



CHANNEL DESIGN AND FINAL DRAINAGE REPORT

FALCON MEADOWS AT BENT GRASS

El Paso County, Colorado

PREPARED FOR:
Challenger Communities
8605 Explorer Dr., Suite 250
Colorado Springs, CO 80920

PREPARED BY:
Galloway & Company, Inc.
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920

DATE:
December 2021
Revised March 2022



ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable 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.

Scott Brown, PE 45900
For and on behalf of Galloway & Company, Inc.

Date

DEVELOPER'S CERTIFICATION

I, The developer, have read and will comply with all of the requirements specified in this drainage report and plan.

By: _____

Date

Address: Challenger Communities, LLC
8605 Explorer Dr., Suite 250
Colorado Springs, CO 80920

EL PASO COUNTY CERTIFICATION

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

Jennifer Irvine, P.E.
County Engineer/ECM Administrator

Date

Conditions:

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I. General Description

This report is to serve to summarize the design and proposed improvements to the West Tributary to the Falcon Basin (CHWS1400), which will be referred to as the Falcon Meadows Channel through the report. It is proposed to construct 11 grouted sloping boulder drop structures and realign portions of the channel to best work with proposed and future development in the area. The proposed work in the channel will begin at approximately at the north property line of the Falcon Meadows at Bent Grass development and end approximately 200' north of Woodmen Road. No other storm structures are anticipated for the channel design.

The project is located in the Falcon area of El Paso County, Colorado. The site is located in the Northwest $\frac{1}{4}$ and Southwest $\frac{1}{4}$ of Section 1, Township 13S, Range 65W, of the Sixth Principal Meridian, County of El Paso, State of Colorado. A Vicinity Map is included in Appendix A.

A portion of the channel has already been realigned along the north boundary line of the Falcon Meadows development, as well as the construction of the twin 16' x 6' concrete box culverts at Bent Grass Meadows Drive, which included a grouted sloping boulder drop structure upstream.

II. Project Background

Falcon Meadows Channel is currently a natural drainageway, running through the Falcon Meadows at Bent Grass development, south to Woodmen Road. The channel continues south under Woodmen Road, eventually entering existing Detention Pond WU in the Falcon Highlands development. The MDDP showed the channel remaining as a natural channel with grade control structures placed throughout to help control velocities and degradation throughout the channel. The channel was to remain as close to natural conditions as possible, with improvements only occurring in the vicinity of the drops/grade control structures.

Due to proposed and future development within the vicinity of the channel, it is now being proposed to add additional drop structures and realign the channel. The channel will be a trapezoidal section with 4:1 side slopes and maintaining an overall channel slope of 0.30% is used to keep the channel flow in a sub-critical flow. Due to the steepness of the site in relation to the 0.30% slope, it is being proposed to use sloping boulder drop structures in lieu of the rock vane grates which had been proposed in the Drainage Basin Planning Study which also showed the channel remaining in its current location.

III. Previous Reports

The proposed site has been included in multiple drainage studies in the past. The following is a composite list of the existing reports pertaining to this site analysis.

1. *Falcon Drainage Basin Planning Study*, by Matrix Design Group, September 2015.
2. *Master Development Drainage Plan – Bent Grass Residential Subdivision*, by Galloway & Company, February 2021 (In Review).
3. *Master Development Drainage Plan and Preliminary Drainage Plan – Bent Grass Subdivision*, by Kiowa Engineering Corporation, December 2006.
4. *Final Drainage Report for Bent Grass Residential (Filing No. 1)*, by Classic Consulting Engineers & Surveyors, LLC, August 2014.
5. *Final Drainage Report Addendum for Bent Grass Residential (Filing No. 1)*, by Classic Consulting Engineers & Surveyors, LLC, August 2015.

6. *Master Development Drainage Plan for The Ranch*, by Classic Consulting Engineers & Surveyors, LLC, November 2018.
7. *Falcon Highlands Master Development Drainage Plan & Preliminary Drainage Report & Final Drainage Report for Filing 1*, by URS, January 2005.
8. *Final Drainage Report and Erosion Control Plan – Latigo Business Center Filing No. 1 A Re-subdivision of a Portion of Latigo Business and Research Center Filing No. 1*, by Kiowa Engineering Corporation, November 2004.
9. *Final Drainage Letter Report for Lot 1, Latigo Business Center Filing No. 1*, by Colorado Design Concepts, April 2005.
10. *Final Drainage and Erosion Control for The Meadows Filing Three Subdivision*, by LADD Engineering, July 2000.
11. *Final Drainage Report Bent Grass Residential Subdivision, Filing No. 2*, Galloway & Company, March 2020.
12. *Preliminary Drainage Report Falcon Meadows at Bent Grass*, by Galloway & Company, February 2021.
13. *Final Drainage Report for Falcon Meadows at Bent Grass Filing No. 1*, by Galloway & Company, under review.

IV. Site Description

The Falcon Area DBPS made recommendations for the channels as they run through the project site. RWT202 was rerouted on the north property lone to convey flows to RWT204. Improvements were designed as part of the Bent Grass Residential Filing No. 2 development.

Existing RWT204 is grossly oversized for the pre-Bent Grass development flows expected through it, with a 5-year flow of 7 cfs and a 100-year flow for 43 cfs from the DBPS study. The future SCS calculations have a total flow of 181 cfs for the 5-year flow and 1029 cfs for the 100-year flow at DP 40, the location where offsite channel flow enters the Bent Grass development, upstream of the existing box culvert crossing at Bent Grass Meadows Drive in Reach RWT204. The FEMA flow reported in this section of channel is 1,400 cfs. Improvements to this section of the channel will adhere and be equivalent to the recommendations in the Falcon Basin DBPS.

RWT204 will generally stay in a location similar to where it is in existing conditions but will have new designed channel sections. The channels will have longitudinal slopes flattened to below 1% in order to reduce the scour potential of the channel. Grouted Sloping Boulder Drops will be utilized within the channel as grade controls (maximum height of 5' with 4:1 slope). Eleven total grade control structures will be utilized within the channel, all the way to Woodmen Road.

RWT210 is the section of the channel south of Bent Grass Meadows Drive and continues south to Woodmen Road. The channel location will shift slightly to the east and “straighten” out the overall flow path. It will be located within a drainage easement. The channel will have a design with a longitudinal slope less than 1%, bottom width of 38', and 4:1 side slopes. The Falcon DBPS recommendations for the channel are to remain as a natural drainage channel.

The West Trib Channel (RWT202, RWT204 & RWT210) will be maintained by the Bent Grass Metropolitan District. For channel improvements offsite of the Falcon Meadows at Bent Grass Filing No. 1 and Bent Grass Residential Filing 2 property, specifically south of the development, it is agreed that the developer will be responsible for the channel improvements, south of the development, to the existing improvements north of Woodmen Road if the current property owners have not initiated the

improvements themselves, or the developer will work with the current property owners to reach an agreement on design/construction, costs, and timing of the channel improvements. Channel improvements shall be complete within three years of the recordation of Falcon Meadows at Bent Grass Filing No. 4.

V. Hydraulics

Hydraulic analyses were performed to establish a corrected condition, Pre-Project (existing) and Post-Project (proposed) condition for the 100-year storm event. The goals of this evaluation were to document: a) that no existing insurable structures are impacted by the proposed project, and b) that the cumulative increase in the 100-year water surface elevation is below the allowable surcharge amount.

PRE PROJECT (EXISTING) CONDITION:

Description of Improvements:

The previously approved floodplain permit was submitted to accompany the Bent Grass Residential Filing No. 2 project, which is located to the east along a portion of the channel. The proposed condition for the previously approved floodplain permit took into account the twin culverts crossing under Bent Grass Meadows Drive, along with a drop structure just upstream of the structure. The remainder of the channel was left in existing condition with no improvements and ended at Cross Section 2605, just south of the Bent Grass property. This model the basis of the pre-project (existing) condition model for this report. The model was updated to include the relocation of the channel along the north property line and was extended to the south to Woodmen Road.

The Bent Grass Residential Filing No. 2 project was a private development subdivision north of East Woodmen Road in Falcon, Colorado. The project regraded portions of the West Tributary to Falcon Basin (CHWS1400) from a natural channel to a grass lined earthen channel and installed a new road crossing over the channel that conveys water through two 16 feet wide by 6 feet tall reinforced concrete box culverts. The location of these improvements is called out on Figure 1 at the end of this letter. The earthen channel was shown on separate design drawings included in the previously approved Floodplain permit report and construction drawings for the Bent Grass Residential Filing No. 2 project. The channel was designed to be approximately 5 feet deep with 4:1 side slopes and lined with native grass seed. Locations where the channel was to be regraded include Cross Section 5000 towards the northern end of the project area, as well as Cross Sections 4400 through 3800 which correspond to the location of the proposed roadway crossing. The roadway crossing also included a 7.6-foot drop structure upstream of the box culverts that has a 4:1 slope, riprap placed upstream of the drop and downstream of the culverts, and wingwalls at the downstream end. Other improvements that were part of the Bent Grass Residential Filing No. 2 Project include: a) a capture channel along the northern property line that collects upstream flows and convey them into the tributary, b) off-line detention ponds that will detain flows coming from the subdivision offsite.

Hydraulic Analysis:

The pre-project condition hydraulic analysis utilized the previous "proposed" HEC-RAS model from the approved floodplain permit to analyze the 100-year flood event in the existing channel and associated improvements on the Bent Grass Residential Filing No. 2 property. The model boundary condition was not changed from the effective condition model from 2003. In the study reach, a Manning's n value of 0.035 was used in the channel. Sections of the overbank that are to be grass lined during this project were also assigned manning's n values of 0.035, while undeveloped channel overbanks were assigned a Manning's n of 0.050 corresponding to the effective condition model. The Bent Grass Meadows road crossing was modeled as a 16W'x6'H double barreled reinforced concrete box culvert.

POST PROJECT (PROPOSED) CONDITION:

Description of Improvements:

The Falcon Meadows at Bent Development includes three additional phases of single-family residential subdivisions, along the east and west sides of the existing channel. South of the Falcon Meadows site, there are 3 additional parcels of land, which have future development planned. The remaining entirety of the channel north of Woodmen Road, which has not previously been improved, will regrade the existing channel from a natural channel to a grass lined earthen channel, with 11 drop structures. The proposed earthen channel is shown on separate design drawings and is approximately 5 feet deep with 4:1 side slopes and lined with native grass seed. The alignment of the channel, once it leaves the Falcon Meadows development, was shifted to the east, to allow larger and more useable tracts of land for future development, and not leaving “slivers” of unusable land along the east side of the channel.

Hydraulic Analysis:

The post project condition hydraulic analysis utilized the pre-project HEC-RAS model to analyze the 100-year flood event in the proposed channel and associated improvements thru the West Tributary Channel, to Woodmen Road. The model boundary condition was not changed from the effective condition model from 2003. In the study reach, a Manning’s *n* value of 0.035 was used in the channel. Sections of the overbank that are to be grass lined during this project were also assigned manning’s *n* values of 0.035, while undeveloped channel overbanks were assigned a Manning’s *n* of 0.050 corresponding to the effective condition model. Manning’s *n* values of 0.04 were used for the channel section at the riprap drop structures and 0.045 at the drop structures overbank areas. See Table 1 for additional Channel Design parameters used in this project.

Adjust the design to meet these.

Table 1: Channel Design Parameters

Design Parameter	Design Value
Maximum 100-year Depth	5 ft
Maximum Velocity*	7 ft/s
Maximum Froude, 100-year*	0.8
Maximum Shear Stress, 100-year*	1.2 lb/sf
Maximum Longitudinal Slope*	0.61%
Side Slope	4:1

*Values are for normal channel section outside of drop structures

No low flow channel was provided for this channel. This is due to several reasons. In the existing condition the natural channel has not formed a low flow channel. This means there is not a base flow (which has been confirmed with site visits) in the channel. Additionally, the existing downstream infrastructure as well as the upstream existing channel have not accommodated for a low flow channel. Given the clayey sand and underlying claystone, which much of the channel will be cut into, it is not anticipated that the channel will be susceptible to erosion creating a low flow in the future.

VI. Maintenance

The channel is to be a private facility until all DBPS identified improvements are complete. Once the DBPS improvements are completed, maintenance for the channel will transition to El Paso County. After completion of construction and upon the Board of County Commissioners acceptance, all public drainage facilities within easements and public Right-of-Way will be owned and maintained by El Paso County.

A deviation request (3.3.3.C) is needed if proposing no low-flow channel (not required for only erosion but for sedimentation and standing water)

Maintenance access to proposed drops and channel will be provided via a proposed access road on the west side of the channel, running parallel to the proposed channel, located along the top bank.

VII. Floodplain Statement

A portion of the project site lies within Zone AE Special Flood Hazard Area as defined by the FIRM Map number 08041C0553G effective December 7, 2018. A copy of the FIRM Panel is included in Appendix A.

The portion of channel that has a floodplain designation is only the RWT210 and RWT204 portions of the channel. It is unknown why the western channel, RWT202 is unmapped since it is the larger contributor regarding flow rates. Discussions have occurred with PPRBD and an allowable rise certificate has been submitted for review. A copy of this has been included in the Appendix.

VIII. Drainage/Bridge Fees and Credits/Reimbursements

As the Falcon Basin channel improvements are an improvement to public infrastructure that is being constructed by a private developer (Challenger Homes, LLC), the cost of the proposed improvements, or some portion of the cost, may be credited to the development and/or defer drainage basin fees. The 2019 basin fee for the Falcon Basin is \$29,622/acre of impervious land and the 2021 basin fee for the Falcon Basin is \$31,885/acre of impervious land. The 2019 bridge fee for the Falcon Basin is \$4,069/acre of impervious land and the 2021 bridge fee for the Falcon Basin is \$4,380/acre of impervious land. The platted acreage for the adjacent Bent Grass Residential Subdivision Filing No. 2 plat is 68.55 acres. The platted acreage for the adjacent Falcon Meadows at Bent Grass Filing No. 1 plat is 21.39 acres. The percent impervious for each of the platted areas are as follows:

The *Bent Grass Residential Subdivision Filing No. 2 subdivision* has a total area of 68.55 acres. The tracts (13.326 acres) and preservation area (4.36 acres) account for a total of 17.686 acres. Tract areas will pay fees when they are platted with future filings. This leaves a total area of 50.864 acres to assess fees for Bent Grass Residential Filing No. 2. The percent impervious for the subdivision has been calculated with this report to be approximately 46.1 percent.

$$50.864 \text{ acres} \times 46.1\% = 23.45 \text{ Impervious Acres}$$

Therefore, the drainage and bridge fees are:

$$\text{Drainage: } \$29,622 \times 23.45 \text{ Imp. Acres} = \underline{\$694,635.90}$$

$$\text{Bridge: } \$4,069 \times 23.45 \text{ Imp. Acres} = \underline{\$95,418.05}$$

The *Falcon Meadows at Bent Grass Filing No. 1 subdivision* has a total area of 21.39 acres. The tracts account for a total of 12.55 acres, 71 residential lots are 6.37 acres and 2.47 acres of right-of-way. The following calculations for the imperviousness of this development have been computed as follows:

$$21.39 \text{ acres} \times 26.78\% = 5.73 \text{ Impervious Acres}$$

Therefore, the drainage and bridge fees are:

$$\text{Drainage: } \$31,885 \times 5.73 \text{ Imp. Acres} = \underline{\$182,701.05}$$

Bridge: \$4,380 x 5.73 Imp. Acres = \$25,097.40

Falcon Meadows at Bent Grass Filing Nos. 2, 3, and 4 subdivisions have not yet been platted. The **anticipated** impervious area calculations are as follow:

The *Falcon Meadows at Bent Grass Filing No. 2* subdivision has a total area of 21.37 acres. The tracts account for a total of 2.77 acres, 108 residential lots are 11.48 acres and 7.12 acres of right-of-way. The following calculations for the imperviousness of this development have been computed as follows:

21.37 acres x 56.5% = 12.08 Impervious Acres

Therefore, the drainage and bridge fees are:

Drainage: \$31,885 x 12.08 Imp. Acres = \$385,170.80

Bridge: \$4,380 x 12.08 Imp. Acres = \$52,910.40

The *Falcon Meadows at Bent Grass Filing No. 3* subdivision has a total area of 12.76 acres. The tracts account for a total of 0.66 acres, 49 residential lots are 9.50 acres and 2.60 acres of right-of-way. The following calculations for the imperviousness of this development have been computed as follows:

12.76 acres x 38.0% = 4.85 Impervious Acres

Therefore, the drainage and bridge fees are:

Drainage: \$31,885 x 4.85 Imp. Acres = \$154,642.25

Bridge: \$4,380 x 4.85 Imp. Acres = \$21,243.00

The *Falcon Meadows at Bent Grass Filing No. 4* subdivision has a total area of 14.68 acres. The tracts account for a total of 8.20 acres, 39 residential lots are 5.44 acres and 1.04 acres of right-of-way. The following calculations for the imperviousness of this development have been computed as follows:

14.68 acres x 19.29% = 2.83 Impervious Acres

Therefore, the drainage and bridge fees are:

Drainage: \$31,885 x 2.83 Imp. Acres = \$90,234.55

Bridge: \$4,380 x 2.83 Imp. Acres = \$12,395.40

Please see the drainage basin fee calculation table at end of section.

Phases 1 through 5 of the proposed channel project lie within Basin WT210 and encompass Segment RWT210 in the 2015 Falcon Drainage Basin Planning Study (**DBPS**). The DBPS indicates that this segment was planned 2,132 LF of Natural Channel Design at a cost of \$278.15 per linear foot for a total estimated cost of \$593,015.80.

Anticipated and historic fees in the area of these proposed Falcon Basin West Tributary Channel Improvements are summarized below:

Area Filings

Basin Fees Paid or Deferred, or Reconciled by Project

Falcon Meadows at Bent Grass Filing No. 1	\$182,701.05 Deferred with Drainage Fee Pre-credit for the Channel Improvements (\$0.00 Confirmed Paid to County as part of the plat)
Bent Grass Residential Sub. Filing No. 2	\$489,284.78 Reconciled with construction of Pond WU (\$489,284.78 Confirmed Paid to Contractor for construction of Pond WU). \$790,035.95 Deferred with Drainage Fee Pre-credit of \$694,635.90 and Bridge Fee Pre-credit of \$95,418.05

An opinion of probable construction cost was completed for Phase 1 through Phase 5 of the proposed improvements (Combined phases totaling roughly 3100 LF of channel improvements). Unit costs developed with the County, regional sources and recently completed similar projects were used.

Projected Construction Costs:

Engineer's Estimate of Probable Construction Costs				
Falcon Meadows at Bent Grass Channel Improvements				
Phase 1 Public Reimbursable				
Item	Quantity	Unit	Unit Cost	Cost
Drainage Chan. Const. (38' x 5')	700	LF	\$ 278.15	\$194,705.00
Phase 2 Public Reimbursable				
Item	Quantity	Unit	Unit Cost	Cost
Drainage Chan. Const. (38' x 5')	950	LF	\$ 278.15	\$264,242.50
Phase 3 Public Reimbursable				
Item	Quantity	Unit	Unit Cost	Cost
Drainage Chan. Const. (38' x 5')	650	LF	\$ 278.15	\$180,797.50
Phase 4 Public Reimbursable				
Item	Quantity	Unit	Unit Cost	Cost
Drainage Chan. Const. (38' x 5')	210	LF	\$ 278.15	\$58,411.50
Phase 5 Public Reimbursable				
Item	Quantity	Unit	Unit Cost	Cost
Drainage Chan. Const. (38' x 5')	590	LF	\$ 278.15	\$164,108.50
Subtotal				\$ 862,265.00
Total (Private)				\$ 862,265.00
Contingency			10%	\$ 86,226.50
Grand Total (Private)				\$ 948,491.50

These cost values do not include permitting, engineering, construction administration/ management, wetlands mitigation, right-of-way acquisition or other "non-construction" costs.

Summary

- Available Cost Credit for Falcon Basin West Tributary Channel Improvements
Per 2013/2015 DBPS: \$593,015.80
- Total Estimated Cost of Channel Improvements: \$948,491.50
- Estimated Future Plat Fee Costs for *Falcon Meadows at Bent Grass Filing Nos. 2, 3, and 4*: \$616,597.15
- Plat Fees Previously Offset (Falcon Meadows at Bent Grass Filing No. 1): \$182,701.05 Drainage Pre-credit
- Plat Fees Previously Offset (Bent Grass Residential Subdivision Filing No. 2): \$790,035.95 Drainage and Bridge Pre-credits
- Construction of Pond WU: \$489,284.78
- Estimated Channel Construction Costs: \$948,491.50
- Estimated Channel Construction Costs less Estimated Drainage and Bridge Fee Costs for *Falcon Meadows at Bent Grass Filing Nos. 2, 3, and 4*: \$331,894.35 (Excess Credit)

this is duplicated

keep drainage and bridge fees separate

I can't find where this value comes from

The above information demonstrates that the proposed channel improvement costs along with Pond WU construction costs, should be more than adequate to defer the Falcon Basin fees for *Falcon Meadows at Bent Grass Filing Nos. 1, 2, 3, & 4* and *Bent Grass Residential Subdivision Filing No. 2*. Falcon Meadows at Bent Grass Channel Improvements will give an excess credit in the amount of **\$331,894.35** as described in the tables at the end of this section.

The applicable pages from the 2015 Falcon DBPS are provided in Appendix A.

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Bent Grass Residential Subdivision Filing No. 2						
Final Drainage Report						
2019 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Falcon Drainage Fee Basin						
Drainage Fee	23.45	\$29,622	\$694,635.90	\$489,284.78	\$205,351.12	\$0.00
Bridge Fee	23.45	\$4,069	\$95,418.05	\$0.00	\$95,418.05	\$0.00
				\$489,284.78	\$300,769.17	\$0.00

Falcon Meadows at Bent Grass Filing No. 1						
Final Drainage Report						
2021 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Pre-Credit
Falcon Drainage Fee Basin						
Drainage Fee	5.73	\$31,885	\$182,701.05	\$948,491.50	\$0.00	\$765,790.45
Bridge Fee	5.73	\$4,380	\$25,097.40	\$0.00	\$25,097.40	\$740,693.05
				\$948,491.50	\$25,097.40	\$740,693.05

Falcon Meadows at Bent Grass Filing No. 2						
Final Drainage Report						
2021 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Pre-Credit
Falcon Drainage Fee Basin						
Drainage Fee	9.60	\$31,885	\$306,096.00	\$0.00	\$0.00	\$434,597.05
Bridge Fee	9.60	\$4,380	\$42,048.00	\$0.00	\$42,048.00	\$392,549.05
				\$0.00	\$42,048.00	\$392,549.05

Channel improvements?

Keep drainage and bridge fees separate

Falcon Meadows at Bent Grass Filing No. 3						
Final Drainage Report						
2021 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Pre-Credit
Falcon Drainage Fee Basin						
Drainage Fee	4.85	\$31,885	\$154,642.25	\$0.00	\$0.00	\$337,906.05
Bridge Fee	4.85	\$4,380	\$21,243.00	\$0.00	\$21,243.00	\$316,663.05
				\$0.00	\$21,243.00	\$316,663.05

Falcon Meadows at Bent Grass Filing No. 4						
Final Drainage Report						
2021 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Pre-Credit
Falcon Drainage Fee Basin						
Drainage Fee	2.83	\$31,885	\$90,234.55	\$0.00	\$0.00	\$226,428.50
Bridge Fee	2.83	\$4,380	\$12,395.40	\$0.00	\$12,395.40	\$214,033.10
				\$0.00	\$12,395.40	\$214,033.10

All drainage facilities within this report were sized according to the Drainage Criteria Manuals. Bent Grass Metropolitan District will own and maintain the channels until such a time that all final improvements have been constructed. At that time, channel corridors will become publicly owned and maintained and shall be the responsibility of El Paso County upon County acceptance. Upon development of future filings within the Bent Grass Residential Subdivision, separate Final Drainage Reports will be required to be submitted and approved by El Paso County.

IX. Conclusion

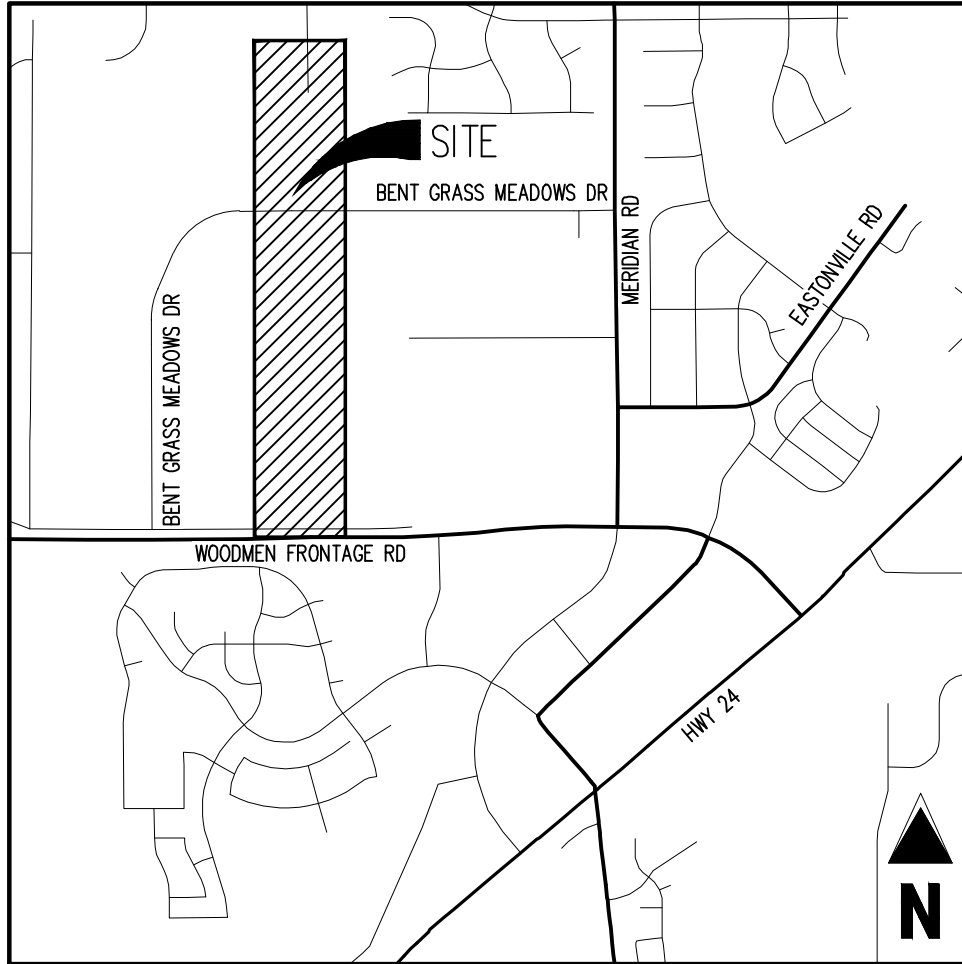
The Bent Grass Residential Subdivisions lie within the West Tributary of the Falcon Basin Area Watershed. Water quality for the existing and proposed developments are provided in two existing and one proposed on-site WQCV ponds to provide water quality for the entire tributary area. The channel is in general conformance with the DBPS and will safely convey runoff through the property. The proposed development will not have any adverse impacts on downstream developments or existing drainageways.

If deviations are requested they need to be addressed.

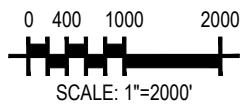
X. References

1. *City of Colorado Springs/County of El Paso Drainage Criteria Manual*, October 1991.
2. *Drainage Criteria Manual, Volume 2*, City of Colorado Springs, November 2002.
3. *Urban Storm Drainage Criteria Manual*, Urban Drainage and Flood Control District, January 2016 (with current revisions).
4. *Falcon Drainage Basin Planning Study*, by Matrix Design Group, September 2013/2015.
5. *Master Development Drainage Plan and Preliminary Drainage Plan – Bent Grass Subdivision*, by Kiowa Engineering Corporation, December 2006.
6. *Final Drainage Report for Bent Grass Residential (Filing No. 1)*, by Classic Consulting Engineers & Surveyors, LLC, August 2014.
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13. *Final Drainage Report for Falcon Meadows at Bent Grass Filing No. 1*, by Galloway & Company, under review.

APPENDIX A
Exhibits and Figures



VICINITY MAP



FALCON MEADOWS AT BENT GRASS
DRAINAGE CHANNEL IMPROVEMENTS

SCALE: 1"=1,000'
VICINITY MAP

Project No: CLH000023.20

Drawn By: TJE

Checked By: CMD

Date: 06/10/2021

Galloway

1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220 • GallowayUS.com

NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSIMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

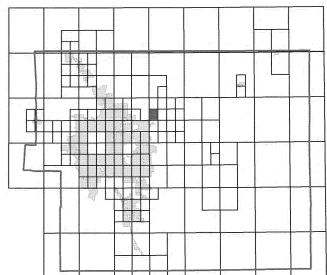
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-335-6227 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

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

Flooding Source	Vertical Datum	Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION		

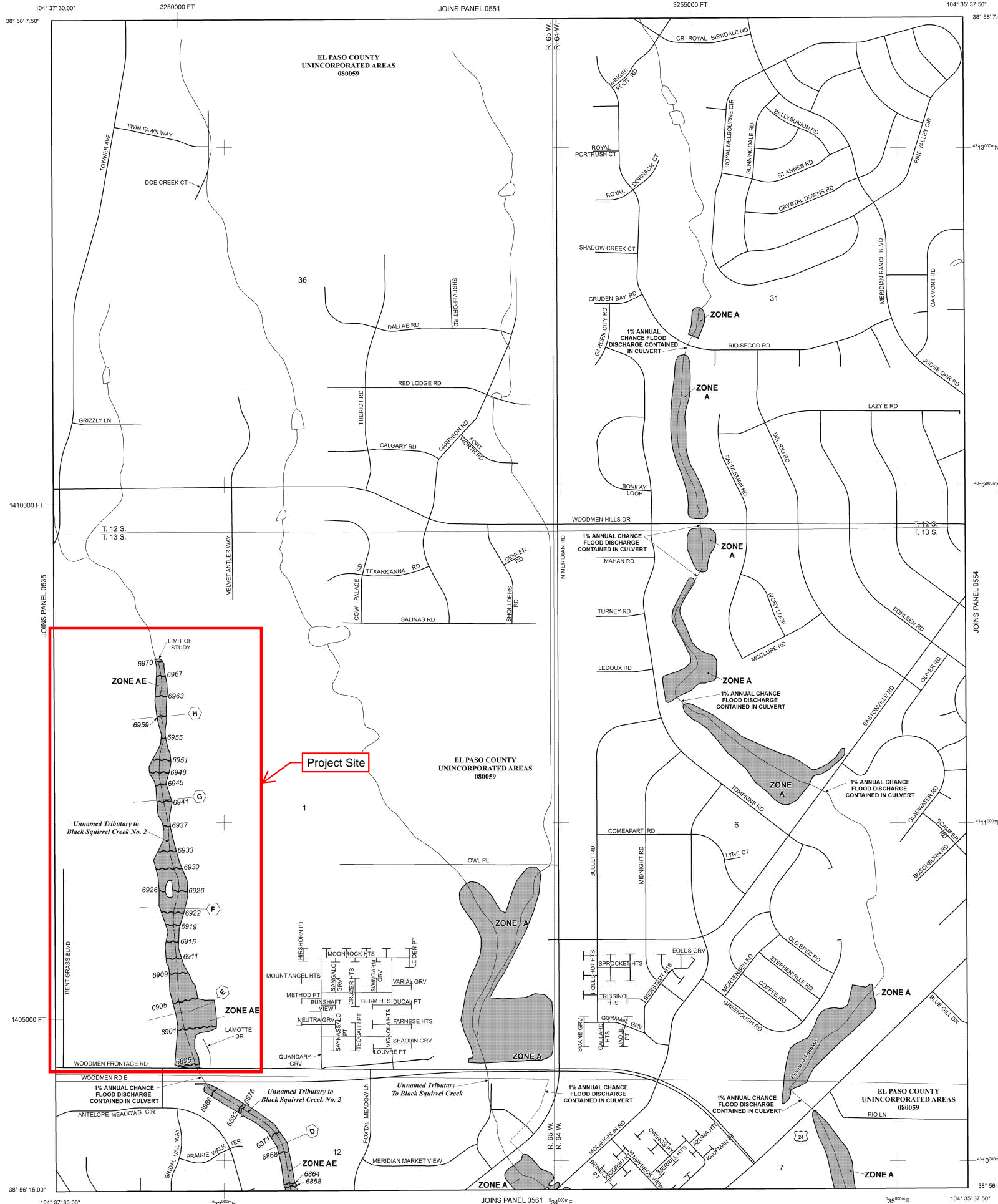
Panel Location Map



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

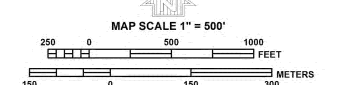


Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



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 derelict. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
- OTHERWISE PROTECTED AREAS (OPAs)
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988 (NAVD 88)
- Cross section line
- Transsect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 100-meter Universal Transverse Mercator grid ticks, zone 13
- 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- River Mile
- MAP REPOSITORIES
- Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP MARCH 17, 1987
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.
- For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.
- To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NFP

PANEL 0553G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 553 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:	NUMBER	PANEL	SUFFIX
COMMUNITY	08009	0553	G
EL PASO COUNTY			

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

MAP NUMBER
08041C0553G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

FALCON DRAINAGE BASIN PLANNING STUDY
SELECTED PLAN REPORT
FINAL - SEPTEMBER 2015

Prepared for:



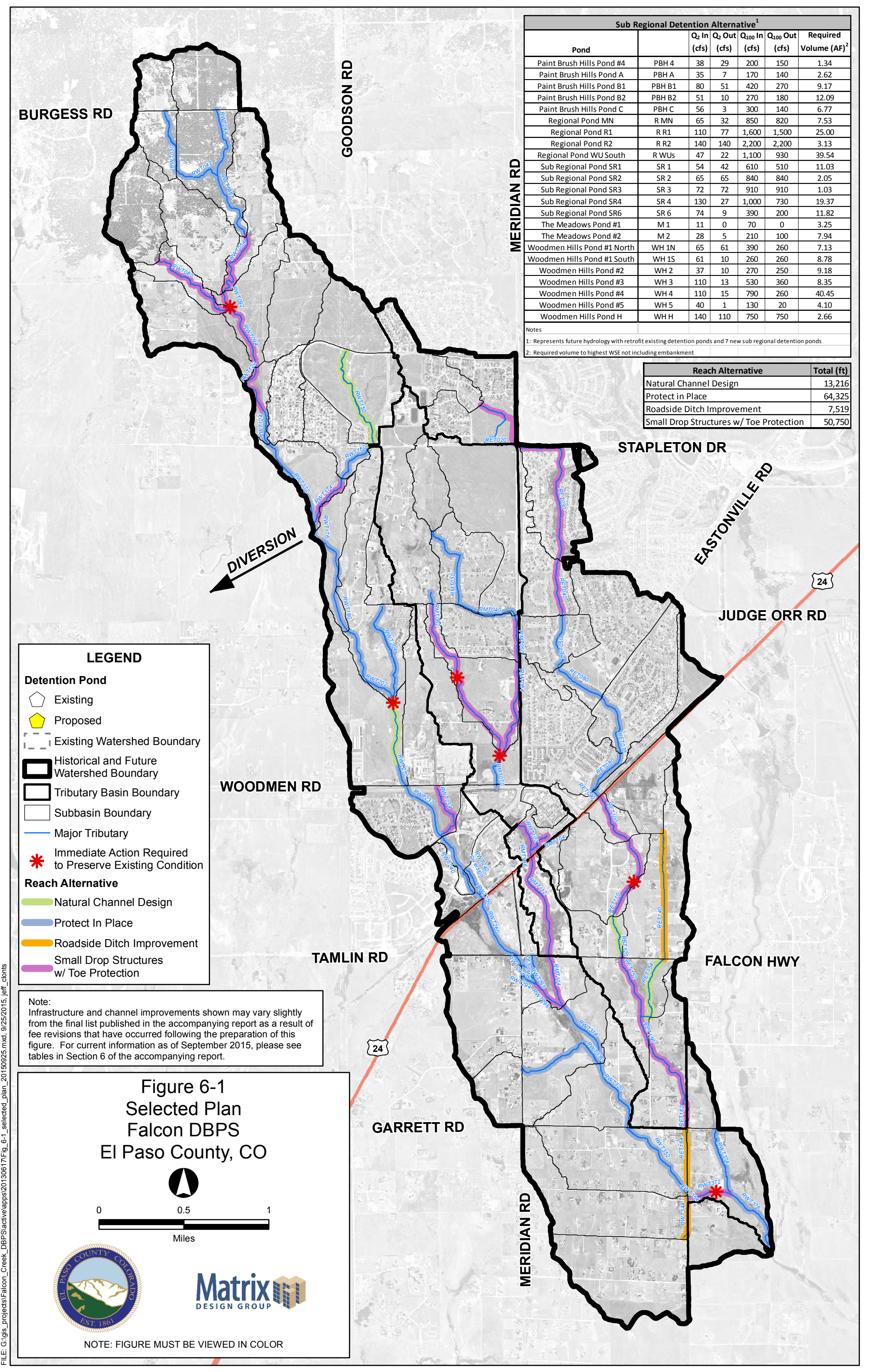
El Paso County Public Services Department
3275 Akers Drive
Colorado Springs, CO 80922

Prepared By:



Matrix Design Group
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920

Matrix Project No. 10.122.003



Sub Regional Detention Alternative ¹						
Pond		Q ₂ In (cfs)	Q ₂ Out (cfs)	Q ₁₀₀ In (cfs)	Q ₁₀₀ Out (cfs)	Required Volume (AF) ²
Paint Brush Hills Pond #4	PBH 4	38	29	200	150	1.34
Paint Brush Hills Pond A	PBH A	35	7	170	140	2.62
Paint Brush Hills Pond B1	PBH B1	80	51	420	270	9.17
Paint Brush Hills Pond B2	PBH B2	51	10	270	180	12.09
Paint Brush Hills Pond C	PBH C	56	3	300	140	6.77
Regional Pond MN	R MN	65	32	850	820	7.53
Regional Pond R1	R R1	110	77	1,600	1,500	25.00
Regional Pond R2	R R2	140	140	2,200	2,200	3.13
Regional Pond WU South	R WUs	47	22	1,100	930	39.54
Sub Regional Pond SR1	SR 1	54	42	610	510	11.03
Sub Regional Pond SR2	SR 2	65	65	840	840	2.05
Sub Regional Pond SR3	SR 3	72	72	910	910	1.03
Sub Regional Pond SR4	SR 4	130	27	1,000	730	19.37
Sub Regional Pond SR6	SR 6	74	9	390	200	11.82
The Meadows Pond #1	M 1	11	0	70	0	3.25
The Meadows Pond #2	M 2	28	5	210	100	7.94
Woodmen Hills Pond #1 North	WH 1N	65	61	390	260	7.13
Woodmen Hills Pond #1 South	WH 1S	61	10	260	260	8.78
Woodmen Hills Pond #2	WH 2	37	10	270	250	9.18
Woodmen Hills Pond #3	WH 3	110	13	530	360	8.35
Woodmen Hills Pond #4	WH 4	110	15	790	260	40.45
Woodmen Hills Pond #5	WH 5	40	1	130	20	4.10
Woodmen Hills Pond H	WH H	140	110	750	750	2.66

Notes
 1: Represents future hydrology with retrofit existing detention ponds and 7 new sub regional detention ponds
 2: Required volume to highest WSE not including embankment

Reach Alternative	Total (ft)
Natural Channel Design	13,216
Protect in Place	64,325
Roadside Ditch Improvement	7,519
Small Drop Structures w/ Toe Protection	50,750

LEGEND

Detention Pond

- Existing
- Proposed

Watershed Boundary

- Existing Watershed Boundary
- Historical and Future Watershed Boundary

Tributary Basin Boundary

- Tributary Basin Boundary
- Subbasin Boundary

Major Tributary

- Major Tributary

Immediate Action Required to Preserve Existing Condition

- Immediate Action Required to Preserve Existing Condition

Reach Alternative

- Natural Channel Design
- Protect In Place
- Roadside Ditch Improvement
- Small Drop Structures w/ Toe Protection

Note:
 Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Figure 6-1
Selected Plan
Falcon DBPS
El Paso County, CO

NOTE: FIGURE MUST BE VIEWED IN COLOR

Sheet 6-10

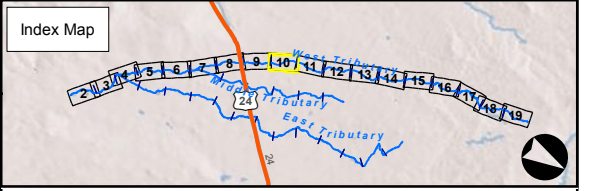
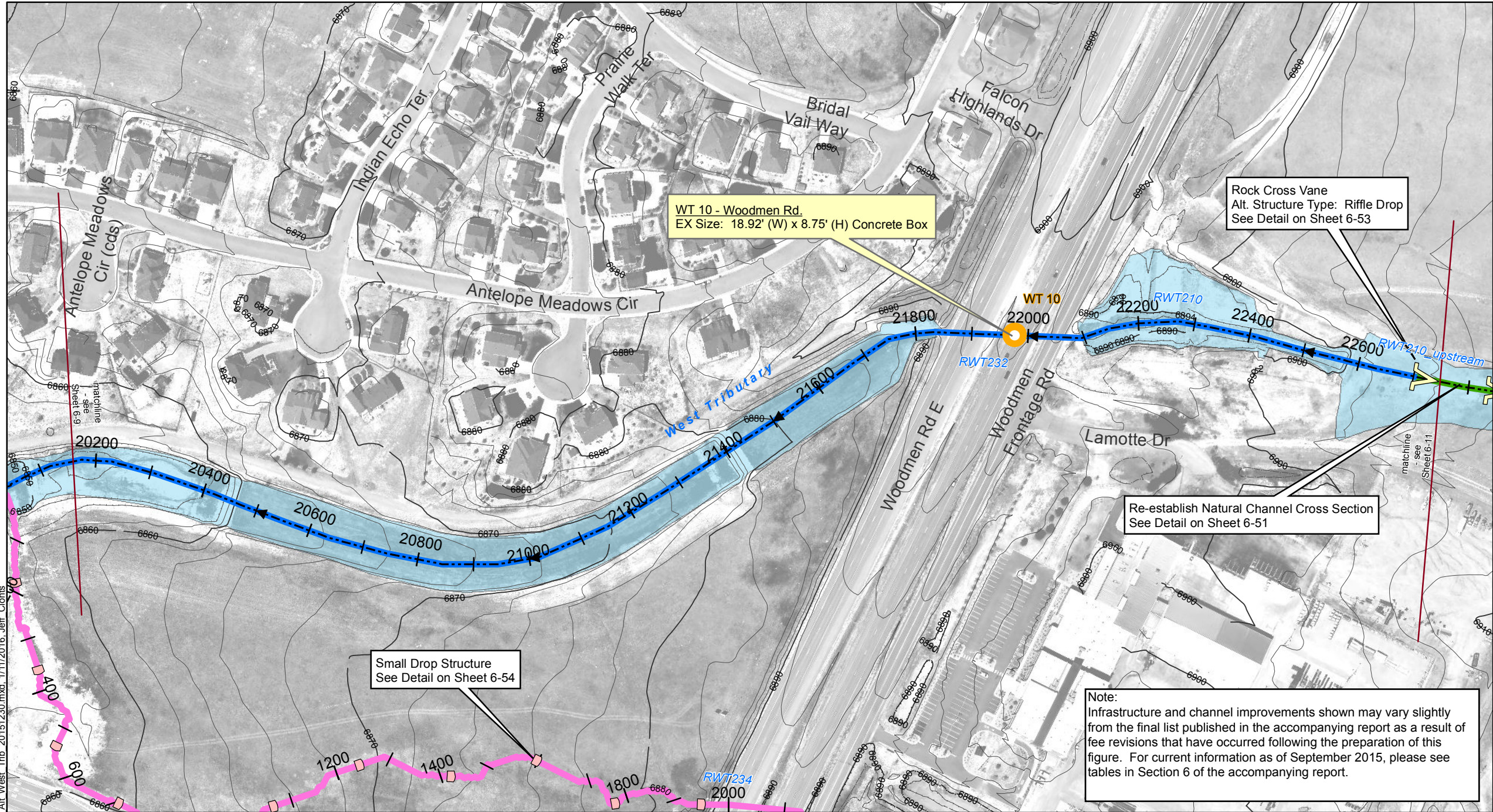
Falcon DBPS

Conceptual Plan

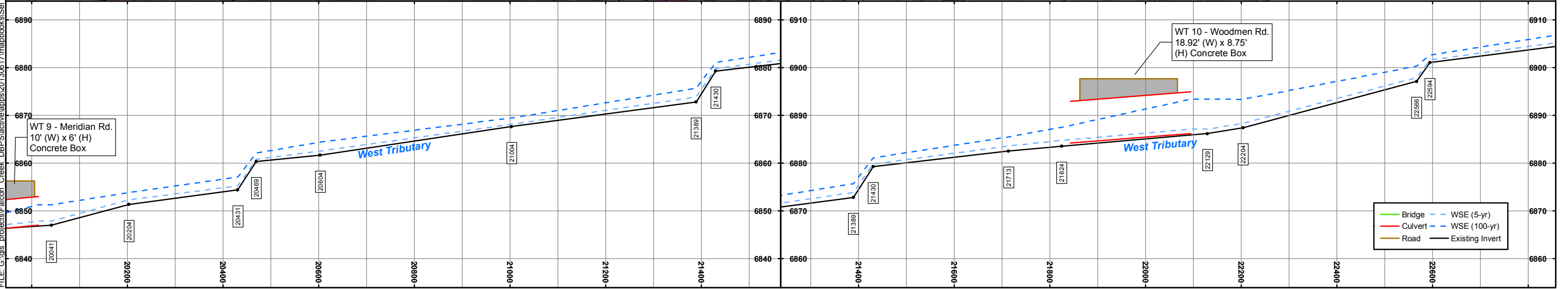
West Tributary

El Paso County, CO

- Drainageway Crossing
 - Stream Centerline
 - Existing Approximate 100-yr Floodplain*
 - Floodplain Study Limit
 - Storm Sewer**
 - Inlet
 - Manhole
 - Pipe
 - Reach Improvements**
 - Natural Channel Design
 - Protect In Place
 - Roadside Ditch Improvement
 - Small Drop Structures w/ Toe Protection
 - Existing Detention
 - Proposed Detention
 - Proposed Detention Grading
 - Small Drop Structure
 - Cross Vane
 - Immediate Action Required to Preserve Existing Condition
- 0 100 200 Feet

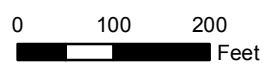


Note:
 Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

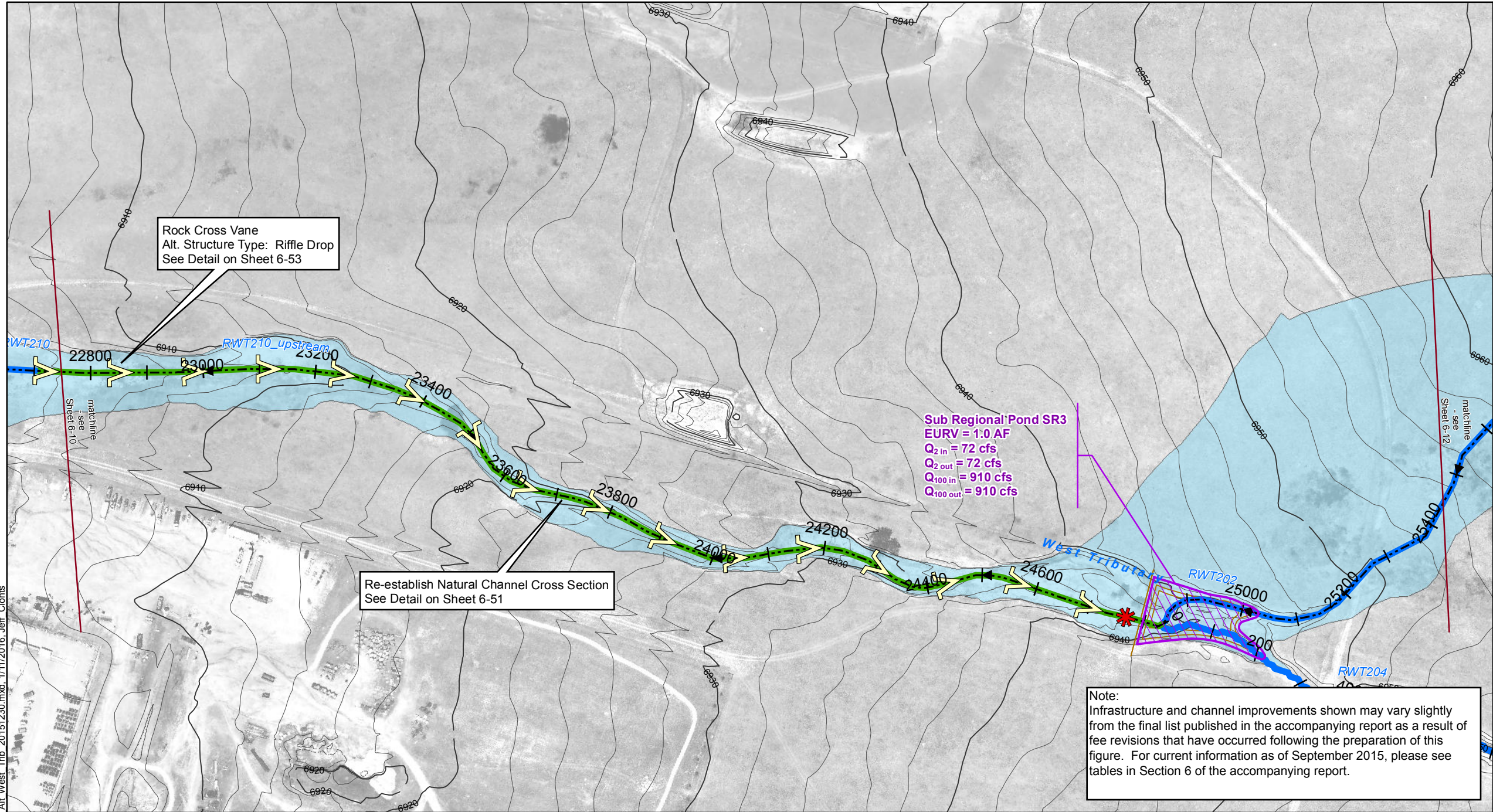
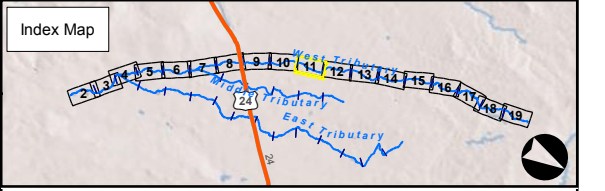


Sheet 6-11
Falcon DBPS
Conceptual Plan
West Tributary
El Paso County, CO

- | | |
|---|--|
| Drainageway Crossing | Reach Improvements
Natural Channel Design |
| Stream Centerline | Protect In Place |
| Existing Approximate 100-yr Floodplain* | Roadside Ditch Improvement |
| Floodplain Study Limit | Small Drop Structures w/ Toe Protection |
| Storm Sewer | Existing Detention |
| Inlet | Proposed Detention |
| Manhole | Proposed Detention Grading |
| Pipe | Small Drop Structure |
| | Cross Vane |
| | Immediate Action Required to Preserve Existing Condition |



* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
 ** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

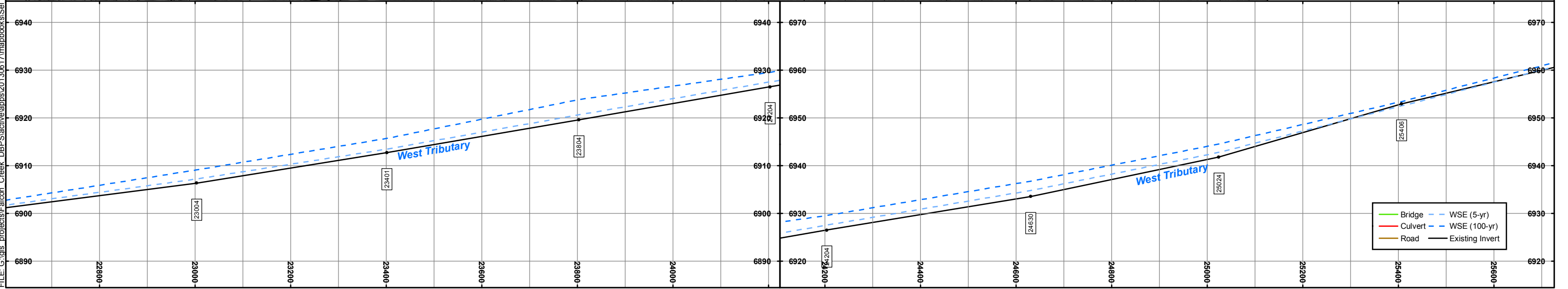


Rock Cross Vane
 Alt. Structure Type: Riffle Drop
 See Detail on Sheet 6-53

Sub Regional Pond SR3
 EURV = 1:0 AF
 Q_{2 in} = 72 cfs
 Q_{2 out} = 72 cfs
 Q_{100 in} = 910 cfs
 Q_{100 out} = 910 cfs

Re-establish Natural Channel Cross Section
 See Detail on Sheet 6-51

Note:
 Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.



FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20130817\mapbooks\sel_Alt_West_Trib_20151230.mxd, 1/11/2016, Jeff Clonis

Falcon DBPS

Expansion & Contraction Coefficients

West Tributary		
River Station	Contraction	Expansion
28432.62	0.1	0.3
28032.62	0.1	0.3
27507.46	0.1	0.3
27232.62	0.1	0.3
26814.63	0.1	0.3
26425.04	0.1	0.3
25882.64	0.1	0.3
25406.2	0.1	0.3
25024.12	0.1	0.3
24630.32	0.1	0.3
24203.51	0.1	0.3
23803.51	0.1	0.3
23401.38	0.1	0.3
23003.51	0.1	0.3
22594.16	0.1	0.3
22566.37	0.1	0.3
22203.51	0.3	0.5
22188.6*	0.3	0.5
22173.7*	0.3	0.5
22158.9*	0.3	0.5
22144.0*	0.3	0.5
22129.18	0.3	0.5
21948.92	Culvert	
21824.12	0.3	0.5
21801.9*	0.1	0.3
21779.8*	0.1	0.3
21757.6*	0.1	0.3
21735.5*	0.1	0.3
21713.34	0.1	0.3
21430.2	0.1	0.3
21388.91	0.1	0.3
21003.51	0.1	0.3
20603.51	0.1	0.3
20469.47	0.1	0.3
20430.88	0.1	0.3
20203.51	0.1	0.3
20162.9*	0.1	0.3
20122.3*	0.1	0.3
20081.7*	0.3	0.5
20041.14	0.3	0.5
19961.38	Culvert	
19894.2	0.3	0.5

Middle Tributary		
River Station	Contraction	Expansion
2393.844	0.1	0.3
2000	0.1	0.3
1923.28*	0.3	0.5
1846.57*	0.3	0.5
1769.85*	0.3	0.5
1693.141	0.3	0.5
1661.946	Culvert	
1631.806	0.3	0.5
1489.711	0.1	0.3
1199.006	0.1	0.3
800	0.1	0.3
400	0.1	0.3

East Tributary		
River Station	Contraction	Expansion
20374.32	0.1	0.3
20291.07	0.1	0.3
20221.25	0.1	0.3
20200.42	0.1	0.3
20150.22	0.1	0.3
19810.83	0.1	0.3
19800.9*	0.1	0.3
19791.1*	0.1	0.3
19781.2*	0.1	0.3
19771.3*	0.1	0.3
19761.5*	0.1	0.3
19751.6*	0.1	0.3
19741.7*	0.1	0.3
19731.9*	0.1	0.3
19722.0*	0.1	0.3
19712.1*	0.1	0.3
19702.3*	0.1	0.3
19692.4*	0.1	0.3
19682.6	0.1	0.3
19619.02	0.1	0.3
19570.53	0.1	0.3
19557.19	0.1	0.3
19477	0.1	0.3
19350.22	0.1	0.3
18950.22	0.1	0.3
18550.22	0.1	0.3
18507.3*	0.1	0.3
18464.4*	0.3	0.5
18421.6*	0.3	0.5
18378.7*	0.3	0.5
18335.8*	0.3	0.5
18292.9*	0.3	0.5
18250.1	0.3	0.5
18205.02	Culvert	
18166.18	0.3	0.5
18119.34	0.3	0.5
18092.76	Culvert	
18065.8	0.3	0.5
18019.2*	0.1	0.3
17972.7*	0.1	0.3
17926.2*	0.1	0.3
17879.6*	0.1	0.3

**Falcon DBPS
Steady Flow Data**

West Tributary													
Hydrologic Element	HEC-RAS Section	Existing Peak Flows (cfs)						Future Peak Flows (cfs)					
		2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
JWT 010	47452.3	9	21	32	58	73	89	9	21	32	58	73	89
JWT 042	47079.4	15	37	57	110	140	170	15	37	57	110	140	170
JWT 044	45564.8	24	59	89	170	210	260	24	59	89	170	210	260
JWT 050	42418.0	43	110	170	310	390	480	43	110	170	310	390	480
JWT 090	40018.0	67	160	250	470	600	740	68	160	250	480	610	730
JWT 120	36496.2	84	190	300	570	740	910	85	190	300	570	730	920
JWT 172	34399.0	90	210	320	600	760	930	99	210	320	600	760	960
JWT 180	31149.0	0	15	130	420	590	770	100	220	330	620	800	1000
JWT 200	27507.0	14	32	150	470	670	880	110	230	360	690	890	1200
JWT 210	24630.0	21	50	170	510	720	950	85	210	390	780	950	1100
JWT 234	21713.0	50	93	180	540	760	1000	130	270	420	810	1100	1400
Pond WU North Inflow	19803.0	65	120	186	548	769	1017	128	272	423	813	1054	1398
Pond WU South Inflow	18554.8	14	46	97	508	727	972	83	235	385	773	1013	1347
JWT 240	17784.0	26	54	86	410	670	890	83	200	380	770	940	1100
JWT 260	17399.7	47	92	130	420	690	910	86	210	390	790	970	1100
RWT 295	14577.8	49	97	130	430	690	910	86	210	390	790	970	1100
JWT 310	13268.4	120	230	370	730	1000	1300	160	420	640	1100	1400	1700
JWT 320	10574.0	120	250	370	740	1000	1300	160	410	630	1100	1400	1700
RWT 352 + WT350	8227.4	146	295	440	870	1170	1510	198	479	730	1290	1630	1980
JWT 352	5544.6	160	320	520	1000	1400	1900	210	530	820	1400	2000	2400
JWT 374_OUT	5379.9	190	400	600	1200	1500	1900	230	560	860	1500	2000	2500

Middle Tributary													
Hydrologic Element	HEC-RAS Section	Existing Peak Flows (cfs)						Future Peak Flows (cfs)					
		2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
JMT 010	15477.3	1	11	25	62	120	160	1	11	25	62	120	160
RMT 62 + MT 60	14907.6	9	32	58	124	190	259	31	70	108	202	280	360
JMT 070	9628.6	61	180	280	510	630	760	150	350	490	800	980	1200
Reg Pond MN Inflow	6738.8	65	180	289	514	644	776	151	360	495	813	991	1184
JMT 080	6346.7	40	110	260	510	640	770	86	330	490	810	980	1200
RMT 102	6210.5	40	110	260	510	640	770	86	320	490	800	980	1200
JMT 106	5363	45	120	260	530	660	800	92	320	490	820	1000	1200
JMT 110	4905.9	46	120	260	540	680	820	94	320	500	830	1000	1200
RMT 114	1489.7	46	120	260	540	670	820	94	320	500	830	1000	1200

**Falcon DBPS
Manning's n Values**

West Tributary				
River Station	Frctn (n/K)	n #1	n #2	n #3
28432.62	n	0.08	0.03	0.08
28032.62	n	0.08	0.03	0.08
27507.46	n	0.08	0.05	0.08
27232.62	n	0.08	0.05	0.08
26814.63	n	0.08	0.05	0.08
26425.04	n	0.08	0.05	0.08
25882.64	n	0.08	0.05	0.08
25406.2	n	0.08	0.05	0.08
25024.12	n	0.08	0.05	0.08
24630.32	n	0.08	0.03	0.08
24203.51	n	0.08	0.03	0.08
23803.51	n	0.08	0.03	0.08
23401.38	n	0.08	0.03	0.08
23003.51	n	0.08	0.03	0.08
22594.16	n	0.08	0.03	0.08
22566.37	n	0.08	0.03	0.08
22203.51	n	0.08	0.03	0.08
22188.6*	n	0.08	0.03	0.08
22173.7*	n	0.08	0.03	0.08
22158.9*	n	0.08	0.03	0.08
22144.0*	n	0.08	0.03	0.08
22129.18	n	0.08	0.03	0.08
21948.92	Culvert			
21824.12	n	0.08	0.05	0.08
21801.9*	n	0.08	0.05	0.08
21779.8*	n	0.08	0.05	0.08
21757.6*	n	0.08	0.05	0.08
21735.5*	n	0.08	0.05	0.08
21713.34	n	0.08	0.05	0.08
21430.2	n	0.08	0.05	0.08
21388.91	n	0.08	0.05	0.08
21003.51	n	0.08	0.05	0.08
20603.51	n	0.08	0.05	0.08
20469.47	n	0.08	0.05	0.08
20430.88	n	0.08	0.05	0.08
20203.51	n	0.08	0.05	0.08
20162.9*	n	0.08	0.05	0.08
20122.3*	n	0.08	0.05	0.08
20081.7*	n	0.08	0.05	0.08
20041.14	n	0.08	0.05	0.08
19961.38	Culvert			
19894.2	n	0.08	0.05	0.08

Middle Tributary				
River Station	Frctn (n/K)	n #1	n #2	n #3
2393.844	n	0.15	0.07	0.15
2000	n	0.15	0.07	0.15
1923.28*	n	0.15	0.07	0.15
1846.57*	n	0.15	0.07	0.15
1769.85*	n	0.15	0.07	0.15
1693.141	n	0.15	0.07	0.15
1661.946	Culvert			
1631.806	n	0.08	0.05	0.08
1489.711	n	0.08	0.05	0.08
1199.006	n	0.08	0.05	0.08
800	n	0.08	0.05	0.08
400	n	0.08	0.05	0.08

East Tributary				
River Station	Frctn (n/K)	n #1	n #2	n #3
20374.32	n	0.08	0.07	0.08
20291.07	n	0.08	0.07	0.08
20221.25	n	0.08	0.07	0.08
20200.42	n	0.08	0.07	0.08
20150.22	n	0.08	0.07	0.08
19810.83	n	0.08	0.07	0.08
19800.9*	n	0.08	0.068	0.08
19791.1*	n	0.08	0.067	0.08
19781.2*	n	0.08	0.065	0.08
19771.3*	n	0.08	0.064	0.08
19761.5*	n	0.08	0.062	0.08
19751.6*	n	0.08	0.061	0.08
19741.7*	n	0.08	0.059	0.08
19731.9*	n	0.08	0.058	0.08
19722.0*	n	0.08	0.056	0.08
19712.1*	n	0.08	0.055	0.08
19702.3*	n	0.08	0.053	0.08
19692.4*	n	0.08	0.052	0.08
19682.6	n	0.08	0.05	0.08
19619.02	n	0.08	0.05	0.08
19570.53	n	0.08	0.05	0.08
19557.19	n	0.08	0.05	0.08
19477	n	0.08	0.05	0.08
19350.22	n	0.08	0.05	0.08
18950.22	n	0.08	0.05	0.08
18550.22	n	0.08	0.05	0.08
18507.3*	n	0.08	0.05	0.08
18464.4*	n	0.08	0.05	0.08
18421.6*	n	0.08	0.05	0.08
18378.7*	n	0.08	0.05	0.08
18335.8*	n	0.08	0.05	0.08
18292.9*	n	0.08	0.05	0.08
18250.1	n	0.08	0.05	0.08
18205.02	Culvert			
18166.18	n	0.08	0.05	0.08
18119.34	n	0.08	0.05	0.08
18092.76	Culvert			
18065.8	n	0.08	0.07	0.08
18019.2*	n	0.08	0.07	0.08
17972.7*	n	0.08	0.07	0.08
17926.2*	n	0.08	0.07	0.08
17879.6*	n	0.08	0.07	0.08

Falcon DBPS
West Tributary Existing Conditions HEC-RAS Outputs
Culverts

Reach	River Sta	Profile	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir Flow (ft)	Q Culv Group (cfs)	Q Weir (cfs)	Delta WS (ft)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)
WestTrib	47262 Culvert #1	2-yr	7404.34	7404.34	7403.73	7404.34	7408.01	9		3.17	5.09	6.13
WestTrib	47262 Culvert #1	5-yr	7408.11	7408.11	7408.04	7408.11	7408.01	14.27	6.91	6.72	8.07	8.36
WestTrib	47262 Culvert #1	10-yr	7408.19	7408.19	7408.17	7408.19	7408.01	14.37	18.05	6.68	8.13	8.41
WestTrib	47262 Culvert #1	25-yr	7408.33	7408.33	7408.35	7408.33	7408.01	14.54	44.05	6.55	8.23	8.49
WestTrib	47262 Culvert #1	50-yr	7408.4	7408.4	7408.38	7408.4	7408.01	14.61	59.15	6.5	8.27	8.52
WestTrib	47262 Culvert #1	100-yr	7408.45	7408.45	7408.45	7408.45	7408.01	14.68	74.82	6.46	8.31	8.56
WestTrib	45766.17 Culvert #1	2-yr	7362.13	7362.13	7362.1	7362.13	7362.01	3.48	11.52	7.64	4.98	5.27
WestTrib	45766.17 Culvert #1	5-yr	7362.25	7362.25	7362.24	7362.25	7362.01	3.51	33.01	7.4	5.03	5.23
WestTrib	45766.17 Culvert #1	10-yr	7362.33	7362.33	7362.32	7362.33	7362.01	3.54	52.64	7.09	5.06	5.27
WestTrib	45766.17 Culvert #1	25-yr	7362.52	7362.51	7362.51	7362.52	7362.01	3.6	105.85	6.81	5.15	5.35
WestTrib	45766.17 Culvert #1	50-yr	7362.6	7362.6	7362.6	7362.6	7362.01	3.62	136.03	6.73	5.18	5.39
WestTrib	45766.17 Culvert #1	100-yr	7362.68	7362.68	7362.68	7362.68	7362.01	3.65	165.78	6.64	5.22	5.43
WestTrib	41441.59 Culvert #1	2-yr	7262.38	7262.38	7262.38	7262.38	7262.01	2.51	40.01	4.11	6.39	6.39
WestTrib	41441.59 Culvert #1	5-yr	7262.71	7262.7	7262.71	7262.71	7262.01	2.49	106.99	3.97	6.34	6.34
WestTrib	41441.59 Culvert #1	10-yr	7262.94	7262.91	7262.94	7262.94	7262.01	2.49	167.29	3.96	6.34	6.34
WestTrib	41441.59 Culvert #1	25-yr	7263.37	7263.29	7263.36	7263.37	7262.01	2.49	307.48	3.9	6.33	6.33
WestTrib	41441.59 Culvert #1	50-yr	7263.57	7263.47	7263.57	7263.57	7262.01	2.49	387.46	3.87	6.33	6.33
WestTrib	41441.59 Culvert #1	100-yr	7263.79	7263.64	7263.78	7263.79	7262.01	2.49	478.2	3.85	6.35	6.35
WestTrib	21948.92 Culvert #1	2-yr	6886.74	6886.66	6886.65	6886.74	6896.01	21		2.16	3.29	3.77
WestTrib	21948.92 Culvert #1	5-yr	6887.19	6887.09	6887.06	6887.19	6896.01	50		2.35	4.4	5.29
WestTrib	21948.92 Culvert #1	10-yr	6888.48	6888.4	6888.25	6888.48	6896.01	170		3.06	6.61	8.53
WestTrib	21948.92 Culvert #1	25-yr	6890.97	6890.9	6890.61	6890.97	6896.01	510		4.53	9.54	12.53
WestTrib	21948.92 Culvert #1	50-yr	6892.21	6892.14	6891.8	6892.21	6896.01	720		5.18	10.7	13.98
WestTrib	21948.92 Culvert #1	100-yr	6893.44	6893.37	6892.99	6893.44	6896.01	950		5.89	11.74	15.2
WestTrib	19961.38 Culvert #1	2-yr	6847.62	6847.57	6847.52	6847.61	6856.01	12.21		1.27	3.4	4.13
WestTrib	19961.38 Culvert #2	2-yr	6847.62	6847.57	6847.53	6847.62	6856.01	12.54		1.27	3.43	5.05
WestTrib	19961.38 Culvert #3	2-yr	6847.62	6847.57	6847.54	6847.62	6856.01	12.6		1.27	3.44	5.07
WestTrib	19961.38 Culvert #4	2-yr	6847.62	6847.57	6847.54	6847.63	6856.01	12.65		1.27	3.44	5.09
WestTrib	19961.38 Culvert #1	5-yr	6847.94	6847.87	6847.81	6847.92	6856.01	22.72		1.39	4.18	5.21
WestTrib	19961.38 Culvert #2	5-yr	6847.94	6847.87	6847.83	6847.94	6856.01	23.3		1.39	4.22	6.37
WestTrib	19961.38 Culvert #3	5-yr	6847.94	6847.87	6847.83	6847.94	6856.01	23.48		1.39	4.23	6.42
WestTrib	19961.38 Culvert #4	5-yr	6847.94	6847.87	6847.83	6847.95	6856.01	23.5		1.39	4.23	6.43
WestTrib	19961.38 Culvert #1	10-yr	6848.46	6848.35	6848.3	6848.45	6856.01	44.67		1.61	5.24	6.73
WestTrib	19961.38 Culvert #2	10-yr	6848.46	6848.35	6848.31	6848.46	6856.01	45.04		1.61	5.25	8
WestTrib	19961.38 Culvert #3	10-yr	6848.46	6848.35	6848.31	6848.46	6856.01	45.16		1.61	5.26	8.01
WestTrib	19961.38 Culvert #4	10-yr	6848.46	6848.35	6848.31	6848.46	6856.01	45.14		1.61	5.26	8.01
WestTrib	19961.38 Culvert #1	25-yr	6850.03	6849.81	6849.77	6850.01	6856.01	133.98		2.32	7.56	9.79

Falcon DBPS
West Tributary Future Conditions HEC-RAS Outputs
Culverts

Reach	River Sta	Profile	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir Flow (ft)	Q Culv Group (cfs)	Q Weir (cfs)	Delta WS (ft)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)
WestTrib	47262 Culvert #1	2-yr	7404.34	7404.34	7403.73	7404.34	7408.01	9		3.17	5.09	6.13
WestTrib	47262 Culvert #1	5-yr	7408.11	7408.11	7408.04	7408.11	7408.01	14.27	6.91	6.72	8.07	8.36
WestTrib	47262 Culvert #1	10-yr	7408.19	7408.19	7408.17	7408.19	7408.01	14.37	18.05	6.68	8.13	8.41
WestTrib	47262 Culvert #1	25-yr	7408.33	7408.33	7408.35	7408.33	7408.01	14.54	44.05	6.55	8.23	8.49
WestTrib	47262 Culvert #1	50-yr	7408.4	7408.4	7408.38	7408.4	7408.01	14.61	59.15	6.5	8.27	8.52
WestTrib	47262 Culvert #1	100-yr	7408.45	7408.45	7408.45	7408.45	7408.01	14.68	74.82	6.46	8.31	8.56
WestTrib	45766.17 Culvert #1	2-yr	7362.13	7362.13	7362.1	7362.13	7362.01	3.48	11.52	7.64	4.98	5.27
WestTrib	45766.17 Culvert #1	5-yr	7362.25	7362.25	7362.24	7362.25	7362.01	3.51	33.01	7.4	5.03	5.23
WestTrib	45766.17 Culvert #1	10-yr	7362.33	7362.33	7362.32	7362.33	7362.01	3.54	52.64	7.09	5.06	5.27
WestTrib	45766.17 Culvert #1	25-yr	7362.52	7362.51	7362.51	7362.52	7362.01	3.6	105.85	6.81	5.15	5.35
WestTrib	45766.17 Culvert #1	50-yr	7362.6	7362.6	7362.6	7362.6	7362.01	3.62	136.03	6.73	5.18	5.39
WestTrib	45766.17 Culvert #1	100-yr	7362.68	7362.68	7362.68	7362.68	7362.01	3.65	165.78	6.64	5.22	5.43
WestTrib	41441.59 Culvert #1	2-yr	7262.38	7262.38	7262.38	7262.38	7262.01	2.51	40.01	4.11	6.39	6.39
WestTrib	41441.59 Culvert #1	5-yr	7262.71	7262.7	7262.71	7262.71	7262.01	2.49	106.99	3.97	6.34	6.34
WestTrib	41441.59 Culvert #1	10-yr	7262.94	7262.91	7262.94	7262.94	7262.01	2.49	167.29	3.96	6.34	6.34
WestTrib	41441.59 Culvert #1	25-yr	7263.37	7263.29	7263.36	7263.37	7262.01	2.49	307.48	3.9	6.33	6.33
WestTrib	41441.59 Culvert #1	50-yr	7263.57	7263.47	7263.57	7263.57	7262.01	2.49	387.46	3.87	6.33	6.33
WestTrib	41441.59 Culvert #1	100-yr	7263.79	7263.64	7263.78	7263.79	7262.01	2.49	478.2	3.85	6.35	6.35
WestTrib	21948.92 Culvert #1	2-yr	6887.62	6887.52	6887.46	6887.62	6896.01	85		2.57	5.25	6.54
WestTrib	21948.92 Culvert #1	5-yr	6888.83	6888.75	6888.58	6888.83	6896.01	210		3.28	7.1	9.19
WestTrib	21948.92 Culvert #1	10-yr	6890.19	6890.11	6889.86	6890.19	6896.01	390		4.11	8.72	11.59
WestTrib	21948.92 Culvert #1	25-yr	6892.55	6892.47	6892.12	6892.55	6896.01	780		5.37	10.99	14.32
WestTrib	21948.92 Culvert #1	50-yr	6893.44	6893.37	6892.99	6893.44	6896.01	950		5.89	11.74	15.2
WestTrib	21948.92 Culvert #1	100-yr	6894.19	6894.11	6893.72	6894.19	6896.01	1100		6.25	12.33	15.86
WestTrib	19961.38 Culvert #1	2-yr	6848.17	6848.09	6848.02	6848.16	6856.01	31.76		1.48	4.68	5.93
WestTrib	19961.38 Culvert #2	2-yr	6848.17	6848.09	6848.04	6848.17	6856.01	32.58		1.48	4.72	7.2
WestTrib	19961.38 Culvert #3	2-yr	6848.17	6848.09	6848.05	6848.18	6856.01	32.79		1.48	4.73	7.33
WestTrib	19961.38 Culvert #4	2-yr	6848.17	6848.09	6848.05	6848.18	6856.01	32.86		1.48	4.73	7.34
WestTrib	19961.38 Culvert #1	5-yr	6848.91	6848.77	6848.72	6848.9	6856.01	66.98		1.81	6	7.82
WestTrib	19961.38 Culvert #2	5-yr	6848.91	6848.77	6848.73	6848.91	6856.01	67.56		1.81	6.01	9.1
WestTrib	19961.38 Culvert #3	5-yr	6848.91	6848.77	6848.73	6848.91	6856.01	67.69		1.81	6.02	9.1
WestTrib	19961.38 Culvert #4	5-yr	6848.91	6848.77	6848.73	6848.91	6856.01	67.77		1.81	6.02	9.11
WestTrib	19961.38 Culvert #1	10-yr	6849.56	6849.38	6849.33	6849.55	6856.01	104.19		2.07	6.95	9.03
WestTrib	19961.38 Culvert #2	10-yr	6849.56	6849.38	6849.35	6849.56	6856.01	105.1		2.07	6.97	10.33
WestTrib	19961.38 Culvert #3	10-yr	6849.56	6849.38	6849.35	6849.57	6856.01	105.28		2.07	6.97	10.34
WestTrib	19961.38 Culvert #4	10-yr	6849.56	6849.38	6849.35	6849.57	6856.01	105.43		2.07	6.98	10.34
WestTrib	19961.38 Culvert #1	25-yr	6850.97	6850.7	6850.67	6850.95	6856.01	200.98		2.69	8.65	11.07

Falcon DBPS
West Tributary Existing Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	27507.46	5-yr		32		6993.21	6993.81		6993.85	0.011399	1.54	20.84	61.87	0.47	5.81	0.24
WestTrib	27507.46	10-yr		150		6993.21	6994.08	6994.05	6994.3	0.040068	3.82	39.25	76.16	0.94	5.3	1.29
WestTrib	27507.46	25-yr	0.3	469.7		6993.21	6994.7	6994.62	6995.06	0.02916	4.83	97.88	118.02	0.93	4.96	1.51
WestTrib	27507.46	50-yr	10.82	659.18		6993.21	6995	6994.88	6995.4	0.022858	5.12	139.06	150.35	0.93	4.85	1.32
WestTrib	27507.46	100-yr	34.26	845.74		6993.21	6995.26	6995.11	6995.7	0.020003	5.41	179.47	161.36	0.89	4.74	1.39
WestTrib	27232.62	2-yr		14		6987.13	6987.65	6987.65	6987.78	0.057863	2.91	4.81	18.45	1.01		0.94
WestTrib	27232.62	5-yr		32		6987.13	6987.85	6987.85	6988.04	0.05147	3.48	9.21	24.84	1.01	7.09	1.19
WestTrib	27232.62	10-yr	0.4	149.52	0.08	6987.13	6988.84		6988.99	0.01123	3.17	48	52.43	0.58	7.64	0.64
WestTrib	27232.62	25-yr	15.49	444.16	10.35	6987.13	6989.72	6989.31	6990.09	0.012263	5.03	107.49	82.91	0.76	8.05	0.99
WestTrib	27232.62	50-yr	33.44	614.31	22.24	6987.13	6990.04	6989.71	6990.55	0.013998	5.96	135.47	93.41	0.84	8.17	1.26
WestTrib	27232.62	100-yr	58.15	783.1	38.76	6987.13	6990.34	6990.05	6990.96	0.014909	6.69	164.86	103.29	0.89	8.33	1.48
WestTrib	26814.63	2-yr		14		6980.37	6980.66	6980.66	6980.73	0.070601	2.11	6.63	48	1		0.61
WestTrib	26814.63	5-yr	0.68	30.48	0.83	6980.37	6980.92	6980.76	6980.95	0.008266	1.4	25.56	90.79	0.45	7.13	0.15
WestTrib	26814.63	10-yr	8.69	132.8	8.51	6980.37	6981.14	6981.12	6981.35	0.034811	3.88	46.69	107.84	0.98	7.01	0.94
WestTrib	26814.63	25-yr	50.1	367.5	52.4	6980.37	6981.63	6981.6	6982.06	0.03442	5.8	110.6	153.63	1.09	7.03	1.55
WestTrib	26814.63	50-yr	80.9	493.99	95.1	6980.37	6981.91	6981.91	6982.37	0.029101	6.21	159.22	195.55	1.06	6.56	1.48
WestTrib	26814.63	100-yr	121.69	613.75	144.56	6980.37	6982.12	6982.12	6982.63	0.027717	6.68	203.49	223.21	1.06	6.45	1.58
WestTrib	26425.04	2-yr		14		6973.44	6973.63	6973.63	6973.7	0.073759	2.02	6.93	55.31	1.01		0.58
WestTrib	26425.04	5-yr		31.98	0.02	6973.44	6973.73	6973.73	6973.82	0.069505	2.47	12.98	74.42	1.04		0.76
WestTrib	26425.04	10-yr	7.35	138.89	3.77	6973.44	6974.26		6974.34	0.010871	2.38	71.52	132.69	0.55	9.21	0.37
WestTrib	26425.04	25-yr	42.69	402.09	25.22	6973.44	6974.86	6974.5	6975.04	0.010897	3.65	179.67	297.72	0.77	9.53	0.41
WestTrib	26425.04	50-yr	108.08	522.78	39.15	6973.44	6975.08		6975.28	0.010747	4.03	249.42	327.19	0.73	9.59	0.51
WestTrib	26425.04	100-yr	186.54	639.66	53.81	6973.44	6975.27	6974.69	6975.5	0.010766	4.38	314.8	353.24	0.71	9.65	0.6
WestTrib	25882.64	2-yr		14		6964.36	6964.57		6964.62	0.051175	1.75	7.99	60.09	0.85	12.2	0.42
WestTrib	25882.64	5-yr	0.13	31.87		6964.36	6964.72		6964.77	0.023484	1.81	17.94	77.22	0.66	12.29	0.34
WestTrib	25882.64	10-yr	23.31	126.29	0.4	6964.36	6964.99	6964.99	6965.14	0.031045	3.34	65.38	282.71	1.13		0.45
WestTrib	25882.64	25-yr	179.95	282.24	7.81	6964.36	6965.29	6965.29	6965.52	0.032874	4.69	167.82	364.34	0.99	10.71	0.95
WestTrib	25882.64	50-yr	290.41	365.49	14.1	6964.36	6965.42	6965.42	6965.69	0.03433	5.27	213.8	377.17	0.97	10.08	1.21
WestTrib	25882.64	100-yr	411.02	447.2	21.78	6964.36	6965.54	6965.54	6965.84	0.034798	5.74	258.33	389.2	0.96	9.69	1.44
WestTrib	25406.2	2-yr			14	6952.93	6952.4		6952.41	0.01849		21.32	169.66	0.33	9.81	0.15
WestTrib	25406.2	5-yr			32	6952.93	6952.48		6952.49	0.022962		36.96	256.53	0.4	9.63	0.21
WestTrib	25406.2	10-yr			150	6952.93	6952.7		6952.73	0.024037		114.68	374.61	0.42	9.21	0.46
WestTrib	25406.2	25-yr		4.54	465.46	6952.93	6953.08		6953.12	0.016185	0.86	278.47	494.32	0.4	8.65	0.57
WestTrib	25406.2	50-yr	0	19.19	650.81	6952.93	6953.25		6953.3	0.014184	1.27	364.38	522.7	0.39	8.39	0.62
WestTrib	25406.2	100-yr	0.63	44.23	835.14	6952.93	6953.4		6953.46	0.013154	1.74	443.81	547.49	0.39	8.14	0.67
WestTrib	25024.12	2-yr	1.69	12.31		6941.81	6942.5	6942.5	6942.61	0.037895	2.86	6.12	26.19	0.98	7.96	0.55

Falcon DBPS
West Tributary Existing Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	25024.12	5-yr	8.03	23.97		6941.81	6942.75		6942.87	0.027721	3.11	14.09	39.91	0.82	7.85	0.61
WestTrib	25024.12	10-yr	66.85	82.96	0.19	6941.81	6943.34		6943.54	0.026753	4.32	48.74	68.9	0.74	7.83	1.18
WestTrib	25024.12	25-yr	225.29	241.22	3.49	6941.81	6943.99	6943.85	6944.48	0.033518	6.93	98.19	82.67	0.9	7.82	2.47
WestTrib	25024.12	50-yr	328.73	334.54	6.73	6941.81	6944.25	6944.21	6944.91	0.037764	8.18	119.45	85.89	0.98	7.84	3.26
WestTrib	25024.12	100-yr	439.98	428.87	11.15	6941.81	6944.5	6944.5	6945.31	0.039216	9.14	141.36	88.71	1.01	7.7	3.88
WestTrib	24630.32	2-yr		21		6933.51	6934.41	6934.37	6934.6	0.014511	3.47	6.05	13.47	0.91	7.19	0.4
WestTrib	24630.32	5-yr		50		6933.51	6934.78	6934.77	6935.02	0.016508	3.96	12.64	25.57	0.99	7.34	0.51
WestTrib	24630.32	10-yr		170		6933.51	6935.35	6935.35	6935.71	0.015764	4.79	35.52	52.3	1.02	6.64	0.66
WestTrib	24630.32	25-yr		510		6933.51	6936.11	6936.11	6936.67	0.013484	6.01	84.8	78.78	1.02	5.38	0.9
WestTrib	24630.32	50-yr		720		6933.51	6936.43	6936.43	6937.07	0.012627	6.46	111.5	88.6	1.01	5.01	0.99
WestTrib	24630.32	100-yr		950		6933.51	6936.74	6936.74	6937.44	0.012005	6.69	142.1	103.21	1	4.73	1.02
WestTrib	24203.51	2-yr		21		6926.49	6927.22	6927.22	6927.42	0.019771	3.53	5.96	16.46	1.03		0.44
WestTrib	24203.51	5-yr		50		6926.49	6927.52	6927.52	6927.68	0.017791	3.26	15.35	44.19	0.97		0.38
WestTrib	24203.51	10-yr		170		6926.49	6927.93	6927.93	6928.32	0.015336	4.98	34.15	46.41	1.02	5.68	0.7
WestTrib	24203.51	25-yr		508.33	1.67	6926.49	6928.76	6928.76	6929.48	0.011721	6.83	76.4	58.29	1.05	4.63	0.95
WestTrib	24203.51	50-yr		713.21	6.79	6926.49	6929.16	6929.16	6930.02	0.010832	7.49	101.08	65.91	1.06	4.19	1.02
WestTrib	24203.51	100-yr		933.8	16.2	6926.49	6929.54	6929.54	6930.52	0.010147	8.02	127.79	73.3	1.06	3.68	1.09
WestTrib	23803.51	2-yr		21		6919.56	6920.31	6920.3	6920.51	0.015534	3.54	5.93	13.55	0.94	7.15	0.42
WestTrib	23803.51	5-yr		50		6919.56	6920.64	6920.64	6920.96	0.015928	4.6	10.88	17.07	1.01	6.86	0.63
WestTrib	23803.51	10-yr		170		6919.56	6921.46	6921.46	6922.02	0.013122	6.02	28.24	25.44	1.01	5.56	0.9
WestTrib	23803.51	25-yr		509.91	0.09	6919.56	6922.68	6922.68	6923.56	0.011363	7.53	67.93	41.2	1.03	4.6	1.15
WestTrib	23803.51	50-yr	1.18	716.45	2.37	6919.56	6923.18	6923.18	6924.21	0.010059	8.16	92.09	55.68	1.12	4.2	1.02
WestTrib	23803.51	100-yr	9.43	928.41	12.16	6919.56	6923.83	6923.83	6924.81	0.008353	8.02	137.19	101.13	1.2	3.57	0.7
WestTrib	23401.38	2-yr		21		6912.71	6913.22	6913.22	6913.35	0.020465	2.98	7.05	25.87	1	5.25	0.35
WestTrib	23401.38	5-yr		50		6912.71	6913.44	6913.44	6913.65	0.018142	3.76	13.31	31.45	1.02	5.24	0.48
WestTrib	23401.38	10-yr		170		6912.71	6913.97	6913.97	6914.38	0.014357	5.15	32.99	40.62	1.01	4.74	0.73
WestTrib	23401.38	25-yr		508.85	1.16	6912.71	6914.88	6914.88	6915.63	0.011302	6.96	74.34	51.49	1.02	4.51	1.01
WestTrib	23401.38	50-yr	0.53	715.56	3.91	6912.71	6915.28	6915.28	6916.19	0.010641	7.68	97.33	62.92	1.08	4.17	1.02
WestTrib	23401.38	100-yr	5.51	935.94	8.55	6912.71	6915.69	6915.69	6916.73	0.009399	8.24	126.38	80.52	1.15	3.78	0.92
WestTrib	23003.51	2-yr		21		6906.3	6906.95	6906.86	6907.03	0.009167	2.33	9.01	26.12	0.7	5.52	0.2
WestTrib	23003.51	5-yr		50		6906.3	6907.19	6907.09	6907.34	0.00993	3.09	16.16	32.49	0.77	5.61	0.31
WestTrib	23003.51	10-yr	0.81	169.01	0.19	6906.3	6907.73	6907.64	6908	0.009892	4.18	42.06	60.06	0.88	5.89	0.43
WestTrib	23003.51	25-yr	11.82	495.48	2.7	6906.3	6908.39	6908.39	6909.06	0.011269	6.68	86.26	77.09	1.1	5.39	0.78
WestTrib	23003.51	50-yr	26.74	687.45	5.81	6906.3	6908.75	6908.75	6909.56	0.010156	7.38	116.75	88.96	1.11	5.07	0.83
WestTrib	23003.51	100-yr	49.46	890.29	10.25	6906.3	6909.1	6909.1	6910.04	0.009435	8.01	149.82	100.26	1.12	4.77	0.88
WestTrib	22594.16	2-yr		21		6901.02	6901.42	6901.42	6901.52	0.021748	2.57	8.18	39.23	0.99	0.59	0.28

Falcon DBPS
West Tributary Existing Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	22594.16	5-yr		50		6901.02	6901.58	6901.58	6901.73	0.020138	3.12	16.04	54.26	1.01	0.54	0.37
WestTrib	22594.16	10-yr		170		6901.02	6901.94	6901.94	6902.1	0.02257	3.27	51.98	178.3	1.07	0.52	0.41
WestTrib	22594.16	25-yr		510		6901.02	6902.29	6902.29	6902.59	0.014886	4.43	115.23	183.66	0.98	0.41	0.58
WestTrib	22594.16	50-yr		719.99	0.01	6901.02	6902.44	6902.44	6902.83	0.01462	5.03	143.32	195.67	1.04	0.41	0.67
WestTrib	22594.16	100-yr		948.75	1.25	6901.02	6902.6	6902.6	6903.06	0.013803	5.5	174.67	202.17	1.04	0.4	0.74
WestTrib	22566.37	2-yr		21		6897.14	6897.66	6897.66	6897.8	0.020335	2.98	7.05	25.66	1	7.19	0.35
WestTrib	22566.37	5-yr		50		6897.14	6897.88	6897.88	6898.1	0.018016	3.76	13.28	31.07	1.01	6.18	0.48
WestTrib	22566.37	10-yr		170		6897.14	6898.42	6898.42	6898.88	0.014183	5.41	31.41	35.49	1.01	5.02	0.78
WestTrib	22566.37	25-yr		510		6897.14	6899.41	6899.41	6900.23	0.011438	7.27	70.11	43.07	1	2.52	1.15
WestTrib	22566.37	50-yr		720		6897.14	6899.86	6899.86	6900.85	0.010888	7.97	90.33	46.54	1.01	1.51	1.3
WestTrib	22566.37	100-yr		950		6897.14	6900.29	6900.29	6901.42	0.010374	8.53	111.35	49.89	1.01	1	1.42
WestTrib	22203.51	2-yr		21		6887.36	6888.02	6888.02	6888.21	0.019314	3.46	6.07	16.91	1.02	0.29	0.43
WestTrib	22203.51	5-yr		50		6887.36	6888.32	6888.32	6888.6	0.016077	4.29	11.65	20.49	1	0.25	0.57
WestTrib	22203.51	10-yr		170		6887.36	6889.03	6889.03	6889.55	0.013468	5.79	29.37	28.78	1.01	0.21	0.85
WestTrib	22203.51	25-yr		510		6887.36	6890.85		6891.25	0.004286	5.04	101.13	51.46	0.63	0.11	0.52
WestTrib	22203.51	50-yr	0.25	715.8	3.95	6887.36	6892.1		6892.37	0.001739	4.11	187.1	109.83	0.55	0.05	0.18
WestTrib	22203.51	100-yr	2.99	892.5	54.52	6887.36	6893.34		6893.53	0.00081	3.57	348.34	145.85	0.4	0.02	0.12
WestTrib	22188.6*	2-yr		21		6887.12	6887.74	6887.74	6887.92	0.01869	3.42	6.14	17.01	1	0.28	0.42
WestTrib	22188.6*	5-yr		50		6887.12	6888.03	6888.03	6888.3	0.016201	4.21	11.87	21.59	1	0.25	0.55
WestTrib	22188.6*	10-yr		170		6887.12	6888.73	6888.73	6889.22	0.013429	5.66	30.01	30.36	1	0.21	0.82
WestTrib	22188.6*	25-yr		510		6887.12	6890.87		6891.13	0.002496	4.13	123.35	56.45	0.49	0.07	0.34
WestTrib	22188.6*	50-yr		720		6887.12	6892.11		6892.31	0.001208	3.6	200.21	65.25	0.36	0.04	0.23
WestTrib	22188.6*	100-yr	0.81	937.91	11.27	6887.12	6893.34		6893.51	0.000673	3.33	315.82	121.34	0.36	0.02	0.11
WestTrib	22173.7*	2-yr		21		6886.88	6887.41	6887.41	6887.6	0.018825	3.52	5.97	15.93	1.01	0.28	0.44
WestTrib	22173.7*	5-yr		50		6886.88	6887.72	6887.72	6887.99	0.016692	4.18	11.97	22.57	1.01	0.25	0.55
WestTrib	22173.7*	10-yr		170		6886.88	6888.41	6888.4	6888.89	0.013162	5.53	30.75	31.83	0.99	0.23	0.79
WestTrib	22173.7*	25-yr		510		6886.88	6890.88		6891.06	0.001478	3.43	148.69	60.81	0.39	0.04	0.22
WestTrib	22173.7*	50-yr		720		6886.88	6892.12		6892.28	0.000809	3.13	229.72	68	0.3	0.03	0.17
WestTrib	22173.7*	100-yr	0.07	949.9	0.04	6886.88	6893.35		6893.49	0.000525	3.01	316.79	89.96	0.28	0.02	0.11
WestTrib	22158.9*	2-yr		21		6886.64	6887.1	6887.1	6887.28	0.018317	3.41	6.16	16.89	1	0.28	0.42
WestTrib	22158.9*	5-yr		50		6886.64	6887.39	6887.39	6887.67	0.016638	4.27	11.7	21.28	1.02	0.25	0.57
WestTrib	22158.9*	10-yr		170		6886.64	6888.4		6888.65	0.005863	4.05	41.99	37.82	0.68	0.12	0.4
WestTrib	22158.9*	25-yr		510		6886.64	6890.89		6891.02	0.000916	2.89	176.73	65.38	0.31	0.03	0.15
WestTrib	22158.9*	50-yr		720		6886.64	6892.13		6892.25	0.000555	2.75	262.26	71.3	0.25	0.02	0.13
WestTrib	22158.9*	100-yr		950		6886.64	6893.36		6893.47	0.000395	2.7	352.12	75.36	0.22	0.02	0.11
WestTrib	22144.0*	2-yr		21		6886.41	6886.81	6886.81	6886.98	0.018548	3.29	6.38	18.68	0.99	0.19	0.39

Falcon DBPS
West Tributary Existing Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	22144.0*	5-yr		50		6886.41	6887.11	6887.09	6887.35	0.01408	3.96	12.64	22.77	0.94	0.17	0.49
WestTrib	22144.0*	10-yr		170		6886.41	6888.39		6888.53	0.002888	3.01	56.56	46.87	0.48	0.06	0.22
WestTrib	22144.0*	25-yr		510		6886.41	6890.9		6890.99	0.000591	2.46	207.18	69.95	0.25	0.02	0.11
WestTrib	22144.0*	50-yr		720		6886.41	6892.14		6892.23	0.00039	2.42	297.46	74.83	0.21	0.01	0.09
WestTrib	22144.0*	100-yr		950		6886.41	6893.36		6893.45	0.000294	2.43	391.38	78.57	0.19	0.01	0.09
WestTrib	22129.18	2-yr		21		6886.17	6886.66	6886.51	6886.73	0.006032	2.18	9.65	22.61	0.59		0.16
WestTrib	22129.18	5-yr		50		6886.17	6887.09	6886.77	6887.18	0.003671	2.44	20.5	27.82	0.5		0.17
WestTrib	22129.18	10-yr		170		6886.17	6888.4	6887.46	6888.47	0.001351	2.26	75.21	54.05	0.34		0.12
WestTrib	22129.18	25-yr		510		6886.17	6890.9	6888.42	6890.97	0.000392	2.12	240.33	74.46	0.21		0.08
WestTrib	22129.18	50-yr		720		6886.17	6892.14	6888.81	6892.21	0.000274	2.15	335.18	78.55	0.18		0.07
WestTrib	22129.18	100-yr		950		6886.17	6893.37	6889.19	6893.44	0.000213	2.21	430.26	82.04	0.17		0.07
WestTrib	21948.92		Culvert													
WestTrib	21824.12	2-yr		21		6883.52	6884.5	6884.39	6884.56	0.018282	2.09	10.07	34.84	0.6	0.35	0.43
WestTrib	21824.12	5-yr		50		6883.52	6884.74	6884.59	6884.88	0.019319	3	16.67	35.09	0.67	0.37	0.75
WestTrib	21824.12	10-yr		170		6883.52	6885.33	6885.19	6885.75	0.024002	5.22	32.54	35.71	0.84	0.51	1.81
WestTrib	21824.12	25-yr		510		6883.52	6886.37	6886.37	6887.47	0.027208	8.42	60.59	36.71	0.99	0.76	3.82
WestTrib	21824.12	50-yr		720		6883.52	6886.96	6886.96	6888.34	0.025036	9.42	76.4	37.23	0.99	0.8	4.43
WestTrib	21824.12	100-yr		950		6883.52	6887.47	6887.47	6889.19	0.025047	10.53	90.21	37.68	1.01	0.87	5.24
WestTrib	21801.9*	2-yr		21		6883.32	6884.17	6884.02	6884.22	0.012669	1.7	12.39	34.21	0.5	0.28	0.29
WestTrib	21801.9*	5-yr		50		6883.32	6884.43	6884.22	6884.51	0.012834	2.32	21.54	37.38	0.54	0.29	0.46
WestTrib	21801.9*	10-yr		170		6883.32	6885.02	6884.73	6885.25	0.014536	3.8	44.77	40.43	0.64	0.34	0.99
WestTrib	21801.9*	25-yr		510		6883.32	6885.92	6885.64	6886.51	0.019275	6.18	82.51	43.78	0.79	0.45	2.21
WestTrib	21801.9*	50-yr		720		6883.32	6886.29	6886.08	6887.11	0.021736	7.26	99.16	44.99	0.86	0.51	2.9
WestTrib	21801.9*	100-yr		950		6883.32	6886.63	6886.51	6887.7	0.02432	8.3	114.5	46.07	0.93	0.58	3.64
WestTrib	21779.8*	2-yr		21		6883.13	6883.89		6883.93	0.012721	1.69	12.4	34.44	0.5	0.3	0.29
WestTrib	21779.8*	5-yr		50		6883.13	6884.13		6884.22	0.013659	2.32	21.56	39.42	0.55	0.3	0.47
WestTrib	21779.8*	10-yr		170		6883.13	6884.7		6884.91	0.015677	3.67	46.33	46.99	0.65	0.36	0.96
WestTrib	21779.8*	25-yr		510		6883.13	6885.53		6886.06	0.019762	5.84	87.3	52.01	0.79	0.45	2.04
WestTrib	21779.8*	50-yr		720		6883.13	6885.88		6886.6	0.022081	6.81	105.68	54.17	0.86	0.51	2.64
WestTrib	21779.8*	100-yr		950		6883.13	6886.19	6886.05	6887.11	0.024502	7.74	122.8	56.11	0.92	0.57	3.28
WestTrib	21757.6*	2-yr		21		6882.93	6883.58		6883.63	0.014219	1.7	12.33	36.93	0.52	0.16	0.3
WestTrib	21757.6*	5-yr		50		6882.93	6883.85		6883.92	0.012834	2.18	22.89	43.75	0.53	0.18	0.42
WestTrib	21757.6*	10-yr		170		6882.93	6884.35		6884.55	0.016573	3.53	48.15	54.17	0.66	0.33	0.92
WestTrib	21757.6*	25-yr		510		6882.93	6885.16		6885.61	0.018894	5.38	94.76	62.14	0.77	0.39	1.78
WestTrib	21757.6*	50-yr		720		6882.93	6885.48		6886.08	0.020939	6.24	115.48	65.48	0.83	0.43	2.28
WestTrib	21757.6*	100-yr		950		6882.93	6885.77	6885.59	6886.54	0.022951	7.03	135.17	68.5	0.88	0.47	2.79

Falcon DBPS
West Tributary Future Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	27507.46	5-yr		230		6993.21	6994.28	6994.23	6994.54	0.034034	4.09	56.25	87.22	0.9	5.21	1.37
WestTrib	27507.46	10-yr		360		6993.21	6994.54	6994.46	6994.85	0.031084	4.49	80.11	100.72	0.89	5.08	1.54
WestTrib	27507.46	25-yr	12.87	677.13		6993.21	6995.03	6994.91	6995.43	0.022318	5.13	143.48	151.6	0.92	4.85	1.32
WestTrib	27507.46	50-yr	35.99	854.01		6993.21	6995.28	6995.12	6995.72	0.01964	5.4	182.23	162.06	0.88	4.73	1.38
WestTrib	27507.46	100-yr	82.85	1117.15		6993.21	6995.62	6995.39	6996.1	0.017068	5.73	240.01	176.72	0.84	4.59	1.45
WestTrib	27232.62	2-yr	0.09	109.91	0	6987.13	6988.68		6988.8	0.010653	2.76	40.04	48.81	0.54	7.58	0.54
WestTrib	27232.62	5-yr	1.68	227.33	0.99	6987.13	6989.1	6988.73	6989.33	0.012014	3.83	62.85	61.15	0.66	7.76	0.77
WestTrib	27232.62	10-yr	7.38	347.71	4.91	6987.13	6989.46	6989.06	6989.77	0.01225	4.56	87.22	73.92	0.73	7.92	0.9
WestTrib	27232.62	25-yr	35.35	631.13	23.51	6987.13	6990.06	6989.74	6990.59	0.014244	6.06	137.76	94.22	0.85	8.2	1.3
WestTrib	27232.62	50-yr	59.18	791.37	39.45	6987.13	6990.34	6990.07	6990.98	0.015069	6.74	165.67	103.55	0.89	8.33	1.5
WestTrib	27232.62	100-yr	102.3	1028.38	69.3	6987.13	6990.71	6990.5	6991.5	0.016112	7.64	206.3	116.59	0.94	8.55	1.78
WestTrib	26814.63	2-yr	4.67	100.6	4.73	6980.37	6981.04	6981.02	6981.22	0.037369	3.54	36.29	99.97	1	6.99	0.85
WestTrib	26814.63	5-yr	18.07	194.29	17.64	6980.37	6981.3	6981.28	6981.56	0.032379	4.42	65.69	121.51	0.99	7.02	1.09
WestTrib	26814.63	10-yr	35.2	289.37	35.43	6980.37	6981.5	6981.49	6981.85	0.033048	5.21	91.32	138.94	1.03	7.04	1.36
WestTrib	26814.63	25-yr	84.8	505.23	99.97	6980.37	6981.93	6981.93	6982.4	0.028548	6.23	164.42	199	1.06	6.54	1.47
WestTrib	26814.63	50-yr	124.1	618.42	147.45	6980.37	6982.13	6982.13	6982.64	0.02731	6.67	206.66	225.06	1.05	6.33	1.57
WestTrib	26814.63	100-yr	191.9	778.44	229.66	6980.37	6982.39	6982.39	6982.95	0.026322	7.23	267.88	255.25	1.04	5.82	1.72
WestTrib	26425.04	2-yr	4.2	103.58	2.22	6973.44	6974.15		6974.22	0.010422	2.09	58.45	124.77	0.52	9.16	0.3
WestTrib	26425.04	5-yr	15.26	207.03	7.71	6973.44	6974.43	6974.17	6974.54	0.011351	2.83	95.37	145.43	0.59	9.28	0.46
WestTrib	26425.04	10-yr	31.8	312.09	16.11	6973.44	6974.67	6974.37	6974.82	0.011208	3.32	132.41	162.94	0.61	9.41	0.57
WestTrib	26425.04	25-yr	114.7	534.81	40.46	6973.44	6975.1	6974.68	6975.3	0.010818	4.08	255.19	329.75	0.73	9.61	0.52
WestTrib	26425.04	50-yr	192.2	643.12	54.67	6973.44	6975.29	6974.7	6975.51	0.010534	4.36	320.68	355.31	0.7	9.66	0.59
WestTrib	26425.04	100-yr	334	785.85	80.17	6973.44	6975.58		6975.8	0.009352	4.55	427.11	381.76	0.63	9.73	0.65
WestTrib	25882.64	2-yr	9.81	100.12	0.07	6964.36	6964.92	6964.92	6965.06	0.031871	3.07	47.09	239.31	1.17	12.21	0.39
WestTrib	25882.64	5-yr	58.65	169.44	1.91	6964.36	6965.11	6965.11	6965.27	0.028637	3.67	101.07	339.26	1.03	11.89	0.53
WestTrib	25882.64	10-yr	123.3	231.73	4.93	6964.36	6965.22	6965.22	6965.41	0.030297	4.23	141.59	356.32	0.98	10.54	0.75
WestTrib	25882.64	25-yr	302.2	372.97	14.83	6964.36	6965.43	6965.43	6965.7	0.034063	5.3	218.97	378.59	0.96	9.75	1.23
WestTrib	25882.64	50-yr	414.7	453.38	21.91	6964.36	6965.53	6965.53	6965.85	0.036269	5.84	256.62	388.74	0.98	9.81	1.49
WestTrib	25882.64	100-yr	579.5	587.8	32.67	6964.36	6965.61	6965.61	6966.06	0.047152	7.01	289.73	401.49	1.11	10.52	2.12
WestTrib	25406.2	2-yr			110	6952.93	6952.66		6952.68	0.020955		98.39	366.9	0.38	9.31	0.35
WestTrib	25406.2	5-yr			230	6952.93	6952.82		6952.85	0.021795		160.01	421.59	0.41	9.04	0.52
WestTrib	25406.2	10-yr		0.51	359.49	6952.93	6952.98		6953.02	0.016734	0.43	231.89	474.14	0.39	8.84	0.51
WestTrib	25406.2	25-yr	0.01	22.37	667.62	6952.93	6953.27		6953.32	0.013487	1.33	377.19	526.78	0.38	8.36	0.6
WestTrib	25406.2	50-yr	0.71	45.6	843.69	6952.93	6953.4		6953.47	0.013081	1.76	447.83	548.71	0.39	8.13	0.67
WestTrib	25406.2	100-yr	5.24	86.64	1108.1	6952.93	6953.58		6953.66	0.01256	2.24	549.1	566	0.39	7.8	0.76
WestTrib	25024.12	2-yr	46.45	63.5	0.06	6941.81	6943.22	6943.11	6943.38	0.024224	3.86	40.34	64.97	0.71	8.08	0.93

Falcon DBPS
West Tributary Future Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	25024.12	5-yr	107.7	121.61	0.73	6941.81	6943.57		6943.82	0.026855	4.93	65.34	74.26	0.76	7.97	1.47
WestTrib	25024.12	10-yr	171.9	186.25	1.87	6941.81	6943.78	6943.67	6944.18	0.033734	6.26	81.37	77.38	0.87	7.8	2.2
WestTrib	25024.12	25-yr	338.3	344.78	6.89	6941.81	6944.24	6944.24	6944.95	0.040653	8.46	118.86	85.81	1.01	7.76	3.49
WestTrib	25024.12	50-yr	445.2	433.41	11.36	6941.81	6944.51	6944.51	6945.33	0.039455	9.19	142.14	88.8	1.02	7.75	3.92
WestTrib	25024.12	100-yr	613.3	566.83	19.91	6941.81	6944.88	6944.88	6945.86	0.03754	10.08	176.4	92.96	1.01	7.82	4.42
WestTrib	24630.32	2-yr		85		6933.51	6935.02	6935.02	6935.29	0.016807	4.19	20.29	38.27	1.01	7	0.55
WestTrib	24630.32	5-yr		210		6933.51	6935.47	6935.47	6935.86	0.015392	5.02	41.8	56.2	1.03	6.36	0.71
WestTrib	24630.32	10-yr		390		6933.51	6935.9	6935.9	6936.39	0.013375	5.61	69.51	71.24	1	5.55	0.81
WestTrib	24630.32	25-yr		780		6933.51	6936.52	6936.52	6937.18	0.012192	6.48	120.4	92.74	1	4.88	0.98
WestTrib	24630.32	50-yr		950		6933.51	6936.74	6936.74	6937.44	0.012005	6.69	142.1	103.21	1	4.73	1.02
WestTrib	24630.32	100-yr		1100		6933.51	6936.89	6936.89	6937.65	0.011644	6.99	157.3	104.35	1	4.61	1.09
WestTrib	24203.51	2-yr		85		6926.49	6927.67	6927.67	6927.9	0.015963	3.87	21.97	44.98	0.98	6.12	0.48
WestTrib	24203.51	5-yr		210		6926.49	6928.05	6928.05	6928.49	0.014395	5.28	39.74	47.05	1.01	5.48	0.75
WestTrib	24203.51	10-yr		389.68	0.32	6926.49	6928.5	6928.5	6929.13	0.012564	6.36	61.85	53.31	1.04	4.88	0.9
WestTrib	24203.51	25-yr		771.12	8.88	6926.49	6929.26	6929.26	6930.16	0.01063	7.64	108.07	67.92	1.06	4.12	1.04
WestTrib	24203.51	50-yr		933.8	16.2	6926.49	6929.54	6929.54	6930.52	0.010147	8.02	127.79	73.3	1.06	3.68	1.09
WestTrib	24203.51	100-yr		1075.97	24.03	6926.49	6929.76	6929.76	6930.82	0.009912	8.35	144.39	78.1	1.07	3.48	1.13
WestTrib	23803.51	2-yr		85		6919.56	6920.93	6920.93	6921.35	0.014594	5.2	16.34	19.89	1.01	6.26	0.74
WestTrib	23803.51	5-yr		210		6919.56	6921.65	6921.65	6922.27	0.012989	6.32	33.21	27.57	1.02	5.49	0.96
WestTrib	23803.51	10-yr		390		6919.56	6922.33	6922.33	6923.12	0.011764	7.12	54.81	35.37	1.01	4.82	1.12
WestTrib	23803.51	25-yr	2.24	774.14	3.62	6919.56	6923.3	6923.3	6924.37	0.009879	8.34	99.09	58.67	1.13	4.09	1.03
WestTrib	23803.51	50-yr	9.43	928.41	12.16	6919.56	6923.83	6923.83	6924.81	0.008353	8.02	137.19	101.13	1.2	3.57	0.7
WestTrib	23803.51	100-yr	25.27	1051.91	22.82	6919.56	6924.12	6924.12	6925.09	0.007569	8.07	177.05	183.81	1.42	3.27	0.45
WestTrib	23401.38	2-yr		85		6912.71	6913.63	6913.63	6913.91	0.01641	4.26	19.98	36.28	1.01	5.21	0.56
WestTrib	23401.38	5-yr		210		6912.71	6914.09	6914.09	6914.56	0.014105	5.51	38.1	41.84	1.02	5.14	0.8
WestTrib	23401.38	10-yr		389.75	0.25	6912.71	6914.58	6914.58	6915.25	0.012022	6.56	59.83	46.6	1.02	4.81	0.96
WestTrib	23401.38	25-yr	1.17	773.9	4.93	6912.71	6915.39	6915.39	6916.34	0.01028	7.84	104.44	67.35	1.11	4.04	0.99
WestTrib	23401.38	50-yr	5.51	935.94	8.55	6912.71	6915.69	6915.69	6916.73	0.009399	8.24	126.38	80.52	1.15	3.78	0.92
WestTrib	23401.38	100-yr	11.41	1075.78	12.81	6912.71	6915.95	6915.95	6917.04	0.008671	8.5	149.73	109.46	1.27	3.57	0.74
WestTrib	23003.51	2-yr	0.01	84.99	0	6906.3	6907.42		6907.61	0.010574	3.44	24.78	46.12	0.83	5.69	0.35
WestTrib	23003.51	5-yr	1.3	208.4	0.3	6906.3	6907.79	6907.74	6908.15	0.011712	4.78	45.76	61.39	0.97	5.97	0.54
WestTrib	23003.51	10-yr	6.34	382.23	1.43	6906.3	6908.16	6908.16	6908.73	0.011999	6.14	69.39	69.65	1.07	6.02	0.74
WestTrib	23003.51	25-yr	32.15	740.96	6.89	6906.3	6908.85	6908.85	6909.69	0.009888	7.55	125.64	92.13	1.11	5.01	0.84
WestTrib	23003.51	50-yr	49.46	890.29	10.25	6906.3	6909.1	6909.1	6910.04	0.009435	8.01	149.82	100.26	1.12	4.77	0.88
WestTrib	23003.51	100-yr	65.95	1020.4	13.66	6906.3	6909.31	6909.31	6910.32	0.009133	8.38	171.33	108.86	1.13	4.6	0.89
WestTrib	22594.16	2-yr		85		6901.02	6901.74	6901.74	6901.91	0.019044	3.24	26.26	80.52	1	0.5	0.39

Falcon DBPS

West Tributary Future Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	22594.16	5-yr		210		6901.02	6902	6902	6902.17	0.018283	3.33	62.98	179.14	0.99	0.47	0.4
WestTrib	22594.16	10-yr		390		6901.02	6902.16	6902.16	6902.44	0.017853	4.22	92.48	181.66	1.04	0.45	0.57
WestTrib	22594.16	25-yr		779.85	0.15	6901.02	6902.48	6902.48	6902.89	0.014646	5.19	150.83	198.06	1.05	0.41	0.7
WestTrib	22594.16	50-yr		948.75	1.25	6901.02	6902.6	6902.6	6903.06	0.013803	5.5	174.67	202.17	1.04	0.4	0.74
WestTrib	22594.16	100-yr		1097.2	2.81	6901.02	6902.7	6902.7	6903.2	0.013172	5.73	195.08	205.63	1.04	0.39	0.78
WestTrib	22566.37	2-yr		85		6897.14	6898.07	6898.07	6898.37	0.01595	4.4	19.3	32.53	1.01	5.6	0.59
WestTrib	22566.37	5-yr		210		6897.14	6898.57	6898.57	6899.08	0.013437	5.72	36.71	36.62	1.01	4.84	0.83
WestTrib	22566.37	10-yr		390		6897.14	6899.11	6899.11	6899.82	0.011962	6.77	57.59	40.77	1	3.71	1.04
WestTrib	22566.37	25-yr		780		6897.14	6899.98	6899.98	6901	0.010701	8.12	96.04	47.47	1.01	1.32	1.33
WestTrib	22566.37	50-yr		950		6897.14	6900.29	6900.29	6901.42	0.010419	8.54	111.18	49.86	1.01	1	1.43
WestTrib	22566.37	100-yr	0	1099.96	0.04	6897.14	6900.62	6900.62	6901.76	0.010377	8.57	128.54	59.29	1.03	0.84	1.38
WestTrib	22203.51	2-yr		85		6887.36	6888.58	6888.58	6888.95	0.014904	4.9	17.33	23.54	1.01	0.23	0.68
WestTrib	22203.51	5-yr		210		6887.36	6889.2	6889.2	6889.78	0.013224	6.15	34.14	30.11	1.02	0.21	0.93
WestTrib	22203.51	10-yr		390		6887.36	6890.05	6889.85	6890.64	0.008697	6.15	63.38	40.72	0.87	0.21	0.83
WestTrib	22203.51	25-yr	0.67	765.96	13.37	6887.36	6892.44		6892.68	0.001373	3.94	225.55	118.95	0.5	0.04	0.16
WestTrib	22203.51	50-yr	2.99	892.5	54.52	6887.36	6893.34		6893.53	0.00081	3.57	348.34	145.85	0.4	0.02	0.12
WestTrib	22203.51	100-yr	6.02	995.84	98.15	6887.36	6894.1		6894.26	0.000575	3.37	465.49	165.85	0.34	0.01	0.1
WestTrib	22188.6*	2-yr		85		6887.12	6888.27	6888.27	6888.64	0.01546	4.87	17.46	24.67	1.02	0.24	0.68
WestTrib	22188.6*	5-yr		210		6887.12	6888.89	6888.89	6889.44	0.013092	5.96	35.24	32.41	1.01	0.24	0.88
WestTrib	22188.6*	10-yr		390		6887.12	6890.07		6890.42	0.004522	4.75	82.18	47.82	0.64	0.11	0.48
WestTrib	22188.6*	25-yr	0.02	779.98		6887.12	6892.45		6892.64	0.001023	3.51	222.18	67.1	0.34	0.03	0.21
WestTrib	22188.6*	50-yr	0.81	937.91	11.27	6887.12	6893.34		6893.51	0.000673	3.33	315.82	121.34	0.36	0.02	0.11
WestTrib	22188.6*	100-yr	2.65	1061.1	36.25	6887.12	6894.09		6894.24	0.000502	3.21	416.67	141.24	0.32	0.02	0.09
WestTrib	22173.7*	2-yr		85		6886.88	6887.97	6887.97	6888.32	0.015074	4.74	17.95	25.97	1	0.23	0.65
WestTrib	22173.7*	5-yr		210		6886.88	6888.74		6889.13	0.008473	5	42.03	36.36	0.82	0.17	0.61
WestTrib	22173.7*	10-yr		390		6886.88	6890.09		6890.31	0.00242	3.76	103.74	53.6	0.48	0.06	0.29
WestTrib	22173.7*	25-yr		780		6886.88	6892.45		6892.6	0.000712	3.09	252.49	69.3	0.29	0.03	0.16
WestTrib	22173.7*	50-yr	0.07	949.9	0.04	6886.88	6893.35		6893.49	0.000525	3.01	316.79	89.96	0.28	0.02	0.11
WestTrib	22173.7*	100-yr	0.8	1092.08	7.12	6886.88	6894.09		6894.23	0.000413	2.96	398.08	119.56	0.28	0.02	0.08
WestTrib	22158.9*	2-yr		85		6886.64	6887.66	6887.66	6888	0.015174	4.69	18.11	26.7	1	0.23	0.64
WestTrib	22158.9*	5-yr		210		6886.64	6888.74		6888.96	0.004207	3.74	56.17	44.46	0.59	0.09	0.33
WestTrib	22158.9*	10-yr		390		6886.64	6890.1		6890.25	0.001374	3.05	127.79	59.04	0.37	0.04	0.18
WestTrib	22158.9*	25-yr		780		6886.64	6892.46		6892.58	0.0005	2.73	286.09	72.46	0.24	0.02	0.12
WestTrib	22158.9*	50-yr		950		6886.64	6893.36		6893.47	0.000395	2.7	352.12	75.36	0.22	0.02	0.11
WestTrib	22158.9*	100-yr	0.08	1099.88	0.04	6886.64	6894.1		6894.21	0.00033	2.69	409.98	87.94	0.22	0.01	0.09
WestTrib	22144.0*	2-yr		85		6886.41	6887.53		6887.73	0.007506	3.59	23.66	30.72	0.72	0.12	0.36

Falcon DBPS

West Tributary Future Conditions HEC-RAS Outputs

Reach	River Sta	Profile	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS	Headloss (ft)	Shear Total (lb/sq ft)
WestTrib	22144.0*	5-yr		210		6886.41	6888.75		6888.87	0.002051	2.84	73.99	51.66	0.42	0.05	0.18
WestTrib	22144.0*	10-yr		390		6886.41	6890.11		6890.21	0.000821	2.53	154.32	64.29	0.29	0.02	0.12
WestTrib	22144.0*	25-yr		780		6886.41	6892.47		6892.56	0.000358	2.42	322.4	75.86	0.21	0.01	0.09
WestTrib	22144.0*	50-yr		950		6886.41	6893.36		6893.45	0.000294	2.43	391.38	78.57	0.19	0.01	0.09
WestTrib	22144.0*	100-yr		1100		6886.41	6894.1		6894.2	0.000258	2.44	450.57	80.7	0.18	0.01	0.09
WestTrib	22129.18	2-yr		85		6886.17	6887.52	6887.01	6887.62	0.002809	2.46	34.48	37.69	0.45		0.16
WestTrib	22129.18	5-yr		210		6886.17	6888.75	6887.61	6888.83	0.001043	2.21	95.14	58.33	0.3		0.11
WestTrib	22129.18	10-yr		390		6886.17	6890.11	6888.15	6890.18	0.00051	2.12	183.62	69.4	0.23		0.08
WestTrib	22129.18	25-yr		780		6886.17	6892.47	6888.91	6892.55	0.000254	2.16	360.82	79.49	0.18		0.07
WestTrib	22129.18	50-yr		950		6886.17	6893.37	6889.19	6893.44	0.000213	2.21	430.26	82.04	0.17		0.07
WestTrib	22129.18	100-yr		1100		6886.17	6894.11	6889.4	6894.19	0.00019	2.25	488.4	84.01	0.16		0.07
WestTrib	21948.92		Culvert													
WestTrib	21824.12	2-yr		85		6883.52	6884.96	6884.8	6885.18	0.020607	3.78	22.48	35.32	0.73	0.41	1.07
WestTrib	21824.12	5-yr		210		6883.52	6885.47	6885.36	6885.99	0.025565	5.79	36.25	35.85	0.88	0.56	2.15
WestTrib	21824.12	10-yr		390		6883.52	6886	6886	6886.92	0.02898	7.71	50.61	36.39	0.99	0.73	3.4
WestTrib	21824.12	25-yr		780		6883.52	6887.11	6887.11	6888.57	0.024845	9.71	80.34	37.36	0.99	0.81	4.63
WestTrib	21824.12	50-yr		950		6883.52	6887.47	6887.47	6889.19	0.025047	10.53	90.21	37.68	1.01	0.87	5.24
WestTrib	21824.12	100-yr		1100		6883.52	6887.86	6887.86	6889.72	0.023305	10.93	100.66	39.36	1	0.86	5.44
WestTrib	21801.9*	2-yr		85		6883.32	6884.64	6884.4	6884.77	0.013099	2.85	29.82	38.5	0.57	0.3	0.63
WestTrib	21801.9*	5-yr		210		6883.32	6885.16	6884.85	6885.43	0.015196	4.15	50.55	41.16	0.66	0.35	1.15
WestTrib	21801.9*	10-yr		390		6883.32	6885.66	6885.36	6886.12	0.017788	5.47	71.31	42.96	0.75	0.41	1.8
WestTrib	21801.9*	25-yr		780		6883.32	6886.38	6886.21	6887.27	0.022412	7.54	103.41	45.29	0.88	0.53	3.09
WestTrib	21801.9*	50-yr		950		6883.32	6886.63	6886.51	6887.7	0.024305	8.3	114.52	46.07	0.93	0.58	3.64
WestTrib	21801.9*	100-yr		1100		6883.32	6886.82	6886.78	6888.05	0.025795	8.9	123.62	46.7	0.96	0.62	4.1
WestTrib	21779.8*	2-yr		85		6883.13	6884.35		6884.47	0.014122	2.8	30.4	43.01	0.59	0.32	0.62
WestTrib	21779.8*	5-yr		210		6883.13	6884.84		6885.08	0.015994	3.98	52.7	47.88	0.67	0.35	1.09
WestTrib	21779.8*	10-yr		390		6883.13	6885.29		6885.71	0.018382	5.2	75.01	50.52	0.75	0.42	1.68
WestTrib	21779.8*	25-yr		780		6883.13	6885.96		6886.74	0.022748	7.07	110.36	54.71	0.88	0.53	2.81
WestTrib	21779.8*	50-yr		950		6883.13	6886.2	6886.05	6887.12	0.023986	7.68	123.68	56.21	0.91	0.55	3.23
WestTrib	21779.8*	100-yr		1100		6883.13	6886.42	6886.28	6887.43	0.024278	8.09	135.93	57.55	0.93	0.53	3.5
WestTrib	21757.6*	2-yr		85		6882.93	6884.04		6884.15	0.014011	2.65	32.08	49	0.58	0.22	0.57
WestTrib	21757.6*	5-yr		210		6882.93	6884.53		6884.73	0.014222	3.63	57.92	55.74	0.63	0.26	0.92
WestTrib	21757.6*	10-yr		390		6882.93	6884.93		6885.29	0.01764	4.81	81.06	59.82	0.73	0.36	1.48
WestTrib	21757.6*	25-yr		780		6882.93	6885.55		6886.21	0.021833	6.49	120.2	66.22	0.85	0.45	2.45
WestTrib	21757.6*	50-yr	0.01	949.99		6882.93	6885.87		6886.57	0.019895	6.69	141.98	70.7	0.83	0.39	2.46
WestTrib	21757.6*	100-yr	0.85	1099.15		6882.93	6886.22		6886.9	0.015915	6.6	167.31	73.26	0.77	0.32	2.24

APPENDIX B
Hydraulic Computations

Boulder Calculations for Drop Structures

Drop Number	1	2	3	4	5	6	7	8	9	10	11
RAS Section	4847	4703	4570	3950	3700	3400	2975	2775	2400	2200	2000
V (fps)	8.22	9.07	9.07	9.12	9.11	9.12	9.12	9.10	9.12	9.44	8.75
S (ft/ft)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Rp	4.90	5.37	5.37	5.40	5.39	5.40	5.40	5.38	5.40	5.58	5.18
Boulder Size (in)	24	24	24	24	24	24	24	24	24	24	24

Rp - From MHFD USDCM Equation 9-7 for rock sizing parameter
 Boulder Size per MHFD USDCM Figure 9-4

1. If the vertical distance from the drop toe to the drop crest is less than or equal to six feet, determine the critical velocity for the design flow in both the low-flow channel and the overbanks. This velocity occurs just upstream of the drop crest. For drop structures up to six feet in height, gradually varied flow acceleration is considered negligible. If the vertical distance from the drop toe to the drop crest is greater than six feet, determine the actual velocity at the drop toe using S2 curve drawdown calculations for the design flow in both the low-flow channel and the overbanks. This can be done using either the standard step or the direct step method. If a detailed hydraulic analysis has been completed using HEC-RAS (see Section 2.3), then the actual velocity is provided in the HEC-RAS output and the critical velocity can be taken from the section just upstream of the drop structure.
2. Calculate rock-sizing parameter, R_p (dimensionless), for both segments of the cross section (overbanks and in the low-flow channel):

$$R_p = \frac{VS^{0.17}}{(S_s - 1)^{0.66}} \quad \text{Equation 9-7}$$

Where:

- V = critical velocity, V_c (for drop structure heights up to six feet) or drawdown velocity at the toe of the drop (for drop height exceeding six feet)
- S = slope along the face of the drop (ft/ft)
- S_s = specific gravity of the rock (Assume 2.55 unless the quarry certifies a higher value.)

Note that for drop heights exceeding six feet, Equation 9-7 becomes iterative, since Manning's roughness coefficient is a function of the boulder size, from Equation 9-1 or 9-2.

3. Select minimum boulder size for cross section segments within and outside the low-flow channel cross-section from Table 9-1. Use the larger boulder sizes for the low-flow channel and the overbank segments and use the smaller boulder sizes for the low-flow channel and the overbank segments downstream. Use only the larger sized boulders throughout the entire structure. Mistakes during construction are more common when specifying multiple rock sizes within the same structure.

2.55 was assumed
and used in the
calculations

Table 9-4. Boulder sizes for various rock sizing parameters

Rock Sizing Parameter, R_p	Grouted Boulders ¹
	Boulder Classification ²
Less than 5.00	B24
5.00 to 5.59	B24
5.60 to 6.99	B36
7.00 to 8.00	B48

¹ Grouted to no less than $\frac{1}{3}$ the height (+1" / - 0"), no more than $\frac{1}{2}$ (+0" / - 1") of boulder height.

² See *Open Channels* chapter.

Grout

Grout all boulders to a depth of one-half their height through the approach, sloping face, and basin areas. Grout should extend near full depth of the rock at the upstream crest and around the perimeter of the structure where it is adjoining the earth in order to provide stability of the approach channel. See Figure 9-15 for grout placement and material specifications.

Edge Wall

Construct a wall that extends roughly 3 feet below the top surface of the structure around the entire perimeter of the GSB drop structure. See Figure 9-22 for an edge wall detail. An edge wall is especially necessary for structures designed to convey less than the 100-year flow but is also beneficial for structures that do span the 100-year flow. In addition, use buried riprap around the perimeter of the structure when this is the case. The transition between soil and the grouted boulders can become a problem if not properly addressed during design and construction. Ensure compaction around the perimeter of the structure and grade this area higher than the structure to promote sheet flow onto the structure.

Additional Design Guidance

Grouted boulders must cover the crest and cutoff and extend downstream through the stilling basin (when applicable), or through the embedded toe of the drop structure when a stilling basin is not included. Place boulders to create a stepped appearance, which helps to increase roughness. Additional information regarding riprap and boulders is in the *Open Channels* chapter.

2.6.4 Construction Guidance

Grouted boulder drop structures require significant construction oversight. During placement of the rock and construction in general, disturb the subgrade as little as possible to reduce the potential for piping under the structure. Good subgrade preparation, careful rock placement, and removal of loose materials will reduce potential piping. Do not place granular bedding (or subgrade fill using granular materials) between subgrade and the boulders. This can cause piping. Place boulders directly on undisturbed subgrade where possible. Where the design requires over excavation and/or fill or where wet or poor subgrade exists onsite, ensure proper density and compaction. See Division 31 specifications available at www.udfcd.org. When fill is required, it is best to fill and compact to a set elevation (or sloped surface)

Add freeboard calculations around curves here or separately; ensure that they are met

Riprap Calculations for Outer Banks of Channel Bends

Curve Number (From Survey Control Plan)	North Channel			South Channel					
	C1	C2	C3	C4	C5	C6	C7	C8	C9
US Station	Offsite	5+54.98	6+26.74	3+24.69	4+71.46	8+76.24	13+12.21	22+49.81	23+63.16
HEC-RAS Section	5072	4402	4302	3684	3580	3193	2725	1700	1600
Centerline Radius (ft)	130	500	160	500	1000	300	250	200	150
Top Width (ft)	50.28	74.13	72.66	71.62	72.97	74.7	76.86	105.73	162.09
Channel Slope (%)	0.35	0.30	0.30	0.61	0.61	0.37	0.30	0.10	0.10
Mean Velocity (fps)	8.64	5.73	6.06	6.45	6.11	5.73	5.31	6.44	5.35
Adjusted Velocity = Va (fps) *	15.5	6.8	11.2	7.4	1.0	9.1	9.0	12.2	10.9
D50 (in) **	12	2	6	3	0	4	4	5	4

6.9?

6.06?

Verify equation

Is this verified by the model?

* Equation 8-10 from MHFD USDCM Chapter 8 for Evaluation of Erosion at Channel Bends

** Equation 8-11 from MHFD USDCM Chapter 8 for Riprap on Mild Slope Conditions

7.3 Evaluation of Erosion at Channel Bends

Special erosion control measures are often needed at bends. Riprap sizing should be based on locally higher velocities at the outside of a bend. An estimate of velocity along the outside of the bend can be made using the following equation.

$$V_a = (-0.147 \frac{r_c}{T} + 2.176) V \quad \text{Equation 8-10}$$

Where:

- V_a = adjusted channel velocity for riprap sizing along the outside of channel bends (ft/sec)
- V = mean channel velocity for the peak flow of the major design flow (ft/sec)
- r_c = channel centerline radius (ft)
- T = Top width of water during the major design flow (ft)

8.1.1 Mild Slope Conditions

When subcritical flow conditions occur and/or slopes are mild (less than 2 percent), UDFCD recommends the following equation (Hughes, et al, 1983):

$$d_{50} \geq \left[\frac{VS^{0.17}}{4.5(G_s - 1)^{0.66}} \right]^2 \quad \text{Equation 8-11}$$

Where:

- V = mean channel velocity (ft/sec)
- S = longitudinal channel slope (ft/ft)
- d_{50} = mean rock size (ft)
- G_s = specific gravity of stone (minimum = 2.50, typically 2.5 to 2.7), Note: In this equation ($G_s - 1$) considers the buoyancy of the water, in that the specific gravity of water is subtracted from the specific gravity of the rock.

Note that Equation 8-11 is applicable for sizing riprap for channel lining with a longitudinal slope of no more than 2%. This equation is not intended for use in sizing riprap for steep slopes (typically in excess of 2 percent), rundowns, or protection downstream of culverts. Information on rundowns is provided in Section 7.0 of the *Hydraulic Structures* chapter of the USDCM, and protection downstream of culverts is discussed in the *Culverts and Bridges* chapter. For channel slopes greater than 2% use one of the methods presented in 8.1.2.

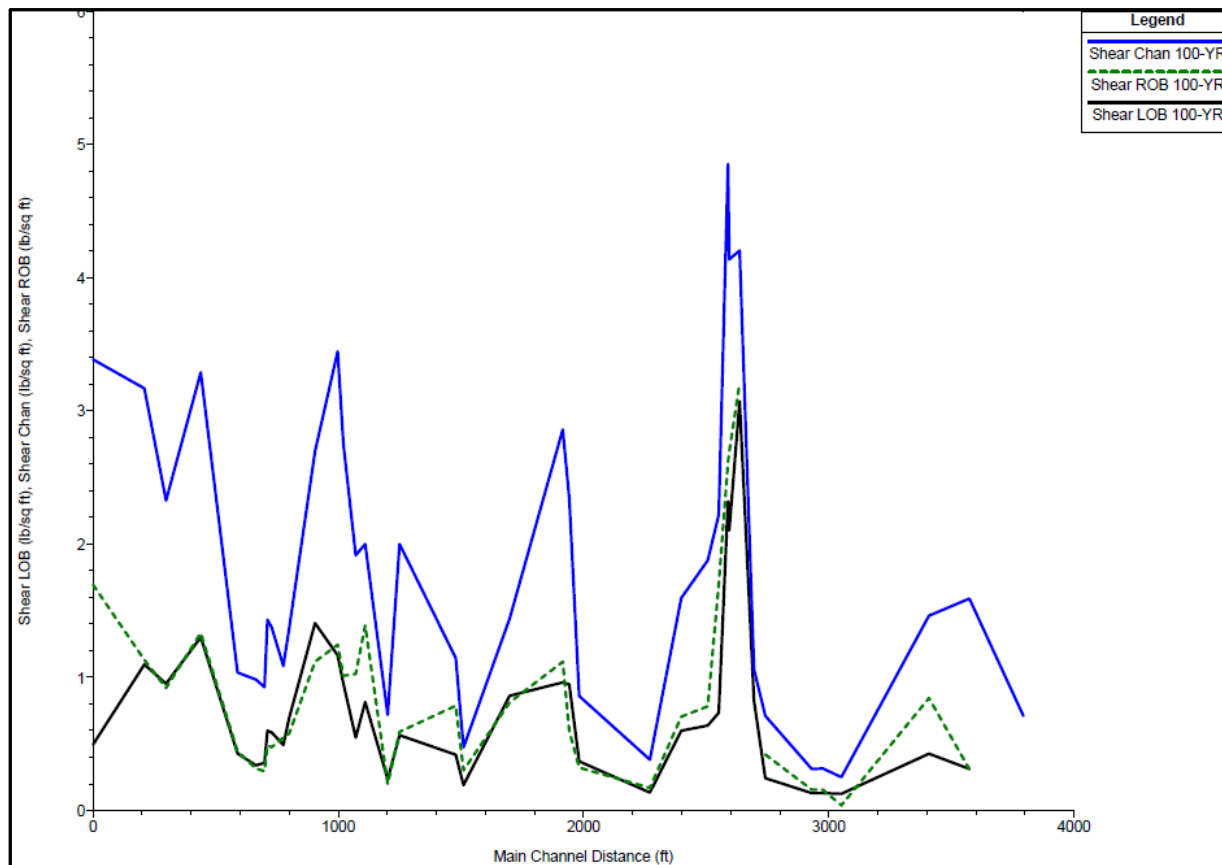


Figure 8-32. Example HEC-RAS general profile plot of shear stress

7.3 Evaluation of Erosion at Channel Bends

Special erosion control measures are often needed at bends. Riprap sizing should be based on locally higher velocities at the outside of a bend. An estimate of velocity along the outside of the bend can be made using the following equation.

$$V_a = \left(-0.147 \frac{r_c}{T} + 2.176\right) V \quad \text{Equation 8-10}$$

Where:

V_a = adjusted channel velocity for riprap sizing along the outside of channel bends (ft/sec)

V = mean channel velocity for the peak flow of the major design flow (ft/sec)

r_c = channel centerline radius (ft)

T = Top width of water during the major design flow (ft)

8.1 Riprap Sizing

Procedures for sizing rock to be used in soil riprap, void-filled riprap, and riprap over bedding are the same.

8.1.1 Mild Slope Conditions

When subcritical flow conditions occur and/or slopes are mild (less than 2 percent), UDFCD recommends the following equation (Hughes, et al, 1983):

$$d_{50} \geq \left[\frac{VS^{0.17}}{4.5(G_s - 1)^{0.66}} \right]^2 \quad \text{Equation 8-11}$$

Where:

V = mean channel velocity (ft/sec)

S = longitudinal channel slope (ft/ft)

d_{50} = mean rock size (ft)

G_s = specific gravity of stone (minimum = 2.50, typically 2.5 to 2.7), Note: In this equation ($G_s - 1$) considers the buoyancy of the water, in that the specific gravity of water is subtracted from the specific gravity of the rock.

Note that Equation 8-11 is applicable for sizing riprap for channel lining with a longitudinal slope of no more than 2%. This equation **2.50 was assumed and used in the calculations** in sizing riprap for steep slopes (typically in excess of 2 percent), rundowns, or protection of culverts. Information on rundowns is provided in Section 7.0 of the *Hydraulic Structures* chapter, USDCM, and protection downstream of culverts is discussed in the *Culverts and Bridges* chapter. For channel slopes greater than 2% use one of the methods presented in 8.1.2.

Rock size does not need to be increased for steeper channel side slopes, provided the side slopes are no steeper than 2.5H:1V (UDFCD 1982). Channel side slopes steeper than 2.5H:1V are not recommended because of stability, safety, and maintenance considerations. See Figure 8-34 for riprap placement specifications. At the upstream and downstream termination of a riprap lining, the thickness should be increased 50% for at least 3 feet to prevent undercutting.

8.1.2 Steep Slope Conditions

Steep slope rock sizing equations are used for applications where the slope is greater than 2 percent and/or flows are in the supercritical flow regime. The following rock sizing equations may be referred to for riprap design analysis on steep slopes:

- CSU Equation, *Development of Riprap Design Criteria by Riprap Testing in Flumes: Phase II* (prepared by S.R. Abt, et al, Colorado State University, 1988). This method was developed for steep slopes from 2 to 20 percent.
- USDA- Agricultural Research Service Equations, *Design of Rock Chutes* (by K.M. Robinson, et al, USDA- ARS, 1998 Transactions of ASAE) and *An Excel Program to Design Rock Chutes for Grade*

APPENDIX C
Allowable Rise Floodplain Permit

March 25, 2022

Mr. Keith Curtis
Floodplain Administrator
Pikes Peak Regional Building Department
2880 International Circle
Colorado Springs, CO 80910.

RE: Less Than One-Foot Rise Certification for Falcon Meadows at Bent Grass Channel Design on Unnamed Tributary to Black Squirrel Creek No. 2

Dear Mr. Curtis,

Galloway and Company Inc. is pleased to provide this letter and supporting documentation for the floodplain evaluation of the proposed channel design for the Falcon Meadows at Bent Grass Project along the Unnamed Tributary to Black Squirrel Creek No. 2 in the West Tributary Falcon Basin. Hydraulic analyses were performed to establish a corrected condition, Pre-Project (existing) and Post-Project (proposed) condition for the 100-year storm event. The goals of this evaluation were to document: a) that no existing insurable structures are impacted by the proposed project, and b) that the cumulative increase in the 100-year water surface elevation is below the allowable surcharge amount.

As the floodplain for the Unnamed Tributary to Black Squirrel Creek No. 2 is classified as ZONE AE on the Effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), and because there is no regulatory floodway associated with the creek, improvements that encroach on the tributary's floodplain meet the criteria to obtain a floodplain permit through a less than one-foot rise certification with the Pikes Peak Regional Building Department. This certification permits development within the Unnamed Tributary to Black Squirrel Creek No. 2 floodplain as long as the hydraulic study demonstrates that: "the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood elevation more than one-foot at any point within the community." However, in January 2014 the State of Colorado implemented a more stringent floodway surcharge of one-half foot. Therefore, per FEMA's and the Pikes Peak Regional Building Department's floodplain and stormwater regulations, the more stringent guideline governs. Submittal of a Conditional Letter of Map Revision (CLOMR) to FEMA is not anticipated for the current project assuming that the minimum guidelines are satisfied. Due to the drop in water surface elevations, it is a Letter of Map Revision (LOMR) will be submitted to FEMA upon construction of the channel improvements.

In January 2020, a floodplain permit was issued for the channel to include the construction of the box culvert under Bent Grass Meadows Drive and the relocation of the channel to run along the north property boundary before tying into the Unnamed Tributary to Black Squirrel Creek No. 2.

EFFECTIVE CONDITION:

The effective hydraulic and hydrologic conditions for our study reach along the Unnamed Tributary to Black Squirrel Creek No. 2 is documented in the 2003 FEMA approved 'Letter of Map Revision for the West Tributary Falcon Basin Zone A Conversion,' LOMR No.: 03-08-0385P. The study modeled the 100-year floodplain conditions along the Unnamed Tributary to Black Squirrel Creek No. 2 from approximately 200 feet upstream to East Woodmen Road. The current model for the Bent Grass Residential Filing No. 2 Project ties into the effective model at Cross Section 1517, which corresponds to section number 4 in the effective model as well as Cross Section F on the effective FIRM. The effective 100-year utilized peak discharges of 1,450 cfs between Cross Sections 5100 and 3900, and 1,482 cfs from Station 3900 to the downstream study limit of the model at Woodmen Road. LOMR 03-08-0385P and the associated model output file are provided at the end of this letter report. The corrected model in



the previously approved floodplain permit had the model ending at Cross Section 2605, at the southern boundary of the Falcon Meadows property. The corrected model has been expanded to extend all the way to Woodmen Road.

REVISED CORRECTED CONDITION:

The revised corrected condition hydraulic analysis was modeled using HEC-RAS version 5.0.7. The model utilized the effective model's results to establish the hydrology for the analysis. 100-year peak discharges were adopted from the effective results. Manning's *n* values of 0.035 and 0.050 were adopted from the effective model and used in the channel and overbanks. Contraction and expansion coefficients were also adopted from the effective model. The known water surface elevation from the effective model was used as the downstream boundary condition.

With the inclusion of three cross sections from the 2003 study (Sections F-H), the following changes were made in the revised corrected condition model:

1. The 2003 study had been modeled using HEC-2, which has limited modeling capabilities when compared to more recent versions of HEC-RAS. Thus, a new version of the model was created in HEC-RAS v. 5.0.3 and geo-rectified along the Unnamed Tributary to Black Squirrel Creek No. 2 into the NAD83 Colorado State Plane Central (FIPS 0502) projected coordinate system.
2. The 2003 study is comprised of 9 cross sections, 5 of which are located within the study area. Only 3 cross section orientations (4550, 3694, and 2605) were carried over from the 2003 study. Additional cross sections were cut in the revised corrected condition model.
3. Except for the cross sections downstream of the Falcon Meadows boundary (offsite sections), cross sections were cut using updated topographic data that was surveyed by Galloway in April 2019.

In general, revised corrected condition water surface elevations at cross sections corresponding to cross sections from the 2003 study tend to be a foot lower in elevation. This can likely be attributed to the current study utilizing more high-resolution topographic information as well as a more robust model. The 100-year water surface elevations from the revised corrected condition and effective condition are compared in Table 1.

PRE PROJECT (EXISTING) CONDITION:

Description of Improvements:

The previously approved floodplain permit was submitted to accompany the Bent Grass Residential Filing No. 2 project, which is located to the east along a portion of the channel. The proposed condition for the previously approved floodplain permit took into account the twin culverts crossing under Bent Grass Meadows Drive, along with a drop structure just upstream of the structure. The remainder of the channel was left in existing condition with no improvements and ended at Cross Section 2605, just south of the Bent Grass property. This model the basis of the pre-project (existing) condition model for this report. The model was updated to include the relocation of the channel along the north property line and was extended to the south to Woodmen Road.

The Bent Grass Residential Filing No. 2 project was a private development subdivision north of East Woodmen Road in Falcon, Colorado. The project regraded portions of the Unnamed Tributary to Black Squirrel Creek No.2 from a natural channel to a grass lined earthen channel and installed a new road crossing over the channel that conveys water through two 16 feet wide by 6 feet tall reinforced concrete box culverts. The location of these improvements is called out on Figure 1 at the end of this letter. The earthen channel was shown on separate design drawings included in the previously approved

Floodplain permit report and construction drawings for the Bent Grass Residential Filing No. 2 project. The channel was designed to be approximately 5 feet deep with 4:1 side slopes and lined with native grass seed. Locations where the channel was to be regraded include Cross Section 5000 towards the northern end of the project area, as well as Cross Sections 4400 through 3800 which correspond to the location of the proposed roadway crossing. The roadway crossing also included a 7.6-foot drop structure upstream of the box culverts that has a 4:1 slope, riprap placed upstream of the drop and downstream of the culverts, and wingwalls at the downstream end. Other improvements that were part of the Bent Grass Residential Filing No. 2 Project include: a) a capture channel along the northern property line that collects upstream flows and convey them into the tributary, b) off line detention ponds that will detain flows coming from the subdivision offsite.

Hydraulic Analysis:

The pre-project condition hydraulic analysis utilized the previous "proposed" HEC-RAS model from the approved floodplain permit to analyze the 100-year flood event in the existing channel and associated improvements on the Bent Grass Residential Filing No. 2 property. The model boundary condition was not changed from the effective condition model from 2003. In the study reach, a Manning's *n* value of 0.035 was used in the channel. Sections of the overbank that are to be grass lined during this project were also assigned manning's *n* values of 0.035, while undeveloped channel overbanks were assigned a Manning's *n* of 0.050 corresponding to the effective condition model. The Bent Grass Meadows road crossing was modeled as a 16W'x6'H double barreled reinforced concrete box culvert.

The following changes were made to the pre-project condition model in order to evaluate the 100-year event associated with the post project condition:

1. Ancillary cross sections that were not close to proposed improvements were removed while additional cross sections were cut closer to the improvements.
2. Flow lengths were reassigned to accommodate the changes in cross section configurations.
3. Cross sections 4100 and 4050 were replaced with the 16'Wx6'H double barreled reinforced
4. concrete box culvert and associated design road with both low and high chords.
5. Cross section geometries were revised to reflect the proposed grade within the Unnamed Tributary to Black Squirrel Creek No. 2.
6. Cross sections were revised to better model and map back water areas.
7. Channel was extended to the south to Woodmen Road

POST PROJECT (PROPOSED) CONDITION:

Description of Improvements:

The Falcon Meadows at Bent Development includes three additional phases of single family residential subdivisions, along the east and west sides of the existing channel. South of the Falcon Meadows site, there are 3 additional parcels of land, which have future development planned. The remaining entirety of the channel north of Woodmen Road, which has not previously been improved, will regrade the existing channel from a natural channel to a grass lined earthen channel, with 11 drop structures. The proposed earthen channel is shown on separate design drawings and is approximately 5 feet deep with 4:1 side slopes and lined with native grass seed. The alignment of the channel, once it leaves the Falcon Meadows development, was shifted to the east, to allow larger and more useable

tracts of land for future development, and not leaving “slivers” of unusable land along the east side of the channel.

Hydraulic Analysis:

The post project condition hydraulic analysis utilized the pre-project HEC-RAS model to analyze the 100-year flood event in the proposed channel and associated improvements thru the Unnamed Tributary Channel, to Woodmen Road. The model boundary condition was not changed from the effective condition model from 2003. In the study reach, a Manning’s *n* value of 0.035 was used in the channel. Sections of the overbank that are to be grass lined during this project were also assigned manning’s *n* values of 0.035, while undeveloped channel overbanks were assigned a Manning’s *n* of 0.050 corresponding to the effective condition model. Manning’s *n* values of 0.04 were used for the channel section at the riprap drop structures and 0.045 at the drop structures overbank areas.

The following changes were made to the post-project condition model in order to evaluate the 100-year event associated with the post project condition:

1. Ancillary cross sections that were not close to proposed improvements were removed while additional cross sections were cut closer to the improvements.
2. Flow lengths were reassigned to accommodate the changes in cross section configurations.
3. Cross section geometries were revised to reflect the proposed grade within the Unnamed Tributary to Black Squirrel Creek No. 2.
4. Realignment of the offsite channel section, south of Falcon Meadows development, to allow for more useable parcels of land available for development.

Conclusions:

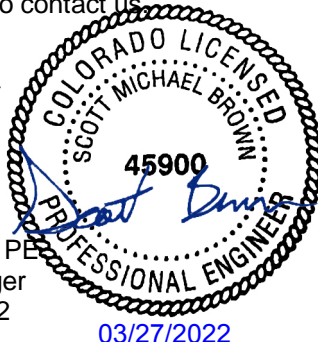
Based on the results depicted on Figure 1 and Table 1 the following conclusions are drawn:

1. The 100-year water surface elevations are generally lower from the corrected to the proposed condition.
2. The maximum increase of 0.5 is noted at Cross Section 4955 & 1900, which is within the maximum increase of 0.5 feet allowed by the State of Colorado.
3. The indicated rises in the 100-year water surface elevations do not impact any insurable structures.

If you have any questions or comments about any of the information presented in this letter, please do not hesitate to contact us.

Sincerely,
GALLOWAY

Scott Brown, PE
Project Manger
303-962-8522



Attachments:

- A. Allowable Rise Certification
- B. Table 1: Summary of Model Water Surface Elevations
- C. Effective Firm Panel
- D. Work Maps
- E. Construction drawings
- F. Corrected Model Results Table
- G. Corrected Water Surface Profiles
- H. Corrected Cross Sections
- I. Pre-Project Model Results Table
- J. Pre-Project Water Surface Profiles
- K. Pre-Project Cross Sections
- L. Post Project Model Results Table
- M. Post Project Water Surface Profiles
- N. Post Project Cross Sections
- O. Cover Page of LOMR No.: 03-08-0385P
- P. HEC-2 Output File From Effective Study

PIKES PEAK REGIONAL FLOODPLAIN MANAGEMENT OFFICE

Floodplain Development Permit Application

Date 12/23/2021

This application is required for authorization of any construction or modification within a designated floodplain. If you need further information regarding this application and regulations, call 719-327-2898. Submit application and attachments to the Regional Floodplain Administration at Pikes Peak Regional Building Department.

OFFICE USE ONLY

F.P. Permit #

Building Permit #

Property Owner

Challenger Communities, LLC

Address 8605 Explorer Dr., Suite 250

City Colorado Springs

State CO

Zip Code 80920

email Jim@MyChallengerhomes.com

Phone 719-598-5190

Contact Jim Beyers

Phone 719-598-5190

email Jim@MyChallengerhomes.com

Project Address/Location Bent Grass Meadows Drive

Community # 080059

Zip Code 80831

Creek Unnamed Tributary to Black Squirrel Creek No. 2

Parcel # 5301000020

FIRM # 08041C0553G

Base Flood Elevation**Contractor**

Phone Number

email

Fax Number

Project Type: (Check all that apply to your project.) New Construction Addition/Remodel Repair Single Family Multi-Family Manufactured Unit Non-Residential Use Water course modification Fill/Excavation Bridge Culvert Other

Project Description: Channel improvements along Unnamed Tributary to Black Squirrel Creek No. 2 including channelization and drop structures, and riprap protection.

Requirements of construction plans include:

- Label mean sea level elevations of proposed lowest floor. Flood proofing level must be noted on plans for new structures.
- All structural elements must be designed to withstand the effects of flooding by an engineer licensed by the state of Colorado.
- A state of Colorado licensed engineer must certify that construction in a *floodway* will not increase of flood elevations.
- Plans must be drawn to scale and include applicable items (listed in box).

- Drawn to Scale
- Dimensions
- Elevations
- Located correctly on site
- All structures on plan
- Fill areas indicated
- Drainage Plan

- Preliminary Elevation Certificate
- Finished Elevation Certificate

Created by

Galloway & Co

Office Use Only: FEMA Submittals

- CLOMR Approved Date
- CLOMR-F Approved Date
- LOMR Approved Date
- LOMR-F Approved Date

Attachments:

- A. Allowable Rise Certification
- B. Table 1: Summary of Model Water Surface Elevations
- C. Effective Firm Panel
- D. Work Maps
- E. Construction drawings
- F. Corrected Model Results Table
- G. Corrected Water Surface Profiles
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- O. Cover Page of LOMR No.: 03-08-0385P
- P. HEC-2 Output File From Effective Study

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ATTACHMENT A
Allowable Rise Certification



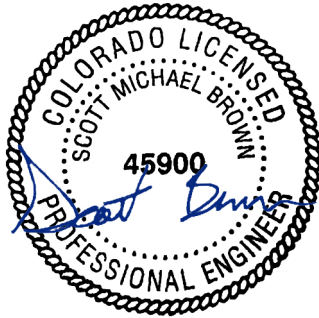
Allowable Rise Certification

I certify that I am a duly qualified registered Professional Engineer licensed in the state of Colorado.

Using standard Engineering practice, I have evaluated the floodplain in the area of the proposed project, and I have determined pre-project 100-year flood depths. I certify that the cumulative effects of the proposed Bent Grass Residential Filing No. 2 Project as detailed in the associated construction drawings will result in less than a half-foot rise in the 100-year flood elevations that I have determined for Unnamed Tributary to Black Squirrel Creek No. 2 which is shown on FEMA FIRM 08041C0553G. This certification is intended as proof of meeting the requirements set forth in the Federal Code 44CFR Chp. 1, 60.3.c.10.

I offer the following documentation in accordance with standard Engineering practice to support my findings:

- a) The Effective Firm Panel
- b) The Current Study



Scott Brown, PE [12/22/2021](#)
Project Manger
303-962-8522



ATTACHMENT B

Table 1: Summary of Model Water Surface Elevations



TABLE 1: SUMMARY OF MODEL WATER SURFACE ELEVATIONS

FEMA Effective Section	Corrected Station	Existing Stream Station	Corresponding Proposed Stream Station	100 Year Water Surface Elevation (ft, NGVD29)				Differences		
				Effective	Corrected	Existing	Proposed	Effective vs. Corrected	Corrected vs. Existing	Existing vs. Proposed
	N/A	6057	6057		--	6973.7	6973.7		--	0.0
	N/A	6007	6007		--	6973.2	6973.2		--	0.0
	N/A	5956	5956		--	6973.1	6973.1		--	0.0
	N/A	5906	5906		--	6972.9	6972.9		--	0.0
	N/A	5856	5856		--	6972.7	6972.7		--	0.0
	N/A	5806	5806		--	6972.5	6972.5		--	0.0
	N/A	5756	5756		--	6972.3	6972.3		--	0.0
	N/A	5706	5706		--	6972.2	6972.2		--	0.0
	N/A	5656	5656		--	6972.0	6972.0		--	0.0
	N/A	5606	5606		--	6971.8	6971.8		--	0.0
	N/A	5556	5556		--	6971.6	6971.6		--	0.0
	N/A	5506	5506		--	6971.4	6971.4		--	0.0
	N/A	5456	5456		--	6971.2	6971.2		--	0.0
	N/A	5406	5406		--	6971.0	6971.0		--	0.0
	N/A	5356	5356		--	6970.8	6970.8		--	0.0
	N/A	5306	5306		--	6970.5	6970.5		--	0.0
	N/A	5256	5256		--	6970.3	6970.3		--	0.0
	N/A	5206	5206		--	6970.0	6970.0		--	0.0
	N/A	5156	5156		--	6969.7	6969.7		--	0.0
	N/A	5106	5106		--	6969.2	6969.2		--	0.0
	N/A	5088	5088		--	6968.8	6968.8		--	0.0
	N/A	5083	5083		--	6968.4	6968.4		--	0.0
	N/A	5072	5072		--	6965.8	6965.8		--	0.0
	N/A	5062	5062		--	6964.0	6964.0		--	0.0
	N/A	5056	5056		--	6964.0	6963.9		--	0.0
	N/A	5006	5006		--	6963.8	6963.8		--	-0.1
	N/A	4955	4955		--	6962.7	6963.2		--	0.5
	4900	4900	4740		6960.8	6960.8	6958.4		0.0	-2.4
	4850	4850	4690		6959.6	6959.6	6958.1		0.0	-1.5
	4750	4750	4590		6957.6	6957.6	6955.1		0.0	-2.5
	4650	4650	4489		6955.7	6955.7	6949.6		0.0	-6.1
	4600	4600	4477		6954.1	6954.2	6950.0		0.0	-4.1
H	4550	4550	4440	6955	6954.0	6954.1	6950.0	-1.01	0.1	-4.1
	4500	4500	4390		6952.6	6952.8	6949.8		0.2	-3.0
	4400	4400	4289		6950.9	6949.1	6949.3		-1.8	0.2
	4300	4300	4167		6949.0	6948.3	6947.8		-0.7	-0.5
	4250	4250	4152		6948.0	6943.1	6943.5		-4.9	0.4
		4212.47	4136		--	6943.7	6943.6		--	-0.1
	4200	4200	4089		6946.6	6943.6	6943.6		-3.0	0.0
		4151.92	4072			6943.4	6943.4		--	0.0
	4150	4150	4056		6946.1	6943.3	6943.3		-2.8	0.0
	4050	4010.56	3931		6944.0	6939.9	6940.0		-4.1	0.0
		4001.57	3923		--	6940.3	6940.1		--	-0.2
	4000	4000	3892		6942.8	6939.6	6939.5		-3.2	-0.1
	3900	3900	3803		6940.4	6939.4	6936.5		-1.0	-2.9
	3850	3850	3764		6939.4	6938.8	6936.3		-0.5	-2.6
	3800	3800	3725		6938.4	6938.0	6936.1		-0.4	-1.9
G	3694	3694	3620	6936.8	6935.9	6935.5	6931.4	-0.9	-0.4	-4.1
	3600	3600	3523		6934.1	6934.1	6931.0		0.0	-3.2
	3500	3500	3375		6933.1	6933.1	6930.2		0.0	-2.8
	3450	3450	3369		6932.2	6932.0	6929.9		-0.2	-2.0
	3350	3350	3302		6930.3	6930.3	6926.2		0.0	-4.0

FEMA Effective Section	Corrected Station	Existing Stream Station	Corresponding Proposed Stream Station	100 Year Water Surface Elevation (ft, NGVD29)				Differences		
				Effective	Corrected	Existing	Proposed	Effective vs. Corrected	Corrected vs. Existing	Existing vs. Proposed
	3300	3300	3237		6929.5	6929.5	6926.0		0.0	-3.5
	3250	3250	3178		6928.7	6928.7	6925.7		0.0	-2.9
	3200	3200	3130		6927.9	6927.9	6925.5		0.0	-2.4
	3150	3150	3086		6926.8	6926.8	6925.3		0.0	-1.5
	3100	3100	3050		6925.7	6925.6	6925.1		-0.1	-0.5
	3050	3050	2994		6925.8	6925.7	6924.8		0.0	-0.9
	3000	3000	2940		6924.9	6924.6	6924.4		-0.3	-0.2
	2900	2900	2848		6923.1	6923.1	6920.6		0.0	-2.6
	2800	2800	2741		6921.9	6921.9	6919.8		0.0	-2.0
	2650	2650	2594		6919.1	6919.2	6916.0		0.1	-3.2
F	2605	2605	2544	6918.9	6918.1	6918.1	6915.8	-0.76	0.0	-2.3
	2550	2550	2490		6916.4	6916.6	6915.6		0.2	-1.0
	2500	2500	2407		6915.6	6915.9	6915.1		0.2	-0.8
	2450	2450	2298		6915.0	6915.0	6911.0		0.0	-4.0
	2400	2400	2290		6913.8	6913.8	6911.0		0.0	-2.8
	2300	2300	2238		6911.7	6911.7	6910.8		0.0	-0.9
	2200	2200	2142		6909.6	6909.6	6909.9		0.0	0.3
	2100	2100	2098		6906.9	6906.9	6906.2		0.0	-0.7
	2000	2000	2039		6906.0	6906.0	6905.6		0.0	-0.4
	1900	1900	1957		6904.6	6904.6	6905.1		0.0	0.4
	1800	1800	1808		6903.2	6903.2	6901.2		0.0	-1.9
	1700	1700	1712		6902.2	6902.2	6900.7		0.0	-1.5
	1600	1600	1606		6900.9	6900.9	6900.5		0.0	-0.4
E	1517	1517	1498	6900.2	6899.0	6900.1	6899.6	-1.18	1.1	-0.6
		1474	1474		--	6899.3	6899.1		--	-0.2
	1450	1453	1453		6898.9	6898.6	6898.3		-0.3	-0.3
		1428	1428		--	6898.1	6898.1		--	0.0
	1350	1386	1386		6897.4	6897.9	6897.9		0.5	0.0
		1329	1329		--	6897.0	6897.0		--	0.0
		1317	1317		--	6894.0	6894.0		--	0.0
	1300	1286	1286		6893.6	6893.7	6893.7		0.1	0.0
		1243	1243		--	6893.4	6893.4		--	0.0
	1200	1179	1179		6892.1	6892.5	6892.5		0.4	0.0
	1150	1169	1169		6890.9	6890.9	6890.9		0.0	0.0
		1126	1126		--	6890.8	6890.8		--	0.0
	1050	1050	1050		6890.7	6890.7	6890.7		0.1	0.0
	1000	1000	1000		6888.6	6888.6	6888.6		0.0	0.0

Table 1: Comparative water surface table between the Effective, Corrected, Pre-Project, and Post Project Condition Models.

ATTACHMENT C
Effective FIRM Panel



NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
 NOAA, NINGS12
 National Geodetic Survey
 SSMC-3, #9202
 1315 East-West Highway
 Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

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

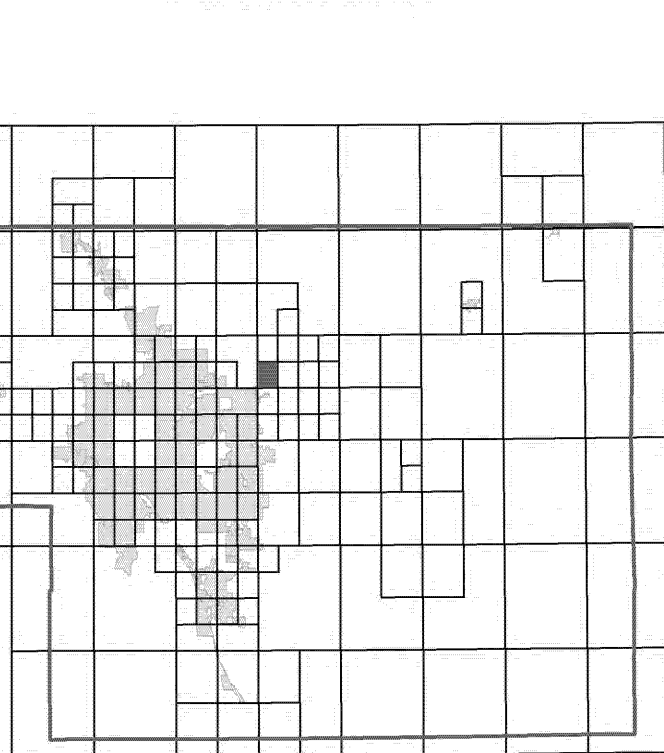
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FIMX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

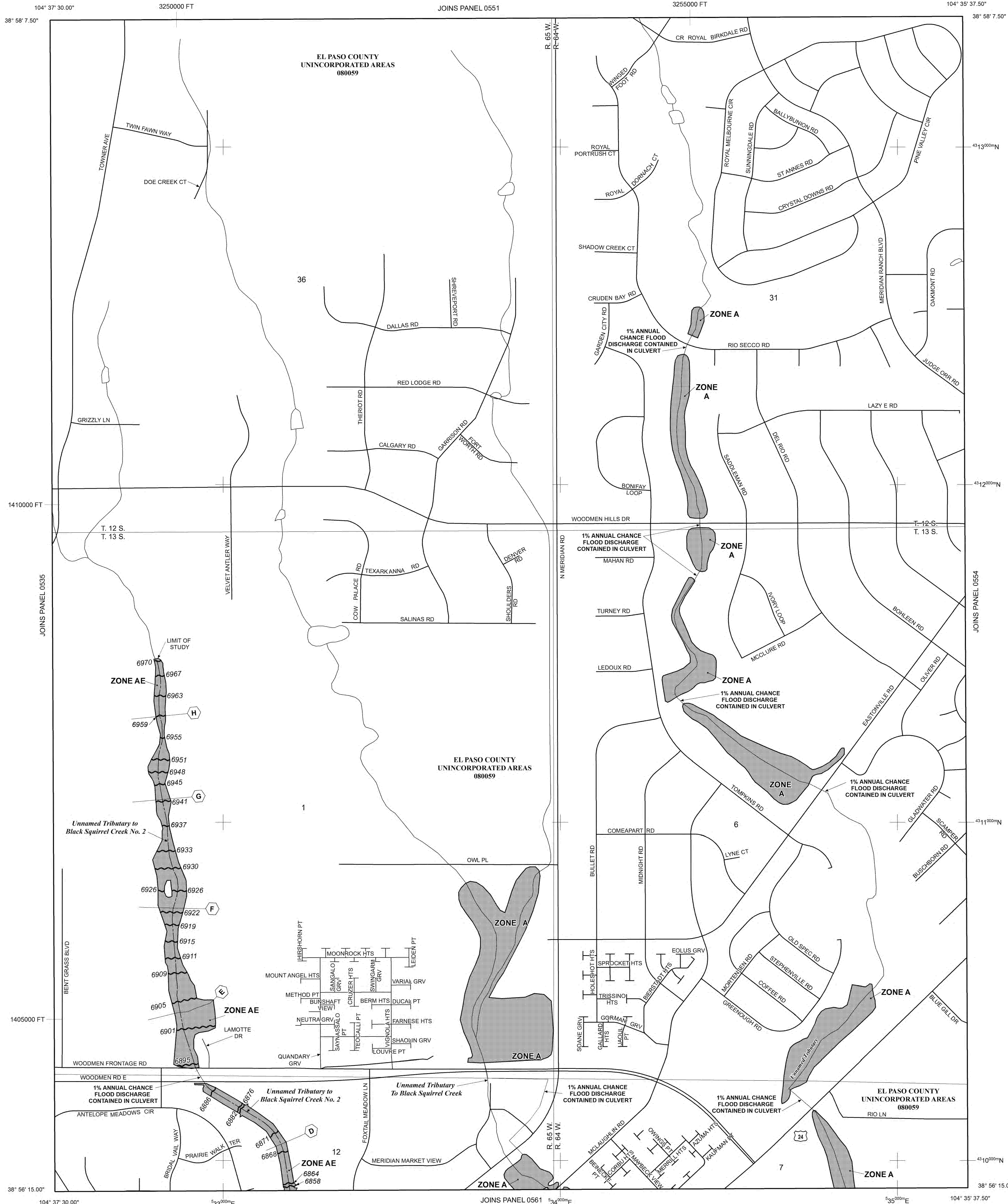
Panel Location Map



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



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



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 equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 Base Flood Elevation line and value; elevation in feet* (EL 987)
 Base Flood Elevation value where uniform within zone; elevation in feet*

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

A-A Cross section line

23-23 Transsect line

97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4750000N 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 River Mile

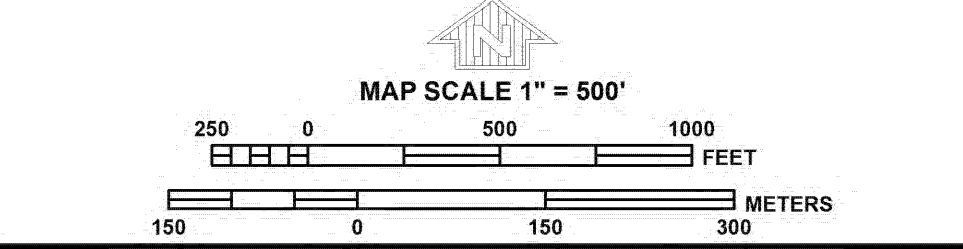
MAP REPOSITORIES Refer to Map Repositories list on Map Index

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

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

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

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



NFP PANEL 0553G

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

PANEL 553 OF 1300
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:
 COMMUNITY NUMBER PANEL SUFFIX
 EL PASO COUNTY 080059 0553 G

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

MAP NUMBER 08041C0553G

MAP REVISED DECEMBER 7, 2018

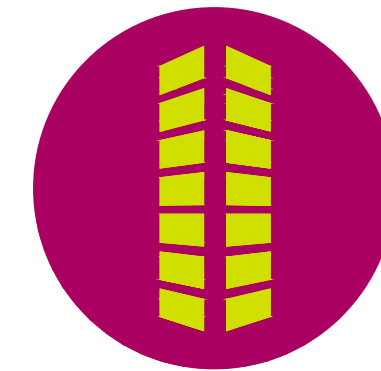
Federal Emergency Management Agency

ATTACHMENT D

Work Maps



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**FLOODPLAIN WORKMAP
 FALCON MEADOWS AT BENT GRASS
 FOR
 CHALLENGER COMMUNITIES, LLC**

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
 FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No:	CLH23
Drawn By:	SMB
Checked By:	SMB
Date:	12/21/2021

CORRECTED EFFECTIVE WORK MAP

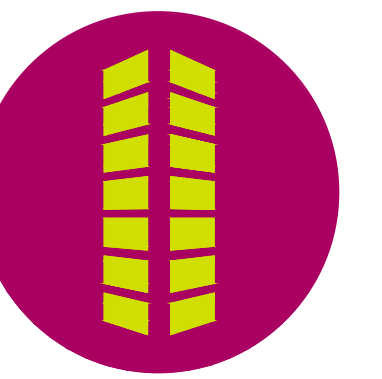


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 2. PROPOSED TOPOGRAPHY IS PER DESIGN BY GALLOWAY & COMPANY, INC., DECEMBER 2021.
 3. ALL WATER SURFACE ELEVATIONS LISTED ARE BASED ON THE 1.0% ANNUAL CHANCE FLOOD UNLESS OTHERWISE NOTED.
 4. THE HORIZONTAL COORDINATE SYSTEM IS THE NAD 83/92 AND STATE PLANE COORDINATE SYSTEM COLORADO NORTH ZONE.

BENCHMARK
 ELEVATIONS ARE BASED ON THE SOUTHWEST CORNER OF LOT 1, WOODMEN HILLS FILING NO. 4, MONUMENTED BY A NO. 4 REBAR WITH A YELLOW PLASTIC CAP, STAMPED Ls# 24954, ELEVATION = 6947.67

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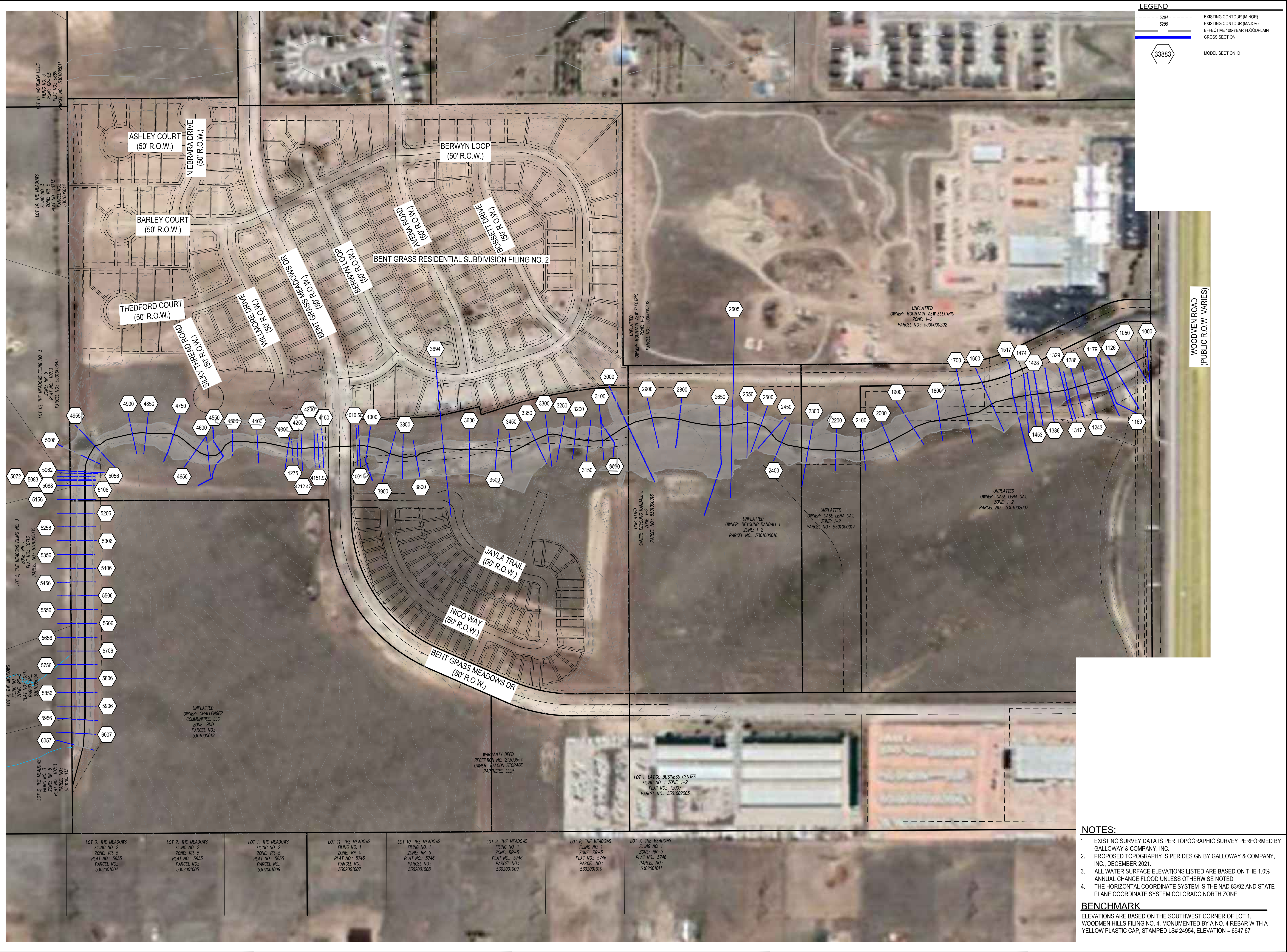


FLOODPLAIN WORKMAP
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FOR
CHALLENGER COMMUNITIES, LLC
BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No: CLH23
Drawn By: SMB
Checked By: SMB
Date: 03/25/2022

EXISTING CONDITION WORK MAP



LEGEND

	EXISTING CONTOUR (MINOR)
	EXISTING CONTOUR (MAJOR)
	EFFECTIVE 100-YEAR FLOODPLAIN CROSS SECTION
33883	MODEL SECTION ID

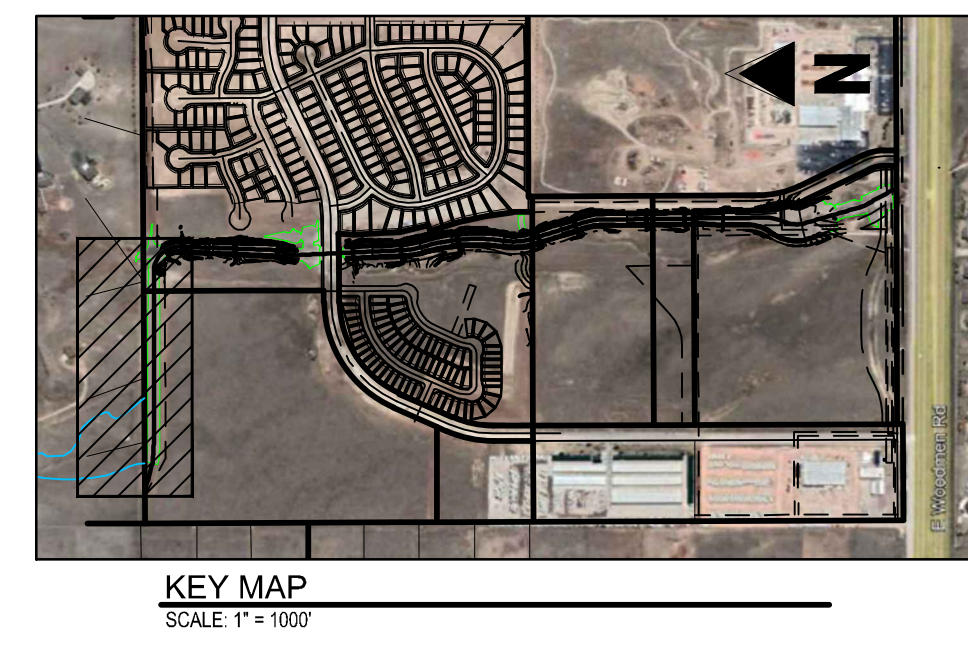
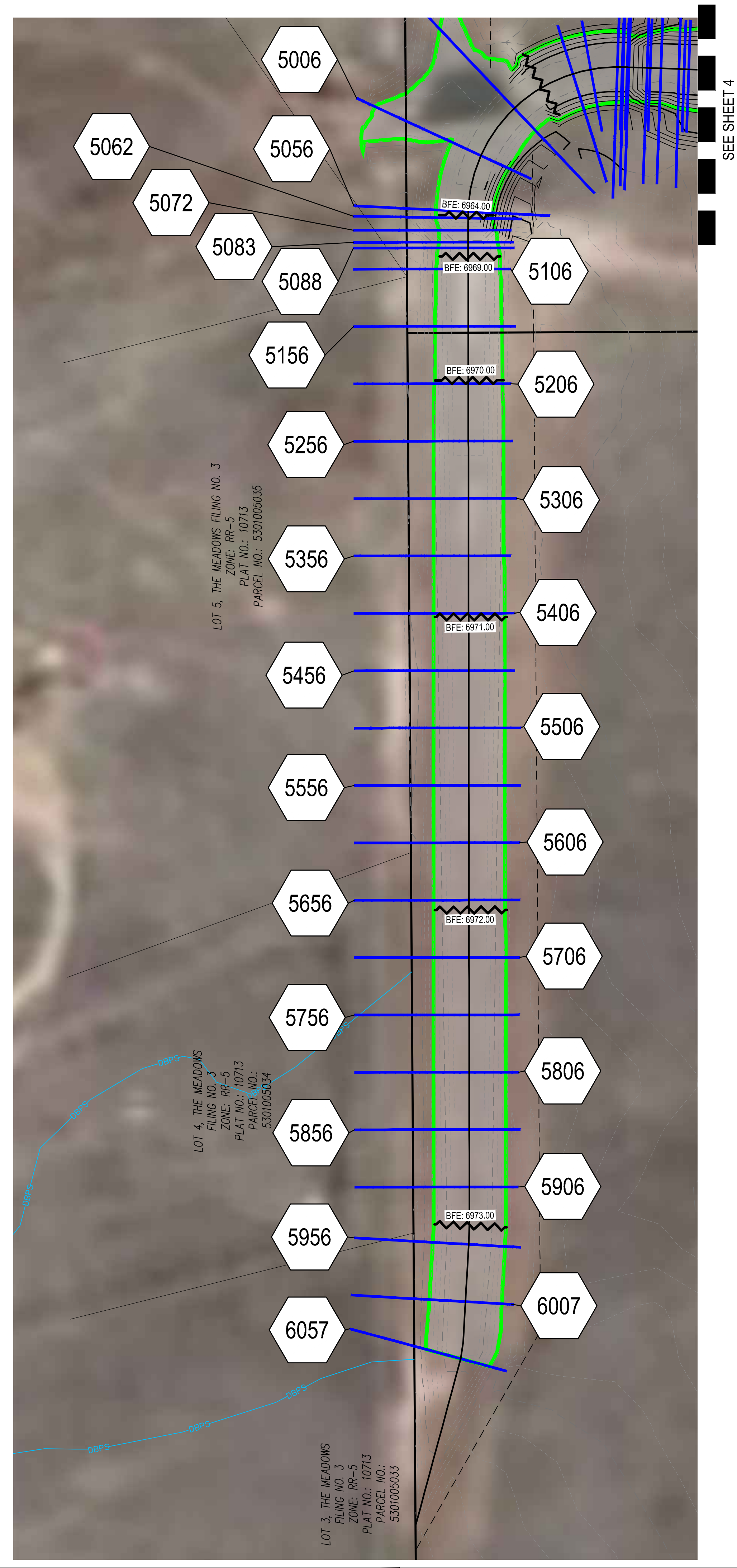
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BENCHMARK

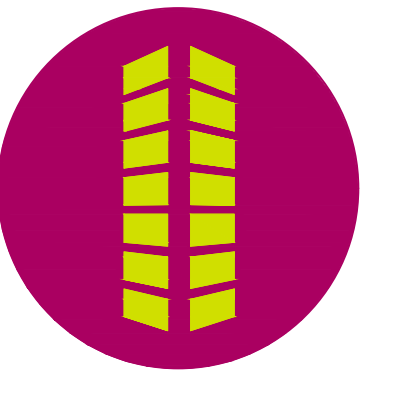
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LOT 3, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5855 PARCEL NO.: 530201004	LOT 2, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5855 PARCEL NO.: 530201005	LOT 1, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5855 PARCEL NO.: 530201006	LOT 11, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 530201007	LOT 10, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 530201008	LOT 9, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 530201009	LOT 8, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 530201010	LOT 7, THE MEADOWS FILING NO. 2 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 530201011
--	--	--	---	---	--	--	--



- LEGEND**
- 5284 --- EXISTING CONTOUR (MINOR)
 - 5285 --- EXISTING CONTOUR (MAJOR)
 - 5284 --- PROPOSED CONTOUR (MINOR)
 - 5285 --- PROPOSED CONTOUR (MAJOR)
 - 5285 --- PROPOSED 100-YEAR FLOODPLAIN
 - 5285 --- CROSS SECTION BASED ON CITY LOMR
 - 5285 --- BASE FLOOD ELEVATION
 - 33883 MODEL SECTION ID

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 FOR
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 BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
 FALCON, CO 80831 - EL PASO COUNTY**

#	Date	Issue / Description	Init.

Project No: CLH23
 Drawn By: SMB
 Checked By: SMB
 Date: 03/25/2022

- NOTES:**
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BENCHMARK
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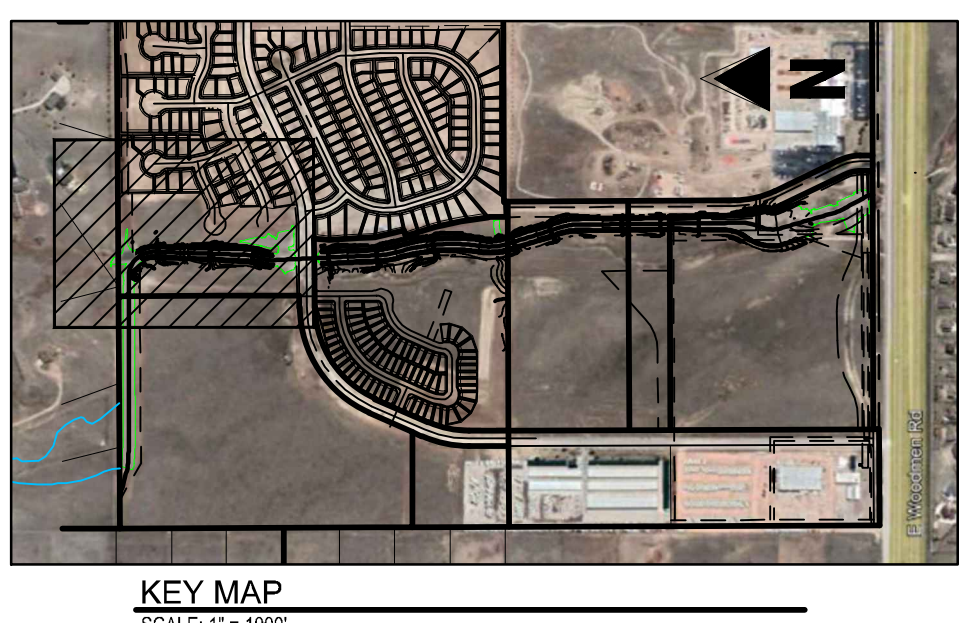


FLOODPLAIN WORKMAP
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 FOR
CHALLENGER COMMUNITIES, LLC
 BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
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#	Date	Issue / Description	Init.

Project No:	CLH23
Drawn By:	SMB
Checked By:	SMB
Date:	03/25/2022

PROPOSED CONDITION WORKMAP



LEGEND

	EXISTING CONTOUR (MINOR)
	EXISTING CONTOUR (MAJOR)
	PROPOSED CONTOUR (MINOR)
	PROPOSED CONTOUR (MAJOR)
	PROPOSED 100-YEAR FLOODPLAIN
	CROSS SECTION BASED ON CITY LOMR
	BASE FLOOD ELEVATION
	MODEL SECTION ID



LOT 13, THE MEADOWS FILING NO. 3
 ZONE: RR-5
 PLAT NO.: 10713
 PARCEL NO.: 5301005043

FILING NO. 3
 13
 050035

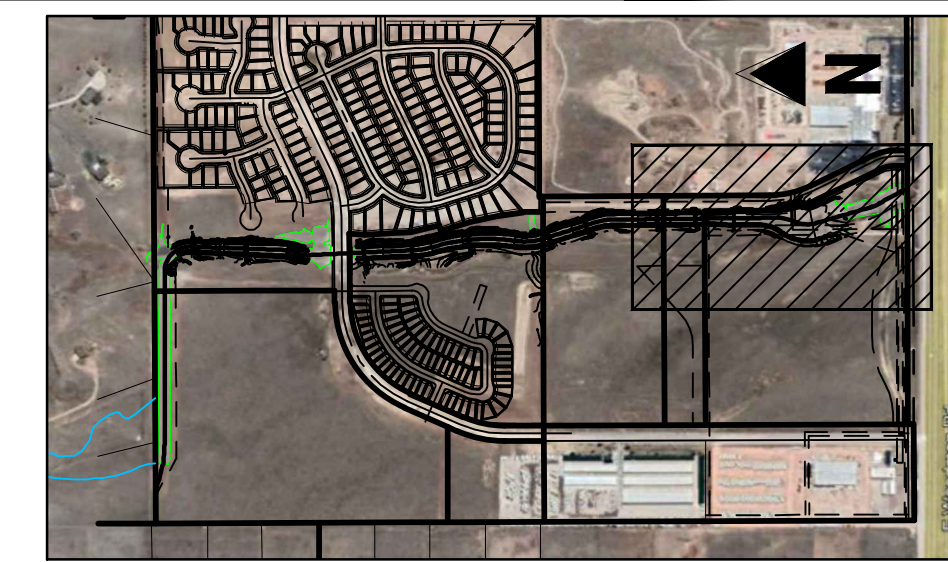
SEE SHEET 3

SEE SHEET 5

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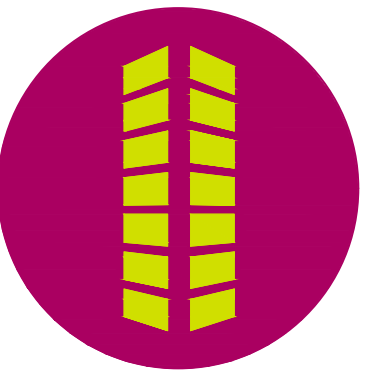
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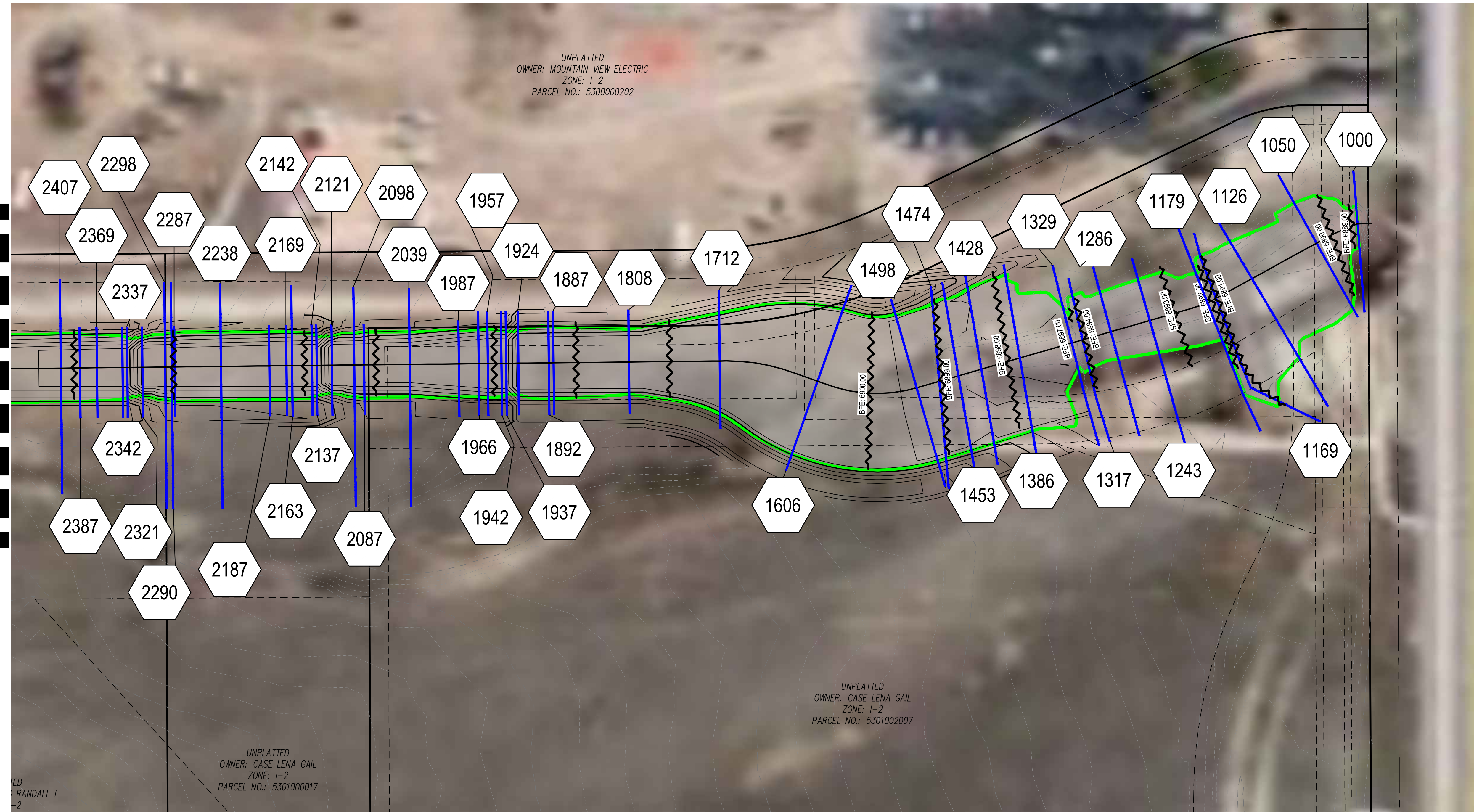
LEGEND

--- 5284 ---	EXISTING CONTOUR (MINOR)
--- 5285 ---	EXISTING CONTOUR (MAJOR)
---	PROPOSED CONTOUR (MINOR)
---	PROPOSED CONTOUR (MAJOR)
---	PROPOSED 100-YEAR FLOODPLAIN
---	CROSS SECTION BASED ON CITY LOMR
---	BASE FLOOD ELEVATION
33883	MODEL SECTION ID

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FLOODPLAIN WORKMAP
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 CHALLENGER COMMUNITIES, LLC
 BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
 FALCON, CO 80831 - EL PASO COUNTY



#	Date	Issue / Description	Init.

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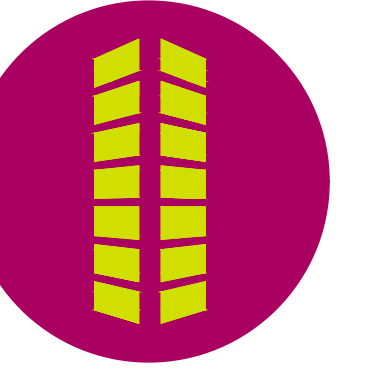
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Project No:	CLH23
Drawn By:	SMB
Checked By:	SMB
Date:	3/25/2022

PROPOSED CONDITION WORK MAP

ATTACHMENT E
Construction Drawings





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CHALLENGER HOMES

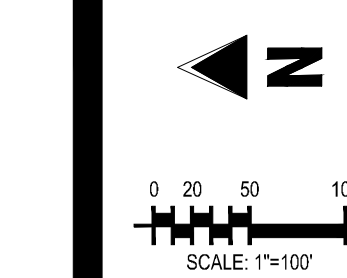
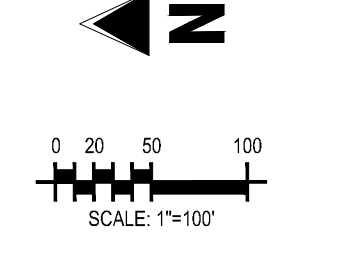
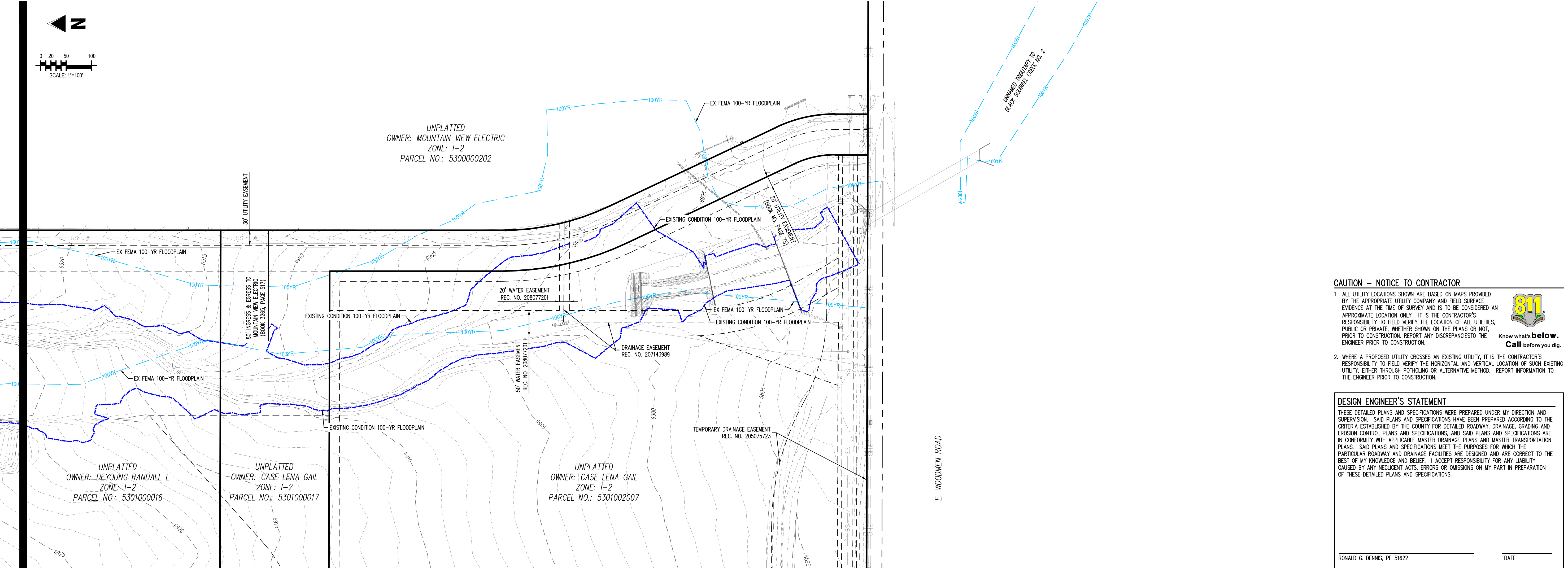
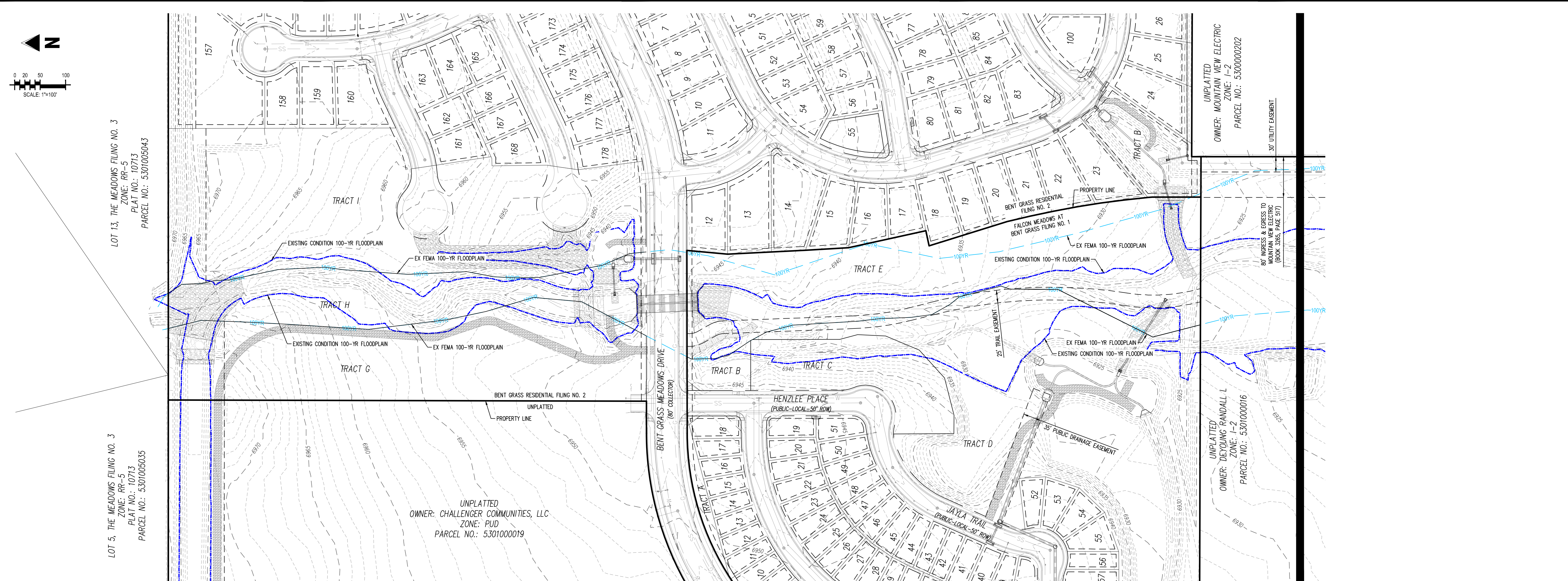
CONSTRUCTION DOCUMENTS
FALCON MEADOWS AT BENT GRASS
FOR
CHALLENGER COMMUNITIES, LLC
BENT GRASS MEADOWS DRIVE & MERIDAN ROAD
FALCON, CO 80831 - EL PASO COUNTY

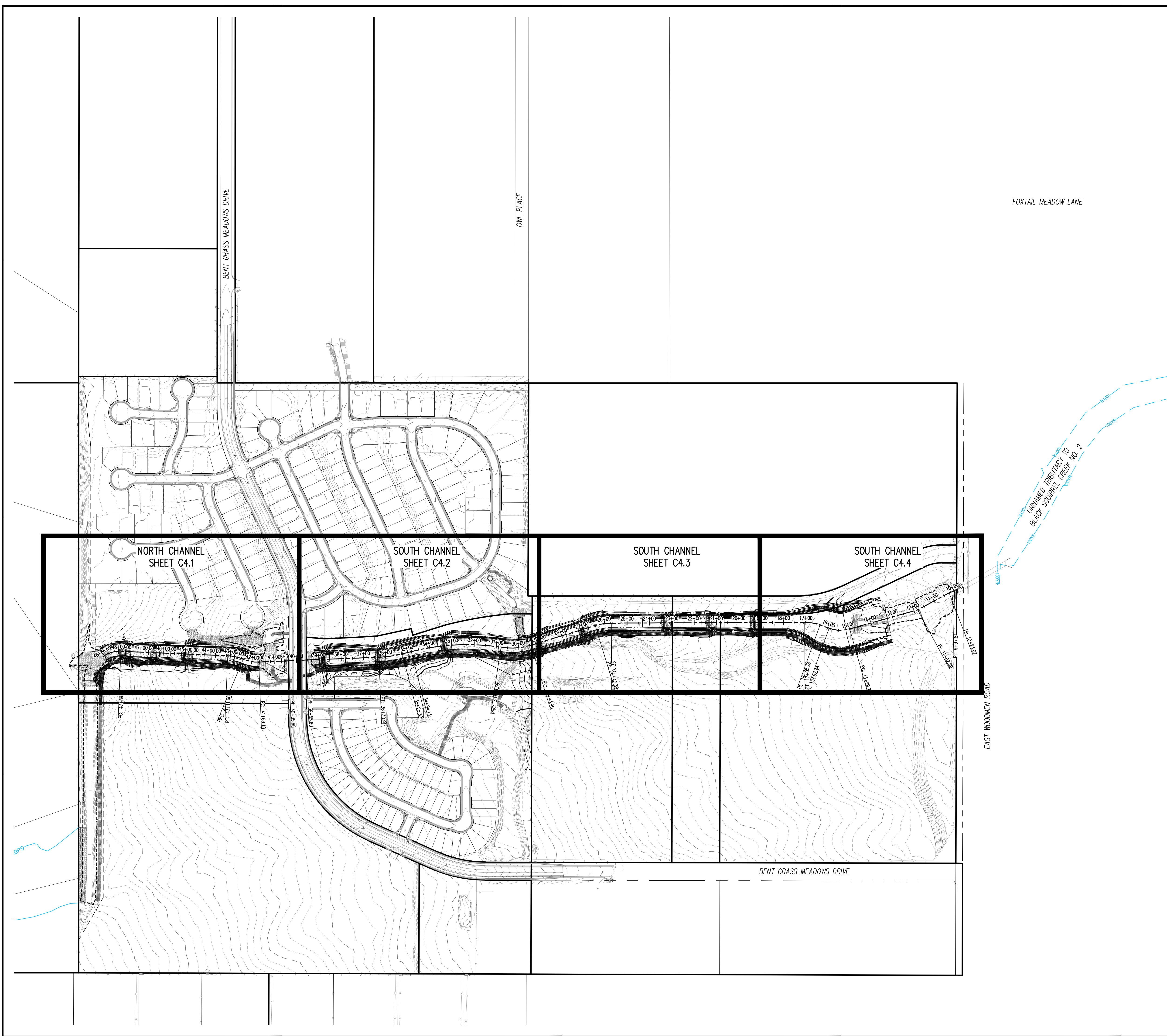
#	Date	Issue / Description	Init.

CAUTION - NOTICE TO CONTRACTOR
1. ALL UTILITY LOCATIONS SHOWN ARE BASED ON MAPS PROVIDED BY THE APPROPRIATE UTILITY COMPANY AND FIELD SURFACE EVIDENCE AT THE TIME OF SURVEY AND IS TO BE CONSIDERED AN APPROXIMATE LOCATION ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION OF ALL UTILITIES, PUBLIC OR PRIVATE, WHETHER SHOWN ON THE PLANS OR NOT, PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO CONSTRUCTION.
811 Know what's below. Call before you dig.
2. WHERE A PROPOSED UTILITY CROSSES AN EXISTING UTILITY, IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF SUCH EXISTING UTILITY, EITHER THROUGH POT-HOLING OR ALTERNATIVE METHOD. REPORT INFORMATION TO THE ENGINEER PRIOR TO CONSTRUCTION.

DESIGN ENGINEER'S STATEMENT
THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED ROADWAY, DRAINAGE, GRADING AND EROSION CONTROL PLANS AND SPECIFICATIONS, AND SAID PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH APPLICABLE MASTER DRAINAGE PLANS AND MASTER TRANSPORTATION PLANS. SAID PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR ROADWAY AND DRAINAGE FACILITIES ARE DESIGNED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENCE, ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THESE DETAILED PLANS AND SPECIFICATIONS.

RONALD G. DENNIS, PE 51622 _____ DATE _____





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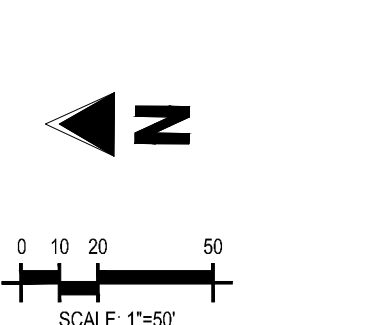
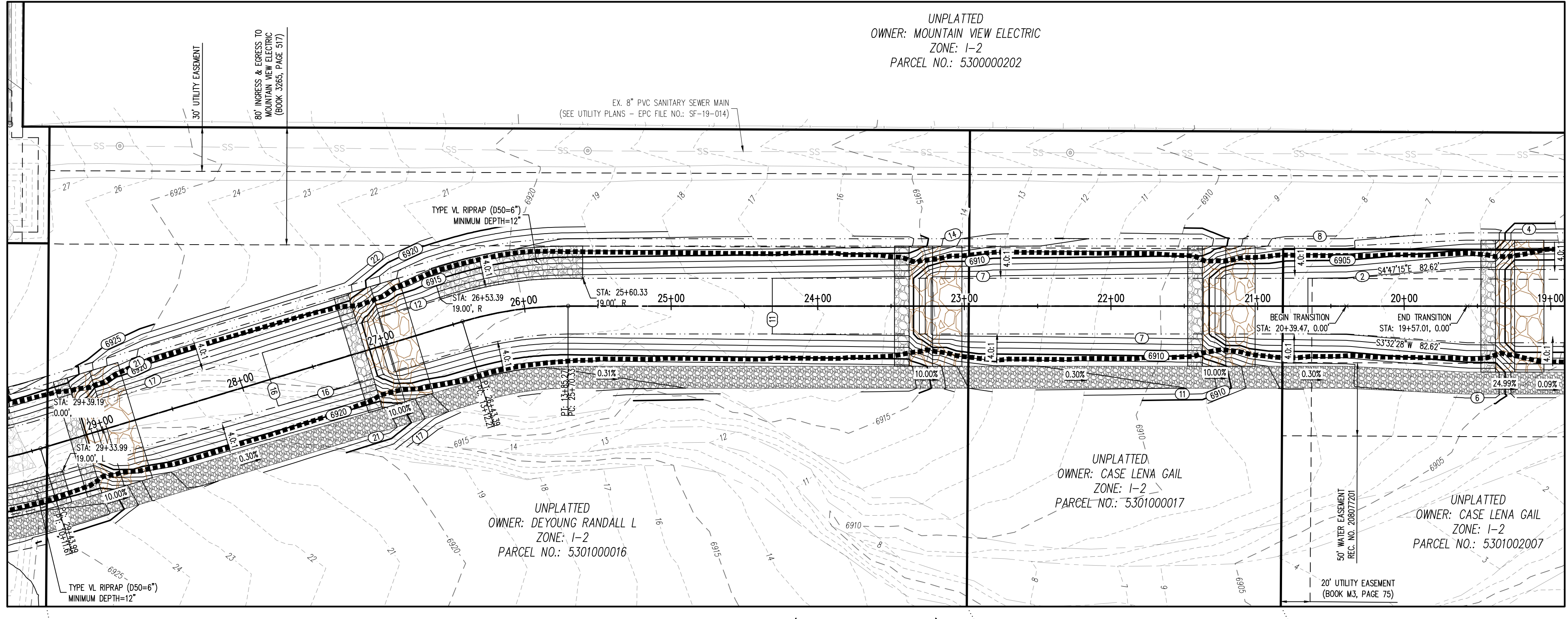
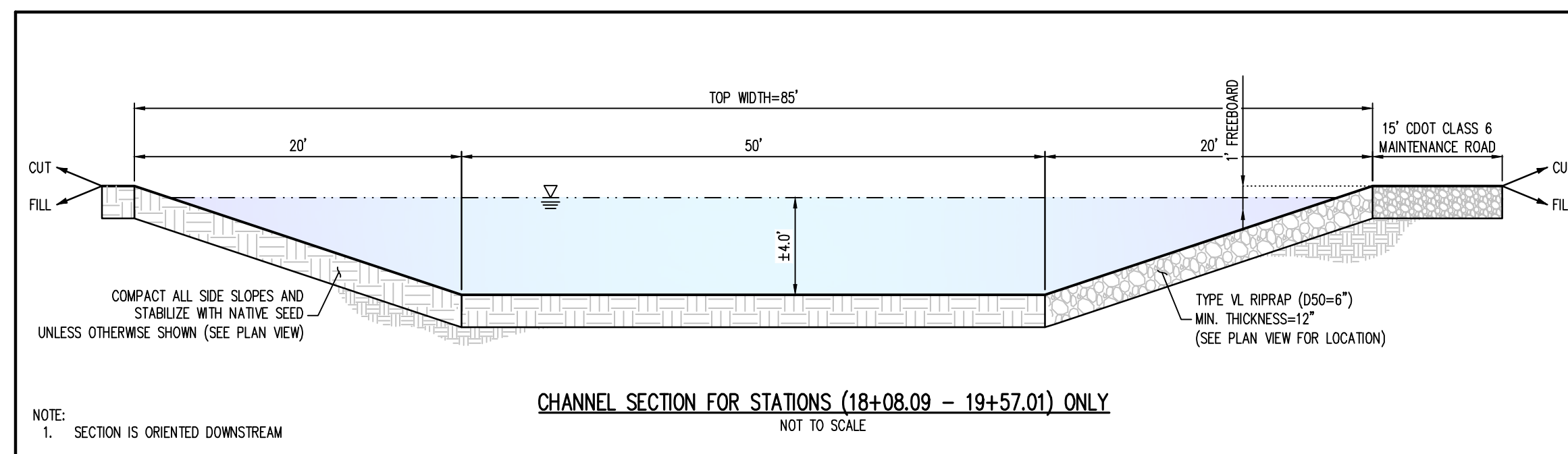
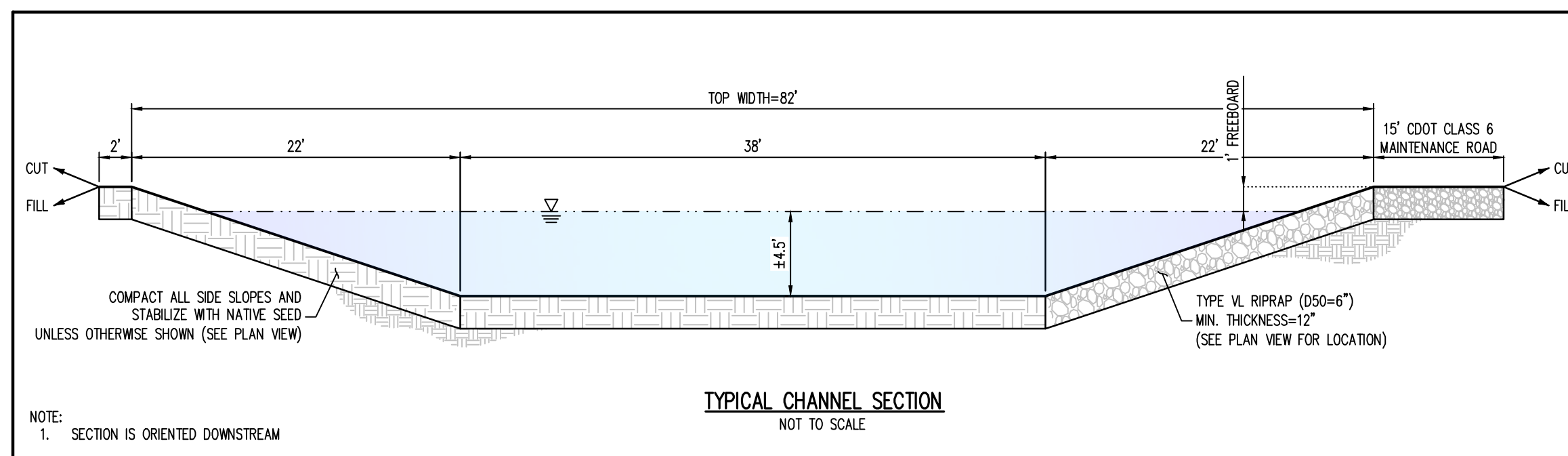
RONALD G. DENNIS, PE 51622 _____ DATE _____

Project No: CLH000023
 Drawn By: CMWJ
 Checked By: RGD
 Date: 01/14/2022

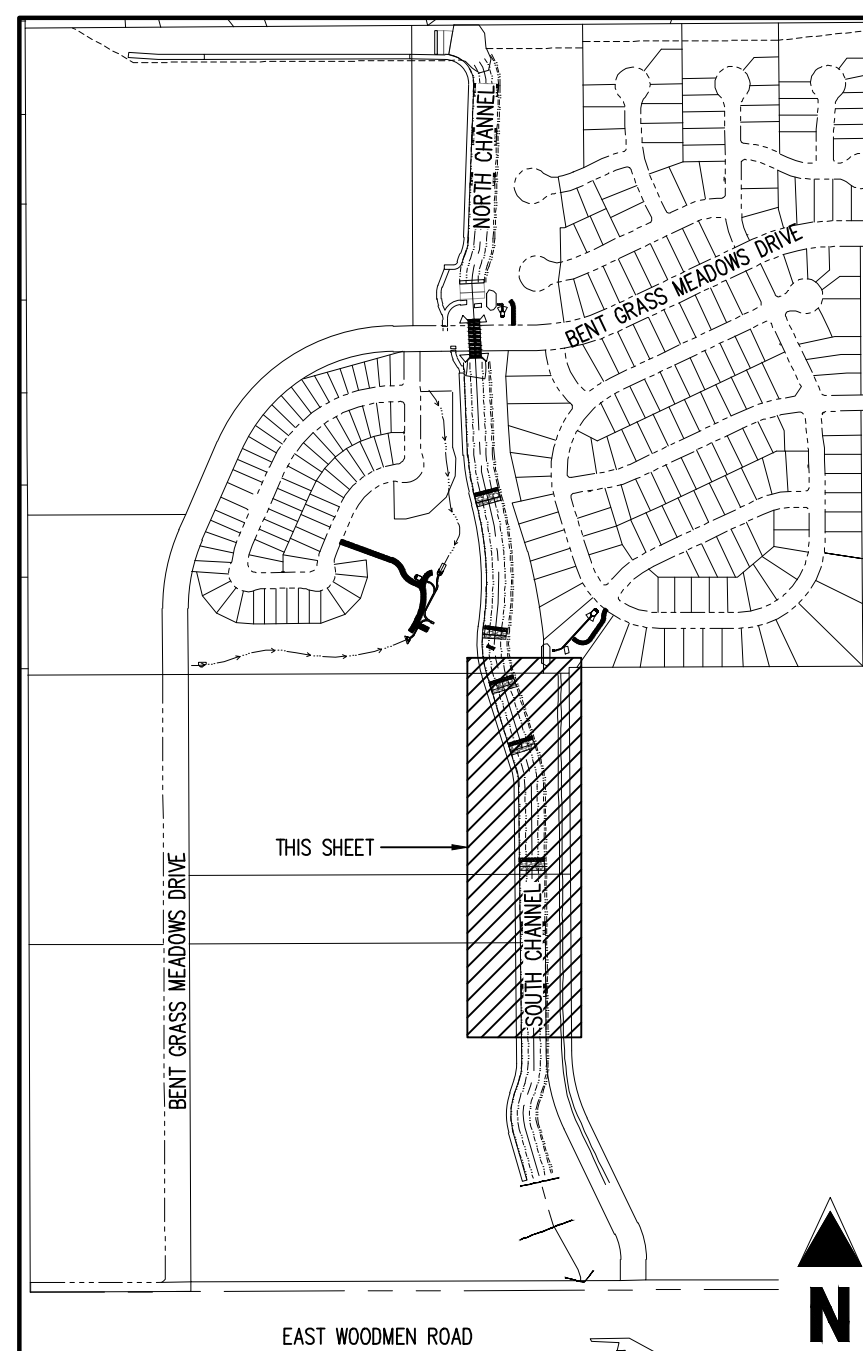
CHANNEL KEY MAP

C4.0

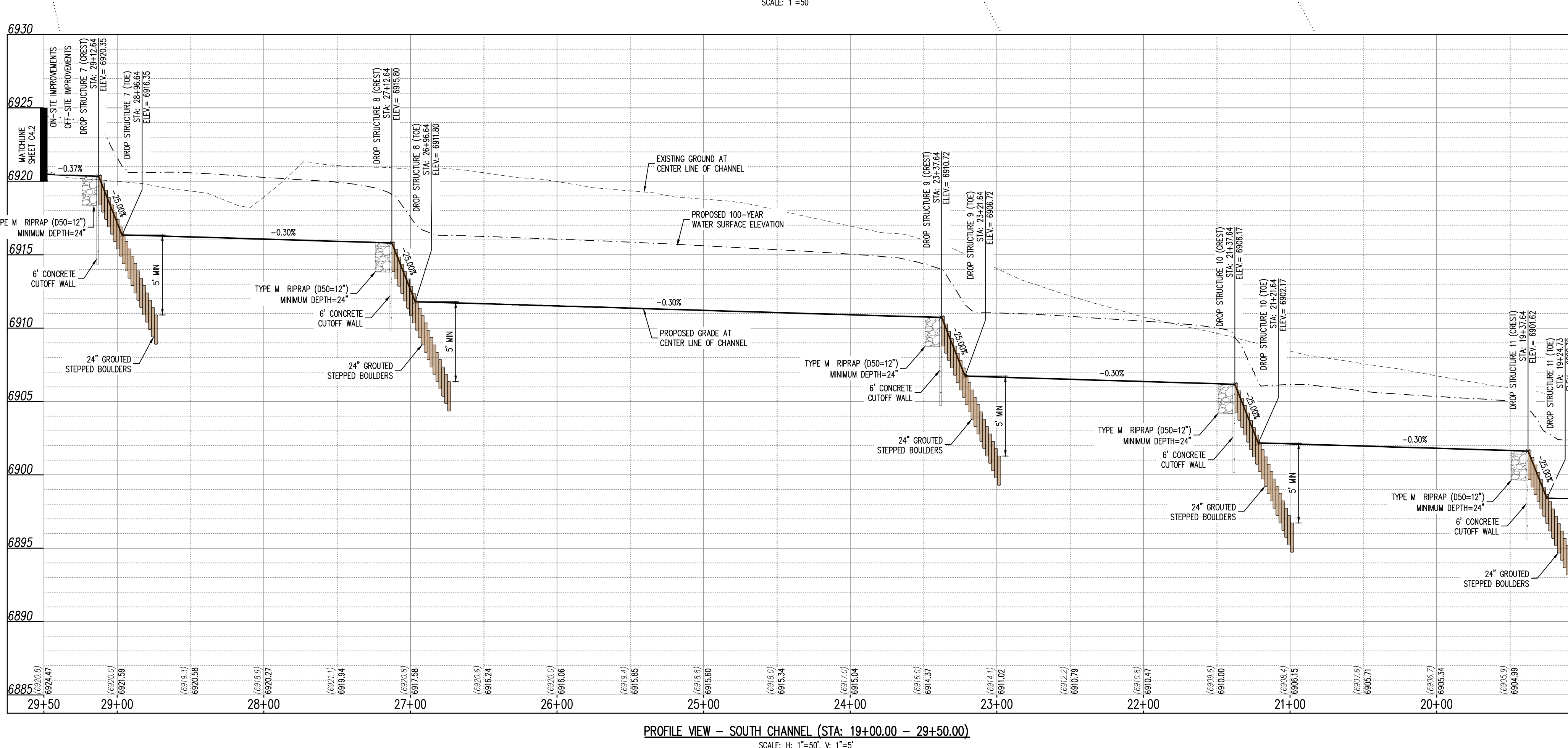
Sheet 6 of 21



- GRADING LEGEND**
- 4660 EXISTING MAJOR CONTOUR
 - 52 EXISTING MINOR CONTOUR
 - 5485 PROPOSED MAJOR CONTOUR
 - 65 PROPOSED MINOR CONTOUR
 - 2.00% EXISTING SLOPE - PERCENT
 - 4:1 EXISTING SLOPE - RISE/RUN
 - 2.00% PROPOSED SLOPE - PERCENT
 - 4:1 PROPOSED SLOPE - RISE/RUN
 - 55.00 FG PROPOSED SPOT ELEVATION - FINISHED GROUND
 - 55.00 CL PROPOSED SPOT ELEVATION - CENTER LINE
 - 55.00 TOB PROPOSED SPOT ELEVATION - TOP OF BANK
- UTILITY LEGEND**
- W- EXISTING WATER LINE
 - W- PROPOSED WATER LINE
 - SS- EXISTING SANITARY SEWER
 - FO- EXISTING FIBER OPTIC LINE
 - G- EXISTING GAS LINE
 - S- EXISTING STORM SEWER
 - E- EXISTING ELECTRICAL BOX
 - T- EXISTING PAD MOUNTED TRANSFORMER
 - P- EXISTING TRAFFIC POLE
 - L- PROPOSED SITE LIGHTING
 - SM- EXISTING SANITARY SEWER MANHOLE
 - SM- EXISTING STORM SEWER MANHOLE
 - M- EXISTING WATER METER
 - V- EXISTING WATER VALVE
 - H- EXISTING FIRE HYDRANT
 - P- PROPOSED FIRE HYDRANT



- KEY MAP**
SCALE: 1"=600'
- SITE LEGEND**
- PROPERTY BOUNDARY LINE
 - RIGHT OF WAY BOUNDARY LINE
 - - - EXISTING EASEMENT LINE
 - - - EXISTING 100-YEAR FLOODPLAIN
 - - - EXISTING CURB AND GUTTER
 - - - EXISTING CONCRETE
 - - - EXISTING CDOT CLASS 6 GRAVEL
 - - - EXISTING RIRRAP
 - - - EXISTING BOLDERS
 - - - PROPOSED CDOT CLASS 6 GRAVEL
 - - - PROPOSED RIRRAP
 - - - PROPOSED BOLDERS
 - X REFERENCE TO DETAIL AND SHEET NUMBER



- NOTES:**
- REF
- NOTE: CONTRACTOR SHALL PROTECT ALL EXISTING SURVEY MONUMENTATION. CONTRACTOR SHALL HAVE LICENSED SURVEYOR REPLACE ANY DAMAGED OR DISTURBED MONUMENTATION AT THEIR COST.
- SURVEYOR TO OBTAIN AUTOCAD FILE FROM ENGINEER AND VERIFY ALL HORIZONTAL CONTROL DIMENSIONING PRIOR TO CONSTRUCTION STAKING. SURVEYOR MUST VERIFY ALL BENCHMARK, BASIS OF BEARING AND DATUM INFORMATION TO ENSURE IMPROVEMENTS WILL BE AT THE SAME HORIZONTAL AND VERTICAL LOCATIONS SHOWN ON THE DESIGN CONSTRUCTION DRAWINGS. PRIOR TO CONSTRUCTION STAKING ANY DISCREPANCY MUST BE REPORTED TO OWNER AND ENGINEER PRIOR TO CONTINUATION OF ANY FURTHER STAKING OR CONSTRUCTION WORK.

BENCHMARK

ELEVATIONS ARE BASED ON THE SOUTHWEST CORNER OF LOT 1, WOODMEN HILLS FILING NO. 4, MONUMENTED BY A NO. 4 REBAR WITH A YELLOW PLASTIC CAP, STAMPED LS# 24954. ELEVATION = 6947.67

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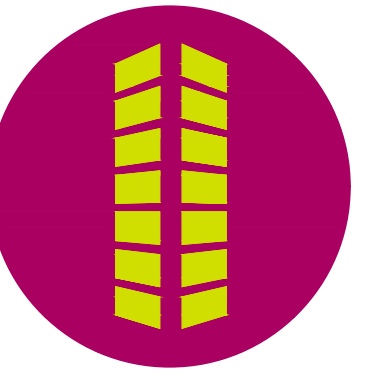
CONSTRUCTION DOCUMENTS
FALCON MEADOWS AT BENT GRASS
FOR
CHALLENGER COMMUNITIES, LLC
BENT GRASS MEADOWS DRIVE & MERIDAN ROAD
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No: CLH000023
Drawn By: CMWJ
Checked By: RGD
Date: 01/14/2022

CHANNEL SOUTH - PLAN & PROFILE

C:\Projects\Bent Grass Meadows\CLH000023.dwg - 01/14/2022 11:11:30 AM

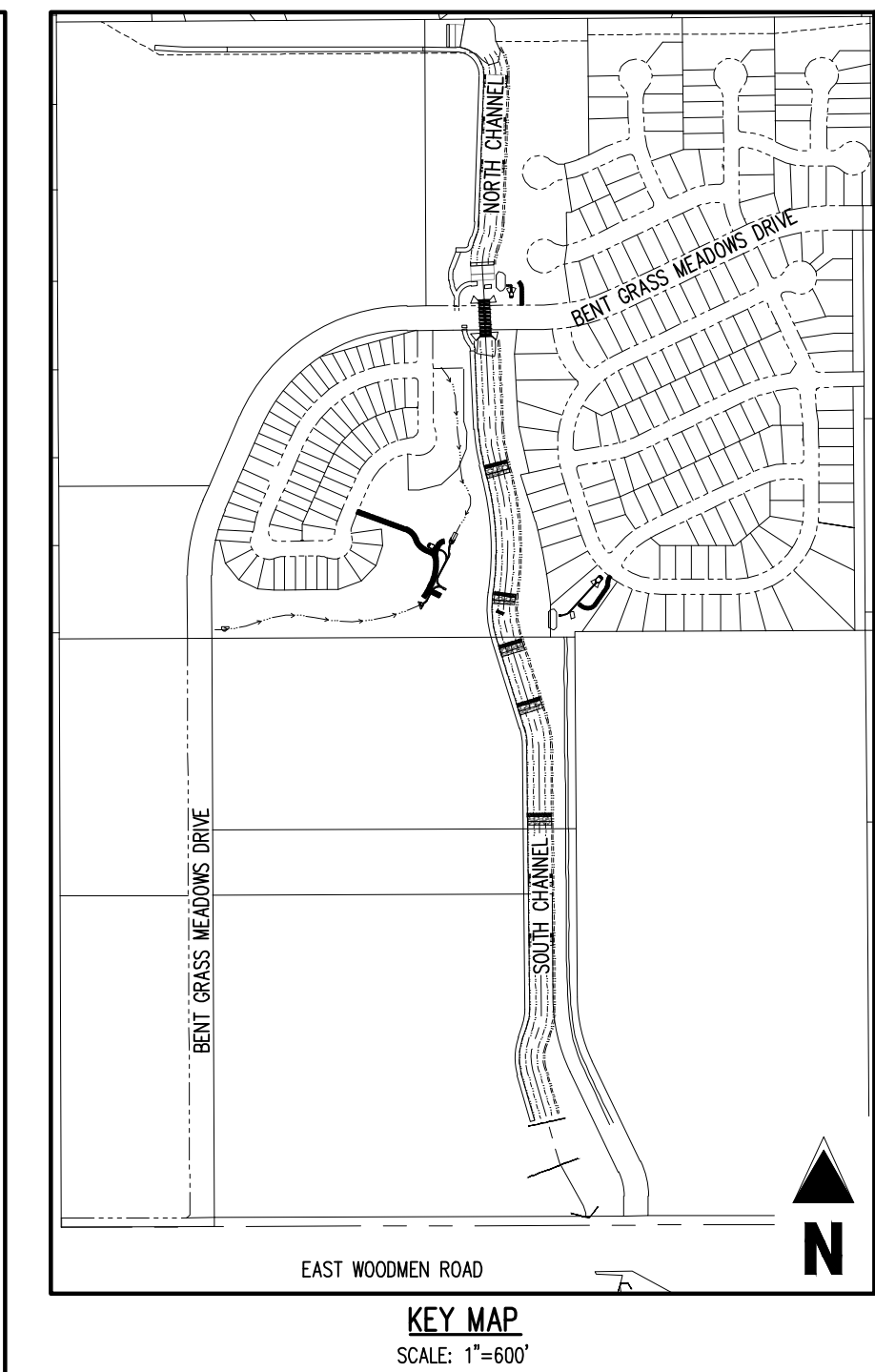


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811
Know what's below.
Call before you dig.

2. WHERE A PROPOSED UTILITY CROSSES AN EXISTING UTILITY, IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF SUCH EXISTING UTILITY, EITHER THROUGH POT-HOLING OR ALTERNATIVE METHOD. REPORT INFORMATION TO THE ENGINEER PRIOR TO CONSTRUCTION.

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RONALD G. DENNIS, PE 51622 _____ DATE _____

	70'																																	DROP STRUCTURE (CREST)			
	16'									38'														16'									DROP STRUCTURE (TOE)				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		
A	8.5	8.0	7.5	7.0	6.5	6.0	5.5	5.0	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	
B	8.1	7.5	7.0	6.5	6.0	5.5	5.0	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	
C	7.8	7.3	6.8	6.3	5.8	5.3	5.0	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	
D	7.7	7.1	6.4	5.8	5.1	4.5	4.0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	
E	7.5	6.9	6.2	5.6	4.9	4.3	3.8	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
F	7.1	6.5	5.8	5.2	4.5	3.9	3.2	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8		
G	6.8	6.1	5.5	4.9	4.0	3.4	2.7	2.1	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8		
H	6.6	5.9	5.1	4.4	3.6	2.9	2.1	1.6	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3		
I	6.4	5.7	4.9	4.2	3.4	2.7	1.9	1.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
J	6.2	5.4	4.6	3.8	3.0	2.3	1.5	0.7	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
K	5.8	5.0	4.2	3.4	2.6	1.8	1.0	0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2		
L	5.3	4.5	3.7	2.9	2.1	1.3	0.5	-0.3	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7		
M	4.8	4.0	3.2	2.4	1.6	0.8	0.0	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2		
N	4.3	3.5	2.7	1.9	1.1	0.3	-0.5	-1.3	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7		
O	3.8	3.0	2.2	1.4	0.6	-0.2	-1.0	-1.8	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2		
P	3.3	2.5	1.7	0.9	0.1	-0.7	-1.5	-2.3	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7		
Q	2.8	2.0	1.2	0.4	-0.4	-1.2	-2.0	-2.8	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2		
R	2.3	1.5	0.7	-0.1	-0.9	-1.7	-2.5	-3.3	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7		
S	1.8	1.0	0.2	-0.6	-1.4	-2.2	-3.0	-3.8	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2		
T	1.3	0.5	-0.3	-1.1	-1.9	-2.7	-3.5	-4.3	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7	-4.7		

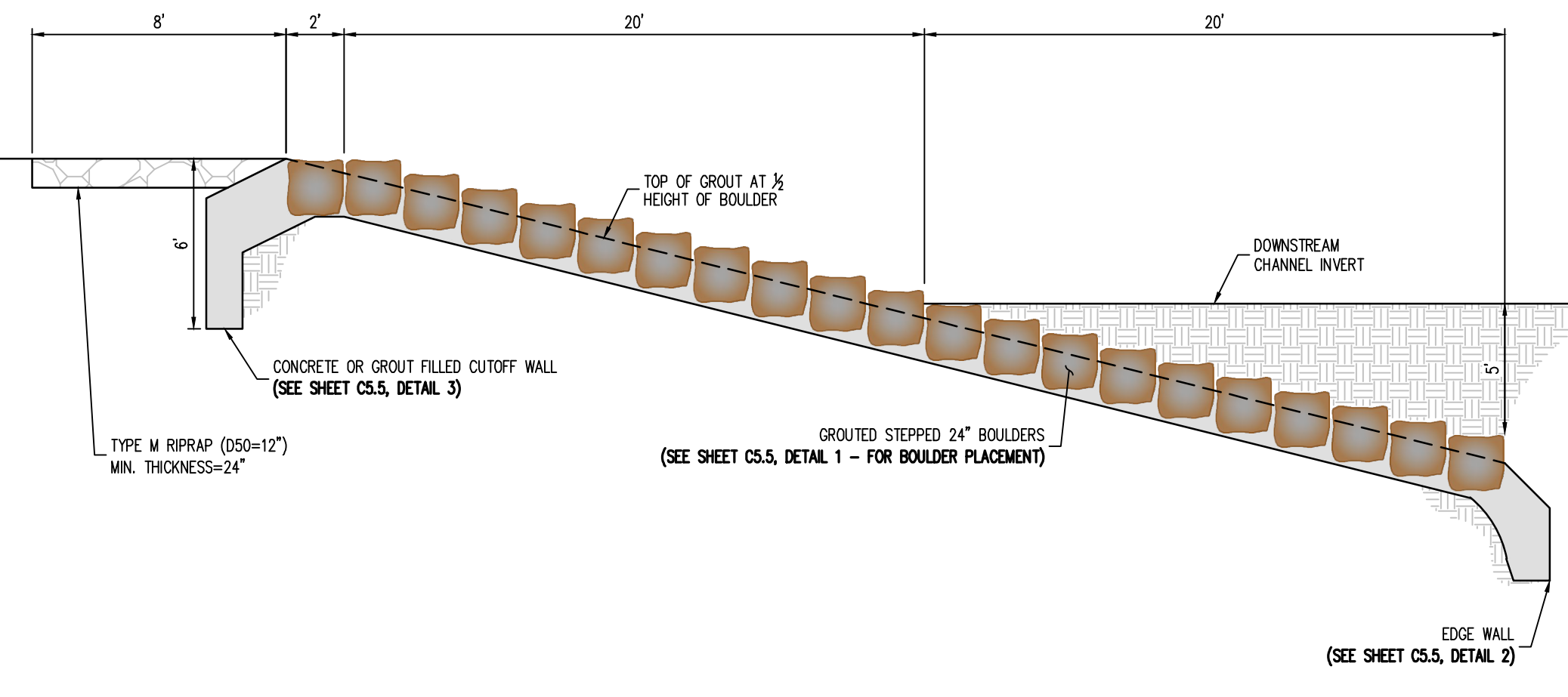
STAGE = 0 (SEE THIS SHEET, TABLE 1)
WEEP DRAIN (TYP) - (SEE SHEET C5.5, DETAIL 4)

TABLE 1: DROP STRUCTURE STAGE ELEVATIONS

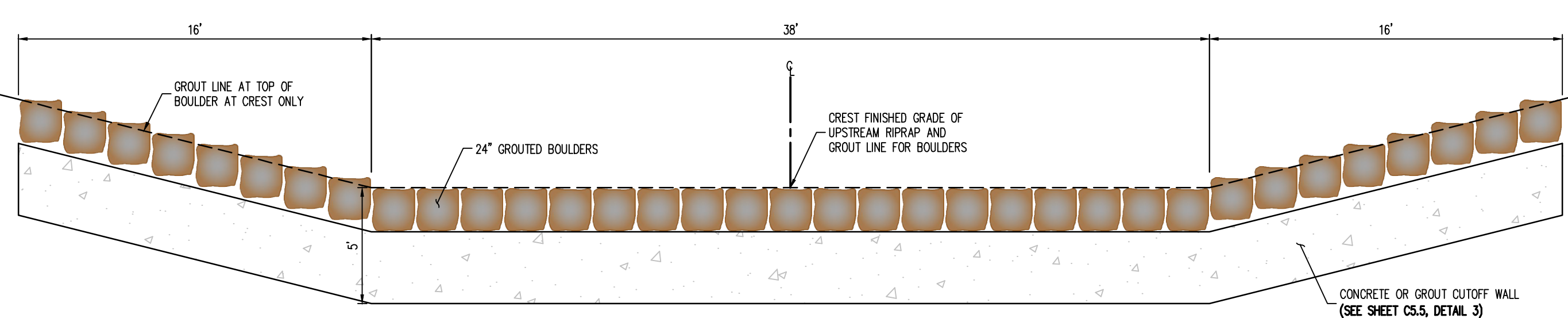
DROP STRUCTURE #1	6954.33'
DROP STRUCTURE #3	6945.62'

NOTE: STAGE=0 IS LOCATED AT THE TOE OF CHANNEL ALONG THE CENTER LINE ALIGNMENT. CONTRACTOR SHALL ENSURE ELEVATIONS ABOVE MATCH THE ELEVATIONS SHOWN ON PLAN & PROFILE SHEETS (C4.1-C4.4)

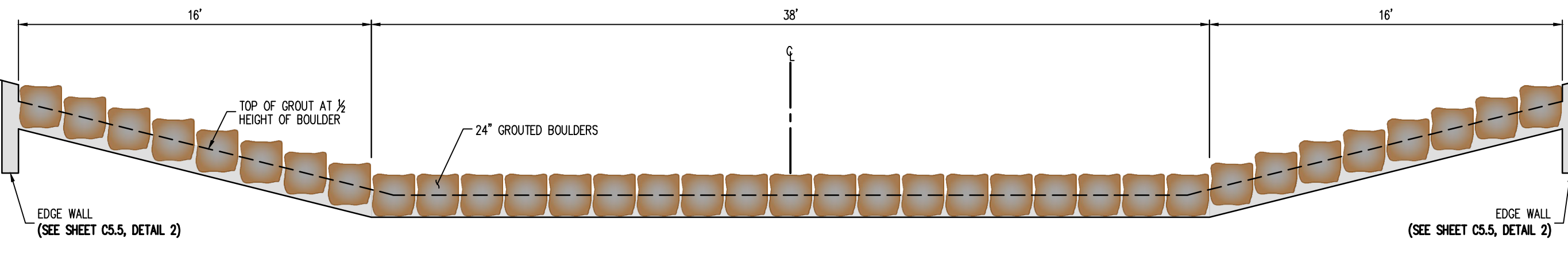
1 DROP STRUCTURE (#1, #3) - PLAN VIEW
SCALE: 1"=5'



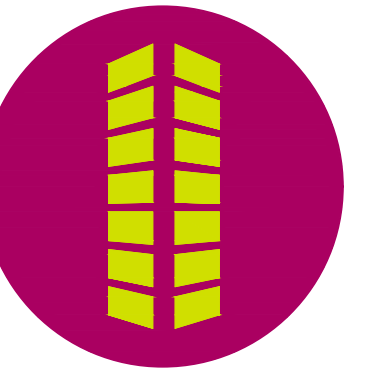
2 DROP STRUCTURE (#1, #3) - PROFILE VIEW (SECTION A)
NOT TO SCALE



3 DROP STRUCTURE (#1, #3) - PROFILE VIEW (SECTION B)
NOT TO SCALE



4 DROP STRUCTURE (#1, #3) - PROFILE VIEW (SECTION C)
NOT TO SCALE



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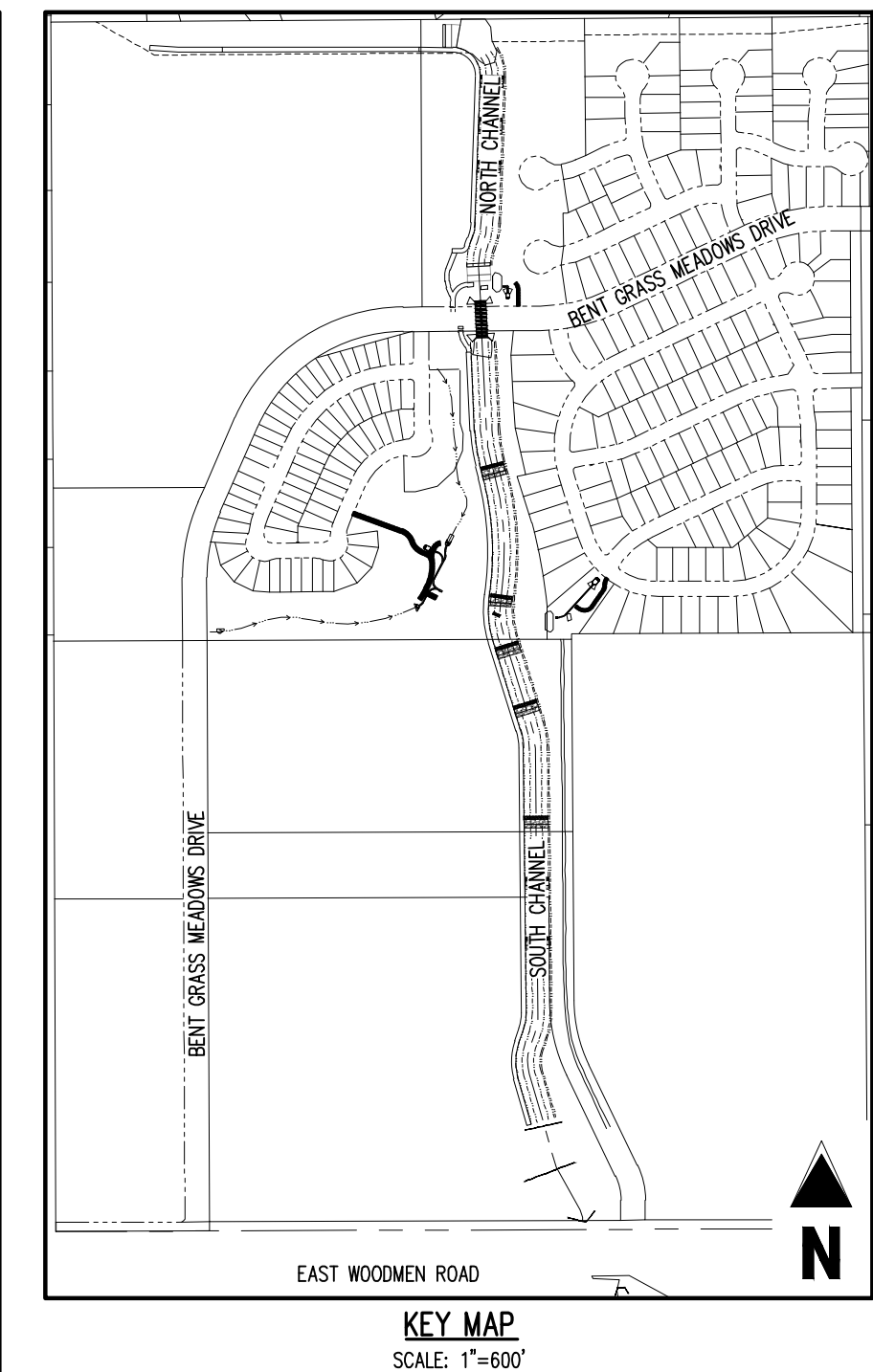
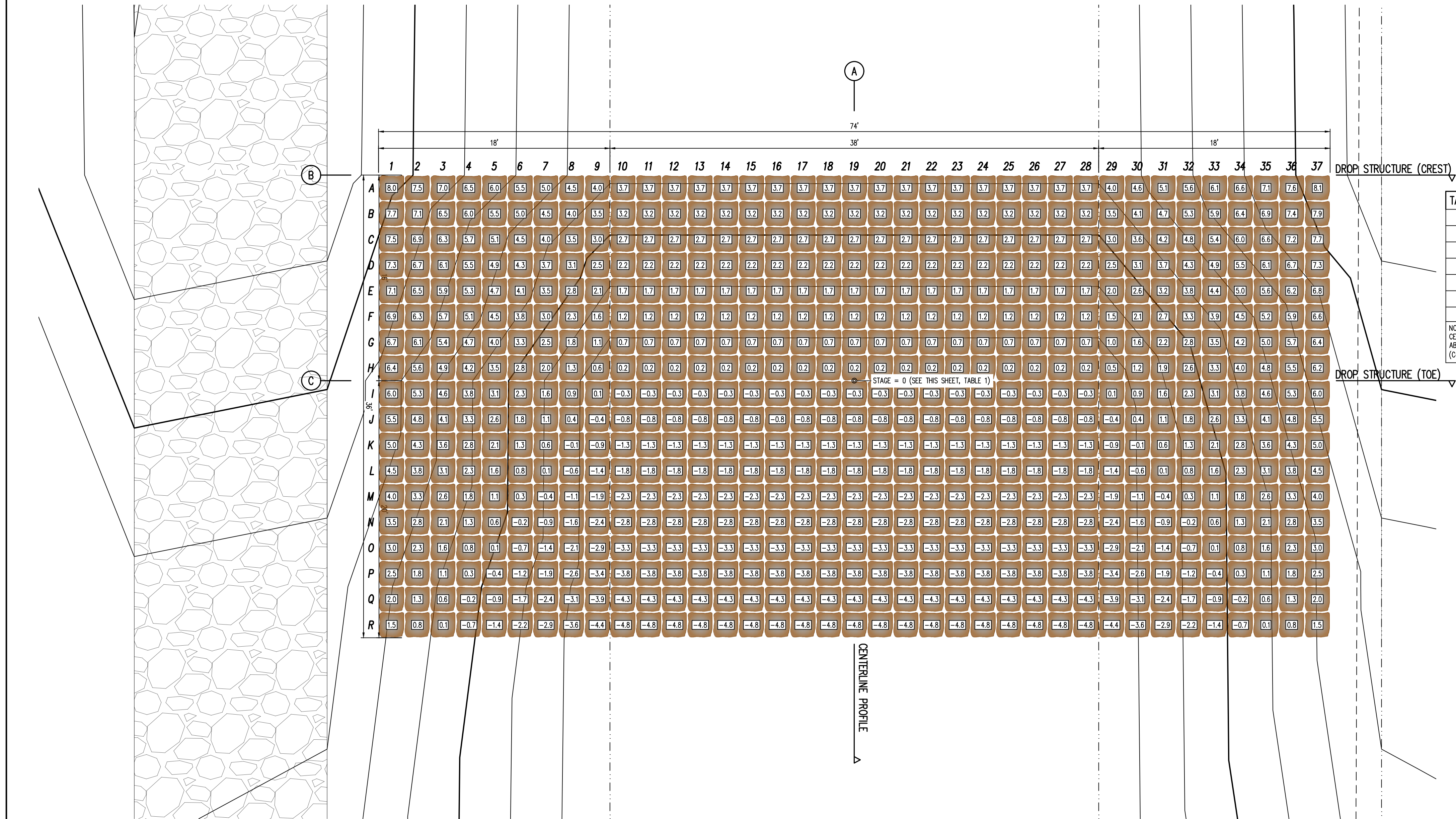


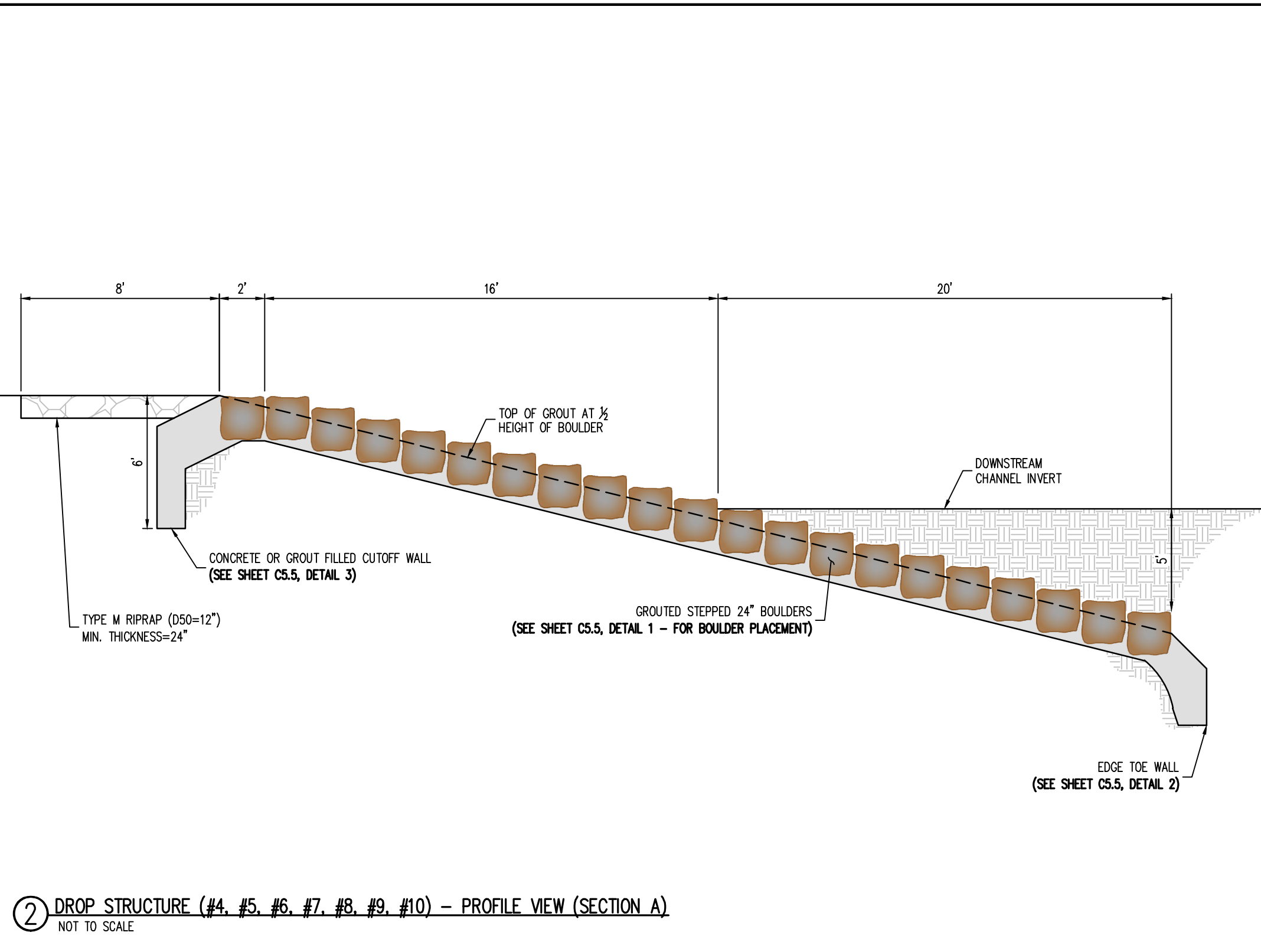
TABLE 1: DROP STRUCTURE STAGE ELEVATIONS

DROP STRUCTURE #4	6932.27
DROP STRUCTURE #5	6927.57
DROP STRUCTURE #6	6921.85
DROP STRUCTURE #7	6916.35
DROP STRUCTURE #8	6911.80
DROP STRUCTURE #9	6906.72
DROP STRUCTURE #10	6902.17

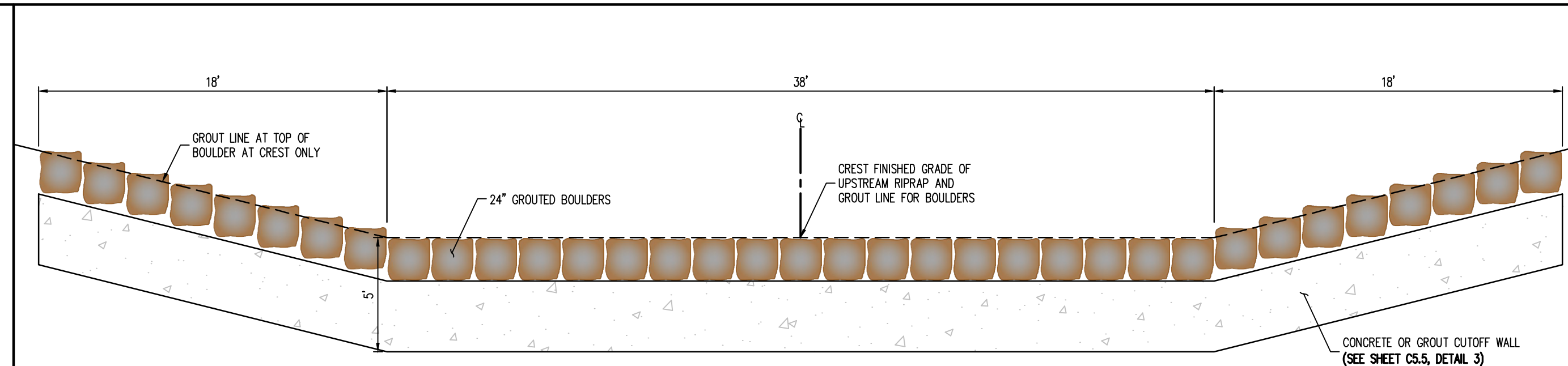
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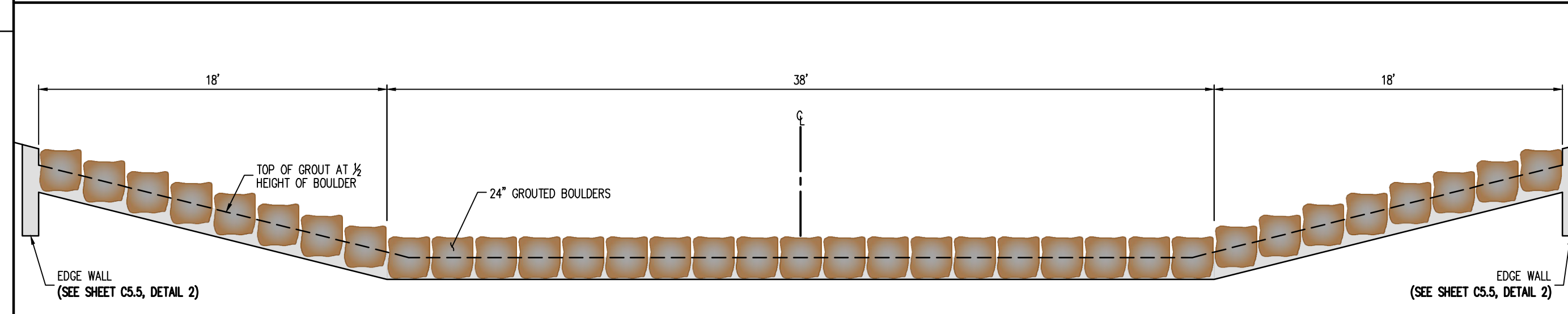
1 DROP STRUCTURE (#4, #5, #6, #7, #8, #9, #10) - PLAN VIEW
 SCALE: 1"=5'



2 DROP STRUCTURE (#4, #5, #6, #7, #8, #9, #10) - PROFILE VIEW (SECTION A)
 NOT TO SCALE



3 DROP STRUCTURE (#4, #5, #6, #7, #8, #9, #10) - PROFILE VIEW (SECTION B)
 NOT TO SCALE



4 DROP STRUCTURE (#4, #5, #6, #7, #8, #9, #10) - PROFILE VIEW (SECTION C)
 NOT TO SCALE

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RONALD G. DENNIS, PE 51622 DATE

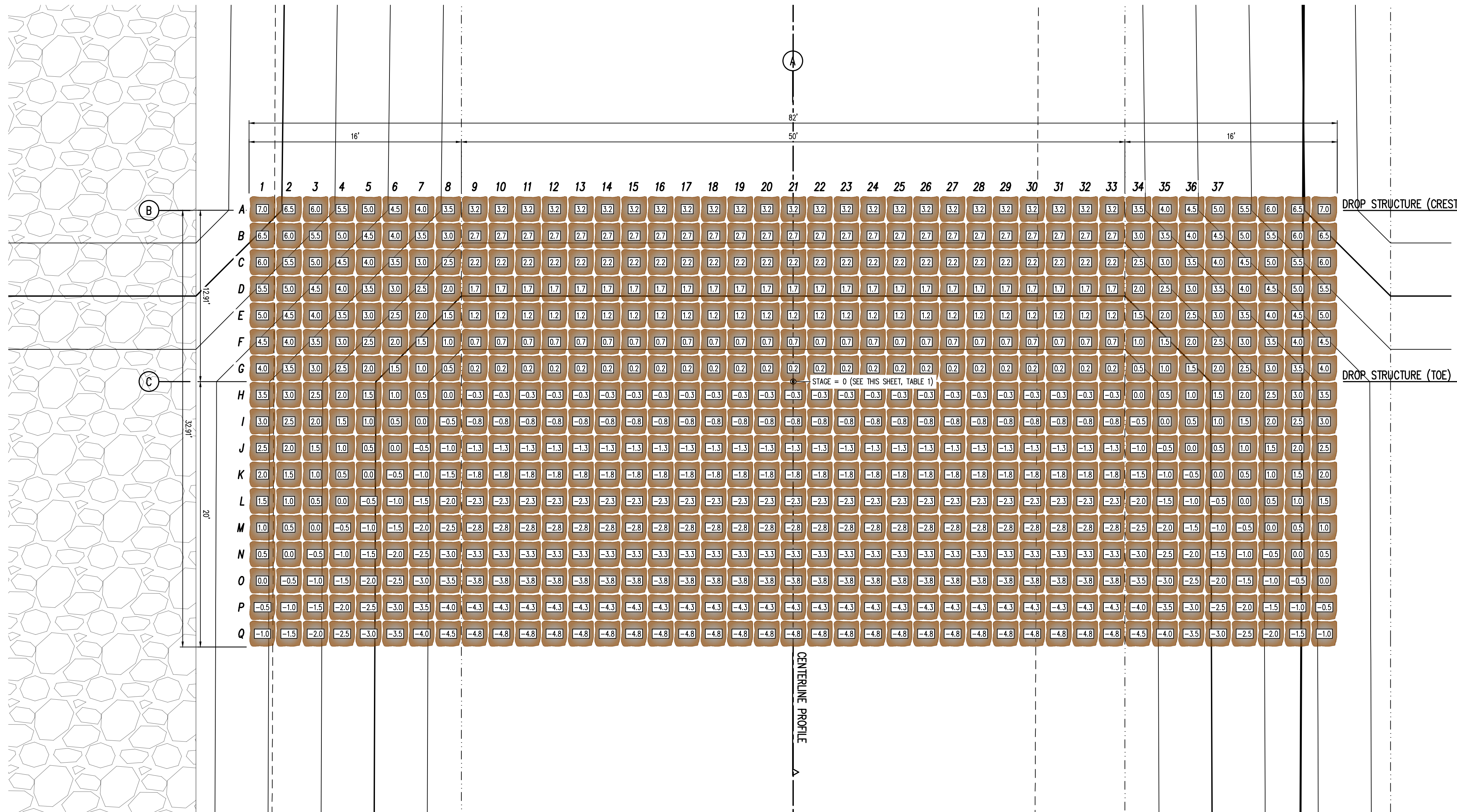
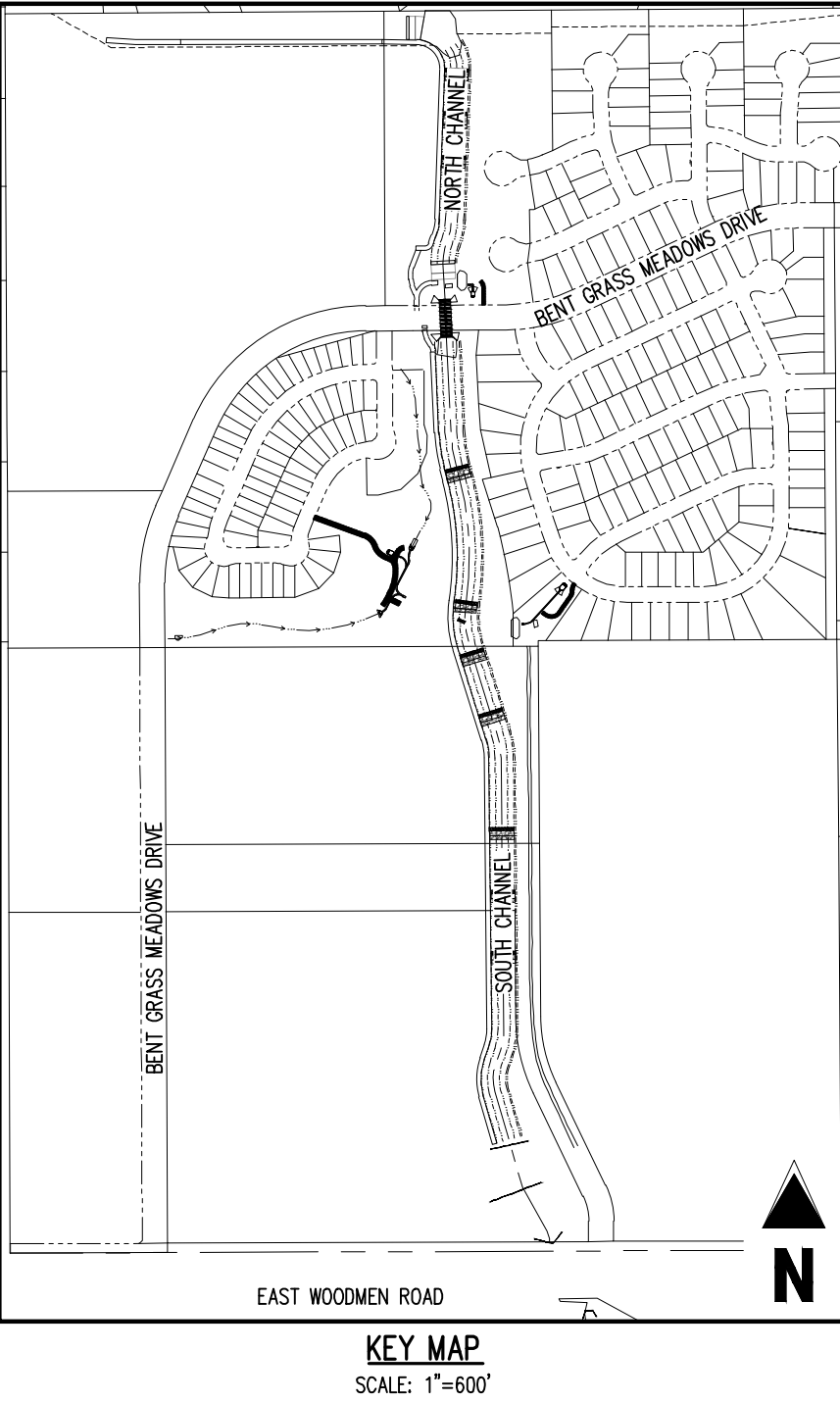
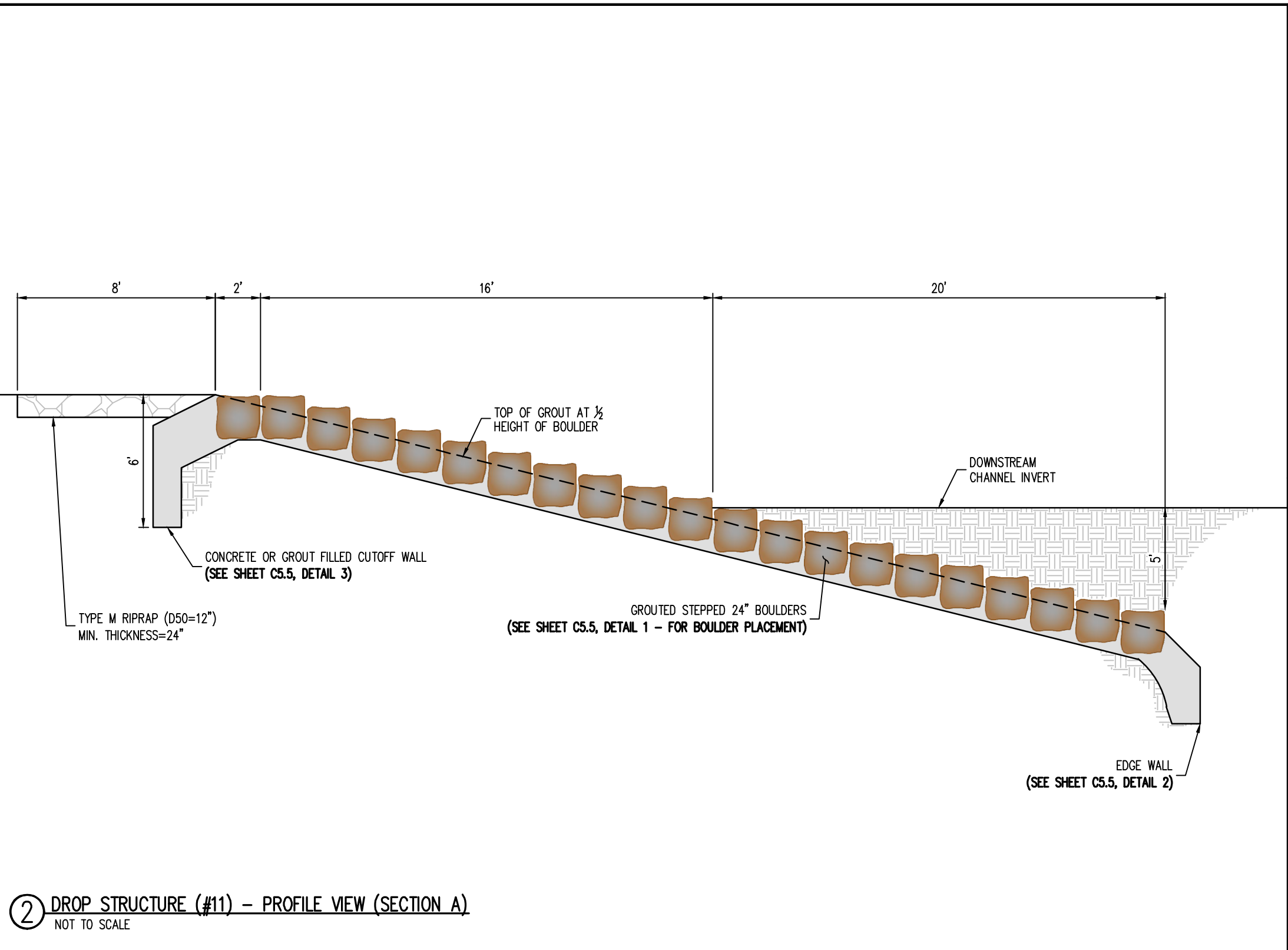


TABLE 1: DROP STRUCTURE STAGE ELEVATIONS

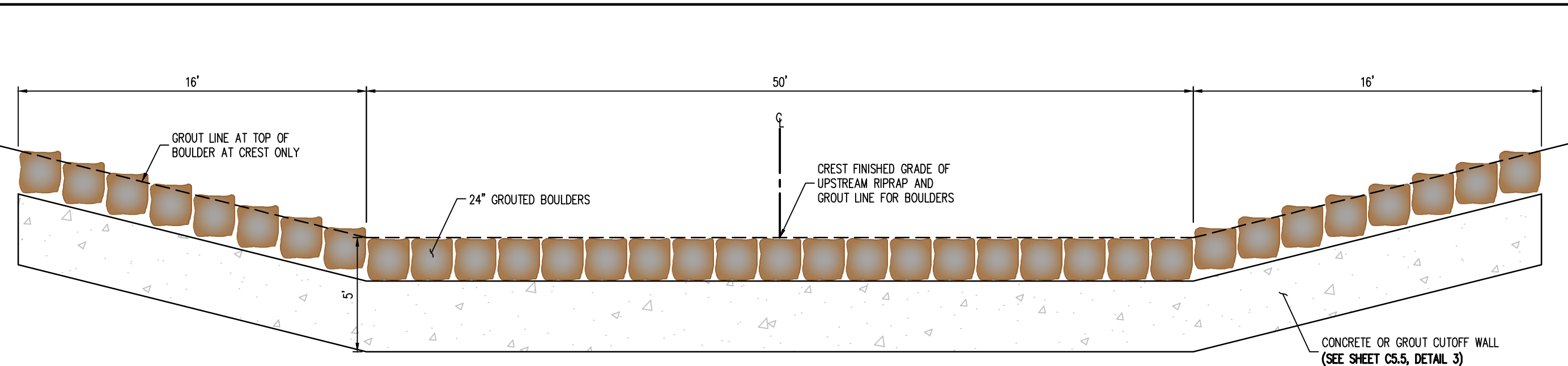
DROP STRUCTURE #11	6898.39
NOTE: STAGE=0 IS LOCATED AT THE TOE OF CHANNEL ALONG THE CENTER LINE ALIGNMENT. CONTRACTOR SHALL ENSURE ELEVATIONS ABOVE MATCH THE ELEVATIONS SHOWN ON PLAN & PROFILE SHEETS (C4.1-C4.4)	



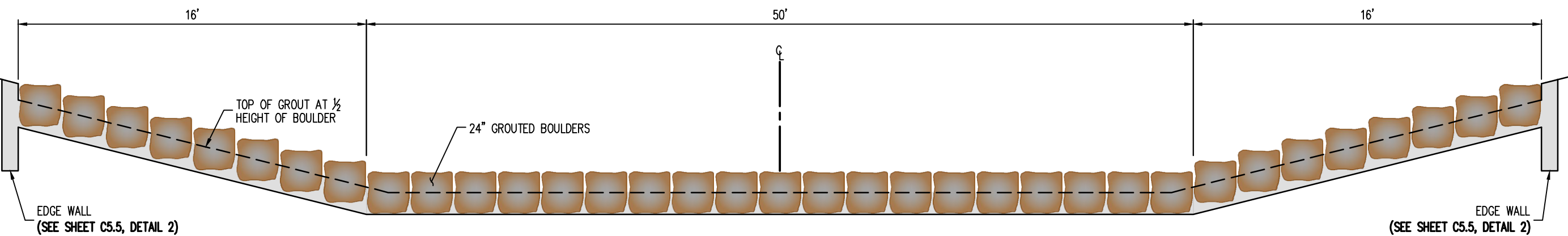
1 DROP STRUCTURE (#11) - PLAN VIEW
SCALE: 1"=5'



2 DROP STRUCTURE (#11) - PROFILE VIEW (SECTION A)
NOT TO SCALE



3 DROP STRUCTURE (#11) - PROFILE VIEW (SECTION B)
NOT TO SCALE



4 DROP STRUCTURE (#11) - PROFILE VIEW (SECTION C)
NOT TO SCALE

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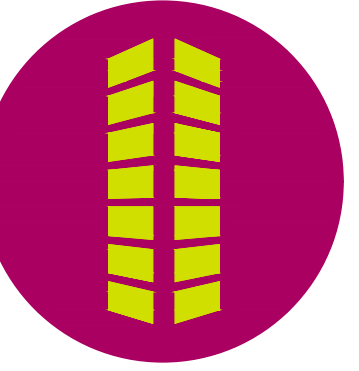
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CONSTRUCTION DOCUMENTS
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FOR
CHALLENGER COMMUNITIES, LLC
BENT GRASS MEADOWS DRIVE & MERIDAN ROAD
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No: CLH000023
Drawn By: CMWJ
Checked By: RGD
Date: 01/14/2022

DROP STRUCTURE DETAILS (#11)



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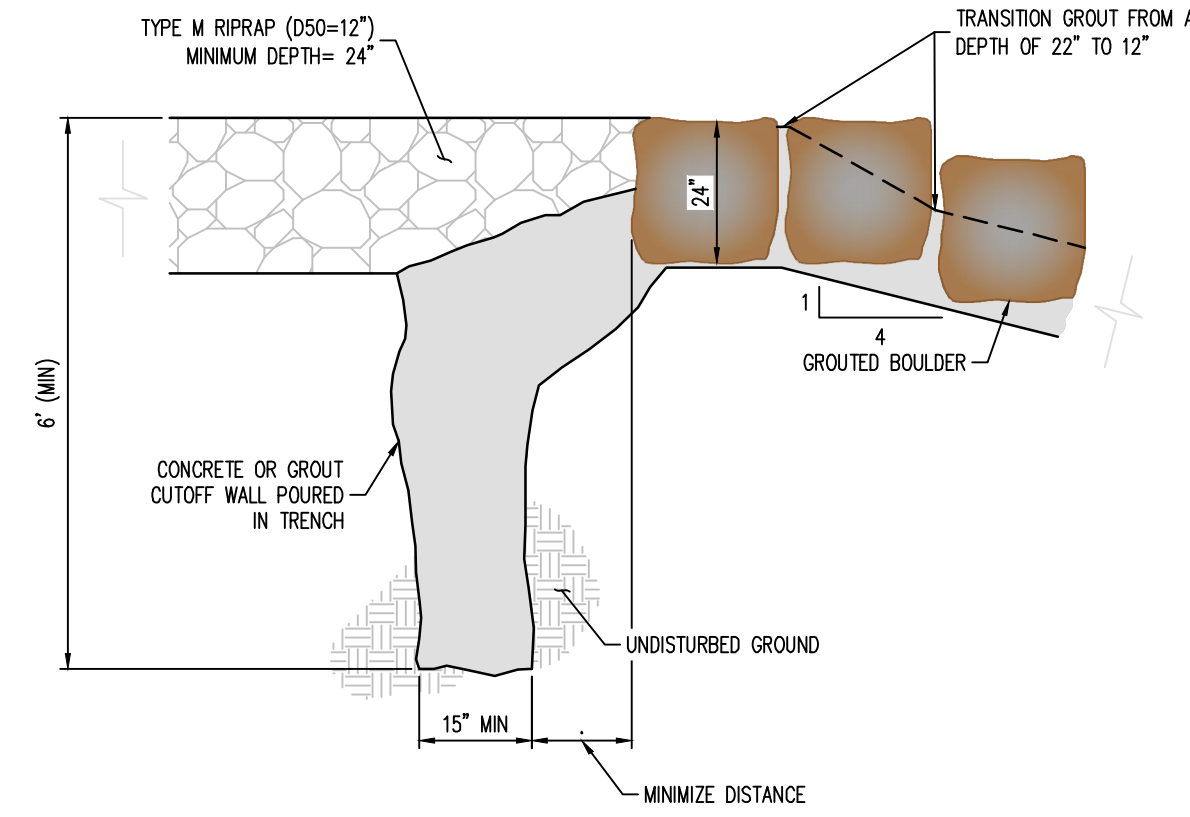
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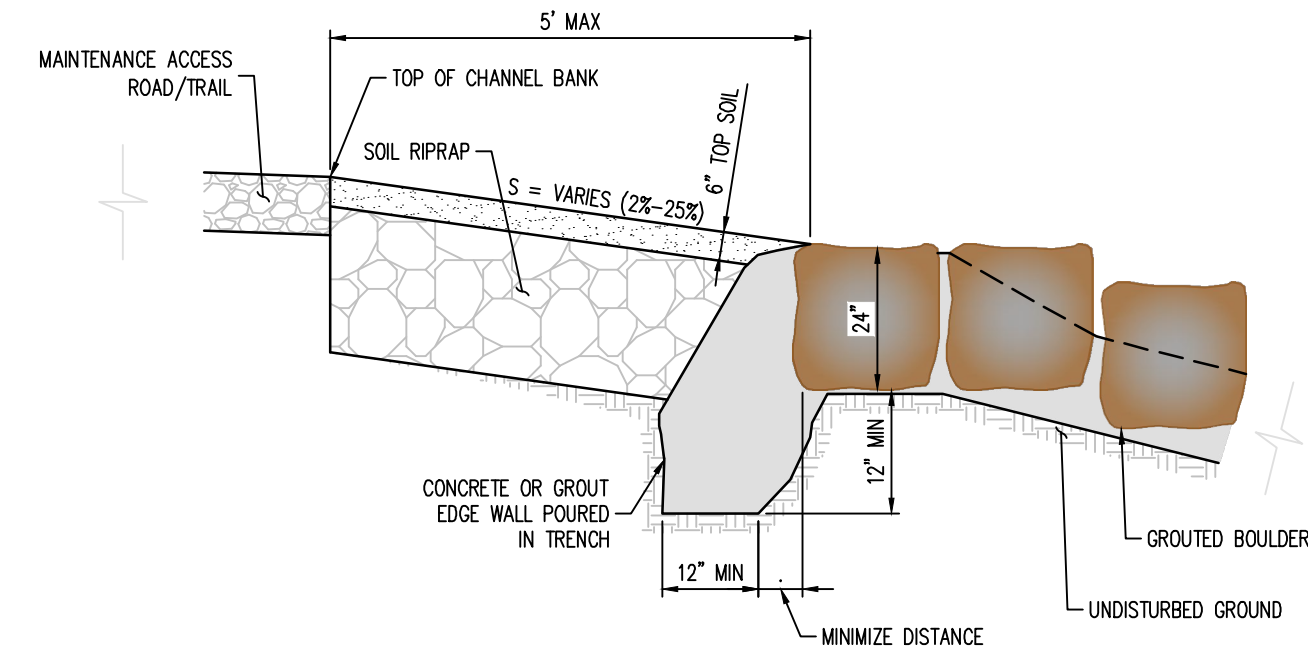
DROP STRUCTURE GENERAL DETAILS

SOIL RIPRAP SPECIFICATIONS:

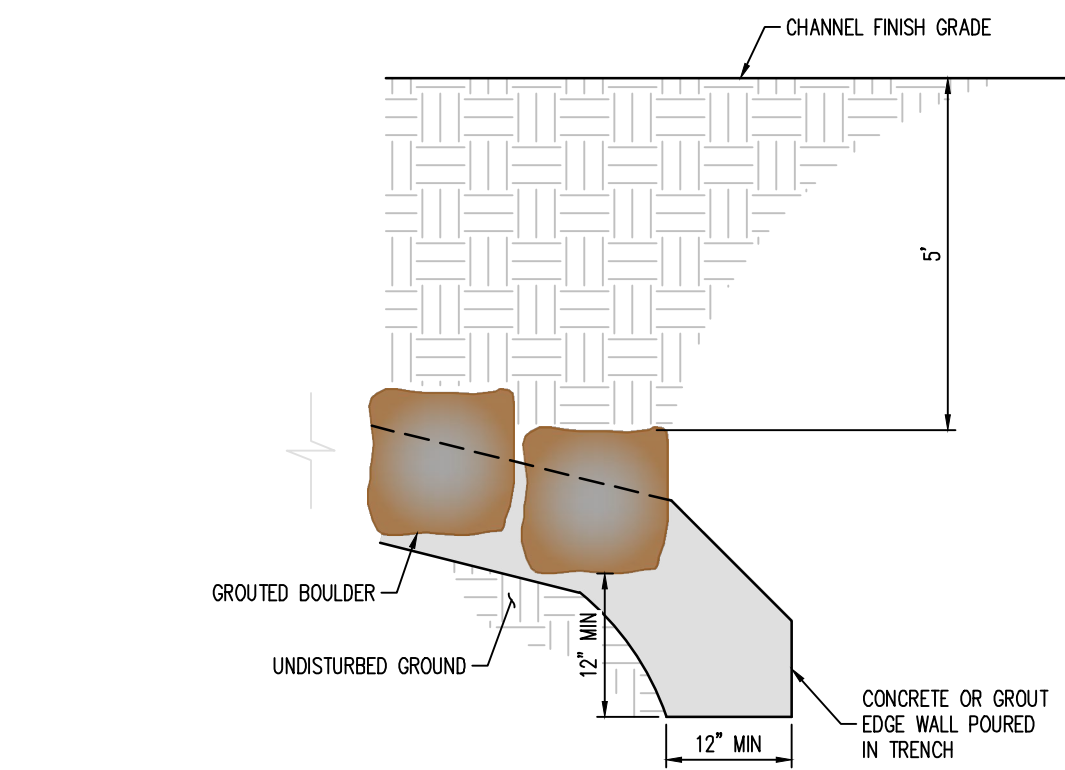
- CONTRACTOR SHALL EXCAVATE AREAS TO RECEIVE SOIL RIPRAP TO THE SPECIFIED DEPTH.
- SUBGRADE SHOULD BE COMPACTED TO NINETY-FIVE PERCENT (95%) MAXIMUM DENSITY.
- NO BEDDING MATERIAL IS REQUIRED FOR SOIL RIPRAP.
- RRIPAP SHALL BE PLACED ON THE PREPARED SLOPE OR CHANNEL BOTTOM AREAS IN A MANNER WHICH WILL PRODUCE A REASONABLY WELL GRADED MASS OF STONE WITH THE MINIMUM PRACTICABLE PERCENTAGE OF VOIDS.
- RRIPAP SHALL BE MACHINE PLACED.
- IT IS THE INTENT OF THESE SPECIFICATIONS TO PRODUCE A FAIRLY COMPACT RIPRAP PROTECTION IN WHICH ALL SIZES OF MATERIAL ARE PLACED IN THEIR PROPER PROPORTIONS.
- WHEN RIPRAP IS PLACED ON SLOPE, PLACEMENT SHALL COMMENCE AT THE BOTTOM OF THE SLOPE WORKING UP THE SLOPE.
- ALL MATERIAL USED FOR RIPRAP PROTECTION FOR CHANNEL SLOPE OR BOTTOM SHALL BE PLACED AND DISTRIBUTED SUCH THAT THERE SHALL BE NO LARGE ACCUMULATIONS OF EITHER THE LARGER OR SMALLER SIZES OF STONE. SOME HAND PLACEMENT MAY BE REQUIRED TO ACHIEVE THIS DISTRIBUTION.
- SMALLER ROCK SHALL BE SECURELY LOCKED BETWEEN THE LARGER STONES. IT IS ESSENTIAL THAT THE MATERIAL BETWEEN THE LARGER STONES NOT BE LOOSE OR EASILY DISPLACED BY FLOW.
- THE SOIL MATERIAL SHALL BE NATIVE OR TOPSOIL AND MIXED WITH SIXTY-FIVE PERCENT (65%) RIPRAP AND THIRTY-FIVE PERCENT (35%) SOIL BY VOLUME.
- SOIL RIPRAP SHALL CONSIST OF A UNIFORM MIXTURE OF SOIL AND RIPRAP WITHOUT VOIDS.
- SOIL RIPRAP SHALL BE FREE OF BRUSH, TREES, STUMPS, AND OTHER OBJECTIONABLE MATERIAL AND BE GRADED TO A SMOOTH COMPACTED SURFACE.
- MIXING OF SOIL AND RIPRAP SHOULD BE DONE AT THE STOCKPILE LOCATION, NOT AT THE LOCATION WHERE SOIL RIPRAP IS TO BE PLACED.
- MIX THIRTY-FIVE PERCENT (35%) SOIL BY VOLUME WITH STOCKPILED RIPRAP USING ADDITIONAL MOISTURE AND CONTROL PROCEDURES THAT ENSURE A HOMOGENOUS MIXTURE, WHERE THE SOIL FILLS THE INHERENT VOIDS IN THE RIPRAP WITHOUT DISPLACING RIPRAP. LAYERING THE RIPRAP AND SOIL INSTEAD OF PREMIXING MAY BE ALLOWED IF THE NATIVE SOIL IS GRANULAR.
- PLACE A FIRST LAYER OF SMALLER SOIL RIPRAP OF APPROXIMATE D50 THICKNESS. THEN PLACE THE TOP LAYER WITH THE SURFACE ROCKS THAT ARE LARGELY D50 OR GREATER. FILLING VOIDS AS NECESSARY WITH THE SMALLER PLANTED RIPRAP.
- THE MIXTURE SHALL BE CONSOLIDATED BY LARGE VIBRATORY EQUIPMENT OR BACKHOE BUCKET TO CREATE A TIGHT, DENSE INTERLOCKING MASS.
- THE SOIL SHALL BE FURTHER WETTED TO ENCLOSE Voids FILLING WITH SOIL.
- ANY LARGE VOIDS SHALL BE FILLED WITH ROCK AND SMALL VOIDS FILLED WITH SOIL.
- THE TOP SURFACE SHALL BE COVERED WITH FOUR (4) INCHES OF TOPSOIL SUCH THAT NO ROCK POINTS ARE PROTRUDING.
- THE FINAL SURFACE SHALL BE THOROUGHLY WETTED FOR GOOD COMPACTION, SMOOTHED AND COMPACTED BY VIBRATING EQUIPMENT.



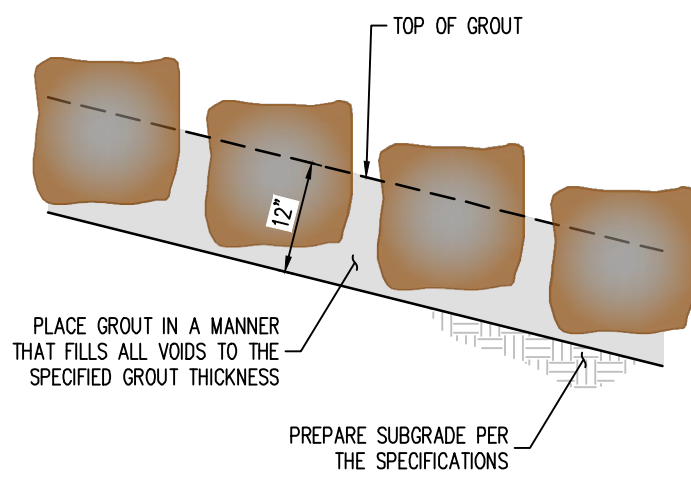
3 CUT-OFF WALL DETAIL
NOT TO SCALE



2 EDGE SIDE WALL DETAIL
NOT TO SCALE



2 EDGE TOE WALL DETAIL
NOT TO SCALE



1 GROUDED BOULDER PLACEMENT DETAIL
NOT TO SCALE

BOULDER PLACEMENT NOTES:

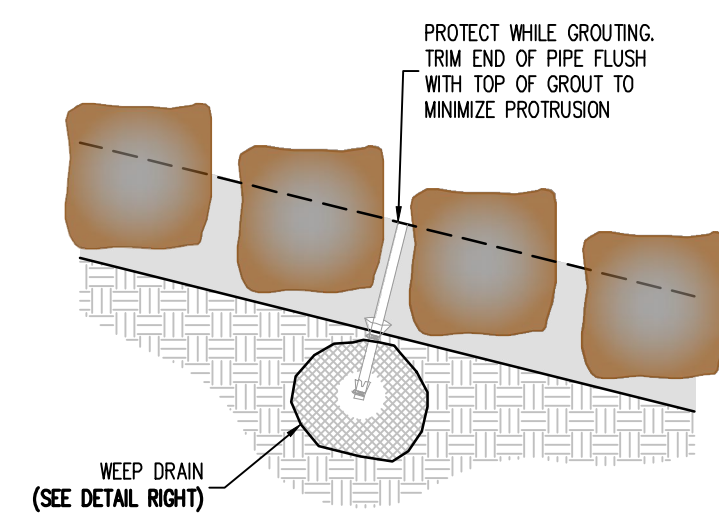
- PLACE BOULDERS WITH THE REQUIRED BOULDER HEIGHT VERTICAL. PLACE BOULDERS AS TIGHTLY TOGETHER AS POSSIBLE (WITHOUT TOUCHING) WHILE PROVIDING ENOUGH ROOM BETWEEN THEM TO THOROUGHLY VIBRATE THE GROUT AND TO ENSURE NO GAPS IN THE GROUT. THE SMALL DIMENSION OF A 2X4 CAN BE USED AS A GUIDE TO CHECK MINIMUM SPACING.
- BEFORE GROUTING, CLEAN ALL DIRT AND MATERIAL FROM ROCK THAT COULD PREVENT THE GROUT FROM BINDING TO THE ROCK. KEEP BOULDERS FROM TOUCHING. AVOID SLIDING BOULDERS AGAINST SUBGRADE TO PROPERLY POSITION.

MATERIAL SPECIFICATIONS:

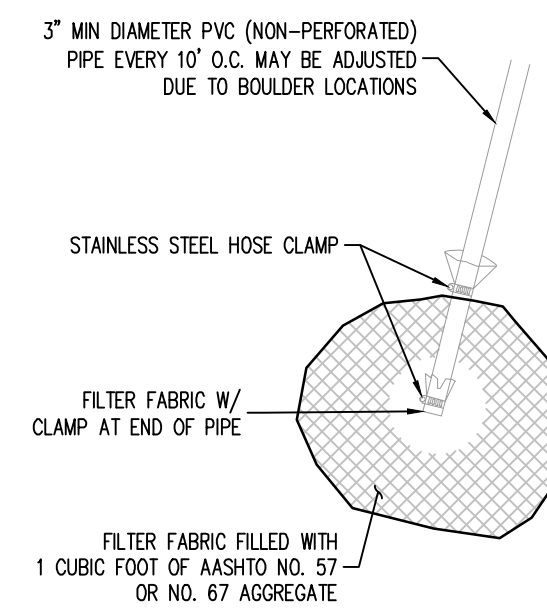
- ALL GROUT SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH EQUAL TO 3200 PSI.
- ONE CUBIC YARD OF GROUT SHALL HAVE A MINIMUM OF SIX (6) SACKS OF TYPE II PORTLAND CEMENT.
- A MAXIMUM OF 25% TYPE F FLY ASH MAY BE SUBSTITUTED FOR THE PORTLAND CEMENT.
- THE AGGREGATE SHALL BE COMPRISED OF 70% NATURAL SAND (FINES) AND 30% 3/4\"/>

GROUT PLACEMENT SPECIFICATIONS:

- SPECIAL PROCEDURES SHALL BE REQUIRED FOR GROUT PLACEMENT WHEN THE AIR TEMPERATURES ARE LESS THAN 40° OR GREATER THAN 90°. CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM THE DESIGN ENGINEER OF THE PROCEDURES TO BE USED FOR PROTECTING THE GROUT.
- GROUT SHALL BE DELIVERED BY MEANS OF A LOW PRESSURE (LESS THAN 10 PSI) GROUT PUMP USING A 2-INCH DIAMETER (MAXIMUM) NOZZLE.
- FULL DEPTH PENETRATION OF THE GROUT INTO THE BOULDER VOIDS SHALL BE ACHIEVED BY INJECTING GROUT STARTING WITH THE NOZZLE NEAR THE BOTTOM AND RAISING IT AS THE GROUT FILLS, WHILE VIBRATING GROUT INTO PLACE USING A FENCAL VIBRATOR.
- ALL GROUT BETWEEN BOULDERS SHALL BE TREATED WITH A BROOM FINISH.
- AFTER GROUT PLACEMENT, EXPOSED BOULDER FACES SHALL BE CLEANED AND FREE OF GROUT.
- ALL FINISHED GROUT SURFACES SHALL BE SPRAYED WITH A CLEAR LIQUID MEMBRANE CURING COMPOUND AS SPECIFIED IN ASTM C309.



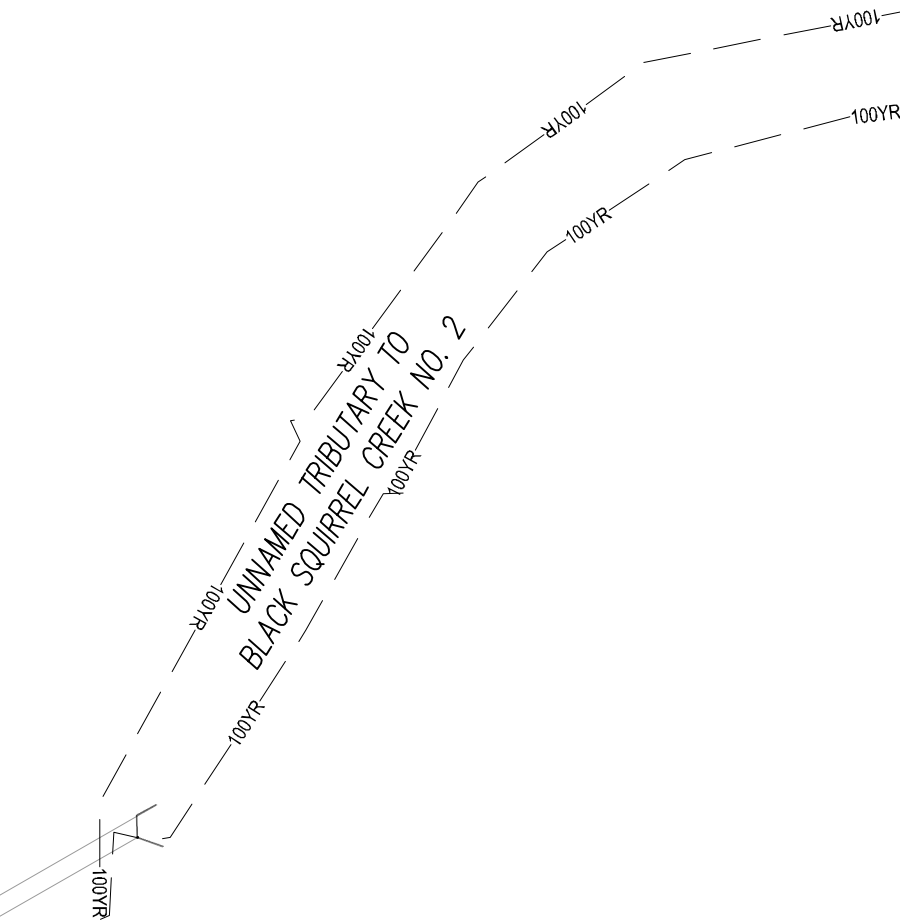
4 WEEP DRAIN DETAIL
NOT TO SCALE





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RONALD G. DENNIS, PE 51622 DATE _____

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CHANNEL SECTIONS KEY
MAP



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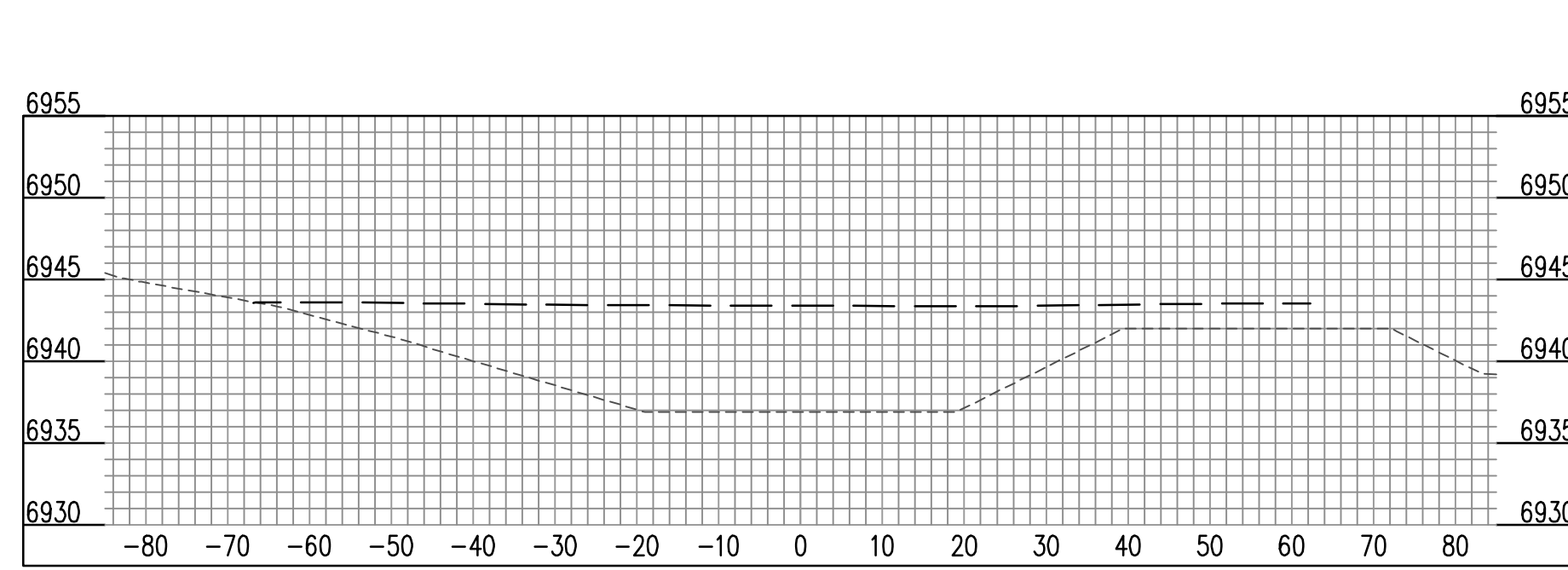
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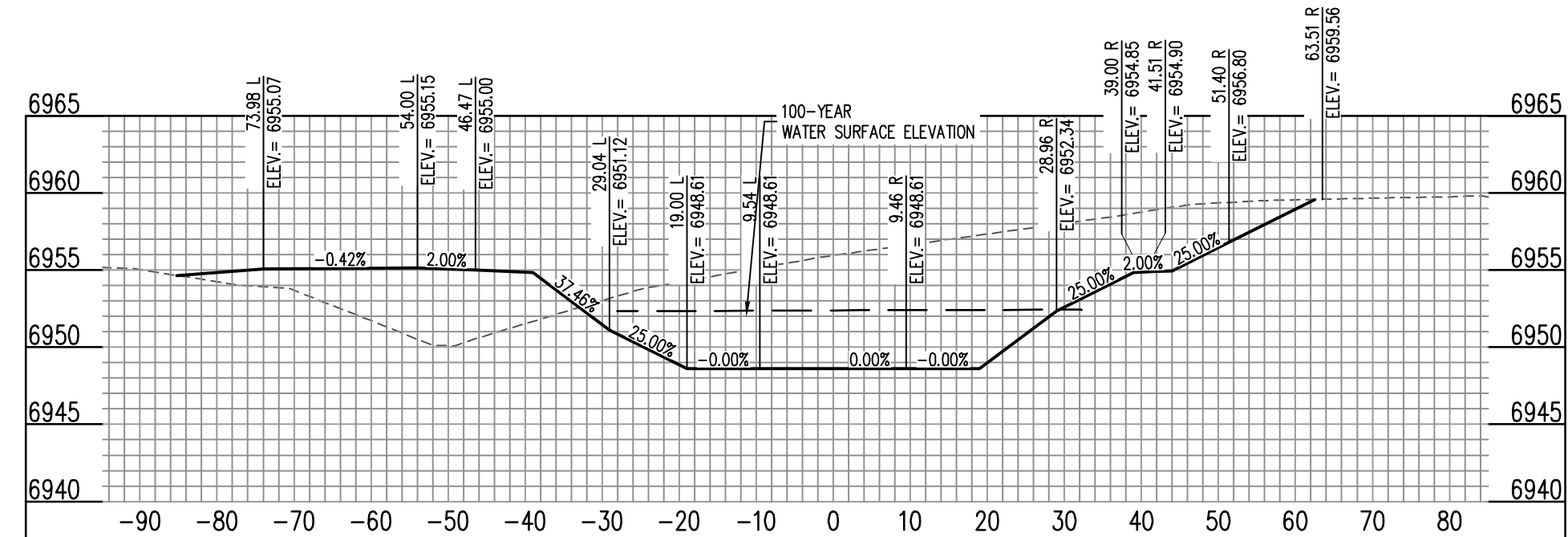
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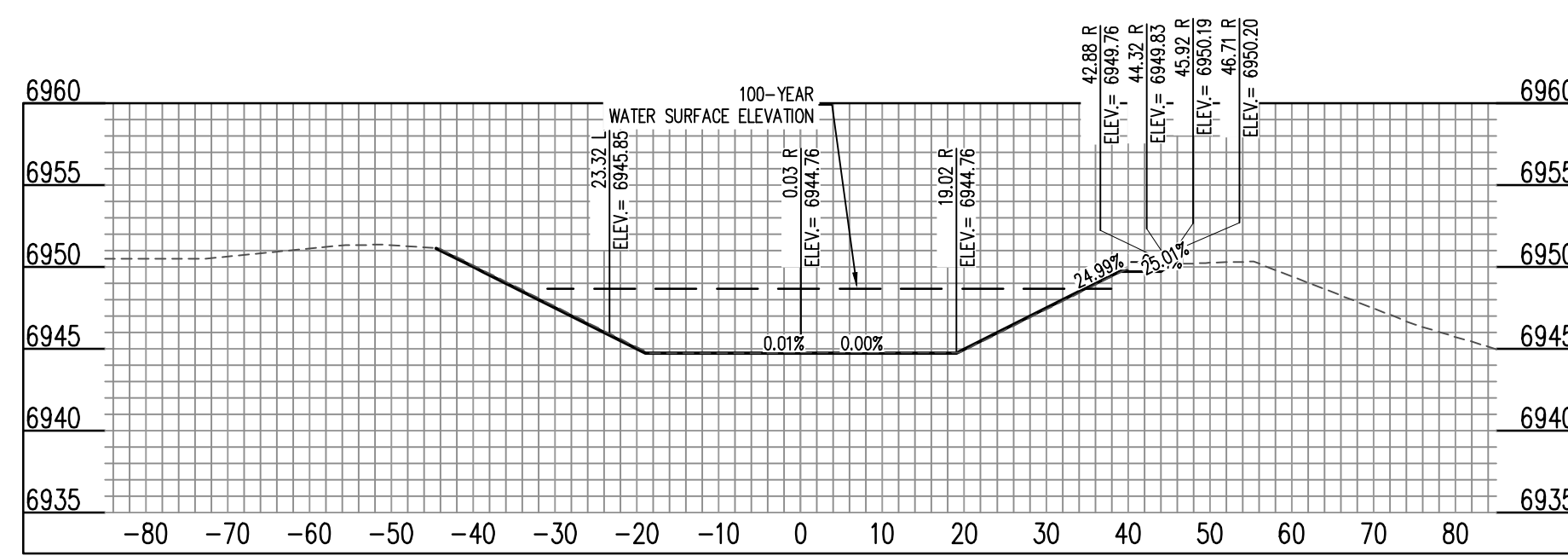
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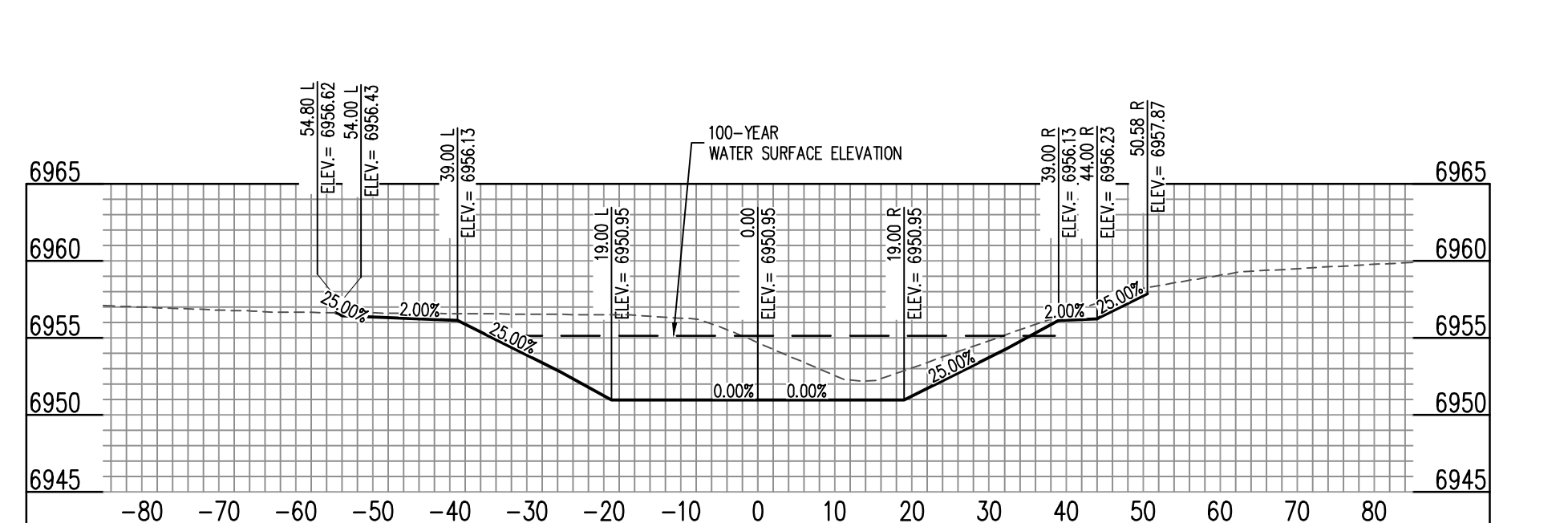
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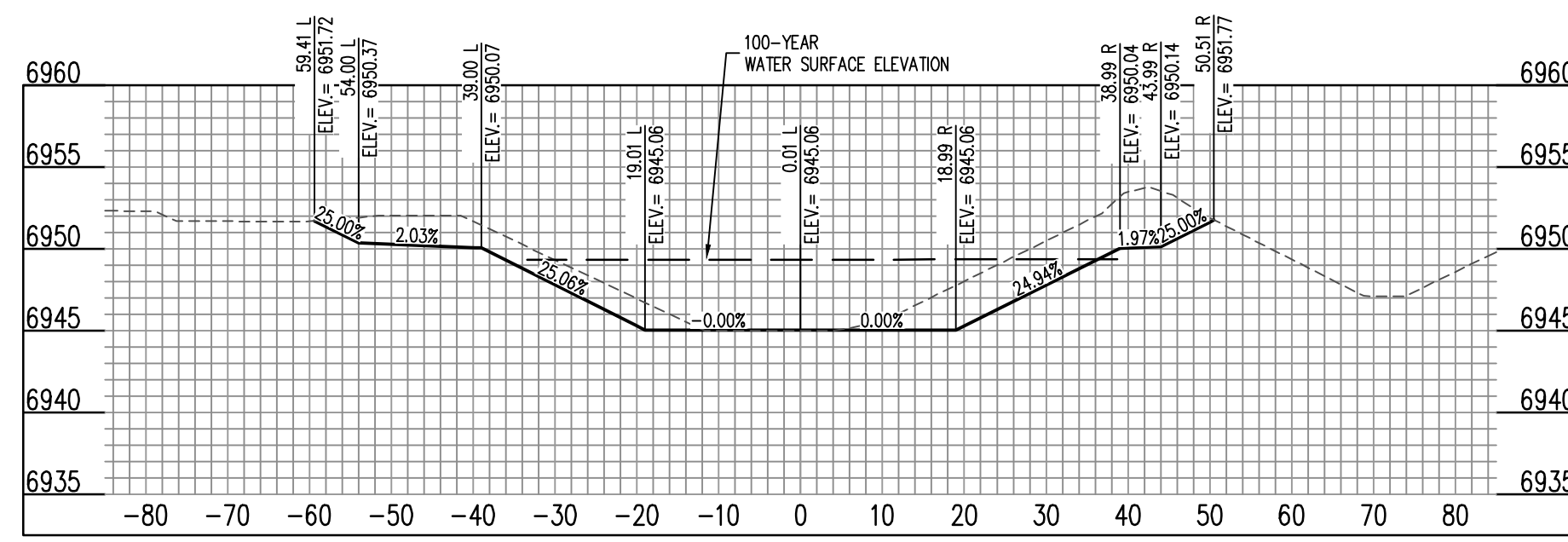
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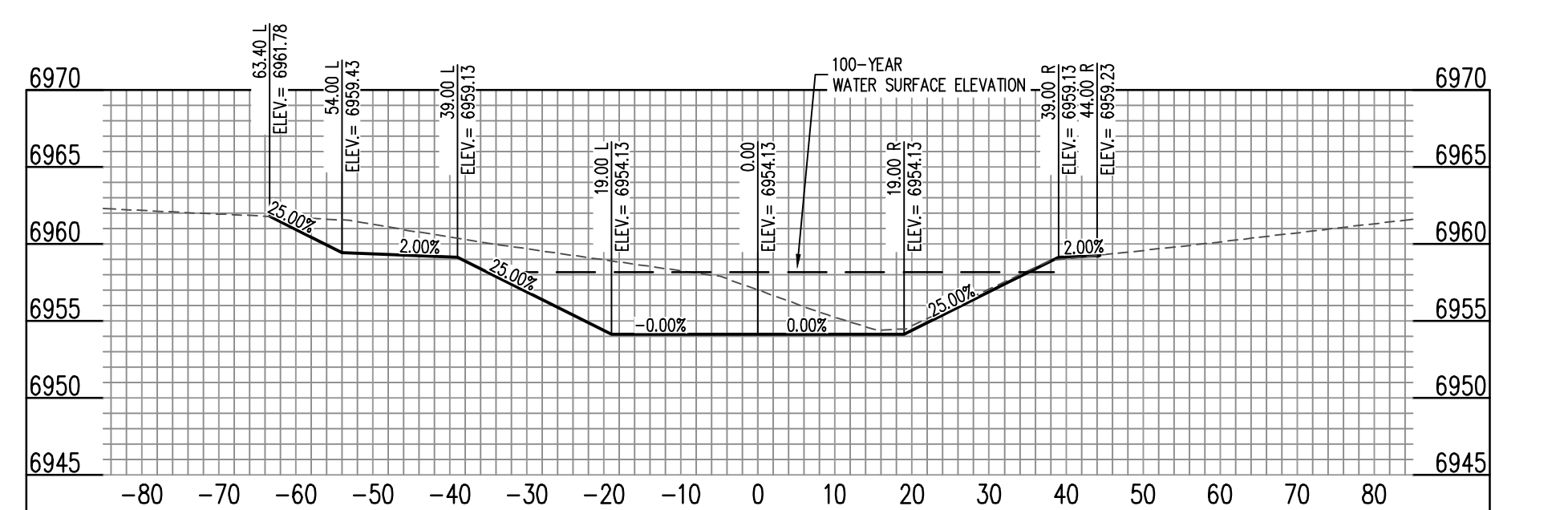
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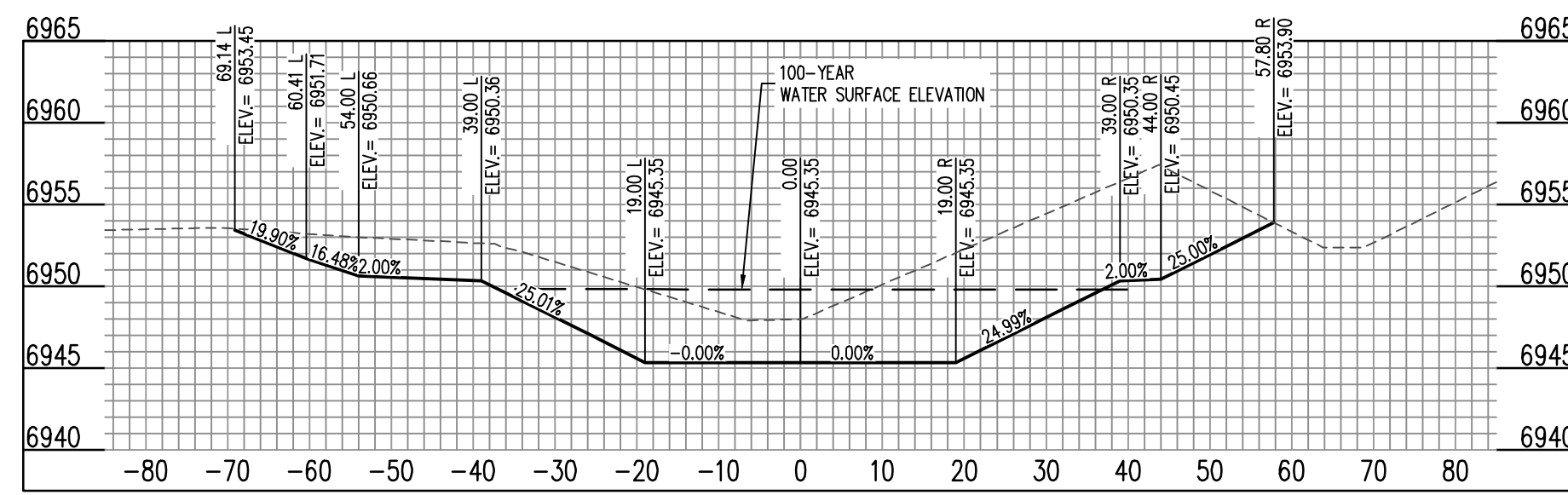
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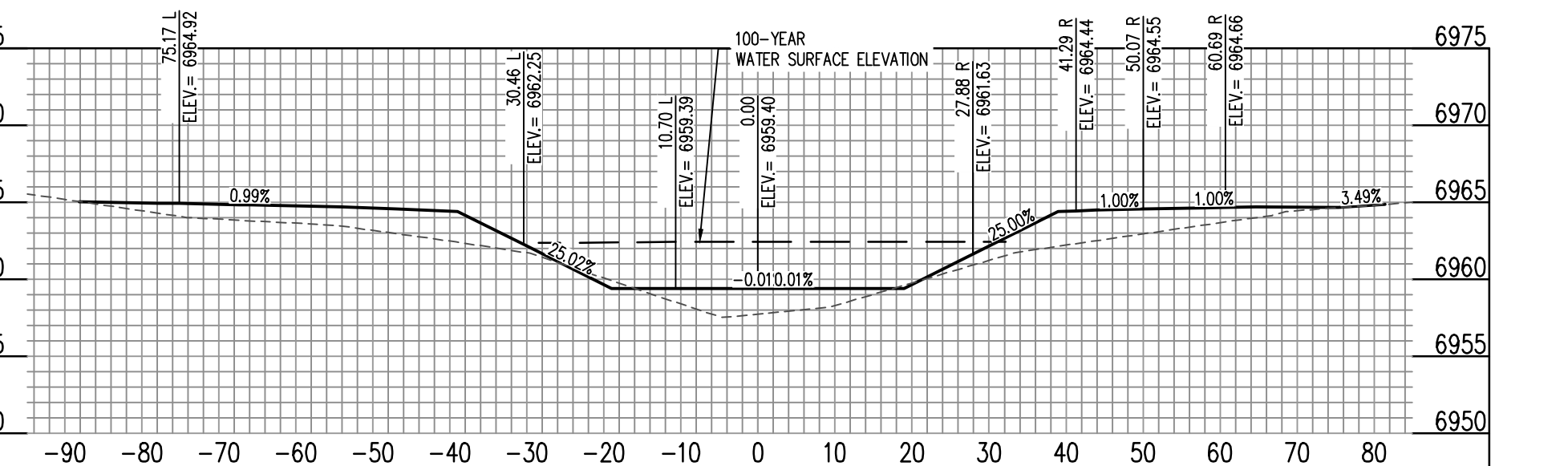
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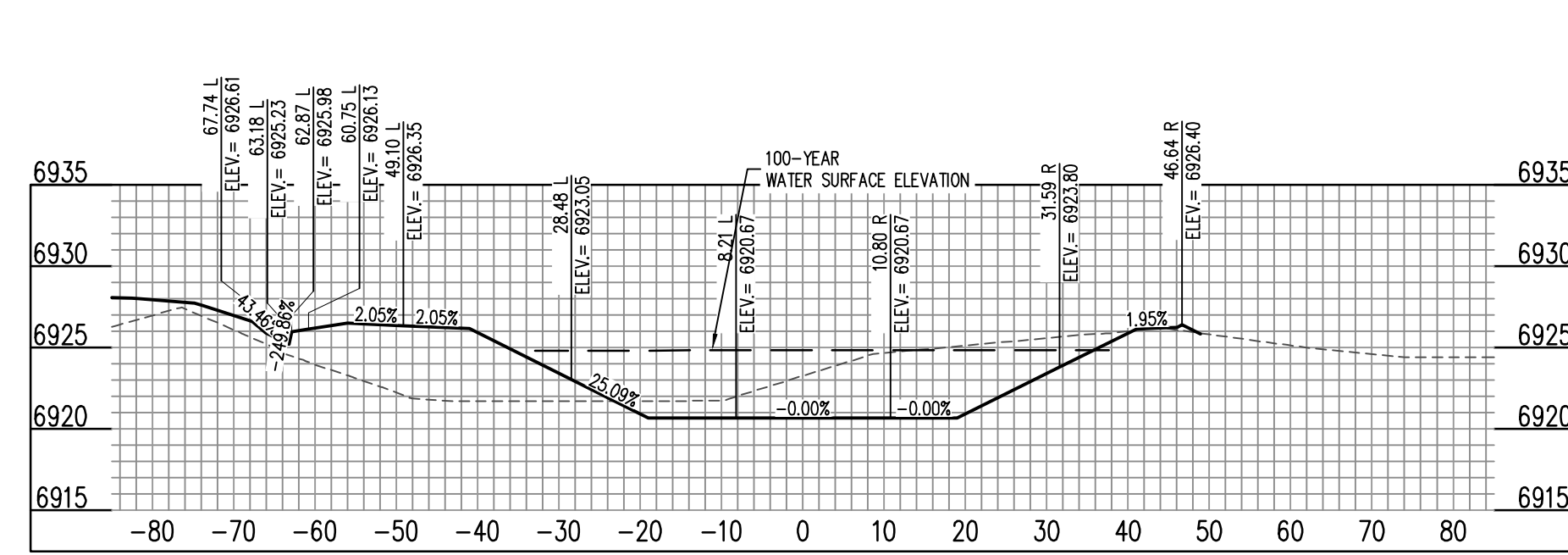
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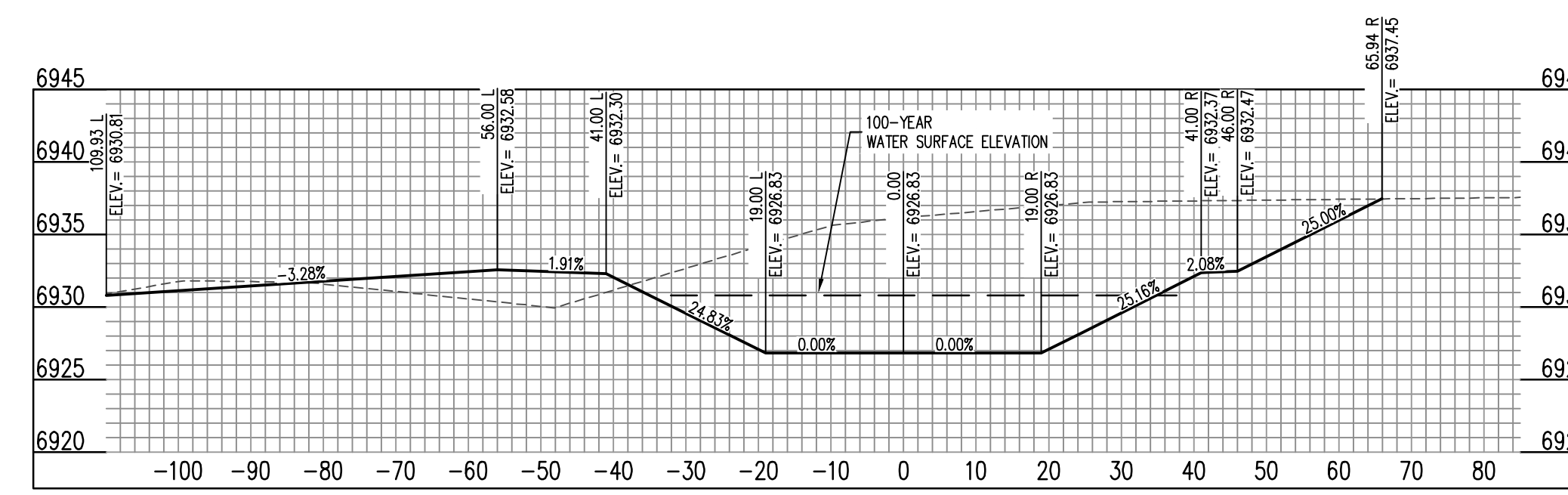
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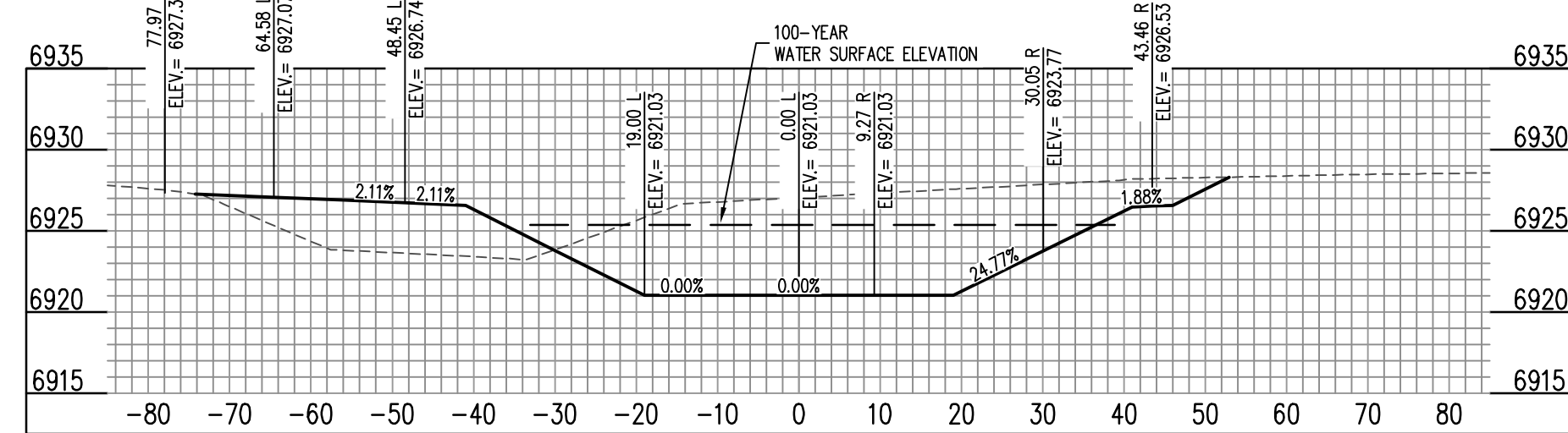
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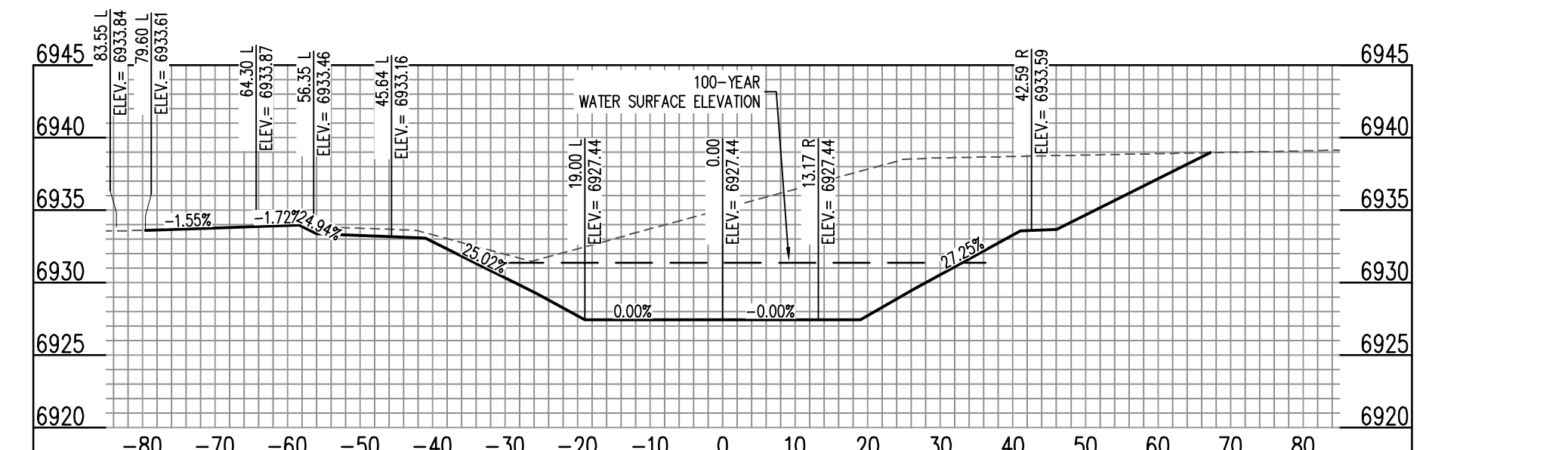
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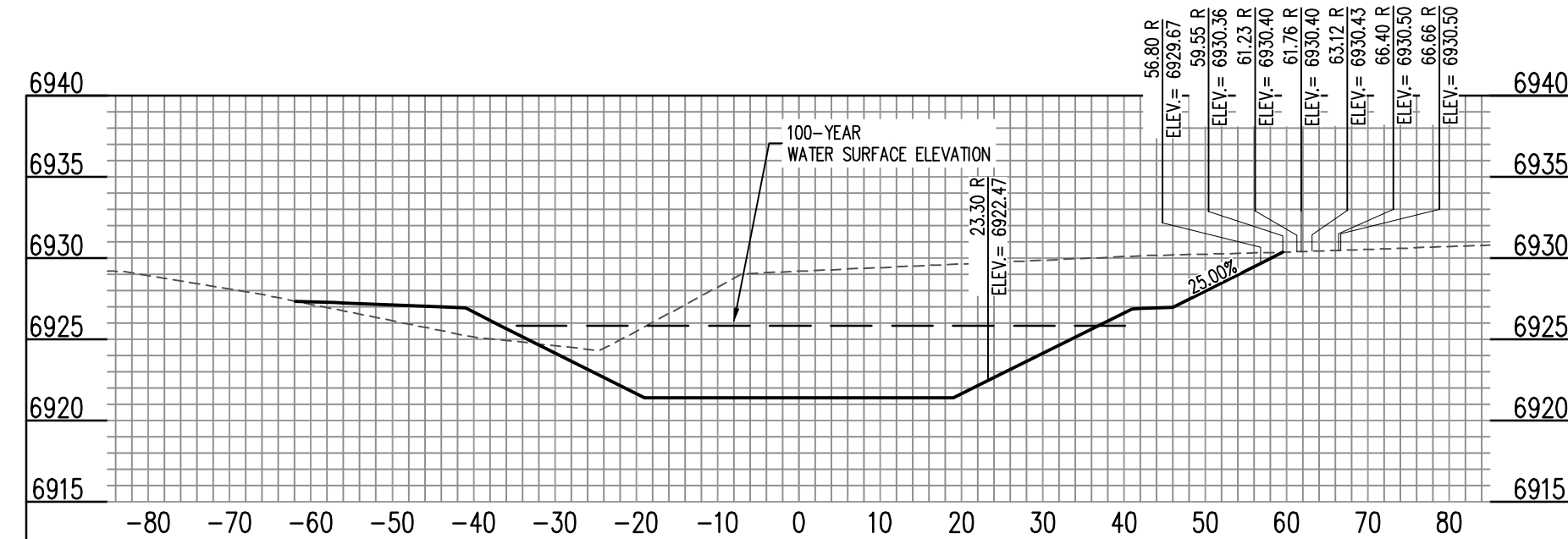
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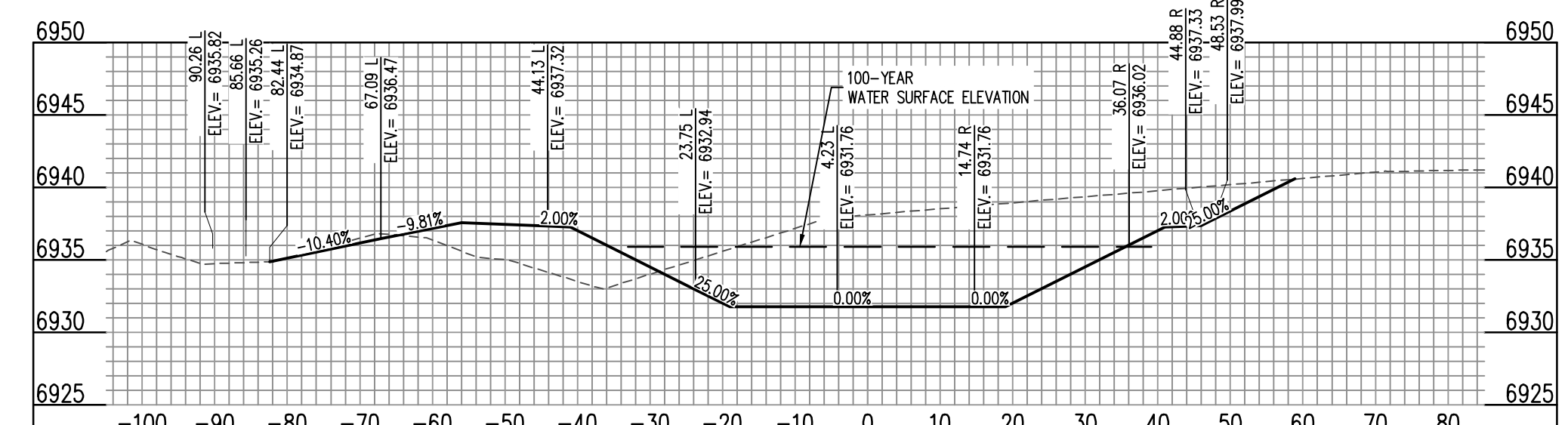
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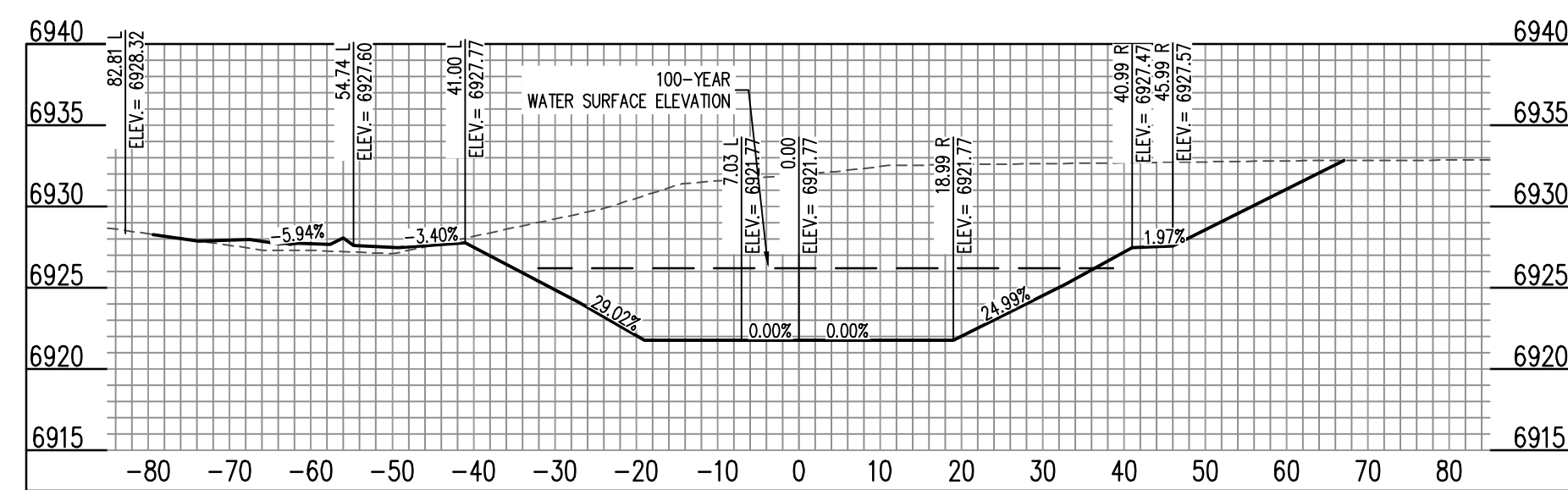
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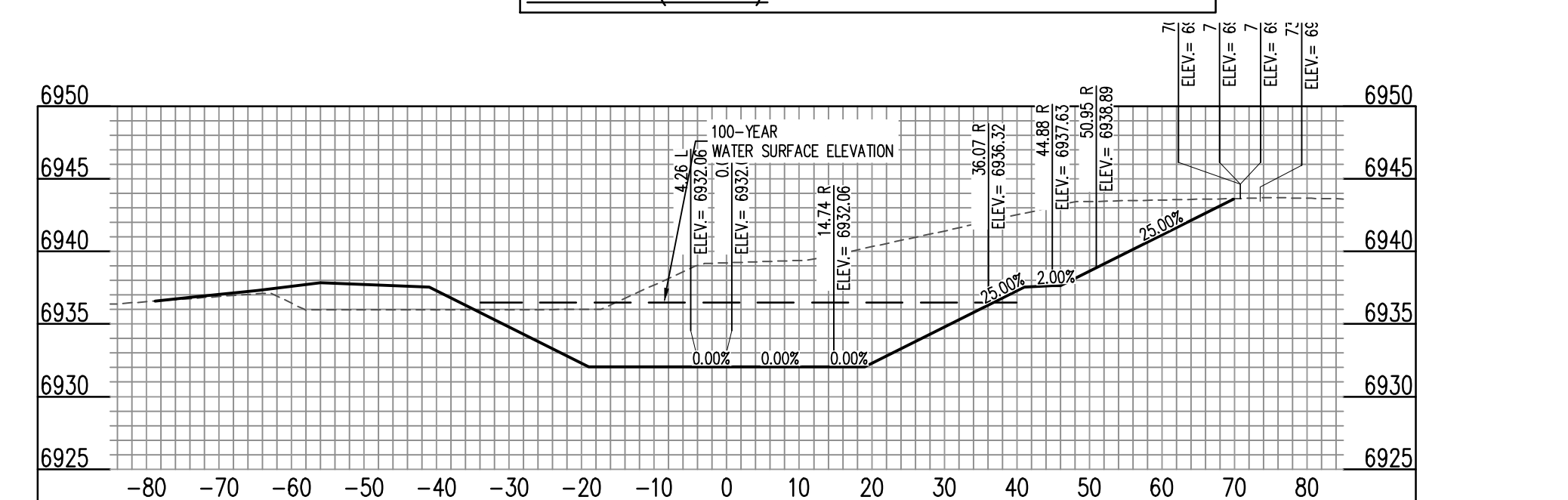
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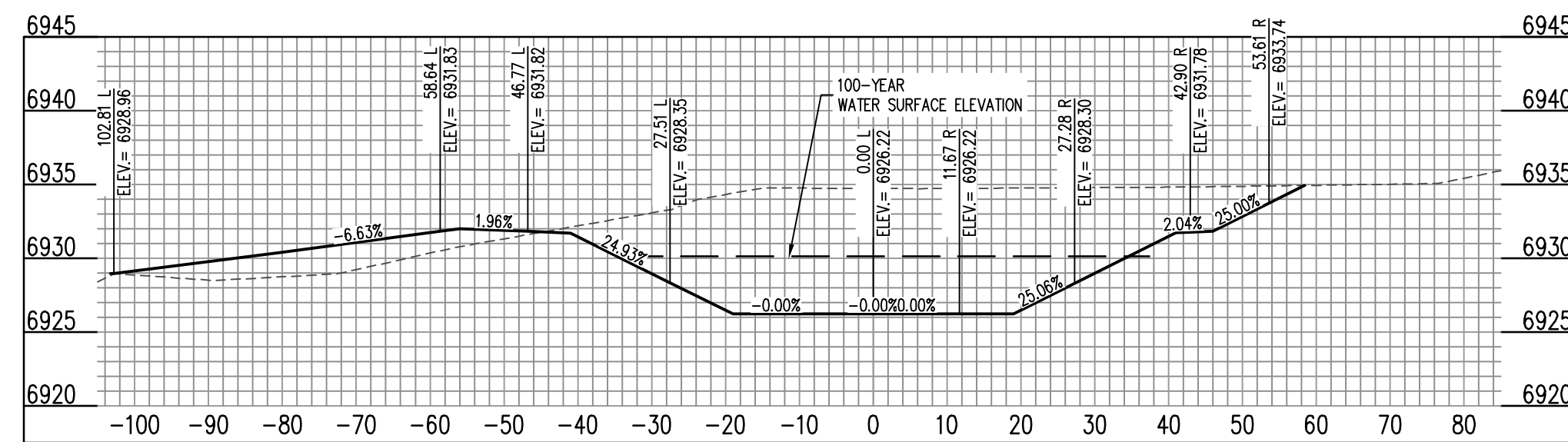
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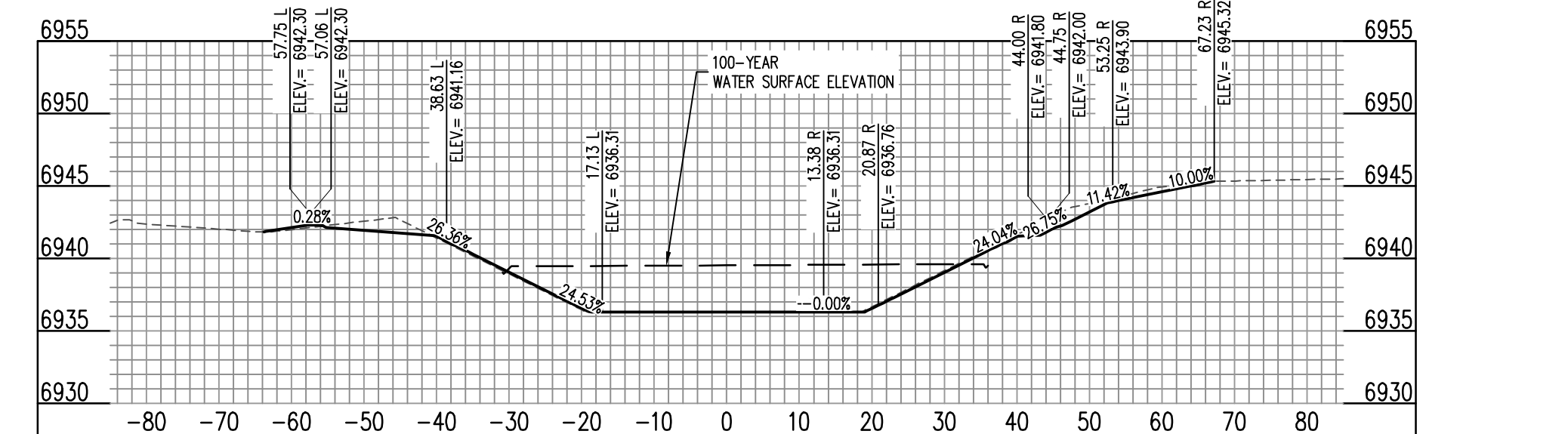
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CHANNEL (38+00) - SCALE: H: 1"=20' V: 1"=10'



CHANNEL (34+00) - SCALE: H: 1"=20' V: 1"=10'



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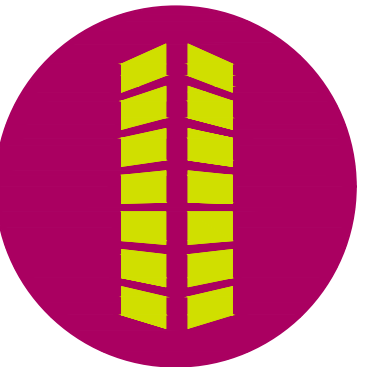
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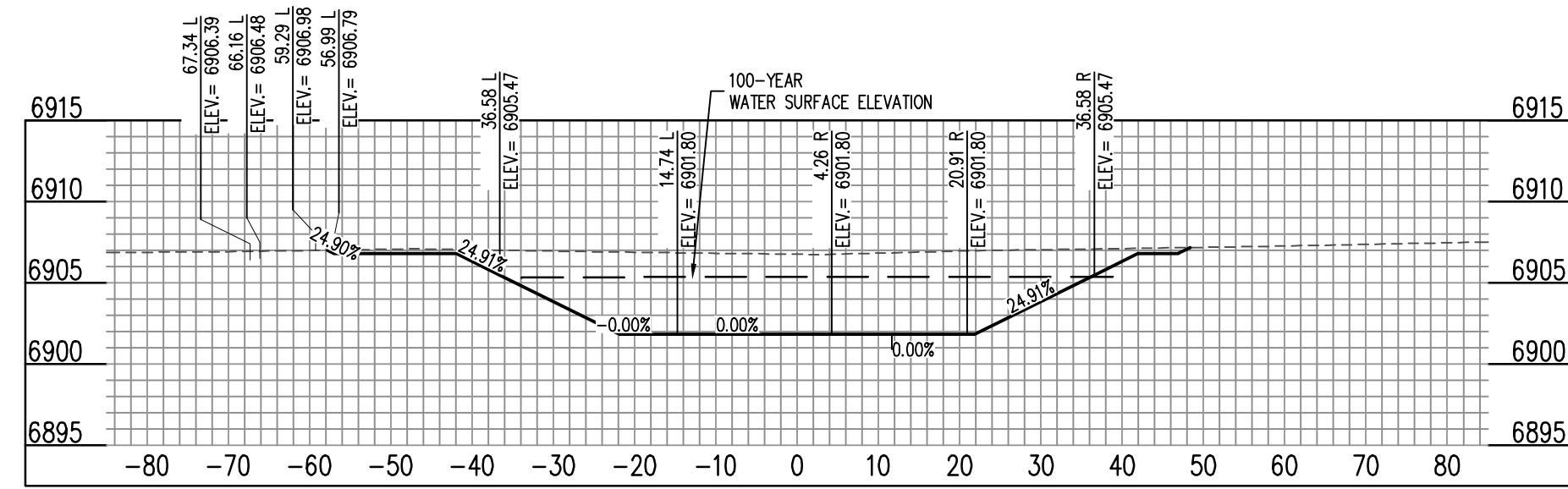
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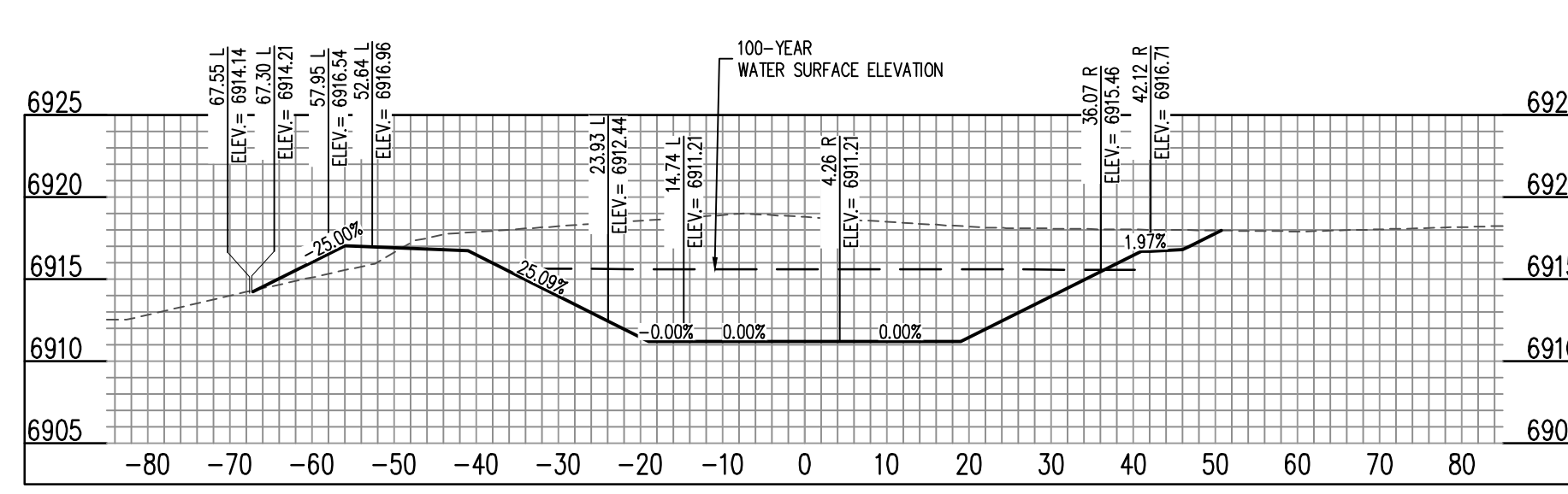
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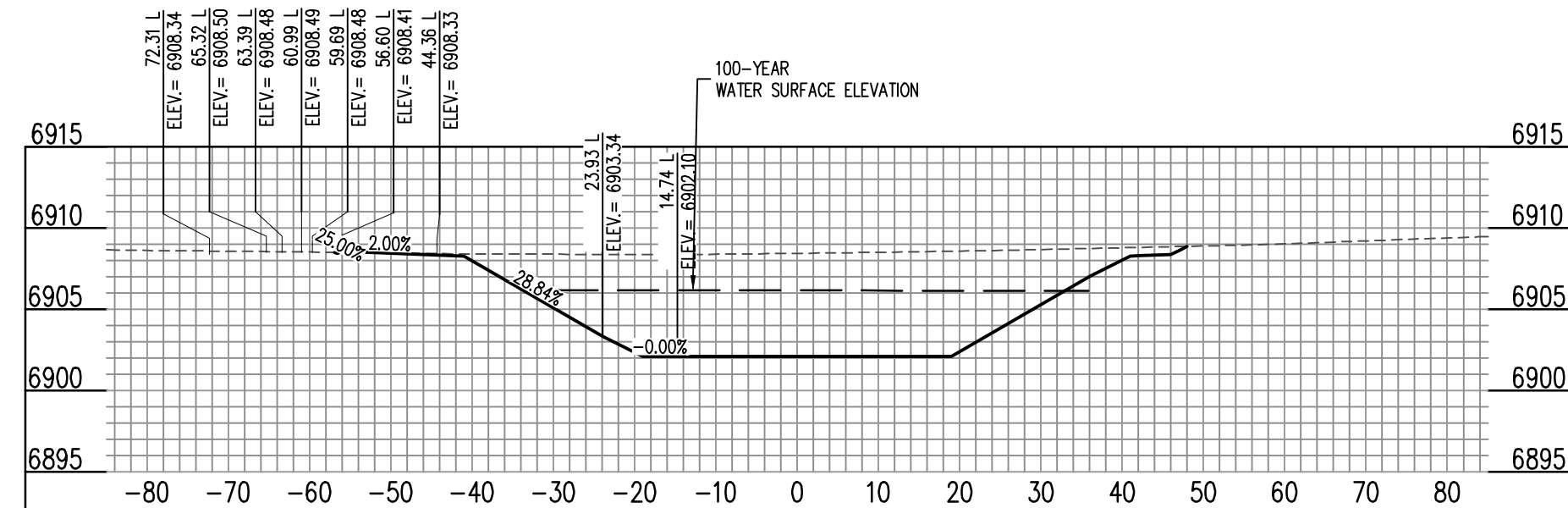
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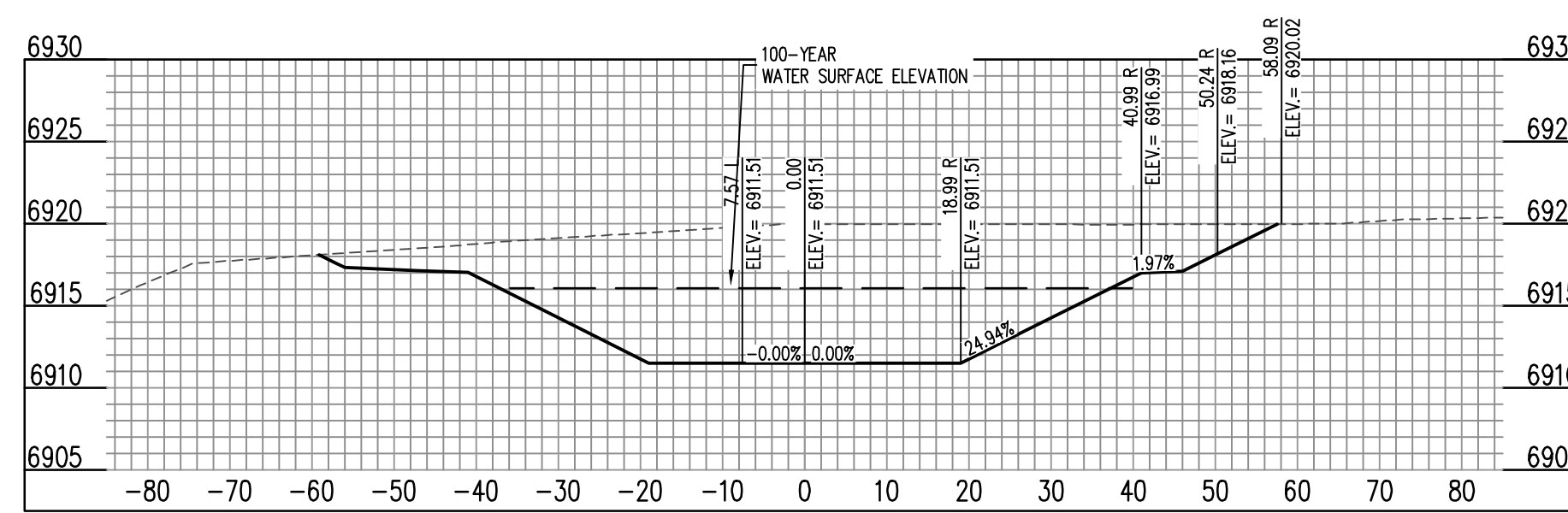
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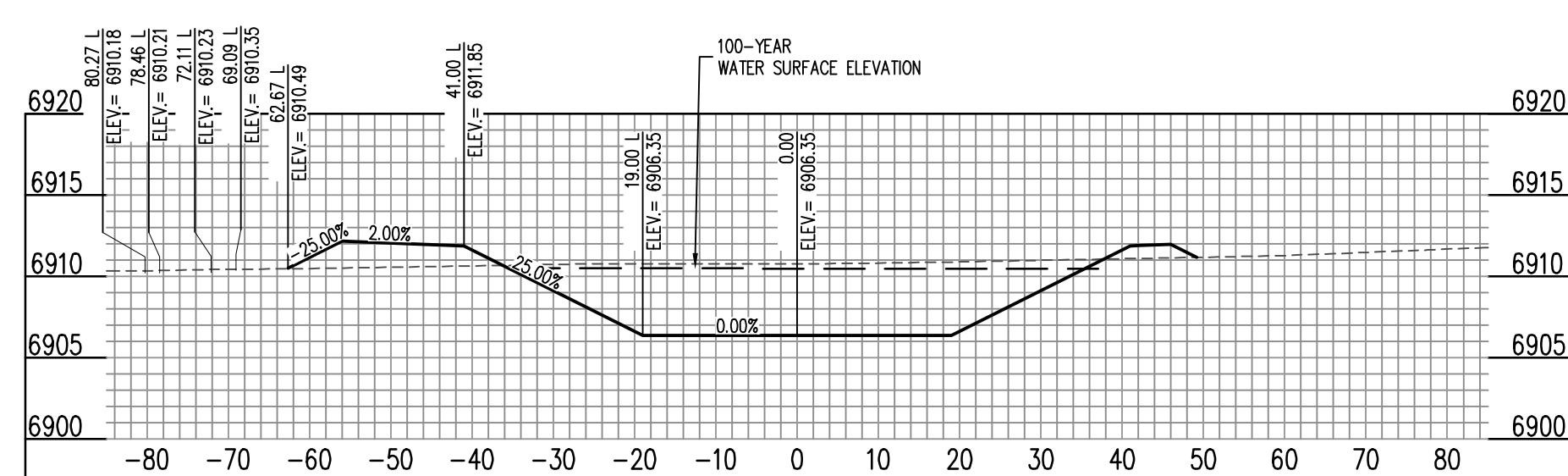
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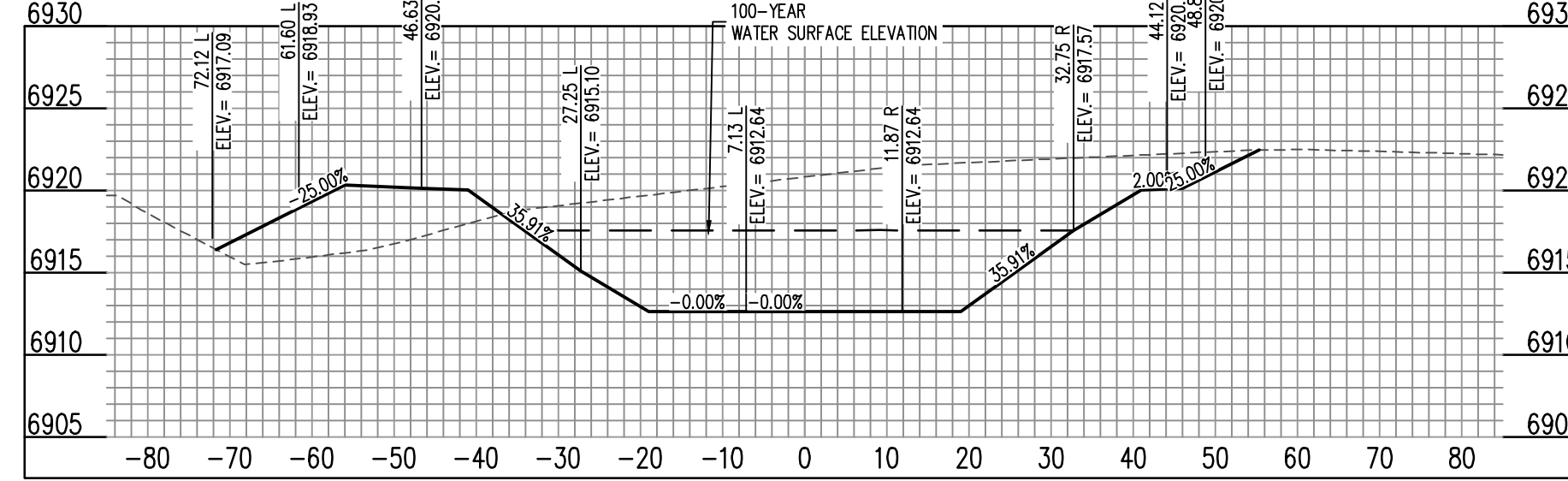
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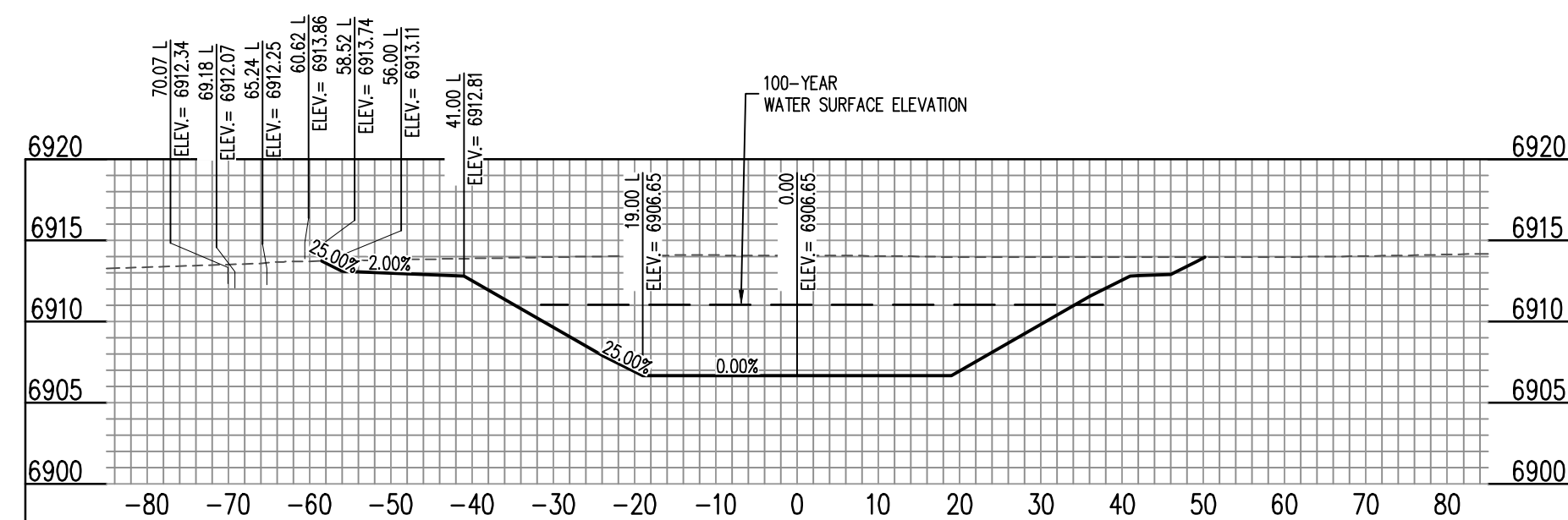
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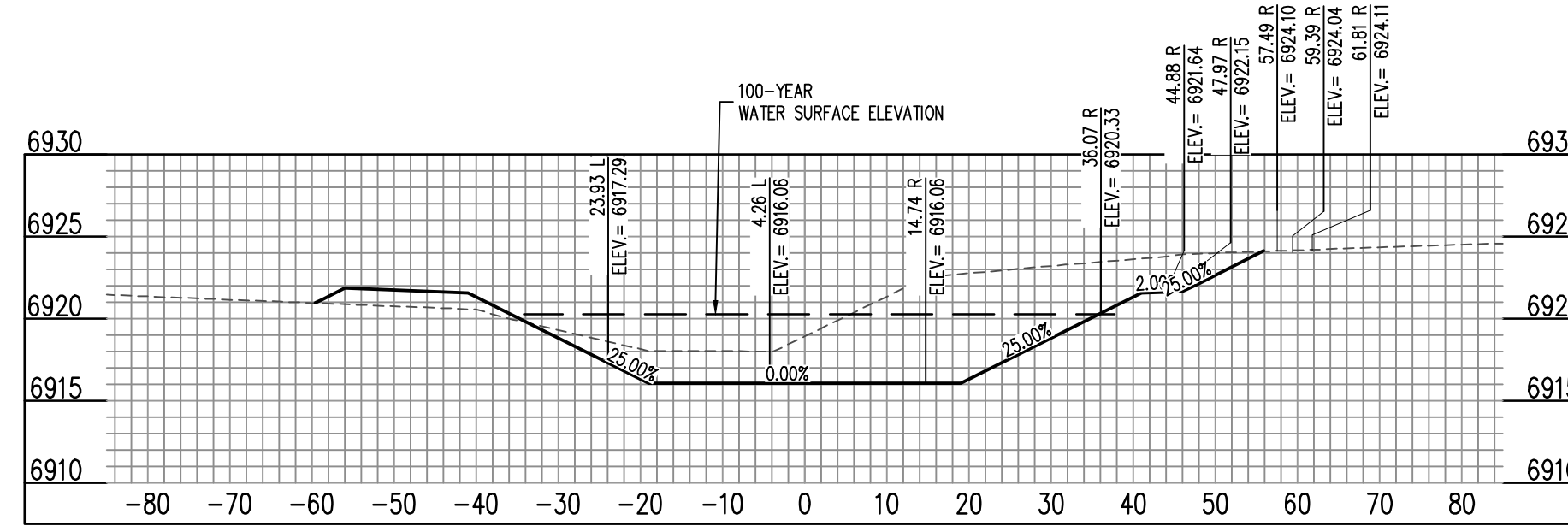
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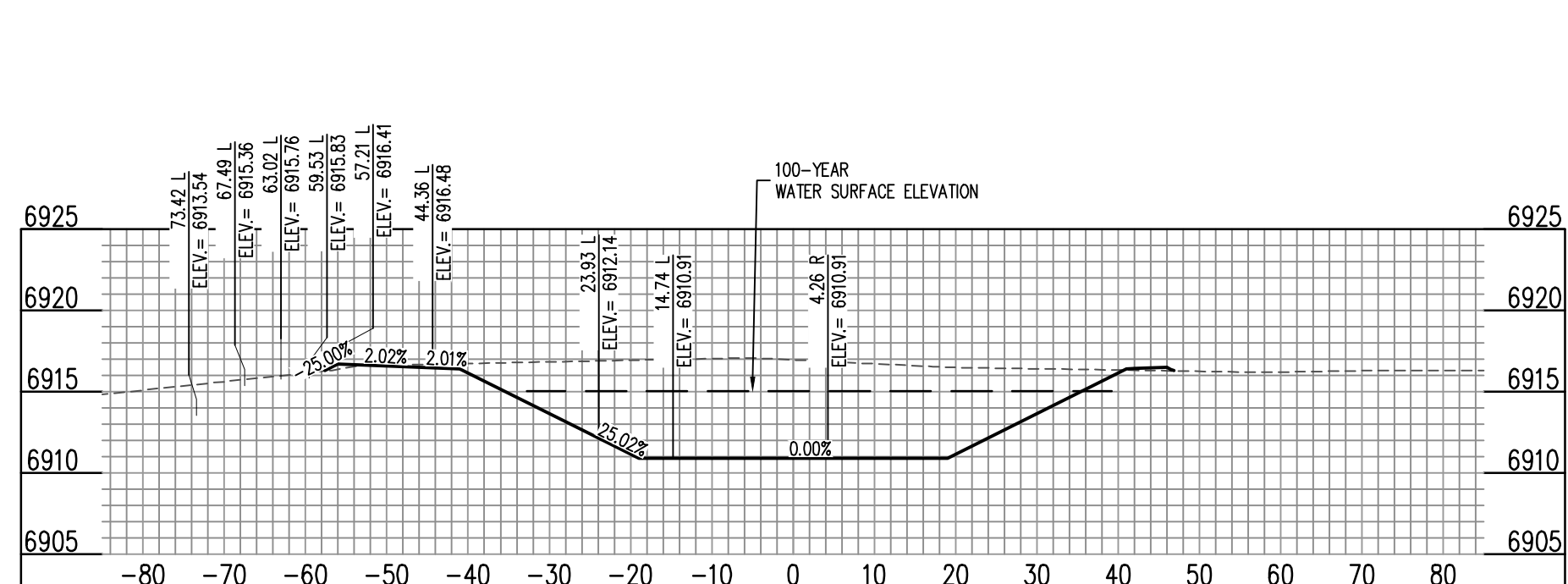
CHANNEL (27+00) - SCALE: H: 1"=20' V: 1"=10'



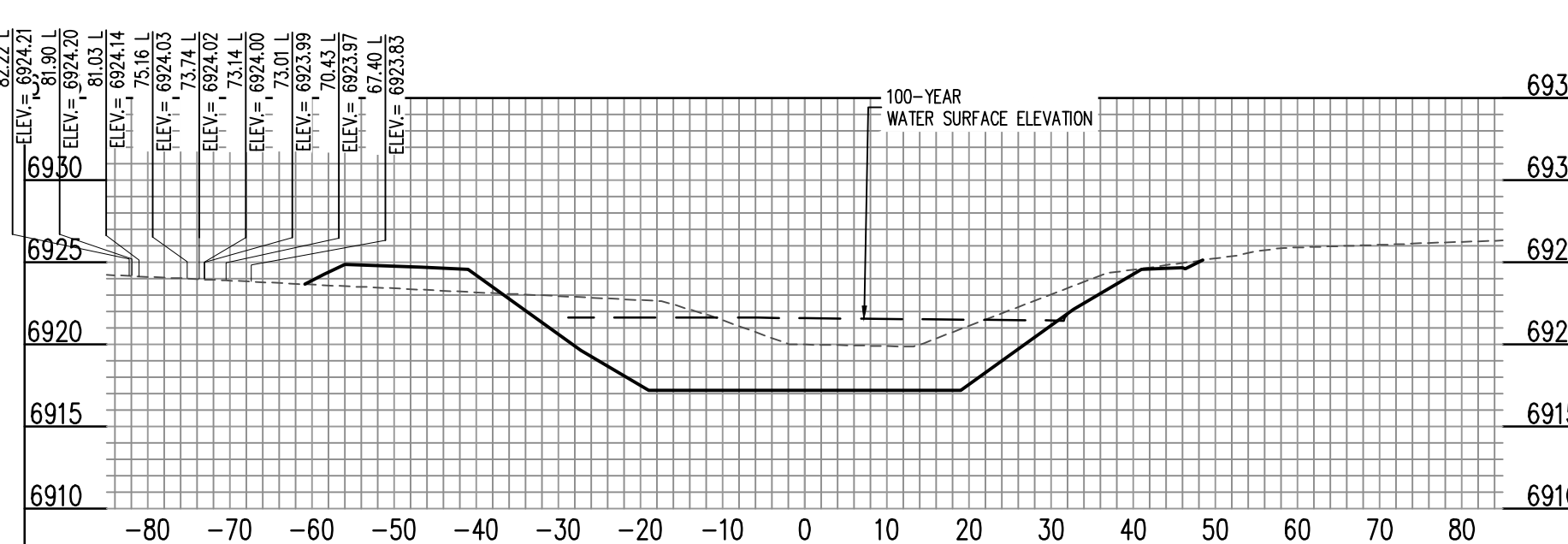
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CHANNEL (28+00) - SCALE: H: 1"=20' V: 1"=10'



CHANNEL (24+00) - SCALE: H: 1"=20' V: 1"=10'



CHANNEL (29+00) - SCALE: H: 1"=20' V: 1"=10'

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- WHERE A PROPOSED UTILITY CROSSES AN EXISTING UTILITY, IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF SUCH EXISTING UTILITY, EITHER THROUGH POT-HOLING OR ALTERNATIVE METHOD. REPORT INFORMATION TO THE ENGINEER PRIOR TO CONSTRUCTION.



DESIGN ENGINEER'S STATEMENT

THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED ROADWAY, DRAINAGE, GRADING AND EROSION CONTROL PLANS AND SPECIFICATIONS, AND SAID PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH APPLICABLE MASTER DRAINAGE PLANS AND MASTER TRANSPORTATION PLANS. SAID PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR ROADWAY AND DRAINAGE FACILITIES ARE DESIGNED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THESE DETAILED PLANS AND SPECIFICATIONS.

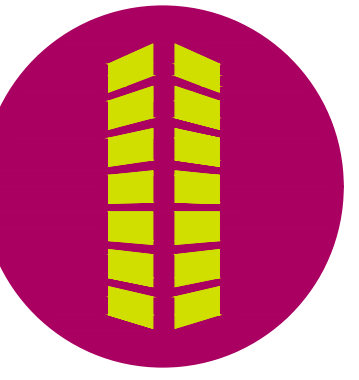
RONALD G. DENNIS, PE 51622

DATE

#	Date	Issue / Description	Init.

Project No: CLH000023
 Drawn By: CMWJ
 Checked By: RGD
 Date: 01/14/2022

SOUTH CHANNEL SECTIONS

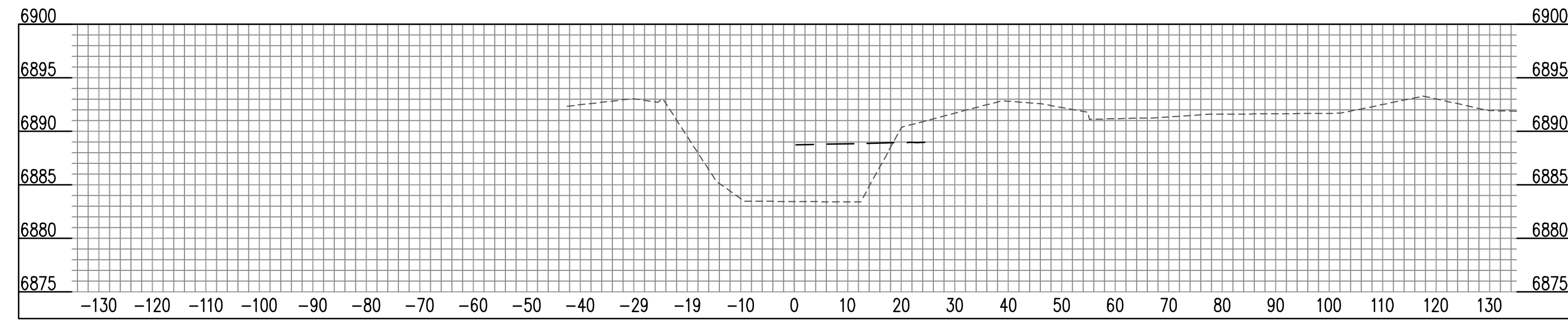


COPYRIGHT
 THESE PLANS ARE AN INSTRUMENT OF SERVICE AND ARE THE PROPERTY OF GALLOWAY, AND MAY NOT BE DUPLICATED, DISCLOSED, OR REPRODUCED WITHOUT THE WRITTEN CONSENT OF GALLOWAY. COPYRIGHTS AND INFRINGEMENTS WILL BE ENFORCED AND PROSECUTED.

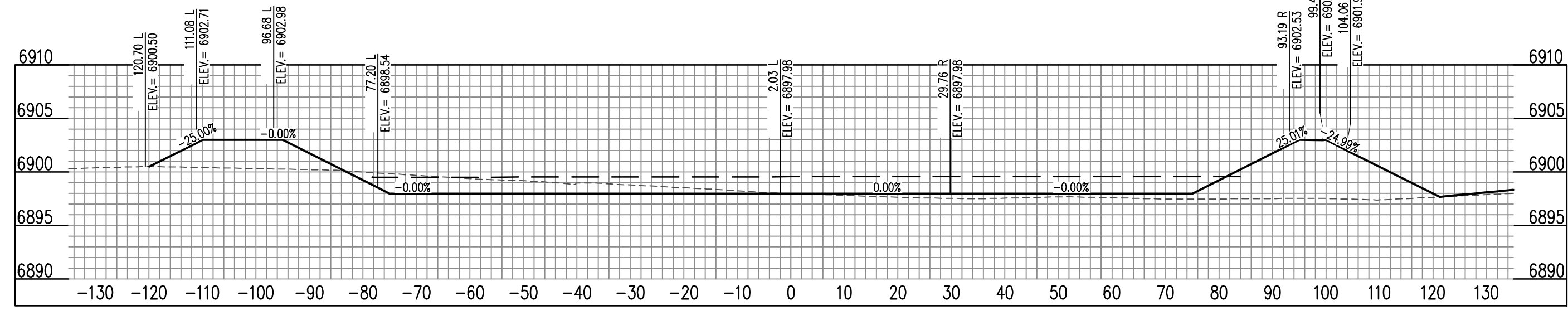


CONSTRUCTION DOCUMENTS
FALCON MEADOWS AT BENT GRASS
FOR
CHALLENGER COMMUNITIES, LLC
 BENT GRASS MEADOWS DRIVE & MERIDAN ROAD
 FALCON, CO 80831 - EL PASO COUNTY

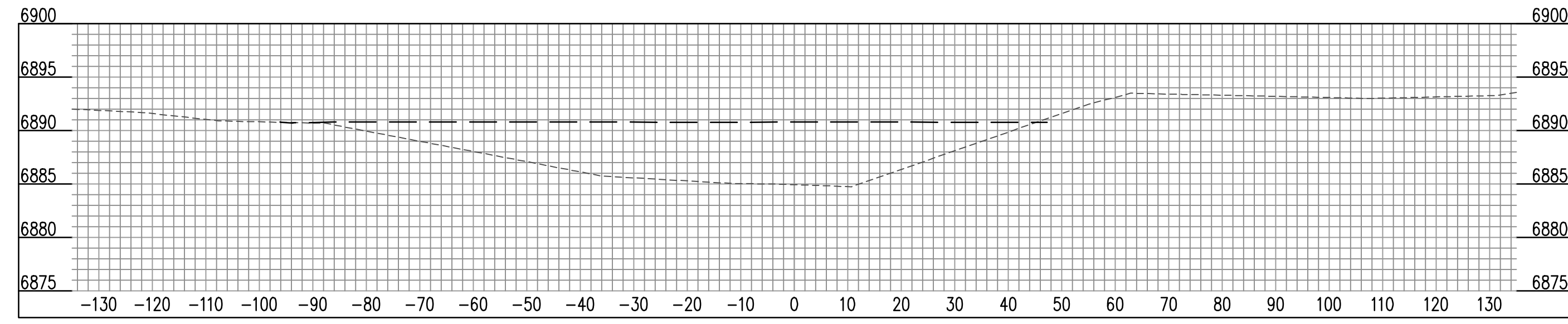
#	Date	Issue / Description	Init.



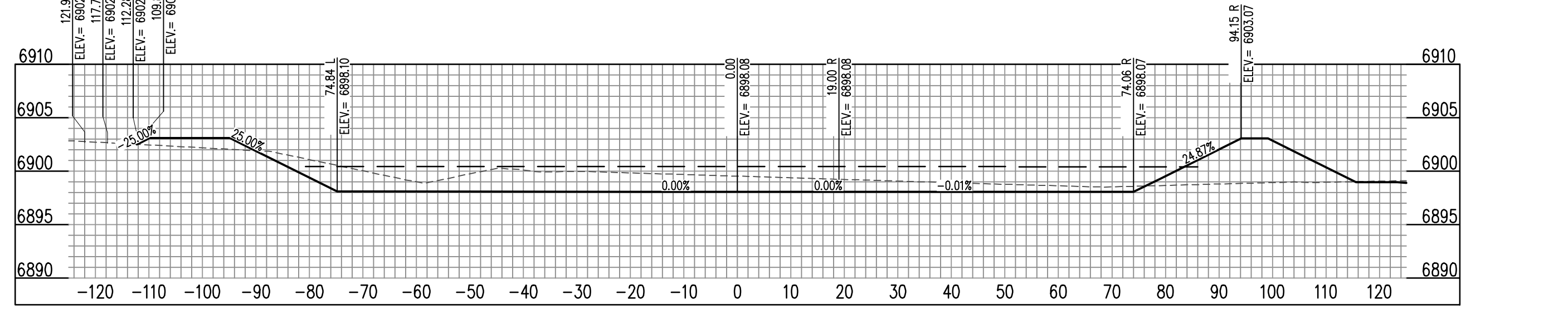
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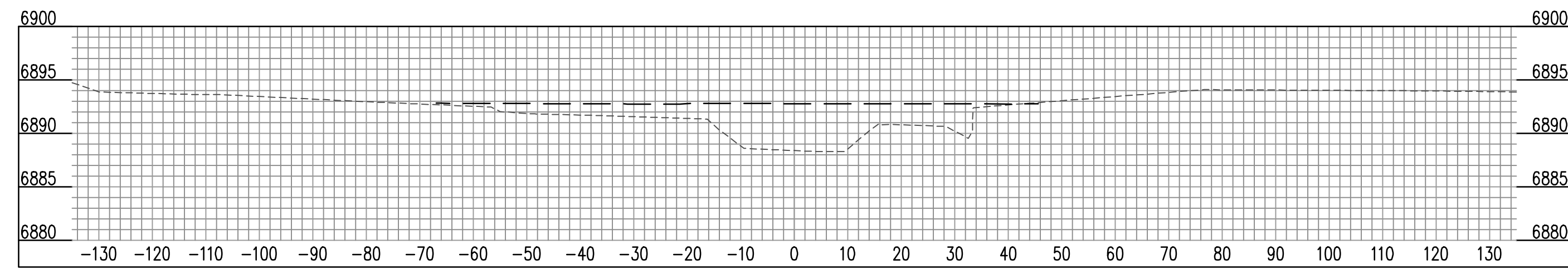
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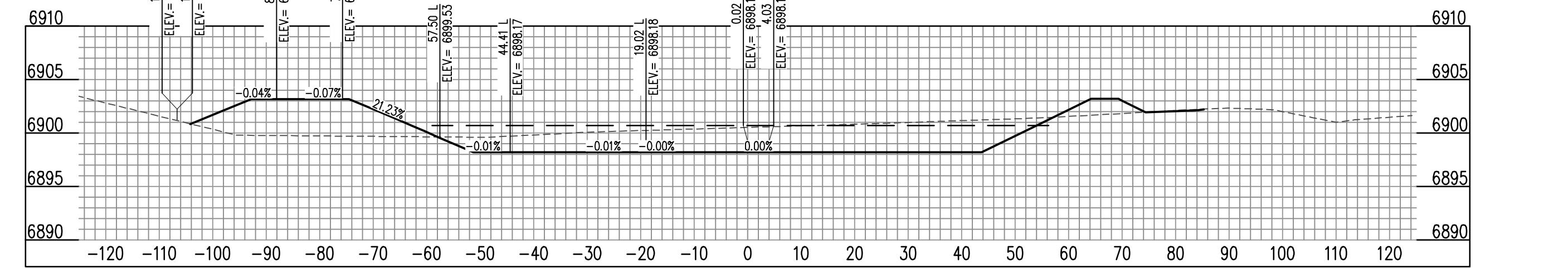
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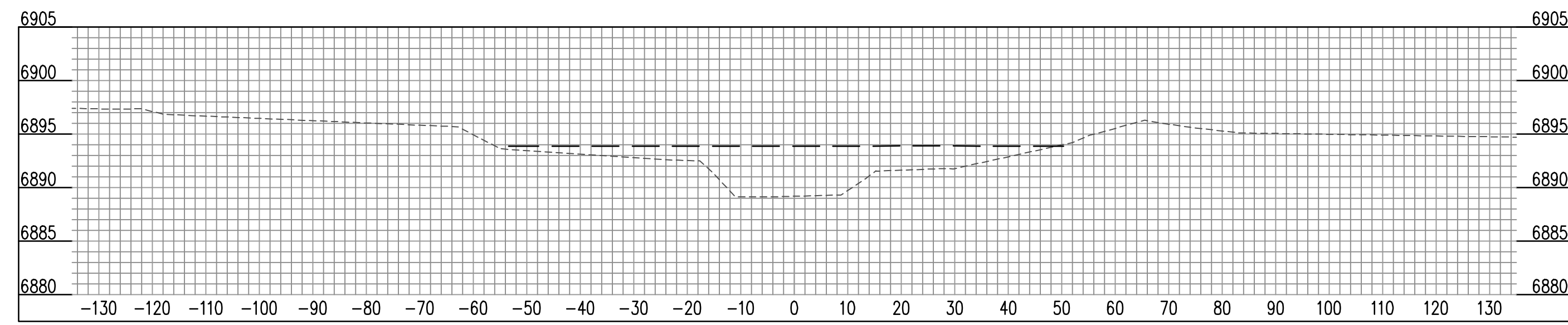
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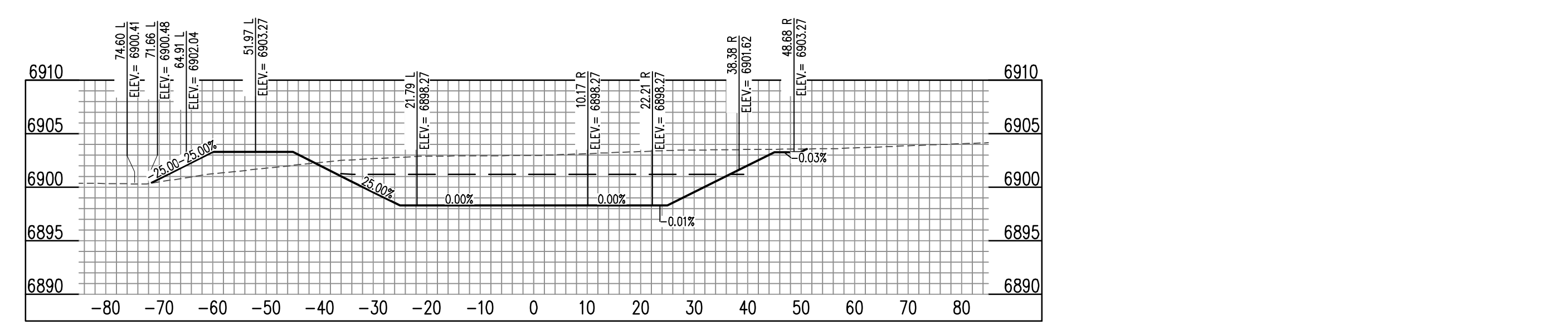
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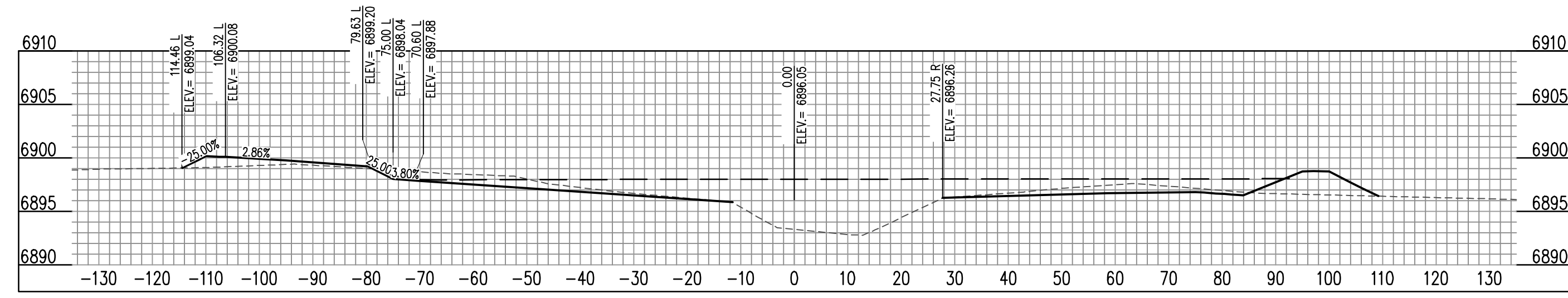
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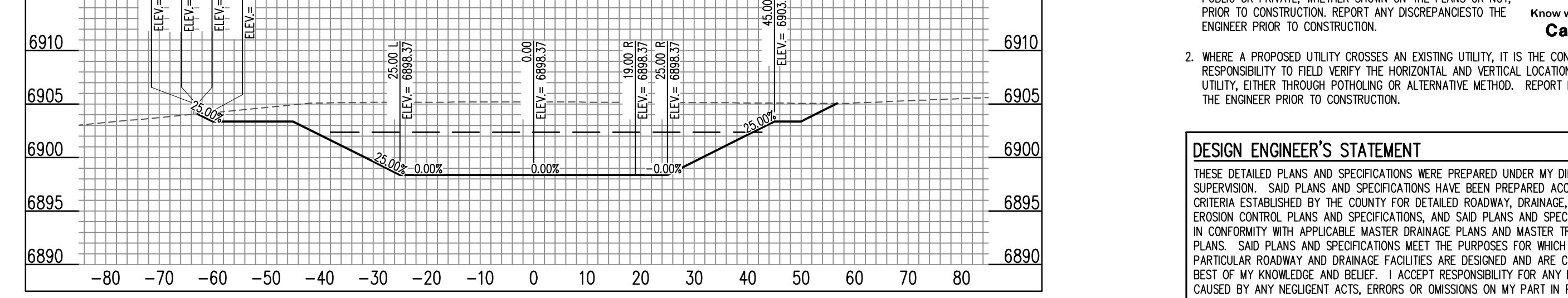
CHANNEL (13+00) - SCALE: H: 1"=20' V: 1"=10'



CHANNEL (18+00) - SCALE: H: 1"=20' V: 1"=10'



CHANNEL (14+00) - SCALE: H: 1"=20' V: 1"=10'



CHANNEL (19+00) - SCALE: H: 1"=20' V: 1"=10'

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Know what's below.
Call before you dig.

DESIGN ENGINEER'S STATEMENT

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RONALD G. DENNIS, PE 51622

DATE

ATTACHMENT F
Corrected Model Results Table



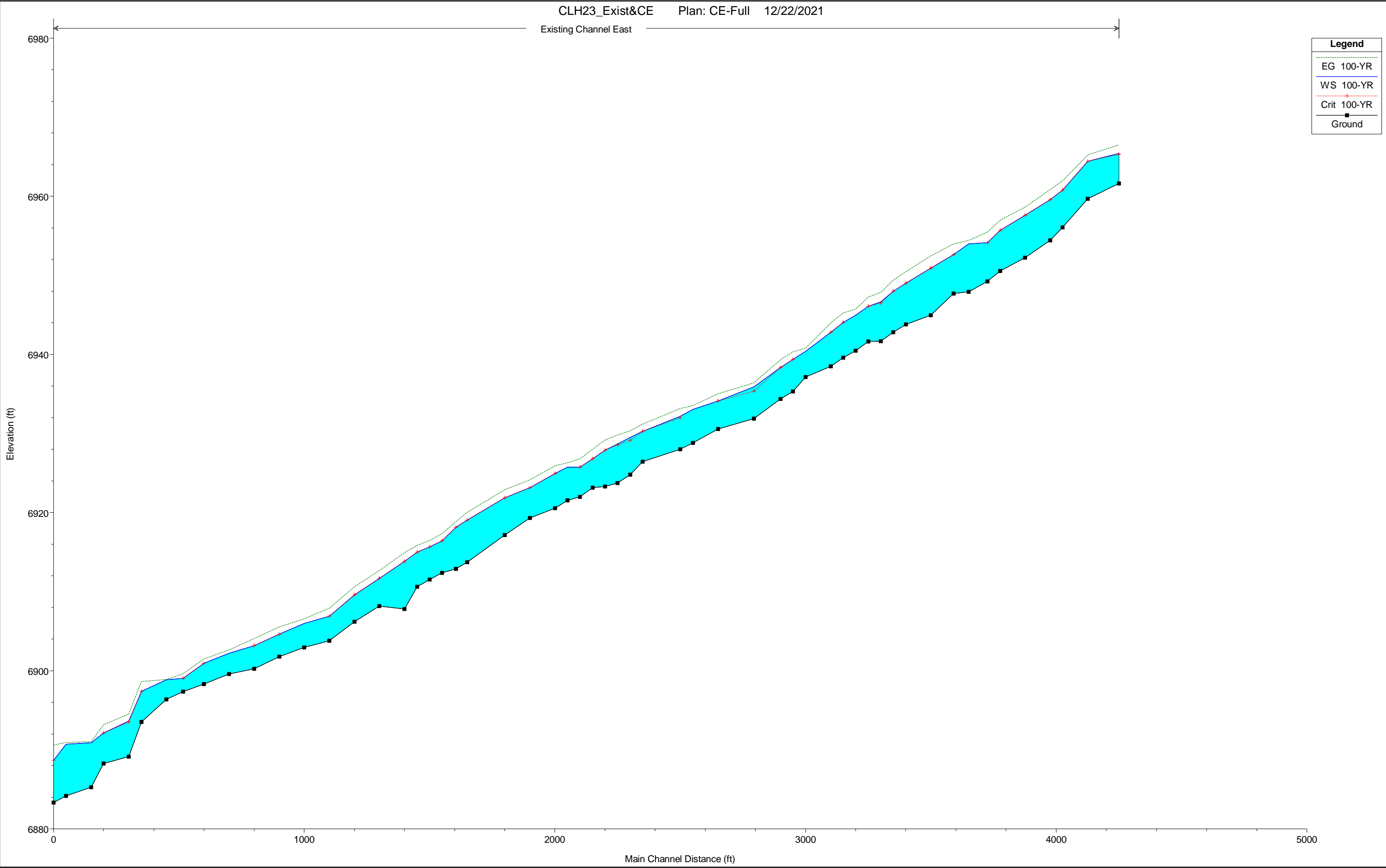
HEC-RAS Plan: CE-Full River: Existing Channel Reach: East Profile: 100-YR

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
East	5100	100-YR	1450.00	6961.61	6965.44	6965.30	6966.52	0.011582	8.37	173.33	69.36	0.93
East	5000	100-YR	1450.00	6959.70	6964.44	6964.44	6965.25	0.008065	7.85	249.03	150.00	0.80
East	4900	100-YR	1450.00	6956.08	6960.79	6960.79	6961.95	0.013766	8.64	167.91	72.92	1.00
East	4850	100-YR	1450.00	6954.44	6959.57	6959.57	6960.85	0.011955	9.11	164.48	76.47	0.96
East	4750	100-YR	1450.00	6952.24	6957.61	6957.61	6958.64	0.009194	8.42	202.35	106.55	0.85
East	4650	100-YR	1450.00	6950.54	6955.69	6955.69	6956.99	0.009734	9.44	180.55	88.71	0.90
East	4600	100-YR	1450.00	6949.23	6954.14	6954.14	6955.50	0.011212	9.39	162.26	72.27	0.95
East	4550	100-YR	1450.00	6947.92	6953.99		6954.44	0.003636	5.85	299.78	108.98	0.55
East	4500	100-YR	1450.00	6947.69	6952.62	6952.62	6953.98	0.012698	9.36	156.36	63.97	0.99
East	4400	100-YR	1450.00	6944.96	6950.91	6950.91	6952.44	0.012996	9.93	145.97	48.16	1.01
East	4300	100-YR	1450.00	6943.79	6949.03	6949.03	6950.47	0.013076	9.63	150.65	52.85	1.01
East	4250	100-YR	1450.00	6942.82	6947.98	6947.98	6949.38	0.013214	9.48	152.90	55.39	1.01
East	4200	100-YR	1450.00	6941.68	6946.64	6946.50	6947.85	0.011256	8.82	165.69	68.05	0.93
East	4150	100-YR	1450.00	6941.65	6946.09	6946.09	6947.25	0.011968	8.69	172.72	93.27	0.95
East	4100	100-YR	1450.00	6940.48	6944.95		6945.73	0.006607	7.16	214.04	87.34	0.73
East	4050	100-YR	1450.00	6939.60	6944.04	6944.04	6945.24	0.012970	8.80	166.68	75.86	0.98
East	4000	100-YR	1450.00	6938.49	6942.81	6942.81	6943.97	0.013747	8.63	167.95	72.77	1.00
East	3900	100-YR	1482.00	6937.13	6940.40		6940.79	0.004893	4.97	298.20	137.20	0.59
East	3850	100-YR	1482.00	6935.31	6939.38	6939.38	6940.33	0.015218	7.83	189.31	102.79	1.02
East	3800	100-YR	1482.00	6934.35	6938.37	6938.37	6939.35	0.014818	7.97	185.87	95.62	1.01
East	3694	100-YR	1482.00	6931.87	6935.90	6935.35	6936.40	0.006339	5.66	261.92	120.28	0.68
East	3600	100-YR	1482.00	6930.58	6934.13	6934.13	6935.02	0.015261	7.59	195.27	111.20	1.01
East	3500	100-YR	1482.00	6928.81	6933.06		6933.53	0.004466	5.49	269.94	99.40	0.59
East	3450	100-YR	1482.00	6928.02	6932.16	6931.98	6933.14	0.011213	7.97	185.96	78.07	0.91
East	3350	100-YR	1482.00	6926.42	6930.26	6930.26	6931.20	0.014860	7.79	190.26	102.64	1.01
East	3300	100-YR	1482.00	6924.78	6929.52	6929.13	6930.36	0.008627	7.33	203.28	90.23	0.81
East	3250	100-YR	1482.00	6923.75	6928.65	6928.57	6929.81	0.012281	8.65	172.15	77.55	0.96
East	3200	100-YR	1482.00	6923.28	6927.89	6927.89	6929.18	0.012805	9.12	164.05	69.81	1.00
East	3150	100-YR	1482.00	6923.15	6926.80	6926.80	6928.02	0.011835	8.92	173.15	89.33	0.96
East	3100	100-YR	1482.00	6921.98	6925.73	6925.73	6926.80	0.010846	8.32	189.46	115.29	0.91
East	3050	100-YR	1482.00	6921.56	6925.75		6926.28	0.003812	5.90	276.01	119.52	0.56
East	3000	100-YR	1482.00	6920.57	6924.94	6924.94	6925.93	0.010696	8.09	198.14	120.81	0.90
East	2900	100-YR	1482.00	6919.31	6923.14	6923.14	6924.13	0.009679	8.40	217.59	125.92	0.87
East	2800	100-YR	1482.00	6917.16	6921.89	6921.89	6922.89	0.007415	8.47	228.01	129.53	0.79
East	2650	100-YR	1482.00	6913.71	6919.05	6919.05	6920.05	0.007453	8.52	233.99	140.11	0.79
East	2605	100-YR	1482.00	6912.90	6918.14	6918.14	6918.84	0.007050	7.18	291.71	257.53	0.74
East	2550	100-YR	1482.00	6912.38	6916.42	6916.42	6917.34	0.009885	8.11	231.50	159.50	0.87
East	2500	100-YR	1482.00	6911.54	6915.64	6915.64	6916.45	0.015320	7.20	205.95	127.95	1.00
East	2450	100-YR	1482.00	6910.62	6915.01	6915.01	6915.85	0.007581	7.87	249.73	150.00	0.78
East	2400	100-YR	1482.00	6907.81	6913.82	6913.82	6914.92	0.008446	8.64	206.08	128.30	0.83
East	2300	100-YR	1482.00	6908.18	6911.66	6911.66	6912.68	0.010513	8.50	214.19	134.14	0.90
East	2200	100-YR	1482.00	6906.18	6909.60	6909.60	6910.63	0.014373	8.16	181.72	89.13	1.01
East	2100	100-YR	1482.00	6903.79	6906.88	6906.88	6907.90	0.014545	8.13	182.20	90.63	1.01
East	2000	100-YR	1482.00	6902.93	6905.98		6906.57	0.007178	6.12	242.21	108.75	0.72
East	1900	100-YR	1482.00	6901.77	6904.63	6904.63	6905.54	0.014740	7.62	194.43	107.89	1.00
East	1800	100-YR	1482.00	6900.25	6903.16	6903.16	6904.07	0.014494	7.69	194.04	114.37	1.00
East	1700	100-YR	1482.00	6899.58	6902.20		6902.60	0.007757	5.09	291.31	183.38	0.71
East	1600	100-YR	1482.00	6898.29	6900.92	6900.92	6901.47	0.017393	5.95	249.03	232.59	1.00
East	1517	100-YR	1482.00	6897.37	6899.02	6899.02	6899.62	0.017218	6.20	238.99	203.41	1.01
East	1450	100-YR	1482.00	6896.35	6898.86		6898.89	0.000429	1.20	1144.29	467.39	0.17
East	1350	100-YR	1482.00	6893.53	6897.38	6897.38	6898.64	0.010449	9.83	200.13	97.33	0.93
East	1300	100-YR	1482.00	6889.13	6893.61	6893.53	6894.55	0.013276	7.75	191.17	94.56	0.96
East	1200	100-YR	1482.00	6888.27	6892.12	6892.12	6893.15	0.014656	8.14	182.05	88.89	1.00
East	1150	100-YR	1482.00	6885.25	6890.89		6891.02	0.000976	2.96	505.40	160.45	0.29
East	1050	100-YR	1482.00	6884.18	6890.69		6890.91	0.001169	3.75	395.65	94.20	0.32
East	1000	100-YR	1482.00	6883.33	6888.64	6888.64	6890.60	0.012887	11.22	132.13	34.10	1.00

ATTACHMENT G
Corrected Water Surface Profiles

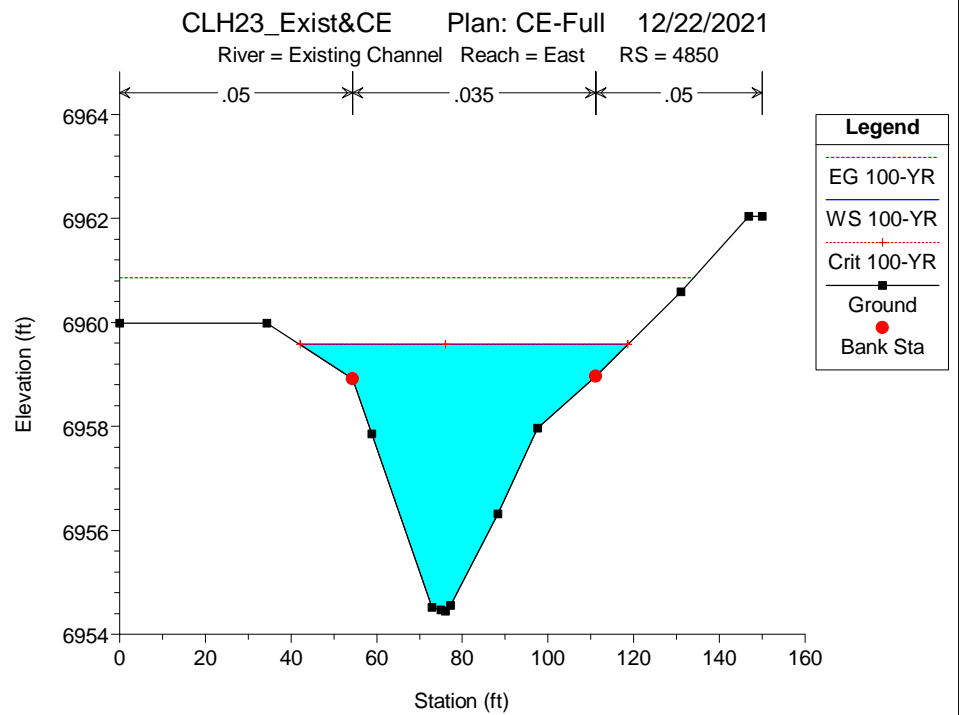
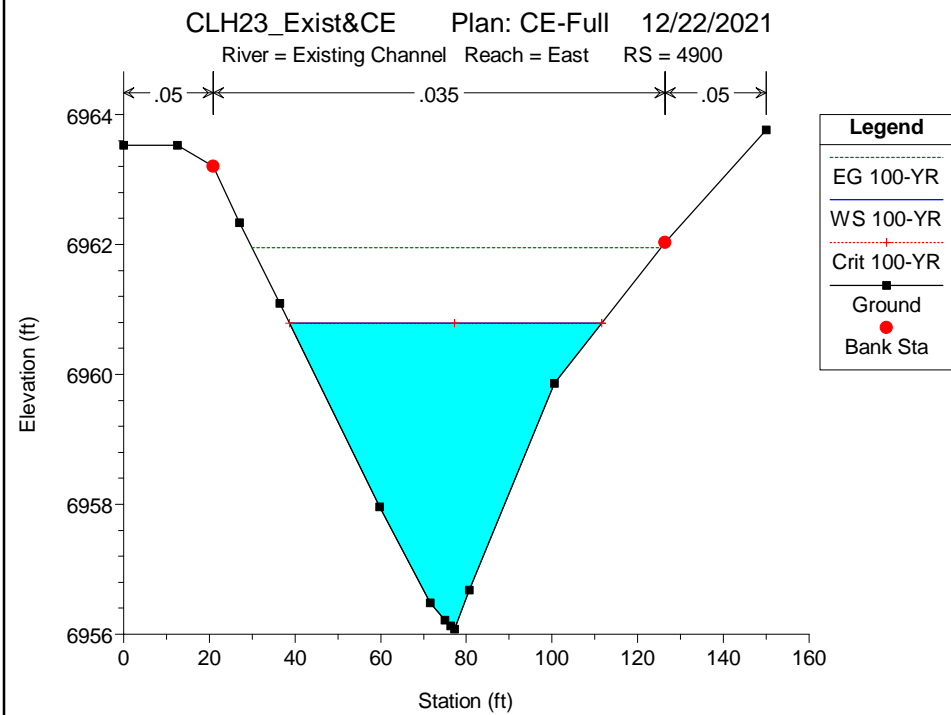
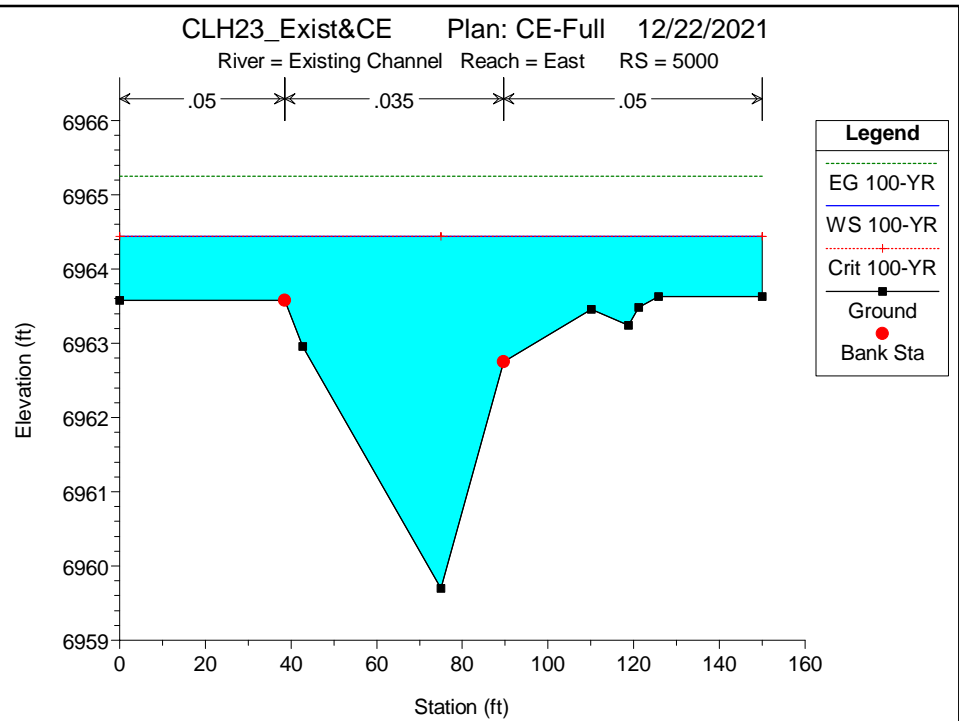
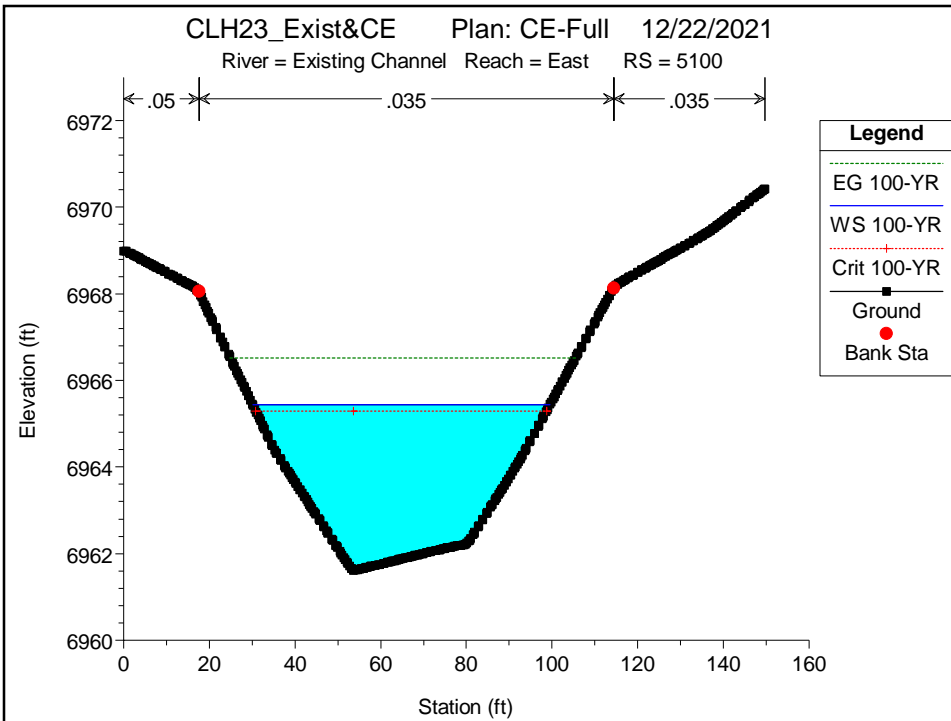


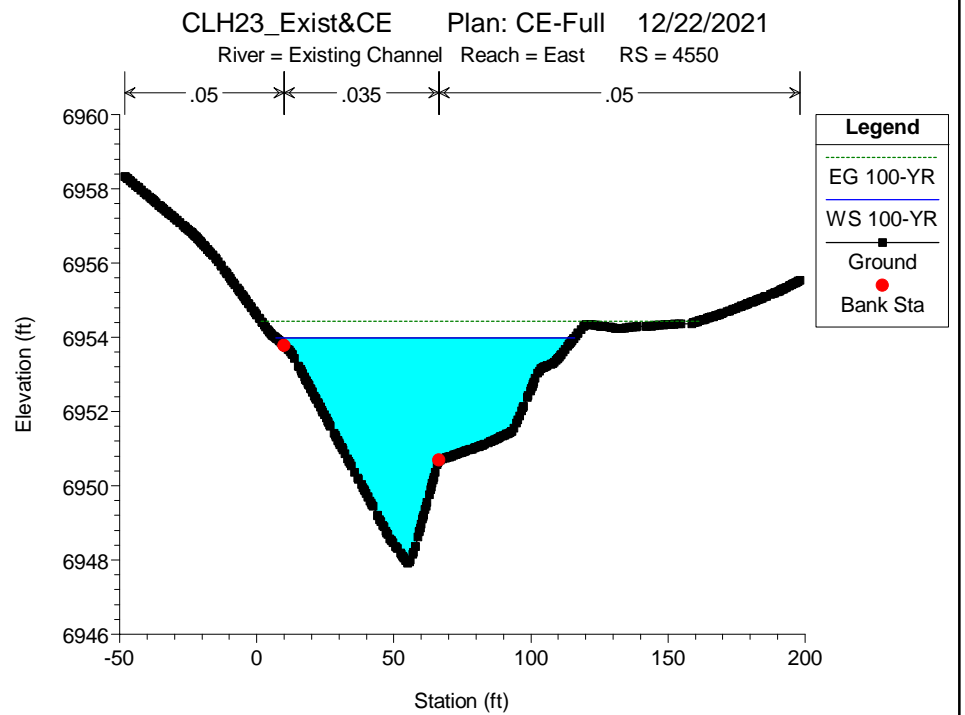
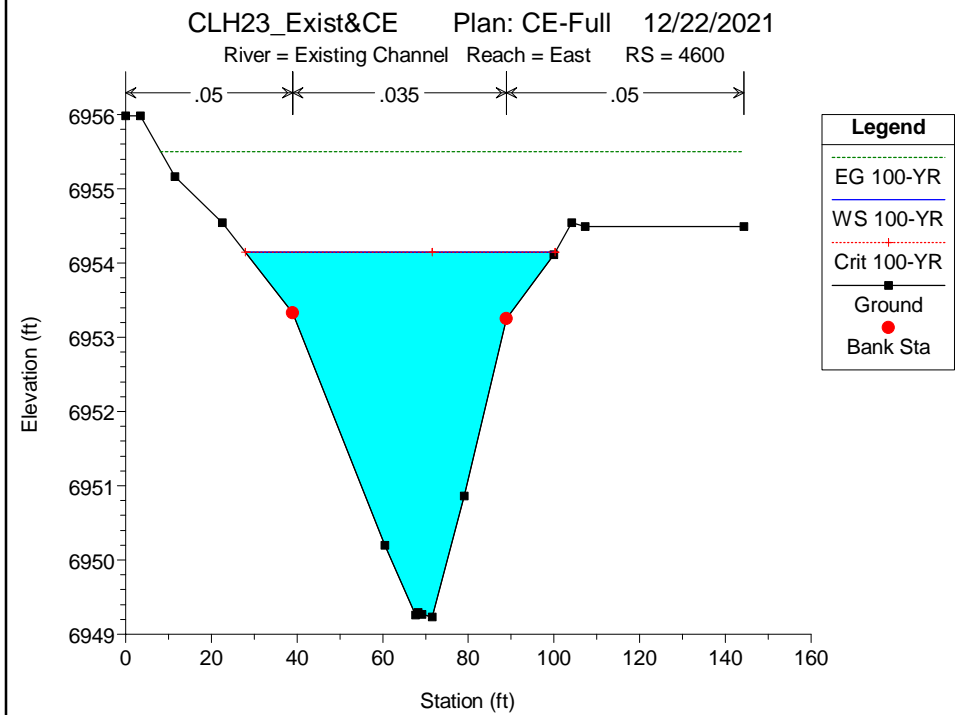
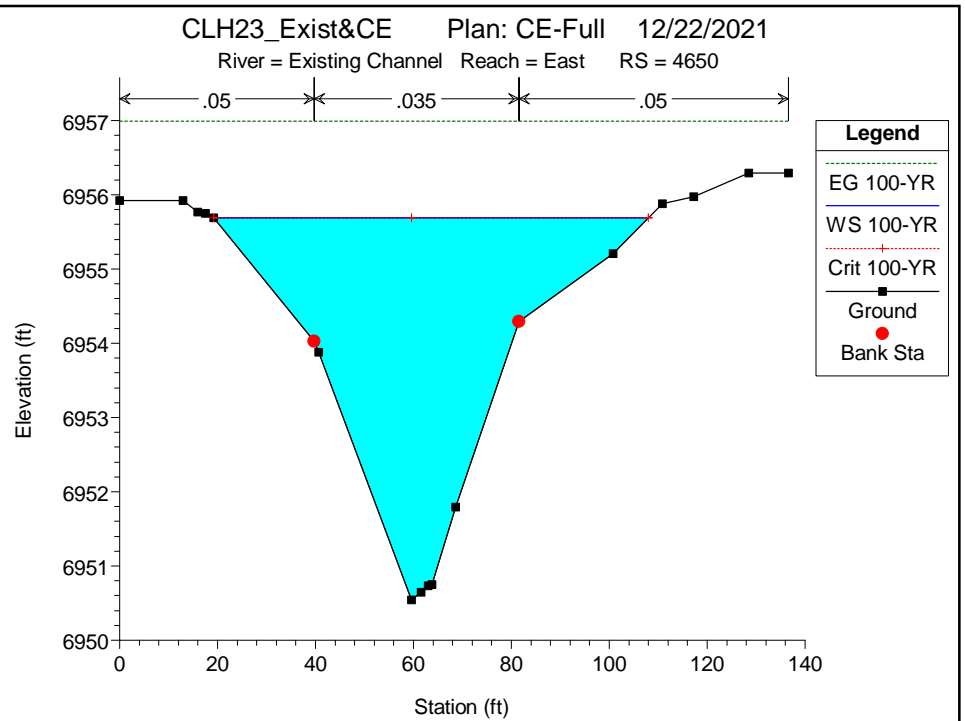
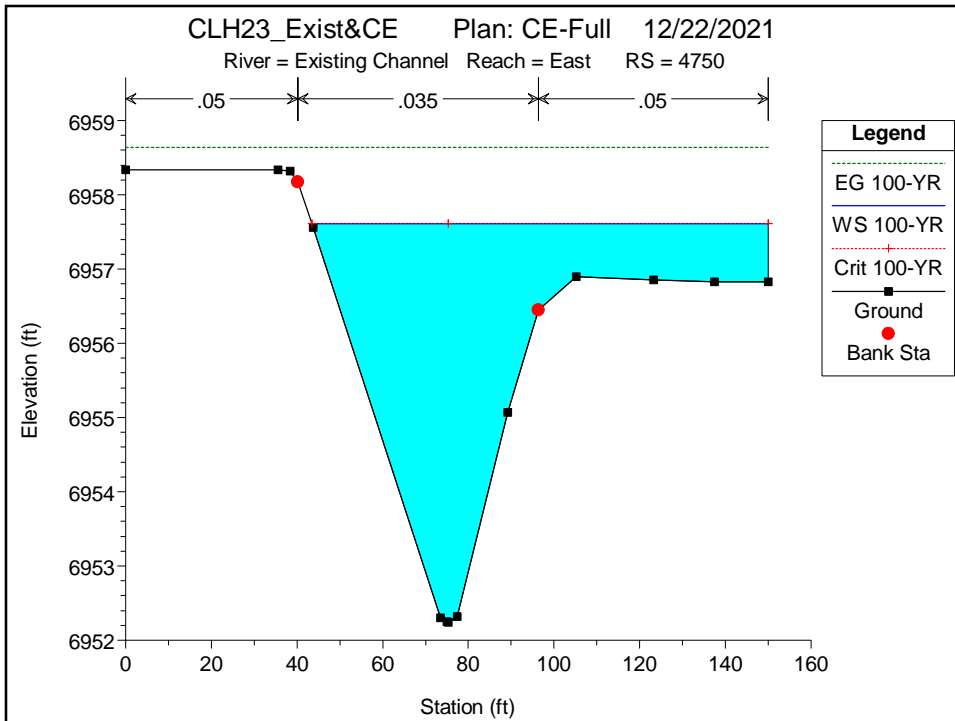
Legend	
EG 100-YR	
WS 100-YR	
Crit 100-YR	
Ground	

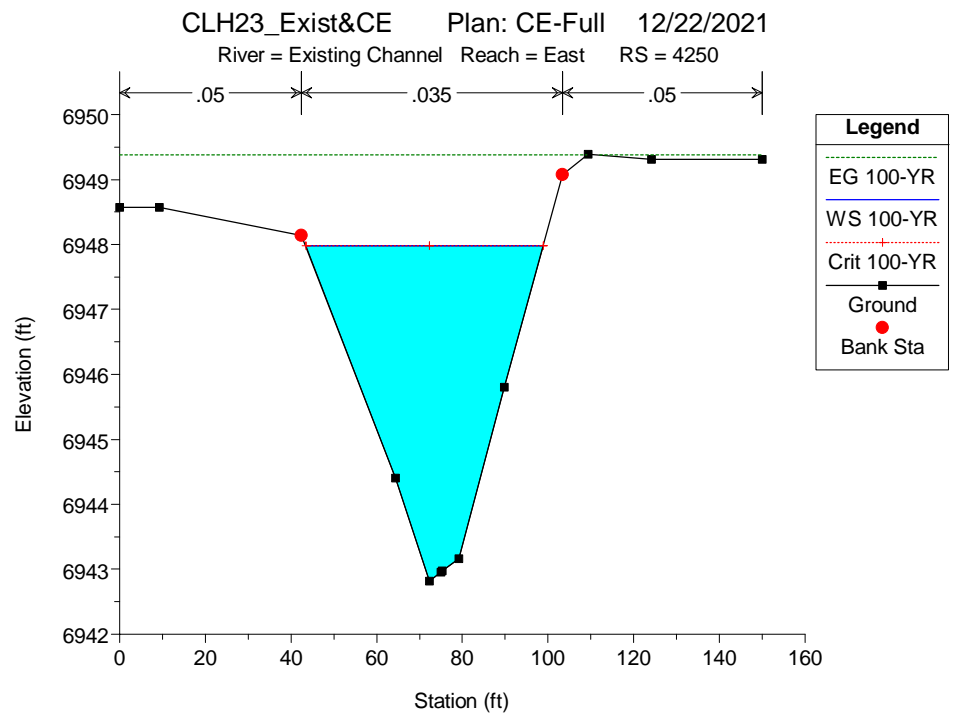
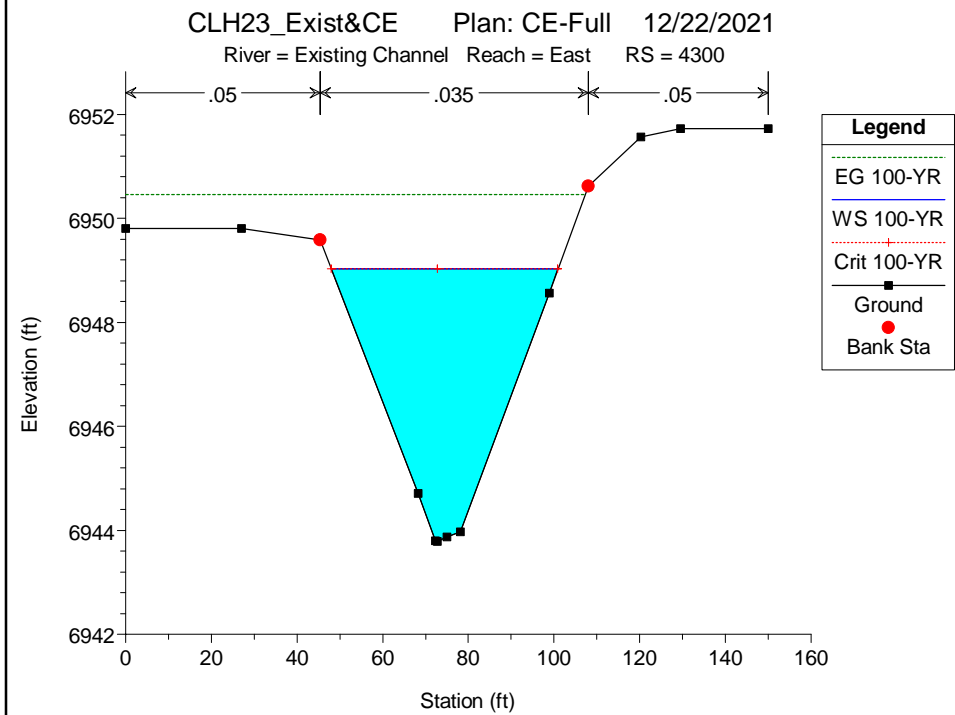
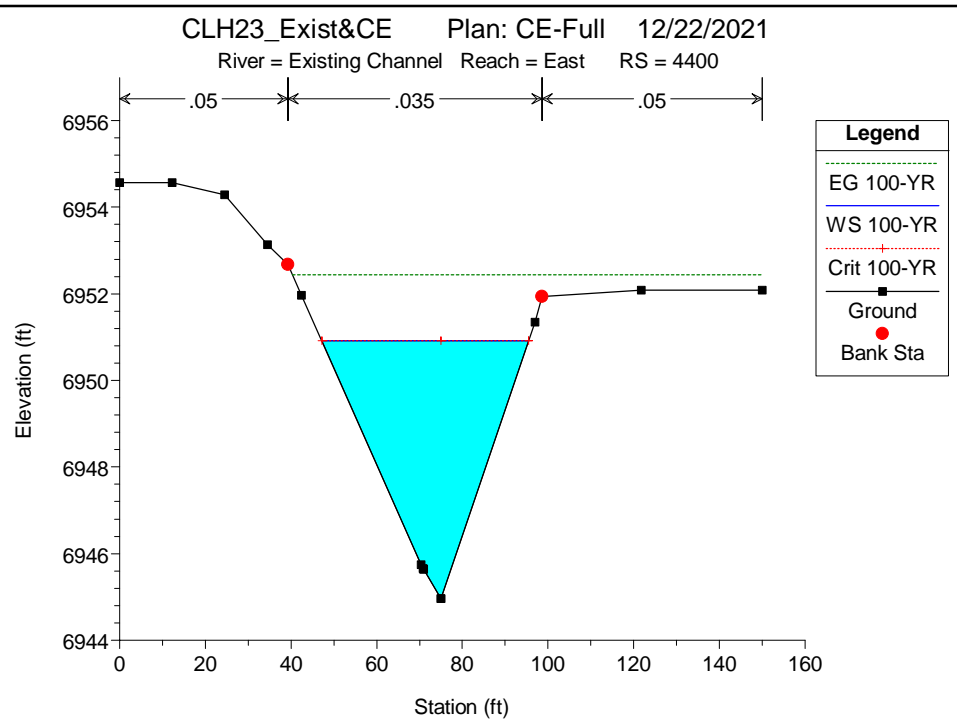
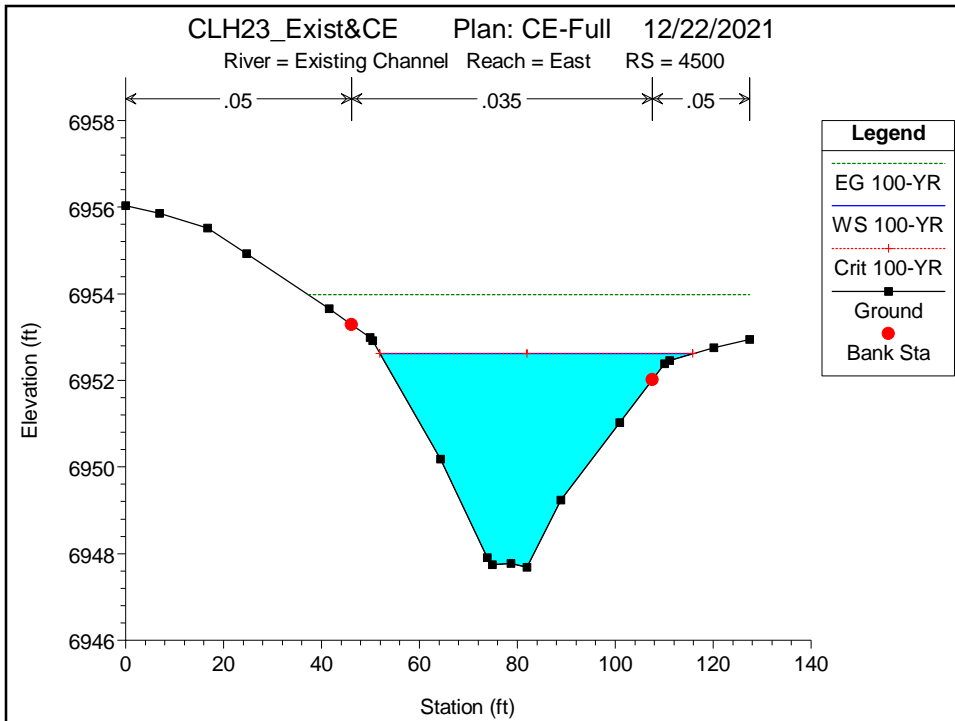


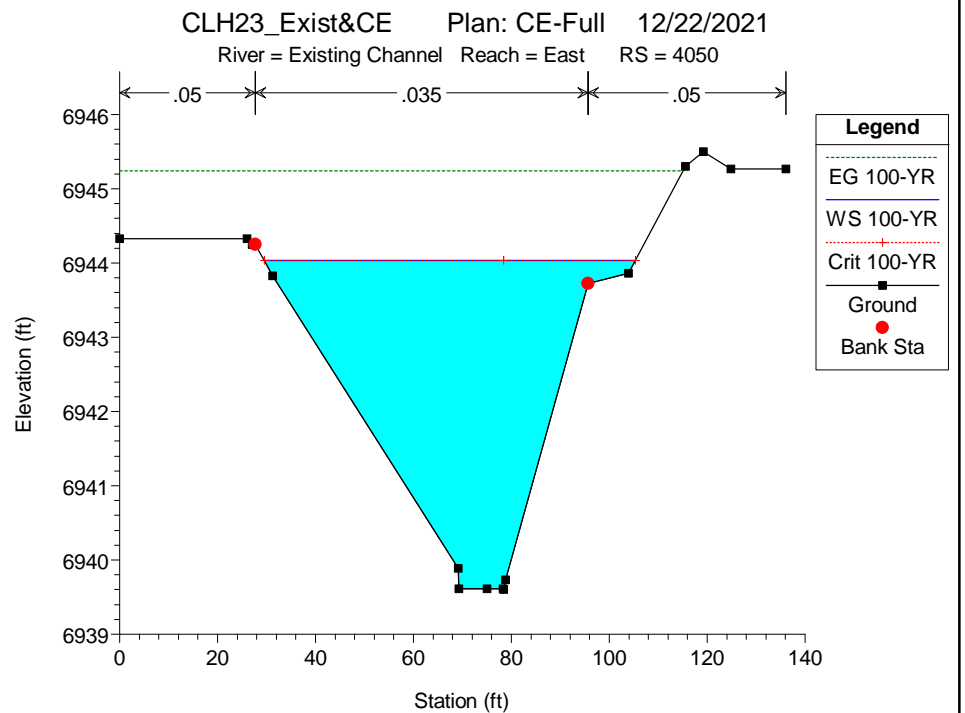
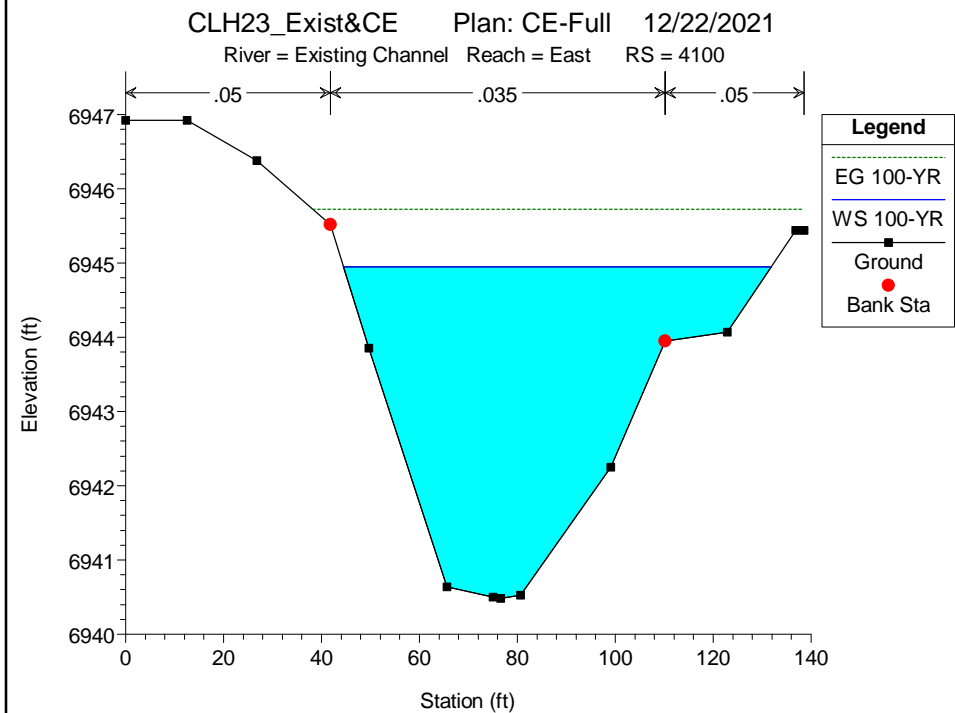
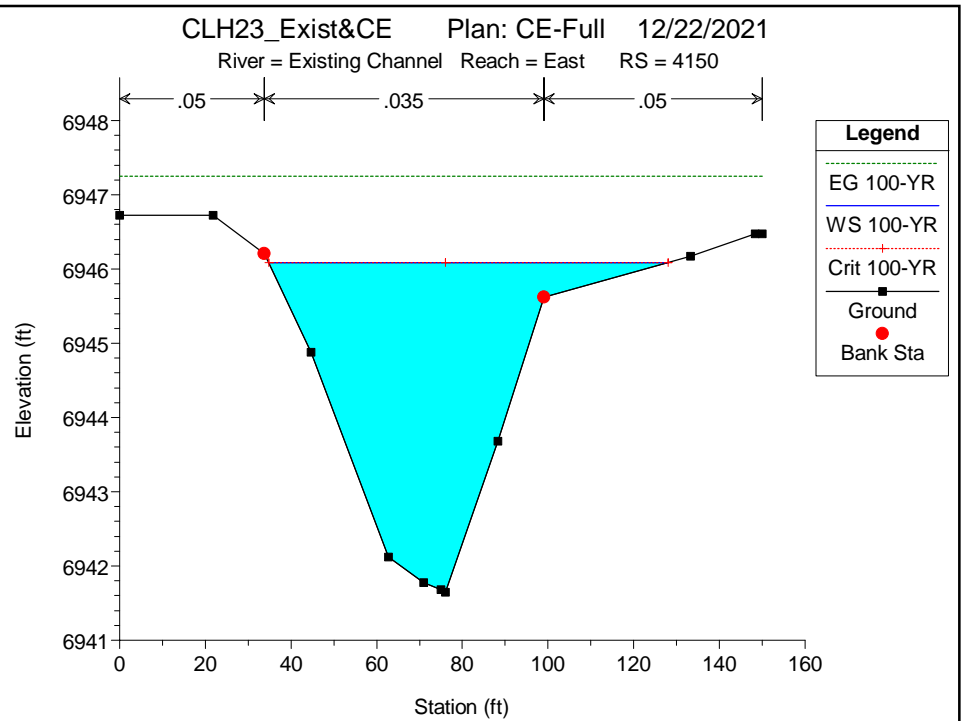
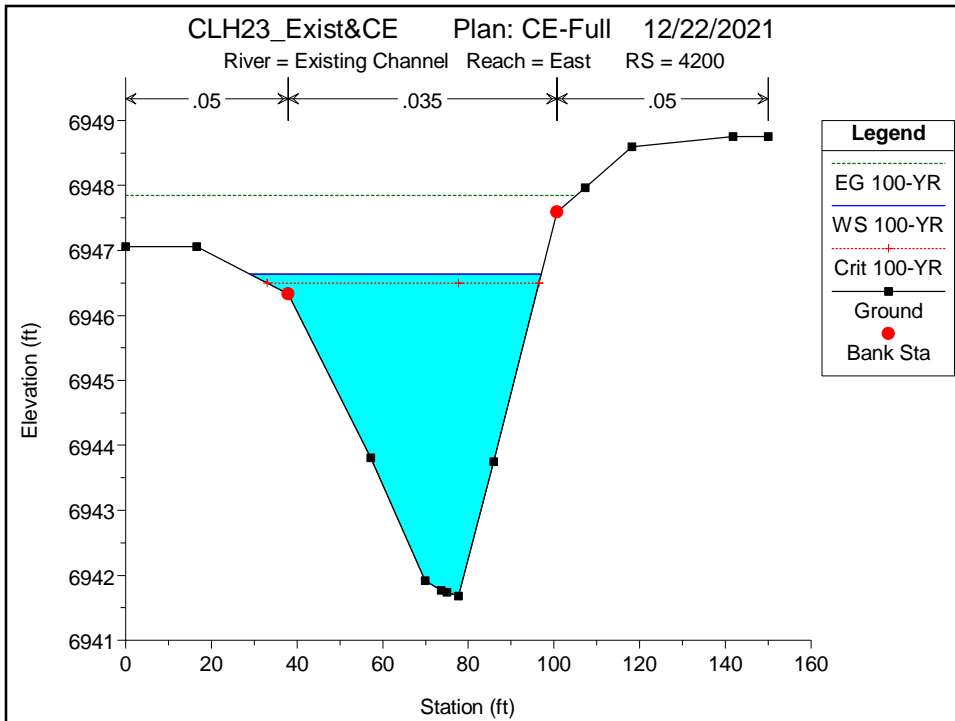
ATTACHMENT H
Corrected Cross Sections

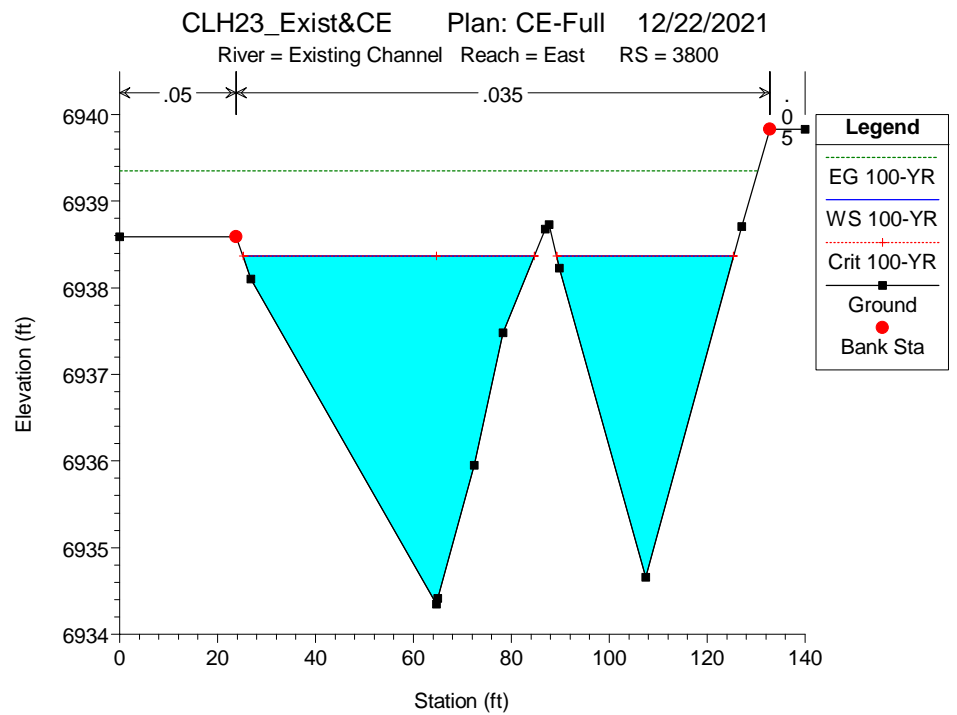
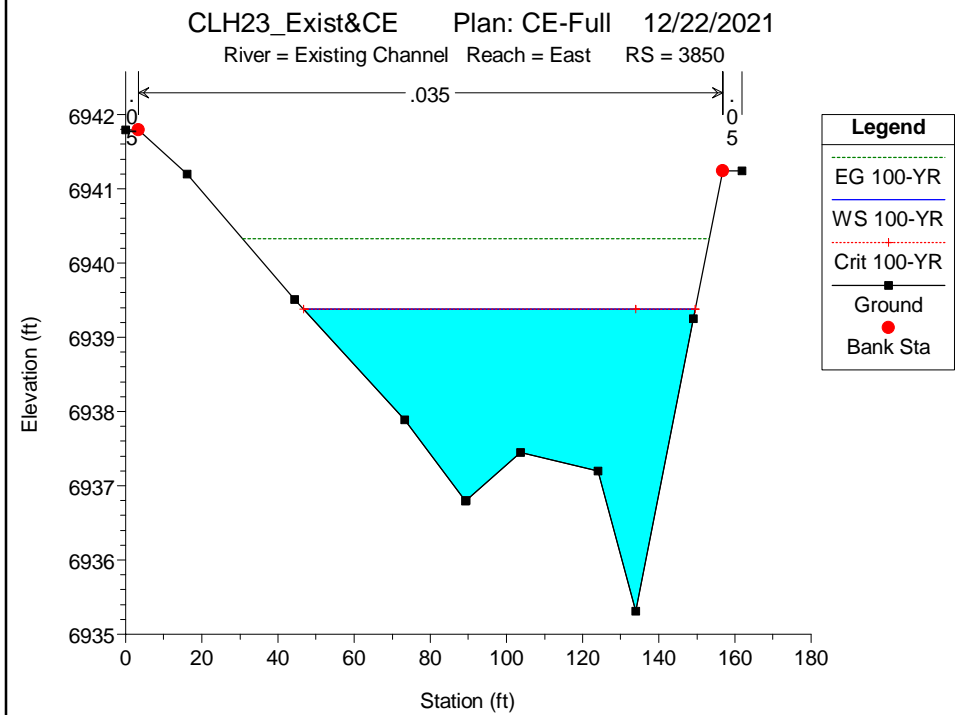
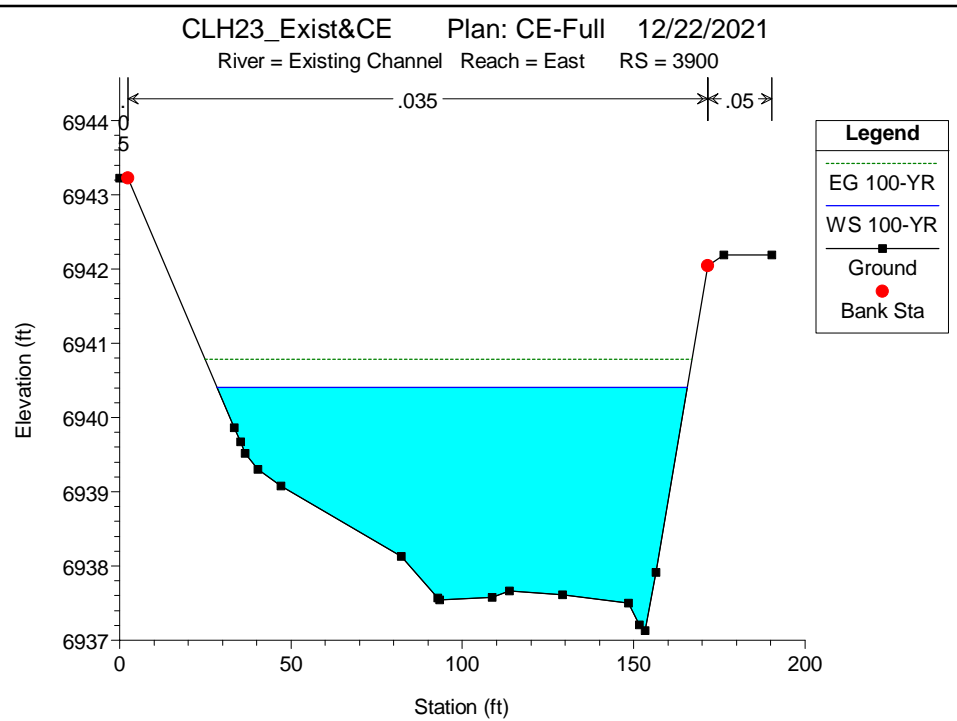
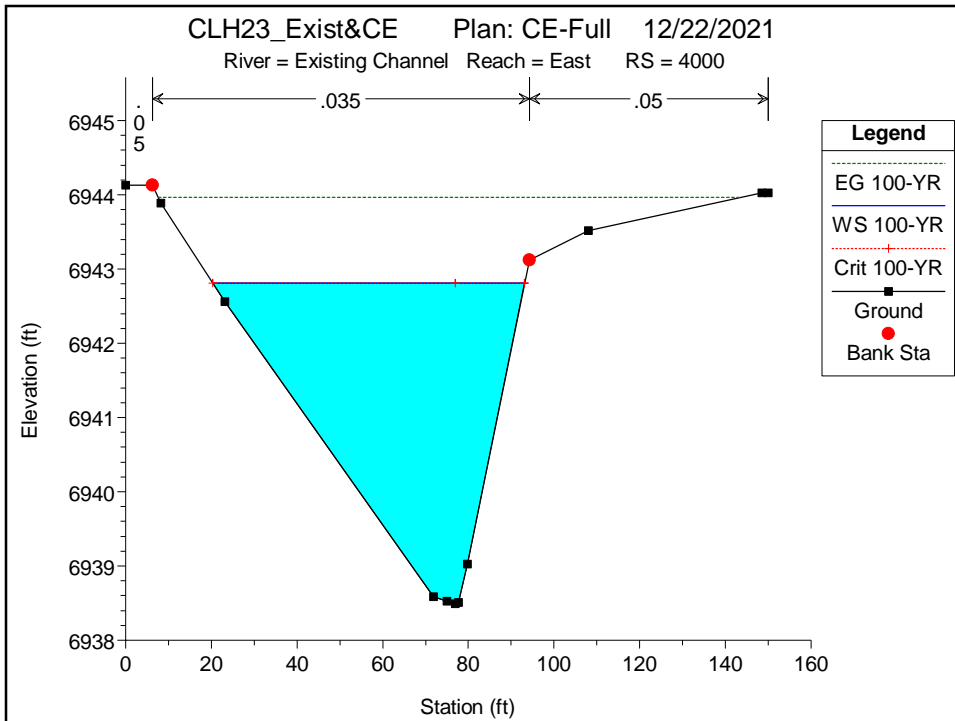


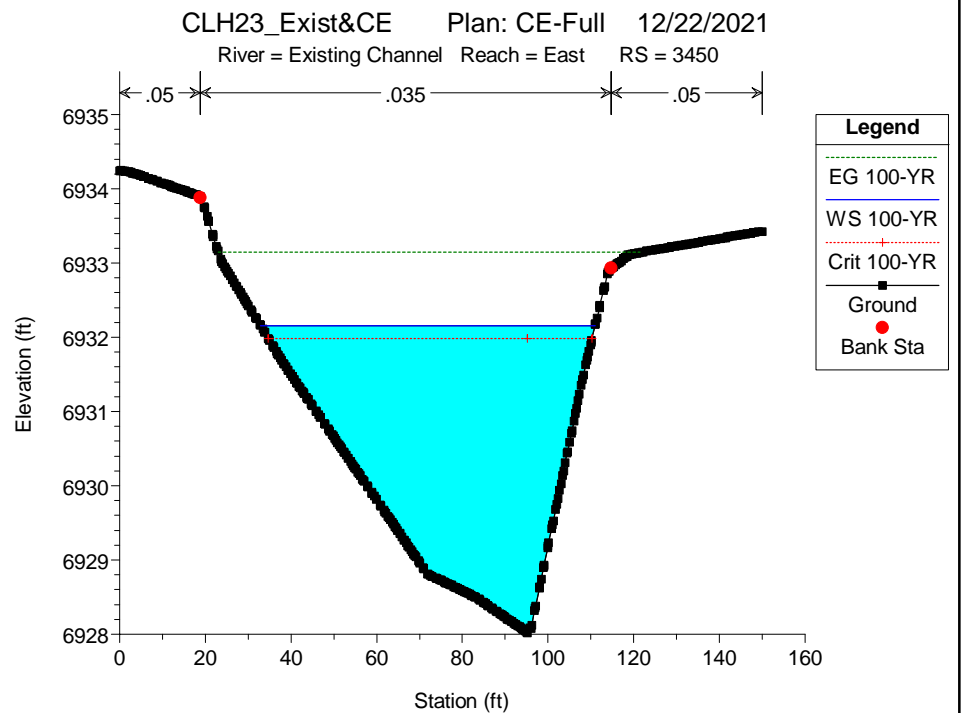
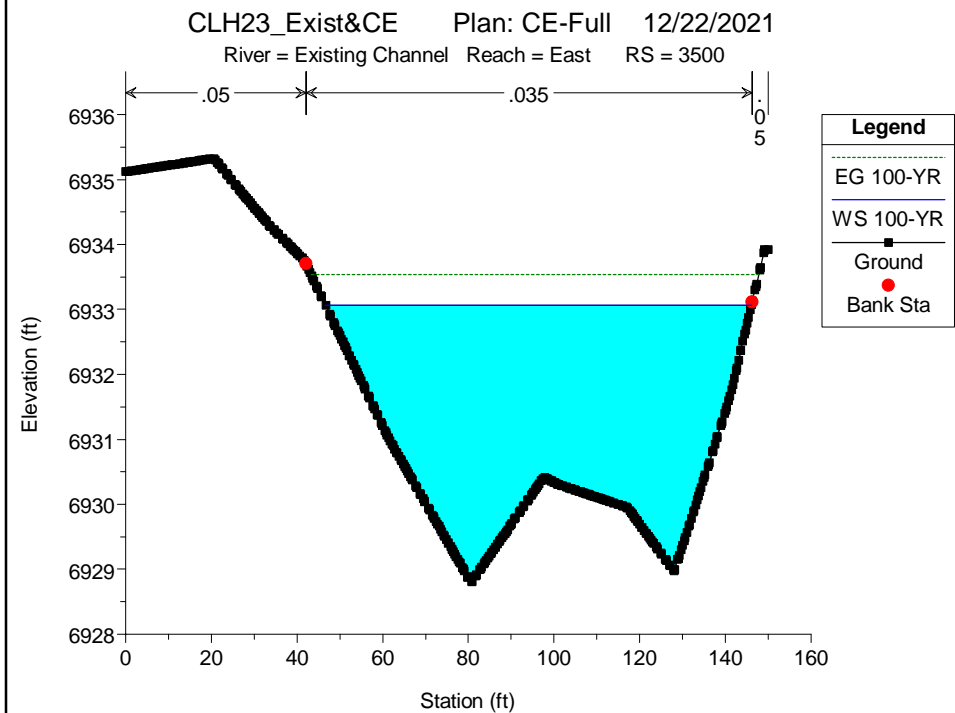
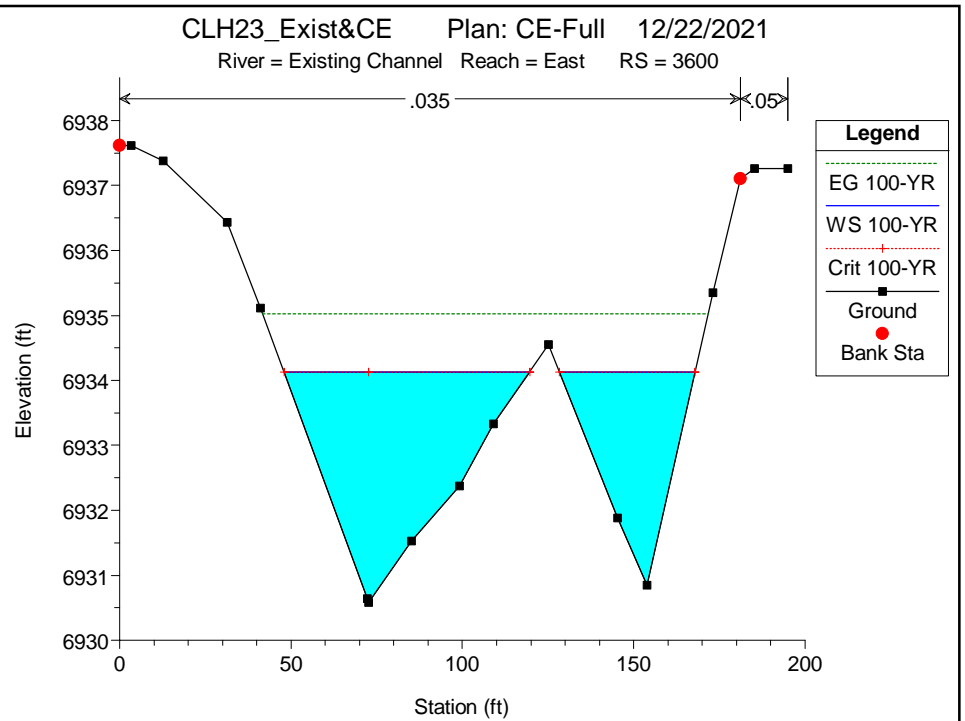
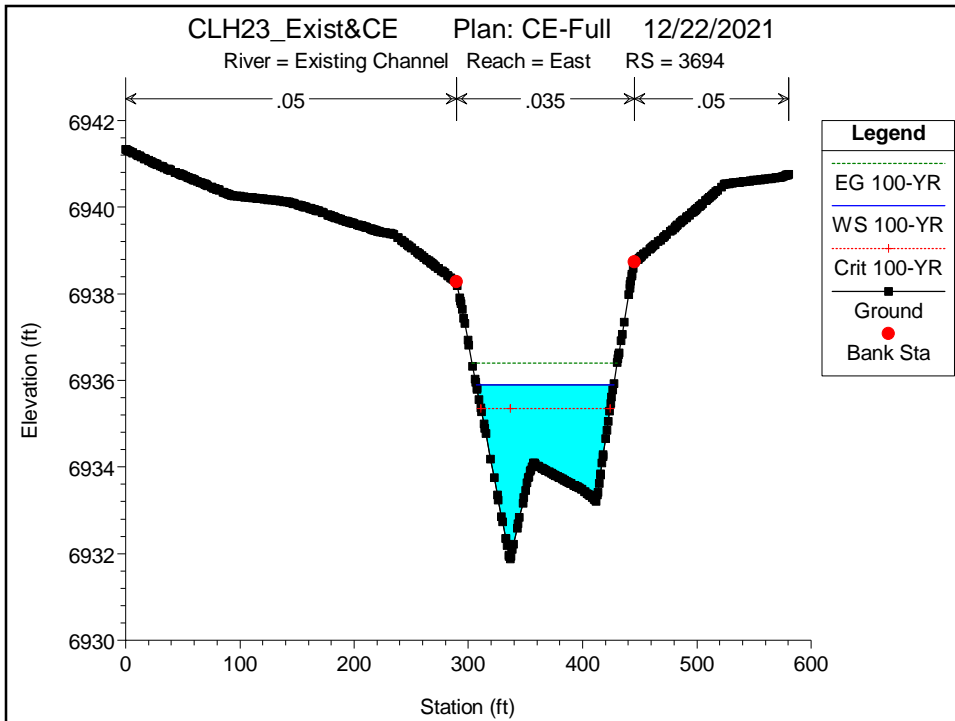


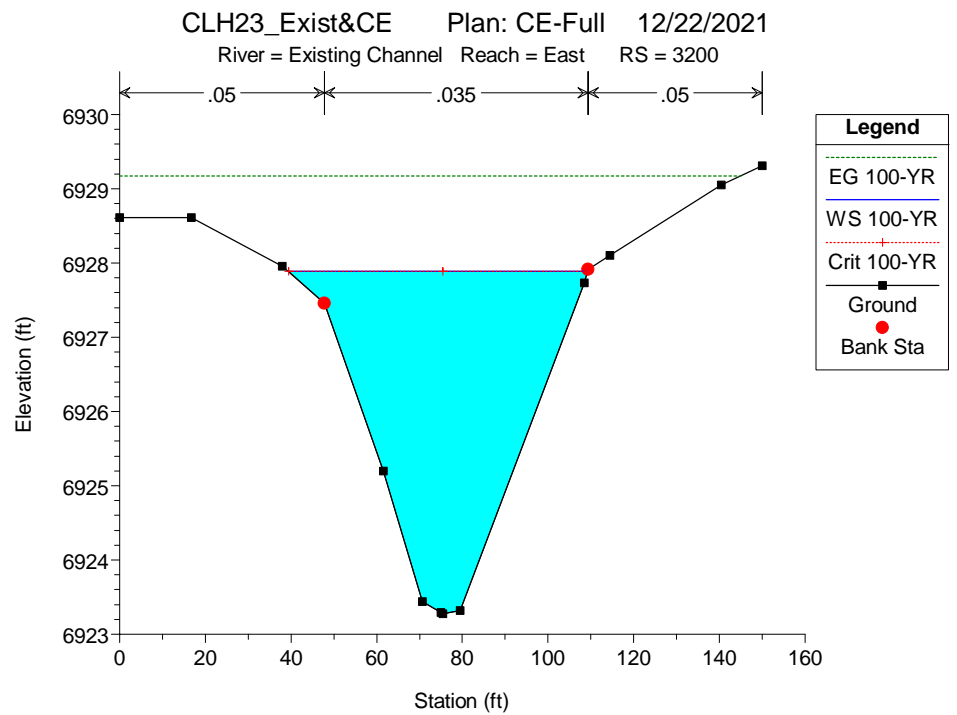
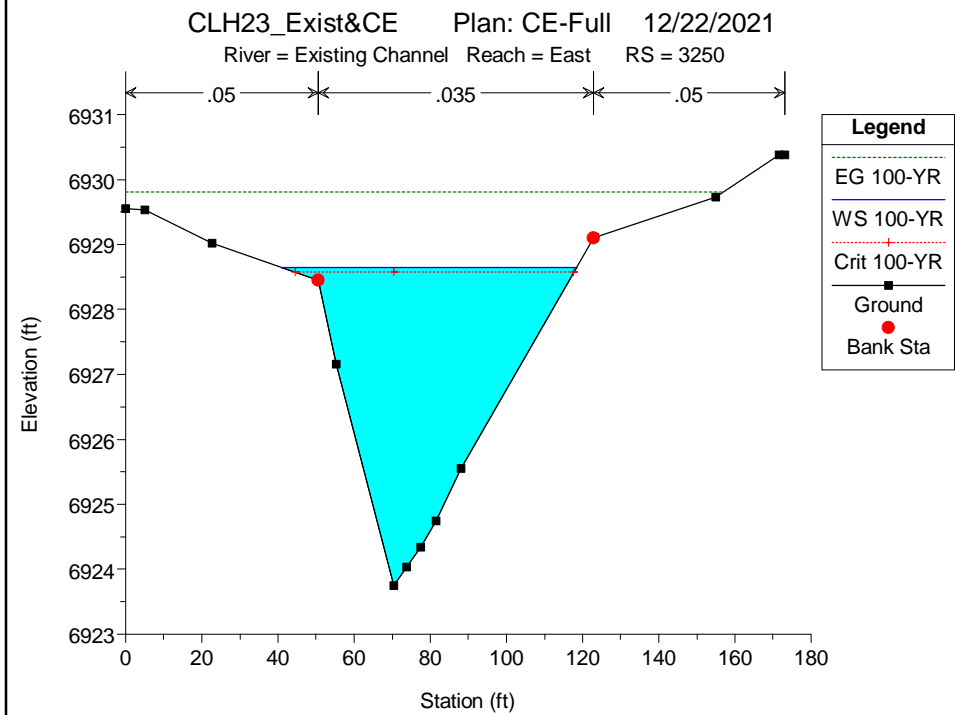
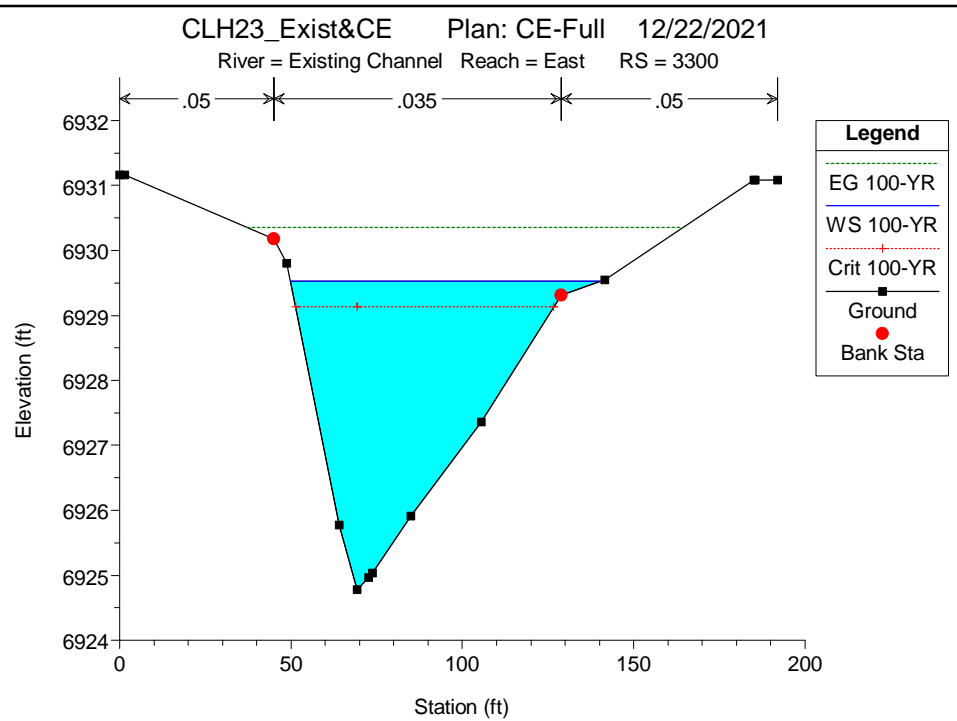
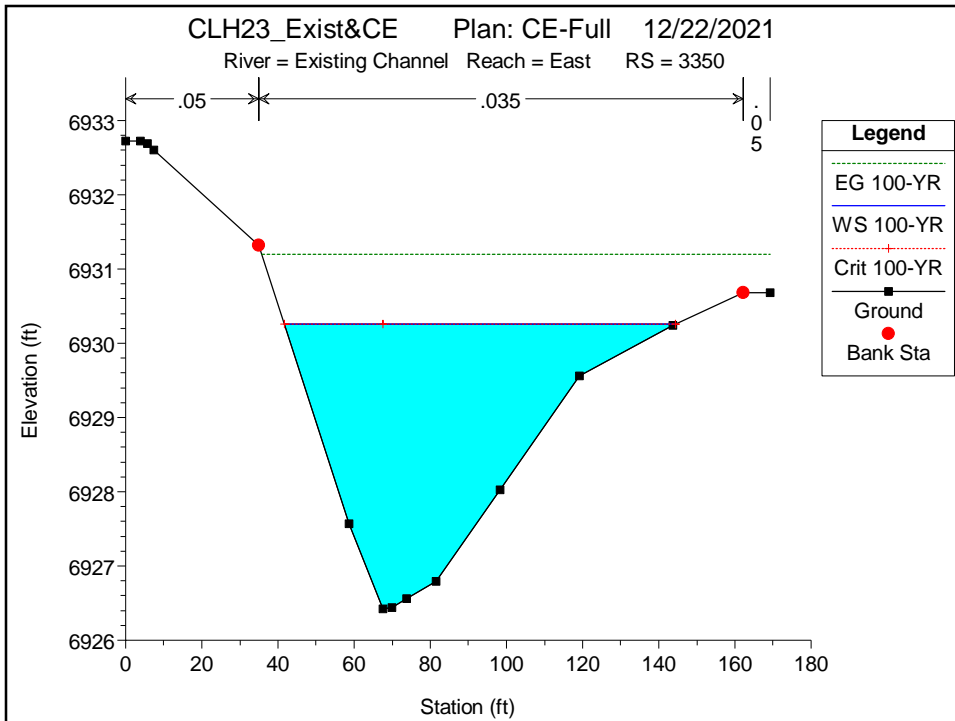


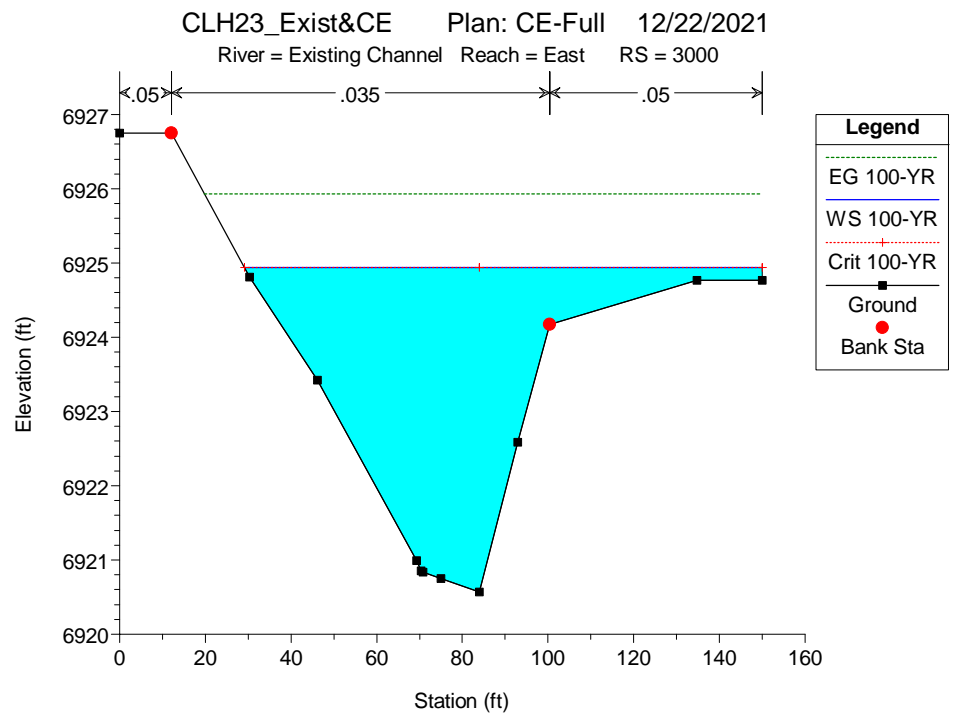
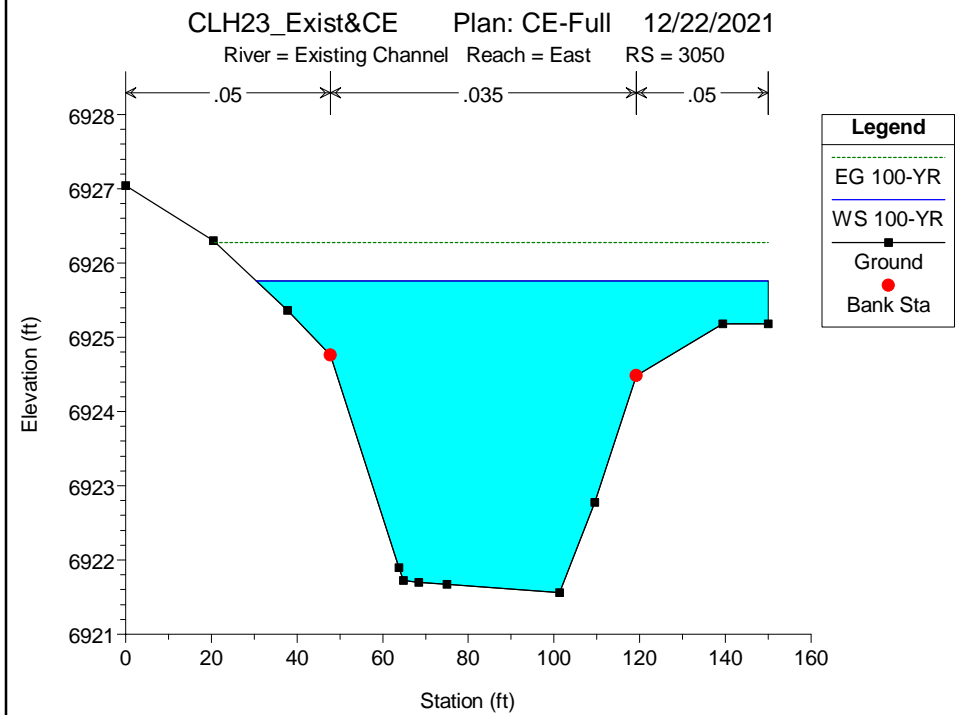
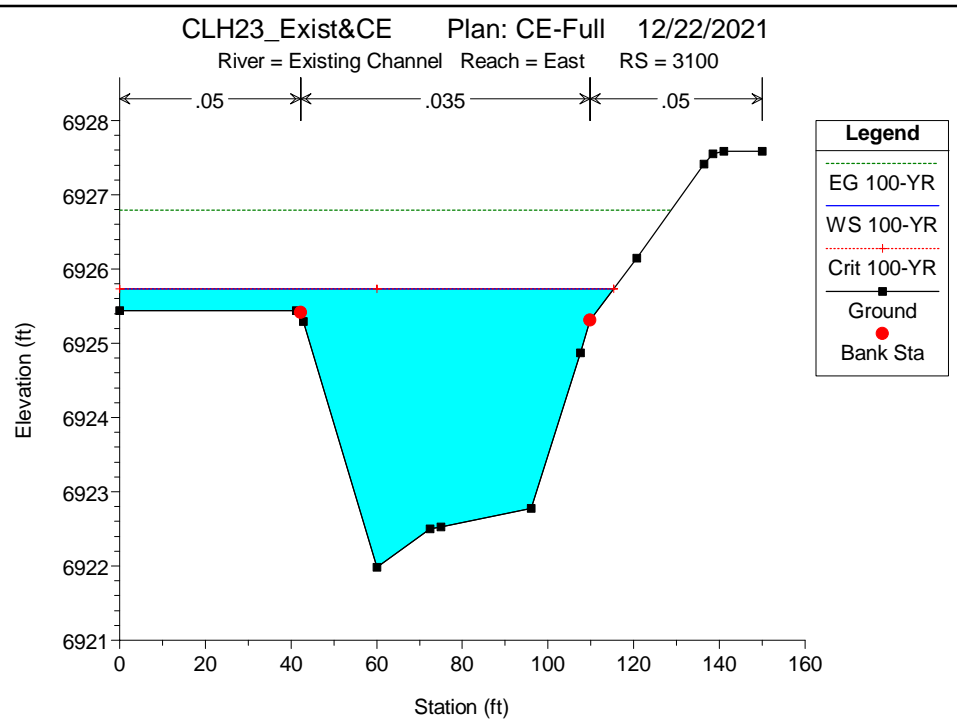
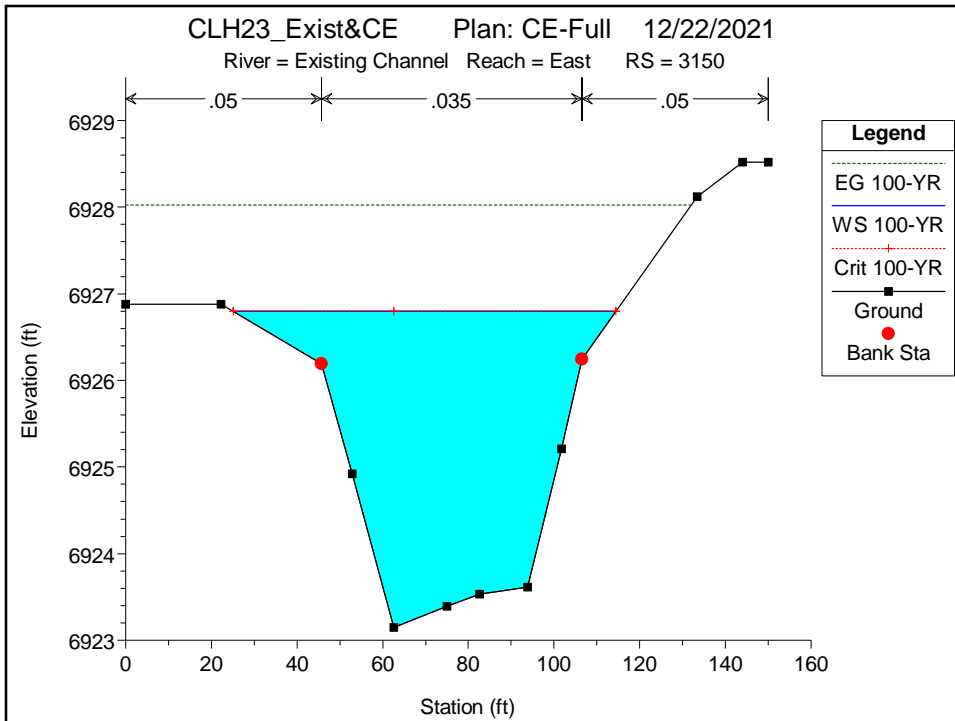


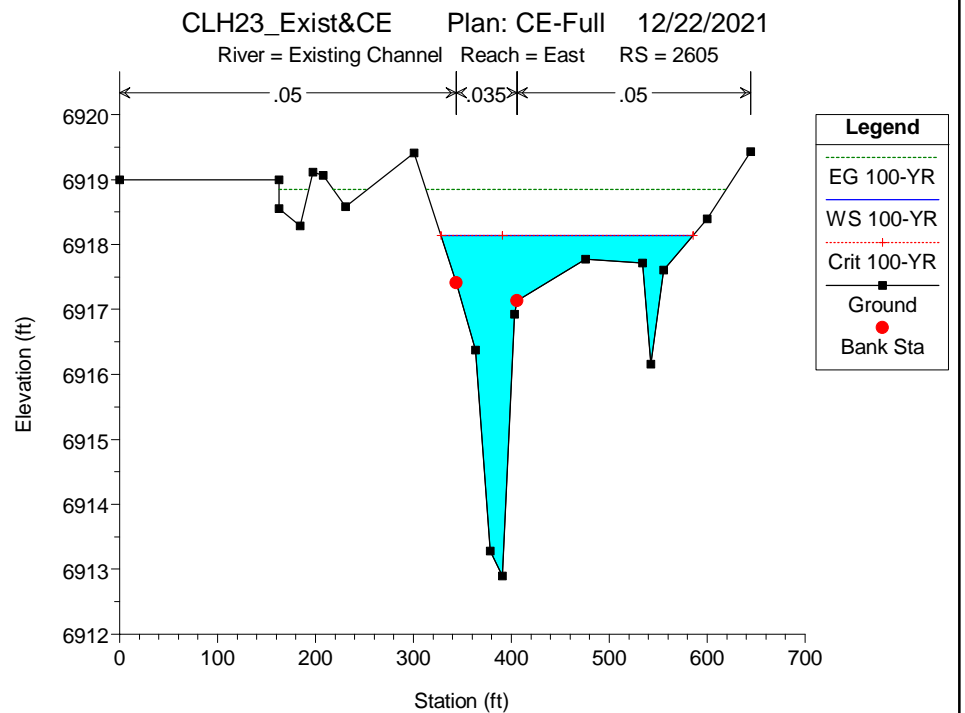
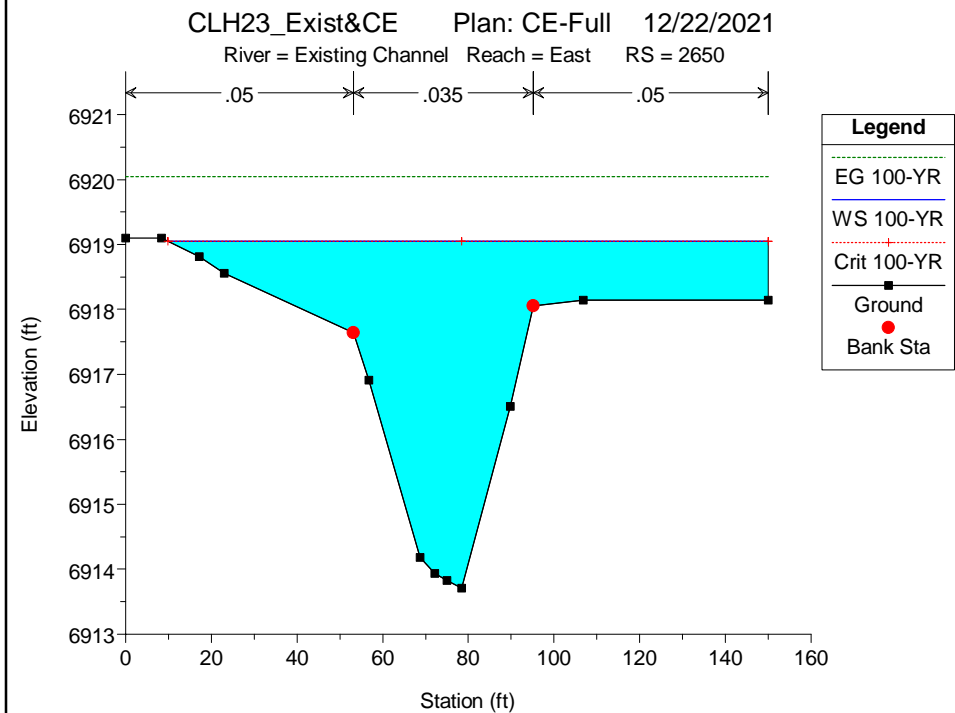
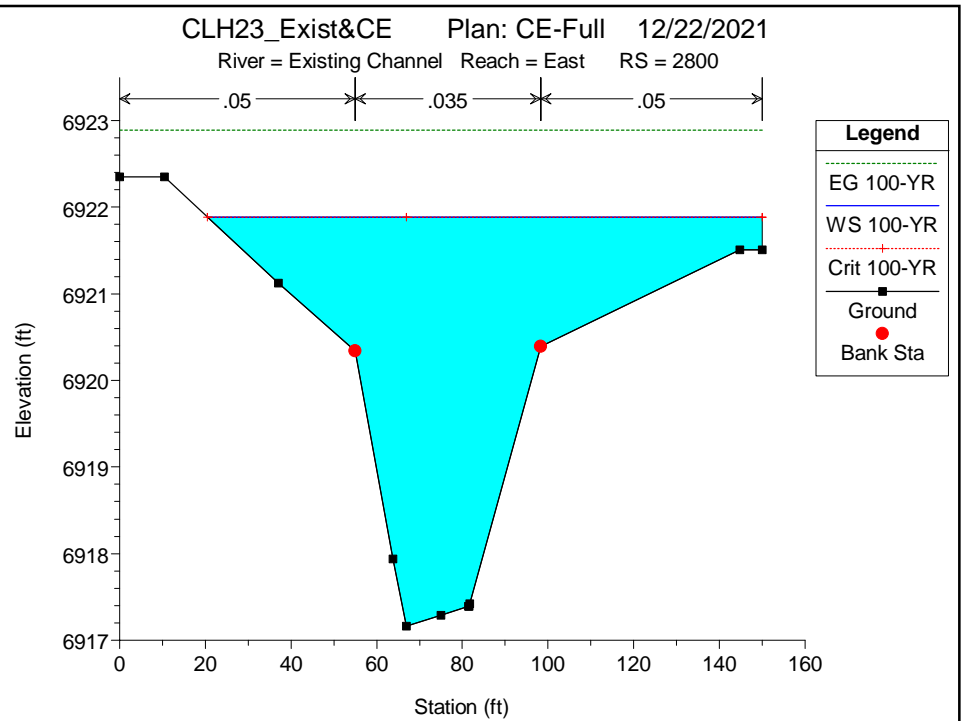
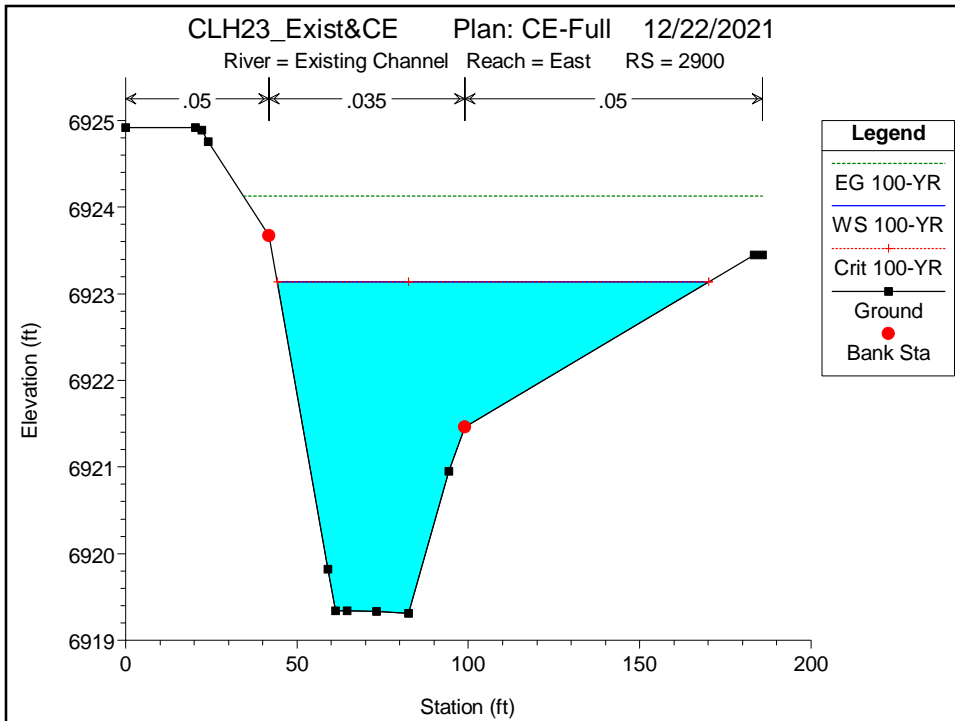


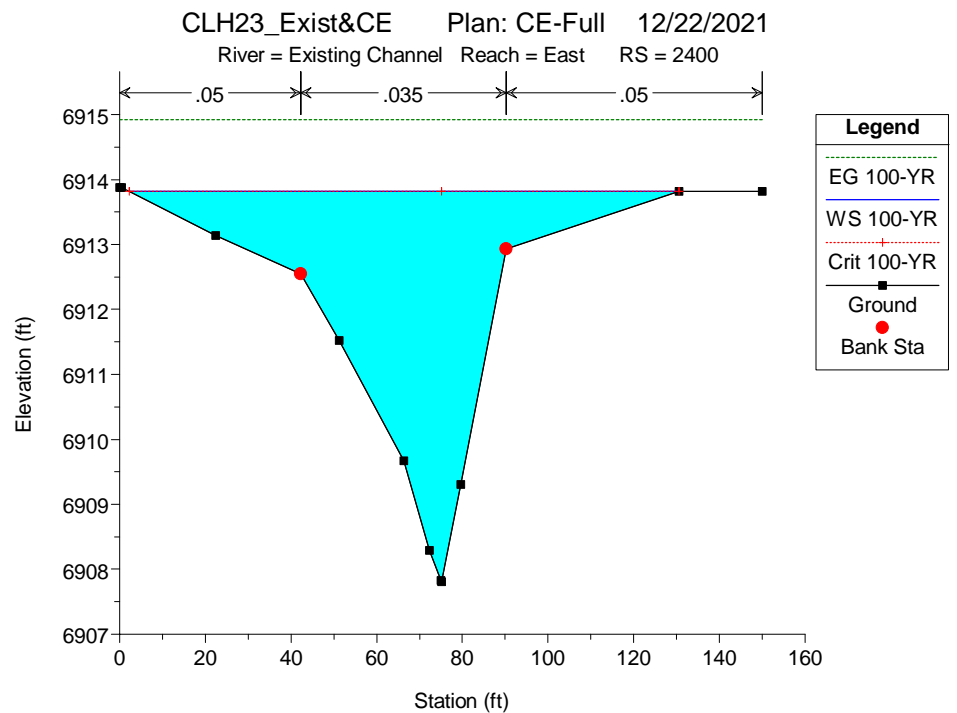
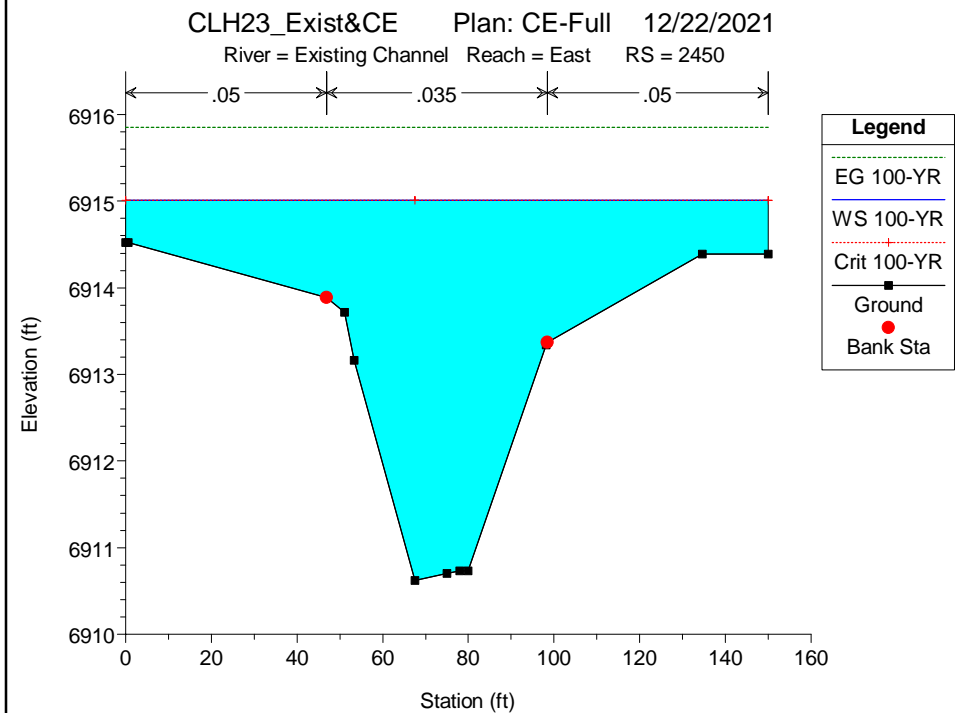
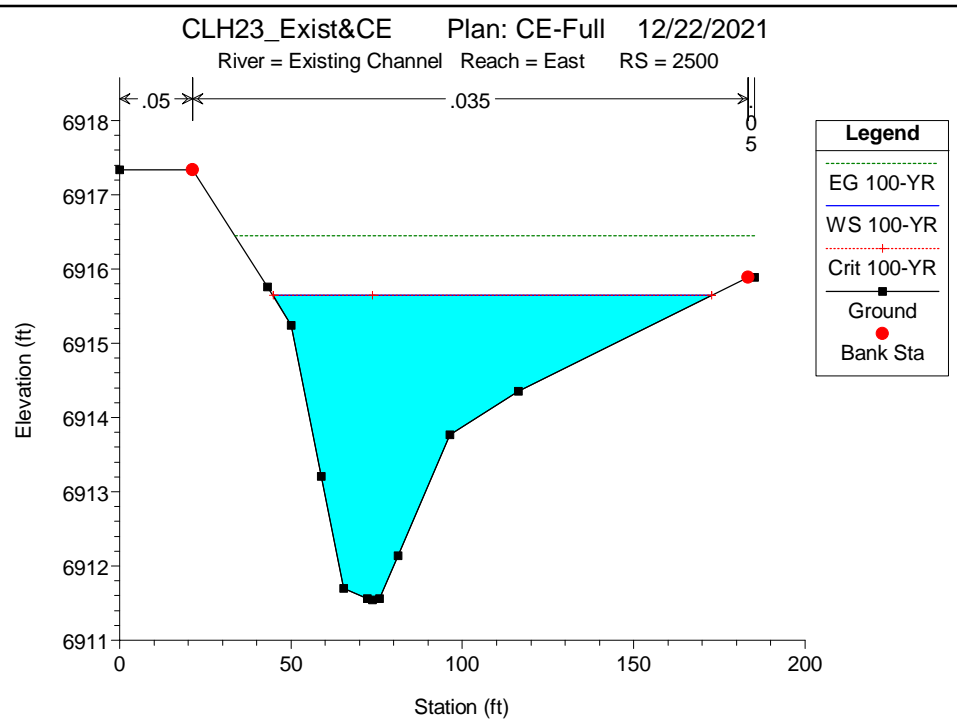
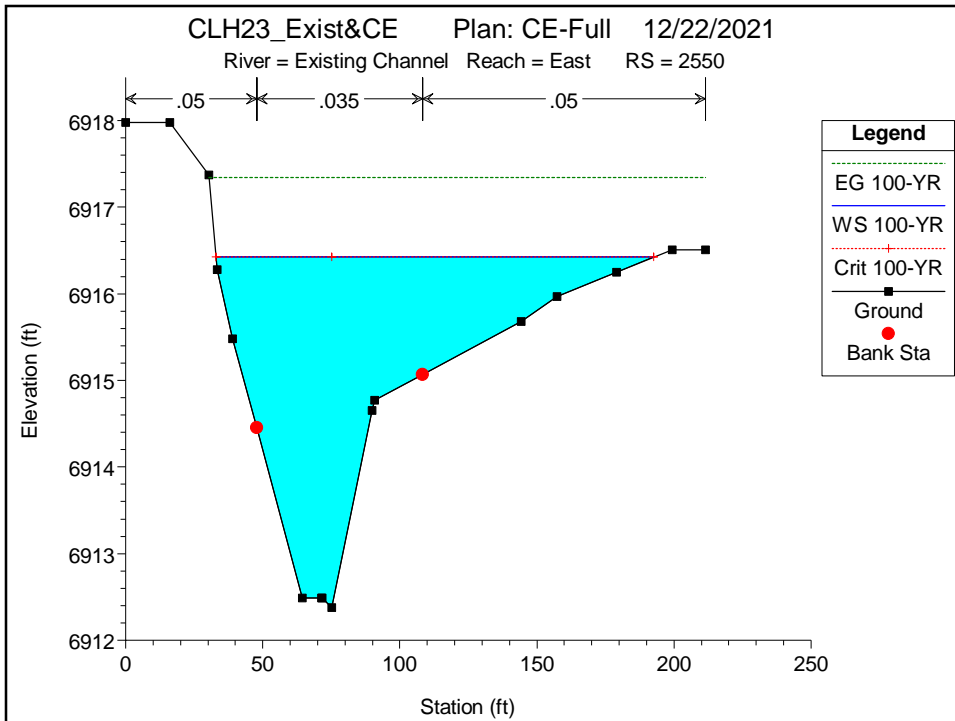


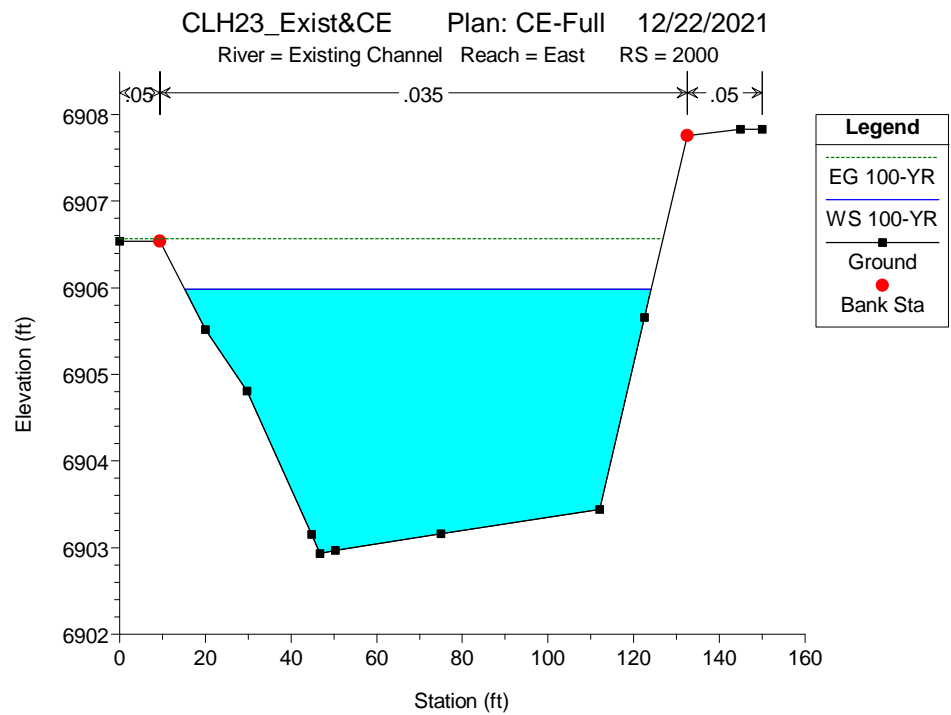
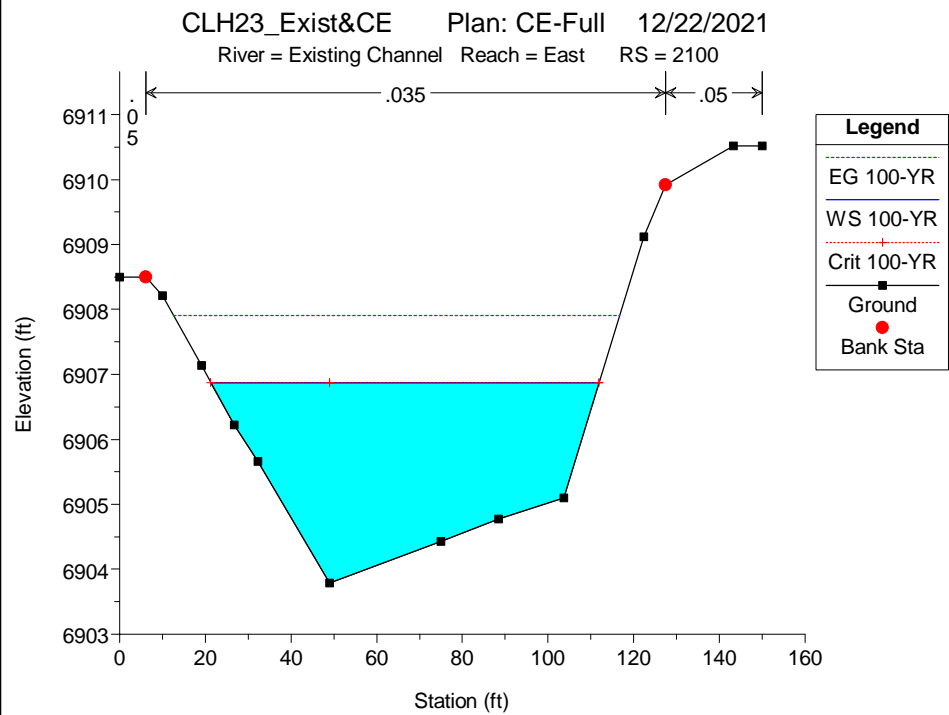
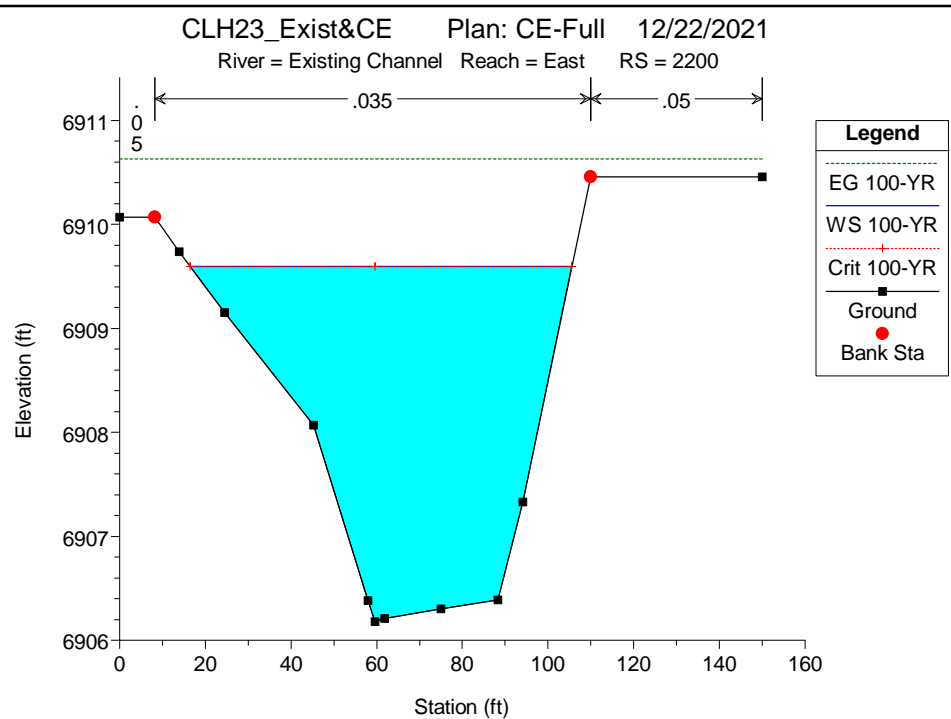
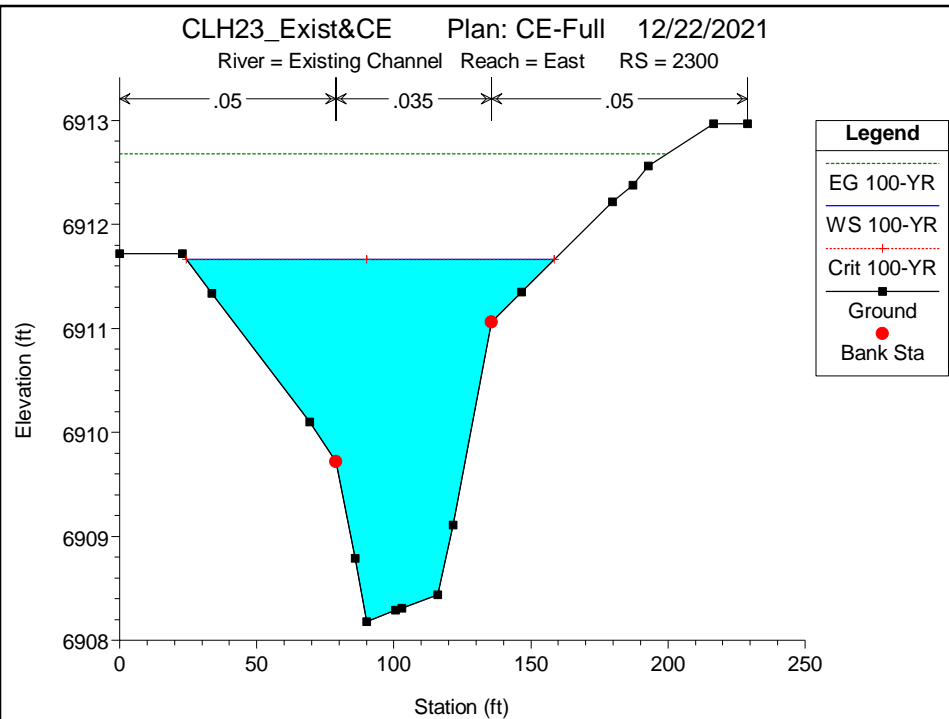


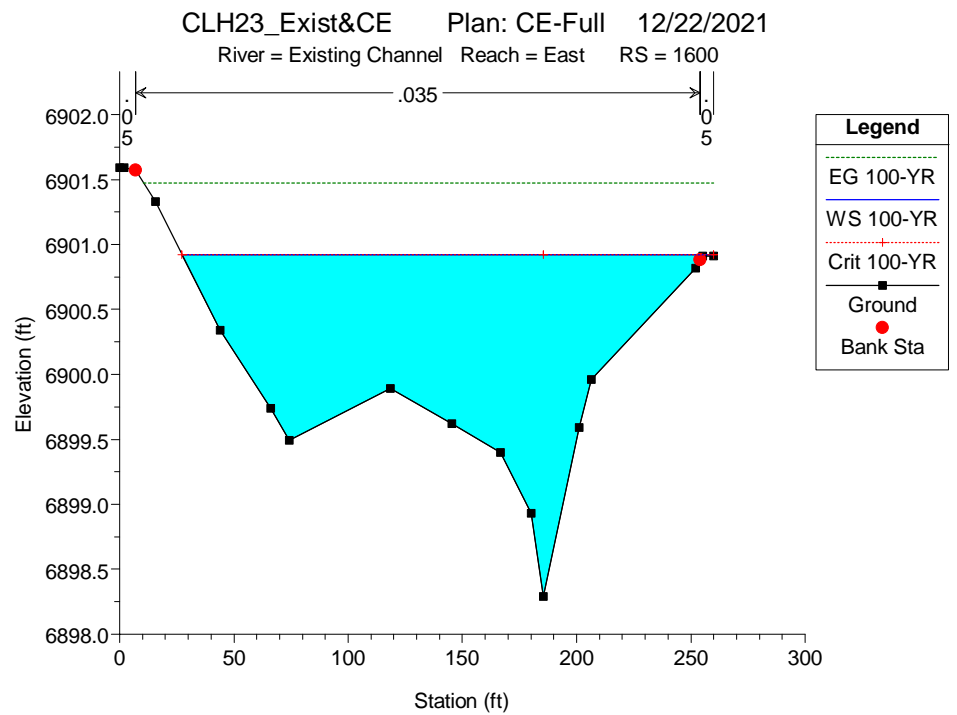
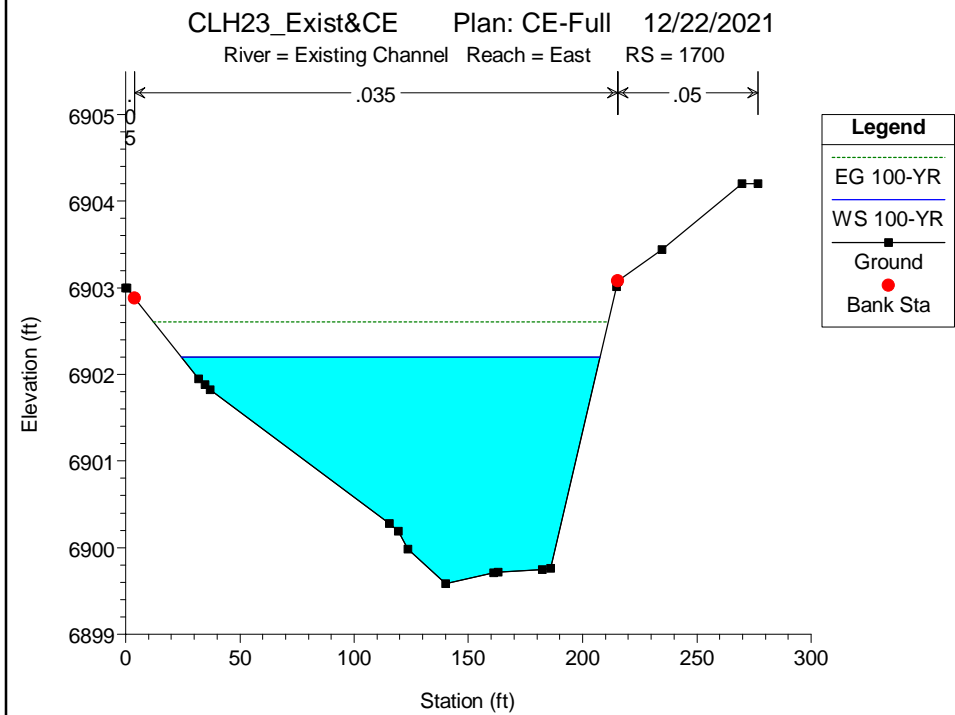
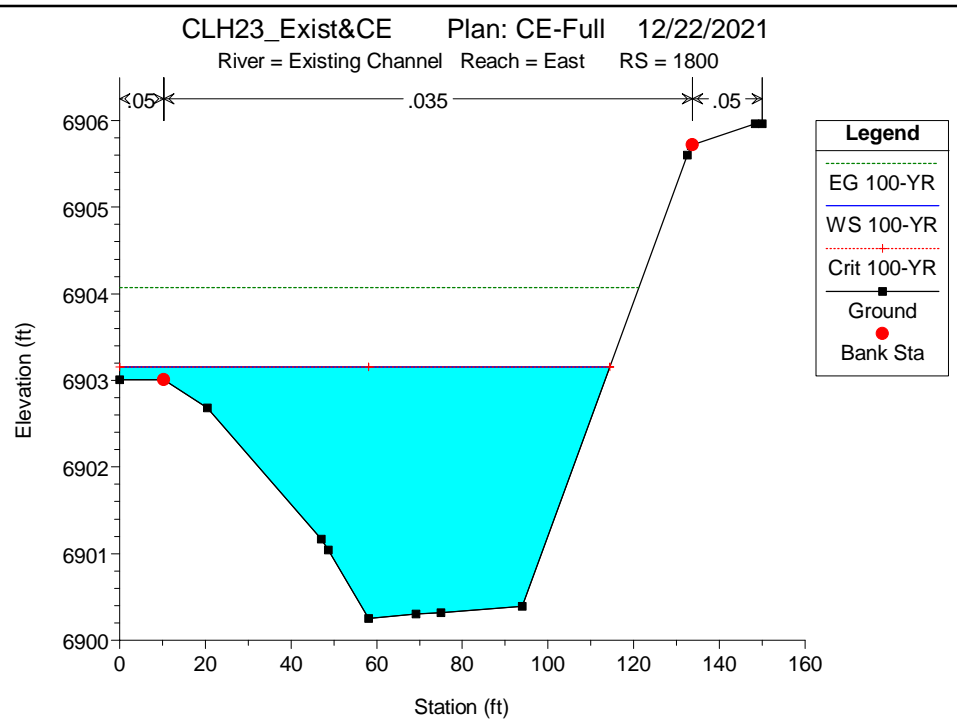
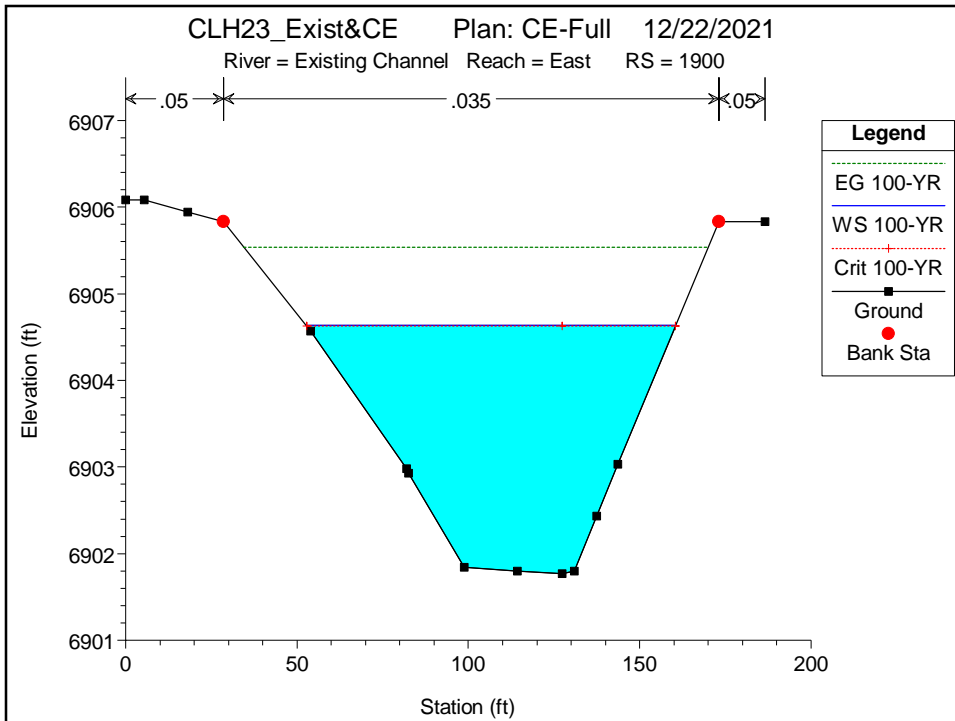


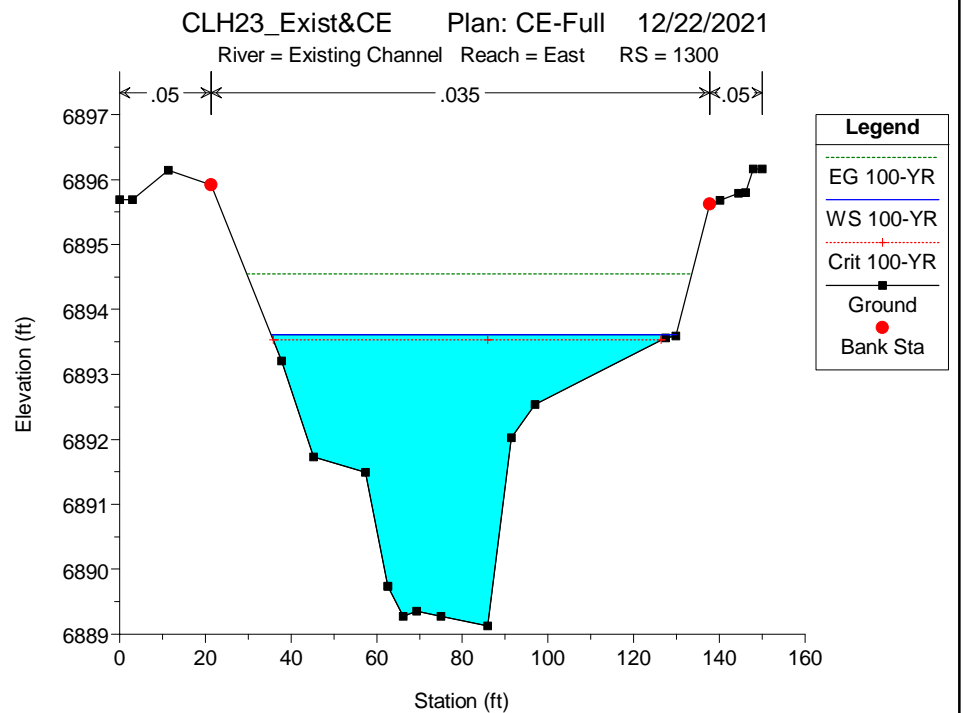
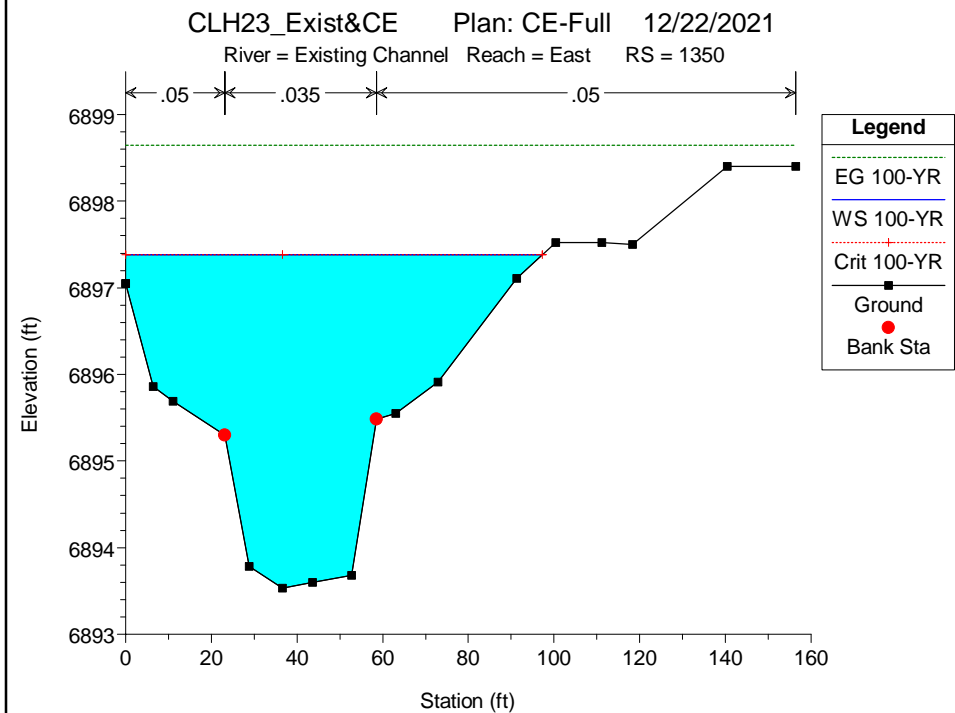
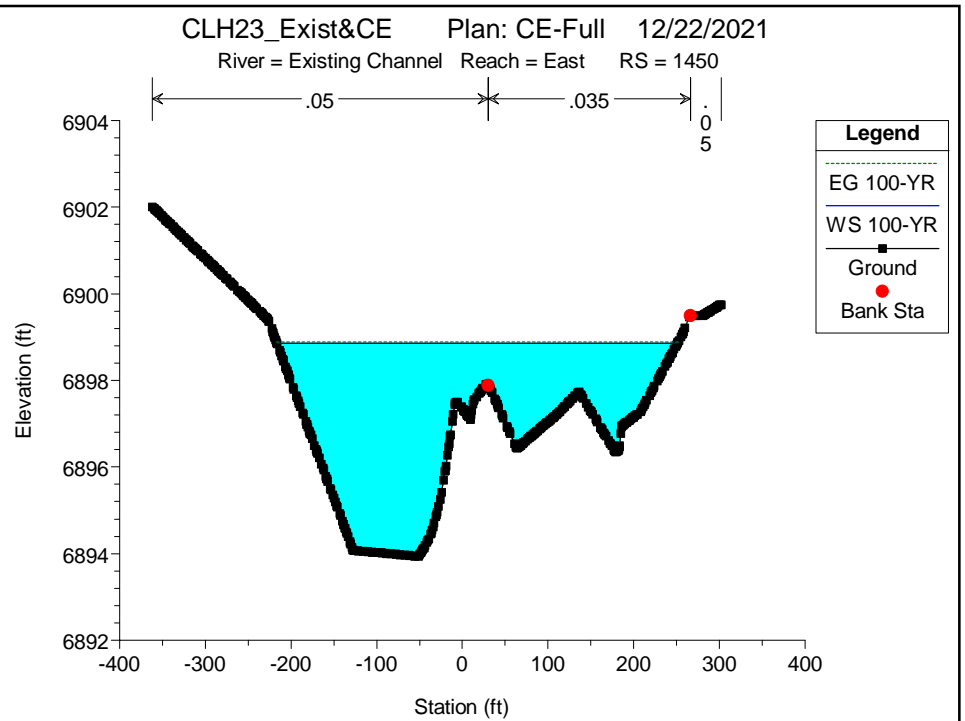
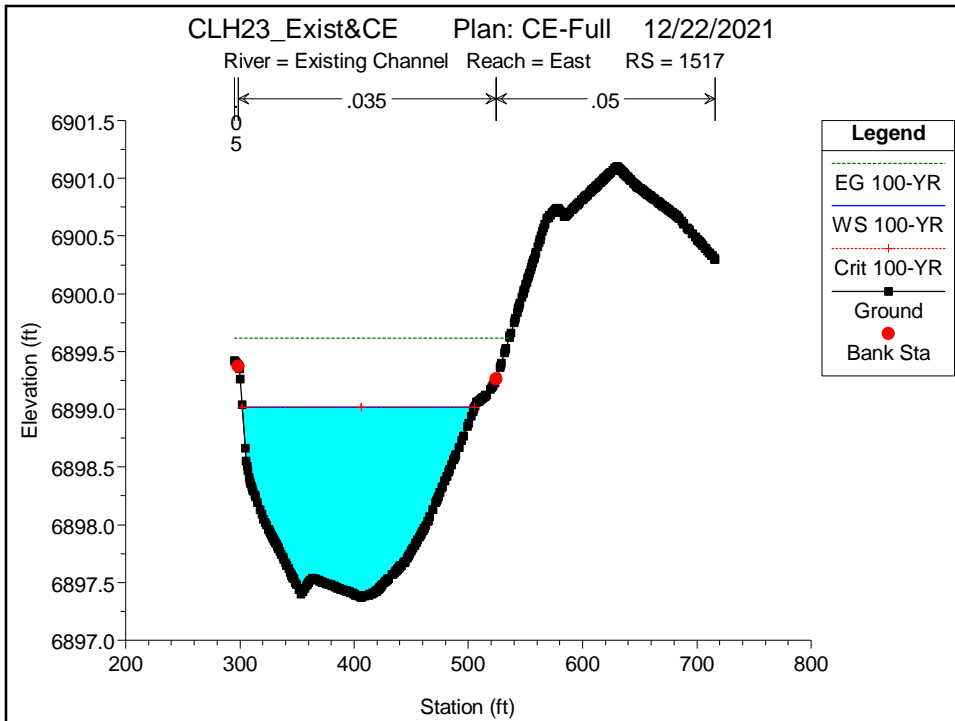


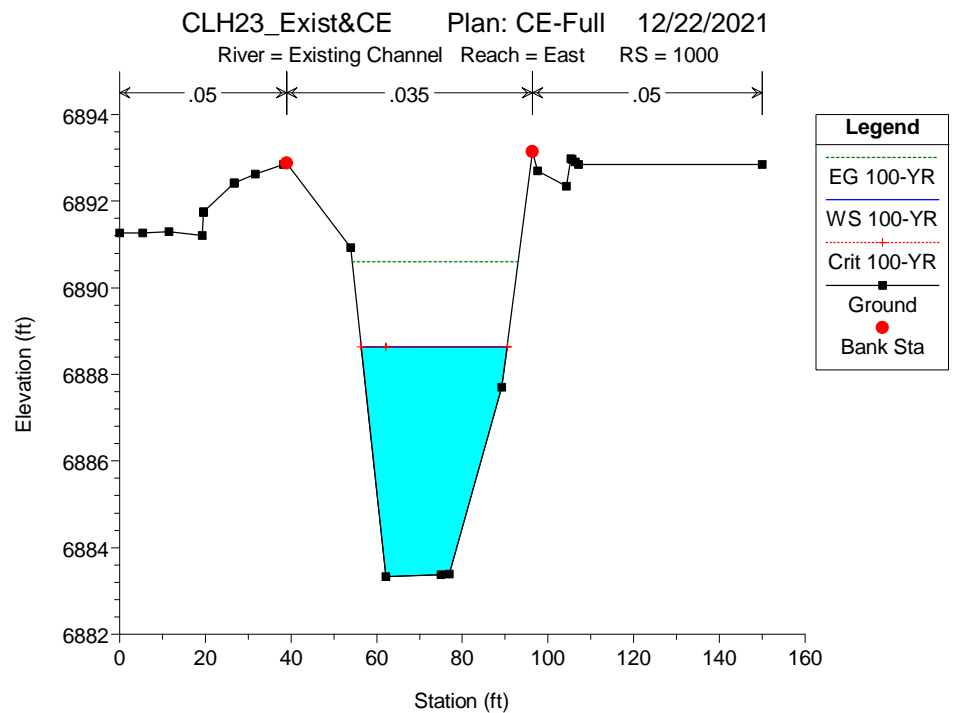
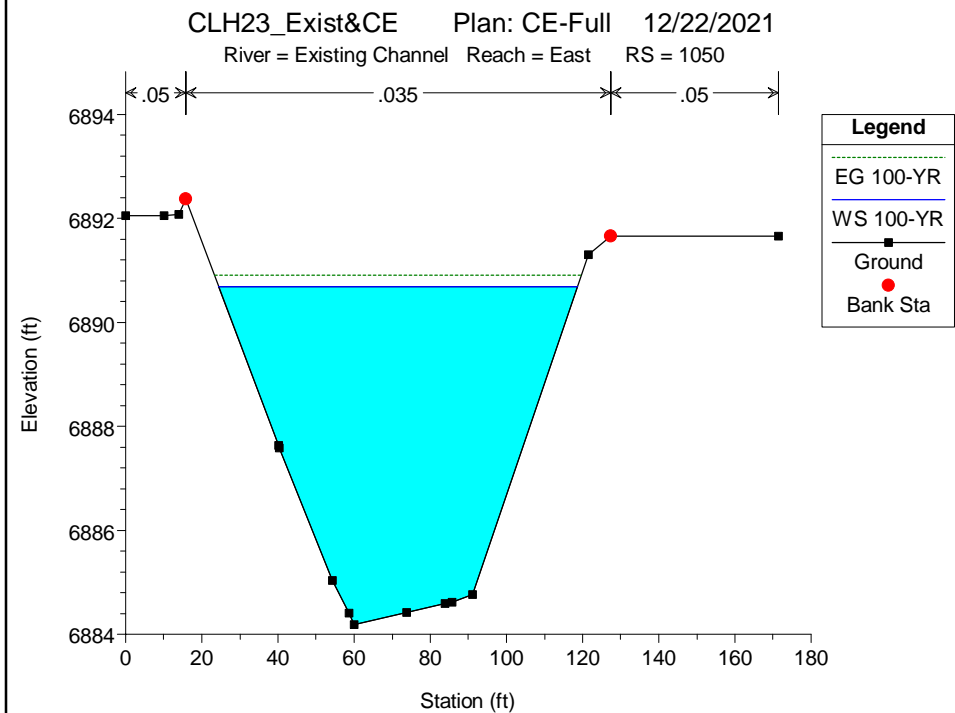
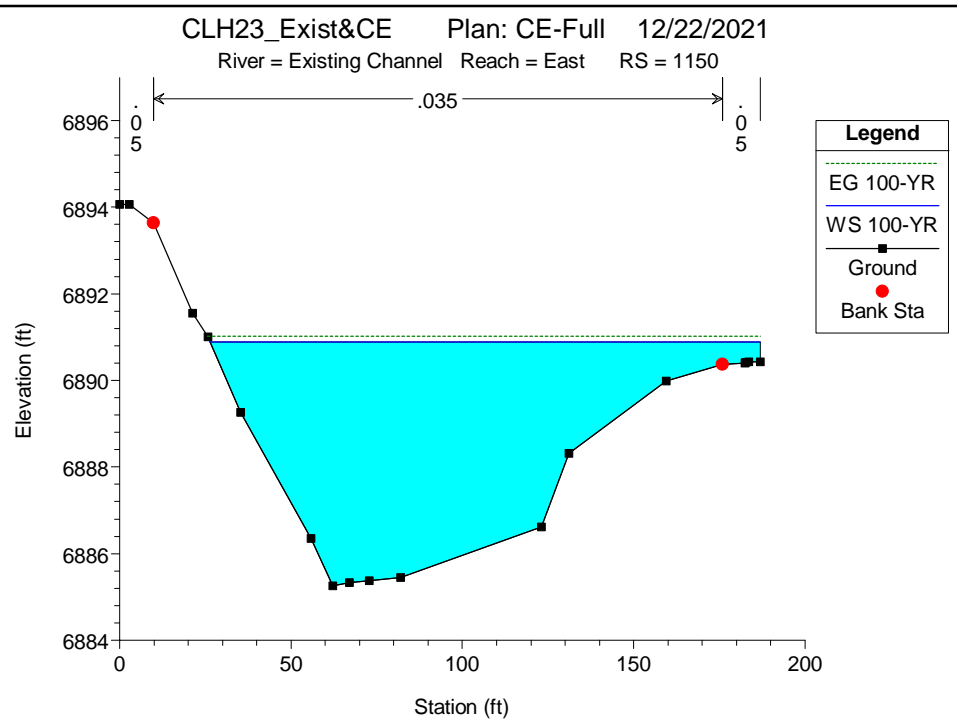
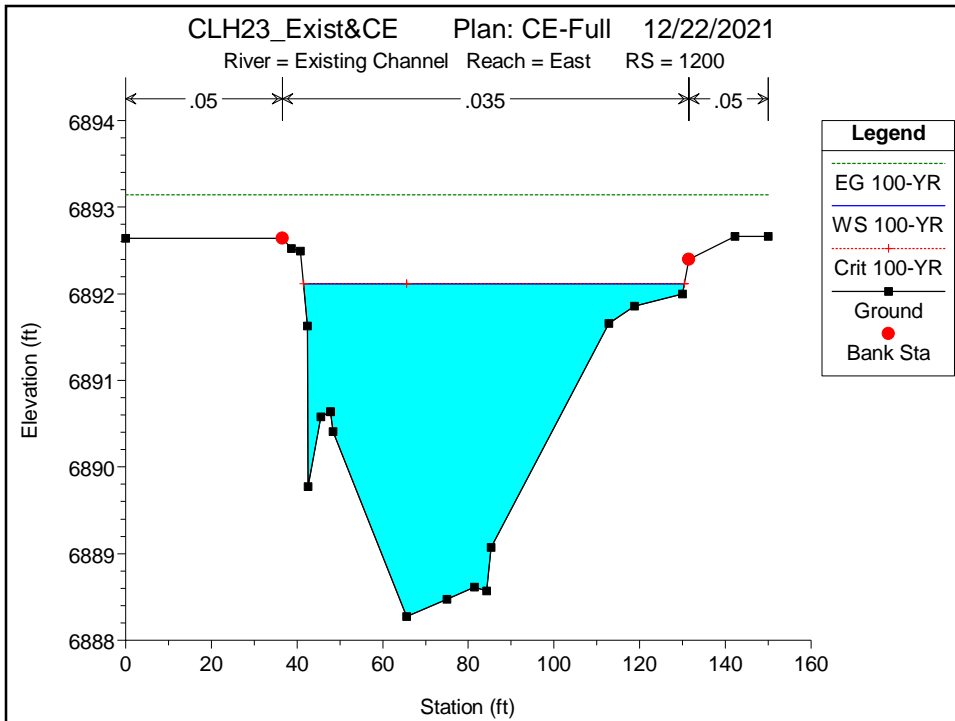












ATTACHMENT I
Pre-Project Model Results Table



Reach	River Sta	Profile	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
NCONFL-BGM	6057	100-YR	1000.00	6969.55	6973.72	6973.72	6975.04	0.018034	9.22	108.42	41.89	1.01
NCONFL-BGM	6007	100-YR	1000.00	6968.59	6973.23		6973.59	0.003560	4.83	206.96	63.16	0.47
NCONFL-BGM	5956	100-YR	1000.00	6968.41	6973.05		6973.42	0.003569	4.84	206.71	63.08	0.47
NCONFL-BGM	5906	100-YR	1000.00	6968.23	6972.88		6973.24	0.003560	4.83	206.93	63.14	0.47
NCONFL-BGM	5856	100-YR	1000.00	6968.06	6972.69		6973.06	0.003587	4.85	206.37	63.07	0.47
NCONFL-BGM	5806	100-YR	1000.00	6967.88	6972.51		6972.88	0.003593	4.85	206.26	63.05	0.47
NCONFL-BGM	5756	100-YR	1000.00	6967.71	6972.33		6972.70	0.003627	4.86	205.57	62.97	0.47
NCONFL-BGM	5706	100-YR	1000.00	6967.53	6972.15		6972.52	0.003639	4.87	205.30	62.93	0.48
NCONFL-BGM	5656	100-YR	1000.00	6967.36	6971.96		6972.33	0.003679	4.89	204.50	62.84	0.48
NCONFL-BGM	5606	100-YR	1000.00	6967.18	6971.78		6972.15	0.003714	4.91	203.80	62.74	0.48
NCONFL-BGM	5556	100-YR	1000.00	6967.01	6971.58		6971.96	0.003780	4.94	202.53	62.58	0.48
NCONFL-BGM	5506	100-YR	1000.00	6966.83	6971.39		6971.77	0.003827	4.96	201.62	62.46	0.49
NCONFL-BGM	5456	100-YR	1000.00	6966.66	6971.19		6971.58	0.003926	5.01	199.78	62.23	0.49
NCONFL-BGM	5406	100-YR	1000.00	6966.48	6970.98		6971.38	0.004028	5.05	197.92	61.98	0.50
NCONFL-BGM	5356	100-YR	1000.00	6966.31	6970.76		6971.17	0.004186	5.12	195.23	61.65	0.51
NCONFL-BGM	5306	100-YR	1000.00	6966.13	6970.54		6970.96	0.004370	5.20	192.23	61.51	0.52
NCONFL-BGM	5256	100-YR	1000.00	6965.96	6970.29		6970.73	0.004680	5.33	187.54	60.64	0.53
NCONFL-BGM	5206	100-YR	1000.00	6965.78	6970.01		6970.48	0.005121	5.51	181.57	59.85	0.56
NCONFL-BGM	5156	100-YR	1000.00	6965.61	6969.67		6970.20	0.006003	5.83	171.53	58.50	0.60
NCONFL-BGM	5106	100-YR	1000.00	6965.43	6969.18		6969.84	0.008144	6.50	153.79	56.00	0.69
NCONFL-BGM	5088	100-YR	1000.00	6965.37	6968.83	6968.41	6969.65	0.011018	7.24	138.13	53.75	0.80
NCONFL-BGM	5083	100-YR	1000.00	6965.35	6968.38	6968.38	6969.54	0.018231	8.65	115.56	50.25	1.01
NCONFL-BGM	5072	100-YR	1000.00	6962.72	6965.75	6965.75	6966.92	0.018224	8.65	115.58	50.25	1.01
NCONFL-BGM	5062	100-YR	1000.00	6960.10	6964.00		6964.60	0.007164	6.22	160.71	56.76	0.65
NCONFL-BGM	5056	100-YR	1000.00	6960.08	6963.97		6964.56	0.007096	6.19	161.57	57.13	0.65
NCONFL-BGM	5006	100-YR	1000.00	6959.90	6963.81		6964.19	0.005112	5.27	230.73	127.77	0.55
NCONFL-BGM	4955	100-YR	1000.00	6959.72	6962.68	6962.68	6963.66	0.019315	7.93	126.09	65.58	1.01
NCONFL-BGM	4900	100-YR	1450.00	6956.08	6960.79	6960.79	6961.95	0.013751	8.63	167.98	72.94	1.00
NCONFL-BGM	4850	100-YR	1450.00	6954.44	6959.58	6959.58	6960.85	0.011886	9.09	164.84	76.61	0.96
NCONFL-BGM	4750	100-YR	1450.00	6952.25	6957.61	6957.61	6958.68	0.009513	8.52	197.20	106.64	0.87
NCONFL-BGM	4650	100-YR	1450.00	6950.54	6955.70	6955.70	6956.99	0.009615	9.40	181.50	89.06	0.89
NCONFL-BGM	4600	100-YR	1450.00	6949.23	6954.15	6954.15	6955.50	0.011109	9.36	162.85	72.45	0.94
NCONFL-BGM	4550	100-YR	1450.00	6947.92	6954.07	6953.08	6954.72	0.004367	6.54	245.57	120.32	0.61
NCONFL-BGM	4500	100-YR	1450.00	6947.90	6952.81	6952.81	6954.22	0.012766	9.55	152.99	63.02	0.99
NCONFL-BGM	4400	100-YR	1450.00	6945.00	6949.07	6948.94	6950.40	0.011001	9.29	158.71	56.31	0.94
NCONFL-BGM	4300	100-YR	1450.00	6944.70	6948.29	6947.84	6949.23	0.007971	7.78	188.38	66.98	0.80
NCONFL-BGM	4275	100-YR	1450.00	6944.60	6947.78	6947.78	6949.05	0.013610	9.03	160.56	64.47	1.01
NCONFL-BGM	4250	100-YR	1450.00	6939.95	6943.08	6943.08	6944.38	0.012851	9.19	159.61	63.34	0.99
NCONFL-BGM	4212.47	100-YR	1450.00	6937.01	6943.68		6943.85	0.000760	3.40	443.50	98.79	0.27
NCONFL-BGM	4200	100-YR	1450.00	6936.87	6943.62		6943.82	0.000677	3.55	408.59	108.11	0.26
NCONFL-BGM	4151.92	100-YR	1450.00	6936.82	6943.43		6943.79	0.001073	4.84	299.84	90.43	0.33
NCONFL-BGM	4150	100-YR	1450.00	6936.78	6943.33	6940.13	6943.76	0.000177	5.31	276.92	83.75	0.37
NCONFL-BGM	4073		Culvert									
NCONFL-BGM	4010.56	100-YR	1450.00	6936.40	6939.94	6939.76	6941.45	0.001399	9.87	149.14	42.54	0.93
NCONFL-BGM	4001.57	100-YR	1450.00	6936.38	6940.28		6941.06	0.005502	7.09	205.72	68.34	0.68
NCONFL-BGM	4000	100-YR	1450.00	6936.28	6939.59	6939.45	6940.73	0.011364	8.54	169.70	79.70	0.93
NCONFL-BGM	3900	100-YR	1450.00	6936.02	6939.36		6939.87	0.005695	5.75	257.56	122.54	0.65
NCONFL-BGM	3850	100-YR	1450.00	6935.31	6938.84		6939.51	0.008202	6.58	220.49	97.40	0.77
NCONFL-BGM	3800	100-YR	1450.00	6934.35	6937.95	6937.95	6938.94	0.014759	7.95	182.42	94.05	1.01
NCONFL-BGM	3694	100-YR	1482.00	6931.81	6935.53	6935.35	6936.24	0.010872	6.76	219.11	115.41	0.87
NCONFL-BGM	3600	100-YR	1482.00	6930.58	6934.13	6934.13	6935.02	0.015245	7.59	195.35	111.22	1.01
NCONFL-BGM	3500	100-YR	1482.00	6928.80	6933.06		6933.52	0.004225	5.39	274.81	99.77	0.57
NCONFL-BGM	3450	100-YR	1482.00	6927.99	6931.95	6931.95	6933.09	0.013780	8.59	172.56	75.61	1.00
NCONFL-BGM	3350	100-YR	1482.00	6926.42	6930.26	6930.26	6931.20	0.014757	7.76	190.87	102.92	1.01
NCONFL-BGM	3300	100-YR	1482.00	6924.78	6929.52	6929.14	6930.36	0.008680	7.34	202.85	89.96	0.81
NCONFL-BGM	3250	100-YR	1482.00	6923.75	6928.66	6928.57	6929.81	0.012179	8.63	172.72	77.97	0.96
NCONFL-BGM	3200	100-YR	1482.00	6923.28	6927.88	6927.88	6929.18	0.012816	9.12	164.00	69.79	0.99
NCONFL-BGM	3150	100-YR	1482.00	6923.15	6926.80	6926.80	6928.02	0.011701	8.89	173.92	89.73	0.95
NCONFL-BGM	3100	100-YR	1482.00	6921.99	6925.61	6925.61	6926.83	0.013162	8.86	168.32	77.51	0.99
NCONFL-BGM	3050	100-YR	1482.00	6921.38	6925.73		6926.31	0.004324	6.12	250.03	97.99	0.60
NCONFL-BGM	3000	100-YR	1482.00	6920.36	6924.59	6924.59	6925.73	0.013102	9.05	198.96	133.53	1.00
NCONFL-BGM	2900	100-YR	1482.00	6919.31	6923.13	6923.13	6924.13	0.009768	8.43	216.67	125.57	0.88
NCONFL-BGM	2800	100-YR	1482.00	6917.18	6921.86	6921.86	6922.91	0.007828	8.65	224.60	139.68	0.81
NCONFL-BGM	2650	100-YR	1482.00	6913.71	6919.18	6919.18	6919.89	0.005569	7.53	323.45	268.13	0.69
NCONFL-BGM	2605	100-YR	1482.00	6912.88	6918.10	6918.10	6918.83	0.006506	7.36	295.36	255.68	0.72
NCONFL-BGM	2550	100-YR	1482.00	6912.38	6916.58	6916.58	6917.36	0.008613	7.70	256.77	166.76	0.82
NCONFL-BGM	2500	100-YR	1482.00	6911.54	6915.86	6915.86	6916.81	0.008681	8.47	234.75	140.20	0.84
NCONFL-BGM	2450	100-YR	1482.00	6910.68	6915.01	6915.01	6915.97	0.008539	8.28	225.43	138.27	0.83
NCONFL-BGM	2400	100-YR	1482.00	6907.81	6913.81	6913.81	6914.92	0.008583	8.69	204.38	127.31	0.83
NCONFL-BGM	2300	100-YR	1482.00	6908.18	6911.66	6911.66	6912.68	0.010554	8.51	213.90	134.11	0.91
NCONFL-BGM	2200	100-YR	1482.00	6906.18	6909.60	6909.60	6910.63	0.014318	8.14	181.98	89.19	1.01
NCONFL-BGM	2100	100-YR	1482.00	6903.79	6906.88	6906.88	6907.90	0.014434	8.11	182.69	90.71	1.01
NCONFL-BGM	2000	100-YR	1482.00	6902.93	6905.98		6906.56	0.007214	6.13	241.81	108.71	0.72
NCONFL-BGM	1900	100-YR	1482.00	6901.77	6904.64	6904.63	6905.54	0.014585	7.59	195.23	108.14	1.00
NCONFL-BGM	1800	100-YR	1482.00	6900.25	6903.16	6903.16	6904.08	0.014520	7.69	193.61	114.37	1.00
NCONFL-BGM	1700	100-YR	1482.00	6899.58	6902.20		6902.60	0.007750	5.09	291.40	183.40	0.71
NCONFL-BGM	1600	100-YR	1482.00	6898.29	6900.92	6900.92	6901.47	0.017355	5.95	249.16	229.12	1.00
NCONFL-BGM	1517	100-YR	1482.00	6897.37	6900.13		6900.27	0.001829	3.03	500.36	256.40	0.36
NCONFL-BGM	1474	Ex. Drop Crest	100-YR	6897.10	6899.26	6899.26	6900.02	0.020626	7.00	211.81	142.62	1.01
NCONFL-BGM	1453	Ex. Drop Toe	100-YR	6893.69	6898.55		6899.01	0.008216	5.44	272.58	125.01	0.65
NCONFL-BGM	1428		100-YR	6893.40	6898.10		6898.75	0.011000	6.47	228.90	128.68	0.86
NCONFL-BGM	1386		100-YR	6892.51	6897.90		6898.33	0.006512	5.25	282.47	152.05	0.67
NCONFL-BGM	1329	Ex. Drop Top	100-YR	6892.85	6896.96	6896.96	6897.79	0.012085	7.39	212.91	149.10	0.92
NCONFL-BGM	1317	Ex. Drop Toe	100-YR	6889.26	6893.98	6893.75	6894.80	0.010956	7.27	203.73	96.01	0.88
NCONFL-BGM	1286		100-YR	6889.05	6893.72		6894.45	0.009902	6.82	217.37	104.86	0.83

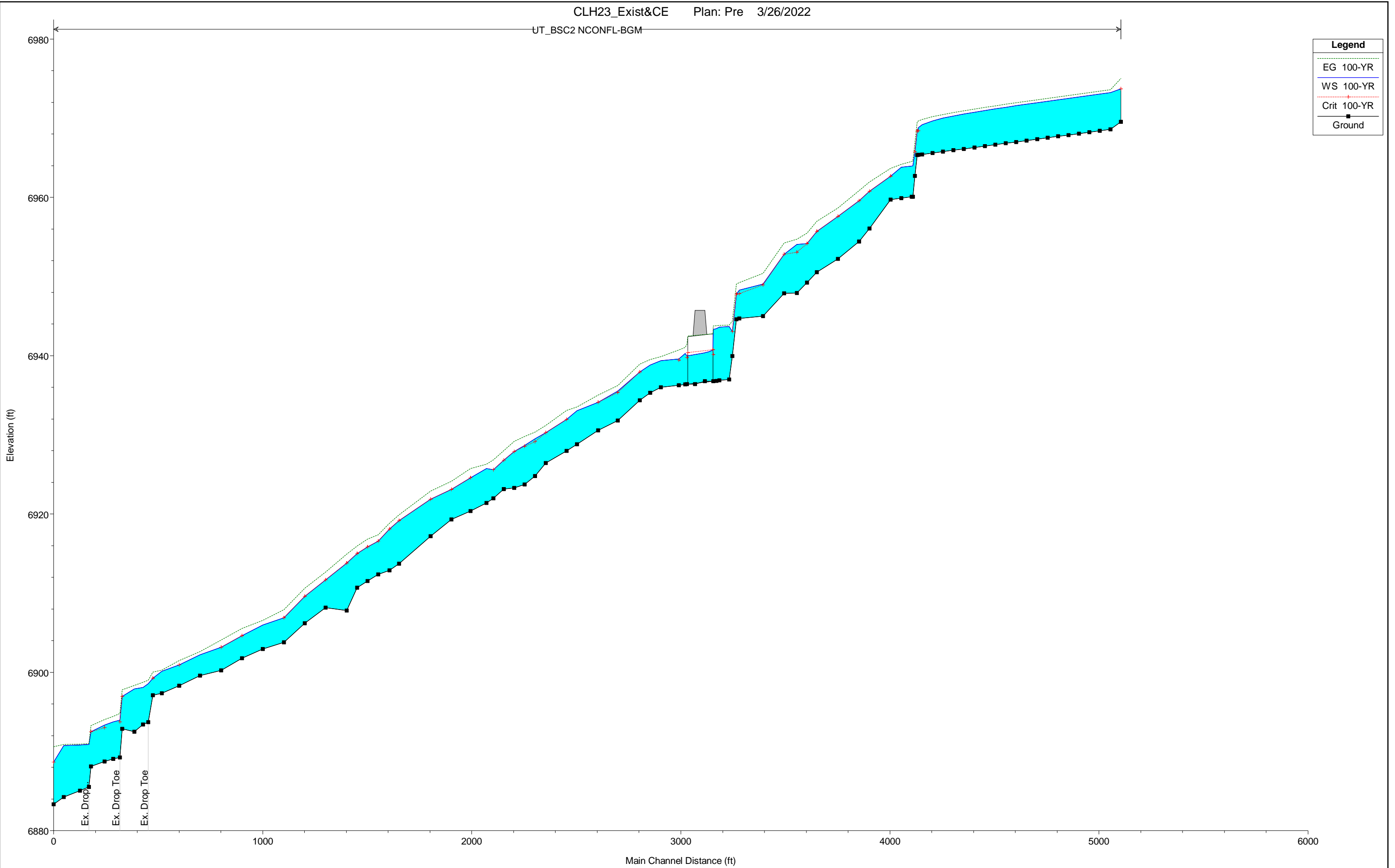
HEC-RAS Plan: Pre River: UT_BSC2 Reach: NCONFL-BGM Profile: 100-YR (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
NCONFL-BGM	1243	100-YR	1482.00	6888.75	6893.35	6893.02	6894.03	0.009078	6.59	224.85	106.90	0.80
NCONFL-BGM	1179 Ex. Drop Top	100-YR	1482.00	6888.12	6892.48	6892.48	6893.27	0.015379	7.15	207.16	129.58	1.00
NCONFL-BGM	1169 Ex. Drop Toe	100-YR	1482.00	6885.50	6890.87		6890.98	0.000817	2.66	563.25	192.89	0.26
NCONFL-BGM	1126	100-YR	1482.00	6885.05	6890.81		6890.94	0.000843	2.96	510.34	157.18	0.27
NCONFL-BGM	1050	100-YR	1482.00	6884.24	6890.74		6890.88	0.000796	2.94	503.45	129.74	0.26
NCONFL-BGM	1000	100-YR	1482.00	6883.33	6888.64	6888.64	6890.60	0.012887	11.22	132.13	34.10	1.00

ATTACHMENT J
Pre-Project Water Surface Profiles

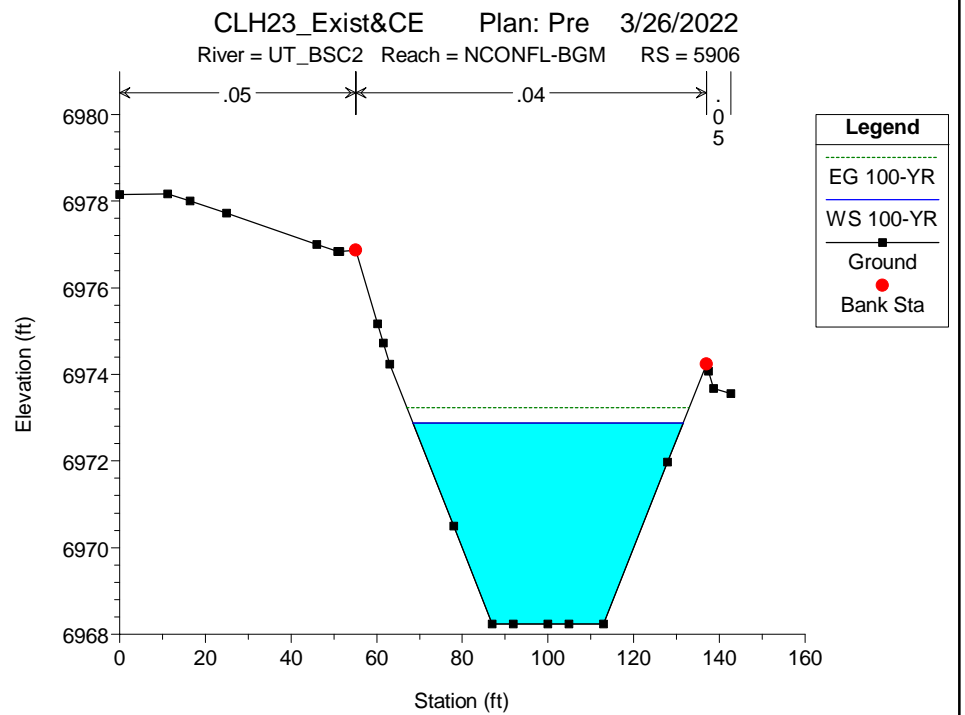
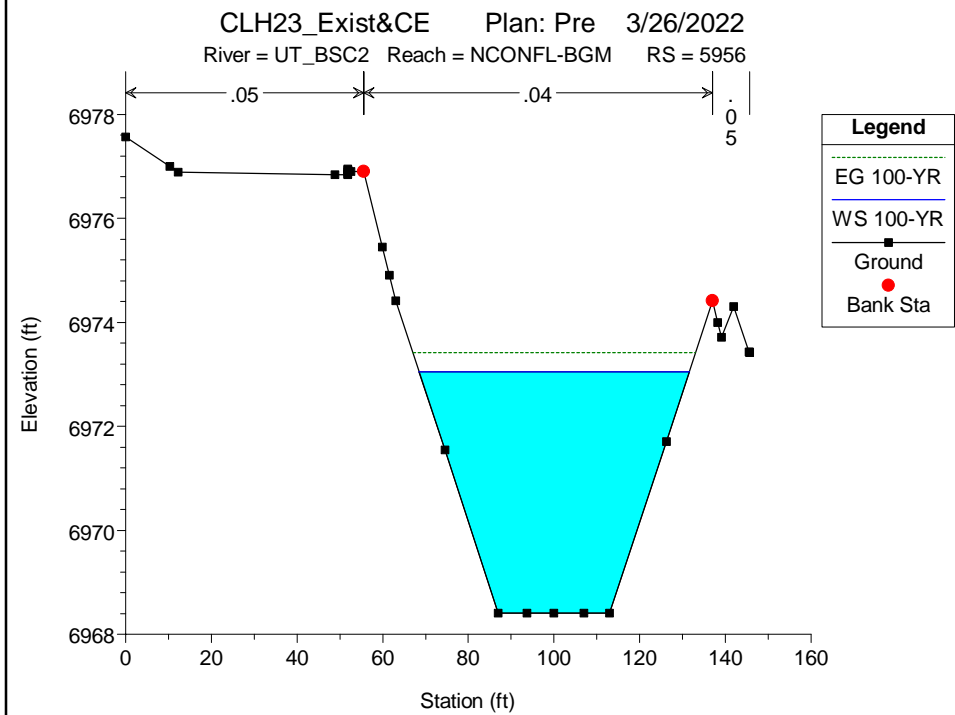
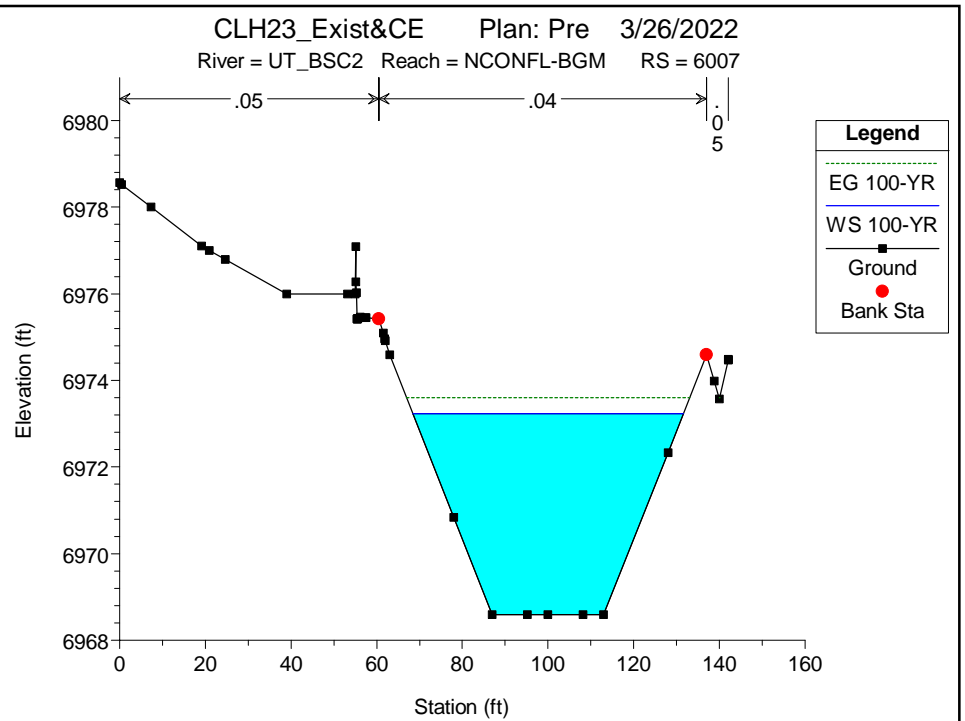
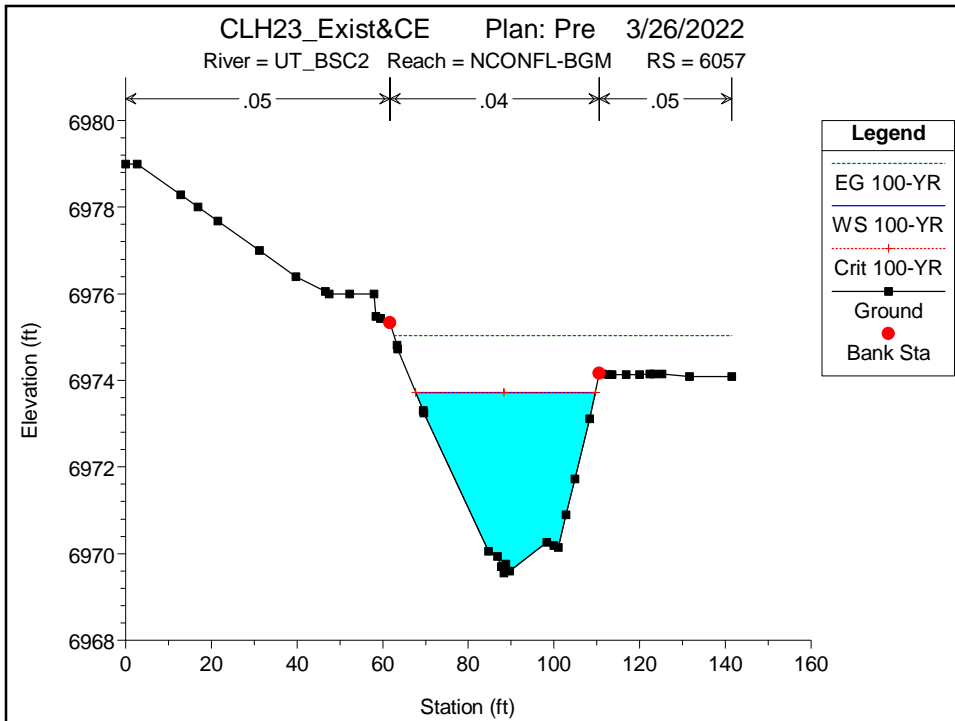


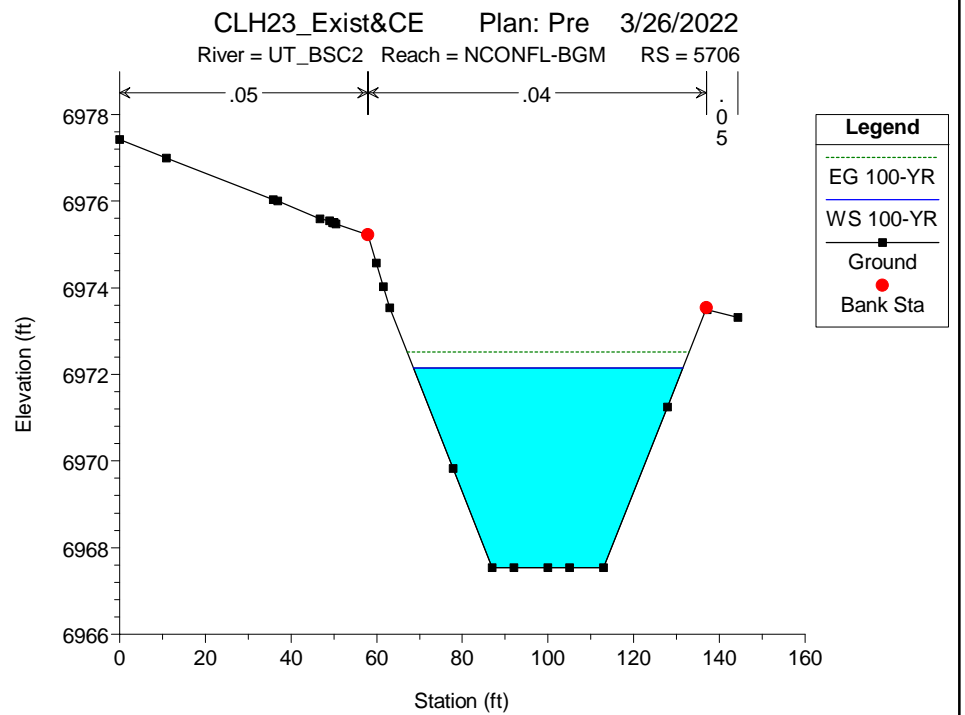
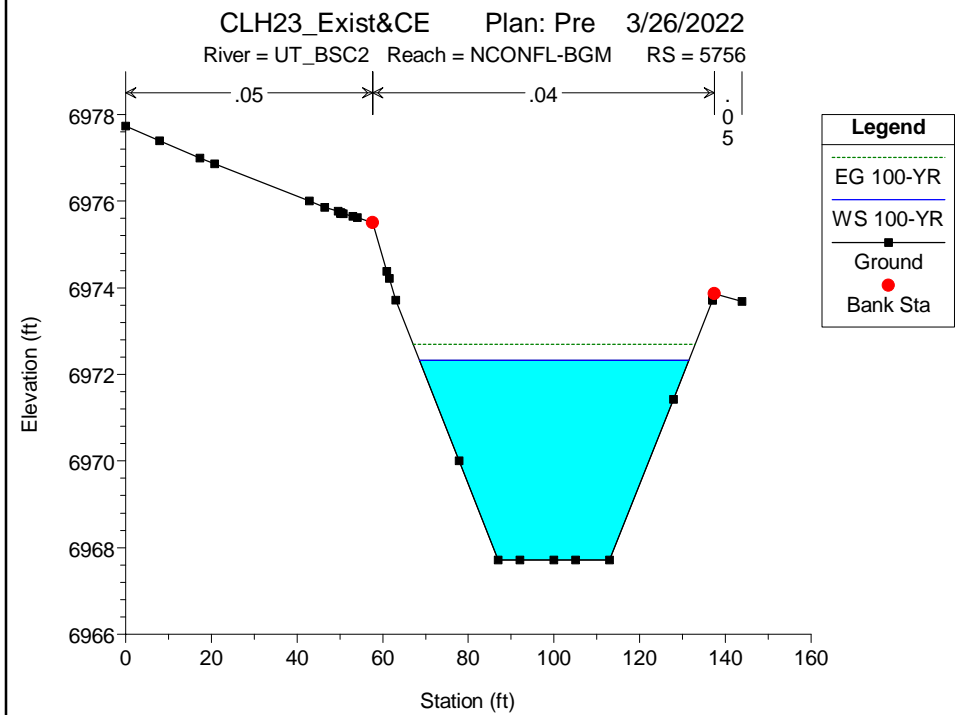
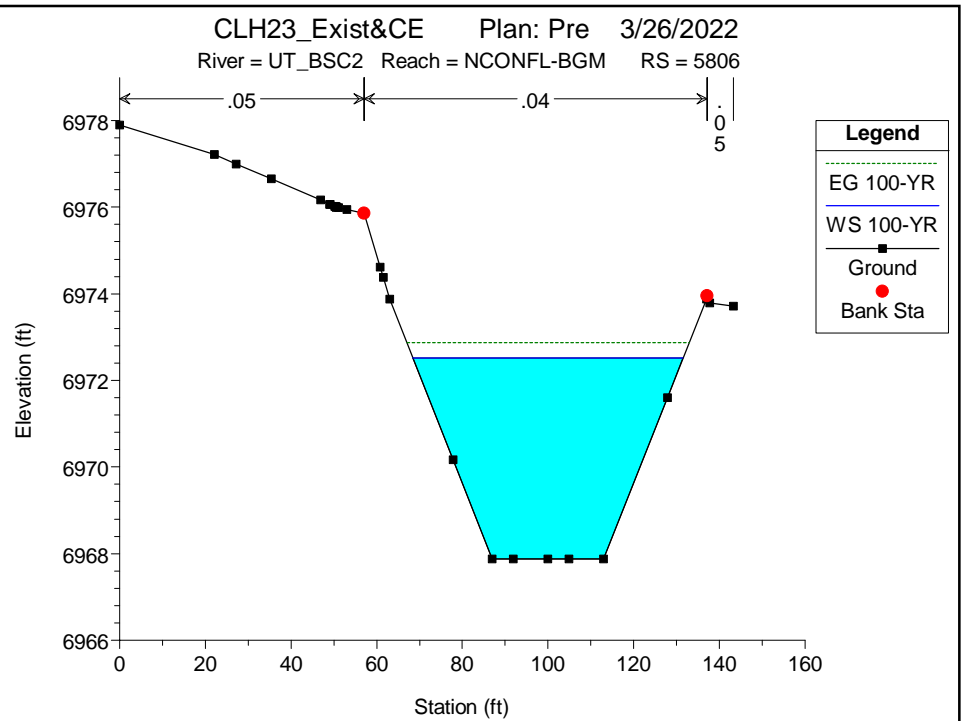
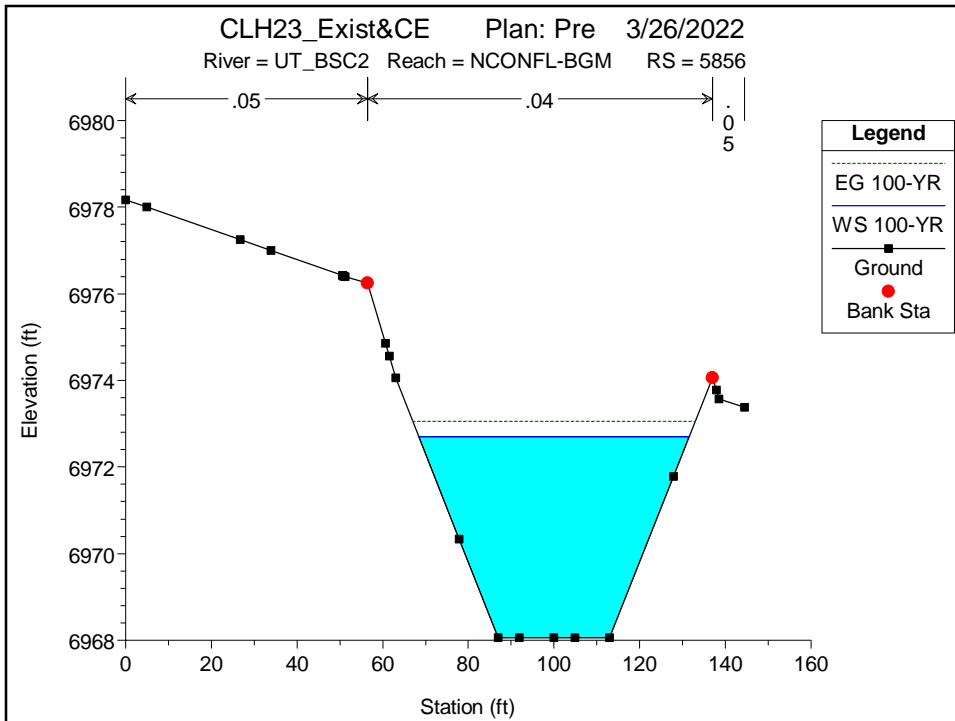
Legend	
EG 100-YR	
WS 100-YR	
Crit 100-YR	
Ground	

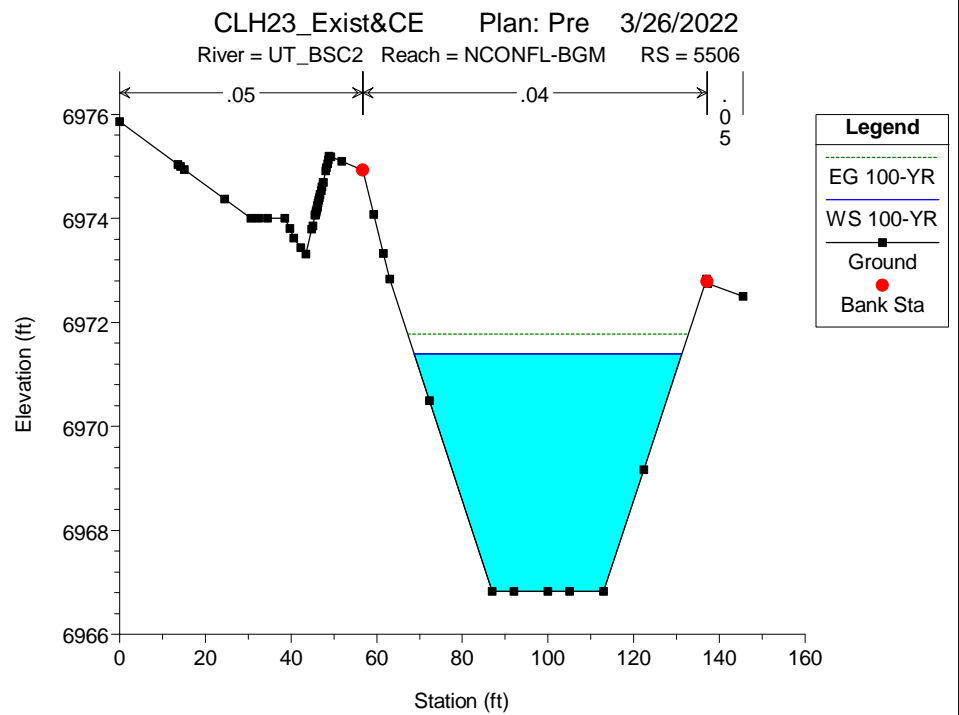
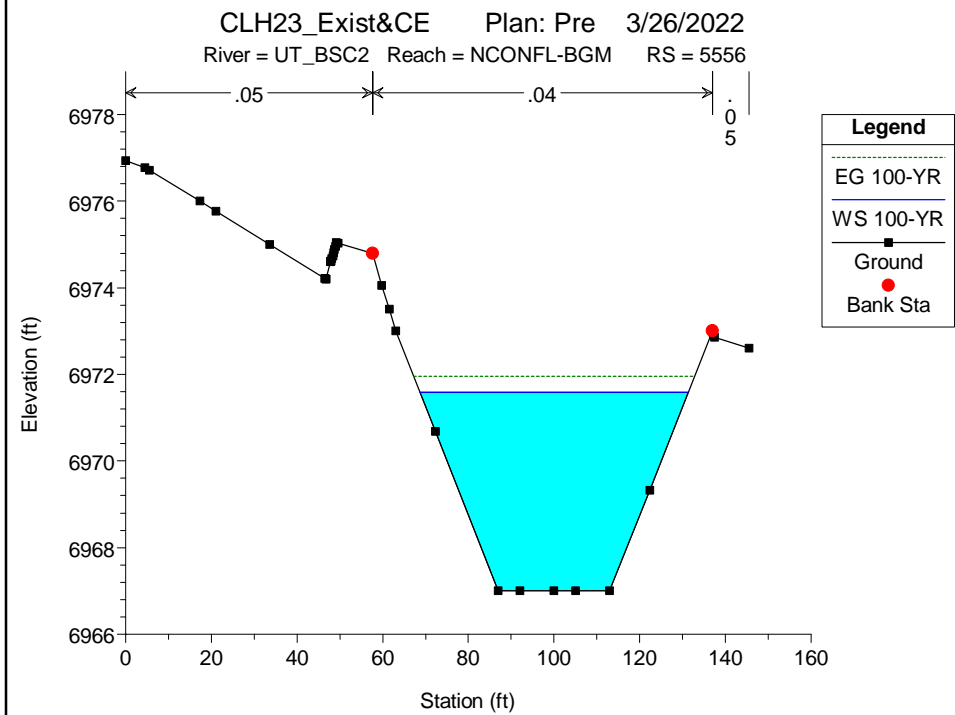
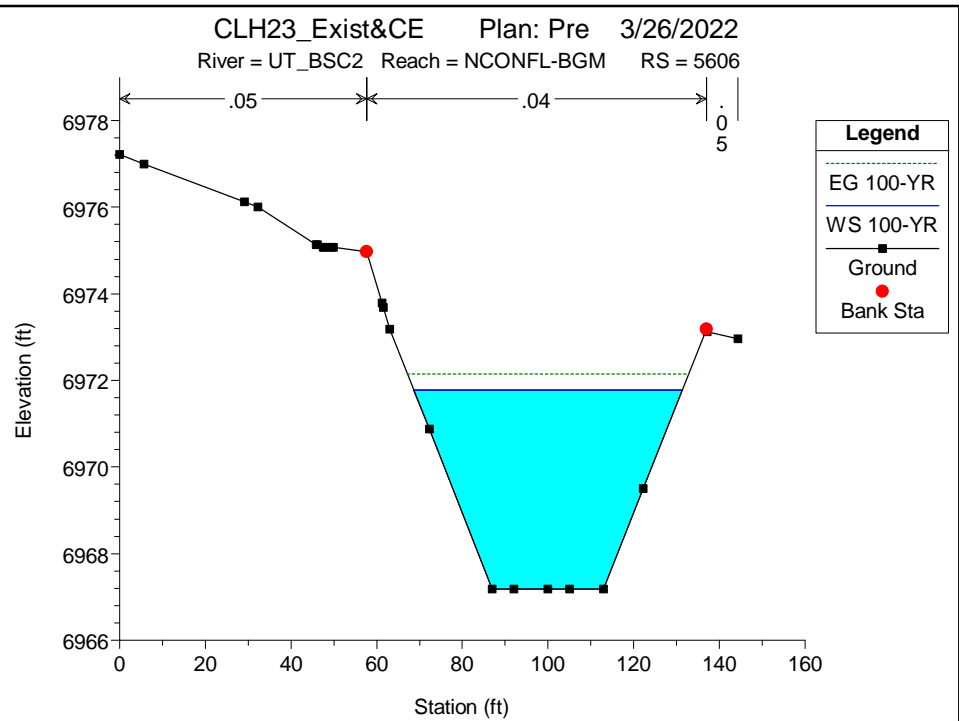
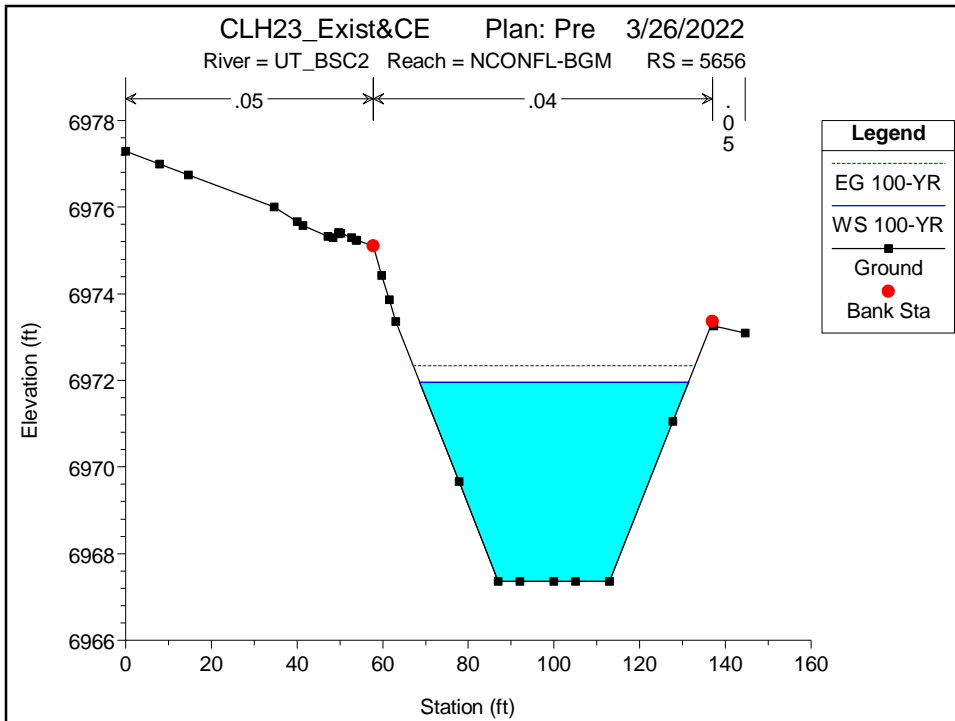


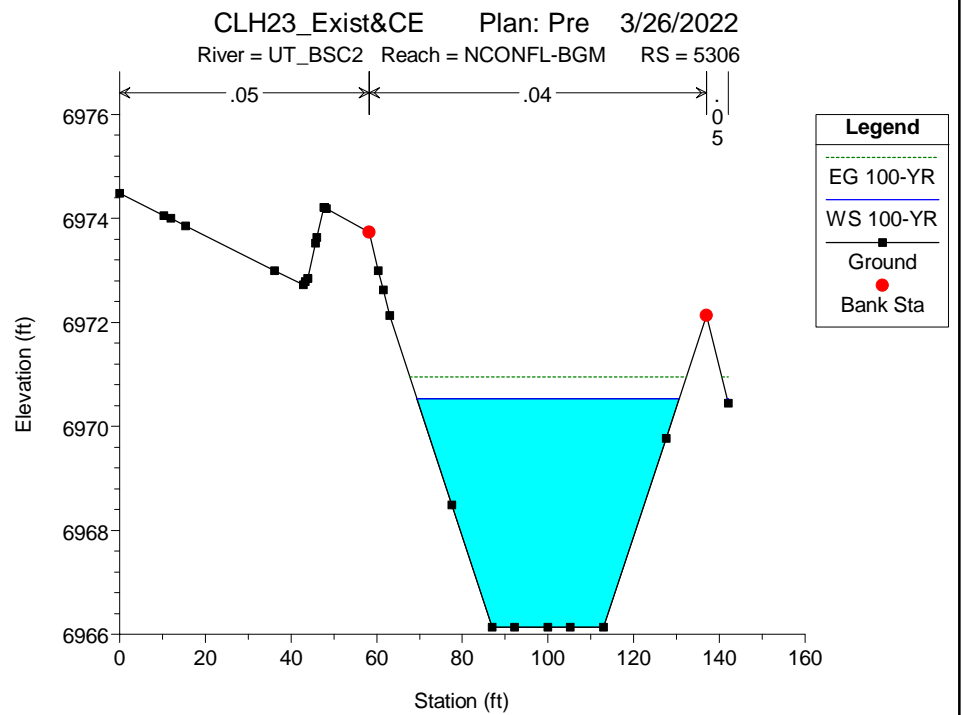
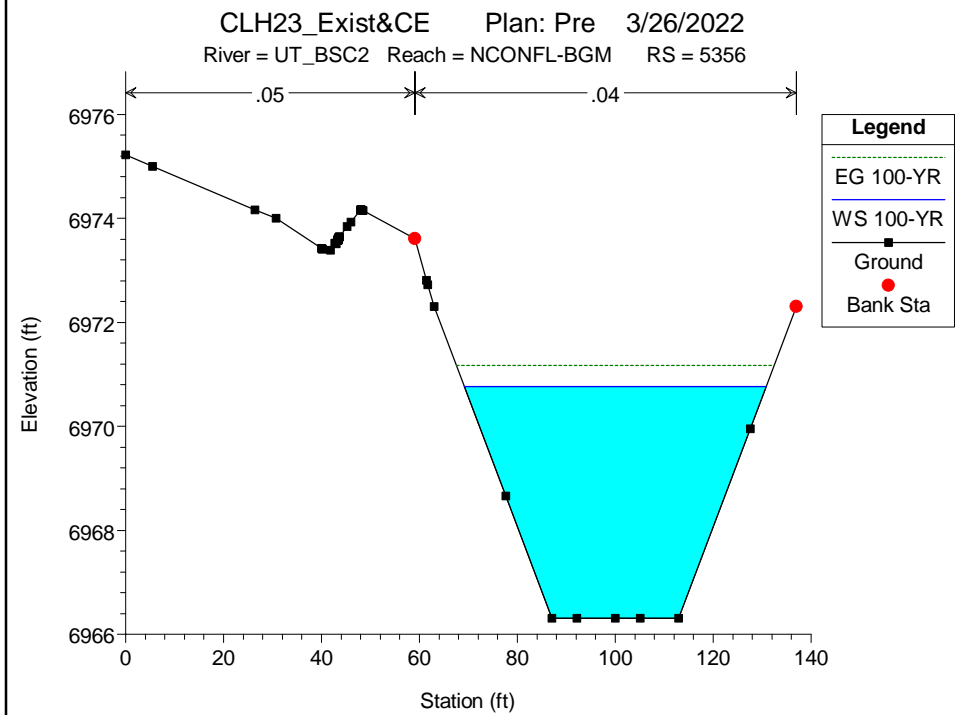
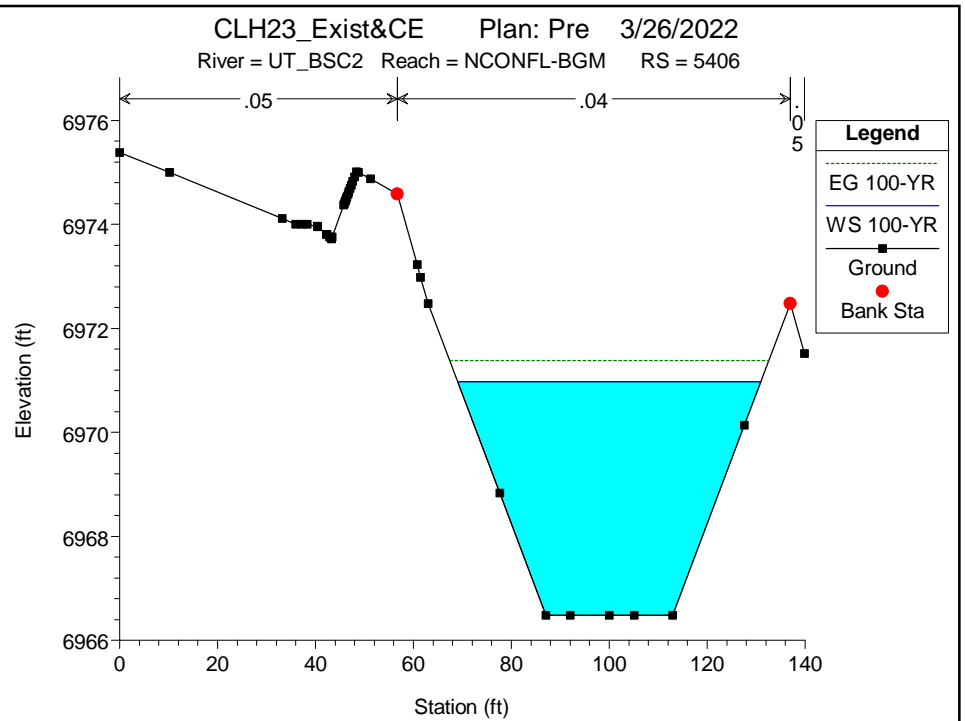
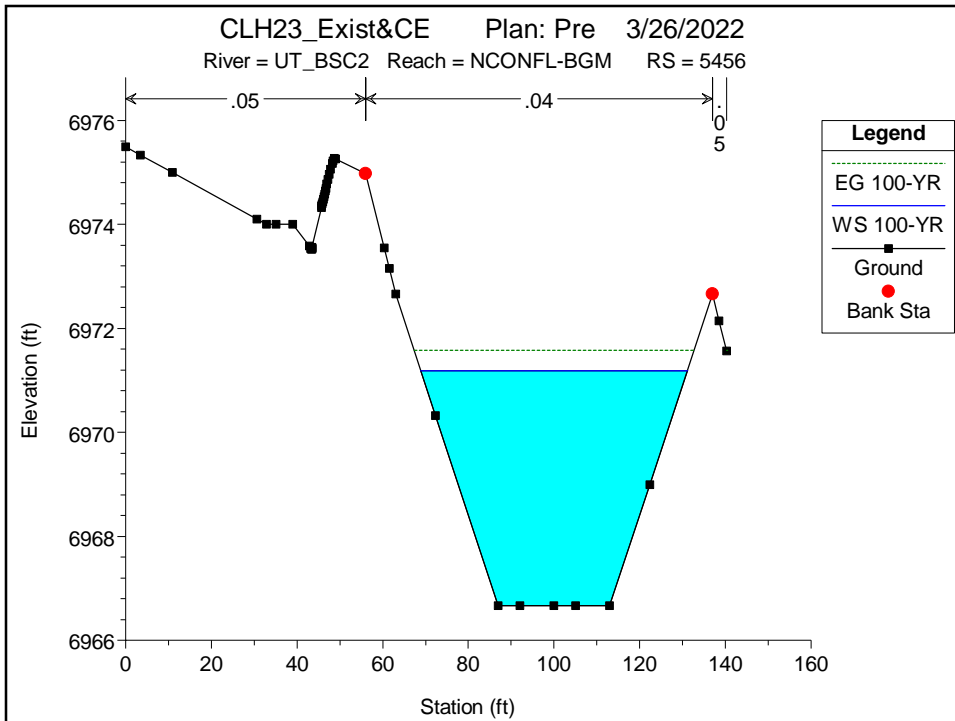
ATTACHMENT K
Pre-Project Cross Sections

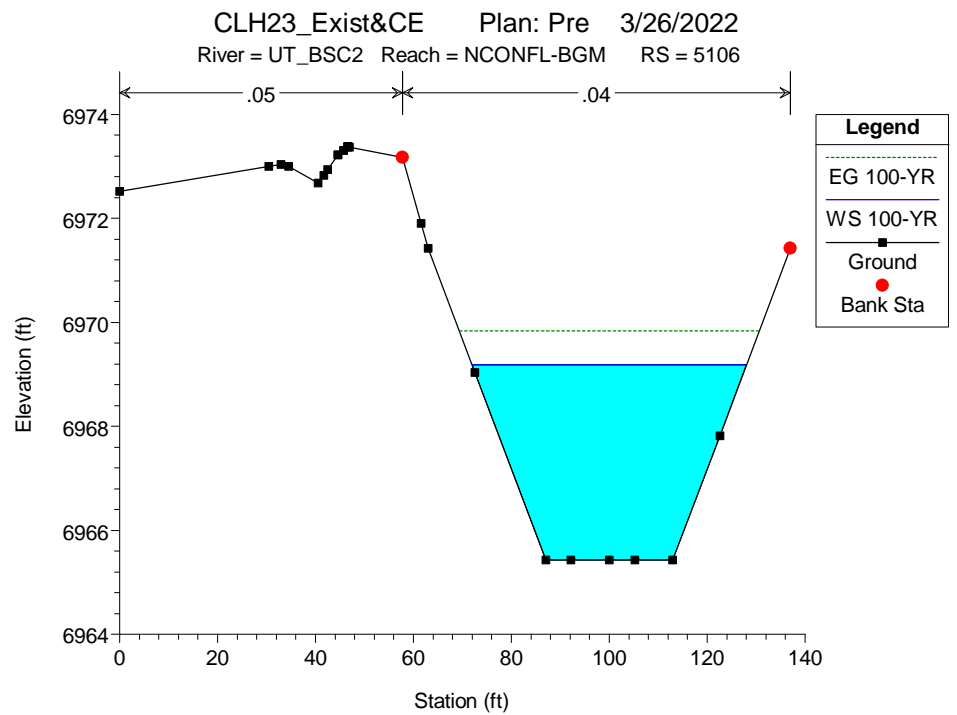
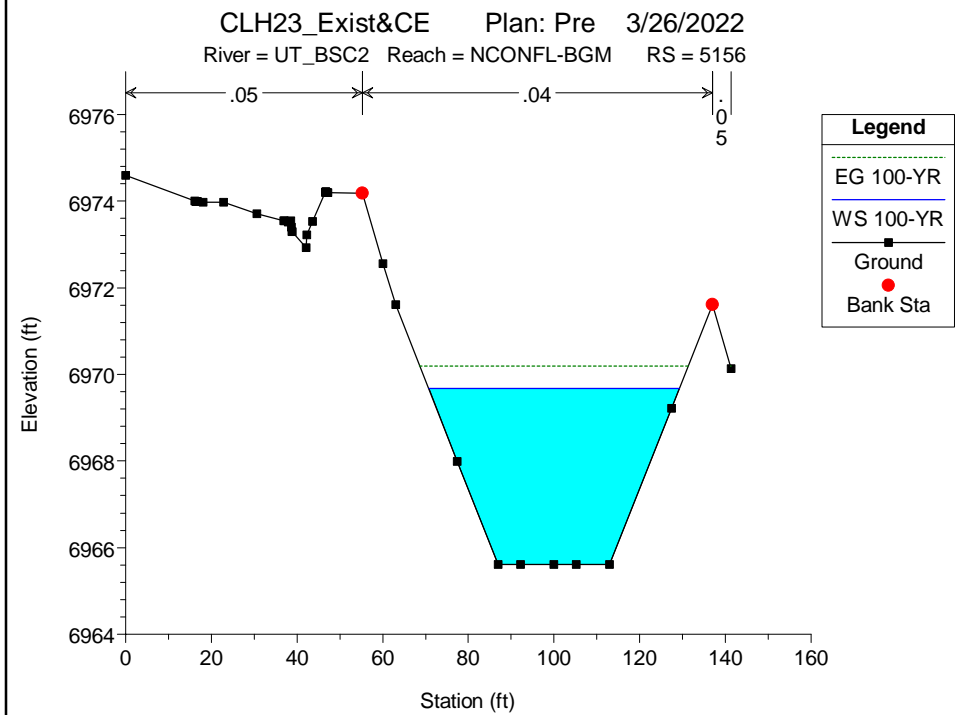
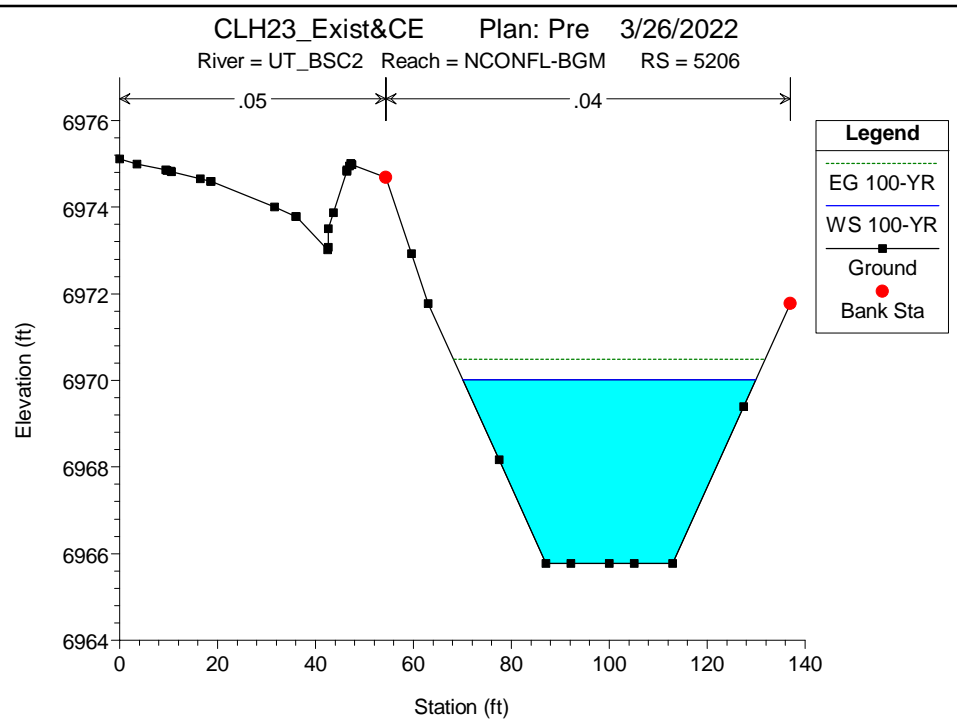
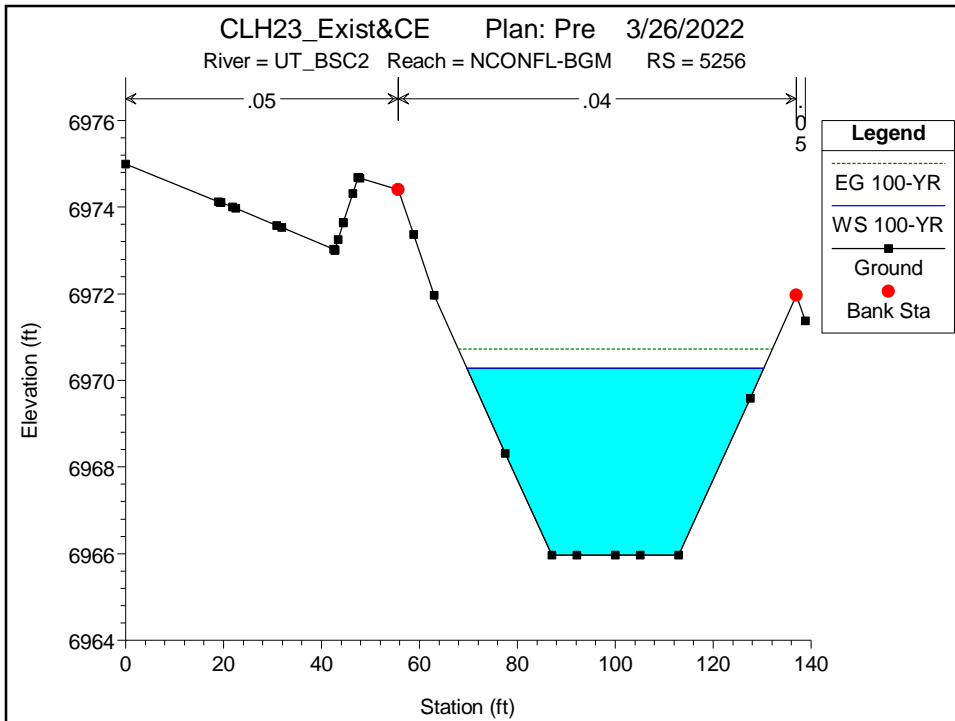


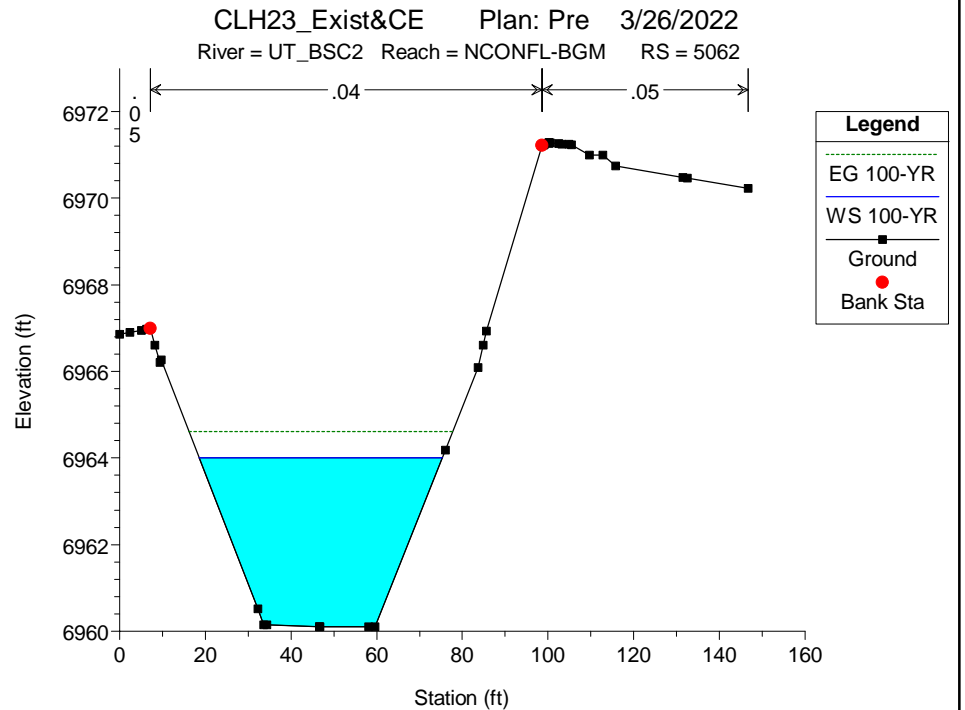
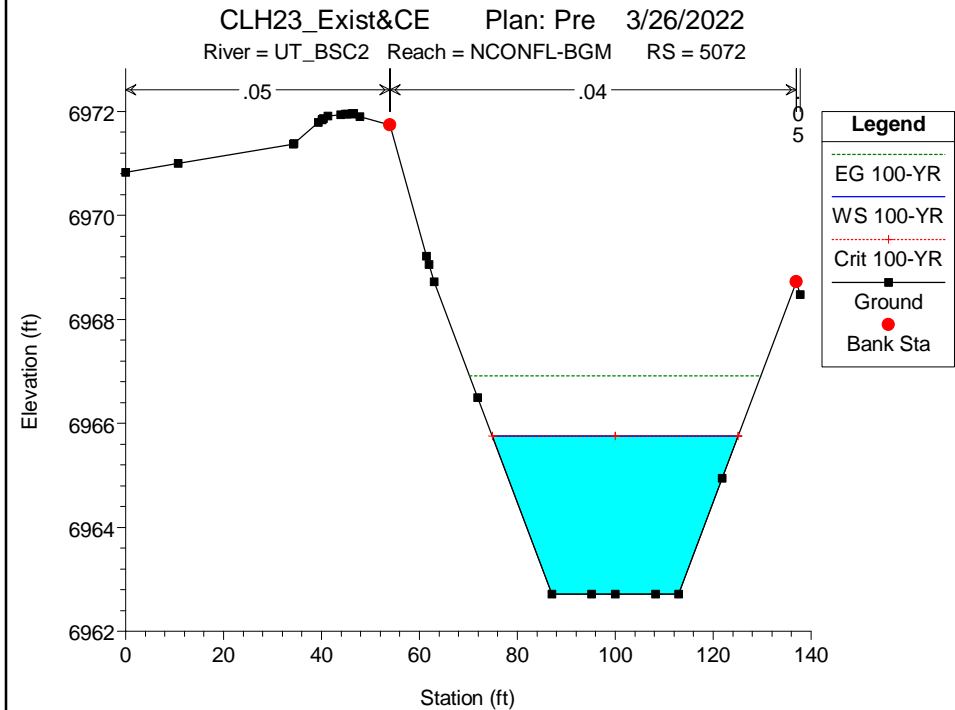
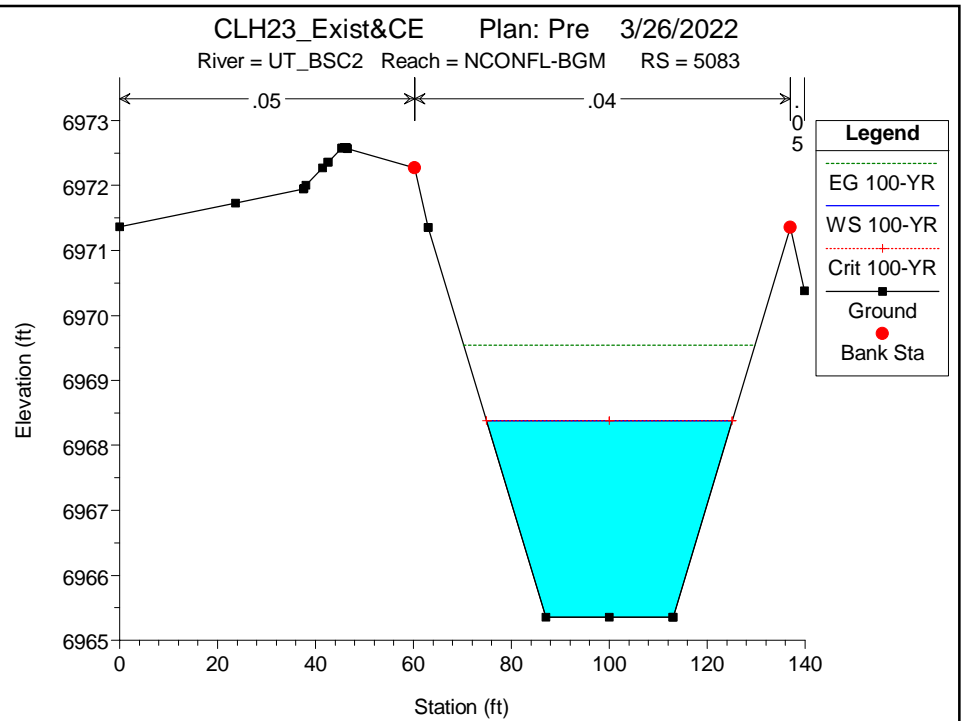
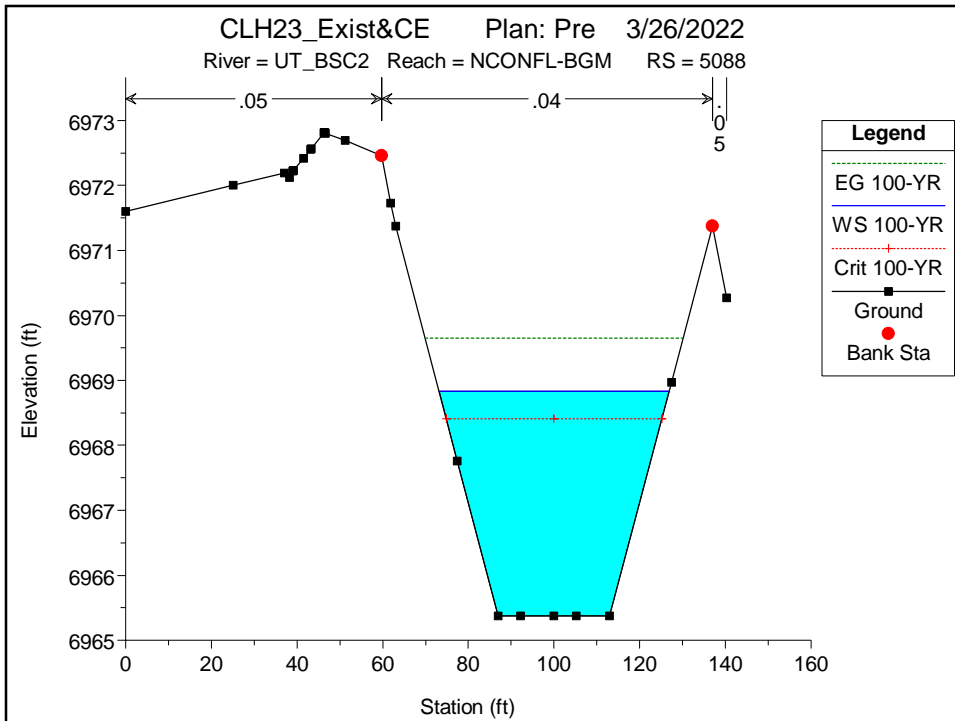


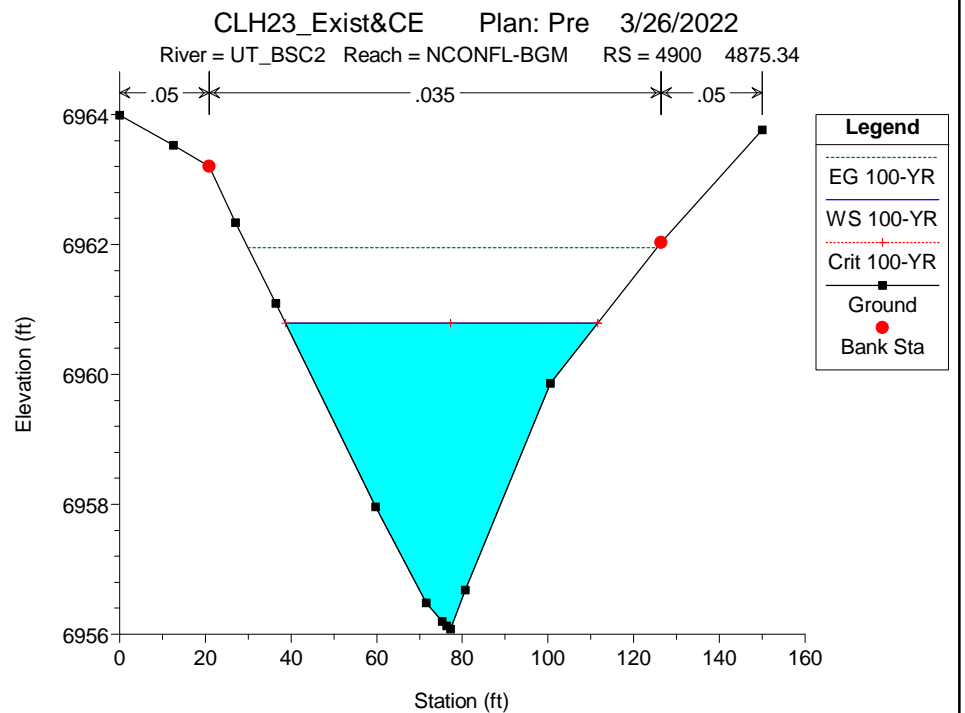
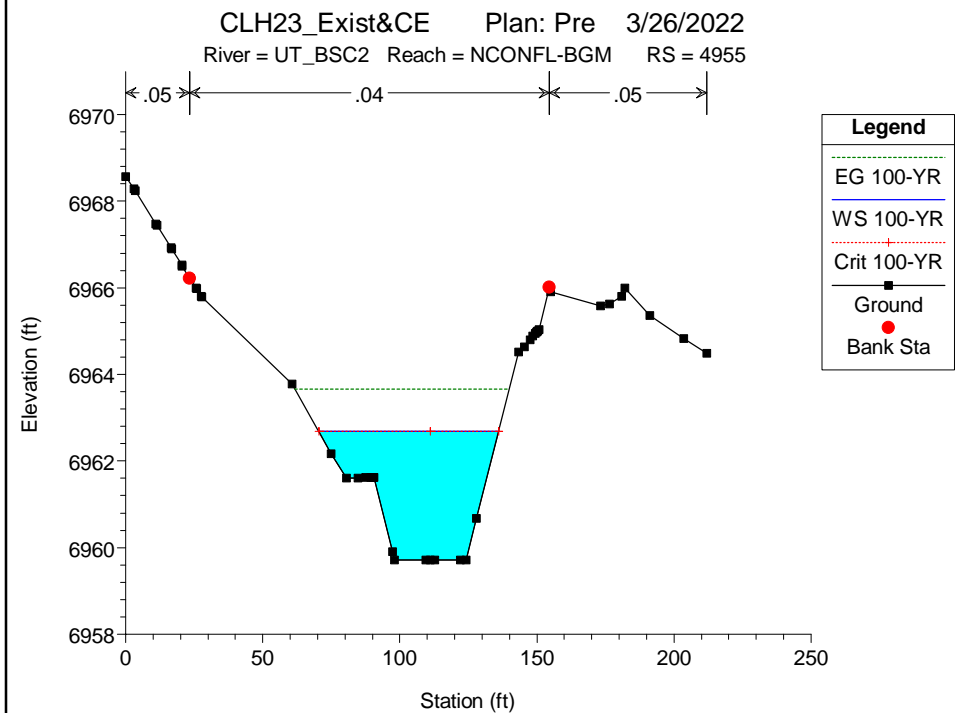
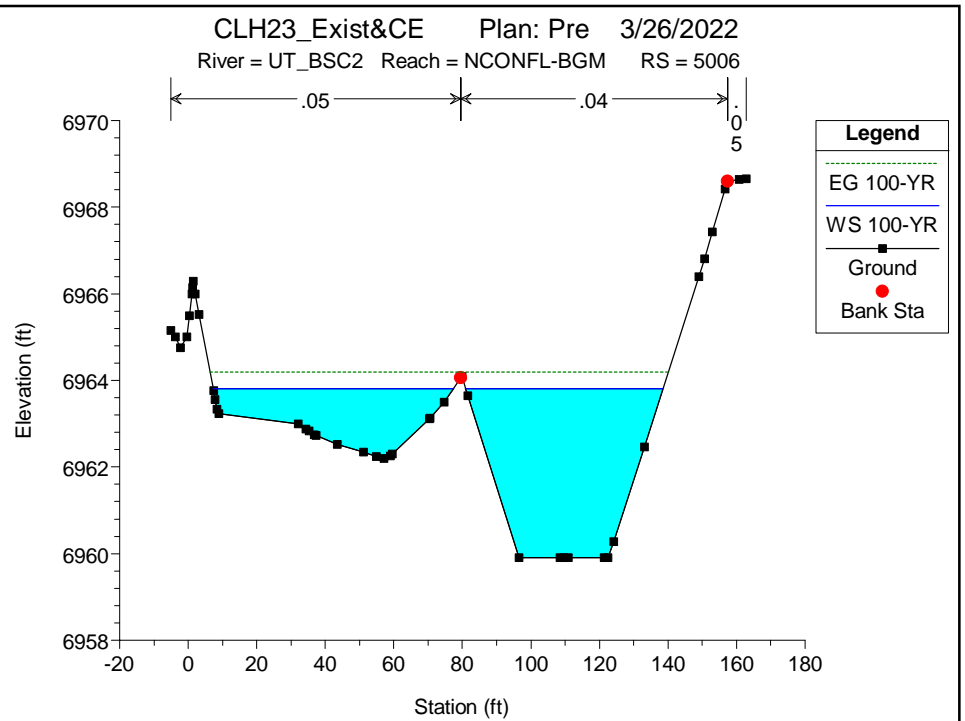
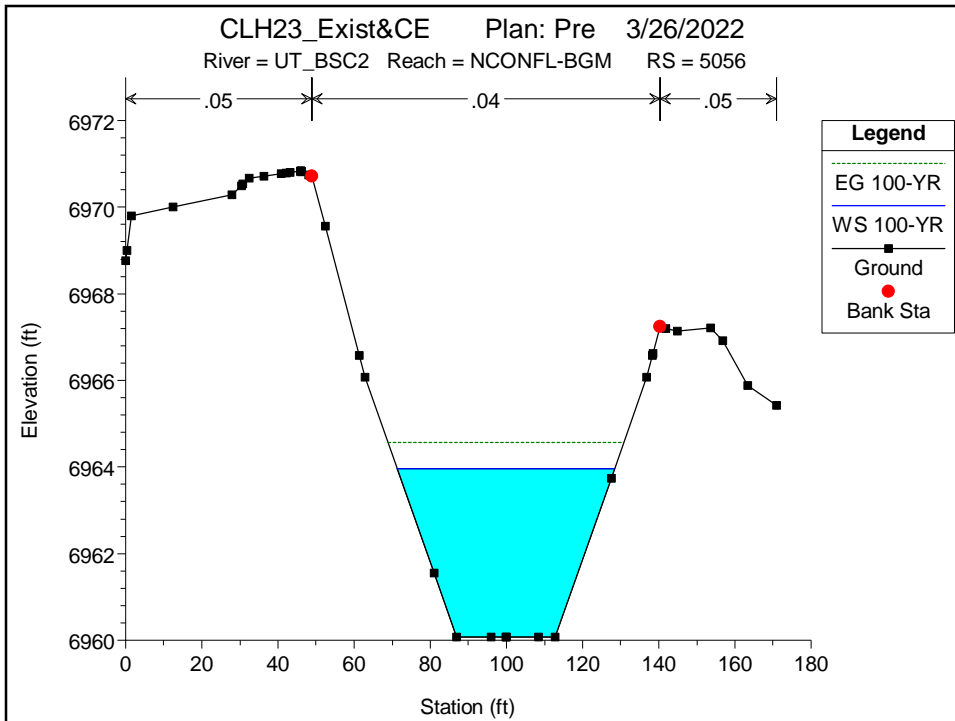


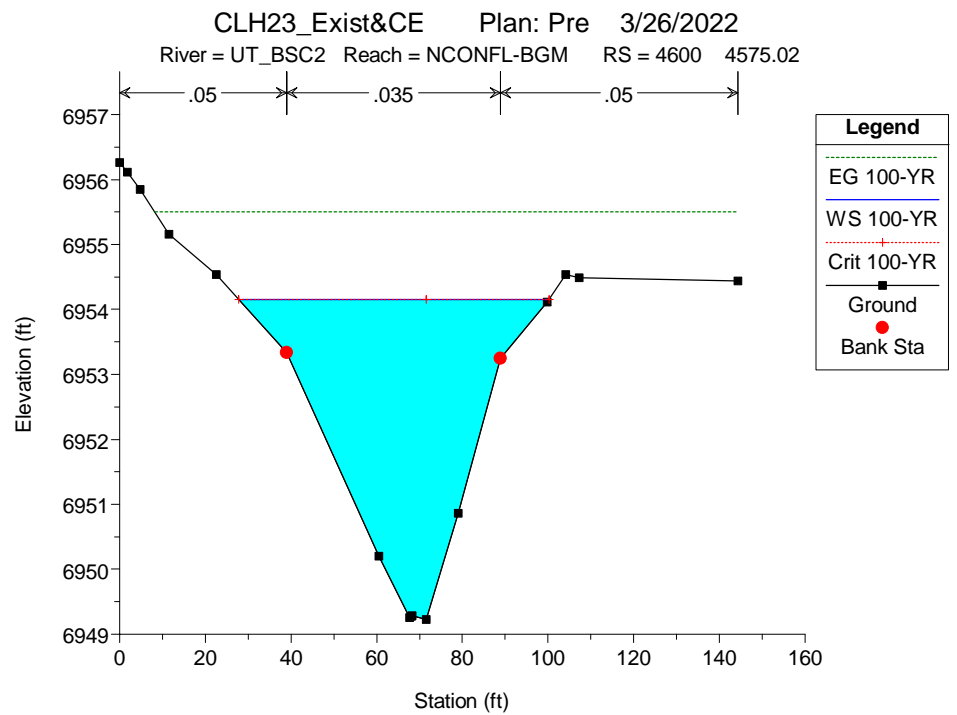
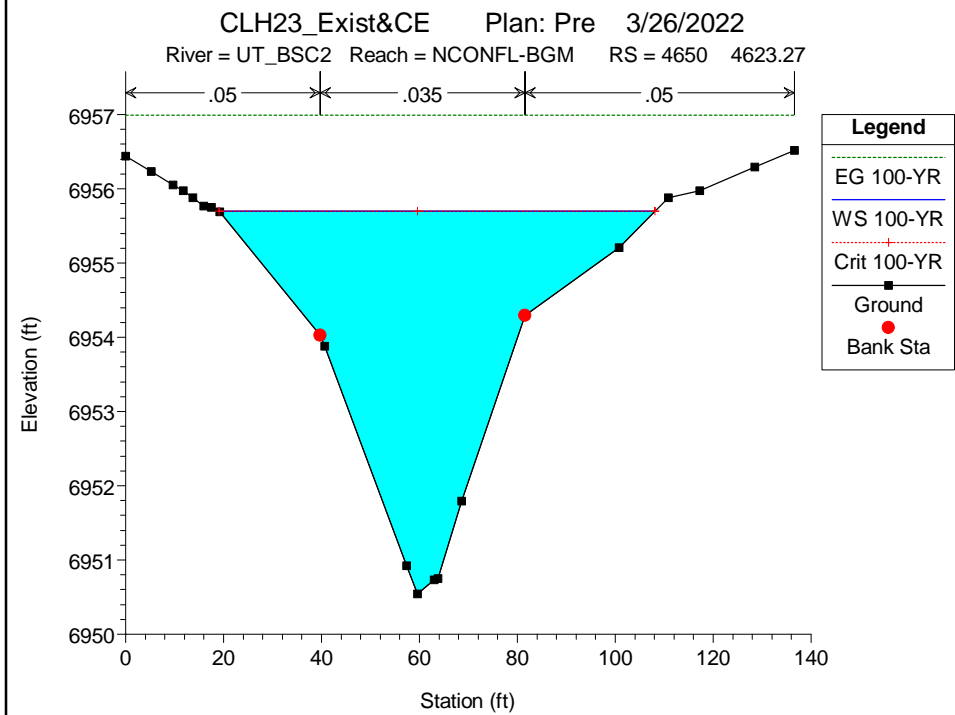
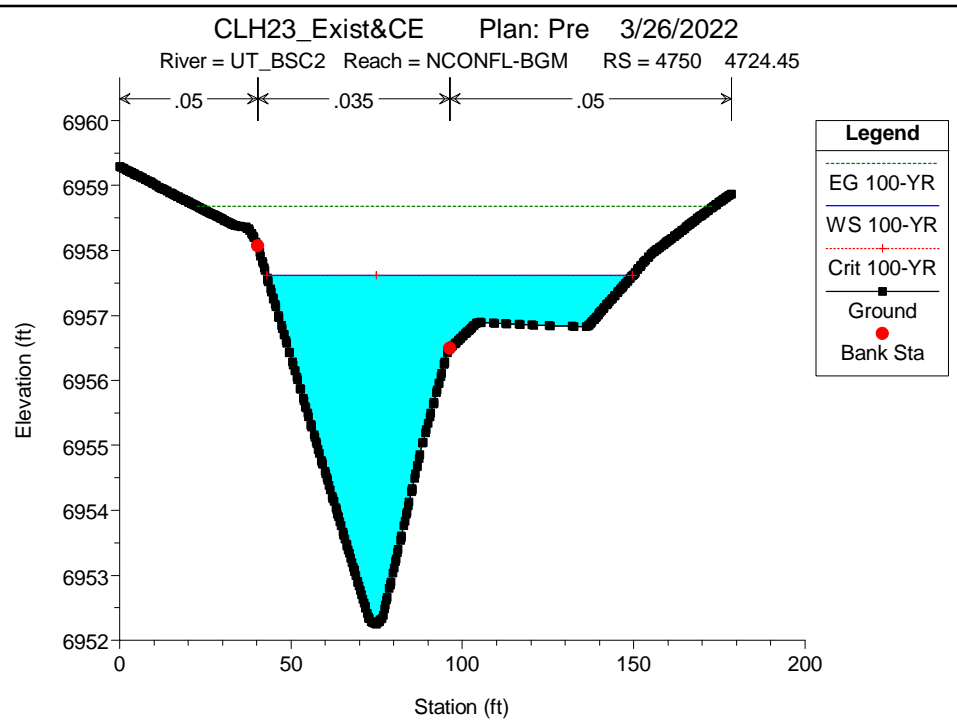
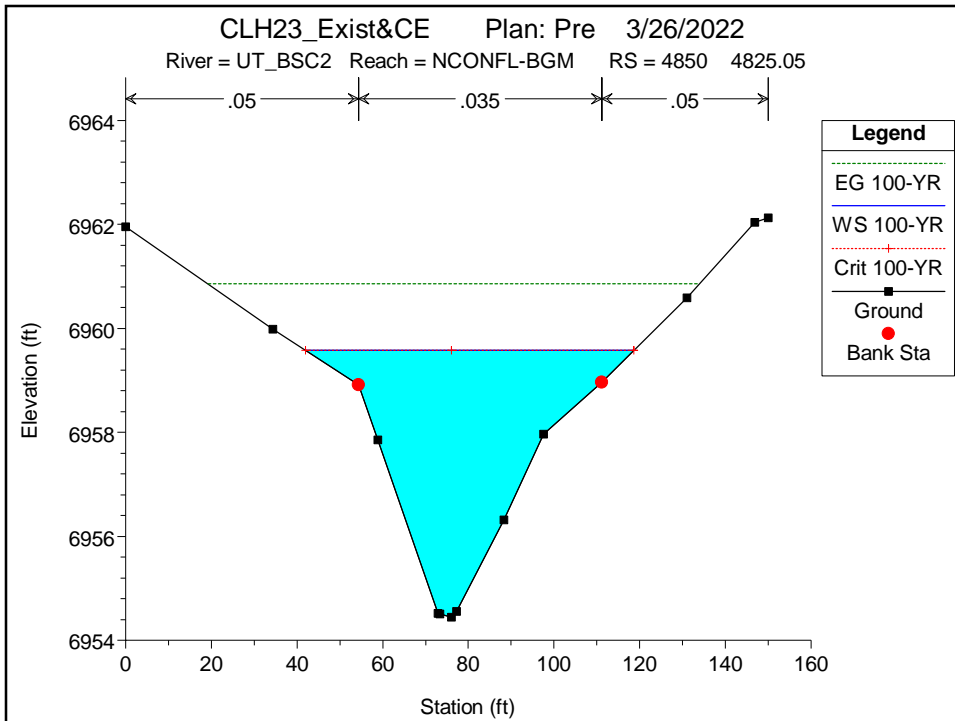


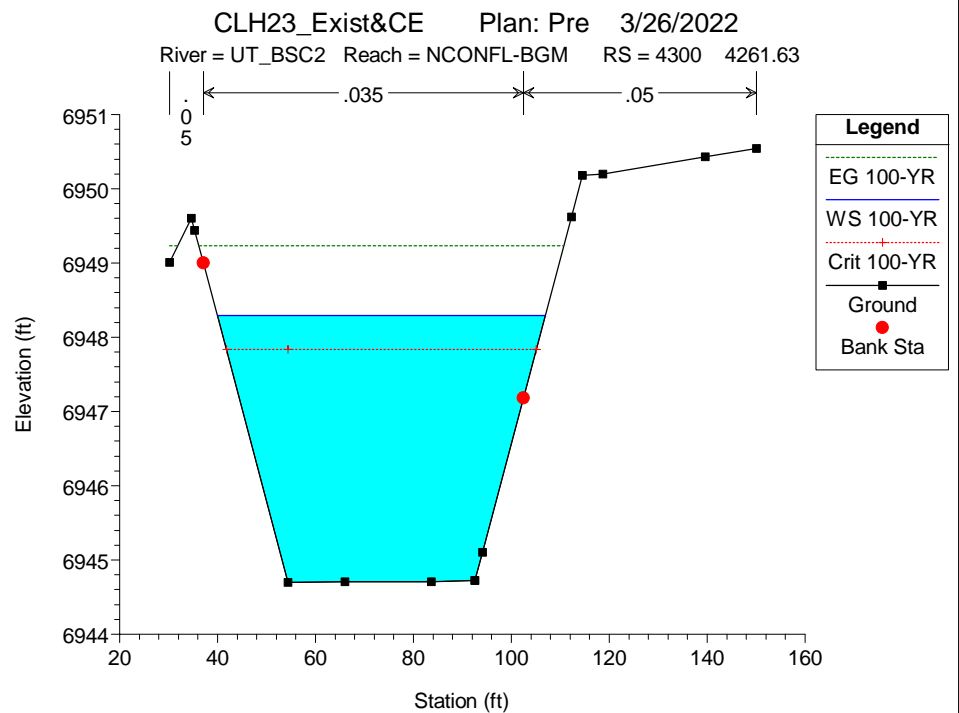
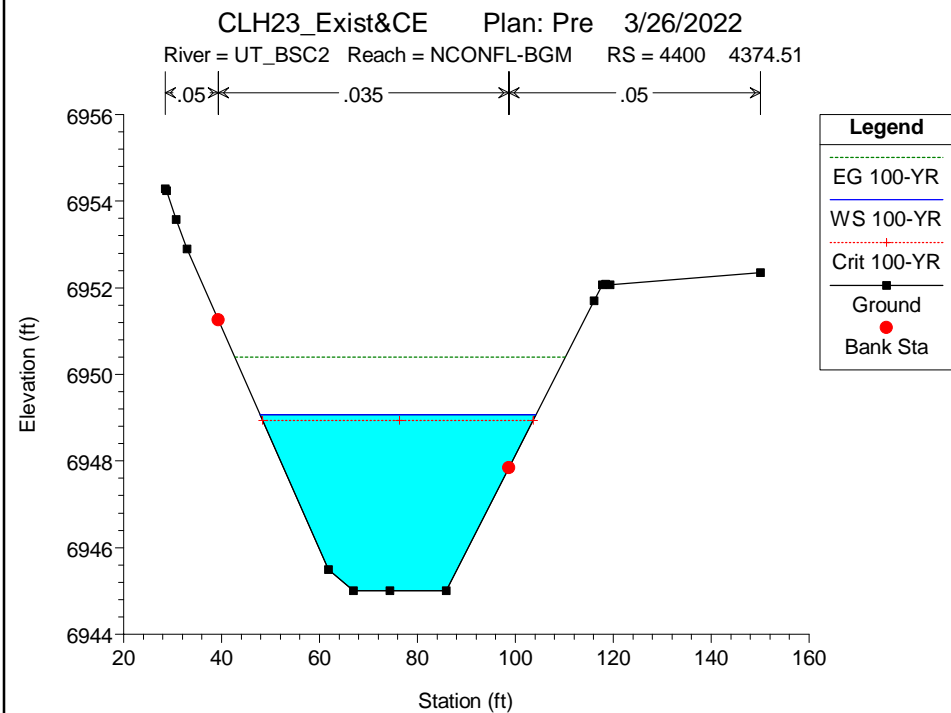
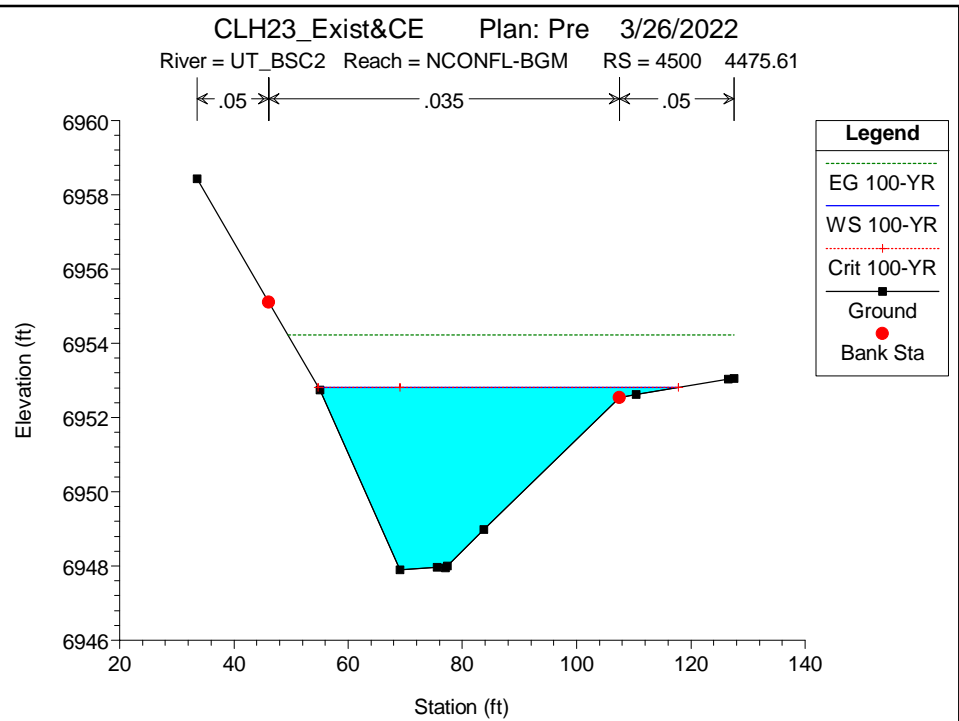
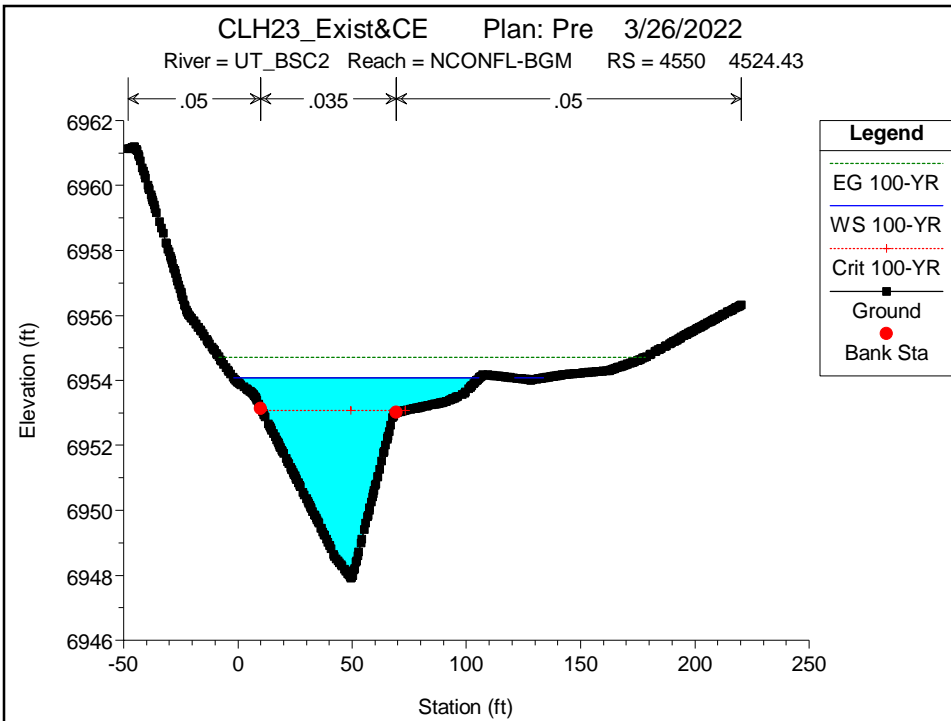


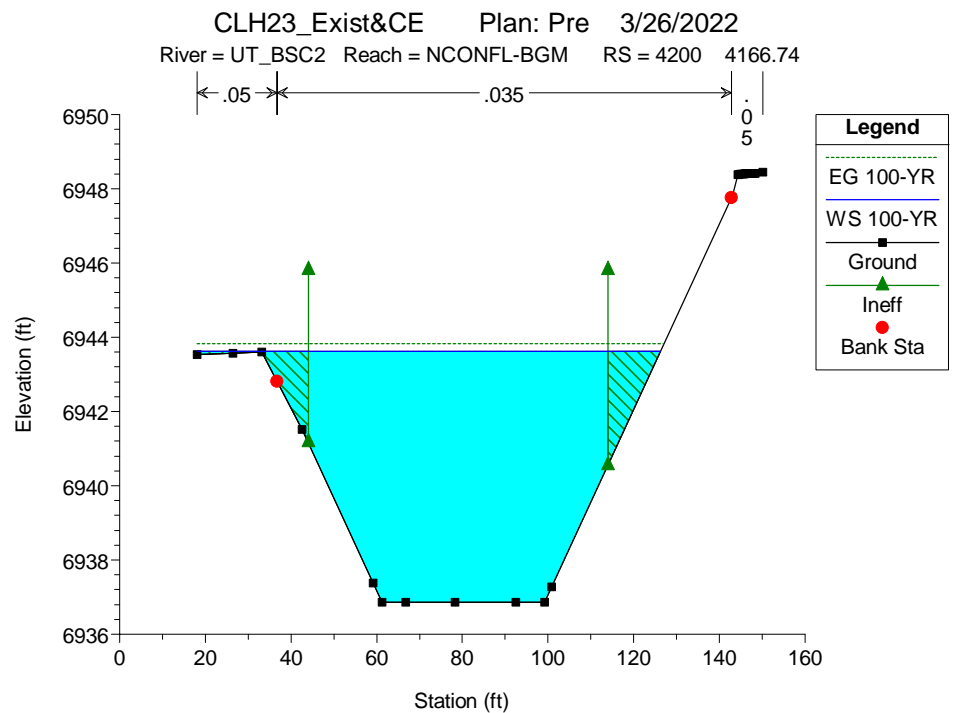
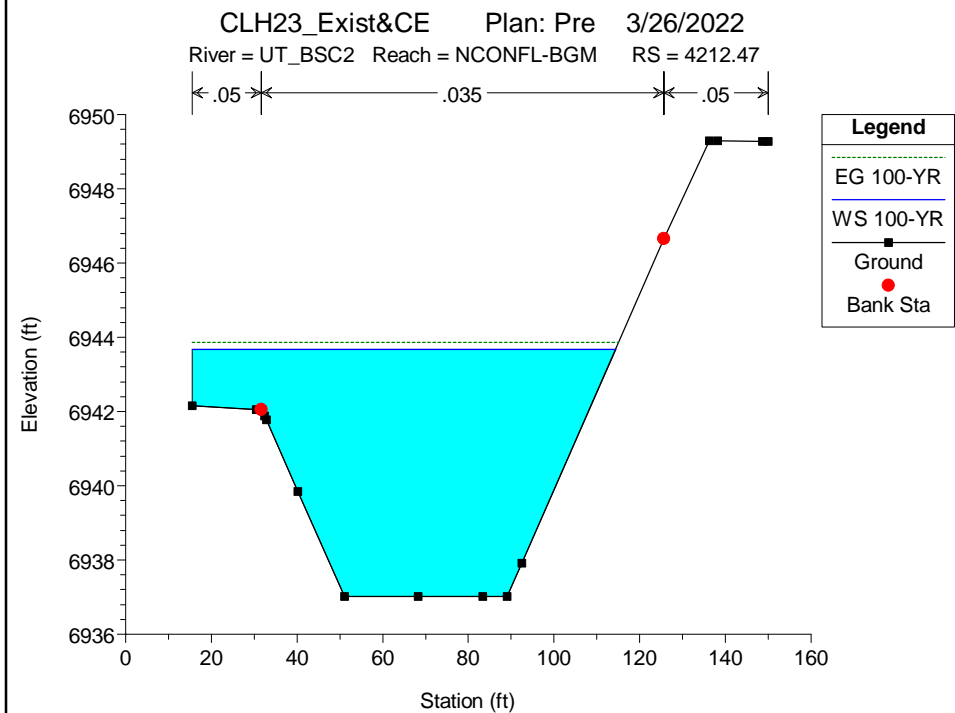
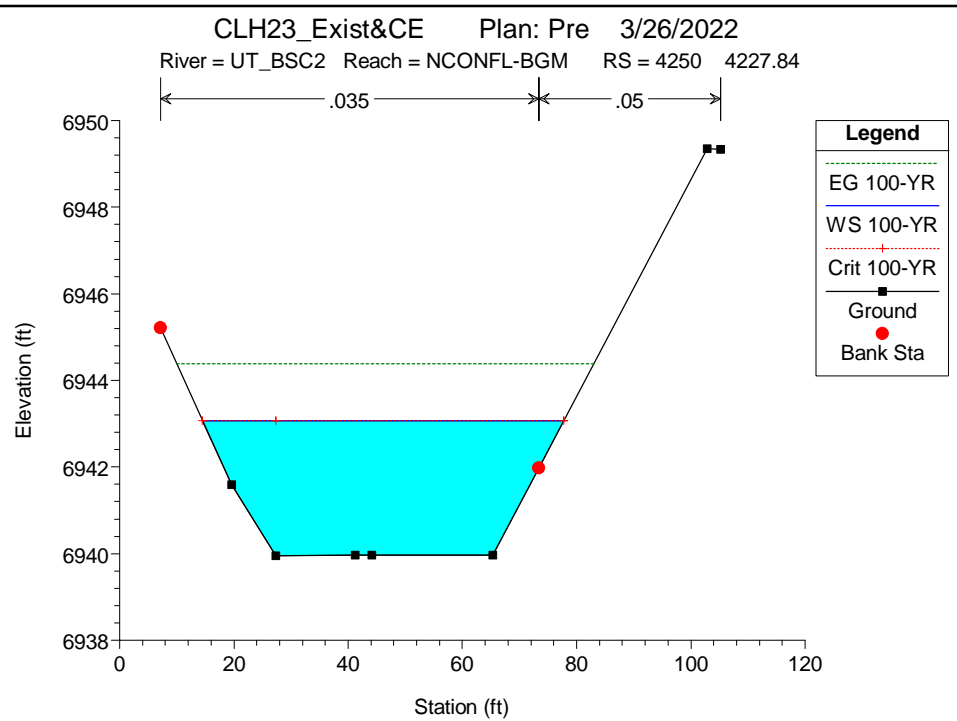
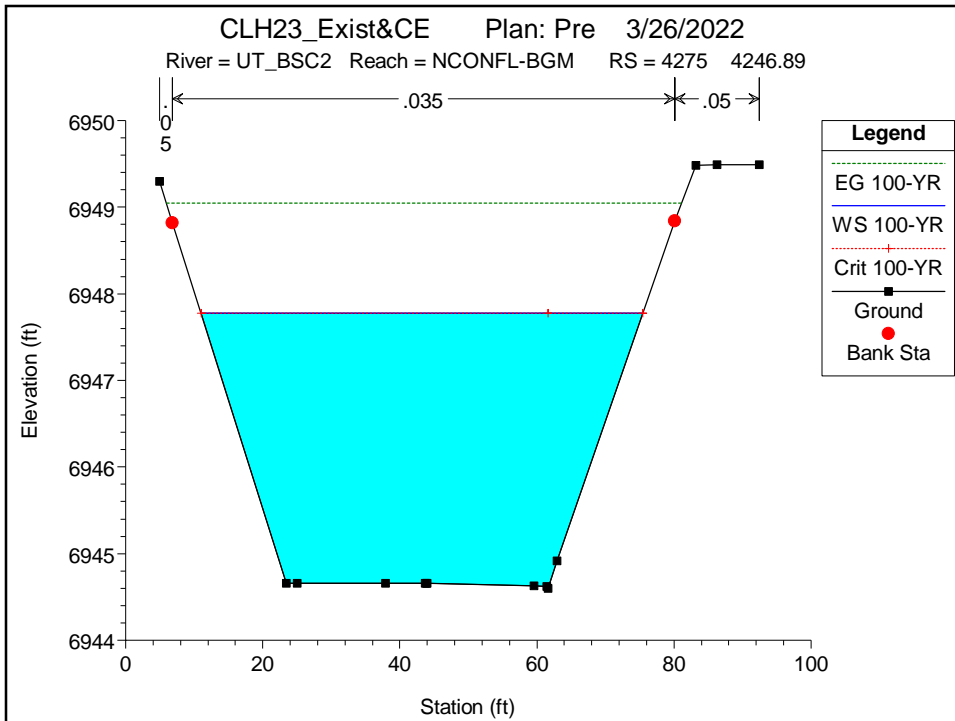


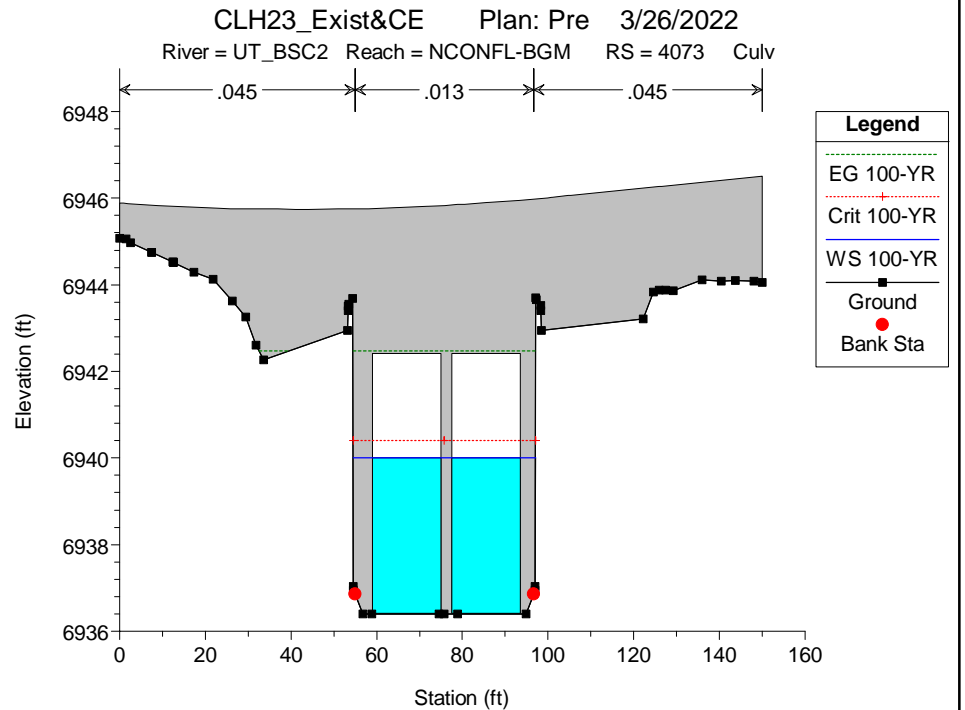
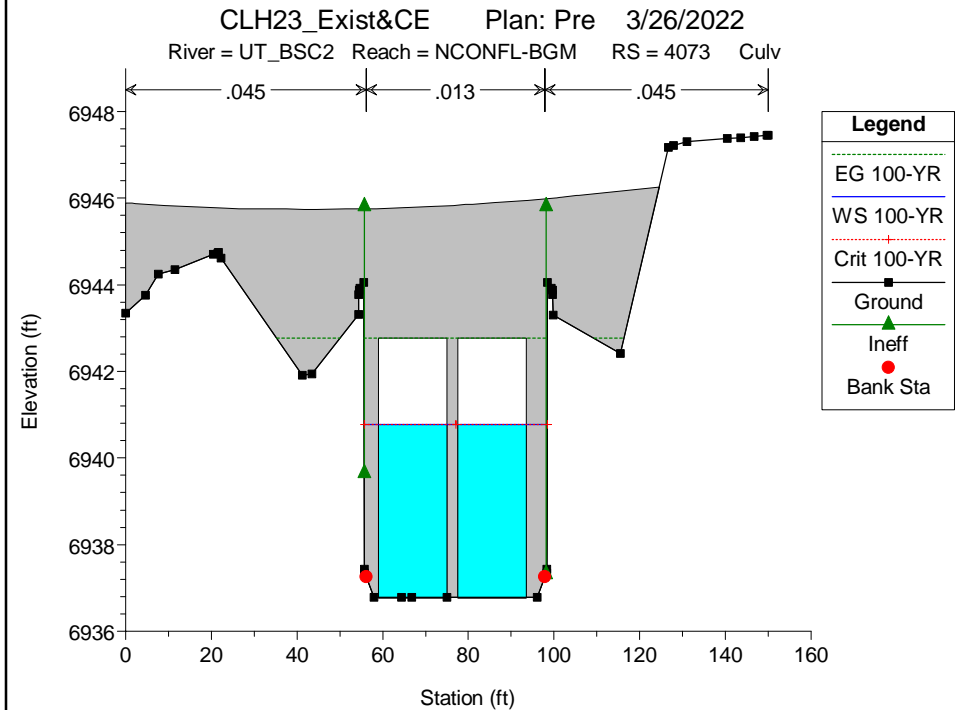
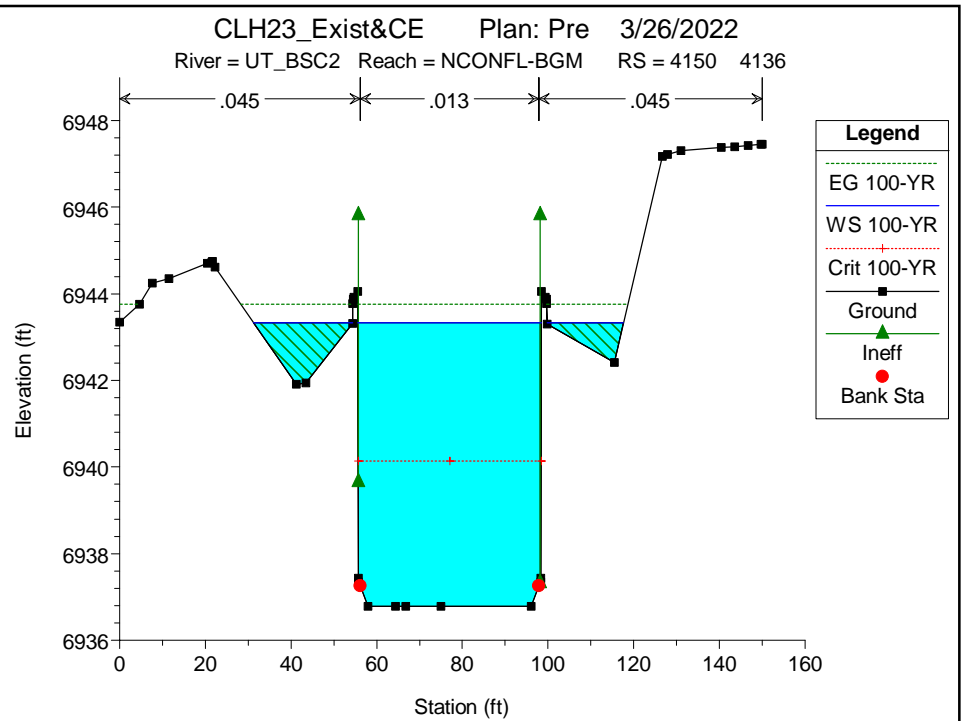
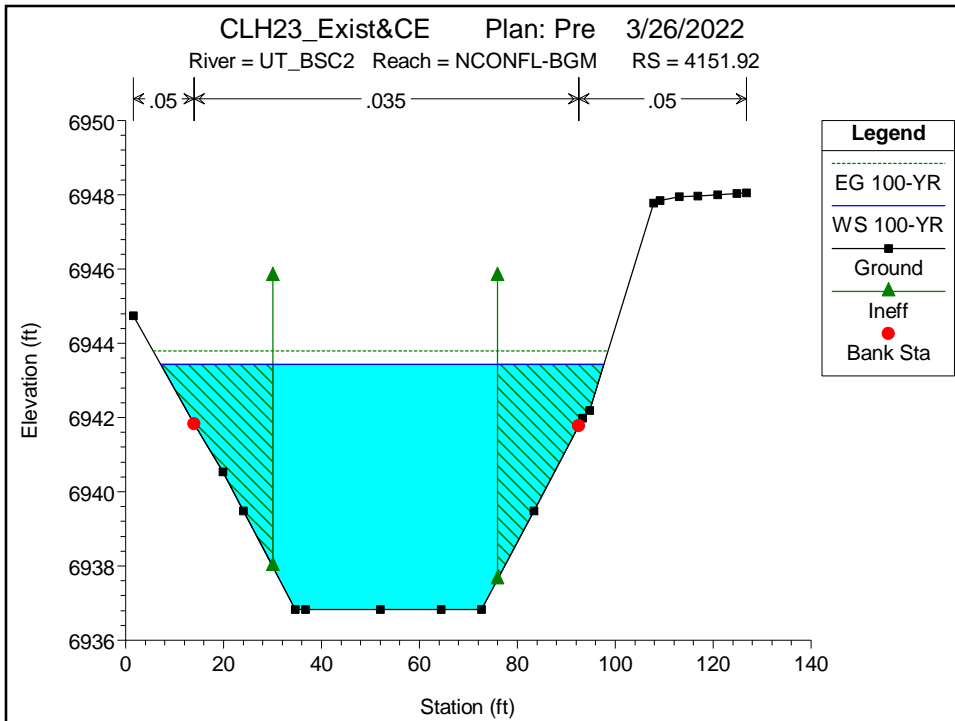


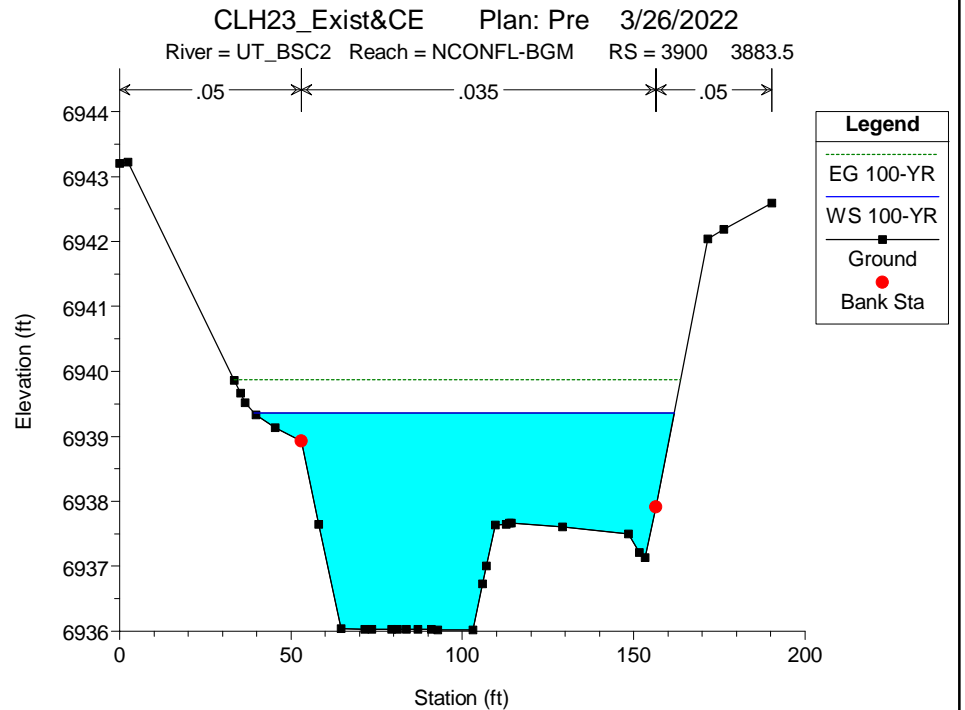
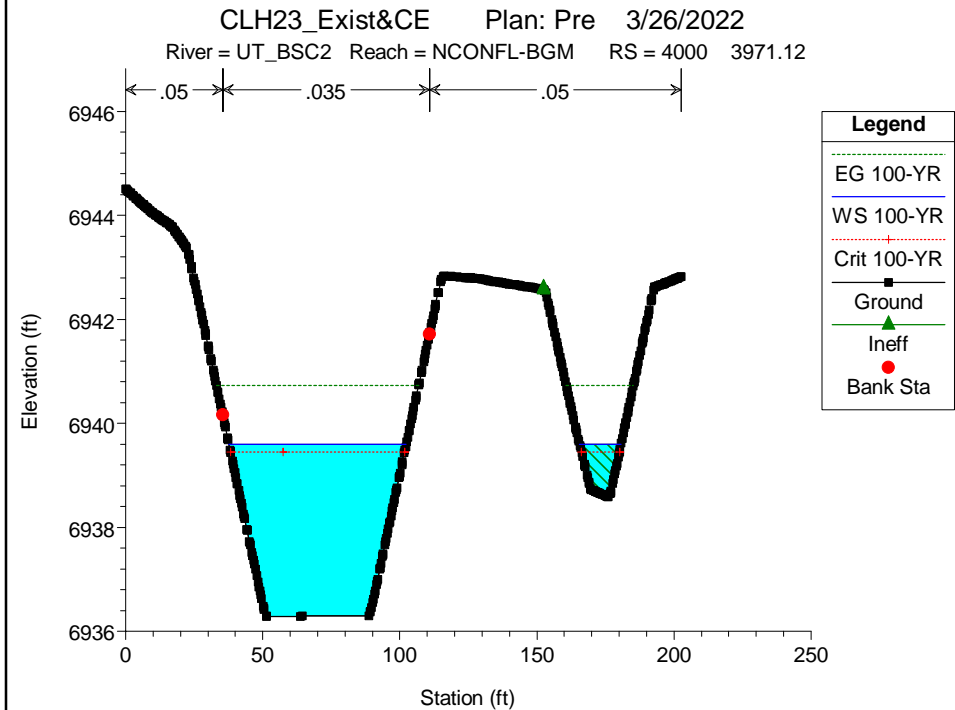
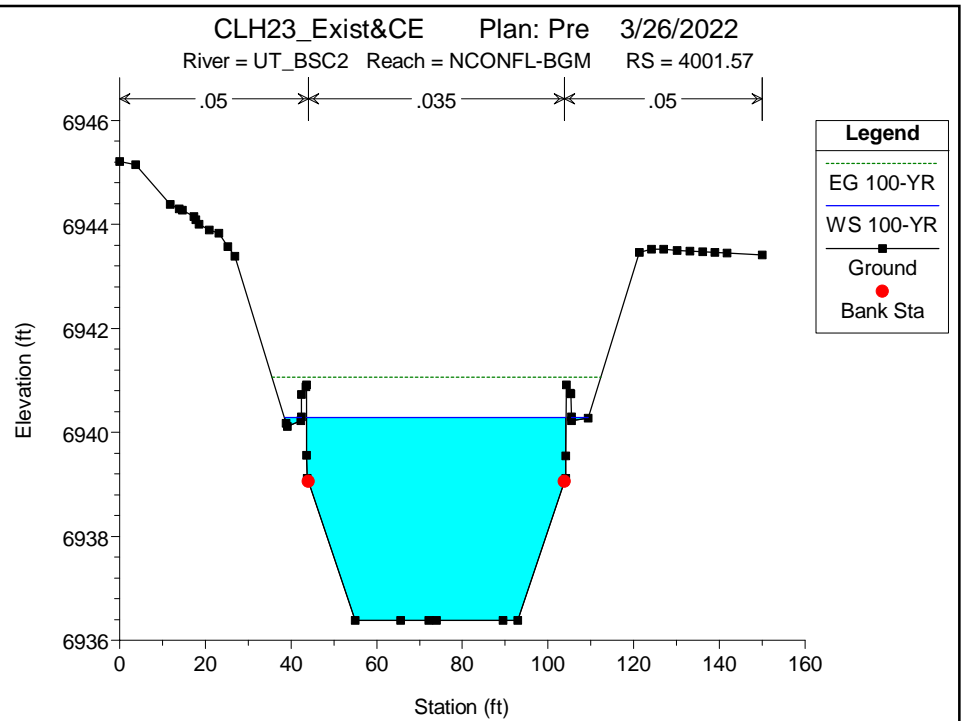
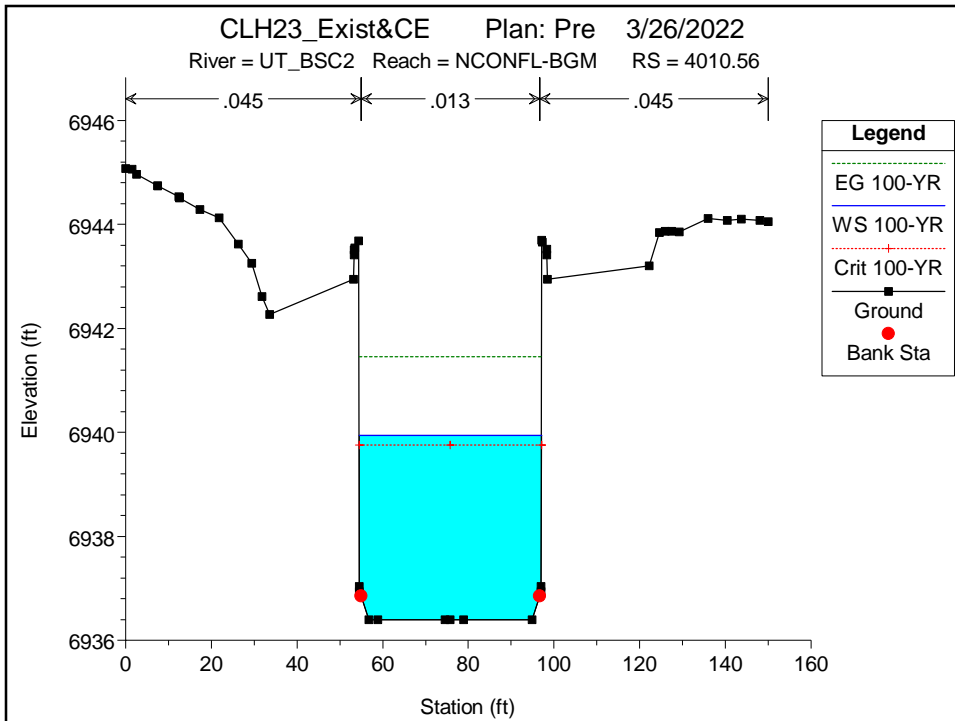


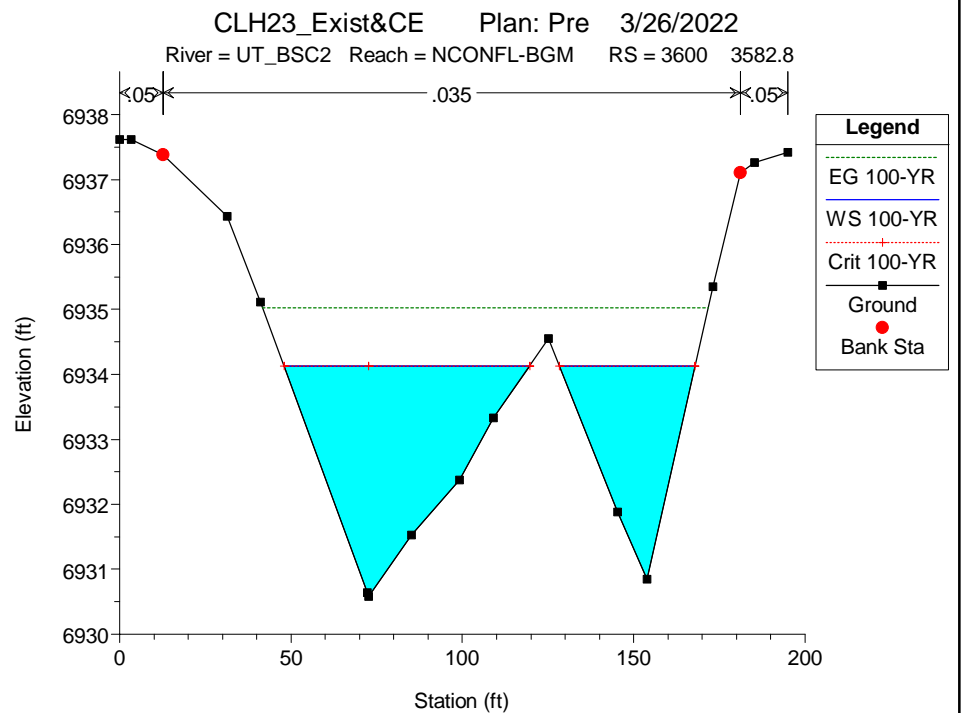
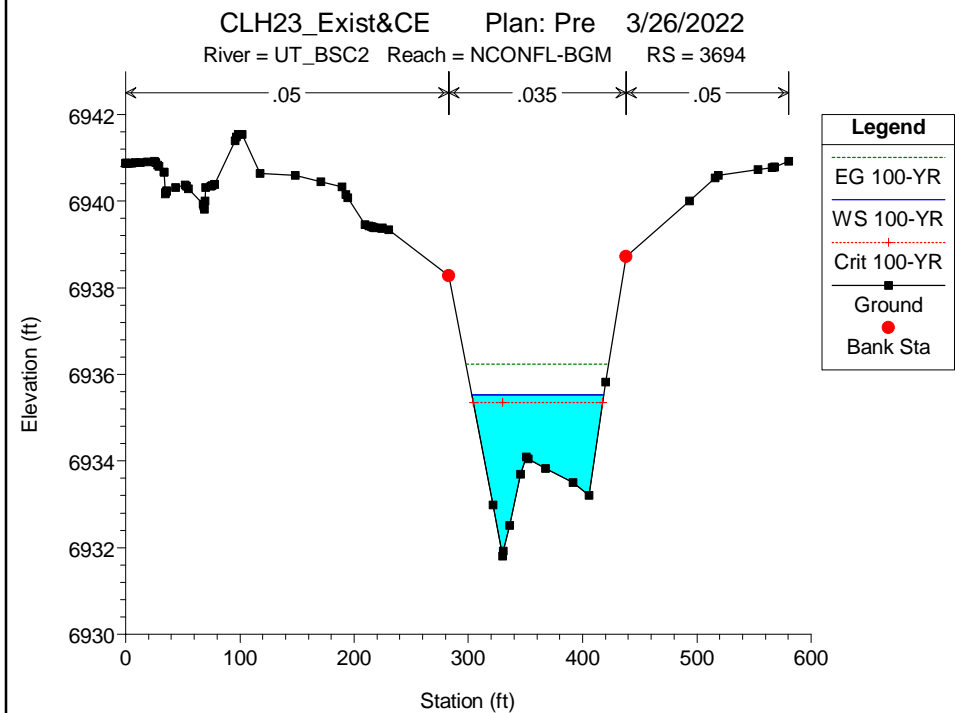
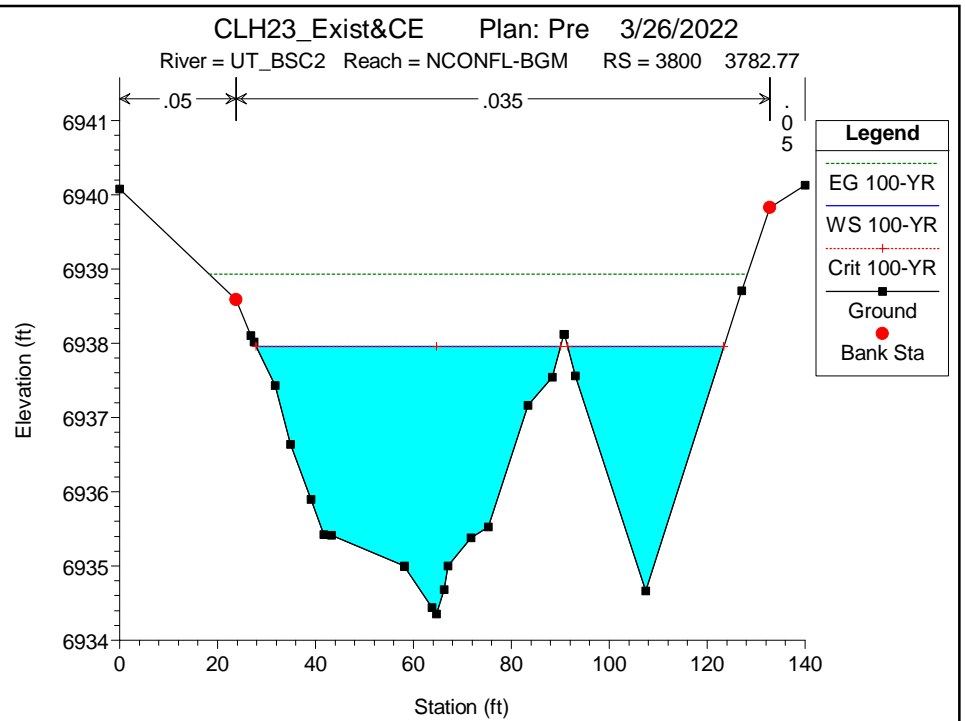
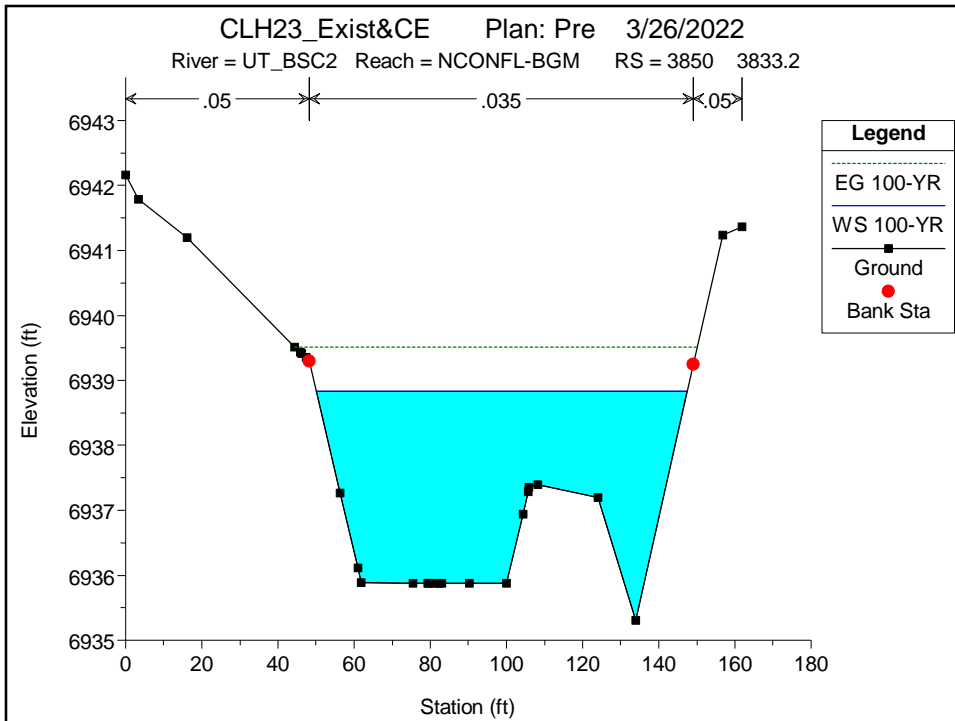


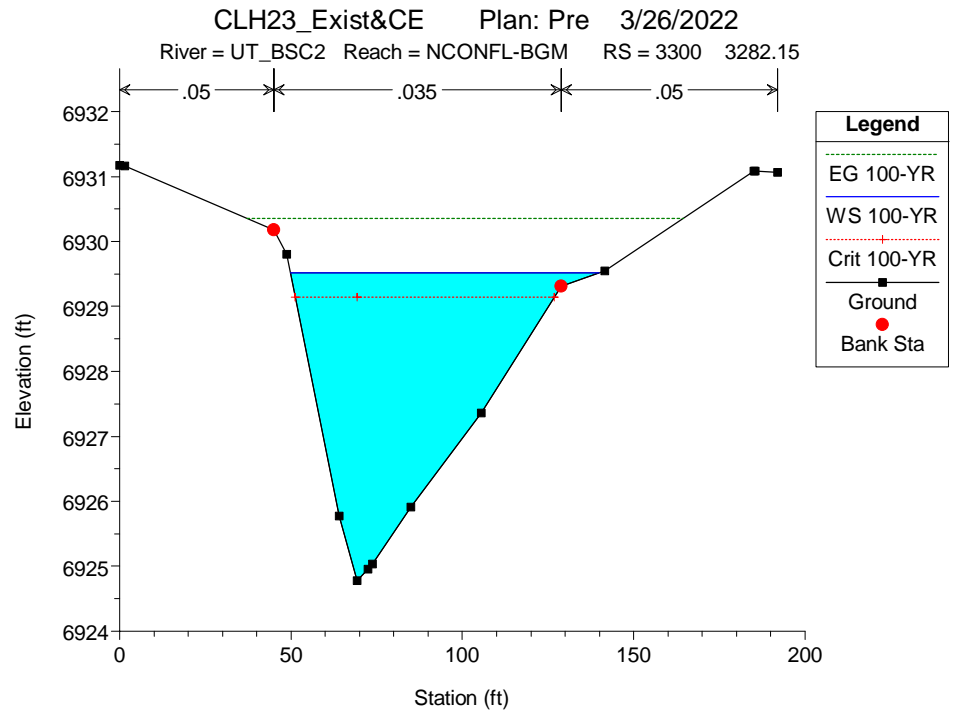
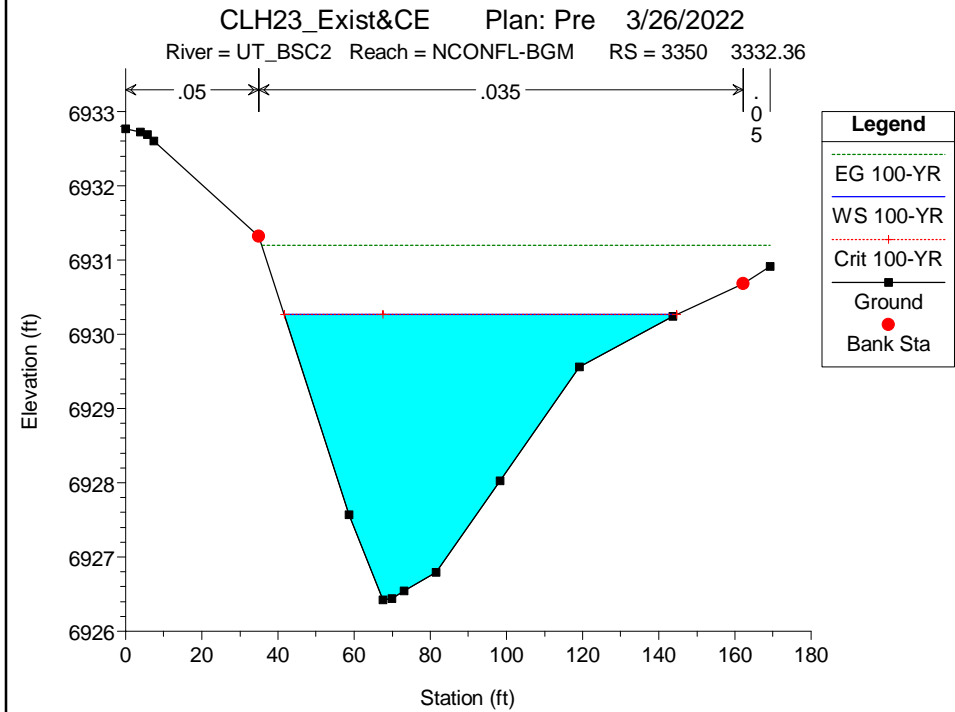
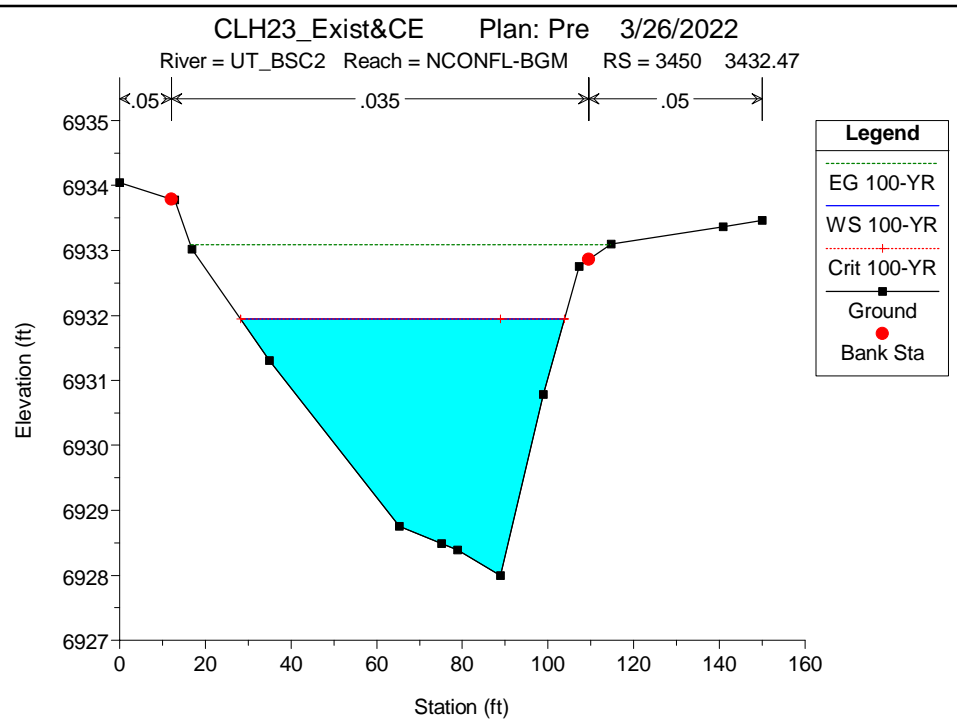
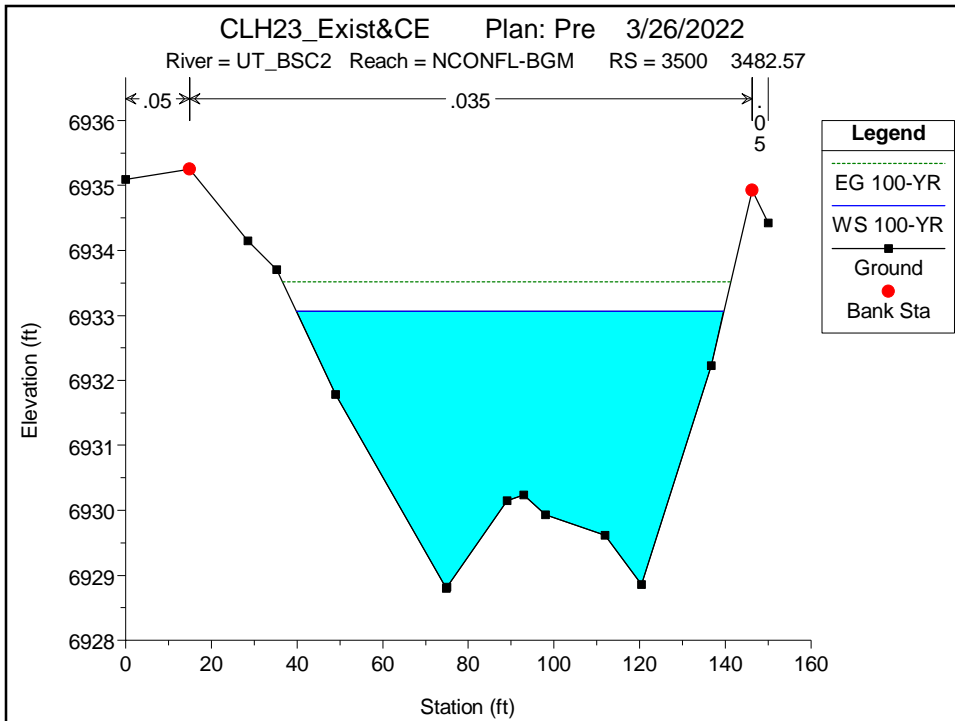


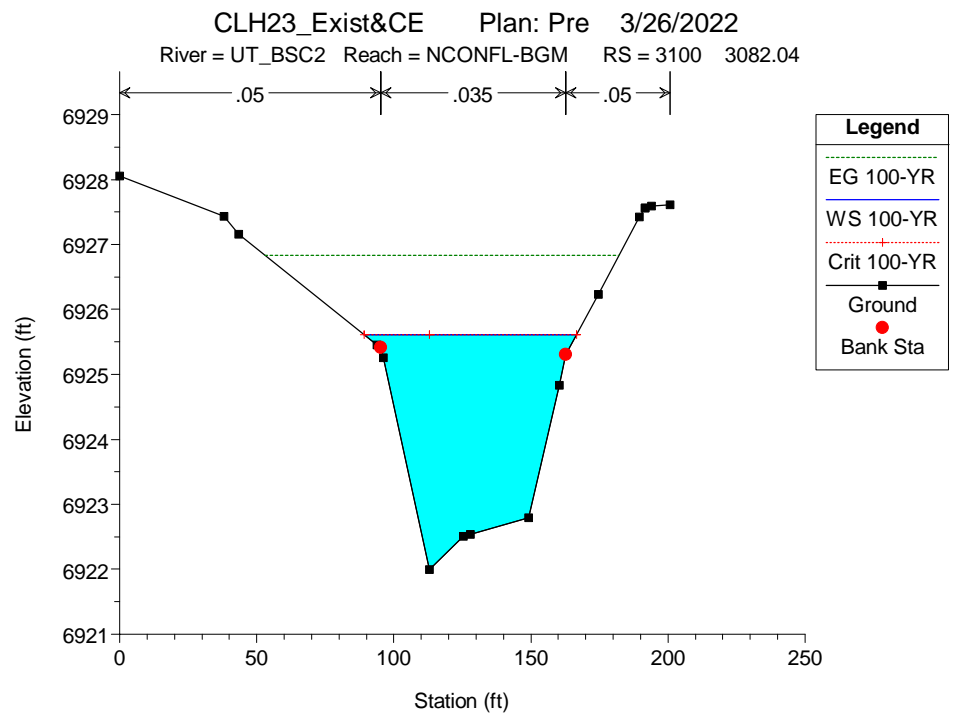
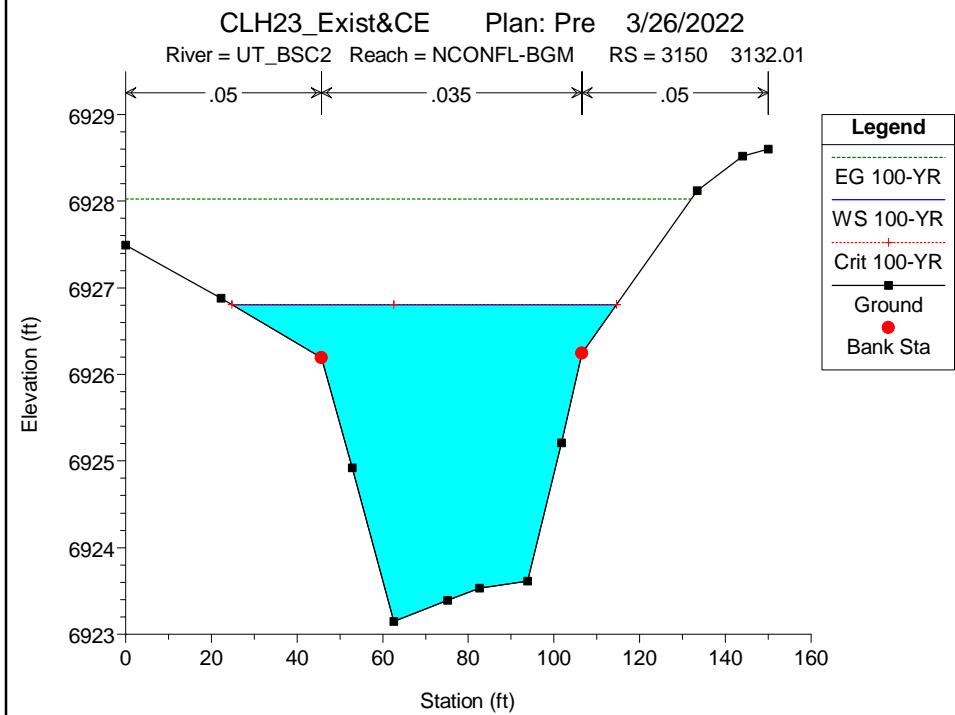
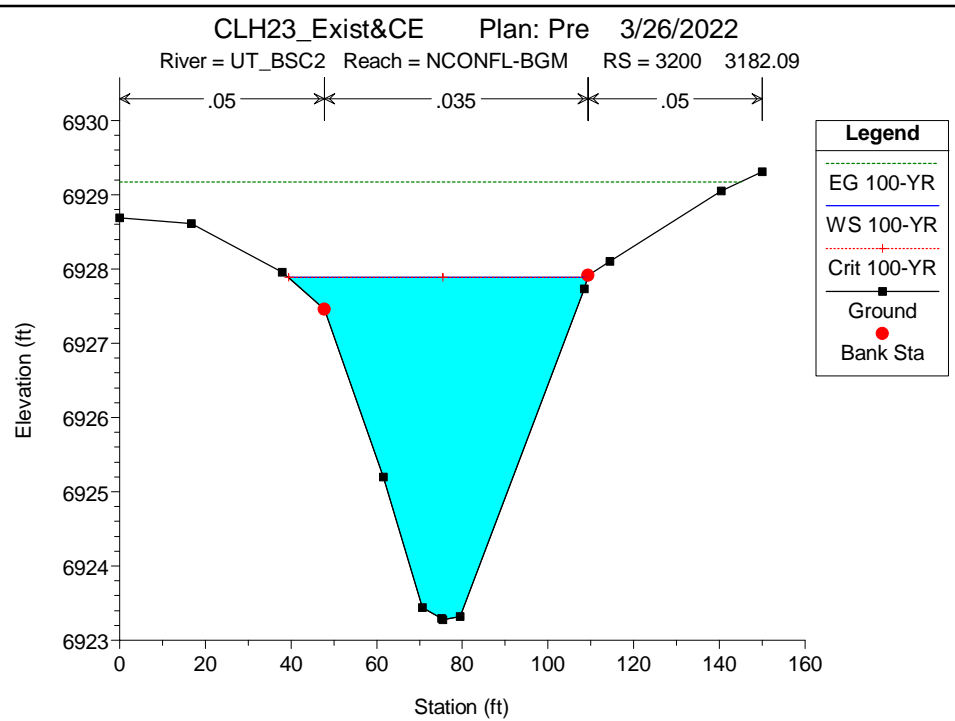
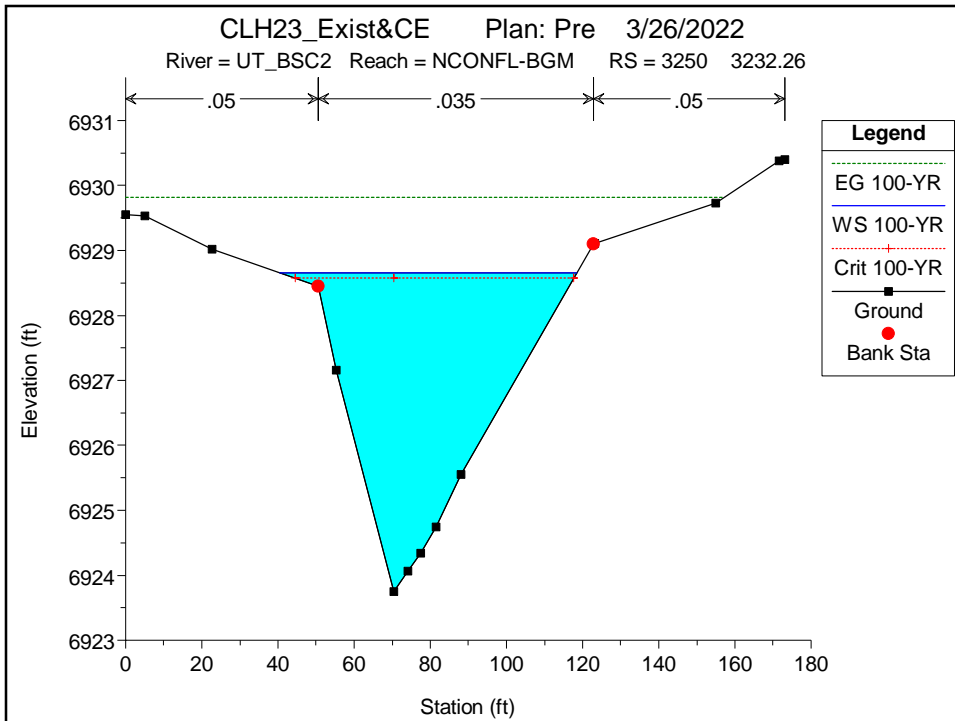


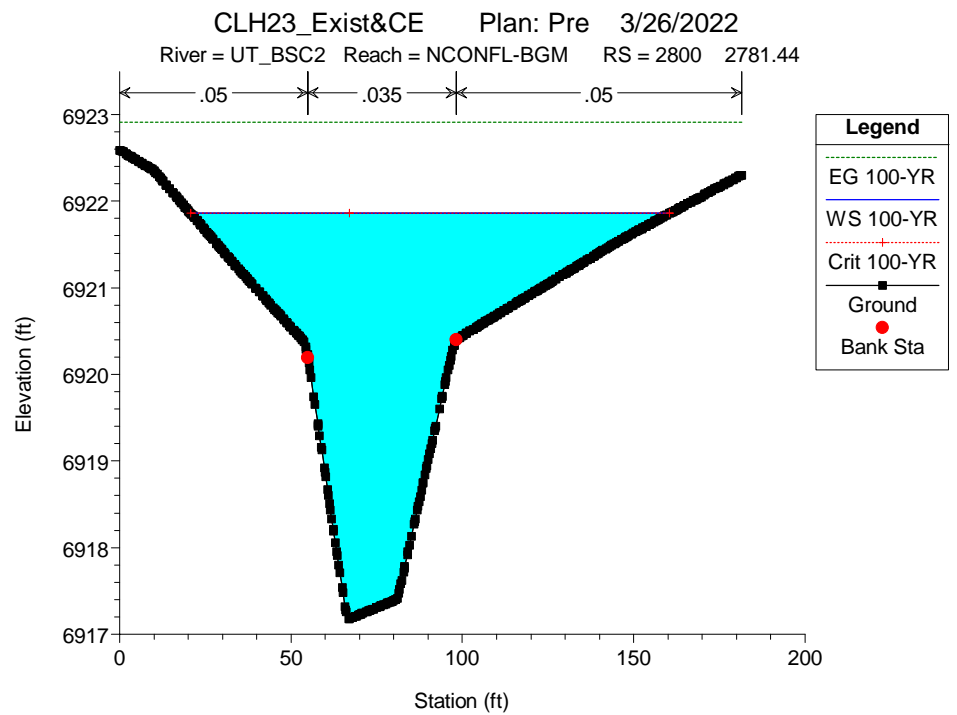
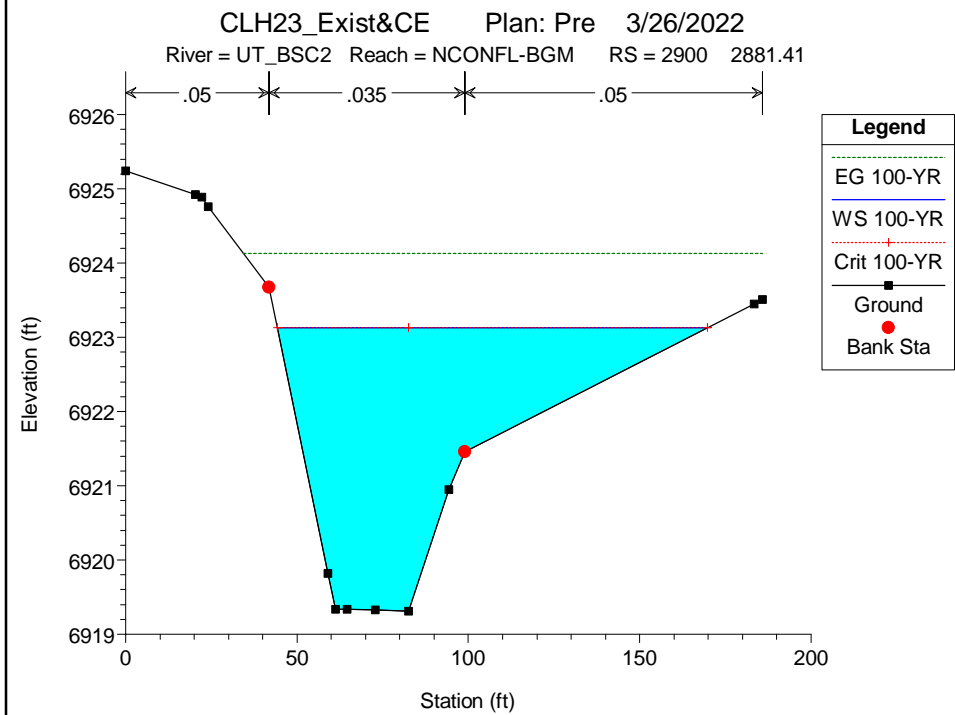
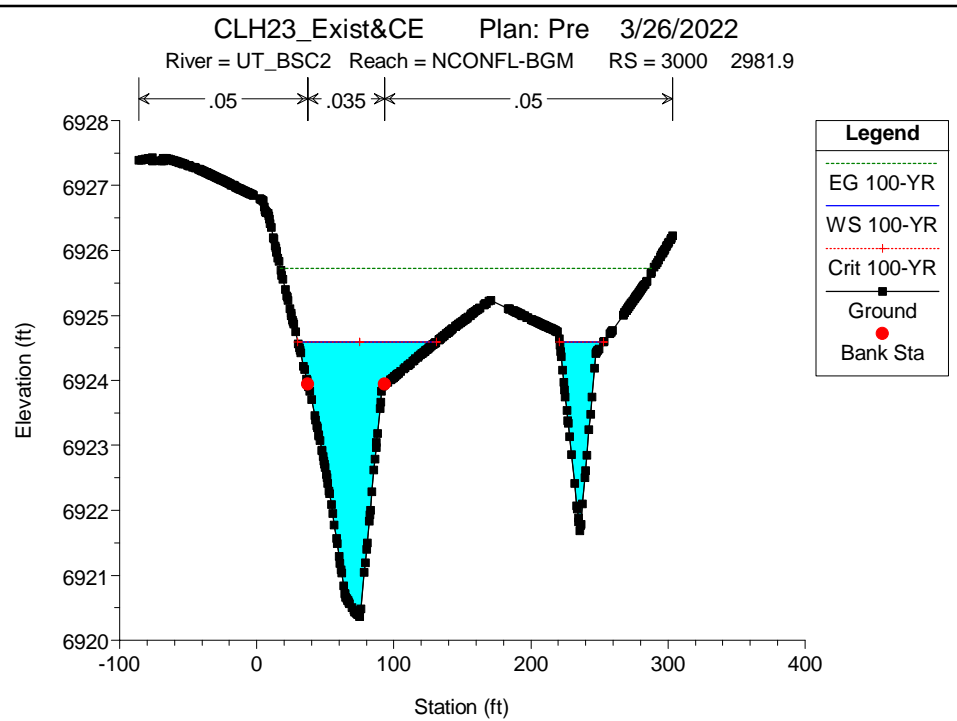
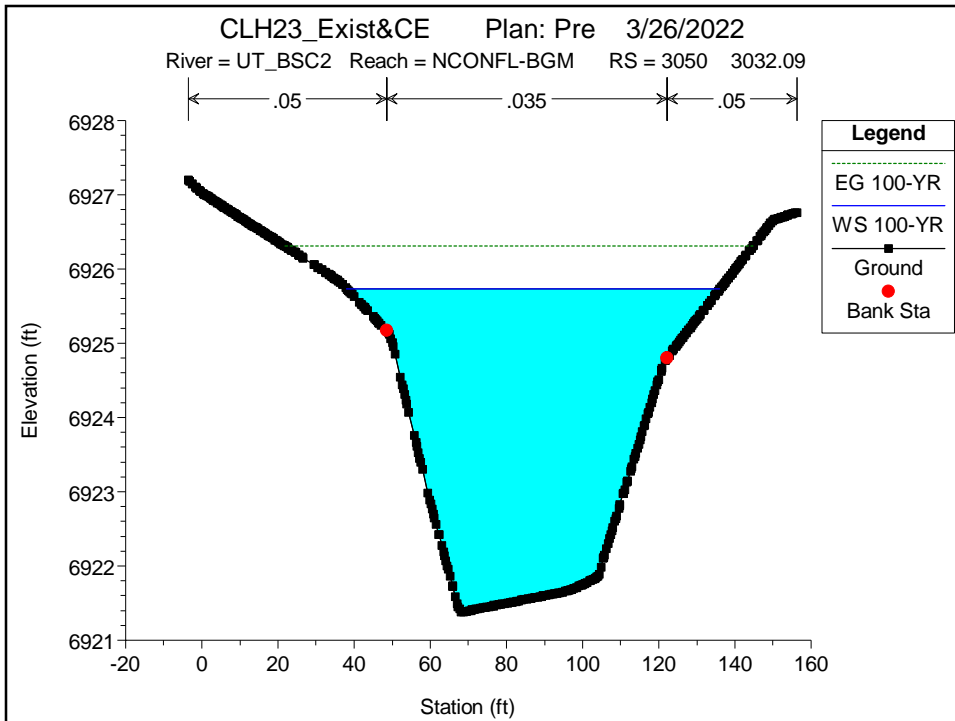


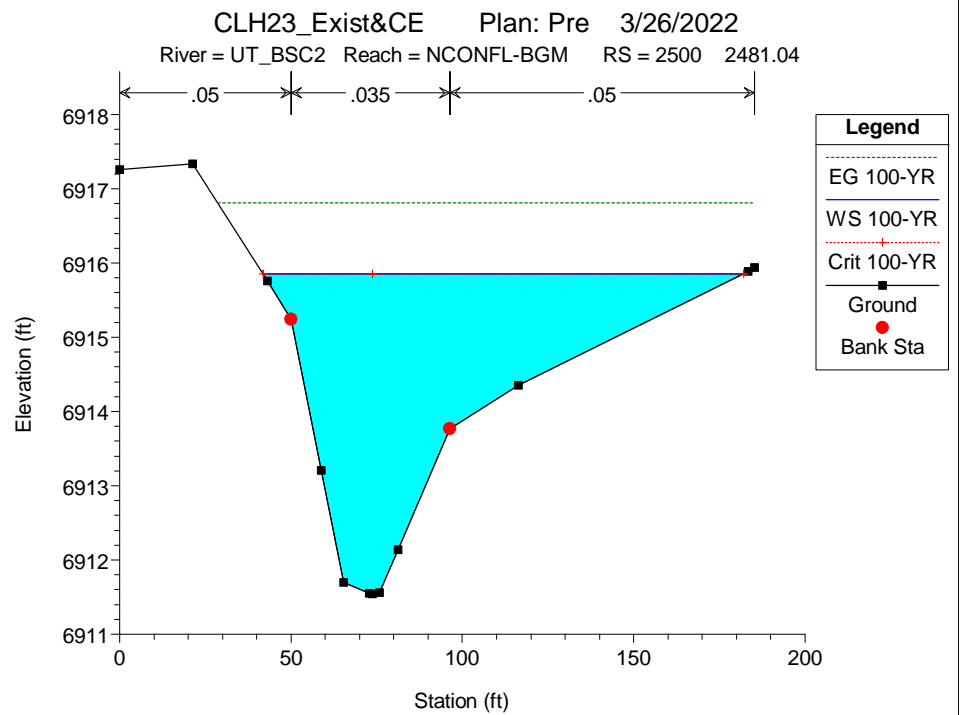
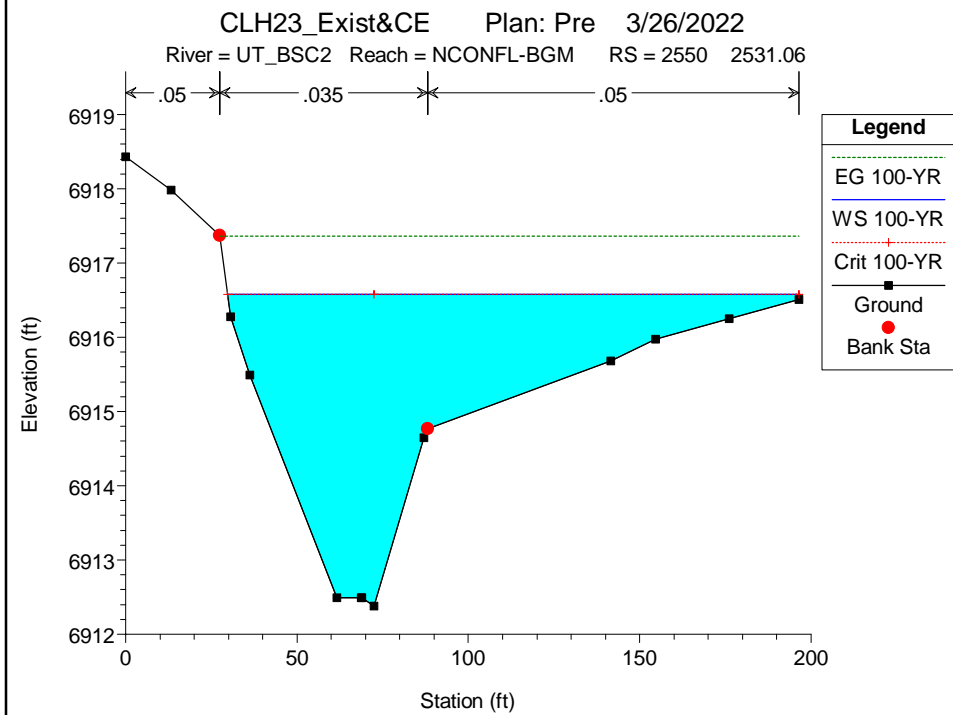
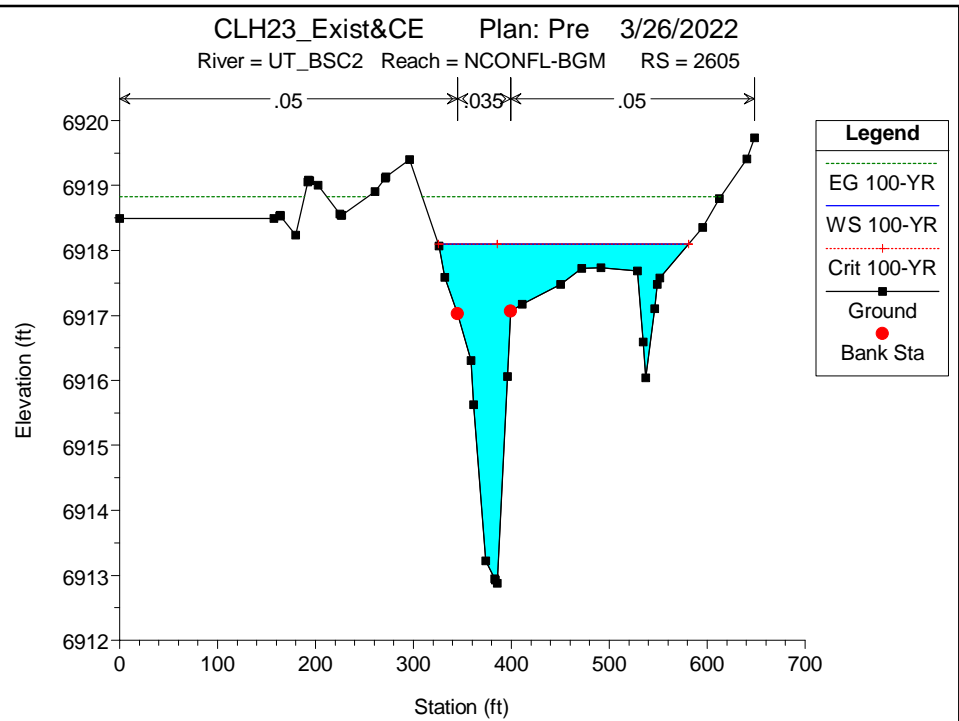
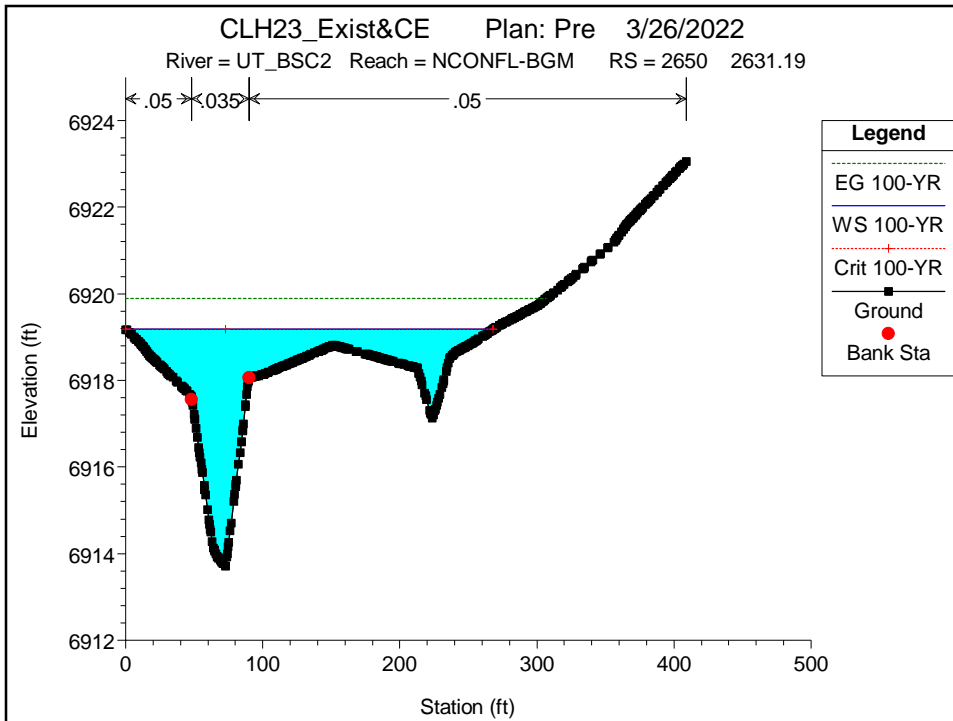


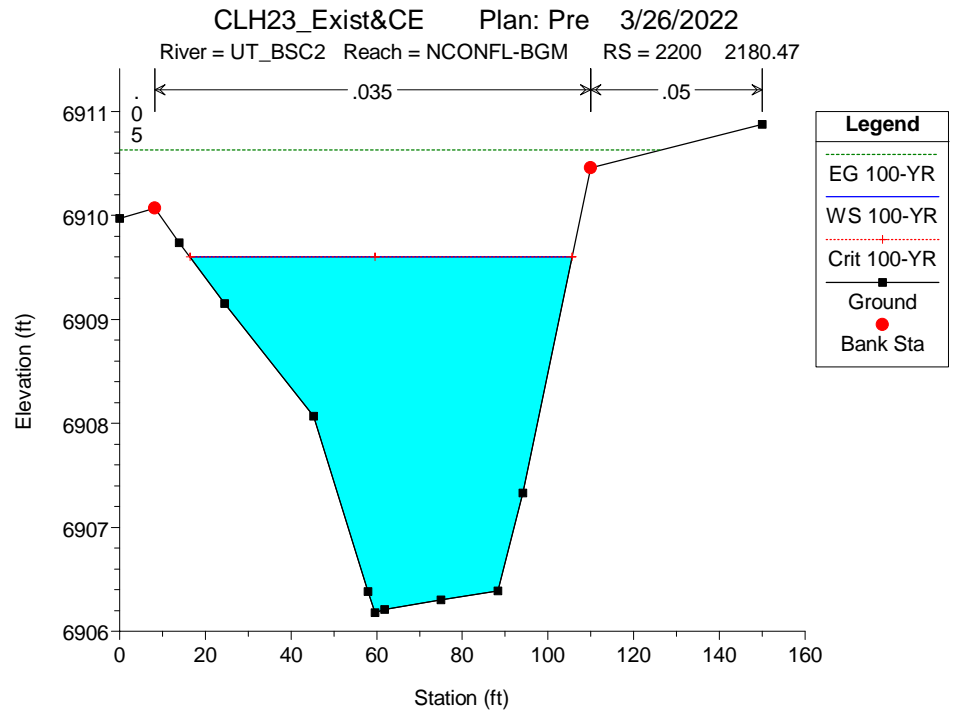
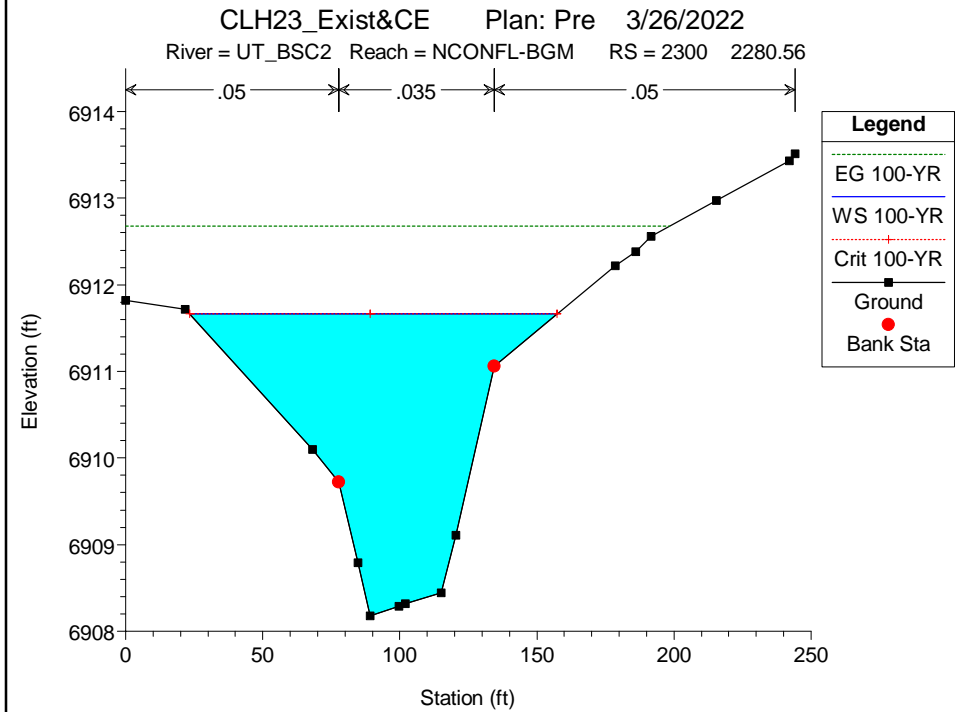
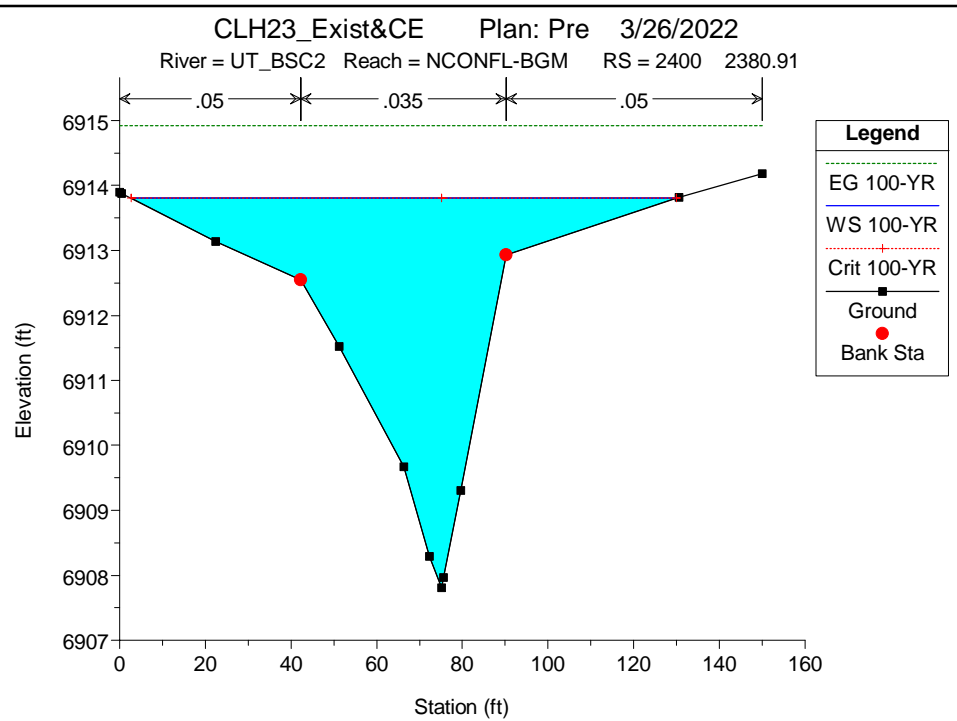
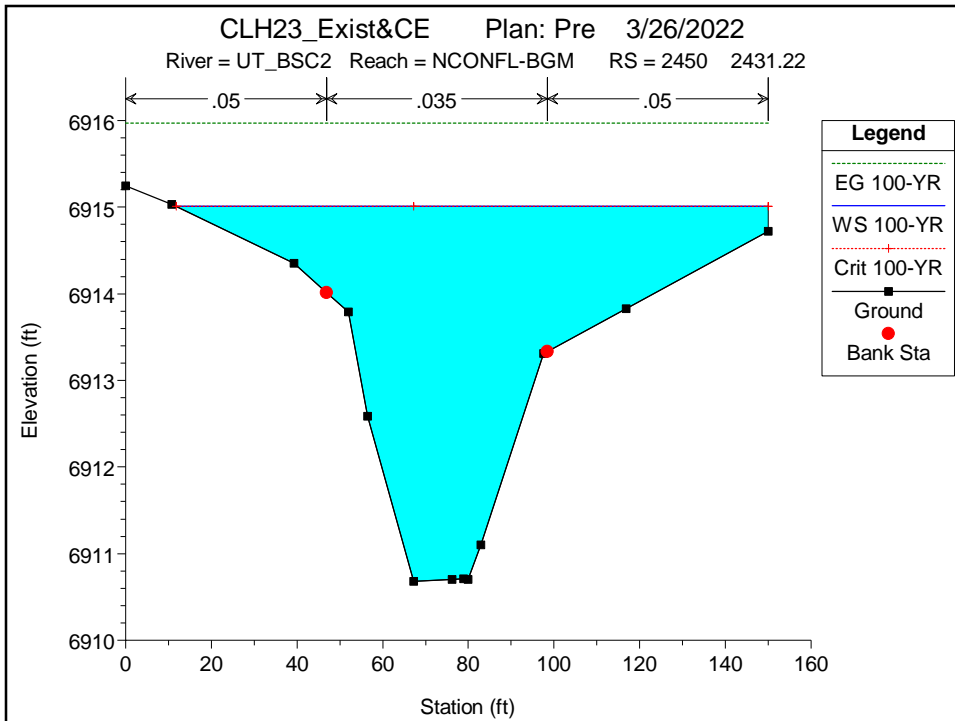


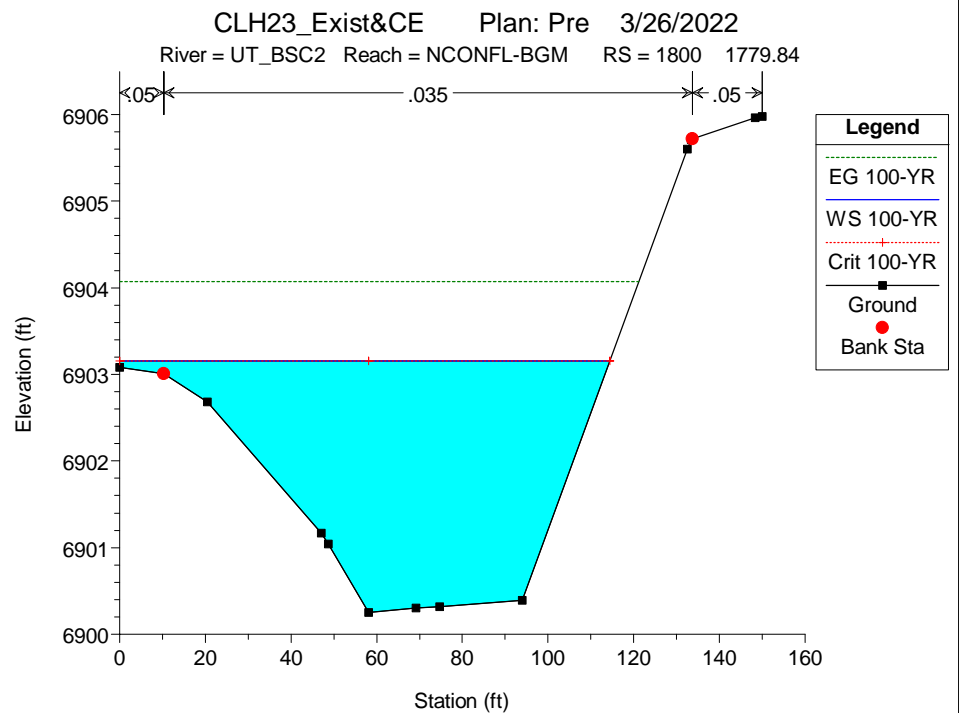
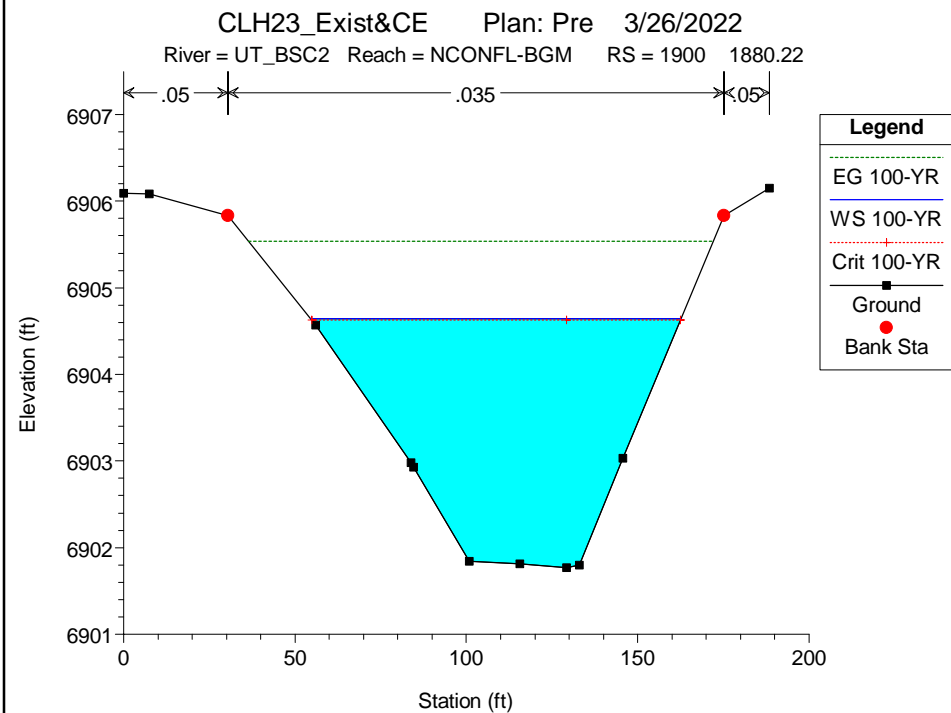
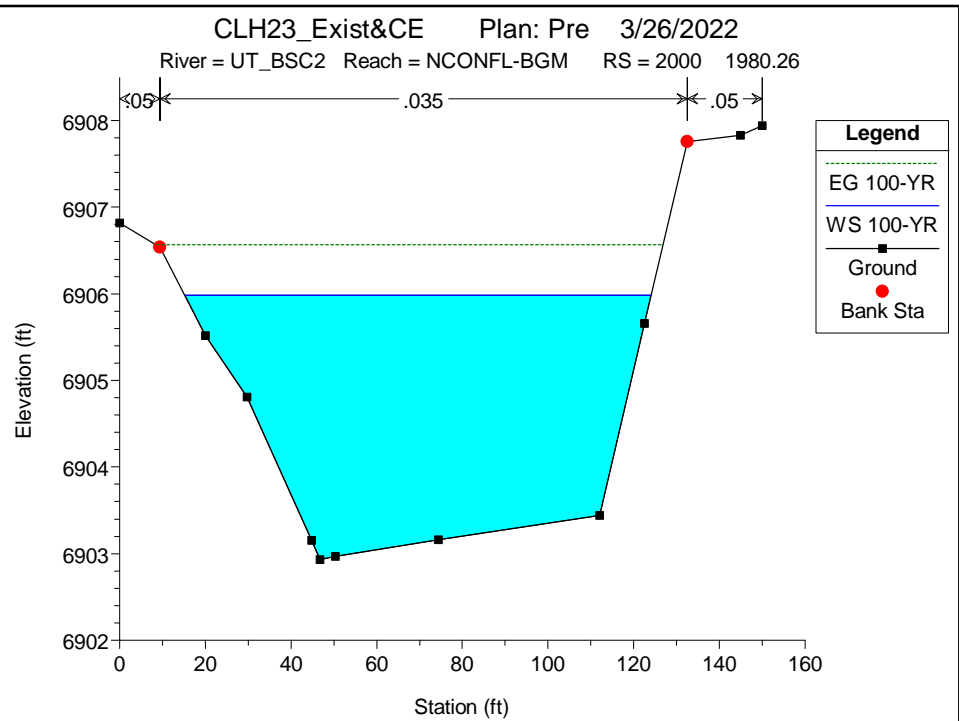
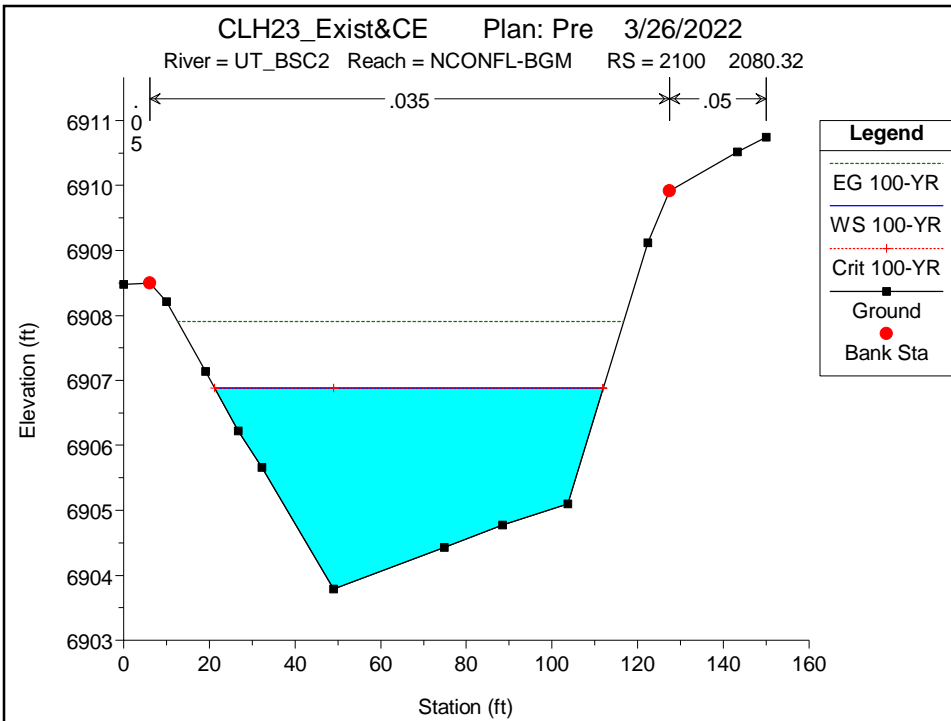


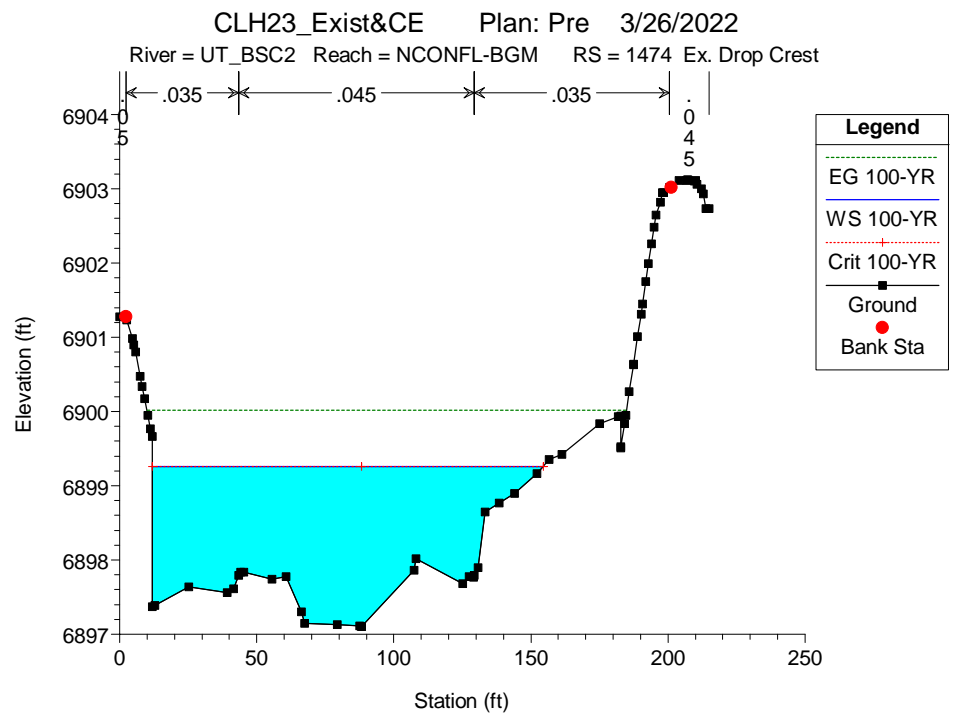
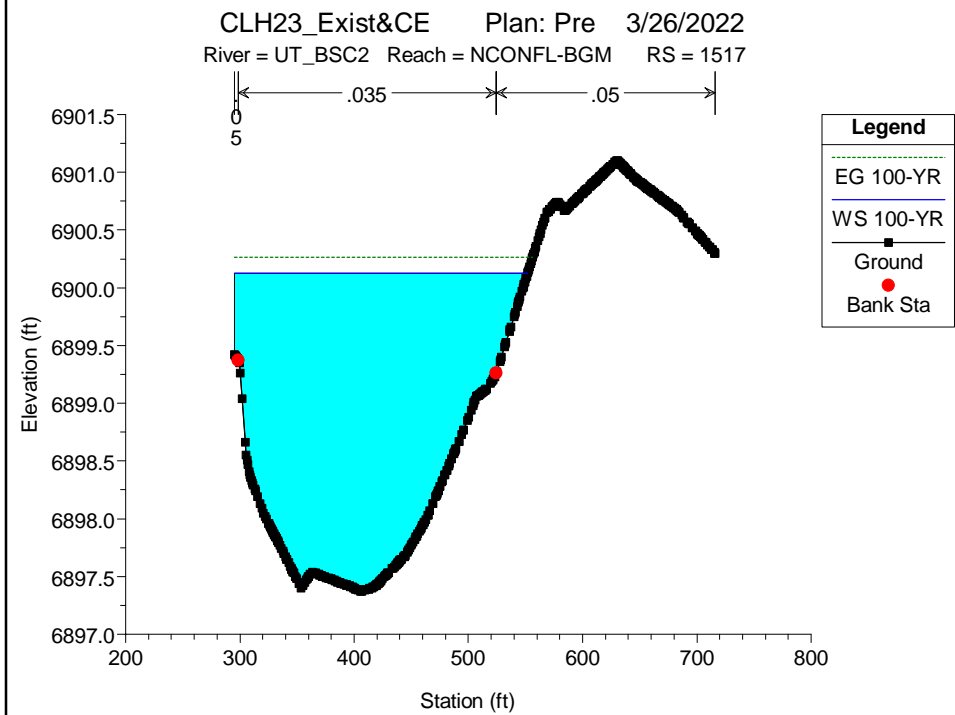
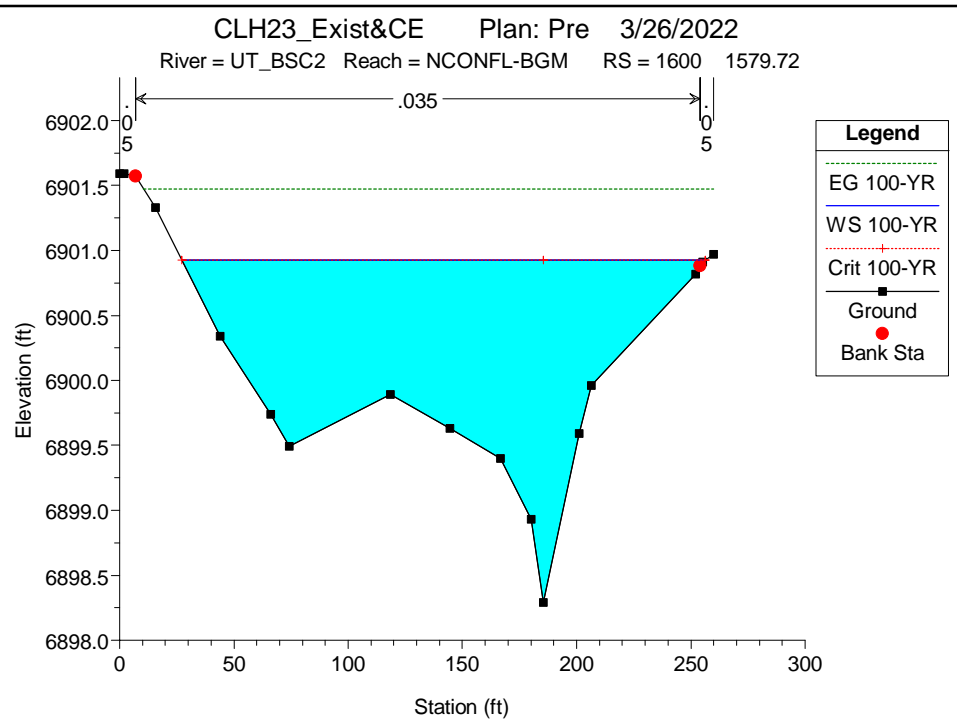
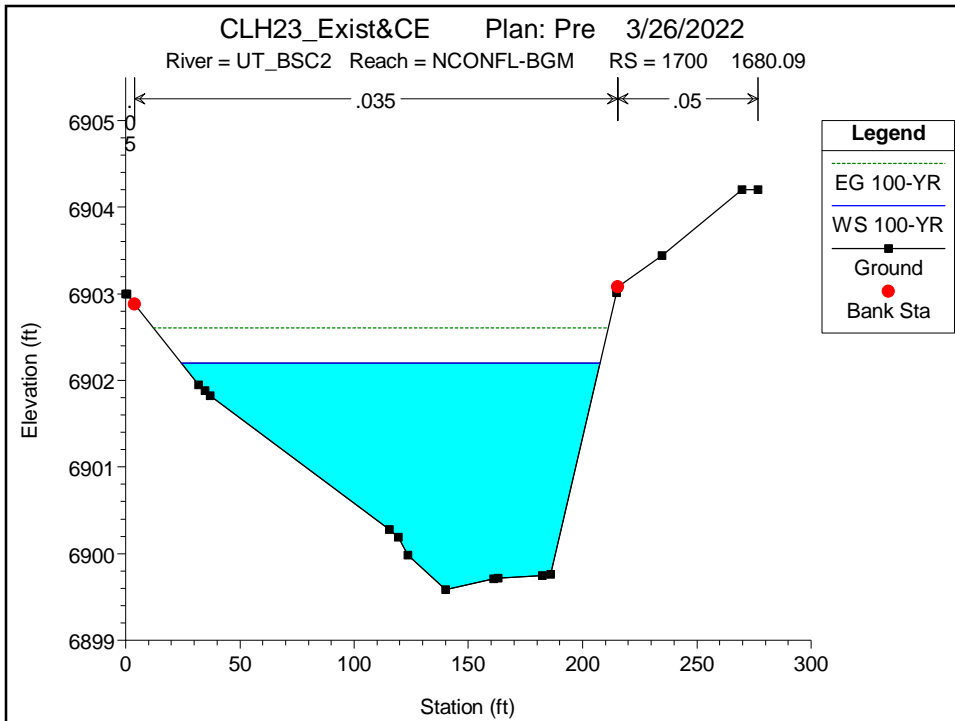


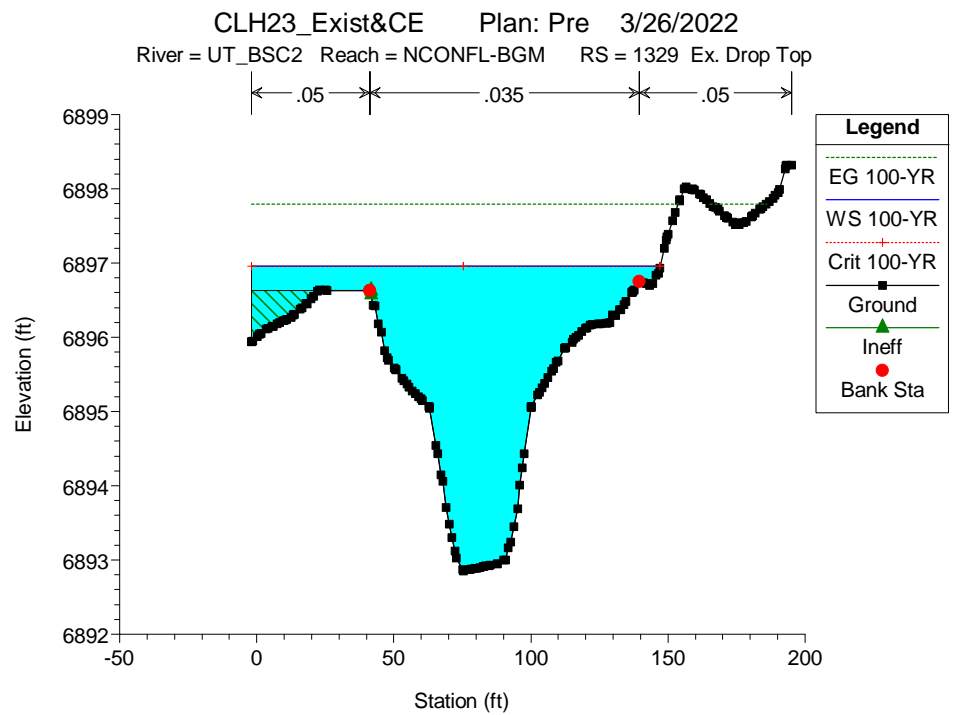
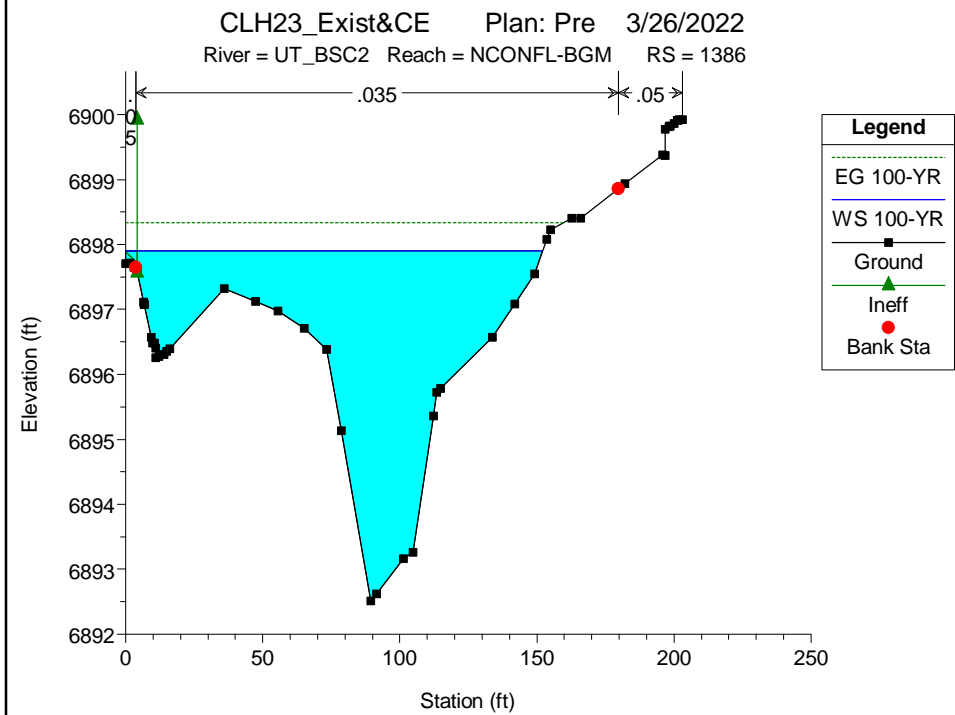
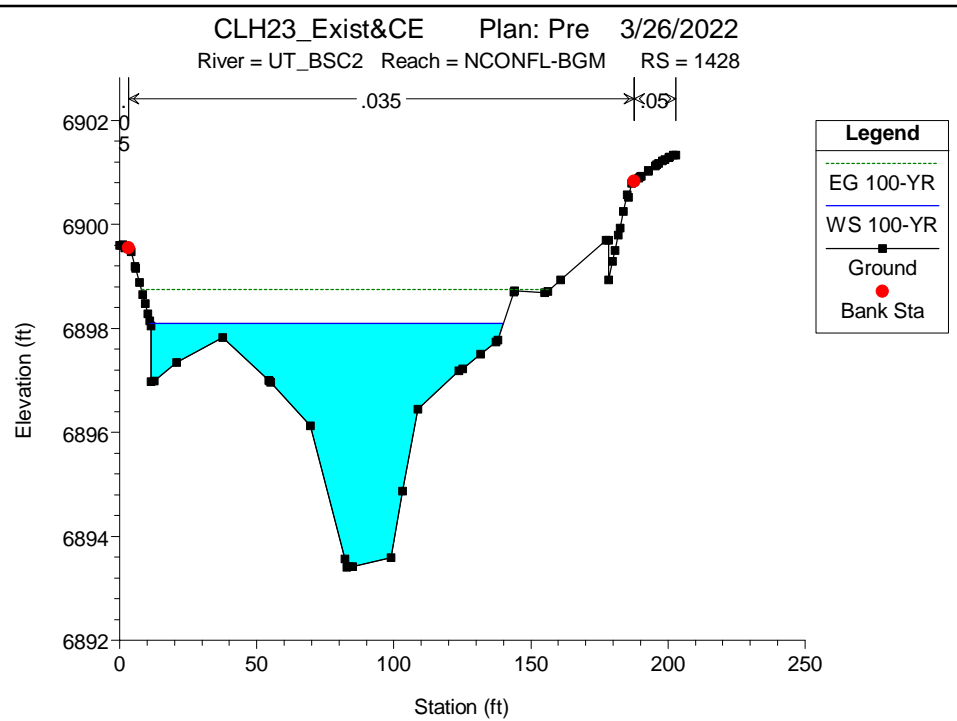
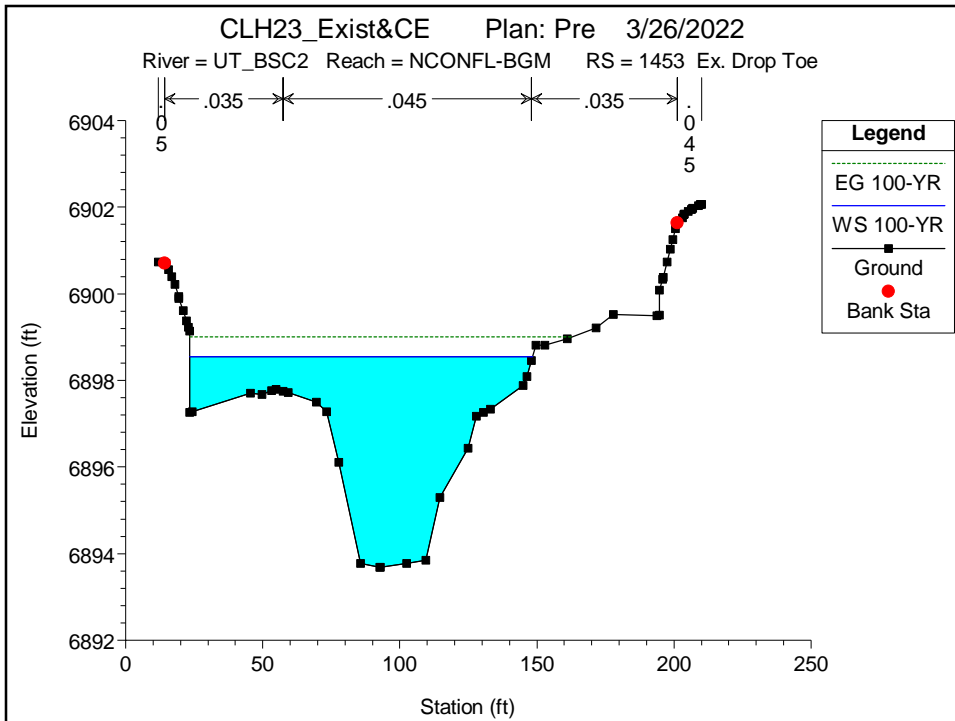


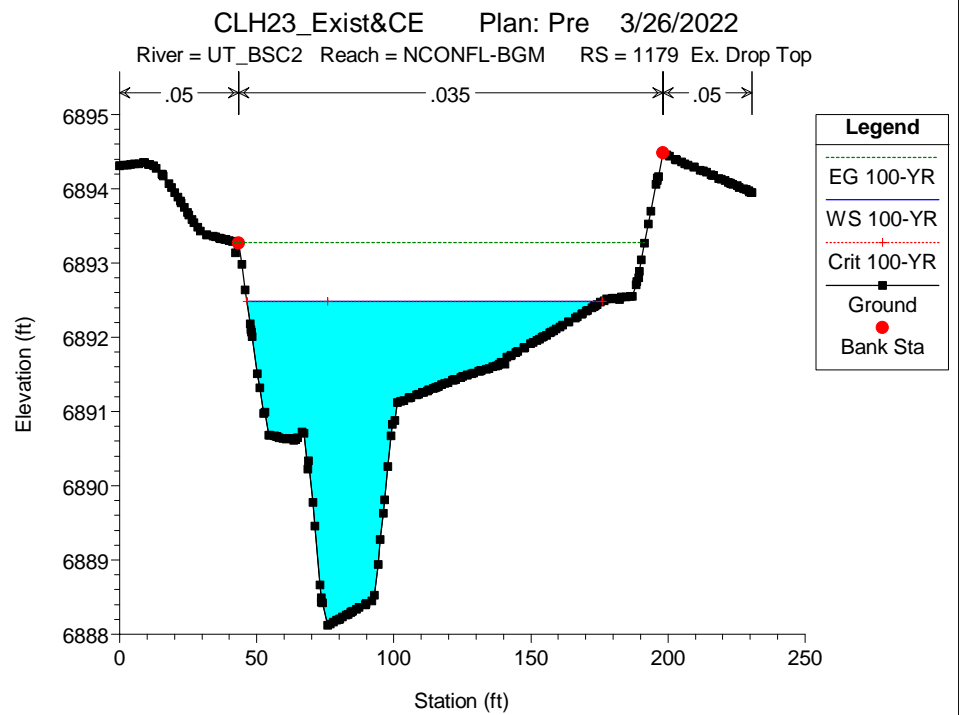
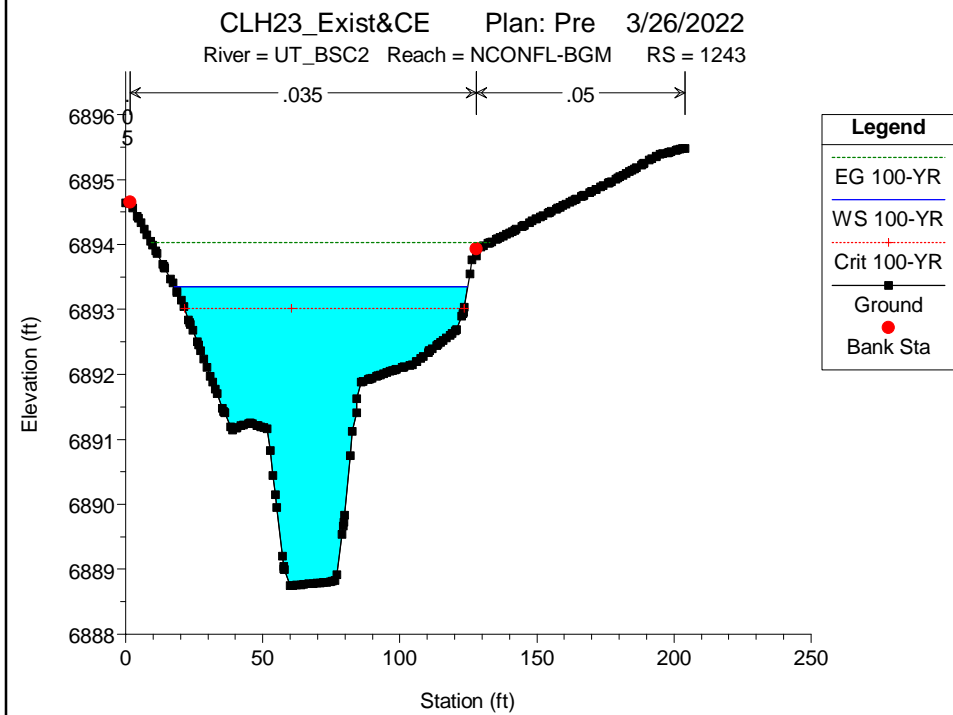
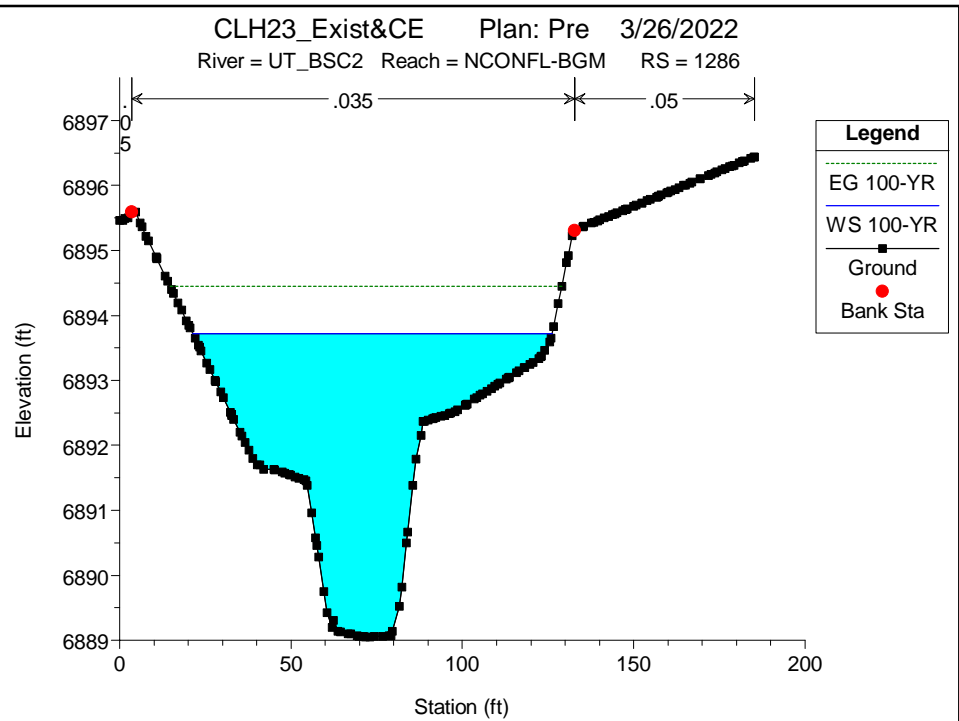
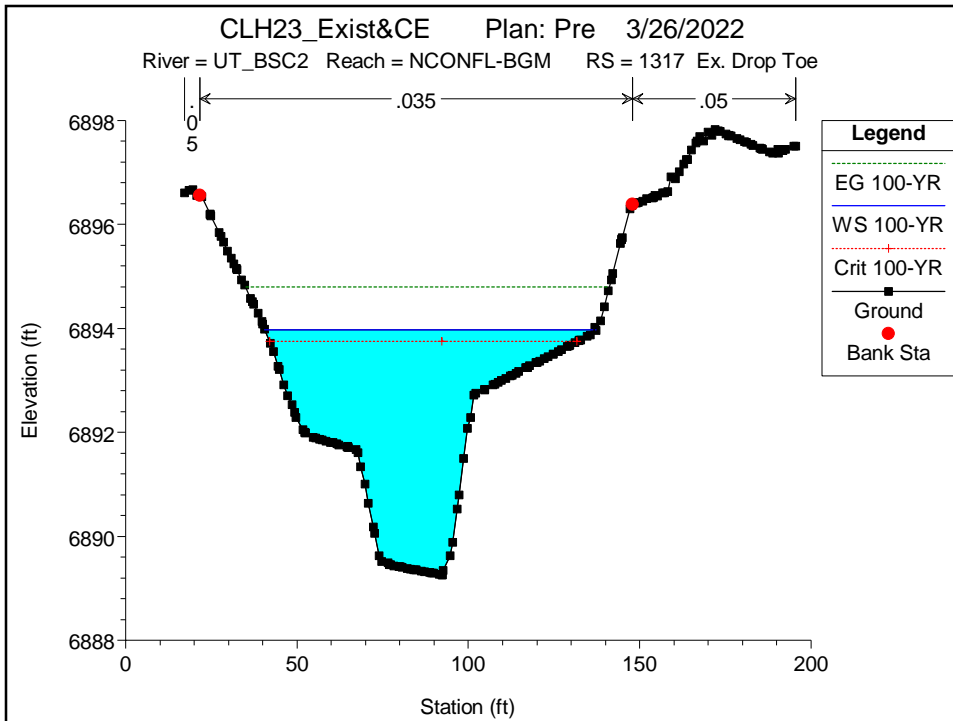


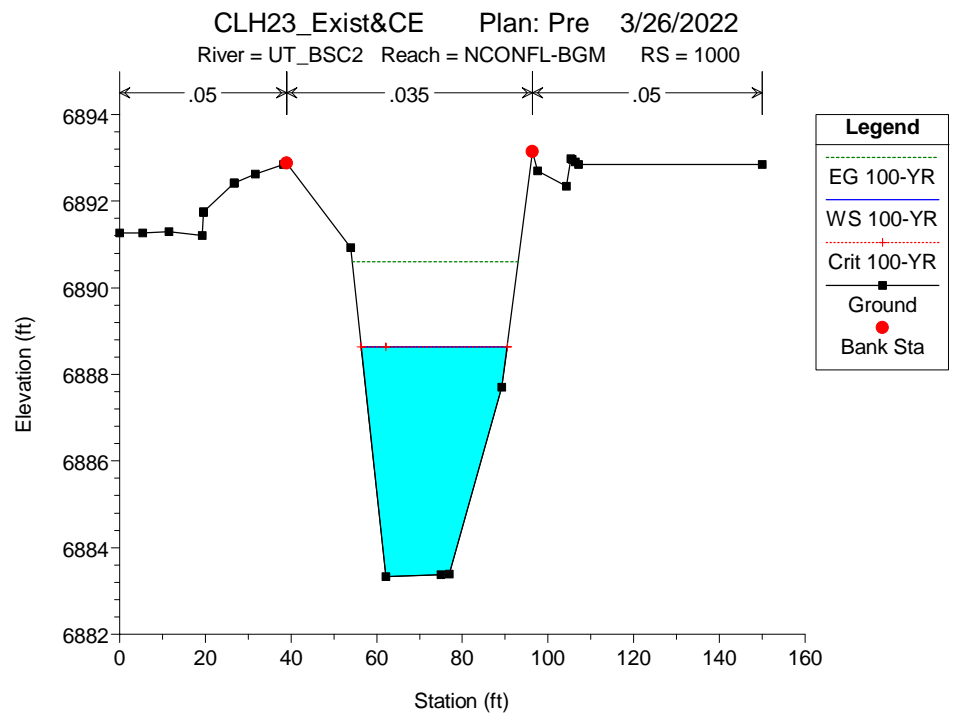
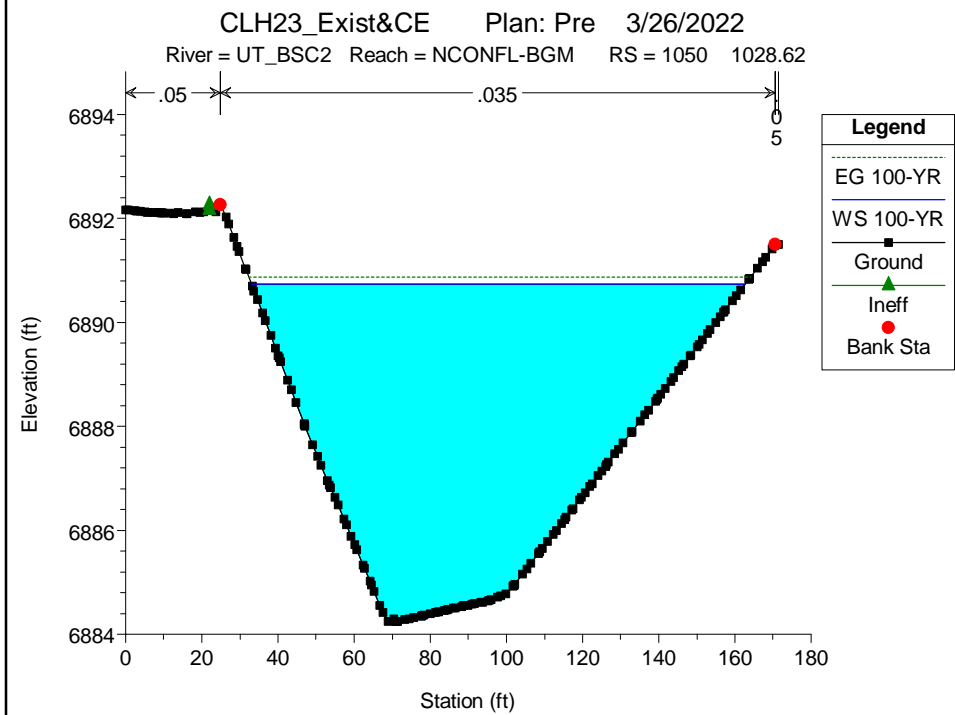
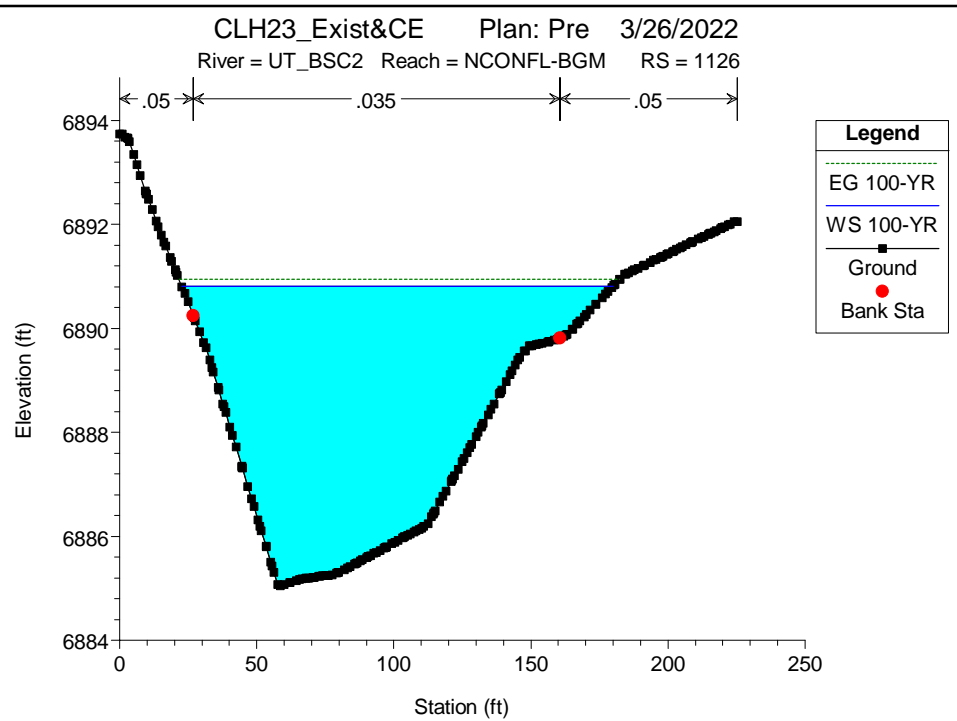
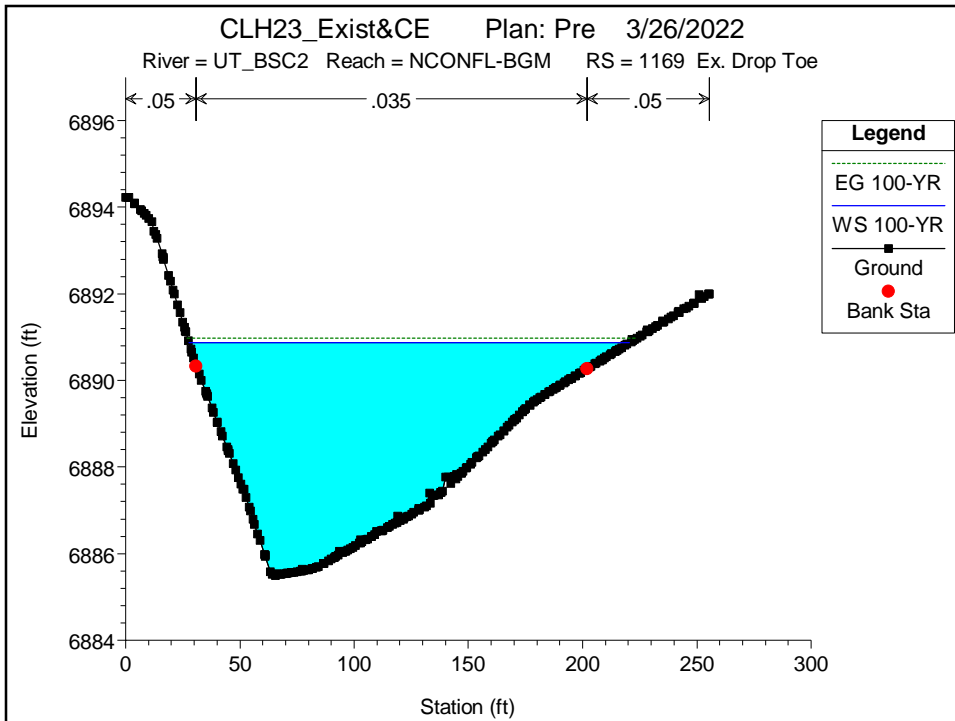












ATTACHMENT L
Post Project Model Results Table



Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel-Rev Stat	6057	PF 1	1000.00	6969.55	6973.72	6973.72	6975.04	0.017958	9.21	108.59	41.91	1.01
Channel-Rev Stat	6007	PF 1	1000.00	6968.59	6973.23		6973.59	0.003560	4.83	206.96	63.16	0.47
Channel-Rev Stat	5956	PF 1	1000.00	6968.41	6973.05		6973.42	0.003569	4.84	206.71	63.08	0.47
Channel-Rev Stat	5906	PF 1	1000.00	6968.23	6972.88		6973.24	0.003560	4.83	206.93	63.14	0.47
Channel-Rev Stat	5856	PF 1	1000.00	6968.06	6972.69		6973.06	0.003587	4.85	206.37	63.07	0.47
Channel-Rev Stat	5806	PF 1	1000.00	6967.88	6972.51		6972.88	0.003593	4.85	206.26	63.05	0.47
Channel-Rev Stat	5756	PF 1	1000.00	6967.71	6972.33		6972.70	0.003627	4.86	205.57	62.97	0.47
Channel-Rev Stat	5706	PF 1	1000.00	6967.53	6972.15		6972.52	0.003639	4.87	205.30	62.93	0.48
Channel-Rev Stat	5656	PF 1	1000.00	6967.36	6971.96		6972.33	0.003679	4.89	204.50	62.84	0.48
Channel-Rev Stat	5606	PF 1	1000.00	6967.18	6971.78		6972.15	0.003714	4.91	203.80	62.74	0.48
Channel-Rev Stat	5556	PF 1	1000.00	6967.01	6971.58		6971.96	0.003780	4.94	202.53	62.58	0.48
Channel-Rev Stat	5506	PF 1	1000.00	6966.83	6971.39		6971.77	0.003827	4.96	201.62	62.46	0.49
Channel-Rev Stat	5456	PF 1	1000.00	6966.66	6971.19		6971.58	0.003926	5.01	199.78	62.23	0.49
Channel-Rev Stat	5406	PF 1	1000.00	6966.48	6970.98		6971.38	0.004028	5.05	197.92	61.98	0.50
Channel-Rev Stat	5356	PF 1	1000.00	6966.31	6970.76		6971.17	0.004186	5.12	195.23	61.65	0.51
Channel-Rev Stat	5306	PF 1	1000.00	6966.13	6970.54		6970.96	0.004372	5.20	192.20	61.50	0.52
Channel-Rev Stat	5256	PF 1	1000.00	6965.96	6970.29		6970.73	0.004682	5.33	187.51	60.64	0.53
Channel-Rev Stat	5206	PF 1	1000.00	6965.78	6970.01		6970.48	0.005123	5.51	181.54	59.84	0.56
Channel-Rev Stat	5156	PF 1	1000.00	6965.61	6969.67		6970.20	0.006005	5.83	171.50	58.49	0.60
Channel-Rev Stat	5106	PF 1	1000.00	6965.43	6969.18		6969.84	0.008152	6.50	153.73	55.99	0.69
Channel-Rev Stat	5088 Ex. Drop Crest	PF 1	1000.00	6965.37	6968.83	6968.40	6969.65	0.011054	7.25	137.97	53.72	0.80
Channel-Rev Stat	5083	PF 1	1000.00	6965.35	6968.39	6968.39	6969.54	0.018057	8.62	115.95	50.31	1.00
Channel-Rev Stat	5072	PF 1	1000.00	6962.72	6965.76	6965.76	6966.92	0.018136	8.64	115.77	50.28	1.00
Channel-Rev Stat	5062 Ex. Drop Toe	PF 1	1000.00	6960.10	6963.97		6964.59	0.007386	6.29	158.96	56.52	0.66
Channel-Rev Stat	5056	PF 1	1000.00	6960.08	6963.94		6964.54	0.007331	6.26	159.70	56.87	0.66
Channel-Rev Stat	5006	PF 1	1000.00	6959.90	6963.75		6964.16	0.005517	5.43	223.34	126.66	0.57
Channel-Rev Stat	4955	PF 1	1000.00	6959.72	6963.20		6963.77	0.009039	6.06	164.96	72.54	0.71
Channel-Rev Stat	4833	PF 1	1000.00	6959.52	6962.78		6963.35	0.005769	6.03	165.85	64.07	0.66
Channel-Rev Stat	4817	PF 1	1000.00	6959.46	6962.65		6963.25	0.006215	6.19	161.57	63.48	0.68
Channel-Rev Stat	4794	PF 1	1000.00	6959.38	6962.31		6963.04	0.010998	6.87	145.61	61.51	0.79
Channel-Rev Stat	4789	PF 1	1000.00	6959.36	6962.18		6962.99	0.012749	7.23	138.34	60.48	0.84
Channel-Rev Stat	4788	PF 1	1000.00	6959.36	6962.16	6961.89	6962.98	0.013036	7.28	137.32	60.37	0.85
Channel-Rev Stat	4785 Drop 1 Crest	PF 1	1000.00	6959.29	6961.85	6961.85	6962.91	0.018703	8.25	121.24	58.00	1.01
Channel-Rev Stat	4784	PF 1	1000.00	6959.17	6961.77	6961.77	6962.83	0.018707	8.23	121.45	58.27	1.01
Channel-Rev Stat	4768	PF 1	1000.00	6955.36	6958.69		6959.33	0.007777	6.40	156.20	56.03	0.68
Channel-Rev Stat	4765 Drop 1 Toe	PF 1	1000.00	6954.68	6958.85		6959.23	0.003597	4.95	201.87	59.39	0.47
Channel-Rev Stat	4756	PF 1	1000.00	6954.31	6958.90		6959.18	0.001836	4.29	233.24	62.83	0.39
Channel-Rev Stat	4740	PF 1	1450.00	6954.26	6958.39		6959.09	0.005361	6.71	216.01	66.97	0.66
Channel-Rev Stat	4735	PF 1	1450.00	6954.24	6958.37		6959.06	0.005298	6.67	217.31	67.40	0.66
Channel-Rev Stat	4731	PF 1	1450.00	6954.23	6958.35		6959.04	0.005266	6.64	218.27	67.86	0.65
Channel-Rev Stat	4690	PF 1	1450.00	6954.11	6958.10		6958.81	0.005741	6.74	215.08	69.93	0.68
Channel-Rev Stat	4672	PF 1	1450.00	6954.06	6957.94		6958.70	0.006341	6.98	207.73	69.08	0.71
Channel-Rev Stat	4655	PF 1	1450.00	6954.00	6957.74		6958.58	0.007364	7.35	197.16	67.86	0.76
Channel-Rev Stat	4649	PF 1	1450.00	6953.99	6957.61		6958.52	0.010809	7.66	189.33	66.95	0.80
Channel-Rev Stat	4645	PF 1	1450.00	6953.97	6957.52		6958.48	0.011625	7.85	184.60	66.38	0.83
Channel-Rev Stat	4644	PF 1	1450.00	6953.97	6957.49	6957.14	6958.47	0.011963	7.93	182.76	66.15	0.84
Channel-Rev Stat	4640 Drop 2 Crest	PF 1	1450.00	6953.90	6957.10	6957.10	6958.39	0.017644	9.08	159.68	63.22	1.01
Channel-Rev Stat	4629 Drop 2 Toe	PF 1	1450.00	6951.39	6955.03		6956.07	0.011822	8.19	177.01	60.16	0.84
Channel-Rev Stat	4616	PF 1	1450.00	6951.00	6955.19		6955.86	0.005081	6.57	220.70	67.85	0.64
Channel-Rev Stat	4604	PF 1	1450.00	6950.97	6955.14		6955.79	0.004968	6.47	224.16	69.47	0.63
Channel-Rev Stat	4595	PF 1	1450.00	6950.94	6955.11		6955.75	0.004969	6.42	225.71	70.75	0.63
Channel-Rev Stat	4590	PF 1	1450.00	6950.93	6955.08		6955.72	0.004956	6.40	226.43	71.20	0.63
Channel-Rev Stat	4557	PF 1	1450.00	6950.83	6954.84		6955.54	0.005638	6.70	216.50	70.15	0.67
Channel-Rev Stat	4539	PF 1	1450.00	6950.77	6954.70		6955.43	0.006122	6.90	210.29	69.37	0.70
Channel-Rev Stat	4537	PF 1	1450.00	6950.77	6954.68		6955.42	0.006222	6.93	209.12	69.26	0.70
Channel-Rev Stat	4515	PF 1	1450.00	6950.70	6954.31		6955.23	0.010832	7.67	189.16	66.89	0.80
Channel-Rev Stat	4512	PF 1	1450.00	6950.69	6954.25		6955.20	0.011502	7.83	185.25	66.42	0.83
Channel-Rev Stat	4510	PF 1	1450.00	6950.69	6954.16	6953.86	6955.17	0.012489	8.05	180.06	65.82	0.86
Channel-Rev Stat	4508 Drop 3 Crest	PF 1	1450.00	6950.67	6953.84	6953.84	6955.11	0.017558	9.05	160.22	63.51	1.00
Channel-Rev Stat	4505	PF 1	1450.00	6950.29	6953.52	6953.52	6954.81	0.017605	9.11	159.17	62.55	1.01
Channel-Rev Stat	4489 Drop 3 Toe	PF 1	1450.00	6946.36	6949.64	6949.64	6951.05	0.017306	9.49	152.73	55.25	1.01
Channel-Rev Stat	4477	PF 1	1450.00	6945.59	6950.04		6950.69	0.004330	6.45	224.65	62.44	0.60
Channel-Rev Stat	4457	PF 1	1450.00	6945.53	6950.02		6950.58	0.003888	6.01	241.26	69.31	0.57
Channel-Rev Stat	4453	PF 1	1450.00	6945.52	6950.01		6950.56	0.003861	5.96	243.25	70.42	0.57
Channel-Rev Stat	4440	PF 1	1450.00	6945.48	6949.98		6950.50	0.003666	5.76	251.81	74.03	0.55
Channel-Rev Stat	4390	PF 1	1450.00	6945.33	6949.77		6950.31	0.003854	5.86	247.50	73.63	0.56
Channel-Rev Stat	4339	PF 1	1450.00	6945.18	6949.55		6950.11	0.004086	5.98	242.39	73.01	0.58
Channel-Rev Stat	4289	PF 1	1450.00	6945.03	6949.30		6949.89	0.004463	6.17	234.96	72.19	0.60
Channel-Rev Stat	4239	PF 1	1450.00	6944.88	6949.01		6949.65	0.005041	6.44	225.17	71.10	0.64
Channel-Rev Stat	4189	PF 1	1450.00	6944.73	6948.56		6949.35	0.006675	7.11	204.02	68.64	0.73
Channel-Rev Stat	4183	PF 1	1450.00	6944.71	6948.49		6949.30	0.006983	7.21	201.17	68.58	0.74
Channel-Rev Stat	4167 Ex. Drop Crest	PF 1	1450.00	6944.58	6947.80	6947.80	6949.07	0.022305	9.05	160.21	63.70	1.01
Channel-Rev Stat	4152	PF 1	1450.00	6940.35	6943.48	6943.48	6944.75	0.022327	9.05	160.21	63.74	1.01
Channel-Rev Stat	4136 Ex. Drop Toe	PF 1	1450.00	6937.01	6943.62		6943.81	0.000796	3.48	416.63	98.87	0.27
Channel-Rev Stat	4089	PF 1	1450.00	6936.87	6943.62		6943.80	0.000086	3.47	417.89	121.95	0.25
Channel-Rev Stat	4072	PF 1	1450.00	6936.83	6943.42		6943.78	0.000150	4.86	298.55	102.52	0.34
Channel-Rev Stat	4056	PF 1	1450.00	6936.78	6943.34	6940.11	6943.76	0.000173	5.23	277.38	83.86	0.36
Channel-Rev Stat	3992 BG Meadows Dr	Culvert										
Channel-Rev Stat	3931	PF 1	1450.00	6936.40	6939.96	6939.96	6941.75	0.015301	10.72	135.32	42.55	1.00
Channel-Rev Stat	3923	PF 1	1450.00	6936.38	6940.08		6941.31	0.013155	8.90	162.84	60.00	0.83
Channel-Rev Stat	3892 Drop 4 Crest	PF 1	1482.00	6936.28	6939.48	6939.48	6940.77	0.017538	9.11	162.61	63.72	1.01
Channel-Rev Stat	3871 Drop 4 Toe	PF 1	1482.00	6932.66	6936.58		6937.50	0.009408	7.69	192.69	60.52	0.76
Channel-Rev Stat	3837	PF 1	1482.00	6932.17	6936.62		6937.20	0.004107	6.08	243.90	71.95	0.58
Channel-Rev Stat	3803	PF 1	1482.00	6932.07	6936.48		6937.05	0.004133	6.05	245.11	73.28	0.58
Channel-Rev Stat	3764	PF 1	1482.00	6931.95	6936.29		6936.89	0.004391	6.18	239.95	72.72	0.60

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel-Rev Stat	3725	PF 1	1482.00	6931.84	6936.07		6936.71	0.004843	6.39	231.84	71.85	0.63
Channel-Rev Stat	3687	PF 1	1482.00	6931.72	6935.81		6936.50	0.005499	6.69	221.66	70.64	0.67
Channel-Rev Stat	3669	PF 1	1482.00	6931.67	6935.66		6936.40	0.006042	6.91	214.51	69.86	0.70
Channel-Rev Stat	3642	PF 1	1482.00	6931.59	6935.21	6934.80	6936.16	0.011283	7.83	189.35	66.92	0.82
Channel-Rev Stat	3637	Drop 5 Crest	1482.00	6931.53	6934.77	6934.77	6936.06	0.017380	9.10	162.90	63.56	1.00
Channel-Rev Stat	3620	Drop 5 Toe	1482.00	6927.58	6931.40		6932.45	0.011483	8.24	179.96	59.26	0.83
Channel-Rev Stat	3587	PF 1	1482.00	6927.37	6931.35		6932.10	0.006057	6.91	214.34	69.84	0.70
Channel-Rev Stat	3523	PF 1	1482.00	6926.98	6930.95		6931.70	0.006122	6.94	213.55	69.75	0.70
Channel-Rev Stat	3375	PF 1	1482.00	6926.32	6930.23		6931.01	0.006506	7.09	209.07	69.27	0.72
Channel-Rev Stat	3369	PF 1	1482.00	6926.09	6929.94		6930.75	0.006855	7.22	205.31	68.85	0.74
Channel-Rev Stat	3342	PF 1	1482.00	6925.89	6929.46	6929.10	6930.44	0.011844	7.96	186.25	66.60	0.84
Channel-Rev Stat	3337	Drop 6 Crest	1482.00	6925.80	6929.05	6929.05	6930.34	0.017561	9.13	162.40	63.57	1.01
Channel-Rev Stat	3321	Drop 6 Toe	1482.00	6921.84	6926.24		6926.92	0.006198	6.65	222.72	63.46	0.63
Channel-Rev Stat	3302	PF 1	1482.00	6921.78	6926.22		6926.82	0.004245	6.22	238.29	69.49	0.59
Channel-Rev Stat	3287	PF 1	1482.00	6921.73	6926.19		6926.74	0.003948	5.95	249.12	73.73	0.57
Channel-Rev Stat	3237	PF 1	1482.00	6921.54	6925.99		6926.54	0.004027	5.99	247.38	73.54	0.58
Channel-Rev Stat	3178	PF 1	1482.00	6921.33	6925.73		6926.30	0.004168	6.06	244.40	73.22	0.59
Channel-Rev Stat	3130	PF 1	1482.00	6921.15	6925.52		6926.10	0.004293	6.13	241.86	72.93	0.59
Channel-Rev Stat	3086	PF 1	1482.00	6920.99	6925.30		6925.90	0.004510	6.23	237.76	72.53	0.61
Channel-Rev Stat	3081	PF 1	1482.00	6920.97	6925.28		6925.88	0.004518	6.24	237.57	72.47	0.61
Channel-Rev Stat	3076	PF 1	1482.00	6920.95	6925.25		6925.86	0.004540	6.25	237.13	72.41	0.61
Channel-Rev Stat	3060	PF 1	1482.00	6920.89	6925.17		6925.79	0.004620	6.29	235.67	72.23	0.61
Channel-Rev Stat	3050	PF 1	1482.00	6920.86	6925.12		6925.74	0.004693	6.32	234.42	72.12	0.62
Channel-Rev Stat	2994	PF 1	1482.00	6920.66	6924.79		6925.46	0.005281	6.59	224.96	71.10	0.65
Channel-Rev Stat	2962	PF 1	1482.00	6920.54	6924.55		6925.28	0.005545	6.86	216.20	76.93	0.67
Channel-Rev Stat	2944	PF 1	1482.00	6920.47	6924.40		6925.17	0.006336	7.02	210.99	69.47	0.71
Channel-Rev Stat	2940	PF 1	1482.00	6920.46	6924.37		6925.15	0.006450	7.07	209.66	69.30	0.72
Channel-Rev Stat	2917	PF 1	1482.00	6920.37	6923.94	6923.58	6924.93	0.011856	7.96	186.14	66.55	0.84
Channel-Rev Stat	2912	Drop 7 Crest	1482.00	6920.26	6923.53	6923.53	6924.83	0.017590	9.13	162.25	63.43	1.01
Channel-Rev Stat	2896	Drop 7 Toe	1482.00	6916.69	6920.60		6921.54	0.009704	7.78	190.57	60.19	0.77
Channel-Rev Stat	2862	PF 1	1482.00	6916.25	6920.62		6921.22	0.004379	6.21	238.56	71.45	0.60
Channel-Rev Stat	2848	PF 1	1482.00	6916.21	6920.57		6921.16	0.004306	6.13	241.60	72.90	0.59
Channel-Rev Stat	2762	PF 1	1482.00	6915.95	6920.03		6920.73	0.005516	6.69	221.45	70.64	0.67
Channel-Rev Stat	2744	PF 1	1482.00	6915.90	6919.87		6920.62	0.006151	6.95	213.24	69.74	0.70
Channel-Rev Stat	2741	PF 1	1482.00	6915.89	6919.84		6920.60	0.006229	6.98	212.32	69.63	0.70
Channel-Rev Stat	2717	PF 1	1482.00	6915.82	6919.39	6919.03	6920.37	0.011779	7.94	186.56	66.61	0.84
Channel-Rev Stat	2712	Drop 8 Crest	1482.00	6915.70	6918.97	6918.97	6920.27	0.017609	9.14	162.14	63.36	1.01
Channel-Rev Stat	2696	Drop 8 Toe	1482.00	6911.79	6916.34		6916.98	0.005488	6.40	231.44	63.67	0.59
Channel-Rev Stat	2662	PF 1	1482.00	6911.70	6916.28		6916.81	0.003676	5.84	253.66	73.01	0.55
Channel-Rev Stat	2594	PF 1	1482.00	6911.49	6916.03		6916.56	0.003719	5.83	254.38	74.28	0.56
Channel-Rev Stat	2544	PF 1	1482.00	6911.35	6915.82		6916.37	0.003918	5.93	249.82	73.83	0.57
Channel-Rev Stat	2490	PF 1	1482.00	6911.18	6915.57		6916.15	0.004213	6.09	243.43	73.08	0.59
Channel-Rev Stat	2407	PF 1	1482.00	6910.93	6915.09		6915.75	0.005157	6.54	226.76	71.25	0.65
Channel-Rev Stat	2387	PF 1	1482.00	6910.87	6914.95		6915.65	0.005553	6.71	220.92	70.56	0.67
Channel-Rev Stat	2369	PF 1	1482.00	6910.82	6914.79		6915.54	0.006117	6.94	213.62	69.78	0.70
Channel-Rev Stat	2342	PF 1	1482.00	6910.74	6914.30	6913.94	6915.29	0.011940	7.98	185.65	66.46	0.84
Channel-Rev Stat	2337	Drop 9 Crest	1482.00	6910.68	6913.89	6913.89	6915.19	0.017462	9.11	162.63	63.53	1.00
Channel-Rev Stat	2321	Drop 9 Toe	1482.00	6906.75	6911.05		6911.81	0.006943	6.95	213.16	61.88	0.66
Channel-Rev Stat	2298	PF 1	1482.00	6906.65	6911.03		6911.64	0.004410	6.30	235.10	69.13	0.60
Channel-Rev Stat	2290	PF 1	1482.00	6906.63	6911.00	6909.89	6911.61	0.004404	6.25	237.16	70.66	0.60
Channel-Rev Stat	2287	PF 1	1482.00	6906.62	6910.99		6911.59	0.004398	6.22	238.17	71.39	0.60
Channel-Rev Stat	2238	PF 1	1482.00	6906.48	6910.75		6911.37	0.004680	6.31	234.69	72.18	0.62
Channel-Rev Stat	2187	PF 1	1482.00	6906.32	6910.40		6911.10	0.005539	6.70	221.16	70.65	0.67
Channel-Rev Stat	2169	PF 1	1482.00	6906.27	6910.25		6910.99	0.006081	6.92	214.05	69.84	0.70
Channel-Rev Stat	2163	PF 1	1482.00	6906.25	6910.19		6910.96	0.006282	7.00	211.65	69.57	0.71
Channel-Rev Stat	2142	PF 1	1482.00	6906.19	6909.85	6909.39	6910.77	0.010833	7.72	192.09	67.28	0.80
Channel-Rev Stat	2137	Drop 10 Crest	1482.00	6906.17	6909.38	6909.38	6910.67	0.017537	9.12	162.56	63.67	1.01
Channel-Rev Stat	2121	Drop 10 Toe	1482.00	6902.59	6906.04	6905.88	6907.28	0.014707	8.95	165.54	57.97	0.93
Channel-Rev Stat	2098	PF 1	1482.00	6902.10	6906.19		6906.92	0.005679	6.89	215.20	67.04	0.68
Channel-Rev Stat	2087	PF 1	1482.00	6902.07	6906.13		6906.86	0.005790	6.85	216.42	69.09	0.68
Channel-Rev Stat	2039	PF 1	1482.00	6901.93	6905.57		6906.50	0.008419	7.76	191.10	67.16	0.81
Channel-Rev Stat	1987	PF 1	1482.00	6901.77	6905.26		6906.06	0.007302	7.18	206.39	73.30	0.75
Channel-Rev Stat	1966	PF 1	1482.00	6901.71	6905.14		6905.89	0.006879	6.95	213.10	75.95	0.73
Channel-Rev Stat	1957	PF 1	1482.00	6901.68	6905.09		6905.82	0.006747	6.87	215.59	77.09	0.72
Channel-Rev Stat	1942	PF 1	1482.00	6901.64	6904.85	6904.42	6905.69	0.010805	7.36	201.30	75.71	0.80
Channel-Rev Stat	1937	Drop 11 Crest	1482.00	6901.62	6904.40	6904.40	6905.59	0.017940	8.73	169.69	72.32	1.01
Channel-Rev Stat	1924	Drop 11 Toe	1482.00	6898.77	6902.41		6903.03	0.006937	6.33	233.97	79.01	0.65
Channel-Rev Stat	1892	PF 1	1482.00	6898.36	6902.33		6902.83	0.003869	5.68	260.87	81.74	0.56
Channel-Rev Stat	1887	PF 1	1482.00	6898.36	6902.30		6902.81	0.003970	5.73	258.59	81.53	0.57
Channel-Rev Stat	1808	PF 1	1482.00	6898.28	6901.23	6901.06	6902.26	0.011123	8.14	182.07	73.58	0.91
Channel-Rev Stat	1712	PF 1	1482.00	6898.18	6900.70		6901.29	0.007117	6.14	241.51	107.14	0.72
Channel-Rev Stat	1606	PF 1	1482.00	6898.08	6900.47		6900.71	0.002970	3.95	374.74	167.15	0.47
Channel-Rev Stat	1498	PF 1	1482.00	6897.97	6899.56	6899.41	6900.13	0.011660	6.03	245.79	162.58	0.86
Channel-Rev Stat	1474	Ex. Drop Crest	1482.00	6897.01	6899.05	6899.05	6899.73	0.021434	6.61	224.14	165.82	1.00
Channel-Rev Stat	1453	Ex. Drop Toe	1482.00	6893.74	6898.29		6898.83	0.011463	5.85	253.20	159.52	0.82
Channel-Rev Stat	1428	PF 1	1482.00	6893.43	6898.12		6898.56	0.007931	5.35	277.11	163.88	0.73
Channel-Rev Stat	1386	PF 1	1482.00	6892.58	6897.94		6898.27	0.004962	4.61	321.73	171.55	0.59
Channel-Rev Stat	1329	Ex. Drop Top	1482.00	6892.85	6896.96	6896.96	6897.79	0.012085	7.39	212.91	149.10	0.92
Channel-Rev Stat	1317	Ex. Drop Toe	1482.00	6889.26	6893.98	6893.75	6894.80	0.010956	7.27	203.73	96.01	0.88
Channel-Rev Stat	1286	PF 1	1482.00	6889.05	6893.72		6894.45	0.009902	6.82	217.37	104.86	0.83
Channel-Rev Stat	1243	PF 1	1482.00	6888.75	6893.35	6893.02	6894.03	0.009078	6.59	224.85	106.90	0.80
Channel-Rev Stat	1179	Ex. Drop Top	1482.00	6888.12	6892.48	6892.48	6893.27	0.015379	7.15	207.16	129.58	1.00
Channel-Rev Stat	1169	Ex. Drop Toe	1482.00	6885.50	6890.86		6890.97	0.000828	2.67	560.71	192.36	0.26
Channel-Rev Stat	1126	PF 1	1482.00	6885.05	6890.79		6890.93	0.000854	2.97	508.19	156.84	0.27
Channel-Rev Stat	1050	PF 1	1482.00	6884.24	6890.73		6890.87	0.000703	3.00	501.62	129.52	0.25

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel-Rev Stat	1000	PF 1	1482.00	6883.33	6888.64	6888.64	6890.60	0.012887	11.22	132.13	34.10	1.00

1000.

Adjust the design to meet these.

Table 1: Channel Design Parameters

Design Parameter	Design Value
Maximum 100-year Depth	5 ft
Maximum Velocity*	7 ft/s
Maximum Froude, 100-year*	0.8
Maximum Shear Stress, 100-year*	1.2 lb/sf
Maximum Longitudinal Slope*	0.61%
Side Slope	4:1

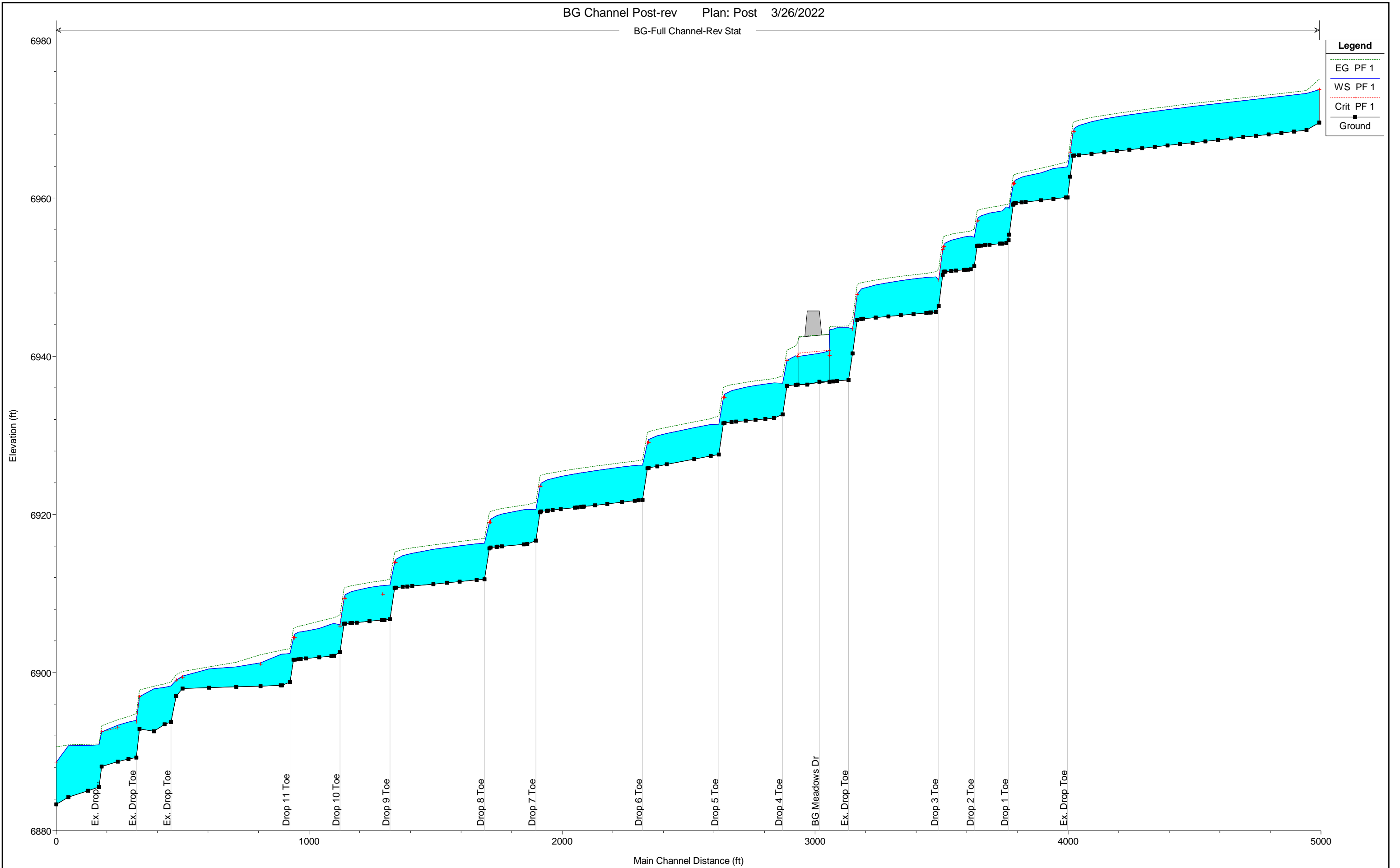
(areas highlighted on previous page)

ATTACHMENT M
Post Project Water Surface Profiles



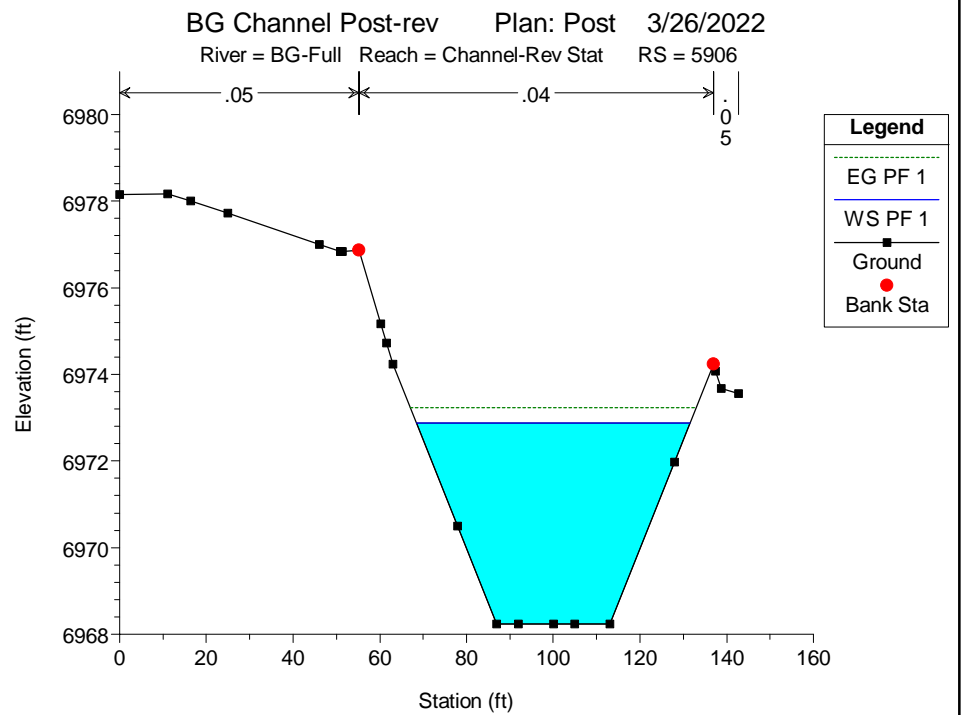
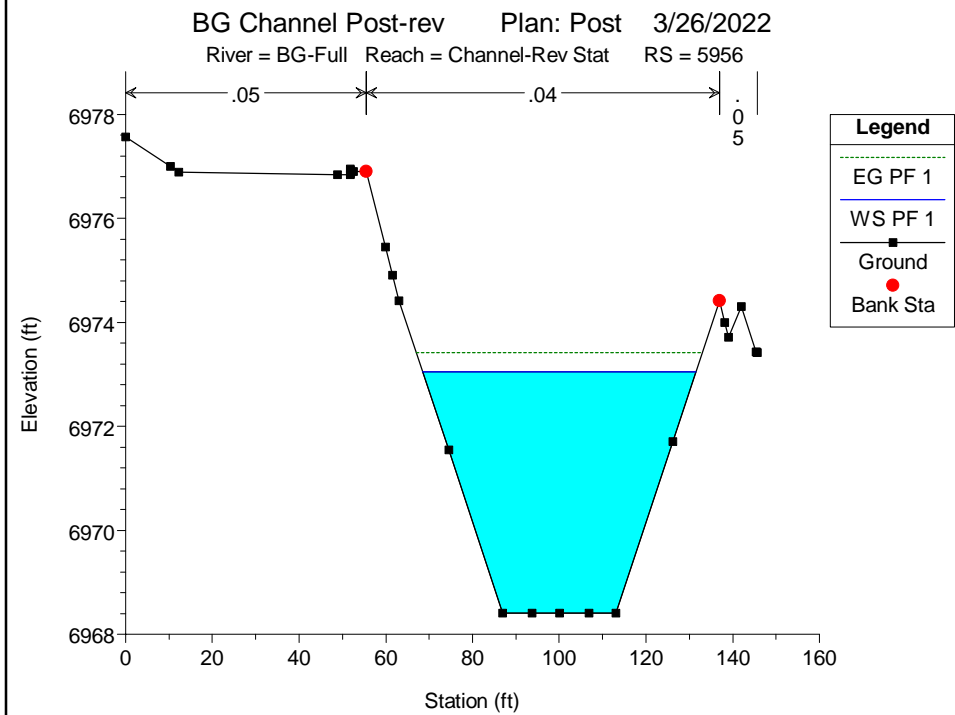
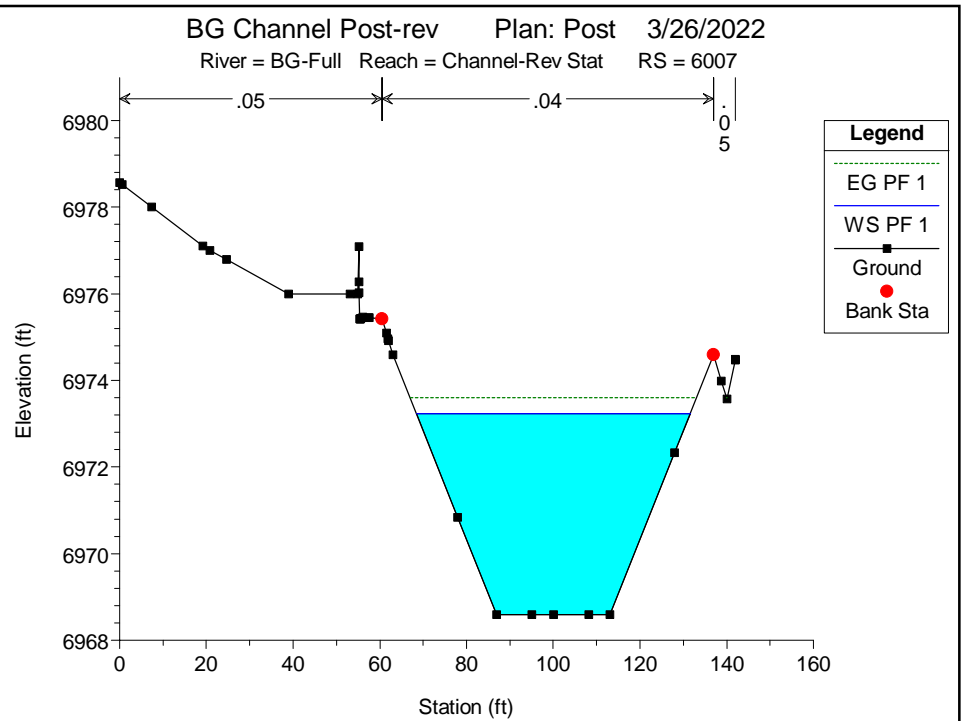
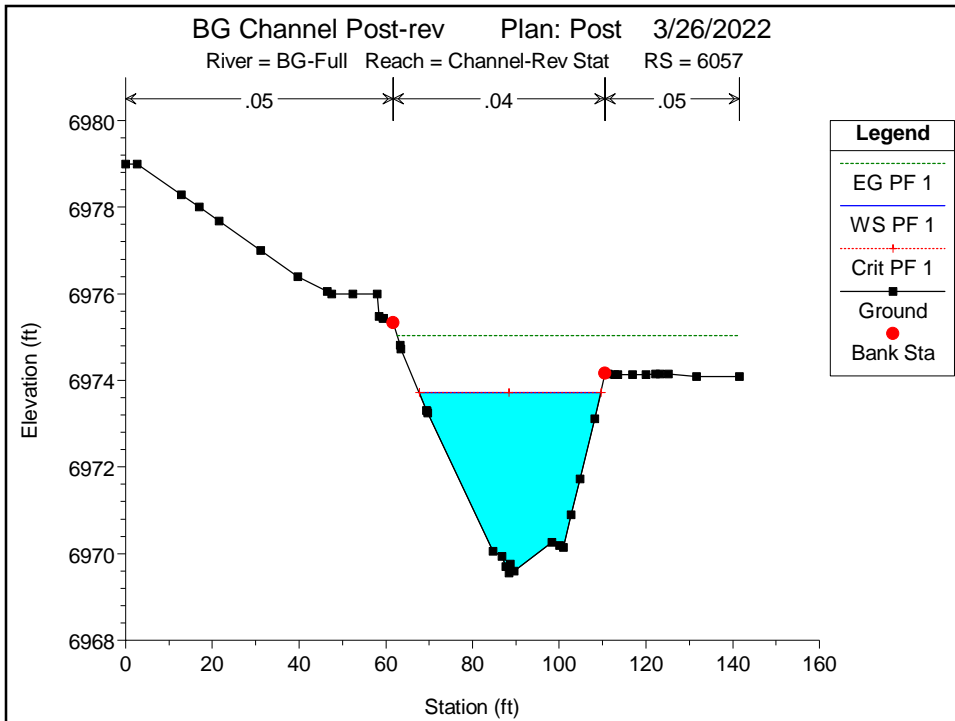
Legend

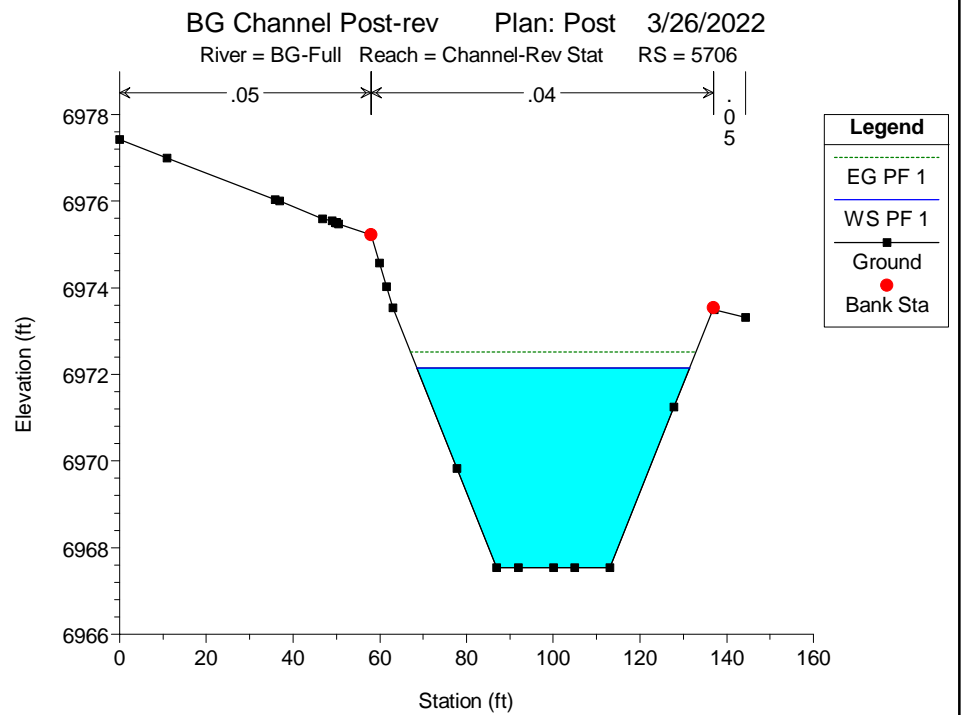
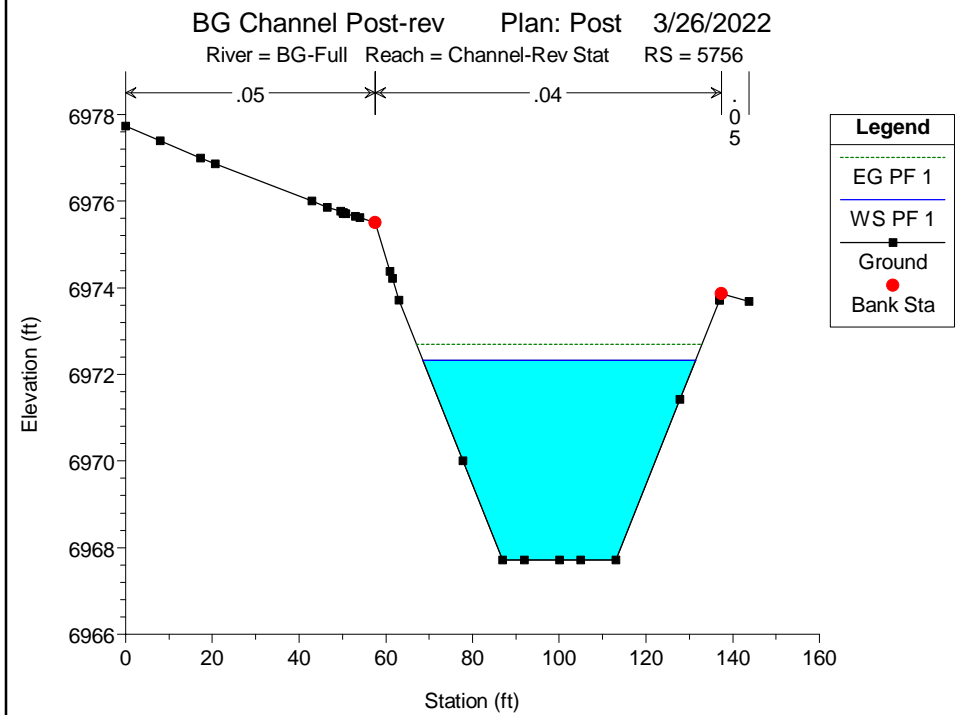
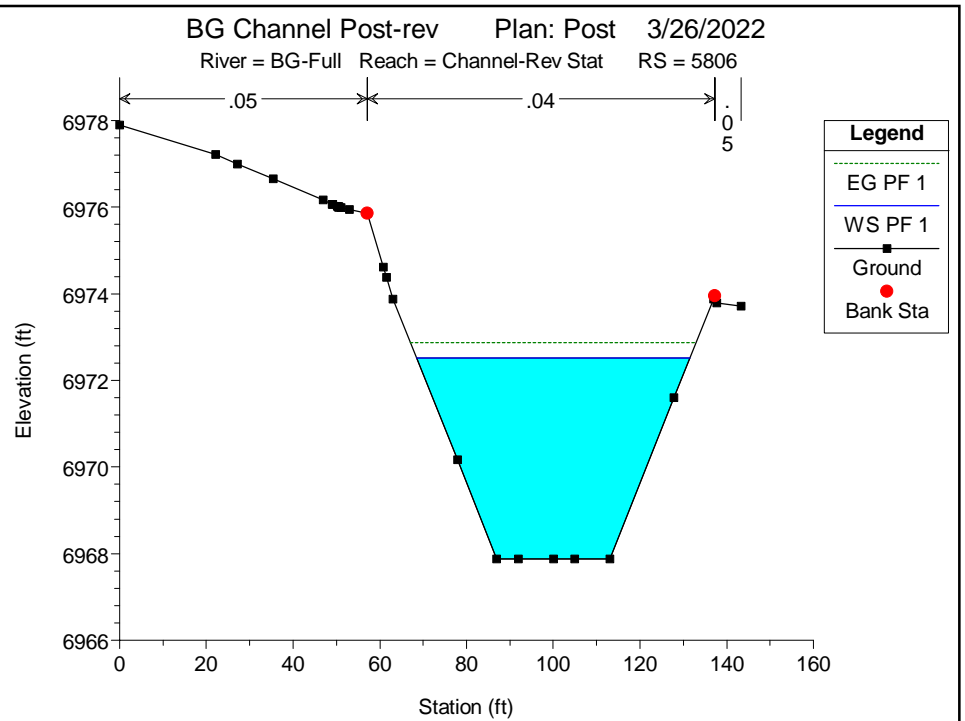
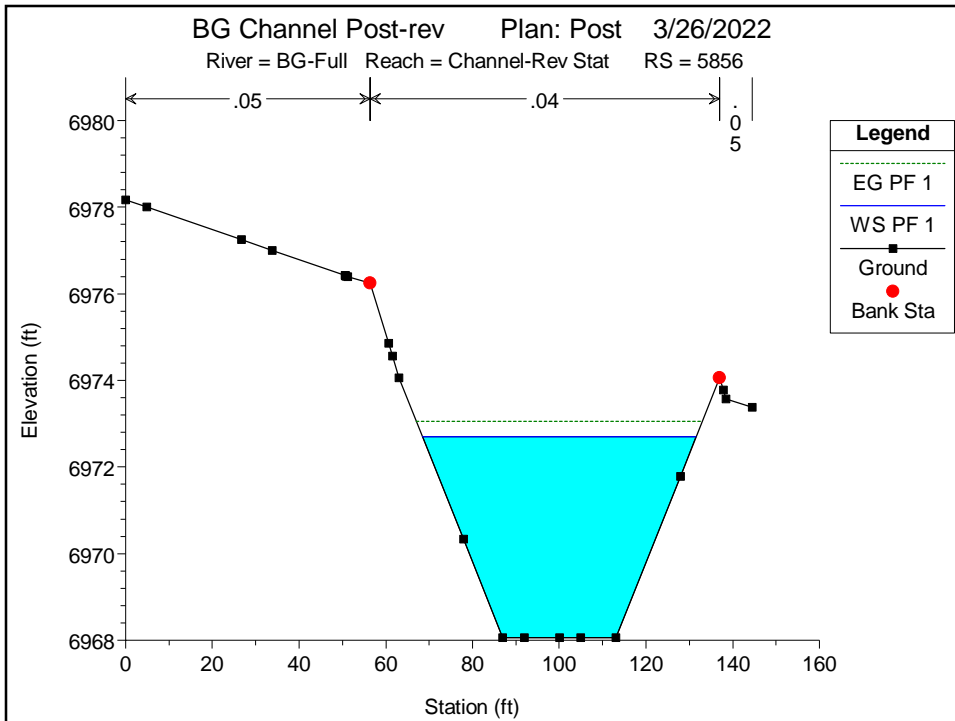
- EG PF 1
- WS PF 1
- Crit PF 1
- Ground

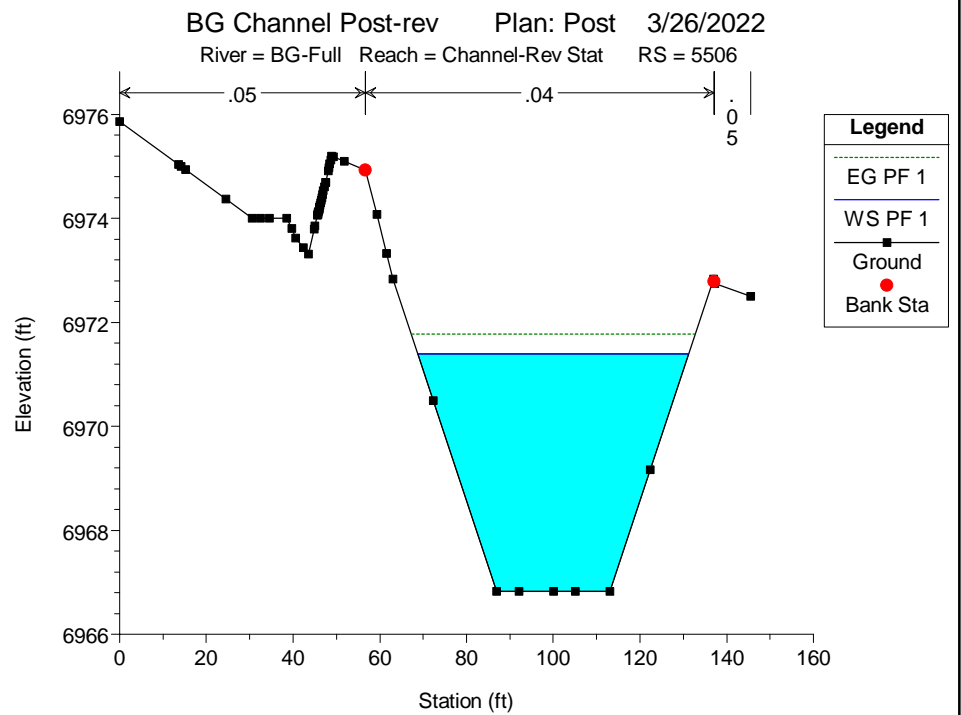
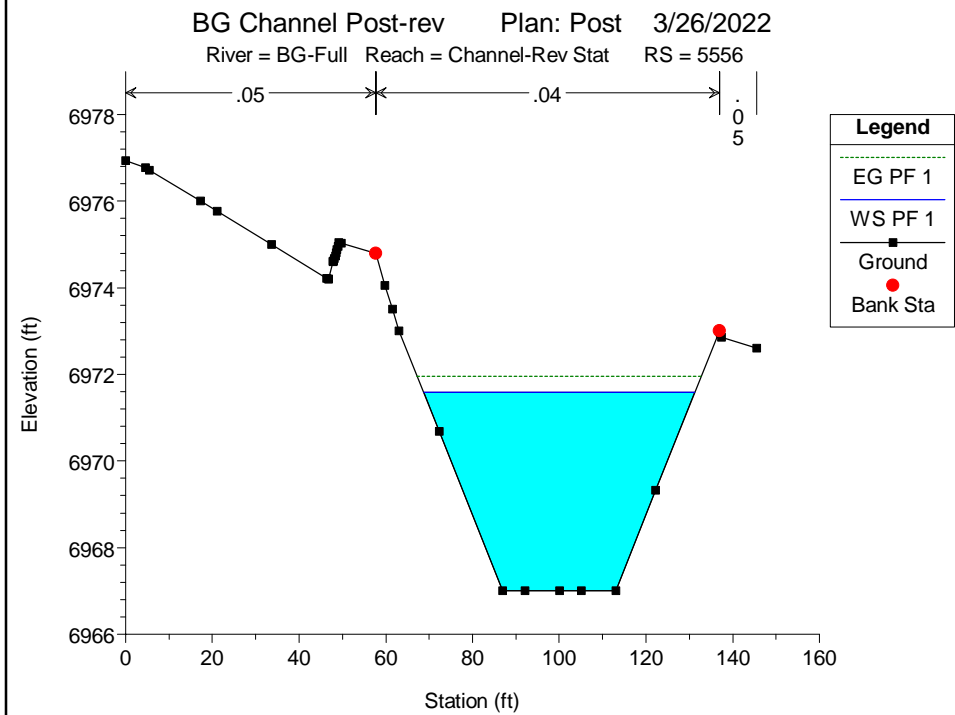
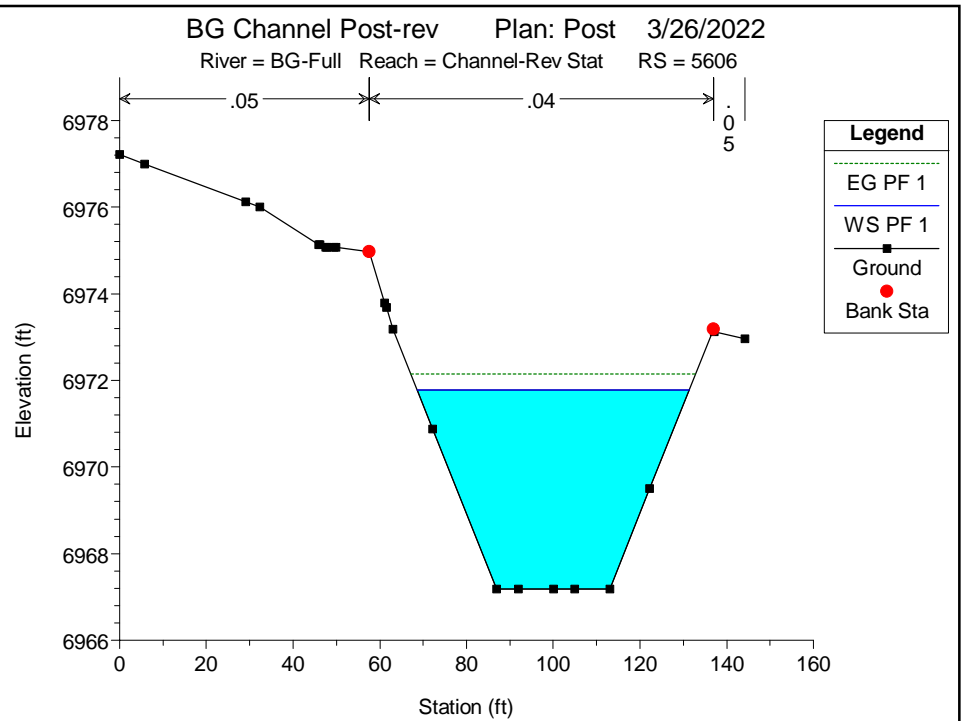
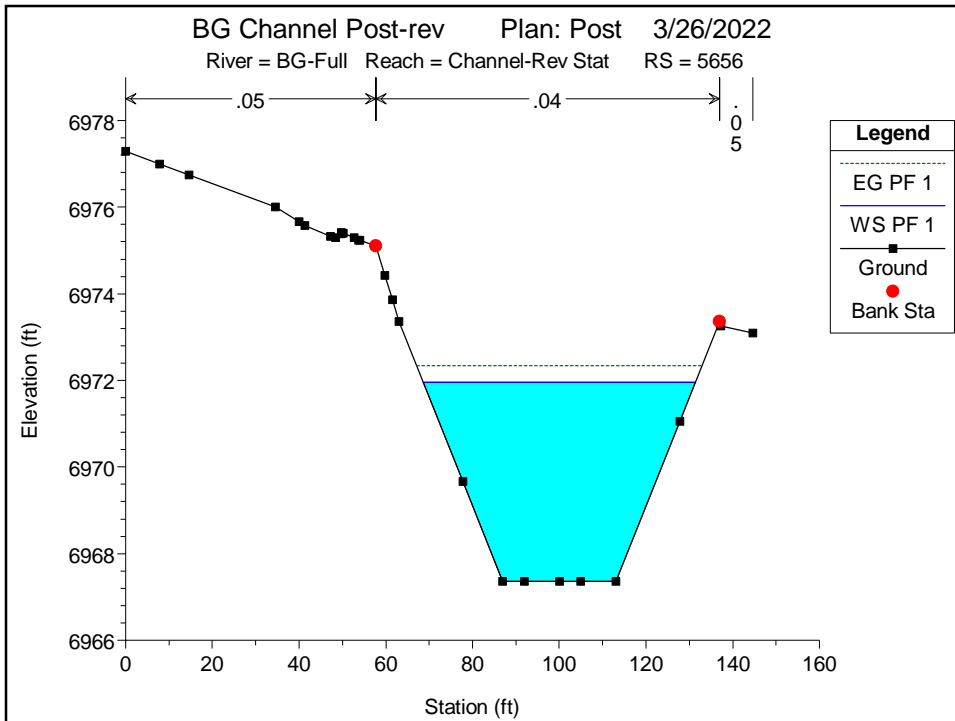


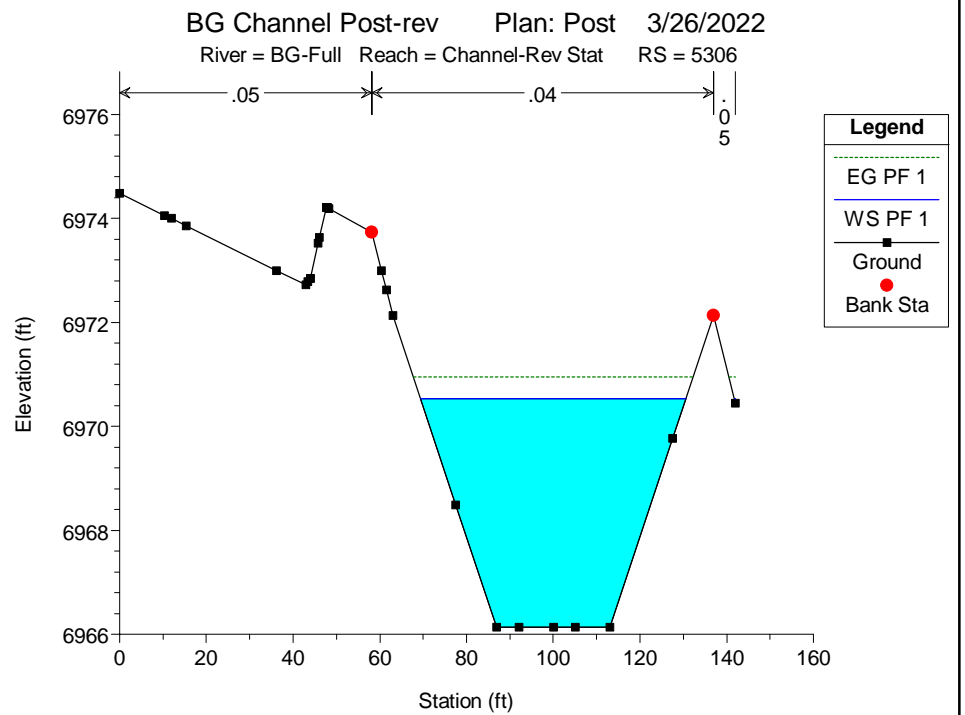
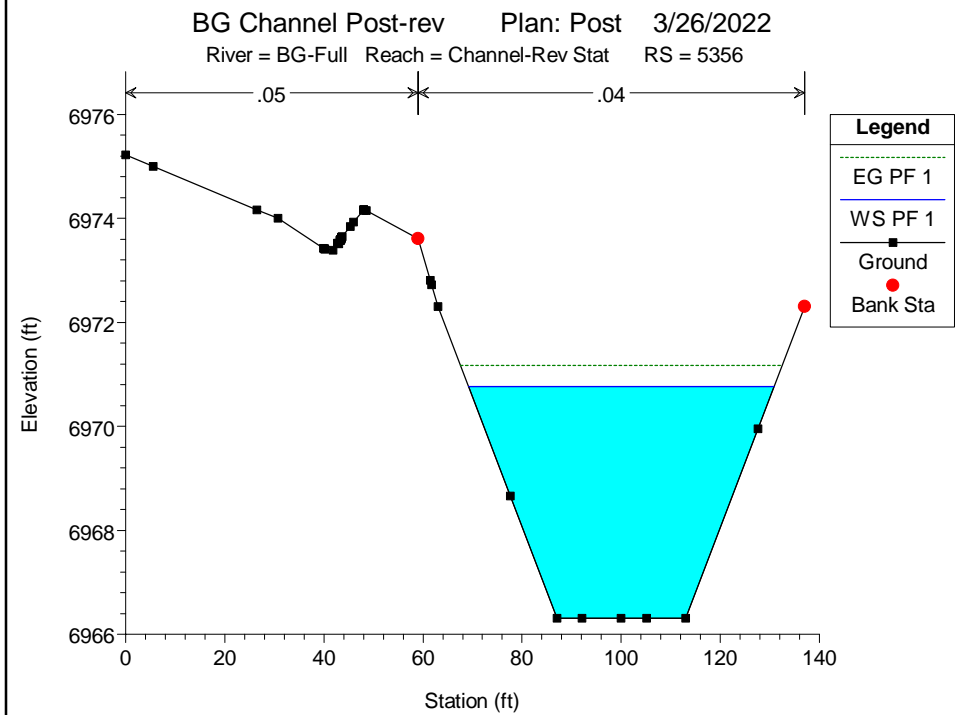
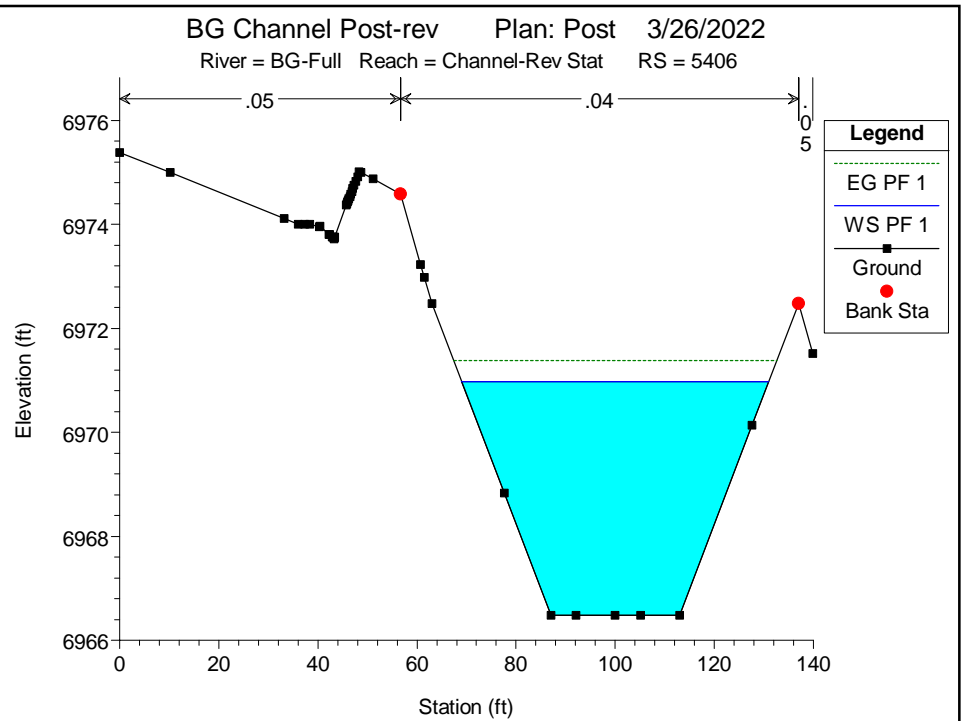
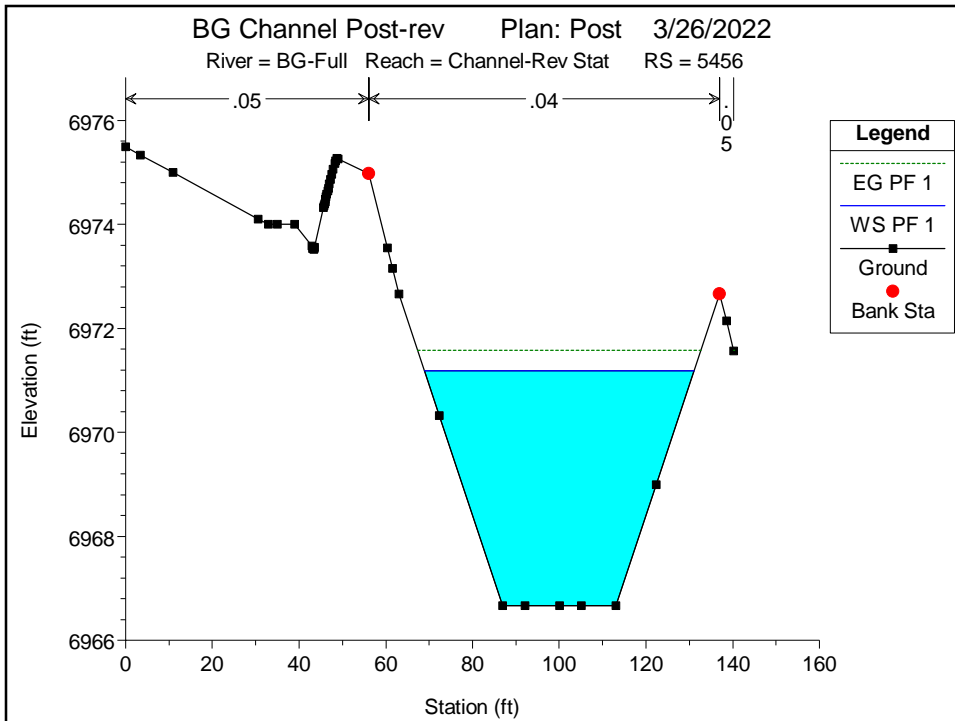
ATTACHMENT N
Post Project Cross Sections

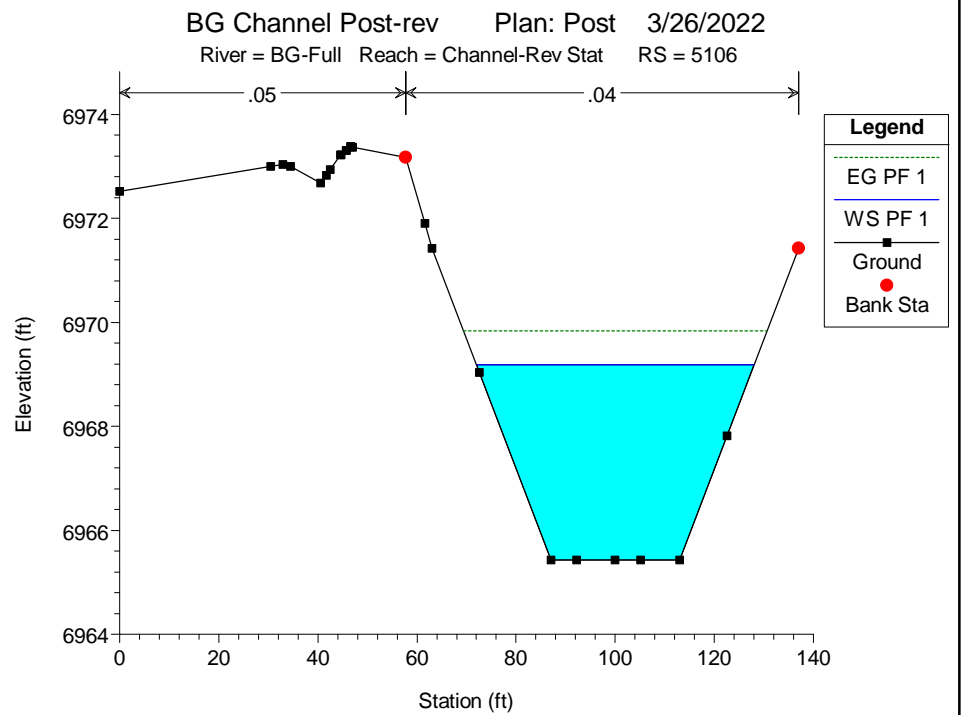
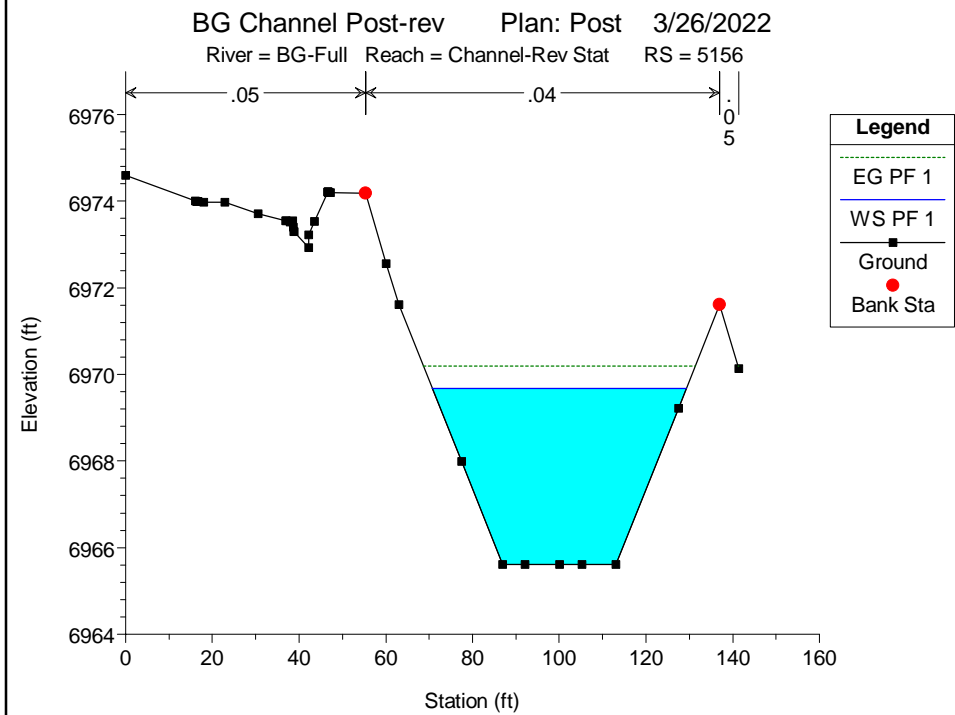
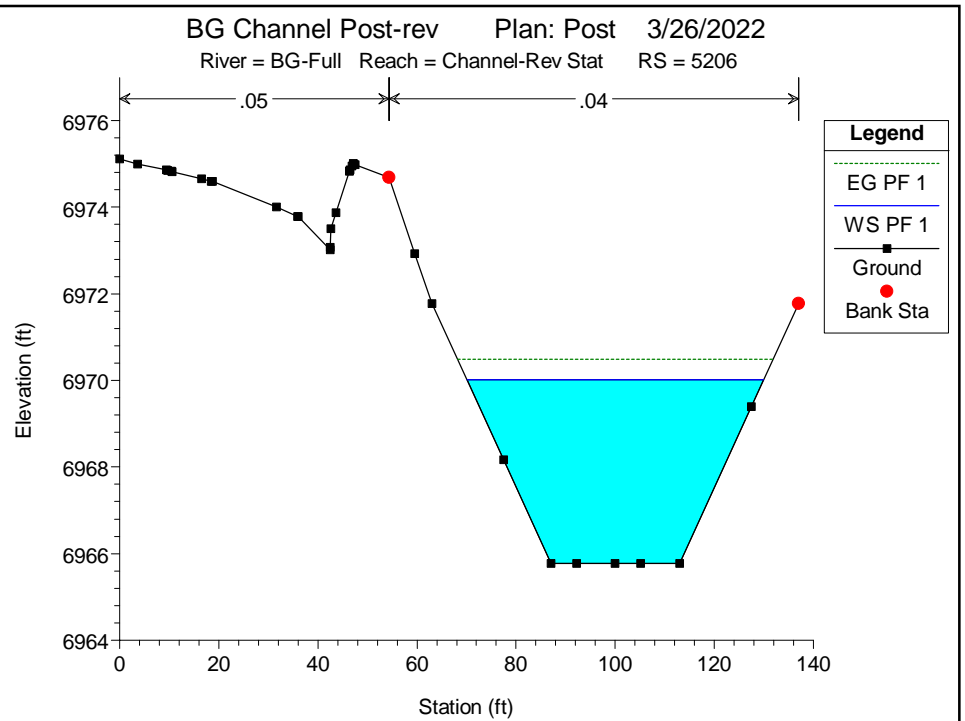
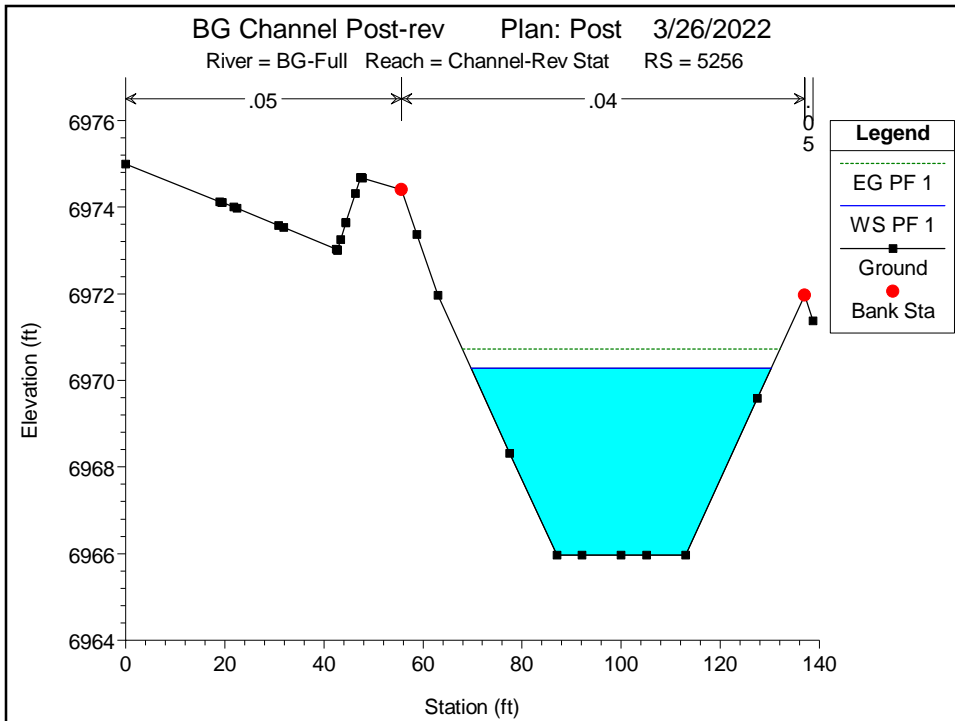


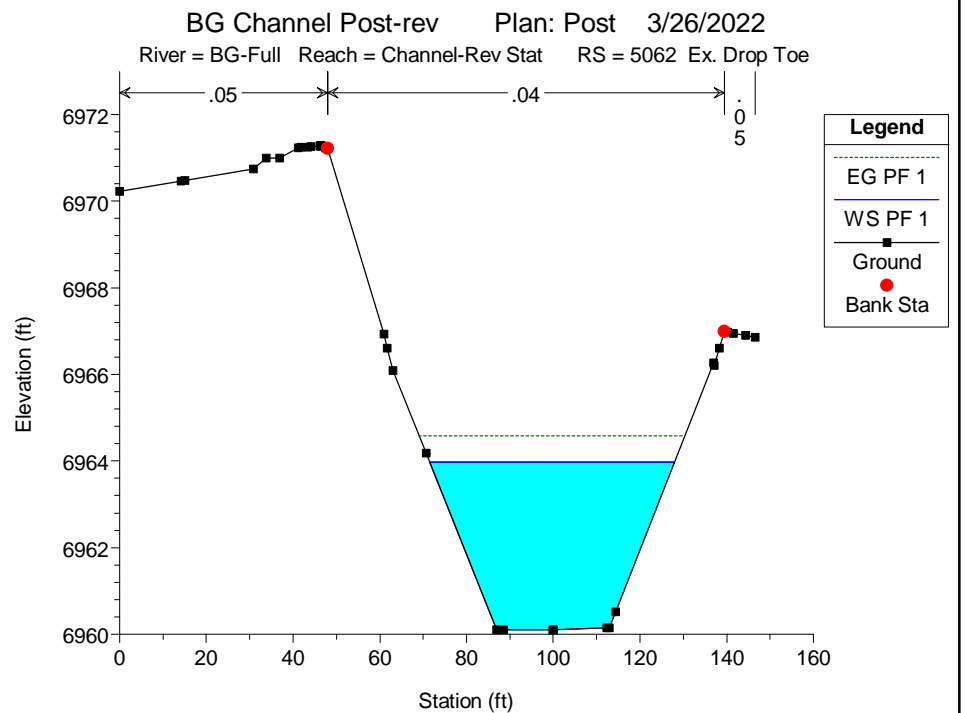
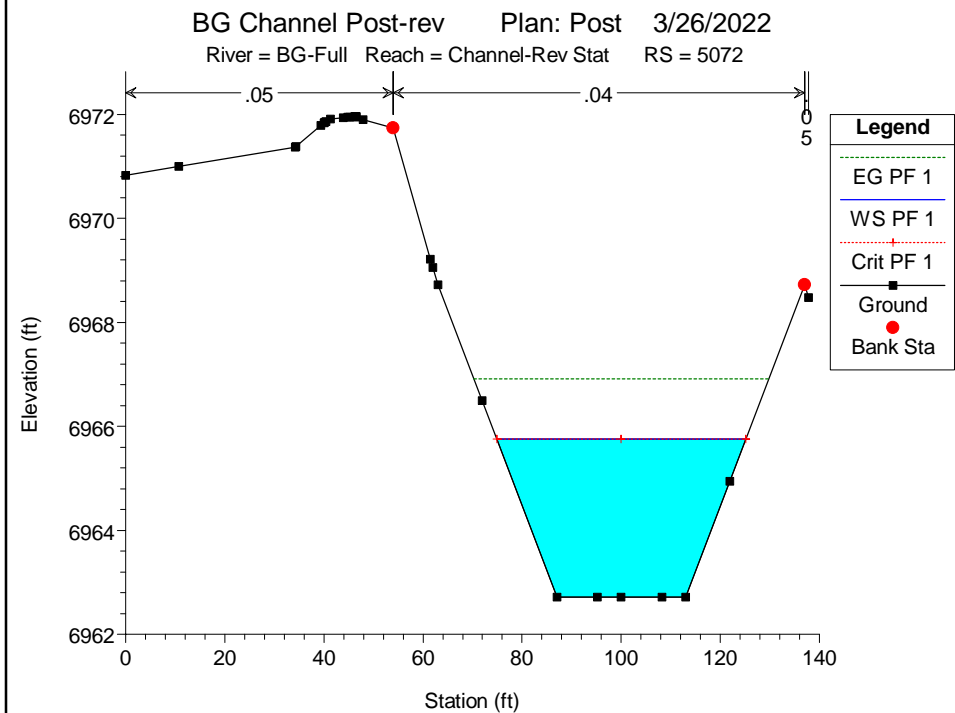
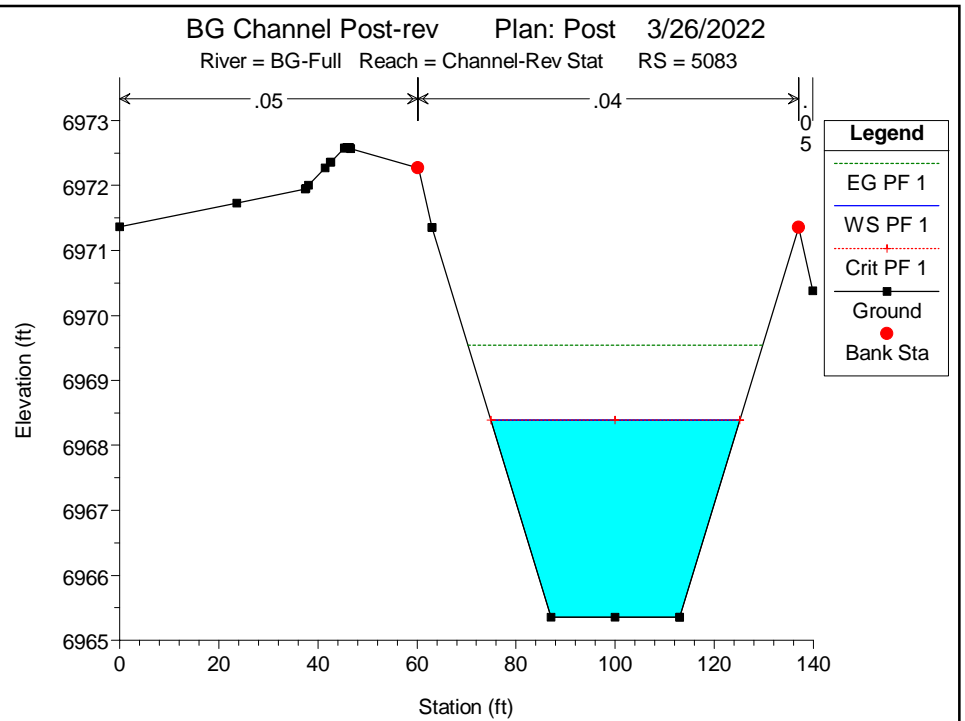
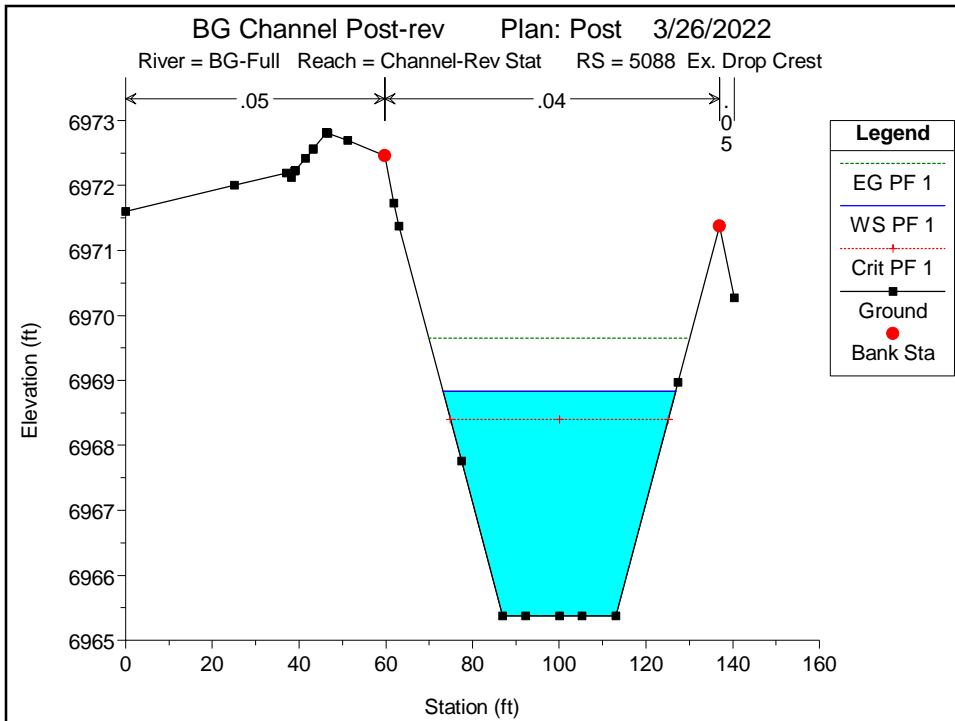


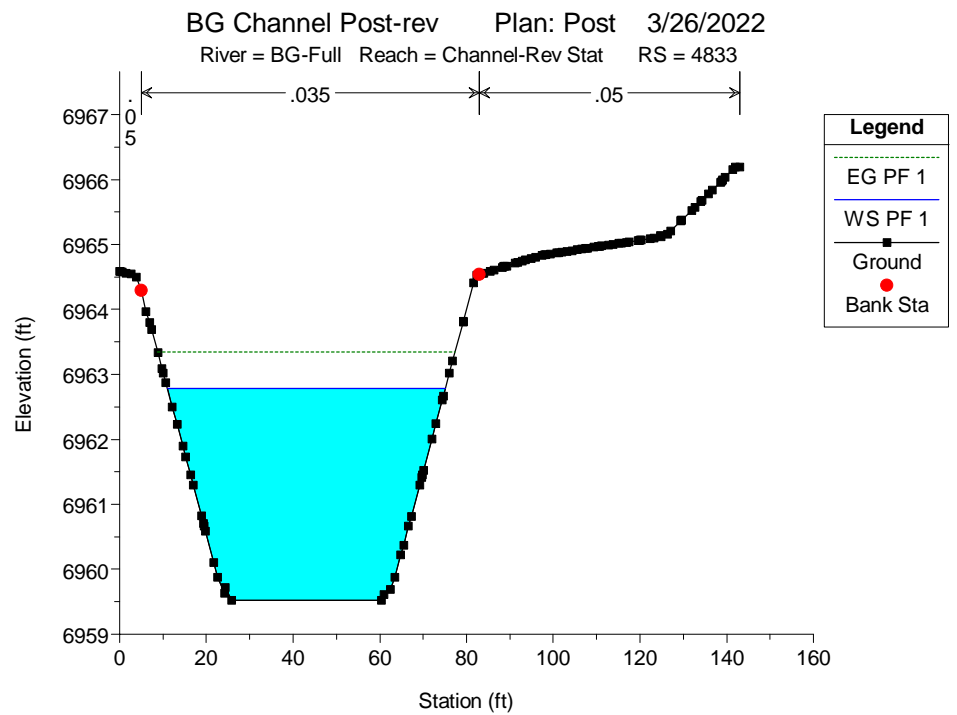
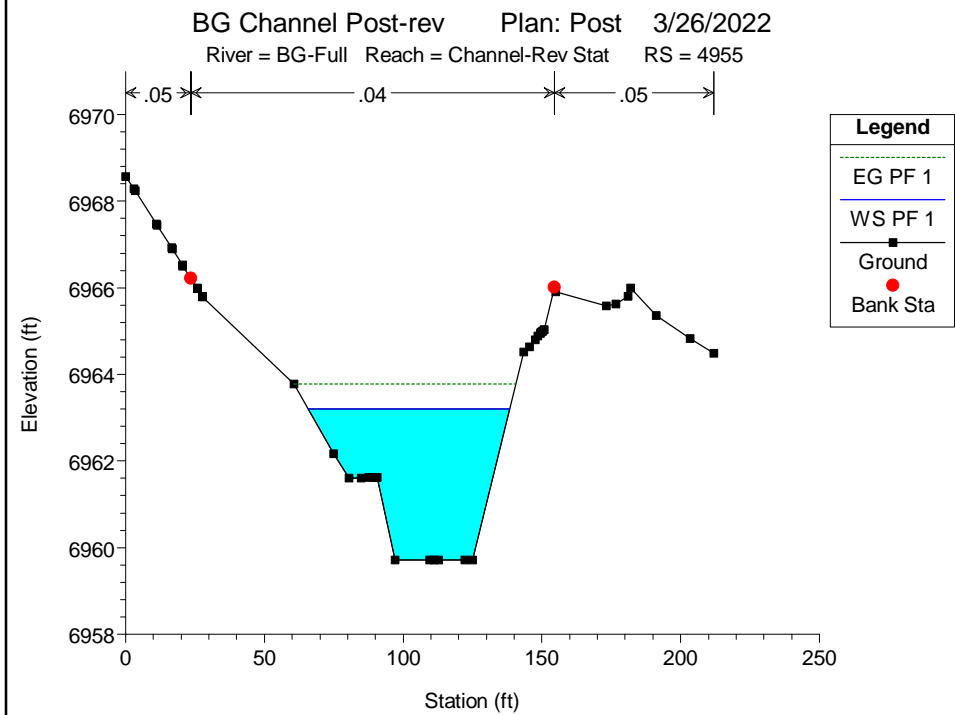
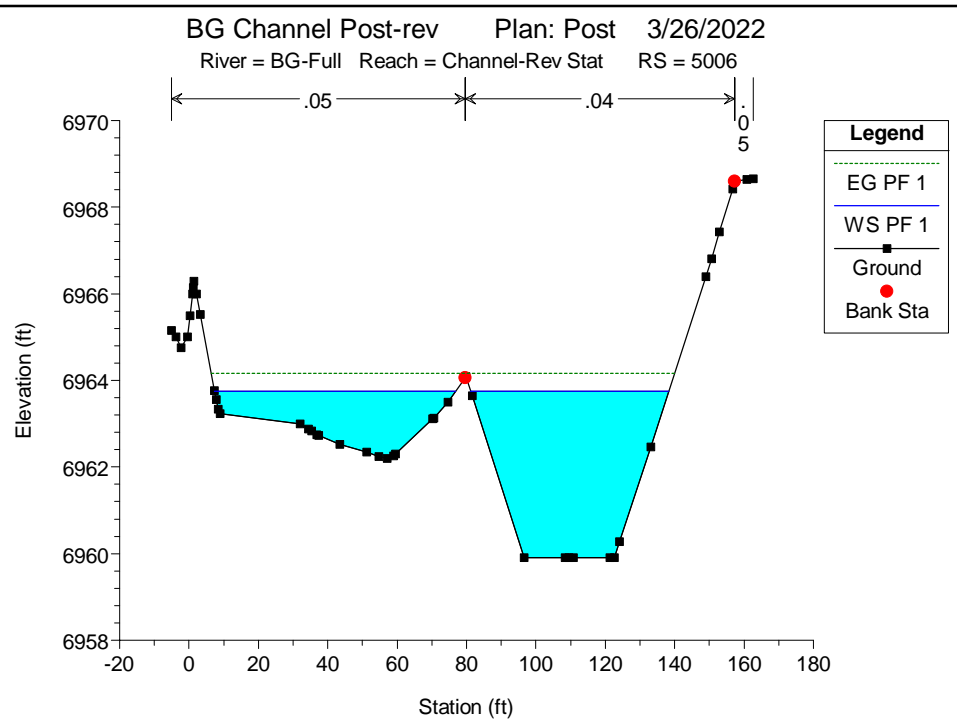
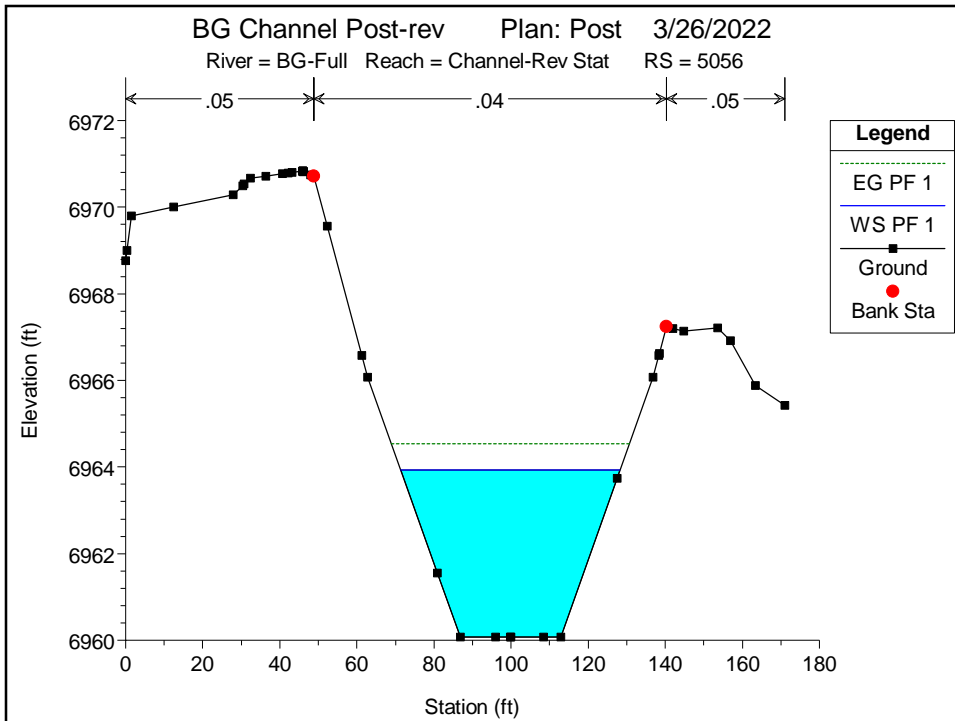


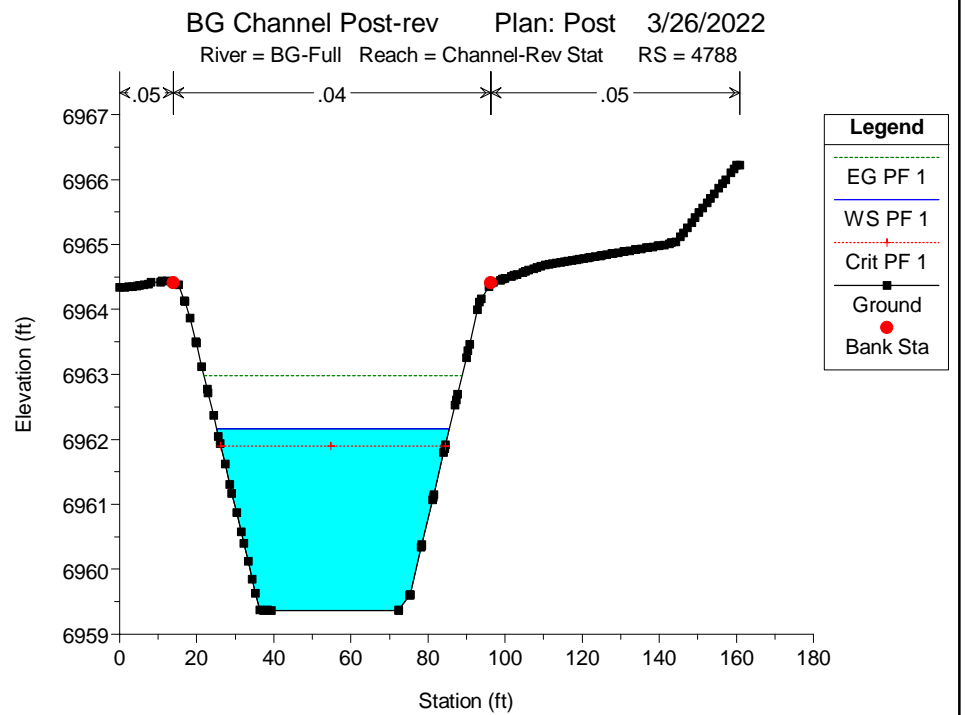
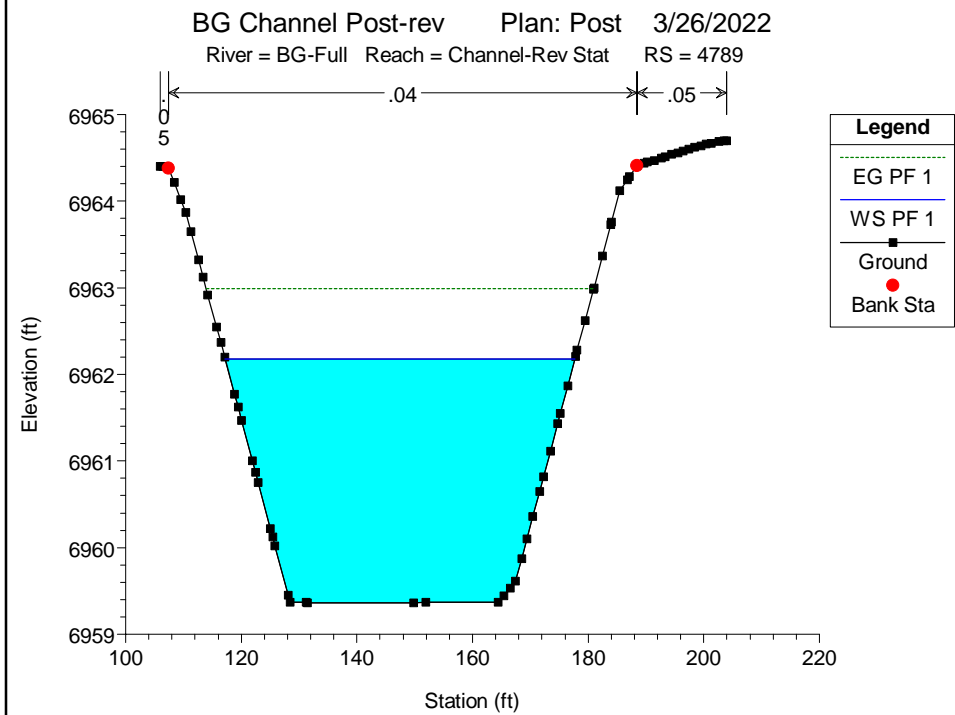
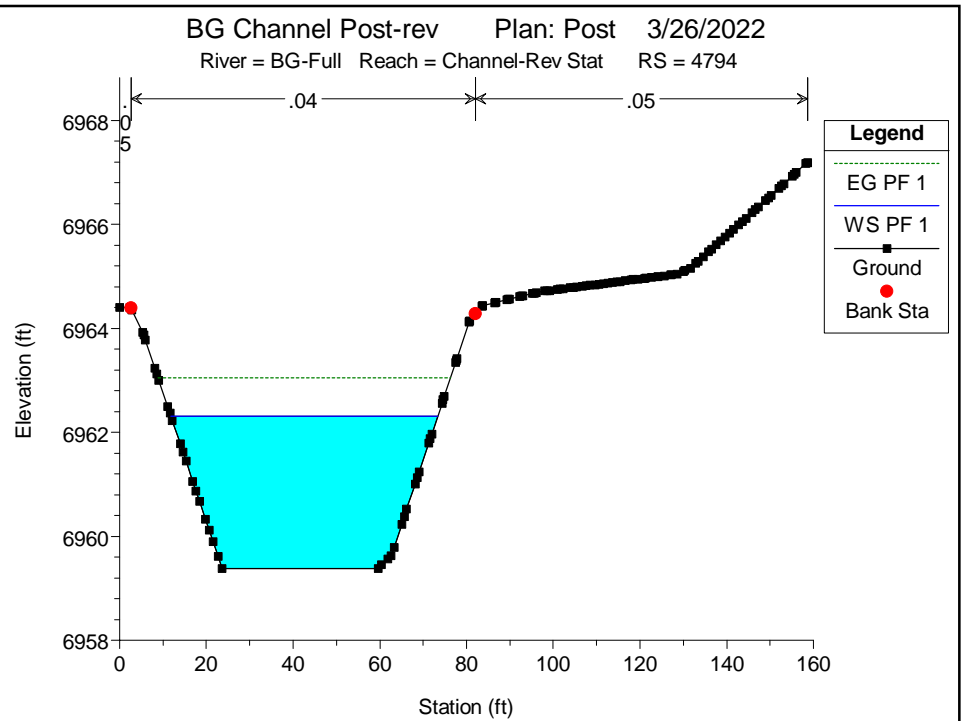
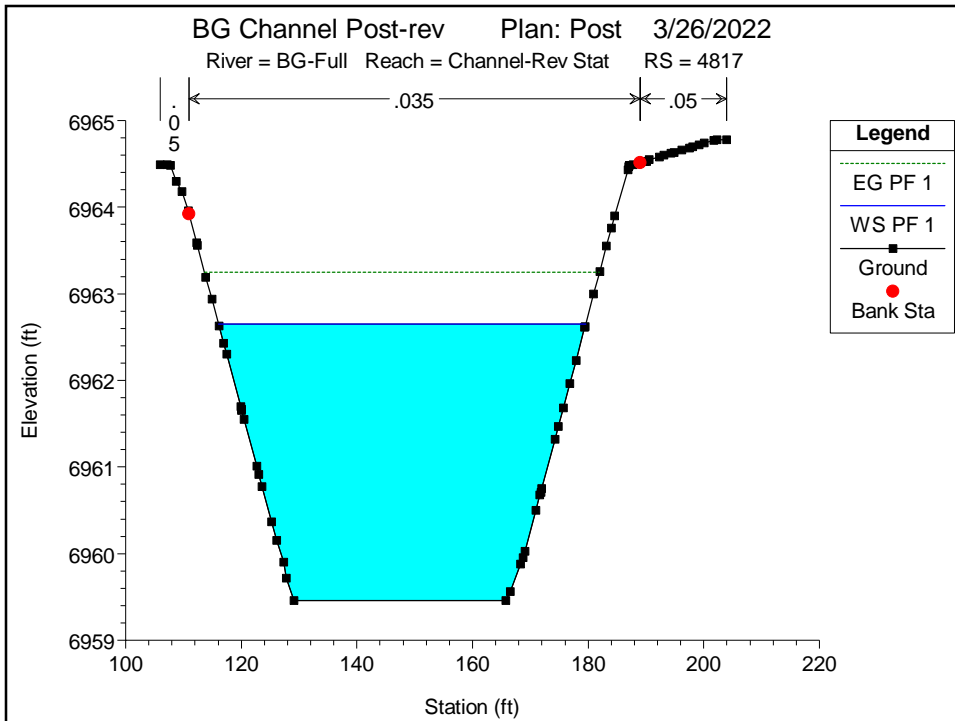


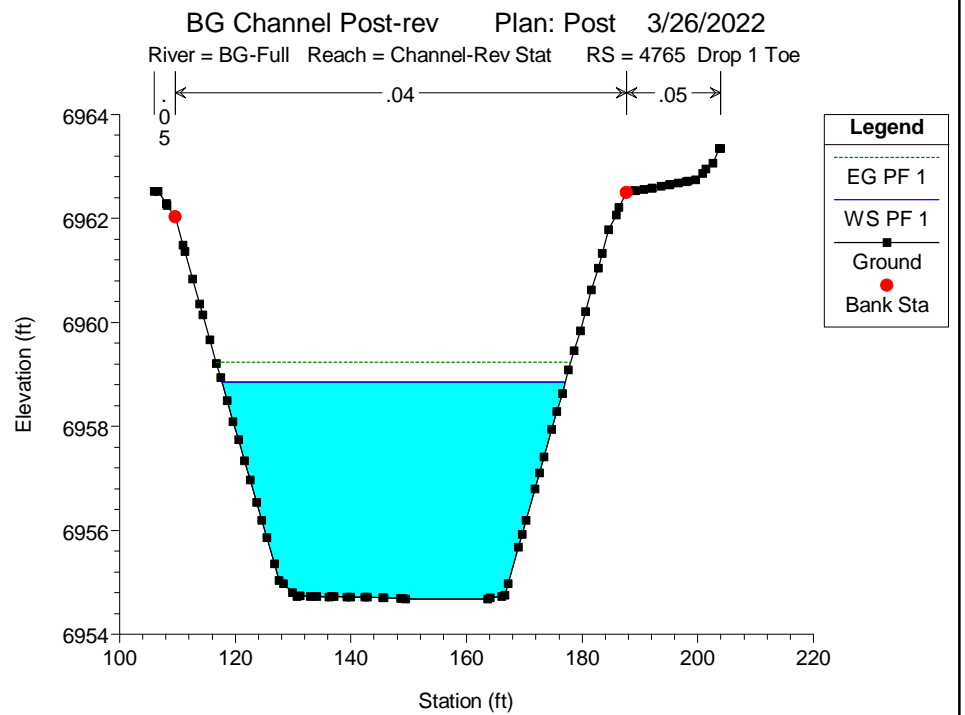
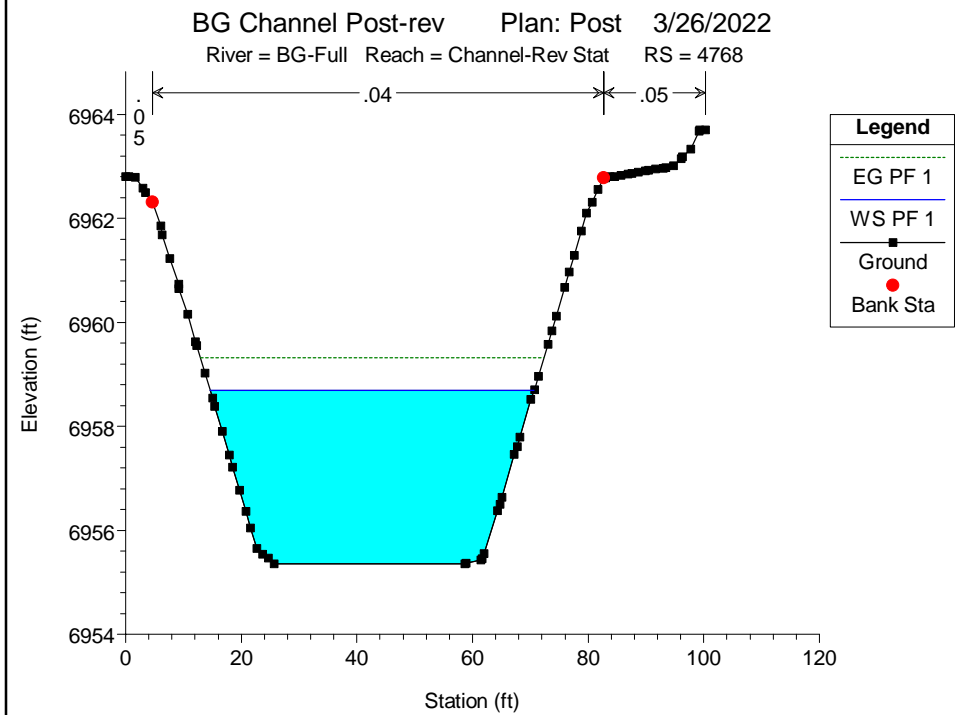
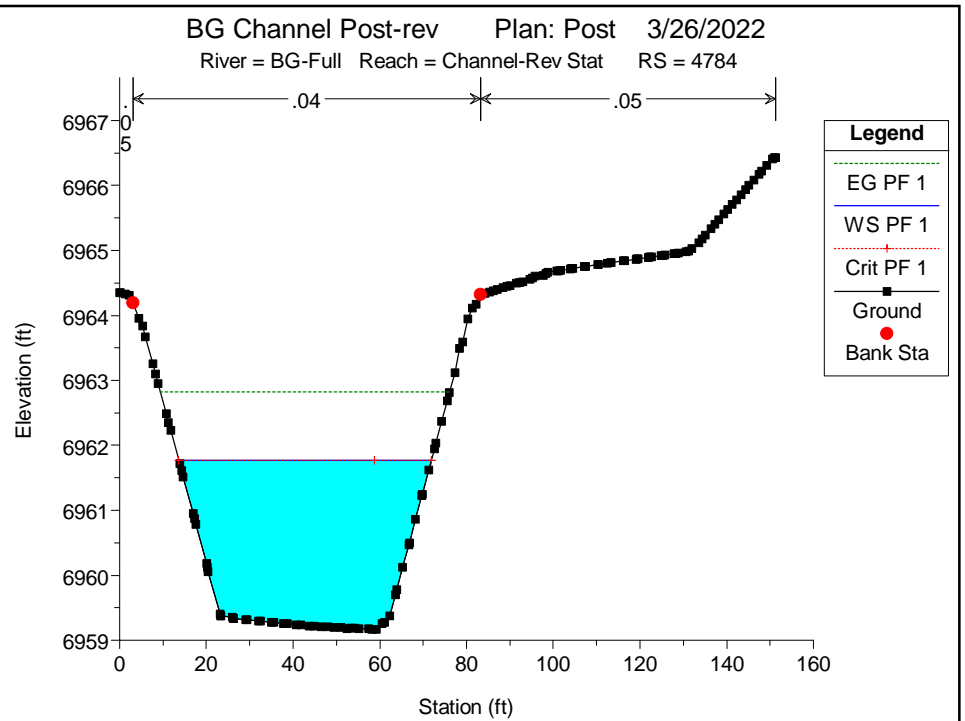
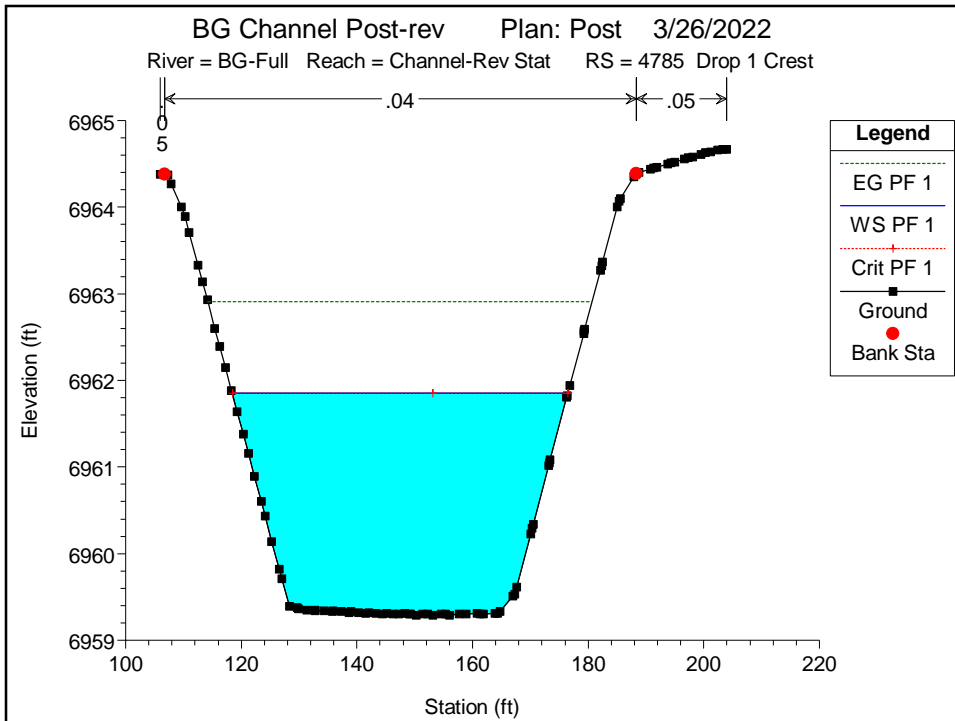


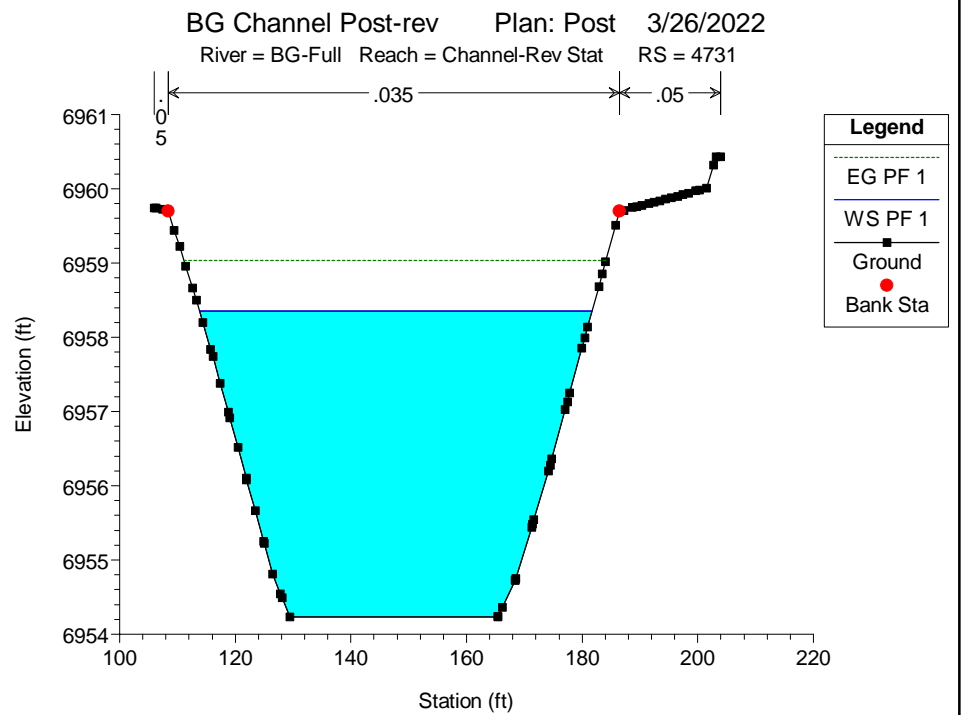
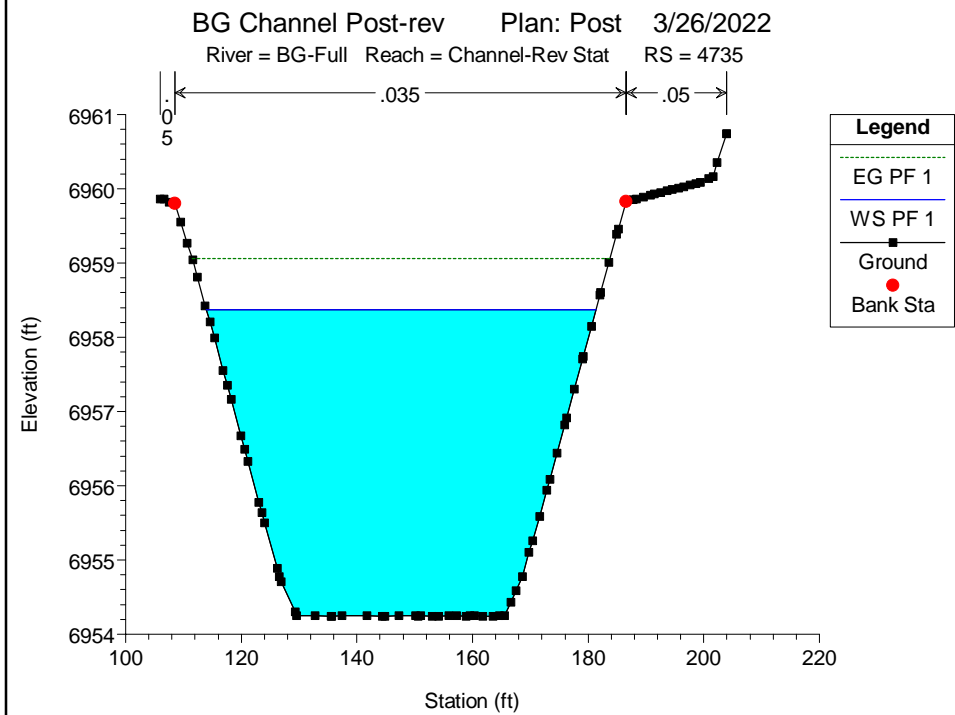
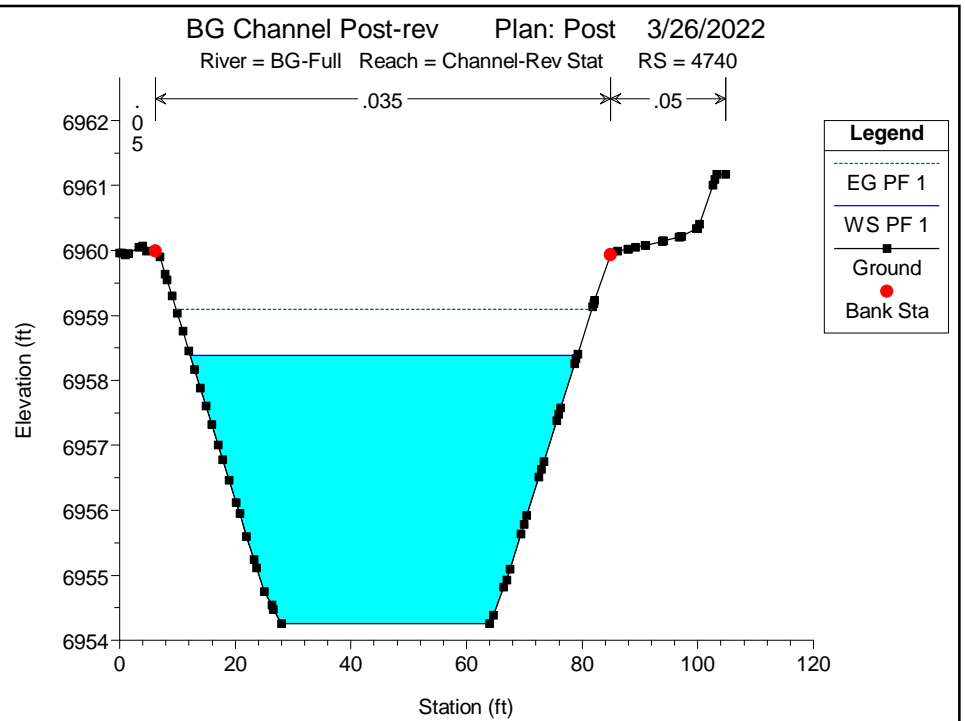
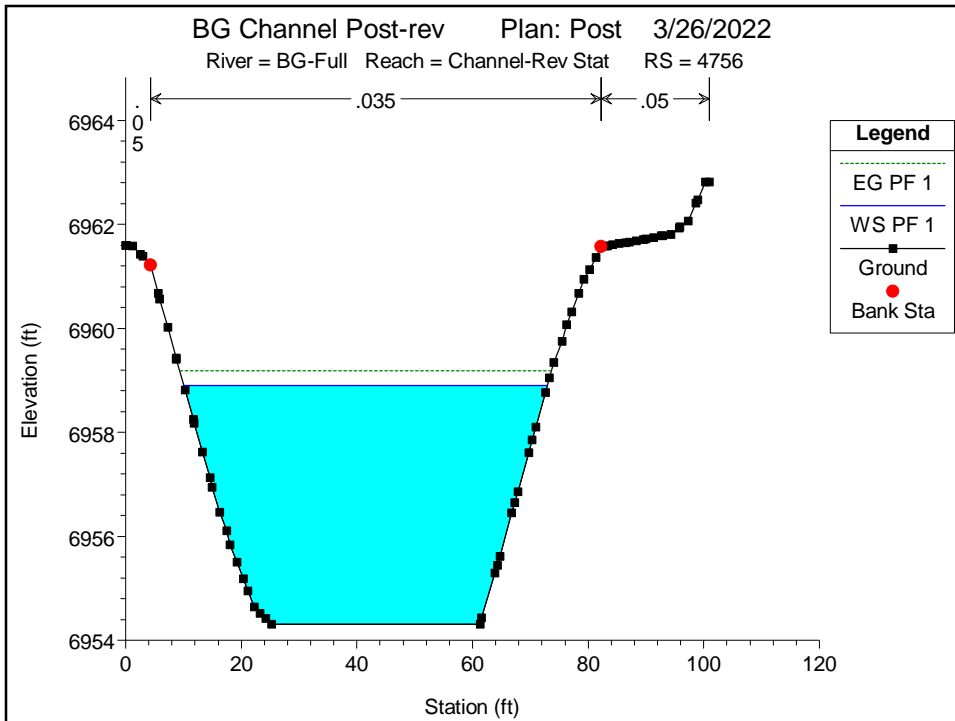


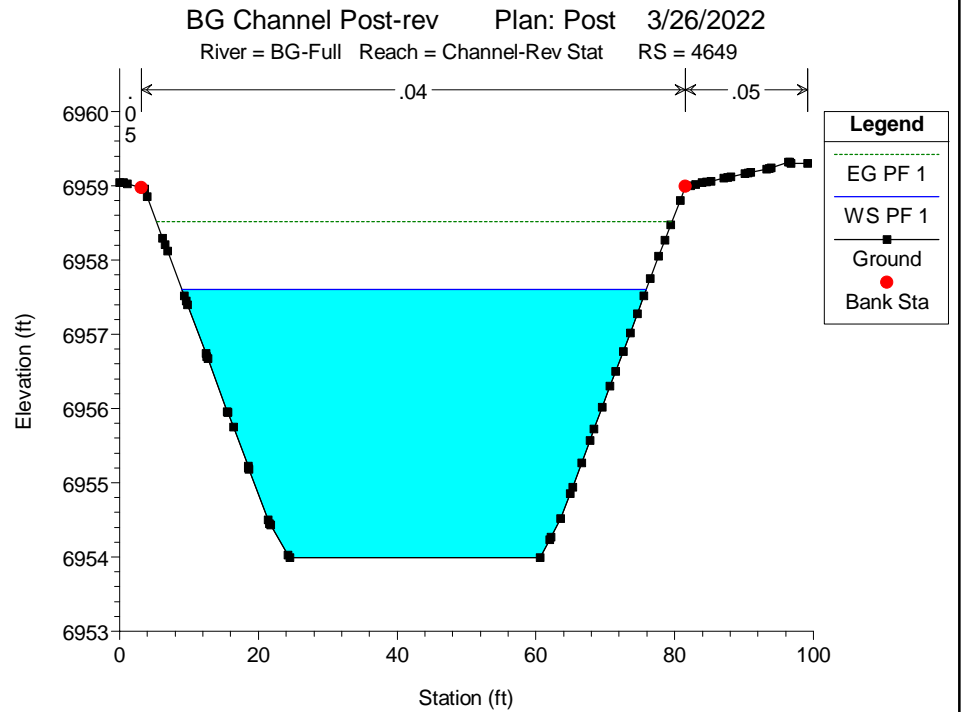
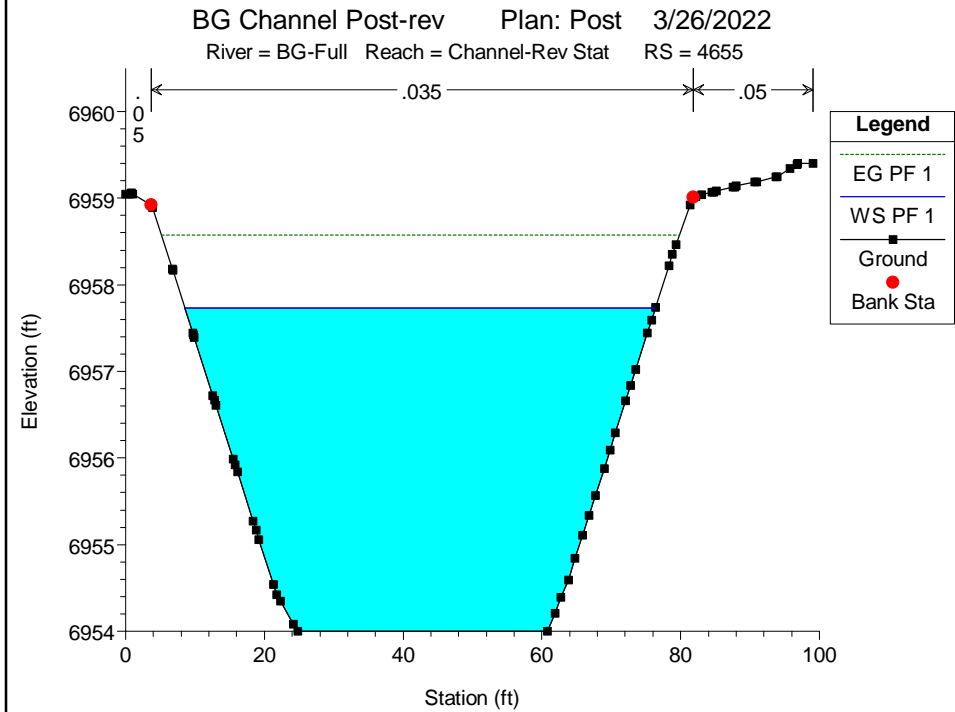
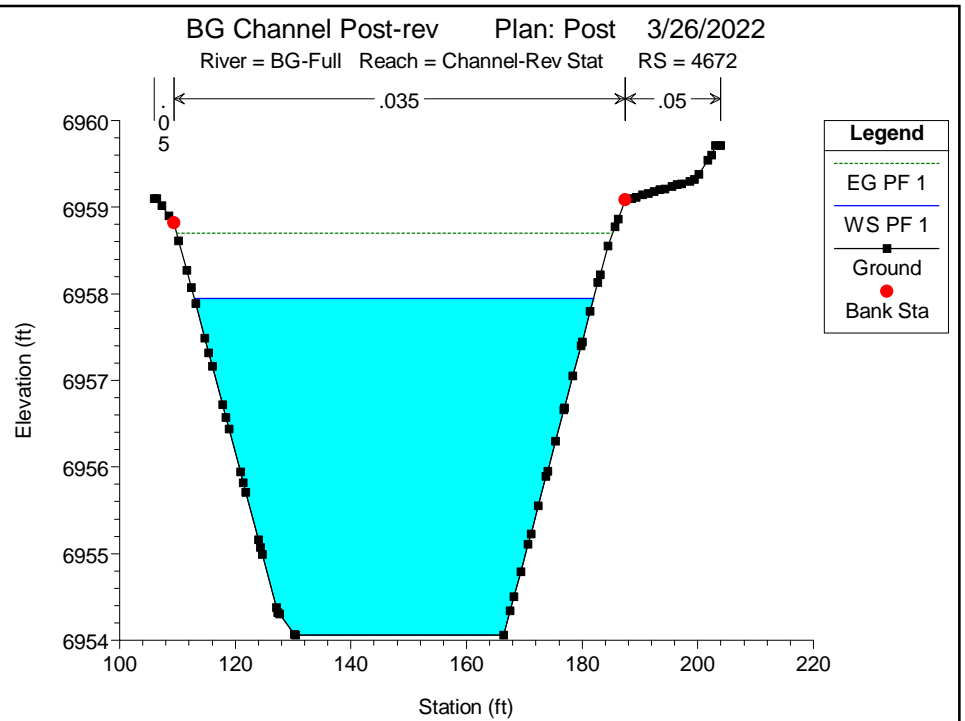
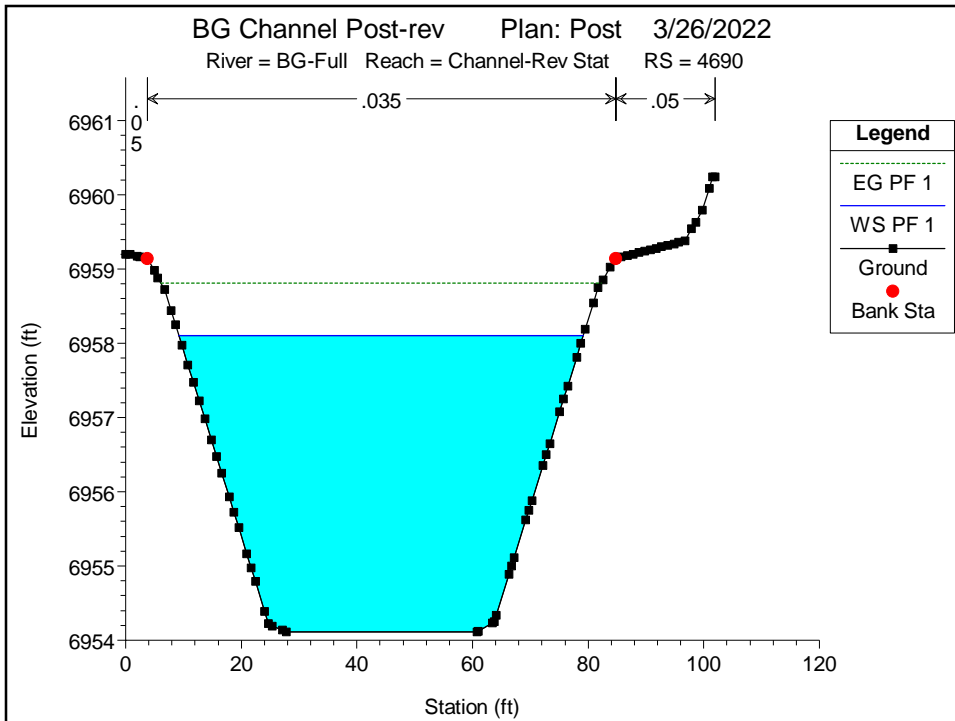


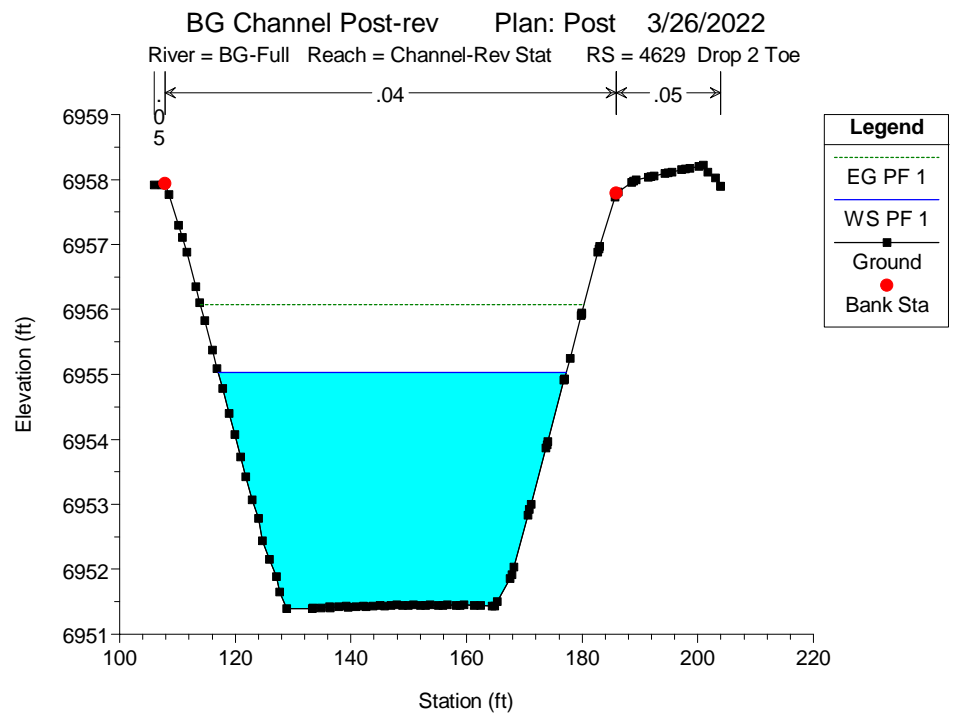
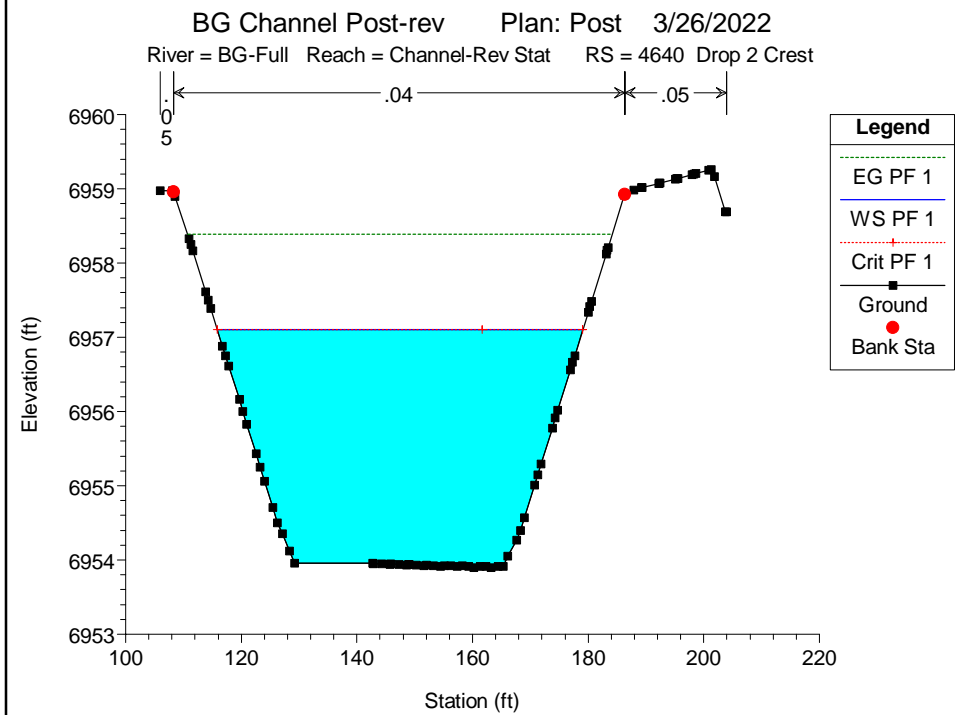
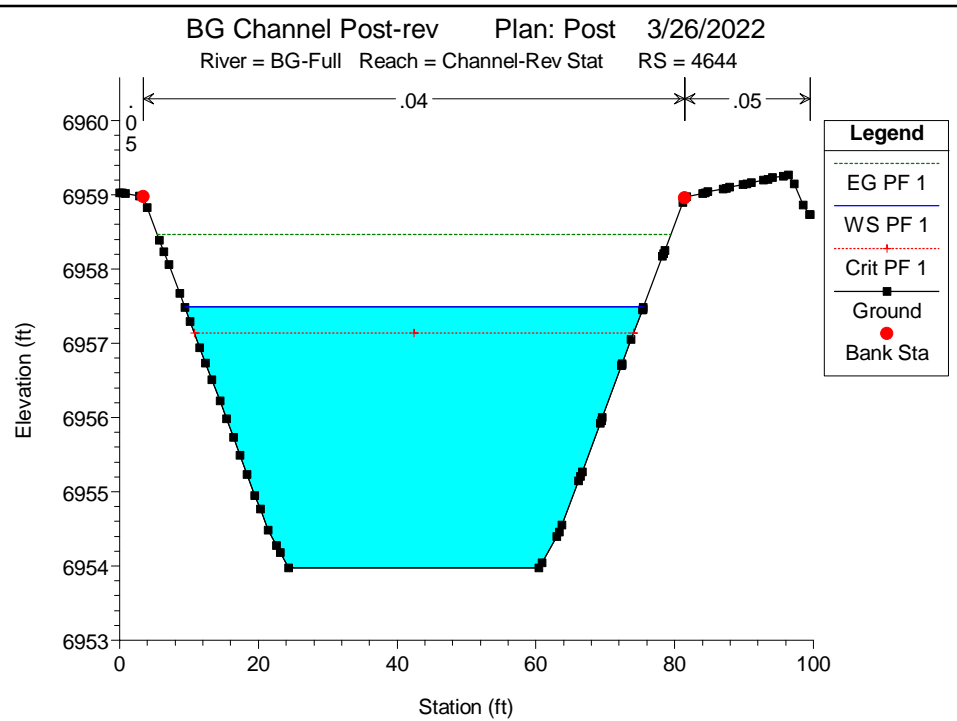
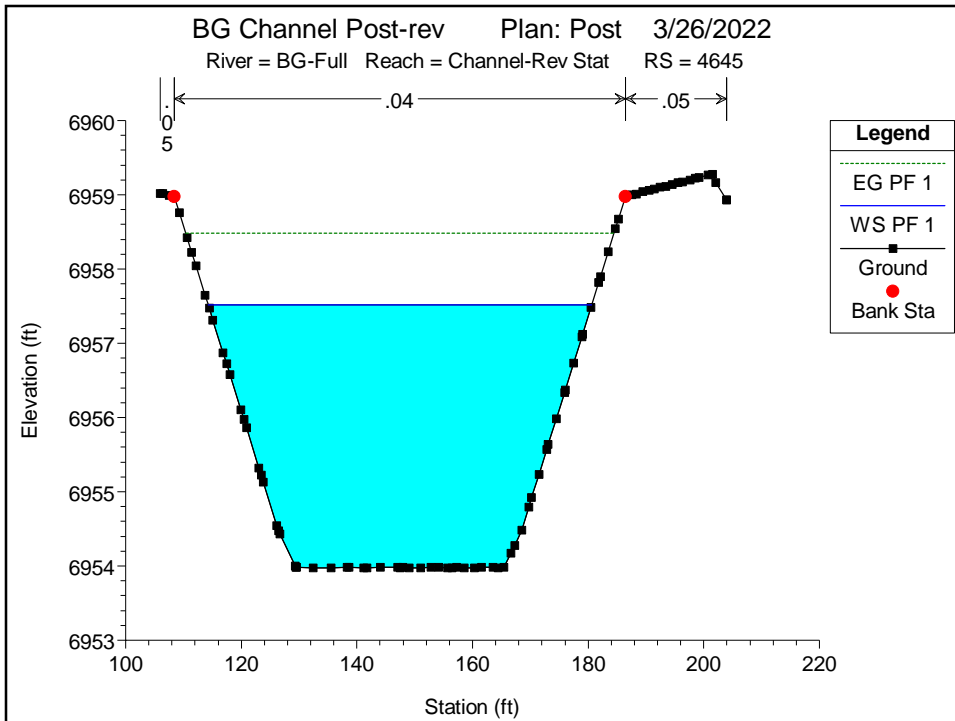


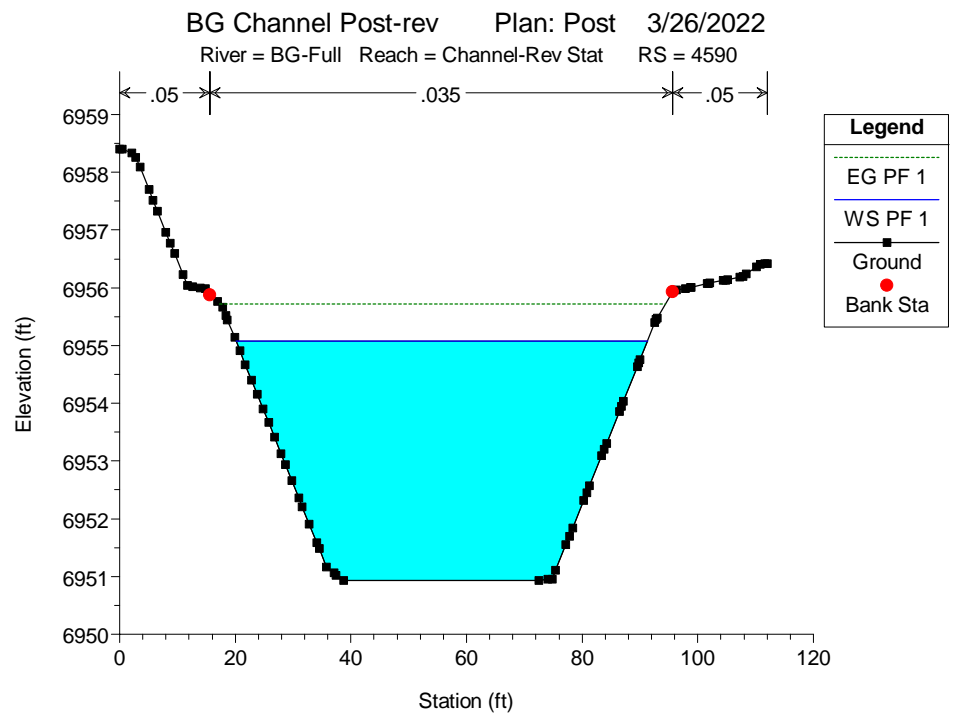
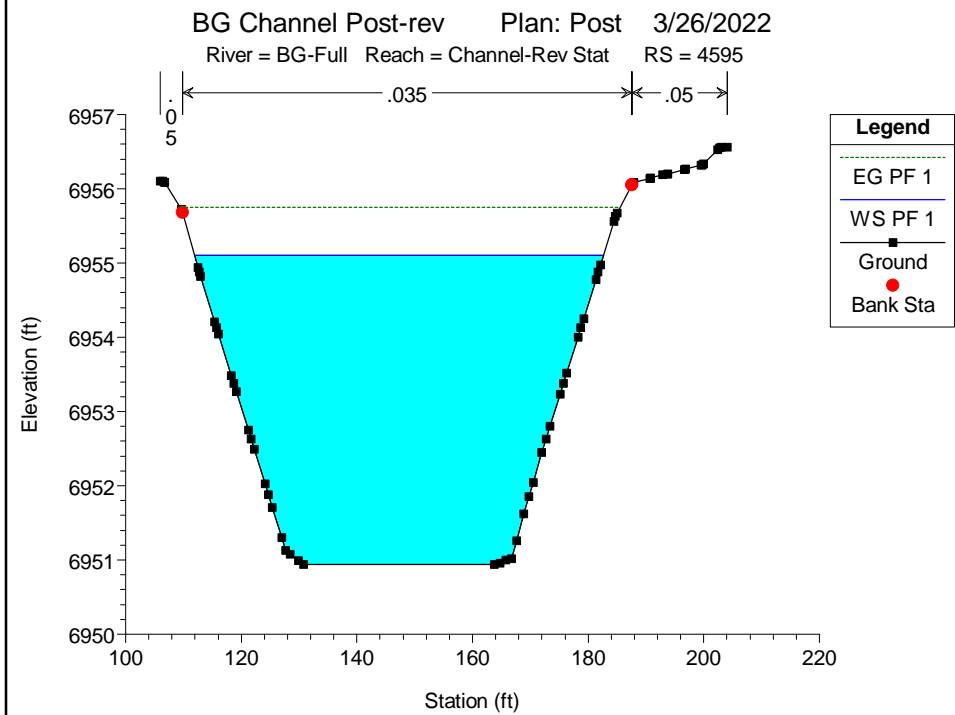
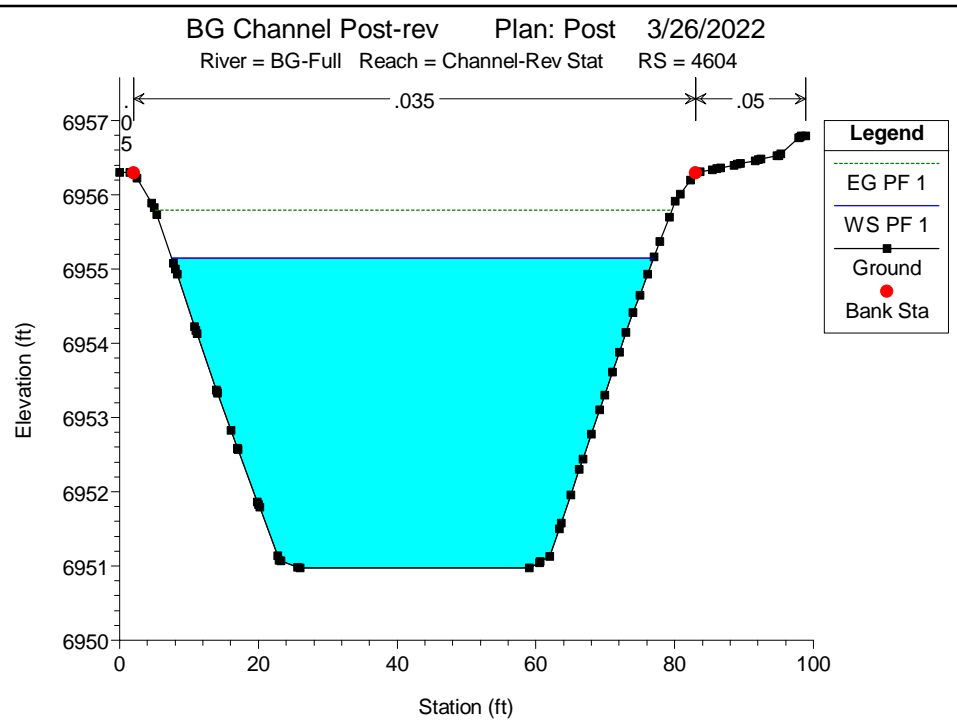
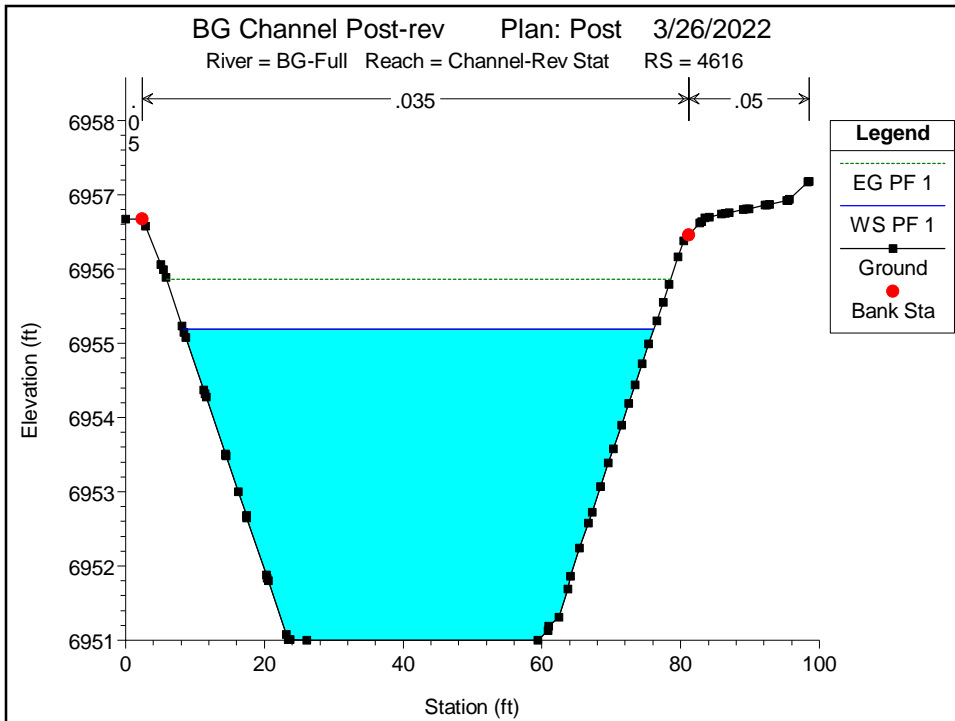


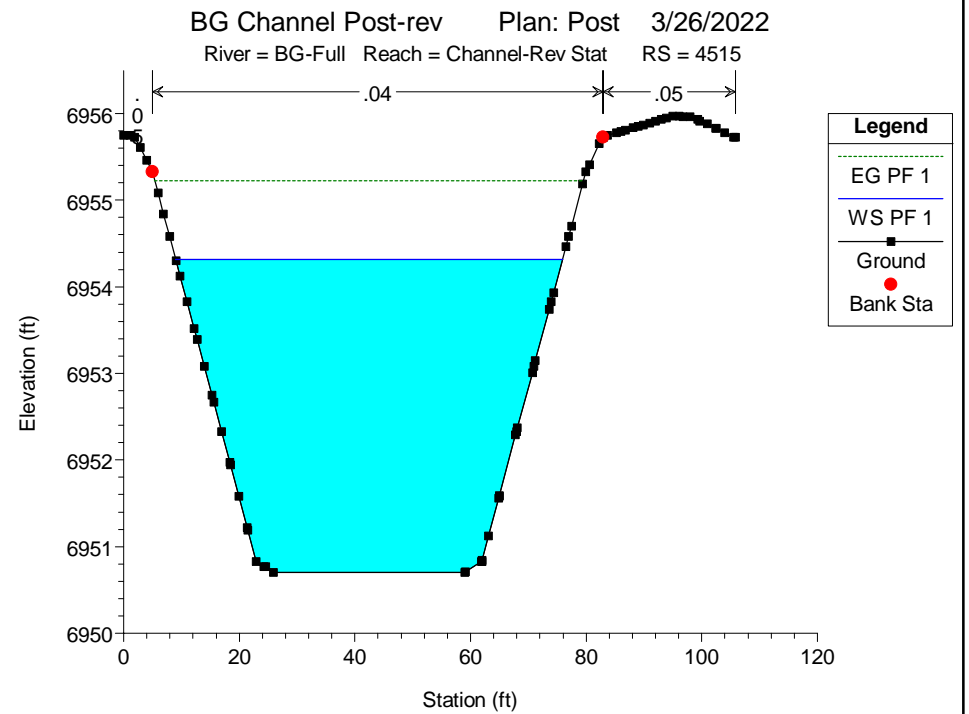
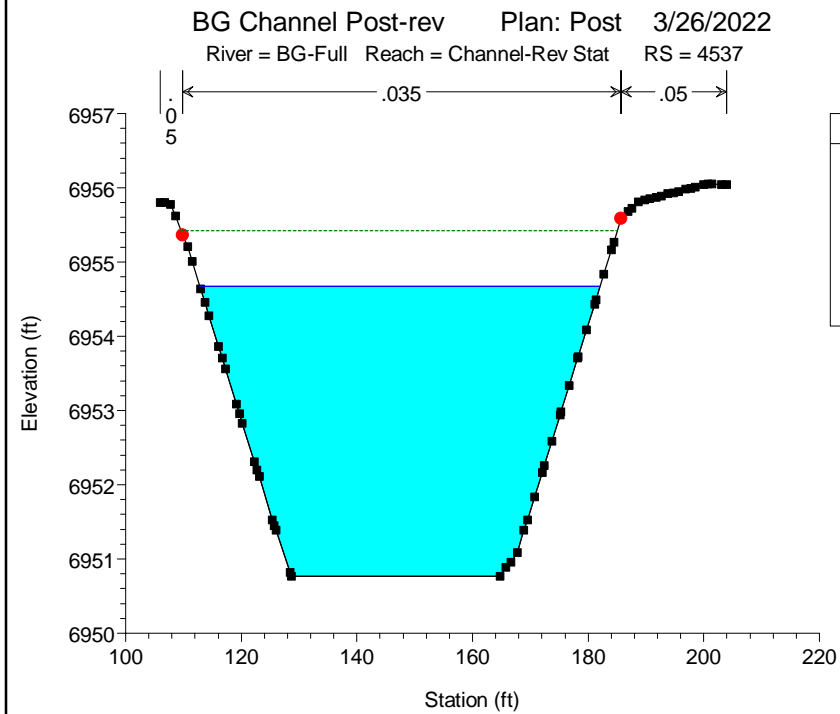
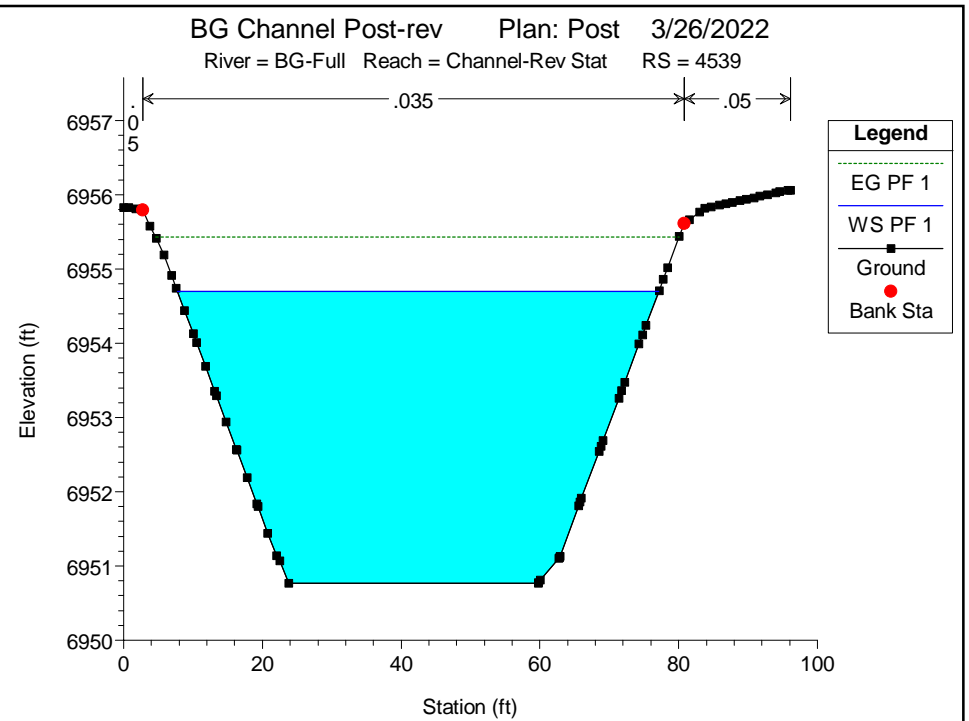
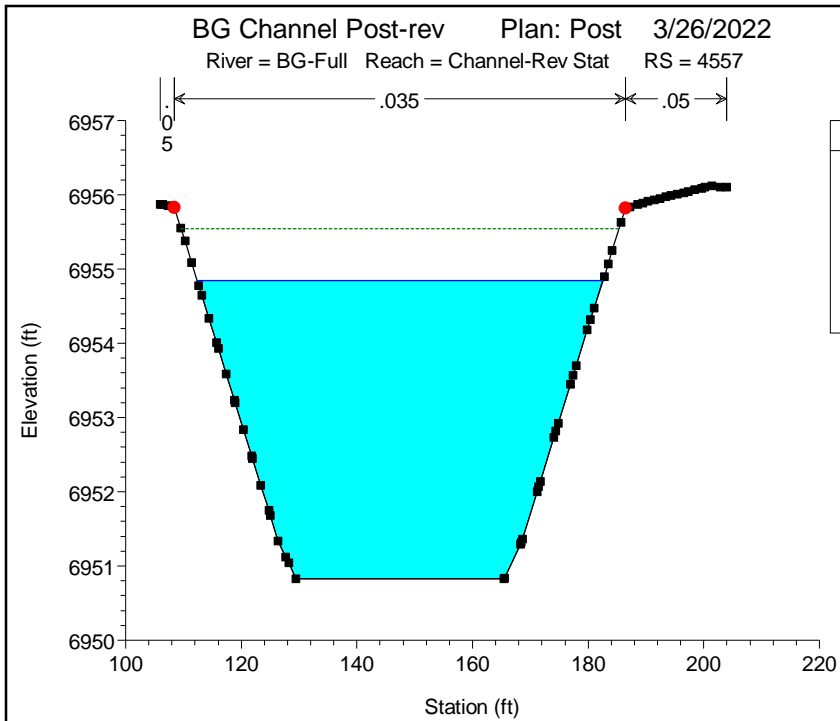


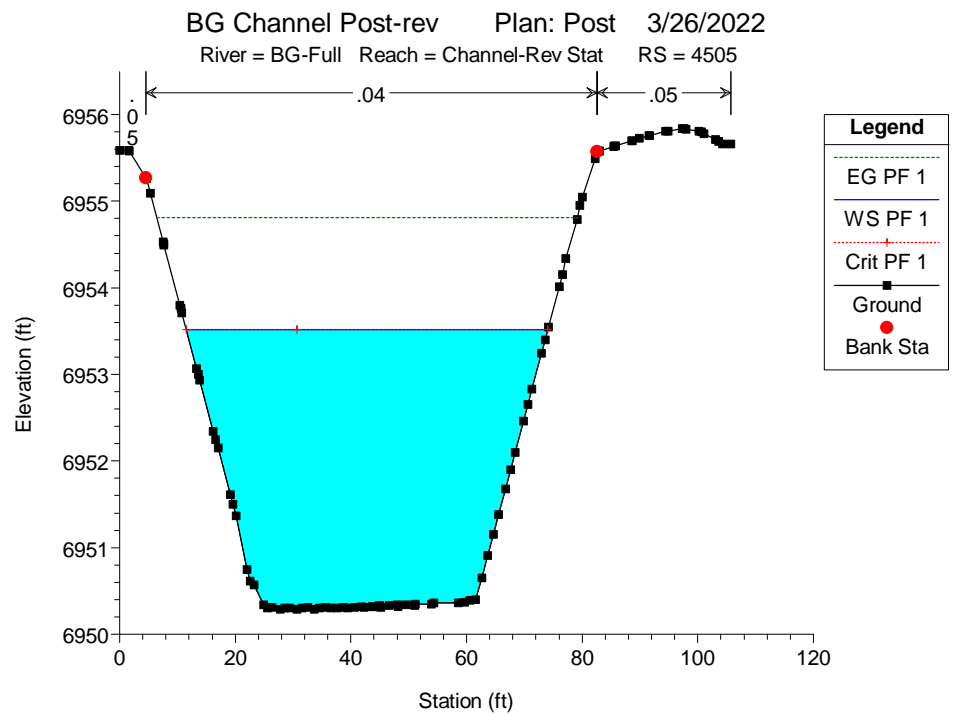
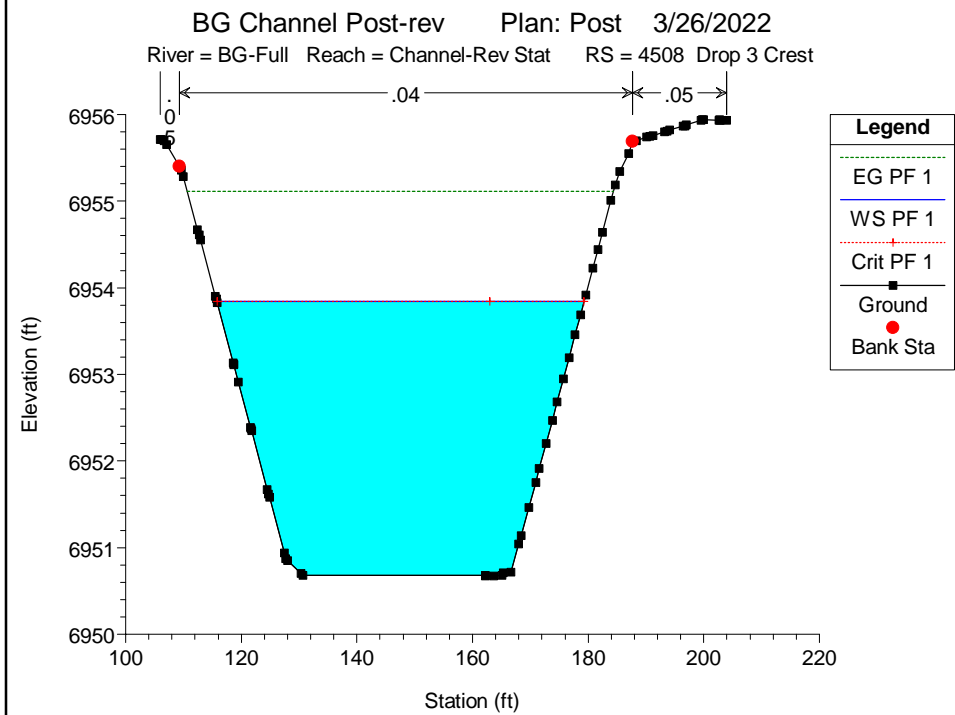
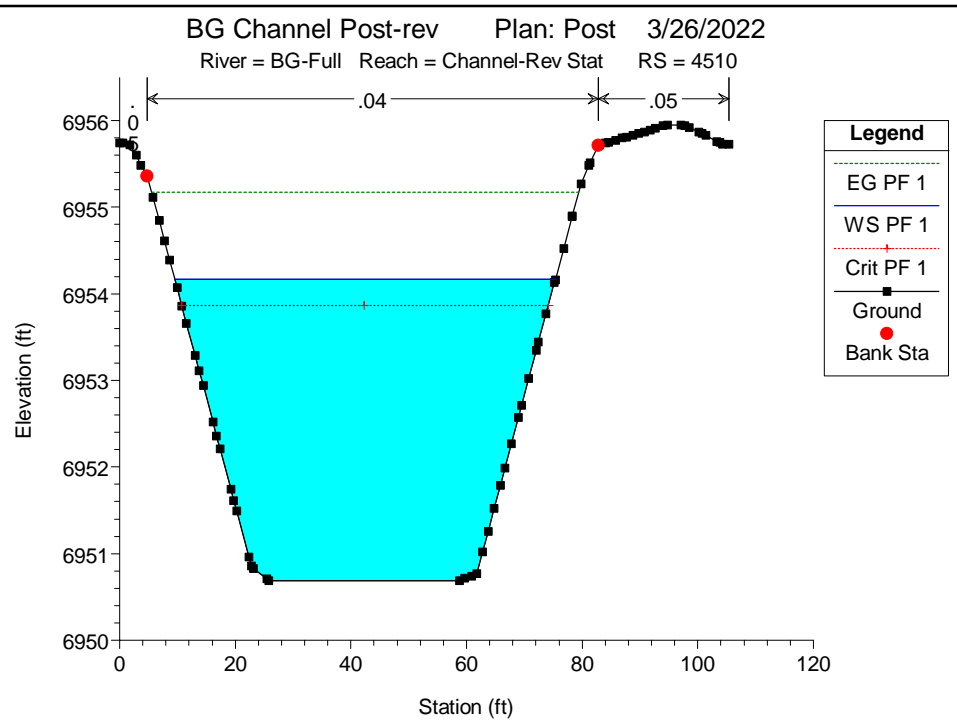
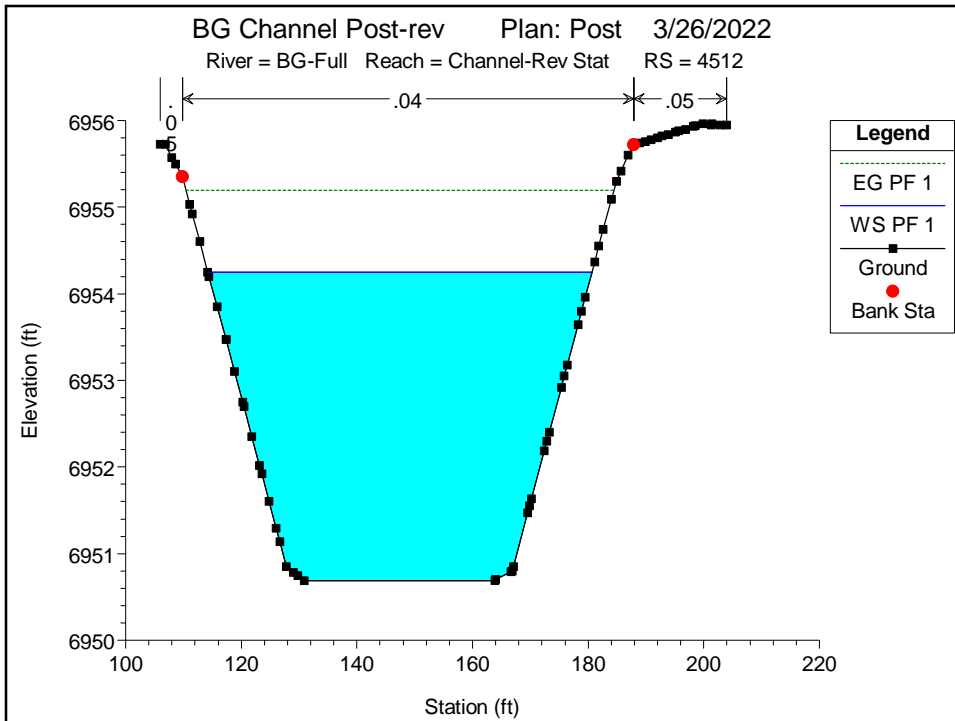


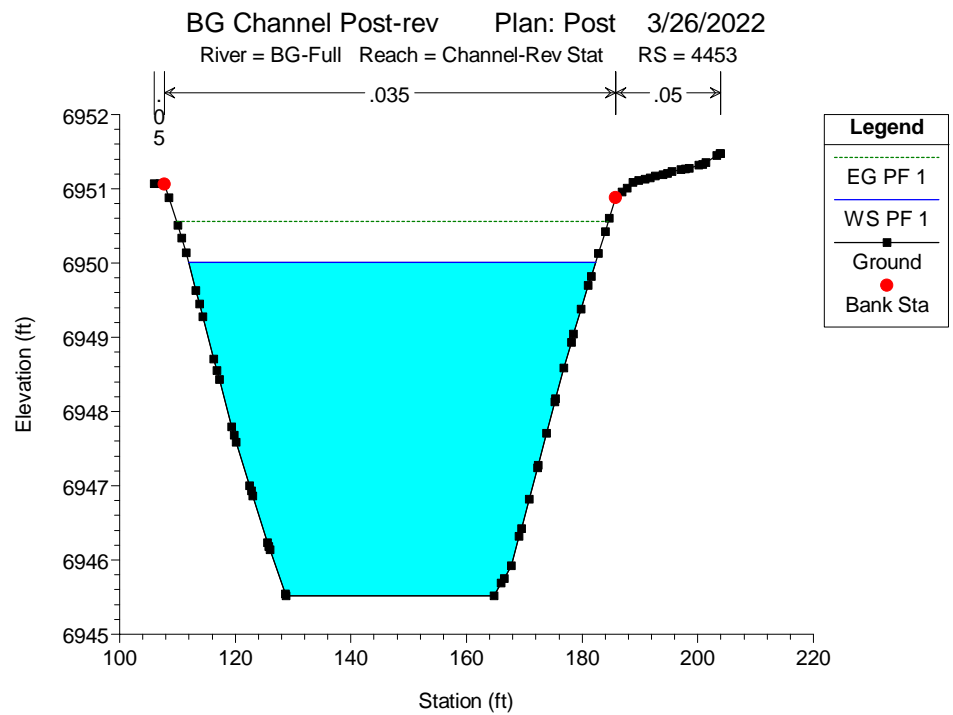
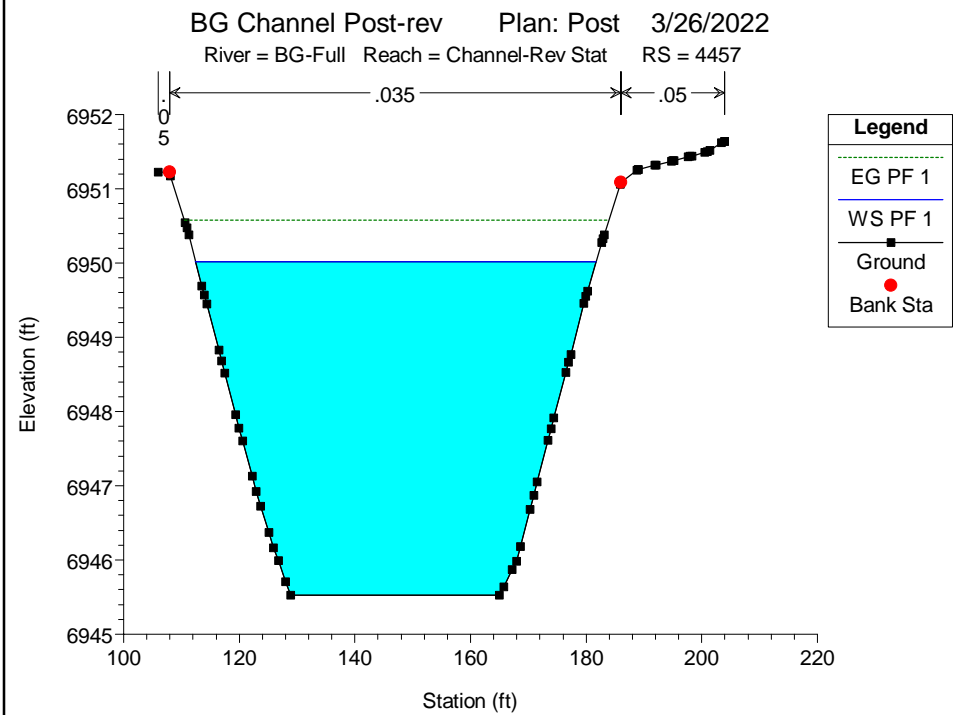
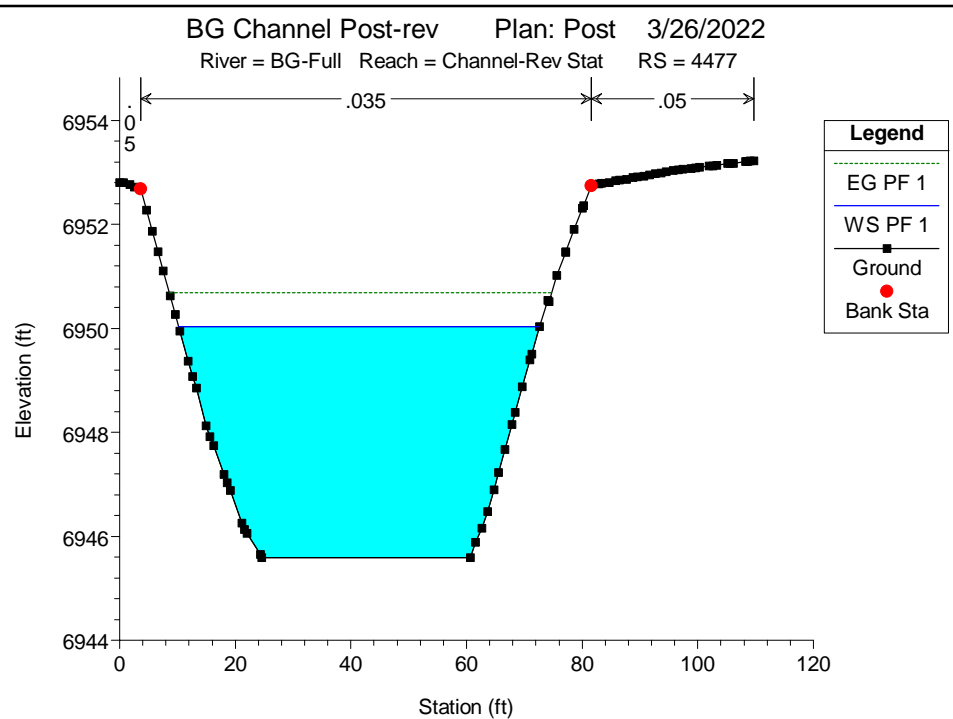
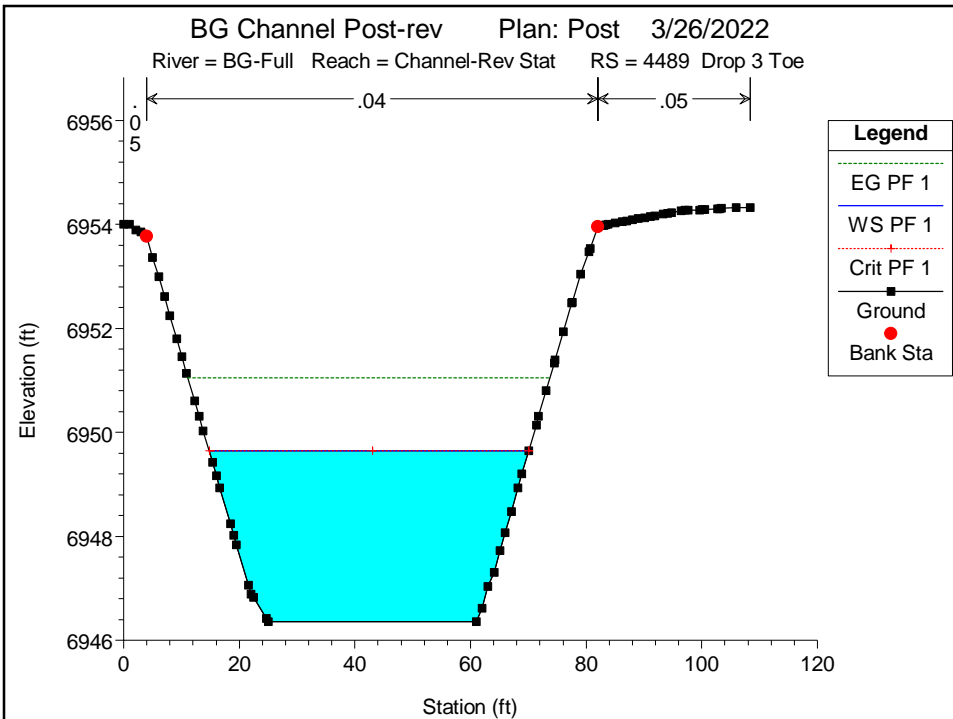


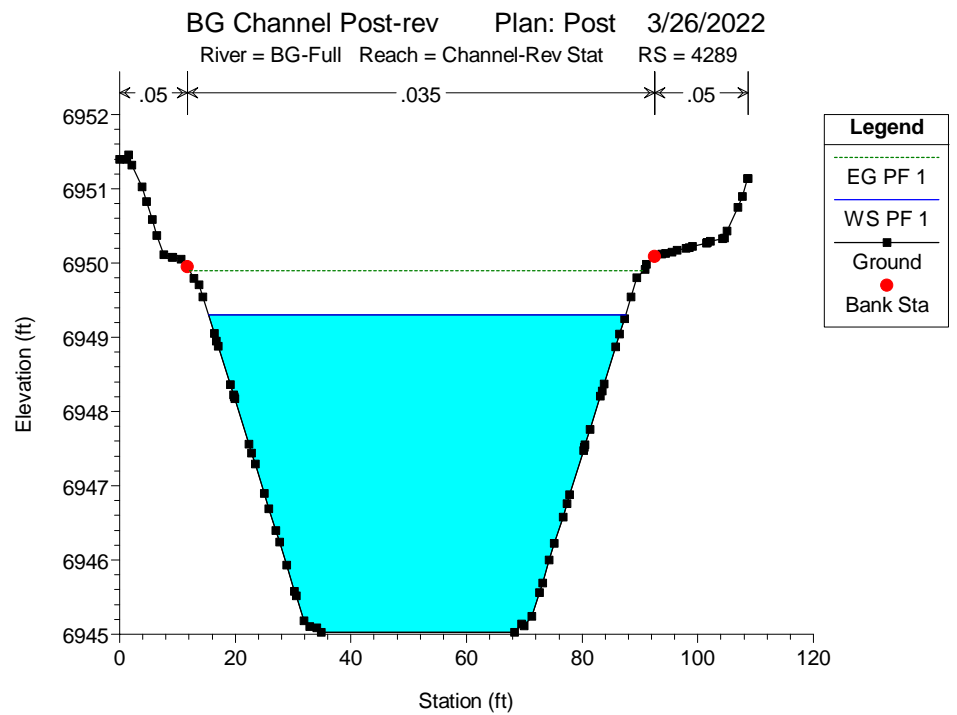
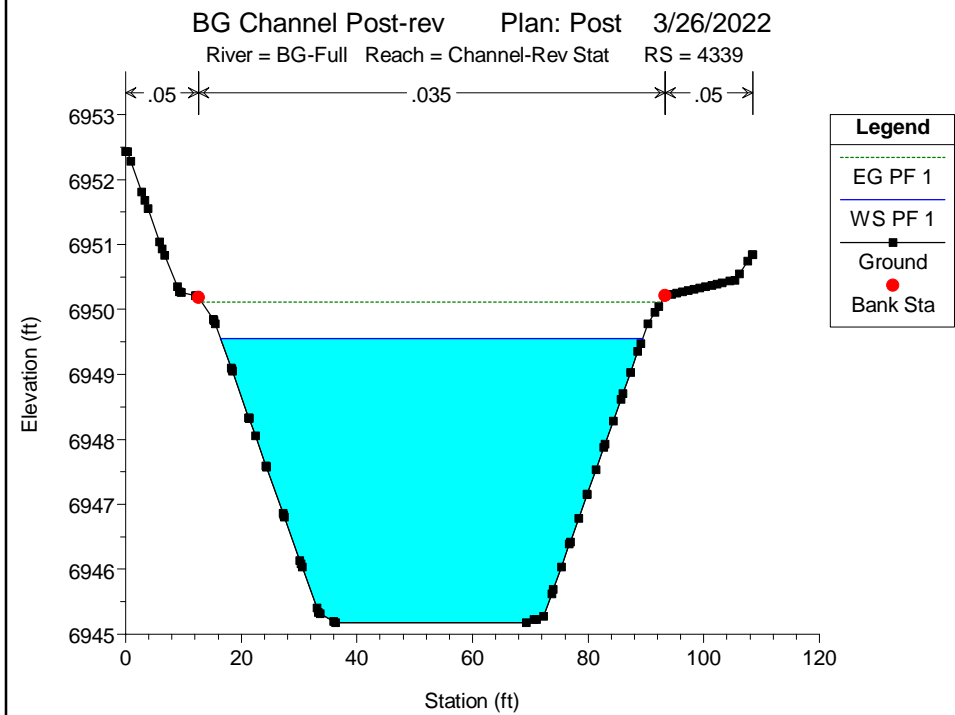
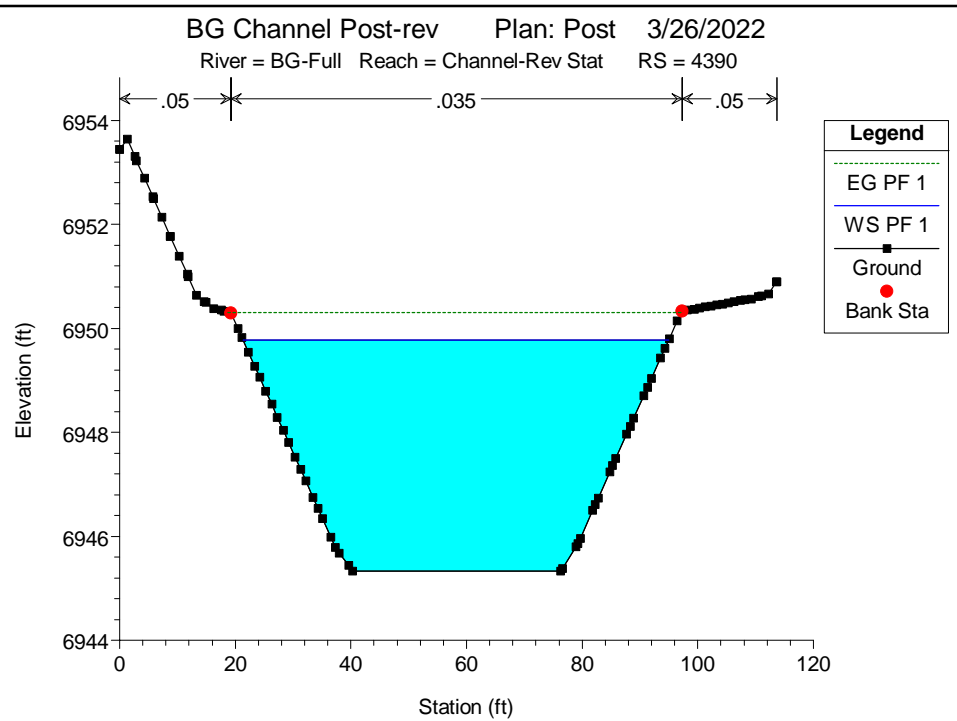
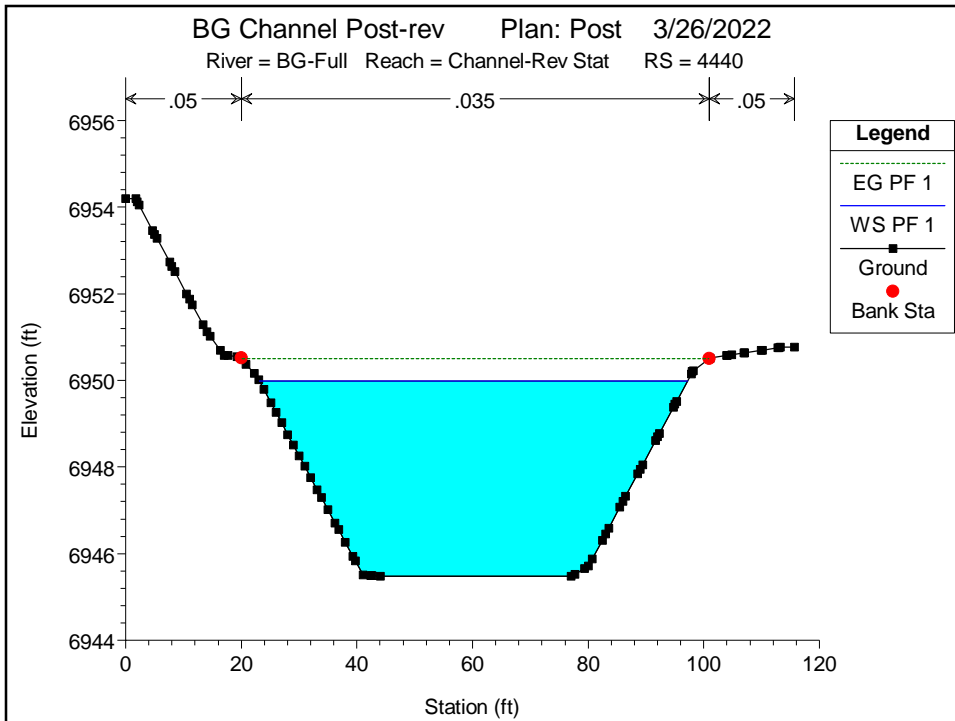


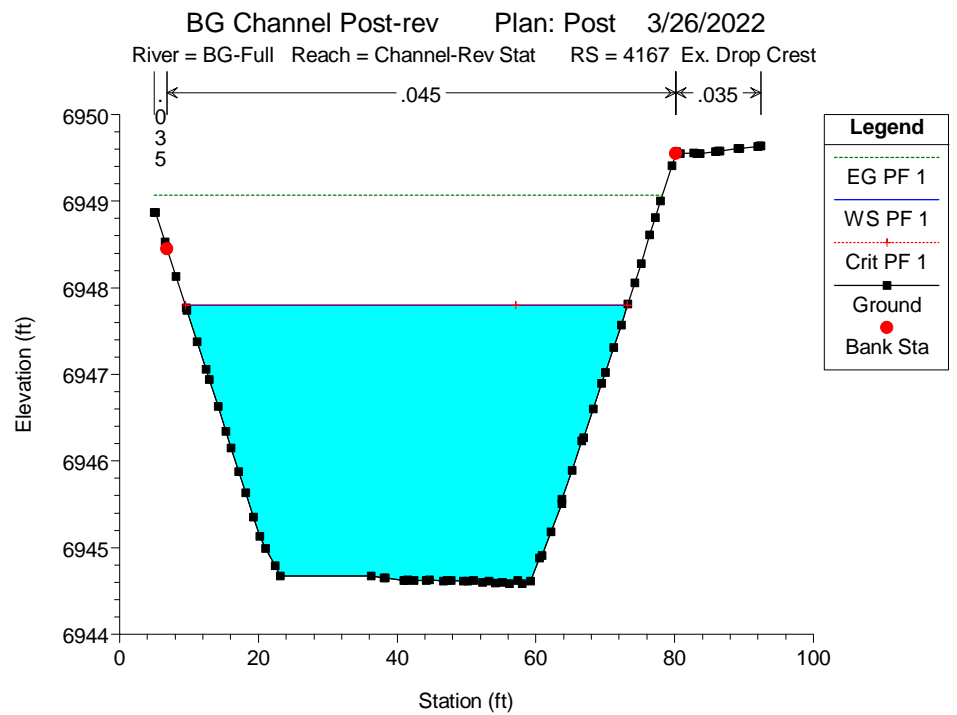
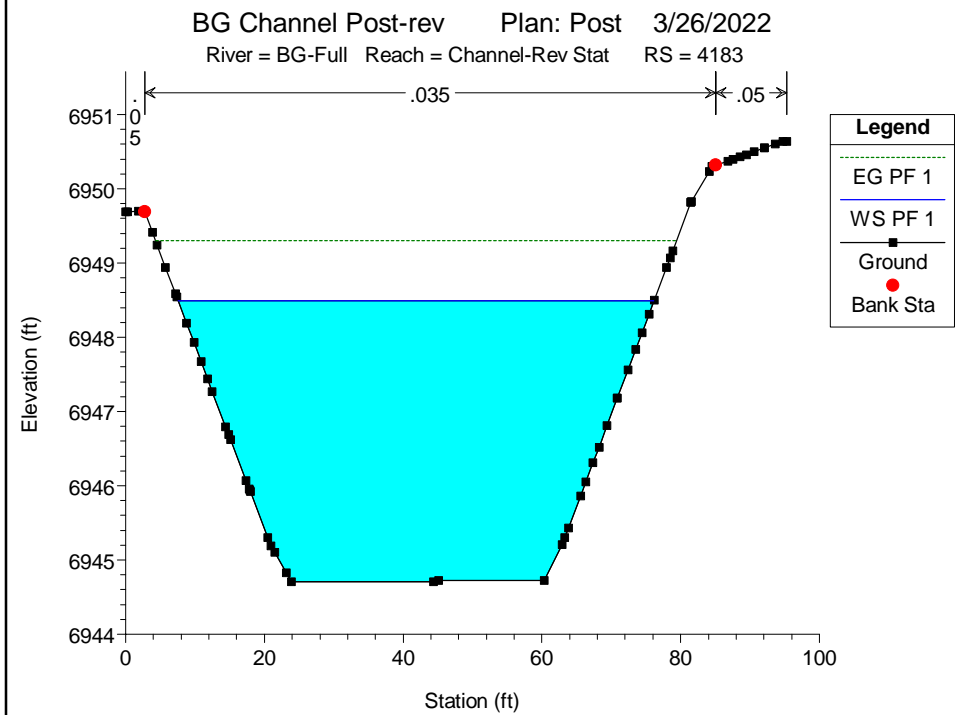
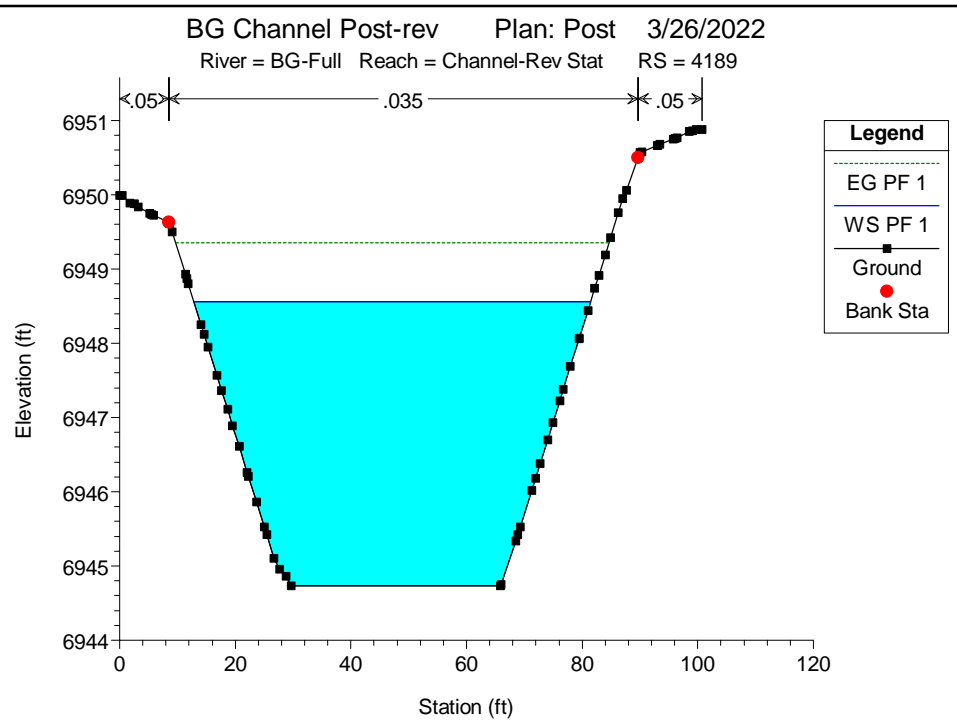
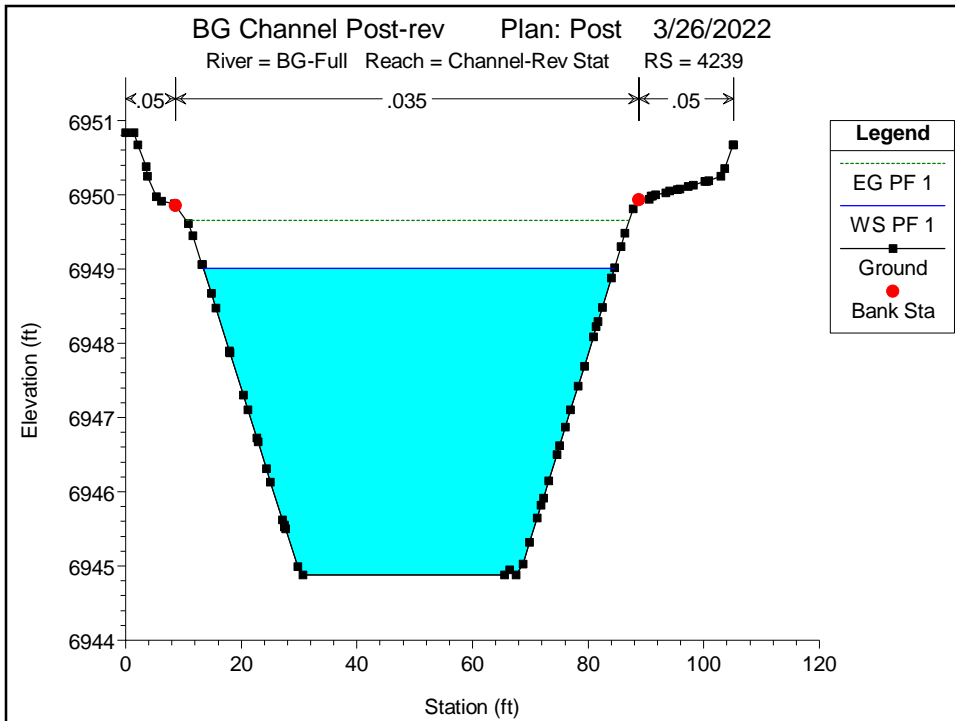


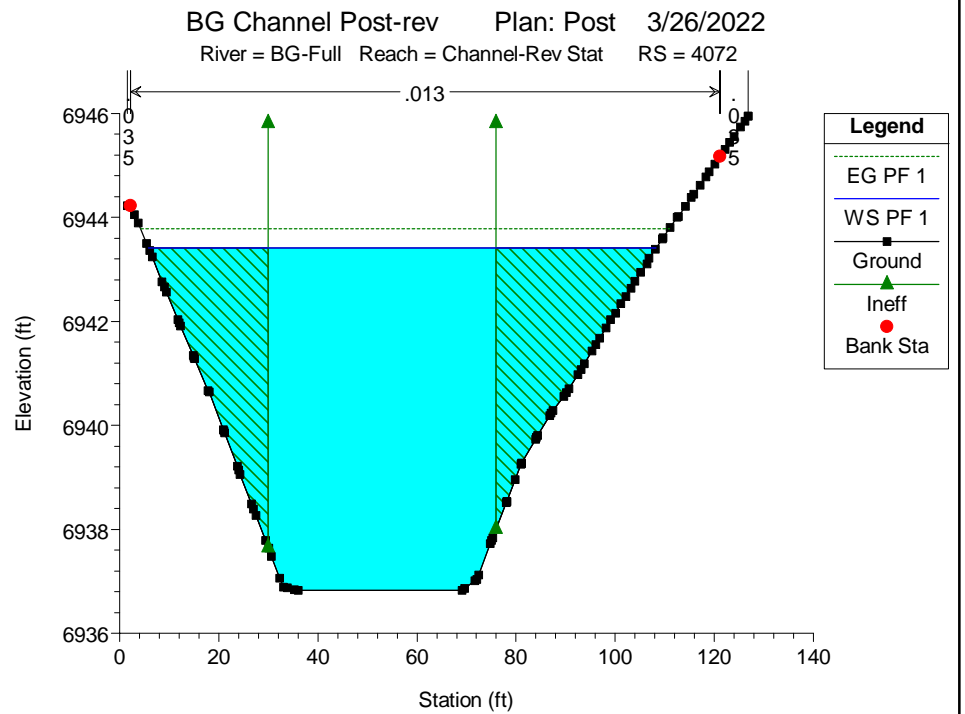
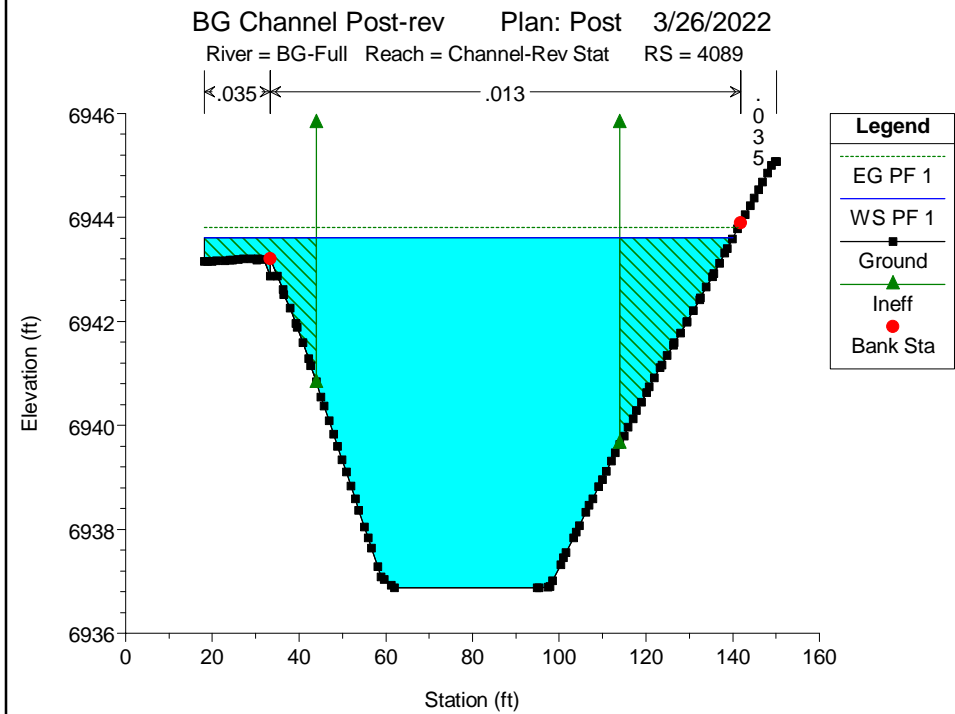
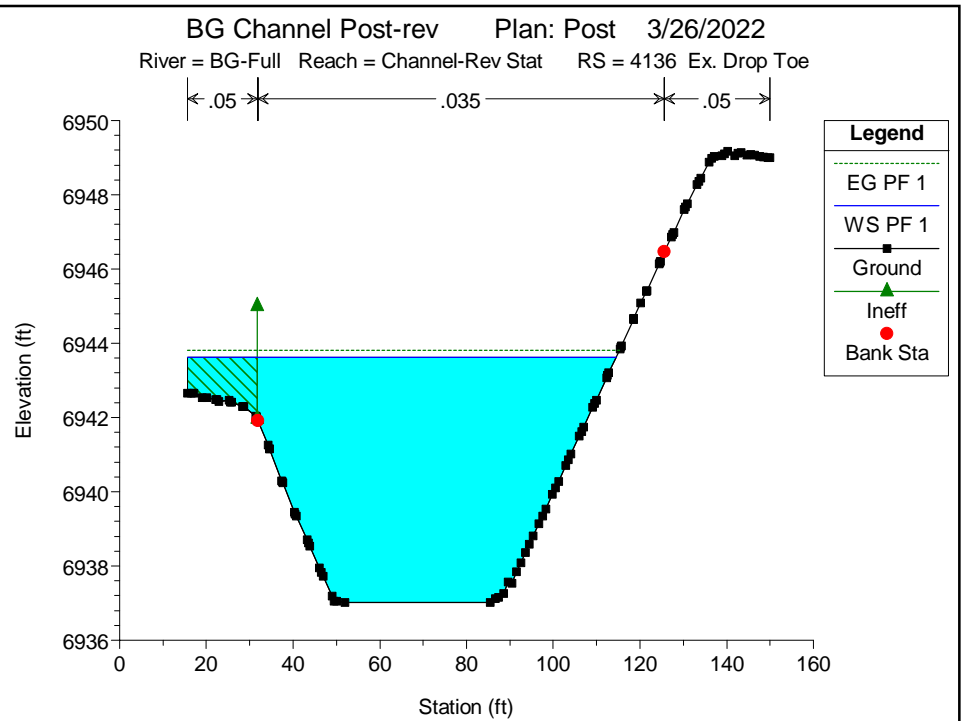
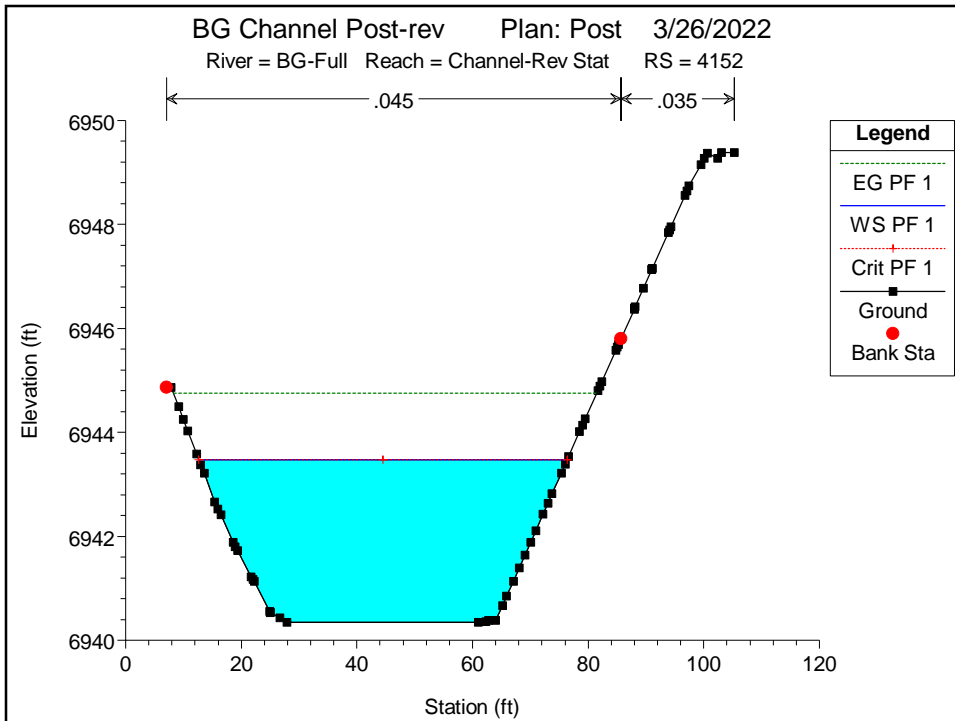


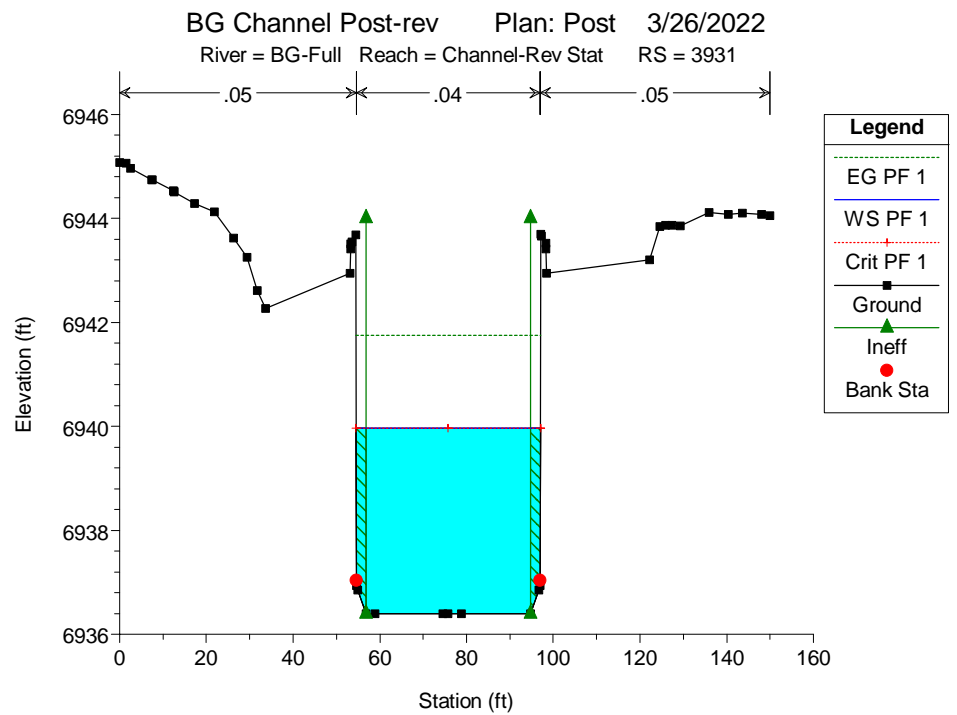
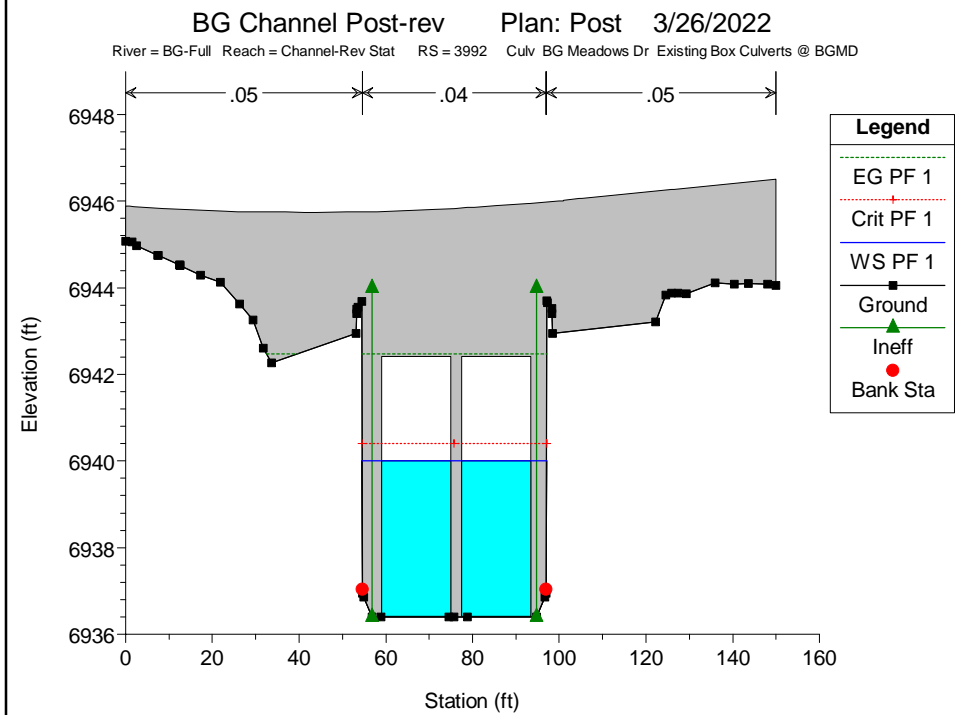
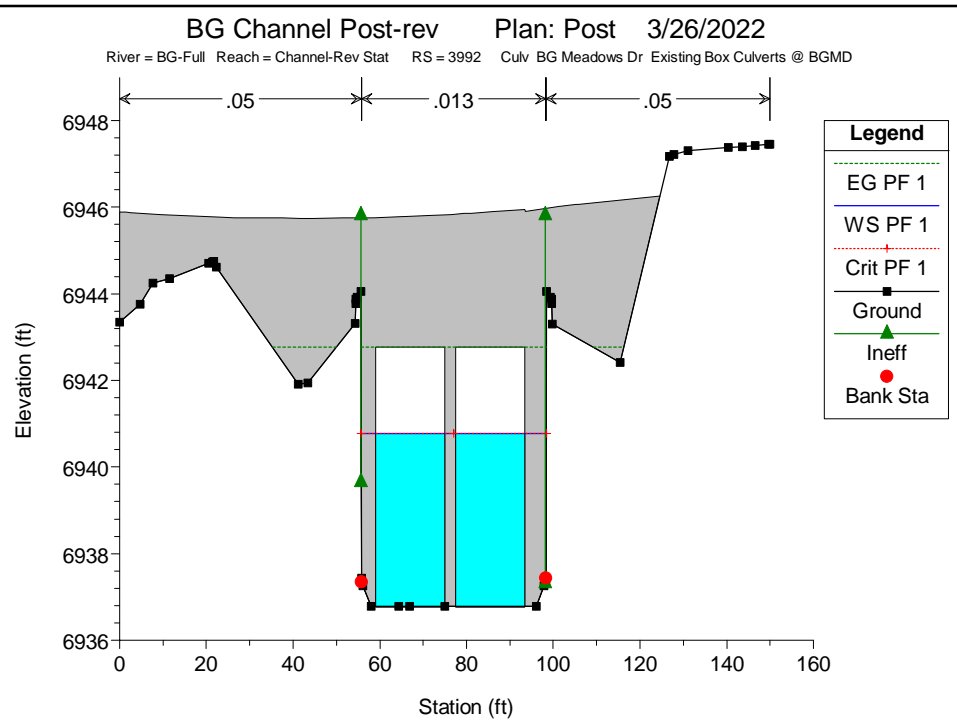
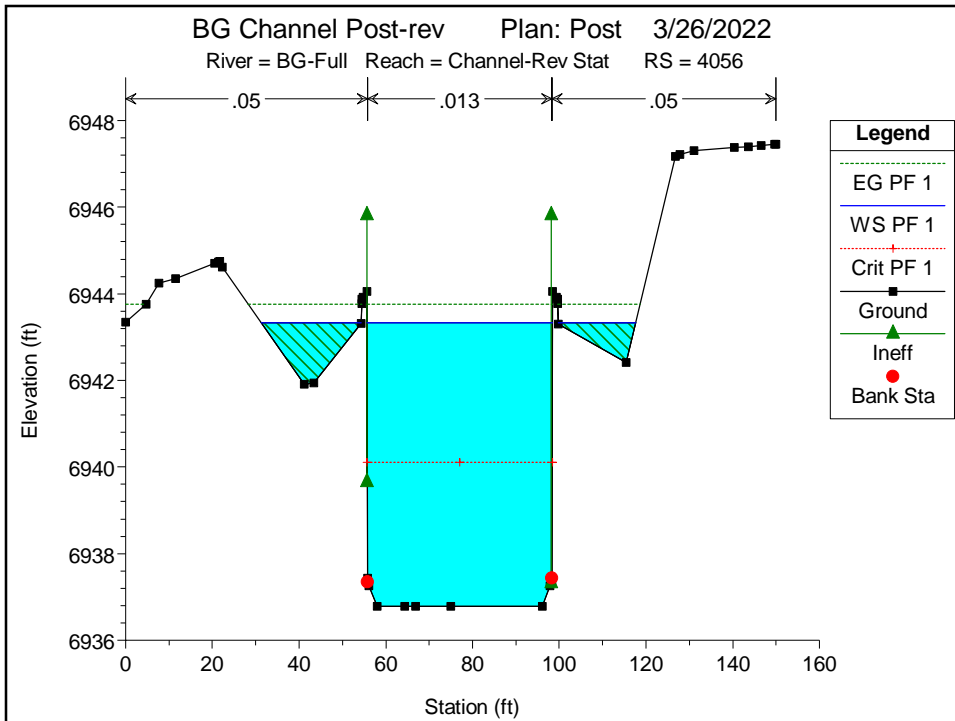


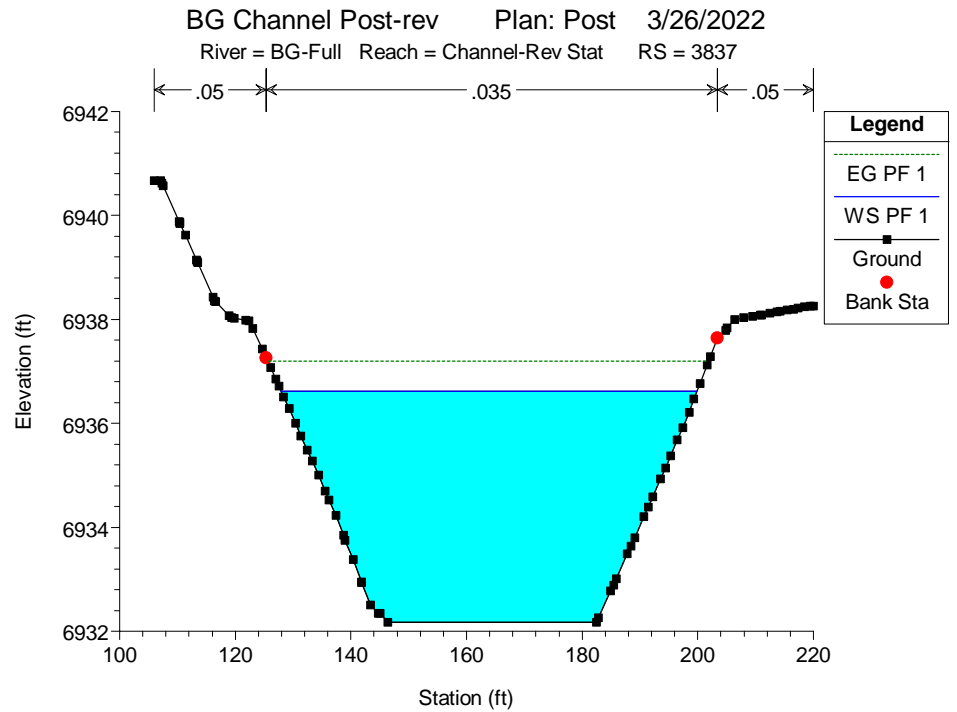
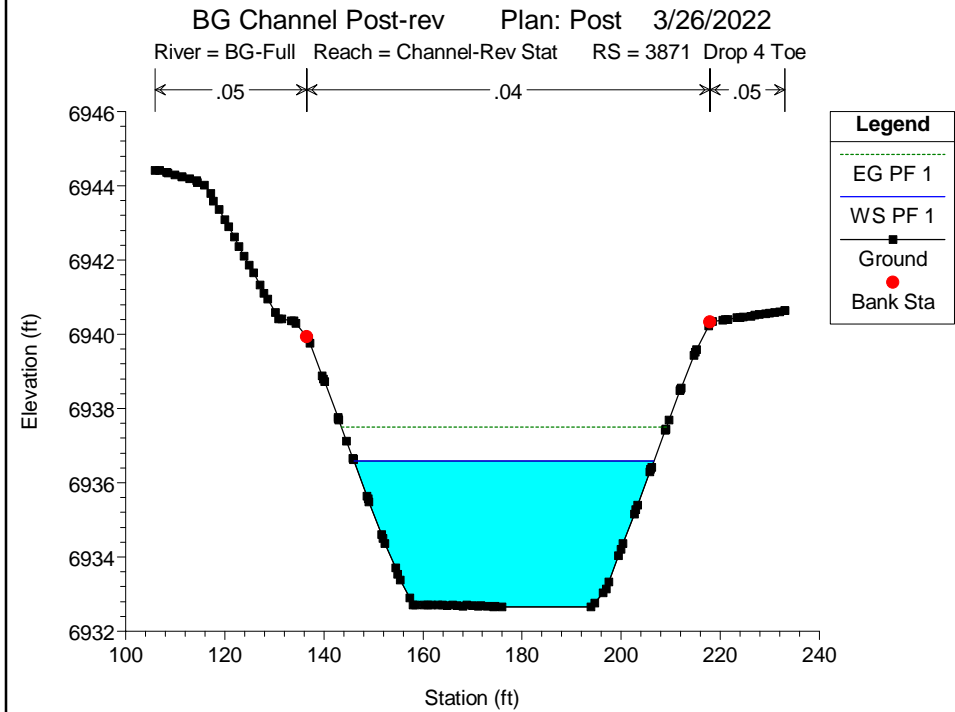
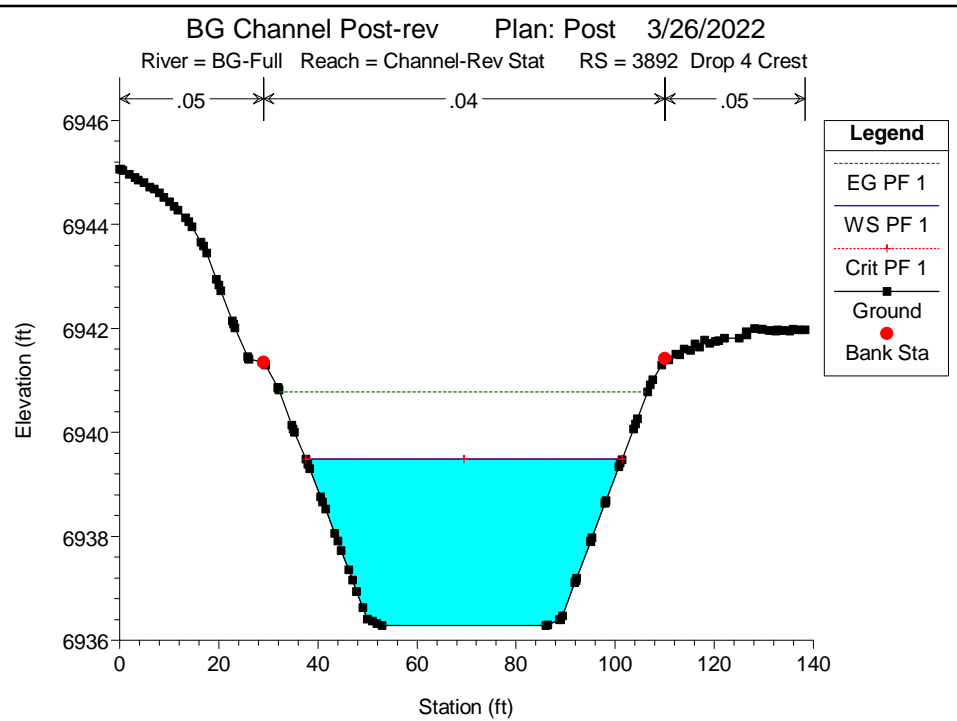
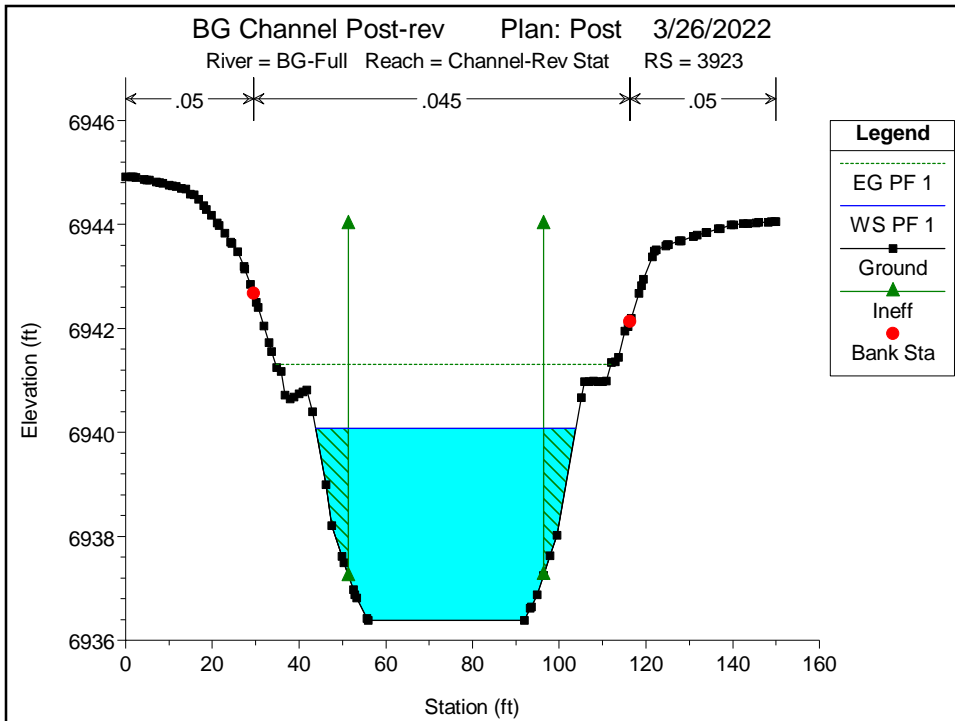


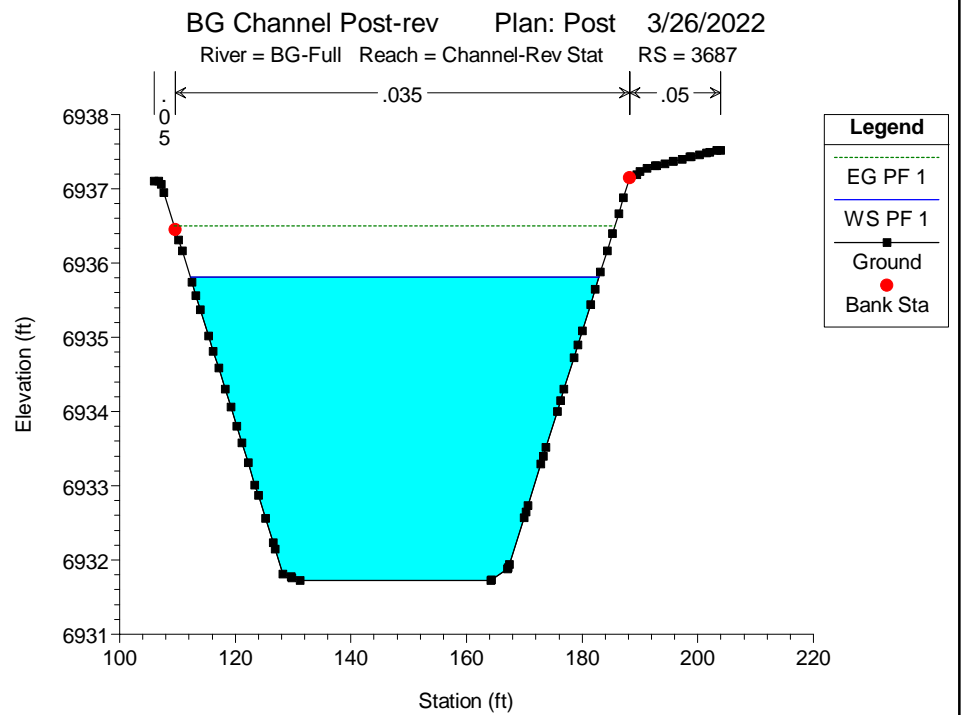
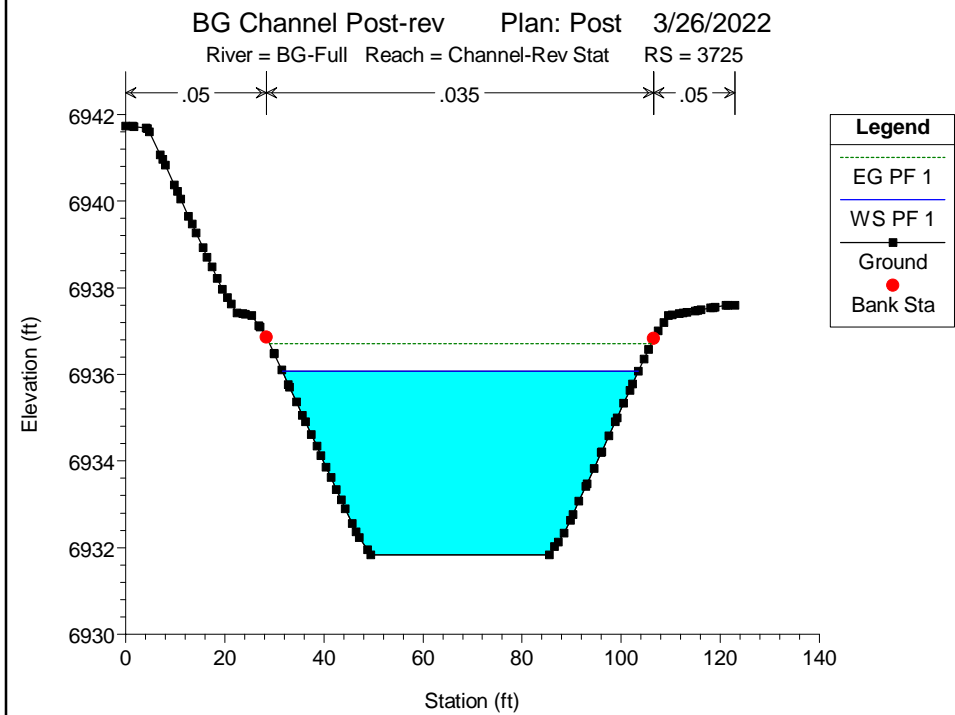
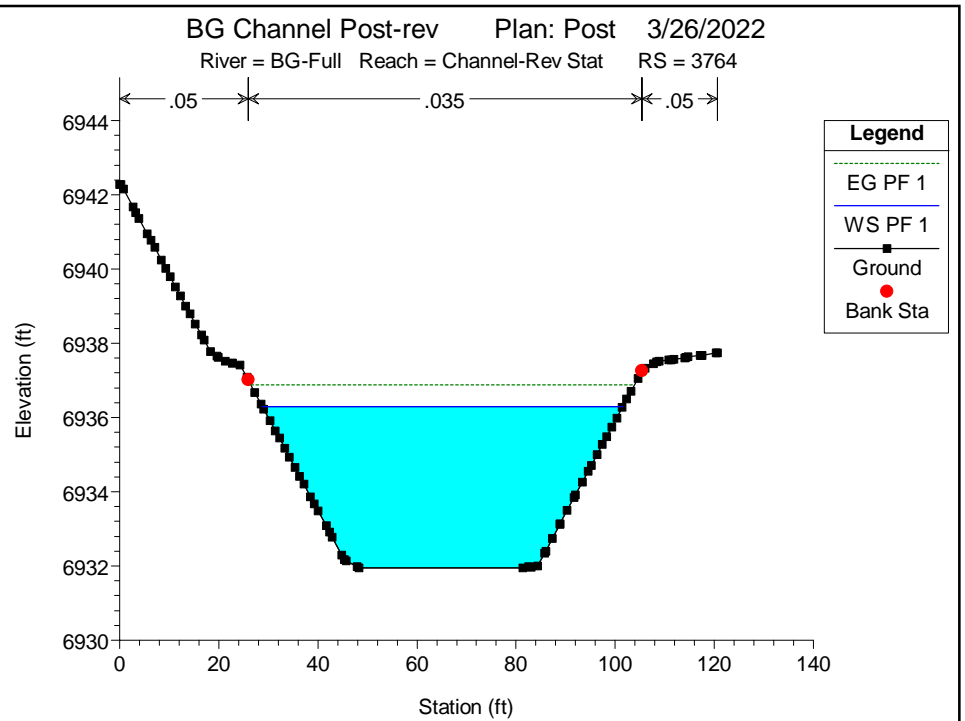
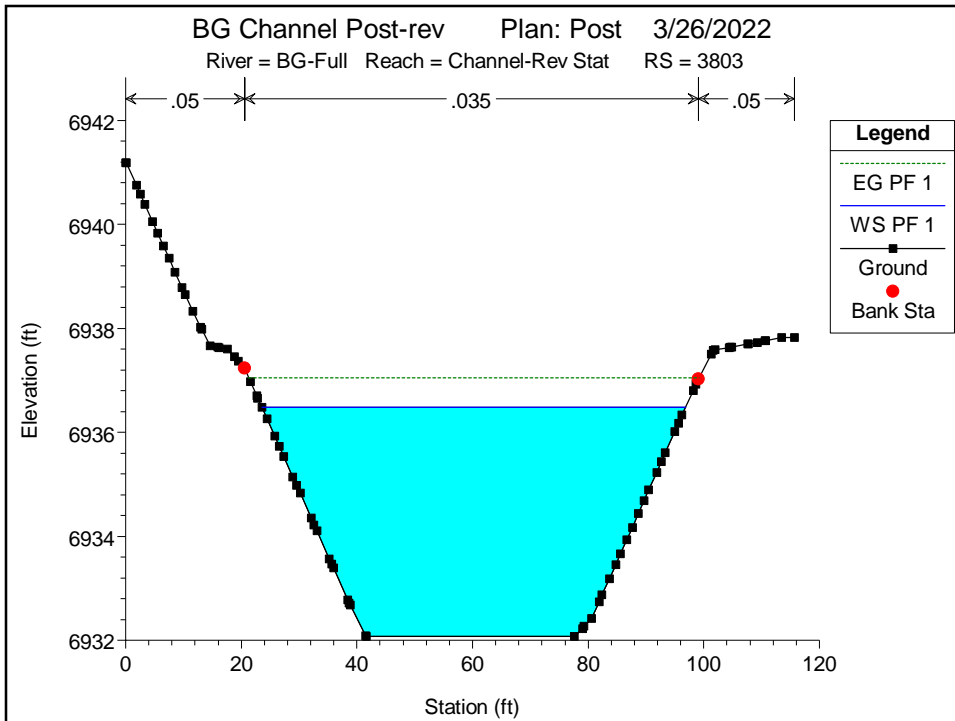


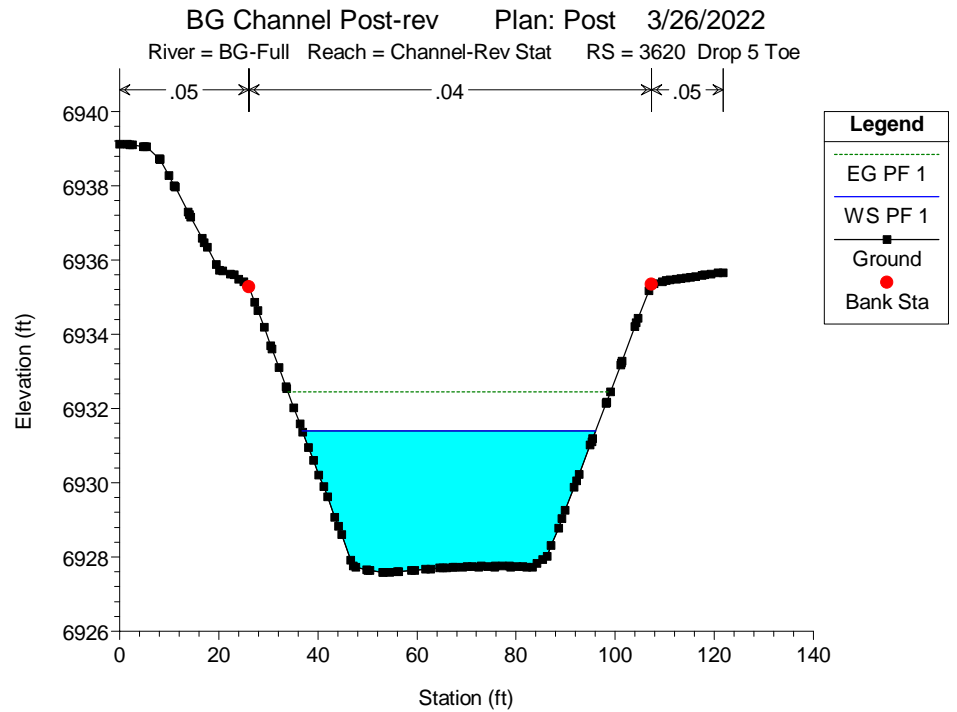
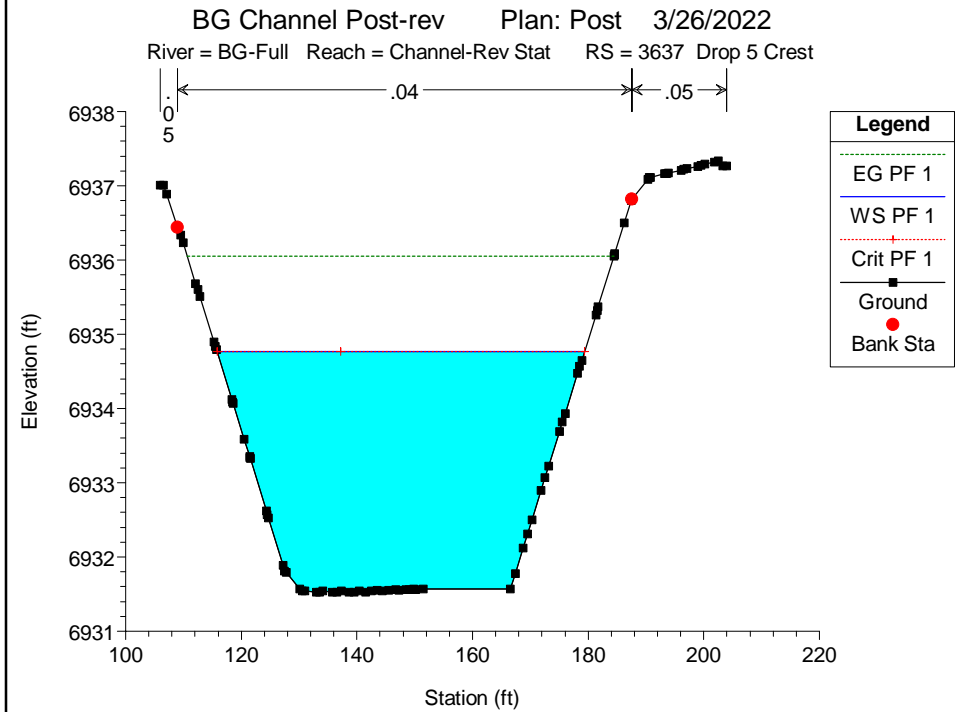
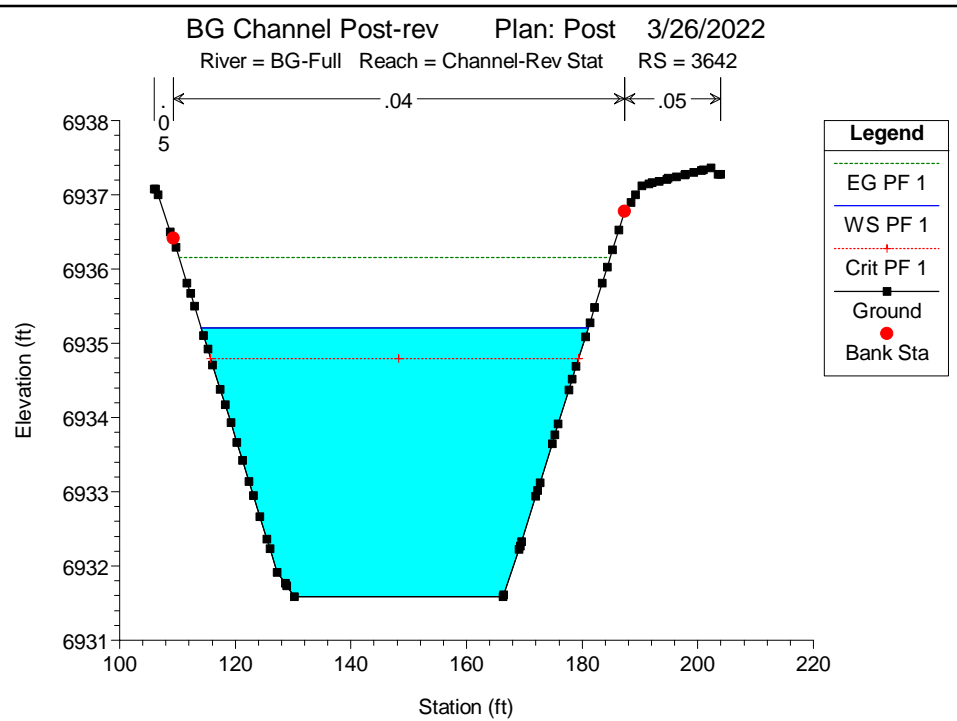
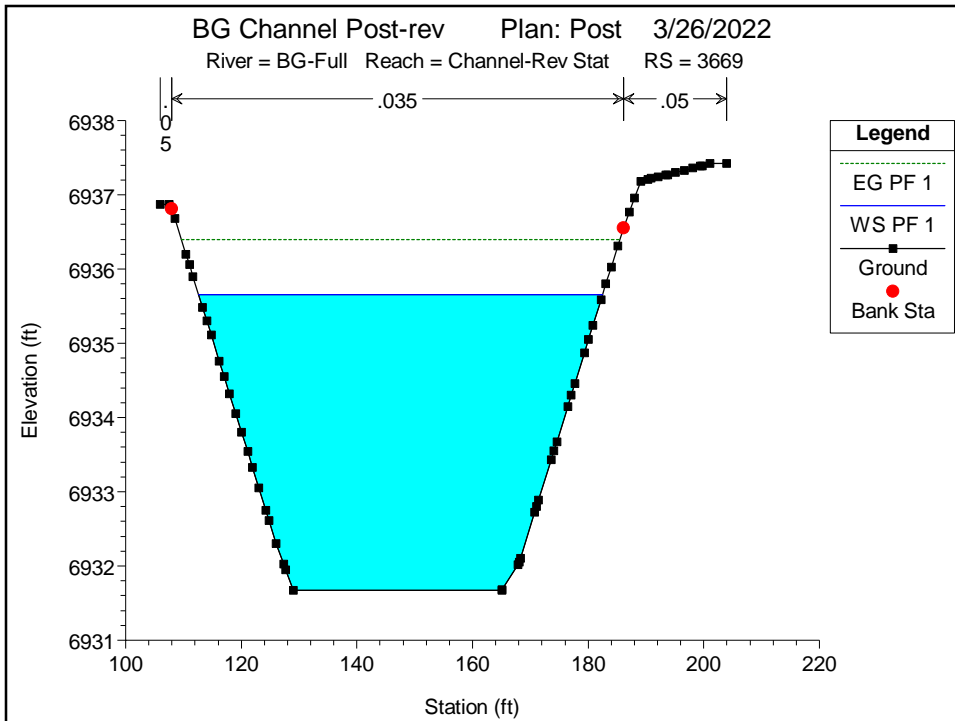


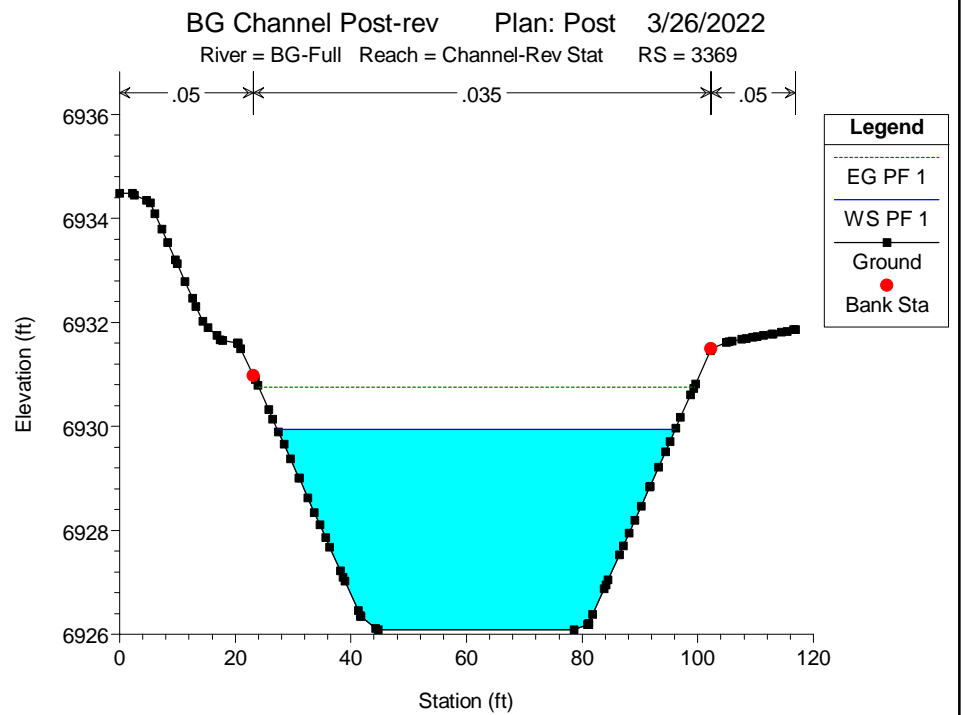
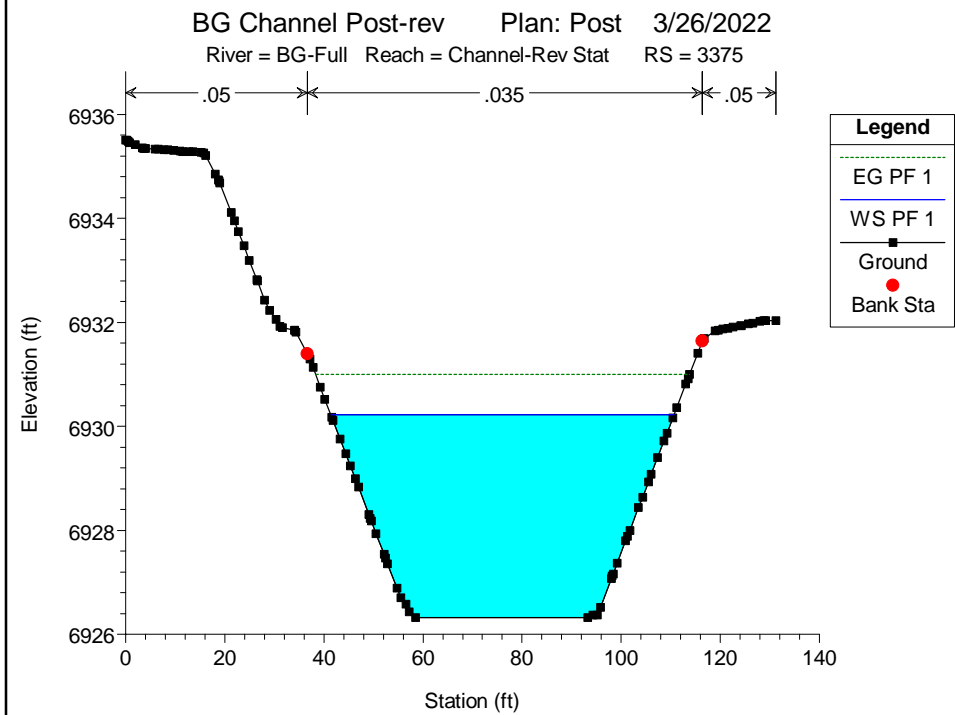
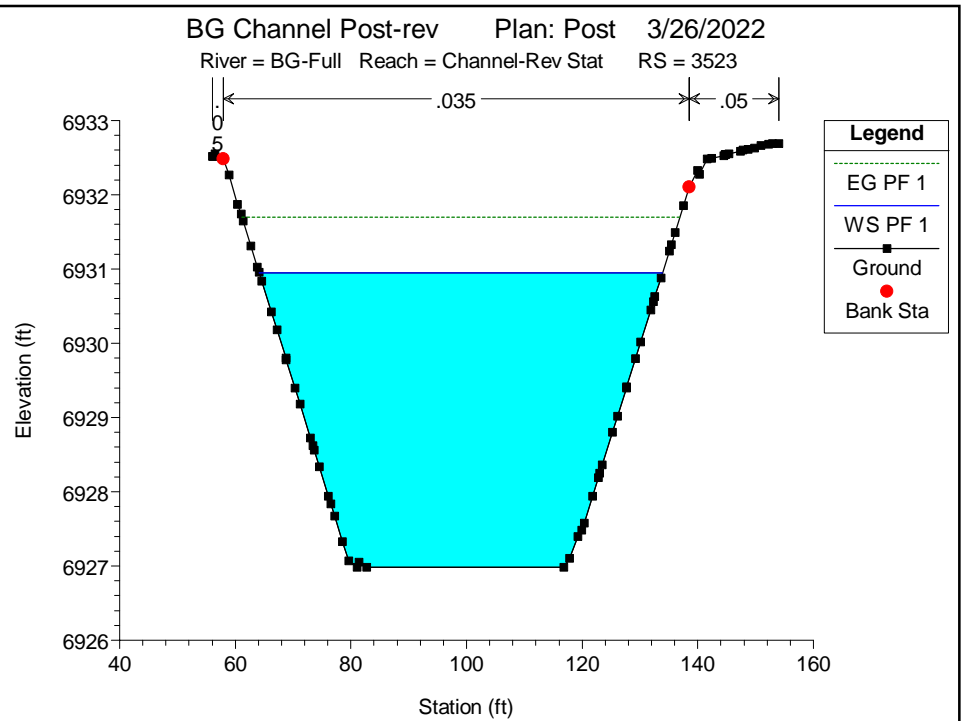
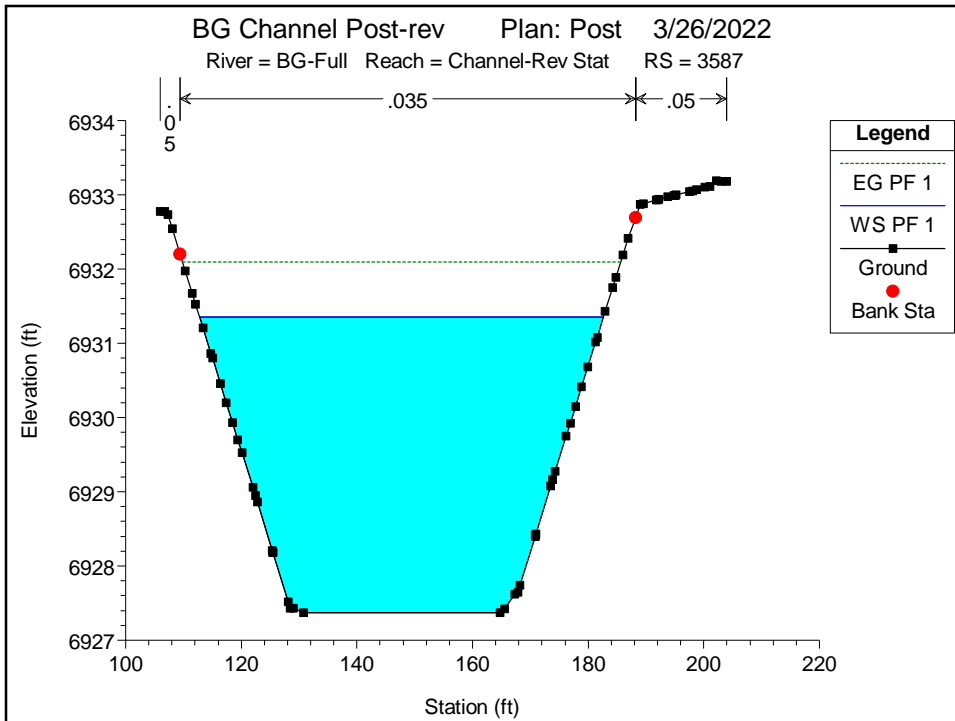


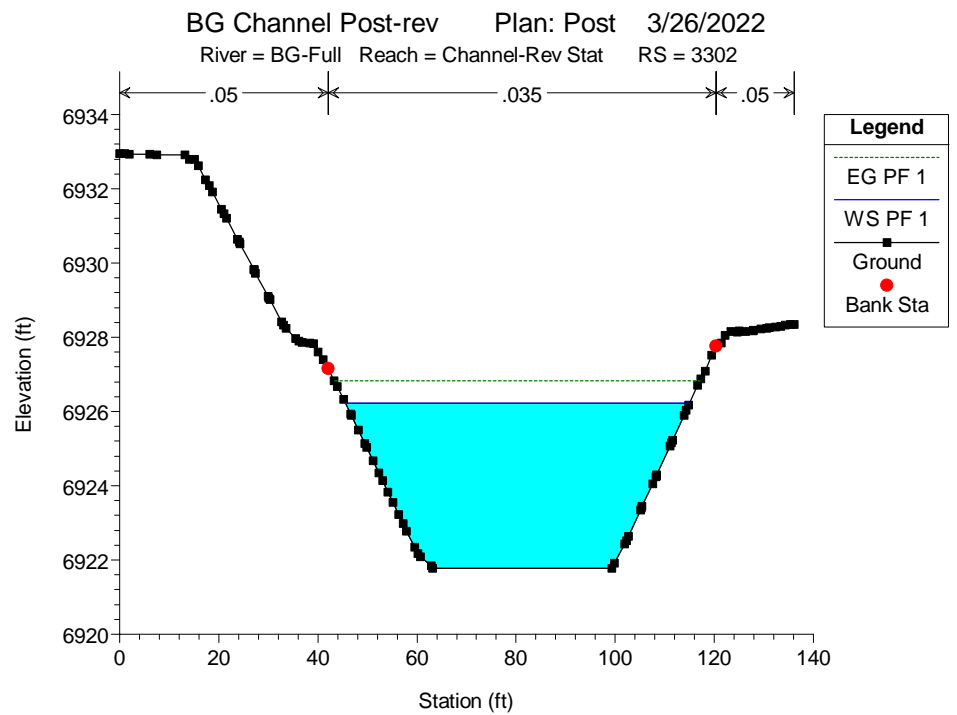
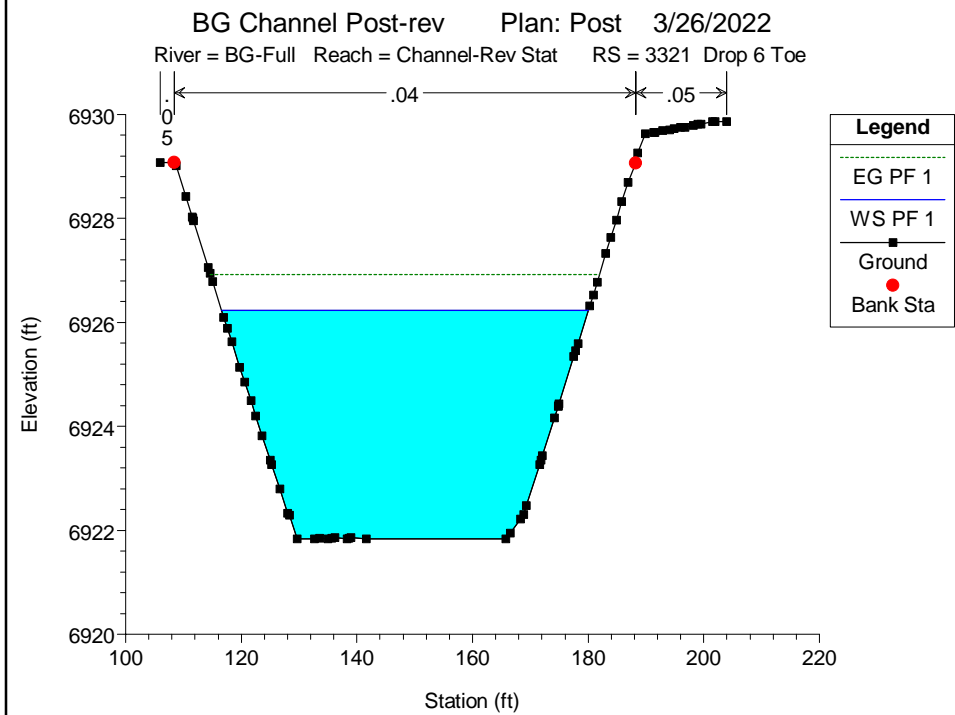
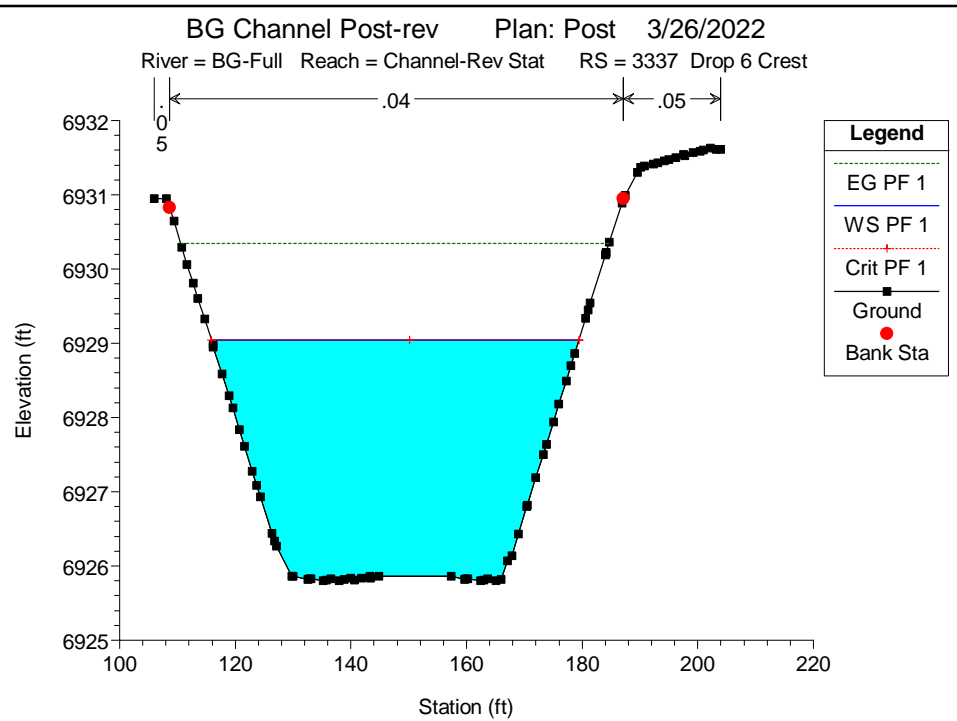
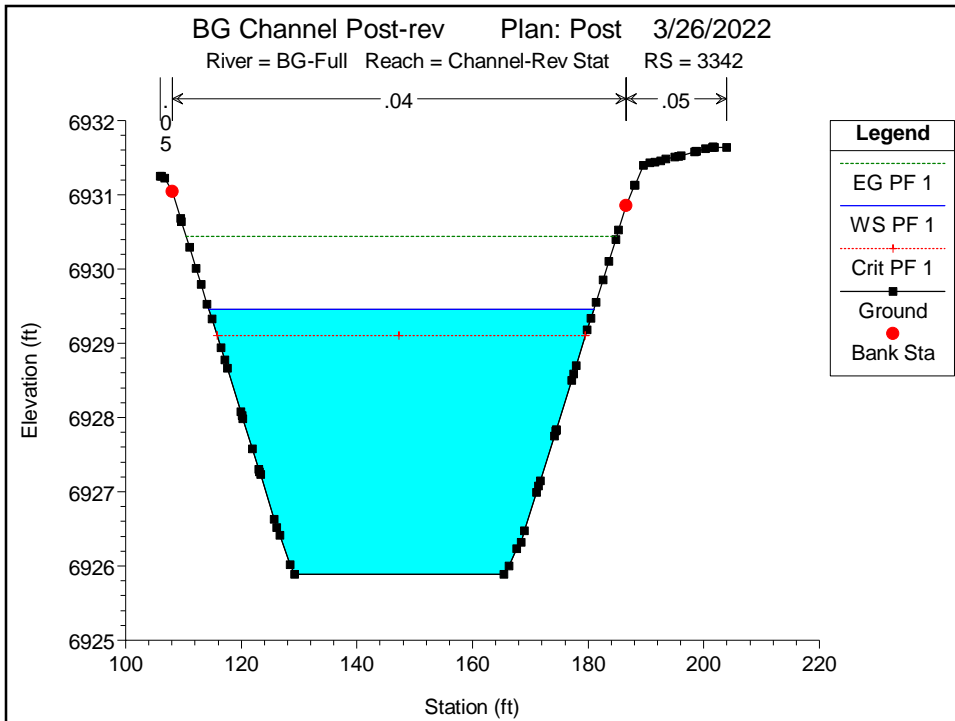


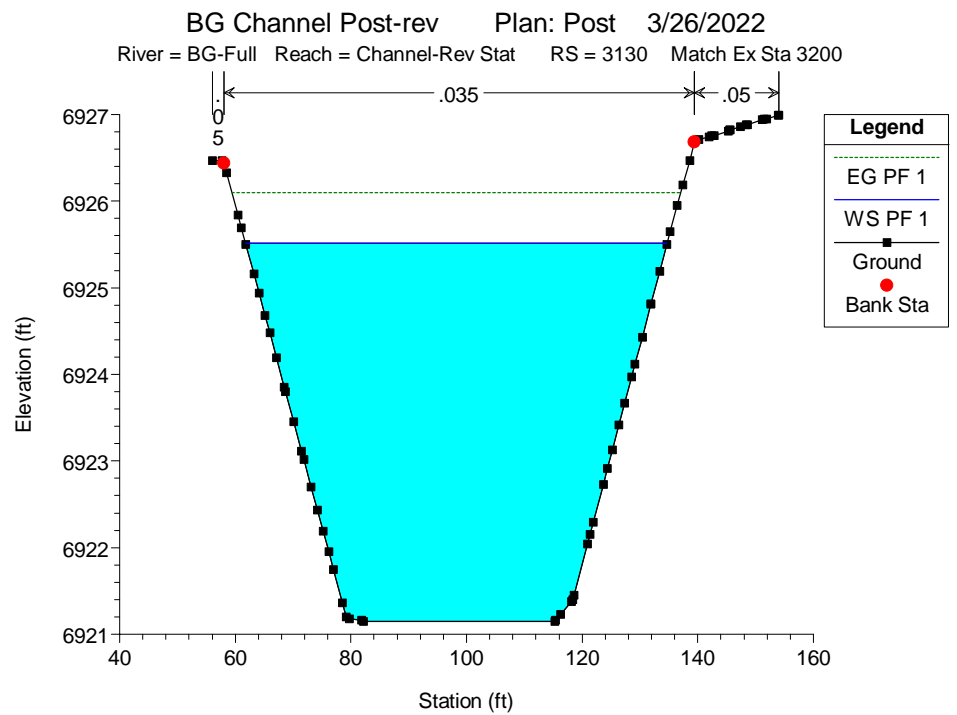
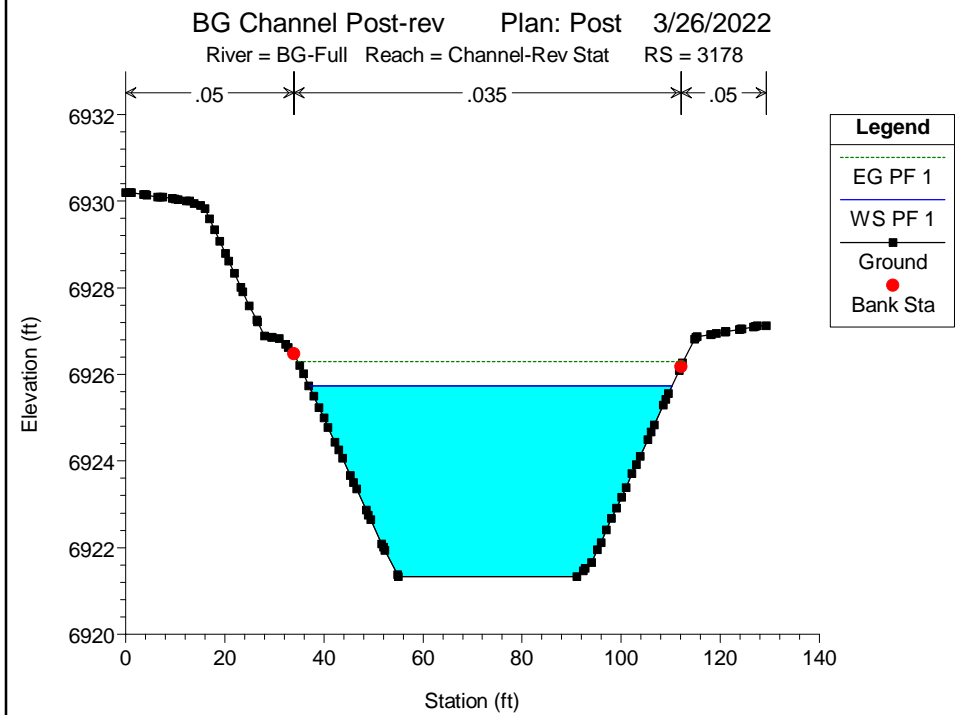
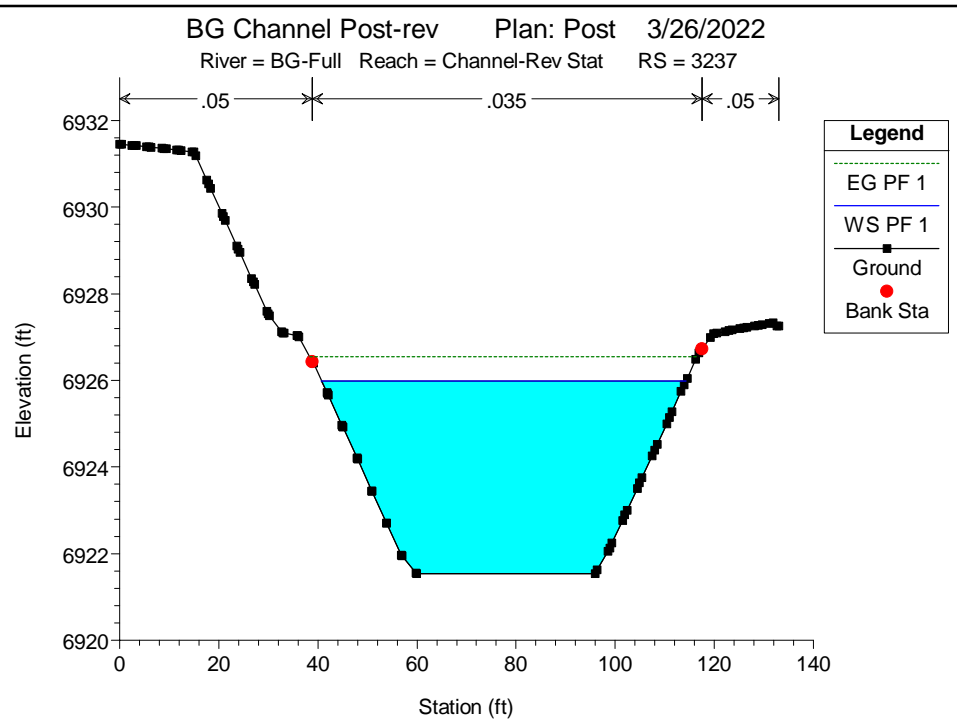
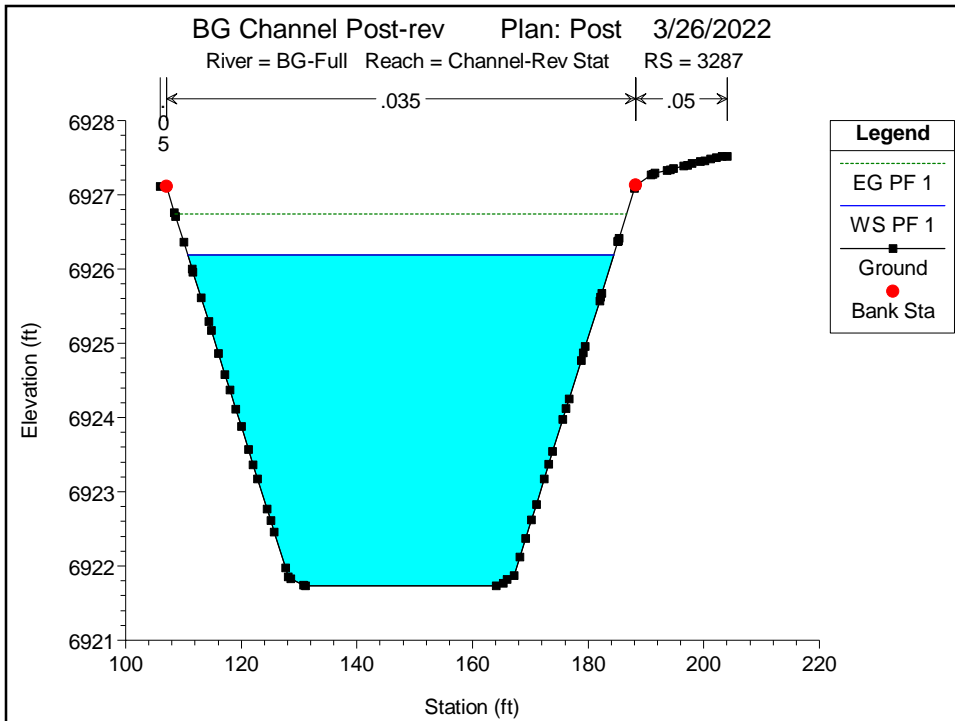


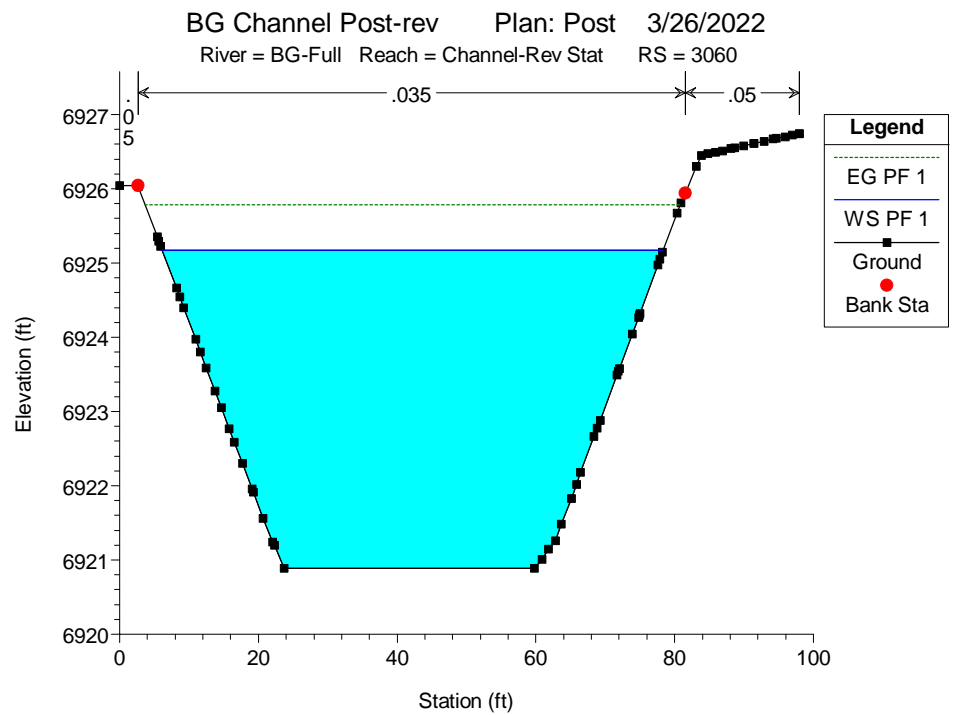
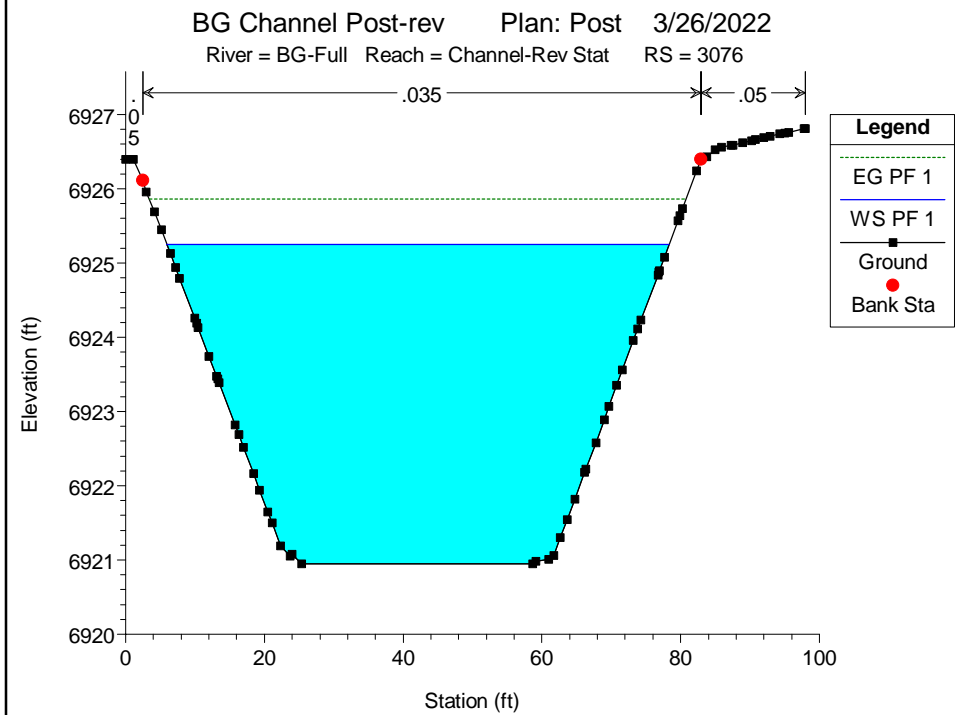
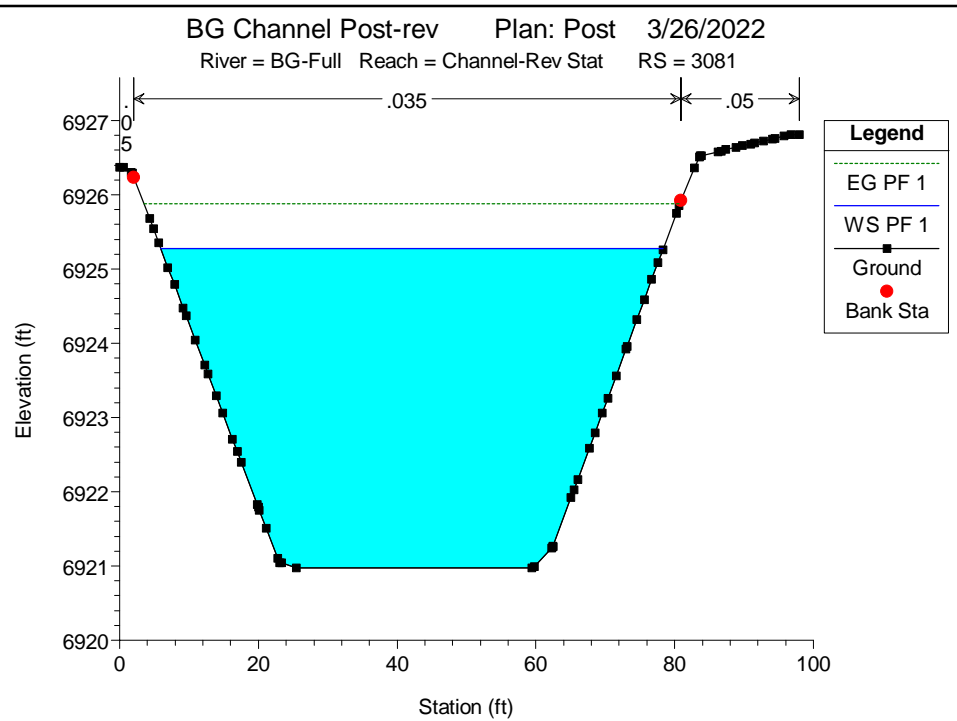
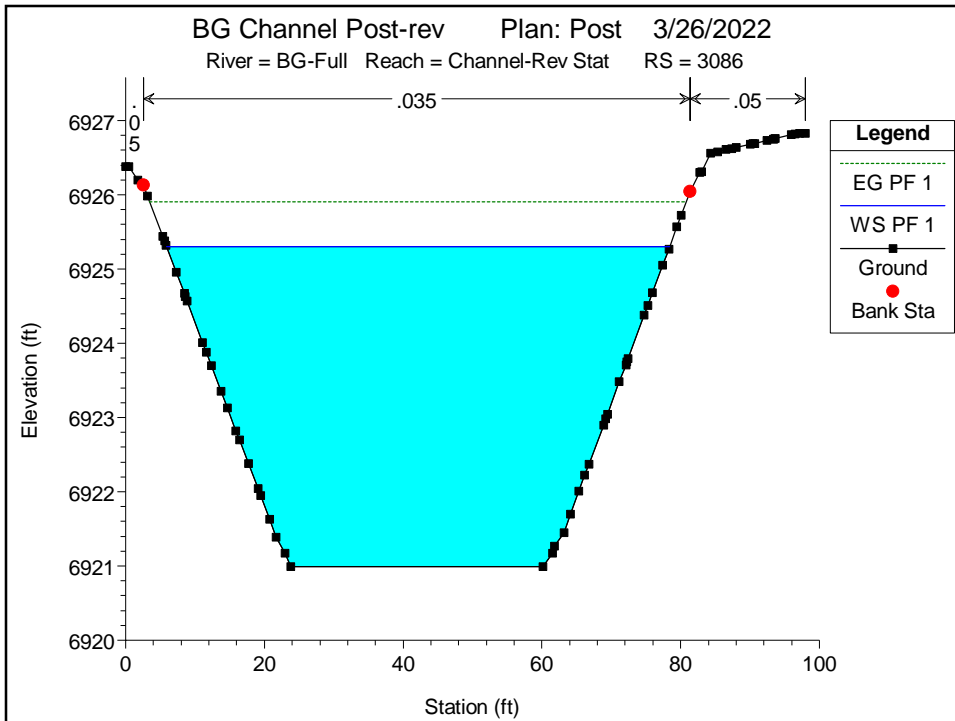


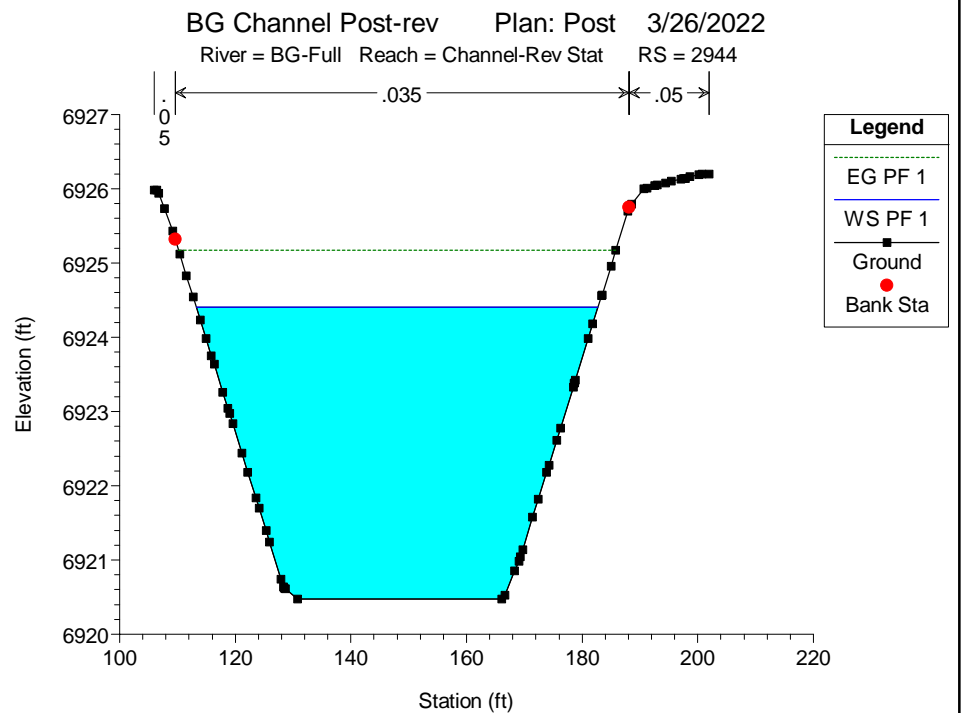
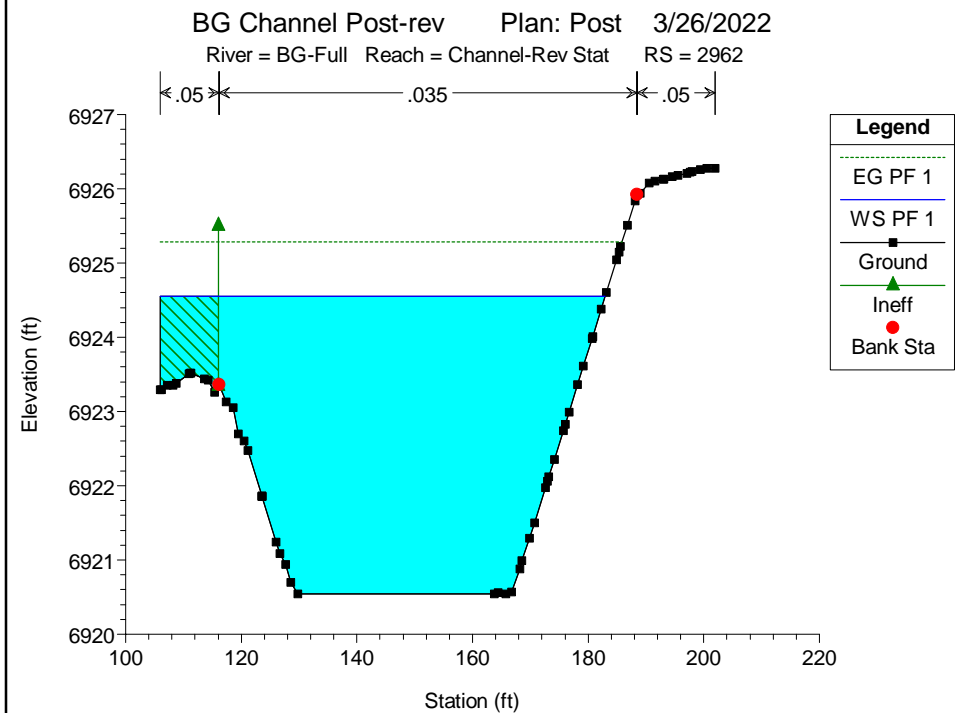
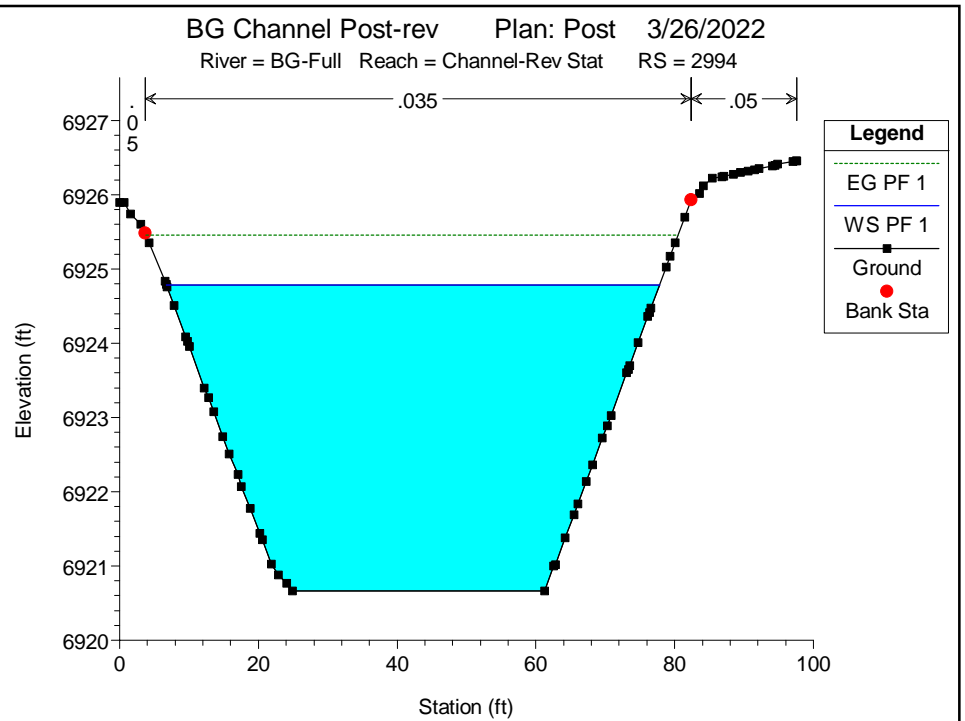
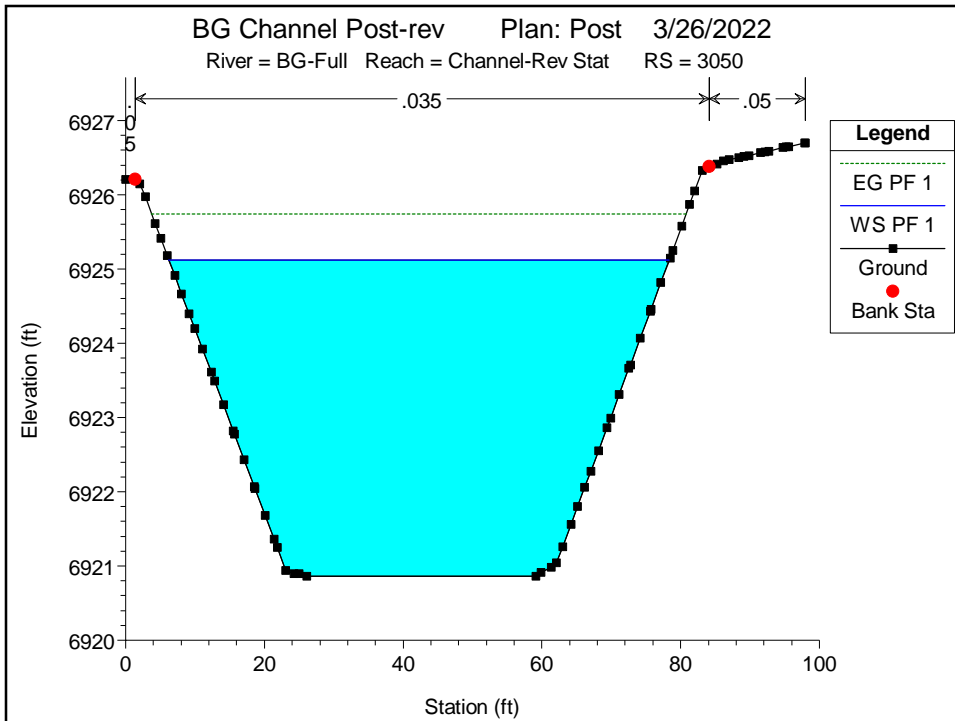


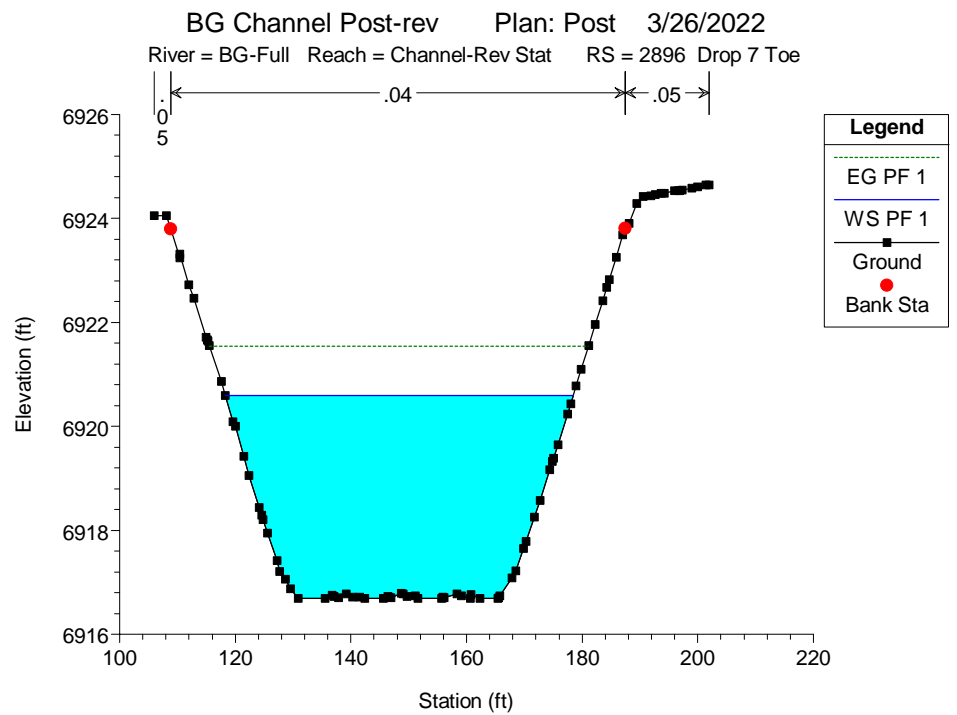
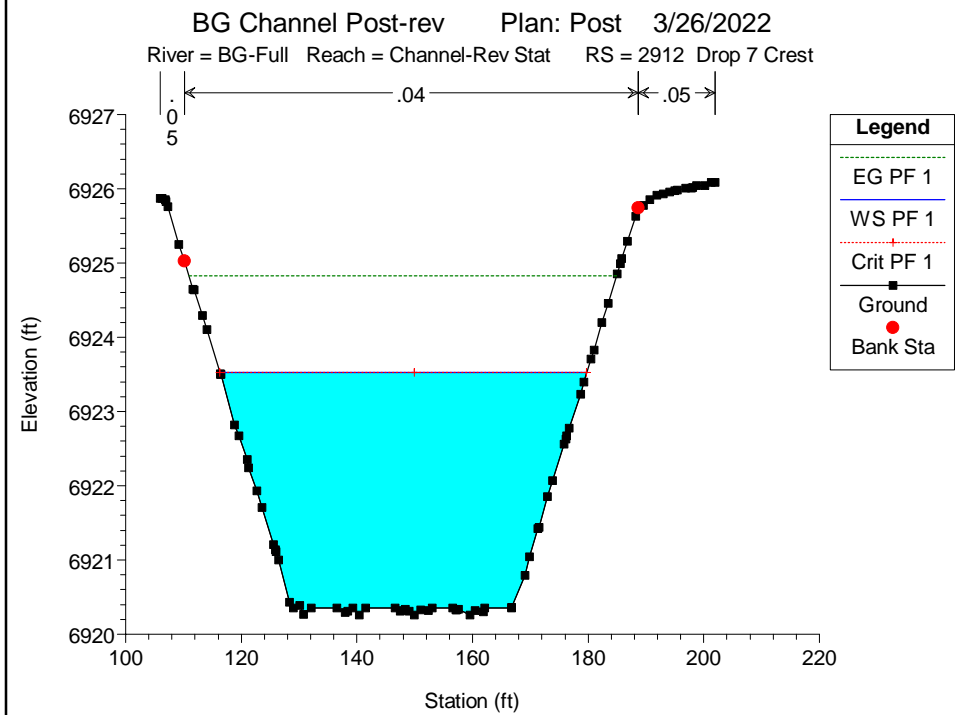
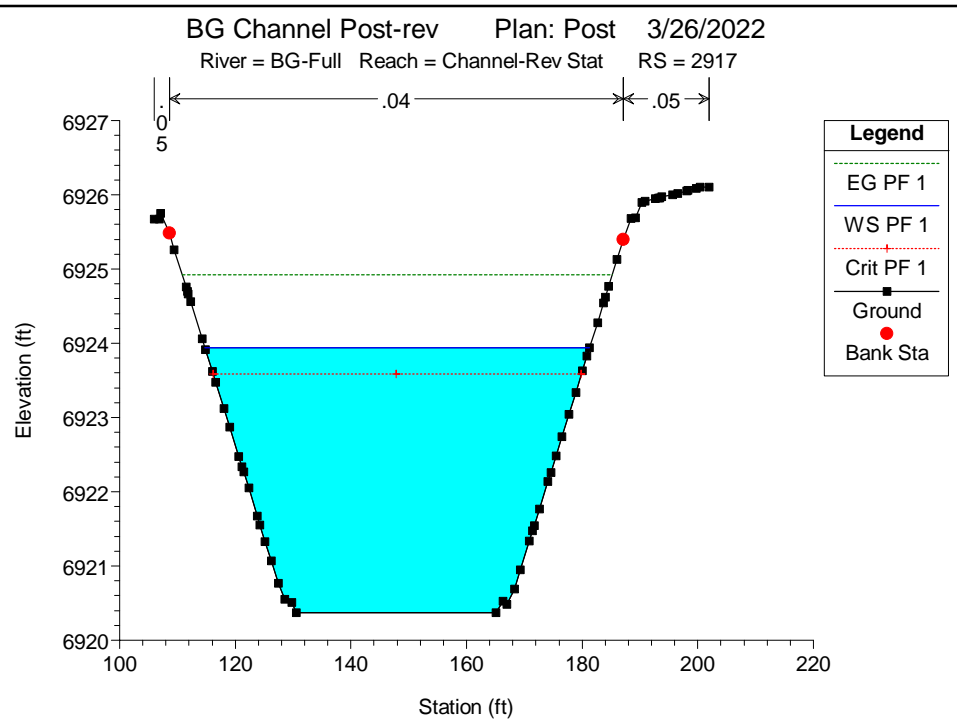
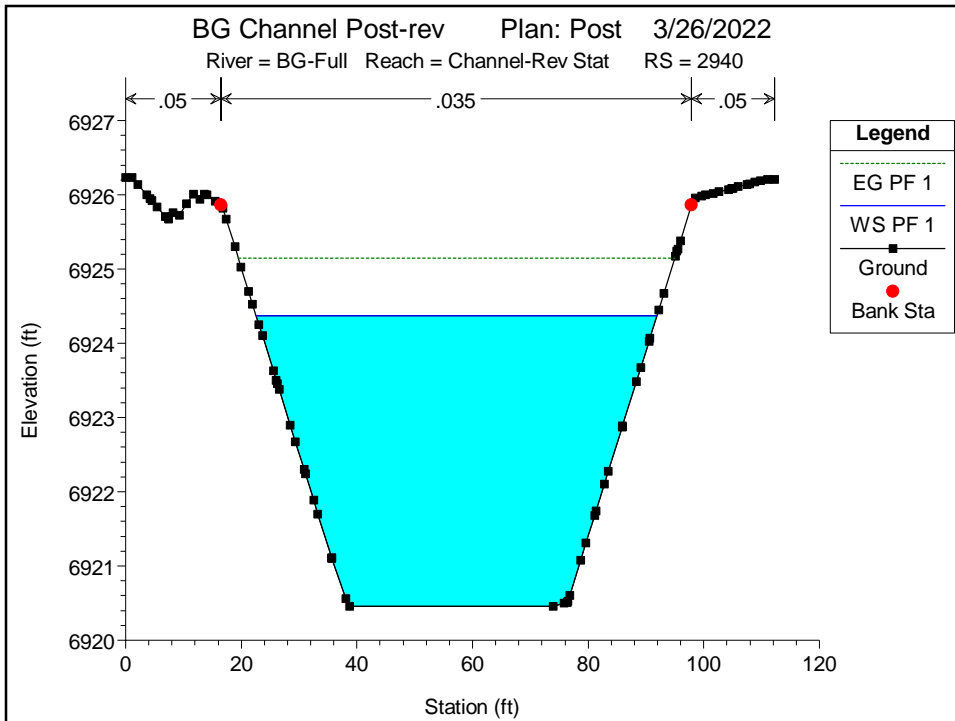


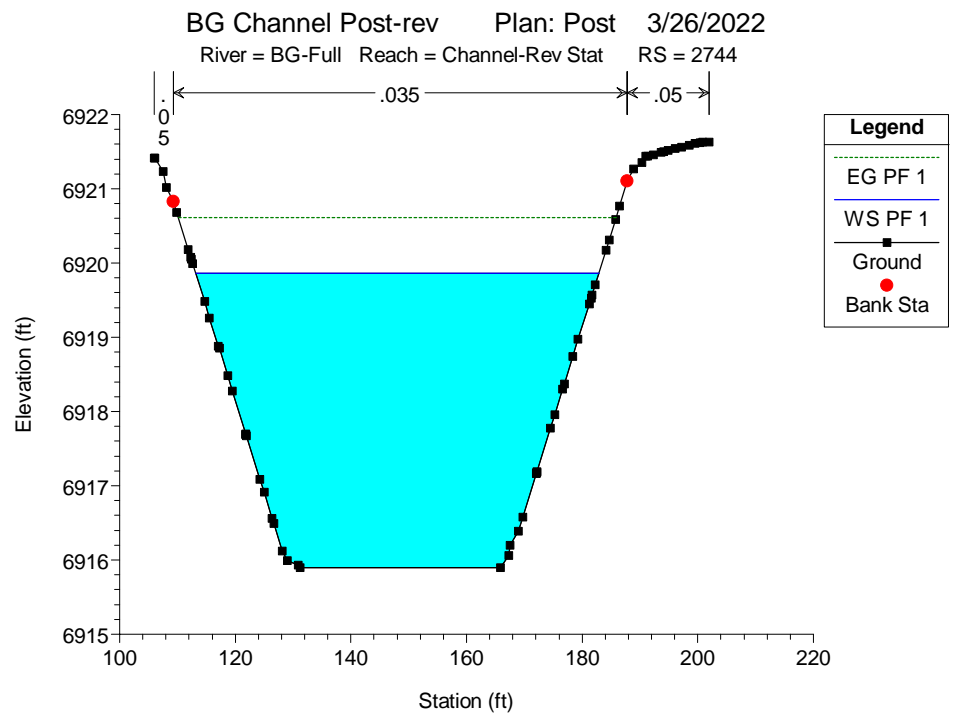
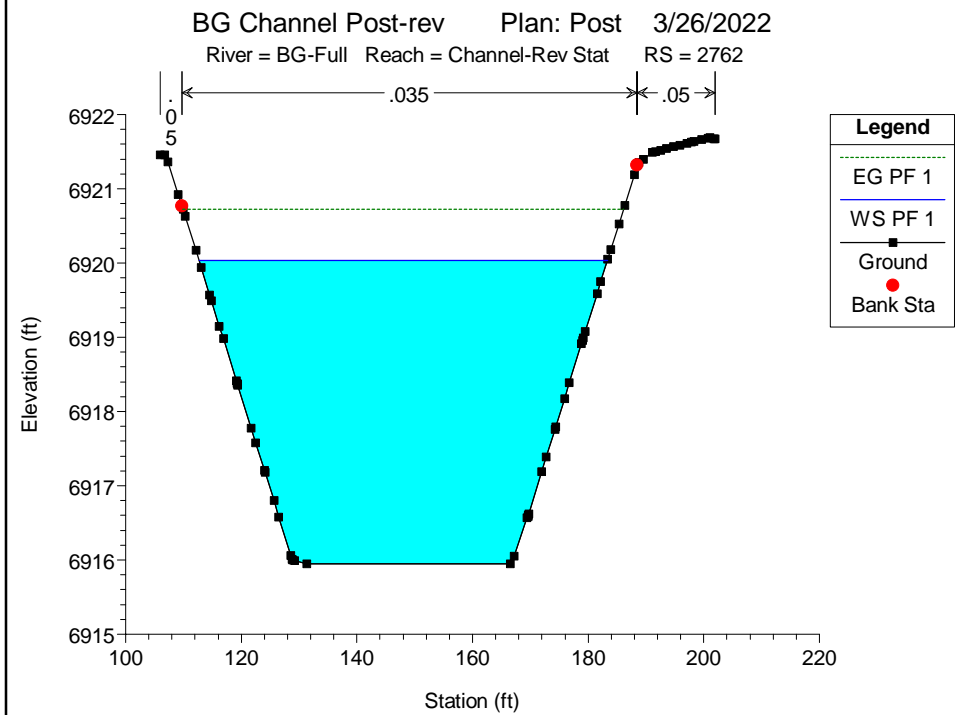
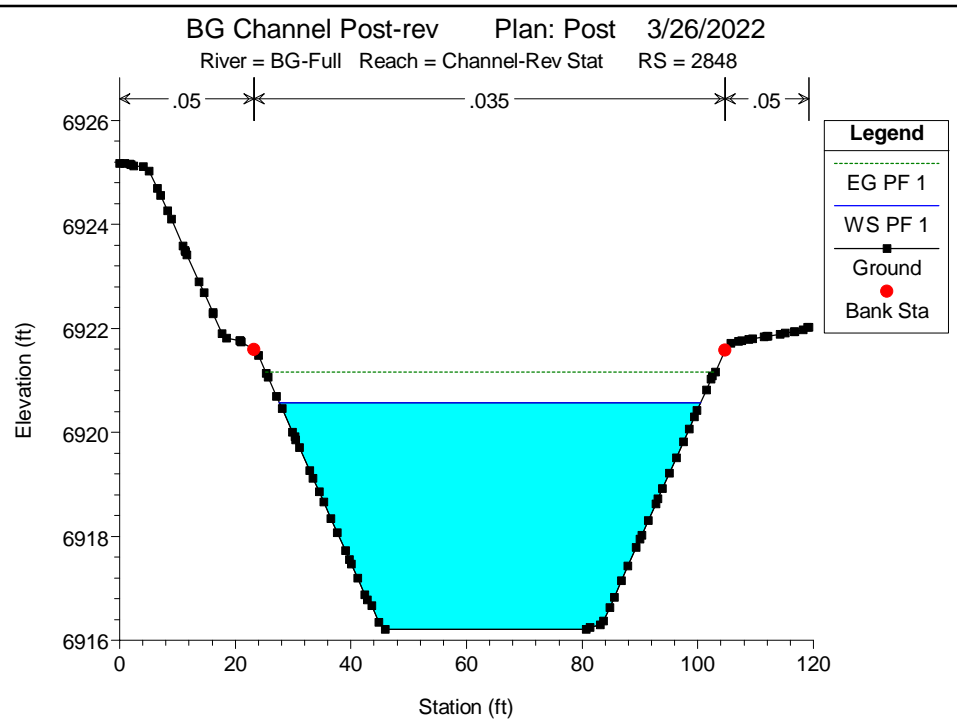
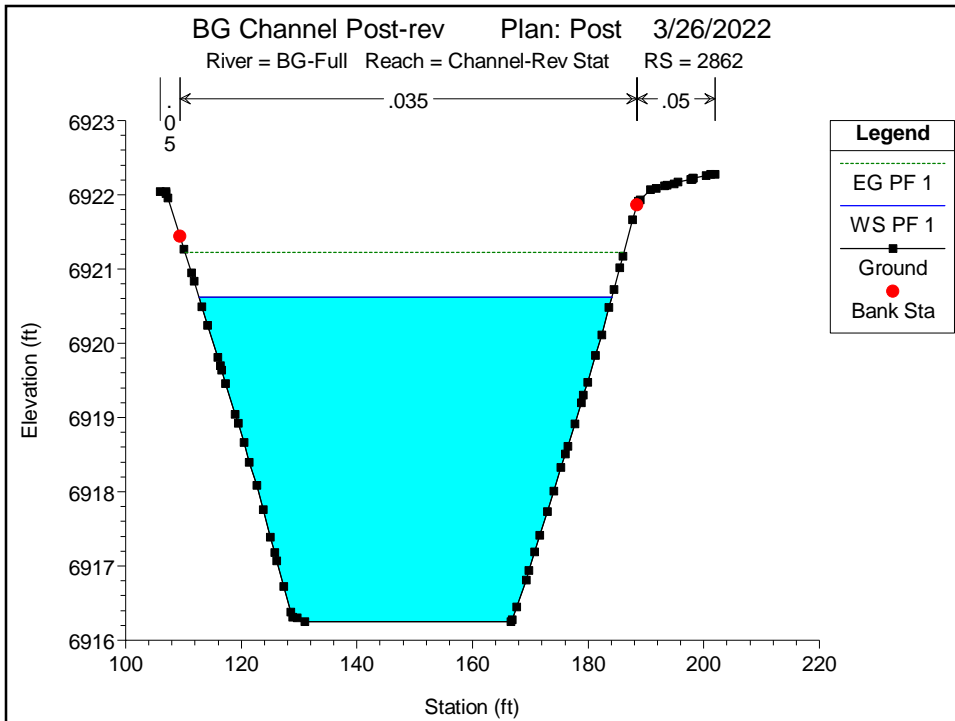


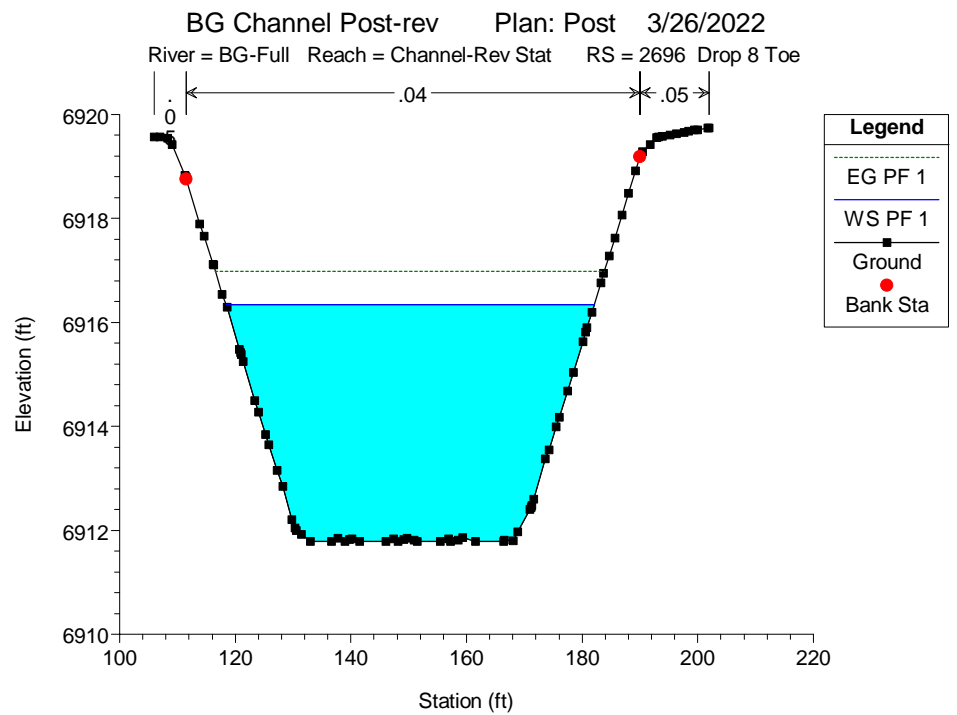
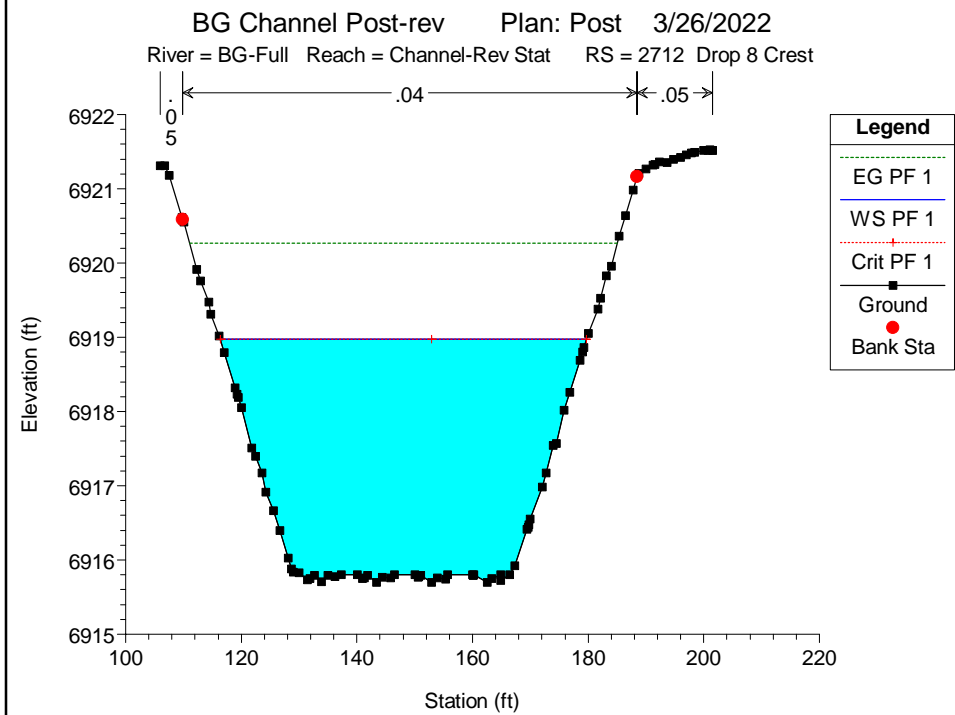
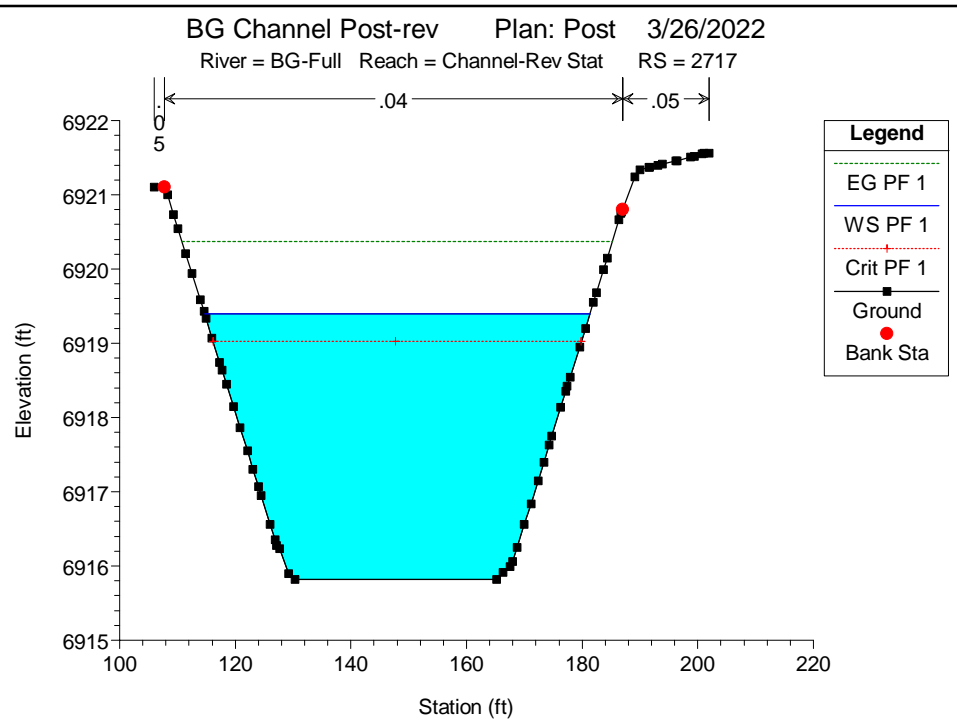
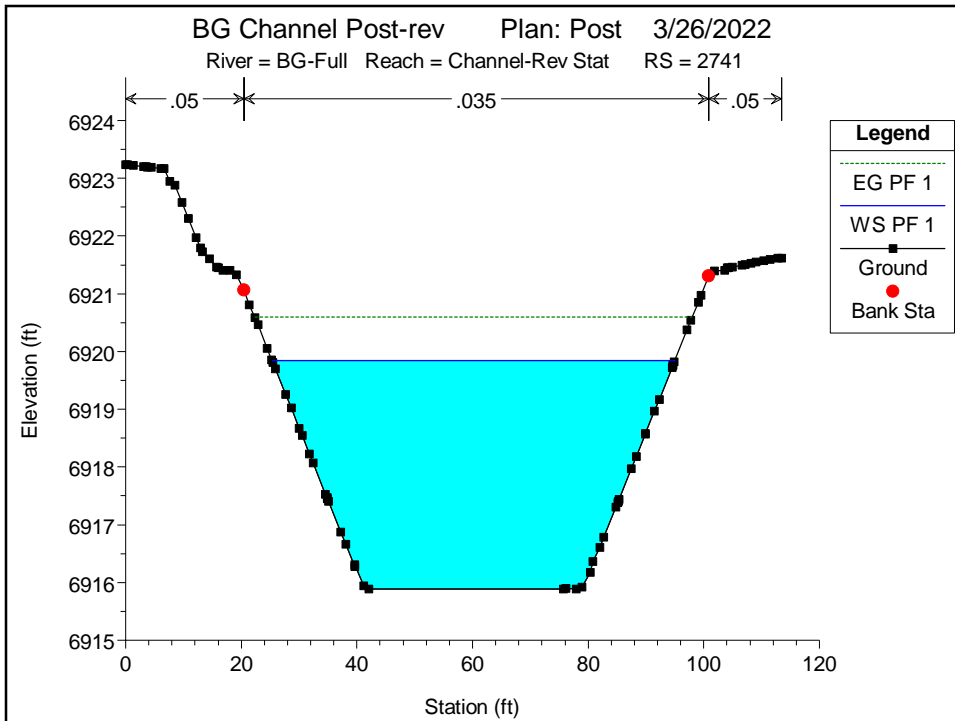


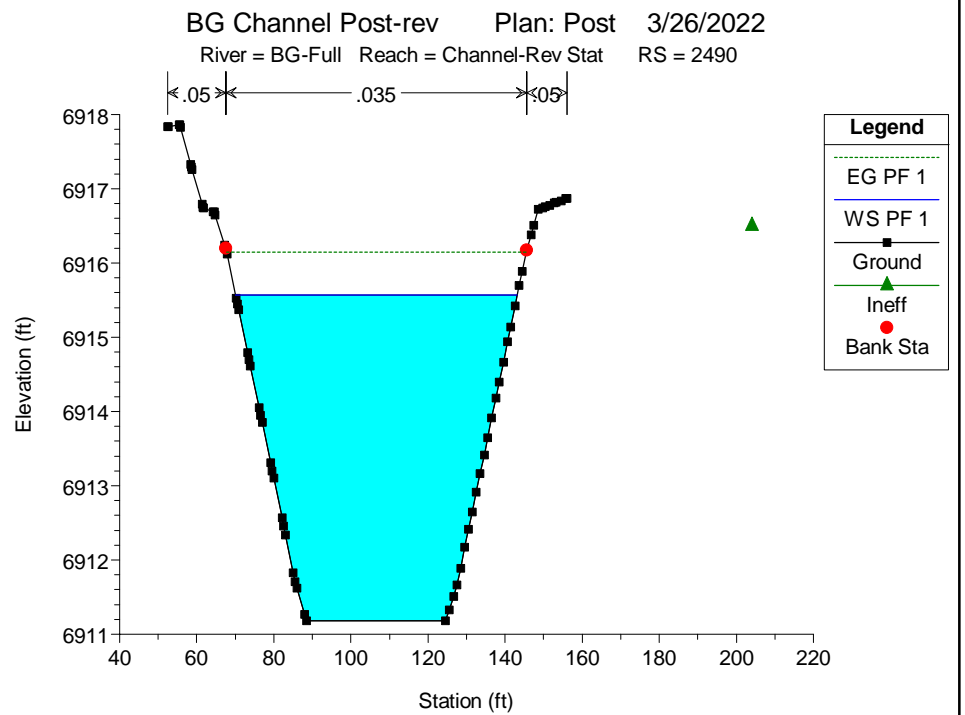
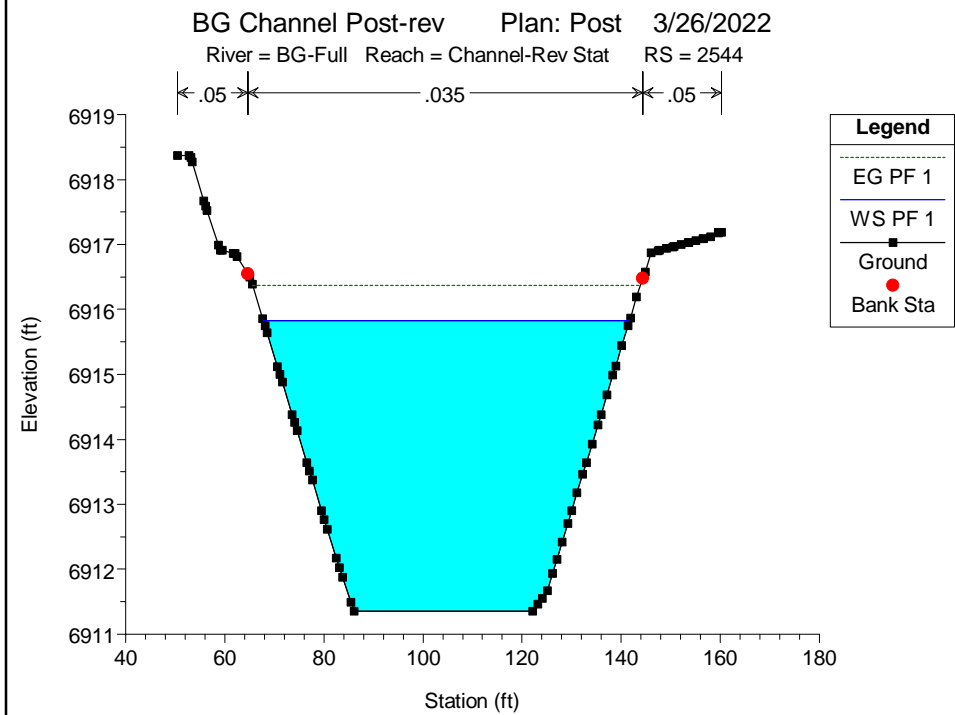
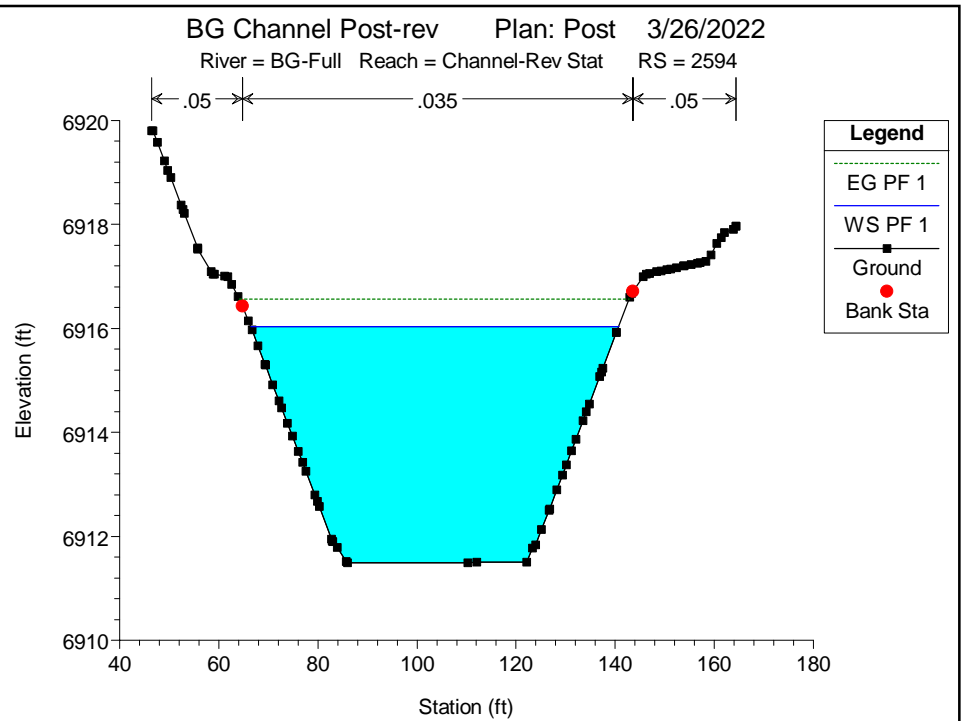
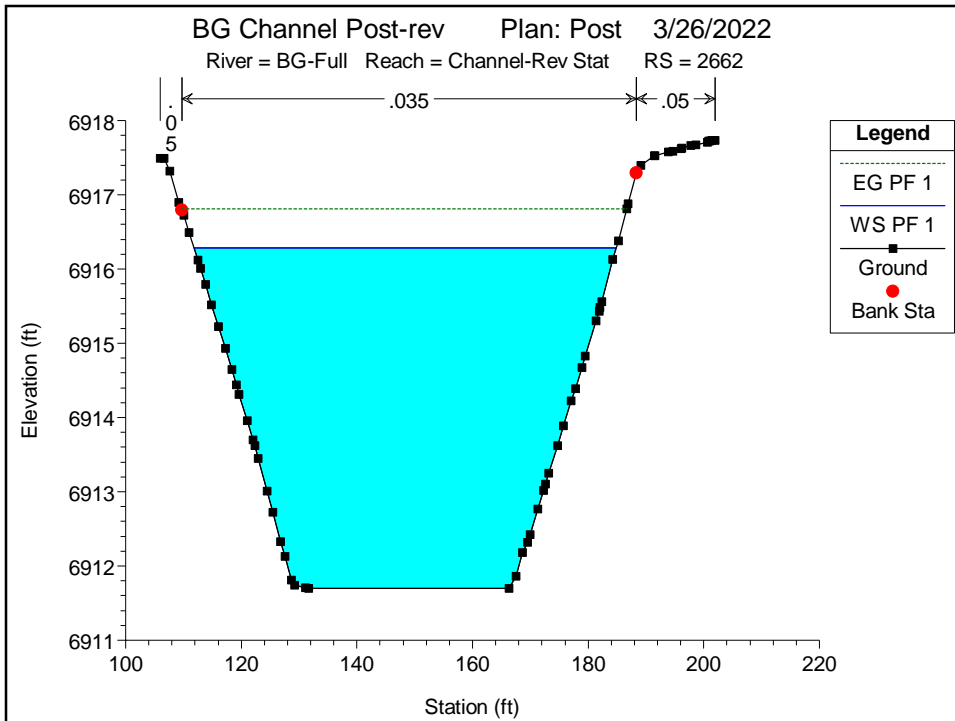


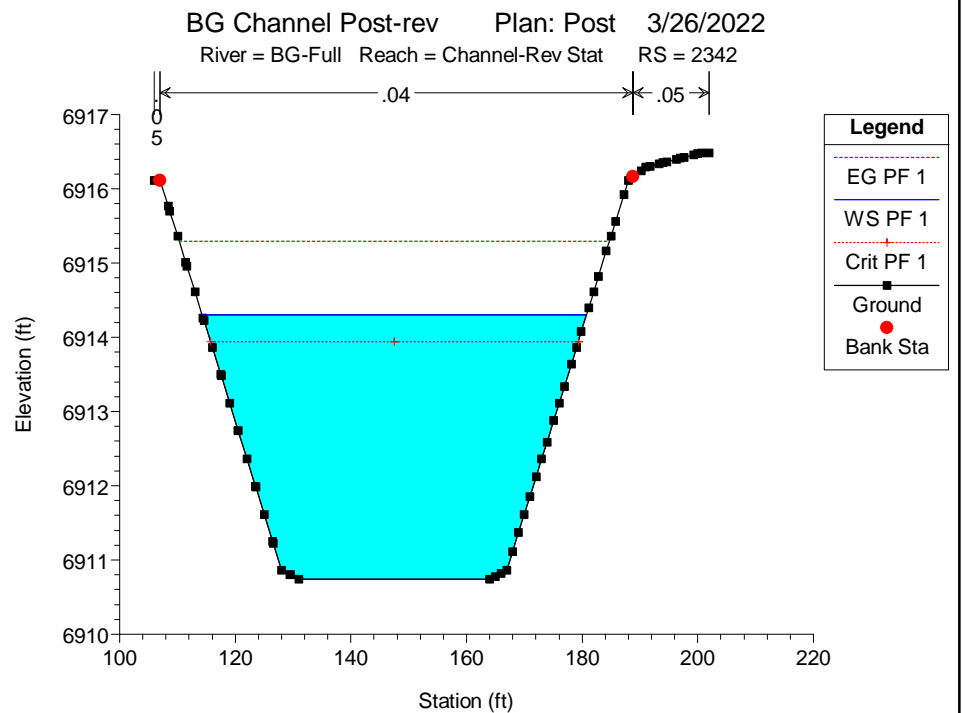
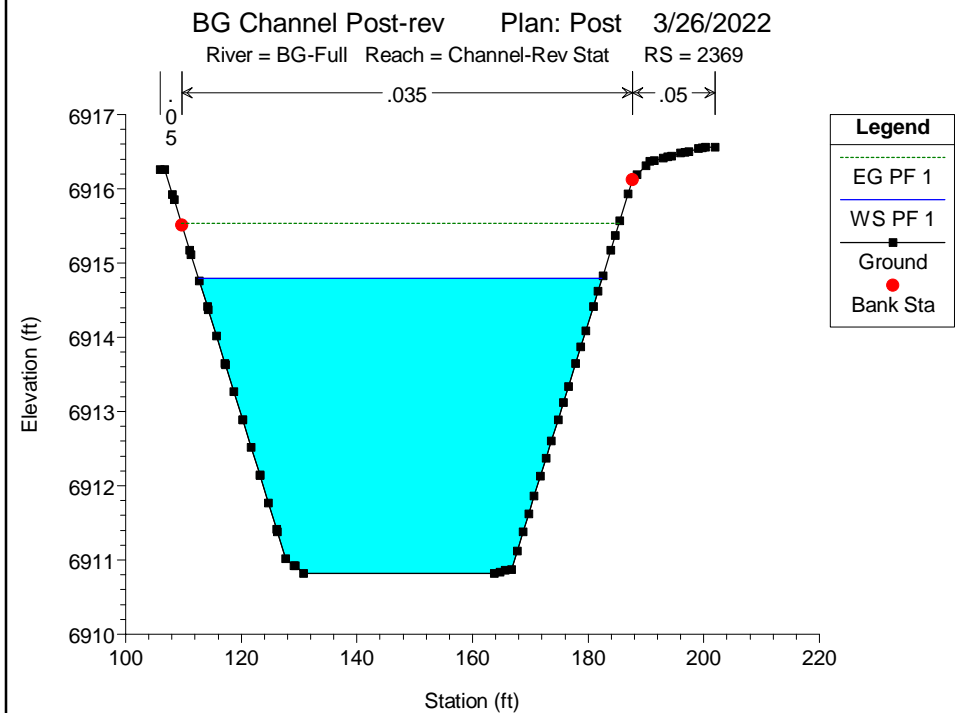
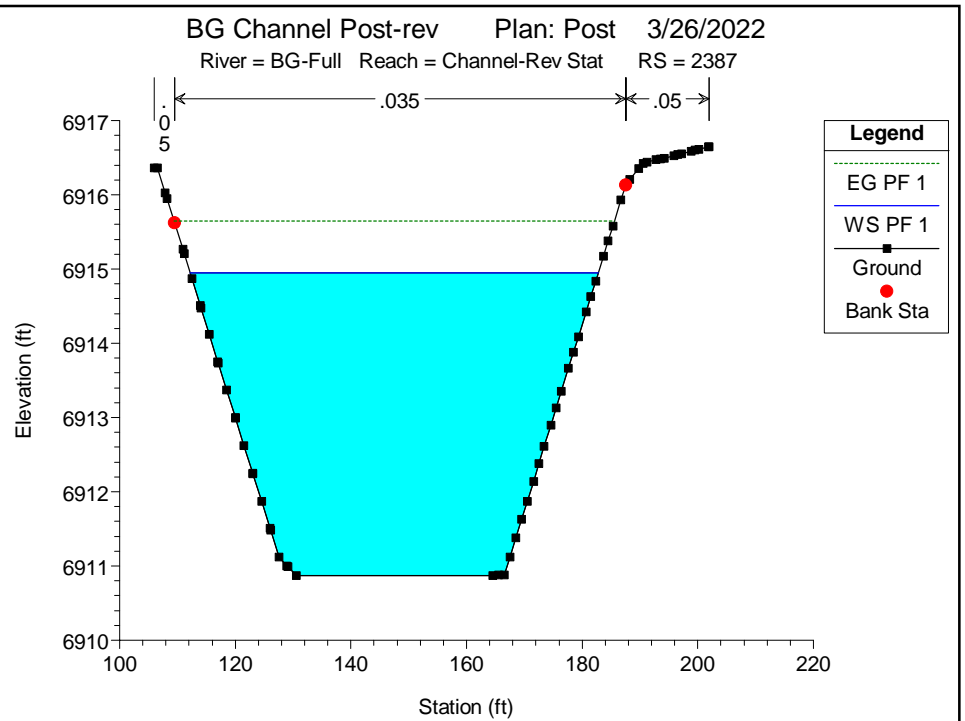
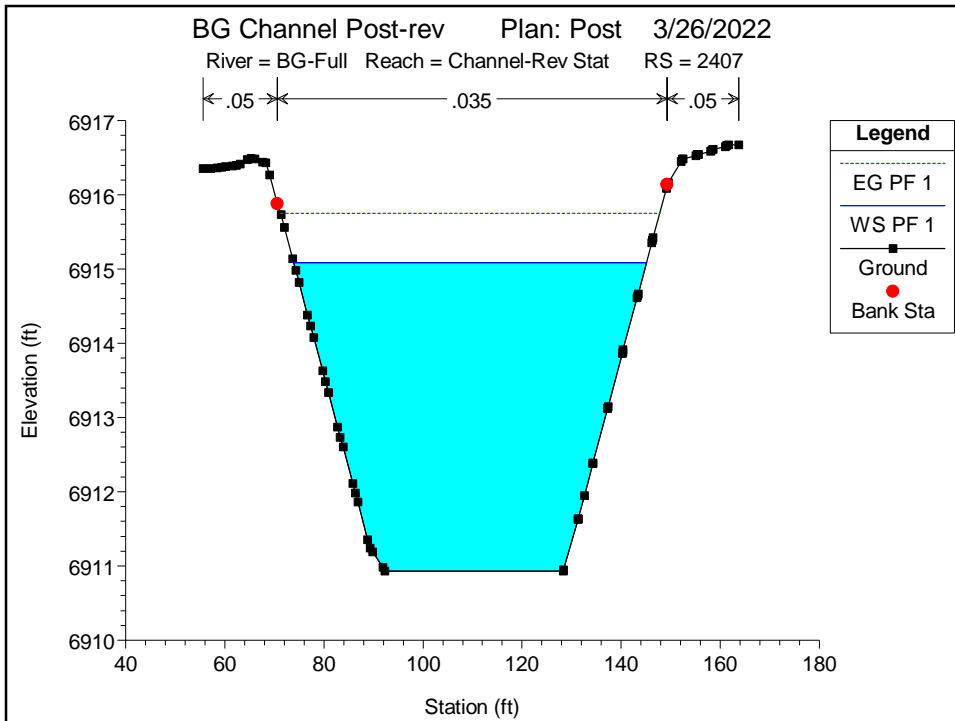


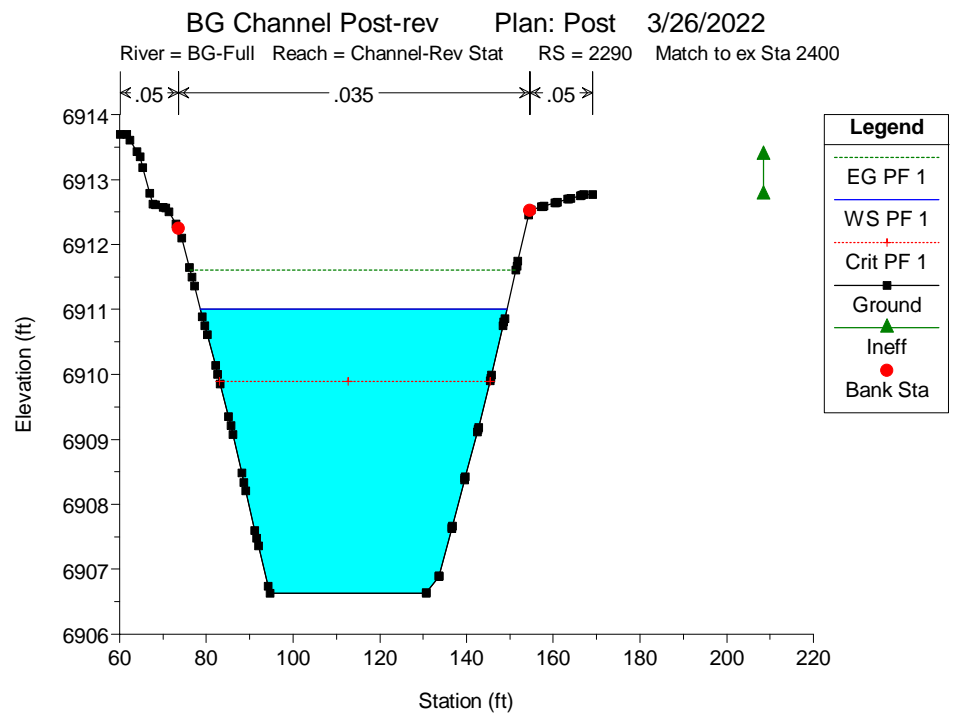
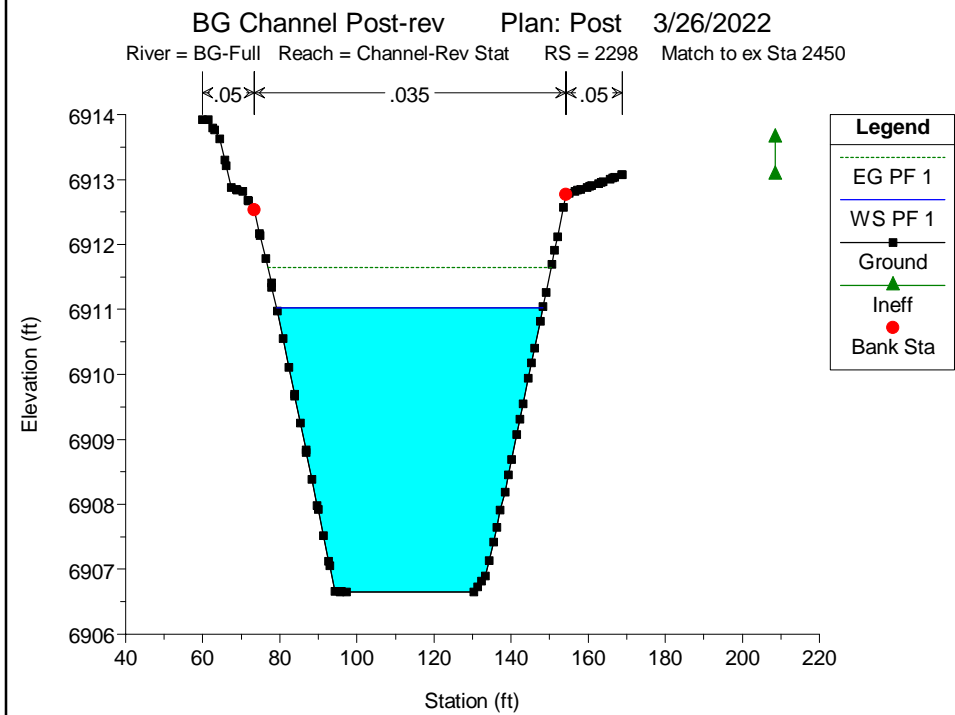
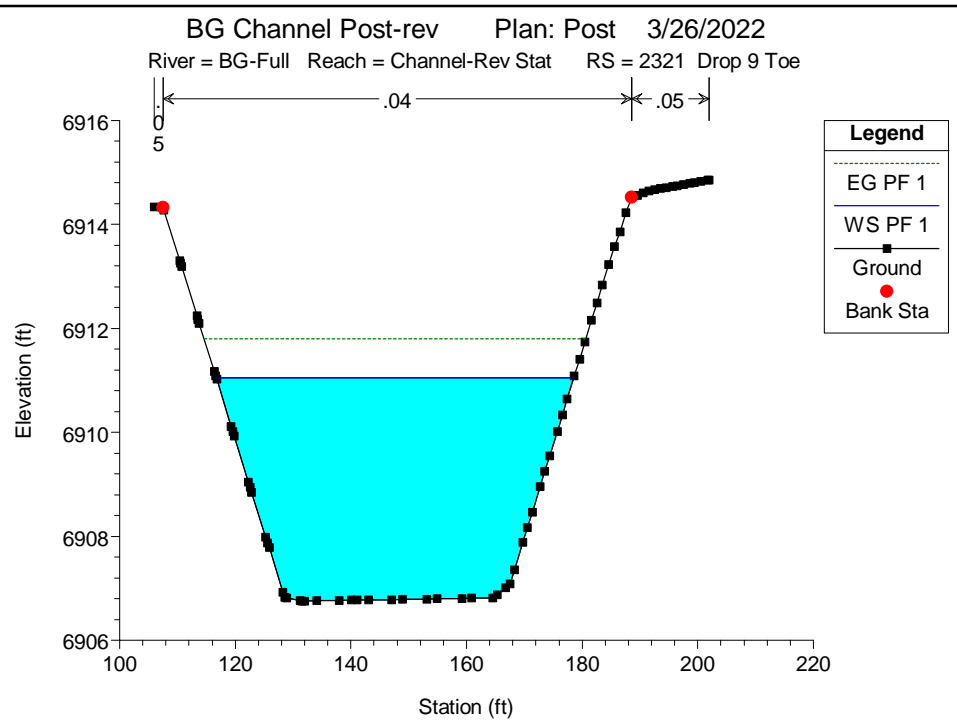
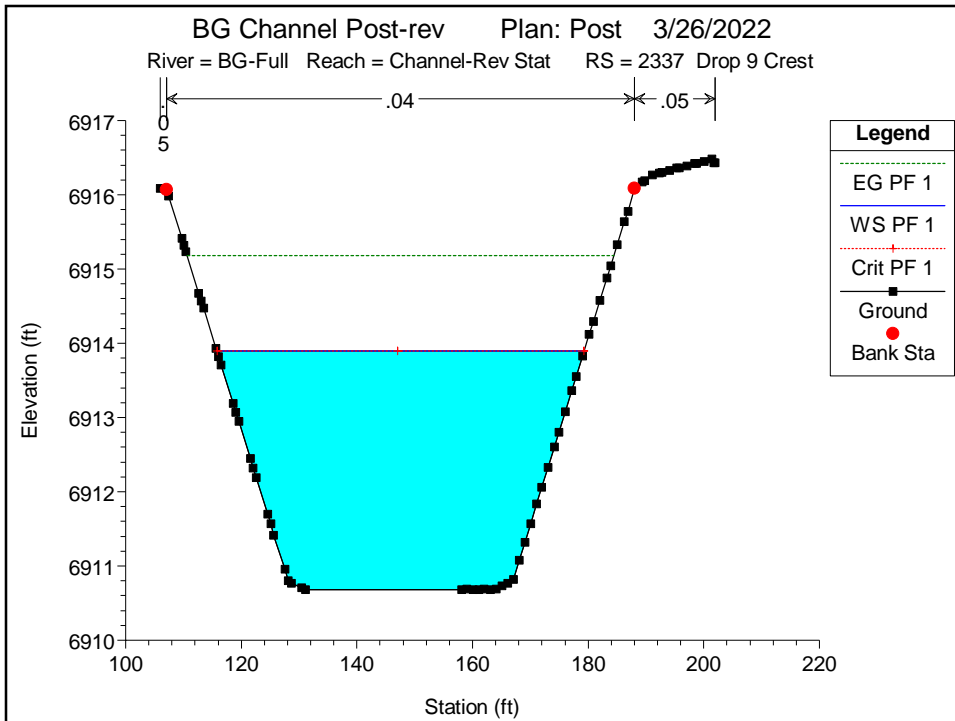


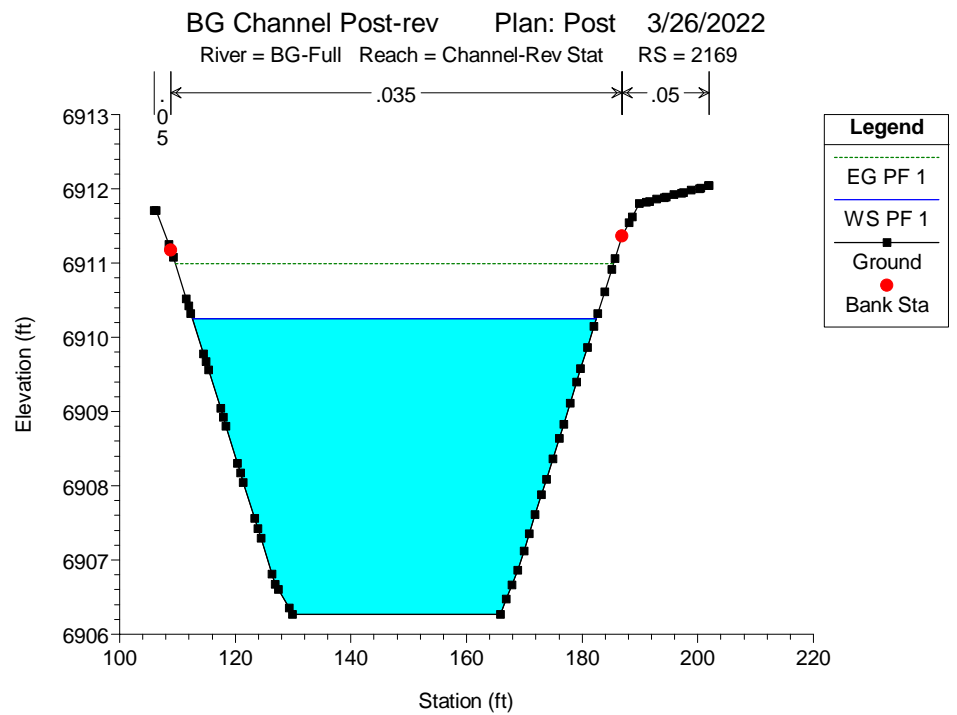
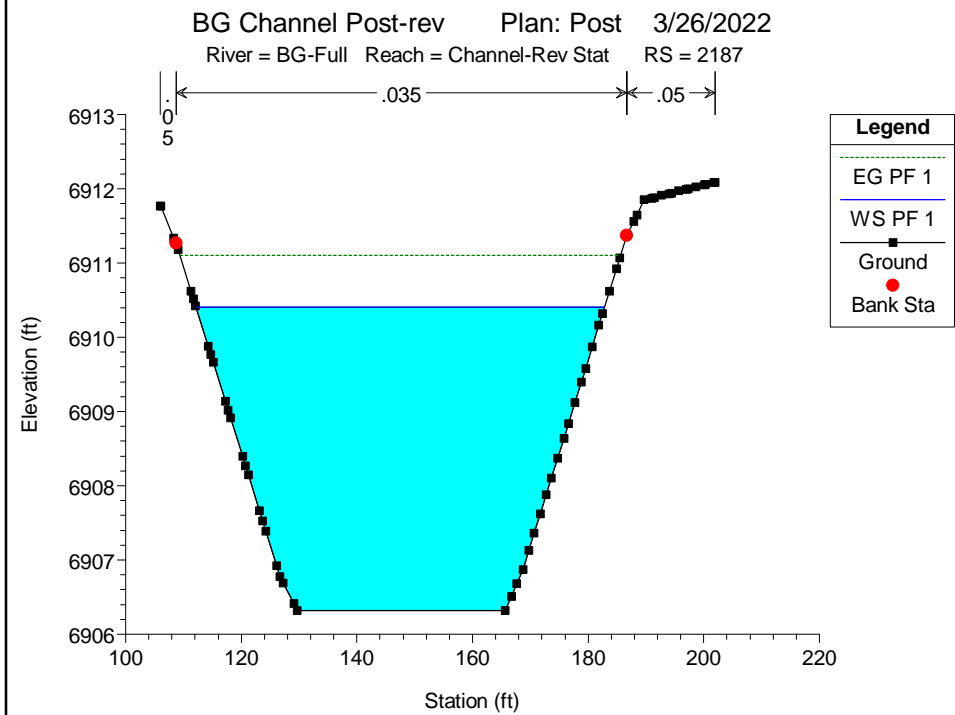
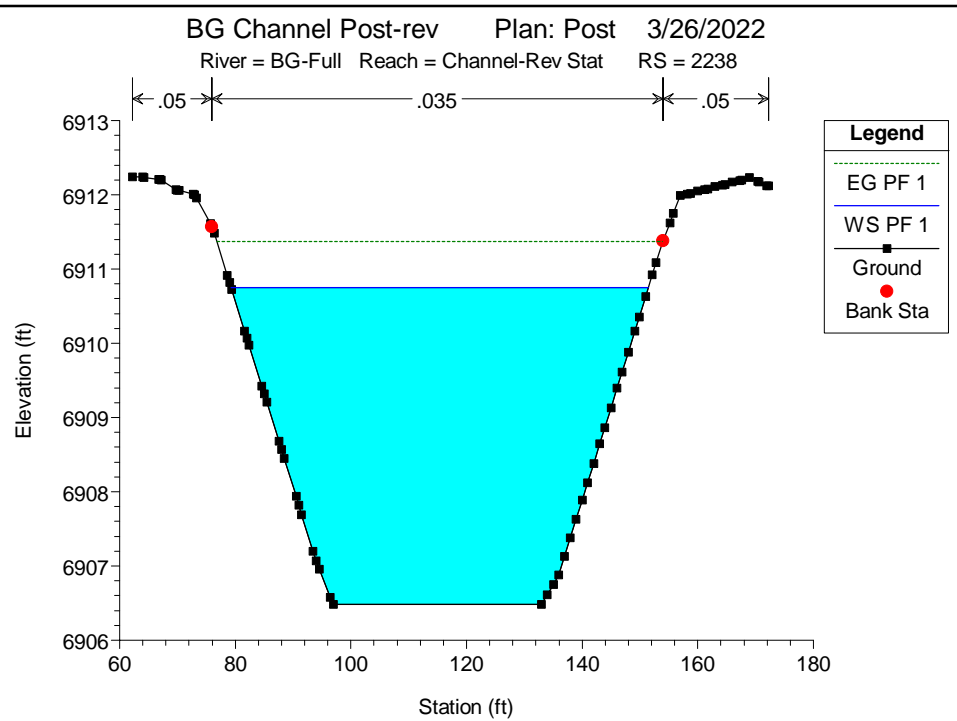
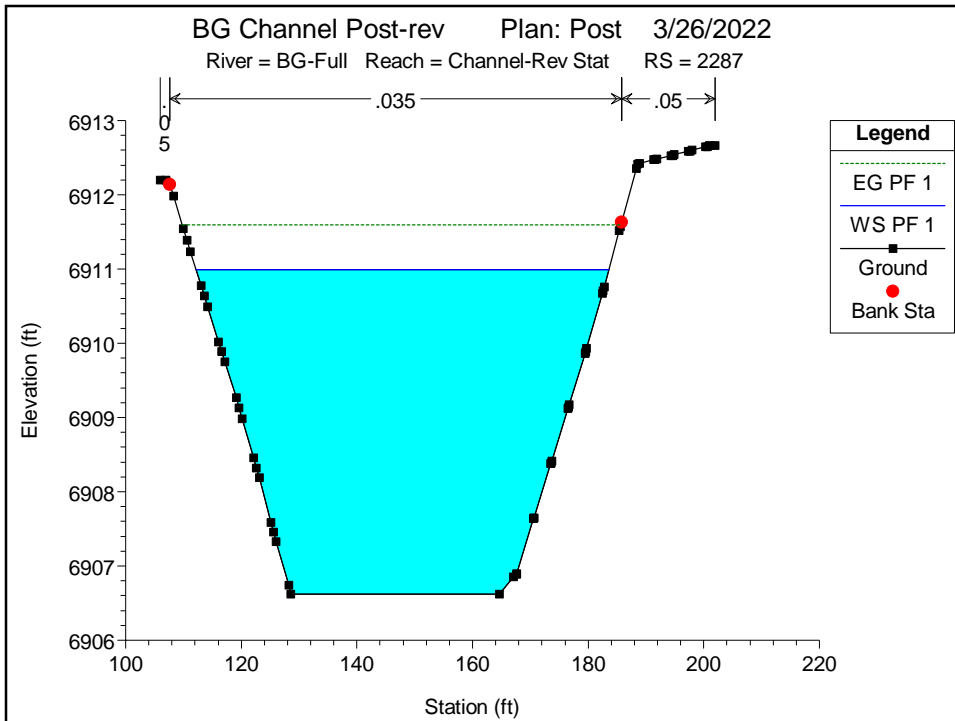


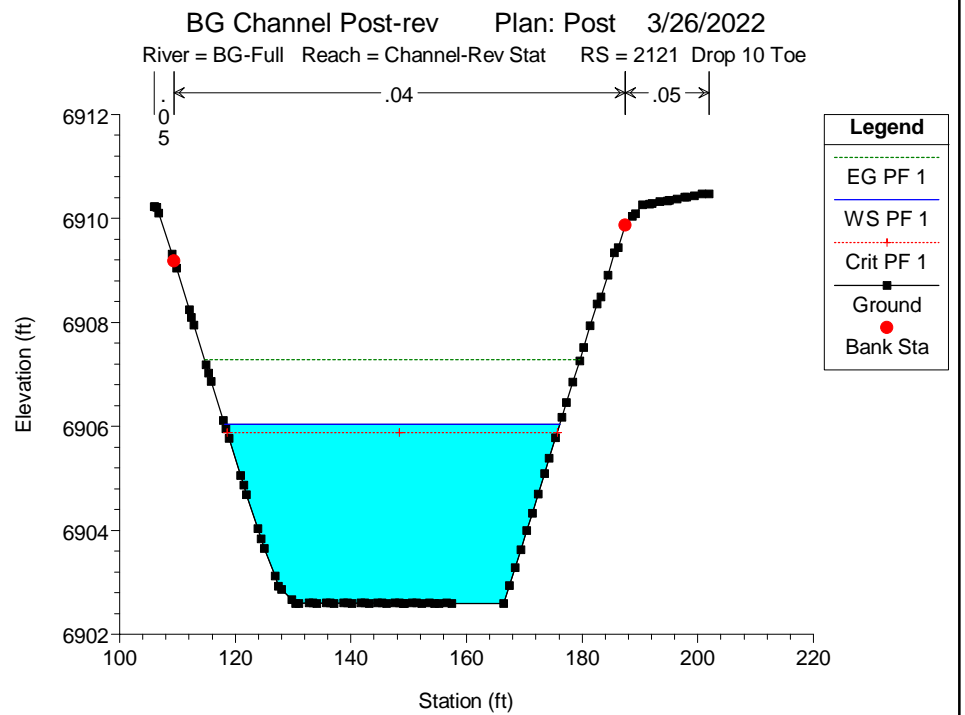
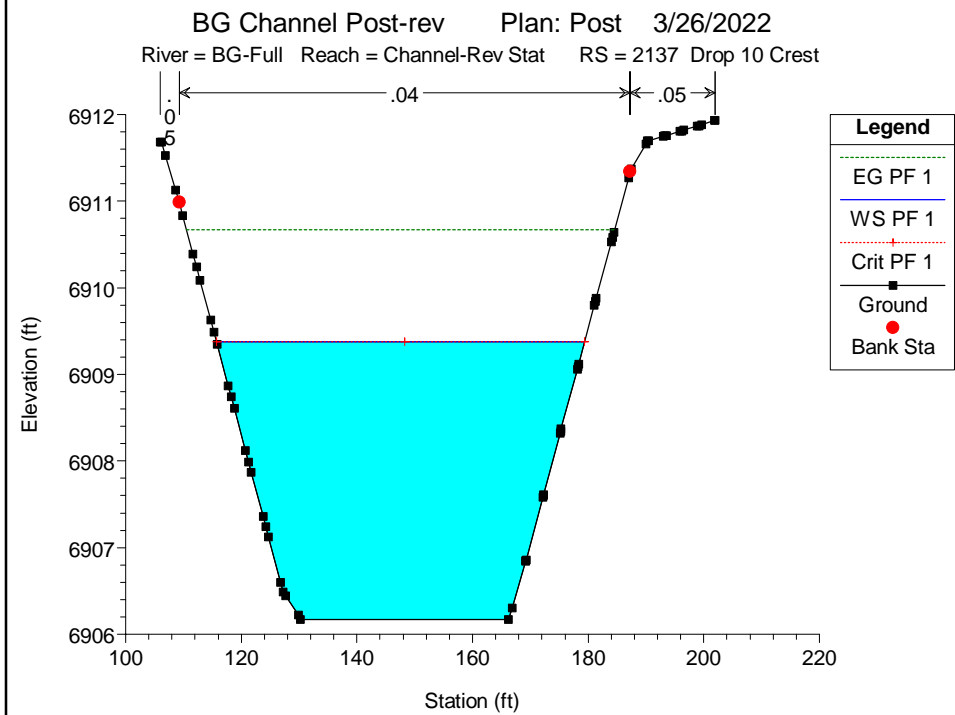
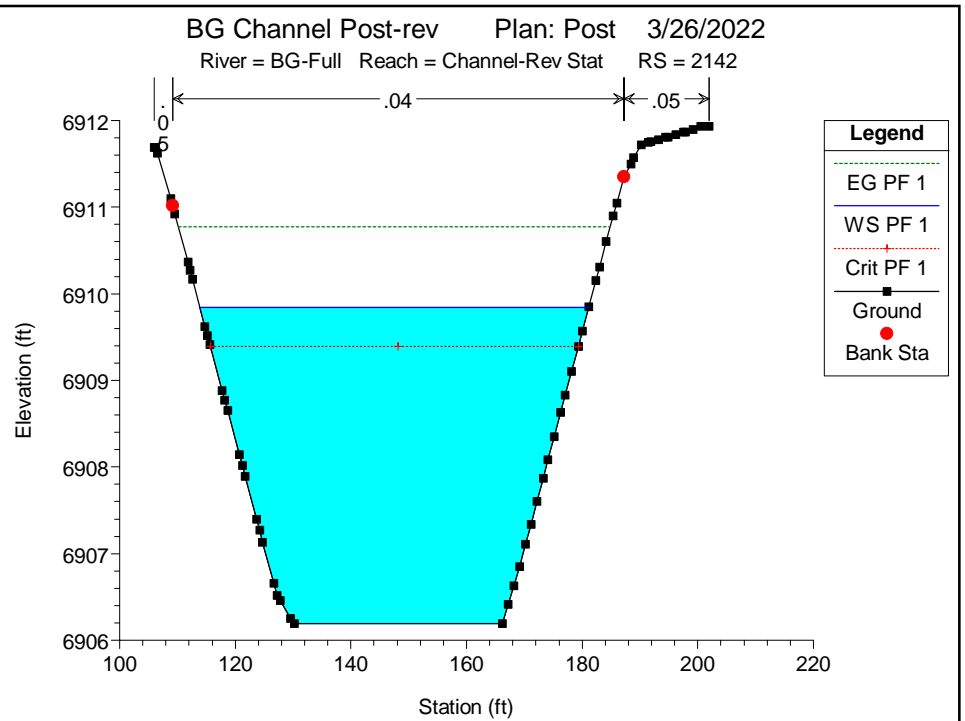
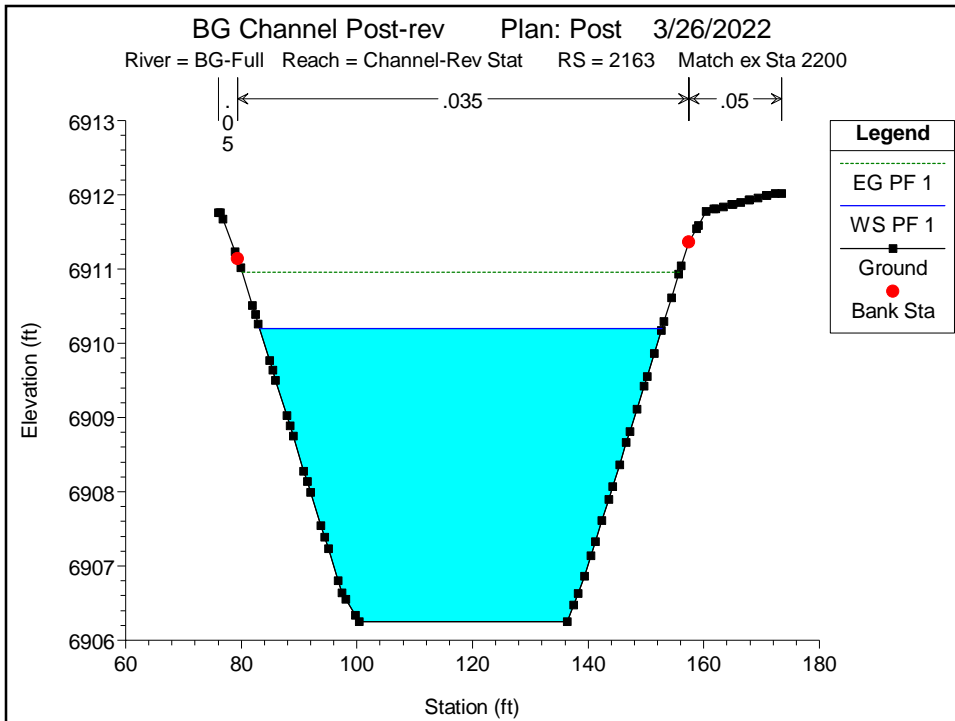


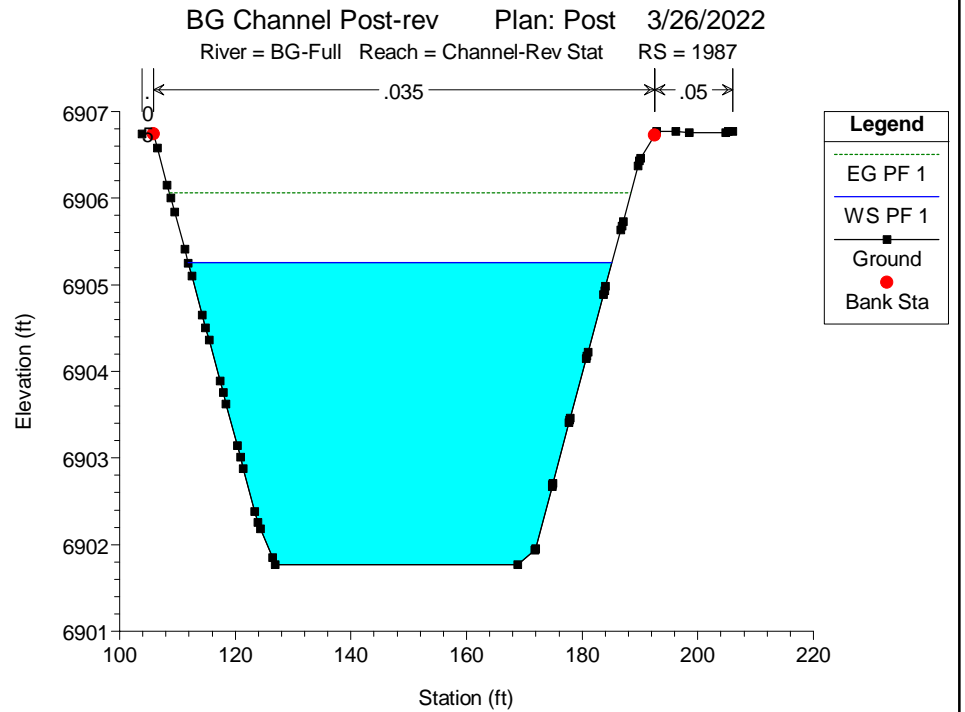
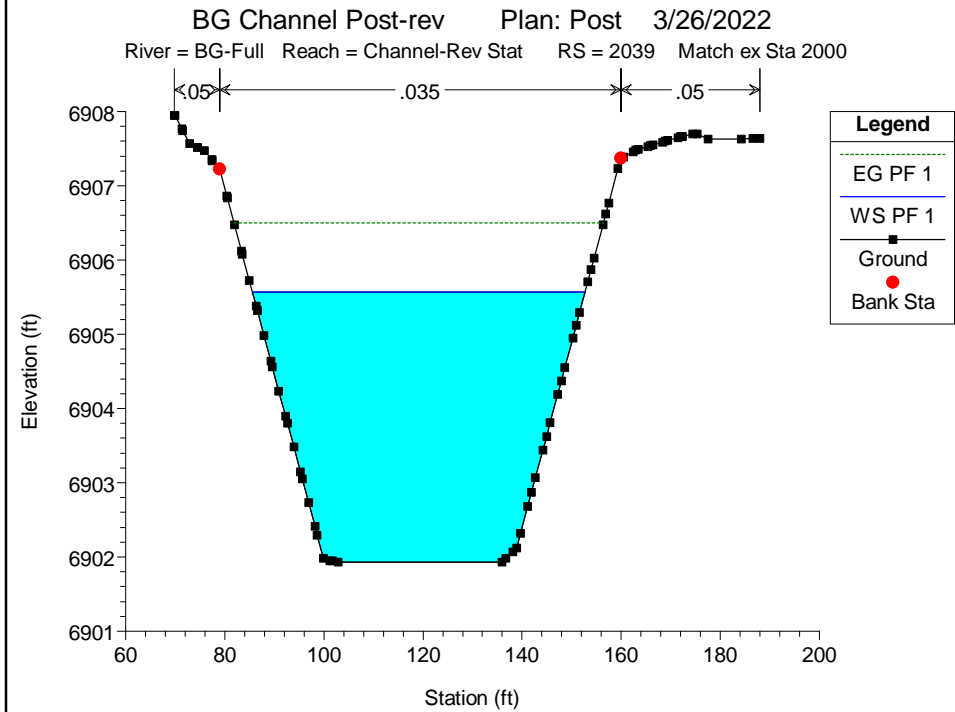
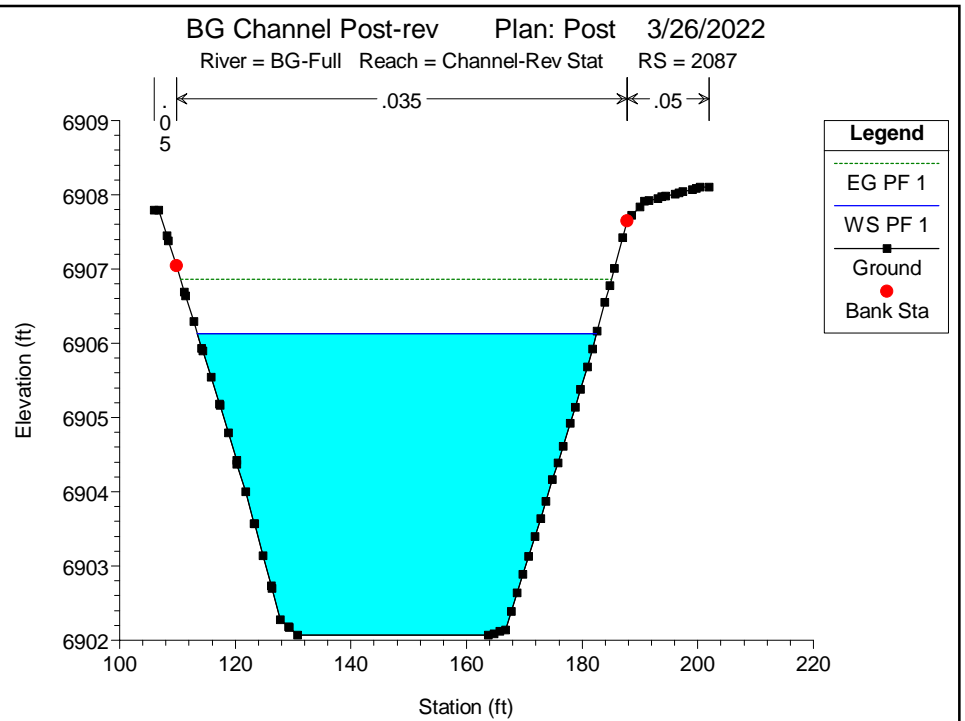
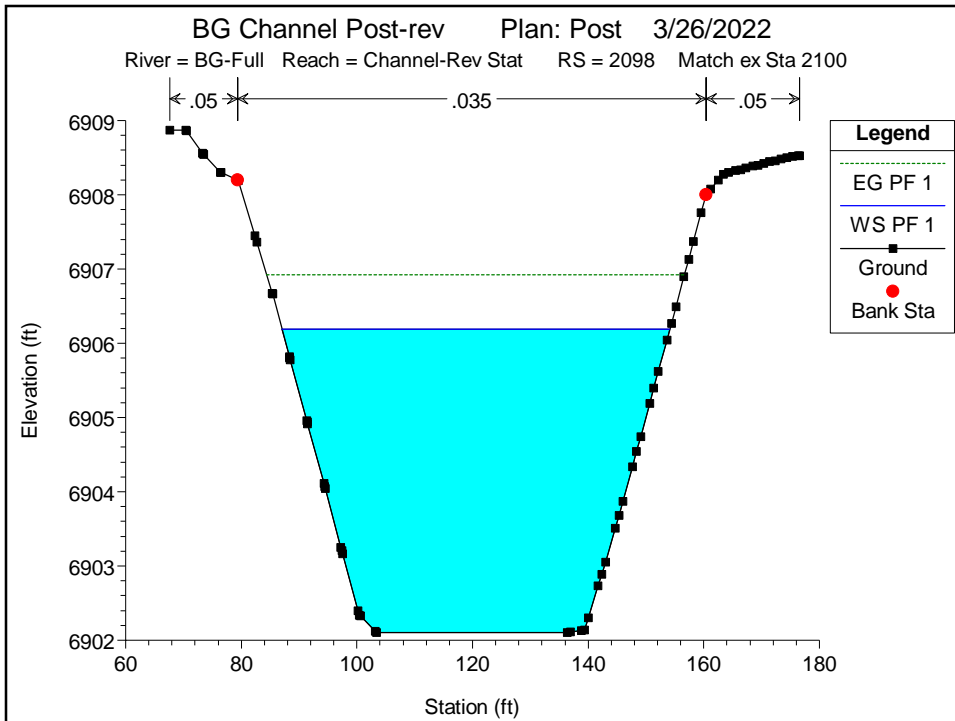


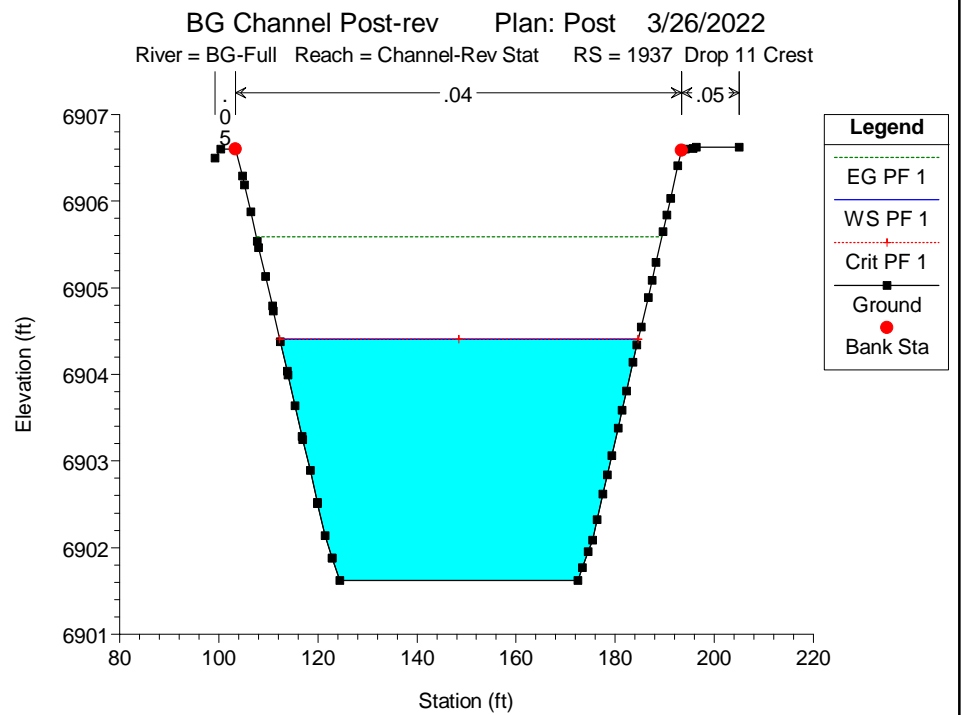
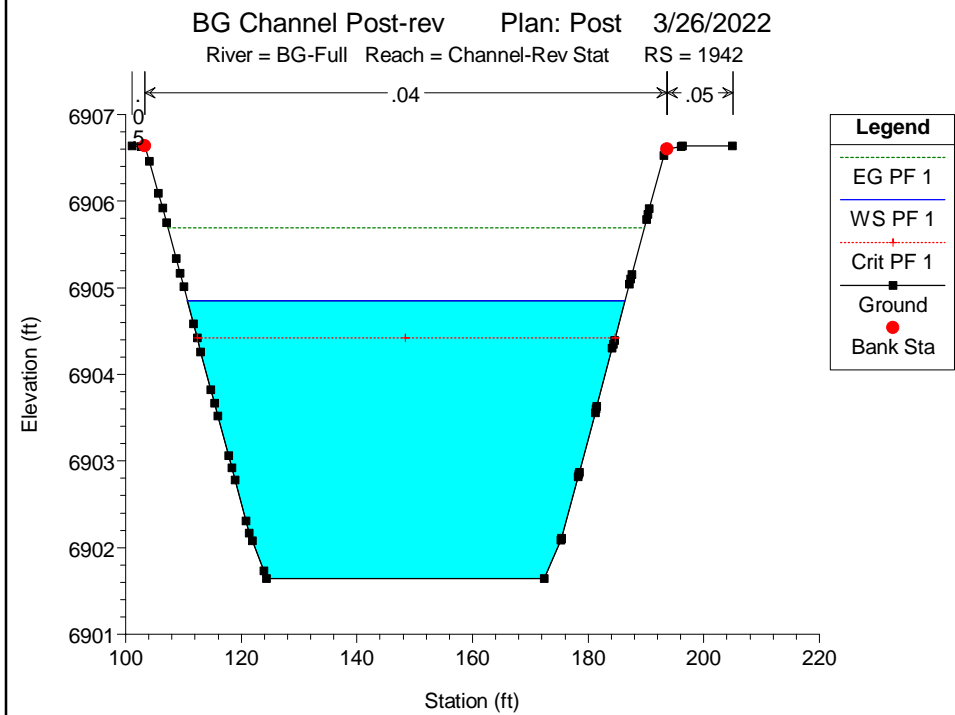
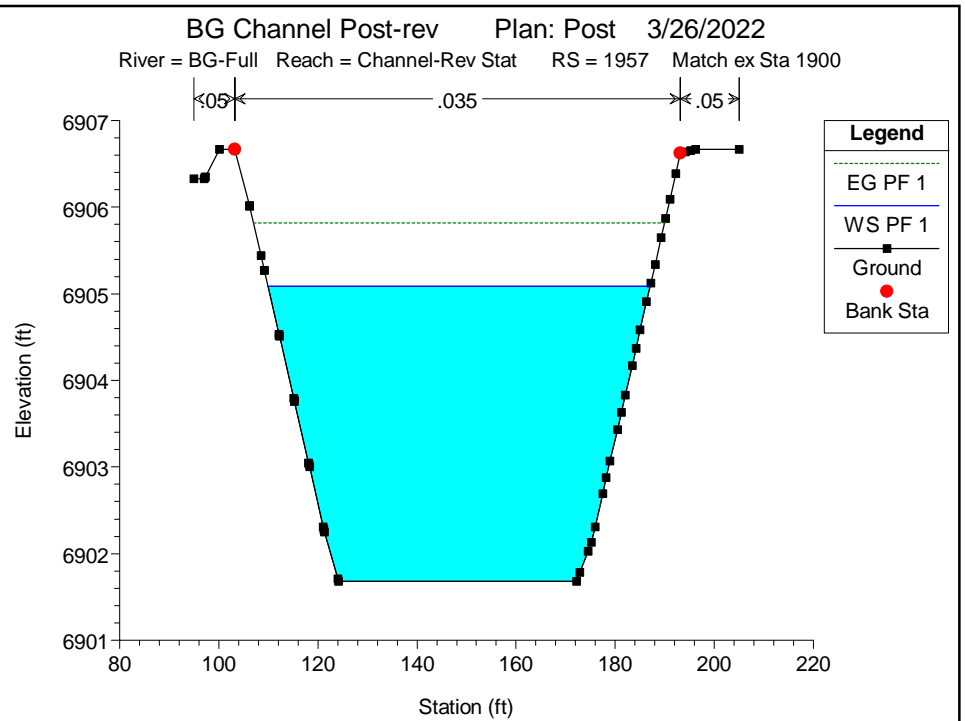
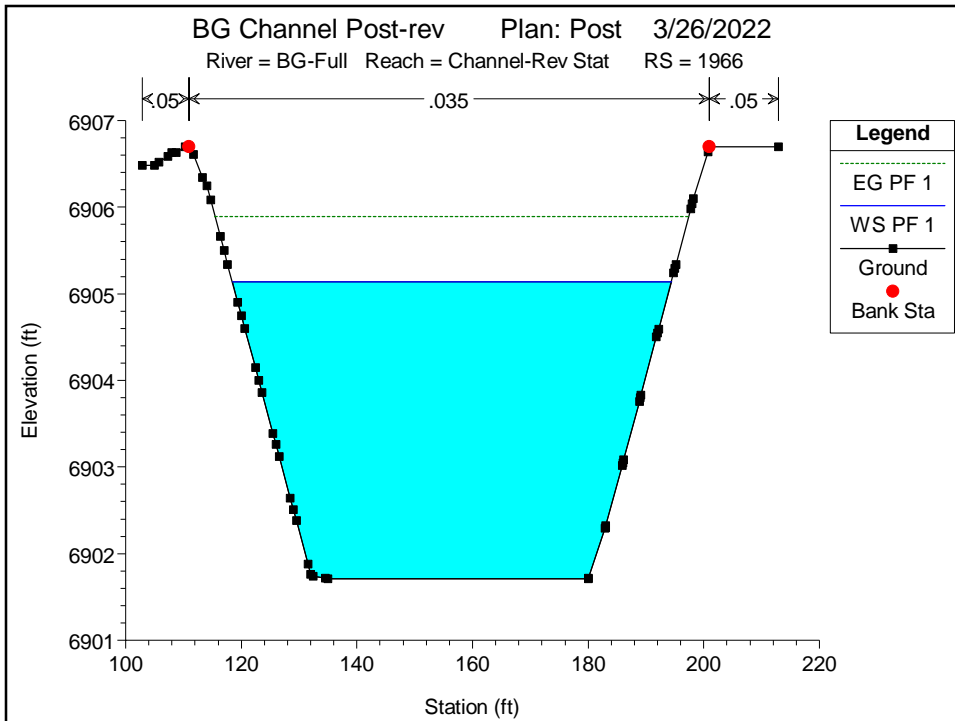


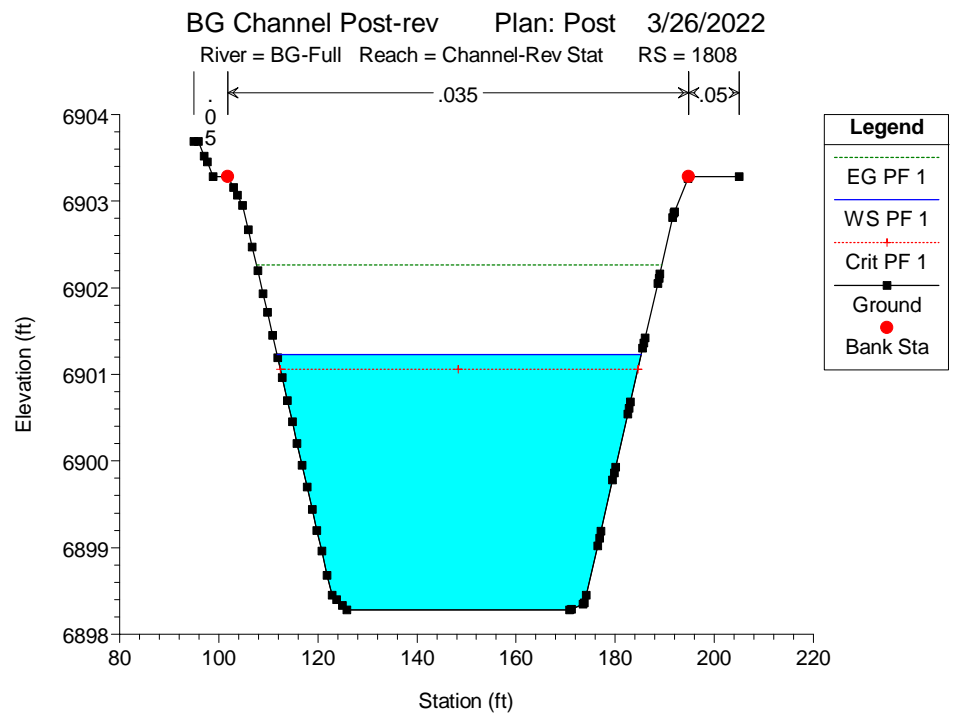
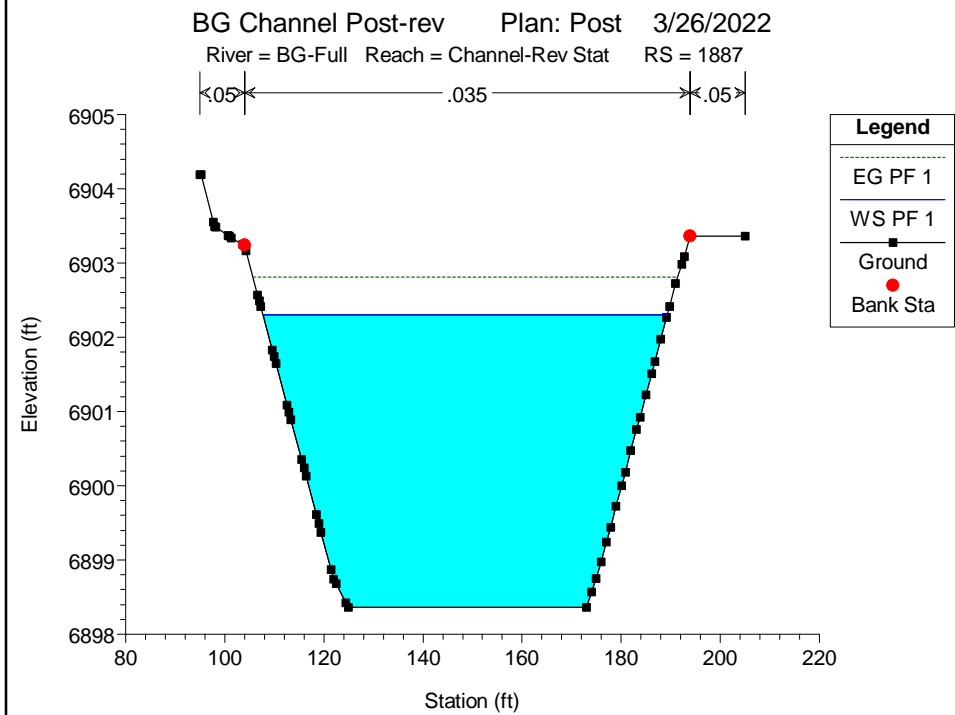
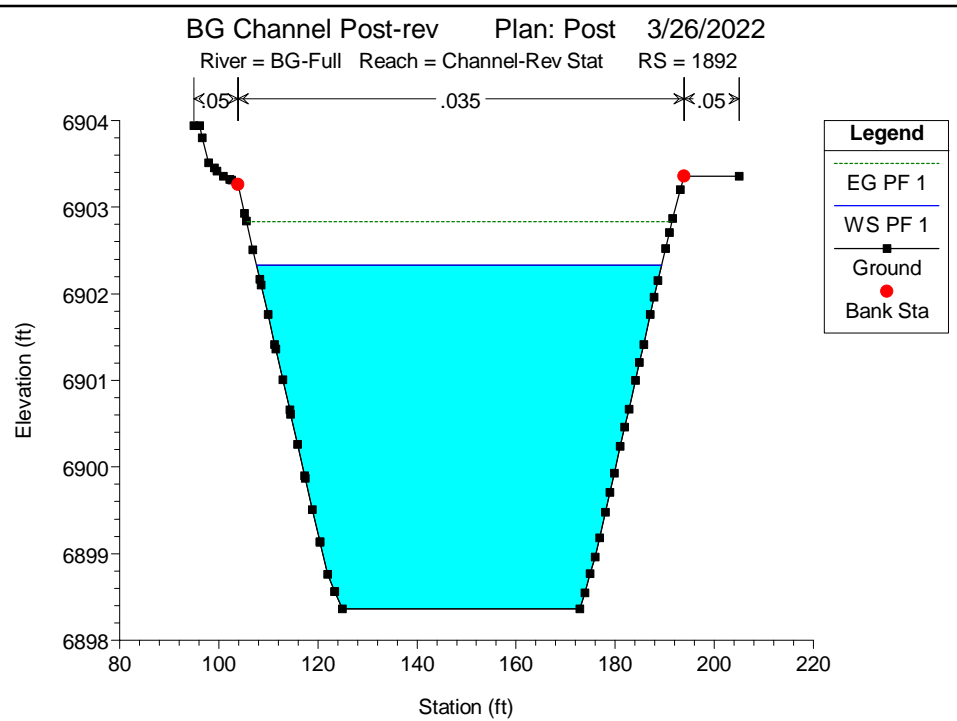
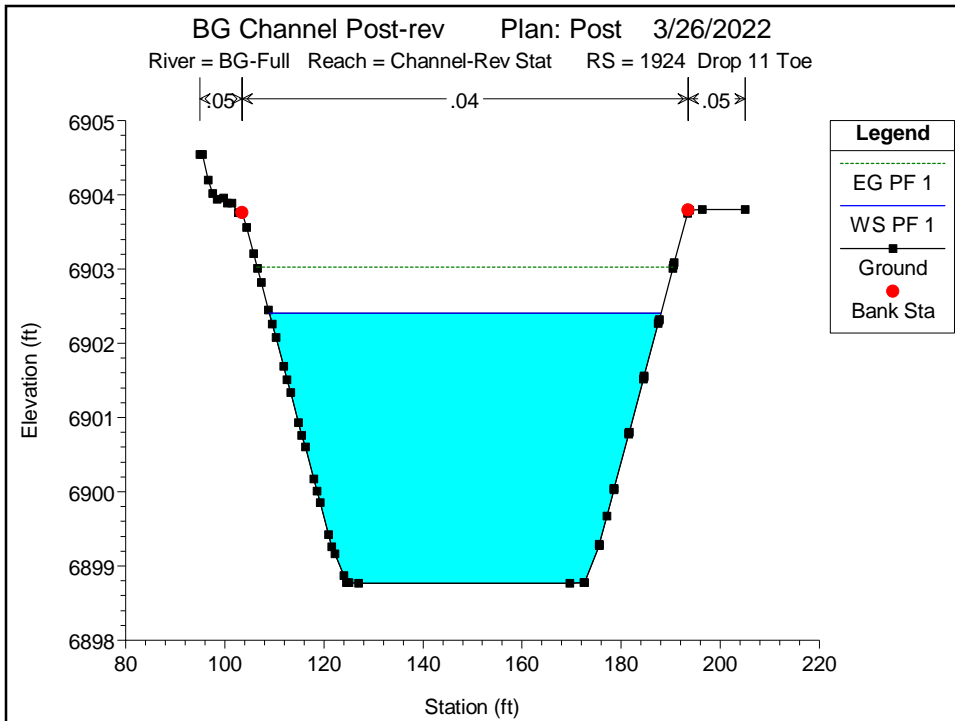


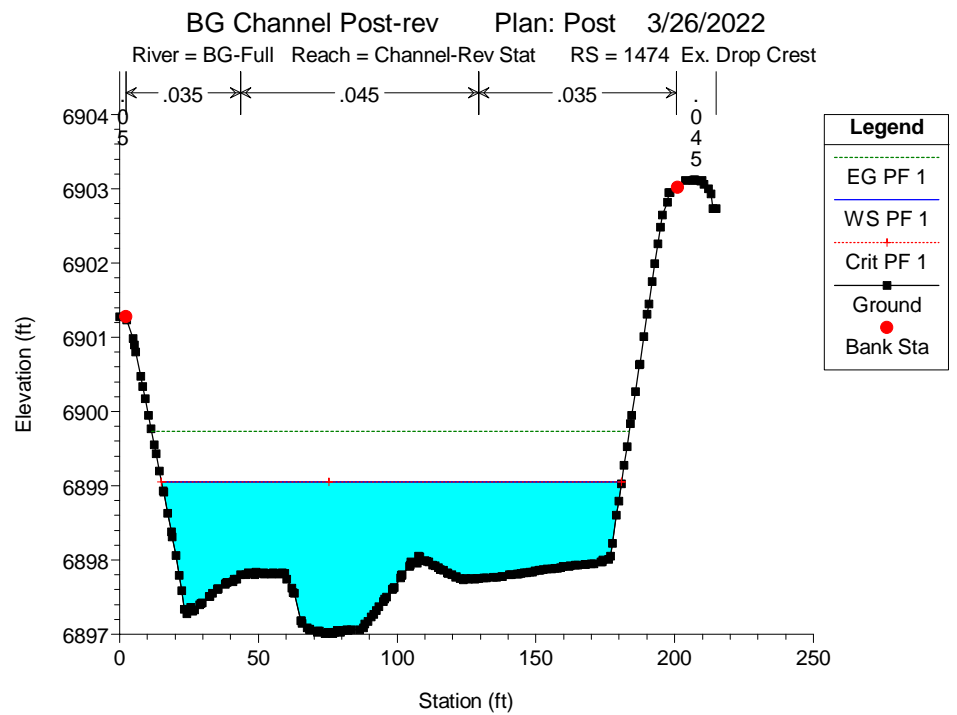
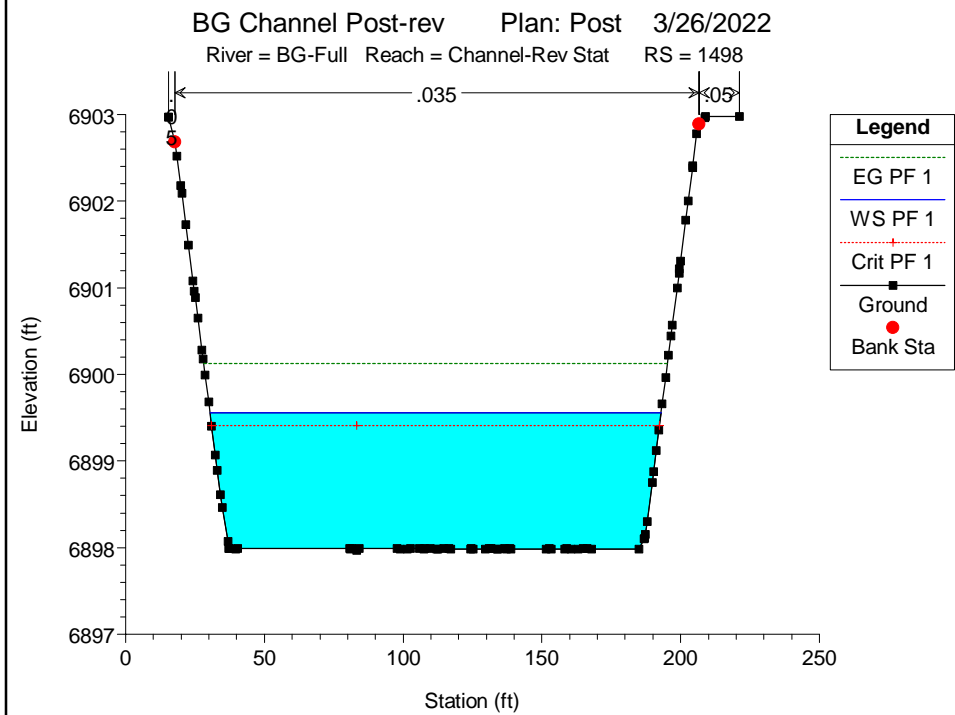
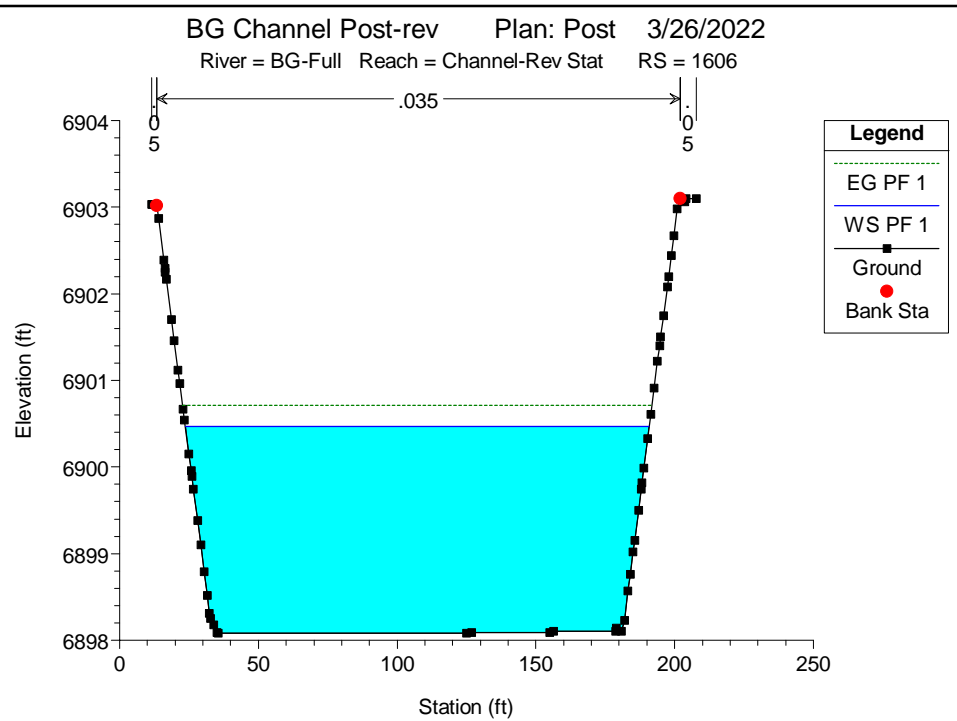
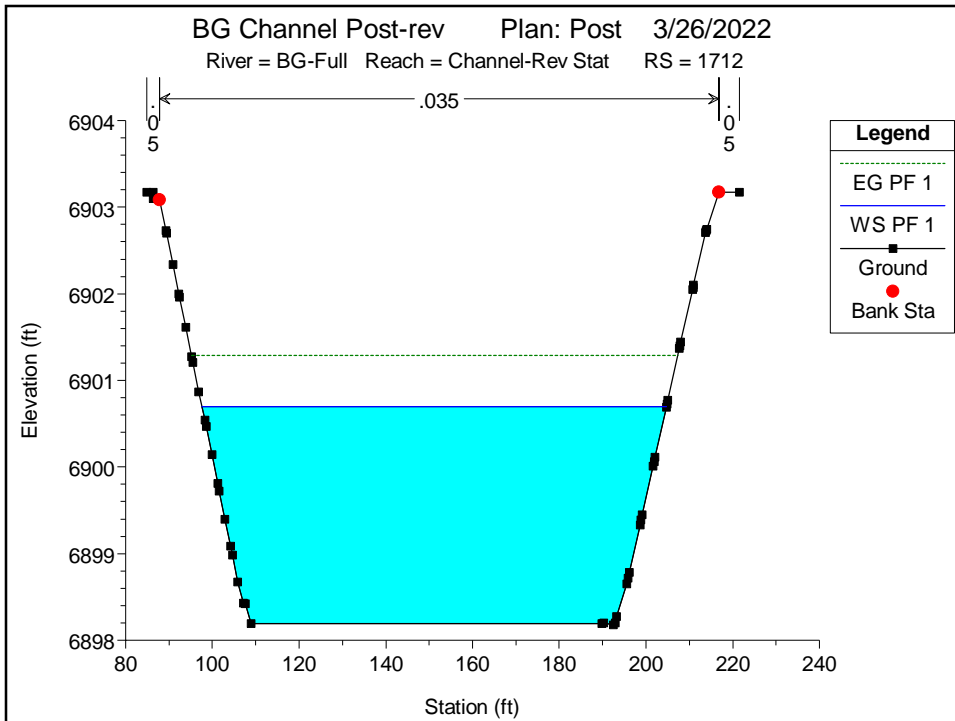


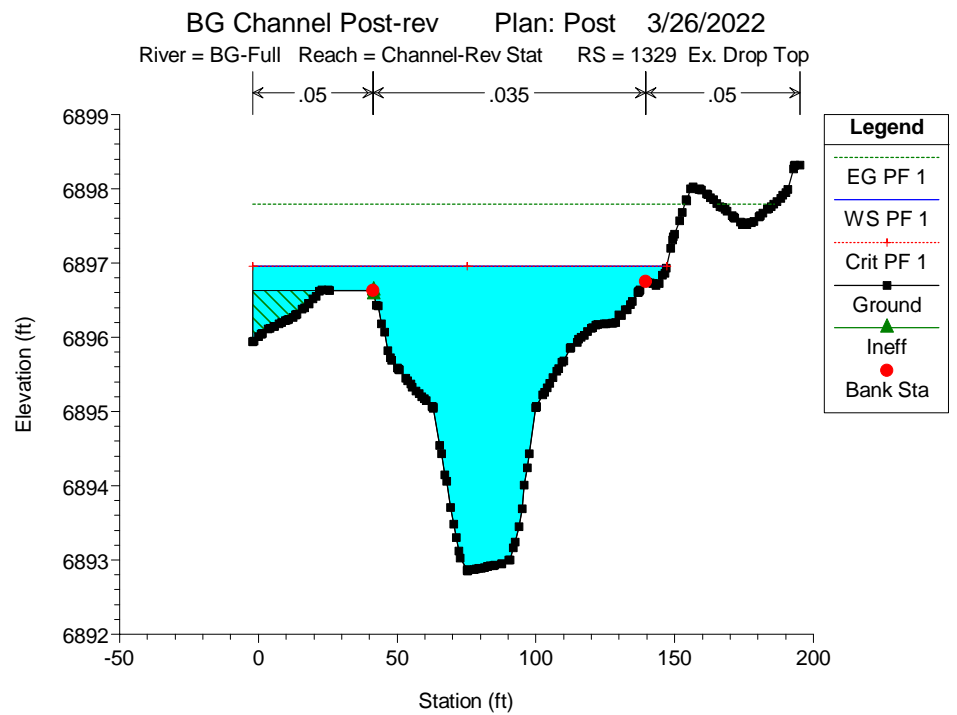
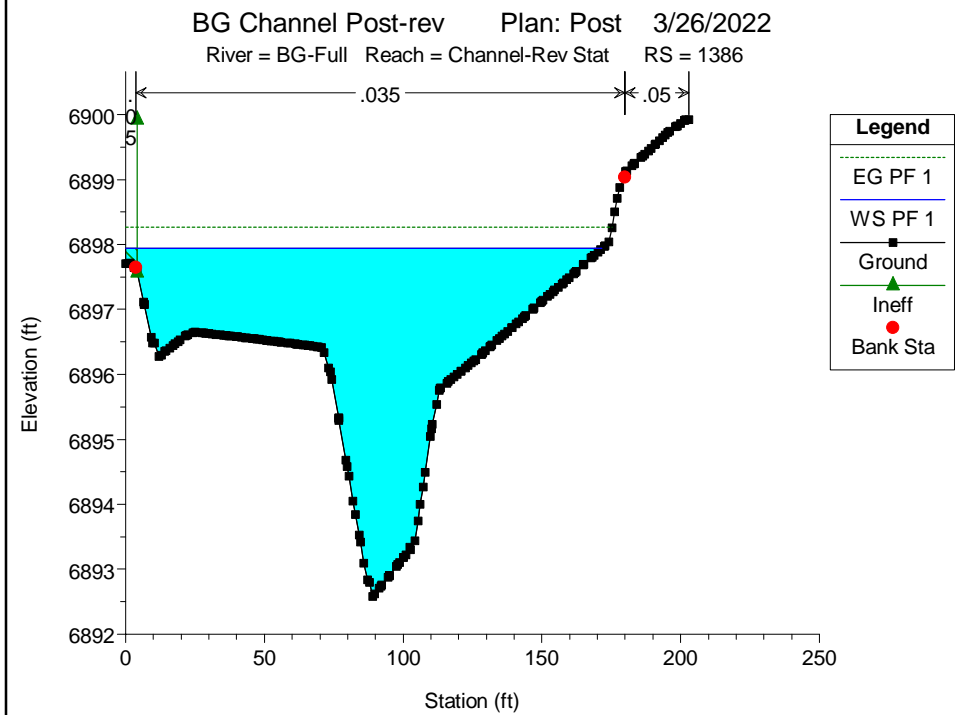
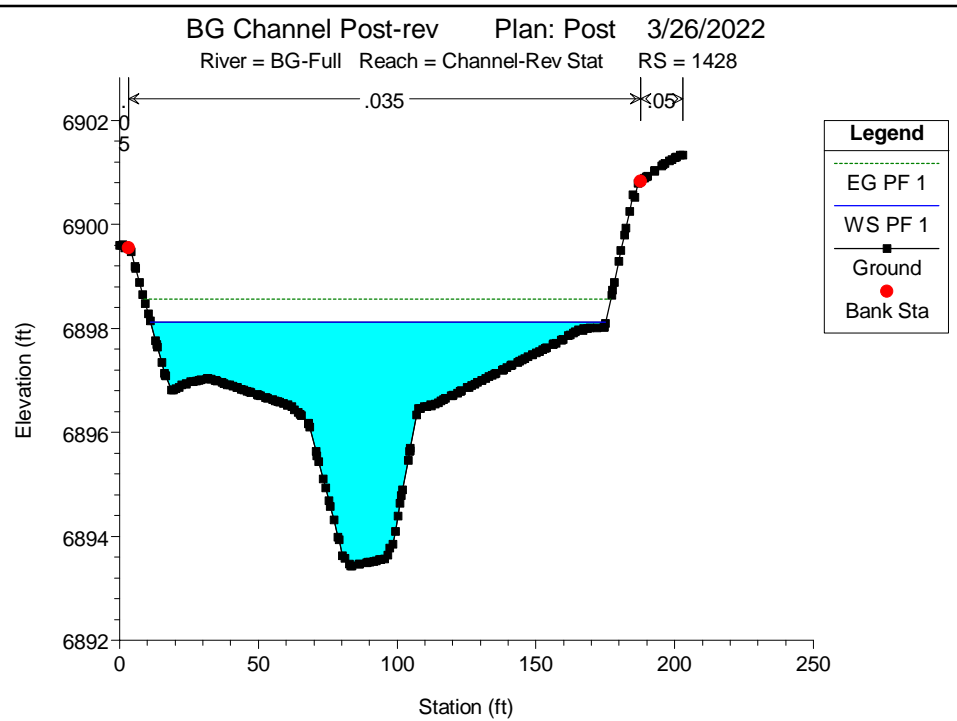
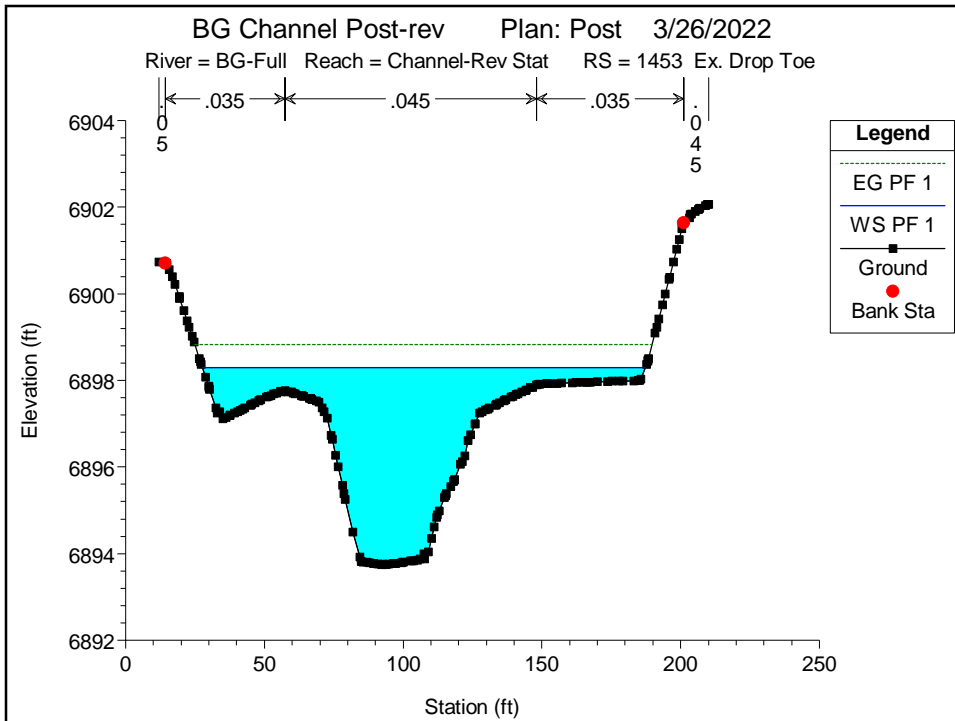


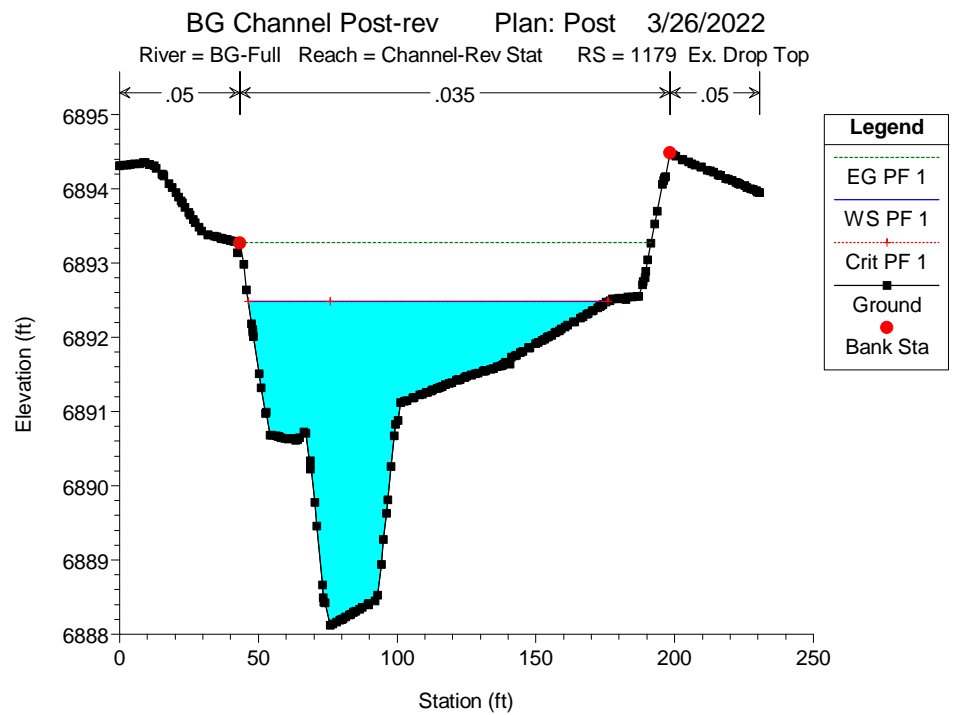
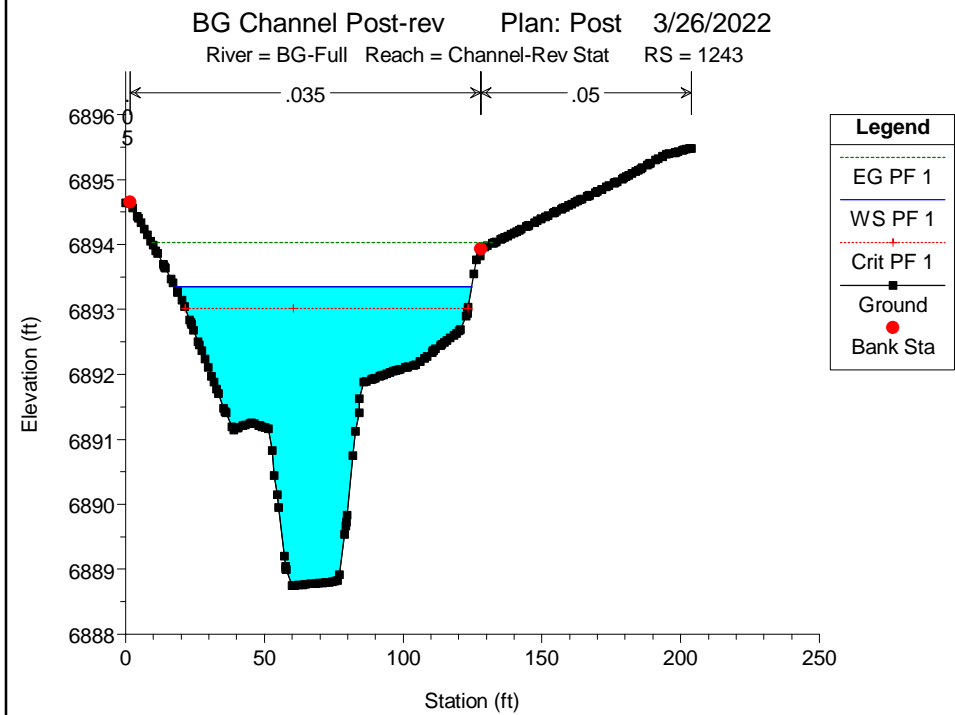
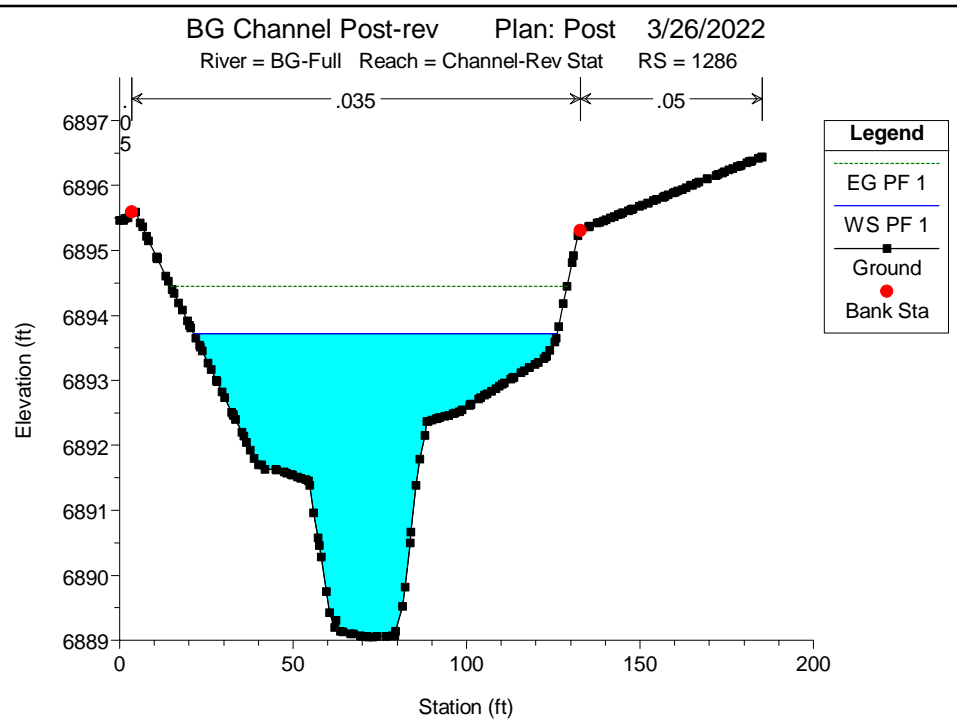
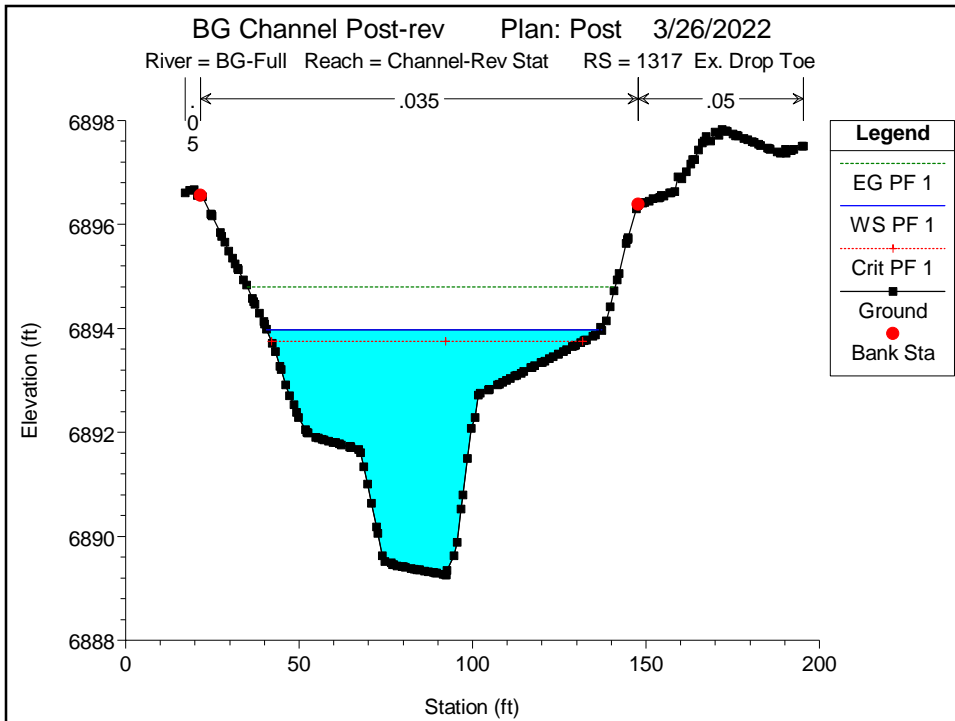


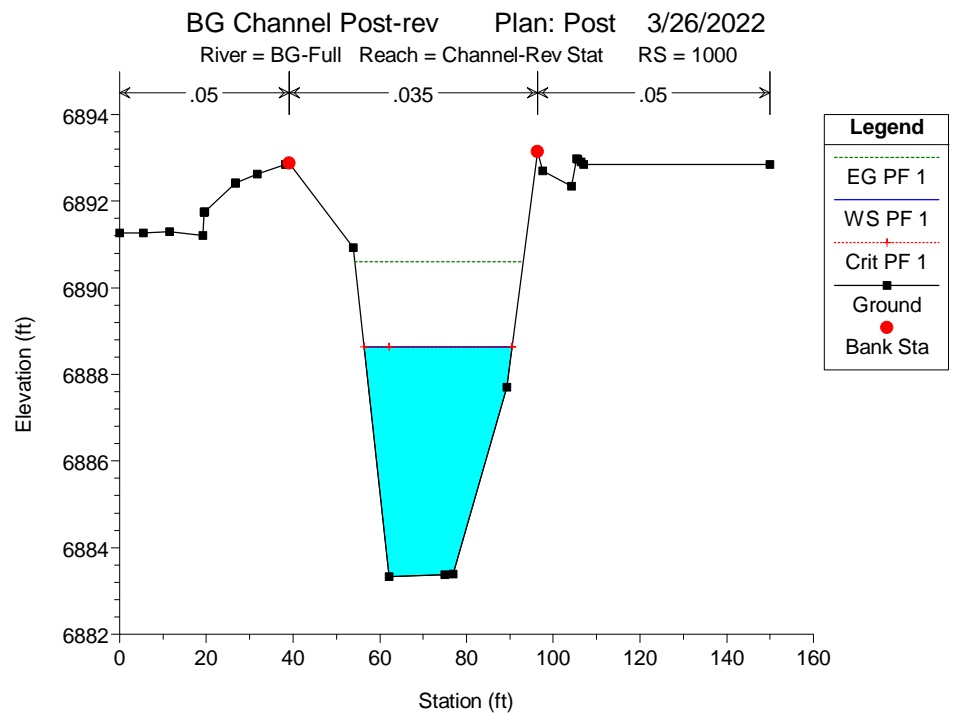
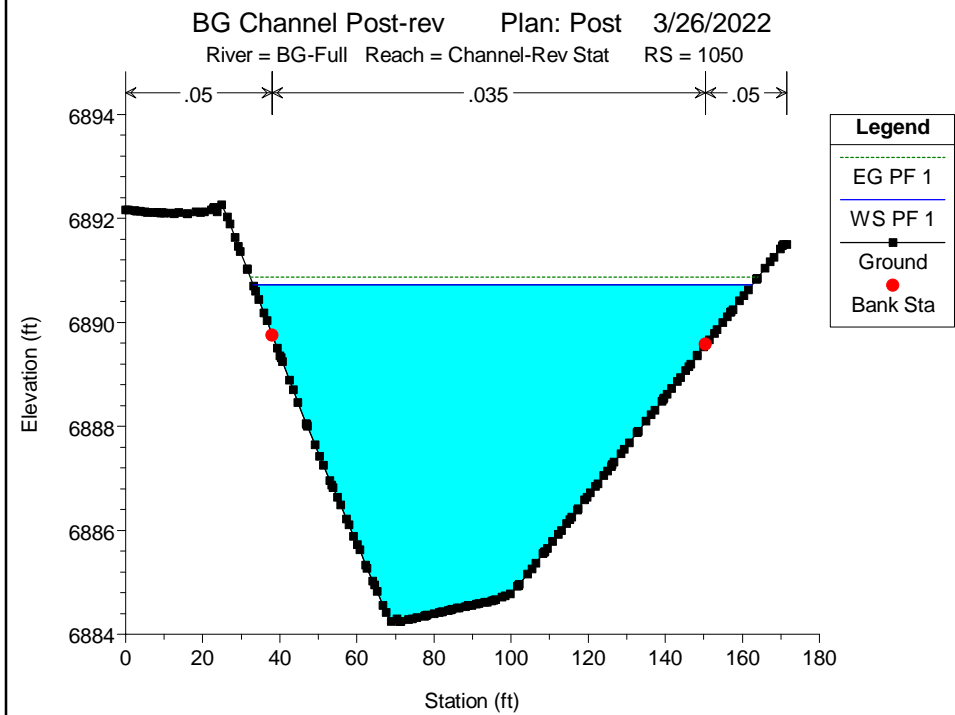
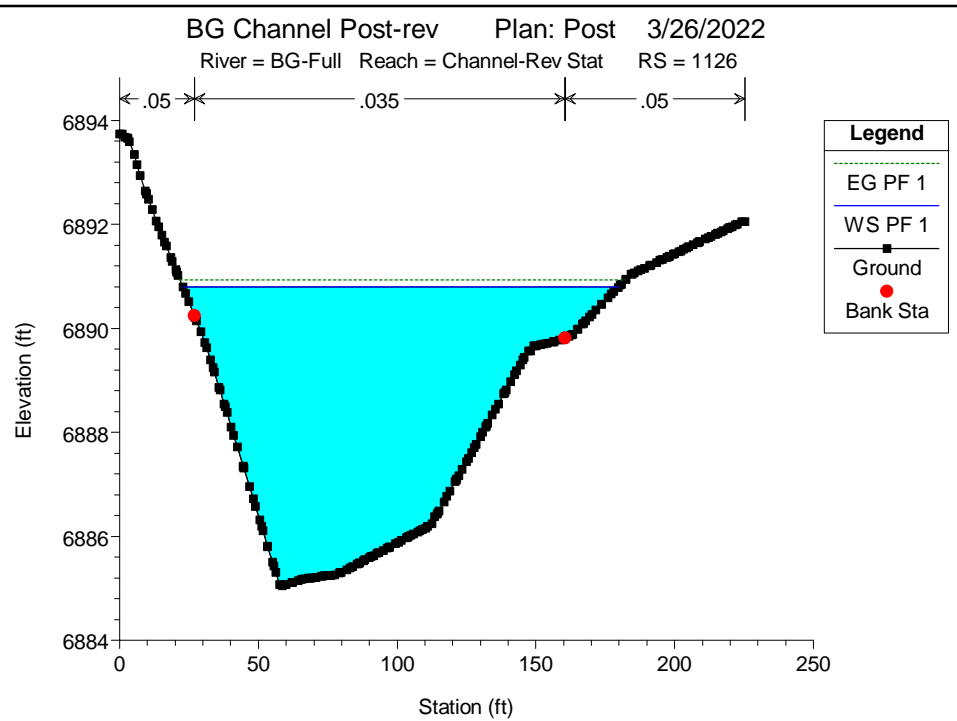
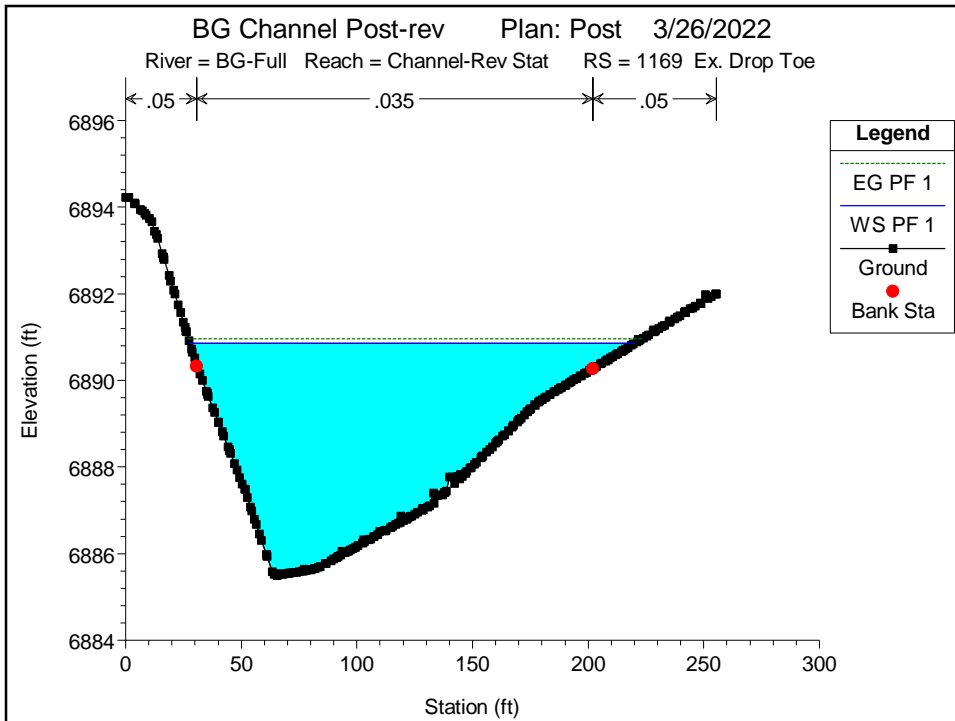












ATTACHMENT O
Cover Page of LOMR No.: 03-08-0385P





Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	EL PASO COUNTY COLORADO (UNINCORPORATED AREAS)	NO PROJECT	HYDROLOGIC ANALYSIS HYDRAULIC ANALYSIS NEW TOPOGRAPHIC DATA BASE MAP CHANGES
	COMMUNITY NO.: 080059		
IDENTIFIER	West Tributary Falcon Basin Zone A Conversion	APPROXIMATE LATITUDE & LONGITUDE: 38.941, -104.619 SOURCE: USGS QUADRANGLE DATUM: NAD 27	

FLOODING SOURCE(S) & REVISED REACH(ES)

Unnamed Tributary to Black Squirrel Creek No. 2 – from approximately 200 feet upstream to approximately 4,300 feet upstream of Woodmen Road

SUMMARY OF REVISIONS

Effective Flooding:	Zone A	No BFEs*
Revised Flooding:	Zone AE	BFEs*
Increases:	YES	YES
Decreases:	YES	NONE

* BFEs – Base Flood Elevations

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO: 08041C0575 F Date: March 17, 1997	PROFILE: 343P SUMMARY OF DISCHARGES TABLE

* FIRM – Flood Insurance Rate Map; ** FBFM – Flood Boundary and Floodway Map; *** FHBM – Flood Hazard Boundary Map

DETERMINATION

This document provides the determination from the Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

Doug Bellomo, P.E., Acting Chief
Hazard Study Branch

Emergency Preparedness and Response Directorate

Version 1.0 10080301DA03080385102

ATTACHMENT P
HEC-2 Output File From Effective Study



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1*****
* WATER SURFACE PROFILES *
* VERSION OF SEPTEMBER 1988 *
* ERROR: 01,02 *
* UPDATED: 4 APRIL 1989 *
* RUN DATE 4/14/ 3 TIME 13: 5:15 *
*****
* U. S. ARMY CORPS OF ENGINEERS *
* THE HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET, SUITE D *
* DAVIS, CALIFORNIA 95616-4687 *
* (916) 756-1104, (916) 551-1748 *
*****

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X X XXXXXXX XXXXX XXXXX
X X X X X X X
X X X X X X X
XXXXXXXX XXXX X XXXXX XXXXX
X X X X X X
X X X X X X
X X XXXXXXX XXXXX XXXXXXX

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END OF BANNER
1 4/14/ 3 13: 5:15 PAGE 1

THIS RUN EXECUTED 4/14/ 3 13: 5:15

HEC2 RELEASE DATED SEP 88 UPDATED APR 1989

ERROR CORR - 01,02
MODIFICATION -

T1 WEST TRIBUTARY FALCON BASIN ZONE A CONVERSION
T2 PROJECT NUMBER 03016 FILENAME WTRB100.DAT
T3 100-YEAR FREQUENCY EX. COND XSEC L TO R FACING UPSTREAM

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
0		3	0	0	.01	0	0	0	6895	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
1		0	-1							
QT	2	111	1482							
NC	.05	.05	.035	.1	.3					
X1	1	14	1130	1240	0	0			0	
GR	6896	1000	6894	1090	6894	1130		6893	1162	6894
GR	6894.2	1255	6894	1270	6893.7	1275		6894	1280	6895
GR	6894	1310	6893.5	1340	6894	1355		6896	1450	1300
X1	2	6	1080	1220	165	155		367		
GR	6901.5	1000	6900	1080	6898	1130		6899	1220	6900
GR	6900.7	1308								1290
X1	3	7	1120	1205	525	522		525		
GR	6912	1000	6910	1102	6906	1110		6904	1172	6906
GR	6908	1230	6910	1420						1205
X1	4	17	1242	1270	560	515		571		
GR	6920	1000	6918	1090	6916.2	1100		6918	1108	6918.2
GR	6918	1127	6917.5	1138	6918	1150		6918	1182	6917.6
GR	6918	1200	6918.4	1222	6918	1242		6914	1258	6916
GR	6918	1305	6919.8	1325						1270
X1	5	13	1150	1195	535	535		551		
GR	6930	1000	6928	1055	6926.2	1065		6928	1072	6929.4
GR	6928	1122	6927.6	1132	6928	1142		6926	1150	6924
GR	6926	1195	6928	1205	6930	1355				1172
QT	2	108	1450							
X1	6	9	1014	1070	560	565		600		
GR	6940	1000	6936	1014	6934	1055		6935.8	1070	6934
GR	6933.8	1088	6934	1096	6936	1105		6940	1138	1080

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X1	7	9	1365	1420	370	375		390		
GR	6950	1000	6948	1090	6946	1365		6944	1375	6942
GR	6944	1410	6946	1420	6948	1490		6950	1620	1385
X1	8	12	1320	1375	470	470		475		
X4	1	6955.5	1250							
GR	6958	1000	6956	1120	6954	1320		6952	1330	6950
GR	6952	1355	6954	1375	6956	1405		6958	1440	6960
GR	6960	1510	6960	1710						1470
X1	9	13	1110	1150	530	620		600		
GR	6976	1000	6974	1055	6972	1080		6970	1090	6968
GR	6966	1110	6964	1135	6964	1150		6966	1180	6968
GR	6970	1220	6972	1275	6974	1325				1190

1 4/14/ 3 13: 5:15 PAGE 3

SECNO	DEPTH	CWSEL	CRISW	WSELK	EG	HV	HL	OLOSS	BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT	
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST	

*PROF 1

CCHV= .100 CEHV= .300

*SECNO 1.000

1.00	2.01	6895.01	.00	6895.00	6895.36	.35	.00	.00	6894.00
1482.	164.	932.	386.	63.	166.	135.	0.	0.	6894.00
.00	2.60	5.62	2.87	.050	.035	.050	.000	6893.00	1044.67
.010134	0.	0.	0.	0	0	3	.00	358.18	1402.85

0

*SECNO 2.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

2.00	2.17	6900.17	6900.17	.00	6900.78	.61	3.75	.08	6900.00
1482.	1.	1356.	125.	1.	209.	47.	2.	2.	6899.00
.01	.67	6.50	2.65	.050	.035	.050	.000	6898.00	1070.96
.013758	165.	367.	155.	2	8	0	.00	223.39	1294.36

0

*SECNO 3.000

3.00	3.00	6907.00	6906.98	.00	6907.92	.91	7.05	.09	6906.00
1482.	2.	1467.	13.	1.	190.	6.	5.	4.	6906.00
.03	1.99	7.71	2.14	.050	.035	.050	.000	6904.00	1108.00
.013101	525.	525.	522.	7	11	0	.00	109.52	1217.52

0

*SECNO 4.000

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

4.00	4.85	6918.85	6918.85	.00	6919.51	.66	5.85	.03	6918.00
1482.	432.	778.	273.	161.	92.	69.	8.	6.	6916.00
.06	2.67	8.46	3.96	.050	.035	.050	.000	6914.00	1051.59
.008404	560.	571.	515.	20	14	0	.00	262.89	1314.48

0

*SECNO 5.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

1 4/14/ 3 13: 5:15 PAGE 4

SECNO	DEPTH	CWSEL	CRIS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNGH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
5.00	4.41	6928.41	6928.41	.00	6929.39	.98	4.40	.10	6926.00
1482.	133.	1297.	52.	51.	154.	20.	12.	9.	6926.00
.08	2.60	8.45	2.52	.050	.035	.050	.000	6924.00	1043.67
.007746	535.	551.	535.	20	11	0	.00	156.96	1235.91

0

*SECNO 6.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

6.00	2.97	6936.77	6936.77	.00	6937.76	.99	6.74	.00	6936.00
1450.	2.	860.	588.	1.	100.	83.	14.	10.	6935.80
.10	2.09	8.56	7.10	.050	.035	.050	.000	6933.80	1011.32
.018718	560.	600.	565.	10	19	0	.00	100.01	1111.32

0

*SECNO 7.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

7.00	4.87	6946.87	6946.87	.00	6947.76	.89	4.35	.01	6946.00
1450.	77.	1353.	20.	52.	173.	13.	16.	12.	6946.00
.11	1.48	7.83	1.48	.050	.035	.050	.000	6942.00	1245.22
.007498	370.	390.	375.	10	14	0	.00	205.26	1450.49

0

*SECNO 8.000

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

8.00	5.02	6955.02	6955.02	.00	6956.13	1.11	4.10	.07	6954.00
1450.	46.	1390.	15.	24.	161.	8.	18.	13.	6954.00
.13	1.90	8.63	1.89	.050	.035	.050	.000	6950.00	1272.54
.010031	470.	475.	470.	20	8	0	.00	117.72	1390.26

0

*SECNO 9.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

9.00	3.28	6967.28	6967.28	.00	6968.43	1.15	7.05	.01	6966.00
1450.	10.	1016.	424.	4.	106.	72.	21.	15.	6964.00
.15	2.56	9.57	5.86	.050	.035	.050	.000	6964.00	1103.61
.013882	530.	600.	620.	10	14	0	.00	82.77	1186.39

1 4/14/ 3 13: 5:15 PAGE 5

***** THIS RUN EXECUTED 4/14/ 3 13: 5:15

HEC2 RELEASE DATED SEP 88 UPDATED APR 1989

ERROR CORR - 01,02

MODIFICATION -

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

100-YEAR FREQUENCY EX. C

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIS	EG	10*KS	VCH	AREA	.01K
1.000	.00	.00	.00	6893.00	1482.00	6895.01	.00	6895.36	101.34	5.62	363.62	147.22

*	2.000	367.00	.00	.00	6898.00	1482.00	6900.17	6900.17	6900.78	137.58	6.50	256.72	126.35
	3.000	525.00	.00	.00	6904.00	1482.00	6907.00	6906.98	6907.92	131.01	7.71	197.41	129.48
*	4.000	571.00	.00	.00	6914.00	1482.00	6918.85	6918.85	6919.51	84.04	8.46	322.19	161.66
*	5.000	551.00	.00	.00	6924.00	1482.00	6928.41	6928.41	6929.39	77.46	8.45	225.25	168.39
*	6.000	600.00	.00	.00	6933.80	1450.00	6936.77	6936.77	6937.76	187.18	8.56	184.32	105.98
*	7.000	390.00	.00	.00	6942.00	1450.00	6946.87	6946.87	6947.76	74.98	7.83	238.36	167.45
*	8.000	475.00	.00	.00	6950.00	1450.00	6955.02	6955.02	6956.13	100.31	8.63	192.84	144.78
*	9.000	600.00	.00	.00	6964.00	1450.00	6967.28	6967.28	6968.43	138.82	9.57	182.57	123.07

1

4/14/ 3 13: 5:15

PAGE 6

100-YEAR FREQUENCY EX. C

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	1482.00	6895.01	.00	.00	.01	358.18	.00
*	2.000	1482.00	6900.17	.00	5.16	.00	223.39	367.00
	3.000	1482.00	6907.00	.00	6.83	.00	109.52	525.00
*	4.000	1482.00	6918.85	.00	11.85	.00	262.89	571.00
*	5.000	1482.00	6928.41	.00	9.56	.00	156.96	551.00
*	6.000	1450.00	6936.77	.00	8.35	.00	100.01	600.00
*	7.000	1450.00	6946.87	.00	10.10	.00	205.26	390.00
*	8.000	1450.00	6955.02	.00	8.15	.00	117.72	475.00
*	9.000	1450.00	6967.28	.00	12.26	.00	82.77	600.00

1

4/14/ 3 13: 5:15

PAGE 7

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 2.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 4.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 4.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 4.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 5.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 5.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 5.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 6.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 7.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 8.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 9.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 9.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY