

APPENDIX 1

Draft: Basis of Design Report

Ossum Wash Repair Project

OCTOBER 2025

Prepared for:

VICTOR VALLEY WASTEWATER RECLAMATION AUTHORITY
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1 Introduction

Victor Valley Wastewater Reclamation Authority (VWRA) owns two existing gravity trunk sewer pipelines (36-in RCP and 42-in VCP) that cross Ossum Wash. These large diameter sewer pipelines transport around 1-MG of the City of Victorville's daily sewage. After recent heavy rain events, the existing grade above these pipelines has eroded substantially. VWRA is concerned that future rain events might expose the two pipelines, making them susceptible to a pipe break and sewage spill from bedload or debris travelling down the wash during a rain event. The two existing pipelines are estimated to have approximately 4-ft of cover remaining above them. VWRA is proposing to construct emergency improvements to the wash to mitigate the risk of pipe exposure and damage.

The proposed project is located within Ossum Wash in Victorville, CA. Ossum Wash is an ephemeral desert wash tributary to the Mojave River. Ossum Wash runs North-South, flowing northerly to its confluence with the Mojave River, approximately 850-feet north of Turner Road. Turner Road runs East-West and the project area is located north of where the wash crosses Turner Road. For details of the project location refer to [Figure 1.1: Vicinity Map](#) and [Figure 1.2: Location Map](#).

1.1 Existing Conditions

The wash upstream of Turner Road is a natural desert wash with sandy earthen wash bottom and earthen banks. The wash crosses Turner Road via an Arizona crossing with a concrete spillway downstream of Turner Road. The concrete spillway transitions to a grouted riprap lined channel consisting of rubble and earthen materials. The grouted riprap abruptly ends and transitions to natural desert wash with an approximately 3-foot drop caused by erosion immediately downstream of the grouted riprap channel terminus. A review of recent historical aerial imagery shows evidence of erosion within the invert and side slopes in the project area.

1.2 Proposed Conditions

To address the critical erosion issues within the wash described above, VWRA hired Dudek to design emergency improvements to protect the sewer lines. The proposed improvements include the following:

- Installing grouted riprap on the channel side slope along the easterly side of the existing grouted riprap channel.
- Installing an extension of the grouted riprap channel from the downstream end of the existing grouted riprap to the northerly extent of the VWRA pipeline easement.
- Installing loose riprap lined channel downstream of the proposed grouted riprap.

For details of the proposed improvements, an excerpt of the Improvement Plans can be found in Appendix A. The following sections provide the design hydrology, hydraulic assumptions, methodology, calculations and proposed design.

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2 Hydrology

The design flowrate is based upon hydrology developed in the report titled, *Victorville Master Plan of Drainage for Oro Grande Wash and Adjacent Watersheds that are Tributary to the Mojave River – Volume III - Plans and Profiles* (MPD), dated March 1992. Appendix B contains the relevant pages and representative drainage area from the MPD. The full MPD is available from the San Bernardino County Flood Control District. The proposed flowrate from the MPD report for Ossum Wash Creek at Turner Road is provided in **Table 2.1. Project Reach Peak Flow Rate**. The hydraulic analysis uses the 100-year flowrate.

Table 2.1. Project Reach Peak Flow Rate

Location	100-Year Flow Rate (cfs)
Upstream of Turner Road	4,876

3 Hydraulics

San Bernardino County design criteria references Los Angeles County Flood Control District's (LACFCD) *Hydraulic Design Manual* (LACFCD HDM) (1982) and to the State of California Department of Transportation *Highway Design Manual* (Caltrans HDM). These standards were used to develop the proposed improvements and are referenced throughout the remainder of the report.

3.1 Hydraulic Modeling

Hydraulic analysis was performed using the Hydrologic Engineering Center River Analysis System (HEC-RAS) version 6.6 developed by the US Army Corps of Engineers (USACE). An existing conditions model was created to characterize the existing condition and provide a base model for comparison to evaluate the effectiveness of the proposed improvements. A proposed condition model was created to represent the proposed improvements. For details of proposed improvements, refer to Appendix A for the Improvement Plans. The results of the proposed conditions model informed the armor protection selection for wash bottom and bank.

A steady state 1-dimensional model was used for the analysis. The hydraulic model used a mixed flow regime, allowing flow to transition between subcritical, critical, and supercritical regimes. Flows are expected in each flow regime based on steep slopes and other hydraulic conditions along the model reach. To be consistent with FEMA modeling standards, additional model plans were run using a subcritical flow regime.

The underlying terrain within the model uses a combination of survey data acquired by Dudek subconsultant Cabrinha, Hearn & Associates (CH&A) within the project area, the 2013 3-ft grid resolution LiDAR DEM data from San Bernardino County Flood Control and obtained from the United States Geological Survey's (USGS) *The National Map (TNM) Download* website for areas outside of the survey extents, and the proposed design developed in Civil3D.

River centerline definition is based on existing conditions topography data and aerial imagery. Cross sections were aligned perpendicular to apparent flow direction in all locations. Dog-leg alignments were used in some cross sections to accurately represent flow direction and cross section data. Cross sections were cut to represent the flow conveyance. The cross section spacing was varied to ensure that the geometry changes along the project limits were accurately modeled. These cross section geometries were obtained using HEC-RAS RAS Mapper (the built-in HEC-RAS GIS interface) by overlaying the cross-section alignments on the terrain data. This method created multi-point cross sections for modeling.

The existing wash upstream of Turner Road is in a semi-natural state and is not sized to convey the 100-year event. To contain flow within model cross sections, cross sections were extended and dog-legged in this reach. Downstream of Turner Road, the existing wash is incised, allowing for additional conveyance as compared to upstream. The project limits occur within the incised reach. To assess a flow condition where all the 100-year flow enters the channel within the project limits, the model cross section extents were shortened to the channel width. See the hydraulic workmap in Appendix C.

The model longitudinally extends from approximately 500-ft upstream of the proposed project area to approximately 500-ft downstream of the proposed project area to ensure model boundary conditions do not influence the hydraulics within the project area. The upstream and downstream boundary conditions for the hydraulic model were

set at normal depth using the existing channel slopes upstream and downstream of the model extents. Boundary conditions are shown in **Table 3.1: Ossum Wash Boundary Conditions**.

Table 3.1: Ossum Wash Boundary Conditions

Location	Type	Slope (ft/ft)
Upstream	Normal Depth	0.020
Downstream	Normal Depth	0.007

An additional model analysis considered the potential influence of the Mojave River on Ossum Wash hydraulic conditions at the Project site. The downstream boundary condition was set to the Mojave River's base flood elevation (BFE – the 100-year flood water surface elevation), interpolated from the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) Flood Profile for the Mojave River. Analysis showed that the Mojave River's influence did not affect hydraulic conditions within the improvement extents. Digital files of this run are included in with the submittal.

The model requires channel roughness coefficients (Manning's n-values) to represent different channel roughness conditions. The n-value assignment is based upon engineering judgement, field observations, aerial imagery, the reference tables for Manning's n values found in Chow's *Open Channel Hydraulics*, and the Manning-Strickler equation for riprap values.

It is noted that the grouted riprap in existing conditions is smoother than the proposed grouted riprap. The existing conditions appear to show a condition of mostly grout with some rock protrusions visible, more akin to concrete channel than that of a grouted rock channel. See **Figure 3.1** on the following page, for a photo of the existing grouted channel. In the proposed conditions, larger diameter rock will be utilized and proposed to be constructed such that 1/3 to 1/2 of the diameter of the rock shall be exposed, inducing a higher roughness condition. To account for the differences in roughness elements between existing and proposed conditions, the Manning's roughness coefficients were assigned differently. The n-values used in the analysis are shown in **Table 3.2: Hydraulic Model Manning's Roughness Coefficients** below.

Table 3.2: Hydraulic Model Manning's Roughness Coefficients

Description	n-value
Desert Wash Earthen	0.030
Desert Wash Banks and Overbanks	0.040
Existing Grouted Riprap – Channel Bottom	0.022
Asphalt and Concrete Spillway off Turner Road	0.020
Proposed Riprap Banks and Exit Apron	0.047
Proposed Grouted Riprap Extension	0.033

Proposed riprap n-values were calculated using the Manning-Strickler equation as follows:

$$n = 0.0395d_{50}^{1/6} \quad (4.31)$$

where:

n = Manning roughness coefficient (dimensionless)
 d_{50} = median stone diameter (feet)



Figure 3.1: Existing Conditions Grouted Rock Channel

Dudek selected riprap sizes using this equation and resulting channel velocities from these analyses. Riprap sizing is discussed in [Section 3.2 – Riprap](#).

The operating depth of the channel varies within the project reach. There is no minimum freeboard requirement because the channel is not a flood control structure. However, the average 100-year depth is 4.4-ft and the average channel depth is 8.6-ft resulting in an average freeboard of 4.2-ft.

A hydraulic workmap and the results of the hydraulic modeling are included in Appendix C.

3.2 Riprap

The existing grouted riprap channel is proposed to be extended and followed by loose riprap. To determine the necessary rock size required, the hydraulic analysis outputs and channel components were input into the USACE (Maynard) riprap sizing equation. The equation is as follows:

$$D_{30} = S_f C_S C_v C_T d \left[\left(\frac{\gamma_w}{\gamma_s - \gamma_w} \right)^{0.5} \frac{V}{\sqrt{K_1 g d}} \right]^{2.5}$$

Where:

d_{30} = Particle size for which 30% is finer by weight, ft;

y = Local depth of flow, ft;

S_f = Safety factor (typically = 1.1);

C_S = Stability coefficient (for blanket thickness $1.5d_{50}$ or d_{100} , whichever is greater) = 0.30 for angular rock;

C_v = Velocity distribution coefficient;

= 1.0 for straight channels or the inside of bends;

= $1.283 - 0.2 \log (R_c/W)$ for the outside of bends (1.0 for $R_c/W > 26$);

= 1.25 downstream from concrete channels;

= 1.25 at the end of dikes;

C_T = Blanket thickness coefficient = 1.0;

S_g = Specific gravity of stone (2.5 minimum);

g = Acceleration due to gravity, 32.2 ft/s²;

V_{des} = Characteristic velocity for design, defined as the depth-averaged velocity at a point 20% upslope from the toe of the revetment, ft/s;

For natural channels,

$$V_{des} = V_{avg} (1.74 - 0.52 \log (R_c/W))$$

$$V_{des} = V_{avg} \text{ for } R_c/W > 26$$

For trapezoidal channels,

$$V_{des} = V_{avg} (1.71 - 0.78 \log (R_c/W))$$

$$V_{des} = V_{avg} \text{ for } R_c/W > 8$$

Where:

R_c = Centerline radius of curvature of channel bend, ft;

W = Width of water surface at upstream end of channel bend, ft;

V_{avg} = Channel cross-sectional average velocity, ft/s;

K_1 = Side slope correction factor;

A separate calculation was performed for the grouted and loose rock determinations. The highest velocity cross section was selected for both the grouted and loose rock areas.

For the grouted rock, the following parameters were used from the hydraulic analysis in the USACE equation:

$$V = 23.54\text{-fps}$$

$$D = 3.75\text{-ft}$$

This yields a rock size of

$$D_{30} = 4.4\text{-ft or } 53.3\text{-in}$$

The Caltrans *Highway Design Manual* (Caltrans HDM) uses this same equation to size riprap, and states to obtain a median rock size for riprap class specification $D_{50} = 1.2 * D_{30}$. Thus:

$$D_{50} = 1.2 * 53.3\text{-in} = 64.0\text{-in (minimum)}$$

The Caltrans HDM states that for grouted riprap, the D_{50} can be reduced by up to a factor of 5. When dividing by a factor of 5, this yields:

$$D_{50,\text{grouted}} = 64.0\text{-in}/5 = 12.8\text{-in (minimum)}$$

Therefore, the next larger riprap class is selected. The channel bottom grouted-riprap class is selected as **Class IV ($D_{50} = 15$ in)**.

For the loose rock, the following parameters were used from the hydraulic analysis in the USACE equation:

$$V = 17.12\text{-fps}$$

$$D = 4.31\text{-ft}$$

This yields a rock size of:

$$D_{30} = 2.5 \text{ ft or } 29.5 \text{ in}$$

The Caltrans HDM, which uses this same equation to size riprap, states to obtain a median rock size for riprap class specification $D_{50} = 1.2 * D_{30}$. Thus:

$$D_{50} = 1.2 * 29.5 \text{ in} = 35.4 \text{ in (minimum)}$$

Therefore, the next larger riprap class is selected. The channel bottom loose-riprap class is also selected as **Class IX ($D_{50} = 36$ in)**.

Riprap determinations used in the design are shown in **Table 3.3: Riprap Size Determinations** below.

Table 3.3: Riprap Size Determinations

Location	Rock Size (W50) (D_{50} Size)
Grouted Riprap	Class IV (300-lb) (15")
Exit Apron	Class IX (2-ton) (36")

The proposed design is shown on the Improvement Plans in Appendix A.

3.3 Cut-Off Wall Depth

Cutoff wall depths were determined using LACFCD HDM methodology. The maximum modeled flow velocities from the hydraulic analysis were used to select the depth of cut-off walls from page F-31, "Levee Criteria: Cut-Off Depths" of the LACFCD HDM. A copy of the referenced table from the LACFCD HDM is included in Appendix C.

Dudek used the LACFCD HDM riprap levee typical sections, on page F-35 of the LACFCD HDM, to develop the design concept for the cut-off walls within the invert of the channel. The LACFCD HDM provides two options for riprap levee cutoff walls: (1) Case A: extend the riprap slope below the grade of the natural watercourse to the depth indicated in the table for cut-off depths or (2) Case B: extend the slope below grade to a depth of 18-in, with

a (1.75 * t) thickness, and extend longitudinally for a distance equal to the cut-off depth plus 3-ft. See **Figure 3.2** for typical sections of the two cases from the LACFCD HDM.

For the grouted riprap channel, Dudek designed the cutoff walls to model the Case A cutoff wall typical section. The riprap will extend to the determined cutoff wall depth at a 2:1 slope. For the loose riprap, Dudek developed a modified Case B cutoff wall to minimize the extents of excavation. Dudek proposed to provide a “launchable” thickened riprap section within invert where the riprap slopes back up to grade at 2:1. As scour develops at the end of the loose riprap, rocks are able to “launch” or fall into the scour hole. Dudek is noting this style of cut-off wall as modified Case B because no cover is provided over the top of rock because this is located within the invert as part of a fully rock lined channel.

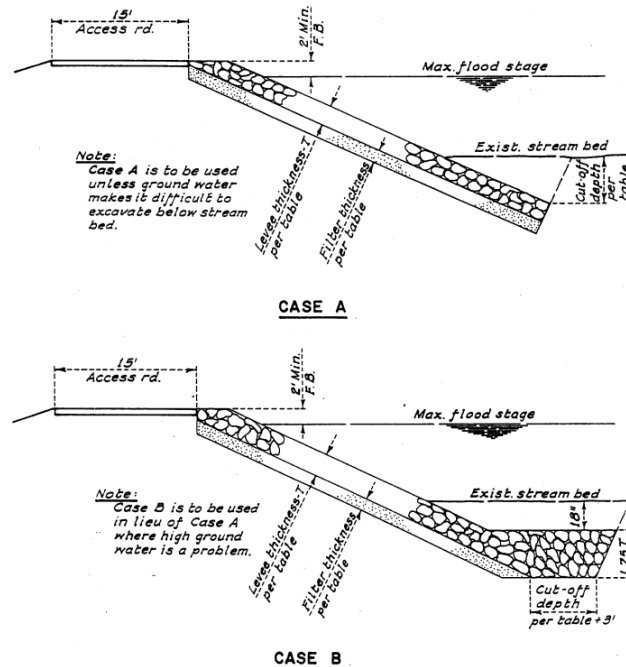


Figure 3.2: Cut-Off Depth Cases from HDM

Cut-off depth determinations and types are shown in **Table 3.4: Cut-Off Wall Depth Determinations** below.

Table 3.4: Cut-Off Wall Depth Determinations

Riprap Type and Extents	HEC-RAS River Stationing	Location of Maximum Velocity	Maximum Velocity (fps)	Straight Reaches (ft)	Cut-Off Wall Type
Grouted (Sta. 10+00 to 11+37.07)	Sta 327 to Sta 439	Station 10+31.21	23.5	14	Case A
Loose (Sta. 9+70 to 10+00)	Sta 283 to Sta 327	Station 10+00.00	17.1	12.5	Modified Case B

4 References

California Department of Transportation (Caltrans). 2023. *Highway Design Manual, Chapter 870: Roadside Management*. Sacramento, CA: California Department of Transportation.

<https://dot.ca.gov/programs/design/manual-highway-design-manual-hdm>

California Department of Transportation (Caltrans). 2023. *Standard Specifications Book*. 2023 Edition

Chow, V.T. 1959. *Open Channel Hydraulics*. McGraw-Hill, New York.

Los Angeles County Flood Control District. 1982. *Hydraulic Design Manual (LACFCD HDM)*. March 1982.

United States Geological Survey (USGS). 2025. *USGS The National Map (TNM) download database*. USGS.

<https://apps.nationalmap.gov/downloader/>

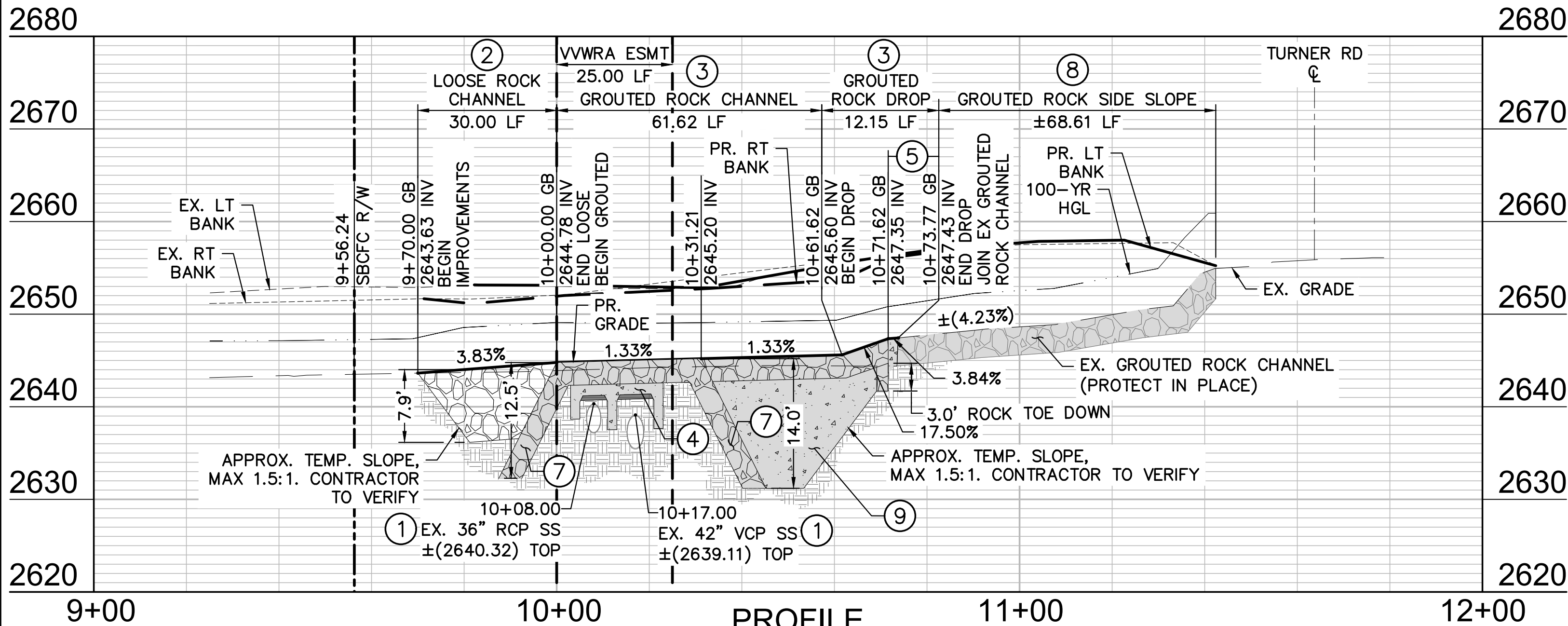
Williamson & Schmid Consulting Civil Engineers and Land Surveyors. 1992. *Victorville Master Plan of Drainage for Oro Grande Wash and Adjacent Watersheds That are Tributary to the Mojave River –Volume III – Plans and Profiles (MPD)*. San Bernardino County. March 1992.

Appendix A

Excerpt of Proposed Improvements Plans

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CONSTRUCTION NOTES

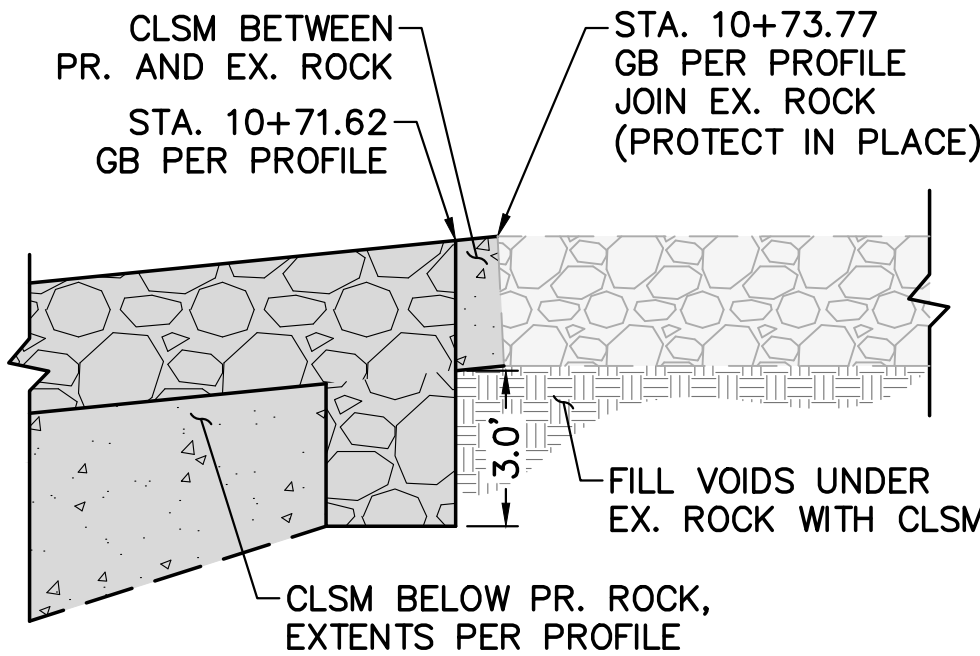
- PROTECT IN PLACE EX. SEWER LINES AND PIPE BEDDING.
- CONSTRUCT 2-TON LOOSE ROCK CHANNEL OVER 1-FT OF BACKING MATERIAL AND RSP FABRIC PER PLAN, PROFILE AND SECTION A, SHEET C-2. ROCK GRADATION PER GRADATION TABLE, THIS SHEET. ROCK THICKNESS PER SECTION A, SHEET C-2.
- CONSTRUCT 2.5-FT THICK GROUDED ROCK CHANNEL PER PLAN AND PROFILE. WHERE ROCK IS NOT OVER CONCRETE OR SLURRY, INSTALL ROCK OVER 1-FT OF BACKING MATERIAL AND RSP FABRIC. ROCK GRADATION PER GRADATION TABLE, THIS SHEET.
- CONSTRUCT CONCRETE SLAB PIPE PROTECTION OVER EX. SEWER PIPES PER S-1 THROUGH S-4.
- INSTALL CLSM SLURRY BETWEEN PR. AND EX. ROCK PER DETAIL 1, THIS SHEET. PROVIDE SMOOTH TRANSITION BETWEEN EX. TOP OF ROCK AND PROPOSED TOP OF ROCK. CONTRACTOR SHALL ENSURE ALL VOIDS ARE FILLED AT CONNECTION WITH EX. ROCK.
- REMOVE AND PROPERLY DISPOSE OF EX. TREE AND ROOTBALL.
- CONSTRUCT ROCK TOE DOWN PER DETAIL 2, SHEET C-2. DEPTH PER PROFILE.
- CONSTRUCT GROUDED ROCK SIDE SLOPE PER SECTION C AND DETAIL 1, SHEET C-2.
- INSTALL CLSM SLURRY BACKFILL WITHIN EXCAVATION LIMITS. PROVIDE WEEP TUBES THROUGH SLURRY AS NEEDED PER DETAIL 2, SHEET C-2.
- CONSTRUCT 2.5-FT THICK 300-LB GROUDED ROCK SHOULDER ALONG EDGE OF EX ROCK SLOPE. DIMENSIONS PER PLAN. MATCH EX. ELEVATIONS.

LEGEND:

	EX. GROUDED ROCK		PR. GROUDED ROCK
	PR. LOOSE ROCK		PR. CLSM
	GEOFOAM		

HYDRAULIC DATA		
STATION	Q (CFS)	V (FPS)
9+70.00 TO 10+00.00	4876	17.30
10+00.00 TO 10+61.62	4876	22.14
10+61.62 TO 10+71.62	4876	23.54
10+71.62 TO 11+42.18	4876	22.37

GRADATION TABLE			
CLASS	D50 (IN)	W50	ROCK T (FT)
I	6	20-LB	1.0
IV	15	300-LB	2.5
IX	36	2-TON	4.5



NOTES:

- CONTRACTOR SHALL THOROUGHLY CLEAN EX. GROUDED ROCK. APPLY BONDING AGENT TO EX. ROCK PRIOR TO INSTALLING SLURRY BACKFILL. BONDING AGENT SHALL BE SIKADUR-32-HI-MOD-LPL OR APPROVED EQUAL.

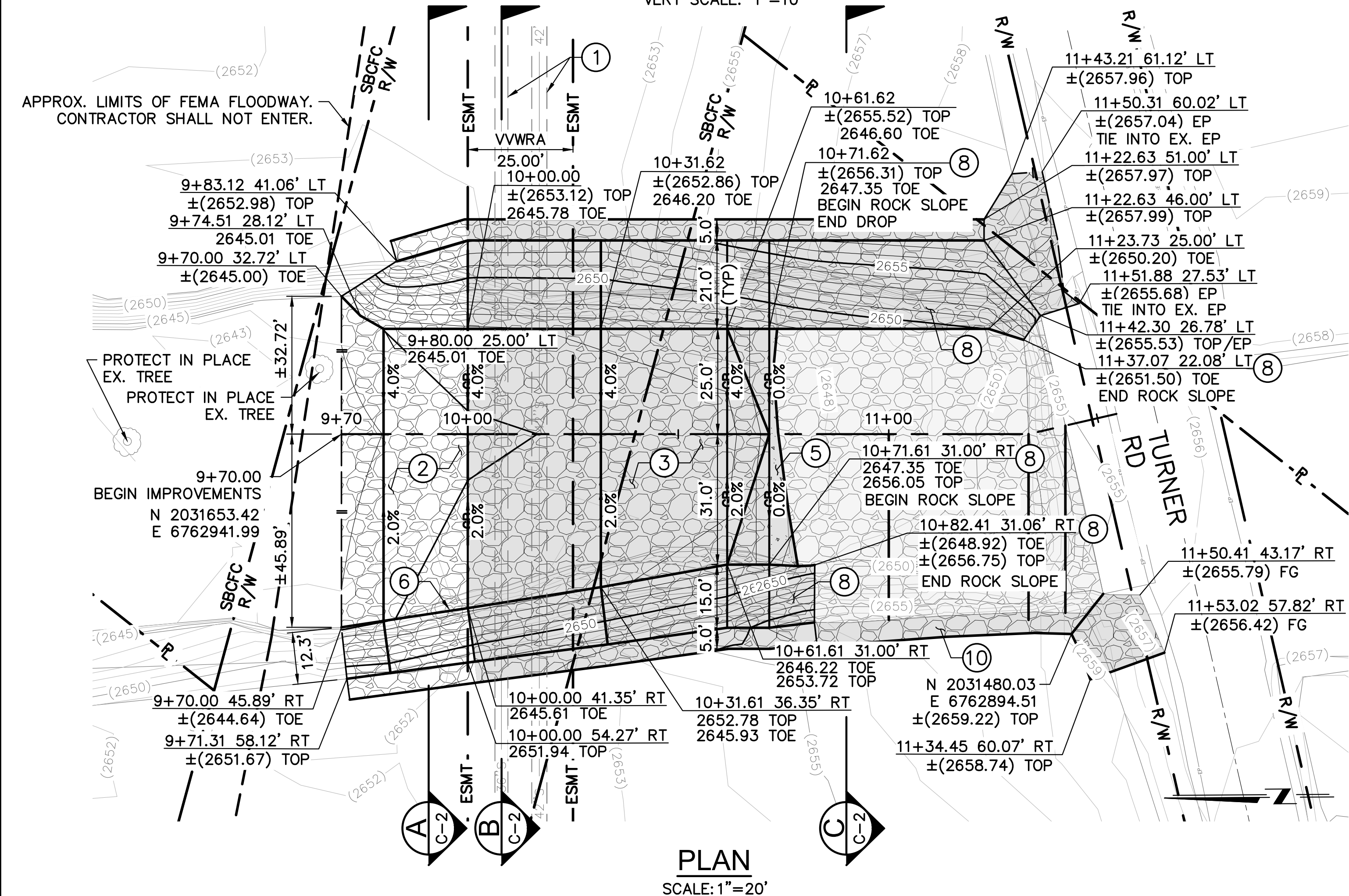
EXISTING AND PROPOSED CONNECTION DETAIL

NOT TO SCALE

NOTES:

- CONTRACTOR SHALL CLEAR AND GRUB AS NEEDED WITHIN GRADING LIMITS.
- CONTRACTOR SHALL PROTECT ALL EX. IMPROVEMENTS AND UTILITIES, UNLESS OTHERWISE NOTED ON PLANS. CONTRACTOR SHALL VERIFY DEPTH, SIZE, LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY CONFLICTS OR DISCREPANCIES. CONTRACTOR SHALL PROTECT IN PLACE ALL EXISTING UTILITIES, UNLESS OTHERWISE NOTED.

GRAPHIC SCALE
0 20' 40'
SCALE: 1" = 20'



100% PROGRESS SET
NOT FOR CONSTRUCTION

PROGRESS: 100% DESIGN
SUBMITTAL DATE: 10/07/2025
PROJECT MANAGER: JO
DESIGNED BY: JO/JC
DRAWN BY: DB
CHECKED BY: NR



PLANS PREPARED BY:
DUDEK
605 Third Street Encinitas, CA 92024
760.942.5147 Fax 760.632.0164

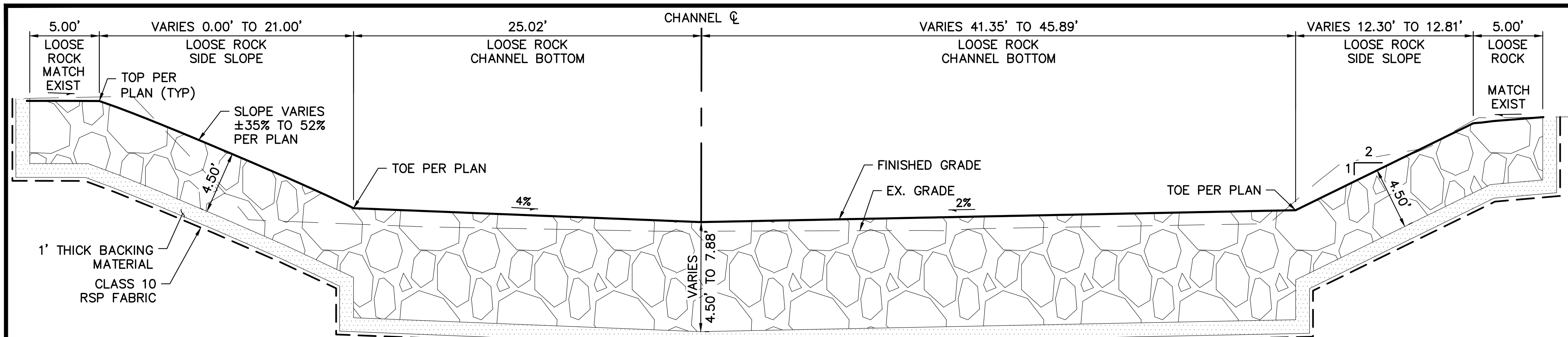


VICTOR VALLEY
WASTEWATER
RECLAMATION
AUTHORITY

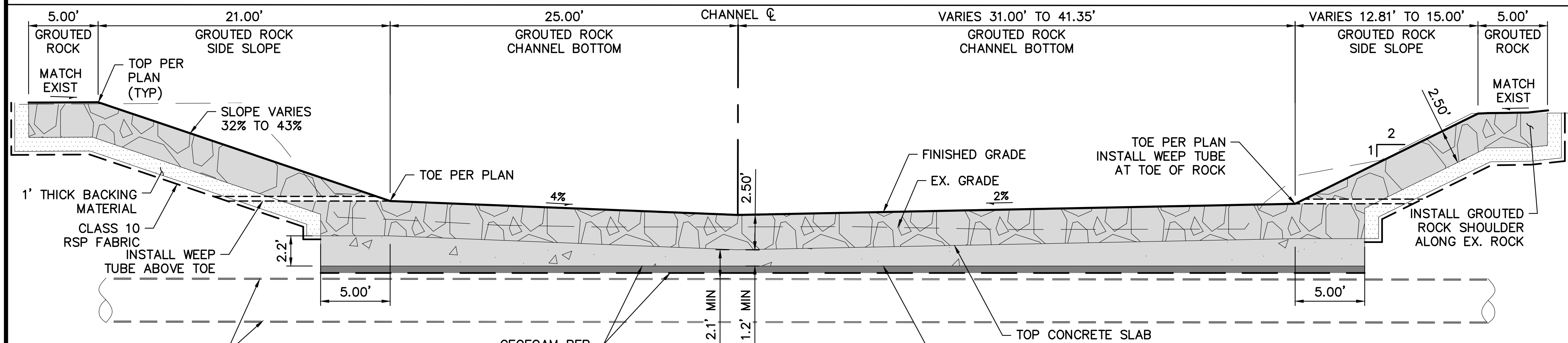
VICTOR VALLEY WASTEWATER RECLAMATION AUTHORITY
OSSUM WASH REPAIR PROJECT
CHANNEL PLAN & PROFILE

C-1
PROJECT NO.
17390
SHT. NO. 3 OF 8

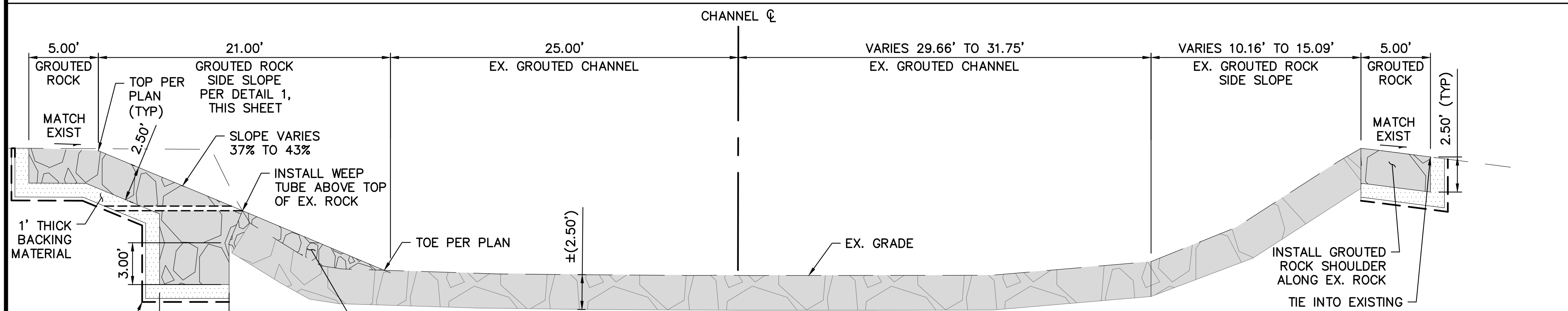
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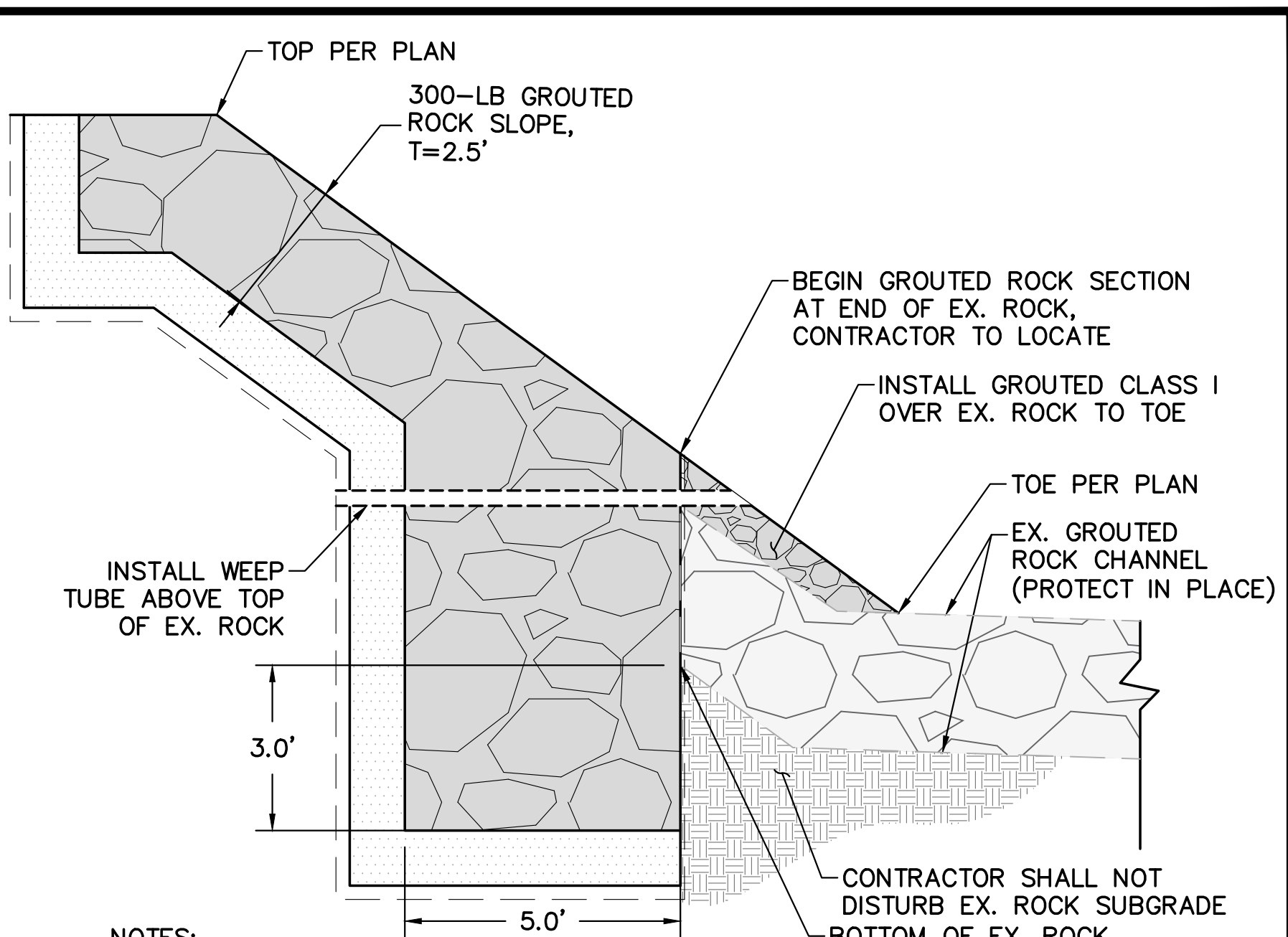
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C-1



SECTION B
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C-1

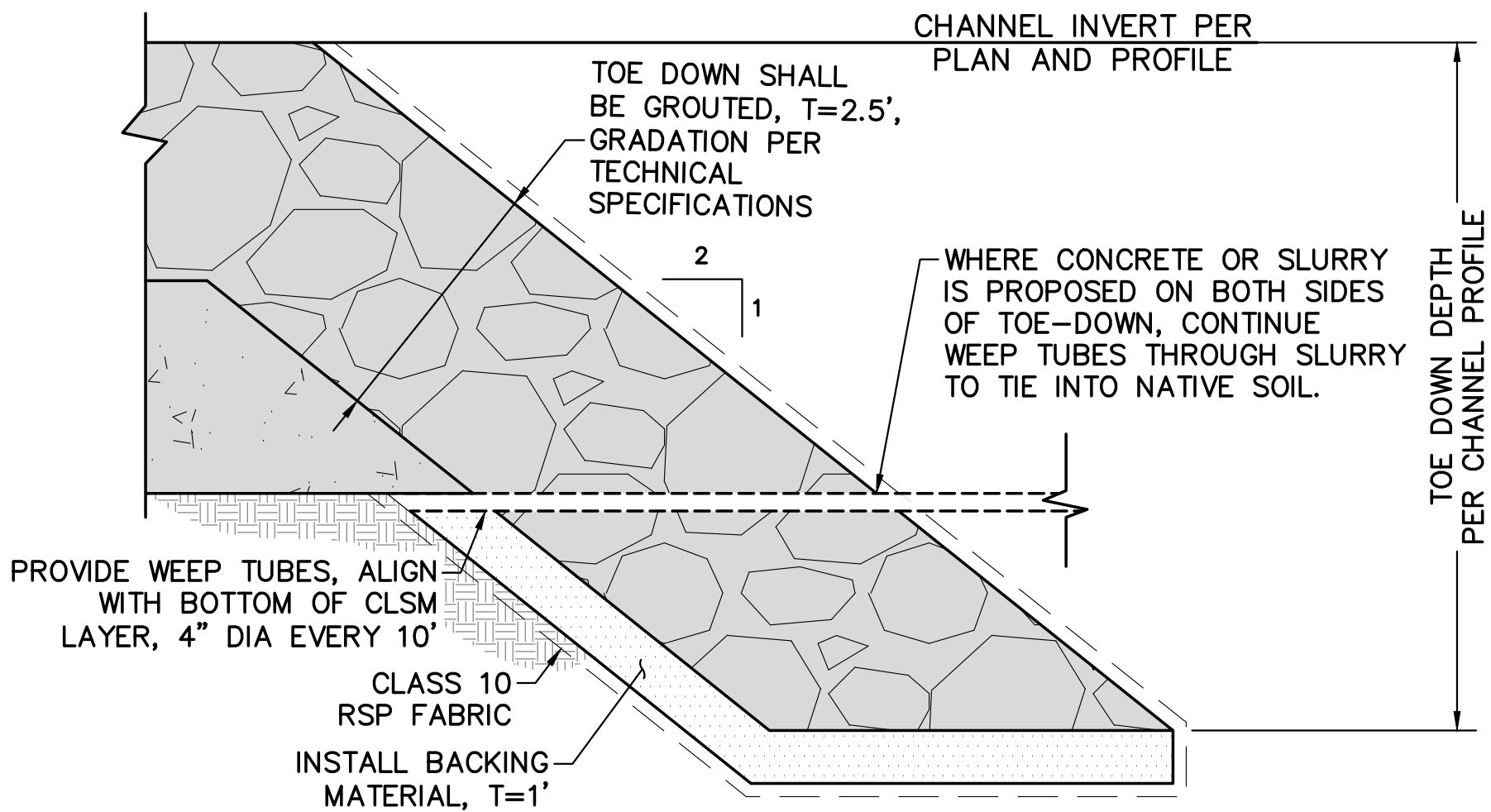


SECTION C
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C-1



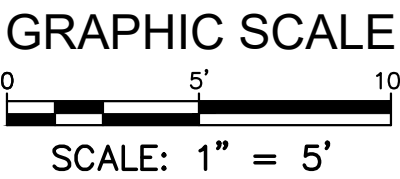
- NOTES:
- CONTRACTOR SHALL THOROUGHLY CLEAN EX. GROUTED ROCK. APPLY BONDING AGENT TO EX. ROCK PRIOR TO INSTALLING SLURRY BACKFILL. BONDING AGENT SHALL BE SIKADUR-32-HI-MOD-LPL OR APPROVED EQUAL.

ROCK SIDE SLOPE DETAIL 1
NOT TO SCALE
VAR



TOE-DOWN TYPICAL DETAIL 2
NOT TO SCALE
C-1

- NOTES:
- CONTRACTOR SHALL CLEAR AND GRUB AS NEEDED WITHIN GRADING LIMITS.
 - CONTRACTOR SHALL PROTECT ALL EXISTING IMPROVEMENTS AND UTILITIES UNLESS OTHERWISE NOTED ON PLANS. CONTRACTOR SHALL VERIFY DEPTH, SIZE, LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY CONFLICTS OR DISCREPANCIES. CONTRACTOR SHALL PROTECT IN PLACE ALL EXISTING UTILITIES, UNLESS OTHERWISE NOTED.



100% PROGRESS SET
NOT FOR CONSTRUCTION

PROGRESS: 100% DESIGN
SUBMITTAL DATE: 10/07/2025
PROJECT MANAGER: JO
DESIGNED BY: JO/JC
DRAWN BY: DB
CHECKED BY: NR



PLANS PREPARED BY:
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OSSUM WASH REPAIR PROJECT

CHANNEL SECTIONS

C-2

PROJECT NO.
17390

SHT. NO. 4 OF 8

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Appendix B

Hydrologic Data

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EXCERPT FROM:

VICTORVILLE

MASTER PLAN OF DRAINAGE

FOR

ORO GRANDE WASH AND ADJACENT WATERSHEDS
THAT ARE TRIBUTARY TO THE MOJAVE RIVER

MARCH 1992

VOLUME III - Plans and Profiles - Lines B - F

PREPARED FOR

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT



WILLIAMSON & SCHMID
CONSULTING CIVIL ENGINEERS AND LAND SURVEYORS

VICTORVILLE MASTER PLAN OF DRAINAGE

TABLE OF VOLUMES

Volume I	-	FINAL REPORT
Volume II	-	PLANS AND PROFILES LINE A (ORO GRANDE WASH)
Volume III	-	PLANS AND PROFILES LINES B-F

LINE D SYSTEM

This system conveys flows originating west of the area contributing to the Oro Grande Wash. The power lines which traverse the entire watershed virtually bisect this watershed. At the outlet to the Mojave River, D-01 has a 100-year peak flow rate of 5090 cfs and the watershed is comprised of almost ten square miles. Regional facilities D-01 and D-02 follow incised or existing channels for a majority of their reach.

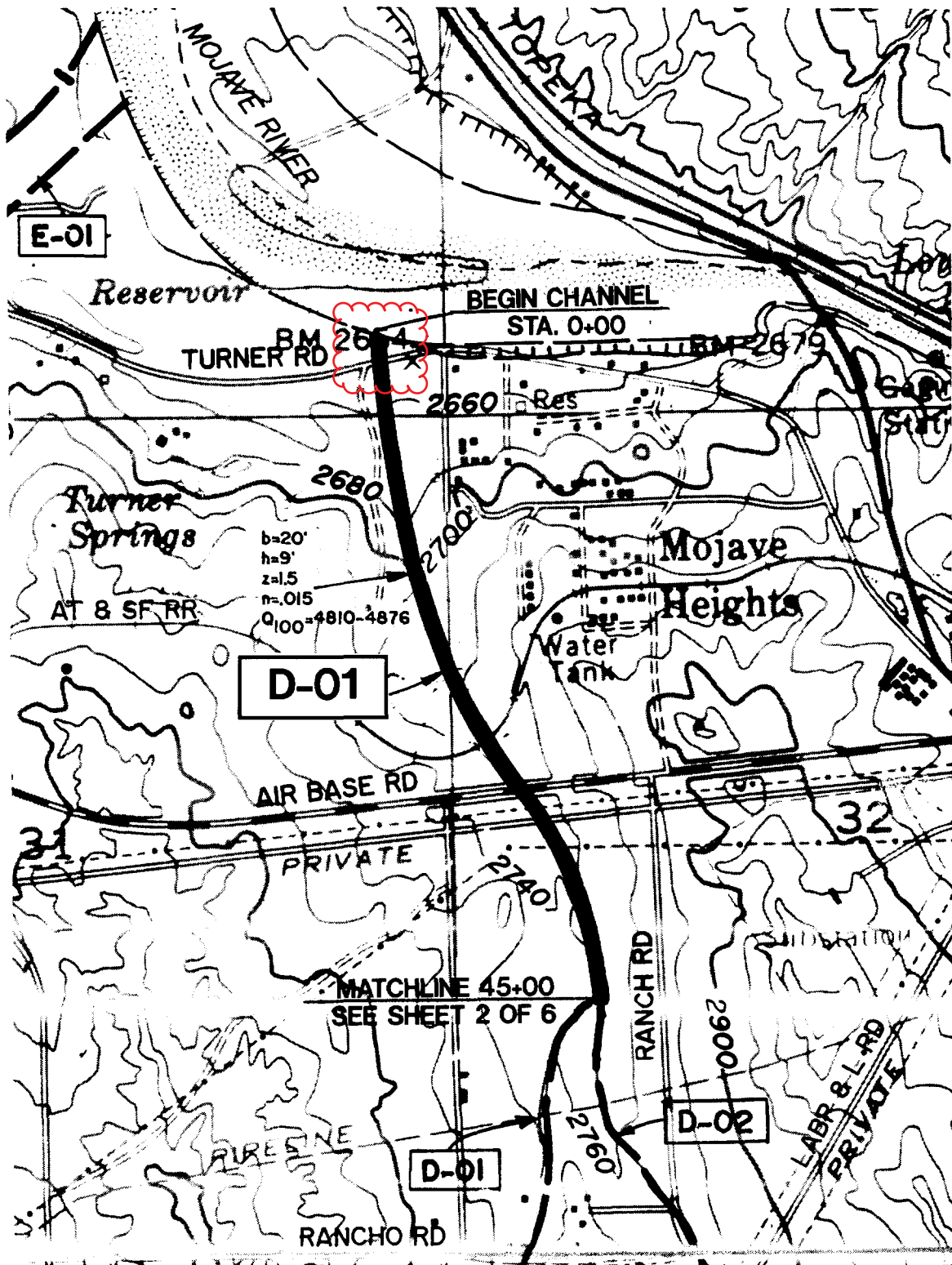
There are three regional facilities in the Line D system. The following is a brief description of each of these facilities.

D-01 and Tributaries

The D-01 facility conveys flows originating west of the areas tributary to the Oro Grande Wash. At its outlet to the Mojave River, D-01 conveys 5090 cfs and 6100 acres are tributary to this facility. From its outlet, D-01 follows a fairly well defined channel upstream through undeveloped area to Village Drive. In this reach, the channel is proposed to be a concrete lined trapezoidal section which confluent with D-02. From Village Drive to Mojave Drive, there is an existing SBCDE which is adequate to contain the improved channel section. From Mojave Drive, D-01 continues in a concrete section to Palmdale Road. On the west side of Hook Junior High School, there is an unidentified drainage easement which is proposed to be utilized. However, it is not wide enough and therefore additional acreage will have to be purchased. D-03 confluent with the channel at Seneca Road. D-01 parallels the power lines to Bonanza Road. The facility continues to be a concrete lined trapezoidal channel. Upstream of Bonanza Road is secondary facility D-01-03 which also parallels the power lines.

D-02 (Mojave Drive Channel) and Tributaries

At its confluence with D-01, the D-02 facility has a 100-year peak flow rate of 2600 cfs with 2600 acres contributing. From the confluence, D-02 follows a well defined wash to Puesta Del Sol Drive in a concrete trapezoidal channel. From Rancho Road to Puesta Del Sol Drive, the proposed facility is contained in an existing City of Victorville Drainage Easement. From Puesta Del Sol Drive to approximately 3000 feet upstream of Mojave Drive, the existing channel is improved as an earth section which is contained in an existing SBCFCD right-of-way. The Mojave Drive Channel is proposed to be lined with concrete to increase its capacity and to reduce erosion and maintenance caused by increased development through this reach. D-02 then parallels Amargosa Road, terminating at the intersection of Amargosa Road and Seneca Road. Secondary facilities D-02-05 and D-02-06 confluence to form the upstream portion of facility D-02.



LEGEND

- PROPOSED FACILITY
- FACILITY SHOWN ELSEWHERE
- WATERSHED BOUNDARY

- FLOODPLAIN
- FLOODWAY
- DETENTION BASIN

VICTORVILLE
MASTER PLAN
OF DRAINAGE

COMPREHENSIVE STORM DRAIN PLAN
LINE D-01
SHEET 1 OF 6

W
S

SCALE
1"=1000'



WILLIAMSON & SCHMID

FACILITY DESCRIPTION	FACILITY QUANTITY	UNIT TYPE	UNIT COST	FACILITY COST

STA 0+00 TO STA 12+00				
TRAP CHANNEL B=20' H=9' Z=1.5				
EXCAVATION	1,200	L.F.	17	20,400
CONCRETE LINING	1,200	L.F.	219	262,800
LEVEE	2,400	L.F.	25	60,000
FENCING	2,400	L.F.	7.5	18,000
RIGHT-OF-WAY (87' WIDTH)	1,200	L.F.	90	108,000
CULVERT (3)-11.5'x9'	1	EA.	162,500	162,500

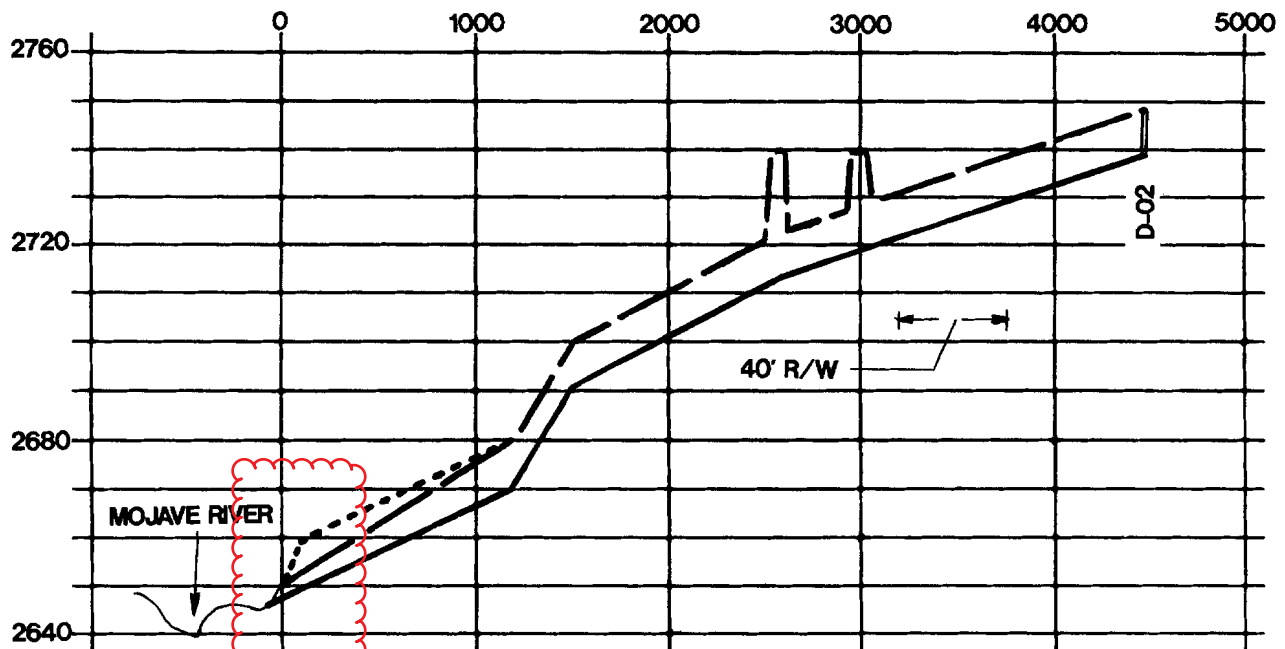
STA 12+00 TO STA 45+00				
TRAP CHANNEL B=20' H=9' Z=1.5				
EXCAVATION	3,300	L.F.	34	112,200
CONCRETE LINING	3,300	L.F.	219	722,700
FENCING	6,600	L.F.	7.5	49,500
RIGHT-OF-WAY (87' WIDTH)	2,700	L.F.	90	243,000
RIGHT-OF-WAY (87' WIDTH)	600	L.F.	45	27,000
CULVERT (3)-11.5'x9'	3	EA.	162,500	487,500

STA 45+00 TO STA 217+00				
TRAP CHANNEL B=15' H=8' Z=1.5				
EXCAVATION	17,200	L.F.	24	412,800
CONCRETE LINING	17,200	L.F.	181	3,113,200
FENCING	34,400	L.F.	7.5	258,000
RIGHT-OF-WAY (79' WIDTH)	8,750	L.F.	82	717,500
RIGHT-OF-WAY (79' WIDTH)	2,000	L.F.	41	82,000
CULVERT (3)-9'x8'	10	EA.	135,500	1,355,000

STA 217+00 TO STA 243+00				
TRAP CHANNEL B=15' H=7' Z=1.5				
EXCAVATION	2,600	L.F.	20	52,000
CONCRETE LINING	2,600	L.F.	168	436,800
FENCING	5,200	L.F.	7.5	39,000
RIGHT-OF-WAY (76' WIDTH)	2,600	L.F.	79	205,400
CULVERT (3)-8.5'x7'	2	EA.	125,500	251,000

STA 243+00 TO STA 297+50				
TRAP CHANNEL B=15' H=6' Z=1.5				
EXCAVATION	5,450	L.F.	16	87,200
CONCRETE LINING	5,450	L.F.	154	839,300
FENCING	10,900	L.F.	7.5	81,750
RIGHT-OF-WAY (73' WIDTH)	5,450	L.F.	75	408,750
CULVERT (3)-8'x6'	3	EA.	115,500	346,500

			SUBTOTAL	10,959,800
			30% CONT.	3,287,940
			TOTAL	14,247,740



	0+00	1+50	12+00	15+00	26+00	30+00	31+50	45+00
	BEGIN CHANNEL	TURNER RD	GB	GB	AT & SF RR GB	AIR BASE RD	LABP & L RD	MATCHLINE SEE SHEET 2 OF 7
LENGTH	1200	300	1100	400	1500			
SLOPE	.018	.067	.020	.010	.010			
FLOW	Q ₁₀₀ =4876							Q ₁₀₀ =4810
SIZE	b=20', h=9', z=15							
TYPE	CONCRETE TRAPEZOIDAL CHANNEL							

LEGEND

- LEVEE
- NATURAL GROUND
- PROPOSED FLOWLINE

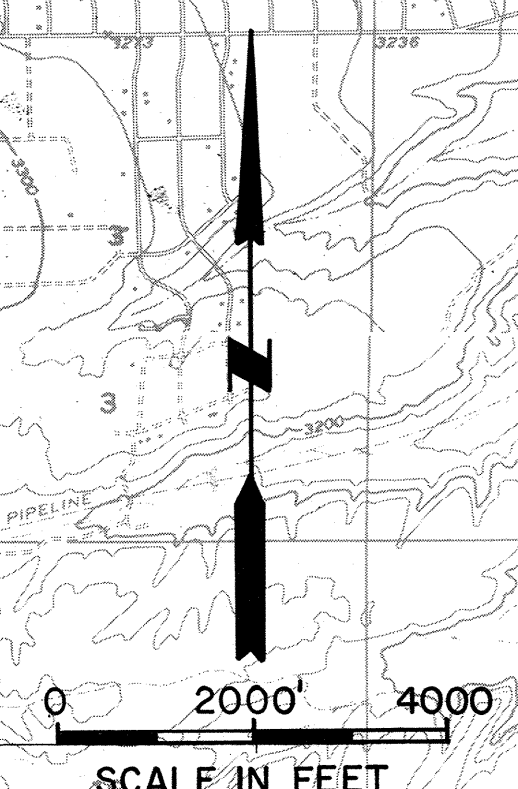
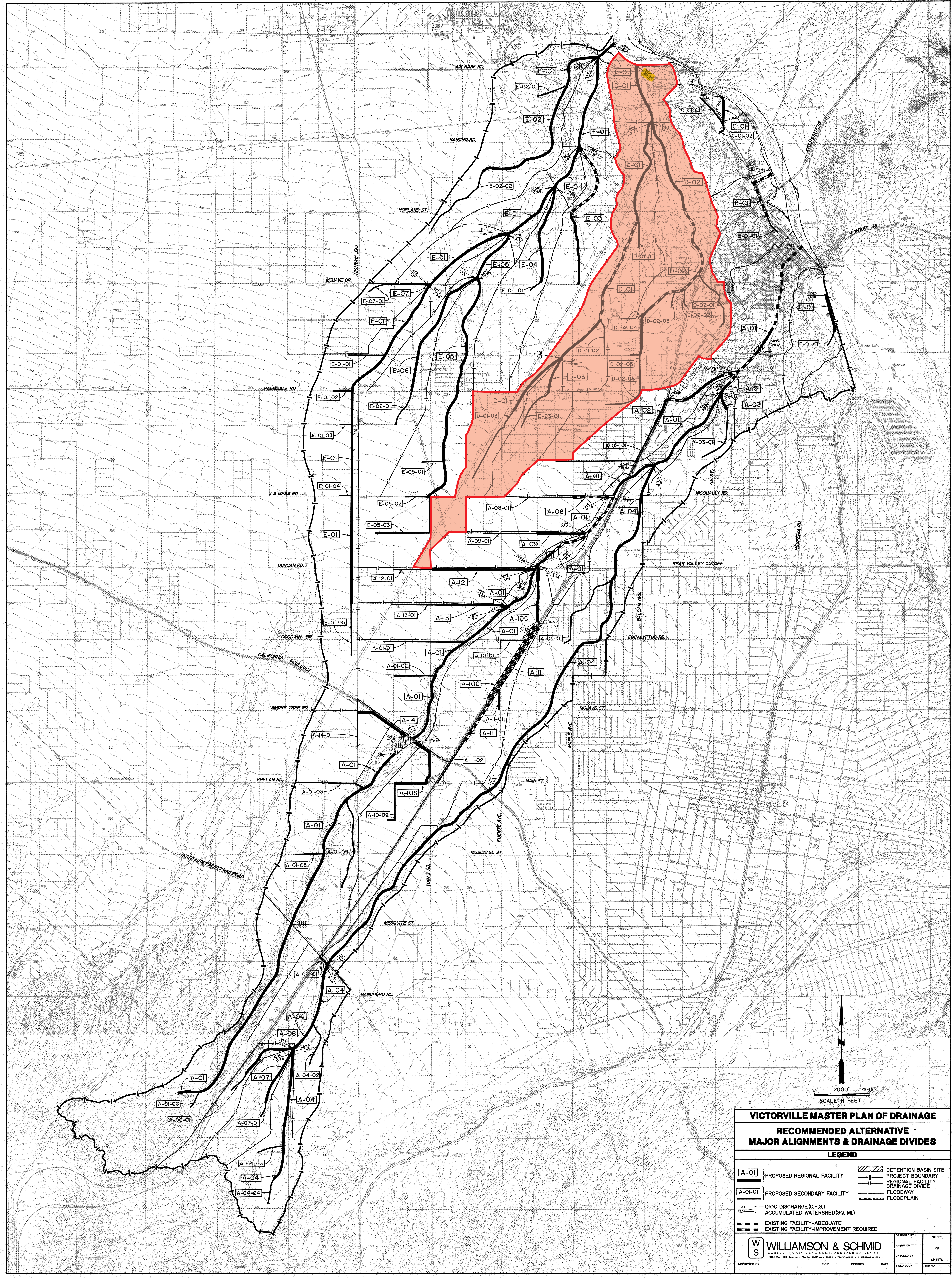
VICTORVILLE
MASTER PLAN
OF DRAINAGE

COMPREHENSIVE STORM DRAIN PLAN
LINE D-01
SHEET 1 OF 7

W
S

SCALE
H: 1"=1000'
V: 1"=40'

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VICTORVILLE MASTER PLAN OF DRAINAGE
RECOMMENDED ALTERNATIVE
MAJOR ALIGNMENTS & DRAINAGE DIVIDES

LEGEND

[A-01]	PROPOSED REGIONAL FACILITY		DETENTION BASIN SITE
[A-01-01]	PROPOSED SECONDARY FACILITY		PROJECT BOUNDARY
	EXISTING FACILITY-ADEQUATE		REGIONAL FACILITY DRAINAGE DIVIDE
	EXISTING FACILITY-IMPROVEMENT REQUIRED		FLOODWAY
	Q100 DISCHARGE (C.F.S.)		FLOODPLAIN
	ACCUMULATED WATERSHED(SQ. MI.)		

	WILLIAMSON & SCHMID CONSULTING CIVIL ENGINEERS AND LAND SURVEYORS 1501 Red Hill Avenue • Tustin, California 92680 • 714/255-7500 • 714/255-9210 FAX	DESIGNED BY	SHEET
		CHECKED BY	OF
APPROVED BY	R.C.E.	EXPIRES	DATE
		FIELD BOOK	JOB NO.

Appendix C

Hydraulic Calculations and Basis

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HEC-RAS Plan: Existing_MIX wo Levees River: Ossum Wash Reach: Reach 1 Profile: Q100_MPD

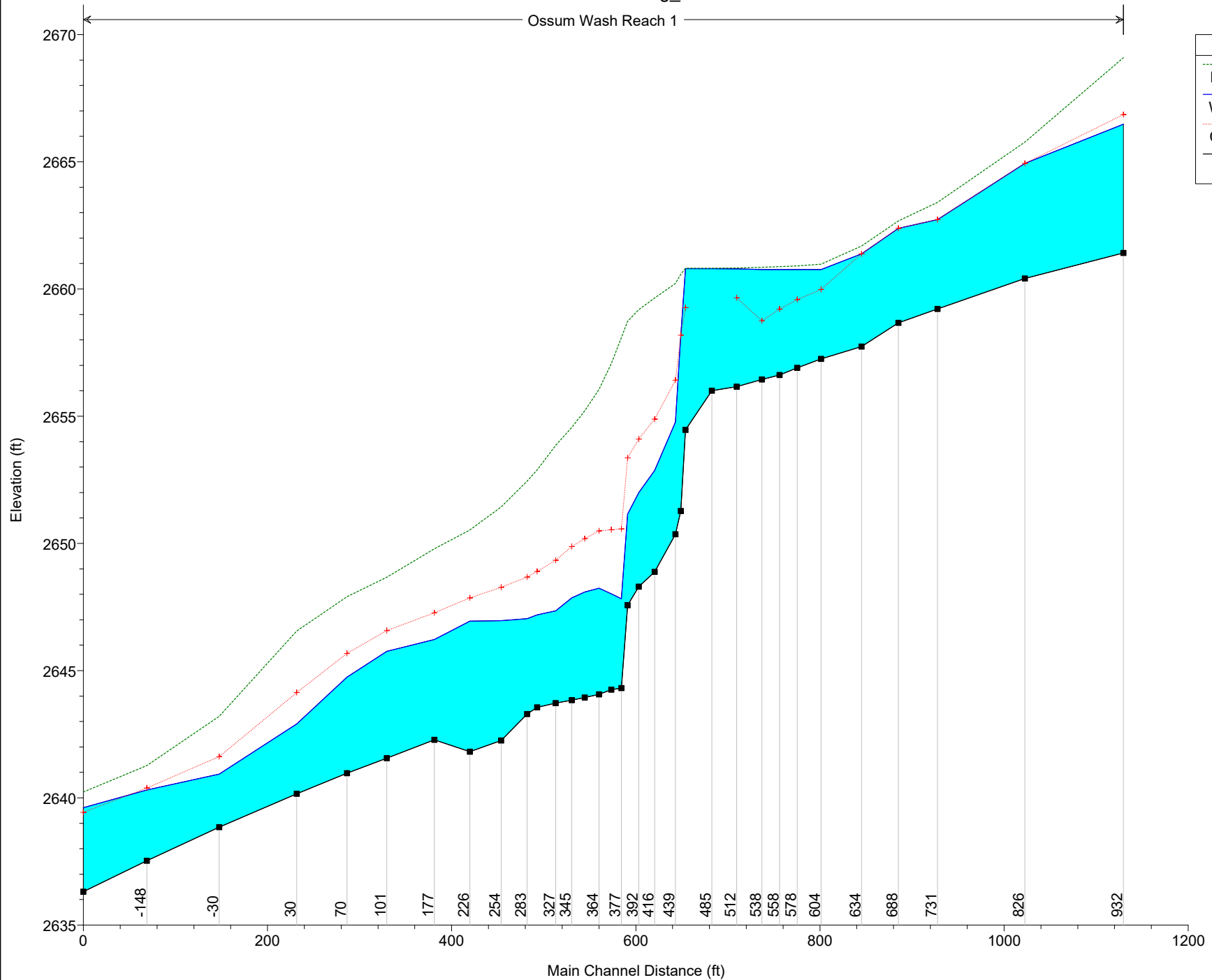
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	932	Q100_MPD	4876.00	2661.42	2666.48	2666.86	2669.09	0.020015	12.98	375.70	94.66	1.15
Reach 1	826	Q100_MPD	4876.00	2660.41	2664.94	2664.94	2665.78	0.008891	8.45	771.89	576.94	0.76
Reach 1	731	Q100_MPD	4876.00	2659.22	2662.73	2662.73	2663.41	0.005891	7.78	907.02	687.62	0.80
Reach 1	688	Q100_MPD	4876.00	2658.67	2662.39	2662.39	2662.68	0.002541	5.34	1317.75	981.09	0.53
Reach 1	634	Q100_MPD	4876.00	2657.74	2661.38	2661.38	2661.69	0.003072	5.39	1210.97	827.94	0.57
Reach 1	604	Q100_MPD	4876.00	2657.25	2660.77	2659.98	2660.97	0.002117	4.91	1596.84	927.52	0.48
Reach 1	578	Q100_MPD	4876.00	2656.90	2660.77	2659.59	2660.91	0.001387	4.26	1926.74	1093.03	0.40
Reach 1	558	Q100_MPD	4876.00	2656.62	2660.77	2659.21	2660.88	0.001016	3.82	2007.80	1170.11	0.34
Reach 1	538	Q100_MPD	4876.00	2656.44	2660.76	2658.75	2660.86	0.000772	3.50	2149.62	1255.56	0.30
Reach 1	512	Q100_MPD	4876.00	2656.16	2660.80	2659.66	2660.83	0.000184	2.76	4148.20	1406.26	0.23
Reach 1	485	Q100_MPD	4876.00	2656.00	2660.80		2660.82	0.000089	1.98	5393.78	1480.50	0.16
Reach 1	456	Q100_MPD	4876.00	2654.46	2660.80	2659.27	2660.82	0.000067	1.81	5845.92	1546.99	0.13
Reach 1	448	Q100_MPD	4876.00	2651.28	2658.19	2658.19	2660.58	0.005730	12.41	396.14	100.27	0.98
Reach 1	439	Q100_MPD	4876.00	2650.36	2654.77	2656.42	2660.22	0.017154	18.72	260.44	71.59	1.73
Reach 1	416	Q100_MPD	4876.00	2648.88	2652.87	2654.88	2659.65	0.022263	20.89	233.42	68.19	1.99
Reach 1	392	Q100_MPD	4876.00	2648.30	2652.00	2654.10	2659.19	0.026205	21.51	226.65	70.90	2.12
Reach 1	387	Q100_MPD	4876.00	2647.57	2651.15	2653.36	2658.74	0.047360	22.09	220.69	71.98	2.22
Reach 1	377	Q100_MPD	4876.00	2644.31	2647.83	2650.57	2658.09	0.067468	25.70	189.75	64.66	2.64
Reach 1	368	Q100_MPD	4876.00	2644.25	2648.02	2650.54	2657.07	0.054042	24.13	202.04	63.82	2.39
Reach 1	364	Q100_MPD	4876.00	2644.07	2648.24	2650.50	2656.06	0.044274	22.43	217.39	66.92	2.19
Reach 1	359	Q100_MPD	4876.00	2643.94	2648.09	2650.19	2655.21	0.038555	21.41	227.78	66.63	2.04
Reach 1	345	Q100_MPD	4876.00	2643.84	2647.86	2649.87	2654.56	0.035064	20.76	234.89	67.31	1.96
Reach 1	327	Q100_MPD	4876.00	2643.72	2647.35	2649.34	2653.86	0.037724	20.47	238.26	74.30	2.01
Reach 1	311	Q100_MPD	4876.00	2643.56	2647.19	2648.90	2652.89	0.034095	19.14	254.71	81.97	1.91
Reach 1	283	Q100_MPD	4876.00	2643.29	2647.04	2648.68	2652.44	0.031550	18.65	261.48	82.54	1.85
Reach 1	254	Q100_MPD	4876.00	2642.25	2646.96	2648.27	2651.43	0.021744	16.96	287.57	77.85	1.56
Reach 1	226	Q100_MPD	4876.00	2641.81	2646.95	2647.86	2650.52	0.016704	15.17	321.48	85.37	1.38
Reach 1	177	Q100_MPD	4876.00	2642.28	2646.22	2647.27	2649.79	0.021499	15.15	321.81	105.72	1.53
Reach 1	101	Q100_MPD	4876.00	2641.56	2645.76	2646.57	2648.67	0.015386	14.98	400.00	139.16	1.35
Reach 1	70	Q100_MPD	4876.00	2640.97	2644.74	2645.67	2647.91	0.019137	15.69	391.13	158.71	1.48
Reach 1	30	Q100_MPD	4876.00	2640.16	2642.90	2644.14	2646.55	0.030409	15.73	344.17	195.97	1.77
Reach 1	-30	Q100_MPD	4876.00	2638.85	2640.93	2641.62	2643.21	0.040440	14.33	448.87	332.75	1.92
Reach 1	-148	Q100_MPD	4876.00	2637.53	2640.31	2640.39	2641.27	0.011597	9.73	704.90	402.21	1.09
Reach 1	-213	Q100_MPD	4876.00	2636.31	2639.61	2639.43	2640.23	0.007002	8.13	906.33	505.28	0.86

----- Turner Rd

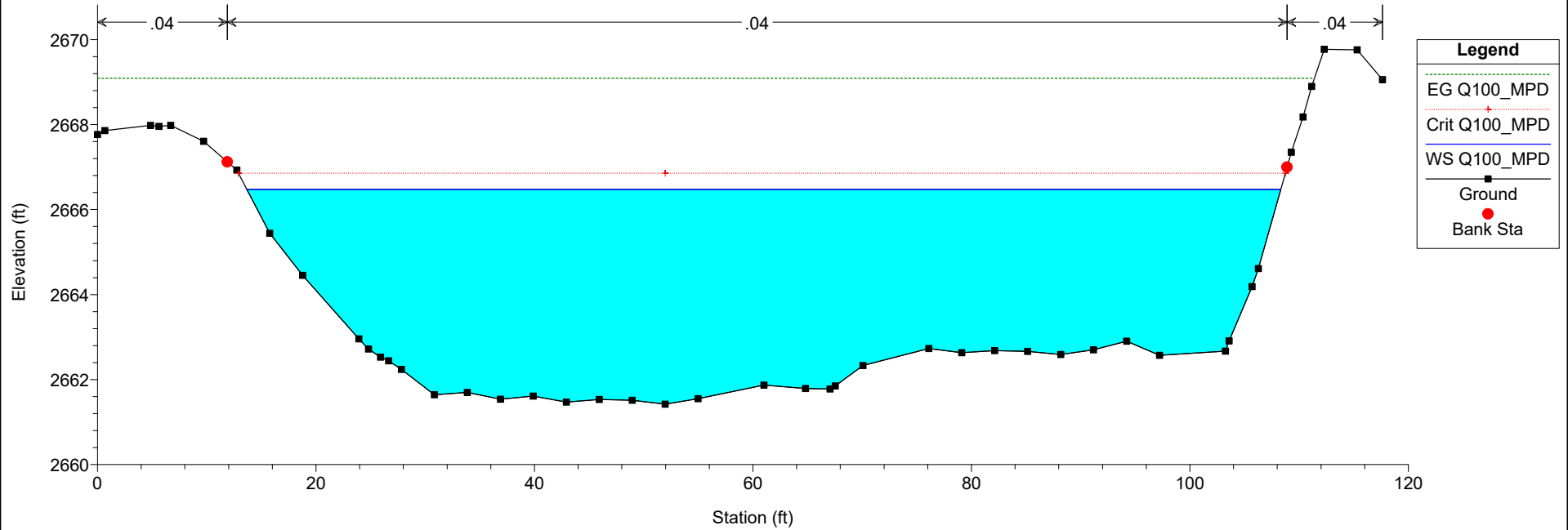
--- Existing drop downstream grouted section

Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025

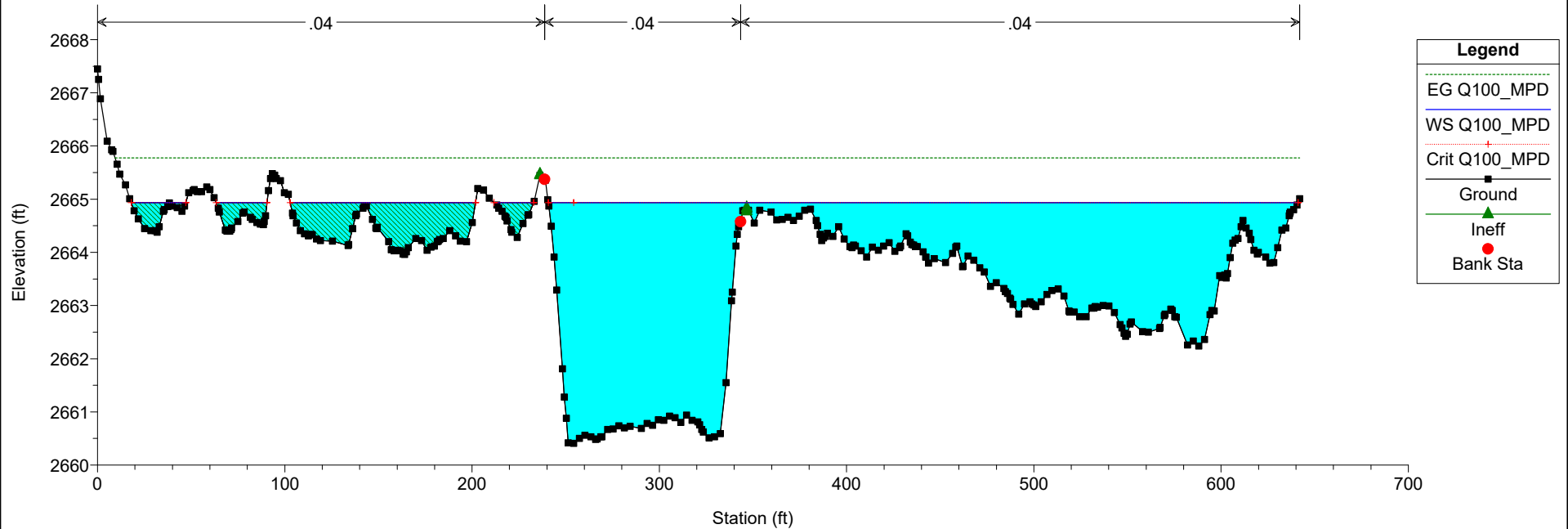
Ossum Wash Reach 1



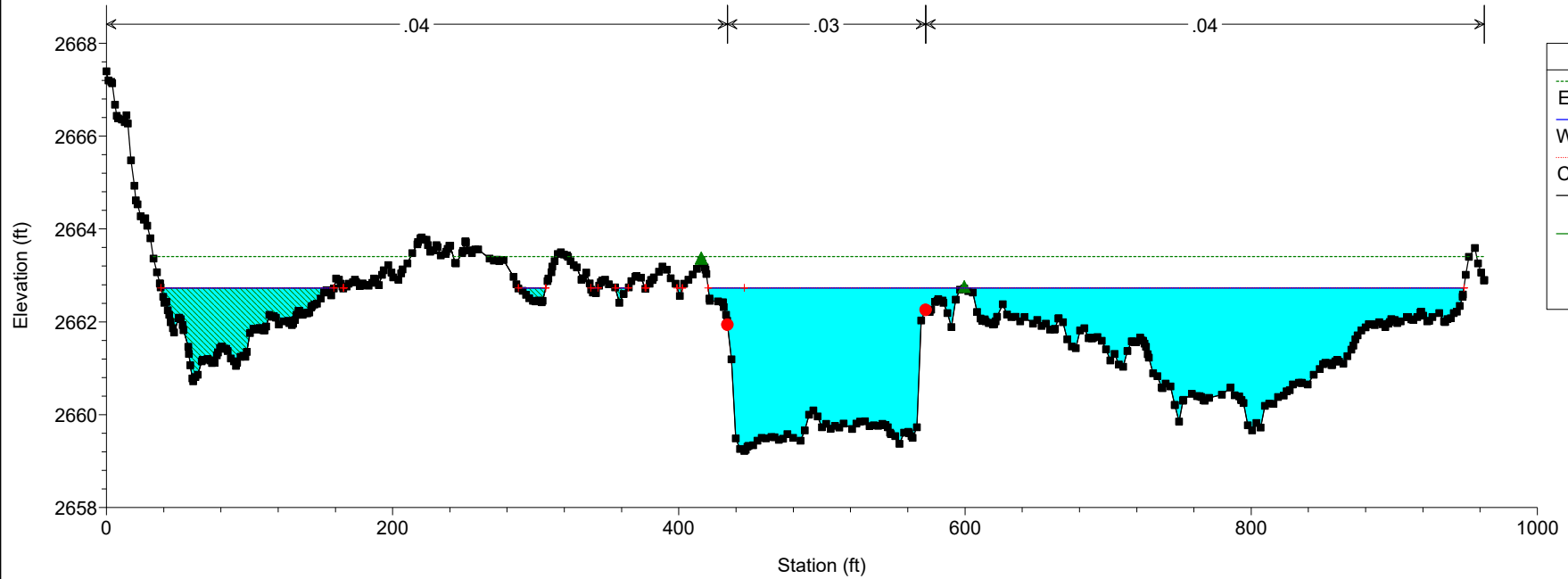
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RS = 932



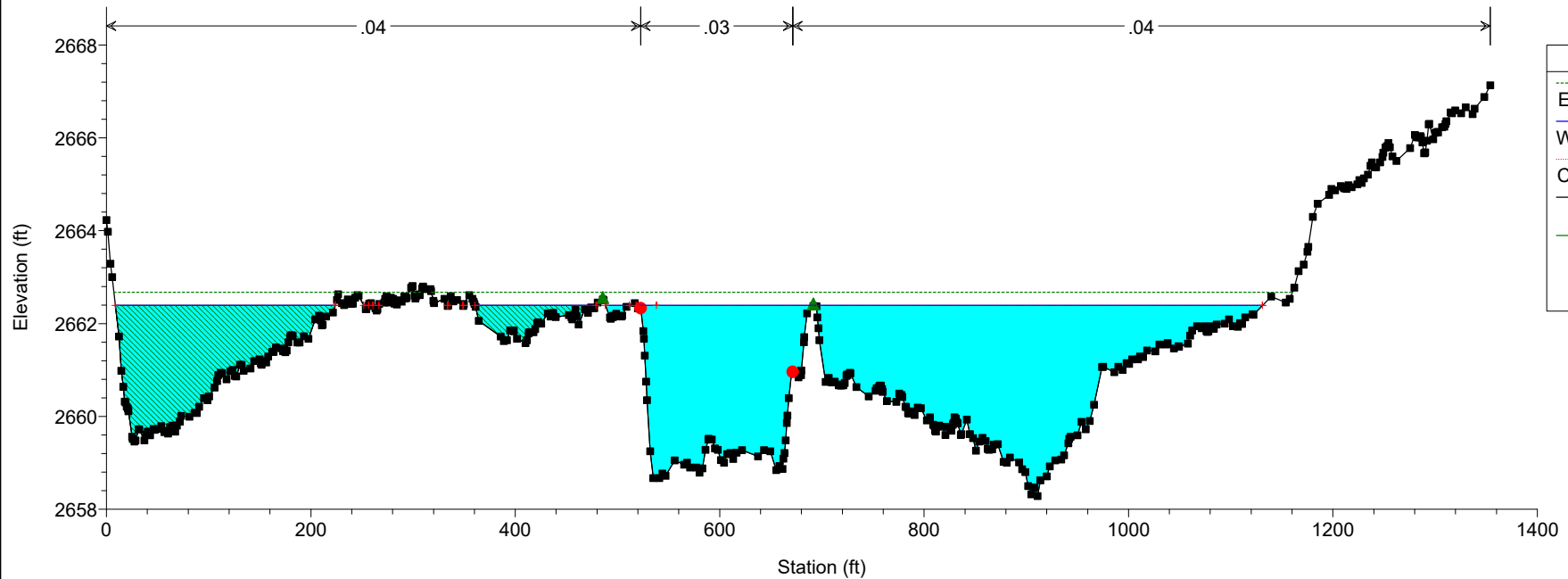
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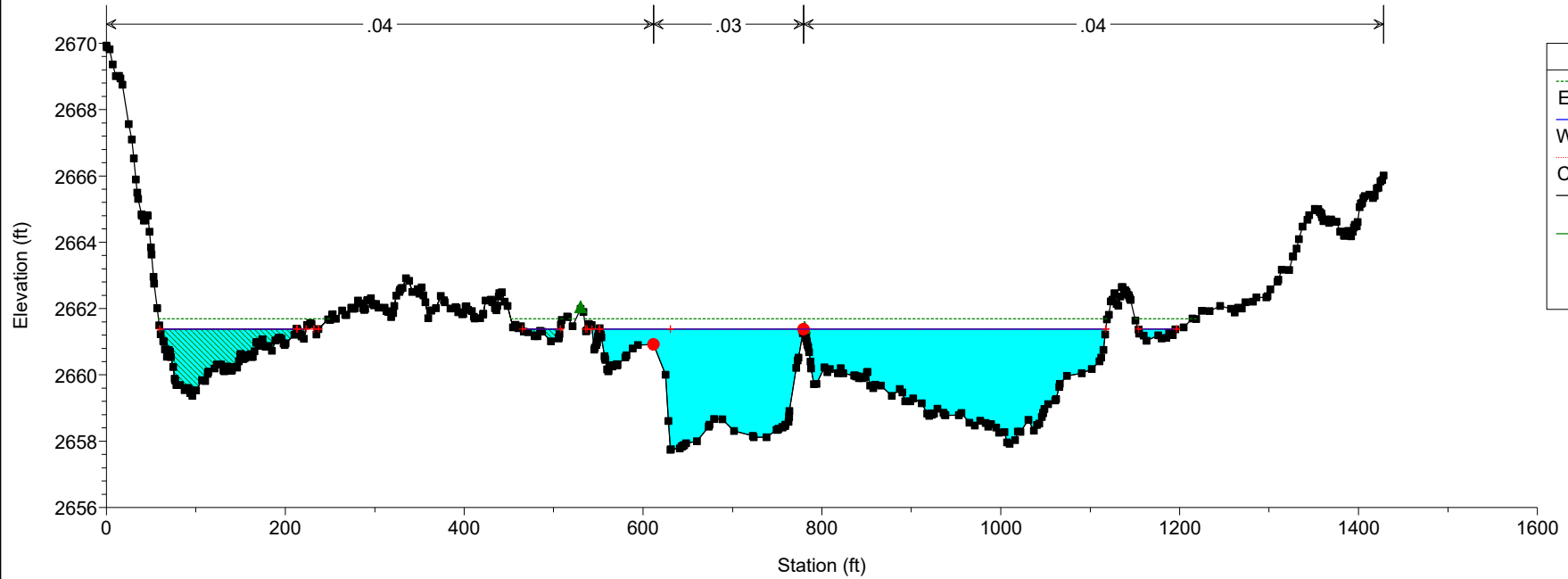
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RS = 731



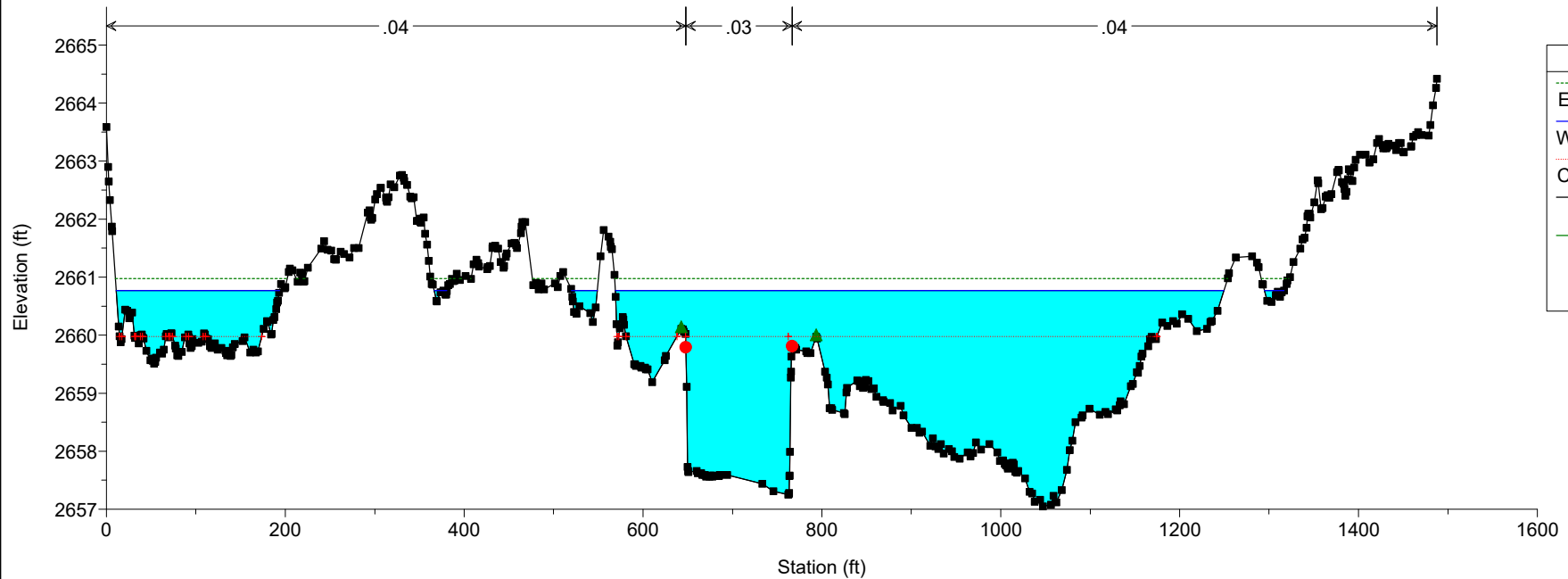
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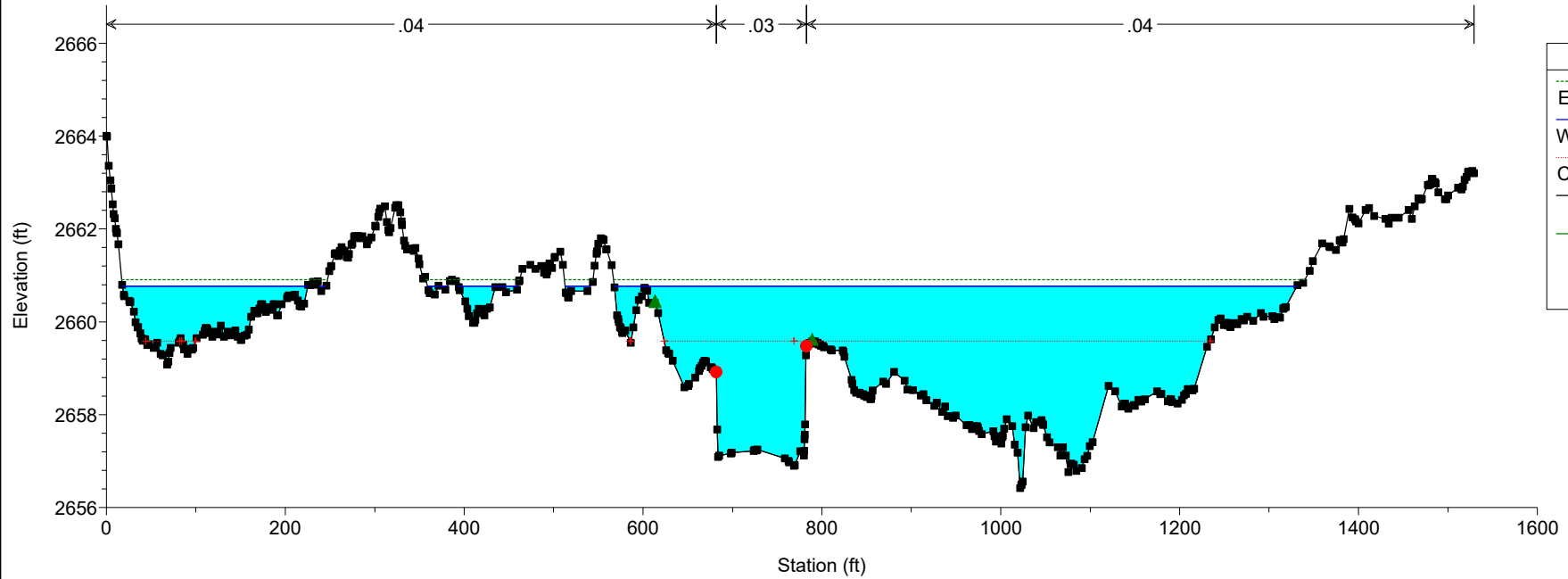
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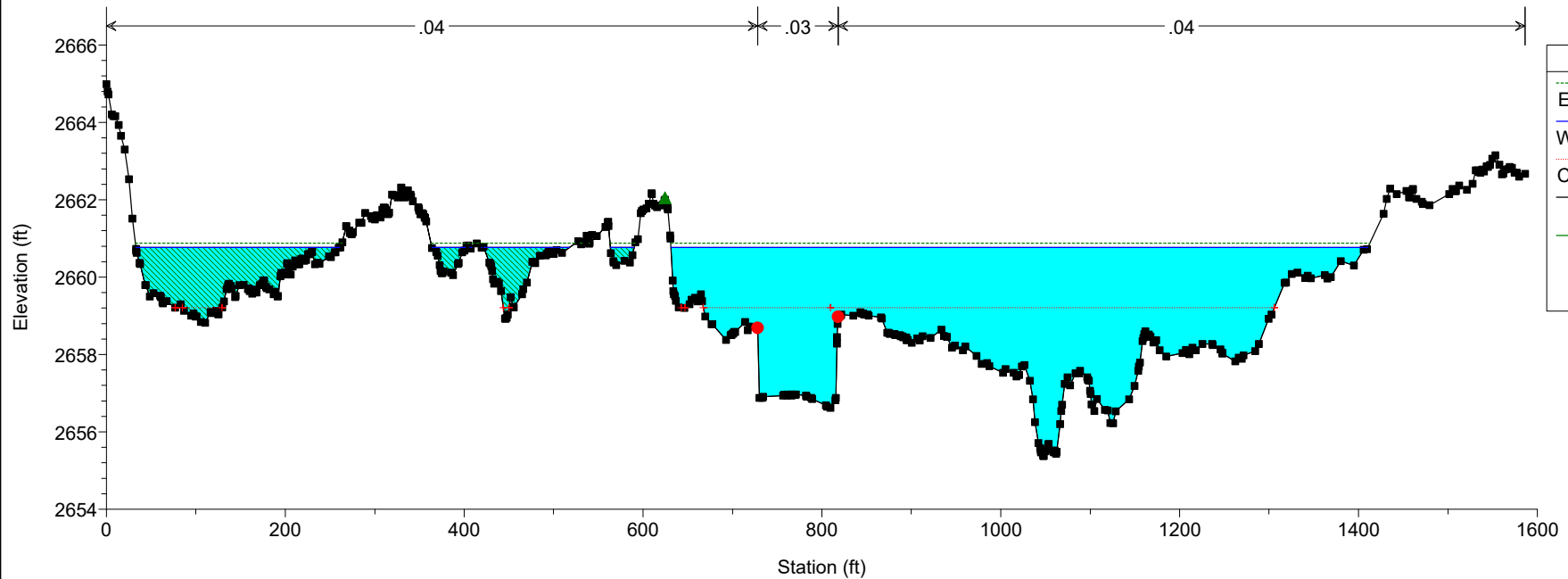
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RS = 604



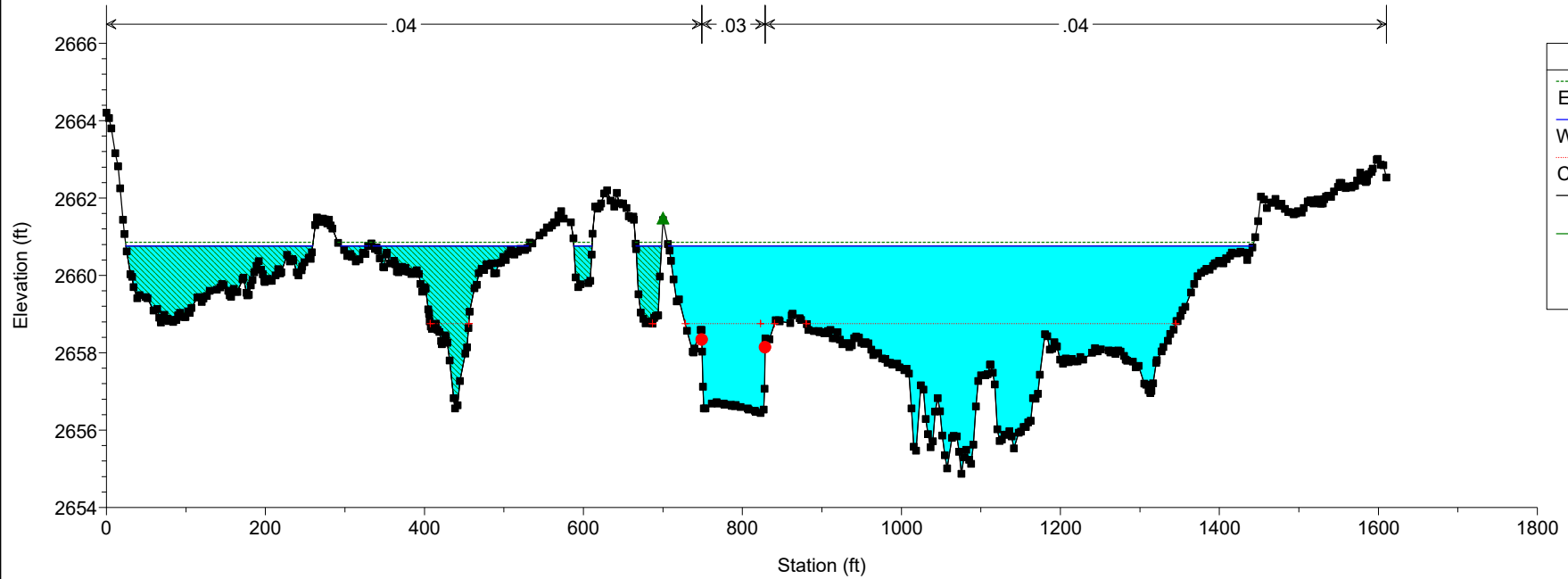
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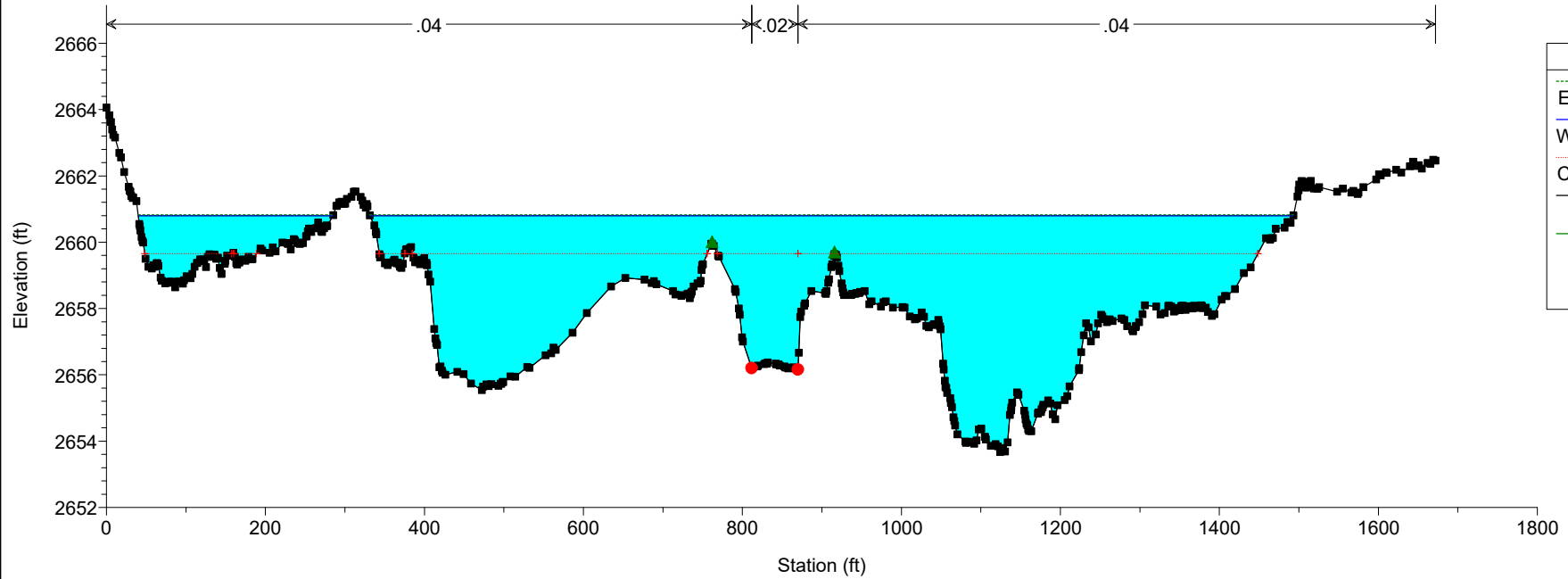
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = 558



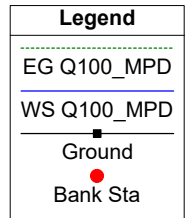
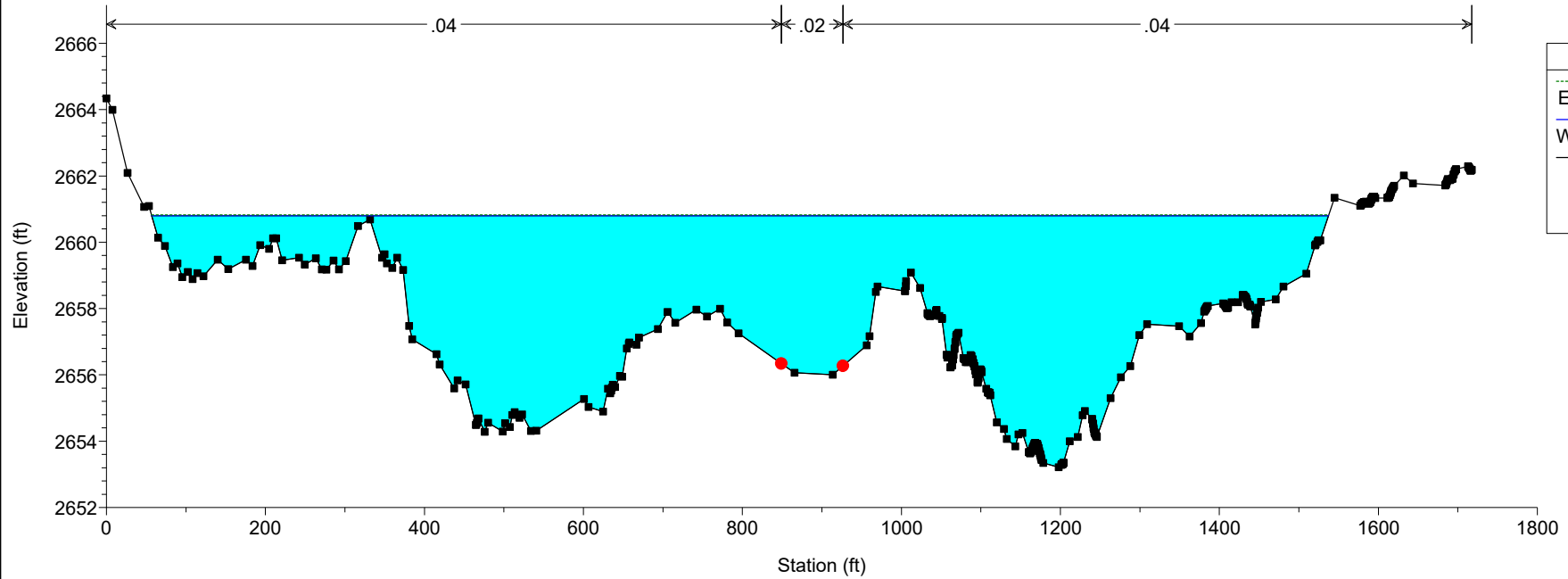
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RS = 538



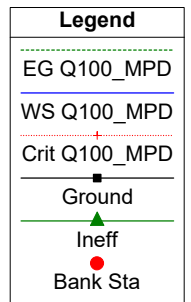
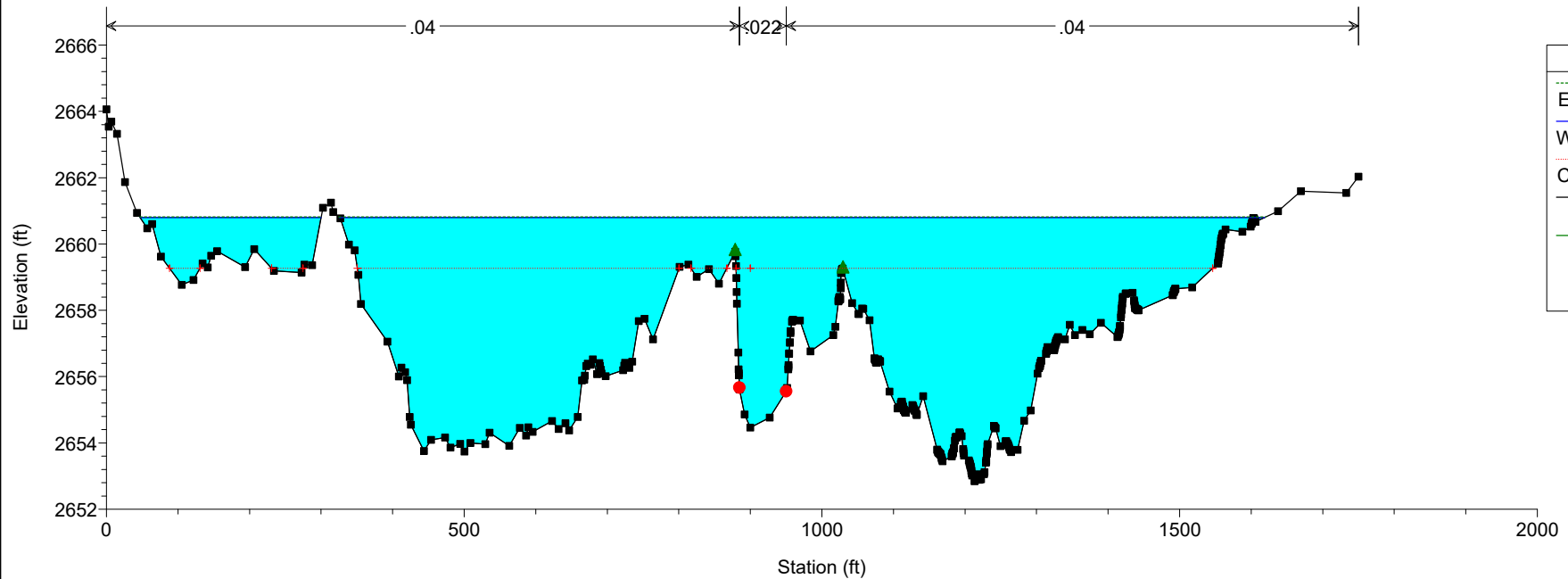
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RS = 512



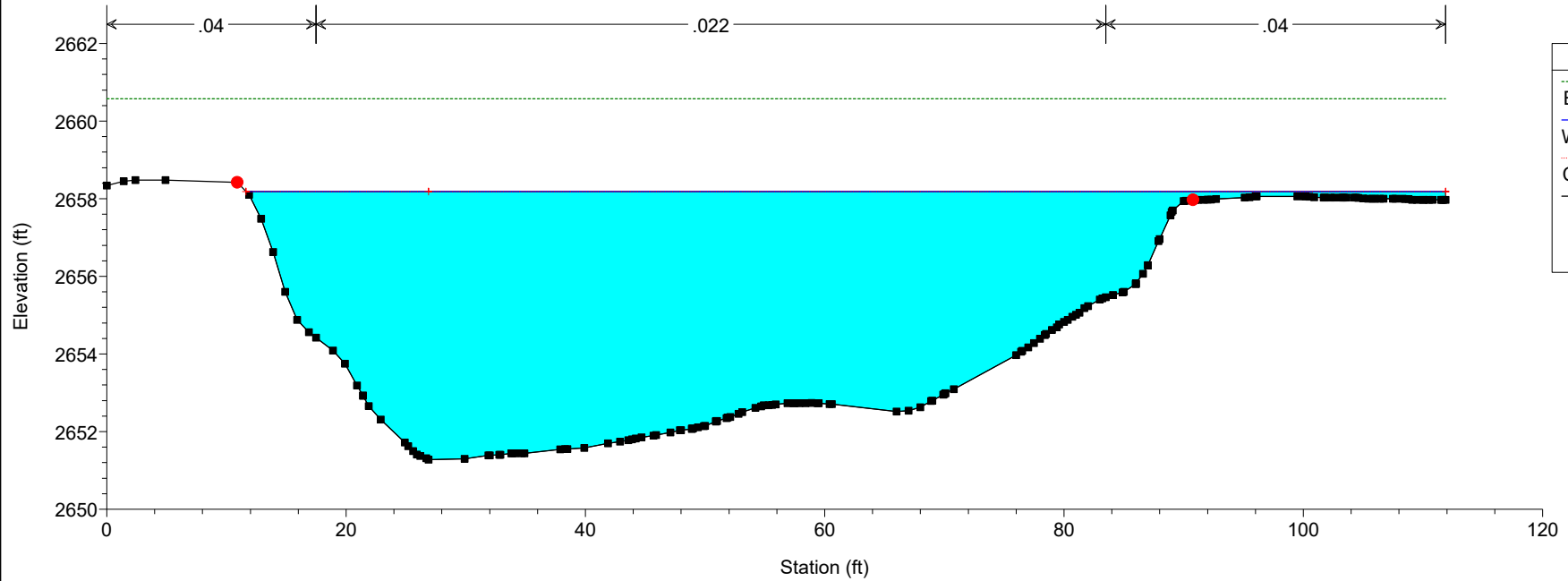
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RS = 485



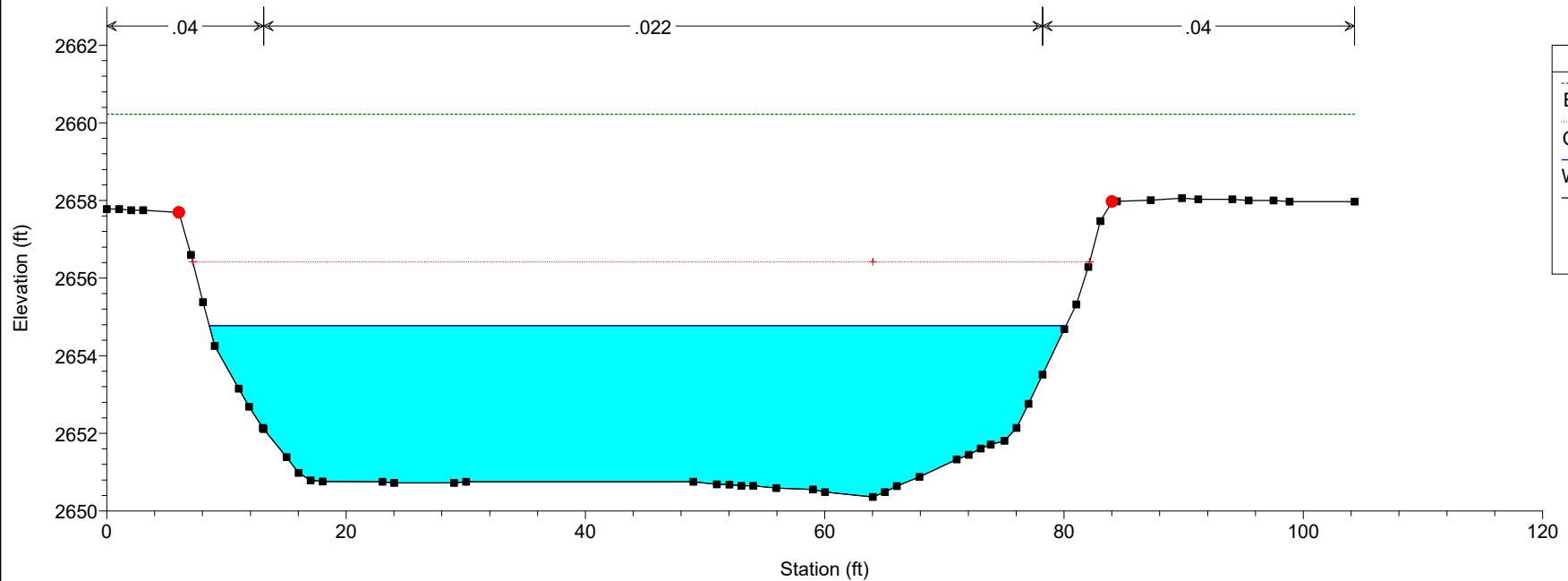
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RS = 456



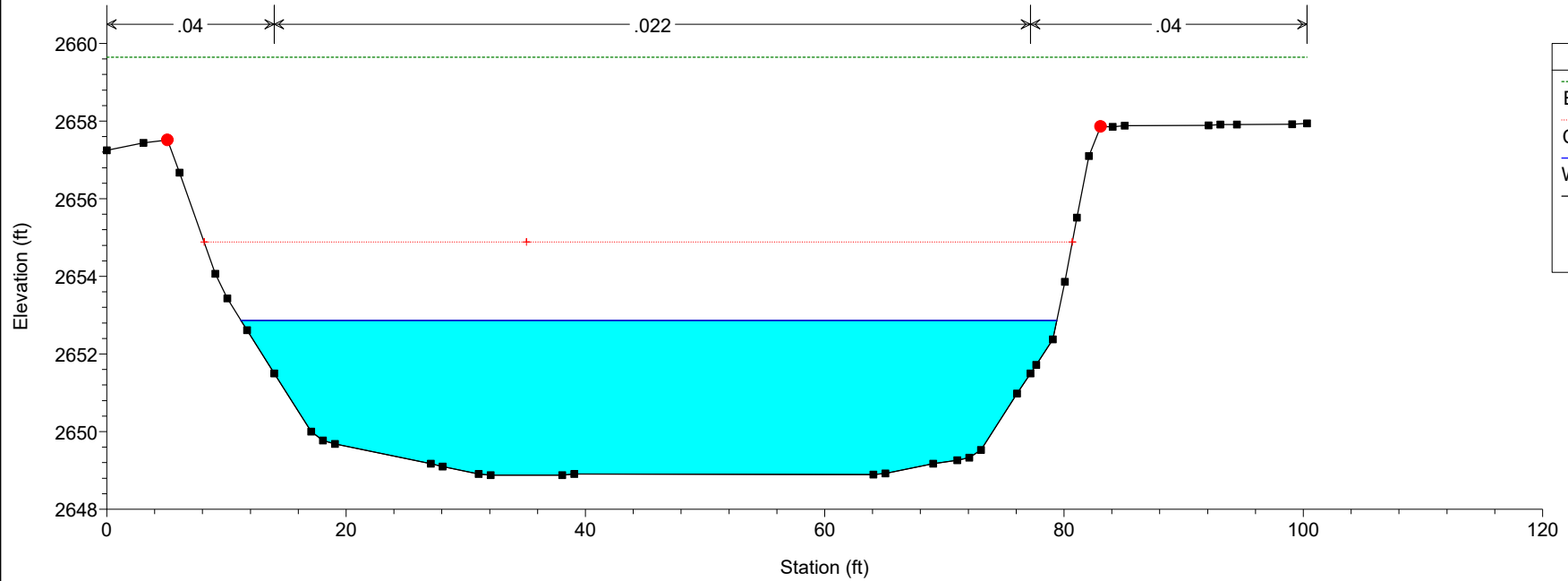
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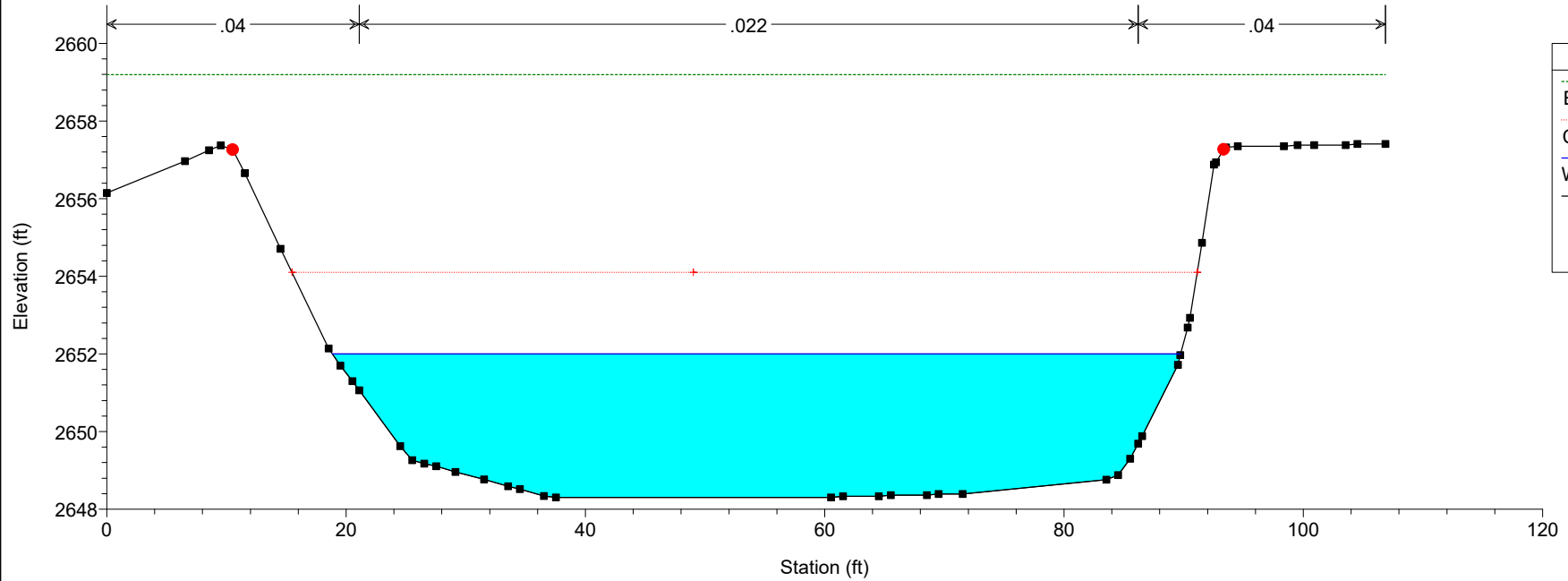
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RS = 439



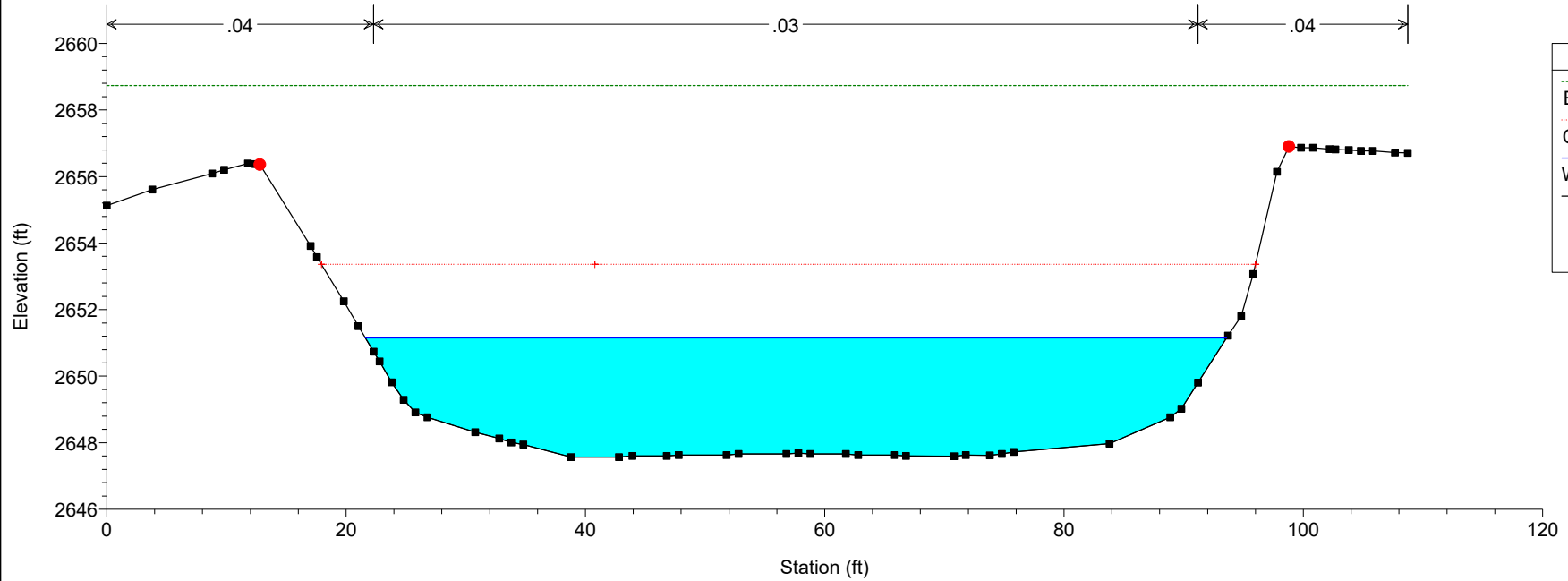
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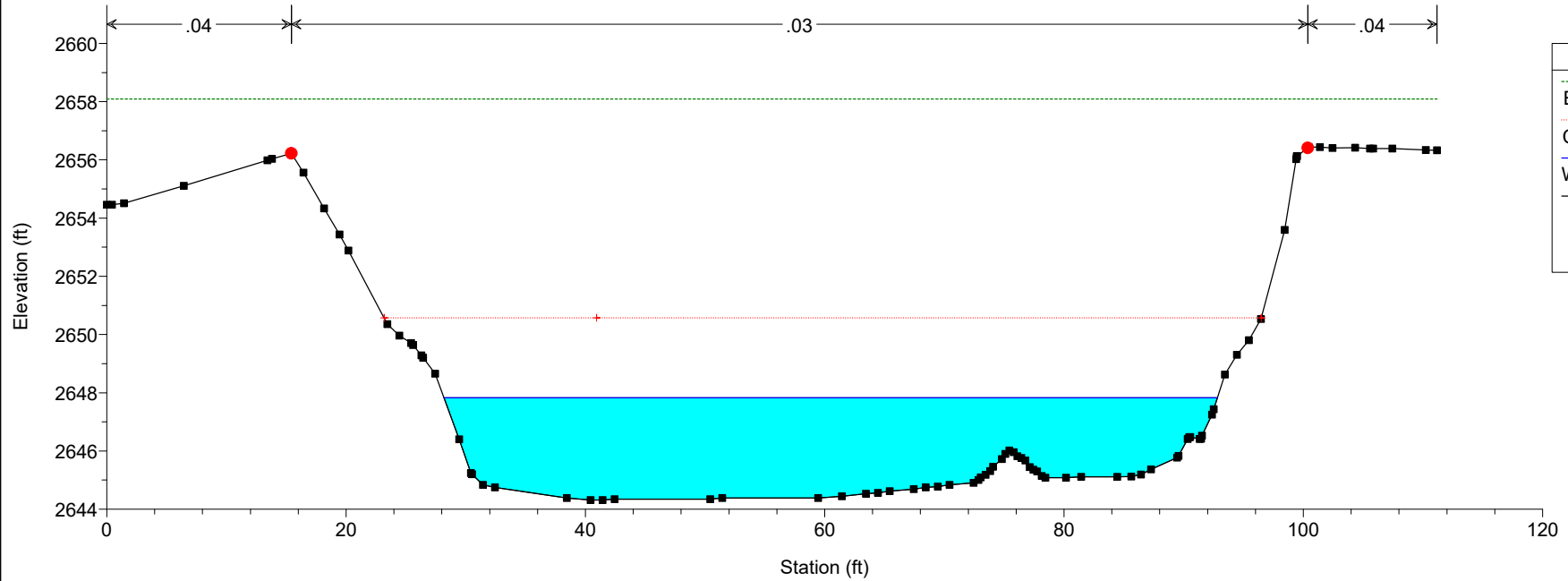
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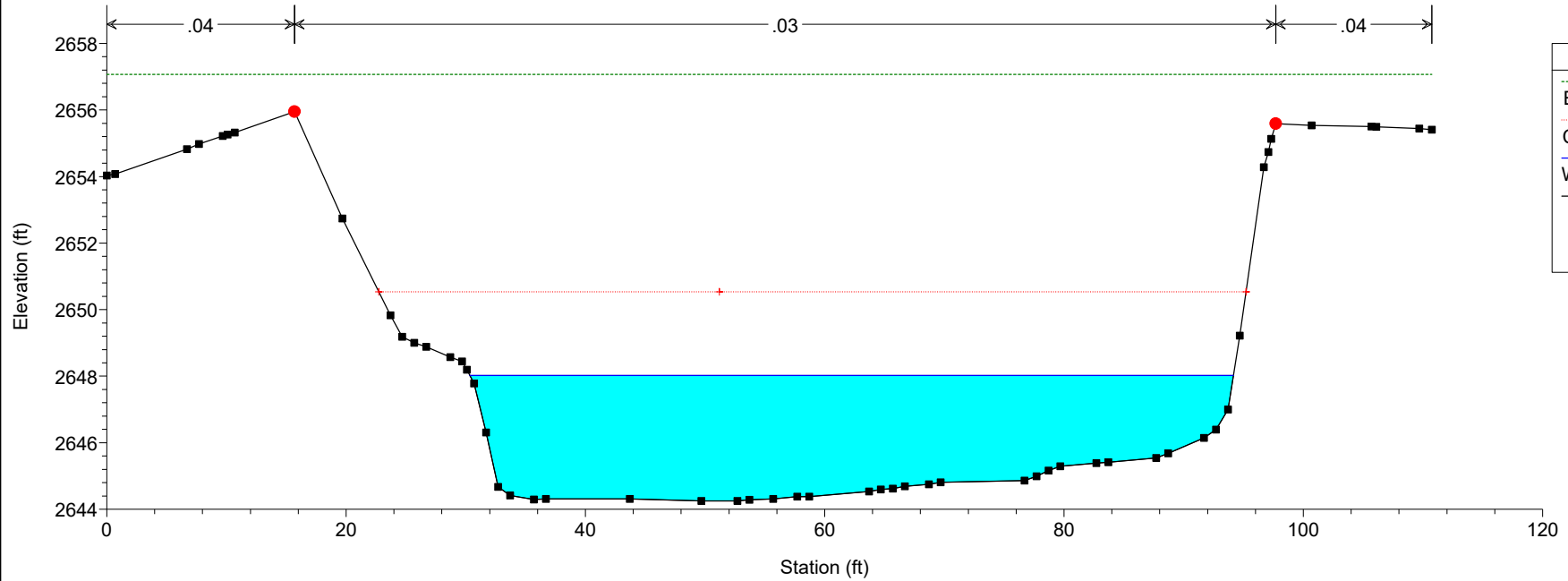
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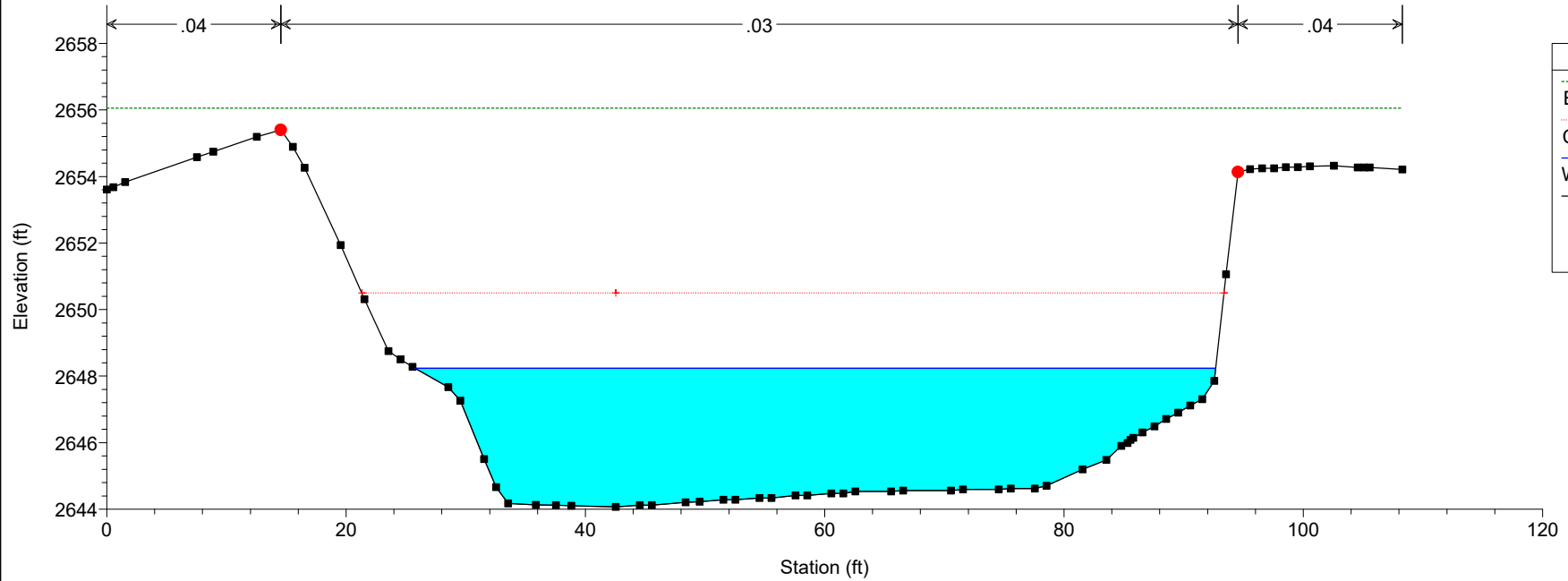
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RS = 377



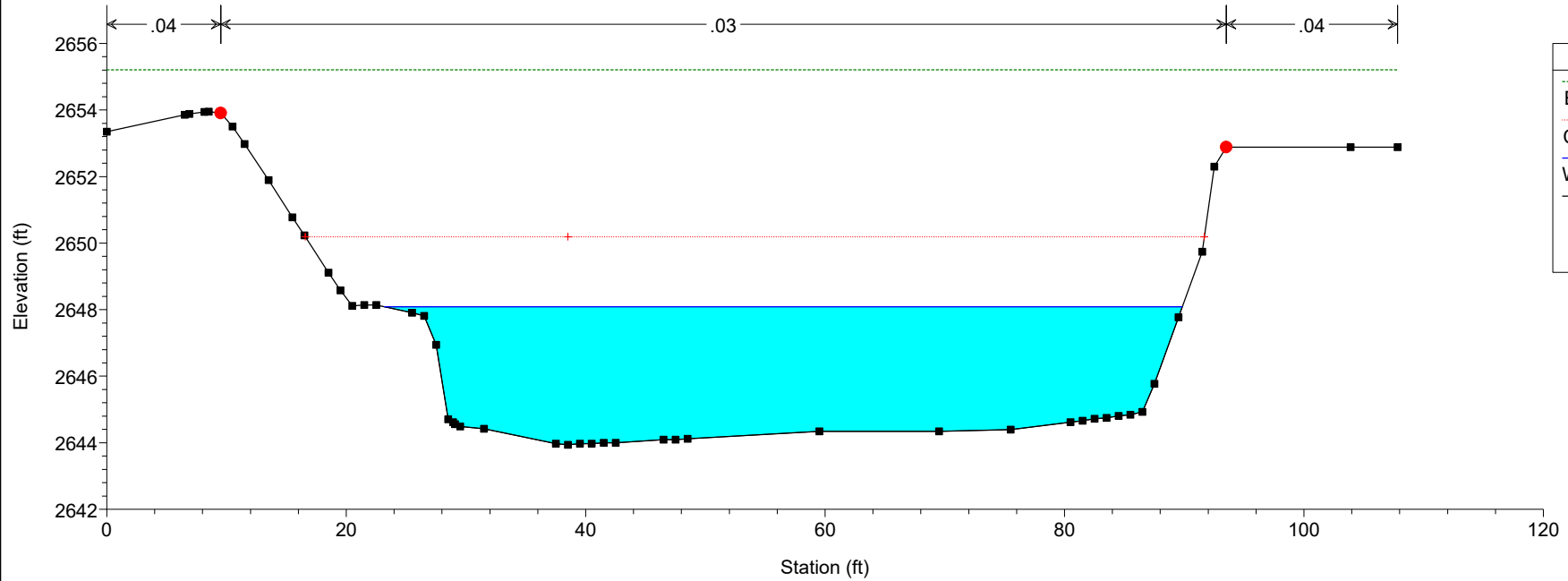
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RS = 368



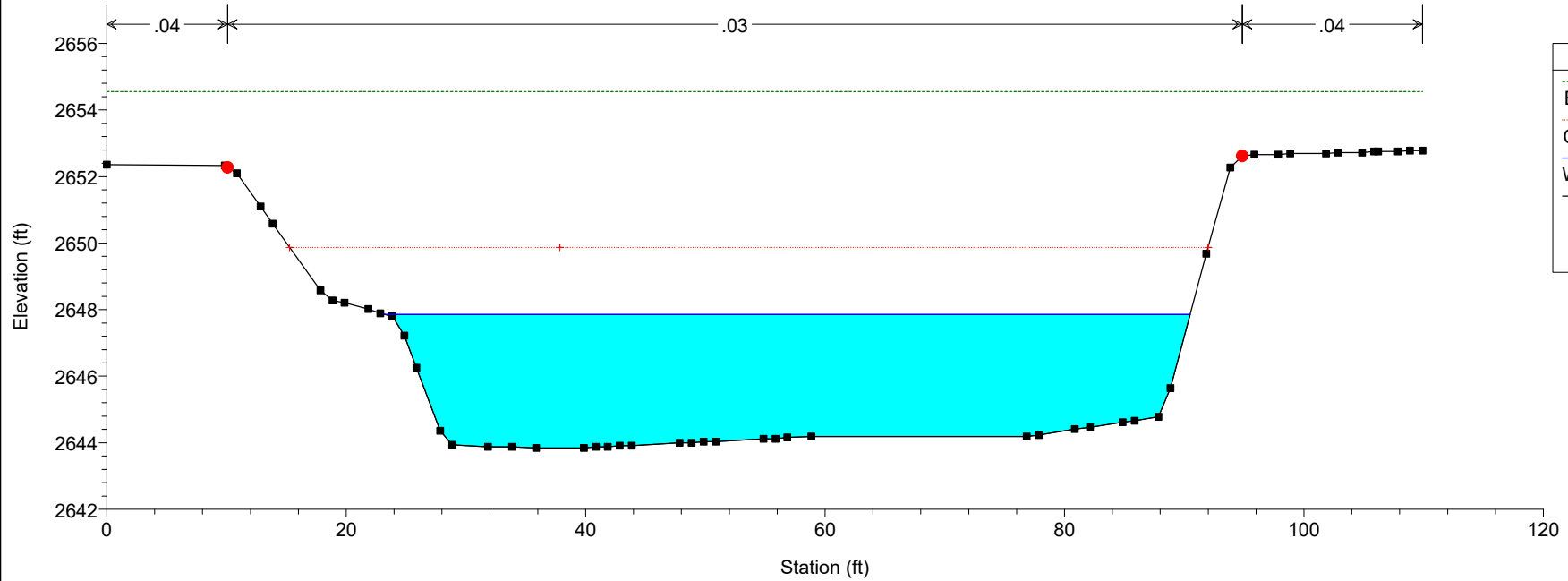
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RS = 364



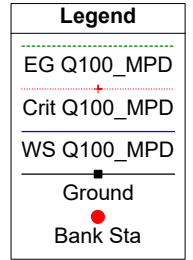
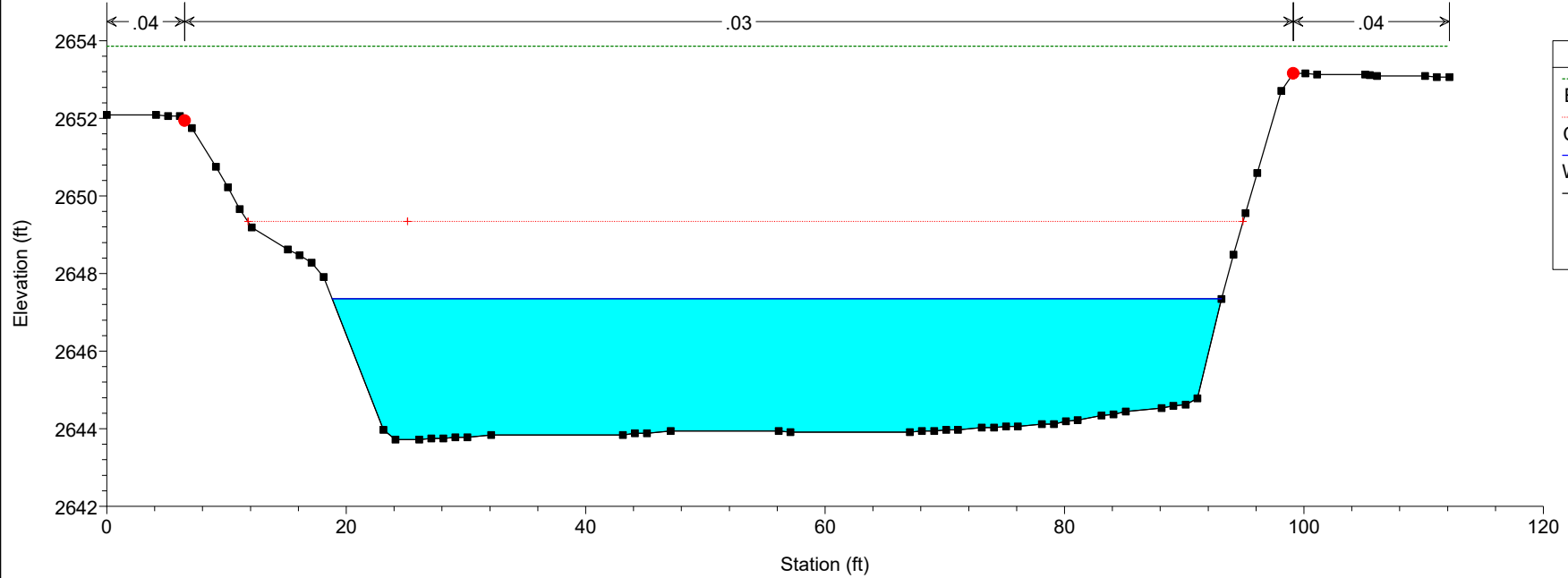
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = 359



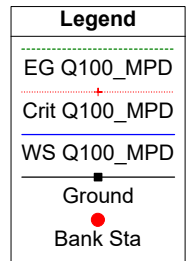
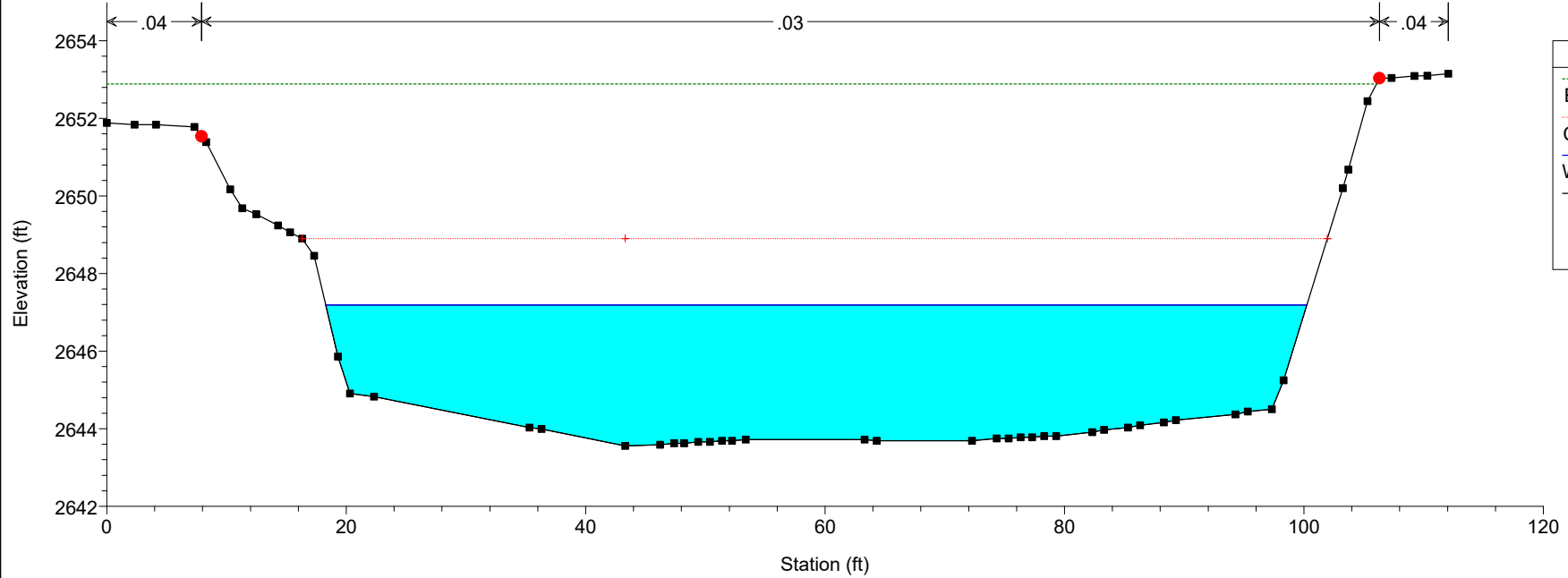
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RS = 345



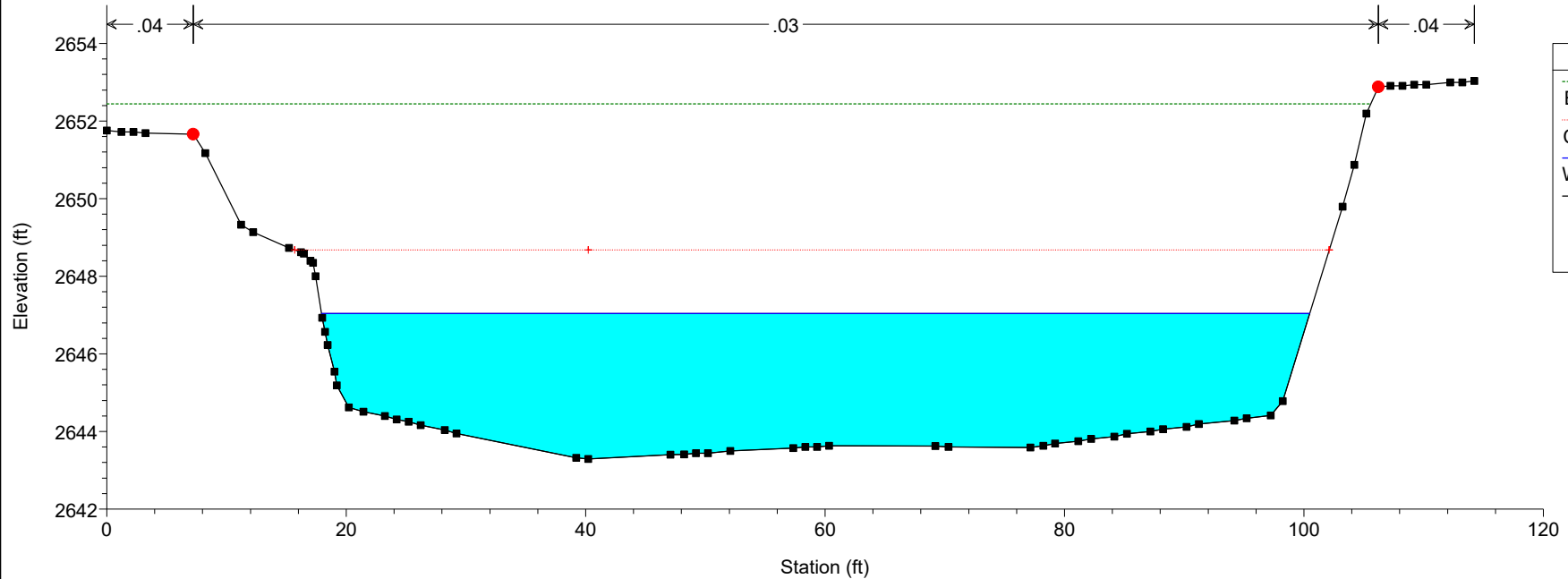
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RS = 327



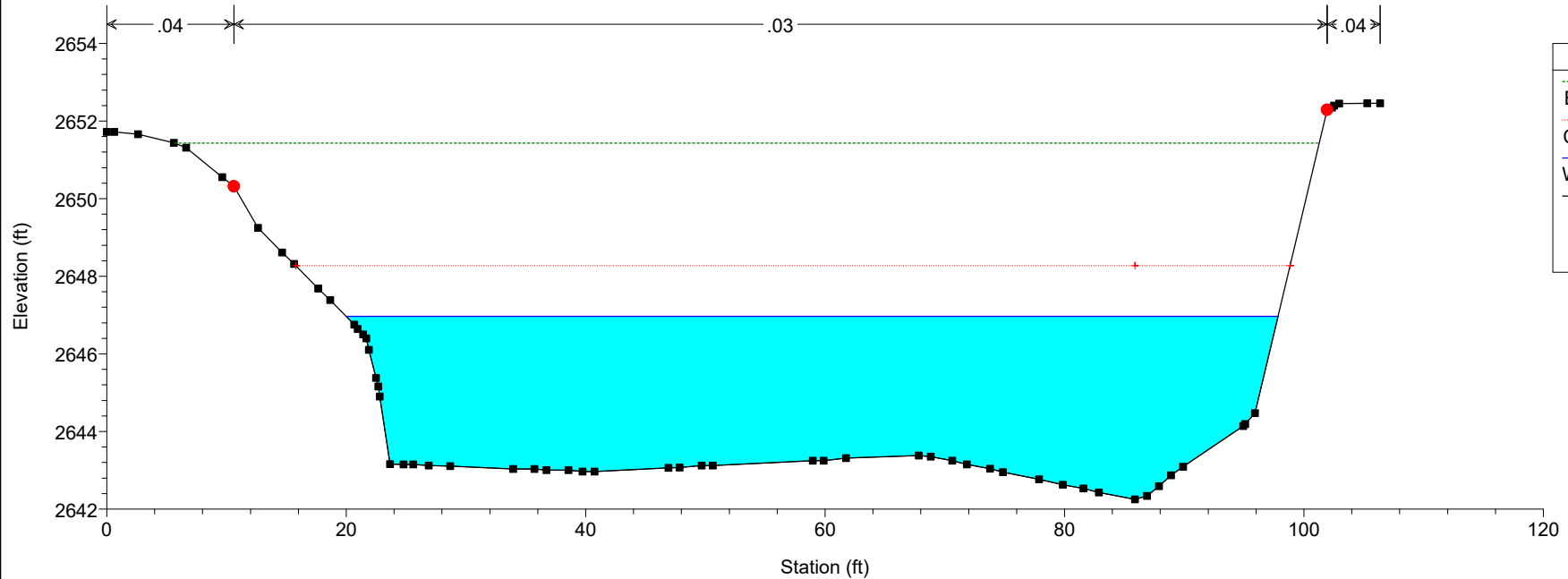
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RS = 311



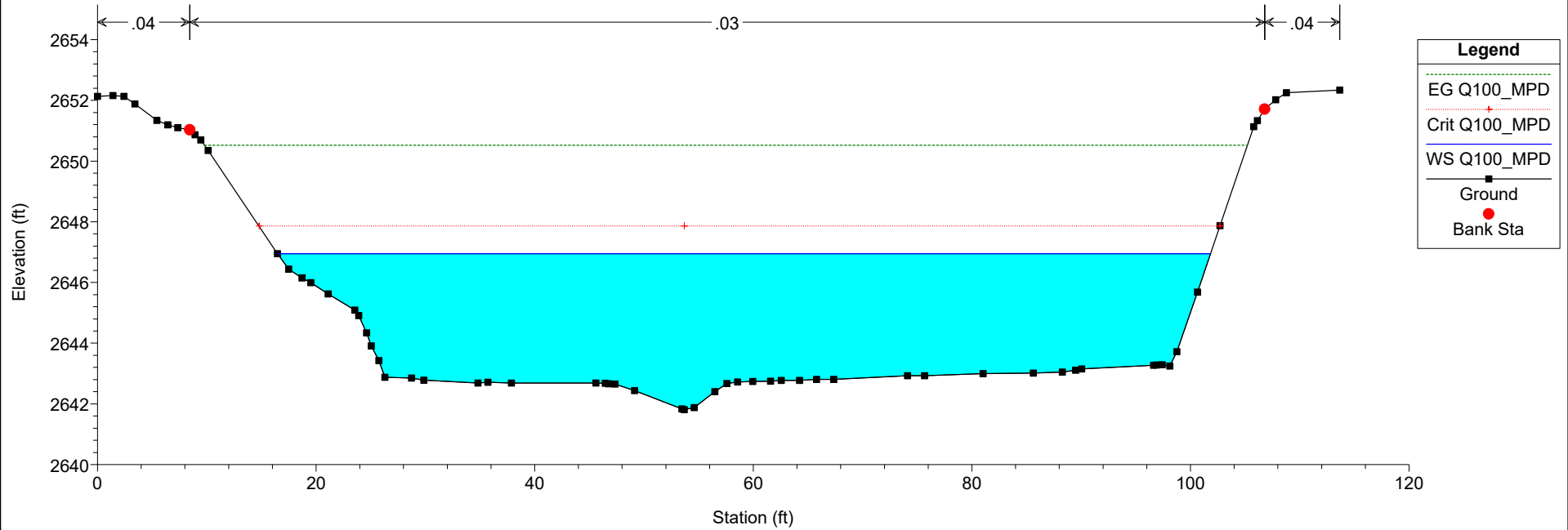
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RS = 283



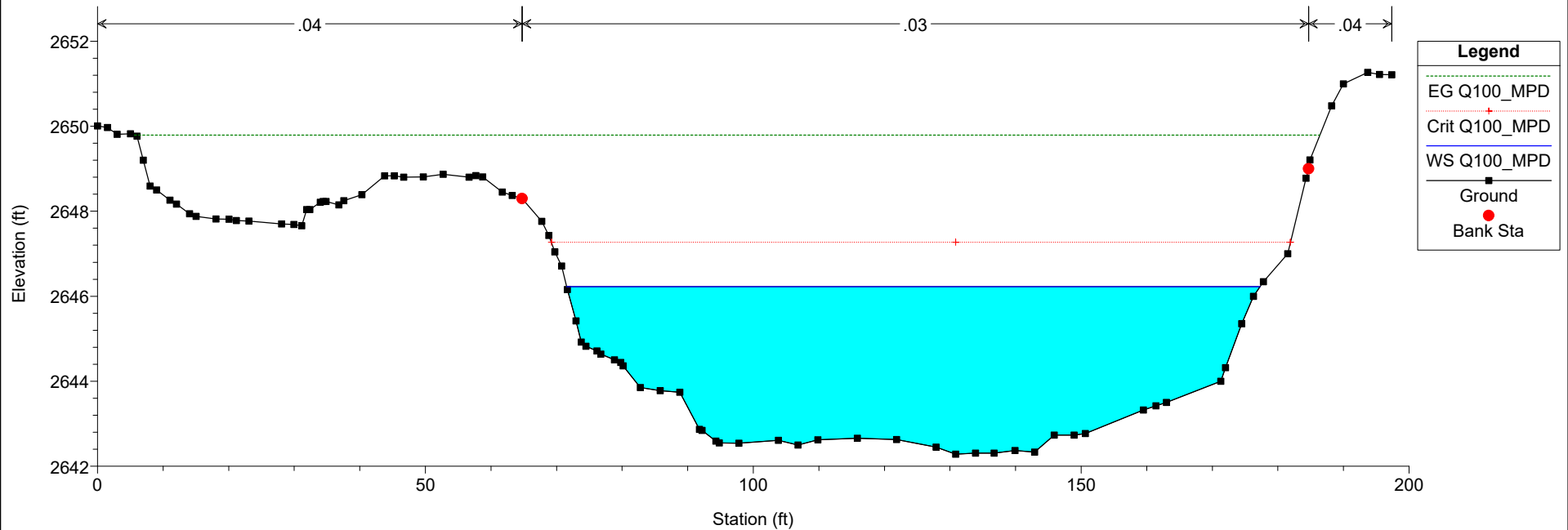
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RS = 254



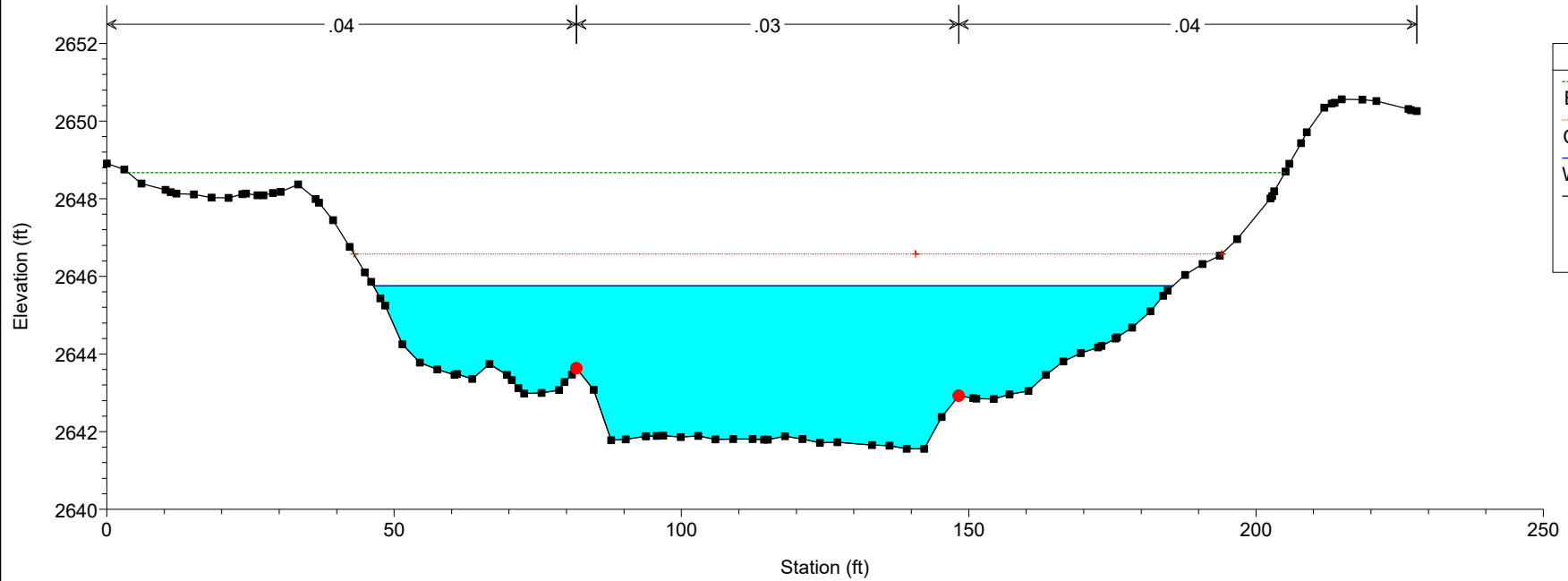
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = 226



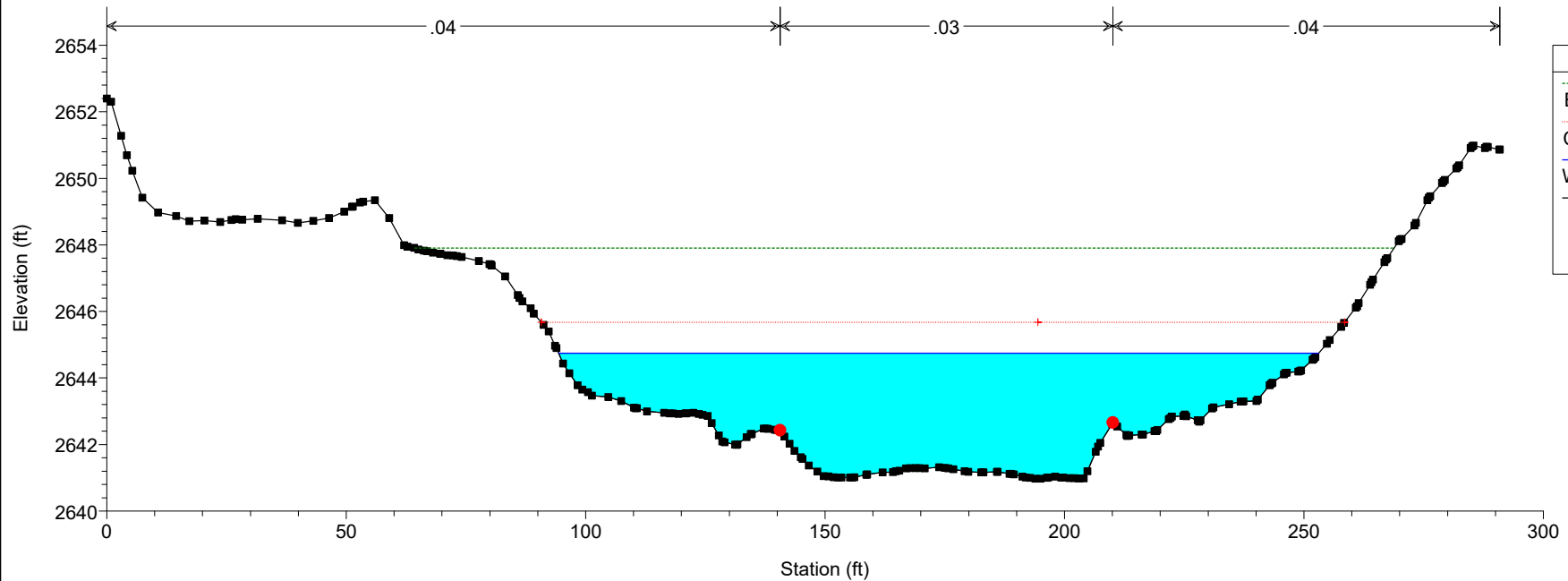
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = 177



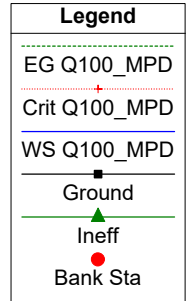
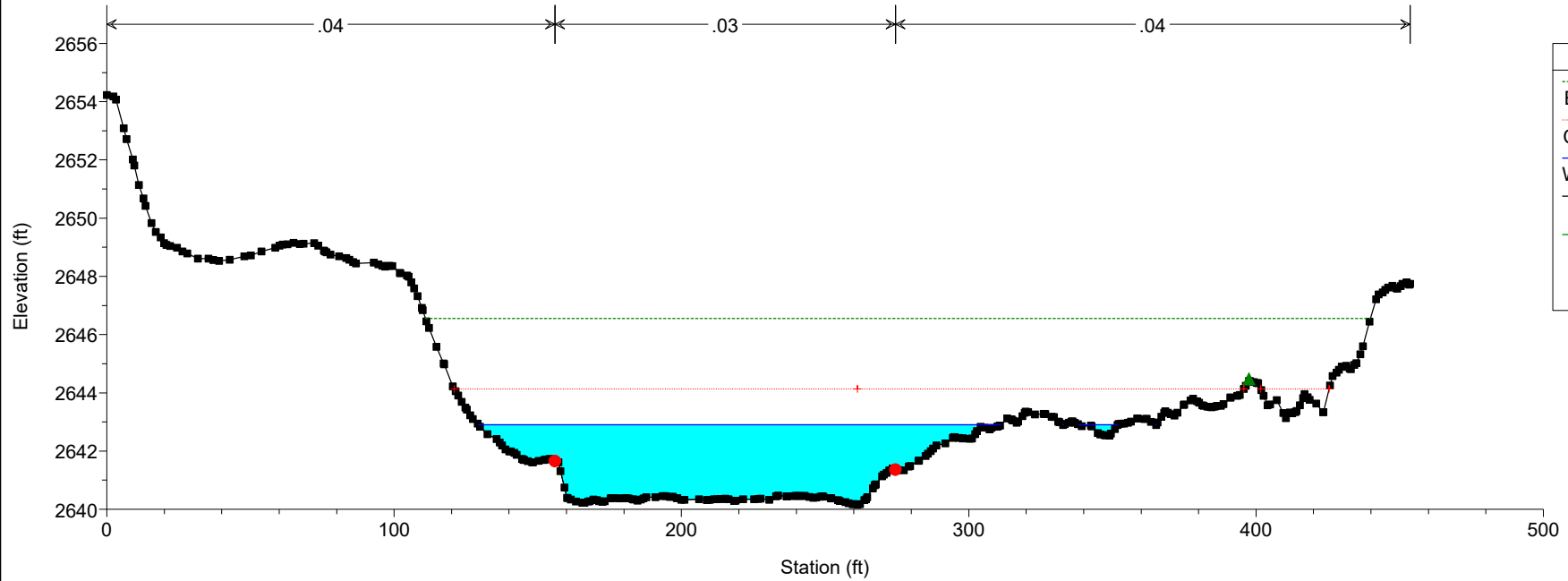
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = 101



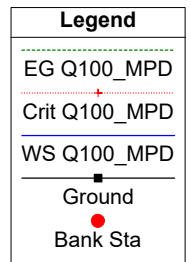
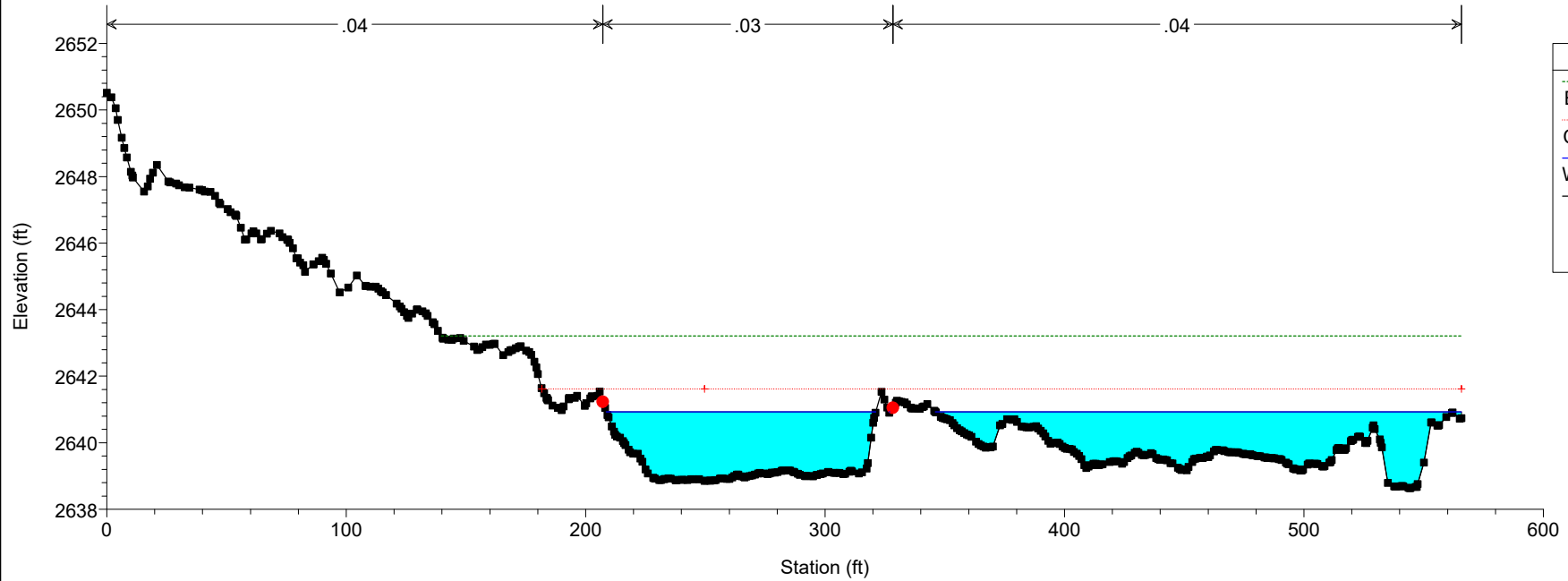
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = 70



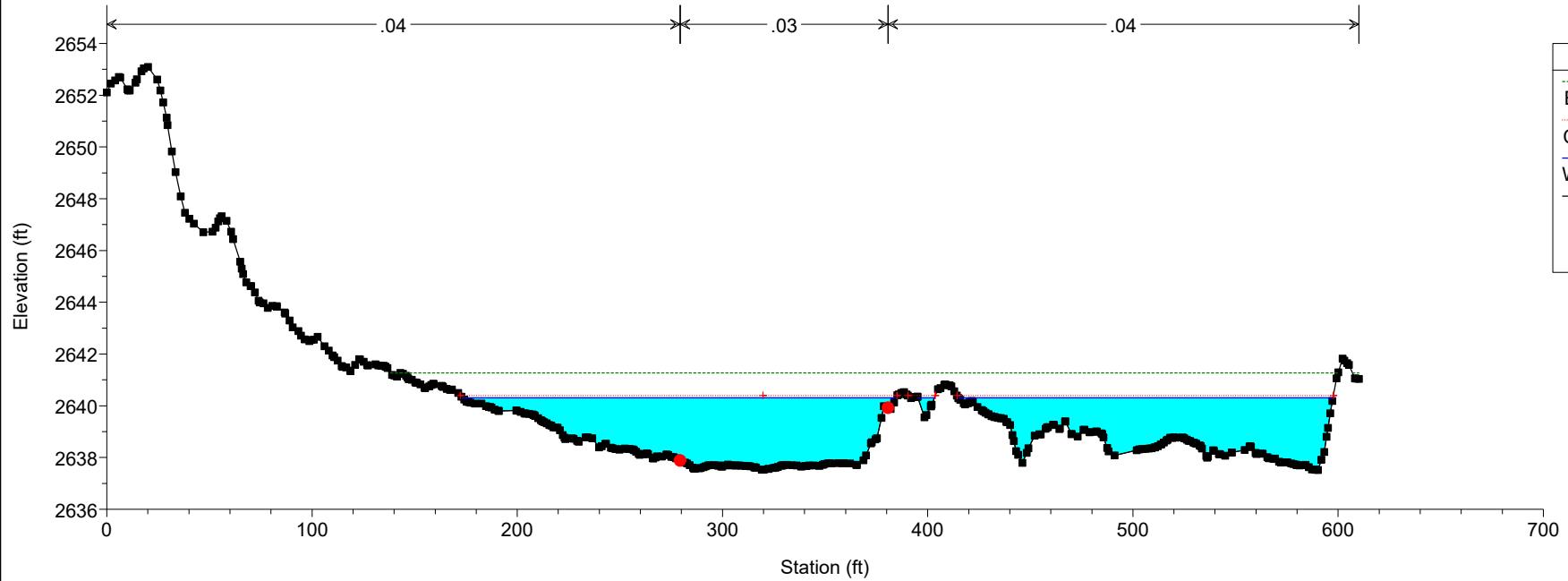
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = 30



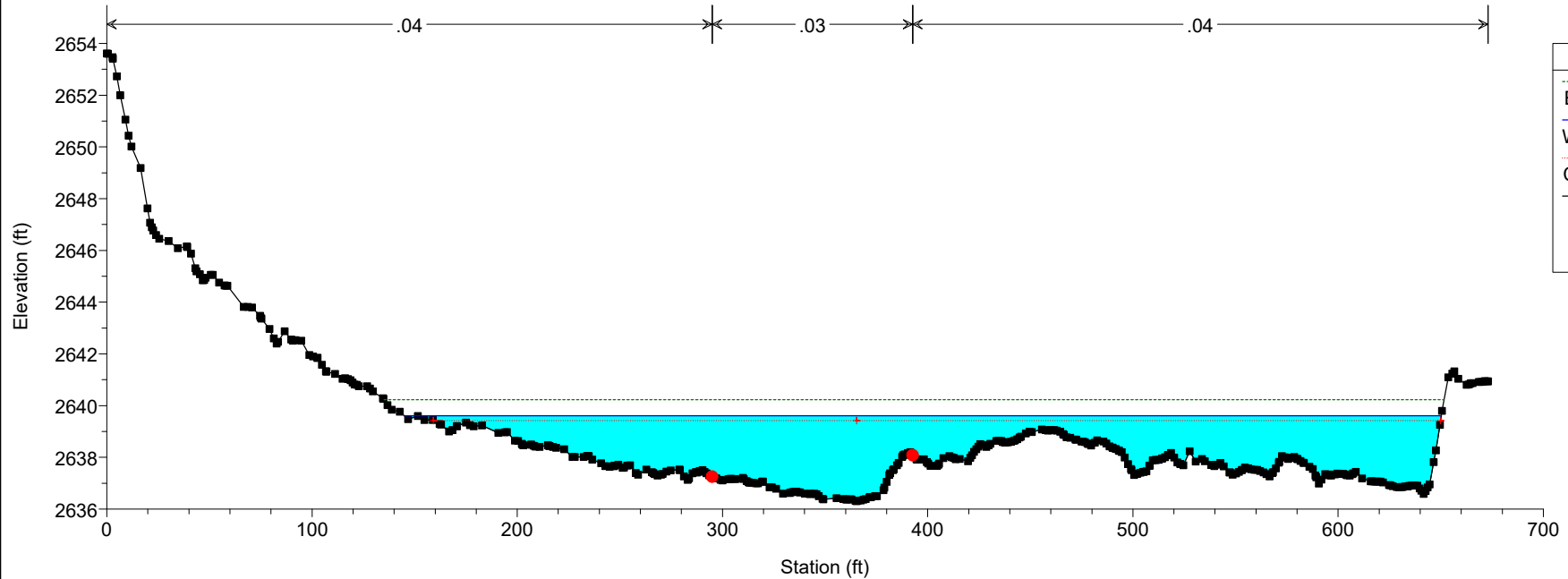
Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = -30



Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = -148



Ossum Wash Plan: Existing_MIX w/o Levees 10/29/2025
RS = -213

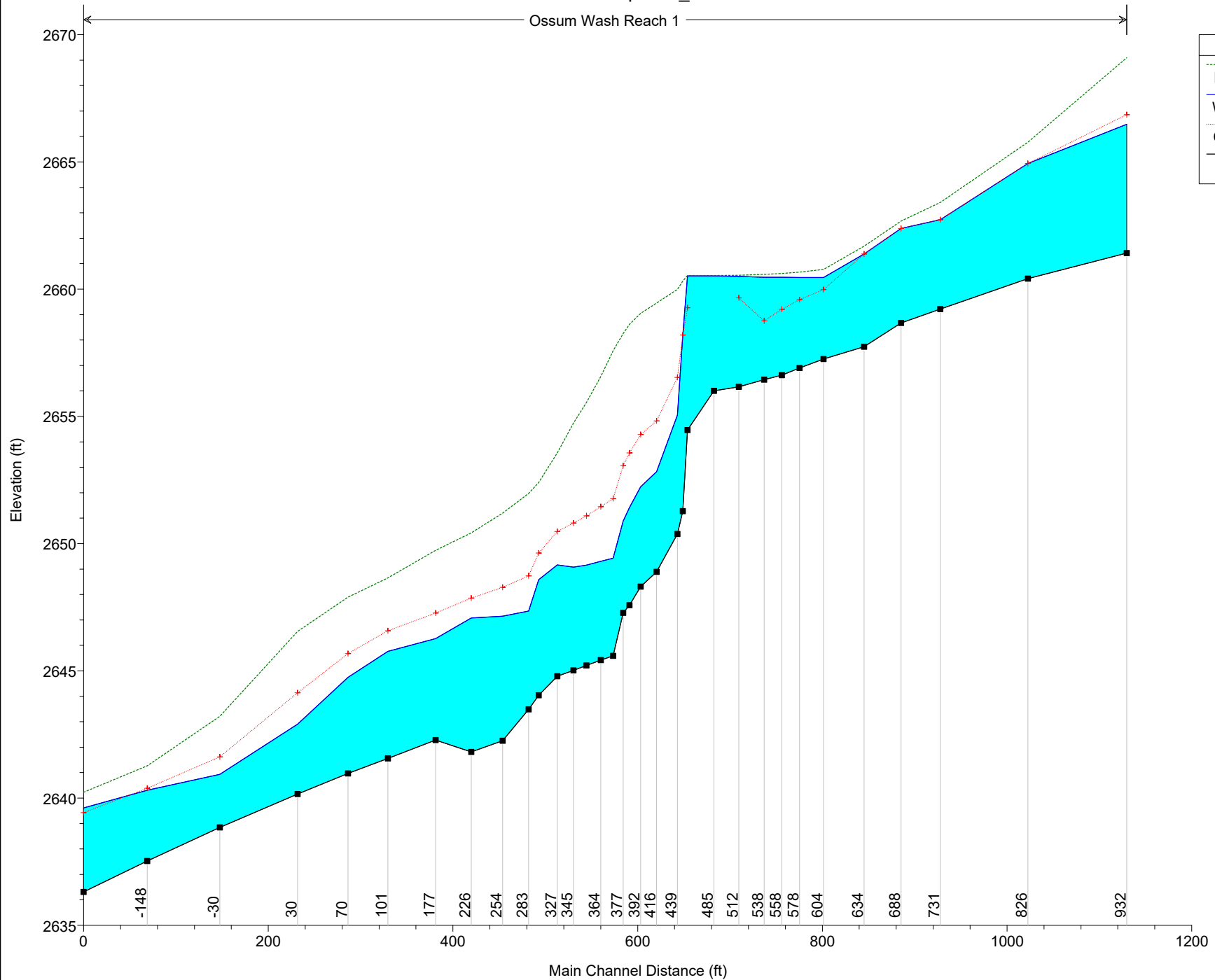


HEC-RAS Plan: Proposed MIX wo Levees River: Ossum Wash Reach: Reach 1 Profile: Q100_MPD

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
Reach 1	932	Q100_MPD	4876.00	2661.42	2666.48	2666.86	2669.09	0.020015	12.98	375.70	94.66	1.15
Reach 1	826	Q100_MPD	4876.00	2660.41	2664.94	2664.94	2665.78	0.008891	8.45	771.89	576.94	0.76
Reach 1	731	Q100_MPD	4876.00	2659.22	2662.73	2662.73	2663.41	0.005891	7.78	907.02	687.62	0.80
Reach 1	688	Q100_MPD	4876.00	2658.67	2662.39	2662.39	2662.68	0.002541	5.34	1317.75	981.09	0.53
Reach 1	634	Q100_MPD	4876.00	2657.74	2661.38	2661.38	2661.69	0.003072	5.39	1210.97	827.94	0.57
Reach 1	604	Q100_MPD	4876.00	2657.25	2660.46	2659.98	2660.77	0.003532	5.92	1320.92	869.98	0.61
Reach 1	578	Q100_MPD	4876.00	2656.90	2660.46	2659.59	2660.67	0.002177	5.04	1617.17	954.65	0.49
Reach 1	558	Q100_MPD	4876.00	2656.62	2660.47	2659.21	2660.62	0.001470	4.36	1777.19	1066.77	0.41
Reach 1	538	Q100_MPD	4876.00	2656.44	2660.47	2658.75	2660.58	0.001028	3.84	1935.35	1150.62	0.35
Reach 1	512	Q100_MPD	4876.00	2656.16	2660.51	2659.66	2660.55	0.000247	3.06	3740.24	1380.51	0.26
Reach 1	485	Q100_MPD	4876.00	2656.00	2660.52		2660.54	0.000103	2.04	4971.47	1457.78	0.17
Reach 1	456	Q100_MPD	4876.00	2654.46	2660.52	2659.27	2660.53	0.000082	1.94	5427.50	1504.52	0.14
Reach 1	448	Q100_MPD	4876.00	2651.28	2658.19	2658.19	2660.32	0.006306	11.70	416.60	100.29	1.01
Reach 1	439	Q100_MPD	4876.00	2650.38	2655.06	2656.53	2659.99	0.012578	17.82	273.63	71.95	1.61
Reach 1	416	Q100_MPD	4876.00	2648.89	2652.83	2654.83	2659.46	0.020865	20.65	236.07	71.12	2.00
Reach 1	392	Q100_MPD	4876.00	2648.31	2652.24	2654.29	2659.05	0.023642	20.94	232.81	70.33	2.03
Reach 1	387	Q100_MPD	4876.00	2647.58	2651.42	2653.57	2658.62	0.048582	21.52	226.55	69.51	2.10
Reach 1	377	Q100_MPD	4876.00	2647.28	2650.89	2653.07	2658.26	0.051495	21.78	223.85	70.27	2.15
Reach 1	368	Q100_MPD	4876.00	2645.59	2649.43	2651.77	2657.58	0.059565	22.91	212.85	69.37	2.31
Reach 1	364	Q100_MPD	4876.00	2645.42	2649.31	2651.45	2656.57	0.052242	21.61	225.63	72.83	2.16
Reach 1	359	Q100_MPD	4876.00	2645.21	2649.16	2651.09	2655.55	0.045406	20.28	240.43	77.00	2.02
Reach 1	345	Q100_MPD	4876.00	2645.02	2649.08	2650.81	2654.74	0.038632	19.09	255.45	79.37	1.88
Reach 1	327	Q100_MPD	4876.00	2644.79	2649.16	2650.48	2653.57	0.055057	16.84	289.57	83.25	1.59
Reach 1	311	Q100_MPD	4876.00	2644.04	2648.58	2649.63	2652.40	0.044418	15.68	311.01	84.52	1.44
Reach 1	283	Q100_MPD	4876.00	2643.49	2647.35	2648.74	2651.97	0.024582	17.24	282.88	83.04	1.65
Reach 1	254	Q100_MPD	4876.00	2642.25	2647.15	2648.28	2651.20	0.018724	16.15	302.01	78.57	1.45
Reach 1	226	Q100_MPD	4876.00	2641.81	2647.07	2647.86	2650.42	0.015086	14.68	332.11	85.72	1.32
Reach 1	177	Q100_MPD	4876.00	2642.28	2646.27	2647.27	2649.73	0.020577	14.94	326.41	105.98	1.50
Reach 1	101	Q100_MPD	4876.00	2641.56	2645.77	2646.57	2648.66	0.015197	14.92	401.73	139.30	1.34
Reach 1	70	Q100_MPD	4876.00	2640.97	2644.75	2645.67	2647.90	0.019024	15.66	391.94	158.75	1.48
Reach 1	30	Q100_MPD	4876.00	2640.16	2642.90	2644.14	2646.55	0.030342	15.72	344.46	196.11	1.76
Reach 1	-30	Q100_MPD	4876.00	2638.85	2640.93	2641.62	2643.21	0.040461	14.33	448.79	332.74	1.92
Reach 1	-148	Q100_MPD	4876.00	2637.53	2640.31	2640.39	2641.27	0.011592	9.73	705.00	402.23	1.09
Reach 1	-213	Q100_MPD	4876.00	2636.31	2639.61	2639.43	2640.23	0.007002	8.13	906.33	505.28	0.86

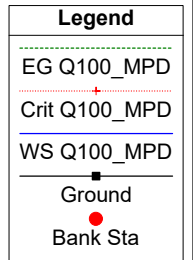
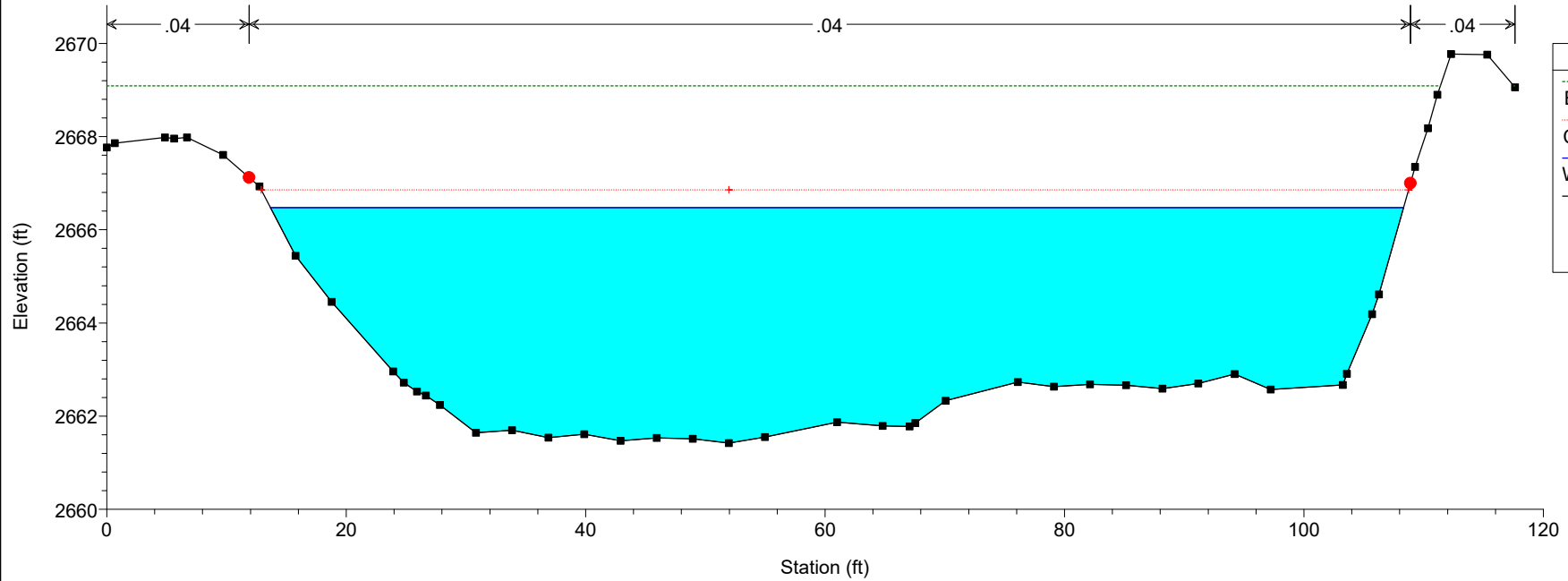
- Turner Rd
- Right Bank Improvements - Existing Grouted
- Full Section Improvements - Grouted
- Full Section Improvements - Loose

Ossum Wash Reach 1



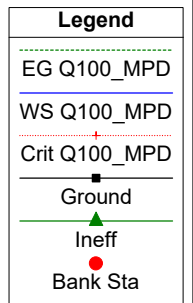
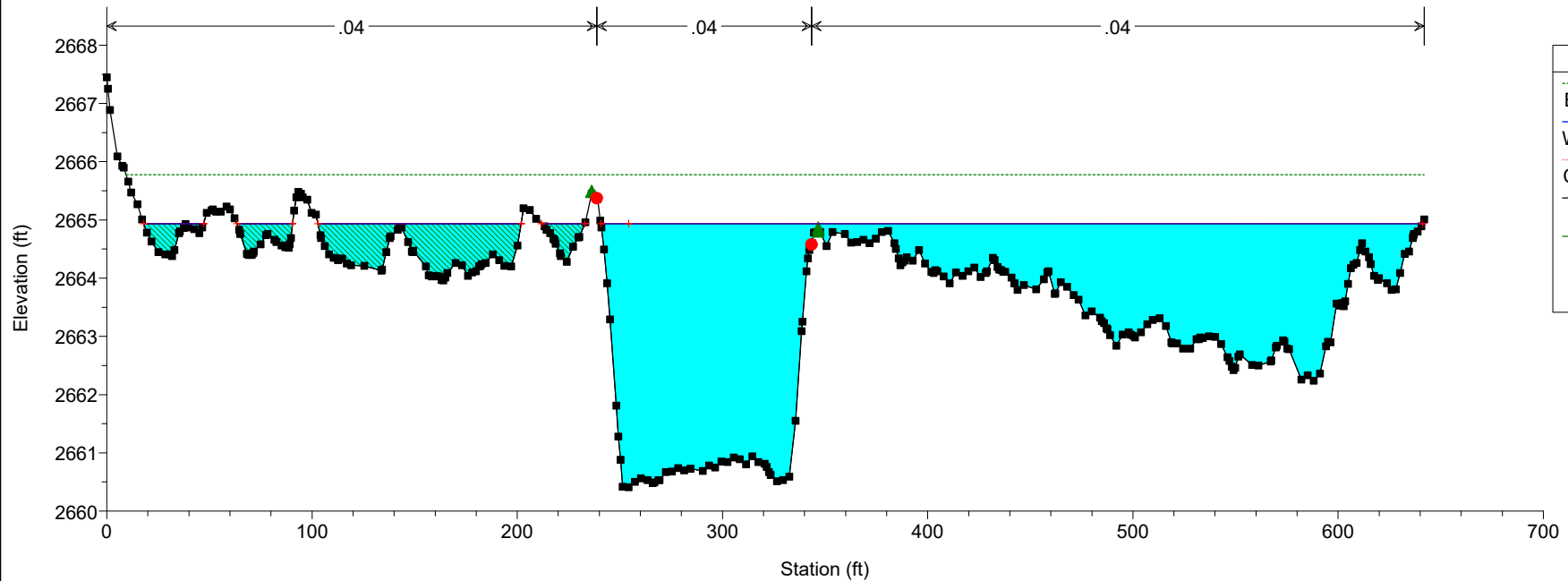
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025

RS = 932

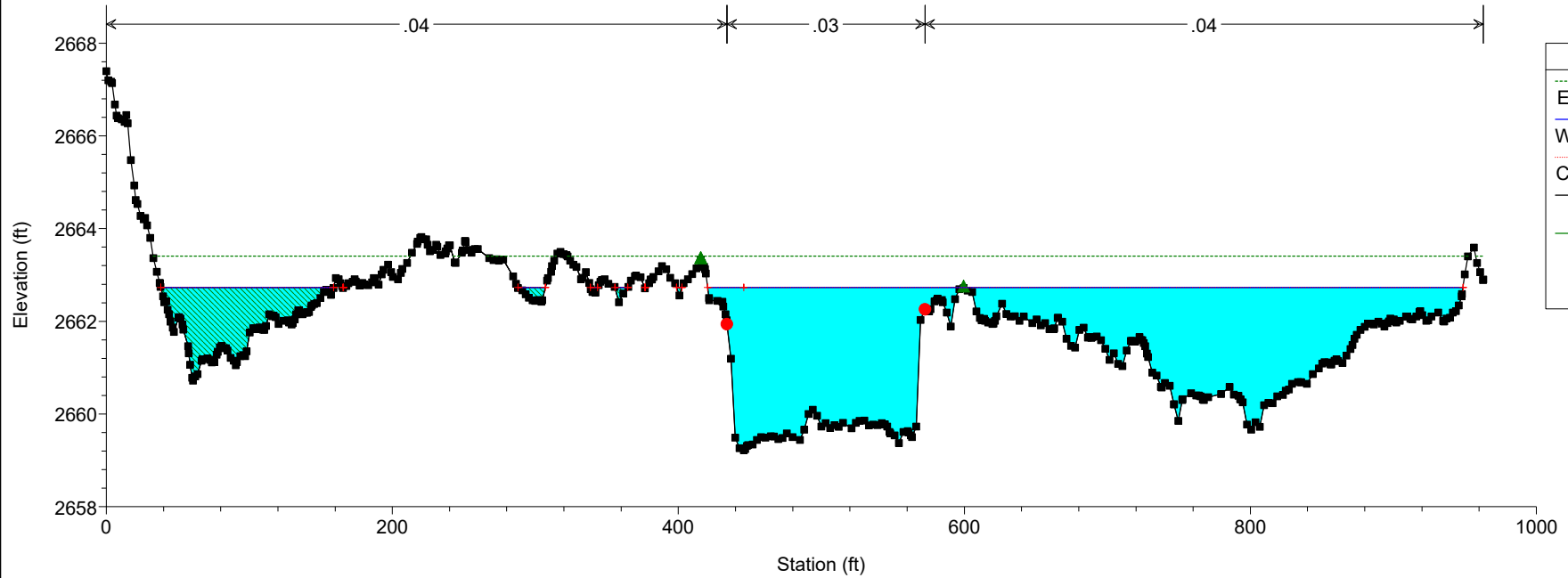


Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025

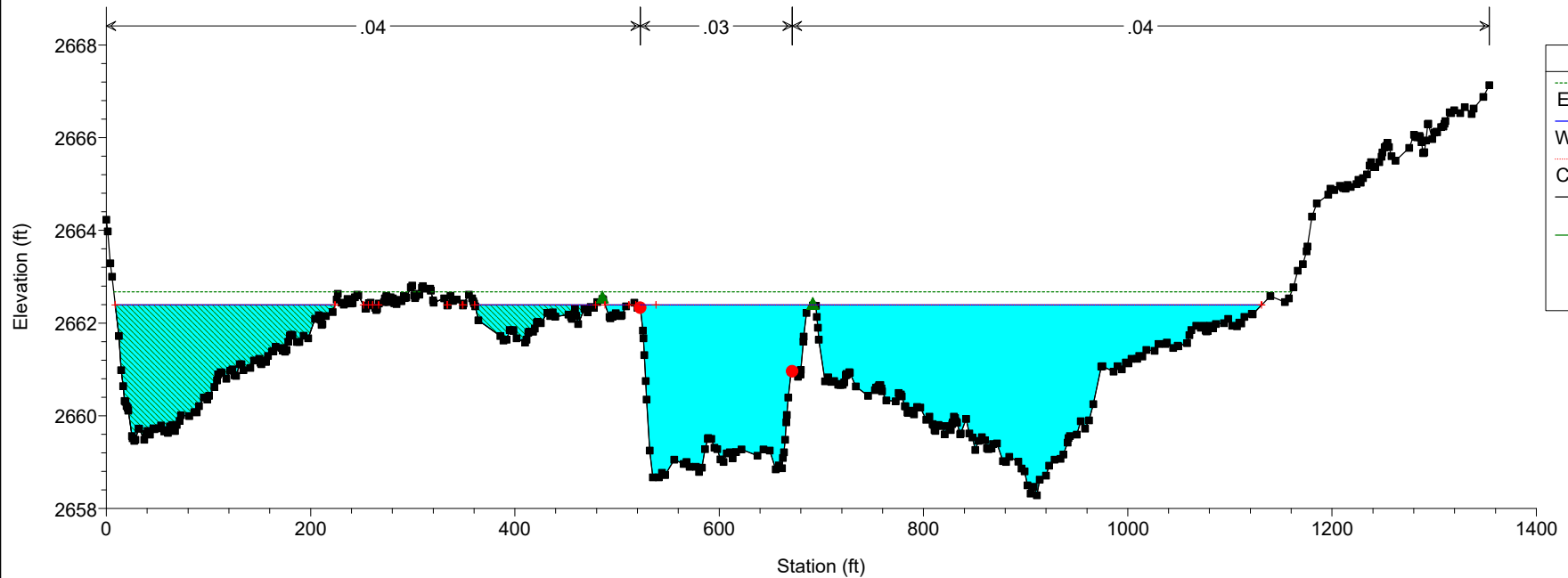
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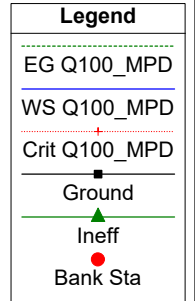
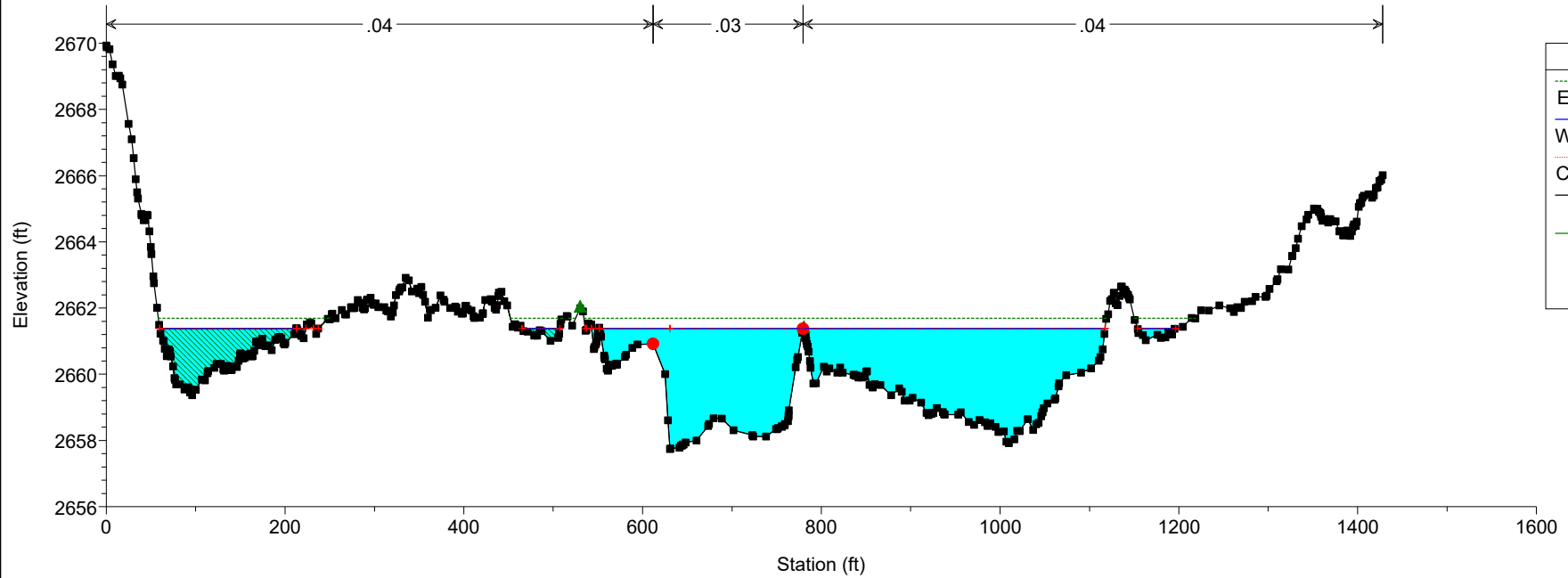
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 731



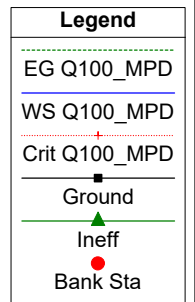
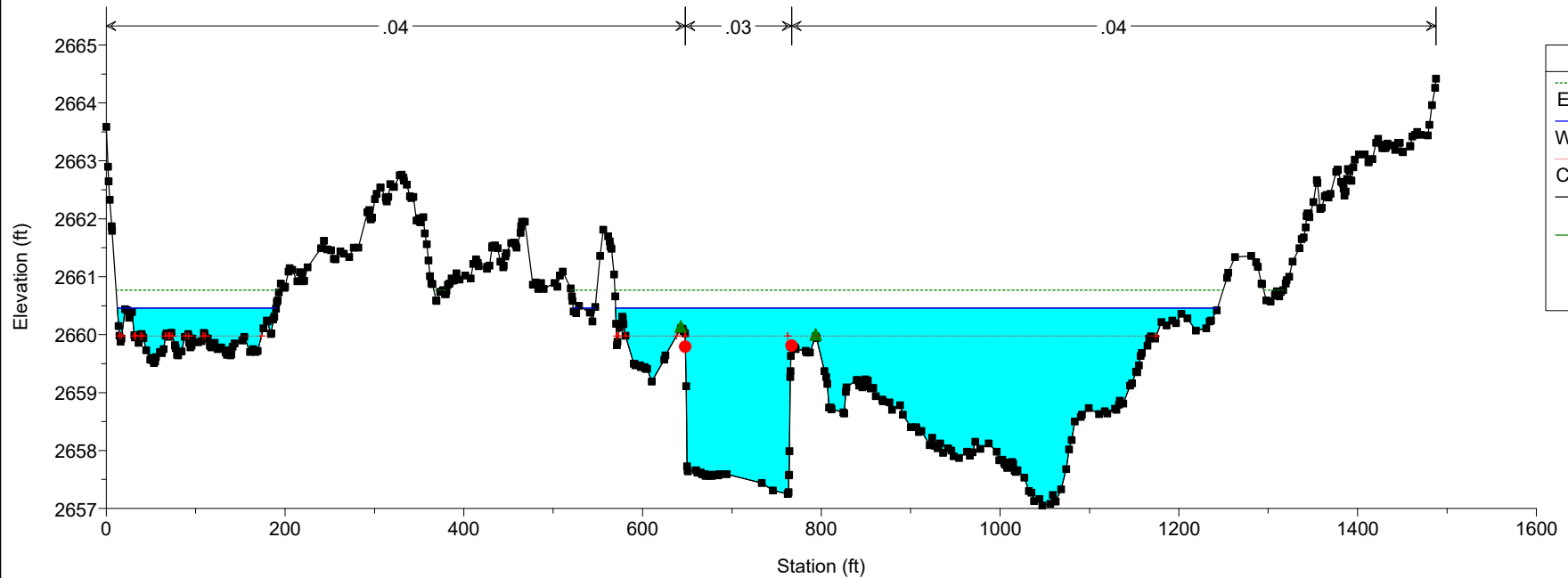
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 688



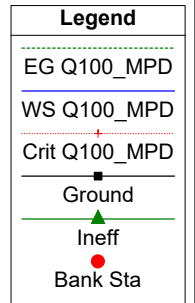
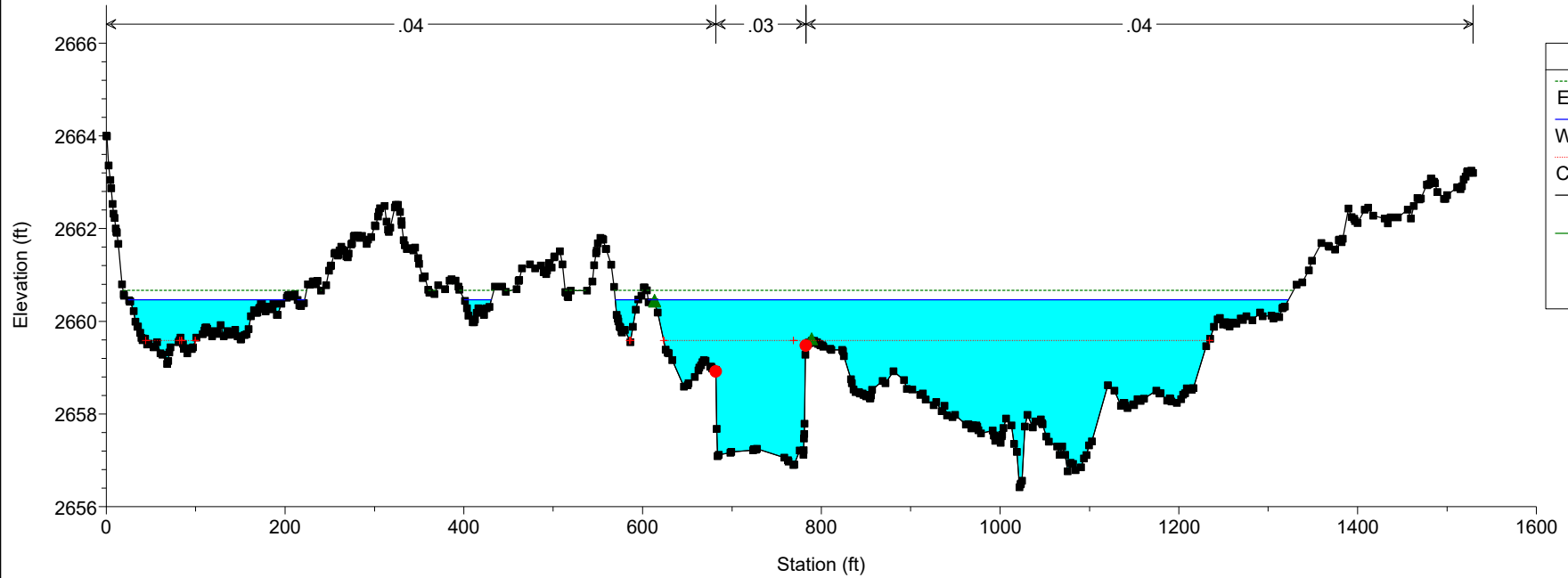
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 634



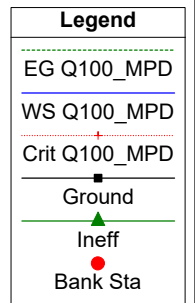
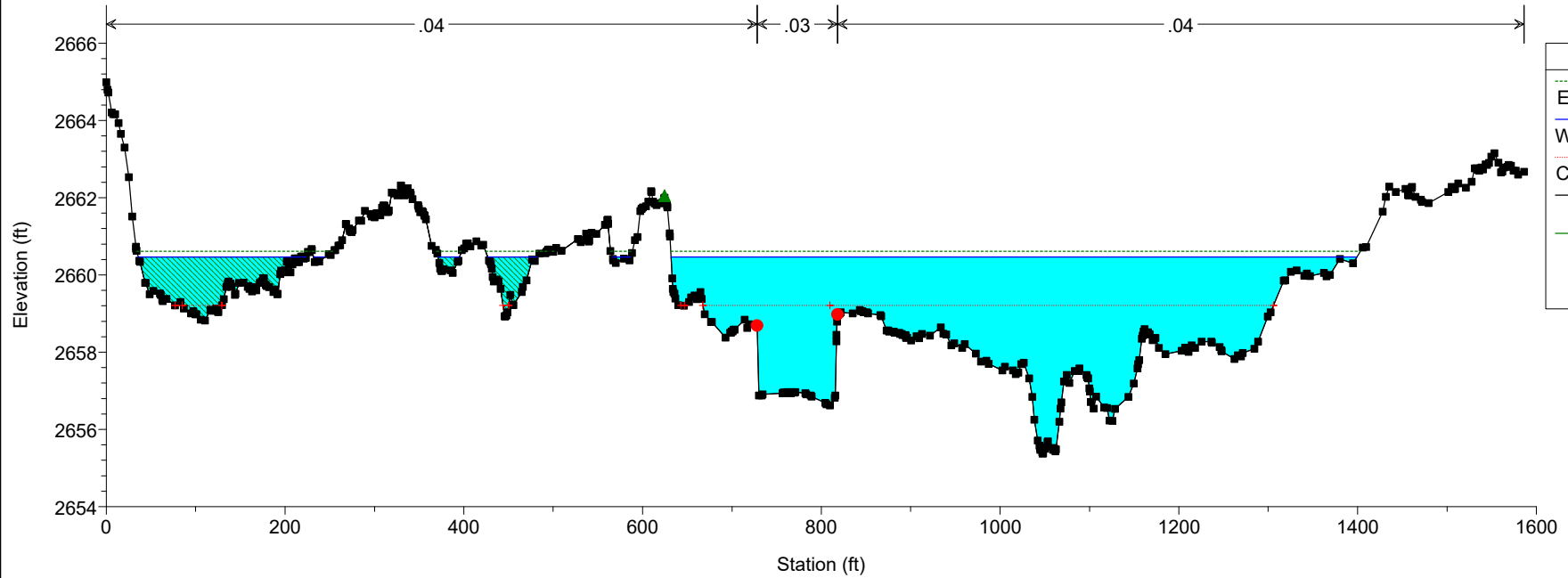
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 604



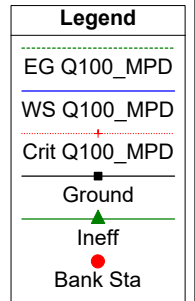
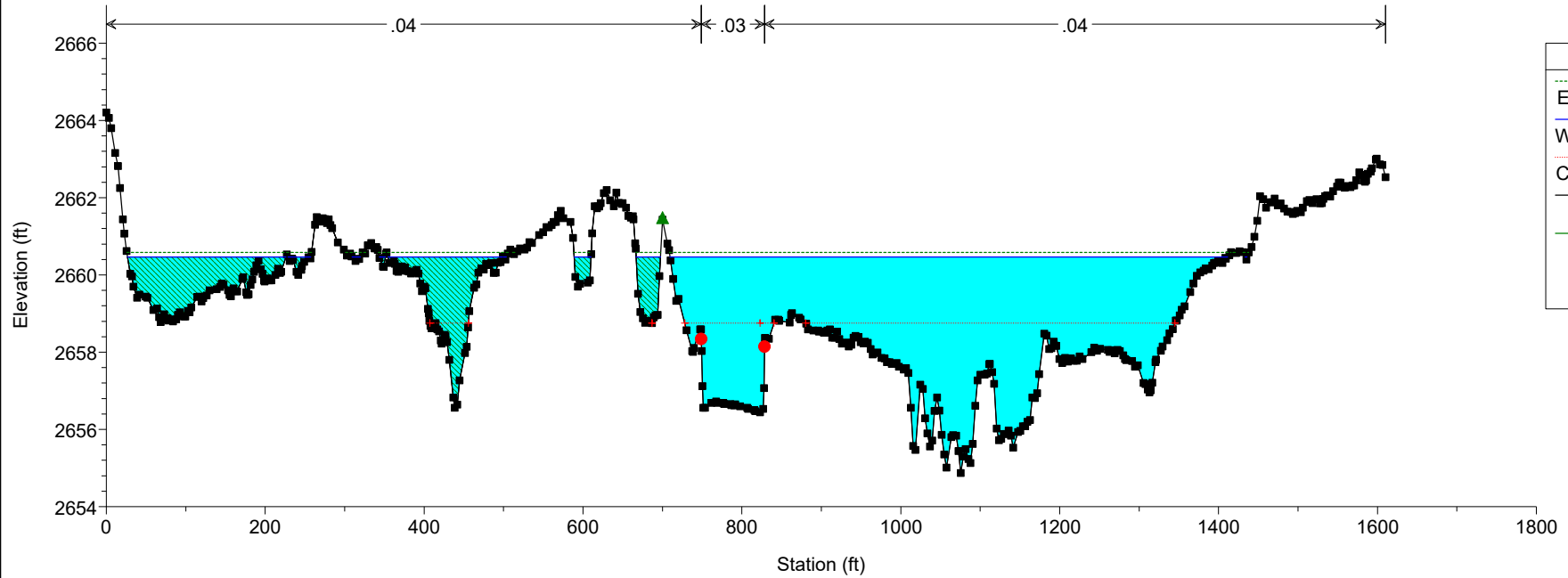
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 578



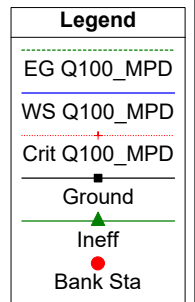
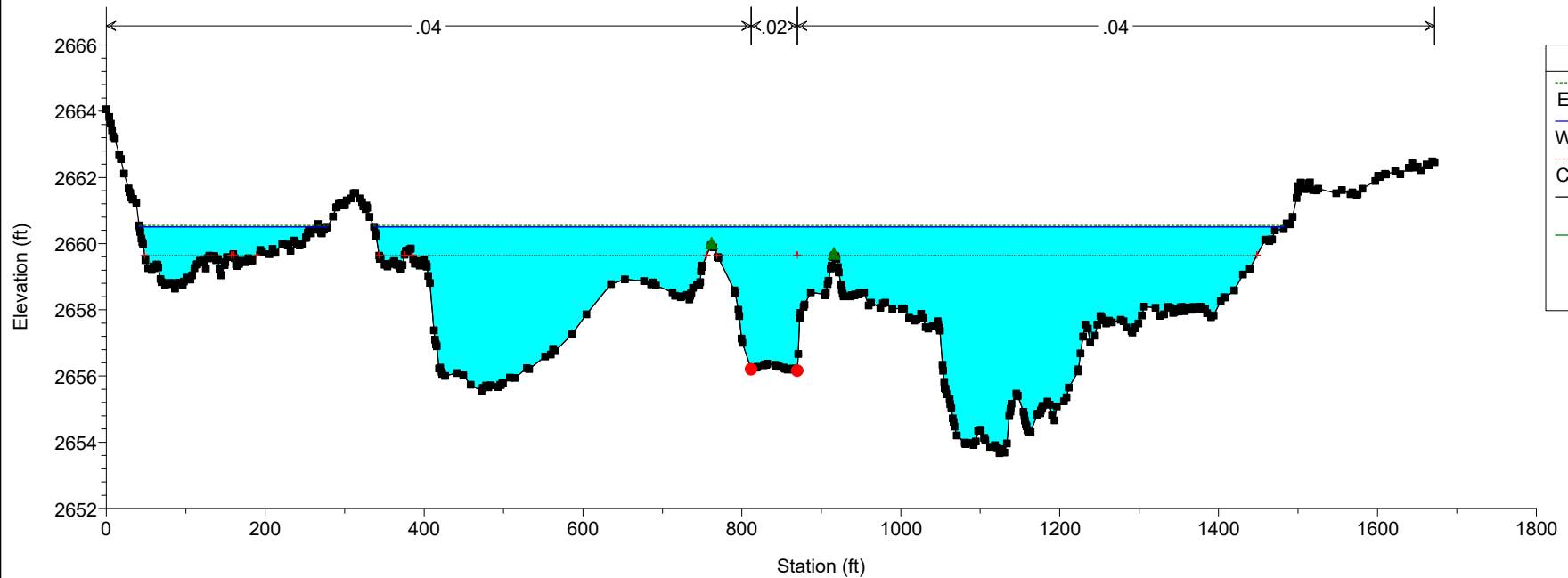
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 558



Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 538

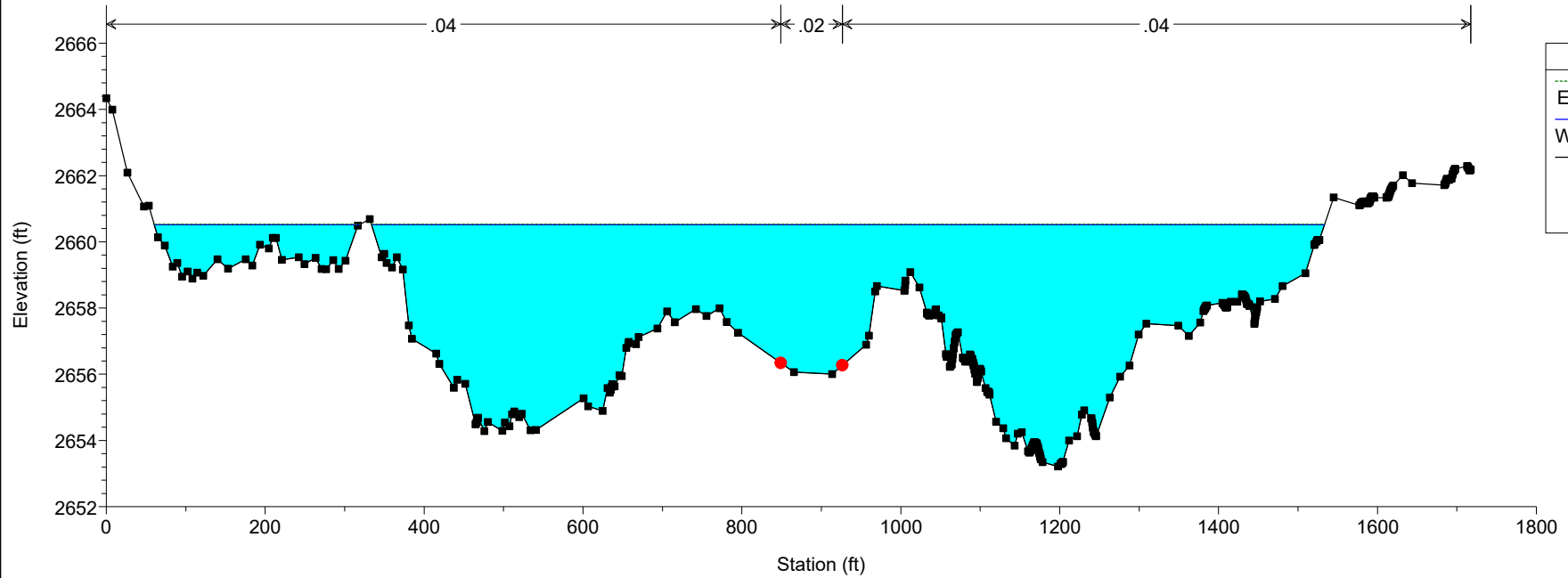


Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 512



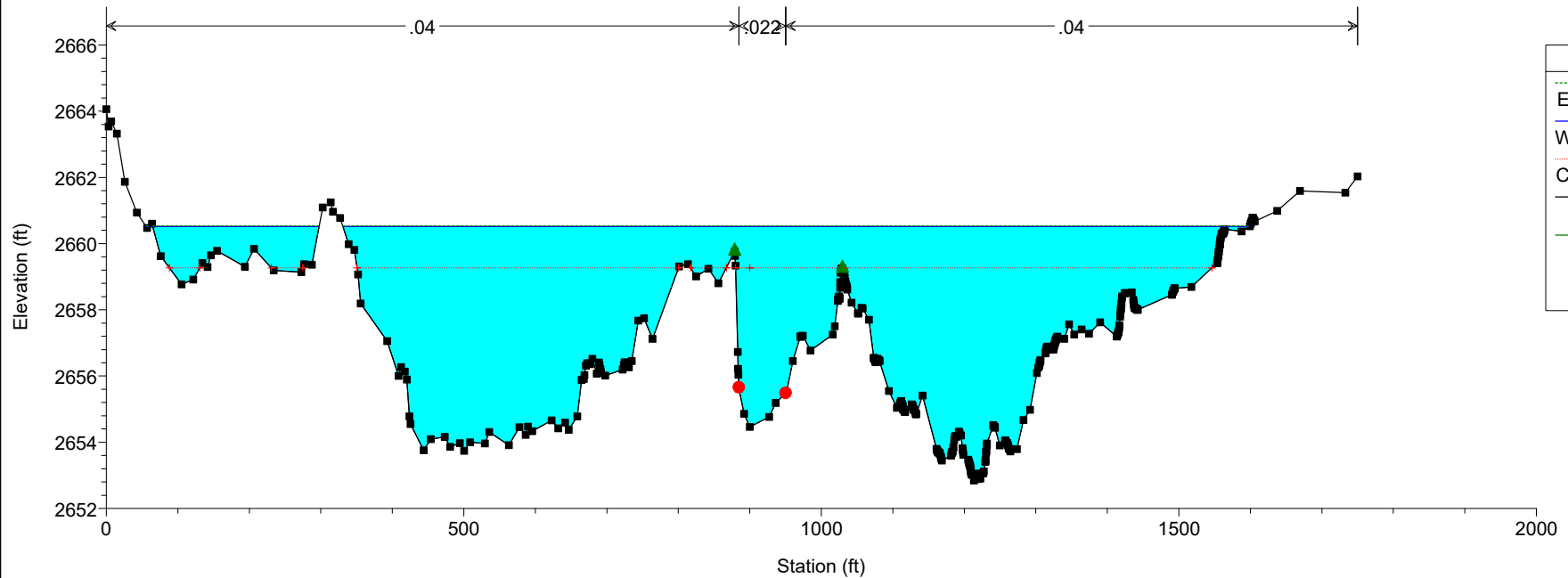
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025

RS = 485

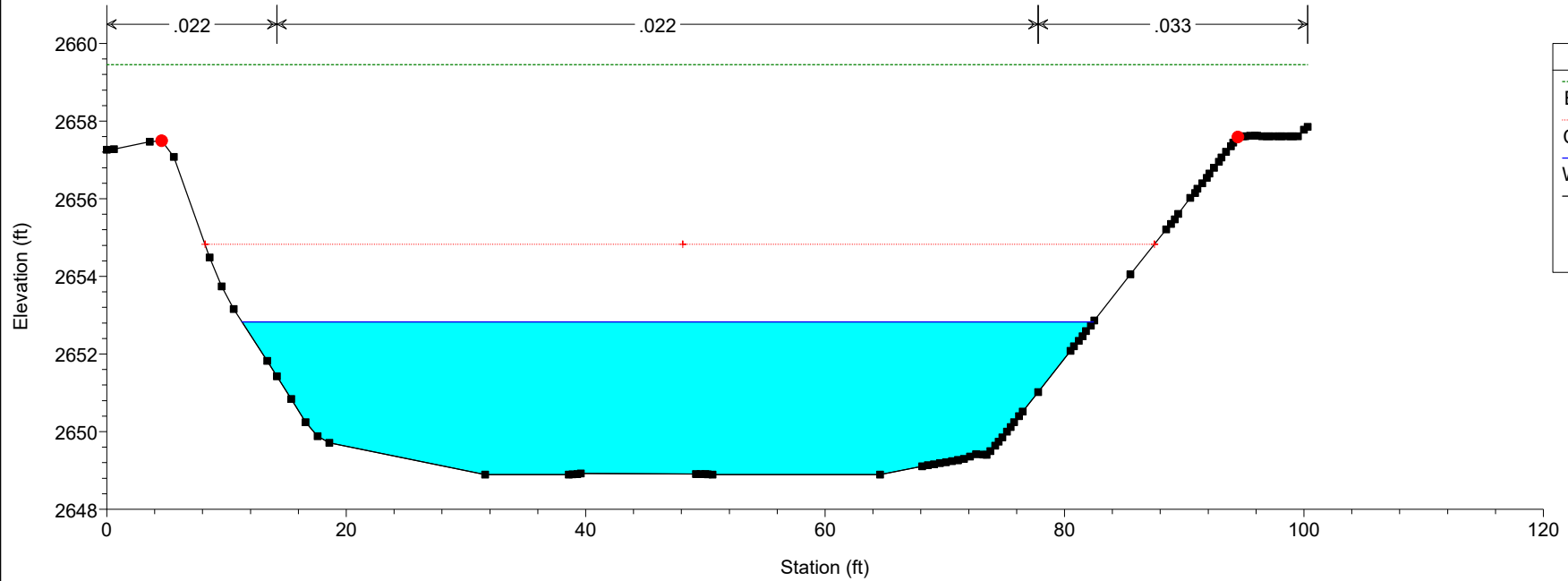


Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025

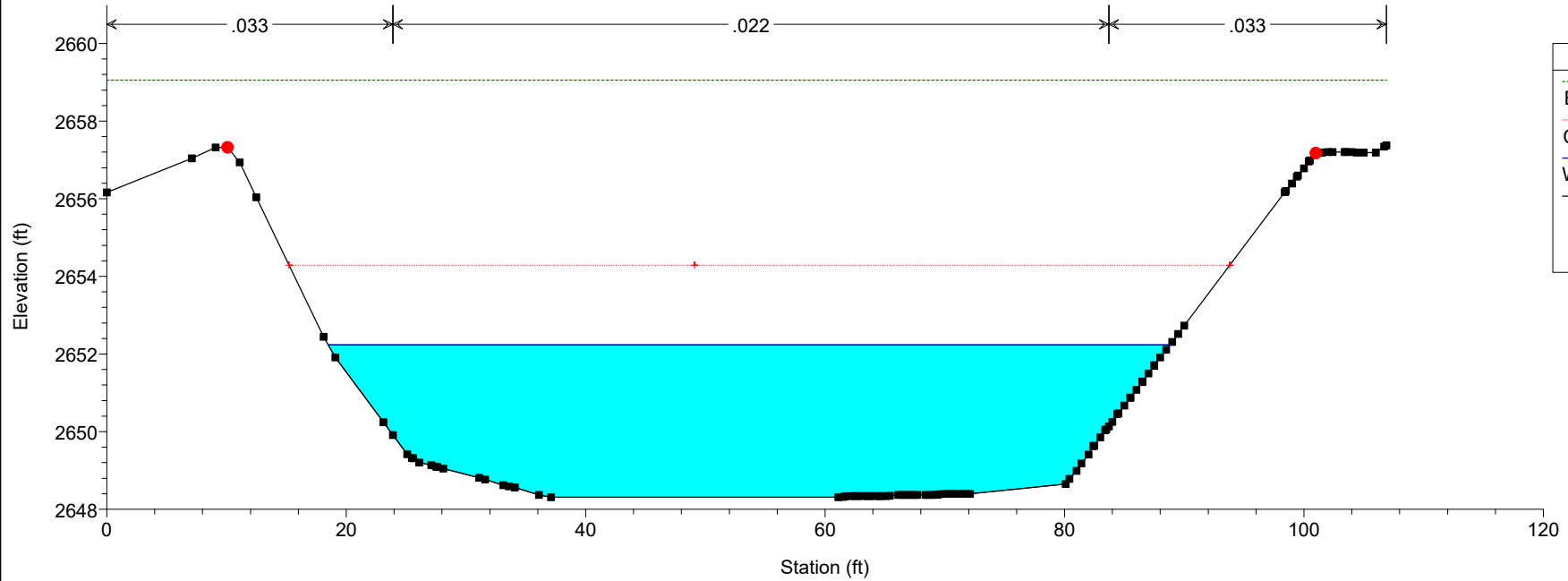
RS = 456



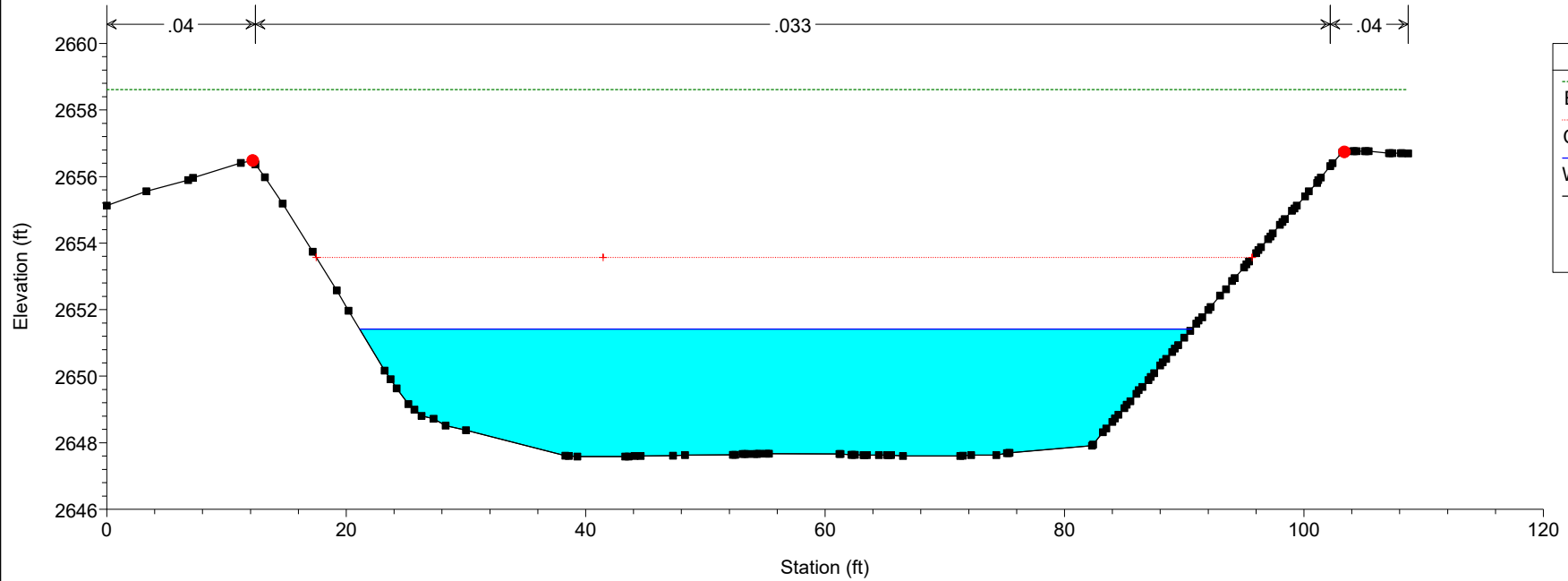
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 416



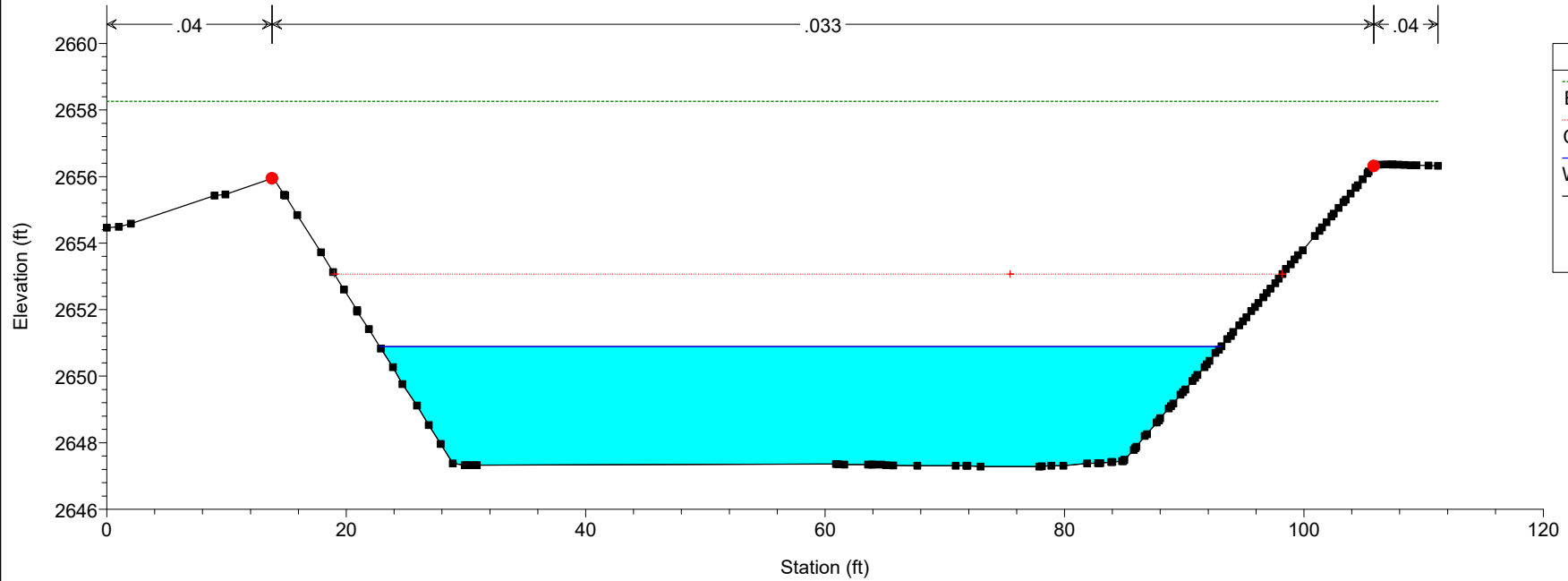
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 392



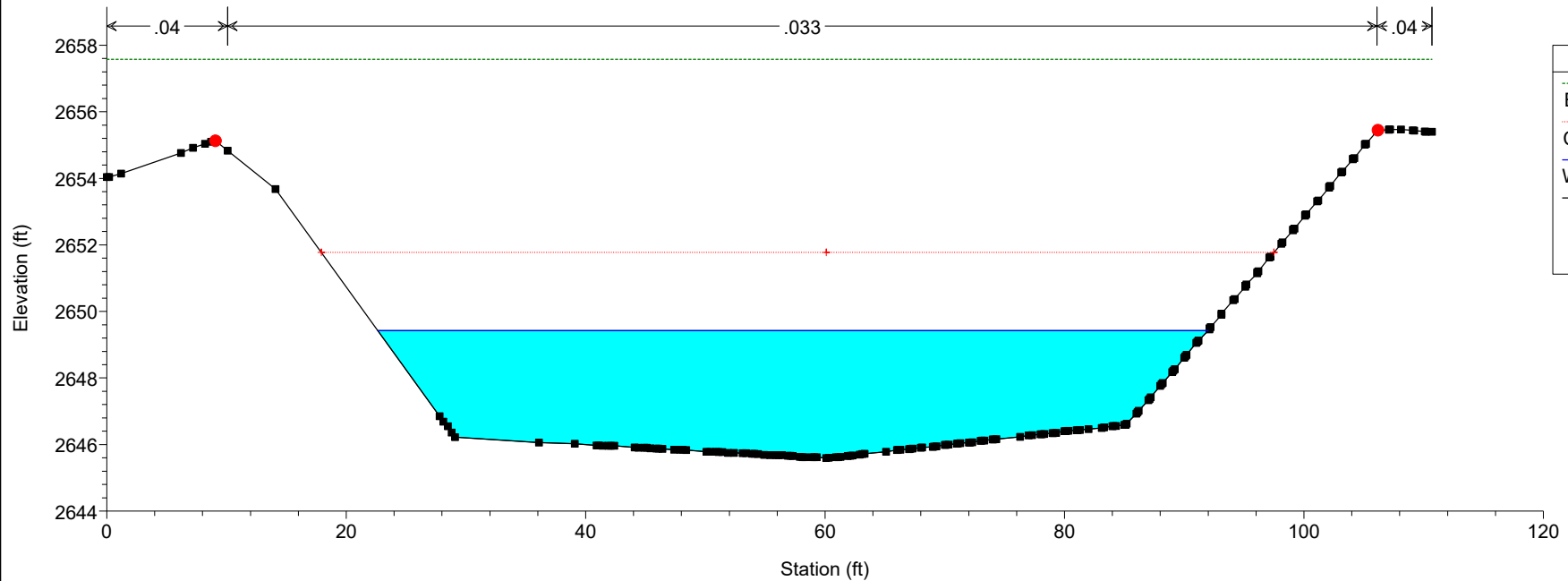
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 387



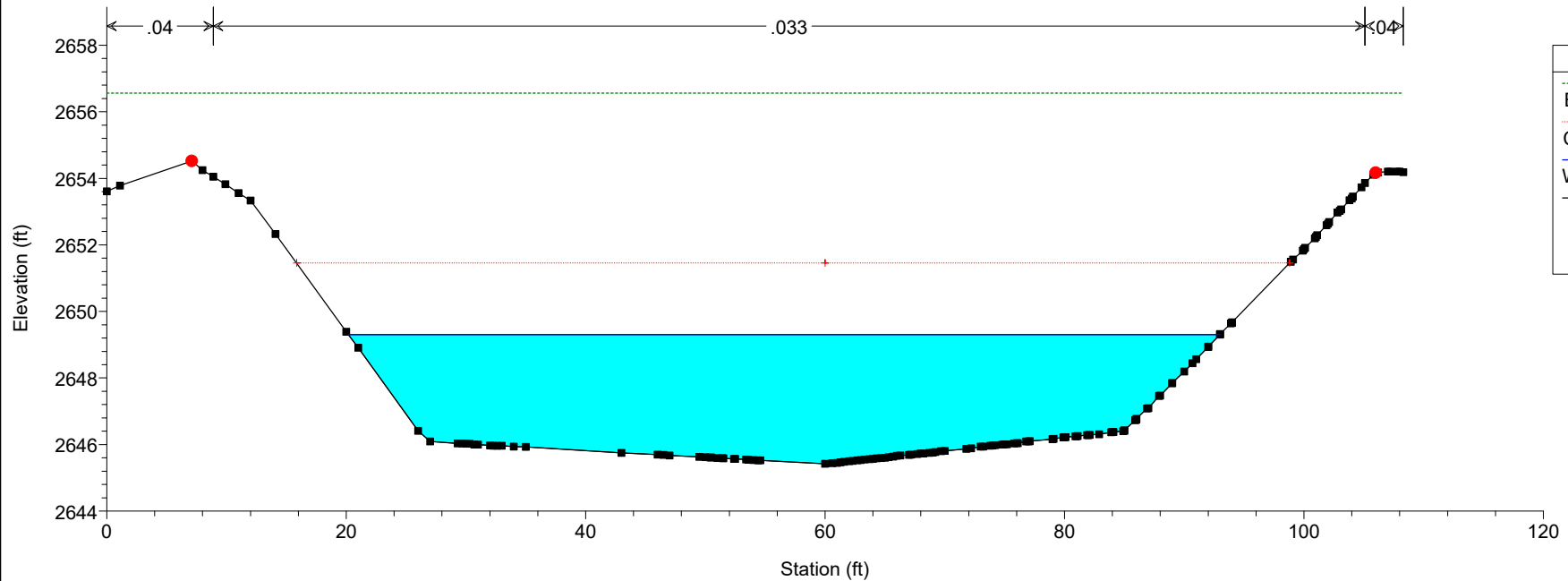
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 377



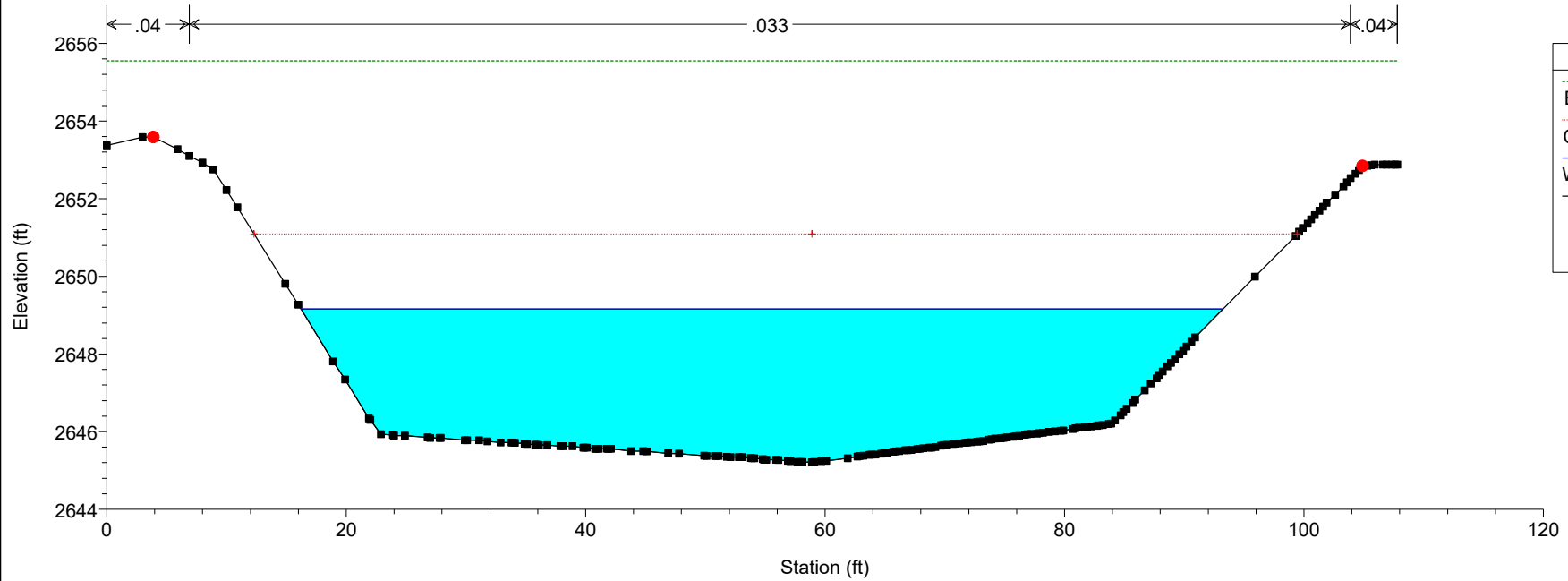
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 368



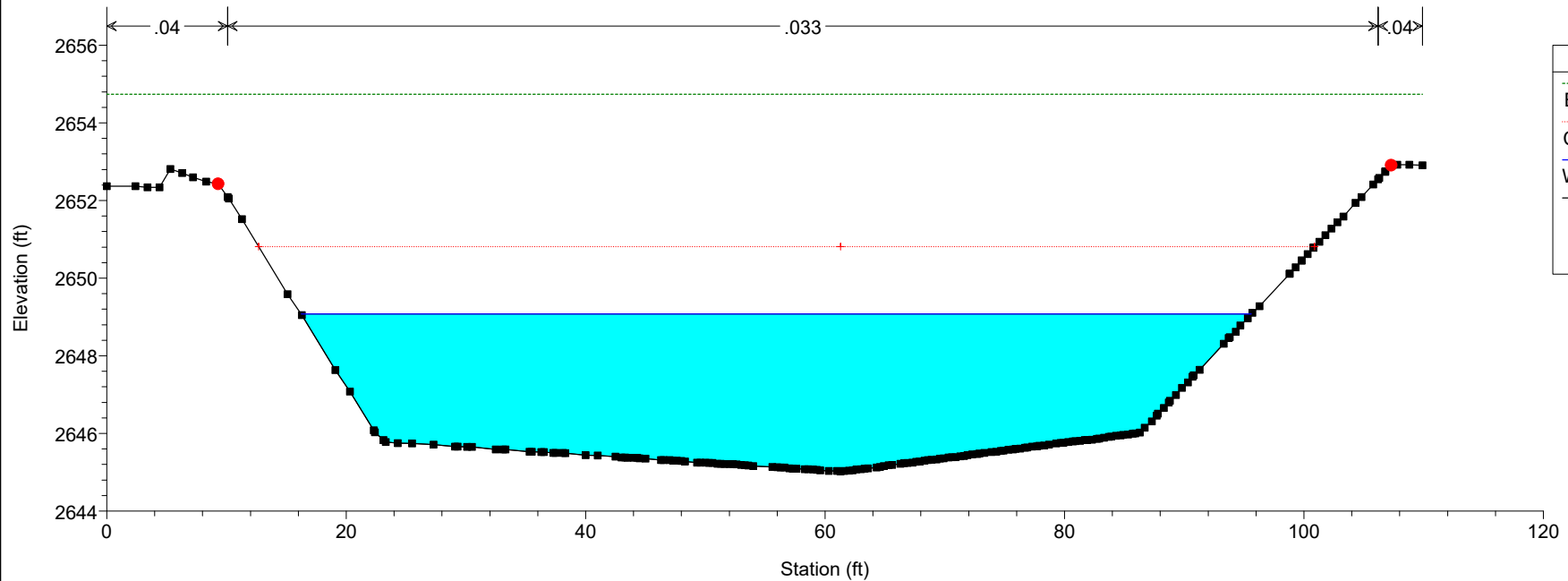
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 364



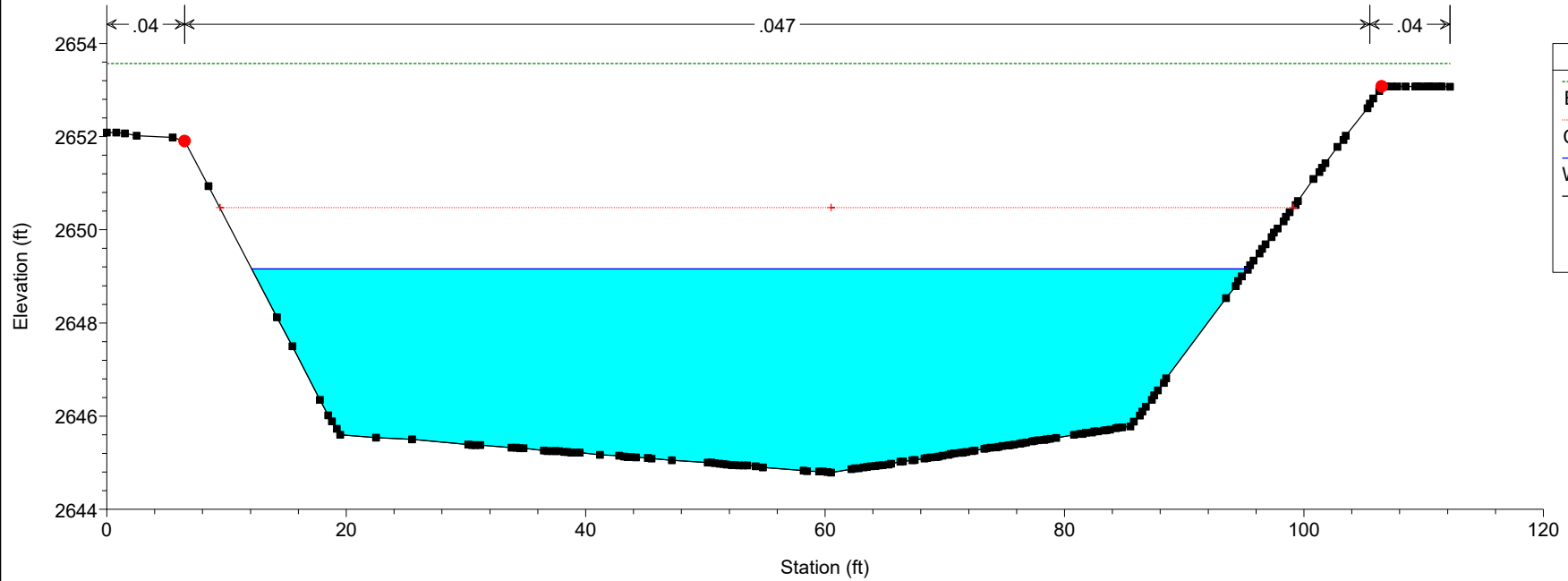
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 359



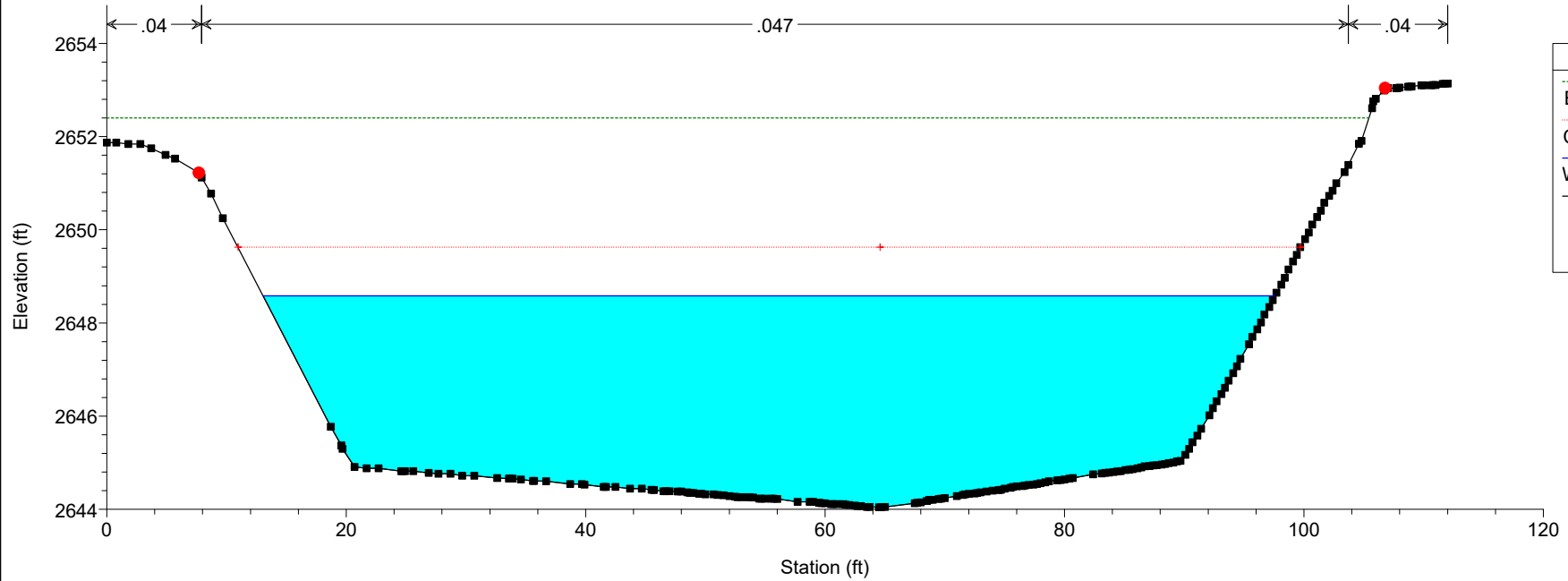
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 345



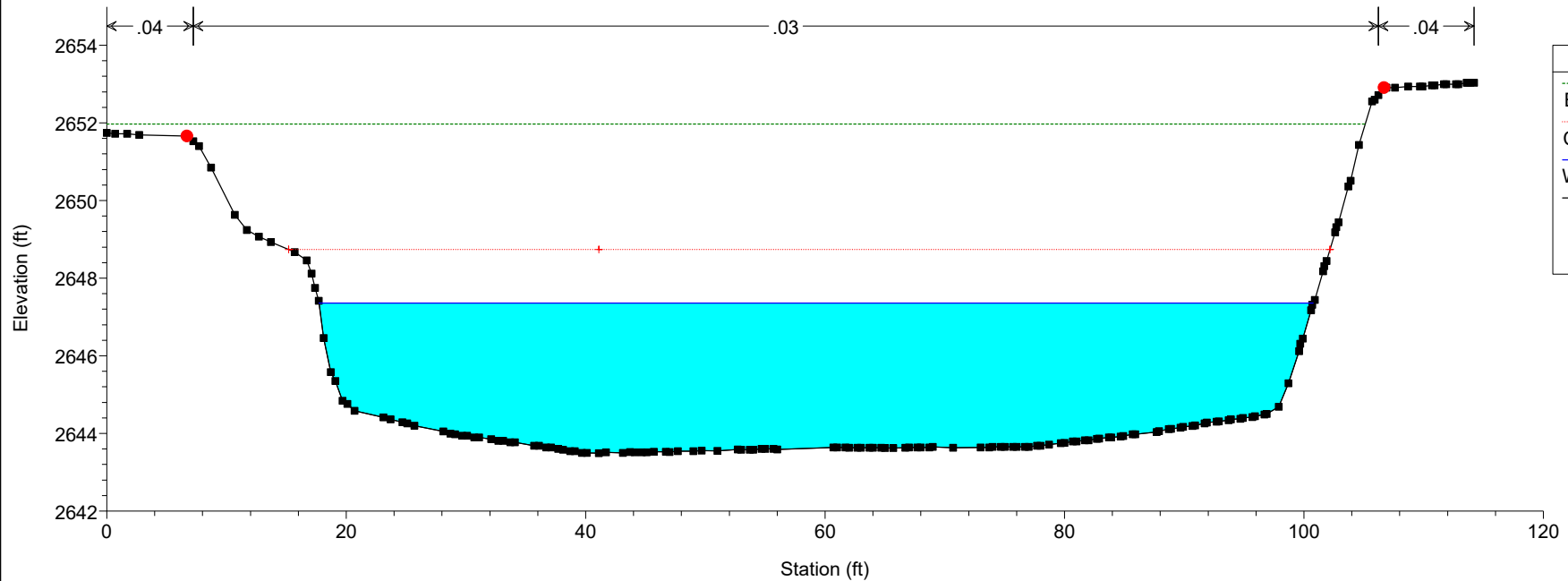
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 327



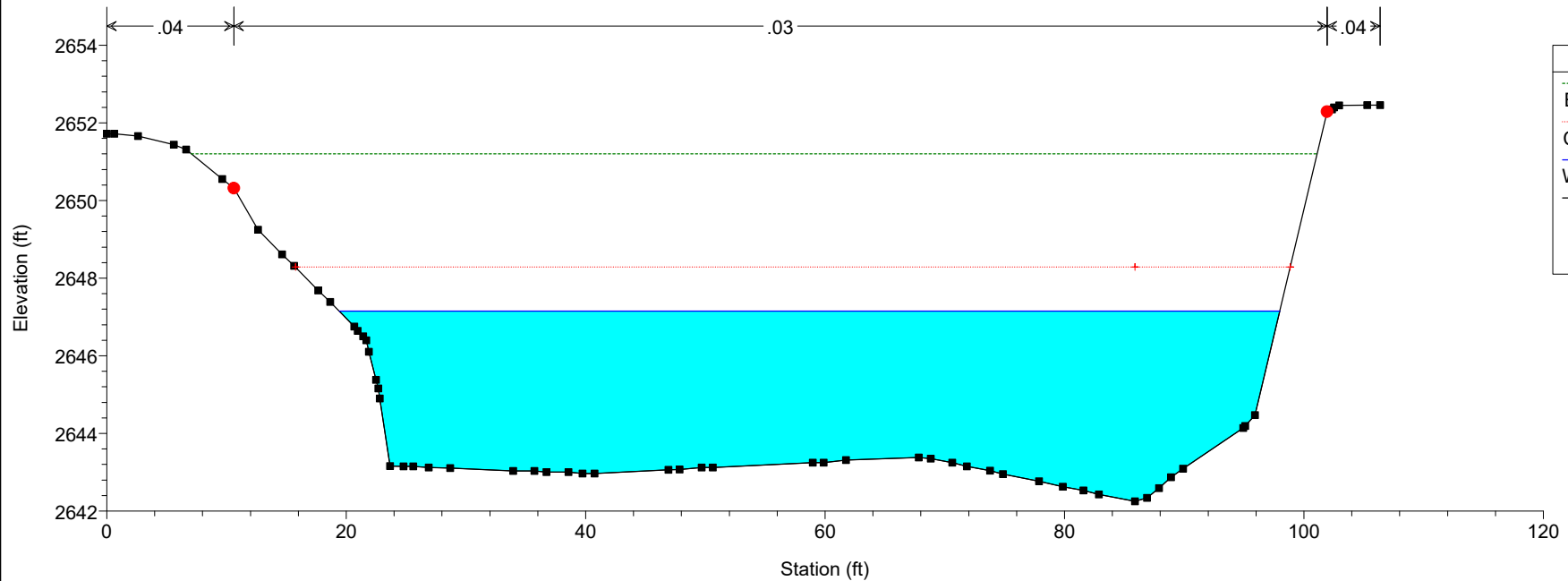
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 311



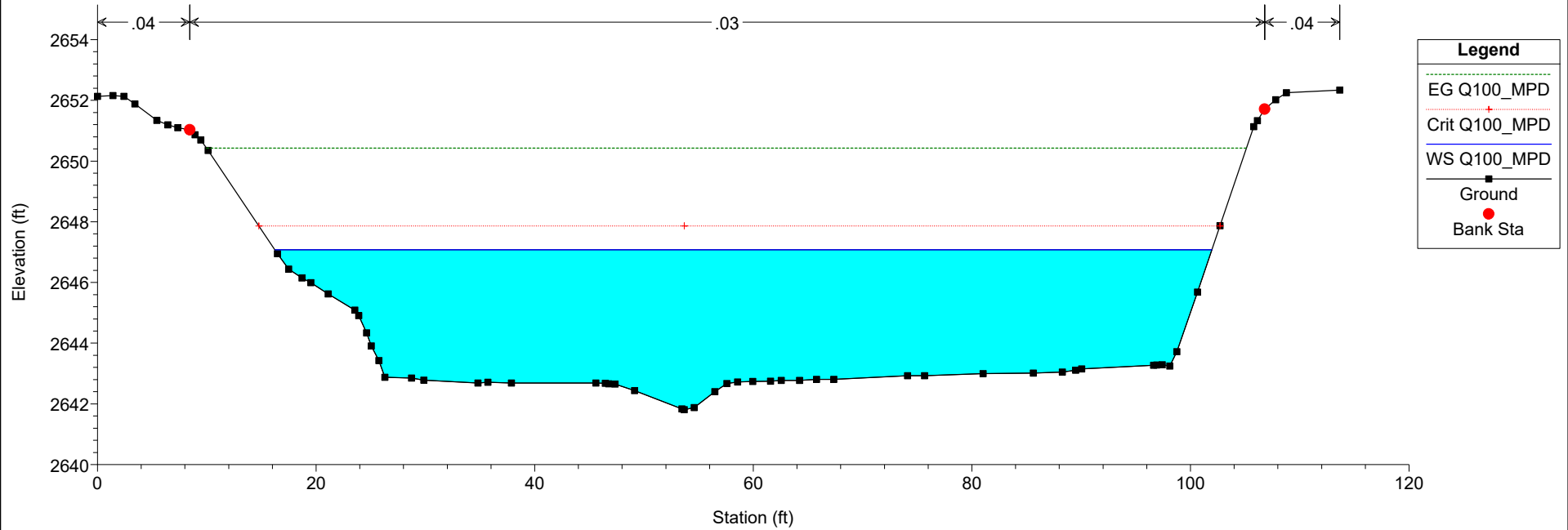
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 283



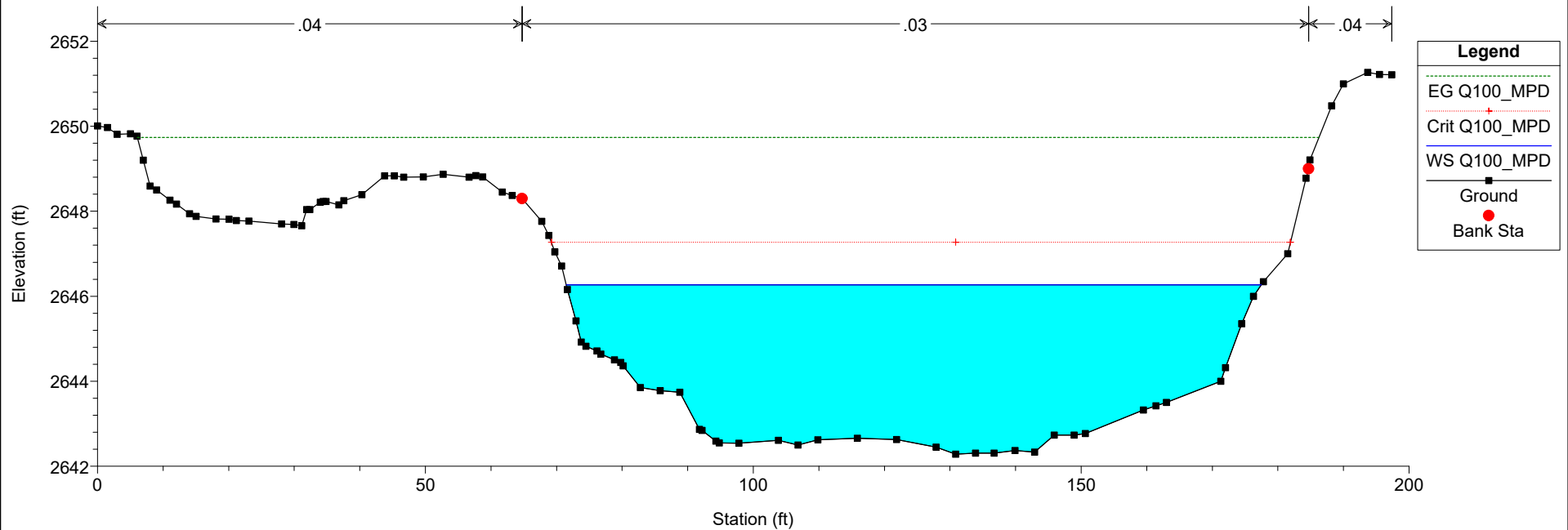
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 254



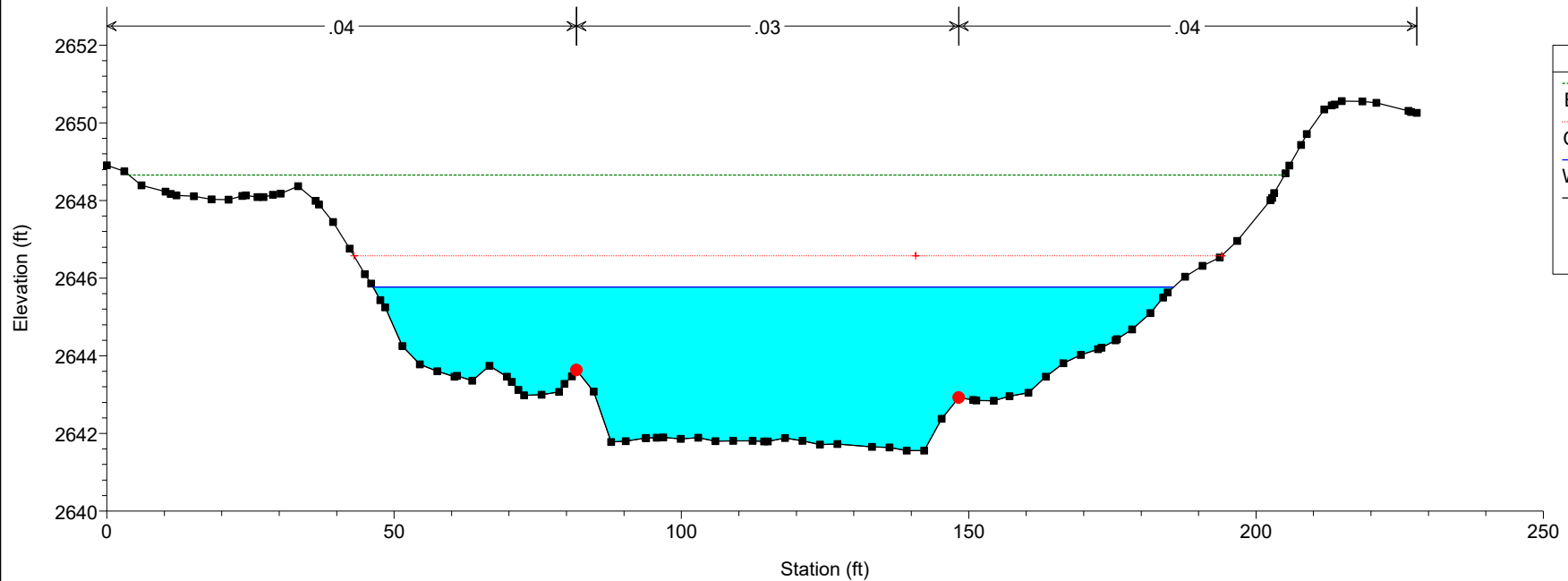
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 226



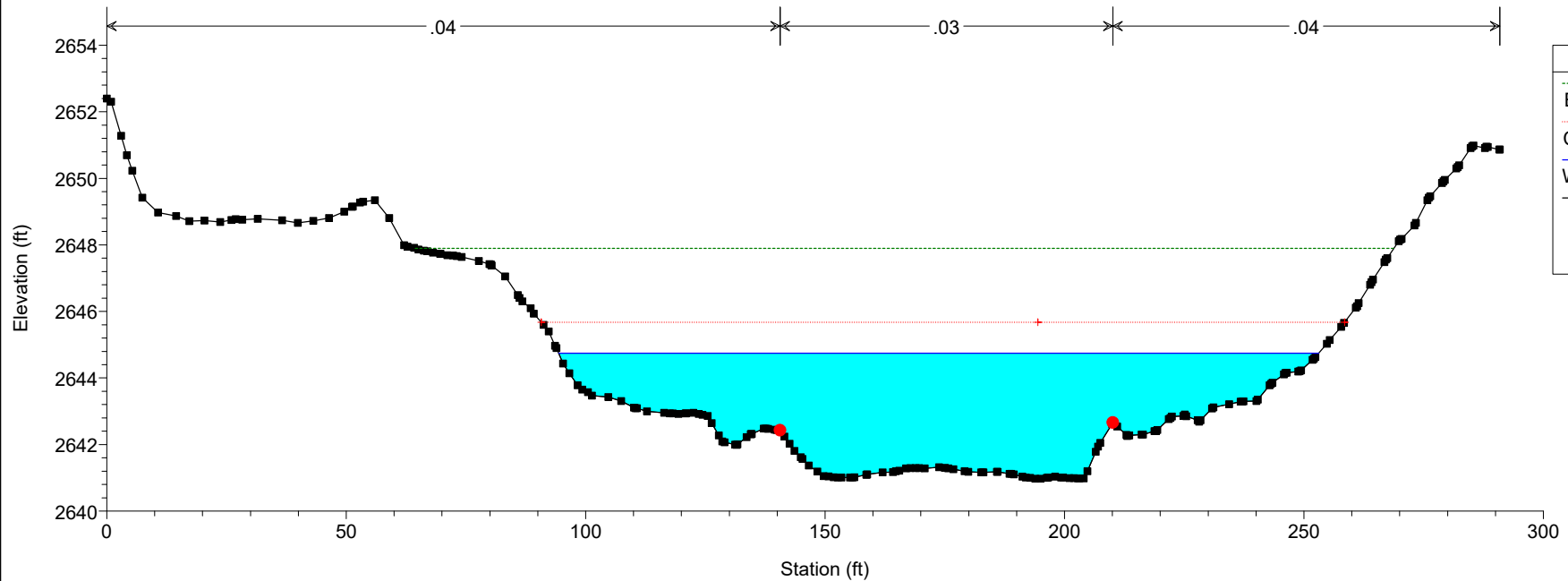
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 177



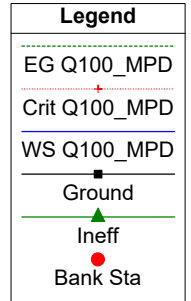
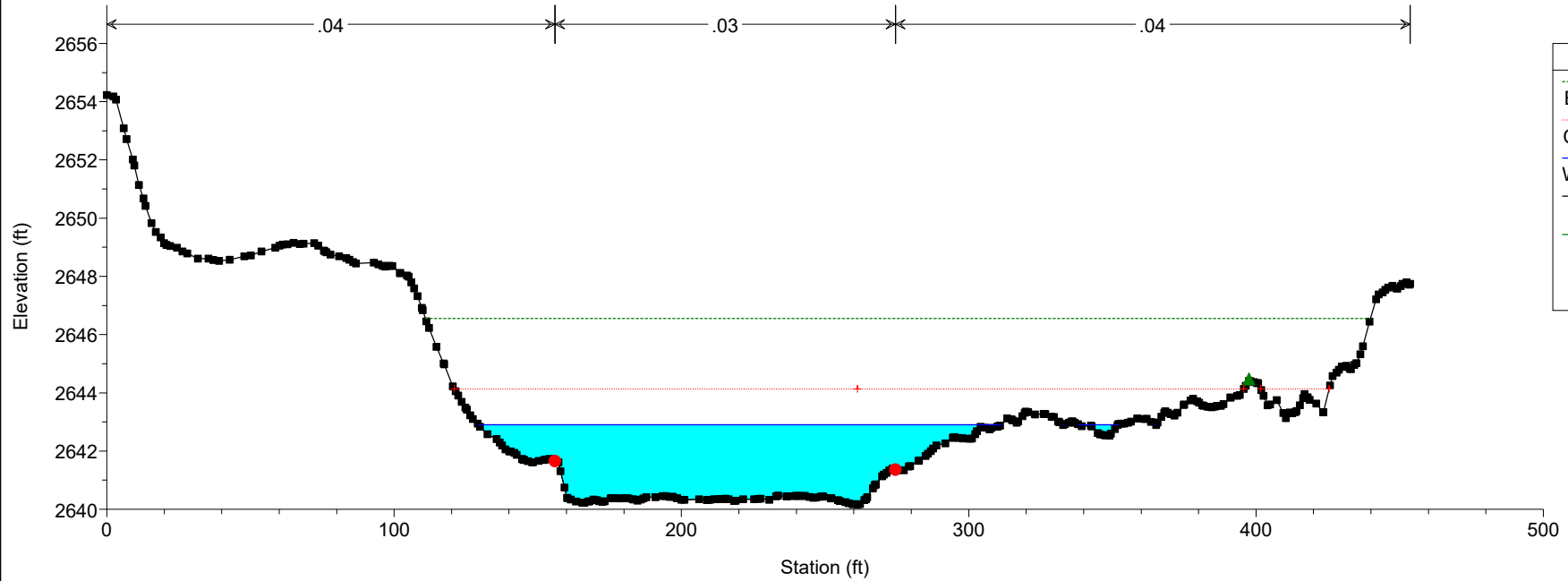
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 101



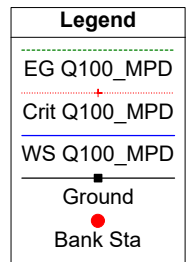
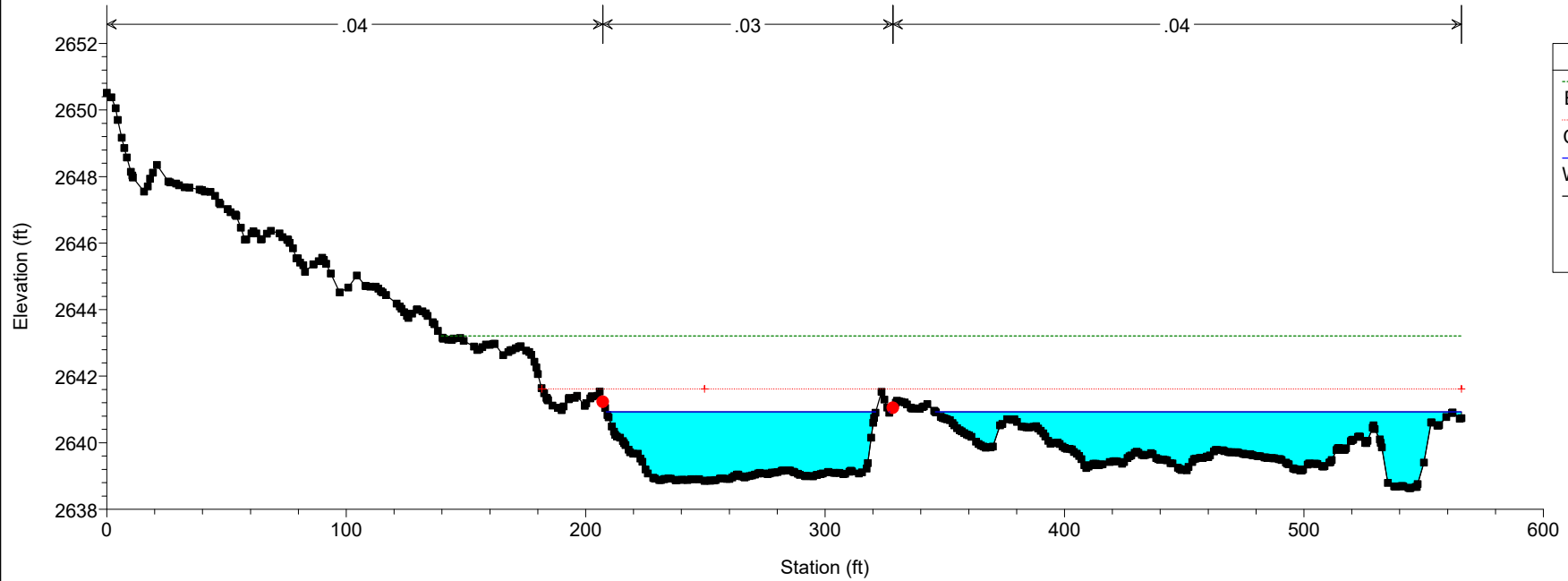
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 70



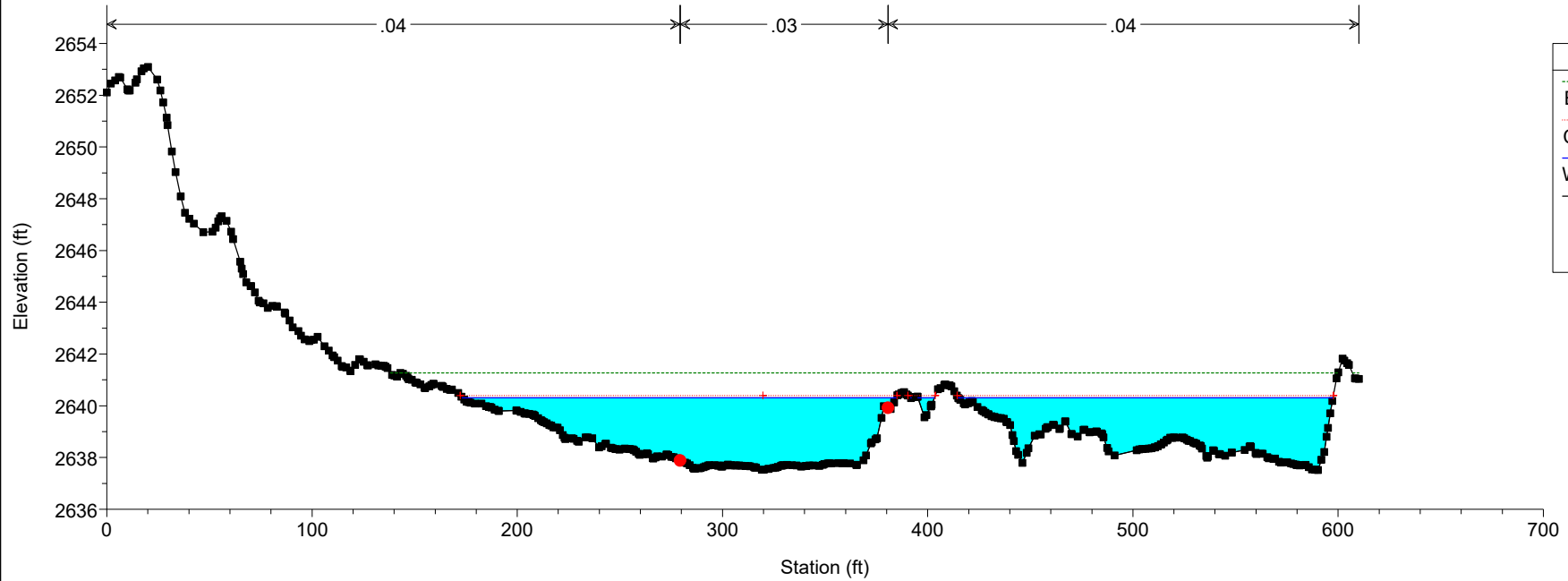
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = 30



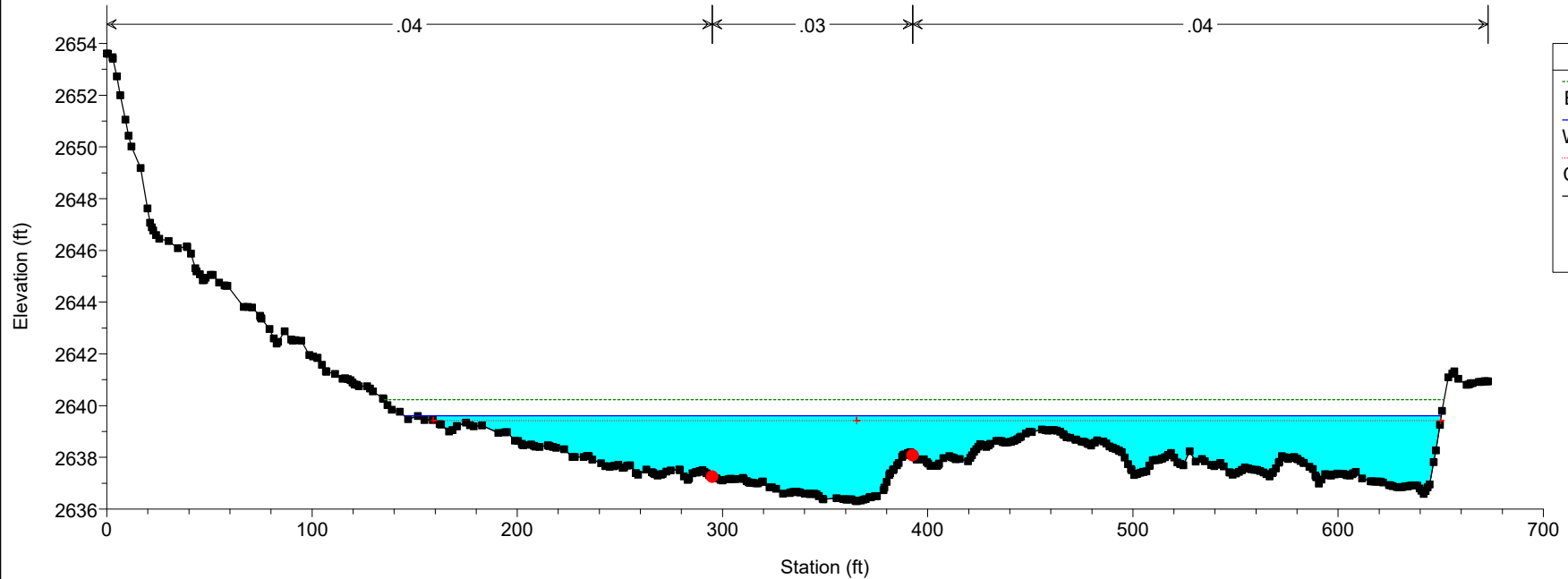
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = -30



Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = -148



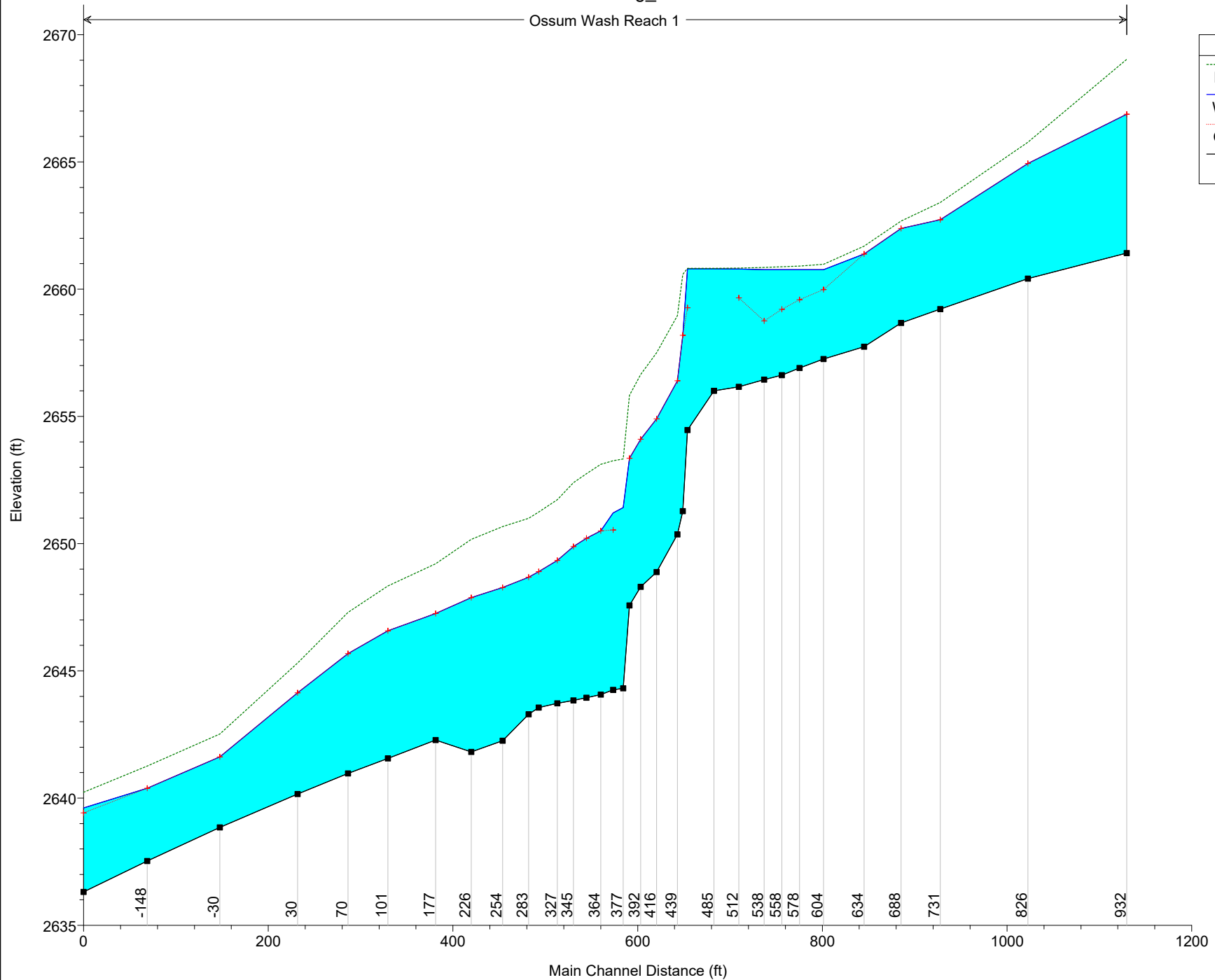
Ossum Wash Plan: Proposed_MIX w/o Levees 10/29/2025
RS = -213



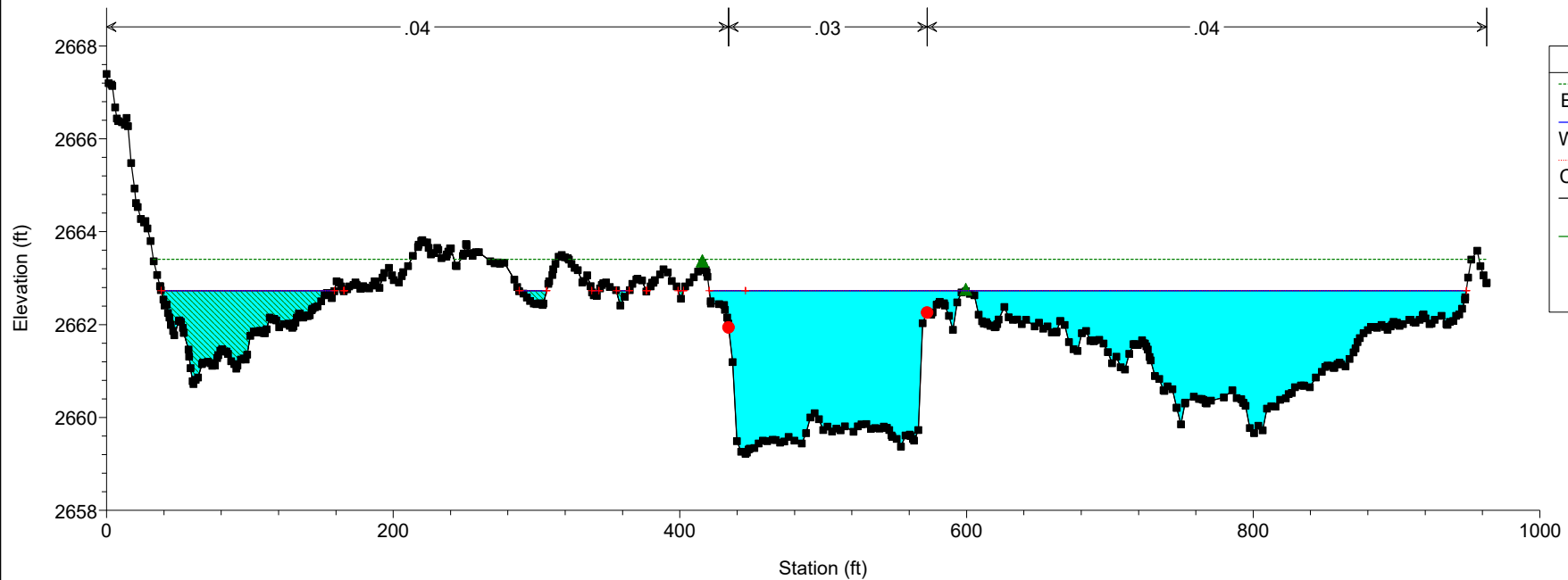
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	932	Q100_MPD	4876.00	2661.42	2666.88	2666.88	2669.03	0.014789	11.78	413.95	95.92	1.00
Reach 1	826	Q100_MPD	4876.00	2660.41	2664.94	2664.94	2665.78	0.008891	8.45	771.89	576.94	0.76
Reach 1	731	Q100_MPD	4876.00	2659.22	2662.73	2662.73	2663.41	0.005891	7.78	907.02	687.62	0.80
Reach 1	688	Q100_MPD	4876.00	2658.67	2662.39	2662.39	2662.68	0.002541	5.34	1317.75	981.09	0.53
Reach 1	634	Q100_MPD	4876.00	2657.74	2661.38	2661.38	2661.69	0.003072	5.39	1210.97	827.94	0.57
Reach 1	604	Q100_MPD	4876.00	2657.25	2660.77	2659.98	2660.97	0.002117	4.91	1596.84	927.52	0.48
Reach 1	578	Q100_MPD	4876.00	2656.90	2660.77	2659.59	2660.91	0.001387	4.26	1926.74	1093.03	0.40
Reach 1	558	Q100_MPD	4876.00	2656.62	2660.77	2659.21	2660.88	0.001016	3.82	2007.80	1170.11	0.34
Reach 1	538	Q100_MPD	4876.00	2656.44	2660.76	2658.75	2660.86	0.000772	3.50	2149.62	1255.56	0.30
Reach 1	512	Q100_MPD	4876.00	2656.16	2660.80	2659.66	2660.83	0.000184	2.76	4148.20	1406.26	0.23
Reach 1	485	Q100_MPD	4876.00	2656.00	2660.80		2660.82	0.000089	1.98	5393.78	1480.50	0.16
Reach 1	456	Q100_MPD	4876.00	2654.46	2660.80	2659.27	2660.82	0.000067	1.81	5845.92	1546.99	0.13
Reach 1	448	Q100_MPD	4876.00	2651.28	2658.19	2658.19	2660.58	0.005730	12.41	396.14	100.27	0.98
Reach 1	439	Q100_MPD	4876.00	2650.36	2656.40	2656.40	2658.96	0.005778	12.84	379.87	74.93	1.01
Reach 1	416	Q100_MPD	4876.00	2648.88	2654.90	2654.90	2657.50	0.005696	12.94	376.96	72.59	1.00
Reach 1	392	Q100_MPD	4876.00	2648.30	2654.10	2654.10	2656.65	0.005879	12.80	381.03	75.66	1.01
Reach 1	387	Q100_MPD	4876.00	2647.57	2653.35	2653.35	2655.83	0.008887	12.62	386.28	78.04	1.00
Reach 1	377	Q100_MPD	4876.00	2644.31	2651.41		2653.33	0.005172	11.09	439.67	74.94	0.81
Reach 1	368	Q100_MPD	4876.00	2644.25	2651.21	2650.54	2653.26	0.005747	11.48	424.61	73.68	0.84
Reach 1	364	Q100_MPD	4876.00	2644.07	2650.50	2650.50	2653.11	0.008191	12.97	375.82	72.07	1.00
Reach 1	359	Q100_MPD	4876.00	2643.94	2650.21	2650.21	2652.75	0.008275	12.78	381.39	75.15	1.00
Reach 1	345	Q100_MPD	4876.00	2643.84	2649.89	2649.89	2652.39	0.008262	12.70	383.89	76.77	1.00
Reach 1	327	Q100_MPD	4876.00	2643.72	2649.34	2649.34	2651.73	0.008377	12.40	393.11	83.11	1.01
Reach 1	311	Q100_MPD	4876.00	2643.56	2648.90	2648.90	2651.24	0.008352	12.26	397.75	85.67	1.00
Reach 1	283	Q100_MPD	4876.00	2643.29	2648.68	2648.68	2651.00	0.008374	12.22	398.99	86.42	1.00
Reach 1	254	Q100_MPD	4876.00	2642.25	2648.28	2648.28	2650.67	0.008434	12.40	393.22	83.07	1.00
Reach 1	226	Q100_MPD	4876.00	2641.81	2647.88	2647.88	2650.17	0.008318	12.13	402.04	87.98	1.00
Reach 1	177	Q100_MPD	4876.00	2642.28	2647.25	2647.25	2649.21	0.008625	11.22	434.57	112.63	1.01
Reach 1	101	Q100_MPD	4876.00	2641.56	2646.57	2646.57	2648.34	0.007405	11.82	518.20	151.00	0.97
Reach 1	70	Q100_MPD	4876.00	2640.97	2645.67	2645.67	2647.29	0.007461	11.47	542.93	167.72	0.96
Reach 1	30	Q100_MPD	4876.00	2640.16	2644.14	2644.14	2645.31	0.006258	9.35	650.80	298.64	0.86
Reach 1	-30	Q100_MPD	4876.00	2638.85	2641.62	2641.62	2642.52	0.011173	9.07	700.41	384.05	1.06
Reach 1	-148	Q100_MPD	4876.00	2637.53	2640.39	2640.39	2641.26	0.010105	9.28	738.63	409.60	1.02
Reach 1	-213	Q100_MPD	4876.00	2636.31	2639.61	2639.42	2640.23	0.007002	8.13	906.33	505.28	0.86

----- Turner Rd
 --- Existing drop downstream grouted section

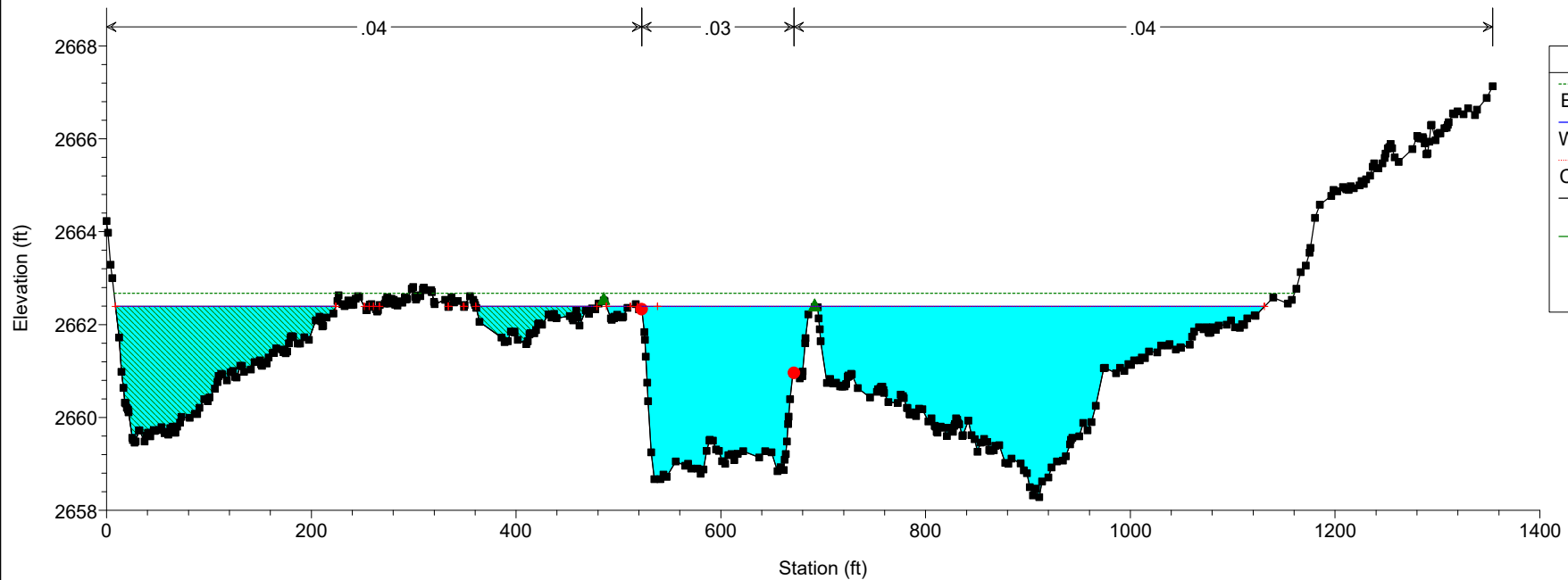
Ossum Wash Reach 1



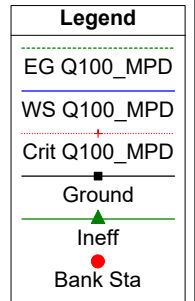
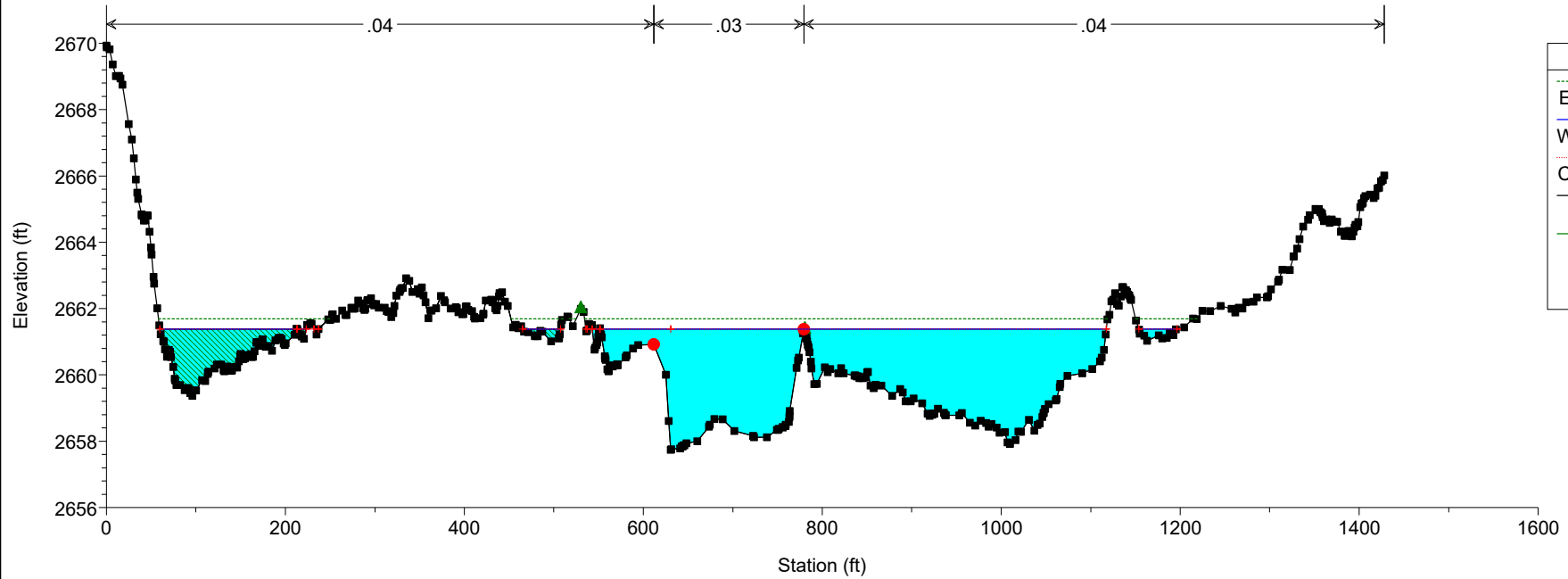
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 731



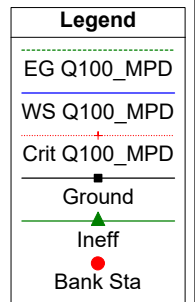
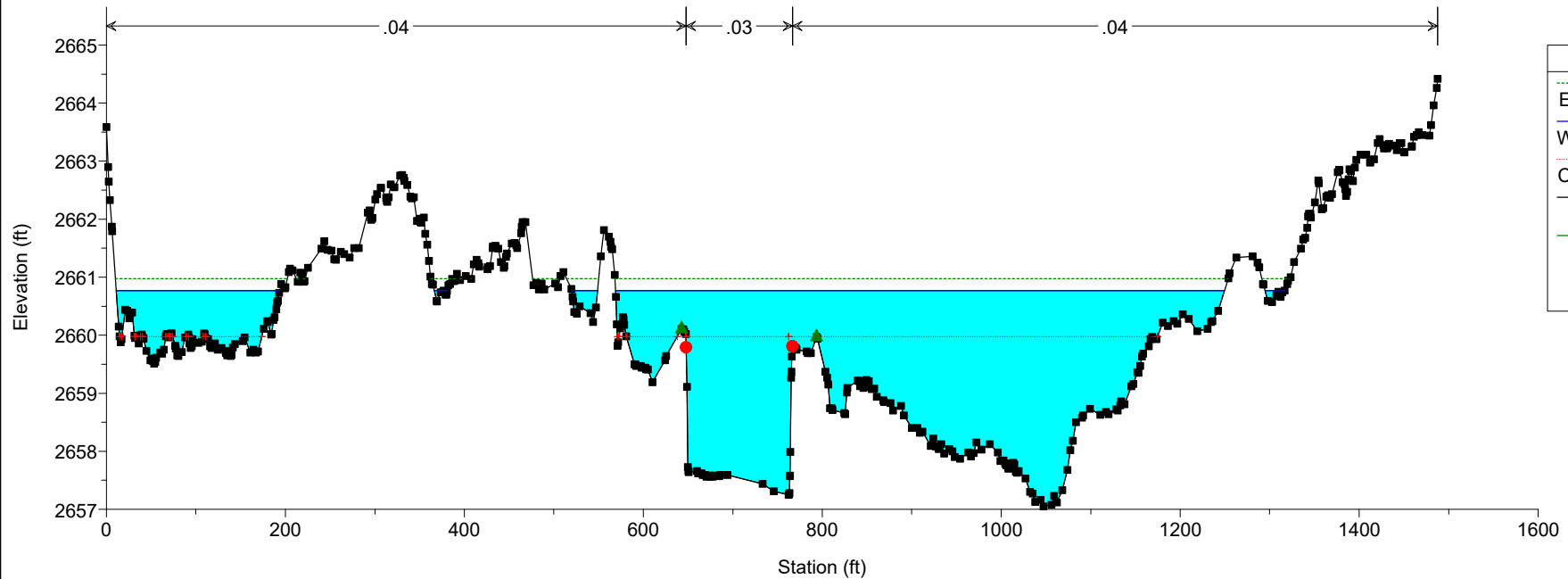
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 688



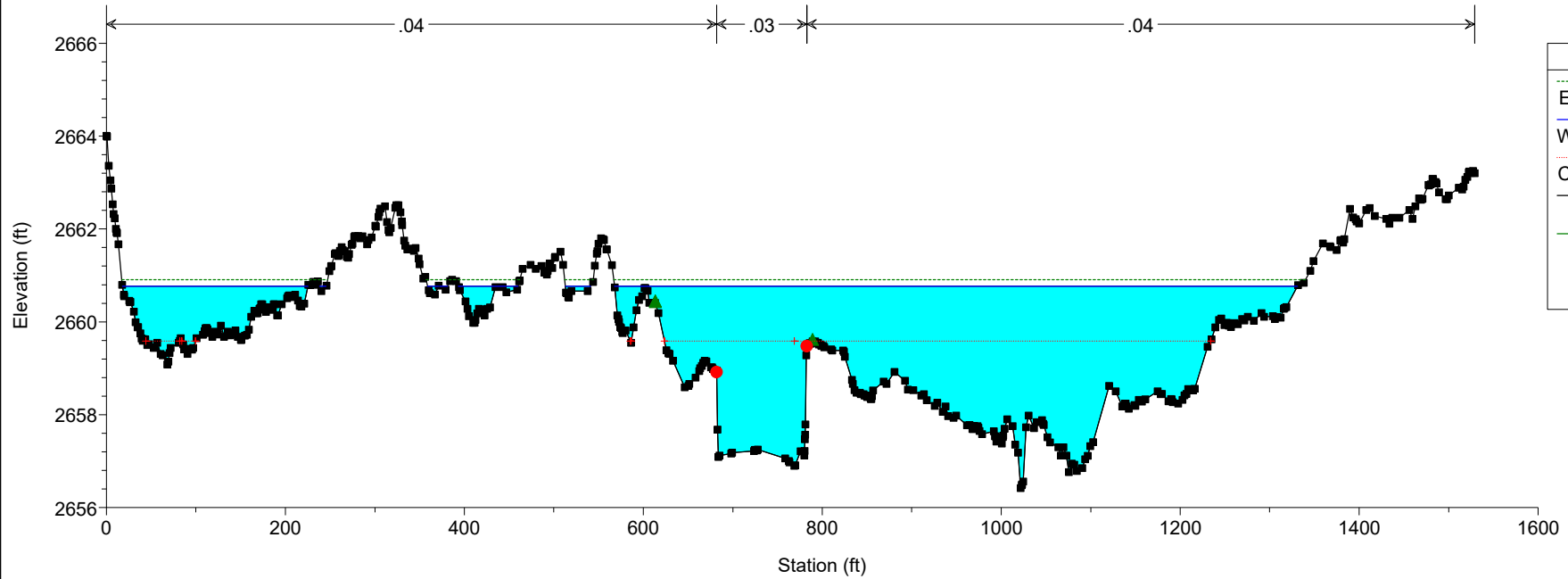
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 634



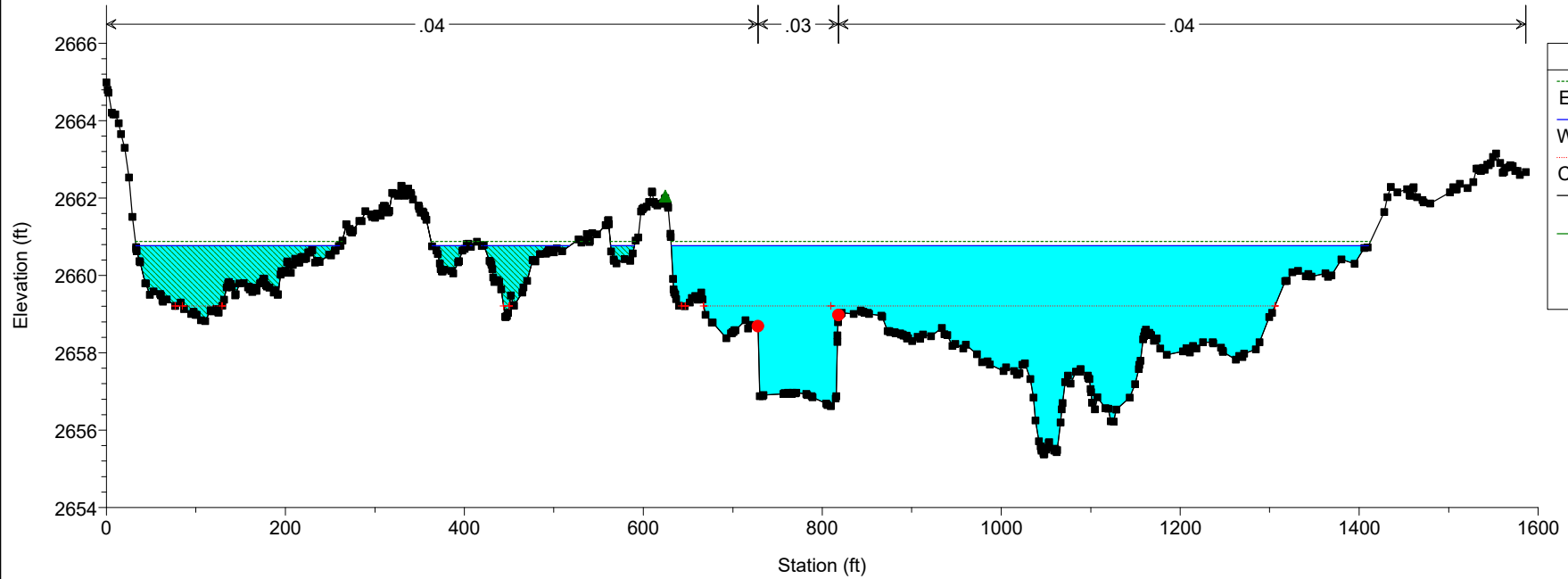
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 604



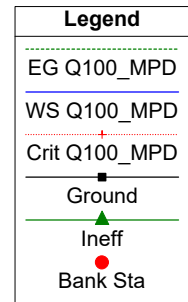
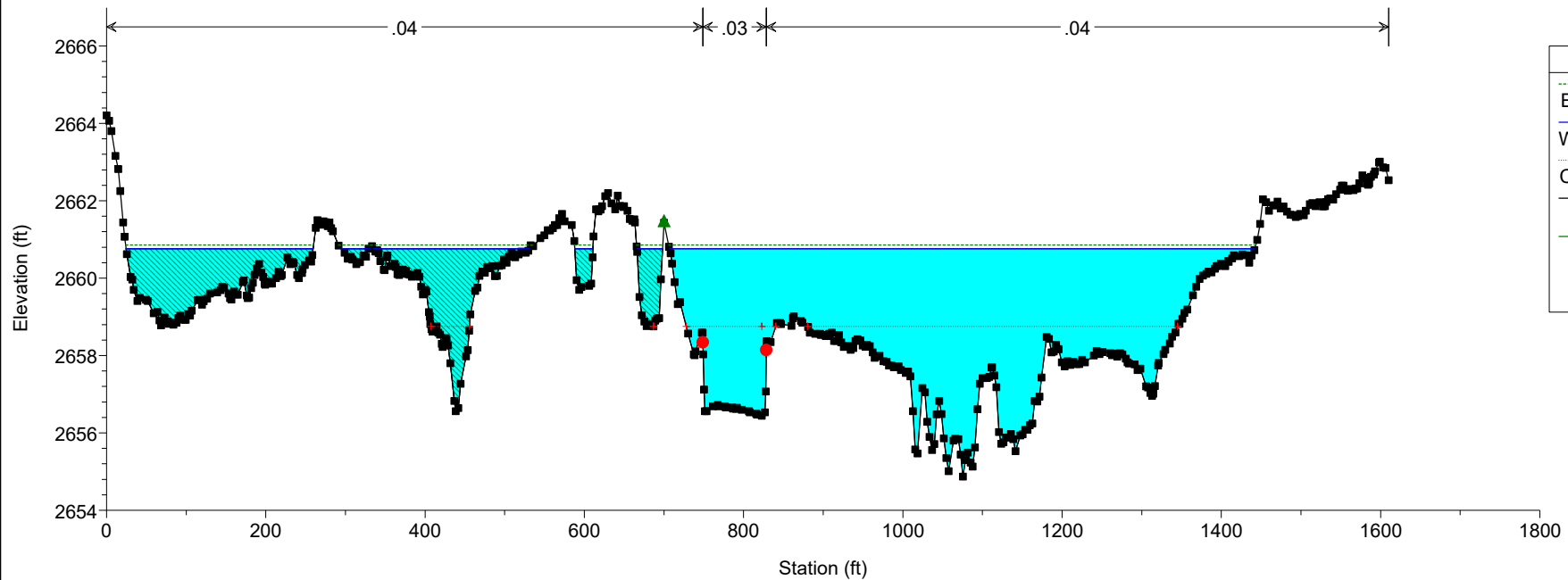
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 578



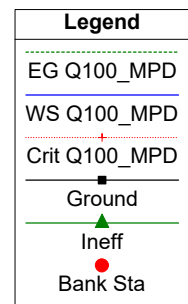
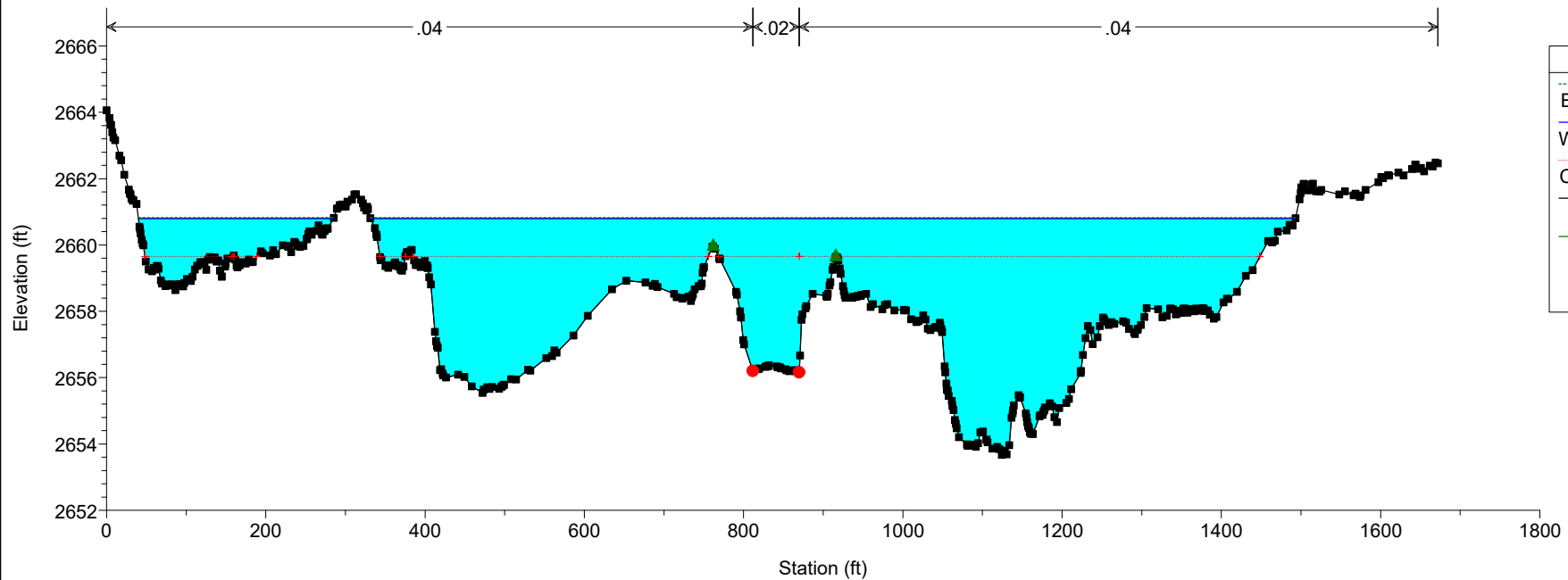
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RS = 558

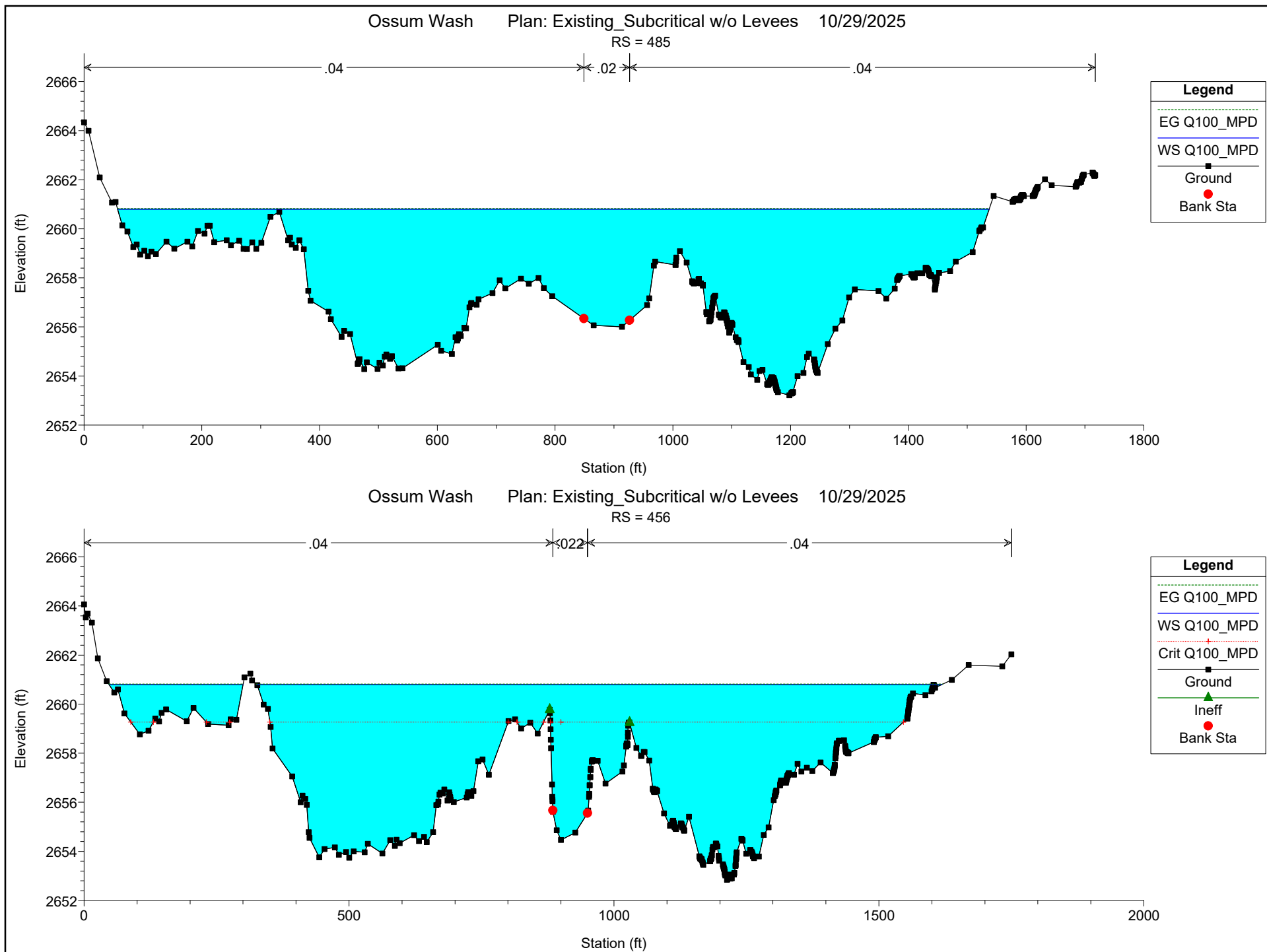


Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 538

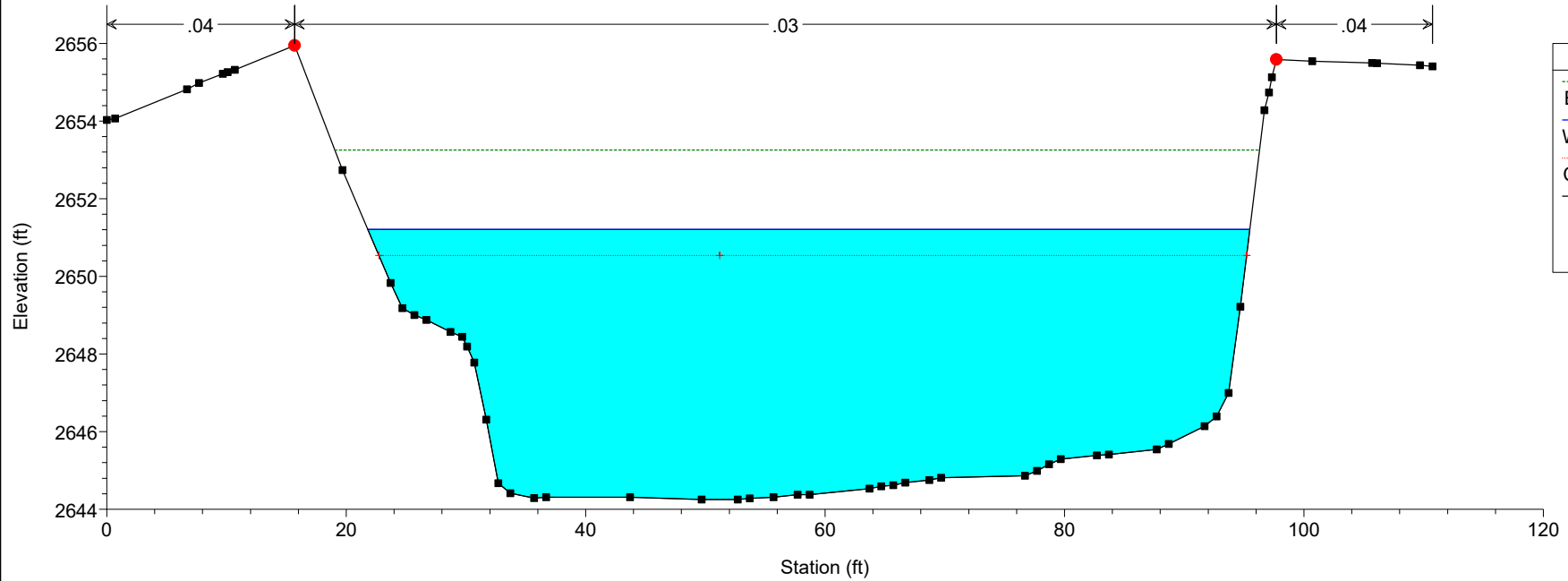


Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 512

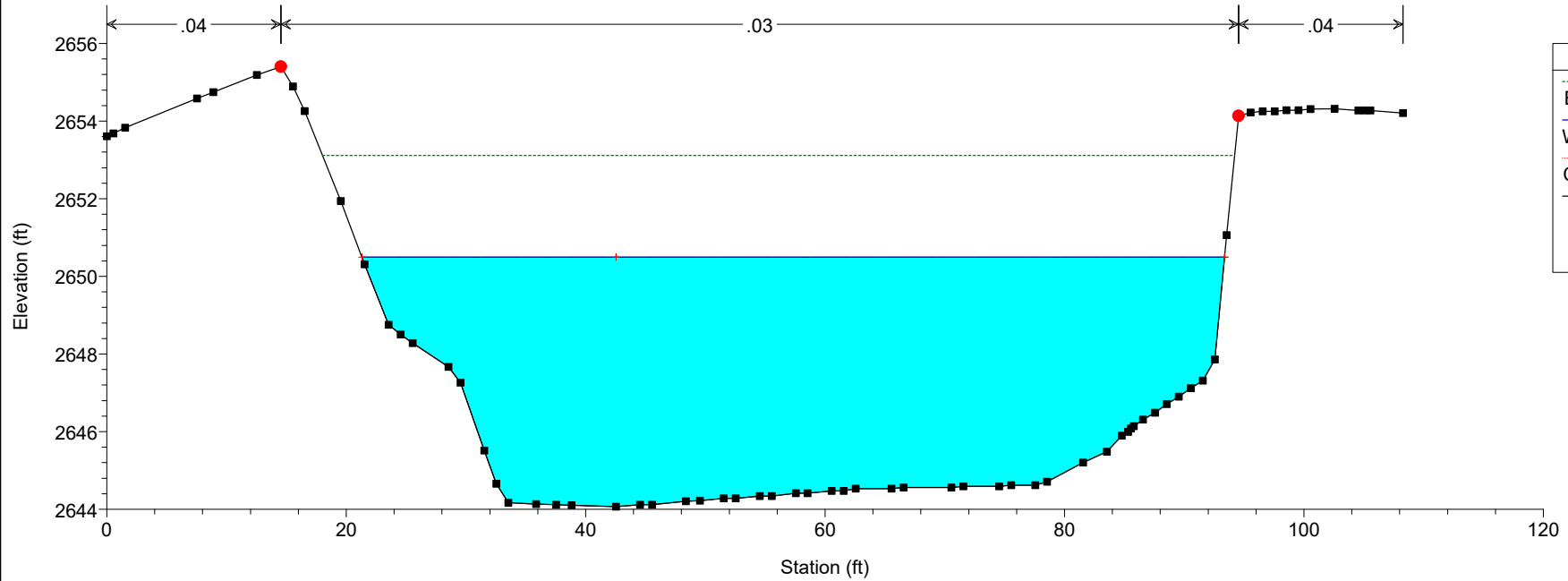




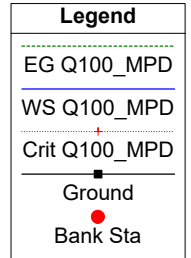
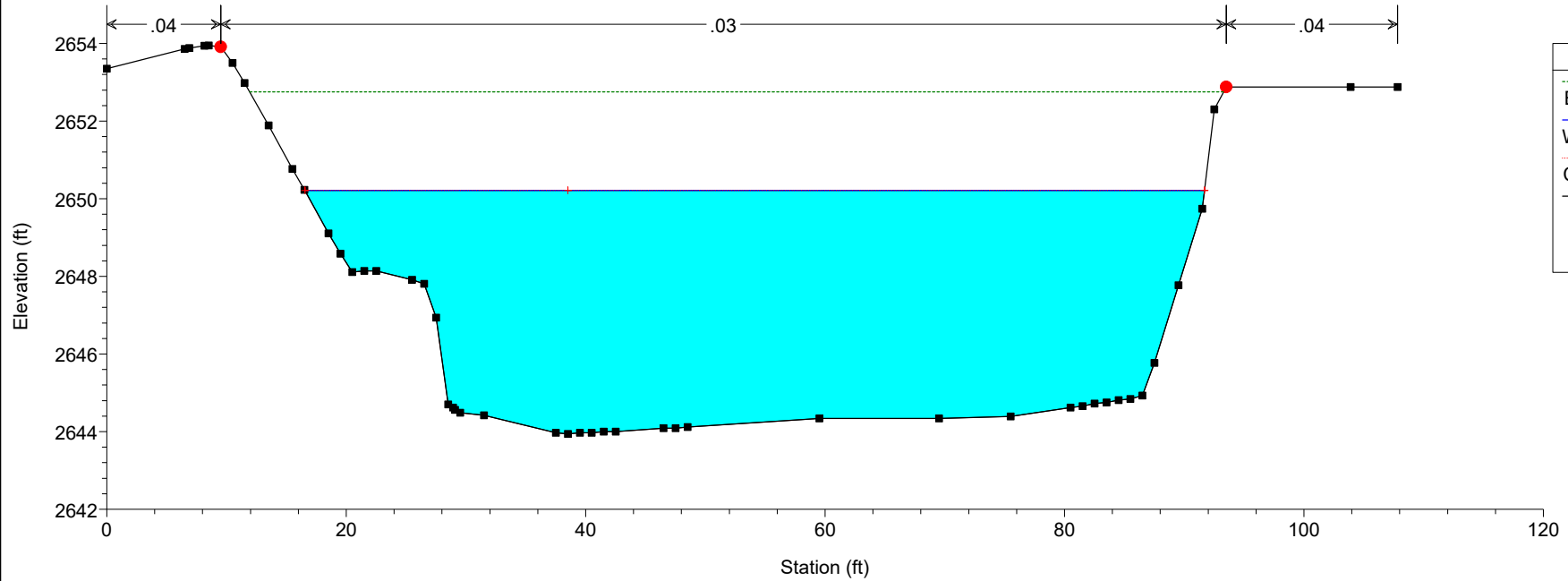
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 368



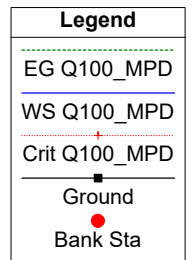
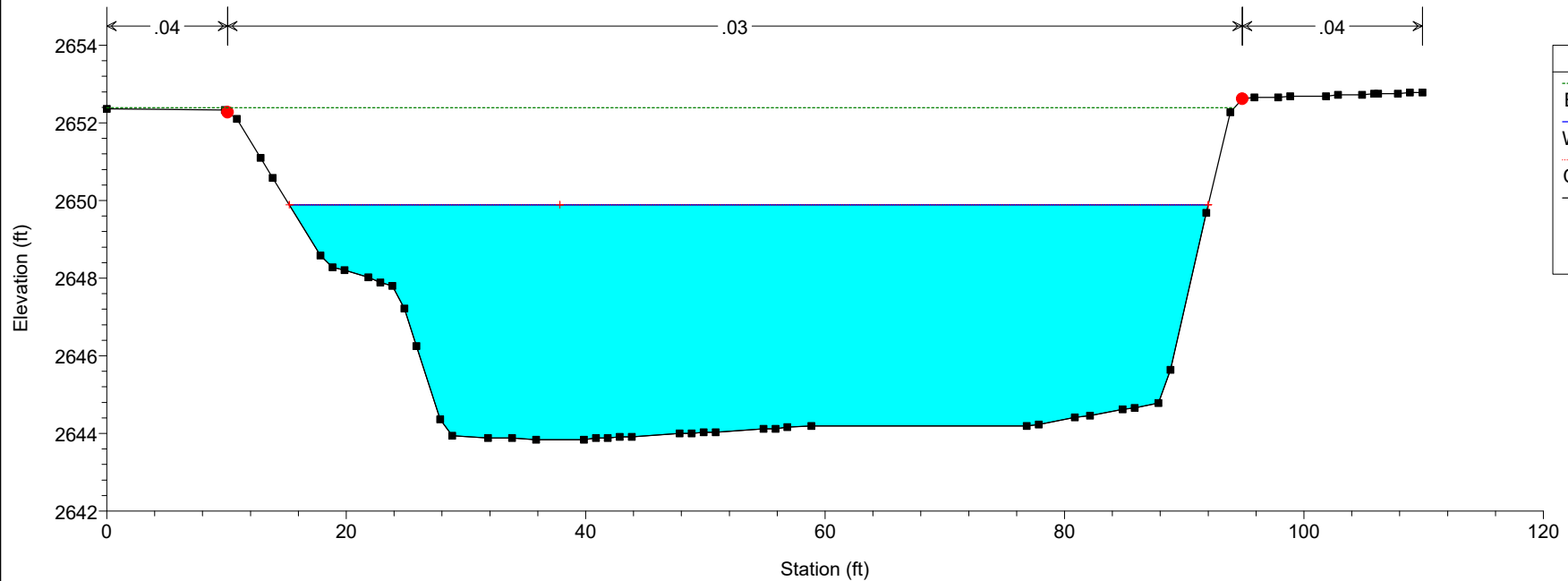
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 364



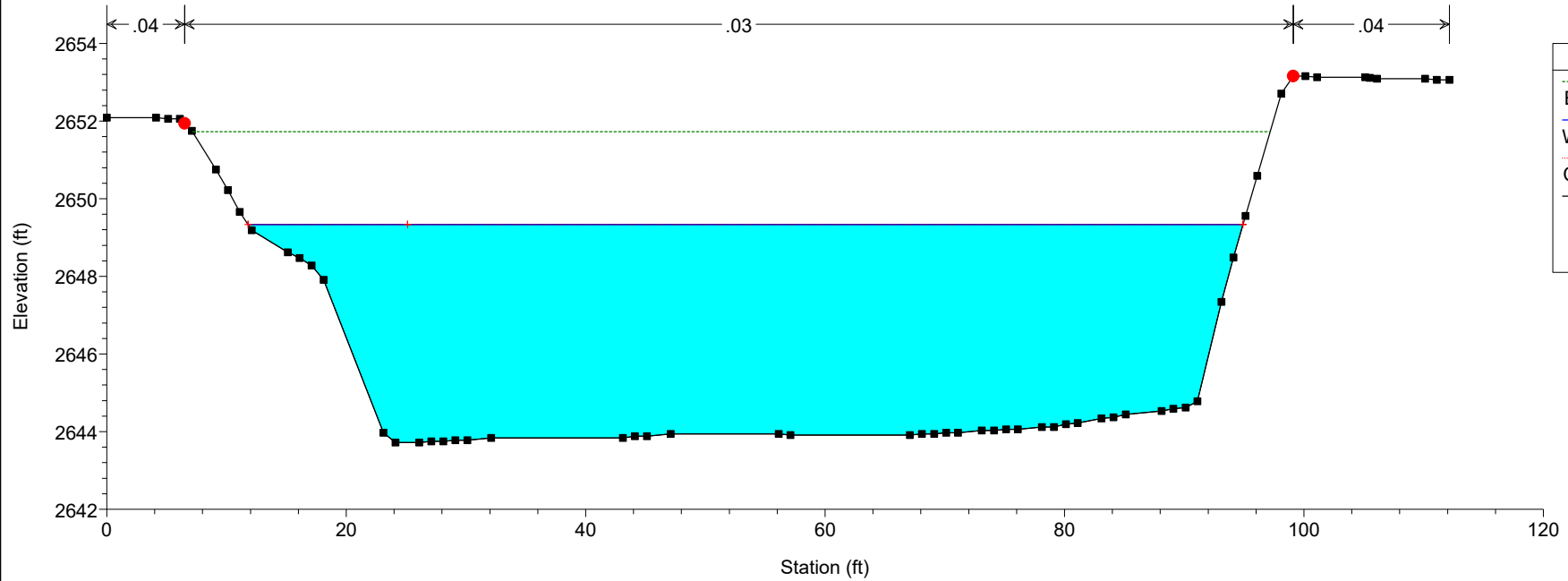
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 359



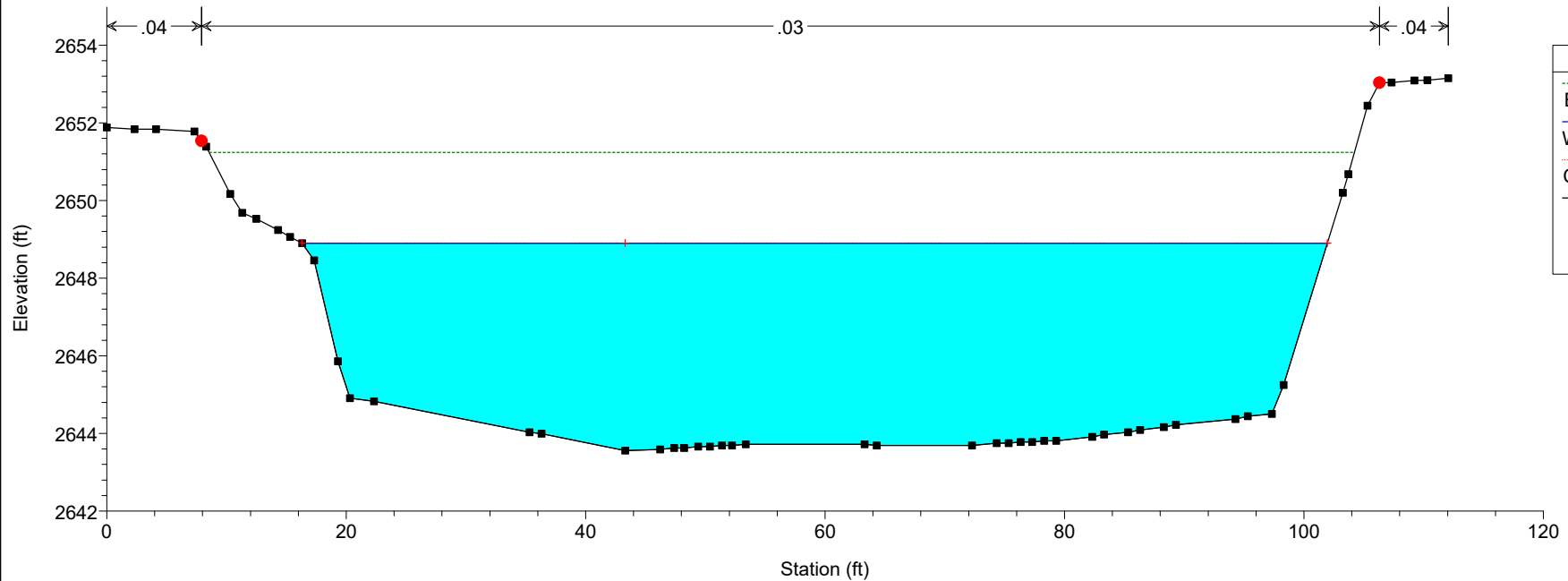
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RS = 345



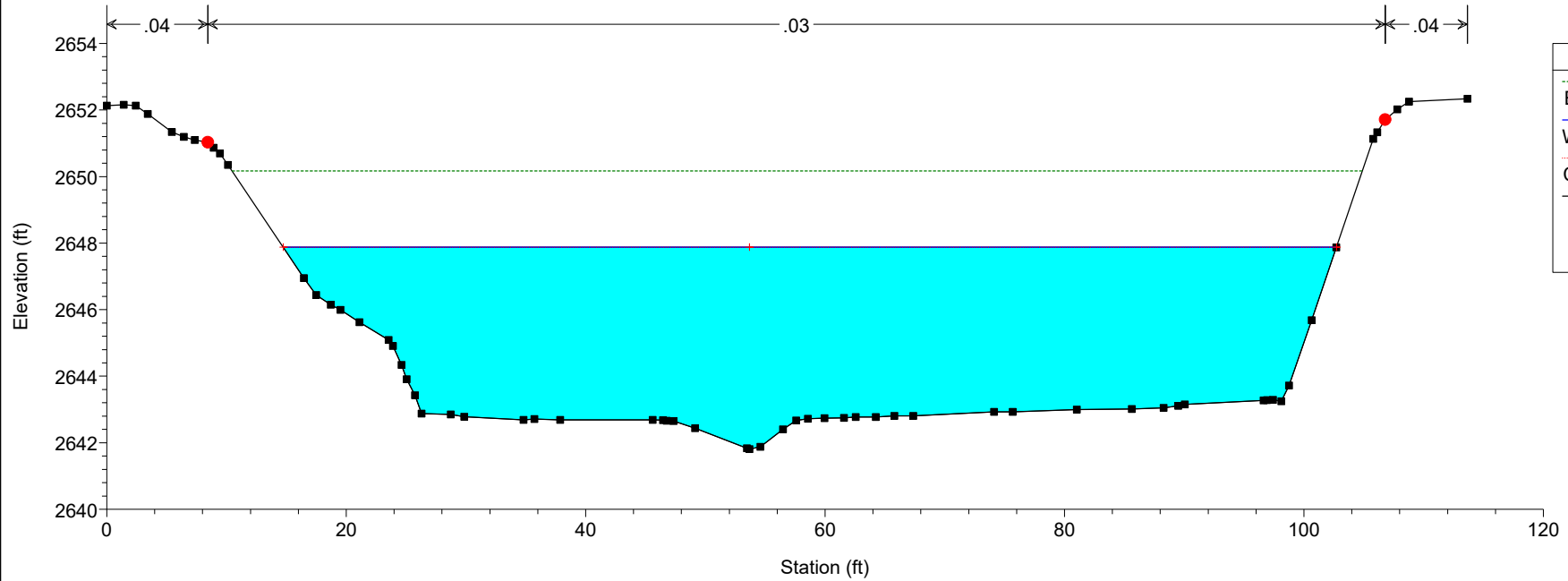
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 327



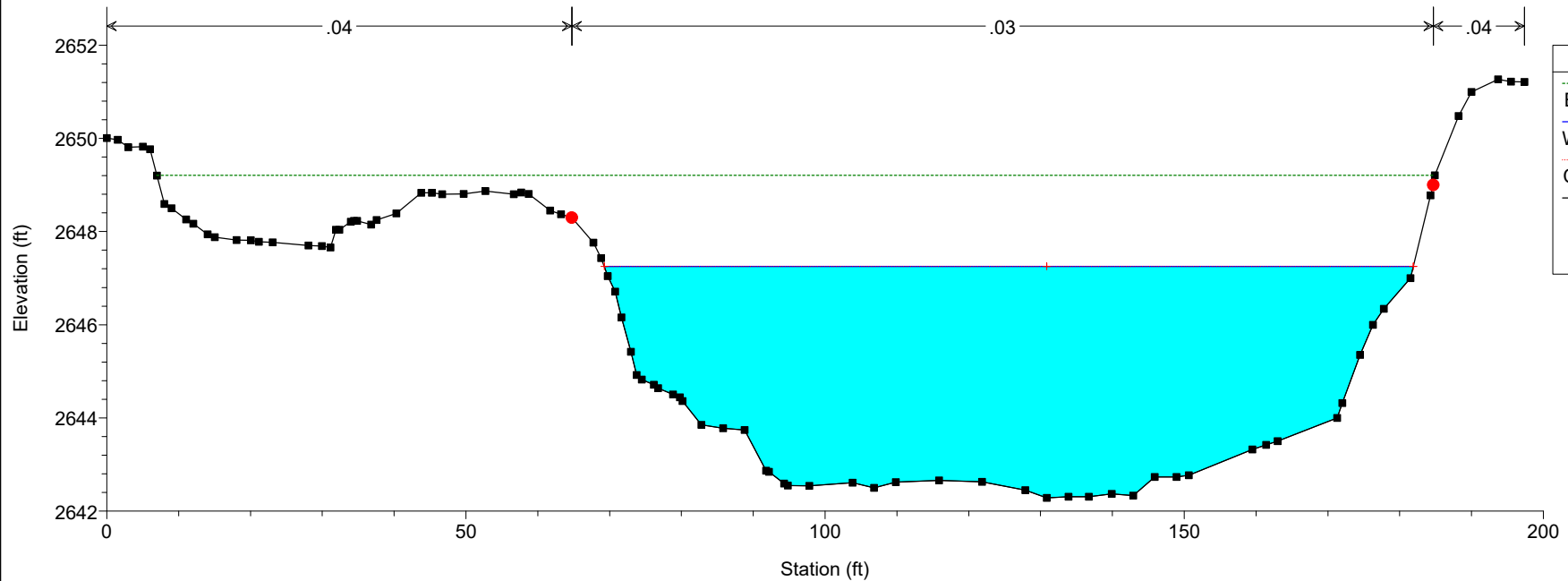
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 311



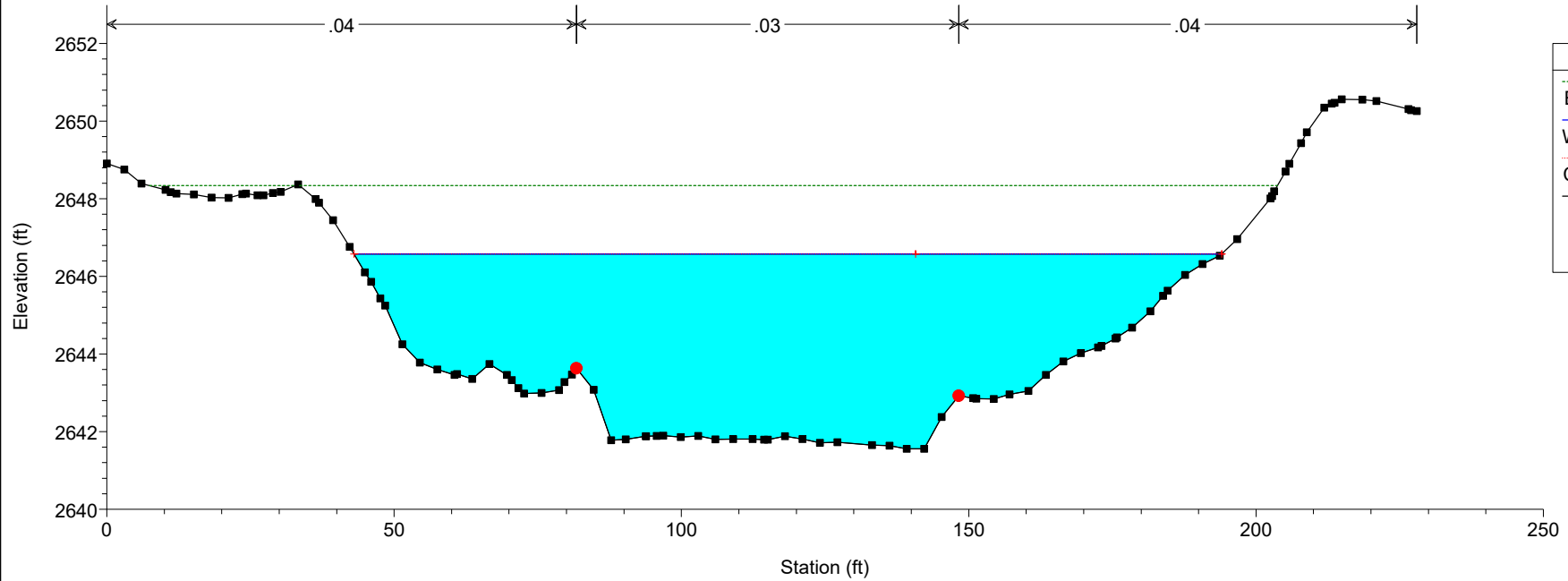
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 226



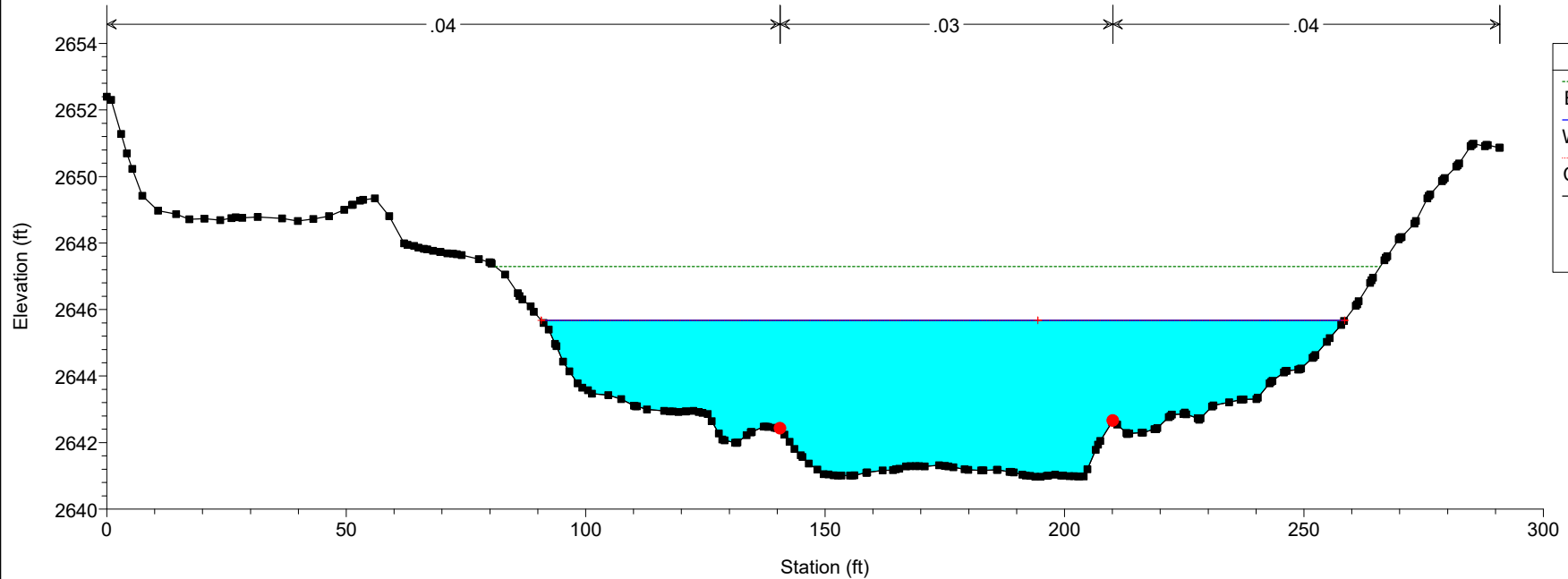
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 177



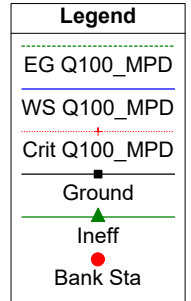
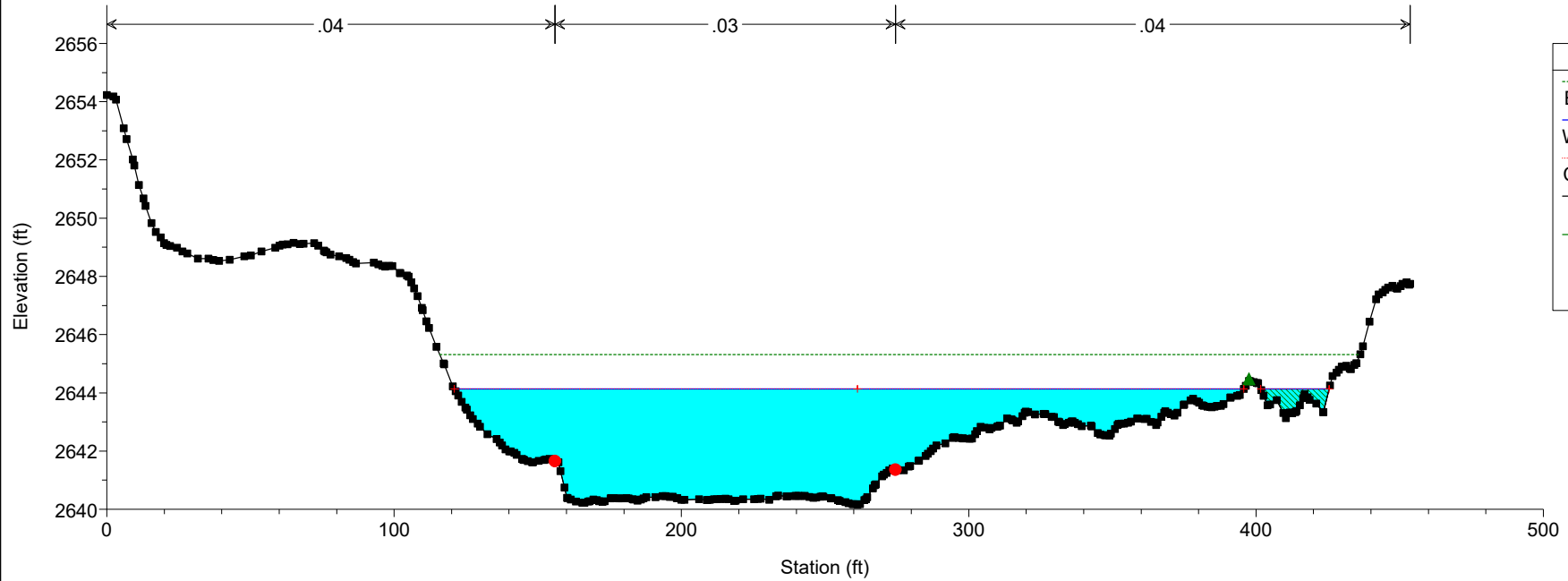
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 101



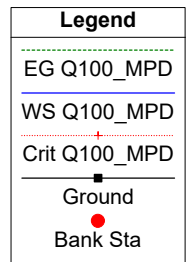
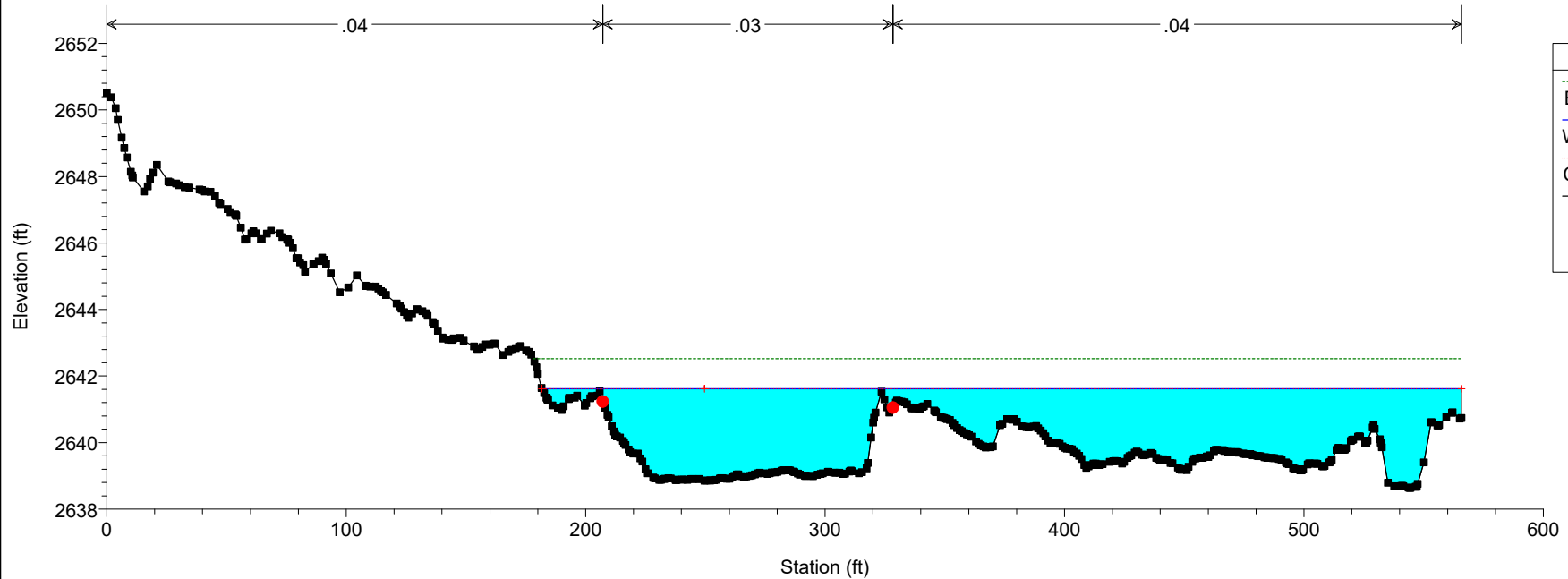
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 70



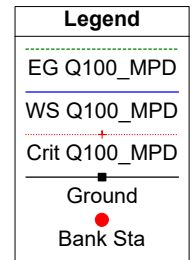
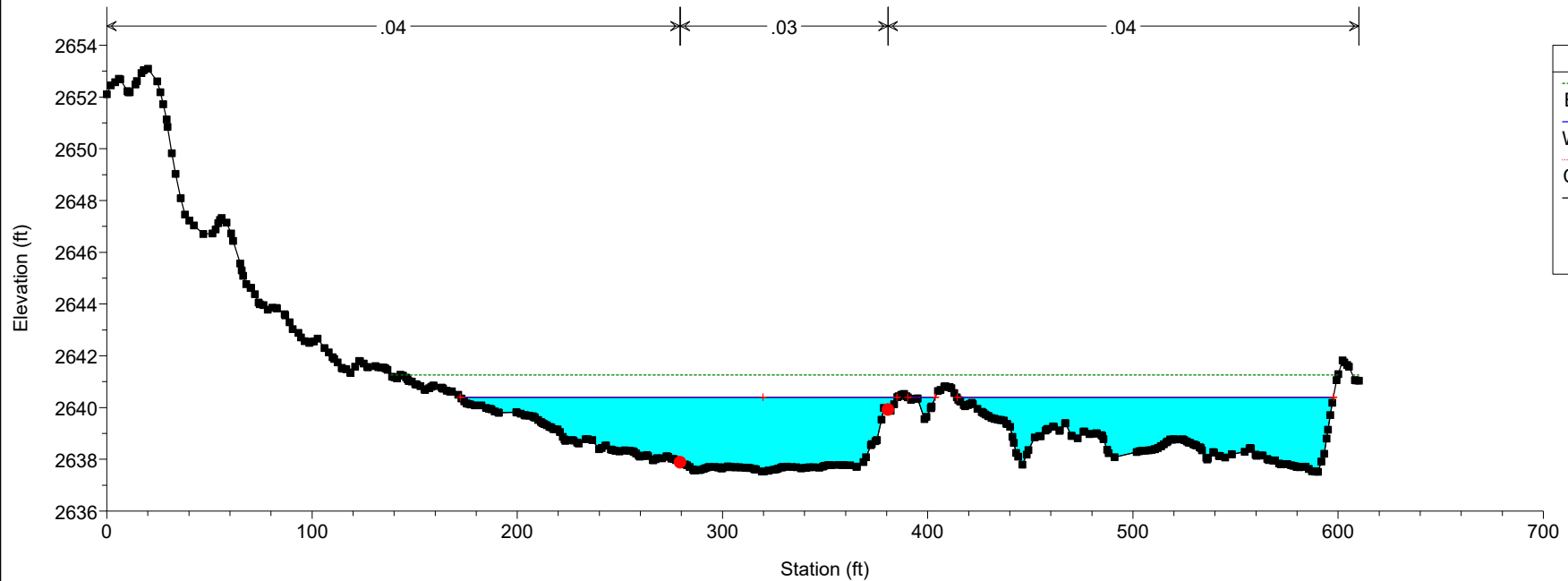
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = 30



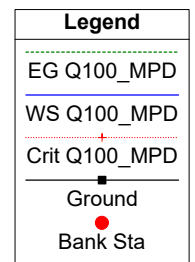
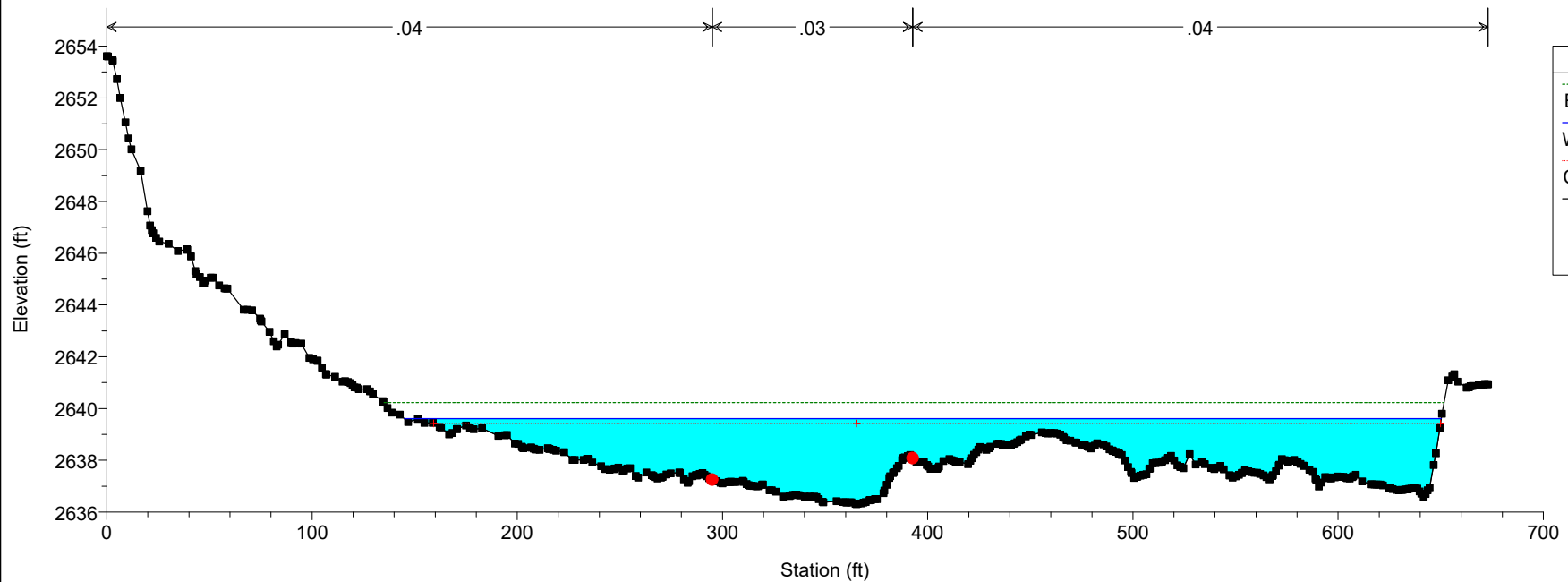
Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = -30



Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = -148



Ossum Wash Plan: Existing_Subcritical w/o Levees 10/29/2025
RS = -213



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
Reach 1	932	Q100_MPD	4876.00	2661.42	2666.88	2666.88	2669.03	0.014789	11.78	413.95	95.92	1.00
Reach 1	826	Q100_MPD	4876.00	2660.41	2664.94	2664.94	2665.78	0.008891	8.45	771.89	576.94	0.76
Reach 1	731	Q100_MPD	4876.00	2659.22	2662.73	2662.73	2663.41	0.005891	7.78	907.02	687.62	0.80
Reach 1	688	Q100_MPD	4876.00	2658.67	2662.39	2662.39	2662.68	0.002541	5.34	1317.75	981.09	0.53
Reach 1	634	Q100_MPD	4876.00	2657.74	2661.38	2661.38	2661.69	0.003072	5.39	1210.97	827.94	0.57
Reach 1	604	Q100_MPD	4876.00	2657.25	2660.46	2659.98	2660.77	0.003532	5.92	1320.92	869.98	0.61
Reach 1	578	Q100_MPD	4876.00	2656.90	2660.46	2659.59	2660.67	0.002177	5.04	1617.17	954.65	0.49
Reach 1	558	Q100_MPD	4876.00	2656.62	2660.47	2659.21	2660.62	0.001470	4.36	1777.19	1066.77	0.41
Reach 1	538	Q100_MPD	4876.00	2656.44	2660.47	2658.75	2660.58	0.001028	3.84	1935.35	1150.62	0.35
Reach 1	512	Q100_MPD	4876.00	2656.16	2660.51	2659.66	2660.55	0.000247	3.06	3740.24	1380.51	0.26
Reach 1	485	Q100_MPD	4876.00	2656.00	2660.52		2660.54	0.000103	2.04	4971.47	1457.78	0.17
Reach 1	456	Q100_MPD	4876.00	2654.46	2660.52	2659.27	2660.53	0.000082	1.94	5427.50	1504.52	0.14
Reach 1	448	Q100_MPD	4876.00	2651.28	2658.19	2658.19	2660.32	0.006306	11.70	416.60	100.29	1.01
Reach 1	439	Q100_MPD	4876.00	2650.38	2656.53	2656.53	2659.04	0.004796	12.71	383.58	77.21	1.01
Reach 1	416	Q100_MPD	4876.00	2648.89	2654.83	2654.83	2657.29	0.004989	12.59	387.44	79.32	1.00
Reach 1	392	Q100_MPD	4876.00	2648.31	2654.29	2654.29	2656.77	0.005648	12.63	386.00	78.60	1.00
Reach 1	387	Q100_MPD	4876.00	2647.58	2653.58	2653.58	2656.06	0.009723	12.61	386.56	78.25	1.00
Reach 1	377	Q100_MPD	4876.00	2647.28	2653.07	2653.07	2655.54	0.009874	12.60	387.00	79.20	1.00
Reach 1	368	Q100_MPD	4876.00	2645.59	2651.77	2651.77	2654.23	0.009861	12.59	387.36	79.55	1.01
Reach 1	364	Q100_MPD	4876.00	2645.42	2651.46	2651.46	2653.85	0.009891	12.41	392.93	82.95	1.01
Reach 1	359	Q100_MPD	4876.00	2645.21	2651.09	2651.09	2653.41	0.009962	12.21	399.25	87.14	1.01
Reach 1	345	Q100_MPD	4876.00	2645.02	2650.81	2650.81	2653.11	0.009978	12.16	400.90	88.18	1.01
Reach 1	327	Q100_MPD	4876.00	2644.79	2650.47	2650.47	2652.75	0.020332	12.10	402.96	89.67	1.01
Reach 1	311	Q100_MPD	4876.00	2644.04	2649.65	2649.65	2651.92	0.020101	12.09	403.18	88.82	1.00
Reach 1	283	Q100_MPD	4876.00	2643.49	2648.74	2648.74	2651.05	0.008381	12.20	399.73	87.00	1.00
Reach 1	254	Q100_MPD	4876.00	2642.25	2648.28	2648.28	2650.67	0.008434	12.40	393.22	83.07	1.00
Reach 1	226	Q100_MPD	4876.00	2641.81	2647.88	2647.88	2650.17	0.008318	12.13	402.04	87.98	1.00
Reach 1	177	Q100_MPD	4876.00	2642.28	2647.25	2647.25	2649.21	0.008625	11.22	434.57	112.63	1.01
Reach 1	101	Q100_MPD	4876.00	2641.56	2646.57	2646.57	2648.34	0.007405	11.82	518.20	151.00	0.97
Reach 1	70	Q100_MPD	4876.00	2640.97	2645.67	2645.67	2647.29	0.007461	11.47	542.93	167.72	0.96
Reach 1	30	Q100_MPD	4876.00	2640.16	2644.14	2644.14	2645.31	0.006258	9.35	650.80	298.64	0.86
Reach 1	-30	Q100_MPD	4876.00	2638.85	2641.62	2641.62	2642.52	0.011173	9.07	700.41	384.05	1.06
Reach 1	-148	Q100_MPD	4876.00	2637.53	2640.39	2640.39	2641.26	0.010105	9.28	738.63	409.60	1.02
Reach 1	-213	Q100_MPD	4876.00	2636.31	2639.61	2639.42	2640.23	0.007002	8.13	906.33	505.28	0.86

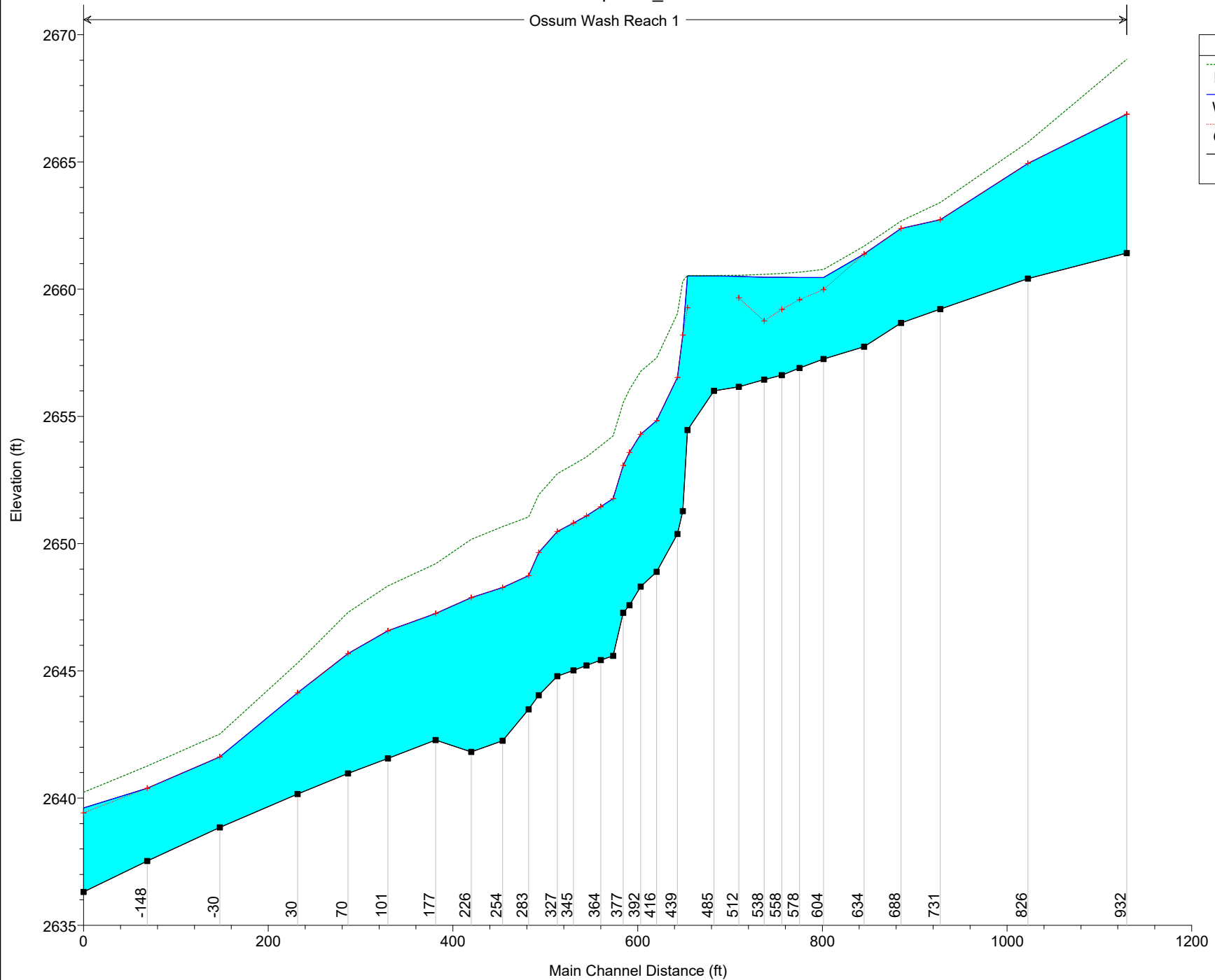
----- Turner Rd

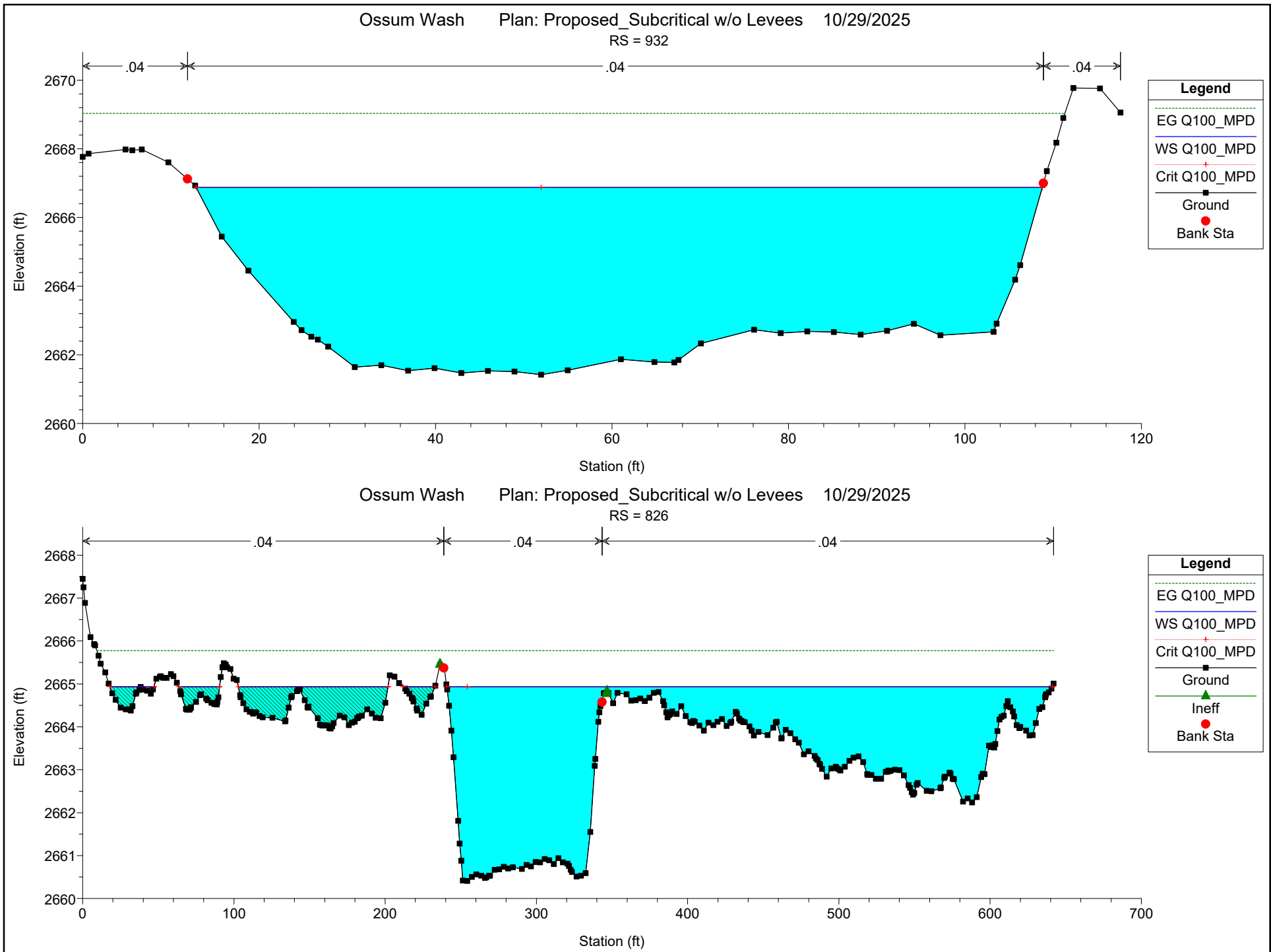
Right Bank Improvements - Existing Grouted

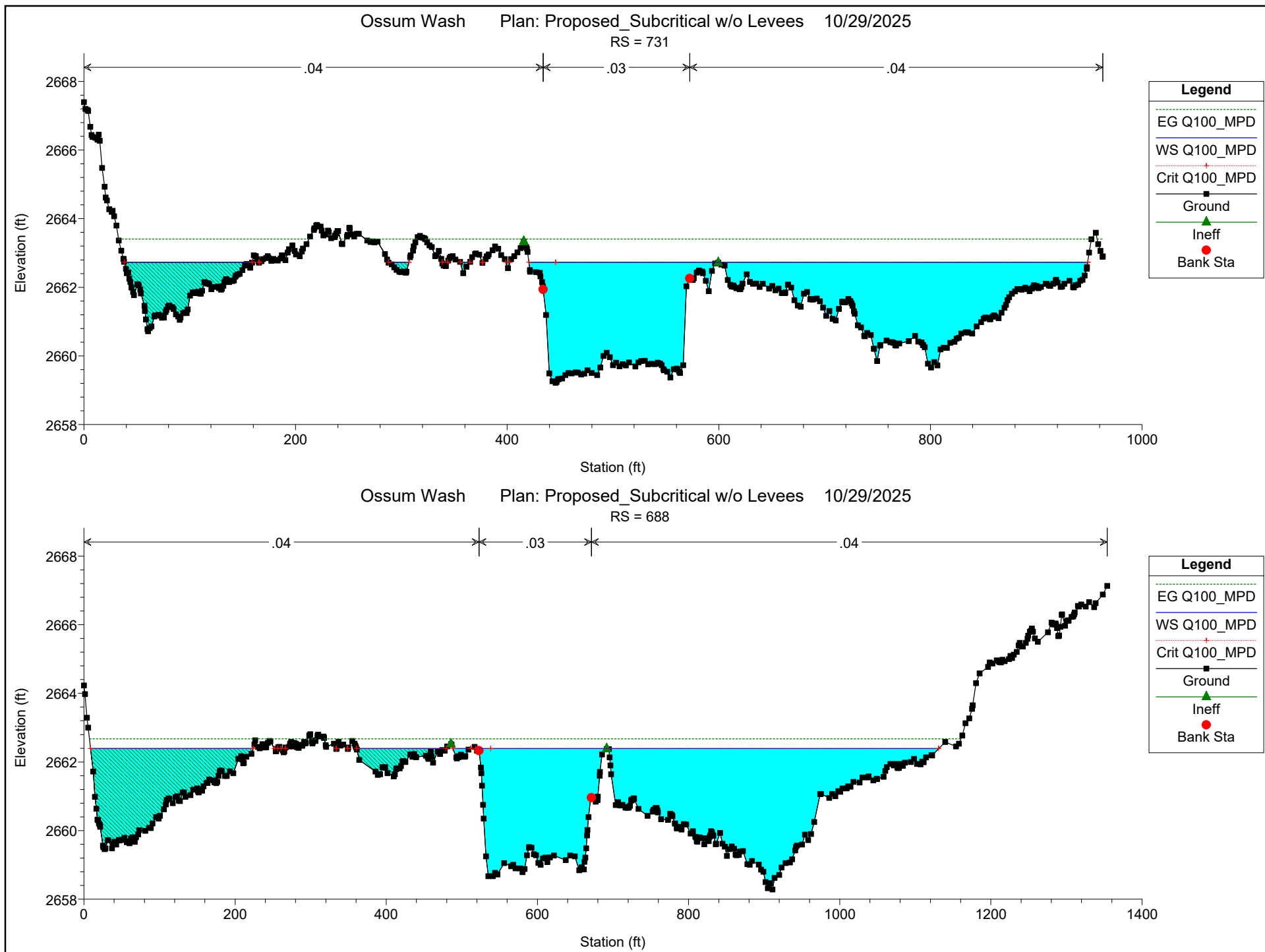
Full Section Improvements - Grouted

Full Section Improvements - Loose

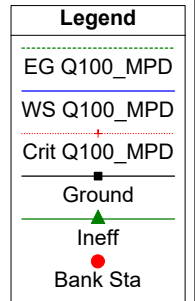
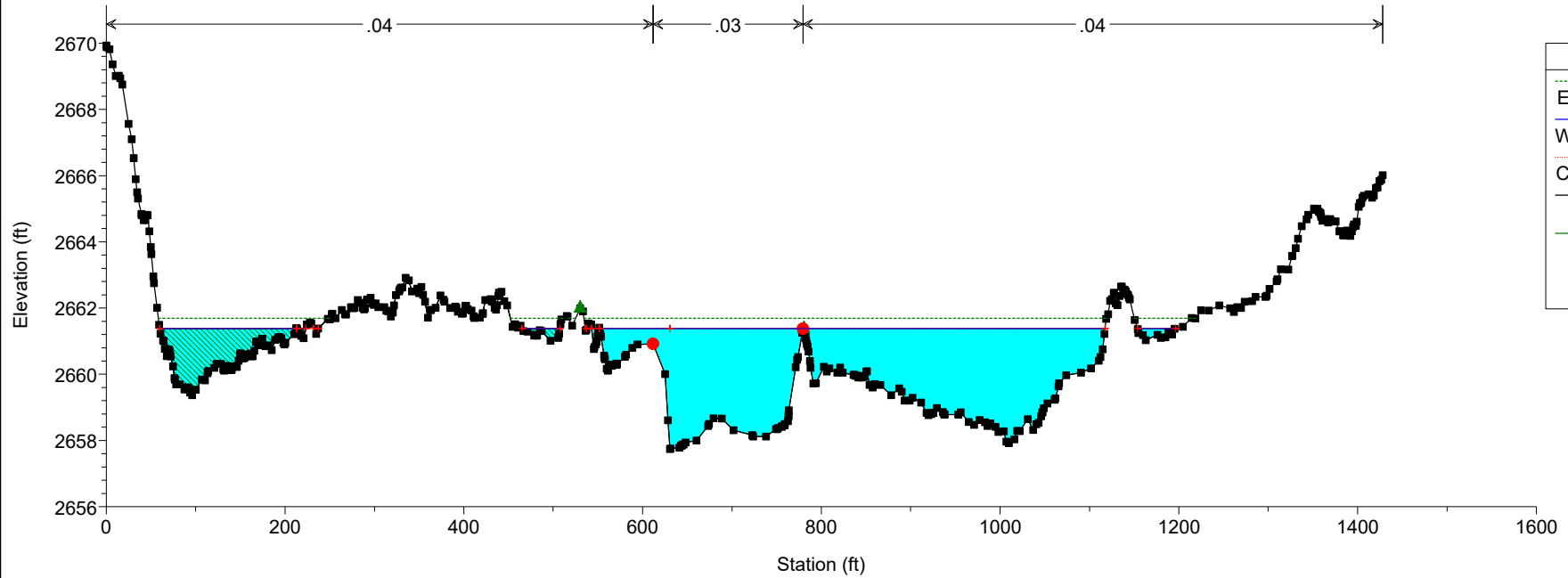
Ossum Wash Reach 1



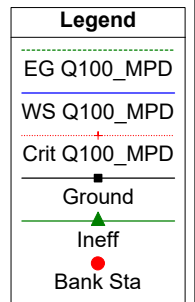
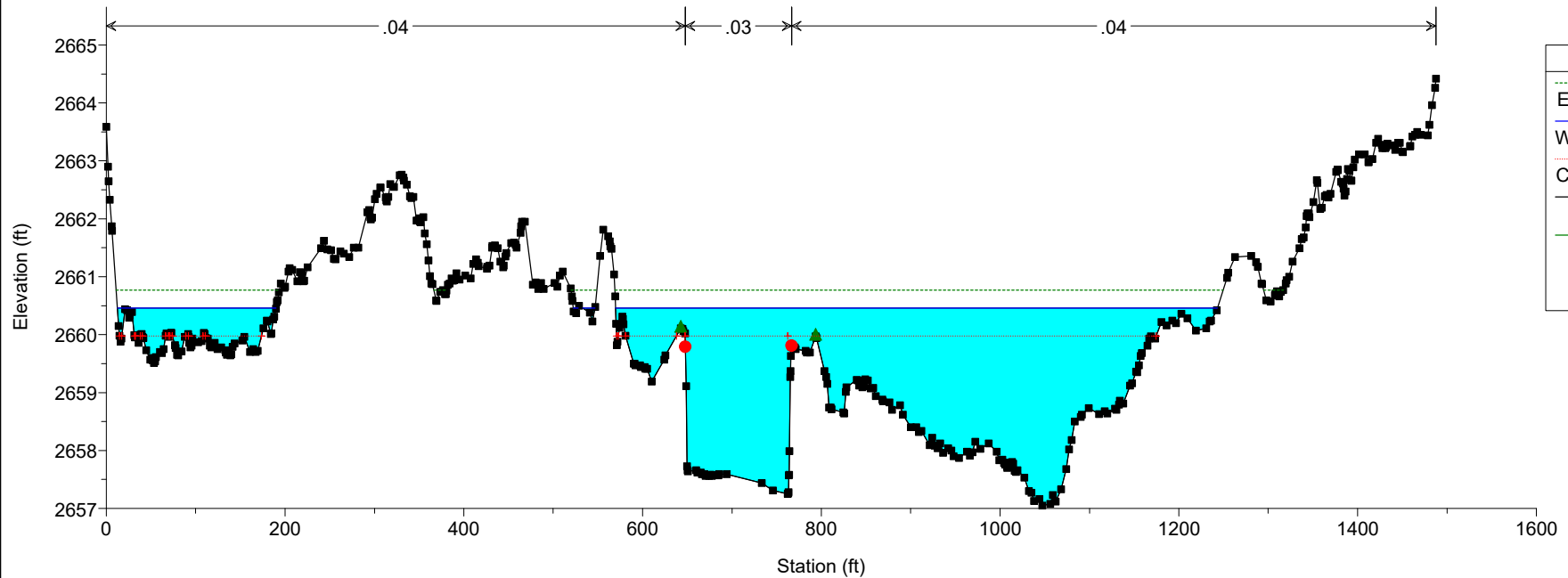


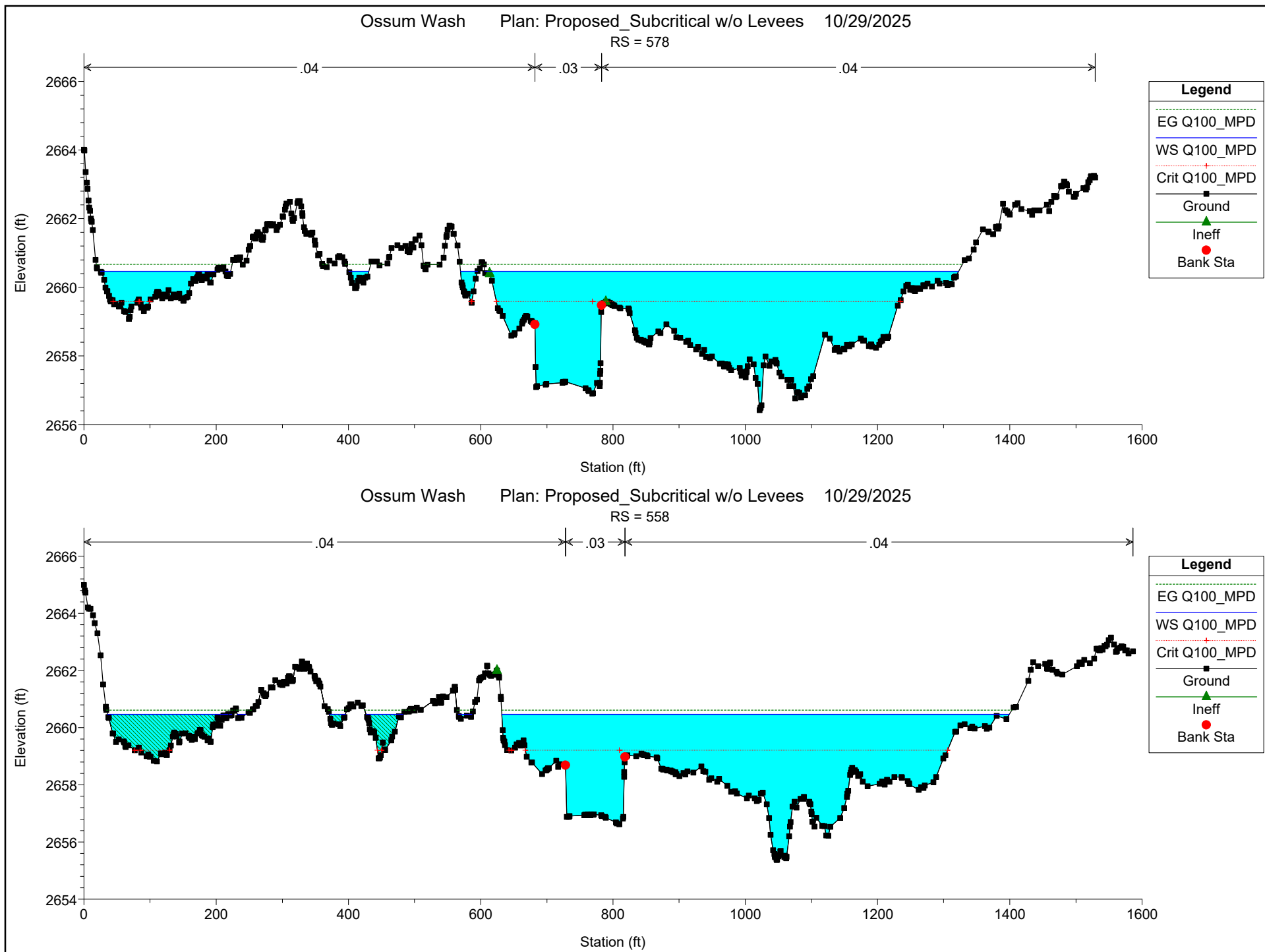


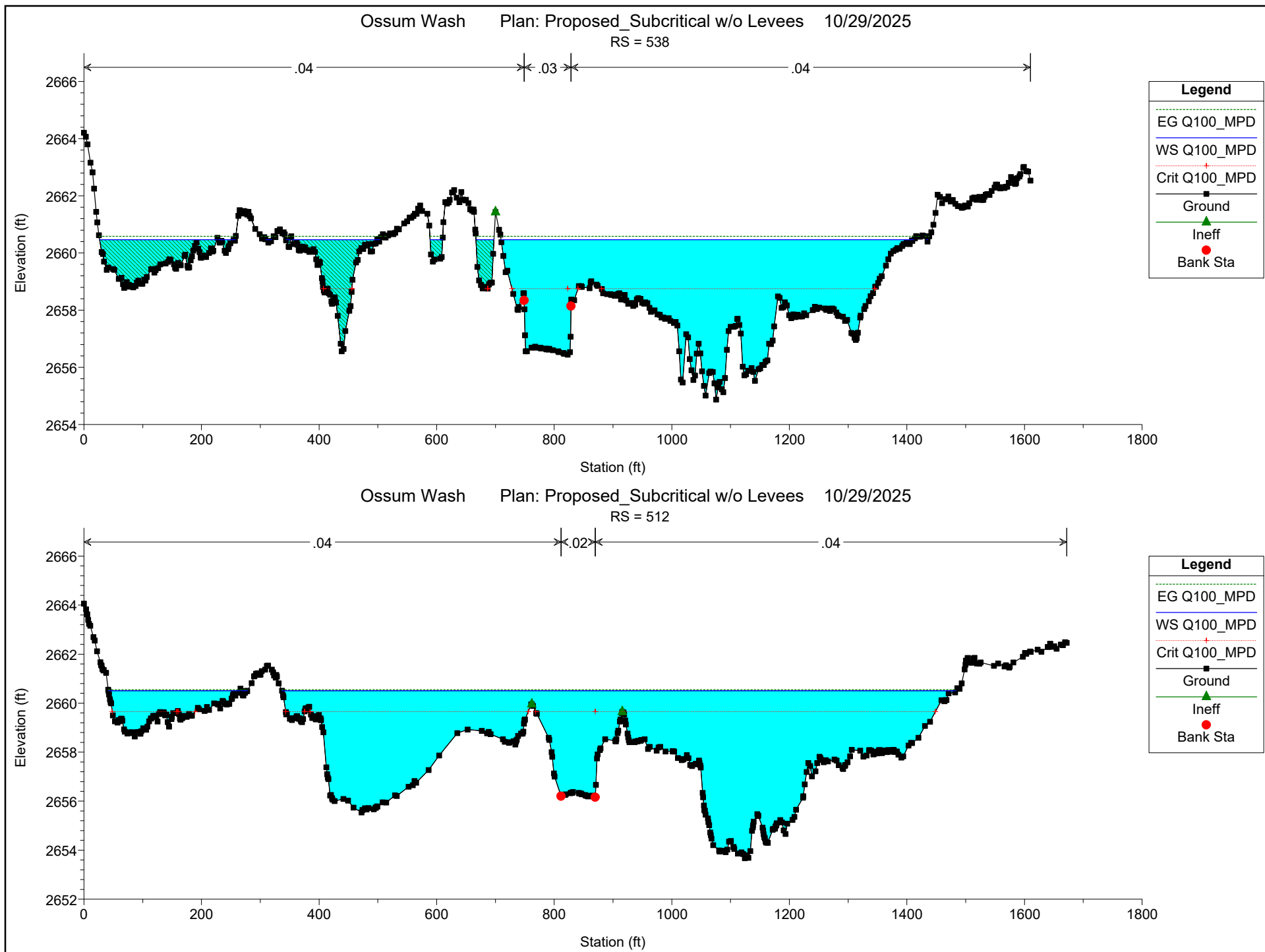
Ossum Wash Plan: Proposed_Subcritical w/o Levees 10/29/2025
RS = 634

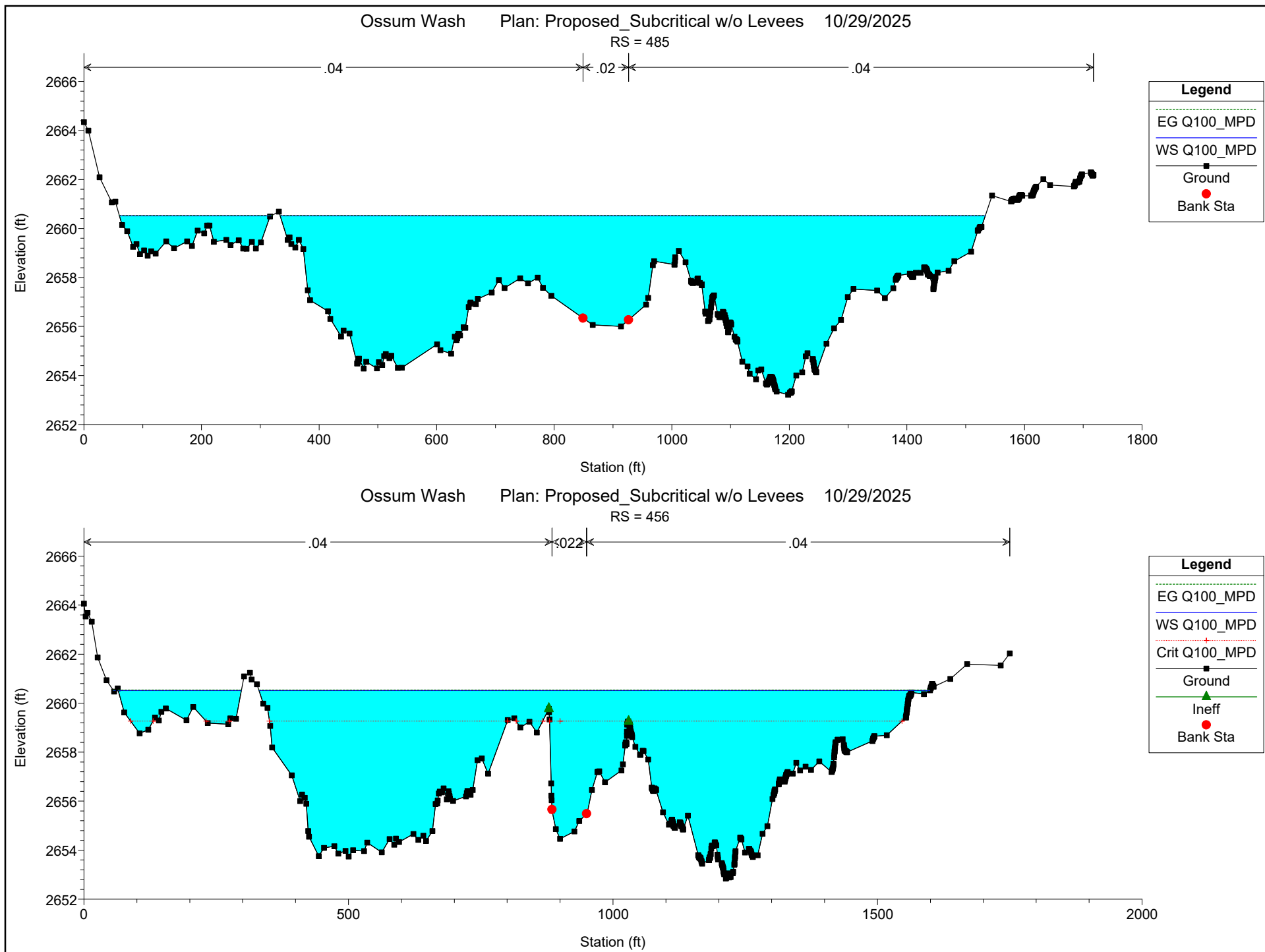


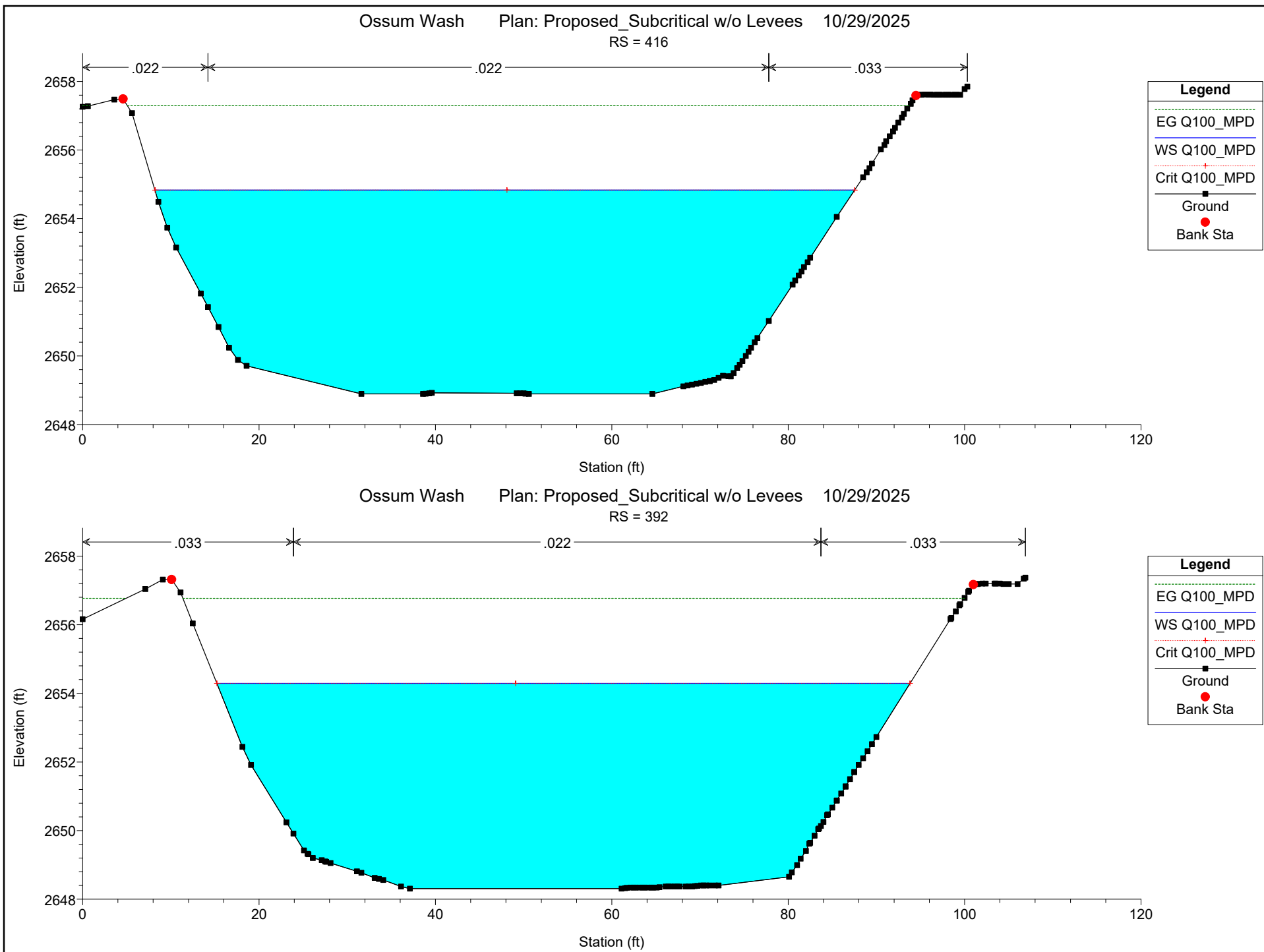
Ossum Wash Plan: Proposed_Subcritical w/o Levees 10/29/2025
RS = 604

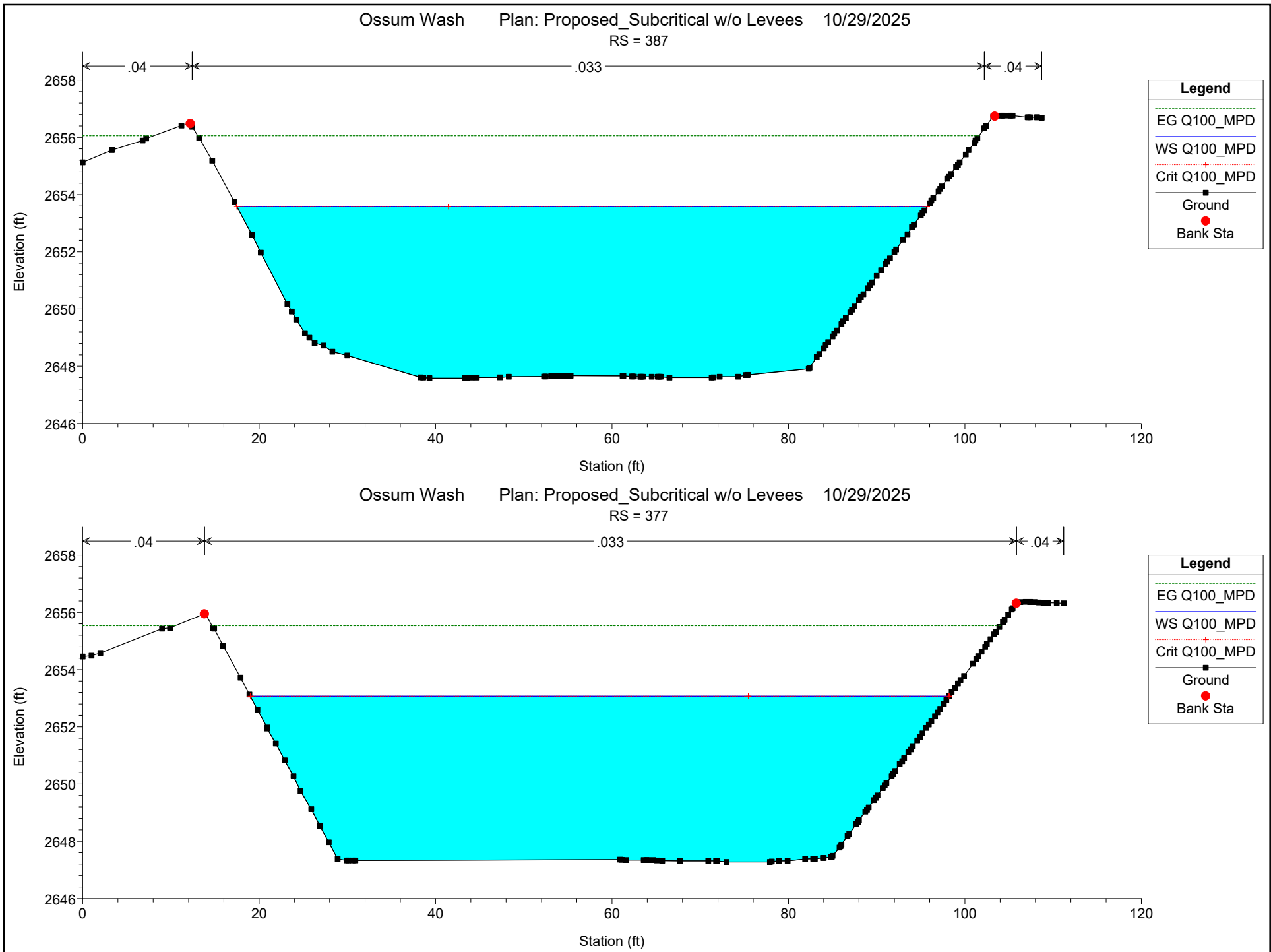


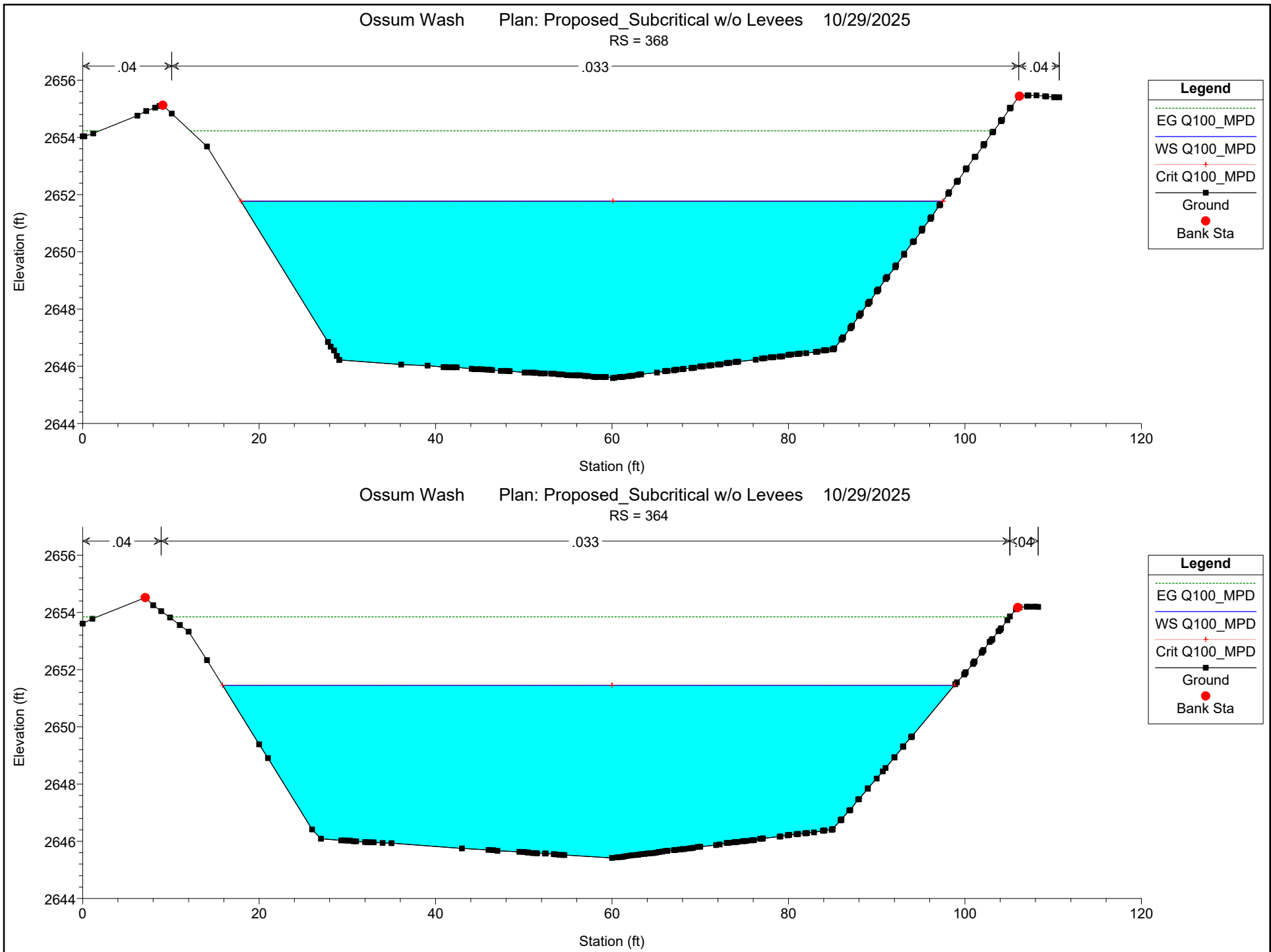






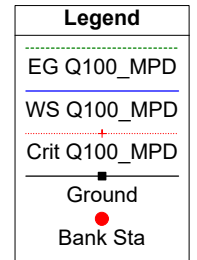
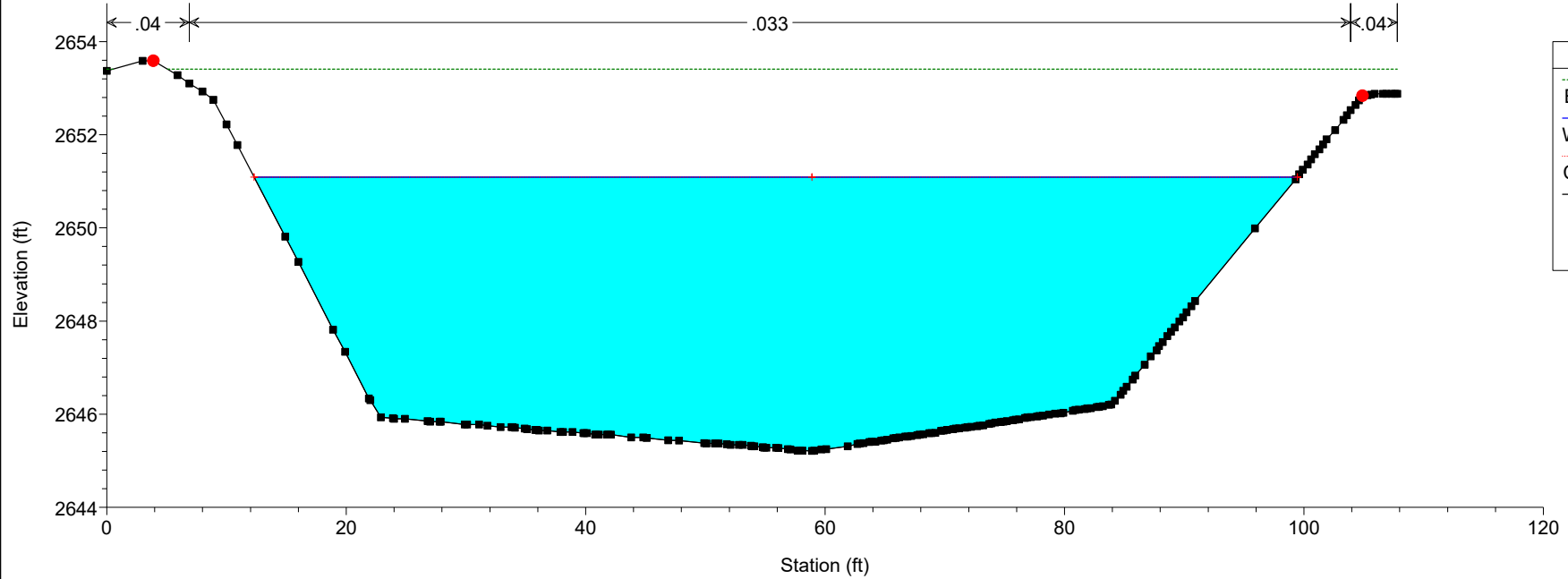






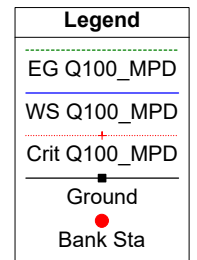
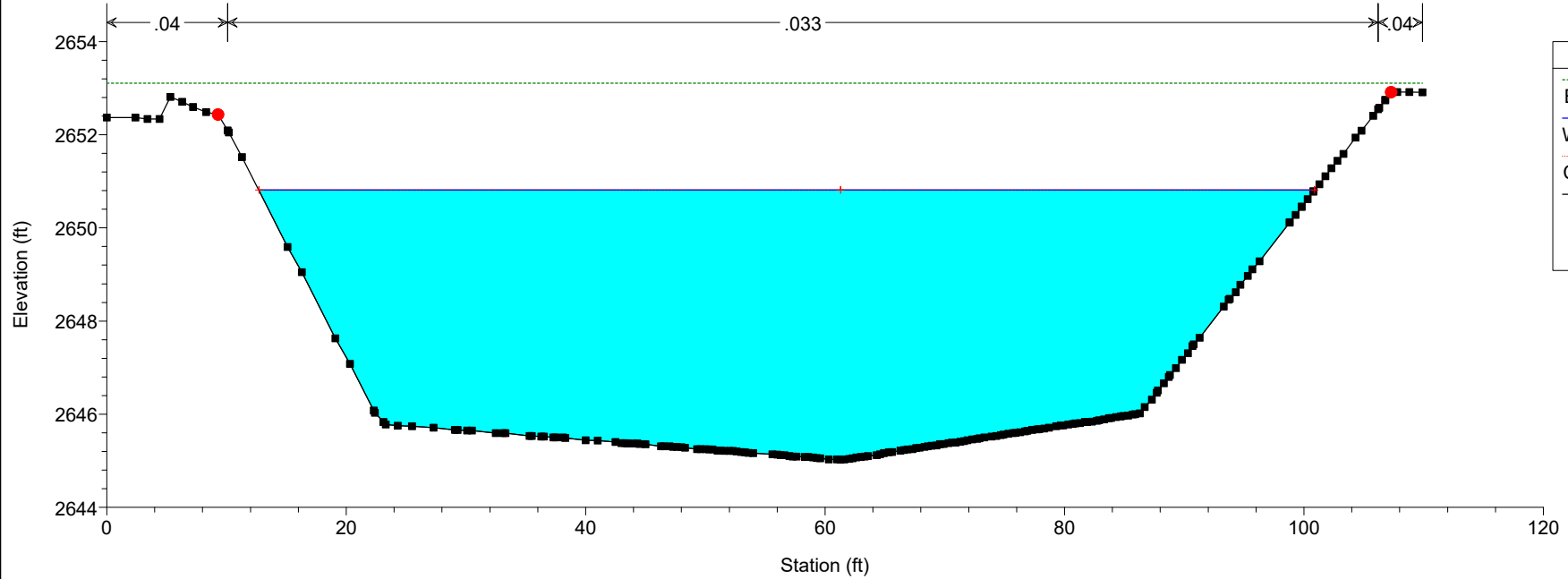
Ossum Wash Plan: Proposed_Subcritical w/o Levees 10/29/2025

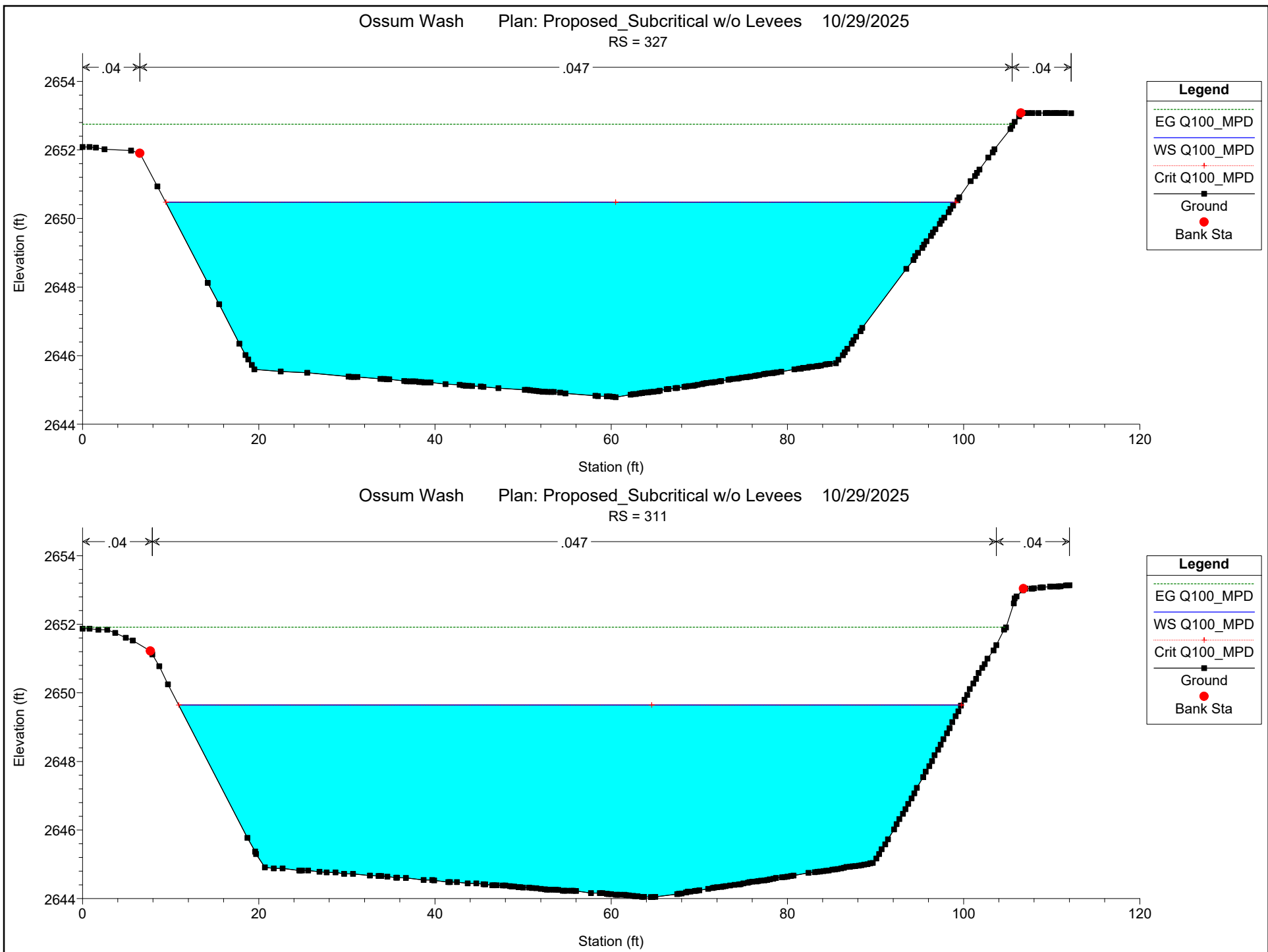
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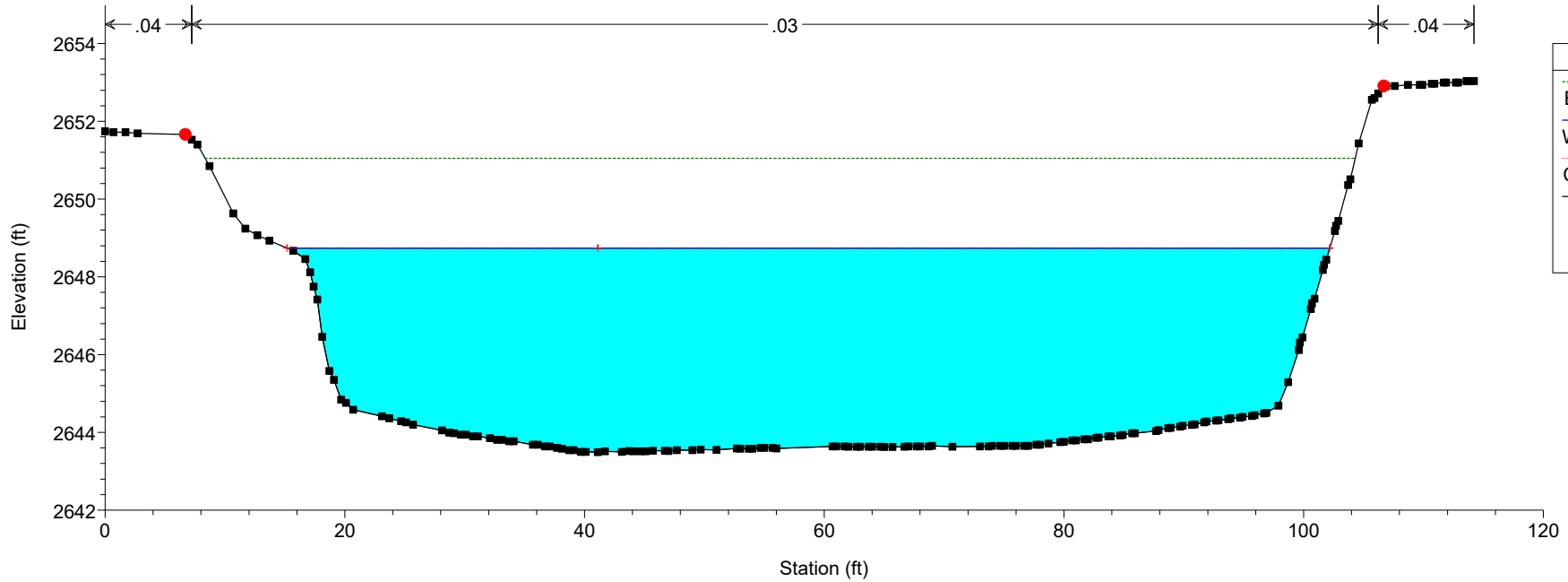
Ossum Wash Plan: Proposed_Subcritical w/o Levees 10/29/2025

RS = 345

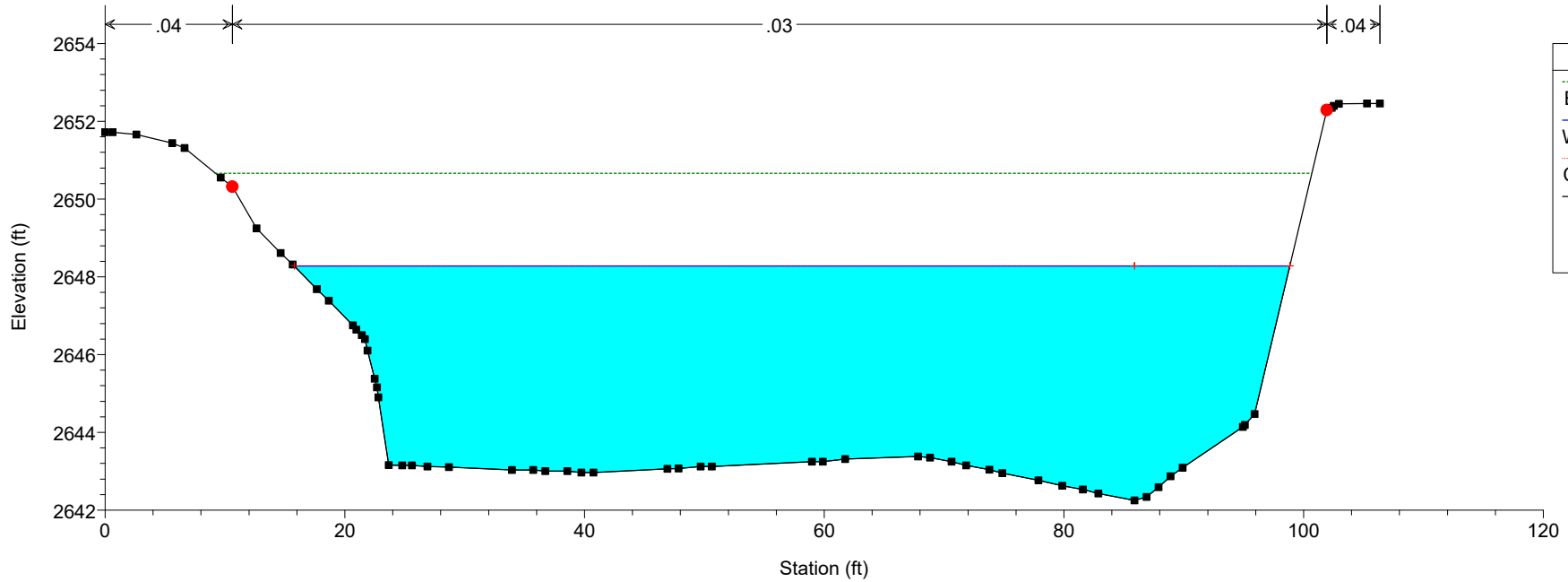


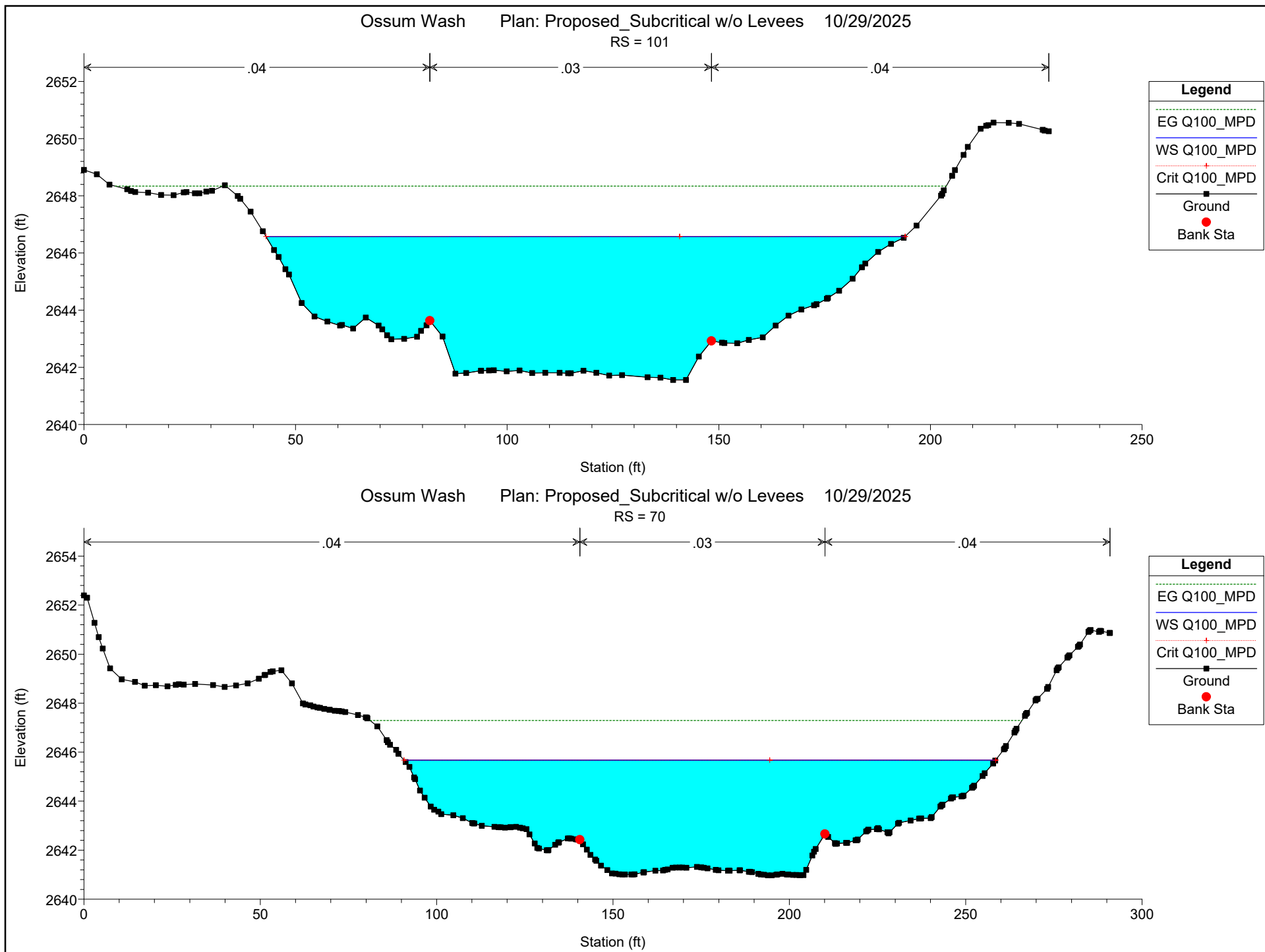


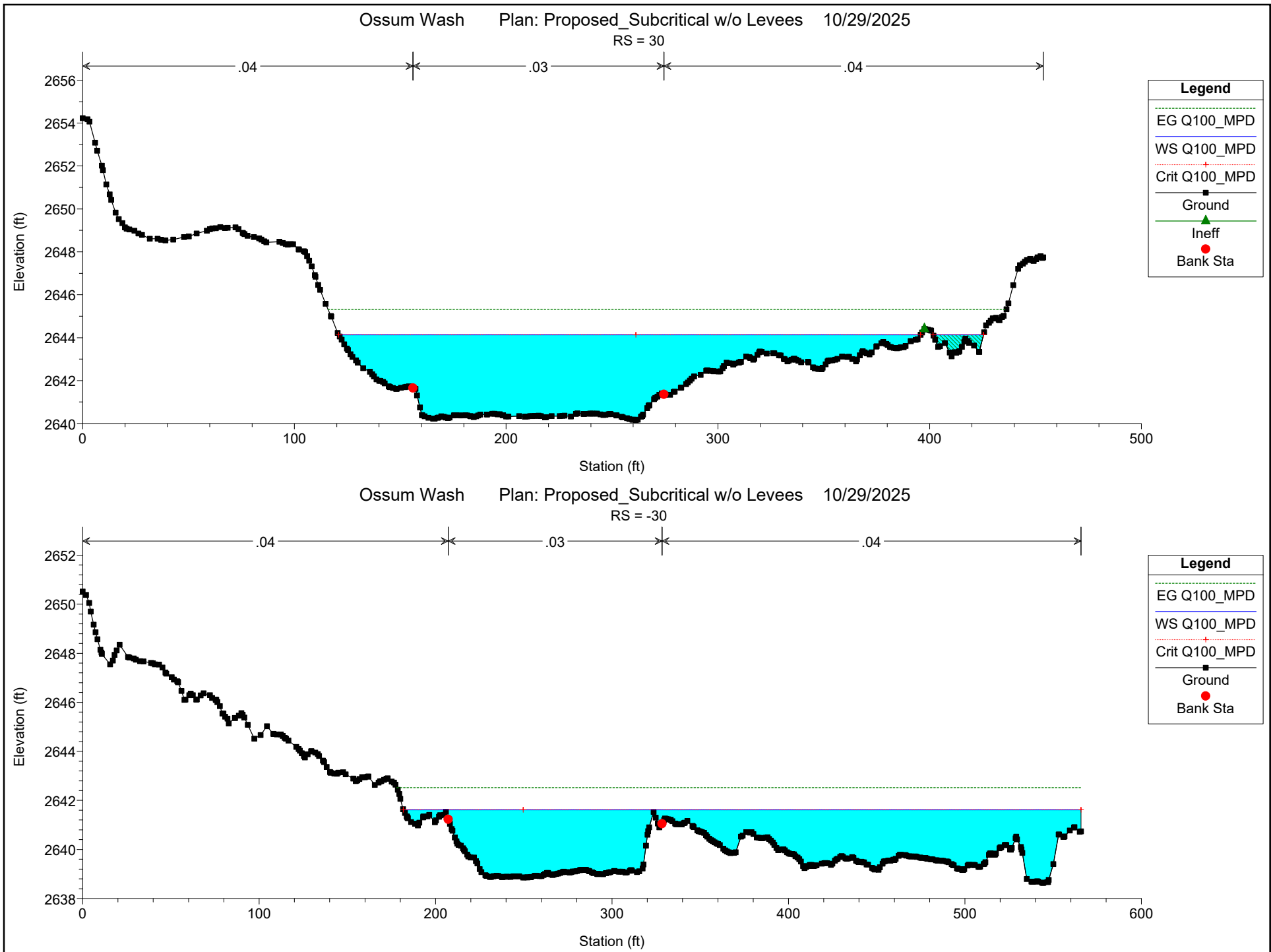
Ossum Wash Plan: Proposed_Subcritical w/o Levees 10/29/2025
RS = 283

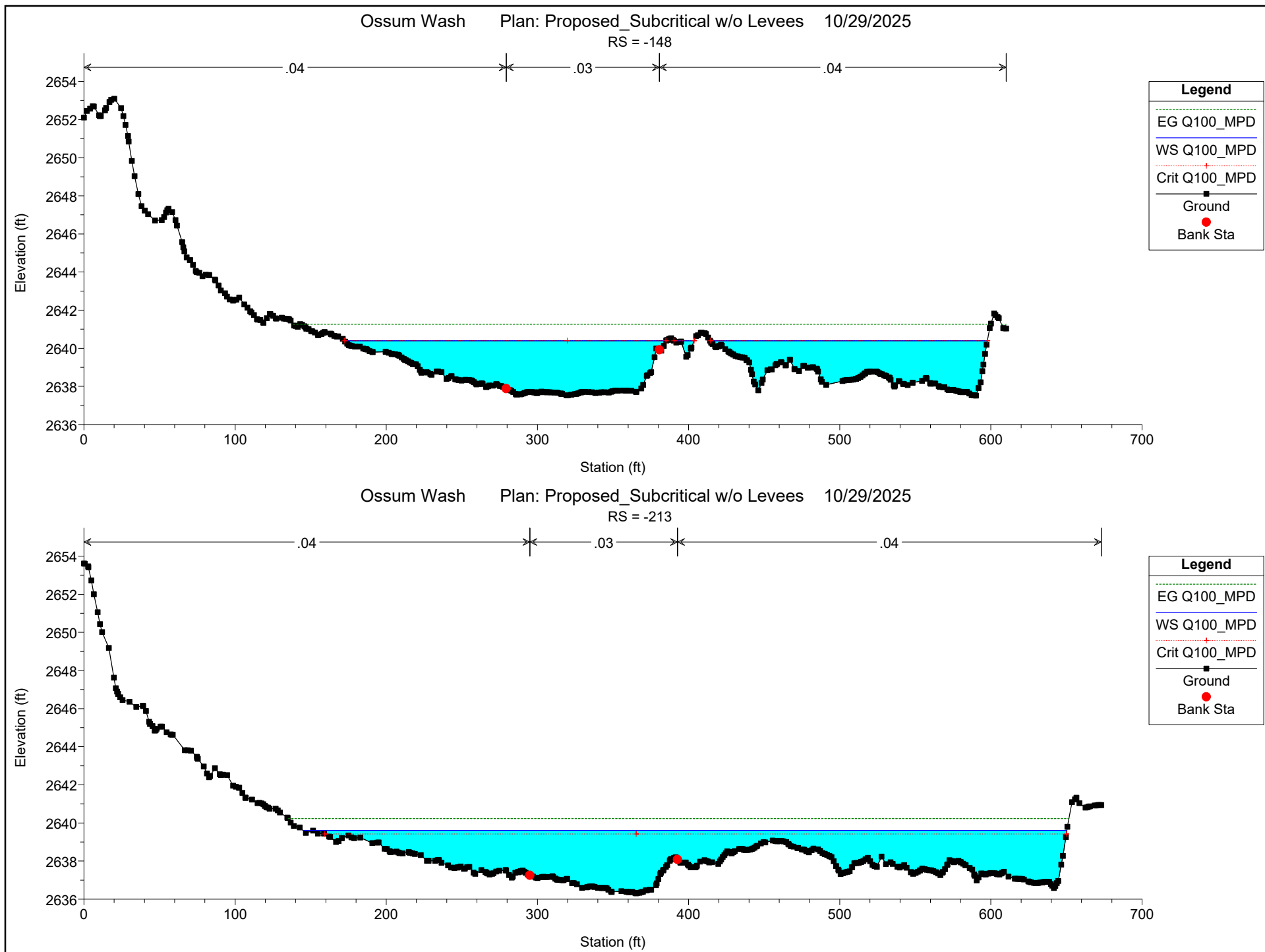


Ossum Wash Plan: Proposed_Subcritical w/o Levees 10/29/2025
RS = 254







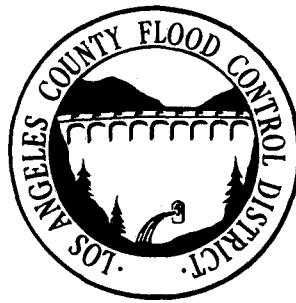


EXCERPT FROM:

Los Angeles County Flood Control District

DESIGN MANUAL

HYDRAULIC



March 1982

**2250 Alcazar Street
Los Angeles, California**

**P.O. Box 2418, Terminal Annex
Los Angeles, California 90051**

LEVEE CRITERIA

Cut-Off Depths

Velocities	Straight Reaches	*Curved Reach
0 - 6 f.p.s.	6-ft.	9-ft.
6 - 10 f.p.s.	8-ft.	12-ft.
10 - 15 f.p.s.	10-ft.	15-ft.
15 - 18 f.p.s.	12.5 ft.	18-ft.
18 - 20 f.p.s.	14 ft.	21-ft.

Downstream cut-off depth

*Check the cut off depth for curved reach on Chart F-06 on Page F-38
Use that depth if greater than given hereon.

Material and Structural Requirements

Concrete Levees (1 1/2:1 max. side slope)

Upstream cut-off
depth

Velocities	Levee Thickness - T		Reinforcing
	Straight Reach	Curved Reach	
0 - 10 f.p.s.	6-inch	8-inch	#4 @ 18" Bothways
10 - 20 f.p.s.	8-inch	10-inch	#4 @ 18" Bothways

Gunite Levees (1 1/2:1 max. side slopes)

Velocities	Levee Thickness - T		Reinforcing
	Straight Reach	Curved Reach	
0 - 10 f.p.s.	8-inch	10-inch	#4 @ 18" Bothways
Gunite levees not permitted where velocities exceed 10 f.p.s.			