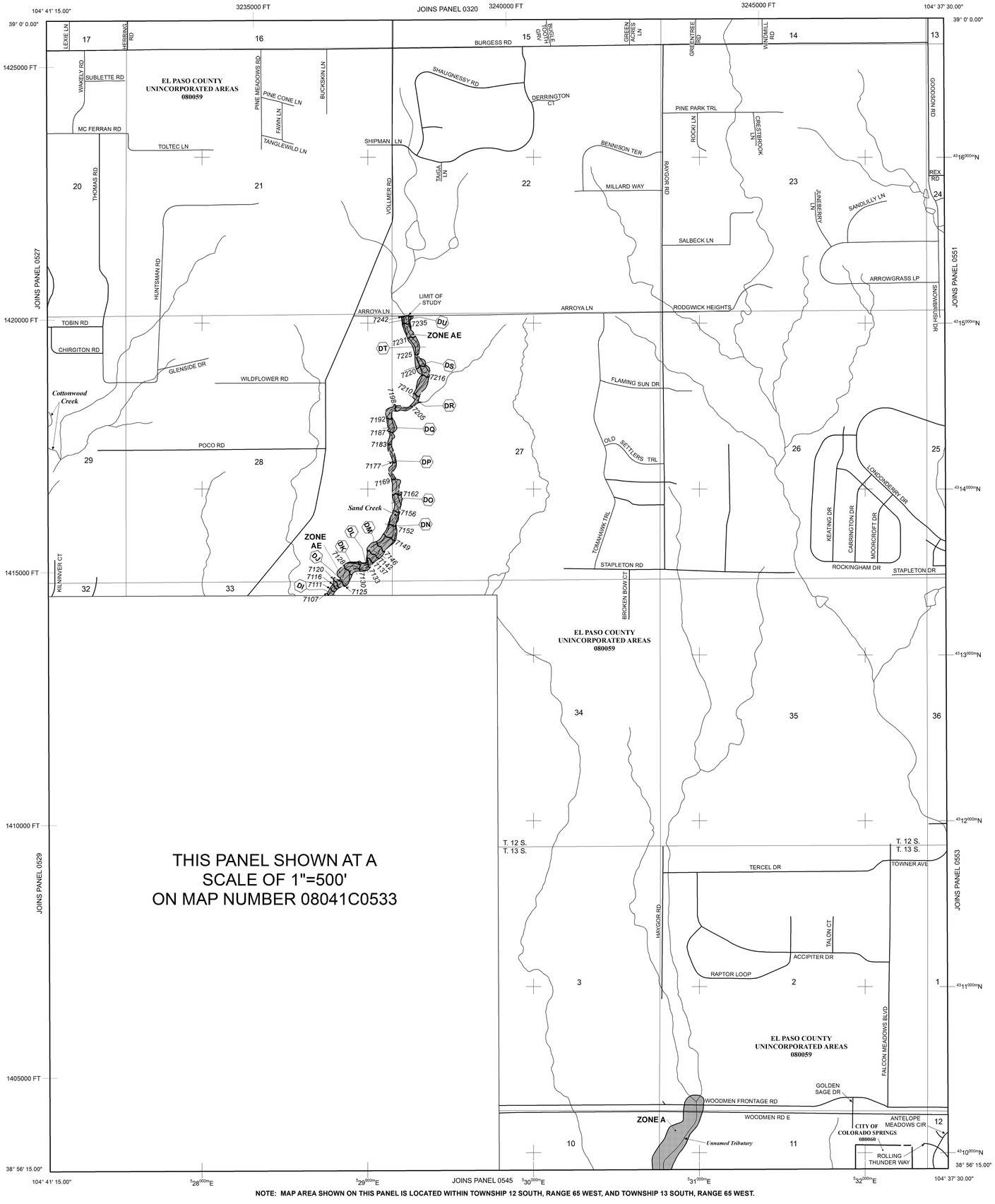

THIS PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08041C0533

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

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MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
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500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0535G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 535 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
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EL PASO COUNTY	080059	0535	G

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MAP NUMBER 08041C0535G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

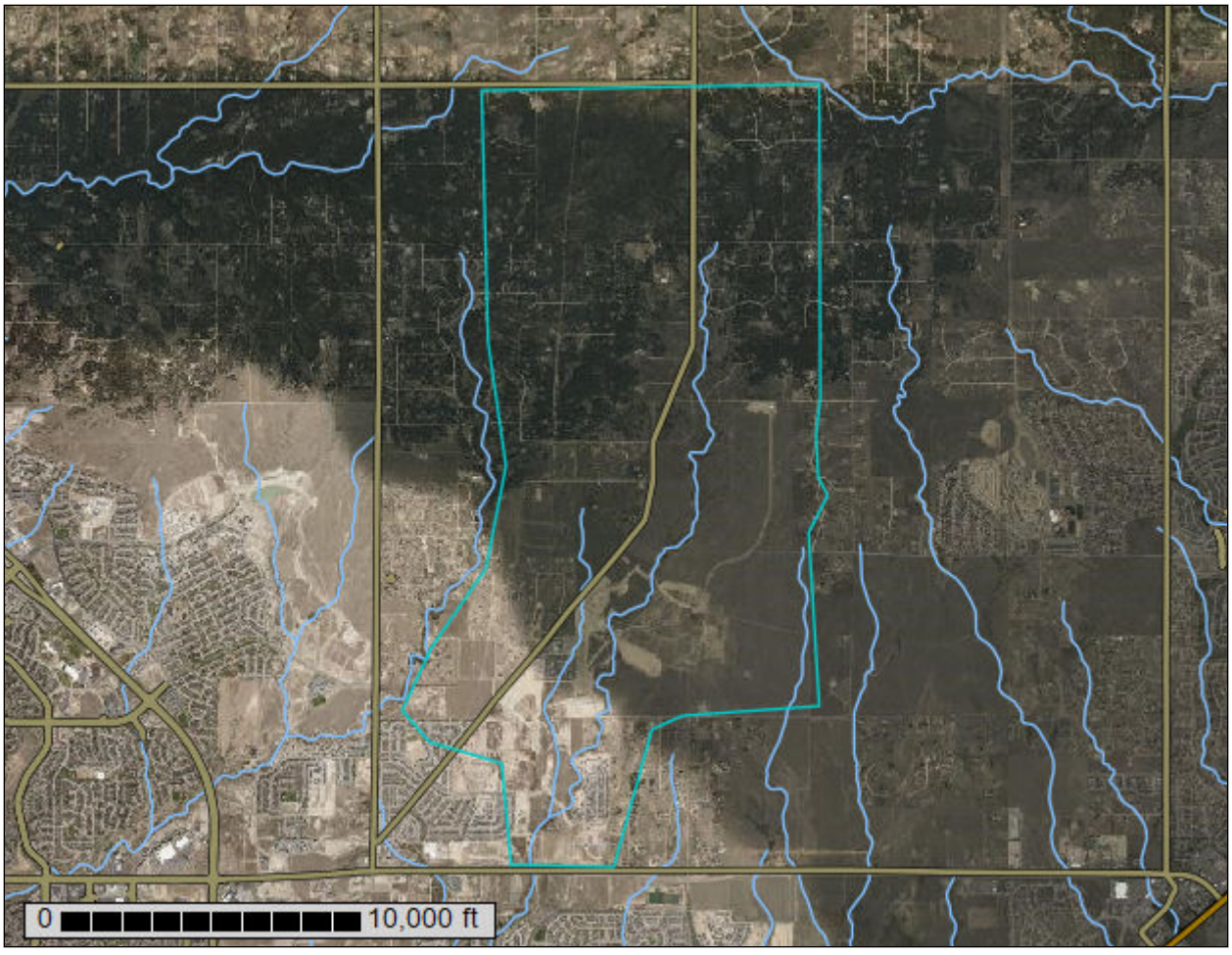
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

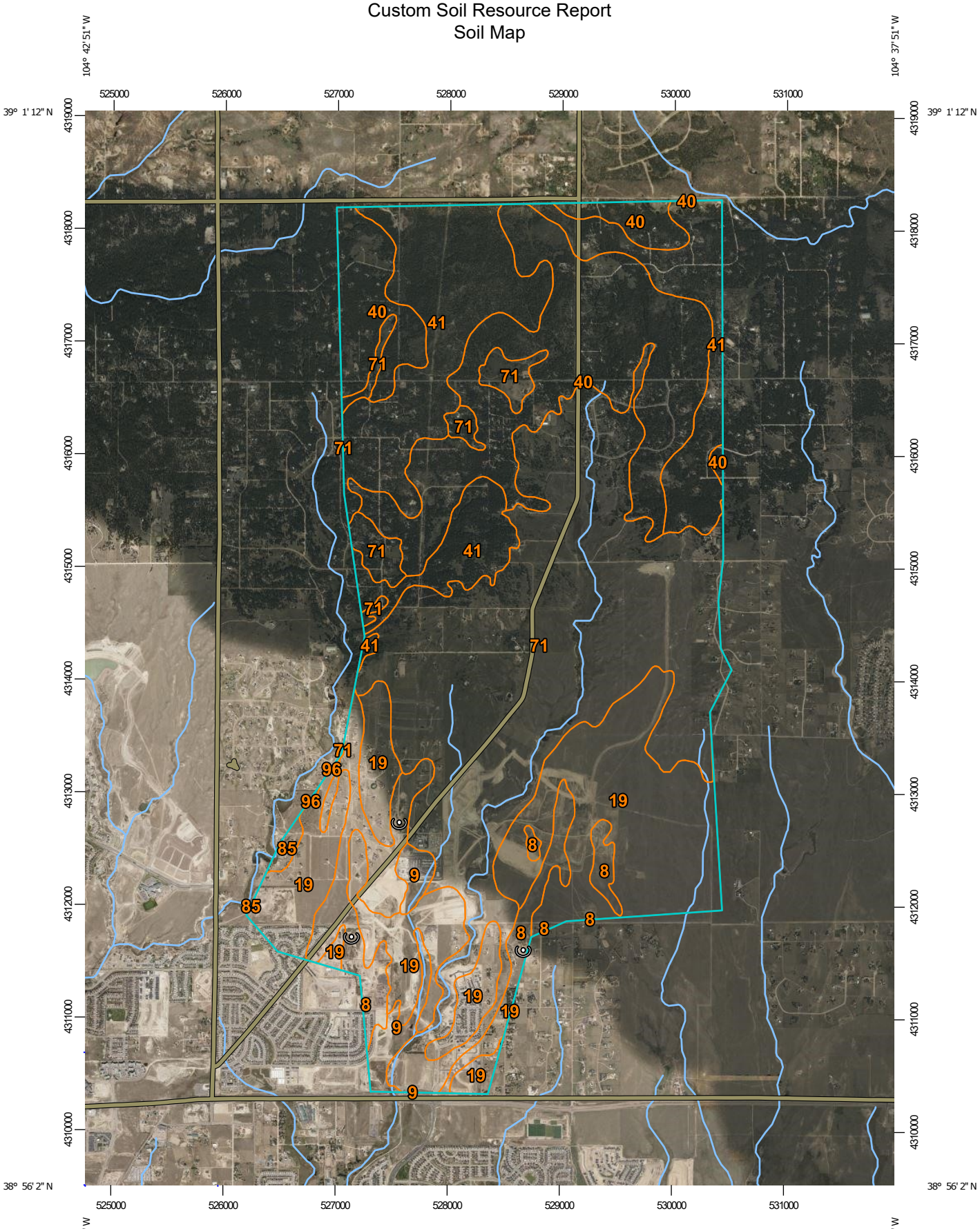
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado



January 24, 2022

Custom Soil Resource Report
Soil Map



Map Scale: 1:46,500 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 2000 4000 8000 12000

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	385.1	6.4%
9	Blakeland-Fluvaquentic Haplaquolls	91.2	1.5%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	1,196.8	19.9%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	1,190.9	19.8%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	1,028.9	17.1%
71	Pring coarse sandy loam, 3 to 8 percent slopes	2,108.3	35.0%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	16.9	0.3%
96	Truckton sandy loam, 0 to 3 percent slopes	2.2	0.0%
Totals for Area of Interest		**6,020.4**	**100.0%**

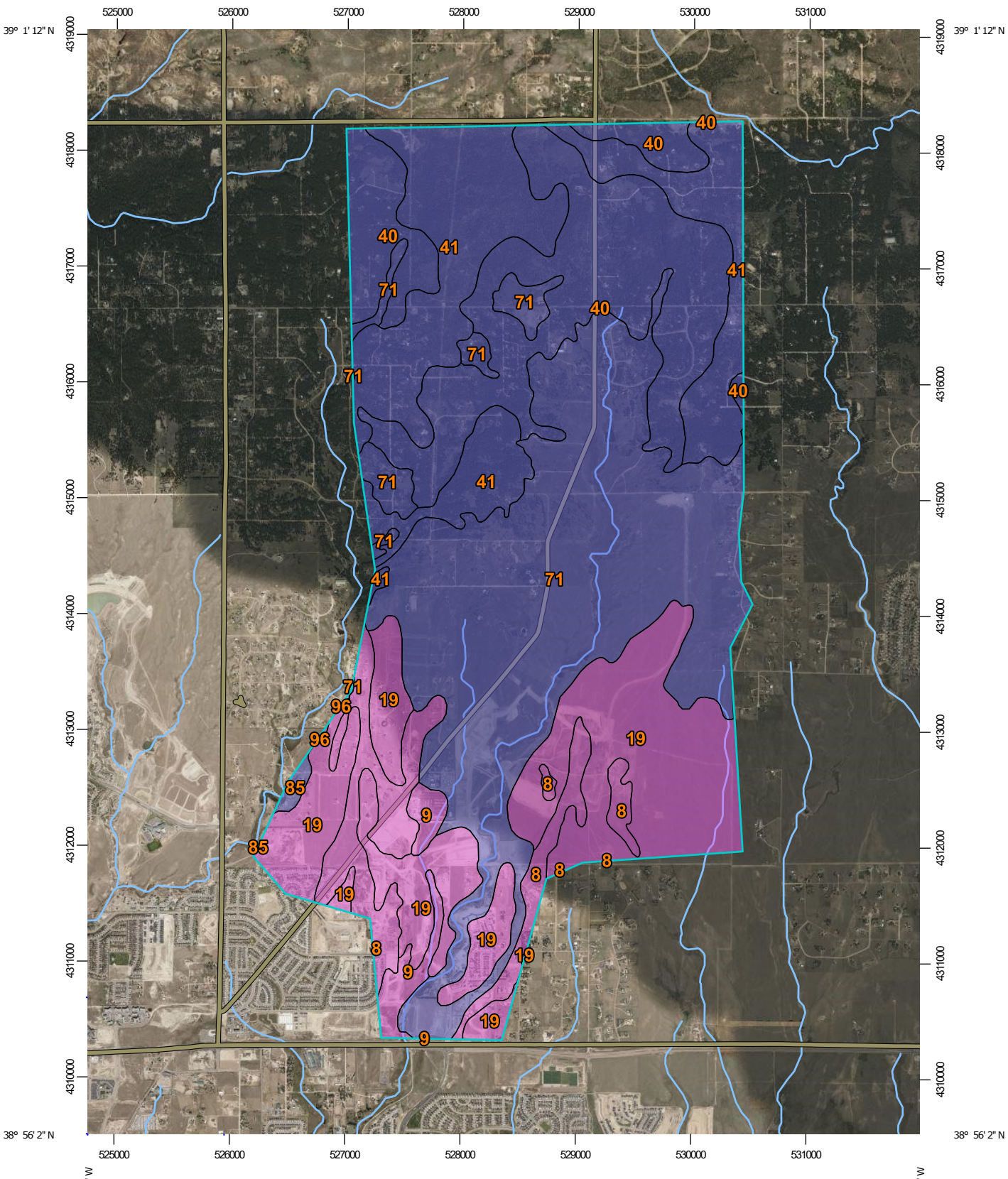
Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:46,500 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 2000 4000 8000 12000

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

Table—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	385.1	6.4%
9	Blakeland-Fluvaquentic Haplaquolls	A	91.2	1.5%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	1,196.8	19.9%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	B	1,190.9	19.8%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	1,028.9	17.1%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	2,108.3	35.0%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	B	16.9	0.3%
96	Truckton sandy loam, 0 to 3 percent slopes	A	2.2	0.0%
Totals for Area of Interest			**6,020.4**	**100.0%**

Rating Options—Hydrologic Soil Group

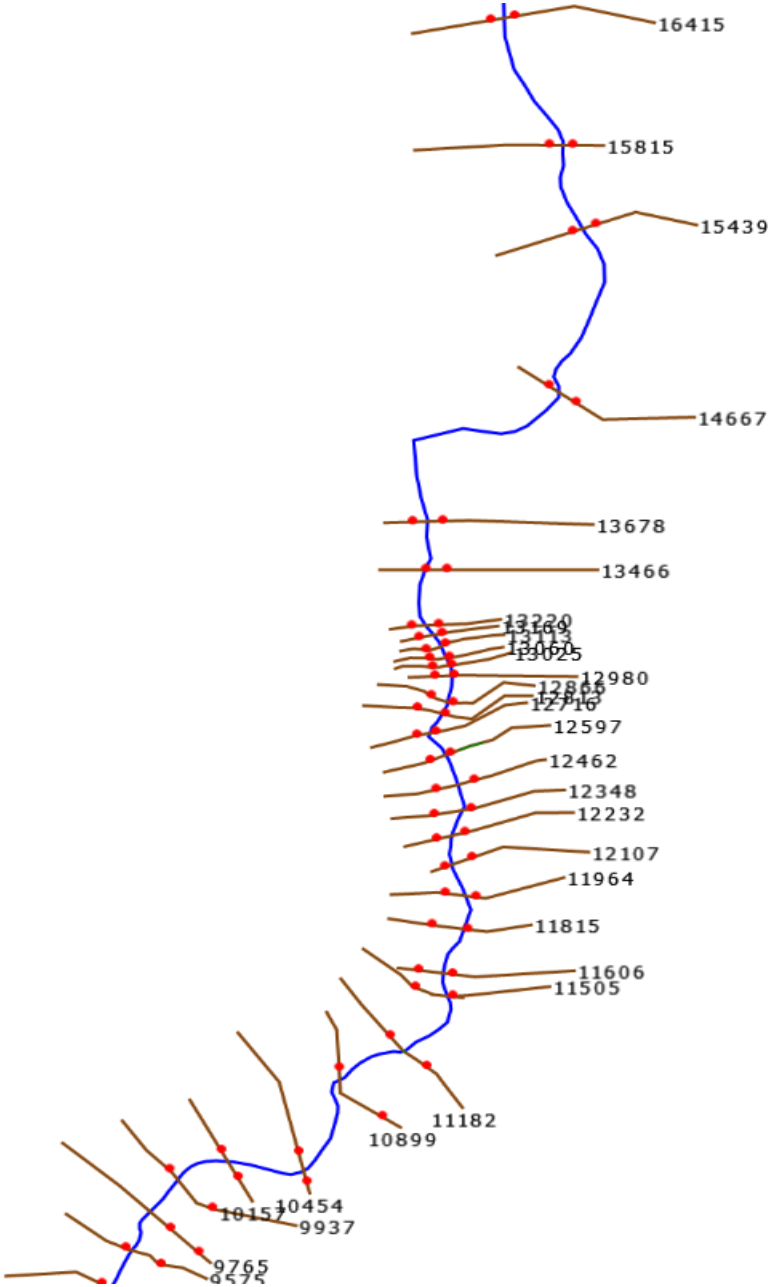
Aggregation Method: Dominant Condition

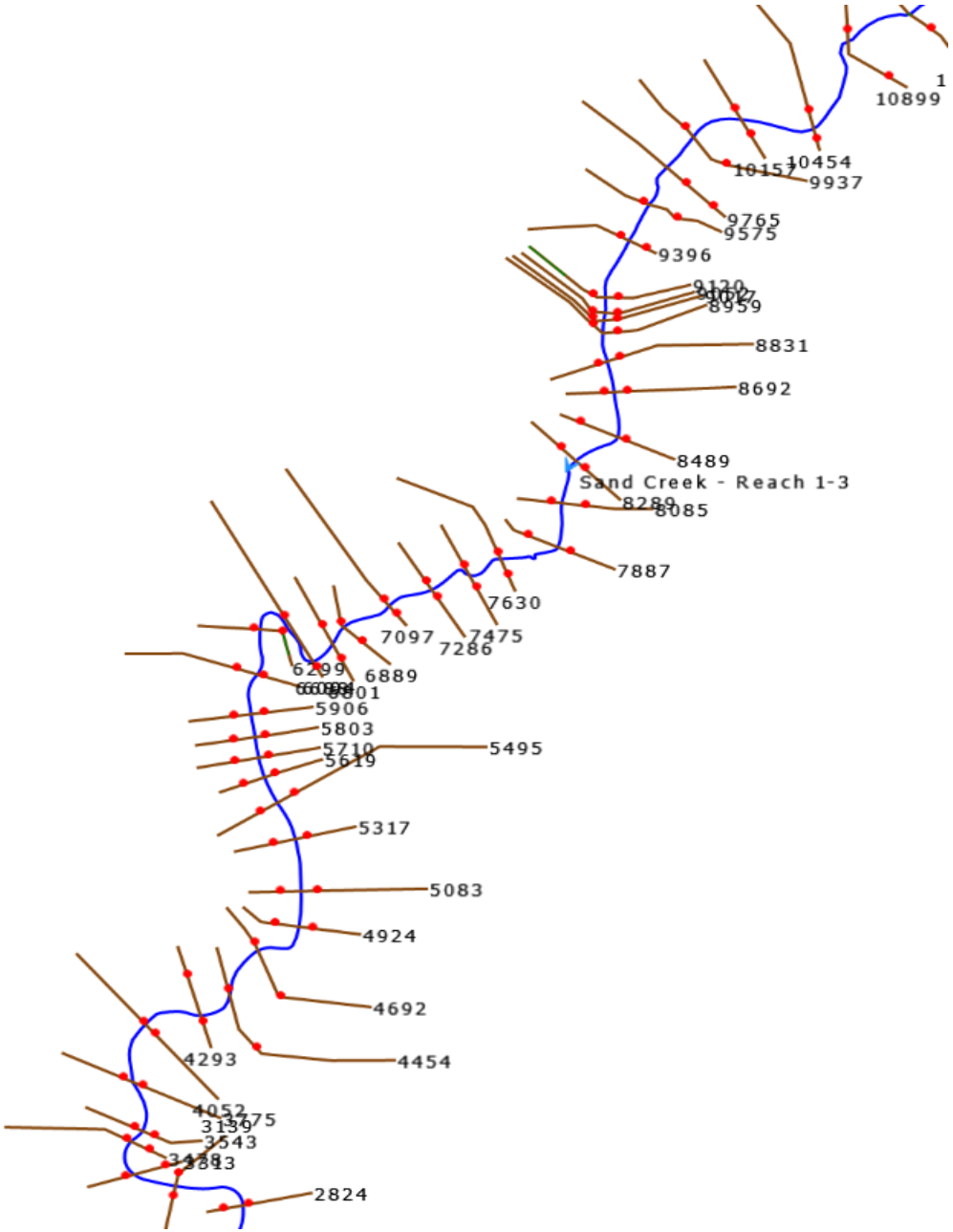
Component Percent Cutoff: None Specified

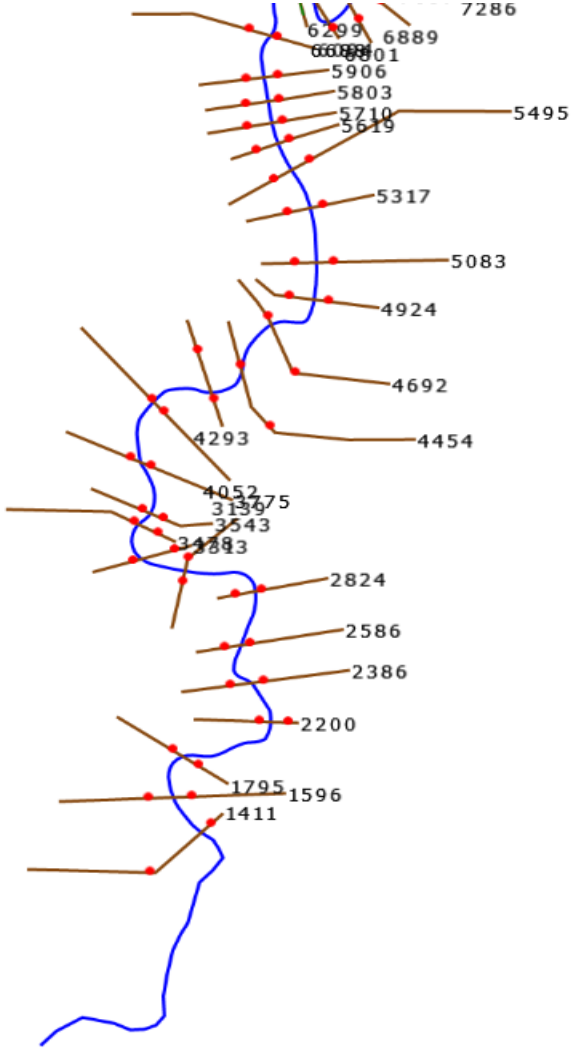
Tie-break Rule: Higher

Appendix B

Existing Conditions Hydraulic Modeling

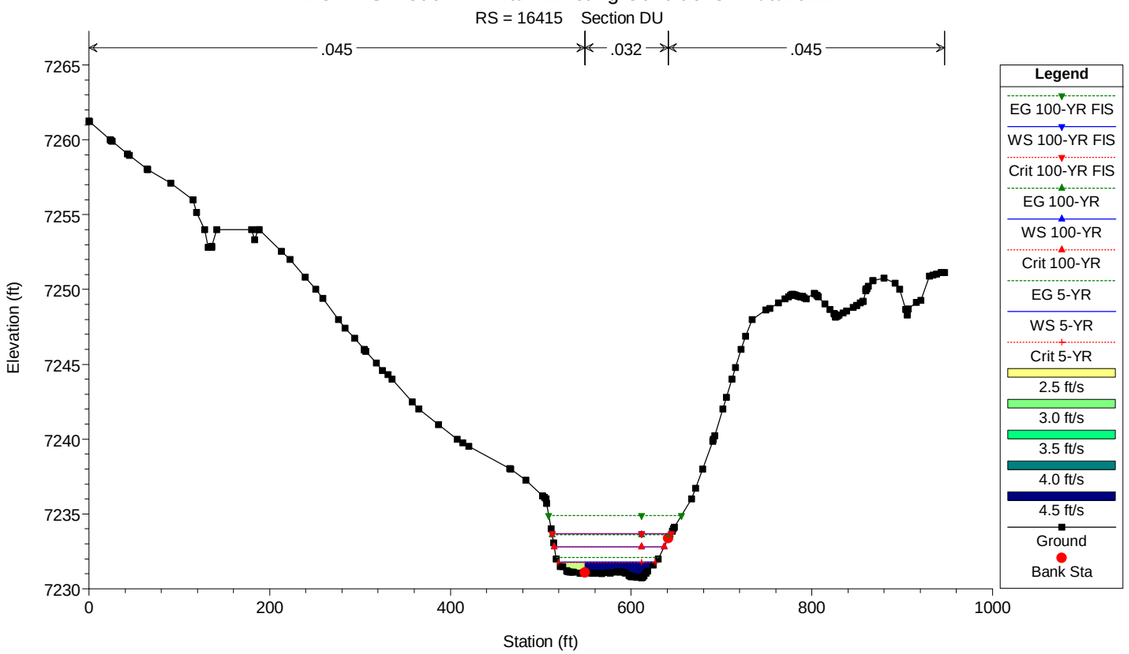






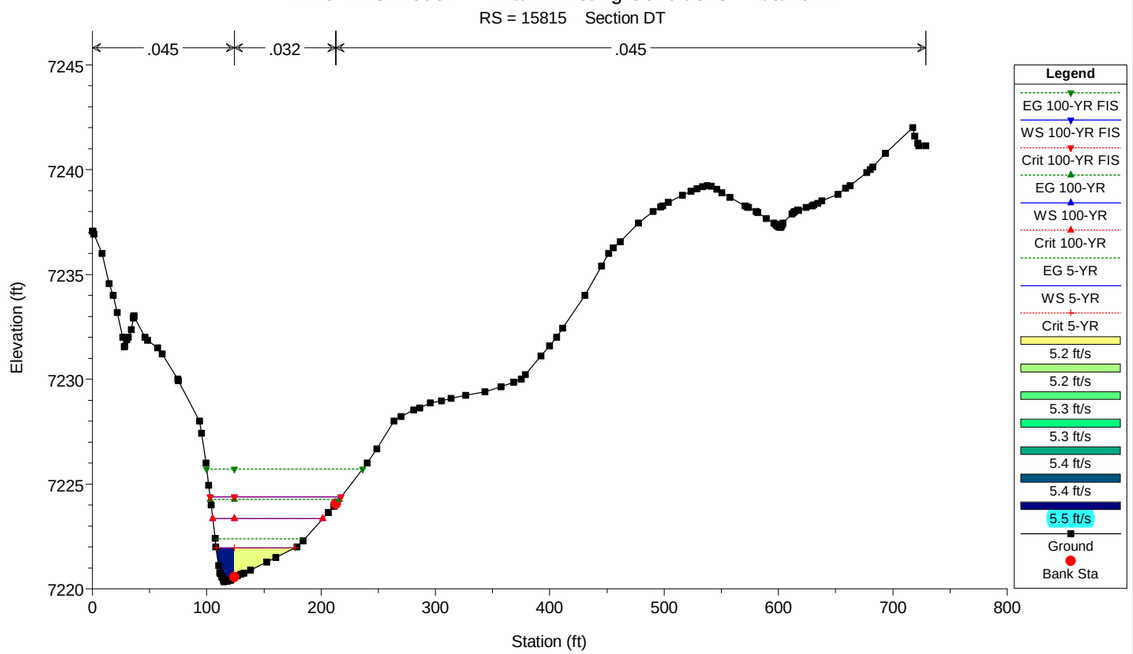
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 16415 Section DU



HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 15815 Section DT



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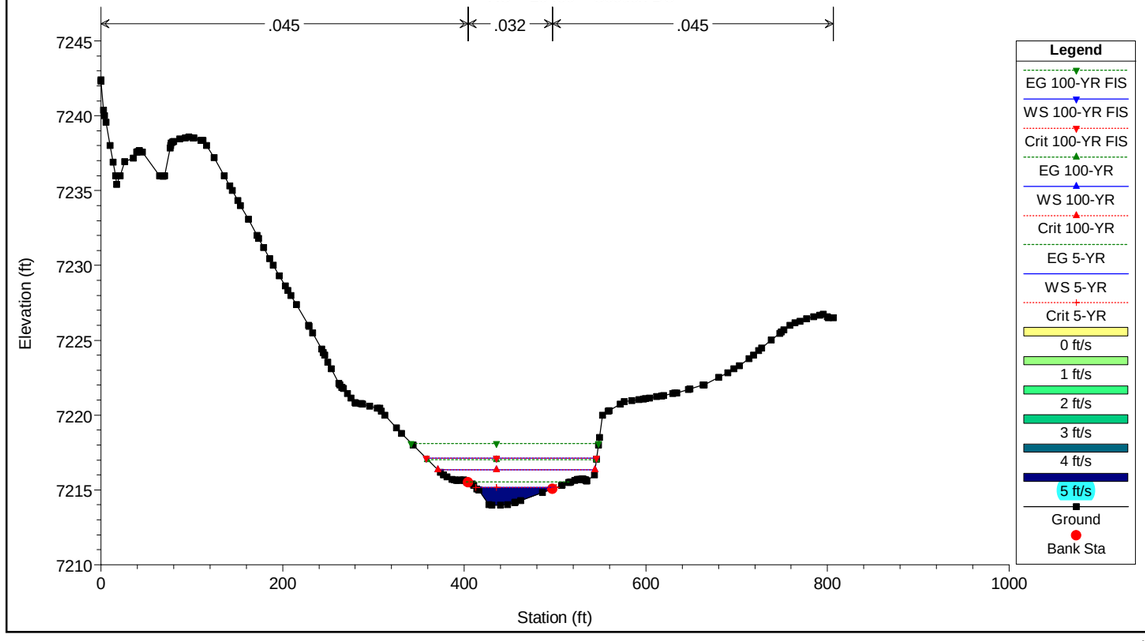

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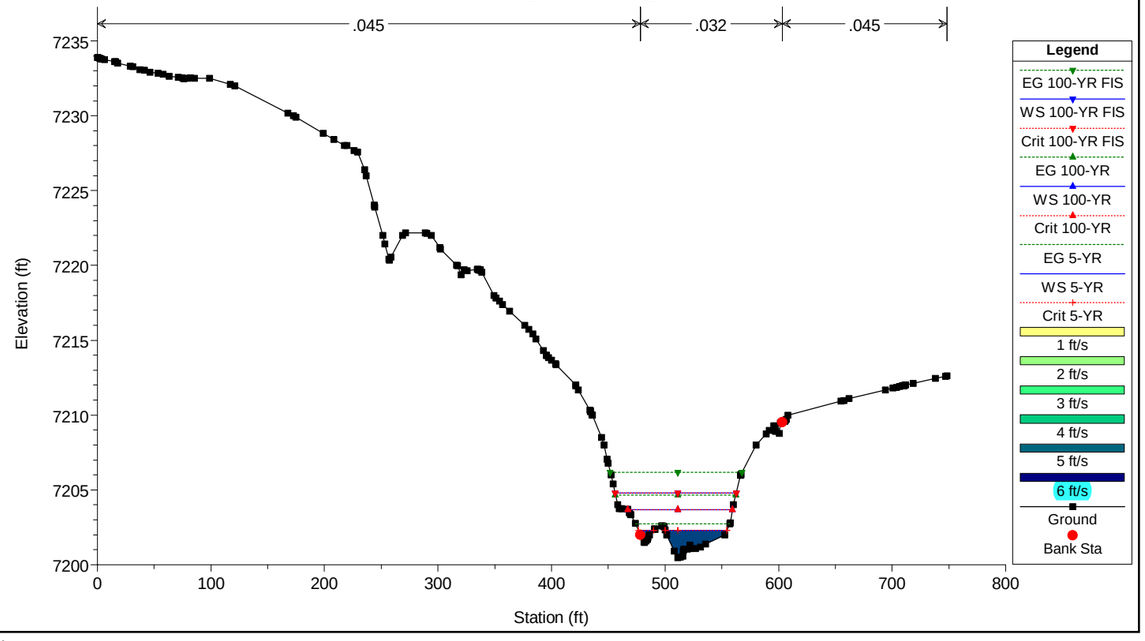
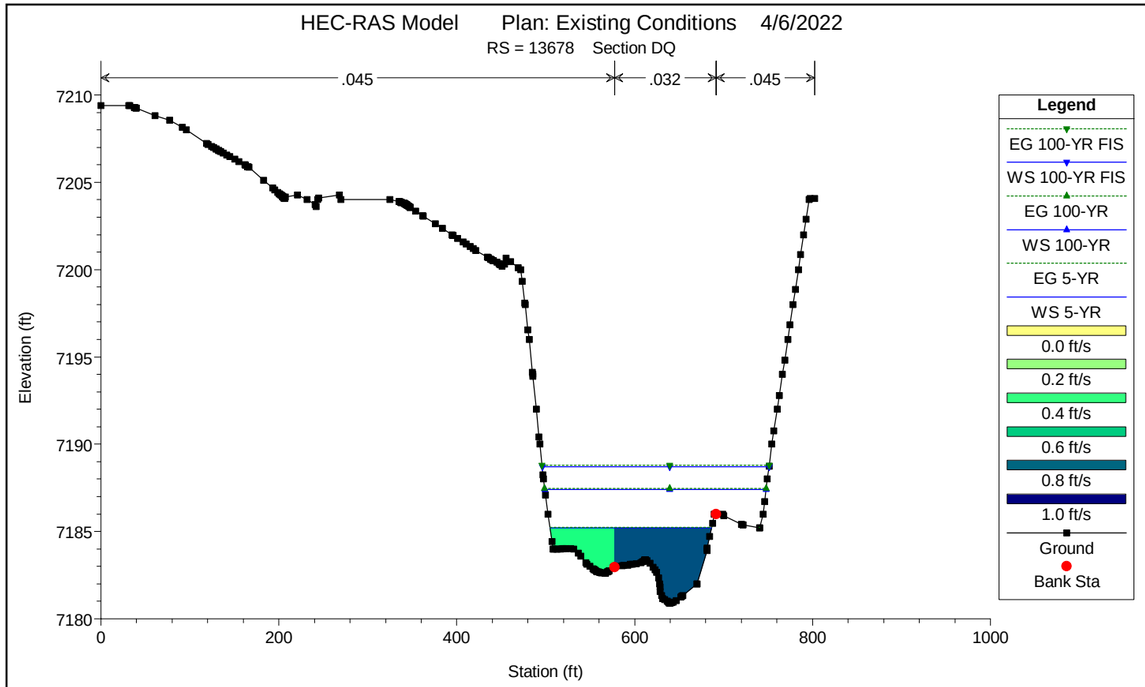
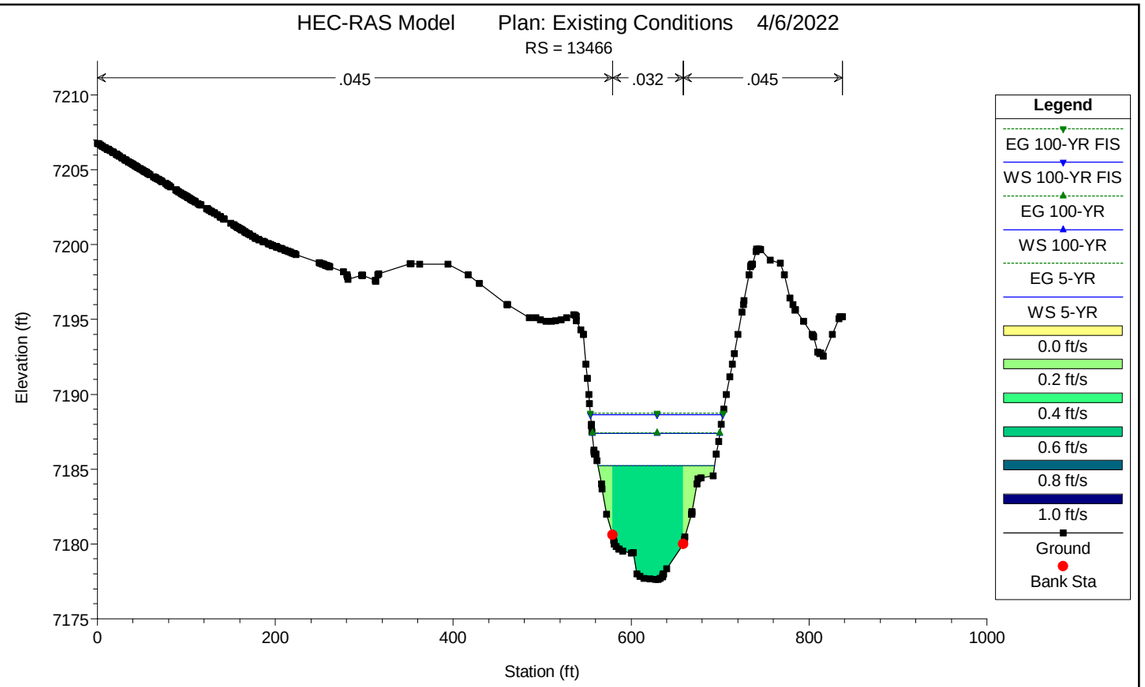



HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 13678 Section DQ
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
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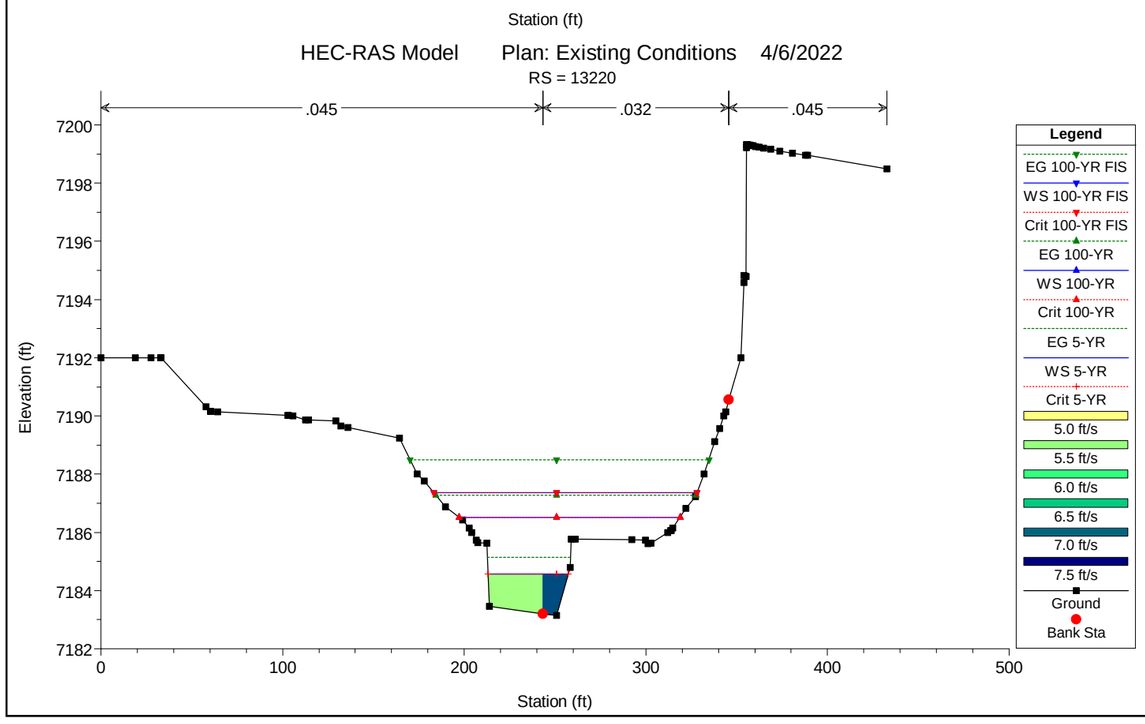
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
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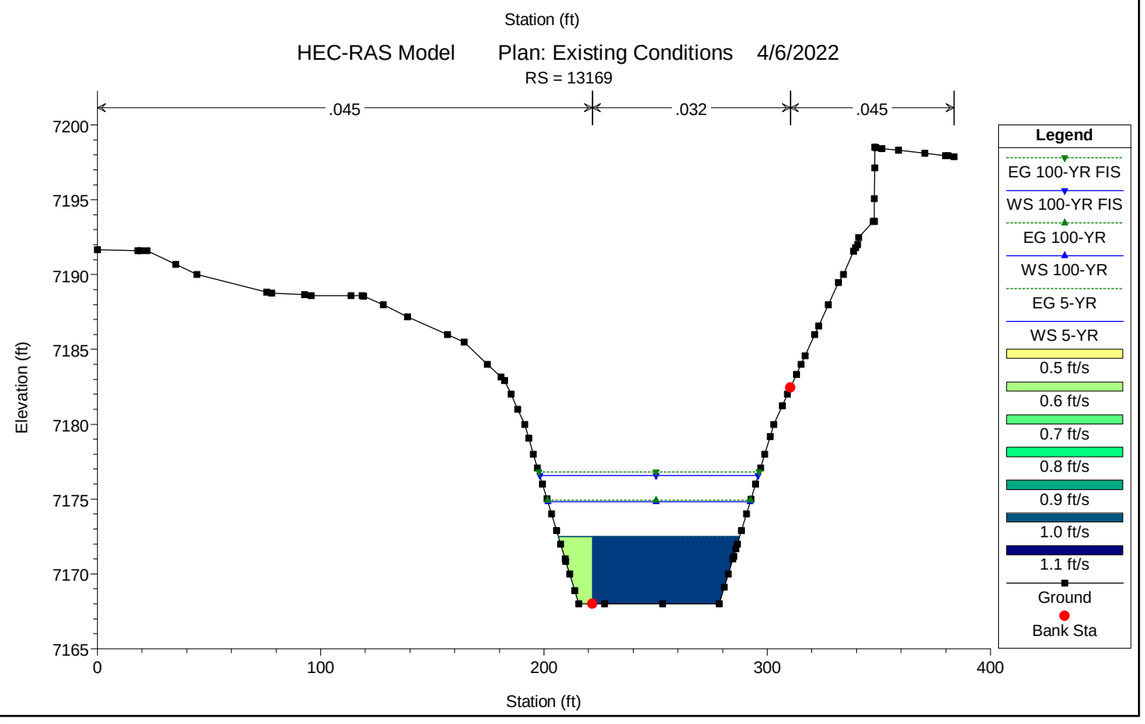
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
5.0 ft/s
5.5 ft/s
6.0 ft/s
6.5 ft/s
7.0 ft/s
7.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
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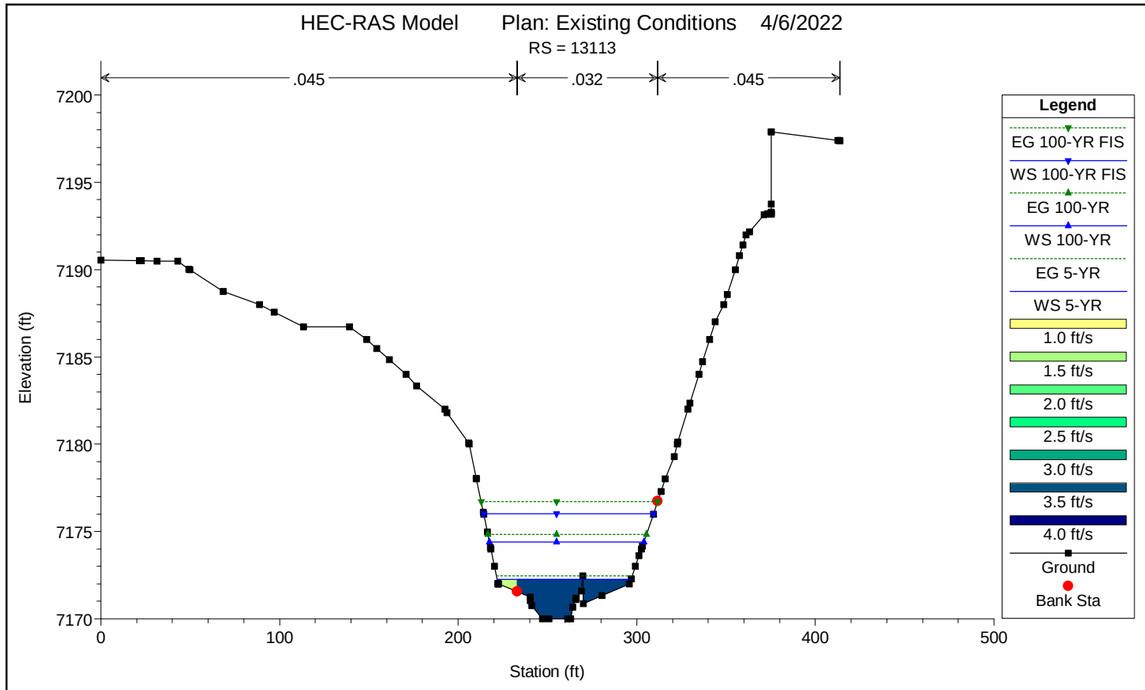
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
0.5 ft/s
0.6 ft/s
0.7 ft/s
0.8 ft/s
0.9 ft/s
1.0 ft/s
1.1 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
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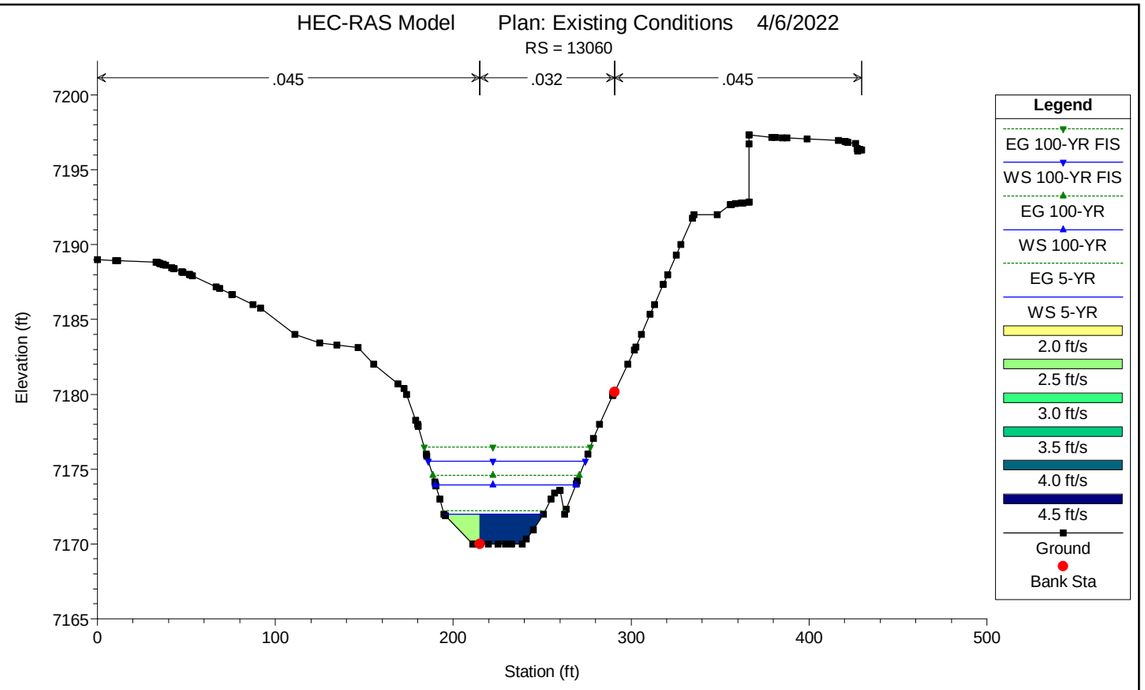
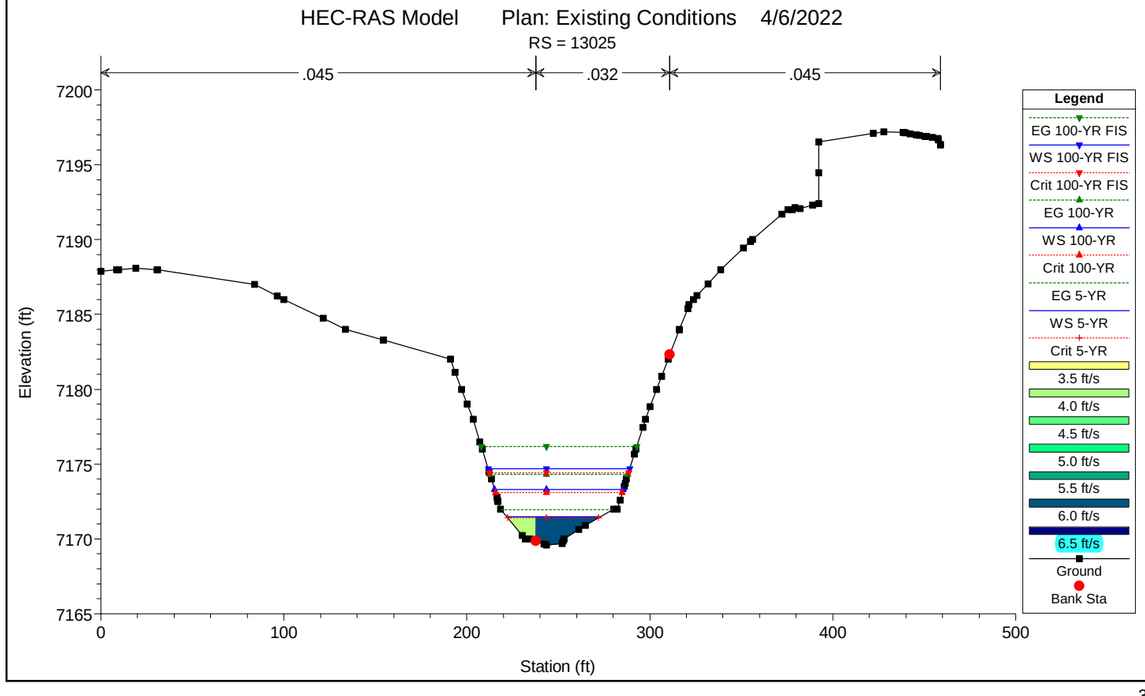
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 13060
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
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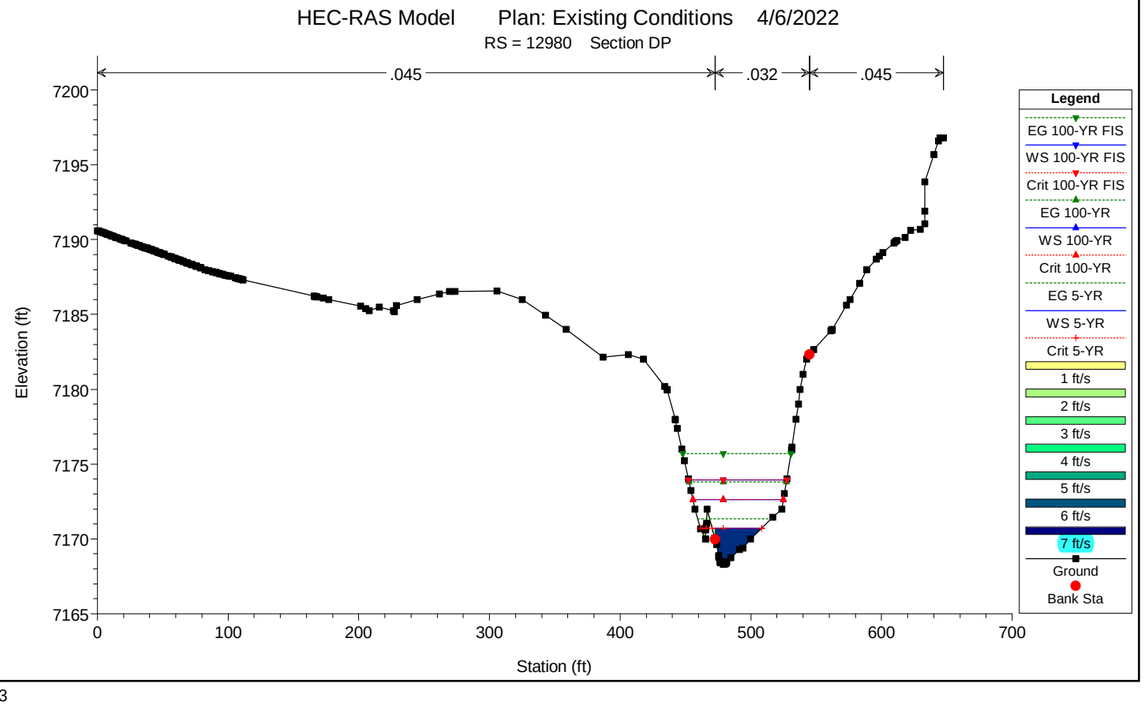
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
3.5 ft/s
4.0 ft/s
4.5 ft/s
5.0 ft/s
5.5 ft/s
6.0 ft/s
6.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
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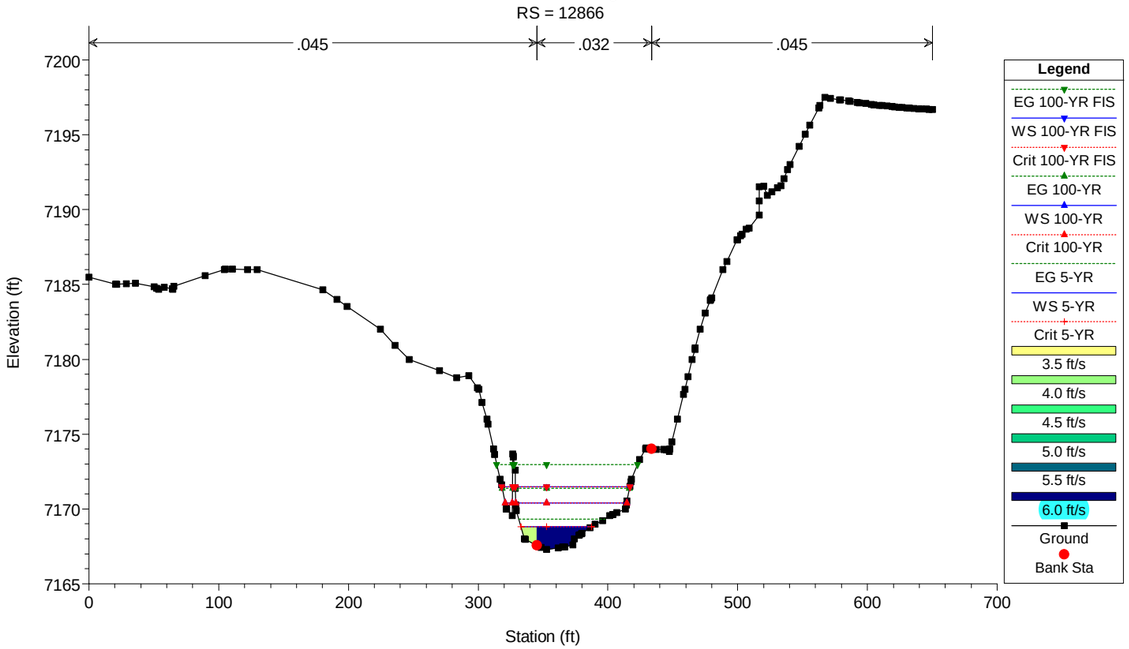
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 12866



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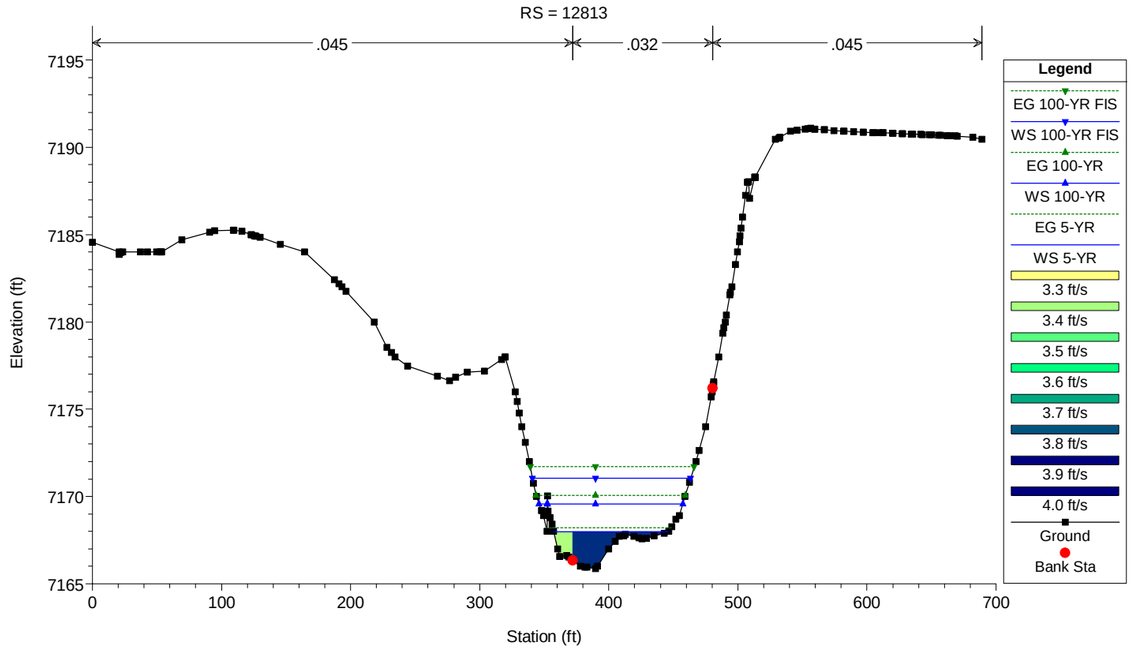
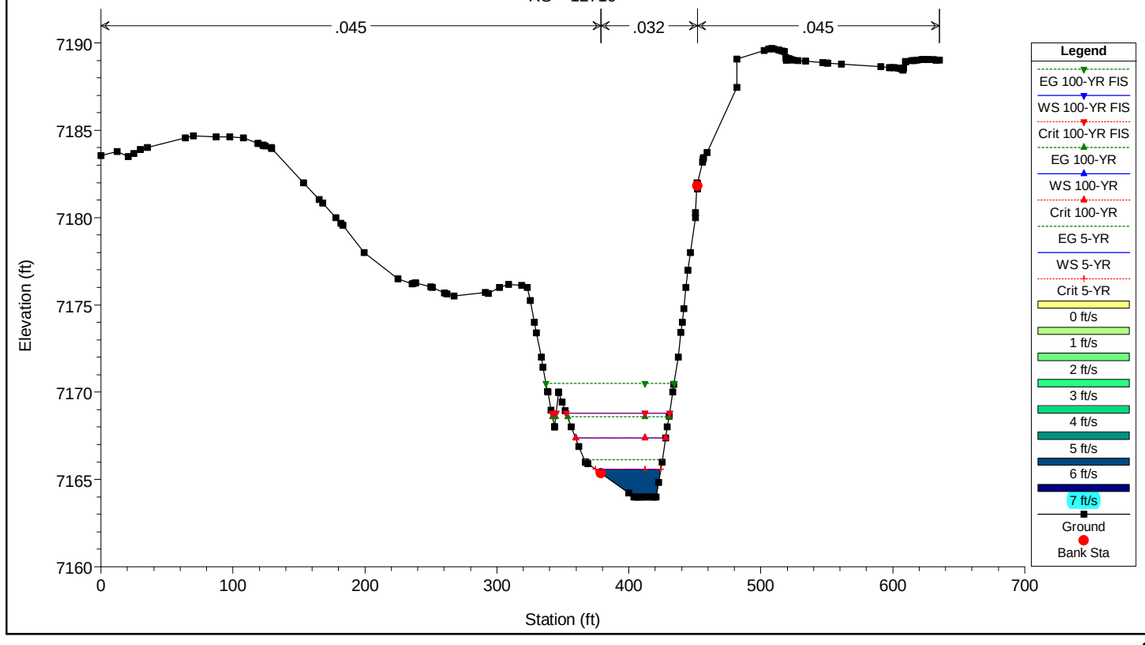
RS = 12813



HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 12716



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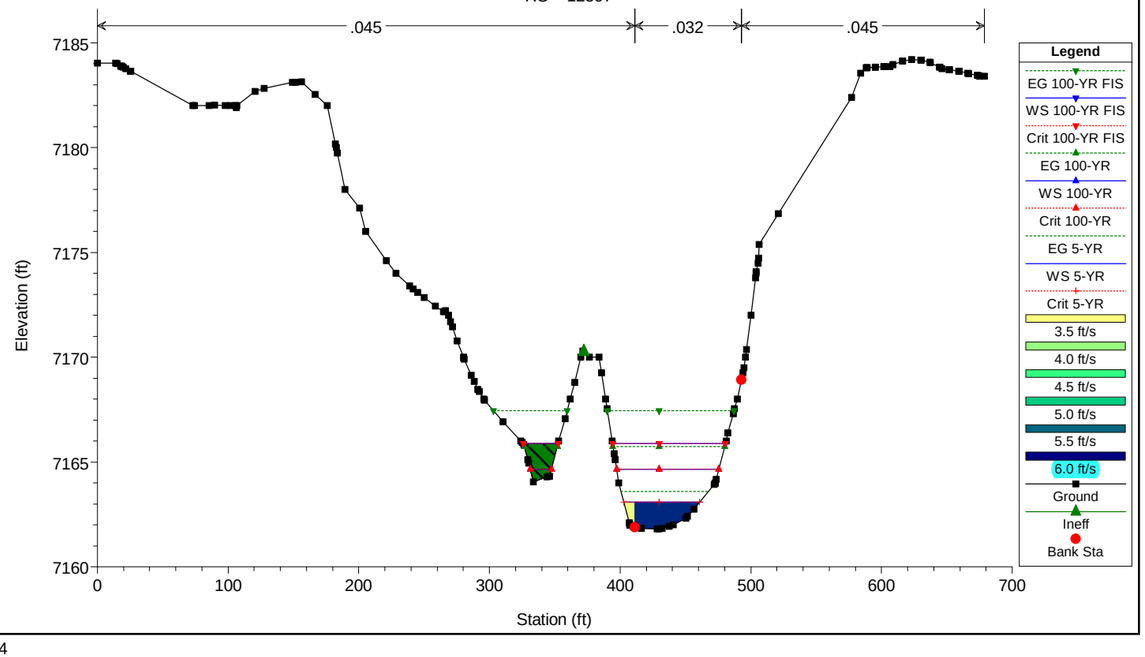

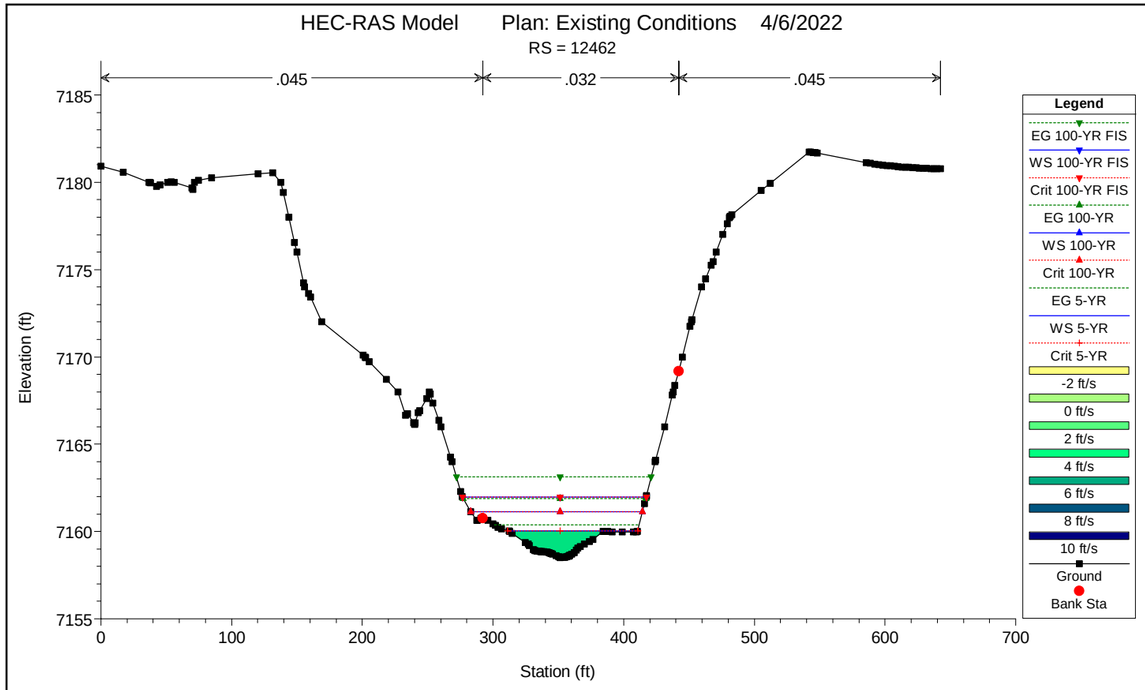
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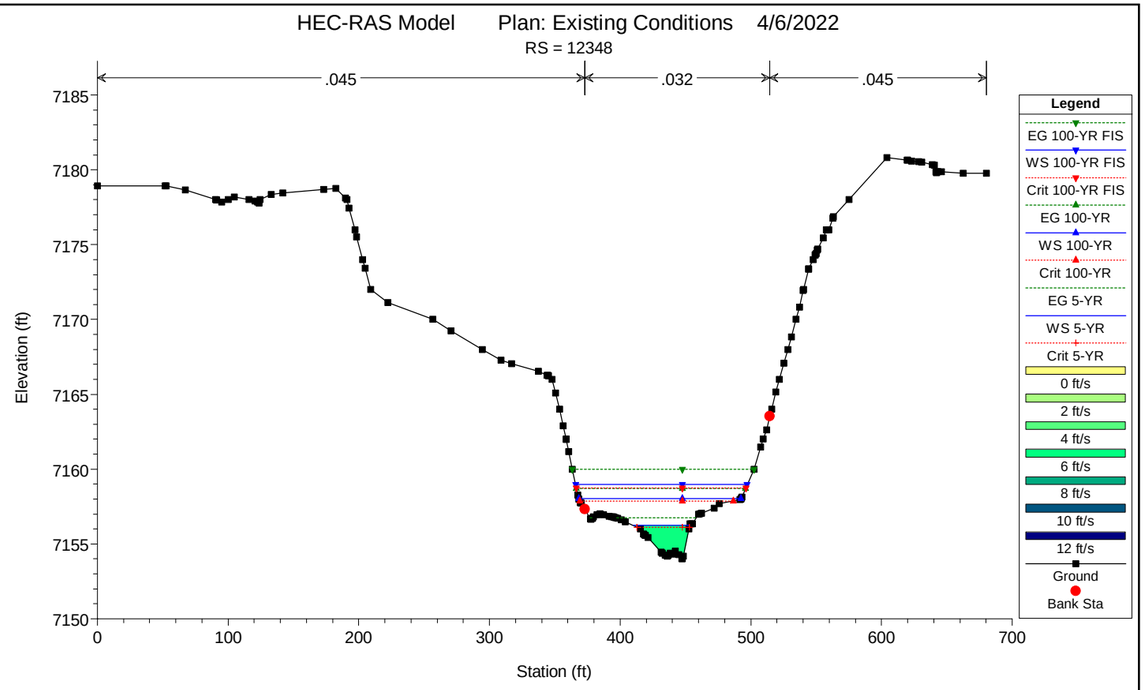
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta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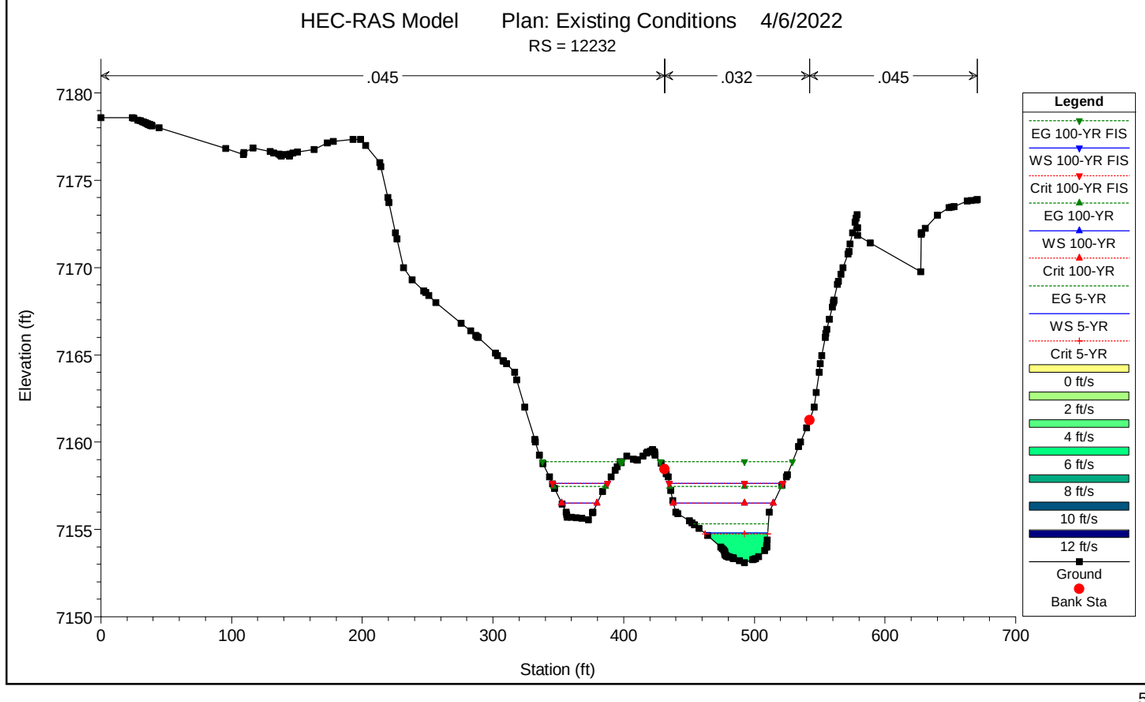
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta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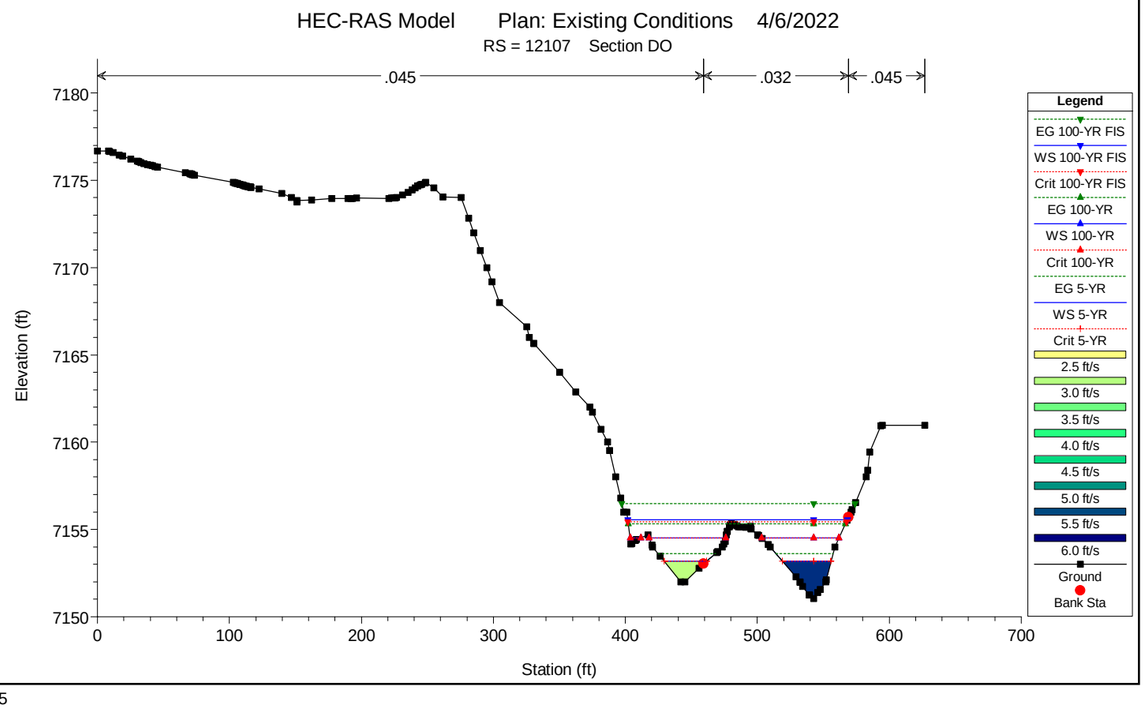
RS = 12232
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 12107 Section DO
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
5.0 ft/s
5.5 ft/s
6.0 ft/s
Ground
Bank Sta

HEC-RAS Model Plan: Existing Conditions 4/6/2022

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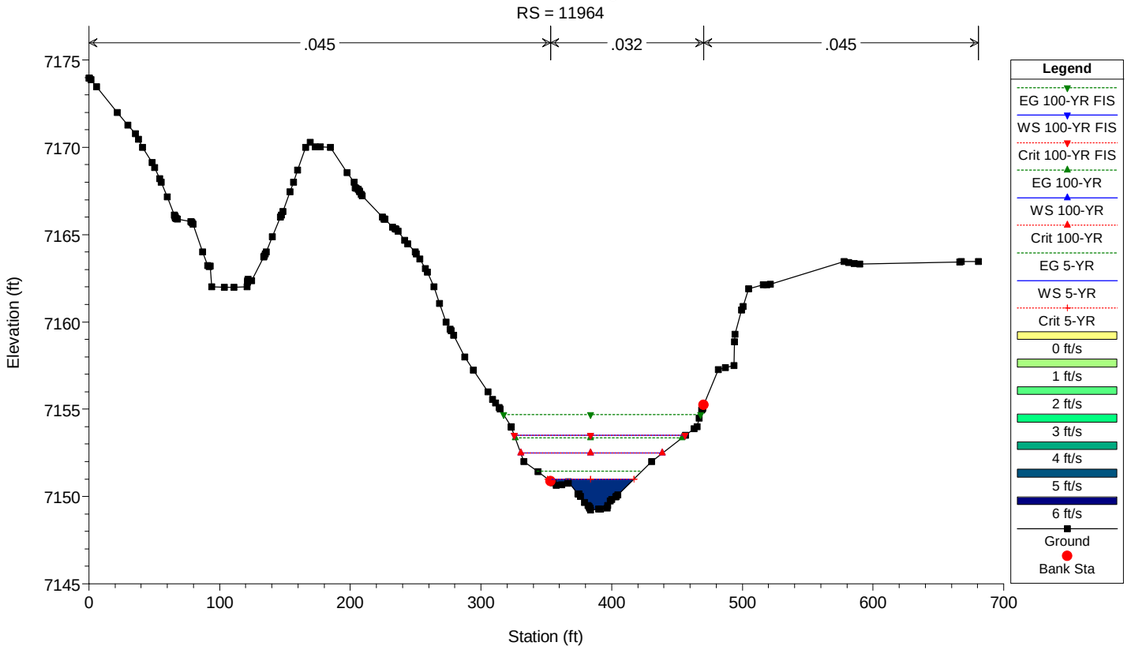

HEC-RAS Model Plan: Existing Conditions 4/6/2022

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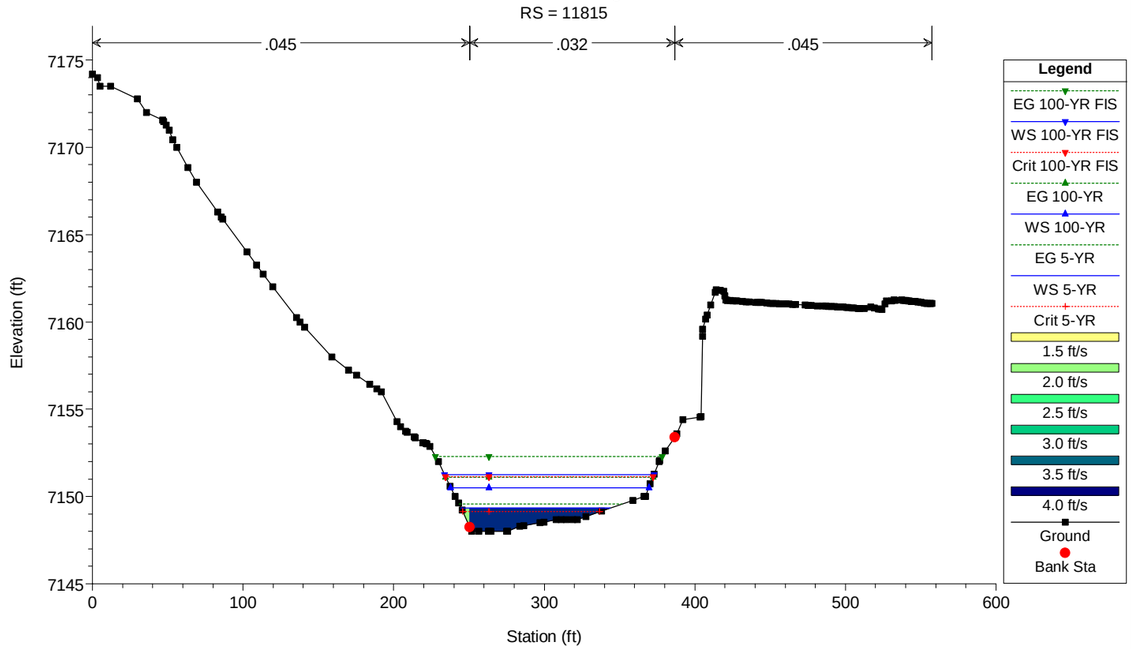
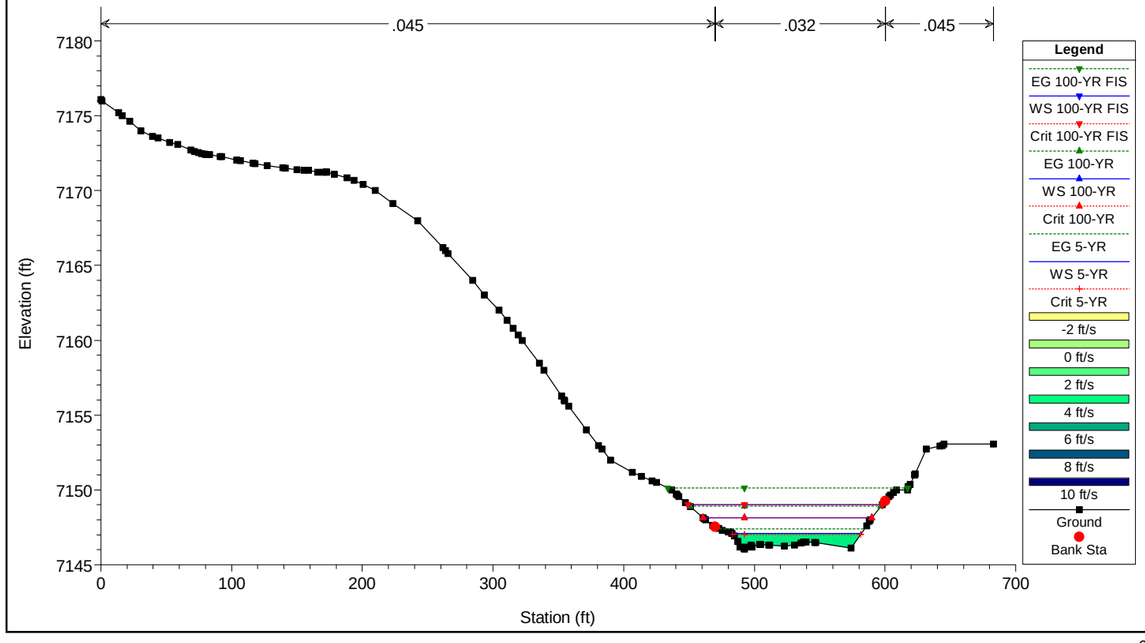


HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 11606 Section DN



HEC-RAS Model Plan: Existing Conditions 4/6/2022

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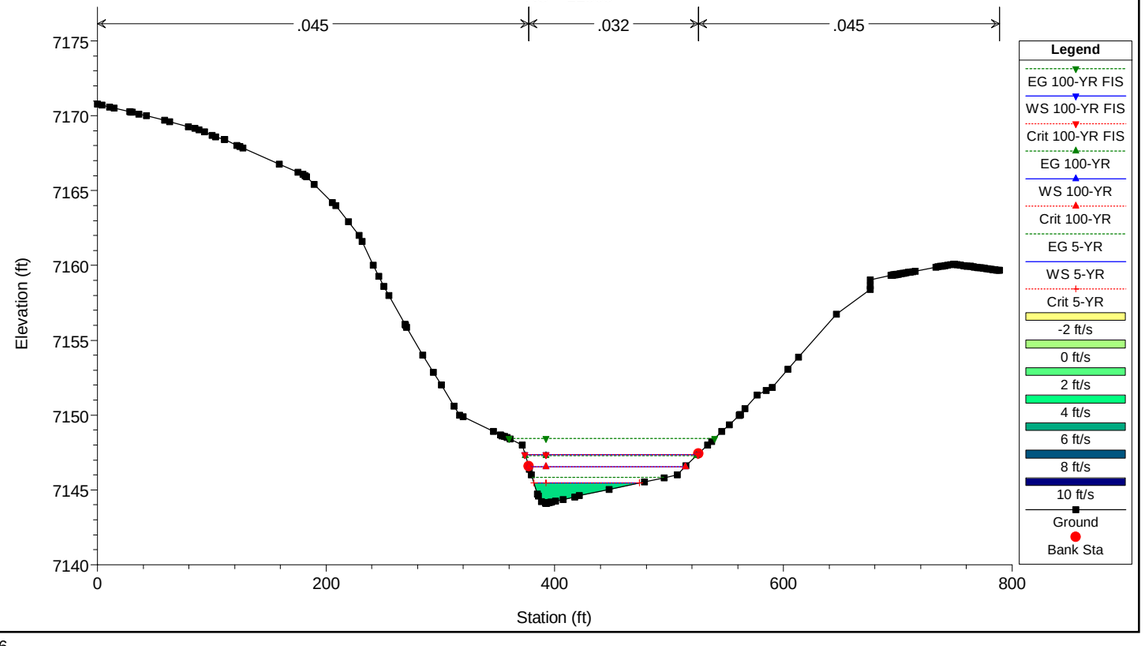

HEC-RAS Model Plan: Existing Conditions 4/6/2022

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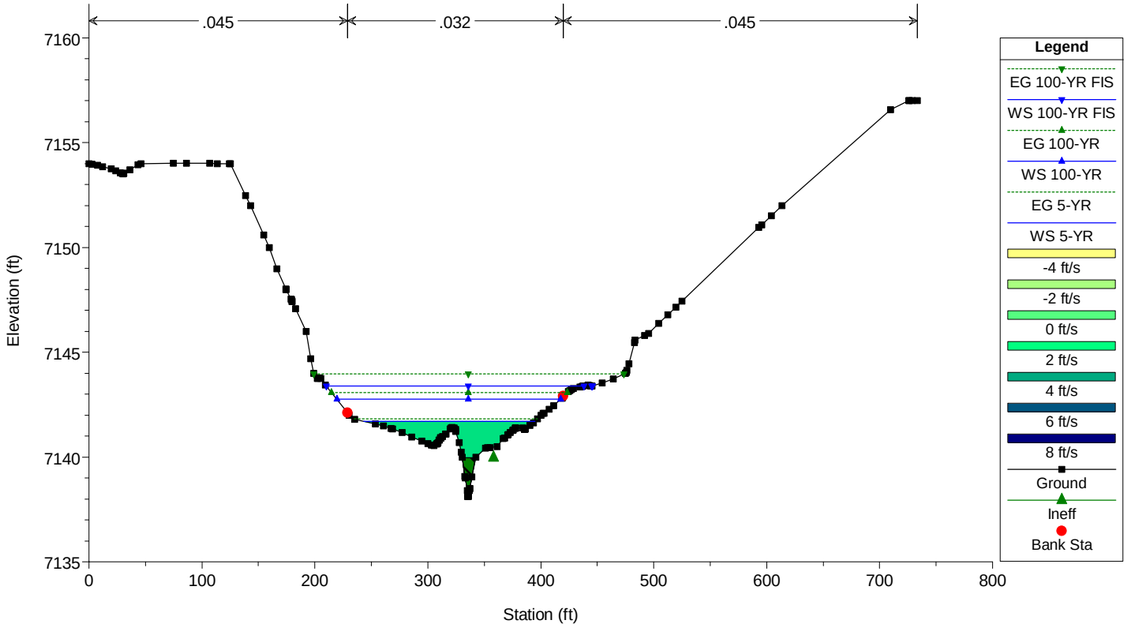

HEC-RAS Model Plan: Existing Conditions 4/6/2022

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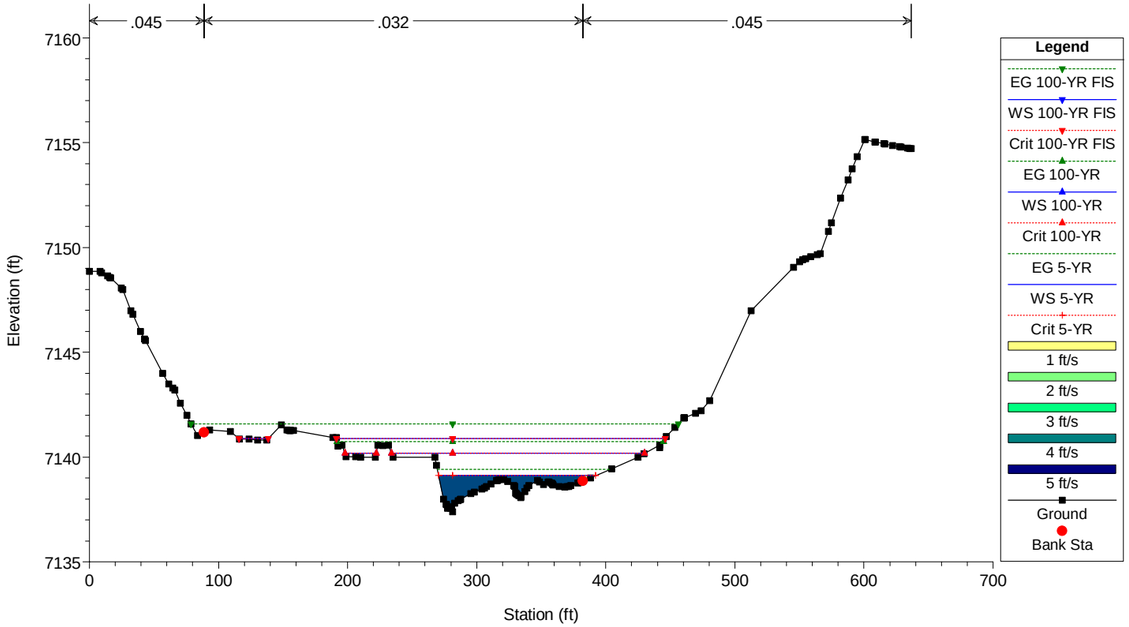

HEC-RAS Model Plan: Existing Conditions 4/6/2022

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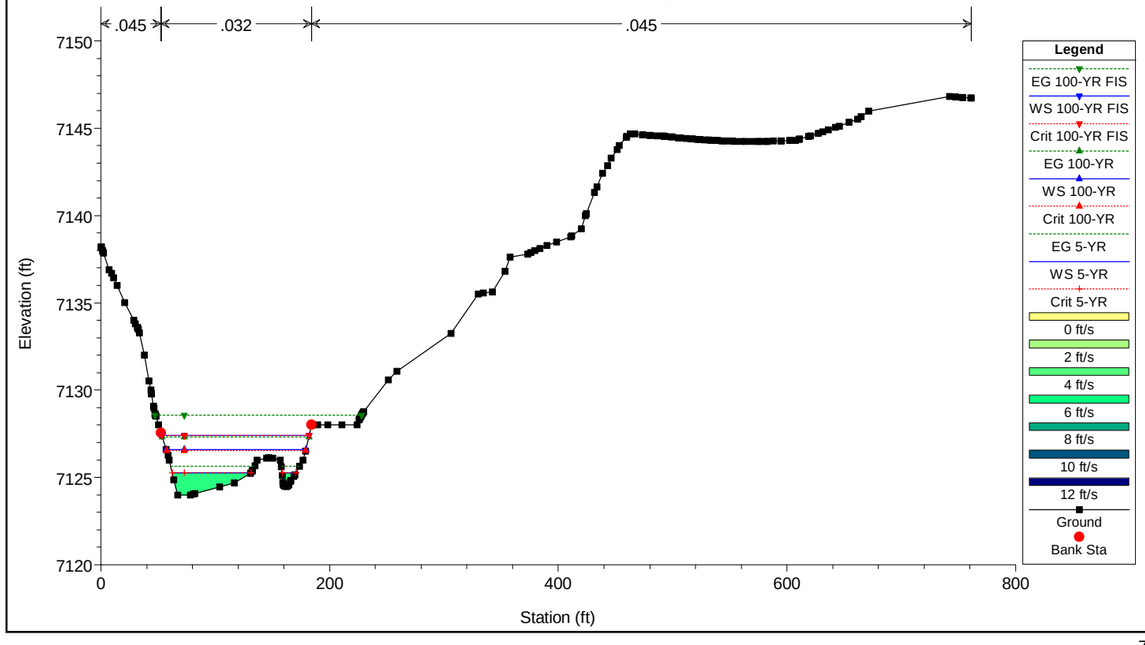

HEC-RAS Model Plan: Existing Conditions 4/6/2022

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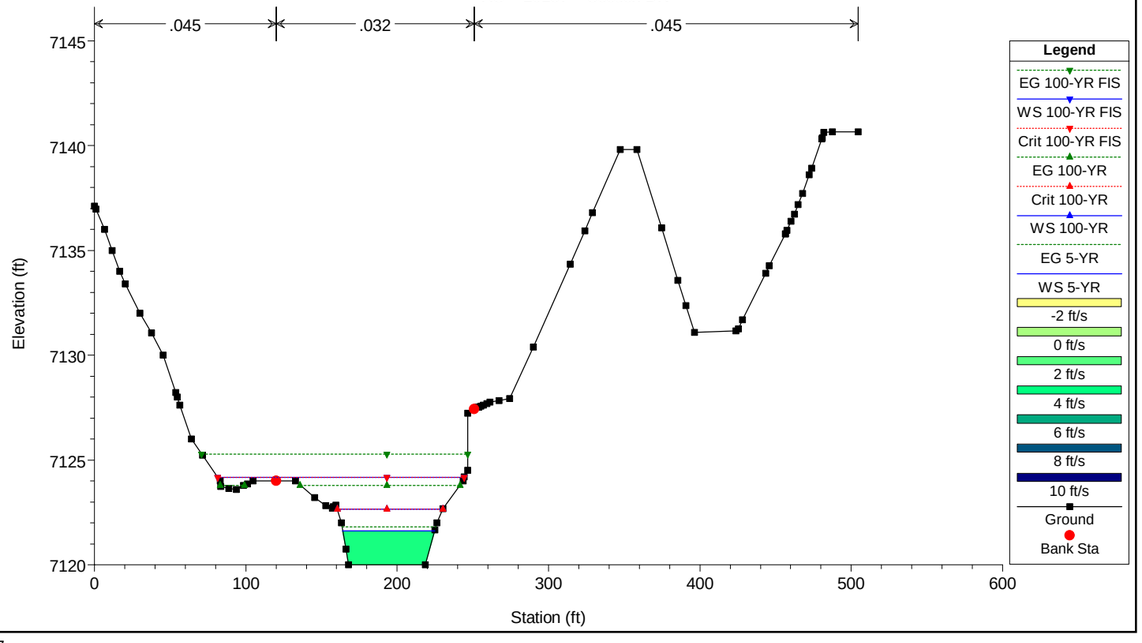
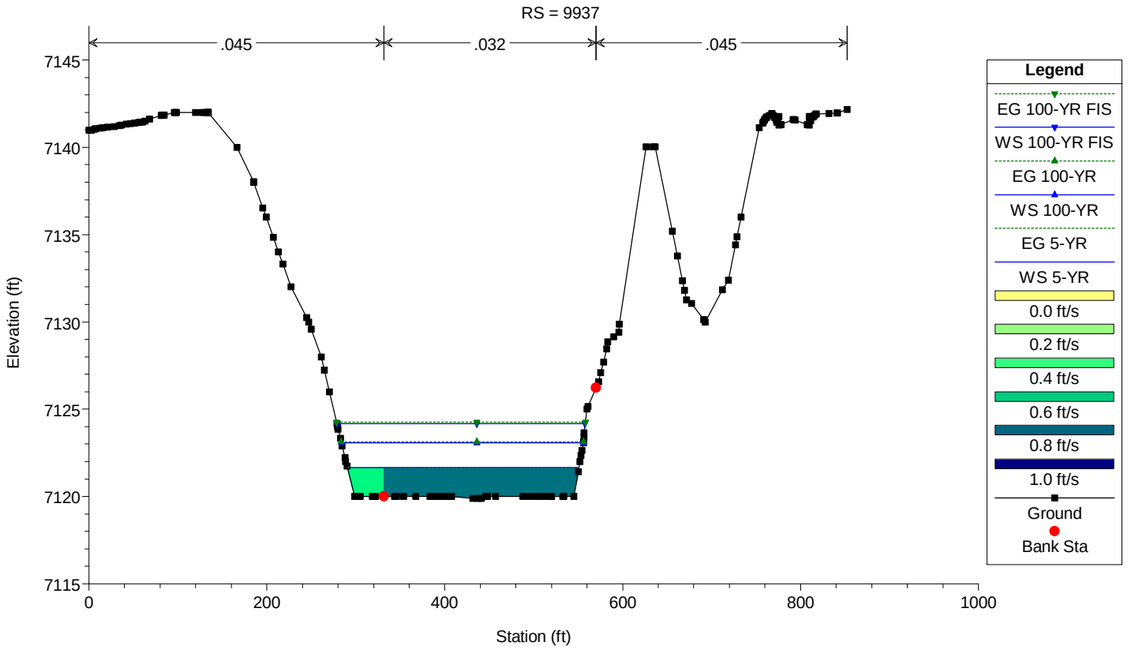


HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 9937



HEC-RAS Model Plan: Existing Conditions 4/6/2022

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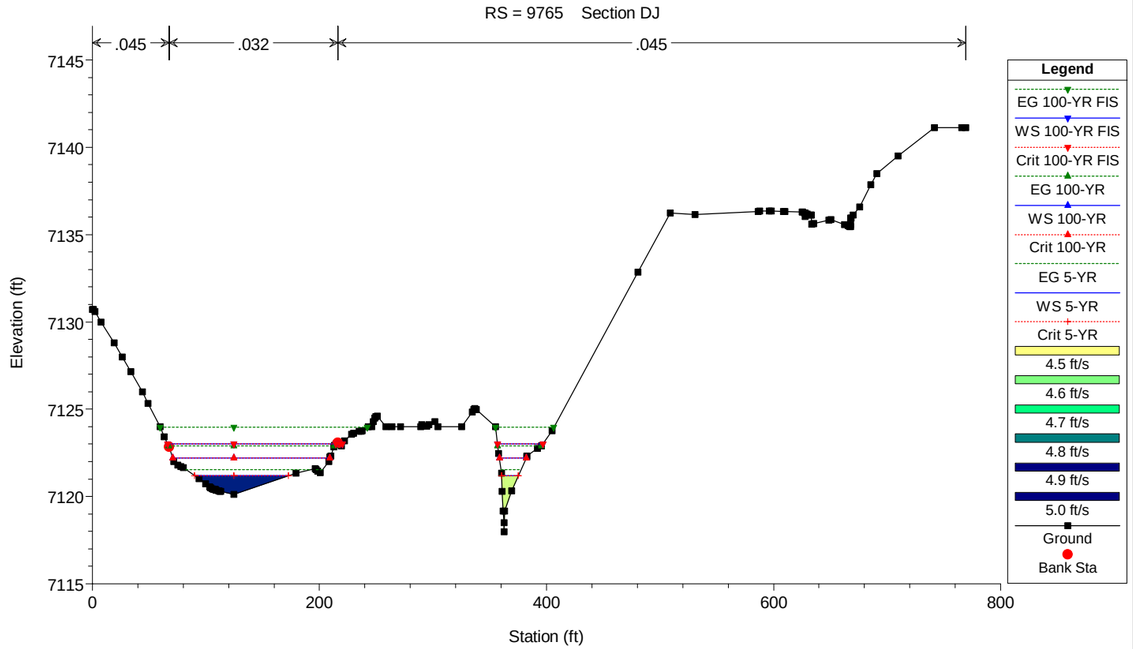
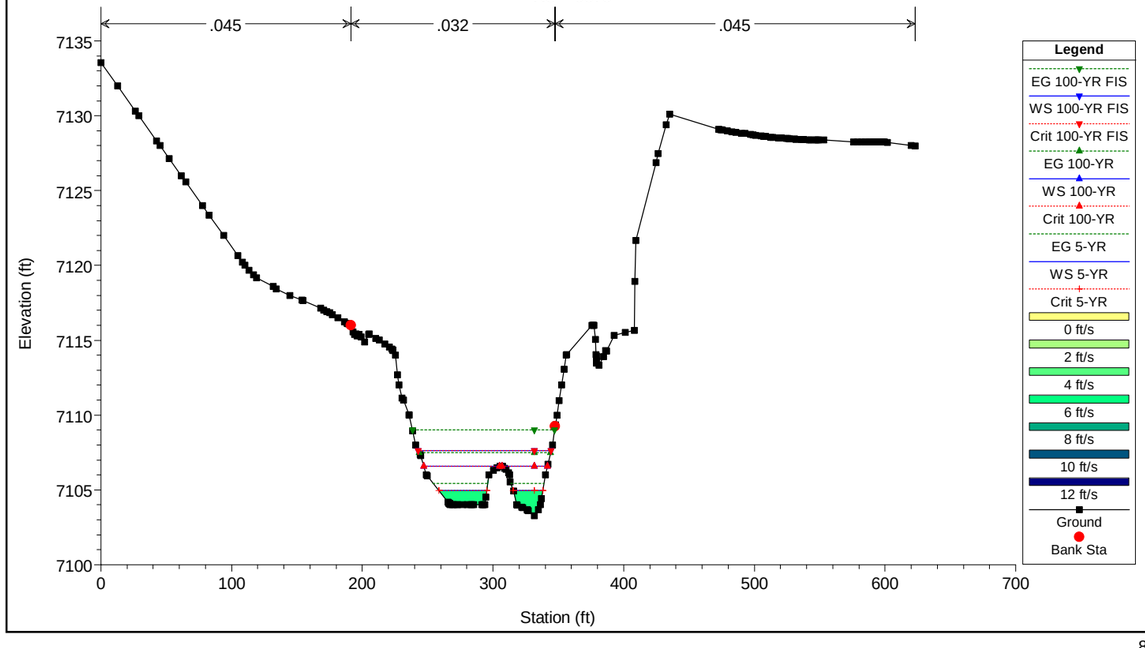


HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 9575



HEC-RAS Model Plan: Existing Conditions 4/6/2022

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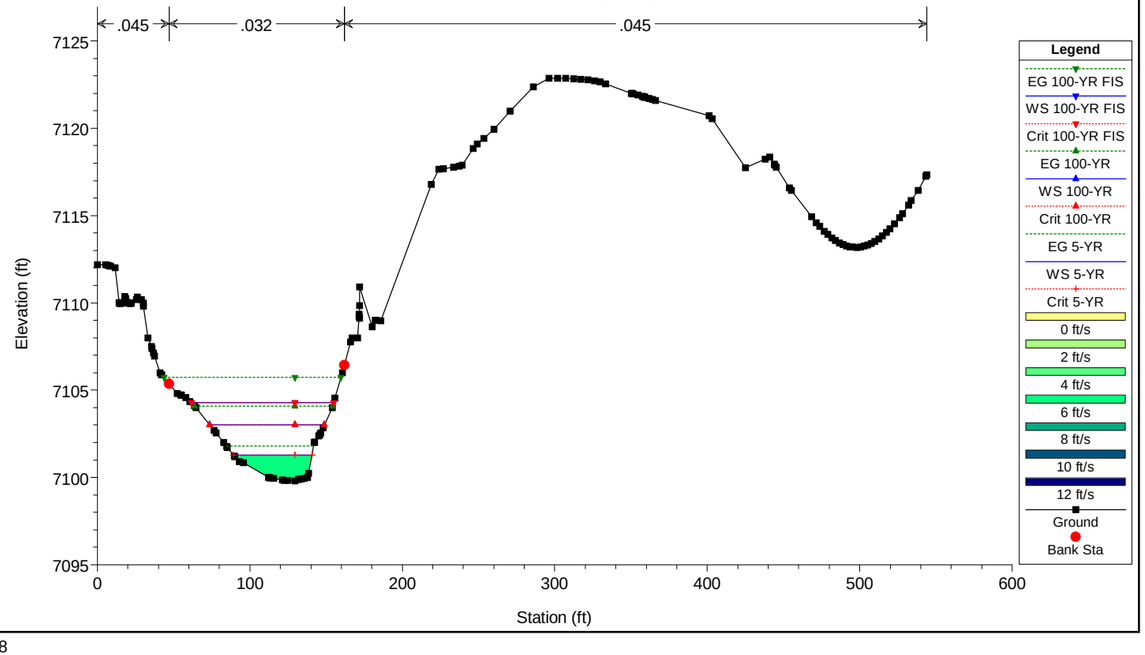
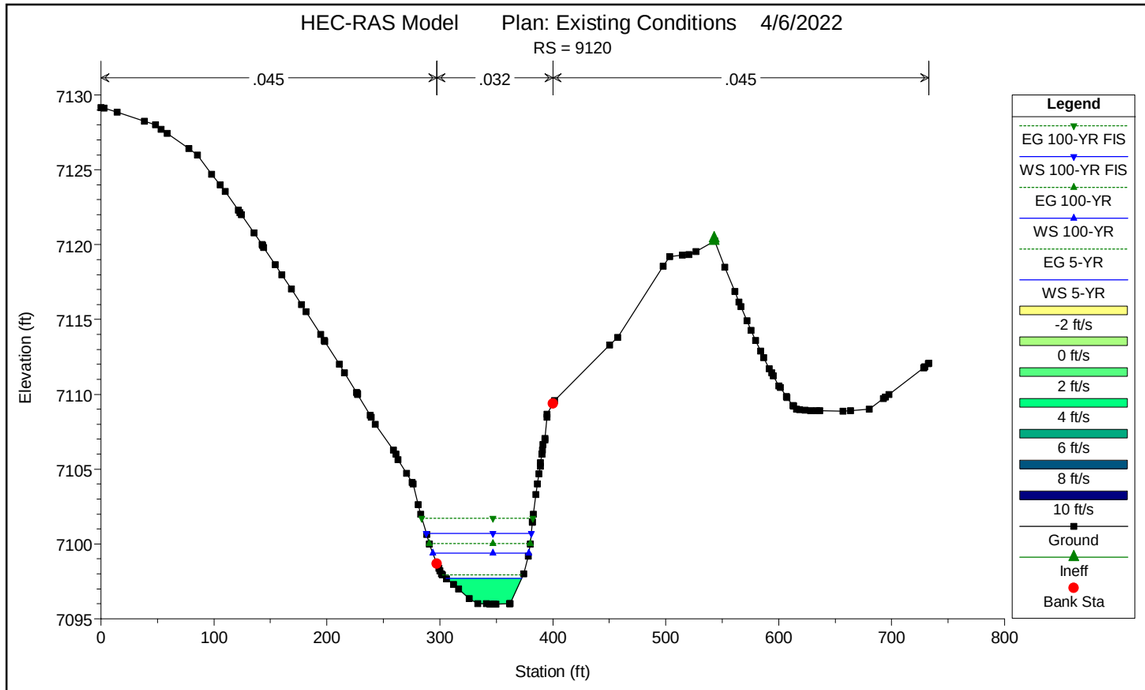
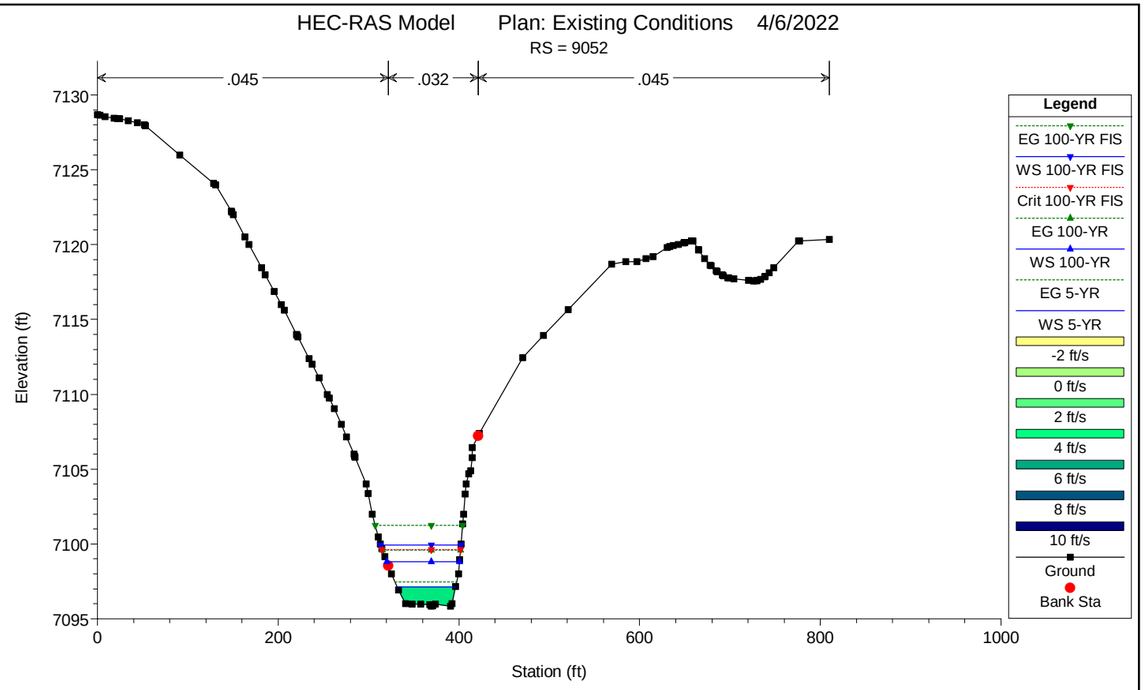
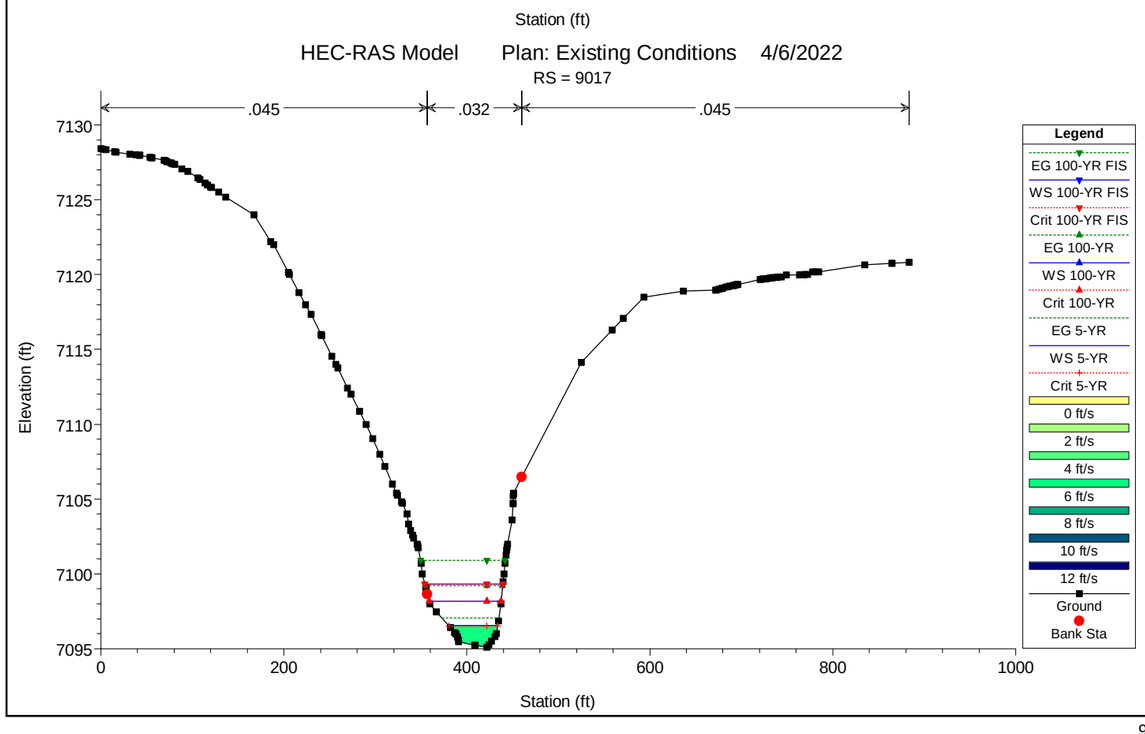
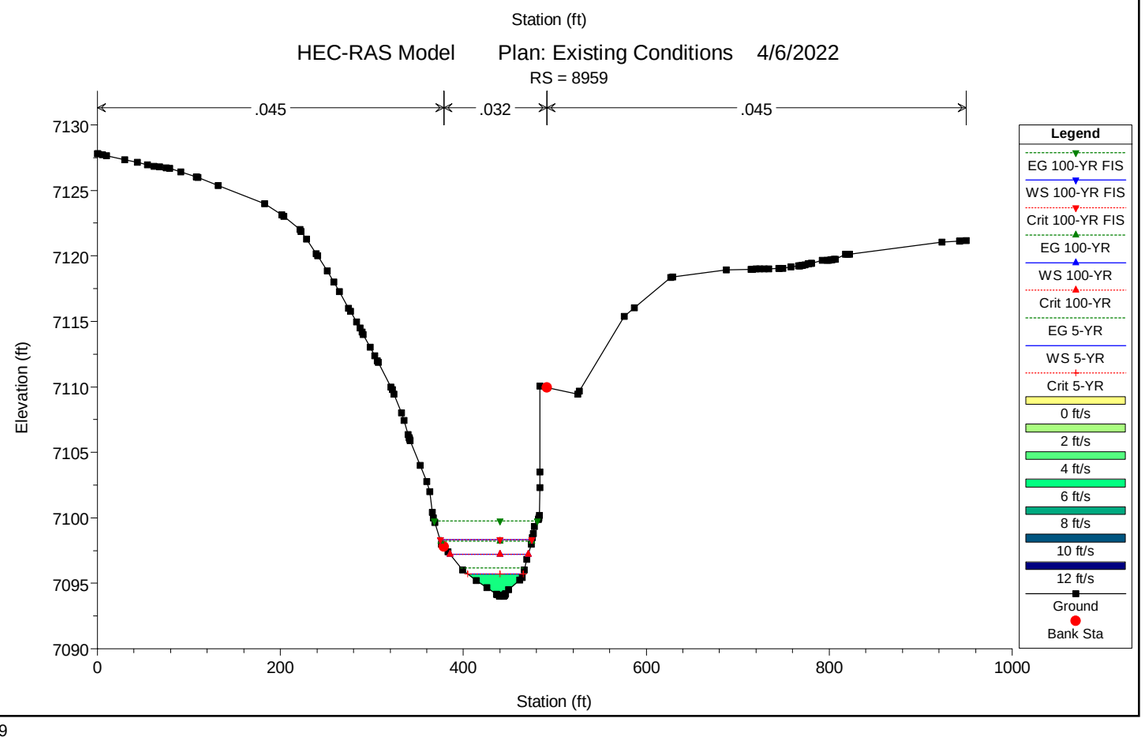



HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 9120
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta

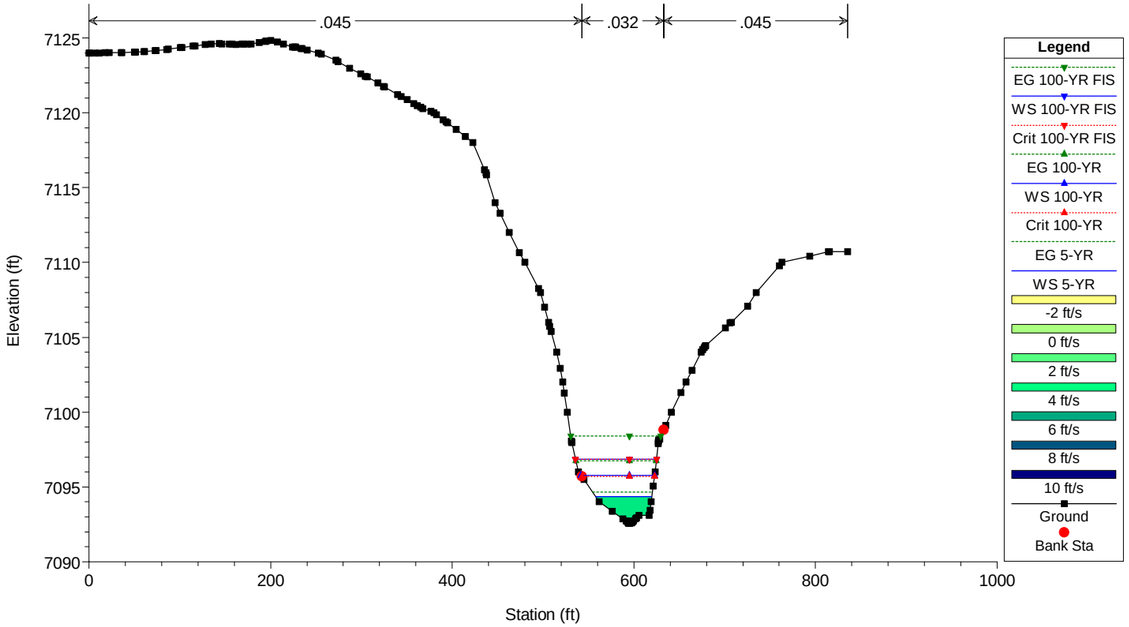

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 9052
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 9017
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 8959
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

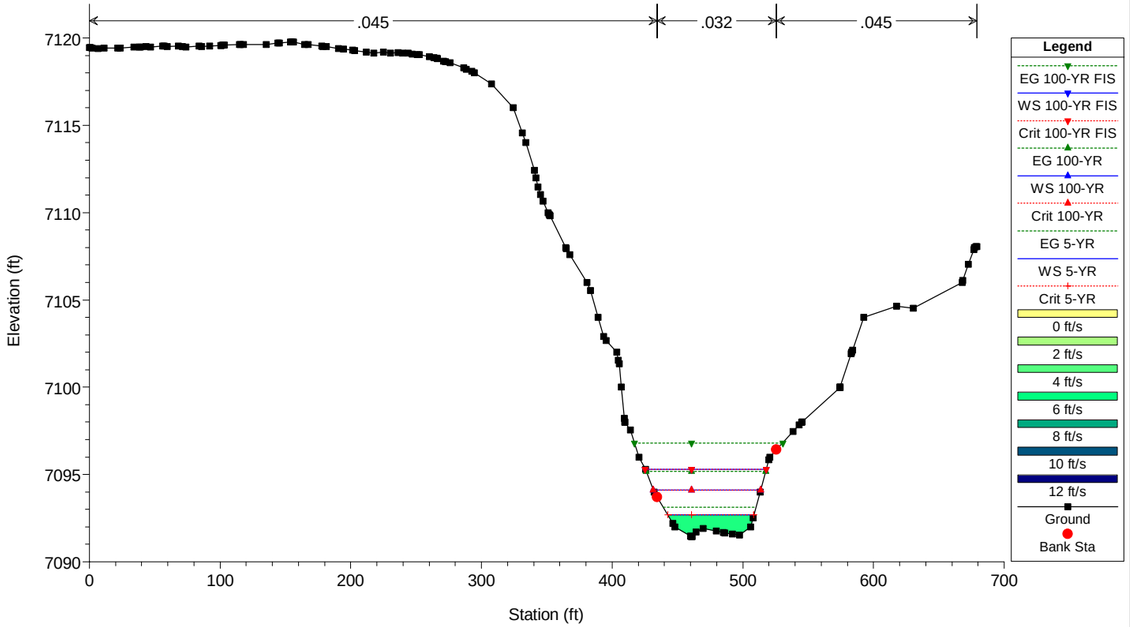
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 8831 Section DH



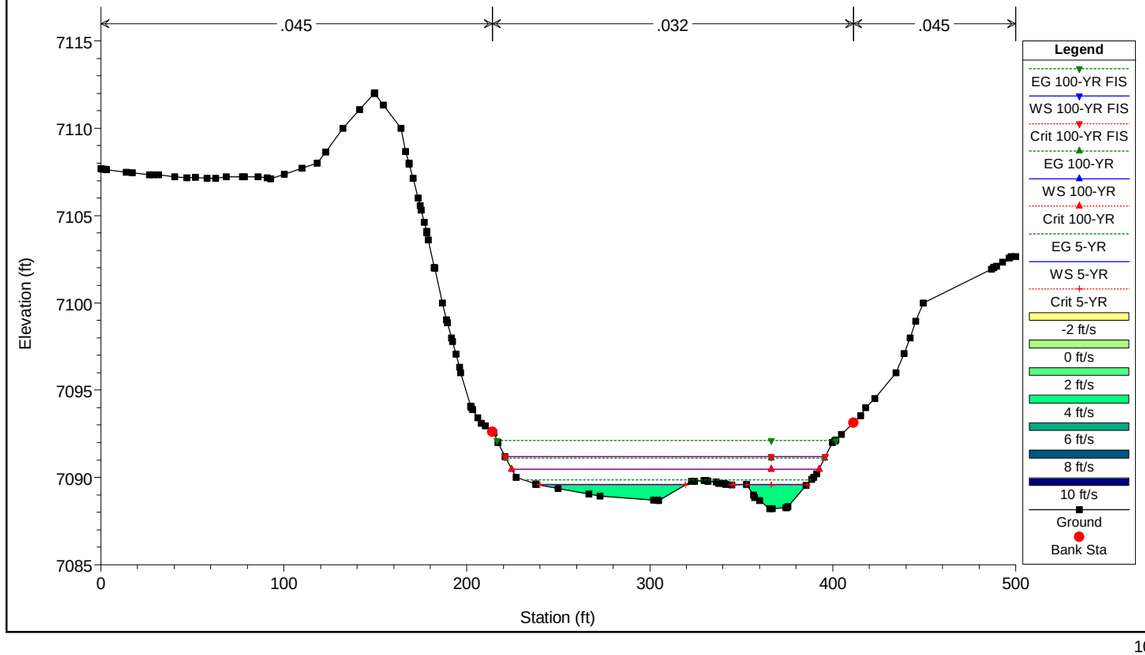
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 8692



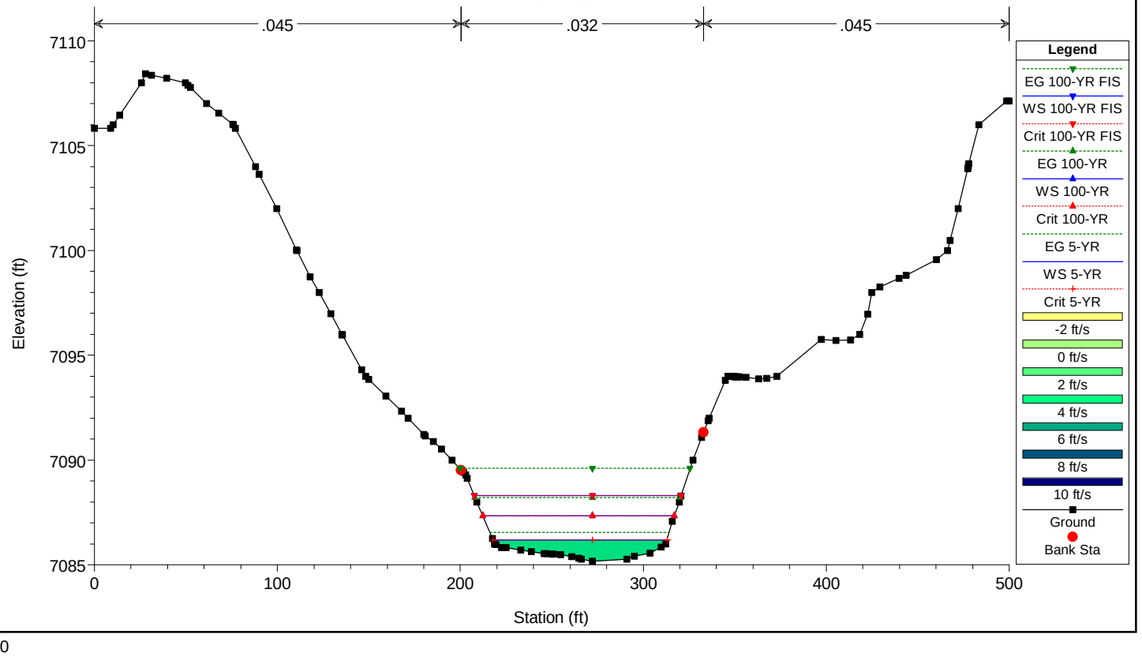
HEC-RAS Model Plan: Existing Conditions 4/6/2022

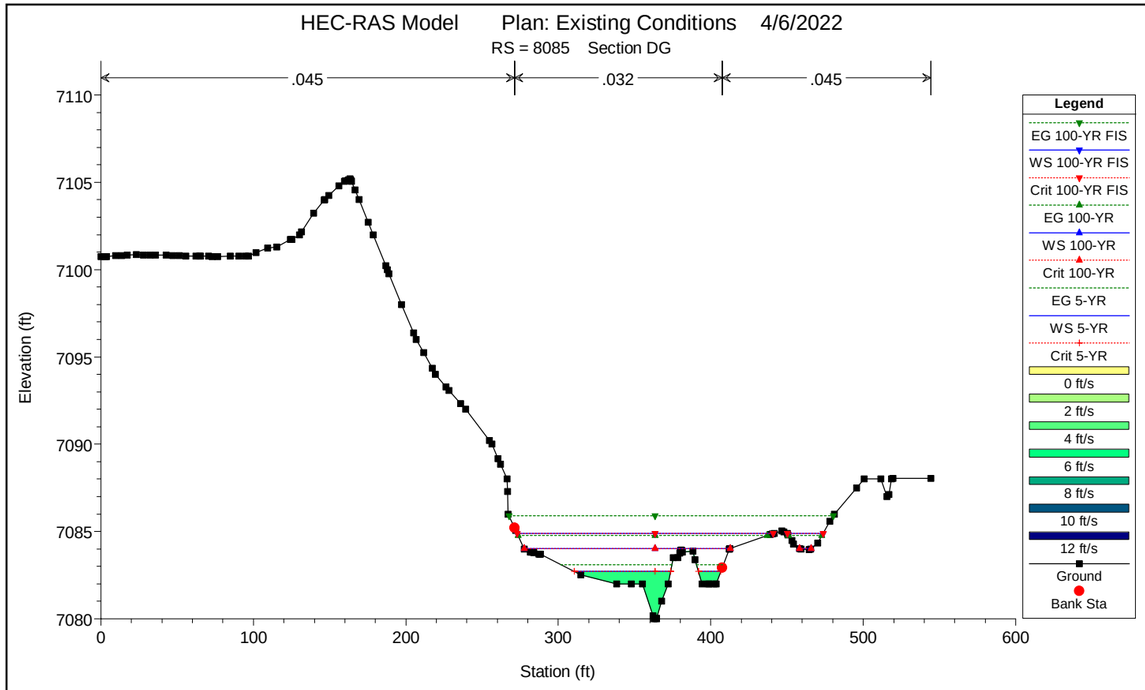
RS = 8489

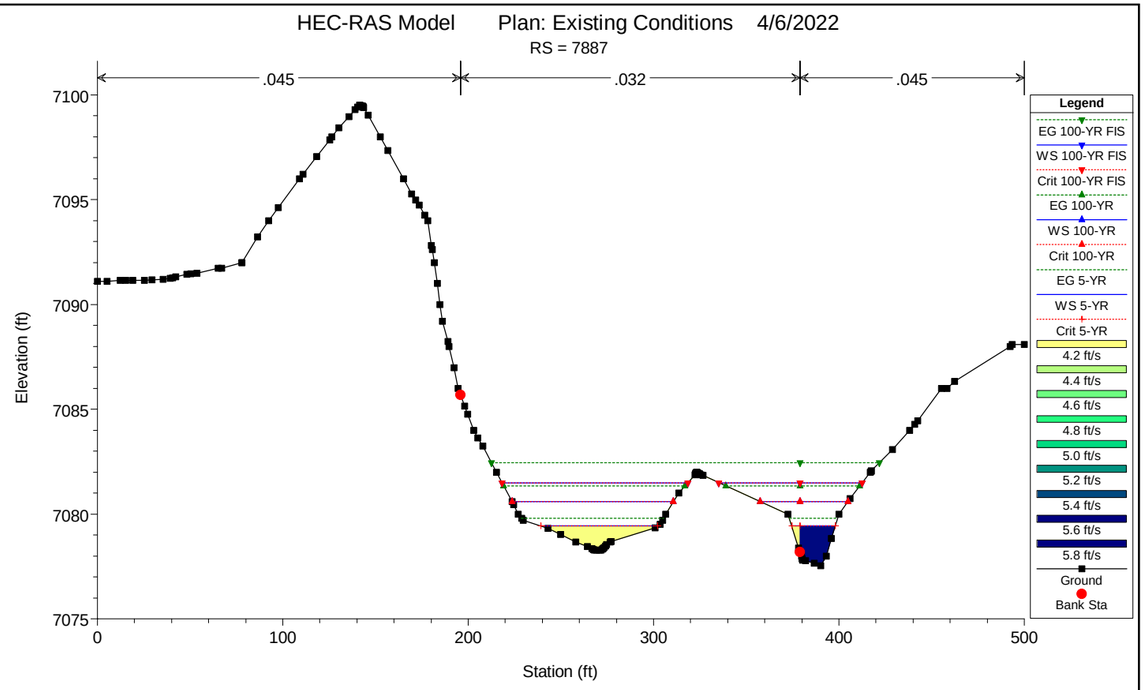


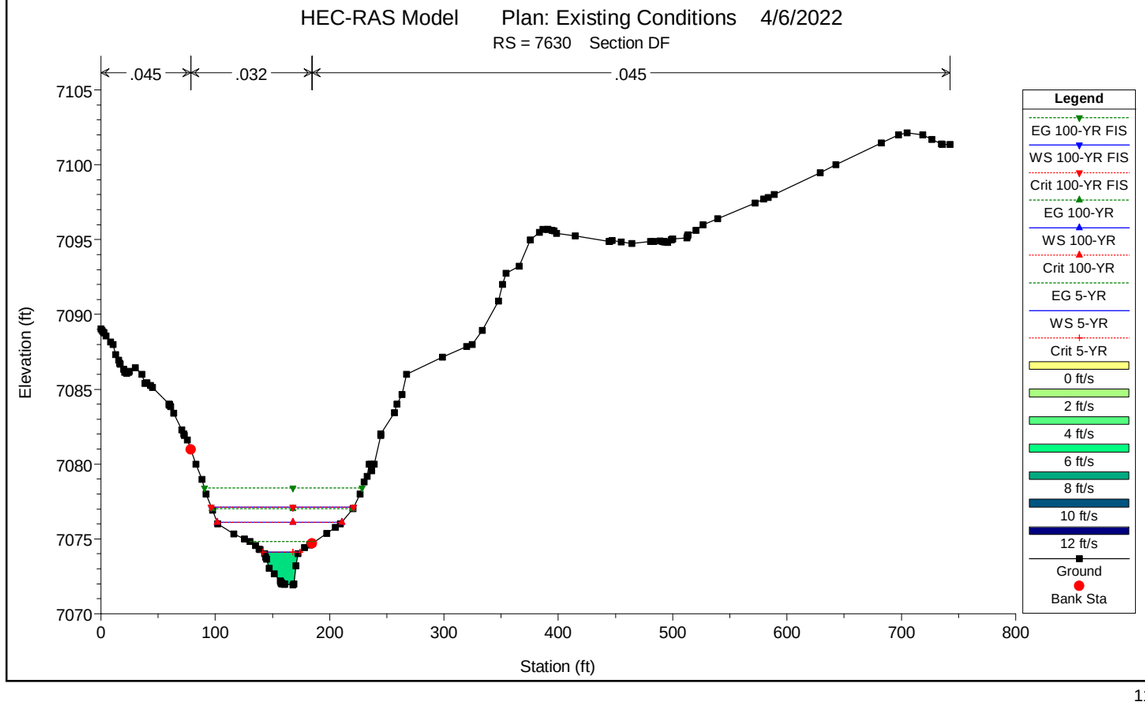
HEC-RAS Model Plan: Existing Conditions 4/6/2022

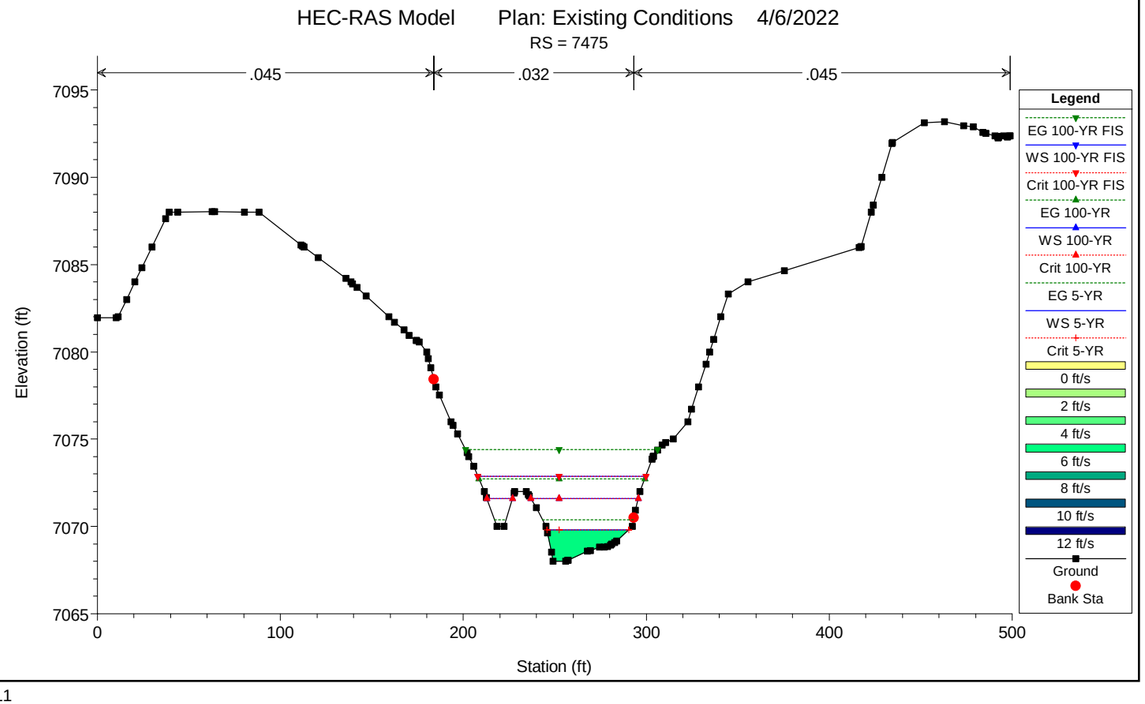
RS = 8289

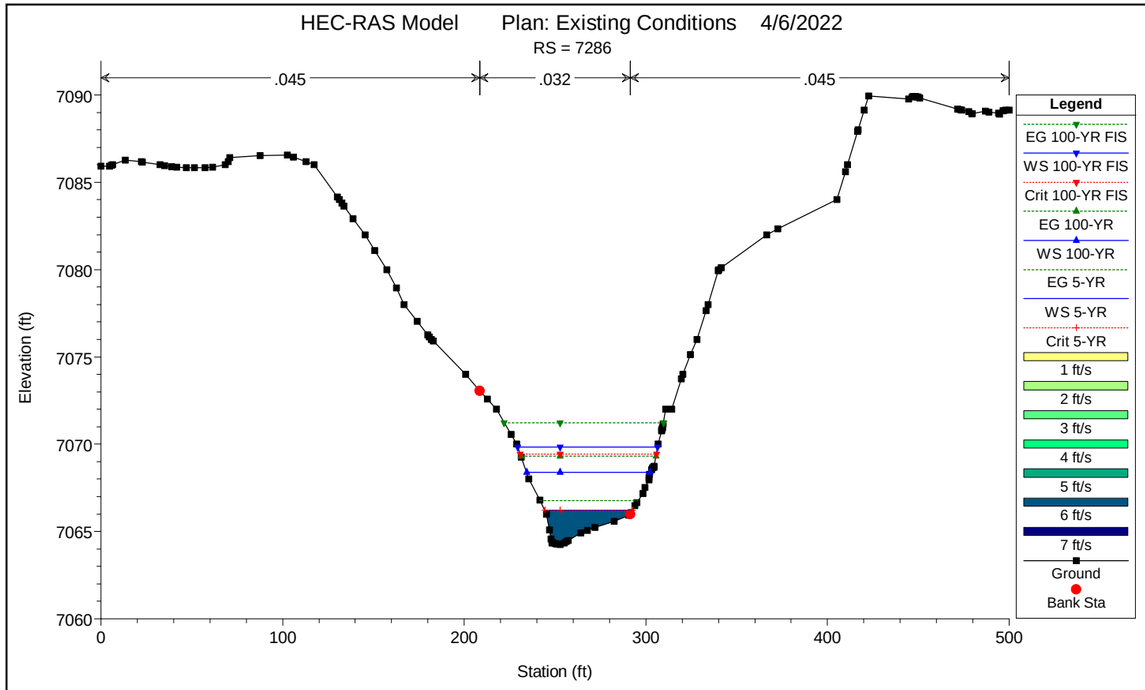


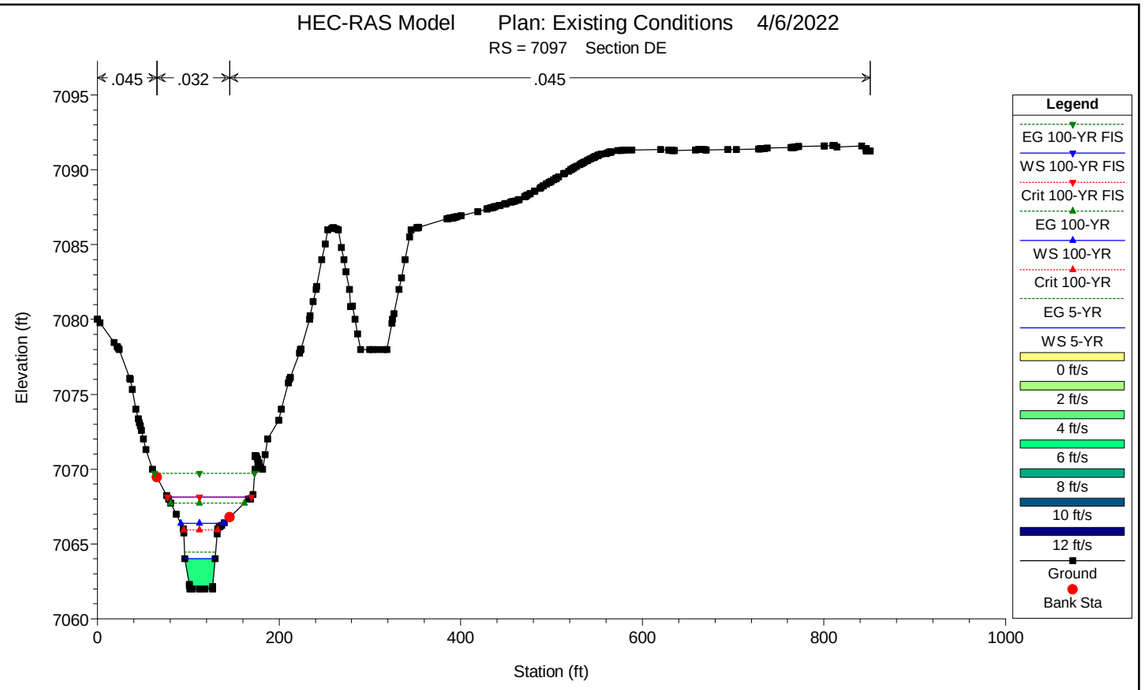

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 8085 Section DG
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

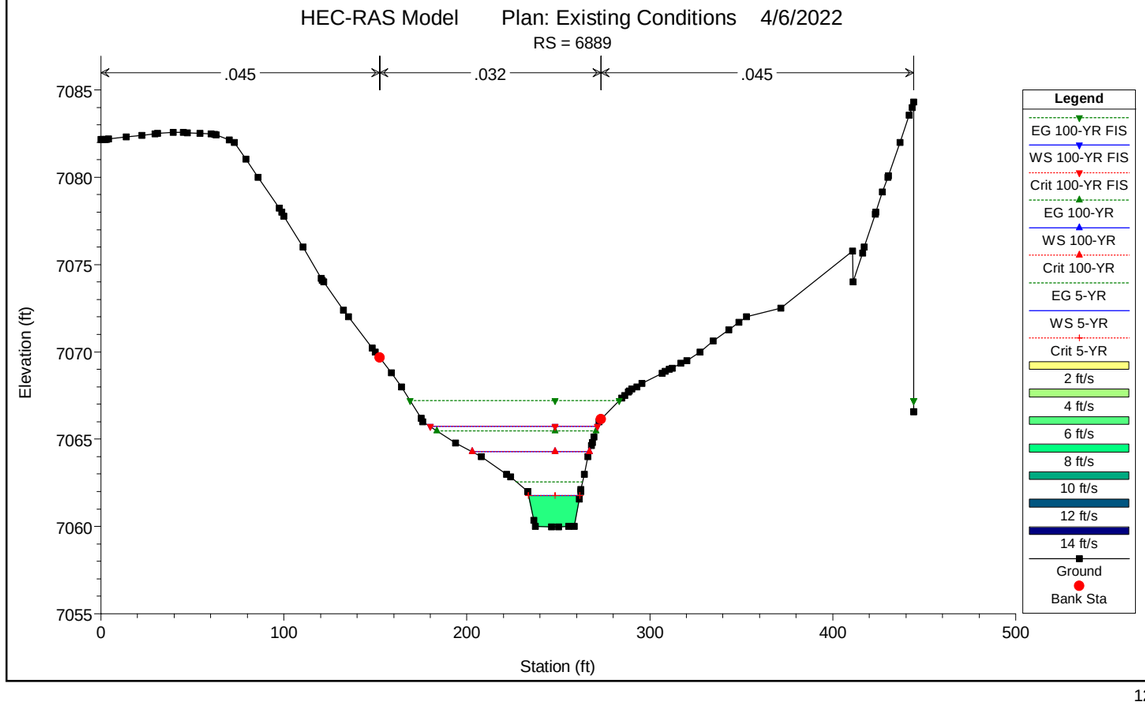

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 7887
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
4.2 ft/s
4.4 ft/s
4.6 ft/s
4.8 ft/s
5.0 ft/s
5.2 ft/s
5.4 ft/s
5.6 ft/s
5.8 ft/s
Ground
Bank Sta

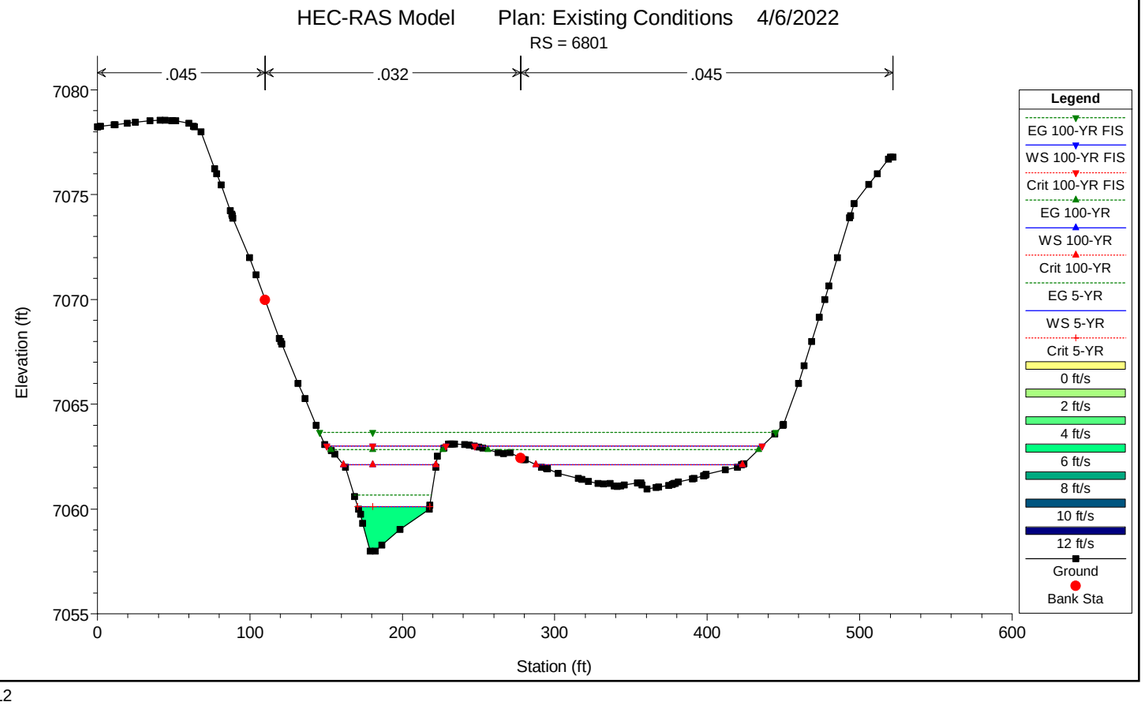

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 7630 Section DF
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 7475
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 7286
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

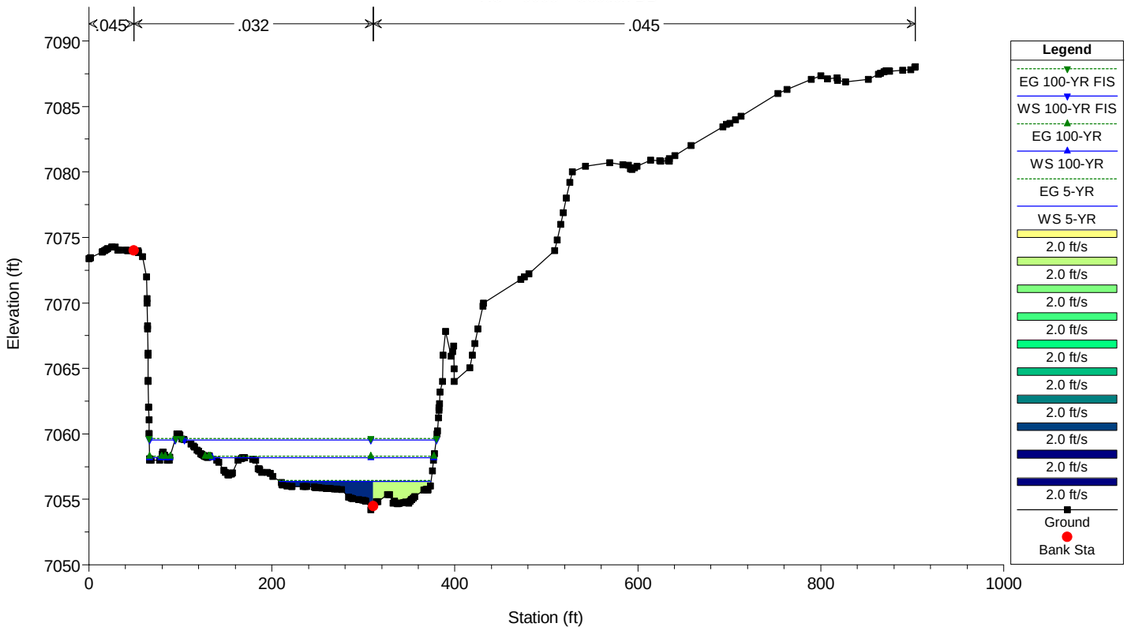

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 7097 Section DE
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 6889
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 6801
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

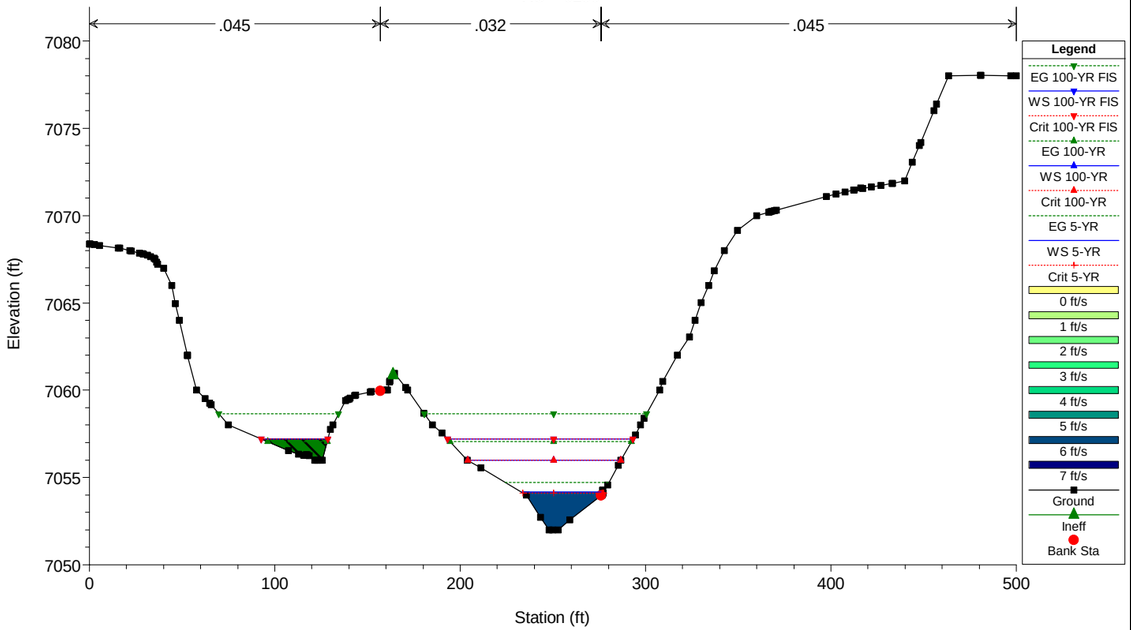
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 6688 Section DD



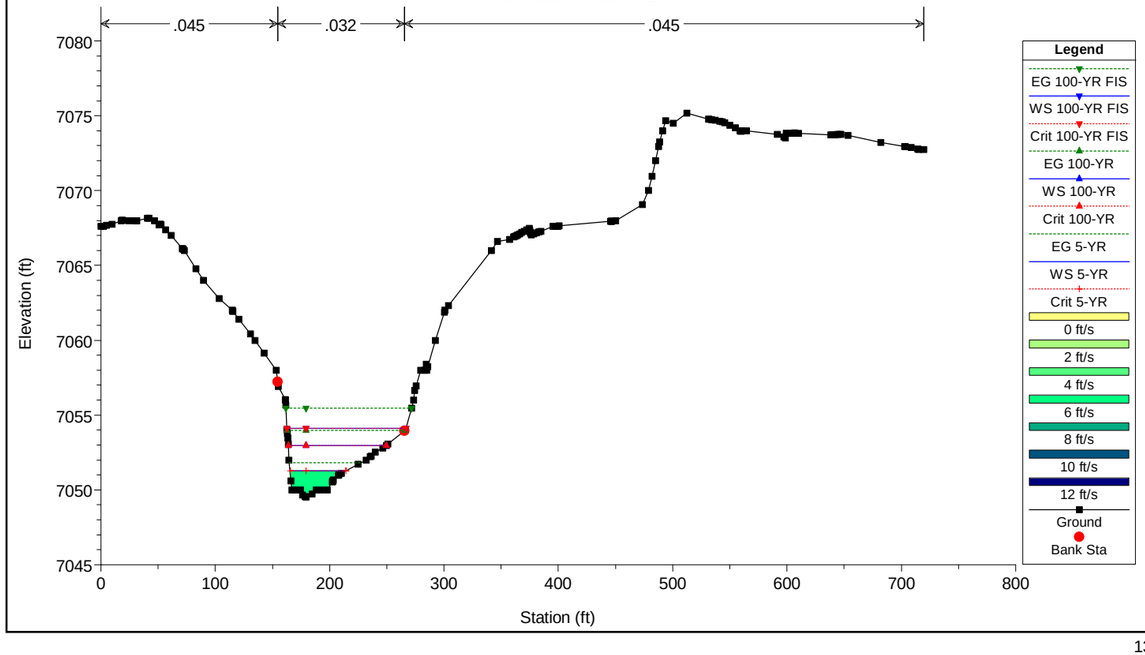
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 6299



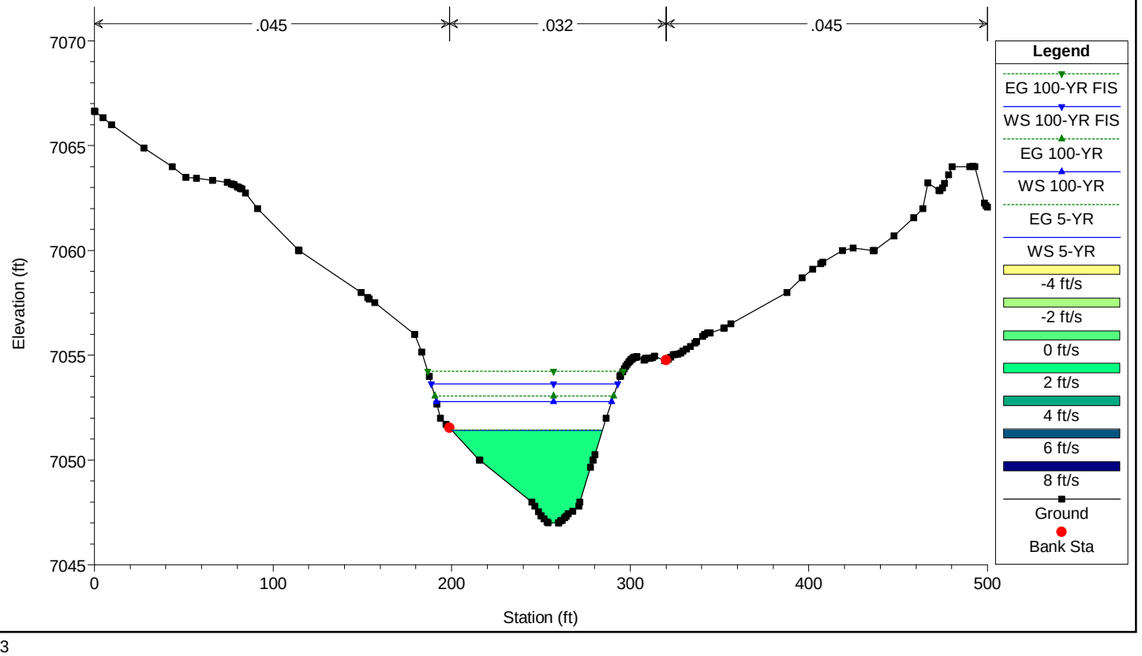
HEC-RAS Model Plan: Existing Conditions 4/6/2022

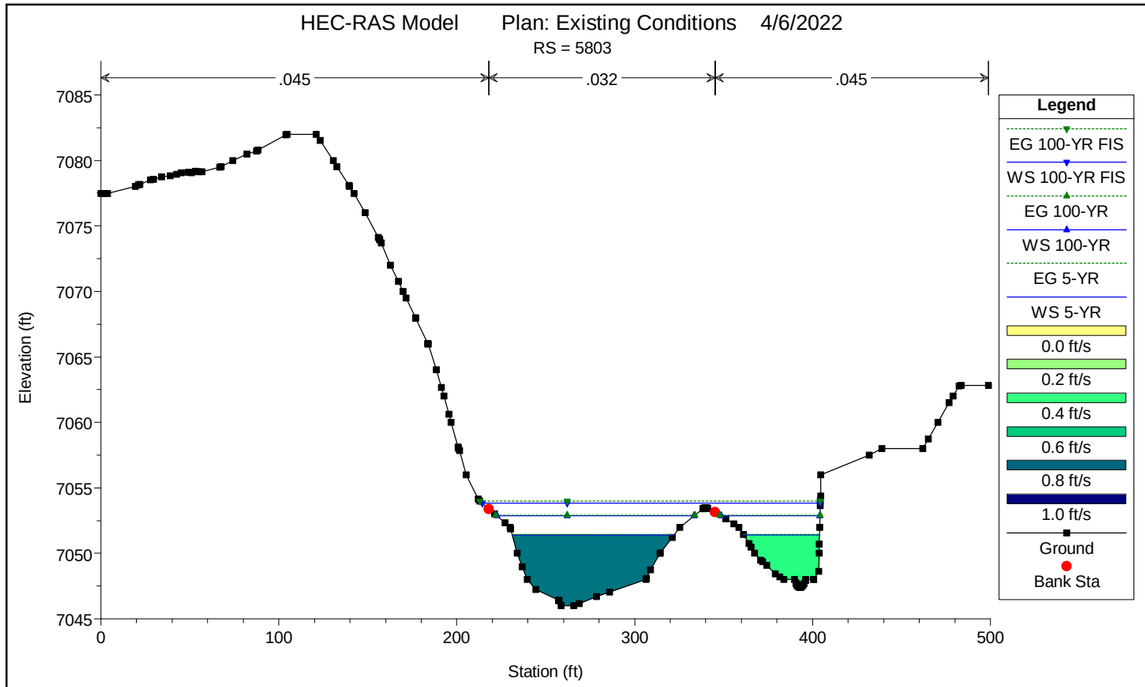
RS = 6094 Section DC

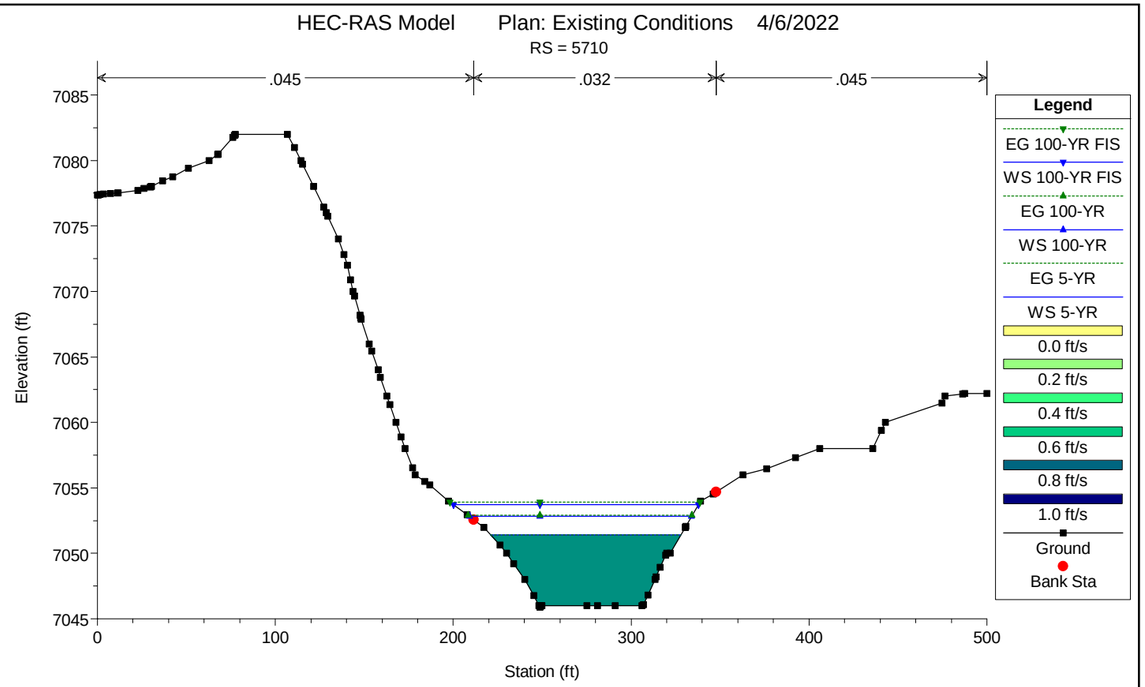


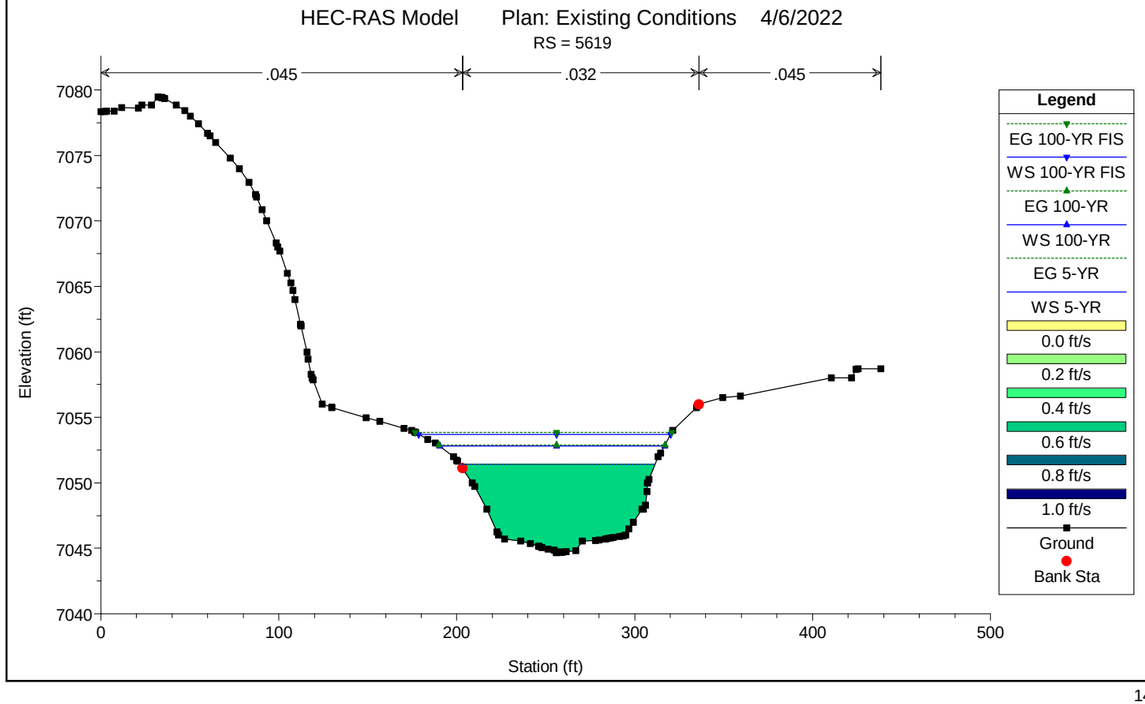
HEC-RAS Model Plan: Existing Conditions 4/6/2022

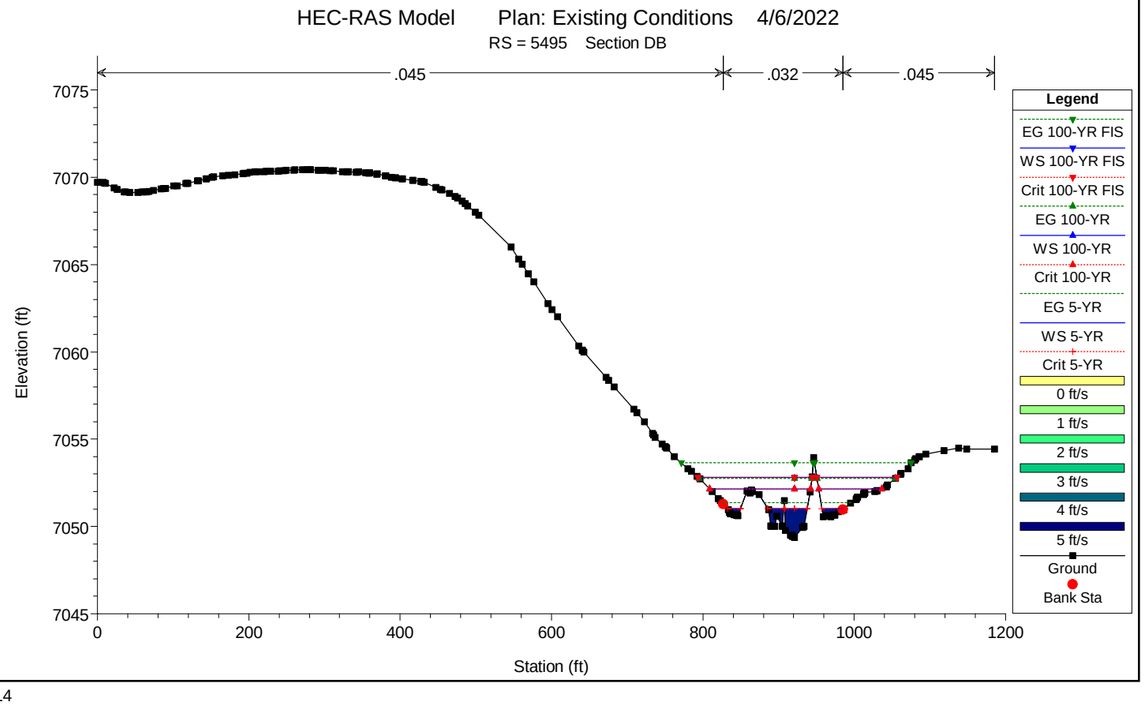
RS = 5906

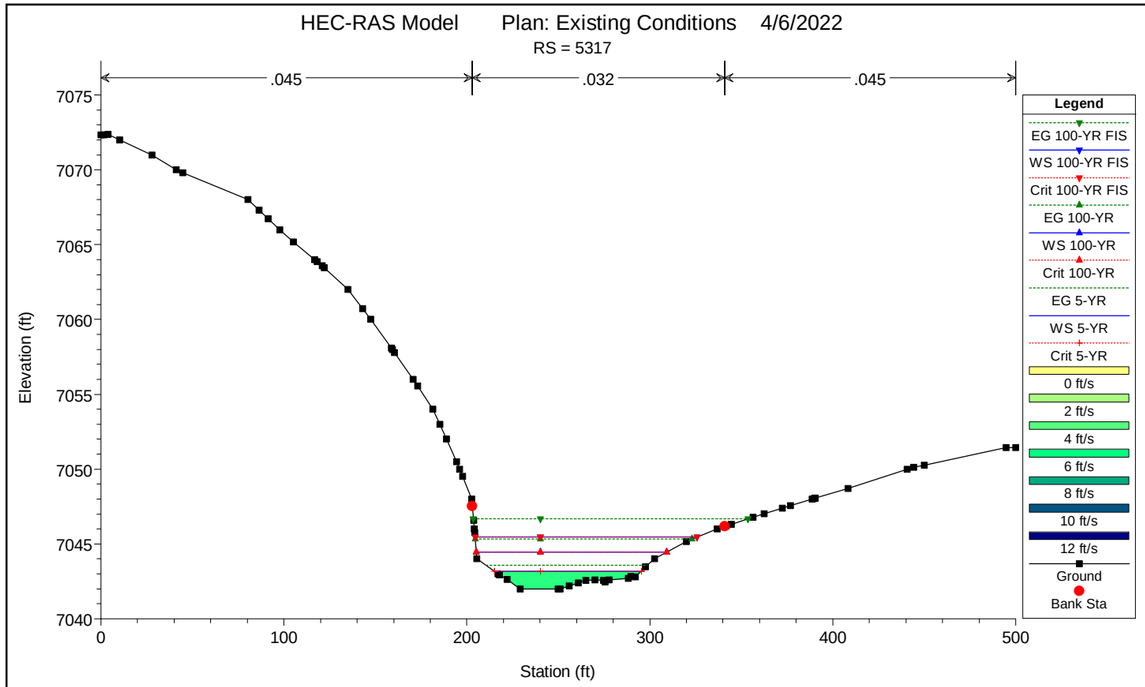


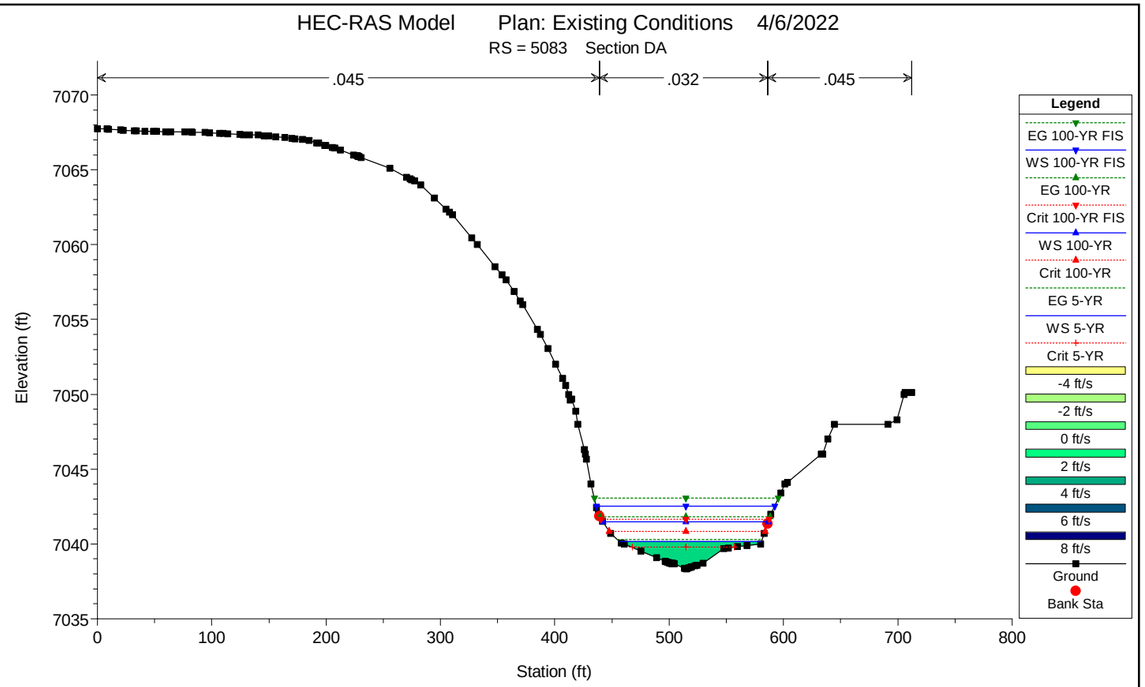

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 5803
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

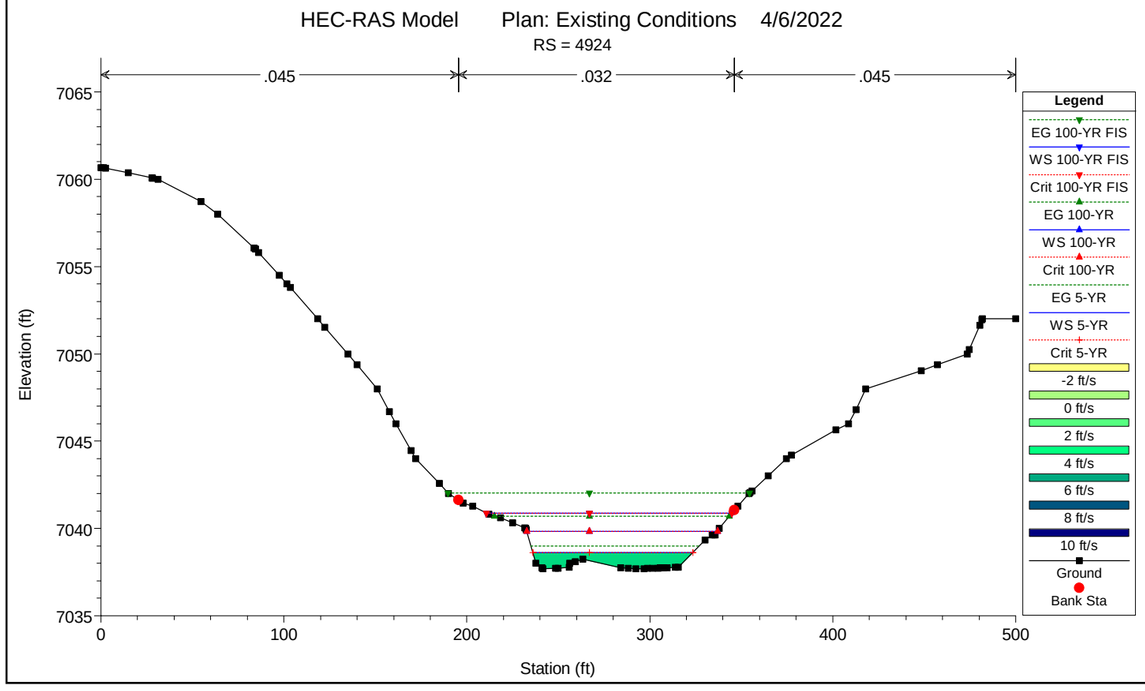

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 5710
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

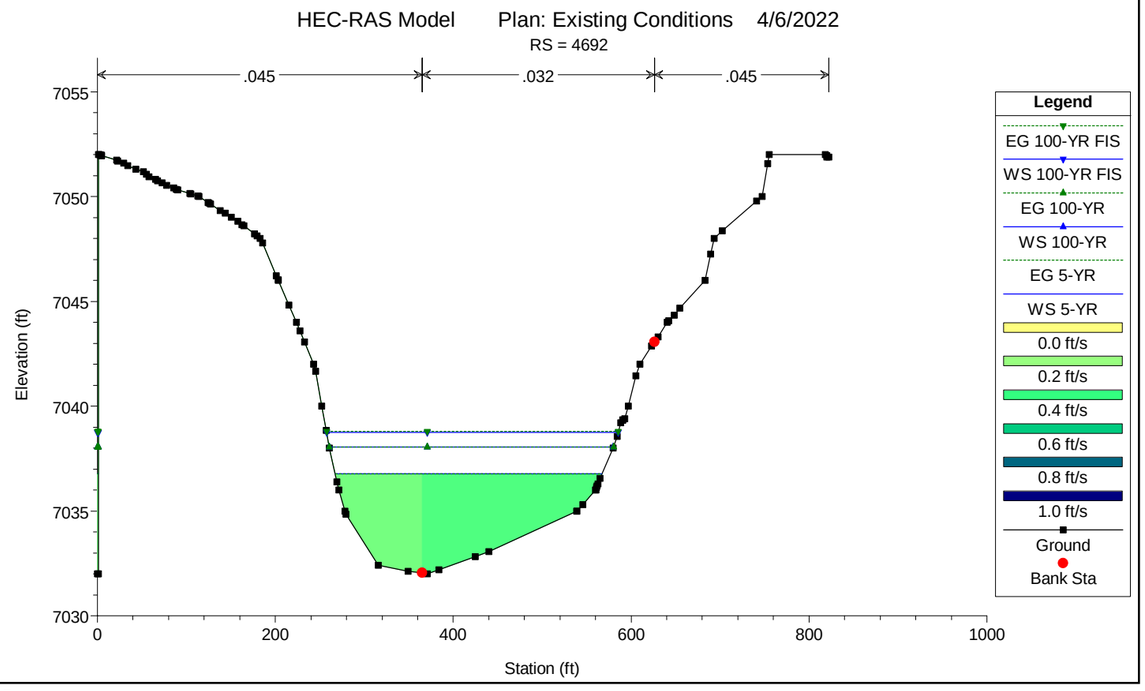

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 5619
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

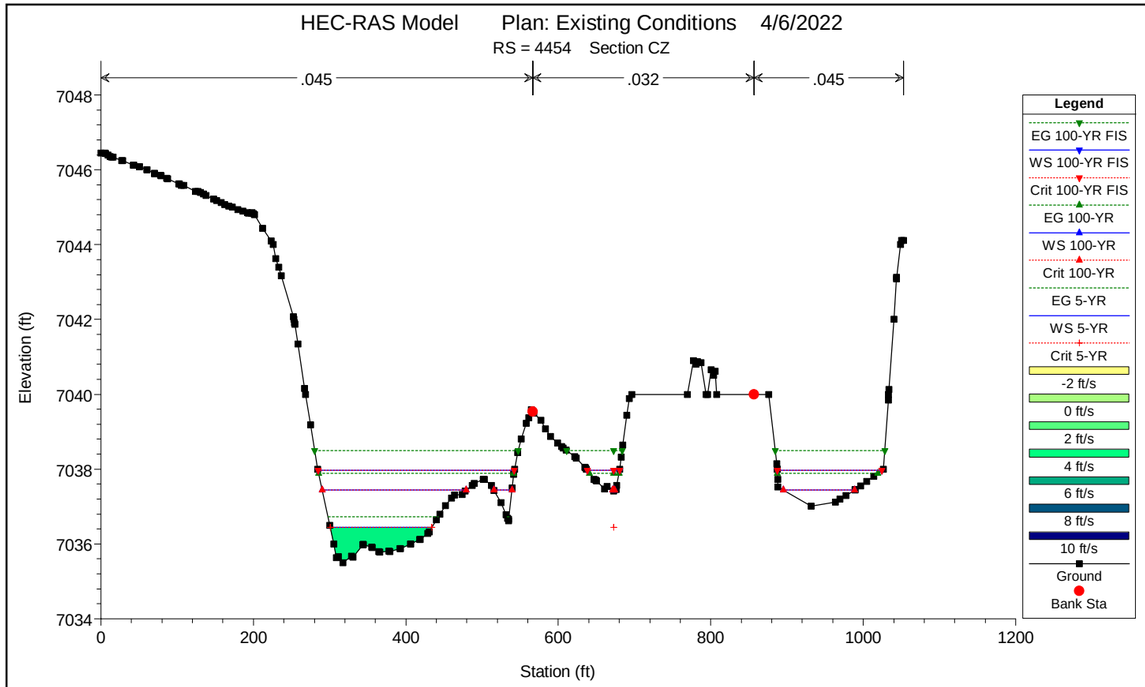

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 5495 Section DB
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta

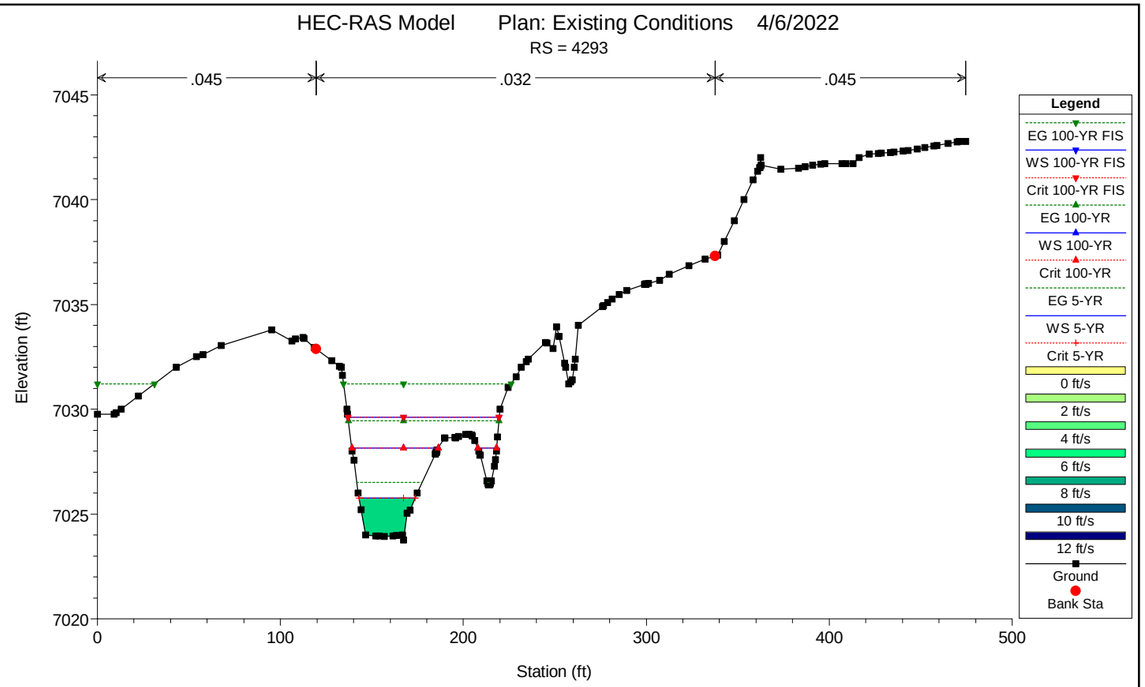

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 5317
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

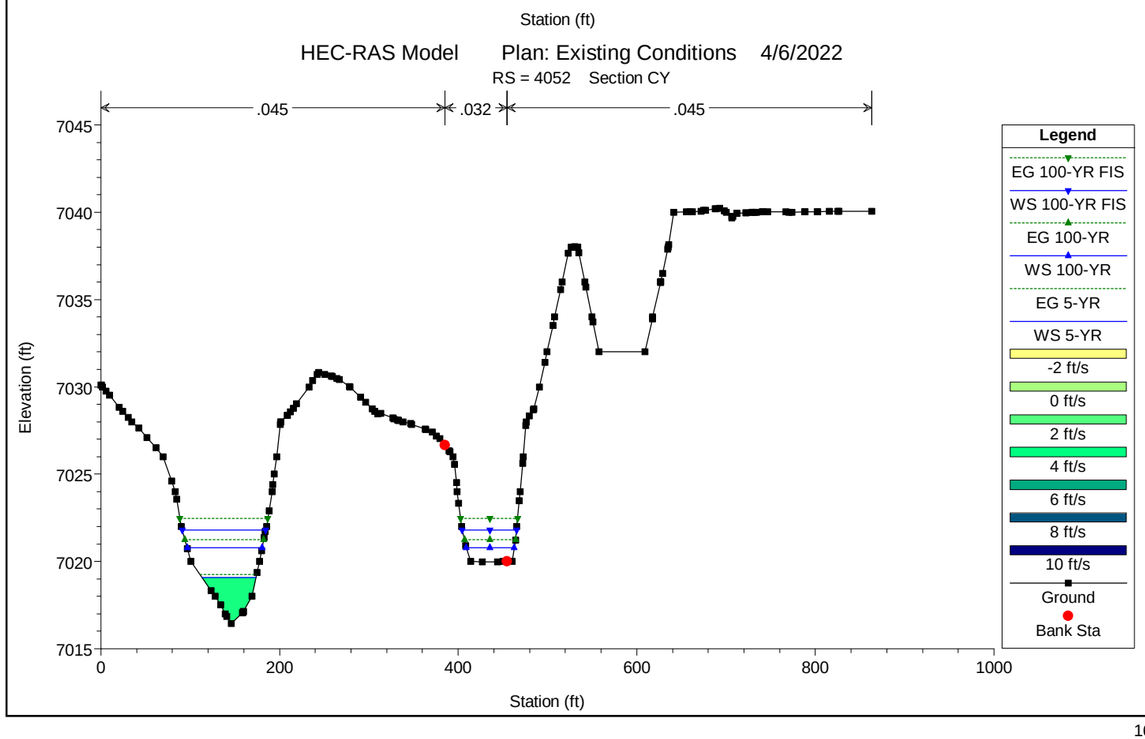

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 5083 Section DA
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
Crit 100-YR FIS
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

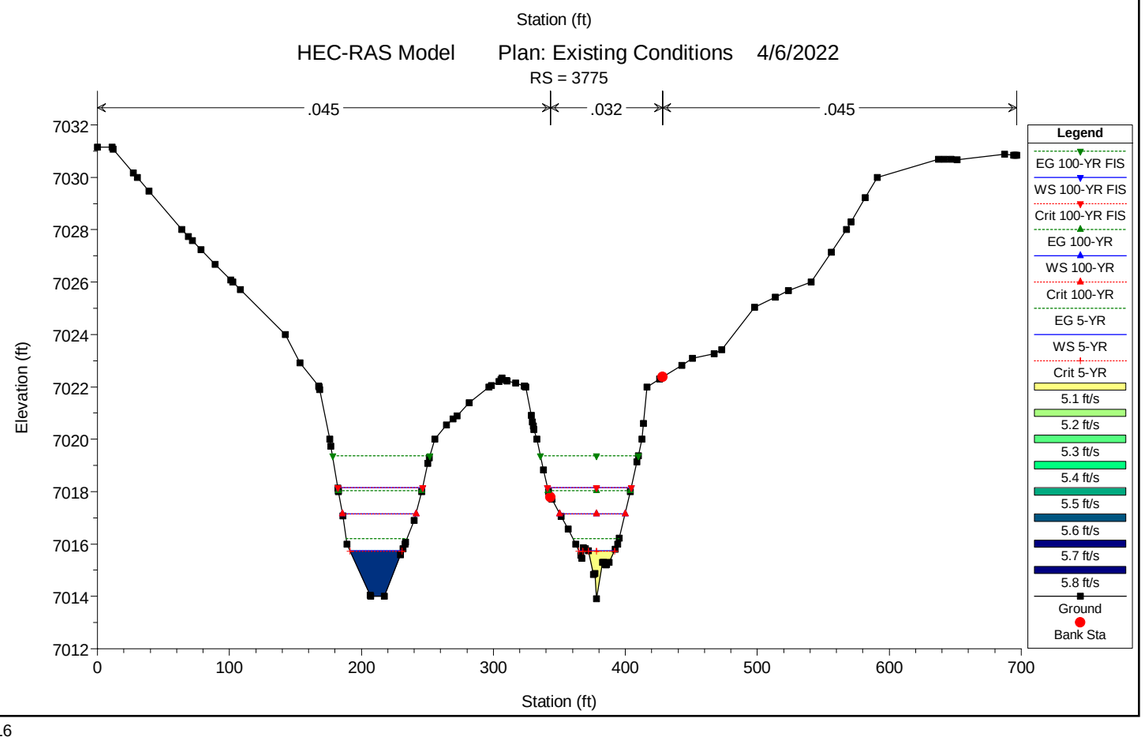

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 4924
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

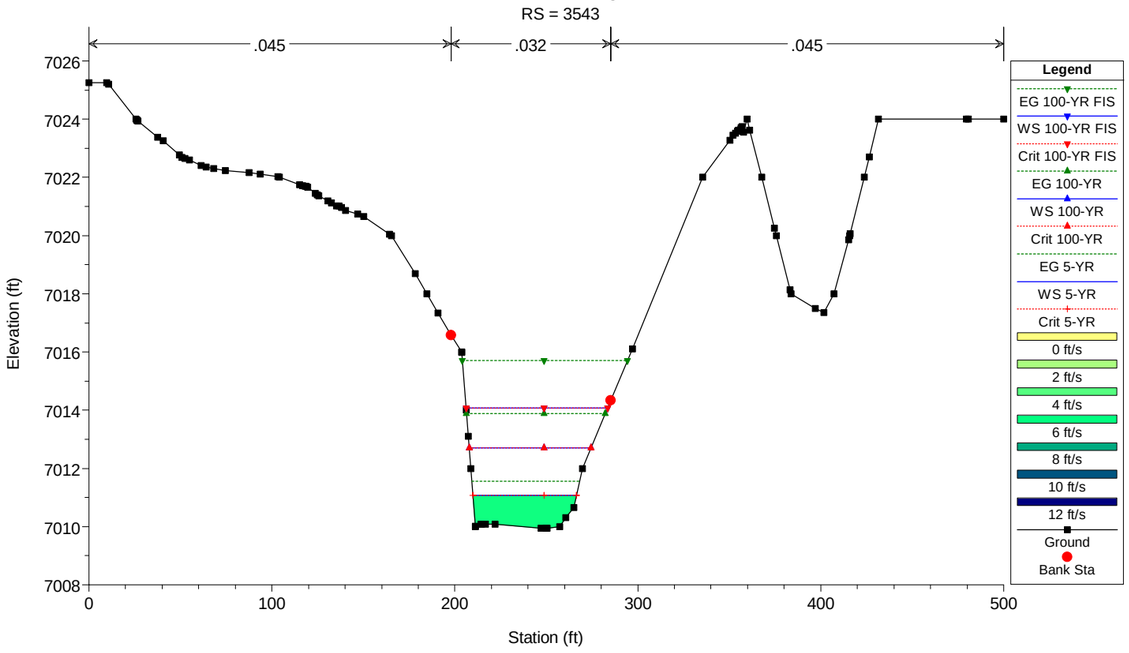

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 4692
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

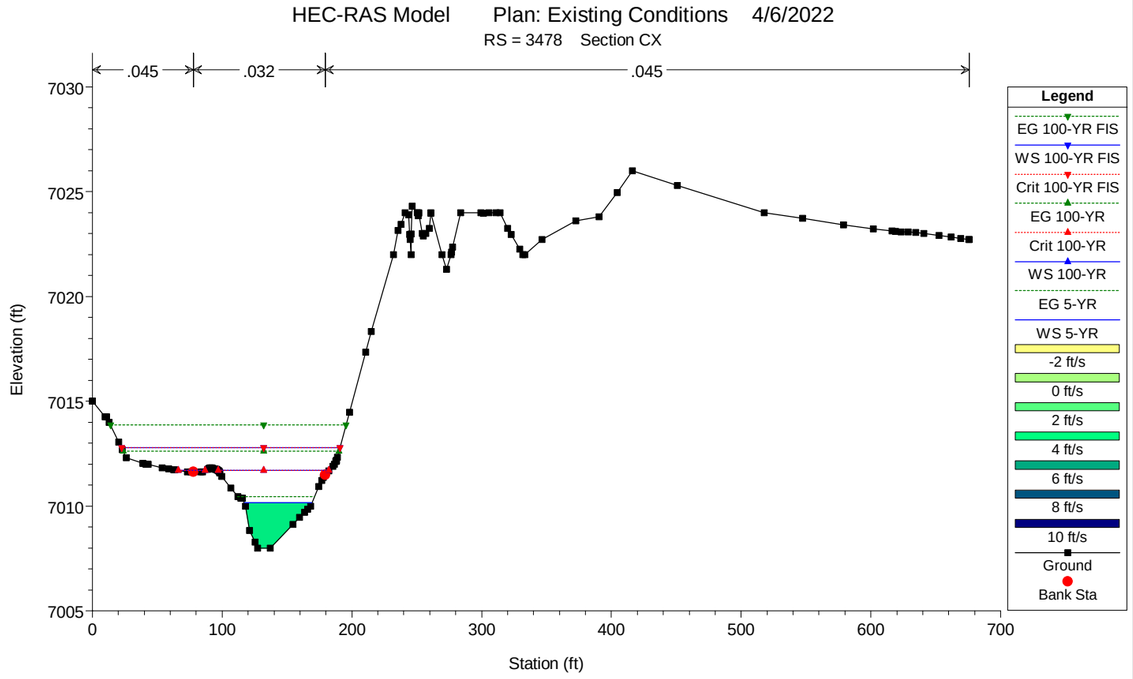

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 4454 Section CZ
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

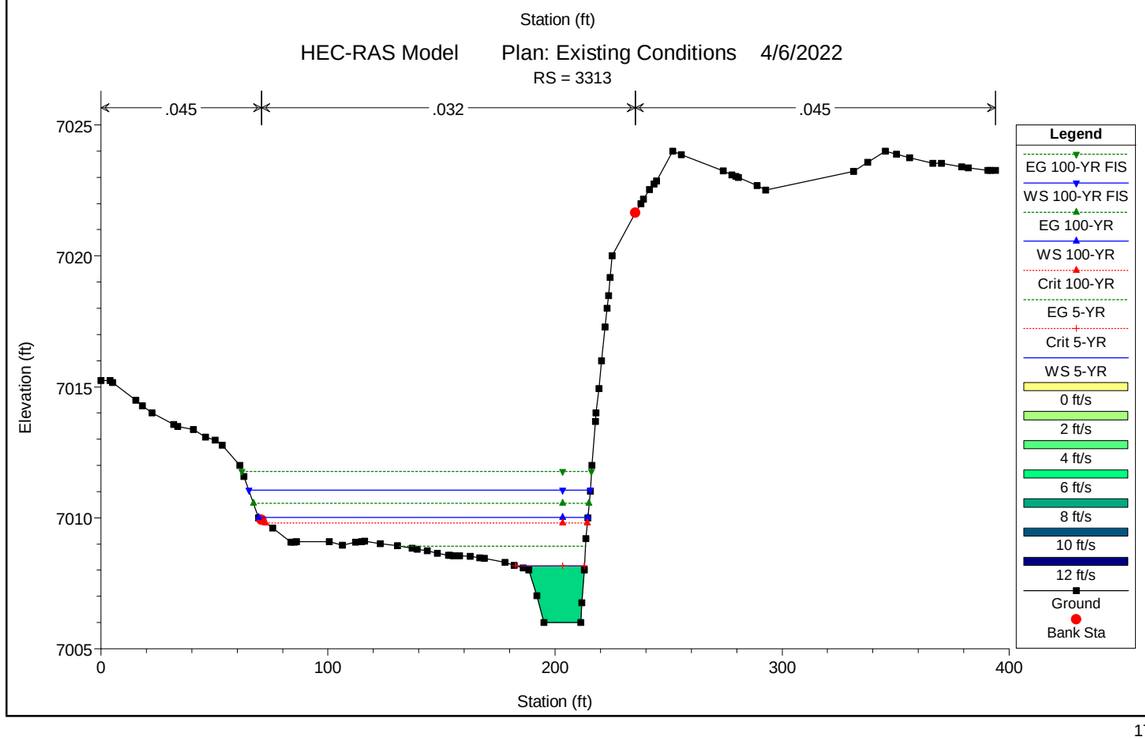

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 4293
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

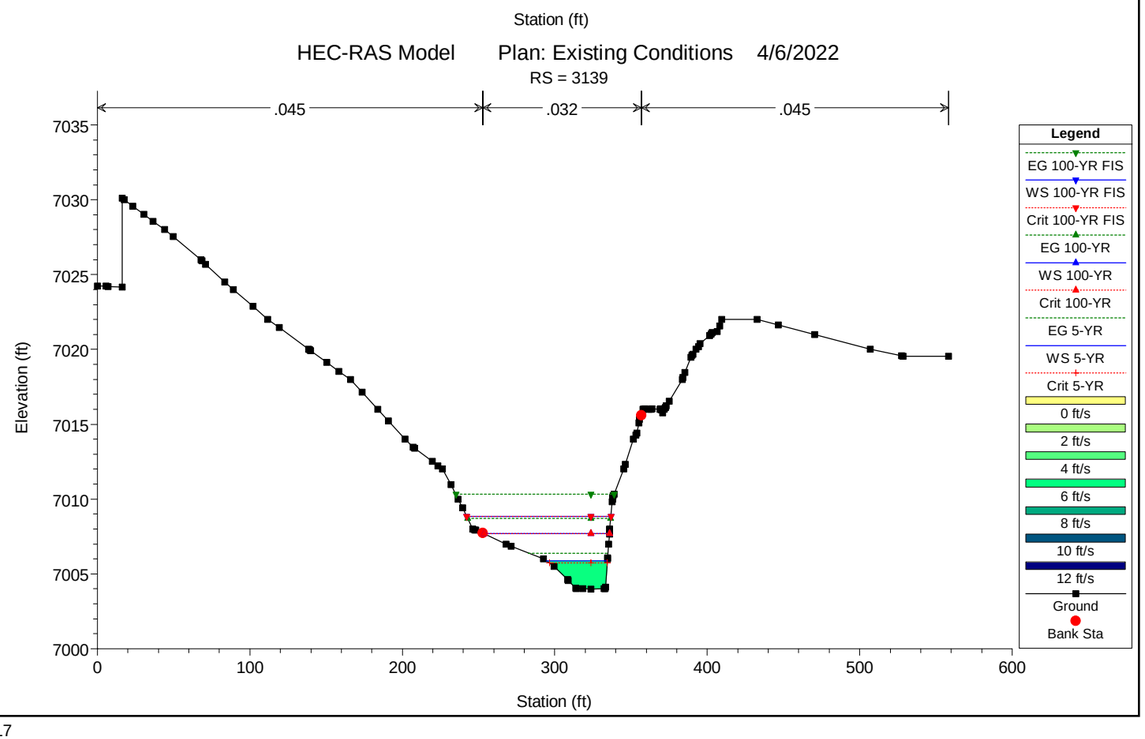

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 4052 Section CY
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 3775
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
5.1 ft/s
5.2 ft/s
5.3 ft/s
5.4 ft/s
5.5 ft/s
5.6 ft/s
5.7 ft/s
5.8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 3543
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

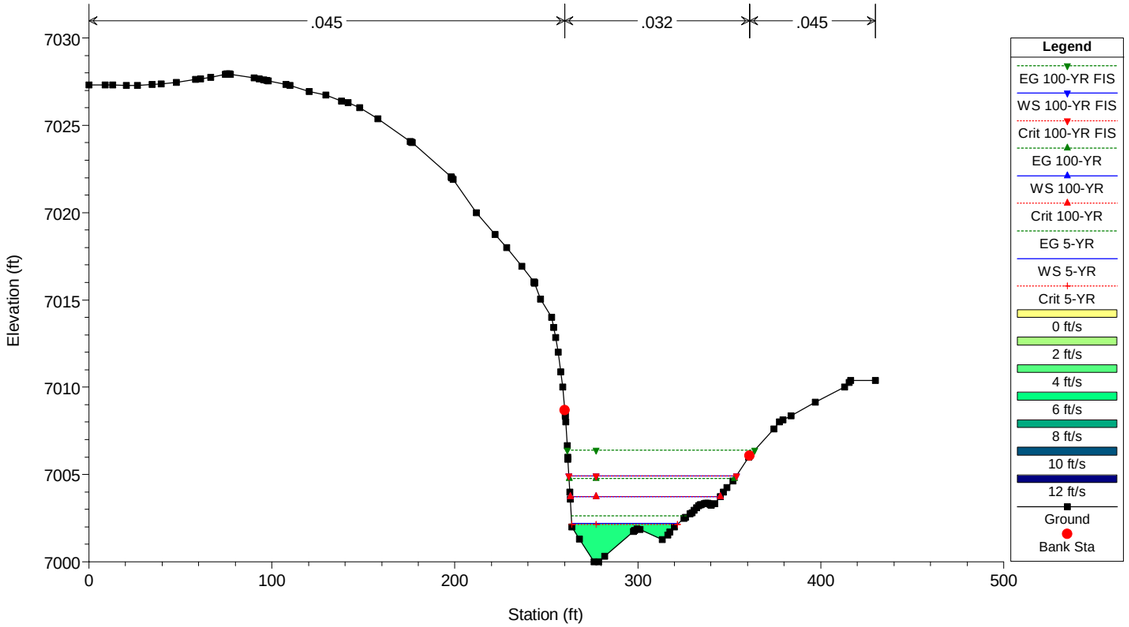

HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 3478 Section CX
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
Crit 100-YR
WS 100-YR
EG 5-YR
WS 5-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 3313
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
Crit 5-YR
WS 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Existing Conditions 4/6/2022
RS = 3139
.045
.032
.045
Elevation (ft)
Station (ft)
Legend
EG 100-YR FIS
WS 100-YR FIS
Crit 100-YR FIS
EG 100-YR
WS 100-YR
Crit 100-YR
EG 5-YR
WS 5-YR
Crit 5-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

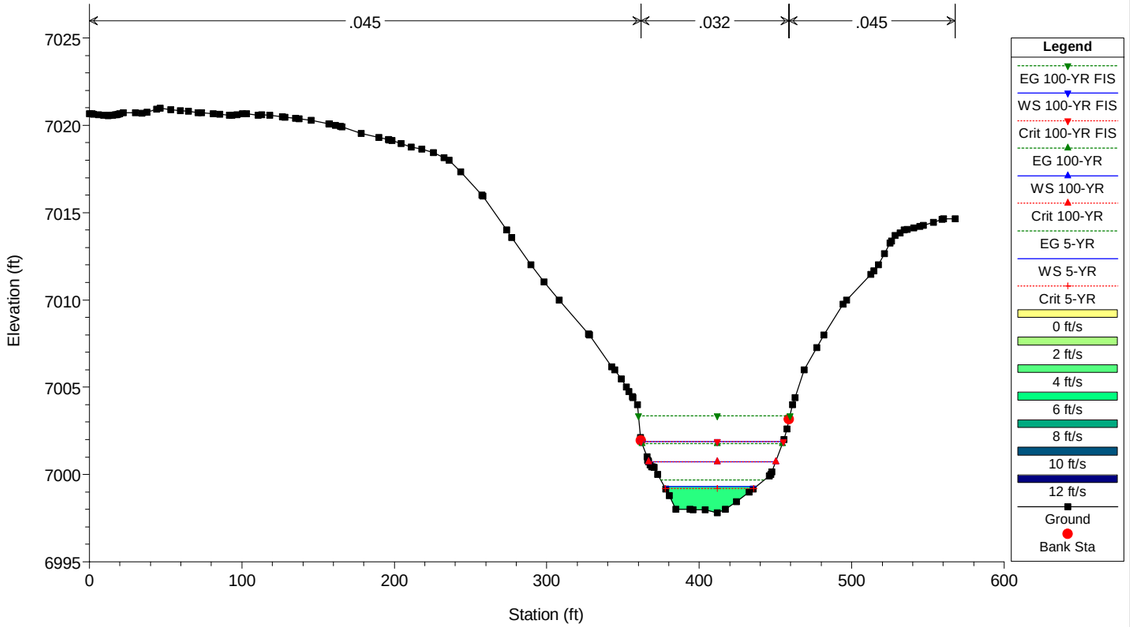
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 2824 Section CW



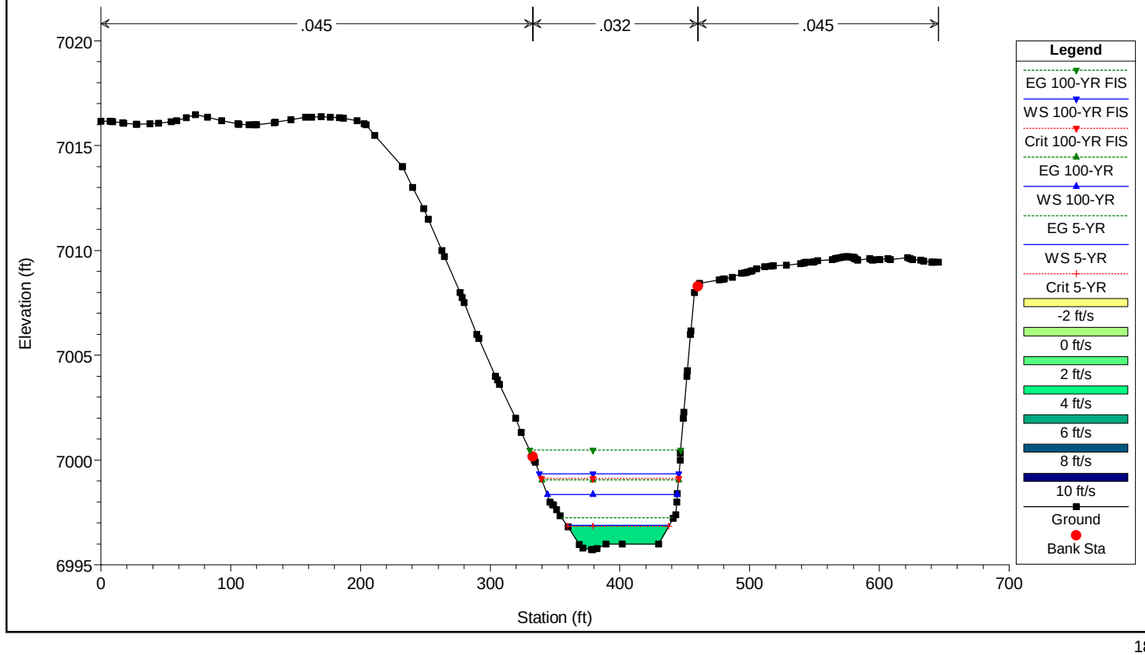
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 2586



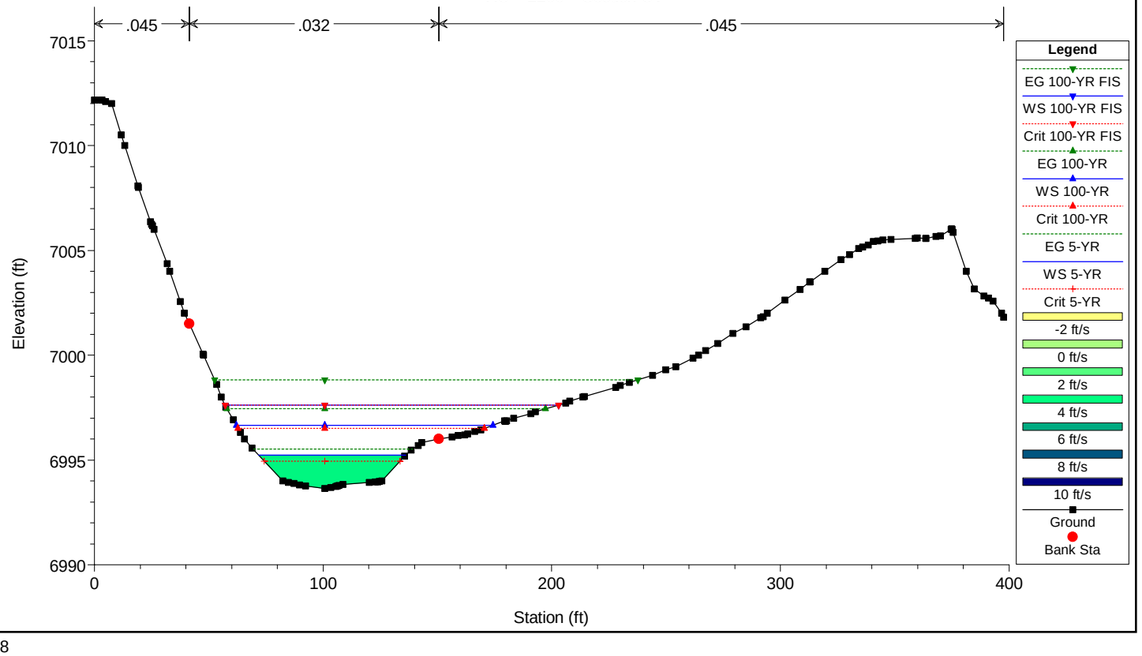
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 2386



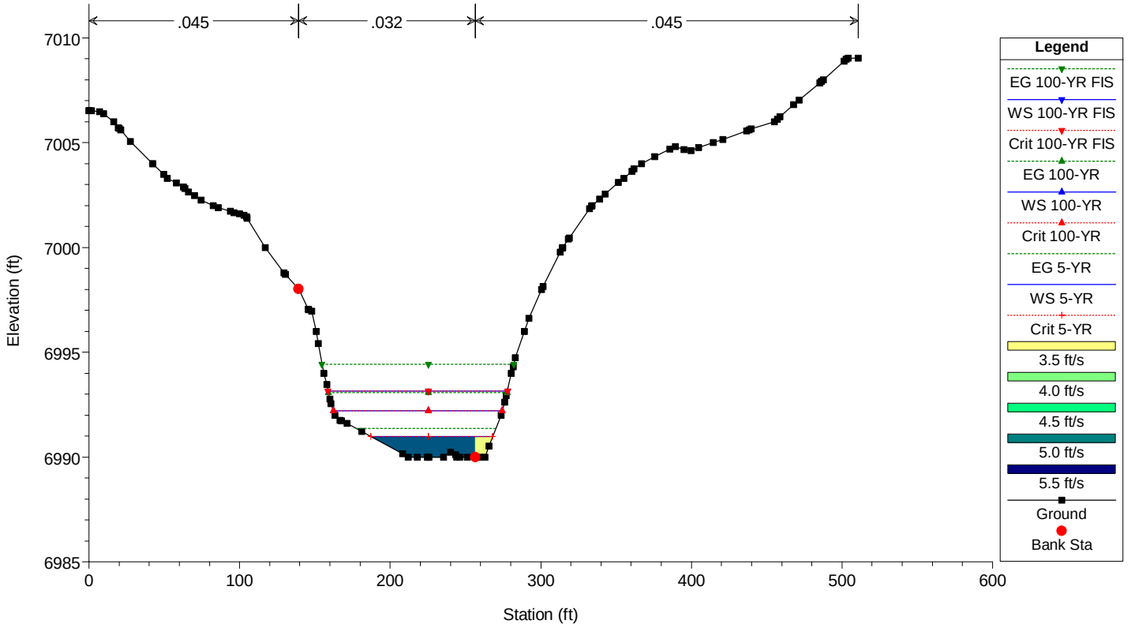
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 2200 Section CV



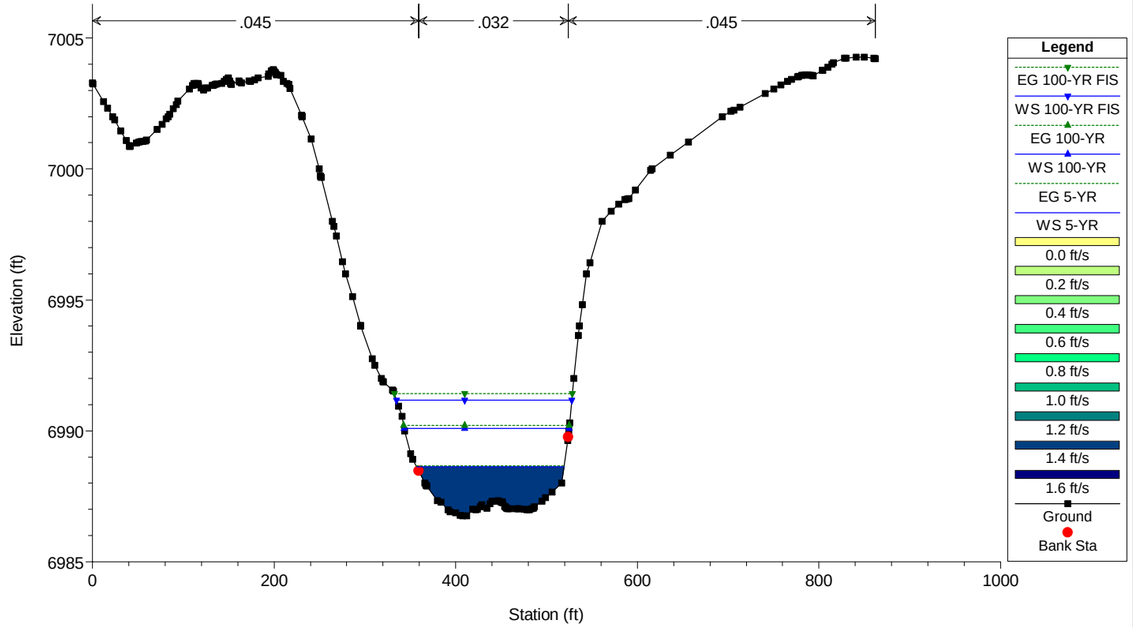
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 1795



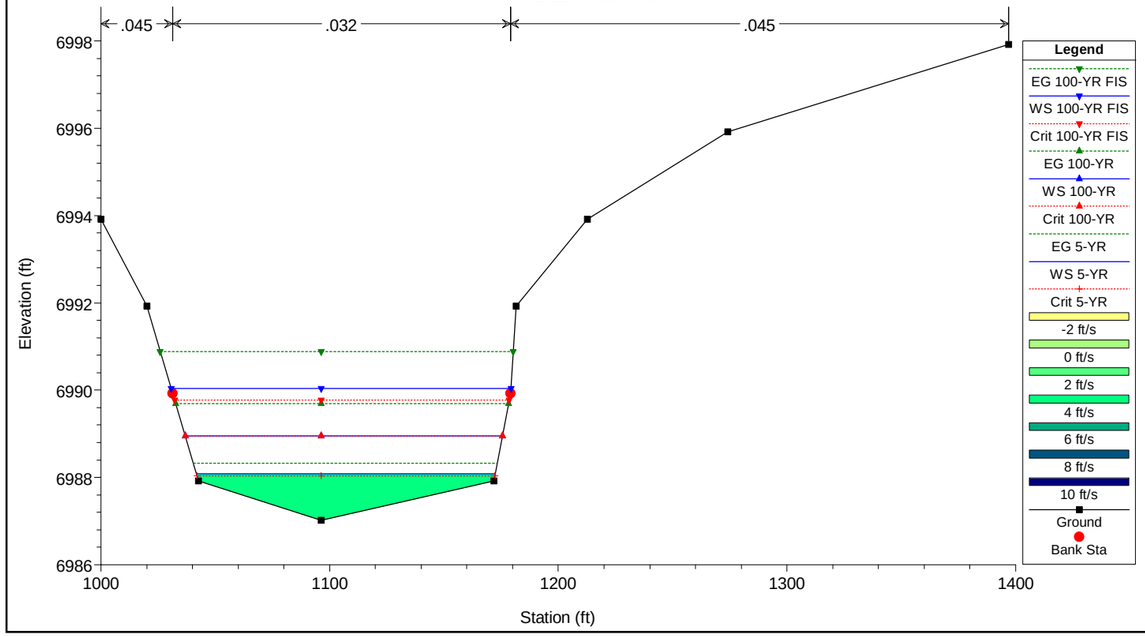
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 1596



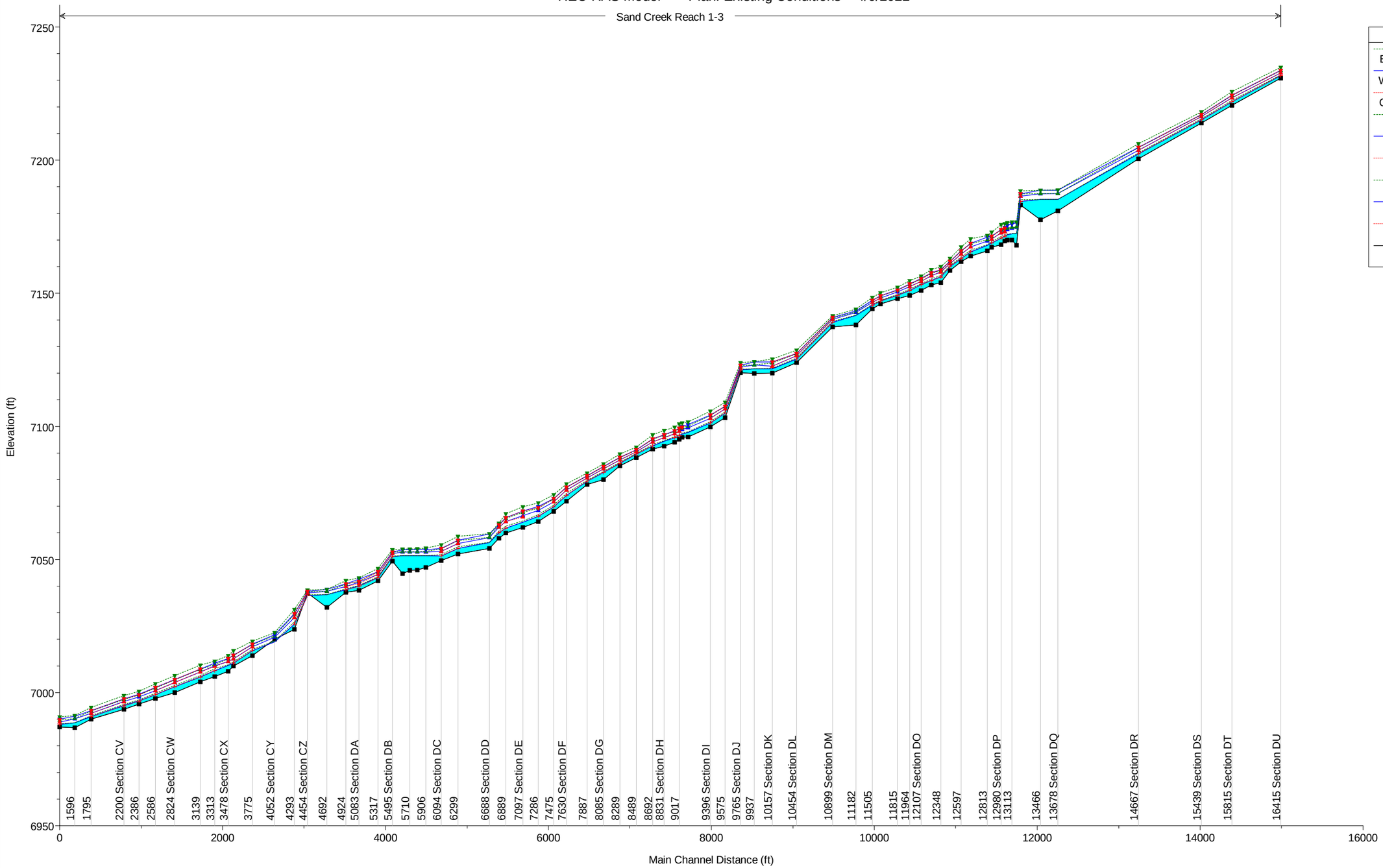
HEC-RAS Model Plan: Existing Conditions 4/6/2022

RS = 1411 Section CU



HEC-RAS Model Plan: Existing Conditions 4/6/2022

Sand Creek Reach 1-3



HEC-RAS Plan: EX River: Sand Creek Reach: Reach 1-3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	16415	5-YR	312.00	7230.74	7231.80	7231.75	7232.09	0.013651	108.40	0.91	0.50	0.64		2.70	4.49		4.07
Reach 1-3	16415	100-YR	1350.00	7230.74	7232.82	7232.82	7233.62	0.014014	121.98	1.05	1.29	1.43		5.07	7.62		6.95
Reach 1-3	16415	100-YR FIS	2600.00	7230.74	7233.70	7233.70	7234.91	0.012528	131.92	1.06	1.73	1.89	0.13	6.27	9.35	1.12	8.51
Reach 1-3	15815	5-YR	312.00	7220.56	7221.96	7221.96	7222.39	0.019209	69.22	1.07	1.55	0.86		5.44	5.16		5.26
Reach 1-3	15815	100-YR	1350.00	7220.56	7223.35	7223.35	7224.28	0.014642	96.39	1.08	2.12	1.53		7.01	7.94		7.69
Reach 1-3	15815	100-YR FIS	2600.00	7220.56	7224.38	7224.38	7225.71	0.012801	114.61	1.08	2.41	1.96	0.13	7.79	9.56	1.13	9.12
Reach 1-3	15439	5-YR	312.00	7213.99	7215.16	7215.16	7215.54	0.016532	88.54	1.00		0.77	0.05		4.92	0.54	4.91
Reach 1-3	15439	100-YR	1350.00	7213.99	7216.35	7216.35	7217.04	0.010046	173.07	0.91	0.34	1.16	0.50	2.22	7.00	2.86	5.93
Reach 1-3	15439	100-YR FIS	2600.00	7213.99	7217.11	7217.11	7218.12	0.009740	187.49	0.95	0.64	1.59	0.93	3.39	8.69	4.31	7.10
Reach 1-3	14667	5-YR	312.00	7200.47	7202.31	7202.31	7202.75	0.015765	67.68	1.00	0.15	0.86		1.19	5.34		5.32
Reach 1-3	14667	100-YR	1350.00	7200.47	7203.68	7203.68	7204.66	0.011679	92.05	0.99	0.56	1.47		3.01	8.01		7.77
Reach 1-3	14667	100-YR FIS	2600.00	7200.47	7204.80	7204.80	7206.17	0.009784	106.88	0.97	0.84	1.84		4.03	9.59		8.99
Reach 1-3	13678	5-YR	312.00	7180.91	7185.21		7185.22	0.000086	181.37	0.09	0.01	0.01		0.45	0.84		0.72
Reach 1-3	13678	100-YR	1350.00	7180.91	7187.41		7187.45	0.000180	248.84	0.14	0.04	0.05	0.02	1.07	1.77	0.64	1.43
Reach 1-3	13678	100-YR FIS	2600.00	7180.91	7188.71		7188.79	0.000273	255.00	0.18	0.08	0.10	0.05	1.56	2.55	1.11	2.04
Reach 1-3	13466	5-YR	312.00	7177.63	7185.21		7185.22	0.000012	131.08	0.04	0.00	0.00	0.00	0.21	0.56	0.18	0.50
Reach 1-3	13466	100-YR	1350.00	7177.63	7187.38		7187.43	0.000078	143.22	0.10	0.02	0.04	0.02	0.68	1.72	0.68	1.46
Reach 1-3	13466	100-YR FIS	2600.00	7177.63	7188.64		7188.74	0.000174	148.75	0.16	0.05	0.11	0.05	1.16	2.82	1.17	2.34
Reach 1-3	13220	5-YR	312.00	7183.14	7184.57	7184.57	7185.15	0.021327	44.29	1.20	1.60	1.44		5.46	7.13		5.95
Reach 1-3	13220	100-YR	1350.00	7183.14	7186.52	7186.52	7187.29	0.016867	121.58	1.08	2.35	1.21		7.32	6.62		7.00
Reach 1-3	13220	100-YR FIS	2600.00	7183.14	7187.36	7187.36	7188.50	0.017163	144.86	1.18	2.64	1.95		7.89	9.06		8.48
Reach 1-3	13169	5-YR	312.00	7168.00	7172.49		7172.50	0.000075	81.17	0.09	0.01	0.02		0.59	1.03		0.96
Reach 1-3	13169	100-YR	1350.00	7168.00	7174.81		7174.92	0.000332	90.61	0.20	0.09	0.12		1.55	2.79		2.58
Reach 1-3	13169	100-YR FIS	2600.00	7168.00	7176.56		7176.81	0.000551	97.74	0.26	0.17	0.25		2.26	4.12		3.78
Reach 1-3	13113	5-YR	312.00	7170.00	7172.27		7172.47	0.004346	74.70	0.55	0.13	0.35		1.33	3.62		3.49
Reach 1-3	13113	100-YR	1350.00	7170.00	7174.40		7174.85	0.003073	86.38	0.54	0.40	0.60		3.00	5.48		5.16
Reach 1-3	13113	100-YR FIS	2600.00	7170.00	7176.03		7176.70	0.002975	95.13	0.56	0.58	0.82		3.85	6.80		6.36
Reach 1-3	13060	5-YR	312.00	7169.99	7171.98		7172.23	0.004238	55.47	0.58	0.31	0.44		2.41	4.26		3.73
Reach 1-3	13060	100-YR	1350.00	7169.99	7173.96		7174.60	0.005801	78.96	0.73	0.97	0.98		4.85	6.86		6.23
Reach 1-3	13060	100-YR FIS	2600.00	7169.99	7175.54		7176.47	0.005127	88.12	0.73	1.19	1.26		5.68	8.28		7.46
Reach 1-3	13025	5-YR	312.00	7169.60	7171.46	7171.41	7171.97	0.013644	50.65	0.98	0.87	1.00		3.90	6.05		5.44
Reach 1-3	13025	100-YR	1350.00	7169.60	7173.30	7173.09	7174.31	0.009940	70.33	0.95	1.43	1.57		5.74	8.60		7.73
Reach 1-3	13025	100-YR FIS	2600.00	7169.60	7174.67	7174.43	7176.18	0.009199	77.33	0.97	1.86	2.10		6.92	10.56		9.42
Reach 1-3	12980	5-YR	312.00	7168.31	7170.71	7170.71	7171.35	0.013251	41.88	0.98	0.27	1.10		1.81	6.47		6.25
Reach 1-3	12980	100-YR	1350.00	7168.31	7172.64	7172.64	7173.82	0.010752	69.50	0.99	0.96	1.73		4.33	9.04		8.25
Reach 1-3	12980	100-YR FIS	2600.00	7168.31	7173.95	7173.95	7175.71	0.010047	75.20	1.01	1.44	2.32		5.75	11.15		10.06
Reach 1-3	12866	5-YR	312.00	7167.28	7168.82	7168.82	7169.33	0.015205	54.36	1.02	0.85	1.02		3.78	5.99		5.55
Reach 1-3	12866	100-YR	1350.00	7167.28	7170.39	7170.39	7171.38	0.013230	90.90	1.05	1.34	1.61		5.83	8.35		7.80
Reach 1-3	12866	100-YR FIS	2600.00	7167.28	7171.48	7171.48	7172.96	0.011621	96.47	1.05	1.62	2.14		6.66	10.28		9.45
Reach 1-3	12813	5-YR	312.00	7165.88	7167.99		7168.21	0.008172	88.80	0.72	0.62	0.45		3.39	3.85		3.75
Reach 1-3	12813	100-YR	1350.00	7165.88	7169.56		7170.07	0.005641	110.92	0.70	0.63	0.79		4.08	5.98		5.58
Reach 1-3	12813	100-YR FIS	2600.00	7165.88	7171.04		7171.71	0.004117	122.66	0.65	0.70	0.90		4.12	6.88		6.26
Reach 1-3	12716	5-YR	312.00	7164.00	7165.57	7165.57	7166.14	0.014398	49.30	1.00	0.10	1.02		0.91	6.05		6.00
Reach 1-3	12716	100-YR	1350.00	7164.00	7167.36	7167.36	7168.60	0.010244	68.30	0.97	0.83	1.75		3.98	9.19		8.37
Reach 1-3	12716	100-YR FIS	2600.00	7164.00	7168.78	7168.78	7170.50	0.009164	81.36	0.97	1.12	2.24		5.23	11.04		9.75
Reach 1-3	12597	5-YR	312.00	7161.80	7163.09	7163.09	7163.59	0.015770	58.09	1.03	0.79	0.98		3.58	5.81		5.54
Reach 1-3	12597	100-YR	1350.00	7161.80	7164.65	7164.65	7165.74	0.012173	94.31	1.03	1.32	1.66		5.25	8.64		8.13
Reach 1-3	12597	100-YR FIS	2600.00	7161.80	7165.87	7165.87	7167.45	0.010727	113.30	1.03	1.65	2.14		6.25	10.44		9.76
Reach 1-3	12462	5-YR	312.00	7158.51	7160.05	7160.05	7160.39	0.017498	99.64	1.01		0.73			4.69		4.69
Reach 1-3	12462	100-YR	1350.00	7158.51	7161.12	7161.12	7161.90	0.012932	131.37	1.00	0.26	1.25		1.76	7.07		6.99
Reach 1-3	12462	100-YR FIS	2600.00	7158.51	7161.98	7161.98	7163.12	0.011052	140.72	0.99	0.59	1.63		3.14	8.64		8.40
Reach 1-3	12348	5-YR	312.00	7154.00	7156.23	7156.11	7156.74	0.011411	43.09	0.90		0.89			5.74		5.74
Reach 1-3	12348	100-YR	1350.00	7154.00	7158.02	7157.88	7158.70	0.010116	124.28	0.90	0.23	1.07		1.68	6.62		6.58
Reach 1-3	12348	100-YR FIS	2600.00	7154.00	7158.96	7158.76	7159.98	0.008787	131.40	0.89	0.54	1.39		3.05	8.10		7.99
Reach 1-3	12232	5-YR	312.00	7153.09	7154.80	7154.76	7155.31	0.013370	48.35	0.96		0.93			5.76		5.76
Reach 1-3	12232	100-YR	1350.00	7153.09	7156.51	7156.51	7157.46	0.010831	103.57	0.96	0.47	1.43		2.69	7.95		7.40
Reach 1-3	12232	100-YR FIS	2600.00	7153.09	7157.63	7157.63	7158.88	0.009775	128.87	0.96	0.83	1.76		3.99	9.31		8.33
Reach 1-3	12107	5-YR	312.00	7151.03	7153.19	7153.19	7153.62	0.013053	69.32	0.95	0.56	0.90		2.95	5.68		4.81
Reach 1-3	12107	100-YR	1350.00	7151.03	7154.53	7154.53	7155.34	0.014996	125.29	1.08	1.33	1.50		5.62	7.78		6.99
Reach 1-3	12107	100-YR FIS	2600.00	7151.03	7155.54	7155.44	7156.47	0.012902	166.33	1.04	1.77	1.59		6.34	8.29		7.57
Reach 1-3	11964	5-YR	312.00	7149.23	7151.00	7151.00	7151.46	0.016147	65.81	1.02	0.06	0.90		0.64	5.47		5.46
Reach 1-3	11964	100-YR	1350.00	7149.23	7152.48	7152.48	7153.35	0.011211	108.16	0.97	0.66	1.36		3.37	7.66		7.17
Reach 1-3	11964	100-YR FIS	2600.00	7149.23	7153.49	7153.49	7154.68	0.010935	130.63	1.00	1.15	1.73		4.89	9.04		8.41
Reach 1-3	11815	5-YR	312.00	7148.00	7149.34	7149.15	7149.56	0.008130	99.02	0.72	0.28	0.44		1.98	3.80		3.73
Reach 1-3	11815	100-YR	1350.00	7148.00	7150.50		7151.10	0.008733	131.61	0.84	0.59	0.95		3.25	6.29		6.10
Reach 1-3	11815	100-YR FIS	2600.00	7148.00	7151.25	7151.14	7152.30	0.009898	139.14	0.94	0.91	1.50		4.25	8.36		8.04
Reach 1-3	11606	5-YR	312.00	7146.04	7147.08	7147.04	7147.38	0.013959	98.98	0.91		0.62			4.39		4.39
Reach 1-3	11606	100-YR	1350.00	7146.04	7148.13	7148.13	7148.91	0.012611	128.89	0.99	0.25	1.25		1.73	7.08		7.00
Reach 1-3	11606	100-YR FIS	2600.00	7146.04	7149.01	7149.01	7150.13	0.010947	148.86	0.99	0.53	1.59		2.90	8.54		8.25
Reach 1-3	11505	5-YR	312.00	7144.13	7145.47	7145.47	7145.83	0.017011	92.57	1.01		0.75			4.79		4.79
Reach 1-3	11505	100-YR	1350.00	7144.13	7146.55	7146.55	7147.29	0.013609	136.83	1.01		1.22			6.88		6.88
Reach 1-3	11505	100-YR FIS	2600.00	7144.13	7147.37	7147.37	7148.44	0.011814	151.18	1.01	0.29	1.56		1.91	8.30		8.28
Reach 1-3	11182	5-YR	312.00	7138.10	7141.71		7141.83	0.004997	151.72	0.55		0.23			2.72		2.72
Reach 1-3	11182	100-YR	1350.00	7138.10	7142.76		7143.07	0.005184	198.20	0.63	0.10	0.51		1.12	4.52		4.48
Reach 1-3	11182	100-YR FIS	2600.00	7138.10	7143.40		7143.97	0.006153	228.95	0.73	0.25	0.84	0.06	1.93	6.14	0.81	5.98
Reach 1-3	10899	5-YR	312.00	7137.38	7139.11	7139.11	7139.42	0.017130	121.57	0.99		0.67	0.14		4.44	1.09	4.38
Reach 1-3	10899	100-YR	1350.00	7137.38	7140.18	7140.18	7140.75	0.014728	220.38	1.02		1.07	0.63		6.22	3.10	5.78
Reach 1-3	10899	100-YR FIS	2600.00	7137.38	7140.89	7140.89	7141.58	0.012585	277.39	0.99		1.21	0.90		6.95	4.07	6.43
Reach 1-3	10454	5-YR	312.00	7124.00	7125.25	7125.25	7125.65	0.017063	80.84	1.02		0.81			5.05		5.05
Reach 1-3	10454	100-YR	1350.00	7124.00	7126.59	7126.53	7127.32	0.011605	122.27	0.95		1.16			6.84		6.84
Reach 1-3	10454	100-YR FIS	2600.00	7124.00	7127.40	7127.40	7128.57	0.011627	129.05	1.01		1.66			8.71		8.71
Reach 1-3	10157	5-YR	312.00	7120.00	7121.62		7121.80	0.003321	60.85	0.50		0.30			3.46		3.46
Reach 1-3	10157	100-YR	1350.00	7120.00	7122.64	7122.64	7123.80	0.011888	69.77	1.01		1.65			8.62		8.62

HEC-RAS Plan: EX River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	10157	100-YR FIS	2600.00	7120.00	7124.17	7124.17	7125.29	0.010313	162.85	0.96	0.20	1.56		1.56	8.51		8.24
Reach 1-3	9937	5-YR	312.00	7119.89	7121.66		7121.66	0.000144	260.48	0.11	0.01	0.01		0.52	0.78		0.74
Reach 1-3	9937	100-YR	1350.00	7119.89	7123.09		7123.13	0.000337	272.10	0.18	0.05	0.06		1.14	1.78		1.68
Reach 1-3	9937	100-YR FIS	2600.00	7119.89	7124.17		7124.27	0.000450	279.05	0.22	0.09	0.11		1.58	2.51		2.36
Reach 1-3	9765	5-YR	312.00	7120.11	7121.19	7121.19	7121.54	0.021999	97.49	1.11		0.82	1.23		4.88	4.54	4.79
Reach 1-3	9765	100-YR	1350.00	7120.11	7122.21	7122.21	7122.89	0.016240	162.11	1.08		1.26	1.33		6.82	5.05	6.52
Reach 1-3	9765	100-YR FIS	2600.00	7120.11	7123.01	7123.01	7123.96	0.012599	190.54	1.03	0.07	1.53	1.04	0.71	8.11	4.63	7.50
Reach 1-3	9575	5-YR	312.00	7103.29	7104.97	7104.97	7105.44	0.015634	59.60	1.00		0.91			5.54		5.54
Reach 1-3	9575	100-YR	1350.00	7103.29	7106.57	7106.57	7107.51	0.012450	92.65	1.00		1.43			7.77		7.77
Reach 1-3	9575	100-YR FIS	2600.00	7103.29	7107.62	7107.62	7109.00	0.011087	101.52	1.00		1.84			9.40		9.40
Reach 1-3	9396	5-YR	312.00	7099.80	7101.28	7101.28	7101.81	0.015149	51.60	1.01		0.97			5.83		5.83
Reach 1-3	9396	100-YR	1350.00	7099.80	7103.00	7103.00	7104.09	0.011915	75.15	1.01		1.58			8.38		8.38
Reach 1-3	9396	100-YR FIS	2600.00	7099.80	7104.28	7104.28	7105.73	0.010667	93.46	1.00		1.90			9.65		9.65
Reach 1-3	9120	5-YR	312.00	7095.99	7097.70		7097.93	0.005008	66.95	0.60		0.38			3.77		3.77
Reach 1-3	9120	100-YR	1350.00	7095.99	7099.40		7100.02	0.005179	84.95	0.69	0.11	0.84		1.18	6.33		6.30
Reach 1-3	9120	100-YR FIS	2600.00	7095.99	7100.72		7101.71	0.004974	93.01	0.72	0.33	1.19		2.43	8.00		7.82
Reach 1-3	9052	5-YR	312.00	7095.85	7097.14		7097.46	0.009012	64.86	0.78		0.59			4.56		4.56
Reach 1-3	9052	100-YR	1350.00	7095.85	7098.80		7099.58	0.007301	80.35	0.81	0.06	1.09		0.70	7.10		7.09
Reach 1-3	9052	100-YR FIS	2600.00	7095.85	7099.94	7099.64	7101.25	0.007544	89.18	0.87	0.32	1.63		2.24	9.21		9.06
Reach 1-3	9017	5-YR	312.00	7095.09	7096.56	7096.53	7097.05	0.013920	53.89	0.97		0.90			5.59		5.59
Reach 1-3	9017	100-YR	1350.00	7095.09	7098.16	7098.16	7099.22	0.012033	78.47	1.01		1.55			8.26		8.26
Reach 1-3	9017	100-YR FIS	2600.00	7095.09	7099.33	7099.33	7100.91	0.010434	85.24	1.00	0.21	2.01		1.59	10.07		10.04
Reach 1-3	8959	5-YR	312.00	7094.00	7095.70	7095.70	7096.18	0.015769	60.34	1.01		0.91			5.55		5.55
Reach 1-3	8959	100-YR	1350.00	7094.00	7097.22	7097.22	7098.22	0.012106	85.87	1.01		1.48			7.99		7.99
Reach 1-3	8959	100-YR FIS	2600.00	7094.00	7098.34	7098.33	7099.75	0.010626	100.44	1.00	0.23	1.86		1.66	9.53		9.49
Reach 1-3	8831	5-YR	312.00	7092.55	7094.36		7094.67	0.008241	61.95	0.75		0.57			4.52		4.52
Reach 1-3	8831	100-YR	1350.00	7092.55	7095.78	7095.70	7096.75	0.010771	81.19	0.96	0.03	1.42		0.42	7.92		7.92
Reach 1-3	8831	100-YR FIS	2600.00	7092.55	7096.87	7096.87	7098.41	0.010163	89.27	0.99	0.47	1.98		2.72	9.98		9.84
Reach 1-3	8692	5-YR	312.00	7091.45	7092.68	7092.68	7093.13	0.015585	65.84	1.00		0.86			5.34		5.34
Reach 1-3	8692	100-YR	1350.00	7091.45	7094.12	7094.12	7095.17	0.011927	82.13	1.01	0.17	1.54		1.33	8.22		8.19
Reach 1-3	8692	100-YR FIS	2600.00	7091.45	7095.30	7095.30	7096.81	0.010097	92.70	0.99	0.53	1.95		2.95	9.90		9.70
Reach 1-3	8489	5-YR	312.00	7088.21	7089.61	7089.57	7089.87	0.015995	126.64	0.95		0.59			4.15		4.15
Reach 1-3	8489	100-YR	1350.00	7088.21	7090.47	7090.47	7091.11	0.013906	167.97	1.00		1.09			6.38		6.38
Reach 1-3	8489	100-YR FIS	2600.00	7088.21	7091.18	7091.18	7092.13	0.012103	175.08	1.00		1.43			7.82		7.82
Reach 1-3	8289	5-YR	312.00	7085.18	7086.19	7086.19	7086.54	0.017231	95.11	1.01		0.74			4.76		4.76
Reach 1-3	8289	100-YR	1350.00	7085.18	7087.33	7087.33	7088.21	0.012794	104.67	1.01		1.37			7.51		7.51
Reach 1-3	8289	100-YR FIS	2600.00	7085.18	7088.31	7088.31	7089.59	0.011186	113.21	1.01		1.76			9.08		9.08
Reach 1-3	8085	5-YR	312.00	7080.00	7082.71	7082.71	7083.11	0.016509	77.74	1.00		0.81			5.07		5.07
Reach 1-3	8085	100-YR	1350.00	7080.00	7084.02	7084.02	7084.77	0.013380	142.91	1.00		1.23	0.18		6.95	2.15	6.88
Reach 1-3	8085	100-YR FIS	2600.00	7080.00	7084.88	7084.88	7085.90	0.010540	191.32	0.96		1.49	0.39		8.21	2.40	7.63
Reach 1-3	7887	5-YR	312.00	7078.18	7079.42	7079.42	7079.80	0.017858	86.30	0.99		0.62	1.58		4.22	5.57	4.79
Reach 1-3	7887	100-YR	1350.00	7078.18	7080.60	7080.60	7081.35	0.016170	134.39	1.09		1.31	2.03		7.03	6.68	6.94
Reach 1-3	7887	100-YR FIS	2600.00	7078.18	7081.50	7081.50	7082.45	0.014130	177.52	1.07		1.55	2.06		8.05	6.92	7.78
Reach 1-3	7630	5-YR	312.00	7071.92	7074.13	7074.13	7074.84	0.013712	32.68	1.00		1.18			6.75		6.75
Reach 1-3	7630	100-YR	1350.00	7071.92	7076.11	7076.11	7077.01	0.011033	108.89	0.96		1.38	0.50		7.74	2.81	7.24
Reach 1-3	7630	100-YR FIS	2600.00	7071.92	7077.14	7077.14	7078.41	0.009988	124.56	0.97		1.79	0.87		9.36	4.13	8.49
Reach 1-3	7475	5-YR	312.00	7068.00	7069.81	7069.81	7070.39	0.014724	44.69	1.01		1.04			6.11		6.11
Reach 1-3	7475	100-YR	1350.00	7068.00	7071.61	7071.61	7072.73	0.011822	72.90	1.01		1.62	0.35		8.53	2.19	8.48
Reach 1-3	7475	100-YR FIS	2600.00	7068.00	7072.88	7072.88	7074.39	0.010532	91.76	1.00		1.97	0.62		9.90	3.26	9.74
Reach 1-3	7286	5-YR	312.00	7064.24	7066.21	7066.21	7066.77	0.014942	48.33	1.01		1.02	0.12		6.01	1.01	6.00
Reach 1-3	7286	100-YR	1350.00	7064.24	7068.38		7069.31	0.007109	67.97	0.82		1.27	0.58		7.88	3.34	7.51
Reach 1-3	7286	100-YR FIS	2600.00	7064.24	7069.85	7069.44	7071.23	0.006807	77.17	0.84		1.70	0.94		9.66	4.62	9.05
Reach 1-3	7097	5-YR	312.00	7061.99	7064.03		7064.46	0.006319	33.41	0.70		0.68			5.29		5.29
Reach 1-3	7097	100-YR	1350.00	7061.99	7066.40	7065.95	7067.73	0.009596	47.55	0.93		1.74			9.26		9.26
Reach 1-3	7097	100-YR FIS	2600.00	7061.99	7068.12	7068.12	7069.73	0.009100	92.52	0.94		2.00	0.36		10.24	2.33	9.78
Reach 1-3	6889	5-YR	312.00	7059.99	7061.77	7061.77	7062.56	0.013639	28.06	1.01		1.29			7.14		7.14
Reach 1-3	6889	100-YR	1350.00	7059.99	7064.27	7064.27	7065.49	0.011685	63.99	1.01		1.70			8.83		8.83
Reach 1-3	6889	100-YR FIS	2600.00	7059.99	7065.72	7065.72	7067.20	0.010906	91.30	1.01		1.95			9.77		9.77
Reach 1-3	6801	5-YR	312.00	7058.00	7060.11	7060.11	7060.66	0.014158	47.19	0.99		0.98			5.92		5.92
Reach 1-3	6801	100-YR	1350.00	7058.00	7062.12	7062.12	7062.83	0.006764	196.15	0.78		1.10	0.28		7.22	2.08	5.36
Reach 1-3	6801	100-YR FIS	2600.00	7058.00	7063.00	7063.00	7063.65	0.009592	266.76	0.90		1.25	0.84		7.42	4.06	5.76
Reach 1-3	6688	5-YR	312.00	7054.20	7056.37		7056.43	0.002578	165.36	0.40		0.12	0.20		1.97	1.96	1.97
Reach 1-3	6688	100-YR	1350.00	7054.20	7058.19		7058.29	0.001552	258.69	0.35		0.16	0.29		2.57	2.67	2.61
Reach 1-3	6688	100-YR FIS	2600.00	7054.20	7059.53		7059.66	0.001102	303.43	0.32		0.18	0.28		2.91	2.82	2.88
Reach 1-3	6299	5-YR	312.00	7052.00	7054.15	7054.12	7054.72	0.013200	43.91	0.97		0.99	0.08		6.04	0.95	6.02
Reach 1-3	6299	100-YR	1350.00	7052.00	7055.98	7055.98	7057.05	0.011632	82.64	1.00		1.57	0.74		8.38	3.59	8.05
Reach 1-3	6299	100-YR FIS	2600.00	7052.00	7057.20	7057.20	7058.65	0.010342	135.95	1.00		1.95	1.03		9.85	4.57	9.32
Reach 1-3	6094	5-YR	312.00	7049.53	7051.28	7051.28	7051.82	0.015086	49.01	1.01		1.00			5.93		5.93
Reach 1-3	6094	100-YR	1350.00	7049.53	7052.98	7052.98	7053.97	0.012178	85.88	1.00		1.48			7.97		7.97
Reach 1-3	6094	100-YR FIS	2600.00	7049.53	7054.10	7054.10	7055.47	0.011193	104.24	1.01		1.85	0.07		9.39	0.79	9.39
Reach 1-3	5906	5-YR	312.00	7047.00	7051.41		7051.44	0.000296	84.07	0.16		0.05			1.47		1.47
Reach 1-3	5906	100-YR	1350.00	7047.00	7052.79		7053.04	0.001343	98.16	0.37	0.07	0.31		1.06	4.03		3.97
Reach 1-3	5906	100-YR FIS	2600.00	7047.00	7053.64		7054.24	0.002557	104.34	0.53	0.21	0.69		2.00	6.24		6.10
Reach 1-3	5803	5-YR	312.00	7046.00	7051.42		7051.42	0.000048	133.63	0.07		0.01	0.01		0.77	0.42	0.68
Reach 1-3	5803	100-YR	1350.00	7046.00	7052.85		7052.92	0.000351	166.28	0.19		0.09	0.07		2.30	1.30	2.03
Reach 1-3	5803	100-YR FIS	2600.00	7046.00	7053.82		7053.98	0.000721	190.07	0.28	0.01	0.21	0.17	0.33	3.48	2.13	3.09
Reach 1-3	5710	5-YR	312.00	7045.88	7051.41		7051.42	0.000038	106.96	0.06		0.01			0.72		0.72
Reach 1-3	5710	100-YR	1350.00	7045.88	7052.81		7052.89	0.000294	124.75	0.18	0.00	0.09		0.14	2.27		2.27
Reach 1-3	5710	100-YR FIS	2600.00	7045.88	7053.71		7053.92	0.000642	137.56	0.27	0.02	0.22		0.57	3.68		3.65
Reach 1-3	5619	5-YR	312.00	7044.65	7051.41		7051.42	0.000019	109.84	0.05	0.00	0.01		0.04	0.58		0.58
Reach 1-3	5619	100-YR	1350.00	7044.65	7052.81		7052.87	0.000163	126.39	0.14	0.01	0.06		0.34	1.95		1.93
Reach 1-3	5619	100-YR FIS	2600.00	7044.65	7053.69		7053.86	0.000394	141.49	0.22	0.03	0.16		0.67	3.26		3.17

HEC-RAS Plan: EX River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	5495	5-YR	312.00	7049.36	7051.02	7051.02	7051.37	0.018057	97.75	1.02		0.76	0.05		4.79	0.52	4.78
Reach 1-3	5495	100-YR	1350.00	7049.36	7052.16	7052.16	7052.75	0.012321	216.52	0.95	0.33	1.04	0.35	2.09	6.32	2.17	5.77
Reach 1-3	5495	100-YR FIS	2600.00	7049.36	7052.82	7052.82	7053.65	0.011024	256.74	0.96	0.51	1.35	0.63	2.84	7.65	3.25	6.62
Reach 1-3	5317	5-YR	312.00	7042.00	7043.18	7043.18	7043.57	0.016734	80.24	1.01		0.80			5.05		5.05
Reach 1-3	5317	100-YR	1350.00	7042.00	7044.45	7044.45	7045.32	0.012582	104.15	1.00		1.35			7.49		7.49
Reach 1-3	5317	100-YR FIS	2600.00	7042.00	7045.46	7045.46	7046.68	0.011372	121.36	1.01		1.70			8.87		8.87
Reach 1-3	5083	5-YR	312.00	7038.33	7040.16	7039.78	7040.30	0.004774	123.91	0.55		0.26			2.91		2.91
Reach 1-3	5083	100-YR	1350.00	7038.33	7041.48	7040.86	7041.83	0.004172	144.67	0.59		0.52	0.02		4.73	0.34	4.73
Reach 1-3	5083	100-YR FIS	2600.00	7038.33	7042.52	7041.66	7043.06	0.003814	155.77	0.61	0.09	0.71	0.13	1.08	5.93	1.33	5.88
Reach 1-3	4924	5-YR	312.00	7037.69	7038.62	7038.62	7038.99	0.016523	87.53	1.00		0.76			4.85		4.85
Reach 1-3	4924	100-YR	1350.00	7037.69	7039.84	7039.84	7040.71	0.012615	104.32	1.00		1.35			7.48		7.48
Reach 1-3	4924	100-YR FIS	2600.00	7037.69	7040.88	7040.88	7042.03	0.011594	134.29	1.01		1.63			8.57		8.57
Reach 1-3	4692	5-YR	312.00	7032.00	7036.78		7036.78	0.000012	301.35	0.03	0.00	0.00		0.27	0.35		0.32
Reach 1-3	4692	100-YR	1350.00	7032.00	7038.04		7038.06	0.000081	320.66	0.09	0.02	0.02		0.81	1.08		0.98
Reach 1-3	4692	100-YR FIS	2600.00	7032.00	7038.75		7038.80	0.000185	328.90	0.14	0.05	0.05		1.32	1.78		1.62
Reach 1-3	4454	5-YR	312.00	7037.42	7036.44	7036.44	7036.73	0.037929	132.85	0.00	1.29			4.30			4.30
Reach 1-3	4454	100-YR	1350.00	7037.42	7037.44	7037.44	7037.89	0.022605	308.74	0.55	1.57	0.01	0.36	5.50	0.29	1.98	5.18
Reach 1-3	4454	100-YR FIS	2600.00	7037.42	7037.97	7037.97	7038.50	0.021823	437.17	1.01	1.93	0.47	0.86	6.15	3.36	3.58	5.58
Reach 1-3	4293	5-YR	312.00	7023.77	7025.77	7025.77	7026.51	0.013806	30.64	1.01		1.23			6.92		6.92
Reach 1-3	4293	100-YR	1350.00	7023.77	7028.14	7028.14	7029.44	0.011705	57.50	1.01		1.80			9.15		9.15
Reach 1-3	4293	100-YR FIS	2600.00	7023.77	7029.61	7029.61	7031.21	0.011248	82.64	1.02		2.08			10.16		10.16
Reach 1-3	4052	5-YR	312.00	7019.99	7019.07		7019.26	0.006695	60.12	0.00	0.62			3.50			3.50
Reach 1-3	4052	100-YR	1350.00	7019.99	7020.78		7021.25	0.008414	137.54	0.71	1.34	0.39	0.35	5.66	3.50	2.29	5.30
Reach 1-3	4052	100-YR FIS	2600.00	7019.99	7021.80		7022.46	0.008560	154.49	0.82	1.73	0.88	0.74	6.68	5.99	3.81	6.43
Reach 1-3	3775	5-YR	312.00	7013.90	7015.73	7015.73	7016.21	0.026045	62.48	1.18	1.77	0.91		5.64	5.11		5.52
Reach 1-3	3775	100-YR	1350.00	7013.90	7017.16	7017.16	7018.03	0.019302	105.42	1.18	2.40	1.62		7.27	7.85		7.49
Reach 1-3	3775	100-YR FIS	2600.00	7013.90	7018.16	7018.16	7019.37	0.016674	127.69	1.18	2.68	2.08		8.16	9.53		8.73
Reach 1-3	3543	5-YR	312.00	7009.94	7011.07	7011.07	7011.56	0.015459	56.63	1.01		0.93			5.65		5.65
Reach 1-3	3543	100-YR	1350.00	7009.94	7012.71	7012.71	7013.89	0.011702	66.51	1.01		1.67			8.72		8.72
Reach 1-3	3543	100-YR FIS	2600.00	7009.94	7014.07	7014.07	7015.71	0.010367	77.33	1.00		2.07			10.27		10.27
Reach 1-3	3478	5-YR	312.00	7008.00	7010.15		7010.46	0.006364	52.01	0.68		0.53			4.48		4.48
Reach 1-3	3478	100-YR	1350.00	7008.00	7011.70	7011.70	7012.61	0.011533	106.20	0.98	0.03	1.38	0.07	0.45	7.68	0.78	7.64
Reach 1-3	3478	100-YR FIS	2600.00	7008.00	7012.78	7012.78	7013.87	0.008706	168.30	0.90	0.46	1.52	0.44	2.76	8.59	2.68	7.63
Reach 1-3	3313	5-YR	312.00	7006.00	7008.17	7008.17	7008.92	0.013984	30.33	1.00		1.24			6.93		6.93
Reach 1-3	3313	100-YR	1350.00	7006.00	7010.02	7009.80	7010.55	0.008727	145.13	0.82	0.03	0.86		0.45	5.87		5.87
Reach 1-3	3313	100-YR FIS	2600.00	7006.00	7011.05		7011.78	0.006209	150.34	0.75	0.25	0.99		1.93	6.85		6.81
Reach 1-3	3139	5-YR	312.00	7003.99	7005.87	7005.73	7006.39	0.010735	40.00	0.88		0.88			5.78		5.78
Reach 1-3	3139	100-YR	1350.00	7003.99	7007.69	7007.69	7008.72	0.012439	82.26	1.01		1.53			8.14		8.14
Reach 1-3	3139	100-YR FIS	2600.00	7003.99	7008.83	7008.83	7010.33	0.010383	94.62	0.99	0.49	1.95		2.80	9.88		9.66
Reach 1-3	2824	5-YR	312.00	7000.00	7002.20	7002.15	7002.64	0.013112	58.17	0.93		0.82			5.32		5.32
Reach 1-3	2824	100-YR	1350.00	7000.00	7003.74	7003.74	7004.78	0.012392	82.17	1.01		1.53			8.15		8.15
Reach 1-3	2824	100-YR FIS	2600.00	7000.00	7004.92	7004.92	7006.39	0.010789	91.46	1.00		1.93			9.71		9.71
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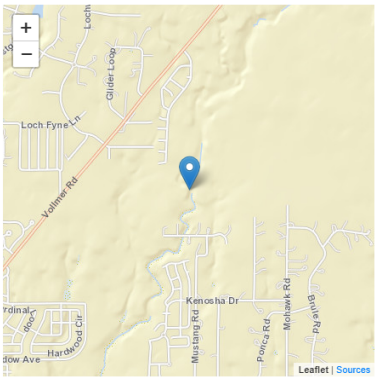
Reach 1-3	2586	100-YR	1350.00	6997.81	7000.74	7000.74	7001.76	0.012176	83.40	1.01		1.51			8.10		8.10
Reach 1-3	2586	100-YR FIS	2600.00	6997.81	7001.89	7001.89	7003.35	0.010714	93.17	1.01		1.91			9.69		9.69
Reach 1-3	2386	5-YR	312.00	6995.72	6996.89	6996.83	6997.23	0.012886	79.20	0.90		0.67			4.69		4.69
Reach 1-3	2386	100-YR	1350.00	6995.72	6998.36		6999.06	0.008354	100.34	0.84		1.04			6.72		6.72
Reach 1-3	2386	100-YR FIS	2600.00	6995.72	6999.34	6999.13	7000.48	0.008642	107.53	0.90		1.51			8.57		8.57
Reach 1-3	2200	5-YR	312.00	6993.65	6995.24	6994.95	6995.51	0.006825	64.24	0.69		0.49			4.21		4.21
Reach 1-3	2200	100-YR	1350.00	6993.65	6996.65	6996.51	6997.45	0.008908	112.19	0.87		1.17	0.21		7.18	1.65	6.92
Reach 1-3	2200	100-YR FIS	2600.00	6993.65	6997.61	6997.61	6998.83	0.009103	145.77	0.93		1.66	0.49		9.04	2.86	8.16
Reach 1-3	1795	5-YR	312.00	6989.98	6990.97	6990.97	6991.36	0.017062	80.81	1.03		0.84	0.80		5.16	3.56	4.94
Reach 1-3	1795	100-YR	1350.00	6989.98	6992.22	6992.22	6993.07	0.013404	112.21	1.03		1.41	1.26		7.62	5.01	7.24
Reach 1-3	1795	100-YR FIS	2600.00	6989.98	6993.16	6993.16	6994.43	0.011631	119.15	1.03		1.85	1.53		9.34	5.85	8.80
Reach 1-3	1596	5-YR	312.00	6986.75	6988.63		6988.66	0.000621	162.34	0.21	0.00	0.05		0.15	1.42		1.42
Reach 1-3	1596	100-YR	1350.00	6986.75	6990.08		6990.21	0.001026	181.40	0.31	0.06	0.18	0.01	1.01	2.93	0.32	2.87
Reach 1-3	1596	100-YR FIS	2600.00	6986.75	6991.17		6991.41	0.001237	193.01	0.36	0.11	0.30	0.05	1.50	4.01	0.90	3.86
Reach 1-3	1411	5-YR	312.00	6987.02	6988.08	6988.04	6988.32	0.014066	130.62	0.89		0.53			3.94		3.94
Reach 1-3	1411	100-YR	1350.00	6987.02	6988.96	6988.96	6989.69	0.013699	138.79	1.01		1.21			6.85		6.85
Reach 1-3	1411	100-YR FIS	2600.00	6987.02	6990.04	6989.77	6990.88	0.007932	148.62	0.84	0.03	1.18	0.02	0.45	7.37	0.38	7.37

convert navd88 to ngvd29 - Goo | NGS Coordinate Conversion and | convert feet to meters - Google | What Is This USMNT Guy's Deal

geodesy.noaa.gov/NCAT/index.xhtml

Select the type of horizontal coordinate: (•) Geodetic lat-long ( ) SPC ( ) UTM ( ) USNG

Select a height ( ) Ellipsoidal (•) Orthometric



Enter lat-lon in decimal degrees

Lat 38.9569393242

Lon -104.6738719940

or degrees-minutes-seconds

Lat N 38-57-24.98157

Lon W 104-40-25.93918

or drag map marker to a location of interest

Input reference frame (historically called 'horizontal datum') NAD83(2011)

Output reference frame (historically called 'horizontal datum') NAD83(2011)

Don't see a reference frame in the list?Click **here** *to learn more.*

Orthometric Height (m) 2,130.500

Input geopotential datum (historically called 'vertical datum') NGVD29

Output geopotential datum (historically called 'vertical datum') NAVD88

SPC zone Auto Pick (default zone)

Submit

Export Results to

Click blue bar(s) to expand/collapse

Transformed Coordinate

Input Coordinate		Output Coordinate		Total Change + Uncertainty	
Latitude	N38° 57' 24.98157" N385724.98157 38.9569393242	Latitude	N38° 57' 24.98157" N385724.98157 38.9569393242	Latitude	0.00000" ±0.000000" (0.000 m ±0.0000 m)*
Longitude	E255° 19' 34.06082" W1044025.93918 -104.6738719940	Longitude	E255° 19' 34.06082" W1044025.93918 -104.6738719940	Longitude	0.00000" ±0.000000" (0.000 m ±0.0000 m)*
Ellipsoid Height (m)	Not given	Ellipsoid Height (m)	Not given	Ellipsoid Height	Not given
Orthometric Height (m)	2130.500	Orthometric Height (m)	2131.690	Orthometric Height	1.190 m ±0.041 m
Reference Frame	NAD83(2011)	Reference Frame	NAD83(2011)		
Geopotential Datum	NGVD29	Geopotential Datum	NAVD88		

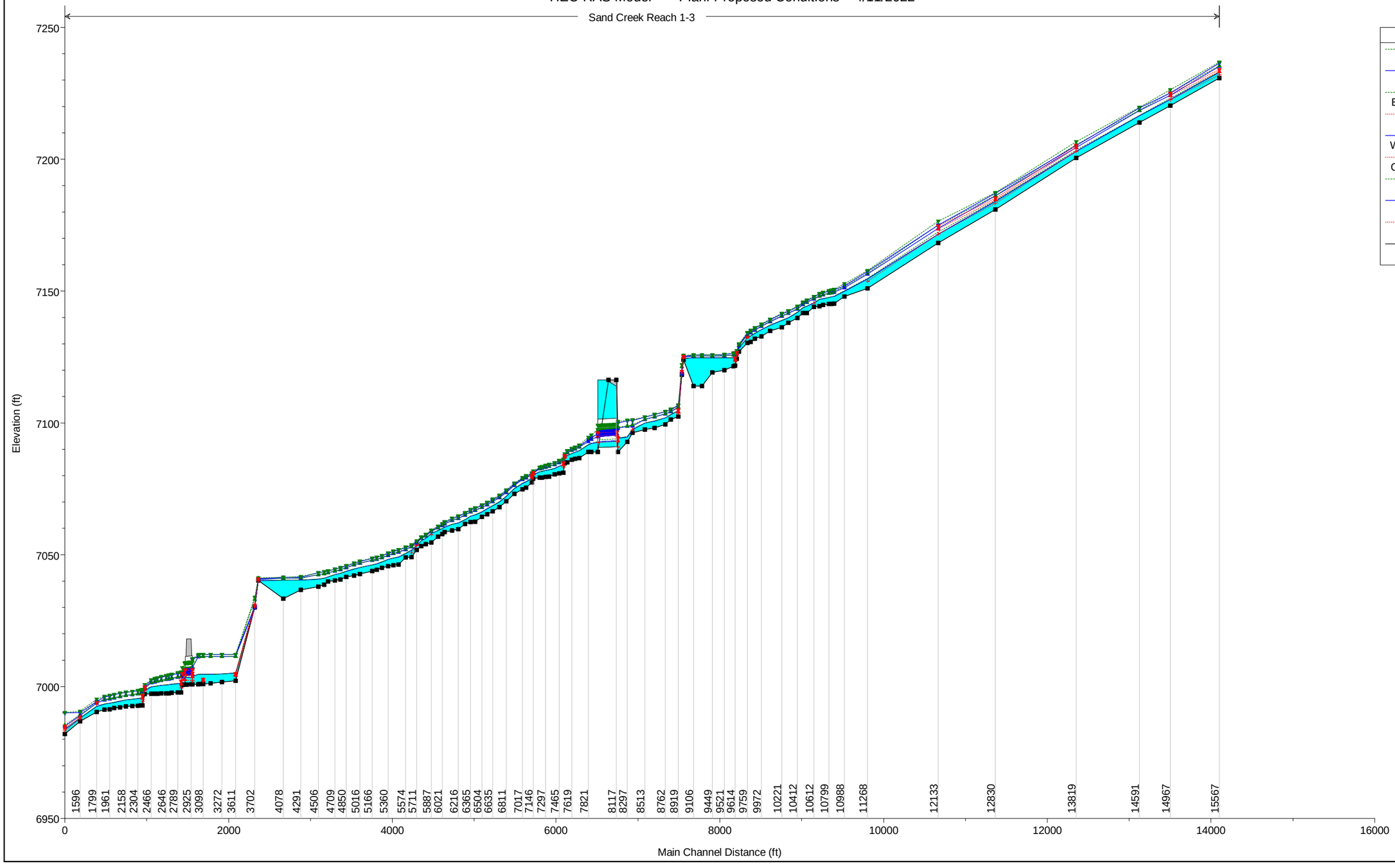
*Approximate value to aid interpretation and not an actual distance. See **TM NOS NGS 82** for more details.

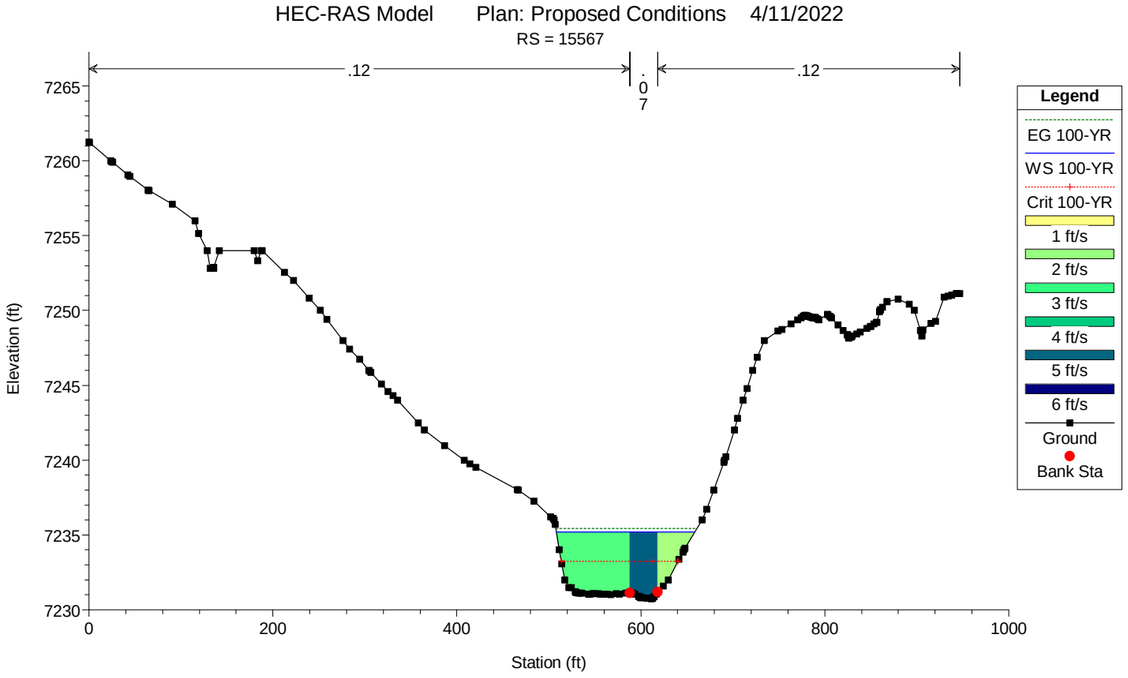
Appendix C

Proposed Conditions Hydraulic Modeling

HEC-RAS Model Plan: Proposed Conditions 4/11/2022

Sand Creek Reach 1-3




HEC-RAS Model Plan: Proposed Conditions 4/11/2022
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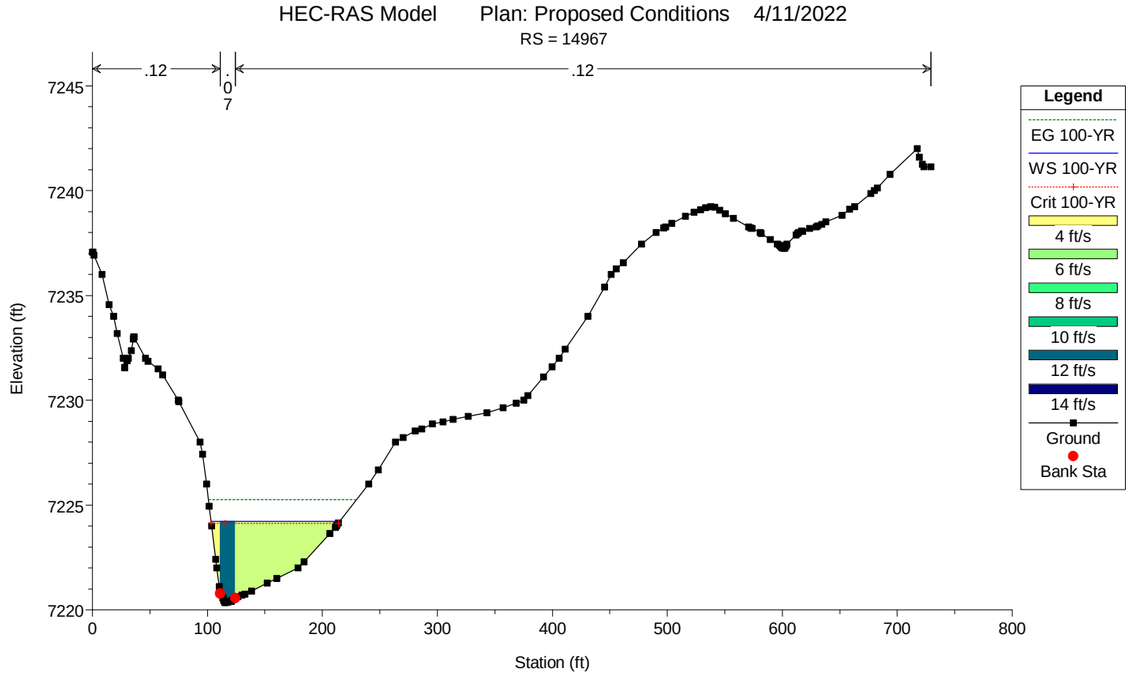
.12
.07
.12
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta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.12
.07
.12
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Station (ft)
Legend
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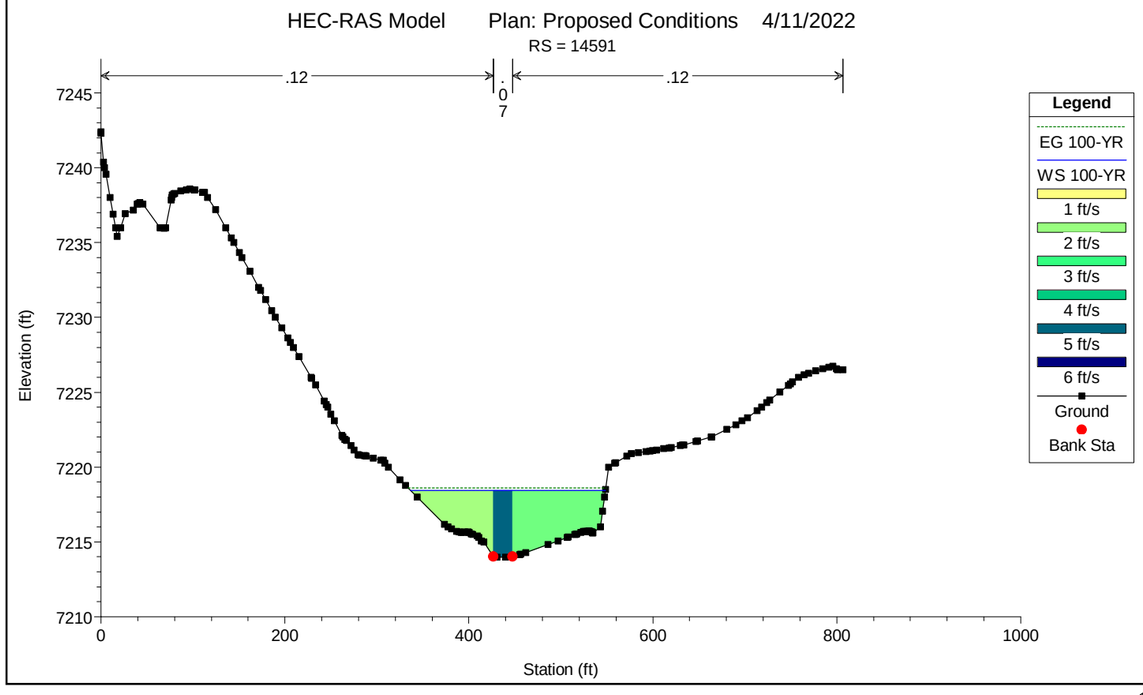
WS 100-YR
Crit 100-YR
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta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.07
.12
Elevation (ft)
Station (ft)
Legend
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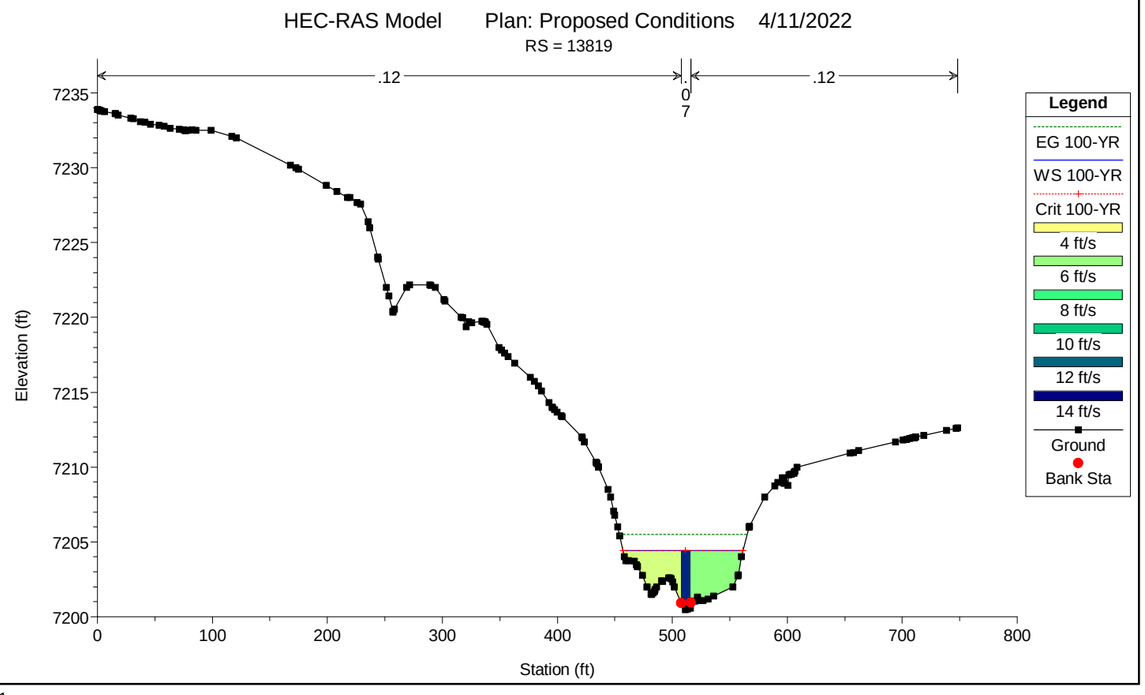
WS 100-YR
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta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.07
.12
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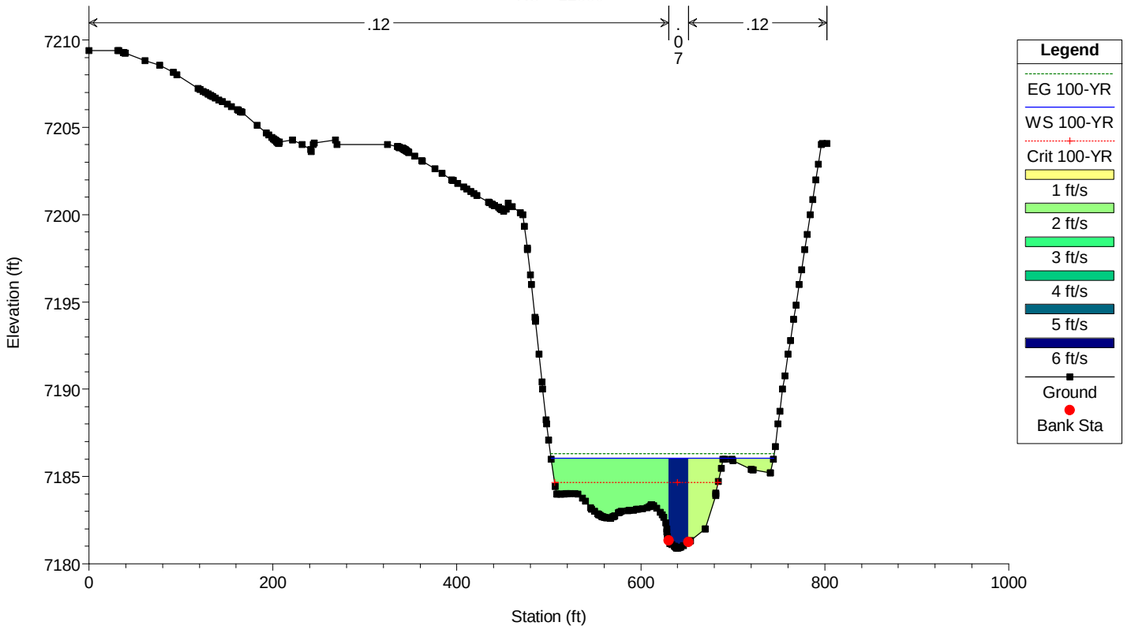
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta

HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 12830



HEC-RAS Model Plan: Proposed Conditions 4/11/2022

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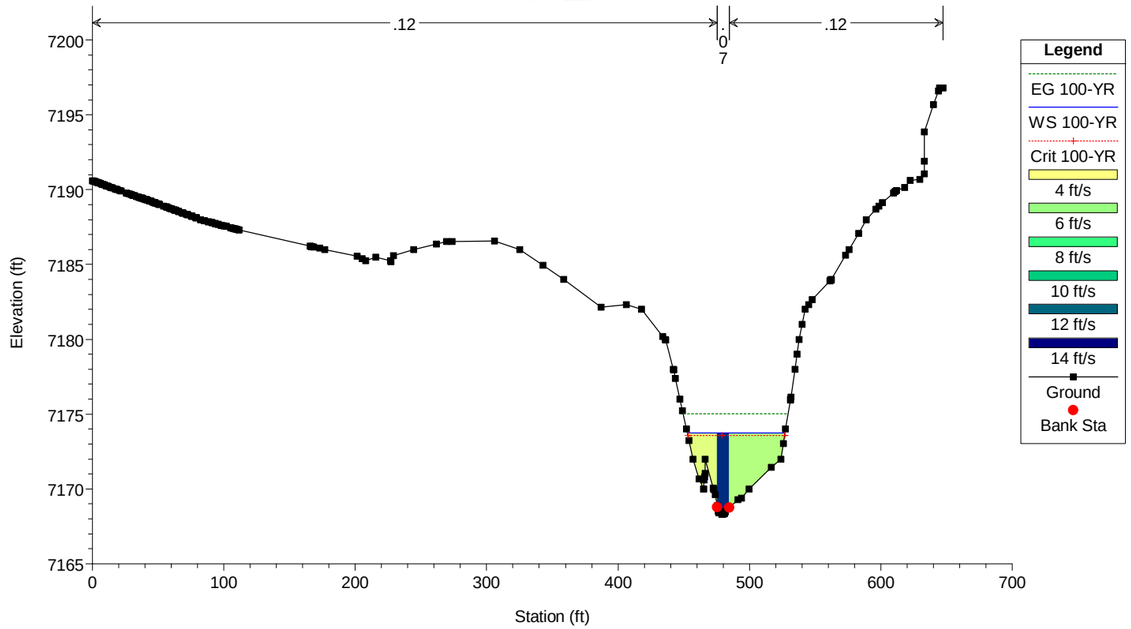

HEC-RAS Model Plan: Proposed Conditions 4/11/2022

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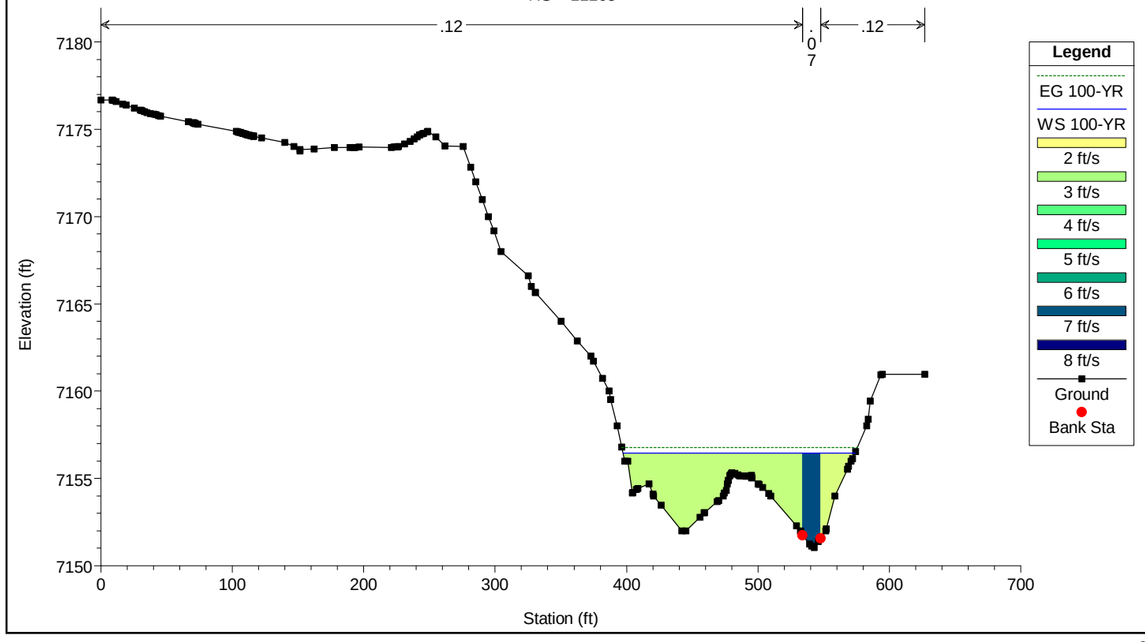
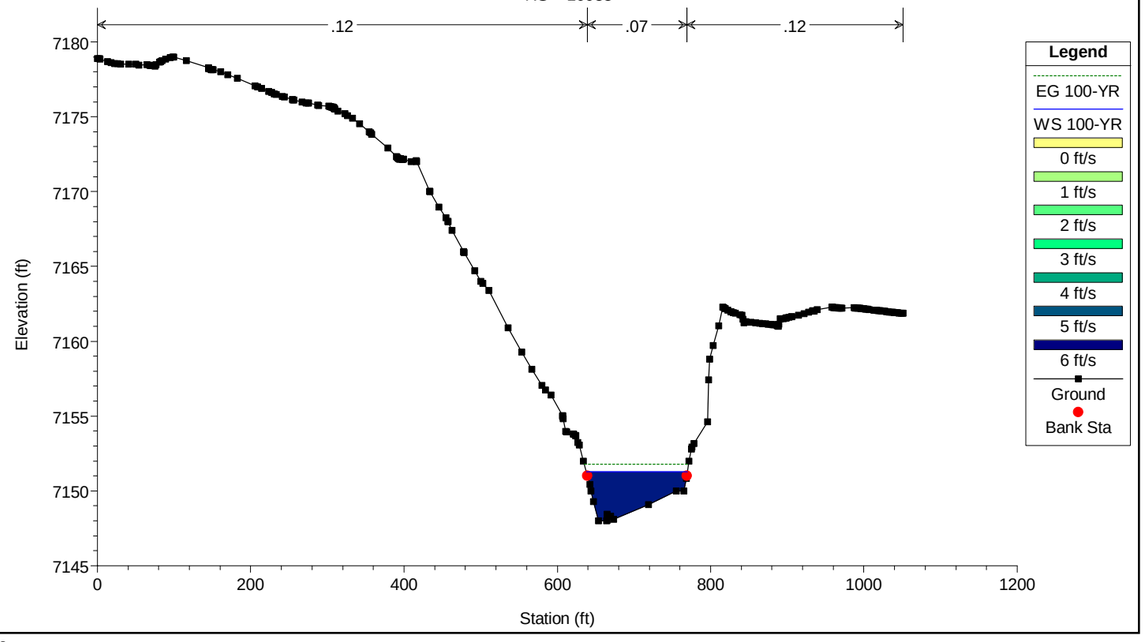
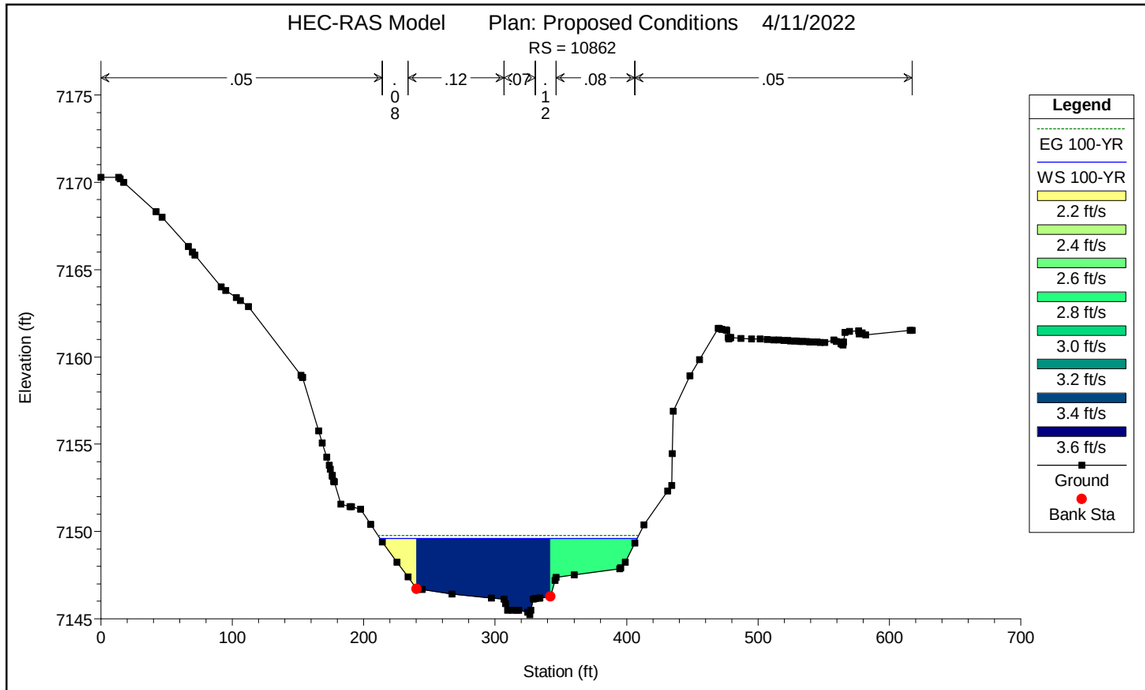


HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 10988

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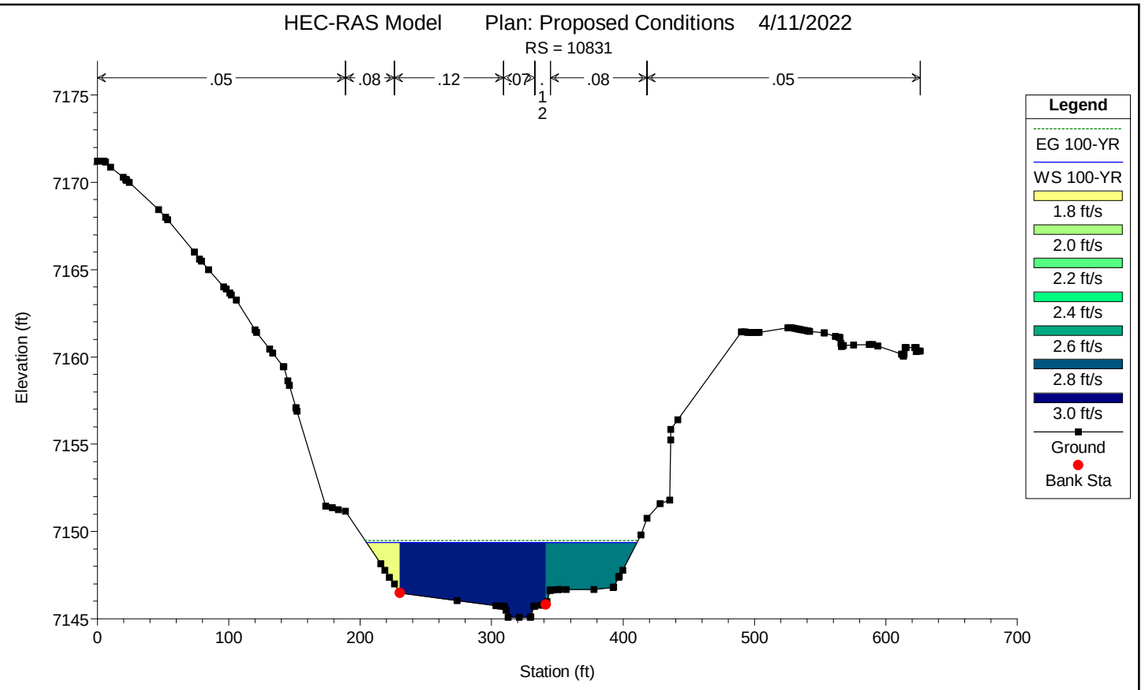
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
3.6 ft/s
Ground
Bank Sta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.08
.12
.07
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.8 ft/s
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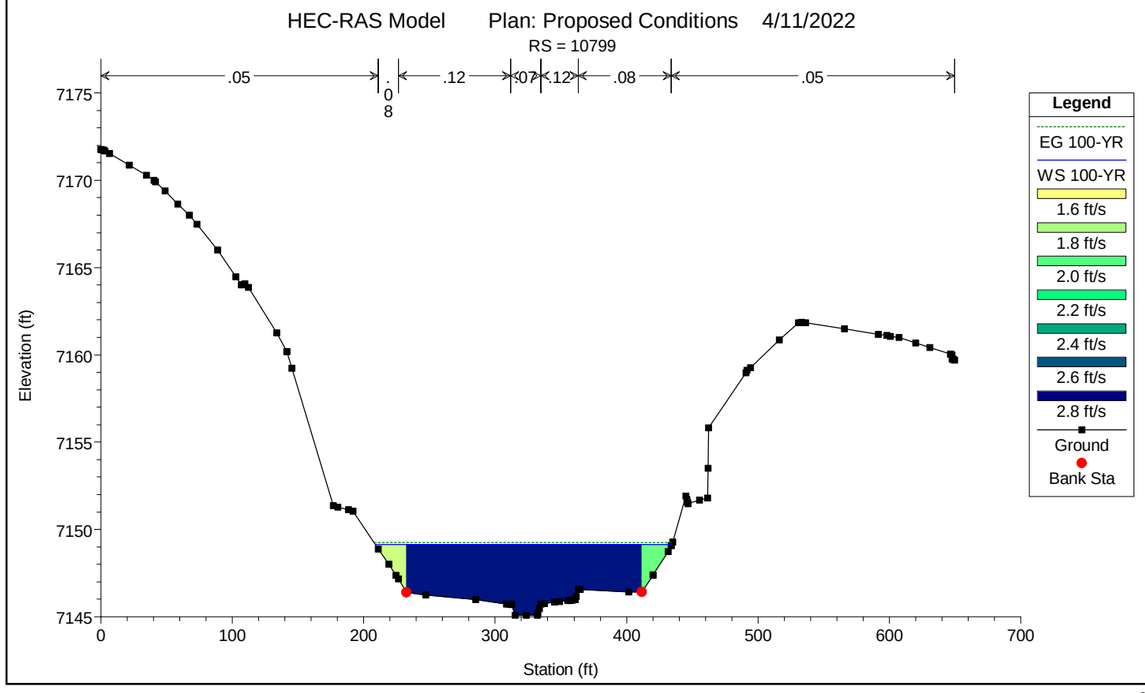
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta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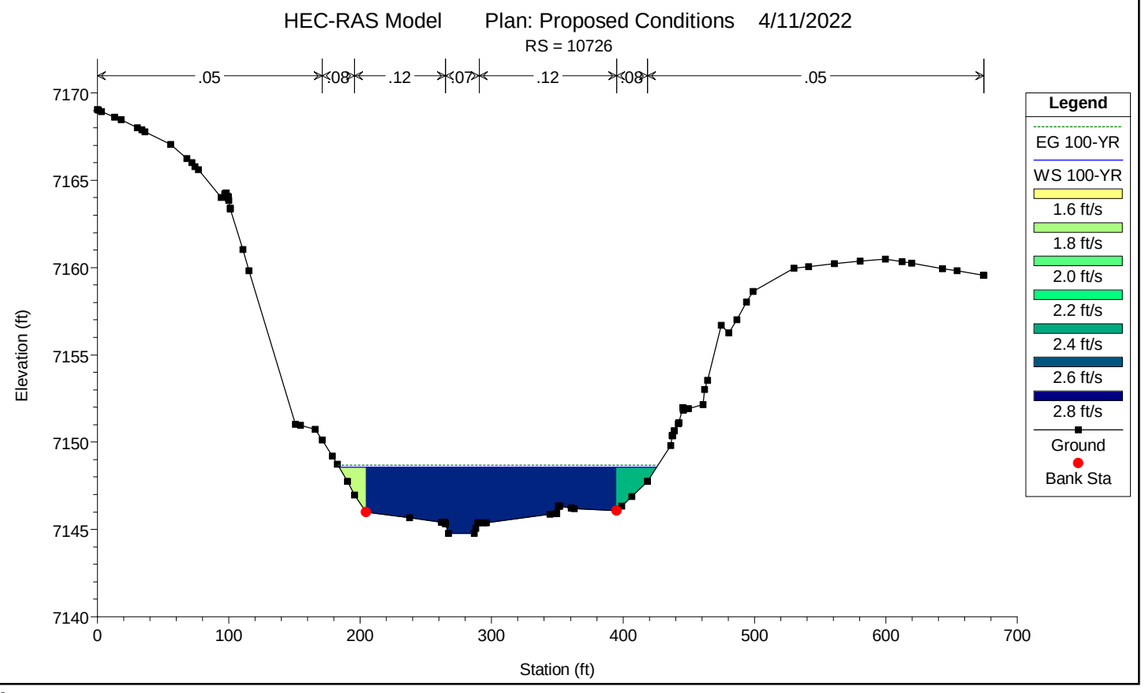
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Bank Sta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.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
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WS 100-YR
1.6 ft/s
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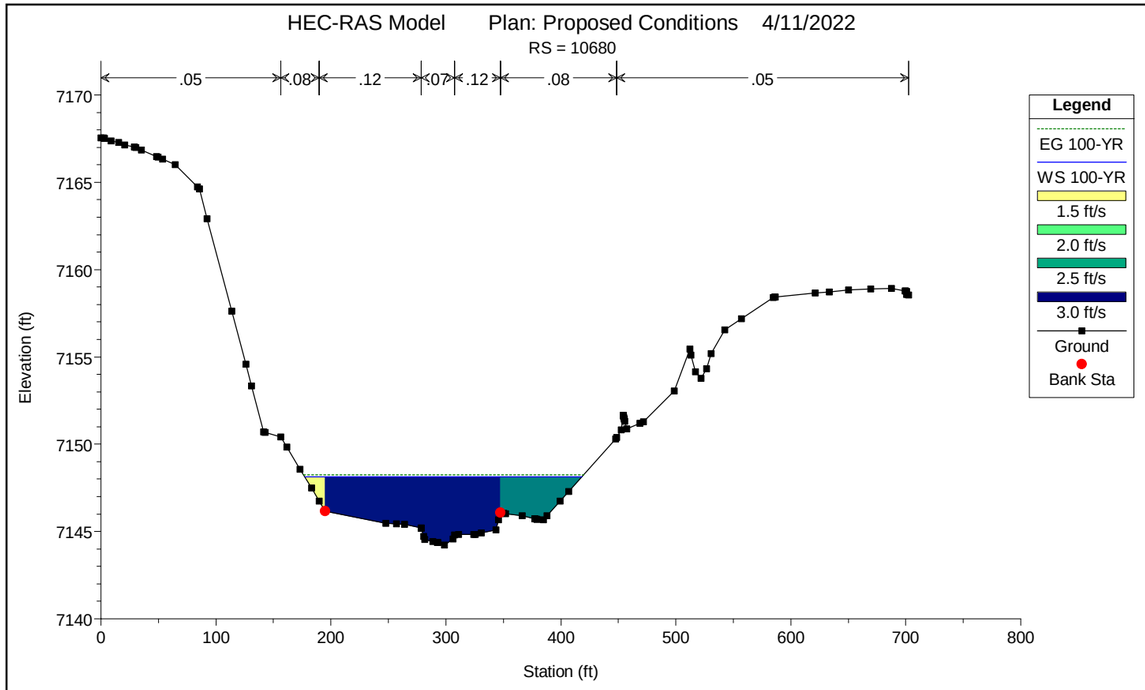
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Bank Sta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.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
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WS 100-YR
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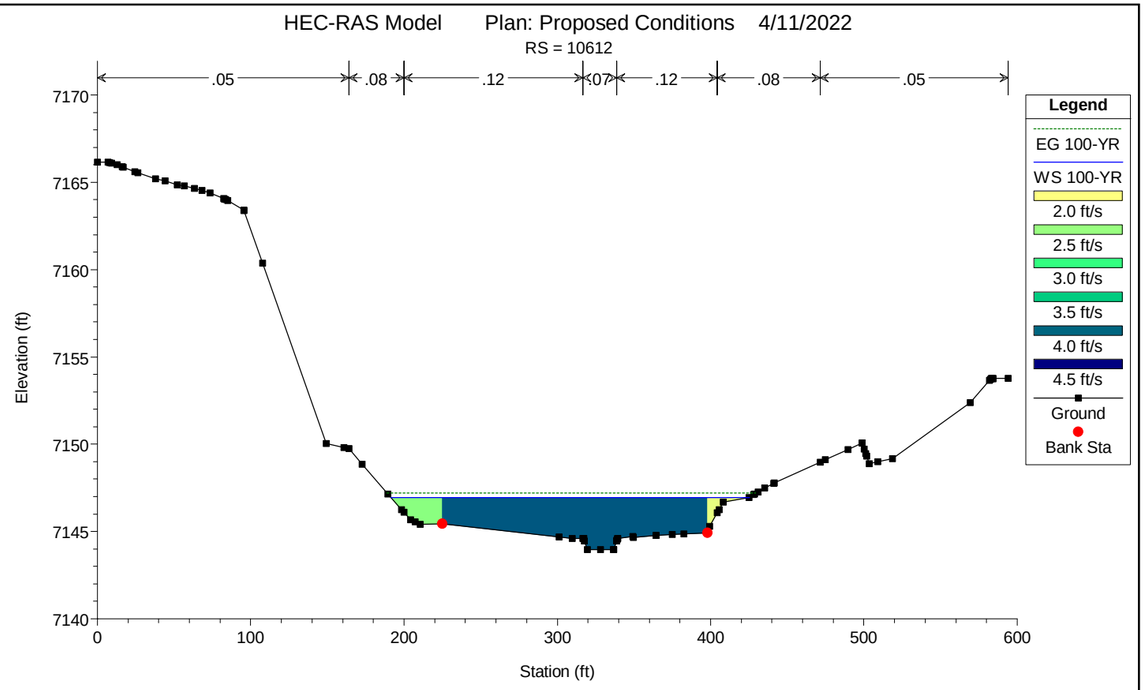
2.5 ft/s
3.0 ft/s
Ground
Bank Sta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.12
.07
.12
.08
.05
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Station (ft)
Legend
EG 100-YR
WS 100-YR
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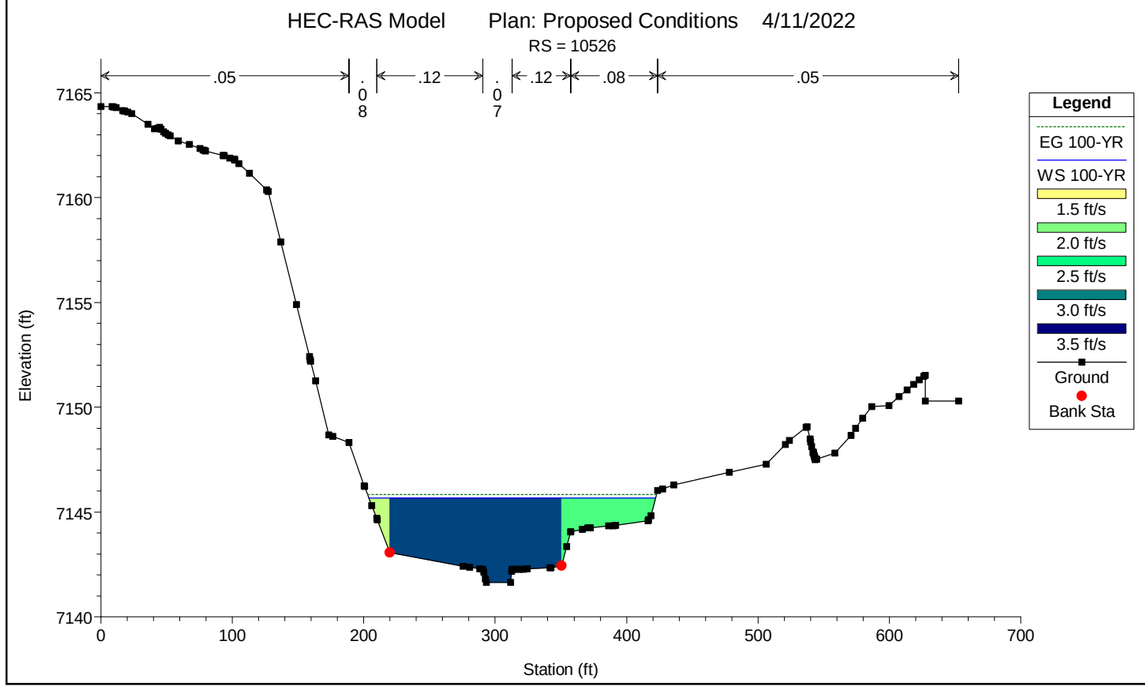
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta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.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
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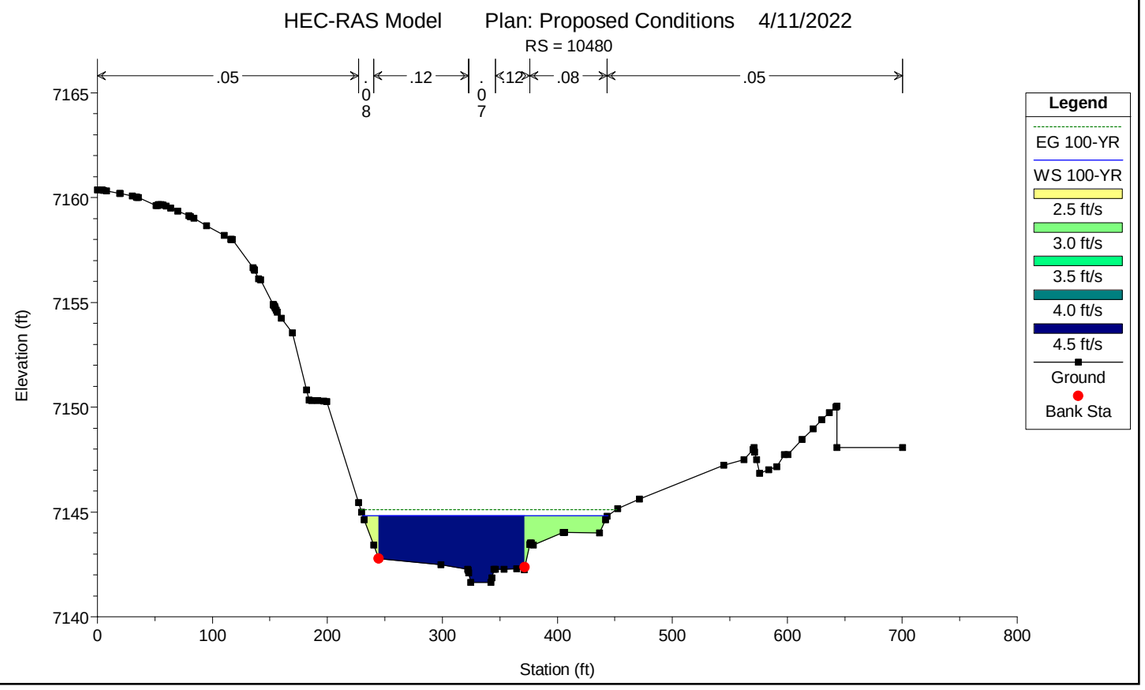
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta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Elevation (ft)
Station (ft)
Legend
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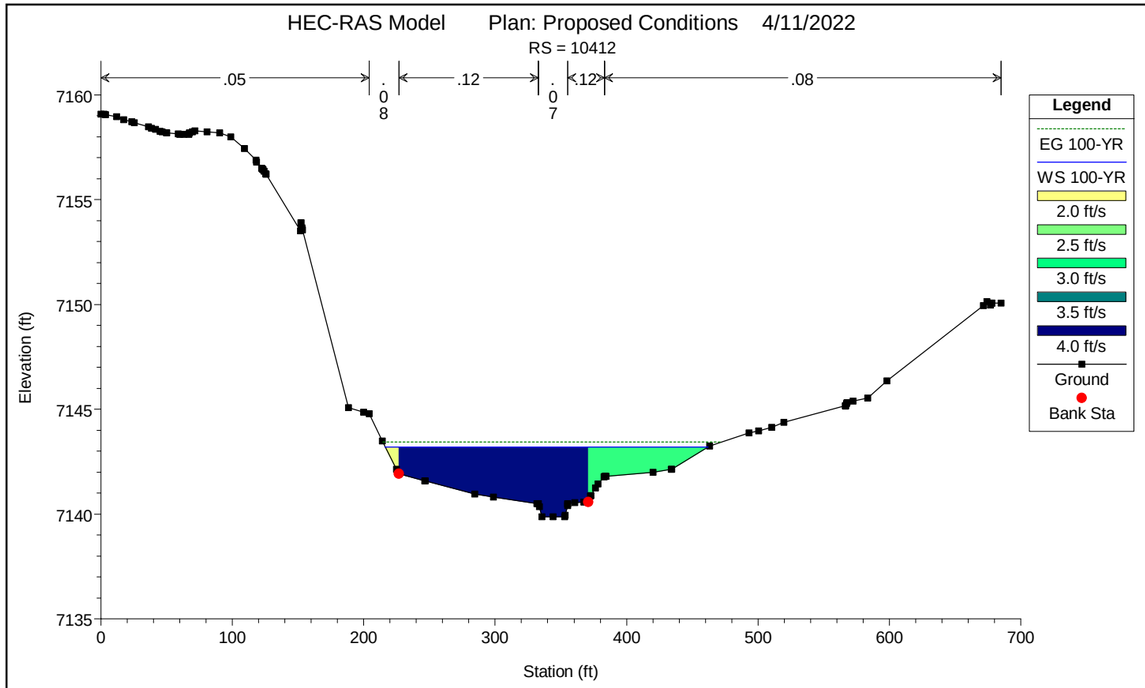
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta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.12
.07
.12
.08
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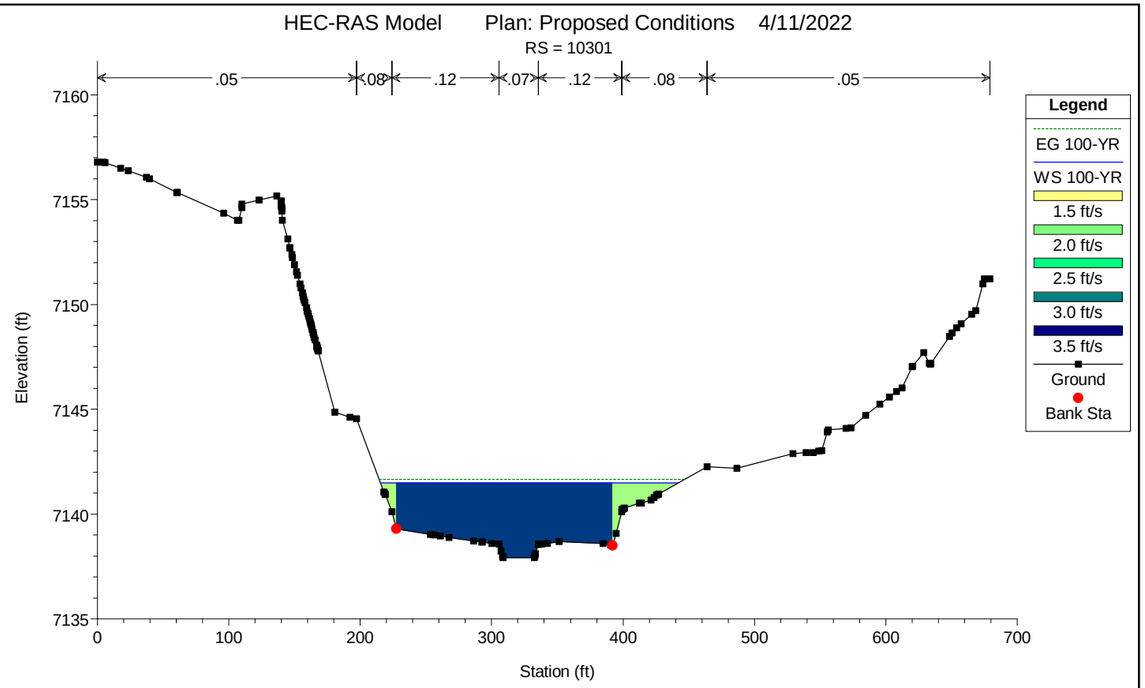
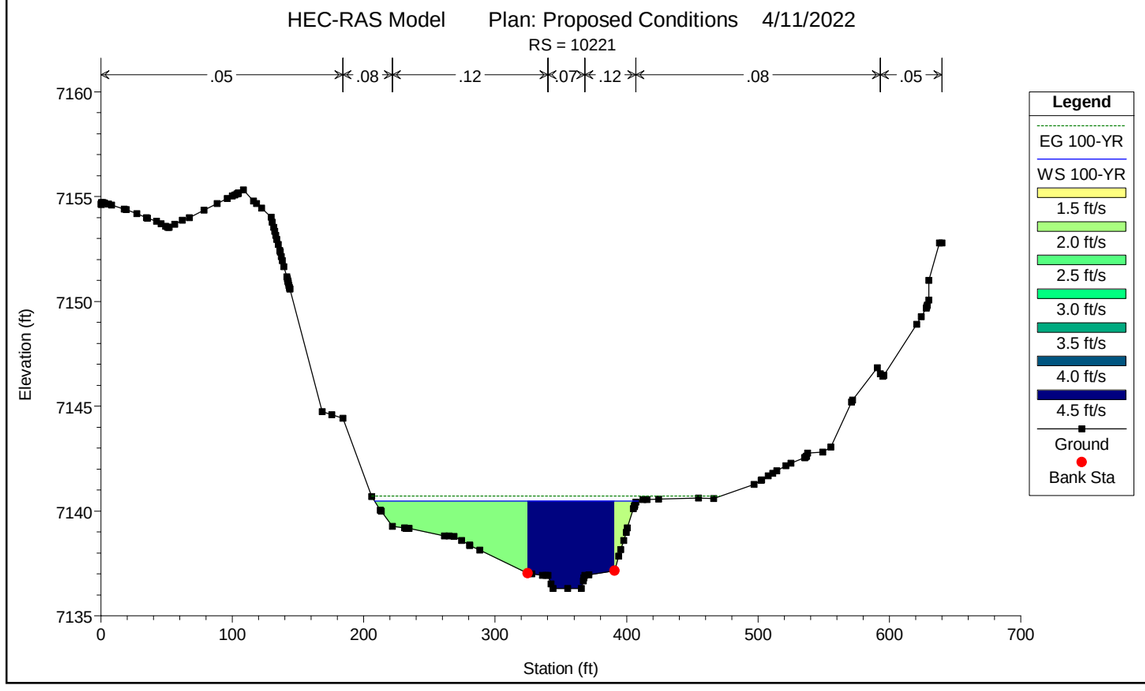
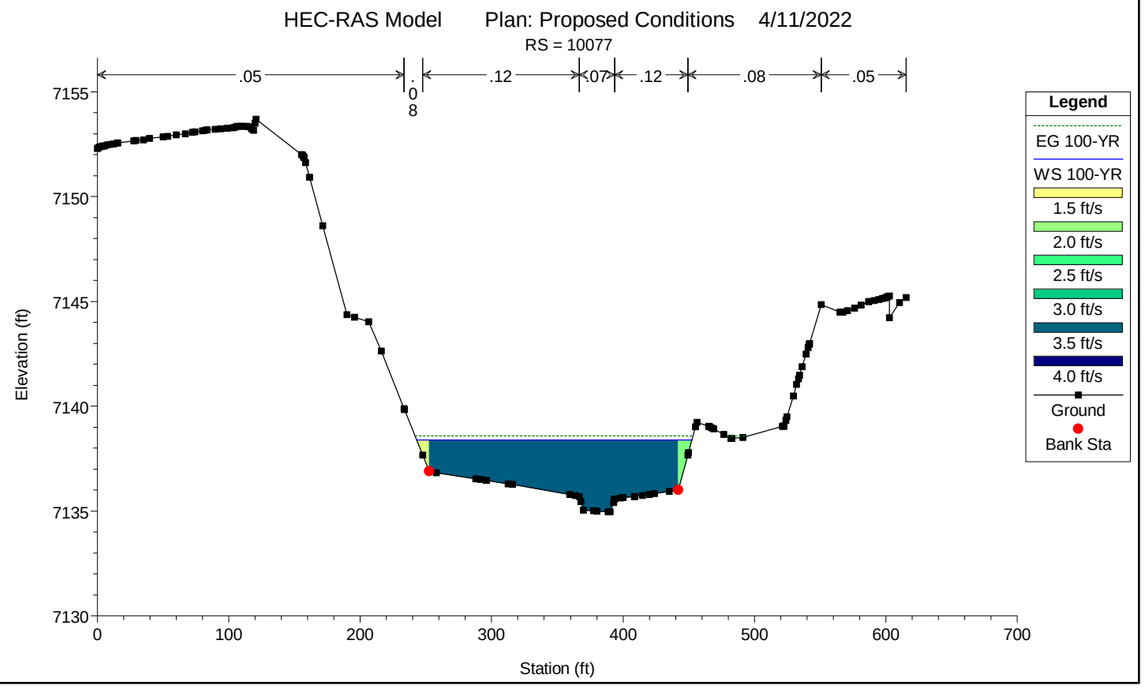
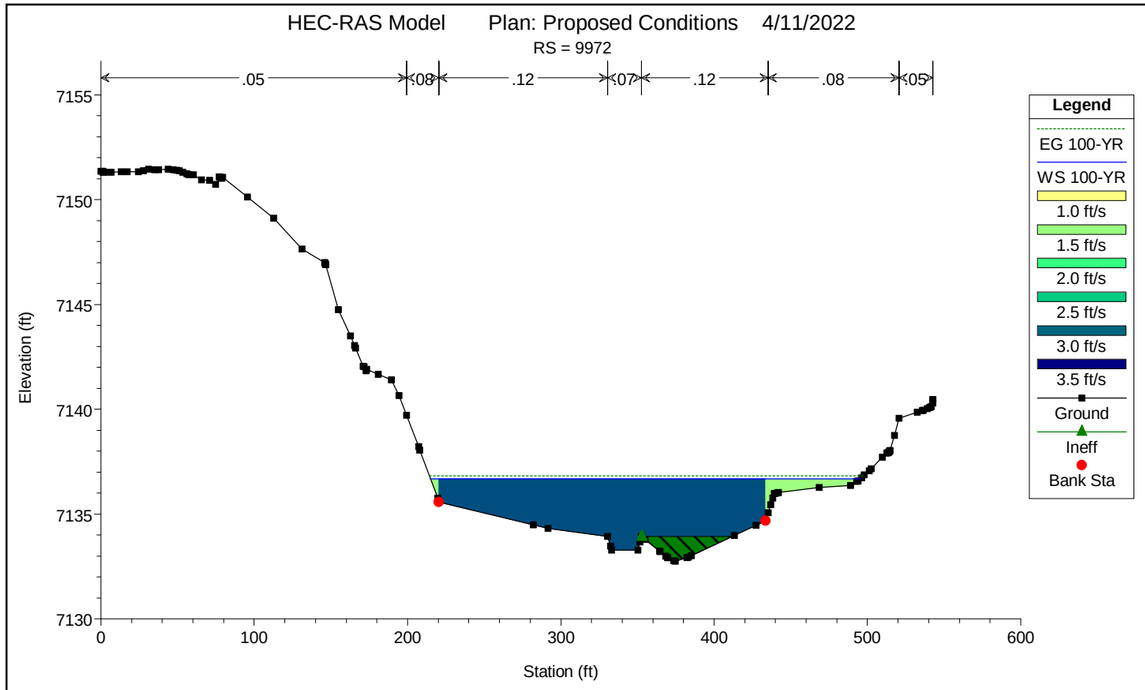
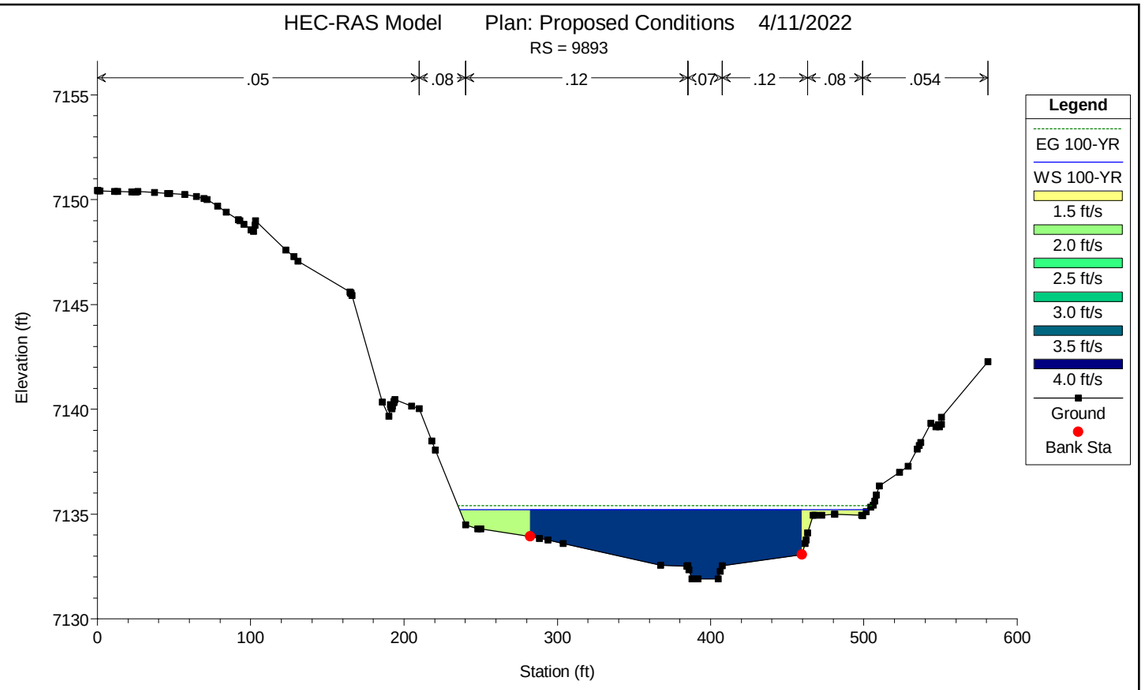
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

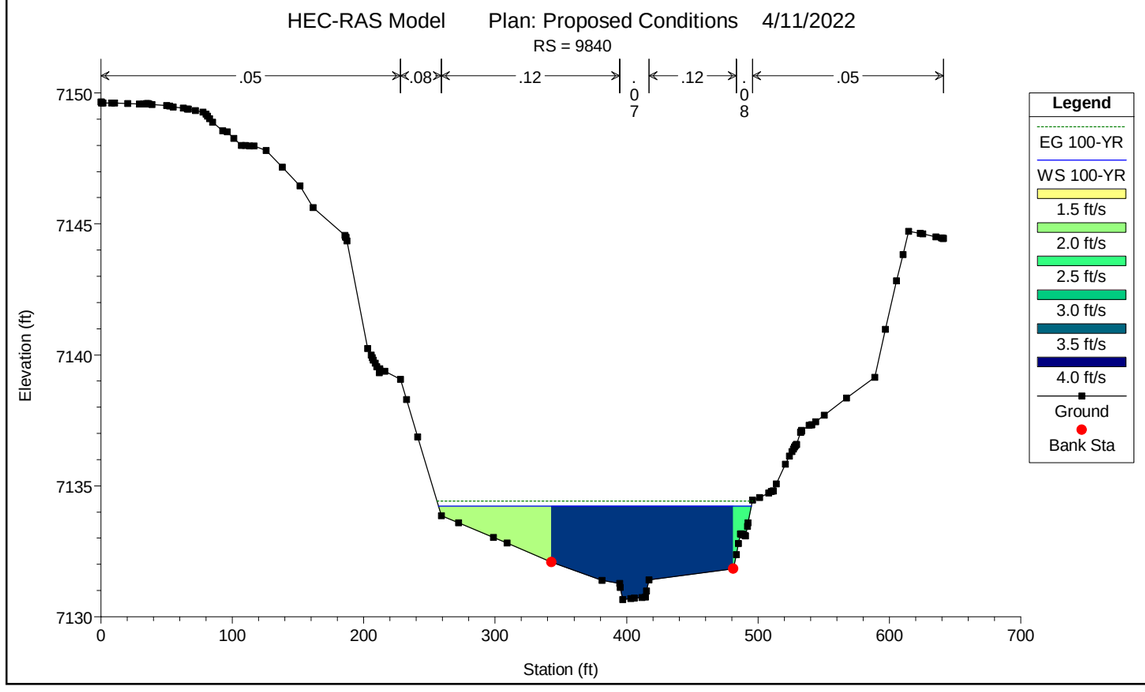

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 10301
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

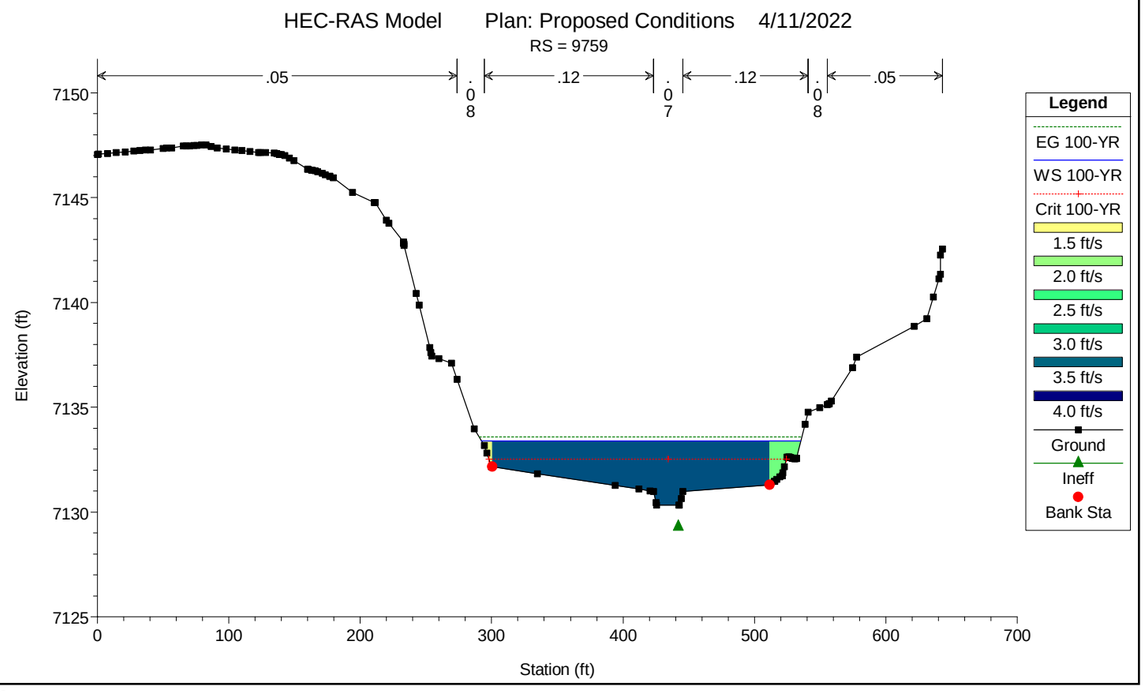

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 10221
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta

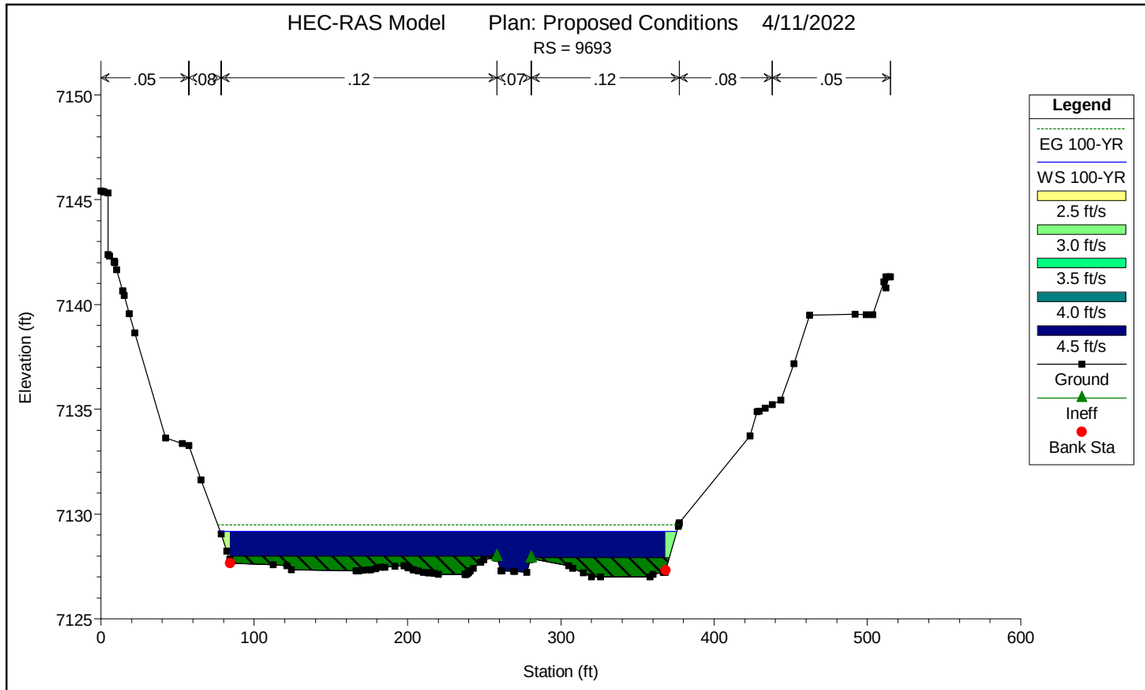

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 10077
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

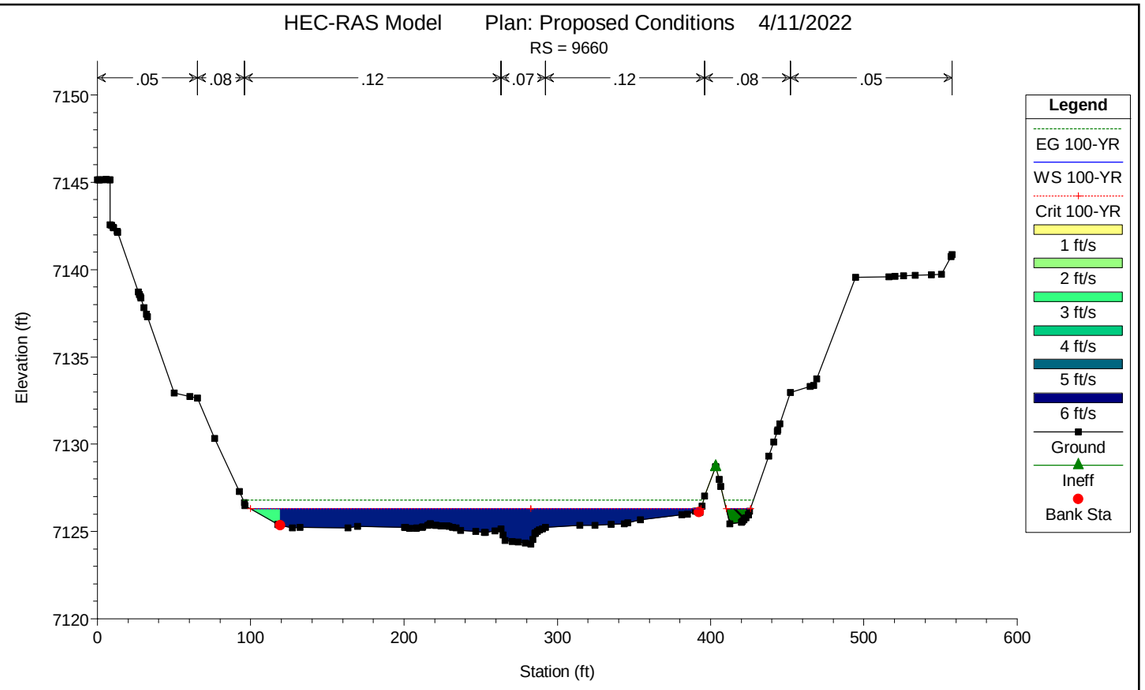

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9972
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Ineff
Bank Sta

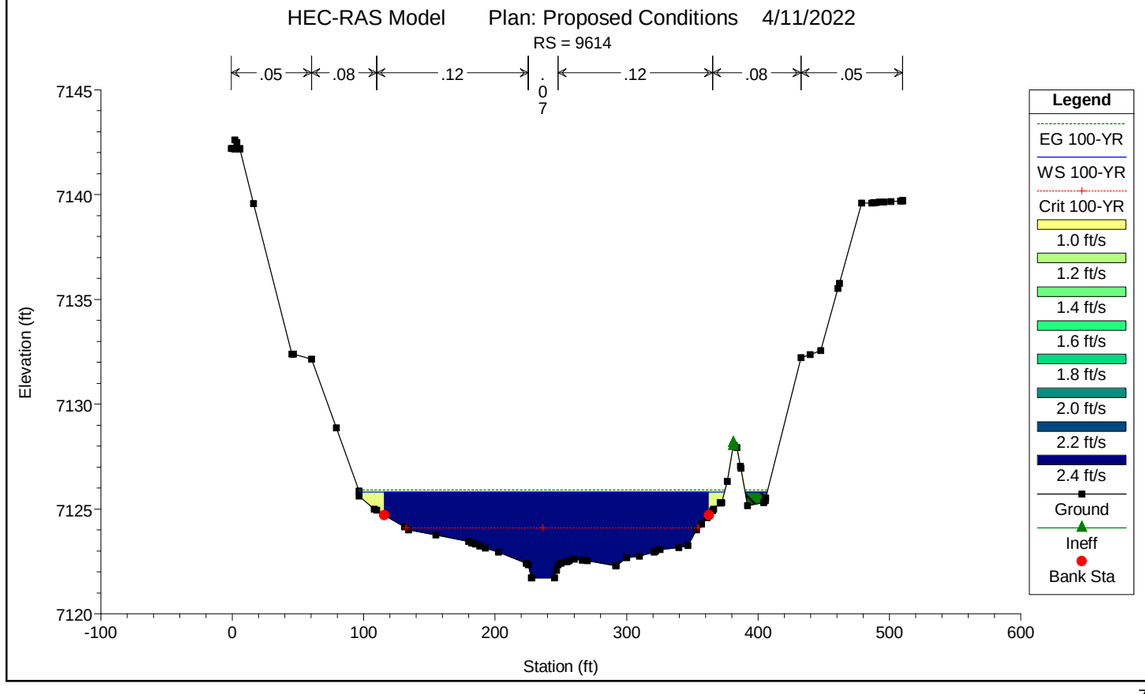

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9893
.05
.08
.12
.07
.12
.08
.054
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

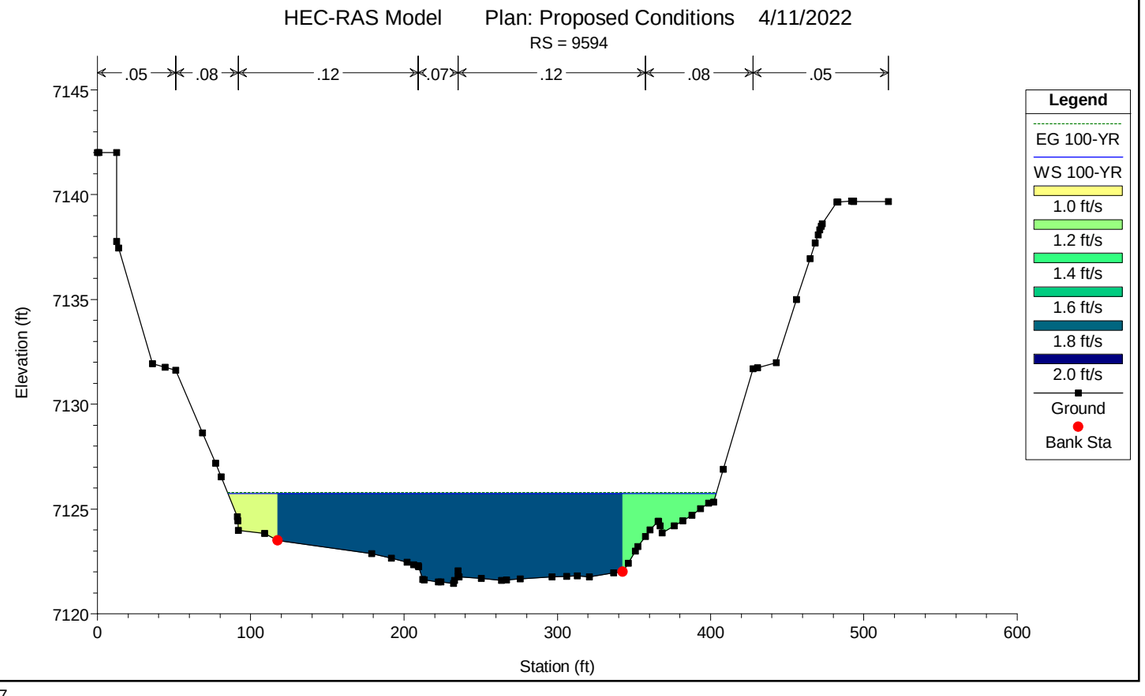

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9840
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

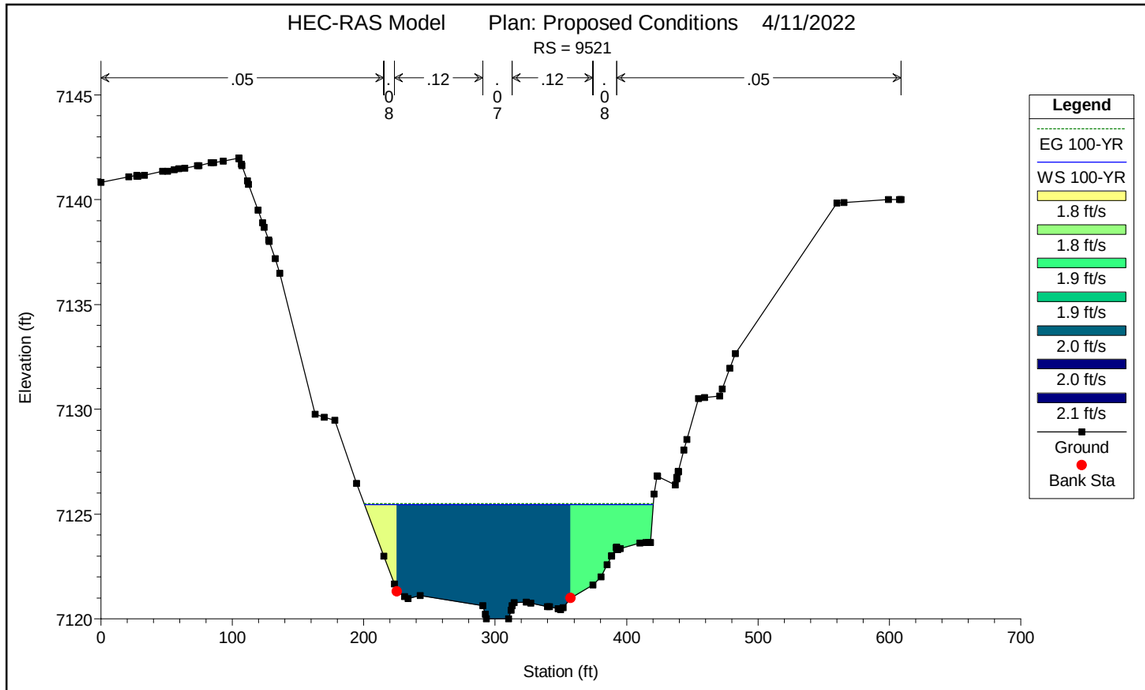

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9759
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Ineff
Bank Sta

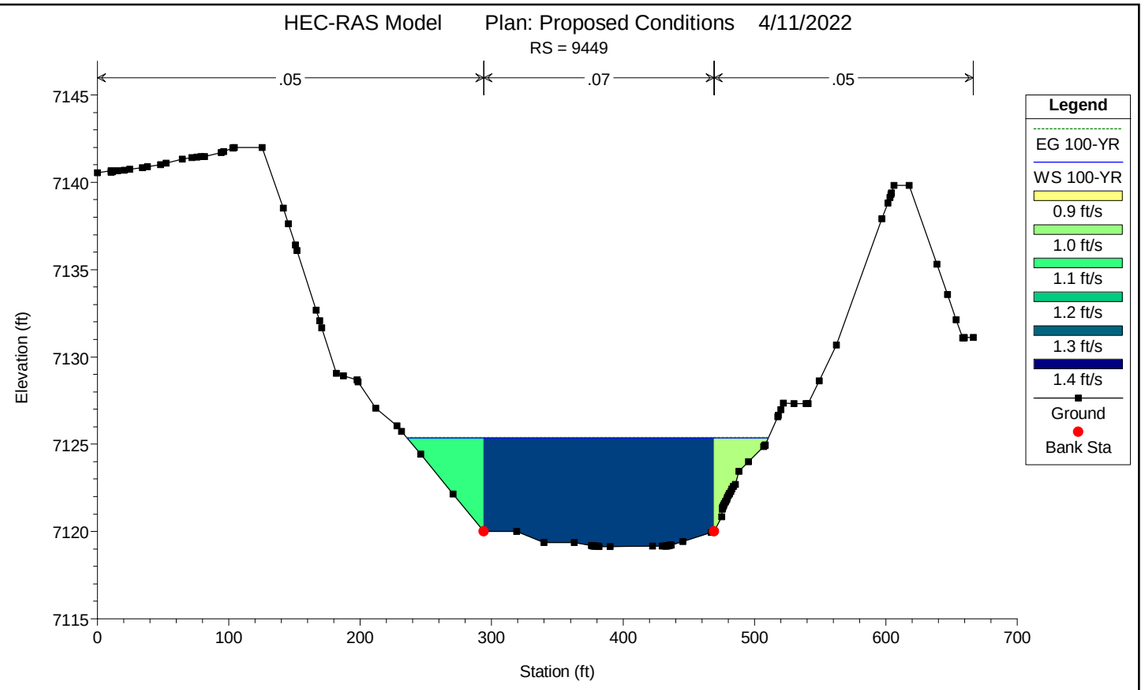

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9693
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Ineff
Bank Sta

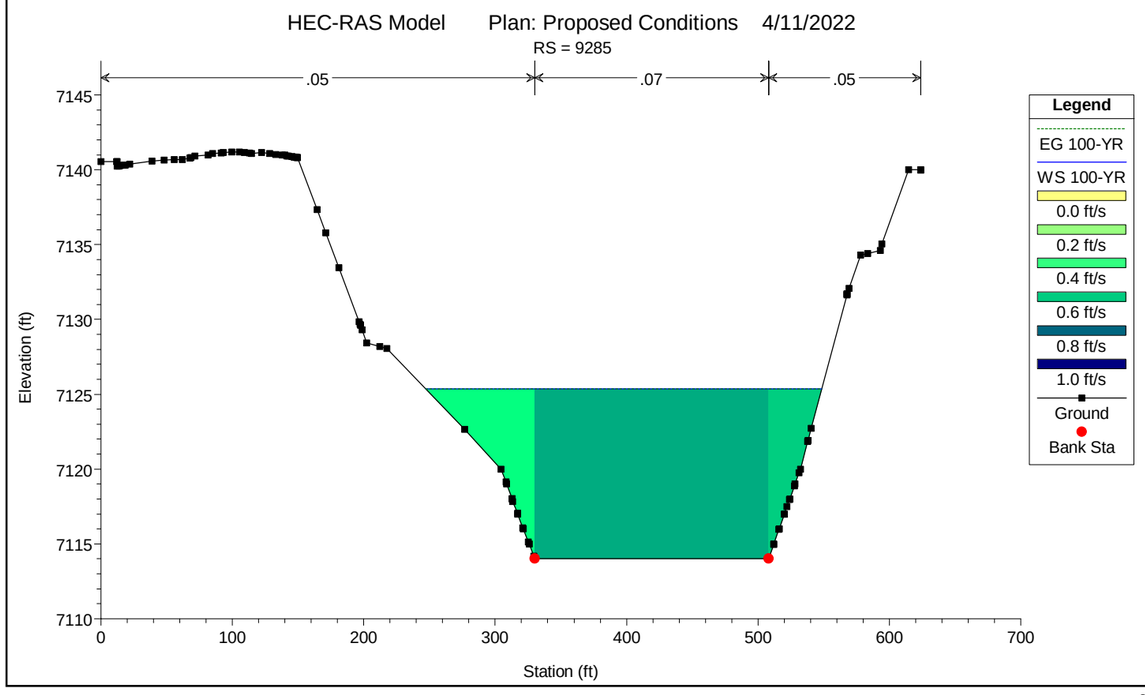

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9660
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta

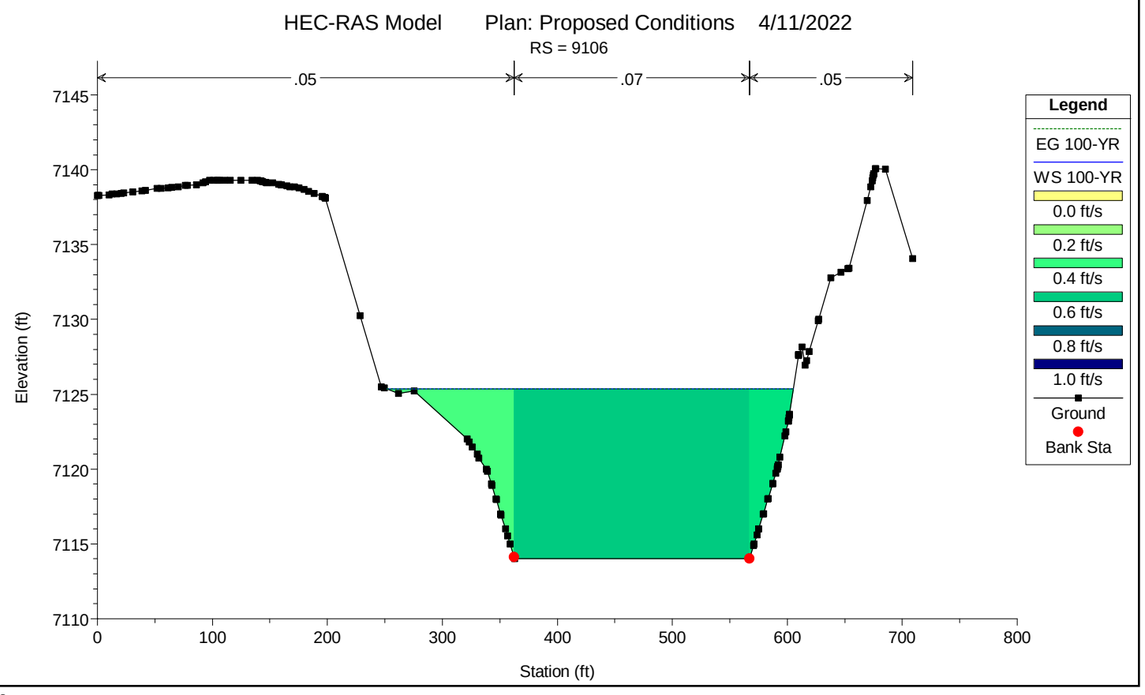

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9614
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
Ground
Ineff
Bank Sta

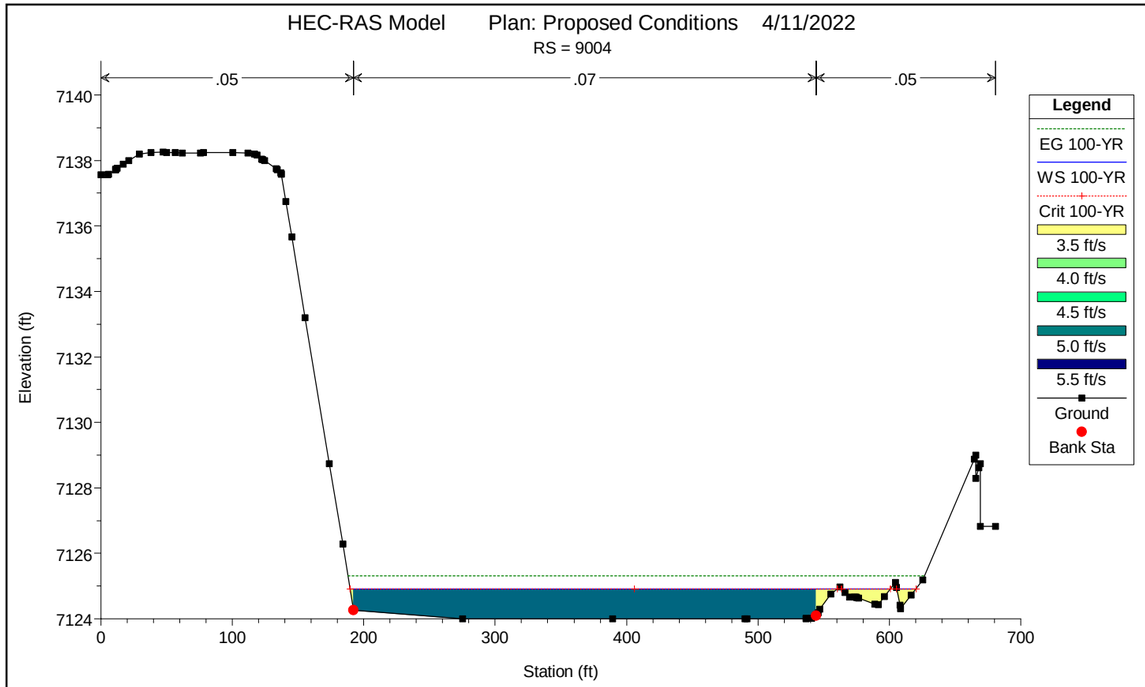

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9594
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
Ground
Bank Sta

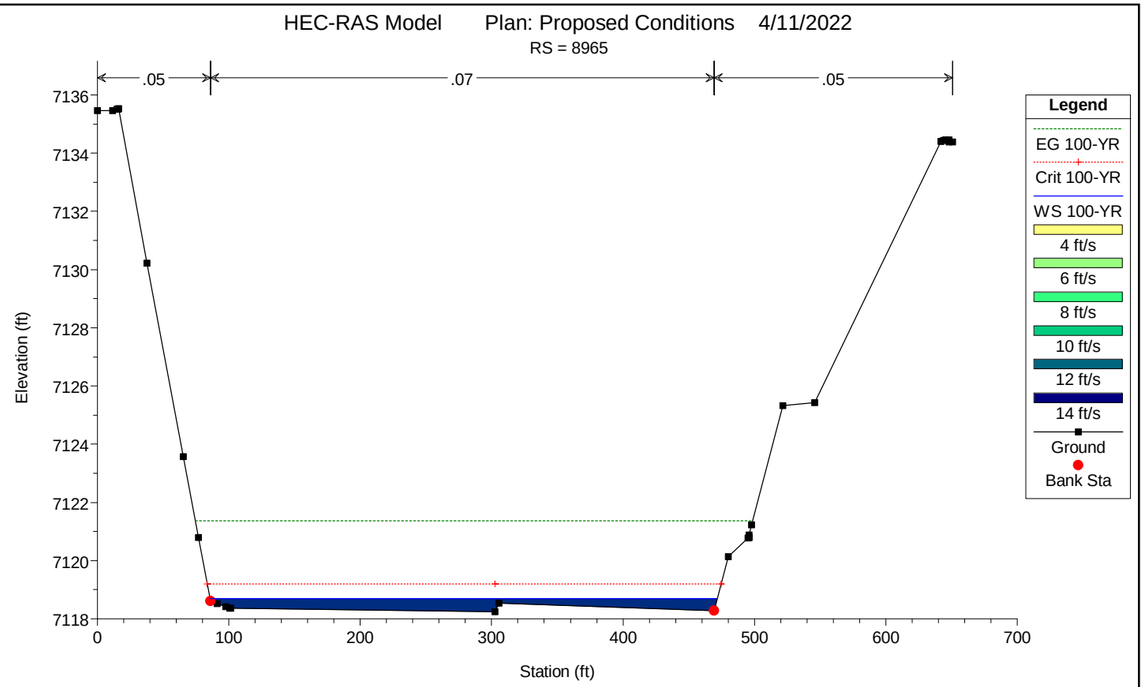

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9521
.05
.12
.12
.05
.08
.07
.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.8 ft/s
1.8 ft/s
1.9 ft/s
1.9 ft/s
2.0 ft/s
2.0 ft/s
2.1 ft/s
Ground
Bank Sta

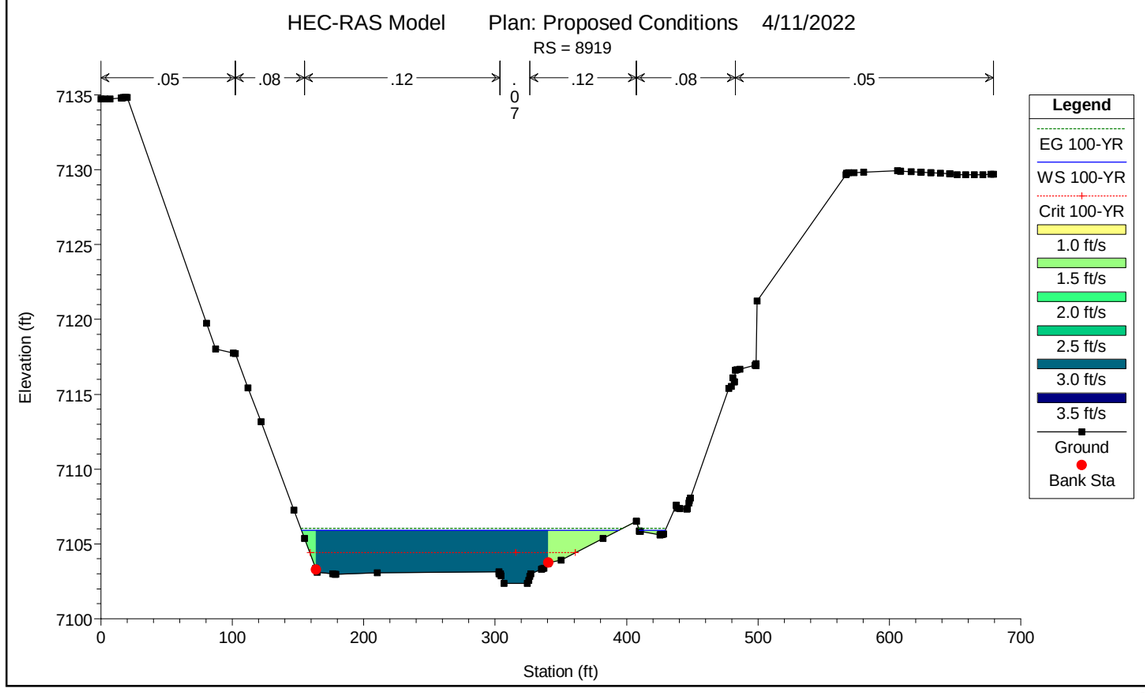

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9449
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.9 ft/s
1.0 ft/s
1.1 ft/s
1.2 ft/s
1.3 ft/s
1.4 ft/s
Ground
Bank Sta

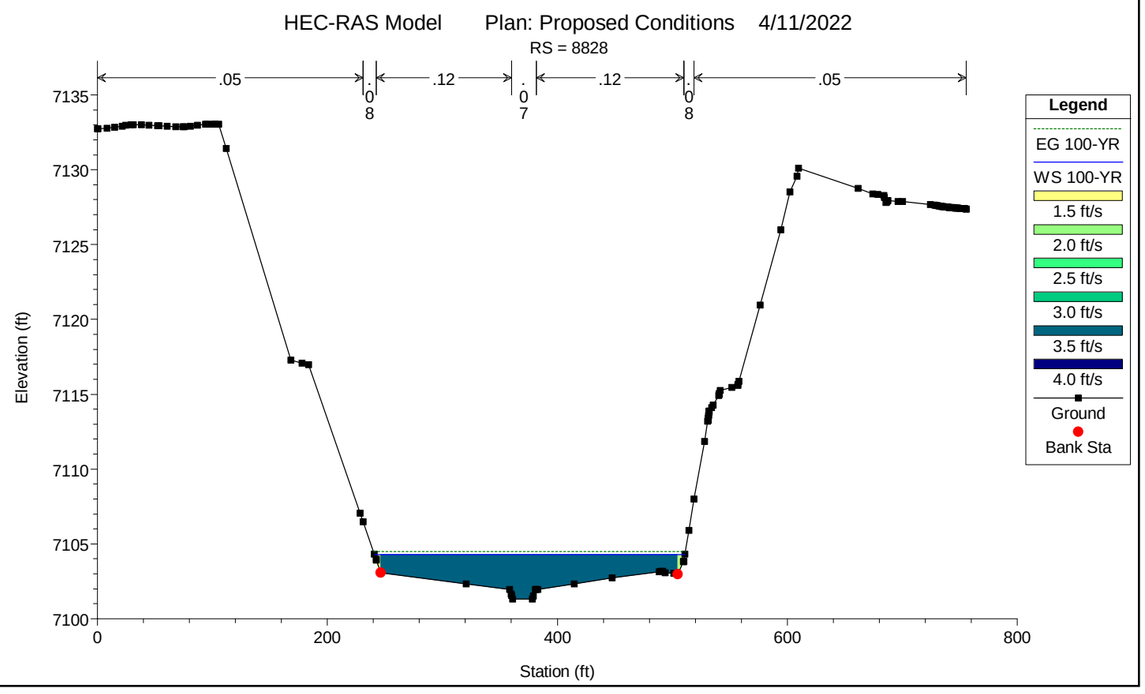

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9285
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

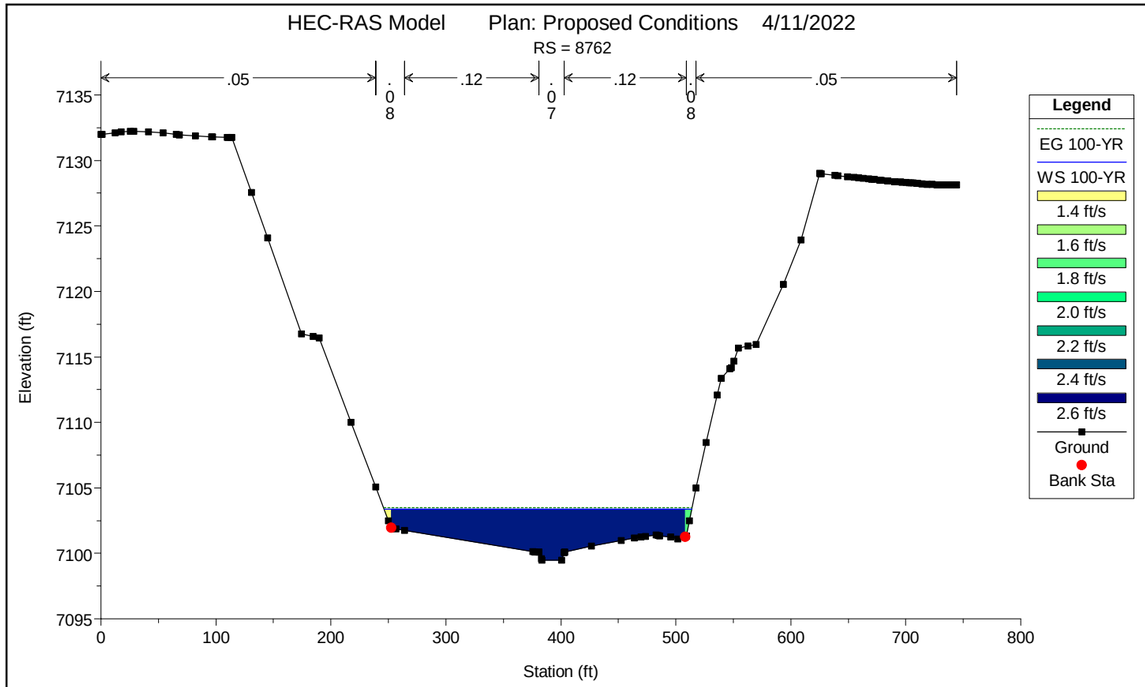

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9106
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

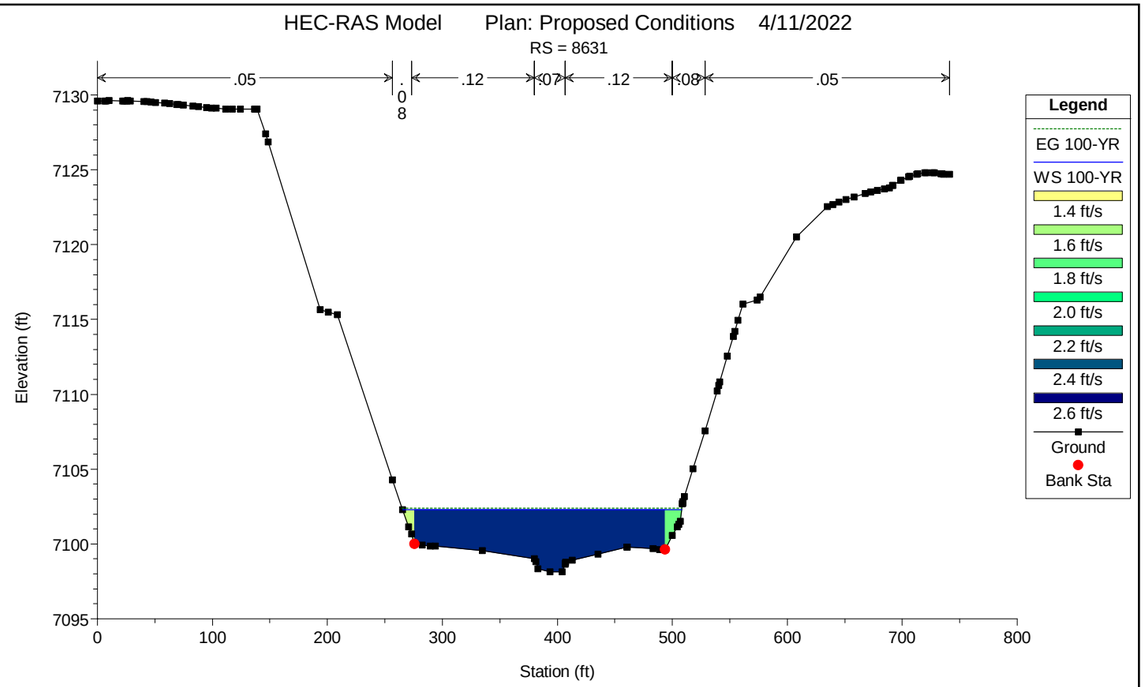

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 9004
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
3.5 ft/s
4.0 ft/s
4.5 ft/s
5.0 ft/s
5.5 ft/s
Ground
Bank Sta

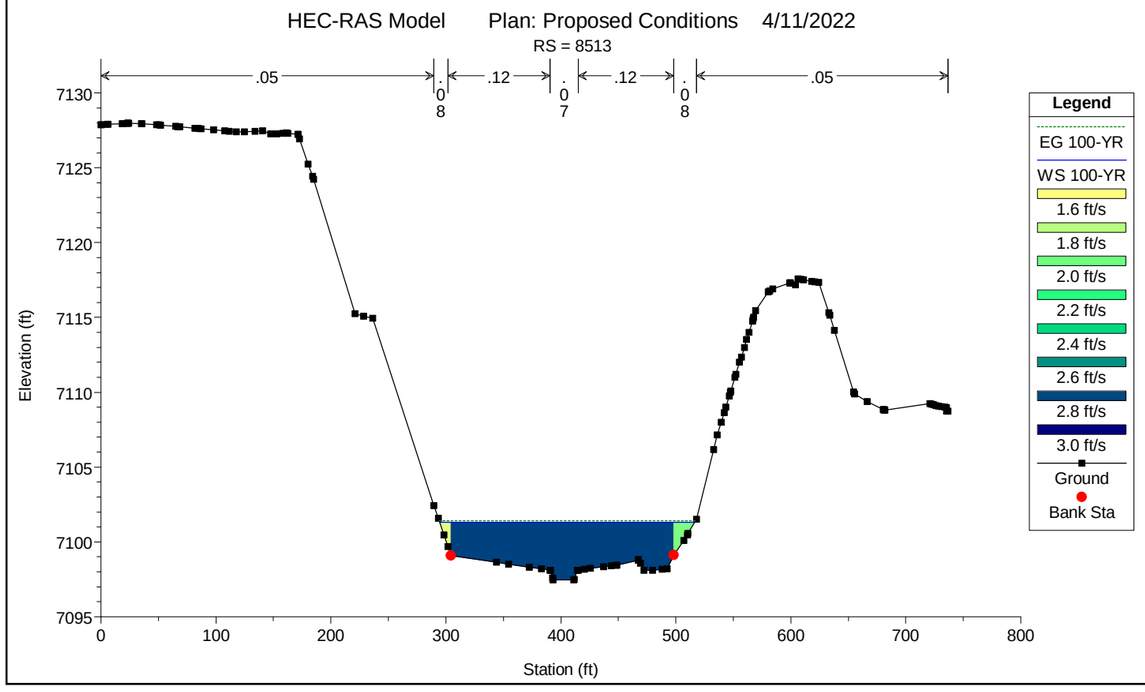

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8965
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
Crit 100-YR
WS 100-YR
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta

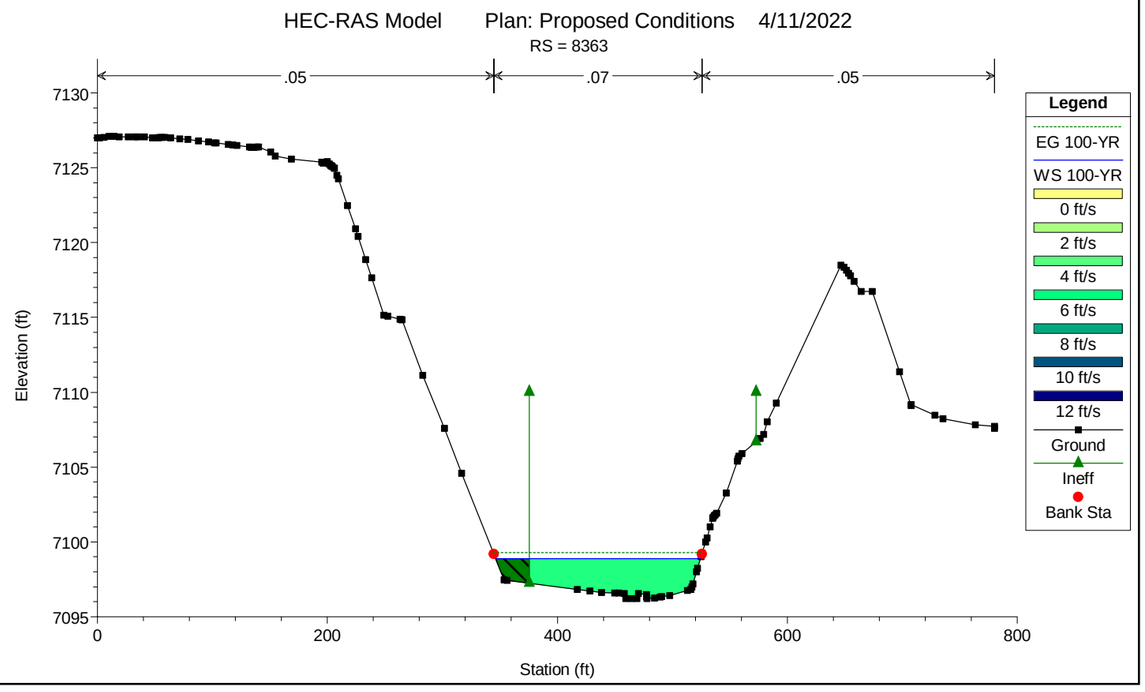

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8919
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

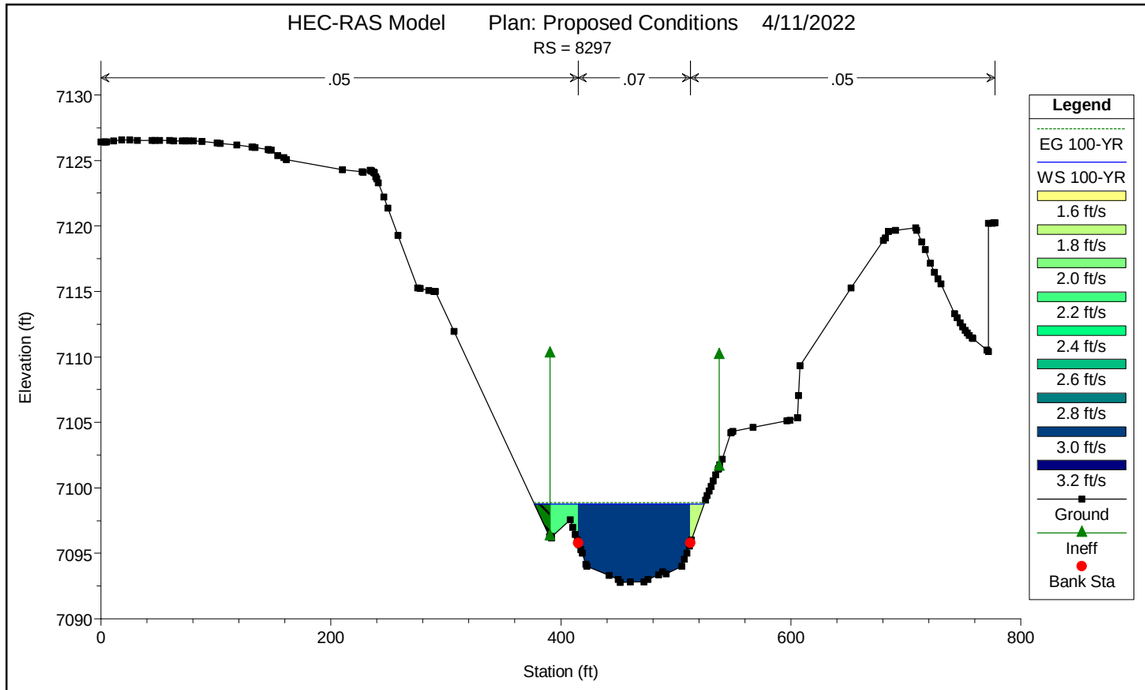

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8828
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

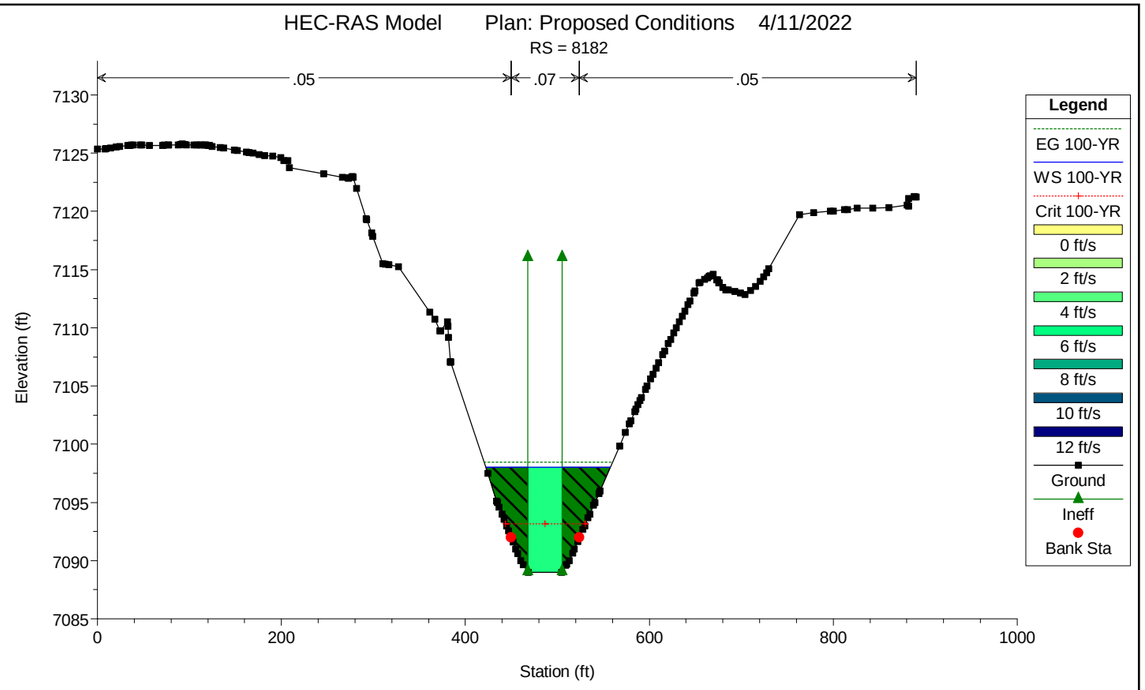

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8762
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
Ground
Bank Sta

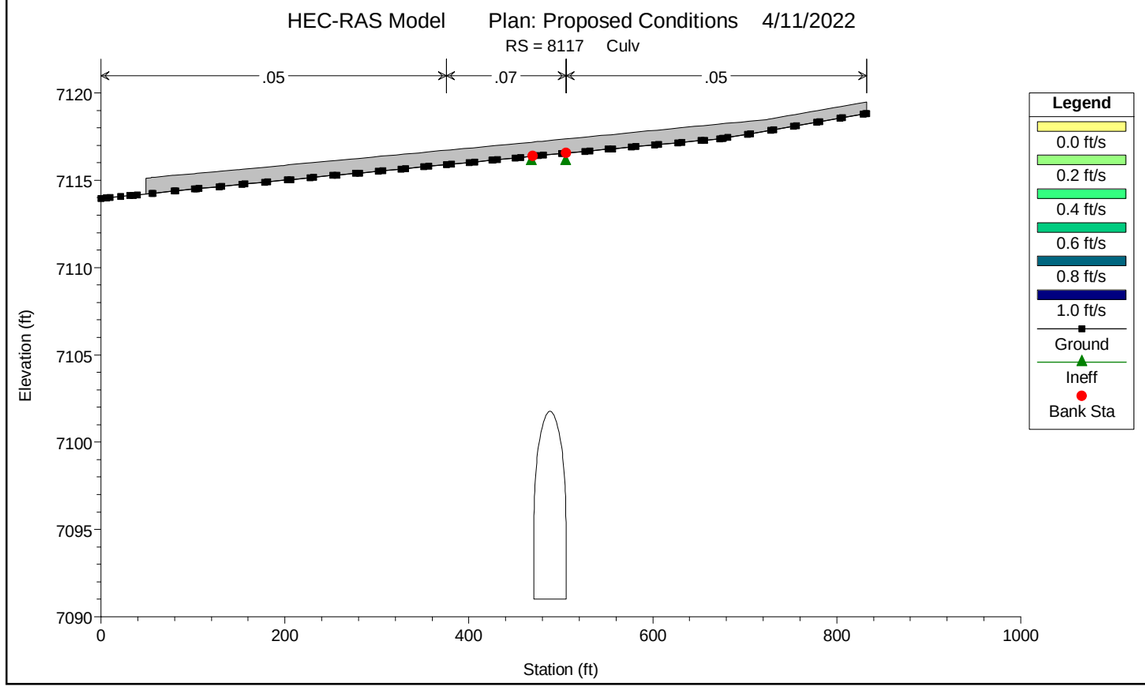

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8631
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
Ground
Bank Sta

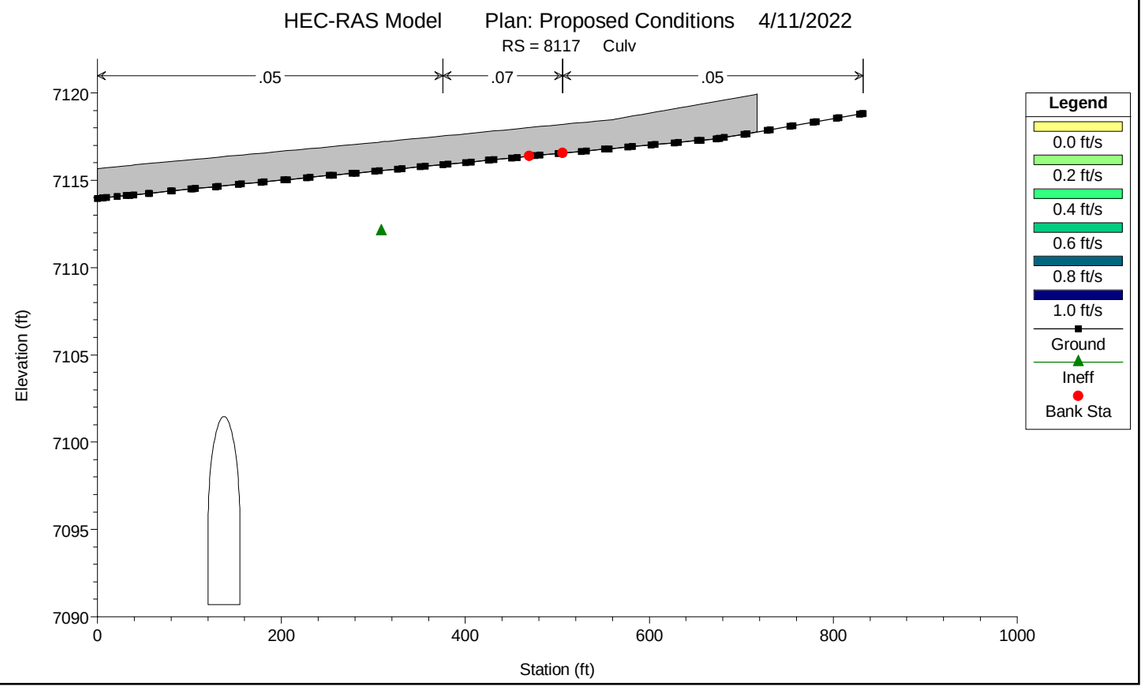

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8513
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8363
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta

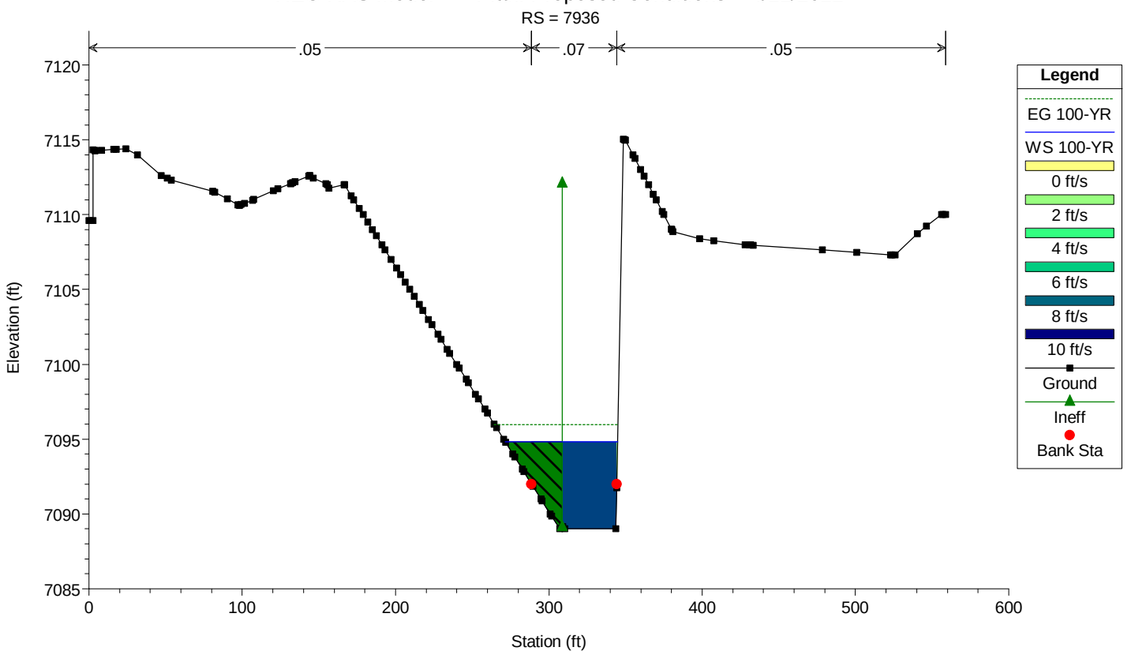

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8297
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8182
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta

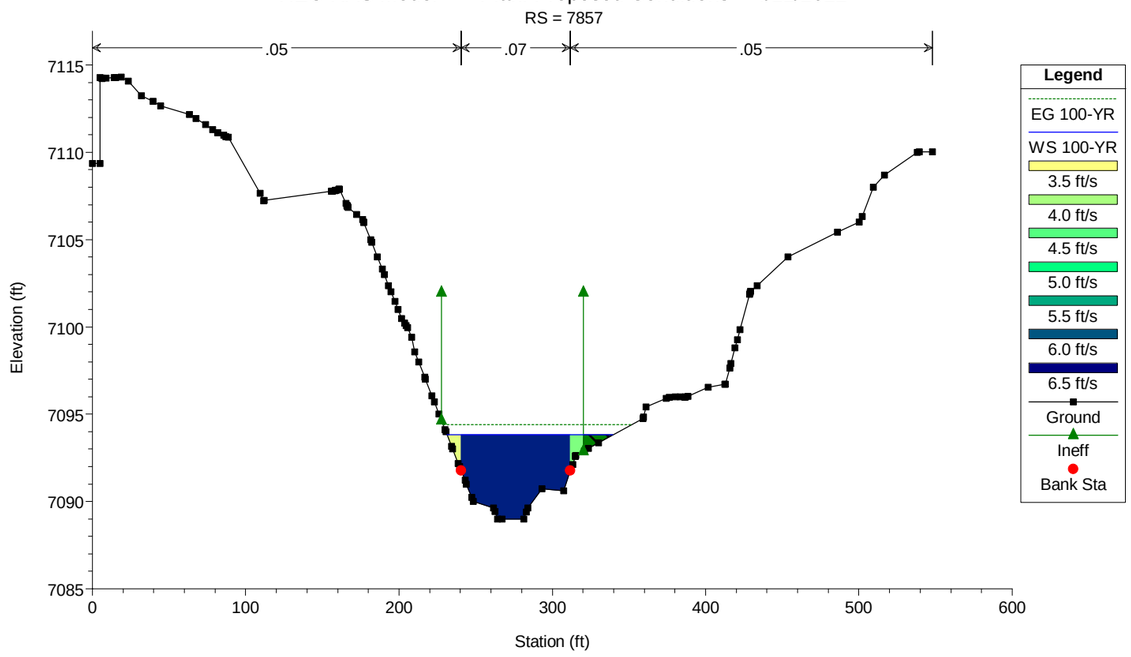

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8117 Culv
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 8117 Culv
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta

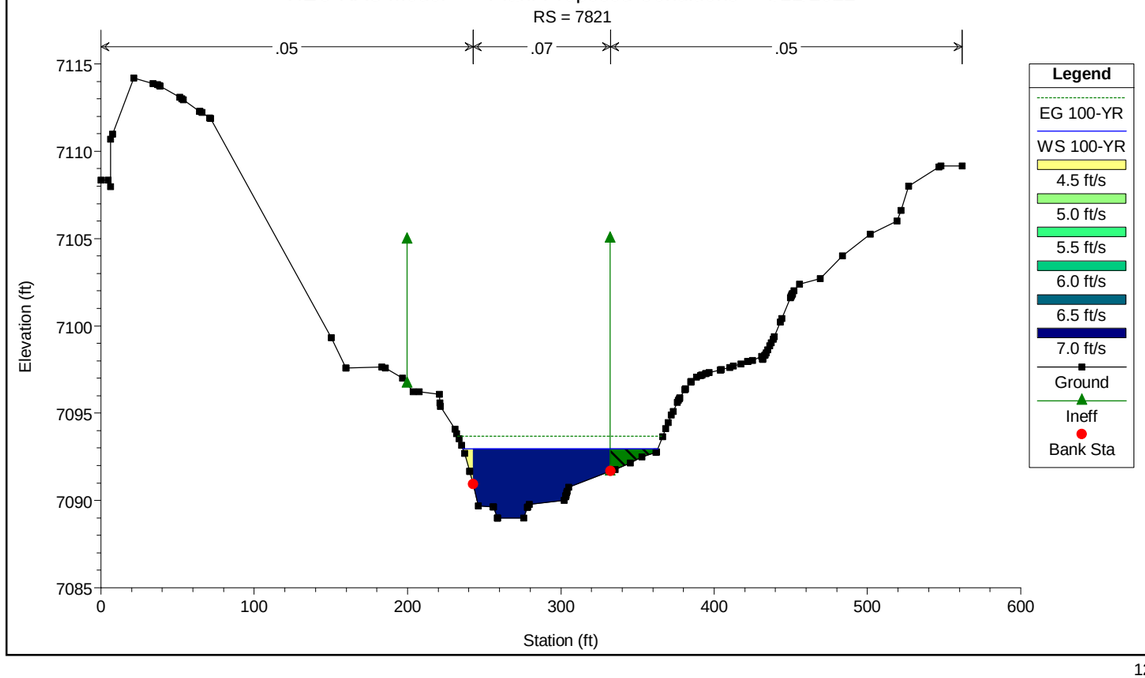
HEC-RAS Model Plan: Proposed Conditions 4/11/2022



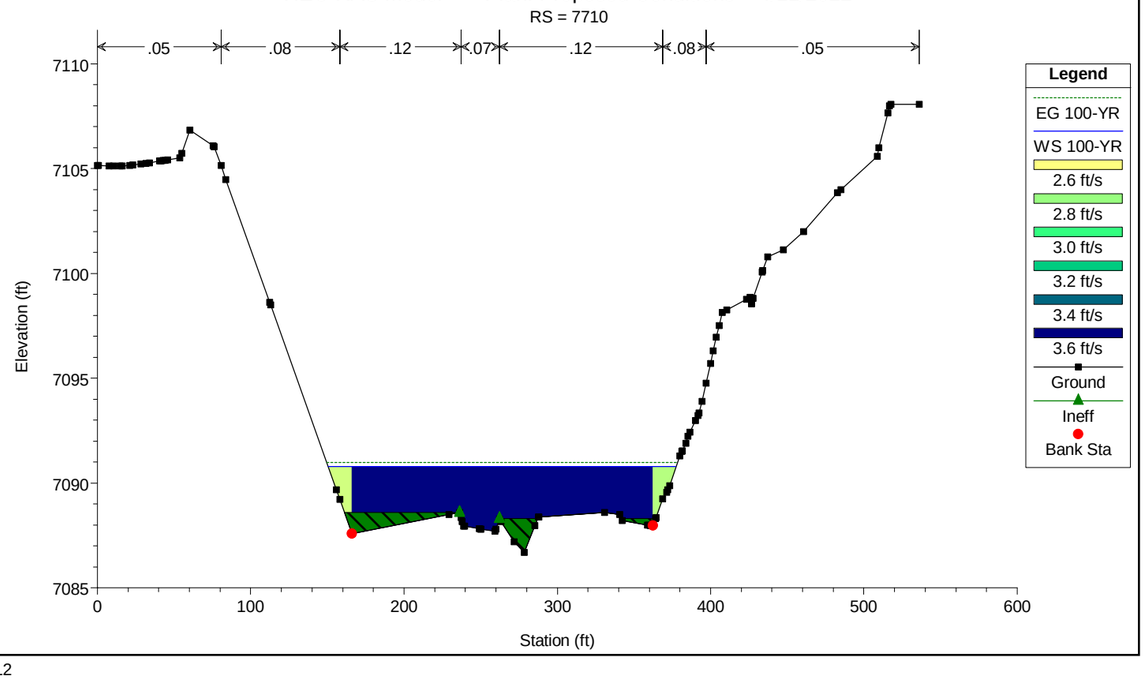
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

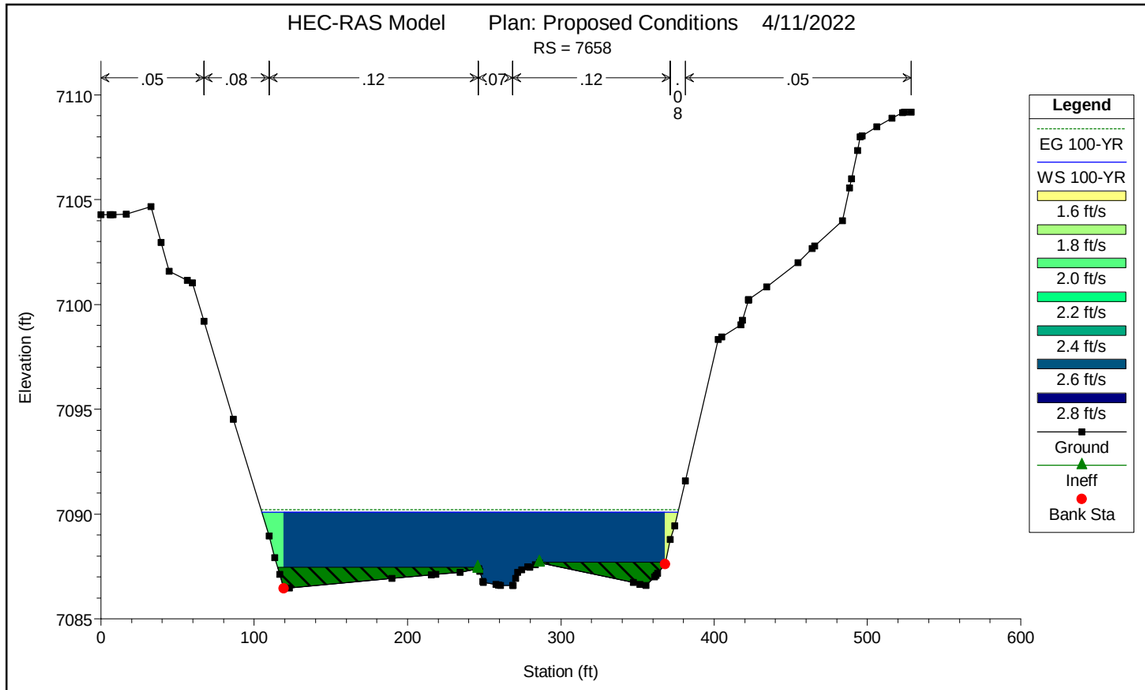


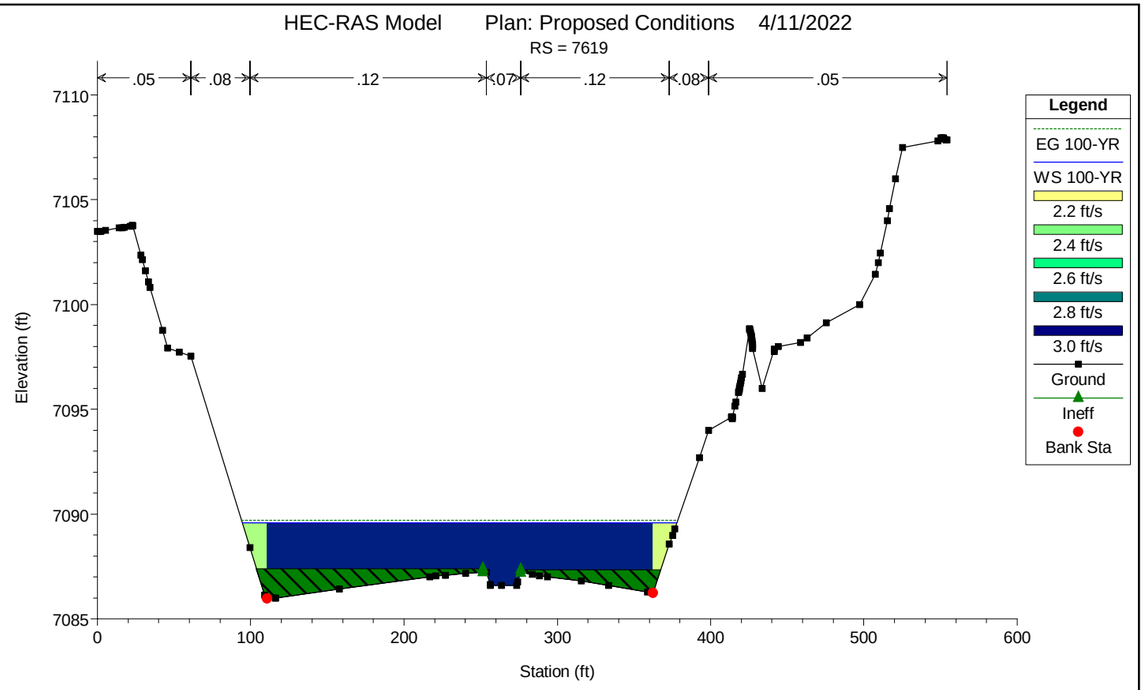
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

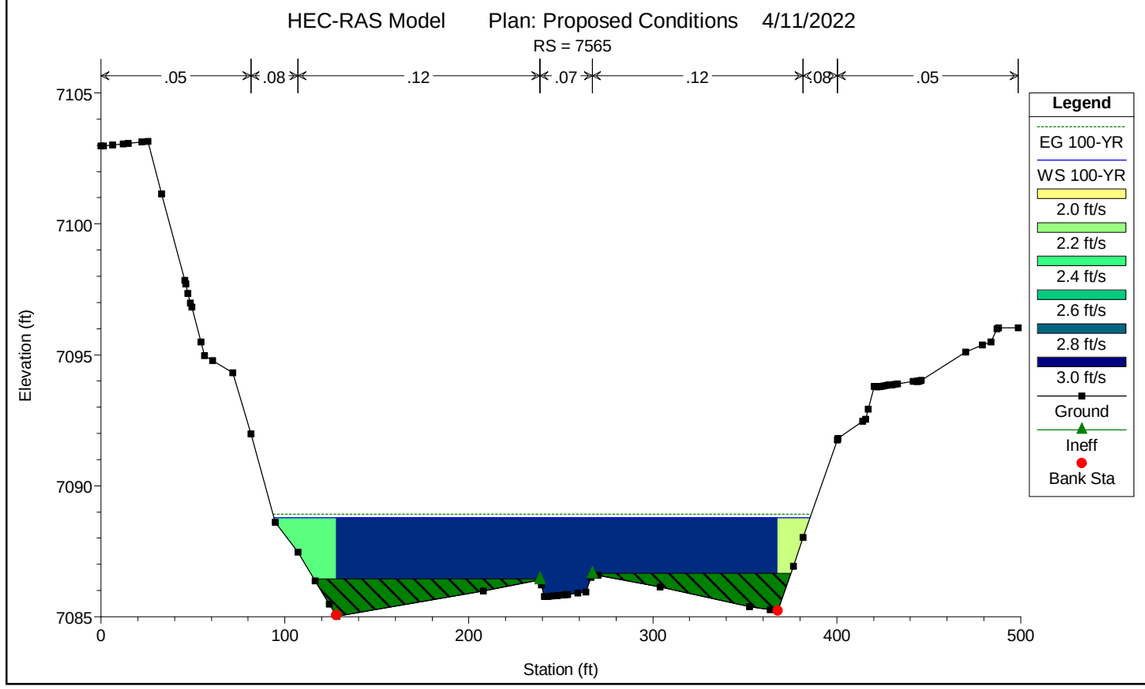


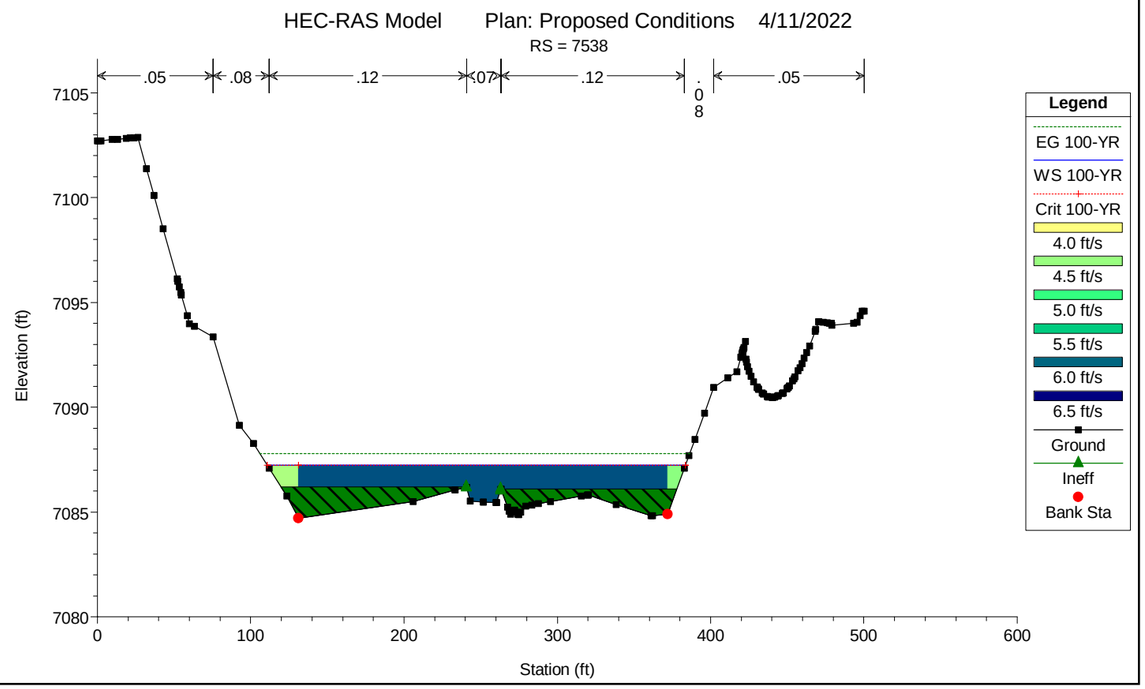
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

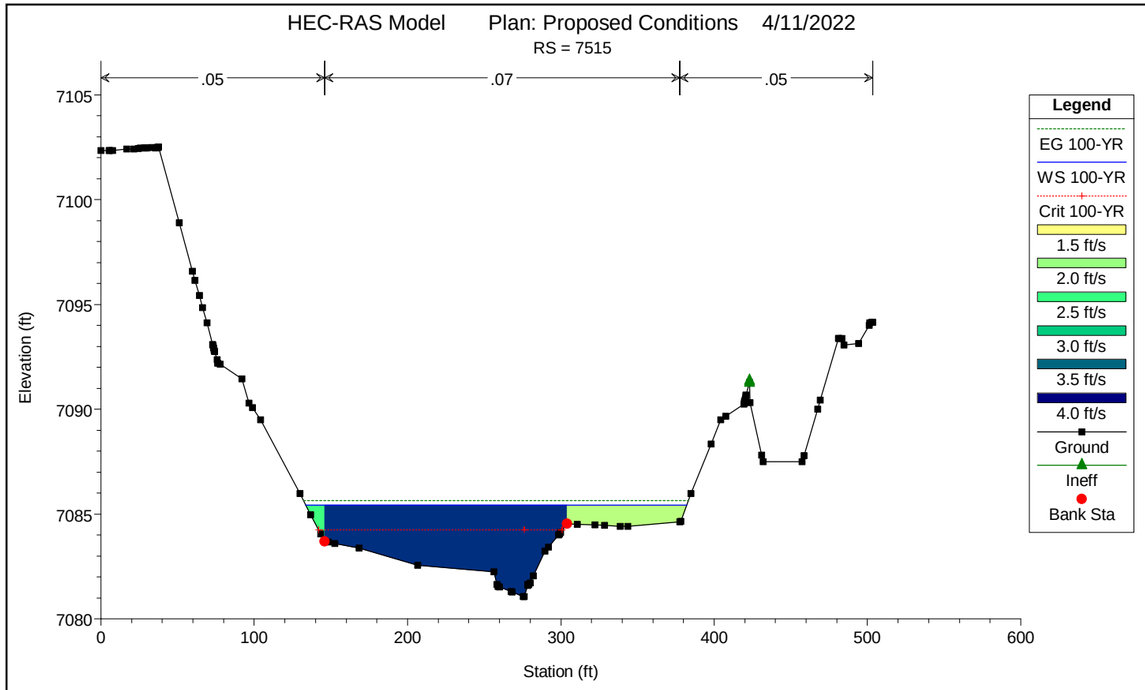


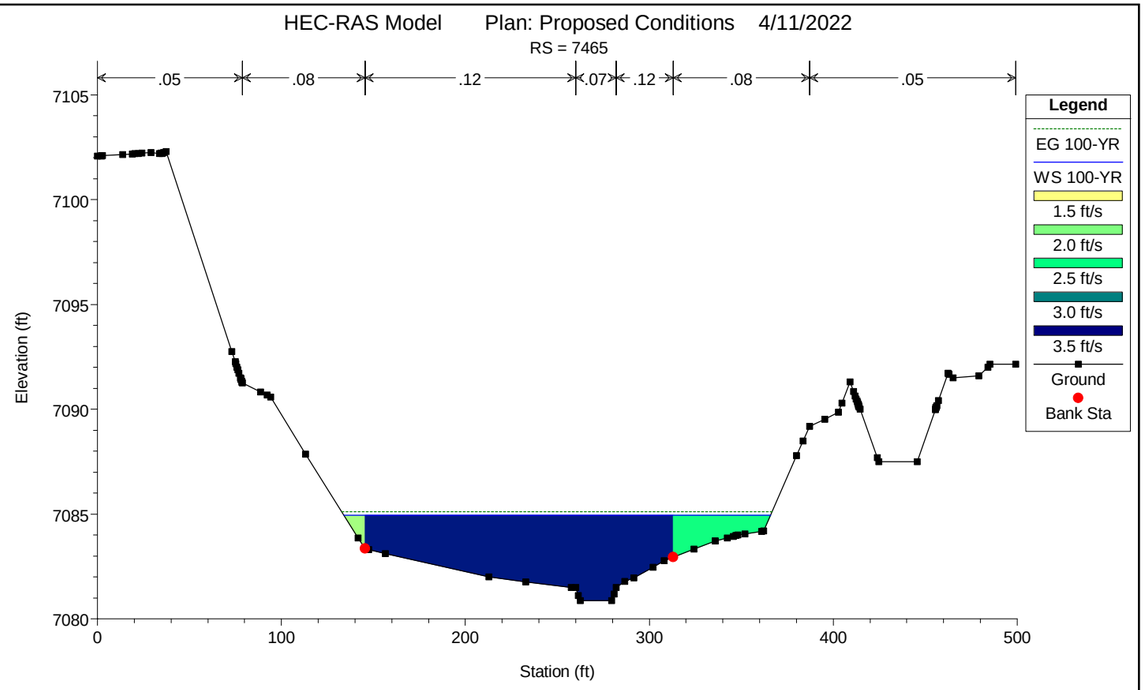

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7658
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Ineff
Bank Sta

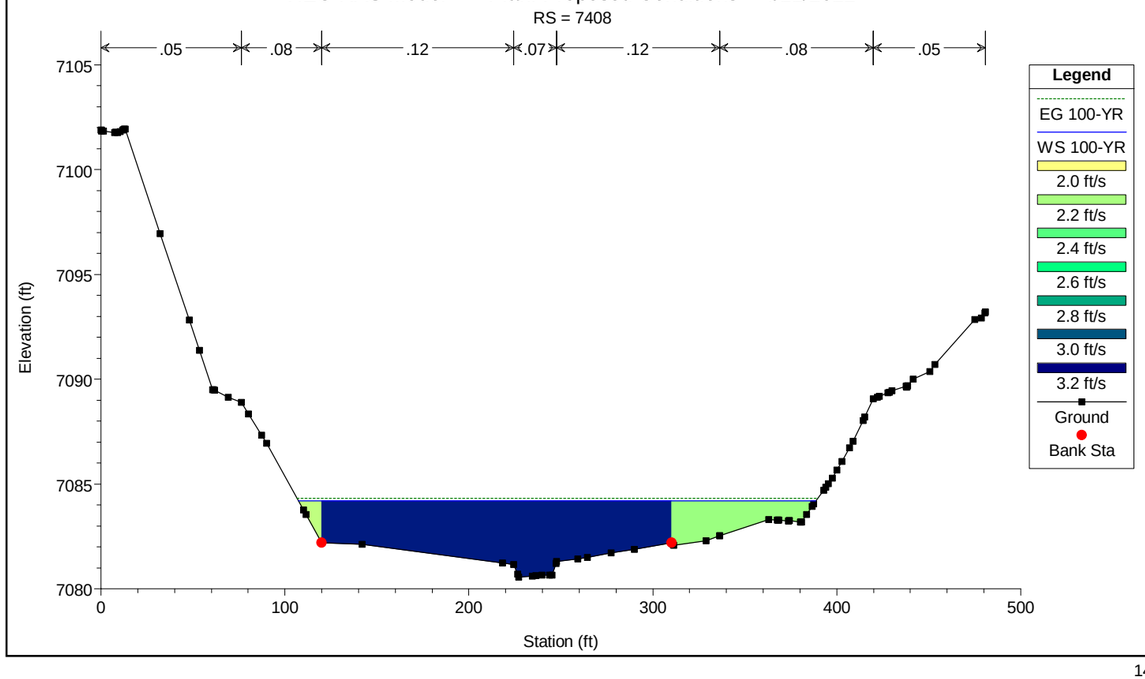

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7619
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta

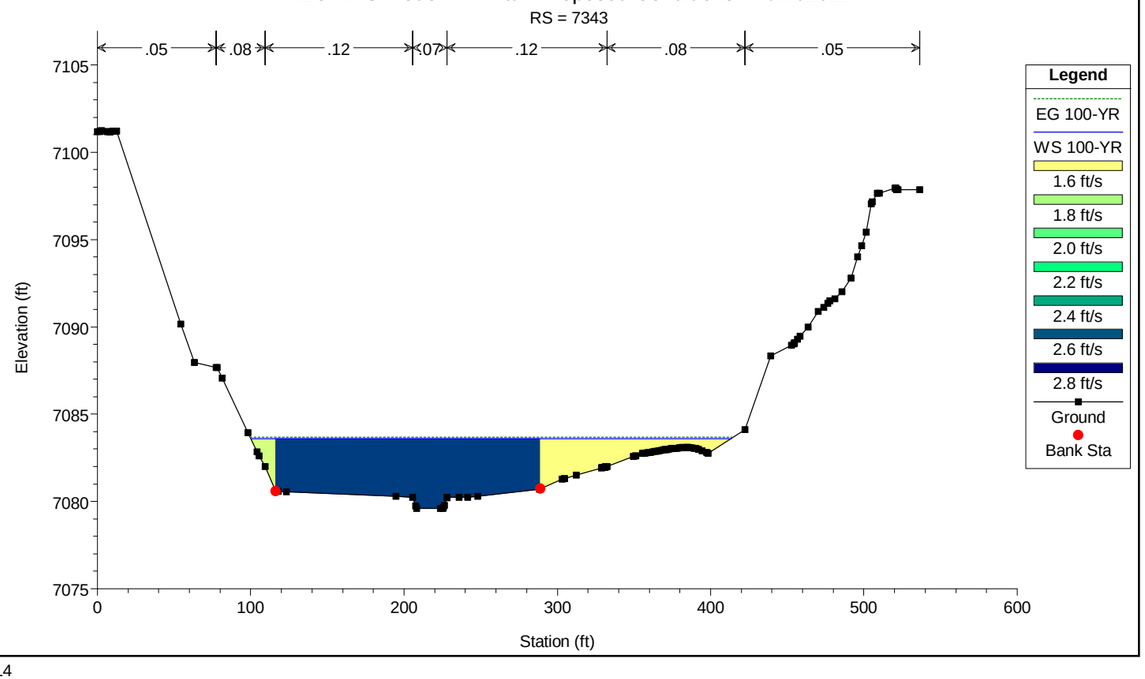

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7565
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta

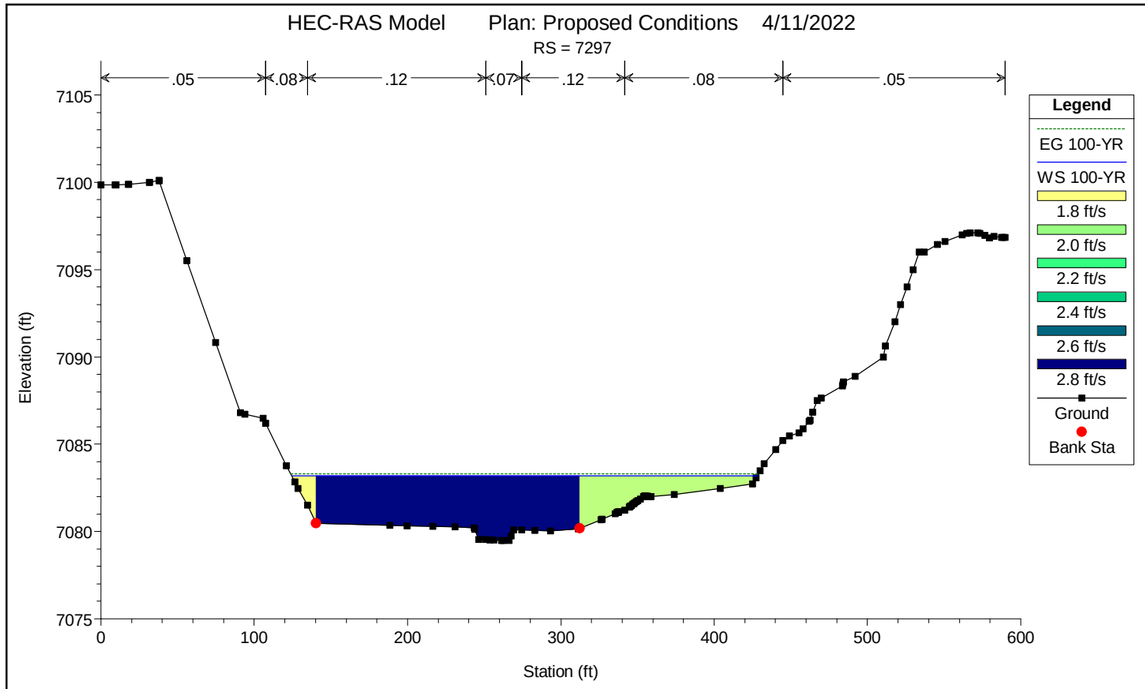

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7538
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
4.0 ft/s
4.5 ft/s
5.0 ft/s
5.5 ft/s
6.0 ft/s
6.5 ft/s
Ground
Ineff
Bank Sta

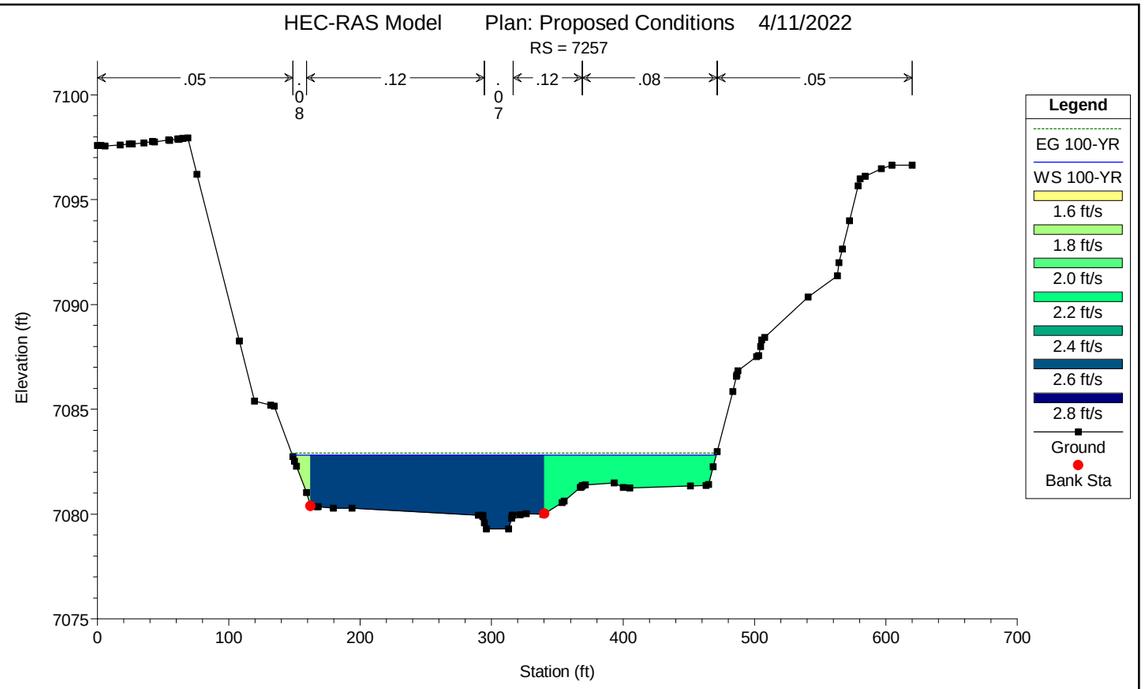

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7515
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Ineff
Bank Sta

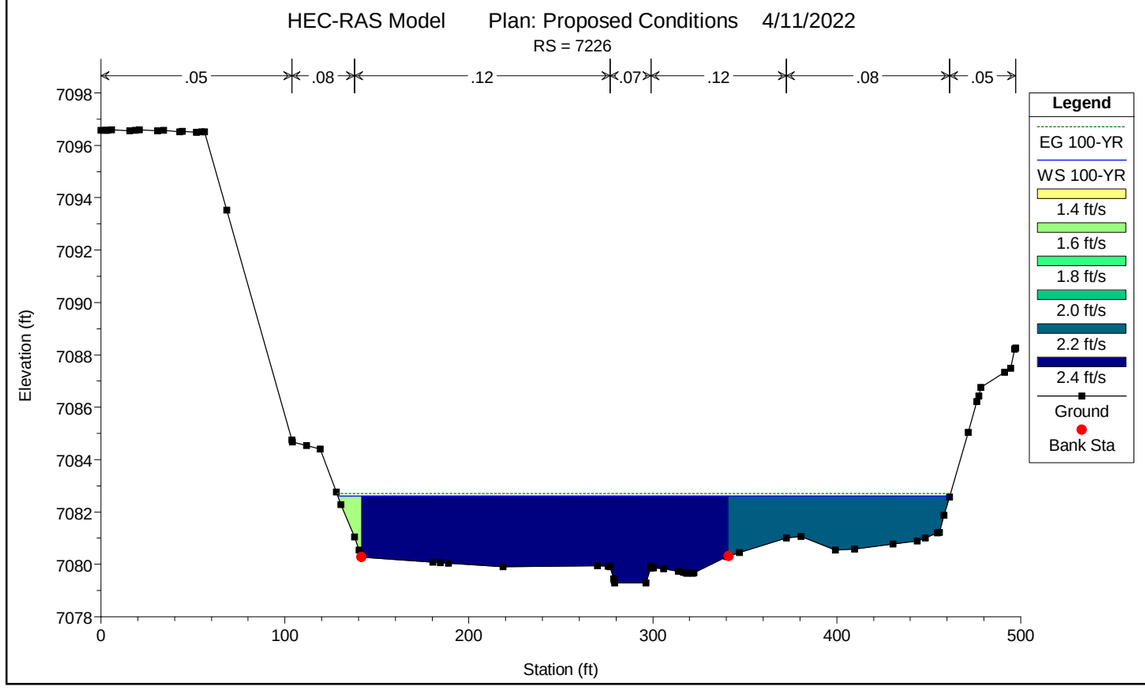

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7465
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

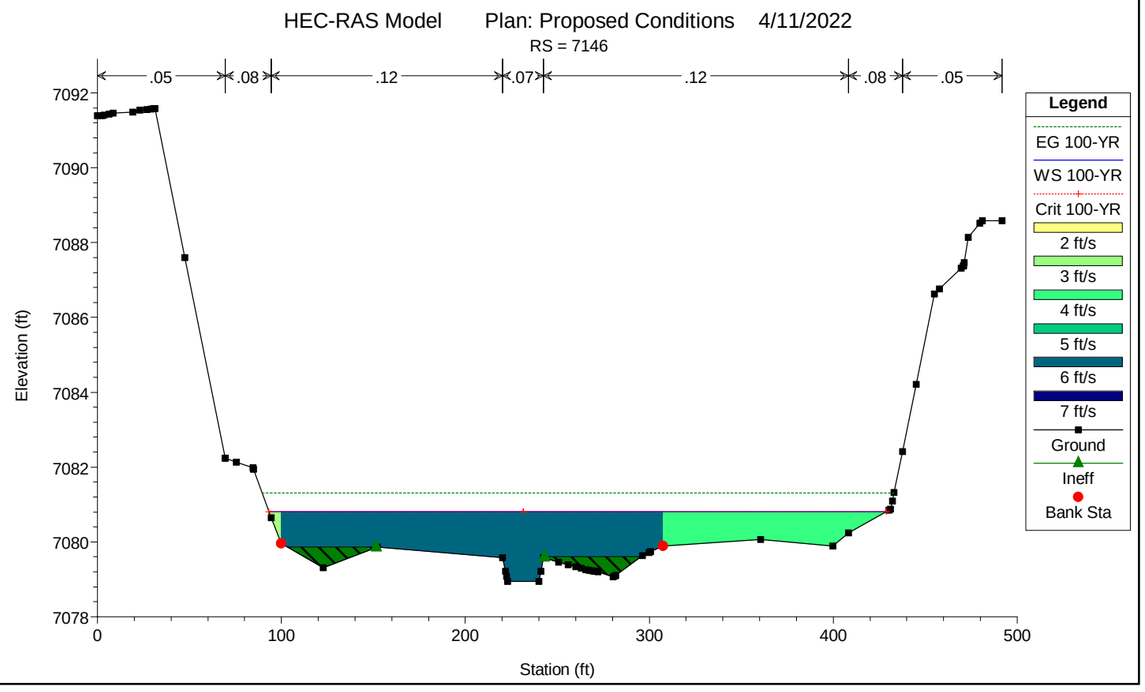

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7408
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7343
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7297
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Bank Sta

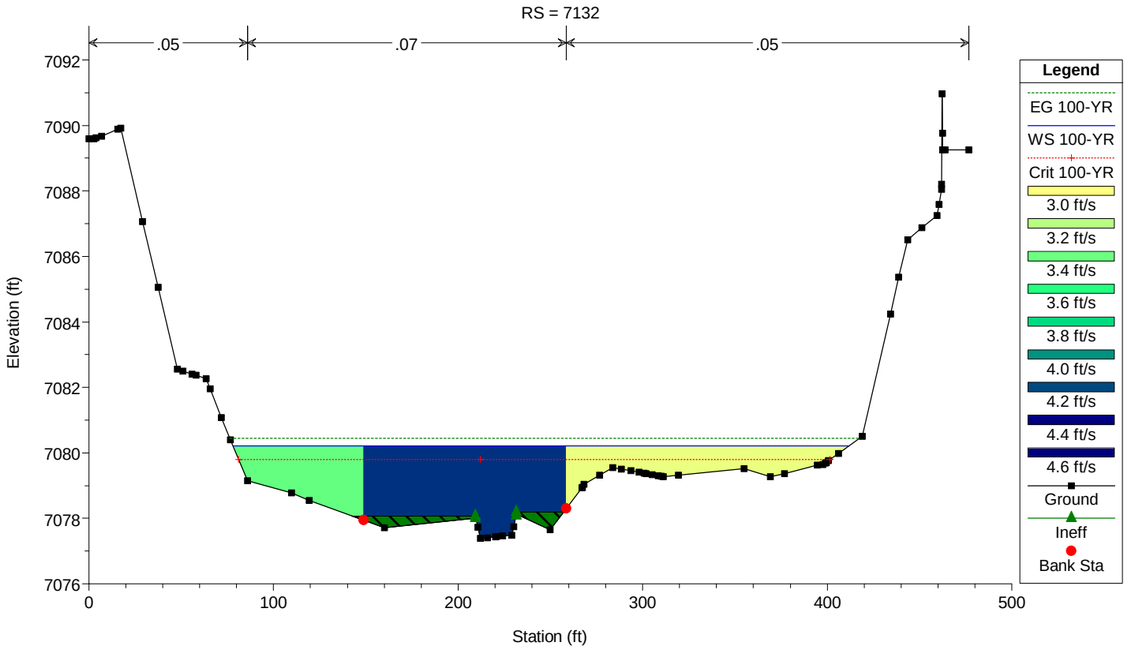

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7257
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7226
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 7146
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Ineff
Bank Sta

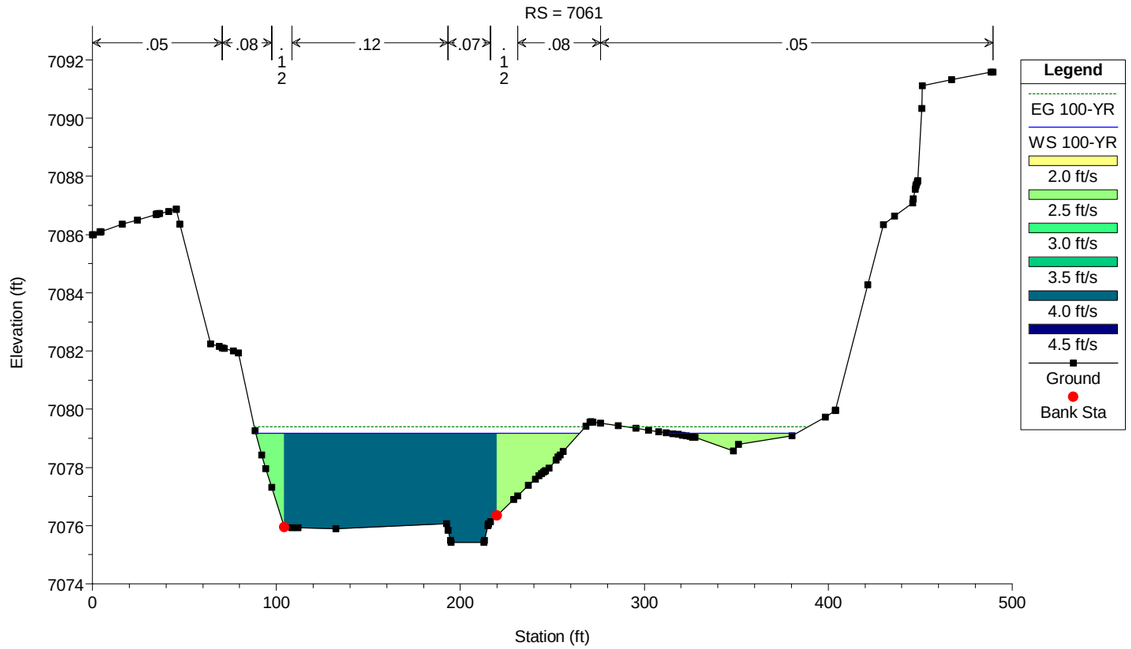
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 7132



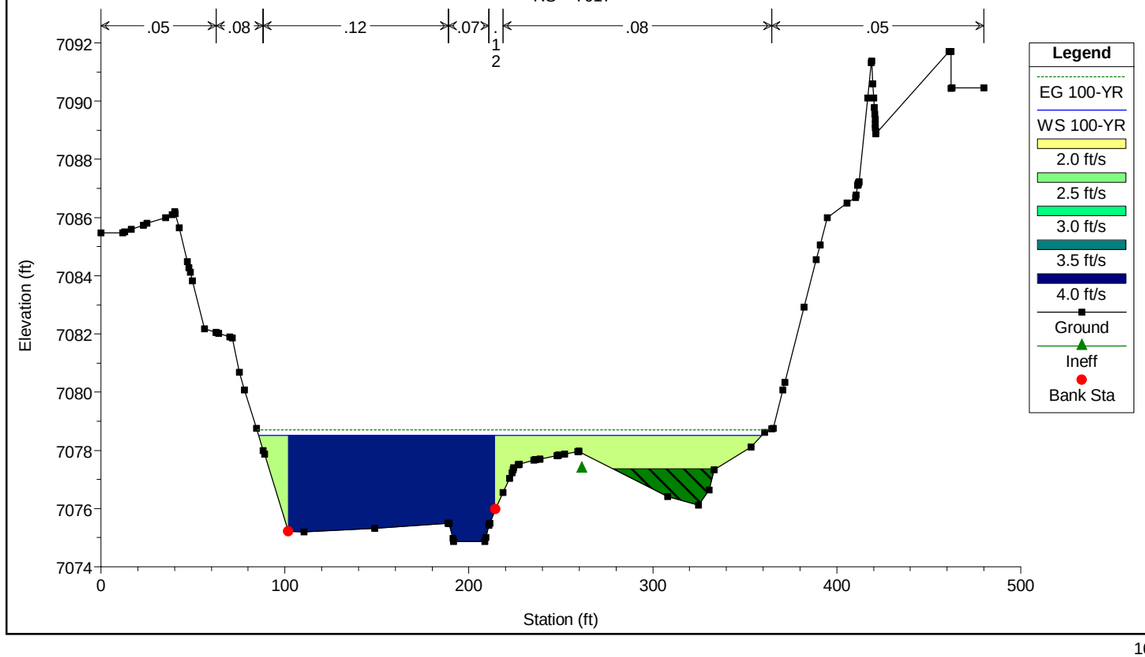
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 7061



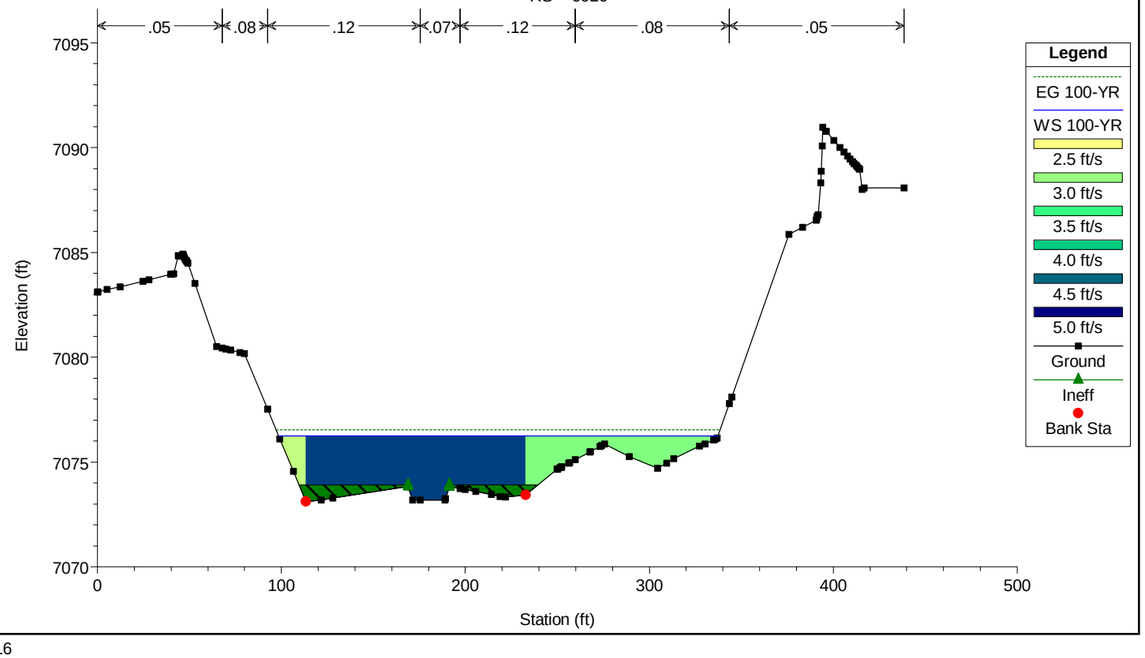
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

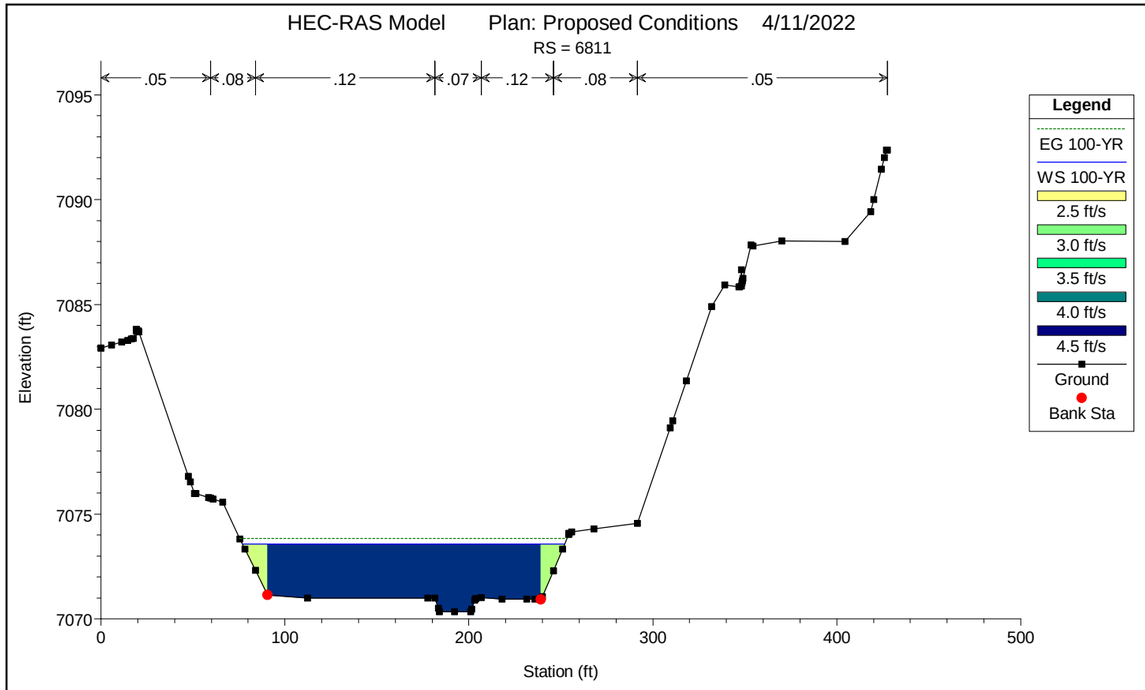
RS = 7017

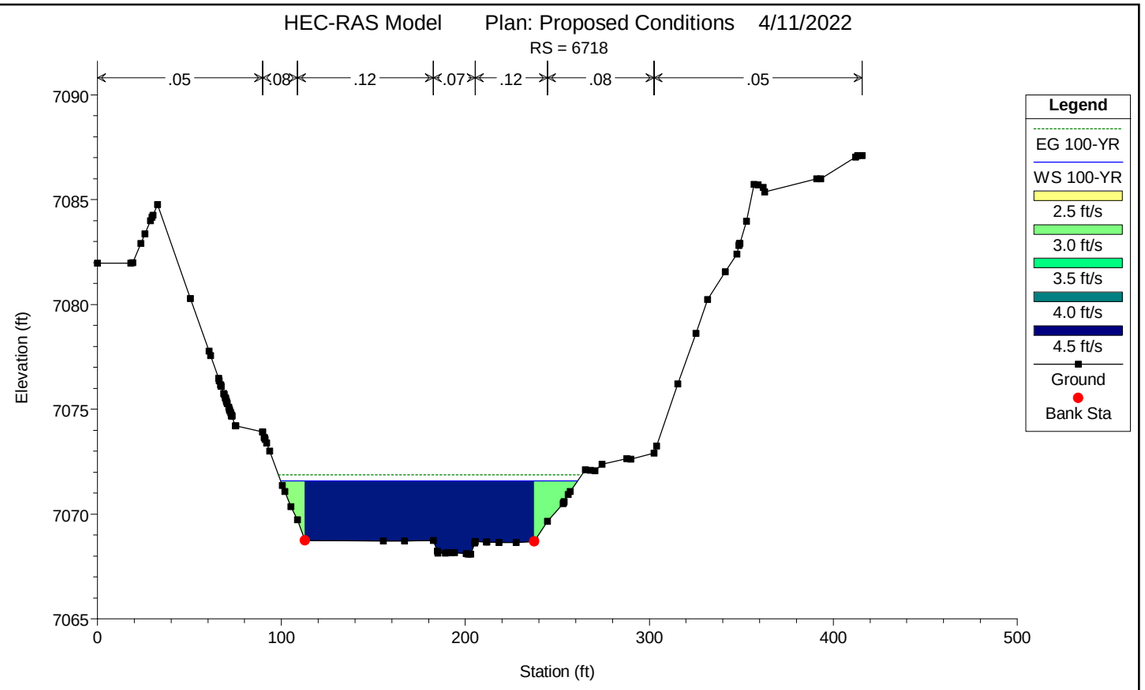


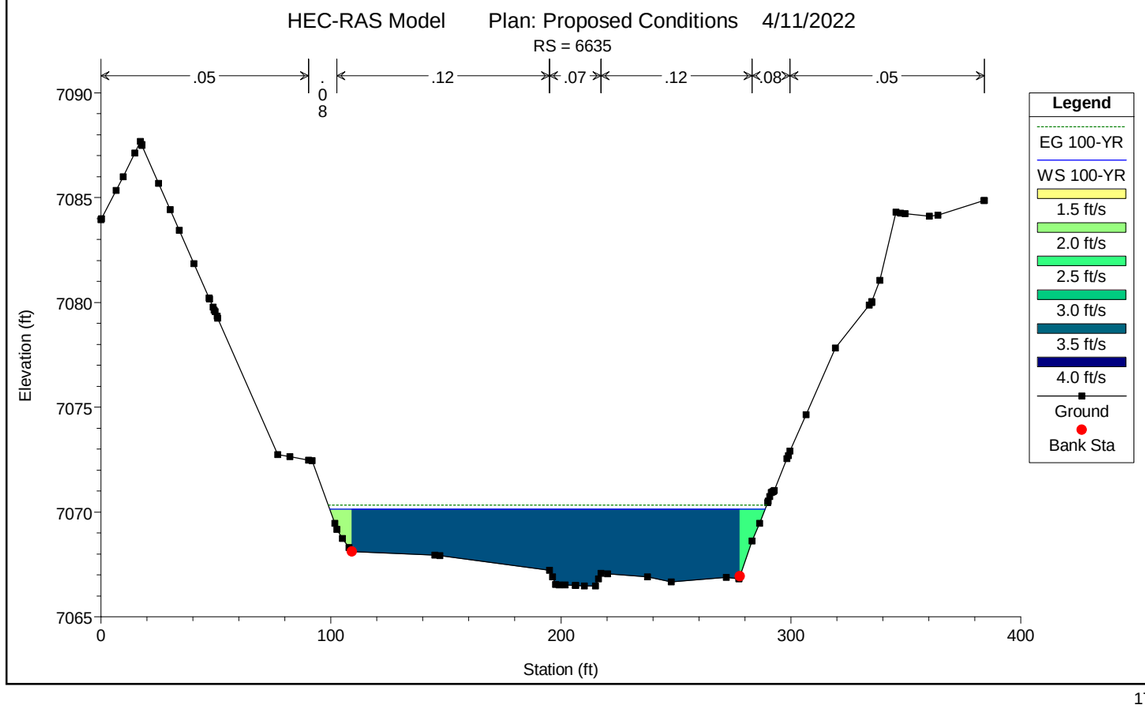
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

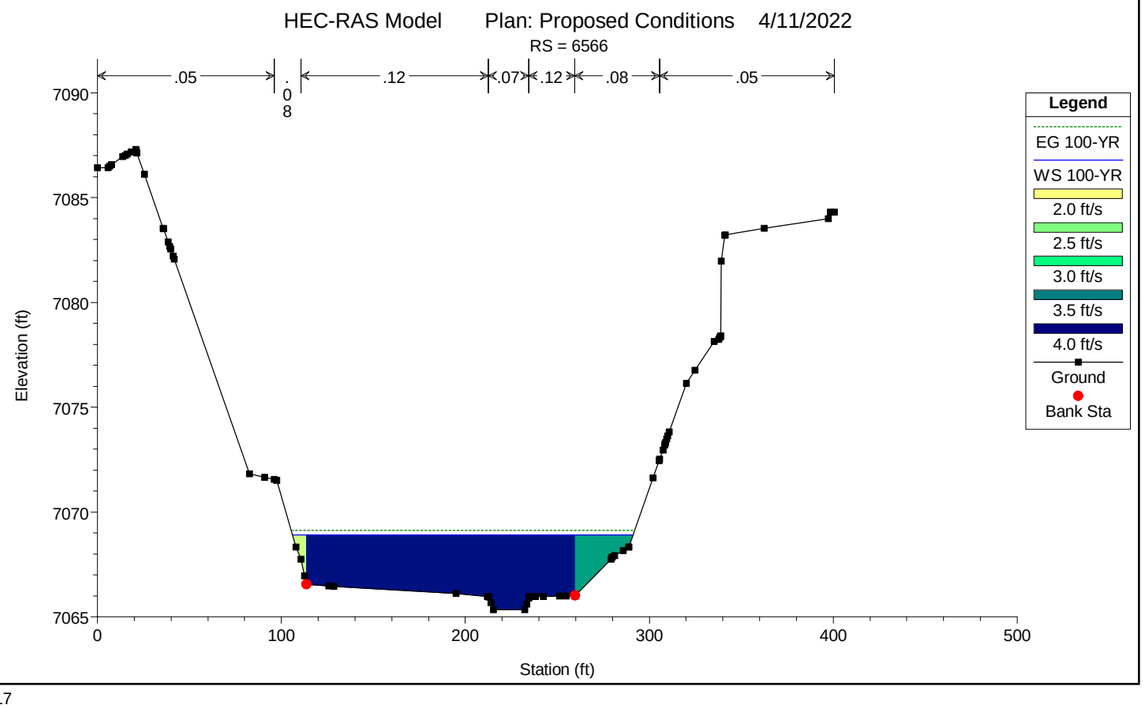
RS = 6920

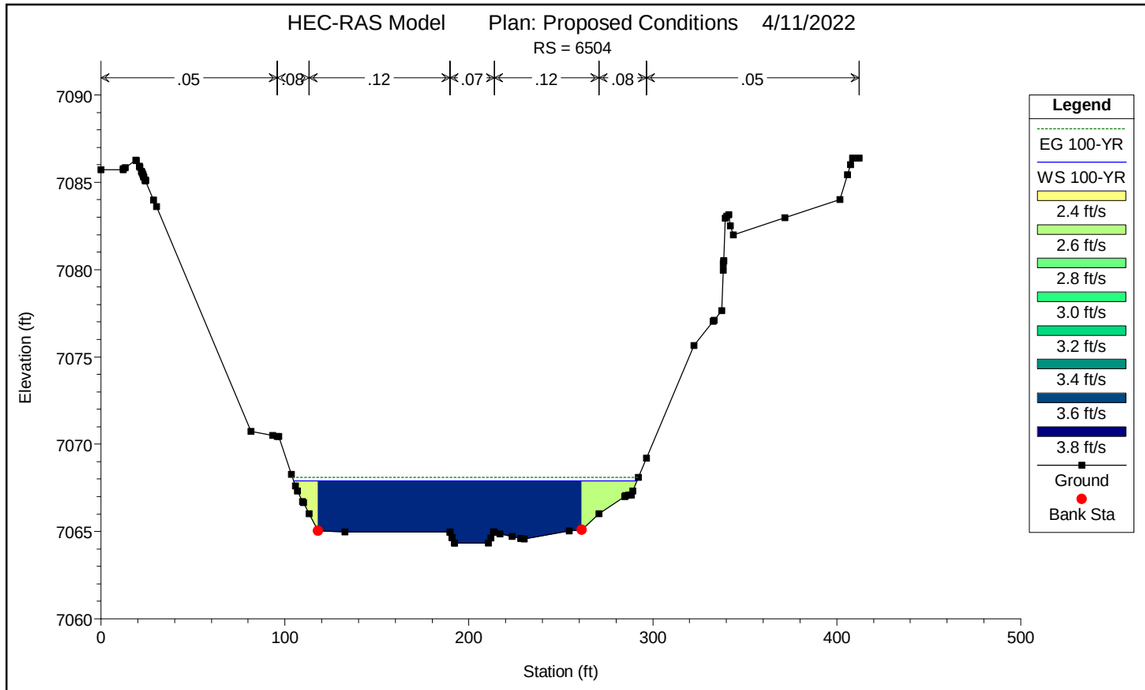


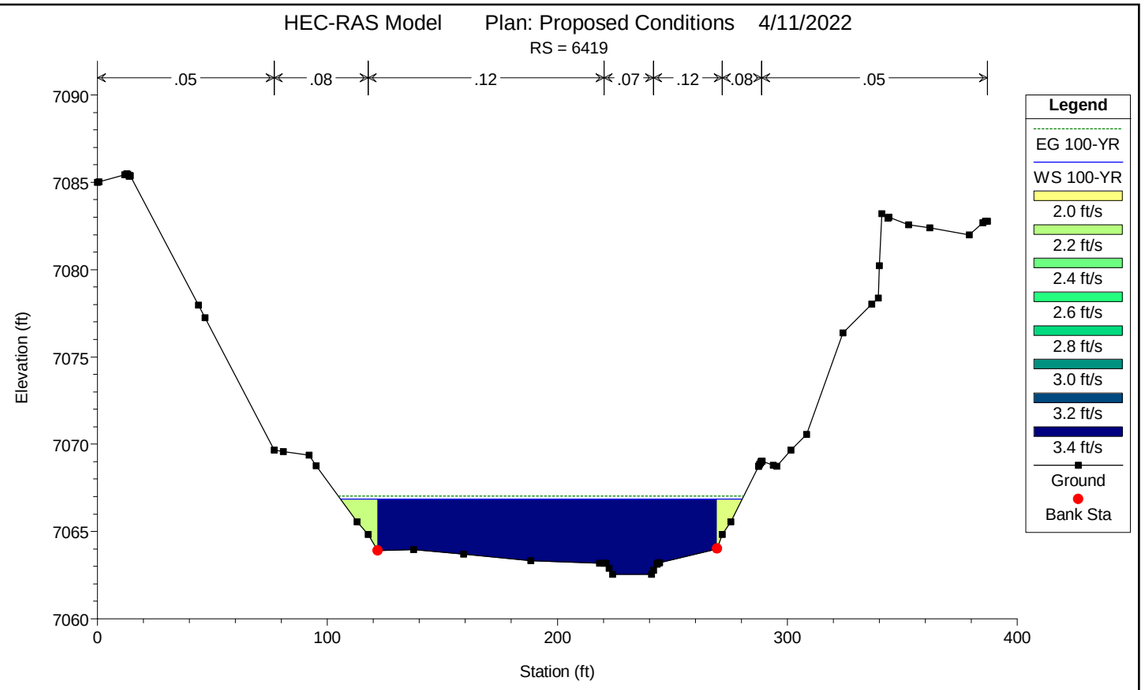

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6811
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta

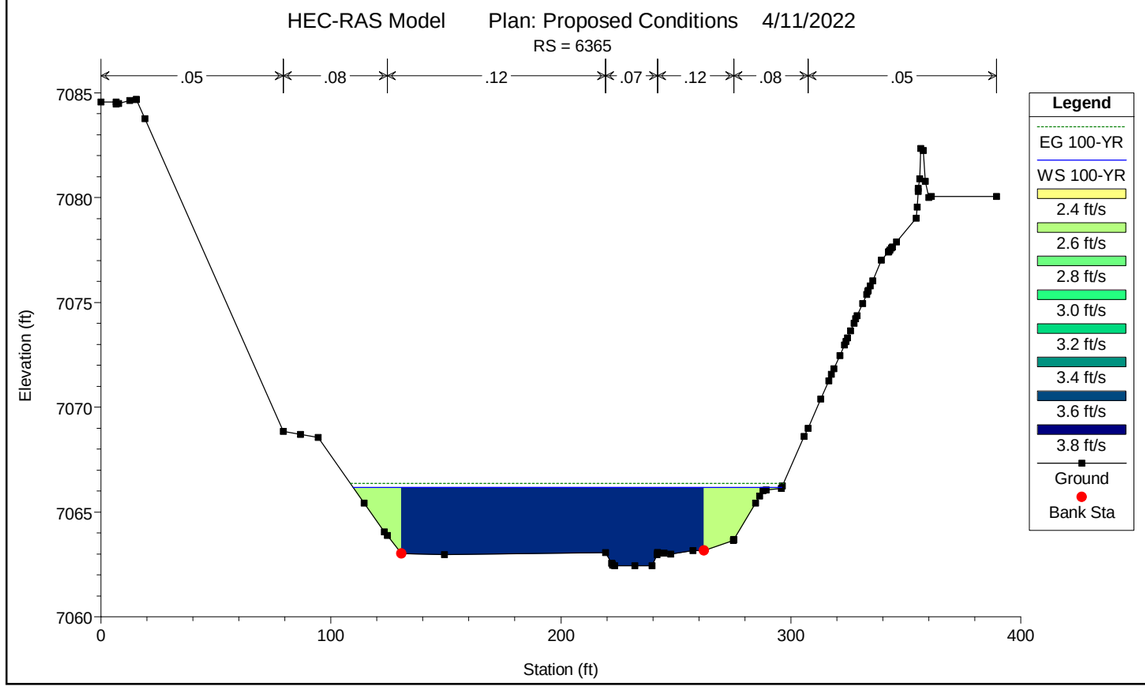

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6718
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta

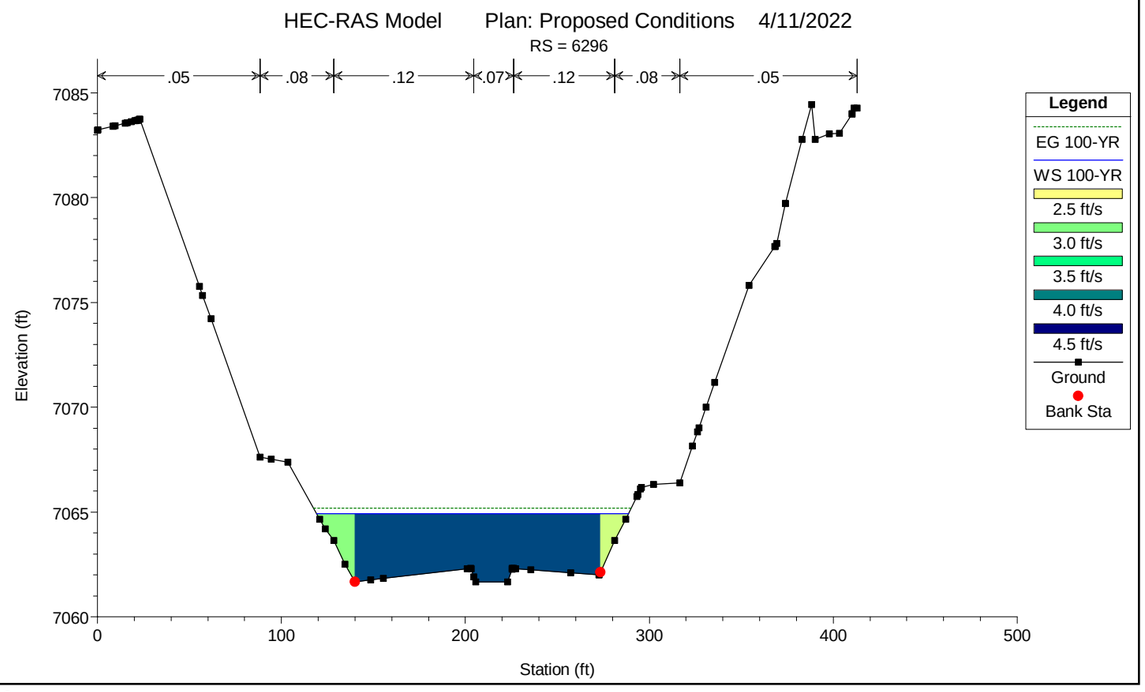

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6635
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

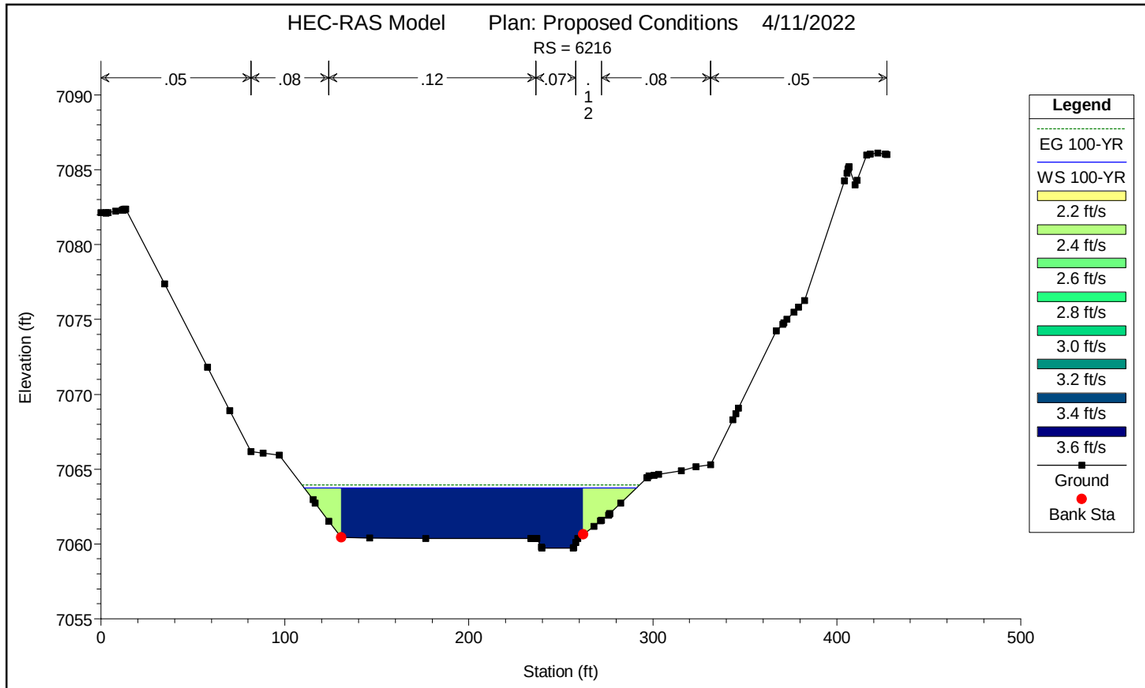

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6566
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

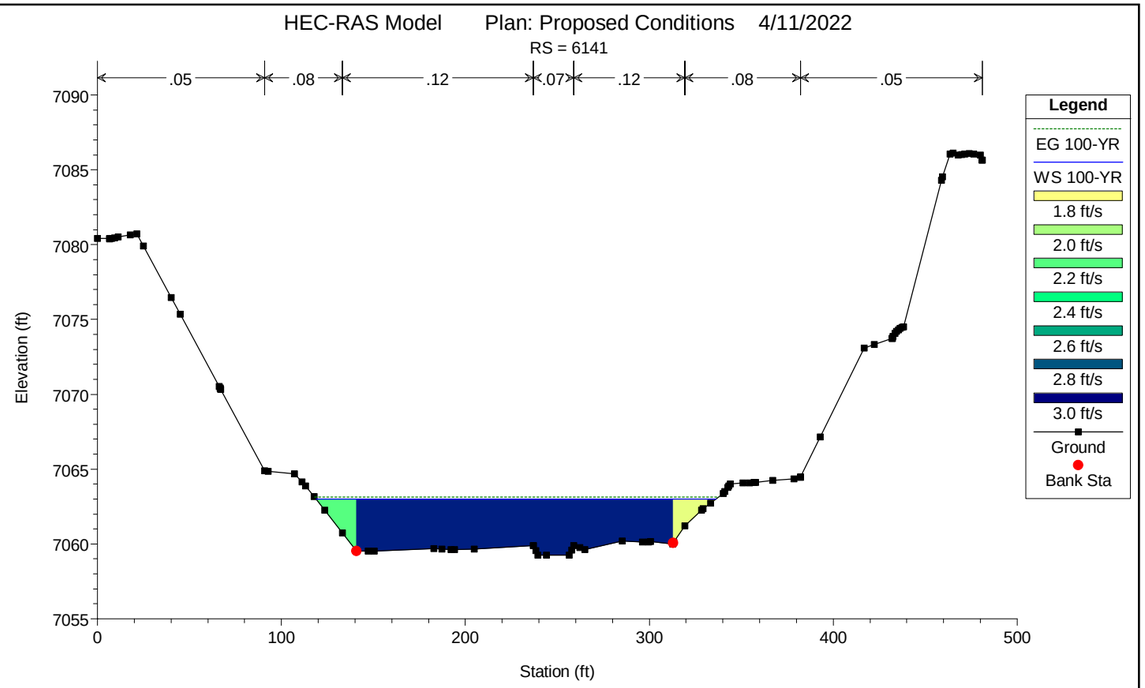

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6504
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
3.6 ft/s
3.8 ft/s
Ground
Bank Sta

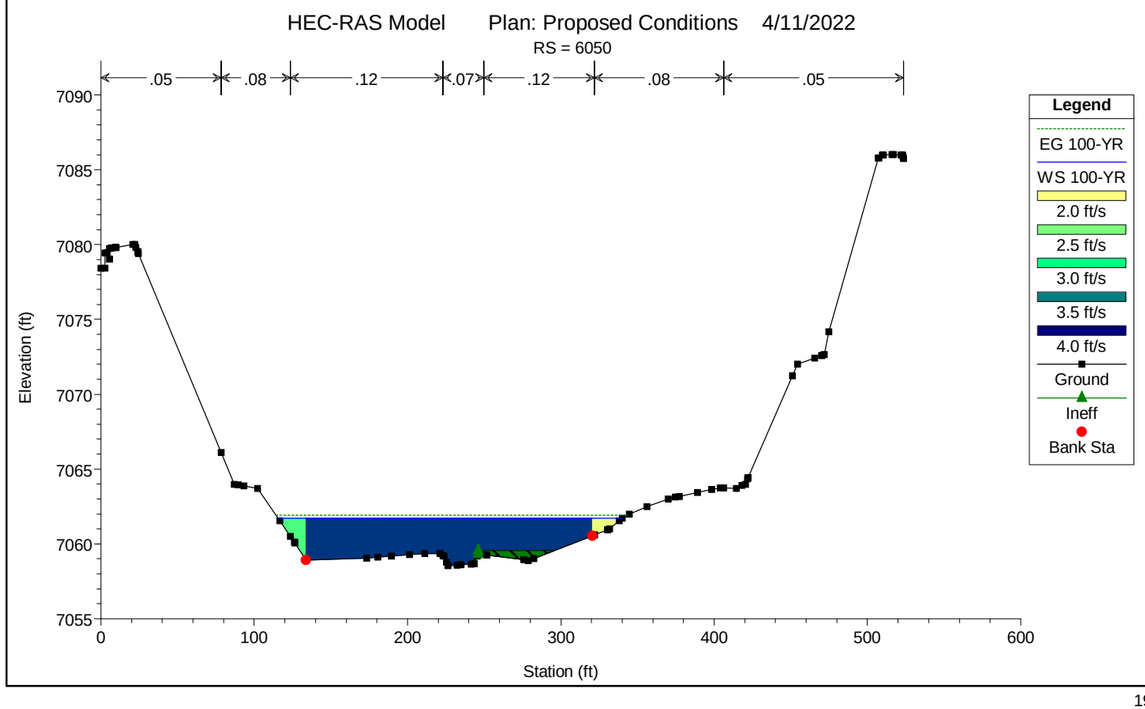

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6419
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
Ground
Bank Sta

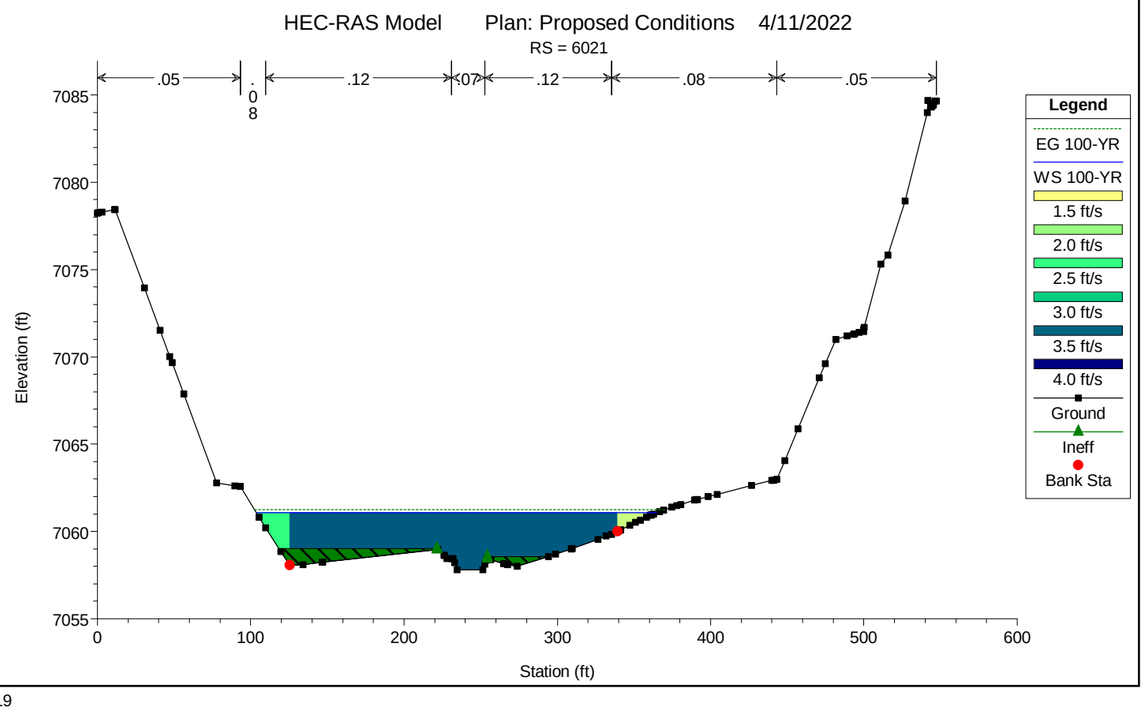

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6365
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
3.6 ft/s
3.8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6296
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6216
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
3.6 ft/s
Ground
Bank Sta

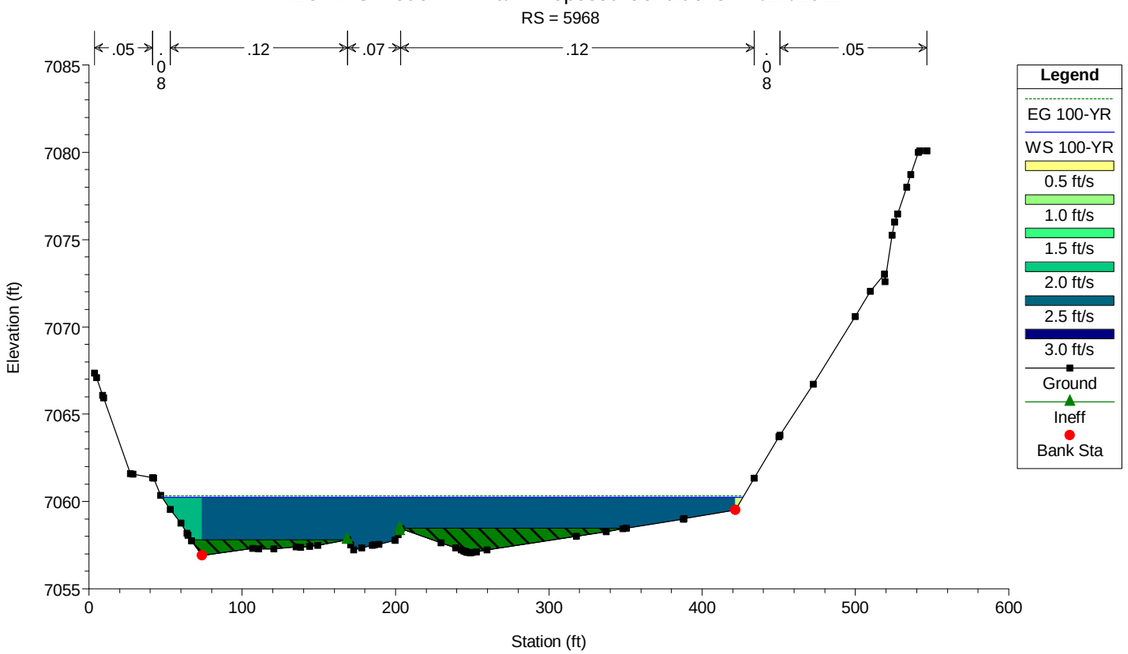

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6141
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6050
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 6021
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Ineff
Bank Sta

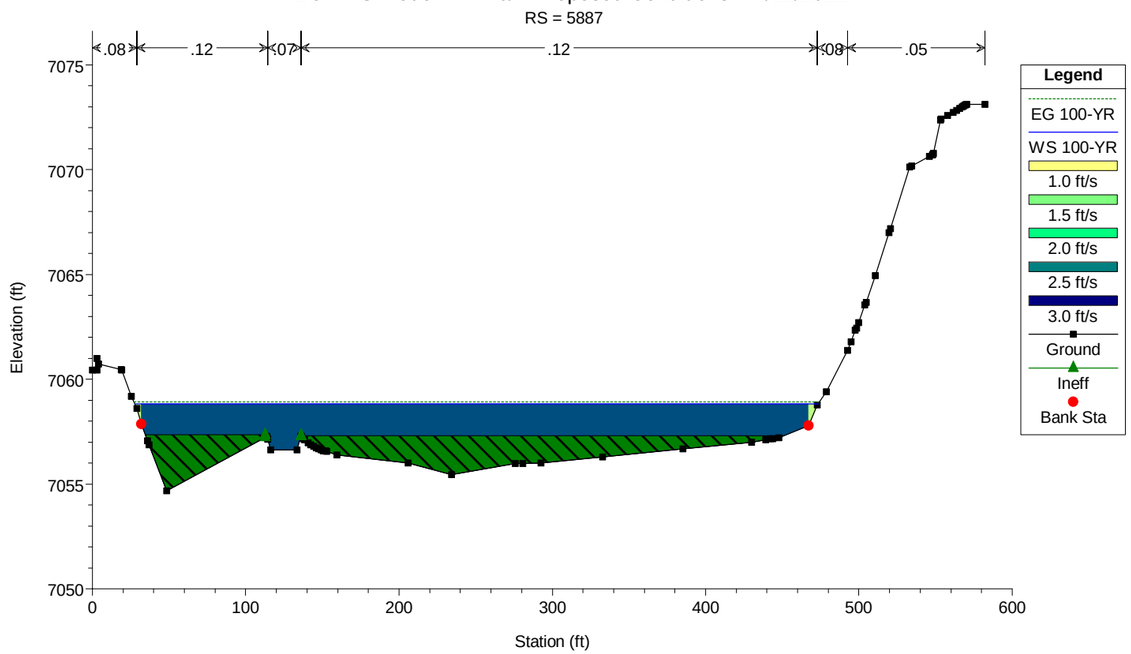
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 5968



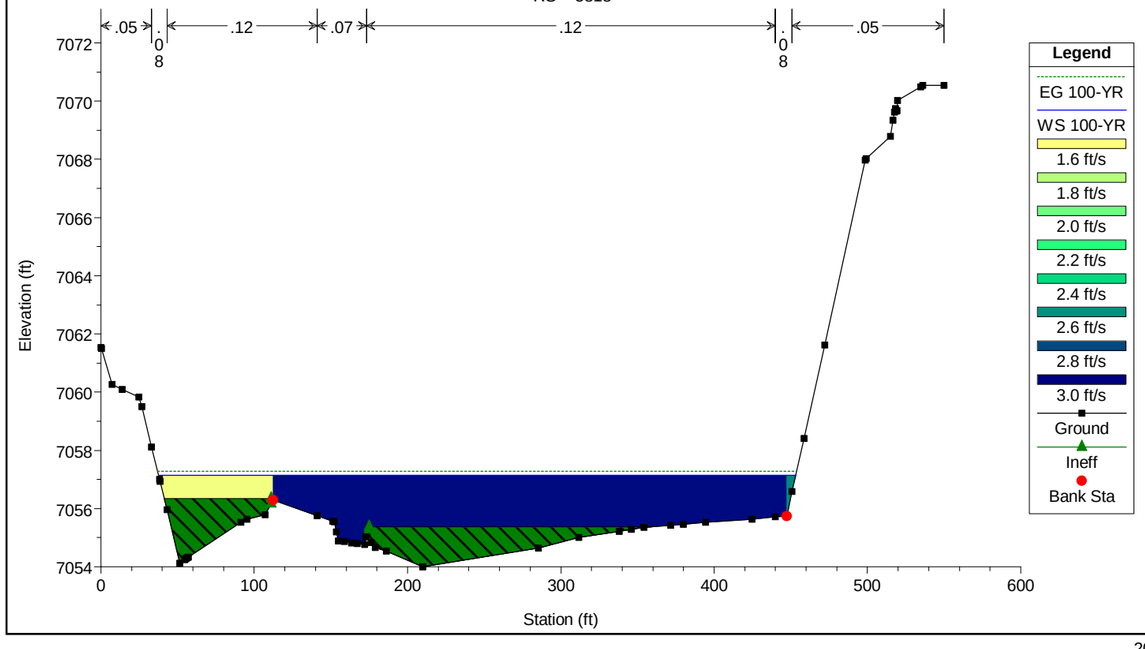
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 5887



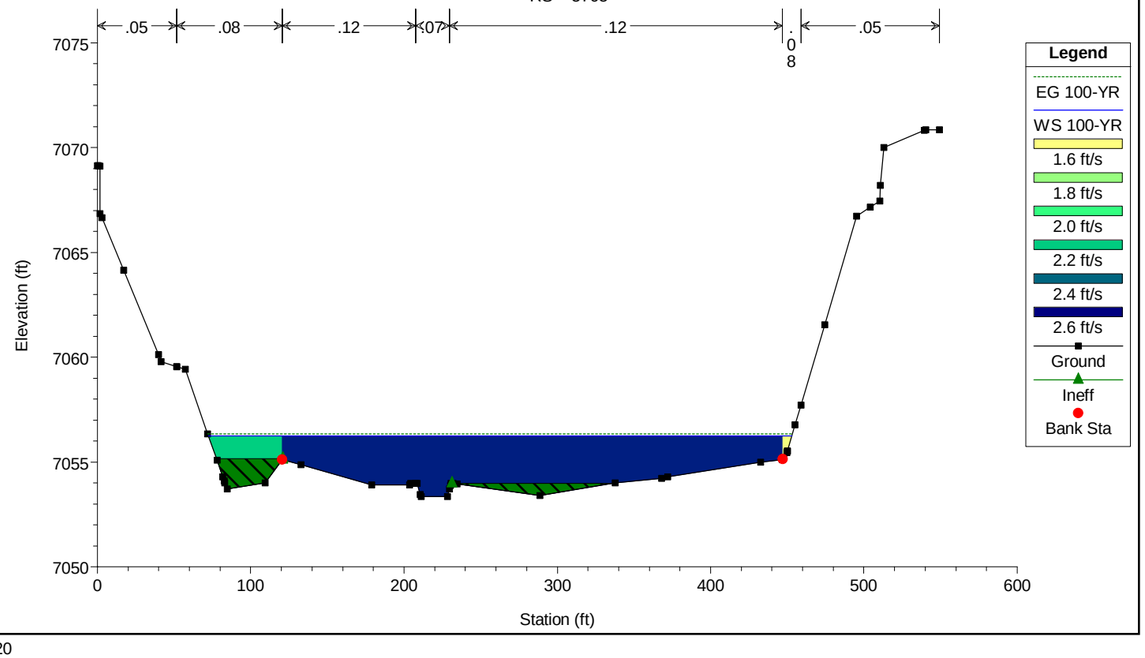
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

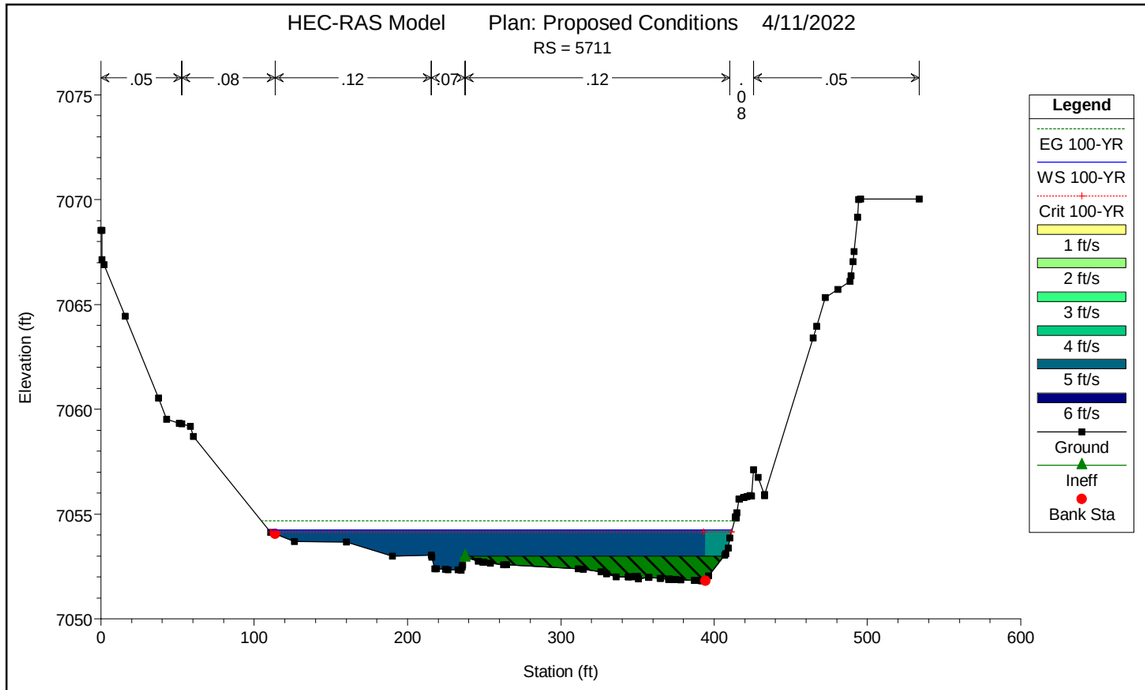
RS = 5818

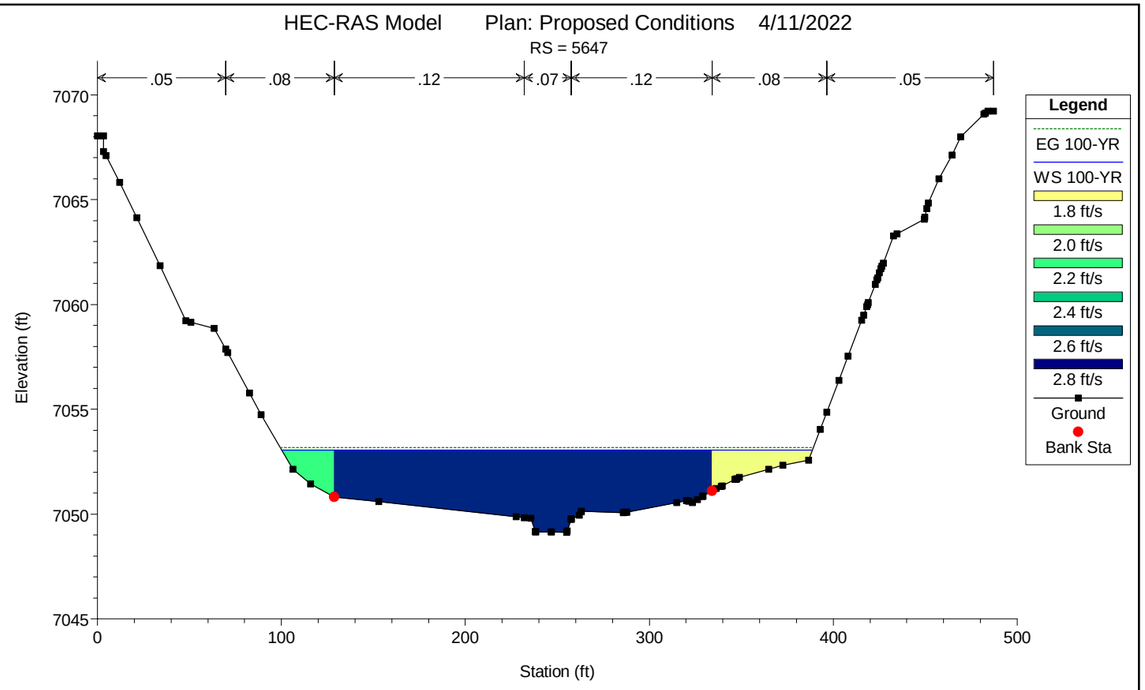


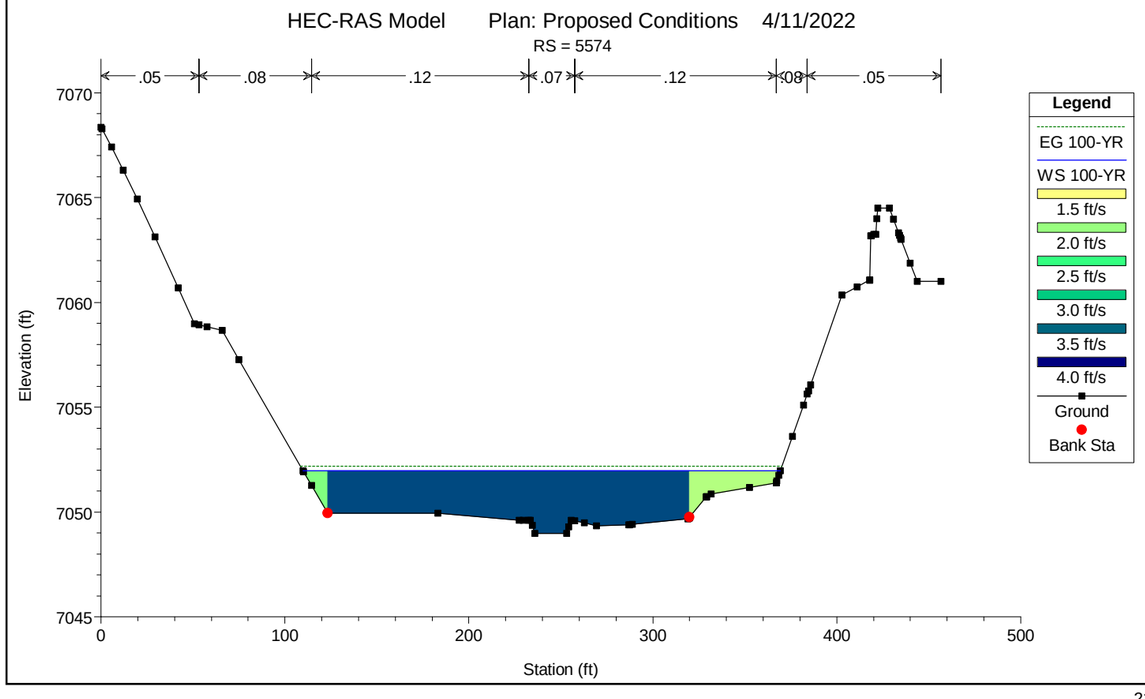
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

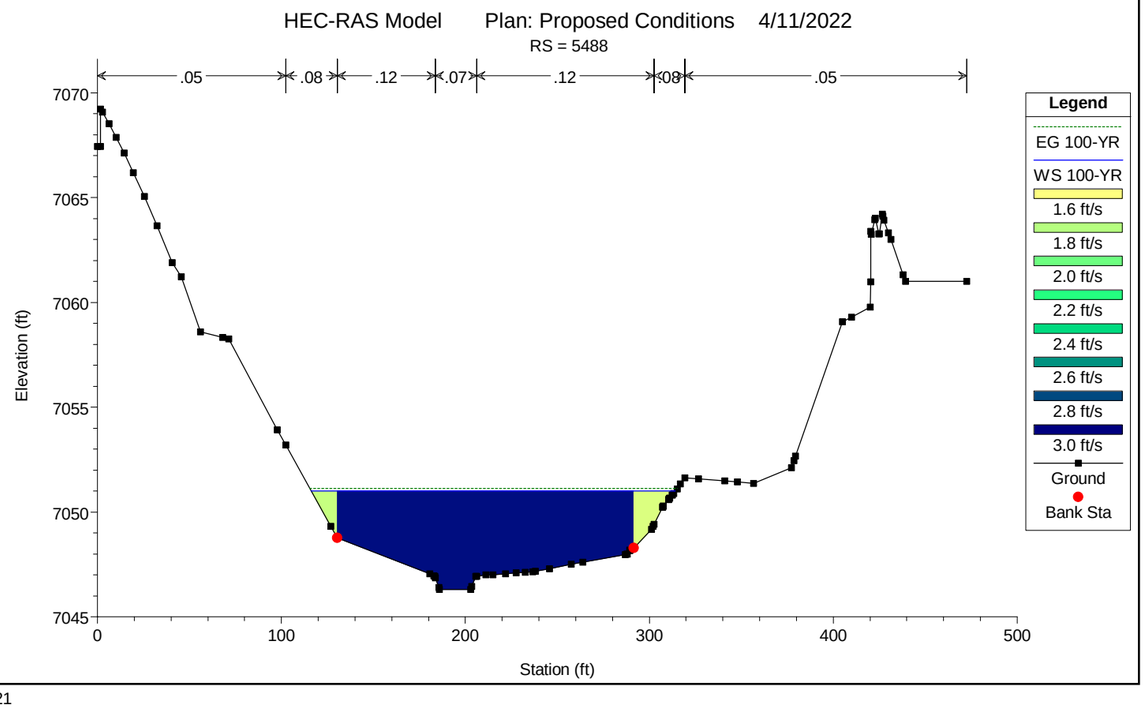
RS = 5765

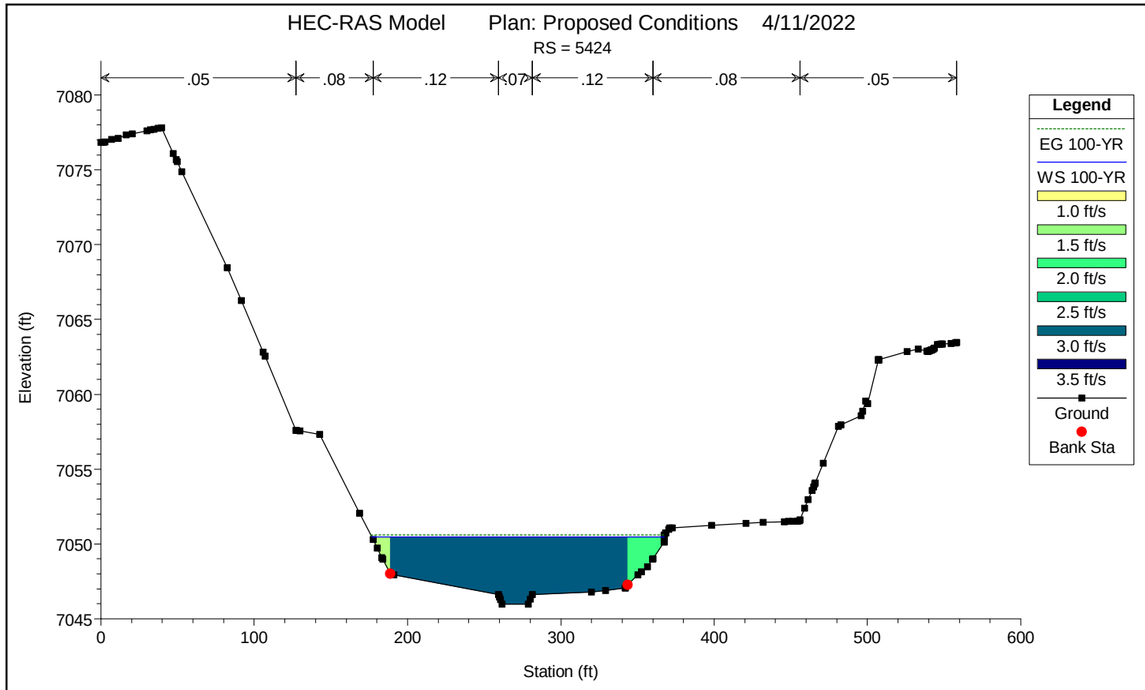


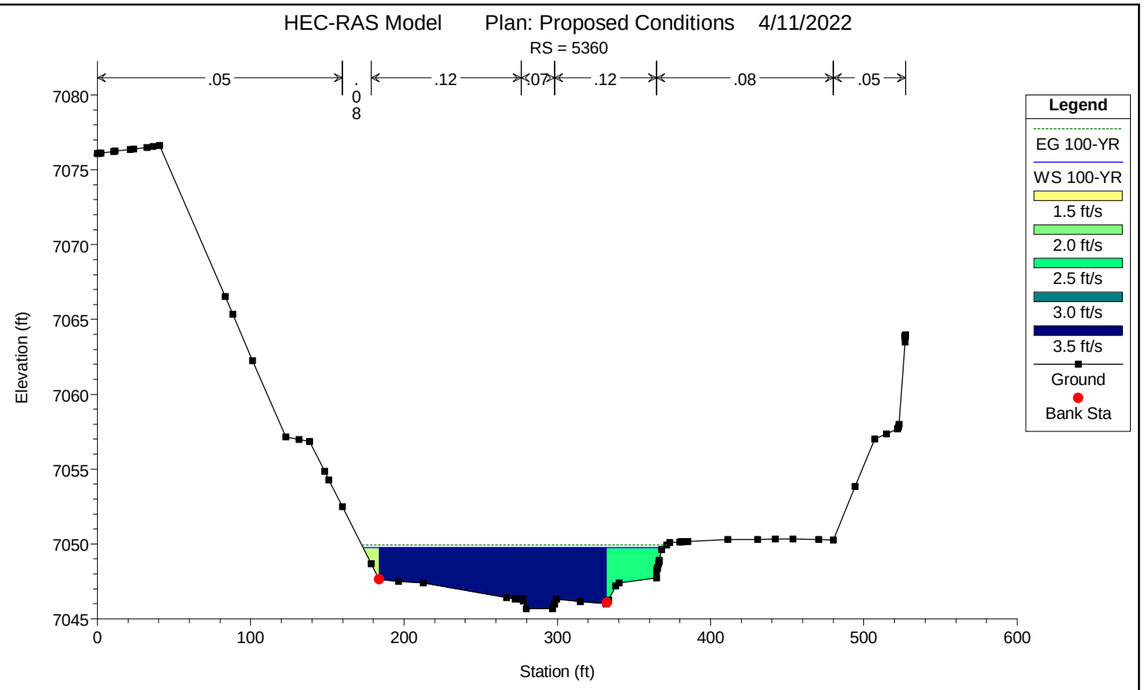

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5711
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta

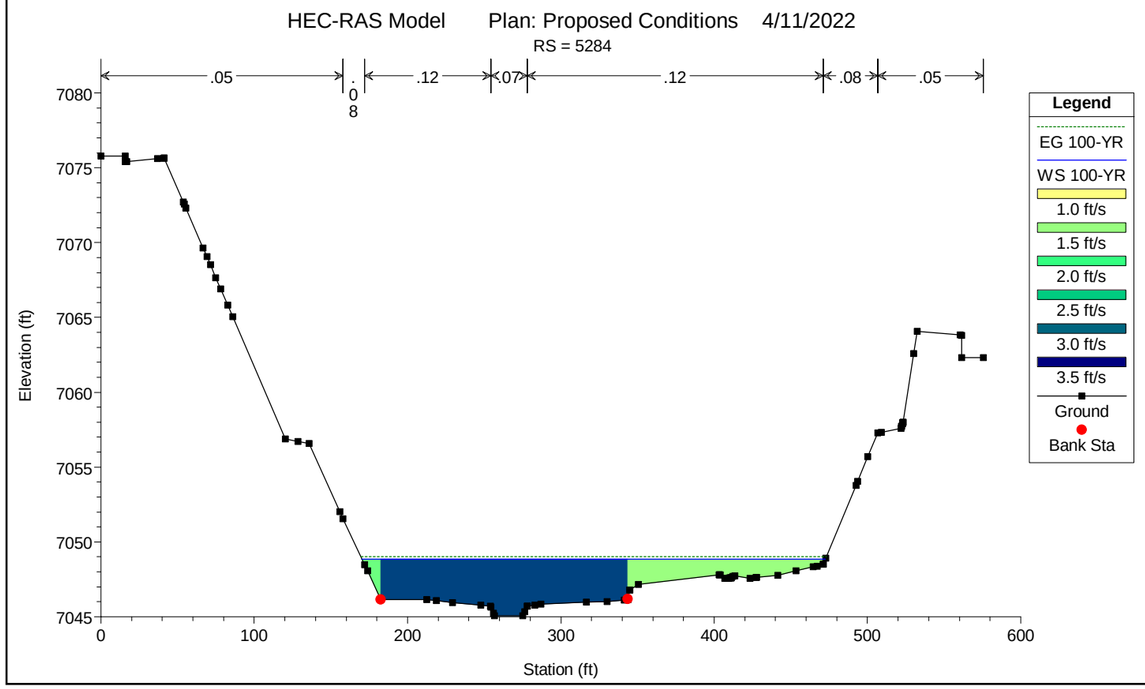

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5647
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Bank Sta

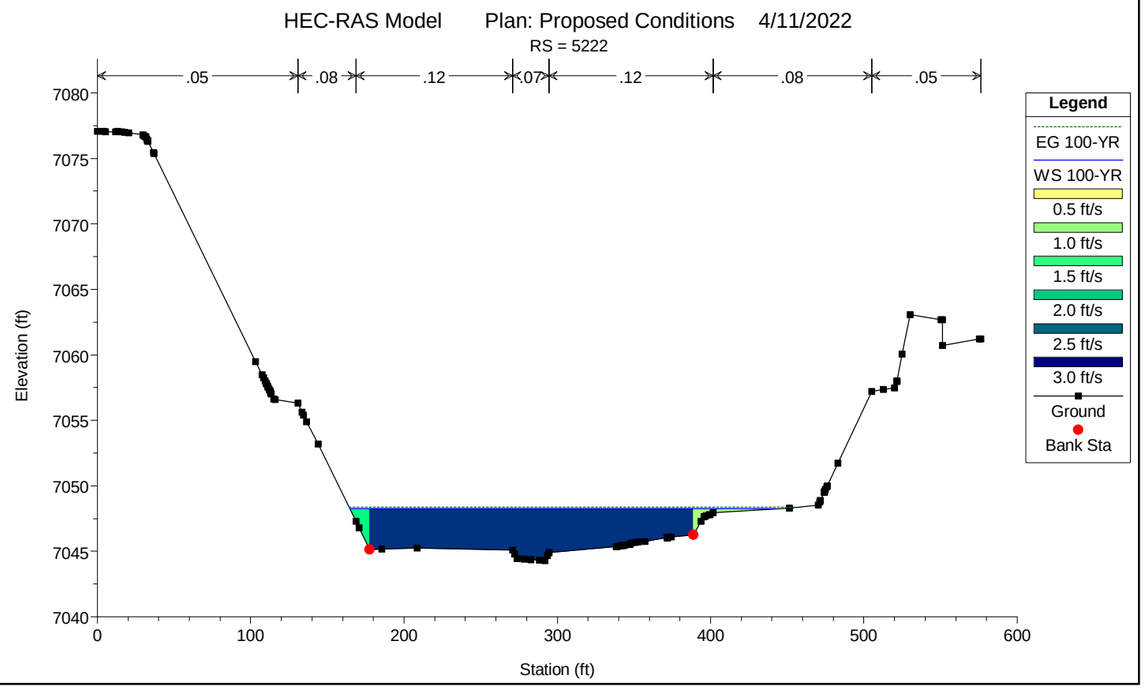

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5574
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

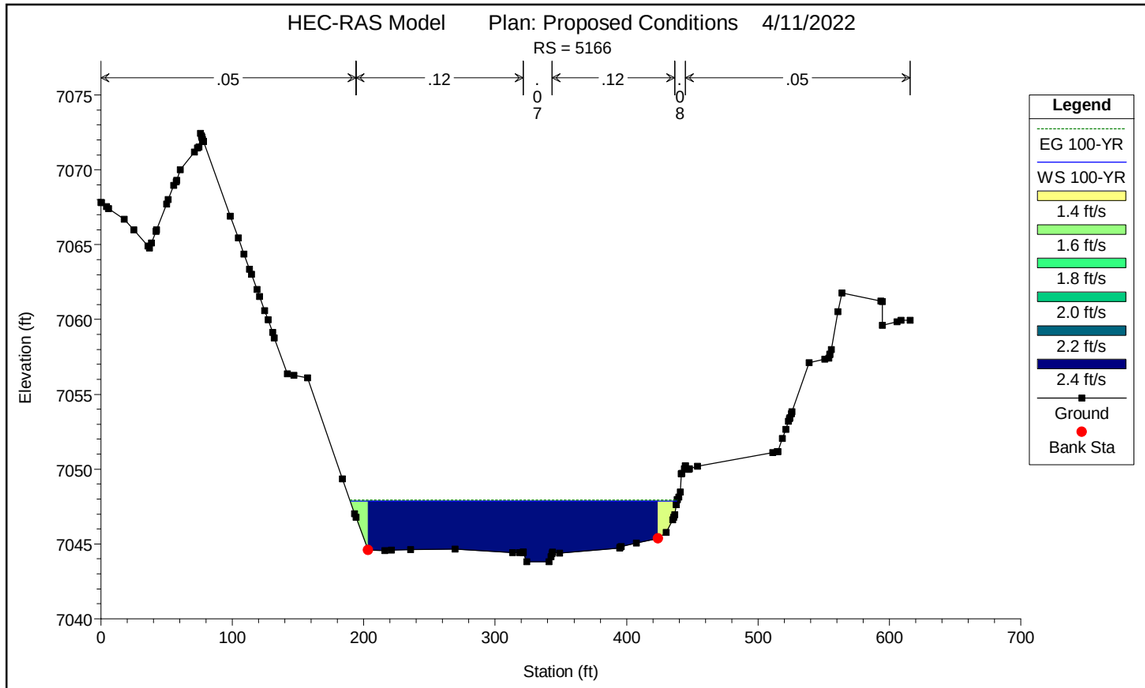

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5488
.05 .08 .12 .07 .12 .08 .05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta

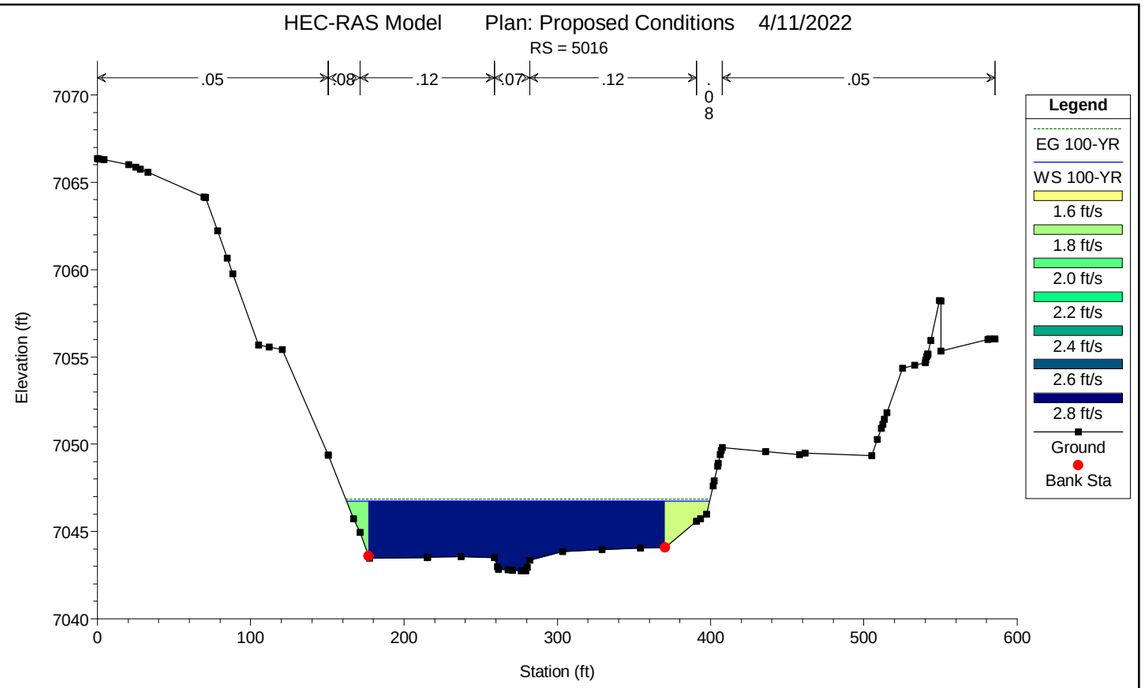

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5424
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

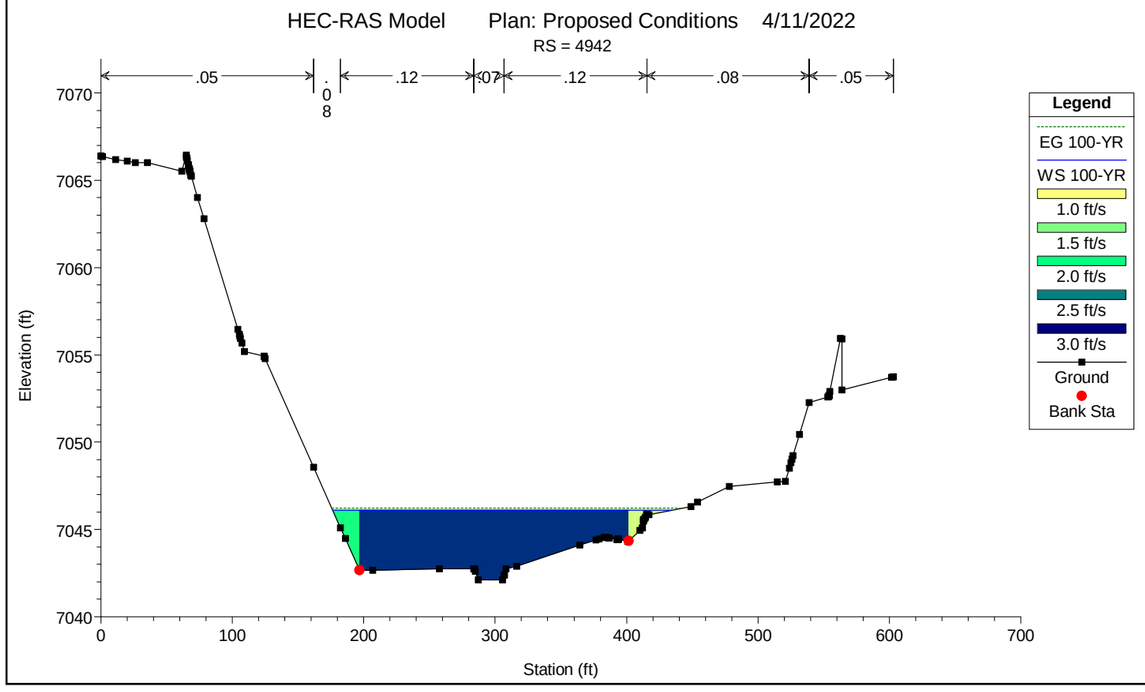

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5360
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

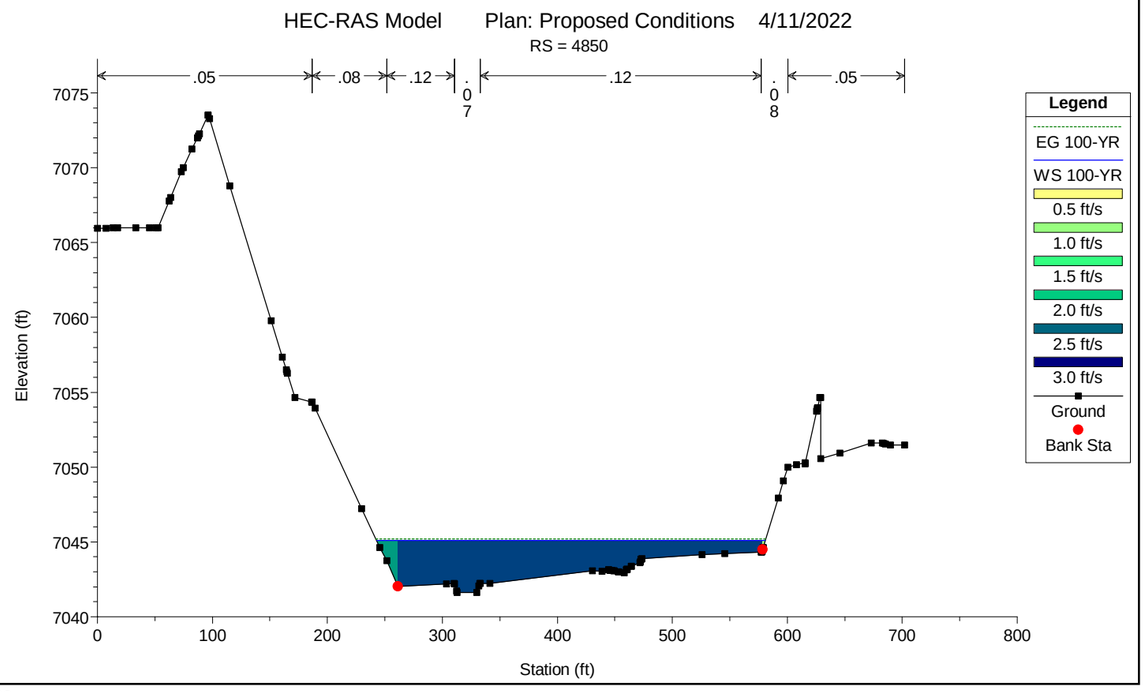

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5284
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

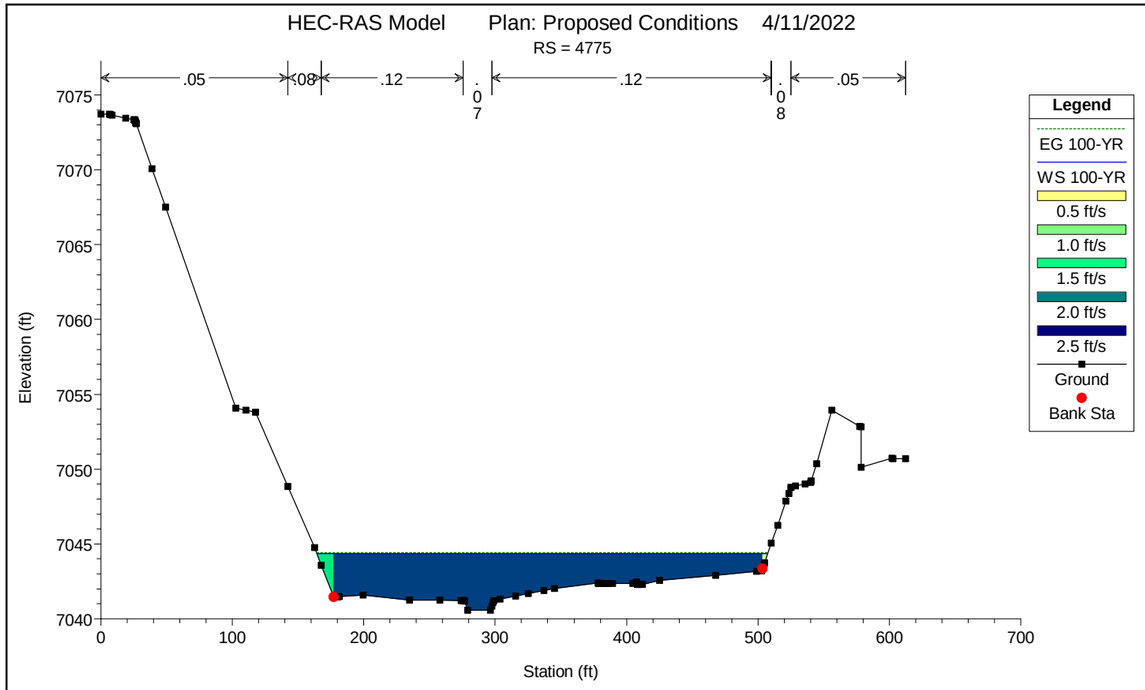

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5222
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

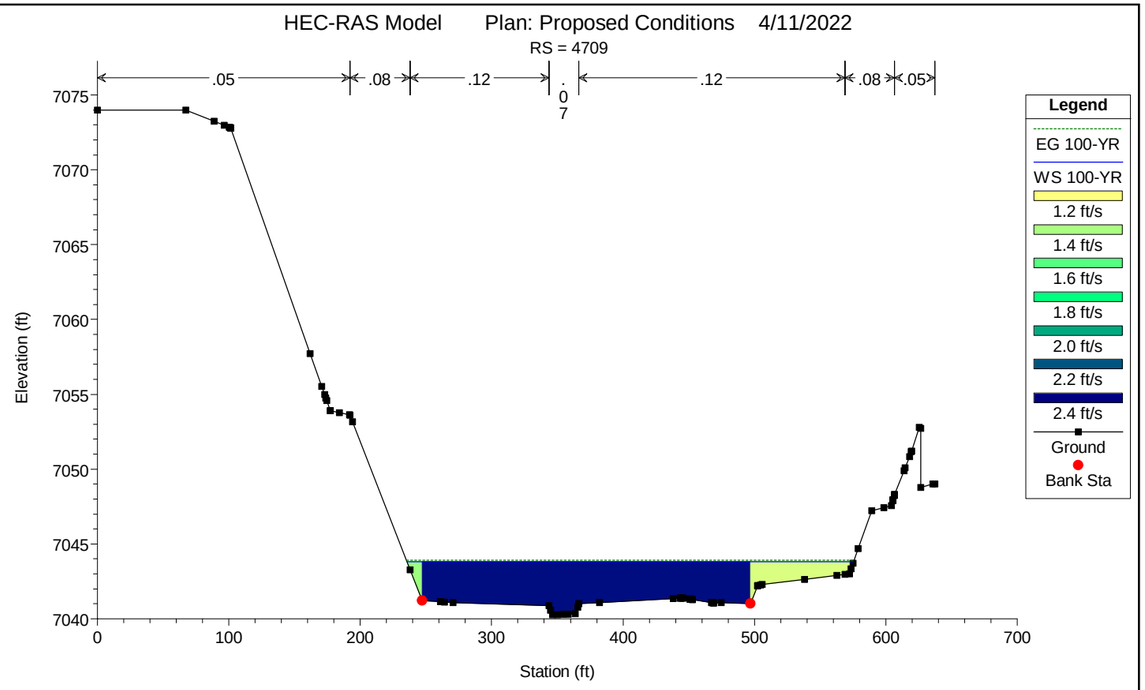

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5166
.05
.12
.12
.05
.07
.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
Ground
Bank Sta

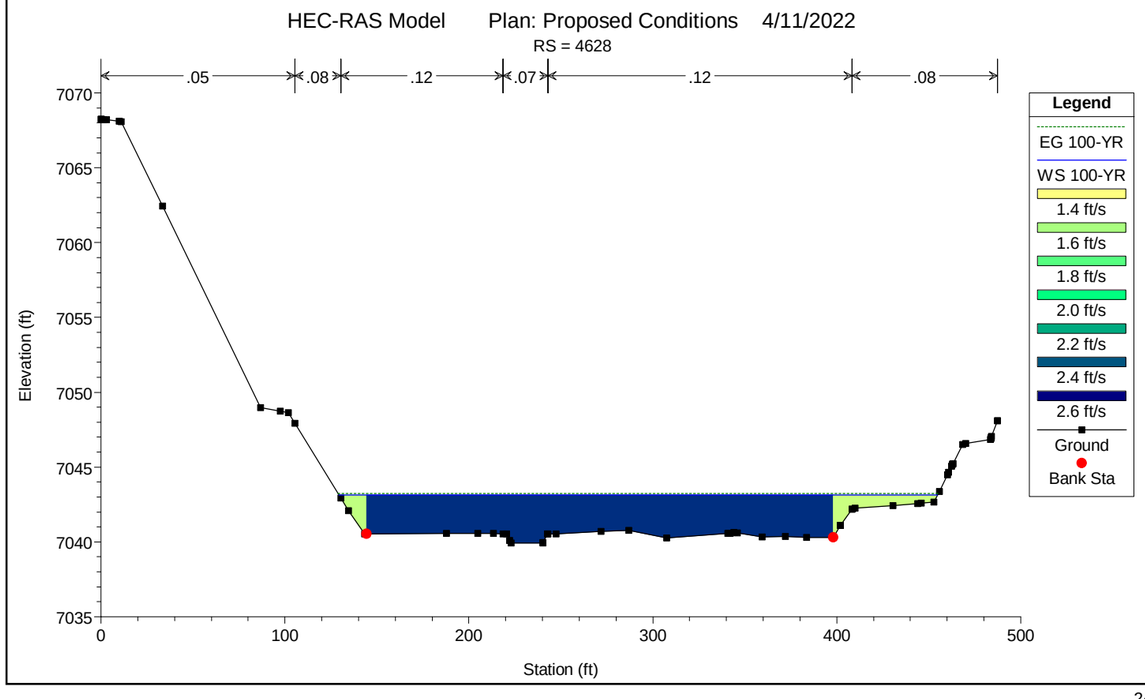

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 5016
.05
.08
.12
.07
.12
.05
.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Bank Sta

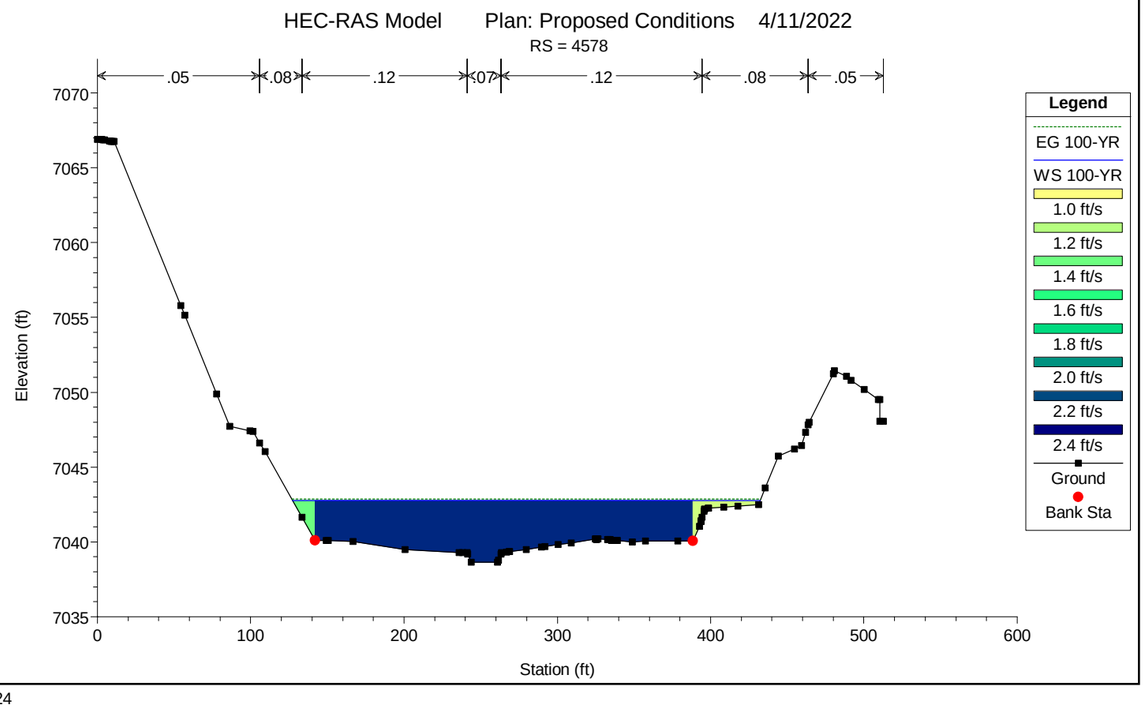

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4942
.05
.12
.12
.08
.05
.08
.07
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

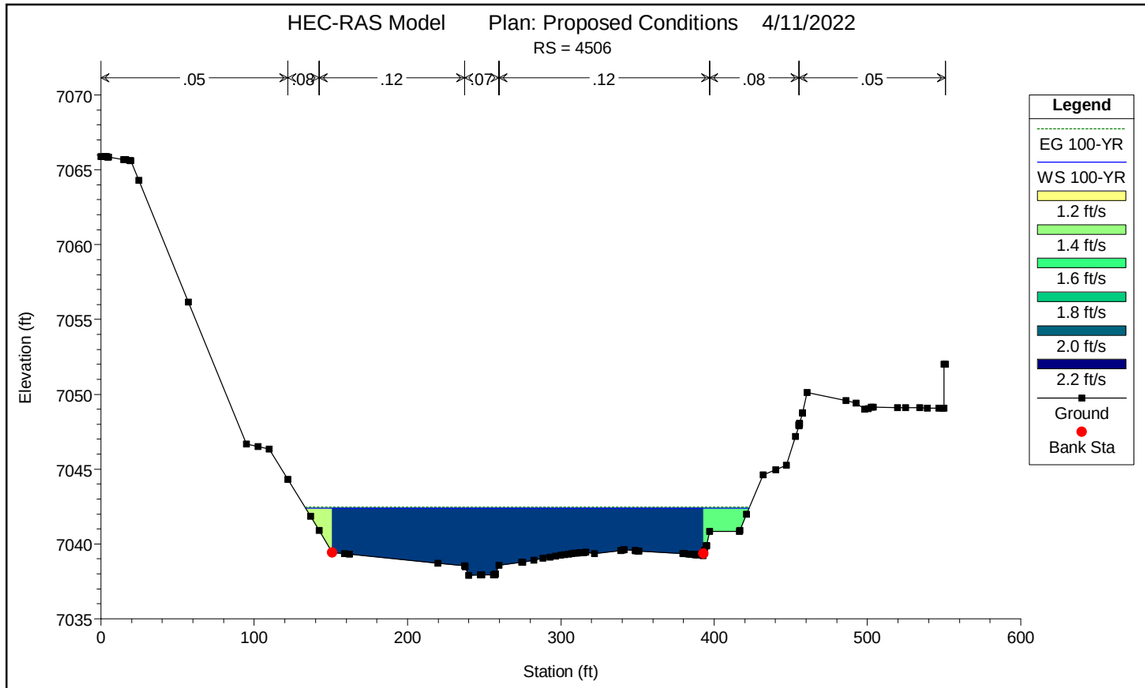

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4850
.05
.08
.12
.12
.05
.07
.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

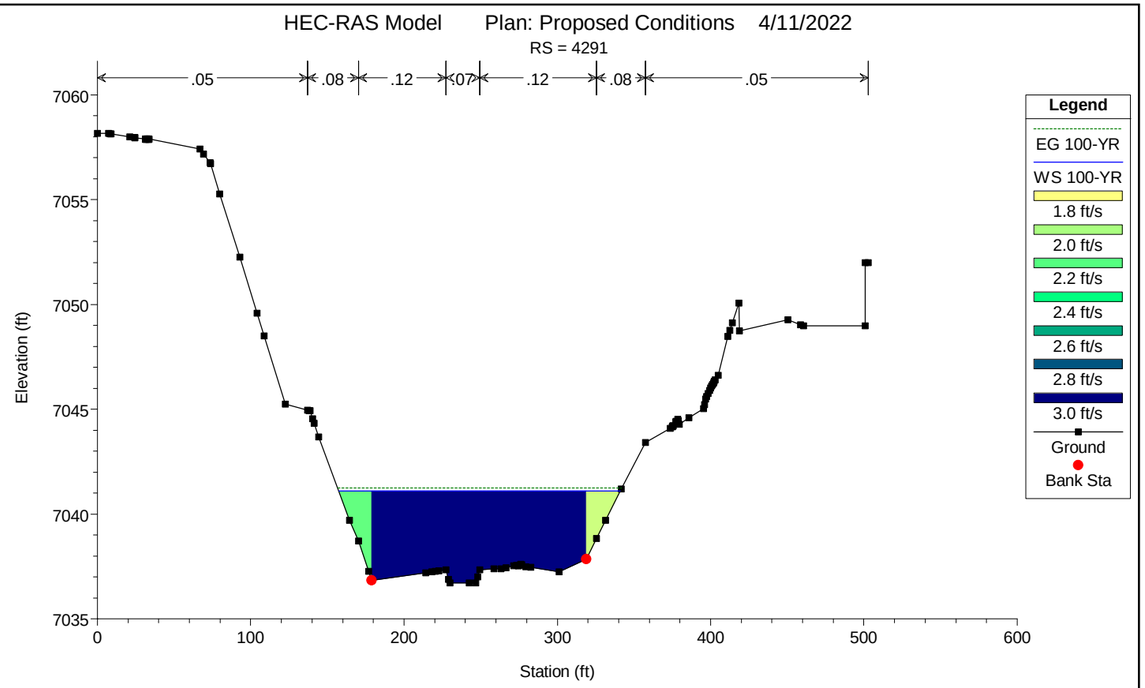

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4775
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

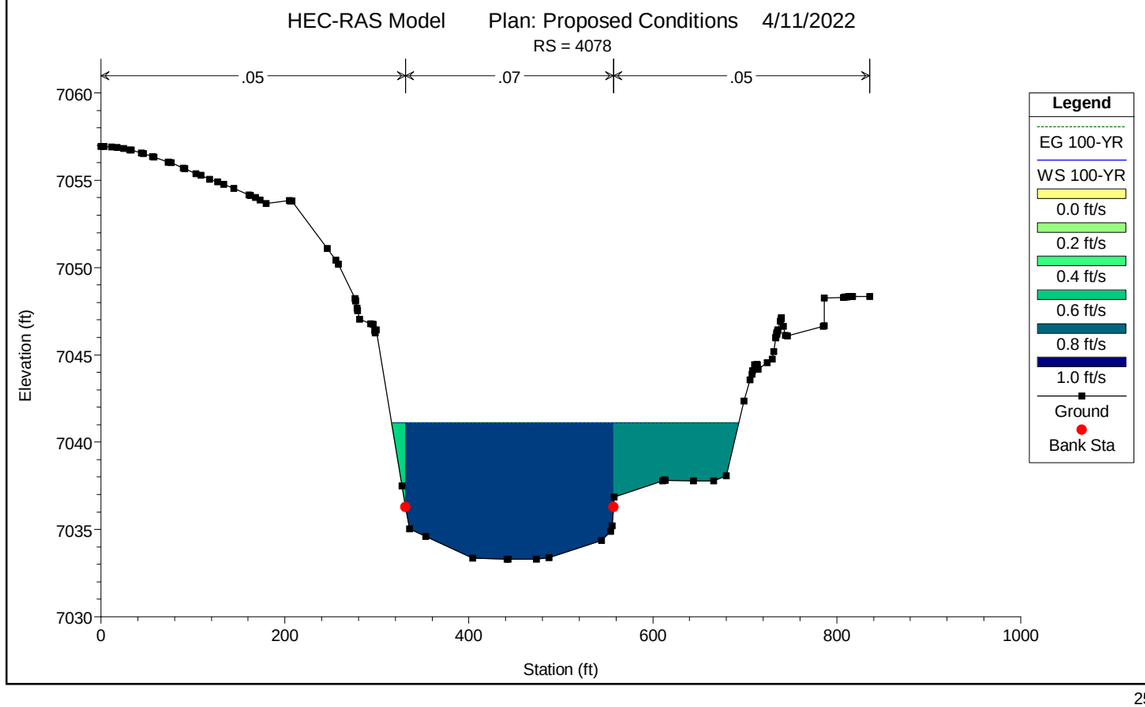

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4709
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
Ground
Bank Sta

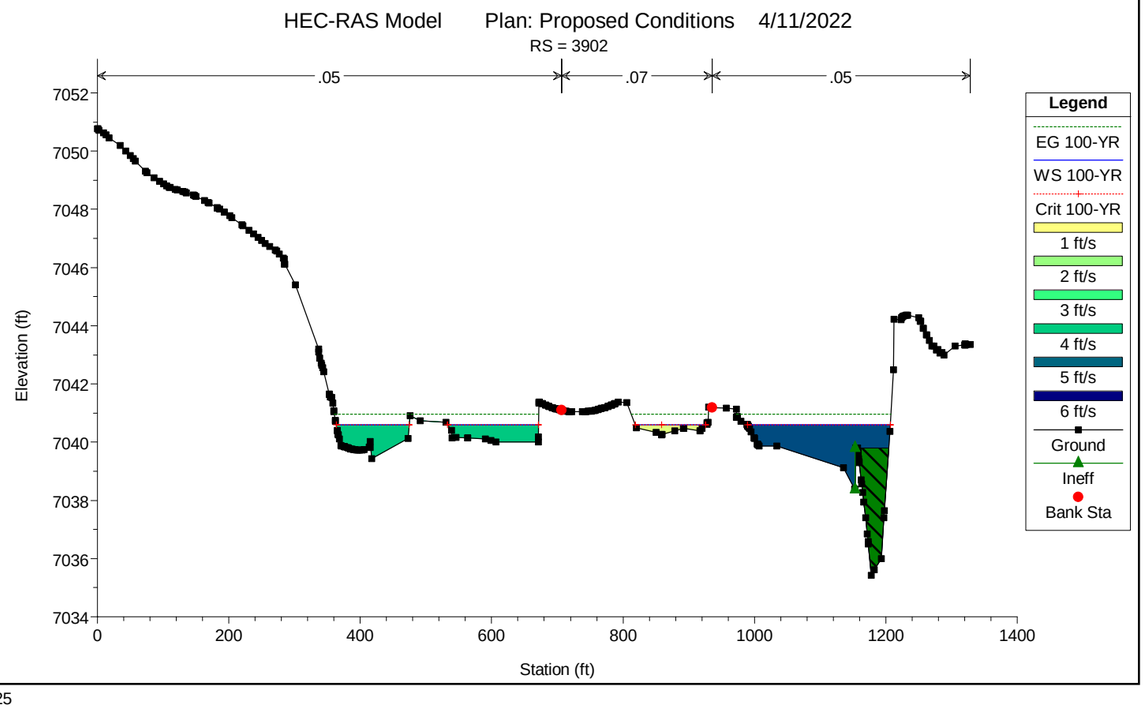

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4628
.05
.08
.12
.07
.12
.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
Ground
Bank Sta

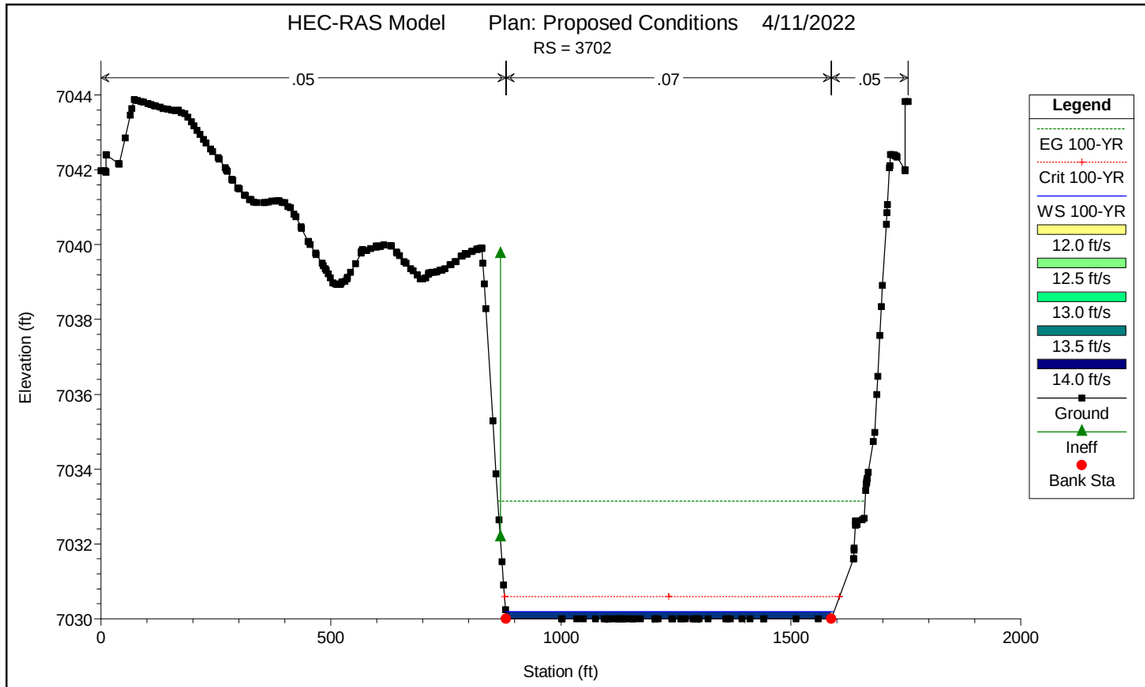

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4578
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
Ground
Bank Sta

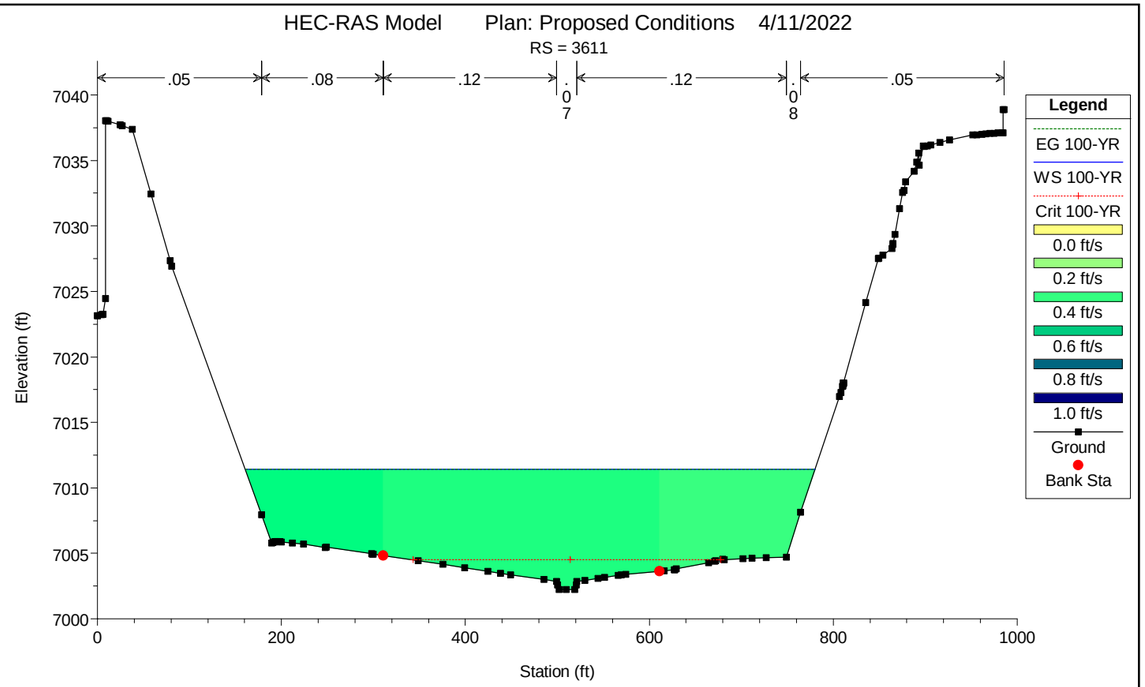

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4506
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
Ground
Bank Sta

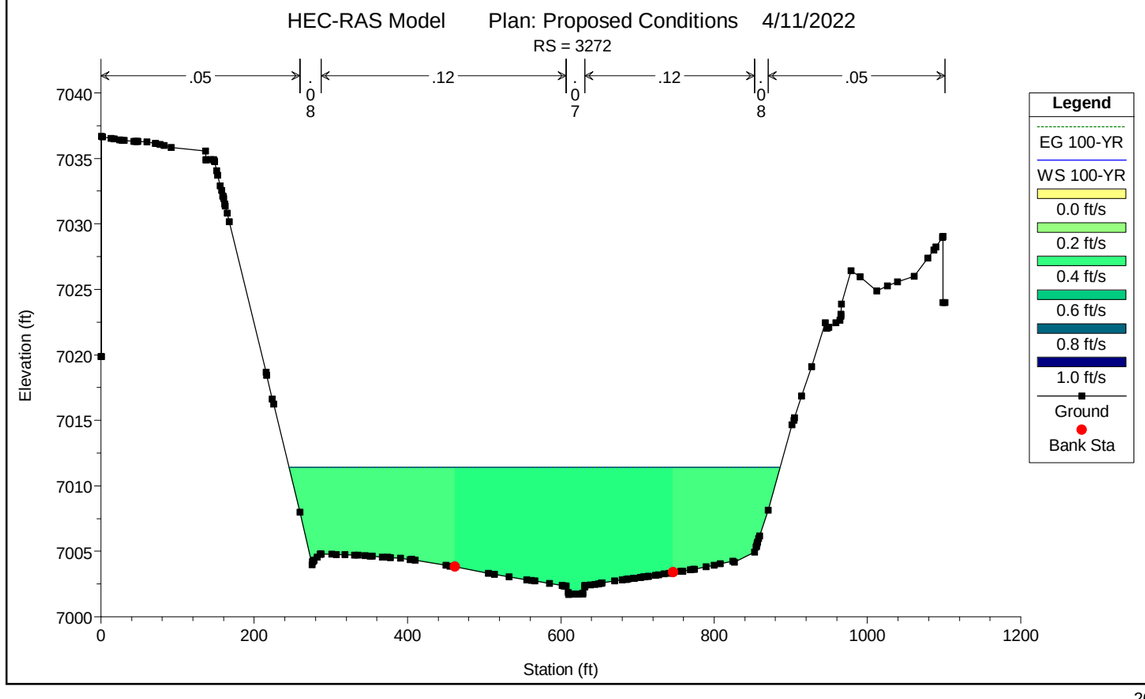

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4291
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta

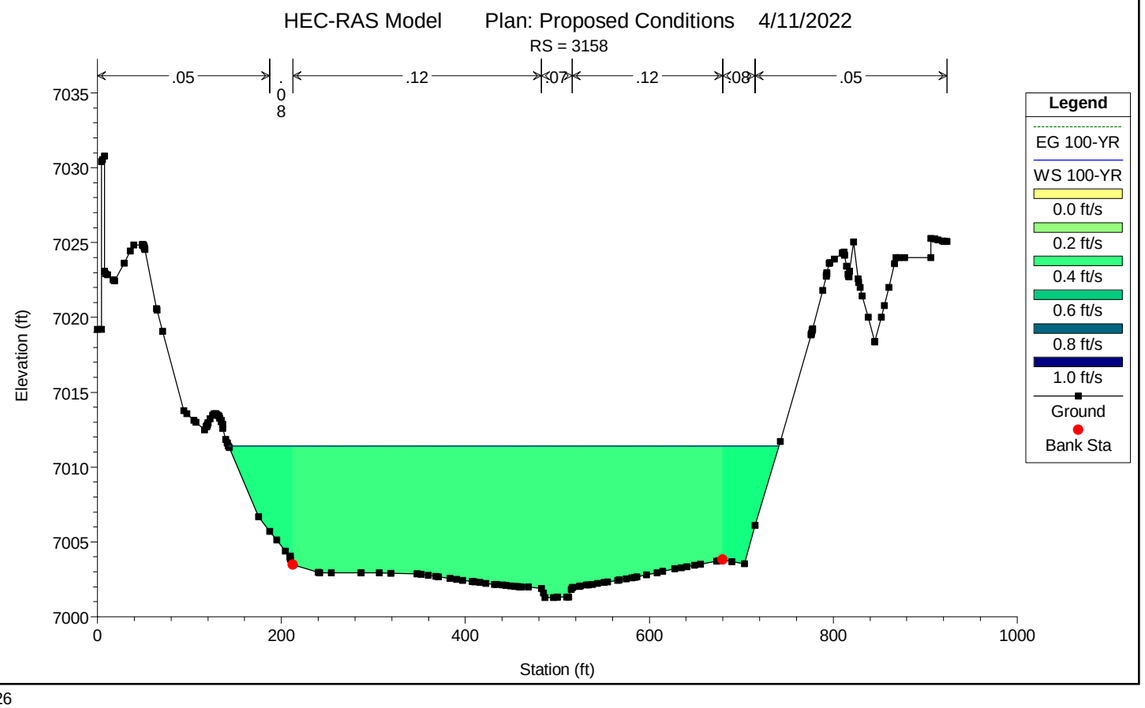

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 4078
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 3902
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 3702
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
Crit 100-YR
WS 100-YR
12.0 ft/s
12.5 ft/s
13.0 ft/s
13.5 ft/s
14.0 ft/s
Ground
Ineff
Bank Sta

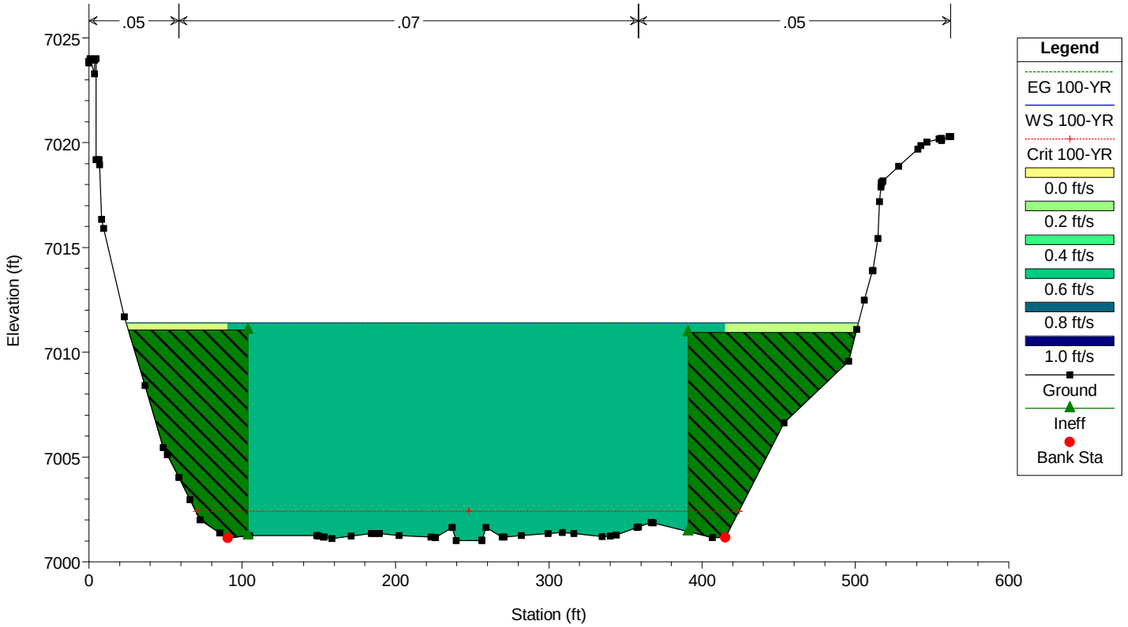

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 3611
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 3272
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 3158
.05
.08
.12
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

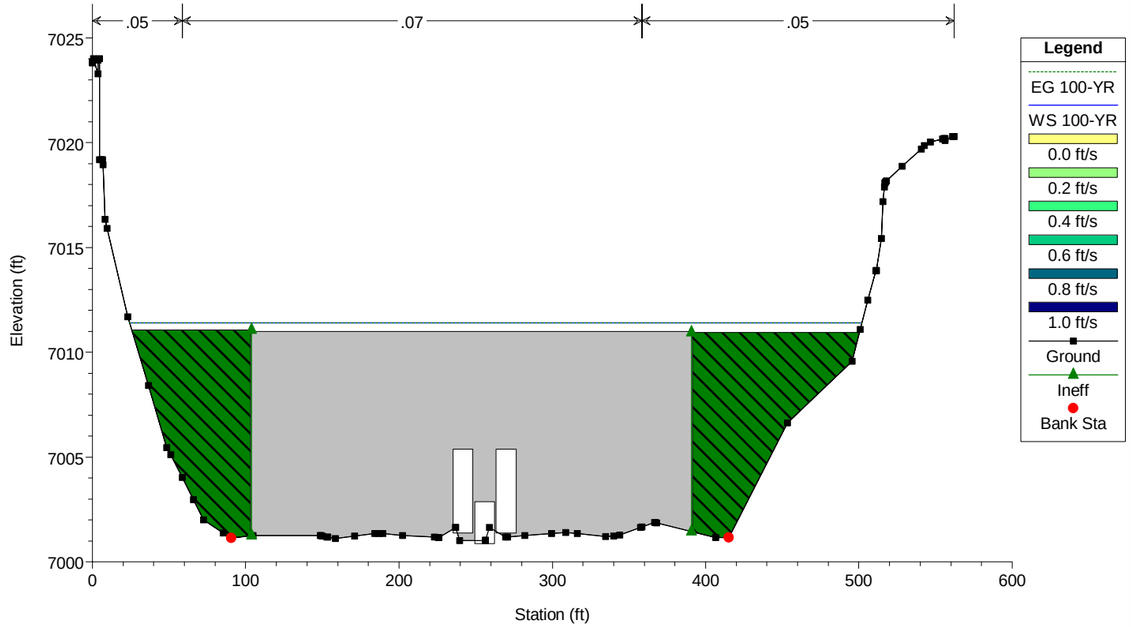
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 3098



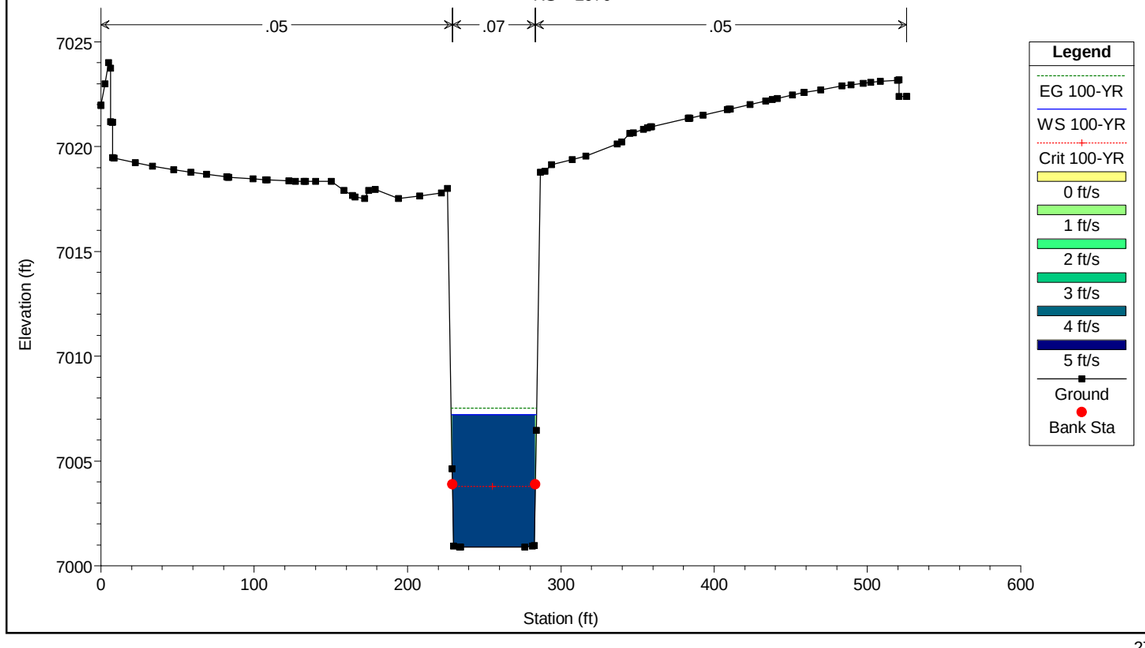
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 3047 IS



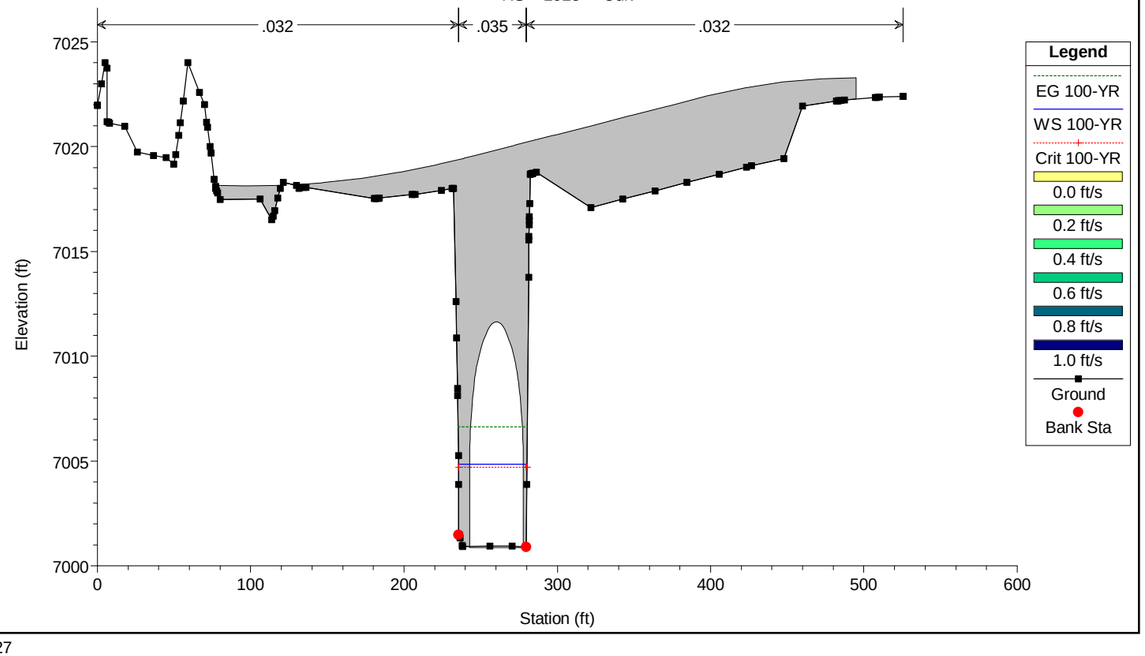
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

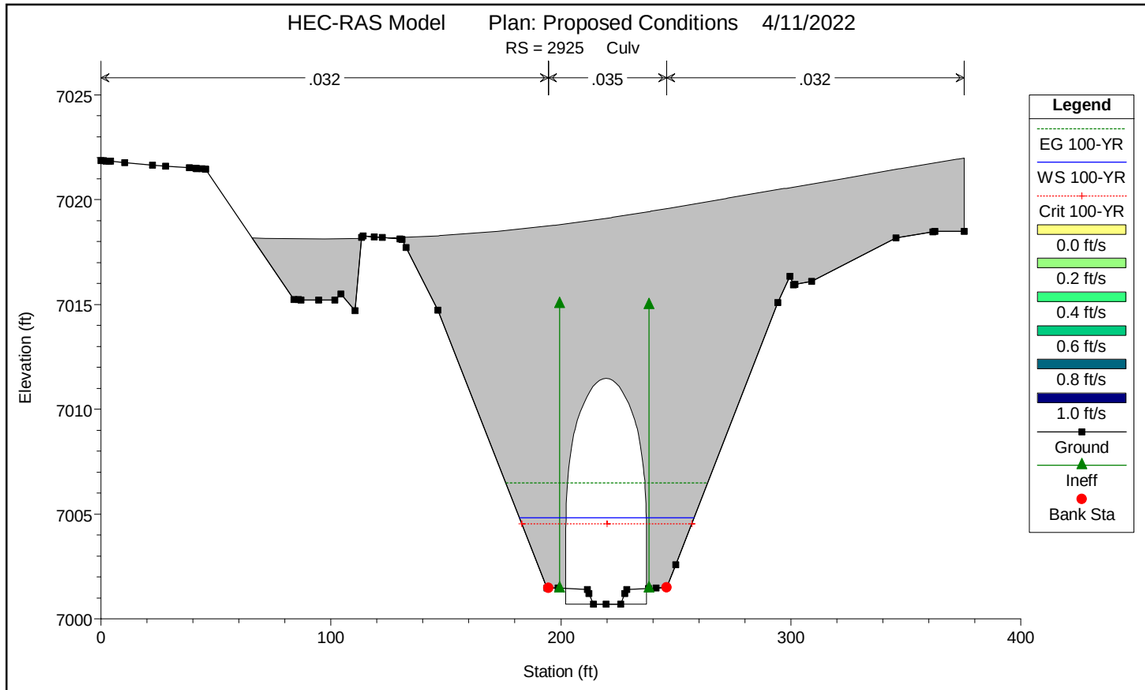
RS = 2970

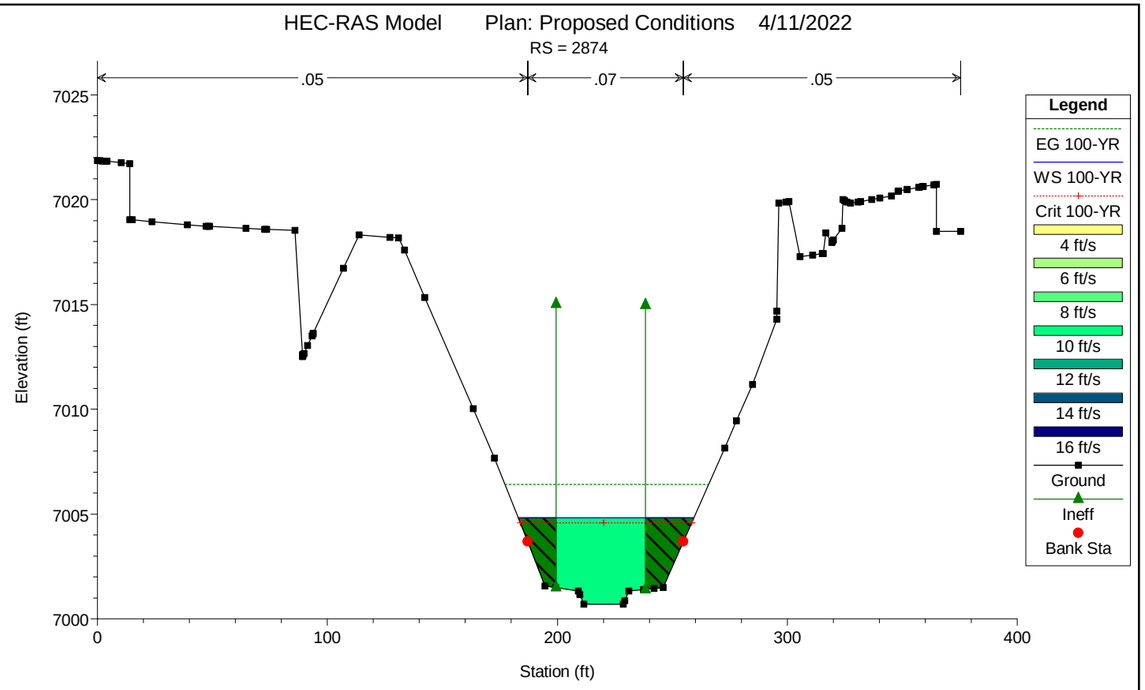


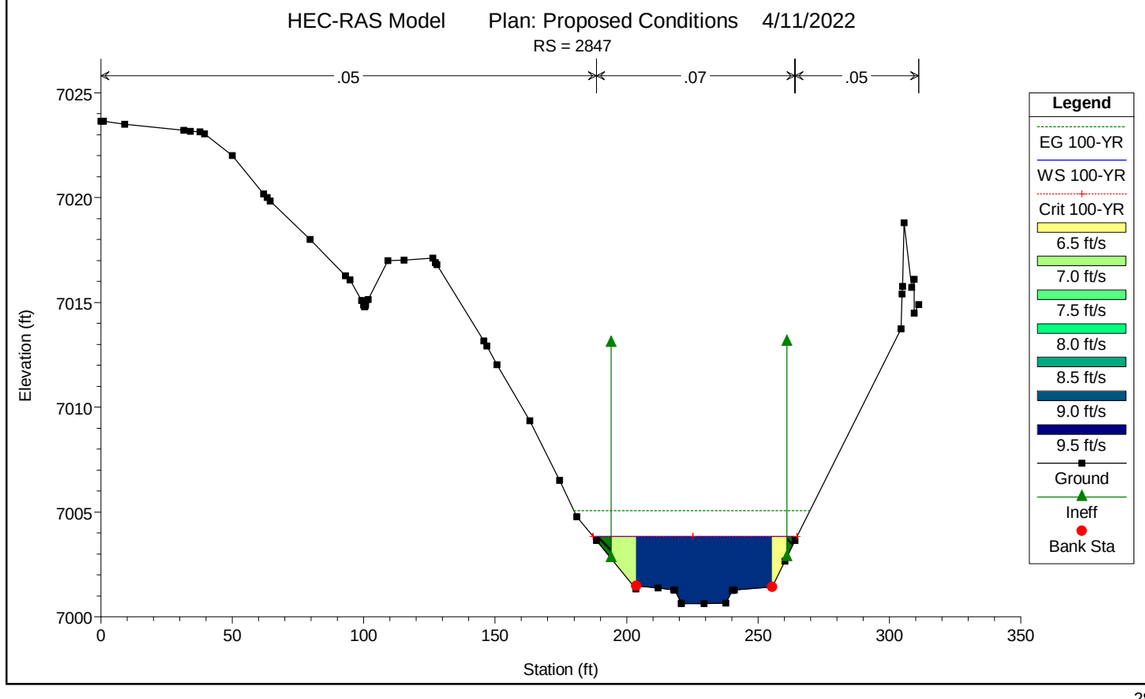
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

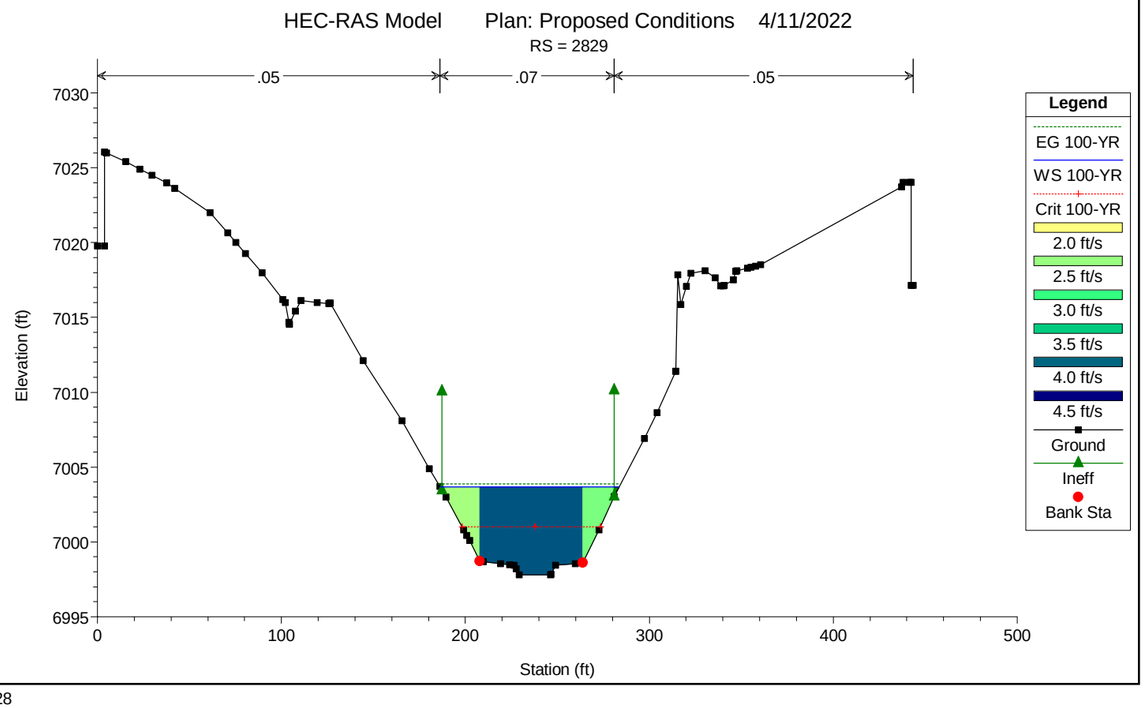
RS = 2925 Culv

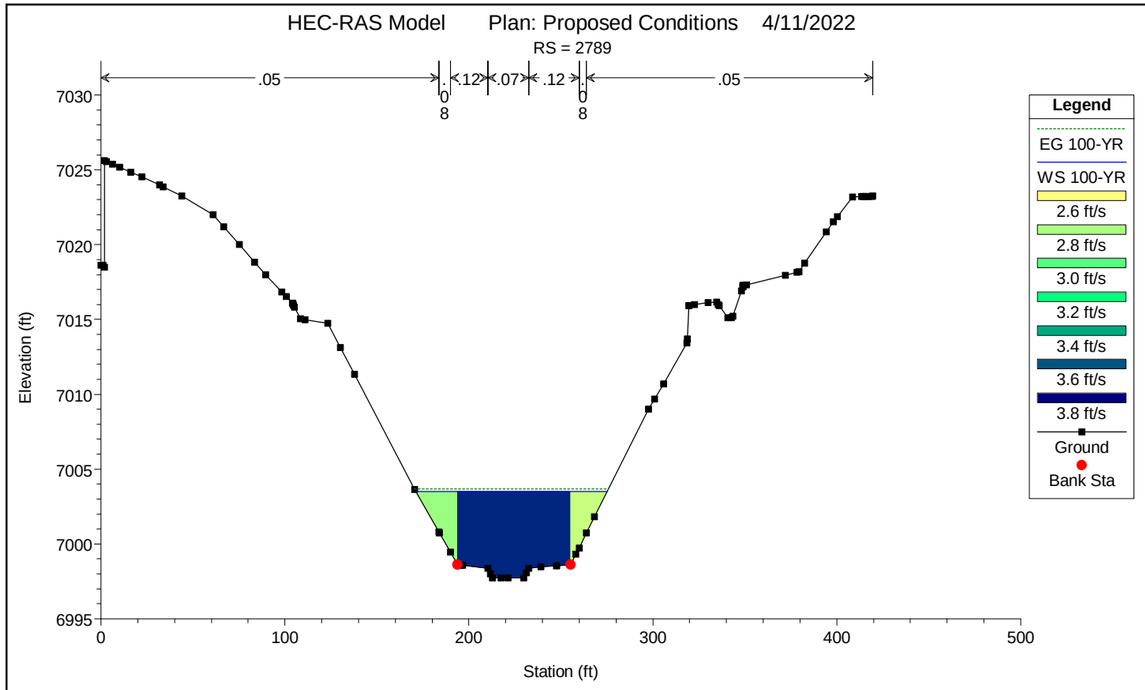


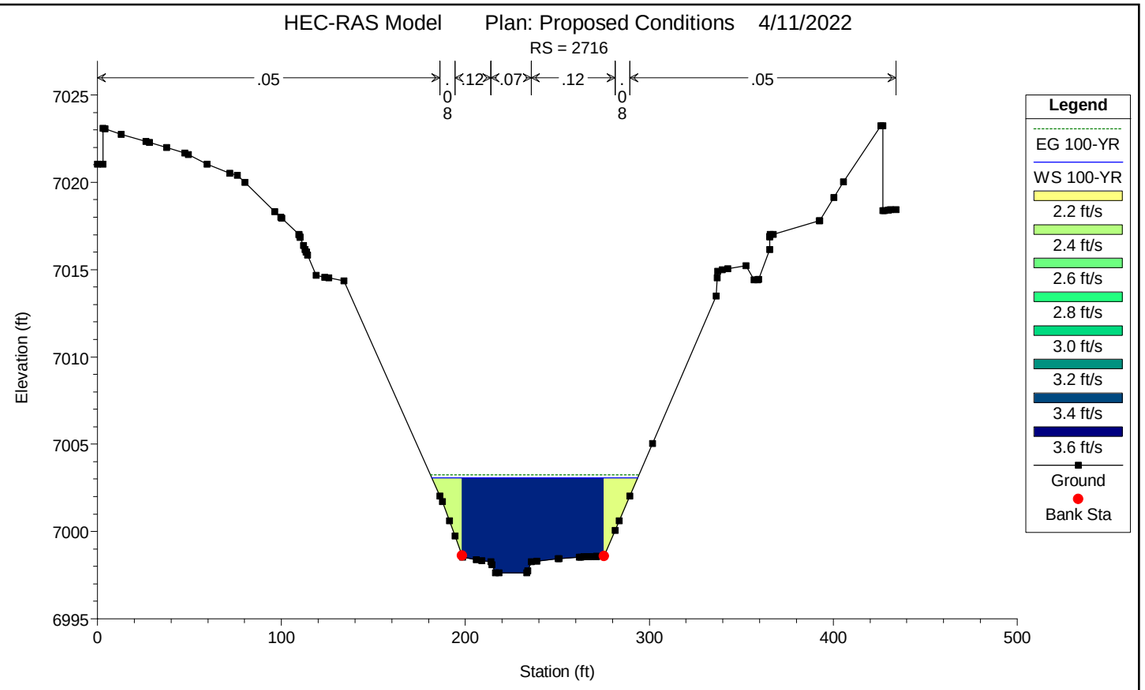

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2925 Culv
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta

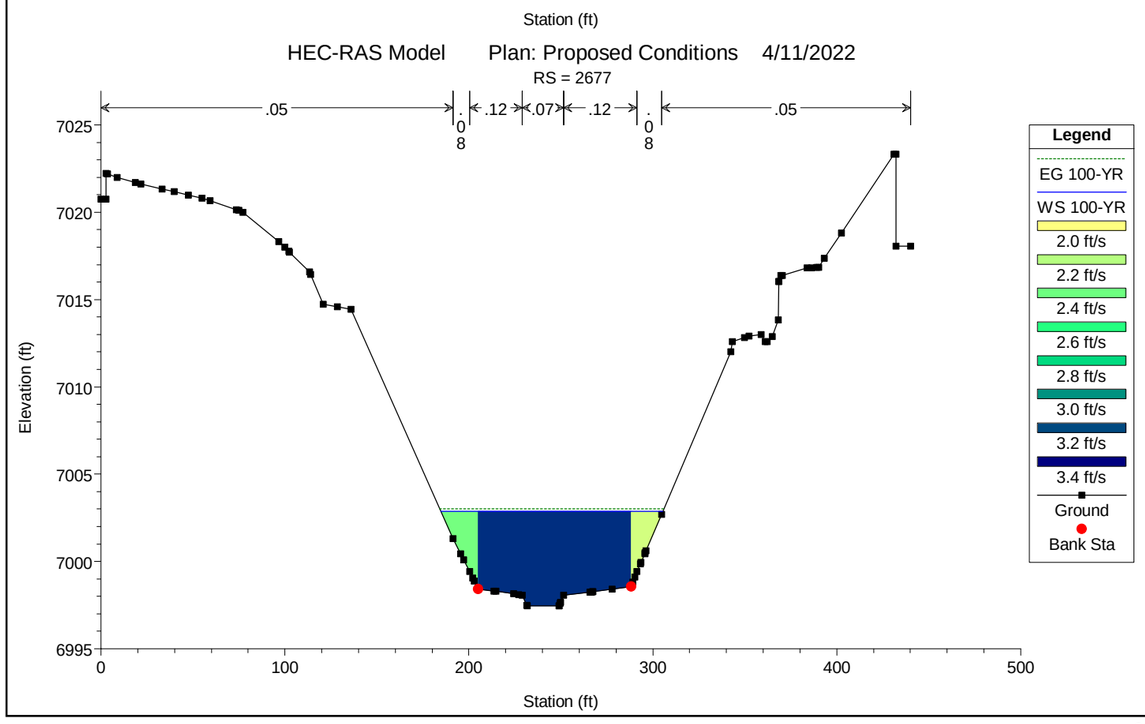

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2874
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
16 ft/s
Ground
Ineff
Bank Sta

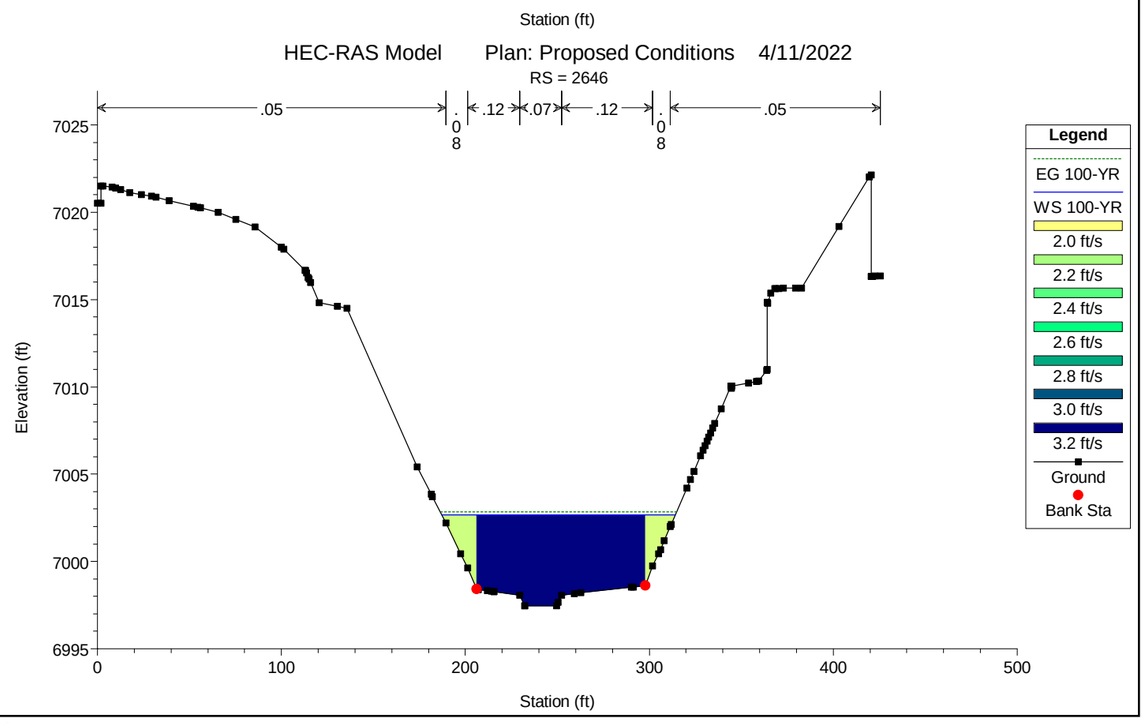

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2847
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
6.5 ft/s
7.0 ft/s
7.5 ft/s
8.0 ft/s
8.5 ft/s
9.0 ft/s
9.5 ft/s
Ground
Ineff
Bank Sta

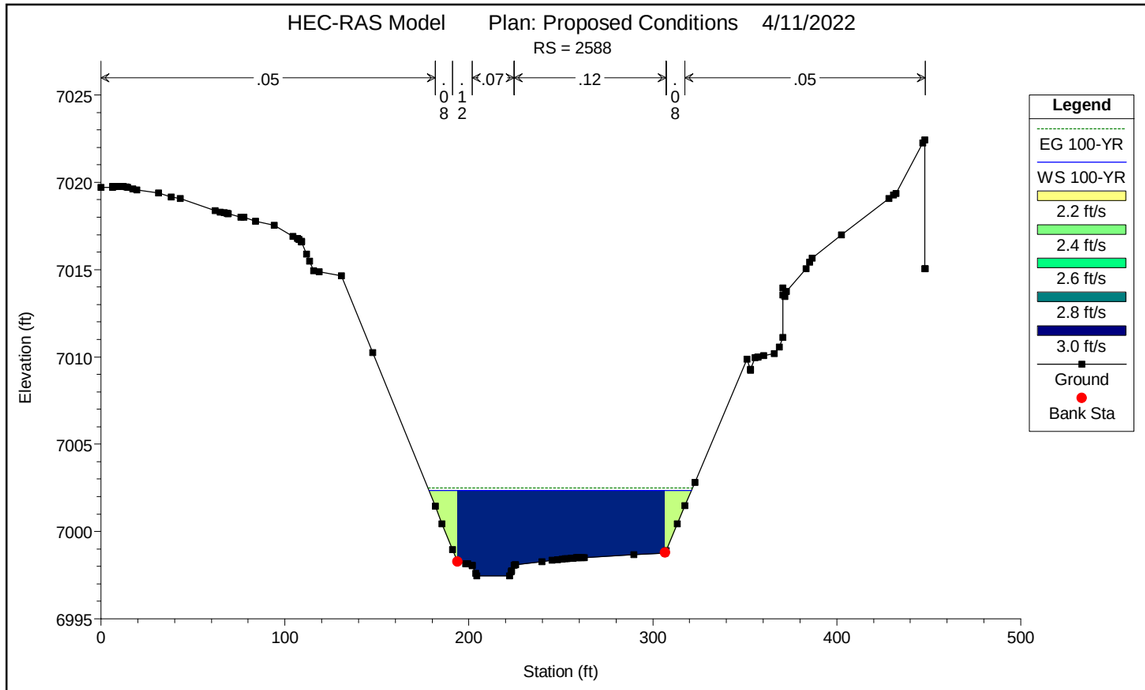

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2829
.05
.07
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Ineff
Bank Sta

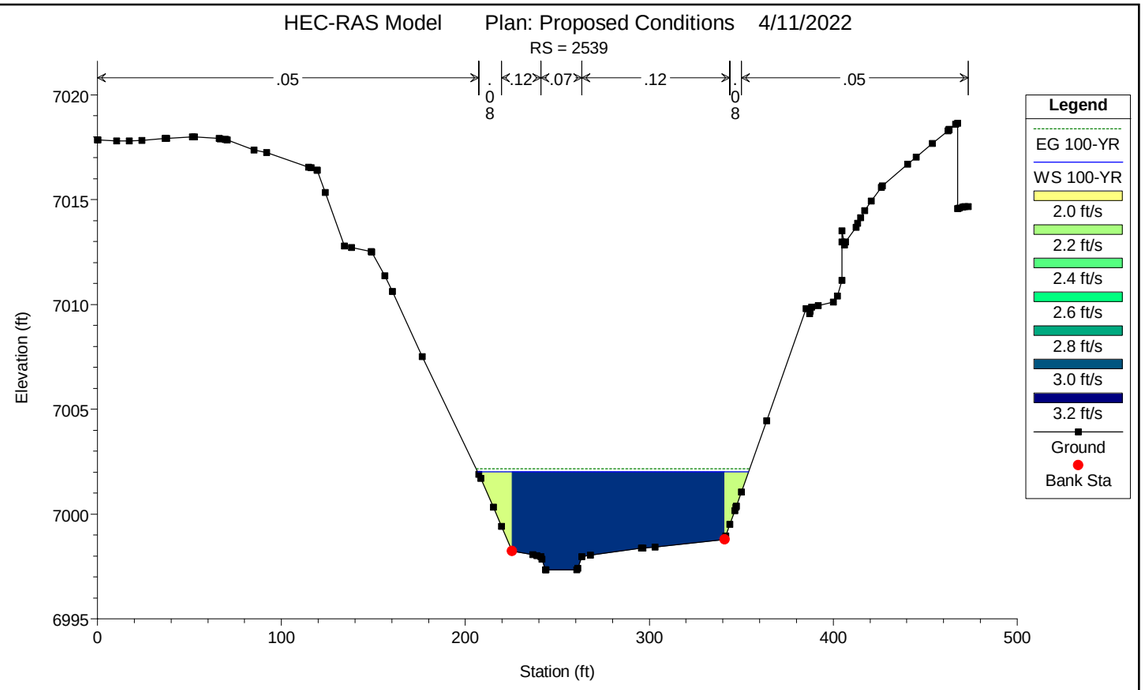

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2789
.05
.12
.07
.12
.05
0.08
0.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
3.6 ft/s
3.8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2716
.05
.12
.07
.12
.05
0.08
0.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
3.6 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2677
.05
.12
.07
.12
.05
0.08
0.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
3.4 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2646
.05
.12
.07
.12
.05
0.08
0.08
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2588
.05
.08
.12
.07
.12
.08
.05
Legend
EG 100-YR
WS 100-YR
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2539
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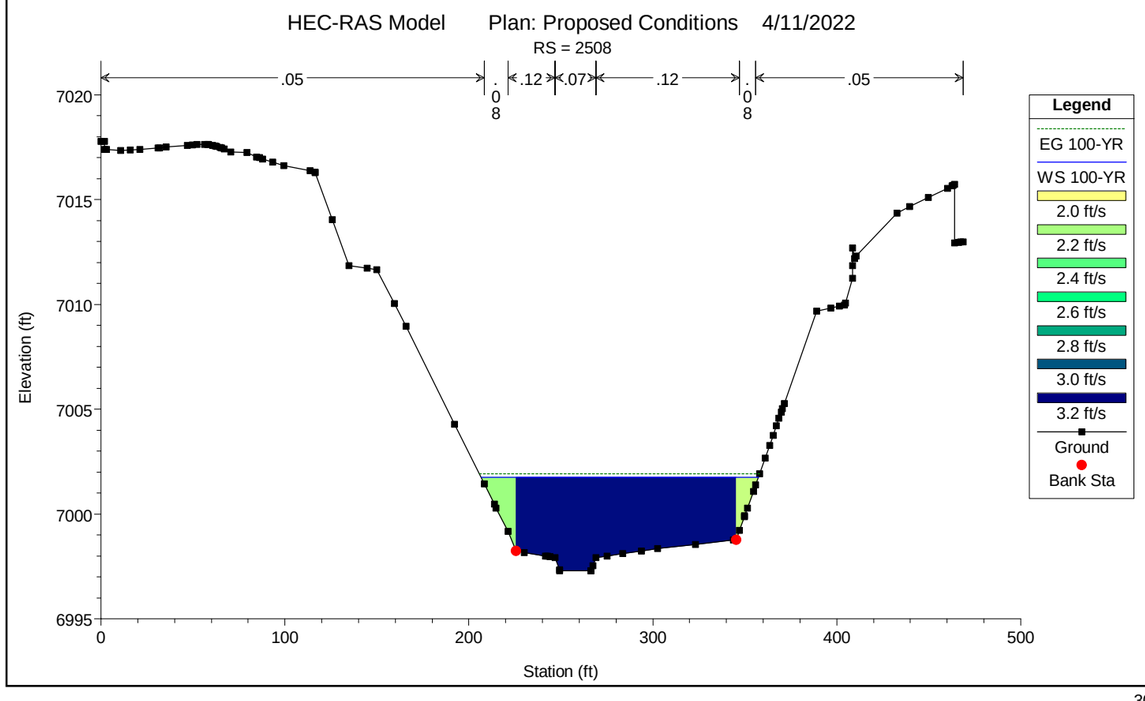
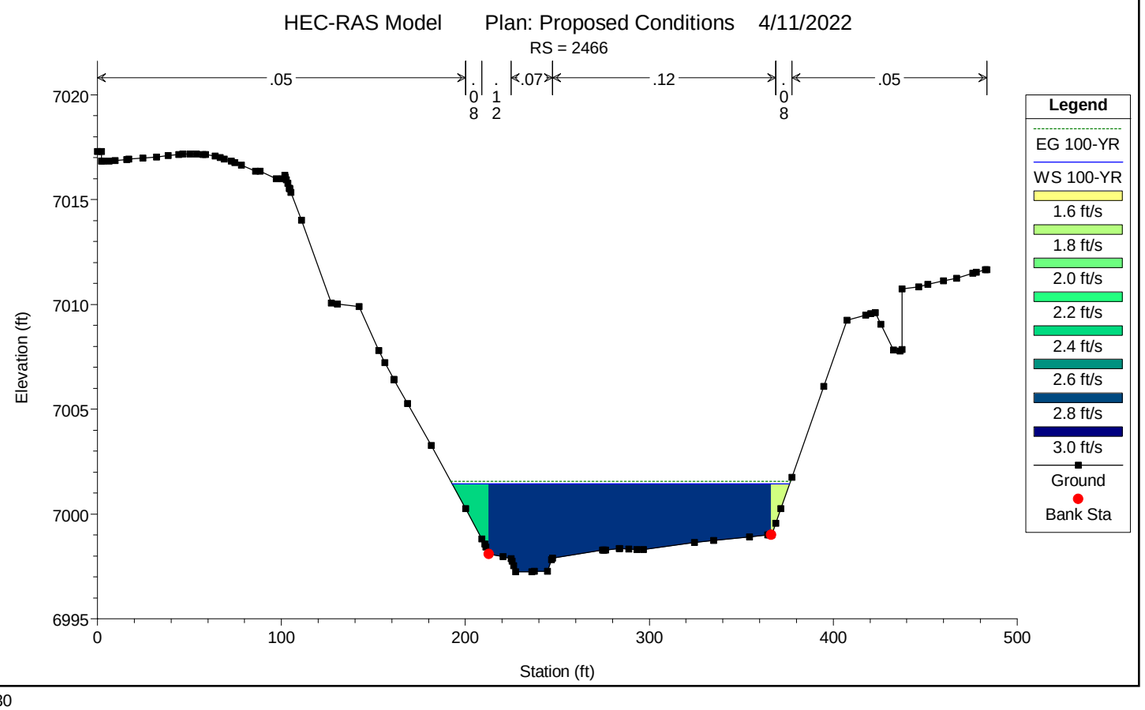
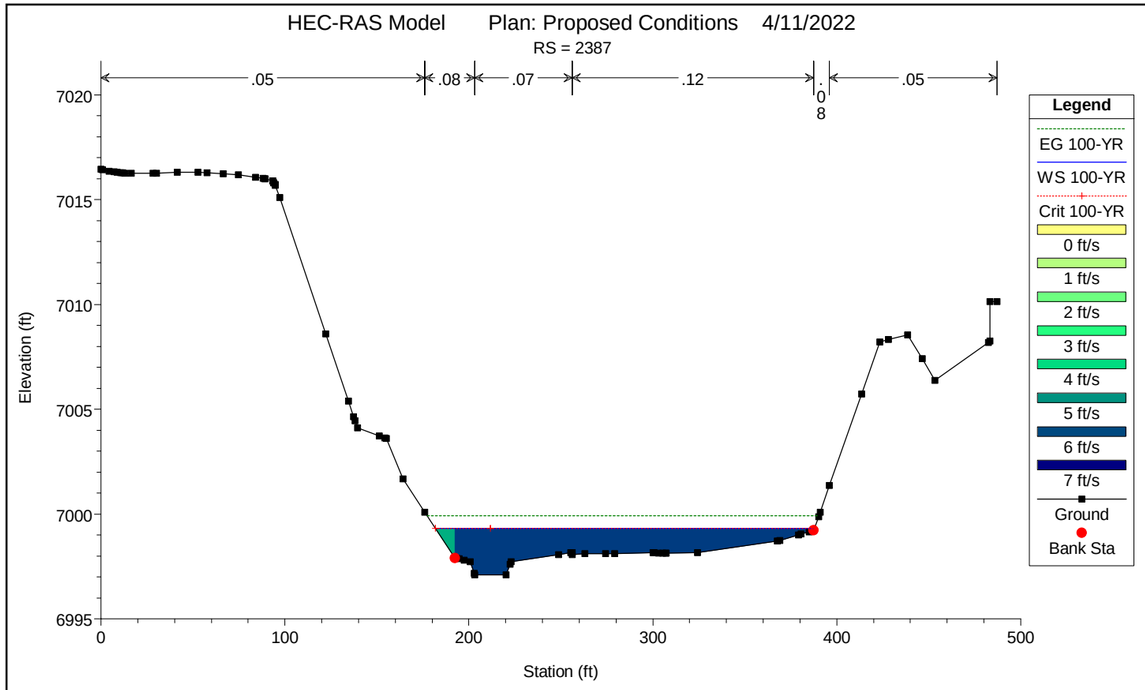
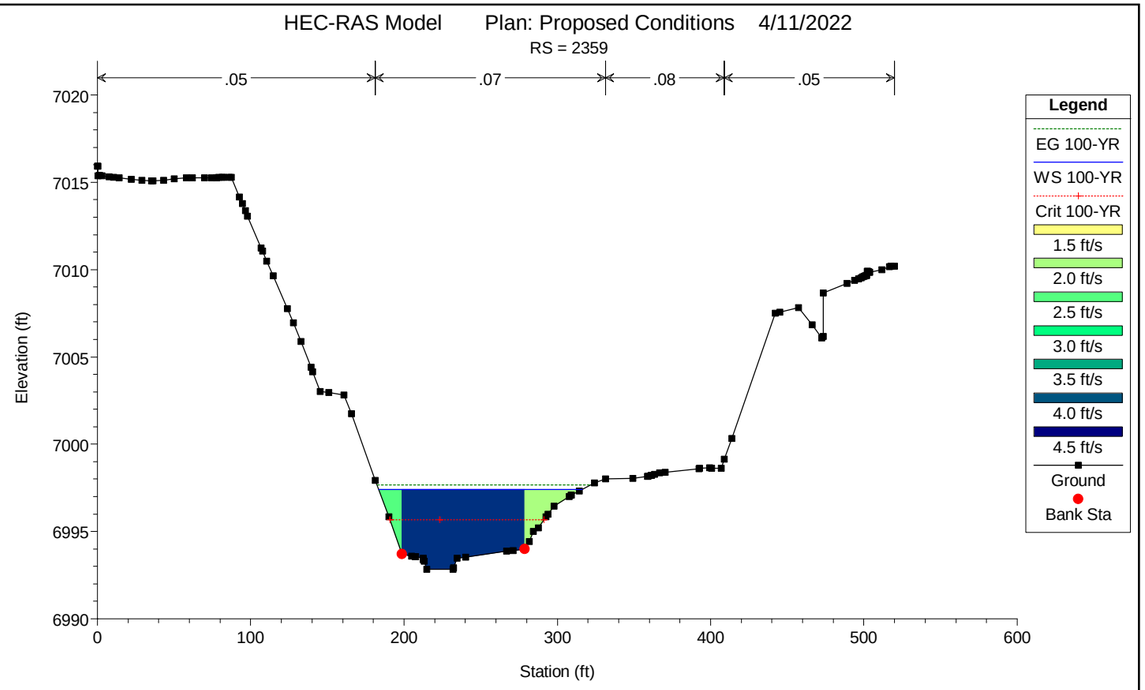
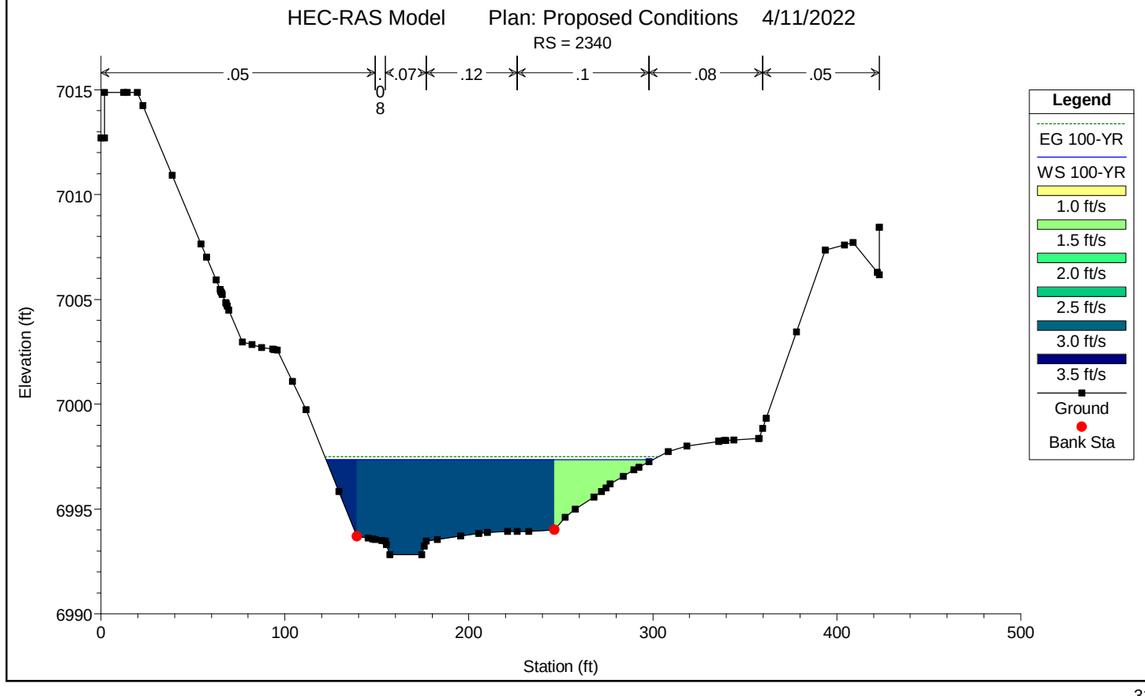
.08
.12
.07
.12
.08
.05
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

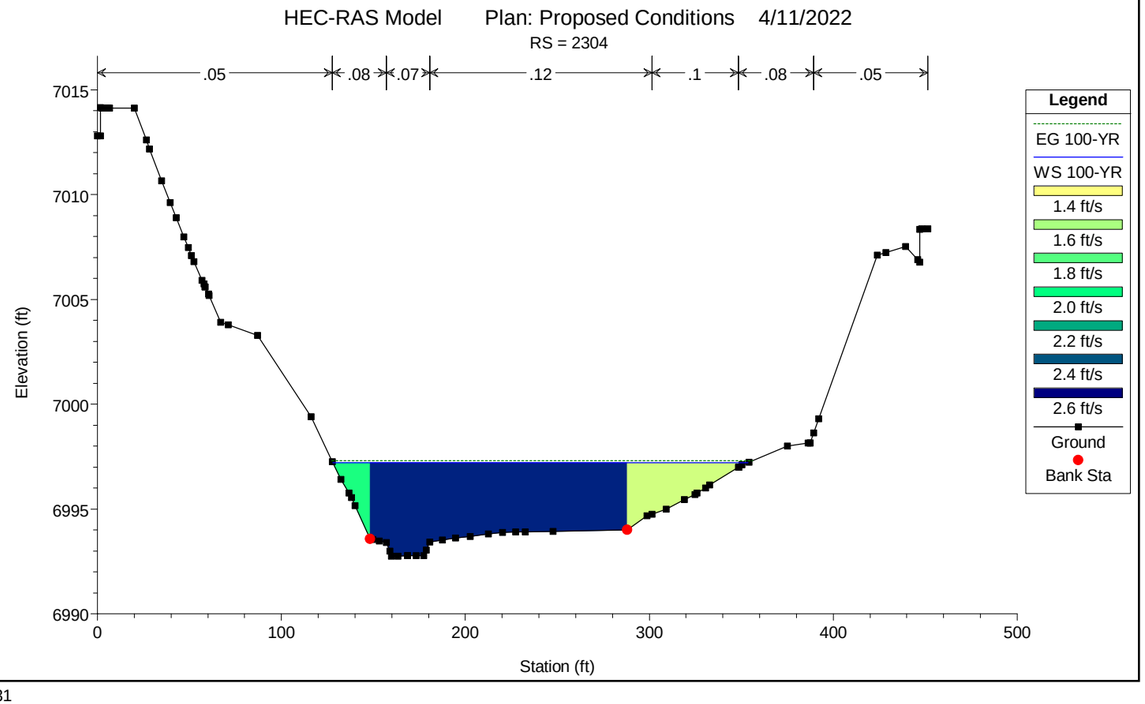

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2508
.05
.08
.12
.07
.12
.08
.05
Legend
EG 100-YR
WS 100-YR
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

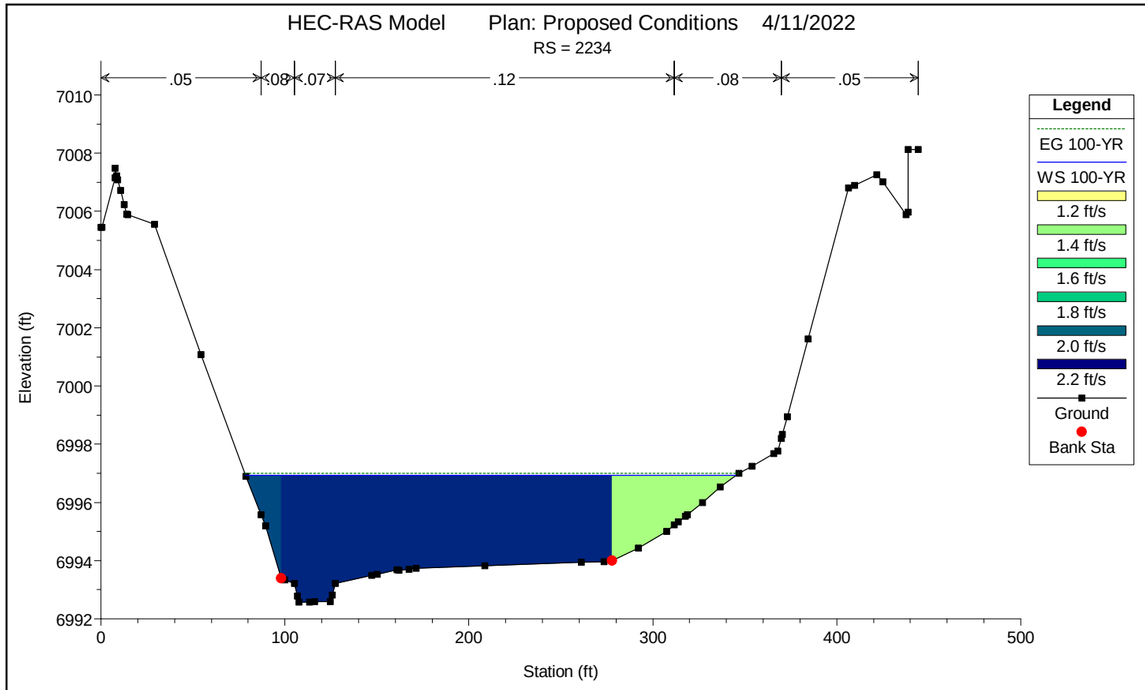

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2466
.05
.08
.12
.07
.12
.08
.05
Legend
EG 100-YR
WS 100-YR
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

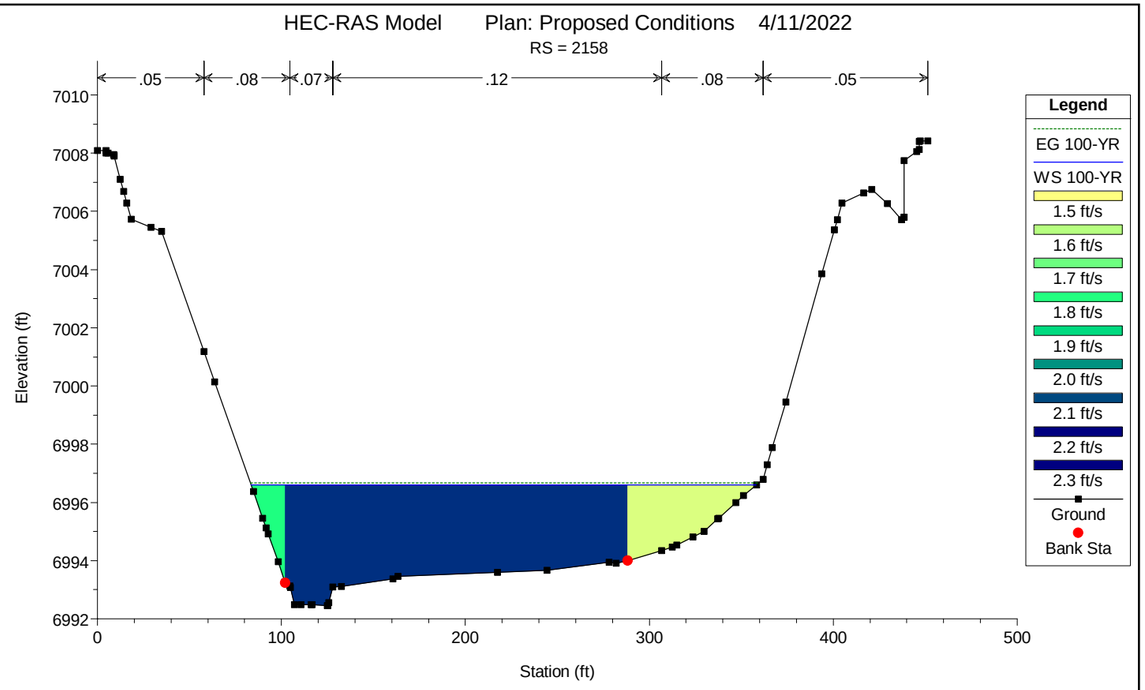

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2387
.05
.08
.07
.12
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

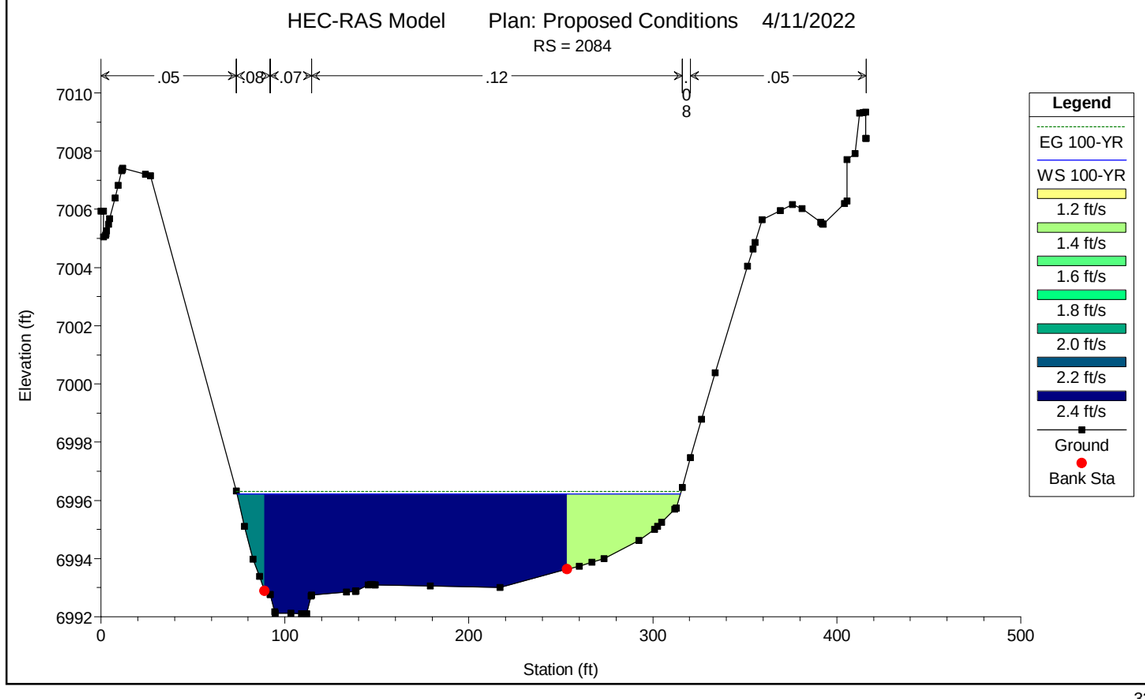

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2359
.05
.07
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta

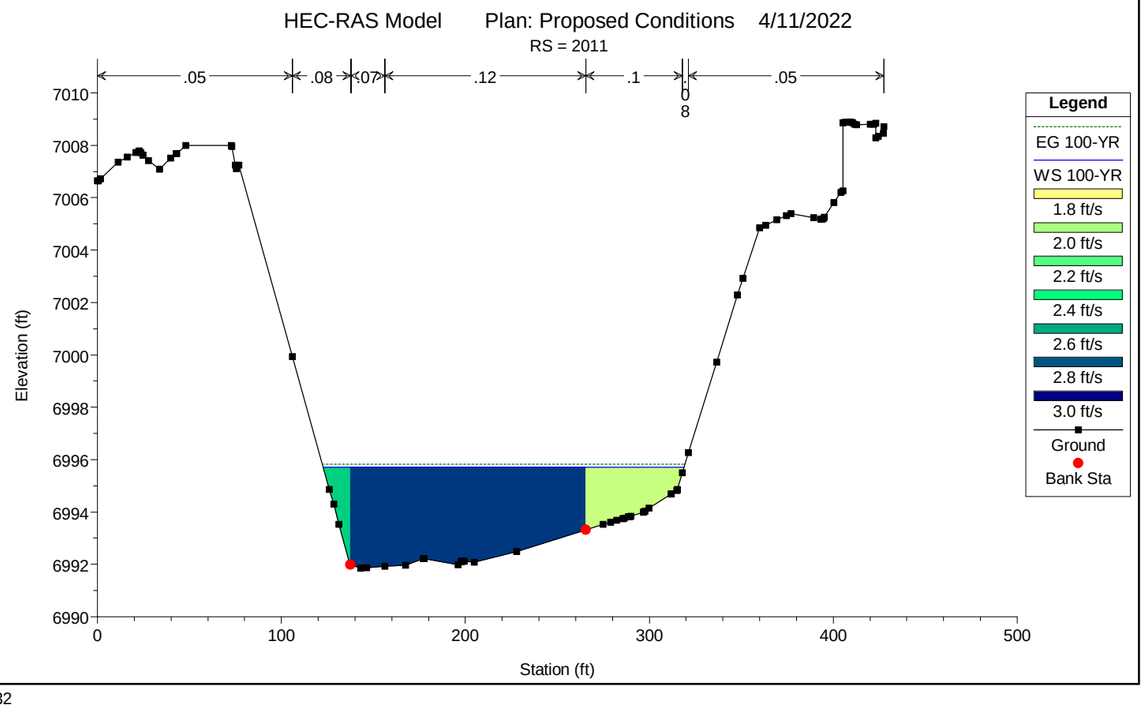

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2340
.05
.07
.12
.1
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2304
.05
.08
.07
.12
.1
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2234
.05
.08
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
Ground
Bank Sta

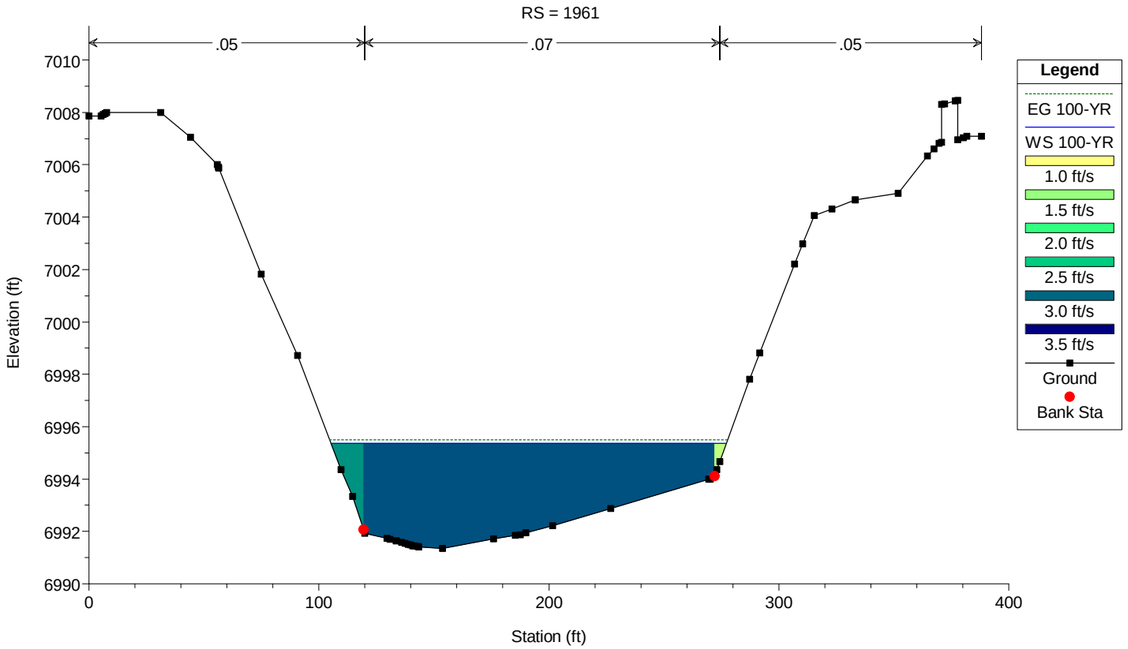

HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2158
.05
.08
.07
.12
.08
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.5 ft/s
1.6 ft/s
1.7 ft/s
1.8 ft/s
1.9 ft/s
2.0 ft/s
2.1 ft/s
2.2 ft/s
2.3 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2084
.05
.08
.07
.12
0
8
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 2011
.05
.08
.07
.12
.1
0
8
.05
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta

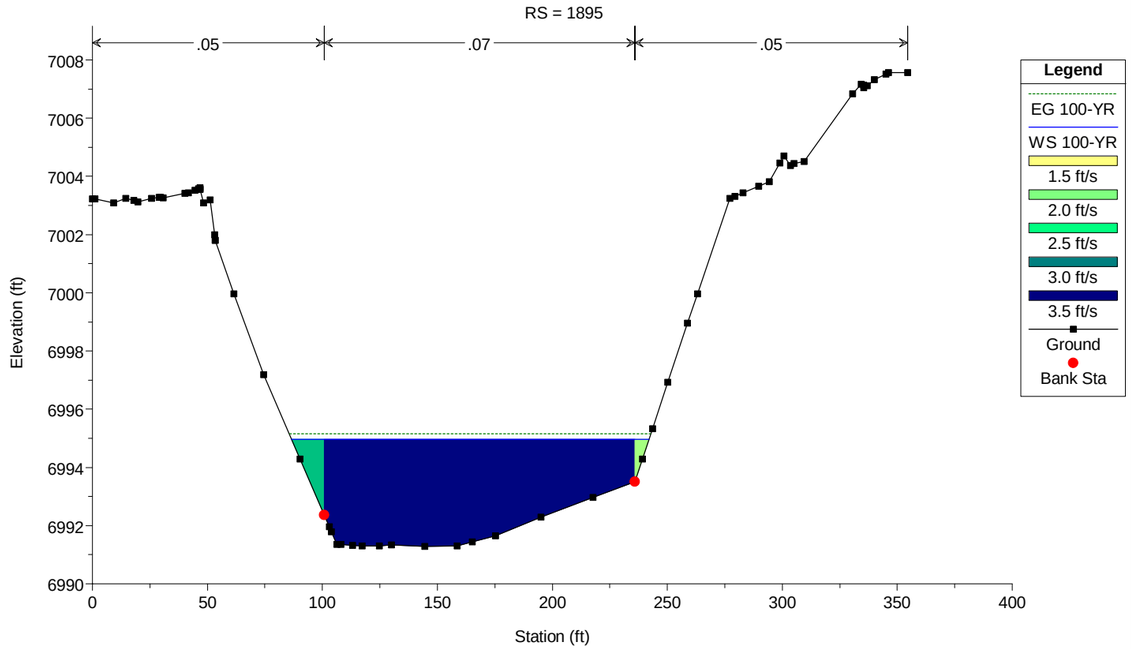
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 1961



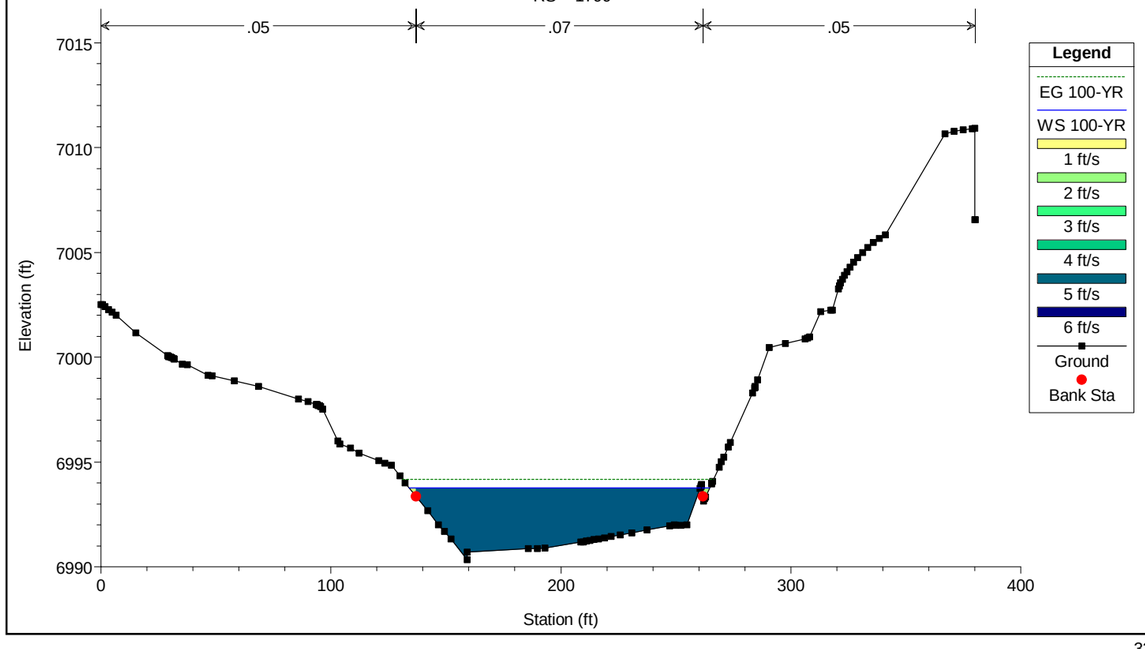
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 1895



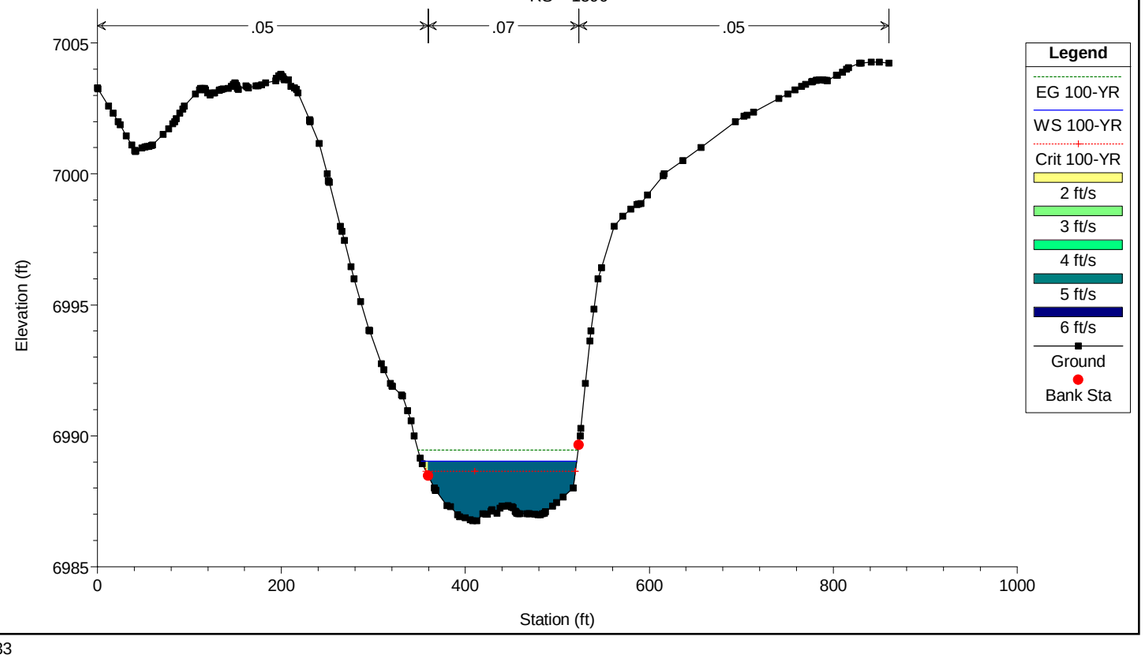
HEC-RAS Model Plan: Proposed Conditions 4/11/2022

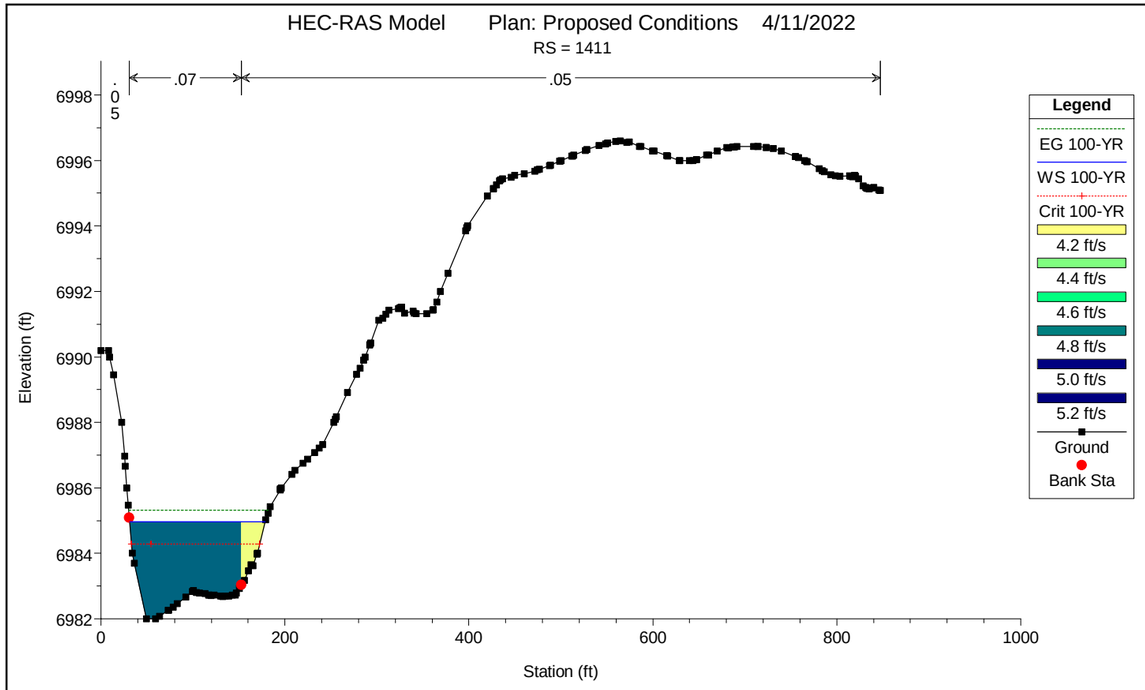
RS = 1799



HEC-RAS Model Plan: Proposed Conditions 4/11/2022

RS = 1596




HEC-RAS Model Plan: Proposed Conditions 4/11/2022
RS = 1411
.07
.05
.05
Elevation (ft)
Station (ft)
6998
6996
6994
6992
6990
6988
6986
6984
6982
0
200
400
600
800
1000
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
4.2 ft/s
4.4 ft/s
4.6 ft/s
4.8 ft/s
5.0 ft/s
5.2 ft/s
Ground
Bank Sta

Highlighted values indicate areas of concern and/or not consistent with Table 2 parameters

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	15567	2-YR	154.80	7230.74	7231.59	7231.55	7231.79	0.017049	103.74	0.92	0.51	0.73	0.22	1.98	4.31	1.13	2.85
Reach 1-3	15567	5-YR	475.50	7230.74	7232.15	7232.07	7232.53	0.016346	114.47	0.99	1.02	1.27	0.53	3.16	6.28	2.05	4.11
Reach 1-3	15567	10-YR	773.90	7230.74	7232.55	7232.42	7233.05	0.015361	118.95	1.01	1.32	1.57	0.74	3.79	7.32	2.57	4.78
Reach 1-3	15567	25-YR	1022.90	7230.74	7232.83	7232.67	7233.43	0.014948	122.13	1.02	1.53	1.79	0.87	4.21	8.02	2.89	5.22
Reach 1-3	15567	50-YR	1389.50	7230.74	7233.19	7233.02	7233.92	0.014696	126.20	1.04	1.81	2.09	1.04	4.72	8.92	3.27	5.77
Reach 1-3	15567	100-YR	1643.00	7230.74	7233.40	7233.23	7234.23	0.014852	128.61	1.06	2.01	2.31	1.16	5.05	9.52	3.50	6.14
Reach 1-3	15567	FIS	2600.00	7230.74	7234.15	7233.95	7235.26	0.014315	137.28	1.09	2.54	2.90	1.47	5.94	11.13	4.12	7.08
Reach 1-3	14967	2-YR	154.80	7220.33	7221.70	7221.70	7222.09	0.015447	59.19	0.96	0.42	1.19	0.57	1.78	6.08	2.16	3.61
Reach 1-3	14967	5-YR	475.50	7220.33	7222.53	7222.53	7223.15	0.015138	81.19	1.04	0.81	1.95	1.07	2.76	8.48	3.30	4.62
Reach 1-3	14967	10-YR	773.90	7220.33	7223.03	7223.03	7223.82	0.015624	90.44	1.09	1.08	2.50	1.43	3.31	9.94	4.00	5.32
Reach 1-3	14967	25-YR	1022.90	7220.33	7223.38	7223.38	7224.29	0.015730	96.94	1.12	1.25	2.86	1.67	3.66	10.86	4.42	5.74
Reach 1-3	14967	50-YR	1389.50	7220.33	7223.83	7223.83	7224.88	0.015689	105.36	1.15	1.46	3.29	1.94	4.05	11.93	4.89	6.21
Reach 1-3	14967	100-YR	1643.00	7220.33	7224.12	7224.12	7225.24	0.015348	110.31	1.15	1.56	3.50	2.08	4.25	12.47	5.14	6.44
Reach 1-3	14967	FIS	2600.00	7220.33	7224.97	7224.97	7226.39	0.015561	124.17	1.20	1.97	4.37	2.63	4.95	14.44	6.01	7.32
Reach 1-3	14591	2-YR	154.80	7213.99	7214.89	7214.94	7215.26	0.020658	72.57	1.06	0.57	1.16	0.58	2.07	5.69	2.09	3.69
Reach 1-3	14591	5-YR	475.50	7213.99	7215.53	7215.61	7216.21	0.021955	114.80	1.19	0.79	2.11	1.08	2.54	8.39	3.13	4.71
Reach 1-3	14591	10-YR	773.90	7213.99	7215.93	7216.16	7216.75	0.021431	162.81	1.22	0.82	2.60	1.26	2.62	9.67	3.48	4.89
Reach 1-3	14591	25-YR	1022.90	7213.99	7216.14	7216.38	7217.05	0.022244	169.11	1.27	1.05	2.98	1.56	3.07	10.54	4.00	5.32
Reach 1-3	14591	50-YR	1389.50	7213.99	7216.39	7216.65	7217.45	0.023612	173.82	1.33	1.38	3.53	2.01	3.65	11.67	4.68	5.92
Reach 1-3	14591	100-YR	1643.00	7213.99	7216.52	7216.81	7217.71	0.024976	176.42	1.38	1.62	3.95	2.34	4.01	12.46	5.12	6.35
Reach 1-3	14591	FIS	2600.00	7213.99	7217.49	7217.39	7218.40	0.013736	194.56	1.08	1.44	3.00	2.07	4.10	11.47	5.22	5.93
Reach 1-3	13819	2-YR	154.80	7200.47	7202.11	7202.15	7202.50	0.014157	62.38	0.94	0.38	1.30	0.61	1.78	6.54	2.30	3.39
Reach 1-3	13819	5-YR	475.50	7200.47	7202.95	7202.95	7203.51	0.014115	85.26	1.01	0.76	2.03	1.25	2.68	8.80	3.71	4.33
Reach 1-3	13819	10-YR	773.90	7200.47	7203.38	7203.38	7204.14	0.016247	89.26	1.12	1.22	2.76	1.83	3.58	10.56	4.68	5.26
Reach 1-3	13819	25-YR	1022.90	7200.47	7203.67	7203.67	7204.58	0.017712	92.00	1.19	1.57	3.33	2.28	4.17	11.78	5.34	5.90
Reach 1-3	13819	50-YR	1389.50	7200.47	7204.18	7204.18	7205.17	0.016402	103.10	1.17	1.67	3.59	2.55	4.39	12.55	5.83	6.20
Reach 1-3	13819	100-YR	1643.00	7200.47	7204.42	7204.42	7205.51	0.016804	104.59	1.20	1.93	3.93	2.81	4.83	13.27	6.20	6.58
Reach 1-3	13819	FIS	2600.00	7200.47	7205.23	7205.23	7206.63	0.017566	109.52	1.26	2.79	4.97	3.62	6.11	15.42	7.28	7.74
Reach 1-3	12830	2-YR	154.80	7180.91	7181.97	7182.15	7182.65	0.029564	41.22	1.27	0.75	1.71	0.67	2.35	6.93	2.18	5.66
Reach 1-3	12830	5-YR	475.50	7180.91	7182.75	7183.26	7184.05	0.027997	65.67	1.37	0.42	2.97	1.71	2.29	10.13	4.09	7.40
Reach 1-3	12830	10-YR	773.90	7180.91	7183.30	7183.78	7184.73	0.023447	130.05	1.31	0.56	3.29	2.00	2.08	11.15	4.67	6.67
Reach 1-3	12830	25-YR	1022.90	7180.91	7183.60	7183.93	7185.05	0.021793	140.36	1.29	0.87	3.47	2.14	2.72	11.71	4.95	6.48
Reach 1-3	12830	50-YR	1389.50	7180.91	7183.87	7184.46	7185.58	0.024139	147.16	1.38	1.31	4.26	2.64	3.51	13.18	5.59	7.05
Reach 1-3	12830	100-YR	1643.00	7180.91	7184.11	7184.66	7185.90	0.023649	173.88	1.39	1.32	4.52	2.86	3.53	13.76	5.92	7.01
Reach 1-3	12830	FIS	2600.00	7180.91	7184.67	7185.26	7186.67	0.023818	177.42	1.43	2.14	5.39	3.50	4.88	15.46	6.77	7.79
Reach 1-3	12133	2-YR	154.80	7168.31	7170.26	7170.26	7170.86	0.012923	32.54	0.93	0.38	1.43	0.64	1.94	7.08	2.42	4.63
Reach 1-3	12133	5-YR	475.50	7168.31	7171.58	7171.58	7172.44	0.011246	58.63	0.95	0.69	2.16	1.01	2.67	9.53	3.34	5.06
Reach 1-3	12133	10-YR	773.90	7168.31	7172.24	7172.37	7173.31	0.011908	67.77	1.01	1.01	2.77	1.37	3.31	11.15	4.07	5.67
Reach 1-3	12133	25-YR	1022.90	7168.31	7172.67	7172.76	7173.86	0.012212	69.63	1.04	1.26	3.16	1.70	3.83	12.12	4.66	6.18
Reach 1-3	12133	50-YR	1389.50	7168.31	7173.26	7173.26	7174.57	0.011896	72.23	1.05	1.53	3.52	2.03	4.38	13.06	5.29	6.68
Reach 1-3	12133	100-YR	1643.00	7168.31	7173.61	7173.61	7175.03	0.012023	73.72	1.07	1.72	3.81	2.28	4.72	13.76	5.69	7.05
Reach 1-3	12133	FIS	2600.00	7168.31	7174.66	7174.66	7176.52	0.012899	78.33	1.14	2.39	4.93	3.14	5.81	16.14	6.97	8.29
Reach 1-3	11268	2-YR	154.80	7151.03	7152.46	7152.79	7153.47	0.035603	40.20	1.44	0.65	2.49	1.20	2.06	8.64	3.10	6.31
Reach 1-3	11268	5-YR	475.50	7151.03	7153.13	7153.76	7155.13	0.045693	66.59	1.76	1.78	5.10	2.68	3.87	13.37	5.08	7.88
Reach 1-3	11268	10-YR	773.90	7151.03	7153.59	7154.32	7155.84	0.042293	85.82	1.76	2.24	5.95	3.15	4.57	15.01	5.73	8.07
Reach 1-3	11268	25-YR	1022.90	7151.03	7153.89	7154.56	7156.30	0.041170	97.65	1.77	2.57	6.56	3.48	5.03	16.08	6.15	8.29
Reach 1-3	11268	50-YR	1389.50	7151.03	7154.20	7155.07	7156.97	0.043529	108.41	1.86	3.21	7.78	3.95	5.81	17.85	6.63	8.94
Reach 1-3	11268	100-YR	1643.00	7151.03	7154.41	7155.48	7157.32	0.043587	118.16	1.88	3.44	8.33	4.11	6.21	18.69	6.80	9.21
Reach 1-3	11268	FIS	2600.00	7151.03	7155.08	7156.11	7158.31	0.041755	145.86	1.90	4.22	9.73	4.53	6.98	20.88	7.31	9.66
Reach 1-3	10988	2-YR	154.80	7148.00	7148.96	7148.97	7149.25	0.022410	63.73	1.02		0.78			4.32		4.32
Reach 1-3	10988	5-YR	475.50	7148.00	7149.60	7149.60	7150.08	0.018779	92.98	1.01		1.08			5.52		5.52
Reach 1-3	10988	10-YR	773.90	7148.00	7150.03	7150.03	7150.58	0.017983	120.96	1.01		1.20			5.96		5.96
Reach 1-3	10988	25-YR	1022.90	7148.00	7150.25	7150.25	7150.91	0.017014	122.93	1.01		1.35			6.51		6.51
Reach 1-3	10988	50-YR	1389.50	7148.00	7150.56	7150.56	7151.35	0.015529	125.79	1.00		1.50			7.09		7.09
Reach 1-3	10988	100-YR	1643.00	7148.00	7150.75	7150.75	7151.62	0.015228	127.59	1.01		1.63			7.49		7.49
Reach 1-3	10988	FIS	2600.00	7148.00	7151.38	7151.38	7152.54	0.013538	132.74	1.00	0.16	1.95	0.15	0.94	8.63	0.91	8.62
Reach 1-3	10862	2-YR	154.80	7145.24	7146.72	7146.57	7146.84	0.009358	103.24	0.69		0.31	0.12		2.85	0.85	2.84
Reach 1-3	10862	5-YR	475.50	7145.24	7147.36	7147.05	7147.59	0.010774	112.26	0.64	0.21	0.79	0.35	1.19	3.94	1.67	3.85
Reach 1-3	10862	10-YR	773.90	7145.24	7147.72	7147.40	7148.07	0.012227	149.29	0.68	0.38	1.17	0.19	1.96	4.79	1.68	4.54
Reach 1-3	10862	25-YR	1022.90	7145.24	7147.97	7147.67	7148.38	0.012546	167.87	0.69	0.49	1.40	0.32	2.39	5.27	2.07	4.83
Reach 1-3	10862	50-YR	1389.50	7145.24	7148.31	7148.03	7148.78	0.012306	174.69	0.69	0.61	1.63	0.54	2.84	5.74	2.85	5.17
Reach 1-3	10862	100-YR	1643.00	7145.24	7148.51	7148.22	7149.02	0.012143	178.06	0.69	0.67	1.76	0.67	3.08	6.01	3.28	5.39
Reach 1-3	10862	FIS	2600.00	7145.24	7149.16	7148.78	7149.80	0.011841	188.75	0.70	0.90	2.19	1.07	3.82	6.86	4.49	6.14
Reach 1-3	10831	2-YR	154.80	7145.08	7146.60		7146.65	0.003594	115.25	0.39	0.01	0.16	0.08	0.22	1.90	0.77	1.89
Reach 1-3	10831	5-YR	475.50	7145.08	7147.22		7147.34	0.005008	171.89	0.43	0.11	0.42	0.17	1.02	2.86	1.51	2.62
Reach 1-3	10831	10-YR	773.90	7145.08	7147.60		7147.76	0.005502	178.10	0.46	0.19	0.59	0.30	1.48	3.41	2.20	3.12
Reach 1-3	10831	25-YR	1022.90	7145.08	7147.86		7148.06	0.005799	182.24	0.47	0.25	0.72	0.40	1.79	3.78	2.64	3.47
Reach 1-3	10831	50-YR	1389.50	7145.08	7148.19		7148.44	0.006122	187.48	0.49	0.32	0.89	0.53	2.16	4.23	3.16	3.90
Reach 1-3	10831	100-YR	1643.00	7145.08	7148.40		7148.68	0.006312	190.71	0.50	0.37	0.99	0.61	2.38	4.51	3.46	4.16
Reach 1-3	10831	FIS	2600.00	7145.08	7149.04		7149.45	0.006893	200.95	0.53	0.55	1.36	0.89	3.06	5.40	4.38	4.99
Reach 1-3	10799	2-YR	154.80	7145.08	7146.46		7146.52	0.004928	153.59	0.48	0.01	0.16	0.01	0.21	1.96	0.18	1.96
Reach 1-3	10799	5-YR	475.50	7145.08	7147.06		7147.16	0.005468	190.11	0.44	0.12	0.35	0.11	0.89	2.54	1.14	2.51
Reach 1-3	10799	10-YR	773.90	7145.08	7147.44		7147.57	0.005687	196.45	0.45	0.18	0.50	0.18	1.35	3.02	1.58	2.97
Reach 1-3	10799	25-YR	1022.90	7145.08	7147.69		7147.86	0.005851	200.88	0.46	0.23	0.61	0.23	1.64	3.35	1.86	3.28
Reach 1-3	10799	50-YR	1389.50	7145.08	7148.02		7148.23	0.006017	206.57	0.47	0.29	0.75	0.30	1.97	3.77	2.19	3.68
Reach 1-3	10799	100-YR	1643.00	7145.08	7148.22		7148.46	0.006124	210.06	0.48	0.34	0.83	0.34	2.17	4.03	2.39	3.92
Reach 1-3	10799	FIS	2600.00	7145.08	7148.85		7149.20	0.006459	220.98	0.51	0.48	1.14	0.49	2.79	4.84	3.03	4.67
Reach 1-3	10726	2-YR	154.80	7144.76	7145.93		7146.03	0.009546	137.82	0.69		0.26			2.59		2.59
Reach 1-3	10726	5-YR	475.50	7144.76	7146.61		7146.72	0.006938	203.90	0.48	0.13	0.40	0.12	0.93	2.65	1.15	2.61
Reach 1-3	10726	10-YR	773.90	7144.76	7146.98		7147.12	0.006741	212.43	0.47	0.21	0.55	0.19	1.28	3.04	1.61	2.98
Reach 1-3	10726	25-YR	1022.90	7144.76	7147.24		7147.41	0.006694	217.69	0.47	0.27	0.65	0.24	1.65	3.33	1.89	3.25
Reach 1-3	10726	50-YR	1389.50	7144.76	7147.56		7147.77	0.006741	224.29	0.47	0.35	0.79	0.31	2.03	3.70	2.23	3.60
Reach 1-3	10726	100-YR	1643.00	7144.76	7147.76		7147.99	0.006810	228.26	0.48	0.40	0.88	0.36	2.25	3.94	2.44	3.81
Reach 1-3	10726	FIS	2600.00	7144.76	7148.40		7148.72	0.006878	238.93	0.49	0.53	1.17	0.54	2.85	4.63	3.47	4.48
Reach 1-3	10680	2-YR	154.80	7144.23	7145.67		7145.74	0.004340	113.23	0.46		0.18			2.10		2.10
Reach 1-3	10680	5-YR	475.50	7144.23	7146.33		7146.44	0.005205	200.09	0.46	0.03	0.35	0.14	0.35	2.71	1.36	2.57
Reach 1-3	10680	10-YR	773.90	7144.23	7146.70		7146.84	0.005595	208.36	0.46	0.09	0.50	0.26	0.77	3.17	2.01	2.99
Reach 1-3	10680	25-YR	1022.90	7144.23	7146.95		7147.12	0.005794	214.07	0.47	0.14	0.61	0.34	1.13	3.48	2.40	3.28
Reach 1-3	10680	50-YR	1389.50	7144.23	7147.25		7147.47	0.006108	221.10	0.48	0.21	0.76	0.44	1.52	3.89	2.85	3.67
Reach 1-3	10680	100-YR	1643.00	7144.23	7147.44		7147.69	0.006309	225.34	0.49	0.25	0.86	0.51	1.75	4.15	3.12	3.91
Reach 1-3	10680	FIS	2600.00	7144.23	7148.06		7148.40	0.006687	239.35	0.52	0.39	1.17	0.72	2.41	4.91	3.87	4.61
Reach 1-3	10612	2-YR	154.80	7143.95	7145.00	7145.00	7145.18	0.019694	128.26	1.01		0.43	0.04		3.42	0.37	3.42
Reach 1-3	10612	5-YR	475.50	7143.95	7145.41	7145.41	7145.72	0.028951	172.64	1.01		1.13	0.39	0.09	4.51	1.51	4.50
Reach 1-3	10612	10-YR	773.90	7143.95	7145.65	7145.65	7146.07	0.030376	197.24	0.99	0.38	1.62	0.61	1.47	5.17	2.02	5.05
Reach 1-3	10612	25-YR	1022.90	7143.95	7145.82	7145.82	7146.31	0.031341	200.05	0.99	0.67	2.00	0.78	2.15	5.68	2.37	5.50
Reach 1-3	10612	50-YR	1389.50	7143.95	7146.05	7146.05	7146.63	0.030701	203.86	0.98	1.01	2.40	0.97	2.84	6.21	2.76	5.97
Reach 1-3	10612	100-YR	1643.00	7143.95	7146.20	7146.20	7146.84	0.029811	206.35	0.97	1.20	2.61	1.08	3.26	6.49	3.15	6.23

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	10612	FIS	2600.00	7143.95	7146.67	7146.67	7147.51	0.029181	213.96	0.97	1.78	3.40	1.47	4.48	7.53	4.24	7.20
Reach 1-3	10526	2-YR	154.80	7141.63	7143.14	7142.66	7143.18	0.002753	134.07	0.32	0.01	0.13	0.06	0.14	1.59	0.63	1.58
Reach 1-3	10526	5-YR	475.50	7141.63	7143.84	7143.13	7143.93	0.003884	141.45	0.37	0.09	0.35	0.17	0.81	2.49	1.20	2.45
Reach 1-3	10526	10-YR	773.90	7141.63	7144.26	7143.42	7144.41	0.004550	162.03	0.40	0.17	0.53	0.10	1.17	3.10	1.44	3.01
Reach 1-3	10526	25-YR	1022.90	7141.63	7144.56	7143.62	7144.74	0.004838	204.41	0.42	0.22	0.65	0.11	1.40	3.48	1.35	3.28
Reach 1-3	10526	50-YR	1389.50	7141.63	7144.93	7143.90	7145.15	0.005036	210.54	0.43	0.29	0.79	0.22	1.78	3.89	1.83	3.58
Reach 1-3	10526	100-YR	1643.00	7141.63	7145.11	7144.09	7145.37	0.005366	212.51	0.45	0.34	0.91	0.29	2.02	4.19	2.16	3.84
Reach 1-3	10526	FIS	2600.00	7141.63	7145.73	7144.79	7146.10	0.006121	218.96	0.49	0.50	1.27	0.55	2.71	5.07	3.19	4.63
Reach 1-3	10480	2-YR	154.80	7141.63	7142.67	7142.67	7142.90	0.019606	90.62	1.02		0.55	0.21		3.88	1.08	3.86
Reach 1-3	10480	5-YR	475.50	7141.63	7143.16	7143.16	7143.54	0.025520	130.87	1.00	0.10	1.20	0.66	0.62	4.94	2.20	4.90
Reach 1-3	10480	10-YR	773.90	7141.63	7143.49	7143.45	7143.97	0.025134	137.90	0.95	0.35	1.69	0.54	1.44	5.61	2.63	5.53
Reach 1-3	10480	25-YR	1022.90	7141.63	7143.69	7143.68	7144.28	0.025937	150.50	0.96	0.52	2.08	0.49	1.92	6.18	2.66	6.02
Reach 1-3	10480	50-YR	1389.50	7141.63	7143.97	7143.97	7144.67	0.025532	165.31	0.95	0.71	2.49	0.65	2.69	6.77	3.01	6.48
Reach 1-3	10480	100-YR	1643.00	7141.63	7144.21	7144.21	7144.90	0.021917	202.62	0.89	0.77	2.47	0.56	2.99	6.78	2.82	6.29
Reach 1-3	10480	FIS	2600.00	7141.63	7144.73	7144.73	7145.59	0.021704	211.41	0.90	1.10	3.14	1.19	3.92	7.77	4.39	7.08
Reach 1-3	10412	2-YR	154.80	7139.86	7140.82	7140.94	7141.23	0.031742	74.61	1.41		0.82	0.26		5.12	1.13	5.10
Reach 1-3	10412	5-YR	475.50	7139.86	7141.59	7141.46	7141.88	0.016787	134.57	0.82		0.91	0.45		4.31	1.82	4.22
Reach 1-3	10412	10-YR	773.90	7139.86	7141.82	7141.80	7142.28	0.024180	156.12	0.96		1.50	0.58		5.46	2.50	5.33
Reach 1-3	10412	25-YR	1022.90	7139.86	7142.03	7142.03	7142.55	0.024269	198.81	0.95	0.09	1.77	0.41	0.80	5.83	2.49	5.56
Reach 1-3	10412	50-YR	1389.50	7139.86	7142.24	7142.29	7142.88	0.026637	212.87	0.98	0.27	2.29	0.69	1.62	6.55	3.03	6.12
Reach 1-3	10412	100-YR	1643.00	7139.86	7142.31	7142.44	7143.10	0.032032	215.07	1.08	0.39	2.89	0.93	2.00	7.34	3.53	6.83
Reach 1-3	10412	FIS	2600.00	7139.86	7142.72	7142.91	7143.76	0.033616	229.25	1.10	0.84	3.90	1.65	3.29	8.52	4.95	7.82
Reach 1-3	10301	2-YR	154.80	7137.92	7138.85	7138.85	7139.04	0.018110	121.80	1.03		0.41	0.19		3.53	1.03	3.52
Reach 1-3	10301	5-YR	475.50	7137.92	7139.27	7139.27	7139.59	0.025839	166.67	1.02		1.01	0.61		4.60	2.07	4.57
Reach 1-3	10301	10-YR	773.90	7137.92	7139.68		7139.99	0.017144	171.47	0.78	0.21	1.11	0.62	1.09	4.48	2.25	4.44
Reach 1-3	10301	25-YR	1022.90	7137.92	7140.02	7139.69	7140.33	0.012910	174.36	0.67	0.29	1.11	0.60	1.42	4.45	2.31	4.39
Reach 1-3	10301	50-YR	1389.50	7137.92	7140.42	7139.93	7140.75	0.010821	185.84	0.62	0.35	1.20	0.36	1.93	4.67	2.52	4.58
Reach 1-3	10301	100-YR	1643.00	7137.92	7140.63	7140.08	7141.00	0.010474	198.48	0.61	0.40	1.30	0.32	2.18	4.90	2.45	4.77
Reach 1-3	10301	FIS	2600.00	7137.92	7141.31	7140.63	7141.78	0.009672	220.56	0.60	0.55	1.61	0.50	2.87	5.60	2.90	5.33
Reach 1-3	10221	2-YR	154.80	7136.30	7137.54	7137.30	7137.66	0.006733	84.63	0.57	0.11	0.33	0.08	0.82	2.88	0.67	2.71
Reach 1-3	10221	5-YR	475.50	7136.30	7138.32	7137.90	7138.56	0.007149	114.28	0.58	0.29	0.70	0.25	1.57	4.11	1.43	3.52
Reach 1-3	10221	10-YR	773.90	7136.30	7138.74		7139.08	0.008281	128.20	0.63	0.45	1.03	0.40	2.07	5.04	1.89	4.17
Reach 1-3	10221	25-YR	1022.90	7136.30	7139.01		7139.46	0.009355	153.45	0.68	0.49	1.32	0.52	2.14	5.77	2.23	4.57
Reach 1-3	10221	50-YR	1389.50	7136.30	7139.33	7139.00	7139.90	0.010390	180.55	0.72	0.60	1.68	0.68	2.41	6.59	2.62	4.98
Reach 1-3	10221	100-YR	1643.00	7136.30	7139.52	7139.35	7140.14	0.010872	183.52	0.74	0.74	1.88	0.77	2.77	7.02	2.82	5.27
Reach 1-3	10221	FIS	2600.00	7136.30	7140.11	7139.94	7140.93	0.011863	193.19	0.79	1.19	2.49	1.06	3.82	8.26	3.42	6.13
Reach 1-3	10077	2-YR	154.80	7134.96	7136.04	7136.04	7136.24	0.015708	106.33	0.97		0.40			3.53	0.23	3.53
Reach 1-3	10077	5-YR	475.50	7134.96	7136.49	7136.49	7136.84	0.023931	151.42	1.01		1.01	0.36		4.71	1.48	4.69
Reach 1-3	10077	10-YR	773.90	7134.96	7136.80	7136.78	7137.20	0.023911	184.92	0.97		1.26	0.58		5.05	2.05	5.02
Reach 1-3	10077	25-YR	1022.90	7134.96	7137.01	7136.96	7137.45	0.023242	194.70	0.93	0.09	1.47	0.72	0.58	5.30	2.36	5.27
Reach 1-3	10077	50-YR	1389.50	7134.96	7137.28	7137.17	7137.78	0.022374	197.53	0.89	0.27	1.78	0.87	1.23	5.71	2.70	5.65
Reach 1-3	10077	100-YR	1643.00	7134.96	7137.44	7137.32	7137.99	0.021827	199.33	0.88	0.37	1.96	0.96	1.54	5.96	2.89	5.90
Reach 1-3	10077	FIS	2600.00	7134.96	7137.97	7137.79	7138.69	0.021077	205.00	0.86	0.70	2.59	1.26	2.67	6.86	3.79	6.75
Reach 1-3	9972	2-YR	154.80	7132.75	7134.34	7134.24	7134.45	0.013706	133.76	0.74		0.36			2.72		2.72
Reach 1-3	9972	5-YR	475.50	7132.75	7134.95	7134.65	7135.10	0.011030	178.95	0.59		0.59	0.09		3.10	0.68	3.10
Reach 1-3	9972	10-YR	773.90	7132.75	7135.31		7135.50	0.010873	200.46	0.58		0.76	0.21		3.50	1.37	3.50
Reach 1-3	9972	25-YR	1022.90	7132.75	7135.55		7135.77	0.010906	214.99	0.59		0.87	0.29		3.78	1.77	3.77
Reach 1-3	9972	50-YR	1389.50	7132.75	7135.83		7136.10	0.011060	219.31	0.59	0.08	1.07	0.39	0.85	4.19	2.19	4.17
Reach 1-3	9972	100-YR	1643.00	7132.75	7136.00		7136.30	0.011324	222.02	0.60	0.14	1.21	0.38	1.21	4.47	2.29	4.44
Reach 1-3	9972	FIS	2600.00	7132.75	7136.52		7136.96	0.012011	276.41	0.63	0.35	1.68	0.28	2.16	5.34	2.01	5.18
Reach 1-3	9893	2-YR	154.80	7131.91	7132.96	7132.96	7133.16	0.019476	105.45	1.01		0.49			3.63		3.63
Reach 1-3	9893	5-YR	475.50	7131.91	7133.40	7133.40	7133.75	0.028215	145.42	1.01		1.22	0.28		4.77	1.22	4.76
Reach 1-3	9893	10-YR	773.90	7131.91	7133.69	7133.69	7134.13	0.029719	164.31	1.01		1.64	0.55		5.38	1.91	5.36
Reach 1-3	9893	25-YR	1022.90	7131.91	7133.88	7133.88	7134.40	0.030221	177.59	1.01		1.91	0.77		5.76	2.38	5.73
Reach 1-3	9893	50-YR	1389.50	7131.91	7134.15	7134.12	7134.74	0.028537	200.11	0.97	0.19	2.25	0.98	0.95	6.18	2.92	6.10
Reach 1-3	9893	100-YR	1643.00	7131.91	7134.32	7134.28	7134.95	0.027091	216.77	0.94	0.32	2.42	1.03	1.34	6.40	3.28	6.24
Reach 1-3	9893	FIS	2600.00	7131.91	7134.84	7134.79	7135.62	0.024390	228.52	0.90	0.98	2.98	1.27	2.93	7.18	4.11	6.82
Reach 1-3	9840	2-YR	154.80	7130.66	7131.95	7131.79	7132.04	0.008374	131.60	0.61		0.26	0.03		2.41	0.34	2.41
Reach 1-3	9840	5-YR	475.50	7130.66	7132.54	7132.20	7132.70	0.009135	162.73	0.55	0.13	0.60	0.20	0.89	3.22	1.30	3.13
Reach 1-3	9840	10-YR	773.90	7130.66	7132.85	7132.48	7133.09	0.010952	178.12	0.60	0.26	0.93	0.34	1.37	4.00	1.92	3.80
Reach 1-3	9840	25-YR	1022.90	7130.66	7133.06	7132.69	7133.36	0.011957	189.04	0.63	0.36	1.17	0.45	1.68	4.51	2.32	4.22
Reach 1-3	9840	50-YR	1389.50	7130.66	7133.33		7133.71	0.012975	206.94	0.67	0.50	1.49	0.42	2.05	5.12	2.49	4.70
Reach 1-3	9840	100-YR	1643.00	7130.66	7133.49		7133.93	0.013464	215.47	0.68	0.59	1.68	0.54	2.26	5.48	2.82	4.97
Reach 1-3	9840	FIS	2600.00	7130.66	7134.02		7134.62	0.014494	236.17	0.72	0.93	2.28	0.91	3.06	6.53	3.83	5.77
Reach 1-3	9759	2-YR	154.80	7130.34	7131.39	7131.39	7131.56	0.018210	131.48	0.97		0.41	0.05		3.31	0.42	3.30
Reach 1-3	9759	5-YR	475.50	7130.34	7131.78	7131.78	7132.09	0.028733	180.74	1.02		1.10	0.45		4.51	1.67	4.44
Reach 1-3	9759	10-YR	773.90	7130.34	7132.06	7132.03	7132.42	0.027571	212.15	0.96		1.35	0.85		4.82	2.57	4.75
Reach 1-3	9759	25-YR	1022.90	7130.34	7132.23	7132.19	7132.64	0.028507	223.79	0.96	0.11	1.62	1.11	0.65	5.20	3.05	5.12
Reach 1-3	9759	50-YR	1389.50	7130.34	7132.42	7132.39	7132.94	0.029930	225.62	0.97	0.35	2.07	1.44	1.41	5.79	3.61	5.70
Reach 1-3	9759	100-YR	1643.00	7130.34	7132.55	7132.52	7133.13	0.030584	227.21	0.98	0.49	2.35	1.59	1.75	6.15	3.92	6.05
Reach 1-3	9759	FIS	2600.00	7130.34	7132.96	7132.96	7133.76	0.031359	238.07	0.99	0.93	3.22	1.74	2.66	7.24	4.05	7.04
Reach 1-3	9693	2-YR	154.80	7127.00	7128.04	7128.11	7128.29	0.058269	288.22	1.92	0.20	0.49	0.43	0.85	4.01	1.44	3.98
Reach 1-3	9693	5-YR	475.50	7127.00	7128.35	7128.35	7128.57	0.041099	290.86	1.00	0.64	1.13	0.86	1.98	3.76	2.43	3.73
Reach 1-3	9693	10-YR	773.90	7127.00	7128.50	7128.50	7128.82	0.045419	292.17	1.03	0.95	1.69	1.23	2.54	4.52	3.02	4.49
Reach 1-3	9693	25-YR	1022.90	7127.00	7128.63	7128.63	7129.00	0.044619	293.22	1.02	1.11	2.01	1.41	2.84	4.93	3.33	4.90
Reach 1-3	9693	50-YR	1389.50	7127.00	7128.79	7128.79	7129.25	0.043347	294.62	1.02	1.32	2.39	1.63	3.19	5.44	3.68	5.40
Reach 1-3	9693	100-YR	1643.00	7127.00	7128.90	7128.90	7129.41	0.042807	295.49	1.02	1.44	2.64	1.76	3.39	5.76	3.88	5.71
Reach 1-3	9693	FIS	2600.00	7127.00	7129.21	7129.25	7129.94	0.043914	298.28	1.06	1.89	3.58	2.28	4.35	6.88	4.59	6.81
Reach 1-3	9660	2-YR	154.80	7124.29	7125.14	7125.40	7126.20	0.104931	53.87	2.47		2.27			8.26		8.26
Reach 1-3	9660	5-YR	475.50	7124.29	7125.41	7125.67	7126.51	0.179239	219.66	2.91	0.41	2.91		1.15	8.40		8.39
Reach 1-3	9660	10-YR	773.90	7124.29	7125.57	7125.87	7126.68	0.167229	243.81	2.37	1.29	4.14		2.51	8.46		8.42
Reach 1-3	9660	25-YR	1022.90	7124.29	7125.67	7126.02	7126.89	0.164293	252.14	2.24	1.80	5.00		3.15	8.88		8.82
Reach 1-3	9660	50-YR	1389.50	7124.29	7125.79	7126.19	7127.19	0.162339	267.76	2.18	2.44	5.97		3.86	9.49		9.40
Reach 1-3	9660	100-YR	1643.00	7124.29	7125.88	7126.30	7127.36	0.158445	277.97	2.14	2.79	6.46		4.24	9.81		9.71
Reach 1-3	9660	FIS	2600.00	7124.29	7126.15	7126.68	7127.92	0.142900	304.32	2.02	3.75	7.83	0.38	5.26	10.73	1.15	10.57
Reach 1-3	9614	2-YR	154.80	7121.71	7124.31	7122.76	7124.32	0.000166	231.11	0.07		0.01			0.49		0.49
Reach 1-3	9614	5-YR	475.50	7121.71	7124.64	7123.25	7124.67	0.000859	244.49	0.17		0.09			1.21		1.21
Reach 1-3	9614	10-YR	773.90	7121.71	7124.88	7123.51	7124.93	0.001502	253.88	0.22	0.01	0.17	0.01	0.19	1.72	0.19	1.71
Reach 1-3	9614	25-YR	1022.90	7121.71	7125.06	7123.70	7125.13	0.001980	260.58	0.26	0.02	0.25	0.02	0.40	2.07	0.40	2.06
Reach 1-3	9614	50-YR	1389.50	7121.71	7125.29	7123.95	7125.39	0.002597	281.25	0.30	0.05	0.36	0.04	0.70	2.51	0.66	2.49
Reach 1-3	9614	100-YR	1643.00	7121.71	7125.44	7124.10	7125.56	0.002971	287.47	0.32	0.07	0.44	0.07	0.88	2.78	0.85	2.75
Reach 1-3	9614	FIS	2600.00	7121.71	7125.91	7124.55	7126.11	0.004118	296.32	0.38	0.20	0.73	0.19	1.61	3.63	1.61	3.57
Reach 1-3	9594	2-YR	154.80	7121.44	7124.31		7124.32	0.000045	285.48	0.04	0.00	0.01	0.00	0.10	0.32	0.19	0.31
Reach 1-3	9594	5-YR	475.50	7121.44	7124.64		7124.65	0.000260	295.15	0.09	0.01	0.04	0.01	0.35	0.83	0.49	0.79
Reach 1-3	9594	10-YR	773.90	7121.44	7124.89		7124.91	0.000497	301.22	0.13	0.03	0.08	0.03	0.57	1.21	0.73	1.15
Reach 1-3	9594	25-YR	1022.90	7121.44	7125.06		7125.09	0.000694	305.43	0.16	0.05	0.12	0.05	0.74	1.49	0.91	1.41

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	9594	50-YR	1389.50	7121.44	7125.29		7125.34	0.000971	311.22	0.19	0.08	0.18	0.08	0.97	1.84	1.16	1.74
Reach 1-3	9594	100-YR	1643.00	7121.44	7125.44		7125.50	0.001151	315.54	0.20	0.10	0.23	0.10	1.13	2.06	1.31	1.94
Reach 1-3	9594	FIS	2600.00	7121.44	7125.92		7126.04	0.001744	320.15	0.25	0.19	0.40	0.19	1.63	2.77	1.89	2.60
Reach 1-3	9521	2-YR	154.80	7120.00	7124.31		7124.31	0.000016	211.74	0.03	0.00	0.00	0.00	0.19	0.27	0.19	0.25
Reach 1-3	9521	5-YR	475.50	7120.00	7124.63		7124.64	0.000109	213.95	0.07	0.01	0.03	0.01	0.55	0.74	0.56	0.70
Reach 1-3	9521	10-YR	773.90	7120.00	7124.85		7124.87	0.000234	215.53	0.10	0.03	0.06	0.03	0.84	1.13	0.88	1.07
Reach 1-3	9521	25-YR	1022.90	7120.00	7125.01		7125.04	0.000353	216.65	0.12	0.04	0.10	0.05	1.08	1.42	1.13	1.34
Reach 1-3	9521	50-YR	1389.50	7120.00	7125.22		7125.27	0.000544	218.12	0.15	0.07	0.15	0.09	1.40	1.81	1.48	1.72
Reach 1-3	9521	100-YR	1643.00	7120.00	7125.35		7125.41	0.000682	219.03	0.17	0.08	0.20	0.11	1.61	2.07	1.71	1.97
Reach 1-3	9521	FIS	2600.00	7120.00	7125.76		7125.88	0.001239	221.87	0.23	0.17	0.39	0.24	2.34	2.94	2.52	2.81
Reach 1-3	9449	2-YR	154.80	7119.15	7124.31		7124.31	0.000002	252.39	0.01	0.00	0.00	0.00	0.10	0.16	0.09	0.15
Reach 1-3	9449	5-YR	475.50	7119.15	7124.63		7124.63	0.000014	260.00	0.04	0.00	0.00	0.00	0.30	0.47	0.26	0.44
Reach 1-3	9449	10-YR	773.90	7119.15	7124.85		7124.86	0.000031	265.44	0.06	0.00	0.01	0.00	0.46	0.73	0.40	0.68
Reach 1-3	9449	25-YR	1022.90	7119.15	7125.01		7125.02	0.000049	268.96	0.07	0.01	0.02	0.01	0.59	0.93	0.51	0.86
Reach 1-3	9449	50-YR	1389.50	7119.15	7125.22		7125.24	0.000078	272.47	0.09	0.01	0.03	0.01	0.77	1.21	0.68	1.12
Reach 1-3	9449	100-YR	1643.00	7119.15	7125.34		7125.37	0.000101	274.64	0.10	0.02	0.04	0.01	0.89	1.39	0.79	1.29
Reach 1-3	9449	FIS	2600.00	7119.15	7125.74		7125.80	0.000197	281.42	0.14	0.04	0.08	0.03	1.31	2.03	1.19	1.87
Reach 1-3	9285	2-YR	155.10	7114.00	7124.31		7124.31	0.000000	286.72	0.00	0.00	0.00	0.00	0.04	0.07	0.05	0.07
Reach 1-3	9285	5-YR	480.20	7114.00	7124.63		7124.63	0.000001	291.12	0.01	0.00	0.00	0.00	0.12	0.22	0.15	0.20
Reach 1-3	9285	10-YR	783.10	7114.00	7124.85		7124.86	0.000003	294.27	0.02	0.00	0.00	0.00	0.20	0.34	0.24	0.32
Reach 1-3	9285	25-YR	1035.50	7114.00	7125.02		7125.02	0.000005	296.50	0.02	0.00	0.00	0.00	0.26	0.45	0.31	0.41
Reach 1-3	9285	50-YR	1408.70	7114.00	7125.23		7125.23	0.000008	299.44	0.03	0.00	0.01	0.00	0.34	0.59	0.42	0.54
Reach 1-3	9285	100-YR	1665.90	7114.00	7125.36		7125.36	0.000010	301.25	0.04	0.00	0.01	0.00	0.40	0.69	0.49	0.63
Reach 1-3	9285	FIS	2600.00	7114.00	7125.77		7125.78	0.000022	306.99	0.05	0.01	0.02	0.01	0.60	1.04	0.73	0.94
Reach 1-3	9106	2-YR	155.10	7114.00	7124.31		7124.31	0.000000	314.88	0.00	0.00	0.00	0.00	0.03	0.06	0.05	0.06
Reach 1-3	9106	5-YR	480.20	7114.00	7124.63		7124.63	0.000001	320.02	0.01	0.00	0.00	0.00	0.10	0.19	0.14	0.18
Reach 1-3	9106	10-YR	783.10	7114.00	7124.85		7124.86	0.000002	323.68	0.02	0.00	0.00	0.00	0.17	0.31	0.22	0.28
Reach 1-3	9106	25-YR	1035.50	7114.00	7125.02		7125.02	0.000004	326.30	0.02	0.00	0.00	0.00	0.21	0.40	0.29	0.37
Reach 1-3	9106	50-YR	1408.70	7114.00	7125.23		7125.23	0.000006	348.20	0.03	0.00	0.00	0.00	0.28	0.53	0.38	0.49
Reach 1-3	9106	100-YR	1665.90	7114.00	7125.36		7125.36	0.000008	353.44	0.03	0.00	0.01	0.00	0.29	0.62	0.45	0.57
Reach 1-3	9106	FIS	2600.00	7114.00	7125.77		7125.78	0.000018	360.41	0.05	0.00	0.01	0.01	0.45	0.93	0.67	0.85
Reach 1-3	9004	2-YR	155.10	7124.00	7124.21	7124.21	7124.30	0.030740	338.05	0.99		0.36	0.12		2.45	1.25	2.44
Reach 1-3	9004	5-YR	480.20	7124.00	7124.42	7124.42	7124.61	0.024274	360.59	1.00	0.12	0.59	0.18	1.31	3.51	1.94	3.50
Reach 1-3	9004	10-YR	783.10	7124.00	7124.57	7124.57	7124.83	0.021756	380.54	0.99	0.20	0.73	0.18	1.92	4.12	1.99	4.08
Reach 1-3	9004	25-YR	1035.50	7124.00	7124.68	7124.68	7124.99	0.019974	399.60	0.98	0.25	0.80	0.20	2.26	4.48	2.13	4.40
Reach 1-3	9004	50-YR	1408.70	7124.00	7124.82	7124.82	7125.19	0.018662	412.98	0.98	0.32	0.92	0.29	2.65	4.94	2.56	4.82
Reach 1-3	9004	100-YR	1665.90	7124.00	7124.92	7124.92	7125.32	0.017129	423.43	0.96	0.34	0.95	0.33	2.84	5.13	2.78	4.98
Reach 1-3	9004	FIS	2600.00	7124.00	7125.20	7125.20	7125.72	0.015578	437.24	0.96	0.44	1.14	0.51	3.44	5.89	3.79	5.68
Reach 1-3	8965	2-YR	155.10	7118.25	7118.37	7118.52	7119.78	2.040622	262.06	6.73		7.92	5.79		9.52	8.45	9.52
Reach 1-3	8965	5-YR	480.20	7118.25	7118.41	7118.72	7123.90	4.924160	286.27	11.10		27.44	19.08		18.81	16.15	18.81
Reach 1-3	8965	10-YR	783.10	7118.25	7118.45	7118.86	7124.35	3.351623	320.42	9.70		26.27	17.97		19.49	16.55	19.48
Reach 1-3	8965	25-YR	1035.50	7118.25	7118.51	7118.97	7123.31	1.905140	359.33	7.64		19.53	13.45		17.57	14.99	17.57
Reach 1-3	8965	50-YR	1408.70	7118.25	7118.56	7119.10	7123.59	1.484305	382.56	7.00		19.00	12.84		17.99	15.15	17.98
Reach 1-3	8965	100-YR	1665.90	7118.25	7118.60	7119.19	7123.77	1.257631	384.89	6.61		18.65	12.18		18.26	15.04	18.25
Reach 1-3	8965	FIS	2600.00	7118.25	7118.72	7119.48	7124.27	0.782271	386.40	5.58	2.72	17.46	10.47	6.00	18.91	14.71	18.89
Reach 1-3	8919	2-YR	155.10	7102.37	7103.05	7103.29	7104.62	0.129782	57.53	3.42		2.17			10.05		10.05
Reach 1-3	8919	5-YR	480.20	7102.37	7104.11	7103.61	7104.20	0.005946	193.80	0.41	0.15	0.41	0.08	1.04	2.45	0.70	2.42
Reach 1-3	8919	10-YR	783.10	7102.37	7104.46	7103.85	7104.60	0.006467	203.19	0.44	0.23	0.59	0.17	1.37	2.99	1.13	2.91
Reach 1-3	8919	25-YR	1035.50	7102.37	7104.70	7104.03	7104.87	0.006956	209.33	0.46	0.30	0.73	0.24	1.60	3.39	1.39	3.27
Reach 1-3	8919	50-YR	1408.70	7102.37	7105.00	7104.26	7105.22	0.007405	217.39	0.48	0.38	0.92	0.33	1.89	3.86	1.70	3.69
Reach 1-3	8919	100-YR	1665.90	7102.37	7103.83	7104.42	7105.87	0.174776	184.01	2.23	2.89	8.95	0.56	4.27	11.45	1.43	11.40
Reach 1-3	8919	FIS	2600.00	7102.37	7104.06	7104.89	7107.09	0.205137	192.33	2.42	4.77	13.34	2.40	5.81	14.02	3.68	13.83
Reach 1-3	8828	2-YR	155.10	7101.32	7102.40	7102.41	7102.61	0.018964	107.35	1.03		0.47			3.67		3.67
Reach 1-3	8828	5-YR	480.20	7101.32	7102.86	7102.86	7103.15	0.027995	191.51	1.02		1.00			4.39		4.39
Reach 1-3	8828	10-YR	783.10	7101.32	7103.11	7103.11	7103.46	0.031581	251.73	1.03		1.30	0.13	0.26	4.74	0.74	4.74
Reach 1-3	8828	25-YR	1035.50	7101.32	7103.26	7103.26	7103.66	0.031816	260.82	1.00	0.18	1.57	0.29	0.88	5.05	1.22	5.05
Reach 1-3	8828	50-YR	1408.70	7101.32	7103.43	7103.43	7103.93	0.034428	262.54	1.02	0.37	2.06	0.49	1.42	5.67	1.71	5.66
Reach 1-3	8828	100-YR	1665.90	7101.32	7103.55	7103.55	7104.10	0.034233	263.76	1.01	0.49	2.31	0.61	1.72	5.96	1.99	5.94
Reach 1-3	8828	FIS	2600.00	7101.32	7103.94	7103.94	7104.66	0.033218	267.65	1.00	0.87	3.04	1.00	2.52	6.84	2.83	6.79
Reach 1-3	8762	2-YR	155.10	7099.48	7100.44	7100.60	7100.95	0.035588	64.92	1.56		0.93			5.71		5.71
Reach 1-3	8762	5-YR	480.20	7099.48	7101.38	7101.13	7101.54	0.011947	215.71	0.68		0.52	0.06		3.23	0.55	3.23
Reach 1-3	8762	10-YR	783.10	7099.48	7101.70	7101.43	7101.89	0.012055	242.13	0.64		0.70	0.22		3.50	1.42	3.49
Reach 1-3	8762	25-YR	1035.50	7099.48	7101.92	7101.58	7102.14	0.011760	257.44	0.63		0.80	0.31		3.72	1.81	3.72
Reach 1-3	8762	50-YR	1408.70	7099.48	7102.21	7101.79	7102.46	0.011069	259.94	0.60	0.09	0.95	0.39	0.92	3.99	2.20	3.98
Reach 1-3	8762	100-YR	1665.90	7099.48	7102.39	7101.92	7102.66	0.010685	261.17	0.59	0.15	1.04	0.44	1.26	4.17	2.41	4.15
Reach 1-3	8762	FIS	2600.00	7099.48	7102.98	7102.30	7103.32	0.009688	265.04	0.57	0.31	1.30	0.57	2.08	4.71	2.99	4.68
Reach 1-3	8631	2-YR	155.10	7098.15	7099.48	7099.31	7099.61	0.007569	101.61	0.70		0.25			2.89		2.89
Reach 1-3	8631	5-YR	480.20	7098.15	7100.15		7100.27	0.007661	222.34	0.55	0.06	0.38	0.13	0.53	2.78	0.90	2.77
Reach 1-3	8631	10-YR	783.10	7098.15	7100.52		7100.67	0.007291	225.78	0.51	0.14	0.53	0.20	0.98	3.09	1.24	3.07
Reach 1-3	8631	25-YR	1035.50	7098.15	7100.78		7100.95	0.007072	228.87	0.49	0.18	0.62	0.24	1.28	3.33	1.57	3.30
Reach 1-3	8631	50-YR	1408.70	7098.15	7101.11		7101.31	0.006935	233.33	0.49	0.23	0.75	0.30	1.65	3.66	1.92	3.61
Reach 1-3	8631	100-YR	1665.90	7098.15	7101.31		7101.54	0.006837	235.92	0.49	0.27	0.83	0.34	1.85	3.85	2.11	3.80
Reach 1-3	8631	FIS	2600.00	7098.15	7101.96		7102.27	0.006639	240.88	0.49	0.40	1.08	0.52	2.46	4.46	2.79	4.38
Reach 1-3	8513	2-YR	155.10	7097.47	7098.74		7098.80	0.006116	157.40	0.50		0.19			1.98		1.98
Reach 1-3	8513	5-YR	480.20	7097.47	7099.32	7098.91	7099.43	0.006868	196.63	0.47	0.05	0.41	0.04	0.47	2.59	0.57	2.59
Reach 1-3	8513	10-YR	783.10	7097.47	7099.68	7099.15	7099.82	0.007130	201.38	0.47	0.13	0.58	0.12	0.90	3.07	1.17	3.06
Reach 1-3	8513	25-YR	1035.50	7097.47	7099.93	7099.32	7100.11	0.007213	204.78	0.48	0.18	0.70	0.18	1.30	3.40	1.51	3.37
Reach 1-3	8513	50-YR	1408.70	7097.47	7100.25	7099.54	7100.48	0.007315	208.96	0.49	0.26	0.86	0.26	1.72	3.80	1.94	3.76
Reach 1-3	8513	100-YR	1665.90	7097.47	7100.46	7099.68	7100.71	0.007365	211.42	0.49	0.30	0.96	0.31	1.95	4.05	2.19	3.99
Reach 1-3	8513	FIS	2600.00	7097.47	7101.07		7101.43	0.007663	218.92	0.52	0.46	1.29	0.48	2.62	4.82	2.90	4.73
Reach 1-3	8363	2-YR	155.10	7096.20	7096.95	7096.95	7097.15	0.024812	111.52	1.01		0.60			3.57		3.57
Reach 1-3	8363	5-YR	480.20	7096.20	7097.38	7097.38	7097.74	0.020708	155.98	1.01		0.90			4.81		4.81
Reach 1-3	8363	10-YR	783.10	7096.20	7097.65	7097.65	7098.14	0.018688	166.89	1.02		1.12			5.65		5.65
Reach 1-3	8363	25-YR	1035.50	7096.20	7097.85	7097.85	7098.44	0.017602	168.72	1.02		1.27			6.19		6.19
Reach 1-3	8363	50-YR	1408.70	7096.20	7098.11	7098.11	7098.84	0.016462	171.17	1.02		1.45			6.84		6.84
Reach 1-3	8363	100-YR	1665.90	7096.20	7098.29	7098.29	7099.09	0.015701	172.78	1.01		1.54			7.20		7.20
Reach 1-3	8363	FIS	2600.00	7096.20	7100.60		7100.91	0.001869	194.05	0.40		0.45	0.08		4.49	1.55	4.47
Reach 1-3	8297	2-YR	155.10	7092.79	7093.44	7093.70	7094.26	0.087486	49.10	1.93		2.39			7.23		7.23
Reach 1-3	8297	5-YR	480.20	7092.79	7093.91	7094.30	7095.24	0.081858	78.27	2.00		3.39			9.24		9.24
Reach 1-3	8297	10-YR	783.10	7092.79	7095.45	7094.69	7095.72	0.003912	94.58	0.52		0.48			4.18		4.18
Reach 1-3	8297	25-YR	1035.50	7092.79	7096.42	7094.98	7096.63	0.001823	106.95	0.38	0.02	0.33	0.03	0.76	3.67	0.90	3.65
Reach 1-3	8297	50-YR	1408.70	7092.79	7097.70	7095.35	7097.87	0.000944	137.71	0.29	0.05	0.24	0.05	1.31	3.37	1.36	3.23
Reach 1-3	8297	100-YR	1665.90	7092.79	7098.48	7095.60	7098.64	0.000704	145.01	0.26	0.07	0.22	0.06	1.72	3.26	1.47	3.10
Reach 1-3	8297	FIS	2600.00	7092.79	7100.65		7100.81	0.000444	166.24	0.22	0.10	0.20	0.06	2.38	3.30	1.71	3.10
Reach 1-3	8182	2-YR	158.20	7089.00	7092.46	7089.82	7092.49	0.000159	79.28	0.12		0.03			1.23		1.23
Reach 1-3	8182	5-YR	521.40	7089.00	7094.15	7090.82	7094.27	0.000459	97.29	0.21		0.15			2.71		2.71

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	8182	10-YR	855.10	7089.00	7095.34	7091.54	7095.54	0.000620	109.50	0.25		0.25			3.62		3.62
Reach 1-3	8182	25-YR	1135.00	7089.00	7096.21	7092.06	7096.49	0.000712	117.88	0.28		0.32			4.22		4.22
Reach 1-3	8182	50-YR	1532.10	7089.00	7097.33	7092.73	7097.71	0.000800	128.73	0.30		0.42			4.93		4.93
Reach 1-3	8182	100-YR	1795.10	7089.00	7098.02	7093.15	7098.46	0.000842	135.43	0.31		0.47			5.34		5.34
Reach 1-3	8182	FIS	2600.00	7089.00	7099.97	7094.31	7100.60	0.000920	154.49	0.34		0.63			6.36		6.36
Reach 1-3	8117		Culvert														
Reach 1-3	7936	2-YR	158.20	7089.00	7090.89		7090.98	0.001435	48.59	0.31		0.16			2.38		2.38
Reach 1-3	7936	5-YR	521.40	7089.00	7091.93		7092.32	0.003723	55.13	0.52		0.63			5.04		5.04
Reach 1-3	7936	10-YR	855.10	7089.00	7092.47		7093.23	0.005660	58.56	0.66		1.14	0.02		6.96	0.43	6.96
Reach 1-3	7936	25-YR	1135.00	7089.00	7092.77		7093.89	0.007556	60.44	0.77		1.65	0.03		8.50	0.69	8.50
Reach 1-3	7936	50-YR	1532.10	7089.00	7093.09	7092.87	7094.83	0.010483	62.44	0.93		2.48	0.07		10.58	1.03	10.57
Reach 1-3	7936	100-YR	1795.10	7089.00	7093.30	7093.30	7095.46	0.012137	63.78	1.00		3.03	0.09		11.78	1.24	11.76
Reach 1-3	7936	FIS	2600.00	7089.00	7094.50	7094.50	7097.26	0.011173	71.31	1.00		3.57	0.16		13.32	1.84	13.28
Reach 1-3	7857	2-YR	158.20	7089.00	7090.60		7090.76	0.005301	46.53	0.55		0.35			3.20		3.20
Reach 1-3	7857	5-YR	521.40	7089.00	7091.58		7091.91	0.006289	69.79	0.64		0.63			4.62		4.62
Reach 1-3	7857	10-YR	855.10	7089.00	7092.11		7092.61	0.006664	74.20	0.69	0.07	0.87	0.07	1.17	5.68	1.16	5.66
Reach 1-3	7857	25-YR	1135.00	7089.00	7092.37		7093.07	0.007974	76.34	0.77	0.15	1.17	0.15	1.85	6.70	1.84	6.66
Reach 1-3	7857	50-YR	1532.10	7089.00	7092.59	7092.44	7093.65	0.010726	78.17	0.90	0.27	1.72	0.27	2.64	8.25	2.62	8.17
Reach 1-3	7857	100-YR	1795.10	7089.00	7092.54	7092.72	7094.05	0.015841	77.72	1.09	0.37	2.49	0.37	3.06	9.89	3.05	9.79
Reach 1-3	7857	FIS	2600.00	7089.00	7092.54	7093.51	7095.71	0.033253	77.71	1.59	0.79	5.22	0.78	4.43	14.32	4.41	14.19
Reach 1-3	7821	2-YR	158.20	7088.99	7090.28	7090.14	7090.49	0.010869	58.79	0.74		0.50			3.62		3.62
Reach 1-3	7821	5-YR	521.40	7088.99	7091.04	7090.92	7091.55	0.013199	71.15	0.89	0.05	1.05		0.78	5.74		5.73
Reach 1-3	7821	10-YR	855.10	7088.99	7091.48	7091.46	7092.20	0.015378	85.58	0.99	0.25	1.42		2.37	6.84		6.82
Reach 1-3	7821	25-YR	1135.00	7088.99	7091.80	7091.80	7092.64	0.014825	96.15	0.99	0.38	1.58		3.15	7.38		7.35
Reach 1-3	7821	50-YR	1532.10	7088.99	7092.17	7092.17	7093.20	0.014081	107.00	1.00	0.51	1.82		3.86	8.18		8.13
Reach 1-3	7821	100-YR	1795.10	7088.99	7092.41	7092.41	7093.54	0.013329	112.81	0.99	0.58	1.92		4.22	8.57		8.50
Reach 1-3	7821	FIS	2600.00	7088.99	7093.05	7093.05	7094.49	0.012244	128.18	0.99	0.73	2.26		4.99	9.66		9.54
Reach 1-3	7710	2-YR	158.20	7086.68	7088.67	7088.67	7088.80	0.022235	205.17	1.00	0.11	0.37	0.39	0.70	2.95	1.58	2.91
Reach 1-3	7710	5-YR	521.40	7086.68	7089.00	7089.00	7089.28	0.033231	208.27	0.98	0.73	1.25	0.99	2.25	4.30	2.75	4.23
Reach 1-3	7710	10-YR	855.10	7086.68	7089.22	7089.22	7089.63	0.035940	210.32	1.00	1.13	1.84	1.34	2.97	5.15	3.33	5.06
Reach 1-3	7710	25-YR	1135.00	7086.68	7089.32	7089.38	7089.88	0.044097	211.64	1.11	1.57	2.54	1.71	3.70	6.05	4.02	5.95
Reach 1-3	7710	50-YR	1532.10	7086.68	7089.39	7089.60	7090.27	0.064490	212.61	1.34	2.48	3.99	2.55	4.78	7.60	5.13	7.46
Reach 1-3	7710	100-YR	1795.10	7086.68	7089.42	7089.73	7090.56	0.081570	212.99	1.51	3.22	5.18	3.25	5.50	8.67	5.87	8.51
Reach 1-3	7710	FIS	2600.00	7086.68	7089.56	7090.10	7091.39	0.112798	215.00	1.79	5.08	8.18	4.79	7.23	10.95	7.52	10.76
Reach 1-3	7658	2-YR	158.20	7086.44	7087.93	7087.64	7087.96	0.003702	255.66	0.34	0.09	0.11	0.03	0.81	1.33	0.40	1.32
Reach 1-3	7658	5-YR	521.40	7086.44	7088.41	7087.96	7088.48	0.005692	258.69	0.39	0.25	0.34	0.13	1.49	2.18	0.96	2.15
Reach 1-3	7658	10-YR	855.10	7086.44	7088.70	7088.16	7088.81	0.006624	260.58	0.43	0.37	0.51	0.21	1.87	2.71	1.28	2.68
Reach 1-3	7658	25-YR	1135.00	7086.44	7088.91	7088.30	7089.06	0.007113	262.16	0.45	0.45	0.65	0.26	2.11	3.07	1.58	3.03
Reach 1-3	7658	50-YR	1532.10	7086.44	7089.17	7088.49	7089.36	0.007637	264.37	0.47	0.55	0.82	0.32	2.51	3.50	1.93	3.46
Reach 1-3	7658	100-YR	1795.10	7086.44	7089.33	7088.62	7089.55	0.007918	265.70	0.48	0.61	0.92	0.36	2.73	3.75	2.12	3.71
Reach 1-3	7658	FIS	2600.00	7086.44	7089.75	7088.93	7090.05	0.008594	268.96	0.52	0.78	1.23	0.50	3.29	4.42	2.64	4.36
Reach 1-3	7619	2-YR	158.20	7085.97	7087.52	7087.52	7087.65	0.026101	265.10	1.11	0.20	0.35	0.28	0.97	2.90	1.23	2.84
Reach 1-3	7619	5-YR	521.40	7085.97	7087.92		7088.08	0.020790	268.65	0.73	0.59	0.80	0.62	2.11	3.25	2.18	3.20
Reach 1-3	7619	10-YR	855.10	7085.97	7088.20		7088.40	0.018291	271.08	0.68	0.75	1.02	0.75	2.54	3.66	2.54	3.60
Reach 1-3	7619	25-YR	1135.00	7085.97	7088.39		7088.63	0.017213	272.82	0.67	0.86	1.17	0.84	2.79	3.97	2.76	3.90
Reach 1-3	7619	50-YR	1532.10	7085.97	7088.64		7088.93	0.016434	275.03	0.66	0.98	1.37	0.95	3.22	4.35	3.09	4.28
Reach 1-3	7619	100-YR	1795.10	7085.97	7088.78		7089.10	0.016137	276.43	0.67	1.06	1.49	1.01	3.45	4.59	3.33	4.51
Reach 1-3	7619	FIS	2600.00	7085.97	7089.18		7089.59	0.015651	280.07	0.67	1.26	1.83	1.19	4.03	5.21	3.91	5.13
Reach 1-3	7565	2-YR	158.20	7085.02	7086.84	7086.70	7086.88	0.007656	263.38	0.52	0.16	0.17	0.08	1.06	1.76	0.65	1.70
Reach 1-3	7565	5-YR	521.40	7085.02	7087.29		7087.39	0.008636	269.62	0.49	0.37	0.44	0.28	1.78	2.49	1.50	2.43
Reach 1-3	7565	10-YR	855.10	7085.02	7087.58		7087.72	0.009144	273.77	0.50	0.49	0.63	0.41	2.22	3.01	1.91	2.92
Reach 1-3	7565	25-YR	1135.00	7085.02	7087.77		7087.94	0.009720	276.75	0.53	0.59	0.78	0.52	2.56	3.39	2.19	3.29
Reach 1-3	7565	50-YR	1532.10	7085.02	7088.01		7088.23	0.010121	280.58	0.54	0.70	0.97	0.63	2.94	3.82	2.50	3.71
Reach 1-3	7565	100-YR	1795.10	7085.02	7088.15		7088.40	0.010389	282.82	0.56	0.77	1.09	0.71	3.16	4.08	2.75	3.97
Reach 1-3	7565	FIS	2600.00	7085.02	7088.54		7088.88	0.010973	288.90	0.58	0.95	1.41	0.90	3.70	4.76	3.36	4.62
Reach 1-3	7538	2-YR	158.20	7084.70	7086.32	7086.32	7086.44	0.029660	260.38	1.05	0.21	0.42	0.38	0.99	2.83	1.48	2.75
Reach 1-3	7538	5-YR	521.40	7084.70	7086.61	7086.61	7086.85	0.038834	264.30	0.98	0.87	1.25	1.04	2.46	4.00	2.78	3.90
Reach 1-3	7538	10-YR	855.10	7084.70	7086.78	7086.78	7087.14	0.043332	266.68	1.03	1.33	1.87	1.50	3.21	4.86	3.48	4.74
Reach 1-3	7538	25-YR	1135.00	7084.70	7086.93	7086.93	7087.35	0.041787	268.68	1.02	1.56	2.19	1.71	3.60	5.28	3.82	5.16
Reach 1-3	7538	50-YR	1532.10	7084.70	7087.11	7087.11	7087.63	0.040934	271.14	1.02	1.85	2.61	1.97	4.08	5.84	4.26	5.69
Reach 1-3	7538	100-YR	1795.10	7084.70	7087.23	7087.23	7087.79	0.039926	272.70	1.01	1.99	2.83	2.10	4.41	6.13	4.58	5.98
Reach 1-3	7538	FIS	2600.00	7084.70	7087.54	7087.54	7088.26	0.037640	277.01	1.01	2.34	3.40	2.43	5.19	6.89	5.32	6.73
Reach 1-3	7515	2-YR	158.20	7081.06	7081.85	7082.58	7084.95	0.294077	23.12	3.58		8.83			14.13		14.13
Reach 1-3	7515	5-YR	521.40	7081.06	7082.58	7083.18	7085.25	0.244725	80.44	3.29		7.53			13.11		13.11
Reach 1-3	7515	10-YR	855.10	7081.06	7082.86	7083.57	7085.60	0.165540	95.33	2.85		6.96			13.27		13.27
Reach 1-3	7515	25-YR	1135.00	7081.06	7083.06	7083.81	7085.90	0.138589	105.62	2.68		6.85			13.53		13.53
Reach 1-3	7515	50-YR	1532.10	7081.06	7083.30	7084.07	7086.28	0.117169	118.61	2.53		6.80			13.85		13.85
Reach 1-3	7515	100-YR	1795.10	7081.06	7083.44	7084.25	7086.48	0.109241	128.39	2.47		6.79			14.00		14.00
Reach 1-3	7515	FIS	2600.00	7081.06	7083.81	7084.83	7087.04	0.090777	151.21	2.32	0.32	6.78		2.08	14.42		14.41
Reach 1-3	7465	2-YR	158.20	7080.86	7082.34	7082.01	7082.42	0.005016	103.63	0.49		0.21			2.27		2.27
Reach 1-3	7465	5-YR	521.40	7080.86	7083.10	7082.60	7083.25	0.007042	160.15	0.52		0.48	0.03		3.08	0.50	3.08
Reach 1-3	7465	10-YR	855.10	7080.86	7083.48	7082.97	7083.69	0.008217	184.57	0.55	0.04	0.71	0.14	0.52	3.66	1.25	3.62
Reach 1-3	7465	25-YR	1135.00	7080.86	7083.71	7083.21	7083.98	0.009142	192.82	0.58	0.11	0.92	0.22	1.02	4.14	1.67	4.06
Reach 1-3	7465	50-YR	1532.10	7080.86	7083.96	7083.48	7084.31	0.010767	205.40	0.62	0.21	1.25	0.31	1.55	4.82	2.05	4.67
Reach 1-3	7465	100-YR	1795.10	7080.86	7084.10	7083.64	7084.51	0.011627	215.80	0.65	0.27	1.45	0.36	1.86	5.20	2.21	5.01
Reach 1-3	7465	FIS	2600.00	7080.86	7084.48	7084.08	7085.05	0.013468	226.31	0.70	0.48	2.00	0.66	2.62	6.16	3.26	5.86
Reach 1-3	7408	2-YR	158.20	7080.55	7081.69	7081.69	7081.92	0.018128	97.24	1.03		0.48			3.81		3.81
Reach 1-3	7408	5-YR	521.40	7080.55	7082.22	7082.22	7082.54	0.026207	203.26	1.02		0.99	0.12	0.32	4.52	0.68	4.49
Reach 1-3	7408	10-YR	855.10	7080.55	7082.47	7082.47	7082.88	0.027976	216.72	0.98	0.24	1.50	0.42	1.49	5.17	1.61	5.03
Reach 1-3	7408	25-YR	1135.00	7080.55	7082.68	7082.65	7083.13	0.026326	224.88	0.93	0.40	1.75	0.61	2.08	5.46	2.25	5.27
Reach 1-3	7408	50-YR	1532.10	7080.55	7083.00	7082.86	7083.46	0.021149	237.65	0.83	0.53	1.83	0.74	2.61	5.54	2.80	5.30
Reach 1-3	7408	100-YR	1795.10	7080.55	7083.18		7083.66	0.019428	245.07	0.80	0.59	1.90	0.80	2.86	5.66	3.05	5.38
Reach 1-3	7408	FIS	2600.00	7080.55	7083.66		7084.19	0.016495	273.82	0.74	0.75	2.10	0.90	3.42	6.03	3.55	5.65
Reach 1-3	7343	2-YR	158.20	7079.61	7080.94	7080.60	7080.98	0.003427	180.07	0.32	0.04	0.13	0.02	0.46	1.46	0.33	1.45
Reach 1-3	7343	5-YR	521.40	7079.61	7081.61	7080.97	7081.69	0.004185	204.96	0.35	0.13	0.34	0.10	1.01	2.28	0.86	2.20
Reach 1-3	7343	10-YR	855.10	7079.61	7082.00	7081.22	7082.12	0.004769	222.58	0.38	0.21	0.50	0.17	1.34	2.82	1.17	2.68
Reach 1-3	7343	25-YR	1135.00	7079.61	7082.25		7082.40	0.005164	231.98	0.40	0.25	0.62	0.23	1.68	3.19	1.53	3.01
Reach 1-3	7343	50-YR	1532.10	7079.61	7082.56		7082.75	0.005608	243.32	0.43	0.31	0.78	0.31	2.03	3.64	1.92	3.40
Reach 1-3	7343	100-YR	1795.10	7079.61	7082.74		7082.96	0.005876	250.59	0.44	0.36	0.89	0.36	2.23	3.90	2.13	3.63
Reach 1-3	7343	FIS	2600.00	7079.61	7083.19		7083.49	0.006578	304.00	0.48	0.50	1.18	0.37	2.76	4.60	2.51	4.19
Reach 1-3	7297	2-YR	158.20	7079.47	7080.78		7080.81	0.003831	190.33	0.33	0.04	0.15	0.07	0.44	1.47	0.69	1.43
Reach 1-3	7297	5-YR	521.40	7079.47	7081.41		7081.49	0.004552	209.40	0.36	0.13	0.35	0.18	1.01	2.30	1.30	2.20
Reach 1-3	7297	10-YR	855.10	7079.47	7081.76		7081.89	0.005297	217.10	0.40	0.20	0.53	0.29	1.47	2.87	1.80	2.73
Reach 1-3	7297	25-YR	1135.00	7079.47	7081.98		7082.15	0.006016	222.15	0.43	0.27	0.68	0.38	1.79	3.30	2.15	3.14
Reach 1-3	7297	50-YR	1532.10	7079.47	7082.25		7082.47	0.006836	255.06	0.47	0.36	0.89	0.34	2.17	3.83	2.39	3.60
Reach 1-3	7297	100-YR	1795.10	7079.47	7082.41		7082.65	0.007289	269.16	0.49	0.41	1.02	0.37	2.39	4.13	2.54	3.85

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	7297	FIS	2600.00	7079.47	7082.81		7083.15	0.008244	299.10	0.53	0.57	1.36	0.51	2.95	4.88	2.98	4.46
Reach 1-3	7257	2-YR	158.20	7079.29	7080.63		7080.66	0.003508	194.13	0.33	0.03	0.13	0.07	0.36	1.46	0.69	1.42
Reach 1-3	7257	5-YR	521.40	7079.29	7081.20		7081.29	0.005145	208.13	0.39	0.12	0.38	0.20	1.07	2.39	1.31	2.30
Reach 1-3	7257	10-YR	855.10	7079.29	7081.52		7081.65	0.006241	309.66	0.43	0.21	0.58	0.13	1.53	3.00	1.40	2.76
Reach 1-3	7257	25-YR	1135.00	7079.29	7081.72		7081.88	0.006765	311.73	0.46	0.26	0.71	0.23	1.81	3.36	1.75	3.05
Reach 1-3	7257	50-YR	1532.10	7079.29	7081.97		7082.17	0.007174	314.30	0.48	0.33	0.87	0.35	2.12	3.76	2.23	3.39
Reach 1-3	7257	100-YR	1795.10	7079.29	7082.11		7082.33	0.007457	315.75	0.49	0.38	0.97	0.43	2.31	4.00	2.52	3.62
Reach 1-3	7257	FIS	2600.00	7079.29	7082.50		7082.79	0.008024	319.63	0.52	0.50	1.23	0.65	2.79	4.60	3.26	4.20
Reach 1-3	7226	2-YR	158.20	7079.29	7080.54		7080.57	0.002956	211.26	0.28	0.02	0.12	0.02	0.34	1.26	0.32	1.25
Reach 1-3	7226	5-YR	521.40	7079.29	7081.09		7081.15	0.004157	313.01	0.34	0.11	0.30	0.09	0.91	2.07	0.94	1.91
Reach 1-3	7226	10-YR	855.10	7079.29	7081.40		7081.49	0.004633	320.60	0.36	0.15	0.43	0.18	1.29	2.51	1.51	2.30
Reach 1-3	7226	25-YR	1135.00	7079.29	7081.60		7081.71	0.005060	322.58	0.38	0.20	0.53	0.26	1.54	2.83	1.89	2.61
Reach 1-3	7226	50-YR	1532.10	7079.29	7081.85		7081.99	0.005457	325.07	0.41	0.25	0.66	0.36	1.82	3.19	2.34	2.97
Reach 1-3	7226	100-YR	1795.10	7079.29	7081.98		7082.15	0.005768	326.46	0.42	0.29	0.74	0.43	1.99	3.43	2.60	3.20
Reach 1-3	7226	FIS	2600.00	7079.29	7082.36		7082.59	0.006417	330.27	0.45	0.39	0.98	0.62	2.44	4.02	3.28	3.79
Reach 1-3	7146	2-YR	158.20	7078.94	7079.91	7079.91	7080.05	0.022142	217.72	1.04		0.35	0.02		2.95	0.18	2.95
Reach 1-3	7146	5-YR	521.40	7078.94	7080.23	7080.23	7080.45	0.032166	310.12	0.94	0.27	1.02	0.47	1.15	3.81	1.69	3.64
Reach 1-3	7146	10-YR	855.10	7078.94	7080.39	7080.39	7080.71	0.038125	317.10	1.00	0.51	1.59	0.86	1.72	4.63	2.56	4.41
Reach 1-3	7146	25-YR	1135.00	7078.94	7080.52	7080.52	7080.90	0.038027	323.02	0.99	0.66	1.90	1.09	2.06	5.04	3.07	4.80
Reach 1-3	7146	50-YR	1532.10	7078.94	7080.69	7080.69	7081.14	0.037476	330.48	0.99	0.85	2.26	1.34	2.52	5.52	3.62	5.26
Reach 1-3	7146	100-YR	1795.10	7078.94	7080.79	7080.79	7081.29	0.037425	334.80	0.99	0.97	2.49	1.50	2.89	5.81	3.93	5.54
Reach 1-3	7146	FIS	2600.00	7078.94	7081.08	7081.08	7081.69	0.035284	340.80	0.98	1.24	2.98	1.96	3.66	6.46	4.72	6.17
Reach 1-3	7132	2-YR	158.20	7077.39	7078.15	7078.37	7079.20	0.309323	117.53	3.20		3.99			8.25		8.25
Reach 1-3	7132	5-YR	521.40	7077.39	7078.48	7078.80	7079.61	0.117851	138.68	2.25		3.29	0.52		8.52	2.74	8.51
Reach 1-3	7132	10-YR	855.10	7077.39	7078.74	7079.11	7079.93	0.070440	152.98	1.87	0.43	3.04	0.87	2.39	8.80	4.18	8.70
Reach 1-3	7132	25-YR	1135.00	7077.39	7078.92	7079.33	7080.19	0.054732	166.82	1.71	0.57	3.00	0.99	3.02	9.10	4.77	8.86
Reach 1-3	7132	50-YR	1532.10	7077.39	7079.16	7079.67	7080.50	0.042503	186.40	1.57	0.76	2.97	0.97	3.83	9.42	4.90	8.98
Reach 1-3	7132	100-YR	1795.10	7077.39	7079.31	7079.79	7080.68	0.037481	208.62	1.51	0.98	2.95	0.51	4.68	9.60	4.72	9.05
Reach 1-3	7132	FIS	2600.00	7077.39	7079.64	7080.10	7081.13	0.031290	316.92	1.43	1.37	3.12	0.57	6.16	10.26	3.62	8.95
Reach 1-3	7061	2-YR	158.20	7075.43	7076.35	7076.28	7076.48	0.014502	117.80	0.76	0.16	0.42		0.95	2.93	0.06	2.92
Reach 1-3	7061	5-YR	521.40	7075.43	7076.95	7076.73	7077.22	0.011842	132.04	0.70	0.35	0.79	0.23	1.63	4.13	1.23	4.00
Reach 1-3	7061	10-YR	855.10	7075.43	7077.35	7077.07	7077.71	0.011175	141.52	0.71	0.45	1.02	0.35	2.20	4.86	1.91	4.64
Reach 1-3	7061	25-YR	1135.00	7075.43	7077.62	7077.31	7078.05	0.010975	148.40	0.72	0.53	1.19	0.44	2.55	5.36	2.29	5.06
Reach 1-3	7061	50-YR	1532.10	7075.43	7077.95	7077.62	7078.48	0.010996	157.61	0.73	0.63	1.42	0.53	2.96	5.99	2.70	5.58
Reach 1-3	7061	100-YR	1795.10	7075.43	7078.14	7077.80	7078.73	0.011214	161.68	0.75	0.71	1.58	0.62	3.20	6.39	2.97	5.91
Reach 1-3	7061	FIS	2600.00	7075.43	7078.57	7078.32	7079.40	0.012597	171.87	0.81	0.91	2.11	0.90	3.84	7.58	3.74	6.92
Reach 1-3	7017	2-YR	158.20	7074.87	7075.86		7075.94	0.009748	118.61	0.52	0.19	0.37		1.14	2.31		2.27
Reach 1-3	7017	5-YR	521.40	7074.87	7076.47		7076.68	0.011800	150.59	0.60	0.49	0.89	0.18	2.06	3.71	1.05	3.60
Reach 1-3	7017	10-YR	855.10	7074.87	7076.88		7077.18	0.012012	172.07	0.62	0.68	1.21	0.33	2.66	4.46	1.84	4.30
Reach 1-3	7017	25-YR	1135.00	7074.87	7077.14		7077.52	0.012876	184.82	0.65	0.83	1.50	0.46	3.16	5.06	2.32	4.86
Reach 1-3	7017	50-YR	1532.10	7074.87	7077.41	7077.02	7077.92	0.014731	199.85	0.71	1.08	1.97	0.13	3.78	5.89	2.35	5.59
Reach 1-3	7017	100-YR	1795.10	7074.87	7077.57	7077.20	7078.16	0.015500	215.54	0.73	1.22	2.23	0.25	4.11	6.33	2.03	5.84
Reach 1-3	7017	FIS	2600.00	7074.87	7077.93	7077.92	7078.73	0.018437	265.52	0.82	1.65	3.06	0.52	5.00	7.56	2.78	6.62
Reach 1-3	6920	2-YR	158.20	7073.11	7074.14	7074.14	7074.33	0.034149	137.79	1.04	0.14	0.72	0.04	0.75	3.43	0.30	3.42
Reach 1-3	6920	5-YR	521.40	7073.11	7074.63	7074.57	7074.95	0.028894	150.58	0.89	0.56	1.48	0.47	1.92	4.59	1.71	4.49
Reach 1-3	6920	10-YR	855.10	7073.11	7074.89	7074.87	7075.37	0.032025	168.05	0.95	0.88	2.17	0.52	2.56	5.63	2.11	5.42
Reach 1-3	6920	25-YR	1135.00	7073.11	7075.11	7075.11	7075.67	0.030756	184.76	0.95	1.05	2.50	0.64	2.90	6.14	2.42	5.80
Reach 1-3	6920	50-YR	1532.10	7073.11	7075.39	7075.39	7076.03	0.027734	207.40	0.92	1.20	2.75	0.79	3.40	6.57	3.04	6.08
Reach 1-3	6920	100-YR	1795.10	7073.11	7075.55	7075.55	7076.23	0.027144	219.31	0.92	1.31	2.95	0.90	3.75	6.88	3.36	6.30
Reach 1-3	6920	FIS	2600.00	7073.11	7075.99	7075.99	7076.77	0.024029	247.76	0.89	1.50	3.28	1.18	4.42	7.45	4.11	6.68
Reach 1-3	6811	2-YR	158.20	7070.33	7071.27	7071.22	7071.40	0.020920	150.95	0.85	0.09	0.48	0.13	0.60	2.90	0.76	2.89
Reach 1-3	6811	5-YR	521.40	7070.33	7071.71	7071.63	7072.00	0.025153	154.90	0.85	0.44	1.26	0.49	1.69	4.33	1.81	4.29
Reach 1-3	6811	10-YR	855.10	7070.33	7072.05		7072.43	0.022624	157.97	0.82	0.63	1.61	0.68	2.18	4.96	2.28	4.90
Reach 1-3	6811	25-YR	1135.00	7070.33	7072.30	7072.11	7072.74	0.021324	160.20	0.81	0.76	1.85	0.80	2.48	5.39	2.57	5.31
Reach 1-3	6811	50-YR	1532.10	7070.33	7072.61	7072.38	7073.14	0.019983	163.07	0.80	0.90	2.12	0.94	2.81	5.90	3.20	5.79
Reach 1-3	6811	100-YR	1795.10	7070.33	7072.80	7072.53	7073.39	0.019400	164.73	0.79	0.99	2.29	1.02	3.13	6.20	3.50	6.07
Reach 1-3	6811	FIS	2600.00	7070.33	7073.32	7072.99	7074.06	0.018056	169.24	0.79	1.23	2.72	1.24	3.96	6.95	4.19	6.79
Reach 1-3	6718	2-YR	158.20	7068.08	7068.98	7068.98	7069.16	0.027894	127.88	0.99	0.21	0.64	0.26	1.02	3.42	1.16	3.40
Reach 1-3	6718	5-YR	521.40	7068.08	7069.55	7069.42	7069.84	0.021620	134.42	0.80	0.54	1.26	0.58	1.97	4.40	2.08	4.32
Reach 1-3	6718	10-YR	855.10	7068.08	7069.85	7069.73	7070.30	0.023553	138.70	0.85	0.78	1.83	0.81	2.70	5.38	2.87	5.25
Reach 1-3	6718	25-YR	1135.00	7068.08	7070.07	7069.96	7070.62	0.024445	142.11	0.88	0.95	2.23	0.98	3.25	6.02	3.39	5.87
Reach 1-3	6718	50-YR	1532.10	7068.08	7070.34	7070.26	7071.04	0.025665	146.25	0.91	1.19	2.77	1.21	3.86	6.82	3.98	6.61
Reach 1-3	6718	100-YR	1795.10	7068.08	7070.50	7070.44	7071.29	0.026229	148.61	0.93	1.35	3.09	1.36	4.21	7.27	4.32	7.03
Reach 1-3	6718	FIS	2600.00	7068.08	7070.93	7070.92	7071.99	0.027510	153.20	0.98	1.78	3.97	1.90	5.12	8.45	5.32	8.13
Reach 1-3	6635	2-YR	158.20	7066.46	7067.43	7067.26	7067.55	0.013800	98.41	0.66		0.49	0.20		2.84	1.11	2.83
Reach 1-3	6635	5-YR	521.40	7066.46	7068.04		7068.29	0.016033	156.29	0.77		0.84	0.53		4.02	2.05	4.00
Reach 1-3	6635	10-YR	855.10	7066.46	7068.43		7068.73	0.014868	175.47	0.72	0.14	1.06	0.66	0.87	4.37	2.41	4.33
Reach 1-3	6635	25-YR	1135.00	7066.46	7068.70		7069.04	0.014342	178.10	0.70	0.26	1.26	0.74	1.29	4.70	2.71	4.64
Reach 1-3	6635	50-YR	1532.10	7066.46	7069.03		7069.43	0.013725	181.39	0.68	0.40	1.50	0.82	1.74	5.11	3.17	5.03
Reach 1-3	6635	100-YR	1795.10	7066.46	7069.23		7069.67	0.013521	183.19	0.68	0.48	1.64	0.87	2.02	5.36	3.40	5.28
Reach 1-3	6635	FIS	2600.00	7066.46	7069.75		7070.31	0.013262	186.84	0.68	0.76	2.04	1.06	2.95	6.07	3.99	5.96
Reach 1-3	6566	2-YR	158.20	7065.33	7066.43	7066.38	7066.58	0.014685	132.11	0.85		0.37	0.19		3.07	1.40	3.04
Reach 1-3	6566	5-YR	521.40	7065.33	7067.01	7066.80	7067.23	0.014710	158.57	0.69	0.21	0.84	0.45	1.11	3.78	2.50	3.72
Reach 1-3	6566	10-YR	855.10	7065.33	7067.31	7067.09	7067.63	0.016794	162.71	0.74	0.40	1.28	0.68	1.68	4.62	3.19	4.53
Reach 1-3	6566	25-YR	1135.00	7065.33	7067.52	7067.29	7067.93	0.017854	165.65	0.76	0.54	1.60	0.84	2.04	5.18	3.64	5.07
Reach 1-3	6566	50-YR	1532.10	7065.33	7067.78	7067.55	7068.30	0.019338	168.98	0.80	0.72	2.04	1.07	2.49	5.89	4.23	5.76
Reach 1-3	6566	100-YR	1795.10	7065.33	7067.94	7067.73	7068.53	0.019804	172.00	0.81	0.78	2.28	1.16	2.86	6.28	4.46	6.12
Reach 1-3	6566	FIS	2600.00	7065.33	7068.38	7068.17	7069.16	0.020428	181.28	0.84	1.01	2.92	1.40	3.64	7.23	5.01	6.99
Reach 1-3	6504	2-YR	158.20	7064.33	7065.16	7065.16	7065.33	0.029395	144.58	1.03	0.12	0.60	0.05	0.67	3.36	0.40	3.36
Reach 1-3	6504	5-YR	521.40	7064.33	7065.60	7065.57	7065.94	0.031288	151.29	0.95	0.54	1.50	0.48	1.86	4.71	1.73	4.65
Reach 1-3	6504	10-YR	855.10	7064.33	7065.96	7065.86	7066.37	0.025366	156.80	0.86	0.72	1.78	0.68	2.33	5.21	2.23	5.10
Reach 1-3	6504	25-YR	1135.00	7064.33	7066.22		7066.69	0.022689	161.61	0.83	0.82	1.97	0.75	2.84	5.56	2.75	5.42
Reach 1-3	6504	50-YR	1532.10	7064.33	7066.55		7067.09	0.020370	167.93	0.80	0.95	2.19	0.85	3.35	5.98	3.23	5.81
Reach 1-3	6504	100-YR	1795.10	7064.33	7066.75		7067.34	0.019331	171.71	0.79	1.02	2.31	0.92	3.61	6.23	3.48	6.03
Reach 1-3	6504	FIS	2600.00	7064.33	7067.30		7068.00	0.017204	181.91	0.77	1.21	2.65	1.10	4.23	6.87	4.09	6.59
Reach 1-3	6419	2-YR	158.20	7062.55	7063.89	7063.63	7063.97	0.006765	122.58	0.54		0.24			2.29		2.29
Reach 1-3	6419	5-YR	521.40	7062.55	7064.57		7064.72	0.007678	152.14	0.51	0.15	0.55	0.12	1.01	3.08	0.87	3.06
Reach 1-3	6419	10-YR	855.10	7062.55	7064.99		7065.20	0.008038	155.98	0.52	0.25	0.78	0.21	1.56	3.68	1.41	3.65
Reach 1-3	6419	25-YR	1135.00	7062.55	7065.28		7065.54	0.008304	159.29	0.53	0.32	0.96	0.27	1.95	4.11	1.76	4.05
Reach 1-3	6419	50-YR	1532.10	7062.55	7065.64		7065.96	0.008569	163.23	0.55	0.42	1.18	0.36	2.38	4.62	2.19	4.53
Reach 1-3	6419	100-YR	1795.10	7062.55	7065.85		7066.22	0.008730	165.22	0.56	0.49	1.32	0.43	2.63	4.91	2.45	4.82
Reach 1-3	6419	FIS	2600.00	7062.55	7066.42		7066.91	0.009118	170.57	0.58	0.68	1.70	0.62	3.29	5.70	3.13	5.56
Reach 1-3	6365	2-YR	158.20	7062.43	7063.51		7063.58	0.007790	144.19	0.48	0.12	0.28	0.09	0.85	2.06	0.68	2.02
Reach 1-3	6365	5-YR	521.40	7062.43	7064.13		7064.28	0.008717	154.70	0.51	0.30	0.65	0.35	1.72	3.16	1.81	3.05
Reach 1-3	6365	10-YR	855.10	7062.43	7064.53		7064.74	0.009043	159.44	0.53	0.43	0.90	0.52	2.28	3.81	2.44	3.66
Reach 1-3	6365	25-YR	1135.00	7062.43	7064.79		7065.06	0.009522	162.58	0.56	0.53	1.10	0.66	2.66	4.29	2.85	4.11

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	6365	50-YR	1532.10	7062.43	7065.13		7065.47	0.009825	166.61	0.58	0.65	1.34	0.81	3.08	4.83	3.33	4.62
Reach 1-3	6365	100-YR	1795.10	7062.43	7065.32		7065.71	0.010032	168.97	0.59	0.73	1.49	0.91	3.33	5.15	3.60	4.92
Reach 1-3	6365	FIS	2600.00	7062.43	7065.86		7066.38	0.010445	175.38	0.62	0.93	1.91	1.16	3.96	5.97	4.28	5.69
Reach 1-3	6296	2-YR	158.20	7061.66	7062.35	7062.35	7062.52	0.040832	138.92	1.03	0.86	0.87	0.28	2.43	3.40	1.16	3.37
Reach 1-3	6296	5-YR	521.40	7061.66	7062.77	7062.77	7063.15	0.039956	143.50	1.01	1.40	1.89	0.79	3.37	4.99	2.30	4.90
Reach 1-3	6296	10-YR	855.10	7061.66	7063.07	7063.06	7063.58	0.037252	146.64	1.00	1.68	2.46	1.08	3.84	5.84	2.86	5.72
Reach 1-3	6296	25-YR	1135.00	7061.66	7063.30	7063.28	7063.91	0.034325	149.09	0.98	1.80	2.76	1.24	4.09	6.33	3.18	6.17
Reach 1-3	6296	50-YR	1532.10	7061.66	7063.59	7063.55	7064.31	0.031606	152.21	0.97	1.96	3.13	1.43	4.38	6.91	3.55	6.70
Reach 1-3	6296	100-YR	1795.10	7061.66	7063.77	7063.74	7064.56	0.030340	154.57	0.96	2.00	3.34	1.52	4.69	7.24	3.91	7.01
Reach 1-3	6296	FIS	2600.00	7061.66	7064.26	7064.21	7065.24	0.027752	161.51	0.95	2.13	3.90	1.76	5.45	8.09	4.80	7.81
Reach 1-3	6216	2-YR	158.20	7059.73	7060.79	7060.63	7060.88	0.010609	135.26	0.58	0.11	0.34	0.05	0.79	2.36	0.45	2.34
Reach 1-3	6216	5-YR	521.40	7059.73	7061.44	7061.06	7061.61	0.010054	145.99	0.55	0.31	0.73	0.25	1.55	3.36	1.35	3.29
Reach 1-3	6216	10-YR	855.10	7059.73	7061.84		7062.09	0.010241	152.84	0.57	0.44	1.00	0.38	2.18	4.03	1.96	3.91
Reach 1-3	6216	25-YR	1135.00	7059.73	7062.12		7062.42	0.010423	157.16	0.58	0.54	1.20	0.49	2.58	4.48	2.39	4.33
Reach 1-3	6216	50-YR	1532.10	7059.73	7062.46		7062.84	0.010722	162.09	0.60	0.67	1.46	0.63	3.03	5.04	2.87	4.84
Reach 1-3	6216	100-YR	1795.10	7059.73	7062.66		7063.09	0.010906	165.00	0.61	0.75	1.62	0.71	3.29	5.37	3.15	5.14
Reach 1-3	6216	FIS	2600.00	7059.73	7063.19		7063.76	0.011442	172.70	0.64	0.97	2.07	0.95	3.96	6.23	3.86	5.93
Reach 1-3	6141	2-YR	158.20	7059.25	7060.33		7060.37	0.004422	178.77	0.34	0.11	0.17	0.04	0.90	1.51	0.42	1.49
Reach 1-3	6141	5-YR	521.40	7059.25	7060.97		7061.06	0.005200	186.33	0.38	0.23	0.40	0.14	1.54	2.39	1.03	2.35
Reach 1-3	6141	10-YR	855.10	7059.25	7061.36		7061.49	0.005664	191.47	0.41	0.32	0.58	0.21	2.01	2.94	1.45	2.89
Reach 1-3	6141	25-YR	1135.00	7059.25	7061.64		7061.80	0.005950	195.63	0.42	0.39	0.71	0.26	2.31	3.32	1.77	3.25
Reach 1-3	6141	50-YR	1532.10	7059.25	7061.97		7062.18	0.006332	200.63	0.45	0.48	0.88	0.33	2.67	3.79	2.12	3.69
Reach 1-3	6141	100-YR	1795.10	7059.25	7062.17		7062.41	0.006514	203.63	0.46	0.53	0.99	0.37	2.87	4.05	2.32	3.95
Reach 1-3	6141	FIS	2600.00	7059.25	7062.69		7063.03	0.006987	212.12	0.49	0.68	1.29	0.49	3.41	4.76	2.83	4.61
Reach 1-3	6050	2-YR	158.20	7058.55	7059.55		7059.66	0.016406	166.28	0.78	0.33	0.37		1.48	2.67		2.64
Reach 1-3	6050	5-YR	521.40	7058.55	7060.02		7060.24	0.018817	180.80	0.74	0.64	0.93		2.28	3.74		3.70
Reach 1-3	6050	10-YR	855.10	7058.55	7060.32		7060.62	0.019564	190.00	0.76	0.84	1.28		2.71	4.42		4.37
Reach 1-3	6050	25-YR	1135.00	7058.55	7060.52		7060.89	0.020179	196.38	0.78	0.99	1.53		3.01	4.89		4.83
Reach 1-3	6050	50-YR	1532.10	7058.55	7060.76		7061.22	0.020805	204.23	0.80	1.17	1.89	0.14	3.60	5.48	1.02	5.40
Reach 1-3	6050	100-YR	1795.10	7058.55	7060.91		7061.43	0.021196	208.85	0.81	1.29	2.11	0.24	3.91	5.83	1.47	5.73
Reach 1-3	6050	FIS	2600.00	7058.55	7061.29	7061.09	7061.98	0.022075	216.69	0.84	1.59	2.73	0.60	4.67	6.75	2.74	6.59
Reach 1-3	6021	2-YR	158.20	7057.81	7058.88	7058.88	7059.13	0.019820	175.75	1.00		0.60			3.95		3.95
Reach 1-3	6021	5-YR	521.40	7057.81	7059.45		7059.67	0.019464	208.29	0.82	0.45	0.82		1.77	3.83		3.77
Reach 1-3	6021	10-YR	855.10	7057.81	7059.73		7060.02	0.020481	218.44	0.80	0.72	1.19		2.41	4.38		4.31
Reach 1-3	6021	25-YR	1135.00	7057.81	7059.92		7060.27	0.021008	225.60	0.81	0.90	1.43		2.79	4.78		4.70
Reach 1-3	6021	50-YR	1532.10	7057.81	7060.14		7060.58	0.022125	232.11	0.83	1.13	1.80	0.09	3.23	5.35	0.46	5.26
Reach 1-3	6021	100-YR	1795.10	7057.81	7060.27	7060.11	7060.77	0.022888	235.96	0.84	1.28	2.04	0.18	3.53	5.71	0.72	5.59
Reach 1-3	6021	FIS	2600.00	7057.81	7060.58	7060.48	7061.27	0.025706	245.43	0.90	1.74	2.79	0.46	4.46	6.73	1.29	6.56
Reach 1-3	5968	2-YR	158.20	7056.91	7058.35	7058.10	7058.41	0.007068	276.18	0.45	0.19	0.27		1.20	1.96		1.92
Reach 1-3	5968	5-YR	521.40	7056.91	7058.81		7058.92	0.009965	315.00	0.59	0.46	0.39		2.02	2.64		2.60
Reach 1-3	5968	10-YR	855.10	7056.91	7059.07	7058.77	7059.21	0.010653	335.15	0.58	0.59	0.57		2.35	3.02		2.99
Reach 1-3	5968	25-YR	1135.00	7056.91	7059.25		7059.42	0.011339	347.83	0.59	0.69	0.70		2.59	3.33		3.30
Reach 1-3	5968	50-YR	1532.10	7056.91	7059.45		7059.66	0.012226	362.87	0.61	0.83	0.88		2.89	3.72		3.68
Reach 1-3	5968	100-YR	1795.10	7056.91	7059.57		7059.81	0.012484	368.99	0.62	0.90	0.98	0.02	3.06	3.93	0.24	3.89
Reach 1-3	5968	FIS	2600.00	7056.91	7059.89		7060.21	0.013168	373.60	0.64	1.09	1.30	0.15	3.64	4.53	0.92	4.48
Reach 1-3	5887	2-YR	158.20	7054.68	7057.48	7057.43	7057.54	0.019508	423.23	0.72		0.25			1.85		1.85
Reach 1-3	5887	5-YR	521.40	7054.68	7057.79	7057.63	7057.88	0.017029	435.19	0.59		0.53			2.38	0.11	2.38
Reach 1-3	5887	10-YR	855.10	7054.68	7057.97	7057.78	7058.10	0.018489	436.92	0.62	0.05	0.78	0.11	0.43	2.90	0.68	2.90
Reach 1-3	5887	25-YR	1135.00	7054.68	7058.09	7057.87	7058.26	0.018866	438.13	0.64	0.13	0.95	0.18	0.77	3.24	0.98	3.24
Reach 1-3	5887	50-YR	1532.10	7054.68	7058.26	7058.01	7058.46	0.018811	439.70	0.65	0.22	1.14	0.28	1.12	3.62	1.30	3.62
Reach 1-3	5887	100-YR	1795.10	7054.68	7058.36	7058.09	7058.59	0.019017	440.61	0.66	0.28	1.27	0.34	1.30	3.86	1.48	3.85
Reach 1-3	5887	FIS	2600.00	7054.68	7058.62	7058.32	7058.93	0.019618	443.08	0.69	0.44	1.62	0.51	1.77	4.48	1.92	4.47
Reach 1-3	5818	2-YR	158.20	7054.00	7055.58	7055.58	7055.69	0.036618	307.04	1.00		0.52			2.69		2.69
Reach 1-3	5818	5-YR	521.40	7054.00	7055.87	7055.85	7056.07	0.042247	377.32	0.94		1.22	0.16		3.62	1.06	3.62
Reach 1-3	5818	10-YR	855.10	7054.00	7056.08	7056.02	7056.33	0.034816	392.47	0.88		1.42	0.36		4.05	1.85	4.04
Reach 1-3	5818	25-YR	1135.00	7054.00	7056.23	7056.15	7056.52	0.032396	403.00	0.87	0.06	1.58	0.48	0.43	4.37	2.27	4.37
Reach 1-3	5818	50-YR	1532.10	7054.00	7056.40	7056.32	7056.76	0.031013	409.18	0.87	0.10	1.84	0.62	0.63	4.80	2.73	4.75
Reach 1-3	5818	100-YR	1795.10	7054.00	7056.51	7056.43	7056.90	0.030275	410.08	0.87	0.29	1.99	0.70	1.26	5.04	2.97	4.92
Reach 1-3	5818	FIS	2600.00	7054.00	7056.79	7056.70	7057.27	0.028382	412.55	0.86	0.76	2.36	0.90	2.40	5.63	3.90	5.41
Reach 1-3	5765	2-YR	158.20	7053.34	7054.29	7054.18	7054.36	0.013955	243.34	0.64		0.30			2.13		2.13
Reach 1-3	5765	5-YR	521.40	7053.34	7054.78		7054.89	0.012868	315.58	0.57		0.56			2.68		2.68
Reach 1-3	5765	10-YR	855.10	7053.34	7055.07		7055.22	0.013164	362.35	0.57		0.72			3.05		3.05
Reach 1-3	5765	25-YR	1135.00	7053.34	7055.25		7055.42	0.013275	370.67	0.58	0.06	0.86	0.04	0.69	3.35	0.54	3.32
Reach 1-3	5765	50-YR	1532.10	7053.34	7055.46		7055.67	0.013234	373.51	0.59	0.23	1.03	0.13	1.64	3.71	1.10	3.65
Reach 1-3	5765	100-YR	1795.10	7053.34	7055.59		7055.82	0.013138	374.91	0.59	0.33	1.13	0.19	2.07	3.91	1.45	3.84
Reach 1-3	5765	FIS	2600.00	7053.34	7055.94		7056.24	0.012696	378.00	0.59	0.58	1.37	0.37	3.03	4.41	2.24	4.33
Reach 1-3	5711	2-YR	158.20	7051.82	7053.19	7053.19	7053.31	0.028725	226.90	0.99		0.46	0.35		2.83	1.41	2.76
Reach 1-3	5711	5-YR	521.40	7051.82	7053.49	7053.49	7053.75	0.040226	241.30	1.01		1.33	1.15		4.17	2.95	4.10
Reach 1-3	5711	10-YR	855.10	7051.82	7053.71	7053.71	7054.05	0.039780	284.17	1.03		1.60	1.65		4.70	3.76	4.65
Reach 1-3	5711	25-YR	1135.00	7051.82	7053.85	7053.85	7054.25	0.039602	289.69	1.02		1.91	1.95		5.10	4.22	5.05
Reach 1-3	5711	50-YR	1532.10	7051.82	7054.03	7054.03	7054.51	0.039511	296.76	1.02		2.29	2.29		5.59	4.79	5.54
Reach 1-3	5711	100-YR	1795.10	7051.82	7054.14	7054.14	7054.67	0.038861	300.78	1.01	0.13	2.52	2.46	0.90	5.86	5.09	5.81
Reach 1-3	5711	FIS	2600.00	7051.82	7054.43	7054.43	7055.10	0.037865	305.02	1.01	0.58	3.14	2.91	2.51	6.62	5.83	6.56
Reach 1-3	5647	2-YR	158.20	7049.13	7050.61	7050.29	7050.66	0.004105	171.35	0.42		0.14			1.74		1.74
Reach 1-3	5647	5-YR	521.40	7049.13	7051.25	7050.74	7051.34	0.005102	217.24	0.41	0.07	0.34	0.02	0.85	2.39	0.38	2.37
Reach 1-3	5647	10-YR	855.10	7049.13	7051.62	7051.00	7051.75	0.005545	232.55	0.42	0.15	0.49	0.09	1.39	2.87	0.99	2.82
Reach 1-3	5647	25-YR	1135.00	7049.13	7051.87	7051.17	7052.03	0.005804	244.51	0.44	0.21	0.61	0.12	1.74	3.21	1.23	3.12
Reach 1-3	5647	50-YR	1532.10	7049.13	7052.19	7051.39	7052.38	0.006020	261.17	0.45	0.29	0.75	0.17	2.14	3.59	1.53	3.46
Reach 1-3	5647	100-YR	1795.10	7049.13	7052.37	7051.53	7052.59	0.006114	270.84	0.45	0.35	0.83	0.20	2.41	3.81	1.70	3.65
Reach 1-3	5647	FIS	2600.00	7049.13	7052.84	7051.91	7053.12	0.006487	286.09	0.48	0.50	1.07	0.34	3.06	4.40	2.39	4.18
Reach 1-3	5574	2-YR	158.20	7048.97	7049.84	7049.84	7050.02	0.028218	124.43	1.00		0.65	0.09		3.46	0.56	3.46
Reach 1-3	5574	5-YR	521.40	7048.97	7050.23	7050.23	7050.54	0.034910	203.15	1.03	0.30	1.29	0.53	1.24	4.47	1.81	4.44
Reach 1-3	5574	10-YR	855.10	7048.97	7050.47	7050.47	7050.89	0.035709	206.92	1.01	0.57	1.84	0.81	1.89	5.21	2.38	5.15
Reach 1-3	5574	25-YR	1135.00	7048.97	7050.64	7050.64	7051.14	0.035486	209.66	1.01	0.76	2.21	0.99	2.28	5.70	2.73	5.62
Reach 1-3	5574	50-YR	1532.10	7048.97	7050.86	7050.86	7051.47	0.034977	214.20	1.00	0.98	2.66	1.12	2.72	6.29	2.97	6.17
Reach 1-3	5574	100-YR	1795.10	7048.97	7051.00	7051.00	7051.67	0.034164	224.33	1.00	1.11	2.89	0.84	2.95	6.61	2.45	6.44
Reach 1-3	5574	FIS	2600.00	7048.97	7051.43	7051.43	7052.20	0.029144	253.64	0.94	1.32	3.24	0.89	3.62	7.16	2.63	6.82
Reach 1-3	5488	2-YR	158.20	7046.31	7047.69	7047.41	7047.78	0.006229	107.77	0.54		0.24			2.39		2.39
Reach 1-3	5488	5-YR	521.40	7046.31	7048.51	7048.00	7048.64	0.006359	156.22	0.48		0.46	0.04		2.94	0.46	2.94
Reach 1-3	5488	10-YR	855.10	7046.31	7048.96	7048.32	7049.14	0.006499	169.72	0.48	0.04	0.63	0.14	0.59	3.41	0.97	3.39
Reach 1-3	5488	25-YR	1135.00	7046.31	7049.27	7048.54	7049.49	0.006579	174.54	0.49	0.11	0.76	0.21	1.09	3.76	1.29	3.71
Reach 1-3	5488	50-YR	1532.10	7046.31	7049.65	7048.82	7049.92	0.006700	179.11	0.49	0.19	0.94	0.32	1.58	4.19	1.80	4.11
Reach 1-3	5488	100-YR	1795.10	7046.31	7049.87	7048.98	7050.18	0.006783	181.80	0.50	0.23	1.04	0.38	1.84	4.44	2.08	4.35
Reach 1-3	5488	FIS	2600.00	7046.31	7050.46	7049.42	7050.86	0.007054	189.59	0.52	0.37	1.34	0.53	2.48	5.13	2.73	4.98
Reach 1-3	5424	2-YR	158.20	7045.98	7047.34		7047.40	0.005428	122.34	0.47		0.21	0.01		2.09	0.18	2.09
Reach 1-3	5424	5-YR	521.40	7045.98	7048.15		7048.27	0.005258	164.49	0.43	0.02	0.41	0.14	0.32	2.70	1.03	2.67

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	5424	10-YR	855.10	7045.98	7048.58		7048.75	0.005718	171.31	0.44	0.10	0.60	0.23	0.81	3.26	1.41	3.19
Reach 1-3	5424	25-YR	1135.00	7045.98	7048.88		7049.08	0.006023	174.77	0.46	0.16	0.74	0.32	1.10	3.65	1.72	3.55
Reach 1-3	5424	50-YR	1532.10	7045.98	7049.24		7049.50	0.006377	178.93	0.48	0.24	0.92	0.43	1.43	4.13	2.16	4.00
Reach 1-3	5424	100-YR	1795.10	7045.98	7049.45		7049.75	0.006576	181.33	0.49	0.30	1.04	0.49	1.61	4.41	2.43	4.26
Reach 1-3	5424	FIS	2600.00	7045.98	7050.01		7050.41	0.007158	187.65	0.52	0.44	1.38	0.68	2.09	5.17	3.09	4.97
Reach 1-3	5360	2-YR	158.20	7045.68	7046.89		7046.99	0.007650	96.41	0.55		0.32	0.20		2.54	1.19	2.50
Reach 1-3	5360	5-YR	521.40	7045.68	7047.62		7047.81	0.009870	171.28	0.63		0.61	0.21		3.53	1.19	3.40
Reach 1-3	5360	10-YR	855.10	7045.68	7048.02		7048.26	0.009881	182.84	0.60	0.12	0.85	0.39	0.82	4.00	1.82	3.79
Reach 1-3	5360	25-YR	1135.00	7045.68	7048.30		7048.58	0.009720	184.52	0.59	0.20	1.01	0.54	1.16	4.32	2.30	4.09
Reach 1-3	5360	50-YR	1532.10	7045.68	7048.63		7048.97	0.009876	186.90	0.60	0.30	1.23	0.74	1.53	4.78	2.84	4.52
Reach 1-3	5360	100-YR	1795.10	7045.68	7048.82		7049.20	0.010087	188.27	0.61	0.37	1.37	0.86	1.85	5.07	3.14	4.80
Reach 1-3	5360	FIS	2600.00	7045.68	7049.26		7049.79	0.011439	191.42	0.65	0.57	1.87	1.25	2.64	5.99	3.99	5.67
Reach 1-3	5284	2-YR	158.20	7045.07	7046.26	7046.15	7046.35	0.009462	161.82	0.67	0.03	0.24	0.02	0.34	2.43	0.25	2.43
Reach 1-3	5284	5-YR	521.40	7045.07	7046.79		7046.97	0.012240	165.13	0.63	0.24	0.71	0.20	1.26	3.46	1.12	3.44
Reach 1-3	5284	10-YR	855.10	7045.07	7047.12		7047.39	0.013170	171.76	0.65	0.39	1.04	0.20	1.73	4.16	1.10	4.11
Reach 1-3	5284	25-YR	1135.00	7045.07	7047.34		7047.68	0.014151	187.93	0.68	0.51	1.31	0.17	2.06	4.69	1.00	4.59
Reach 1-3	5284	50-YR	1532.10	7045.07	7047.62		7048.04	0.014935	224.75	0.70	0.67	1.64	0.22	2.42	5.29	1.32	5.07
Reach 1-3	5284	100-YR	1795.10	7045.07	7047.78	7047.43	7048.26	0.015152	264.11	0.71	0.75	1.82	0.26	2.62	5.61	1.43	5.24
Reach 1-3	5284	FIS	2600.00	7045.07	7048.25		7048.81	0.014461	287.69	0.71	0.92	2.16	0.59	3.03	6.23	2.24	5.51
Reach 1-3	5222	2-YR	158.20	7044.28	7045.37	7045.37	7045.52	0.019505	162.85	1.00	0.14	0.38		0.80	3.16		3.16
Reach 1-3	5222	5-YR	521.40	7044.28	7045.93		7046.12	0.015699	192.02	0.70	0.38	0.77		1.64	3.50		3.48
Reach 1-3	5222	10-YR	855.10	7044.28	7046.28		7046.52	0.014868	216.05	0.68	0.52	0.96		2.04	3.89	0.19	3.87
Reach 1-3	5222	25-YR	1135.00	7044.28	7046.53		7046.80	0.013839	218.30	0.65	0.58	1.10	0.12	2.24	4.17	0.77	4.14
Reach 1-3	5222	50-YR	1532.10	7044.28	7046.84		7047.15	0.012869	221.15	0.63	0.66	1.28	0.23	2.47	4.52	1.23	4.47
Reach 1-3	5222	100-YR	1795.10	7044.28	7047.03		7047.37	0.012413	222.88	0.62	0.71	1.38	0.30	2.61	4.72	1.45	4.67
Reach 1-3	5222	FIS	2600.00	7044.28	7047.54		7047.97	0.011588	227.55	0.62	0.84	1.65	0.46	3.13	5.29	1.96	5.21
Reach 1-3	5166	2-YR	158.20	7043.80	7045.01	7044.75	7045.05	0.003962	203.86	0.38	0.05	0.13		0.73	1.54		1.54
Reach 1-3	5166	5-YR	521.40	7043.80	7045.55		7045.64	0.004895	227.57	0.42	0.14	0.30	0.03	1.39	2.38	0.38	2.36
Reach 1-3	5166	10-YR	855.10	7043.80	7045.91		7046.04	0.004959	233.17	0.43	0.20	0.42	0.10	1.73	2.85	0.82	2.82
Reach 1-3	5166	25-YR	1135.00	7043.80	7046.18		7046.33	0.004896	235.88	0.44	0.24	0.49	0.15	1.95	3.14	1.09	3.10
Reach 1-3	5166	50-YR	1532.10	7043.80	7046.51		7046.70	0.004833	239.29	0.44	0.28	0.59	0.21	2.20	3.50	1.37	3.44
Reach 1-3	5166	100-YR	1795.10	7043.80	7046.71		7046.92	0.004819	241.17	0.45	0.31	0.65	0.25	2.34	3.71	1.52	3.64
Reach 1-3	5166	FIS	2600.00	7043.80	7047.25		7047.52	0.004818	245.01	0.46	0.39	0.81	0.37	2.96	4.27	2.02	4.18
Reach 1-3	5016	2-YR	158.20	7042.74	7043.81	7043.77	7043.96	0.017270	125.87	0.86	0.11	0.44		0.70	3.11		3.10
Reach 1-3	5016	5-YR	521.40	7042.74	7044.53		7044.66	0.009128	203.30	0.53	0.26	0.53	0.12	1.39	2.90	0.86	2.87
Reach 1-3	5016	10-YR	855.10	7042.74	7044.95		7045.11	0.007845	210.89	0.49	0.32	0.66	0.21	1.67	3.23	1.25	3.17
Reach 1-3	5016	25-YR	1135.00	7042.74	7045.23		7045.42	0.007634	216.26	0.49	0.36	0.77	0.27	2.01	3.53	1.49	3.45
Reach 1-3	5016	50-YR	1532.10	7042.74	7045.57		7045.80	0.007575	222.75	0.49	0.42	0.93	0.35	2.35	3.92	1.76	3.80
Reach 1-3	5016	100-YR	1795.10	7042.74	7045.76		7046.02	0.007587	226.73	0.50	0.46	1.02	0.39	2.54	4.14	2.03	4.02
Reach 1-3	5016	FIS	2600.00	7042.74	7046.26		7046.60	0.007939	233.26	0.52	0.61	1.31	0.58	3.07	4.80	2.69	4.63
Reach 1-3	4942	2-YR	158.20	7042.10	7043.38		7043.42	0.003715	143.43	0.34	0.08	0.16		0.75	1.63		1.61
Reach 1-3	4942	5-YR	521.40	7042.10	7044.05		7044.16	0.005184	174.23	0.41	0.22	0.39		1.38	2.57		2.53
Reach 1-3	4942	10-YR	855.10	7042.10	7044.46		7044.60	0.006056	206.08	0.46	0.33	0.53	0.02	1.77	3.09	0.29	3.05
Reach 1-3	4942	25-YR	1135.00	7042.10	7044.73		7044.90	0.006445	222.65	0.48	0.41	0.64	0.08	2.01	3.41	0.66	3.35
Reach 1-3	4942	50-YR	1532.10	7042.10	7045.05		7045.27	0.006685	229.05	0.48	0.49	0.80	0.15	2.25	3.79	1.02	3.71
Reach 1-3	4942	100-YR	1795.10	7042.10	7045.24		7045.49	0.006848	230.81	0.49	0.54	0.90	0.22	2.48	4.03	1.32	3.93
Reach 1-3	4942	FIS	2600.00	7042.10	7045.67		7046.02	0.007975	235.07	0.53	0.74	1.26	0.41	3.15	4.81	1.94	4.68
Reach 1-3	4850	2-YR	158.20	7041.61	7042.54	7042.51	7042.72	0.021794	115.90	0.92	0.34	0.56		1.46	3.36		3.33
Reach 1-3	4850	5-YR	521.40	7041.61	7043.19		7043.38	0.015494	206.30	0.72	0.55	0.71		2.13	3.51		3.47
Reach 1-3	4850	10-YR	855.10	7041.61	7043.53		7043.76	0.014829	215.92	0.68	0.68	0.95		2.46	3.92		3.88
Reach 1-3	4850	25-YR	1135.00	7041.61	7043.75		7044.03	0.014804	220.60	0.68	0.78	1.14		2.69	4.27		4.22
Reach 1-3	4850	50-YR	1532.10	7041.61	7044.03		7044.36	0.015575	252.99	0.70	0.93	1.30		3.28	4.63		4.58
Reach 1-3	4850	100-YR	1795.10	7041.61	7044.20		7044.55	0.016268	290.91	0.73	1.05	1.34		3.62	4.76		4.72
Reach 1-3	4850	FIS	2600.00	7041.61	7044.62		7045.01	0.015628	333.33	0.72	1.18	1.53	0.06	4.13	5.08	0.61	5.04
Reach 1-3	4775	2-YR	158.20	7040.59	7041.83		7041.88	0.006321	158.48	0.47	0.07	0.21		0.65	1.93		1.92
Reach 1-3	4775	5-YR	521.40	7040.59	7042.42		7042.54	0.008193	244.22	0.53	0.25	0.41		1.37	2.70		2.69
Reach 1-3	4775	10-YR	855.10	7040.59	7042.77		7042.91	0.008408	279.59	0.53	0.34	0.54		1.70	3.02		3.01
Reach 1-3	4775	25-YR	1135.00	7040.59	7043.01		7043.17	0.008466	310.36	0.53	0.41	0.61		1.91	3.21		3.19
Reach 1-3	4775	50-YR	1532.10	7040.59	7043.30		7043.48	0.008346	334.25	0.52	0.47	0.71		2.12	3.43		3.41
Reach 1-3	4775	100-YR	1795.10	7040.59	7043.47		7043.67	0.008147	335.66	0.51	0.50	0.77	0.03	2.22	3.57	0.34	3.55
Reach 1-3	4775	FIS	2600.00	7040.59	7043.92		7044.16	0.007890	339.40	0.50	0.59	0.97	0.14	2.68	3.99	0.93	3.96
Reach 1-3	4709	2-YR	158.20	7040.26	7041.52		7041.54	0.004045	253.42	0.34	0.04	0.12	0.06	0.45	1.33	0.61	1.32
Reach 1-3	4709	5-YR	521.40	7040.26	7042.01		7042.08	0.005532	257.80	0.38	0.14	0.34	0.17	0.99	2.13	1.13	2.12
Reach 1-3	4709	10-YR	855.10	7040.26	7042.30		7042.42	0.006563	265.56	0.42	0.22	0.52	0.14	1.33	2.69	0.99	2.66
Reach 1-3	4709	25-YR	1135.00	7040.26	7042.52		7042.66	0.007028	285.56	0.44	0.28	0.65	0.12	1.54	3.04	0.87	2.98
Reach 1-3	4709	50-YR	1532.10	7040.26	7042.78		7042.97	0.007385	311.06	0.46	0.36	0.80	0.16	1.79	3.45	1.07	3.33
Reach 1-3	4709	100-YR	1795.10	7040.26	7042.95		7043.15	0.007492	327.00	0.47	0.40	0.89	0.20	1.93	3.67	1.21	3.50
Reach 1-3	4709	FIS	2600.00	7040.26	7043.39		7043.65	0.007473	336.28	0.48	0.50	1.10	0.38	2.32	4.17	1.91	3.93
Reach 1-3	4628	2-YR	158.20	7039.92	7040.68	7040.68	7040.81	0.036324	234.75	1.03	0.26	0.54	0.42	1.11	2.86	1.54	2.85
Reach 1-3	4628	5-YR	521.40	7039.92	7041.08	7040.97	7041.25	0.024247	261.60	0.75	0.51	0.93	0.58	1.87	3.32	2.03	3.29
Reach 1-3	4628	10-YR	855.10	7039.92	7041.40		7041.59	0.017639	265.19	0.65	0.55	1.02	0.57	2.07	3.57	2.12	3.54
Reach 1-3	4628	25-YR	1135.00	7039.92	7041.63		7041.85	0.014983	267.88	0.62	0.58	1.09	0.58	2.20	3.77	2.21	3.72
Reach 1-3	4628	50-YR	1532.10	7039.92	7041.93		7042.18	0.012896	271.30	0.59	0.62	1.18	0.62	2.36	4.03	2.35	3.97
Reach 1-3	4628	100-YR	1795.10	7039.92	7042.12		7042.39	0.011976	273.39	0.57	0.65	1.23	0.64	2.46	4.18	2.44	4.11
Reach 1-3	4628	FIS	2600.00	7039.92	7042.63		7042.95	0.010146	319.13	0.55	0.72	1.37	0.27	2.71	4.57	2.27	4.43
Reach 1-3	4578	2-YR	158.20	7038.64	7040.02	7039.69	7040.07	0.005055	148.88	0.45		0.18			1.91		1.91
Reach 1-3	4578	5-YR	521.40	7038.64	7040.63		7040.71	0.005847	251.79	0.42	0.09	0.34	0.10	0.77	2.30	0.79	2.29
Reach 1-3	4578	10-YR	855.10	7038.64	7041.00		7041.11	0.005742	255.59	0.41	0.16	0.46	0.16	1.09	2.67	1.11	2.65
Reach 1-3	4578	25-YR	1135.00	7038.64	7041.26		7041.40	0.005677	257.83	0.41	0.20	0.55	0.22	1.29	2.93	1.36	2.90
Reach 1-3	4578	50-YR	1532.10	7038.64	7041.59		7041.75	0.005680	260.48	0.42	0.26	0.67	0.29	1.52	3.26	1.64	3.22
Reach 1-3	4578	100-YR	1795.10	7038.64	7041.79		7041.97	0.005661	262.08	0.42	0.29	0.74	0.33	1.73	3.45	1.85	3.40
Reach 1-3	4578	FIS	2600.00	7038.64	7042.32		7042.56	0.005635	277.68	0.43	0.39	0.92	0.19	2.25	3.94	2.24	3.88
Reach 1-3	4506	2-YR	158.20	7037.91	7039.96		7039.97	0.000544	247.20	0.13	0.01	0.03	0.01	0.24	0.71	0.25	0.71
Reach 1-3	4506	5-YR	521.40	7037.91	7040.45		7040.49	0.001672	251.23	0.23	0.05	0.15	0.06	0.65	1.52	0.68	1.51
Reach 1-3	4506	10-YR	855.10	7037.91	7040.78		7040.84	0.002356	253.91	0.27	0.10	0.25	0.10	0.92	2.02	0.96	2.00
Reach 1-3	4506	25-YR	1135.00	7037.91	7041.02		7041.11	0.002718	275.61	0.29	0.13	0.34	0.05	1.15	2.34	0.89	2.30
Reach 1-3	4506	50-YR	1532.10	7037.91	7041.33		7041.44	0.003078	278.66	0.32	0.18	0.44	0.11	1.47	2.71	1.25	2.64
Reach 1-3	4506	100-YR	1795.10	7037.91	7041.52		7041.65	0.003230	280.56	0.33	0.21	0.50	0.15	1.64	2.91	1.49	2.84
Reach 1-3	4506	FIS	2600.00	7037.91	7042.05		7042.23	0.003540	285.80	0.35	0.29	0.66	0.26	2.06	3.42	2.10	3.33
Reach 1-3	4291	2-YR	158.20	7036.71	7039.94		7039.94	0.000050	169.78	0.04	0.00	0.01	0.00	0.27	0.39	0.22	0.38
Reach 1-3	4291	5-YR	521.40	7036.71	7040.32		7040.34	0.000344	174.31	0.11	0.04	0.07	0.03	0.77	1.12	0.64	1.08
Reach 1-3	4291	10-YR	855.10	7036.71	7040.53		7040.58	0.000739	176.77	0.17	0.08	0.15	0.06	1.18	1.71	1.00	1.64
Reach 1-3	4291	25-YR	1135.00	7036.71	7040.68		7040.75	0.001121	178.49	0.20	0.13	0.24	0.10	1.50	2.16	1.28	2.07
Reach 1-3	4291	50-YR	1532.10	7036.71	7040.85		7040.96	0.001732	180.48	0.26	0.21	0.39	0.16	1.92	2.77	1.66	2.65
Reach 1-3	4291	100-YR	1795.10	7036.71	7040.94		7041.09	0.002167	181.63	0.29	0.26	0.50	0.21	2.19	3.15	1.90	3.01
Reach 1-3	4291	FIS	2600.00	7036.71	7041.18		7041.45	0.003662	184.43	0.38	0.48	0.90	0.38	2.98	4.26	2.60	4.07

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	4078	2-YR	158.20	7033.29	7039.94		7039.94	0.000001	368.57	0.01	0.00	0.00	0.00	0.05	0.10	0.06	0.09
Reach 1-3	4078	5-YR	521.40	7033.29	7040.33		7040.33	0.000004	371.56	0.02	0.00	0.00	0.00	0.15	0.31	0.18	0.28
Reach 1-3	4078	10-YR	855.10	7033.29	7040.55		7040.56	0.000010	373.25	0.03	0.00	0.00	0.00	0.24	0.49	0.30	0.45
Reach 1-3	4078	25-YR	1135.00	7033.29	7040.71		7040.72	0.000017	374.47	0.04	0.00	0.01	0.00	0.32	0.63	0.39	0.57
Reach 1-3	4078	50-YR	1532.10	7033.29	7040.90		7040.91	0.000027	375.91	0.05	0.00	0.01	0.01	0.42	0.82	0.52	0.75
Reach 1-3	4078	100-YR	1795.10	7033.29	7041.02		7041.03	0.000035	376.78	0.06	0.01	0.02	0.01	0.48	0.94	0.60	0.86
Reach 1-3	4078	FIS	2600.00	7033.29	7041.31		7041.33	0.000063	379.04	0.08	0.01	0.03	0.01	0.67	1.29	0.85	1.18
Reach 1-3	3902	2-YR	158.20	7040.25	7039.78	7039.78	7039.93	0.013582	208.77	0.00	0.09		0.38	1.49		3.14	2.97
Reach 1-3	3902	5-YR	521.40	7040.25	7040.09	7040.09	7040.31	0.017362	383.92	0.00	0.23		0.56	2.55		3.95	3.58
Reach 1-3	3902	10-YR	855.10	7040.25	7040.28	7040.28	7040.52	0.014111	453.34	0.42	0.29	0.01	0.61	2.88	0.25	4.30	3.80
Reach 1-3	3902	25-YR	1135.00	7040.25	7040.37	7040.37	7040.67	0.014897	483.47	0.56	0.40	0.05	0.72	3.37	0.74	4.77	4.21
Reach 1-3	3902	50-YR	1532.10	7040.25	7040.53	7040.53	7040.85	0.012866	565.69	0.61	0.46	0.11	0.73	3.73	1.24	4.96	4.33
Reach 1-3	3902	100-YR	1795.10	7040.25	7040.60	7040.60	7040.96	0.012984	575.02	0.65	0.52	0.16	0.79	4.00	1.64	5.21	4.54
Reach 1-3	3902	FIS	2600.00	7040.25	7040.83	7040.83	7041.23	0.012443	650.04	0.72	0.57	0.31	0.88	4.37	2.59	5.65	4.85
Reach 1-3	3702	2-YR	141.50	7030.00	7030.11	7030.11	7030.16	0.040584	710.69	1.04	0.13	0.27	0.13	1.30	1.90	1.31	1.90
Reach 1-3	3702	5-YR	512.60	7030.00	7030.03	7030.25	7042.69	60.591330	707.78	31.59		96.05	48.00	19.50	28.55	19.66	28.54
Reach 1-3	3702	10-YR	860.40	7030.00	7030.02	7030.36	7104.48	581.716100	707.49	92.05		638.38		47.29	69.23	47.68	69.22
Reach 1-3	3702	25-YR	1154.90	7030.00	7030.11	7030.43	7033.44	2.222502	710.93	7.74	7.62	15.45	7.72	10.01	14.65	10.09	14.63
Reach 1-3	3702	50-YR	1590.60	7030.00	7030.08	7030.54	7043.09	14.034220	709.69	18.31	33.57	68.02	33.99	19.77	28.94	19.94	28.93
Reach 1-3	3702	100-YR	1874.90	7030.00	7030.10	7030.60	7040.36	7.585996	710.62	14.11	24.08	48.79	24.38	17.55	25.70	17.70	25.68
Reach 1-3	3702	FIS	2600.00	7030.00	7030.19	7030.75	7035.80	1.798461	713.91	7.63	10.69	21.66	10.82	12.98	19.01	13.09	18.98
Reach 1-3	3611	2-YR	141.50	7002.22	7002.68	7003.31	7006.81	0.476211	20.83	4.45		12.33			16.29		16.29
Reach 1-3	3611	5-YR	512.60	7002.22	7004.73	7003.78	7004.75	0.001581	427.62	0.22		0.12	0.04		1.38	0.53	1.27
Reach 1-3	3611	10-YR	860.40	7002.22	7006.20	7004.03	7006.21	0.000251	568.04	0.09	0.01	0.04	0.03	0.44	0.84	0.59	0.75
Reach 1-3	3611	25-YR	1154.90	7002.22	7007.87	7004.20	7007.88	0.000069	583.97	0.05	0.01	0.02	0.01	0.48	0.59	0.47	0.55
Reach 1-3	3611	50-YR	1590.60	7002.22	7010.99	7004.44	7011.00	0.000017	615.03	0.03	0.01	0.01	0.01	0.41	0.41	0.36	0.40
Reach 1-3	3611	100-YR	1874.90	7002.22	7011.41	7004.51	7011.42	0.000019	619.23	0.03	0.01	0.01	0.01	0.46	0.46	0.40	0.44
Reach 1-3	3611	FIS	2600.00	7002.22	7012.20	7004.89	7012.20	0.000026	627.04	0.03	0.01	0.01	0.01	0.58	0.56	0.49	0.55
Reach 1-3	3272	2-YR	141.50	7001.71	7003.06	7002.76	7003.10	0.004271	177.46	0.43		0.13			1.69		1.69
Reach 1-3	3272	5-YR	512.60	7001.71	7004.59		7004.61	0.000551	490.21	0.13	0.01	0.06	0.02	0.28	0.96	0.46	0.87
Reach 1-3	3272	10-YR	860.40	7001.71	7006.18		7006.19	0.000119	592.54	0.06	0.01	0.02	0.02	0.39	0.66	0.45	0.57
Reach 1-3	3272	25-YR	1154.90	7001.71	7007.86		7007.87	0.000043	608.95	0.04	0.01	0.01	0.01	0.37	0.52	0.40	0.46
Reach 1-3	3272	50-YR	1590.60	7001.71	7010.99		7010.99	0.000013	637.21	0.02	0.00	0.01	0.00	0.32	0.39	0.32	0.36
Reach 1-3	3272	100-YR	1874.90	7001.71	7011.41		7011.41	0.000015	640.97	0.03	0.01	0.01	0.01	0.36	0.43	0.36	0.40
Reach 1-3	3272	FIS	2600.00	7001.71	7012.20		7012.20	0.000021	648.00	0.03	0.01	0.01	0.01	0.45	0.54	0.46	0.50
Reach 1-3	3158	2-YR	141.50	7001.27	7002.50		7002.55	0.003851	182.81	0.43		0.11			1.67		1.67
Reach 1-3	3158	5-YR	512.60	7001.27	7004.56		7004.57	0.000163	505.91	0.07	0.00	0.02	0.01	0.23	0.56	0.37	0.55
Reach 1-3	3158	10-YR	860.40	7001.27	7006.17		7006.17	0.000062	533.39	0.05	0.00	0.01	0.01	0.32	0.49	0.43	0.49
Reach 1-3	3158	25-YR	1154.90	7001.27	7007.86		7007.86	0.000029	556.21	0.03	0.00	0.01	0.01	0.36	0.43	0.42	0.43
Reach 1-3	3158	50-YR	1590.60	7001.27	7010.99		7010.99	0.000011	593.30	0.02	0.00	0.01	0.00	0.34	0.35	0.37	0.35
Reach 1-3	3158	100-YR	1874.90	7001.27	7011.41		7011.41	0.000012	598.28	0.02	0.00	0.01	0.00	0.38	0.40	0.41	0.40
Reach 1-3	3158	FIS	2600.00	7001.27	7012.19		7012.20	0.000018	606.67	0.03	0.01	0.01	0.01	0.49	0.50	0.52	0.50
Reach 1-3	3098	2-YR	141.50	7001.02	7002.51	7001.47	7002.51	0.000073	355.63	0.07		0.01			0.41		0.41
Reach 1-3	3098	5-YR	512.60	7001.02	7004.56	7001.77	7004.56	0.000035	384.10	0.05		0.01			0.55		0.55
Reach 1-3	3098	10-YR	860.40	7001.02	7006.16	7001.96	7006.17	0.000025	404.48	0.05		0.01			0.62		0.62
Reach 1-3	3098	25-YR	1154.90	7001.02	7007.85	7002.11	7007.86	0.000017	432.07	0.04		0.01			0.62		0.62
Reach 1-3	3098	50-YR	1590.60	7001.02	7010.99	7002.30	7010.99	0.000009	474.53	0.03		0.01	0.00		0.57	0.02	0.57
Reach 1-3	3098	100-YR	1874.90	7001.02	7011.40	7002.41	7011.41	0.000012	477.74	0.04	0.00	0.01	0.00	0.07	0.64	0.09	0.63
Reach 1-3	3098	FIS	2600.00	7001.02	7012.18	7002.68	7012.19	0.000017	483.25	0.05	0.00	0.01	0.00	0.19	0.81	0.21	0.78
Reach 1-3	3047		Inl Struct														
Reach 1-3	2970	2-YR	101.60	7000.89	7002.14	7001.38	7002.18	0.001049	53.19	0.25		0.08			1.55		1.55
Reach 1-3	2970	5-YR	398.70	7000.89	7003.50	7002.10	7003.62	0.001444	53.85	0.32		0.22			2.88		2.88
Reach 1-3	2970	10-YR	676.70	7000.89	7004.58	7002.62	7004.77	0.001303	54.37	0.32	0.01	0.27	0.01	0.32	3.44	0.30	3.43
Reach 1-3	2970	25-YR	931.20	7000.89	7005.49	7003.02	7005.71	0.001176	54.78	0.31	0.01	0.31	0.01	0.52	3.78	0.50	3.78
Reach 1-3	2970	50-YR	1282.90	7000.89	7006.67	7003.53	7006.93	0.001036	55.30	0.31	0.02	0.34	0.02	0.69	4.14	0.68	4.12
Reach 1-3	2970	100-YR	1486.60	7000.89	7007.28	7003.79	7007.57	0.000989	55.56	0.30	0.02	0.36	0.02	0.77	4.33	0.76	4.30
Reach 1-3	2970	FIS	2600.00	7000.89	7010.21	7005.10	7010.63	0.000849	56.82	0.30	0.04	0.45	0.04	1.06	5.17	1.05	5.10
Reach 1-3	2925		Culvert														
Reach 1-3	2874	2-YR	101.60	7000.69	7001.98		7002.10	0.004593	54.81	0.50		0.27			2.77		2.77
Reach 1-3	2874	5-YR	398.70	7000.69	7002.64	7002.51	7003.27	0.012168	59.81	0.89		1.21			6.40		6.40
Reach 1-3	2874	10-YR	676.70	7000.69	7003.14	7003.14	7004.20	0.014101	63.65	1.00		1.85			8.27		8.27
Reach 1-3	2874	25-YR	931.20	7000.69	7003.64	7003.64	7004.96	0.013217	67.42	1.01		2.14			9.22		9.22
Reach 1-3	2874	50-YR	1282.90	7000.69	7004.26	7004.26	7005.89	0.012271	72.16	1.01		2.46			10.25		10.25
Reach 1-3	2874	100-YR	1486.60	7000.69	7004.59	7004.59	7006.39	0.011917	74.67	1.01		2.64			10.77		10.77
Reach 1-3	2874	FIS	2600.00	7000.69	7006.21	7006.21	7008.82	0.010448	86.98	1.00		3.36			12.95		12.95
Reach 1-3	2847	2-YR	101.60	7000.63	7001.57	7001.57	7001.82	0.023356	53.89	1.01	0.17	0.71	0.10	1.54	4.01	1.08	3.99
Reach 1-3	2847	5-YR	398.70	7000.63	7002.29	7002.29	7002.86	0.016349	61.47	0.99	0.48	1.23	0.43	3.30	6.15	3.03	5.95
Reach 1-3	2847	10-YR	676.70	7000.63	7002.50	7002.81	7003.66	0.027276	63.64	1.31	0.98	2.40	0.88	4.85	8.82	4.52	8.47
Reach 1-3	2847	25-YR	931.20	7000.63	7002.70	7003.16	7004.34	0.032077	65.81	1.45	1.36	3.23	1.24	5.86	10.47	5.51	9.99
Reach 1-3	2847	50-YR	1282.90	7000.63	7002.95	7003.59	7005.18	0.036358	68.45	1.58	2.00	4.23	1.80	7.45	12.27	6.94	11.67
Reach 1-3	2847	100-YR	1486.60	7000.63	7003.08	7003.82	7005.64	0.038233	69.83	1.64	2.41	4.76	2.20	8.36	13.16	7.85	12.52
Reach 1-3	2847	FIS	2600.00	7000.63	7003.73	7004.94	7007.85	0.042642	76.68	1.81	4.39	7.04	4.13	12.23	16.76	11.74	16.03
Reach 1-3	2829	2-YR	101.60	6997.80	6999.30	6998.75	6999.35	0.001661	61.25	0.31	0.03	0.11	0.04	0.75	1.75	0.85	1.72
Reach 1-3	2829	5-YR	398.70	6997.80	6998.82	6999.44	7001.51	0.219780	57.39	3.16	0.68	7.38	1.48	2.68	13.16	4.51	13.13
Reach 1-3	2829	10-YR	676.70	6997.80	6999.14	6999.92	7002.18	0.135573	59.90	2.68	1.71	7.20	2.20	5.38	14.03	6.37	13.88
Reach 1-3	2829	25-YR	931.20	6997.80	6999.37	7000.29	7002.82	0.111582	61.81	2.53	2.21	7.57	2.61	6.59	14.99	7.37	14.73
Reach 1-3	2829	50-YR	1282.90	6997.80	6999.66	7000.76	7003.65	0.095199	64.11	2.43	2.71	8.16	3.06	7.76	16.18	8.41	15.78
Reach 1-3	2829	100-YR	1486.60	6997.80	6999.81	7000.99	7004.11	0.089682	65.31	2.40	2.96	8.52	3.28	8.31	16.82	8.91	16.35
Reach 1-3	2829	FIS	2600.00	6997.80	7000.49	7002.13	7006.34	0.075768	71.06	2.35	3.97	10.43	4.34	10.40	19.79	11.04	18.90
Reach 1-3	2789	2-YR	101.60	6997.73	6999.24		6999.28	0.001937	66.86	0.29	0.04	0.12	0.04	0.49	1.66	0.50	1.63
Reach 1-3	2789	5-YR	398.70	6997.73	7000.29	6999.33	7000.43	0.003104	76.09	0.37	0.16	0.39	0.16	1.43	3.04	1.39	2.89
Reach 1-3	2789	10-YR	676.70	6997.73	7000.88	6999.80	7001.11	0.003813	81.30	0.42	0.26	0.63	0.26	2.01	3.90	1.98	3.67
Reach 1-3	2789	25-YR	931.20	6997.73	7001.31	7000.16	7001.61	0.004291	85.00	0.46	0.35	0.82	0.35	2.53	4.53	2.46	4.24
Reach 1-3	2789	50-YR	1282.90	6997.73	7001.79	7000.59	7002.19	0.004826	89.24	0.49	0.46	1.07	0.47	3.13	5.26	3.03	4.89
Reach 1-3	2789	100-YR	1486.60	6997.73	7002.04	7000.83	7002.50	0.005099	91.38	0.51	0.53	1.20	0.53	3.44	5.64	3.33	5.23
Reach 1-3	2789	FIS	2600.00	6997.73	7003.12	7001.90	7003.86	0.006222	100.76	0.58	0.85	1.89	0.85	4.83	7.28	4.69	6.71
Reach 1-3	2716	2-YR	101.60	6997.62	6999.10		6999.14	0.001902	80.99	0.28	0.03	0.10	0.03	0.41	1.50	0.42	1.49
Reach 1-3	2716	5-YR	398.70	6997.62	7000.09		7000.20	0.002985	88.48	0.35	0.13	0.35	0.13	1.20	2.71	1.11	2.62
Reach 1-3	2716	10-YR	676.70	6997.62	7000.64		7000.82	0.003682	92.61	0.40	0.22	0.55	0.23	1.74	3.49	1.69	3.35
Reach 1-3	2716	25-YR	931.20	6997.62	7001.04		7001.29	0.004190	95.61	0.43	0.31	0.73	0.31	2.13	4.08	2.10	3.89
Reach 1-3	2716	50-YR	1282.90	6997.62	7001.49		7001.83	0.004782	99.06	0.47	0.41	0.97	0.42	2.59	4.77	2.56	4.52
Reach 1-3	2716	100-YR	1486.60	6997.62	7001.72		7002.11	0.005104	100.77	0.48	0.48	1.11	0.48	2.83	5.13	2.80	4.86
Reach 1-3	2716	FIS	2600.00	6997.62	7002.73		7003.39	0.006404	109.12	0.56	0.76	1.79	0.80	4.07	6.73	4.04	6.31
Reach 1-3	2677	2-YR	101.60	6997.45	6999.05		6999.08	0.001229	88.00	0.22	0.02	0.07	0.02	0.40	1.25	0.34	1.24
Reach 1-3	2677	5-YR	398.70	6997.45	7000.00		7000.09	0.002344	96.30	0.31	0.11	0.28	0.10	1.17	2.43	1.11	2.35

HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	2677	10-YR	676.70	6997.45	7000.53		7000.69	0.003035	100.94	0.36	0.20	0.46	0.18	1.67	3.17	1.60	3.05
Reach 1-3	2677	25-YR	931.20	6997.45	7000.92		7001.13	0.003532	104.34	0.39	0.27	0.62	0.25	2.05	3.73	1.97	3.56
Reach 1-3	2677	50-YR	1282.90	6997.45	7001.36		7001.64	0.004097	108.22	0.43	0.37	0.84	0.34	2.51	4.39	2.40	4.16
Reach 1-3	2677	100-YR	1486.60	6997.45	7001.58		7001.91	0.004391	110.04	0.45	0.43	0.96	0.40	2.80	4.72	2.63	4.47
Reach 1-3	2677	FIS	2600.00	6997.45	7002.56		7003.13	0.005604	118.21	0.52	0.73	1.57	0.67	4.09	6.23	3.64	5.84
Reach 1-3	2646	2-YR	101.60	6997.45	6999.01		6999.03	0.001313	95.44	0.23	0.02	0.07	0.02	0.40	1.24	0.29	1.23
Reach 1-3	2646	5-YR	398.70	6997.45	6999.93		7000.02	0.002415	102.81	0.31	0.11	0.27	0.09	1.10	2.35	0.96	2.29
Reach 1-3	2646	10-YR	676.70	6997.45	7000.44		7000.59	0.003111	107.59	0.36	0.19	0.45	0.16	1.59	3.07	1.44	2.97
Reach 1-3	2646	25-YR	931.20	6997.45	7000.81		7001.01	0.003609	110.78	0.39	0.26	0.61	0.23	1.96	3.61	1.80	3.47
Reach 1-3	2646	50-YR	1282.90	6997.45	7001.24		7001.51	0.004180	114.47	0.42	0.35	0.81	0.32	2.38	4.24	2.23	4.06
Reach 1-3	2646	100-YR	1486.60	6997.45	7001.45		7001.76	0.004489	116.29	0.44	0.41	0.93	0.37	2.61	4.57	2.46	4.36
Reach 1-3	2646	FIS	2600.00	6997.45	7002.40		7002.94	0.005734	124.56	0.51	0.68	1.53	0.64	3.67	6.04	3.59	5.71
Reach 1-3	2588	2-YR	101.60	6997.45	6998.91		6998.94	0.001971	115.79	0.31	0.04	0.08	0.01	0.51	1.40	0.18	1.39
Reach 1-3	2588	5-YR	398.70	6997.45	6999.78		6999.86	0.002847	122.66	0.33	0.13	0.27	0.09	1.29	2.29	1.05	2.25
Reach 1-3	2588	10-YR	676.70	6997.45	7000.26		7000.39	0.003467	126.45	0.36	0.21	0.43	0.16	1.75	2.92	1.52	2.86
Reach 1-3	2588	25-YR	931.20	6997.45	7000.61		7000.79	0.003907	129.14	0.39	0.28	0.57	0.22	2.10	3.39	1.87	3.31
Reach 1-3	2588	50-YR	1282.90	6997.45	7001.02		7001.25	0.004407	132.17	0.42	0.37	0.75	0.30	2.51	3.95	2.28	3.84
Reach 1-3	2588	100-YR	1486.60	6997.45	7001.22		7001.49	0.004685	133.67	0.44	0.42	0.86	0.35	2.72	4.25	2.49	4.12
Reach 1-3	2588	FIS	2600.00	6997.45	7002.14		7002.59	0.005696	140.83	0.49	0.67	1.37	0.58	3.89	5.52	3.74	5.34
Reach 1-3	2539	2-YR	101.60	6997.33	6998.82		6998.85	0.001875	118.51	0.30	0.03	0.08		0.46	1.35	0.08	1.34
Reach 1-3	2539	5-YR	398.70	6997.33	6999.64		6999.72	0.003069	125.63	0.34	0.13	0.28	0.08	1.16	2.32	0.83	2.28
Reach 1-3	2539	10-YR	676.70	6997.33	7000.08		7000.21	0.003899	129.68	0.38	0.22	0.46	0.15	1.67	3.00	1.32	2.92
Reach 1-3	2539	25-YR	931.20	6997.33	7000.40		7000.58	0.004495	132.55	0.41	0.30	0.62	0.21	2.04	3.50	1.69	3.41
Reach 1-3	2539	50-YR	1282.90	6997.33	7000.76		7001.02	0.005184	135.82	0.45	0.40	0.84	0.31	2.47	4.11	2.11	3.98
Reach 1-3	2539	100-YR	1486.60	6997.33	7000.94		7001.24	0.005584	137.41	0.47	0.46	0.96	0.36	2.70	4.43	2.34	4.29
Reach 1-3	2539	FIS	2600.00	6997.33	7001.77		7002.28	0.007059	144.83	0.54	0.76	1.58	0.63	3.70	5.83	3.60	5.60
Reach 1-3	2508	2-YR	101.60	6997.29	6998.76		6998.79	0.001928	120.79	0.30	0.03	0.08		0.44	1.35		1.34
Reach 1-3	2508	5-YR	398.70	6997.29	6999.53		6999.62	0.003333	129.15	0.35	0.13	0.29	0.07	1.19	2.35	0.85	2.31
Reach 1-3	2508	10-YR	676.70	6997.29	6999.94		7000.08	0.004358	133.20	0.40	0.22	0.49	0.15	1.69	3.06	1.35	2.99
Reach 1-3	2508	25-YR	931.20	6997.29	7000.23		7000.43	0.005107	136.07	0.44	0.30	0.67	0.22	2.07	3.60	1.73	3.51
Reach 1-3	2508	50-YR	1282.90	6997.29	7000.57		7000.84	0.005994	139.25	0.48	0.41	0.91	0.32	2.52	4.24	2.18	4.12
Reach 1-3	2508	100-YR	1486.60	6997.29	7000.73		7001.05	0.006535	140.77	0.50	0.48	1.06	0.38	2.77	4.59	2.42	4.45
Reach 1-3	2508	FIS	2600.00	6997.29	7001.47		7002.03	0.008661	147.83	0.59	0.84	1.80	0.70	3.88	6.13	3.55	5.91
Reach 1-3	2466	2-YR	101.60	6997.25	6998.66		6998.70	0.002466	116.07	0.35	0.04	0.09		0.52	1.53		1.51
Reach 1-3	2466	5-YR	398.70	6997.25	6999.38		6999.46	0.004094	162.51	0.39	0.16	0.28	0.06	1.36	2.31	0.58	2.28
Reach 1-3	2466	10-YR	676.70	6997.25	6999.75		6999.88	0.005023	166.31	0.42	0.25	0.46	0.13	1.83	2.91	1.07	2.86
Reach 1-3	2466	25-YR	931.20	6997.25	7000.03		7000.20	0.005672	169.08	0.45	0.33	0.62	0.19	2.18	3.37	1.45	3.31
Reach 1-3	2466	50-YR	1282.90	6997.25	7000.34		7000.57	0.006420	172.26	0.48	0.43	0.83	0.28	2.63	3.91	1.87	3.83
Reach 1-3	2466	100-YR	1486.60	6997.25	7000.48		7000.75	0.006953	173.71	0.50	0.50	0.96	0.33	2.92	4.22	2.09	4.13
Reach 1-3	2466	FIS	2600.00	6997.25	7001.18		7001.64	0.008626	180.82	0.57	0.80	1.56	0.59	4.15	5.51	3.05	5.38
Reach 1-3	2387	2-YR	101.60	6997.09	6998.15	6998.15	6998.29	0.014728	126.27	1.01	0.12	0.25		1.03	2.99		2.97
Reach 1-3	2387	5-YR	398.70	6997.09	6998.54	6998.54	6998.83	0.019216	166.70	1.03	0.39	0.67		2.15	4.36		4.33
Reach 1-3	2387	10-YR	676.70	6997.09	6998.80	6998.80	6999.18	0.018044	185.47	1.01	0.51	0.85		2.60	4.98		4.93
Reach 1-3	2387	25-YR	931.20	6997.09	6998.98	6998.98	6999.44	0.017577	193.74	1.01	0.59	0.99		2.90	5.47		5.40
Reach 1-3	2387	50-YR	1282.90	6997.09	6999.21	6999.21	6999.76	0.016948	204.24	1.01	0.69	1.15		3.23	5.99		5.91
Reach 1-3	2387	100-YR	1486.60	6997.09	6999.34	6999.34	6999.92	0.015787	206.27	0.99	0.71	1.19	0.06	3.32	6.18	0.61	6.09
Reach 1-3	2387	FIS	2600.00	6997.09	6999.87	6999.87	7000.72	0.014737	212.35	1.00	0.90	1.60	0.29	3.95	7.47	1.85	7.32
Reach 1-3	2359	2-YR	101.60	6992.83	6993.19	6993.80	6996.75	0.543357	19.93	4.59		11.39			15.12		15.12
Reach 1-3	2359	5-YR	398.70	6992.83	6993.81	6994.39	6997.12	0.352939	62.12	3.87	1.01	9.71		3.24	14.61		14.60
Reach 1-3	2359	10-YR	676.70	6992.83	6994.05	6994.78	6997.58	0.276204	81.80	3.56	2.81	9.60	0.38	6.65	15.10	1.76	15.06
Reach 1-3	2359	25-YR	931.20	6992.83	6994.23	6995.08	6997.95	0.197880	83.77	3.17	3.14	9.19	1.42	7.57	15.51	4.46	15.40
Reach 1-3	2359	50-YR	1282.90	6992.83	6994.48	6995.46	6998.38	0.141462	86.33	2.81	3.31	8.77	2.14	8.31	15.90	6.21	15.70
Reach 1-3	2359	100-YR	1486.60	6992.83	6994.62	6995.66	6998.62	0.123064	87.56	2.68	3.39	8.67	2.46	8.63	16.15	6.97	15.89
Reach 1-3	2359	FIS	2600.00	6992.83	6995.35	6996.57	6999.62	0.068710	96.54	2.17	3.41	7.96	2.49	9.55	16.80	7.75	16.23
Reach 1-3	2340	2-YR	101.60	6992.83	6994.23	6993.79	6994.27	0.002008	112.03	0.32	0.03	0.08	0.01	0.85	1.47	0.35	1.46
Reach 1-3	2340	5-YR	398.70	6992.83	6995.00	6994.34	6995.10	0.003178	124.41	0.38	0.13	0.28	0.09	1.93	2.55	1.10	2.49
Reach 1-3	2340	10-YR	676.70	6992.83	6995.43	6994.65	6995.59	0.003880	134.20	0.42	0.20	0.44	0.15	2.58	3.26	1.47	3.15
Reach 1-3	2340	25-YR	931.20	6992.83	6995.73	6994.91	6995.95	0.004366	140.63	0.46	0.27	0.58	0.20	3.05	3.79	1.80	3.62
Reach 1-3	2340	50-YR	1282.90	6992.83	6996.09	6995.21	6996.37	0.004895	147.21	0.49	0.36	0.76	0.29	3.60	4.39	2.23	4.16
Reach 1-3	2340	100-YR	1486.60	6992.83	6996.27	6995.38	6996.59	0.005153	150.71	0.51	0.40	0.86	0.33	3.88	4.70	2.43	4.44
Reach 1-3	2340	FIS	2600.00	6992.83	6997.08	6996.16	6997.61	0.006123	170.55	0.57	0.63	1.33	0.52	5.08	6.04	3.17	5.58
Reach 1-3	2304	2-YR	101.60	6992.76	6994.16		6994.19	0.002313	145.21	0.35	0.04	0.07	0.01	0.69	1.43	0.22	1.41
Reach 1-3	2304	5-YR	398.70	6992.76	6994.90		6994.98	0.003268	164.61	0.35	0.13	0.26	0.08	1.42	2.21	0.85	2.14
Reach 1-3	2304	10-YR	676.70	6992.76	6995.33		6995.44	0.003757	177.12	0.37	0.20	0.39	0.14	1.83	2.74	1.29	2.62
Reach 1-3	2304	25-YR	931.20	6992.76	6995.64		6995.78	0.004070	185.66	0.39	0.25	0.50	0.19	2.11	3.12	1.60	2.96
Reach 1-3	2304	50-YR	1282.90	6992.76	6996.00		6996.18	0.004379	195.32	0.41	0.31	0.64	0.26	2.38	3.56	1.96	3.34
Reach 1-3	2304	100-YR	1486.60	6992.76	6996.18		6996.39	0.004507	199.38	0.42	0.34	0.71	0.30	2.52	3.78	2.15	3.54
Reach 1-3	2304	FIS	2600.00	6992.76	6997.05		6997.36	0.004845	220.64	0.45	0.50	1.03	0.47	3.21	4.67	2.91	4.31
Reach 1-3	2234	2-YR	101.60	6992.58	6993.98		6994.01	0.002769	180.27	0.43	0.05	0.07		0.76	1.49		1.48
Reach 1-3	2234	5-YR	398.70	6992.58	6994.69		6994.75	0.003301	207.11	0.34	0.13	0.22	0.07	1.40	1.99	0.72	1.93
Reach 1-3	2234	10-YR	676.70	6992.58	6995.09		6995.18	0.003572	219.31	0.35	0.19	0.33	0.13	1.75	2.41	1.04	2.31
Reach 1-3	2234	25-YR	931.20	6992.58	6995.40		6995.51	0.003710	226.95	0.36	0.22	0.42	0.18	1.95	2.71	1.34	2.58
Reach 1-3	2234	50-YR	1282.90	6992.58	6995.76		6995.90	0.003810	236.36	0.36	0.26	0.51	0.23	2.29	3.04	1.67	2.88
Reach 1-3	2234	100-YR	1486.60	6992.58	6995.95		6996.10	0.003843	241.28	0.37	0.28	0.56	0.26	2.50	3.20	1.83	3.03
Reach 1-3	2234	FIS	2600.00	6992.58	6996.84		6997.06	0.003814	264.10	0.38	0.38	0.77	0.37	3.28	3.87	2.43	3.64
Reach 1-3	2158	2-YR	101.60	6992.46	6993.66		6993.72	0.005258	143.48	0.60	0.08	0.12		0.91	2.02		2.00
Reach 1-3	2158	5-YR	398.70	6992.46	6994.35		6994.43	0.005309	210.19	0.42	0.18	0.30	0.06	1.63	2.30	0.56	2.25
Reach 1-3	2158	10-YR	676.70	6992.46	6994.75		6994.86	0.005010	228.02	0.40	0.23	0.41	0.13	1.92	2.64	1.13	2.54
Reach 1-3	2158	25-YR	931.20	6992.46	6995.06		6995.19	0.004771	238.79	0.40	0.27	0.49	0.18	2.13	2.87	1.45	2.74
Reach 1-3	2158	50-YR	1282.90	6992.46	6995.44		6995.58	0.004519	247.25	0.39	0.31	0.57	0.25	2.34	3.14	1.82	2.98
Reach 1-3	2158	100-YR	1486.60	6992.46	6995.64		6995.79	0.004418	251.71	0.39	0.33	0.61	0.28	2.45	3.27	1.98	3.10
Reach 1-3	2158	FIS	2600.00	6992.46	6996.56		6996.77	0.003972	273.73	0.38	0.41	0.78	0.39	2.89	3.83	2.59	3.60
Reach 1-3	2084	2-YR	101.60	6992.11	6993.22	6993.12	6993.29	0.006865	141.85	0.63	0.07	0.15		0.81	2.09		2.08
Reach 1-3	2084	5-YR	398.70	6992.11	6993.94		6994.03	0.005784	187.09	0.43	0.19	0.35	0.06	1.62	2.43	0.56	2.39
Reach 1-3	2084	10-YR	676.70	6992.11	6994.38		6994.49	0.005240	203.90	0.41	0.25	0.46	0.14	2.01	2.78	1.02	2.67
Reach 1-3	2084	25-YR	931.20	6992.11	6994.70		6994.84	0.005030	214.65	0.41	0.30	0.55	0.20	2.27	3.06	1.28	2.89
Reach 1-3	2084	50-YR	1282.90	6992.11	6995.09		6995.26	0.004865	224.30	0.41	0.35	0.65	0.27	2.54	3.37	1.58	3.16
Reach 1-3	2084	100-YR	1486.60	6992.11	6995.29		6995.47	0.004788	228.22	0.41	0.38	0.70	0.30	2.69	3.53	1.73	3.29
Reach 1-3	2084	FIS	2600.00	6992.11	6996.24		6996.49	0.004414	241.05	0.41	0.50	0.90	0.48	3.26	4.17	2.39	3.85
Reach 1-3	2011	2-YR	101.60	6991.86	6992.64		6992.70	0.009674	100.18	0.49	0.20	0.31		1.57	1.99		1.98
Reach 1-3	2011	5-YR	398.70	6991.86	6993.44		6993.55	0.007430	139.47	0.46	0.34	0.52	0.03	2.29	2.73	0.45	2.71
Reach 1-3	2011	10-YR	676.70	6991.86	6993.91		6994.07	0.006634	163.01	0.45	0.40	0.66	0.12	2.64	3.18	1.21	3.09
Reach 1-3	2011	25-YR	931.20	6991.86	6994.25		6994.44	0.006354	173.56	0.45	0.46	0.77	0.21	2.88	3.51	1.72	3.36
Reach 1-3	2011	50-YR	1282.90	6991.86	6994.64		6994.86	0.006308	183.73	0.45	0.51	0.91	0.31	3.13	3.92	2.22	3.72
Reach 1-3	2011	100-YR	1486.60	6991.86	6994.84		6995.09	0.006242	188.95	0.46	0.54	0.98	0.35	3.24	4.12	2.44	3.88
Reach 1-3	2011	FIS	2600.00	6991.86	6995.81		6996.14	0.005606	197.08	0.45	0.65	1.22	0.62	3.74	4.80	3.66	4.56

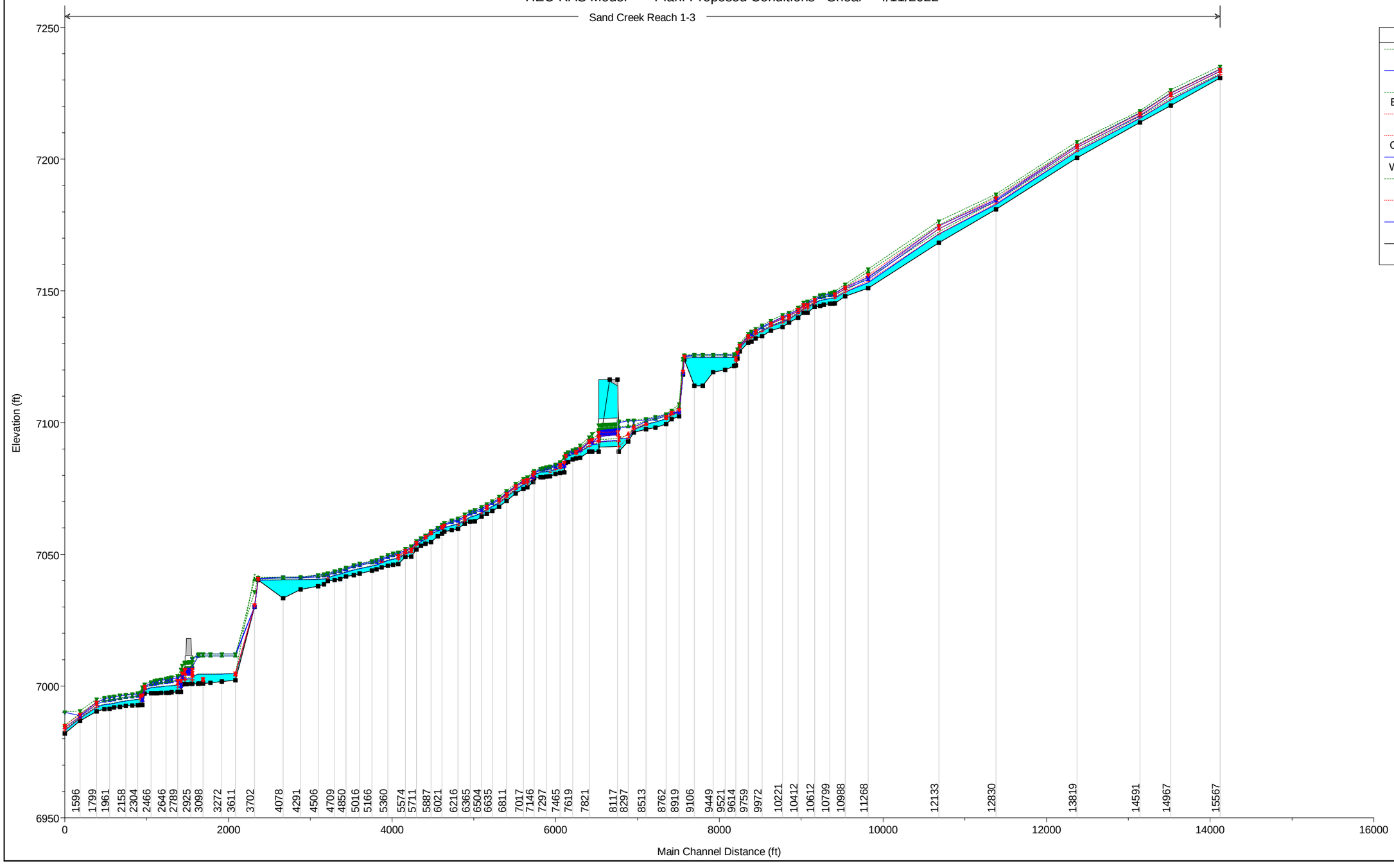
HEC-RAS Plan: PROP - Shear River: Sand Creek Reach: Reach 1-3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 1-3	1961	2-YR	101.60	6991.35	6992.32		6992.38	0.003964	87.12	0.43	0.03	0.15		0.74	1.93		1.92
Reach 1-3	1961	5-YR	398.70	6991.35	6993.15		6993.27	0.003795	121.61	0.47	0.12	0.27		1.86	2.89		2.87
Reach 1-3	1961	10-YR	676.70	6991.35	6993.62		6993.80	0.003873	141.91	0.50	0.17	0.35		2.31	3.38		3.36
Reach 1-3	1961	25-YR	931.20	6991.35	6993.96		6994.17	0.003964	156.53	0.51	0.21	0.41		2.62	3.73		3.70
Reach 1-3	1961	50-YR	1282.90	6991.35	6994.34		6994.61	0.003783	163.54	0.52	0.24	0.47	0.03	2.89	4.13	0.63	4.09
Reach 1-3	1961	100-YR	1486.60	6991.35	6994.55		6994.84	0.003653	165.26	0.52	0.26	0.50	0.05	3.04	4.33	0.93	4.28
Reach 1-3	1961	FIS	2600.00	6991.35	6995.51		6995.92	0.003255	173.34	0.52	0.33	0.64	0.14	3.65	5.20	2.17	5.10
Reach 1-3	1895	2-YR	101.60	6991.28	6992.10		6992.15	0.003192	87.03	0.39		0.13			1.80		1.80
Reach 1-3	1895	5-YR	398.70	6991.28	6992.92		6993.04	0.003545	118.44	0.46	0.06	0.27		1.16	2.86		2.85
Reach 1-3	1895	10-YR	676.70	6991.28	6993.37		6993.55	0.003880	136.12	0.50	0.12	0.36		1.81	3.45		3.43
Reach 1-3	1895	25-YR	931.20	6991.28	6993.69		6993.92	0.003877	143.14	0.51	0.16	0.43	0.02	2.18	3.86	0.60	3.83
Reach 1-3	1895	50-YR	1282.90	6991.28	6994.07		6994.36	0.003824	146.77	0.53	0.20	0.51	0.07	2.56	4.36	1.22	4.30
Reach 1-3	1895	100-YR	1486.60	6991.28	6994.27		6994.60	0.003791	148.69	0.53	0.22	0.55	0.09	2.74	4.61	1.49	4.54
Reach 1-3	1895	FIS	2600.00	6991.28	6995.21		6995.69	0.003666	157.69	0.55	0.32	0.75	0.19	3.52	5.67	2.48	5.52
Reach 1-3	1799	2-YR	101.60	6990.34	6991.42	6991.34	6991.57	0.014927	69.52	0.80		0.43			3.12		3.12
Reach 1-3	1799	5-YR	398.70	6990.34	6991.97	6991.97	6992.36	0.019078	101.30	0.99		0.94			4.99		4.99
Reach 1-3	1799	10-YR	676.70	6990.34	6992.31	6992.31	6992.83	0.017733	111.17	1.00		1.15			5.81		5.81
Reach 1-3	1799	25-YR	931.20	6990.34	6992.55	6992.55	6993.20	0.017001	113.67	1.01		1.34			6.46		6.46
Reach 1-3	1799	50-YR	1282.90	6990.34	6992.87	6992.87	6993.65	0.015798	117.04	1.01		1.51			7.10		7.10
Reach 1-3	1799	100-YR	1486.60	6990.34	6993.04	6993.04	6993.89	0.015367	118.84	1.01		1.61			7.43		7.43
Reach 1-3	1799	FIS	2600.00	6990.34	6993.82	6993.82	6995.01	0.013503	131.00	1.00	0.20	1.99	0.29	2.08	8.76	2.63	8.72
Reach 1-3	1596	2-YR	101.60	6986.76	6987.35	6987.35	6987.49	0.028579	116.09	1.03		0.50			3.09		3.09
Reach 1-3	1596	5-YR	398.70	6986.76	6987.76	6987.77	6988.10	0.022819	138.11	1.04		0.88			4.66		4.66
Reach 1-3	1596	10-YR	676.70	6986.76	6987.98	6988.06	6988.50	0.025441	149.98	1.15		1.24			5.76		5.76
Reach 1-3	1596	25-YR	931.20	6986.76	6988.12	6988.27	6988.82	0.028252	153.11	1.24		1.60			6.69		6.69
Reach 1-3	1596	50-YR	1282.90	6986.76	6988.29	6988.51	6989.23	0.031305	156.11	1.34		2.06			7.78		7.78
Reach 1-3	1596	100-YR	1486.60	6986.76	6988.37	6988.64	6989.46	0.033047	157.61	1.39		2.33			8.36		8.36
Reach 1-3	1596	FIS	2600.00	6986.76	6988.75	6989.30	6990.60	0.039178	164.45	1.58	0.34	3.62		2.47	10.92		10.90
Reach 1-3	1411	2-YR	101.60	6982.00	6982.87	6982.82	6982.99	0.017033	106.88	0.82		0.37			2.74		2.74
Reach 1-3	1411	5-YR	398.70	6982.00	6983.23	6983.28	6983.65	0.025200	116.76	1.11		1.07	0.16		5.20	1.61	5.18
Reach 1-3	1411	10-YR	676.70	6982.00	6983.52	6983.59	6984.10	0.022085	123.29	1.10		1.31	0.36		6.11	2.84	6.05
Reach 1-3	1411	25-YR	931.20	6982.00	6983.76	6983.84	6984.44	0.019944	131.03	1.08		1.46	0.43		6.67	3.21	6.55
Reach 1-3	1411	50-YR	1282.90	6982.00	6984.05	6984.14	6984.85	0.018014	136.48	1.07		1.62	0.60		7.27	4.10	7.10
Reach 1-3	1411	100-YR	1486.60	6982.00	6984.20	6984.28	6985.06	0.017174	138.30	1.06		1.70	0.69		7.56	4.53	7.38
Reach 1-3	1411	FIS	2600.00	6982.00	6990.04	6984.98	6990.10	0.000178	278.37	0.14	0.02	0.08	0.04	0.94	2.15	1.39	1.86

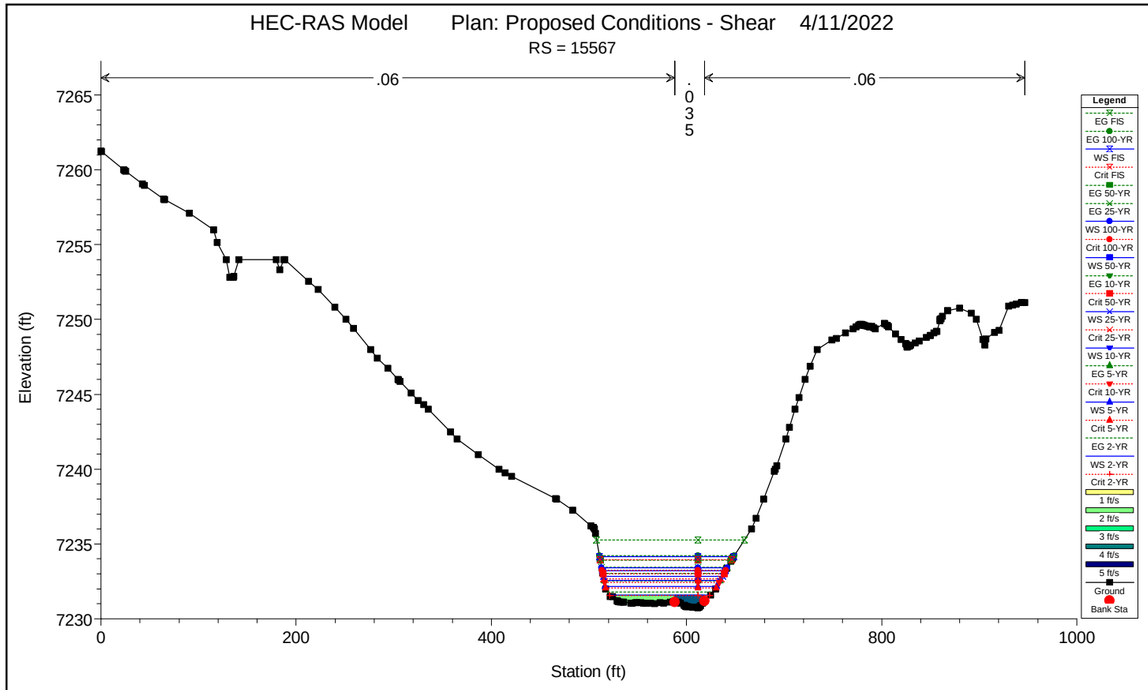
Add check structure near S property line?

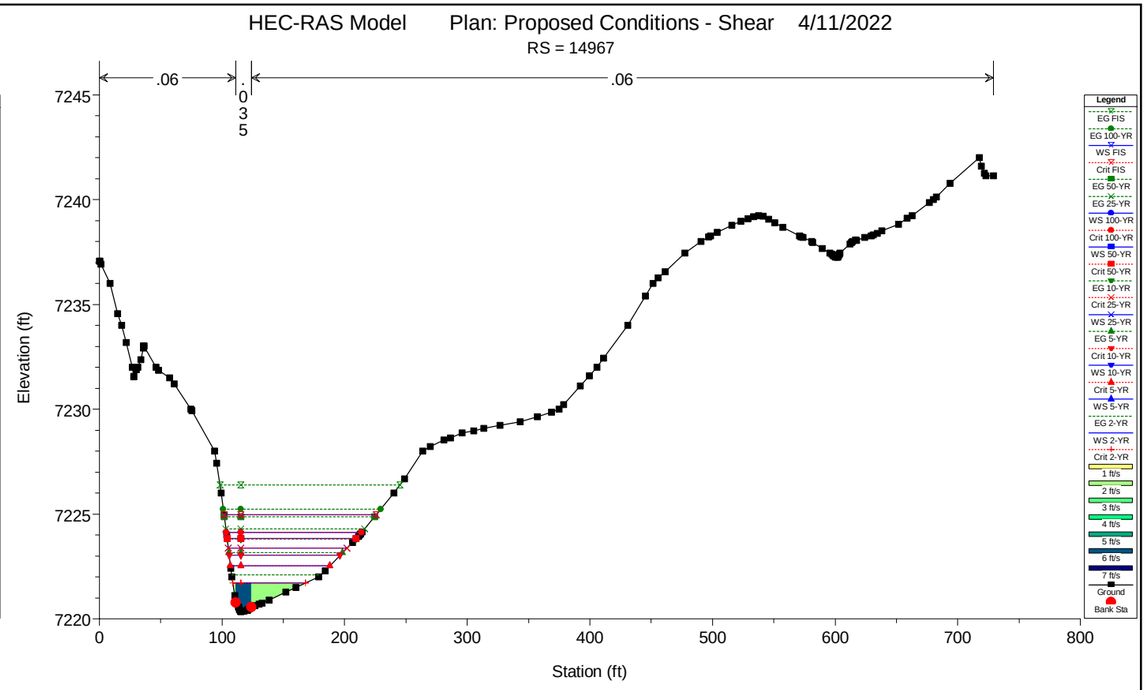
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

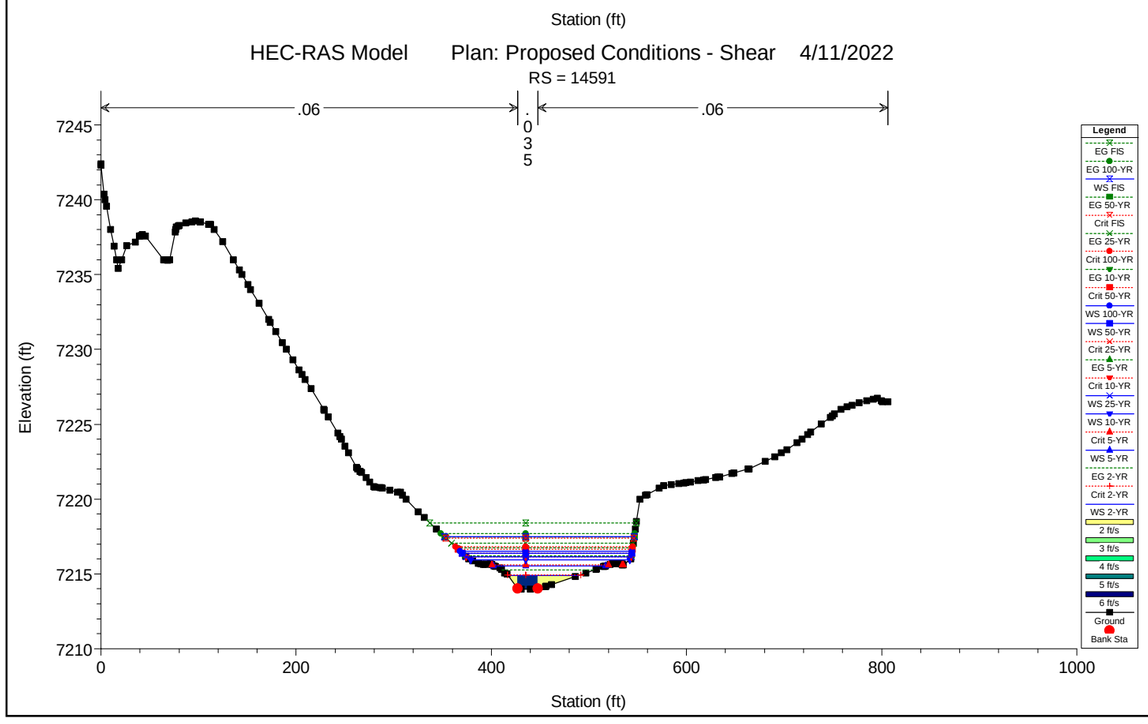
Sand Creek Reach 1-3

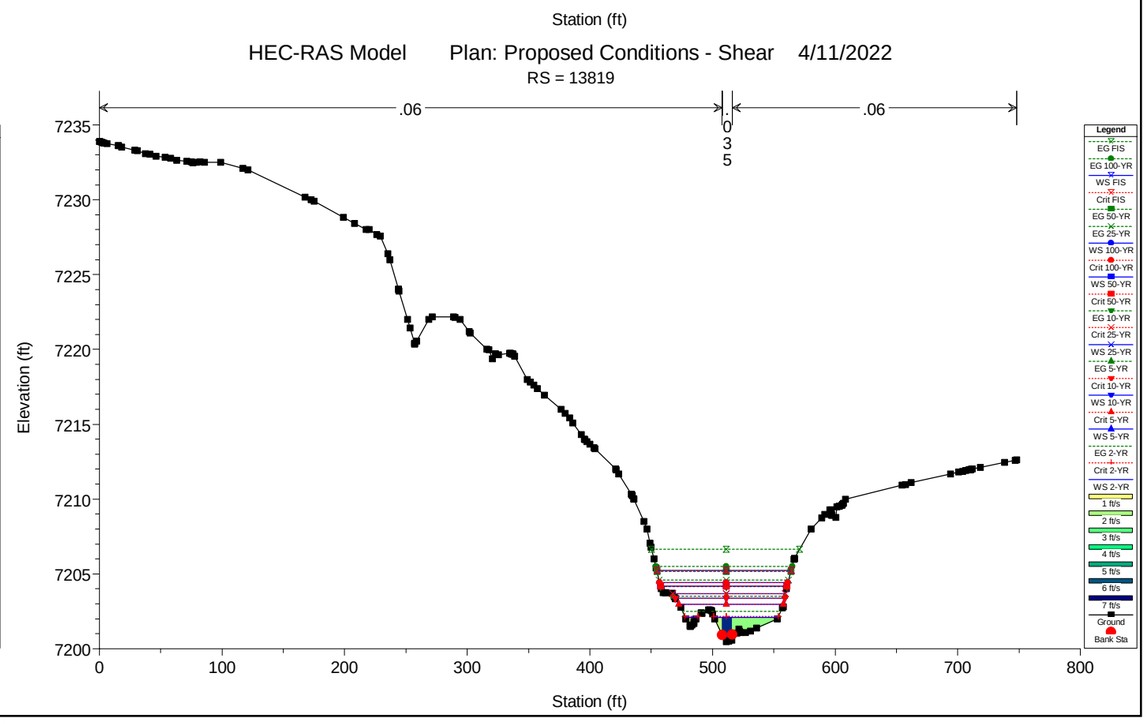


Not checked with this review









HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

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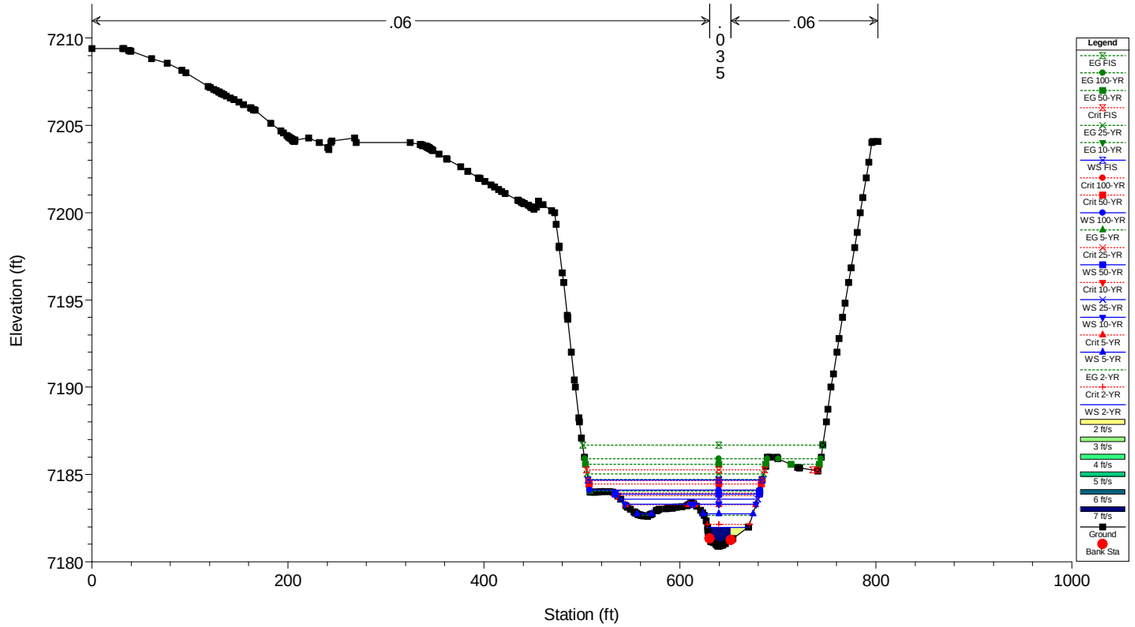
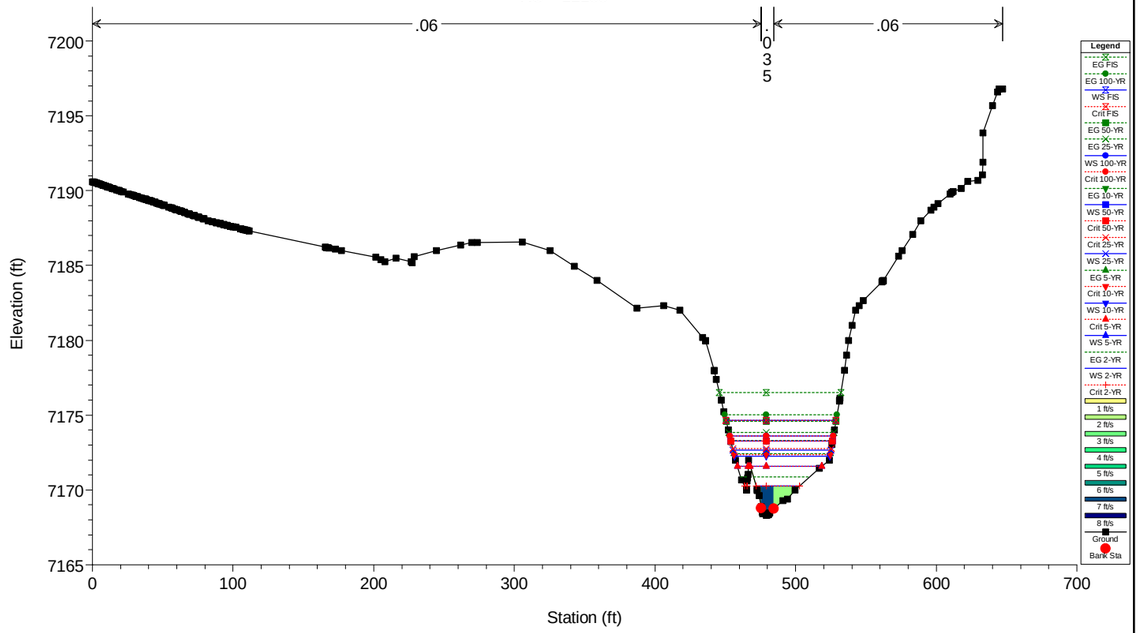


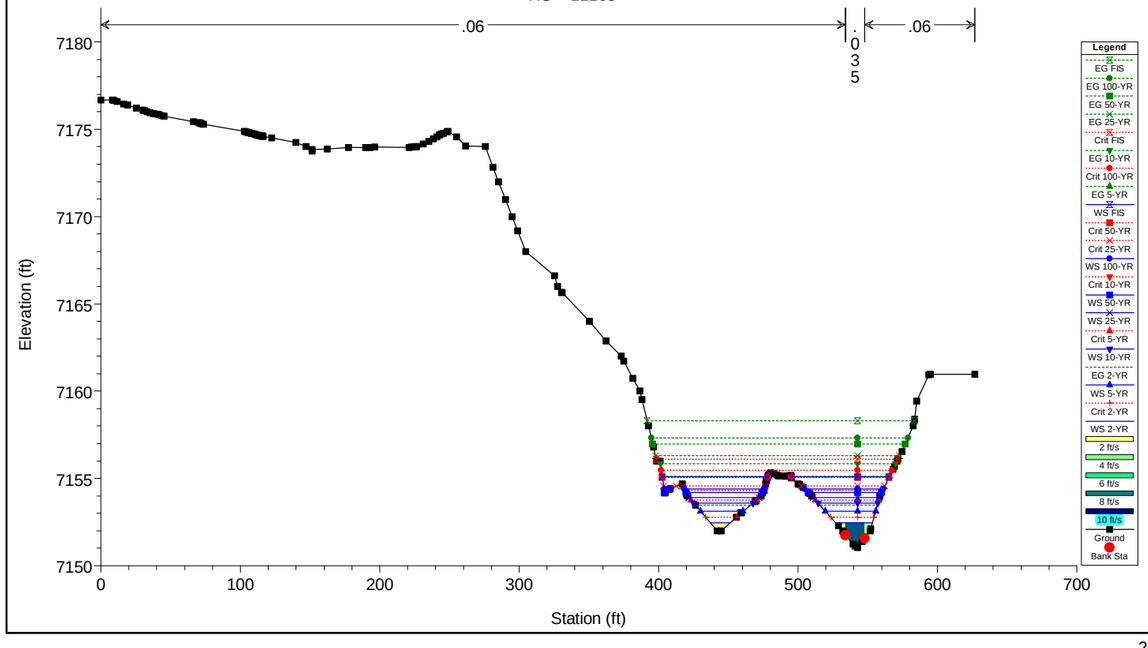
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 12133



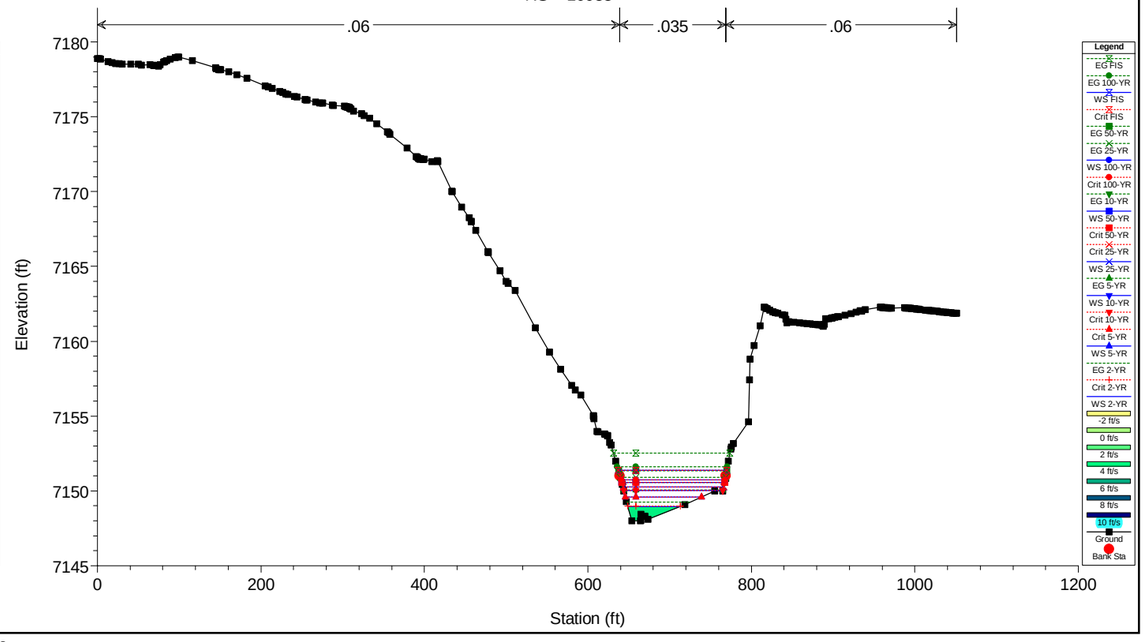
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 11268

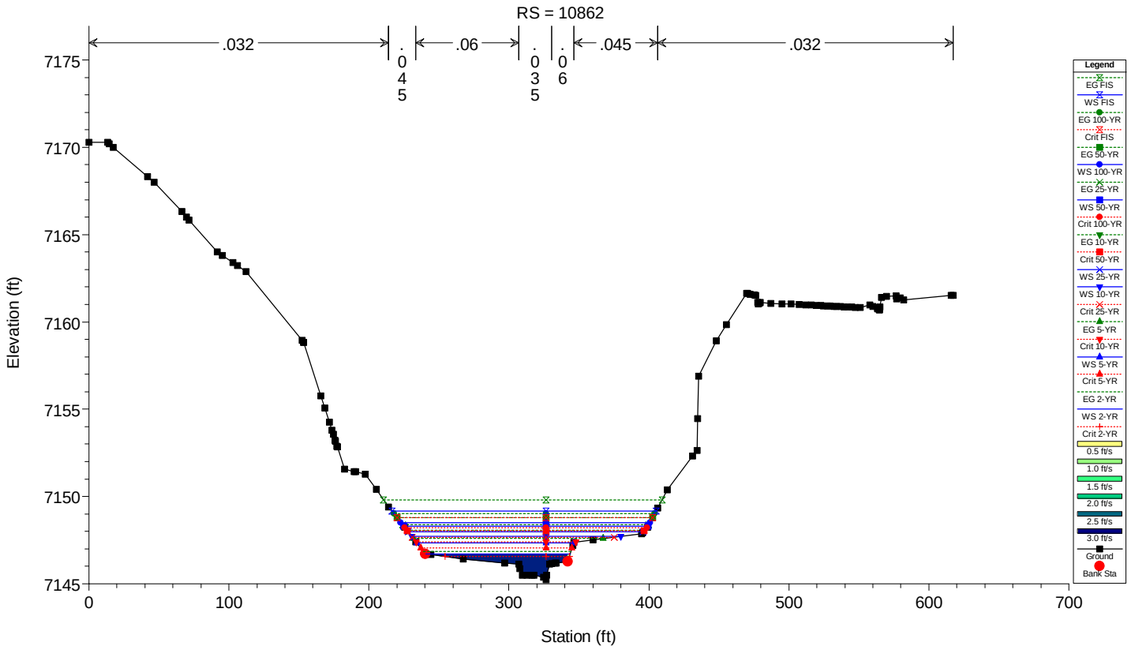


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

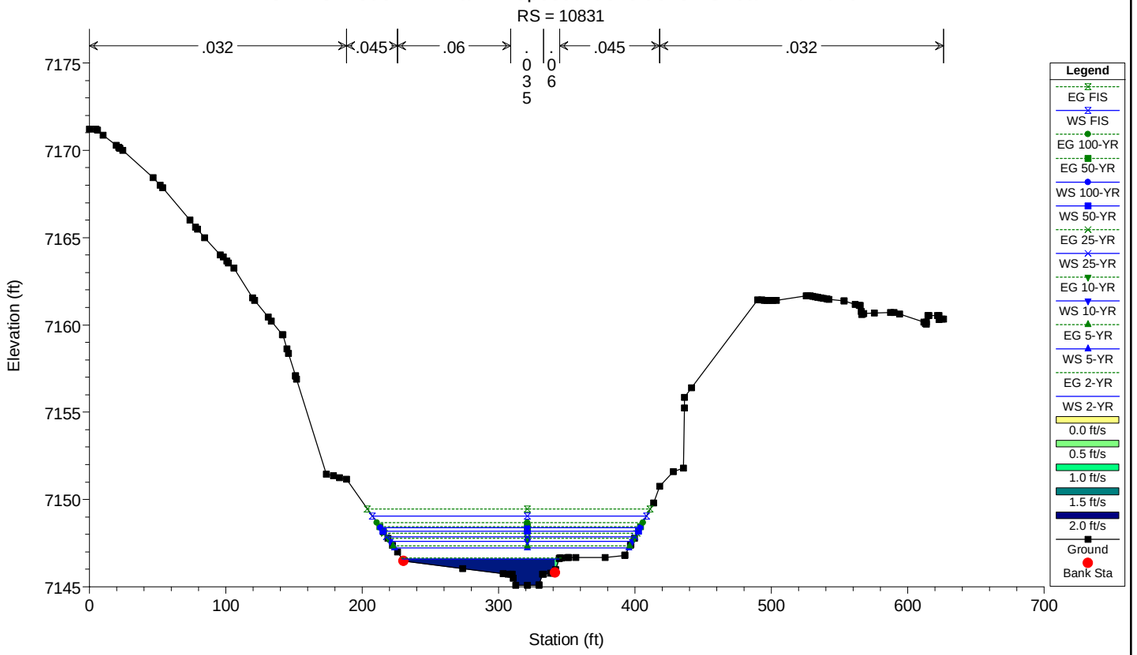
RS = 10988



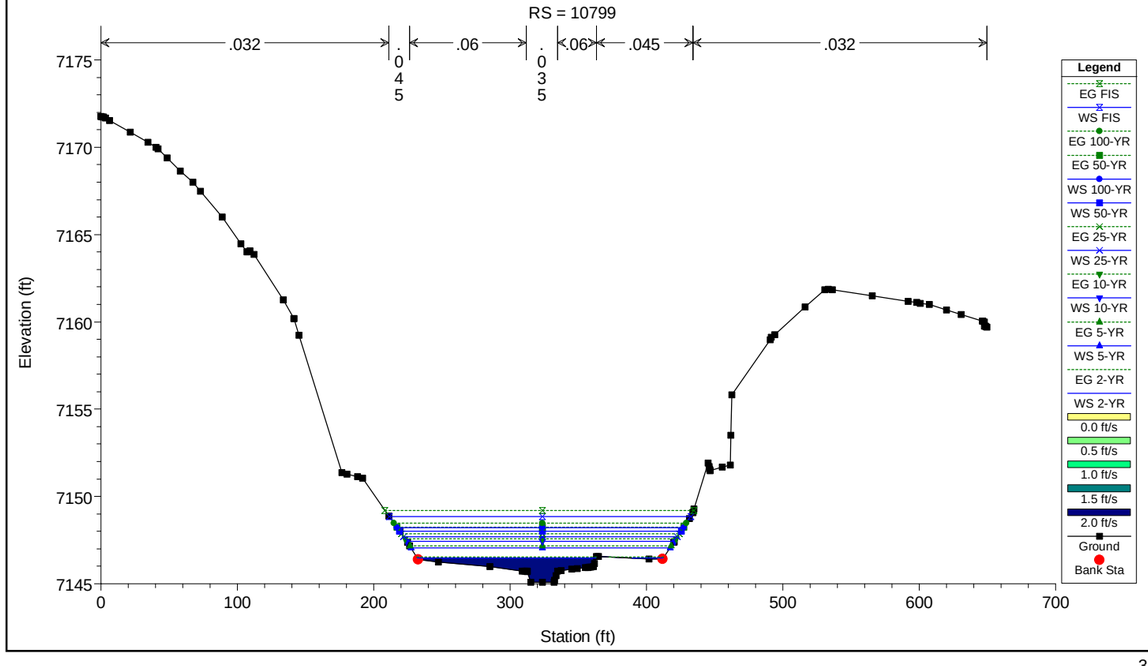
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022



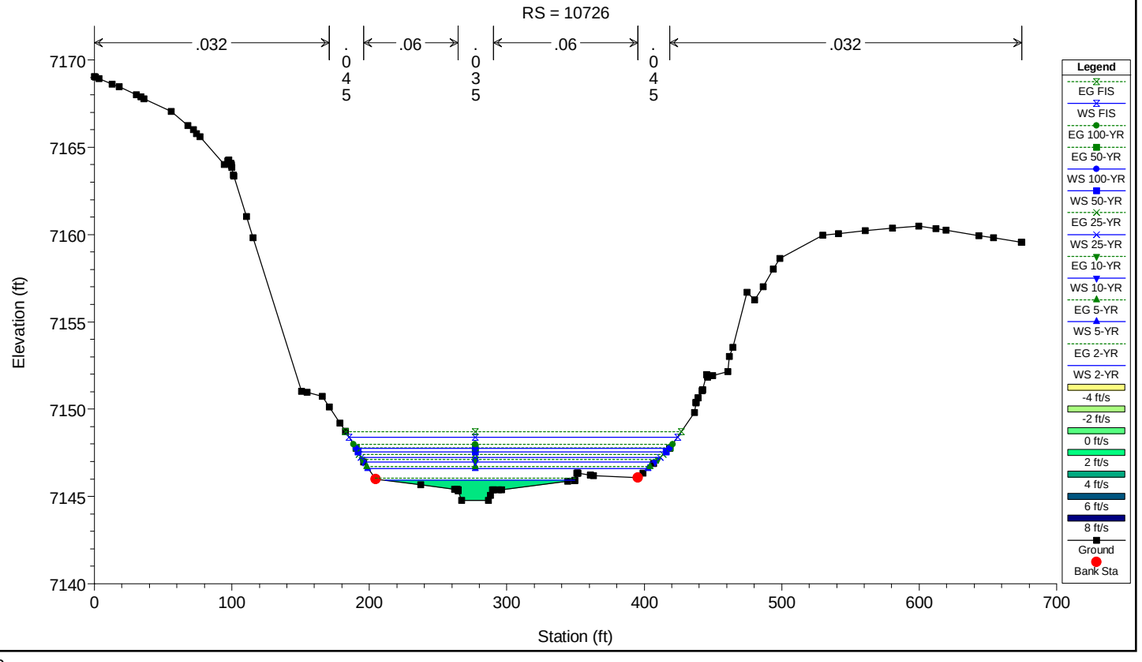
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

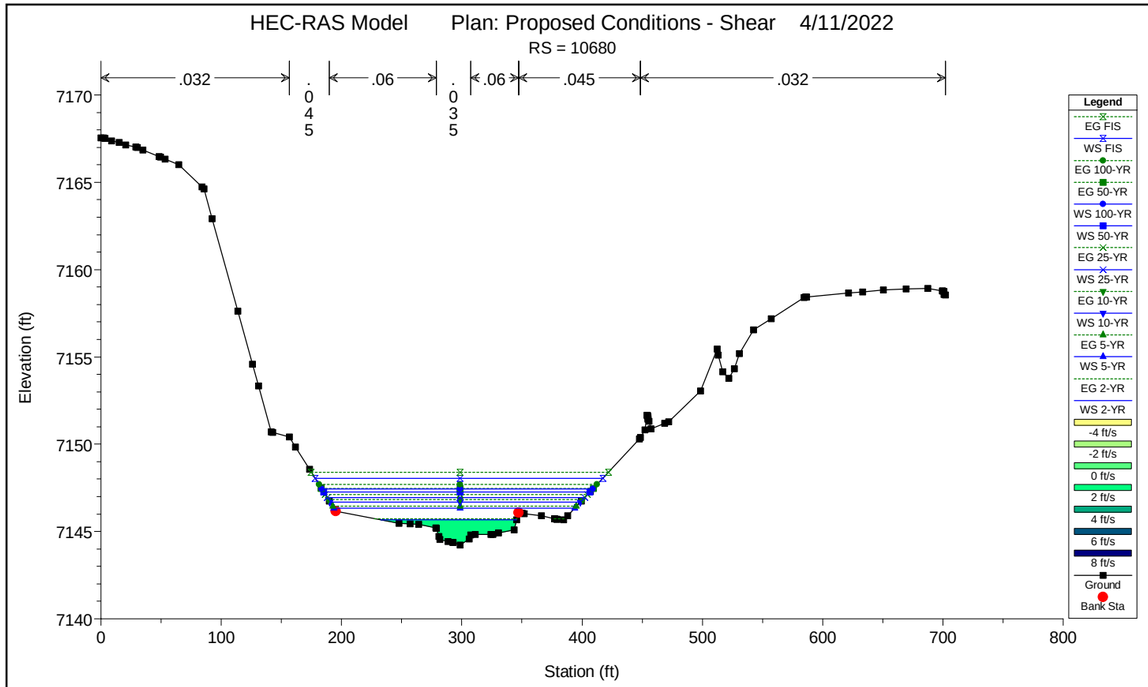


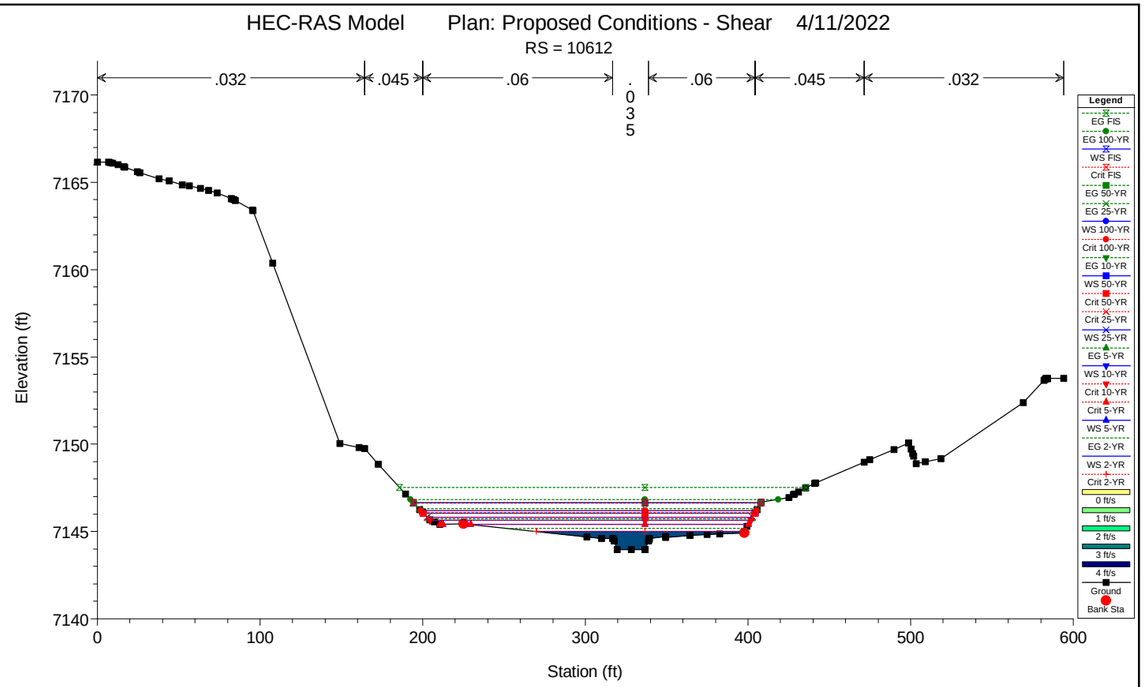
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022



HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022




HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 10680
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta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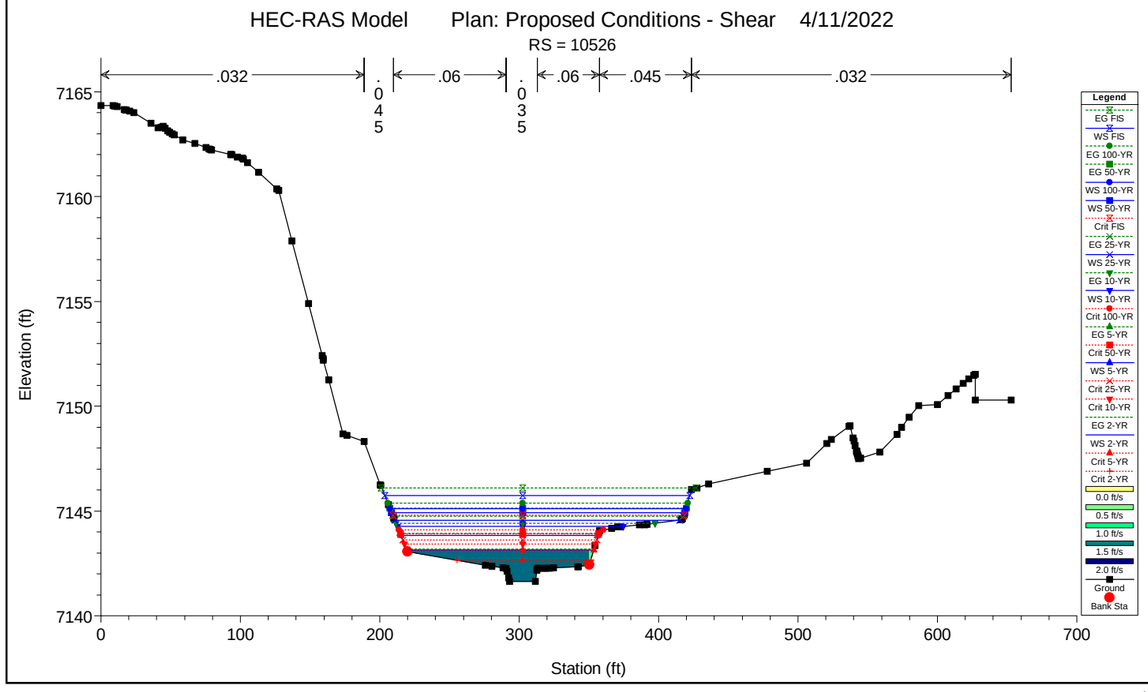
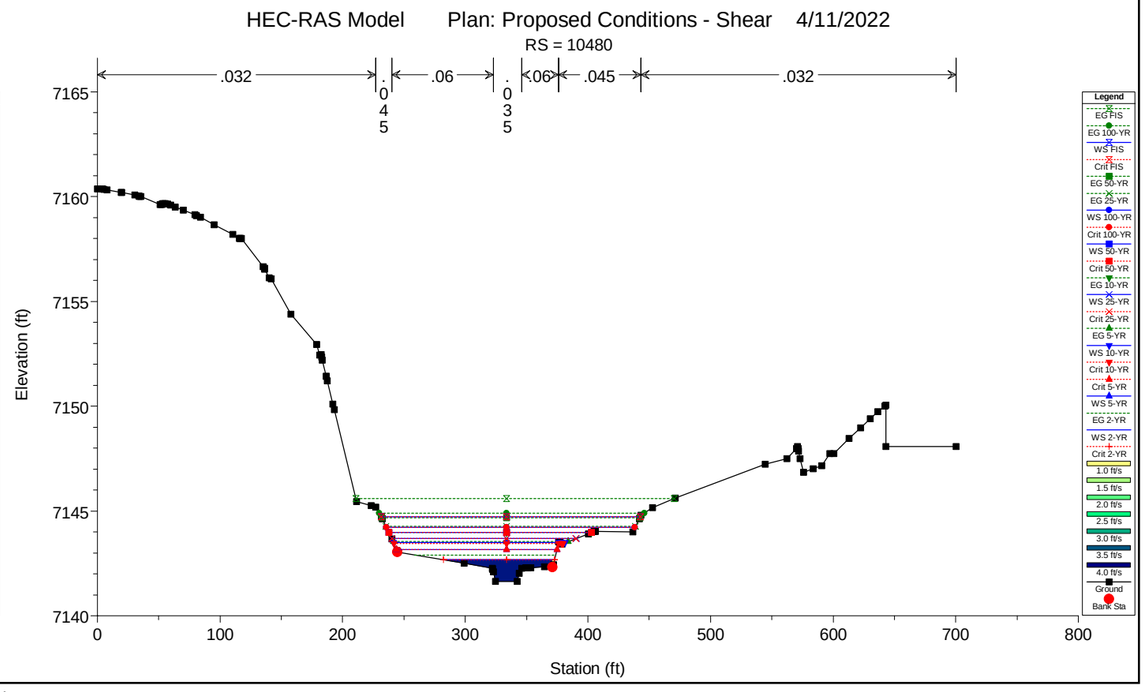
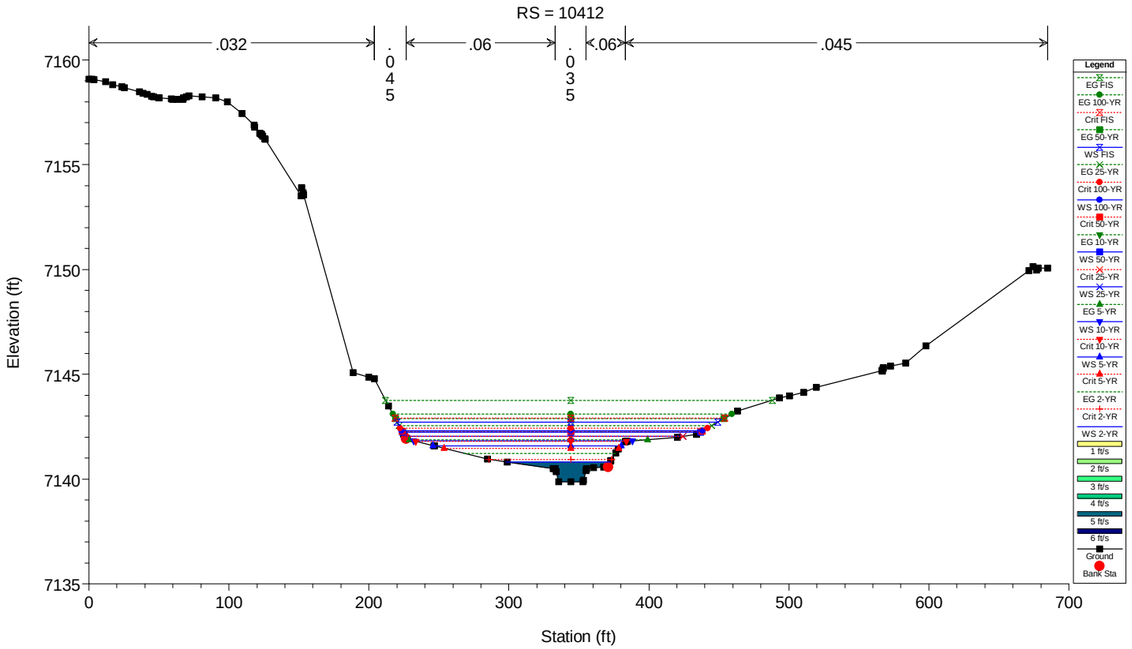
RS = 10612
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 10526
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
Crit FIS
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
Crit 100-YR
EG 5-YR
Crit 50-YR
WS 5-YR
Crit 25-YR
Crit 10-YR
EG 2-YR
WS 2-YR
Crit 5-YR
Crit 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 10480
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
Crit 50-YR
EG 10-YR
WS 10-YR
Crit 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

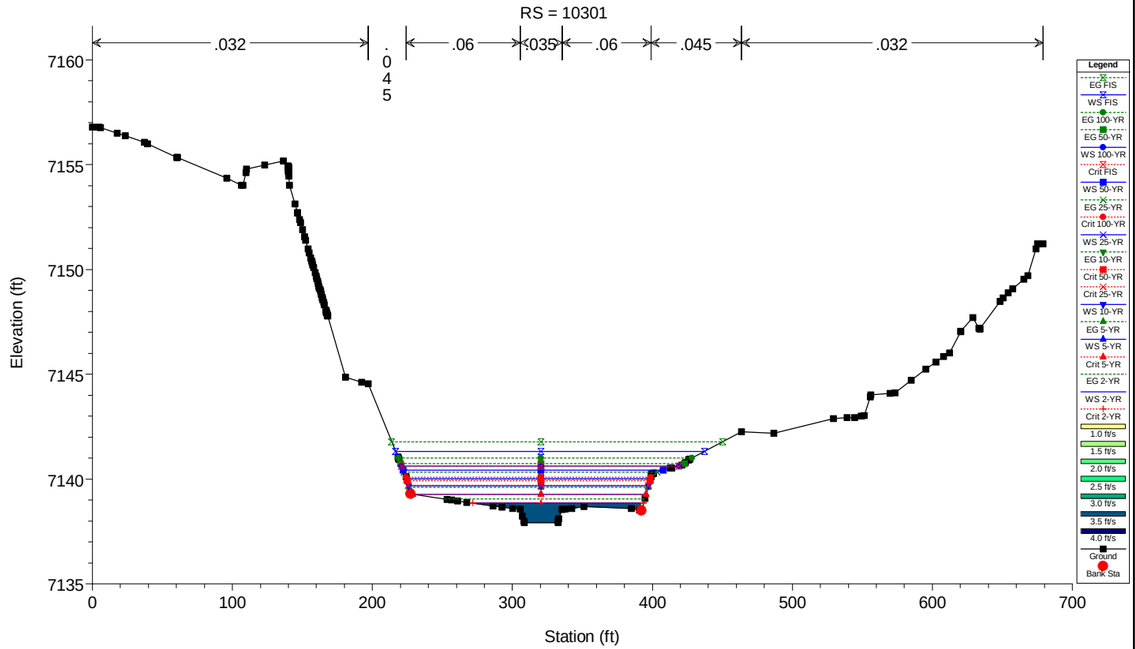
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 10412



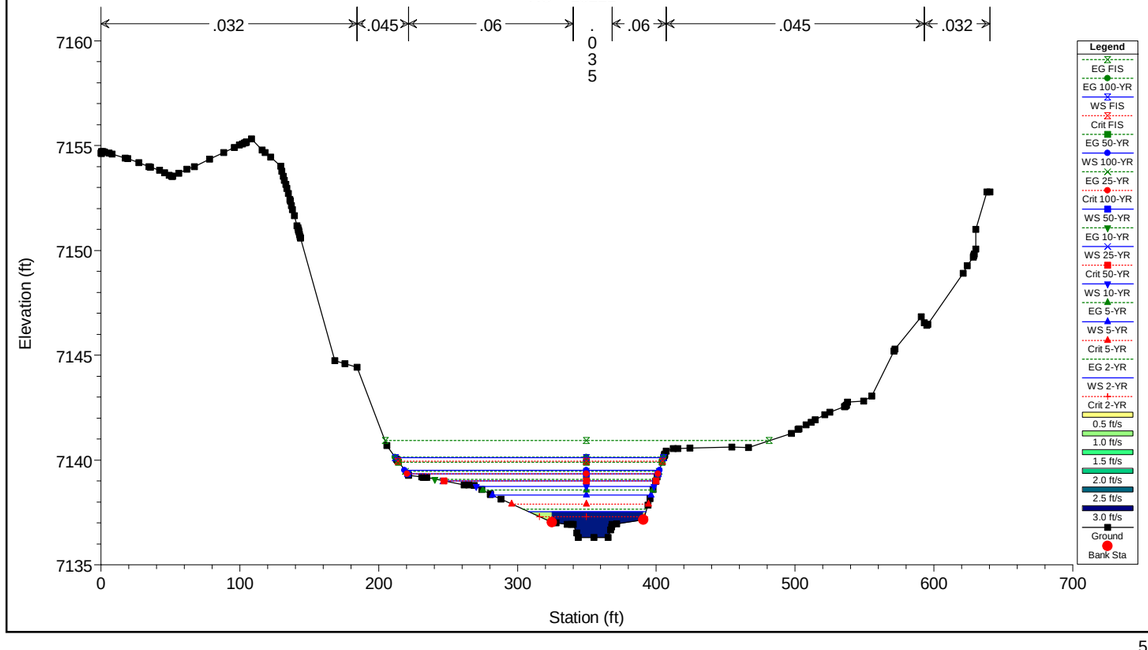
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 10301



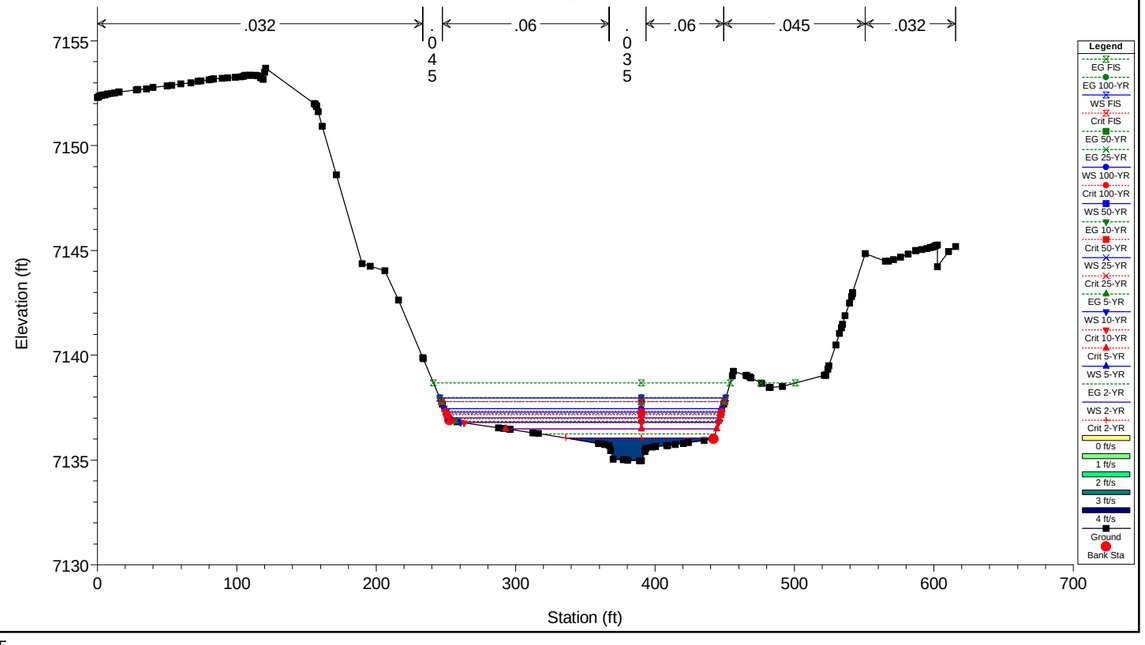
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

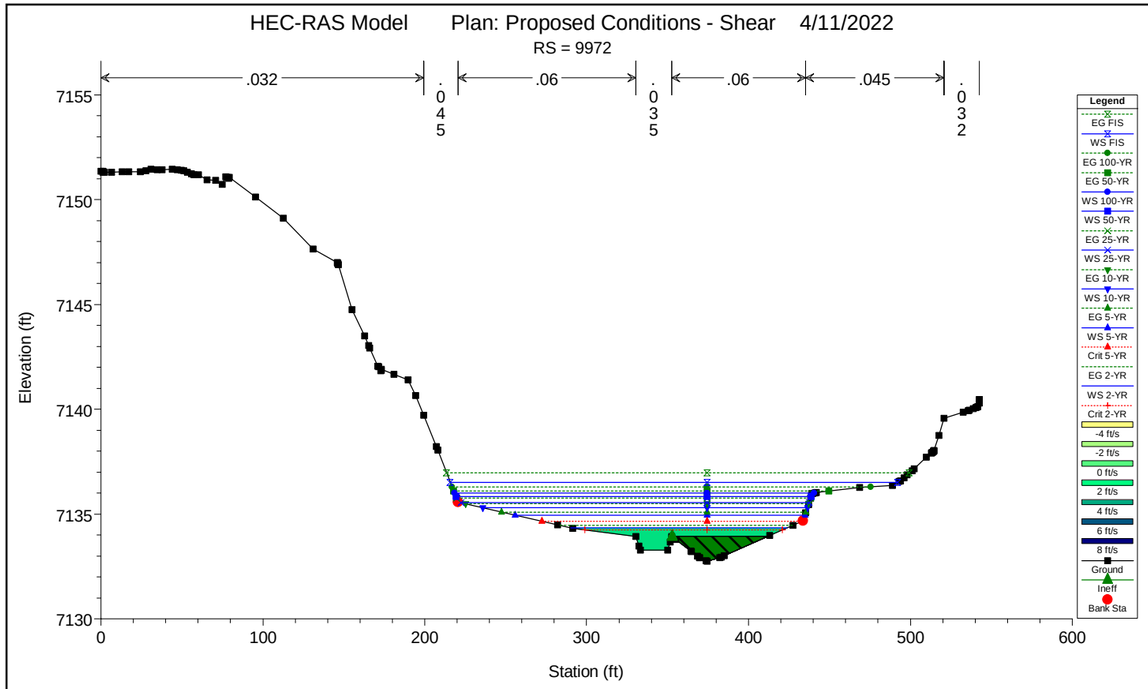
RS = 10221

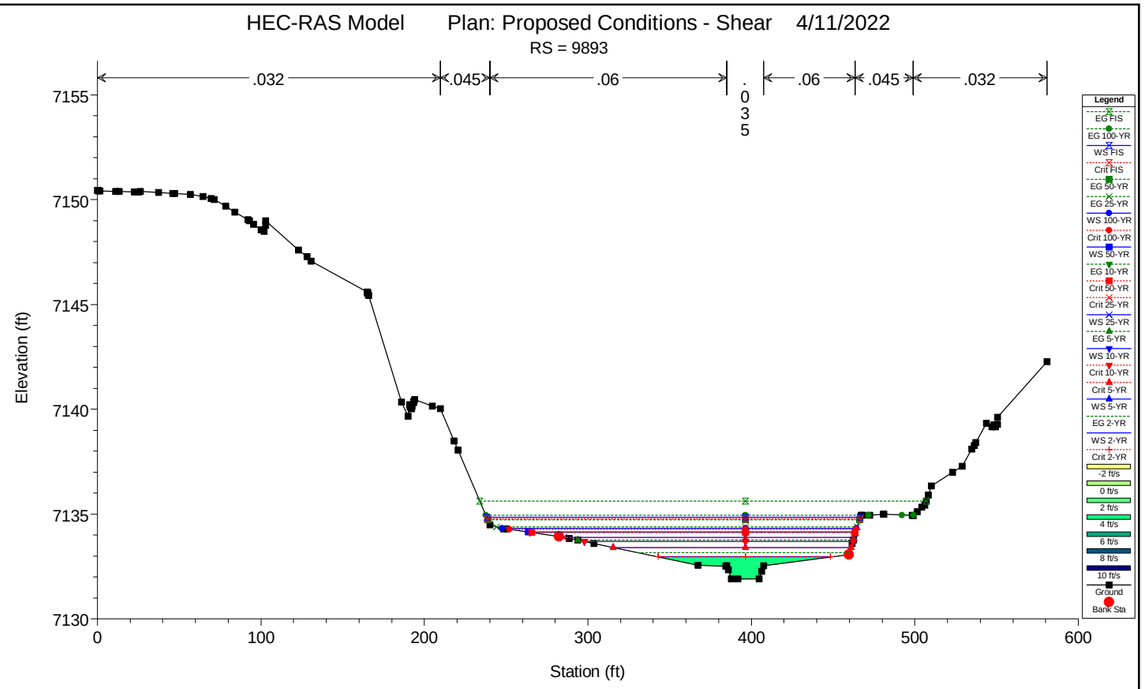


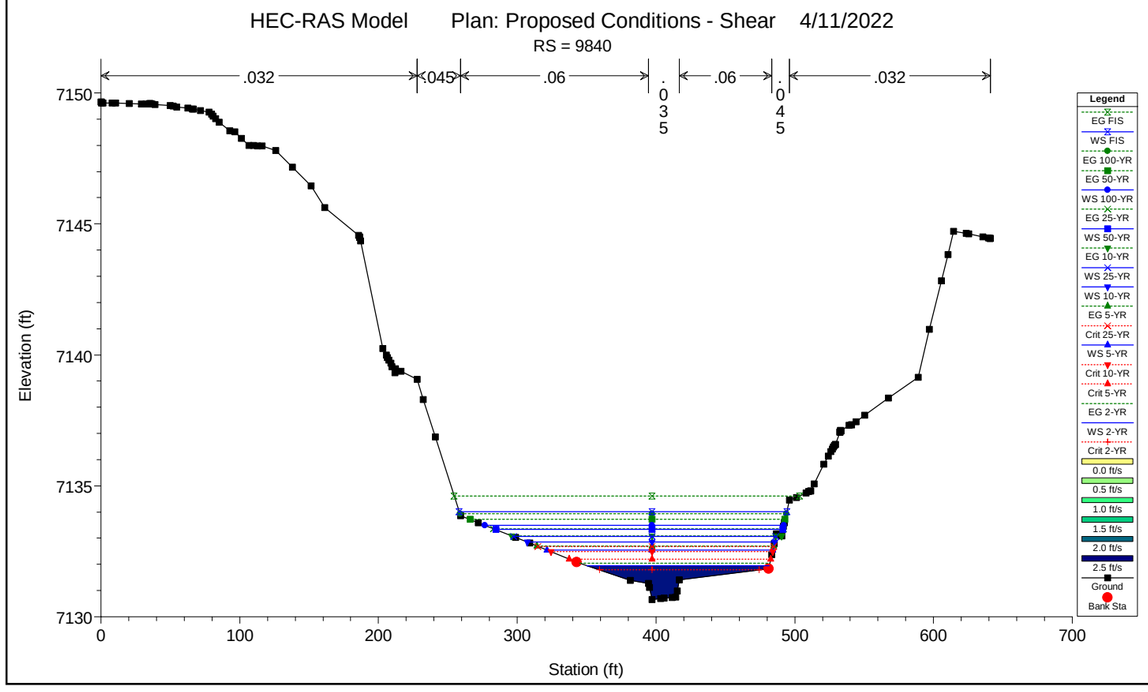
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 10077




HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9972
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9893
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
EG 10-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
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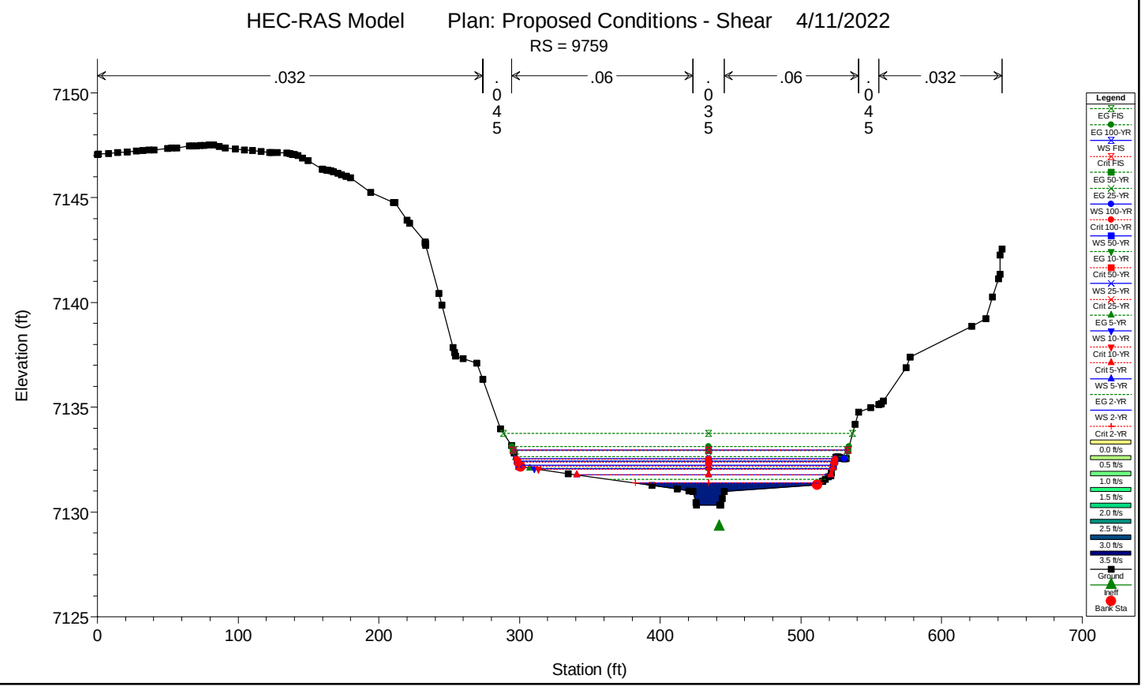
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
EG 25-YR
WS 50-YR
EG 10-YR
WS 25-YR
EG 5-YR
Crit 25-YR
WS 5-YR
Crit 10-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
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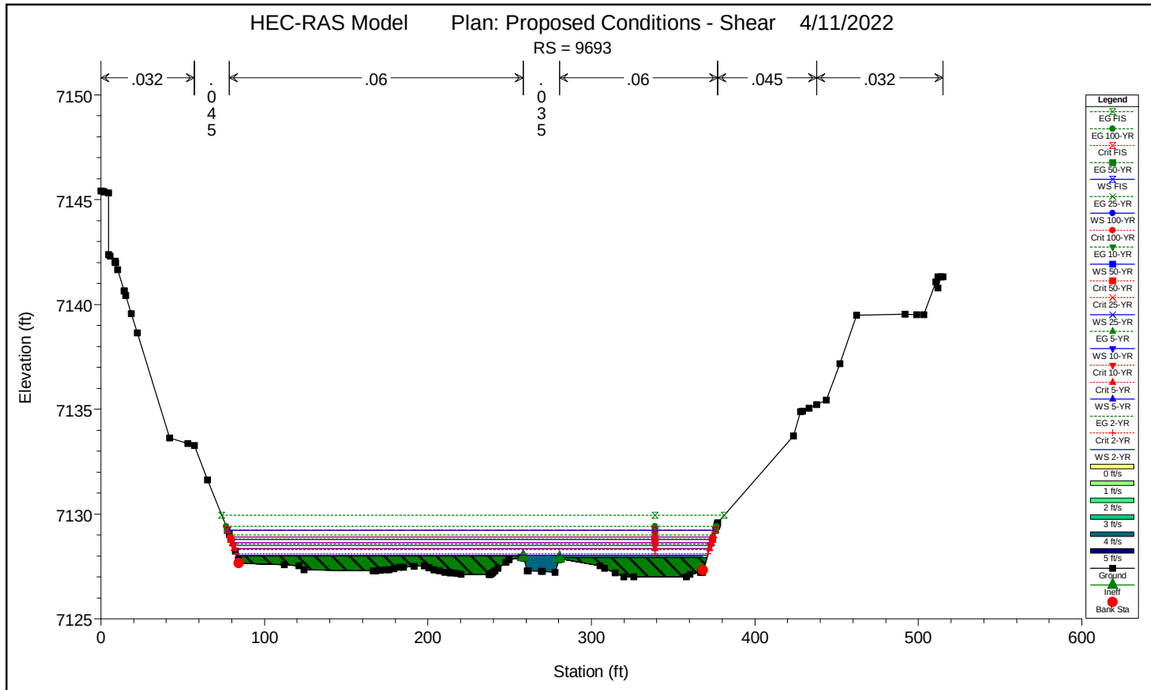
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
EG 10-YR
Crit 50-YR
WS 25-YR
Crit 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Ineff
Bank Sta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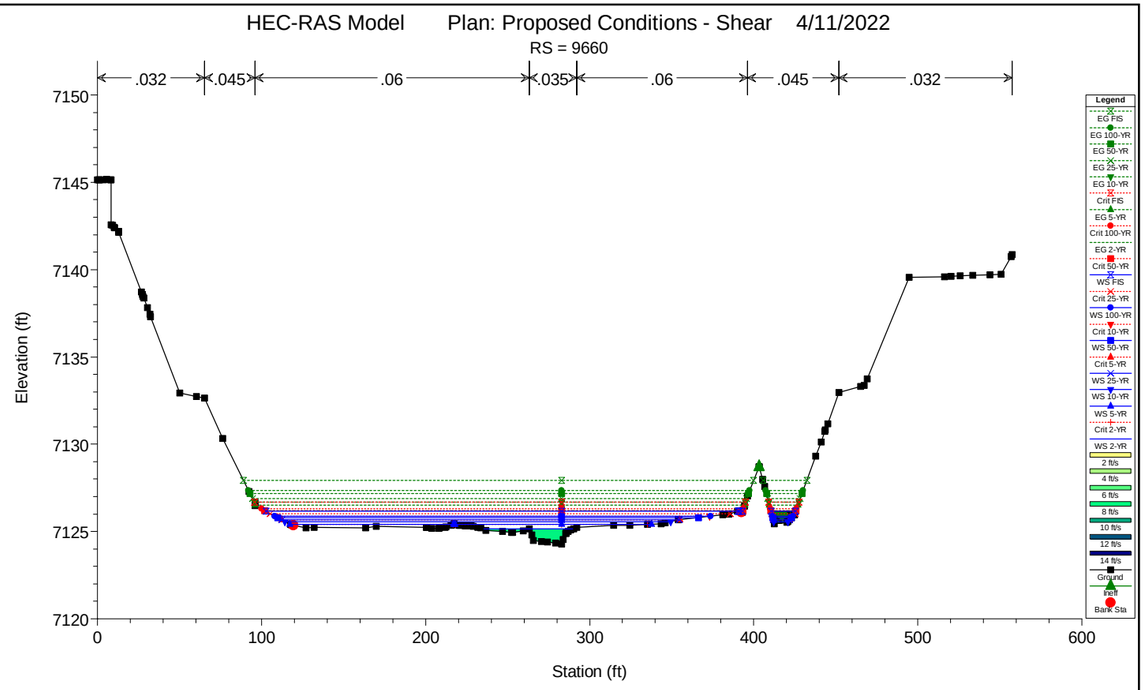
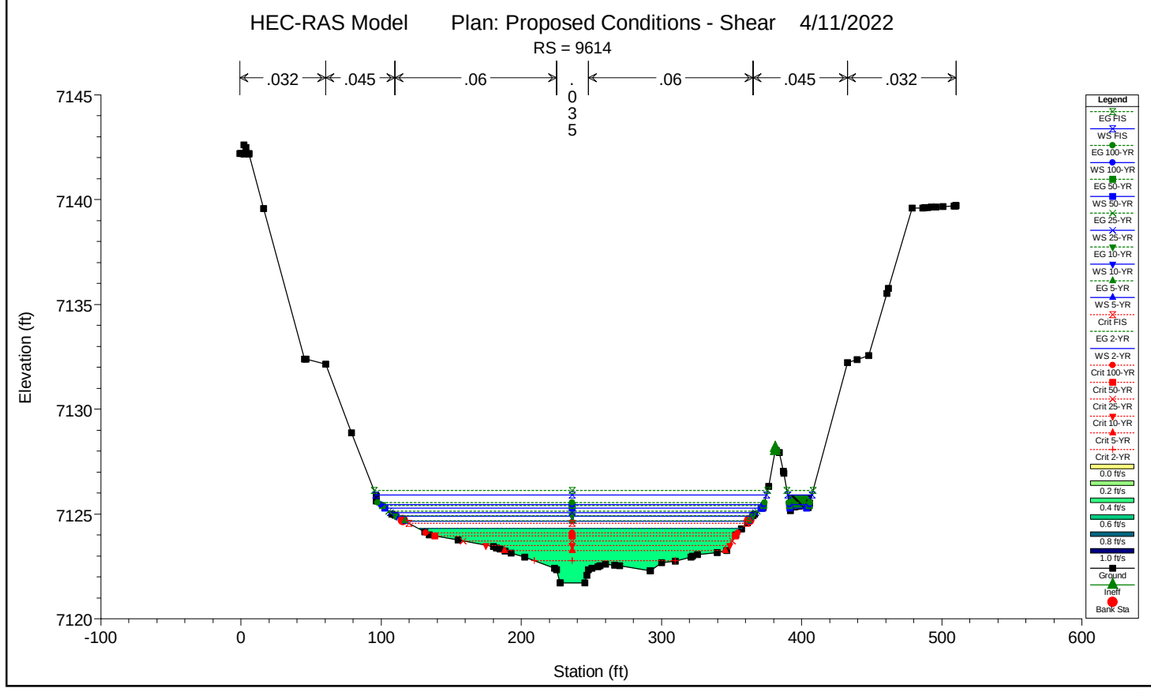
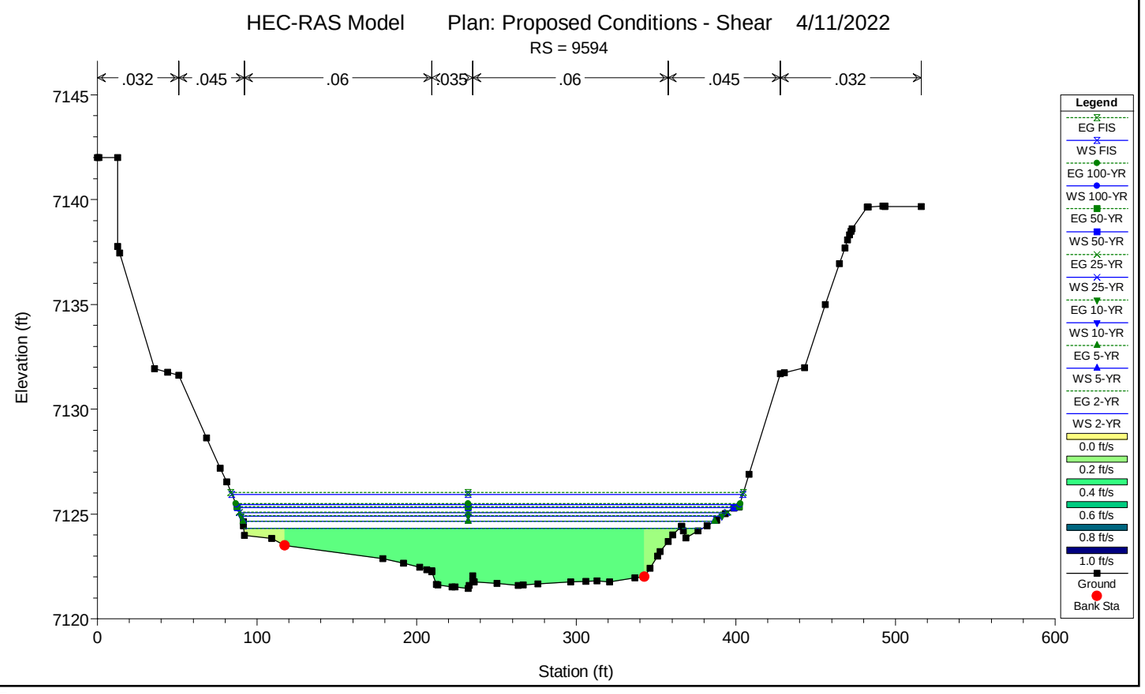
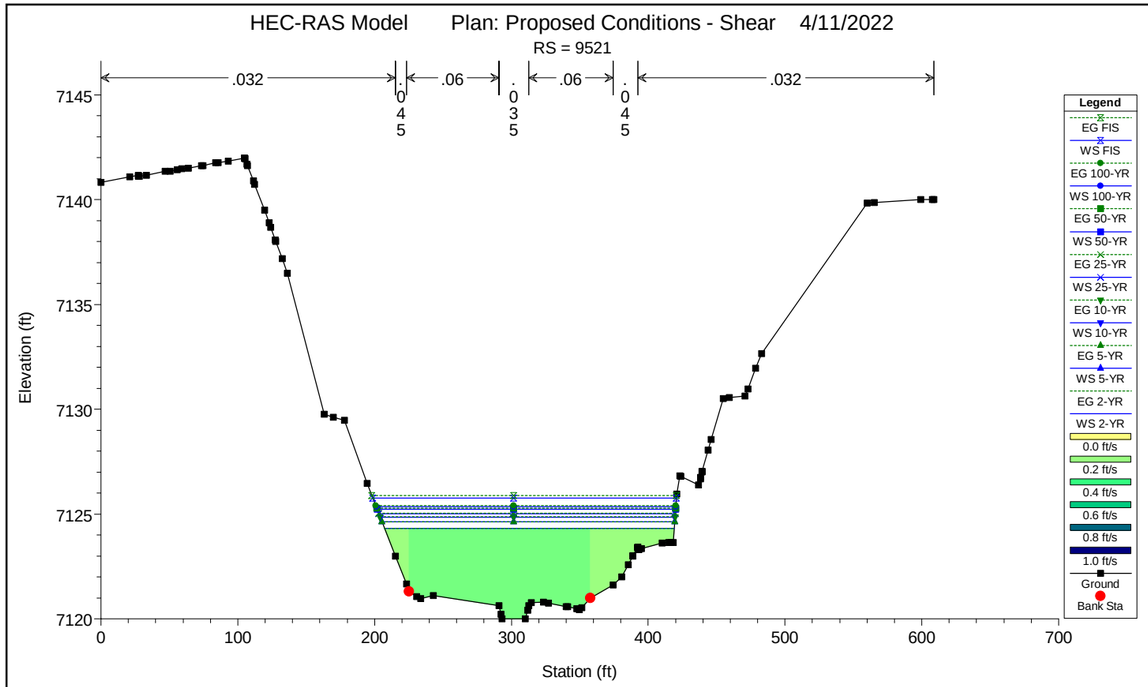
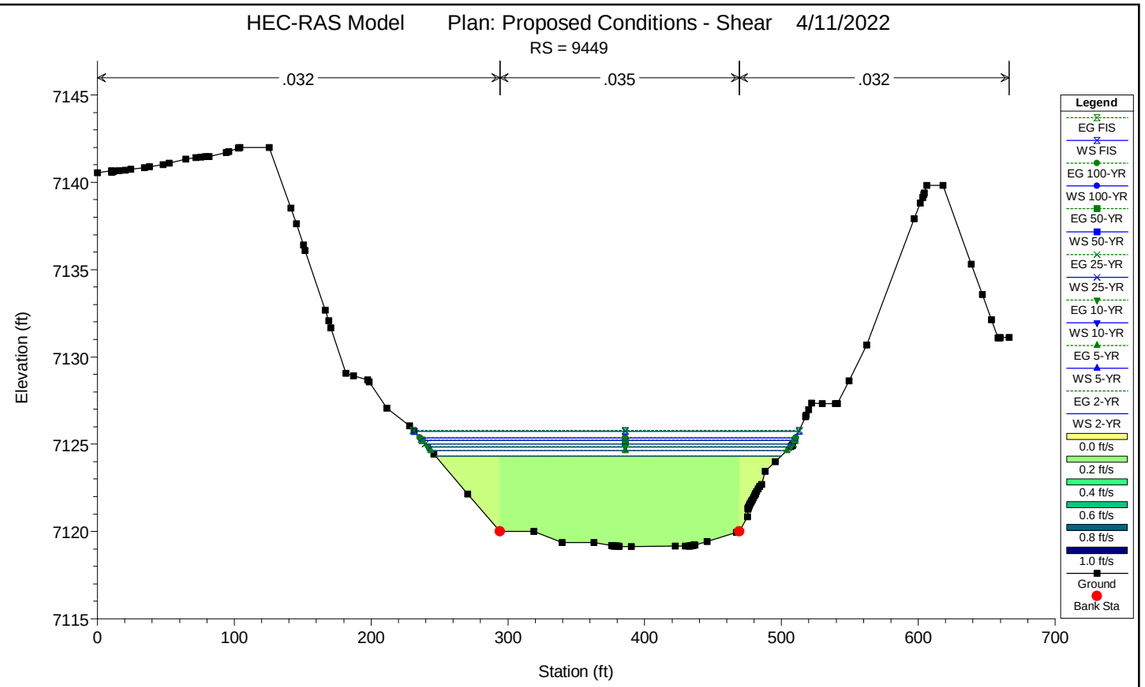
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
Crit FIS
EG 50-YR
WS FIS
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Ineff
Bank Sta

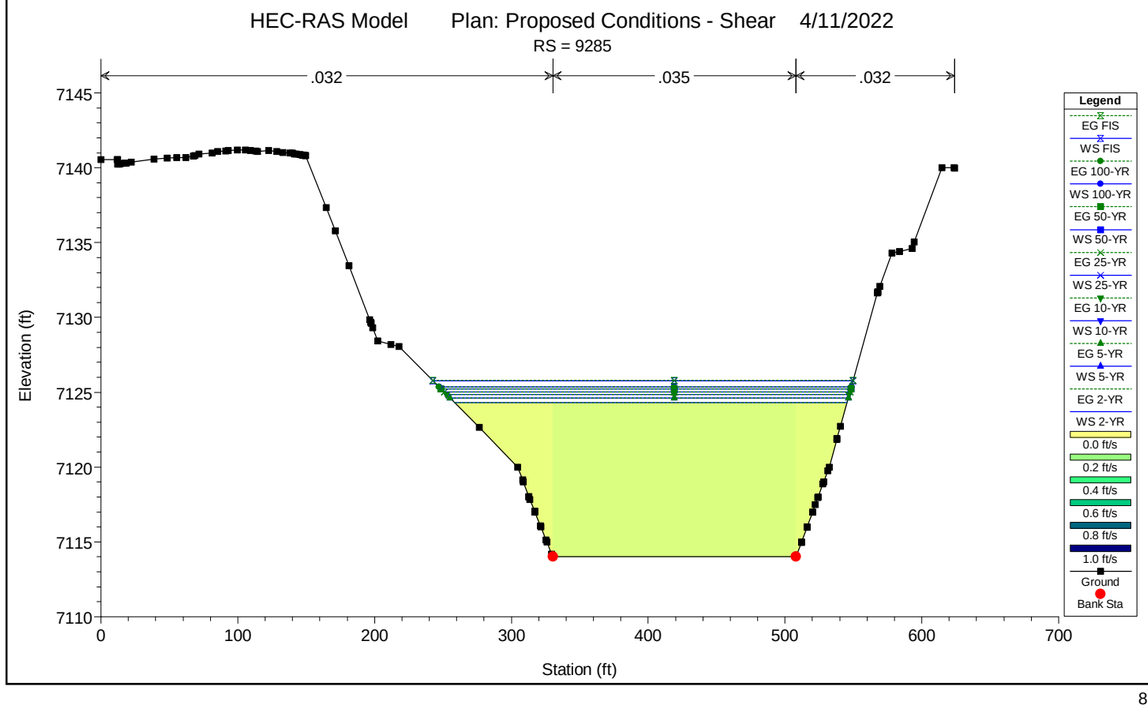

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9660
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
EG 25-YR
EG 10-YR
Crit FIS
EG 5-YR
Crit 100-YR
EG 2-YR
Crit 50-YR
WS FIS
Crit 25-YR
WS 100-YR
Crit 10-YR
WS 50-YR
Crit 5-YR
WS 25-YR
WS 10-YR
WS 5-YR
Crit 2-YR
WS 2-YR
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Ineff
Bank Sta

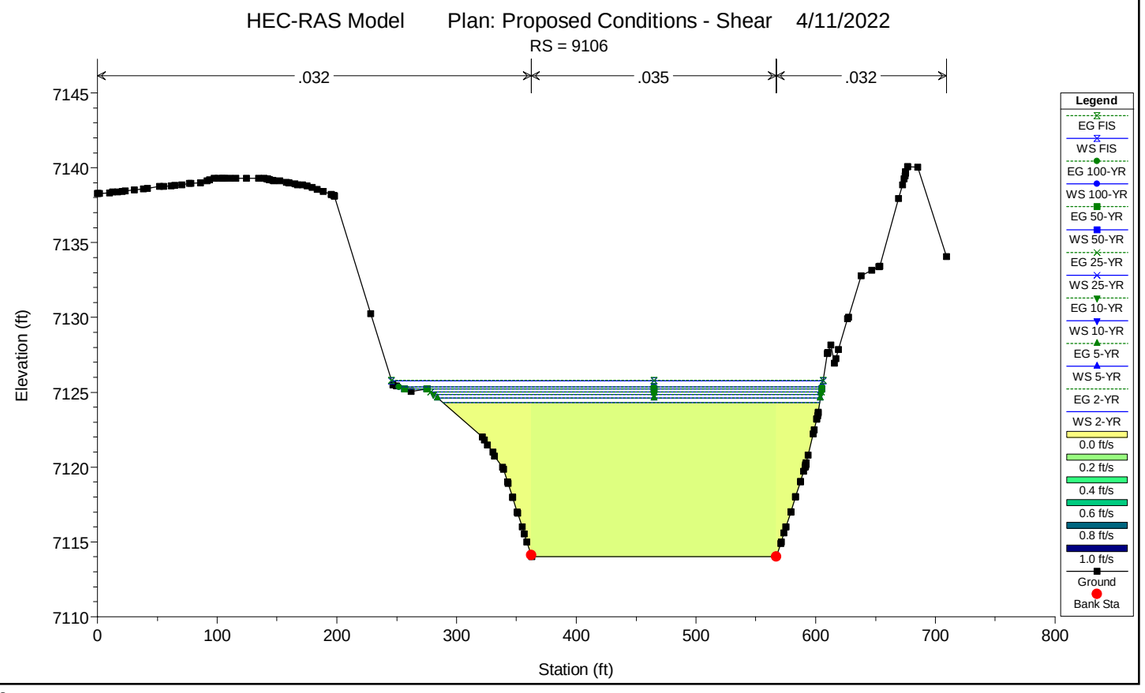

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9614
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
Crit FIS
EG 2-YR
WS 2-YR
Crit 100-YR
Crit 50-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
Crit 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta

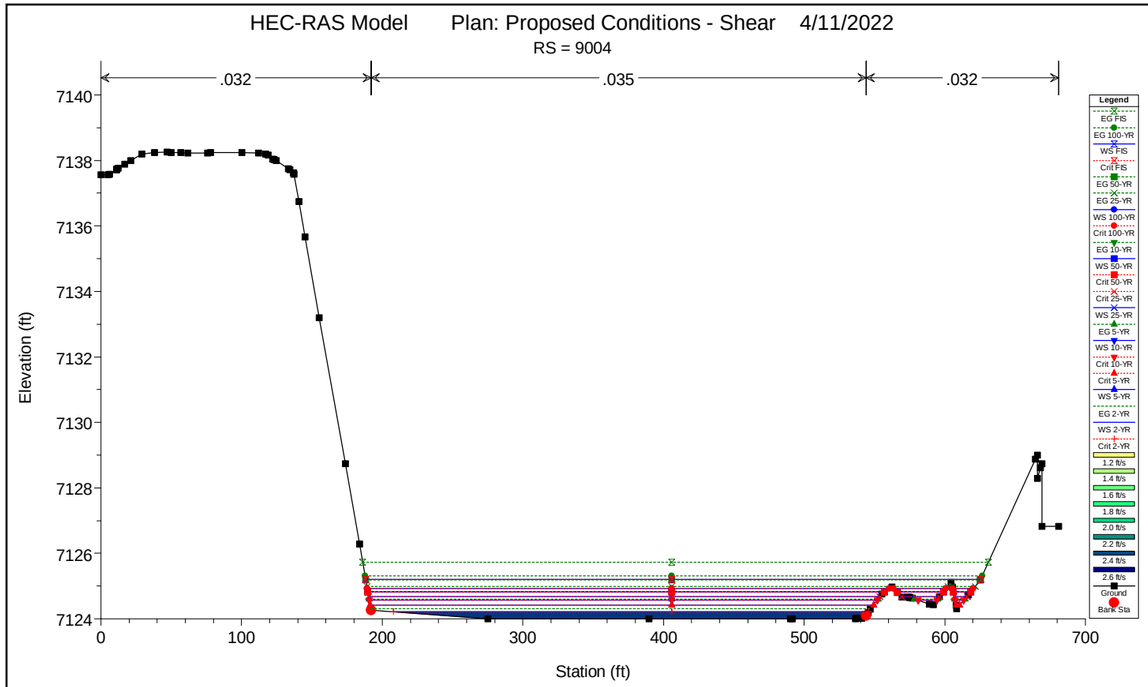

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9594
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

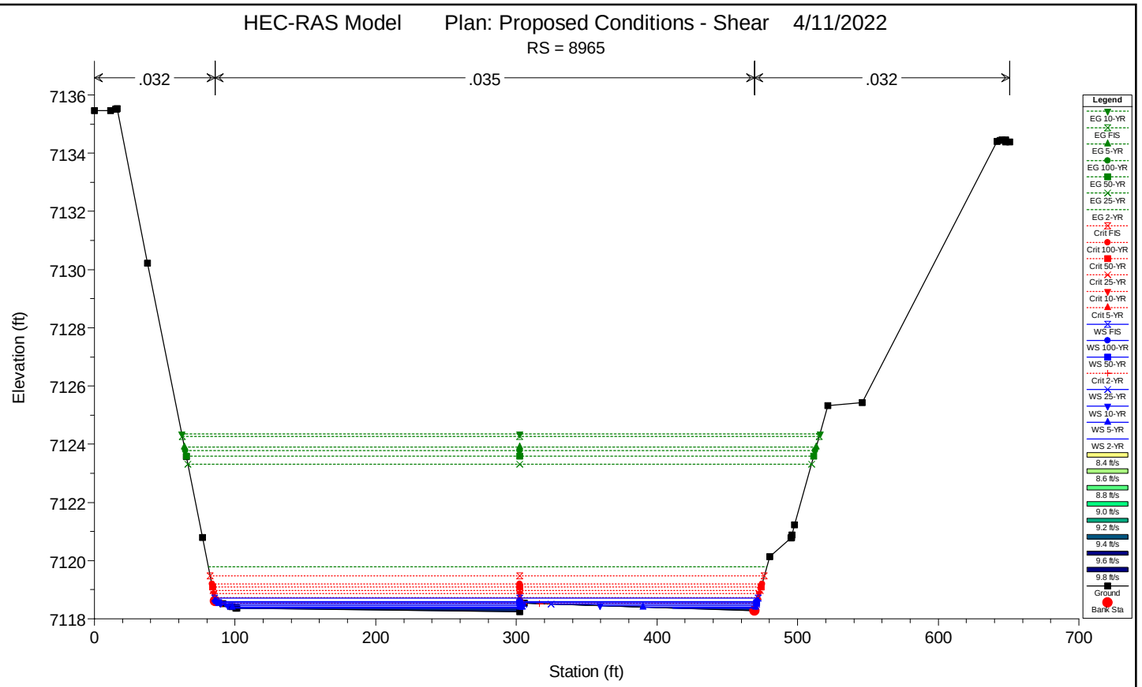

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9521
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

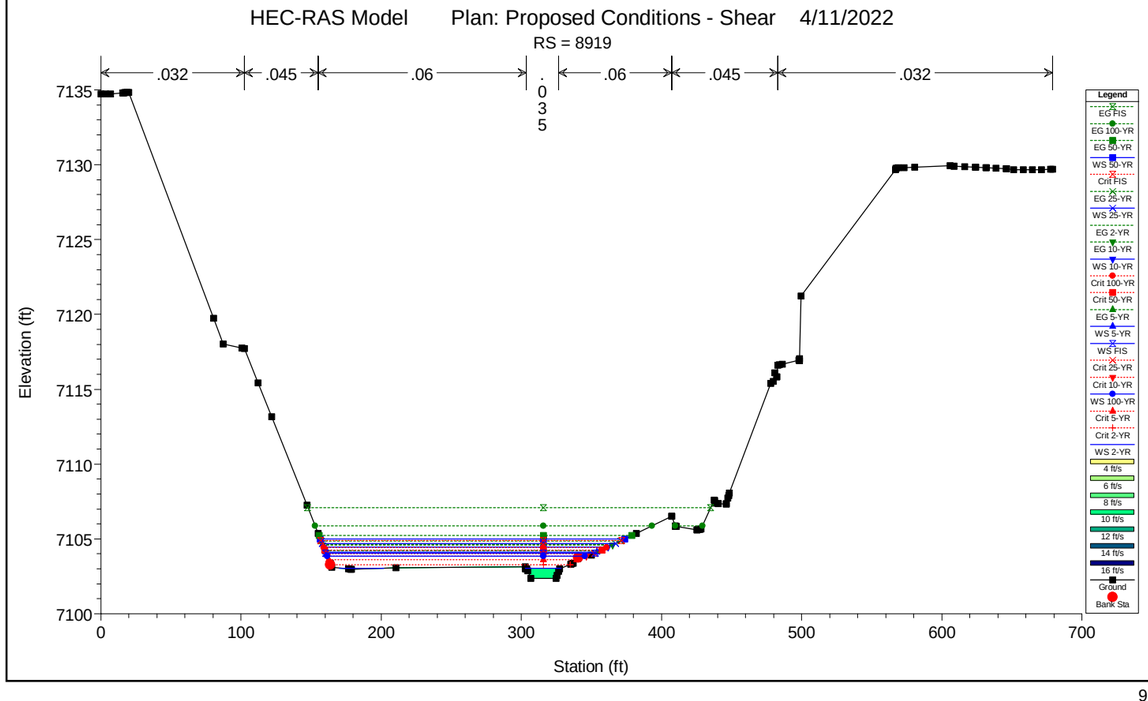

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9449
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

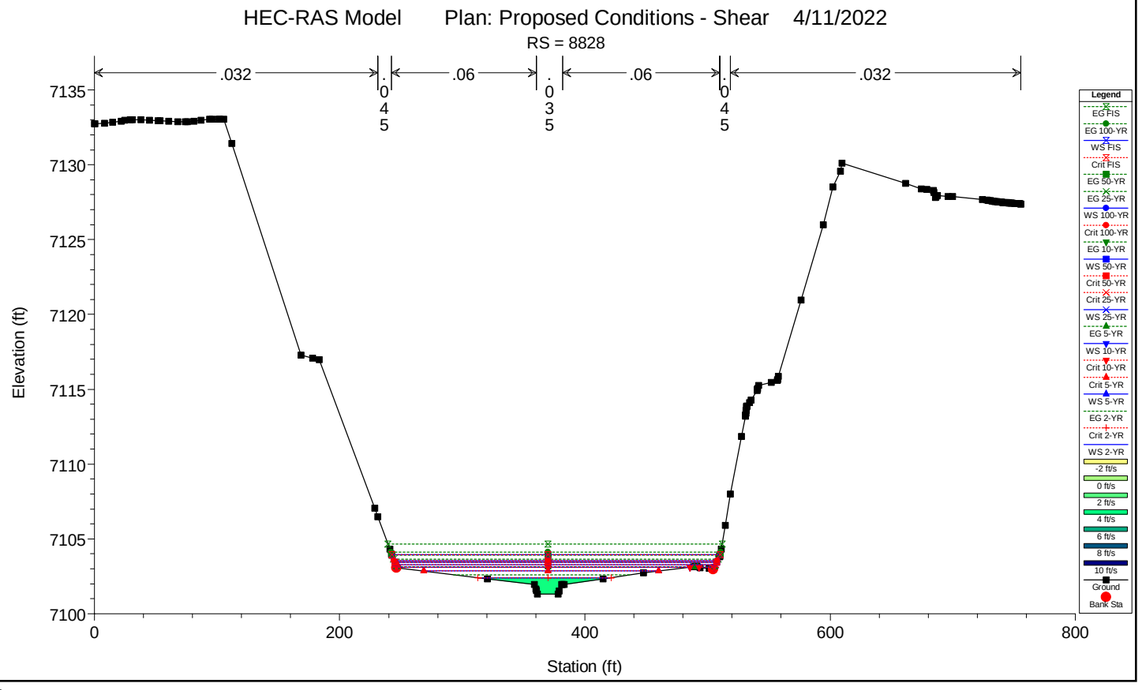

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9285
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

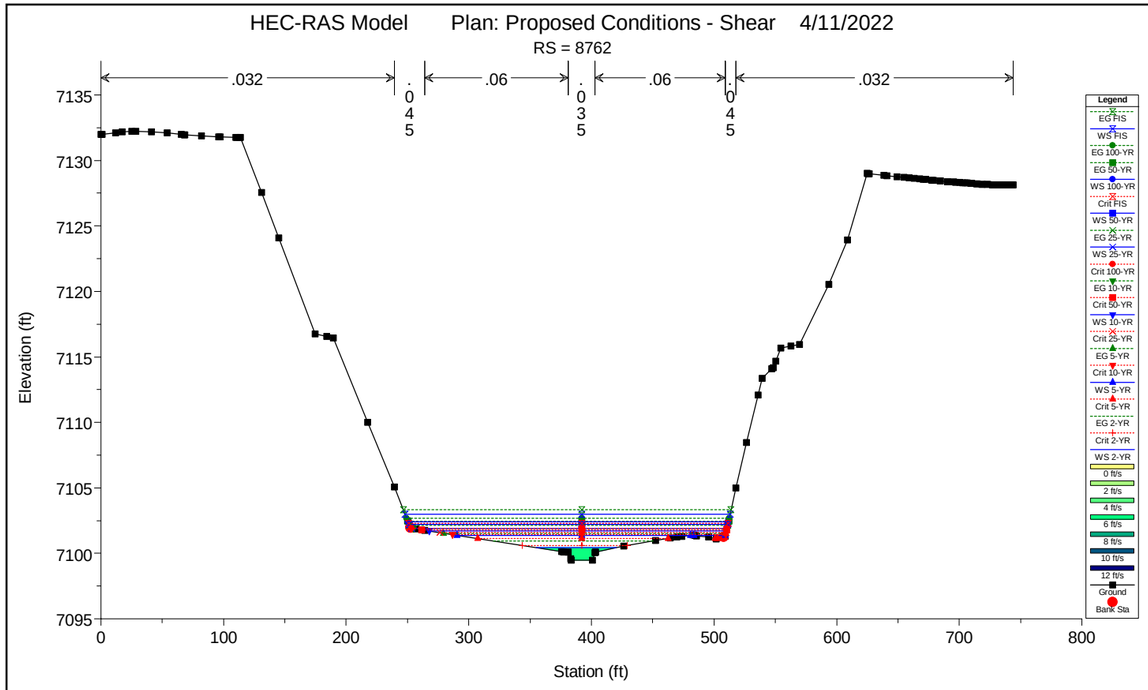

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9106
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

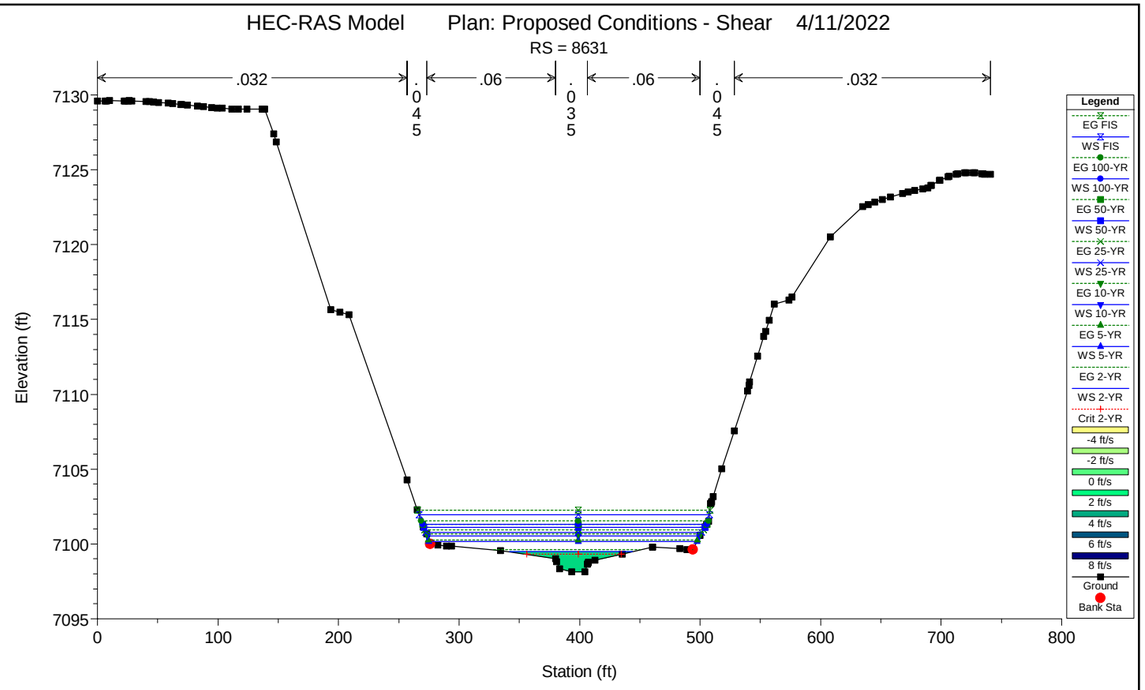

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 9004
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
Ground
Bank Sta

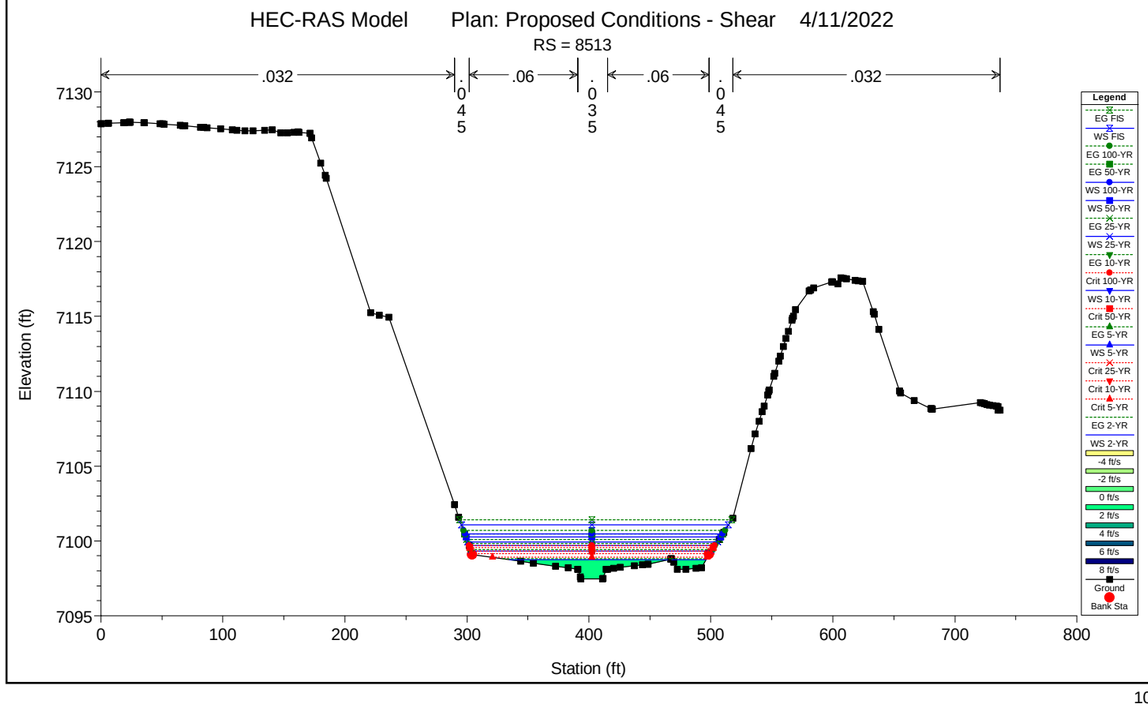

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 8965
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG 10-YR
EG FIS
EG 5-YR
EG 100-YR
EG 50-YR
EG 25-YR
EG 2-YR
Crit FIS
Crit 100-YR
Crit 50-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
WS FIS
WS 100-YR
WS 50-YR
Crit 2-YR
WS 25-YR
WS 10-YR
WS 5-YR
WS 2-YR
8.4 ft/s
8.6 ft/s
8.8 ft/s
9.0 ft/s
9.2 ft/s
9.4 ft/s
9.6 ft/s
9.8 ft/s
Ground
Bank Sta

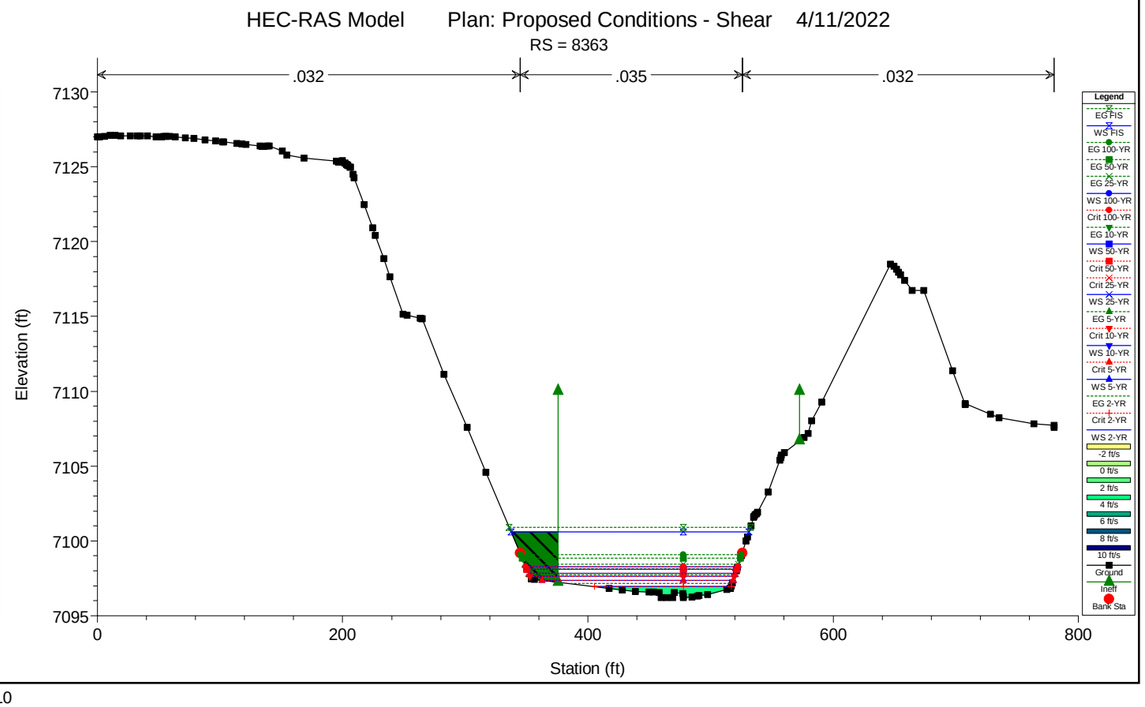

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 8919
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS 50-YR
Crit FIS
EG 25-YR
WS 25-YR
EG 2-YR
EG 10-YR
WS 10-YR
Crit 100-YR
Crit 50-YR
EG 5-YR
WS 5-YR
WS FIS
Crit 25-YR
Crit 10-YR
WS 100-YR
Crit 5-YR
Crit 2-YR
WS 2-YR
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
16 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 8828
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

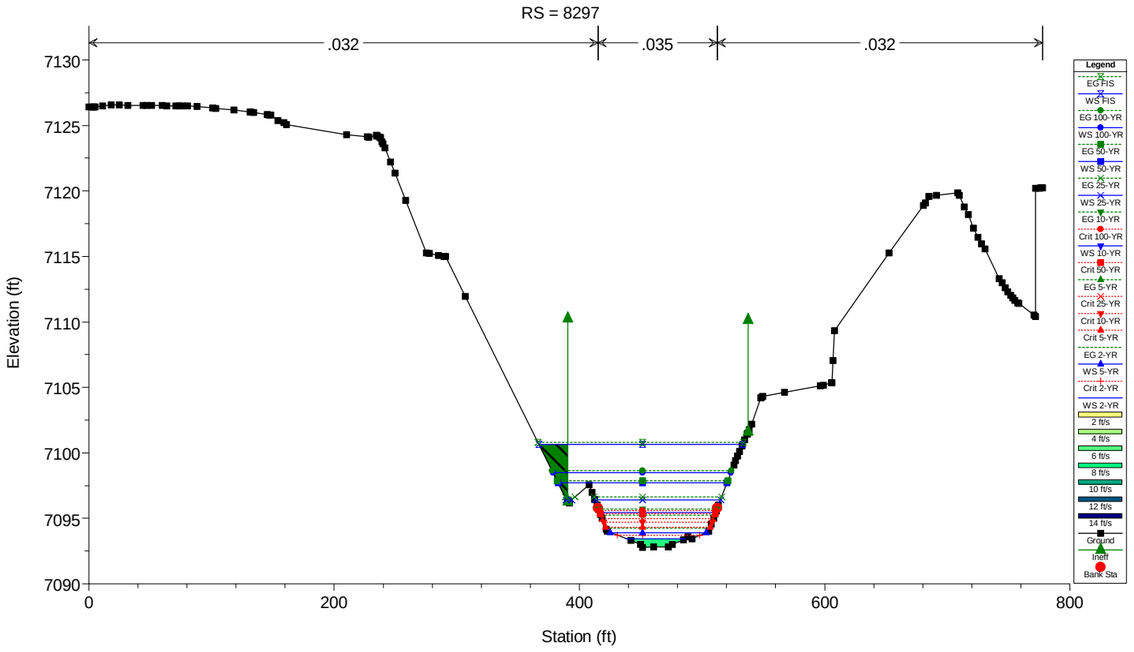

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 8762
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
Crit FIS
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
Crit 100-YR
EG 10-YR
Crit 50-YR
WS 10-YR
Crit 25-YR
EG 5-YR
Crit 10-YR
WS 5-YR
Crit 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 8631
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

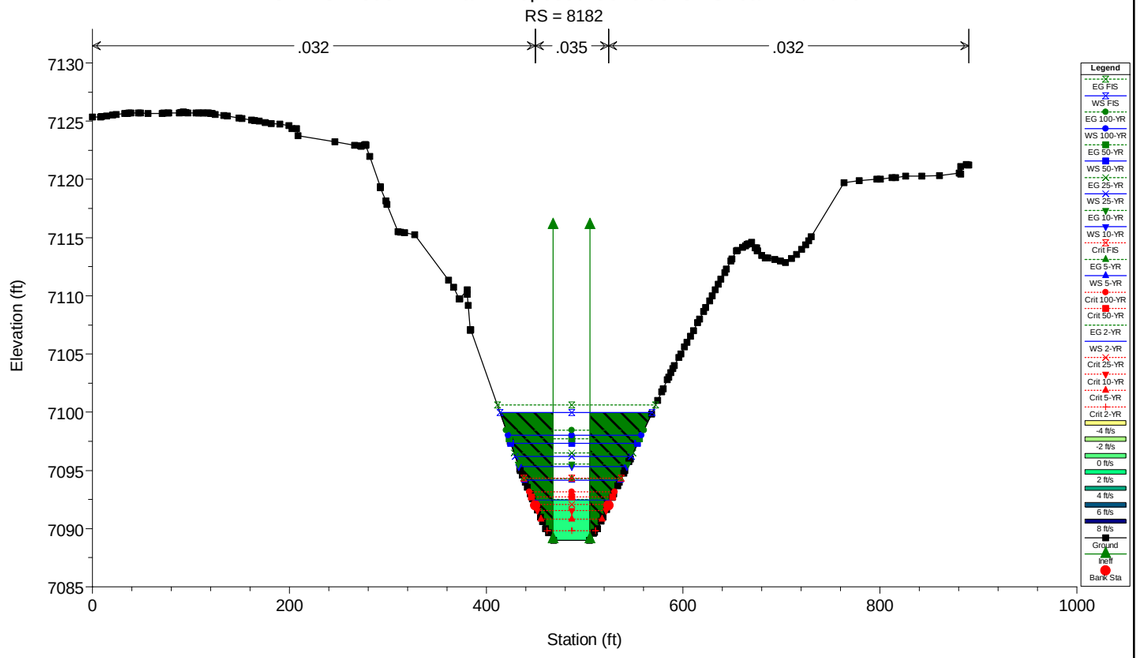

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 8513
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
Crit 100-YR
WS 10-YR
Crit 50-YR
EG 5-YR
WS 5-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
EG 2-YR
WS 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 8363
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
Crit 10-YR
WS 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta

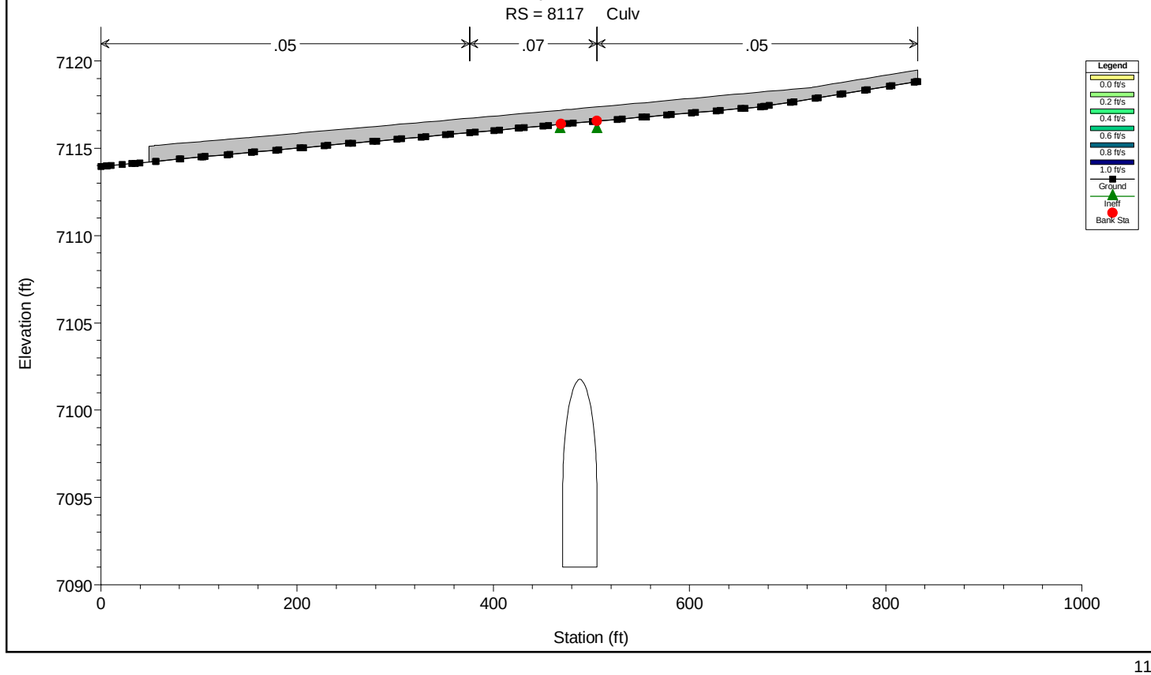
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022



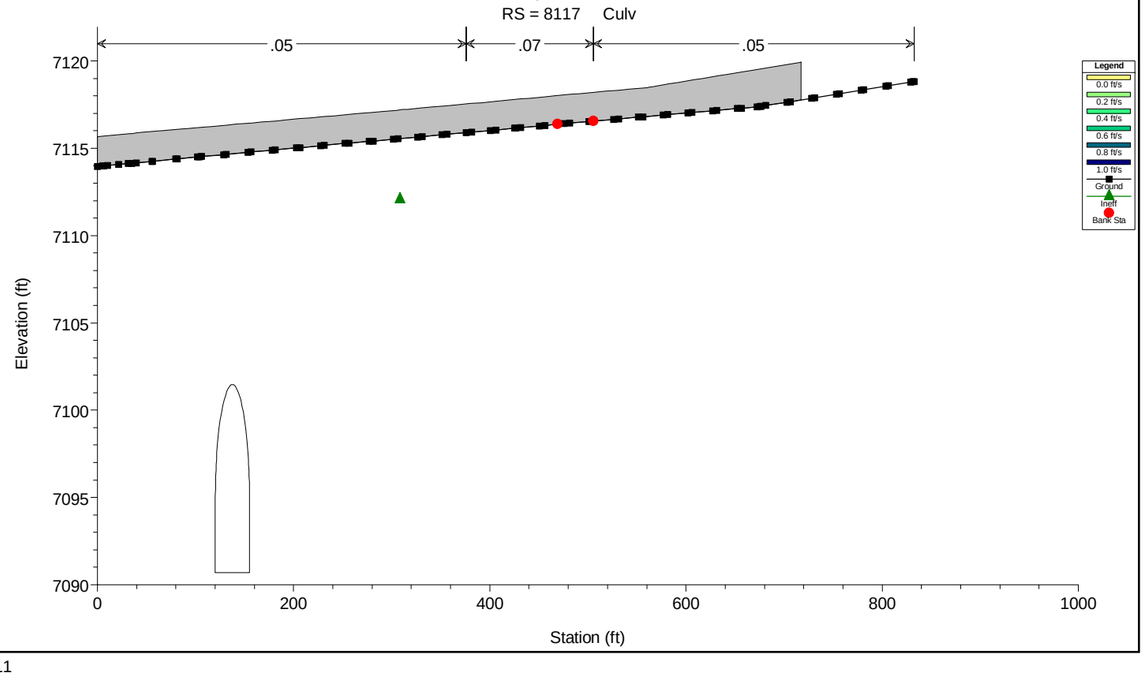
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

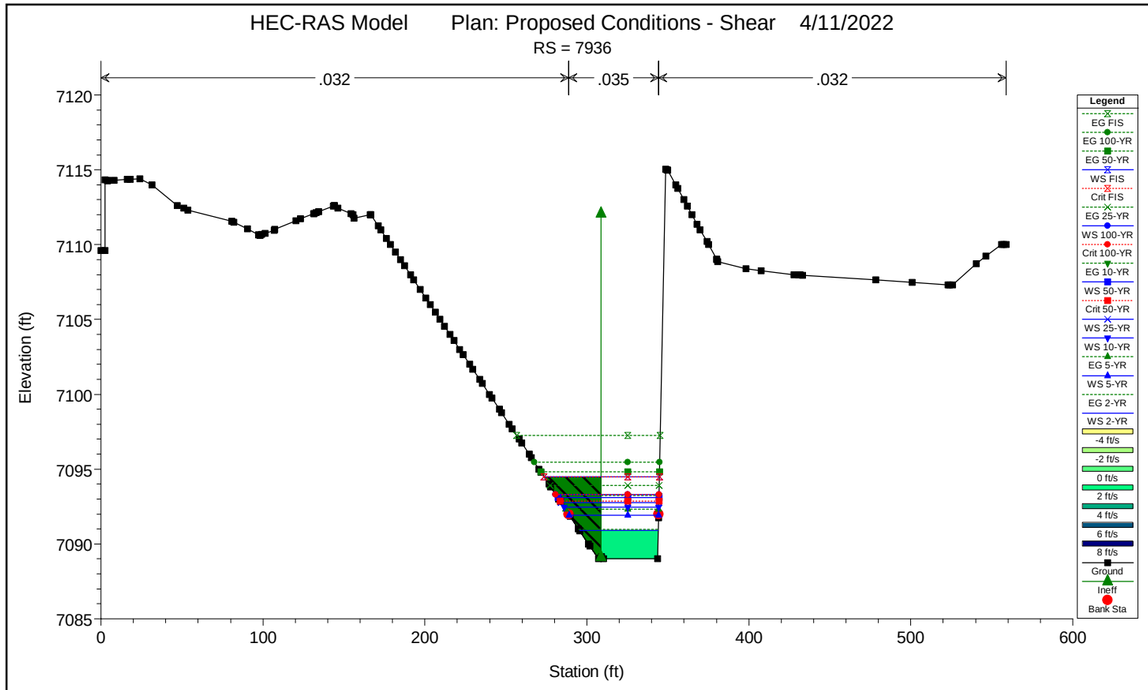


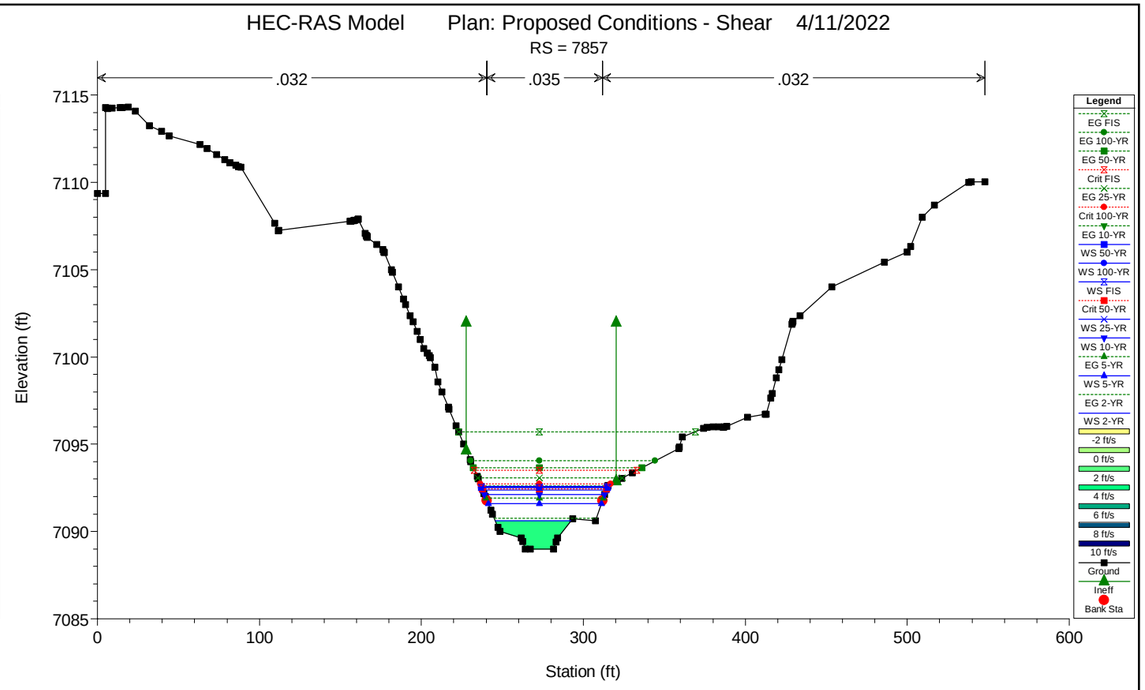
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

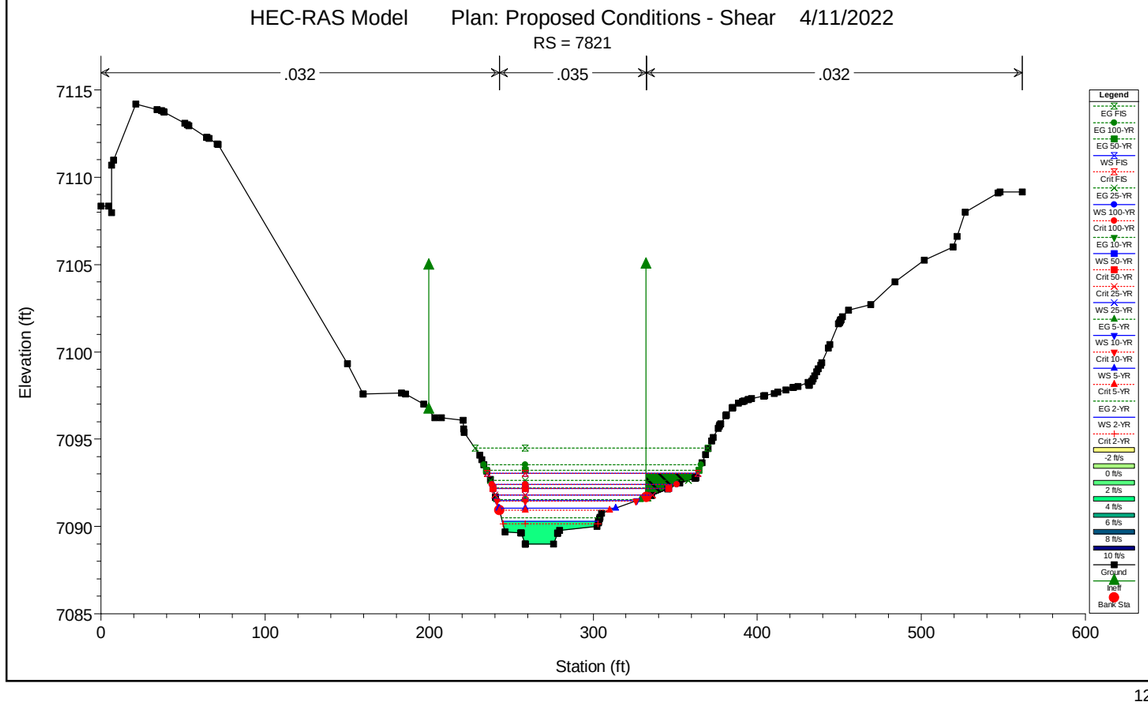


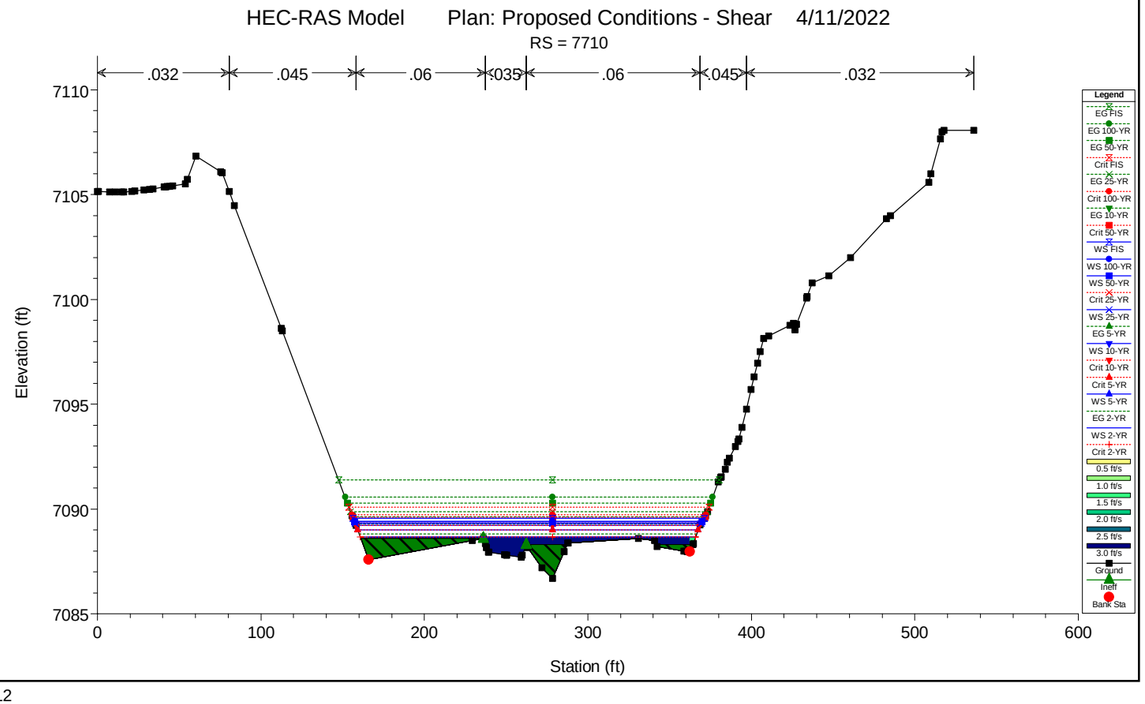
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

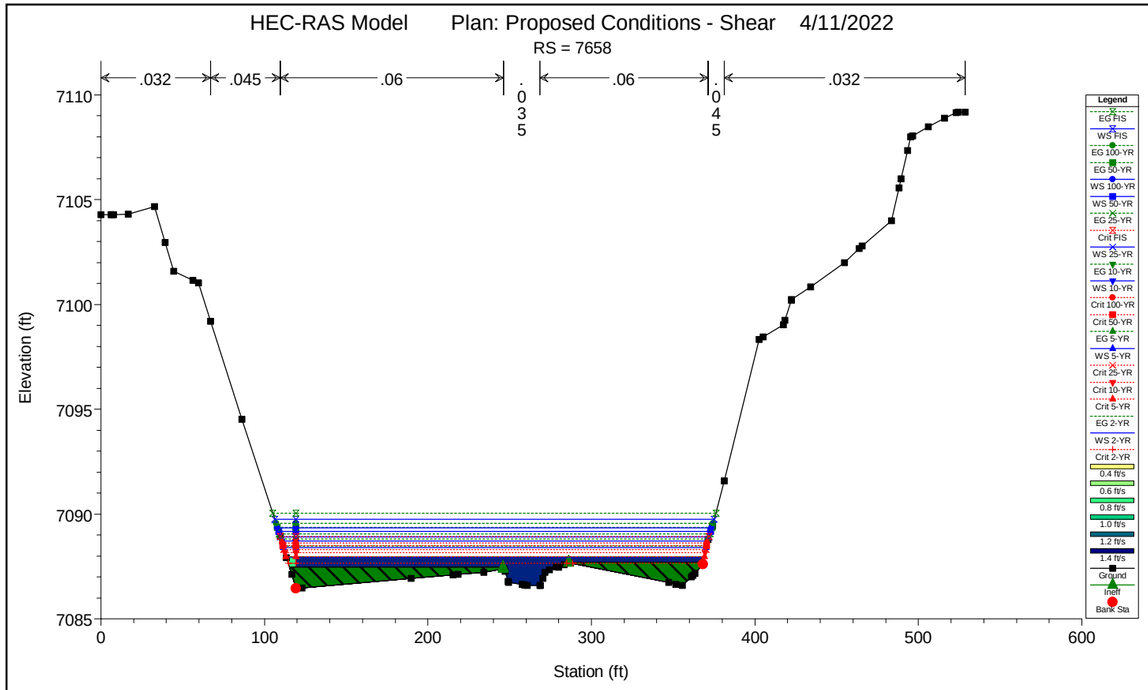


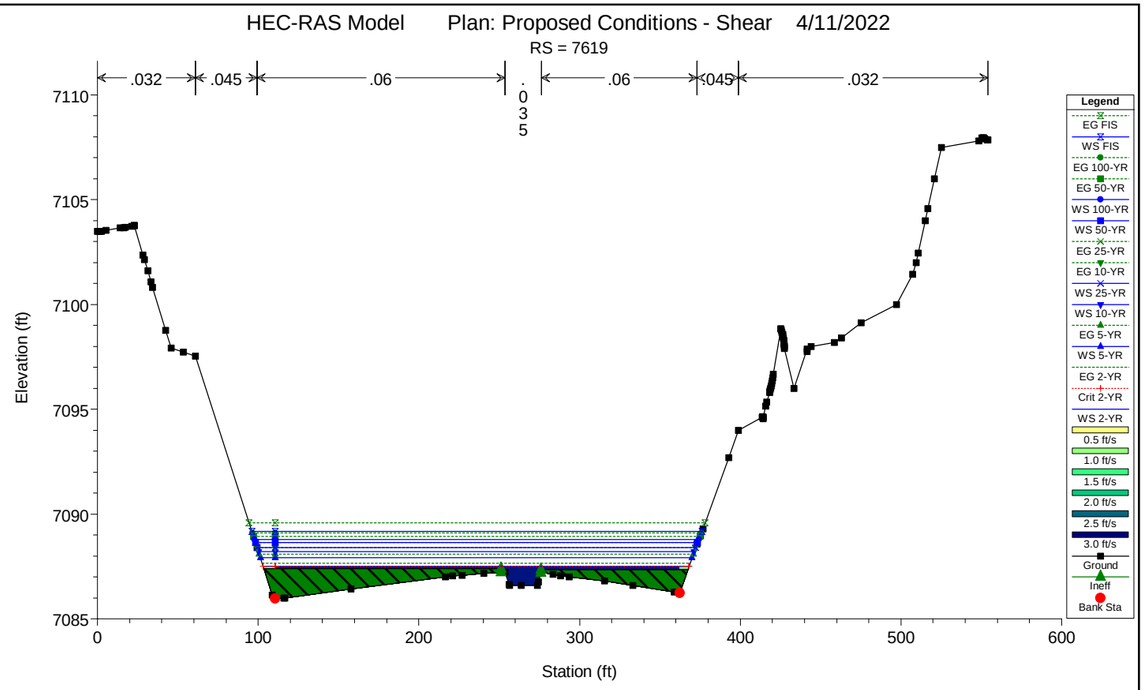

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7936
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
WS 25-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta

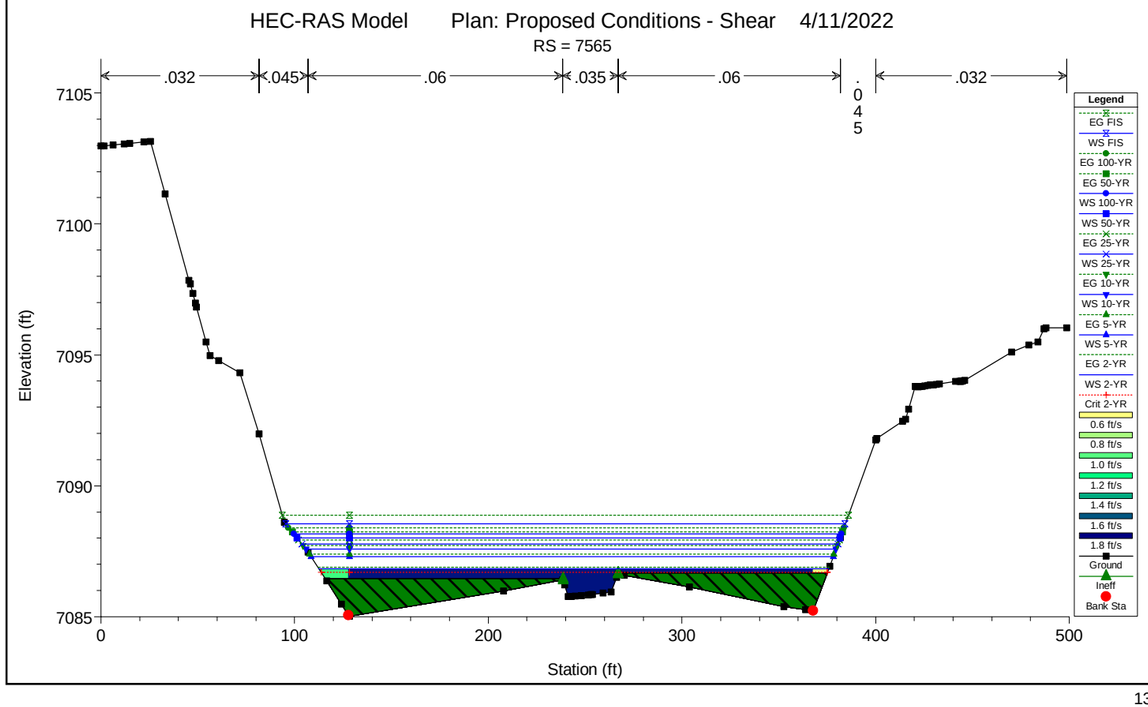

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7857
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
Crit FIS
EG 25-YR
Crit 100-YR
EG 10-YR
WS 50-YR
WS 100-YR
WS FIS
Crit 50-YR
WS 25-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta

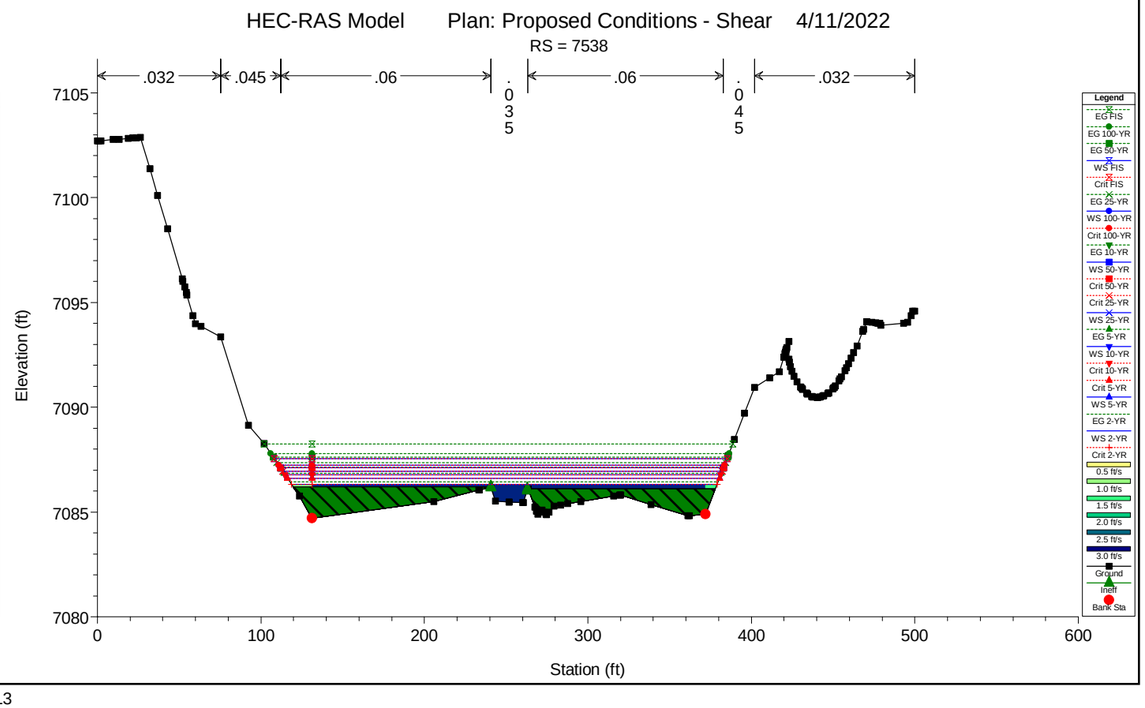

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7821
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
WS 5-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta

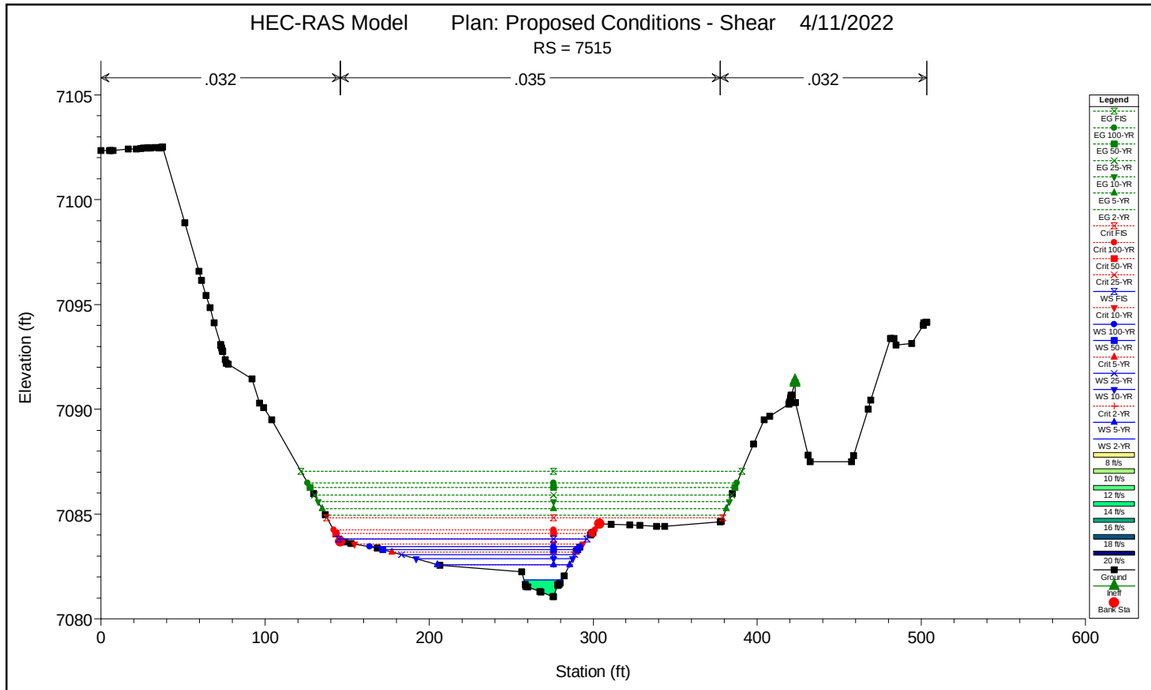

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7710
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
Crit FIS
EG 25-YR
Crit 100-YR
EG 10-YR
Crit 50-YR
WS FIS
WS 100-YR
WS 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta

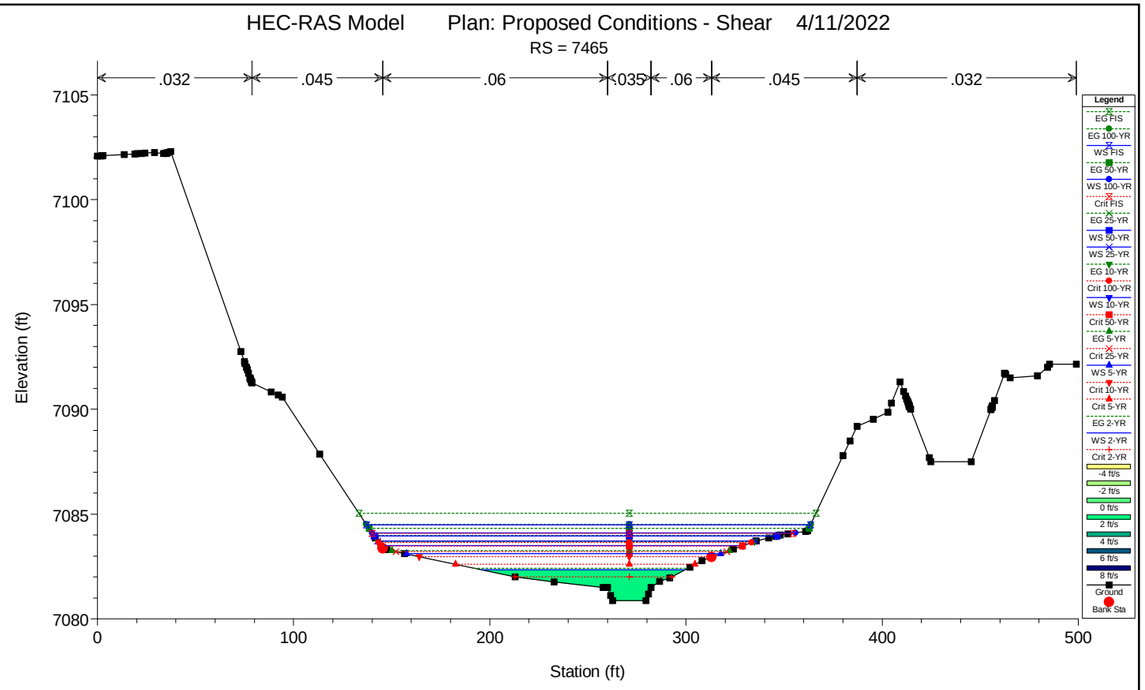

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7658
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
Crit FIS
WS 25-YR
EG 10-YR
WS 10-YR
Crit 100-YR
Crit 50-YR
EG 5-YR
WS 5-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
Ground
Ineff
Bank Sta

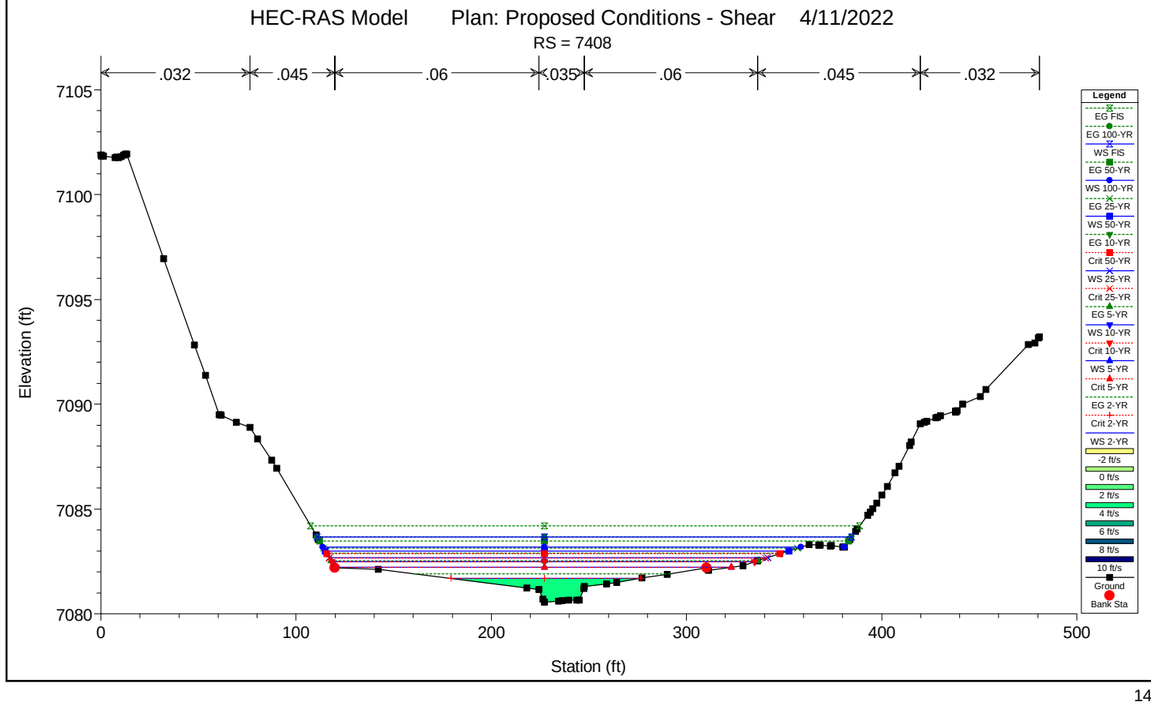

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7619
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta

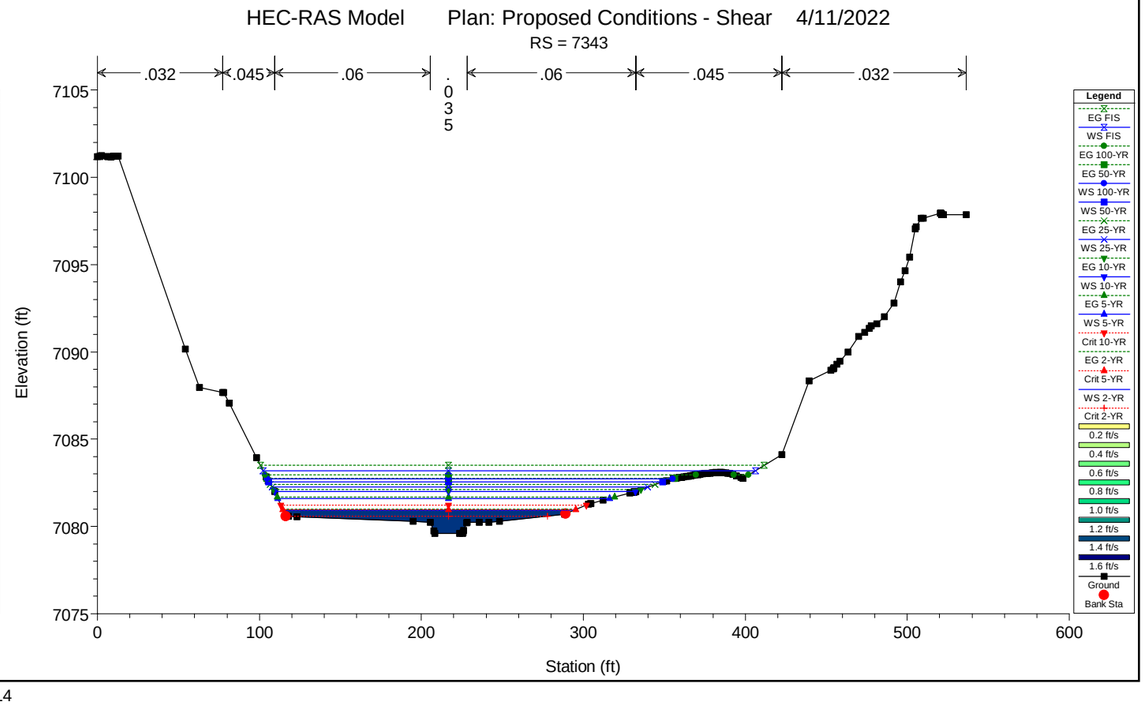

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7565
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
Ground
Ineff
Bank Sta

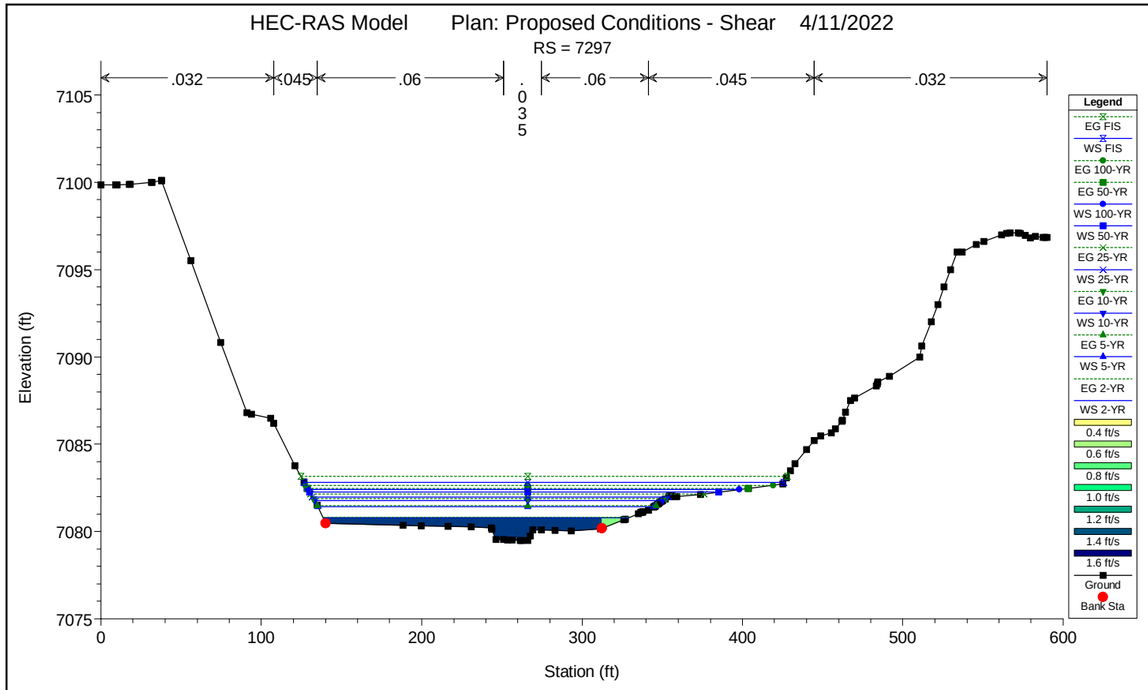

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7538
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta

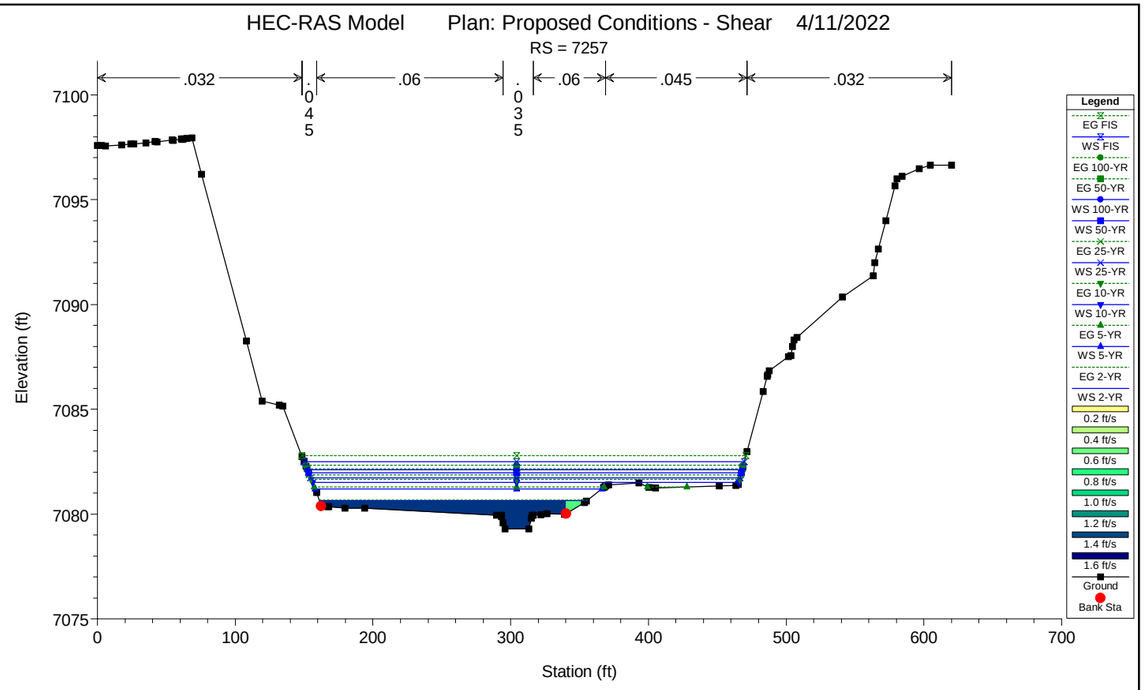

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7515
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
EG 25-YR
EG 10-YR
EG 5-YR
EG 2-YR
Crit FIS
Crit 100-YR
Crit 50-YR
Crit 25-YR
WS FIS
Crit 10-YR
WS 100-YR
WS 50-YR
Crit 5-YR
WS 25-YR
WS 10-YR
Crit 2-YR
WS 5-YR
WS 2-YR
8 ft/s
10 ft/s
12 ft/s
14 ft/s
16 ft/s
18 ft/s
20 ft/s
Ground
Bank Sta

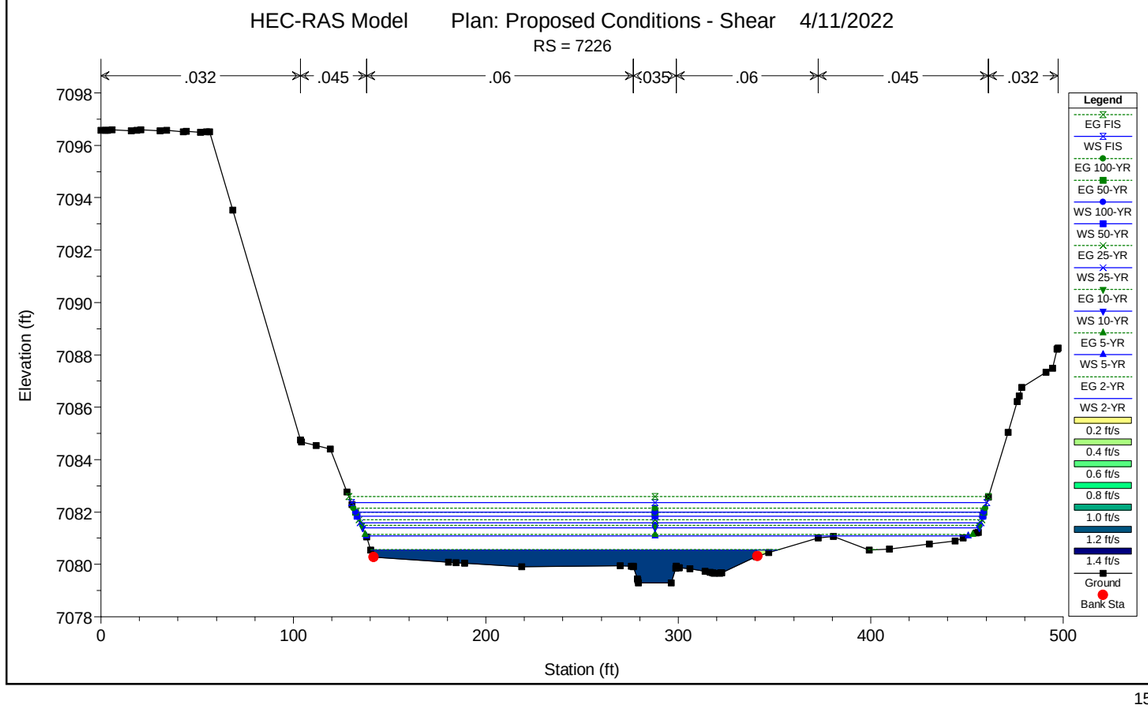

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7465
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
WS 100-YR
Crit FIS
EG 25-YR
WS 50-YR
WS 25-YR
EG 10-YR
Crit 100-YR
WS 10-YR
Crit 50-YR
EG 5-YR
Crit 25-YR
WS 5-YR
Crit 10-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

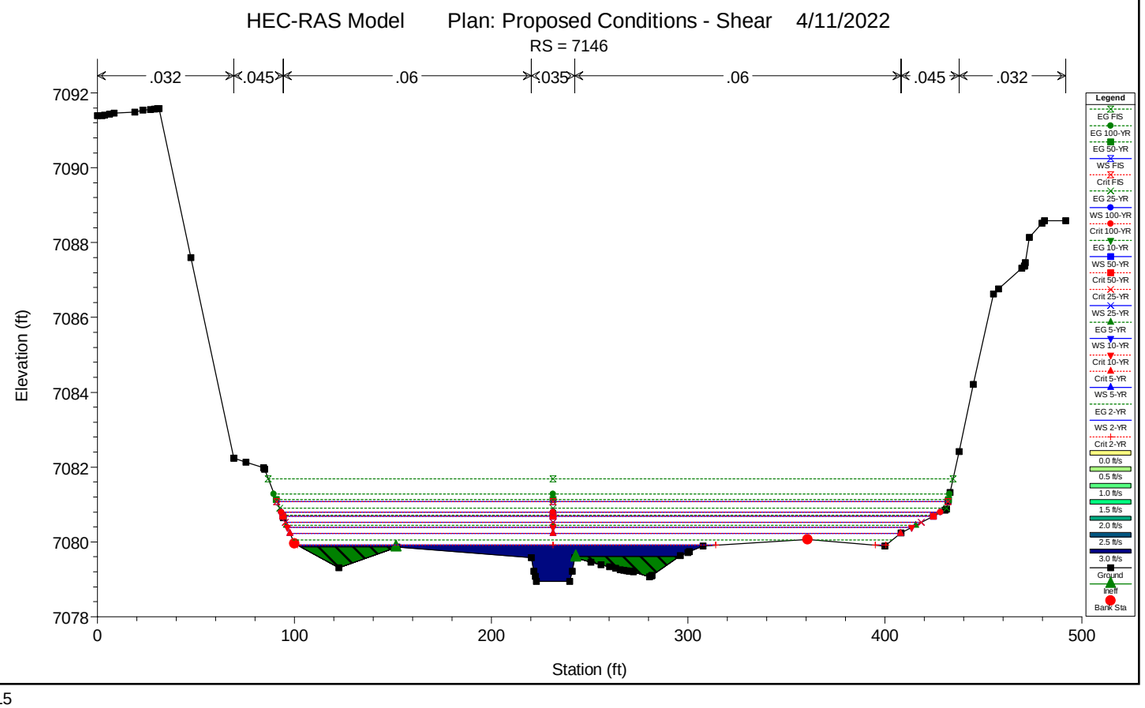

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7408
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
WS 100-YR
EG 25-YR
WS 50-YR
EG 10-YR
Crit 50-YR
WS 25-YR
Crit 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
WS 5-YR
Crit 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

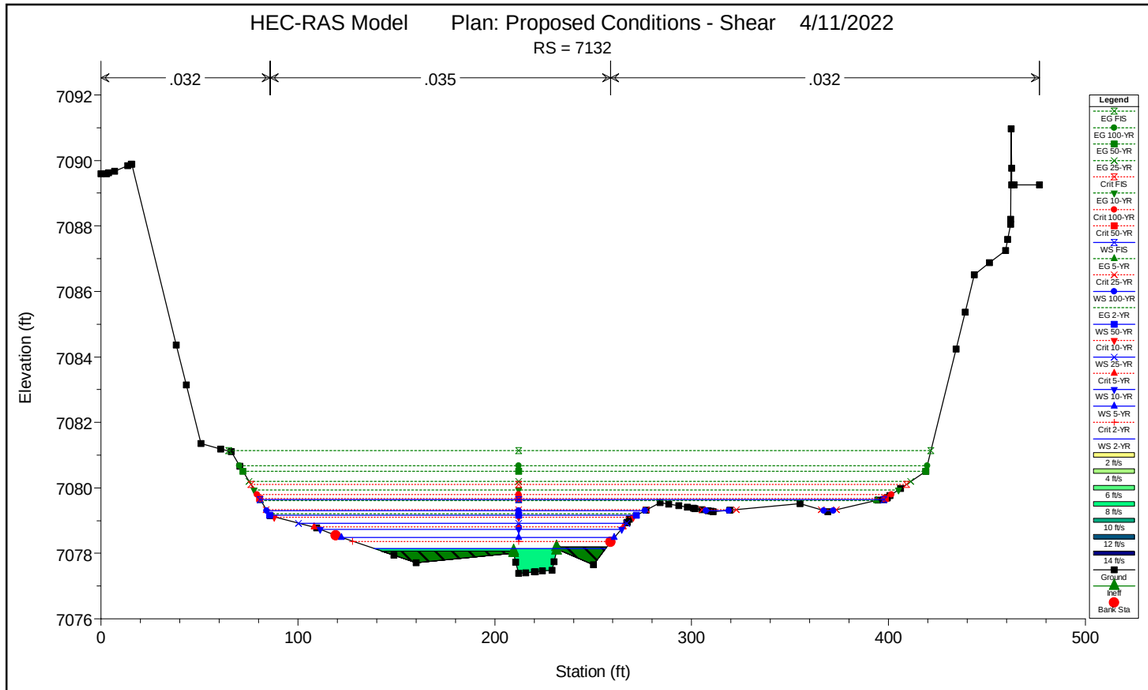

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7343
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
Crit 10-YR
EG 2-YR
Crit 5-YR
WS 2-YR
Crit 2-YR
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

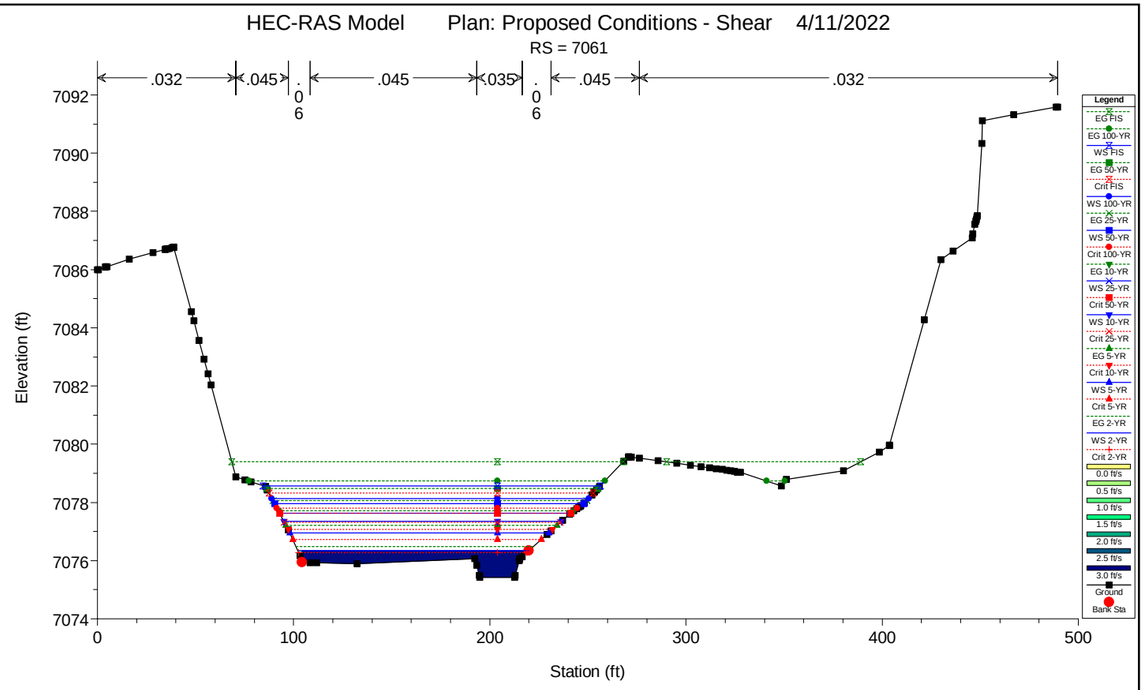

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7297
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

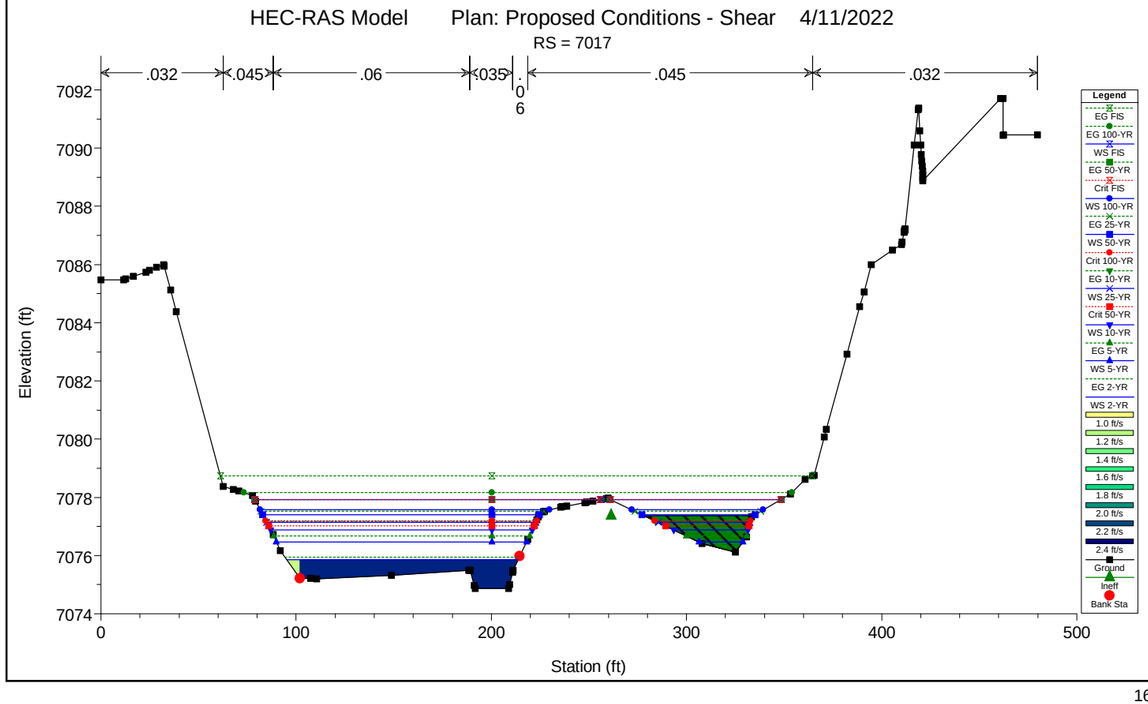

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7257
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

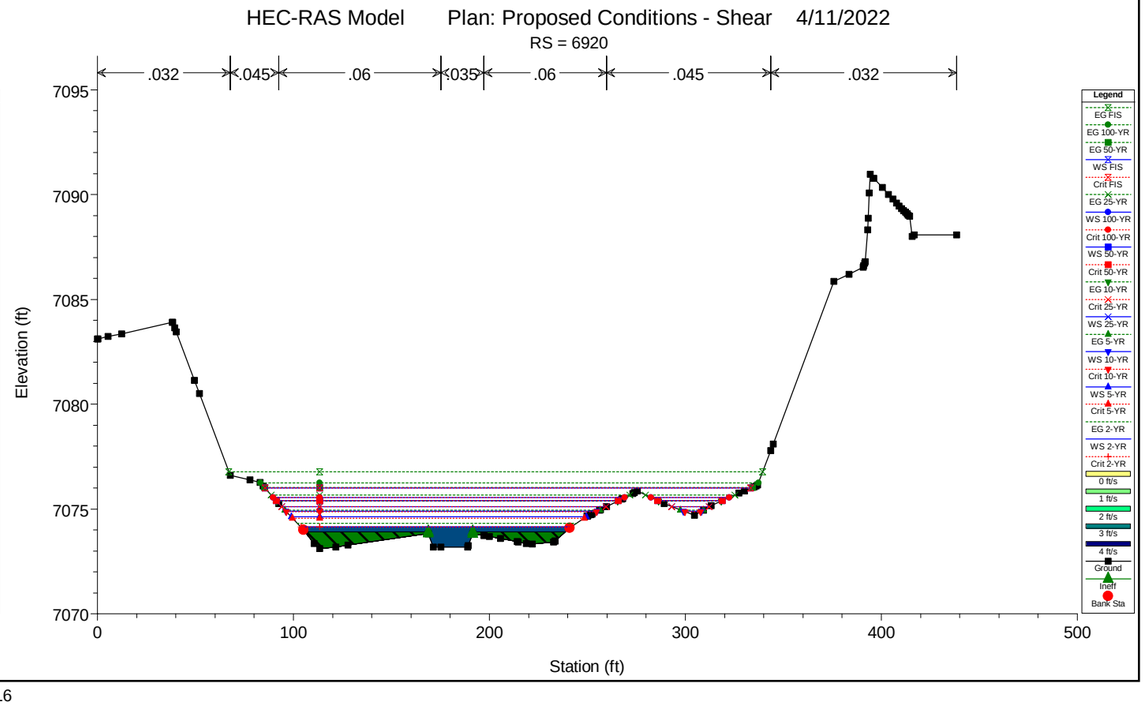

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7226
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7146
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7132
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
EG 25-YR
Crit FIS
EG 10-YR
Crit 100-YR
Crit 50-YR
WS FIS
EG 5-YR
Crit 25-YR
WS 100-YR
EG 2-YR
WS 50-YR
Crit 10-YR
WS 25-YR
Crit 5-YR
WS 10-YR
WS 5-YR
Crit 2-YR
WS 2-YR
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Ineff
Bank Sta

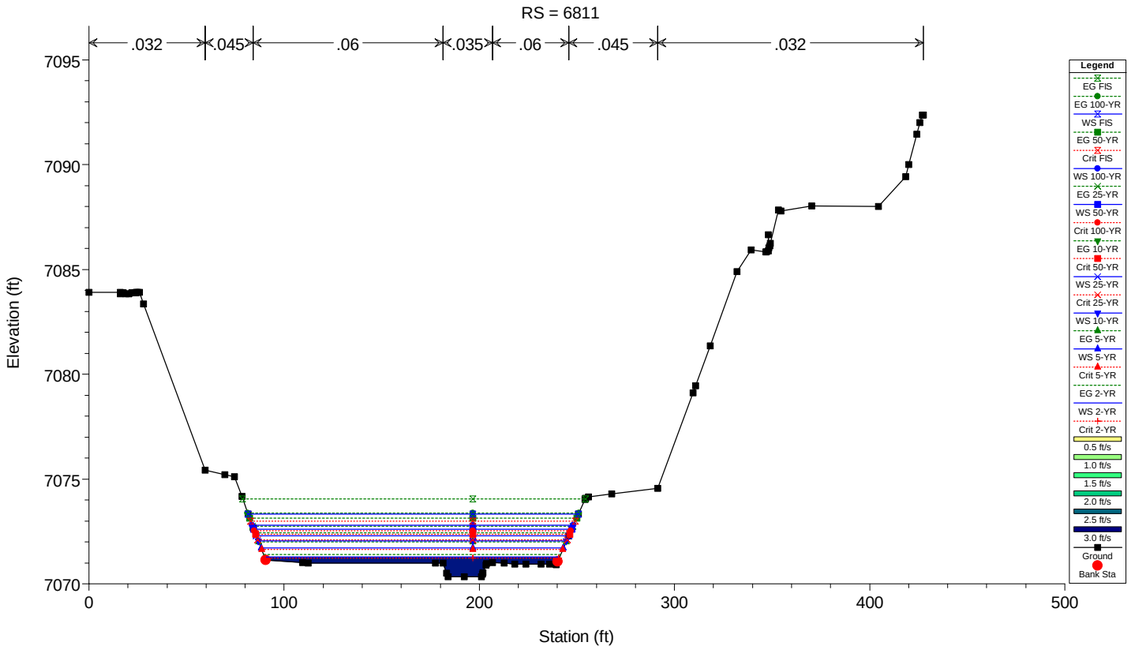

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7061
.032
.045
.06
.045
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
Crit FIS
WS 100-YR
EG 25-YR
WS 50-YR
Crit 100-YR
EG 10-YR
WS 25-YR
Crit 50-YR
WS 10-YR
Crit 25-YR
EG 5-YR
Crit 10-YR
WS 5-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 7017
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
Crit FIS
WS 100-YR
EG 25-YR
WS 50-YR
Crit 100-YR
EG 10-YR
WS 25-YR
Crit 50-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6920
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
Crit 50-YR
EG 10-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
WS 5-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Ineff
Bank Sta

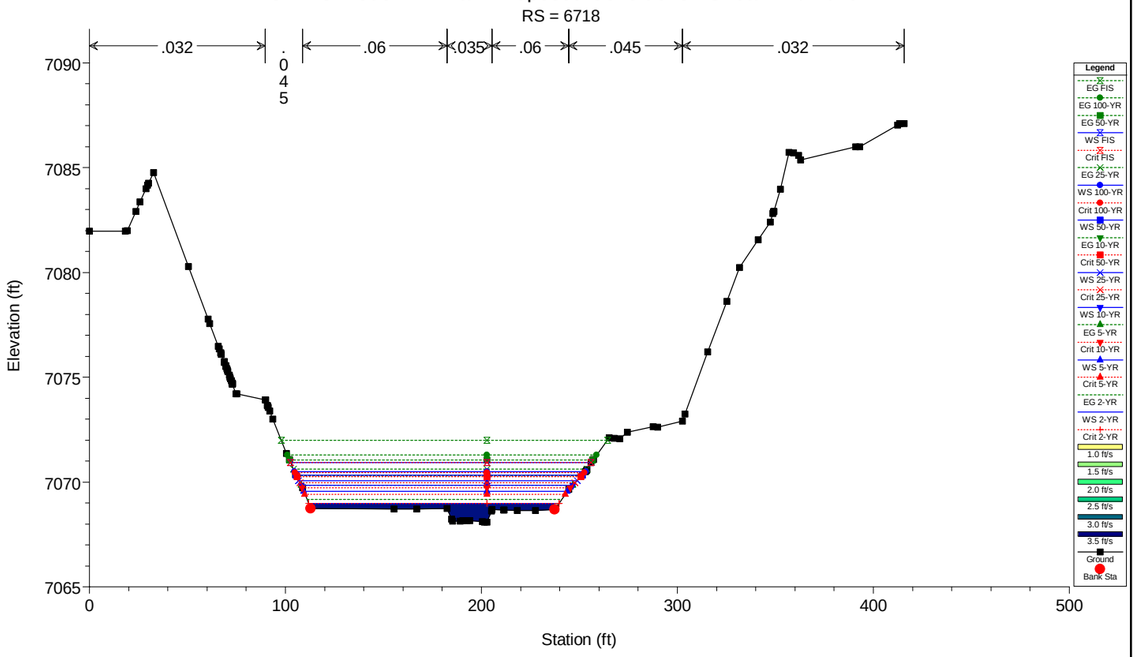
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 6811



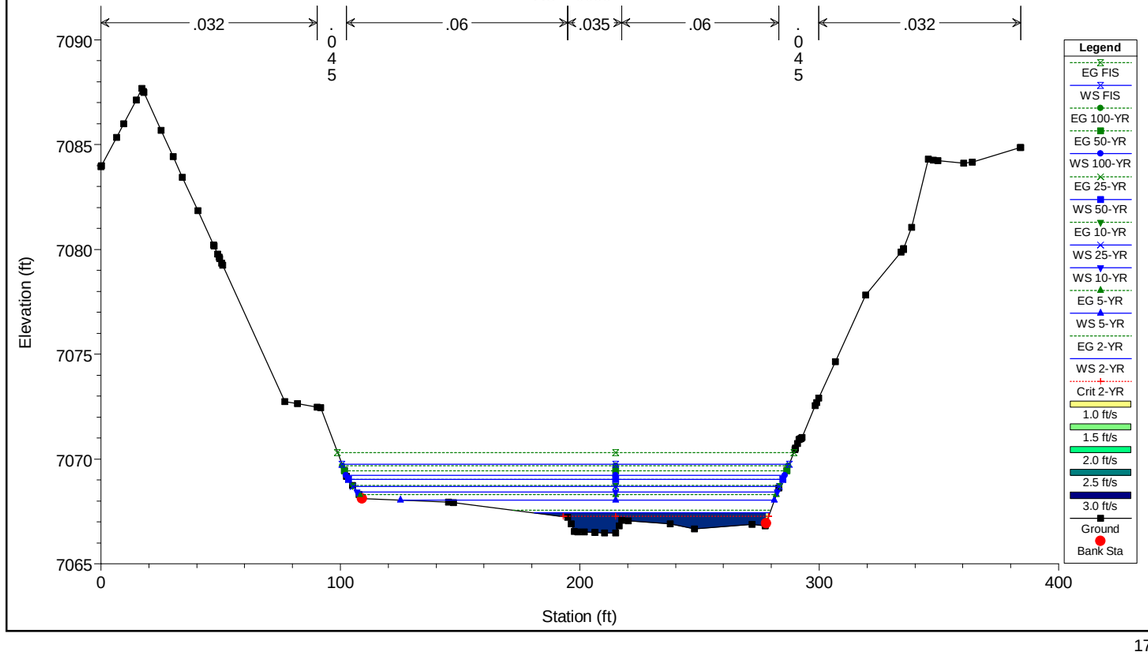
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 6718



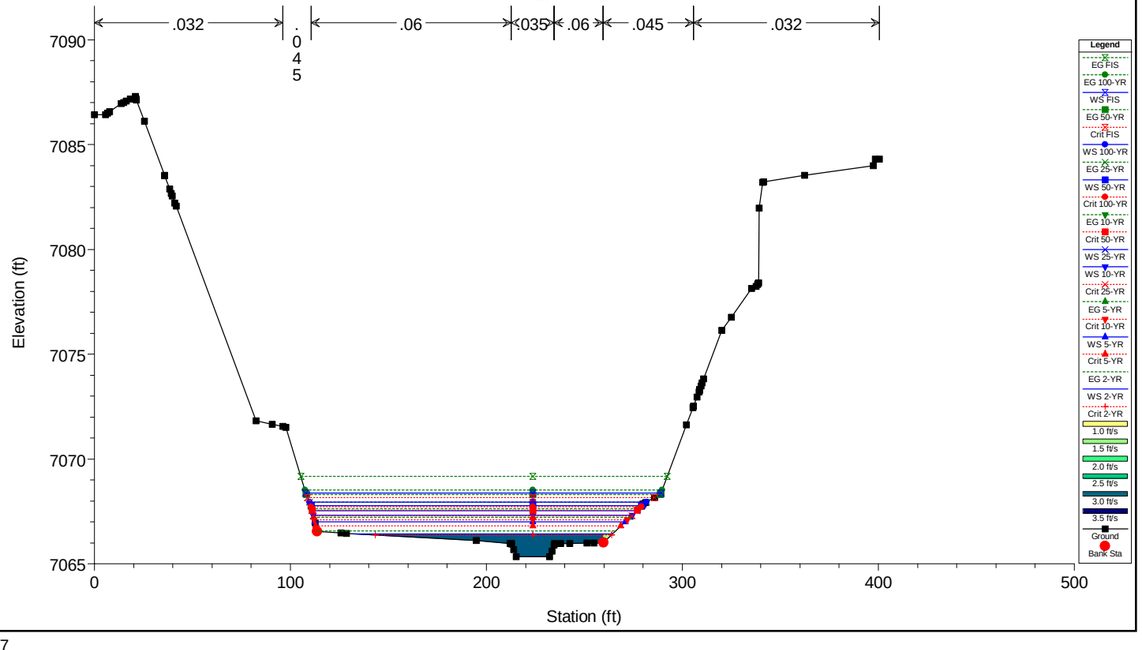
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

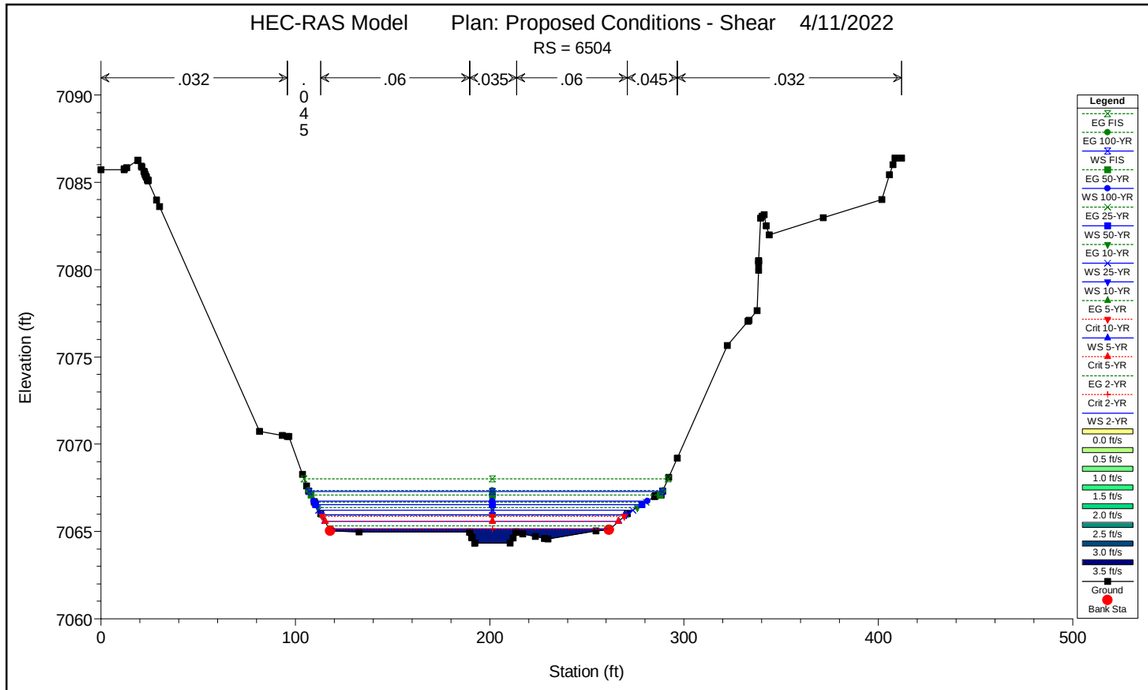
RS = 6635

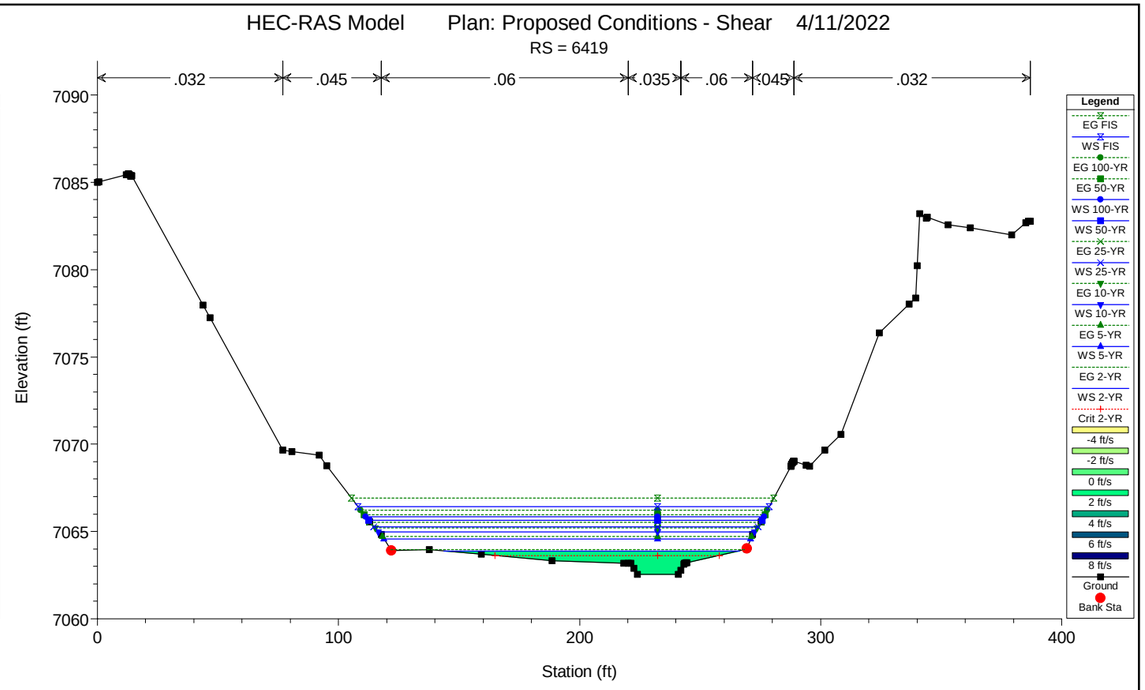


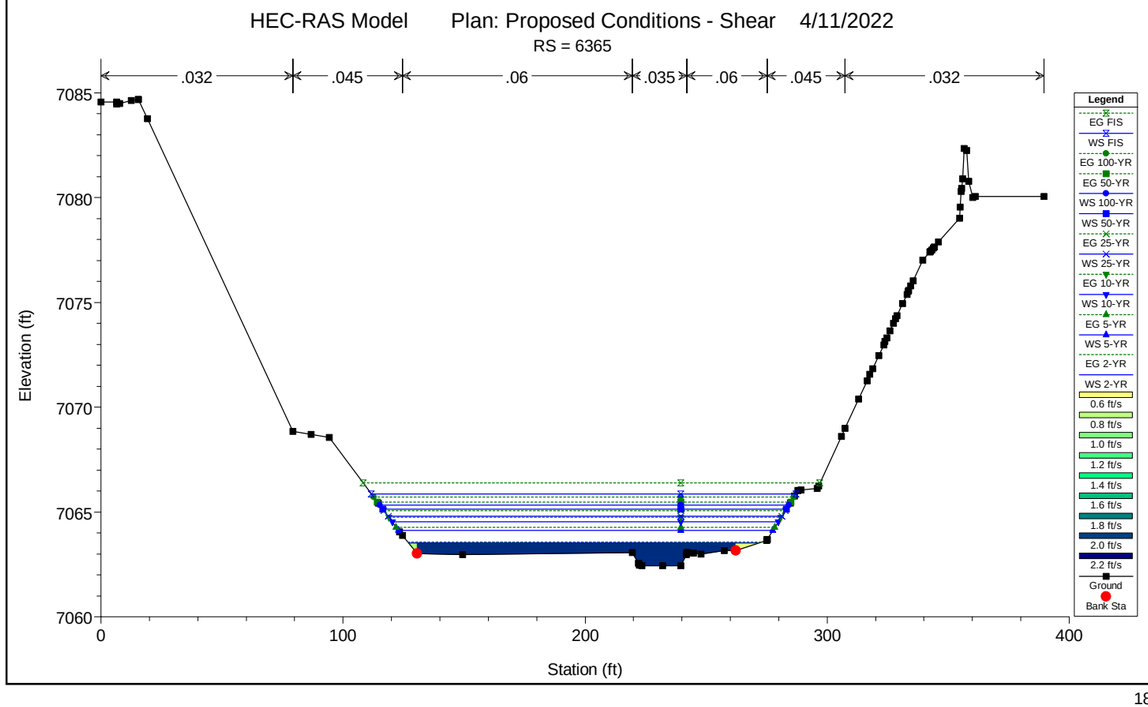
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

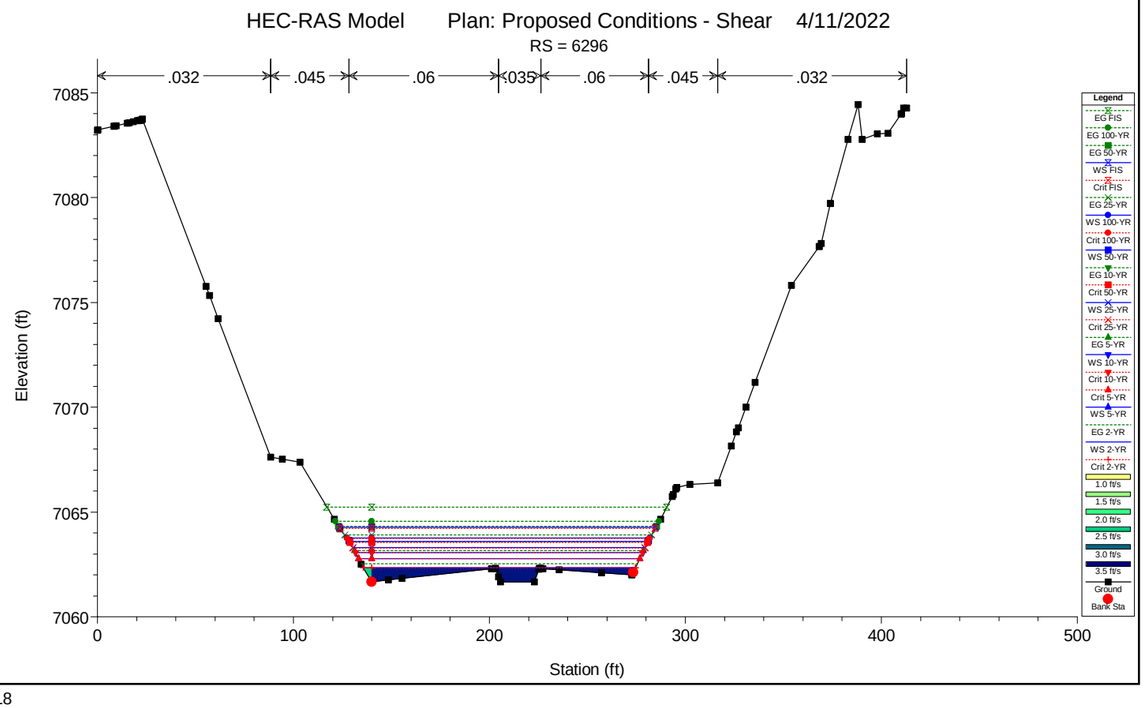
RS = 6566

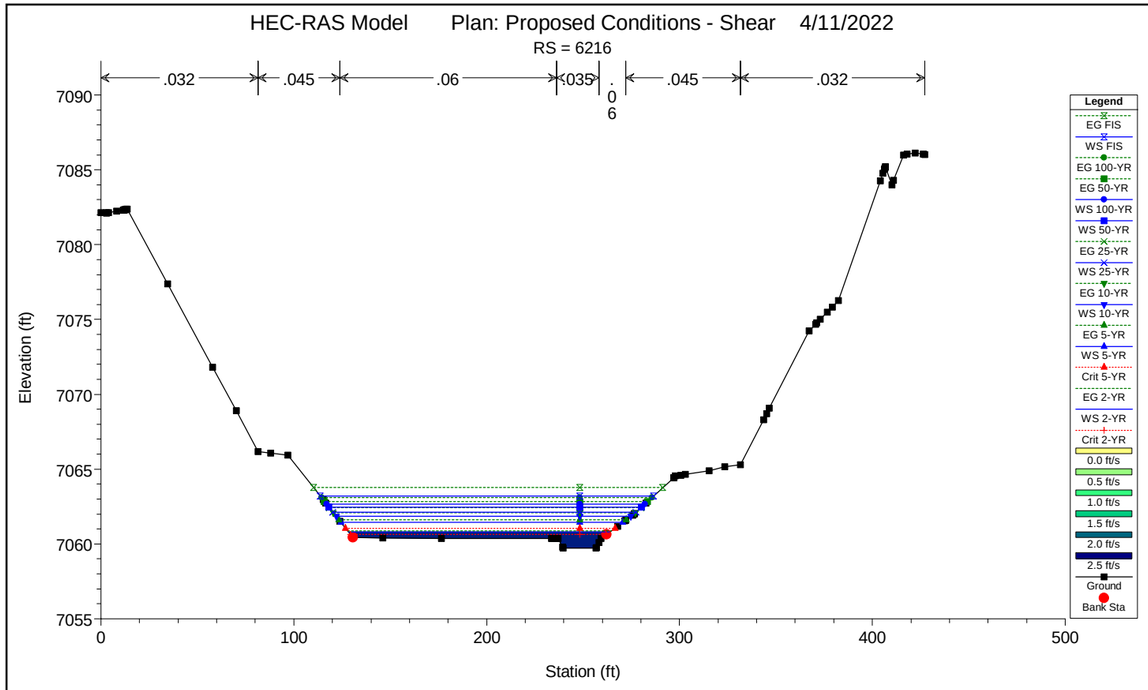


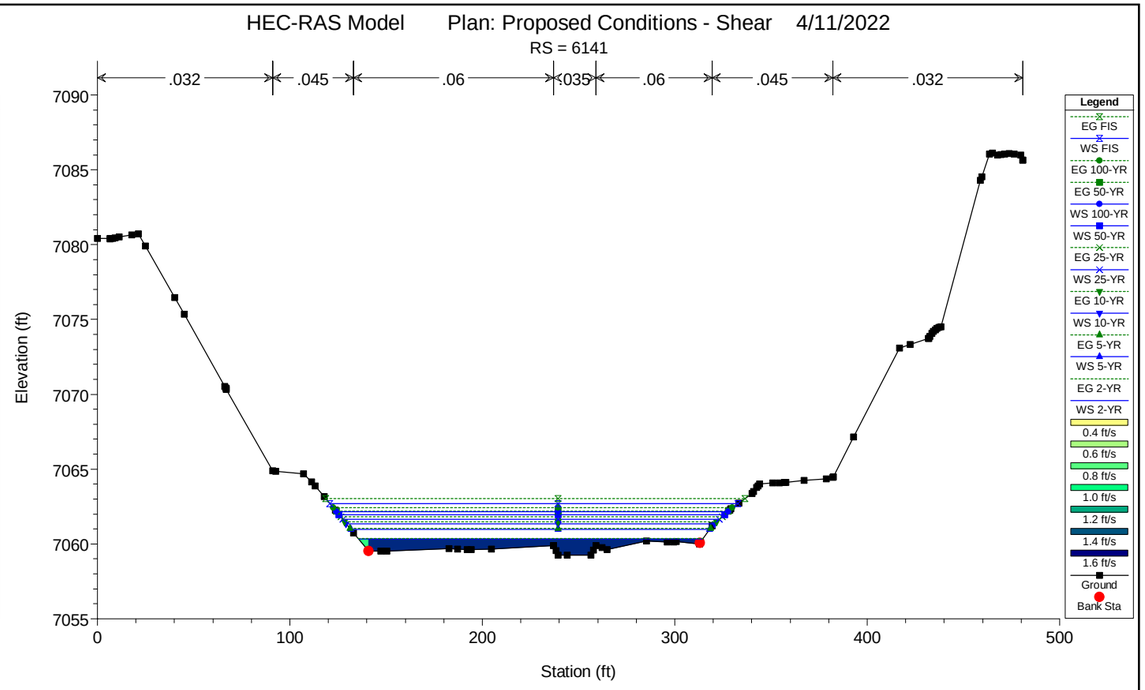

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6504
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
WS 100-YR
EG 25-YR
WS 50-YR
EG 10-YR
WS 25-YR
WS 10-YR
EG 5-YR
Crit 10-YR
WS 5-YR
Crit 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

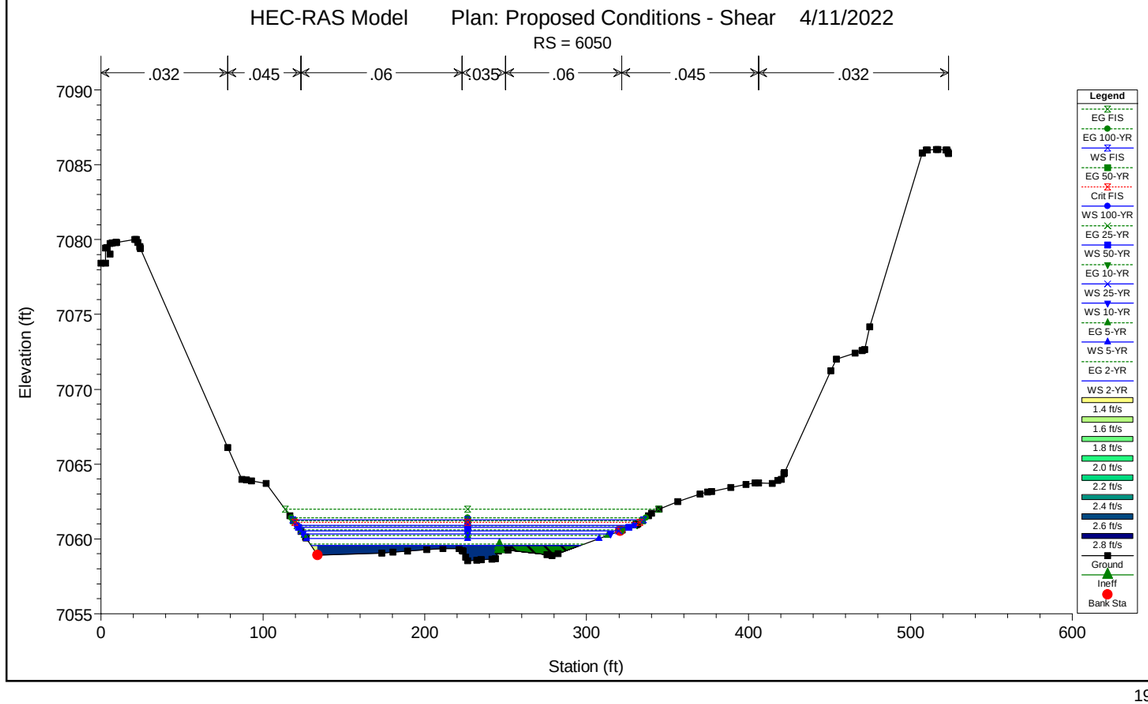

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6419
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

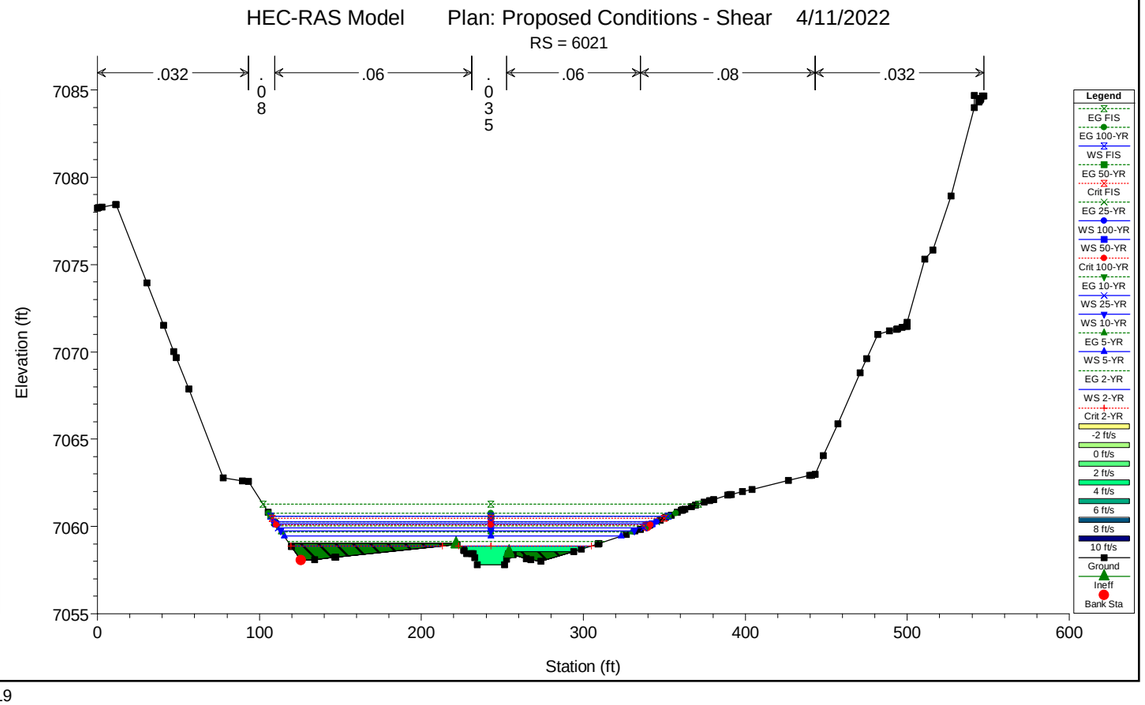

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6365
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6296
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
EG 10-YR
Crit 50-YR
WS 25-YR
Crit 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6216
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

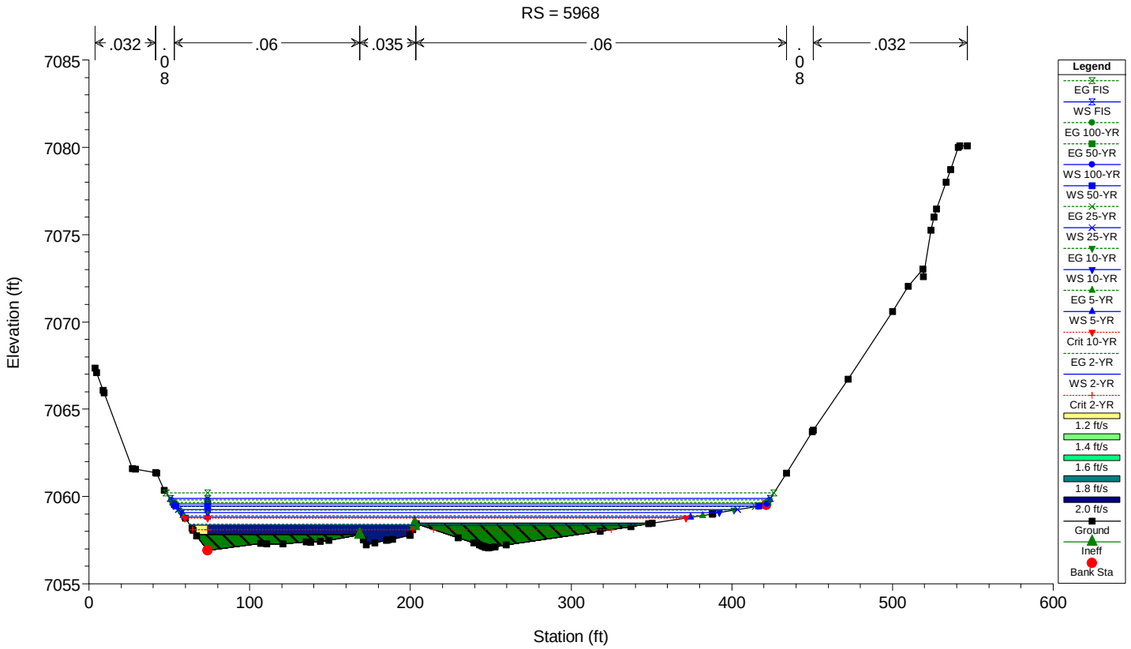

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6141
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6050
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
Crit FIS
WS 100-YR
EG 25-YR
WS 50-YR
EG 10-YR
WS 25-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 6021
.032
.08
.06
.06
.08
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
Crit FIS
EG 25-YR
WS 100-YR
WS 50-YR
Crit 100-YR
EG 10-YR
WS 25-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta

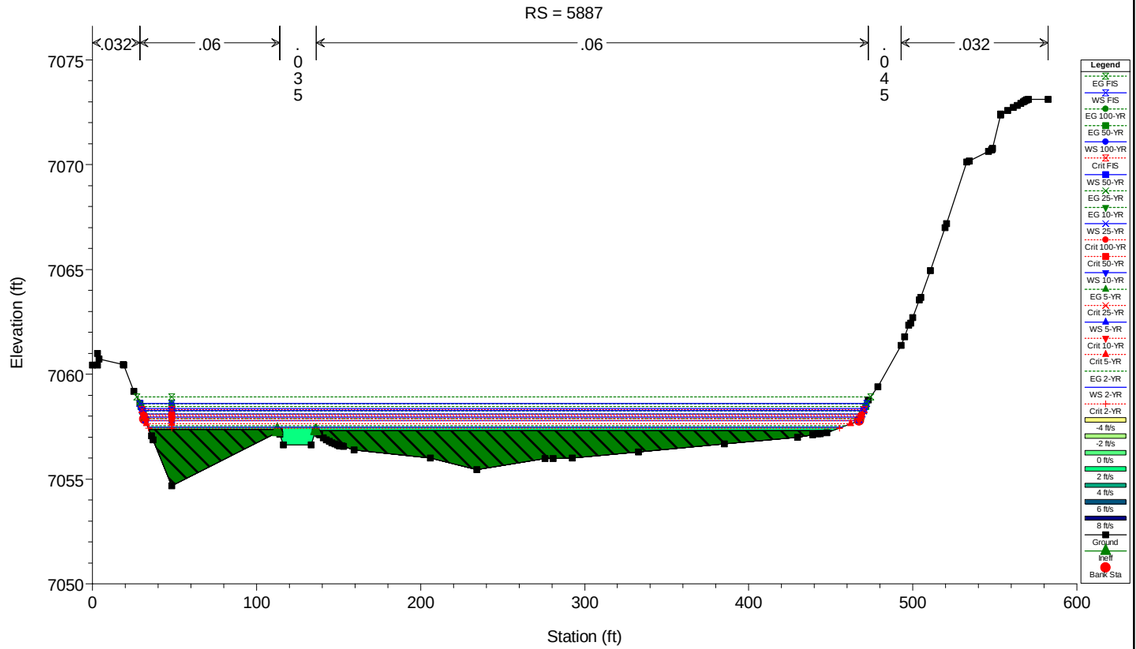
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 5968



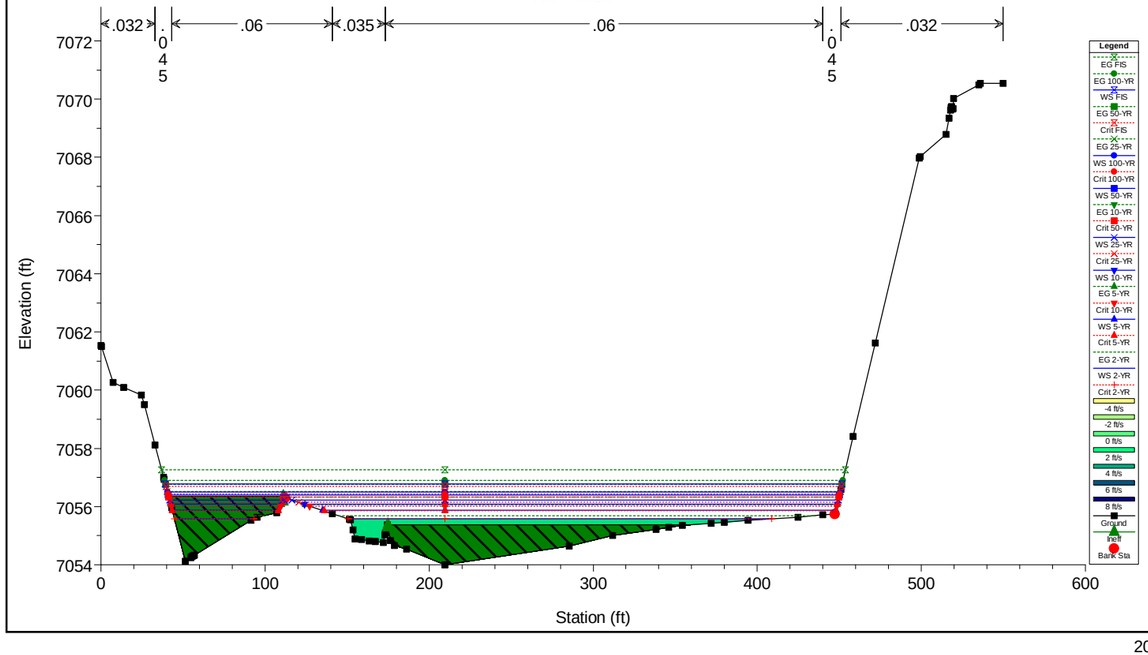
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 5887



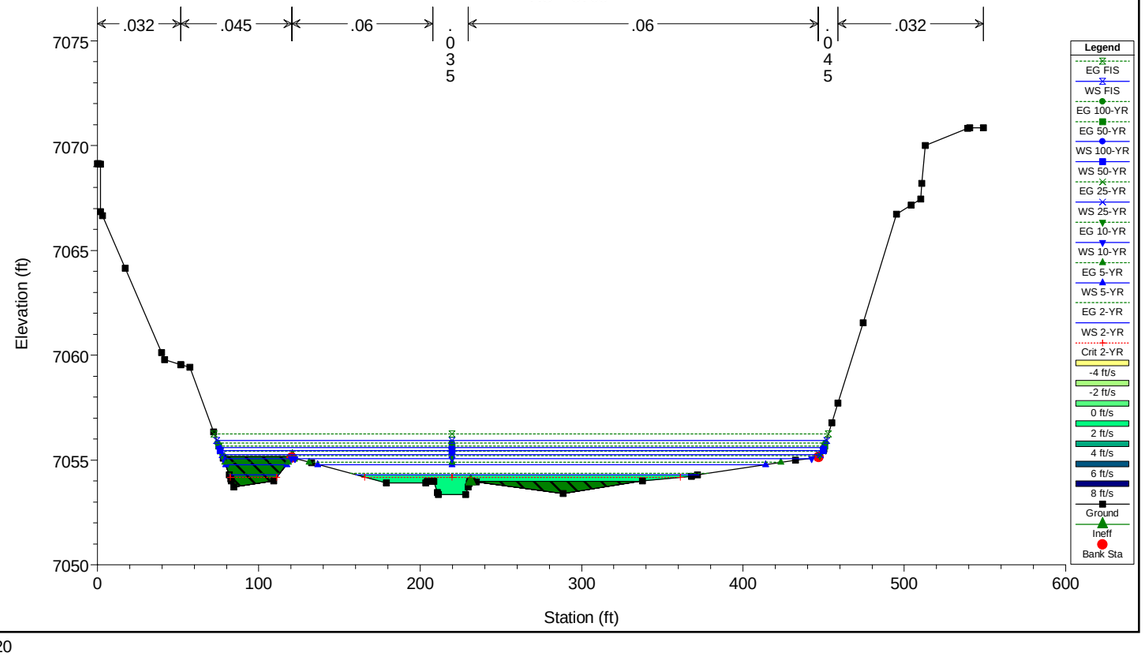
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

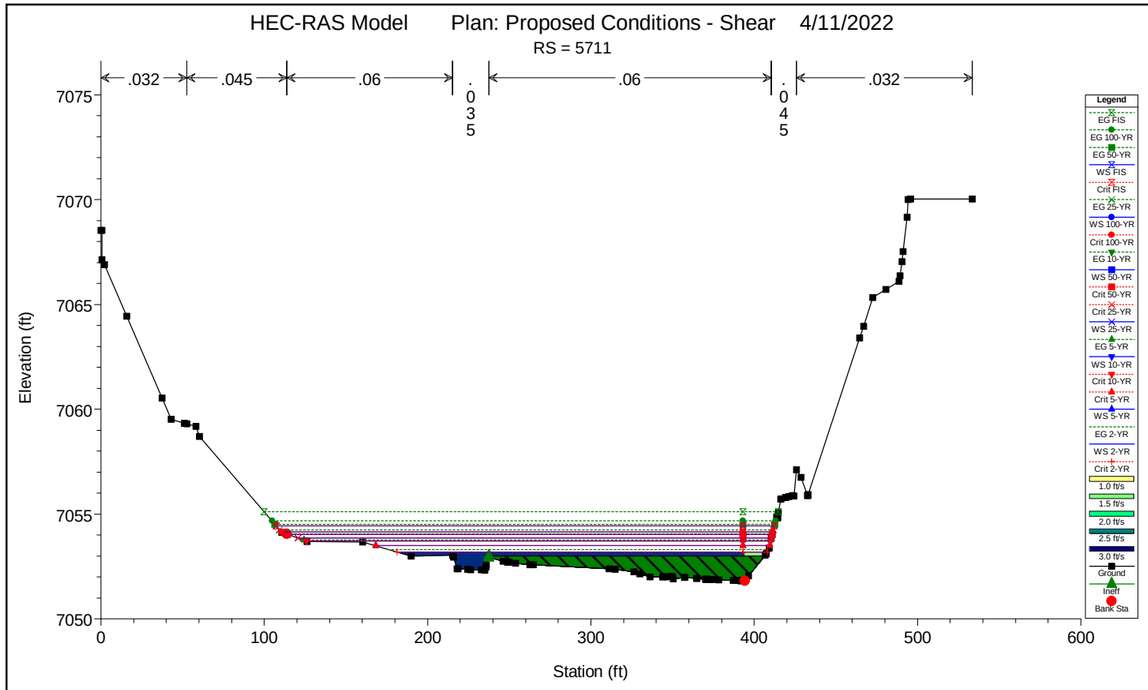
RS = 5818

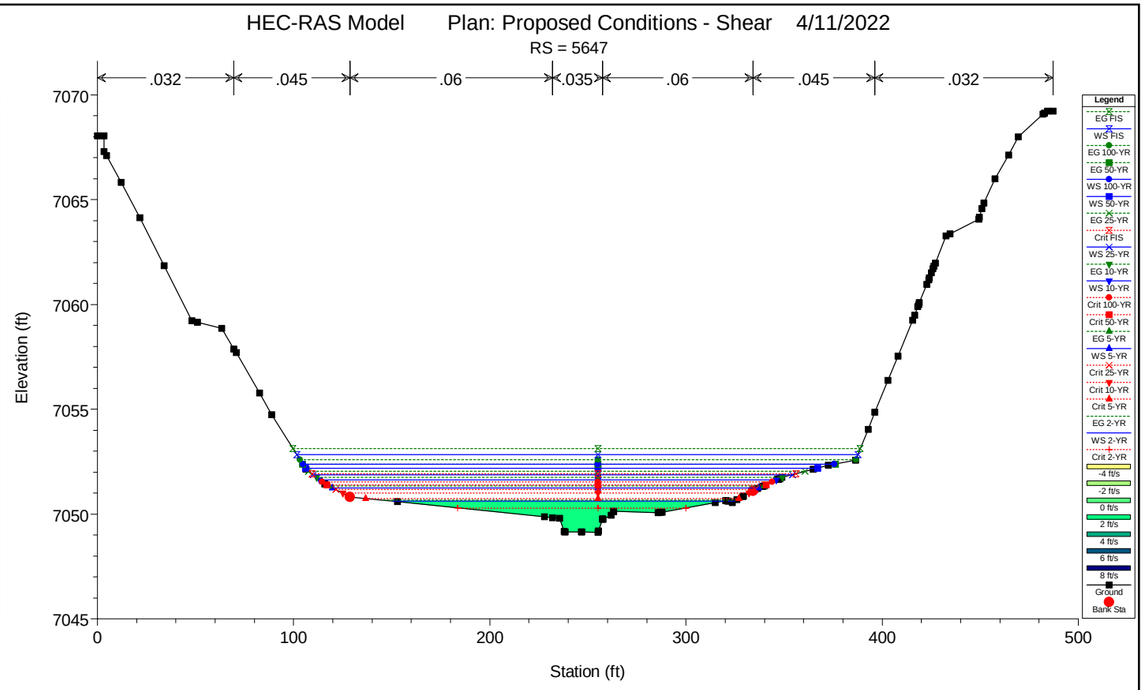


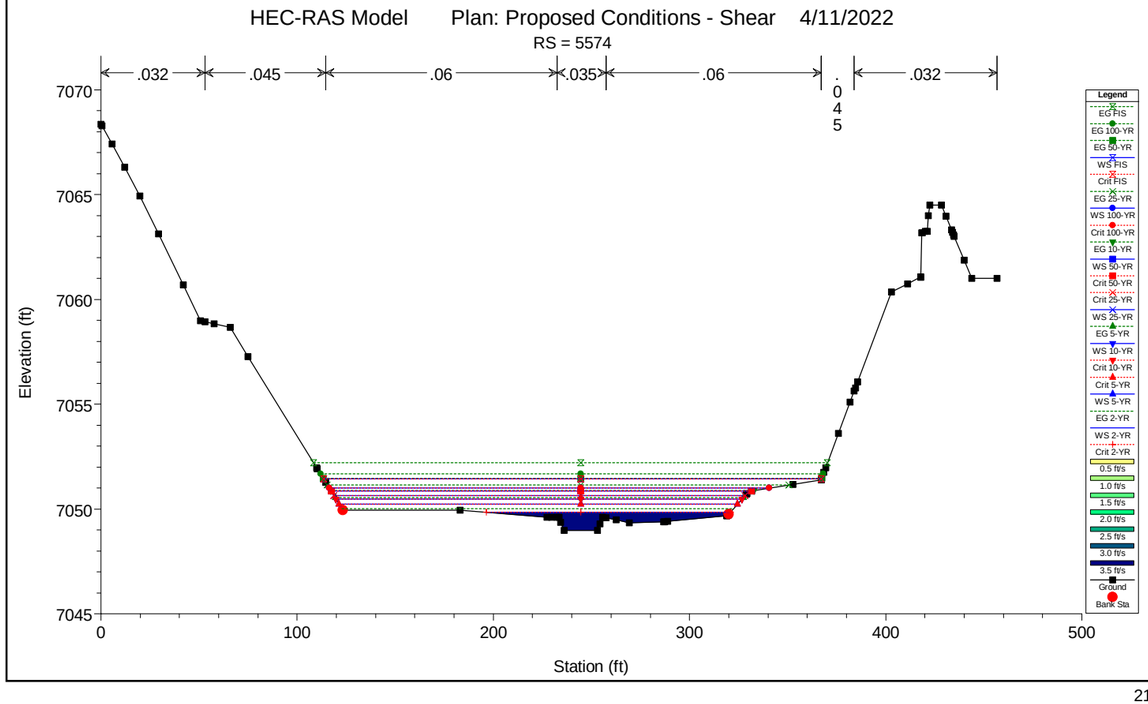
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

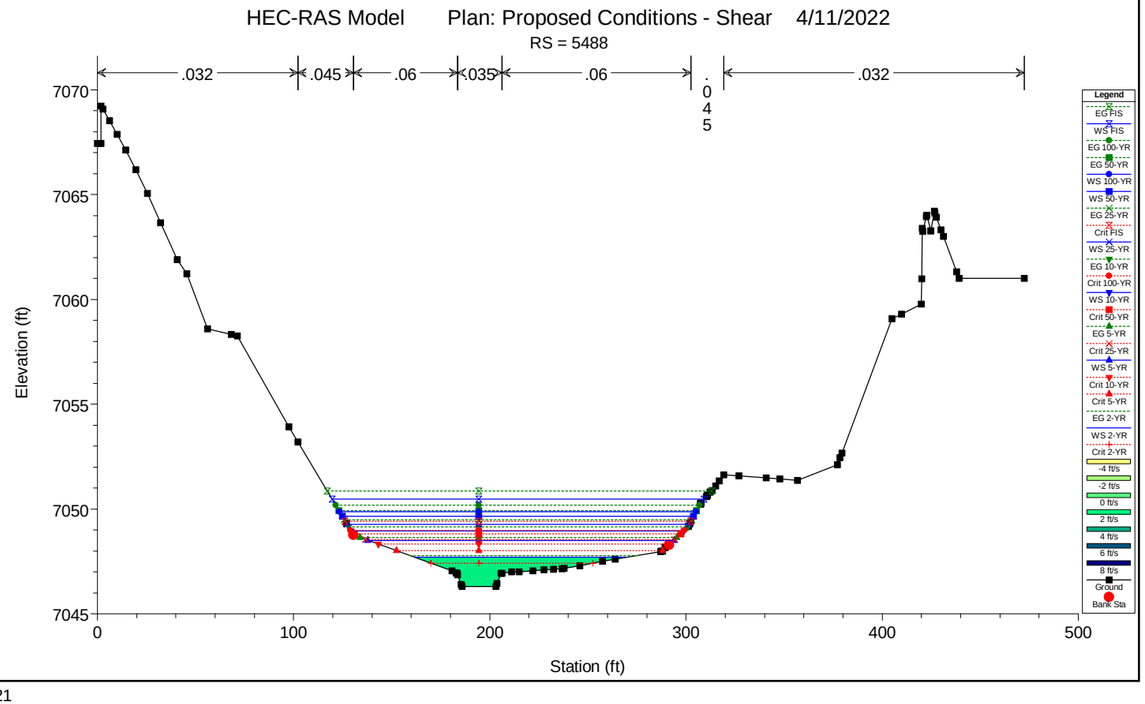
RS = 5765

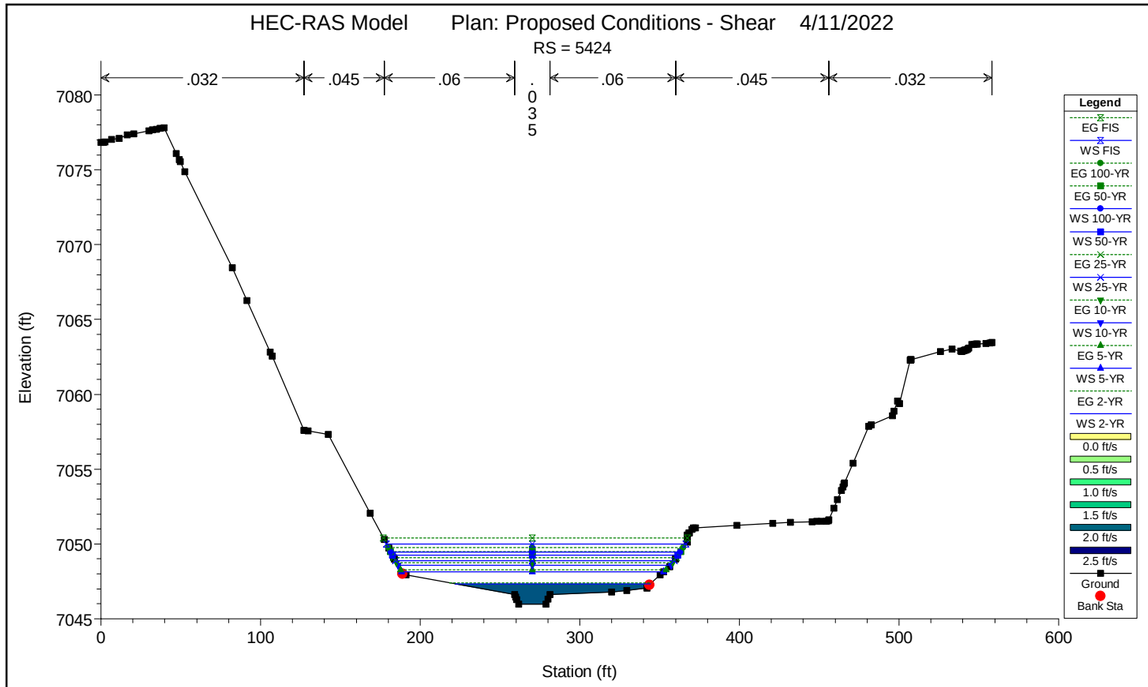


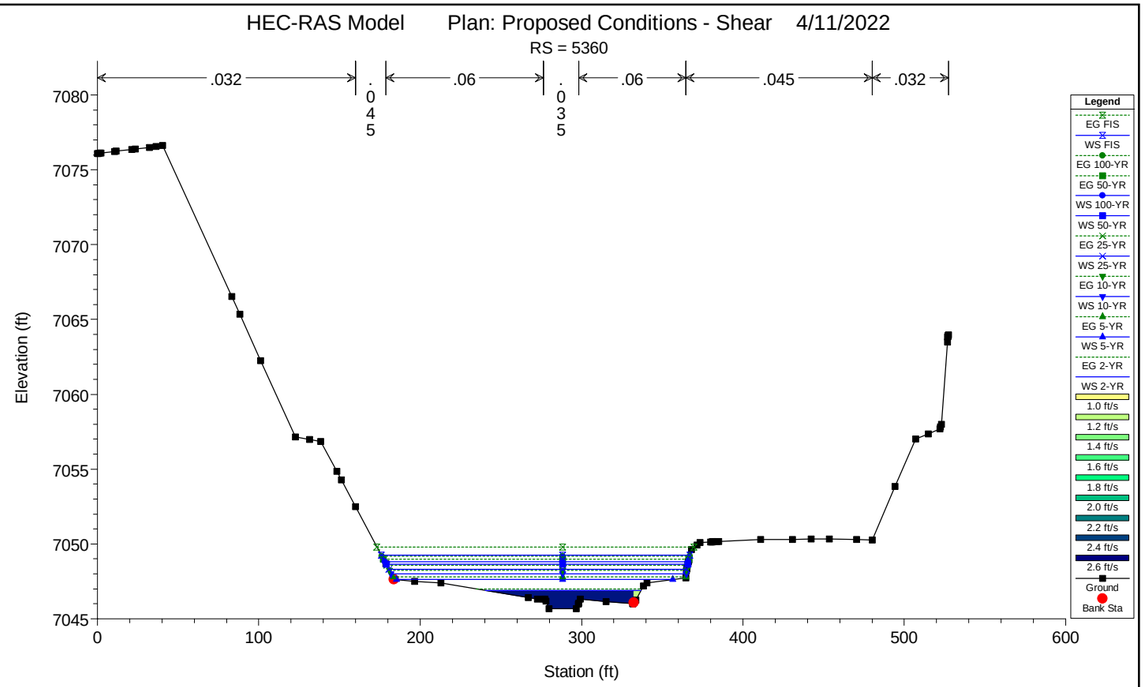

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5711
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta

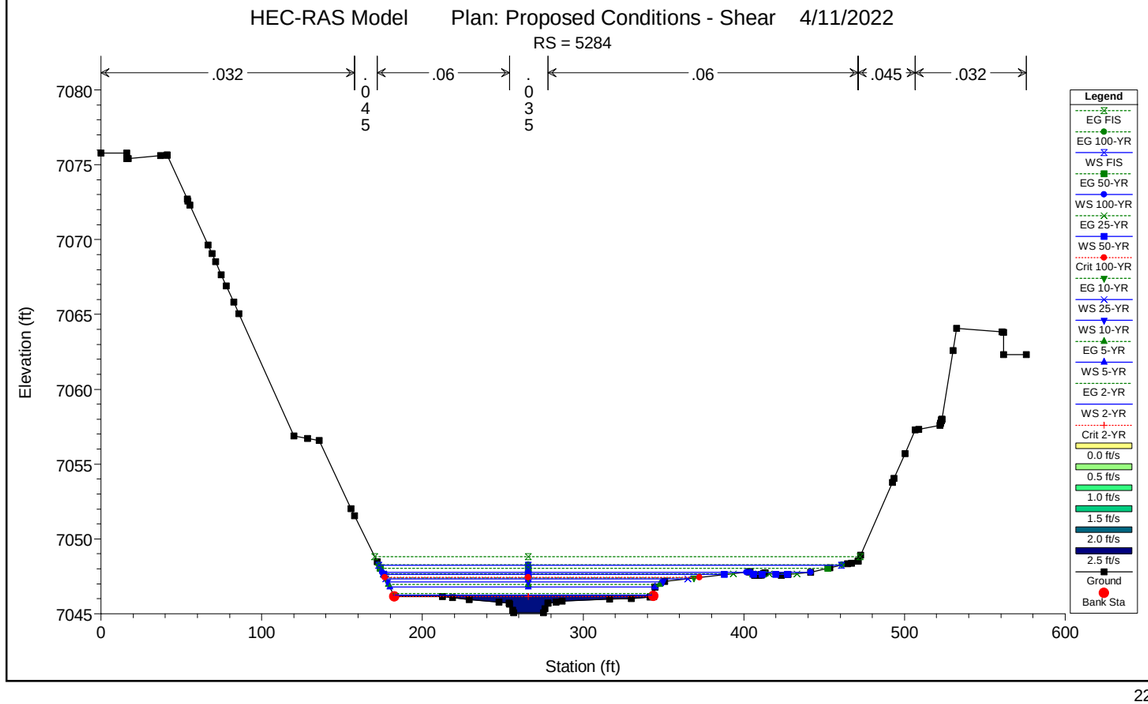

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5647
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
Crit FIS
WS 25-YR
EG 10-YR
Crit 100-YR
WS 10-YR
Crit 50-YR
EG 5-YR
WS 5-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

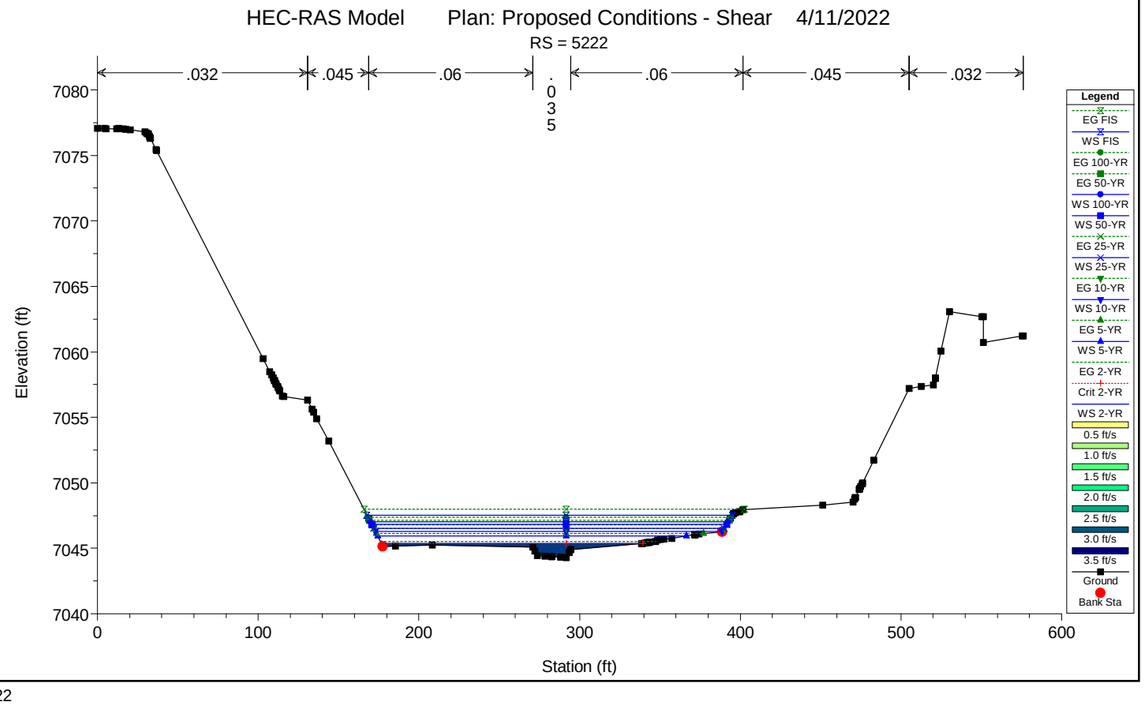

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5574
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
EG 10-YR
WS 50-YR
Crit 50-YR
WS 25-YR
EG 5-YR
WS 10-YR
Crit 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5488
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
Crit FIS
WS 25-YR
EG 10-YR
Crit 100-YR
WS 10-YR
Crit 50-YR
EG 5-YR
Crit 25-YR
WS 5-YR
Crit 10-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

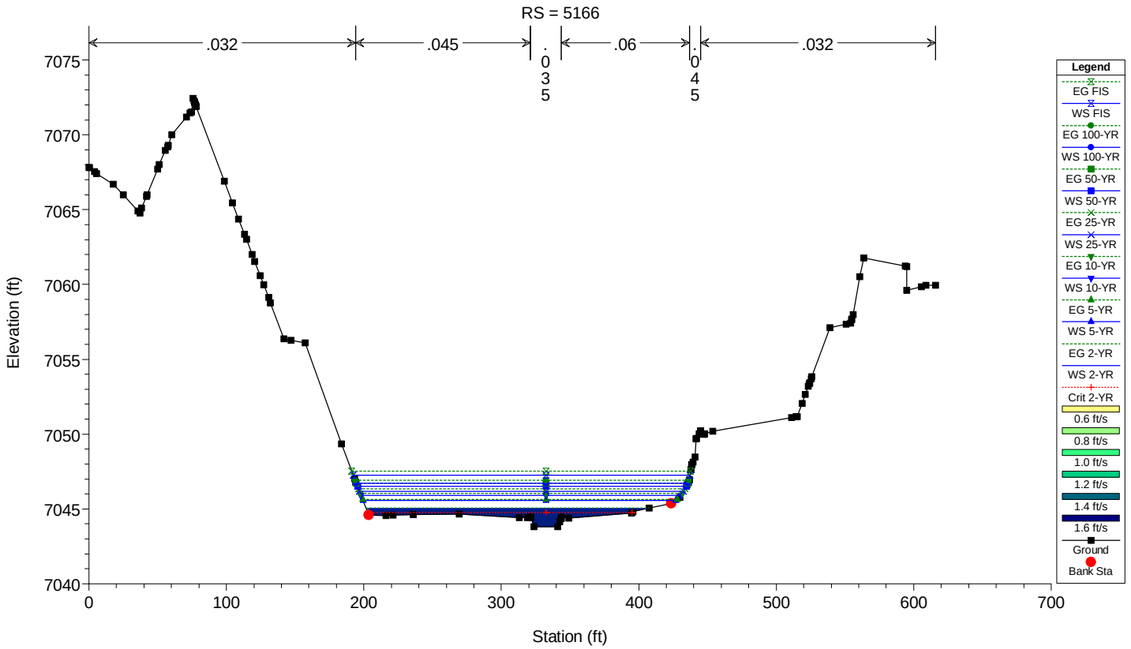

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5424
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5360
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
Ground
Bank Sta

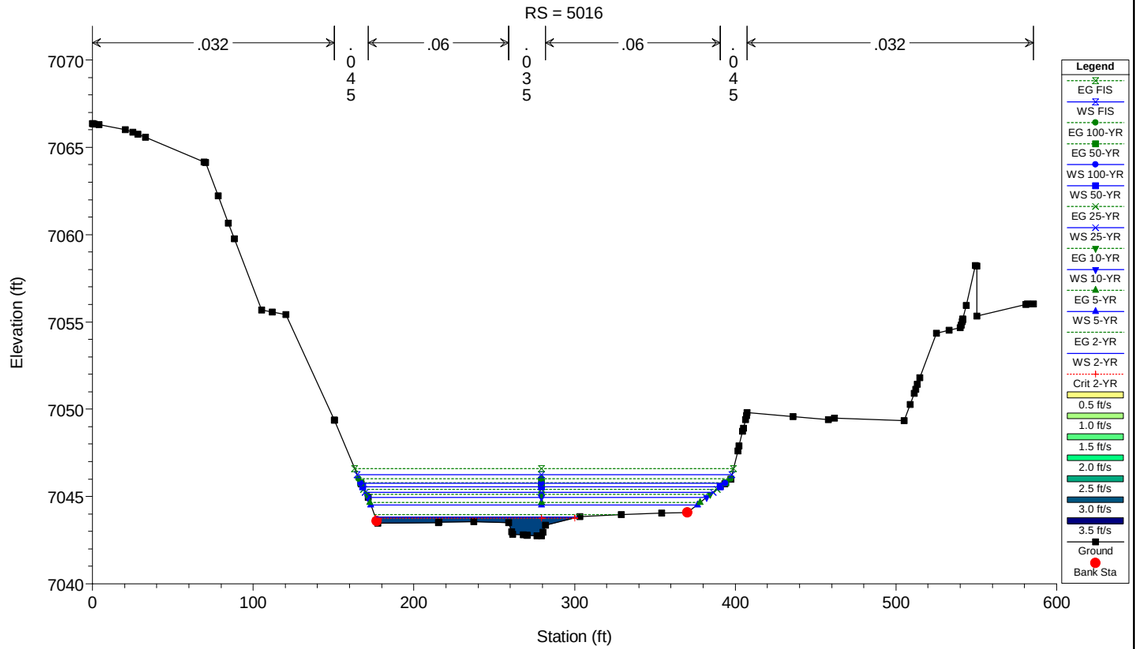

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5284
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
EG 50-YR
WS 100-YR
EG 25-YR
WS 50-YR
Crit 100-YR
EG 10-YR
WS 25-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 5222
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

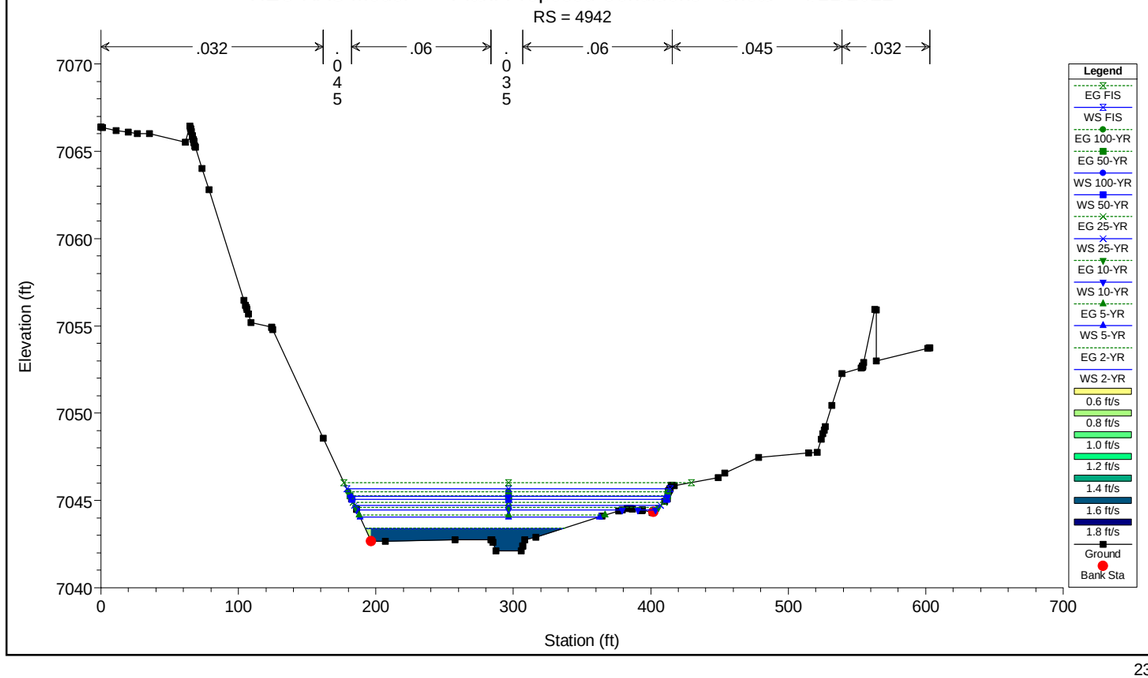
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022



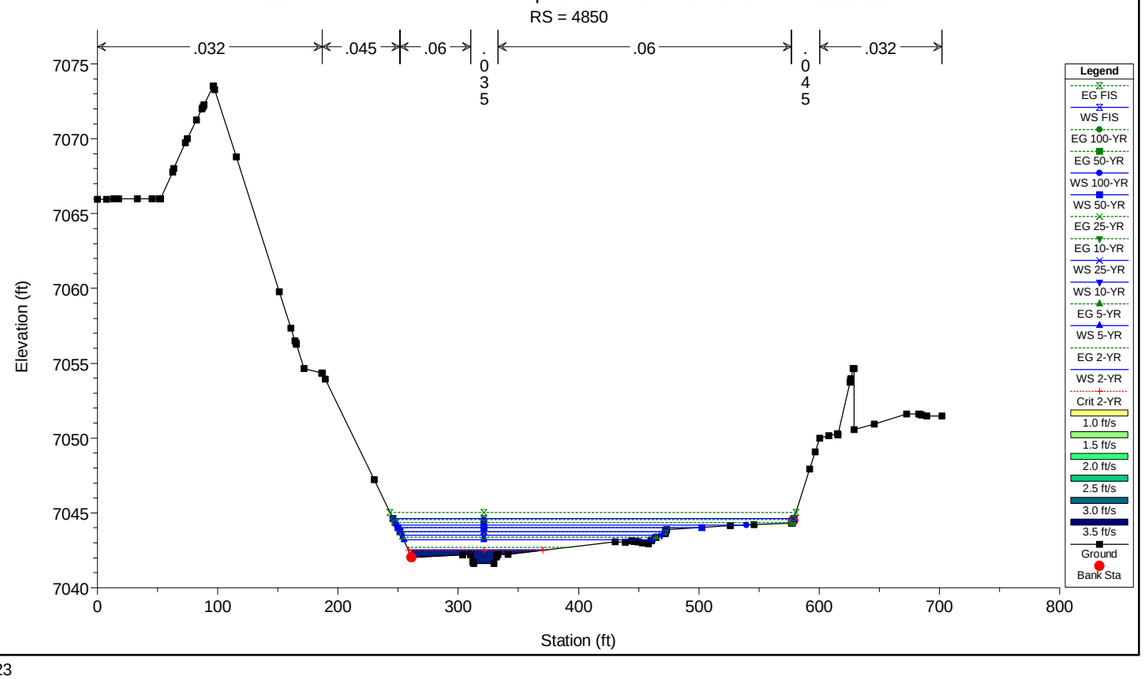
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

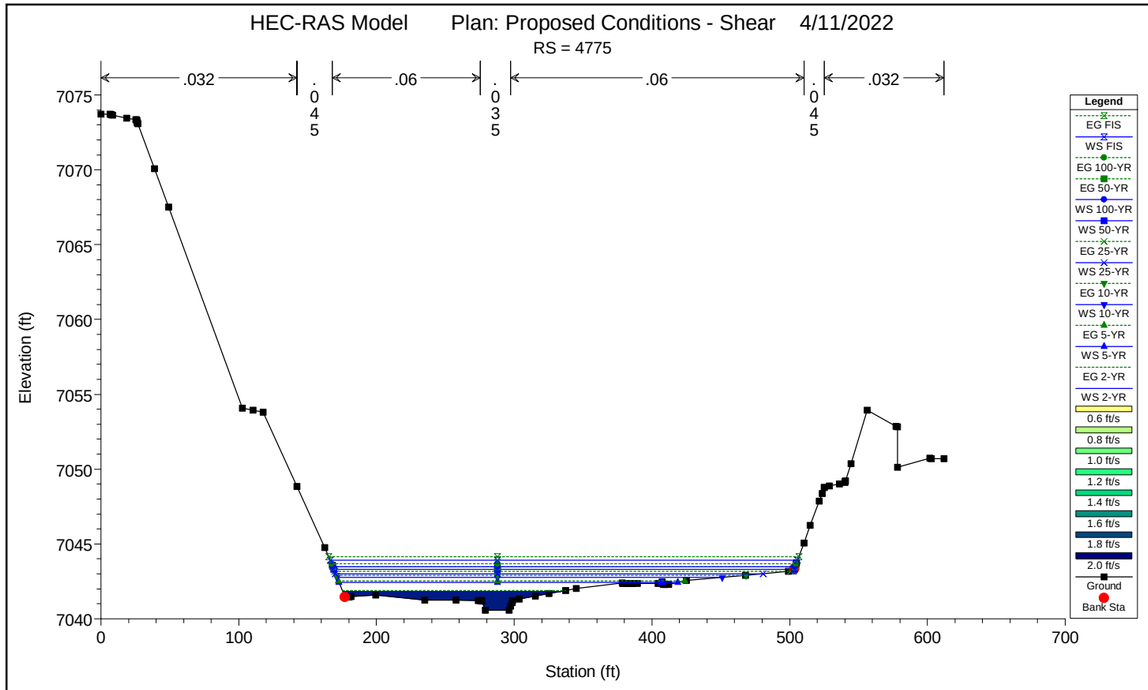


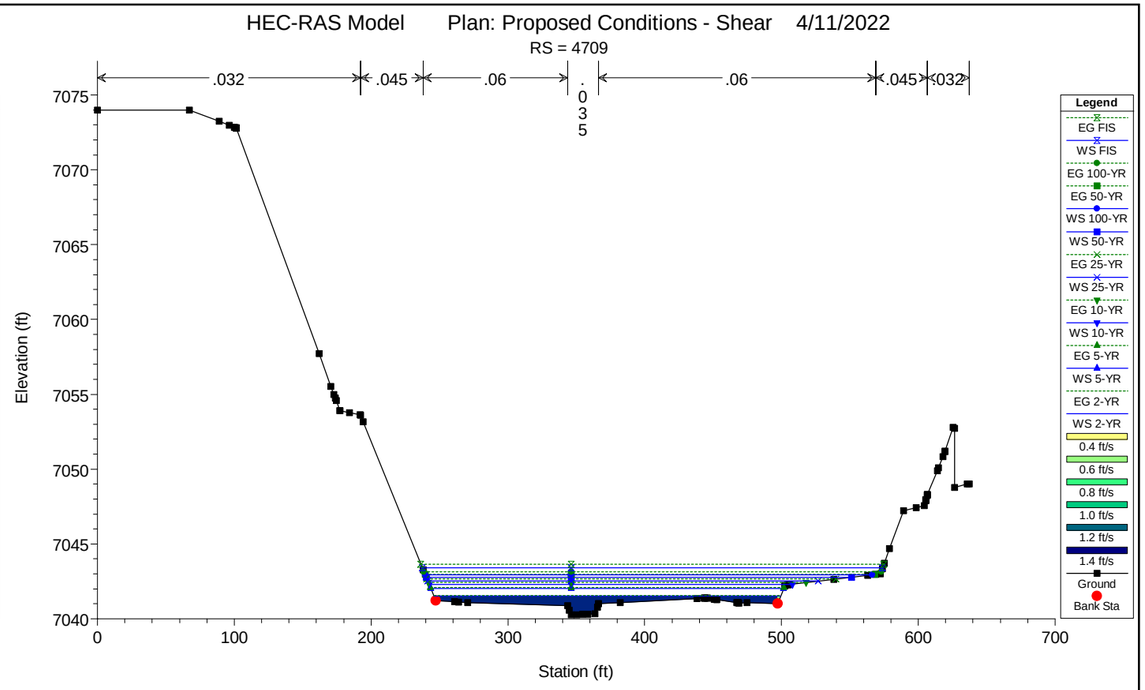
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

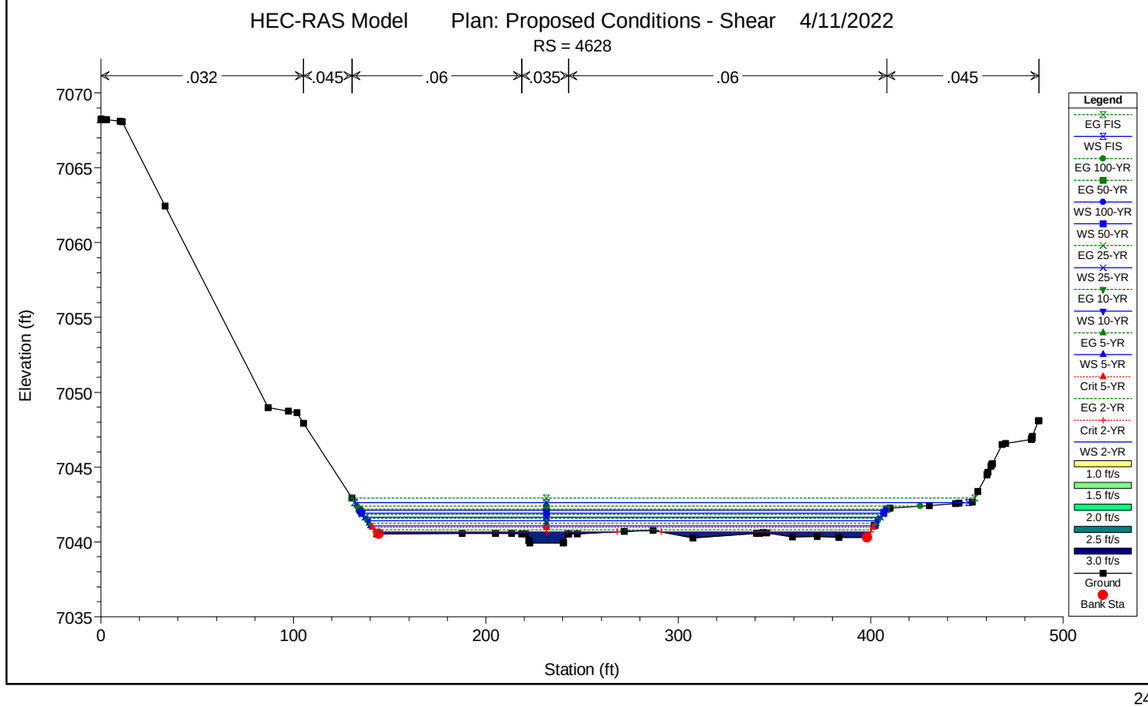


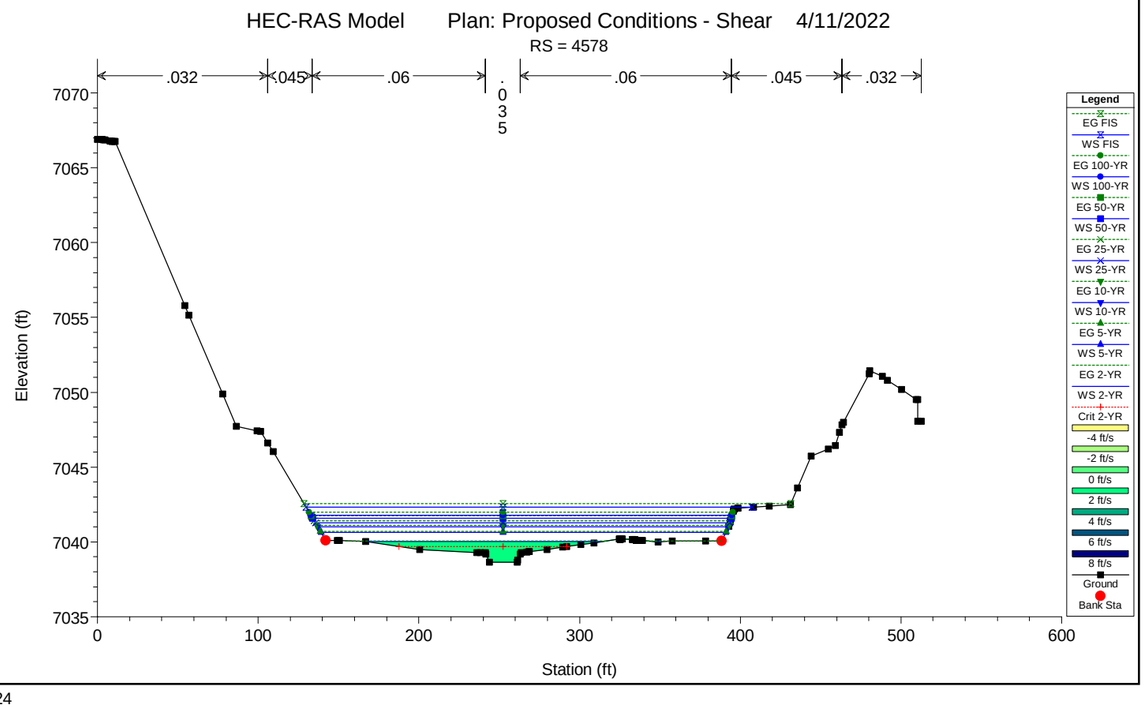
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

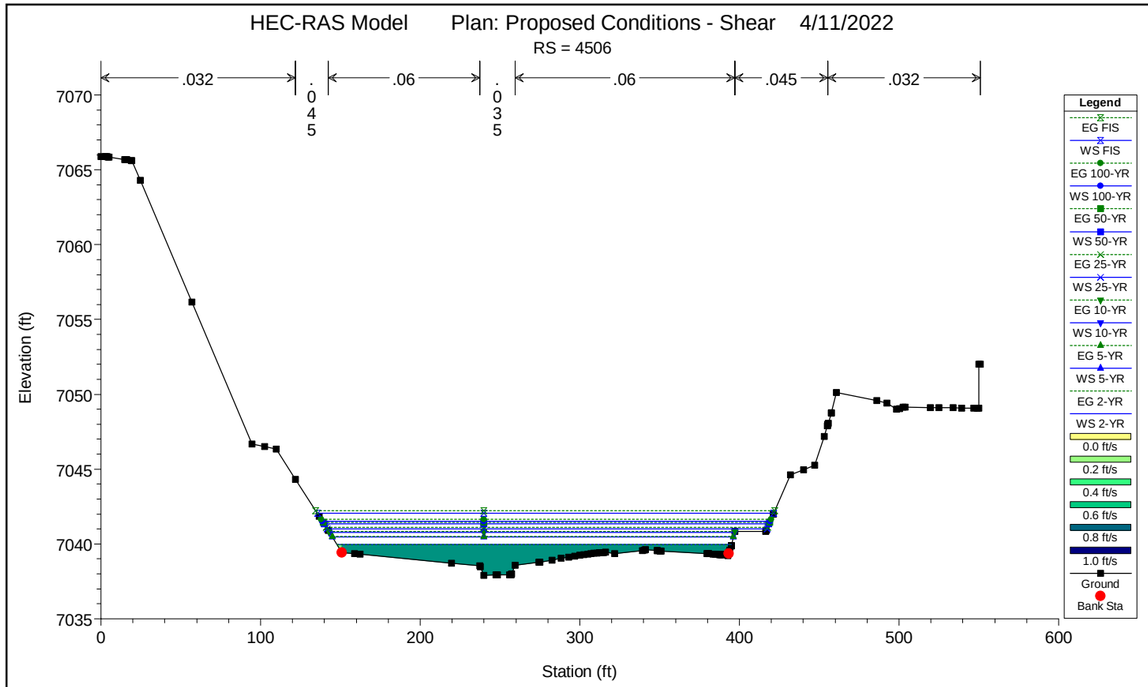


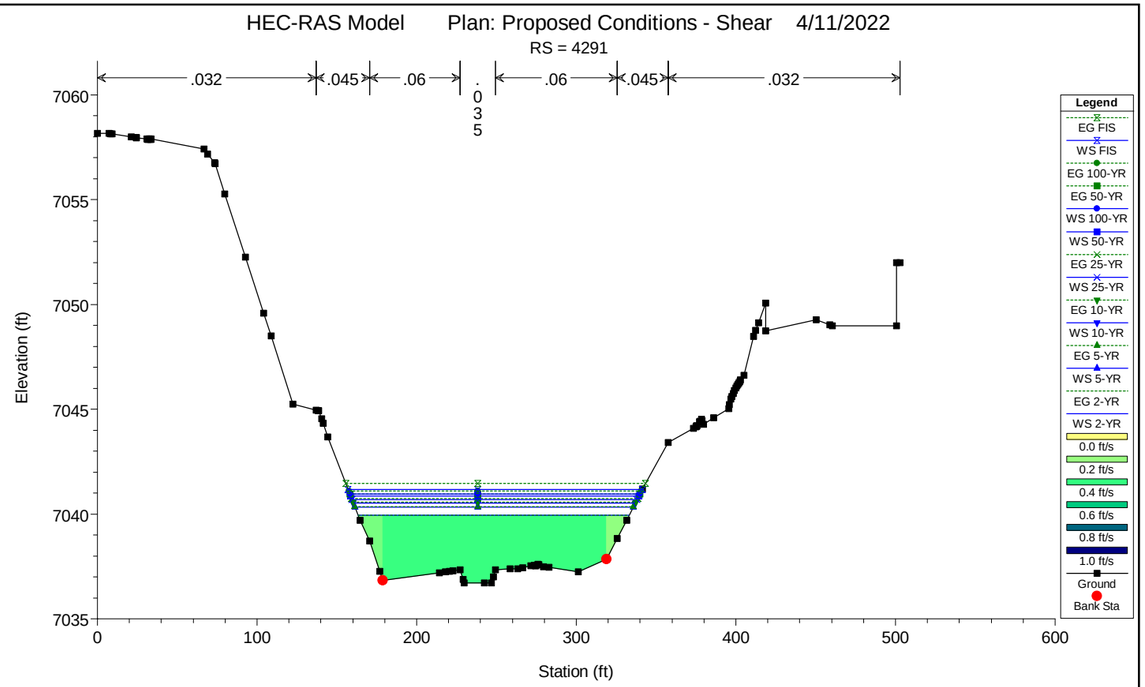

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 4775
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
Ground
Bank Sta

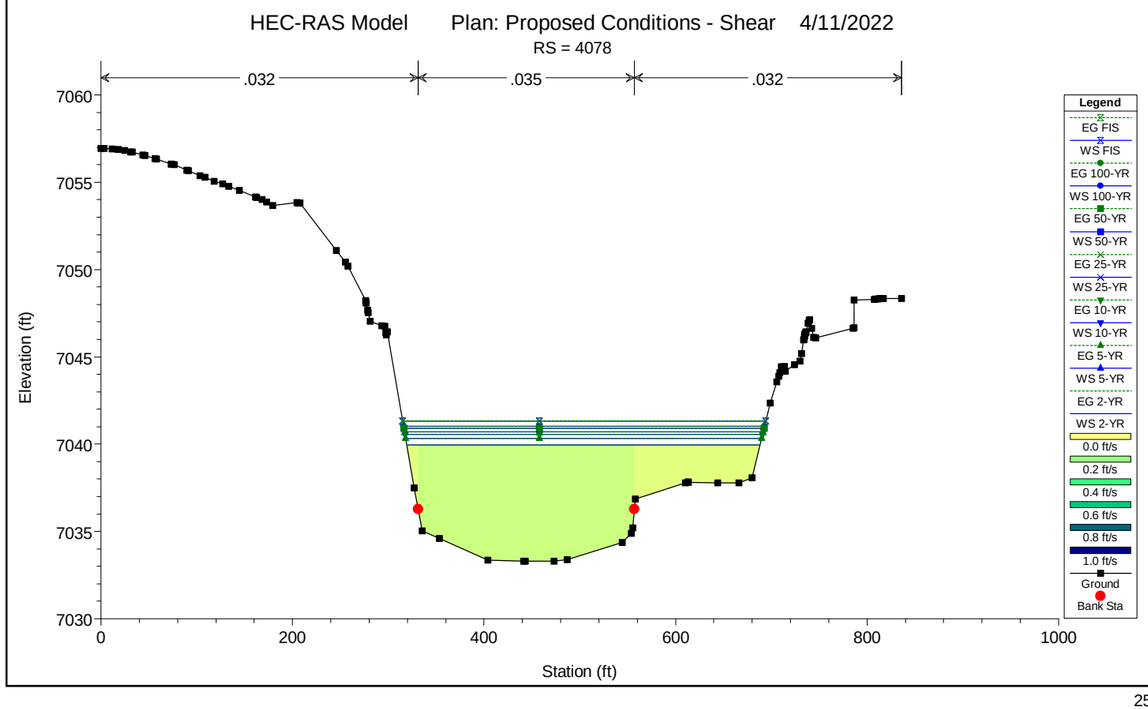

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 4709
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
Ground
Bank Sta

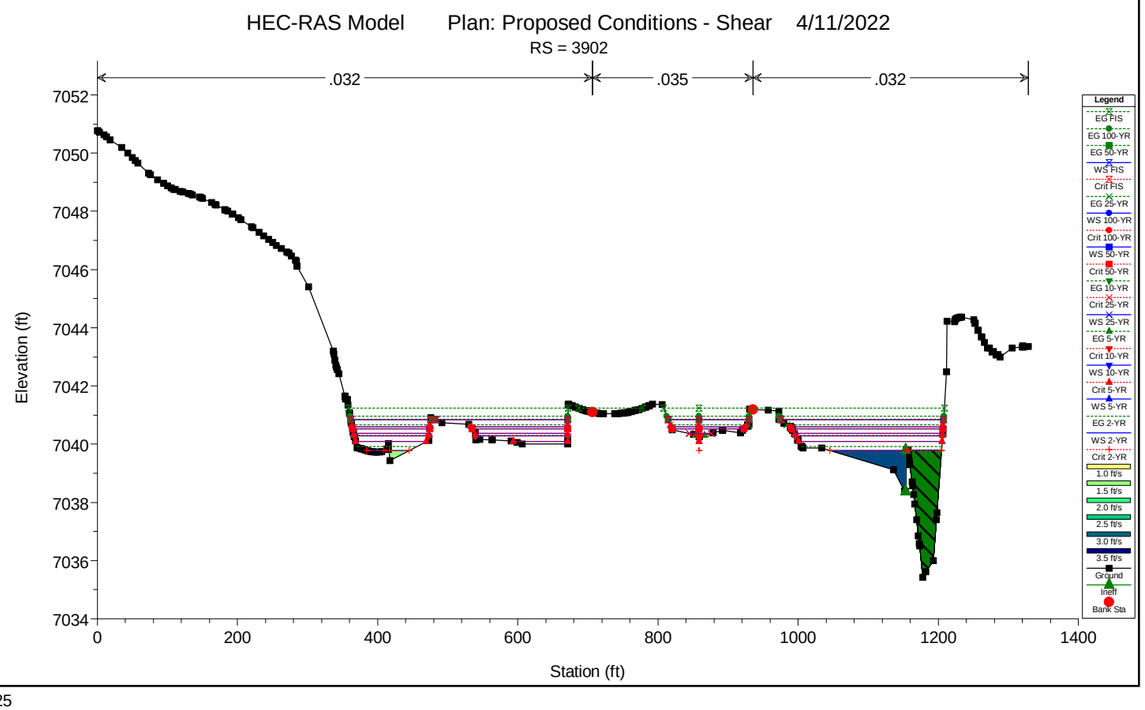

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 4628
.032
.045
.06
.035
.06
.045
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
Crit 5-YR
EG 2-YR
Crit 2-YR
WS 2-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

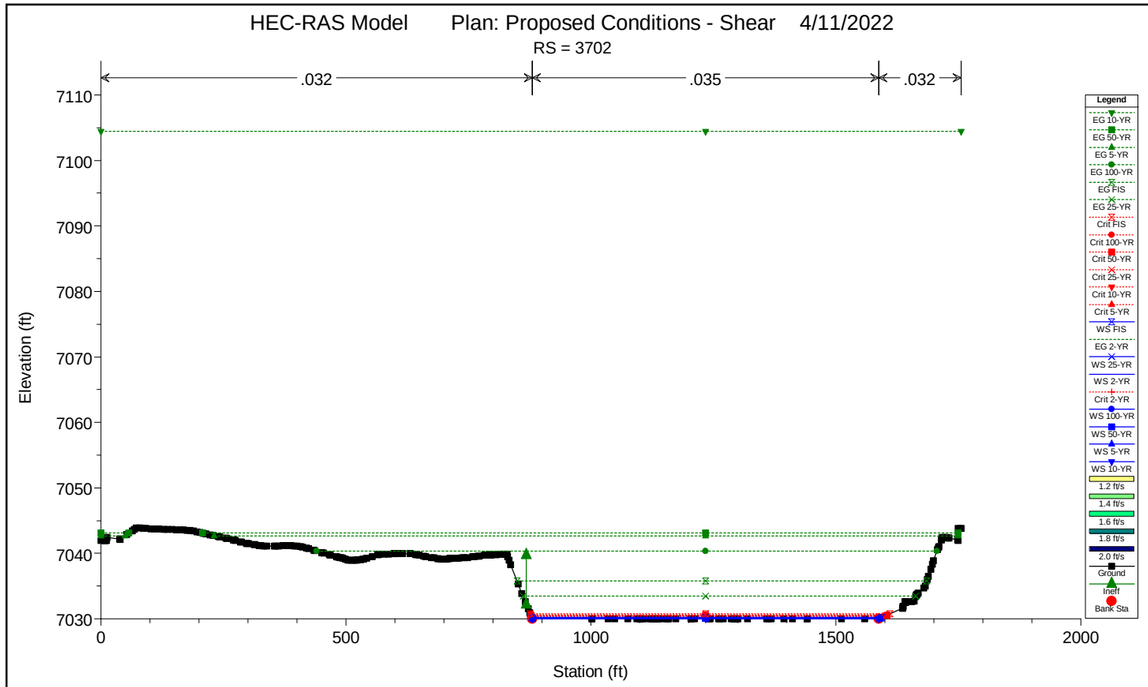

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 4578
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

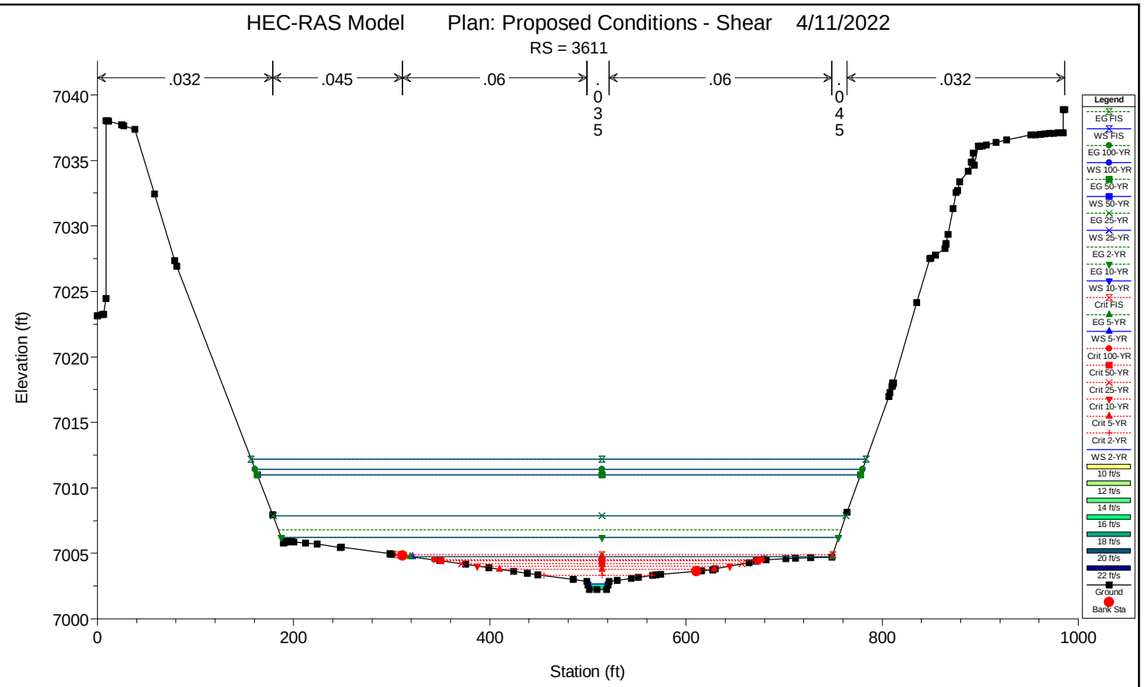

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 4506
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

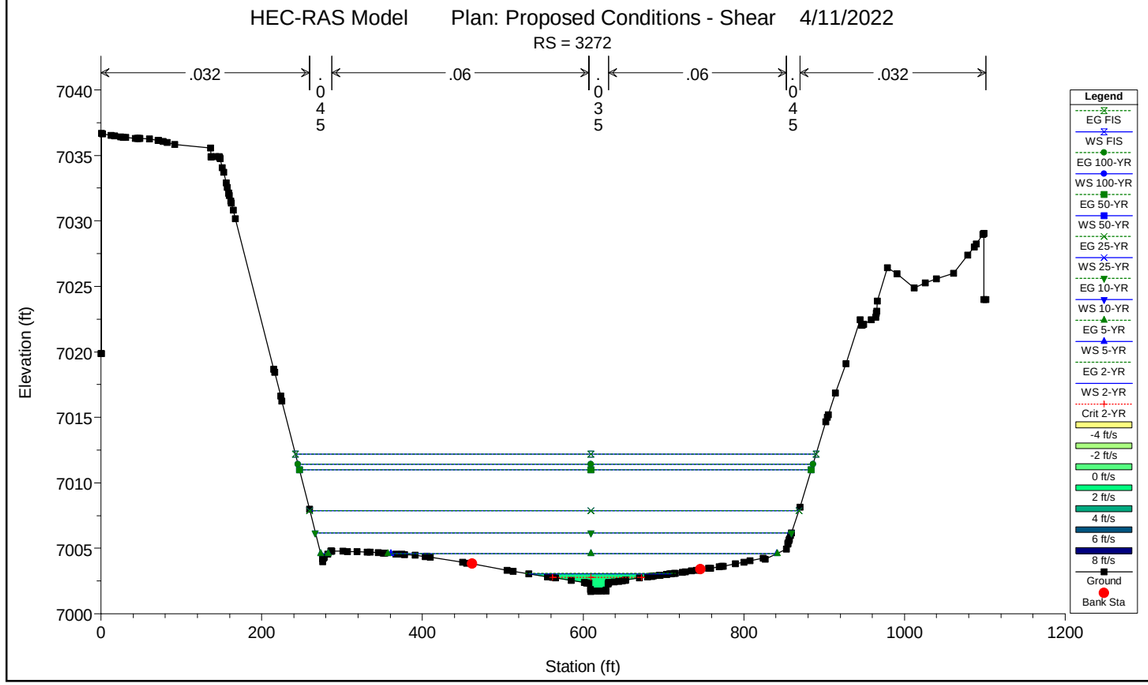

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 4291
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

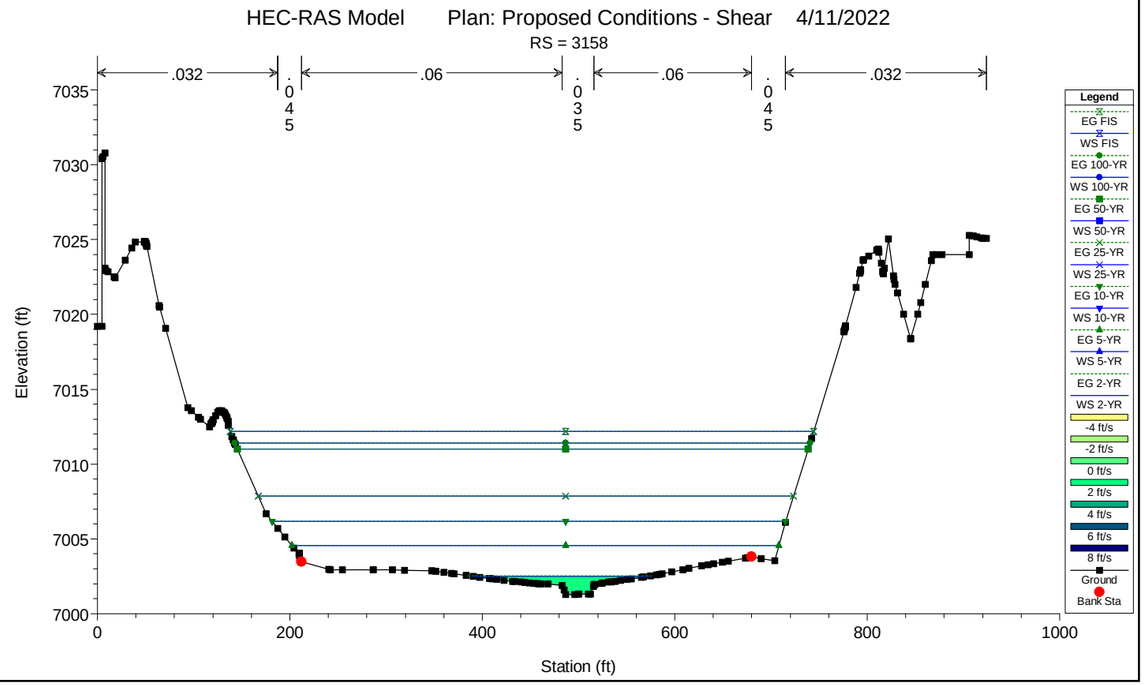

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 4078
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 3902
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
WS FIS
Crit FIS
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
Crit 50-YR
EG 10-YR
Crit 25-YR
WS 25-YR
EG 5-YR
Crit 10-YR
WS 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 3702
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG 10-YR
EG 50-YR
EG 5-YR
EG 100-YR
EG FIS
EG 25-YR
Crit FIS
Crit 100-YR
Crit 50-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
WS FIS
EG 2-YR
WS 25-YR
WS 2-YR
Crit 2-YR
WS 100-YR
WS 50-YR
WS 5-YR
WS 10-YR
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
Ground
Ineff
Bank Sta

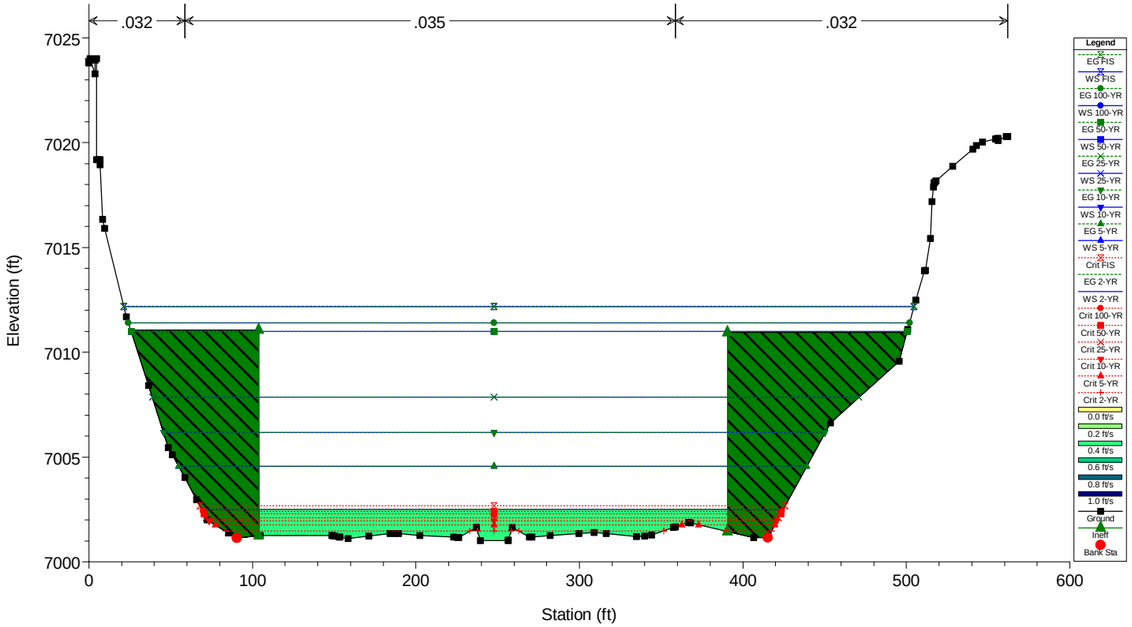

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 3611
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 2-YR
EG 10-YR
WS 10-YR
Crit FIS
EG 5-YR
WS 5-YR
Crit 100-YR
Crit 50-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
Crit 2-YR
WS 2-YR
10 ft/s
12 ft/s
14 ft/s
16 ft/s
18 ft/s
20 ft/s
22 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 3272
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 3158
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

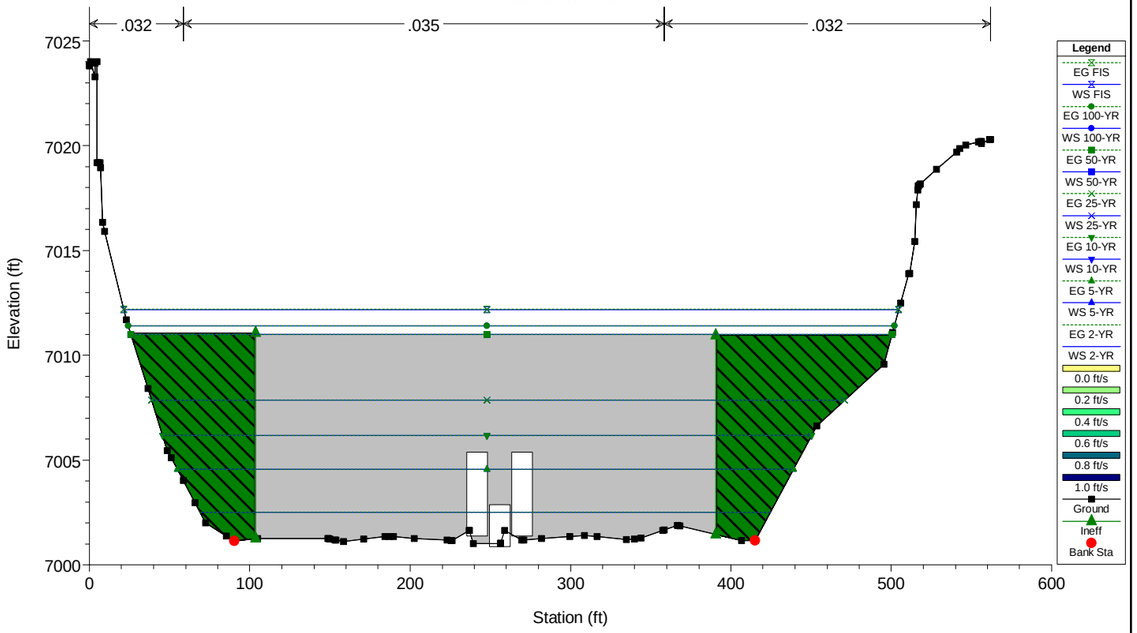
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 3098



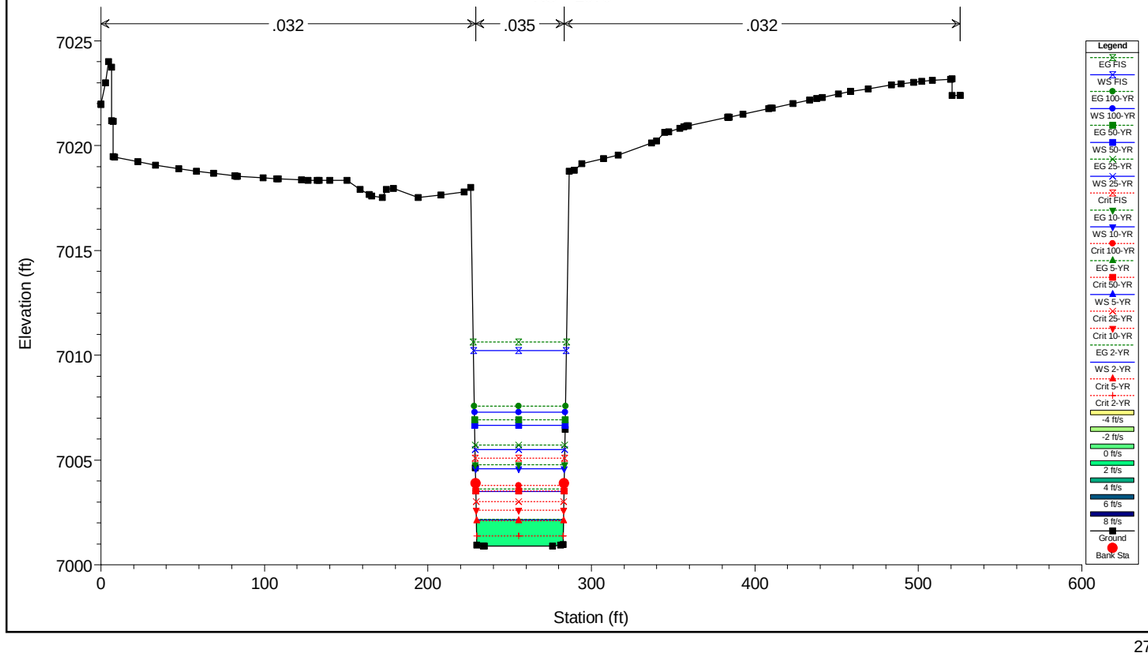
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 3047 IS



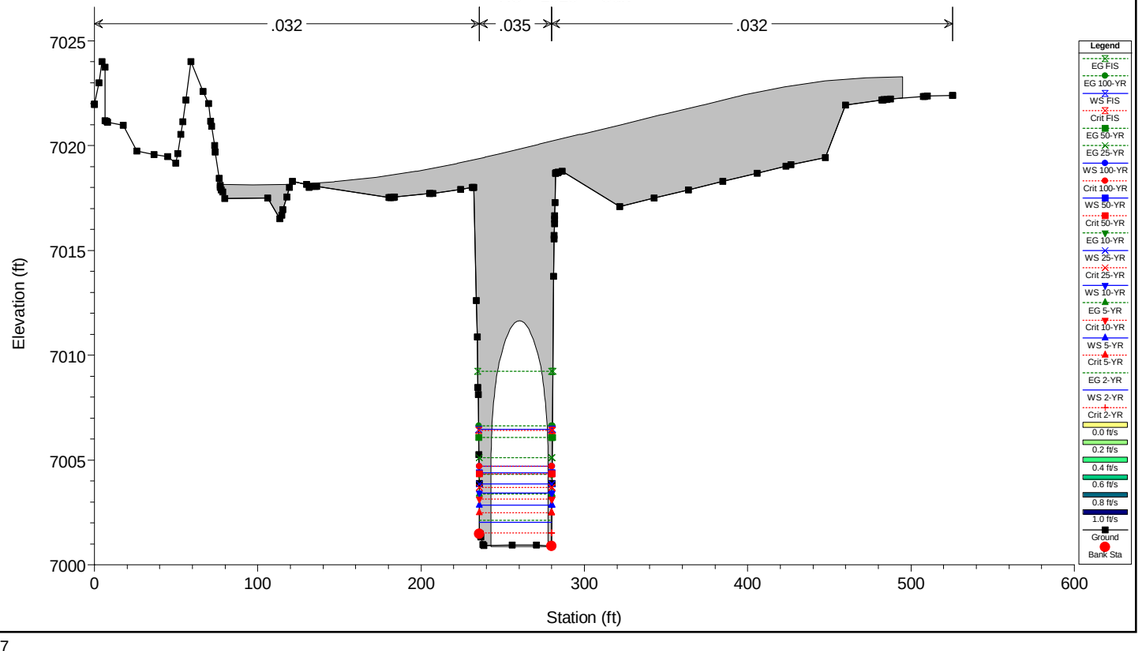
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2970



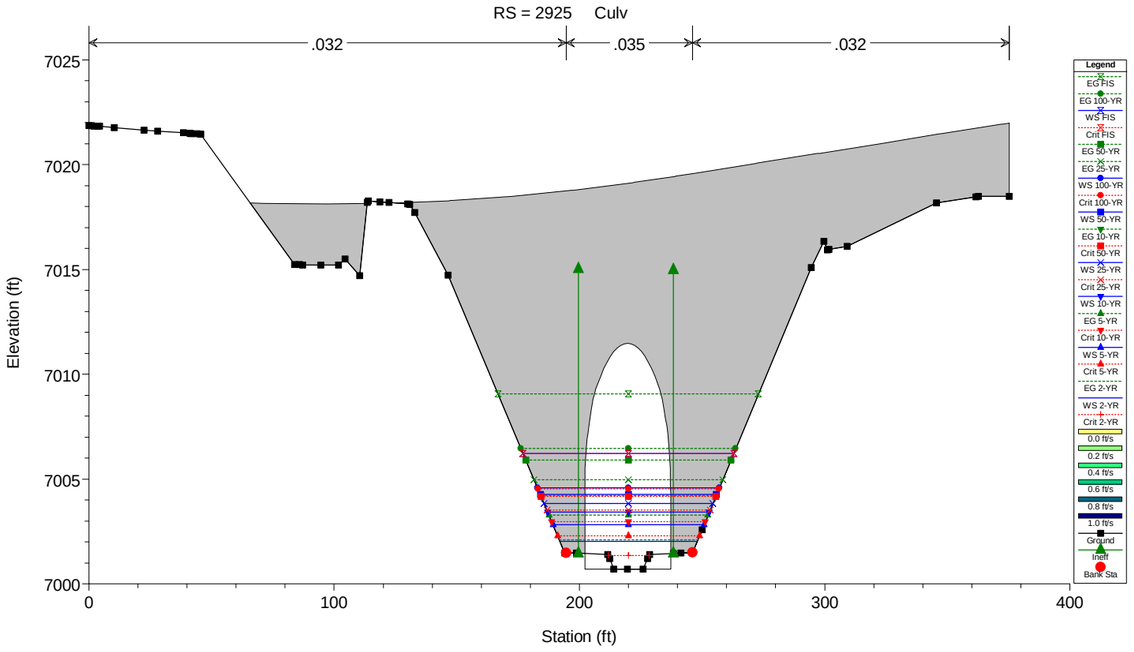
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2925 Culv



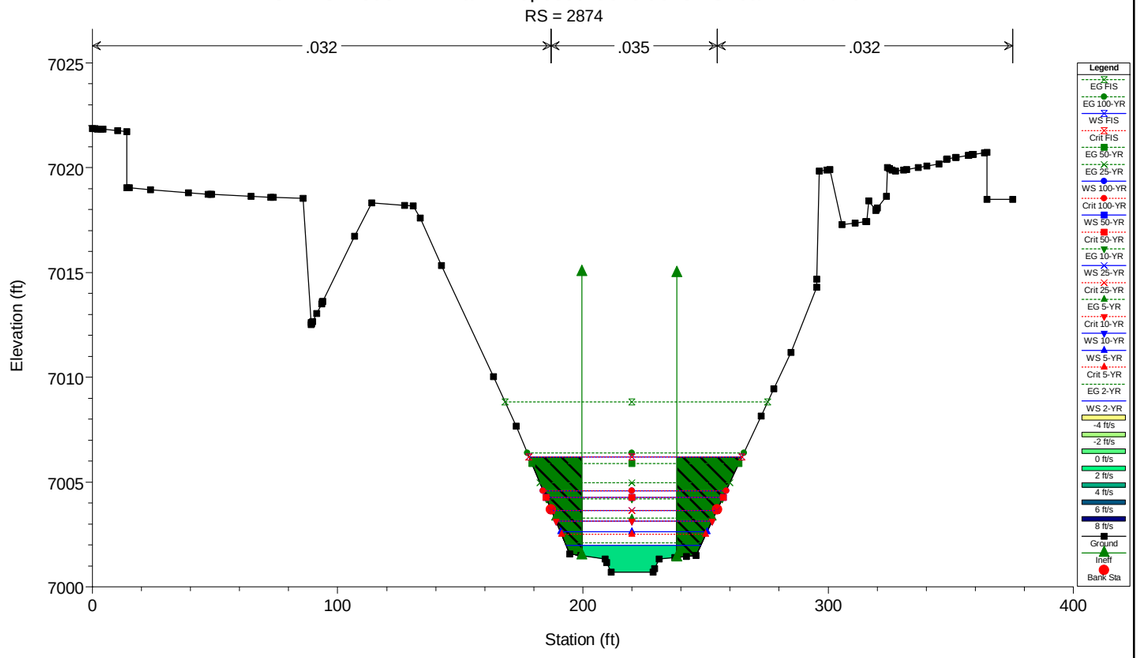
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2925 Culv



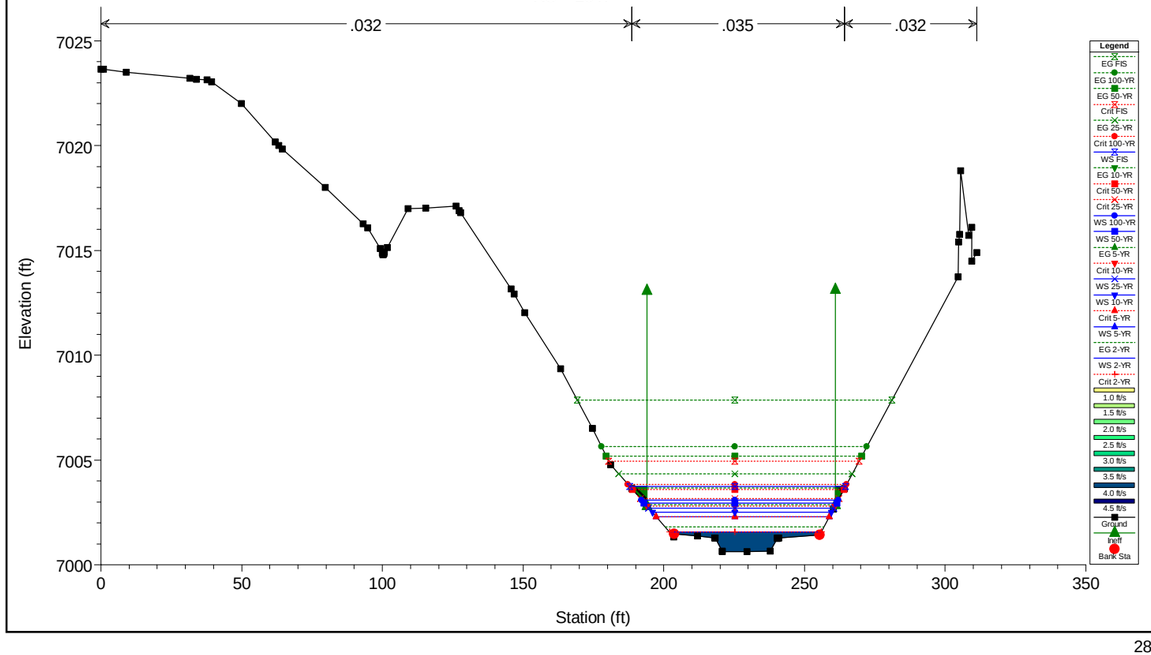
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2874



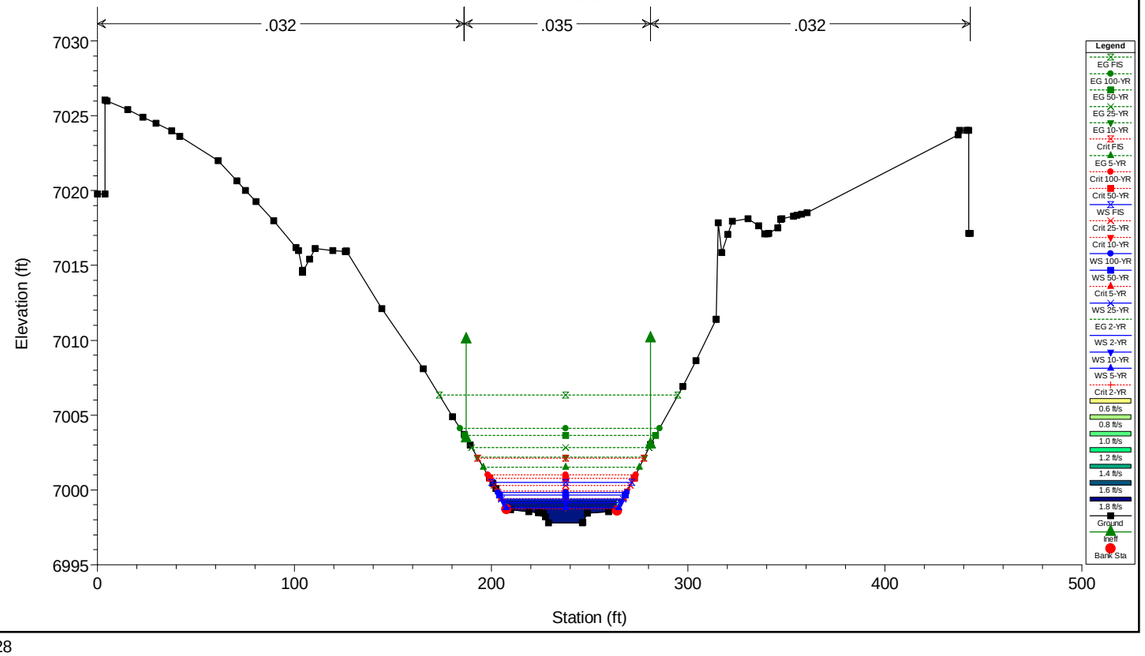
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2847



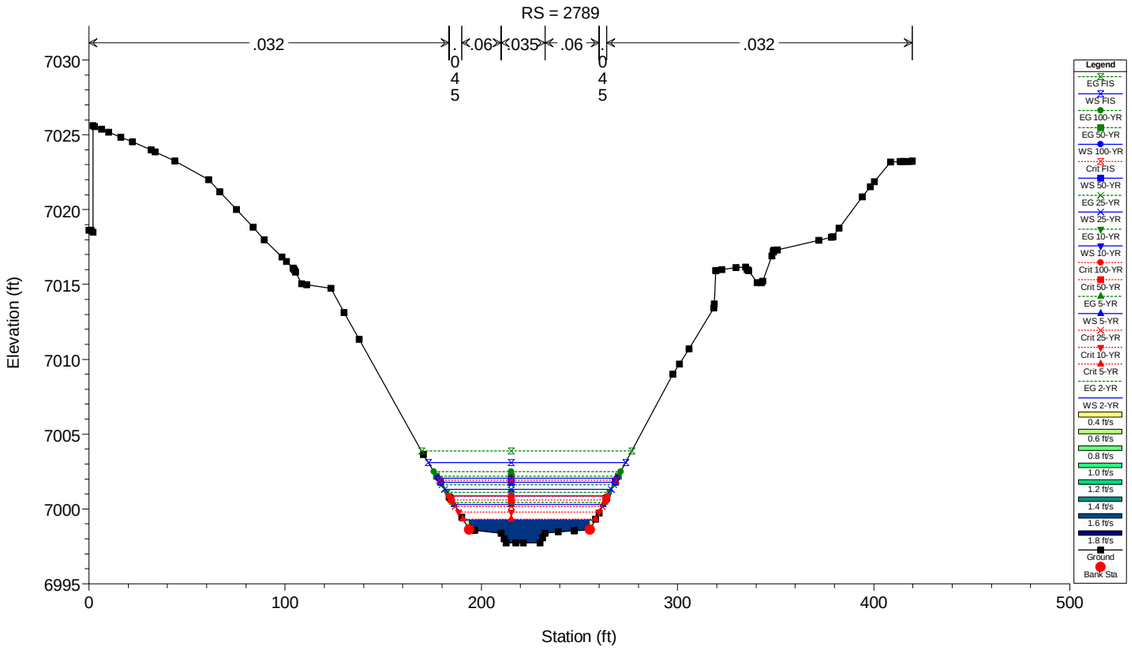
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2829



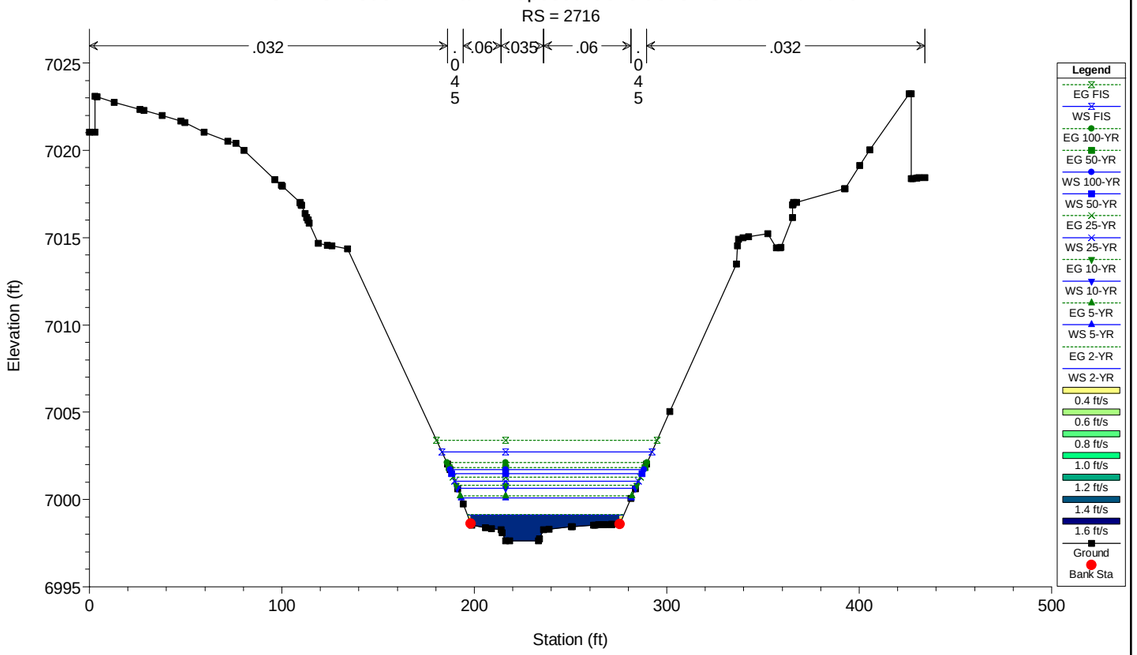
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2789



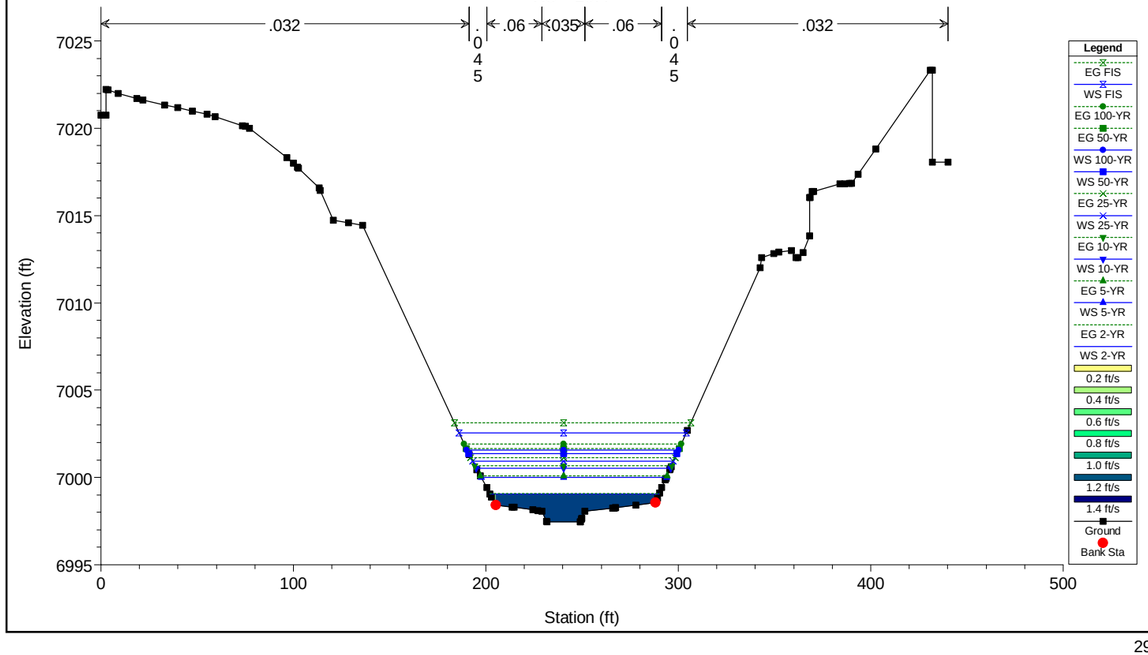
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

RS = 2716



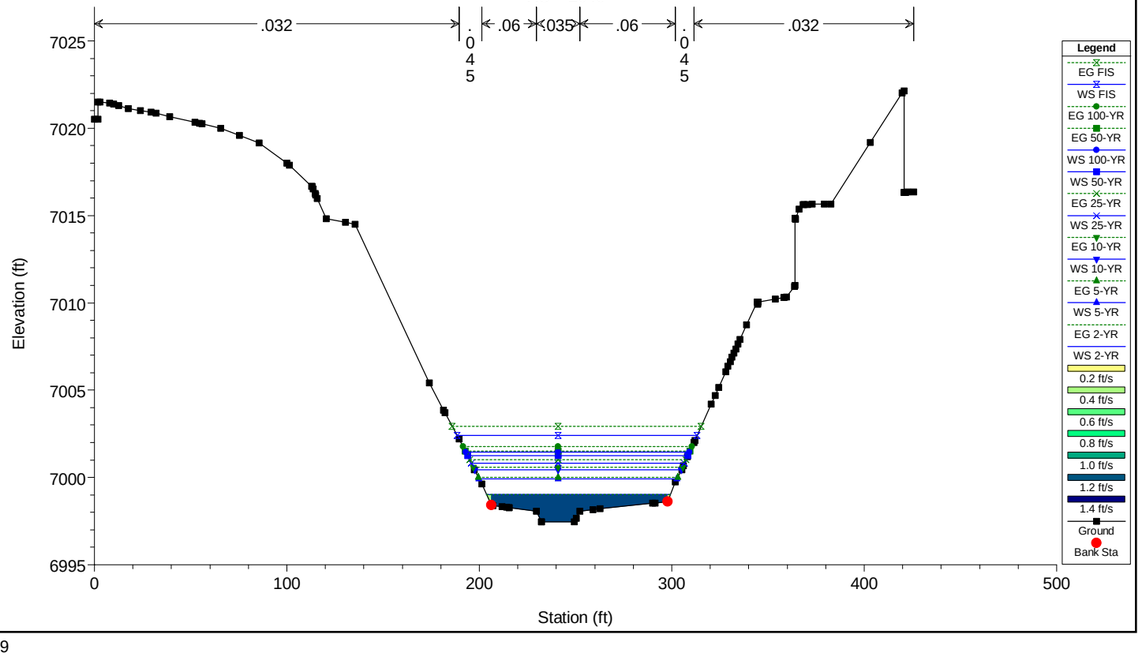
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

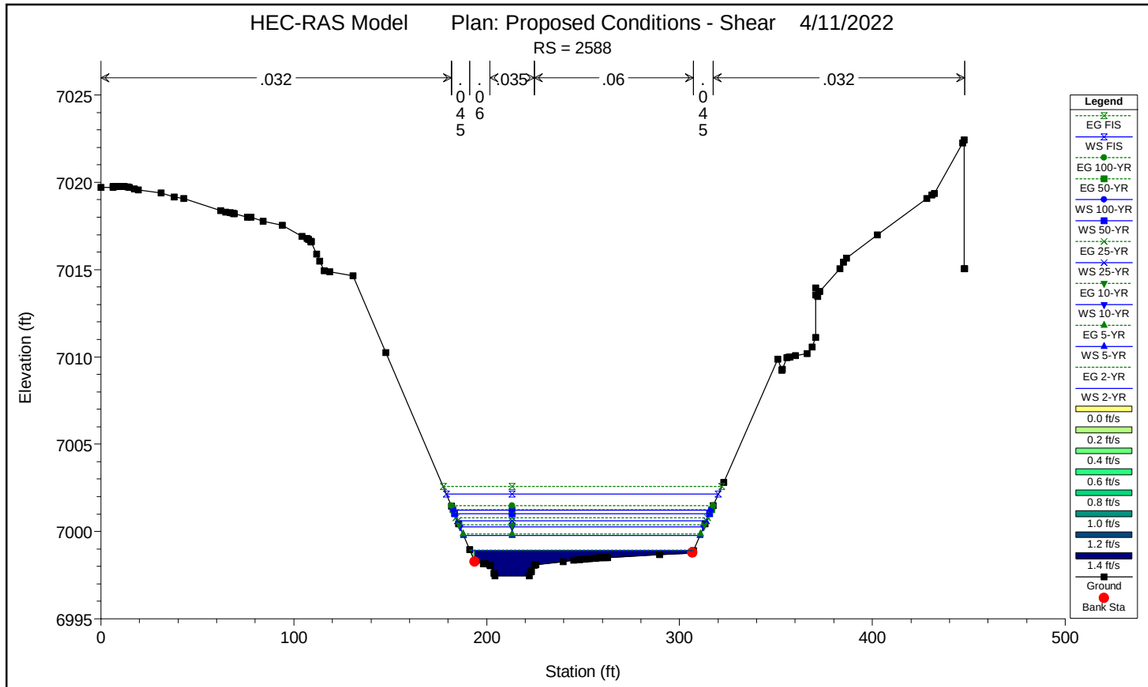
RS = 2677

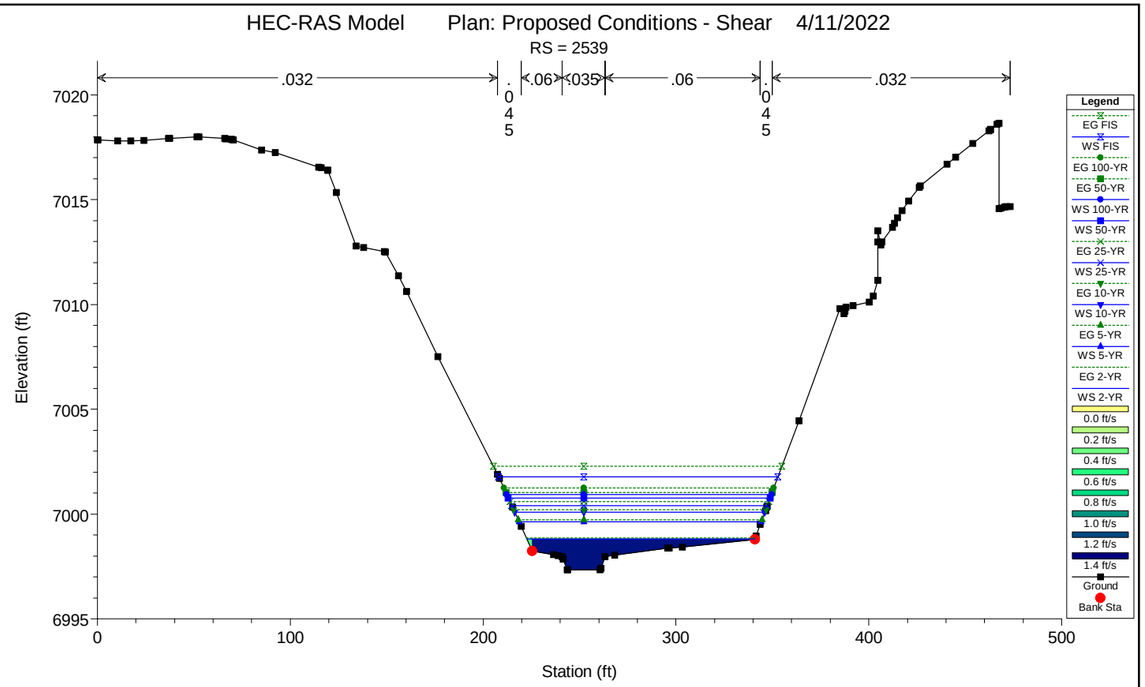


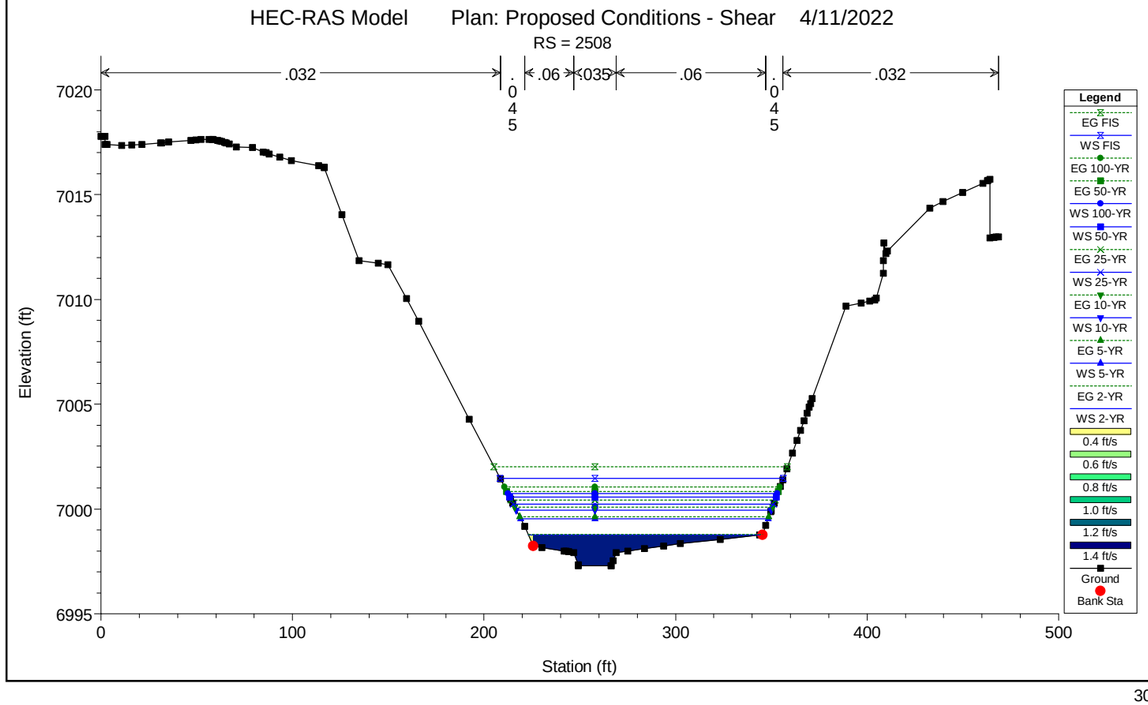
HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022

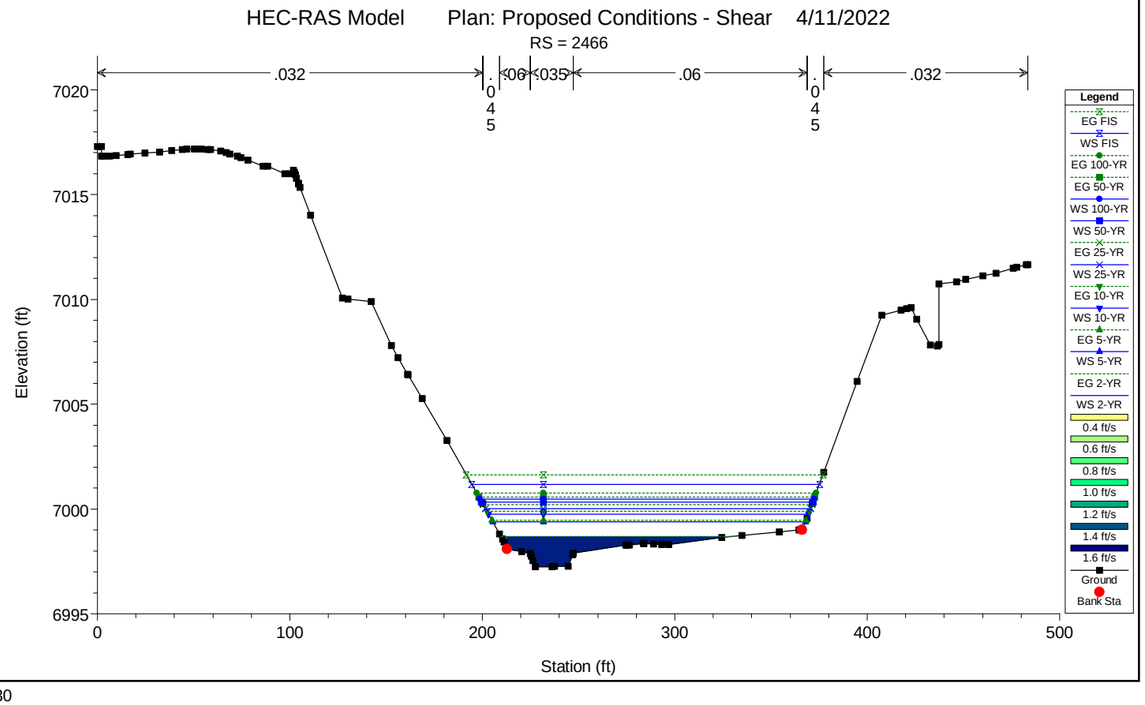
RS = 2646

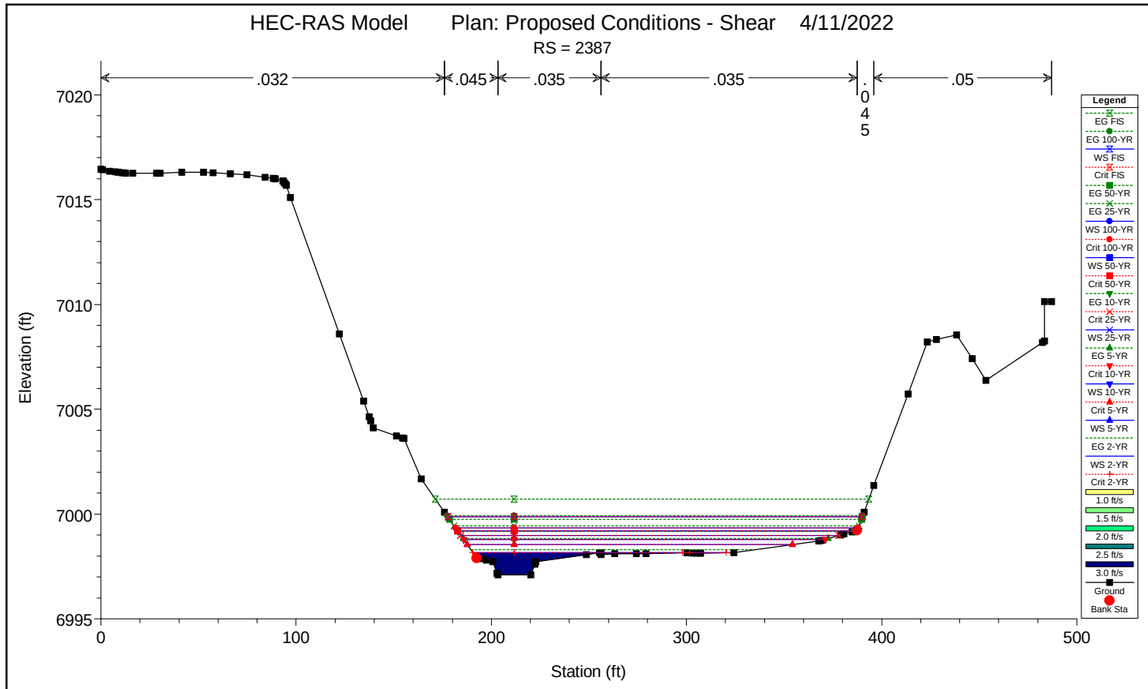


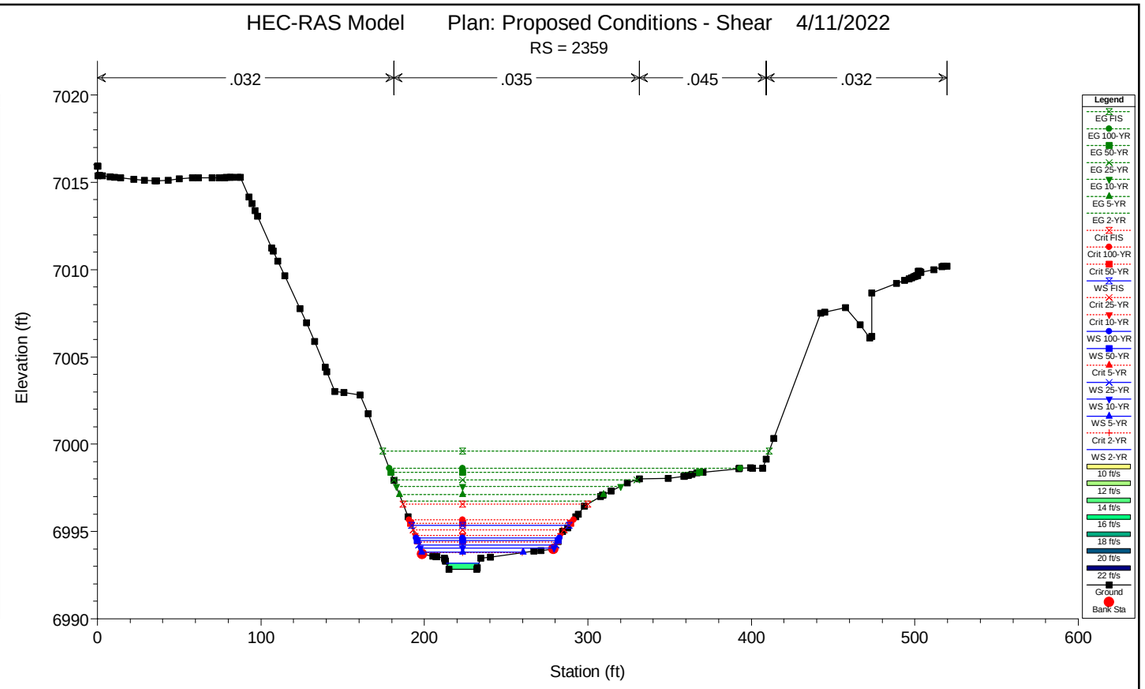

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2588
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
Ground
Bank Sta

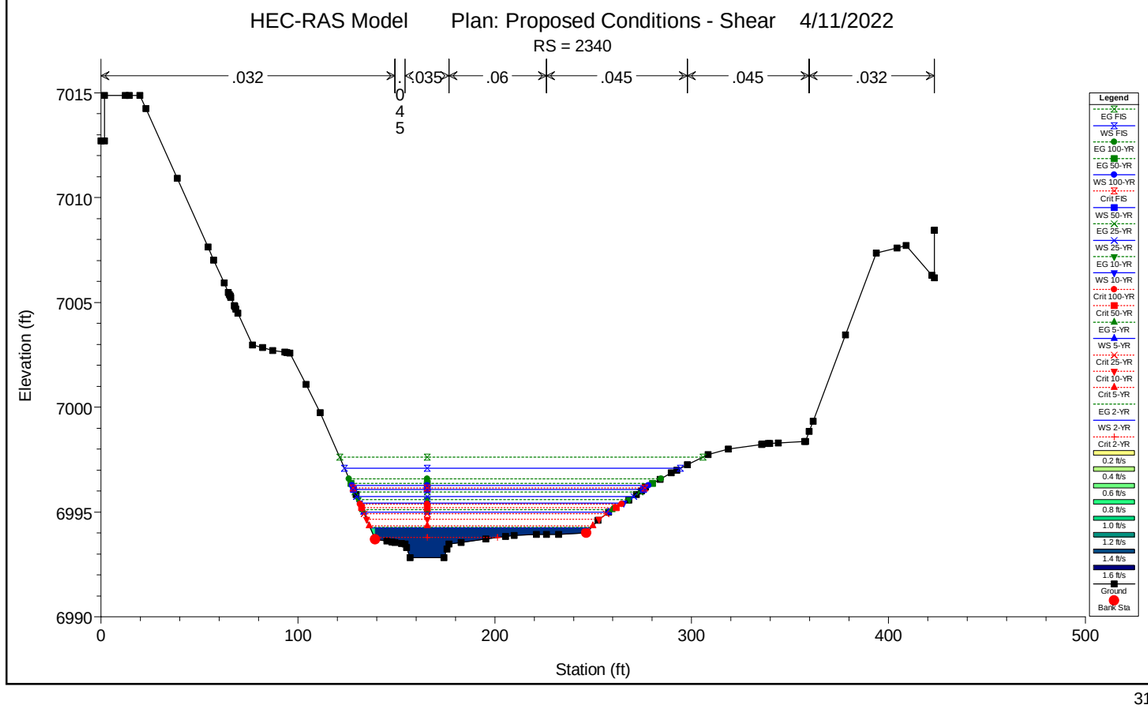

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2539
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
Ground
Bank Sta

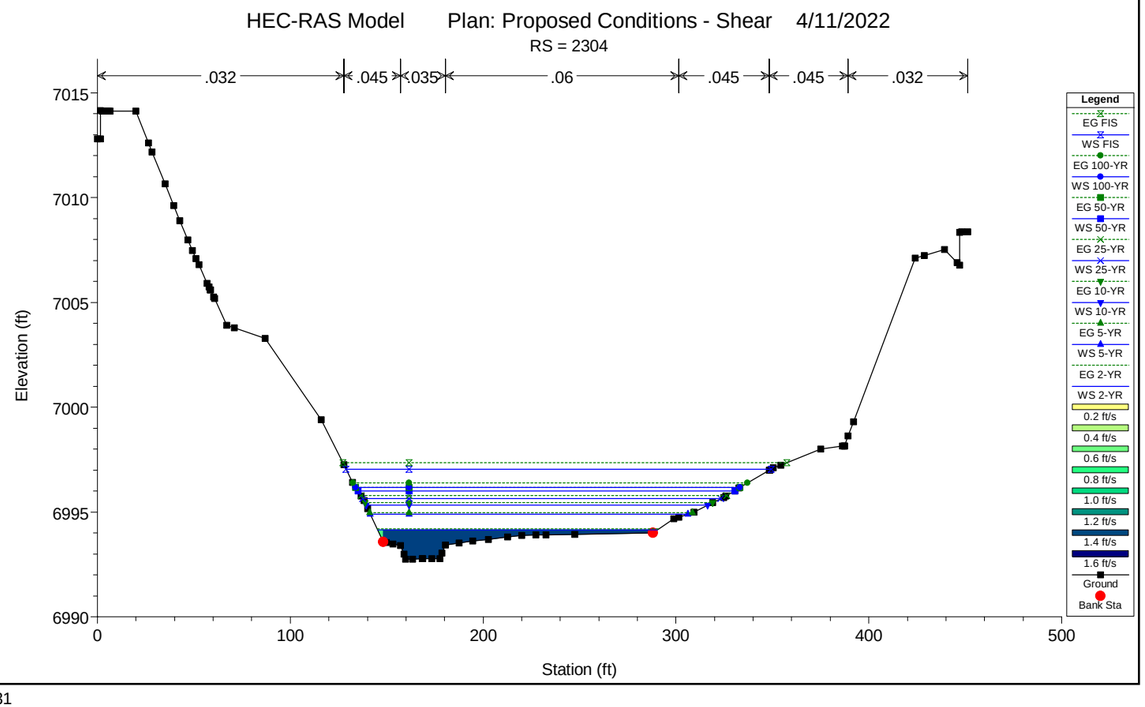

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2508
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
Ground
Bank Sta

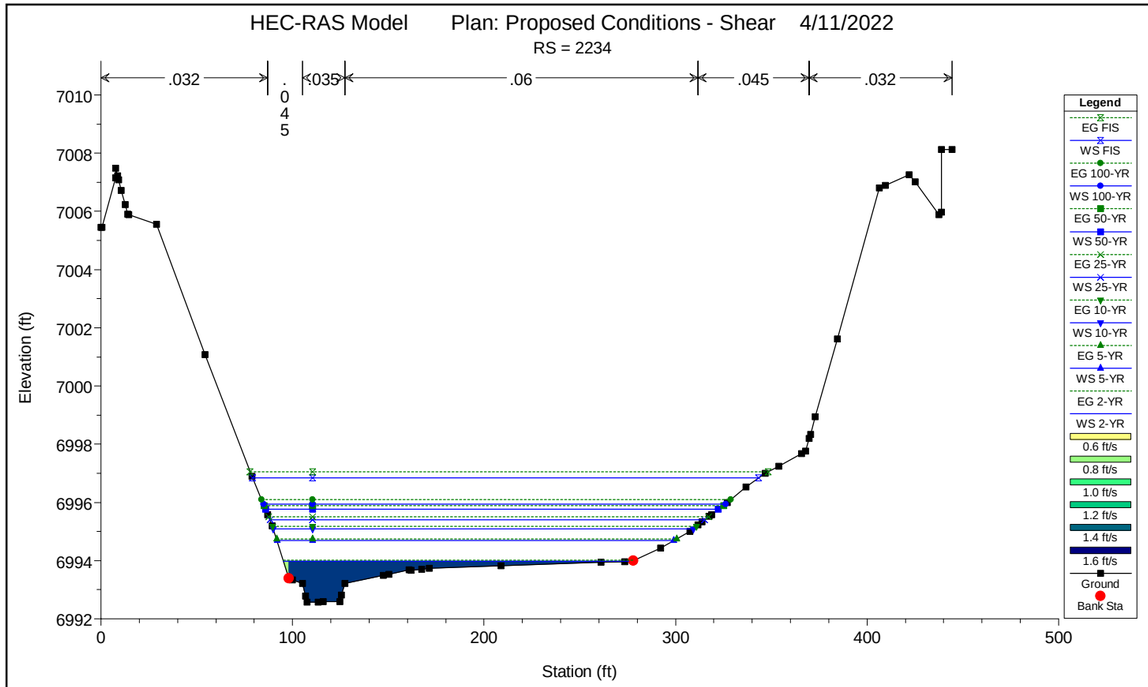

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2466
.032
.045
.06
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

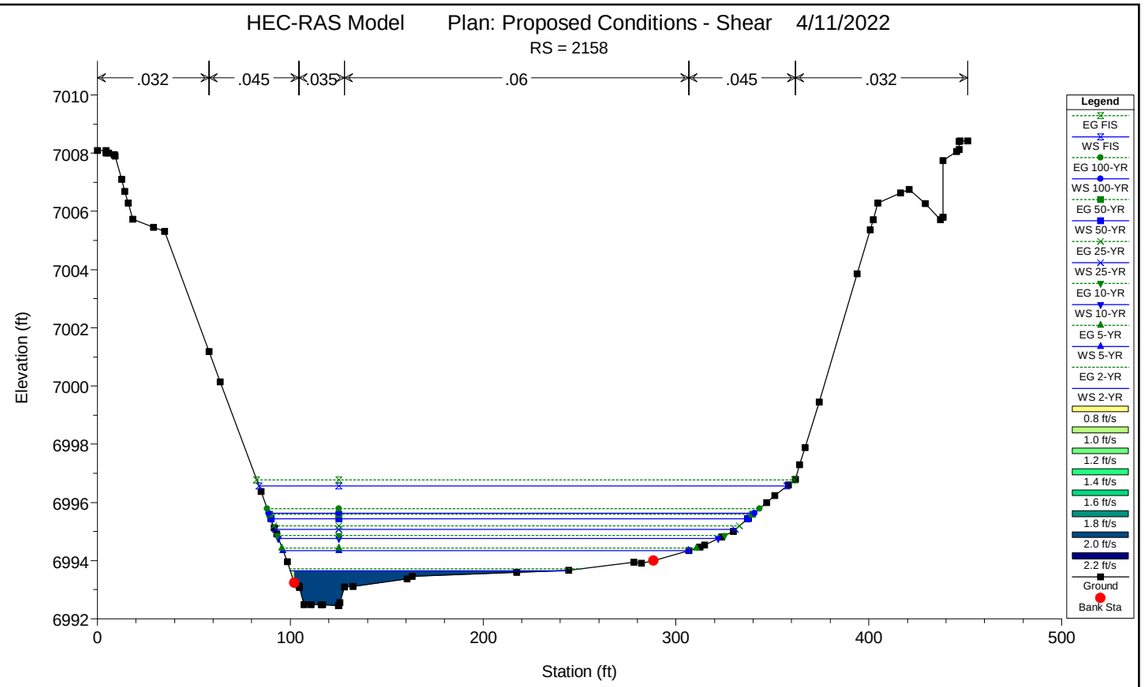

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2387
.032
.045
.035
.035
.045
.05
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
Crit 50-YR
EG 10-YR
Crit 25-YR
WS 25-YR
EG 5-YR
Crit 10-YR
WS 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

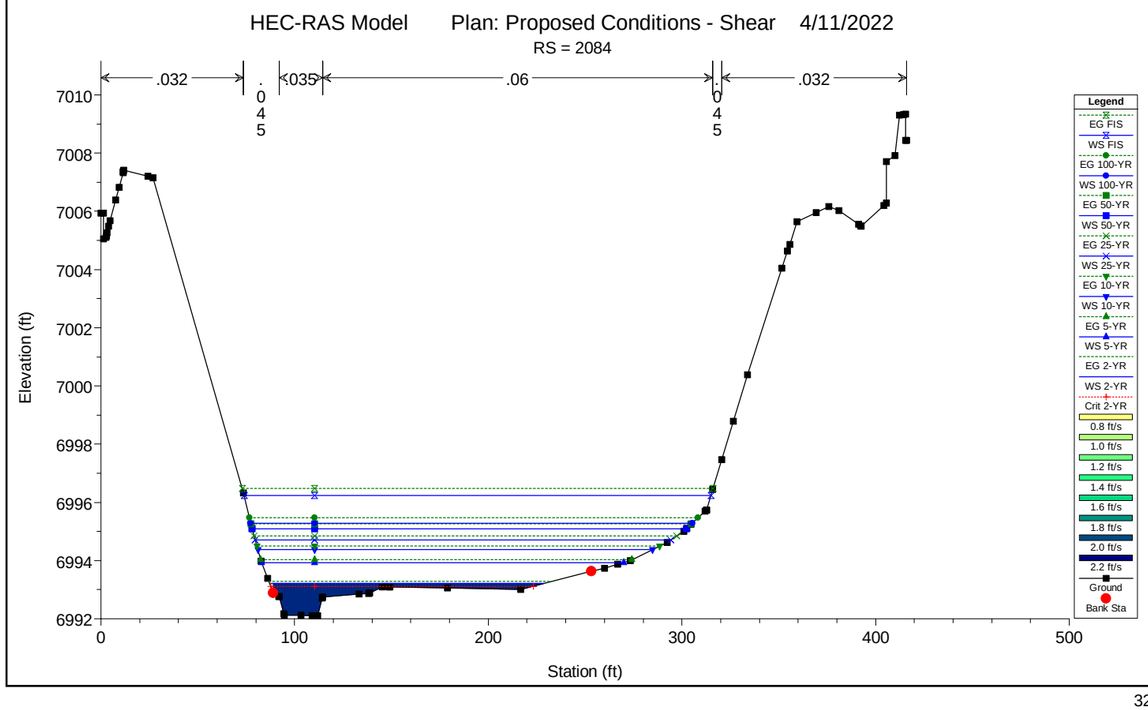

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2359
.032
.035
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
EG 50-YR
EG 25-YR
EG 10-YR
EG 5-YR
EG 2-YR
Crit FIS
Crit 100-YR
Crit 50-YR
WS FIS
Crit 25-YR
Crit 10-YR
WS 100-YR
WS 50-YR
Crit 5-YR
WS 25-YR
WS 10-YR
WS 5-YR
Crit 2-YR
WS 2-YR
10 ft/s
12 ft/s
14 ft/s
16 ft/s
18 ft/s
20 ft/s
22 ft/s
Ground
Bank Sta

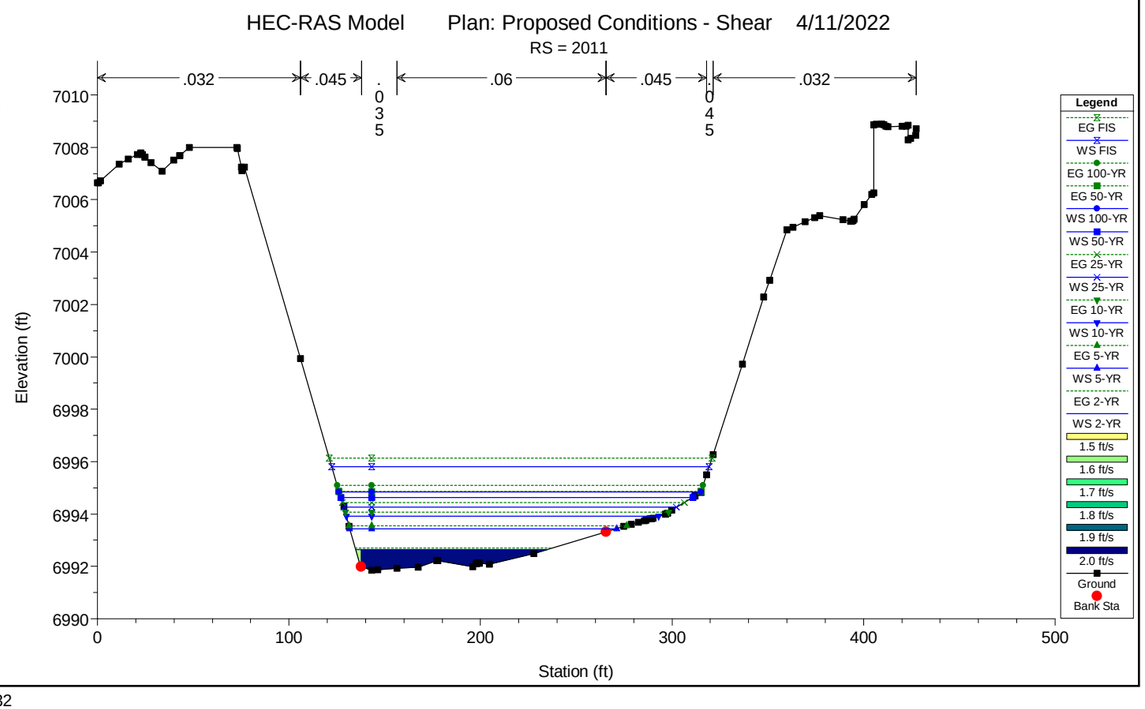

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2340
.032
.035
.06
.045
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
Crit FIS
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
Crit 100-YR
Crit 50-YR
EG 5-YR
WS 5-YR
Crit 25-YR
Crit 10-YR
Crit 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

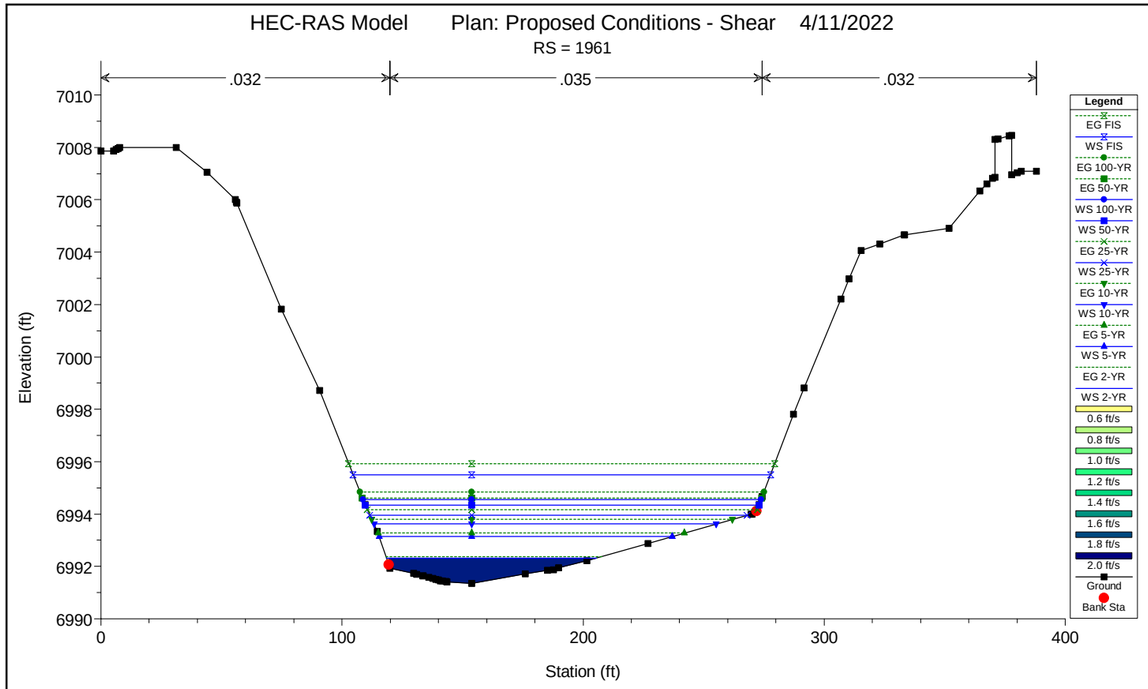

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2304
.032
.045
.035
.06
.045
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

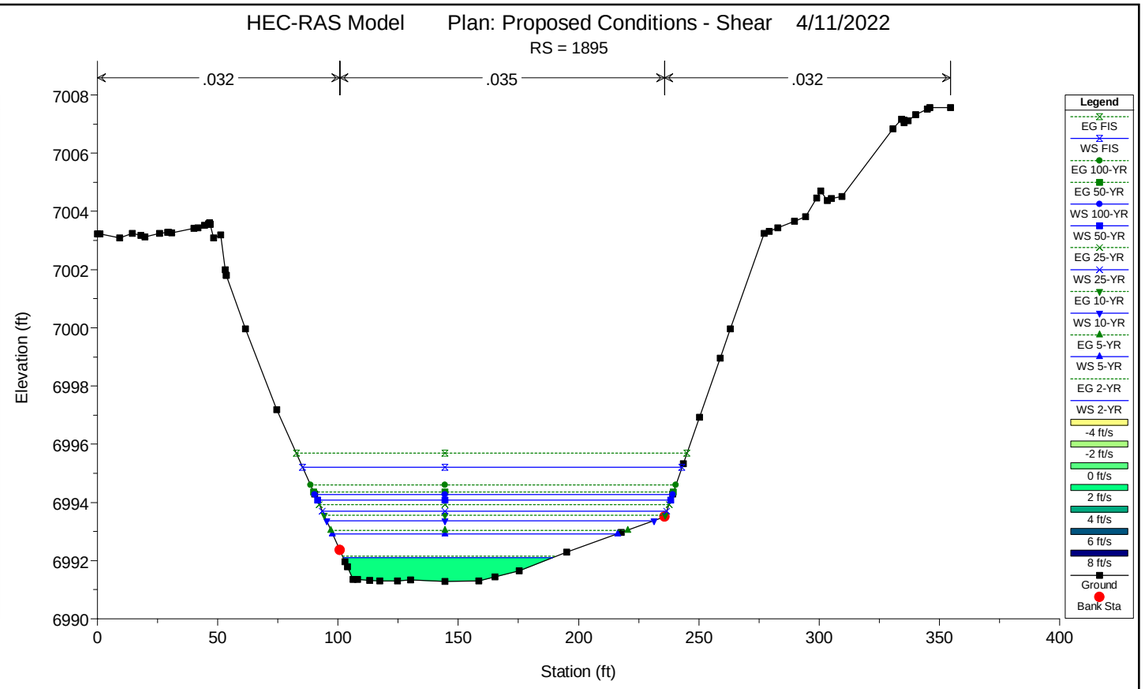

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2234
.032
.045
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

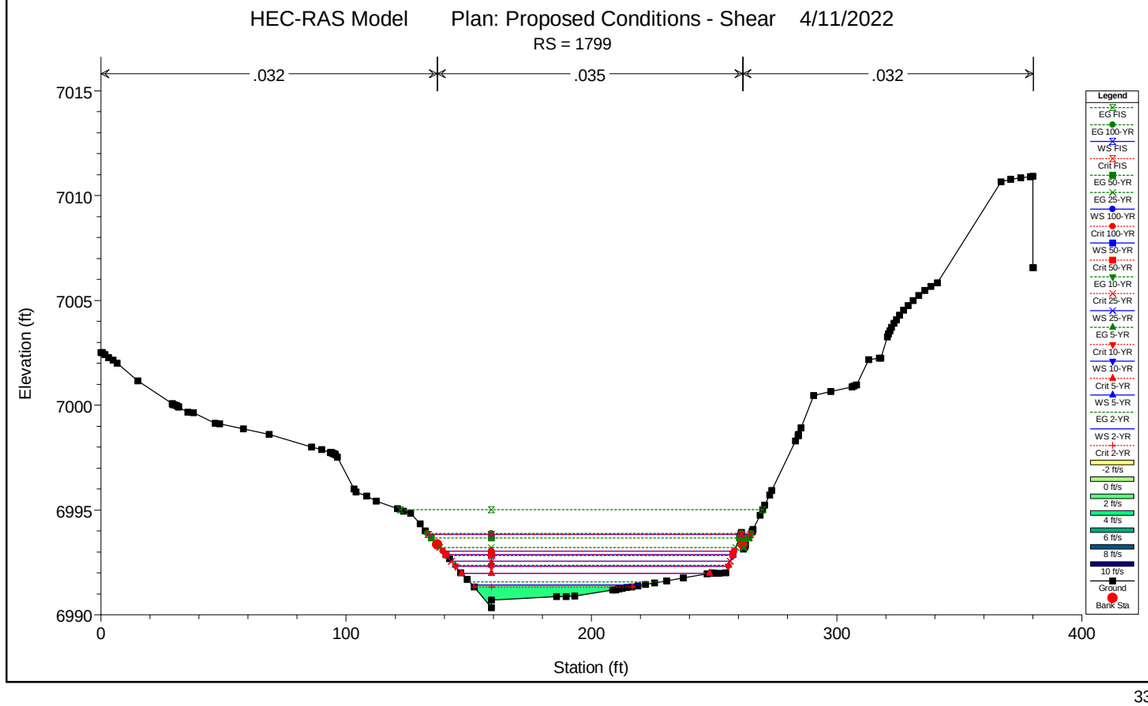

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2158
.032
.045
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
Ground
Bank Sta

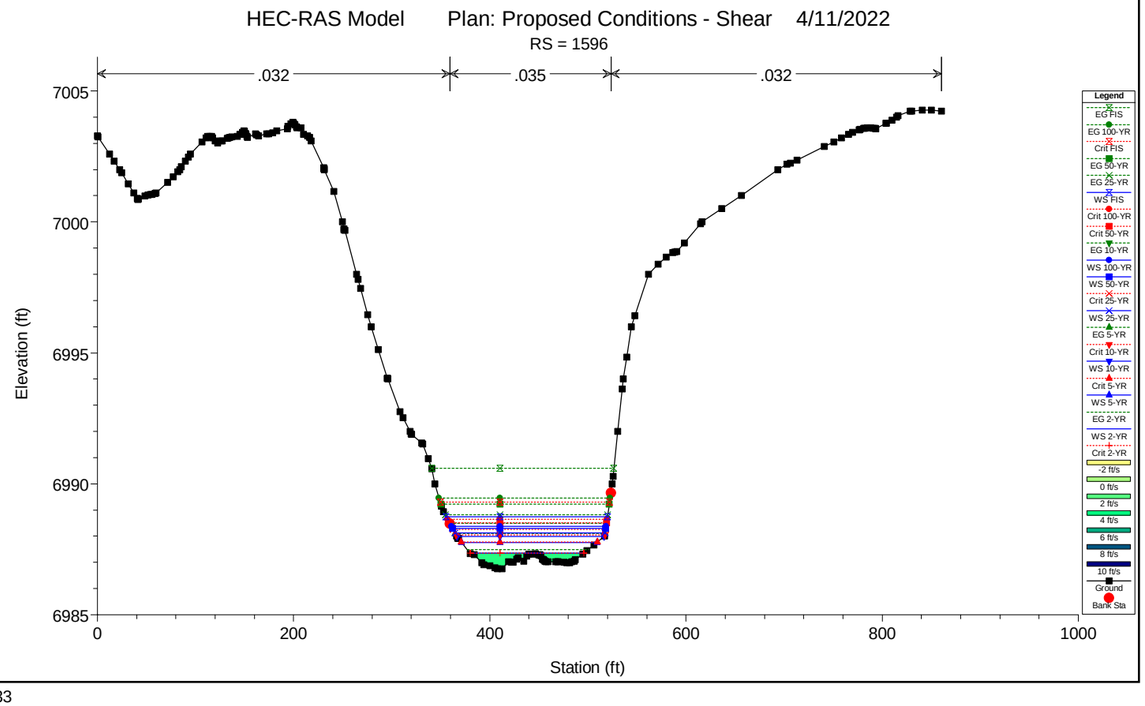

HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2084
.032
.045
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
WS 100-YR
EG 50-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 2011
.032
.045
.035
.06
.045
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
1.5 ft/s
1.6 ft/s
1.7 ft/s
1.8 ft/s
1.9 ft/s
2.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 1961
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 1895
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
WS FIS
EG 100-YR
EG 50-YR
WS 100-YR
WS 50-YR
EG 25-YR
WS 25-YR
EG 10-YR
WS 10-YR
EG 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
RS = 1799
.032
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
WS FIS
Crit FIS
EG 50-YR
EG 25-YR
WS 100-YR
Crit 100-YR
WS 50-YR
Crit 50-YR
EG 10-YR
Crit 25-YR
WS 25-YR
EG 5-YR
Crit 10-YR
WS 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
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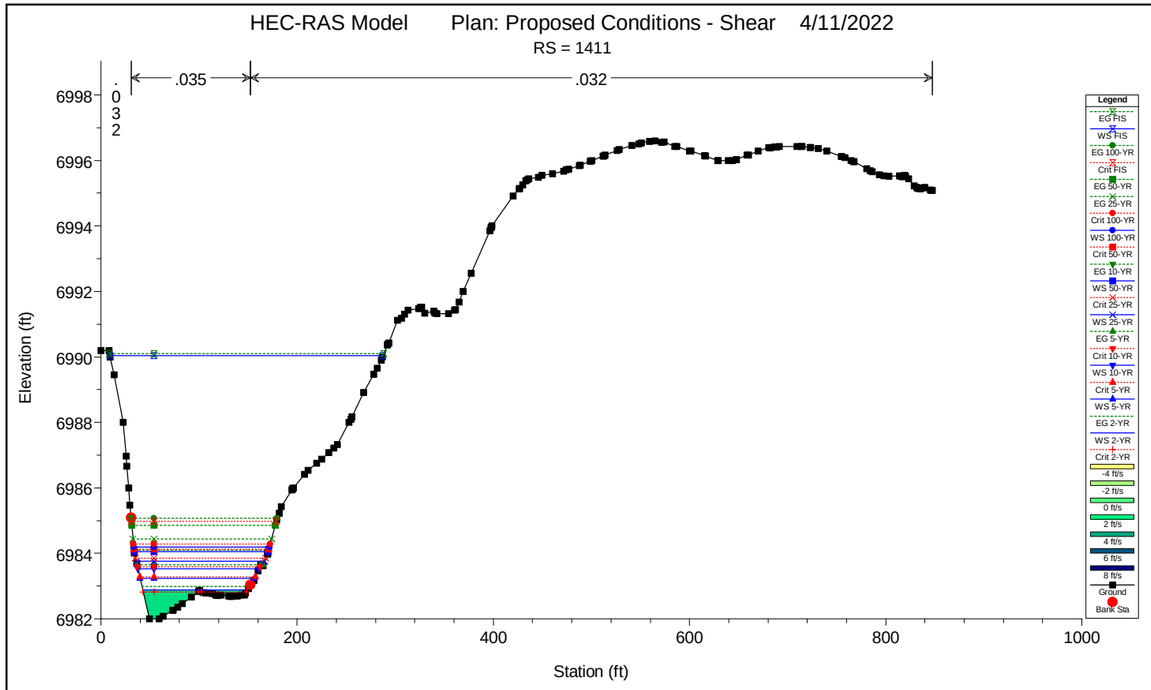
.035
.032
Elevation (ft)
Station (ft)
Legend
EG FIS
EG 100-YR
Crit FIS
EG 50-YR
EG 25-YR
WS FIS
Crit 100-YR
Crit 50-YR
EG 10-YR
WS 100-YR
WS 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
Crit 10-YR
WS 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Proposed Conditions - Shear 4/11/2022
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.035
.032
.032
Elevation (ft)
Station (ft)
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6996
6994
6992
6990
6988
6986
6984
6982
0
200
400
600
800
1000
Legend
EG FIS
WS FIS
EG 100-YR
Crit FIS
EG 50-YR
EG 25-YR
Crit 100-YR
WS 100-YR
Crit 50-YR
EG 10-YR
WS 50-YR
Crit 25-YR
WS 25-YR
EG 5-YR
Crit 10-YR
WS 10-YR
Crit 5-YR
WS 5-YR
EG 2-YR
WS 2-YR
Crit 2-YR
-4 ft/s
-2 ft/s
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

update the stations or provide
a plan showing these stations

Please add a label for this table

HEC-RAS Plan: Shear River: Sand Creek Reach: Reach 4

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 4	9475	5-YR	482.50	7148.00	7149.65	7149.65	7150.08	0.019615	109.44	1.02		1.02			5.27		5.27
Reach 4	9475	100-YR	1627.10	7148.00	7150.69	7150.69	7151.56	0.015243	127.26	1.01		1.62			7.48		7.48
Reach 4	9475	FIS	2600.00	7148.00	7151.35	7151.35	7152.49	0.013654	132.46	1.00		1.94			8.58		8.58
Reach 4	9167	5-YR	482.50	7143.51	7145.69	7145.45	7145.86	0.007977	181.83	0.65	0.07	0.40		1.10	3.30		3.29
Reach 4	9167	100-YR	1627.10	7143.51	7146.64	7146.23	7147.00	0.006504	210.90	0.66	0.25	0.69	0.22	2.70	4.89	2.46	4.81
Reach 4	9167	FIS	2600.00	7143.51	7147.18	7146.72	7147.70	0.006437	218.30	0.69	0.35	0.90	0.34	3.42	5.84	3.36	5.72
Reach 4	9099	5-YR	482.50	7143.25	7144.65	7144.65	7145.03	0.019818	132.90	1.00	1.02	0.90		5.75	4.83		4.92
Reach 4	9099	100-YR	1627.10	7143.25	7145.65	7145.65	7146.33	0.015282	184.34	0.98	1.39	1.33	0.07	7.37	6.55	1.00	6.61
Reach 4	9099	FIS	2600.00	7143.25	7146.17	7146.17	7147.06	0.013322	207.94	0.96	1.46	1.60	0.32	7.82	7.57	2.85	7.43
Reach 4	9012	5-YR	482.50	7140.92	7143.23		7143.37	0.003521	126.41	0.46	0.10	0.29		1.64	3.00		2.99
Reach 4	9012	100-YR	1627.10	7140.92	7144.43		7144.78	0.004949	176.33	0.59	0.32	0.62		3.36	4.74		4.71
Reach 4	9012	FIS	2600.00	7140.92	7145.10		7145.58	0.004948	201.21	0.62	0.41	0.79	0.07	3.98	5.60	1.16	5.51
Reach 4	8967	5-YR	482.50	7140.92	7142.61	7142.61	7143.02	0.020092	120.68	1.02	0.24	0.99		2.20	5.14		5.12
Reach 4	8967	100-YR	1627.10	7140.92	7143.61	7143.61	7144.36	0.015365	155.75	0.99	0.68	1.47		4.59	6.99		6.95
Reach 4	8967	FIS	2600.00	7140.92	7144.20	7144.20	7145.17	0.013469	185.46	0.98	0.84	1.72	0.11	5.40	7.95	1.44	7.83
Reach 4	8899	5-YR	482.50	7139.15	7140.83	7140.83	7141.29	0.019066	100.69	1.01		1.07	0.42		5.44	3.23	5.42
Reach 4	8899	100-YR	1627.10	7139.15	7141.96	7141.96	7142.72	0.013463	181.59	0.95	0.19	1.44	0.30	2.02	7.06	3.18	6.76
Reach 4	8899	FIS	2600.00	7139.15	7142.55	7142.55	7143.46	0.011392	196.52	0.92	0.41	1.64	0.59	3.43	7.91	4.39	7.35
Reach 4	8788	5-YR	482.50	7136.86	7138.33	7138.33	7138.68	0.019364	151.10	0.97		0.81	1.07		4.51	5.96	4.66
Reach 4	8788	100-YR	1627.10	7136.86	7139.37		7139.85	0.009442	192.57	0.78	0.18	0.91	0.85	2.08	5.52	5.76	5.54
Reach 4	8788	FIS	2600.00	7136.86	7139.84	7139.62	7140.55	0.010071	197.04	0.84	0.34	1.27	1.06	3.09	6.80	6.60	6.76
Reach 4	8708	5-YR	482.50	7135.59	7137.52		7137.71	0.005293	117.39	0.56		0.40	0.09		3.49	1.45	3.48
Reach 4	8708	100-YR	1627.10	7135.59	7138.62		7139.07	0.009729	205.59	0.79		0.90	0.50		5.45	4.00	5.42
Reach 4	8708	FIS	2600.00	7135.59	7139.15		7139.77	0.008791	214.78	0.79	0.22	1.11	0.59	2.40	6.35	4.58	6.28
Reach 4	8564	5-YR	482.50	7134.66	7136.30		7136.56	0.013182	154.82	0.82		0.63	0.43		4.10	3.44	4.08
Reach 4	8564	100-YR	1627.10	7134.66	7137.27		7137.72	0.009135	202.32	0.77	0.25	0.88	0.58	2.58	5.43	4.46	5.37
Reach 4	8564	FIS	2600.00	7134.66	7137.68	7137.49	7138.39	0.010419	206.03	0.85	0.44	1.28	0.79	3.64	6.79	5.40	6.70
Reach 4	8459	5-YR	482.50	7132.75	7134.44	7134.44	7134.92	0.018127	92.43	1.00		1.10	0.51		5.60	3.66	5.55
Reach 4	8459	100-YR	1627.10	7132.75	7135.65	7135.65	7136.49	0.014299	130.89	0.98		1.58	0.94		7.41	5.74	7.31
Reach 4	8459	FIS	2600.00	7132.75	7136.49	7136.49	7137.25	0.011053	233.30	0.89		1.42	0.57		7.21	4.32	6.73
Reach 4	8379	5-YR	482.50	7130.59	7132.29		7132.46	0.007852	187.01	0.64	0.13	0.40	0.15	1.67	3.28	1.87	3.26
Reach 4	8379	100-YR	1627.10	7130.59	7133.12		7133.56	0.008198	198.02	0.74	0.34	0.84	0.36	3.23	5.36	3.35	5.27
Reach 4	8379	FIS	2600.00	7130.59	7133.62		7134.26	0.008478	204.60	0.78	0.49	1.13	0.50	4.05	6.50	4.14	6.36
Reach 4	8327	5-YR	482.50	7130.49	7131.55	7131.52	7131.84	0.018859	174.34	0.96	0.36	0.76		2.90	4.37		4.34
Reach 4	8327	100-YR	1627.10	7130.49	7132.29	7132.29	7132.96	0.016060	191.56	1.00	0.68	1.37	0.44	4.53	6.62	3.39	6.52
Reach 4	8327	FIS	2600.00	7130.49	7132.79	7132.79	7133.68	0.014172	198.15	0.99	0.82	1.65	0.62	5.24	7.65	4.34	7.50
Reach 4	8246	5-YR	482.50	7128.49	7129.83	7129.83	7130.23	0.020110	123.21	1.02	0.83	0.98		5.00	5.10		5.09
Reach 4	8246	100-YR	1627.10	7128.49	7130.81	7130.81	7131.48	0.016526	190.30	1.01	1.19	1.36		6.55	6.57		6.56
Reach 4	8246	FIS	2600.00	7128.49	7131.30	7131.30	7132.20	0.014836	196.68	1.01	1.29	1.67	0.16	7.05	7.66	1.73	7.59
Reach 4	8179	5-YR	482.50	7127.03	7128.59	7128.39	7128.75	0.008005	206.19	0.64	0.21	0.38	0.26	2.36	3.19	2.70	3.15
Reach 4	8179	100-YR	1627.10	7127.03	7129.34	7129.09	7129.77	0.009075	216.52	0.76	0.45	0.86	0.61	3.81	5.34	4.66	5.24
Reach 4	8179	FIS	2600.00	7127.03	7129.79	7129.55	7130.42	0.009509	222.74	0.82	0.61	1.17	0.82	4.60	6.49	5.63	6.35
Reach 4	8147	5-YR	482.50	7127.03	7128.04	7128.04	7128.33	0.022096	205.27	1.01	0.25	0.78	0.03	2.22	4.32	0.53	4.30
Reach 4	8147	100-YR	1627.10	7127.03	7128.74	7128.74	7129.36	0.016337	216.59	0.99	0.55	1.29	0.61	3.93	6.35	4.21	6.25
Reach 4	8147	FIS	2600.00	7127.03	7129.19	7129.19	7130.02	0.014739	222.65	0.99	0.70	1.58	0.83	4.71	7.38	5.28	7.24
Reach 4	8081	5-YR	482.50	7121.00	7124.07		7124.23	0.004068	112.03	0.50		0.33			3.25		3.25
Reach 4	8081	100-YR	1627.10	7121.00	7125.26		7125.70	0.006109	150.08	0.66		0.77			5.32		5.32
Reach 4	8081	FIS	2600.00	7121.00	7125.91		7126.54	0.006865	167.43	0.72		1.04			6.36		6.36
Reach 4	8008	5-YR	482.50	7120.99	7123.72	7123.09	7123.89	0.005365	130.09	0.56		0.37			3.33		3.33
Reach 4	8008	100-YR	1627.10	7120.99	7124.92	7124.34	7125.28	0.004976	174.20	0.60	0.04	0.65	0.29	0.83	4.91	3.16	4.81
Reach 4	8008	FIS	2600.00	7120.99	7125.56	7124.89	7126.09	0.004997	178.58	0.63	0.18	0.86	0.47	2.28	5.88	4.34	5.74
Reach 4	7935	5-YR	487.40	7121.53	7122.76	7122.76	7123.20	0.019215	107.79	1.01		1.02			5.29		5.29
Reach 4	7935	100-YR	1648.70	7121.53	7123.85	7123.85	7124.65	0.015348	146.79	1.00		1.54	0.23		7.21	2.24	7.19
Reach 4	7935	FIS	2600.00	7121.53	7124.44	7124.44	7125.48	0.013280	157.99	0.98	0.32	1.81	0.46	2.83	8.23	3.63	8.12
Reach 4	7772	5-YR	487.40	7117.41	7121.72		7121.73	0.000095	193.46	0.09		0.02	0.01		0.87	0.43	0.86
Reach 4	7772	100-YR	1648.70	7117.41	7123.11		7123.17	0.000317	223.53	0.17	0.01	0.08	0.03	0.47	1.95	1.13	1.92
Reach 4	7772	FIS	2600.00	7117.41	7123.87		7123.97	0.000443	233.46	0.21	0.02	0.14	0.05	0.85	2.58	1.54	2.52
Reach 4	7593	5-YR	487.40	7115.12	7121.73		7121.73	0.000006	268.87	0.03	0.00	0.00	0.00	0.01	0.34	0.15	0.34
Reach 4	7593	100-YR	1648.70	7115.12	7123.13		7123.14	0.000035	286.87	0.06	0.00	0.02	0.00	0.22	0.91	0.47	0.90
Reach 4	7593	FIS	2600.00	7115.12	7123.90		7123.92	0.000060	296.59	0.08	0.00	0.03	0.01	0.39	1.29	0.70	1.26
Reach 4	7491	5-YR	487.40	7120.17	7121.28	7121.28	7121.68	0.019627	118.93	1.01		0.99	0.65		5.16	4.25	5.12
Reach 4	7491	100-YR	1648.70	7120.17	7122.30	7122.30	7123.05	0.015765	159.45	1.01		1.49	0.94		7.02	5.65	6.95
Reach 4	7491	FIS	2600.00	7120.17	7122.88	7122.88	7123.81	0.014654	183.17	1.01		1.71	1.09		7.80	6.30	7.72
Reach 4	7452	5-YR	487.40	7110.76	7112.46	7112.46	7112.89	0.018270	107.94	0.99		1.03	0.64		5.36	4.26	5.26
Reach 4	7452	100-YR	1648.70	7110.76	7113.52	7113.52	7114.26	0.016082	166.27	1.01		1.43	1.39		6.82	7.31	6.88
Reach 4	7452	FIS	2600.00	7110.76	7114.10	7114.10	7114.99	0.015145	199.13	1.00		1.60	1.69		7.43	8.42	7.53
Reach 4	7406	5-YR	487.40	7100.67	7102.91		7102.97	0.001814	193.85	0.33	0.04	0.14		1.02	2.07		2.07
Reach 4	7406	100-YR	1648.70	7100.67	7103.95		7104.16	0.002745	212.86	0.45	0.15	0.37		2.24	3.70		3.68
Reach 4	7406	FIS	2600.00	7100.67	7104.49		7104.82	0.003337	222.64	0.51	0.24	0.54		2.93	4.63		4.60
Reach 4	7314	5-YR	487.40	7100.67	7102.22	7102.22	7102.54	0.022908	182.22	1.04		0.84			4.52		4.52
Reach 4	7314	100-YR	1648.70	7100.67	7103.00	7103.00	7103.61	0.017309	224.43	1.01	0.38	1.28		3.06	6.26		6.25
Reach 4	7314	FIS	2600.00	7100.67	7103.47	7103.47	7104.20	0.016081	264.95	1.01	0.59	1.45		4.11	6.88		6.86
Reach 4	7249	5-YR	487.40	7098.77	7100.76		7100.87	0.005648	227.15	0.54	0.07	0.28		1.24	2.74		2.73
Reach 4	7249	100-YR	1648.70	7098.77	7101.55		7101.85	0.006285	255.02	0.63	0.28	0.59	0.04	2.97	4.42	0.76	4.40
Reach 4	7249	FIS	2600.00	7098.77	7101.82		7102.36	0.008897	259.55	0.78	0.49	0.99	0.13	4.04	5.88	1.64	5.83
Reach 4	7118	5-YR	487.40	7097.44	7099.23	7099.23	7099.55	0.021458	174.60	1.01	0.17	0.84		2.02	4.56		4.55

HEC-RAS Plan: Shear River: Sand Creek Reach: Reach 4 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 4	7118	100-YR	1648.70	7097.44	7100.05	7100.02	7100.61	0.014966	234.24	0.95	0.70	1.16	0.12	4.69	5.99	1.43	5.94
Reach 4	7118	FIS	2600.00	7097.44	7101.14		7101.51	0.004383	240.64	0.57	0.40	0.64	0.28	3.94	4.93	3.11	4.86
Reach 4	7000	5-YR	487.40	7096.76	7098.41		7098.49	0.002454	199.95	0.38	0.15	0.17		2.29	2.23		2.23
Reach 4	7000	100-YR	1648.70	7096.76	7099.91		7100.06	0.001633	220.27	0.35	0.18	0.25		2.73	3.12		3.10
Reach 4	7000	FIS	2600.00	7096.76	7101.05		7101.21	0.001151	230.58	0.31	0.17	0.25	0.00	2.77	3.33	0.12	3.30
Reach 4	6850	5-YR	487.40	7095.02	7097.16	7097.16	7097.67	0.016945	85.19	0.98		1.15	0.49		5.84	3.83	5.70
Reach 4	6850	100-YR	1648.70	7095.02	7098.43	7098.43	7099.43	0.013116	104.51	0.97		1.81	0.94		8.24	5.95	7.91
Reach 4	6850	FIS	2600.00	7095.02	7100.25		7100.87	0.004131	123.38	0.60		0.96	0.55		6.56	5.08	6.26
Reach 4	6784	5-YR	487.40	7092.79	7094.44		7094.85	0.011629	86.47	0.83		0.87	0.40		5.15	3.36	5.04
Reach 4	6784	100-YR	1648.70	7092.79	7098.46		7098.63	0.000740	119.16	0.27	0.09	0.24	0.14	1.94	3.47	2.59	3.23
Reach 4	6784	FIS	2600.00	7092.79	7100.47		7100.66	0.000552	136.28	0.24	0.10	0.25	0.14	2.21	3.72	2.71	3.39
Reach 4	6668	5-YR	538.70	7089.00	7094.66	7090.68	7094.69	0.000131	102.64	0.11	0.03	0.05	0.02	1.13	1.54	1.08	1.32
Reach 4	6668	100-YR	1833.50	7089.00	7098.49	7092.43	7098.57	0.000177	141.91	0.14	0.06	0.11	0.05	1.84	2.53	1.76	2.09
Reach 4	6668	FIS	2600.00	7089.00	7100.52	7093.19	7100.60	0.000155	161.31	0.14	0.06	0.11	0.06	1.97	2.70	1.87	2.19
Reach 4	6539.16		Culvert														
Reach 4	6423	5-YR	538.70	7091.70	7093.64	7093.64	7094.39	0.015943	52.22	1.01		1.48	0.17		6.97	1.83	6.95
Reach 4	6423	100-YR	1833.50	7091.70	7095.51	7095.51	7097.07	0.012561	59.48	1.01		2.41	0.27		10.05	2.56	10.00
Reach 4	6423	FIS	2600.00	7091.70	7096.36	7096.36	7098.28	0.011724	62.21	1.01		2.75	0.31		11.12	2.83	11.05
Reach 4	6343	5-YR	538.70	7088.29	7090.18	7090.18	7090.71	0.012316	96.05	0.89	0.42	1.19	0.75	3.43	6.32	5.08	5.48
Reach 4	6343	100-YR	1833.50	7088.29	7091.52	7091.52	7092.35	0.009551	150.20	0.87	0.77	1.72	1.03	5.39	8.42	6.54	6.85
Reach 4	6343	FIS	2600.00	7088.29	7091.97	7091.97	7092.99	0.009742	155.43	0.90	1.03	2.03	1.20	6.49	9.36	7.19	7.74
Reach 4	6308	5-YR	538.70	7087.82	7089.45		7089.56	0.003622	192.05	0.46	0.21	0.24	0.13	2.66	2.67	1.91	2.66
Reach 4	6308	100-YR	1833.50	7087.82	7090.37		7090.73	0.005190	197.21	0.60	0.44	0.65	0.36	4.08	4.85	3.56	4.79
Reach 4	6308	FIS	2600.00	7087.82	7090.76		7091.26	0.005709	199.65	0.65	0.54	0.85	0.46	4.64	5.73	4.13	5.65
Reach 4	6197	5-YR	538.70	7086.68	7088.64	7088.56	7088.84	0.013868	259.30	0.81	0.49	0.51	0.49	3.76	3.51	3.72	3.53
Reach 4	6197	100-YR	1833.50	7086.68	7089.24	7089.20	7089.79	0.015525	264.94	0.96	0.89	1.15	0.95	5.45	5.94	5.72	5.91
Reach 4	6197	FIS	2600.00	7086.68	7089.50	7089.50	7090.23	0.016268	267.33	1.01	1.07	1.47	1.17	6.14	6.92	6.50	6.88
Reach 4	6145	5-YR	538.70	7086.15	7087.62	7087.62	7087.92	0.021637	209.28	1.01		0.80	0.38		4.41	2.96	4.39
Reach 4	6145	100-YR	1833.50	7086.15	7088.33	7088.33	7088.92	0.017173	261.52	1.01	0.45	1.26	0.86	3.39	6.19	5.27	6.14
Reach 4	6145	FIS	2600.00	7086.15	7088.64	7088.64	7089.38	0.015733	263.93	1.00	0.62	1.46	0.99	4.29	6.92	5.84	6.85
Reach 4	6106	5-YR	538.70	7085.58	7087.04	7086.94	7087.23	0.012720	253.61	0.78	0.29	0.49	0.47	2.68	3.47	3.68	3.47
Reach 4	6106	100-YR	1833.50	7085.58	7087.65	7087.60	7088.19	0.014976	258.82	0.95	0.65	1.14	0.87	4.45	5.94	5.43	5.90
Reach 4	6106	FIS	2600.00	7085.58	7087.91	7087.91	7088.65	0.015863	261.03	1.01	0.82	1.46	1.06	5.15	6.94	6.13	6.89
Reach 4	6052	5-YR	538.70	7084.95	7086.07	7086.07	7086.34	0.022430	247.16	1.01	0.75	0.74	0.21	4.59	4.16	1.96	4.16
Reach 4	6052	100-YR	1833.50	7084.95	7086.74	7086.74	7087.34	0.017051	252.50	1.01	0.99	1.27	0.67	5.79	6.24	4.47	6.20
Reach 4	6052	FIS	2600.00	7084.95	7087.05	7087.05	7087.80	0.015790	254.98	1.01	1.09	1.48	0.81	6.24	7.00	5.13	6.95
Reach 4	6025	5-YR	538.70	7082.34	7084.17	7084.17	7084.75	0.017410	77.73	1.01		1.23			6.09		6.09
Reach 4	6025	100-YR	1833.50	7082.34	7085.79	7085.79	7086.41	0.016416	240.48	0.99	0.34	1.28	0.22	2.87	6.31	2.15	6.28
Reach 4	6025	FIS	2600.00	7082.34	7086.11	7086.11	7086.89	0.015297	244.29	1.00	0.52	1.50	0.40	3.82	7.09	3.20	7.03
Reach 4	6002	5-YR	538.70	7080.15	7082.79		7083.15	0.006242	63.88	0.65		0.67			4.83		4.83
Reach 4	6002	100-YR	1833.50	7080.15	7084.69		7085.42	0.009465	125.35	0.82		1.26	0.02		6.85	0.53	6.85
Reach 4	6002	FIS	2600.00	7080.15	7085.51	7085.01	7086.17	0.010280	222.73	0.84	0.05	1.20	0.31	0.82	6.52	2.91	6.48
Reach 4	5952	5-YR	538.70	7080.15	7082.53		7082.86	0.005257	65.43	0.60		0.61	0.15		4.63	1.96	4.60
Reach 4	5952	100-YR	1833.50	7080.15	7083.85	7083.85	7084.83	0.013921	117.66	0.99		1.76	0.94		8.01	5.79	7.92
Reach 4	5952	FIS	2600.00	7080.15	7084.47	7084.47	7085.54	0.013856	148.41	1.00		1.87	1.20		8.35	6.79	8.28
Reach 4	5895	5-YR	538.70	7079.84	7081.80	7081.80	7082.33	0.018523	91.52	1.02		1.17			5.81		5.81
Reach 4	5895	100-YR	1833.50	7079.84	7083.11	7083.11	7083.96	0.015051	144.68	1.00		1.60			7.42		7.42
Reach 4	5895	FIS	2600.00	7079.84	7083.62	7083.62	7084.61	0.014588	167.00	1.01		1.77			7.98		7.98
Reach 4	5830	5-YR	538.70	7078.90	7081.14		7081.38	0.006172	109.63	0.61		0.49			3.89		3.89
Reach 4	5830	100-YR	1833.50	7078.90	7082.25	7081.99	7082.89	0.010279	154.81	0.84		1.18			6.44		6.44
Reach 4	5830	FIS	2600.00	7078.90	7082.66	7082.50	7083.51	0.011653	171.81	0.91		1.49			7.38		7.38
Reach 4	5784	5-YR	538.70	7078.84	7080.71		7081.00	0.011199	134.52	0.78		0.65			4.29		4.29
Reach 4	5784	100-YR	1833.50	7078.84	7081.79	7081.60	7082.39	0.011201	181.76	0.86		1.13			6.20		6.20
Reach 4	5784	FIS	2600.00	7078.84	7082.25		7082.97	0.010304	194.94	0.85		1.27			6.77		6.77
Reach 4	5743	5-YR	538.70	7078.58	7080.61		7080.72	0.003229	177.65	0.44	0.12	0.23		1.85	2.67		2.65
Reach 4	5743	100-YR	1833.50	7078.58	7081.73		7082.05	0.003954	186.93	0.54	0.30	0.55		3.30	4.56		4.51
Reach 4	5743	FIS	2600.00	7078.58	7082.19		7082.62	0.004278	190.75	0.58	0.38	0.71		3.87	5.33		5.27
Reach 4	5660	5-YR	538.70	7078.23	7079.92	7079.85	7080.20	0.015449	178.26	0.88	0.09	0.69		1.18	4.23		4.23
Reach 4	5660	100-YR	1833.50	7078.23	7080.69	7080.69	7081.41	0.016196	190.14	1.01	0.48	1.44		3.58	6.84		6.82
Reach 4	5660	FIS	2600.00	7078.23	7081.07	7081.07	7081.97	0.014975	195.55	1.01	0.61	1.66		4.28	7.61		7.58
Reach 4	5549	5-YR	538.70	7076.51	7077.86	7077.86	7078.27	0.019528	132.96	1.01	0.38	0.98		3.01	5.13		5.11
Reach 4	5549	100-YR	1833.50	7076.51	7078.92	7078.92	7079.62	0.015865	197.76	1.00	0.82	1.41	0.31	5.17	6.76	2.72	6.71
Reach 4	5549	FIS	2600.00	7076.51	7079.34	7079.34	7080.14	0.014941	228.66	0.99	0.98	1.53	0.51	5.85	7.21	3.79	7.14
Reach 4	5522	5-YR	538.70	7074.16	7075.97	7075.85	7076.32	0.012312	113.01	0.83	0.14	0.78		1.64	4.75		4.74
Reach 4	5522	100-YR	1833.50	7074.16	7076.99	7076.99	7077.95	0.014394	124.29	1.00	0.60	1.73		4.25	7.88		7.83
Reach 4	5522	FIS	2600.00	7074.16	7077.52	7077.52	7078.69	0.013250	130.34	0.99	0.76	1.97		5.06	8.70		8.63
Reach 4	5485	5-YR	538.70	7074.11	7075.33	7075.33	7075.76	0.019265	124.34	1.01	0.77	1.01		4.80	5.24		5.22
Reach 4	5485	100-YR	1833.50	7074.11	7076.40	7076.40	7077.24	0.014998	149.37	1.00	1.10	1.60		6.31	7.42		7.36
Reach 4	5485	FIS	2600.00	7074.11	7076.86	7076.86	7077.88	0.014098	159.95	1.00	1.23	1.81		6.90	8.16		8.09
Reach 4	5444	5-YR	538.70	7072.48	7074.56		7074.69	0.003548	150.98	0.46	0.14	0.28		1.99	2.92		2.91
Reach 4	5444	100-YR	1833.50	7072.48	7075.65		7076.06	0.005543	178.89	0.63	0.39	0.72	0.05	3.76	5.15	0.90	5.11
Reach 4	5444	FIS	2600.00	7072.48	7076.07		7076.61	0.007118	215.13	0.72	0.59	0.95	0.18	4.75	5.92	2.17	5.87
Reach 4	5395	5-YR	538.70	7072.48	7073.91	7073.91	7074.31	0.020794	143.80	1.03	0.45	0.97		3.31	5.06		5.04
Reach 4	5395	100-YR	1833.50	7072.48	7074.91	7074.91	7075.58	0.016595	215.99	1.01	0.86	1.37	0.18	5.29	6.59	1.86	6.55
Reach 4	5395	FIS	2600.00	7072.48	7075.30	7075.30	7076.08	0.015303	241.59	1.00	0.98	1.50	0.39	5.84	7.08	3.14	7.04

HEC-RAS Plan: Shear River: Sand Creek Reach: Reach 4 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 4	5359	5-YR	538.70	7070.74	7072.63	7072.63	7073.12	0.018221	97.67	1.00		1.11			5.64		5.64
Reach 4	5359	100-YR	1833.50	7070.74	7073.80	7073.80	7074.74	0.014251	131.32	0.99	0.50	1.69		3.79	7.79		7.70
Reach 4	5359	FIS	2600.00	7070.74	7074.55	7074.55	7075.37	0.014969	222.33	1.00	0.89	1.56		5.48	7.30		7.22
Reach 4	5326	5-YR	538.70	7069.72	7071.15		7071.47	0.011378	121.11	0.80	0.53	0.71		4.07	4.51		4.50
Reach 4	5326	100-YR	1833.50	7069.72	7072.09	7072.09	7073.02	0.014584	130.82	1.00	0.94	1.71		5.72	7.80		7.71
Reach 4	5326	FIS	2600.00	7069.72	7072.59	7072.59	7073.73	0.013519	135.98	1.00	1.04	1.97		6.22	8.68		8.55
Reach 4	5263	5-YR	538.70	7068.82	7070.21	7070.21	7070.58	0.018930	147.85	0.98	1.14	0.86		6.23	4.74		4.87
Reach 4	5263	100-YR	1833.50	7068.82	7071.15	7071.15	7071.96	0.015091	156.35	1.00	1.38	1.54		7.37	7.22		7.23
Reach 4	5263	FIS	2600.00	7068.82	7071.57	7071.57	7072.59	0.014263	160.23	1.00	1.50	1.81		7.86	8.12		8.10
Reach 4	5187	5-YR	538.70	7067.05	7068.62	7068.62	7068.99	0.020805	155.91	1.02	0.16	0.93		1.63	4.89		4.89
Reach 4	5187	100-YR	1833.50	7067.05	7069.54	7069.54	7070.31	0.015427	172.10	1.00	0.63	1.49		4.36	7.05		7.01
Reach 4	5187	FIS	2600.00	7067.05	7069.95	7069.95	7070.90	0.014507	179.32	1.00	0.79	1.72		5.09	7.85		7.79
Reach 4	5078	5-YR	538.70	7064.62	7066.22	7066.22	7066.61	0.020570	144.48	1.02	0.49	0.96		3.51	5.03		5.01
Reach 4	5078	100-YR	1833.50	7064.62	7067.18	7067.18	7068.02	0.015224	153.12	1.01	0.71	1.59		4.74	7.39		7.33
Reach 4	5078	FIS	2600.00	7064.62	7067.64	7067.64	7068.67	0.013781	157.61	0.99	0.82	1.81		5.27	8.19		8.10
Reach 4	4992	5-YR	538.70	7063.62	7065.50		7065.66	0.005356	163.15	0.55	0.11	0.35		1.63	3.19		3.19
Reach 4	4992	100-YR	1833.50	7063.62	7066.54		7066.97	0.006183	179.46	0.66	0.34	0.77	0.08	3.33	5.29	1.33	5.26
Reach 4	4992	FIS	2600.00	7063.62	7066.97		7067.55	0.006442	181.86	0.70	0.43	0.98	0.20	3.91	6.15	2.36	6.10
Reach 4	4957	5-YR	538.70	7063.29	7064.92	7064.92	7065.31	0.020123	144.61	1.01		0.94			4.97		4.97
Reach 4	4957	100-YR	1833.50	7063.29	7065.85	7065.85	7066.61	0.015938	178.53	1.01	0.33	1.48		2.82	7.00	0.24	6.98
Reach 4	4957	FIS	2600.00	7063.29	7066.25	7066.25	7067.19	0.014326	184.73	1.00	0.48	1.70	0.25	3.65	7.78	2.38	7.73
Reach 4	4898	5-YR	538.70	7061.84	7063.37	7063.33	7063.76	0.016315	126.12	0.93	0.12	0.90		1.47	4.98		4.96
Reach 4	4898	100-YR	1833.50	7061.84	7064.37	7064.37	7065.25	0.014718	143.85	1.00	0.72	1.63		4.78	7.55		7.46
Reach 4	4898	FIS	2600.00	7061.84	7064.84	7064.84	7065.92	0.013560	147.66	0.99	0.91	1.87		5.67	8.40		8.28
Reach 4	4629	5-YR	538.70	7058.43	7060.11		7060.33	0.009991	170.12	0.73	0.19	0.53		2.13	3.79		3.78
Reach 4	4629	100-YR	1833.50	7058.43	7061.15		7061.65	0.007892	180.62	0.74	0.41	0.91		3.63	5.67		5.63
Reach 4	4629	FIS	2600.00	7058.43	7061.50		7062.20	0.009001	184.09	0.81	0.56	1.22		4.39	6.74		6.69
Reach 4	4521	5-YR	538.70	7057.10	7058.74	7058.63	7059.07	0.013573	128.26	0.86	0.04	0.77		0.71	4.64		4.64
Reach 4	4521	100-YR	1833.50	7057.10	7059.78	7059.75	7060.50	0.014395	178.90	0.96	0.55	1.40		4.04	6.84		6.78
Reach 4	4521	FIS	2600.00	7057.10	7060.28	7060.15	7061.08	0.011755	189.60	0.91	0.72	1.44		4.97	7.22		7.15
Reach 4	4469	5-YR	538.70	7056.64	7058.30		7058.51	0.008020	154.94	0.66	0.34	0.48		3.23	3.68		3.67
Reach 4	4469	100-YR	1833.50	7056.64	7059.35		7059.87	0.008784	178.83	0.77	0.65	0.98		4.87	5.85		5.82
Reach 4	4469	FIS	2600.00	7056.64	7059.94		7060.47	0.009046	253.18	0.78	0.83	0.99		5.69	5.87		5.87
Reach 4	4376	5-YR	538.70	7055.93	7057.70		7057.85	0.005939	178.80	0.57	0.15	0.36	0.15	1.94	3.20	1.95	3.18
Reach 4	4376	100-YR	1833.50	7055.93	7058.46		7058.96	0.010845	227.73	0.83	0.54	0.99	0.52	4.15	5.70	4.08	5.65
Reach 4	4376	FIS	2600.00	7055.93	7058.71	7058.65	7059.43	0.013727	243.49	0.95	0.80	1.38	0.77	5.19	6.85	5.06	6.78
Reach 4	4348	5-YR	538.70	7055.93	7057.24	7057.24	7057.55	0.021719	203.76	1.01	0.29	0.82	0.40	2.43	4.47	3.04	4.45
Reach 4	4348	100-YR	1833.50	7055.93	7058.01	7058.01	7058.57	0.017563	282.12	1.01	0.65	1.21	0.79	4.33	6.02	4.95	5.98
Reach 4	4348	FIS	2600.00	7055.93	7058.33	7058.33	7058.98	0.016391	316.67	1.00	0.77	1.33	0.91	4.91	6.48	5.49	6.43
Reach 4	4319	5-YR	538.70	7054.67	7056.58	7056.58	7056.89	0.022018	202.22	1.02		0.82			4.46		4.46
Reach 4	4319	100-YR	1833.50	7054.67	7057.32	7057.32	7057.83	0.017853	313.82	1.00	0.35	1.14		2.85	5.76		5.75
Reach 4	4319	FIS	2600.00	7054.67	7057.64	7057.64	7058.22	0.016883	374.57	1.00	0.49	1.23	0.14	3.64	6.11	1.56	6.09
Reach 4	4266	5-YR	538.70	7052.63	7054.53	7054.53	7055.00	0.018815	107.36	1.01		1.07			5.48		5.48
Reach 4	4266	100-YR	1833.50	7052.63	7055.64	7055.64	7056.22	0.017513	263.88	1.01		1.24			6.11		6.11
Reach 4	4266	FIS	2600.00	7052.63	7056.04	7056.04	7056.64	0.017283	355.72	1.01		1.27			6.21		6.21
Reach 4	4207	5-YR	538.70	7051.41	7052.90	7052.90	7053.18	0.021246	228.65	0.99		0.74			4.20		4.20
Reach 4	4207	100-YR	1833.50	7051.41	7053.60	7053.60	7054.19	0.017333	254.30	1.01		1.26			6.19		6.19
Reach 4	4207	FIS	2600.00	7051.41	7053.92	7053.92	7054.65	0.016263	266.05	1.01		1.45			6.85		6.85
Reach 4	4124	5-YR	538.70	7048.17	7050.16		7050.25	0.002908	187.54	0.41	0.15	0.21		2.19	2.53		2.51
Reach 4	4124	100-YR	1833.50	7048.17	7051.31		7051.57	0.003523	224.96	0.50	0.30	0.45		3.43	4.08		4.05
Reach 4	4124	FIS	2600.00	7048.17	7051.68		7052.04	0.004493	246.30	0.57	0.44	0.63		4.20	4.86		4.83
Reach 4	4009	5-YR	572.10	7048.19	7049.18	7049.18	7049.51	0.021263	194.73	1.01	0.39	0.85		3.01	4.62		4.60
Reach 4	4009	100-YR	2023.60	7048.19	7050.04	7050.04	7050.77	0.015791	206.68	1.00	0.71	1.44		4.68	6.87		6.83
Reach 4	4009	FIS	2600.00	7048.19	7050.31	7050.31	7051.16	0.014812	210.50	1.00	0.79	1.59		5.09	7.41		7.35
Reach 4	3959	5-YR	572.10	7046.20	7047.93	7047.90	7048.25	0.018233	179.91	0.95	0.05	0.80		0.79	4.53		4.53
Reach 4	3959	100-YR	2023.60	7046.20	7048.83	7048.80	7049.58	0.014989	191.43	0.98	0.45	1.45		3.47	6.95		6.93
Reach 4	3959	FIS	2600.00	7046.20	7049.12	7049.08	7049.99	0.014058	195.20	0.98	0.54	1.59		4.00	7.49		7.46
Reach 4	3900	5-YR	572.10	7045.39	7047.13		7047.39	0.011405	161.42	0.78		0.61			4.11		4.11
Reach 4	3900	100-YR	2023.60	7045.39	7048.16	7047.96	7048.81	0.010547	173.53	0.85	0.29	1.20		2.79	6.52		6.49
Reach 4	3900	FIS	2600.00	7045.39	7048.47	7048.27	7049.26	0.010466	177.17	0.87	0.39	1.38		3.37	7.14		7.11
Reach 4	3847	5-YR	572.10	7044.97	7046.66		7046.87	0.008069	163.73	0.67	0.46	0.48		3.95	3.67		3.70
Reach 4	3847	100-YR	2023.60	7044.97	7047.76		7048.29	0.008053	181.15	0.75	0.79	0.97		5.65	5.91		5.88
Reach 4	3847	FIS	2600.00	7044.97	7048.10		7048.73	0.007910	186.42	0.76	0.88	1.10		6.05	6.43		6.40
Reach 4	3771	5-YR	572.10	7044.36	7046.14		7046.32	0.006491	175.10	0.60	0.09	0.40		1.36	3.37		3.36
Reach 4	3771	100-YR	2023.60	7044.36	7047.37		7047.73	0.005820	234.82	0.63	0.29	0.66		3.07	4.82		4.80
Reach 4	3771	FIS	2600.00	7044.36	7047.74		7048.14	0.006118	275.52	0.65	0.38	0.72		3.60	5.07		5.05
Reach 4	3709	5-YR	572.10	7043.57	7045.95		7046.05	0.002565	174.96	0.40	0.08	0.21		1.47	2.56		2.55
Reach 4	3709	100-YR	2023.60	7043.57	7047.08		7047.41	0.004228	205.90	0.55	0.28	0.58		3.12	4.64		4.61
Reach 4	3709	FIS	2600.00	7043.57	7047.39		7047.81	0.004634	214.44	0.59	0.35	0.70		3.57	5.19		5.15
Reach 4	3653	5-YR	572.10	7043.09	7045.95		7045.98	0.000412	201.81	0.17	0.02	0.05		0.81	1.41		1.40
Reach 4	3653	100-YR	2023.60	7043.09	7047.09		7047.24	0.001238	218.53	0.32	0.11	0.24		2.08	3.17		3.12
Reach 4	3653	FIS	2600.00	7043.09	7047.40		7047.61	0.001499	223.14	0.35	0.15	0.31		2.46	3.68		3.63
Reach 4	3502	5-YR	572.10	7042.03	7045.92		7045.94	0.000186	197.71	0.12	0.02	0.03		0.78	1.12		1.11
Reach 4	3502	100-YR	2023.60	7042.03	7046.96		7047.08	0.000787	206.74	0.26	0.09	0.18		1.99	2.82		2.78
Reach 4	3502	FIS	2600.00	7042.03	7047.24		7047.41	0.001022	209.15	0.30	0.13	0.25		2.37	3.36		3.31
Reach 4	3429	5-YR	572.10	7041.39	7045.92		7045.93	0.000066	247.72	0.07	0.01	0.01		0.58	0.75		0.74

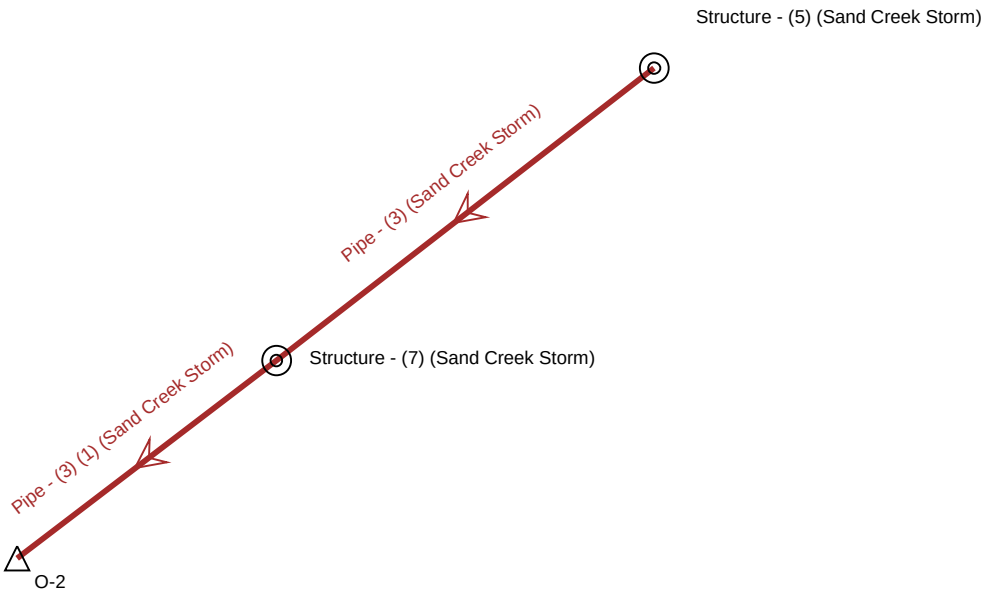
HEC-RAS Plan: Shear River: Sand Creek Reach: Reach 4 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 4	3429	100-YR	2023.60	7041.39	7046.97		7047.03	0.000365	298.52	0.18	0.05	0.08		1.59	1.92		1.90
Reach 4	3429	FIS	2600.00	7041.39	7047.25		7047.33	0.000483	307.42	0.21	0.08	0.12		1.90	2.28		2.26
Reach 4	3336	5-YR	572.10	7040.90	7045.92		7045.92	0.000027	366.61	0.05	0.00	0.01	0.00	0.42	0.49	0.22	0.49
Reach 4	3336	100-YR	2023.60	7040.90	7046.97		7047.00	0.000134	374.18	0.11	0.02	0.04	0.01	1.08	1.31	0.66	1.29
Reach 4	3336	FIS	2600.00	7040.90	7047.26		7047.30	0.000178	376.23	0.13	0.03	0.05	0.02	1.28	1.57	0.81	1.55
Reach 4	3262	5-YR	572.10	7039.88	7045.92		7045.92	0.000015	352.67	0.04	0.00	0.00	0.00	0.29	0.42	0.21	0.41
Reach 4	3262	100-YR	2023.60	7039.88	7046.97		7046.99	0.000086	364.63	0.09	0.01	0.03	0.01	0.77	1.18	0.63	1.15
Reach 4	3262	FIS	2600.00	7039.88	7047.25		7047.28	0.000118	367.86	0.11	0.02	0.04	0.01	0.93	1.43	0.77	1.40
Reach 4	3195	5-YR	572.10	7039.55	7045.92		7045.92	0.000008	357.03	0.03	0.00	0.00	0.00	0.28	0.35	0.19	0.34
Reach 4	3195	100-YR	2023.60	7039.55	7046.97		7046.98	0.000052	366.48	0.07	0.01	0.02	0.01	0.81	1.01	0.58	0.99
Reach 4	3195	FIS	2600.00	7039.55	7047.25		7047.28	0.000073	370.41	0.09	0.02	0.03	0.01	0.99	1.24	0.69	1.21
Reach 4	3114	5-YR	572.10	7039.18	7045.92		7045.92	0.000005	346.14	0.02	0.00	0.00	0.00	0.23	0.31	0.18	0.30
Reach 4	3114	100-YR	2023.60	7039.18	7046.97		7046.98	0.000037	367.26	0.06	0.01	0.02	0.00	0.68	0.93	0.43	0.90
Reach 4	3114	FIS	2600.00	7039.18	7047.25		7047.27	0.000053	369.00	0.08	0.01	0.02	0.01	0.83	1.14	0.55	1.11
Reach 4	3065	5-YR	572.10	7037.93	7045.92		7045.92	0.000005	320.62	0.02	0.00	0.00	0.00	0.18	0.32	0.17	0.31
Reach 4	3065	100-YR	2023.60	7037.93	7046.96		7046.98	0.000035	337.88	0.06	0.01	0.02	0.01	0.56	0.95	0.49	0.92
Reach 4	3065	FIS	2600.00	7037.93	7047.25		7047.27	0.000050	339.94	0.07	0.01	0.02	0.01	0.70	1.17	0.62	1.13
Reach 4	2993	5-YR	572.10	7037.01	7045.92		7045.92	0.000003	324.54	0.02	0.00	0.00	0.00	0.22	0.27	0.13	0.26
Reach 4	2993	100-YR	2023.60	7037.01	7046.96		7046.98	0.000022	331.42	0.05	0.01	0.01	0.00	0.65	0.84	0.45	0.81
Reach 4	2993	FIS	2600.00	7037.01	7047.25		7047.26	0.000033	333.27	0.06	0.01	0.02	0.01	0.80	1.04	0.57	1.00
Reach 4	2778	5-YR	572.10	7036.48	7045.92		7045.92	0.000014	231.93	0.04		0.00	0.00		0.50	0.21	0.49
Reach 4	2778	100-YR	2023.60	7036.48	7046.93		7046.96	0.000097	248.52	0.10	0.00	0.04	0.01	0.24	1.48	0.71	1.43
Reach 4	2778	FIS	2600.00	7036.48	7047.20		7047.25	0.000140	251.39	0.12	0.00	0.06	0.02	0.35	1.81	0.91	1.75
Reach 4	2584	5-YR	572.10	7044.49	7045.56	7045.56	7045.88	0.015076	230.56	0.83		0.50	0.99		3.44	5.88	4.06
Reach 4	2584	100-YR	2023.60	7044.49	7046.38	7046.38	7046.86	0.013220	392.49	0.85		0.77	1.42		4.64	7.65	5.14
Reach 4	2584	FIS	2600.00	7044.49	7046.59	7046.59	7047.11	0.013053	431.84	0.86		0.84	1.52		4.96	8.05	5.43
Reach 4	2406	5-YR	572.10	7019.43	7022.46	7022.46	7023.29	0.015558	47.46	1.01		1.58			7.33		7.33
Reach 4	2406	100-YR	2023.60	7019.43	7024.63	7024.63	7026.06	0.013008	74.35	1.01		2.27			9.62		9.62
Reach 4	2406	FIS	2600.00	7019.43	7025.22	7025.22	7026.81	0.012545	81.61	1.01		2.44			10.13		10.13
Reach 4	2114	5-YR	466.80	7007.64	7010.38	7010.38	7010.69	0.013760	163.30	0.82	1.31	0.56		7.22	3.77		4.07
Reach 4	2114	100-YR	1921.70	7007.64	7011.32	7011.32	7012.07	0.015415	183.29	0.99	1.83	1.41		8.85	6.81		6.92
Reach 4	2114	FIS	2600.00	7007.64	7011.68	7011.67	7012.56	0.014468	191.07	0.99	1.83	1.59		8.95	7.45		7.52
Reach 4	1918	5-YR	466.80	7005.76	7006.84		7007.10	0.013667	151.84	0.83		0.64			4.10		4.10
Reach 4	1918	100-YR	1921.70	7005.76	7010.88		7010.91	0.000217	533.01	0.13		0.04	0.01		1.26	0.35	1.26
Reach 4	1918	FIS	2600.00	7005.76	7012.20		7012.22	0.000113	541.01	0.10		0.03	0.01		1.17	0.50	1.17
Reach 4	1740	5-YR	466.80	7003.99	7005.54	7005.16	7005.64	0.005203	234.61	0.52		0.25			2.58		2.58
Reach 4	1740	100-YR	1921.70	7003.99	7010.88		7010.89	0.000038	500.00	0.06		0.01	0.01		0.78	0.50	0.77
Reach 4	1740	FIS	2600.00	7003.99	7012.20		7012.21	0.000032	506.42	0.06		0.01	0.01		0.83	0.55	0.82
Reach 4	1668	5-YR	466.80	7003.52	7004.71	7004.67	7004.97	0.018749	188.51	0.94		0.70			4.13		4.13
Reach 4	1668	100-YR	1921.70	7003.52	7010.88		7010.89	0.000031	434.41	0.06		0.01	0.01		0.77	0.62	0.76
Reach 4	1668	FIS	2600.00	7003.52	7012.20		7012.21	0.000029	438.92	0.06		0.01	0.01		0.85	0.67	0.84
Reach 4	1549	5-YR	466.80	7002.57	7004.31		7004.35	0.002075	396.23	0.32		0.10	0.02		1.59	0.55	1.59
Reach 4	1549	100-YR	1921.70	7002.57	7010.88		7010.88	0.000014	478.52	0.04	0.00	0.01	0.00	0.09	0.59	0.41	0.58
Reach 4	1549	FIS	2600.00	7002.57	7012.20		7012.20	0.000015	484.61	0.04	0.00	0.01	0.00	0.15	0.67	0.47	0.66
Reach 4	1494.166	5-YR	466.80	7002.04	7004.28	7002.98	7004.30	0.000363	372.99	0.15		0.04	0.01		1.12	0.51	1.11
Reach 4	1494.166	100-YR	1921.70	7002.04	7010.87	7003.85	7010.88	0.000024	470.86	0.05		0.01	0.01		0.84	0.80	0.83
Reach 4	1494.166	FIS	2600.00	7002.04	7012.19	7004.13	7012.20	0.000031	478.91	0.06	0.00	0.02	0.00	0.26	0.96	0.47	0.89
Reach 4	1397		Inl Struct														
Reach 4	1256	5-YR	463.11	7000.89	7003.70	7002.44	7003.93	0.002353	44.57	0.40		0.37			3.78		3.78
Reach 4	1256	100-YR	1590.50	7000.89	7007.41	7004.35	7007.88	0.001627	45.48	0.38	0.02	0.59	0.02	0.63	5.52	0.61	5.50
Reach 4	1256	FIS	2600.00	7000.89	7009.98	7005.67	7010.63	0.001418	46.26	0.38	0.04	0.72	0.03	1.00	6.45	0.82	6.39
Reach 4	1214.7		Culvert														
Reach 4	1161	5-YR	463.11	7000.69	7003.07		7003.38	0.005259	63.35	0.60	0.27	0.58	0.08	2.98	4.51	1.27	4.42
Reach 4	1161	100-YR	1590.50	7000.69	7004.71	7004.17	7005.58	0.006383	75.06	0.73	0.65	1.36	0.41	5.12	7.67	3.76	7.29
Reach 4	1161	FIS	2600.00	7000.69	7005.54	7005.21	7006.94	0.007803	80.99	0.84	0.99	2.06	0.69	6.56	9.81	5.18	9.19
Reach 4	1134	5-YR	463.11	7000.63	7002.50	7002.50	7003.12	0.015853	61.72	0.99	0.51	1.31	0.61	3.78	6.44	4.22	6.24
Reach 4	1134	100-YR	1590.50	7000.63	7004.08	7004.08	7005.32	0.011551	76.61	0.96	0.93	2.09	0.97	5.93	9.27	6.09	8.67
Reach 4	1134	FIS	2600.00	7000.63	7005.11	7005.11	7006.69	0.010112	86.30	0.94	1.14	2.48	1.16	6.91	10.62	7.01	9.73
Reach 4	1116	5-YR	463.11	6997.80	7000.26		7000.53	0.004135	67.63	0.54	0.21	0.50	0.29	2.61	4.22	3.25	4.04
Reach 4	1116	100-YR	1590.50	6997.80	7001.64		7002.53	0.007116	78.70	0.77	0.66	1.46	0.83	5.09	7.92	5.93	7.39
Reach 4	1116	FIS	2600.00	6997.80	7002.34	7002.22	7003.84	0.009348	84.39	0.91	1.07	2.33	1.30	6.71	10.33	7.65	9.53
Reach 4	1076	5-YR	463.11	6997.73	7000.15		7000.36	0.003448	79.57	0.48	0.12	0.39	0.20	1.88	3.69	2.57	3.57
Reach 4	1076	100-YR	1590.50	6997.73	7001.55		7002.21	0.005350	92.62	0.66	0.41	1.07	0.54	3.92	6.73	4.67	6.36
Reach 4	1076	FIS	2600.00	6997.73	7002.35		7003.39	0.006386	99.85	0.75	0.66	1.59	0.80	5.17	8.53	5.90	7.96
Reach 4	1004	5-YR	463.11	6997.63	6999.97		7000.12	0.002708	98.24	0.42	0.11	0.28	0.07	1.77	3.09	1.40	3.04
Reach 4	1004	100-YR	1590.50	6997.63	7001.37		7001.83	0.003874	109.34	0.56	0.33	0.74	0.27	3.57	5.55	3.12	5.35
Reach 4	1004	FIS	2600.00	6997.63	7002.20		7002.92	0.004430	115.96	0.62	0.50	1.07	0.42	4.56	6.97	4.09	6.65
Reach 4	965	5-YR	463.11	6997.45	6999.89		7000.02	0.002303	100.61	0.39	0.07	0.25	0.07	1.35	2.93	1.32	2.88
Reach 4	965	100-YR	1590.50	6997.45	7001.24		7001.68	0.003632	116.07	0.54	0.26	0.70	0.25	3.06	5.41	3.02	5.18
Reach 4	965	FIS	2600.00	6997.45	7002.07		7002.74	0.004144	125.52	0.60	0.40	1.01	0.39	4.01	6.77	3.96	6.39
Reach 4	933	5-YR	463.11	6997.45	6999.81		6999.94	0.002439	103.84	0.40	0.05	0.25	0.08	1.09	2.91	1.46	2.88
Reach 4	933	100-YR	1590.50	6997.45	7001.12		7001.56	0.003828	116.43	0.55	0.23	0.70	0.27	2.81	5.39	3.14	5.22
Reach 4	933	FIS	2600.00	6997.45	7001.92		7002.61	0.004378	125.40	0.62	0.35	1.02	0.42	3.64	6.77	4.09	6.46
Reach 4	876	5-YR	463.11	6997.45	6999.67		6999.79	0.002769	120.22	0.42	0.14	0.25	0.08	2.17	2.85	1.47	2.80
Reach 4	876	100-YR	1590.50	6997.45	7000.94		7001.32	0.003723	130.59	0.54	0.34	0.63	0.25	3.67	5.04	2.99	4.89

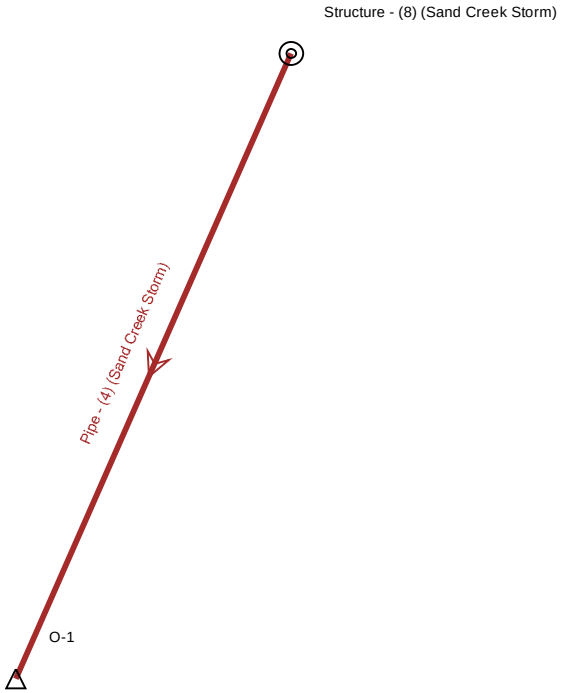
HEC-RAS Plan: Shear River: Sand Creek Reach: Reach 4 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Top Width	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Vel Left	Vel Chnl	Vel Right	Vel Total
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(ft/s)	(ft/s)	(ft/s)	(ft/s)
Reach 4	876	FIS	2600.00	6997.45	7001.76		7002.34	0.003980	137.12	0.58	0.47	0.88	0.37	4.48	6.21	3.81	5.98
Reach 4	827	5-YR	463.11	6997.33	6999.47		6999.63	0.003865	115.37	0.49	0.17	0.32	0.10	2.33	3.21	1.60	3.16
Reach 4	827	100-YR	1590.50	6997.33	7000.56		7001.08	0.005900	126.04	0.67	0.46	0.90	0.35	4.16	5.90	3.43	5.71
Reach 4	827	FIS	2600.00	6997.33	7001.29		7002.07	0.006339	133.14	0.72	0.64	1.25	0.51	5.10	7.27	4.39	6.98
Reach 4	795	5-YR	463.11	6997.29	6999.33		6999.50	0.004459	119.28	0.52	0.23	0.35	0.16	2.76	3.31	2.15	3.25
Reach 4	795	100-YR	1590.50	6997.29	7000.26		7000.86	0.008007	128.38	0.76	0.66	1.09	0.53	5.00	6.39	4.32	6.19
Reach 4	795	FIS	2600.00	6997.29	7000.76	7000.61	7001.79	0.010346	133.39	0.90	1.02	1.74	0.85	6.40	8.35	5.67	8.04
Reach 4	753	5-YR	463.11	6997.25	6999.04		6999.24	0.008749	151.47	0.68	0.25	0.48	0.17	2.55	3.64	1.98	3.60
Reach 4	753	100-YR	1590.50	6997.25	6999.90		7000.48	0.010007	160.88	0.82	0.55	1.09	0.47	4.26	6.15	3.82	6.03
Reach 4	753	FIS	2600.00	6997.25	7000.34	7000.28	7001.29	0.012444	165.60	0.95	0.85	1.69	0.75	5.50	7.95	5.05	7.76
Reach 4	674	5-YR	463.11	6995.52	6997.77	6997.77	6998.23	0.019051	94.31	1.01	0.09	1.07		1.11	5.46		5.46
Reach 4	674	100-YR	1590.50	6995.52	6998.80	6998.80	6999.47	0.016683	191.06	1.01	0.59	1.37	0.16	4.10	6.57	1.70	6.53
Reach 4	674	FIS	2600.00	6995.52	6999.31	6999.31	7000.22	0.014740	195.00	1.00	0.75	1.68	0.48	4.91	7.69	3.65	7.60
Reach 4	646	5-YR	463.11	6992.83	6995.13		6995.39	0.007276	94.51	0.66	0.44	0.55		3.90	4.11		4.09
Reach 4	646	100-YR	1590.50	6992.83	6996.17	6996.04	6996.89	0.012601	137.20	0.92	1.16	1.35		6.75	6.82		6.81
Reach 4	646	FIS	2600.00	6992.83	6996.76	6996.76	6997.77	0.014405	161.40	1.01	1.58	1.80		8.11	8.09		8.09
Reach 4	627	5-YR	463.11	6992.83	6995.05		6995.24	0.005758	118.31	0.58	0.31	0.41		3.20	3.50		3.49
Reach 4	627	100-YR	1590.50	6992.83	6996.14		6996.63	0.007962	160.27	0.74	0.69	0.89		5.15	5.60		5.58
Reach 4	627	FIS	2600.00	6992.83	6996.76		6997.45	0.008844	183.44	0.80	0.93	1.19		6.17	6.67		6.64
Reach 4	591	5-YR	463.11	6992.76	6994.90		6995.04	0.004603	136.79	0.52	0.20	0.32		2.50	3.09		3.08
Reach 4	591	100-YR	1590.50	6992.76	6995.95		6996.34	0.006447	181.67	0.66	0.49	0.72		4.25	5.01		4.98
Reach 4	591	FIS	2600.00	6992.76	6996.58		6997.12	0.006932	204.07	0.71	0.66	0.94		5.10	5.95		5.92
Reach 4	522	5-YR	463.11	6992.58	6994.65		6994.75	0.003513	187.77	0.44	0.11	0.22		1.77	2.51		2.50
Reach 4	522	100-YR	1590.50	6992.58	6995.71		6995.95	0.003973	228.63	0.52	0.26	0.45		2.98	3.95		3.93
Reach 4	522	FIS	2600.00	6992.58	6996.36		6996.69	0.004090	256.59	0.55	0.34	0.57		3.62	4.64		4.61
Reach 4	445	5-YR	463.11	6992.49	6994.27		6994.41	0.005764	178.89	0.55	0.34	0.31		3.41	2.94		2.96
Reach 4	445	100-YR	1590.50	6992.49	6995.30		6995.59	0.005596	234.46	0.60	0.50	0.55		4.43	4.30		4.31
Reach 4	445	FIS	2600.00	6992.49	6996.00		6996.35	0.004798	263.17	0.59	0.53	0.62		4.71	4.79		4.79
Reach 4	372	5-YR	463.11	6992.12	6993.86		6993.99	0.005630	186.43	0.55	0.38	0.30		3.66	2.84		2.90
Reach 4	372	100-YR	1590.50	6992.12	6994.94		6995.21	0.004478	213.78	0.55	0.45	0.50		4.29	4.18		4.19
Reach 4	372	FIS	2600.00	6992.12	6995.67		6996.03	0.004078	231.84	0.55	0.51	0.60		4.70	4.80		4.80
Reach 4	299	5-YR	463.11	6991.89	6993.39		6993.56	0.006225	150.58	0.59	0.30	0.37		3.08	3.25		3.24
Reach 4	299	100-YR	1590.50	6991.89	6994.56		6994.86	0.005143	208.12	0.59	0.43	0.56		4.05	4.43		4.41
Reach 4	299	FIS	2600.00	6991.89	6995.36		6995.73	0.003981	218.49	0.55	0.43	0.62		4.23	4.91		4.88
Reach 4	249	5-YR	463.11	6991.38	6992.96		6993.18	0.008624	128.86	0.69	0.23	0.52		2.48	3.83		3.81
Reach 4	249	100-YR	1590.50	6991.38	6994.21		6994.57	0.006085	186.81	0.64	0.40	0.68		3.73	4.88		4.85
Reach 4	249	FIS	2600.00	6991.38	6995.09		6995.52	0.004280	194.90	0.57	0.39	0.70		3.94	5.28	0.19	5.23
Reach 4	182	5-YR	463.11	6990.73	6992.49		6992.69	0.006339	124.72	0.60	0.18	0.43		2.16	3.55		3.53
Reach 4	182	100-YR	1590.50	6990.73	6993.83		6994.22	0.004665	149.10	0.59	0.32	0.67	0.10	3.40	5.03	1.55	4.95
Reach 4	182	FIS	2600.00	6990.73	6994.72		6995.23	0.004051	157.67	0.58	0.39	0.80	0.20	3.95	5.83	2.49	5.69
Reach 4	86	5-YR	463.11	6990.03	6991.78	6991.46	6992.03	0.007321	101.61	0.66		0.53	0.03		4.01	0.60	4.01
Reach 4	86	100-YR	1590.50	6990.03	6993.00	6992.62	6993.64	0.007326	118.50	0.74	0.25	1.09	0.43	2.65	6.47	3.83	6.30
Reach 4	86	FIS	2600.00	6990.03	6993.77	6993.36	6994.68	0.007333	126.88	0.78	0.42	1.44	0.66	3.75	7.80	5.05	7.50

Scenario: 5-YR



Scenario: 5-YR



Scenario: 5-YR
Current Time Step: 0.000 h
Conduit FlexTable: Combined Pipe/Node Report

Label	Flow (cfs)	Diameter (in)	Rise (ft)	Span (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Upstream Structure Headloss Coefficient	Manning's n	Barrels (Maximum)	Capacity (Design) (cfs)
Pipe - (3) (1) (Sand Creek Storm)	537.00	-	10.0	12.0	25.3	0.008	7,002.83	7,002.62	16.06	7,025.01	7,020.64	7,006.80	7,006.09	7,008.78	7,008.68	1.320	0.013	1	2,450.71
Pipe - (3) (Sand Creek Storm)	537.00	-	10.0	12.0	115.6	0.001	7,011.52	7,011.40	7.59	7,036.02	7,025.01	7,016.18	7,015.37	7,017.61	7,017.35	1.320	0.013	1	860.07
Pipe - (4) (Sand Creek Storm)	487.00	-	10.0	10.0	87.2	0.004	7,101.02	7,100.67	12.29	7,117.76	7,124.81	7,105.21	7,104.66	7,107.31	7,106.98	1.320	0.013	1	1,333.67

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Scenario: 100-YR
Current Time Step: 0.000 h
Conduit FlexTable: Combined Pipe/Node Report

Label	Flow (cfs)	Diameter (in)	Rise (ft)	Span (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Upstream Structure Headloss Coefficient	Manning's n	Barrels (Maximum)	Capacity (Design) (cfs)
Pipe - (3) (1) (Sand Creek Storm)	1,978.00	-	10.0	12.0	25.3	0.008	7,002.83	7,002.62	23.02	7,025.01	7,020.64	7,012.29	7,011.35	7,017.01	7,016.89	1.320	0.013	1	2,450.71
Pipe - (3) (Sand Creek Storm)	1,978.00	-	10.0	12.0	115.6	0.001	7,011.52	7,011.40	16.48	7,036.02	7,025.01	7,021.97	7,020.85	7,026.19	7,025.58	1.320	0.013	1	860.07
Pipe - (4) (Sand Creek Storm)	1,649.00	-	10.0	10.0	87.2	0.004	7,101.02	7,100.67	16.49	7,117.76	7,124.81	7,111.04	7,110.12	7,115.26	7,114.85	1.320	0.013	1	1,333.67

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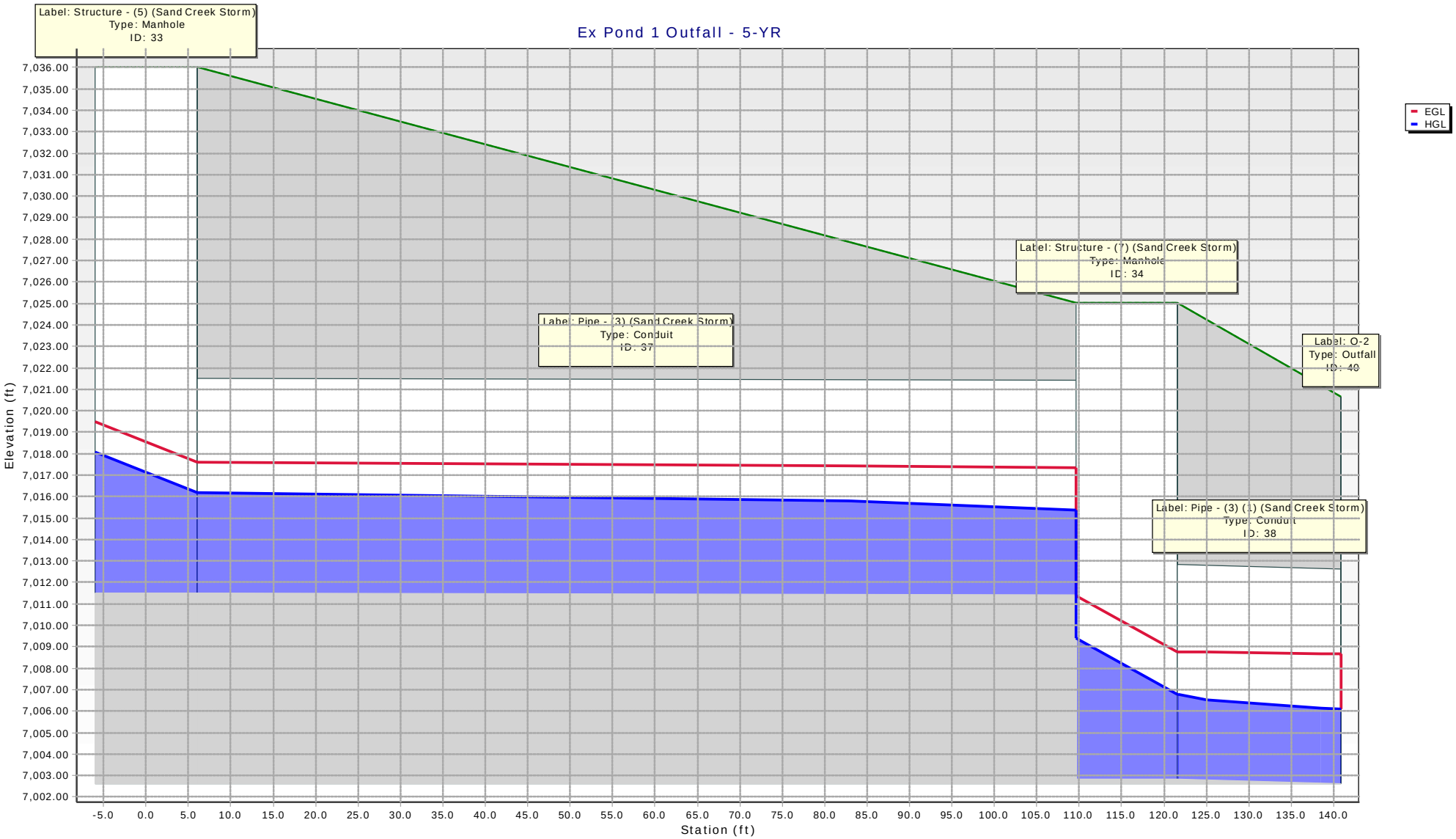
Label: Structure - (5) (Sand Creek Storm)
Type: Manhole
ID: 33
Ex Pond 1 Outfall - 5-YR
Label: Structure - (7) (Sand Creek Storm)
Type: Manhole
ID: 34
Label: Pipe - (3) (Sand Creek Storm)
Type: Conduit
ID: 37
Label: O-2
Type: Outfall
ID: 40
Label: Pipe - (3) (1) (Sand Creek Storm)
Type: Conduit
ID: 38
EGL
HGL
Elevation (ft)
7,036.00
7,035.00
7,034.00
7,033.00
7,032.00
7,031.00
7,030.00
7,029.00
7,028.00
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55.0
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65.0
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75.0
80.0
85.0
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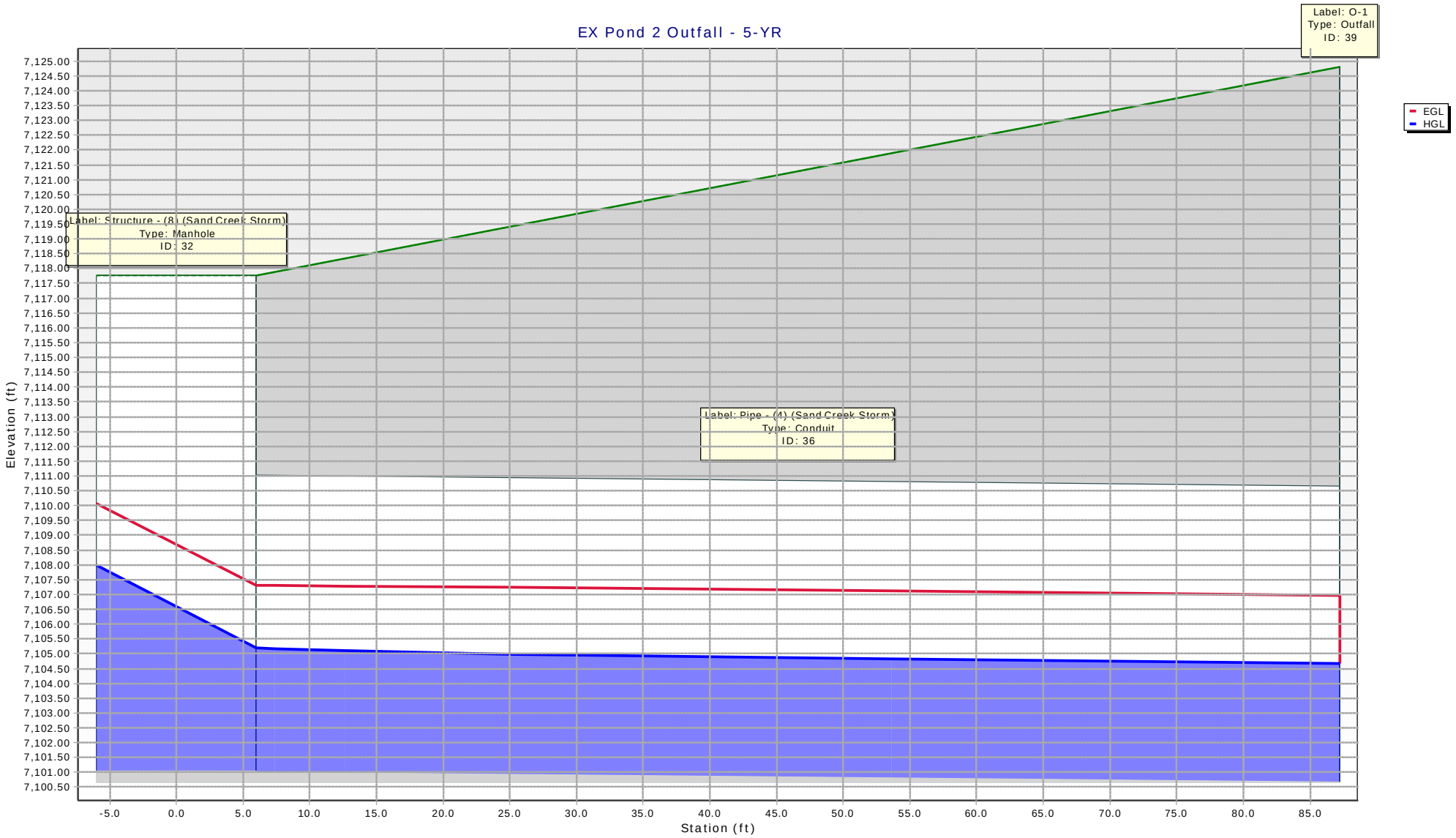
140.0
Station (ft)


EX Pond 2 Outfall - 5-YR
Label: O-1
Type: Outfall
ID: 39
EGL
HGL
Label: Structure - (8) (Sand Creek Storm)
Type: Manhole
ID: 32
Label: Pipe - (4) (Sand Creek Storm)
Type: Conduit
ID: 36
Elevation (ft)
Station (ft)
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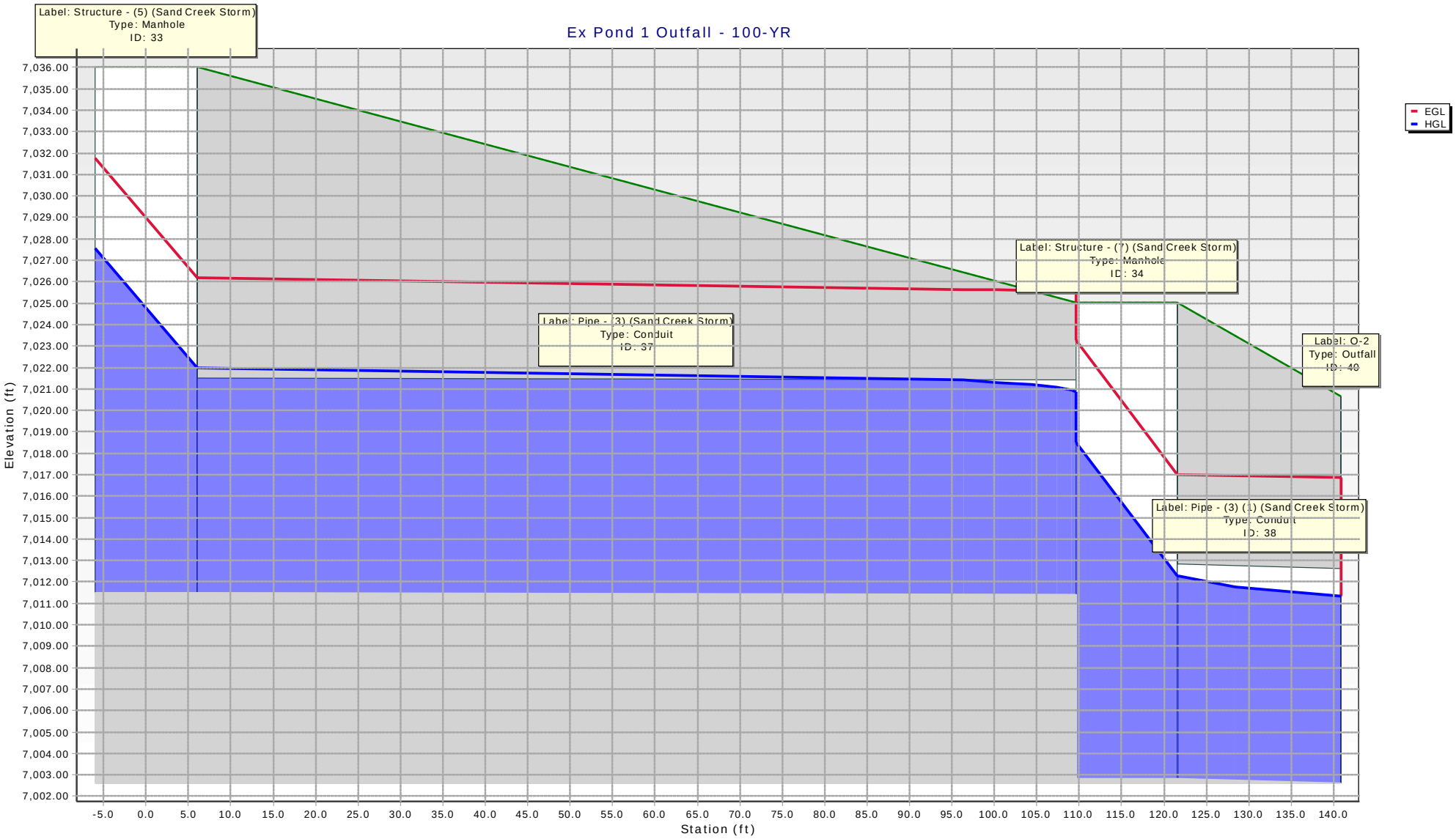
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Label: Structure - (5) (Sand Creek Storm)
Type: Manhole
ID: 33
Label: Structure - (7) (Sand Creek Storm)
Type: Manhole
ID: 34
Label: Pipe - (3) (Sand Creek Storm)
Type: Conduit
ID: 37
Label: O-2
Type: Outfall
ID: 40
Label: Pipe - (3) (1) (Sand Creek Storm)
Type: Conduit
ID: 38
EGL
HGL
Elevation (ft)
Station (ft)
7,036.00
7,035.00
7,034.00
7,033.00
7,032.00
7,031.00
7,030.00
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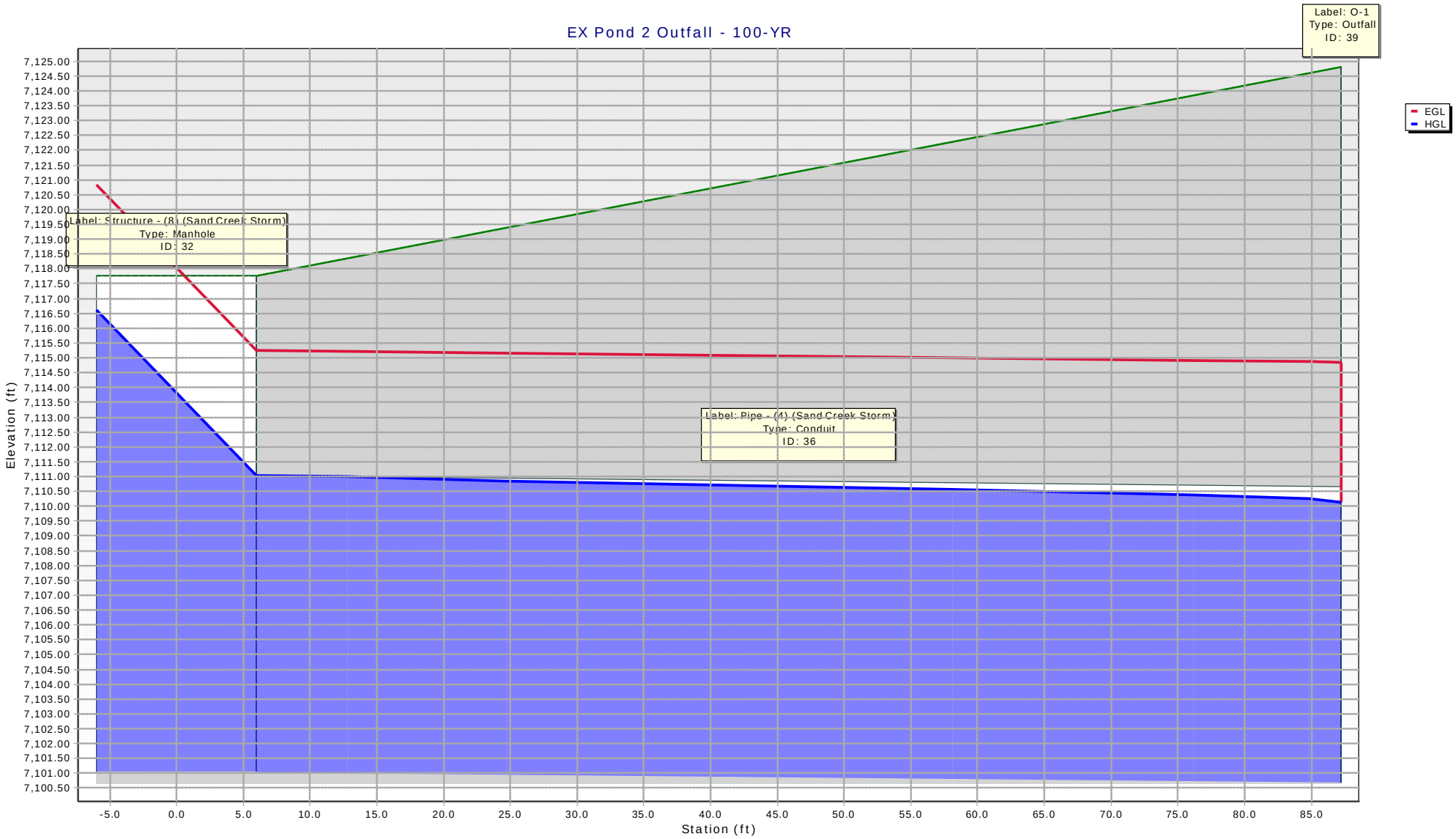
EX Pond 2 Outfall - 100-YR
Label: O-1
Type: Outfall
ID: 39
EGL
HGL
Label: Structure - (8) (Sand Creek Storm)
Type: Manhole
ID: 32
Label: Pipe - (4) (Sand Creek Storm)
Type: Conduit
ID: 36
Elevation (ft)
Station (ft)
7,125.00
7,124.50
7,124.00
7,123.50
7,123.00
7,122.50
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35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 1550 cfs

Maximum Flow: 2600 cfs

Table 1 - Summary of Culvert Flows at Crossing: SRR (separate berm)

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 (low flow) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
7000.88	0.00	0.00	0.00	0.00	0
7003.13	260.00	151.32	108.64	0.00	3
7004.37	520.00	339.63	180.32	0.00	4
7005.52	780.00	552.62	227.38	0.00	4
7006.71	1040.00	773.45	266.59	0.00	4
7008.18	1300.00	994.87	305.19	0.00	4
7009.91	1550.00	1205.48	344.57	0.00	4
7011.14	1820.00	1333.23	369.90	115.89	7
7011.40	2080.00	1359.45	375.23	344.67	5
7011.62	2340.00	1380.22	379.47	580.03	5
7011.81	2600.00	1398.22	383.17	817.61	4
7010.88	1672.34	1307.58	364.76	0.00	Overtopping

Rating Curve Plot for Crossing: SRR (separate berm)

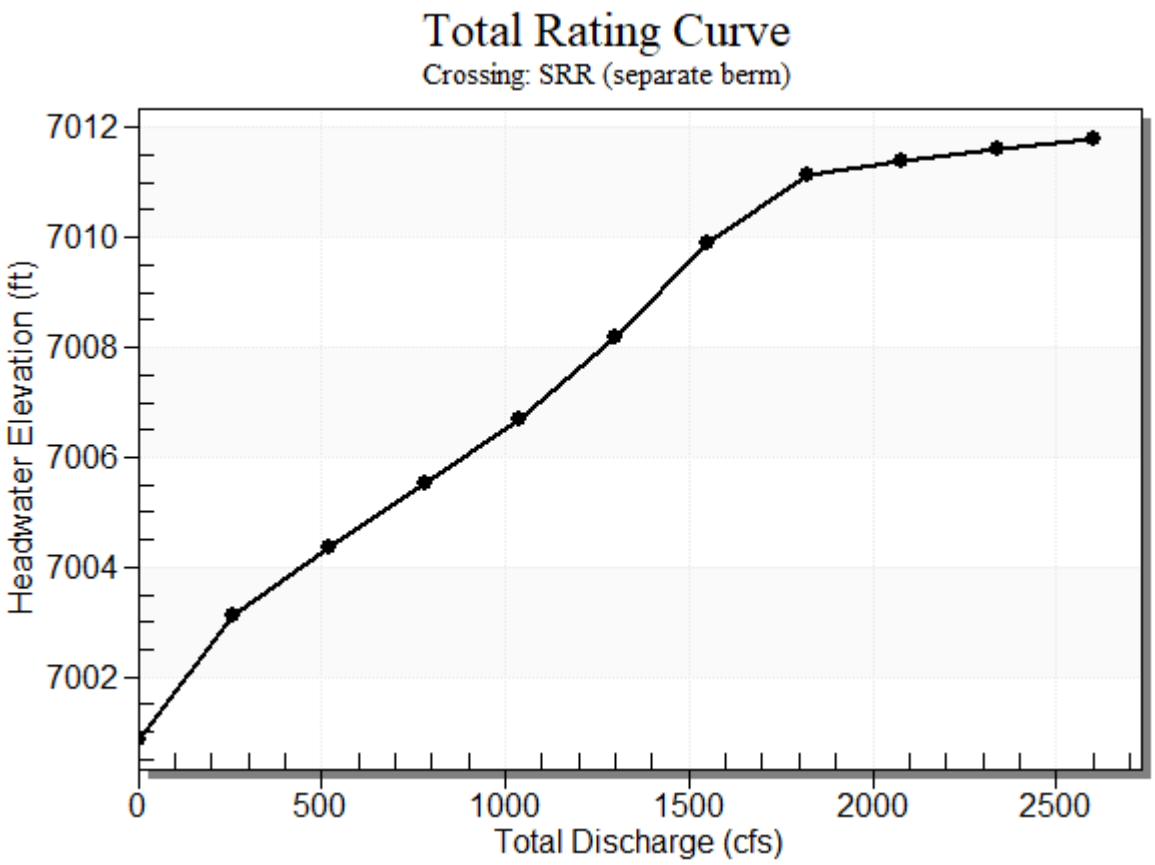


Table 2 - Culvert Summary Table: Culvert 1

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)
0.00	0.00	7000.88	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
260.00	151.32	7003.13	1.745	1.751	3-M2t	1.225	1.017	1.177	1.738	4.944	2.537
520.00	339.63	7004.37	2.954	2.998	3-M2t	2.077	1.743	2.032	2.593	6.429	3.216
780.00	552.62	7005.52	4.097	4.143	3-M2t	2.886	2.412	2.703	3.264	7.863	3.673
1040.00	773.45	7006.71	5.326	5.184	3-M2t	3.644	3.018	3.274	3.835	9.085	4.027
1300.00	994.87	7008.18	6.800	6.142	7-M2t	4.000	3.569	3.780	4.341	10.124	4.318
1550.00	1205.48	7009.91	8.531	4.111	5-M2t	4.000	4.000	3.780	4.781	0.000	4.558
1820.00	1333.23	7011.14	9.756	4.548	5-M2t	4.000	4.000	3.780	5.218	10.124	4.786
2080.00	1359.45	7011.40	10.024	4.939	5-M2t	4.000	4.000	3.780	5.609	10.124	4.982
2340.00	1380.22	7011.62	10.241	5.306	5-M2t	4.000	4.000	3.780	5.976	10.124	5.159
2600.00	1398.22	7011.81	10.431	5.652	5-M2t	4.000	4.000	3.780	6.322	10.124	5.322

****

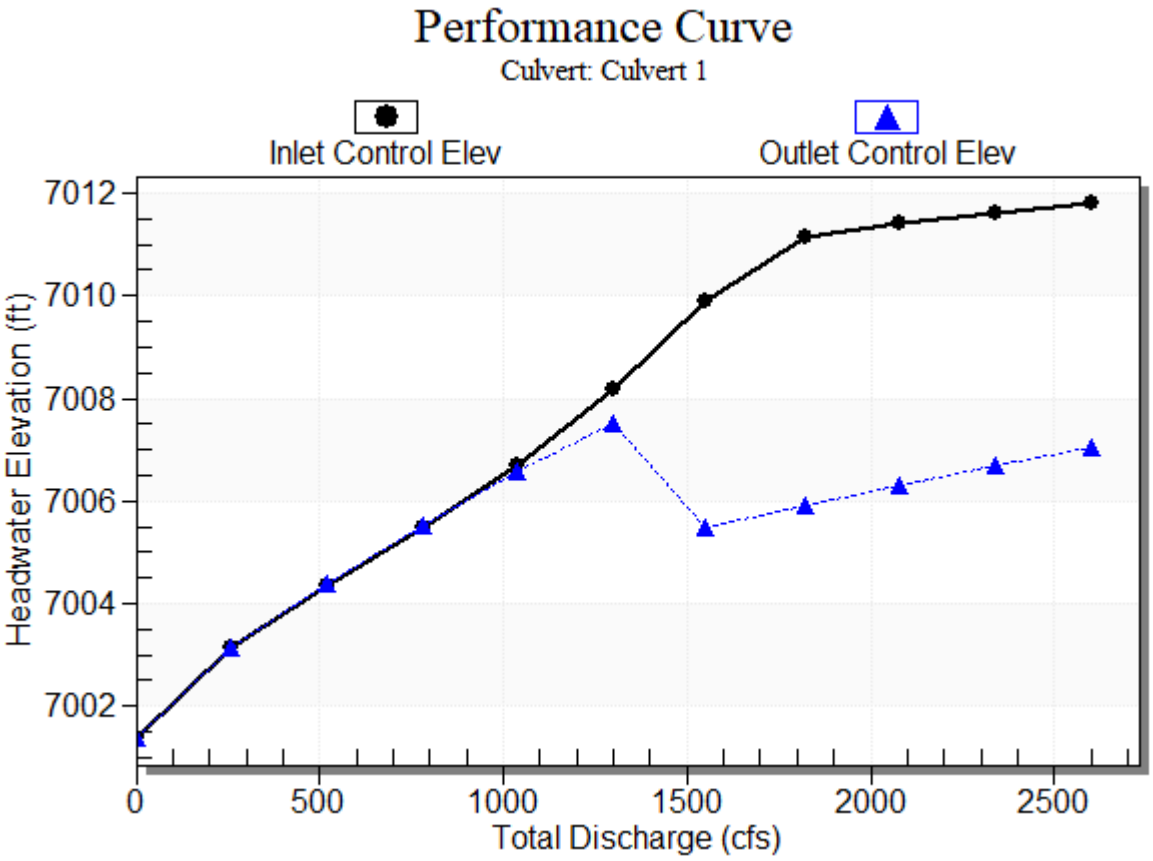
Straight Culvert

Inlet Elevation (invert): 7001.38 ft, Outlet Elevation (invert): 7001.27 ft

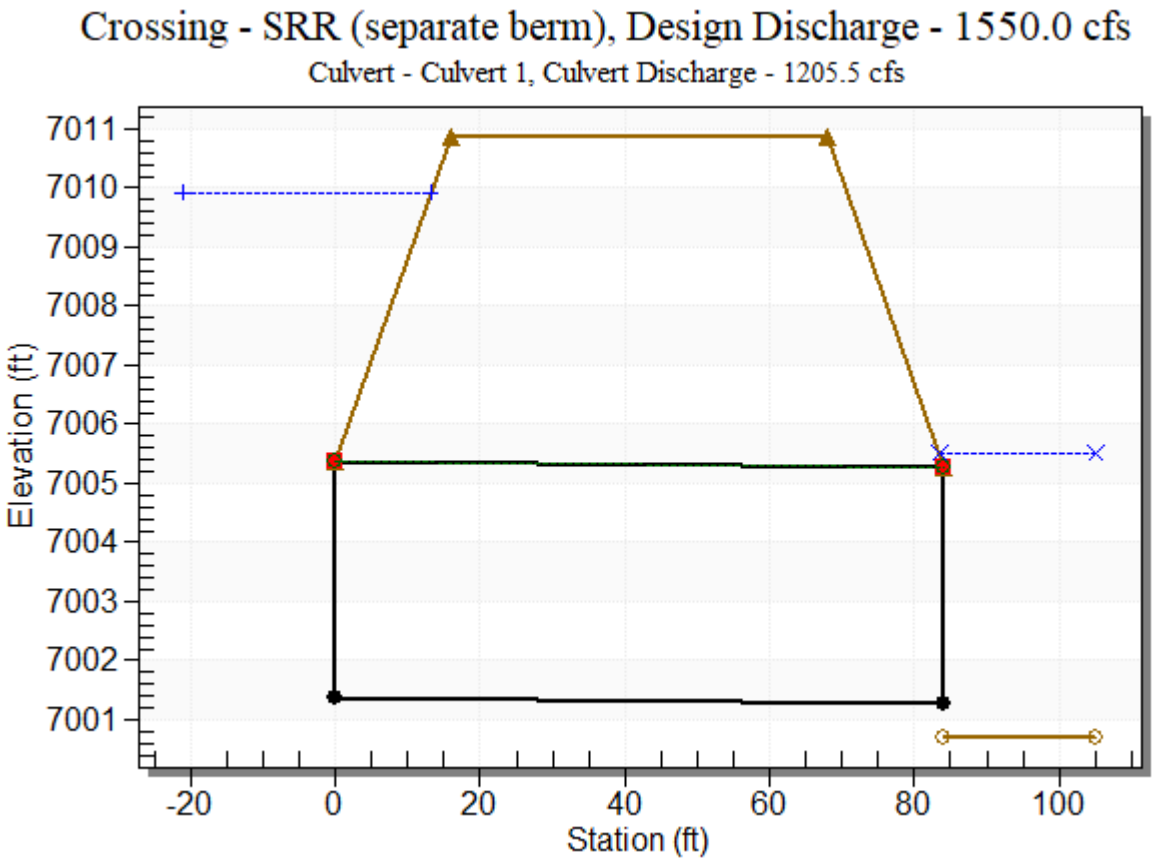
Culvert Length: 84.00 ft, Culvert Slope: 0.0013

****

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: 7001.38 ft

Outlet Station: 84.00 ft

Outlet Elevation: 7001.27 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 13.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 3 - Culvert Summary Table: Culvert 2 (low flow)

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)
0.00	0.00	7000.88	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
260.00	108.64	7003.13	2.213	2.235	7-M1t	1.340	1.294	1.738	1.738	4.808	2.537
520.00	180.32	7004.37	3.494	3.860	4-FFf	1.865	1.815	2.000	2.593	6.935	3.216
780.00	227.38	7005.52	4.644	5.380	4-FFf	2.000	2.000	2.000	3.264	8.745	3.673
1040.00	266.59	7006.71	5.825	6.807	4-FFf	2.000	2.000	2.000	3.835	10.253	4.027
1300.00	305.19	7008.18	7.300	8.288	4-FFf	2.000	2.000	2.000	4.341	11.738	4.318
1550.00	344.57	7009.91	9.031	9.860	4-FFf	2.000	2.000	2.000	4.781	13.253	4.558
1820.00	369.90	7011.14	10.255	11.097	4-FFf	2.000	2.000	2.000	5.218	14.227	4.786
2080.00	375.23	7011.40	10.524	11.663	4-FFf	2.000	2.000	2.000	5.609	14.432	4.982
2340.00	379.47	7011.62	10.740	12.172	4-FFf	2.000	2.000	2.000	5.976	14.595	5.159
2600.00	383.17	7011.81	10.931	12.642	4-FFf	2.000	2.000	2.000	6.322	14.737	5.322

****

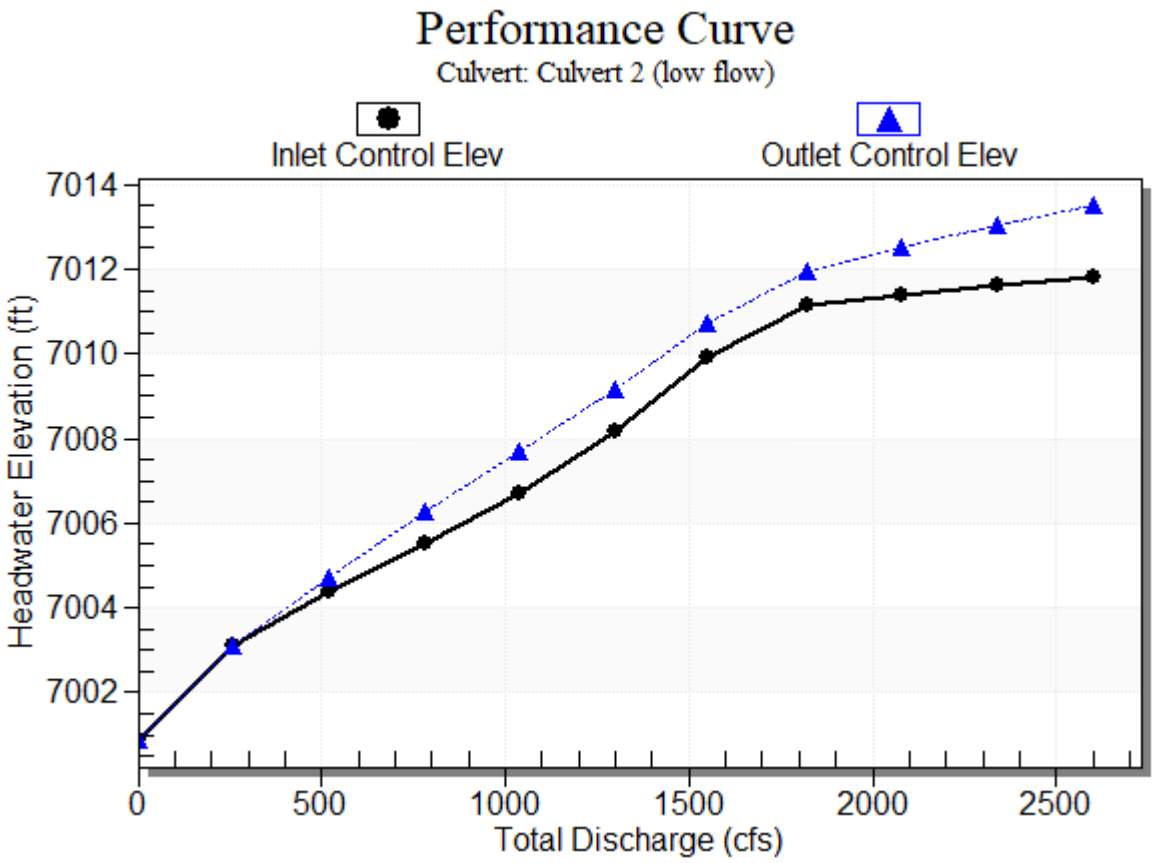
Straight Culvert

Inlet Elevation (invert): 7000.88 ft, Outlet Elevation (invert): 7000.71 ft

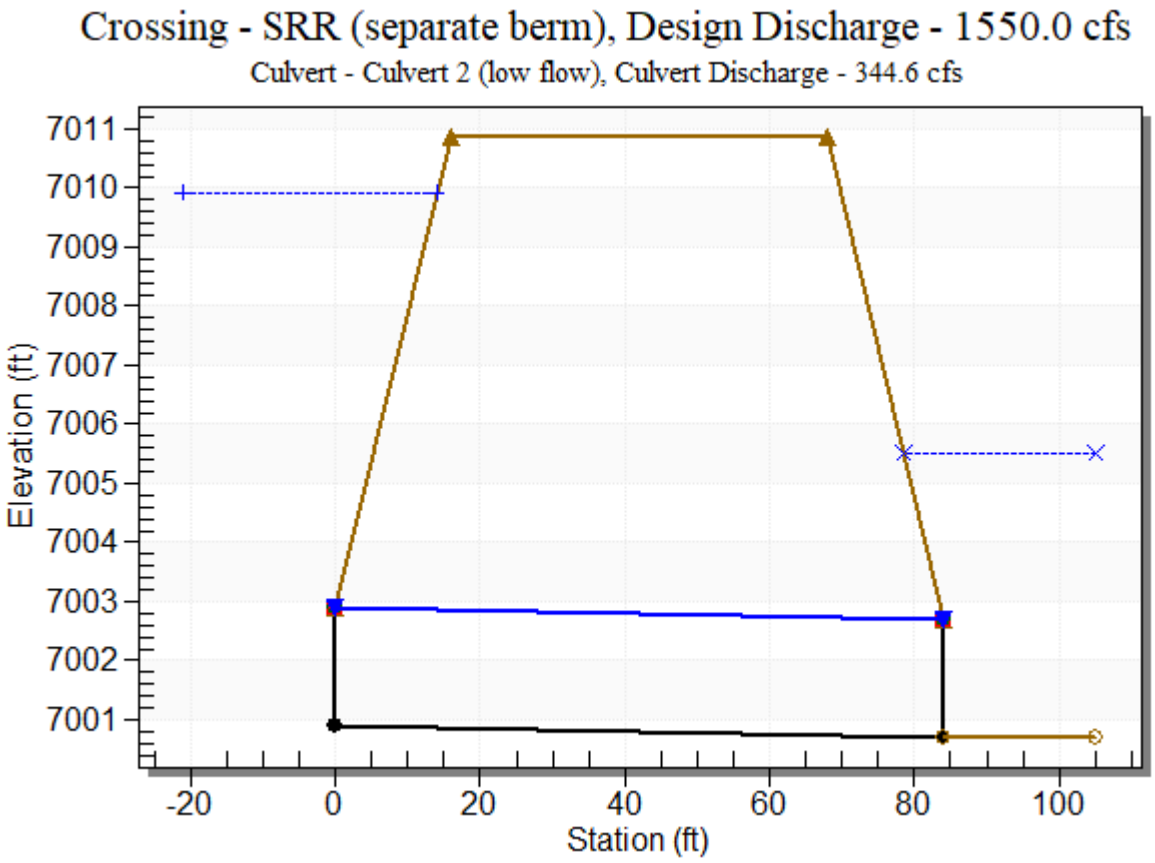
Culvert Length: 84.00 ft, Culvert Slope: 0.0020

****

Culvert Performance Curve Plot: Culvert 2 (low flow)



Water Surface Profile Plot for Culvert: Culvert 2 (low flow)



Site Data - Culvert 2 (low flow)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 7000.88 ft

Outlet Station: 84.00 ft

Outlet Elevation: 7000.71 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2 (low flow)

Barrel Shape: Concrete Box

Barrel Span: 13.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 4 - Downstream Channel Rating Curve (Crossing: SRR (separate berm))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	7000.71	0.00	0.00	0.00	0.00
260.00	7002.45	1.74	2.54	0.22	0.36
520.00	7003.30	2.59	3.22	0.32	0.38
780.00	7003.97	3.26	3.67	0.41	0.39
1040.00	7004.55	3.84	4.03	0.48	0.40
1300.00	7005.05	4.34	4.32	0.54	0.41
1550.00	7005.49	4.78	4.56	0.60	0.41
1820.00	7005.93	5.22	4.79	0.65	0.42
2080.00	7006.32	5.61	4.98	0.70	0.42
2340.00	7006.69	5.98	5.16	0.75	0.43
2600.00	7007.03	6.32	5.32	0.79	0.43

Tailwater Channel Data - SRR (separate berm)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 52.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0020

Channel Manning's n: 0.0350

Channel Invert Elevation: 7000.71 ft

Roadway Data for Crossing: SRR (separate berm)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 7010.88 ft

Roadway Surface: Paved

Roadway Top Width: 52.00 ft

Existing Stock Pond 1 Proposed Outlet Structure

width	25	area	625	open area x 70%	218.75	0.25
length	25	blockage	0.5			
perimeter	100	blockage	0	avail perm.	100	

Elev (ft)	Head (ft)	Orifice	Weir
7036	0	0	0
7036.25	0.25	526.6381	38.75
7036.5	0.5	744.7787	109.6016
7036.75	0.75	912.1639	201.3509
7037	1	1053.276	310
7037.25	1.25	1177.599	433.2382
7037.5	1.5	1289.995	569.5064
7037.75	1.75	1393.353	717.66
7038	2	1489.557	876.8124
7038.25	2.25	1579.914	1046.25
7038.5	2.5	1665.376	1225.383
7038.75	2.75	1746.661	1413.711
7039	3	1824.328	1610.807
7039.25	3.25	1898.821	1816.296
7039.5	3.5	1970.499	2029.849
7039.75	3.75	2039.66	2251.172
7040	4	2106.552	2480
7040.25	4.25	2171.384	2716.096
7040.5	4.5	2234.336	2959.242
7040.75	4.75	2295.562	3209.239
7041	5	2355.197	3465.905
7041.25	5.25	2413.359	3729.071
7041.5	5.5	2470.152	3998.579
7041.75	5.75	2525.667	4274.285
7042	6	2579.989	4556.051
7042.25	6.25	2633.19	4843.75
7042.5	6.5	2685.338	5137.262
7042.75	6.75	2736.492	5436.474
7043	7	2786.707	5741.28
7043.25	7.25	2836.033	6051.579
7043.5	7.5	2884.516	6367.275
7043.75	7.75	2932.197	6688.277
7044	8	2979.115	7014.499
7044.25	8.25	3025.305	7345.859
7044.5	8.5	3070.801	7682.279
7044.75	8.75	3115.633	8023.683
7045	9	3159.828	8370
7045.25	9.25	3203.414	8721.161
7045.5	9.5	3246.415	9077.1
7045.75	9.75	3288.854	9437.753
7046	10	3330.752	9803.061
7046.25	10.25	3372.129	10172.96
7046.5	10.5	3413.005	10547.41
7046.75	10.75	3453.397	10926.33
7047	11	3493.322	11309.69
7047.25	11.25	3532.796	11697.43
7047.5	11.5	3571.833	12089.5
7047.75	11.75	3610.449	12485.86
7048	12	3648.656	12886.46

Existing Stock Pond 2 Proposed Outlet Structure

width	25	area	625	open area x 70%	218.75
length	25	blockage	0.5		
perimeter	100	blockage	0	avail perm.	100

Elev (ft)	Head (ft)	Orifice	Weir
7117.75	0	0	0
7118	0.25	526.6381	38.75
7118.25	0.5	744.7787	109.6016
7118.5	0.75	912.1639	201.3509
7118.75	1	1053.276	310
7119	1.25	1177.599	433.2382
7119.25	1.5	1289.995	569.5064
7119.5	1.75	1393.353	717.66
7119.75	2	1489.557	876.8124
7120	2.25	1579.914	1046.25
7120.25	2.5	1665.376	1225.383
7120.5	2.75	1746.661	1413.711
7120.75	3	1824.328	1610.807
7121	3.25	1898.821	1816.296
7121.25	3.5	1970.499	2029.849
7121.5	3.75	2039.66	2251.172
7121.75	4	2106.552	2480
7122	4.25	2171.384	2716.096
7122.25	4.5	2234.336	2959.242
7122.5	4.75	2295.562	3209.239
7122.75	5	2355.197	3465.905
7123	5.25	2413.359	3729.071
7123.25	5.5	2470.152	3998.579
7123.5	5.75	2525.667	4274.285
7123.75	6	2579.989	4556.051
7124	6.25	2633.19	4843.75
7124.25	6.5	2685.338	5137.262
7124.5	6.75	2736.492	5436.474
7124.75	7	2786.707	5741.28
7125	7.25	2836.033	6051.579
7125.25	7.5	2884.516	6367.275
7125.5	7.75	2932.197	6688.277
7125.75	8	2979.115	7014.499
7126	8.25	3025.305	7345.859
7126.25	8.5	3070.801	7682.279
7126.5	8.75	3115.633	8023.683
7126.75	9	3159.828	8370
7127	9.25	3203.414	8721.161
7127.25	9.5	3246.415	9077.1
7127.5	9.75	3288.854	9437.753
7127.75	10	3330.752	9803.061
7128	10.25	3372.129	10172.96
7128.25	10.5	3413.005	10547.41
7128.5	10.75	3453.397	10926.33
7128.75	11	3493.322	11309.69
7129	11.25	3532.796	11697.43
7129.25	11.5	3571.833	12089.5
7129.5	11.75	3610.449	12485.86
7129.75	12	3648.656	12886.46

Appendix D

Reference Material

Please provide SCDBPS page 1,
Section IV pages 40, 49, and VII 51-54
and 58-60 (as applicable)

MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT FOR STERLING RANCH

Prepared For:
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April 12, 2022
Project No. 25188.04

Prepared By:
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(update with revisions)

The comparison between the routed hydrographs at the design points of the MDDP Amendment proposed conditions model and MDDP proposed conditions model shows a more consistent change. Peak runoff rates along the main fork are mostly a few percent higher, with a handful further downstream the reach 14 to 16% higher. The East Fork saw a reduction of peak runoff rates around 60% from the previous model. The total volume of water is consistently 10 to 25% lower than the previous model with a exception of a few places. This is due in part to the changes in detention release rates as well as the previously mentioned differences in how the hydrographs were created. The differences between the two models of when peak runoff occurs were typically within 10 to 15 minutes in each basin and at each node. Tables comparing the MDDP Amendment proposed conditions model with the previous one from the MDDP can be found in **Appendix C.**

The last and most crucial comparison is between the updated existing conditions model and the updated proposed conditions model. As seen in Table 1, all of the online and offline detention shows a clear reduction in flows along Sand Creek. The total volume of runoff is very similar in the undeveloped upper portion of the reach at Design Points 74, 75, and 78. As runoff accumulates downstream at Design Points 73, 71, 69, and 63 the volume of runoff drastically increases due to the increased imperviousness of the adjacent developments, but the peak flow rates remain lower than existing due to all of the full spectrum detention ponds along the reach. As seen in Table 1, Pond W-3 reduces peak flow rates downstream of it at Design Points 60A and 53A to below the pre-development rates seen in the updated existing conditions model. Flows have been reduced from 1969.2 and 2197.2 cfs, respectively, to 1889.4 and 1895.2 cfs. A table comparing the peak runoff rates and the total volume of runoff at the design points can be found in **Appendix C**.

DRAINAGE FACILITY DESIGN

General Concept

The third stated purpose of this MDDP Amendment is an evaluation of the required volume for on-line detention at Sterling Ranch Road (Pond W-3). Along with an on-line detention pond, new culverts are proposed at Sterling Ranch Road and Briargate Parkway being designed by others. The amendment also includes revisions to the existing stock pond north of Sterling Ranch Road, the stock ponds north of Briargate Parkway, and improvements to Sand Creek channel.

Specific Details

Compared to the previous preliminary design of Pond W-3, the amount of storage volume has decreased from 78.2 ac-ft. to 50.6 ac-ft. In order to avoid classification as a jurisdictional dam, the maximum ponding depth is 10 feet. The peak release rate has been increased from 1350.6 cfs to 1552.5 cfs. Despite the increase in release rate, peak flow rates along Sand Creek downstream of the pond are lower than existing. The previous MDDP model outfalls at DP 53A, which is defined as the Full Spectrum Pond at Woodmen Drive, and so does the MDDP Amendment SWMM model. The MDDP model over-detains at Pond W-3 in order to reduce flows downstream well below those in the existing conditions. With the goal being to simply reduce flows to less than predevelopment rates, this amount of detention is unnecessary, hence the reduced storage volume and the increased release rate. A complete comparison between existing and proposed conditions of design flows along Sand Creek can be seen below.

Table 1.

Design Point Comparison Summary						
Location	Design Point ID	Existing (Updated)	Proposed (MDDP)	Proposed (Amendment)	% Difference Amend vs. MDDP	% Difference Amend vs. EX
		Q100 (cfs)				
	DP-74	352.3	262.8	293.76	12%	-17%
	DP-75	970.5	950.5	887.87	-7%	-9%
	DP-78	497.7	385.3	422.09	10%	-15%
	DP-73	1672	1506.7	1497.12	-1%	-10%
Sterling Ranch N BNDY	DP-71	1734.9	1612.2	1642.96	2%	-5%
Briargate Pkwy X'ing	DP-69	1988.4	1775.7	1795.11	1%	-10%
Sterling Ranch S BNDY	DP-63	1980.7	1385.1	1554.72	12%	-22%
Marksheffel X'ing	DP-60A	1969.2	1661.8	1839.17	11%	-7%
Sand Creek and Pond 3	DP-53A	2197.7	1668.9	1843.8	10%	-16%
Near SE Prop Corner	DP-56	242.9	196.4	145.69	-26%	-40%

Conceptually, the current preliminary design for Pond W-3 is similar to what was previously shown in the MDDP. Ponding will occur adjacent to Sterling Ranch Road and pass through an outlet structure before entering the roadway culvert and continuing downstream. The Sterling Ranch Road culvert is currently proposed to be a Conspan arch, O-535 shape (by others).

The existing stock pond upstream of Sterling Ranch Road will remain in place, with flows passing through the pond and leaving through an outlet structure. The major change in how the

Existing Conditions Design Point Peak Flow Rate Summary

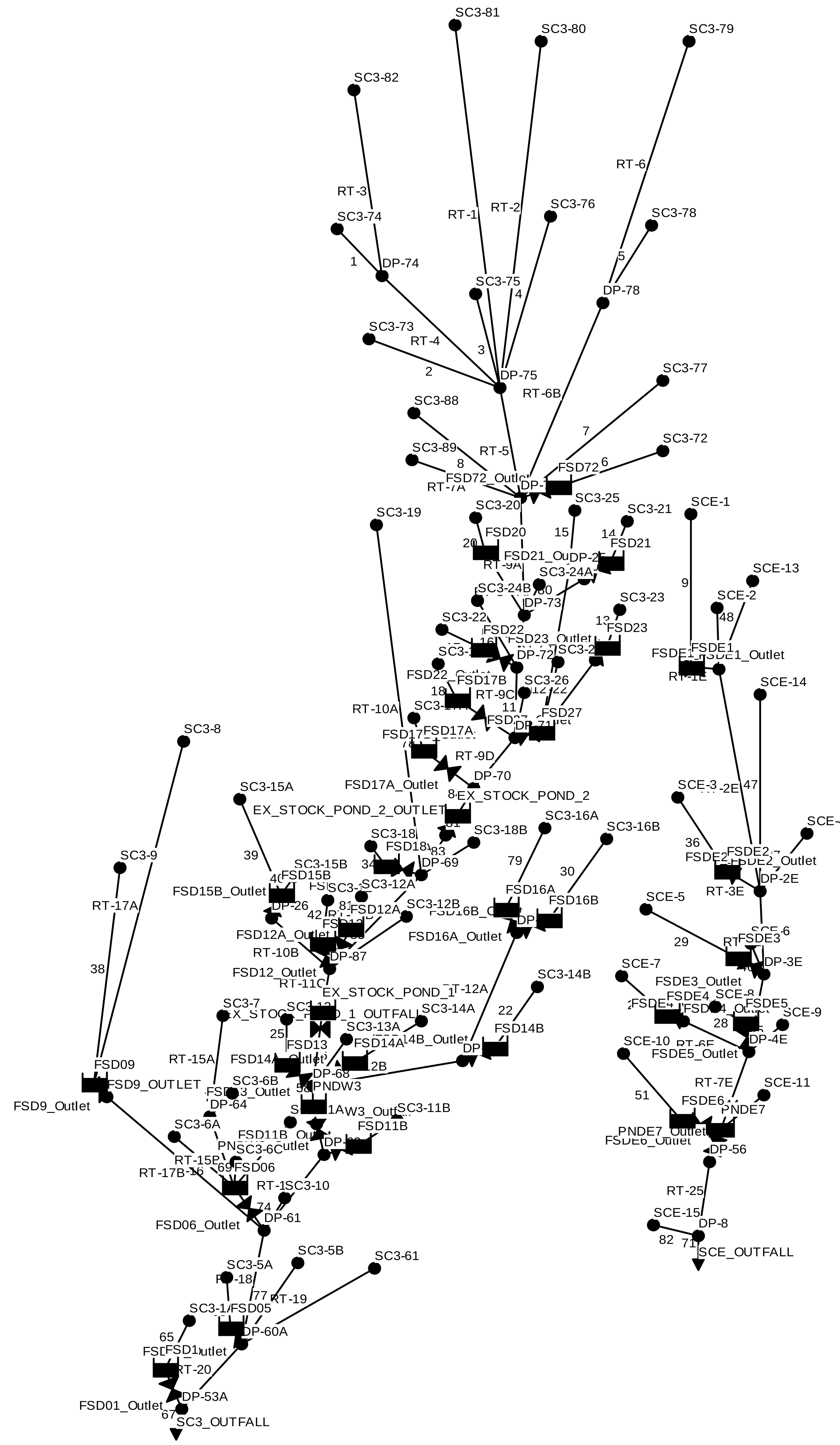
Design Point	MDDP						MDDP Amendment						% Difference					
	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
DP-73	225.9	380.7	618	957	1260.4	1582.3	171.2	503.09	791.79	1033.04	1414.41	1672.0	-32%	24%	22%	7%	11%	5%
DP-71	229.3	388.9	629.7	978.8	1277.3	1637.9	175	518.37	818.24	1068.91	1466.2	1734.9	-31%	25%	23%	8%	13%	6%
DP-69	253	434.8	707.7	1100	1453.3	1870.4	189.69	579.88	923.83	1213.68	1675.53	1988.4	-33%	25%	23%	9%	13%	6%
DP-63	251.4	430.7	713.1	1113.2	1496.2	1911.5	175.18	557.4	899.71	1192.36	1661.58	1980.7	-44%	23%	21%	7%	10%	3%
DP-10	36.5	56	106.4	162.9	220.6	287.2	32.32	93.36	146.19	189.33	255.2	300.1	-13%	40%	27%	14%	14%	4%
DP-9A	55.3	94.3	150.3	227.7	299.5	380.5	31.89	101.87	173.68	232.21	321.39	381.1	-73%	7%	13%	2%	7%	0%
DP-9	52.8	88.8	142.1	214.2	281	351.4	28.73	93.68	160.49	215.19	297.14	351.7	-84%	5%	11%	0%	5%	0%
DP-8A	7.7	15.2	27.1	44.2	60.5	78.4	0.56	17.3	31.43	42.65	59.34	70.5	-1275%	12%	14%	-4%	-2%	-11%
DP-8	24.2	45.1	77.8	124.4	169.5	220.9	1.97	50.28	115.07	167.23	245.12	297.4	-1128%	10%	32%	26%	31%	26%
DP-7	32.4	57.1	97.3	156.1	213.8	277.9	22.38	82.23	143.62	194.75	273.43	326.3	-45%	31%	32%	20%	22%	15%
DP-6	12.2	23.9	43.1	70.9	97	125.2	7.82	24.38	46.12	63.58	89.43	106.6	-56%	2%	7%	-12%	-8%	-17%
DP-5	0.5	1.7	4.5	9.4	14.5	20.5	1.18	9.36	20.8	29.82	42.58	50.9	58%	82%	78%	68%	66%	60%
DP-4	11.6	21.5	37.5	60.9	83.1	107.4	12.95	35.87	65.46	89.09	123.98	147.0	10%	40%	43%	32%	33%	27%
DP-3	1.1	1.8	2.8	4.3	5.6	7.1	0.0	0.69	1.71	2.52	3.71	4.5	-10900%	-161%	-64%	-71%	-51%	-57%
DP-2	4.8	7.9	12.4	18.7	24.5	30.9	0.0	4.41	10.85	15.93	23.17	27.9	-47900%	-79%	-14%	-17%	-6%	-11%
DP-1	5	8.2	13	19.6	25.7	32.2	0.0	4.88	11.82	17.63	25.97	31.5	-49900%	-68%	-10%	-11%	1%	-2%
DP-60A	247.7	430.2	707.1	1113	1496.6	1913.5	167.91	546.35	886.79	1179	1649.04	1969.2	-48%	21%	20%	6%	9%	3%
DP-56	23.2	42.5	71.9	115.6	157.4	202.9	0.35	40.19	96.37	141.51	207.98	242.9	-6529%	-6%	25%	18%	24%	16%
DP-53A	262.1	454	763.2	1196.5	1609.8	2061.5	182.68	602.01	983.58	1311.23	1837.86	2197.7	-43%	25%	22%	9%	12%	6%

Existing Conditions Design Point Total Runoff Volume Summary

Design Point	MDDP						MDDP Amendment						% Difference					
	V_2 (ac-ft)	V_5 (ac-ft)	V_{10} (ac-ft)	V_{25} (ac-ft)	V_{50} (ac-ft)	V_{100} (ac-ft)	V_2 (ac-ft)	V_5 (ac-ft)	V_{10} (ac-ft)	V_{25} (ac-ft)	V_{50} (ac-ft)	V_{100} (ac-ft)	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}
DP-73	40.4	61.5	92.1	134.3	173.1	214.9	19.9	51.9	78.6	101.0	136.3	159.9	-103%	-19%	-17%	-33%	-27%	-34%
DP-71	42.5	64.9	97.1	141.6	182.5	226.6	20.7	54.6	82.6	106.2	143.6	168.5	-105%	-19%	-18%	-33%	-27%	-34%
DP-69	50.7	77.4	116.1	169.4	218.6	271.4	24.0	64.4	98.2	126.4	171.2	201.0	-111%	-20%	-18%	-34%	-28%	-35%
DP-63	54.1	82.5	123.8	180.8	233.3	289.9	25.9	69.7	105.9	136.3	184.4	216.4	-109%	-18%	-17%	-33%	-26%	-34%
DP-10	7.6	11.7	17.6	25.8	33.4	41.6	5.4	12.2	17.9	22.5	29.6	34.4	-41%	4%	1%	-15%	-13%	-21%
DP-9A	9.3	14.1	21.1	30.7	39.4	48.8	3.6	9.4	15.2	20.0	27.5	32.5	-159%	-50%	-39%	-53%	-43%	-50%
DP-9	8.4	12.7	19	27.6	35.5	44	3.0	8.1	13.4	17.7	24.4	28.9	-181%	-56%	-42%	-56%	-45%	-52%
DP-8A	1.3	2.1	3.4	5.2	7	8.9	0.1	1.7	3.2	4.3	6.0	7.1	-2153%	-21%	-8%	-22%	-17%	-25%
DP-8	4.4	7	11.1	16.8	22.3	28.4	0.2	4.9	10.3	14.5	21.0	25.3	-2483%	-43%	-8%	-15%	-6%	-12%
DP-7	6.1	10	15.9	24.3	32.4	41.3	3.1	10.3	17.6	23.6	32.8	39.0	-99%	3%	10%	-3%	1%	-6%
DP-6	2.4	4	6.3	9.6	12.7	16	1.0	2.7	4.8	6.5	9.2	10.9	-142%	-51%	-31%	-47%	-38%	-46%
DP-5	0.2	0.4	0.8	1.4	1.9	2.6	0.1	0.5	1.2	1.7	2.6	3.1	-160%	26%	34%	20%	26%	16%
DP-4	2.6	4.2	6.7	10.2	13.5	17.2	1.6	3.7	6.5	8.7	12.0	14.2	-64%	-12%	-3%	-17%	-12%	-21%
DP-3	0.1	0.2	0.3	0.5	0.6	0.8	0.0	0.1	0.2	0.2	0.3	0.4	-9900%	-231%	-98%	-123%	-79%	-97%
DP-2	0.6	0.9	1.4	2.1	2.7	3.4	0.0	0.3	0.7	1.0	1.5	1.8	-59900%	-236%	-108%	-111%	-82%	-88%
DP-1	0.6	0.9	1.3	1.9	2.5	3.1	0.0	0.2	0.6	0.9	1.4	1.7	-59900%	-263%	-110%	-106%	-83%	-86%
DP-60A	55.3	84.4	126.4	184.8	238.5	296.6	26.1	71.2	108.6	139.6	189.0	221.9	-112%	-19%	-16%	-32%	-26%	-34%
DP-56	4	6.3	9.9	14.9	19.8	25.1	0.1	4.0	8.7	12.6	18.2	22.0	-6352%	-58%	-13%	-19%	-9%	-14%
DP-53A	63	96.4	144.7	211.8	273.9	340.9	31.6	84.1	128.0	164.5	221.9	260.5	-99%	-15%	-13%	-29%	-23%	-31%

APPENDIX C

PROPOSED CONDITIONS HYDRAULIC CALCULATIONS


SC3-81
SC3-80
SC3-79
SC3-82
RT-6
RT-3
RT-1
RT-2
SC3-76
SC3-78
SC3-74
DP-74
SC3-75
DP-78
SC3-73
RT-4
DP-75
RT-6B
SC3-77
SC3-88
SC3-89
RT-5
SC3-72
FSD72
FSD72_Outlet
RT-7A
SC3-20
SC3-25
SC3-21
SC3-19
SCE-1
FSD20
FSD21
RT-9A
SC3-24A
SC3-24B
SCE-13
DP-73
SC3-23
SCE-2
SC3-22
FSD22
FSD23
FSD23_Outlet
DP-72
FSDE1
FSDE1_Outlet
FSD22_Outlet
FSD17B
SC3-26
SCE-14
RT-10A
RT-9C
FSD27
SC3-8
FSD17A
RT-9D
DP-70
FSD17A_Outlet
SC3-15A
EX_STOCK_POND_2
EX_STOCK_POND_2_OUTLET
SCE-3
SCE-4
SC3-16A
SC3-18B
SC3-16B
DP-69
SC3-9
SC3-15B
FSD15B
FSD15B_Outlet
SC3-12A
DP-26
FSD16A
FSD16B
FSD12A
SC3-12B
RT-17A
FSD12A_Outlet
FSD16A_Outlet
RT-10B
DP-87
FSD12_Outlet
SCE-5
FSDE2_Outlet
DP-2E
RT-3E
FSDE3
DP-3E
FSDE3_Outlet
SCE-7
SC3-14B
EX_STOCK_POND_1
SC3-7
SC3-14A
SC3-13A
FSD14B
FSDE4
FSDE5
SCE-9
DP-4E
SCE-10
FSDE5_Outlet
RT-15A
FSD14A
FSD13
FSD14A_Outlet
DP-68
FSD09
FSD9_OUTLET
FSD9_Outlet
SC3-6B
DP-64
SC3-6A
SC3-11B
FSD11B
SC3-6C
FSD06
RT-15B
RT-17B-16
SC3-10
DP-61
FSD06_Outlet
RT-7E
SCE-11
FSDE6
PNDE7
PNDE7_Outlet
FSDE6_Outlet
DP-56
RT-25
SCE-15
DP-8
SCE_OUTFALL
SC3-5B
SC3-61
SC3-5A
RT-18
RT-19
FSD05
DP-60A
RT-20
FSD01_Outlet
DP-53A
SC3_OUTFALL

Existing vs. Proposed Peak Flow Rate Design Point Summary

Design Point	Existing Q_2 (cfs)	Proposed Q_2 (cfs)	% Difference	Existing Q_5 (cfs)	Proposed Q_5 (cfs)	% Difference	Existing Q_{10} (cfs)	Proposed Q_{10} (cfs)	% Difference	Existing Q_{25} (cfs)	Proposed Q_{25} (cfs)	% Difference	Existing Q_{50} (cfs)	Proposed Q_{50} (cfs)	% Difference	Existing Q_{100} (cfs)	Proposed Q_{100} (cfs)	% Difference
DP-73	171.20	147.29	-14%	503.09	442.62	-12%	791.79	703.56	-11%	1033.04	919.74	-11%	1414.41	1257.44	-11%	1672.0	1497.12	-10%
DP-71	175.00	154.76	-12%	518.37	475.49	-8%	818.24	773.89	-5%	1068.91	1022.86	-4%	1466.2	1389.51	-5%	1734.9	1642.96	-5%
DP-69	189.69	158.17	-17%	579.88	521.37	-10%	923.83	855.08	-7%	1213.68	1134.95	-6%	1675.53	1532.12	-9%	1988.4	1795.11	-10%
DP-63	175.18	136.83	-22%	557.4	404.27	-27%	899.71	684.34	-24%	1192.36	940.16	-21%	1661.58	1293.98	-22%	1980.7	1554.72	-22%
DP-60A	167.91	150.16	-11%	546.35	456.15	-17%	886.79	769.88	-13%	1179	1056.06	-10%	1649.04	1471.37	-11%	1969.2	1839.17	-7%
DP-53A	182.68	150.2	-18%	602.01	456.7	-24%	983.58	772.23	-21%	1311.23	1058.86	-19%	1837.86	1474.82	-20%	2197.7	1843.8	-16%
DP-56	0.35	25.44	7169%	40.19	46.04	15%	96.37	68.58	-29%	141.51	85.35	-40%	207.98	124.7	-40%	242.9	145.69	-40%
DP-8	1.97	27.54	1298%	50.28	49.4	-2%	115.07	72.24	-37%	167.23	90.17	-46%	245.12	125.47	-49%	297.4	147.14	-51%

Existing vs. Proposed Total Runoff Volume Design Point Summary

Design Point	Existing V_2 (ac-ft)	Proposed V_2 (ac-ft)	% Difference	Existing V_5 (ac-ft)	Proposed V_5 (ac-ft)	% Difference	Existing V_{10} (ac-ft)	Proposed V_{10} (ac-ft)	% Difference	Existing V_{25} (ac-ft)	Proposed V_{25} (ac-ft)	% Difference	Existing V_{50} (ac-ft)	Proposed V_{50} (ac-ft)	% Difference	Existing V_{100} (ac-ft)	Proposed V_{100} (ac-ft)	% Difference
DP-73	19.9	20.62	4%	51.9	52.17	1%	78.6	78.56	0%	101.0	100.66	0%	136.3	135.64	0%	159.9	158.97	-1%
DP-71	20.7	27.13	31%	54.6	63.22	16%	82.6	93.29	13%	106.2	118.46	12%	143.6	158.05	10%	168.5	184.75	10%
DP-69	24.0	29.52	23%	64.4	71.50	11%	98.2	106.18	8%	126.4	134.42	6%	171.2	178.30	4%	201.0	207.46	3%
DP-63	25.9	59.84	131%	69.7	126.74	82%	105.9	182.60	72%	136.3	228.02	67%	184.4	298.29	62%	216.4	343.71	59%
DP-60A	26.1	87.77	236%	71.2	173.08	143%	108.6	244.90	125%	139.6	302.90	117%	189.0	392.82	108%	221.9	451.12	103%
DP-53A	31.6	88.38	180%	84.1	174.00	107%	128.0	246.12	92%	164.5	304.74	85%	221.9	395.88	78%	260.5	454.19	74%
DP-56	0.1	31.61	50890%	4.0	46.65	1069%	8.7	60.15	588%	12.6	71.81	472%	18.2	89.30	391%	22.0	100.97	359%
DP-8	0.2	32.84	19179%	4.9	48.49	894%	10.3	62.91	514%	14.5	74.88	415%	21.0	93.29	344%	25.3	105.88	318%

MDDP Proposed vs. Amendment Proposed Peak Flow Rate Basin Summary

Basin	MDDP Q_2 (cfs)	Amend Q_2 (cfs)	% Difference	MDDP Q_5 (cfs)	Amend Q_5 (cfs)	% Difference	MDDP Q_{10} (cfs)	Amend Q_{10} (cfs)	% Difference	MDDP Q_{25} (cfs)	Amend Q_{25} (cfs)	% Difference	MDDP Q_{50} (cfs)	Amend Q_{50} (cfs)	% Difference	MDDP Q_{100} (cfs)	Amend Q_{100} (cfs)	% Difference
SC3-1A	16.3	15.4	-6%	23.3	32.05	38%	33	44.63	35%	45.8	54.22	18%	57.1	68.02	19%	68.9	77.21	12%
SC3-5A	40.6	48.38	19%	53.7	75.2	40%	71	95.88	35%	92.4	112.35	22%	110.6	135.5	23%	129.1	150.82	17%
SC3-5B	53.8	60.26	12%	73	97.13	33%	98.5	126.36	28%	130.8	149	14%	158.6	181.48	14%	187	203.13	9%
SC3-6A	61.4	59.98	-2%	79.3	84.21	6%	102.2	106.32	4%	130.1	123.77	-5%	153.6	149.06	-3%	177.1	165.69	-6%
SC3-6B	32.9	31.63	-4%	43.4	49.78	15%	57	63.88	12%	73.9	74.85	1%	88.2	90.7	3%	102.7	101.25	-1%
SC3-6C	53.9	52.26	-3%	72.5	84.02	16%	97.1	115.61	19%	128	140.03	9%	154.5	174.32	13%	181.5	196.64	8%
SC3-7	54	60.94	13%	69.9	87.91	26%	90.3	109.28	21%	115.2	126.05	9%	136.2	150.45	10%	157.2	166.71	6%
SC3-8	25.4	12.18	-52%	42.1	56.41	34%	66.7	93.96	41%	100.7	122.75	22%	132.3	166.13	26%	166.2	195.44	18%
SC3-9	45.8	24.66	-46%	71.5	73.44	3%	108.6	114.01	5%	158.9	146.06	-8%	204.9	193.77	-5%	254	225.81	-11%
SC3-10	7.6	2.94	-61%	12.3	14.36	17%	19.4	23.62	22%	29.1	30.77	6%	38	41.33	9%	47.7	48.66	2%
SC3-11A	5.3	1.99	-62%	7.8	5.36	-31%	11.3	8.05	-29%	15.9	10.06	-37%	20	13.08	-35%	24.3	15.09	-38%
SC3-11B	59.4	79.84	34%	81.3	116.98	44%	110.8	148.27	34%	148.1	172.72	17%	180.5	208.2	15%	213.7	231.81	8%
SC3-12	77.8	47.61	-39%	105.6	71.53	-32%	142.5	91.34	-36%	189.1	106.54	-44%	229.1	129.44	-44%	270	144.67	-46%
SC3-12A		15.01			24.03			31.22			36.66			44.86			50.3	
SC3-12B		1.38			4.03			6.23			8.01			10.7			12.51	
SC3-13	43.9	56.24	28%	57.8	80.96	40%	76.5	100.72	32%	98.5	115.86	18%	117.6	138.53	18%	136.9	153.6	12%
SC3-13A		2.61			7.62			11.81			15.18			20.28			23.7	
SC3-14A	127.6	137.91	8%	175.4	201.61	15%	239.8	260.35	9%	321.9	307.16	-5%	393.2	373.37	-5%	466.3	417.25	-11%
SC3-14B	24.6	77.46	215%	34.3	109.84	220%	47.4	139.54	194%	64.2	162.93	154%	79	196.7	149%	94.1	218.85	133%
SC3-15A	21.6	13.21	-39%	35.5	38.41	8%	56.3	59.28	5%	85.3	76.32	-11%	112.1	102.43	-9%	141	119.86	-15%
SC3-15B	10.8	8.38	-22%	14	12.29	-12%	18.2	15.45	-15%	23.3	17.9	-23%	27.6	21.56	-22%	31.9	24	-25%
SC3-16A	84.4	206.37	145%	120.4	292.54	143%	170	371.39	118%	234.8	434.23	85%	292.2	523.16	79%	351.8	582.23	66%
SC3-16B	39	60.38	55%	53.7	82.91	54%	73.6	103.49	41%	99	119.96	21%	121.1	143.94	19%	143.8	159.74	11%
SC3-17A	41.8	27.45	-34%	59.6	42.18	-29%	85.2	54.03	-37%	119	63.03	-47%	149.1	76.6	-49%	180.6	85.6	-53%
SC3-17B		34.53			50.54			63.5			73.46			88.39			98.33	
SC3-18	49.3	22.75	-54%	67.1	32.96	-51%	91	41.34	-55%	121.2	47.83	-61%	147.3	57.56	-61%	174	64.05	-63%
SC3-18B		1.53			4.45			6.89			8.86			11.91			13.95	
SC3-19	28.8	28	-3%	47.7	78.96	66%	75.7	120.84	60%	114.4	154.22	35%	150.2	205.45	37%	188.8	239.67	27%
SC3-20	9.9	9.29	-6%	15.5	21.02	36%	23.8	30.73	29%	35.1	38.5	10%	45.5	50.17	10%	56.6	57.99	2%
SC3-21	7	9.77	40%	10.8	20.68	91%	16.3	29.45	81%	23.7	36.03	52%	30.4	45.92	51%	37.5	52.53	40%
SC3-22	9.4	7.15	-24%	14.8	16.35	10%	22.5	24.05	7%	32.9	30.08	-9%	42.5	39.14	-8%	52.6	45.22	-14%
SC3-23	5.5	10.92	99%	8.3	22.1	166%	12.4	31.23	152%	18	38.2	112%	23	48.72	112%	28.4	55.73	96%
SC3-24A	13	6.43	-51%	20.4	15.26	-25%	31.1	22.51	-28%	45.7	28.3	-38%	59	37.09	-37%	73.2	42.98	-41%
SC3-24B	3.4	1.95	-43%	5.3	4.78	-10%	8.1	7.12	-12%	11.8	8.98	-24%	15.2	11.76	-23%	18.9	13.62	-28%
SC3-25	5.8	5.58	-4%	8.9	12.02	35%	13.4	17.2	28%	19.5	21.1	8%	25.1	26.97	7%	31	30.9	0%
SC3-26	2.5	1.66	-34%	4	4.37	9%	6.2	6.61	7%	9.2	8.4	-9%	12.1	11.13	-8%	15.1	12.95	-14%
SC3-27	35.1	14.49	-59%	51.2	27.87	-46%	73.8	39.1	-47%	103.7	48.09	-54%	130.3	61.8	-53%	158.3	70.95	-55%
SC3-61	13.7	5.61	-59%	22	22.4	2%	34.4	36.4	6%	51.6	47.4	-8%	67.6	63.67	-6%	84.8	74.61	-12%
SC3-72	12.8	9.55	-25%	20.2	23.84	18%	31.4	35.61	13%	46.7	44.98	-4%	60.9	59.19	-3%	76	68.7	-10%
SC3-73	16.4	12.16	-26%	26.4	33.03	25%	41.3	50.14	21%	62.1	63.84	3%	81.3	84.94	4%	102	99.04	-3%
SC3-74	22.3	22.51	1%	36.5	53.27	46%	57.3	79.1	38%	85.9	99.77	16%	112.3	131.03	17%	140.7	151.94	8%
SC3-75	13.1	11.12	-15%	21.5	26.37	23%	33.7	38.98	16%	50.5	49.21	-3%	66.1	64.91	-2%	82.8	75.41	-9%
SC3-76	14.2	10.85	-24%	23.1	27.09	17%	36.4	40.54	11%	54.6	51.45	-6%	71.4	68.18	-5%	89.6	79.38	-11%
SC3-77	16.6	8.93	-46%	27.6	27.11	-2%	43.8	42.16	-4%	66.2	54.46	-18%	87	73.59	-15%	109.4	86.36	-21%
SC3-78	28.1	32.29	15%	45.3	77.46	71%	70.6	114.83	63%	106.2	144.42	36%	139.1	189.21	36%	174.5	219.17	26%
SC3-79	34.9	32.26	-8%	57	82.54	45%	89.5	123.52	38%	134.3	156.01	16%	175.6	205.95	17%	220.1	239.34	9%
SC3-80	27.3	22.36	-18%	44.3	57.34	29%	69.6	86.09	24%	104.5	109.14	4%	136.8	144.5	6%	171.4	168.15	-2%
SC3-81	42.6	26.67	-37%	70.2	81	15%	111	125.85	13%	167.4	162.22	-3%	219.6	218.65	0%	275.7	256.32	-7%
SC3-82	20	17.01	-15%	33.2	50.83	53%	52.8	79.48	51%	80	102.02	28%	105.1	136.18	30%	132.3	158.98	20%
SC3-88	10.5	6.28	-40%	17.4	18.99	9%	27.6	29.44	7%	41.8	37.84	-9%	54.9	50.8	-7%	69	59.46	-14%
SC3-89	6.1	2.86	-53%	10	8.64	-14%	15.7	13.39	-15%	23.6	17.14	-27%	30.8	22.87	-26%	38.6	26.69	-31%
SCE-1	23.3	9.82	-58%	35.9	21.3	-41%	53.8	30.85	-43%	79.1	38.58	-51%	102.4	50.51	-51%	127.4	58.52	-54%
SCE-2	4.4	1.42	-68%	7	3.35	-52%	10.8	4.95	-54%	15.9	6.27	-61%	20.7	8.3	-60%	25.7	9.66	-62%
SCE-3	30.6	9.63	-69%	45.2	19.25	-57%	65.9	28.62	-57%	93.3	36.11	-61%	118	47.22	-60%	143.9	54.72	-62%
SCE-4	13.3	4.16	-69%	19.6	7.52	-62%	28.6	10.35	-64%	40.6	12.67	-69%	257.8	16.29	-94%	62.6	18.71	-70%
SCE-5	100.4	95.82	-5%	130.6	133.18	2%	169.6	168.48	-1%	217.4	197.05	-9%	257.8	238.47	-7%	298.4	265.69	-11%
SCE-6	1.6	0.18	-89%	2.5	0.55	-78%	3.7	1.03	-72%	5.4	1.42	-74%	7	2	-71%	8.6	2.39	-72%
SCE-7	58.9	39.33	-33%	75.5	54.94	-27%	96.6	67.52	-30%	122.2	77.22	-37%	143.7	91.69	-36%	165.2	101.34	-39%
SCE-8	38.6	47.1	22%	48.4	61.37	27%	60.7	73.41	21%	75.4	82.94	10%	87.7	97.16	11%	99.9	106.61	7%
SCE-9	1.5	0.22	-85%	2.4	0.68	-72%	3.6	1.27	-65%	5.3	1.75	-67%	6.8	2.46	-64%	8.5	2.94	-65%
SCE-10	7.6	107.37	1313%	189.4	167.39	-12%	19.4	232.98	1101%	29.1	286.58	885%	398.9	362.01	-9%	467.5	411.15	-12%
SCE-11	2.3	0.77	-67%	3.6	2.52	-30%	5.5	4.75	-14%	8	6.5	-19%	10.3	8.93	-13%	12.8	10.51	-18%
SCE-13	19.6	10.9	-44%	31.3	25.85	-17%	48.7	38.21	-22%	73.1	48.24	-34%	95.7	63.64	-34%	120	73.94	-38%
SCE-14	13.2	8	-39%	21.2	19.04	-10%	33.3	28.21	-15%	49.9	35.59	-29%	65.2	46.77	-28%	81.7	54.26	-34%
SCE-15	2.2	13.6	518%	5.1	27.2	433%	10.1	38.53	281%	17.7	47.35	168%	25.1	60.67	142%	35.4	69.54	96%

MDDP Proposed vs. Amendment Proposed Peak Flow Rate Design Point Summary																		
Design Point	MDDP Q_2 (cfs)	Amend Q_2 (cfs)	% Difference	MDDP Q_5 (cfs)	Amend Q_5 (cfs)	% Difference	MDDP Q_{10} (cfs)	Amend Q_{10} (cfs)	% Difference	MDDP Q_{25} (cfs)	Amend Q_{25} (cfs)	% Difference	MDDP Q_{50} (cfs)	Amend Q_{50} (cfs)	% Difference	MDDP Q_{100} (cfs)	Amend Q_{100} (cfs)	% Difference
DP-74	39.3	33.68	-14%	65.3	94.55	45%	104.8	145.74	39%	158.9	187.2	18%	209.1	251.03	20%	262.8	293.76	12%
DP-75	141.2	95.13	-33%	235.1	274.57	17%	376.6	427.98	14%	566.6	555.2	-2%	750.9	754.29	0%	950.5	887.87	-7%
DP-77	209.9	144.08	-31%	351.9	426.57	21%	580.6	672.84	16%	886.6	877.81	-1%	1168.4	1201.19	3%	1467.7	1423.89	-3%
DP-78	59.7	52.82	-12%	98.4	138.33	41%	154	210.37	37%	232.6	269.64	16%	306.2	360.98	18%	385.3	422.09	10%
DP-73	207.5	147.29	-29%	354.3	442.62	25%	588.5	703.56	20%	897.1	919.74	3%	1187.2	1257.44	6%	1506.7	1497.12	-1%
DP-72	206.2	148.04	-28%	352.5	450.6	28%	586.7	718.24	22%	897.2	939.53	5%	1195.3	1285.42	8%	1518.6	1527.19	1%
DP-71	205.9	154.76	-25%	349.3	475.49	36%	610.5	773.89	27%	932.4	1022.86	10%	1226.9	1389.51	13%	1612.2	1642.96	2%
DP-70	205.3	155.07	-24%	349.8	480.21	37%	614	783.11	28%	940.1	1035.54	10%	1260.6	1408.68	12%	1636.7	1665.91	2%
DP-69	212.7	158.17	-26%	366.6	521.37	42%	653.7	855.08	31%	1010.6	1134.95	12%	1364.1	1532.12	12%	1775.7	1795.11	1%
DP-87	216.9	151.73	-30%	374.6	531.49	42%	681.9	884.92	30%	1072.1	1181.68	10%	1471.5	1613.16	10%	1905.9	1903.95	0%
DP-68	214.6	101.57	-53%	374.5	467.33	25%	714.9	897.95	26%	1187.6	1286.67	8%	1674.9	1785.56	7%	2204.1	2095.47	-5%
DP-64	85.9	91.34	6%	112.1	135.67	21%	145.9	170.56	17%	187.5	198.05	6%	222.6	238.16	7%	258	264.76	3%
DP-63	154.4	136.83	-11%	201	404.27	101%	375.7	684.34	82%	815.9	940.16	15%	1112.1	1293.98	16%	1385.1	1554.72	12%
DP-61	156.6	140.26	-10%	223.9	448.63	100%	428	758.6	77%	928.2	1042.07	12%	1287.3	1451.8	13%	1620.1	1816.26	12%
DP-60A	161.6	150.16	-7%	224.8	456.15	103%	439.1	769.88	75%	950.4	1056.06	11%	1320.5	1471.37	11%	1661.8	1839.17	11%
DP-53A	161.6	150.2	-7%	225.7	456.7	102%	441.8	772.23	75%	951.1	1058.86	11%	1326	1474.82	11%	1668.9	1843.8	10%
DP-1E	23.9	12.41	-48%	38.3	29.33	-23%	70.1	43.32	-38%	132.8	54.71	-59%	173	72.19	-58%	220.9	83.88	-62%
DP-2E	48.9	25	-49%	76.8	56.23	-27%	123	82.03	-33%	228.7	103.33	-55%	319.7	135.61	-58%	419.4	157.53	-62%
DP-3E	48.5	28	-42%	75.7	60.94	-19%	122.2	88.92	-27%	271.1	116.05	-57%	387.1	175.35	-55%	500.1	221.76	-56%
DP-4E	48.1	29.8	-38%	76.2	64.13	-16%	122.4	93.94	-23%	286.9	122.72	-57%	407.3	184.86	-55%	534.8	230.91	-57%
DP-56	23.1	25.44	10%	35.3	46.04	30%	71.5	68.58	-4%	108.3	85.35	-21%	152.1	124.7	-18%	196.4	145.69	-26%
DP-8	24.1	27.54	14%	37.2	49.4	33%	73.5	72.24	-2%	111.3	90.17	-19%	155.4	125.47	-19%	200.7	147.14	-27%
DP-21	0.6	84.32	13953%	8.8	145.61	1555%	17.8	175.84	888%	57.1	176.17	209%	116.8	176.17	51%	174.9	176.17	1%
DP-22	0.6	65.06	10743%	8.8	126.55	1338%	17.6	156.5	789%	56.8	156.5	176%	105.1	156.5	49%	156.4	156.5	0%
DP-25	5.9	5.58	-5%	9.1	12.02	32%	16.3	17.2	6%	35.1	21.1	-40%	46.4	26.97	-42%	58.2	30.9	-47%
DP-26	0.1	0.74	640%	1.1	9.32	747%	3.2	19.8	519%	7.3	32.37	343%	9.5	53.15	459%	12	68.04	467%
EX_STOCK_POND_1		141.53			512.56			860.4			1154.93			1590.6			1874.89	
EX_STOCK_POND_2		155.07			480.21			783.11			1035.54			1408.68			1665.91	
PNDE7	46.5	33.49	-28%	75.4	70.68	-6%	121.2	103.63	-14%	285.2	134.94	-53%	402.4	212.81	-47%	548	269.11	-51%
PNDW3	214.6	101.57	-53%	374.5	467.33	25%	714.9	897.95	26%	1187.6	1286.68	8%	1674.9	1785.56	7%	2204.1	2095.47	-5%

MDDP Proposed vs. Amendment Total Runoff Volume Proposed Design Point Summary

Design Point	MDDP V_2 (ac-ft)	Amend V_2 (ac-ft)	% Difference	MDDP V_5 (ac-ft)	Amend V_5 (ac-ft)	% Difference	MDDP V_{10} (ac-ft)	Amend V_{10} (ac-ft)	% Difference	MDDP V_{25} (ac-ft)	Amend V_{25} (ac-ft)	% Difference	MDDP V_{50} (ac-ft)	Amend V_{50} (ac-ft)	% Difference	MDDP V_{100} (ac-ft)	Amend V_{100} (ac-ft)	% Difference
DP-74	5.9	3.03	-49%	9	7.67	-15%	13.6	11.57	-15%	19.8	14.82	-25%	25.5	20.04	-21%	31.6	23.51	-26%
DP-75	22.7	11.05	-51%	34.5	28.82	-16%	51.7	43.58	-16%	75.4	56.16	-26%	97.1	75.80	-22%	120.5	89.00	-26%
DP-77	37.7	18.84	-50%	57.4	48.49	-16%	85.9	73.04	-15%	125.1	93.91	-25%	161.1	126.74	-21%	199.9	148.53	-26%
DP-78	8.9	4.91	-45%	13.5	11.69	-13%	20.1	17.40	-13%	29.3	22.25	-24%	37.7	29.86	-21%	46.7	34.99	-25%
DP-73	40	20.62	-48%	60.8	52.17	-14%	91	78.56	-14%	132.5	100.66	-24%	170.7	135.64	-21%	211.7	158.97	-25%
DP-72	41.3	21.30	-48%	62.9	53.71	-15%	94	80.71	-14%	136.8	103.42	-24%	176.2	139.33	-21%	218.5	163.26	-25%
DP-71	46.3	27.13	-41%	70	63.22	-10%	104.3	93.29	-11%	151.3	118.46	-22%	194.5	158.05	-19%	240.8	184.75	-23%
DP-70	49.5	29.25	-41%	74.5	66.29	-11%	110.6	96.98	-12%	160.1	122.75	-23%	205.4	163.26	-21%	254	190.58	-25%
DP-69	57.5	29.52	-49%	86.1	71.50	-17%	127.4	106.18	-17%	183.8	134.42	-27%	235.3	178.30	-24%	290.6	207.46	-29%
DP-87	66.5	35.91	-46%	98.9	83.17	-16%	145.6	122.45	-16%	209.1	154.36	-26%	267.1	204.08	-24%	329.1	236.92	-28%
DP-68	81.8	53.09	-35%	123.7	117.23	-5%	183.9	170.94	-7%	264.9	214.82	-19%	338	282.34	-16%	415.8	328.37	-21%
DP-64	7	7.58	8%	9.1	10.25	13%	11.8	12.52	6%	15.2	14.33	-6%	18.1	17.03	-6%	21.1	18.87	-11%
DP-63	85.6	59.84	-30%	129.5	126.74	-2%	192.3	182.60	-5%	276.7	228.02	-18%	352.8	298.29	-15%	433.5	343.71	-21%
DP-61	103.7	79.18	-24%	157.8	159.89	1%	235.1	227.71	-3%	338.4	282.95	-16%	431.3	368.26	-15%	529.8	423.50	-20%
DP-60A	111	87.77	-21%	168.6	173.08	3%	250.4	244.90	-2%	359.5	302.90	-16%	457.7	392.82	-14%	561.5	451.12	-20%
DP-53A	112	88.38	-21%	170	174.00	2%	252.6	246.12	-3%	362.6	304.74	-16%	461.7	395.88	-14%	566.5	454.19	-20%
DP-1E	3.1	2.48	-20%	5.2	5.19	0%	8.4	7.73	-8%	12.7	10.00	-21%	16.6	13.56	-18%	20.9	15.96	-24%
DP-2E	6.1	6.20	2%	10.4	11.94	15%	16.9	17.25	2%	25.7	21.76	-15%	33.7	28.79	-15%	42.2	33.45	-21%
DP-3E	7	15.38	120%	13.7	24.24	77%	23.4	32.53	39%	36.1	39.28	9%	47.4	49.72	5%	59.3	56.77	-4%
DP-4E	7.6	21.67	185%	15.6	32.53	109%	27.2	42.35	56%	43	50.64	18%	57.2	63.22	11%	72	71.81	0%
DP-56	7.7	31.61	311%	16.1	46.65	190%	28.6	60.15	110%	51.3	71.81	40%	71.7	89.30	25%	92.9	100.97	9%
DP-8	8	32.84	310%	16.7	48.49	190%	26.6	62.91	137%	53	74.88	41%	74	93.29	26%	95.9	105.88	10%
DP-21	6.3	20.47	225%	11.3	31.00	174%	18.3	39.90	118%	27.5	47.26	72%	35.6	58.31	64%	44	65.67	49%
DP-22	6.3	16.08	155%	10.7	24.40	128%	16.7	31.61	89%	24.6	37.13	51%	31.5	46.03	46%	38.7	51.56	33%
DP-25	1.3	0.31	-76%	1.9	0.61	-68%	2.8	0.87	-69%	4.1	1.08	-74%	5.2	1.42	-73%	6.4	1.65	-74%
DP-26	0.7	2.01	188%	0.9	4.73	425%	1.2	7.03	486%	1.5	8.93	495%	1.8	11.97	565%	2.1	13.99	566%

Summary of Peak Discharges						
Design Point 75						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	141	235	377	567	751	951
2021 Existing Cond. (cfs)						971
2018 Developed Cond. (cfs)	141	235	377	567	751	951
2021 Developed Cond. (cfs)	95	275	428	555	754	888
Design Point 77						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	n/a	n/a	n/a	n/a	n/a	n/a
2021 Existing Cond. (cfs)						
2018 Developed Cond. (cfs)	210	352	581	887	1168	1468
2021 Developed Cond. (cfs)	144	428	674	880	1204	1423
1996 DBPS Existing Cond. (cfs)						2193
1996 DBPS Developed Cond. (cfs)						2262
Design Point 73						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	226	381	618	957	1260	1582
2021 Existing Cond. (cfs)						1672
2018 Developed Cond. (cfs)	208	354	589	897	1187	1507
2021 Developed Cond. (cfs)	147	442	703	919	1258	1497
Design Point 71						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	229	389	630	979	1277	1638
2021 Existing Cond. (cfs)						1735
2018 Developed Cond. (cfs)	206	349	611	932	1227	1612
2021 Developed Cond. (cfs)	150	482	776	1018	1379	1643
Design Point 69						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	253	435	708	1100	1453	1870
2021 Existing Cond. (cfs)						1988
2018 Developed Cond. (cfs)	213	367	654	1011	1364	1776
2021 Developed Cond. (cfs)	153	536	871	1149	1564	1795
Design Point 68						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	n/a	n/a	n/a	n/a	n/a	n/a
2021 Existing Cond. (cfs)						
2018 Developed Cond. w/o Pnd (cfs)	215	375	715	1188	1675	2204
2021 Developed Cond. (cfs)						
2018 Developed w/Pnd (cfs) Pnd W3	154	200	367	800	1086	1351
2021 Developed Cond. w/ Pnd(cfs)	98	513	952	1336	1863	2095
Design Point 63						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	251	431	713	1113	1496	1912
2021 Existing Cond. (cfs)						1981
2018 Developed Cond. w/o Pnd (cfs)	213	373	721	1198	1705	2237
2018 Developed w/Pnd (cfs)	154	201	376	816	1112	1385
2021 Developed Cond. w/ Pnd(cfs)	130	432	723	981	1348	1554
2011 Wilson (cfs)			1066			1791
1996 DBPS Existing Cond. (cfs)						2508
1996 DBPS Developed Cond. (cfs)						2689
Design Point 61						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	n/a	n/a	n/a	n/a	n/a	n/a
2018 Developed Cond. w/o Pnd (cfs)	214	375	783	1370	1967	2607
2018 Developed w/Pnd (cfs)	157	224	428	928	1287	1620
2021 Developed Cond. w/ Pnd(cfs)						1816
2011 Wilson (cfs)			1232			2087
Design Point 60a						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	248	430	707	1113	1497	1914
2021 Existing Cond. (cfs)						1969
2018 Developed Cond. w/o Pnd (cfs)	216	378	795	1395	2004	2645
2018 Developed w/Pnd (cfs)	162	225	439	950	1321	1662
2021 Developed Cond. w/ Pnd(cfs)	133	480	802	1091	1518	1839
2011 Wilson (cfs)			1265			2133
1996 DBPS Existing Cond. (cfs)						2629
1996 DBPS Developed Cond. (cfs)						3295
Design Point 53a						
Storm Event (YR)	2	5	10	25	50	100
2016 Existing Cond. (cfs)	262	454	763	1197	1610	2062
2021 Existing Cond. (cfs)						2198
2018 Developed Cond. w/o Pnd (cfs)	215	378	792	1392	2009	2657
2018 Developed w/Pnd (cfs)	162	226	442	951	1326	1669
2021 Developed Cond. w/ Pnd(cfs)	142	488	817	1109	1542	1843

APPENDIX D

REFERENCE MATERIAL

STERLING RANCH
RETENTION POND VOLUME

(Pond Volume Calculation)

BIG POND

Elevation	SF	CF	Storage AF	Storage Sum
7028	0.00	-		0
7030	53,785.00	53,785.00	1.23	1.23
7032	70,507.00	124,292.00	2.85	4.09
7034	87,672.00	158,179.00	3.63	7.72
7036	109,612.00	197,284.00	4.53	12.25

Total = 533,540 CF

Total = 12.25 Ac-ft

At Elevation 7035, the Storage is 9.98 Ac-ft.
At Elevation 7034, the Storage is 7.72 Ac-ft.

Calculated by: VAS

Date: 4/21/2016

Checked by: VAS

STERLING RANCH

"BIG POND"

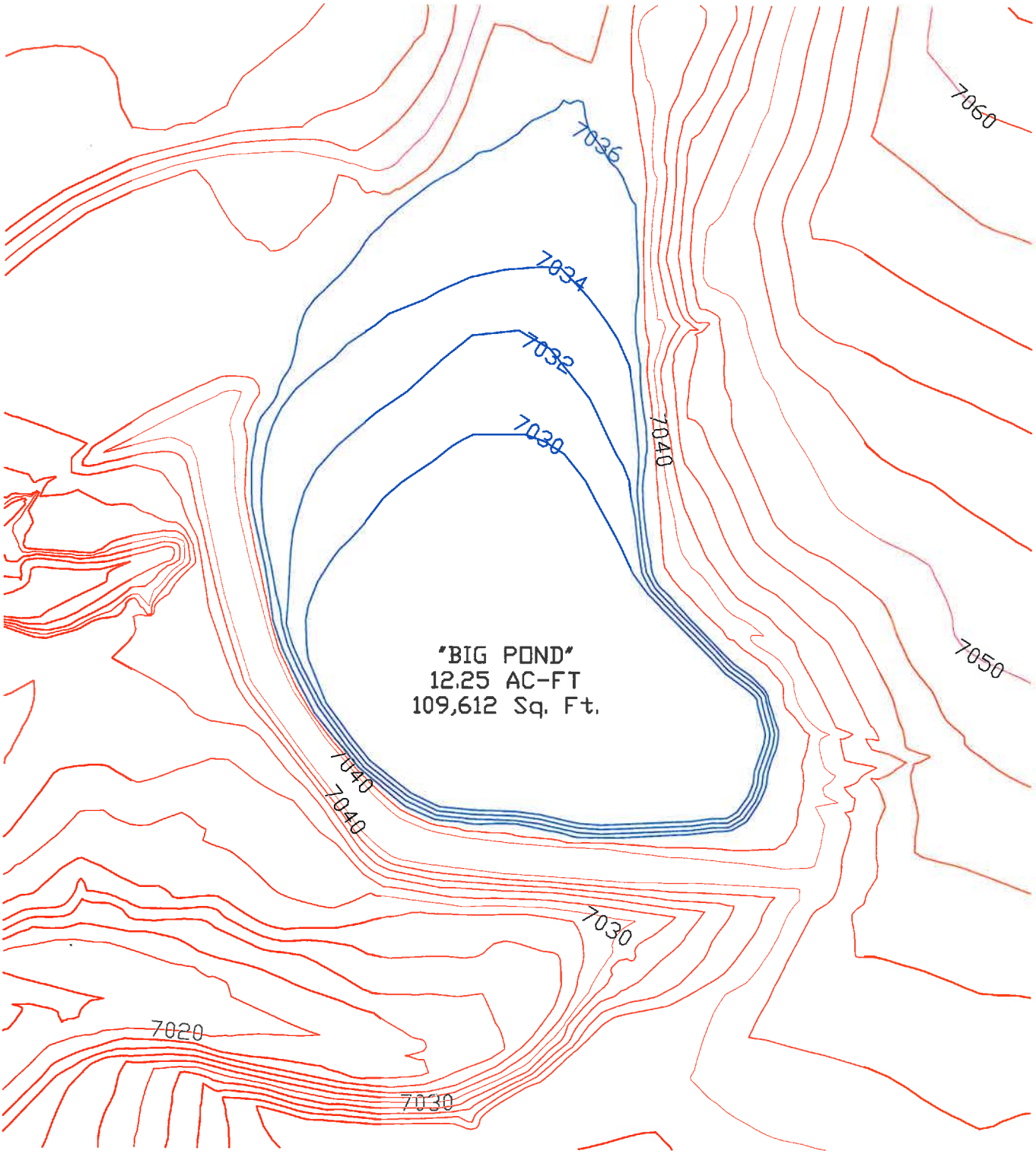


EXHIBIT
STERLING RANCH
JOB NO. 09-001
DATE PREPARED: 4-25-16
DATE REVISED:

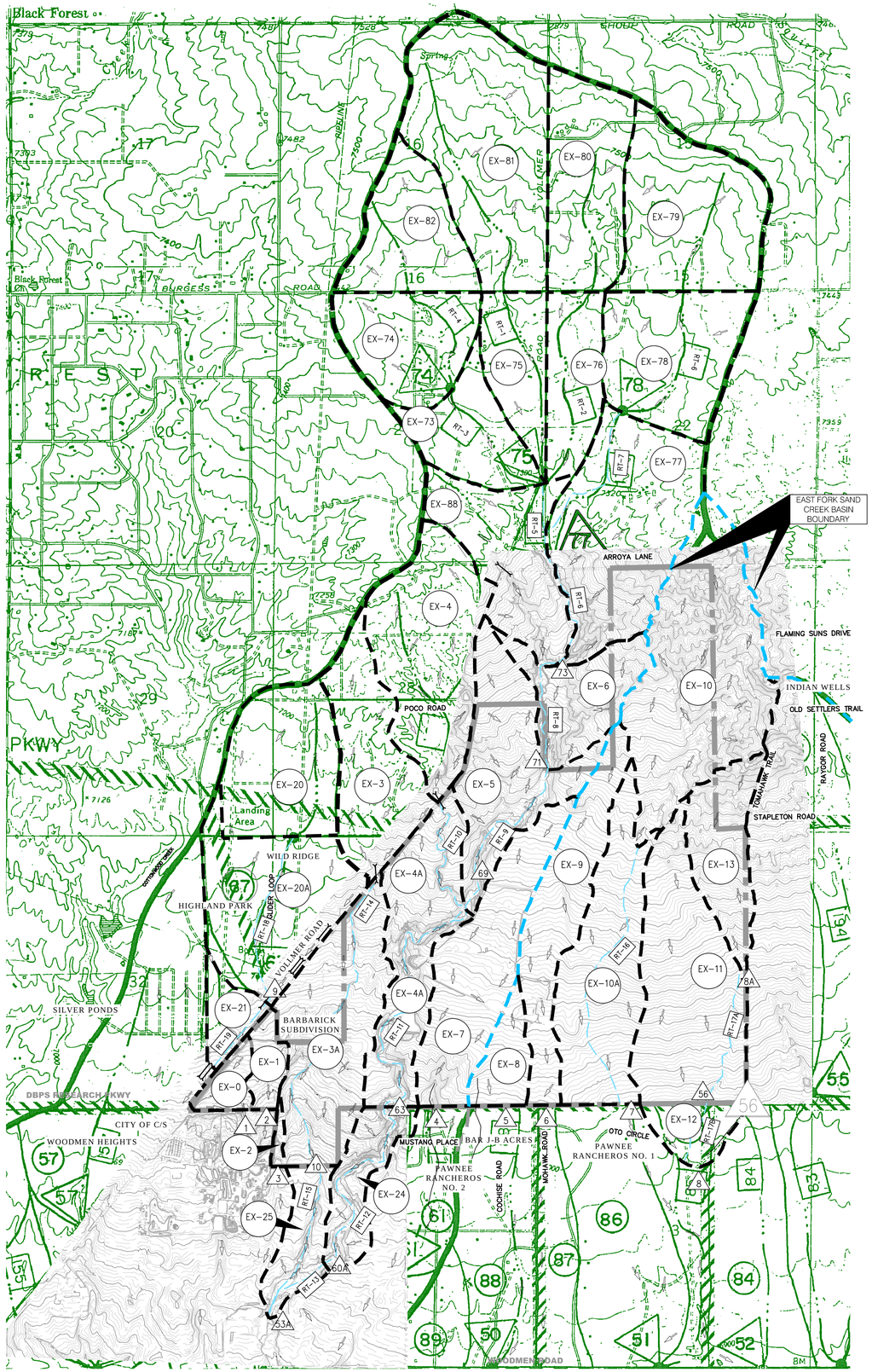
CIVIL CONSULTANTS, INC.

20 BOULDER CRESCENT, STE. 110
COLORADO SPRINGS,
COLORADO 80903

v 719.955.5485
f 719.444.8427

APPENDIX E

DRAINAGE MAPS



0 600 1200 2400

Scale in Feet

LEGEND

BASIN ID – SC3–77

DESIGN POINT – 87

REACH IDENTIFIER – RT–17A

BASIN BOUNDARY –

EAST FORK SAND CREEK BASIN BOUNDARY –

FLOW DIRECTION –

BASIN SUMMARY

BASIN	CN	AREA (ACRES)	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)
EX–0	62	23.8	0.037	5.0	8.2	13.0	19.6	25.7	32.2
EX–1	62	25.7	0.040	4.8	7.9	12.4	18.7	24.5	30.9
EX–2	62	5.5	0.009	1.1	1.8	2.8	4.3	5.6	7.1
EX–3	62	136.8	0.214	22.0	36.4	57.6	86.9	114.0	143.1
EX–3A	61	188.1	0.294	28.3	47.4	75.7	115.1	152.2	192.6
EX–4	62	192.0	0.300	30.1	49.9	79.1	119.5	157.0	197.3
EX–4A	62	151.5	0.237	24.7	40.8	64.4	97.0	127.2	160.1
EX–5	62	153.9	0.240	24.2	40.0	63.4	95.9	125.9	158.2
EX–6	62	90.2	0.141	15.3	25.5	40.1	60.7	79.9	100.5
EX–7	56	165.0	0.258	11.6	21.5	37.5	60.9	83.1	107.4
EX–8	45	42.0	0.066	0.5	1.7	4.5	9.4	14.5	20.5
EX–9	54	131.9	0.206	12.2	23.9	43.1	70.9	97.0	125.2
EX–10	60	270.7	0.423	32.7	56.0	91.1	140.1	185.9	236.1
EX–10A	41	179.3	0.280	0.6	2.2	7.3	17.4	29.1	43.1
EX–11	43	209.3	0.327	18.0	29.8	47.7	73.4	98.3	126.1
EX–12	51	39.5	0.062	2.2	5.1	10.1	17.7	25.1	33.3
EX–13	55	89.3	0.139	7.7	15.2	27.1	44.2	60.5	78.4
EX–20	62	143.4	0.224	25.4	42.1	66.7	100.7	132.3	166.2
EX–20A	64	179.7	0.281	32.2	51.9	80.5	119.8	155.9	194.6
EX–21	65	33.3	0.052	8.6	13.5	20.7	30.5	39.4	49.0
EX–24	59	63.1	0.099	9.5	16.6	27.5	42.9	57.4	73.0
EX–25	43	54.4	0.085	0.3	1.5	4.8	10.7	17.2	25.1
EX–73	63	90.0	0.141	16.4	26.4	41.3	62.1	81.3	102.0
EX–74	63	119.7	0.187	22.3	36.5	57.3	85.9	112.3	140.7
EX–75	63	79.3	0.124	13.1	21.5	33.7	50.5	66.1	82.8
EX–76	63	86.4	0.135	14.2	23.1	36.4	54.6	71.4	89.6
EX–77	62	230.6	0.360	34.7	56.9	90.6	137.5	180.9	227.7
EX–78	63	155.6	0.243	28.1	45.3	70.6	106.2	139.1	174.5
EX–79	63	189.0	0.295	34.9	57.0	89.5	134.3	175.6	220.1
EX–80	63	147.7	0.231	27.3	44.3	69.6	104.5	136.8	171.4
EX–81	62	262.9	0.411	42.6	70.2	111.0	167.4	219.6	275.7
EX–82	62	117.8	0.184	20.0	33.2	52.8	80.0	105.1	132.3
EX–88	62	139.2	0.217	22.2	36.7	58.0	87.6	115.0	144.4

DESIGN POINT SUMMARY (PEAK FLOW)

DESIGN POINT	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)	LOCATION
DP–74	0.371	39.3	65.3	104.8	158.9	209.1	262.8	
DP–75	1.413	141.2	235.1	376.6	566.6	750.9	950.5	
DP–78	0.538	59.7	98.4	154.0	232.6	306.2	385.3	
DP–73	2.528	225.9	380.7	618.0	957.0	1260.4	1582.3	
DP–71	2.669	229.3	388.9	629.7	978.8	1277.3	1637.9	STERLING RANCH NORTHERN BNDRY
DP–69	3.209	253.0	434.8	707.7	1100.0	1453.3	1870.4	
DP–63	3.446	251.4	430.7	713.1	1113.2	1496.2	1911.5	STERLING RANCH SOUTHERN BNDRY
DP–10	0.508	36.5	56.0	106.4	162.9	220.6	287.2	COLORADO SPRINGS/EL PASO BNDRY
DP–9A	0.557	55.3	94.3	150.3	227.7	299.5	380.5	VOLLMER/TAHITI DRIVE
DP–9	0.505	52.8	88.8	142.1	214.2	281.0	351.4	VOLLMER/LOCHWINNOCH LN
DP–8A	0.139	7.7	15.2	27.1	44.2	60.5	78.4	D/S STERLING RANCH EASTERN BNDRY
DP–8	0.528	24.2	45.1	77.8	124.4	169.5	220.9	D/S STERLING RANCH SOUTHERN BNDRY
DP–7	0.703	32.4	57.1	97.3	156.1	213.8	277.9	STERLING RANCH SOUTHERN BNDRY
DP–6	0.206	12.2	23.9	43.1	70.9	97.0	125.2	STERLING RANCH SOUTHERN BNDRY
DP–5	0.066	0.5	1.7	4.5	9.4	14.5	20.5	STERLING RANCH SOUTHERN BNDRY
DP–4	0.258	11.6	21.5	37.5	60.9	83.1	107.4	STERLING RANCH SOUTHERN BNDRY
DP–3	0.009	1.1	1.8	2.8	4.3	5.6	7.1	STERLING RANCH SOUTHERN BNDRY
DP–2	0.040	4.8	7.9	12.4	18.7	24.5	30.9	STERLING RANCH SOUTHERN BNDRY
DP–1	0.037	5.0	8.2	13.0	19.6	25.7	32.2	STERLING RANCH SOUTHERN BNDRY
DP–60A	3.545	247.7	430.2	707.1	1113.0	1496.6	1913.5	FUTURE MARKSHEFFEL X–ING
DP–56	0.466	23.2	42.5	71.9	115.6	157.4	202.9	STERLING RANCH SOUTHERN BNDRY
DP–53A	4.138	262.1	454.0	763.2	1196.5	1609.8	2061.5	SAND CREEK AND POND 3

DESIGN POINT SUMMARY (VOLUME)

DESIGN POINT	AREA (SQ MI)	V_2 (AC–FT)	V_5 (AC–FT)	V_{10} (AC–FT)	V_{25} (AC–FT)	V_{50} (AC–FT)	V_{100} (AC–FT)	LOCATION
DP–74	0.371	5.9	9.0	13.6	19.8	25.5	31.6	
DP–75	1.413	22.7	34.5	51.7	75.4	97.1	120.5	
DP–78	0.538	8.9	13.5	20.1	29.3	37.7	46.7	
DP–73	2.528	40.4	61.5	92.1	134.3	173.1	214.9	
DP–71	2.669	42.5	64.9	97.1	141.6	182.5	226.6	STERLING RANCH NORTHERN BNDRY
DP–69	3.209	50.7	77.4	116.1	169.4	218.6	271.4	
DP–63	3.446	54.1	82.5	123.8	180.8	233.3	289.9	STERLING RANCH SOUTHERN BNDRY
DP–10	0.508	7.6	11.7	17.6	25.8	33.4	41.6	COLORADO SPRINGS/EL PASO BNDRY
DP–9A	0.557	9.3	14.1	21.1	30.7	39.4	48.8	VOLLMER/TAHITI DRIVE
DP–9	0.505	8.4	12.7	19.0	27.6	35.5	44.0	VOLLMER/LOCHWINNOCH LN
DP–8A	0.139	1.3	2.1	3.4	5.2	7.0	8.9	D/S STERLING RANCH EASTERN BNDRY
DP–8	0.528	4.4	7.0	11.1	16.8	22.3	28.4	D/S STERLING RANCH SOUTHERN BNDRY
DP–7	0.703	6.1	10.0	15.9	24.3	32.4	41.3	STERLING RANCH SOUTHERN BNDRY
DP–6	0.206	2.4	4.0	6.3	9.6	12.7	16.0	STERLING RANCH SOUTHERN BNDRY
DP–5	0.066	0.2	0.4	0.8	1.4	1.9	2.6	STERLING RANCH SOUTHERN BNDRY
DP–4	0.258	2.6	4.2	6.7	10.2	13.5	17.2	STERLING RANCH SOUTHERN BNDRY
DP–3	0.009	0.1	0.2	0.3	0.5	0.6	0.8	STERLING RANCH SOUTHERN BNDRY
DP–2	0.040	0.6	0.9	1.4	2.1	2.7	3.4	STERLING RANCH SOUTHERN BNDRY
DP–1	0.037	0.6	0.9	1.3	1.9	2.5	3.1	STERLING RANCH SOUTHERN BNDRY
DP–60A	3.545	55.3	84.4	126.4	184.8	238.5	296.6	FUTURE MARKSHEFFEL X–ING
DP–56	0.466	4.0	6.3	9.9	14.9	19.8	25.1	SAND CREEK AND POND 3
DP–53A	4.138	63.0	96.4	144.7	211.8	273.9	340.9	SAND CREEK AND POND 3

EFSC DBPS DESIGN POINT SUMMARY (PEAK FLOW)

DBPS DESIGN POINT	AREA (SQ MI)	Q_{10} (CFS)	Q_{100} (CFS)
DP–50	0.32	47.0	195.7
DP–51 (BASIN 86)	0.33	17.7	74.1
DP–52	1.67	80.5	456.5
DP–56	0.79	63.6	265.0

Values reported from SCDBPS
(DP 50, 51, 52 Not analyzed as a part of this study)
DBPS Reach 85(Basin91)=Q10=28.8cfs Q100=115.2cfs

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2018 STERLING RANCH MDDP

EXISTING HYDROLOGIC CONDITIONS MAP

PROJECT NO. 09–002
FILE: \dwg\Eng Exhibits\2018–MDDP–ExistCondWSWrkMap.dwg
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VAS
SCALE
HORIZ: NTS
VERT: NTS
DATE: 08–22–18

DM1

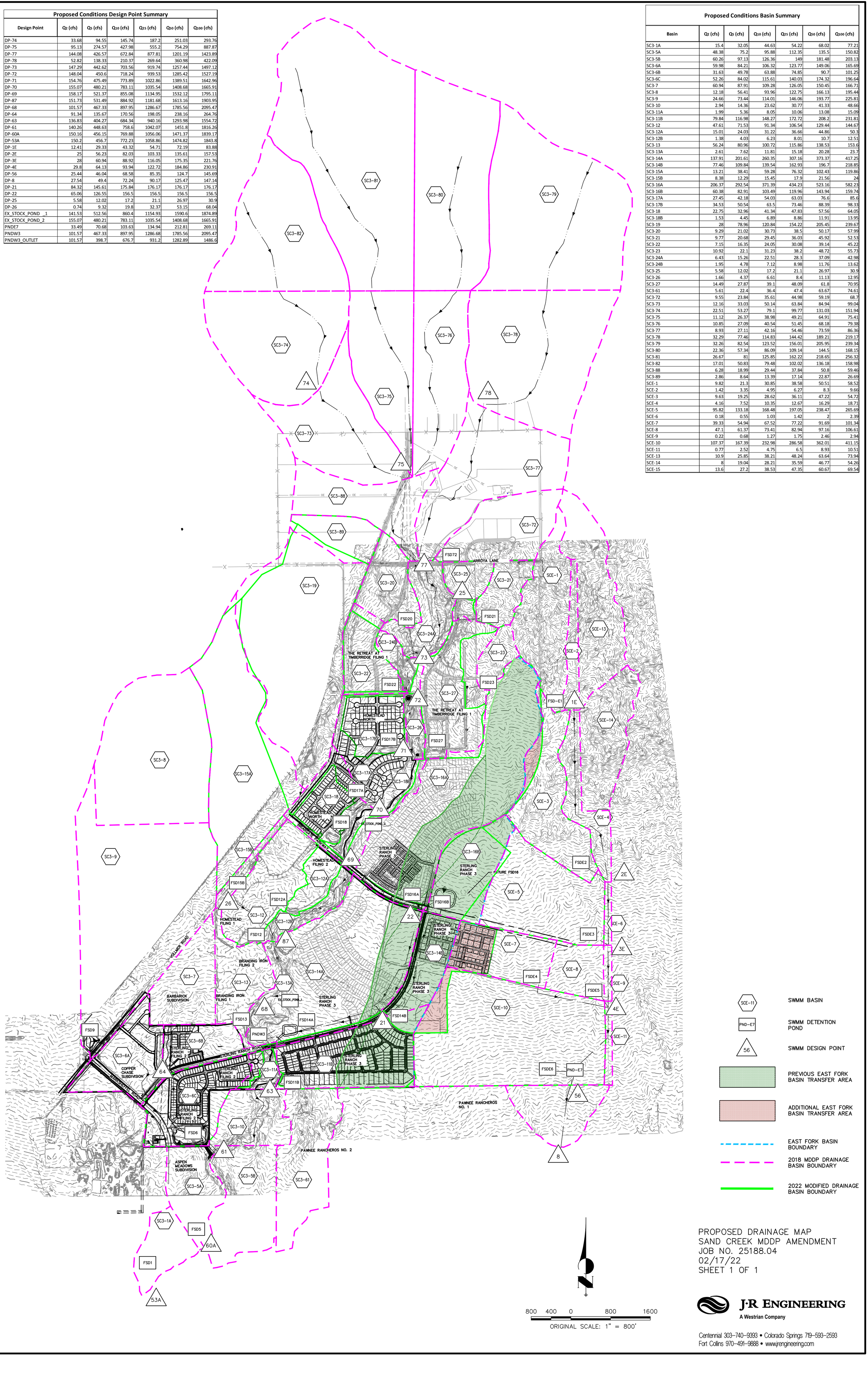
File: O:\09002A\Sterling Ranch District\dwg\Eng Exhibits\2018 MDDP\2018–MDDP–ExistCondWSWrkMap.dwg Plotstamp: 11/13/2018 1:52 PM

Proposed Conditions Design Point Summary

Design Point	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
DP-74	33.68	94.55	145.74	187.2	251.03	293.76
DP-75	95.13	274.57	427.98	555.2	754.29	887.87
DP-77	144.08	426.57	672.84	877.81	1201.19	1423.89
DP-78	52.82	138.33	210.37	269.64	360.98	422.09
DP-73	147.29	442.62	703.56	919.74	1257.44	1497.12
DP-72	148.04	450.6	718.24	939.53	1285.42	1527.19
DP-71	154.76	475.49	773.89	1022.86	1389.51	1642.96
DP-70	155.07	480.21	783.11	1035.54	1408.68	1665.91
DP-69	158.17	521.37	855.08	1134.95	1532.12	1795.11
DP-87	151.73	531.49	884.92	1181.68	1613.16	1903.95
DP-68	101.57	467.33	897.95	1286.67	1785.56	2095.47
DP-64	91.34	135.67	170.56	198.05	238.16	264.76
DP-63	136.83	404.27	684.34	940.16	1293.98	1554.72
DP-61	140.26	448.63	758.6	1042.07	1451.8	1816.26
DP-60A	150.16	456.15	769.88	1056.06	1471.37	1839.17
DP-53A	150.2	456.7	772.23	1058.86	1474.82	1843.8
DP-1E	12.41	29.33	43.32	54.71	72.19	83.88
DP-2E	25	56.23	82.03	103.33	135.61	157.53
DP-3E	28	60.94	88.92	116.05	175.35	221.76
DP-4E	29.8	64.13	93.94	122.72	184.86	230.91
DP-56	25.44	46.04	68.58	85.35	124.7	145.69
DP-8	27.54	49.4	72.24	90.17	125.47	147.14
DP-21	84.32	145.61	175.84	176.17	176.17	176.17
DP-22	65.06	126.55	156.5	156.5	156.5	156.5
DP-25	5.58	12.02	17.2	21.1	26.97	30.9
DP-26	0.74	9.32	19.8	32.37	53.15	68.04
EX_STOCK_POND _1	141.53	512.56	860.4	1154.93	1590.6	1874.89
EX_STOCK_POND_2	155.07	480.21	783.11	1035.54	1408.68	1665.91
PNDE7	33.49	70.68	103.63	134.94	212.81	269.11
PNDW3	101.57	467.33	897.95	1286.68	1785.56	2095.47
PNDW3_OUTLET	101.57	398.7	676.7	931.2	1282.89	1486.6

Proposed Conditions Basin Summary

Basin	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
SC3-1A	15.4	32.05	44.63	54.22	68.02	77.21
SC3-5A	48.38	75.2	95.88	112.35	135.5	150.82
SC3-5B	60.26	97.13	126.36	149	181.48	203.13
SC3-6A	59.98	84.21	106.32	123.77	149.06	165.69
SC3-6B	31.63	49.78	63.88	74.85	90.7	101.25
SC3-6C	52.26	84.02	115.61	140.03	174.32	196.64
SC3-7	60.94	87.91	109.28	126.05	150.45	166.71
SC3-8	12.18	56.41	93.96	122.75	166.13	195.44
SC3-9	24.66	73.44	114.01	146.06	193.77	225.81
SC3-10	2.94	14.36	23.62	30.77	41.33	48.66
SC3-11A	1.99	5.36	8.05	10.06	13.08	15.09
SC3-11B	79.84	116.98	148.27	172.72	208.2	231.81
SC3-12	47.61	71.53	91.34	106.54	129.44	144.67
SC3-12A	15.01	24.03	31.22	36.66	44.86	50.3
SC3-12B	1.38	4.03	6.23	8.01	10.7	12.51
SC3-13	56.24	80.96	100.72	115.86	138.53	153.6
SC3-13A	2.61	7.62	11.81	15.18	20.28	23.7
SC3-14A	137.91	201.61	260.35	307.16	373.37	417.25
SC3-14B	77.46	109.84	139.54	162.93	196.7	218.85
SC3-15A	13.21	38.41	59.28	76.32	102.43	119.86
SC3-15B	8.38	12.29	15.45	17.9	21.56	24
SC3-16A	206.37	292.54	371.39	434.23	523.16	582.23
SC3-16B	60.38	82.91	103.49	119.96	143.94	159.74
SC3-17A	27.45	42.18	54.03	63.03	76.6	85.6
SC3-17B	34.53	50.54	63.5	73.46	88.39	98.33
SC3-18	22.75	32.96	41.34	47.83	57.56	64.05
SC3-18B	1.53	4.45	6.89	8.86	11.91	13.95
SC3-19	28	78.96	120.84	154.22	205.45	239.67
SC3-20	9.29	21.02	30.73	38.5	50.17	57.99
SC3-21	9.77	20.68	29.45	36.03	45.92	52.53
SC3-22	7.15	16.35	24.05	30.08	39.14	45.22
SC3-23	10.92	22.1	31.23	38.2	48.72	55.73
SC3-24A	6.43	15.26	22.51	28.3	37.09	42.98
SC3-24B	1.95	4.78	7.12	8.98	11.76	13.62
SC3-25	5.58	12.02	17.2	21.1	26.97	30.9
SC3-26	1.66	4.37	6.61	8.4	11.13	12.95
SC3-27	14.49	27.87	39.1	48.09	61.8	70.95
SC3-61	5.61	22.4	36.4	47.4	63.67	74.61
SC3-72	9.55	23.84	35.61	44.98	59.19	68.7
SC3-73	12.16	33.03	50.14	63.84	84.94	99.04
SC3-74	22.51	53.27	79.1	99.77	131.03	151.94
SC3-75	11.12	26.37	38.98	49.21	64.91	75.41
SC3-76	10.85	27.09	40.54	51.45	68.18	79.38
SC3-77	8.93	27.11	42.16	54.46	73.59	86.36
SC3-78	32.29	77.46	114.83	144.42	189.21	219.17
SC3-79	32.26	82.54	123.52	156.01	205.95	239.34
SC3-80	22.36	57.34	86.09	109.14	144.5	168.15
SC3-81	26.67	81	125.85	162.22	218.65	256.32
SC3-82	17.01	50.83	79.48	102.02	136.18	158.98
SC3-88	6.28	18.99	29.44	37.84	50.8	59.46
SC3-89	2.86	8.64	13.39	17.14	22.87	26.69
SCE-1	9.82	21.3	30.85	38.58	50.51	58.52
SCE-2	1.42	3.35	4.95	6.27	8.3	9.66
SCE-3	9.63	19.25	28.62	36.11	47.22	54.72
SCE-4	4.16	7.52	10.35	12.67	16.29	18.71
SCE-5	95.82	133.18	168.48	197.05	238.47	265.69
SCE-6	0.18	0.55	1.03	1.42	2	2.39
SCE-7	39.33	54.94	67.52	77.22	91.69	101.34
SCE-8	47.1	61.37	73.41	82.94	97.16	106.61
SCE-9	0.22	0.68	1.27	1.75	2.46	2.94
SCE-10	107.37	167.39	232.98	286.58	362.01	411.15
SCE-11	0.77	2.52	4.75	6.5	8.93	10.51
SCE-13	10.9	25.85	38.21	48.24	63.64	73.94
SCE-14	8	19.04	28.21	35.59	46.77	54.26
SCE-15	13.6	27.2	38.53	47.35	60.67	69.54



PROPOSED DRAINAGE MAP
SAND CREEK MDDP AMENDMENT
JOB NO. 25188.04
02/17/22
SHEET 1 OF 1

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5 | SMOOTH STONES RESTORATION PLLC

To: Tristin Bonser, PE JR Engineering

From: David Bidelspach, 5 Smooth Stones Restoration, PLLC

CC:

Date: April 6th, 2021

Re: Sand Creek Channel Stabilization Project; El Paso County - General Guidelines for Geomorphic Assessment / Design and Performance Standards

Five Smooth Stones Restoration (5SSR) was tasked with developing general guidelines for geomorphic assessment and conceptual design for the drainage referred to as Sand Creek adjacent to the current private development within El Paso County, Colorado. The location of Sand Creek limits and development is shown below in Error! Reference source not found.. This memo discusses the geomorphic findings from field survey and site visit along with general guidelines used to develop the suggested parameters for the reaches within the Sand Creek.

Background

Development is currently on going adjacent to the site. Most of the infrastructure for the development is near completion and it also appears most development drainage systems to Sand Creek, such as culverts and detention basins have been installed.

Development flows were provided to 5SSR from JR Engineering from The Sand Creek Basing Planning Study of Q_{10} = 700cfs and Q_{100} = 2,620 cfs and used for the evaluation of performance standards for the site.

Drainage Areas and current watershed uses using USGS StreamStats (https://streamstats.usgs.gov) and used for initial investigation for regional curve comparisons and existing conditions evaluation.

Project Objectives

5SSR identified five objectives to direct the project study for Sand Creek channels. The objectives of the study are:

1. Preform geomorphic assessment of current conditions
2. Identify potential future conditions
3. Provide MCDA Alternative Analysis for Design Options
4. Provide design dimensions (Performance Standards) for a multi-stage channel to handle proposed development flows for different Alternatives.
5. Improve the riparian functions of stability, habitat, and aesthetics.

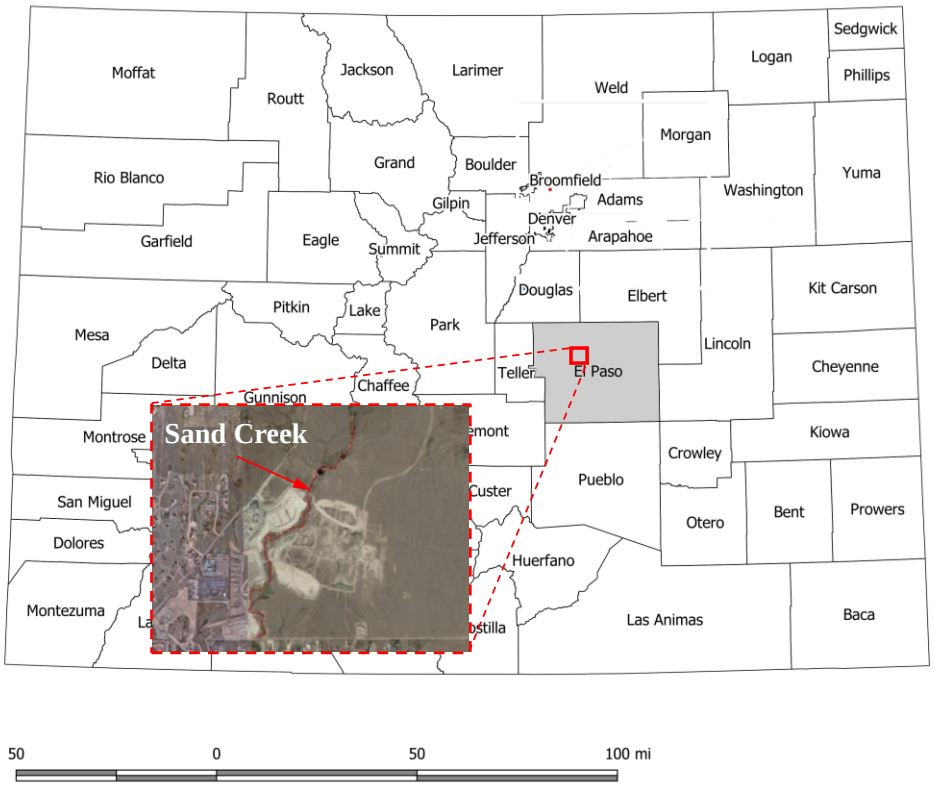


Figure 1 – Project Location Map

Figure 2 – Project Site Location Map

Geomorphic Assessment

A geomorphic survey and assessment were performed in March 10th, 2021 on approximately 9000ft of Sand Creek. Data collection consisted of visual inspection, photo documentation, profile, pattern and cross-sections for the entire length of the project of Sand Creek, Error! Reference source not found.. Data from this assessment were used to evaluate existing conditions of the project area, informing stable slope angles, channel dimensions, trajectory and current function. Existing dimension, pattern, and profile data was analyzed and provided as separate items attached to this memo.

The site consists of multiple ponds and detection structures that have impacted stream function and process. Vegetation is very limited on the project other than presence of willows in the lower laying areas with the typical shrubs on the upper riparian zones. The upper section of the reach (Figure 3, Figure 6) has good floodplain connection leading into the ponds with minimal erosion impacts in a more of a semi confined valley with low bank heights being in the 2-3ft range. Downstream of the second pond, there is a significate change in bed elevation and we start to see the valley become more confined with more upper terrace erosion and down valley migration tendencies, Figure 4, Figure 7. It is theorized that at one point the steam had an active head cut and incision occurred, then over time the channel carved new floodplain to balance equilibrium. And some point the ponds were installed and changed the how the valley functioned to how it sits today. Near the Development a blockage of a road, Figure 5, has affected the hydrology and downstream there is another large pond. Towards the end of the reach, we still see channel migration into high terrace banks but do appear to have more floodplain access and less confinement.

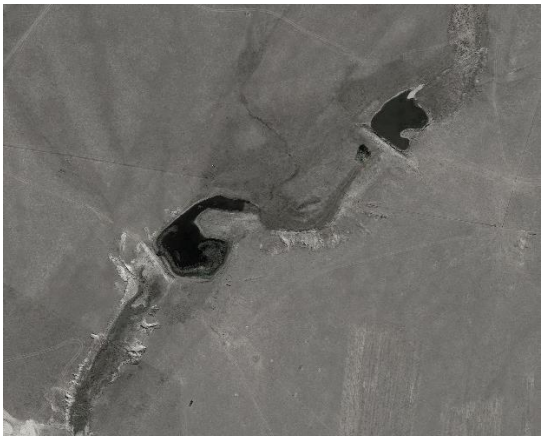


Figure 3, 4 – Upper Reach Ponds and Down Valley Migration Example

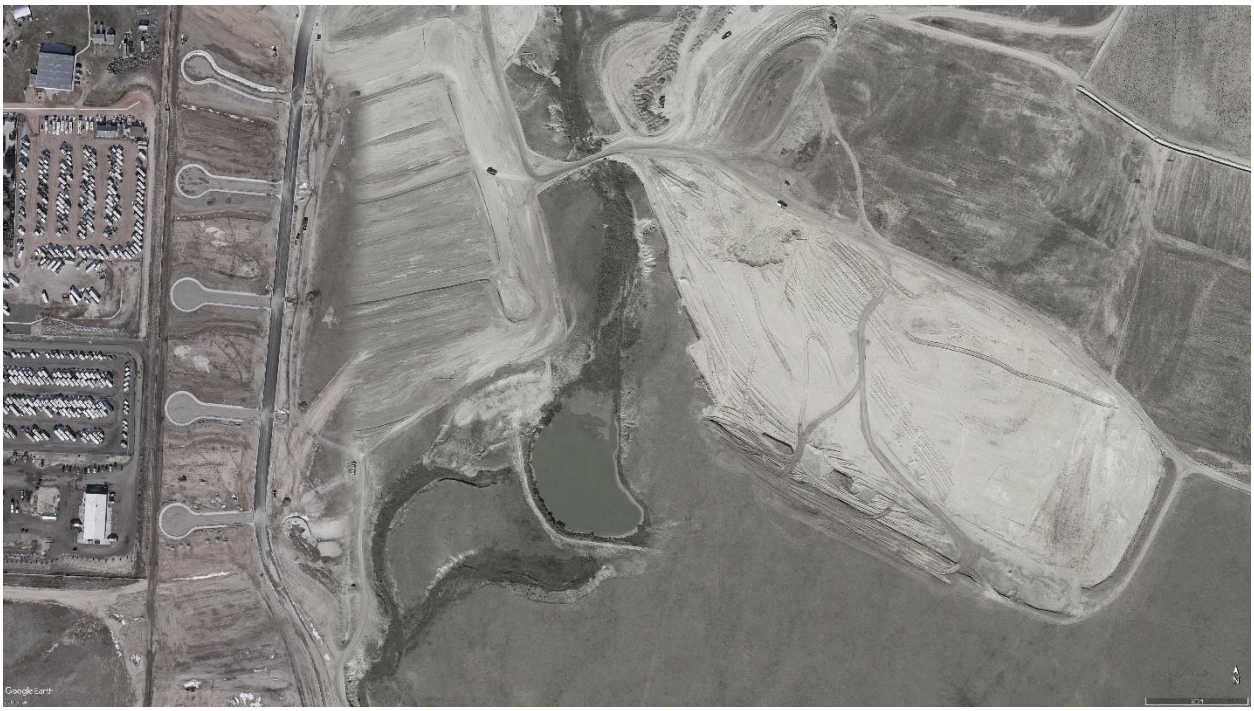


Figure 5 – Road Detention and Pond #3

Existing cross-sections though the site show increased channel incision (disconnection from floodplains) and low bank heights reaching as high as 12ft. the average slope thought the reach is 0.016 ft/ft. The existing channel sinuosity, or stream length/valley length, is nearly 1.2.

Figure 6 – Start of Reach – Unconfined

Figure 7 – DW Pond #2 Confined Valley

Figure 8 – Willows in Riparian Zone

Figure 9 – Confined Valley, Limited Bank Erosion

Figure 10 – Down Valley Migration

Figure 11 – Headcut

Figure 12 – High Terrace with open floodplain towards end of project

Bankfull Channel Dimensions

USGS StreamStats (https://streamstats.usgs.gov) was used to evaluate the drainage area, in square miles (A) and mean annual rainfall, in inches per year, for the reaches. The mean annual rainfall and drainage area used for upper and lower limits are 19.84 inches/year and 2.6 square miles at the start and 3.4 square miles at the end of the project reach. From the existing conditions survey, cross-sections were analyzed using in field bankfull calls thought the reach and are listed in the table below:

Table 1 - Existing Bankfull Dimensions

	XS STA	Area (sq mi)	WBKF (ft)	DBKF	ABKF (sq ft)	W/D	Entrenchment Ratio	Stream Type
1	97	2.62	15.6	0.58	9	27	1.46	B
6	927	2.75	24.9	0.33	8.09	75	<5	C
7	1725	2.86	16.7	0.59	9.84	28	1.61	B
13	4770	3.21	20.5	0.62	12.7	33	1.52	B
17	6612	3.35	29.2	0.36	10.6	81.11	1.72	B
21	9940	3.48	22.2	0.71	15.9	31.27	2.78	C

From this data, a local mini-regional curve was also used to evaluate the validity of 1) compared to expected watershed response factor (WRF) using the Southwest Regional Curve intercept graph and 2) compared to other local curves collected thought the front range for suggested bankfull areas. Typically, there is a high correlation between the bankfull cross-sectional area and the associated drainage area. This is evident for this mini-regional curve.

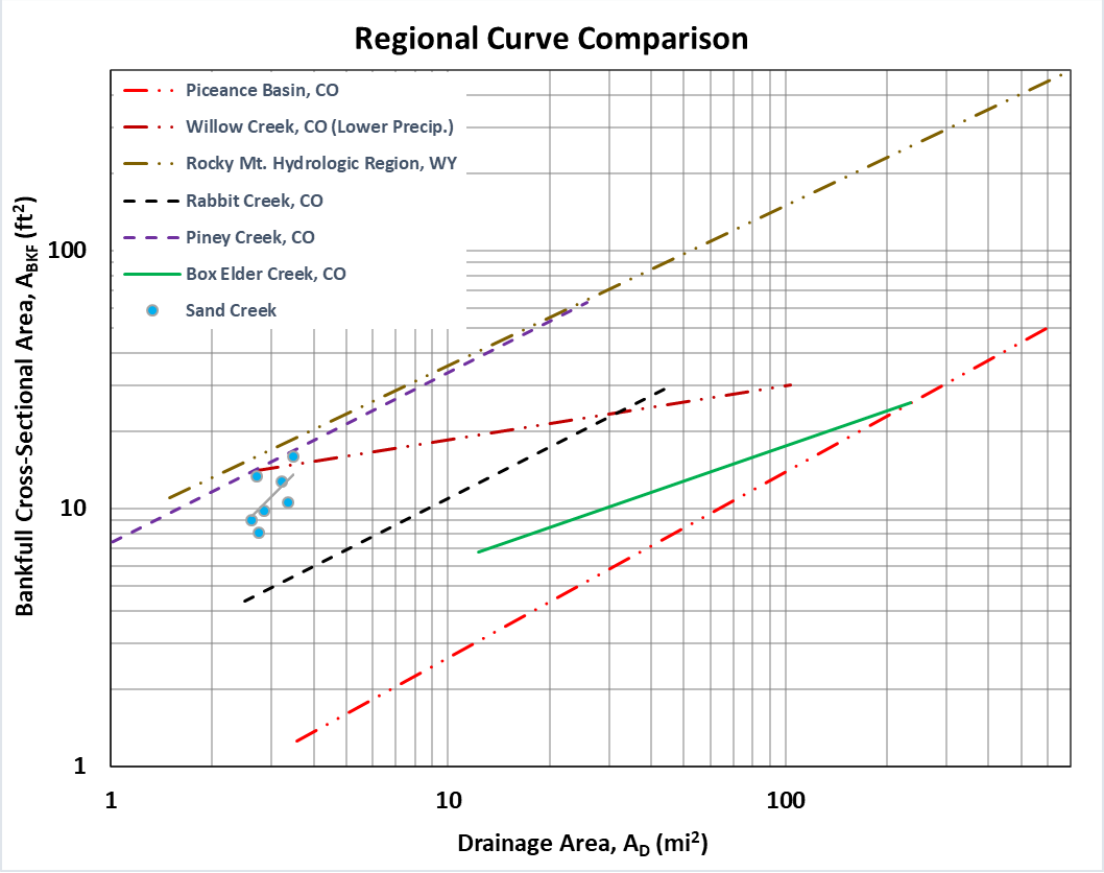


Figure 13 – Regional Curve Comparison.

Using the Southwest Regional Curve Intercept graph (Error! Reference source not found.) to relate the mean annual rainfall to the cross-sectional area y-intercept, a.k.a. watershed response factor (WRF), along with field observations and measurements, a WRF of 7.9 was used to calculate the recommended bankfull cross-sectional area, A_{BKF}, for the reaches.

$$A_{BKF} = WRF * DA^{0.67}$$

Reference design bankfull width-to-depth ratios (WDR_{BKF}) between 18 and 22 should be evaluated for the channel design. The WDR is defined as the bankfull width (W_{BKF}) divided by the mean depth of the bankfull cross-section d_{BKF}.

$$WDR = \frac{W_{BKF}}{d_{BKF}}$$

Using the WDR the recommended design bankfull widths can be calculated using:

$$W_{BKF} = \sqrt{WDR * A_{BKF}}$$

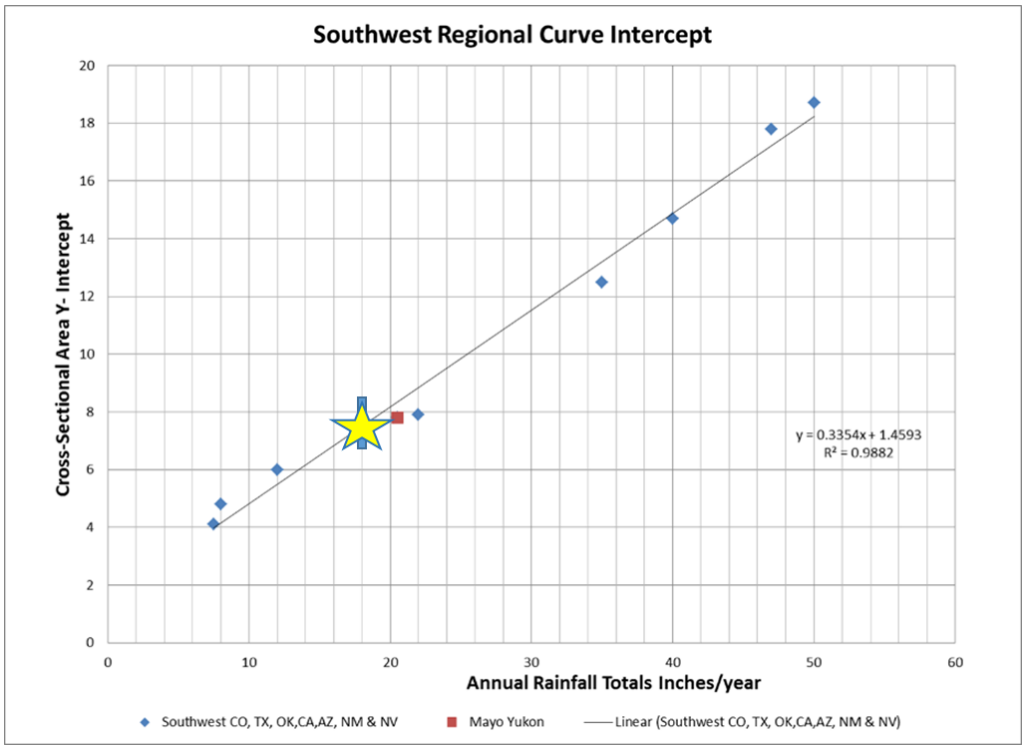


Figure 14 – Southwest Regional Curve Intercept.

Bankfull cross-sectional areas ranging from approximately 8 to 15 square feet were observed on-site with a degree of uncertainty, but for the most part fell within range of what we would expect.

MCDA Alternative Analysis

Design Alternatives Analysis

The design alternative analysis was done using the Multi-Criterial Decision Analysis (MCDA), the MCDA is a scoring system that compares the different design alternatives based on the goals and objectives of the project. For Sand Creek the goals are to reduce maintenance, enhance ecosystem and habitat, reduce sediment transport, and increase channel stability while reducing the risk of further degradation. For this project four alternatives are considered:

Alternative 1: Do nothing

The do-nothing alternative sees what is going to happen if no action it is taken for stream restoration, for Sand Creek these means further erosion of the banks, movement of the channel trajectory overtime, and increase in risk of damaging private property with increased flows dure to the proposed development. The initial capital cost for this alternative is nothing but the maintenance cost would be the maximum potential cost.

Alternative 2: Priority II restauration with 700ft with floodplain

The priority II restoration main objective is to widen the floodplain at the existing channel elevation to reduce shear stress. For Sand Creek this means that the channel width/floodplain would be about 700ft in order maintain shear stress to about 1.2 lbf/ft^2, the increase of the channel width will happen in 4 stages (Inner berm, Bankfull, Flood Terrace, and Floodplain) (Figure 5). Priority II restauration produces very stable streams however it requires more floodplain grading, some structures and periodic maintenance making this this alternative more expensive compared to priority I or II. Priority III restoration for Sand Creek comes with a few challenges, one of them being the confinement of the channel between two urban areas, limiting the channel width to about 200 to 300 ft, making the shear stress grader than 1.2 lbf/ft^2, due to the higher shear stress the channel restauration would requiring more structures to stabilize the banks to reduce the risk of bank erosion. The initial capital construction, design and permitting cost for this 10,800ft reach would be 4.9 Million dollars with the low maintenance cost of less $2,000/year.

Alternative 3: Priority II four stages channel with 1-2ft floodplain drops.

Alternative 3 restoration for Sand Creek it is the same as alternative 2 with the difference that instead of increasing the floodplain width to 700ft, alternative 3 will take into consideration the current channel dimensions and fit the channel design with 4 stages with 1 – 2 ft drops, however, due to the constrains of the channel dimensions, more structure would be needed to stabilize banks. 5SSR's assumption is that is some areas the available floodplain width may only be 200ft. With an approximate 200ft floodplain this would require channel slope of .006 ft/ft to obtain 1.2lb/ft and would also require around 100 - 1ft riffle drops to make up for the project reach. The design could have a riffle/drop structure as close as every 100ft. This alternative also has assumed 2 smaller stock ponds and 1 larger pond online with Sand Creek will remain with the proposed development. This alternative requires less floodplain grading than Alternative 2 but will be more costly due to importing more boulders for structures and

grade control. The initial capital construction, design and permitting cost for this 10,800ft reach would be 6.3 Million dollars with the low maintenance cost of less $2,500/year.

Alternative 4: Priority II/III channel realignment as needed and rip rap floodplain protection and bank stabilization.

This alternative prioritizes the most vulnerable places along the channel and proposes realignment of the channel where bank erosion could be a risk for private property. In places where stabilization its needed, the banks would be stabilized using sill joint planted rip rap, coir and transplants. This alternative is not ideal however address the main issues of bank erosion of the channel. This alternative would allow the maximum floodplain slope to increase to .016 ft/ft average slope with ~200ft flood width and no drop structures. The applied shear of less than 3psf for this alternative would be higher than the natural stable reference threshold shear for vegetated floodplains in the region. The initial capital construction, design and permitting cost for this 10,800ft reach would be 9.1 Million dollars with the low maintenance cost of less $3,600/year.

5 | SMOOTH STONES
RESTORATION PLLC

Table 2: MCDA matrix table

			Option #1	Option #2	Option #3	Option #4
	Concept Option Description		Do nothing	Priority II - Stabilize Banks with Coir, River NCD Structures and Regrade Floddplain to 700ft	Priority II - Stabilize Banks with Coir, River NCD Structures and Regrade Floodplain 1-2ft drops to fit into design	Priority III - Realignment as needed stabilize banks with sill joint planted rip rap, coir and transplants
Reduce Maintenance	**Sustainability and Robustness**	***2***	4	1	2	3
	Minimize the need for future maintenance	***1***	4	1	2	3
Ecosystem and Habitat Enhancements	**Habiatat Improvements**	***2***	5	2	2	3
	Ecological Resiliency	***3***	5	1	3	3
	Floodplain Restoration and Connectivity	***3***	4	1	3	4
Sediment Reduction and Stabilization	**Reduction of Bank Erosion and Lateral Bank Migration**	***1***	4	1	3	3
	Minimize Vertical Instabilty by adding needed grade control	***2***	5	1	3	3
	Sustainable Sediment Transport Balance	***2***	4	1	2	2
Risk Reduction	**No Increase in Liability to Funders**	***2***	3	1	3	3
	No Rise in Flood Stage or Flood Stage Reduction (No CLOMR and LOMR project requirements)	***4***	1	1	2	1
	Protect and not disturb the cultural resource area.	***5***	1	3	2	2
	Engineering Design Life Spand and Risk Reduction	***5***	5	1	3	4
	Minimize disturbance as required by permit conditions of the existing USACE NWP 27 and the Preble's Mouse	***4***	1	4	3	2
	MCDA Matrix Score		**115**	**60**	**92**	**97**
	MCDA RANKING		4	1	2	3

Performance Standards and Design Recommendations

Reference dimensionless ratios, based on the valley type, channel slopes, and region, informed the recommended pattern design of each of the reaches based on the proposed bankfull width. Pool-to-pool spacing recommended to be between 4.5 to 6.0 times the W_{BKF}. Radius of curvatures are recommended to be 2.5 to 3.5 times W_{BKF}. Riffle lengths are recommended to be between 1.5 to 2.5 times W_{BKF}. Meander wavelengths are recommended to be between 9 and 12 times W_{BKF}. Channel belt widths are recommended to be between 2 and 3.5 times W_{BKF}. For Sand Creek, it is recommended that a multi stage channel be designed that includes an Inner Berm feature, Bankfull Feature, Floodplain Terrace, and a 10 and 100-year bench to handle flood flows and reducing shear stresses to around 1.2 lb/sqft.

Bankfull Design

Using the existing conditions site values as well as regional curve information from other locations it is determined to size the channel with a bankfull area of 14sq ft, bankfull width of 17ft and mean depth of 0.71 ft. The low flow should account for 33% of the bankfull area.

Floodplain Design

The area for flood terraces for each of the reaches is recommended to be designed to approximately 300% of the A_{BKF}. The flood terrace width-to-depth ratio (WDR_{FLTR}) is recommended to be three times that of the WDR_{BKF}.

JRE provided 100-year flows for each of the reaches for the ultimate buildout condition. Floodplain widths and depths were designed to accommodate the estimated 100-year peak flood assuming a 100-year design shear stress not to exceed 1.2 pounds per square foot. Discharge and velocity estimates were calculated assuming a manning's "n" of 0.055. Width required for this alternative would require close to 700ft of floodplain, which is most likely not an option. Other design alternatives such as using drop structures to manage the slope was evaluated to keep the shear at 1.2 assuming a maximum width of 200ft. The alterative of looking at the max shear based on a 200ft floodplain width was also evaluated for consideration of design for a steeper slope.

Drop Structures Evaluation

The use of drop structures maybe required to reduce channel slope where proposed corridor widths make it implausible to construct a floodplain wide enough to convey the 100-year discharge while staying below the 100-year design shear stress. The concepts evaluated for using drops in each of these reaches will need to be further evaluated to ensure that the channel designs fit the landscape. The concepts should also be optimized, potentially reducing the required channel/floodplain corridor.

Design Considerations

100-year floodplain design assumes that vegetation at each of the reaches can provide stability up to an applied shear stress of 1.2 psf. Bank stabilization can be used to reduce risk to areas that the applied shear stress nears, exceeds, or is expected to exceed 1.2 psf.

Common treatment methods based on shear are listed as follows:

- 0 – 1 psf - Treatment Seed and Straw with Riparian Plantings
- 1 –1.4 psf – Treatment Floodplain Coir Matting / Seed and Straw with Riparian Plantings
- 1.5 – 2.5 psf - Treatment Floodplain Boulder/ Log Sills, Floodplain Coir Matting / Seed and Straw with Riparian Plantings
- 2.6 – 4.0 psf - Treatment Floodplain Vegetated Rip-Rap, Floodplain Coir Matting / Seed and Straw with Riparian Plantings

Riffle grade control structures are being recommended to stabilize channel grade throughout the design. Where cascade riffles are not utilized, augmenting each of the riffles with 4 to 8-inch riprap is recommended to reduce the risk of scour at the riffles. This is particularly important at regions downstream of "clear water" discharge points or where threshold riffle design, a riffle with minimal movement, is required. The 4-8-inch riprap will be stable in-place for all design discharges that have an applied shear stress less than 1.2 psf. **Figure 15** shows the Shield's/Rosgen Entrainment Function used for sizing particles for applied shear stress.

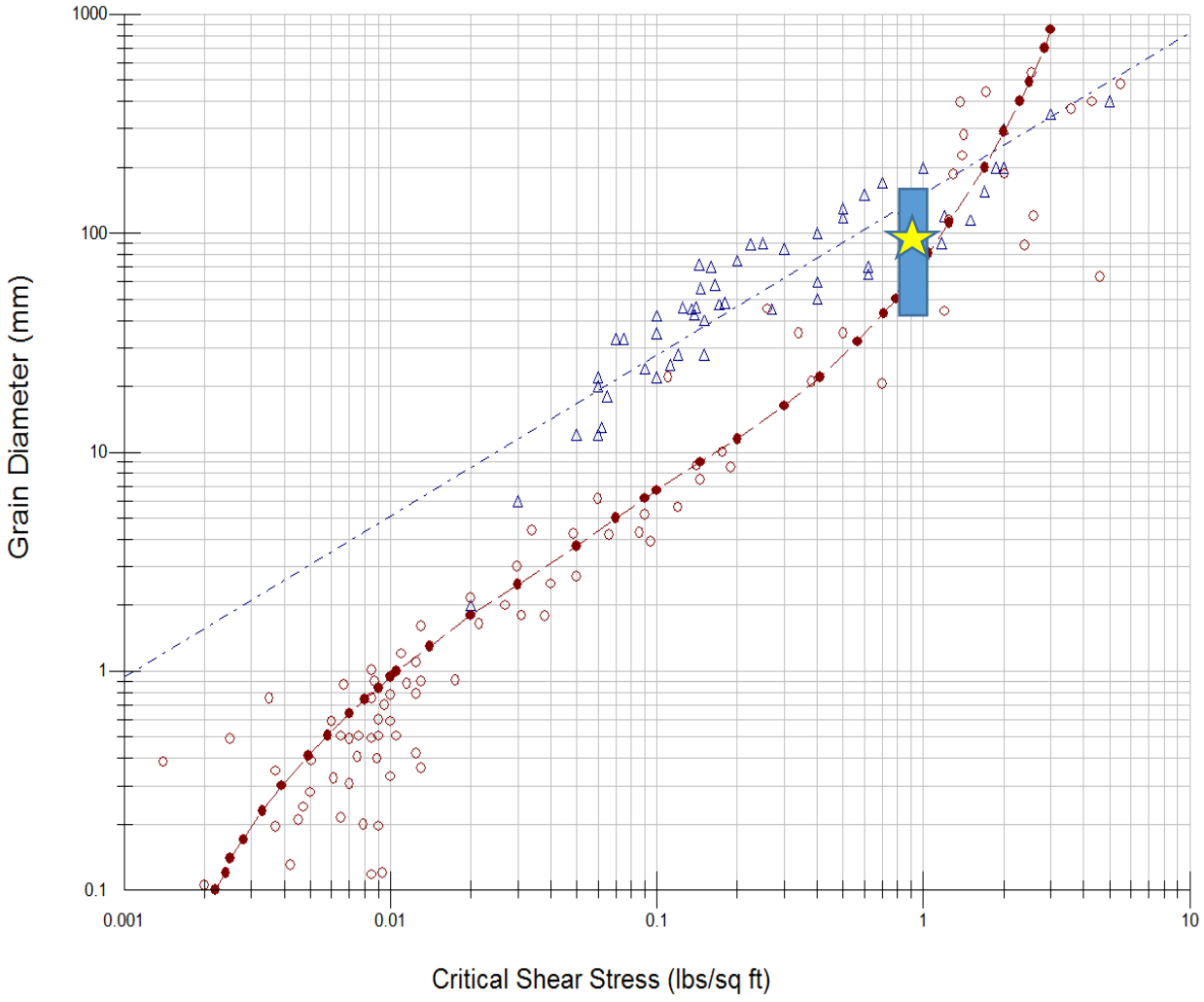


Figure 15: Shield's/Rosgen Entrainment Function. The red trendline shows the Shields function, while the blue trendline shows Rosgen function.

Joint planted riprap is recommended at the terminus of the project reach for scour protection at the catchment pond. The in-line pond outlet structure design required for the successful implementation of Alternatives 2-4 has not been investigated at this time. This report is to serve as a conceptual reconnaissance level geomorphic assessment. The later design process will require a greater detail of investigation and analysis. The 5SSR team has assumed that the

Potential Structures In-streams Structures

Gravel Constructed Riffle

Gravel constructed riffles utilize immobile gravel in the riffle section of the channel. Gravel armors the channel, increases channel roughness, provides grade control, and promotes macroinvertebrate habitat. Gravel augmented riffles promote channel stability in high shear stress situations within perennial channels. All gravel riffles would designed to a threshold shear of 1.2psf with gravel having a D50 exceeding 100mm and a D84 exceeding 180mm.

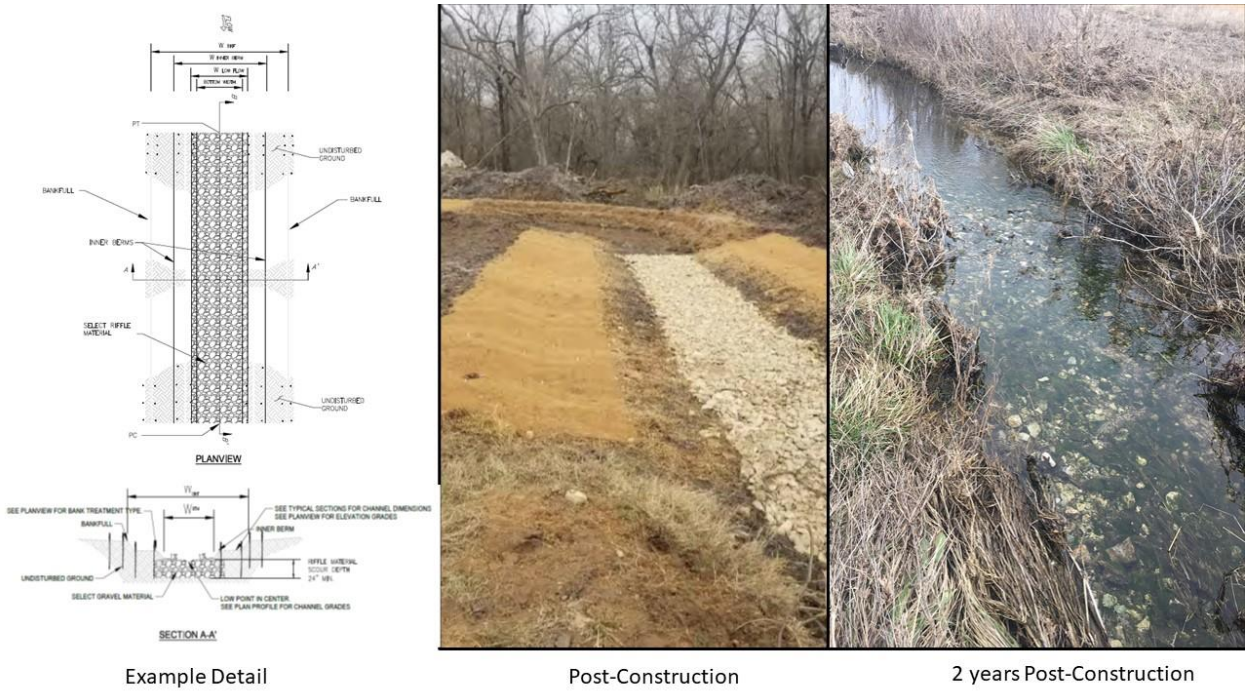


Figure 1: Gravel Constructed Riffle

Toe wood Bank Stabilization

Toe wood structures incorporate native woody material into a submerged undercut bank to replicate natural stream banks. The structure consists of large woody debris such as logs, branches, brush, and roots buried at the bankfull bench. The bottom layer consists of woody debris and soil as fill. Root wads are placed to cantilever foundation logs; the root wads protrude from the stream bank, protecting it from the shearing force of flow. Filler materials such as small logs, limbs, and tree branches are placed on the second layer. The top layer consists of backfill with overlying coir-wrapped soil lifts and live stakes. Toe

wood can be placed along the geomorphic channel streambanks. When placed in the outside meander bank, toe wood helps protect it from lateral migration and subsequent bank erosion while promoting revegetation. Toe wood is also a cost-effective stream stabilization method, as it reuses woody material harvested from site clearing. There is a possibility with later design phases that the wood toe stabilization could be substituted by hay bales for cost reduction or coir lifts if wood is unavailable.

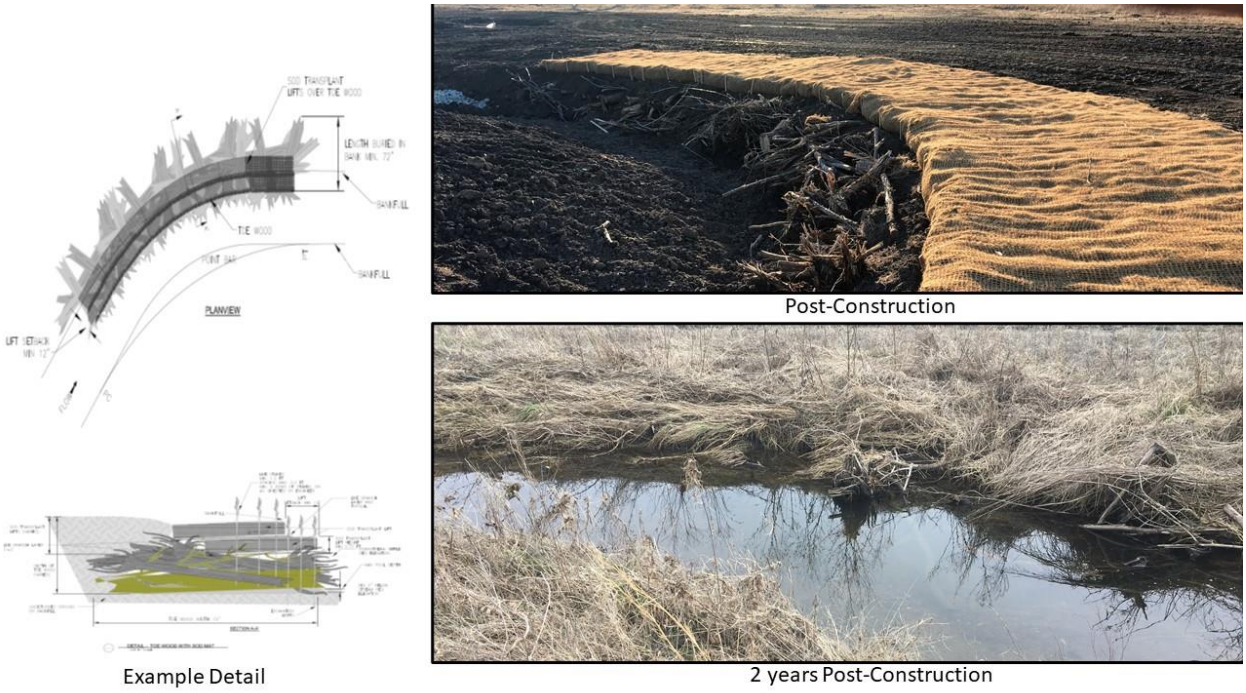


Figure 2: Toe Wood and Bank Stabilization

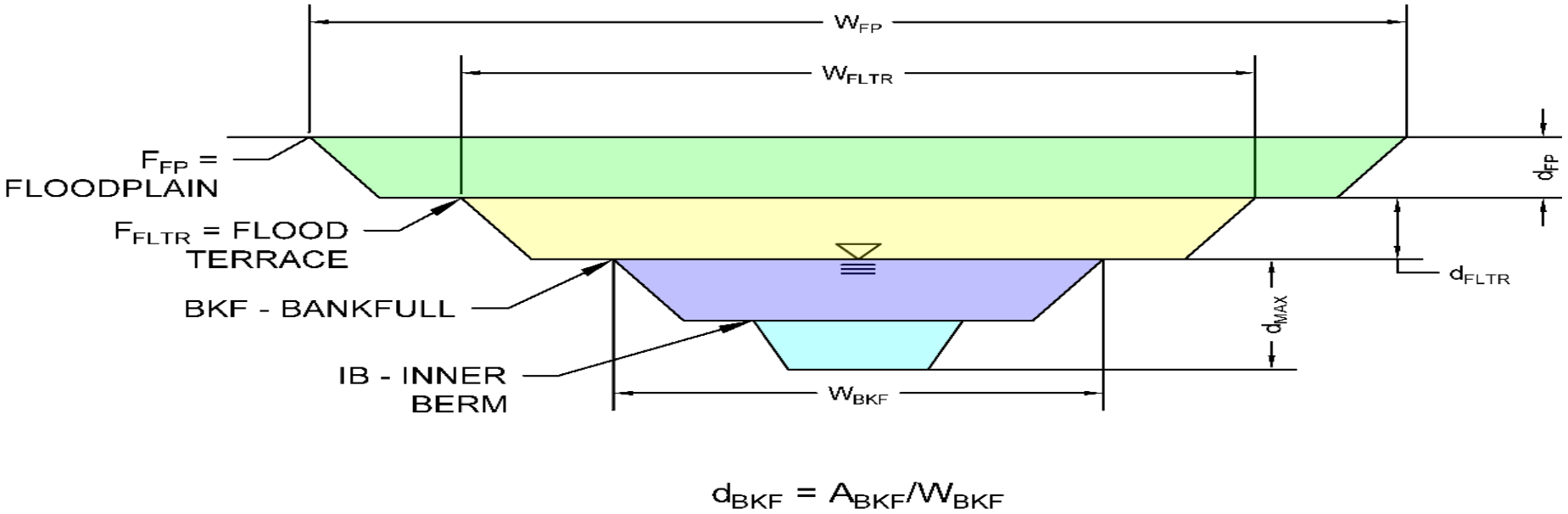


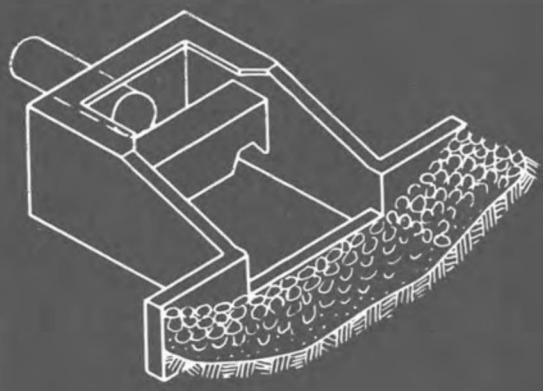
Figure 18 Typical riffle (tangent section) channel cross-section and channel acronyms.

Table 3: Performance Standard

Reach #	Rainfall	Reach Name	Watershed Area	Existing Reach Drop	Existing Reach Length	Existing Reach Slope	Regional Relationship	Assumed Bankfull Velocity	Design Bankfull XS Area	Design Bankfull WDR	Design Bankfull XS Width	Design Pool-Pool Spacing Ratio	Design Pool-Pool Spacing	% Flood Terrace Channel	Design Flood Terrace Area	Design Flood Terrace WDR	Design Flood Terrace Width	Depth for Offset	% Low Flow Channel	Design Inner Berm	Design Inner Berm WDR	Design Inner Berm Width	100-yr Design Discharge	100-yr Design Shear Stress	100-yr Design Average Depth	100-yr Floodplain Velocity	100-yr Floodplain Area	100-yr Floodplain Width	Min Riffle Substrate D84	Min Riffle Substrate D50	Min. Design Scour Depth of Riffles
1	19.84	R1	2.4	46.47	2286	0.020	8.11	3	14.59	20	17.08	4	68.32	3	43.76	60	51.24	0.85	0.3	4.38	16	8.37	2620	1.2	0.95	3.41	768.01	811.83	6.84	3.71	17.11
2	19.84	R2	2.9	59.51	3840	0.015	8.11	3	16.56	20	18.20	4	72.79	3	49.68	60	54.59	0.91	0.3	4.97	16	8.92	2620	1.2	1.24	3.57	733.39	591.01	6.84	3.71	17.11
3	19.84	R3	3.4	43	3600	0.012	8.11	3	18.42	20	19.19	4	76.78	3	55.26	60	57.58	0.96	0.3	7.74	16	11.13	2620	1.2	1.61	3.73	701.63	435.79	6.84	3.71	17.11
ALT 1	19.84	ALT 3	2.4	43	3600	0.016	8.11	3	14.59	20	17.08	5	85.40	3	43.76	60	51.24	0.85	0.3	4.38	16	8.37	2620	1.2	1.20	3.55	737.38	613.50	6.84	3.71	17.11
ALT 3	19.84	ALT 3	2.4	43	3600	0.006	8.11	3	14.59	20	17.08	5	85.40	3	43.76	60	51.24	0.85	0.3	4.38	16	8.37	2620	1.2	3.13	4.18	626.56	200.00	6.84	3.71	17.11
ALT 4	19.84	ALT 4	2.4	43	3600	0.016	8.11	3	14.59	20	17.08	4	68.32	3	43.76	60	51.24	0.85	0.3	4.38	16	8.37	2620	2.26	2.26	5.43	482.49	213.15	10.90	7.18	27.24

Table 4: Channel alternatives

WS (ft)	Depth Y (ft)	XS Area (ft2)	Top Width (ft)	V (ft/s)	Hydraulic Depth (ft)	Hydraulic Radius (ft)	Shear Stress	Stream Power	Slope (ft/ft)	Q (cfs)	Alternative
97.33	0.68	4.32	12.90	1.01	0.33	0.33	0.13	0.13	0.006	4.36	IB-ALT3
98.00	1.35	14.29	16.85	1.85	0.85	0.83	0.32	0.59	0.006	26.44	BKF-ALT3
98.96	2.31	66.83	57.62	2.30	1.16	1.15	0.43	1.00	0.006	153.52	FLD TERRACE ALT3
100.03	3.38	267.60	191.36	2.62	1.40	1.39	0.52	1.37	0.006	700.00	Q10 - ALT3
101.74	5.09	603.92	201.55	4.34	3.00	2.97	1.12	4.87	0.006	2620.00	Q100 -ALT3
99.66	3.02	198.45	189.28	3.53	1.05	1.04	1.05	3.69	0.016	700.00	Q10 - ALT4
100.94	4.30	445.58	196.98	5.88	2.26	2.25	2.26	13.28	0.016	2620.00	Q100 - ALT4
99.38	2.73	313.05	593.57	2.24	0.53	0.53	0.53	1.18	0.016	700.00	Q10 - Alt 2
100.01	3.37	692.92	597.18	3.78	1.16	1.16	1.16	4.38	0.016	2620.00	Q100 Alt 2



Hydraulic Design of Stilling Basin for Pipe or Channel Outlets

A Water Resources Technical Publication

RESEARCH REPORT NO. 24

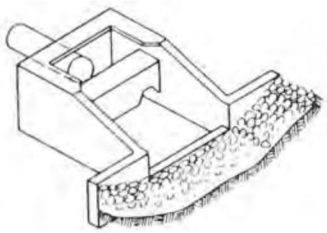
United States Department of the

INTERIOR

Bureau of Reclamation

PAP 269

Research Report No. 24 • A WATER RESOURCES TECHNICAL PUBLICATION



Hydraulic Design of Stilling Basin for Pipe or Channel Outlets

Basin VI in the Bureau of Reclamation designation

By G. L. Beichley
Division of General Research
Denver, Colorado

UNITED STATES DEPARTMENT OF THE INTERIOR
ROGERS C. B. MORTON, *Secretary*

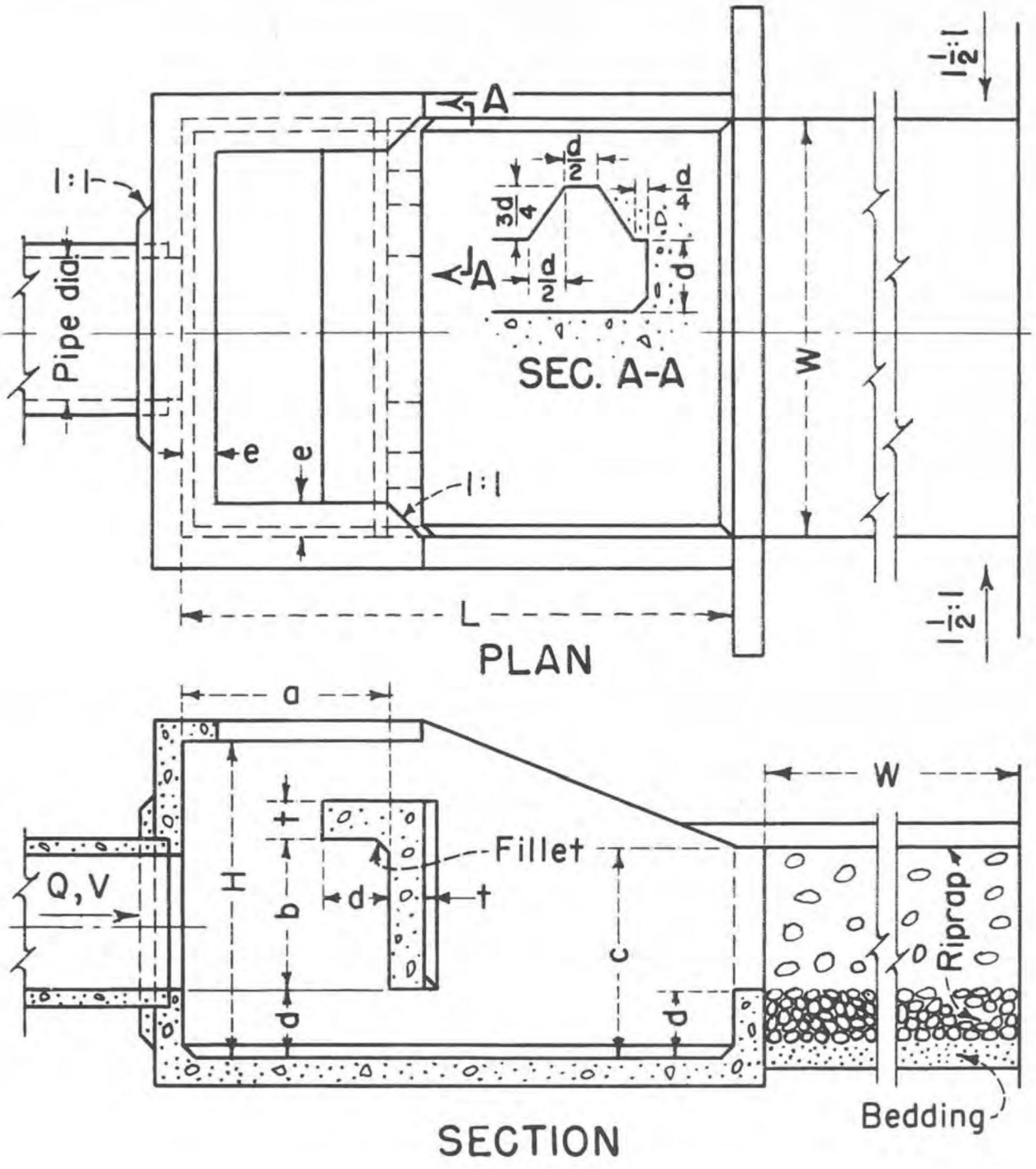
BUREAU OF RECLAMATION
ELLIS L. ARMSTRONG, *Commissioner*

THE MODELS

Two model basins, 1.6 and 2.4 feet (48.76 and 73.15 centimeters) wide, were constructed. The other dimensions were related to the width of the basin, as shown in figure 1.

An 8-inch (20.32-centimeter) inside-diameter pipe was used at the entrance to each of the basins. Deflectors of various sizes were installed on the crown of this pipe upstream of the portal to vary the velocity of flow entering the basins. One-fourth, one-half, three-fourths, and full pipe flows were used in the tests, as well as flow from an 8-inch (20.32-centimeter) rectangular open channel.

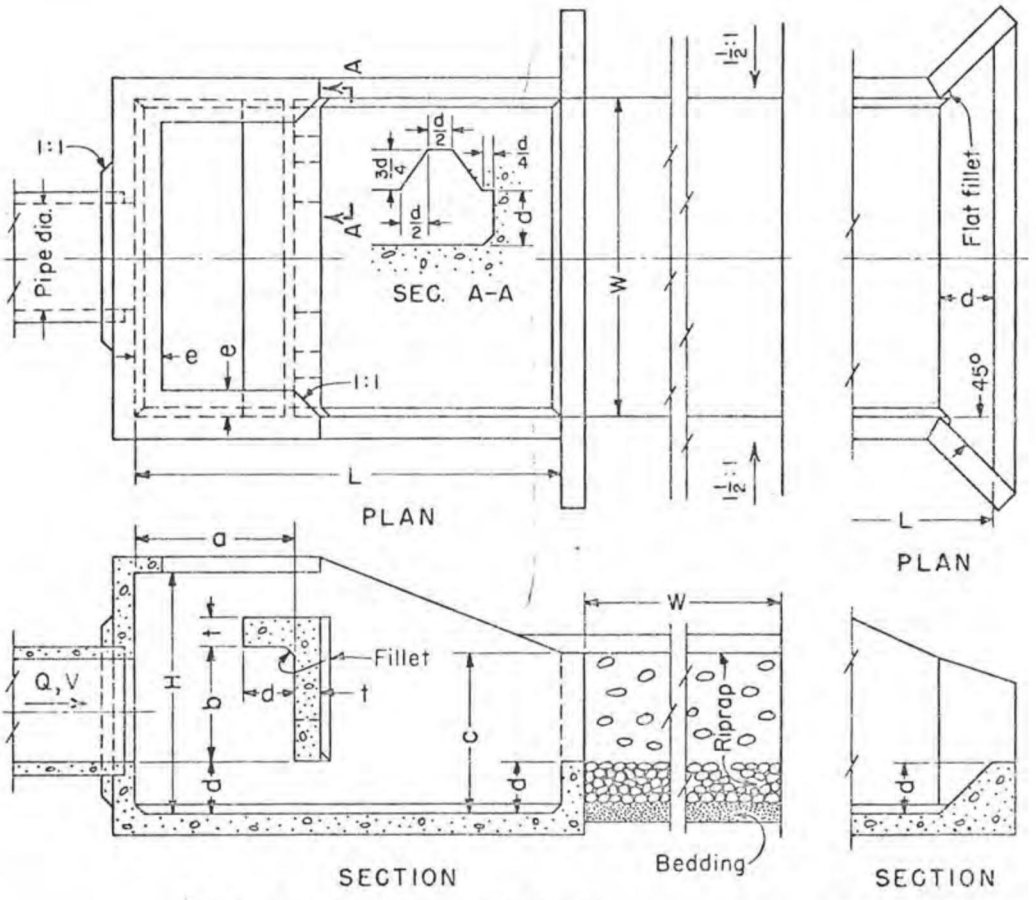
Each of the two basins discharged into a canal section lined with 1½-inch (38.10-centimeter) gravel. Tailwater elevations were controlled by stoplogs at the end of the canal section. The bottoms of the canal sections were at the same elevation of the basin end sill and were as wide and as long as the basin width. The side slopes were 1½ to 1 for the 2.4-foot (73.15-centimeter) wide basin and vertical for the smaller basin.



H = 3/4 (W)
L = 4/3 (W)
a = 1/2 (W)
b = 3/8 (W)
c = 1/2 (W)
d = 1/6 (W)
e = 1/12 (W)
t = 1/12 (W), suggested minimum
Riprap stone size diameter = 1/20 (W)

Figure 1.—General design of the Type VI impact stilling basin.

FIGURE 1
REPORT HYD-572



STILLING BASIN DESIGN

ALTERNATE END SILL & WING WALL

H = ¾ (W)
L = 4/3 (W)
a = ½ (W)
b = ⅜ (W)
c = ½ (W)

d = 1/6 (W)
e = 1/12 (W)
t = 1/12 (W), suggested minimum
Riprap stone size diameter = 1/20 (W)

THE INVESTIGATION

The investigation was primarily concerned with relating the basin size to the discharge and velocity and in relating the downstream channel and riprap requirements to the basin size. It was also concerned with special situations involving debris, silt, tailwater, sloping entrance pipe, and rectangular open channel entrances not usually encountered in the standard design of the Type VI basin.

Standardization of the Basin Dimensions in Terms of Basin Width

A test basin was constructed having dimensions related to the basin width in accordance with those developed for the basin in the earlier study (2).

To test the adequacy of this 2.4-foot (73.15-centimeter) wide model basin, tests were conducted over a range of flows that had been determined in the earlier tests (2) to be the limits of exceptionally mild operation and of safe maximum operation for a given basin width, provided the entrance flow velocity did not exceed 30 feet (9.14 meters) per second (prototype).

These test discharges were related to the basin width in accordance with the equation:

$$Q = (W/C)^{2.5}$$

where "Q" is the discharge in cubic feet per second, "W" is the inside width of basin in feet, and "C" is a coefficient that varies for the maximum, minimum, and intermediate flows. The coefficient in English units is 1.46 for the maximum permissible flow, 1.80 for the minimum mild flow, and 1.60 for the intermediate flow. (To obtain the discharge in cubic meters per second, the width must be in meters and the coefficient must be multiplied by 1.27.) Each test discharge was run at approximately half full and full pipe to obtain high- and low-entrance velocity conditions and with controlled and uncontrolled tailwater depths (figures 2 and 3).

The larger flows with the higher velocities intermittently surged and splashed high on the basin walls immediately downstream from the hanging baffle and overtopped the sidewalls at the downstream end of the basin (figures 2 and 3). To improve these flow conditions, the width of the notches in the baffle was reduced and the notches moved a short distance away from the sidewalls. Also, the slope of the top of the basin sidewalls was reduced to increase the height of the wall at the downstream end of the basin. The modification to the notches reduced the splashing and the height of the water surface rise on the sidewalls. Increasing the height of the sidewalls provided additional freeboard at the downstream end of the basin. These modifications are incorporated into the standard design dimensions shown in figure 1.

Standardization of the Basin Flow Entrance

The flow will usually enter the basin from a circular pipe but may enter from a rectangular open channel. The pipe may flow full or partially full. If it flows partially full and the upstream entrance to the pipe is submerged, the pipe should be vented to the atmosphere. The vent should be located near the upstream end of the pipe and have a diameter of about one-sixth the pipe diameter.

Although the entrance pipe or channel is usually horizontal or on a very slight downward grade, some installations may require an entrance pipe on a relatively steep slope. The hydraulic performance of the 2.4-foot (73.15-centimeter) wide model basin was determined with the entrance pipe sloped downward about 12°. Both high- and low-velocity test flows partially impinged on the hanging baffle and the bottom of the baffle was only partially submerged, resulting in incomplete energy dissipation.

The model tests showed that a horizontal fillet on the invert of the pipe for a distance of one pipe diameter upstream from the portal caused greater jet impingement on the baffle, deeper submergence of the bottom of the baffle, and consequently better energy dissipation. The same improvement could be obtained by placing the entrance pipe horizontally

Standardization of the Basin Size

After standardizing the basin dimensions in relation to the basin width, the next step was to standardize the size in relation to the quantity and velocity of the flow entering the basin. The basin size is represented by the basin width, the quantity and velocity of flow by the Froude number of the incoming jet.

It was believed that the shape of the incoming jet was relatively unimportant in evaluating the adequacy of a Type VI basin. Therefore, to standardize the method of computing the Froude number of the incoming flow, it was assumed that the cross sectional area of the jet in the circular pipe or rectangular channel had the shape of a square; thus, the depth of the incoming flow "D" was considered to be the square root of its cross sectional area.

The test flows (figures 2 and 3) used in verifying the standard dimensions of the basin in reference (*2*) were repeated in the 2.4-foot (73.15-centimeter) wide model basin, but with a riprapped channel simulated at the downstream end of the basin. Water surface roughness and erosion together with the ability of the basin to contain the flow were used as guidelines in evaluating the hydraulic performance test flows (figures 4 through 7). Each of the test flows was judged to be satisfactory or unsatisfactory and plotted in dimensionless terms (Froude number of the incoming flow "F" versus the ratio of basin width to the incoming depth of the flow "W/D") in figure 8.

To increase the range of data to be evaluated for figure 8, the cross sectional area of the incoming flow was reduced to one-fourth the area of the 8-inch (20.32-centimeter) pipe, and the velocity of the flow entering the 2.4-foot (73.15-centimeter) wide model basin was increased (figure 9). Thus, both the Froude number and the width/depth ratio increased. The width/depth ratio for these tests was 8.15, at which the Froude number of a theoretical square jet at the entrance was 6.70 for the minimum satisfactory operation. Because the size of the jet was becoming very small in relation to the width of the basin, the design curve in figure 8 was not extended beyond a width to depth ratio of 10, which corresponded to flow having a Froude number of about 9.

To increase the range of data in the other direction, the cross sectional area of the incoming flow was increased in relation to the basin width by switching to the 1.6-foot (48.76-centimeter) wide model while maintaining the 8-inch (20.32-centimeter) entrance pipe (figure 10). The tests were evaluated and plotted in figure 8 at a W/D ratio of 3.08. The side slopes of the downstream discharge channel were vertical and the same distance apart as the basin sidewalls. Although this was not typical of the usual prototype installation and is not recommended, it was not considered to be critical in evaluating the performance of the basin. For these tests, the Froude number was in the vicinity of 1.0 and the height of the incoming flow was near the top of the baffle. Therefore, it did not appear practical to design this basin for W/D ratios smaller than 3, which corresponds to a flow having a Froude number of 1.1.

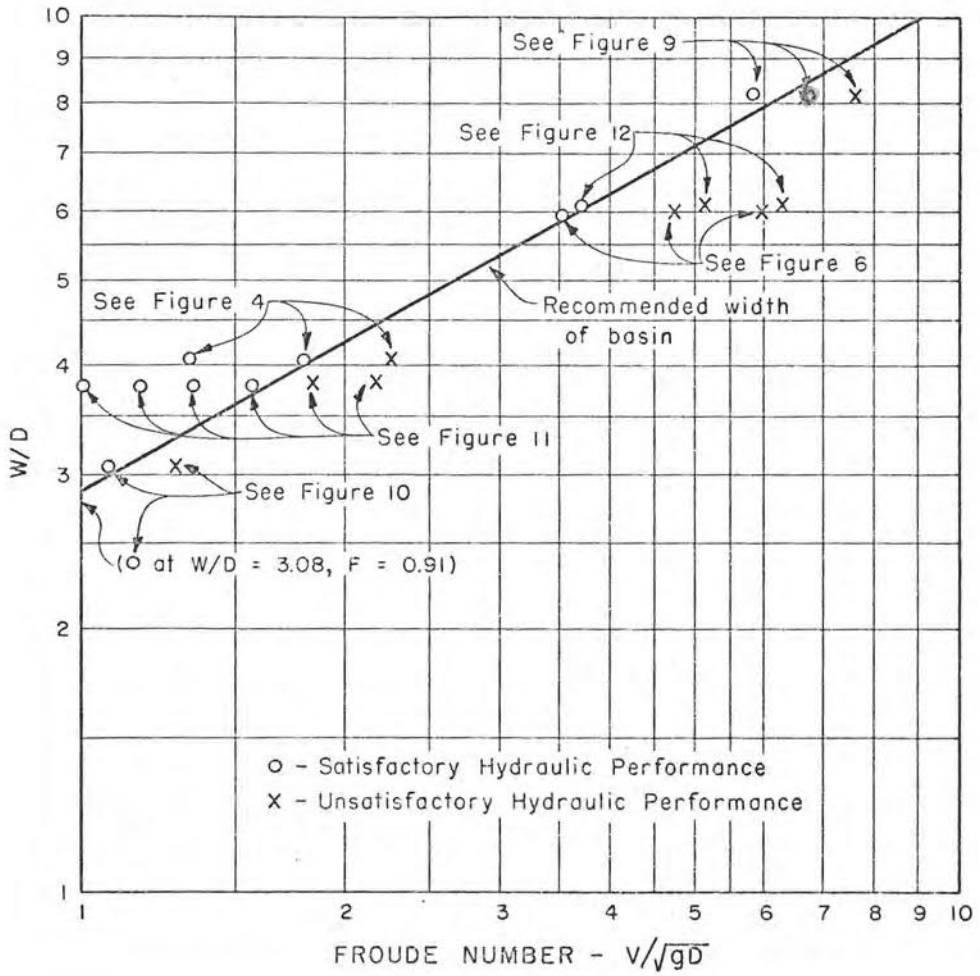
Additional tests were run in this smaller model (figures 11 and 12) to confirm the findings found in the larger model basin. The results of these tests are plotted in figure 8 at W/D ratios of 3.8 and 6.1. The two models showed very good agreement in what was considered satisfactory and unsatisfactory performance, as seen by comparing figures 4 and 6 with 11 and 12.

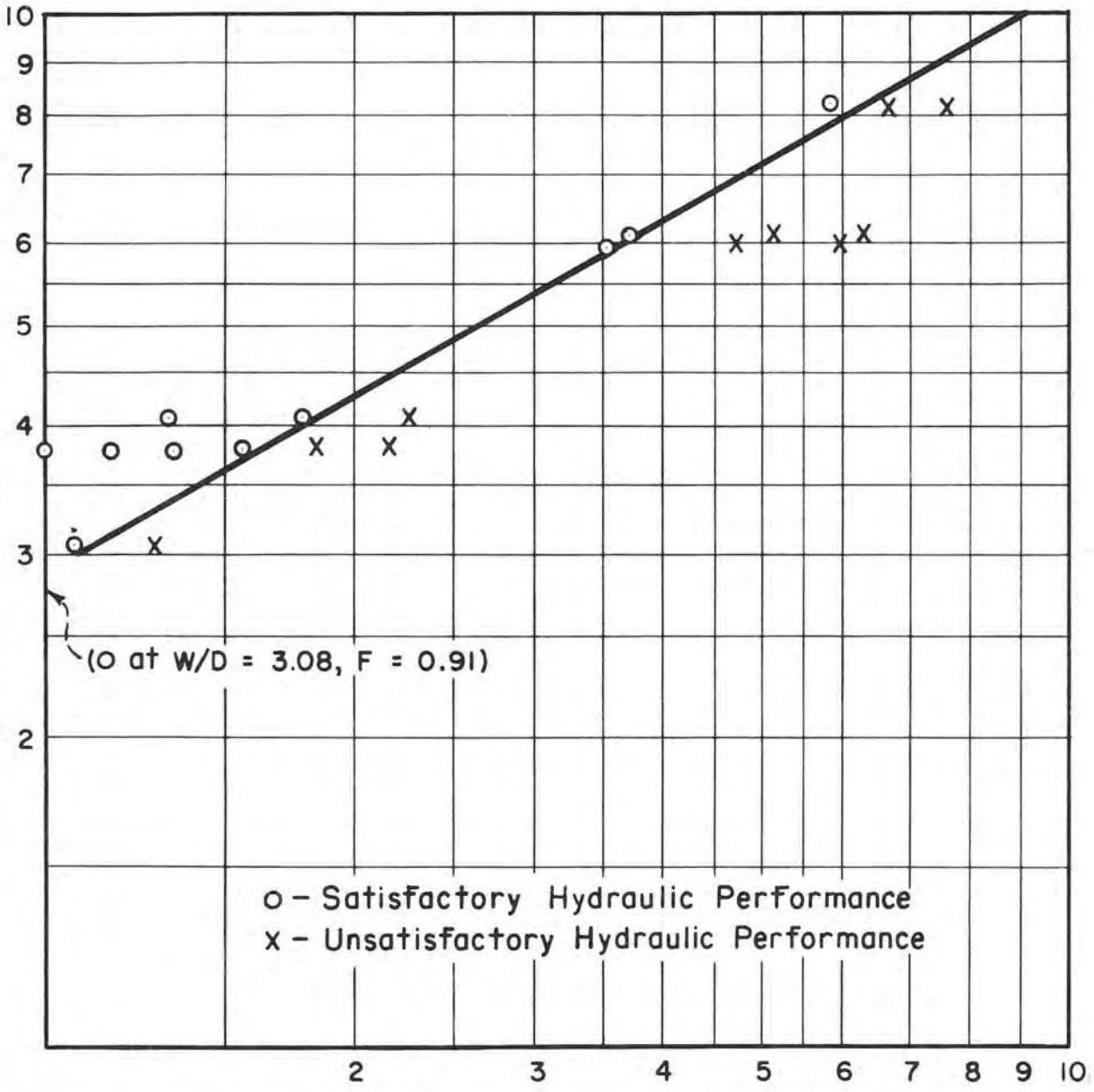
In figure 8, the straight line drawn through the data points with the highest Froude numbers for which satisfactory operation existed indicates the minimum width of basin that can be used for a given Froude number. Data points above the line indicate that it should be permissible to increase the size of the basin approximately 25 percent; however, this should not be done as these points represent the condition when the basin is operating at less than the design discharge. If the basin is too large, the incoming jet will pass under the baffle as has occurred at some installations and effective energy dissipation will not occur. For best results, the basin should be designed for the minimum width indicated in figure 8.

Standardization of the Entrance Velocity Limitation

In previous studies (*2*), the design criteria for this type of structure were based on discharge alone. The maximum incoming velocity was arbitrarily limited to 30 feet (9.14 meters) per second. However, some prototype structures have been designed and operated at velocities exceeding this limit. The Type VI stilling basins for the outlet works of Picacho South and North Dams were designed for velocities up to 39 and 48 feet (11.90 and 14.63 meters) per second, respectively, for flows of 165 and 275 cubic feet (4.67 and 7.78 cubic meters) per second, respectively. They have operated satisfactorily at 80

FIGURE 8
REPORT HYD-572





"W" is the inside width of the basin.
"D" represents the depth of flow entering the basin and is the square root of the flow area.

"V" is the velocity of the incoming flow.
The tailwater depth is uncontrolled.

Figure 8.—**Design width of basin.**

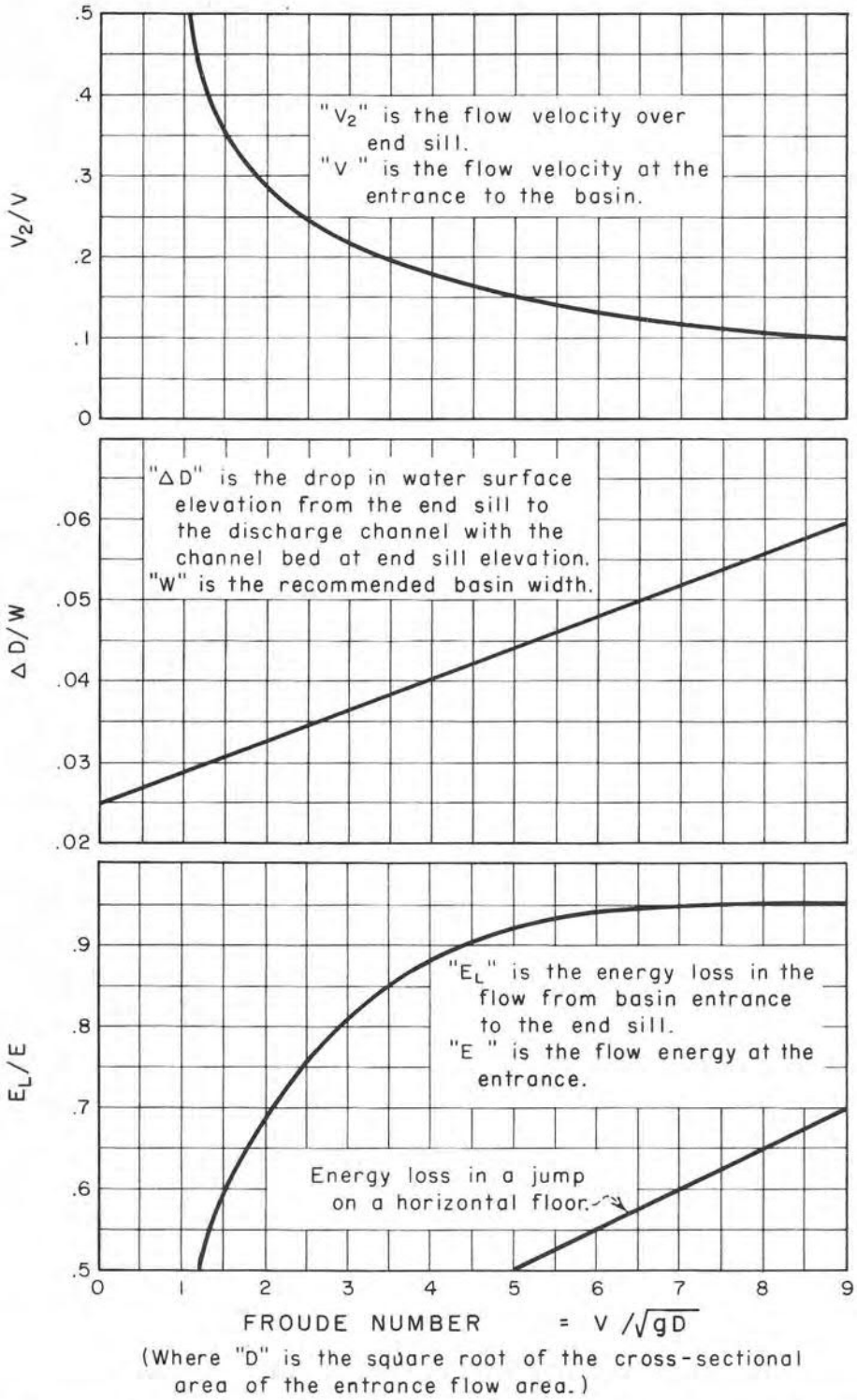


Figure 14.—**End sill velocity, water surface drop from end sill, and energy loss through basin.**

percent capacity at velocities of 32 and 37 feet (9.75 and 11.28 meters) per second (figure 13).

To prevent the possibility of cavitation or impact damage to the basin, the maximum entrance velocity should be limited to about 50 feet (15.24 meters) per second. At this velocity the maximum Froude number, 9.00, for which the basin is recommended will occur at a design flow of 46 cubic feet (1.30 cubic meters) per second. For Froude numbers less than about 4, this basin would not be feasible at this velocity because of the enormous size of the structure involved.

Standardization of the Discharge Channel Riprap

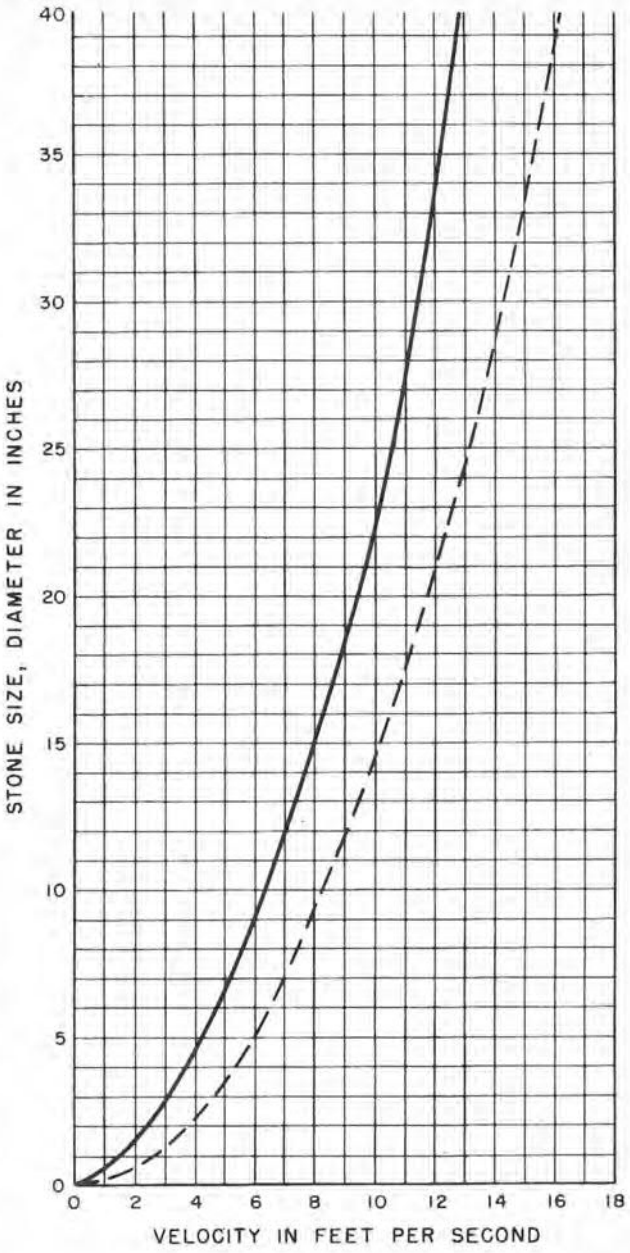
Channel bed erosion tests were not conducted to prove the required size of stones in the riprap. Instead, a reasonable riprap size was chosen to fit the size of the basin. Having predetermined the basin size and relative size of stones in the riprap, the discharge capacity and entrance velocity limitations were determined as already described.

A model riprap was chosen that approximated a basin width-to-stone diameter ratio of 20 to 1. This size appeared to be reasonable and satisfactory, as was confirmed by the tests described in the preceding section on standardization of basin size. These tests showed that slight erosion of the riprap began at about the same time as excessive water surface roughness appeared within and downstream of the basin. The model stones were rounded, although angular ones would be preferred in the prototype.

The gravel was placed on the channel bottom at end still elevation and on the 1½ to 1 side slopes to a normal depth equal to the height of the end sill (figure 1) and for a distance downstream equal to the basin width. This arrangement was satisfactory in the model tests and is, therefore, recommended for prototype construction.

In some instances, the discharge channel bed may be several inches (centimeters) or a few feet (meters) below the end sill elevation. This will considerably increase the riprap stone size requirement. To determine the increased riprap stone size requirement, the average flow velocity at the end sill was determined. It was then related to the average entrance velocity and plotted versus Froude number in figure 14, and plotted versus the stone size requirement in figure 15.

The additional head as provided by the lower channel bed should be added to the velocity head



NOTE

The riprap should be composed of a well graded mixture but most of the stones should be of the size indicated by the curve.

——— End sill velocity in Type VI Basin vs stone size required in riprap.

– – – – Bottom velocity in a channel vs stone size required in riprap. (See figure 165 in reference 2)

Figure 15.—**Recommended riprap stone size.**

at the sill to determine the velocity of flow entering the channel. Having determined the increased velocity, figure 15 can be entered to determine the riprap stone size requirement.

The stone size requirement for end sill velocities is compared in figure 15 with the stone size requirement for bottom velocities in channels downstream of stilling basin (2). The comparison indicates that the stone size recommendation here is conservative; however, the flow from the sill is in a downward direction as there is a drop in water surface from end sill to channel (figure 14). Also, the average velocity plotted in figure 14 is not as high as the velocity of flow from the center of the sill.

Tailwater Recommendations

The effect of tailwater on the basin efficiency was determined by repeating the above tests using a maximum tailwater controlled to a depth of d+b/2 above the basin floor. (2) (See figure 1 for definitions.) A comparison of these flow conditions (figures 16 and 17) with the uncontrolled tailwater flow conditions (figures 4 and 6) shows that the water surface roughness and bed erosion are reduced by the higher tailwater but not sufficiently to allow a reduction in the basin size. The riprap stone size could be reduced slightly as determined by the reduced velocity using figure 15.

Performance Evaluation

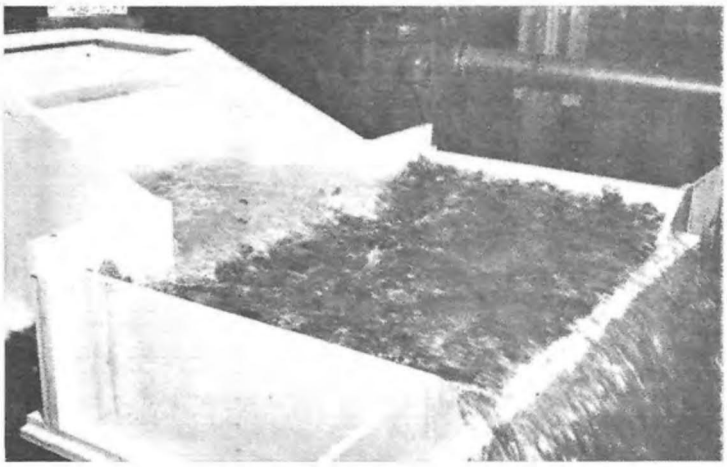
Energy dissipation is initiated by flow striking the vertical hanging baffle and being turned upstream by the horizontal portion of the baffle and by the floor, in vertical eddies. Its effectiveness is best illustrated by plotting the percent of energy loss between the entrance portal and the end sill for a range of operating conditions as represented by the Froude number (figure 14). Comparing the energy loss with the losses in a hydraulic jump shows the impact basin to be more efficient.

Prototype structures (2) that meet these design standards have operated successfully. The outlet basins at Picacho South and North Dams, discharging at 80-percent capacity, are examples (figure 13). The design requirements for the 80-percent capacity and for the 100-percent design capacity are given in table 1.

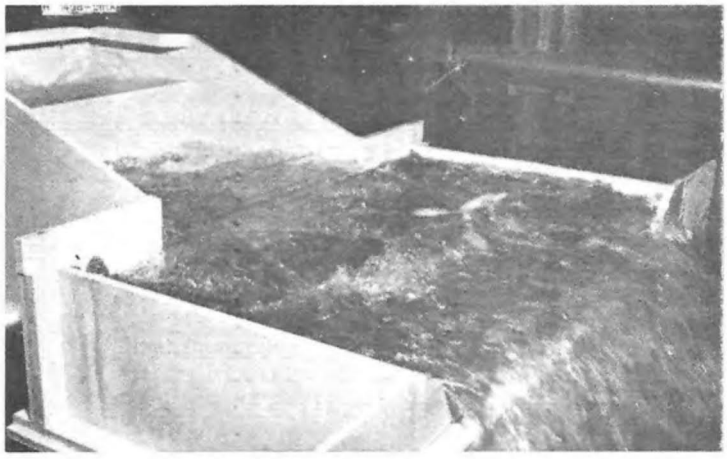
For operation of these structures at 80-percent capacity, the table shows the width of basin and, therefore, the size of basins to be adequate to meet design requirements. However, for 100-percent design capacity, the table shows the basins to be about

Table 1.—DESIGN SPECIFICATIONS FOR THE OUTLET WORKS STRUCTURE AT PICACHO NORTH AND SOUTH DAMS

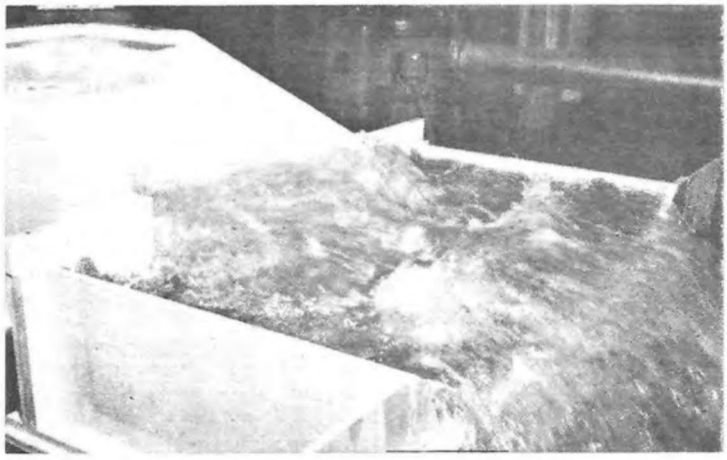
	Estimated flood of record		Maximum designed flood	
	South Dam	North Dam	South Dam	North Dam
Discharge cfs, "Q"	130	210	165	275
Estimated entrance velocity, "V", feet per second	31.8	37	39	48
Cross sectional area of flow, "A", square feet	4.09	5.67	4.23	5.73
Depth, "D", feet	2.02	2.38	2.06	2.39
Froude number, "F"	3.94	4.23	4.77	5.46
Width to depth ratio from figure 8, "W/D"	6.21	6.50	6.95	7.50
Width recommended, "W", feet	12.54	15.47	14.31	17.93
Actual width used, feet	12.50	15.50	12.50	15.50
Percent undersized	1	0	13	13
Ratio of end sill velocity to entrance velocity, "V_2/V" (figure 14)	0.18	0.17	0.158	0.149
End sill velocity in recommended width basin "V_2", feet per second	5.72	6.29	6.16	6.77
Velocity head at end sill, feet	0.50	0.61	0.58	0.71
Drop from end sill to channel, feet (y)	0.75	1.33	0.75	1.33
Velocity head in channel, feet	1.25	1.94	1.33	2.04
Velocity in channel, feet per second	8.98	11.17	9.26	11.47
Riprap stone diameter for recommended basin above channel, figure 15, inches	18	28	20	30
Riprap stone diameter for channel at end sill elevation, figure 15, inches	8.0	9.8	9.3	11.0
Stone diameter specification (both dams), inches	18 to 51½			



F = 1.34
W/D = 4.06
No erosion
Satisfactory



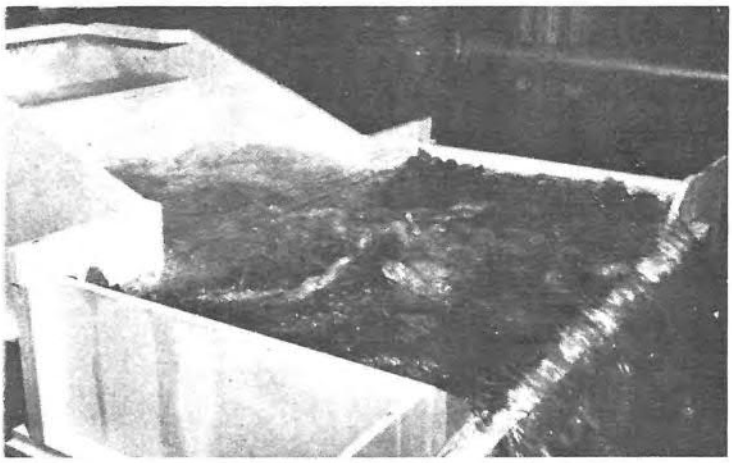
F = 1.81
W/D = 4.06
No erosion
Satisfactory



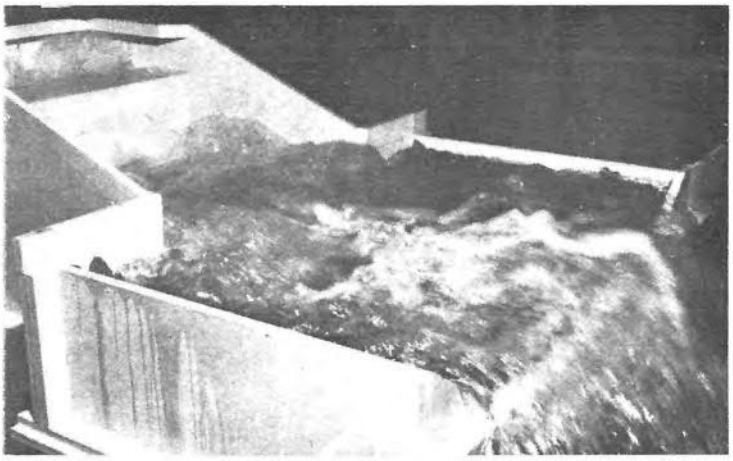
F = 2.27
W/D = 4.06
Excessive erosion
Unsatisfactory

Note: Tailwater = d + b/2: see figure 1 for definitions

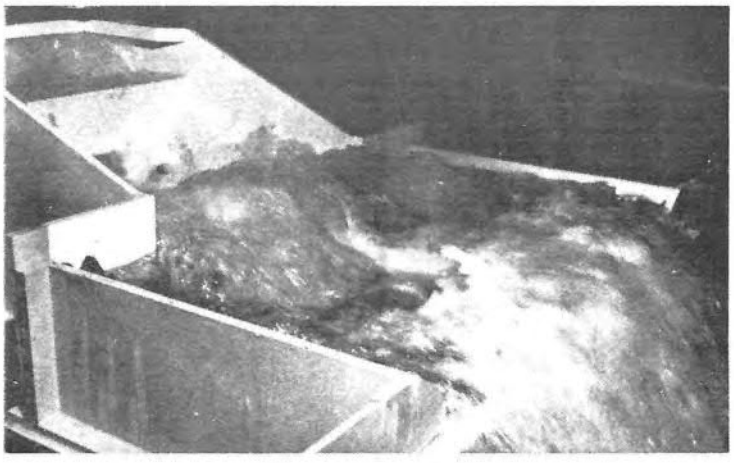
***Figure 16.*—Entrance pipe flowing full with controlled tailwater in 2.4-foot-wide basin.**



F = 3.53
W/D = 5.98
No erosion
Satisfactory



F = 4.77
W/D = 5.98
Minor erosion
Unsatisfactory



F = 6.01
W/D = 5.98
Excessive erosion
Unsatisfactory

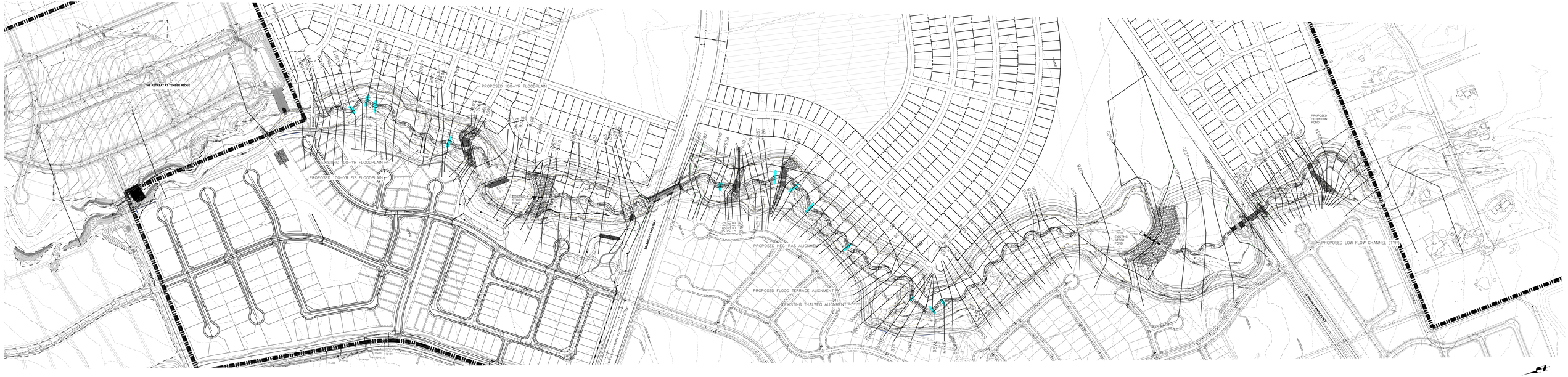
Note: Tailwater = d + b/2; see figure 1 for definitions

***Figure 17.*—Entrance pipe flowing half full with controlled tailwater in 2.4-foot-wide basin.**

Appendix E

Work Map

SAND CREEK RESTORATION WORK MAP



0 50 100 200
GRAPHIC SCALE: 1" = 100'

HEC-RAS WORK MAP
SAND CREEK RESTORATION
EL PASO COUNTY, CO
DATE: 04/06/2022
SHEET 1 OF 1

SAND CREEK RESTORATION – WETLANDS EXHIBIT

LEGEND

- PERMANENT LOSSES FROM CHANNEL
- PERMANENT LOSSES FROM BRIDGE
- MITIGATION AREAS
- PRESERVED WETLANDS

Sand Creek Wetlands Disturbances		
Totals	Sq Ft	Acres
Total Existing Onsite Wetland	709,592	16.29
Reach 1 Permanent Loss	32,636	0.74
Reach 2 Permanent Loss	159,695	4.28
Reach 3 Permanent Loss	184,711	5.44
Permanent Loss Total	455,827	10.46
Reach 1 Wetlands Preserved	25,988	0.60
Reach 2 Wetlands Preserved	174,465	4.01
Reach 3 Wetlands Preserved	92,825	2.13
Total Wetlands Preserved	293,278	6.73
Reach 1 Mitigation	112,420	2.58
Reach 2 Mitigation	1,072,820	24.63
Reach 3 Mitigation	430,110	9.87
Mitigation Total	1,615,350	37.08
Total (Mitigation less Permanent Loss)	1,159,523	26.62
Mitigation to Permanent Loss Ratio	3.54	

PRELIMINARY GRADING TOTALS:

REACH 1 –30,764 CY CUT
4,603 CY FILL
26,162 NET

REACH 2 –646,436 CY CUT
24,522 CY FILL
621,913 CY NET

REACH 3 –129,691 CY CUT
3,462 CY FILL
126,229 CY NET

TOTAL– 806,8911 CY CUT
32,587 CY FILL
774,304 CY NET

Wetlands Impacts Summary	
Total Permanent Loss	**11.0132**
Total Re-Establishment	6.2259
Total Establishment	20.58264
Total Enhancement	4.3825
Total Preservation	2.3502
Total Mitigation	**33.54124**
Mitigation to Permanent Loss Ratio	**3.05**

Permanent Impacts	
Impact Area	Area (ac)
1	0.0186
2	0.4507
3	0.0382
4	0.236
5	0.5489
6	0.3344
7	0.6318
8	0.0261
9	0.1306
10	0.4761
11	0.5038
12	0.0425
13	0.0885
14	0.6140
15	0.2477
16	0.1301
17	0.3332
18	0.0152
19	0.0205
20	0.0540
21	0.1194
22	0.0228
23	0.0174
24	0.3144
25	0.0233
26	0.0950
27	0.0423
28	0.6390
29	0.0409
30	0.4823
31	0.2454
32	0.0048
33	0.0387
34	0.7750
35	0.3849
36	0.0991
37	0.3448
38	0.0683
39	0.3993
40	0.0033
41	0.0227
42	0.0288
43	0.2464
44	0.0142
45	0.1237
46	0.4149
47	0.0903
48	0.4540
49	0.0829
50	0.1529
51	0.2467
52	0.0344
Total	11.01326

Total Mitigation		
Mitigation Area	Area (ac)	Designation
1	0.5966	Enhancement
2	0.4507	Re-Establishment
3	0.0433	Establishment
4	0.0295	Establishment
5	0.9167	Establishment
6	0.236	Re-Establishment
7	0.1626	Establishment
8	0.1454	Establishment
9	2.429	Establishment
10	1.2358	Establishment
11	0.3344	Re-Establishment
12	1.4367	Establishment
13	0.1306	Re-Establishment
14	2.3502	Preservation
15	0.0464	Establishment
16	0.0425	Re-Establishment
17	0.5477	Enhancement
18	0.6140	Re-Establishment
19	1.9964	Establishment
20	0.2477	Re-Establishment
21	2.0198	Establishment
22	0.7436	Enhancement
23	0.3332	Re-Establishment
24	1.0938	Establishment
25	0.3637	Enhancement
26	6.2610	Establishment
27	0.0152	Re-Establishment
28	0.0205	Re-Establishment
29	0.0540	Re-Establishment
30	0.0343	Establishment
31	0.1489	Establishment
32	0.1194	Re-Establishment
33	1.1455	Establishment
34	0.0174	Re-Establishment
35	0.0632	Establishment
36	0.2112	Establishment
37	0.3144	Re-Establishment
38	0.0127	Establishment
39	0.0233	Re-Establishment
40	0.1798	Establishment
41	0.0423	Re-Establishment
42	0.0484	Re-Establishment
43	0.4825	Enhancement
44	0.2493	Establishment
45	0.2454	Re-Establishment
46	0.2010	Establishment
47	1.1357	Establishment
48	0.7750	Re-Establishment
49	0.2016	Establishment
50	0.0060	Establishment
51	1.2397	Establishment
52	0.3448	Re-Establishment
53	0.1045	Enhancement
54	0.3993	Re-Establishment
55	0.0107	Establishment
56	0.0179	Establishment
57	0.4222	Establishment
58	0.0800	Establishment
59	0.4149	Re-Establishment
60	0.4540	Re-Establishment
61	1.0532	Establishment
62	0.0798	Establishment
63	1.5440	Enhancement
64	0.0829	Re-Establishment
65	0.2467	Re-Establishment
66	0.0344	Re-Establishment
Total	37.08333	

Establishment	
Mitigation Area	Area (ac)
3	0.0433
4	0.0295
5	0.9167
7	0.1626
8	0.1454
9	2.429
10	1.2358
12	1.4367
15	0.046419
19	1.996396
21	2.019812
24	1.093802
26	6.26095
30	0.034275
31	0.148898
33	1.1455
35	0.063246
36	0.211203
38	0.012672
40	0.179775
44	0.249288
46	0.20101
47	1.135744
49	0.201561
50	0.006
51	1.239738
55	0.010744
56	0.0179
57	0.422222
58	0.08
61	1.053191
62	0.079798
Total	20.58264

Re-Establishment	
Mitigation Area	Area (ac)
2	0.4507
6	0.236
11	0.3344
13	0.1306
16	0.0425
18	0.614
20	0.2477
23	0.3332
27	0.0152
28	0.205
29	0.054
32	0.1194
34	0.0174
37	0.3144
39	0.0233
41	0.0423
42	0.0484
45	0.2454
48	0.775
52	0.3448
54	0.3993
59	0.4149
60	0.454
64	0.0829
65	0.2467
66	0.0344
Total	6.2259

Enhancement	
Mitigation Area	Area (ac)
1	0.5966
17	0.547658
22	0.7436
25	0.363728
43	0.482461
53	0.104477
63	1.544031
Total	4.382527

Preservation	
Mitigation Area	Area (ac)
14	2.3502
Total	2.3502

100 50 0 100 200

HORIZONTAL
ORIGINAL SCALE: 1" = 100'
VERTICAL
ORIGINAL SCALE: 1" = 10'

WETLANDS EXHIBIT
SAND CREEK RESTORATION
PROJECT NO: 25188.04
DATE: 04/11/2022
SHEET 1 OF 1

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