

El Mirage Rd; 303L – Jomax Road Design Concept Report and Environmental Assessment

Preliminary Drainage Report

Consultant:	Jacobs Engineering Group
ADOT Project No:	T0428 03D
Contract No:	2024-001



Arizona Department of Transportation
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Executive Summary

This preliminary drainage report has been prepared for the Arizona Department of Transportation (ADOT), the Maricopa County Department of Transportation (MCDOT), and the City of Peoria (COP) to summarize the drainage analysis and design associated with ADOT Project No. T0428 *El Mirage Rd; SR303L to Jomax Road – Design Concept Report and Environmental Assessment*.

This report documents the assumptions, procedures, and methodologies utilized in the hydrologic and hydraulic analysis of the onsite and offsite roadway drainage systems and the McMicken Wash crossing structure alternatives. The drainage analysis and design summarized within this report are in accordance with our understanding of the standards and criteria set forth by Maricopa County and the City of Peoria in the following publications:

- *Drainage Policies and Standards Manual for Maricopa County*, Revised August 2018
- *Drainage Design Manual for Maricopa County (DDMMC), Volume I Hydrology*, Revised July 2023
- *Drainage Design Manual for Maricopa County (DDMMC), Volume II Hydraulics*, Revised Dec 2018
- *City of Peoria Engineering Standards*, Updated January 2024

Acronyms and Abbreviations

ADOT	Arizona Department of Transportation
APS	Arizona Public Service
ASLD	Arizona State Land Department
BFE	Base Flood Elevations
CFS	Cubic Feet Per Second
COP	City of Peoria
DCR	Design Concept Report
DDMMC	Drainage Design Manual for Maricopa County
EMR	El Mirage Road
EOP	Edge of Pavement
FCDMC	Flood Control District of Maricopa County
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
HGL	Hydraulic Grade Line
HVR	Happy Valley Road
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
RGRCP	Rubber Gasket Reinforced Concrete Pipe
SFHA	Special Flood Hazard Area
TI	Traffic Interchange
USDOE	United States Department of Energy
WSEL	Water Surface Elevation



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1.0 Introduction

El Mirage Road (EMR): State Route 303L (SR 303L) to Jomax Road extension is a multi-agency project with the City of Peoria (COP), the Maricopa Association of Governments (MAG), the Arizona Department of Transportation (ADOT), and Maricopa County. The purpose of the project is to identify gaps in the EMR alignment and recommend appropriate improvements to establish it as a key transportation facility and to better connect the surrounding communities to the regional transportation system. Specifically, this project aims to establish a connection at the existing SR 303L Traffic Interchange (TI) between north Peoria and the rest of the City and region.

The Flood Control District of Maricopa County (FCDMC) recently developed and began construction on improvements to the McMicken Dam Outlet Channel, in the vicinity of the proposed EMR extension. Construction of the channel improvements was complete as of January 16, 2025. The proposed EMR extension intersects the riprap outlet channel lining section. FCDMC has evaluated and modeled design discharges within the channel/wash and has provided a HEC-RAS model representing the proposed dam outlet channel configuration. Within this report is a hydraulic analysis of the preferred McMicken Dam Outlet Wash crossing structure, a 10-12'x12' Reinforced Concrete Box Culvert.

The proposed roadway will utilize existing roadway construction at two locations. North of Happy Valley Road (HVR), the eastern half of EMR has been constructed for approximately 3,500 ft adjacent to the Coldwater Ranch development. EMR has also been constructed in an interim configuration north of Beardsley Canal. The proposed roadway will utilize these pavement sections where possible.

The general offsite drainage approach consists of cross culverts to collect and route flow to existing flowpaths, with offsite flow ultimately contributing to the Agua Fria River by way of the McMicken Dam Outlet Wash. The general onsite drainage approach consists of scuppers and curb opening catch basins with storm drain systems to collect and route onsite stormwater runoff to temporary or permanent retention basins. Temporary basins may be reconfigured if/when future developments are constructed adjacent to the roadway.



2.0 Location

The proposed EMR extension is located in the Northwest Phoenix Metropolitan area, within Maricopa County, Arizona. The project is located primarily in Unincorporated Maricopa County with the north end of the improvements located in the City of Peoria. The project falls within the following Sections of the Public Land Survey System, with respect to the Gila and Salt River Meridian:

- Section 1/2/11/12, Township 4 North, Range 1 West
- Section 35 & 36, Township 5 North, Range 1 West

Refer to Figure 1 for the location of the project within the greater Phoenix Metropolitan area and Figure 2 for an illustration of the project with respect to local municipal boundaries and arterial roadway network.



Figure 2-1 - Project Location

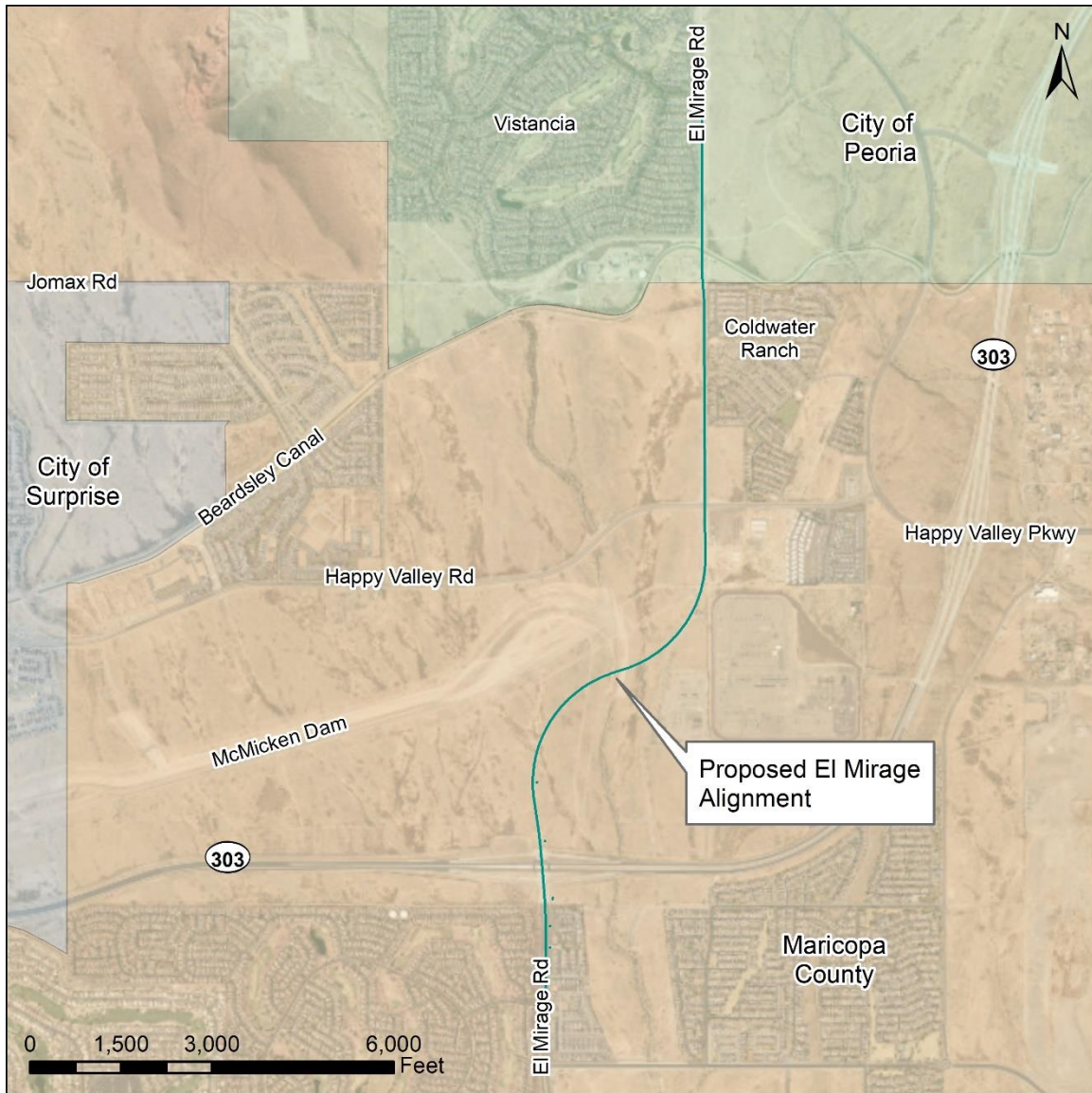


Figure 2-2 - Project Aerial



3.0 Site Description & Proposed Development

The project vicinity currently consists of mainly undeveloped desert rangeland. The McMicken Dam extends west of the project site approximately 5 miles toward Grand Ave. East of the site, south of HVR, are two substation facilities owned by the United States Department of Energy and the Arizona Public Service (APS) company. North of HVR, the proposed EMR extension will tie in to an existing half-street constructed adjacent to the Coldwater Ranch subdivision, located east of the proposed roadway. At the north end of the project, the proposed roadway alignment will cross the Beardsley Canal. North of the Beardsley Canal, the proposed EMR alignment will tie into Jomax Road at the Vistancia housing subdivision located along the western frontage of EMR.

The interim condition of EMR will consist of the ultimate condition outside curb and an interim condition inside curbed median. The roadway will provide north-south connectivity to the communities on HVR and will relieve traffic demand at the SR303L/HVR interchange. The alignment will cross the existing McMicken Dam Outlet Channel/Wash, approximately 2,000 feet north of SR 303L. The preferred wash crossing alternative is a 10-12'x12' Reinforced Concrete Box Culvert, evaluated in Section 9 of this report.

The proposed EMR extension will also cross the existing Beardsley Canal. This crossing will consist of a single-span bridge that will not impact the canal lining or its hydraulic properties. The corridor includes numerous utility crossings, including sewer, water, and gas. There are two locations where the proposed EMR alignment crosses existing overhead power lines.



4.0 FEMA Flood Hazard Assessment

Proposed roadway improvements intersect FEMA Special Flood Hazard Areas (SFHAs). The McMicken Dam Outlet Wash is designated as a Zone AE floodplain, defined as a SFHA subject to inundation by the flood event having a 1-percent chance of being equaled or exceeded in any given year, and has Base Flood Elevations (BFEs) determined. Further, the Outlet Wash includes a Zone AE Floodway. FEMA defined a regulatory floodway as the portion of a wash that is reserved from encroachment in order to discharge the base flood without increasing the water-surface elevation by more than a designated height. The McMicken Dam Outlet Channel, upstream of the project area, as well as Wash 16 East, located upstream of the dam outfall, are classified as Zone A floodplains, a SFHA subject to inundation by the 1-percent chance flood but with no BFEs determined.

Effective SFHAs in the project vicinity are shown on FEMA Flood Insurance Rate Map (FIRM) 04013C1230L, dated October 16, 2013. This FIRM panel includes SFHAs for the communities of Maricopa County (040037), City of Peoria (040050), and City of Surprise (040053). The area includes one Letter of Map Revision. LOMR Case No. 13-09-2729P incorporates updates to profiles, floodway data, and discharges in the McMicken Dam Outlet Wash, from approximately 565 ft upstream of the confluence of Agua Fria River to approximately 8,600 ft upstream of Happy Valley Pkwy and became Effective June 27, 2014.

Figure 4-1 illustrates flood hazard zones in the project vicinity. Refer to Appendix A for a copy of the Effective FIRM Panel and additional LOMR information.

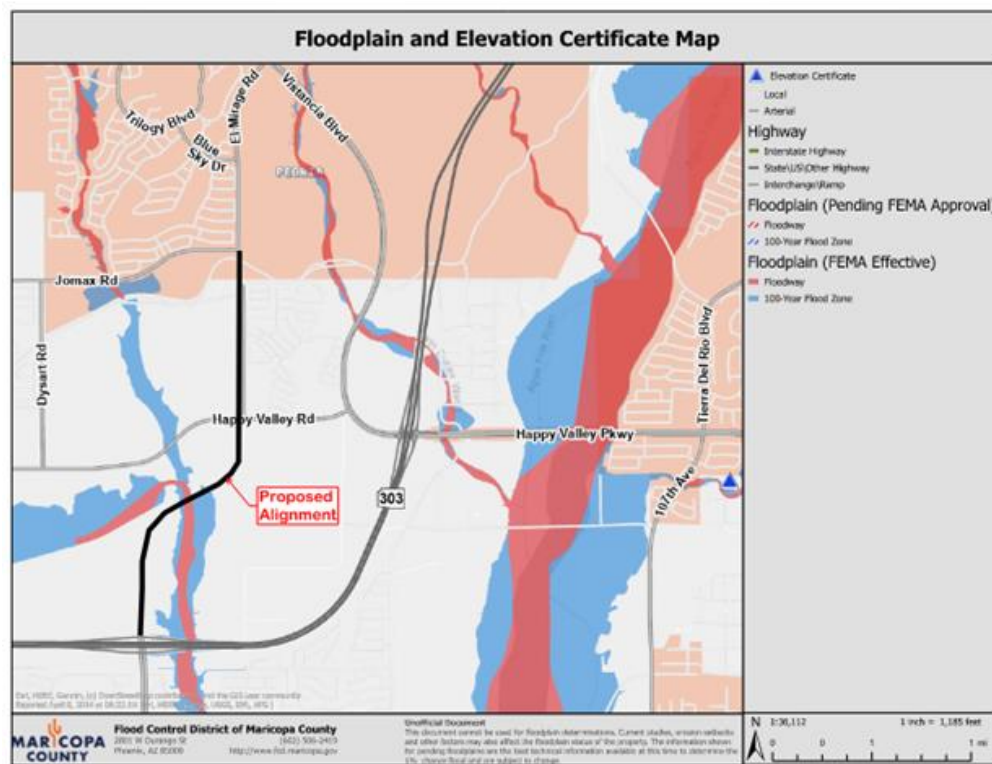


Figure 4-1 - FEMA Floodplain Delineation Map



5.0 Drainage Design Criteria

Drainage design criteria, as presented in the City of Peoria *Engineering Standards* are summarized below. Supplemental criteria are provided in the Maricopa County *Drainage Policies and Standards Manual* and Volumes I & II of the *Drainage Design Manual* for Maricopa County.

Hydrology

- Rational Method may be used for determining peak discharges and runoff volumes
- Rainfall Data may be obtained from the National Oceanic and Atmospheric Administration's Point Precipitation Frequency Estimates
- Runoff Coefficients per Table 6.3 and/or Table 6.4 of the Drainage Policies & Standards
- Minimum Time of Concentration of 5 minutes

Hydraulics

- Pipes and Open Channels may be sized using Manning's Formula
- Step-Backwater calculations may be performed with a HEC-RAS steady state analysis

Street Drainage

- 10-Year design storm event for onsite pavement drainage analysis
- 50-Year design storm event for offsite culverts at roadways classified as Arterial or All-Weather Access Streets
- Maximum gutter flow depth of 6 inches during the onsite design storm event
- Maximum overtopping depth of 6 inches over the crown of a roadway during the offsite design storm event
- Allowable Spread for a multi-lane roadway of ½ lane + shoulder, turn lane, or parking lane during the design storm event.
- Inlet Capture Ratios
 - o Grate Inlets On-Grade or in Sump Condition: 0.50
 - o Curb Opening Inlets On-Grade or in Sump Condition: 0.80

Storm Drain Systems

- Allowable storm drain pipe velocities between 3-9 feet/second
- Storm drain lateral pipe size shall be at least 15 inches. Storm drain main lines shall be at least 18 inches
- Minimum cover of 2 feet
- Manhole shall be located at all horizontal and vertical alignment changes and shall include a minimum drop of 0.1 ft
- Hydraulic Grade Line (HGL) shall be at least 12 inches below the finished-grade elevation at inlets and manholes
- Storm drain pipe shall be Class IV or Class V RGRCP
- Manholes shall be spaced no more than 400 feet on 15-36 inch diameter storm drain lines or no more than 550 feet on storm drain lines that are over 36 inch diameter

Stormwater Storage

- Developments must retain stormwater runoff volume from the 100-Year 2-Hour event, including adjacent half-streets
- Minimum freeboard of 1 foot
- Basin side slopes shall be no steeper than 4H:1V
- Retained stormwater storage must be disposed within 36 hours after the end of the rainfall event



Erosion Protection

- Maximum cross culvert outlet velocity of 15ft/s

Channels

- Maximum channel velocities per Table 6.2 of DDMMC, Hydraulics, or limited by scour potential
- Channel lining to be 4-12 inch riprap
- Minimum freeboard of 1 foot from Energy Grade Line to top of bank



6.0 Methodology

6.1 Hydrology

Rainfall Intensity-Depth-Frequency (I-D-F) and Depth-Duration-Frequency (D-D-F) statistics for Arizona have been derived from information in the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume I, Arizona. For projects in Maricopa County, the mean precipitation frequency estimates shall be used. Site-Specific mean rainfall depth and intensity values are summarized below and documented in Appendix B.

Table 6-1 - Average Rainfall Depth (inches)

Duration	Recurrence Interval (years)					
	2	5	10	25	50	100
5-min	0.254	0.345	0.414	0.508	0.580	0.655
10-min	0.387	0.525	0.630	0.773	0.883	0.997
15-min	0.479	0.650	0.781	0.958	1.10	1.24
30-min	0.645	0.876	1.05	1.29	1.47	1.66
1-hr	0.798	1.08	1.30	1.60	1.82	2.06
2-hr	0.918	1.23	1.47	1.79	2.04	2.30
3-hr	0.958	1.26	1.51	1.84	2.10	2.38
6-hr	1.10	1.41	1.66	2.00	2.27	2.55
12-hr	1.23	1.56	1.82	2.18	2.44	2.72
24-hr	1.52	1.97	2.31	2.79	3.17	3.57

Table 6-2 - Average Rainfall Intensity (inches/hour)

Duration	Recurrence Interval (years)					
	2	5	10	25	50	100
5-min	3.05	4.14	4.97	6.10	6.96	7.86
10-min	2.32	3.15	3.78	4.64	5.30	5.98
15-min	1.92	2.60	3.12	3.83	4.38	4.94
30-min	1.29	1.75	2.10	2.58	2.95	3.33
1-hr	0.798	1.08	1.30	1.60	1.82	2.06
2-hr	0.459	0.614	0.733	0.895	1.02	1.15
3-hr	0.319	0.420	0.501	0.612	0.700	0.794
6-hr	0.183	0.235	0.276	0.334	0.378	0.425
12-hr	0.102	0.129	0.151	0.180	0.202	0.225
24-hr	0.063	0.081	0.096	0.116	0.132	0.148



The Rational Method may be used to estimate peak discharges and runoff volume for uniform drainage areas of 160 acres or less. The Rational Method is as follows:

$$Q = CiA$$

Where Q = Peak Discharge of Selected Return Period (cfs)
C = Runoff Coefficient
i = Average Rainfall Intensity of Calculated Rainfall Duration (in/hr)
A = Contributing Drainage Area (acres)

The Time of Concentration, TC, for the Rational Method is estimated by the Papadakis and Kazan equation, as follows:

$$T_C = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$$

Where T_C = Time of Concentration (hr)
L = Length of Longest Flow Path (miles)
 K_b = Watershed Resistance Coefficient
S = Slope of the Longest Flow Path (ft/mile)
i = Average Rainfall Intensity of Calculated Rainfall Duration (in/hr)

The 5-min rainfall intensity shall be used when the computed Time of Concentration is less than 5 minutes.

The Watershed Resistance Coefficients is calculated using the following equation.

$$K_b = m \log_{10} A + b$$

Where K_b = Watershed Resistance Coefficient
A = Contributing Drainage Area (acres)
m = Parameter per Table 3.1, DDMMC Hydrology
b = Parameter per Table 3.1, DDMMC Hydrology

Values for the parameters m & b are obtained from Table 3.1 of the DDMMC, Hydrology and are summarized in the following table.

Table 6-3 - Watershed Roughness Coefficient Parameters

Type	Description	Typical Applications	m	b
A	Minimal Roughness	Commercial/Industrial Areas, Roadways	-0.00625	0.04
B	Moderately Low Roughness	Desert Rangelands, Undeveloped Urban Lands	-0.01375	0.08

Runoff Coefficient values have been determined from Table 3.2 of the DDMMC, Hydrology. The following table summarizes the values utilized in this drainage analysis.

*Table 6-4 - Rational Method Runoff Coefficients*

Landuse Code	Landuse Category	10-Yr Min-Max	10-Yr Design	100-Yr Min-Max	100-Yr Design
P	<i>Pavement & Rooftops</i>	<i>0.75 – 0.85</i>	<i>0.95</i>	<i>0.94 – 0.95</i>	<i>0.95</i>
DL2	<i>Desert Landscaping 2</i>	<i>0.30 – 0.40</i>	<i>0.40</i>	<i>0.38 – 0.50</i>	<i>0.50</i>
NDR	<i>Undeveloped Desert Rangeland</i>	<i>0.30 – 0.40</i>	<i>0.40</i>	<i>0.38 – 0.50</i>	<i>0.50</i>

In an interim condition, a runoff coefficient of 0.95 has been used for the entire contributing areas to onsite catch basins and retention basins to conservatively estimate the hydrologic impact from the ultimate configuration.

For locations where the Rational Method is not applicable, due to subbasin areas exceeding the recommended 160 acre maximum, the US Army Corp of Engineers' (USACE) HEC-1 Flood Hydrograph Package has been utilized to estimate peak discharges.

HEC-1 modeling utilizes average precipitation depths per NOAA, summarized in Table 6-1. Models have been developed for the 50-year, 6-hour and 24-hour storm events. Precipitation distributions have been obtained from Tables 2.4 and 2.5 of the DDMMC, Hydrology.

Green and Ampt Loss Rate parameters have been utilized. Moisture Deficit, Suction Head, and Hydraulic Conductivity have been calculated using National Resource Conservation Service (NRCS) soil spatial data and area-weighted averages from values in the FCDMC Soil Default table obtained from the Drainage Design Management System for Windows (DDMSW). Initial Losses and Impervious Percentages are based on Undeveloped Desert Rangeland parameters obtained from the DDMSW Landuse Default table.

Clark Unit Hydrograph parameters for Time of Concentration and Storage Coefficient have been calculated using equations presented in the DDMMC, Hydrology.

Time-Area relationships for the Clark Unit Hydrograph are based on the Natural Watershed classification per the DDMMC, Hydrology Table 5.4.



6.2 Hydraulics

Curb opening and grated catch basin calculations for capture efficiency have been performed in accordance with the equations and guidelines set forth in the Federal Highway Administration (FHWA) Hydraulic Engineering Circular (HEC) No. 22, 4th Edition, Revised February 2024.

Culvert capacity, ponded headwater, outlet velocity, and other hydraulic properties have been calculated using the FHWA HY-8 Culvert Hydraulic Analysis Program version 7.50.

Closed conduit storm drain hydraulic properties, including discharge capacity and velocity, have been estimated using Manning's Equation, as follows:

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

Where Q = Total Flow (cfs)

A = Flow Area (sq ft)

n = Manning's Roughness Coefficient

R = Hydraulic Radius (ft)

S = Slope of Energy Grade Line (assumed equal to longitudinal slope) (ft/ft)

Roughness coefficients for closed conduit storm drain and open channels are summarized in Table 4.1 and 7.3, respectively, of the DDMMC, Hydraulics.

Riprap erosion protection at pipe outlets and scupper spillways has been calculated in accordance with the DDMMC, Hydraulics guidelines for loose riprap for *channel bed on straight reach*. The median diameter riprap sizing equation is as follows:

$$d_{50} = 0.0191 V_a^2 \frac{\gamma_w}{\gamma_s - \gamma_w}$$

Where d_{50} = Median Diameter of loose Angular Riprap (ft)

V_a = Average Velocity (ft/s)

γ_s = Specific Weight of Stone (150 lb/ft³) (Specific Gravity = 2.5)

γ_w = Specific Weight of Water (62.4 lb/ft³)

Riprap apron sizing has been designed in accordance with Figure 8.21 and Table 8.6 from the DDMMC, Hydraulics.

A clogging factor of 80% has been applied to curb opening catch basins, both MAG 206 and MAG 542 details, per Table 6.8 of the County *Drainage Policies & Standards*.



6.3 Stormwater Storage

Determination of design volumes for temporary or permanent retention basins has been calculated using the following equation:

$$V = C \frac{P}{12} A$$

Where V = Retention Volume Generated During Design Storm Event (ac-ft)
C = Runoff Coefficient
P = Precipitation Depth Associated with Design Storm Event (100-yr 2-hr) (2.30 in)
A = Contributing Drainage Area (acres)

When sizing for a First Flush storm event, the above equation has been utilized with a Precipitation Depth of 0.50 in and a Runoff Coefficient of 1.0.

Basin Drain Time has been determined using the following equations:

$$P_d = \frac{P_r}{D_r} \qquad T_d = \frac{V}{A_p \frac{P_d}{12}}$$

Where P_d = Design Percolation Rate (in/hr)
P_r = Lowest Measured Percolation Rate (in/hr)
D_r = De-Rating Factor (2.0)
T_d = Retention Basin Drain Time (hr)
V = Retention Basin Design Storage Volume (100-yr 2-hr) (ac-ft)
A_p = Percolation Area of the Basin Bottom (acres)

Project specific infiltration rates have not been provided at this time.



7.0 Onsite Drainage Design

The City of Peoria requires that developments must retain their onsite stormwater runoff volume from the 100-year, 2-hour storm event, including adjacent half-streets. There are two developments adjacent to the proposed EMR extension, Vistancia and Coldwater Ranch, that include onsite retention basins to meet this criterion from previously constructed roadway sections.

Throughout much of the rest of the corridor, an onsite system has been designed to remove water from the roadway and retain the 100-year, 2-hour storm event within temporary or permanent surface retention basins. In some locations, as described in the following subsections, and adjacent to existing offsite flowpaths, retention basins have been designed to retain the First Flush storm event, defined as the first 0.5 inches of rainfall over a contributing area.

Stormwater runoff will be removed from the roadway through the use of MAG Standard Detail 206 concrete curb-opening scuppers or MAG Standard Detail 542 concrete curb-opening catch basins. In the case of scuppers, retention basins will be located immediately adjacent to the scupper spillway outfalls. In the case of catch basins, storm drain will be utilized to convey runoff to retention basins.

Refer to the onsite drainage area maps in Appendix C for an illustration of inlet and retention basin locations. Discharges to each inlet have been determined using the Rational Method, summarized in the previous section, as onsite drainage areas are less than 160 acres. Onsite discharges are based on a 10-year, 5-minute Time of Concentration. Scupper and catch basin curb opening lengths have been sized per FHWA HEC-22 Pavement Drainage guidelines, with 20% clogging factors for on-grade and in-sag conditions.

The following subsections summarize the onsite drainage design by segment.

7.1 SR303L to Station 161+25

From the intersection with the existing ADOT El Mirage/SR303L TI to Sta 161+25, onsite stormwater runoff within the roadway section flows from north to south. At approximately Sta 138+00, the proposed EMR alignment intersects the proposed alignment of W Mariposa Grande. Hunter Engineering, in July 2022, developed paving and drainage plans for the Westwing Business Park, located immediately south of the APS substation. These plans include improvements for an interim condition of El Mirage Road to provide access to W Mariposa Grande from the ADOT TI. The drainage improvements recommended in this T0428 drainage analysis and design are intended to build upon the drainage improvements to be constructed per the Hunter plans. A copy of the Westwing Business Park (Hunter) plans is included in Appendix K.

Immediately north of the ADOT ROW, and within the WAPA easement, proposed 12' scuppers within both the east and west curb & gutter sections will remove onsite stormwater before being allowed to enter ADOT ROW. These scupper locations were recommended by Hunter. Scupper outfalls correspond with swales that convey flow toward retention basins constructed per the Hunter plans. These basins were not previously designed to provide 1' freeboard. It is recommended that both basins are expanded to meet freeboard criteria. The east basin is to be expanded to the east. The west basin is to be expanded to the west. Both basins are to be excavated to a depth of 2 feet to provide 1 foot of ponded retention and 1 foot of freeboard.

At the south end of the project, immediately north of the existing edge of ADOT pavement, proposed curb opening catch basins will remove additional onsite stormwater runoff such that bypass flow leaving the project site is less than 0.50 cfs. These catch basin locations were also recommended by Hunter. A proposed storm drain connection shall convey flow from the east catch basin to the west catch basin. At the west catch basin, the proposed inlet will be constructed in place of an existing area inlet and will connect to an existing 24" storm drain that outfalls into the existing ADOT basin located in the northeast corner of the TI. The



drainage design within the south portion of this segment seeks to utilize existing (or currently under construction) drainage facilities.

North of the Mariposa Grande alignment, stormwater runoff continues flowing from north to south from a high point in the vertical profile near Sta 161+25. Curb opening catch basins have been placed in the east and west curb & gutter sections to capture runoff and route flow to a retention basin located east of the roadway immediately north of the Mariposa Grande alignment. This basin may be sized for the first flush storm event, with excess volume breaking out of the basin and flowing east toward an existing offsite flowpath.

7.2 Station 161+25 to Station 193+00

From Station 161+25 to Station 193+00, onsite stormwater runoff flows toward a low point in the vertical profile near Sta 172+20. This low point is located within FCDMC right-of-way, designated for the McMicken Dam Outlet Channel/Wash and its associated floodplain. Accordingly, onsite stormwater runoff is captured with curb opening catch basins and routed via storm drain to a retention basin located northeast of the low point. The basin is located in a parcel west of the roadway, east of FCDMC right-of-way, and south of an existing overhead power easement. This basin depth, designed primarily to accommodate the vertical requirements of the storm drain outfall, may accommodate the full 100-year 2-hour retention volume. ASLD has identified that land east of the roadway and north of the Department of Energy site has been designated as potentially developable.

7.3 Station 193+00 to Happy Valley Rd

North of Station 193+00, toward Happy Valley Rd, onsite stormwater runoff flows from south to north. Curb opening catch basins have been placed in both the east and west curb & gutter sections to capture runoff before it is allowed to flow into the intersection with HVR. Because the southeast corner of the EMR/HVR intersection is already developed, it is necessary to utilize catch basins and storm drain to capture and route stormwater runoff to a retention basin located in the southwest corner of the intersection. This basin is sized for the 100-year 2-hour storm event, is temporary, and may be reconfigured when this corner of the intersection is developed. The storm drain crossings of existing sewer and gas utilities under the EMR alignment are to be evaluated during final design.

7.4 Happy Valley Rd to Station 212+50

From the intersection with Happy Valley Rd to approximately Station 212+50, onsite stormwater runoff within the roadway section flows from north to south. An onsite drainage system has been designed to collect, convey, and store onsite runoff.

City of Peoria and Arizona State Land Department have expressed an interest in reducing and/or consolidating retention basins within this area to reduce impact on developable land. The west side of EMR is currently Arizona State Land while the east side (bound by Happy Valley Rd, El Mirage Rd, and Coldwater Ranch), is privately owned and is in the plan development stage.

Catch basins have been placed within the east and west curb & gutter, upstream of the intersection with Happy Valley Rd, to capture onsite stormwater runoff before being allowed to flow into the intersection. Due to the roadway geometry and the size of the contributing area, a singular catch basin in both the east and west curb & gutter sections is insufficient to capture onsite stormwater runoff without violating pavement drainage criteria. Accordingly, an upstream catch basin has been placed on both sides of the roadway approximately 550' to the north. Storm drain will be utilized to convey stormwater runoff to retention basins located in the northwest and northeast corners of the EMR/HVR intersection.



Onsite drainage systems, including storm drain and retention basins, within the east and west portions of the roadway section have been kept separate due to the presence of existing water and gas utilities located near the proposed EMR centerline alignment. The onsite system has been designed to allow for less than 0.50 cfs of stormwater runoff to flow from north to south into the intersection of El Mirage Road and Happy Valley Rd. The retention basins located in the northwest and northeast corners of the intersection are temporary and may be reconfigured or reconstructed when and if these areas are developed.

7.5 Station 212+50 to Jomax Rd

From Station 212+50 to Jomax Rd, on the west side of the alignment, onsite stormwater runoff within the roadway section will flow toward a low point located at approximately Sta 216+80. A scupper and retention basin have been placed at the vertical low point in the roadway. Due to the roadway geometry and the size of the contributing area, a singular inlet is insufficient to capture onsite stormwater runoff without violating pavement drainage criteria. Accordingly, an additional scupper has been located approximately 1200 ft to the north with an adjacent retention basin at the scupper spillway outfall. The existing land within this segment, west of the EMR alignment, is undeveloped State Land. Runoff generated in this area under existing conditions flows southwest toward a crossing at Happy Valley Rd within an unnamed offsite wash. To utilize this existing drainage pattern, and to minimize retention basin earthwork, the retention basins located adjacent to the two (2) scuppers within this segment have been sized for the First Flush storm event. Onsite stormwater runoff in excess of the First Flush volume will break out of the basins to the southwest toward the unnamed offsite wash.

Portions of the east half of El Mirage Road through this segment have been previously constructed, including existing scuppers and catch basins to convey stormwater runoff to retention facilities within the Coldwater Ranch residential development. There are three (3) existing inlets within the existing east curb & gutter section, including MAG 533 Type D Combination Catch Basins near Sta 211+20 and 218+60, and a MAG 206 Scupper near Sta 226+00. The proposed T0428 east curb & gutter alignment will require reconstruction in-kind of all existing inlets, as well as portions of the adjacent scupper spillways and storm drain pipe.

The proposed EMR roadway section contributes additional onsite stormwater runoff from north to south for approximately 700 ft north of the Coldwater Ranch residential development. This stormwater runoff will flow to the reconstructed inlets in the east curb & gutter section, and into the existing retention facilities within Coldwater Ranch.



7.6 Onsite Drainage Summary

The following section summarizes tabular results for onsite hydrologic and hydraulic calculations. Tables 7-1 and 7-2 summarize Rational Method peak discharges and onsite pavement drainage calculations, respectfully. Flowmaster summary sheets are included in Appendix D.

Table 7-1 - Onsite Rational Method Peak Discharges

Catch Basin/Inlet ID	Station	Contributing Area (ac)	Runoff Coefficient	Precipitation Intensity (in/hr)	Peak Discharge (cfs)
10	128+20 Lt	0.79	0.95	4.97	3.72
12	128+20 Rt	0.52	0.95	4.97	2.44
14	132+30 Lt	0.93	0.95	4.97	4.40
16	132+10 Rt	0.98	0.95	4.97	4.63
18	138+80 Lt	0.33	0.95	4.97	1.54
20	138+80 Rt	0.32	0.95	4.97	1.49
22	141+00 Lt	2.96	0.95	4.97	13.96
24	141+00 Rt	2.86	0.95	4.97	13.51
26	172+20 Lt	2.64	0.95	4.97	12.48
28	172+20 Rt	2.71	0.95	4.97	12.80
30	180+40 Lt	1.80	0.95	4.97	8.48
32	180+40 Rt	1.83	0.95	4.97	8.64
34	196+90 Lt	0.61	0.95	4.97	2.89
36	196+90 Rt	0.64	0.95	4.97	3.03
38	198+80 Lt	1.02	0.95	4.97	4.82
40	198+80 Rt	0.78	0.95	4.97	3.67
42	204+50 Lt	1.14	0.95	4.97	5.39
44	204+50 Rt	1.14	0.95	4.97	5.39
46	216+80 Lt	2.35	0.95	4.97	11.09
48	228+60 Lt	1.85	0.95	4.97	8.71

*Table 7-2 - Pavement Drainage Calculations*

Catch Basin/Inlet ID	Discharge to Inlet + Upstream Bypass (cfs)	Inlet Detail	Curb Opening Length (ft)	Efficiency (%)	Spread/ Allowable Spread (ft)	Depth in Gutter (in)
10	4.57	MAG 542 On Grade	20	100	14.0/39	4.0
12	3.36	MAG 542 On Grade	13	95.83	12.4/28	3.6
14	4.84	MAG 220 On Grade	12	82.44	14.3/28	4.1
16	4.98	MAG 220 On Grade	12	81.53	14.4/28	4.1
18	7.65	MAG 542 On Grade	20	94.25	17.0/28	4.7
20	7.29	MAG 542 On Grade	20	95.20	16.7/28	4.7
22	13.96	MAG 542 On Grade	13	56.23	21.4/28	5.8
24	13.51	MAG 542 On Grade	13	57.07	21.1/28	5.7
26	13.61	MAG 542 In Sag	23	100	19.7/28	5.4
28	14.00	MAG 542 In Sag	23	100	20.0/28	5.5
30	8.48	MAG 542 On Grade	20	86.67	16.2/28	4.5
32	8.64	MAG 542 On Grade	20	86.11	16.3/28	4.6
34	2.89	MAG 542 On Grade	13	98.62	11.7/28	3.5
36	3.03	MAG 542 On Grade	13	97.69	11.9/39	3.5
38	5.72	MAG 542 On Grade	20	94.76	13.3/39	3.9
40	4.57	MAG 542 On Grade	20	98.91	12.2/28	3.6
42	5.39	MAG 542 On Grade	13	83.30	14.9/28	4.2
44	5.39	MAG 542 On Grade	13	83.30	14.9/28	4.2
46	11.87	MAG 220 In Sag	20	100	19.7/28	5.4
48	8.71	MAG 220 On Grade	20	81.04	17.9/28	5.0

New retention basins have been sized for at least 20' bottom width in both directions, 4H:1V side slopes, and a maximum ponding depth of 3' with a minimum of 1' of freeboard. At this design stage, project specific basin-bottom infiltration rates are not available. It is not recommended that drywells be considered for retention basin disposal, particularly for temporary retention basins that may be reconfigured after future development. Tables 7-3 and 7-4 summarize retention basin volumes and geometric parameters, respectively.

Table 7-3 - Required Retention Volumes

Basin ID	Retention Criteria	Station	Contributing Area (ac)	Precipitation Depth (in)	Runoff Coefficient	Required Retention Volume (cu ft)
14	100-Yr 2-Hr	132+30 Lt	0.93	2.30	0.95	7,394
16	100-Yr 2-Hr	132+30 Rt	0.98	2.30	0.95	7,786
20	First Flush	138+80 Rt	6.46	0.50	1.00	11,727
30	100-Yr 2-Hr	180+40 Lt	8.98	2.30	0.95	71,247
34	100-Yr 2-Hr	196+90 Lt	1.25	2.30	0.95	9,947
38	100-Yr 2-Hr	198+80 Lt	2.16	2.30	0.95	17,158
40	100-Yr 2-Hr	198+80 Rt	1.92	2.30	0.95	15,213
46	First Flush	216+80 Lt	2.35	0.50	1.00	4,265
48	First Flush	228+60 Lt	1.85	0.50	1.00	3,351

*Table 7-4 - Retention Basin Design Parameters*

Basin ID	Basin Bottom Dimensions	Required Retention Volume (cu ft)	Provided Retention Volume (with 1' freeboard) (cu ft)	Ponded Depth (ft)	Freeboard (ft)	Basin Drain Time (hr)
14	50'x140'	7,394	8,038	0.92	1.08	TBD
16	55'x165'	7,786	9,953	0.78	1.22	TBD
20	20'x220'	11,727	12,674	1.85	2.15	TBD
30	160'x220'x300'	71,247	75,596	2.83	7.17	TBD
34	35'x60'	9,947	10,321	2.89	1.11	TBD
38	35'x110'	17,158	17,230	2.99	1.01	TBD
40	35'x95'	15,213	15,256	2.99	1.01	TBD
46	20'x70'	4,265	4,329	1.97	1.03	TBD
48	20'x55'	3,351	3,433	1.95	1.05	TBD

Riprap erosion protection shall be placed at all outlet locations, including scupper-spillways and storm drain pipe outlets. The methodology for determining average riprap diameter is discussed in Section 6.2. Manning's equation has been utilized for both circular pipe outlets and rectangular scupper spillways. Average velocities in non-pressure flow pipes are based on a ratio of the design flow to the pipe full flow capacity. A steady-state hydraulic storm drain model has not been developed as part of this DCR drainage analysis and design. The following table summarizes outlet velocities and riprap sizing.

Table 7-5 - Riprap Erosion Protection

Outlet	Description	Discharge (cfs)	Average Velocity (ft)	Nominal Mean Riprap Diameter, D ₅₀ (in)	Minimum Length of Riprap Apron (ft)
14	13' Scupper	4.40	4.07	3	*
16	13' Scupper	4.63	4.07	3	*
20	24" Pipe Outlet	12.42	3.95	3	8
24	24" Pipe Outlet	12.42	3.95	3	8
30	24" Pipe Outlet	12.42	3.95	3	8
34	24" Pipe Outlet	5.92	1.88	3	8
38	24" Pipe Outlet	10.21	3.25	3	8
40	24" Pipe Outlet	9.06	2.88	3	8
46	22' Scupper	11.09	3.33	3	14
48	22' Scupper	8.71	3.33	3	14

*Riprap swale to modified existing retention basin



8.0 Offsite Drainage Design

Offsite drainage impacts the project corridor at two locations in the form of unnamed washes that cross the proposed roadway alignment at approximately Station 144+40 and Station 168+00. Due to the contributing area of the wash at Station 168+00, the USACE HEC-1 hydrologic package has been used to estimate peak discharges for both locations, as discussed in Section 6, for use in developing design discharges at proposed culvert crossings. Figure 8-1 illustrates the subbasin delineations to each crossing location.

It should be noted that the wash within Subbasin B crosses HVR. There is no culvert crossing beneath HVR at this wash location. HVR is superelevated and there is a curb-opening inlet within the median curb on the upstream side which will serve to capture some, but not all, offsite discharge. The presence of vegetation on the upstream side of Happy Valley Rd also indicates that offsite flow may pond in this area before breaking out into the roadway. To conservatively estimate the peak discharge contributing to EMR from this wash, the ponding and onsite catch basin have not been included in the hydrologic analysis. It is assumed that all flow generated north of HVR will contribute to a proposed crossing structure beneath EMR.

Table 8-1 summarizes the HEC-1 subbasin parameters, including Green & Ampt Loss parameters, Time of Concentration and Storage Coefficient, and peak discharges from the 50-Year, 6-Hour and 24-Hour storm events. The 24-Hour storm is the controlling storm event for these natural washes.

Table 8-1 - HEC-1 Subbasin Parameters

Parameter	SUB-A	SUB-B
Area (square miles)	0.066	0.337
Time of Concentration (hr)	0.277	0.631
Storage Coefficient (hr)	0.185	0.487
Initial Loss (in)	0.35	0.35
Volumetric Moisture Deficit	0.13	0.13
Wetting Front Suction (in)	15.54	15.46
Hydraulic Conductivity (in/hr)	0.14	0.14
Percent Impervious (%)	0	0
50-Year 6-Hour Peak Discharge (cfs)	52	169
50-Year 24-Hour Peak Discharge (cfs)	84	235

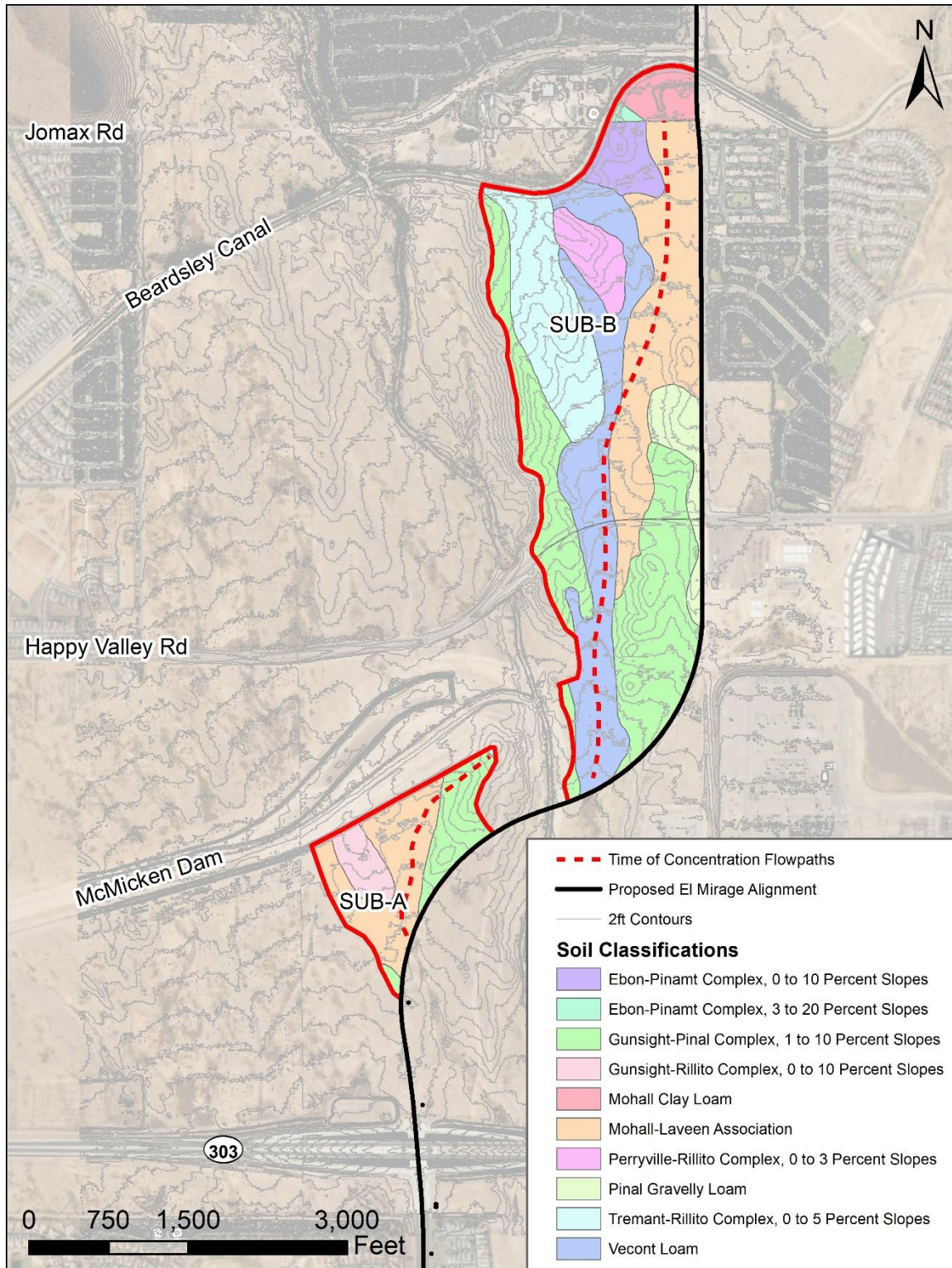


Figure 8-1 - Offsite Subbasins



As discussed in Section 6.2, Culverts have been designed using the FHWA HY-8 Culvert Analysis Program. Maximum culvert headwater elevations have been determined based on the lowest adjacent subgrade elevation. Generally, culverts have been designed such that headwater depths are approximately 1.5x the culvert height. The following table summarizes culvert locations and design parameters.

Table 8-2 - Cross Culvert Design Parameters

Culvert ID	Station	Skew (Deg)	50-Year Design Discharge (cfs)	Size	Headwater Depth (ft)	H/D Ratio
CUL-A	144+40	35	84	4-24"	3.09	1.55
CUL-B	168+00	35	235	7-30"	4.02	1.61

Outlet velocities have also been determined using HY-8 during the design 50-Year storm event. Riprap erosion protection has been designed per the DDMC, Hydraulics and Section 6.2 of this report. Table 8-3 summarizes the outlet velocities during the 50-Year storm event and resulting dumped riprap sizing.

Table 8-3 - Culvert Outlet Protection

Culvert ID	Station	50-Year Outlet Velocity (ft/s)	Nominal Mean Riprap Diameter, D ₅₀ (in)	Length of Dumped Riprap Apron (ft)
CUL-A	144+40	8.16	9	8
CUL-B	168+00	8.10	9	10

HEC-1 output is included in Appendix E. HY-8 output summary sheets are included in Appendix F.



9.0 McMicken Wash Hydraulic Analysis

The proposed EMR alignment will cross the McMicken Dam Outlet Wash near Station 164+00. The most recent HEC-RAS model for the area was developed by FCDMC and is associated with the McMicken Dam Outlet Channel Improvement project, constructed as of January 16, 2025. The Outlet Channel improvement project will channelize the dam outfall and will include an engineered spillway to collect flow from Wash 16 East. Downstream of the confluence of Wash 16 East and the McMicken Dam Outlet Channel, the combined drainageway is referred to as the McMicken Dam Outlet Wash.

The design team has developed additional HEC-RAS models to represent pre-project and post-project conditions within the Wash to analyze the impact of constructing a reinforced box culvert crossing beneath El Mirage Road. The following sections summarize the background data and stages of model development, with the goal of evaluating potential adverse impacts to Water Surface Profiles, velocities, and other hydraulic properties within the Wash.

9.1 Previous Studies

The following hydrologic and hydraulic studies and projects have been completed in the project area:

- Wittmann Area Drainage Master Study Update (WADMSU), Hydrology Addendum, *FCD Contract 2002C029*, Entellus, *July 2005*
- Loop 303/White Tanks Area Drainage Master Plan Update (ADMPU) Area Hydrologic Analysis, Final Hydrology Report, *FCD Contract 2007C031*, HDR Engineering Inc., *September 2009*
- McMicken Dam Outlet Wash Floodplain Delineation Study (FDS), *FCD Contract 2011C003*, RBF Consultants, *June 2013*
- McMicken Dam Outlet Channel, *FCD Contract 2020C006*, Flood Control District of Maricopa County, *October 2021*.

9.2 Effective HEC-RAS Model

The Effective Model, provided by the Flood Control District of Maricopa County, was prepared by RBF Consultants in June 2013 using HEC-RAS Version 4.1 and is associated with LOMR 13-09-2729P, developed as part of the above referenced McMicken Dam Outlet Wash FDS. This study incorporated hydrology from the Wittmann and Loop 303/White Tanks Drainage Master Studies. Resulting floodplain delineations correspond with those shown on FEMA FIRM Panel 04013C1230L, dated October 16, 2013.

9.3 McMicken Dam Outlet Channel HEC-RAS Model

The Flood Control District of Maricopa County developed a HEC-RAS model in December 2018 to evaluate impacts associated with improvements to the McMicken Dam Outlet Channel, per *FCD Project Control No. 204.01.30*, *FCD Contract No. 2020C006*. This model overlaps with the upstream end of the above referenced Effective HEC-RAS model, and extends further upstream along the McMicken Dam Outlet Channel to US 60. The 100-year (1% Annual Exceedance Probability) flow event utilized in the FCDMC Model is 8,800 cfs within the reach at the El Mirage crossing, an increase from the Effective 100-year discharge of 7,481 cfs as determined in the McMicken Dam Outlet Wash FDS.

The locations of the McMicken Dam Outlet Channel and Wash centerline and cross sections vary slightly from the Effective model. The centerline follows the reconstructed alignment of the outfall channel. The HEC-RAS model provided by FCDMC represents a 90% modeling effort. FCDMC staff have indicated that a final model is not available at this time.



9.4 Corrected Effective HEC-RAS Model

The FCDMC provided HEC-RAS model associated with the McMicken Dam Outlet Channel construction, *FCD Contract No. 2020C006*, has been utilized as the most up to date pre-project model. Updates have been made to the FCDMC HEC-RAS Model, using HEC-RAS Version 6.5, to establish an existing conditions Corrected Effective model. The following subsections summarize modeling parameters and decisions in the development of the Corrected Effective model. Full HEC-RAS model results for the Corrected Effective model are included in Appendix I.

9.4.1 *Model Limits*

Model limits were unchanged from the FCDMC HEC-RAS model. Tabular results presented within the body of this report are truncated to the El Mirage DCR project area (River Stations 0.706 to 0.236).

9.4.2 *Topographic Data*

Cross Section Station-Elevation Data was updated within the project limits based on recently obtained topographic mapping provided by Aerotech Mapping for project T0428.

9.4.3 *Cross Section Locations*

The proposed EMR alignment crosses the McMicken Dam Outlet Wash near FCDMC Cross Section 0.473 and FEMA Lettered Cross Section AE. In order to provide existing conditions hydraulic parameters within the Wash at the future RCBC location, Cross Sections 0.530 through 0.416 have been removed and replaced with six (6) new Corrected Effective cross sections to represent the upstream and downstream faces of the proposed box and the curvature of the channel. These cross section locations will provide a comparison from the Corrected Effective to Proposed model after incorporating the culvert geometry. The Corrected Effective cross section locations are illustrated in the HECRAS workmaps included in Appendix G.

9.4.4 *Boundary Conditions*

Boundary Conditions are unchanged from the FCDMC HEC-RAS model.

9.4.5 *Bridge/Culvert Geometry*

Culvert geometry has not been included in the Corrected Effective model. Cross sections have been placed in anticipation of the culvert geometry that is to be included in the proposed HEC-RAS model, discussed in Section 9.3. The Corrected Effective model represents an existing open-channel condition.

9.4.6 *Roughness Coefficients*

Roughness coefficients at FCDMC cross sections are unchanged from the FCDMC HEC-RAS model. Roughness coefficients at new cross sections have been derived from the FCDMC model and are summarized below.

*Table 9-1 - Roughness Coefficient Values*

Cross Section Component	Roughness Coefficient
Overbanks	0.035
Channel Side Slopes	0.040
Channel Bottom	0.035

9.4.7 Expansion & Contraction Coefficients

Expansion and Contraction Coefficients at FCDMC cross sections are unchanged from the FCDMC HEC-RAS model at 0.1 & 0.3 for contraction and expansion, respectively. New cross sections, used to represent the bridge/culvert opening, also utilize contraction and expansion coefficients of 0.1 and 0.3, respectively.

9.4.8 Ineffective Flow Areas

Ineffective Flow Areas have not been added to the Corrected Effective HEC-RAS model. Channel transitions within the El Mirage crossing are gradual.

9.4.9 Results Comparison

The following table summarizes computed water surface elevations and velocities resulting from the FCDMC provided model and the Corrected Effective model which represents existing pre-project conditions. Note that models are being refined as the proposed roadway configuration is under development.

Table 9-2 - HEC-RAS Results Comparison - FCDMC & Corrected Effective

River Station	FCDMC Model		Corrected Effective Model		Difference	
	WSEL (ft)	Velocity (ft/s)	WSEL (ft)	Velocity (ft/s)	WSEL (ft)	Velocity (ft/s)
0.706	1307.47	4.18	1306.98	4.47	-0.49	0.29
0.649	1307.30	3.27	1306.76	3.52	-0.54	0.25
0.589	1306.82	5.80	1306.16	6.38	-0.66	0.58
0.547	Not Modeled		1305.65	6.33	N/A	
0.530	1306.12	6.79	Not Modeled		N/A	
0.493	Not Modeled		1305.16	6.27	N/A	
0.473	1305.26	7.81	Not Modeled		N/A	
0.464	Not Modeled		1304.86	6.42	N/A	
0.447	Not Modeled		1304.74	6.29	N/A	
0.416	1304.07	8.98	Not Modeled		N/A	
0.401	Not Modeled		1304.34	6.64	N/A	
0.353	Not Modeled		1303.39	10.11	N/A	
0.308	1301.84	10.26	1301.84	10.26	0	0
0.236	1300.11	10.82	1300.11	10.82	0	0



The Corrected Effective model indicates no changes to Water Surface Elevation or Velocity downstream of the proposed El Mirage Road crossing. Upstream of the crossing, the Corrected Effective model indicates reductions in Water Surface Elevation, and associated increases in velocity, extending to cross section 2.691. that the hydraulic modeling effort provide an existing conditions analysis that incorporates a single source of topographic data and consistent hydraulic modeling methodology.

9.5 Proposed HEC-RAS Models

A proposed model was developed to represent post-project conditions after the construction of a 10-barrel 12'x12' reinforced box culvert beneath the proposed El Mirage roadway. The following subsections summarize the proposed model development steps. Full HEC-RAS model results for the Proposed model are included in Appendix I.

9.5.1 *Model Limits*

Model limits were unchanged from the Corrected Effective HEC-RAS model.

9.5.2 *Topographic Data*

No new topographic data was utilized in the development of the Proposed HEC-RAS models.

9.5.3 *Cross Section Locations*

Cross Section locations are unchanged from the Corrected Effective HEC-RAS model.

9.5.4 *Boundary Conditions*

Boundary Conditions are unchanged from the Corrected Effective HEC-RAS model.

9.5.5 *Bridge/Culvert Geometry*

The preliminary culvert geometry is illustrated on the conceptual exhibit included in Appendix J.

9.5.6 *Roughness Coefficients*

Roughness Coefficients are unchanged from the Corrected Effective HEC-RAS model. At the proposed box culvert, a coefficient of 0.013 has been utilized for the concrete floor and walls.

9.5.7 *Expansion & Contraction Coefficients*

At Cross Sections representing the bridge and culvert upstream and downstream faces, expansion and contraction coefficients have been set to 0.3 and 0.5, respectively.

9.5.8 *Ineffective Flow Areas*

Ineffective Flow Areas were added to the cross sections that represent the box culvert openings and represent the ineffective flow outside of the limits of the culvert opening.

9.5.9 *Results Comparison*

The following table summarizes computed water surface elevations and velocities resulting from the Corrected Effective and Proposed Box Culvert model. Note that models are being refined as the proposed roadway configuration is under development.

*Table 9-3 - HEC-RAS Results Comparison - Corrected Effective & Proposed*

River Station	Corrected Effective Model		Proposed Model		Difference	
	WSEL (ft)	Velocity (ft/s)	WSEL (ft)	Velocity (ft/s)	WSEL (ft)	Velocity (ft/s)
0.706	1306.98	4.47	1307.33	4.26	0.35	-0.21
0.649	1306.76	3.52	1307.15	3.34	0.39	-0.18
0.589	1306.16	6.38	1306.64	5.95	0.48	-0.43
0.547	1305.65	6.33	1306.33	5.40	0.68	-0.93
0.493	1305.16	6.27	1305.52	7.33	0.36	1.06
0.4785	10-12'x12' RCBC					
0.464	1304.86	6.42	1304.74	7.44	-0.12	1.02
0.447	1304.74	6.29	1304.74	6.29	0	0
0.401	1304.34	6.64	1304.34	6.64	0	0
0.353	1303.39	10.11	1303.39	10.11	0	0
0.308	1301.84	10.26	1301.84	10.26	0	0
0.236	1300.11	10.82	1300.11	10.82	0	0

The Proposed model indicates a decrease to Water Surface Elevation and increase in Velocity immediately downstream of the proposed El Mirage Road crossing. Upstream of the crossing, the Proposed model indicates increases in Water Surface Elevation and mostly decreases in Velocity, with the exception of an increase in velocity at the upstream face of the culvert opening. Changes to Water Surface Elevation and Velocity extend upstream to cross section 2.634.

9.6 Summary of Hydraulic Impacts

The proposed HEC-RAS model has been evaluated against a Corrected Effective existing-conditions model to determine the hydraulic impact of introducing a box culvert into the McMicken Dam Outlet Channel to convey flow beneath the proposed El Mirage Roadway alignment. The proposed model indicates changes to Water Surface Elevations and Velocities due to the introduction of the box culvert structure.

The largest magnitude change in Water Surface Elevation is an 8.2" rise at Cross Section 0.547, located approximately 285' upstream of the box culvert opening.

The largest magnitude change in Velocity is an a 1.06 ft/s increase at Cross Section 0.493, located at the upstream face of the box culvert opening.

While velocities decrease under proposed conditions at all but one cross section located upstream of the box culvert crossing, it is recommended that riprap erosion protection placed by FCDMC be replaced in-kind wherever it is disturbed by construction activities. The proposed $D_{50}=24"$ riprap located throughout the channel is sufficient to withstand the average velocities indicated in the proposed model, based on riprap sizing equation 6.36 from the DDMC, Hydraulics, and utilizing a riprap specific gravity of 2.5.

It should be noted that due to the scope of this DCR hydraulic analysis, the FCDMC provided HEC-RAS model has been updated only within the vicinity of the El Mirage Roadway crossing. New cross sections utilize project-specific topography, however no other changes were made to the provided model geometry or modeling decisions or methodology. During final design, it is recommended that that hydraulic analysis at that time incorporate a single source of topographic data, as well as consistent hydraulic modeling decisions and methodology applied throughout the entire modeled reach.



It is recommended that a Conditional Letter of Map Revision (CLOMR) effort be included in final design. The proposed roadway, placed on fill and raised above surrounding grade within the vicinity of the McMicken Dam Outlet Wash crossing, will significantly alter the delineation of the effective Zone AE floodplain. The physical changes in the topography in and around the wash, as well as the impacts of hydraulic properties due to the box culvert crossing, will likely require review and approval from FEMA.

10.0 Summary

The drainage systems associated with El Mirage Road (EMR): State Route 303L (SR 303L) to Jomax Road, have been designed to safely collect, route, and store onsite stormwater runoff within the project limits and to convey offsite stormwater runoff through the project corridor.

The onsite system consists of a series of curb opening inlets, including MAG Standard Detail 206 Scuppers and 542 Catch Basins. Onsite runoff is directed to one of several surface retention basins located adjacent to the project corridor. Scuppers have been prioritized, with adjacent temporary retention basins in currently undeveloped land. If the undeveloped areas adjacent to the project corridor are developed in the future, temporary retention basins may be reconfigured to meet the needs of the development. Catch basins and storm drain have been utilized in locations where it is infeasible to have a retention basin immediately adjacent to the roadway corridor. Retention basins are designed to pond no more than 3 feet during the 100-year 2-hour storm event, with at least 1 foot of freeboard. Basin drain times are to be determined at a later design stage as percolation tests have not been performed for this DCR analysis.

The crossing of the McMicken Dam Outlet Channel has been evaluated using the USACE HEC-RAS program, version 6.5. The proposed model evaluates a 10-barrel 12'x12' Reinforced Box Culvert. Preliminary impacts to the hydraulic properties of the wash, under proposed conditions, upstream of the EMR crossing include a Water Surface Elevation increase of approximately 8.2" and Velocity increase of approximately 1.06 ft/s. Impacts to the hydraulic properties of the wash, under proposed conditions, downstream of the EMR crossing include a Water Surface Elevation decrease of approximately 1.4" and Velocity increase of approximately 1.02 ft/s. Recommendations for hydraulic modeling for final design include consistency in both the source of topographic information as well as hydraulic modeling decisions and methodology. It is anticipated that final design will require the completion of a CLOMR.



11.0 References

- 1.0 *Drainage Policies and Standards Manual for Maricopa County*, Flood Control District of Maricopa County, Revised August 2018
- 2.0 *Drainage Design Manual for Maricopa County, Volume I, Hydrology*, Flood Control District of Maricopa County, Revised July 2023
- 3.0 *Drainage Design Manual for Maricopa County, Volume II, Hydraulics*, Flood Control District of Maricopa County, Revised December 2018
- 4.0 *City of Peoria Engineering Standards*, Updated January 2024
- 5.0 *HECRAS Version 6.5*, US Army Corp of Engineers Hydrologic Engineering Center, February 2024
- 6.0 *HY-8 Culvert Hydraulic Analysis Program*, Federal Highway Administration, Build Dat July 28, 2016
- 7.0 *Hydraulic Engineering Circular No. 22, Fourth Edition, Urban Drainage Design Manual*, Federal Highway Administration, US Department of Transportation, February 2024
- 8.0 *Flowmaster Connect Edition Update 3*, Bentley Haestead, March 2020.



Appendix A - FEMA

A.1 Effective FIRM Panel

A.2 2024 Flood Insurance Study Excerpts

A.3 LOMR 13-09-2729P



A.1 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 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables 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 Arizona State Plane Central zone (FIPSZONE 0202). The **horizontal datum** was NAD 83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane 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 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. Map users wishing to obtain flood elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29) may use the following Maricopa County website application: <http://www.fcd.maricopa.gov/Maps/gsmaps/apps/gdacs/application/index.cfm>

This web tool allows users to obtain point-specific datum conversion values by zooming in and hovering over a VERTCON checkbox on the layers menu on the left side of the screen. The VERTCON grid referenced in this web application was also used to convert existing flood elevations from NGVD 29 to NAVD 88.

To obtain current elevation, description, and/or location information for National Geodetic Survey 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>. To obtain information about Geodetic Demarcation and Cadastral Survey bench marks produced by the Maricopa County Department of Transportation, please visit the Flood Control District of Maricopa County website at: <http://www.fcd.maricopa.gov/Maps/gsmaps/apps/gdacs/application/index.cfm>.

Base map information shown on this FIRM was derived from multiple sources. Aerial imagery was provided in digital format by the Maricopa County Department of Public Works, Flood Control District. The imagery is dated October 2009 to November 2009. Additional National Aerial Imagery Program (NAIP) imagery was provided by the Arizona State Land Department (ALIS) and is dated 2007. The coordinate system used for the production of the digital FIRM is State Plane Arizona Central NAD83 HARN, International Feet.

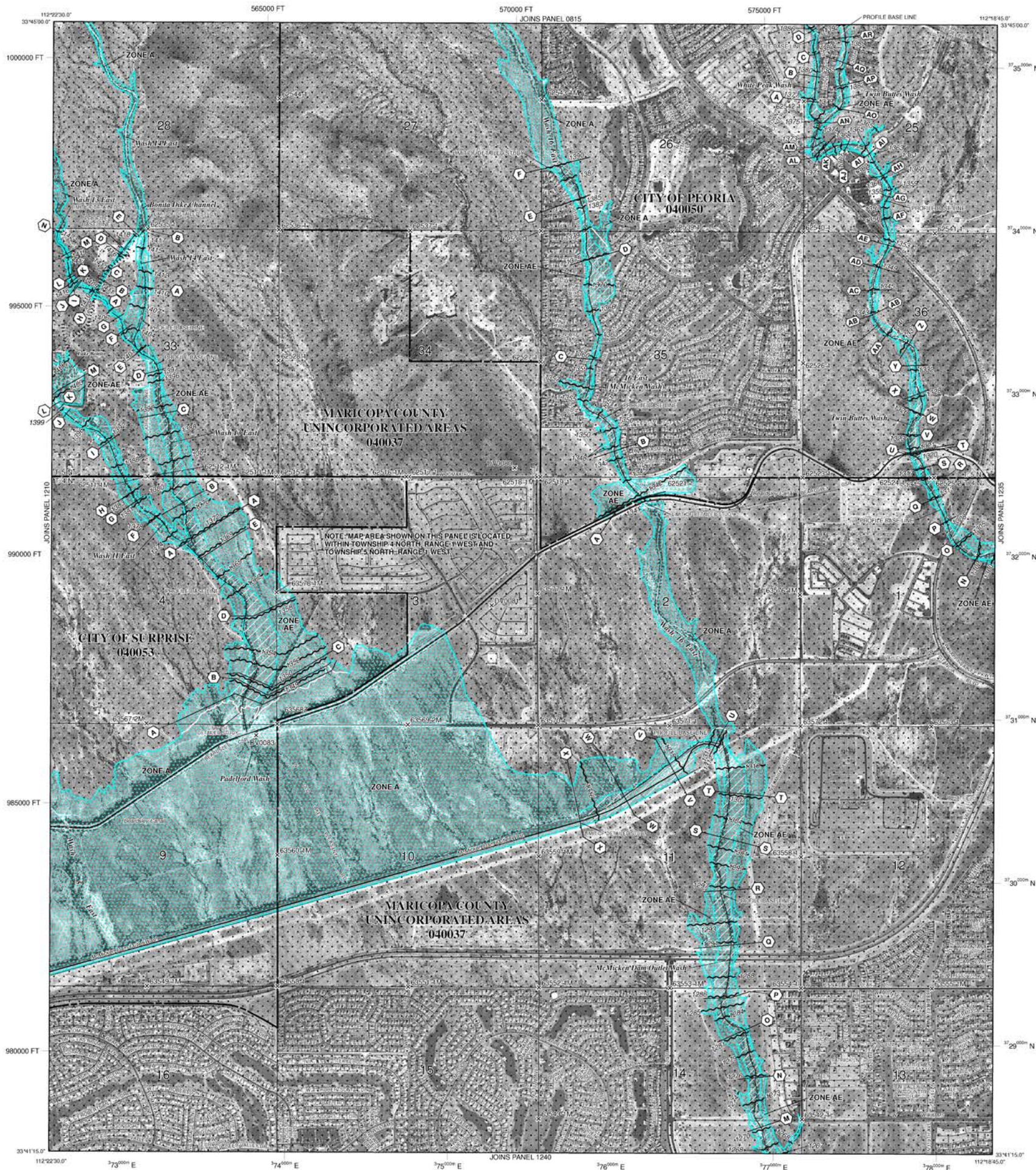
The **profile baseline** depicted on this map represents the hydraulic modeling baselines that match flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

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.

For information on available products associated with this FIRM, visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/>.



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 derelictified. 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.

- 1% annual chance floodplain boundary
- 0.2% annual chance 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*
- 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)

1000-meter Universal Transverse Mercator grid ticks, zone 12

5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 0202), Transverse Mercator

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 COUNTYWIDE FLOOD INSURANCE RATE MAP

April 15, 1988

EFFECTIVE DATES OF REVISION(S) TO THIS PANEL

September 4, 1991 December 3, 1993 July 19, 2001 September 30, 2005

October 16, 2013 - to advance suffix, to add roads and road names, to update corporate limits, to add special flood hazard areas, to change base flood elevations, to change floodway, to incorporate previously issued letters of map revision, to add floodway, and to add base flood elevation.

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

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

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1230L

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY,
ARIZONA
AND INCORPORATED AREAS

PANEL 1230 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1230	L
PEORIA, CITY OF	040050	1230	L
SURPRISE, CITY OF	040053	1230	L

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

04013C1230L

MAP REVISED

OCTOBER 16, 2013

Federal Emergency Management Agency



A.2 2024 Flood Insurance Study Excerpts

FLOOD INSURANCE STUDY

VOLUME 1 OF 58



MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

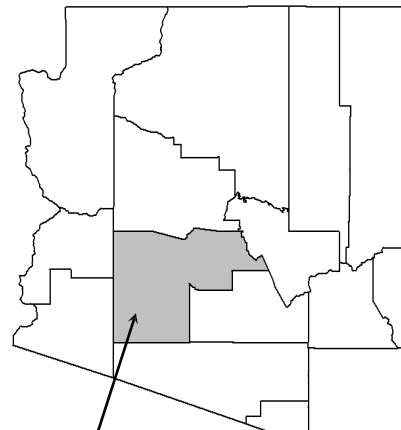
COMMUNITY NAME

COMMUNITY NUMBER

AVONDALE, CITY OF
BUCKEYE, CITY OF
CAREFREE, TOWN OF CAVE
CREEK, TOWN OF
CHANDLER, CITY OF
EL MIRAGE, CITY OF
FOUNTAIN HILLS, TOWN OF
GILA BEND, TOWN OF
GILBERT, TOWN OF
GLENDALE, CITY OF
GOODYEAR, CITY OF
GUADALUPE, TOWN OF
LITCHFIELD PARK, CITY OF
MARICOPA COUNTY
(UNINCORPORATED AREAS)
MESA, CITY OF
PARADISE VALLEY, TOWN OF
PEORIA, CITY OF
PHOENIX, CITY OF
QUEEN CREEK, TOWN OF
SCOTTSDALE, CITY OF
SURPRISE, CITY OF
TEMPE, CITY OF
TOLLESON, CITY OF
WICKENBURG, TOWN OF
YOUNGTOWN, TOWN OF

040038
040039
040126
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040040
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040037
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040057



Maricopa County

REVISED
February 8, 2024



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
04013CV001F

Table 3. Summary of Discharges

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (Sq. Miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
Luke Wash East Main Tributary					
At confluence with Luke Wash	10.61	-- ¹	-- ¹	1,915	-- ¹
Luke Wash East Sub Tributary					
At confluence with Luke Wash	1.63	-- ¹	-- ¹	810	-- ¹
Luke Wash Minor Tributary					
At confluence with Luke Wash	0.76	-- ¹	-- ¹	559	-- ¹
Lum Wash					
At W Westar Drive	7.81	-- ¹	-- ¹	2,586	-- ¹
At South Estrella Parkway	1.89	-- ¹	-- ¹	633	-- ¹
At South 178th Avenue	1.93	-- ¹	-- ¹	705	-- ¹
Malta Drain					
Upstream of Emerald Wash	0.24	-- ¹	-- ¹	466	-- ¹
Upstream of Rand Drive	0.17	-- ¹	-- ¹	366	-- ¹
Mangrum Wash					
Upstream of Jacklin Wash	0.12	-- ¹	-- ¹	562	-- ¹
Martinez Wash					
At mouth	103	9,220	27,400	32,000	45,000
McCormick Ranch Lakes East Branch					
Downstream of McCormick Parkway	12.4	-- ¹	-- ¹	9,280	-- ¹
McCormick Ranch Lakes West Branch					
Upstream of the confluence with McCormick Ranch Lakes East Branch	5.49	-- ¹	-- ¹	3,650	-- ¹
McMicken Dam Outlet Channel					
Confluence with McMicken Dam Outlet Wash	304.92	2,613	4,279	5,087	-- ¹

--¹ Data Not Computed

--² Data Not Available

Table 3. Summary of Discharges

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (Sq. Miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
McMicken Dam Outlet Wash					
At confluence with Aqua Fria River (discharges due to storage behind McMicken Dam and CAP Canal)	322.99	2,917	5,085	6,522	-- ¹
Approximately 4,200 feet south of Deer Valley Drive	320.56	2,876	4,916	6,273	-- ¹
Approximately 1,700 feet north of Deer Valley Drive	318.13	2,835	4,747	6,023	-- ¹
T0428 El Mirage					
Mesquite Tank Wash					
At Cave Butte Recreation Area	-- ¹	-- ¹	-- ¹	1,000	-- ¹
Mockingbird Wash					
US Highway 60 crossing / at confluence with Hassayampa River	6.5	2,572	4,382	5,482	7,840
Upstream of confluence with Mockingbird Wash Tributary 1	5.14	2,222	3,813	4,735	6,748
Mockingbird Wash Tributary 1					
At confluence with Mockingbird Wash	1.26	791	1,268	1,492	2,096
Monarch Wash					
US Highway 60 crossing / at confluence with Hassayampa River	10.65	2,663	4,473	5,357	7,957
Moon Valley Wash					
At Cave Creek confluence	N/A	-- ¹	-- ¹	2,810	-- ¹
Moon Valley Wash Diversion Channel					
At Moon Valley Wash North Branch convergence	N/A	-- ¹	-- ¹	243	-- ¹
Approximately 600 feet upstream of Medinan Road	N/A	-- ¹	-- ¹	189	-- ¹
Approximately 400 feet downstream of the Moon Valley Wash South Branch divergence	N/A	-- ¹	-- ¹	113	-- ¹

--¹ Data Not Computed--² Data Not Available

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NAVD)			
McMicken Dam Outlet Wash								
A	565	807	1,005	6.5	1,183.6	1,183.6	1,183.6	0.0
B	1,848	365	893	7.3	1,192.8	1,192.8	1,192.8	0.0
C	3,057	478	1,164	5.6	1,202.4	1,202.4	1,202.8	0.4
D	3,939	181	825	7.9	1,206.6	1,206.6	1,206.7	0.1
E	4,995	201	948	6.9	1,211.4	1,211.4	1,211.4	0.0
F	6,172	184	797	7.9	1,215.1	1,215.1	1,215.1	0.0
G	6,901	215	736	8.5	1,238.4	1,238.4	1,238.4	0.0
H	7,809	213	1,012	6.2	1,242.8	1,242.8	1,242.8	0.0
I	9,018	203	913	6.9	1,247.2	1,247.2	1,247.2	0.0
J	9,810	216	979	6.4	1,251.2	1,251.2	1,251.2	0.0
K	10,684	180	877	7.2	1,259.8	1,259.8	1,260.7	0.9
L	11,658	215	1,360	4.4	1,265.8	1,265.8	1,266.4	0.6
M	12,646	220	1,161	5.2	1,270.4	1,270.4	1,270.9	0.5
N	13,665	210	908	6.6	1,275.7	1,275.7	1,276.2	0.5
O	14,647	180	782	7.7	1,281.3	1,281.3	1,281.5	0.2
P	15,507	330	1,377	4.4	1,285.8	1,285.8	1,286.4	0.6
Q	16,579	365	1,266	4.8	1,290.7	1,290.7	1,291.5	0.8
R	17,709	310	1,234	4.9	1,296.9	1,296.9	1,297.4	0.5
S	18,813	340	956	6.3	1,302.2	1,302.2	1,303.1	0.9
T	19,731	350	928	6.5	1,306.9	1,306.9	1,307.1	0.2
U	20,830	240	910	6.6	1,312.3	1,312.3	1,312.6	0.3
V	21,901	405	2,466	2.1	1,315.2	1,315.2	1,315.4	0.2
W	23,021	349	2,000	2.5	1,315.8	1,315.8	1,316.0	0.2
X	24,045	255	1,650	3.1	1,316.1	1,316.1	1,316.4	0.3

¹Stream Distance in Feet Above Confluence With Agua Fria River

T0428 El Mirage

T
A
B
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E
6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

McMICKEN DAM OUTLET WASH



A.3 LOMR 13-09-2729P



Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	Maricopa County Arizona (Unincorporated Areas)	CULVERT	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 040037		
IDENTIFIER	Mcmicken Dam Outlet Wash Floodplain Delineation Study	APPROXIMATE LATITUDE & LONGITUDE: 33.586, -112.478 SOURCE: USGS QUADRANGLE DATUM: NAD 83	
ANNOTATED MAPPING ENCLOSURES		ANNOTATED STUDY ENCLOSURES	
TYPE: FIRM* NO.: 04013C1230L DATE: October 16, 2013 TYPE: FIRM* NO.: 04013C1240L DATE: October 16, 2013		DATE OF EFFECTIVE FLOOD INSURANCE STUDY: October 16, 2013 PROFILE(S): 753P, 754P, 755P, 756P, 757P FLOODWAY DATA TABLE: 6 SUMMARY OF DISCHARGES TABLE: 3	

Enclosures reflect changes to flooding sources affected by this revision.

* FIRM - Flood Insurance Rate Map

FLOODING SOURCE & REVISED REACH

Mcmicken Dam Outlet Wash – From approximately 565 feet upstream of the confluence of Agua Fria River to approximately 8,600 feet upstream of W. Happy Valley Parkway.

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Mcmicken Dam Outlet Wash	Zone AE	Zone AE	YES	YES
	Zone X (unshaded)	Zone X (unshaded)	YES	YES
	BFEs*	BFEs	YES	YES
	Floodway	Floodway	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's 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 Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

13-09-2729P
102-I-A-C



Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

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 Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

A handwritten signature in black ink, appearing to read "Luis Rodriguez".

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration



Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

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 Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

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Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the Federal Register. This information will be published in your local newspaper on or about the dates listed below and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp.

LOCAL NEWSPAPER

Name: Arizona Republic

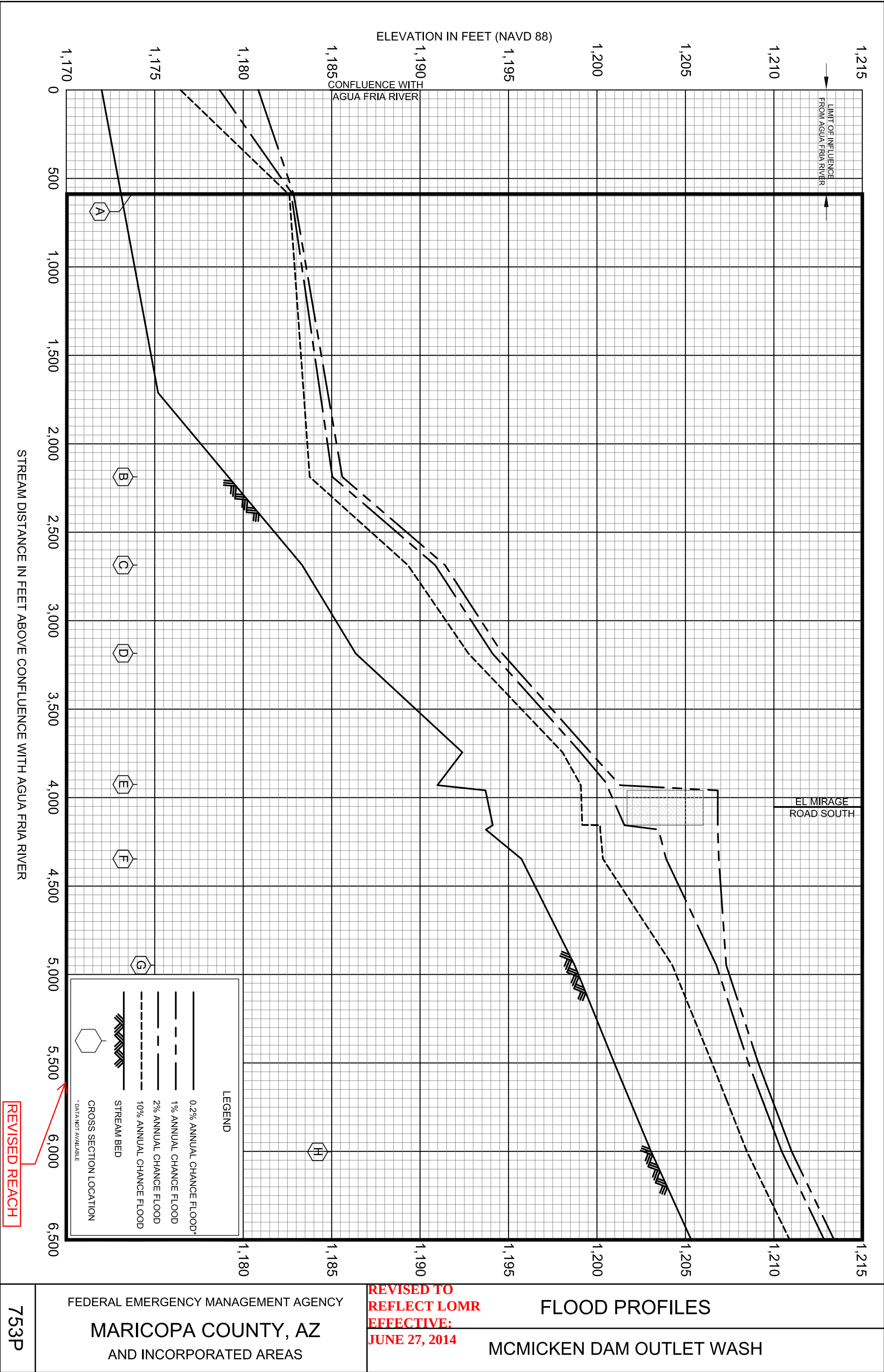
Dates: February 20, 2014 and February 27, 2014

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard information presented in this LOMR may be changed.

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 Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

A handwritten signature in black ink, appearing to read "Luis Rodriguez".

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration



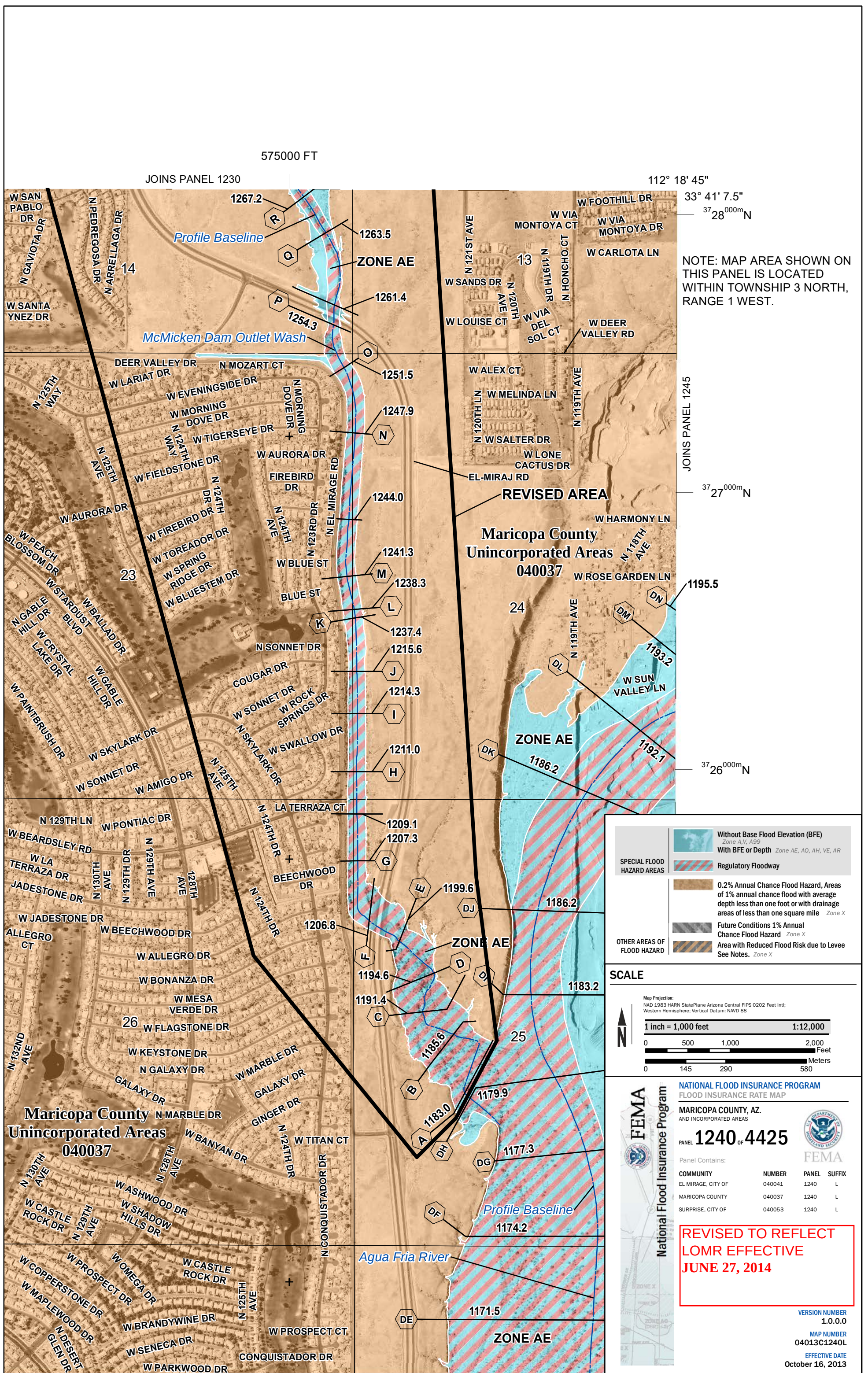
REVISED TO REFLECT LOMR
EFFECTIVE JUNE 27, 2014

Table 3. Summary of Discharges

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (Sq. Miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
Malta Drain					
Upstream of Emerald Wash	0.24	-- ¹	-- ¹	466	-- ¹
Upstream of Rand Drive	0.17	-- ¹	-- ¹	366	-- ¹
Mangrum Wash					
Upstream of Jacklin Wash	0.12	-- ¹	-- ¹	562	-- ¹
Martinez Wash					
At mouth	103	9,220	27,400	32,000	45,000
McCormick Ranch Lakes East Branch					
Downstream of McCormick Parkway	12.4	-- ¹	-- ¹	9,280	-- ¹
McCormick Ranch Lakes West Branch					
Upstream of the confluence with McCormick Ranch Lakes East Branch	5.49	-- ¹	-- ¹	3,650	-- ¹
McMicken Dam Outlet Channel					
Confluence with McMicken Dam Outlet Wash	304.92	2,613	4,279	5,087	-- ¹
McMicken Dam Outlet Wash					
Approximately 800 feet downstream of W. Happy Valley Pkwy	108.42	2,667	5,555	7,620	-- ¹
Discharges from McMicken Dam	101.08	2,618	5,454	7,481	
Approximately 4,200 feet south of Deer Valley Drive	320.56	2,876	4,916	6,273	-- ¹
Approximately 1,700 feet north of Deer Valley Drive	318.13	2,835	4,747	6,023	-- ¹
Mesquite Tank Wash					
At Cave Butte Recreation Area	-- ¹	-- ¹	-- ¹	1,000	-- ¹

--¹ Data Not Computed

--² Data Not Available



**REVISED TO REFLECT LOMR
EFFECTIVE JUNE 27, 2014**

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
McMicken Dam Outlet Wash								
Z	16,245	466	1821	4.2	1283.3	1283.3	1283.9	0.6
AA	16,745	533	1405	5.4	1284.6	1284.6	1285.6	1.0
AB	17,478	395	1408	5.3	1287.6	1287.6	1288.4	0.8
AC	17,496	407	1518	4.9	1289.1	1289.1	1289.6	0.5
AD	17,948	268	1488	5.0	1291.7	1291.7	1292.1	0.4
AE	20,976	282	1706	4.4	1307.1	1307.1	1307.5	0.4
AF	21,669	196	1206	6.2	1310.5	1310.5	1311.5	1.0
AG	22,169	114	633	11.8	1312.4	1312.4	1313.1	0.7
AH	22,669	235	1467	5.1	1315.3	1315.3	1315.3	0.0
AI	23,169	425	4056	1.8	1316.1	1316.1	1316.3	0.2
AJ	24,293	320	2805	2.6	1316.2	1316.2	1316.3	0.1
AK	24,793	196	4469	1.6	1316.7	1316.7	1317.0	0.3
AL	25,813	174	3548	2.1	1316.8	1316.8	1317.3	0.5

REVISED DATA

¹ Stream Distance in Feet Above Confluence With Agua Fria River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

**MARICOPA COUNTY, AZ
AND INCORPORATED AREAS**

FLOODWAY DATA

McMICKEN DAM OUTLET WASH

**REVISED TO REFLECT LOMR
EFFECTIVE JUNE 27, 2014**

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
McMicken Dam Outlet Wash								
A	565	916	2811	2.7	1183.0	1183.0	1183.0	0.0
B	2,187	553	1080	7.0	1185.6	1185.6	1185.6	0.0
C	2,685	608	1614	4.7	1191.4	1191.4	1191.4	0.0
D	3,184	480.7	1473	5.1	1194.6	1194.6	1194.6	0.0
E	3,926	378	1223	6.2	1199.6	1199.6	1199.6	0.0
F	4,350	496	2737	2.8	1206.8	1206.8	1206.8	0.0
G	4,948	212	1123	6.8	1207.1	1207.3	1207.3	0.0
H	6,000	205	994	7.6	1211.0	1211.0	1211.0	0.0
I	6,689	206	968	7.8	1214.3	1214.3	1214.3	0.0
J	7,424	201	921	8.2	1215.6	1215.6	1215.6	0.0
K	7,821	235	751	10.1	1237.4	1237.4	1237.4	0.0
L	7,924	223	843	9.0	1238.3	1238.3	1238.3	0.0
M	8,323	222	1100	6.9	1241.3	1241.3	1241.3	0.0
N	10,026	204	997	7.6	1247.9	1247.9	1247.9	0.0
O	11,359	224	964	7.9	1251.5	1251.5	1251.5	0.0
P	11,391	85	859	12.9	1254.3	1254.3	1254.3	0.0
Q	12,500	147	915	8.3	1263.5	1263.5	1263.6	0.1
R	12,996	185	1692	4.5	1267.2	1267.2	1267.9	0.7
S	13,496	188	1022	7.4	1269.1	1269.1	1270.1	1.0
T	13,744	191	1962	3.8	1271.3	1271.3	1271.9	0.6
U	13,783	196	2269	3.4	1272.7	1272.7	1273.4	0.7
V	14,215	167	1258	6.0	1272.7	1272.7	1273.2	0.5
W	14,715	208	1213	6.3	1275.7	1275.7	1276.5	0.8
X	15,266	130	1109	6.8	1278.6	1278.6	1278.9	0.3
Y	15,766	214	1588	4.8	1281.5	1281.5	1282.1	0.6

REVISED DATA

¹ Stream Distance in Feet Above Confluence With Agua Fria River

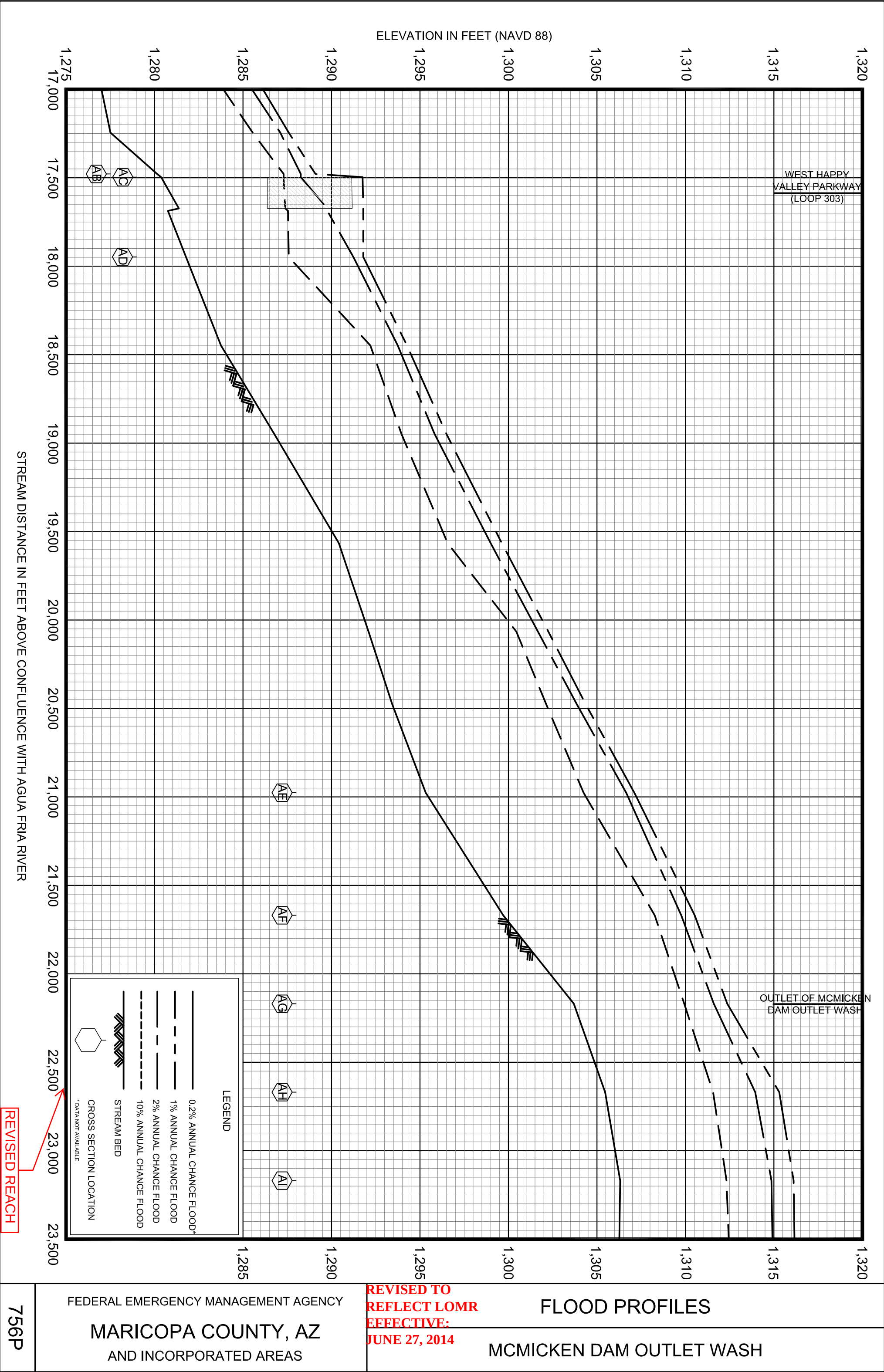
TABLE 6

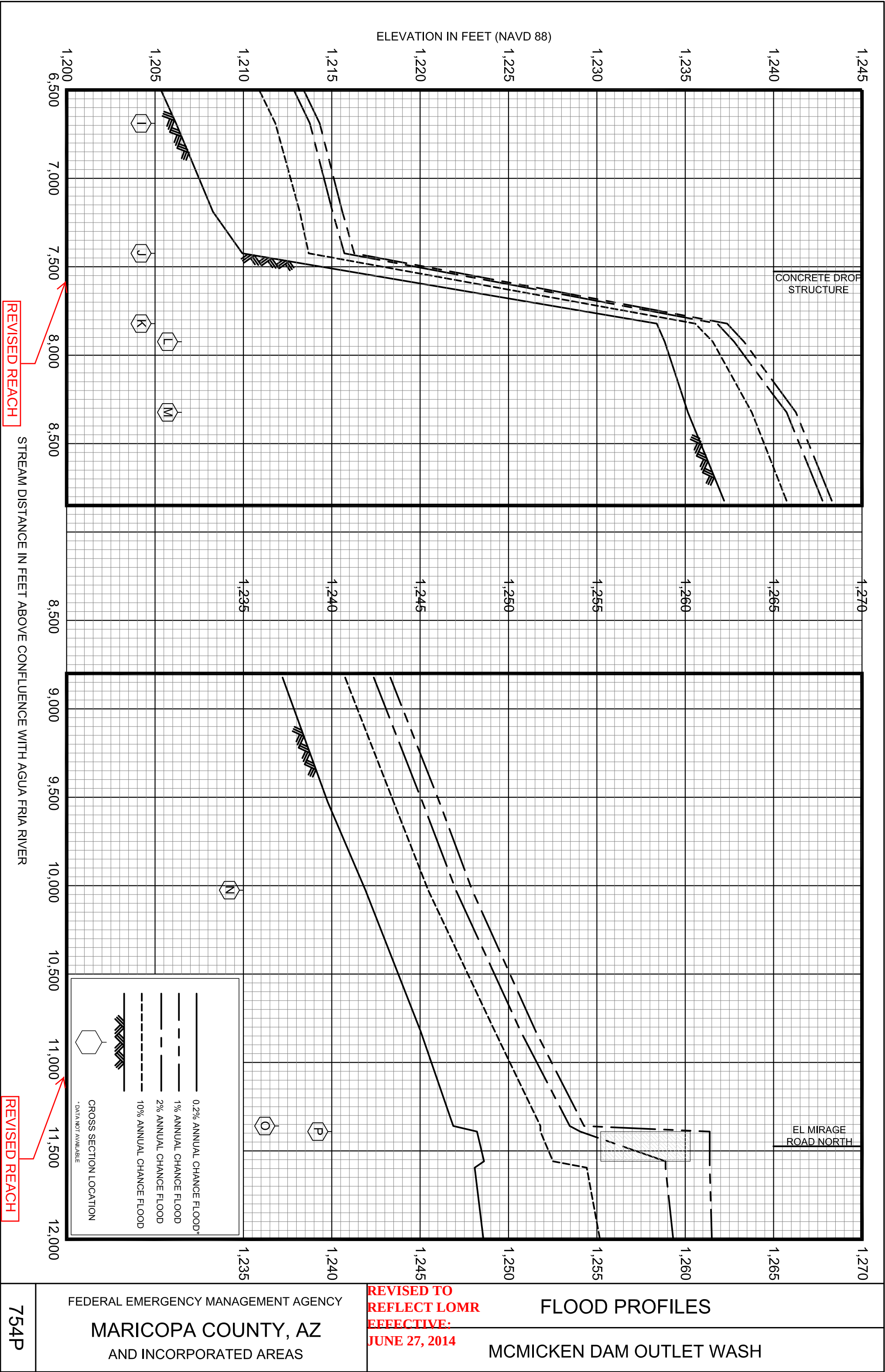
FEDERAL EMERGENCY MANAGEMENT AGENCY

**MARICOPA COUNTY, AZ
AND INCORPORATED AREAS**

FLOODWAY DATA

McMICKEN DAM OUTLET WASH







Appendix B - NOAA Precipitation Estimates

B.1 Depth Table

B.2 Intensity Table



B.1 Depth Table



NOAA Atlas 14, Volume 1, Version 5
Location name: Peoria, Arizona, USA*
Latitude: 33.7133°, Longitude: -112.3308°
Elevation: 1325 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

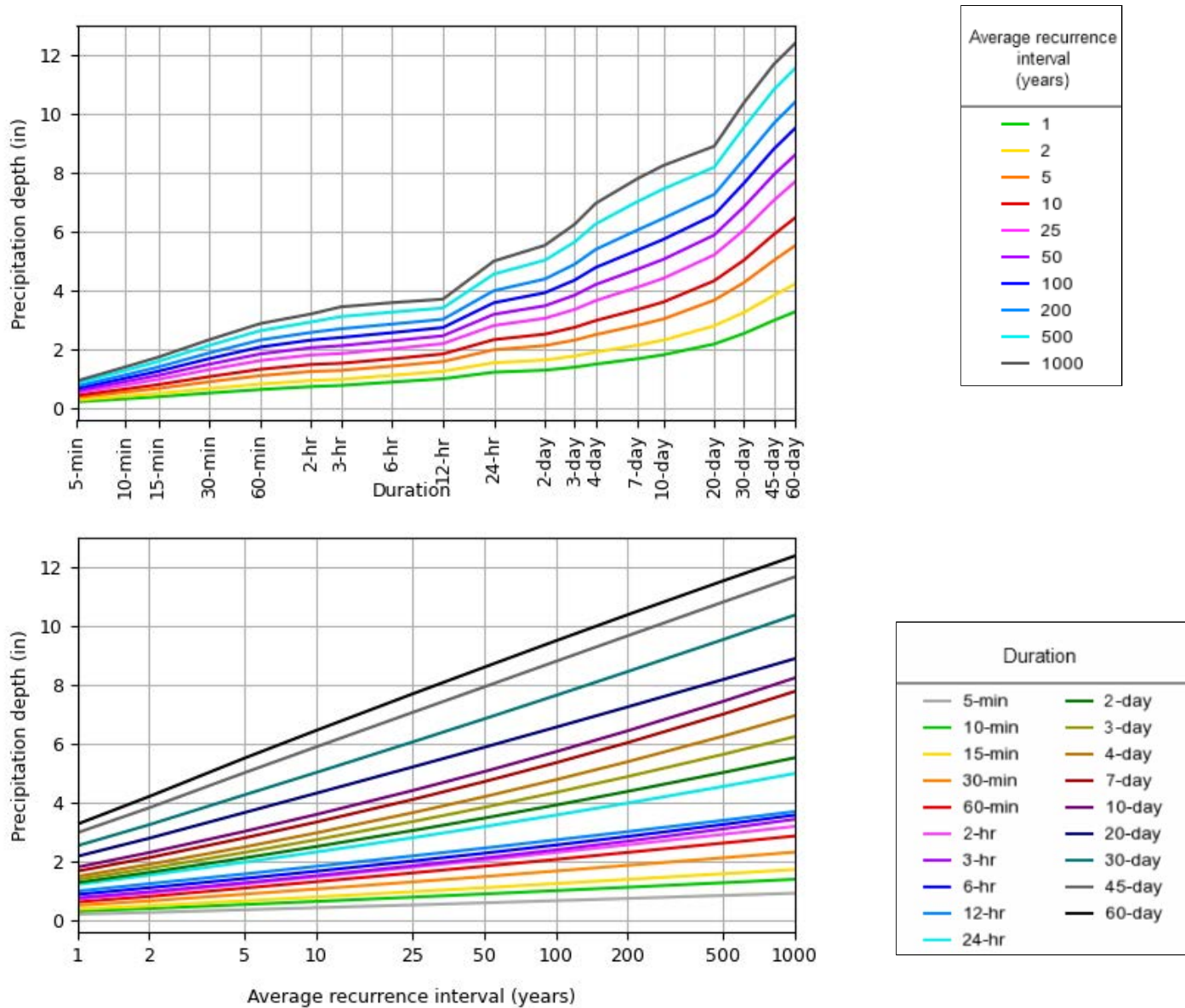
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.195 (0.157-0.248)	0.254 (0.205-0.324)	0.345 (0.276-0.438)	0.414 (0.329-0.524)	0.508 (0.399-0.641)	0.580 (0.449-0.729)	0.655 (0.498-0.822)	0.731 (0.547-0.919)	0.832 (0.607-1.05)	0.909 (0.650-1.14)
10-min	0.296 (0.239-0.378)	0.387 (0.312-0.493)	0.525 (0.419-0.666)	0.630 (0.501-0.797)	0.773 (0.607-0.975)	0.883 (0.683-1.11)	0.997 (0.758-1.25)	1.11 (0.832-1.40)	1.27 (0.924-1.59)	1.38 (0.989-1.74)
15-min	0.367 (0.295-0.469)	0.479 (0.386-0.611)	0.650 (0.519-0.826)	0.781 (0.621-0.988)	0.958 (0.752-1.21)	1.10 (0.847-1.38)	1.24 (0.940-1.55)	1.38 (1.03-1.73)	1.57 (1.14-1.97)	1.72 (1.23-2.16)
30-min	0.495 (0.398-0.631)	0.645 (0.520-0.823)	0.876 (0.699-1.11)	1.05 (0.836-1.33)	1.29 (1.01-1.63)	1.47 (1.14-1.85)	1.66 (1.27-2.09)	1.86 (1.39-2.33)	2.11 (1.54-2.66)	2.31 (1.65-2.91)
60-min	0.612 (0.492-0.781)	0.798 (0.644-1.02)	1.08 (0.866-1.38)	1.30 (1.04-1.65)	1.60 (1.25-2.02)	1.82 (1.41-2.29)	2.06 (1.57-2.58)	2.30 (1.72-2.89)	2.62 (1.91-3.29)	2.86 (2.04-3.60)
2-hr	0.712 (0.585-0.886)	0.918 (0.753-1.15)	1.23 (1.00-1.53)	1.47 (1.19-1.82)	1.79 (1.43-2.21)	2.04 (1.60-2.51)	2.30 (1.78-2.82)	2.56 (1.94-3.13)	2.91 (2.16-3.57)	3.19 (2.32-3.92)
3-hr	0.751 (0.615-0.939)	0.958 (0.790-1.20)	1.26 (1.04-1.58)	1.51 (1.23-1.87)	1.84 (1.47-2.27)	2.10 (1.66-2.59)	2.38 (1.85-2.93)	2.68 (2.04-3.29)	3.10 (2.29-3.79)	3.43 (2.48-4.21)
6-hr	0.867 (0.734-1.05)	1.10 (0.930-1.33)	1.41 (1.19-1.70)	1.66 (1.38-2.00)	2.00 (1.64-2.40)	2.27 (1.84-2.71)	2.55 (2.03-3.04)	2.84 (2.22-3.39)	3.25 (2.47-3.88)	3.57 (2.65-4.27)
12-hr	0.979 (0.840-1.16)	1.23 (1.06-1.46)	1.56 (1.33-1.85)	1.82 (1.55-2.15)	2.18 (1.82-2.55)	2.44 (2.02-2.86)	2.72 (2.22-3.19)	3.00 (2.42-3.53)	3.39 (2.66-3.99)	3.69 (2.84-4.38)
24-hr	1.20 (1.04-1.39)	1.52 (1.32-1.76)	1.97 (1.70-2.27)	2.31 (1.99-2.66)	2.79 (2.39-3.20)	3.17 (2.70-3.63)	3.57 (3.00-4.08)	3.98 (3.32-4.55)	4.54 (3.73-5.21)	4.99 (4.05-5.73)
2-day	1.27 (1.08-1.50)	1.62 (1.37-1.90)	2.11 (1.78-2.48)	2.50 (2.10-2.93)	3.04 (2.54-3.56)	3.46 (2.88-4.05)	3.91 (3.22-4.56)	4.38 (3.58-5.10)	5.02 (4.04-5.87)	5.52 (4.39-6.49)
3-day	1.38 (1.18-1.62)	1.75 (1.50-2.06)	2.30 (1.96-2.69)	2.73 (2.32-3.20)	3.34 (2.82-3.91)	3.83 (3.22-4.46)	4.34 (3.62-5.06)	4.88 (4.04-5.68)	5.64 (4.60-6.57)	6.24 (5.04-7.30)
4-day	1.48 (1.28-1.74)	1.89 (1.63-2.22)	2.48 (2.13-2.91)	2.96 (2.54-3.47)	3.64 (3.10-4.25)	4.19 (3.55-4.88)	4.77 (4.02-5.55)	5.39 (4.50-6.25)	6.26 (5.17-7.27)	6.96 (5.70-8.10)
7-day	1.66 (1.42-1.96)	2.12 (1.82-2.50)	2.79 (2.39-3.29)	3.33 (2.84-3.92)	4.09 (3.47-4.80)	4.70 (3.96-5.51)	5.35 (4.48-6.25)	6.04 (5.02-7.05)	7.00 (5.76-8.18)	7.78 (6.35-9.11)
10-day	1.79 (1.55-2.10)	2.29 (1.98-2.68)	3.01 (2.59-3.52)	3.59 (3.08-4.19)	4.40 (3.75-5.11)	5.04 (4.28-5.86)	5.72 (4.83-6.63)	6.44 (5.40-7.45)	7.44 (6.17-8.62)	8.24 (6.78-9.55)
20-day	2.16 (1.88-2.49)	2.78 (2.42-3.20)	3.66 (3.17-4.20)	4.32 (3.73-4.95)	5.20 (4.48-5.95)	5.87 (5.05-6.71)	6.56 (5.62-7.50)	7.26 (6.19-8.28)	8.19 (6.93-9.35)	8.90 (7.48-10.2)
30-day	2.52 (2.17-2.92)	3.24 (2.80-3.76)	4.26 (3.67-4.93)	5.02 (4.32-5.80)	6.05 (5.18-6.98)	6.84 (5.84-7.88)	7.64 (6.50-8.82)	8.46 (7.16-9.75)	9.55 (8.02-11.0)	10.4 (8.66-12.0)
45-day	2.97 (2.58-3.42)	3.82 (3.32-4.39)	5.01 (4.34-5.77)	5.89 (5.10-6.78)	7.06 (6.08-8.10)	7.93 (6.82-9.11)	8.80 (7.54-10.1)	9.68 (8.25-11.1)	10.8 (9.18-12.5)	11.7 (9.86-13.5)
60-day	3.26 (2.85-3.72)	4.20 (3.68-4.80)	5.51 (4.81-6.28)	6.46 (5.62-7.35)	7.69 (6.68-8.75)	8.60 (7.45-9.78)	9.50 (8.20-10.8)	10.4 (8.94-11.9)	11.5 (9.89-13.2)	12.4 (10.6-14.2)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
 Please refer to NOAA Atlas 14 document for more information.

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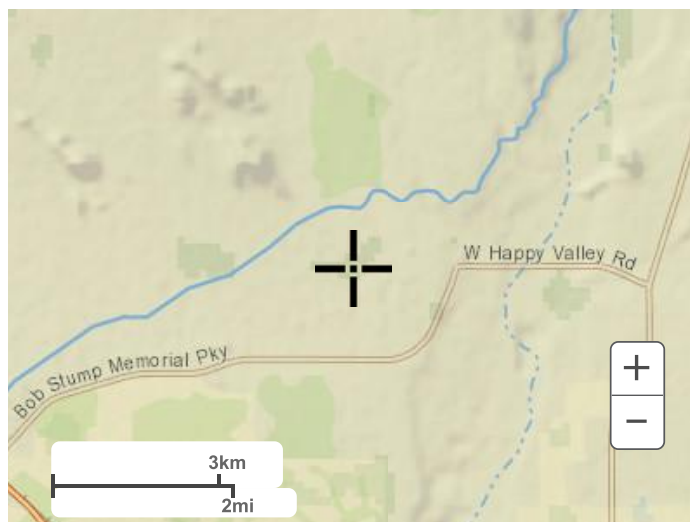
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.7133°, Longitude: -112.3308°



Maps & aerials

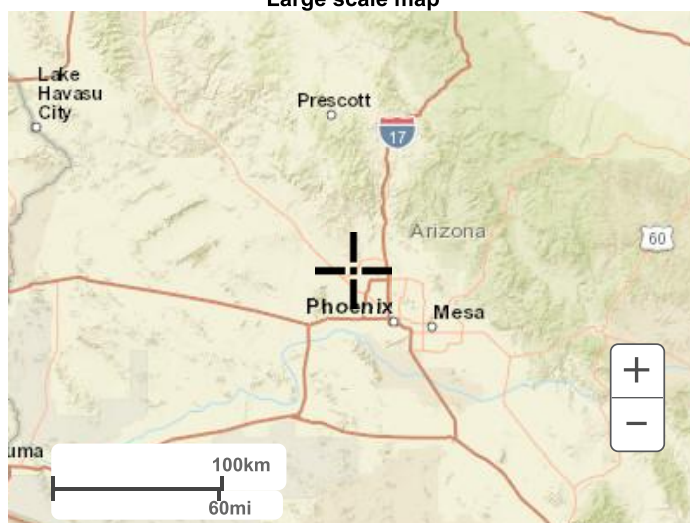
Small scale terrain



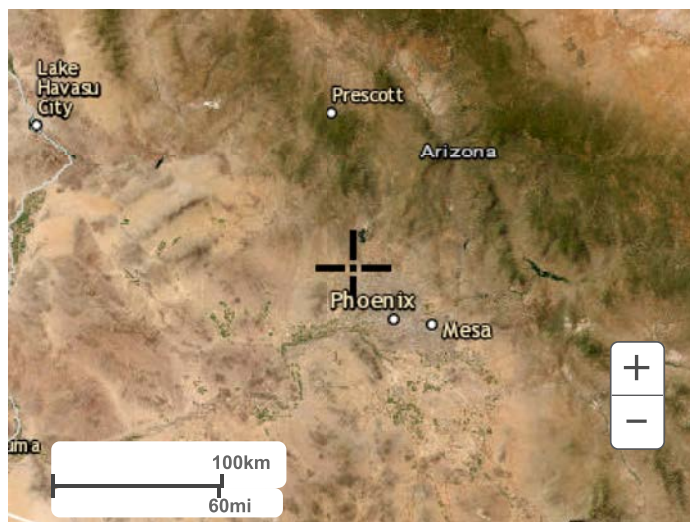
Large scale terrain



Large scale map



Large scale aerial



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[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)



B.2 Intensity Table



NOAA Atlas 14, Volume 1, Version 5
Location name: Peoria, Arizona, USA*
Latitude: 33.7133°, Longitude: -112.3308°
Elevation: 1325 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.34 (1.88-2.98)	3.05 (2.46-3.89)	4.14 (3.31-5.26)	4.97 (3.95-6.29)	6.10 (4.79-7.69)	6.96 (5.39-8.75)	7.86 (5.98-9.86)	8.77 (6.56-11.0)	9.98 (7.28-12.6)	10.9 (7.80-13.7)
10-min	1.78 (1.43-2.27)	2.32 (1.87-2.96)	3.15 (2.51-4.00)	3.78 (3.01-4.78)	4.64 (3.64-5.85)	5.30 (4.10-6.66)	5.98 (4.55-7.51)	6.67 (4.99-8.39)	7.60 (5.54-9.56)	8.30 (5.93-10.5)
15-min	1.47 (1.18-1.88)	1.92 (1.54-2.44)	2.60 (2.08-3.30)	3.12 (2.48-3.95)	3.83 (3.01-4.84)	4.38 (3.39-5.50)	4.94 (3.76-6.20)	5.52 (4.13-6.93)	6.28 (4.58-7.90)	6.86 (4.90-8.64)
30-min	0.990 (0.796-1.26)	1.29 (1.04-1.65)	1.75 (1.40-2.22)	2.10 (1.67-2.66)	2.58 (2.03-3.26)	2.95 (2.28-3.70)	3.33 (2.53-4.18)	3.72 (2.78-4.67)	4.23 (3.08-5.32)	4.62 (3.30-5.82)
60-min	0.612 (0.492-0.781)	0.798 (0.644-1.02)	1.08 (0.866-1.38)	1.30 (1.04-1.65)	1.60 (1.25-2.02)	1.82 (1.41-2.29)	2.06 (1.57-2.58)	2.30 (1.72-2.89)	2.62 (1.91-3.29)	2.86 (2.04-3.60)
2-hr	0.356 (0.292-0.443)	0.459 (0.376-0.573)	0.614 (0.501-0.764)	0.733 (0.593-0.910)	0.895 (0.713-1.11)	1.02 (0.801-1.25)	1.15 (0.888-1.41)	1.28 (0.972-1.56)	1.46 (1.08-1.78)	1.59 (1.16-1.96)
3-hr	0.250 (0.204-0.312)	0.319 (0.263-0.400)	0.420 (0.345-0.527)	0.501 (0.408-0.624)	0.612 (0.490-0.754)	0.700 (0.553-0.863)	0.794 (0.616-0.977)	0.893 (0.680-1.10)	1.03 (0.763-1.26)	1.14 (0.824-1.40)
6-hr	0.144 (0.122-0.175)	0.183 (0.155-0.222)	0.235 (0.198-0.284)	0.276 (0.230-0.333)	0.334 (0.274-0.400)	0.378 (0.306-0.453)	0.425 (0.338-0.508)	0.474 (0.370-0.566)	0.542 (0.412-0.647)	0.596 (0.443-0.713)
12-hr	0.081 (0.069-0.096)	0.102 (0.087-0.121)	0.129 (0.110-0.153)	0.151 (0.128-0.178)	0.180 (0.151-0.211)	0.202 (0.167-0.237)	0.225 (0.184-0.264)	0.249 (0.200-0.292)	0.281 (0.220-0.331)	0.306 (0.235-0.363)
24-hr	0.050 (0.043-0.058)	0.063 (0.055-0.073)	0.081 (0.070-0.094)	0.096 (0.083-0.110)	0.116 (0.099-0.133)	0.132 (0.112-0.151)	0.148 (0.125-0.170)	0.165 (0.138-0.189)	0.189 (0.155-0.217)	0.207 (0.168-0.238)
2-day	0.026 (0.022-0.031)	0.033 (0.028-0.039)	0.043 (0.037-0.051)	0.052 (0.043-0.061)	0.063 (0.052-0.074)	0.072 (0.060-0.084)	0.081 (0.067-0.094)	0.091 (0.074-0.106)	0.104 (0.084-0.122)	0.115 (0.091-0.135)
3-day	0.019 (0.016-0.022)	0.024 (0.020-0.028)	0.031 (0.027-0.037)	0.037 (0.032-0.044)	0.046 (0.039-0.054)	0.053 (0.044-0.061)	0.060 (0.050-0.070)	0.067 (0.056-0.078)	0.078 (0.063-0.091)	0.086 (0.070-0.101)
4-day	0.015 (0.013-0.018)	0.019 (0.016-0.023)	0.025 (0.022-0.030)	0.030 (0.026-0.036)	0.037 (0.032-0.044)	0.043 (0.036-0.050)	0.049 (0.041-0.057)	0.056 (0.046-0.065)	0.065 (0.053-0.075)	0.072 (0.059-0.084)
7-day	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.016 (0.014-0.019)	0.019 (0.016-0.023)	0.024 (0.020-0.028)	0.027 (0.023-0.032)	0.031 (0.026-0.037)	0.035 (0.029-0.041)	0.041 (0.034-0.048)	0.046 (0.037-0.054)
10-day	0.007 (0.006-0.008)	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.014 (0.012-0.017)	0.018 (0.015-0.021)	0.021 (0.017-0.024)	0.023 (0.020-0.027)	0.026 (0.022-0.031)	0.031 (0.025-0.035)	0.034 (0.028-0.039)
20-day	0.004 (0.003-0.005)	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.010)	0.010 (0.009-0.012)	0.012 (0.010-0.013)	0.013 (0.011-0.015)	0.015 (0.012-0.017)	0.017 (0.014-0.019)	0.018 (0.015-0.021)
30-day	0.003 (0.003-0.004)	0.004 (0.003-0.005)	0.005 (0.005-0.006)	0.006 (0.005-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.012)	0.011 (0.009-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.016)
45-day	0.002 (0.002-0.003)	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.004-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.006-0.009)	0.008 (0.007-0.010)	0.010 (0.008-0.011)	0.010 (0.009-0.012)
60-day	0.002 (0.001-0.002)	0.002 (0.002-0.003)	0.003 (0.003-0.004)	0.004 (0.003-0.005)	0.005 (0.004-0.006)	0.005 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.006-0.009)	0.008 (0.007-0.009)

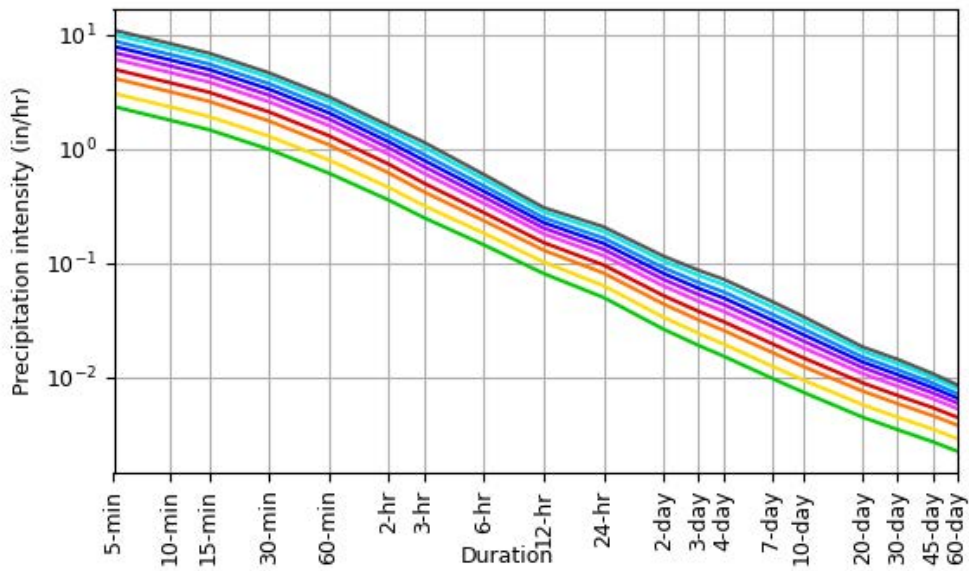
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
 Please refer to NOAA Atlas 14 document for more information.

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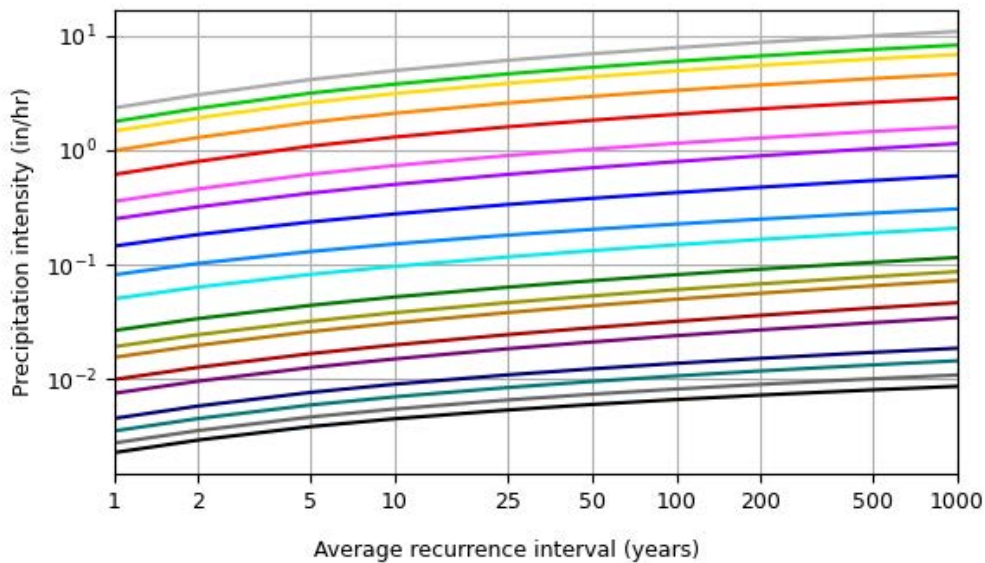
PF graphical

PDS-based intensity-duration-frequency (IDF) curves

Latitude: 33.7133°, Longitude: -112.3308°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000

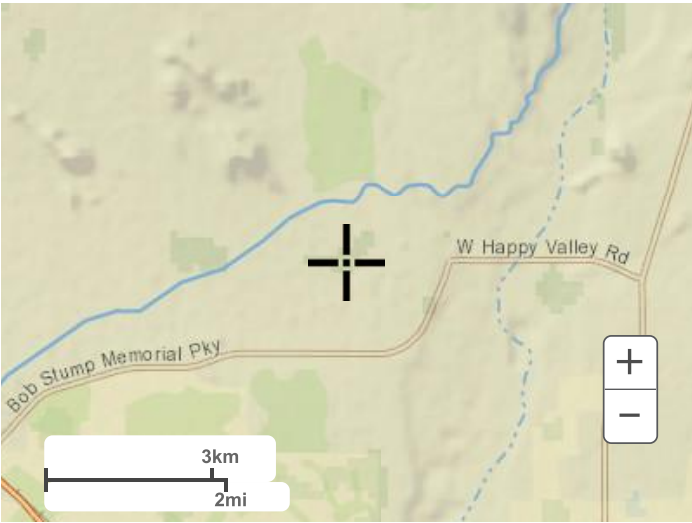


Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
60-day

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Maps & aerials

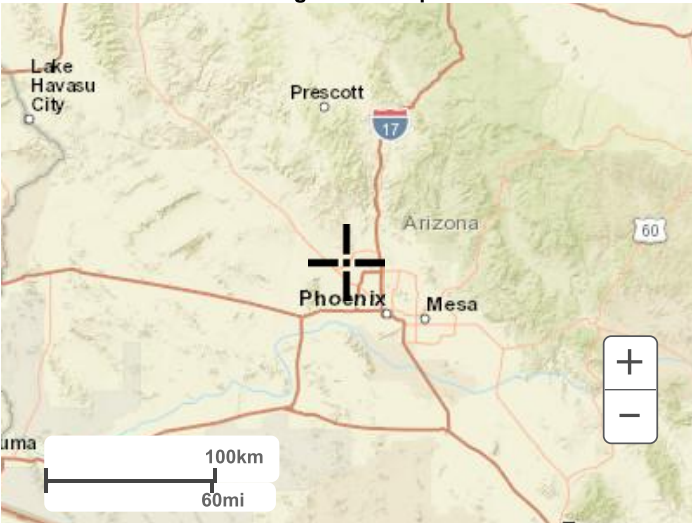
Small scale terrain



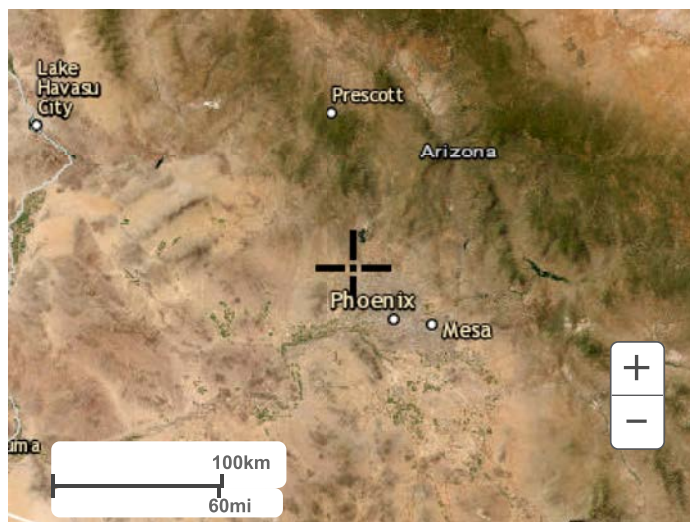
Large scale terrain



Large scale map



Large scale aerial



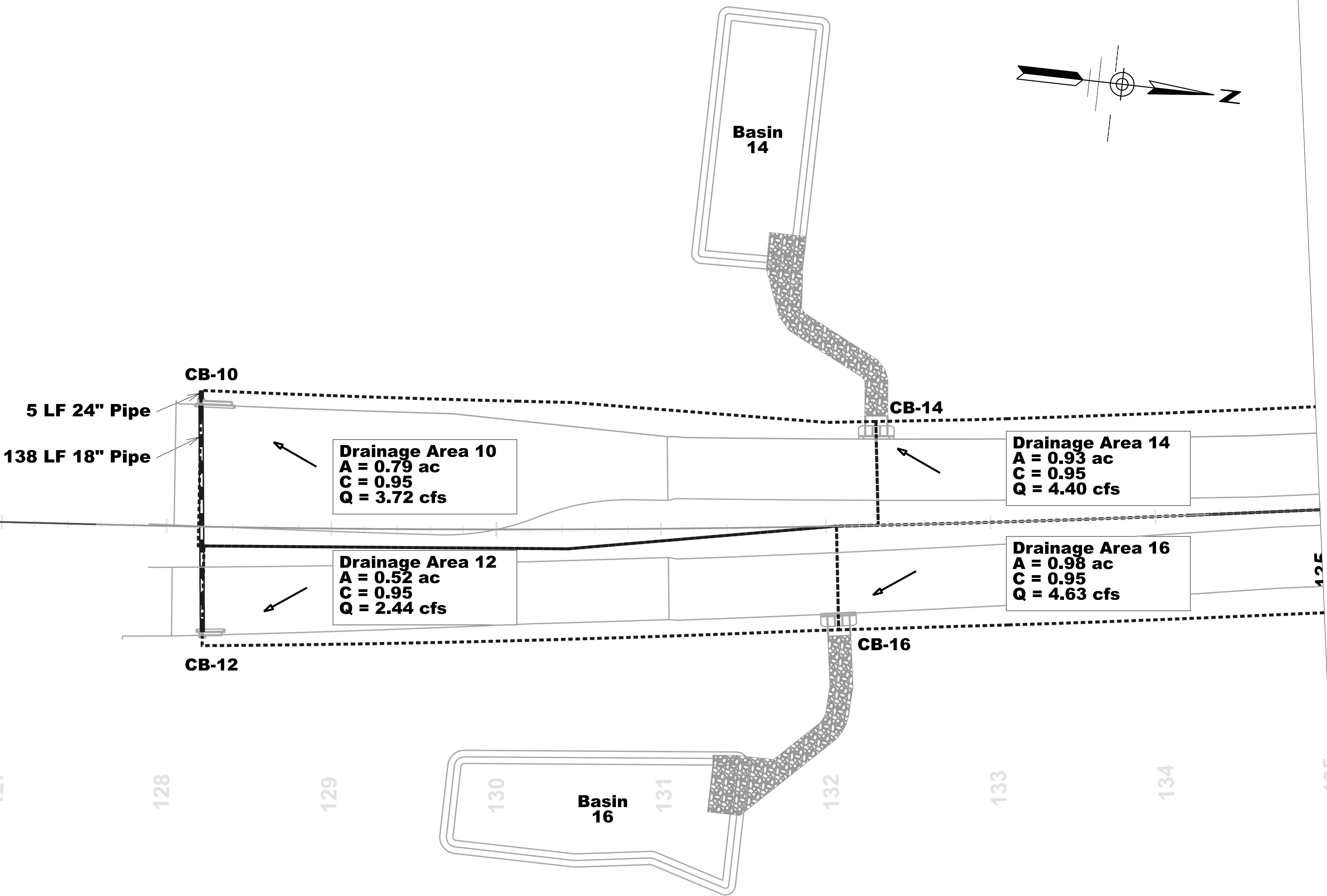
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[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

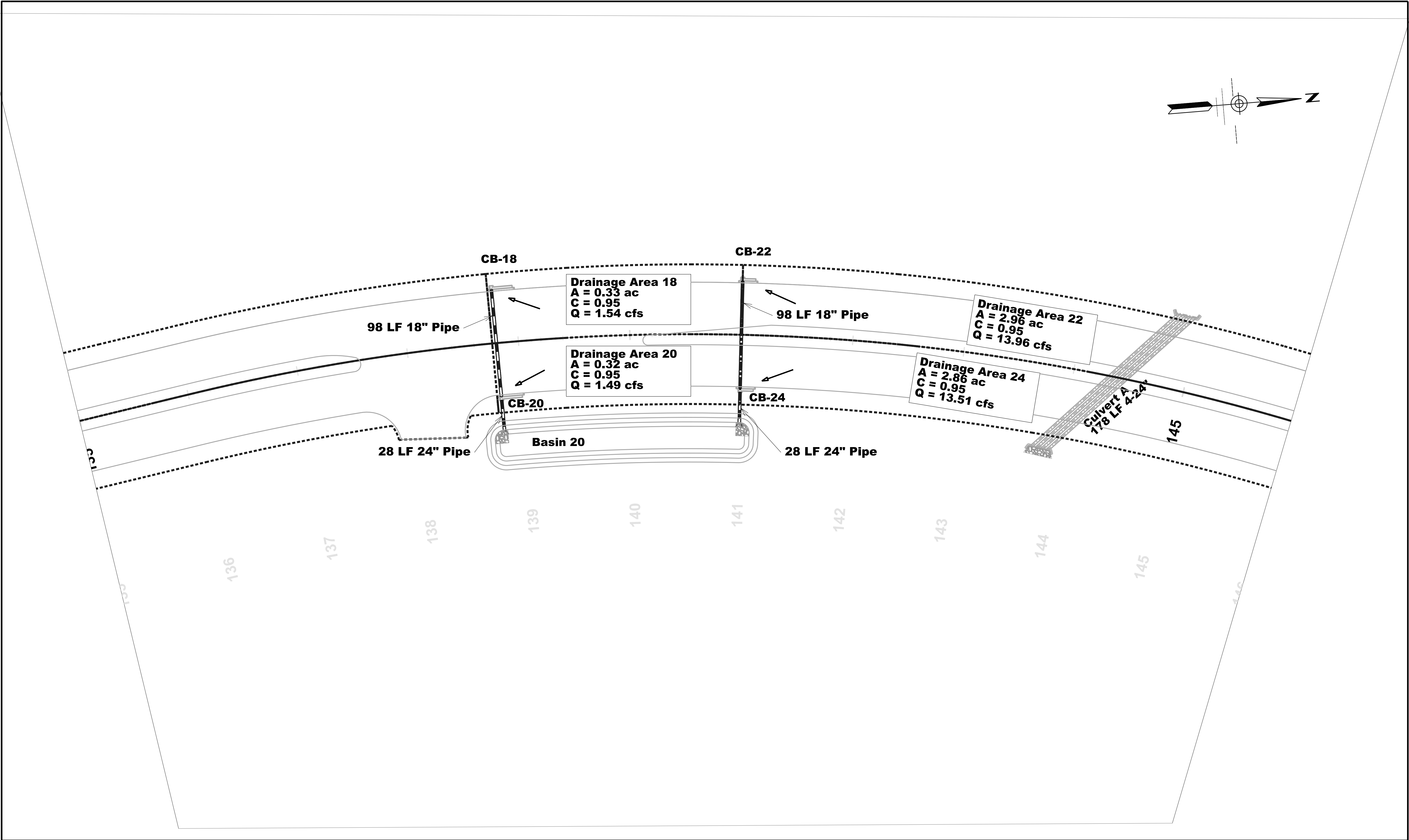
[Disclaimer](#)



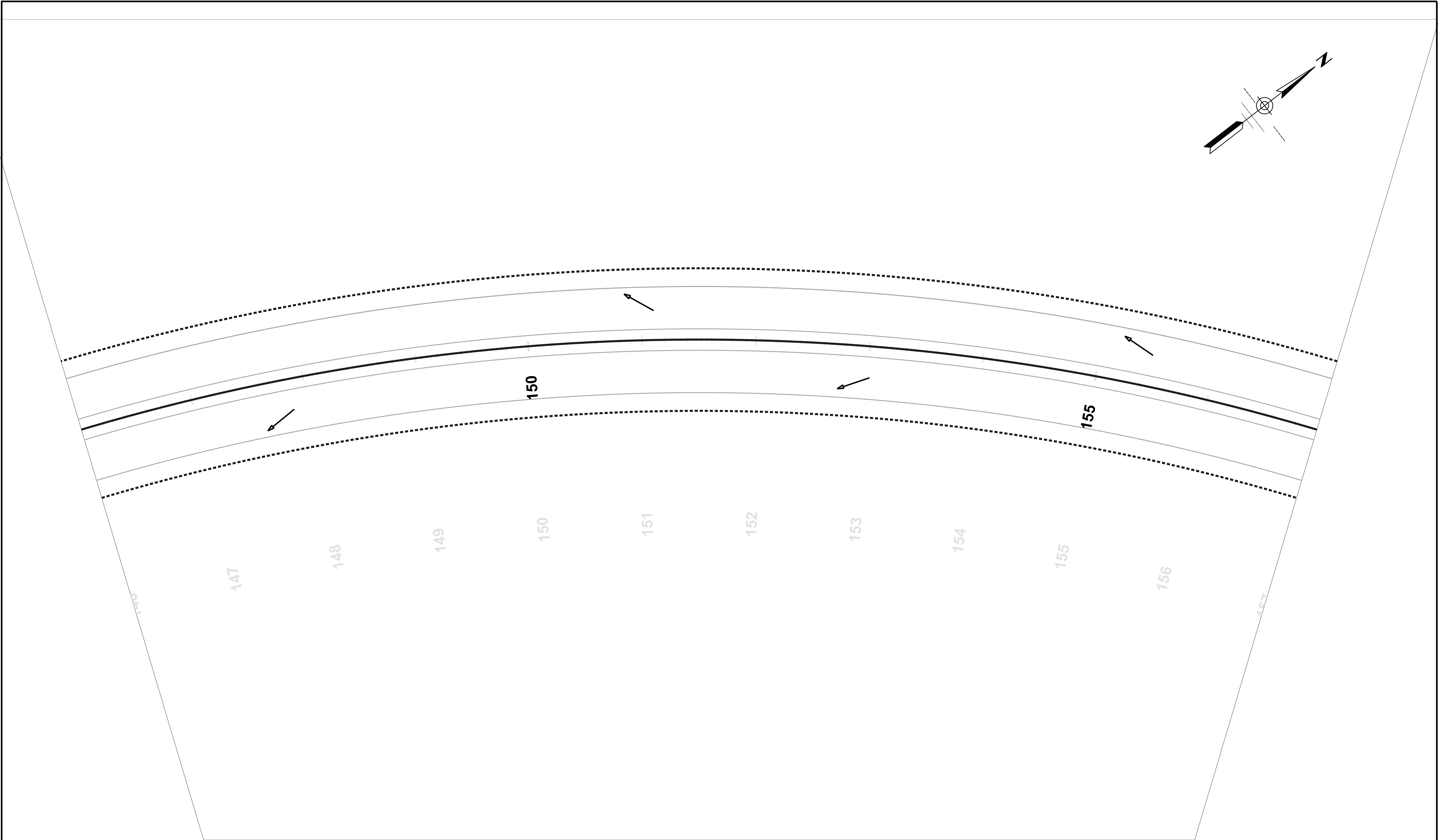
Appendix C - Onsite Drainage Area Sheets



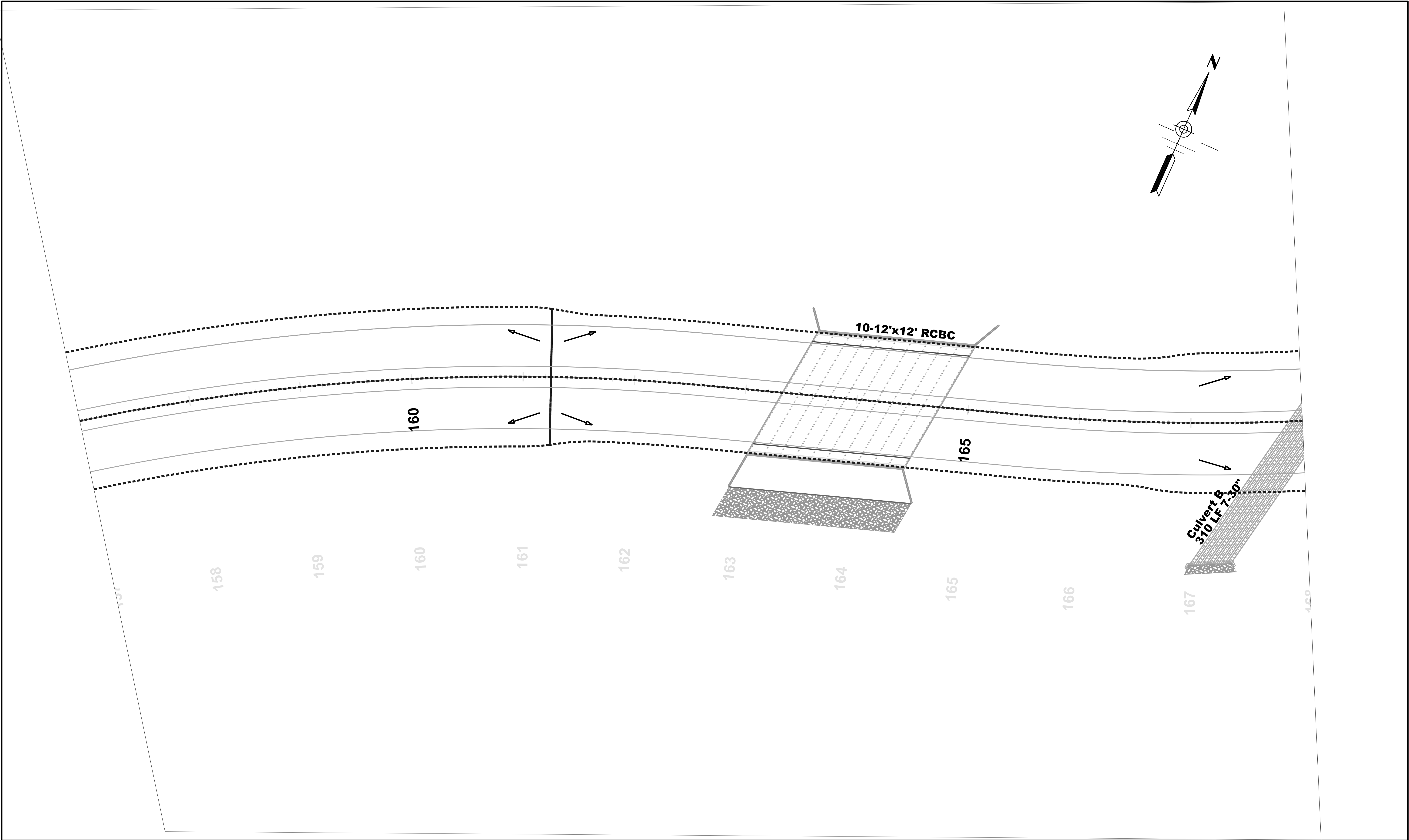
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		DESIGN											
		DRAWN											
		CHECKED											
							DRAINAGE AREA SHEET 1 OF 12	MILEPOST N/A	LOCATION EL MIRAGE RD; SR 303L TO JOMAX RD				
						STRUCTURE NO. N/A	TRACS NO. T0428 01C				OF		



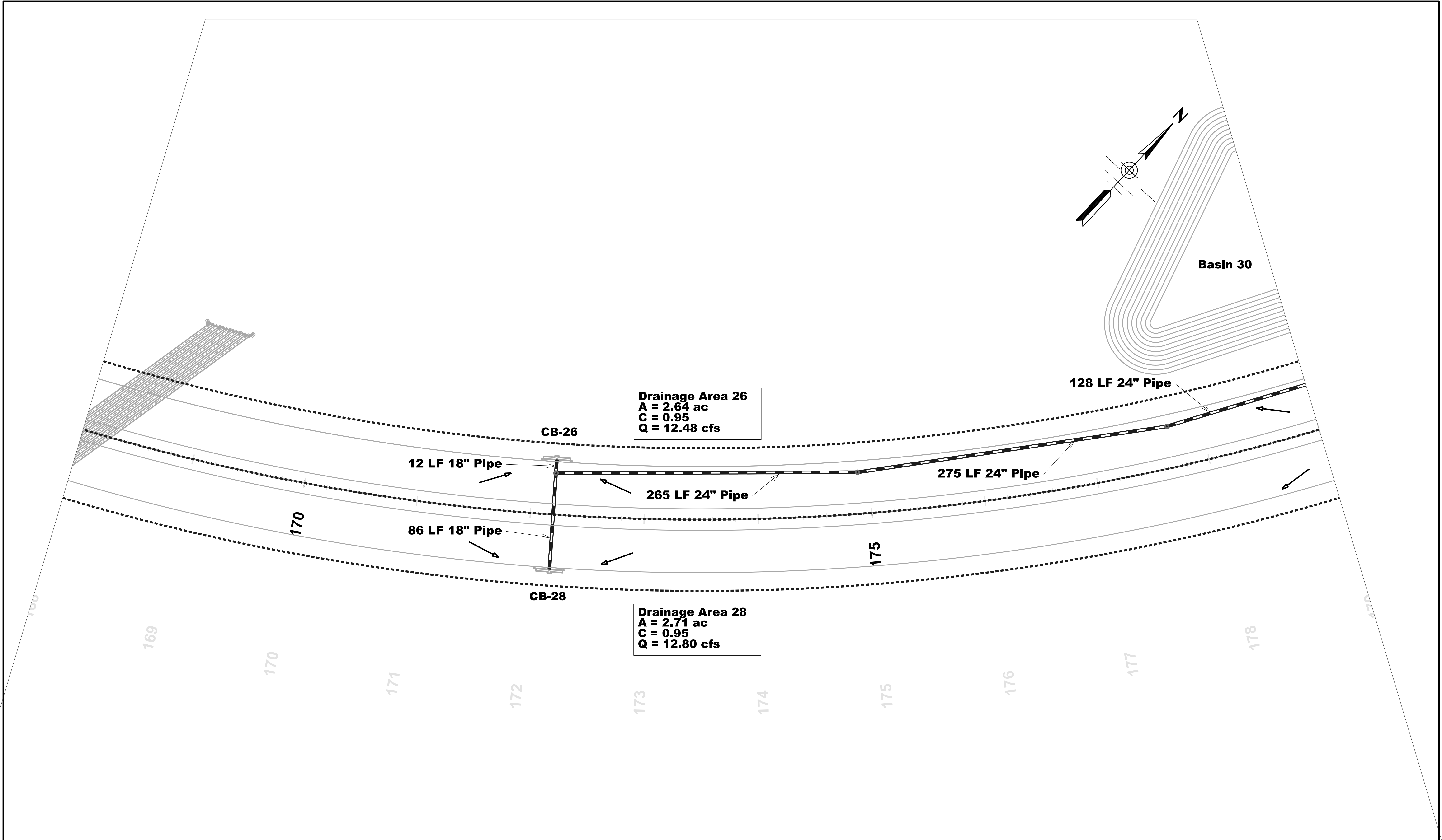
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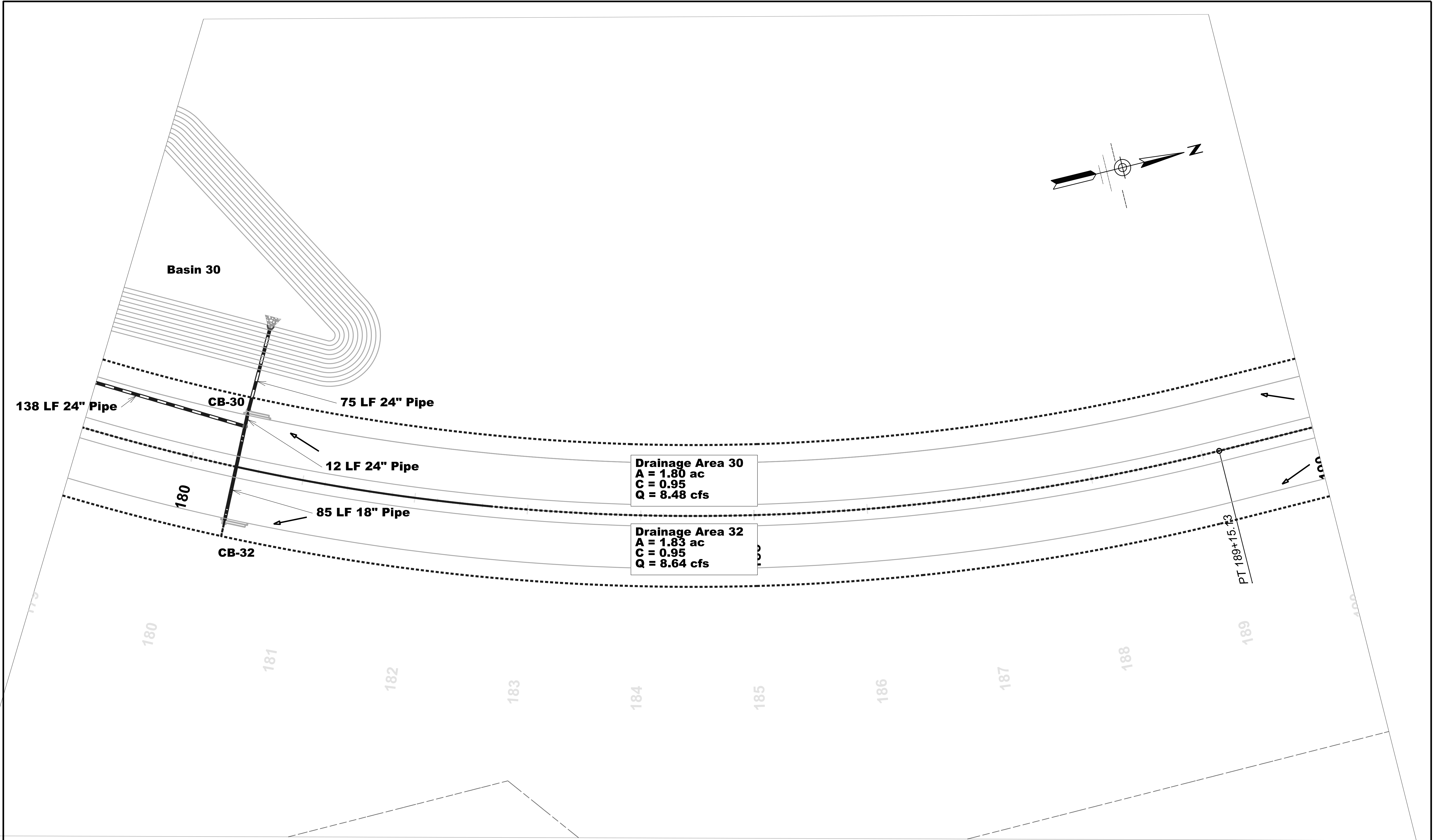
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		CHECKED											
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						STRUCTURE NO. N/A	TRACS NO. T0428 01C					_ OF _	



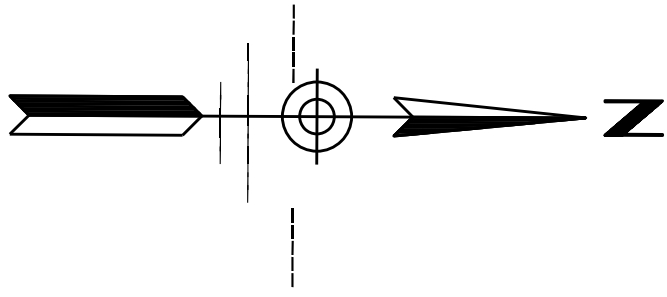
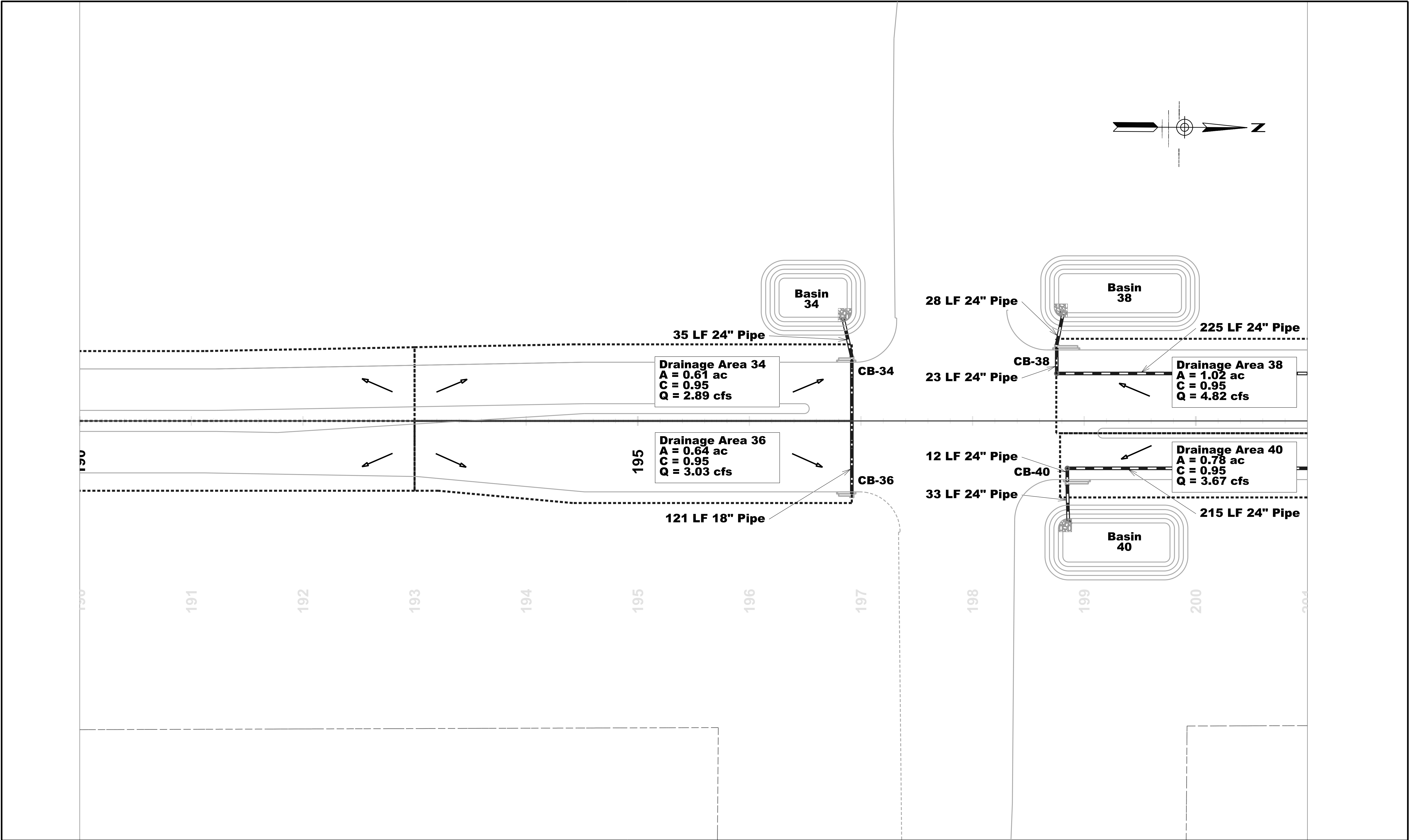
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		DRAWN						LOCATION EL MIRAGE RD; SR 303L TO JOMAX RD	SHEET 0	OF	OF		
		CHECKED										TRACS NO.	T0428 01C
ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION ROADWAY DESIGN SERVICES					MILEPOST N/A								
DRAINAGE AREA SHEET 4 OF 12					STRUCTURE NO. N/A								



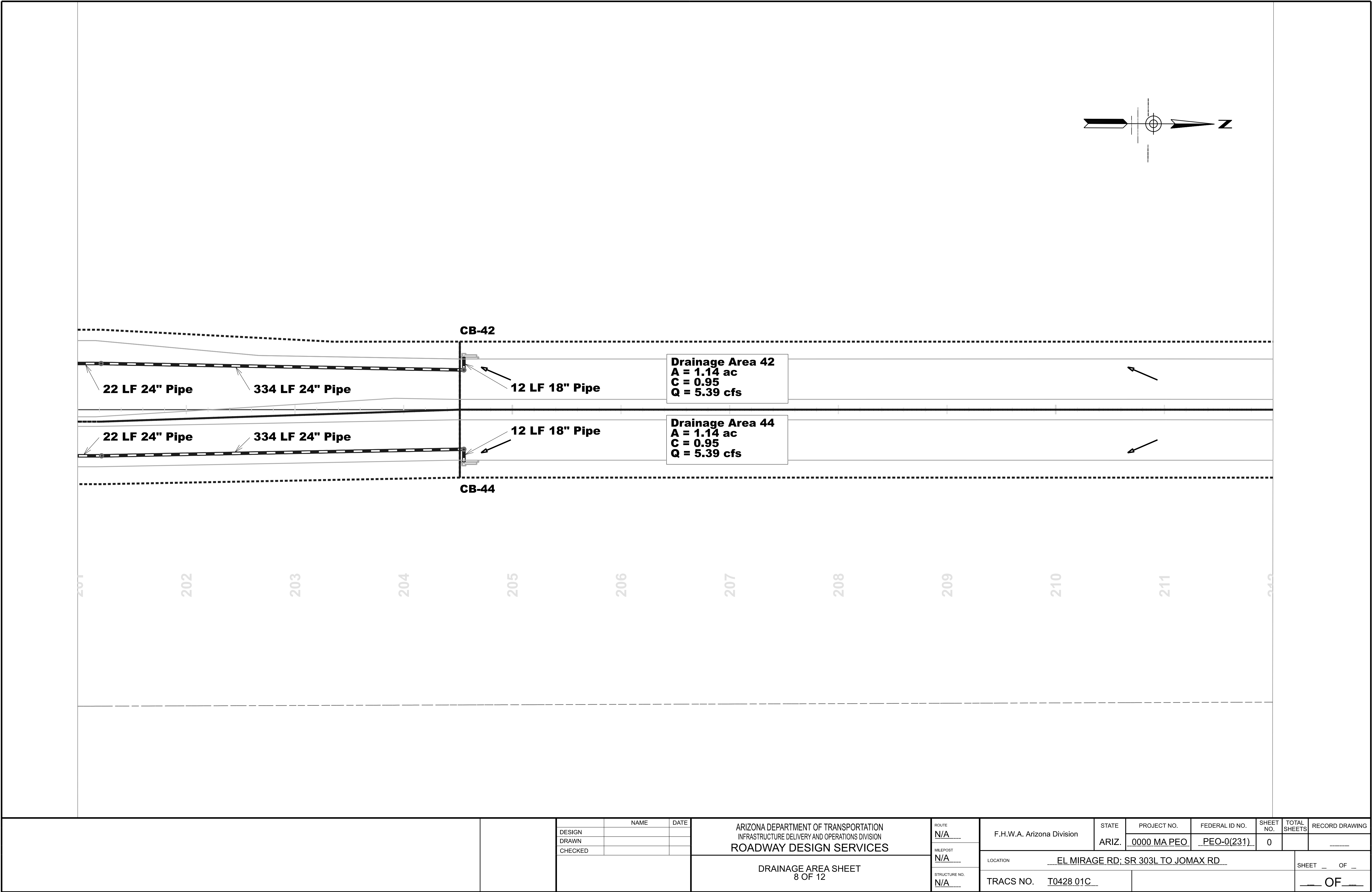
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			CHECKED				N/A	LOCATION EL MIRAGE RD; SR 303L TO JOMAX RD										
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															SHEET _ OF _		_ OF _	

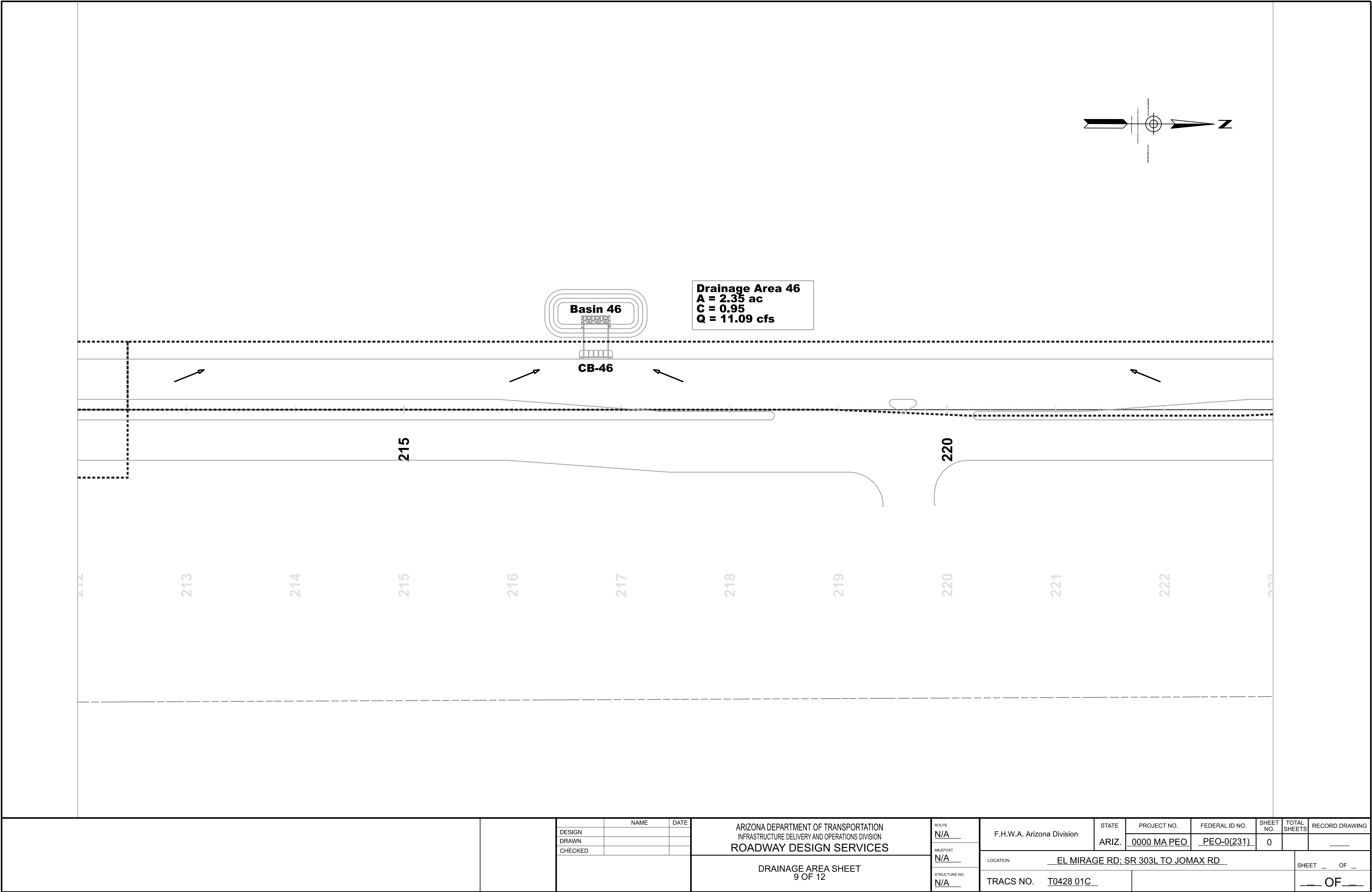


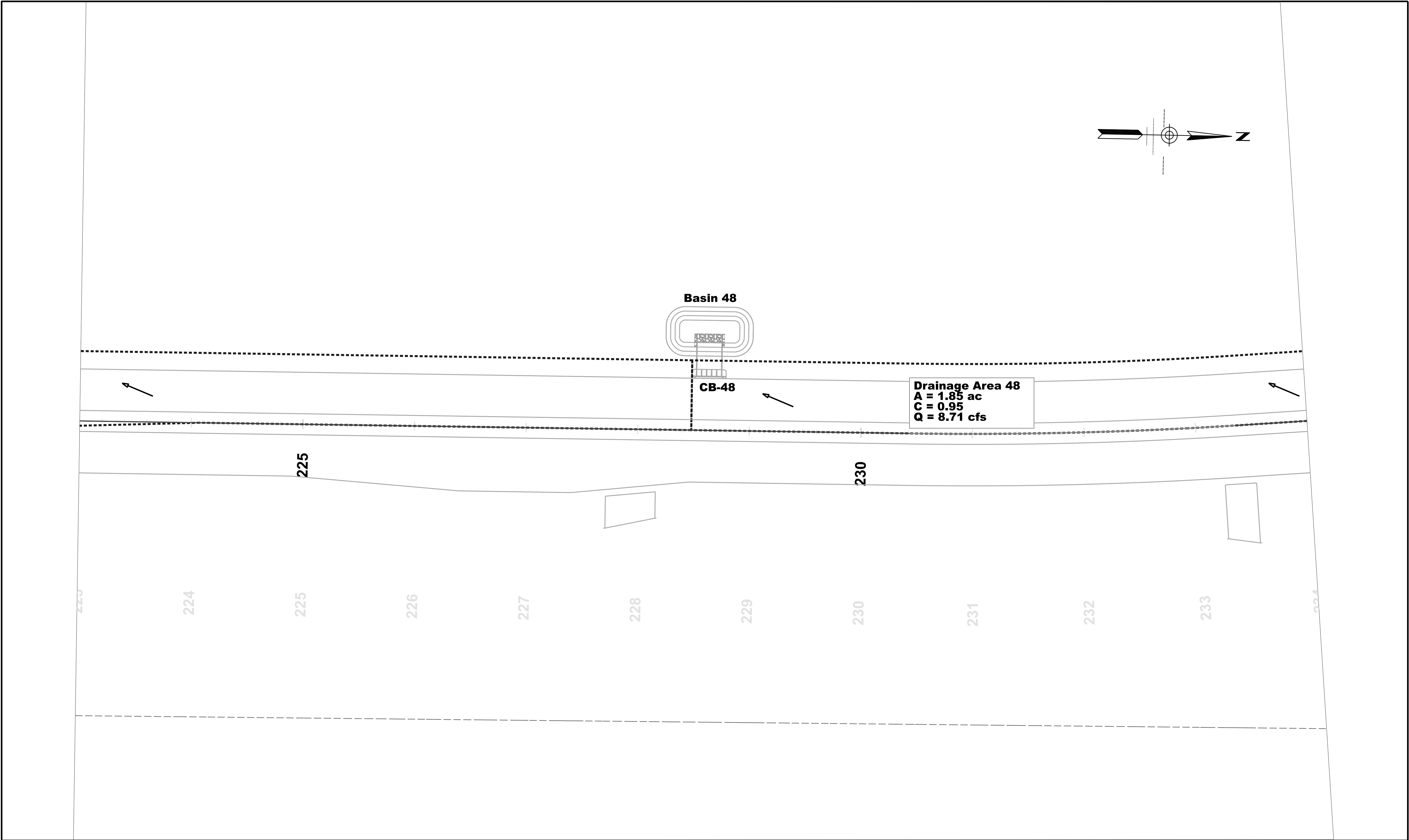
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F.H.W.A. Arizona Division	STATE ARIZ.	PROJECT NO. 0000 MA PEO	FEDERAL ID NO. PEO-0(231)	SHEET NO. 0	TOTAL SHEETS	RECORD DRAWING																				
MILEPOST N/A	LOCATION EL MIRAGE RD; SR 303L TO JOMAX RD					SHEET _ OF _																				
DRAINAGE AREA SHEET 6 OF 12		STRUCTURE NO. N/A	TRACS NO. T0428 01C		OF																					



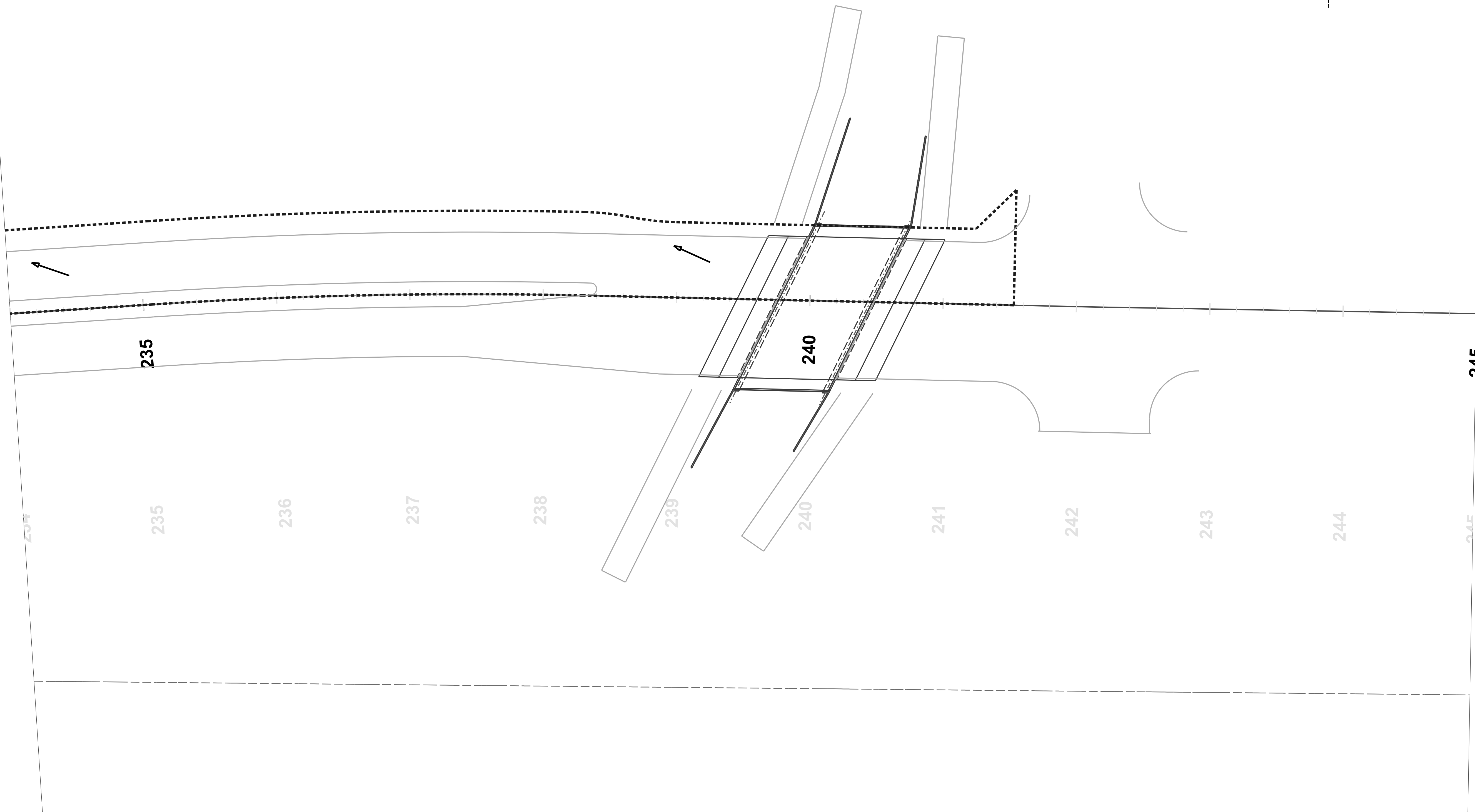
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							DRAINAGE AREA SHEET 7 OF 12	MILEPOST N/A	LOCATION EL MIRAGE RD; SR 303L TO JOMAX RD						
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			NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION ROADWAY DESIGN SERVICES	ROUTE	F.H.W.A. Arizona Division	STATE ARIZ.	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING		
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		DRAWN				N/A	LOCATION EL MIRAGE RD; SR 303L TO JOMAX RD								SHEET _ OF _
		CHECKED					STRUCTURE NO. N/A	TRACS NO. T0428 01C		OF					
					DRAINAGE AREA SHEET 10 OF 12										



GRACEE1 3/11/2025 4:32:43 PM c:\bnpw\bn-pw-03\dms10950\T0428pDAS-11.dgn \ Model Name: 40SC Plan - Plan 11



Appendix D Flowmaster Output Summary Sheets

Worksheet for Inlet 10 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	4.57 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	100.00 %
Intercepted Flow	4.57 cfs
Bypass Flow	0.00 cfs
Spread	14.0 ft
Depth	4.0 in
Flow Area	2.0 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.30 ft/s
Equivalent Cross Slope	0.064 ft/ft
Length Factor	1.068
Total Interception Length	15.0 ft

Worksheet for Inlet 12 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	3.36 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	10.4 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	95.88 %
Intercepted Flow	3.22 cfs
Bypass Flow	0.14 cfs
Spread	12.4 ft
Depth	3.6 in
Flow Area	1.6 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.14 ft/s
Equivalent Cross Slope	0.070 ft/ft
Length Factor	0.830
Total Interception Length	12.5 ft

Worksheet for Inlet 14 - Scupper on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	4.84 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	9.6 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	82.45 %
Intercepted Flow	3.99 cfs
Bypass Flow	0.85 cfs
Spread	14.3 ft
Depth	4.1 in
Flow Area	2.1 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.33 ft/s
Equivalent Cross Slope	0.063 ft/ft
Length Factor	0.620
Total Interception Length	15.5 ft

Worksheet for Inlet 16 - Scupper on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	4.98 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	9.6 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	81.60 %
Intercepted Flow	4.06 cfs
Bypass Flow	0.92 cfs
Spread	14.4 ft
Depth	4.1 in
Flow Area	2.1 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.35 ft/s
Equivalent Cross Slope	0.063 ft/ft
Length Factor	0.610
Total Interception Length	15.7 ft

Worksheet for Inlet 18 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	7.65 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	94.19 %
Intercepted Flow	7.21 cfs
Bypass Flow	0.44 cfs
Spread	17.0 ft
Depth	4.7 in
Flow Area	2.9 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.61 ft/s
Equivalent Cross Slope	0.056 ft/ft
Length Factor	0.794
Total Interception Length	20.1 ft

Worksheet for Inlet 20 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	7.29 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	95.27 %
Intercepted Flow	6.94 cfs
Bypass Flow	0.35 cfs
Spread	16.7 ft
Depth	4.7 in
Flow Area	2.8 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.58 ft/s
Equivalent Cross Slope	0.057 ft/ft
Length Factor	0.816
Total Interception Length	19.6 ft

Worksheet for Inlet 22 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	13.96 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	10.4 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	56.22 %
Intercepted Flow	7.85 cfs
Bypass Flow	6.11 cfs
Spread	21.4 ft
Depth	5.8 in
Flow Area	4.6 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	3.02 ft/s
Equivalent Cross Slope	0.049 ft/ft
Length Factor	0.368
Total Interception Length	28.3 ft

Worksheet for Inlet 24 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	13.51 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	10.4 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	57.06 %
Intercepted Flow	7.71 cfs
Bypass Flow	5.80 cfs
Spread	21.1 ft
Depth	5.7 in
Flow Area	4.5 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	3.00 ft/s
Equivalent Cross Slope	0.049 ft/ft
Length Factor	0.375
Total Interception Length	27.7 ft

Worksheet for Inlet 26 - Curb Opening in Sag

Project Description	
Solve For	Spread
Input Data	
Discharge	13.61 cfs
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Curb Opening Length	18.4 ft
Opening Height	0.5 ft
Curb Throat Type	Horizontal
Local Depression	2.0 in
Local Depression Width	17.0 in
Throat Incline Angle	90.00 degrees
Results	
Spread	19.7 ft
Depth	5.4 in
Gutter Depression	0.7 in
Total Depression	2.7 in

Worksheet for Inlet 28 - Curb Opening in Sag

Project Description	
Solve For	Spread
Input Data	
Discharge	14.00 cfs
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Curb Opening Length	18.4 ft
Opening Height	0.5 ft
Curb Throat Type	Horizontal
Local Depression	2.0 in
Local Depression Width	17.0 in
Throat Incline Angle	90.00 degrees
Results	
Spread	20.0 ft
Depth	5.5 in
Gutter Depression	0.7 in
Total Depression	2.7 in

Worksheet for Inlet 30 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	8.48 cfs
Slope	0.008 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	86.69 %
Intercepted Flow	7.35 cfs
Bypass Flow	1.13 cfs
Spread	16.2 ft
Depth	4.5 in
Flow Area	2.7 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	3.19 ft/s
Equivalent Cross Slope	0.058 ft/ft
Length Factor	0.674
Total Interception Length	23.7 ft

Worksheet for Inlet 32 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	8.64 cfs
Slope	0.008 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	86.16 %
Intercepted Flow	7.44 cfs
Bypass Flow	1.20 cfs
Spread	16.3 ft
Depth	4.6 in
Flow Area	2.7 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	3.21 ft/s
Equivalent Cross Slope	0.058 ft/ft
Length Factor	0.667
Total Interception Length	24.0 ft

Worksheet for Inlet 34 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	2.89 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	10.4 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	98.59 %
Intercepted Flow	2.85 cfs
Bypass Flow	0.04 cfs
Spread	11.7 ft
Depth	3.5 in
Flow Area	1.4 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.06 ft/s
Equivalent Cross Slope	0.072 ft/ft
Length Factor	0.906
Total Interception Length	11.5 ft

Worksheet for Inlet 36 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	3.03 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	10.4 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	97.85 %
Intercepted Flow	2.96 cfs
Bypass Flow	0.07 cfs
Spread	11.9 ft
Depth	3.5 in
Flow Area	1.5 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.09 ft/s
Equivalent Cross Slope	0.072 ft/ft
Length Factor	0.882
Total Interception Length	11.8 ft

Worksheet for Inlet 38 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	5.72 cfs
Slope	0.010 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	94.71 %
Intercepted Flow	5.42 cfs
Bypass Flow	0.30 cfs
Spread	13.3 ft
Depth	3.9 in
Flow Area	1.8 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	3.16 ft/s
Equivalent Cross Slope	0.066 ft/ft
Length Factor	0.805
Total Interception Length	19.9 ft

Worksheet for Inlet 40 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	4.57 cfs
Slope	0.010 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	98.87 %
Intercepted Flow	4.52 cfs
Bypass Flow	0.05 cfs
Spread	12.2 ft
Depth	3.6 in
Flow Area	1.5 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	3.00 ft/s
Equivalent Cross Slope	0.070 ft/ft
Length Factor	0.917
Total Interception Length	17.4 ft

Worksheet for Inlet 42 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	5.39 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	10.4 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	83.37 %
Intercepted Flow	4.49 cfs
Bypass Flow	0.90 cfs
Spread	14.9 ft
Depth	4.2 in
Flow Area	2.3 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.39 ft/s
Equivalent Cross Slope	0.061 ft/ft
Length Factor	0.631
Total Interception Length	16.5 ft

Worksheet for Inlet 44 - Curb Opening on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	5.39 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	10.4 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	83.37 %
Intercepted Flow	4.49 cfs
Bypass Flow	0.90 cfs
Spread	14.9 ft
Depth	4.2 in
Flow Area	2.3 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.39 ft/s
Equivalent Cross Slope	0.061 ft/ft
Length Factor	0.631
Total Interception Length	16.5 ft

Worksheet for Inlet 46 - Scupper in Sag

Project Description	
Solve For	Spread
Input Data	
Discharge	11.87 cfs
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Curb Opening Length	16.0 ft
Opening Height	0.5 ft
Curb Throat Type	Horizontal
Local Depression	2.0 in
Local Depression Width	17.0 in
Throat Incline Angle	90.00 degrees
Results	
Spread	19.7 ft
Depth	5.4 in
Gutter Depression	0.7 in
Total Depression	2.7 in

Worksheet for Inlet 48 - Scupper on Grade

Project Description	
Solve For	Efficiency
Input Data	
Discharge	8.71 cfs
Slope	0.005 ft/ft
Gutter Width	1.42 ft
Gutter Cross Slope	0.059 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Curb Opening Length	16.0 ft
Local Depression	2.0 in
Local Depression Width	17.0 in
Results	
Efficiency	91.02 %
Intercepted Flow	7.93 cfs
Bypass Flow	0.78 cfs
Spread	17.9 ft
Depth	5.0 in
Flow Area	3.2 ft ²
Gutter Depression	0.7 in
Total Depression	2.7 in
Velocity	2.69 ft/s
Equivalent Cross Slope	0.054 ft/ft
Length Factor	0.738
Total Interception Length	21.7 ft



Appendix E - HEC-1 Output

E.1 50-Year 6-Hour Output

E.2 50-Year 24-Hour Output



E.1 50-Year 6-Hour Output

El Mirage DCR

50-Year 6-Hour HEC-1 Output

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 24SEP24 TIME 09:13:03
*
*****
```

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

```

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

```

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

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

1 HEC-1 INPUT PAGE 1

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

1 ID Project ID: W7Y63700 El Mirage
2 ID Offsite Subbasin Check Model
3 ID 50-Year 6-Hour Storm
4 ID SCS Type II Precipitation Distribution
5 ID Green and Ampt Loss Method
6 ID Clark Unit Hydrograph
7 ID *****
8 ID
9 ID
10 ID *****
11 IT 5 1000
12 IN 15
13 IO 3
*
*DIAGRAM
*

*** FREE ***
*** FREE ***

14 JD 2.270 0.01
15 PC 0.000 0.009 0.016 0.025 0.034 0.042 0.051 0.059 0.067 0.076
16 PC 0.087 0.100 0.120 0.163 0.252 0.451 0.694 0.837 0.900 0.938
17 PC 0.950 0.963 0.975 0.988 1.000
18 JD 2.256 0.50
19 JD 2.240 1.00
*

20 KK SUBB1
21 KM Area North of Happy Valley
22 BA 0.235
23 LG 0.35 0.12 15.44 0.14 0
24 UC 0.481 0.300
25 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
26 UA 100
*

27 KK SUBB2
28 KM Area South of Happy Valley
29 BA 0.102
30 LG 0.35 0.14 15.52 0.15 0
31 UC 0.381 0.256
32 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
33 UA 100
*

34 KK SUBB
35 KM Total Area to El Mirage Crossing
36 BA 0.337
37 LG 0.35 0.13 15.46 0.14 0
38 UC 0.631 0.487
39 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
40 UA 100
*
```

1 HEC-1 INPUT PAGE 2

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

50-Year 6-Hour HEC-1 Output

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

El Mirage DCR

50-Year 6-Hour HEC-1 Output

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 24SEP24 TIME 09:13:03
*
*****
```

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

```
Project ID: W7Y63700 El Mirage
Offsite Subbasin Check Model
50-Year 6-Hour Storm
SCS Type II Precipitation Distribution
Green and Ampt Loss Method
Clark Unit Hydrograph
*****
```

```
13 IO      OUTPUT CONTROL VARIABLES
           IPRNT      3 PRINT CONTROL
           IPLOT      0 PLOT CONTROL
           QSCAL      0. HYDROGRAPH PLOT SCALE

12 IN      TIME DATA FOR INPUT TIME SERIES
           JXMIN      15 TIME INTERVAL IN MINUTES
           JXDATE      1 0 STARTING DATE
           JXTIME      0 STARTING TIME

IT         HYDROGRAPH TIME DATA
           NMIN       5 MINUTES IN COMPUTATION INTERVAL
           IDATE      1 0 STARTING DATE
           ITIME      0000 STARTING TIME
           NQ         1000 NUMBER OF HYDROGRAPH ORDINATES
           NDDATE     4 0 ENDING DATE
           NDDTIME    1115 ENDING TIME
           ICENT      19 CENTURY MARK

           COMPUTATION INTERVAL .08 HOURS
           TOTAL TIME BASE 83.25 HOURS
```

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

```
14 JD      INDEX STORM NO. 1
           STRM      2.27 PRECIPITATION DEPTH
           TRDA      .01 TRANSPOSITION DRAINAGE AREA
```

```
15 PI      PRECIPITATION PATTERN
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .01 .01 .01 .01 .01 .03
           .03 .03 .07 .07 .07 .08 .08 .08 .05
           .05 .02 .02 .02 .01 .01 .01 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00
```

```
18 JD      INDEX STORM NO. 2
           STRM      2.26 PRECIPITATION DEPTH
           TRDA      .50 TRANSPOSITION DRAINAGE AREA
```

```
0 PI      PRECIPITATION PATTERN
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .01 .01 .01 .01 .01 .03
           .03 .03 .07 .07 .07 .08 .08 .08 .05
           .05 .02 .02 .02 .01 .01 .01 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00
```

```
19 JD      INDEX STORM NO. 3
           STRM      2.24 PRECIPITATION DEPTH
           TRDA      1.00 TRANSPOSITION DRAINAGE AREA
```

```
0 PI      PRECIPITATION PATTERN
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .00 .00 .00 .00 .00 .00
           .00 .00 .00 .01 .01 .01 .01 .01 .03
           .03 .03 .07 .07 .07 .08 .08 .08 .05
           .05 .02 .02 .02 .01 .01 .01 .00 .00
```



```

.00      .00      .00      .00      .00      .00      .00      .00      .00      .00
.00      .00

*** **
***

*****
*      *
20 KK      SUBB1  *
*      *
*****

Area North of Happy Valley

SUBBASIN RUNOFF DATA

22 BA      SUBBASIN CHARACTERISTICS
TAREA      .23      SUBBASIN AREA

23 LG      GREEN AND AMPT LOSS RATE
STRTL      .35      STARTING LOSS
DTH        .12      MOISTURE DEFICIT
PSIF       15.44     WETTING FRONT SUCTION
XKSAT      .14      HYDRAULIC CONDUCTIVITY
RTIMP      .00      PERCENT IMPERVIOUS AREA

24 UC      CLARK UNITGRAPH
TC          .48      TIME OF CONCENTRATION
R          .30      STORAGE COEFFICIENT

25 UA      ACCUMULATED-AREA VS. TIME, 11 ORDINATES
.0          3.0      5.0      8.0      12.0      20.0      43.0      75.0      90.0      96.0
100.0

***

UNIT HYDROGRAPH PARAMETERS
CLARK      TC= .48 HR,      R= .30 HR
SNYDER     TP= .41 HR,      CP= .81

UNIT HYDROGRAPH
23 END-OF-PERIOD ORDINATES
10.      29.      67.      190.      298.      286.      229.      173.      131.      99.
75.      57.      43.      32.      24.      19.      14.      11.      8.      6.
5.      3.      3.

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

HYDROGRAPH AT STATION      SUBB1
TRANSPPOSITION AREA      .0 SQ MI

TOTAL RAINFALL =      2.27, TOTAL LOSS =      1.43, TOTAL EXCESS =      .84

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+ 156.      4.33      (CFS)      21.      5.      2.      2.
(INCHES)      .833      .833      .833      .833
(AC-FT)      10.      10.      10.      10.

CUMULATIVE AREA =      .23 SQ MI

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

HYDROGRAPH AT STATION      SUBB1
TRANSPPOSITION AREA      .5 SQ MI

TOTAL RAINFALL =      2.26, TOTAL LOSS =      1.43, TOTAL EXCESS =      .83

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+ 154.      4.33      (CFS)      21.      5.      2.      1.
(INCHES)      .822      .822      .822      .822
(AC-FT)      10.      10.      10.      10.

CUMULATIVE AREA =      .23 SQ MI

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

HYDROGRAPH AT STATION      SUBB1
TRANSPPOSITION AREA      1.0 SQ MI

TOTAL RAINFALL =      2.24, TOTAL LOSS =      1.43, TOTAL EXCESS =      .81

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+ (CFS)      (HR)
(CFS)

```

El Mirage DCR

50-Year 6-Hour HEC-1 Output

+	152.	4.33		20.	5.	2.	1.
			(INCHES)	.809	.809	.809	.809
			(AC-FT)	10.	10.	10.	10.

CUMULATIVE AREA = .23 SQ MI

INTERPOLATED HYDROGRAPH AT SUBB1

PEAK FLOW	TIME		6-HR	24-HR	72-HR	83.25-HR
+	(CFS)	(HR)				
		(CFS)				
+	155.	4.33	21.	5.	2.	2.
		(INCHES)	.824	.824	.824	.824
		(AC-FT)	10.	10.	10.	10.

CUMULATIVE AREA = .23 SQ MI

27 KK *****
* SUBB2 *
*

Area South of Happy Valley

SUBBASIN RUNOFF DATA

29 BA	SUBBASIN CHARACTERISTICS									
	TAREA	.10	SUBBASIN AREA							
30 LG	GREEN AND AMPT LOSS RATE									
	STRTL	.35	STARTING LOSS							
	DTH	.14	MOISTURE DEFICIT							
	PSIF	15.52	WETTING FRONT SUCTION							
	XKSAT	.15	HYDRAULIC CONDUCTIVITY							
	RTIMP	.00	PERCENT IMPERVIOUS AREA							
31 UC	CLARK UNITGRAPH									
	TC	.38	TIME OF CONCENTRATION							
	R	.26	STORAGE COEFFICIENT							
32 UA	ACCUMULATED-AREA VS. TIME, 11 ORDINATES									
	.0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0
	100.0									

UNIT HYDROGRAPH PARAMETERS
CLARK TC= .38 HR, R= .26 HR
SNYDER TP= .33 HR, CP= .75

UNIT HYDROGRAPH 20 END-OF-PERIOD ORDINATES									
6.	21.	76.	143.	146.	111.	80.	58.	42.	30.
22.	16.	11.	8.	6.	4.	3.	2.	2.	1.

HYDROGRAPH AT STATION SUBB2
TRANSPPOSITION AREA .0 SQ MI

TOTAL RAINFALL = 2.27, TOTAL LOSS = 1.52, TOTAL EXCESS = .75

PEAK FLOW	TIME		6-HR	24-HR	72-HR	83.25-HR
+	(CFS)	(HR)				
		(CFS)				
+	68.	4.25	8.	2.	1.	1.
		(INCHES)	.744	.744	.744	.744
		(AC-FT)	4.	4.	4.	4.

CUMULATIVE AREA = .10 SQ MI

HYDROGRAPH AT STATION SUBB2
TRANSPPOSITION AREA .5 SQ MI

TOTAL RAINFALL = 2.26, TOTAL LOSS = 1.52, TOTAL EXCESS = .74

PEAK FLOW	TIME		6-HR	24-HR	72-HR	83.25-HR
+	(CFS)	(HR)				

El Mirage DCR

50-Year 6-Hour HEC-1 Output

```
(CFS)
+ 67. 4.25 8. 2. 1. 1.
(INCHES) .733 .733 .733 .733
(AC-FT) 4. 4. 4. 4.

CUMULATIVE AREA = .10 SQ MI

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

HYDROGRAPH AT STATION SUBB2
TRANSPPOSITION AREA 1.0 SQ MI

TOTAL RAINFALL = 2.24, TOTAL LOSS = 1.52, TOTAL EXCESS = .72

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
+ (CFS) (HR) 6-HR 24-HR 72-HR 83.25-HR
+ 66. 4.25 (CFS) 8. 2. 1. 1.
(INCHES) .720 .720 .720 .720
(AC-FT) 4. 4. 4. 4.

CUMULATIVE AREA = .10 SQ MI

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

INTERPOLATED HYDROGRAPH AT SUBB2

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
+ (CFS) (HR) 6-HR 24-HR 72-HR 83.25-HR
+ 67. 4.25 (CFS) 8. 2. 1. 1.
(INCHES) .738 .738 .738 .738
(AC-FT) 4. 4. 4. 4.

CUMULATIVE AREA = .10 SQ MI

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

*****
* *
34 KK * SUBB *
* *
*****

Total Area to El Mirage Crossing

SUBBASIN RUNOFF DATA

36 BA SUBBASIN CHARACTERISTICS
TAREA .34 SUBBASIN AREA

37 LG GREEN AND AMPT LOSS RATE
STRTL .35 STARTING LOSS
DTH .13 MOISTURE DEFICIT
PSIF 15.46 WETTING FRONT SUCTION
XKSAT .14 HYDRAULIC CONDUCTIVITY
RTIMP .00 PERCENT IMPERVIOUS AREA

38 UC CLARK UNITGRAPH
TC .63 TIME OF CONCENTRATION
R .49 STORAGE COEFFICIENT

39 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
100.0

***

UNIT HYDROGRAPH PARAMETERS
CLARK TC= .63 HR, R= .49 HR
SNYDER TP= .55 HR, CP= .74

UNIT HYDROGRAPH
36 END-OF-PERIOD ORDINATES
7. 21. 34. 69. 162. 265. 294. 271. 234. 197.
166. 140. 118. 99. 84. 71. 59. 50. 42. 36.
30. 25. 21. 18. 15. 13. 11. 9. 8. 6.
5. 5. 4. 3. 3. 2.

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

HYDROGRAPH AT STATION SUBB
TRANSPPOSITION AREA .0 SQ MI

TOTAL RAINFALL = 2.27, TOTAL LOSS = 1.46, TOTAL EXCESS = .81
```

El Mirage DCR

50-Year 6-Hour HEC-1 Output

PEAK FLOW	TIME	6-HR	24-HR	72-HR	83.25-HR	
+	(CFS)	(HR)	(CFS)	(INCHES)	(AC-FT)	(CFS)
+	171.	4.50	29.	7.	2.	2.
			.805	.805	.805	.805
			14.	14.	14.	14.
CUMULATIVE AREA =			.34 SQ MI			

HYDROGRAPH AT STATION SUBB
TRANSPOSITION AREA .5 SQ MI

TOTAL RAINFALL = 2.26, TOTAL LOSS = 1.46, TOTAL EXCESS = .80

PEAK FLOW	TIME	6-HR	24-HR	72-HR	83.25-HR	
+	(CFS)	(HR)	(CFS)	(INCHES)	(AC-FT)	(CFS)
+	169.	4.50	29.	7.	2.	2.
			.794	.794	.794	.794
			14.	14.	14.	14.
CUMULATIVE AREA =			.34 SQ MI			

HYDROGRAPH AT STATION SUBB
TRANSPOSITION AREA 1.0 SQ MI

TOTAL RAINFALL = 2.24, TOTAL LOSS = 1.46, TOTAL EXCESS = .78

PEAK FLOW	TIME	6-HR	24-HR	72-HR	83.25-HR	
+	(CFS)	(HR)	(CFS)	(INCHES)	(AC-FT)	(CFS)
+	166.	4.50	28.	7.	2.	2.
			.781	.781	.781	.781
			14.	14.	14.	14.
CUMULATIVE AREA =			.34 SQ MI			

INTERPOLATED HYDROGRAPH AT SUBB

PEAK FLOW	TIME	6-HR	24-HR	72-HR	83.25-HR	
+	(CFS)	(HR)	(CFS)	(INCHES)	(AC-FT)	(CFS)
+	169.	4.50	29.	7.	2.	2.
			.795	.795	.795	.795
			14.	14.	14.	14.
CUMULATIVE AREA =			.34 SQ MI			

41 KK SUBA

West Area

SUBBASIN RUNOFF DATA

43 BA SUBBASIN CHARACTERISTICS
TAREA .07 SUBBASIN AREA

44 LG GREEN AND AMPT LOSS RATE
STRTL .35 STARTING LOSS
DTH .13 MOISTURE DEFICIT
PSIF 15.54 WETTING FRONT SUCTION
XKSAT .14 HYDRAULIC CONDUCTIVITY
RTIMP .00 PERCENT IMPERVIOUS AREA

45 UC CLARK UNITGRAPH
TC .28 TIME OF CONCENTRATION
R .19 STORAGE COEFFICIENT

46 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
100.0

El Mirage DCR

50-Year 6-Hour HEC-1 Output

```

***
UNIT HYDROGRAPH PARAMETERS
CLARK TC= .28 HR, R= .19 HR
SNYDER TP= .25 HR, CP= .76

UNIT HYDROGRAPH
14 END-OF-PERIOD ORDINATES
      8.      46.      112.      124.      82.      52.      33.      21.      13.      8.
      5.      3.      2.      1.

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

HYDROGRAPH AT STATION      SUBA
TRANSPOSITION AREA      .0 SQ MI

TOTAL RAINFALL =      2.27, TOTAL LOSS =      1.46, TOTAL EXCESS =      .81

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+      52.      4.17      (CFS)
      (INCHES)      6.      1.      0.      0.
      (AC-FT)      .803      .803      .803      .803
      3.      3.      3.      3.

CUMULATIVE AREA =      .07 SQ MI

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

HYDROGRAPH AT STATION      SUBA
TRANSPOSITION AREA      .5 SQ MI

TOTAL RAINFALL =      2.26, TOTAL LOSS =      1.46, TOTAL EXCESS =      .80

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+      52.      4.17      (CFS)
      (INCHES)      6.      1.      0.      0.
      (AC-FT)      .792      .792      .792      .792
      3.      3.      3.      3.

CUMULATIVE AREA =      .07 SQ MI

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

HYDROGRAPH AT STATION      SUBA
TRANSPOSITION AREA      1.0 SQ MI

TOTAL RAINFALL =      2.24, TOTAL LOSS =      1.46, TOTAL EXCESS =      .78

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+      51.      4.17      (CFS)
      (INCHES)      6.      1.      0.      0.
      (AC-FT)      .779      .779      .779      .779
      3.      3.      3.      3.

CUMULATIVE AREA =      .07 SQ MI

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

INTERPOLATED HYDROGRAPH AT      SUBA

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+      52.      4.17      (CFS)
      (INCHES)      6.      1.      0.      0.
      (AC-FT)      .798      .798      .798      .798
      3.      3.      3.      3.

CUMULATIVE AREA =      .07 SQ MI

```

El Mirage DCR
50-Year 6-Hour HEC-1 Output

RUNOFF SUMMARY

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	SUBB1	155.	4.33	21.	5.	2.	.23		
+	HYDROGRAPH AT	SUBB2	67.	4.25	8.	2.	1.	.10		
+	HYDROGRAPH AT	SUBB	169.	4.50	29.	7.	2.	.34		
+	HYDROGRAPH AT	SUBA	52.	4.17	6.	1.	0.	.07		

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



E.2 50-Year 24-Hour Output

El Mirage DCR

50-Year 24-Hour HEC-1 Output

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 24SEP24 TIME 09:13:28
*
*****
```

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

```

X      X XXXXXXXX XXXXX      X
X      X X      X      X      XX
X      X X      X      X      X
XXXXXXX XXXX      X      XXXXX X
X      X X      X      X      X
X      X X      X      X      X
X      X XXXXXXXX XXXXX      XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

```

1 ID Project ID: W7Y63700 El Mirage
2 ID Offsite Subbasin Check Model
3 ID 50-Year 24-Hour Storm
4 ID SCS Type II Precipitation Distribution
5 ID Green and Ampt Loss Method
6 ID Clark Unit Hydrograph
7 ID *****
8 ID
9 ID
10 ID *****
11 IT 5 1000
12 IN 15
13 IO 3
*
*DIAGRAM
*
```

*** FREE ***
*** FREE ***

14	JD	3.170	0.01								
15	PC	0.000	0.002	0.005	0.008	0.011	0.014	0.017	0.020	0.023	0.026
16	PC	0.029	0.032	0.035	0.038	0.041	0.044	0.048	0.052	0.056	0.060
17	PC	0.064	0.068	0.072	0.076	0.080	0.085	0.090	0.095	0.100	0.105
18	PC	0.110	0.115	0.120	0.126	0.133	0.140	0.147	0.155	0.163	0.172
19	PC	0.181	0.191	0.203	0.218	0.236	0.257	0.283	0.387	0.663	0.707
20	PC	0.735	0.758	0.776	0.791	0.804	0.815	0.825	0.834	0.842	0.849
21	PC	0.856	0.863	0.869	0.875	0.881	0.887	0.893	0.898	0.903	0.908
22	PC	0.913	0.918	0.922	0.926	0.930	0.934	0.938	0.942	0.946	0.950
23	PC	0.953	0.956	0.959	0.962	0.965	0.968	0.971	0.974	0.977	0.980
24	PC	0.983	0.986	0.989	0.992	0.995	0.998	1.000			
25	JD	3.012	10.0								
	*										

```

26 KK SUBB1
27 KM Area North of Happy Valley
28 BA 0.235
29 LG 0.35 0.12 15.44 0.14 0
30 UC 0.481 0.300
31 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
32 UA 100
*
```

```

33 KK SUBB2
34 KM Area South of Happy Valley
35 BA 0.102
36 LG 0.35 0.14 15.52 0.15 0
37 UC 0.381 0.256
38 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
39 UA 100
*
```

1 HEC-1 INPUT PAGE 2

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

```

40 KK SUBB
41 KM Total Area to El Mirage Crossing
42 BA 0.337
```

El Mirage DCR
50-Year 24-Hour HEC-1 Output

43	LG	0.35	0.13	15.46	0.14	0						
44	UC	0.631	0.487									
45	UA	0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0	
46	UA	100										
	*											
47	KK	SUBA										
48	KM	West Area										
49	BA	0.066										
50	LG	0.35	0.13	15.54	0.14	0						
51	UC	0.277	0.185									
52	UA	0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0	
53	UA	100										
	*											
54	ZZ											

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

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

26 SUBB1
.
.
33 . SUBB2
.
.
40 . SUBB
.
.
47 . SUBA

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

El Mirage DCR
50-Year 24-Hour HEC-1 Output

```
*****
*
*   FLOOD HYDROGRAPH PACKAGE   (HEC-1)
*           JUN   1998
*   VERSION 4.1
*
*   RUN DATE   24SEP24   TIME   09:13:28
*
*****
```

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

```

Project ID: W7Y63700 El Mirage
Offsite Subbasin Check Model
50-Year 24-Hour Storm
SCS Type II Precipitation Distribution
Green and Ampt Loss Method
Clark Unit Hydrograph
*****

```

13	IO	OUTPUT CONTROL VARIABLES		
		IPRNT	3	PRINT CONTROL
		IPLOT	0	PLOT CONTROL
		QSCAL	0.	HYDROGRAPH PLOT SCALE
12	IN	TIME DATA FOR INPUT TIME		SERIES
		JXMIN	15	TIME INTERVAL IN MINUTES
		JXDATE	1 0	STARTING DATE
		JXTIME	0	STARTING TIME
IT		HYDROGRAPH TIME DATA		
		NMIN	5	MINUTES IN COMPUTATION INTERVAL
		IDATE	1 0	STARTING DATE
		ITIME	0000	STARTING TIME
		NQ	1000	NUMBER OF HYDROGRAPH ORDINATES
		NDDATE	4 0	ENDING DATE
		NDTIME	1115	ENDING TIME
		ICENT	19	CENTURY MARK
		COMPUTATION INTERVAL		.08 HOURS
		TOTAL TIME BASE		83.25 HOURS

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

14 JD	INDEX	STORM NO. 1		
	STRM	3.17	PRECIPITATION	DEPTH
	TRDA	.01	TRANSPOSITION	DRAINAGE AREA

[illegible]

```

25 JD          INDEX STORM NO. 2
                STRM          3.01  PRECIPITATION DEPTH
                TRDA          10.00  TRANSPOSITION DRAINAGE AREA

```

50-Year 24-Hour HEC-1 Output

PEAK FLOW	TIME		6-HR	24-HR	72-HR	83.25-HR
+	(CFS)	(CFS)				
+	108.	12.25	10.	2.	1.	1.
		(INCHES)	.906	.906	.906	.906
		(AC-FT)	5.	5.	5.	5.
		CUMULATIVE AREA =		.10 SQ MI		

El Mirage DCR

50-Year 24-Hour HEC-1 Output

```
***          ***          ***          ***          ***
          HYDROGRAPH AT STATION  SUBB2
          TRANSPOSITION AREA  10.0 SQ MI

TOTAL RAINFALL = 3.01, TOTAL LOSS = 2.19, TOTAL EXCESS = .83

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+ 100.      12.25      (CFS)
          (INCHES)      .823      2.      1.      1.
          (AC-FT)      4.      .823      4.      .823      .823
          (AC-FT)      4.      4.      4.      4.

          CUMULATIVE AREA = .10 SQ MI

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

          INTERPOLATED HYDROGRAPH AT  SUBB2

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+ 105.      12.25      (CFS)
          (INCHES)      .878      2.      1.      1.
          (AC-FT)      5.      .878      5.      .878      .878
          (AC-FT)      5.      5.      5.      5.

          CUMULATIVE AREA = .10 SQ MI

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

*****
*          *
40 KK      *          SUBB      *
*          *
*****

          Total Area to El Mirage Crossing

SUBBASIN RUNOFF DATA

42 BA      SUBBASIN CHARACTERISTICS
          TAREA      .34  SUBBASIN AREA

43 LG      GREEN AND AMPT LOSS RATE
          STRTL      .35  STARTING LOSS
          DTH      .13  MOISTURE DEFICIT
          PSIF      15.46  WETTING FRONT SUCTION
          XKSAT      .14  HYDRAULIC CONDUCTIVITY
          RTIMP      .00  PERCENT IMPERVIOUS AREA

44 UC      CLARK UNITGRAPH
          TC      .63  TIME OF CONCENTRATION
          R      .49  STORAGE COEFFICIENT

45 UA      ACCUMULATED-AREA VS. TIME, 11 ORDINATES
          .0      3.0      5.0      8.0      12.0      20.0      43.0      75.0      90.0      96.0
          100.0

***

          UNIT HYDROGRAPH PARAMETERS
          CLARK TC= .63 HR, R= .49 HR
          SNYDER TP= .55 HR, CP= .74

          UNIT HYDROGRAPH
          36 END-OF-PERIOD ORDINATES
          7.      21.      34.      69.      162.      265.      294.      271.      234.      197.
          166.      140.      118.      99.      84.      71.      59.      50.      42.      36.
          30.      25.      21.      18.      15.      13.      11.      9.      8.      6.
          5.      5.      4.      3.      3.      2.

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

          HYDROGRAPH AT STATION  SUBB
          TRANSPOSITION AREA  .0 SQ MI

TOTAL RAINFALL = 3.17, TOTAL LOSS = 2.22, TOTAL EXCESS = .95

PEAK FLOW      TIME      MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)      6-HR      24-HR      72-HR      83.25-HR
+ 245.      12.42      (CFS)
          (INCHES)      .949      9.      3.      2.
          (AC-FT)      17.      .949      17.      17.      17.
          (AC-FT)      17.      17.      17.      17.
```

El Mirage DCR
50-Year 24-Hour HEC-1 Output

CUMULATIVE AREA = .34 SQ MI									
***	***	***	***	***					
HYDROGRAPH AT STATION SUBB									
TRANSPPOSITION AREA 10.0 SQ MI									
TOTAL RAINFALL = 3.01, TOTAL LOSS = 2.14, TOTAL EXCESS = .87									
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW					
		6-HR	24-HR	72-HR	83.25-HR				
+	(CFS)	(HR)							
		(CFS)							
+	226.	12.42	31.	8.	3.	2.			
		(INCHES)	.867	.867	.867	.867			
		(AC-FT)	16.	16.	16.	16.			
CUMULATIVE AREA = .34 SQ MI									
***	***	***	***	***	***				
INTERPOLATED HYDROGRAPH AT SUBB									
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW					
		6-HR	24-HR	72-HR	83.25-HR				
+	(CFS)	(HR)							
		(CFS)							
+	235.	12.42	33.	8.	3.	2.			
		(INCHES)	.907	.907	.907	.907			
		(AC-FT)	16.	16.	16.	16.			
CUMULATIVE AREA = .34 SQ MI									
*** **									
47 KK									

* *									
* SUBA *									
* *									

West Area									
SUBBASIN RUNOFF DATA									
49 BA SUBBASIN CHARACTERISTICS									
TAREA .07 SUBBASIN AREA									
50 LG GREEN AND AMPT LOSS RATE									
STRTL .35 STARTING LOSS									
DTH .13 MOISTURE DEFICIT									
PSIF 15.54 WETTING FRONT SUCTION									
XKSAT .14 HYDRAULIC CONDUCTIVITY									
RTIMP .00 PERCENT IMPERVIOUS AREA									
51 UC CLARK UNITGRAPH									
TC .28 TIME OF CONCENTRATION									
R .19 STORAGE COEFFICIENT									
52 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES									
.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0									
100.0									

UNIT HYDROGRAPH PARAMETERS									
CLARK TC= .28 HR, R= .19 HR									
SNYDER TP= .25 HR, CP= .76									
UNIT HYDROGRAPH									
14 END-OF-PERIOD ORDINATES									
8. 46. 112. 124. 82. 52. 33. 21. 13. 8.									
5. 3. 2. 1.									
***	***	***	***	***	***				
HYDROGRAPH AT STATION SUBA									
TRANSPPOSITION AREA .0 SQ MI									
TOTAL RAINFALL = 3.17, TOTAL LOSS = 2.22, TOTAL EXCESS = .95									
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW					
		6-HR	24-HR	72-HR	83.25-HR				
+	(CFS)	(HR)							
		(CFS)							
+	86.	12.17	7.	2.	1.	0.			
		(INCHES)	.948	.948	.948	.948			
		(AC-FT)	3.	3.	3.	3.			

El Mirage DCR
50-Year 24-Hour HEC-1 Output

		CUMULATIVE AREA =		.07 SQ MI	
***		***		***	
		HYDROGRAPH AT STATION		SUBA	
		TRANSPPOSITION AREA		10.0 SQ MI	
TOTAL RAINFALL =		3.01, TOTAL LOSS =		2.14, TOTAL EXCESS = .87	
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW	
		6-HR		24-HR 72-HR	
+	(CFS)	(CFS)		83.25-HR	
+	80. 12.17	6. 2. 1. 0.			
		.866 .866 .866 .866			
	(AC-FT)	3. 3. 3. 3.			
		CUMULATIVE AREA =		.07 SQ MI	
***		***		***	

		INTERPOLATED HYDROGRAPH AT		SUBA			
PEAK FLOW	TIME		6-HR	MAXIMUM AVERAGE FLOW	24-HR	72-HR	83.25-HR
+	(CFS)	(HR)	(CFS)				
+	84.	12.17	7.	2.	1.	0.	
			(INCHES)	.925	.925	.925	.925
			(AC-FT)	3.	3.	3.	3.
CUMULATIVE AREA =				.07 SQ MI			

1

		RUNOFF SUMMARY								
		FLOW IN CUBIC FEET PER SECOND								
		TIME IN HOURS, AREA IN SQUARE MILES								
	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	SUBB1	225.	12.33	24.	6.	2.	.23		
+	HYDROGRAPH AT	SUBB2	105.	12.25	10.	2.	1.	.10		
+	HYDROGRAPH AT	SUBB	235.	12.42	33.	8.	3.	.34		
+	HYDROGRAPH AT	SUBA	84.	12.17	7.	2.	1.	.07		

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



Appendix F - HY-8 Output Summary Sheets

HY-8 Culvert Analysis Report

Culvert A

Crossing Discharge Data

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

Minimum Flow: 50 cfs

Design Flow: 84 cfs

Maximum Flow: 100 cfs

Table 1 - Summary of Culvert Flows at Crossing: Culvert A

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1304.42	50.00	50.00	0.00	1
1304.56	55.00	55.00	0.00	1
1304.71	60.00	60.00	0.00	1
1304.86	65.00	65.00	0.00	1
1305.03	70.00	70.00	0.00	1
1305.20	75.00	75.00	0.00	1
1305.39	80.00	80.00	0.00	1
1305.55	84.00	84.00	0.00	1
1305.81	90.00	90.00	0.00	1
1306.04	95.00	95.00	0.00	1
1306.29	100.00	100.00	0.00	1
1306.60	105.38	105.38	0.00	Overtopping

Rating Curve Plot for Crossing: Culvert A

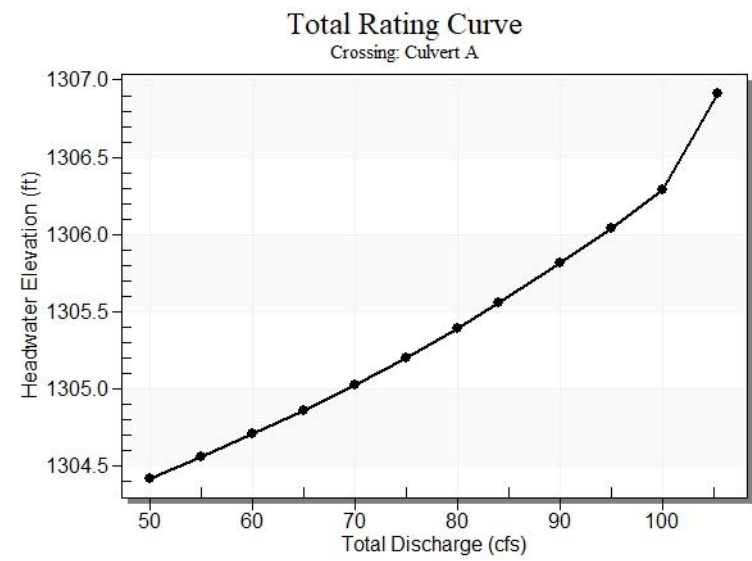


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
50.00	50.00	1304.42	1.964	0.0*	1-S2n	1.035	1.269	1.035	1.000	7.376	0.000
55.00	55.00	1304.56	2.103	0.662	5-S2n	1.097	1.332	1.097	1.000	7.544	0.000
60.00	60.00	1304.71	2.249	0.931	5-S2n	1.160	1.392	1.194	1.000	7.435	0.000
65.00	65.00	1304.86	2.403	1.215	5-S2n	1.223	1.448	1.223	1.000	7.825	0.000
70.00	70.00	1305.03	2.568	1.765	5-S2n	1.288	1.506	1.288	1.000	7.944	0.000
75.00	75.00	1305.20	2.745	2.054	5-S2n	1.355	1.557	1.392	1.000	7.806	0.000
80.00	80.00	1305.39	2.934	2.360	5-S2n	1.425	1.604	1.425	1.000	8.117	0.000
84.00	84.00	1305.55	3.095	0.0*	5-S2n	1.486	1.640	1.486	1.000	8.163	0.000
90.00	90.00	1305.81	3.353	3.021	5-S2n	1.589	1.690	1.589	1.000	8.203	0.000
95.00	95.00	1306.04	3.583	3.279	7-M2c	2.000	1.728	1.728	1.000	8.233	0.000
100.00	100.00	1306.29	3.828	3.635	7-M2c	2.000	1.761	1.761	1.000	8.533	0.000

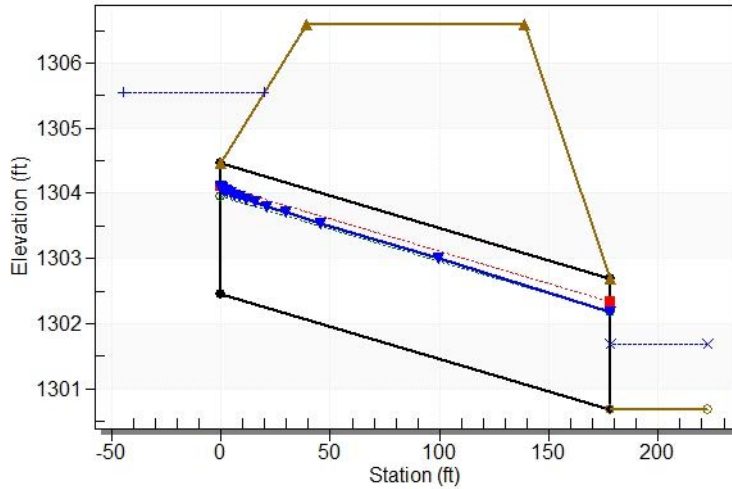
Straight Culvert

Inlet Elevation (invert): 1302.46 ft, Outlet Elevation (invert): 1300.69 ft

Culvert Length: 178.01 ft, Culvert Slope: 0.0099

Water Surface Profile Plot for Culvert: Culvert 1

Crossing - Culvert A, Design Discharge - 84.0 cfs
Culvert - Culvert 1, Culvert Discharge - 84.0 cfs



Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material:

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Channel Data - Culvert A

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 1301.69 ft

HY-8 Culvert Analysis Report

Culvert B

Crossing Discharge Data

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

Minimum Flow: 200 cfs

Design Flow: 235 cfs

Maximum Flow: 250 cfs

Table 1 - Summary of Culvert Flows at Crossing: Culvert B

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1309.82	200.00	200.00	0.00	1
1309.89	205.00	205.00	0.00	1
1309.98	210.00	210.00	0.00	1
1310.08	215.00	215.00	0.00	1
1310.24	220.00	220.00	0.00	1
1310.43	225.00	225.00	0.00	1
1310.57	230.00	230.00	0.00	1
1310.73	235.00	235.00	0.00	1
1310.90	240.00	240.00	0.00	1
1311.05	245.00	245.00	0.00	1
1311.23	250.00	250.00	0.00	1
1320.60	471.72	471.72	0.00	Overtopping

Rating Curve Plot for Crossing: Culvert B

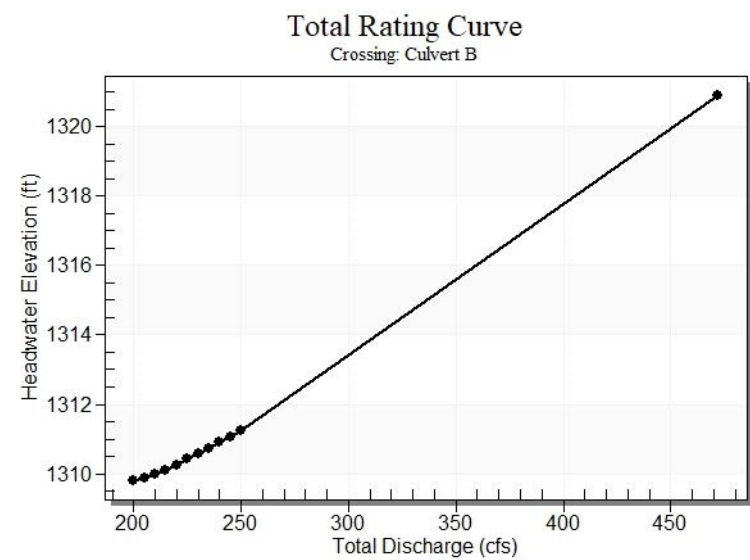


Table 2 - Culvert Summary Table: Culvert 1

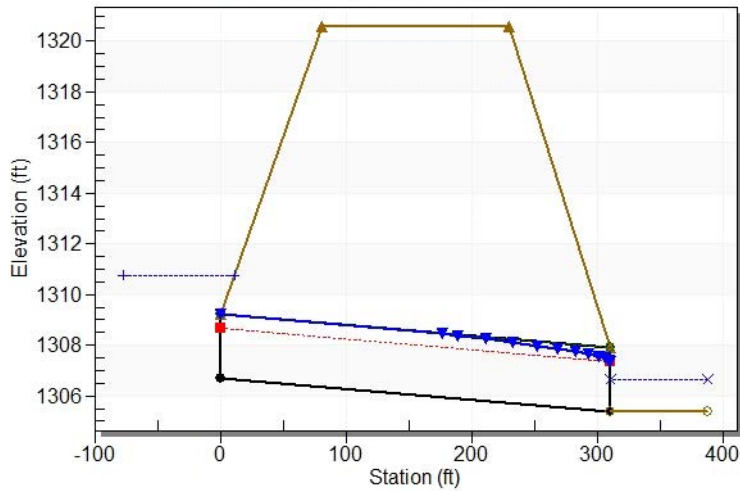
Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
200.00	200.00	1309.82	3.028	3.110	7-M2c	2.500	1.820	1.820	1.250	7.462	0.000
205.00	205.00	1309.89	3.094	3.182	7-M2c	2.500	1.843	1.843	1.250	7.550	0.000
210.00	210.00	1309.98	3.162	3.266	7-M2c	2.500	1.865	1.865	1.250	7.640	0.000
215.00	215.00	1310.08	3.231	3.369	7-M2c	2.500	1.886	1.886	1.250	7.730	0.000
220.00	220.00	1310.24	3.302	3.532	7-M2c	2.500	1.907	1.907	1.250	7.820	0.000
225.00	225.00	1310.43	3.374	3.719	7-M2c	2.500	1.928	1.928	1.250	7.912	0.000
230.00	230.00	1310.57	3.448	3.861	7-M2c	2.500	1.949	1.949	1.250	8.004	0.000
235.00	235.00	1310.73	3.524	4.018	7-M2c	2.500	1.968	1.968	1.250	8.097	0.000
240.00	240.00	1310.90	3.602	4.187	7-M2c	2.500	1.988	1.988	1.250	8.191	0.000
245.00	245.00	1311.05	3.681	4.335	7-M2c	2.500	2.007	2.007	1.250	8.286	0.000
250.00	250.00	1311.23	3.762	4.517	7-M2c	2.500	2.026	2.026	1.250	8.382	0.000

Straight Culvert

Inlet Elevation (invert): 1306.71 ft, Outlet Elevation (invert): 1305.40 ft
Culvert Length: 310.00 ft, Culvert Slope: 0.0042

Water Surface Profile Plot for Culvert: Culvert 1

Crossing - Culvert B, Design Discharge - 235.0 cfs
Culvert - Culvert 1, Culvert Discharge - 235.0 cfs



Culvert Data Summary - Culvert 1

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material:
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

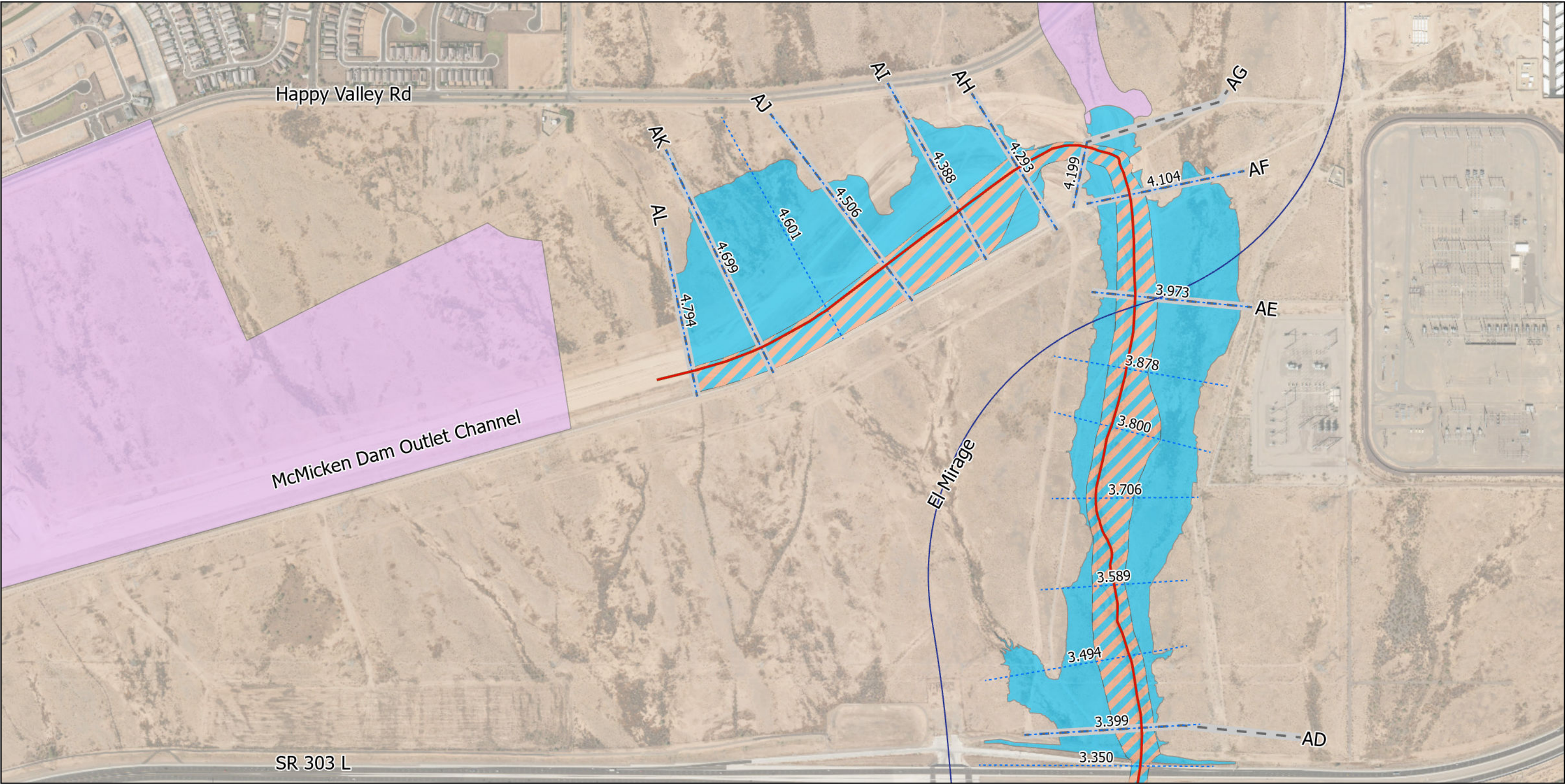
Tailwater Channel Data - Culvert B

Tailwater Channel Option: Enter Constant Tailwater Elevation

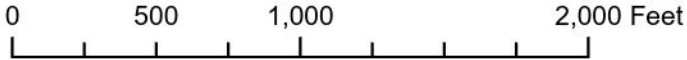
Constant Tailwater Elevation: 1306.65 ft



Appendix G - HEC-RAS Workmaps



HEC-RAS Workmap - Effective Model



Legend

— El Mirage Proposed Alignment

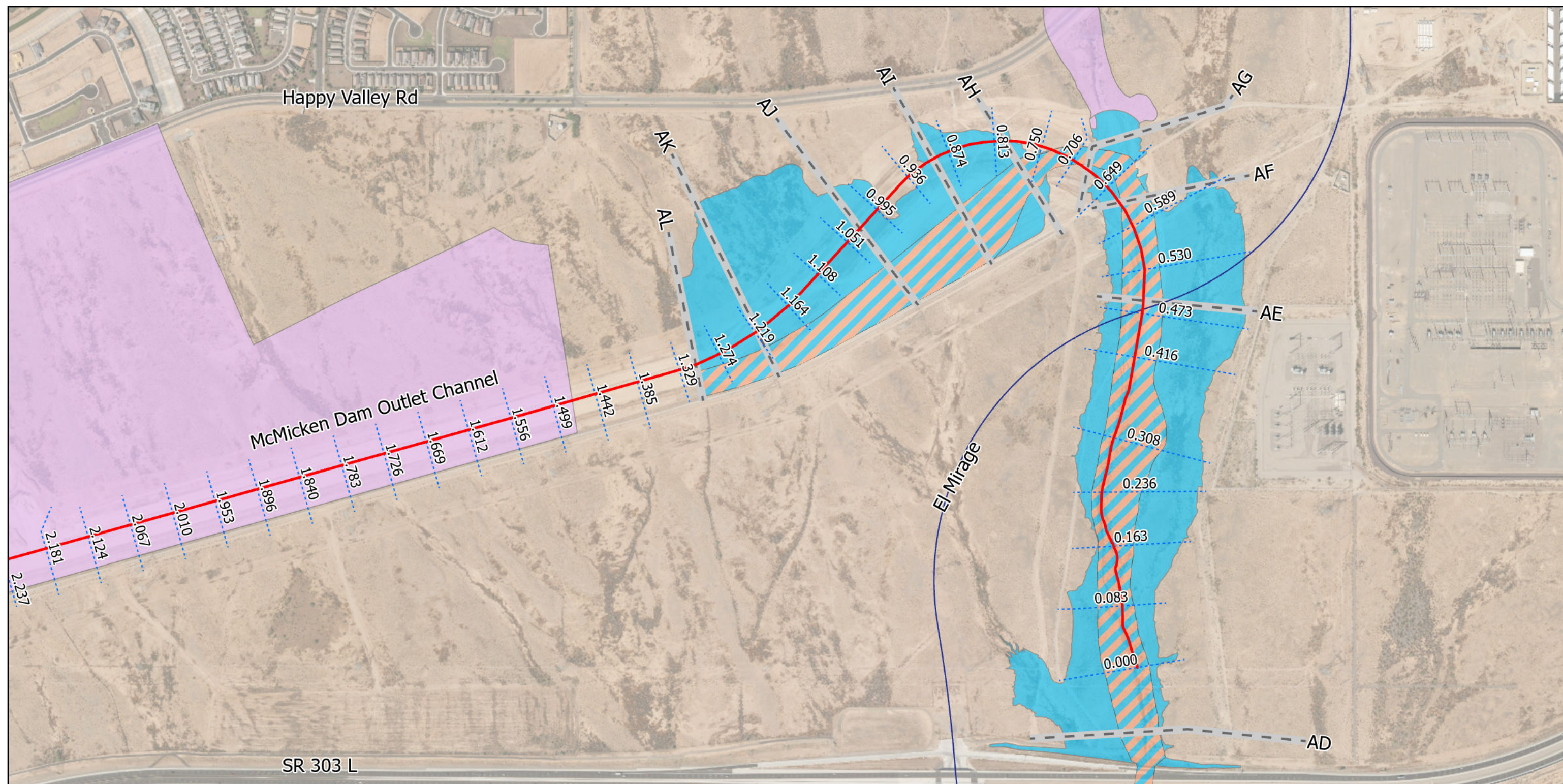
— Effective Centerline

--- Effective Cross Sections

--- FEMA Lettered Cross Sections

FEMA Special Flood Hazard Areas

- A
- AE
- AE FLOODWAY



HEC-RAS Workmap - FCDMC Model



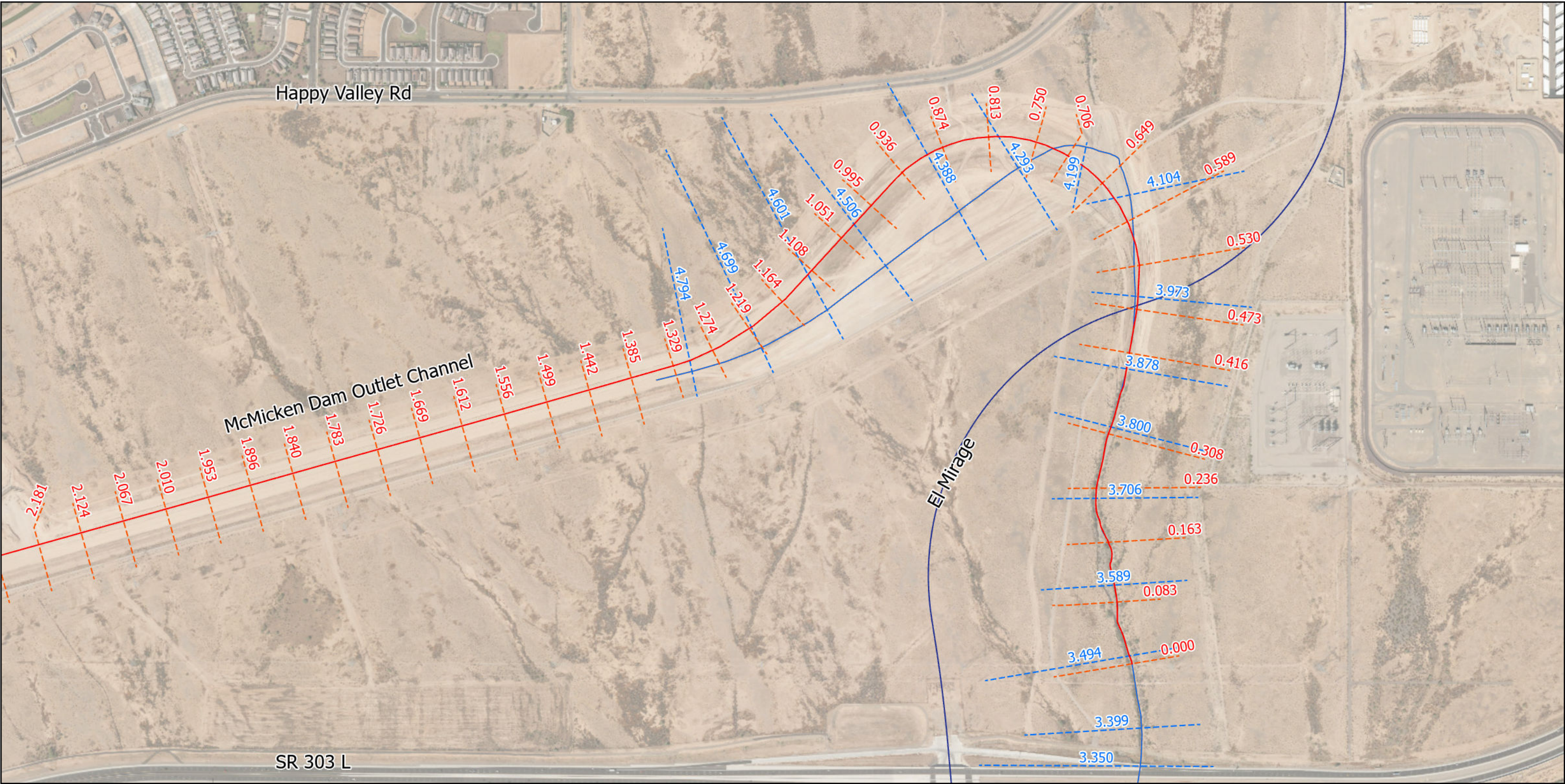
0 500 1,000 2,000 Feet

Legend

- El Mirage Proposed Alignment
- FCDMC Centerline
- FCDMC Cross Sections
- FEMA Lettered Cross Sections

FEMA Special Flood Hazard Areas

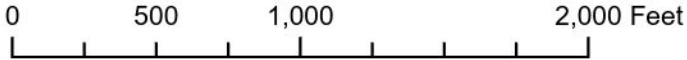
- A
- AE
- AE FLOODWAY
- Aerial Photography

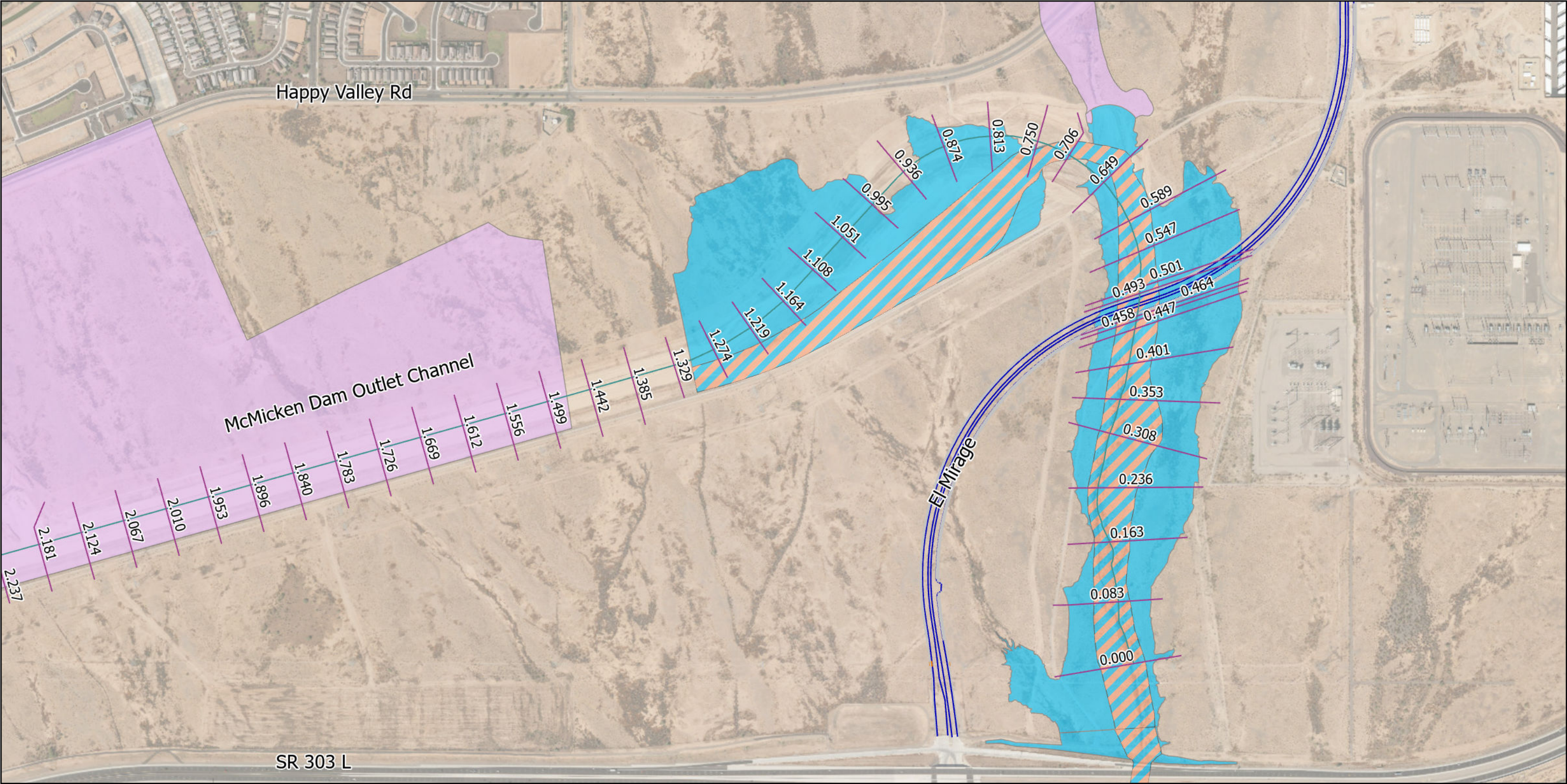


HEC-RAS Workmap - Spatial Comparison of Effective and FCDMC Models

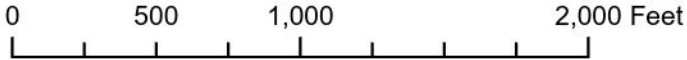
Legend

- FCDMC Centerline
- FCDMC Cross Sections
- Effective Centerline
- Effective Cross Sections
- Aerial Photography
- El Mirage Proposed Alignment





HEC-RAS Workmap - Corrected Effective Model

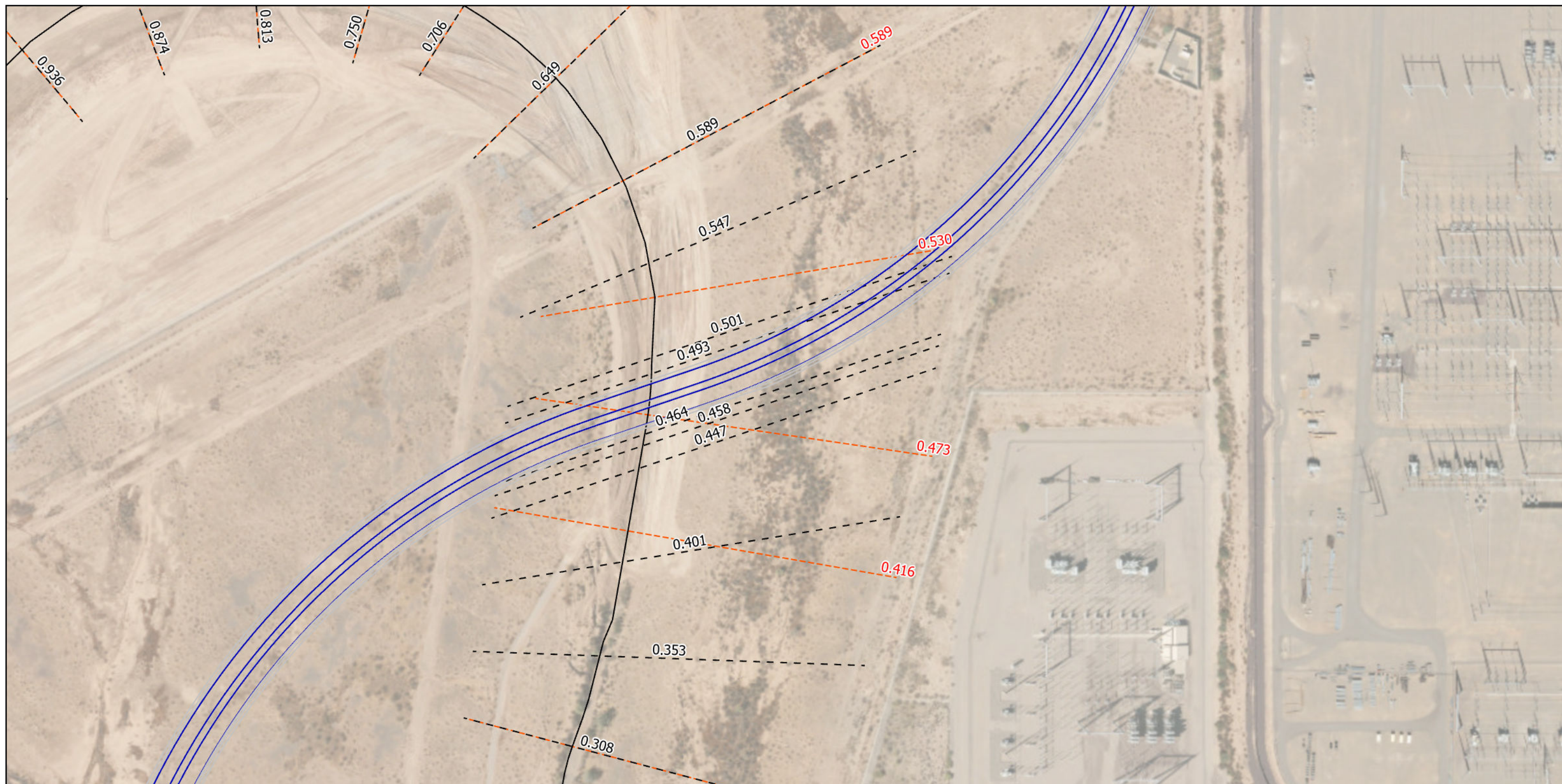


Legend

- Corrected Effective Cross Sections
- Corrected Effective Centerline

FEMA Special Flood Hazard Areas

- A
- AE
- AE FLOODWAY



HEC-RAS Workmap - Spatial Comparison of FCDMC and Corrected Effective Models

Legend

- - - Corrected Effective Cross Sections
- Corrected Effective Centerline
- FCDMC Centerline
- - - FCDMC Cross Sections
- Aerial Photography



0 250 500 1,000 Feet



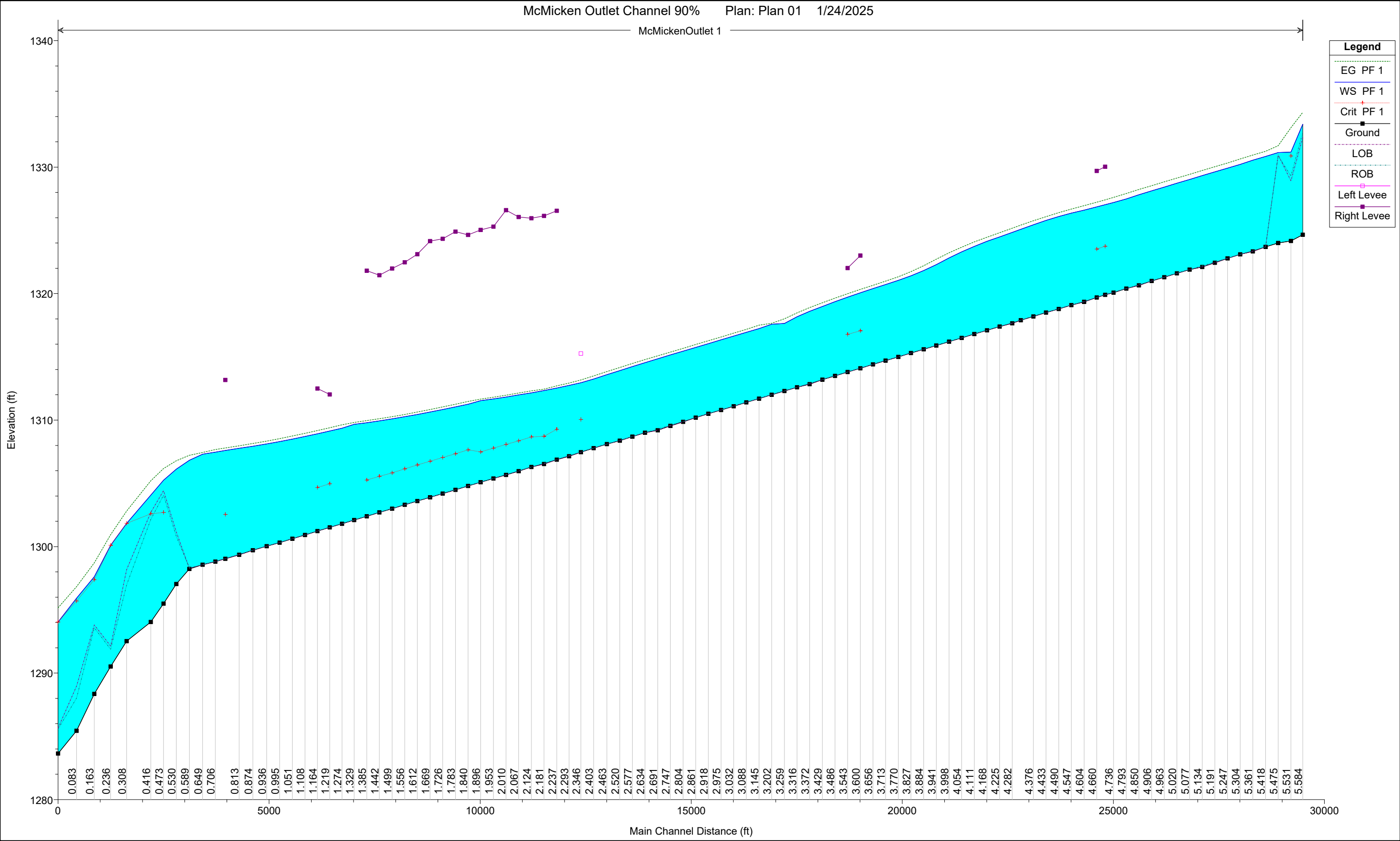
Appendix H - HEC-RAS Output - FCDMC Model

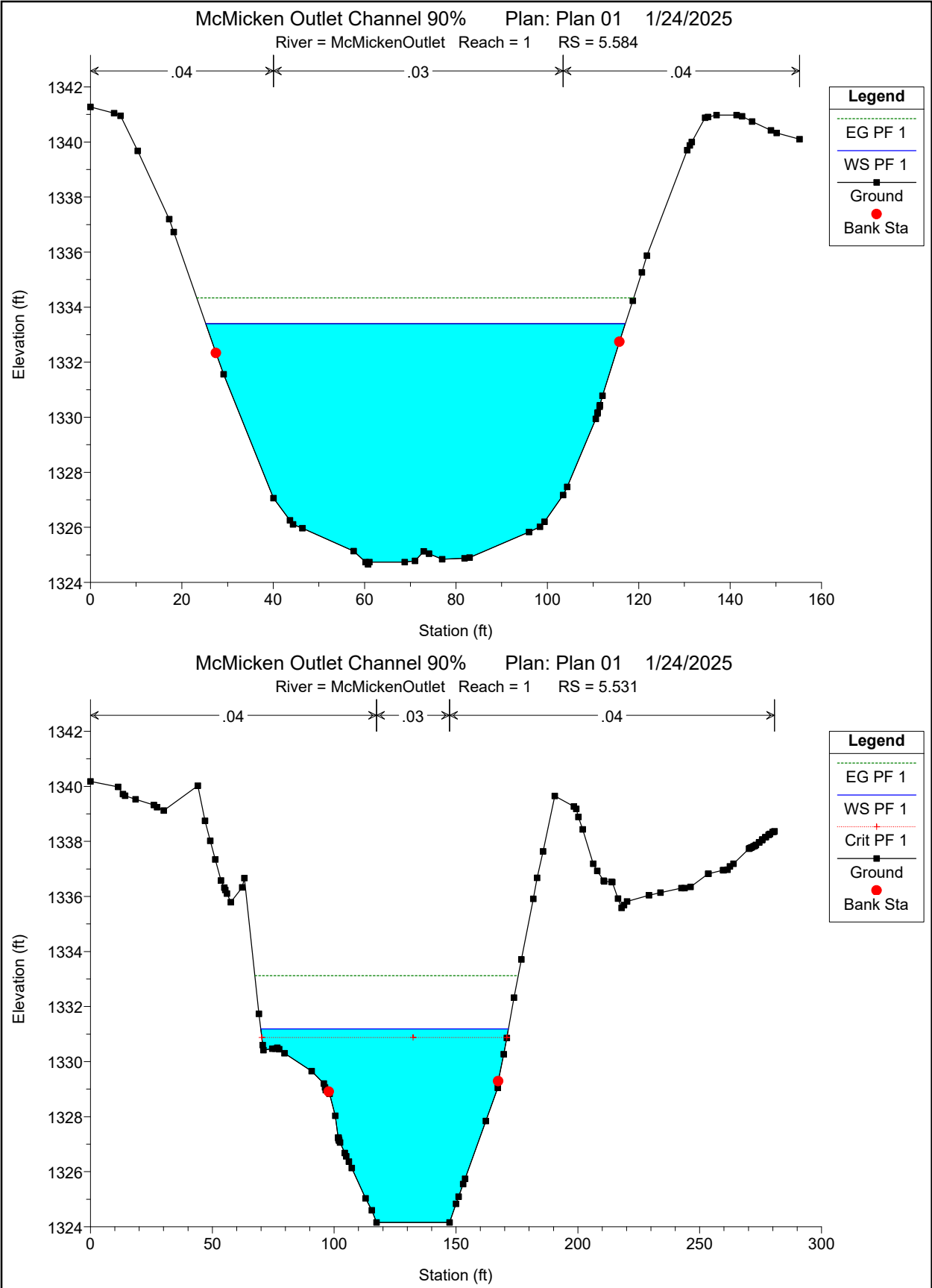
HEC-RAS Plan: Plan 01 River: McMickenOutlet Reach: 1 Profile: PF 1

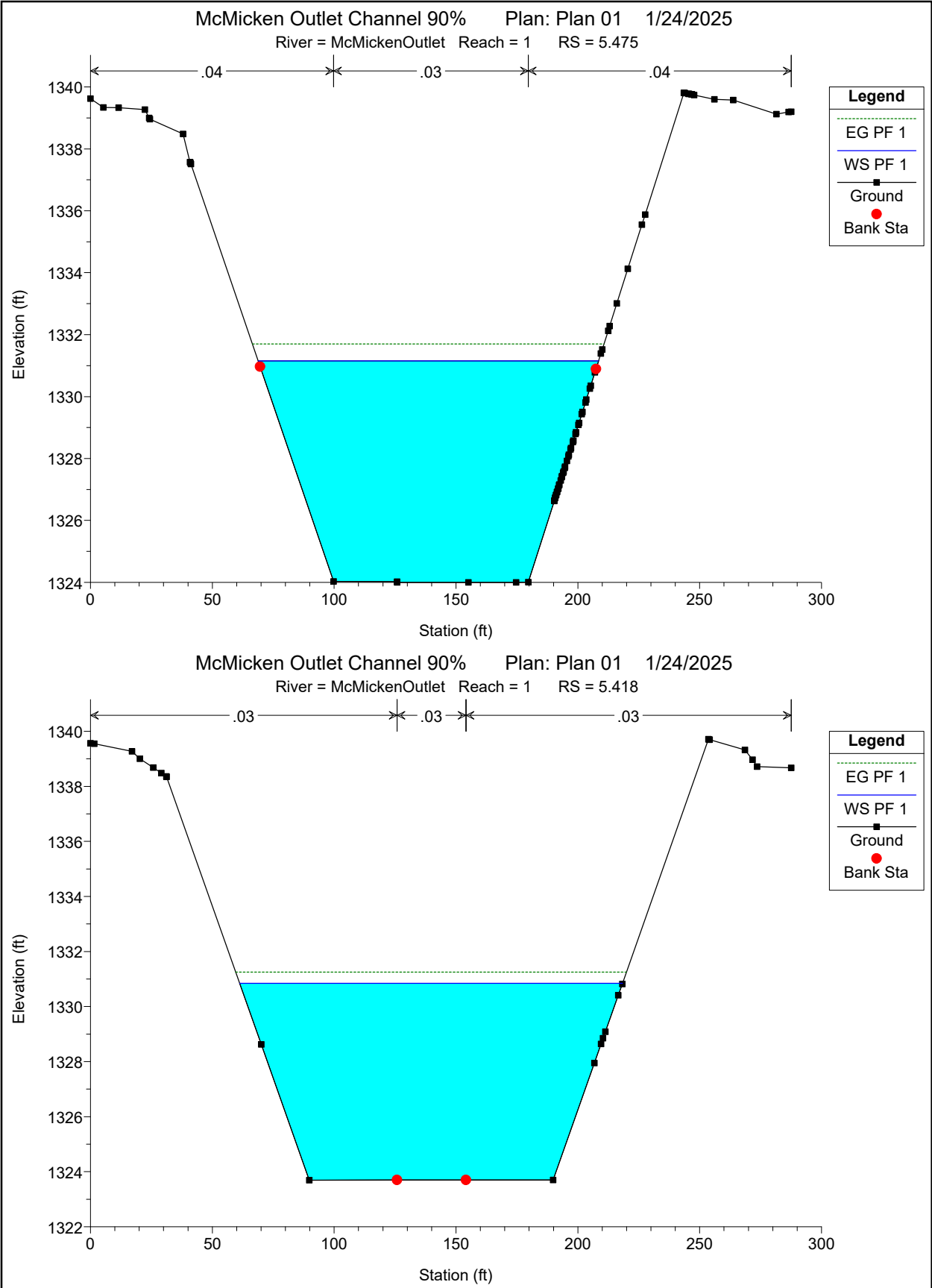
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	5.584	PF 1	4650.00	1324.66	1333.40		1334.33	0.002437	7.77	599.95	91.80	0.53
1	5.531	PF 1	4650.00	1324.16	1331.19	1330.88	1333.12	0.007492	11.31	436.82	101.59	0.83
1	5.475	PF 1	4650.00	1324.00	1331.15		1331.70	0.001894	5.93	783.76	139.66	0.44
1	5.418	PF 1	4650.00	1323.70	1330.85		1331.25	0.000991	5.79	919.23	157.14	0.38
1	5.361	PF 1	4650.00	1323.34	1330.55		1330.96	0.000986	5.79	920.41	157.13	0.38
1	5.304	PF 1	4650.00	1323.10	1330.22		1330.65	0.001045	5.92	888.63	149.72	0.39
1	5.247	PF 1	4650.00	1322.78	1329.93		1330.33	0.001000	5.81	916.09	156.90	0.38
1	5.191	PF 1	4650.00	1322.44	1329.63		1330.03	0.000998	5.81	916.55	156.91	0.38
1	5.134	PF 1	4650.00	1322.11	1329.33		1329.74	0.000996	5.81	917.08	156.90	0.38
1	5.077	PF 1	4650.00	1321.90	1329.03		1329.44	0.001002	5.81	915.61	156.90	0.38
1	5.020	PF 1	4650.00	1321.60	1328.73		1329.14	0.001002	5.81	915.43	156.84	0.38
1	4.963	PF 1	4650.00	1321.30	1328.43		1328.83	0.001003	5.81	915.25	156.84	0.38
1	4.906	PF 1	4650.00	1321.00	1328.12		1328.53	0.001004	5.81	915.14	156.87	0.38
1	4.850	PF 1	4650.00	1320.66	1327.82		1328.23	0.001002	5.82	915.30	156.84	0.38
1	4.793	PF 1	4650.00	1320.40	1327.48		1327.92	0.001064	5.96	882.85	149.40	0.39
1	4.736	PF 1	4650.00	1320.08	1327.20		1327.61	0.000954	5.66	915.75	157.67	0.37
1	4.698	PF 1	4650.00	1319.90	1327.03	1323.75	1327.41	0.000919	5.56	937.59	163.08	0.37
1	4.660	PF 1	4650.00	1319.70	1326.86	1323.53	1327.23	0.000888	5.48	955.42	167.03	0.36
1	4.604	PF 1	4650.00	1319.35	1326.60		1326.95	0.000878	5.49	991.91	174.68	0.36
1	4.547	PF 1	4650.00	1319.09	1326.37		1326.69	0.000806	5.28	1044.22	186.91	0.35
1	4.490	PF 1	4650.00	1318.79	1326.09		1326.40	0.001083	5.26	1051.21	188.08	0.34
1	4.433	PF 1	4650.00	1318.50	1325.79		1326.08	0.001032	5.13	1089.97	199.05	0.33
1	4.376	PF 1	4650.00	1318.20	1325.44		1325.76	0.001105	5.28	1046.44	188.92	0.35
1	4.319	PF 1	4650.00	1317.90	1325.09		1325.42	0.001163	5.39	1020.05	184.04	0.35
1	4.282	PF 1	4650.00	1317.65	1324.85		1325.18	0.001172	5.40	1019.74	185.00	0.36
1	4.225	PF 1	4650.00	1317.40	1324.48		1324.82	0.001204	5.43	1013.59	186.02	0.36
1	4.168	PF 1	4650.00	1317.10	1324.13		1324.46	0.001191	5.38	1033.06	193.71	0.36
1	4.111	PF 1	4650.00	1316.80	1323.74		1324.08	0.001283	5.53	997.51	187.39	0.37
1	4.054	PF 1	4650.00	1316.50	1323.30		1323.68	0.001416	5.73	954.53	180.66	0.39
1	3.998	PF 1	4650.00	1316.20	1322.82		1323.23	0.001559	5.91	923.74	178.81	0.40
1	3.941	PF 1	4650.00	1315.90	1322.29		1322.73	0.001765	6.14	888.45	177.95	0.43
1	3.884	PF 1	4650.00	1315.60	1321.82		1322.21	0.001604	5.75	947.72	194.65	0.41
1	3.827	PF 1	4650.00	1315.30	1321.40		1321.74	0.001406	5.32	1007.56	205.10	0.38
1	3.770	PF 1	4650.00	1315.00	1321.05		1321.34	0.001202	4.88	1080.99	217.76	0.35
1	3.713	PF 1	4650.00	1314.70	1320.72		1320.99	0.001078	4.61	1136.36	227.31	0.33
1	3.656	PF 1	4650.00	1314.40	1320.40		1320.66	0.001095	4.64	1133.72	228.22	0.33
1	3.600	PF 1	4650.00	1314.10	1320.07	1317.06	1320.33	0.001095	4.62	1143.77	233.12	0.33
1	3.543	PF 1	4650.00	1313.80	1319.72	1316.78	1319.99	0.001146	4.70	1116.14	227.10	0.34
1	3.486	PF 1	4650.00	1313.50	1319.36		1319.64	0.001188	4.76	1099.82	225.33	0.35
1	3.429	PF 1	4650.00	1313.20	1318.99		1319.28	0.001243	4.82	1083.23	224.23	0.35
1	3.372	PF 1	4650.00	1312.84	1318.60		1318.90	0.001305	4.91	1070.62	225.44	0.36
1	3.316	PF 1	4650.00	1312.60	1318.17		1318.48	0.001430	5.04	1035.58	222.01	0.38
1	3.259	PF 1	4650.00	1312.30	1317.64		1318.01	0.001711	5.36	957.43	208.61	0.41
1	3.202	PF 1	5000.00	1312.00	1317.58		1317.65	0.000282	2.24	2288.97	432.85	0.17
1	3.145	PF 1	5000.00	1311.70	1317.23		1317.50	0.001116	4.44	1202.65	247.42	0.33
1	3.088	PF 1	5000.00	1311.40	1316.94		1317.17	0.001004	4.21	1300.35	268.88	0.32
1	3.032	PF 1	5000.00	1311.10	1316.65		1316.87	0.000986	4.18	1319.75	275.24	0.31
1	2.975	PF 1	5000.00	1310.80	1316.35		1316.58	0.000997	4.20	1308.39	271.53	0.31
1	2.918	PF 1	5000.00	1310.50	1316.05		1316.28	0.000996	4.20	1307.88	271.28	0.31
1	2.861	PF 1	5000.00	1310.20	1315.75		1315.98	0.000995	4.20	1309.21	271.66	0.31
1	2.804	PF 1	5000.00	1309.87	1315.45		1315.68	0.000988	4.19	1316.37	273.94	0.31
1	2.747	PF 1	5000.00	1309.54	1315.16		1315.38	0.000987	4.20	1315.21	273.11	0.31
1	2.691	PF 1	5000.00	1309.20	1314.85		1315.08	0.001003	4.24	1296.55	266.65	0.32
1	2.634	PF 1	5000.00	1309.00	1314.55		1314.78	0.001013	4.23	1290.55	265.61	0.32
1	2.577	PF 1	5000.00	1308.70	1314.23		1314.47	0.001031	4.27	1275.28	261.14	0.32
1	2.520	PF 1	5000.00	1308.38	1313.91		1314.16	0.001054	4.31	1257.65	256.16	0.32
1	2.463	PF 1	5000.00	1308.10	1313.59		1313.84	0.001067	4.31	1256.63	257.98	0.32
1	2.403	PF 1	5000.00	1307.78	1313.25		1313.49	0.001069	4.31	1269.33	265.27	0.32
1	2.346	PF 1	5000.00	1307.46	1312.96	1310.04	1313.18	0.000982	4.14	1331.61	280.62	0.31
1	2.293	PF 1	5000.00	1307.14	1312.74		1312.93	0.000779	3.73	1469.16	301.74	0.28
1	2.237	PF 1	5000.00	1306.87	1312.54	1309.27	1312.70	0.000710	3.59	1526.03	309.26	0.27
1	2.181	PF 1	5000.00	1306.53	1312.34	1308.72	1312.45	0.000455	2.91	1803.24	345.80	0.21
1	2.124	PF 1	5000.00	1306.29	1312.16	1308.67	1312.31	0.000593	3.36	1594.44	312.32	0.24
1	2.067	PF 1	5000.00	1305.96	1311.99	1308.36	1312.14	0.000577	3.37	1631.72	313.10	0.24
1	2.010	PF 1	5000.00	1305.67	1311.82	1308.08	1311.97	0.000540	3.31	1656.60	309.35	0.24
1	1.953	PF 1	5000.00	1305.38	1311.67	1307.79	1311.81	0.000502	3.24	1687.67	306.71	0.23
1	1.896	PF 1	5000.00	1305.09	1311.53	1307.49	1311.66	0.000459	3.15	1741.23	310.06	0.22
1	1.840	PF 1	6550.00	1304.79	1311.26	1307.65	1311.47	0.000771	4.09	1764.55	315.36	0.28
1	1.783	PF 1	6550.00	1304.49	1311.04	1307.35	1311.25	0.000699	3.93	1797.62	318.42	0.27
1	1.726	PF 1	6550.00	1304.19	1310.83	1307.04	1311.04	0.000682	3.91	1792.43	309.59	0.27
1	1.669	PF 1	6550.00	1303.90	1310.64	1306.75	1310.84	0.000679	3.94	1822.77	310.77	0.27
1	1.612	PF 1	6550.00	1303.60	1310.44	1306.46	1310.64	0.000638	3.87	1867.04	315.22	0.26
1	1.556	PF 1	6550.00	1303.30	1310.27	1306.15	1310.45	0.000592	3.77	1927.04	322.76	0.25
1	1.499	PF 1	6550.00	1303.00	1310.10	1305.83	1310.27	0.000552	3.68	1977.64	326.65	0.24
1	1.442	PF 1	6550.00	1302.70	1309.94	1305.56	1310.11	0.000522	3.63	2000.20	322.02	0.24
1	1.385	PF 1	6550.00	1302.40	1309.80	1305.26	1309.96	0.000491	3.57	2028.54	318.57	0.23

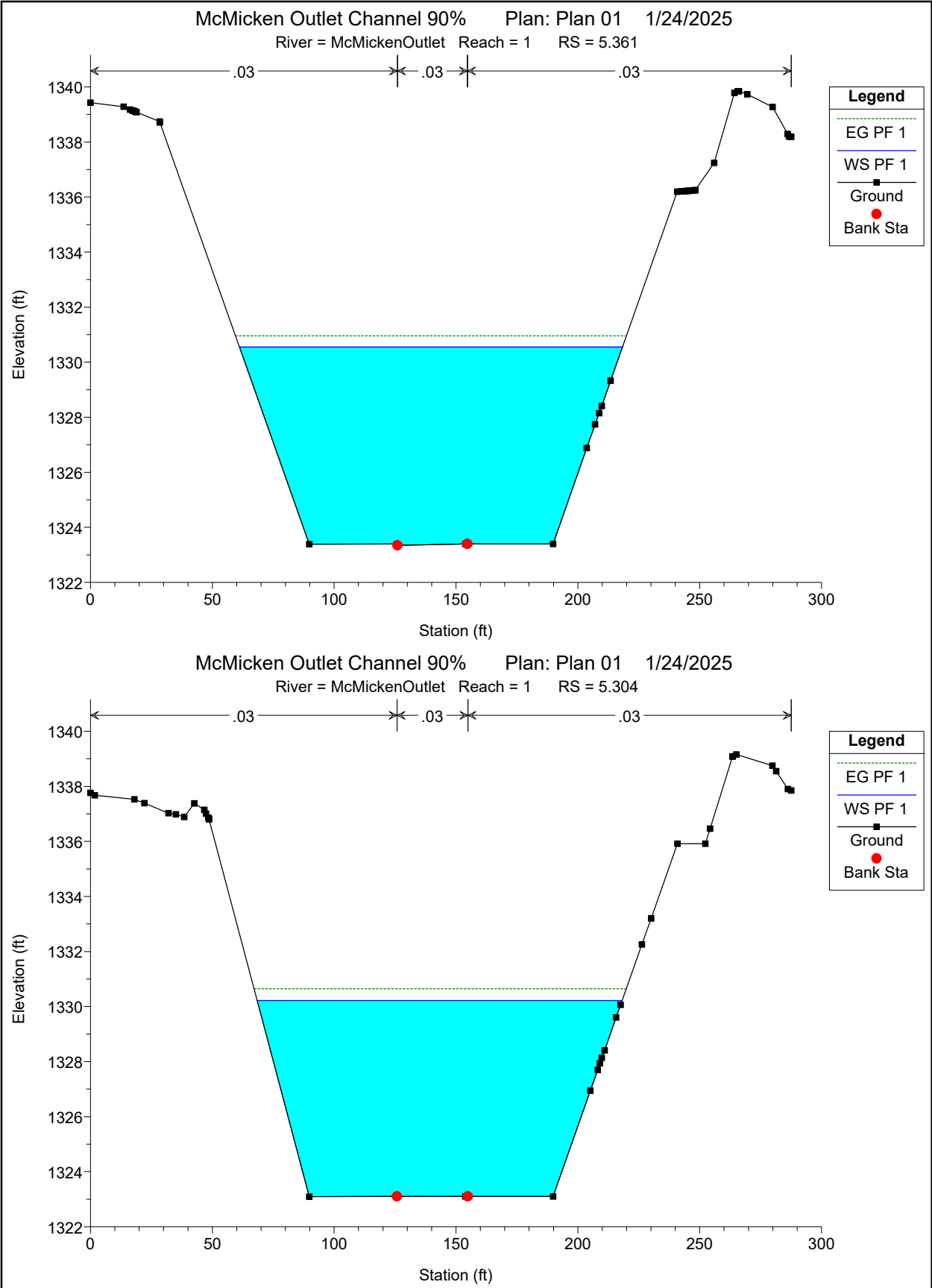
HEC-RAS Plan: Plan 01 River: McMickenOutlet Reach: 1 Profile: PF 1 (Continued)

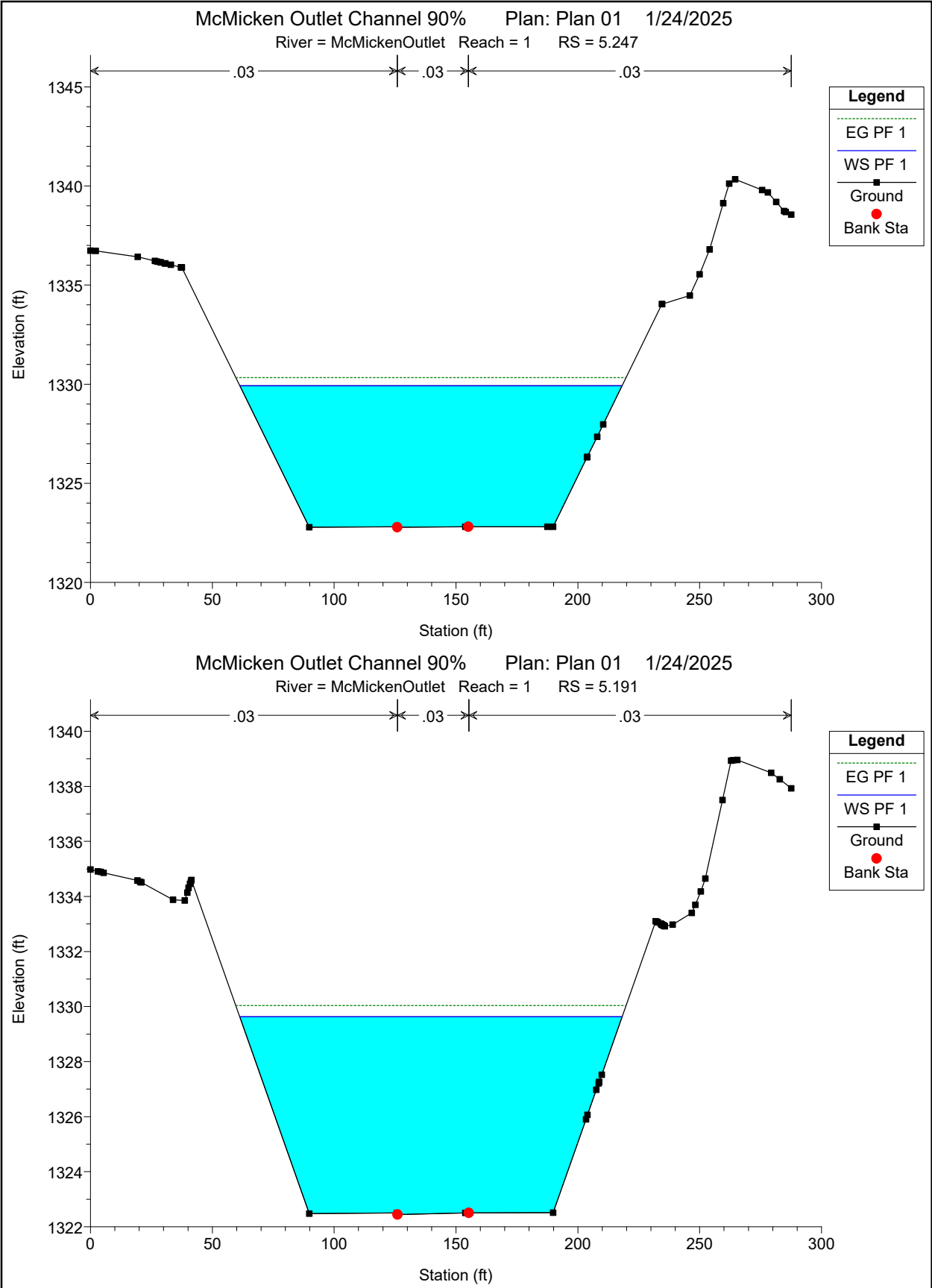
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	1.329	PF 1	6550.00	1302.10	1309.66		1309.82	0.000449	3.47	2103.92	326.33	0.22
1	1.274	PF 1	8800.00	1301.81	1309.36		1309.63	0.000802	4.63	2126.16	332.92	0.30
1	1.219	PF 1	8800.00	1301.52	1309.14	1304.96	1309.40	0.000774	4.57	2154.03	334.87	0.29
1	1.164	PF 1	8800.00	1301.23	1308.92	1304.67	1309.17	0.000745	4.51	2184.33	336.89	0.29
1	1.108	PF 1	8800.00	1300.92	1308.71		1308.96	0.000717	4.47	2209.00	336.58	0.28
1	1.051	PF 1	8800.00	1300.62	1308.50		1308.74	0.000686	4.40	2244.33	338.84	0.28
1	0.995	PF 1	8800.00	1300.32	1308.31		1308.54	0.000654	4.34	2283.91	341.38	0.27
1	0.936	PF 1	8800.00	1300.03	1308.12		1308.34	0.000602	4.20	2337.66	347.23	0.26
1	0.874	PF 1	8800.00	1299.71	1307.94		1308.15	0.000572	4.14	2370.76	345.50	0.25
1	0.813	PF 1	8800.00	1299.36	1307.77		1307.97	0.000535	4.06	2423.27	347.32	0.25
1	0.750	PF 1	8800.00	1299.03	1307.60	1302.55	1307.80	0.000523	4.06	2430.06	344.22	0.24
1	0.706	PF 1	8800.00	1298.82	1307.47		1307.68	0.000546	4.18	2398.67	352.45	0.25
1	0.649	PF 1	8800.00	1298.57	1307.30		1307.44	0.000331	3.27	2953.16	401.00	0.20
1	0.589	PF 1	8800.00	1298.24	1306.82		1307.22	0.001069	5.80	1749.90	255.25	0.35
1	0.530	PF 1	8800.00	1297.04	1306.12		1306.79	0.001544	6.79	1473.75	322.14	0.41
1	0.473	PF 1	8800.00	1295.49	1305.26	1302.70	1306.17	0.002647	7.81	1286.07	584.99	0.53
1	0.416	PF 1	8800.00	1294.04	1304.07	1302.59	1305.20	0.003822	8.98	1295.96	741.78	0.61
1	0.308	PF 1	8800.00	1292.53	1301.84	1301.84	1302.81	0.004392	10.26	1522.35	736.70	0.64
1	0.236	PF 1	8800.00	1290.52	1300.11	1300.11	1300.94	0.003903	10.82	1654.31	802.85	0.63
1	0.163	PF 1	8800.00	1288.36	1297.63	1297.39	1298.72	0.004896	10.00	1335.75	569.05	0.69
1	0.083	PF 1	8800.00	1285.44	1295.92	1295.70	1296.83	0.003989	11.11	1353.83	558.63	0.64
1	0.000	PF 1	8800.00	1283.64	1294.04	1294.04	1295.16	0.003556	11.47	1464.41	688.24	0.65

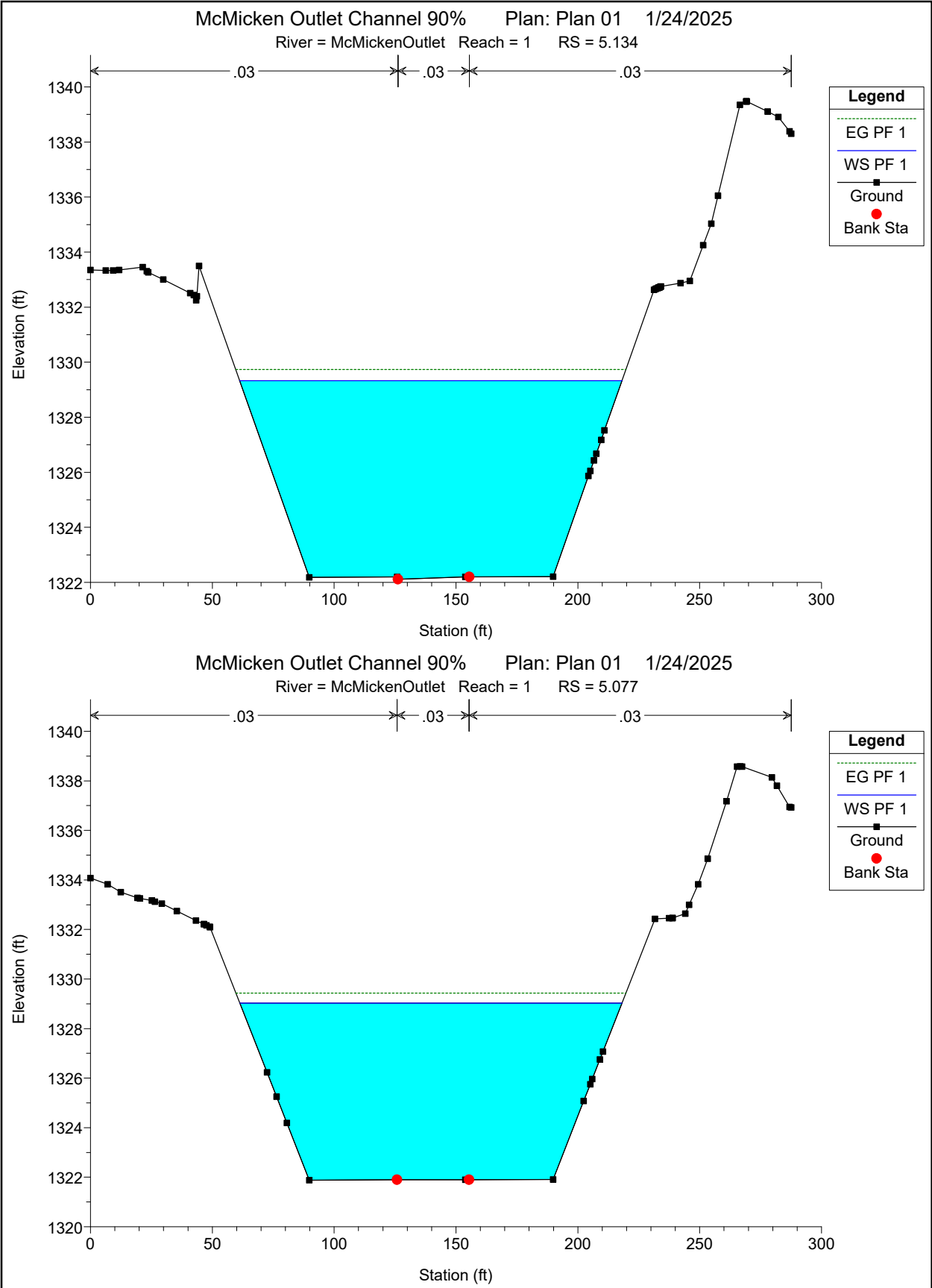


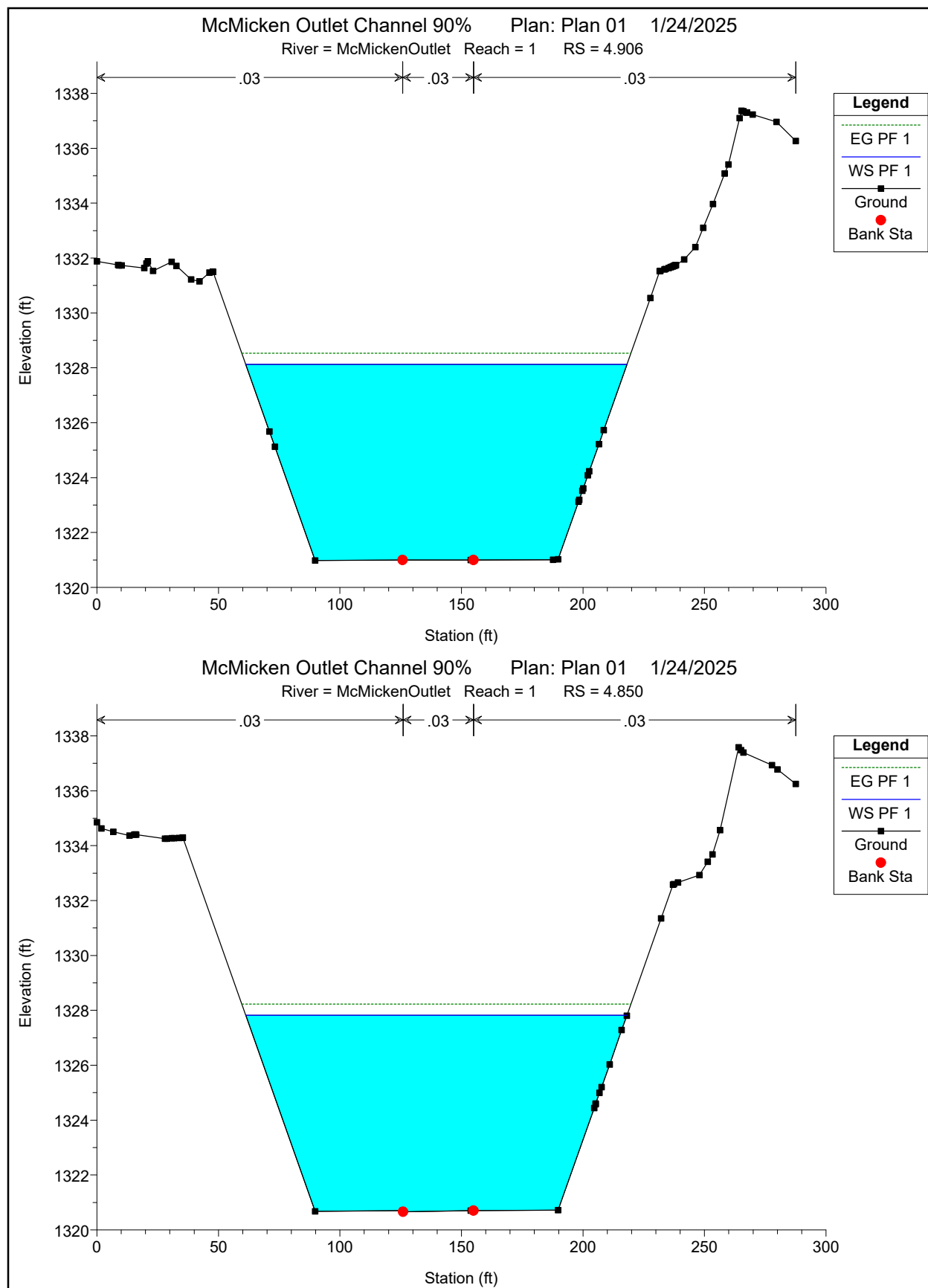


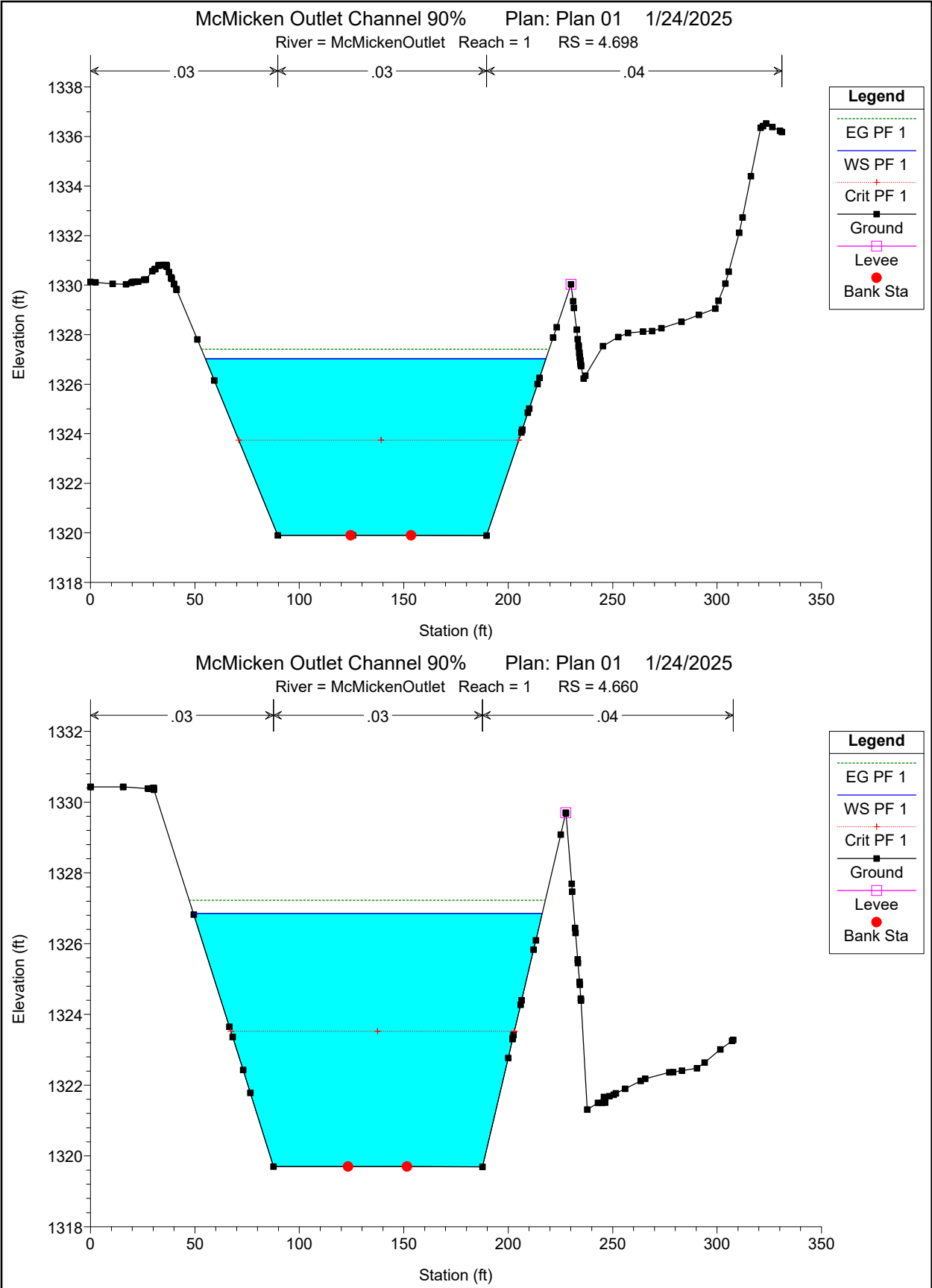


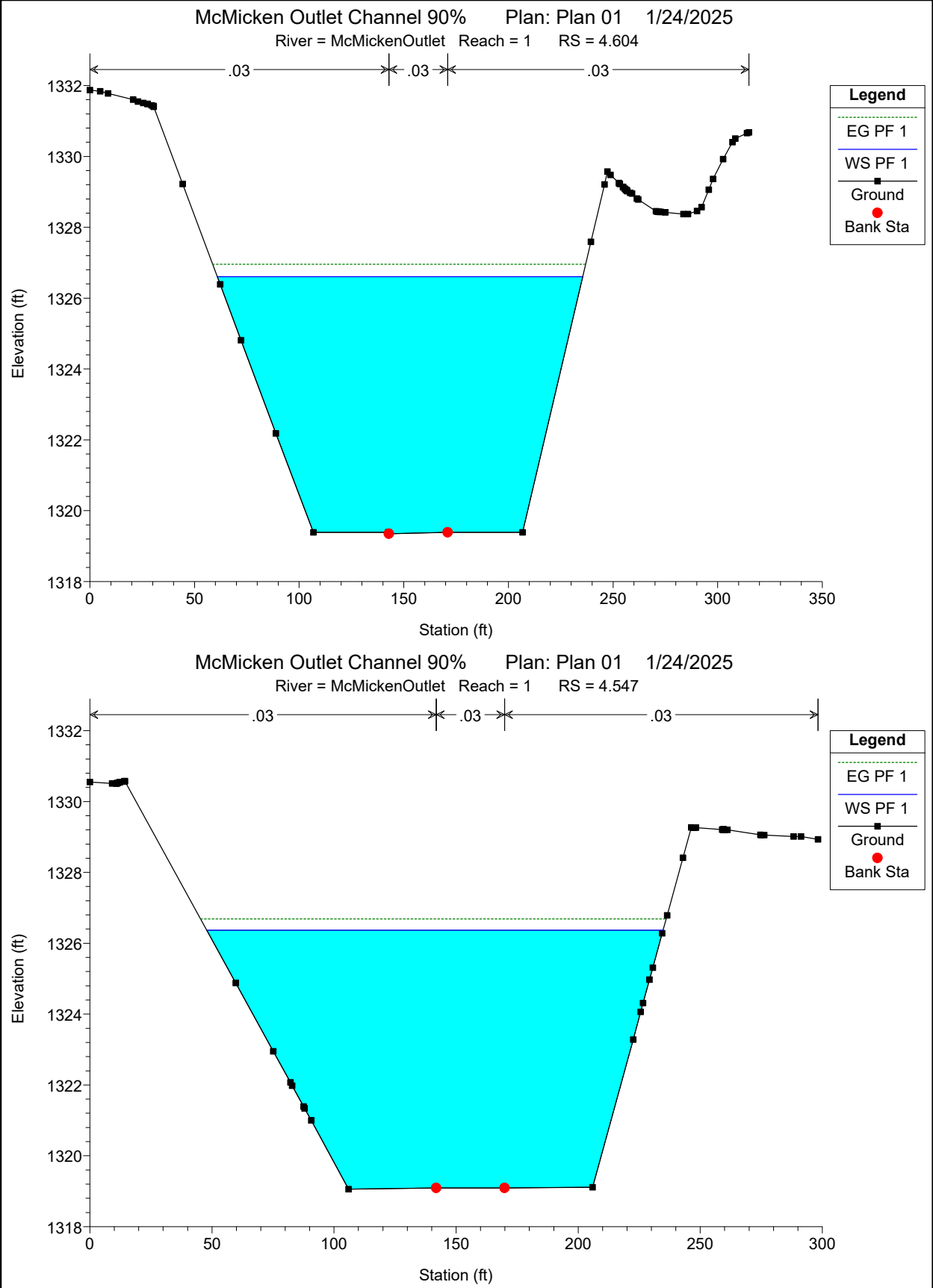


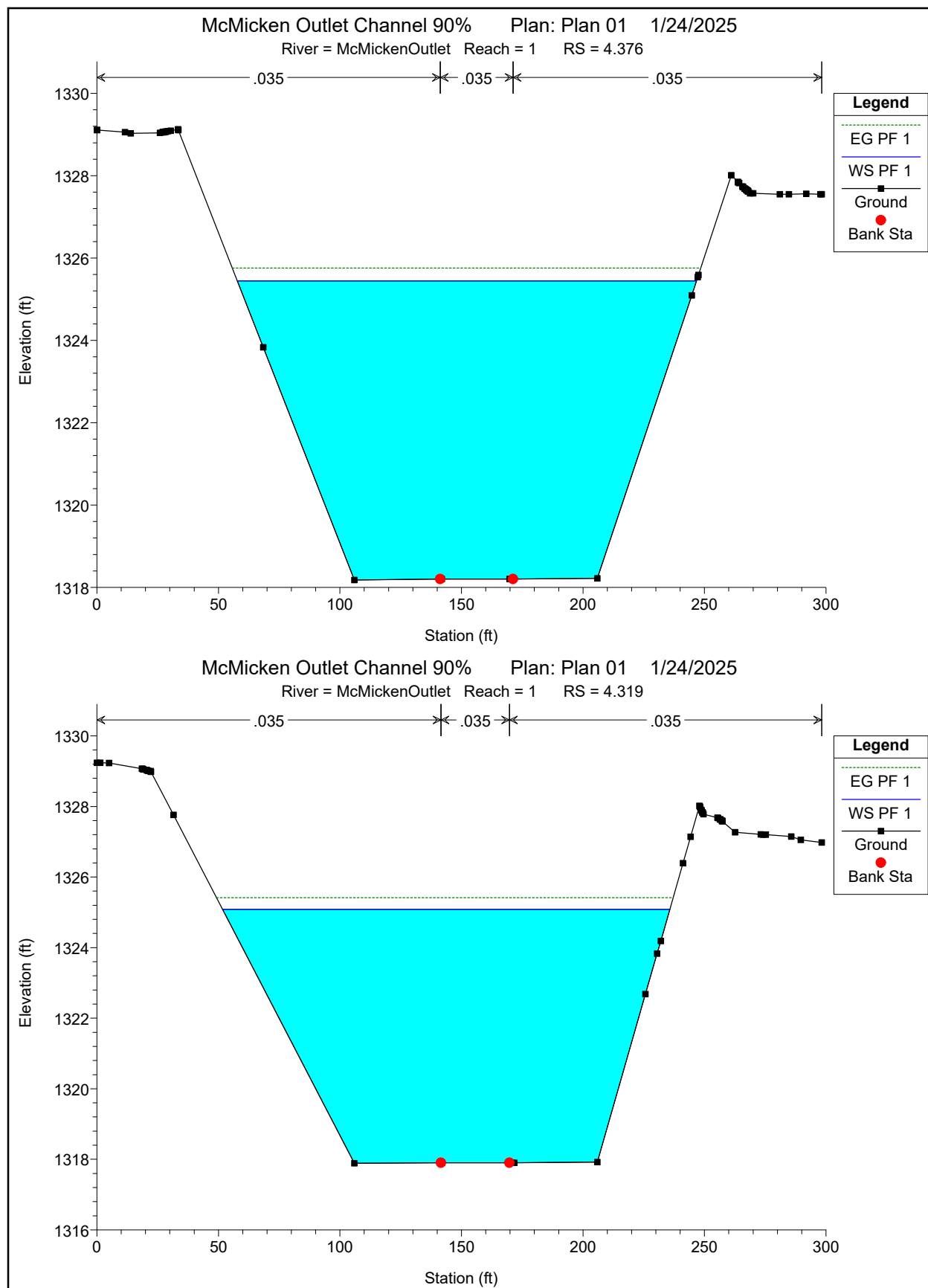


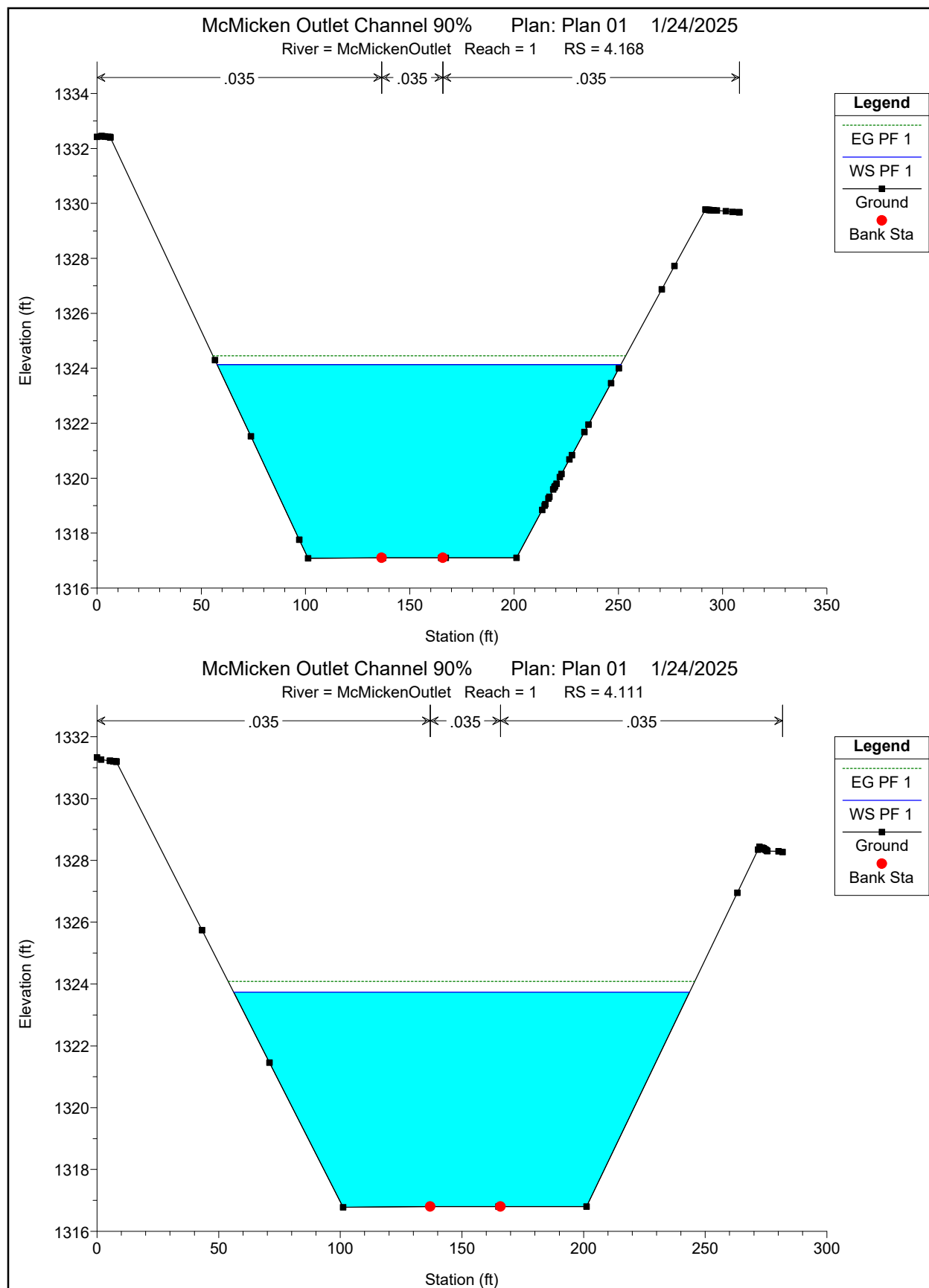


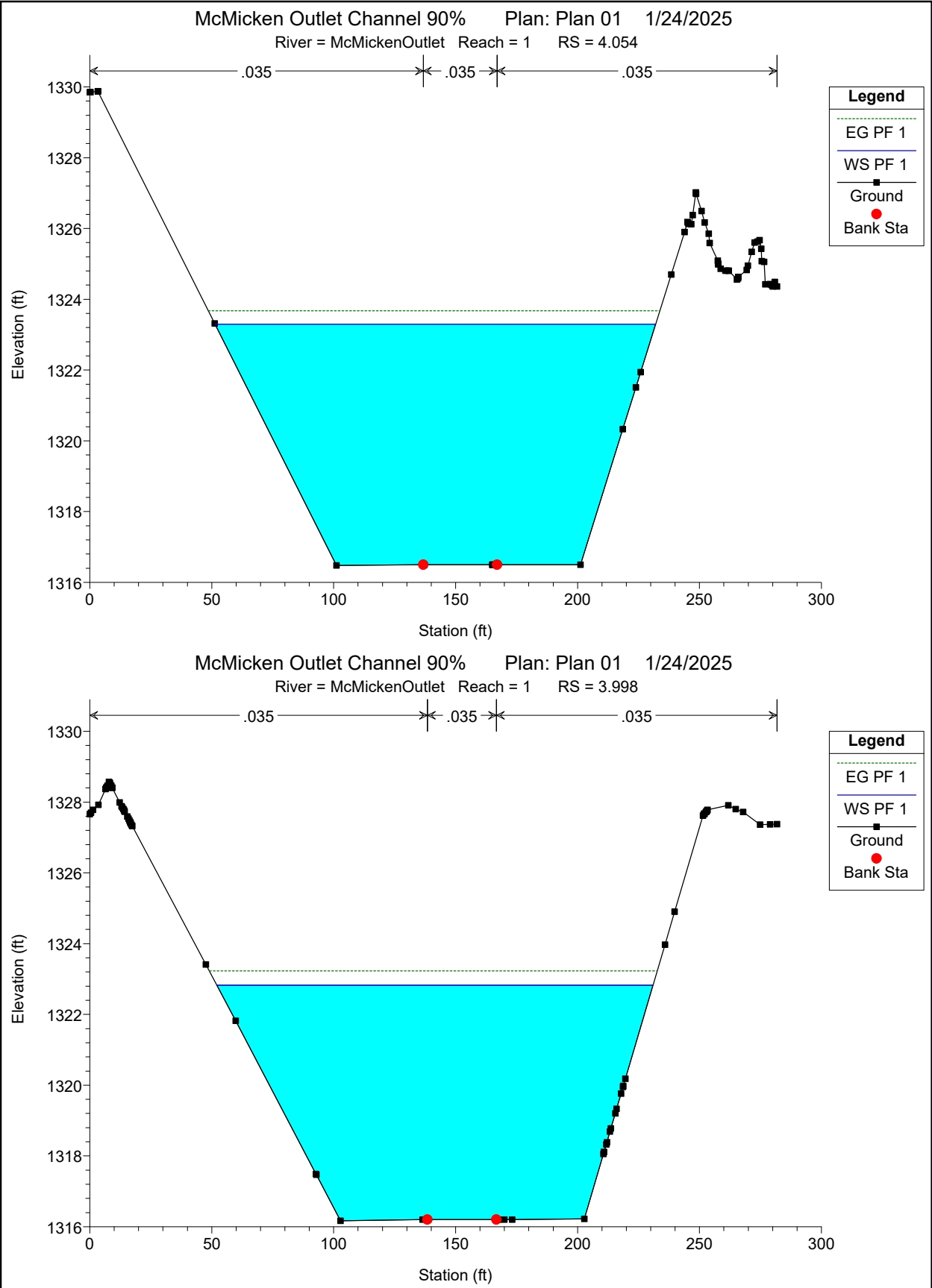


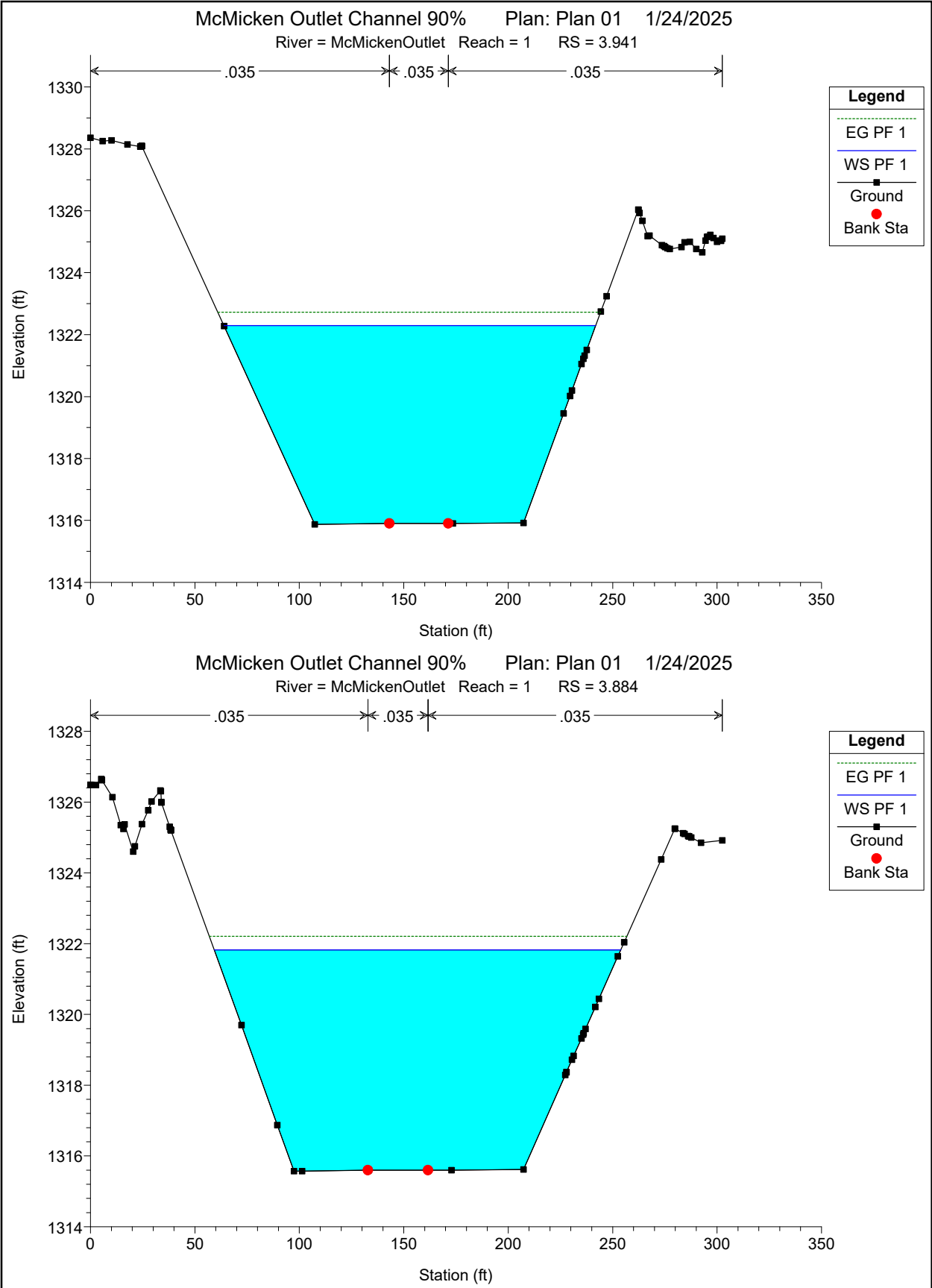


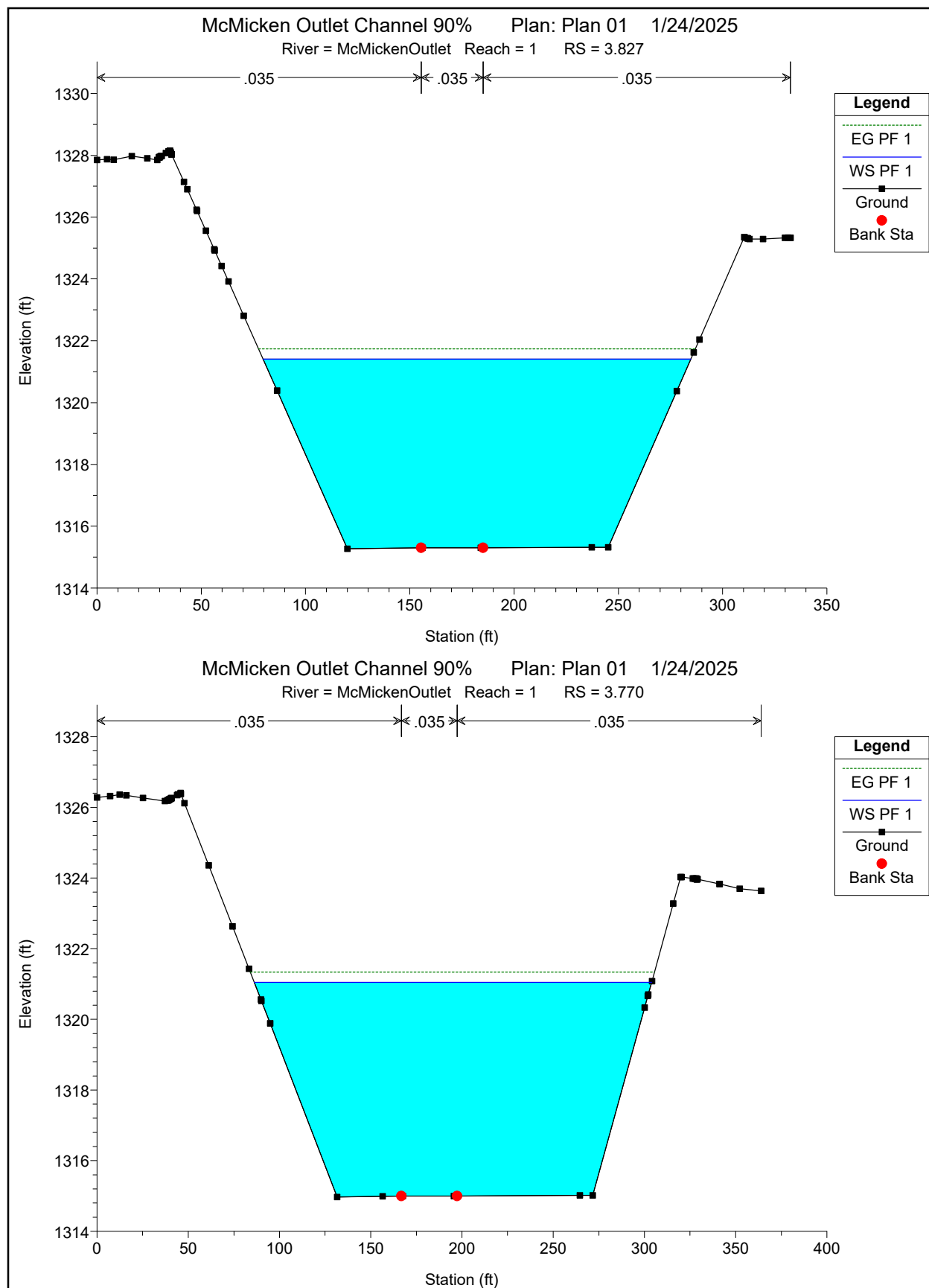


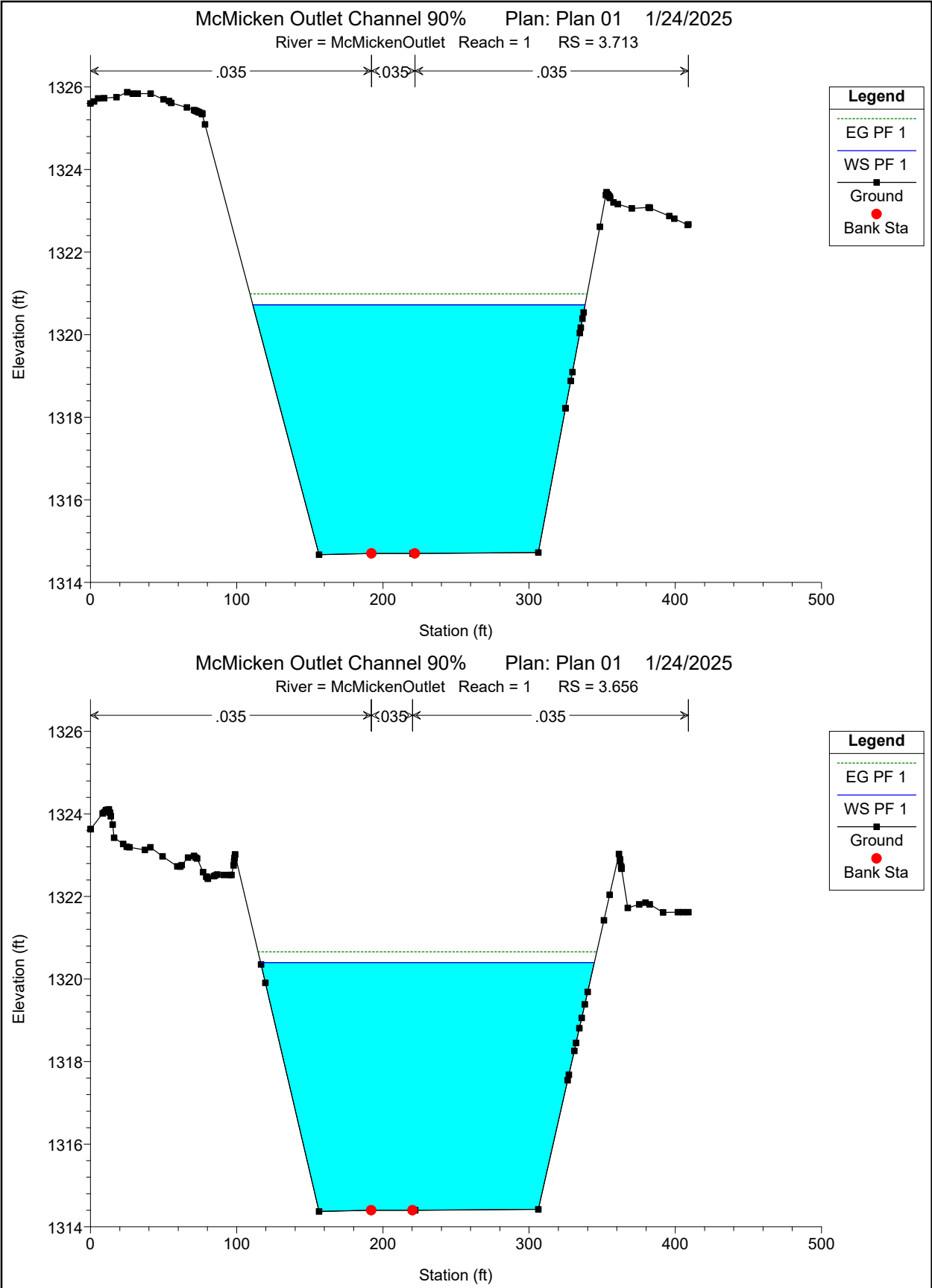


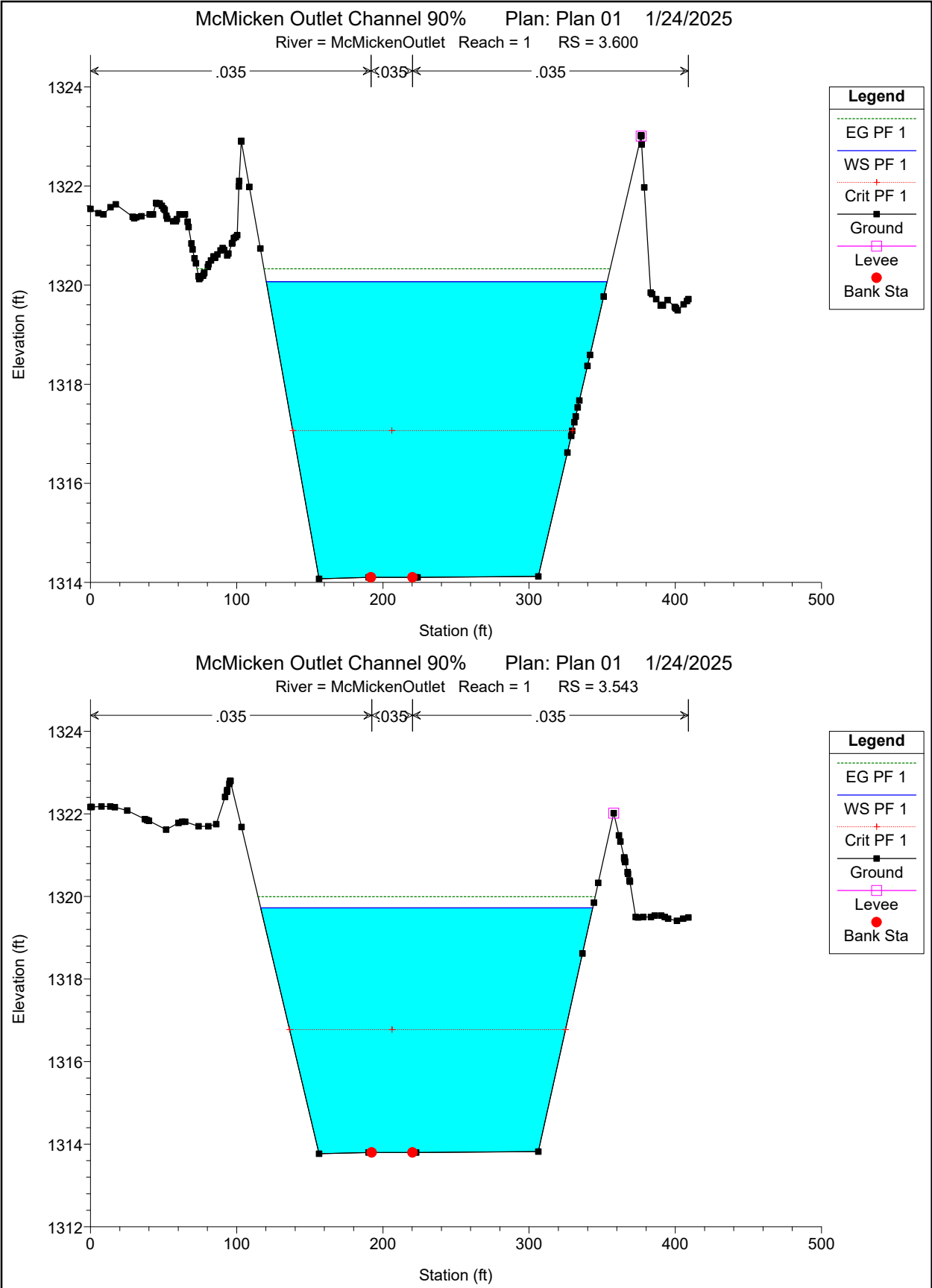


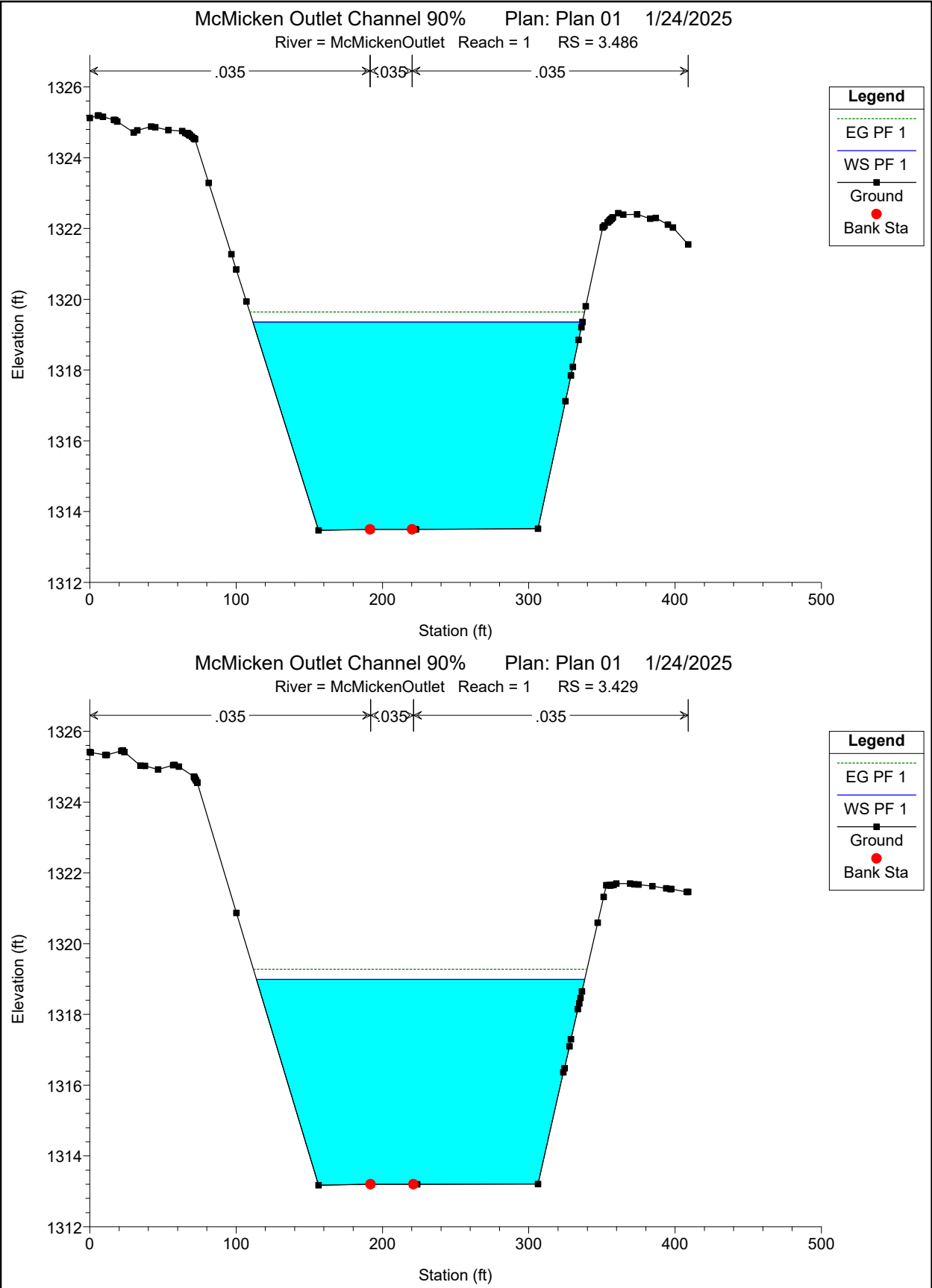


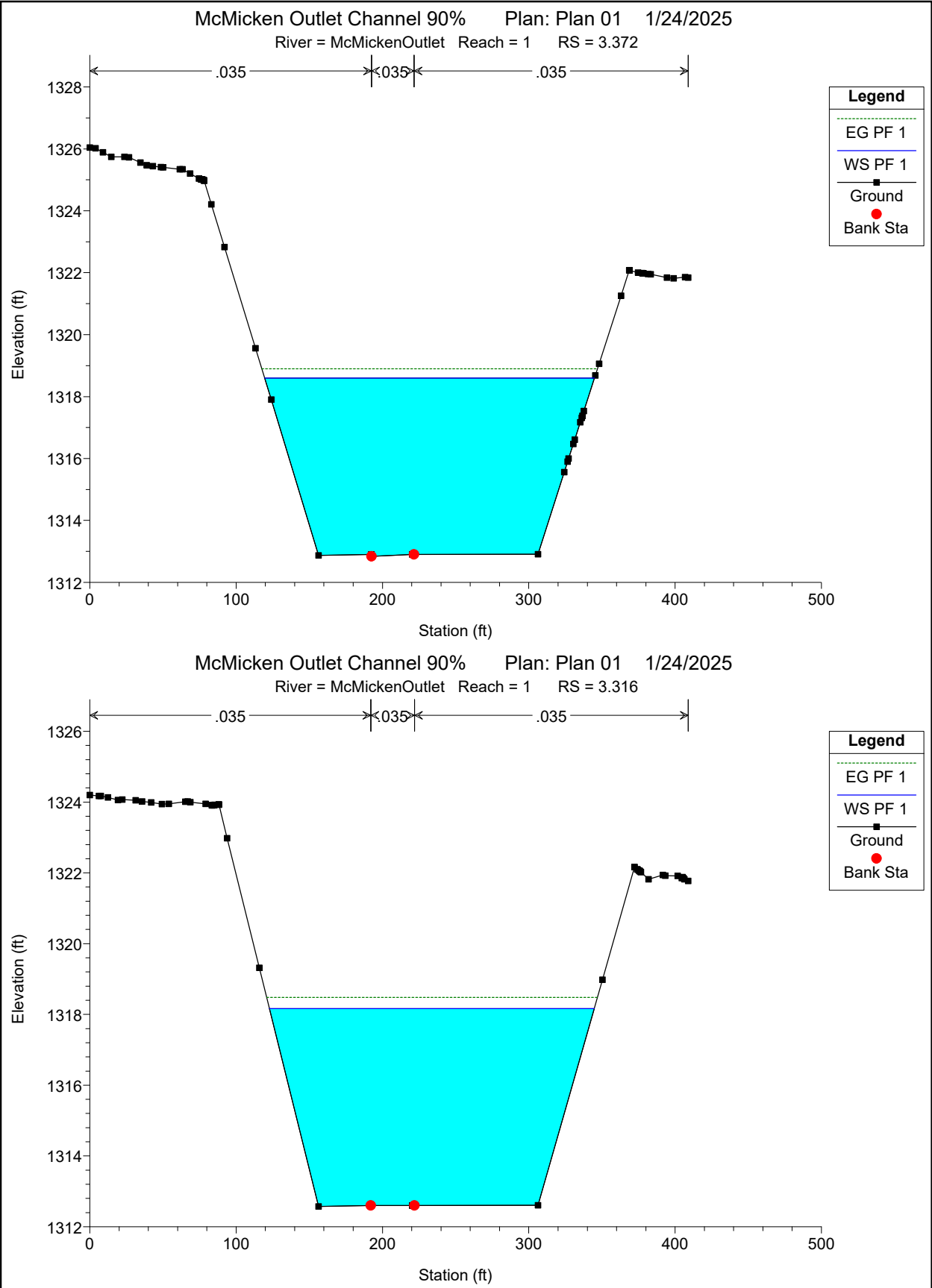


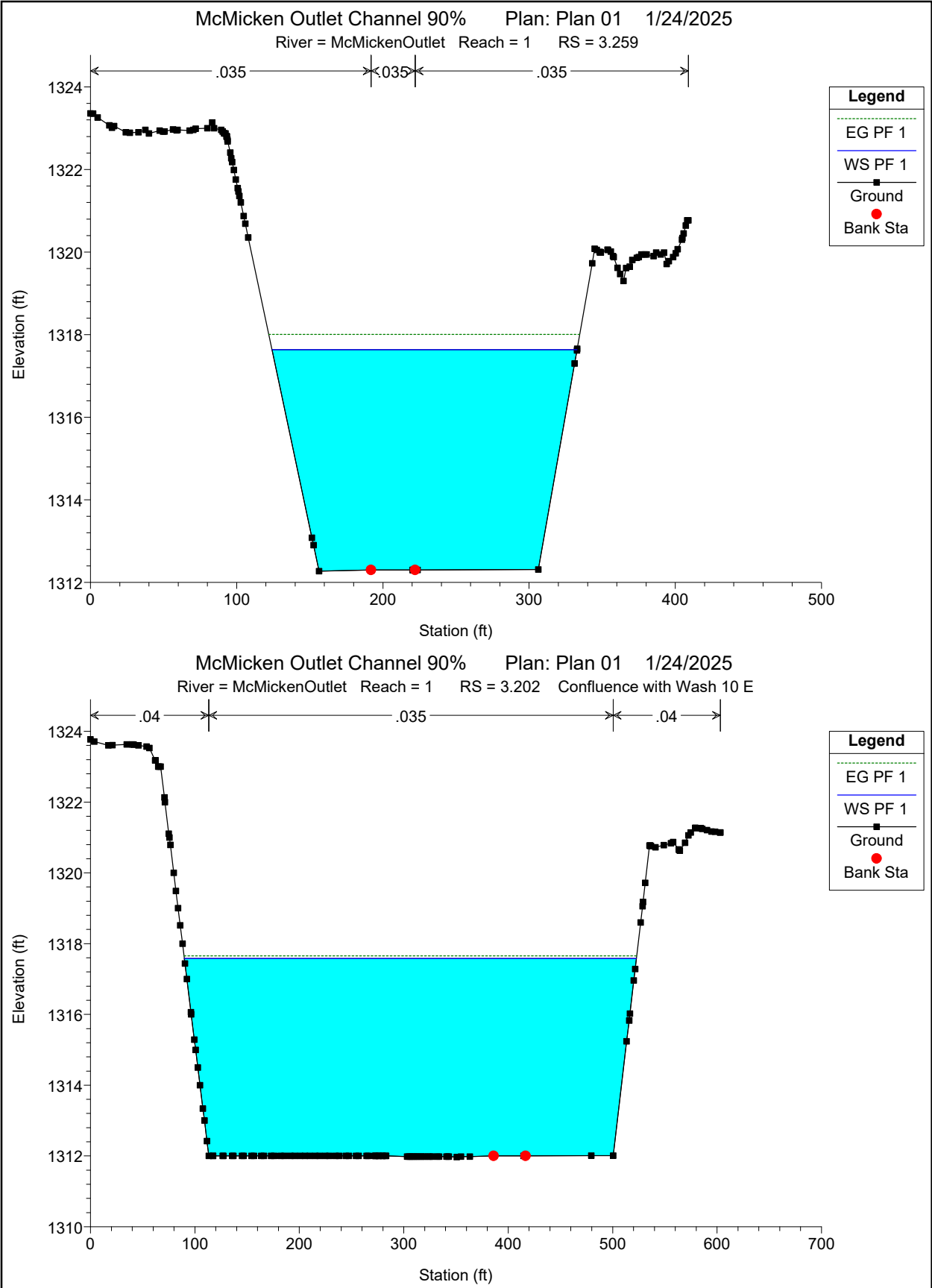


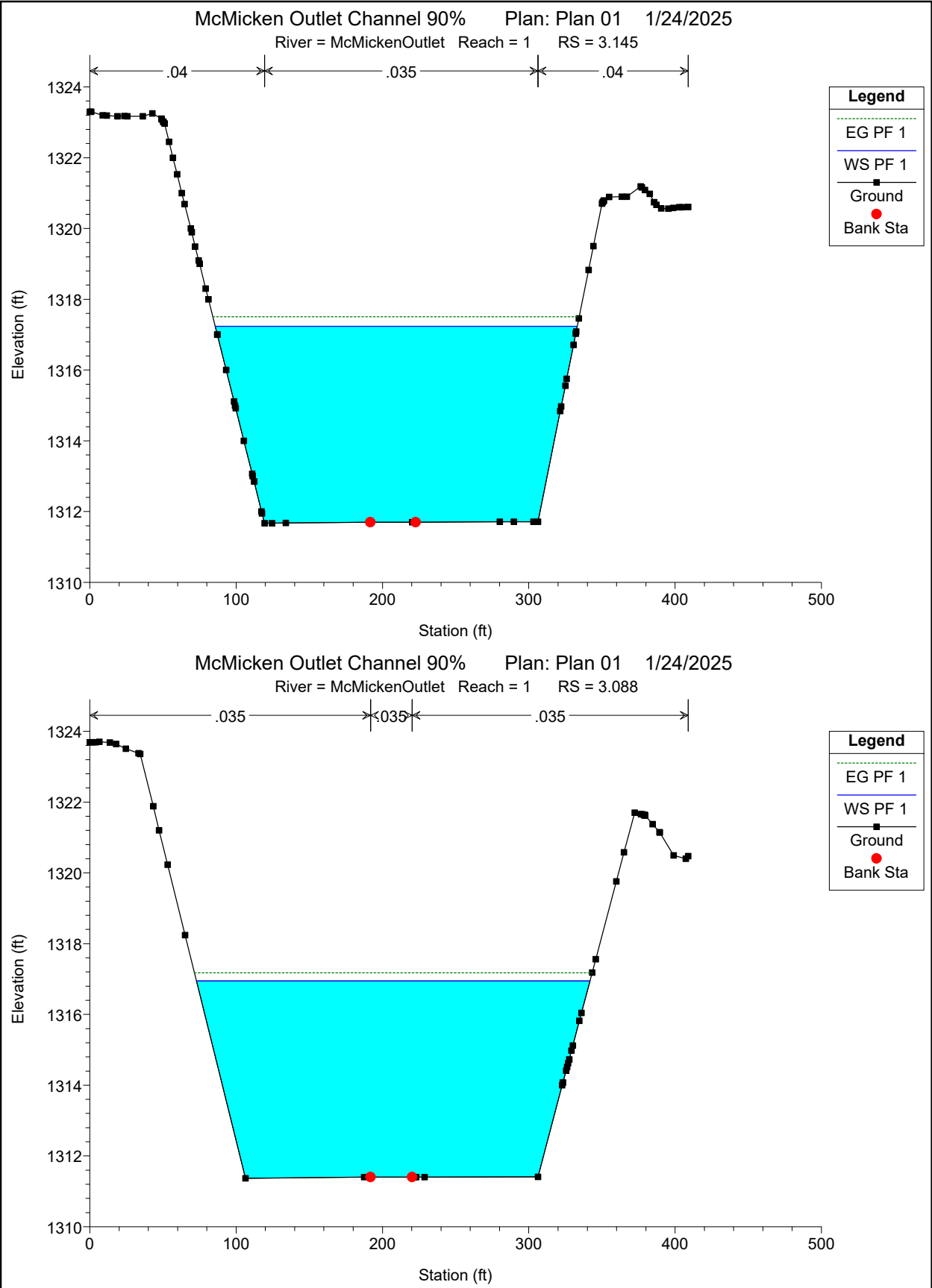


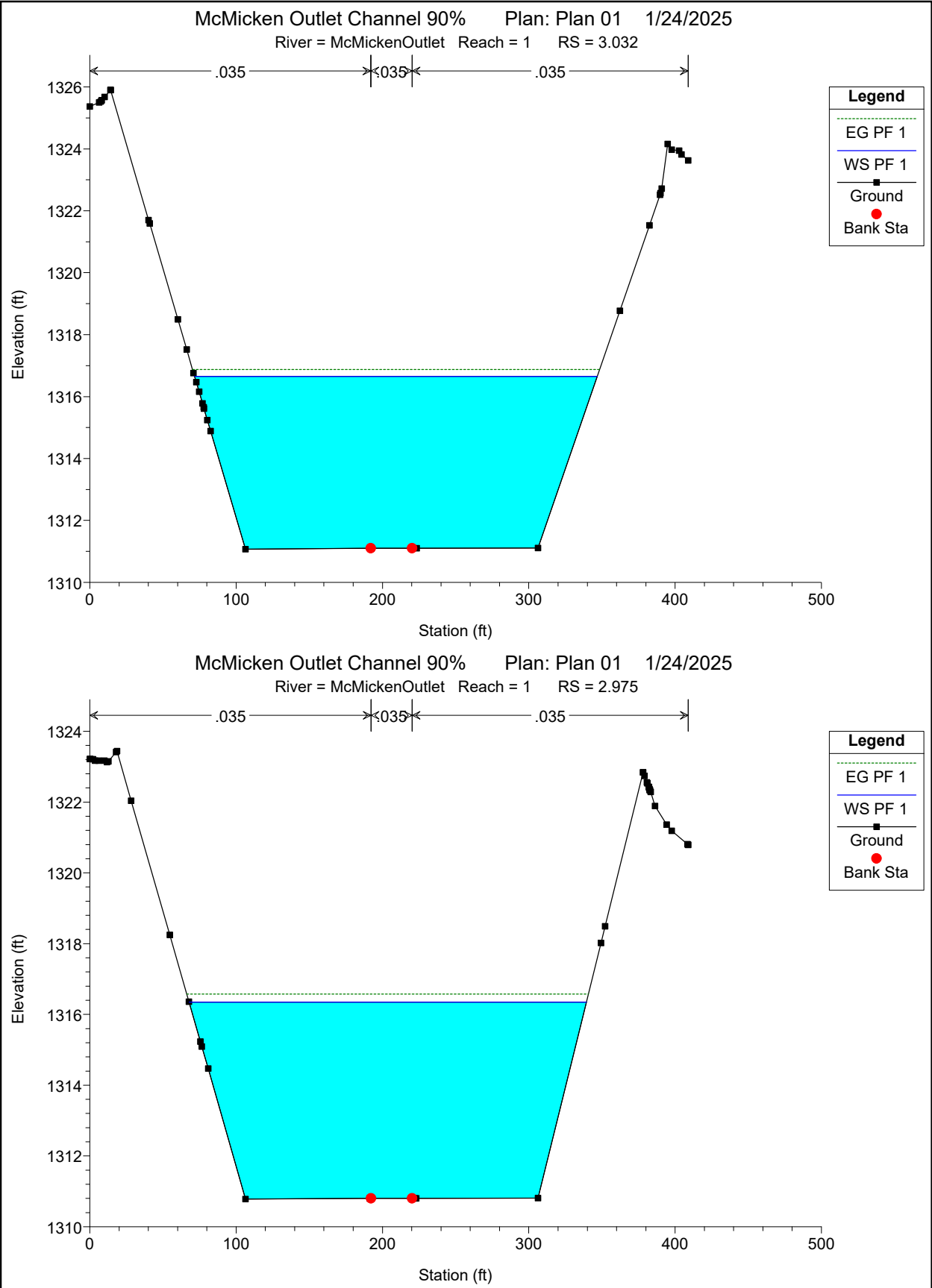


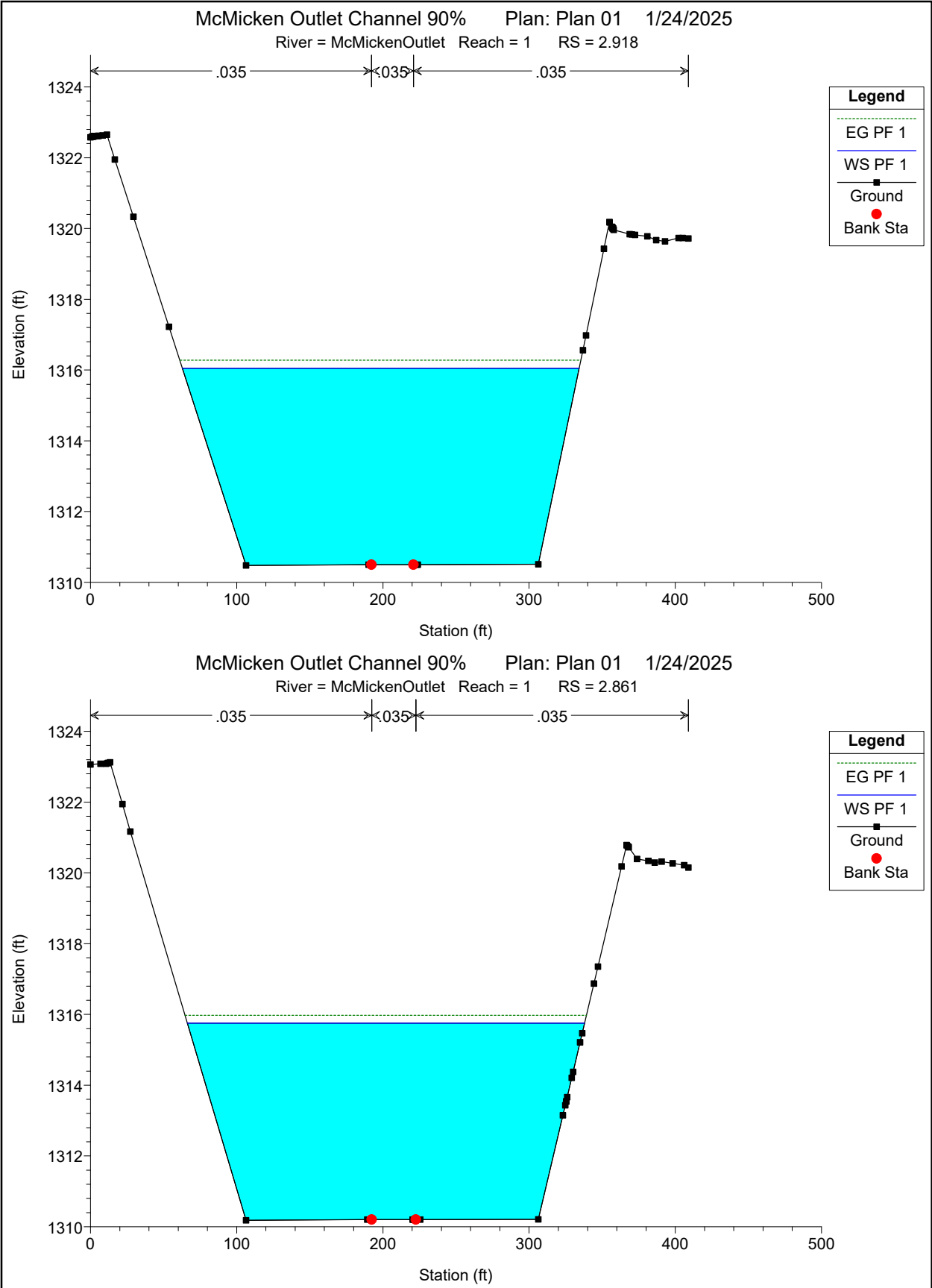


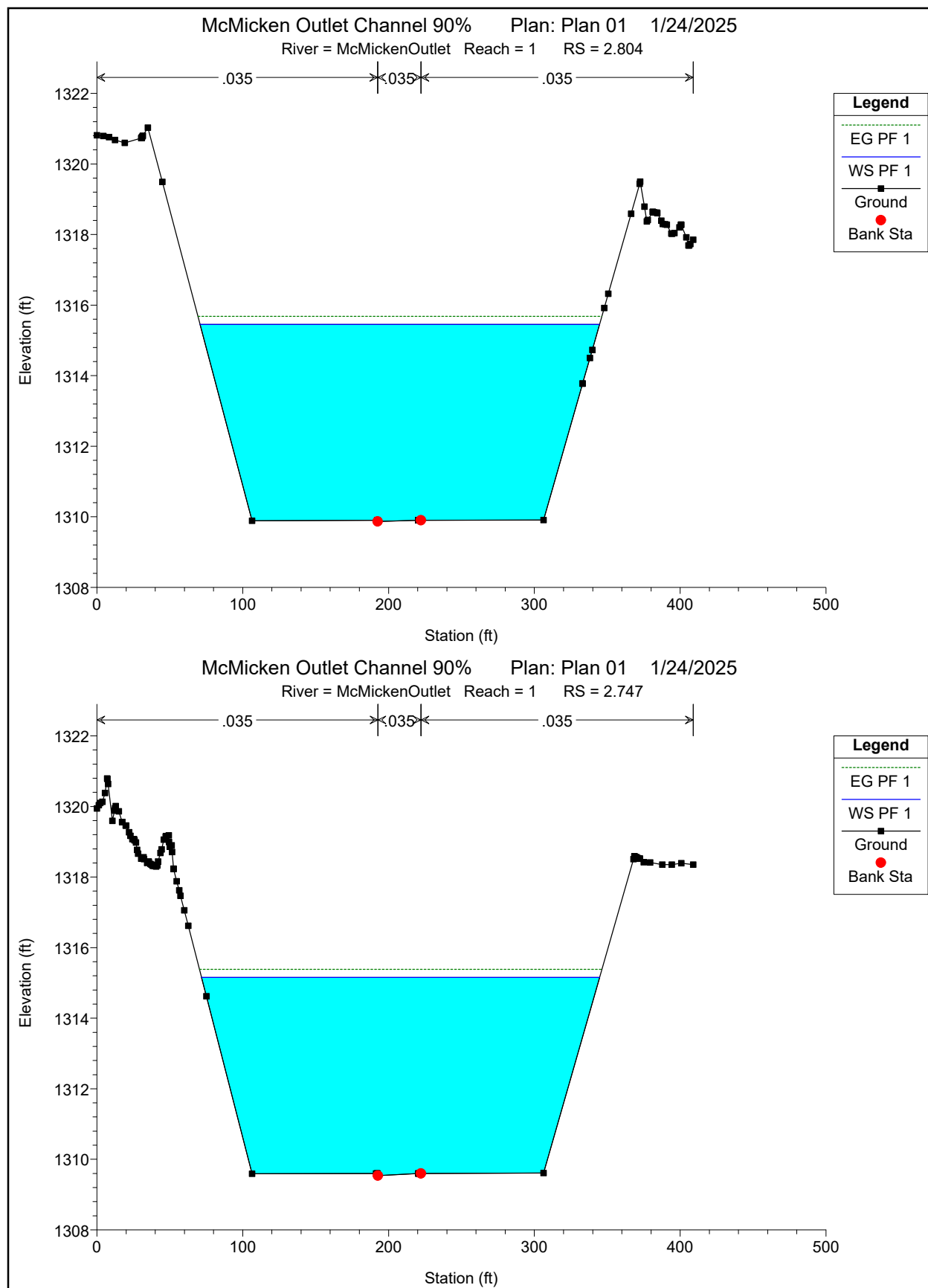


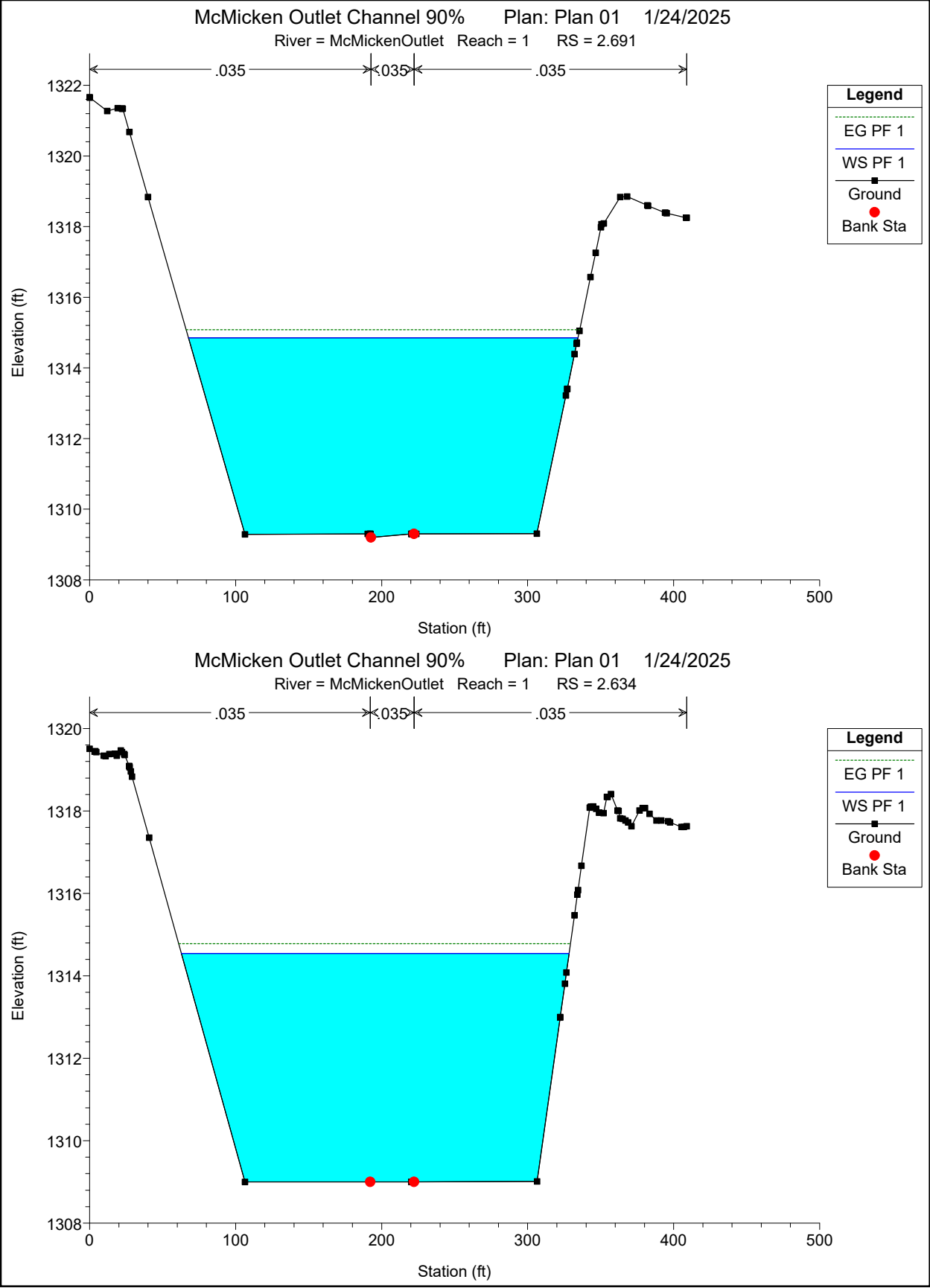


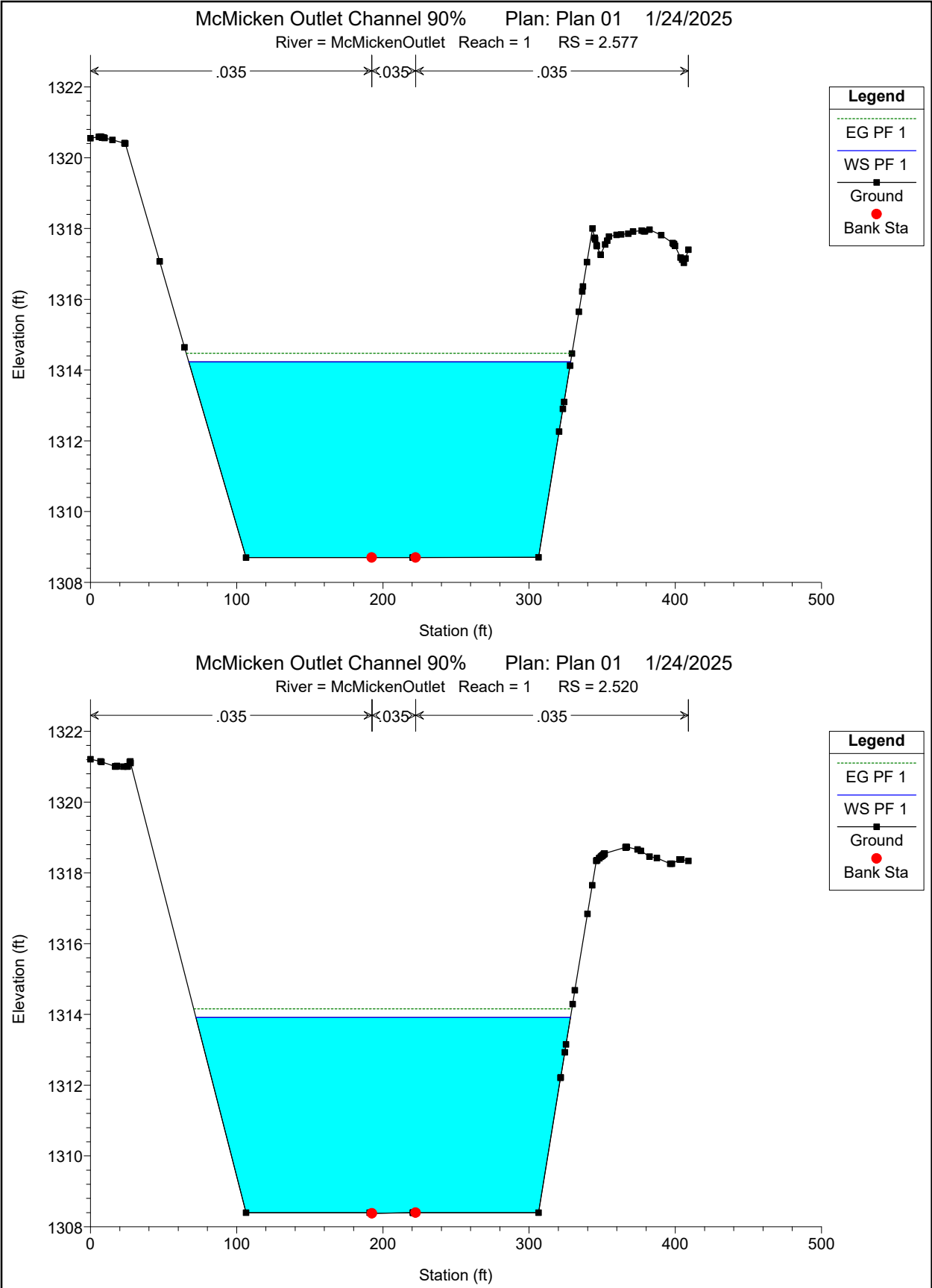


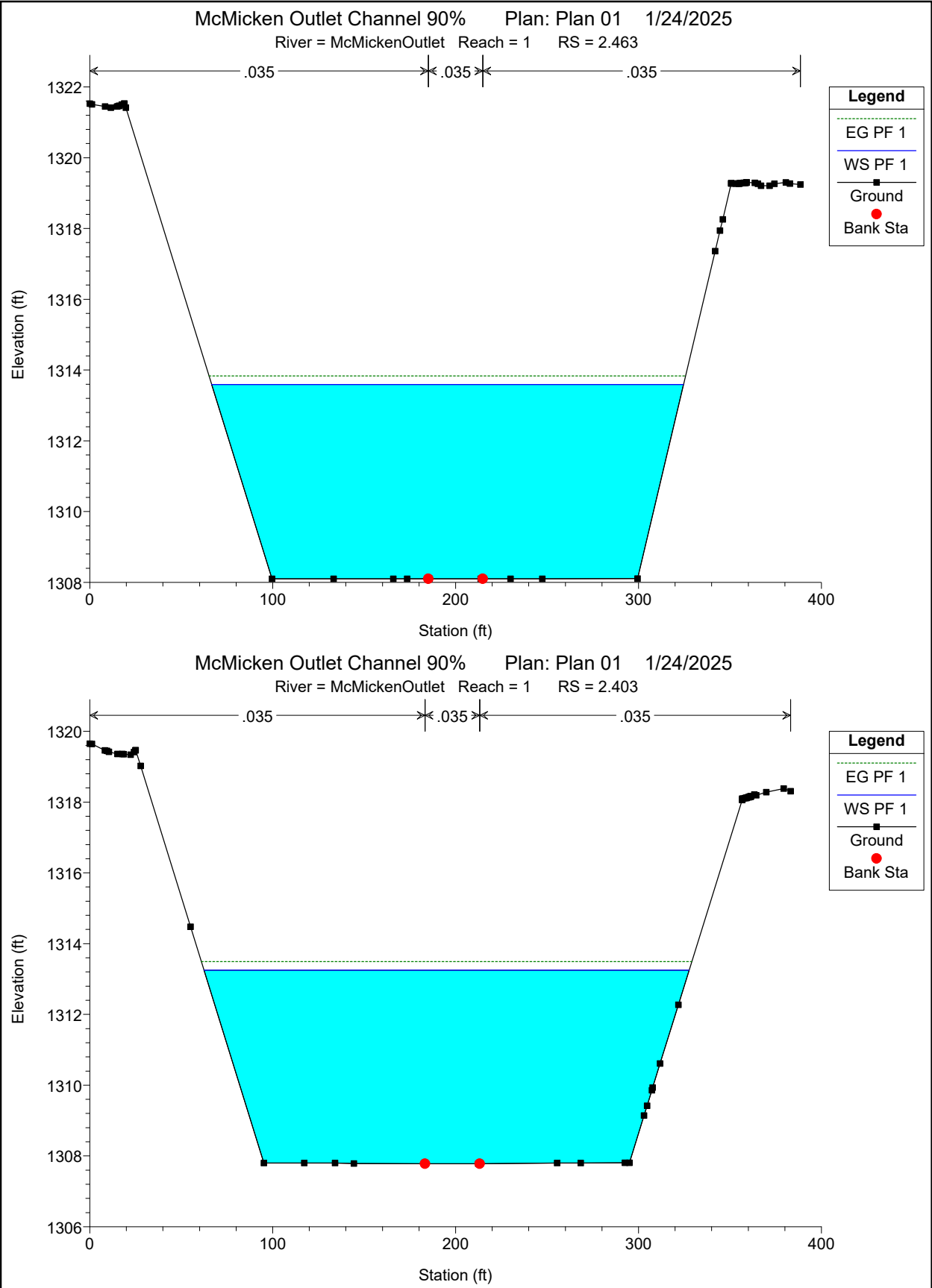


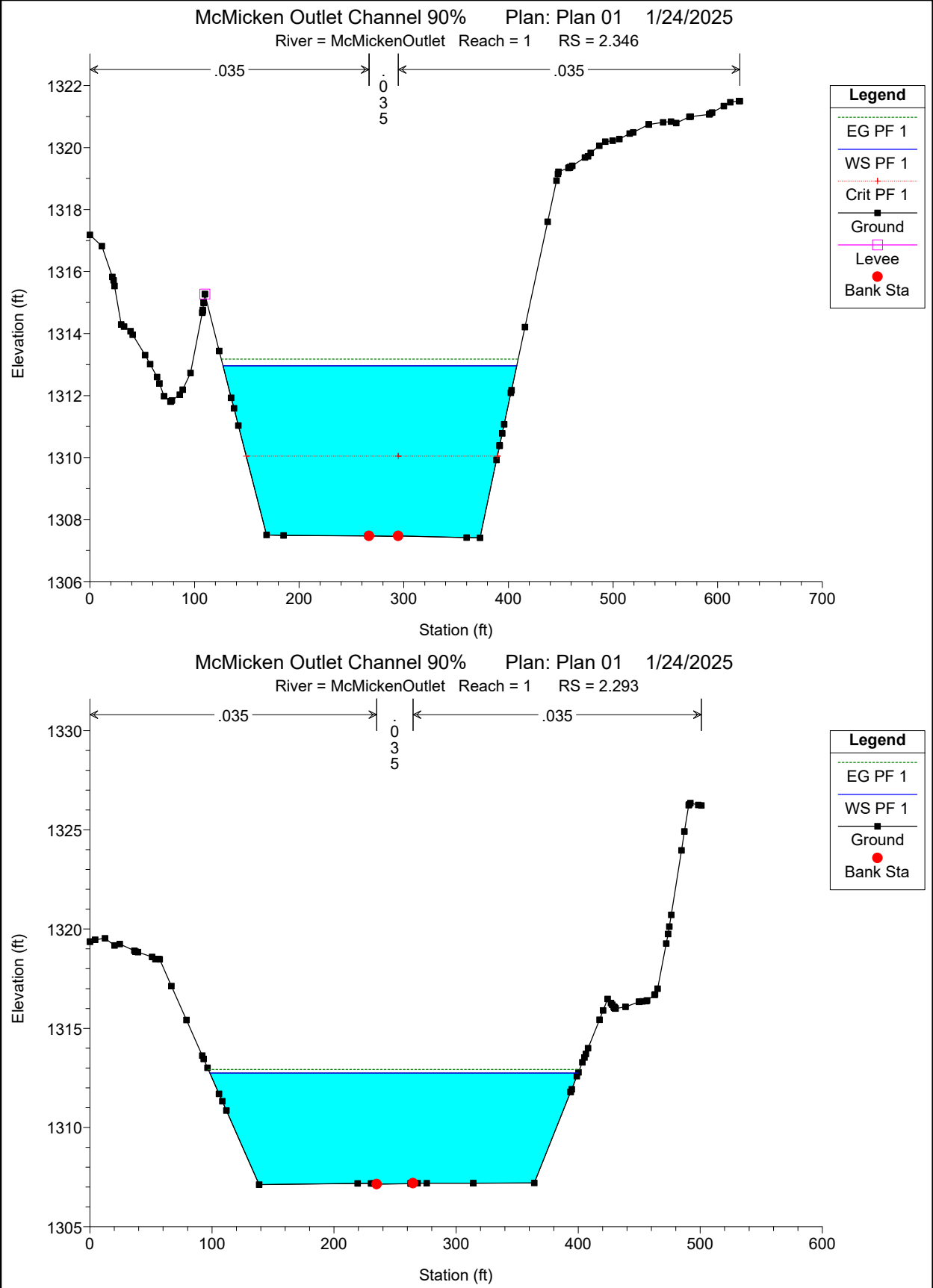


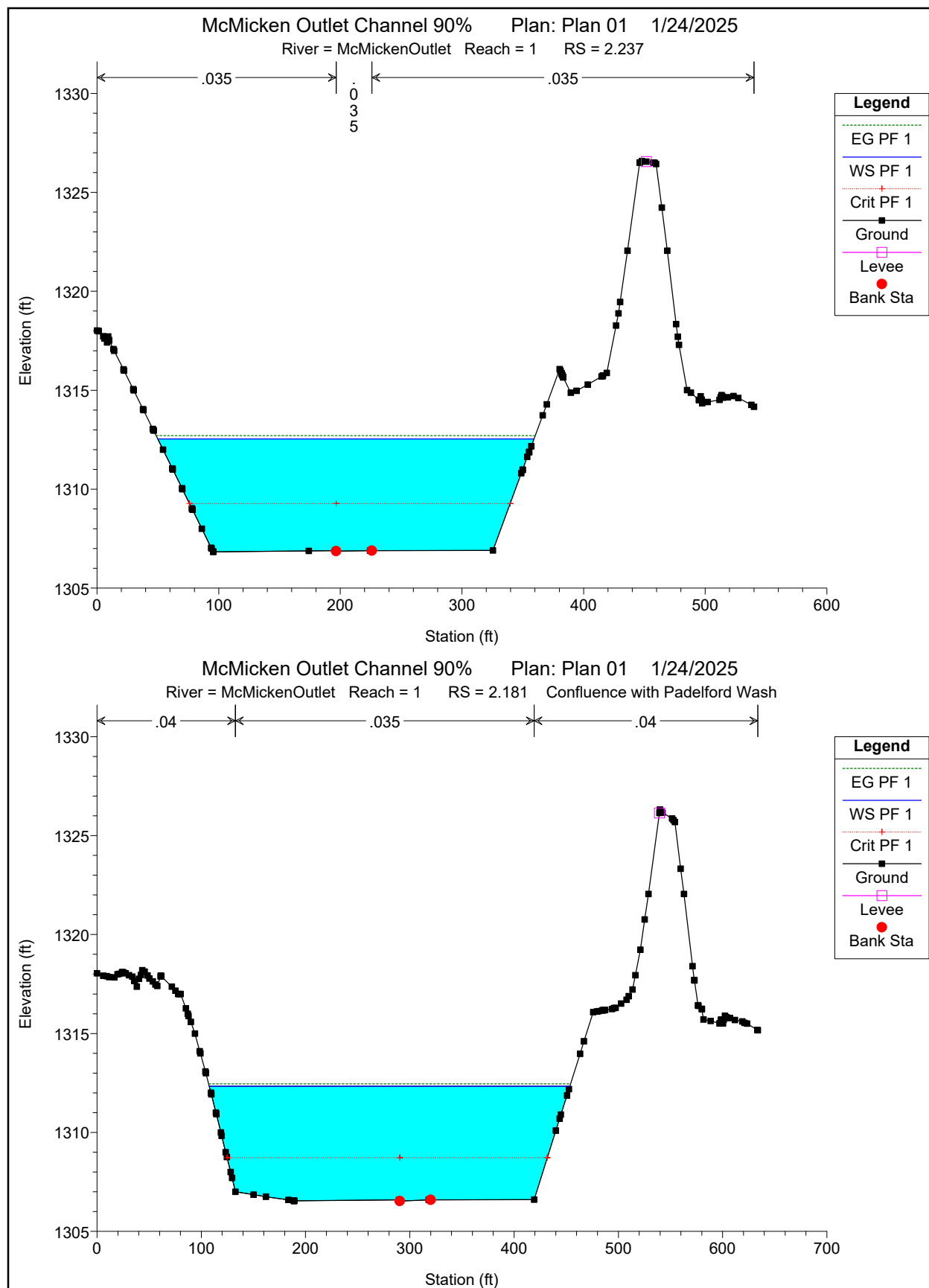


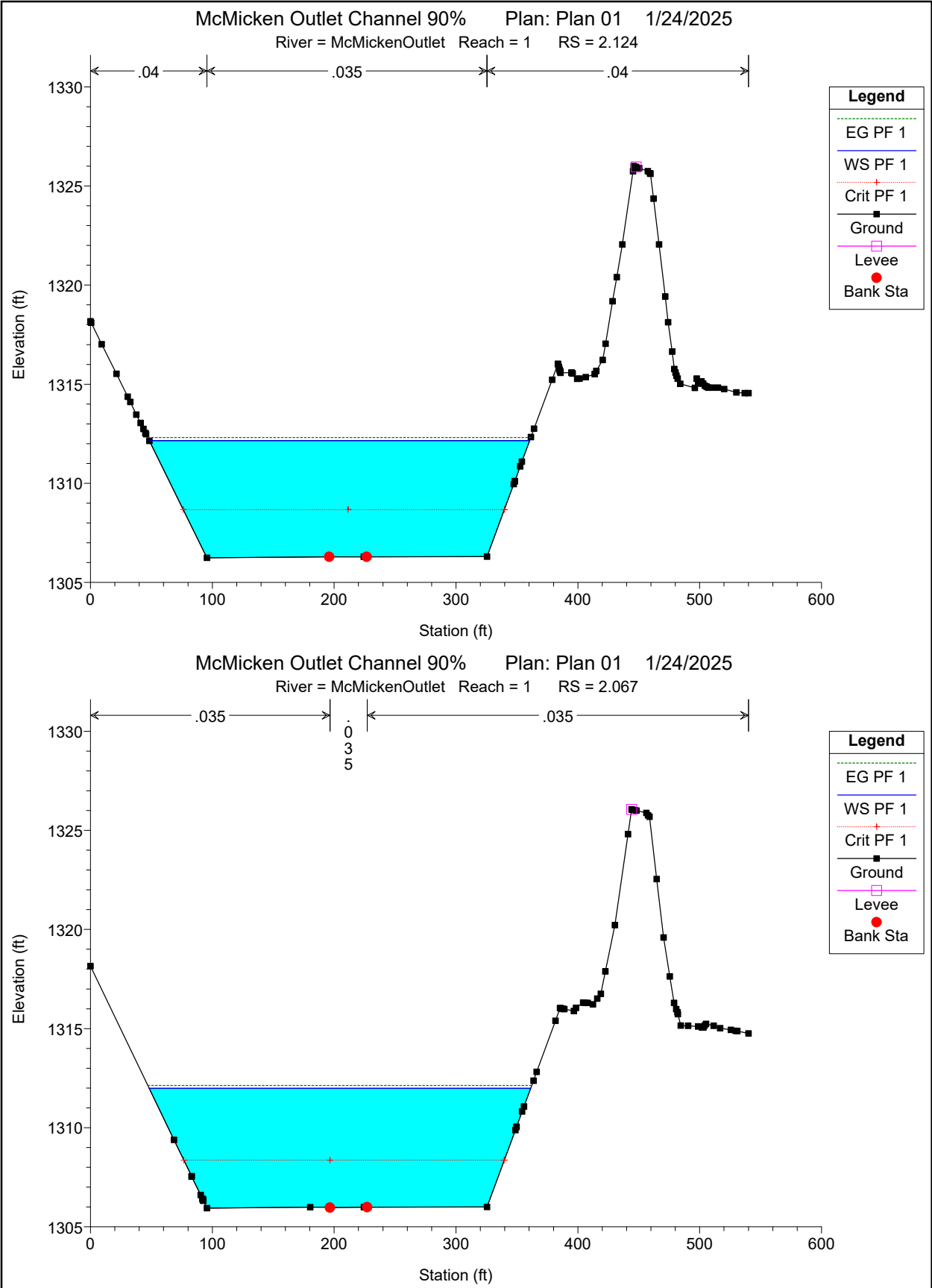


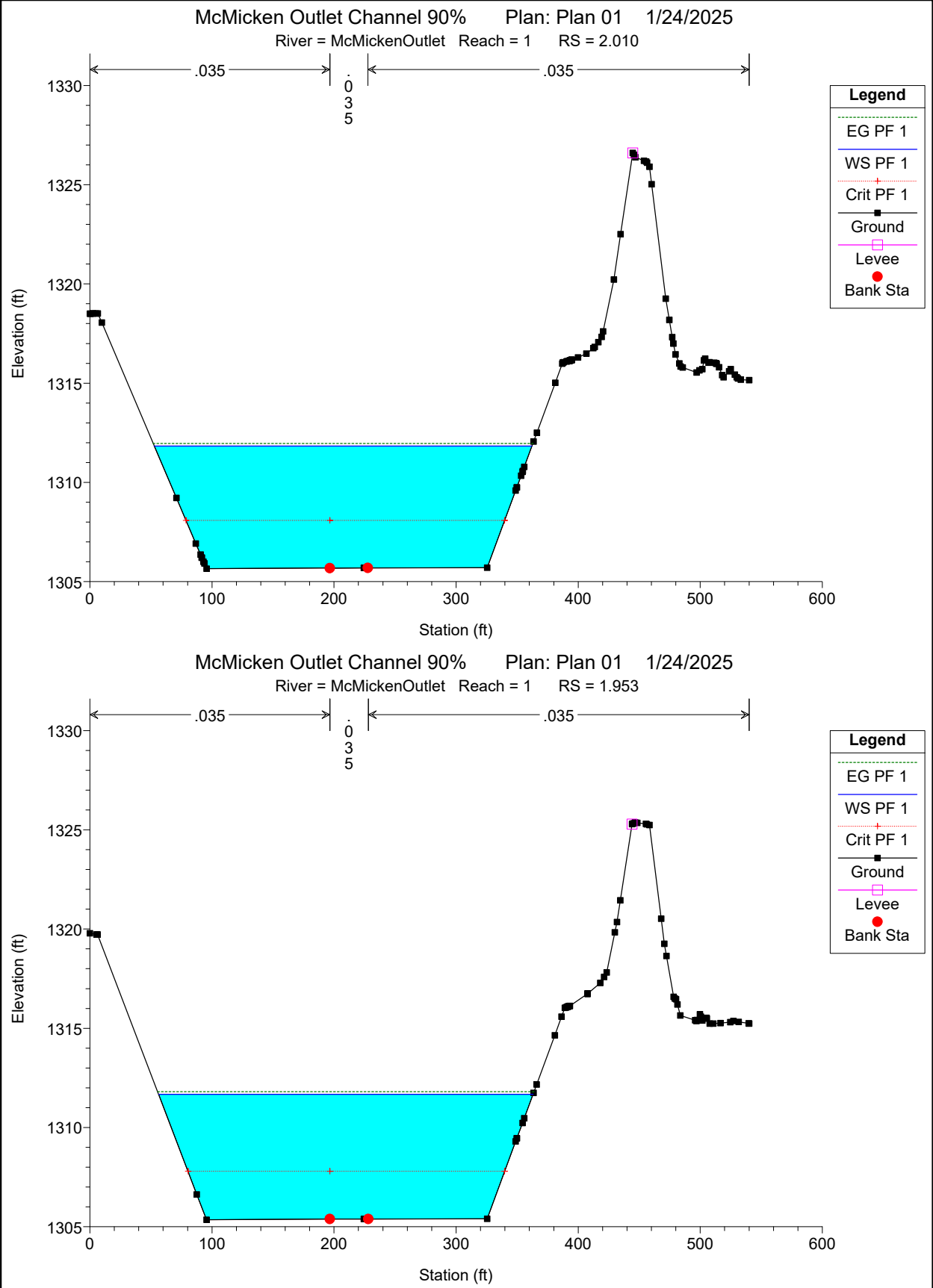


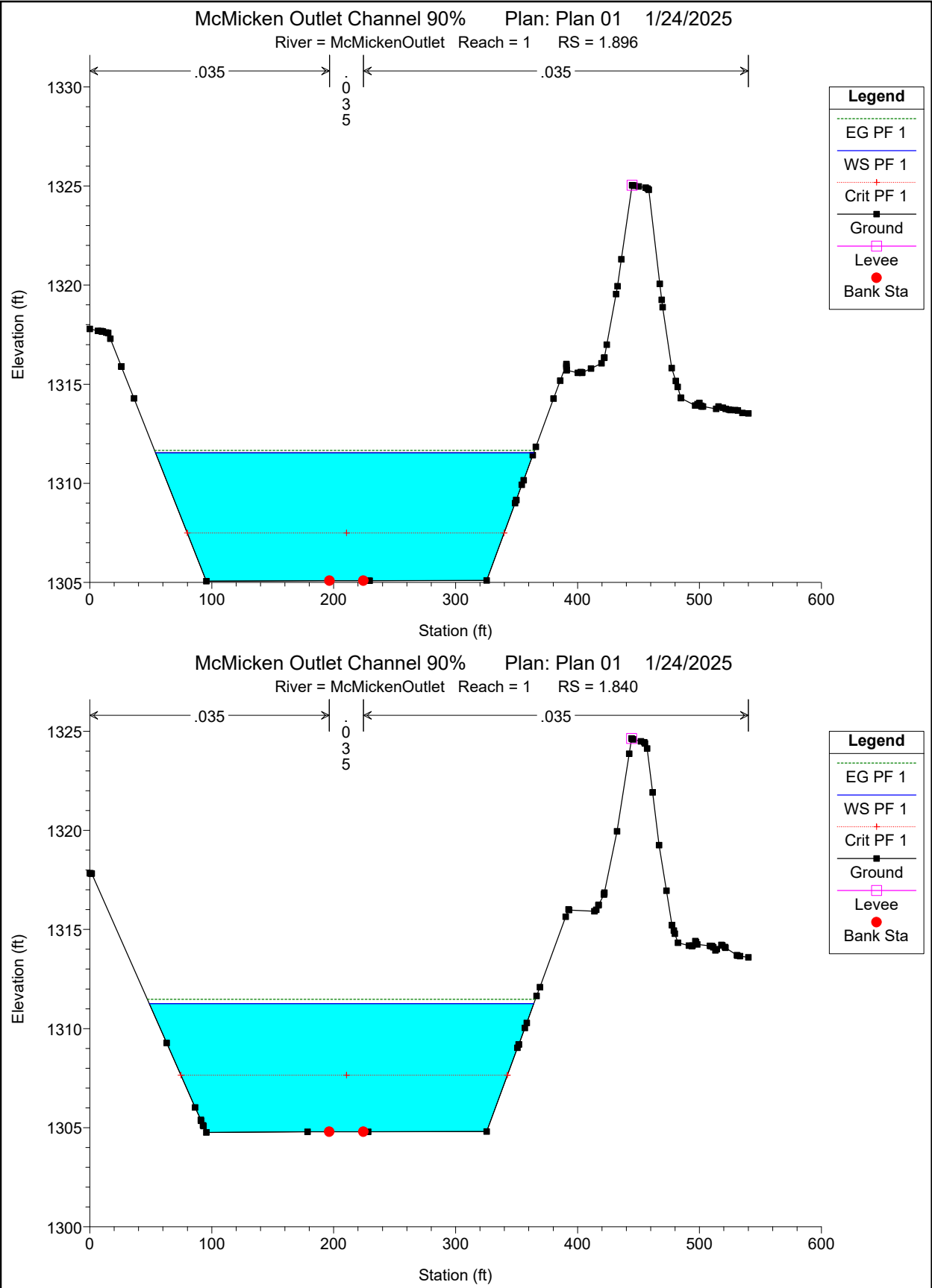


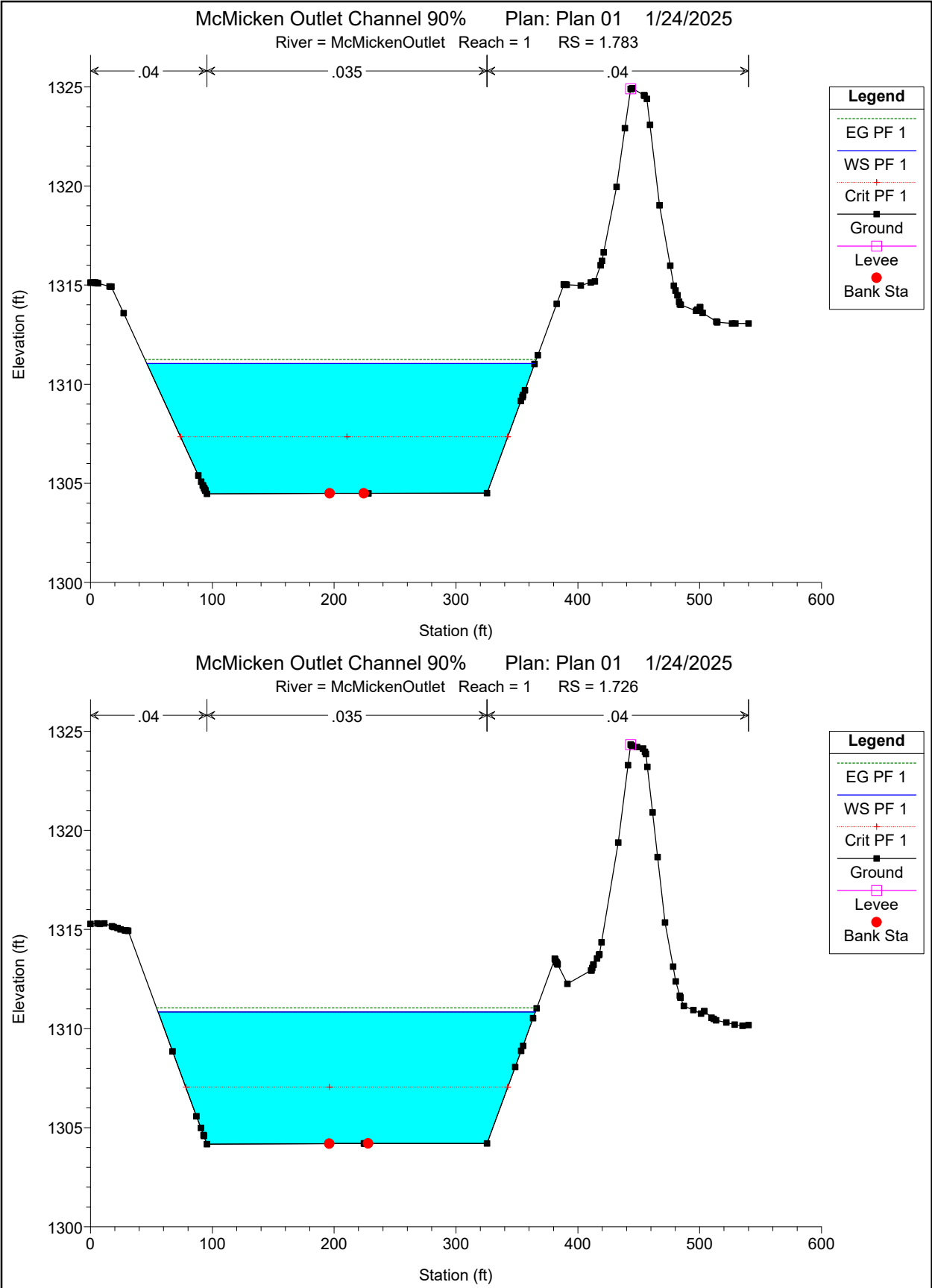


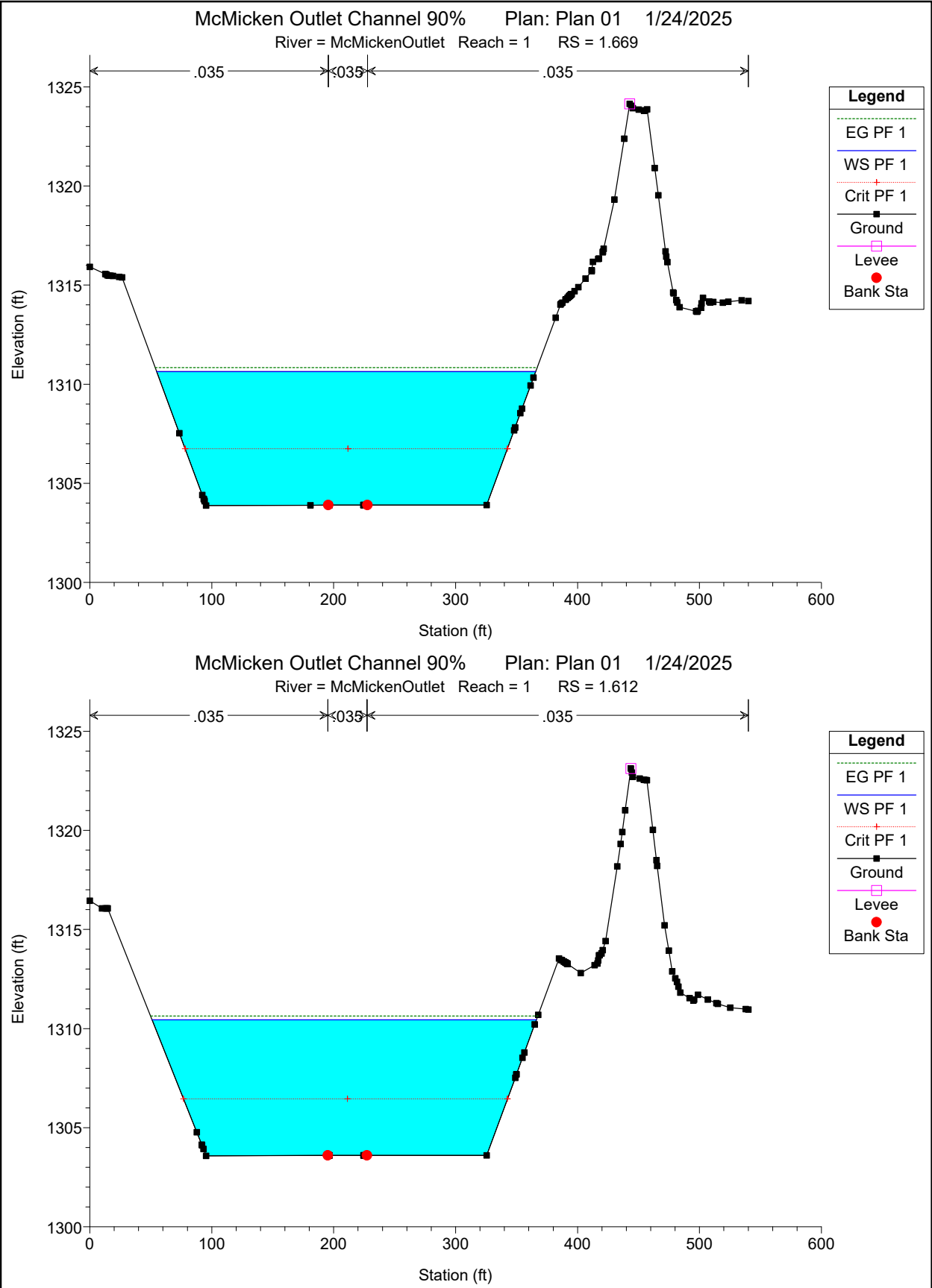


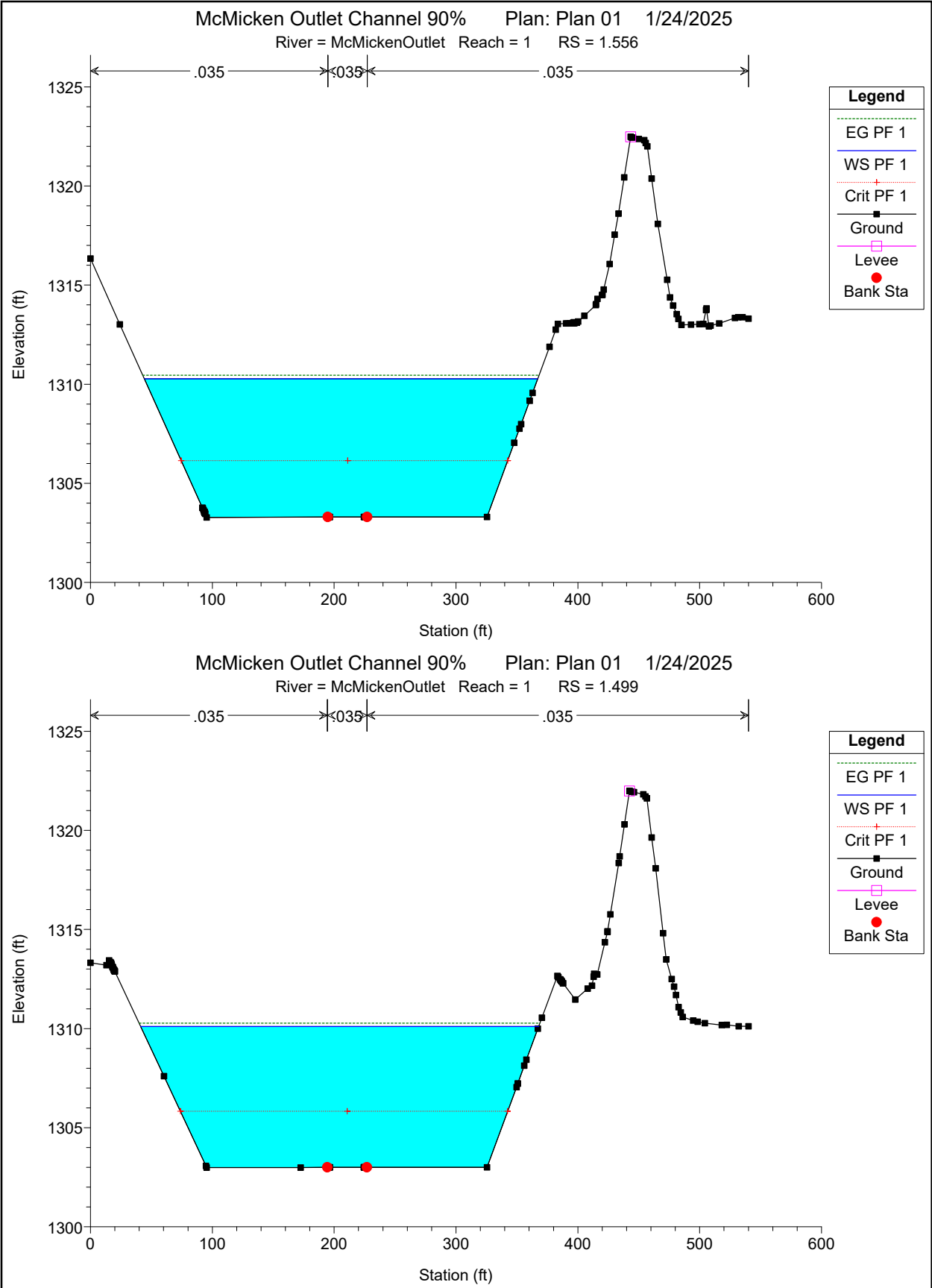


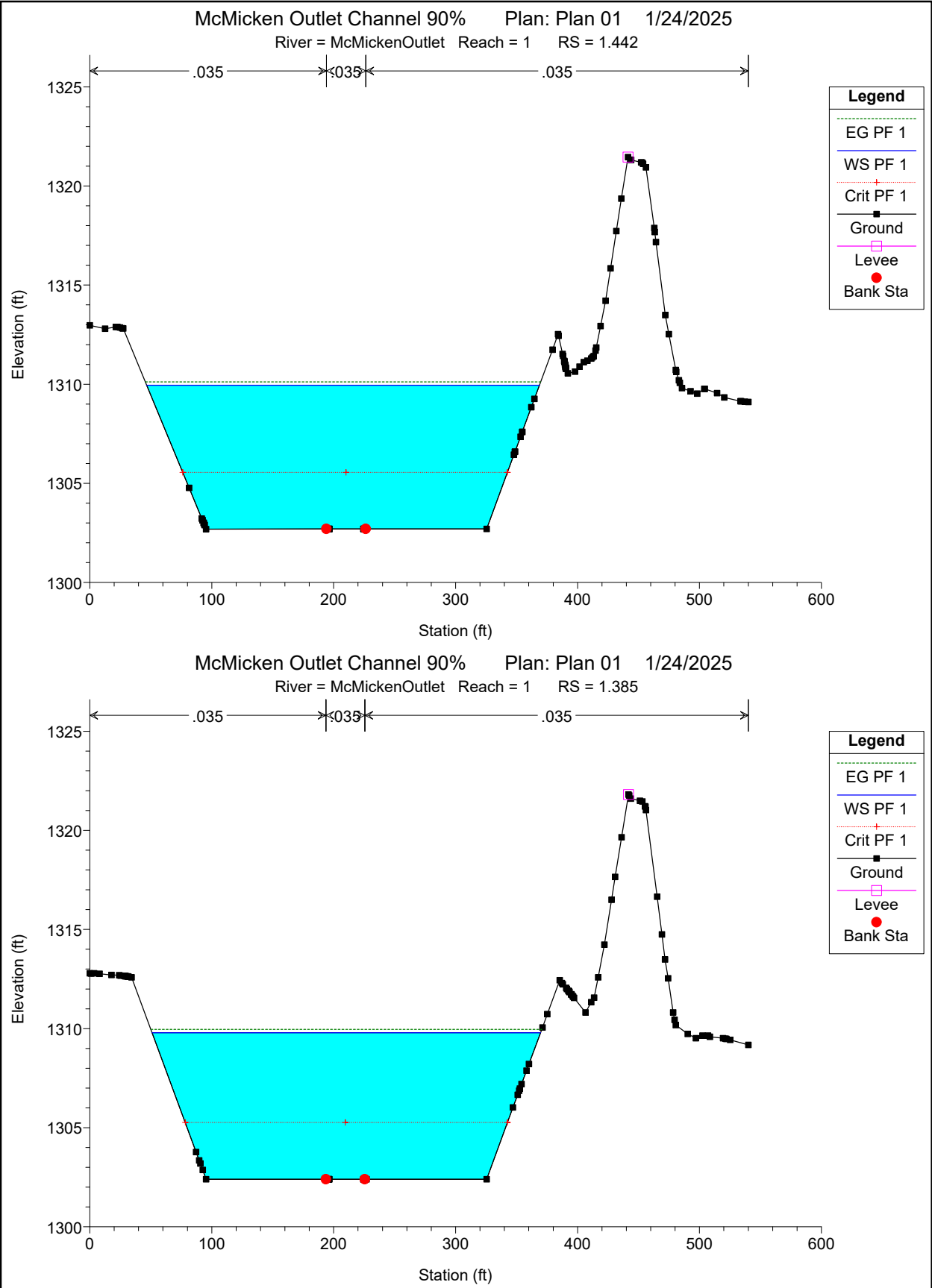


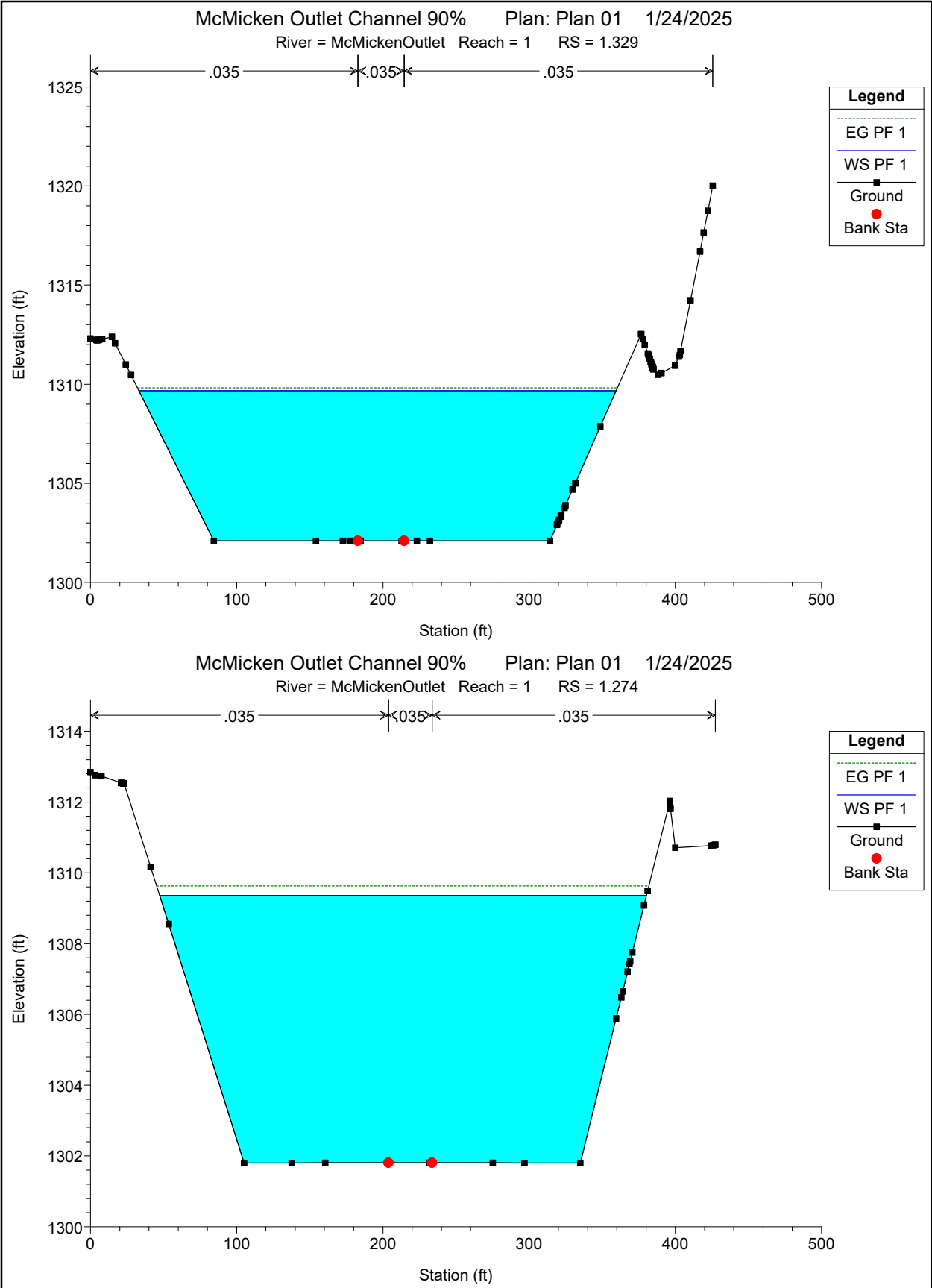


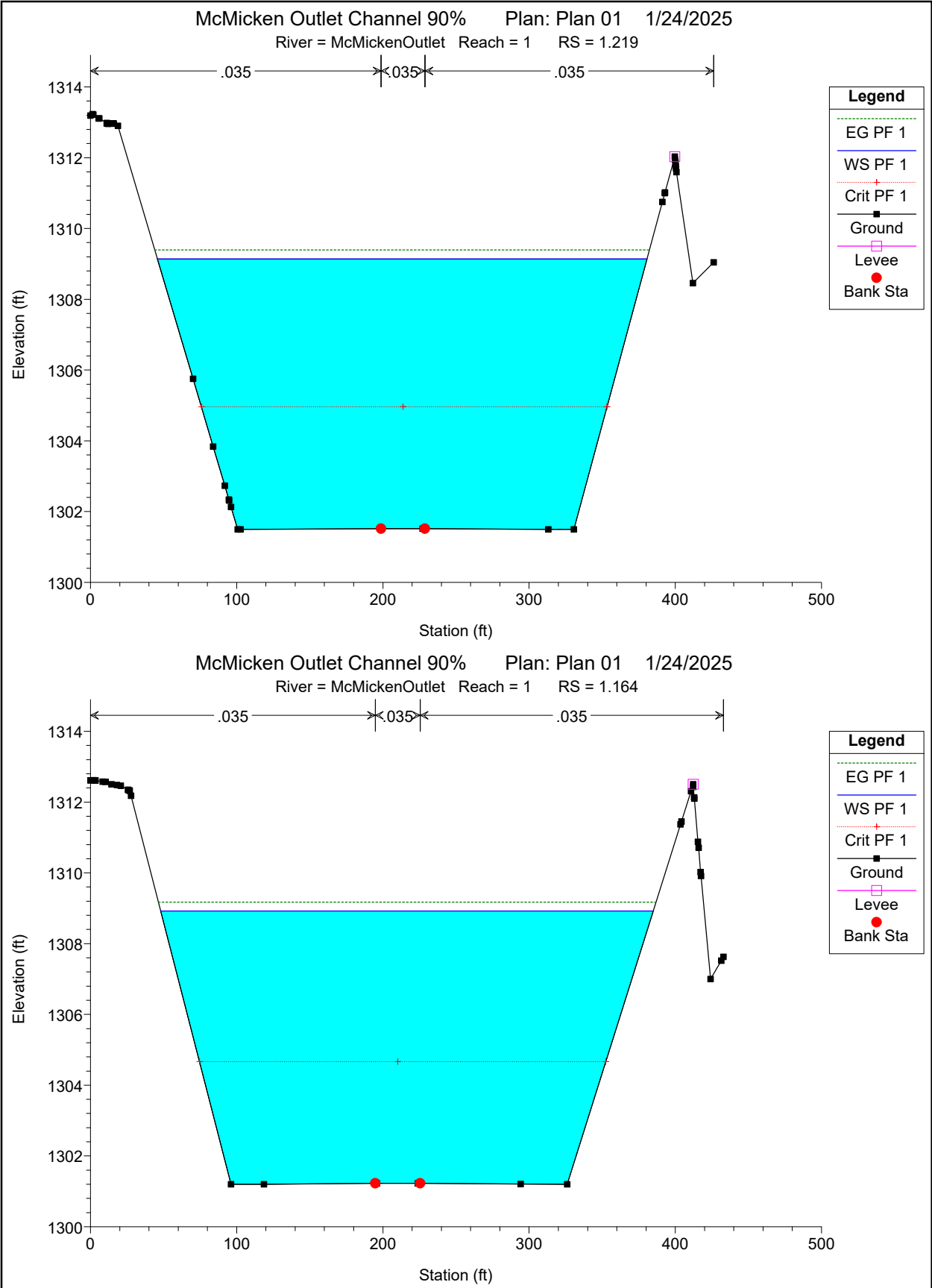


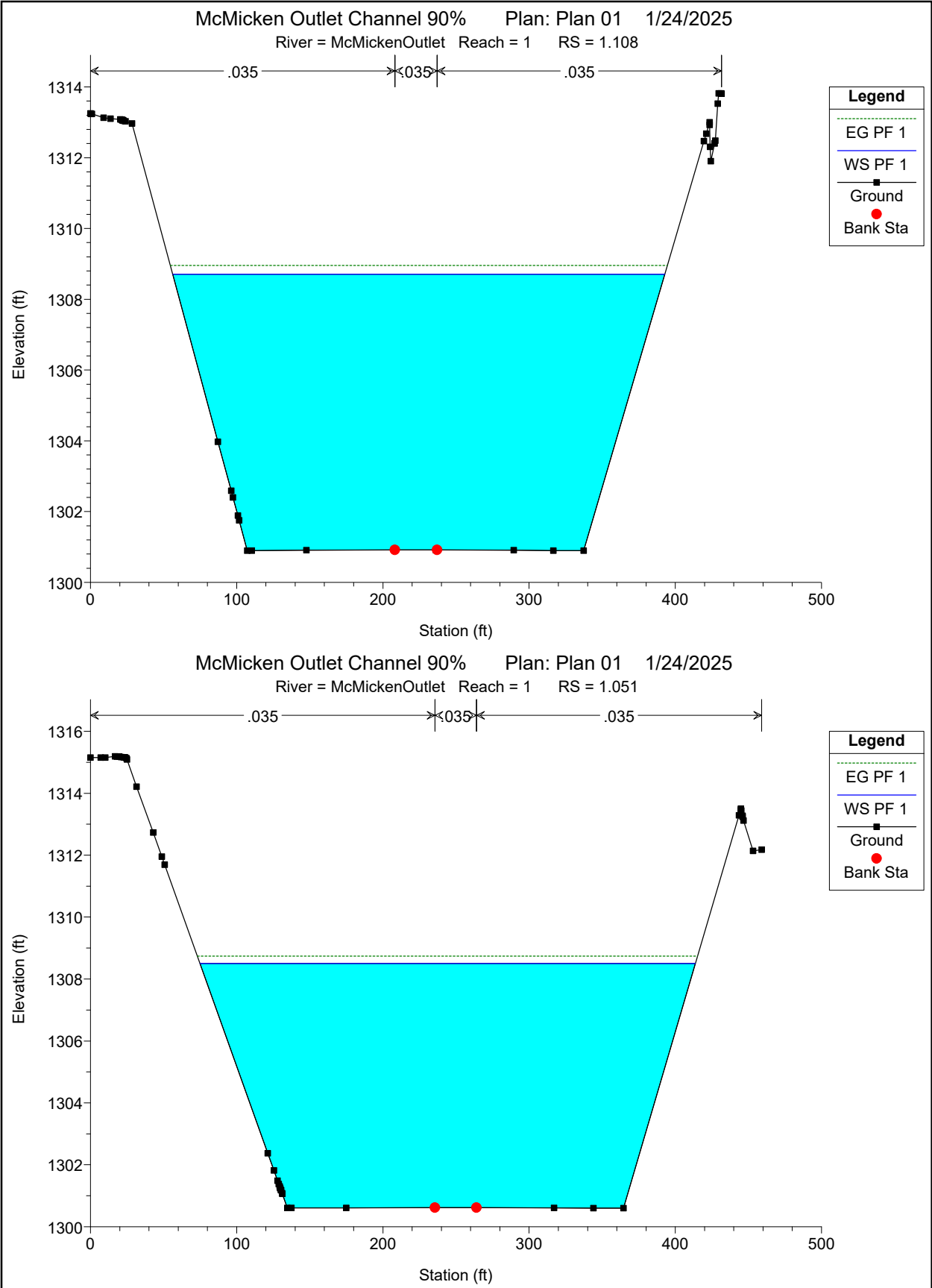


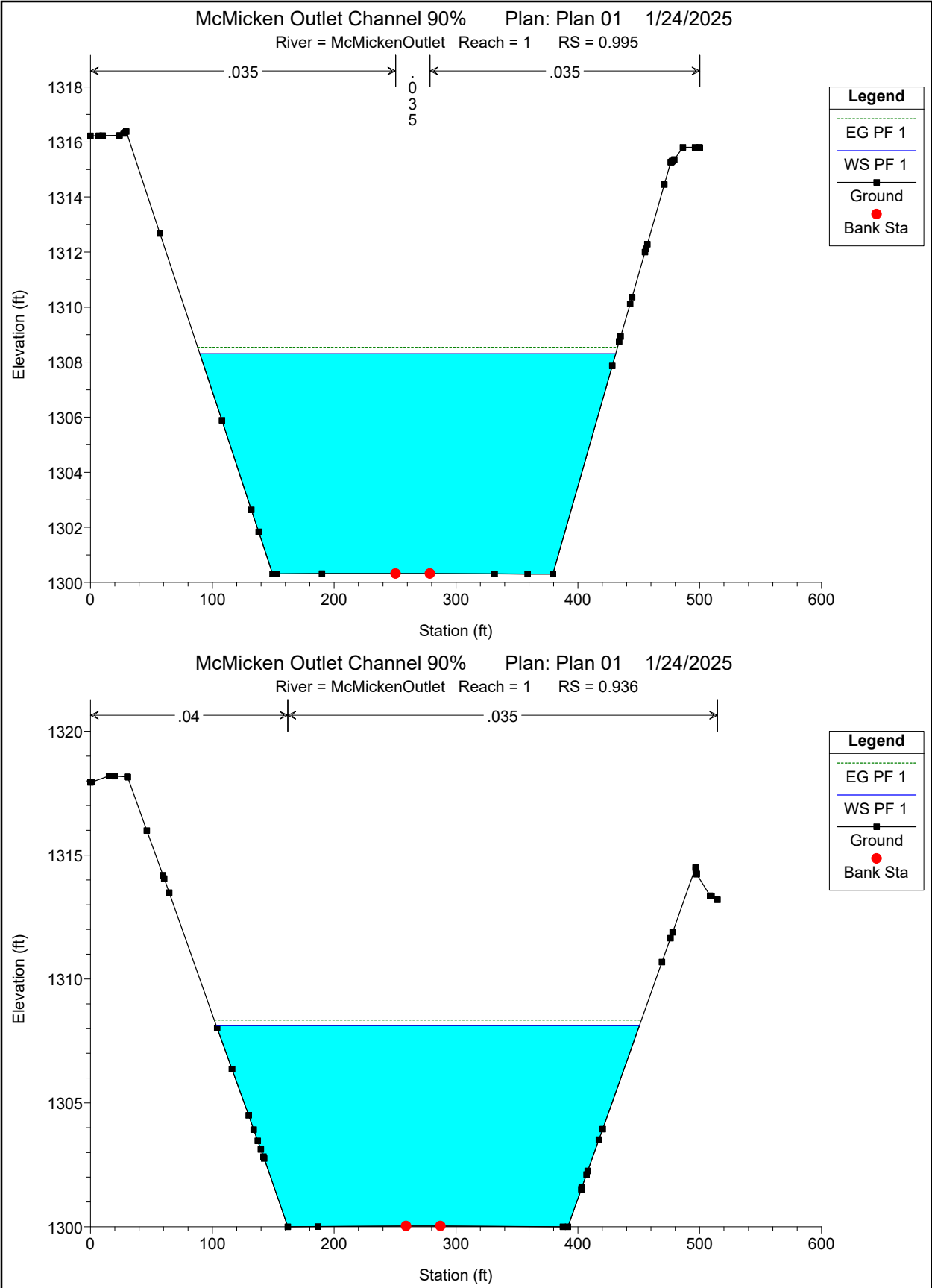


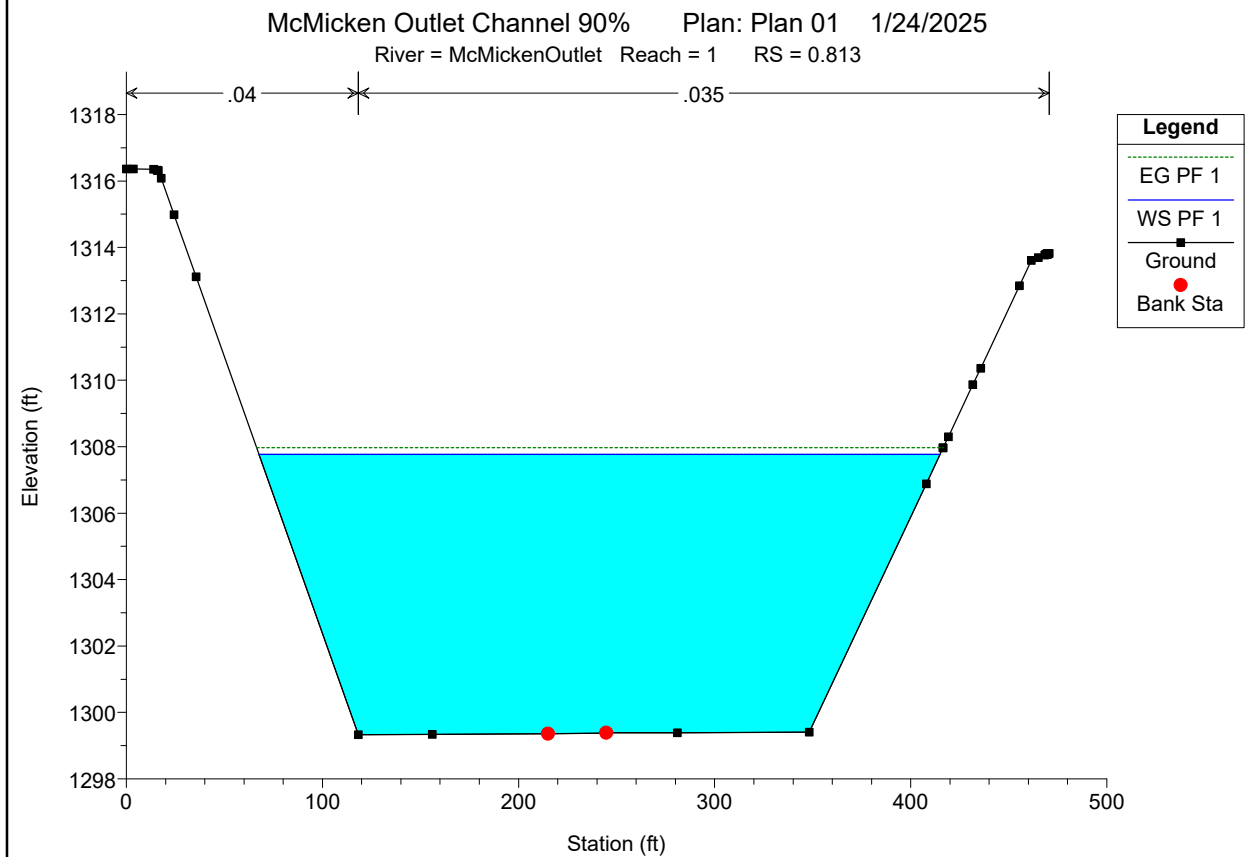
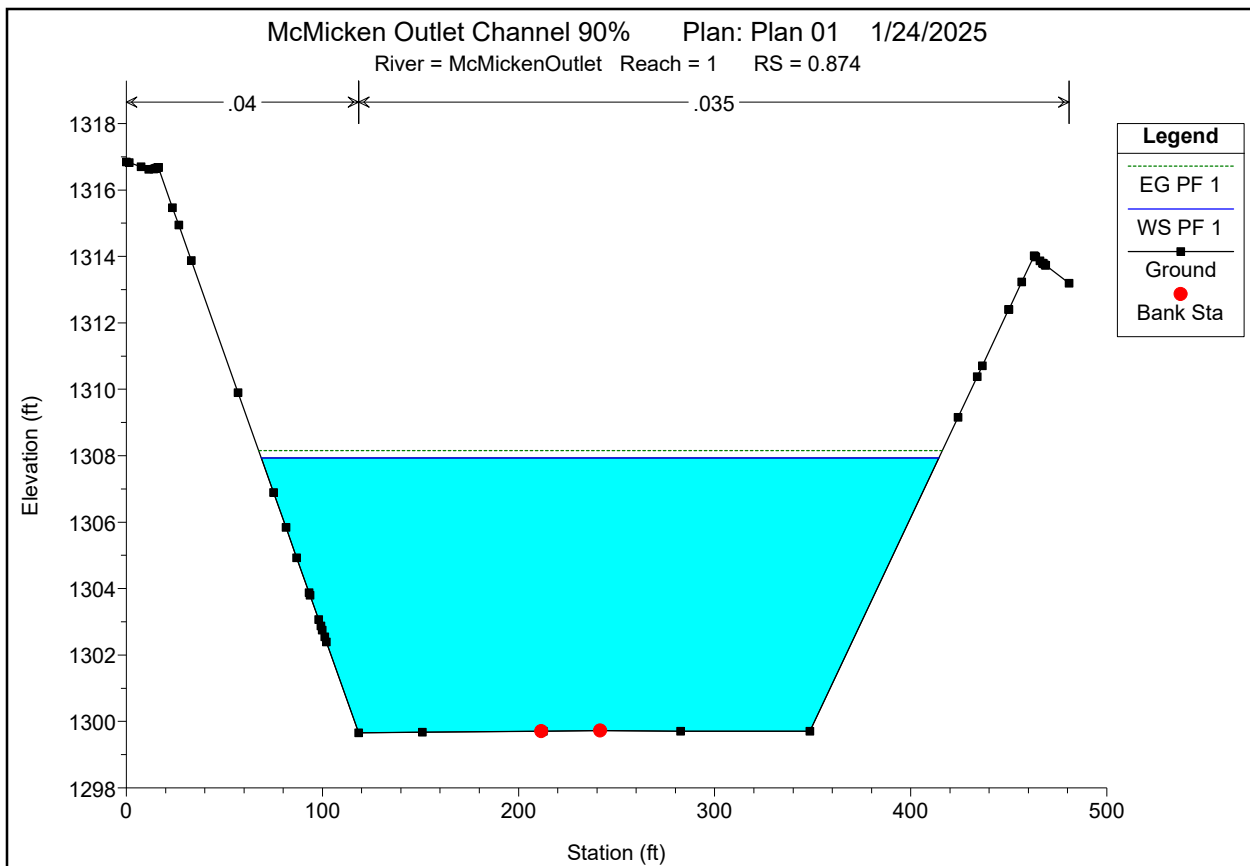


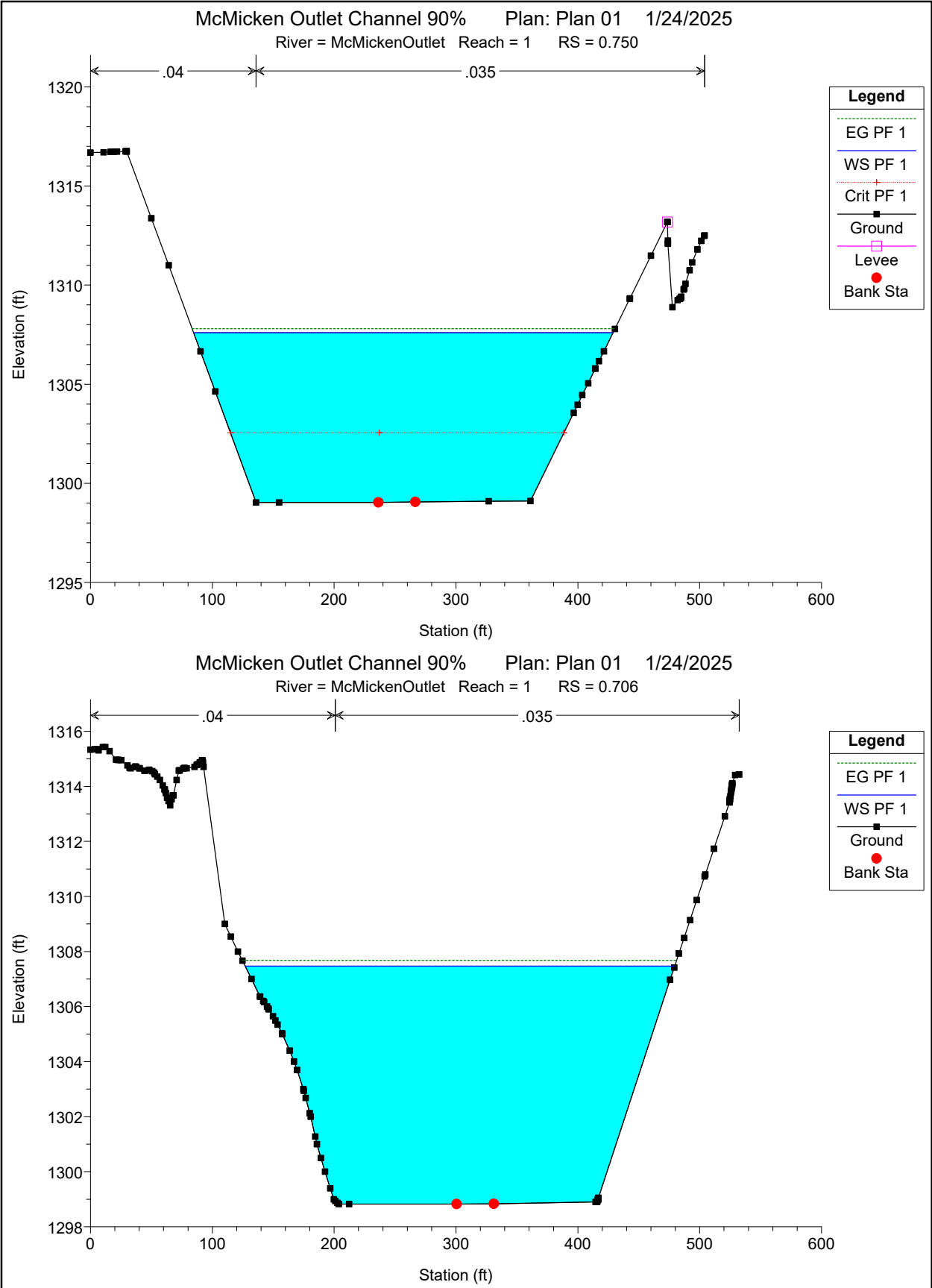


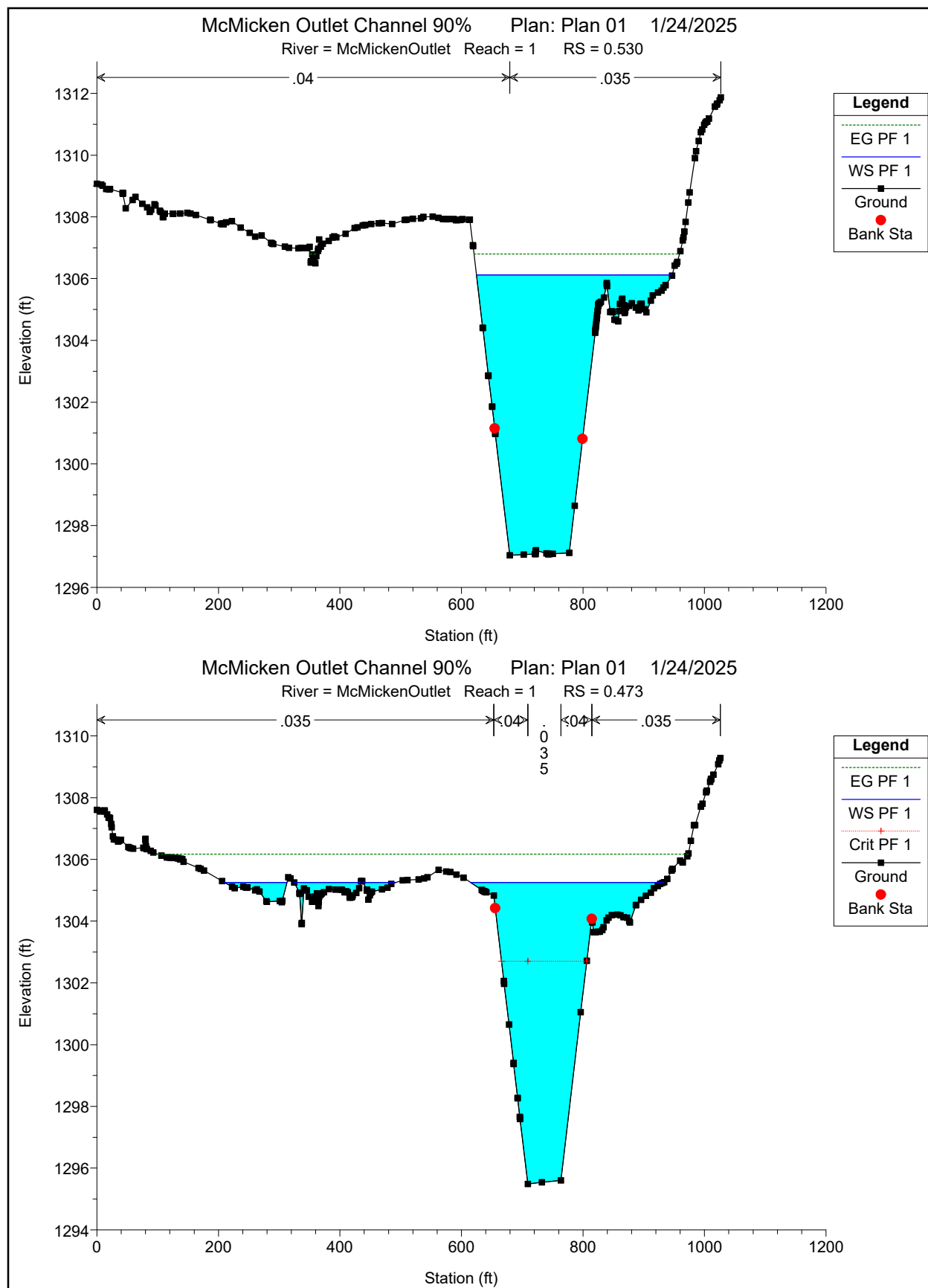


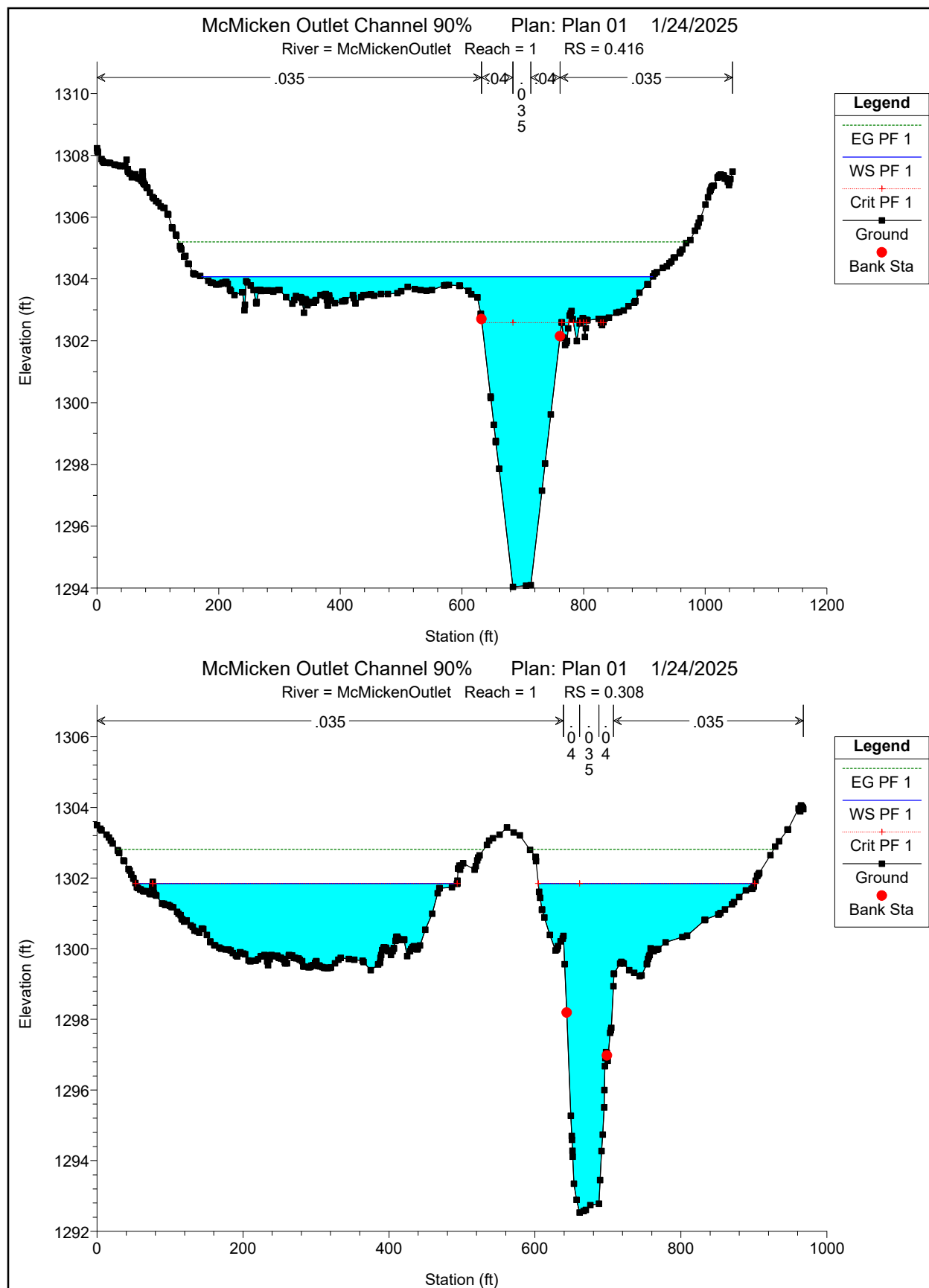


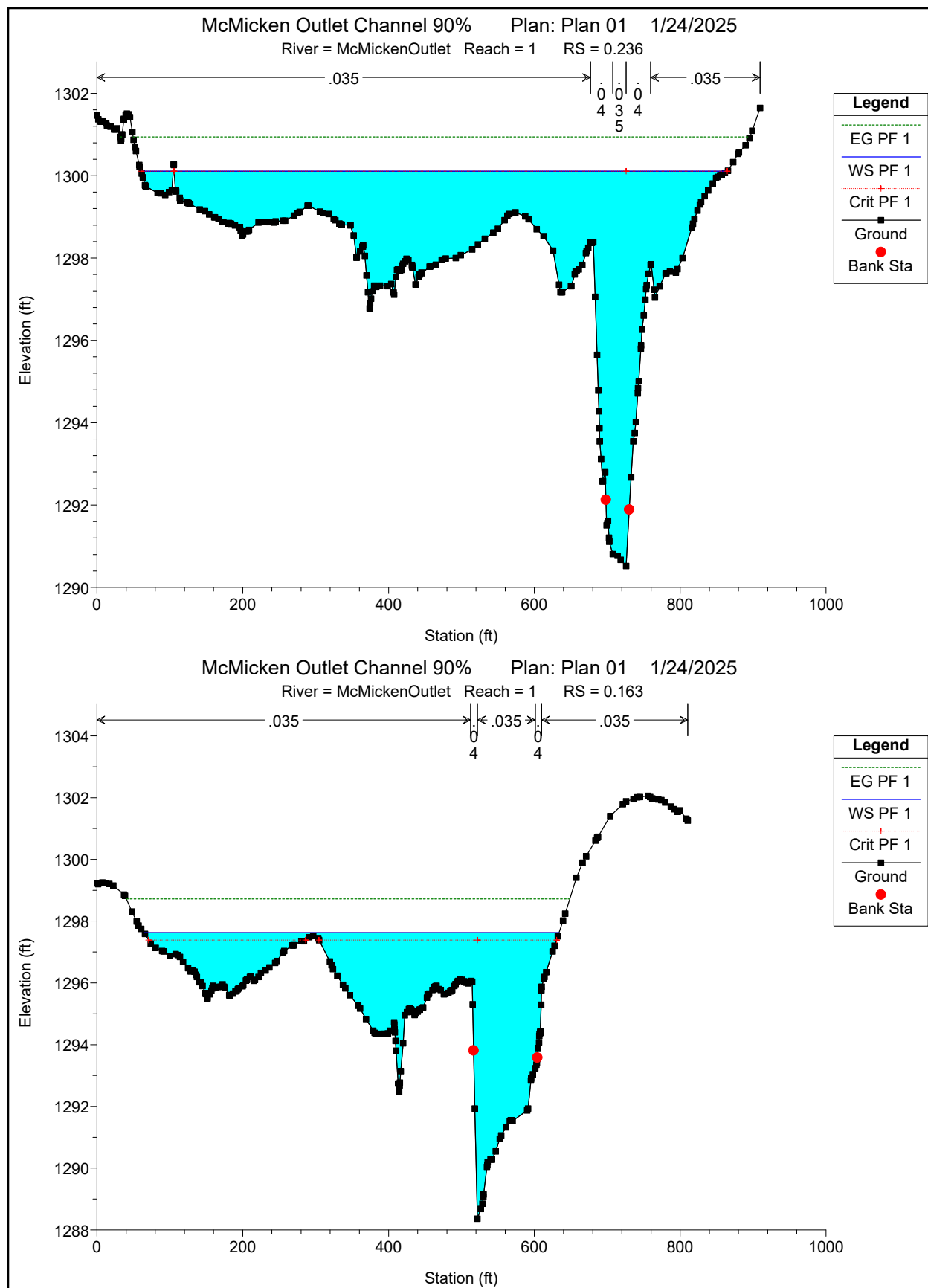


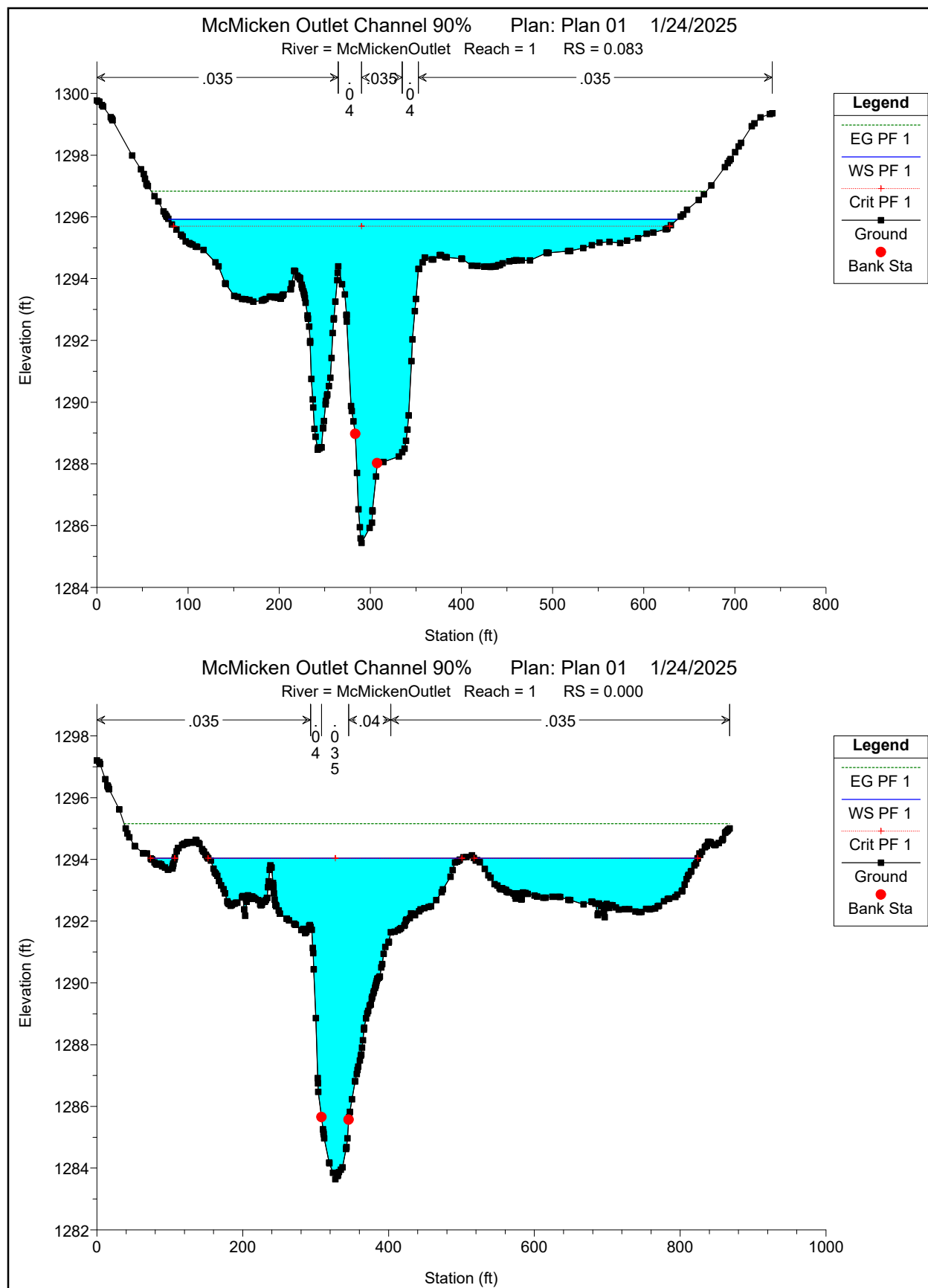














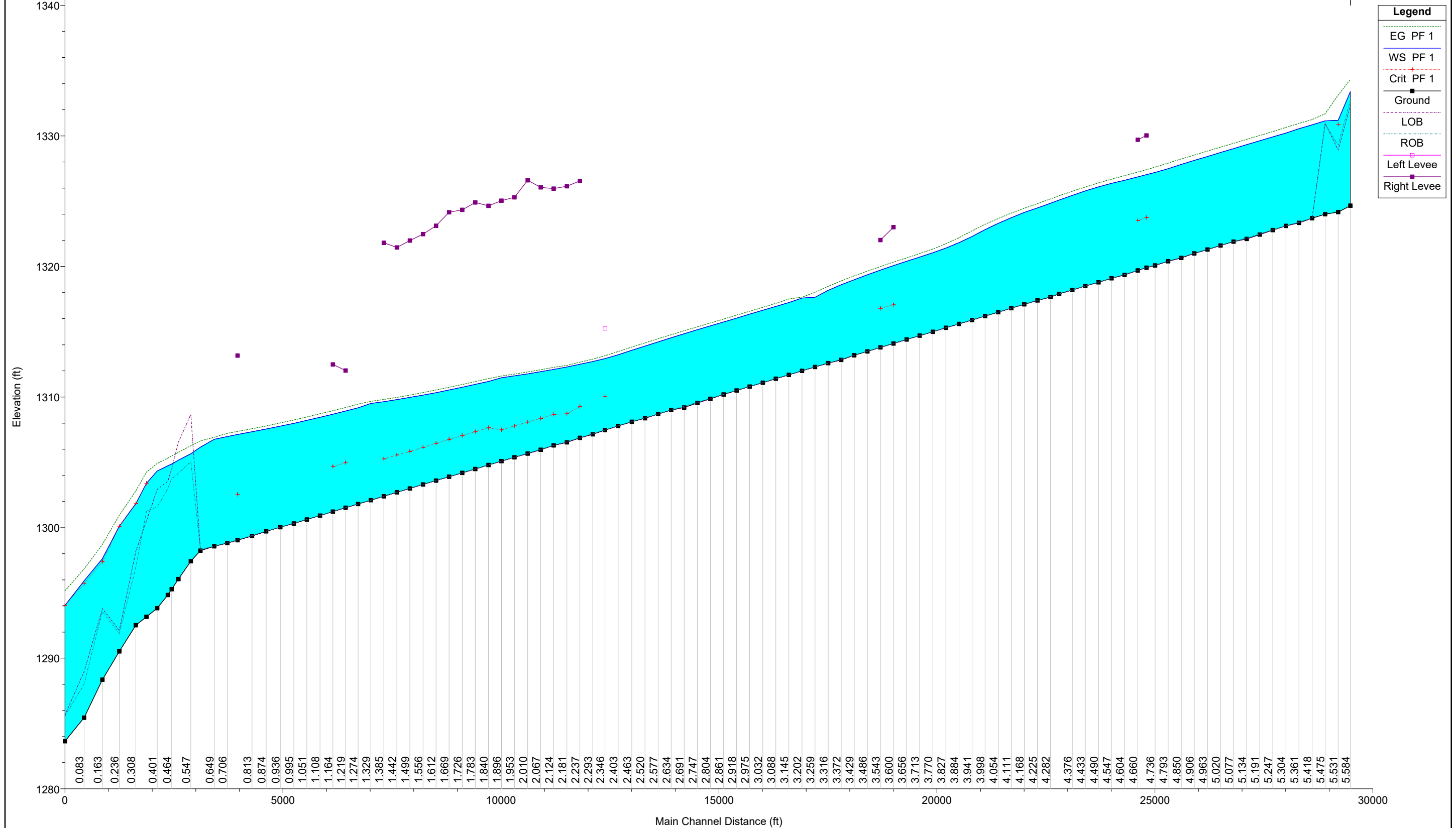
Appendix I - HEC-RAS Output - Corrected Effective Model

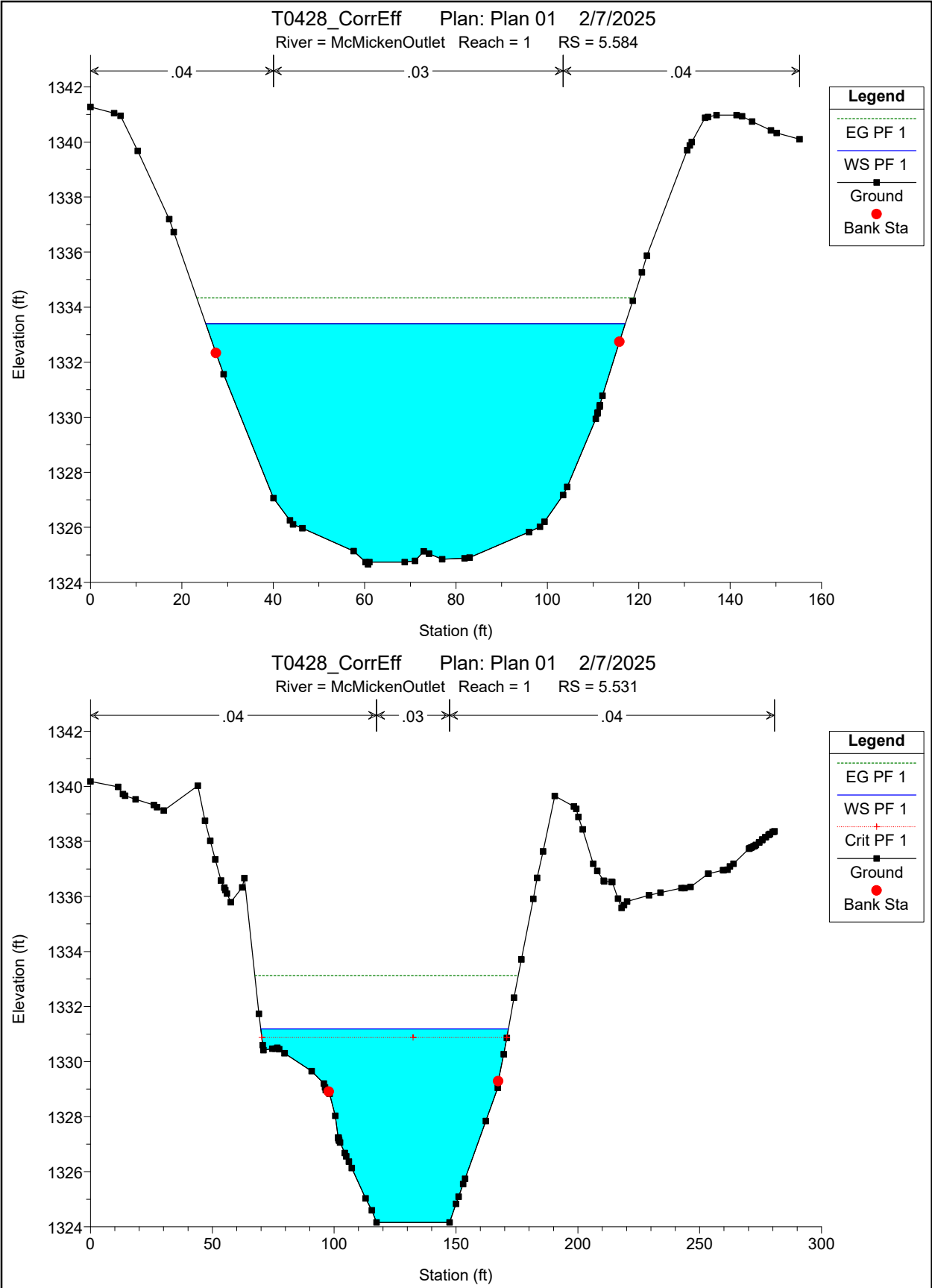
HEC-RAS Plan: Plan 01 River: McMickenOutlet Reach: 1 Profile: PF 1

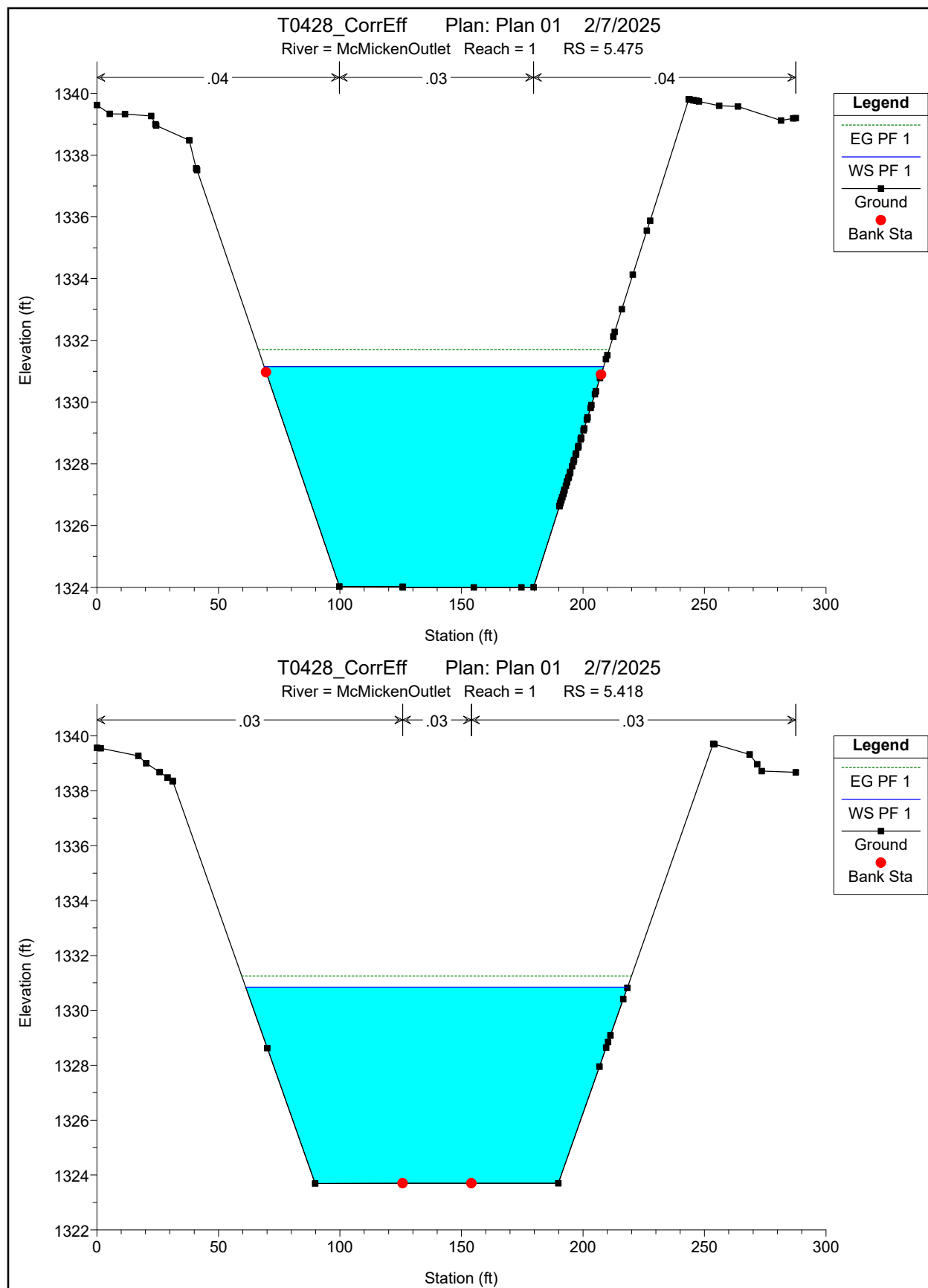
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	5.584	PF 1	4650.00	1324.66	1333.40		1334.33	0.002437	7.77	599.95	91.80	0.53
1	5.531	PF 1	4650.00	1324.16	1331.19	1330.88	1333.12	0.007492	11.31	436.82	101.59	0.83
1	5.475	PF 1	4650.00	1324.00	1331.15		1331.70	0.001894	5.93	783.76	139.66	0.44
1	5.418	PF 1	4650.00	1323.70	1330.85		1331.25	0.000991	5.79	919.23	157.14	0.38
1	5.361	PF 1	4650.00	1323.34	1330.55		1330.96	0.000986	5.79	920.41	157.13	0.38
1	5.304	PF 1	4650.00	1323.10	1330.22		1330.65	0.001045	5.92	888.63	149.72	0.39
1	5.247	PF 1	4650.00	1322.78	1329.93		1330.33	0.001000	5.81	916.09	156.90	0.38
1	5.191	PF 1	4650.00	1322.44	1329.63		1330.03	0.000998	5.81	916.55	156.91	0.38
1	5.134	PF 1	4650.00	1322.11	1329.33		1329.74	0.000996	5.81	917.08	156.90	0.38
1	5.077	PF 1	4650.00	1321.90	1329.03		1329.44	0.001002	5.81	915.61	156.90	0.38
1	5.020	PF 1	4650.00	1321.60	1328.73		1329.14	0.001002	5.81	915.43	156.84	0.38
1	4.963	PF 1	4650.00	1321.30	1328.43		1328.83	0.001003	5.81	915.25	156.84	0.38
1	4.906	PF 1	4650.00	1321.00	1328.12		1328.53	0.001004	5.81	915.14	156.87	0.38
1	4.850	PF 1	4650.00	1320.66	1327.82		1328.23	0.001002	5.82	915.30	156.84	0.38
1	4.793	PF 1	4650.00	1320.40	1327.48		1327.92	0.001064	5.96	882.85	149.40	0.39
1	4.736	PF 1	4650.00	1320.08	1327.20		1327.61	0.000954	5.66	915.75	157.67	0.37
1	4.698	PF 1	4650.00	1319.90	1327.03	1323.75	1327.41	0.000919	5.56	937.59	163.08	0.37
1	4.660	PF 1	4650.00	1319.70	1326.86	1323.53	1327.23	0.000888	5.48	955.42	167.03	0.36
1	4.604	PF 1	4650.00	1319.35	1326.60		1326.95	0.000878	5.49	991.91	174.68	0.36
1	4.547	PF 1	4650.00	1319.09	1326.37		1326.69	0.000806	5.28	1044.22	186.91	0.35
1	4.490	PF 1	4650.00	1318.79	1326.09		1326.40	0.001083	5.26	1051.21	188.08	0.34
1	4.433	PF 1	4650.00	1318.50	1325.79		1326.08	0.001032	5.13	1089.97	199.05	0.33
1	4.376	PF 1	4650.00	1318.20	1325.44		1325.76	0.001105	5.28	1046.44	188.92	0.35
1	4.319	PF 1	4650.00	1317.90	1325.09		1325.42	0.001163	5.39	1020.05	184.04	0.35
1	4.282	PF 1	4650.00	1317.65	1324.85		1325.18	0.001172	5.40	1019.74	185.00	0.36
1	4.225	PF 1	4650.00	1317.40	1324.48		1324.82	0.001204	5.43	1013.59	186.02	0.36
1	4.168	PF 1	4650.00	1317.10	1324.13		1324.46	0.001191	5.38	1033.06	193.71	0.36
1	4.111	PF 1	4650.00	1316.80	1323.74		1324.08	0.001283	5.53	997.51	187.39	0.37
1	4.054	PF 1	4650.00	1316.50	1323.30		1323.68	0.001416	5.73	954.53	180.66	0.39
1	3.998	PF 1	4650.00	1316.20	1322.82		1323.23	0.001559	5.91	923.74	178.81	0.40
1	3.941	PF 1	4650.00	1315.90	1322.29		1322.73	0.001765	6.14	888.45	177.95	0.43
1	3.884	PF 1	4650.00	1315.60	1321.82		1322.21	0.001604	5.75	947.72	194.65	0.41
1	3.827	PF 1	4650.00	1315.30	1321.40		1321.74	0.001406	5.32	1007.56	205.10	0.38
1	3.770	PF 1	4650.00	1315.00	1321.05		1321.34	0.001202	4.88	1080.99	217.76	0.35
1	3.713	PF 1	4650.00	1314.70	1320.72		1320.99	0.001078	4.61	1136.36	227.31	0.33
1	3.656	PF 1	4650.00	1314.40	1320.40		1320.66	0.001095	4.64	1133.72	228.22	0.33
1	3.600	PF 1	4650.00	1314.10	1320.07	1317.06	1320.33	0.001095	4.62	1143.77	233.12	0.33
1	3.543	PF 1	4650.00	1313.80	1319.72	1316.78	1319.99	0.001146	4.70	1116.12	227.09	0.34
1	3.486	PF 1	4650.00	1313.50	1319.36		1319.64	0.001188	4.76	1099.77	225.33	0.35
1	3.429	PF 1	4650.00	1313.20	1318.99		1319.28	0.001243	4.82	1083.18	224.23	0.35
1	3.372	PF 1	4650.00	1312.84	1318.60		1318.89	0.001305	4.91	1070.54	225.43	0.36
1	3.316	PF 1	4650.00	1312.60	1318.17		1318.48	0.001430	5.04	1035.47	222.00	0.38
1	3.259	PF 1	4650.00	1312.30	1317.64		1318.01	0.001712	5.36	957.25	208.60	0.41
1	3.202	PF 1	5000.00	1312.00	1317.58		1317.65	0.000282	2.24	2288.60	432.84	0.17
1	3.145	PF 1	5000.00	1311.70	1317.23		1317.50	0.001117	4.44	1202.38	247.41	0.33
1	3.088	PF 1	5000.00	1311.40	1316.94		1317.17	0.001005	4.22	1299.99	268.87	0.32
1	3.032	PF 1	5000.00	1311.10	1316.65		1316.87	0.000987	4.18	1319.28	275.21	0.31
1	2.975	PF 1	5000.00	1310.80	1316.35		1316.57	0.000998	4.20	1307.79	271.50	0.31
1	2.918	PF 1	5000.00	1310.50	1316.05		1316.27	0.000998	4.20	1307.18	271.25	0.31
1	2.861	PF 1	5000.00	1310.20	1315.75		1315.97	0.000997	4.20	1308.31	271.62	0.31
1	2.804	PF 1	5000.00	1309.87	1315.45		1315.68	0.000990	4.19	1315.27	273.89	0.31
1	2.747	PF 1	5000.00	1309.54	1315.15		1315.38	0.000990	4.20	1313.81	273.04	0.31
1	2.691	PF 1	5000.00	1309.20	1314.85		1315.08	0.001007	4.24	1294.86	266.58	0.32
1	2.634	PF 1	5000.00	1309.00	1314.54		1314.77	0.001018	4.24	1288.48	265.52	0.32
1	2.577	PF 1	5000.00	1308.70	1314.22		1314.47	0.001038	4.27	1272.80	261.04	0.32
1	2.520	PF 1	5000.00	1308.38	1313.90		1314.15	0.001062	4.32	1254.65	256.04	0.32
1	2.463	PF 1	5000.00	1308.10	1313.58		1313.82	0.001077	4.33	1252.82	257.82	0.33
1	2.403	PF 1	5000.00	1307.78	1313.23		1313.48	0.001082	4.33	1264.34	265.04	0.33
1	2.346	PF 1	5000.00	1307.46	1312.94	1310.04	1313.16	0.000996	4.16	1325.14	280.30	0.31
1	2.293	PF 1	5000.00	1307.14	1312.72		1312.90	0.000793	3.75	1461.10	301.37	0.28
1	2.237	PF 1	5000.00	1306.87	1312.51	1309.27	1312.67	0.000723	3.61	1516.53	308.83	0.27
1	2.181	PF 1	5000.00	1306.53	1312.30	1308.72	1312.42	0.000465	2.93	1791.00	345.41	0.22
1	2.124	PF 1	5000.00	1306.29	1312.12	1308.67	1312.28	0.000607	3.39	1582.21	311.78	0.25
1	2.067	PF 1	5000.00	1305.96	1311.95	1308.36	1312.09	0.000592	3.40	1618.01	312.50	0.25
1	2.010	PF 1	5000.00	1305.67	1311.78	1308.08	1311.92	0.000555	3.34	1641.70	308.72	0.24
1	1.953	PF 1	5000.00	1305.38	1311.62	1307.79	1311.76	0.000517	3.27	1671.51	306.06	0.23
1	1.896	PF 1	5000.00	1305.09	1311.48	1307.49	1311.61	0.000474	3.18	1723.54	309.35	0.22
1	1.840	PF 1	6550.00	1304.79	1311.19	1307.65	1311.41	0.000799	4.14	1743.71	314.49	0.29
1	1.783	PF 1	6550.00	1304.49	1310.97	1307.35	1311.18	0.000728	3.98	1773.71	317.40	0.28
1	1.726	PF 1	6550.00	1304.19	1310.75	1307.04	1310.96	0.000713	3.97	1766.20	308.58	0.27
1	1.669	PF 1	6550.00	1303.90	1310.54	1306.75	1310.75	0.000713	4.00	1793.27	309.64	0.27
1	1.612	PF 1	6550.00	1303.60	1310.34	1306.46	1310.54	0.000674	3.93	1833.79	313.89	0.27
1	1.556	PF 1	6550.00	1303.30	1310.15	1306.15	1310.34	0.000628	3.84	1889.46	321.20	0.26
1	1.499	PF 1	6550.00	1303.00	1309.98	1305.83	1310.15	0.000588	3.76	1936.00	324.91	0.25
1	1.442	PF 1	6550.00	1302.70	1309.81	1305.56	1309.98	0.000558	3.71	1955.55	320.26	0.25
1	1.385	PF 1	6550.00	1302.40	1309.65	1305.26	1309.82	0.000528	3.65	1980.84	316.77	0.24

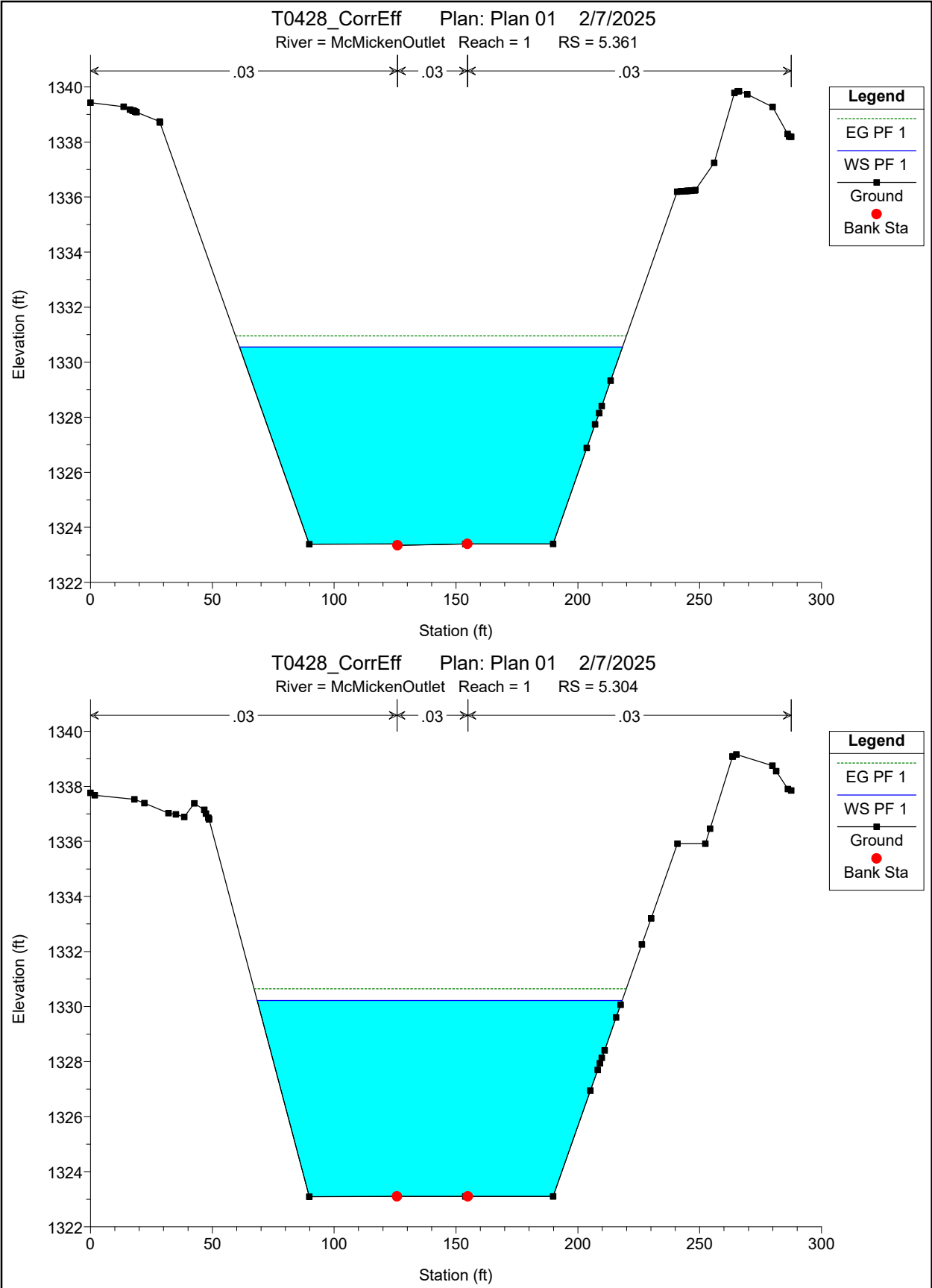
HEC-RAS Plan: Plan 01 River: McMickenOutlet Reach: 1 Profile: PF 1 (Continued)

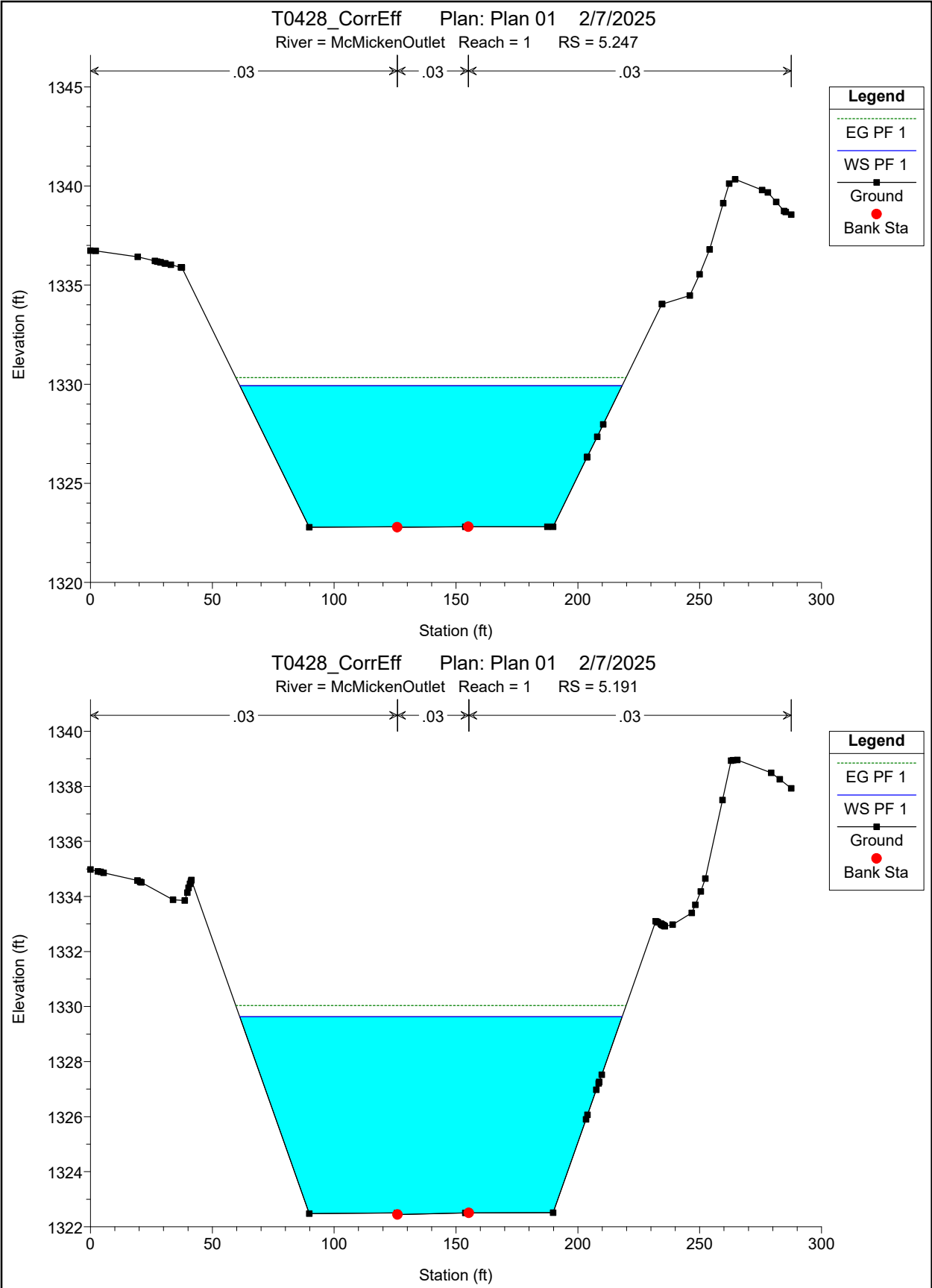
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	1.329	PF 1	6550.00	1302.10	1309.50		1309.66	0.000484	3.55	2051.66	324.29	0.23
1	1.274	PF 1	8800.00	1301.81	1309.18		1309.46	0.000876	4.76	2064.95	330.42	0.31
1	1.219	PF 1	8800.00	1301.52	1308.93	1304.96	1309.21	0.000854	4.71	2084.71	332.02	0.31
1	1.164	PF 1	8800.00	1301.23	1308.69	1304.67	1308.96	0.000831	4.67	2106.24	333.66	0.30
1	1.108	PF 1	8800.00	1300.92	1308.45		1308.72	0.000809	4.64	2121.91	333.03	0.30
1	1.051	PF 1	8800.00	1300.62	1308.21		1308.48	0.000783	4.59	2146.79	334.84	0.29
1	0.995	PF 1	8800.00	1300.32	1307.99		1308.24	0.000756	4.54	2175.24	336.92	0.29
1	0.936	PF 1	8800.00	1300.03	1307.77		1308.01	0.000705	4.41	2215.99	342.10	0.28
1	0.874	PF 1	8800.00	1299.71	1307.55		1307.79	0.000680	4.37	2237.78	340.07	0.27
1	0.813	PF 1	8800.00	1299.36	1307.34		1307.58	0.000643	4.30	2277.57	341.41	0.27
1	0.750	PF 1	8800.00	1299.03	1307.13	1302.55	1307.37	0.000638	4.32	2272.64	337.77	0.27
1	0.706	PF 1	8800.00	1298.82	1306.98		1307.22	0.000676	4.47	2226.82	343.29	0.28
1	0.649	PF 1	8800.00	1298.57	1306.76		1306.93	0.000416	3.52	2738.82	393.52	0.22
1	0.589	PF 1	8800.00	1298.24	1306.16		1306.64	0.001440	6.38	1581.80	247.86	0.40
1	0.547	PF 1	8800.00	1297.42	1305.65		1306.27	0.001785	6.33	1414.33	302.29	0.43
1	0.493	PF 1	8800.00	1296.06	1305.16		1305.77	0.001726	6.27	1473.33	323.70	0.42
1	0.464	PF 1	8800.00	1295.28	1304.86		1305.49	0.001834	6.42	1491.93	395.20	0.43
1	0.447	PF 1	8800.00	1294.84	1304.74		1305.32	0.001631	6.29	1579.73	406.13	0.40
1	0.401	PF 1	8800.00	1293.83	1304.34		1304.92	0.001669	6.64	1864.52	813.21	0.40
1	0.353	PF 1	8800.00	1293.17	1303.39	1303.39	1304.25	0.004469	10.11	1604.93	789.83	0.62
1	0.308	PF 1	8800.00	1292.53	1301.84	1301.84	1302.81	0.004392	10.26	1522.35	736.70	0.64
1	0.236	PF 1	8800.00	1290.52	1300.11	1300.11	1300.94	0.003903	10.82	1654.31	802.85	0.63
1	0.163	PF 1	8800.00	1288.36	1297.63	1297.39	1298.72	0.004896	10.00	1335.75	569.05	0.69
1	0.083	PF 1	8800.00	1285.44	1295.92	1295.70	1296.83	0.003989	11.11	1353.83	558.63	0.64
1	0.000	PF 1	8800.00	1283.64	1294.04	1294.04	1295.16	0.003556	11.47	1464.41	688.24	0.65

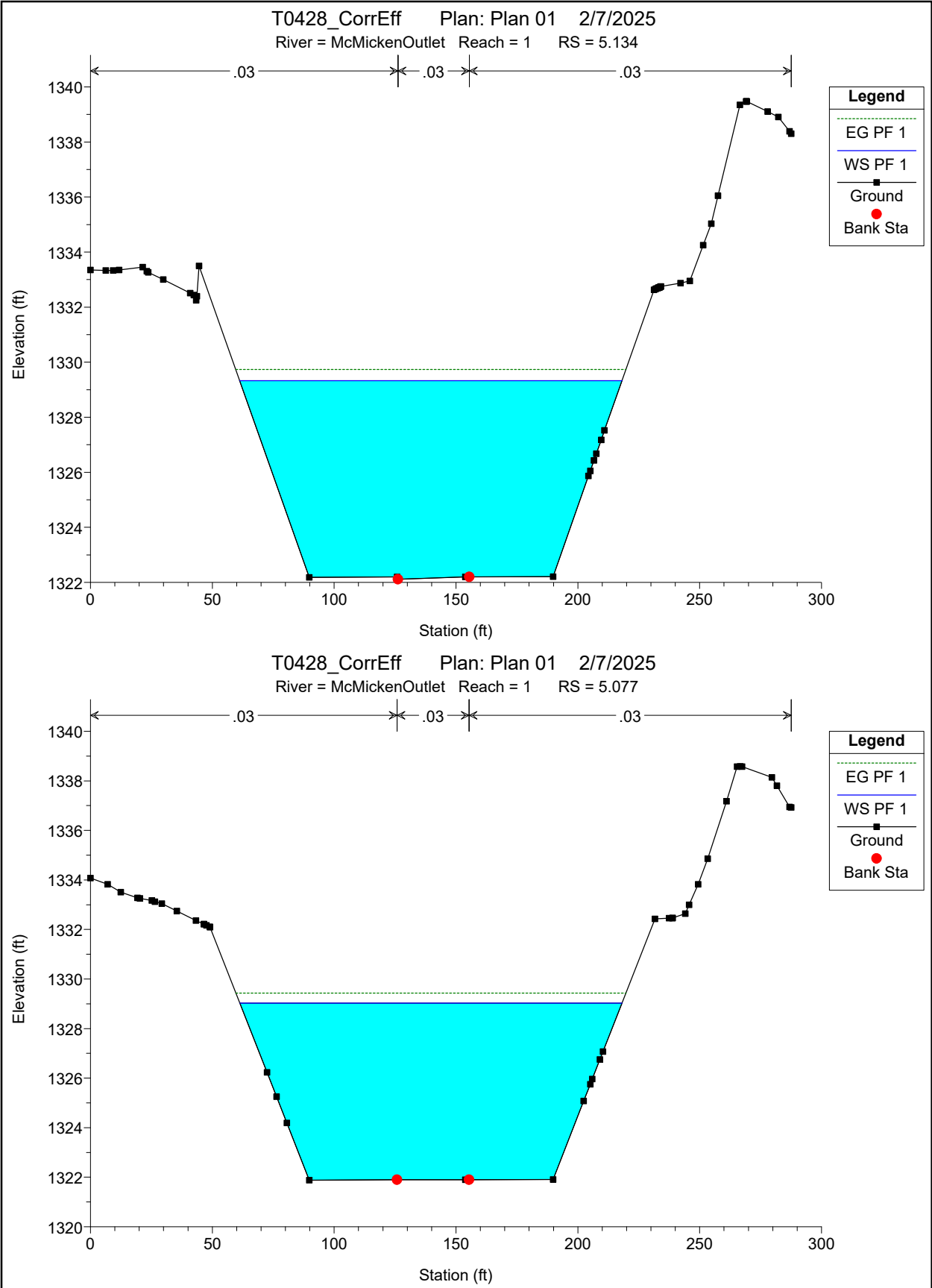


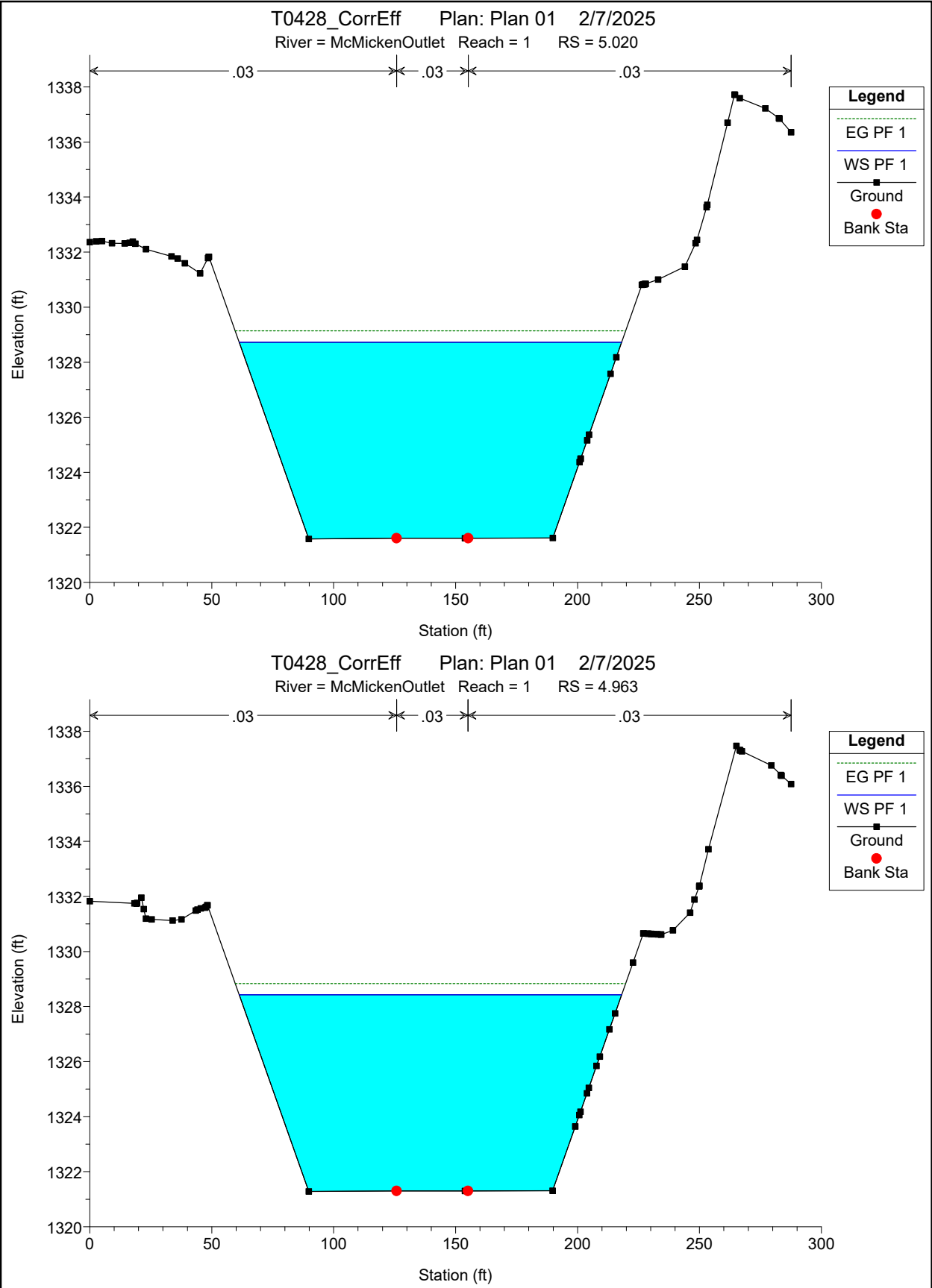


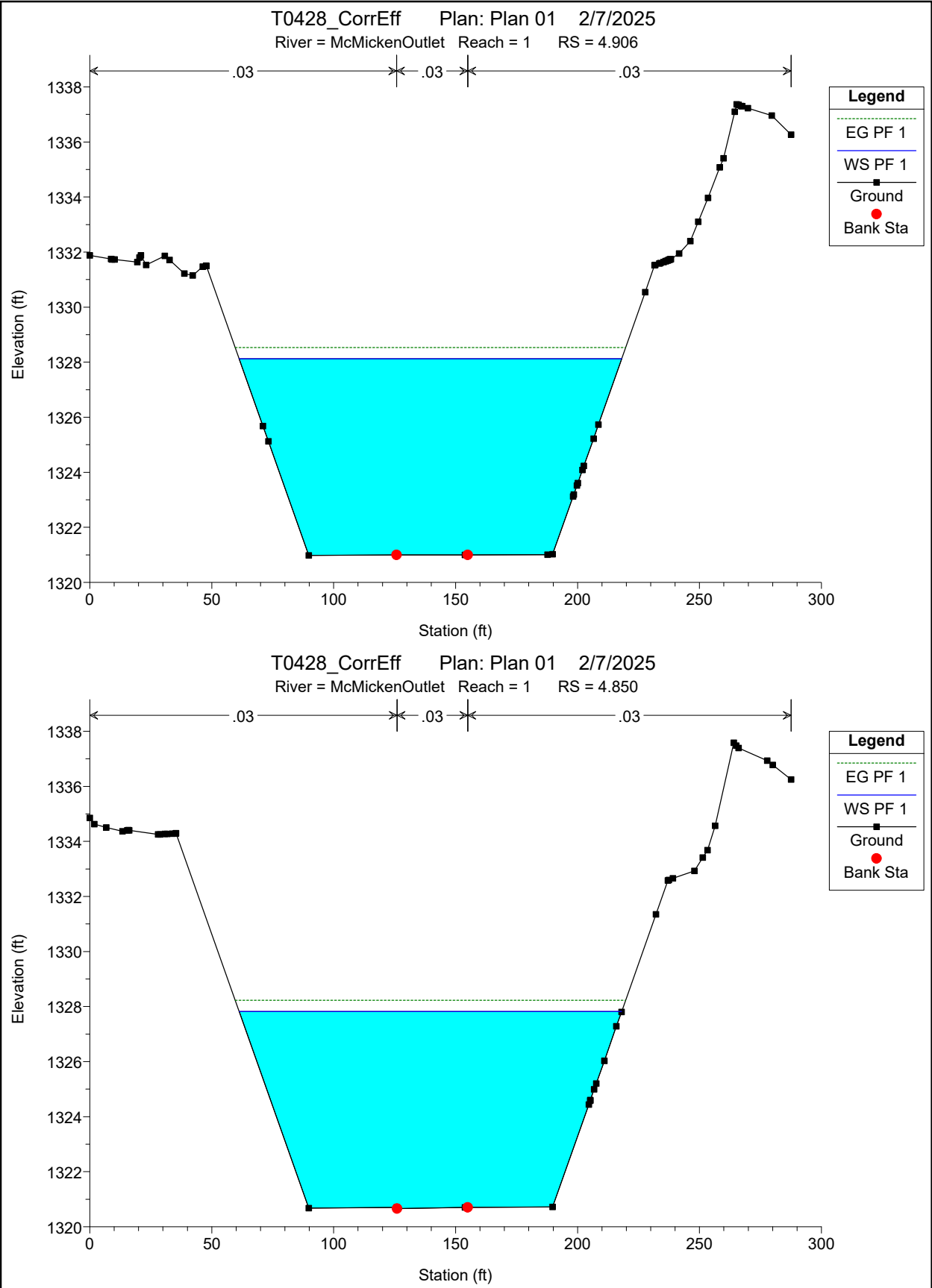


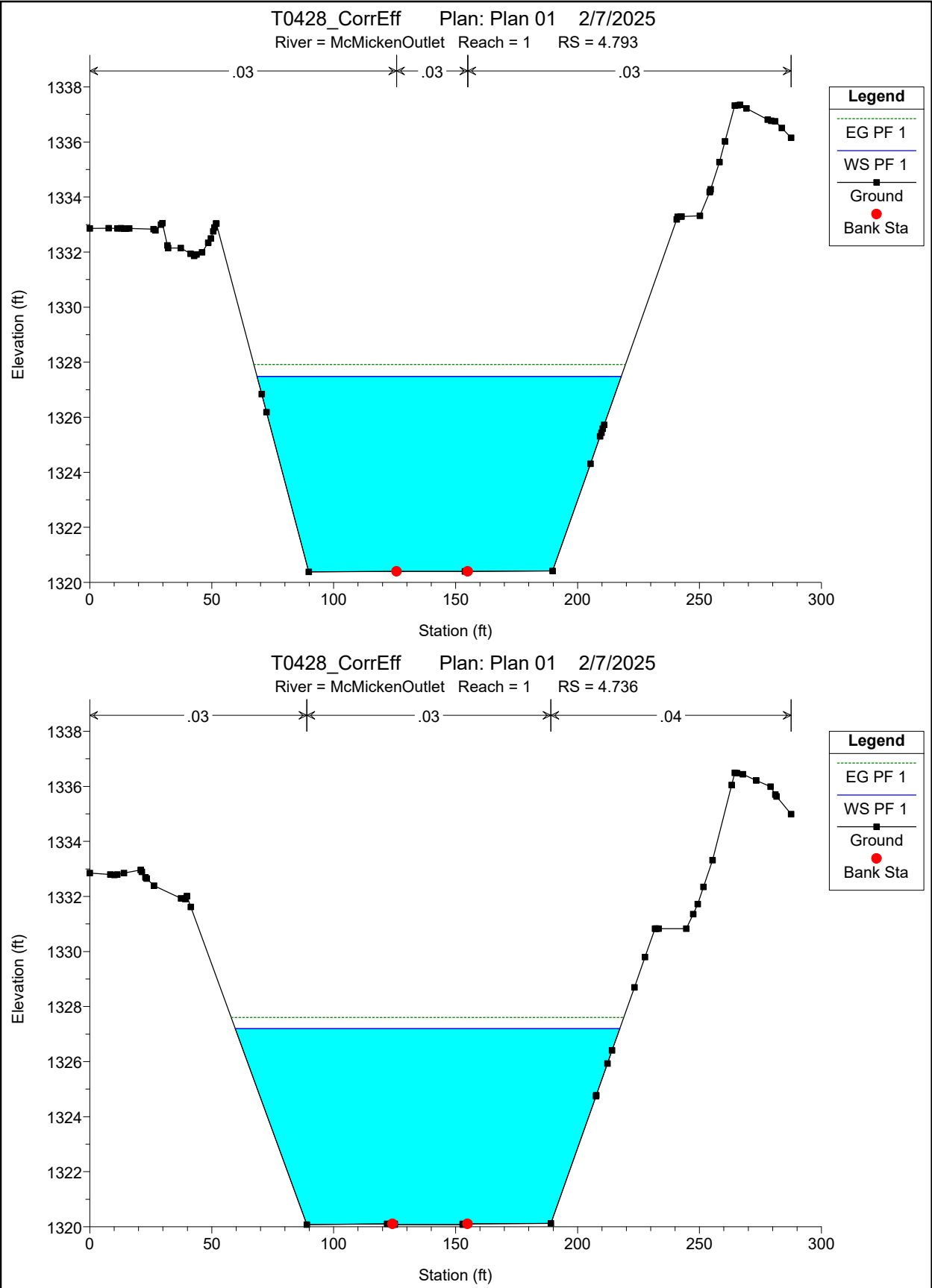


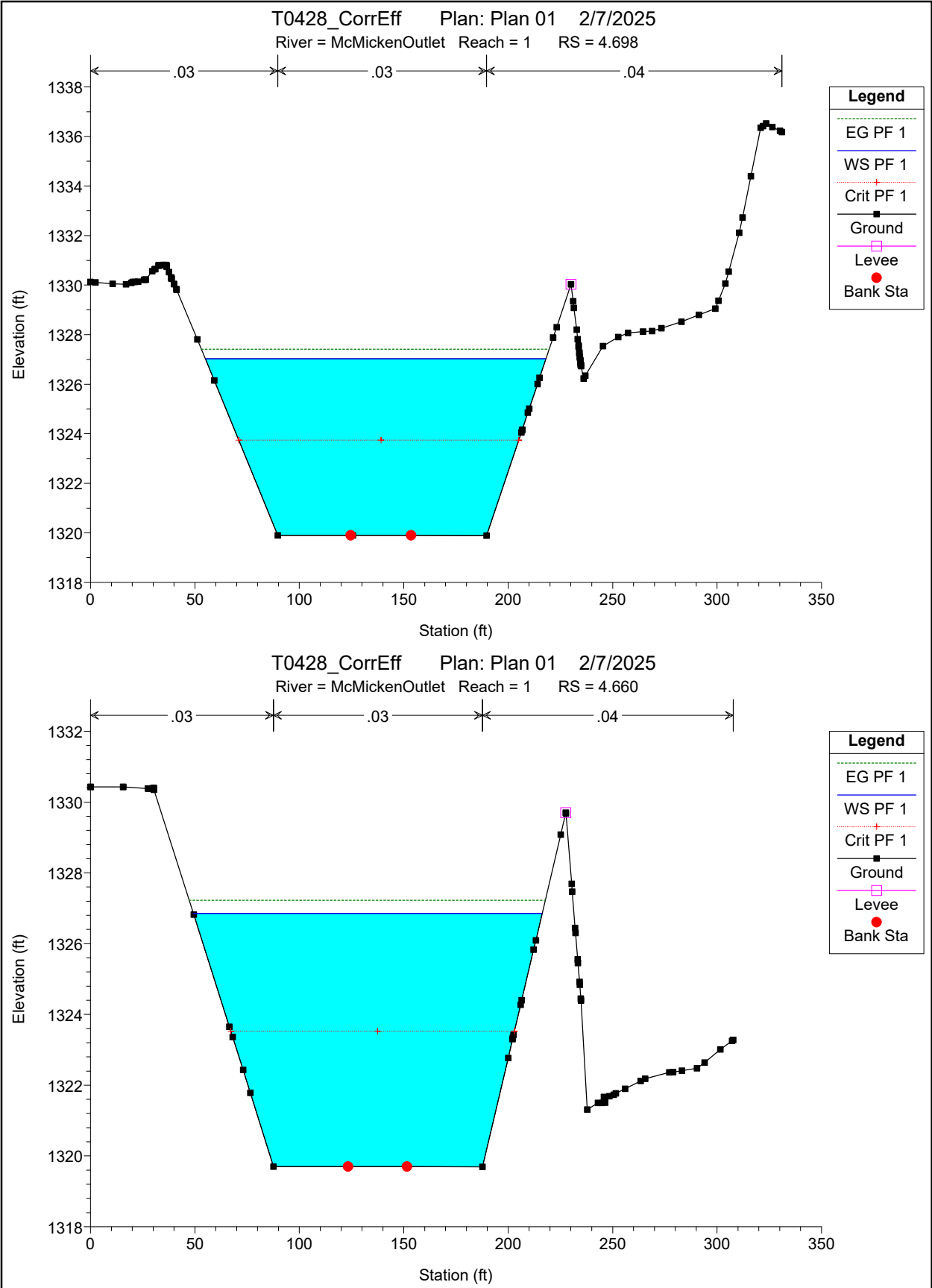


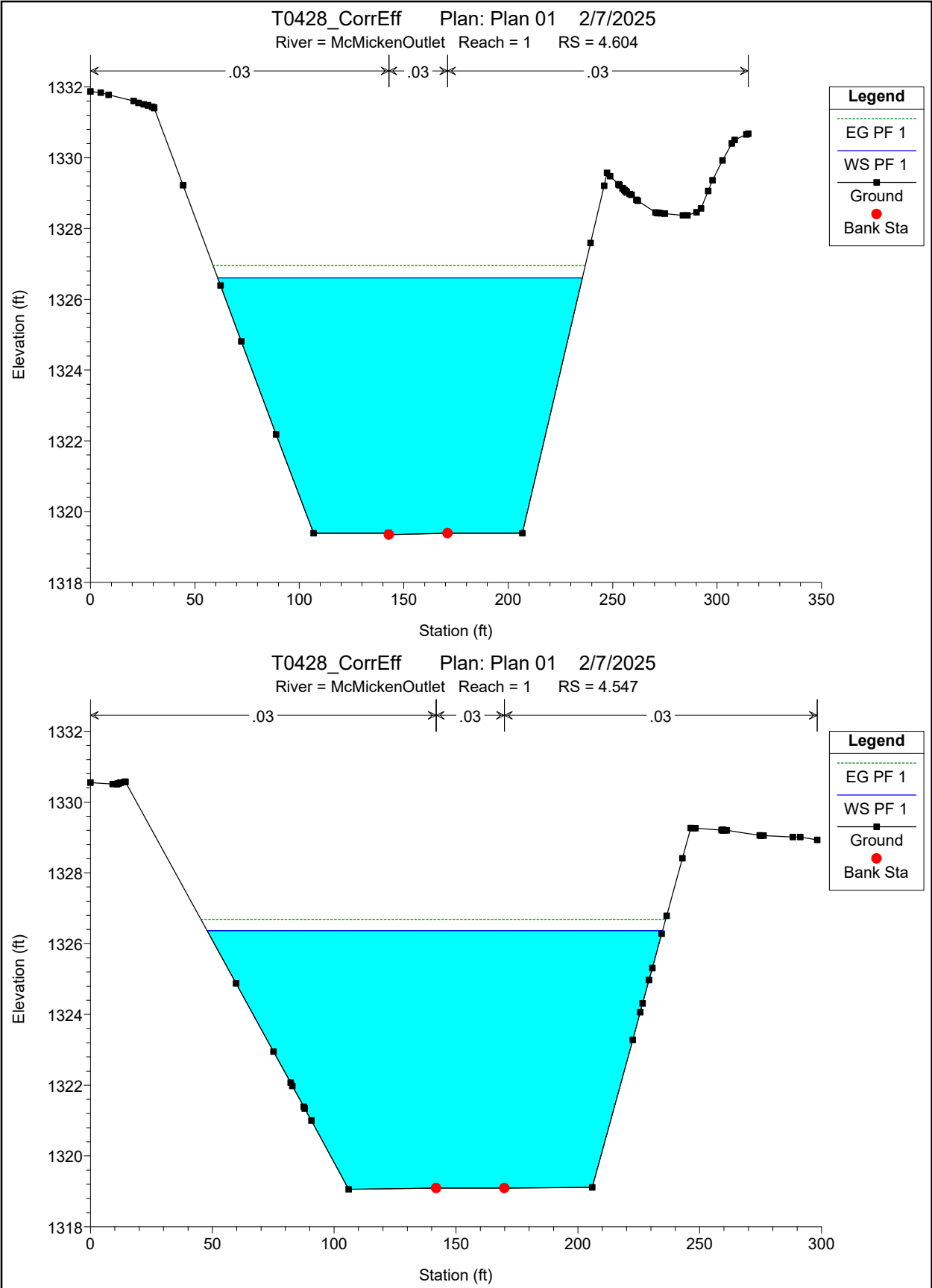


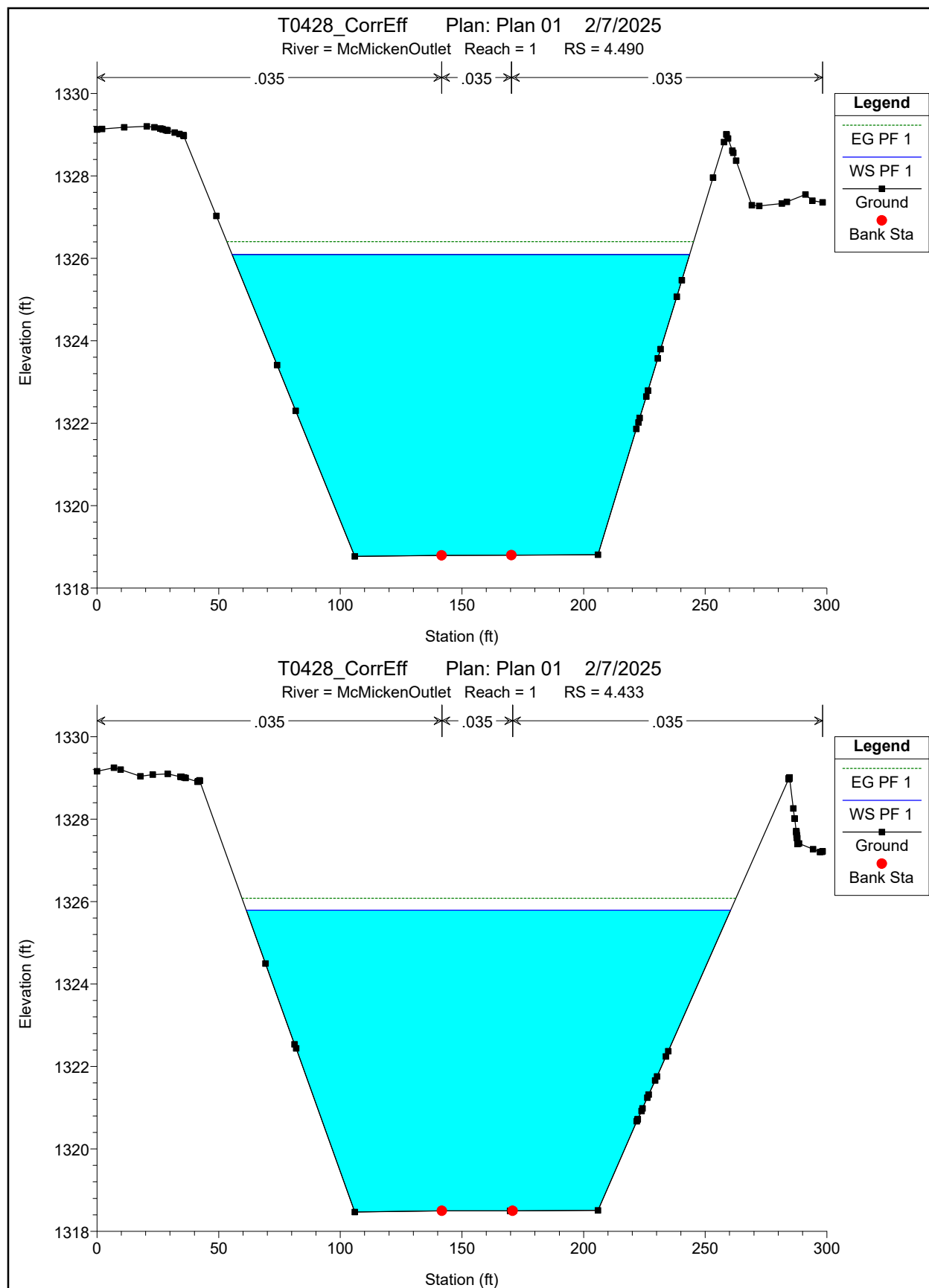


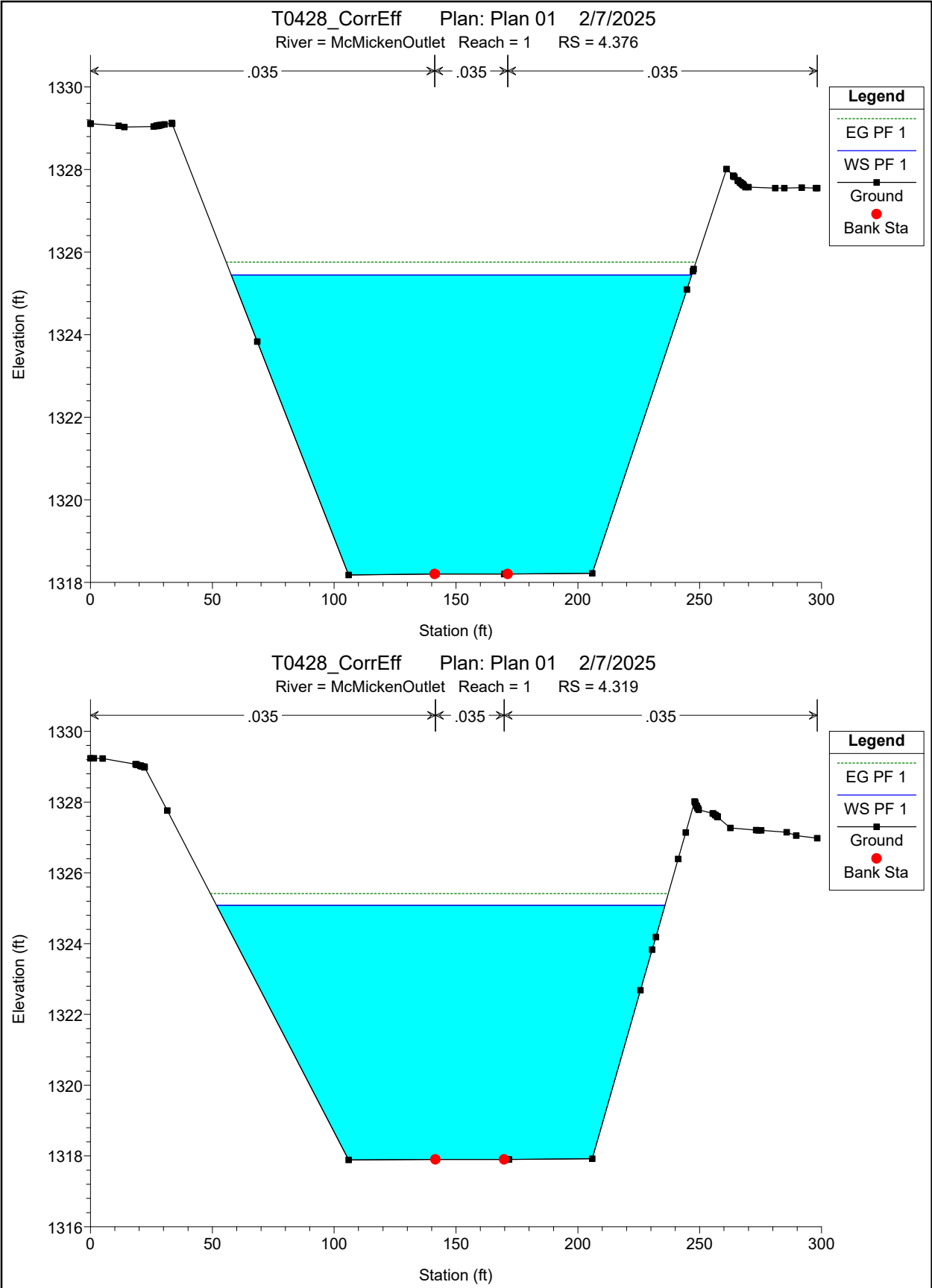


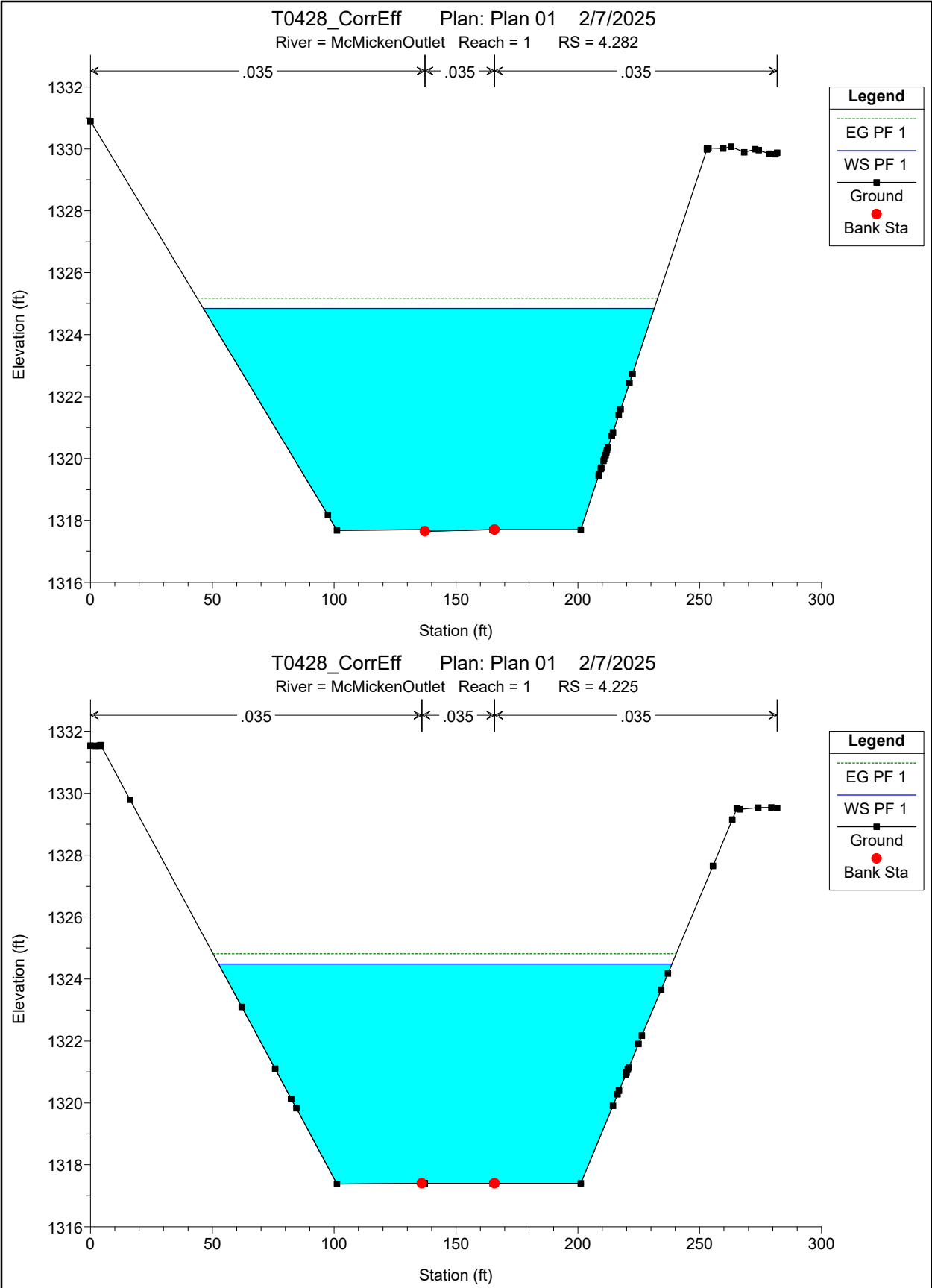


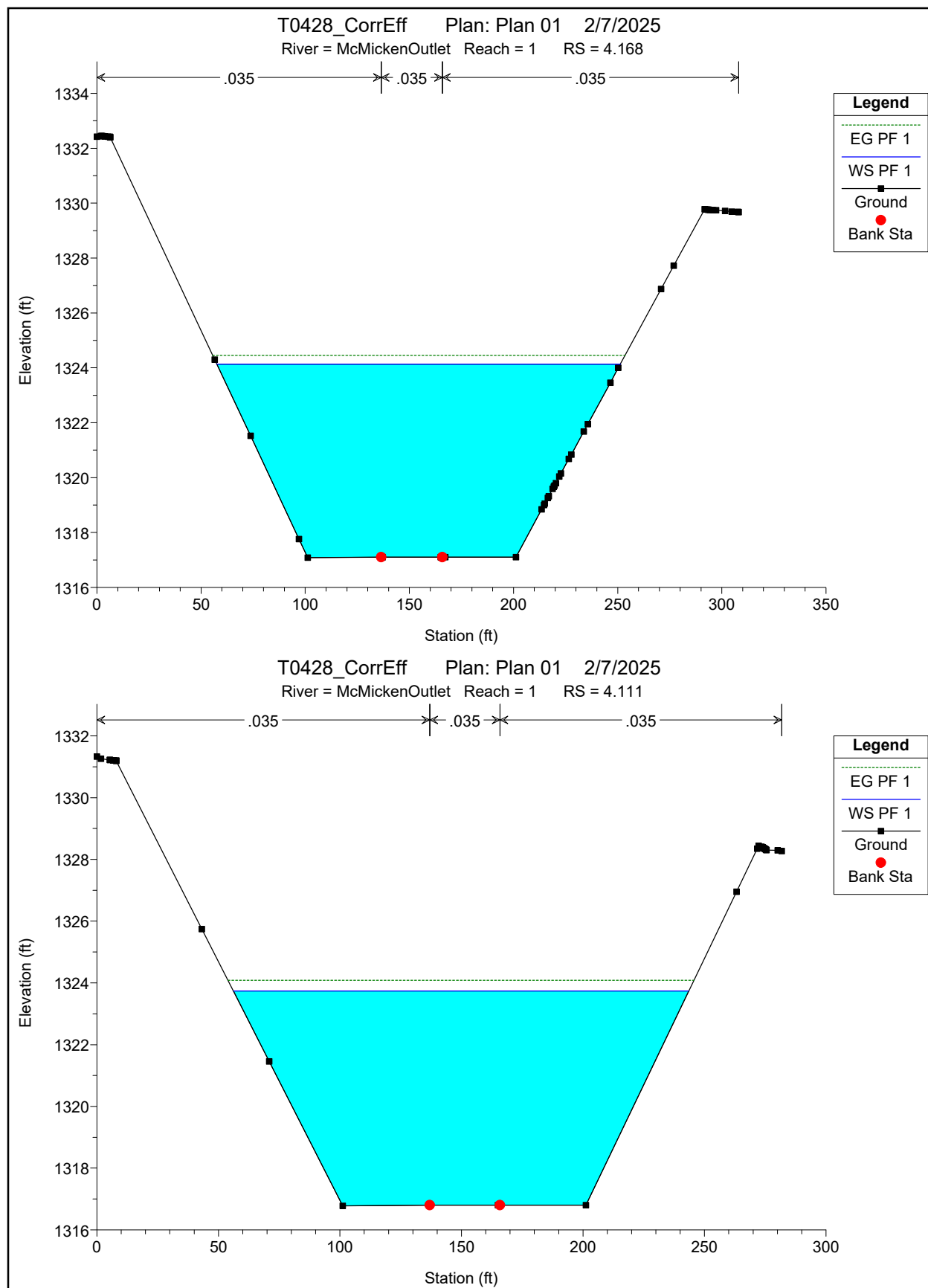


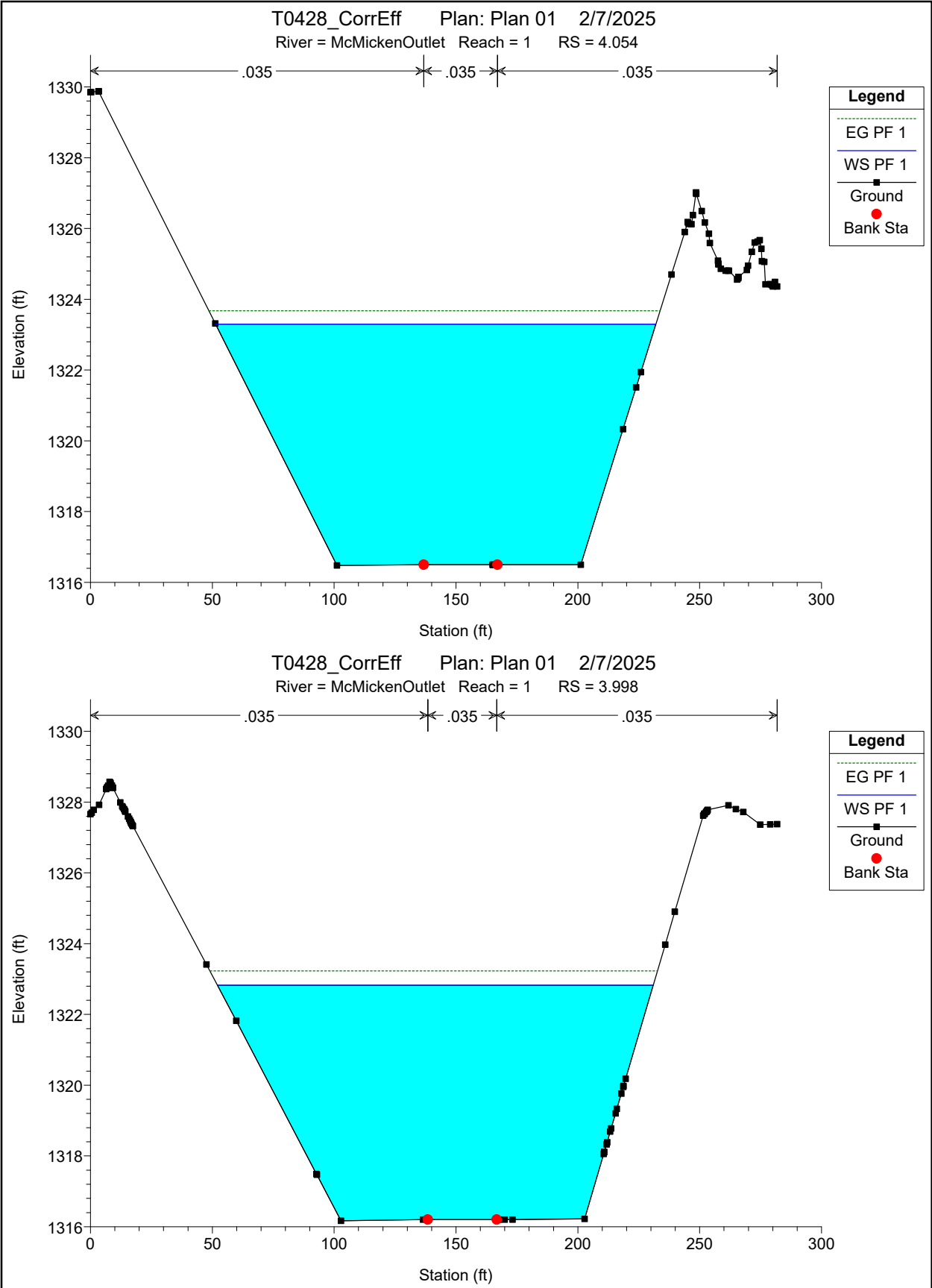


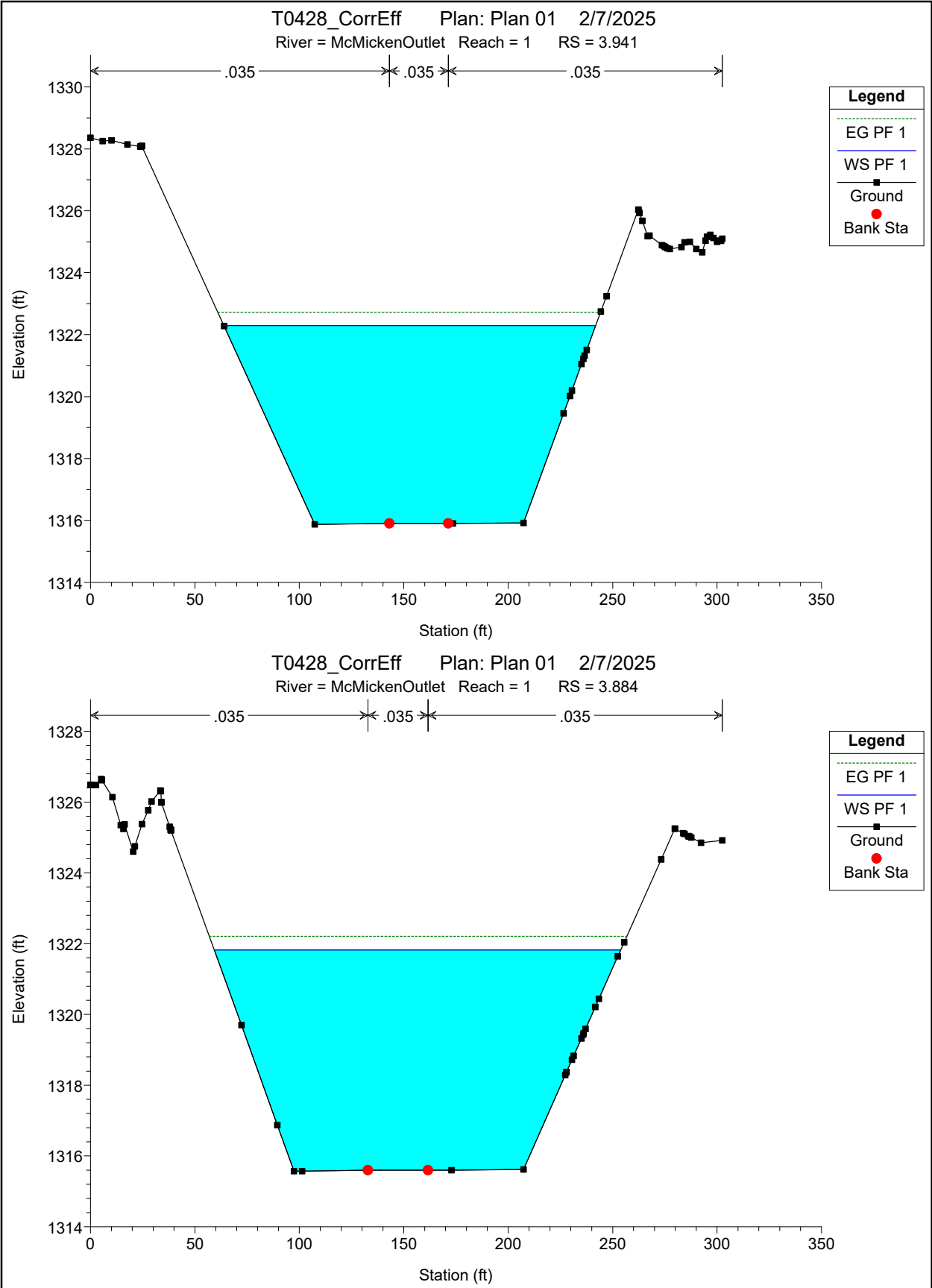


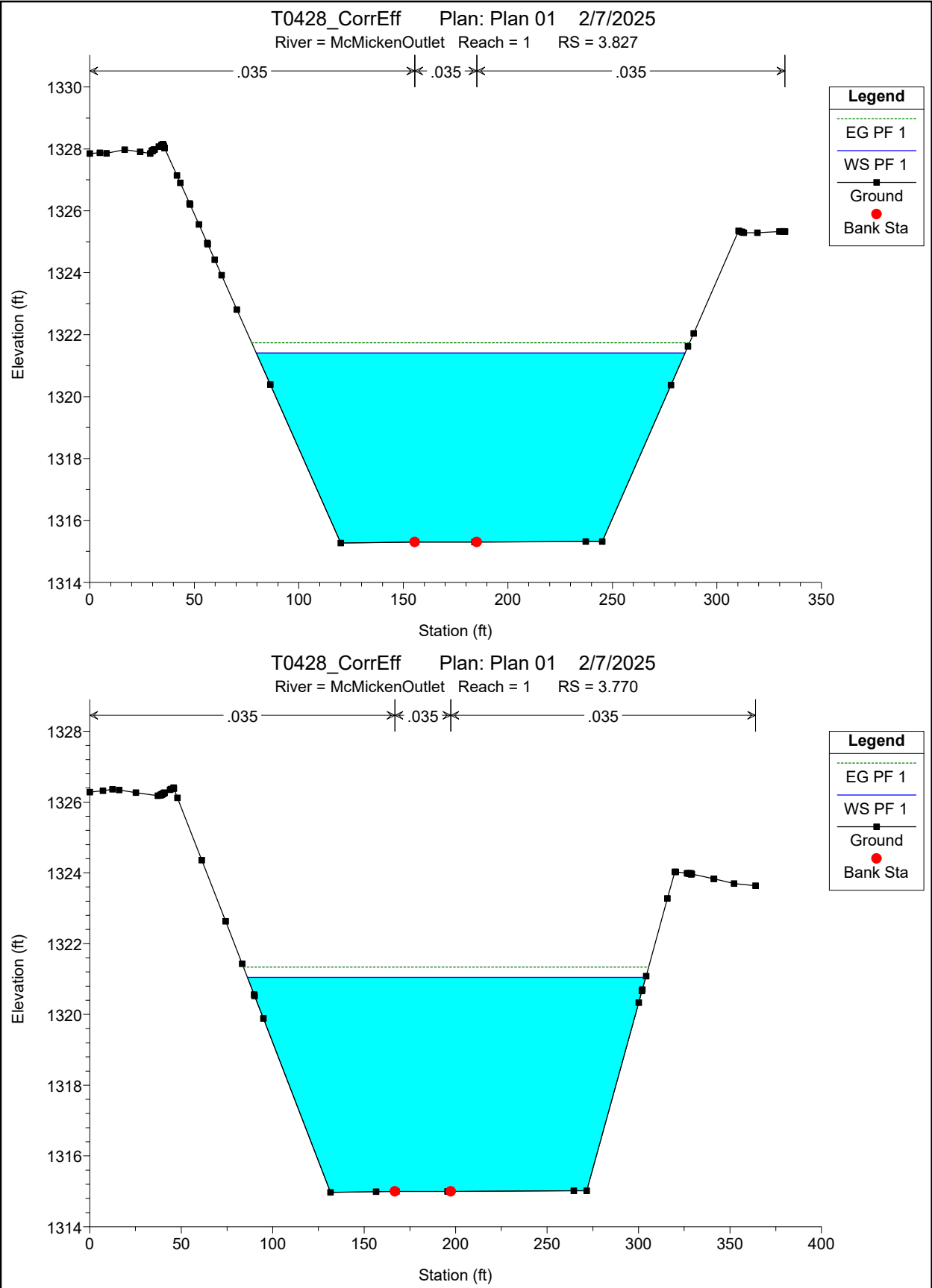


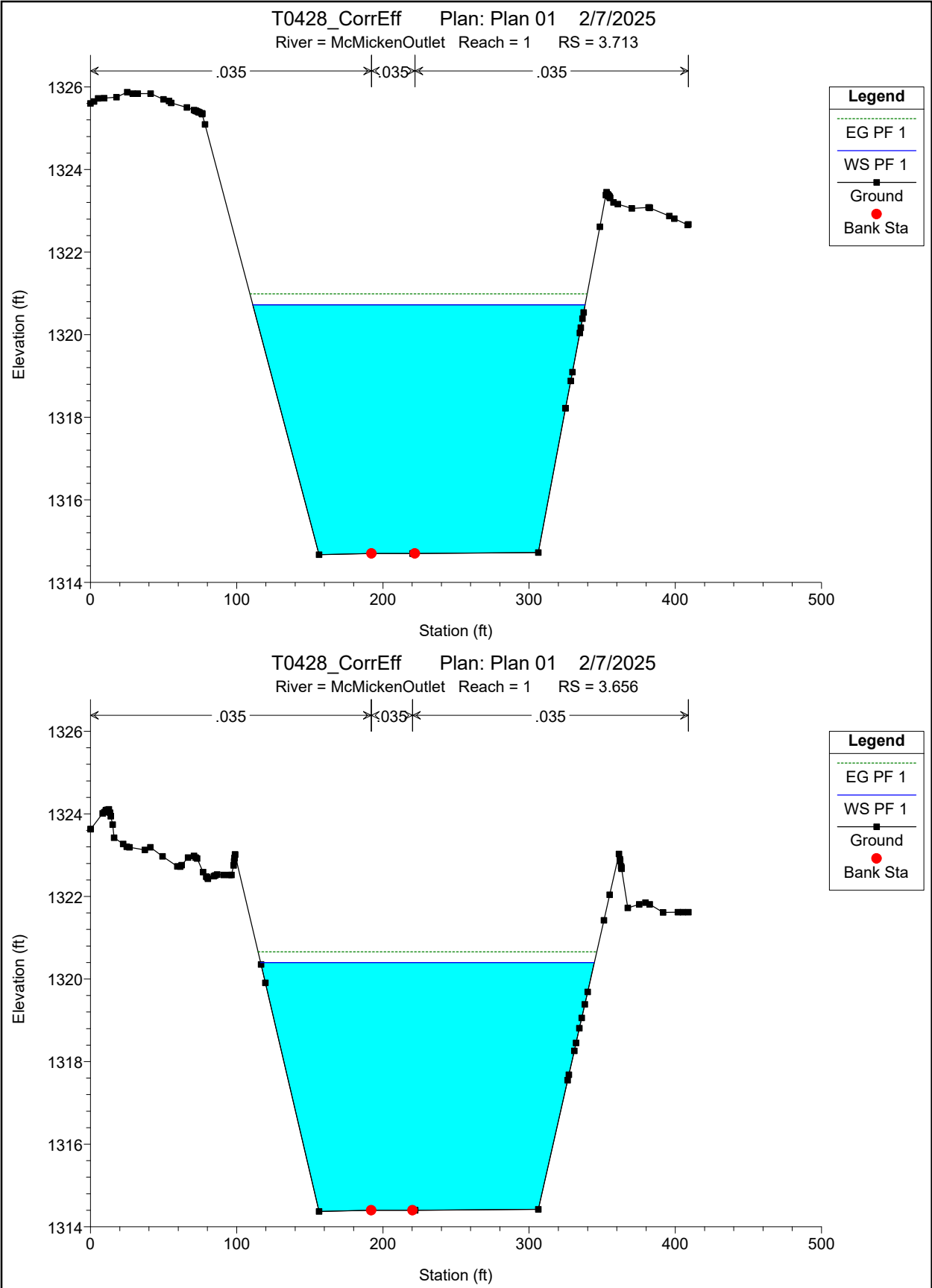


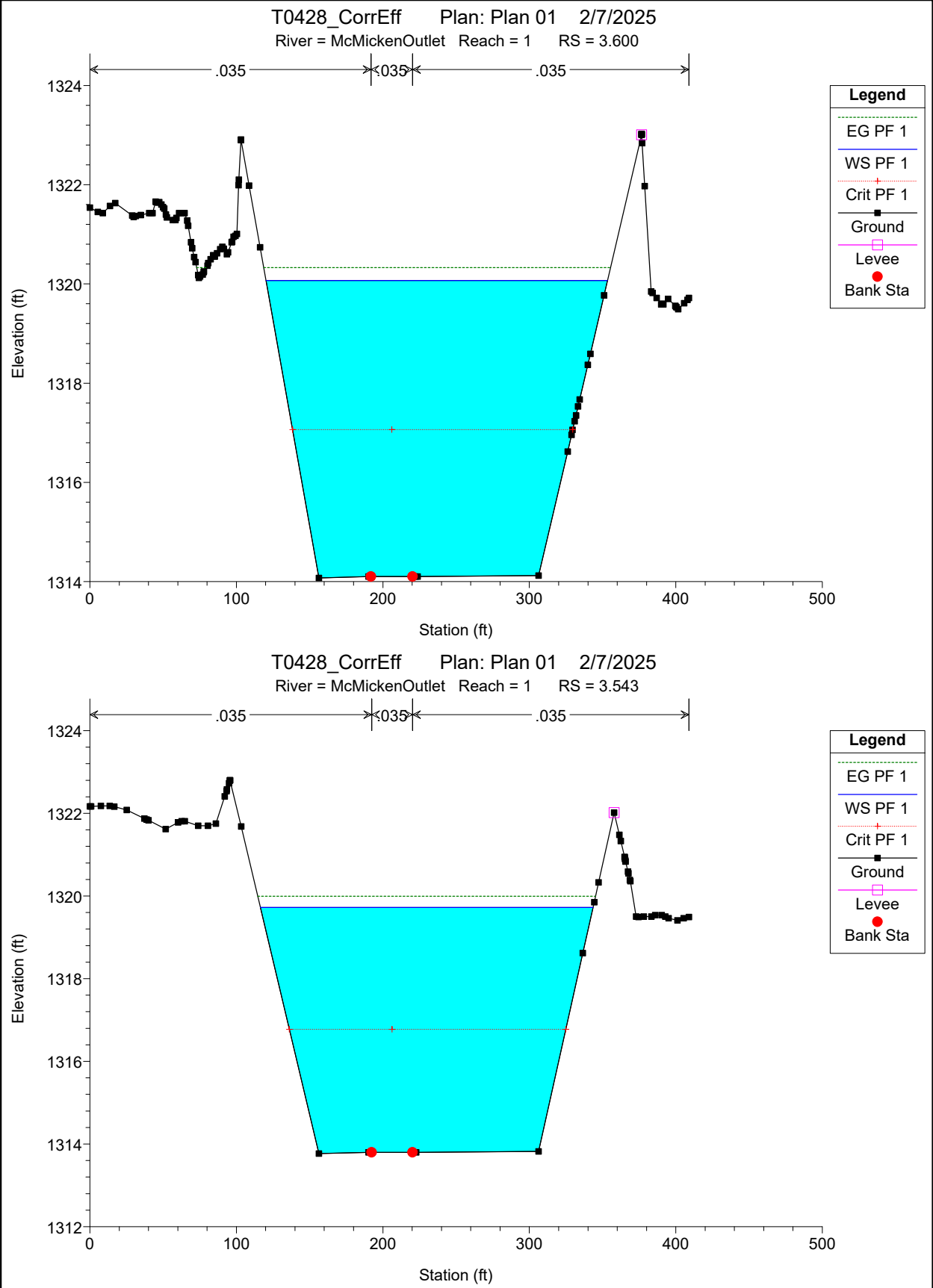


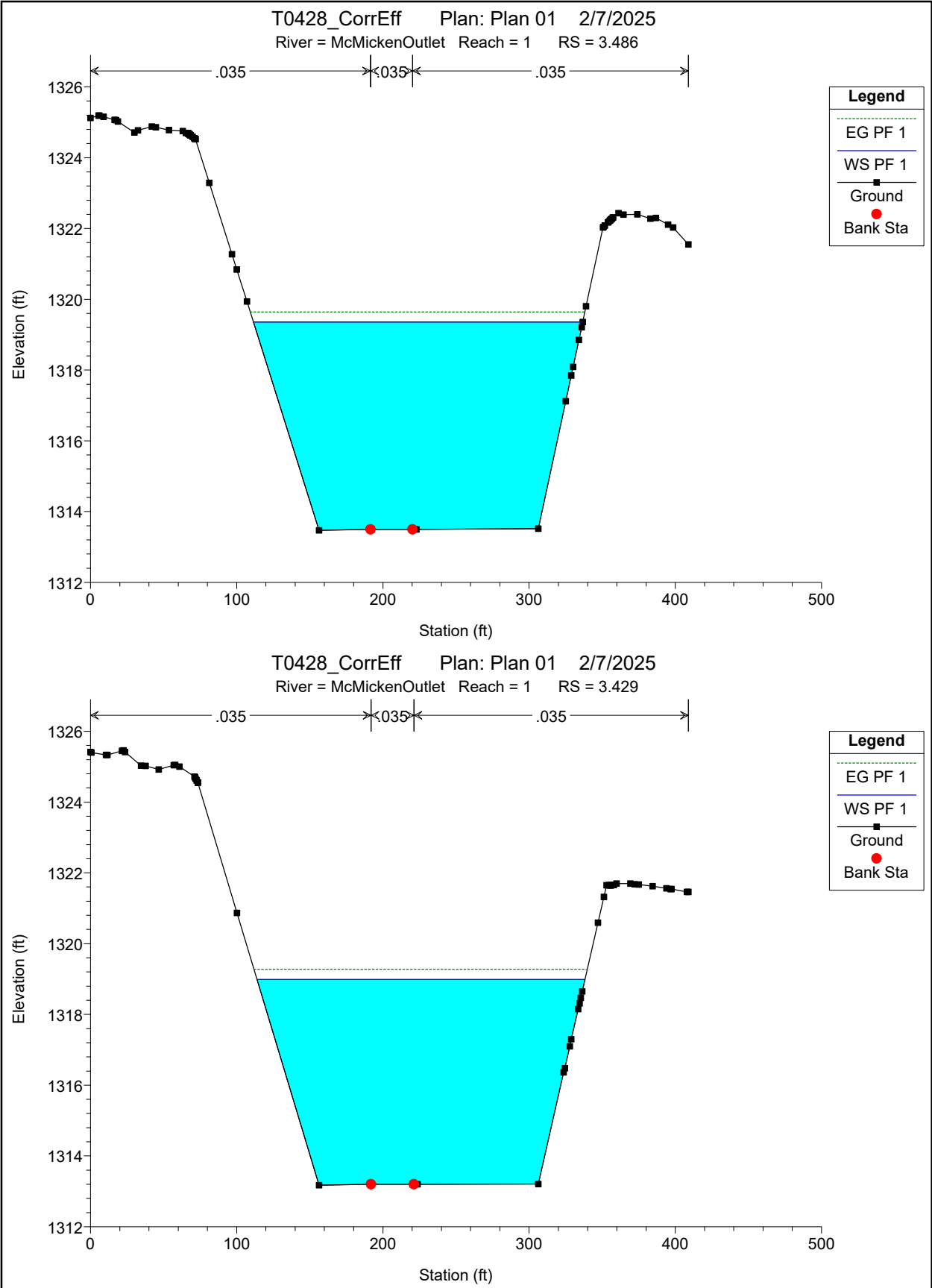


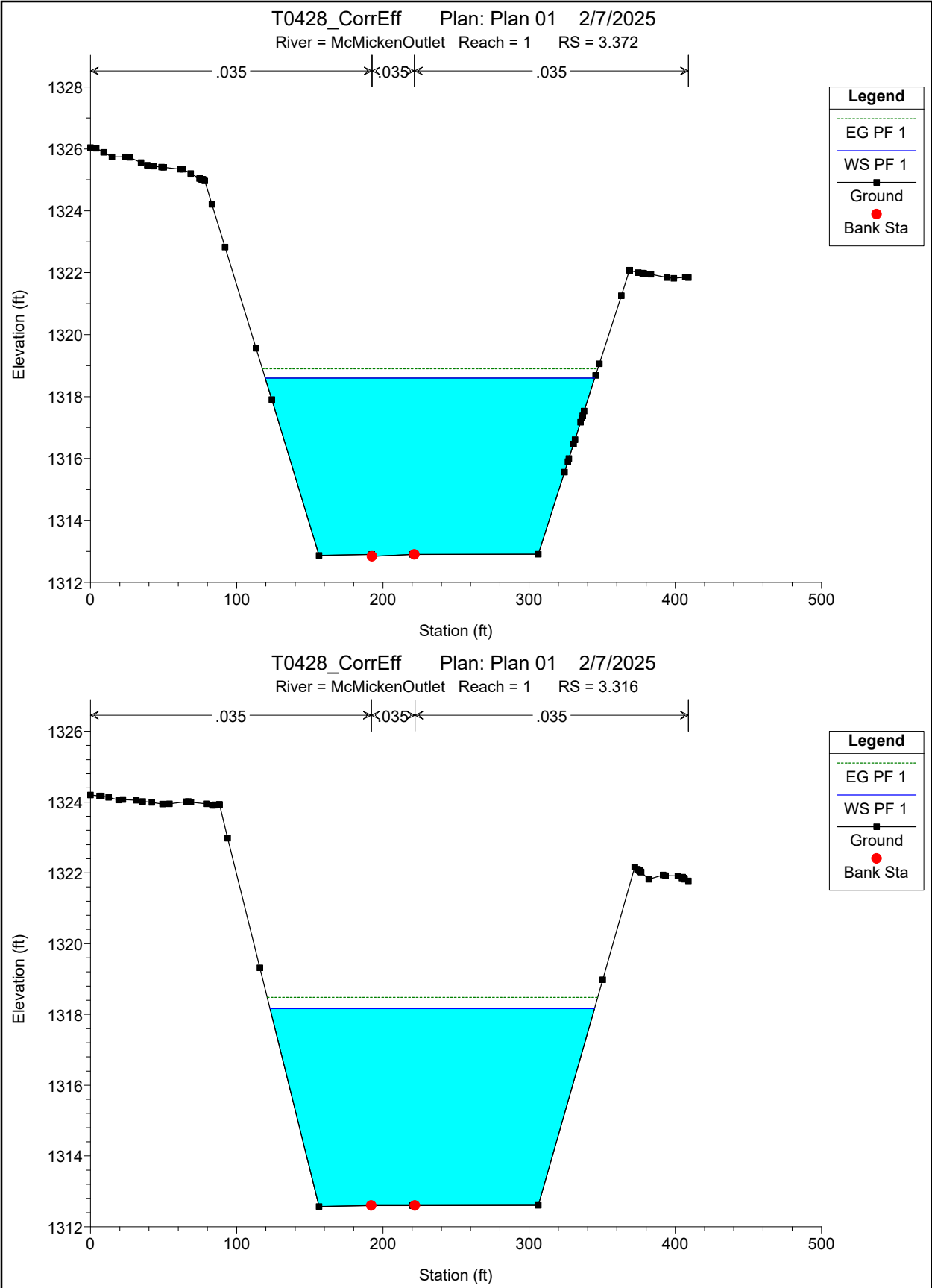


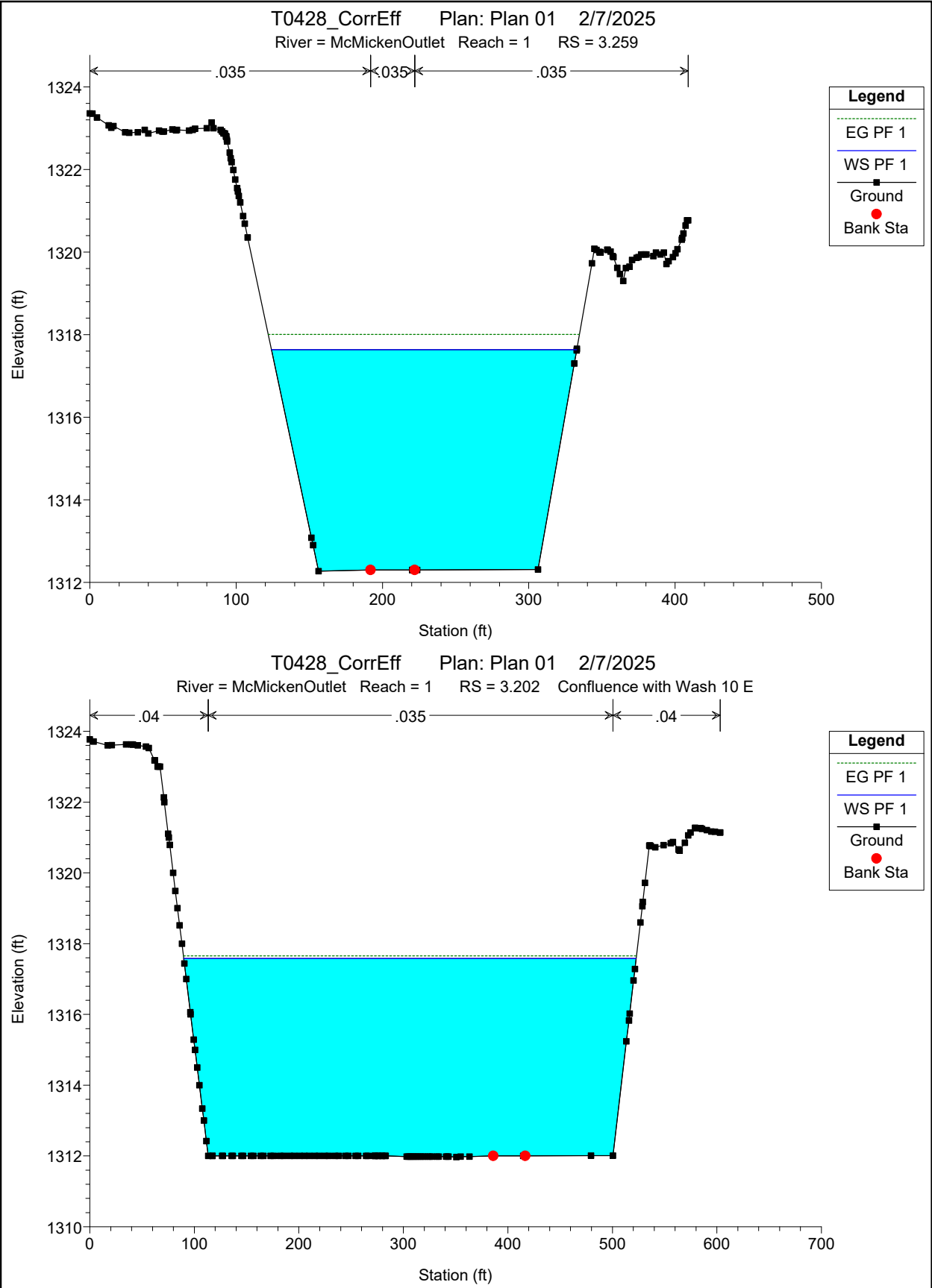


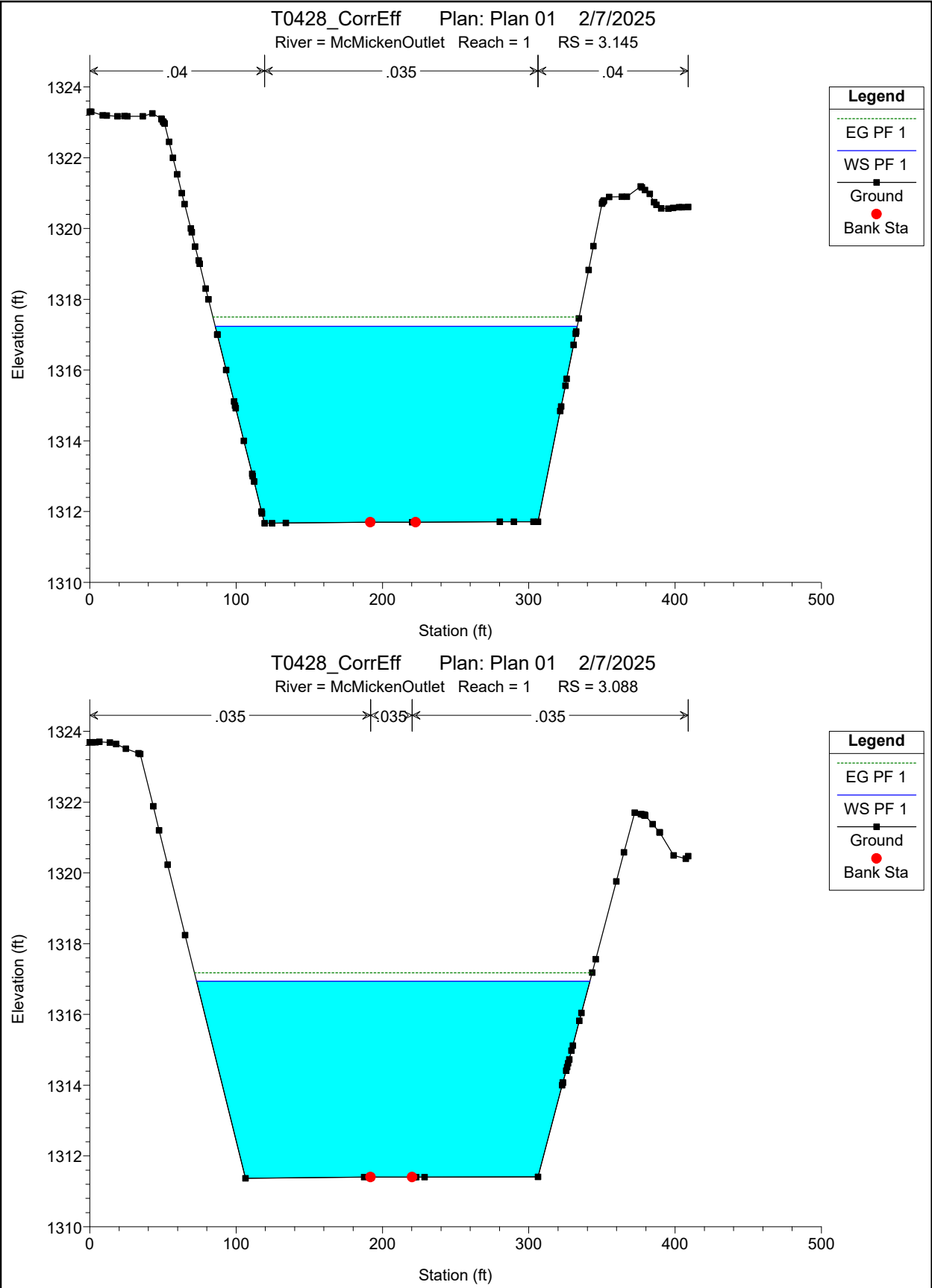


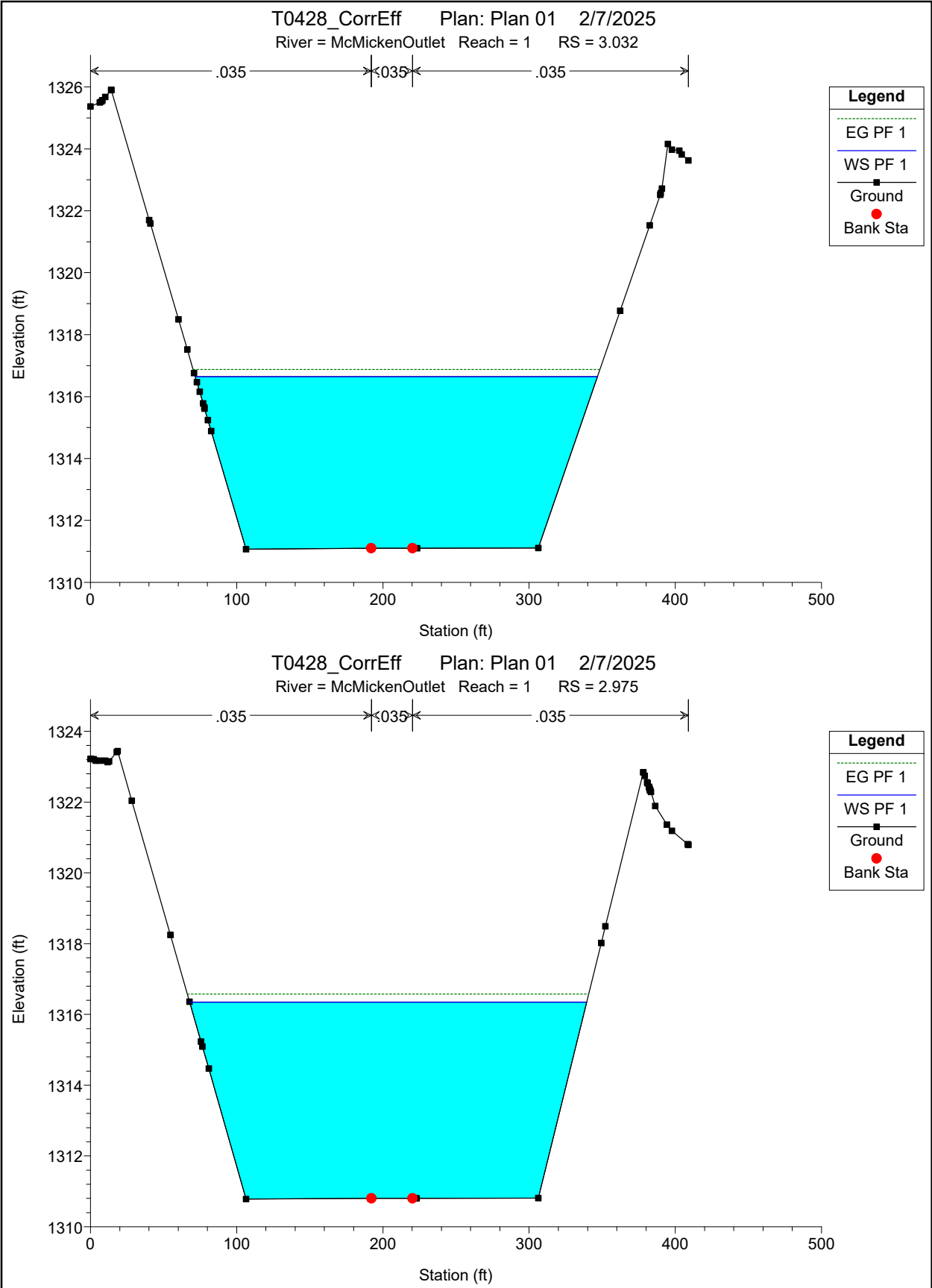


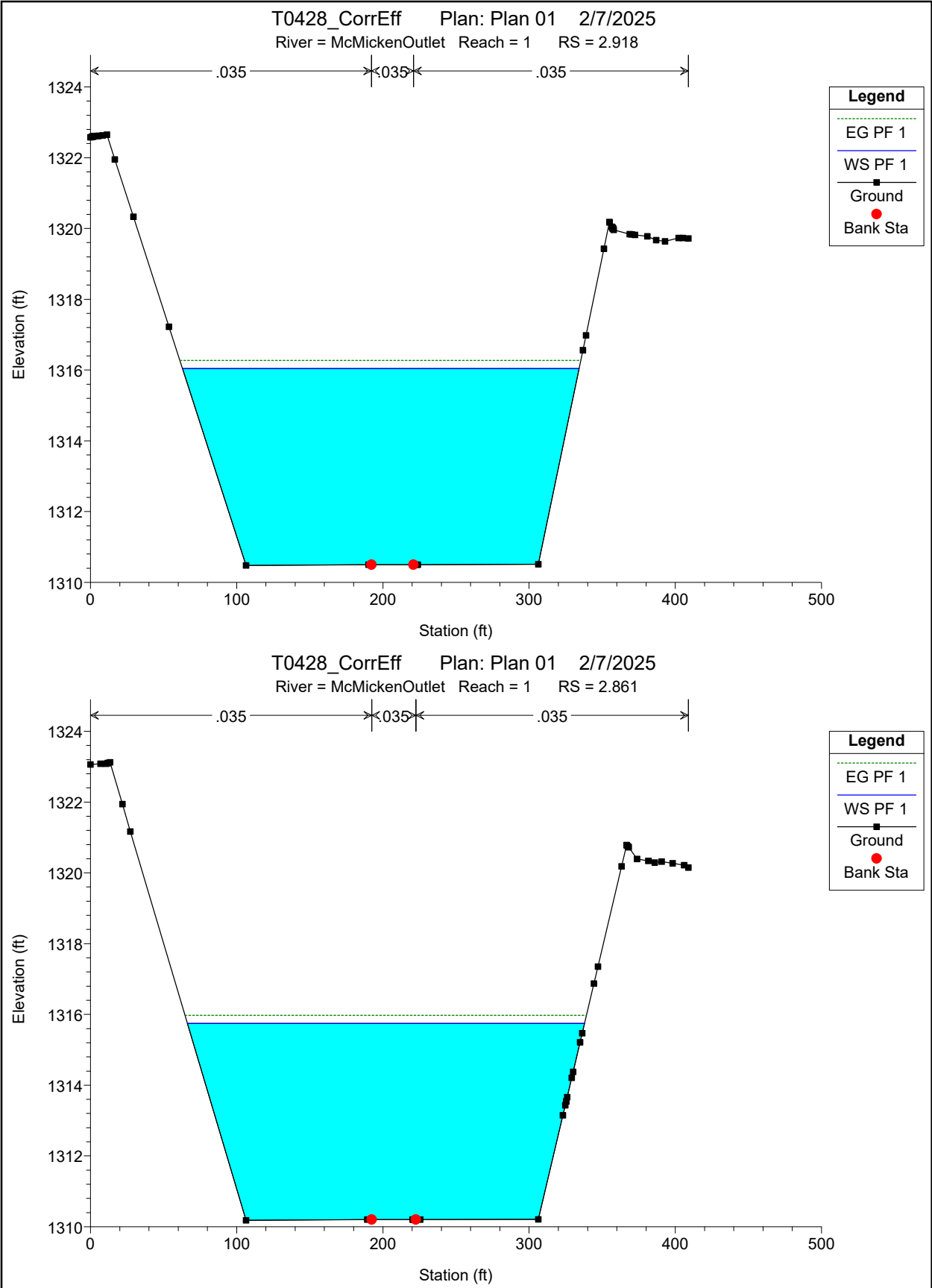


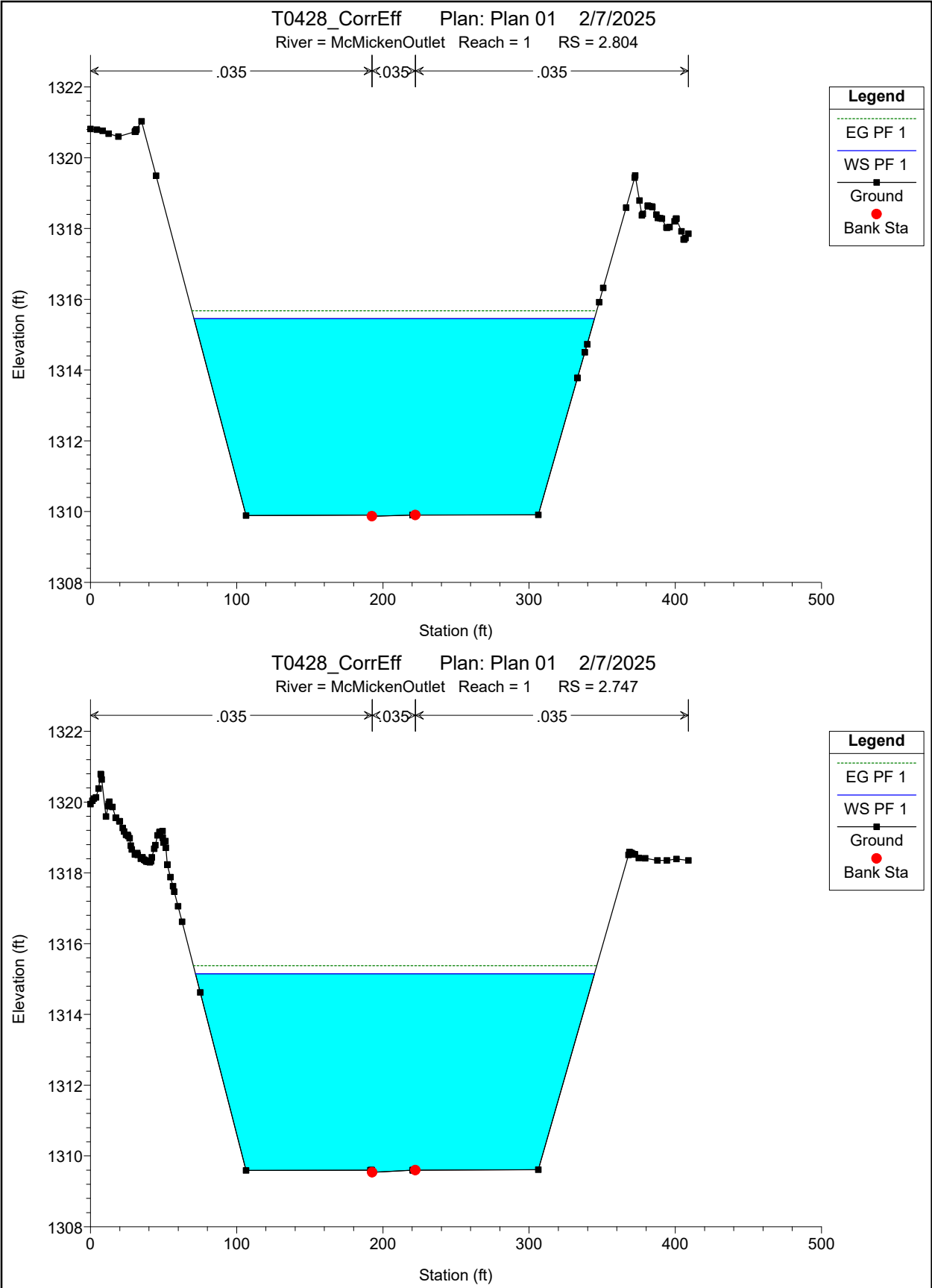


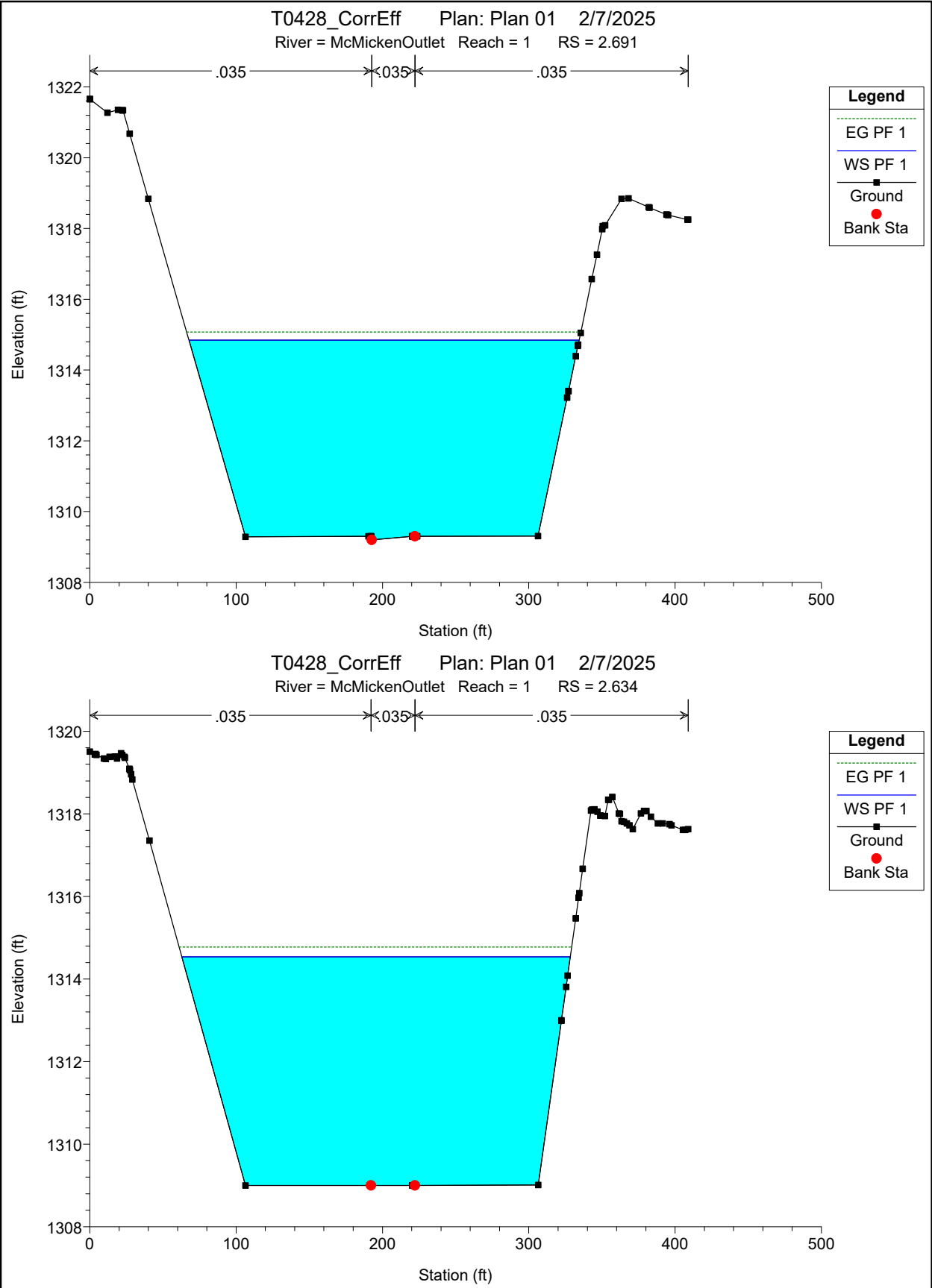


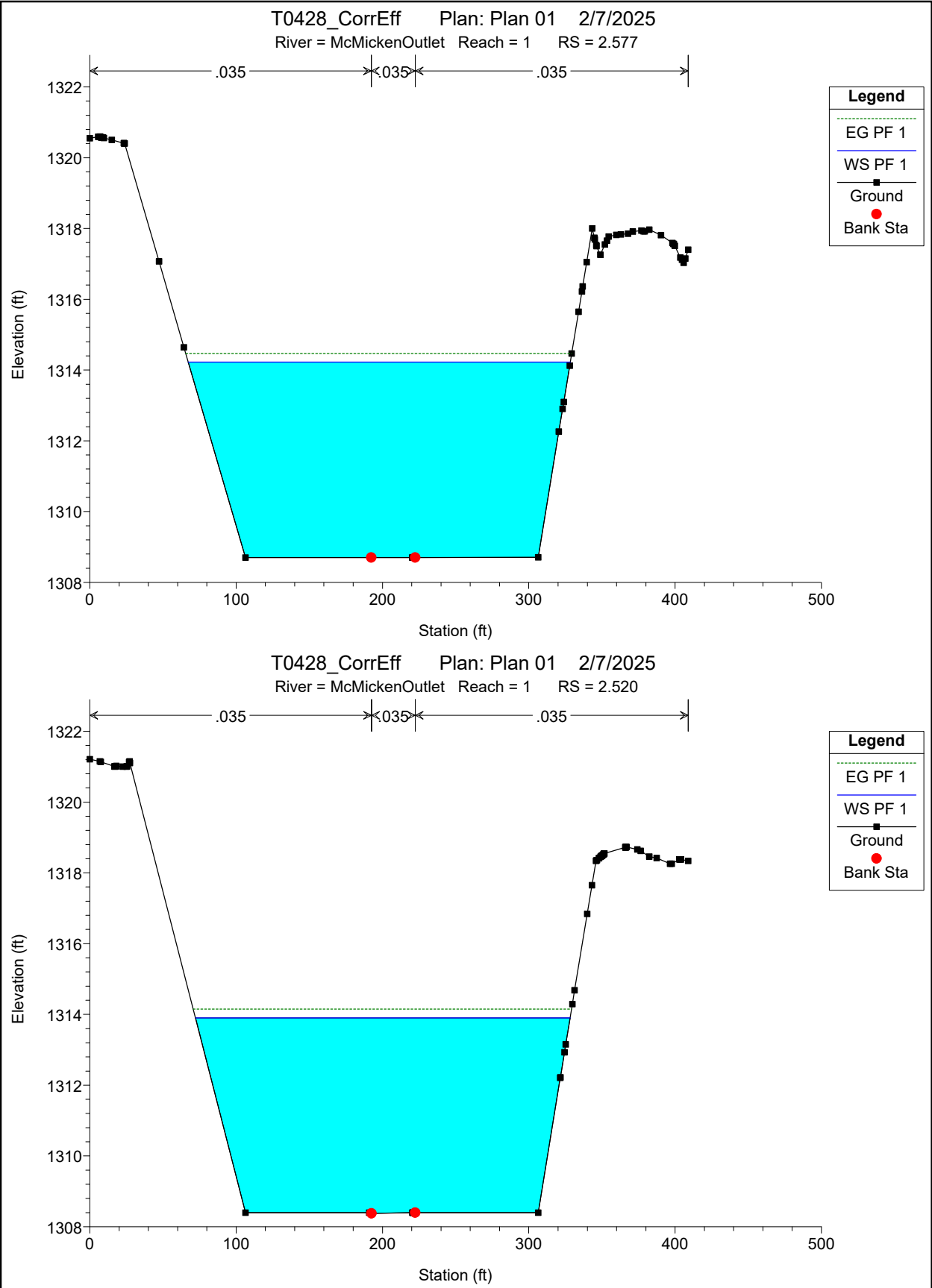


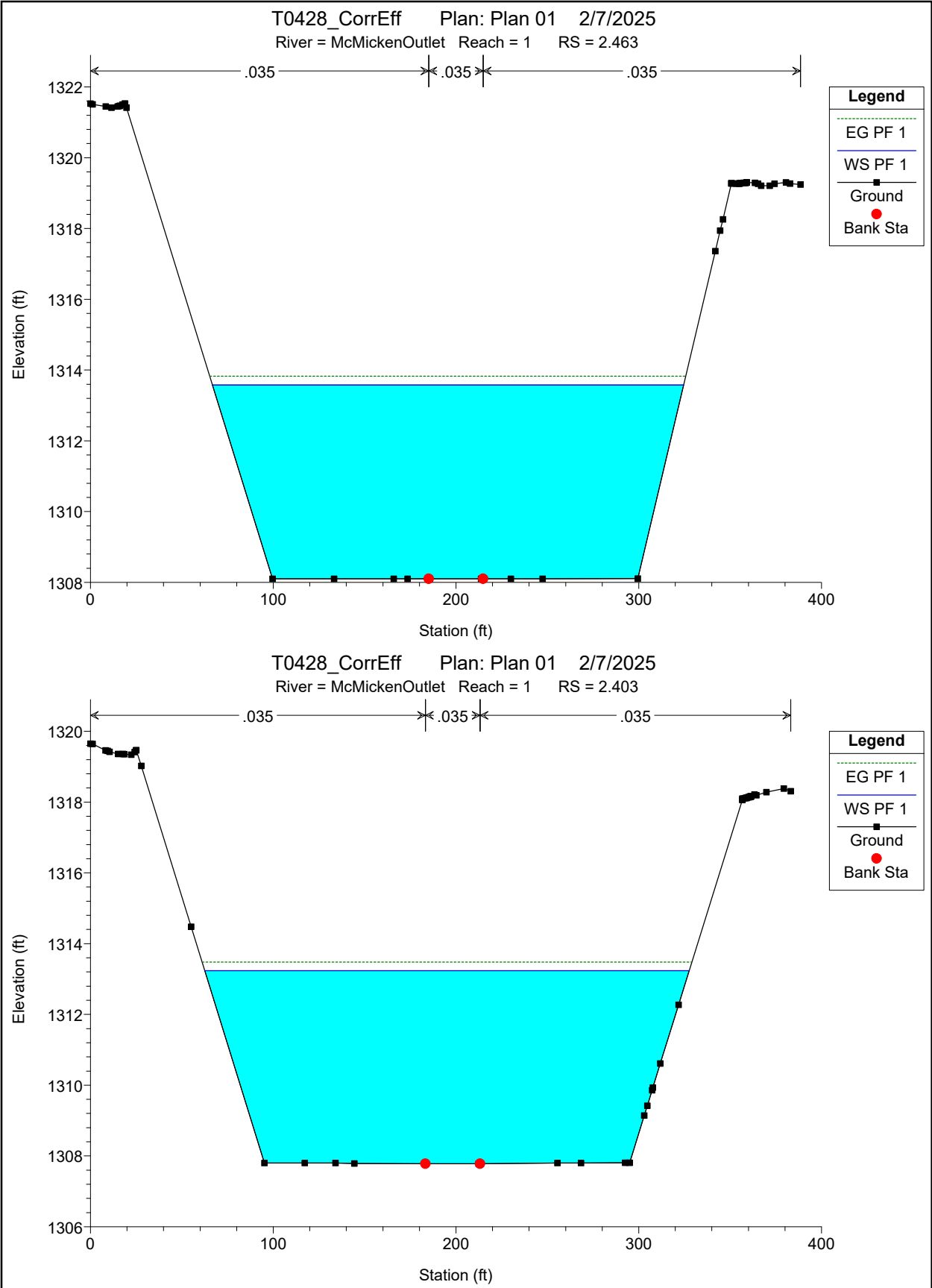


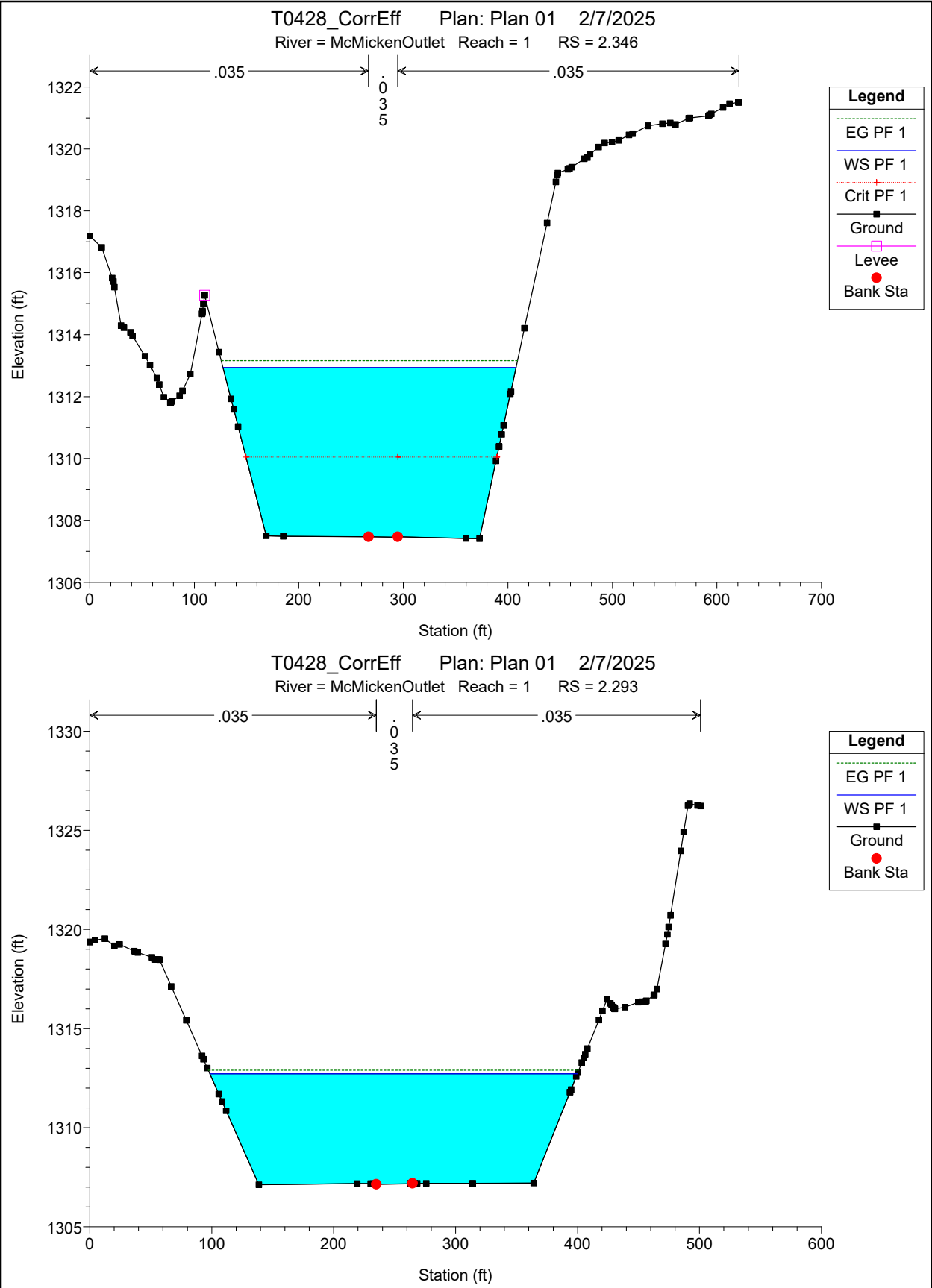


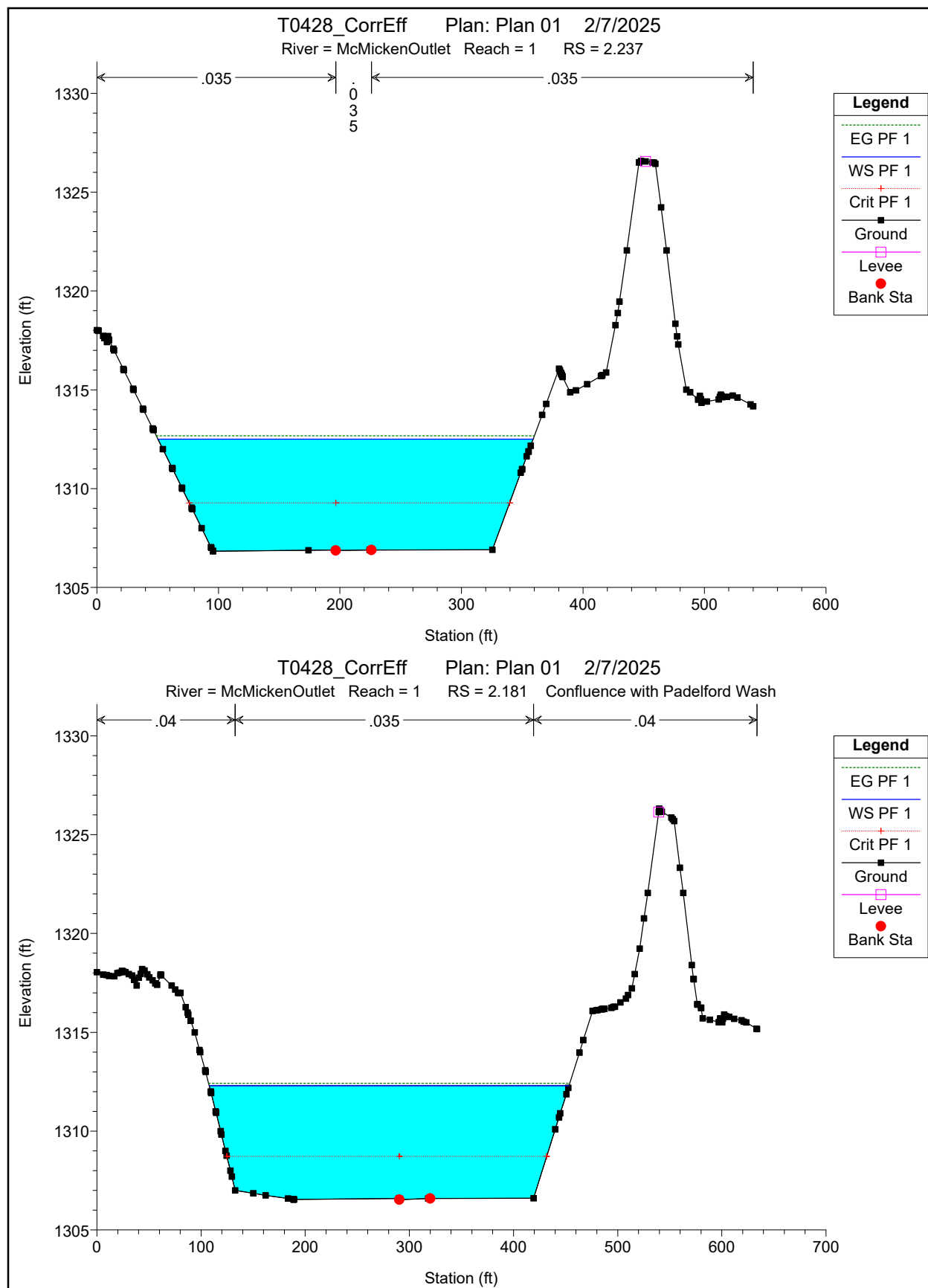


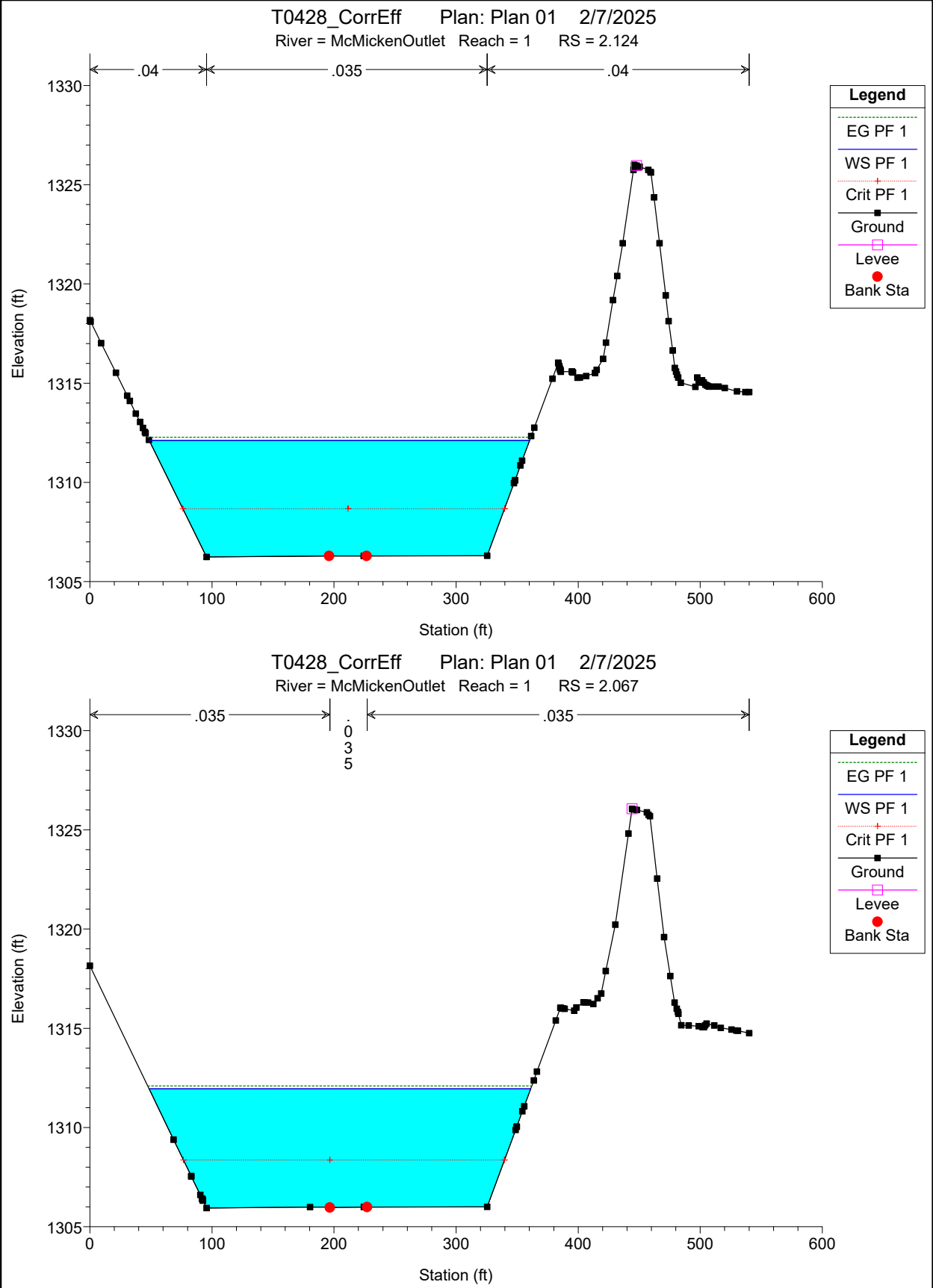


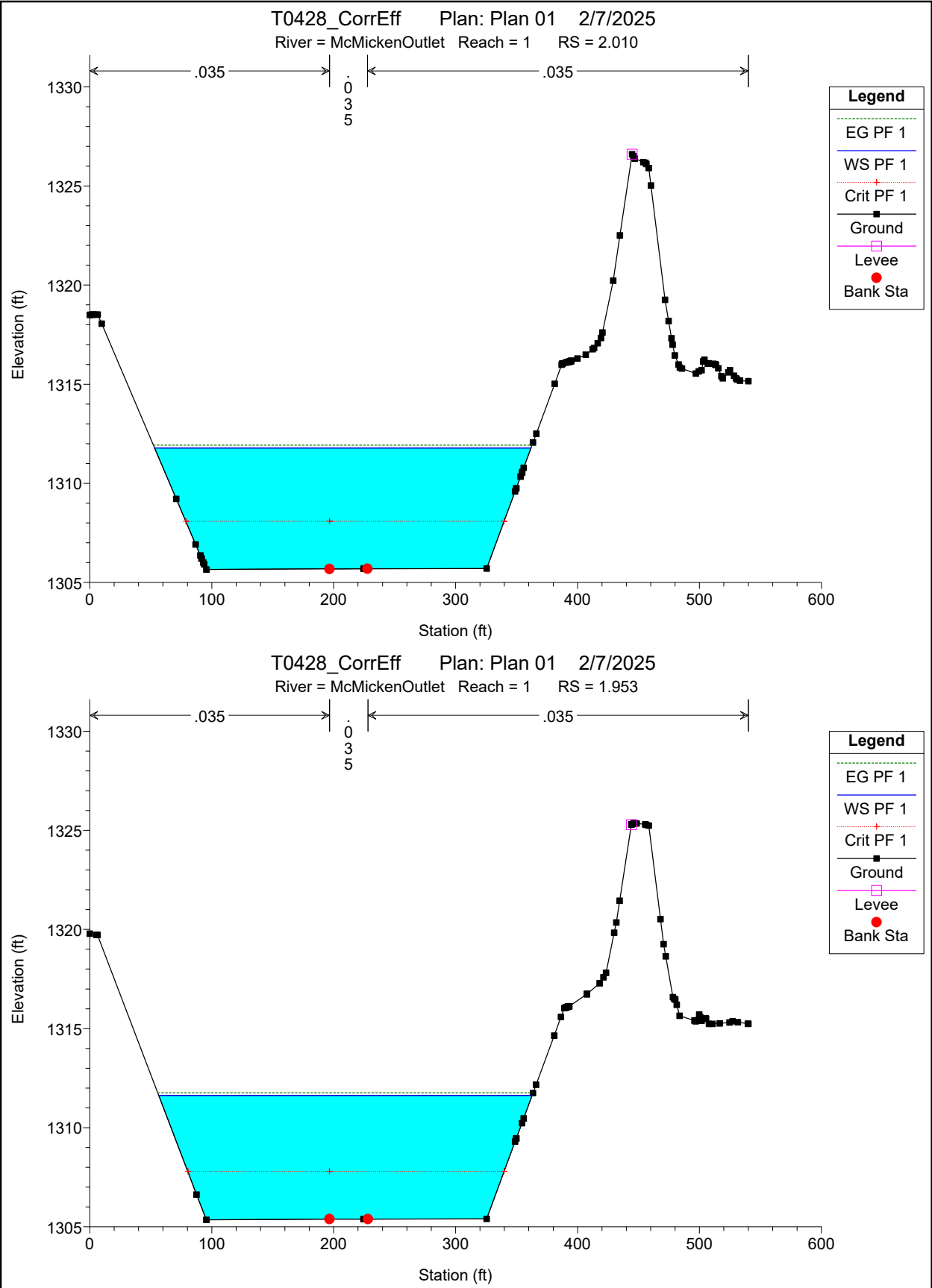


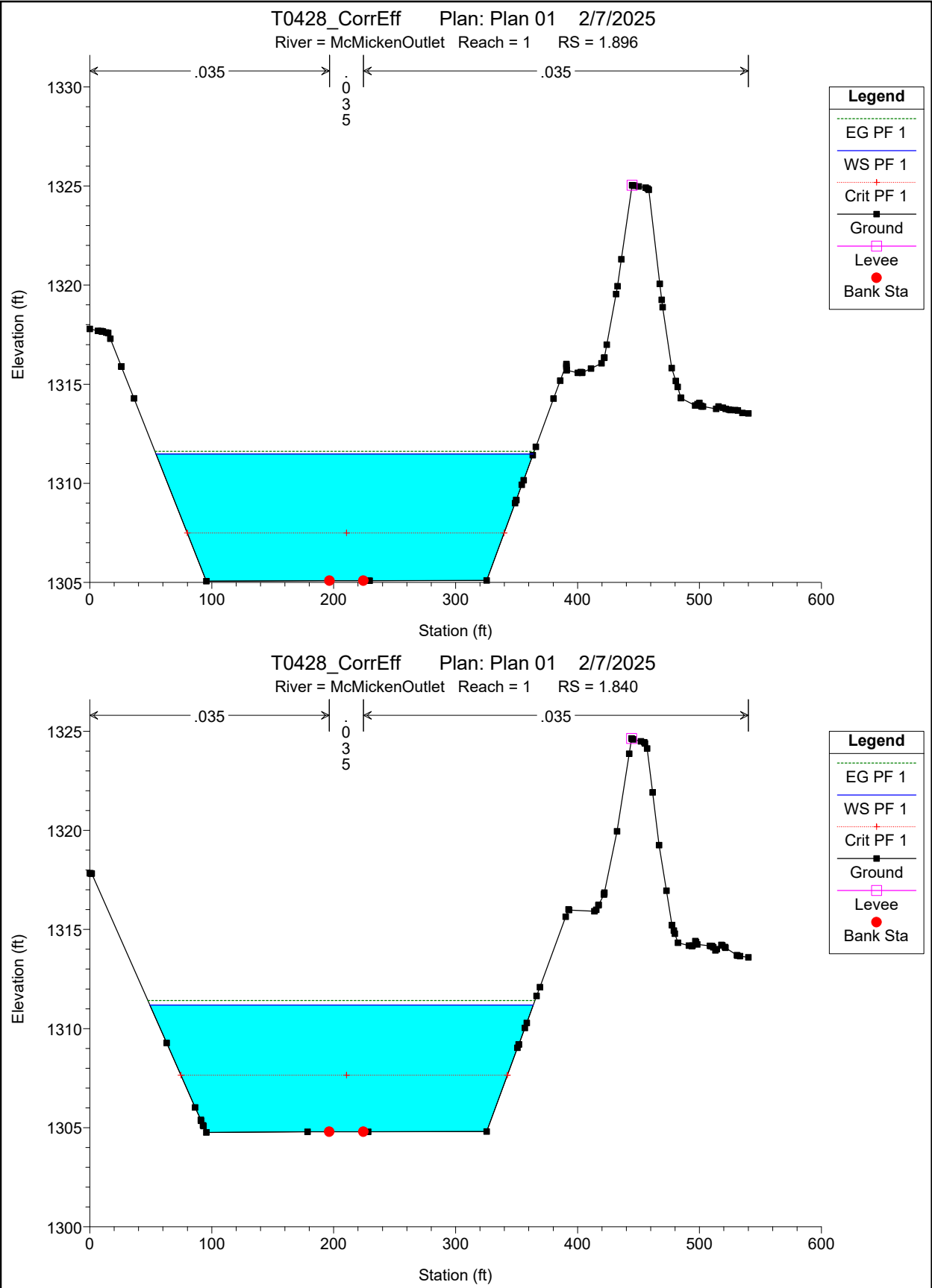


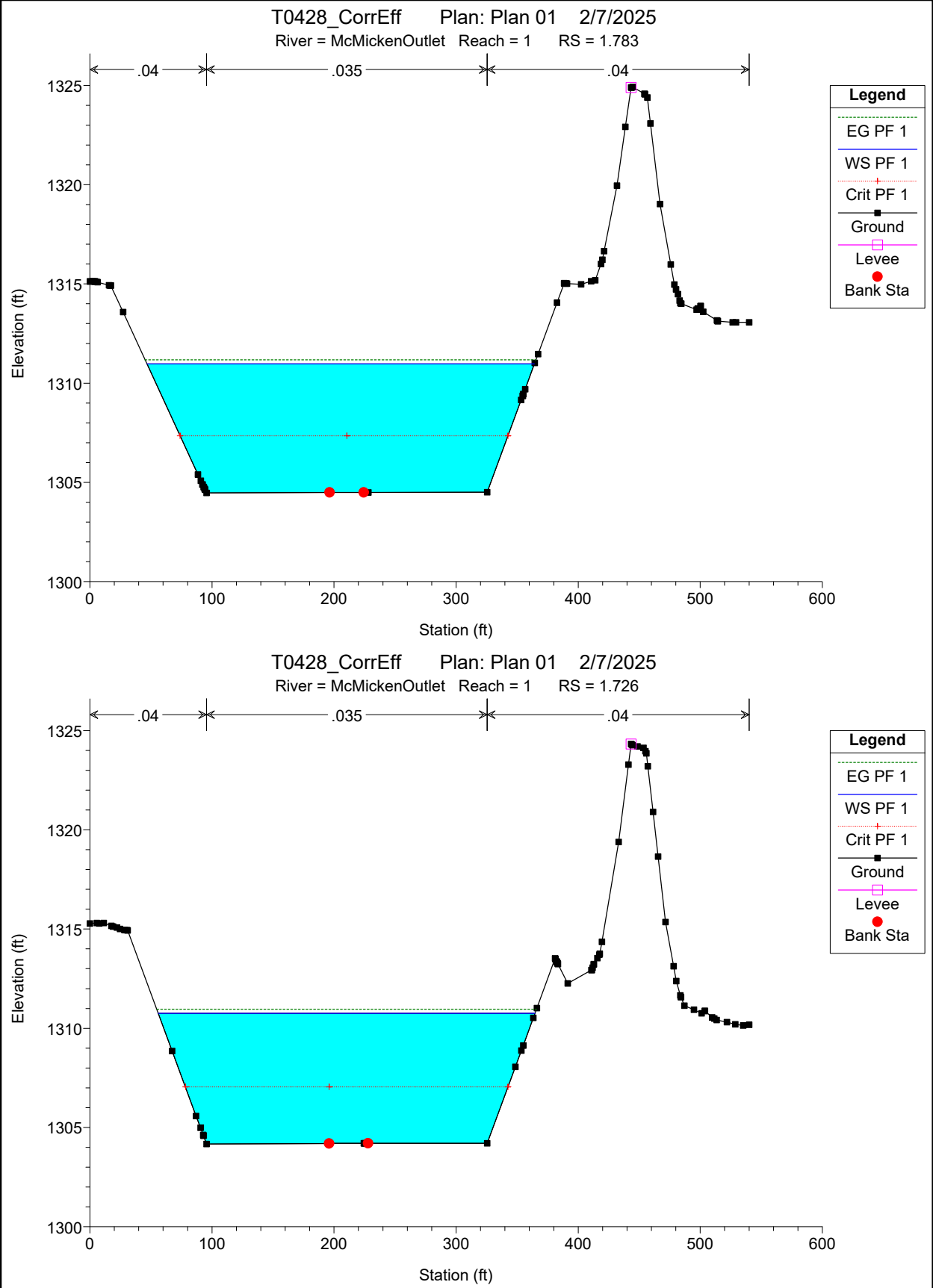


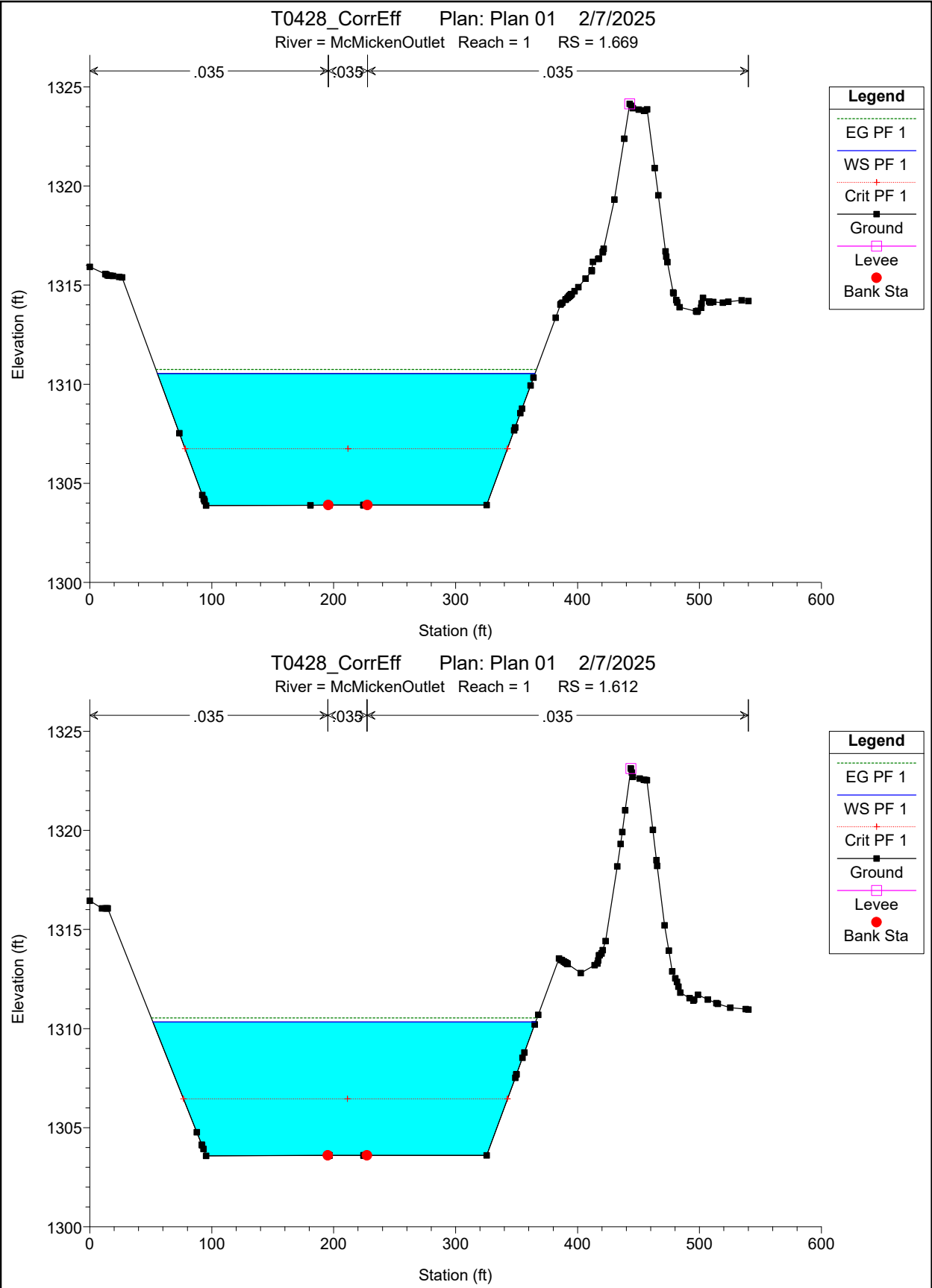


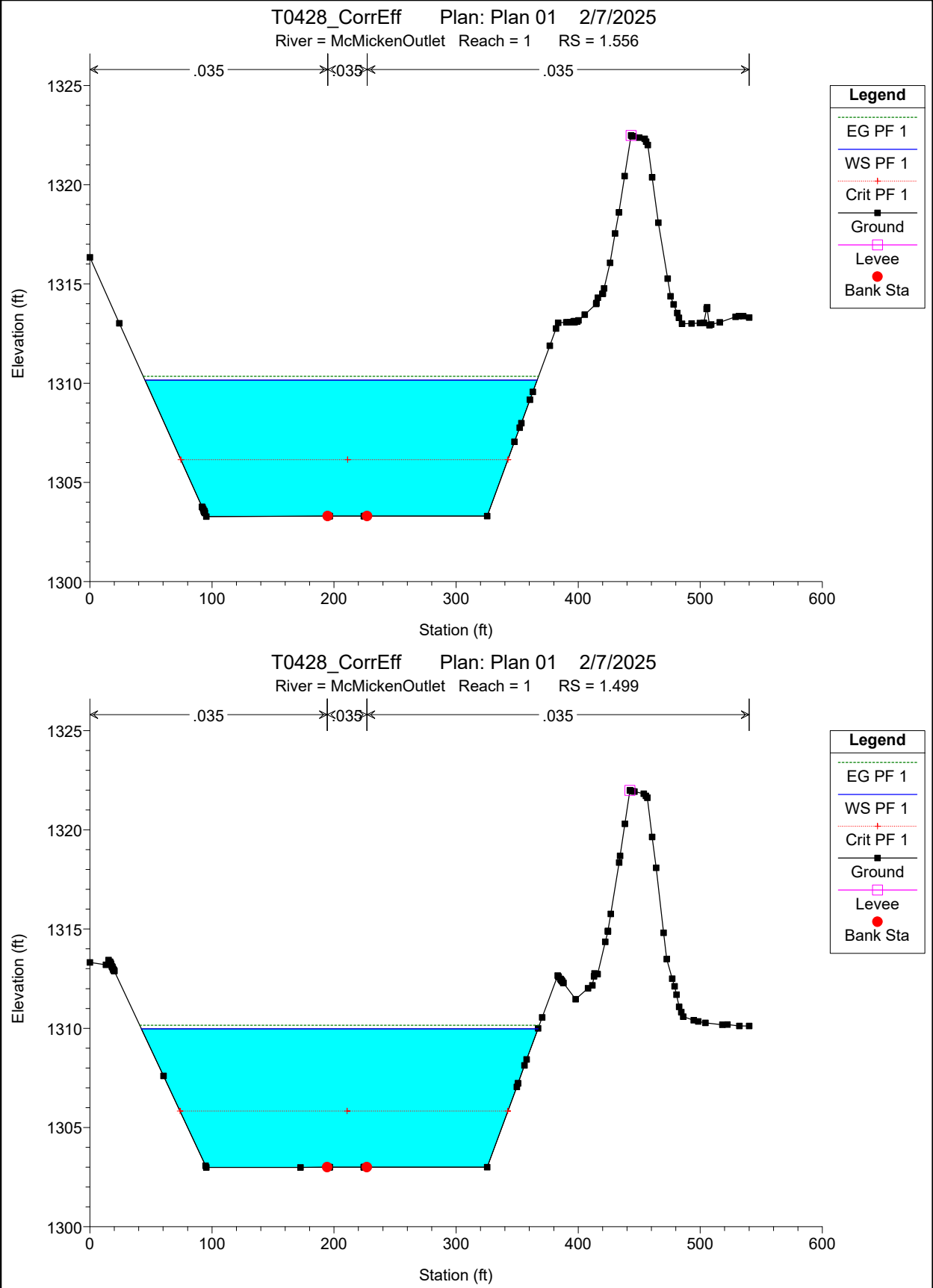


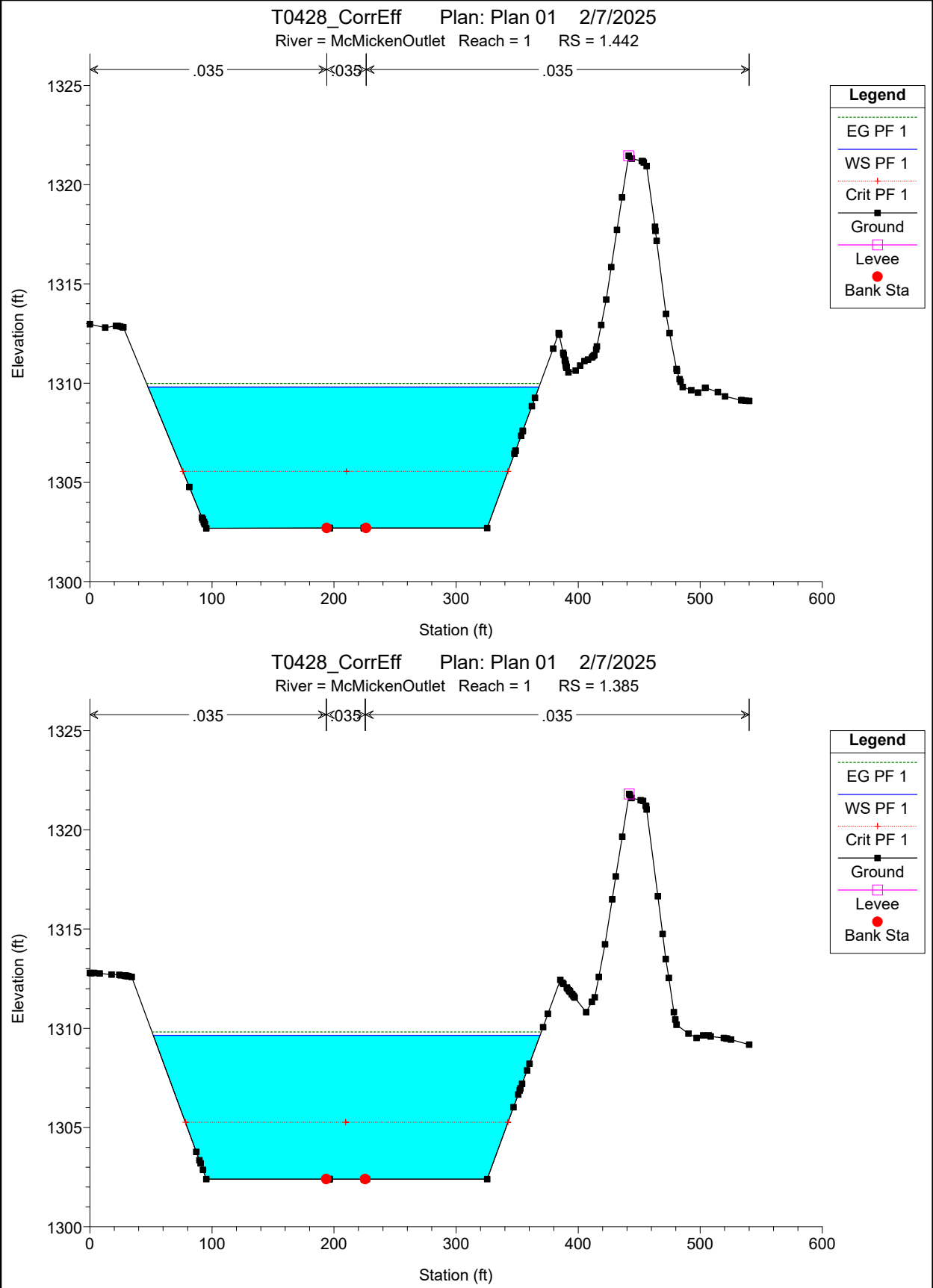


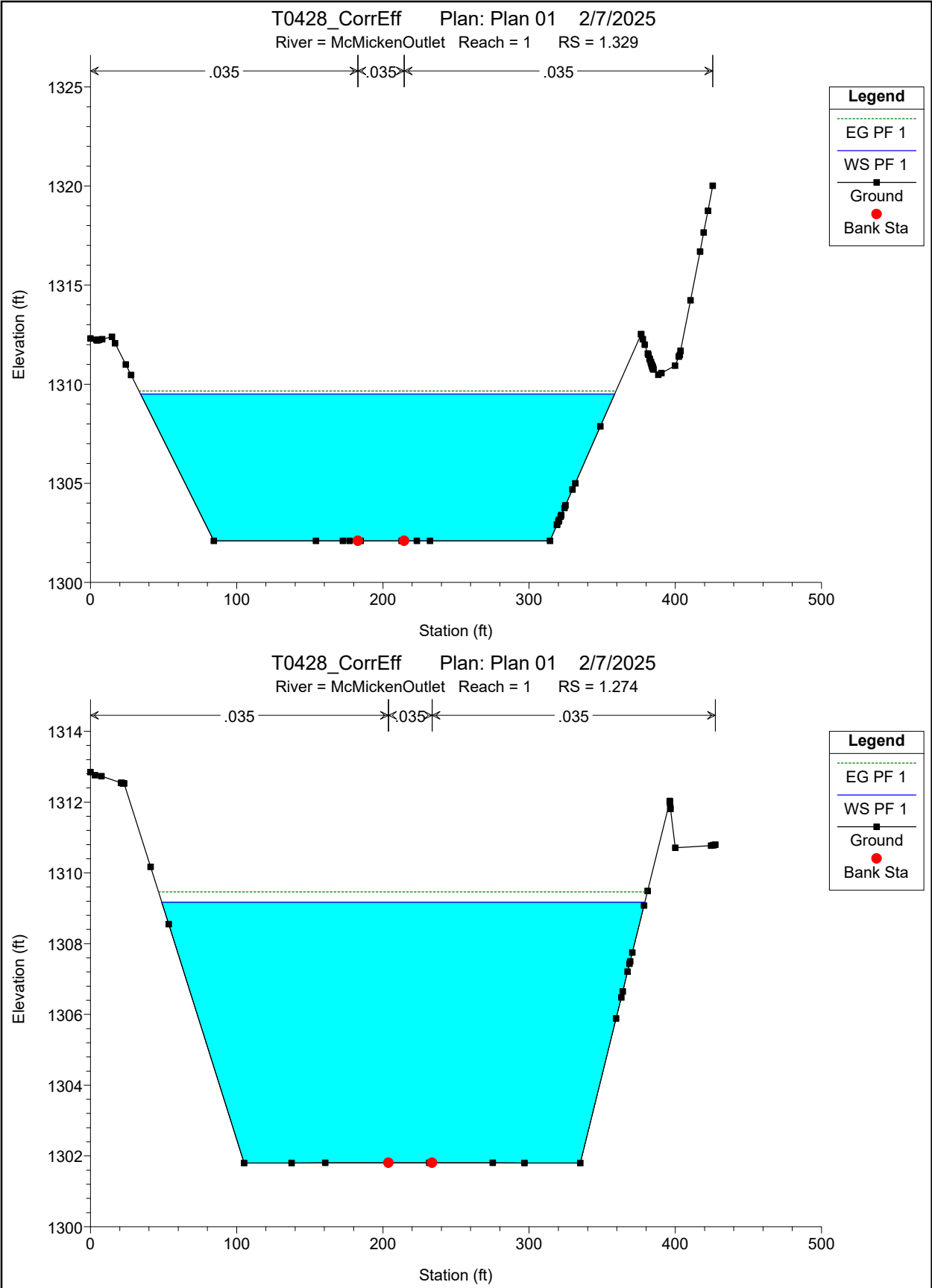


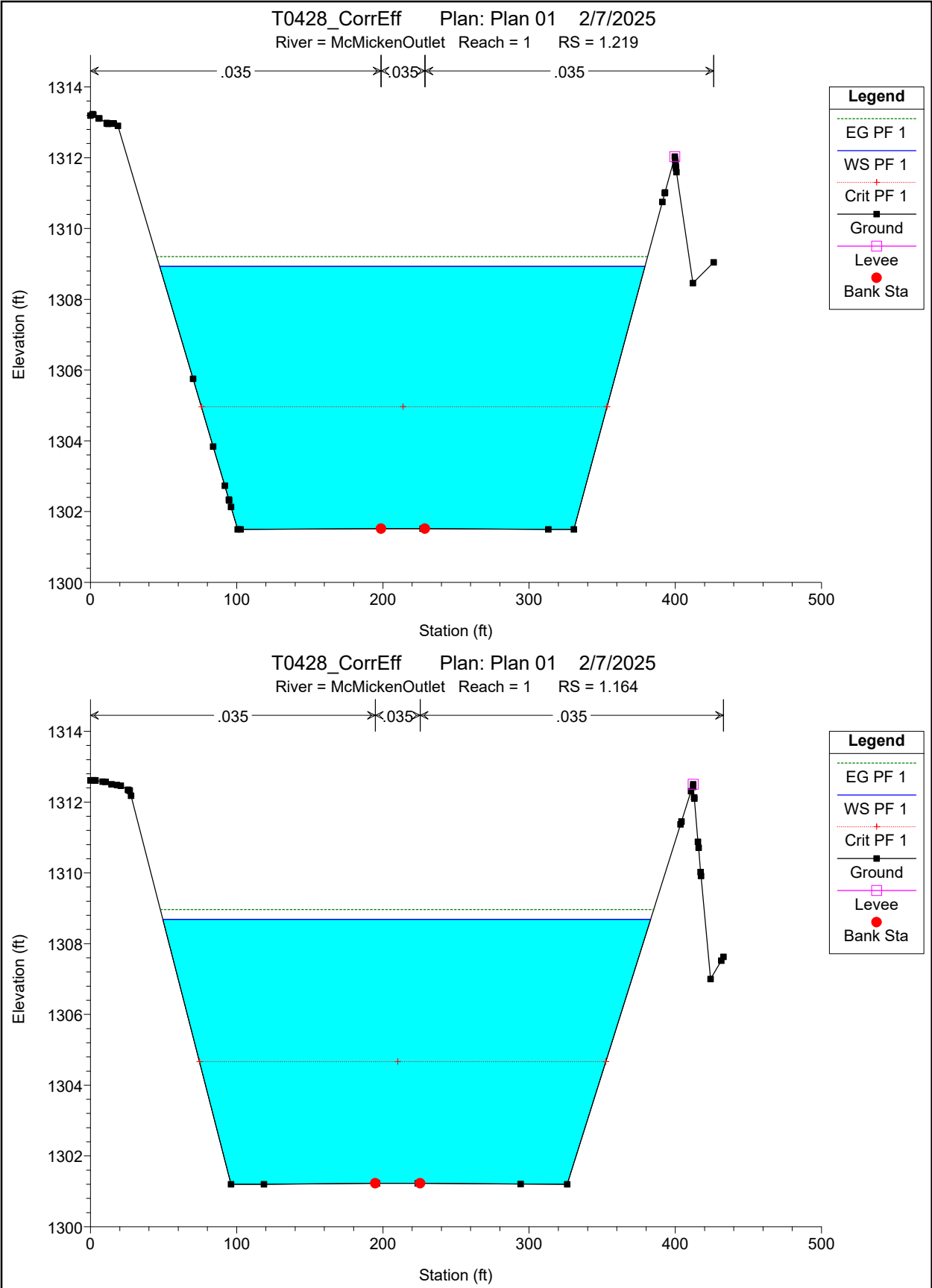


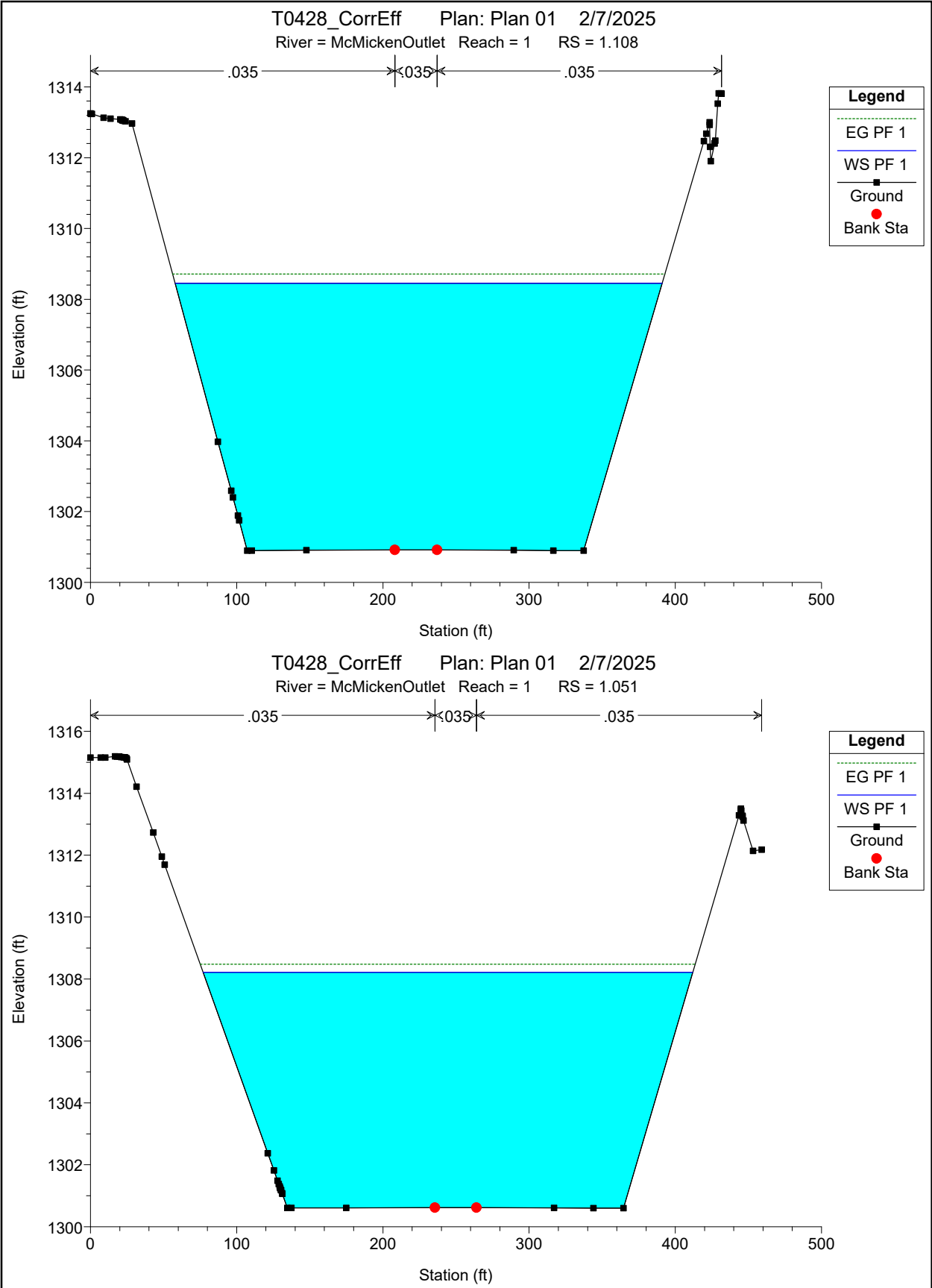


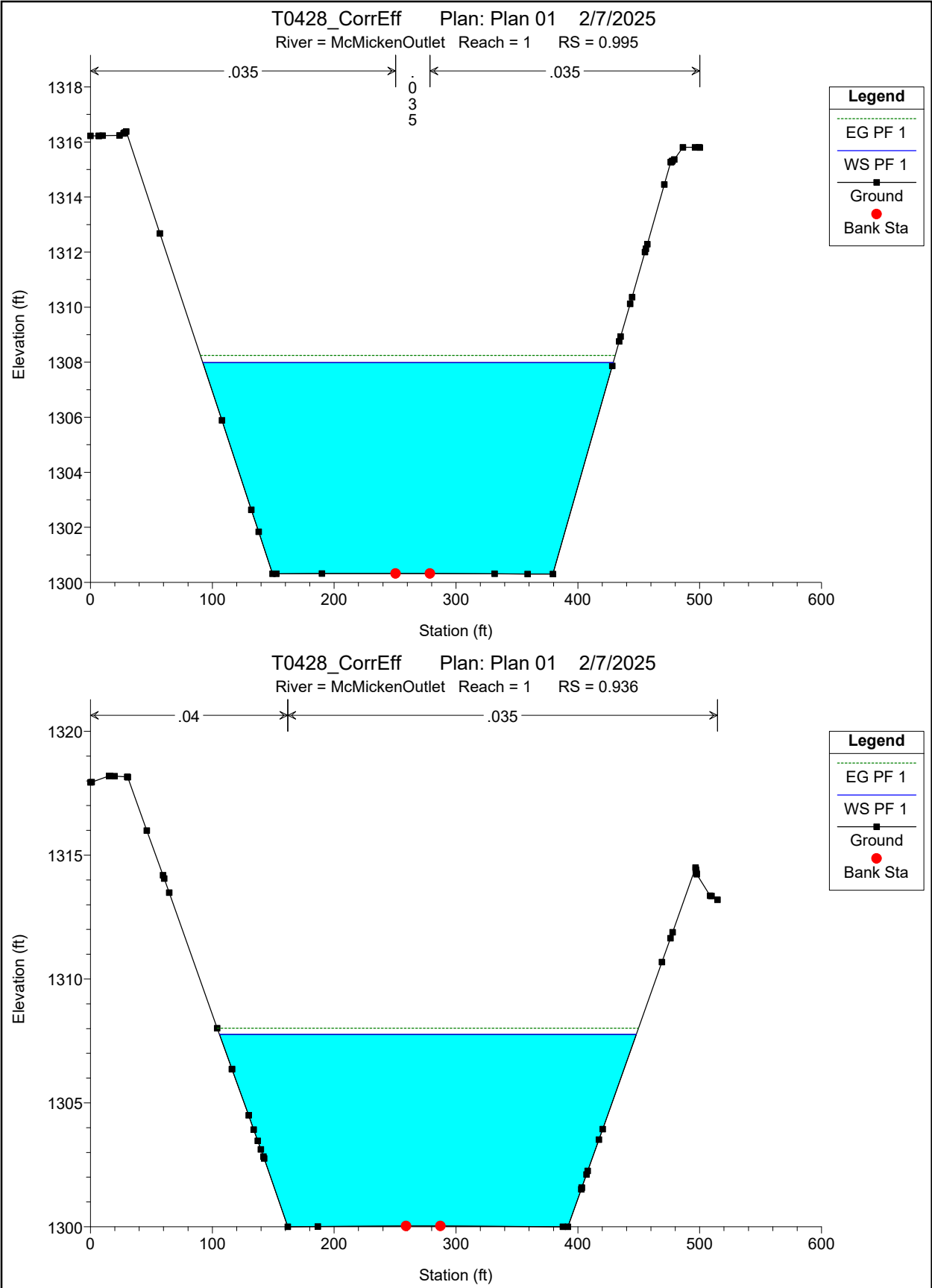


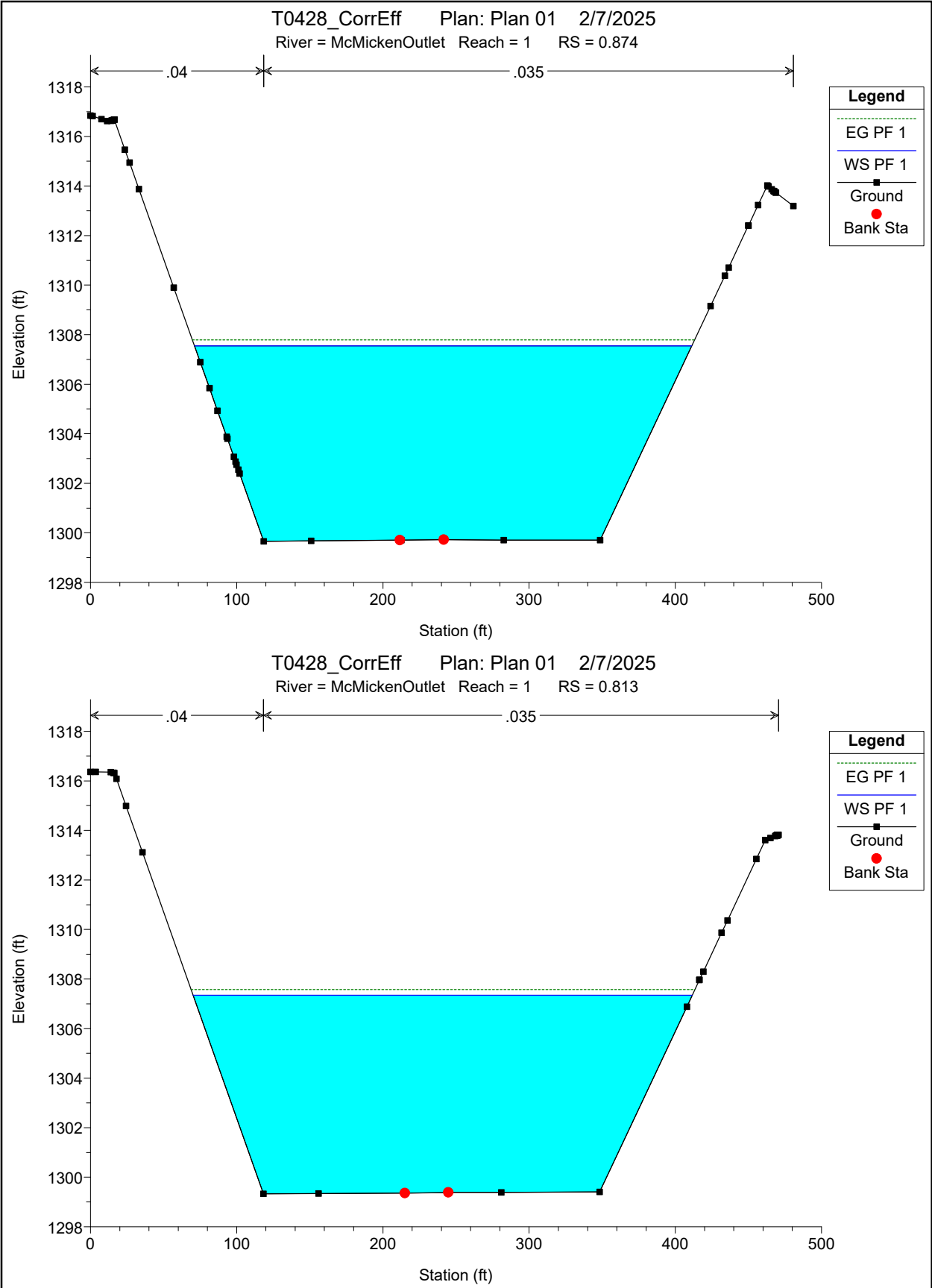


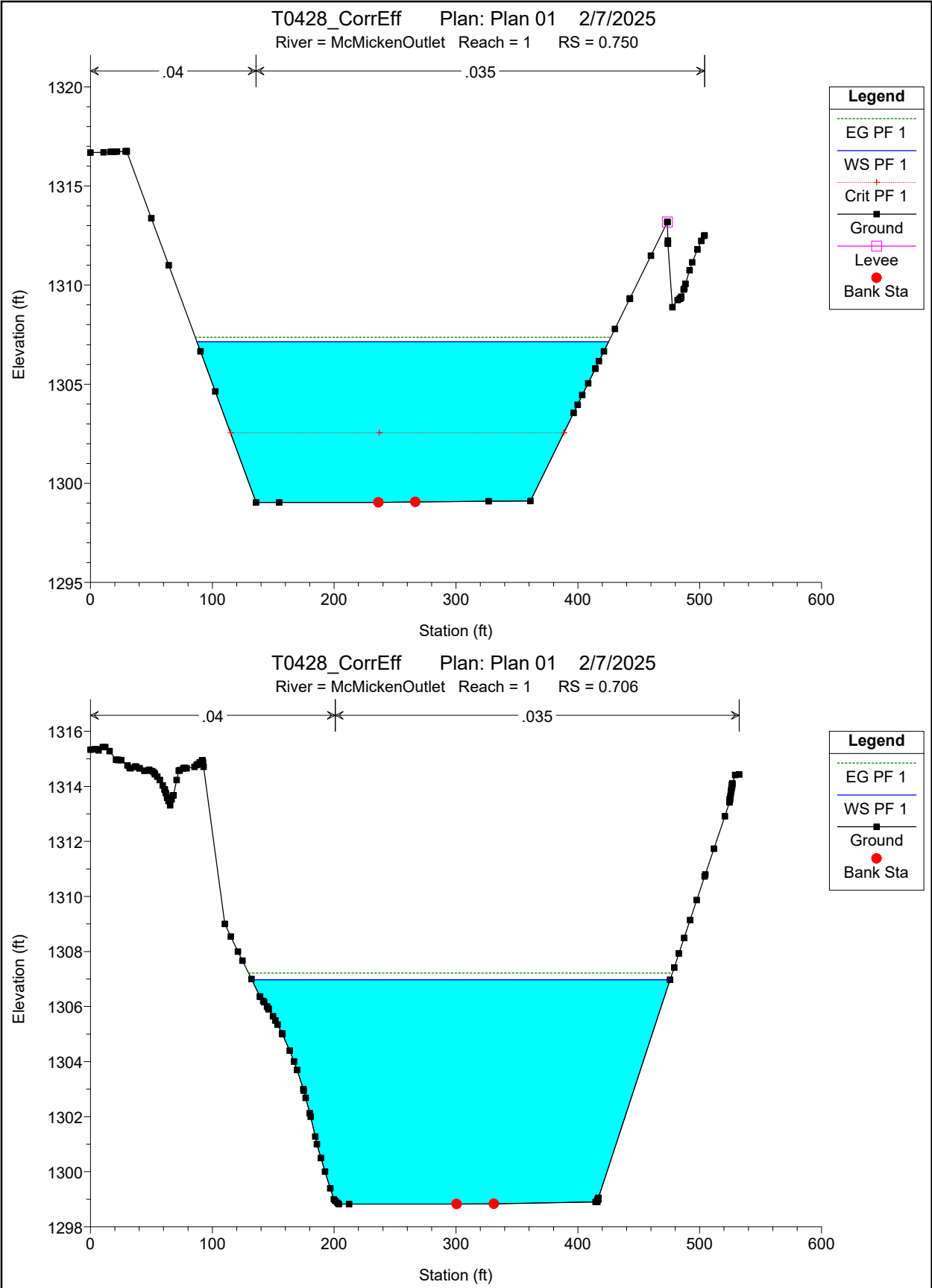


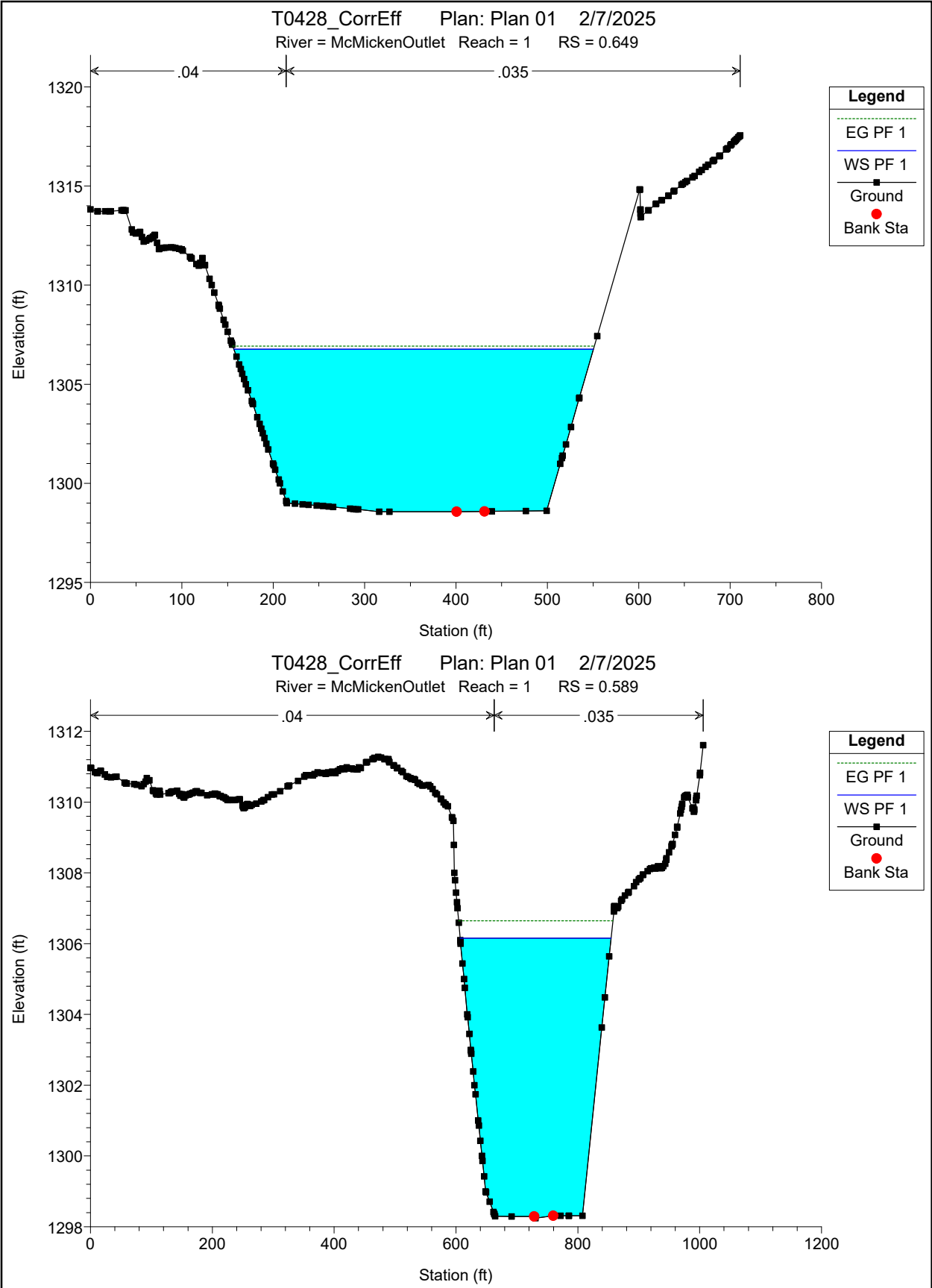


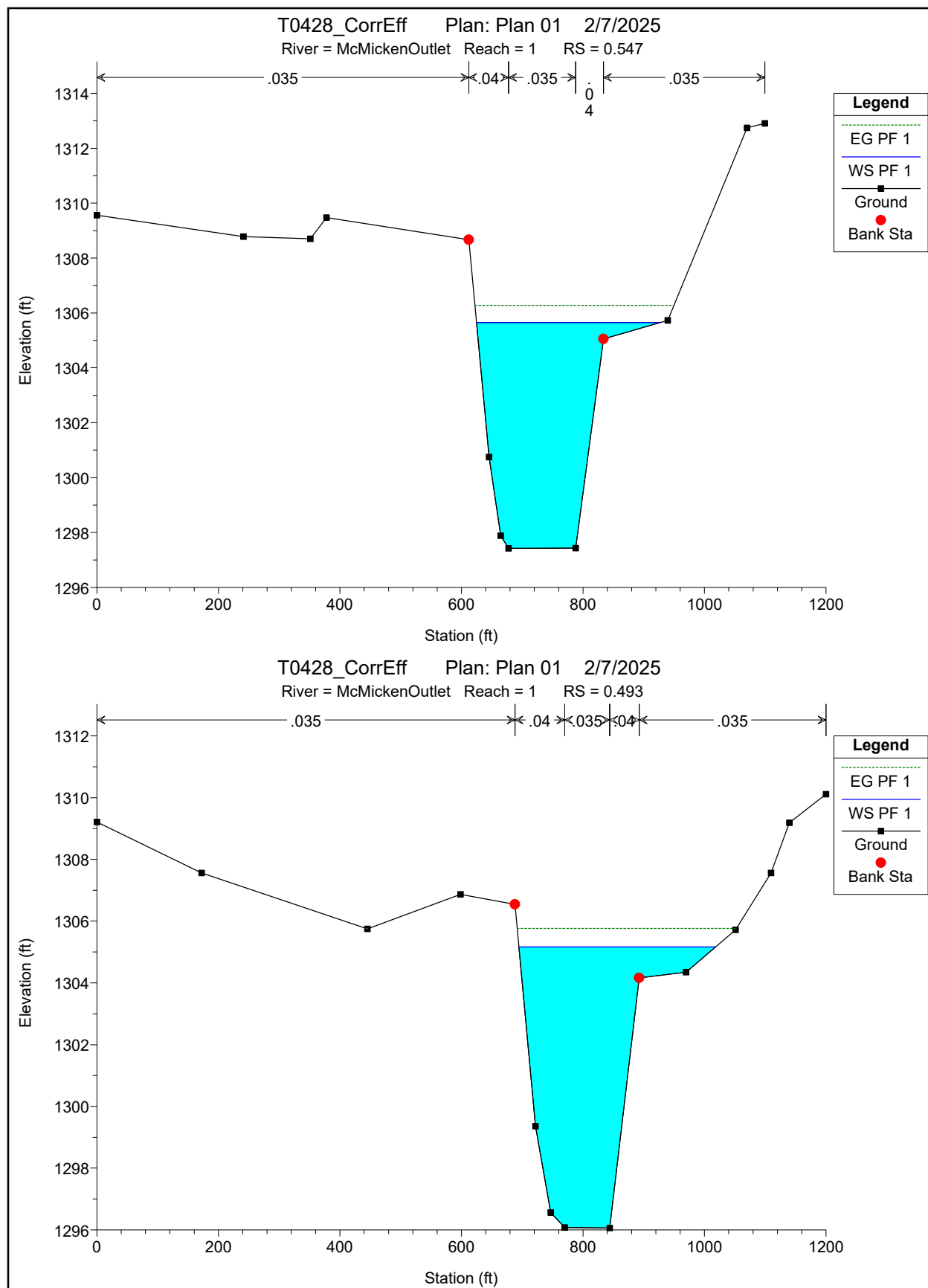


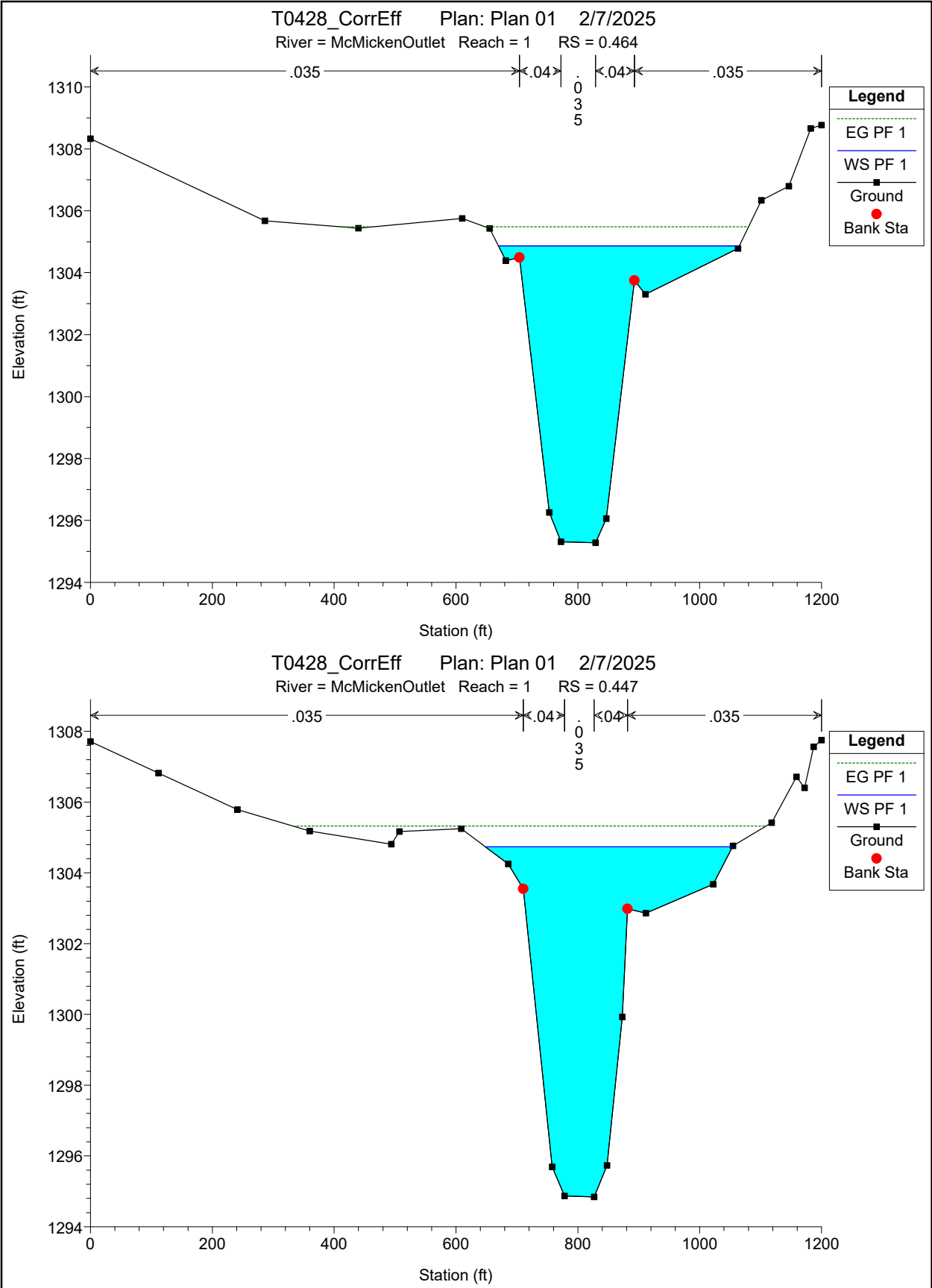


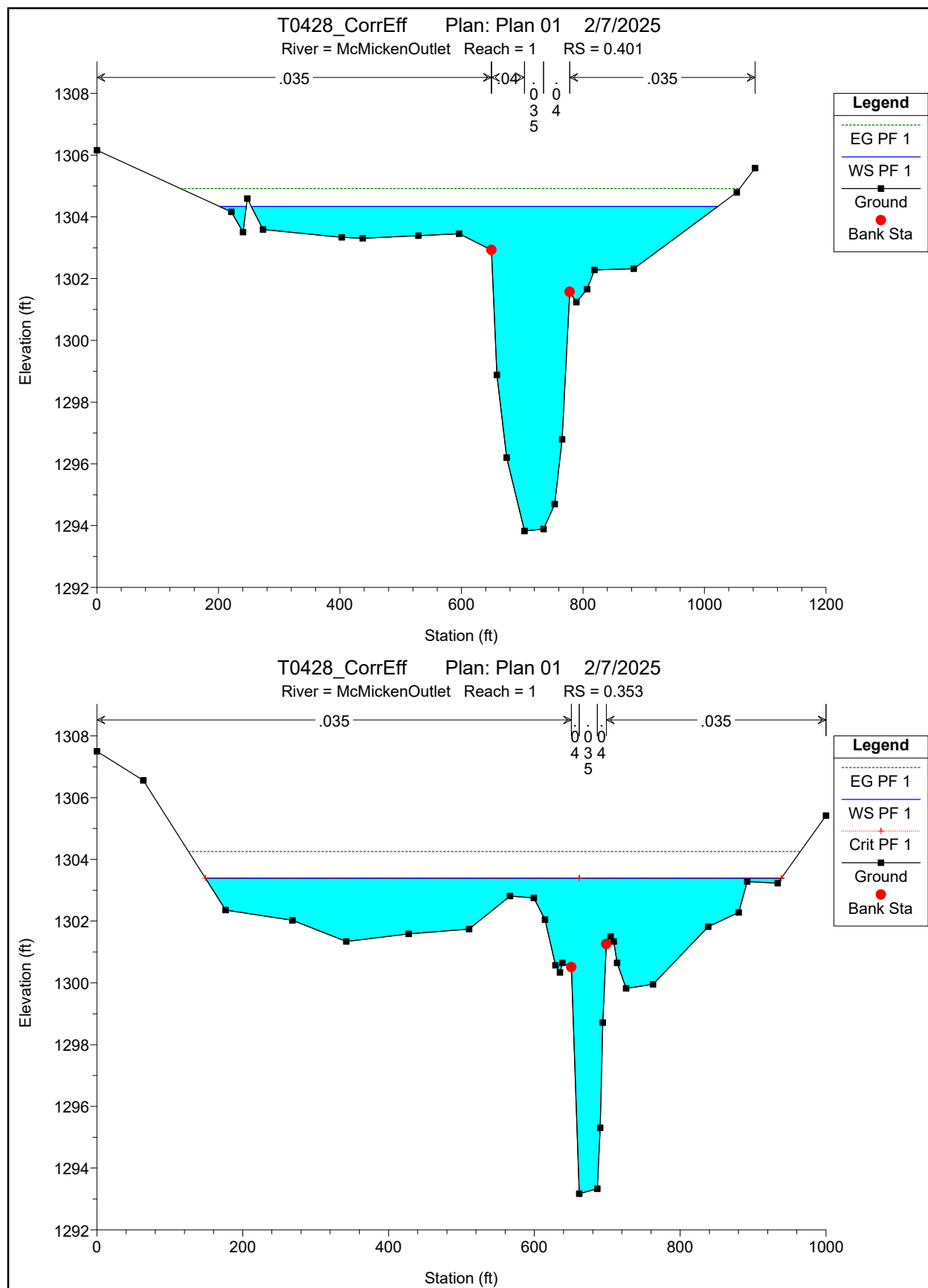


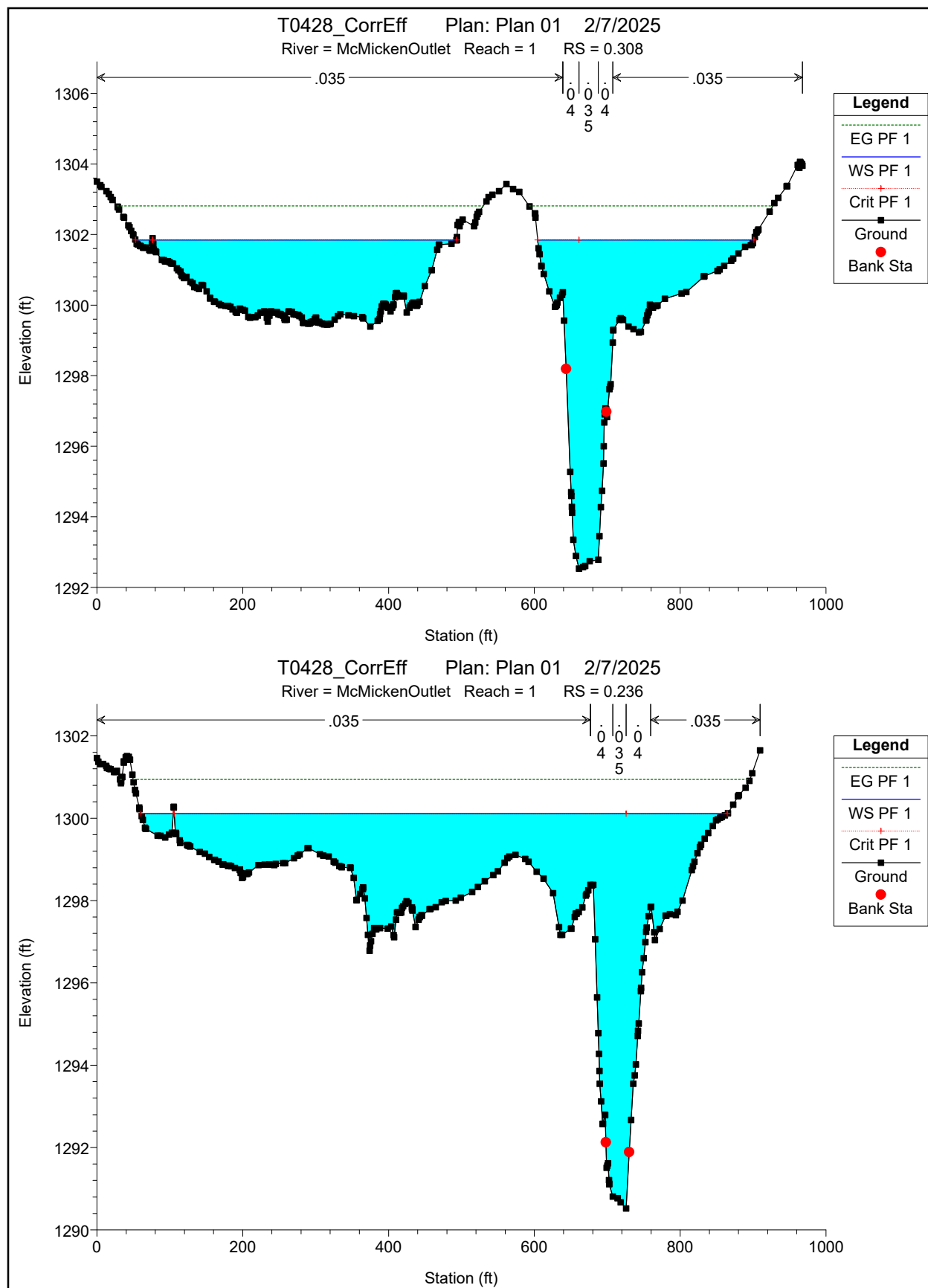


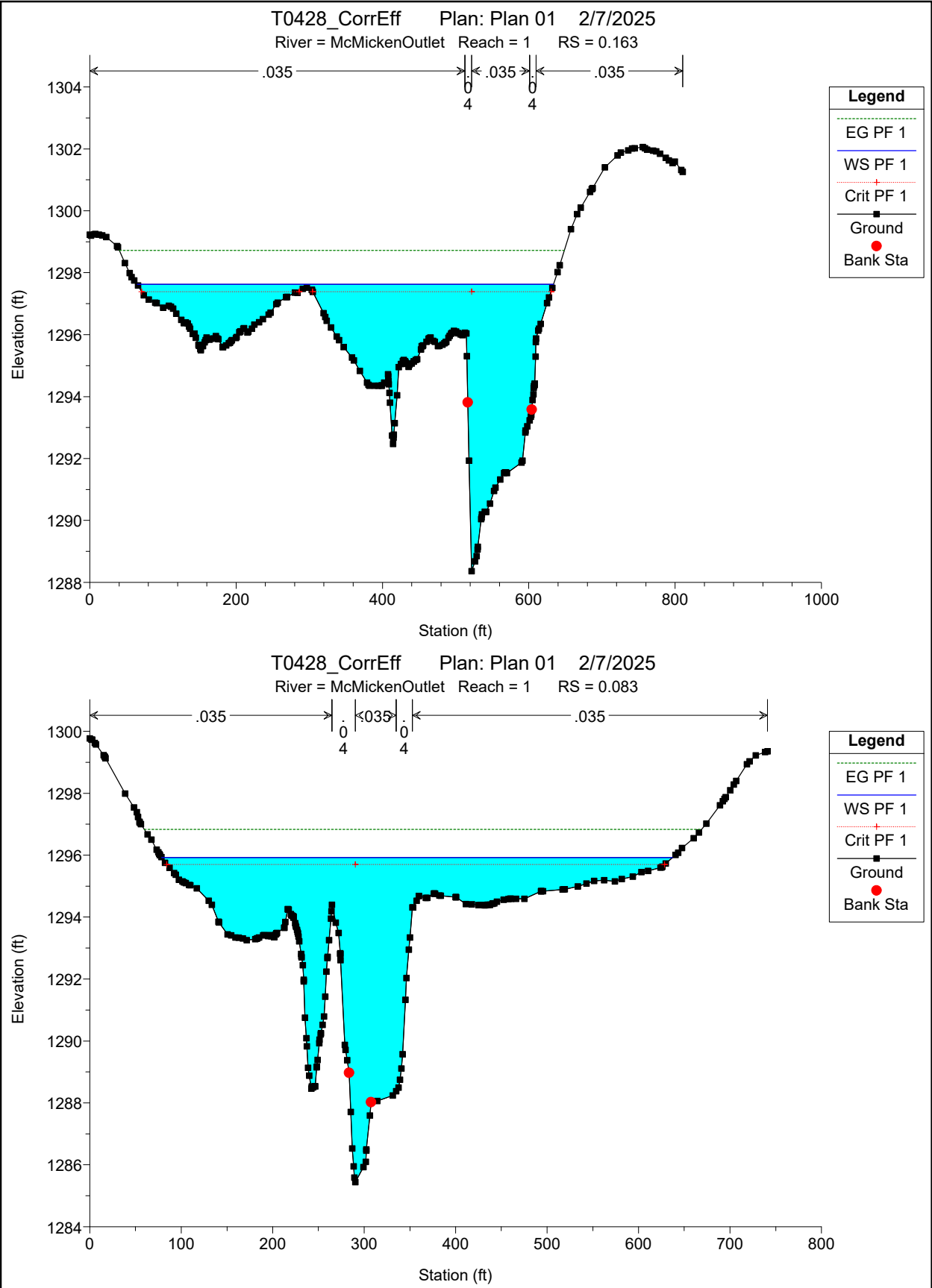


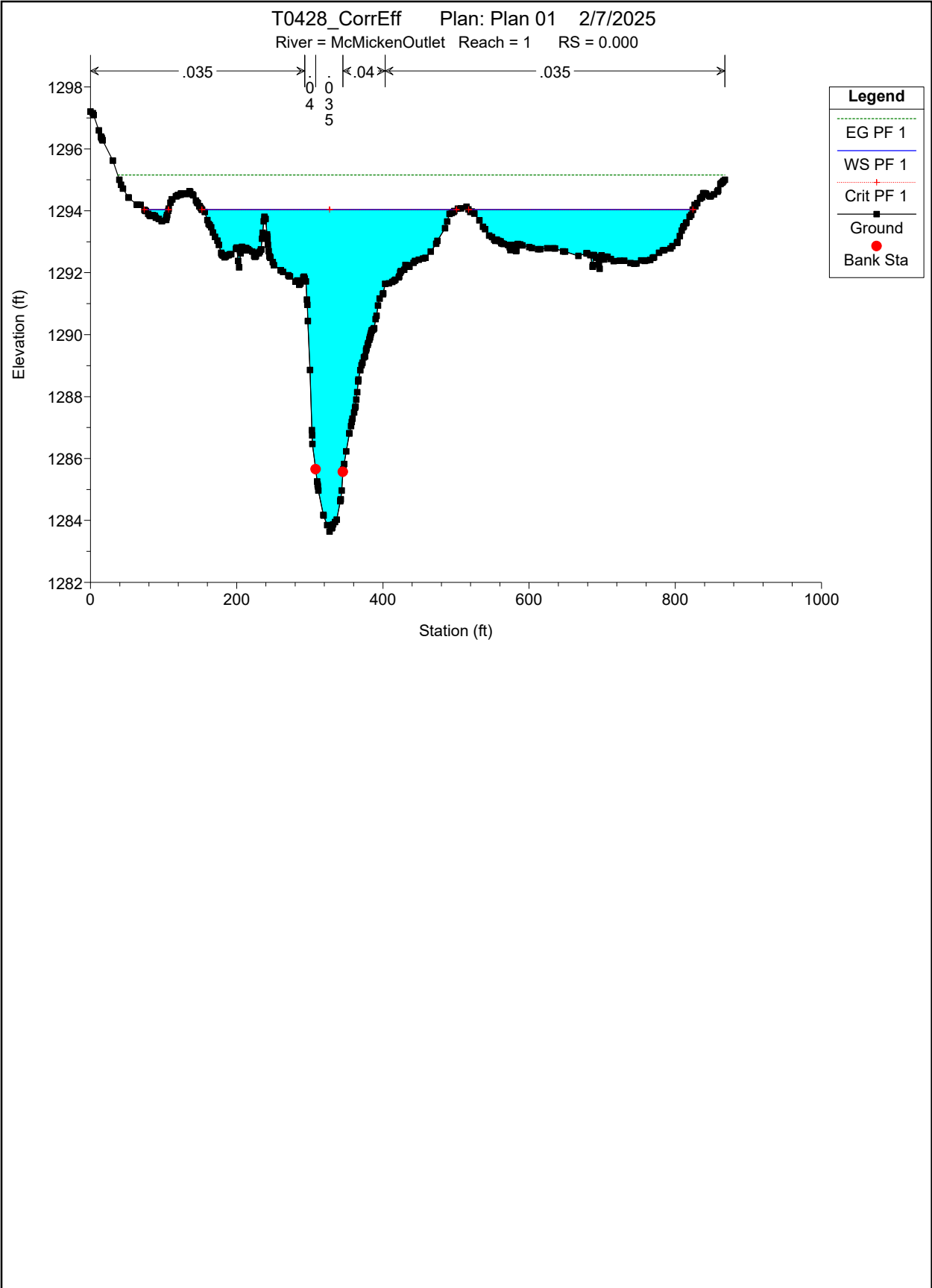














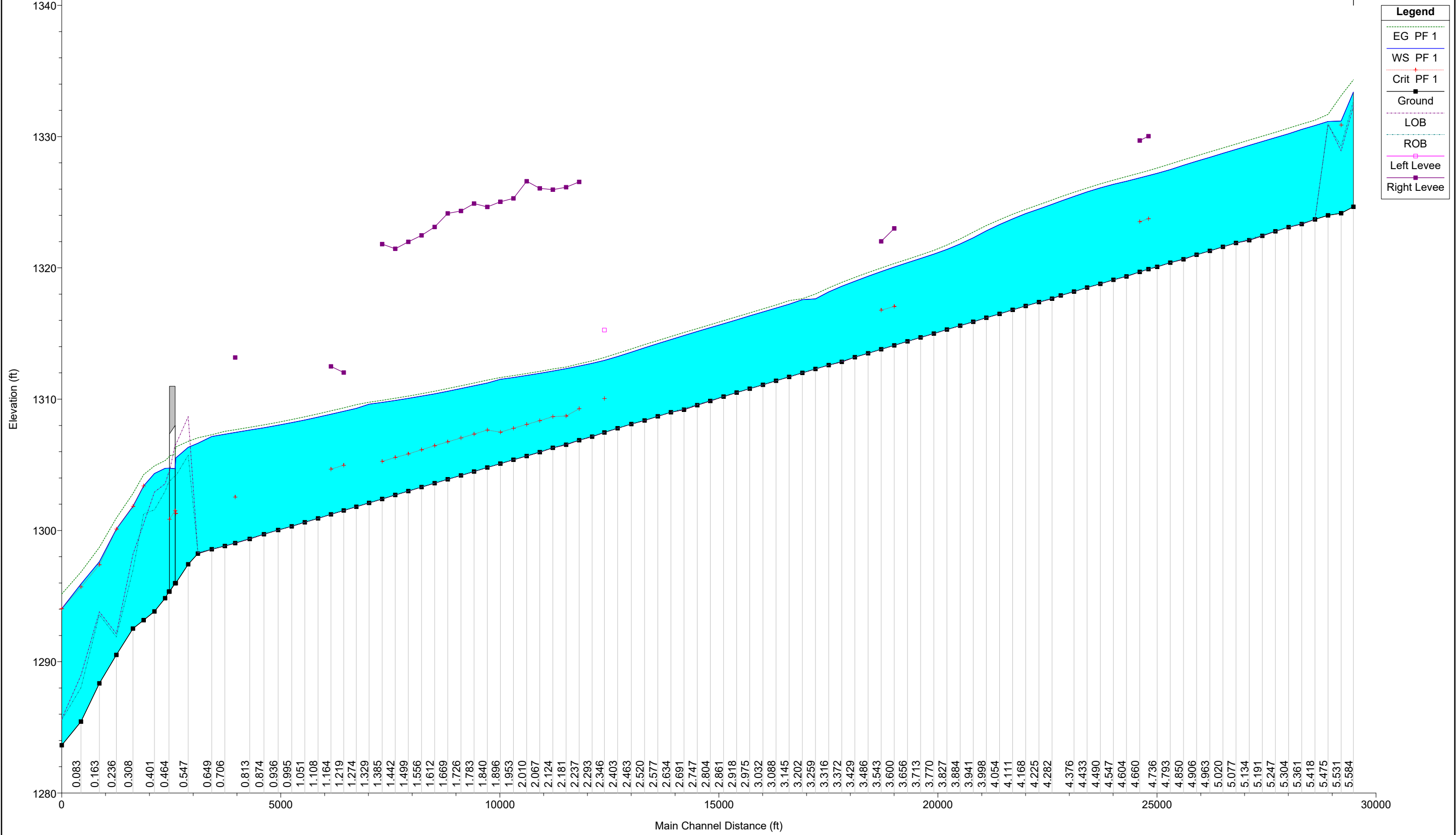
Appendix J - HEC-RAS Output - Proposed Model

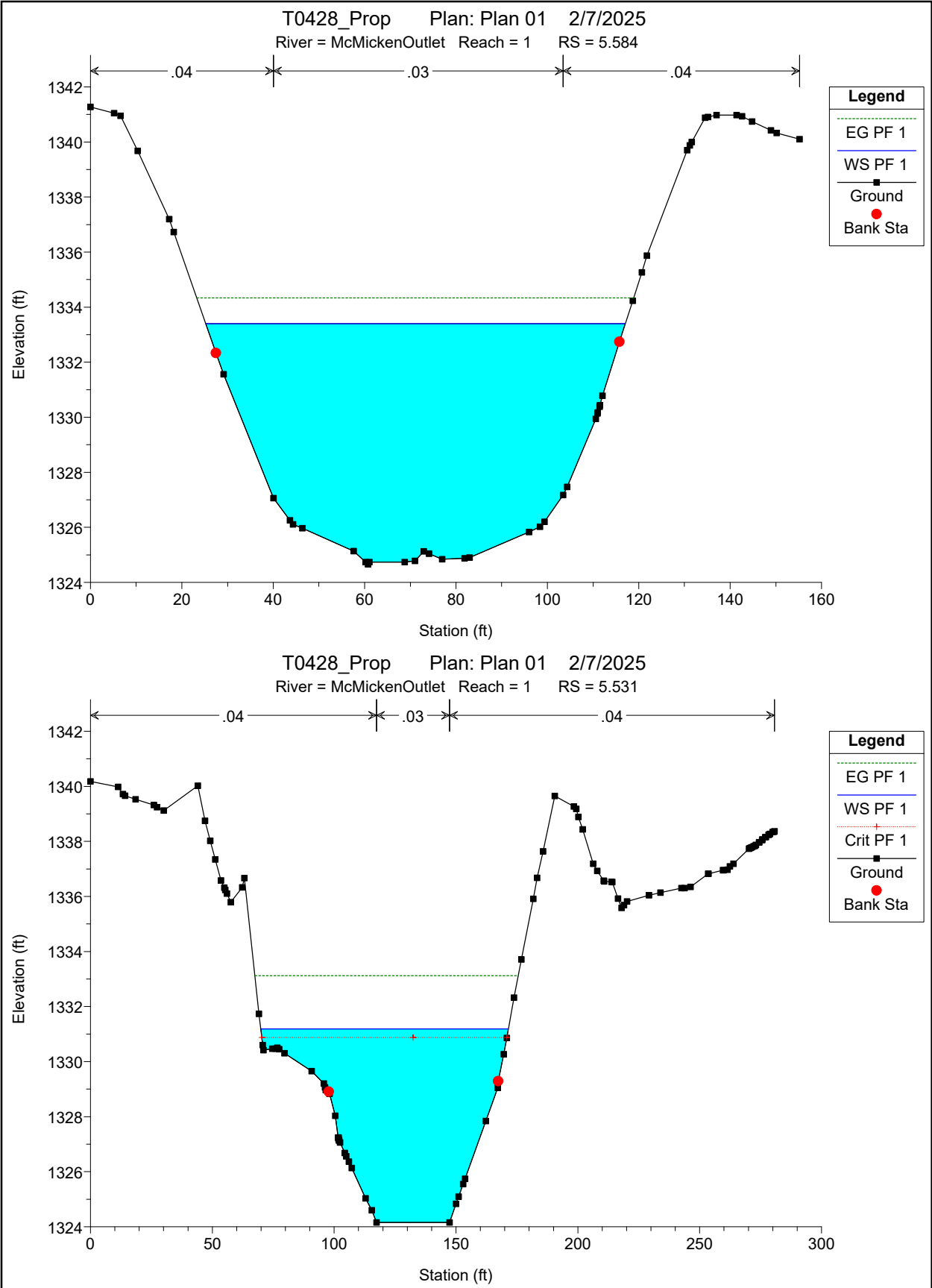
HEC-RAS Plan: Plan 01 River: McMickenOutlet Reach: 1 Profile: PF 1

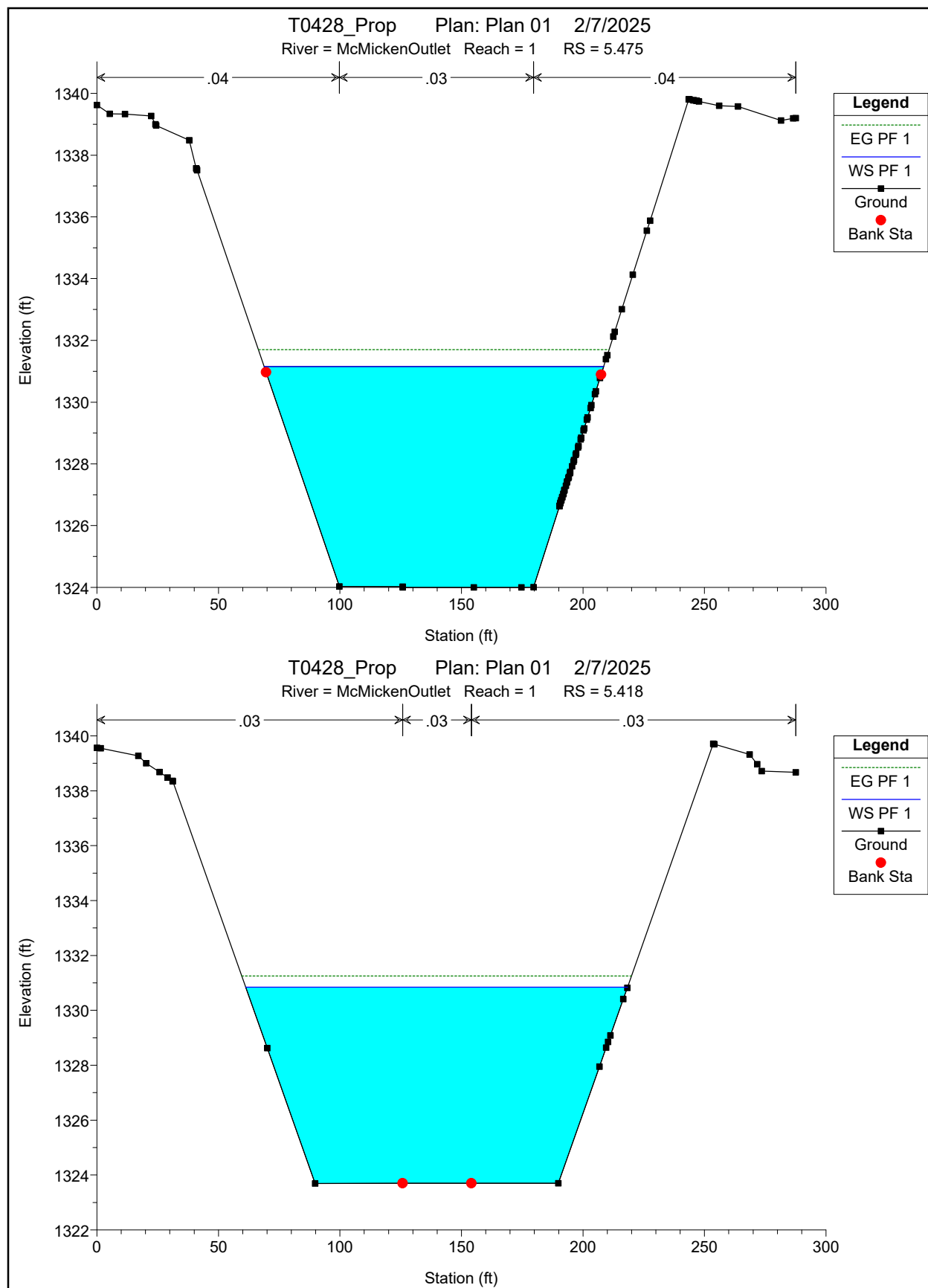
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	5.584	PF 1	4650.00	1324.66	1333.40		1334.33	0.002437	7.77	599.95	91.80	0.53
1	5.531	PF 1	4650.00	1324.16	1331.19	1330.88	1333.12	0.007492	11.31	436.82	101.59	0.83
1	5.475	PF 1	4650.00	1324.00	1331.15		1331.70	0.001894	5.93	783.76	139.66	0.44
1	5.418	PF 1	4650.00	1323.70	1330.85		1331.25	0.000991	5.79	919.23	157.14	0.38
1	5.361	PF 1	4650.00	1323.34	1330.55		1330.96	0.000986	5.79	920.41	157.13	0.38
1	5.304	PF 1	4650.00	1323.10	1330.22		1330.65	0.001045	5.92	888.63	149.72	0.39
1	5.247	PF 1	4650.00	1322.78	1329.93		1330.33	0.001000	5.81	916.09	156.90	0.38
1	5.191	PF 1	4650.00	1322.44	1329.63		1330.03	0.000998	5.81	916.55	156.91	0.38
1	5.134	PF 1	4650.00	1322.11	1329.33		1329.74	0.000996	5.81	917.08	156.90	0.38
1	5.077	PF 1	4650.00	1321.90	1329.03		1329.44	0.001002	5.81	915.61	156.90	0.38
1	5.020	PF 1	4650.00	1321.60	1328.73		1329.14	0.001002	5.81	915.43	156.84	0.38
1	4.963	PF 1	4650.00	1321.30	1328.43		1328.83	0.001003	5.81	915.25	156.84	0.38
1	4.906	PF 1	4650.00	1321.00	1328.12		1328.53	0.001004	5.81	915.14	156.87	0.38
1	4.850	PF 1	4650.00	1320.66	1327.82		1328.23	0.001002	5.82	915.30	156.84	0.38
1	4.793	PF 1	4650.00	1320.40	1327.48		1327.92	0.001064	5.96	882.85	149.40	0.39
1	4.736	PF 1	4650.00	1320.08	1327.20		1327.61	0.000954	5.66	915.75	157.67	0.37
1	4.698	PF 1	4650.00	1319.90	1327.03	1323.75	1327.41	0.000919	5.56	937.59	163.08	0.37
1	4.660	PF 1	4650.00	1319.70	1326.86	1323.53	1327.23	0.000888	5.48	955.42	167.03	0.36
1	4.604	PF 1	4650.00	1319.35	1326.60		1326.95	0.000878	5.49	991.91	174.68	0.36
1	4.547	PF 1	4650.00	1319.09	1326.37		1326.69	0.000806	5.28	1044.22	186.91	0.35
1	4.490	PF 1	4650.00	1318.79	1326.09		1326.40	0.001083	5.26	1051.21	188.08	0.34
1	4.433	PF 1	4650.00	1318.50	1325.79		1326.08	0.001032	5.13	1089.97	199.05	0.33
1	4.376	PF 1	4650.00	1318.20	1325.44		1325.76	0.001105	5.28	1046.44	188.92	0.35
1	4.319	PF 1	4650.00	1317.90	1325.09		1325.42	0.001163	5.39	1020.05	184.04	0.35
1	4.282	PF 1	4650.00	1317.65	1324.85		1325.18	0.001172	5.40	1019.74	185.00	0.36
1	4.225	PF 1	4650.00	1317.40	1324.48		1324.82	0.001204	5.43	1013.59	186.02	0.36
1	4.168	PF 1	4650.00	1317.10	1324.13		1324.46	0.001191	5.38	1033.06	193.71	0.36
1	4.111	PF 1	4650.00	1316.80	1323.74		1324.08	0.001283	5.53	997.51	187.39	0.37
1	4.054	PF 1	4650.00	1316.50	1323.30		1323.68	0.001416	5.73	954.53	180.66	0.39
1	3.998	PF 1	4650.00	1316.20	1322.82		1323.23	0.001559	5.91	923.74	178.81	0.40
1	3.941	PF 1	4650.00	1315.90	1322.29		1322.73	0.001765	6.14	888.45	177.95	0.43
1	3.884	PF 1	4650.00	1315.60	1321.82		1322.21	0.001604	5.75	947.72	194.65	0.41
1	3.827	PF 1	4650.00	1315.30	1321.40		1321.74	0.001406	5.32	1007.56	205.10	0.38
1	3.770	PF 1	4650.00	1315.00	1321.05		1321.34	0.001202	4.88	1080.99	217.76	0.35
1	3.713	PF 1	4650.00	1314.70	1320.72		1320.99	0.001078	4.61	1136.36	227.31	0.33
1	3.656	PF 1	4650.00	1314.40	1320.40		1320.66	0.001095	4.64	1133.72	228.22	0.33
1	3.600	PF 1	4650.00	1314.10	1320.07	1317.06	1320.33	0.001095	4.62	1143.77	233.12	0.33
1	3.543	PF 1	4650.00	1313.80	1319.72	1316.78	1319.99	0.001146	4.70	1116.14	227.10	0.34
1	3.486	PF 1	4650.00	1313.50	1319.36		1319.64	0.001188	4.76	1099.79	225.33	0.35
1	3.429	PF 1	4650.00	1313.20	1318.99		1319.28	0.001243	4.82	1083.21	224.23	0.35
1	3.372	PF 1	4650.00	1312.84	1318.60		1318.89	0.001305	4.91	1070.57	225.43	0.36
1	3.316	PF 1	4650.00	1312.60	1318.17		1318.48	0.001430	5.04	1035.53	222.00	0.38
1	3.259	PF 1	4650.00	1312.30	1317.64		1318.01	0.001711	5.36	957.37	208.61	0.41
1	3.202	PF 1	5000.00	1312.00	1317.58		1317.65	0.000282	2.24	2288.86	432.84	0.17
1	3.145	PF 1	5000.00	1311.70	1317.23		1317.50	0.001116	4.44	1202.56	247.42	0.33
1	3.088	PF 1	5000.00	1311.40	1316.94		1317.17	0.001005	4.21	1300.25	268.88	0.32
1	3.032	PF 1	5000.00	1311.10	1316.65		1316.87	0.000986	4.18	1319.62	275.23	0.31
1	2.975	PF 1	5000.00	1310.80	1316.35		1316.58	0.000997	4.20	1308.22	271.52	0.31
1	2.918	PF 1	5000.00	1310.50	1316.05		1316.28	0.000997	4.20	1307.68	271.27	0.31
1	2.861	PF 1	5000.00	1310.20	1315.75		1315.98	0.000996	4.20	1308.94	271.65	0.31
1	2.804	PF 1	5000.00	1309.87	1315.45		1315.68	0.000988	4.19	1316.07	273.93	0.31
1	2.747	PF 1	5000.00	1309.54	1315.16		1315.38	0.000987	4.20	1314.81	273.09	0.31
1	2.691	PF 1	5000.00	1309.20	1314.85		1315.08	0.001004	4.24	1296.03	266.63	0.32
1	2.634	PF 1	5000.00	1309.00	1314.54		1314.78	0.001015	4.24	1289.87	265.58	0.32
1	2.577	PF 1	5000.00	1308.70	1314.23		1314.47	0.001033	4.27	1274.49	261.11	0.32
1	2.520	PF 1	5000.00	1308.38	1313.91		1314.16	0.001057	4.31	1256.68	256.12	0.32
1	2.463	PF 1	5000.00	1308.10	1313.59		1313.83	0.001070	4.32	1255.40	257.93	0.33
1	2.403	PF 1	5000.00	1307.78	1313.25		1313.49	0.001073	4.32	1267.74	265.20	0.33
1	2.346	PF 1	5000.00	1307.46	1312.95	1310.04	1313.17	0.000986	4.15	1329.56	280.52	0.31
1	2.293	PF 1	5000.00	1307.14	1312.74		1312.92	0.000784	3.74	1466.58	301.62	0.28
1	2.237	PF 1	5000.00	1306.87	1312.53	1309.27	1312.69	0.000714	3.60	1523.05	309.13	0.27
1	2.181	PF 1	5000.00	1306.53	1312.32	1308.72	1312.44	0.000458	2.92	1799.39	345.68	0.21
1	2.124	PF 1	5000.00	1306.29	1312.15	1308.67	1312.30	0.000597	3.37	1590.59	312.15	0.25
1	2.067	PF 1	5000.00	1305.96	1311.98	1308.36	1312.12	0.000582	3.38	1627.40	312.91	0.24
1	2.010	PF 1	5000.00	1305.67	1311.81	1308.08	1311.95	0.000545	3.32	1651.92	309.15	0.24
1	1.953	PF 1	5000.00	1305.38	1311.66	1307.79	1311.79	0.000507	3.25	1682.62	306.51	0.23
1	1.896	PF 1	5000.00	1305.09	1311.52	1307.49	1311.65	0.000464	3.16	1735.71	309.83	0.22
1	1.840	PF 1	6550.00	1304.79	1311.24	1307.65	1311.45	0.000779	4.10	1758.05	315.09	0.29
1	1.783	PF 1	6550.00	1304.49	1311.02	1307.35	1311.23	0.000708	3.95	1790.16	318.10	0.27
1	1.726	PF 1	6550.00	1304.19	1310.81	1307.04	1311.02	0.000691	3.93	1784.27	309.27	0.27
1	1.669	PF 1	6550.00	1303.90	1310.61	1306.75	1310.81	0.000689	3.96	1813.59	310.42	0.27
1	1.612	PF 1	6550.00	1303.60	1310.41	1306.46	1310.61	0.000649	3.89	1856.74	314.81	0.26
1	1.556	PF 1	6550.00	1303.30	1310.23	1306.15	1310.41	0.000603	3.79	1915.42	322.28	0.25
1	1.499	PF 1	6550.00	1303.00	1310.06	1305.83	1310.24	0.000563	3.71	1964.77	326.11	0.25
1	1.442	PF 1	6550.00	1302.70	1309.90	1305.56	1310.07	0.000533	3.65	1986.45	321.48	0.24
1	1.385	PF 1	6550.00	1302.40	1309.75	1305.26	1309.92	0.000502	3.60	2013.89	318.01	0.23

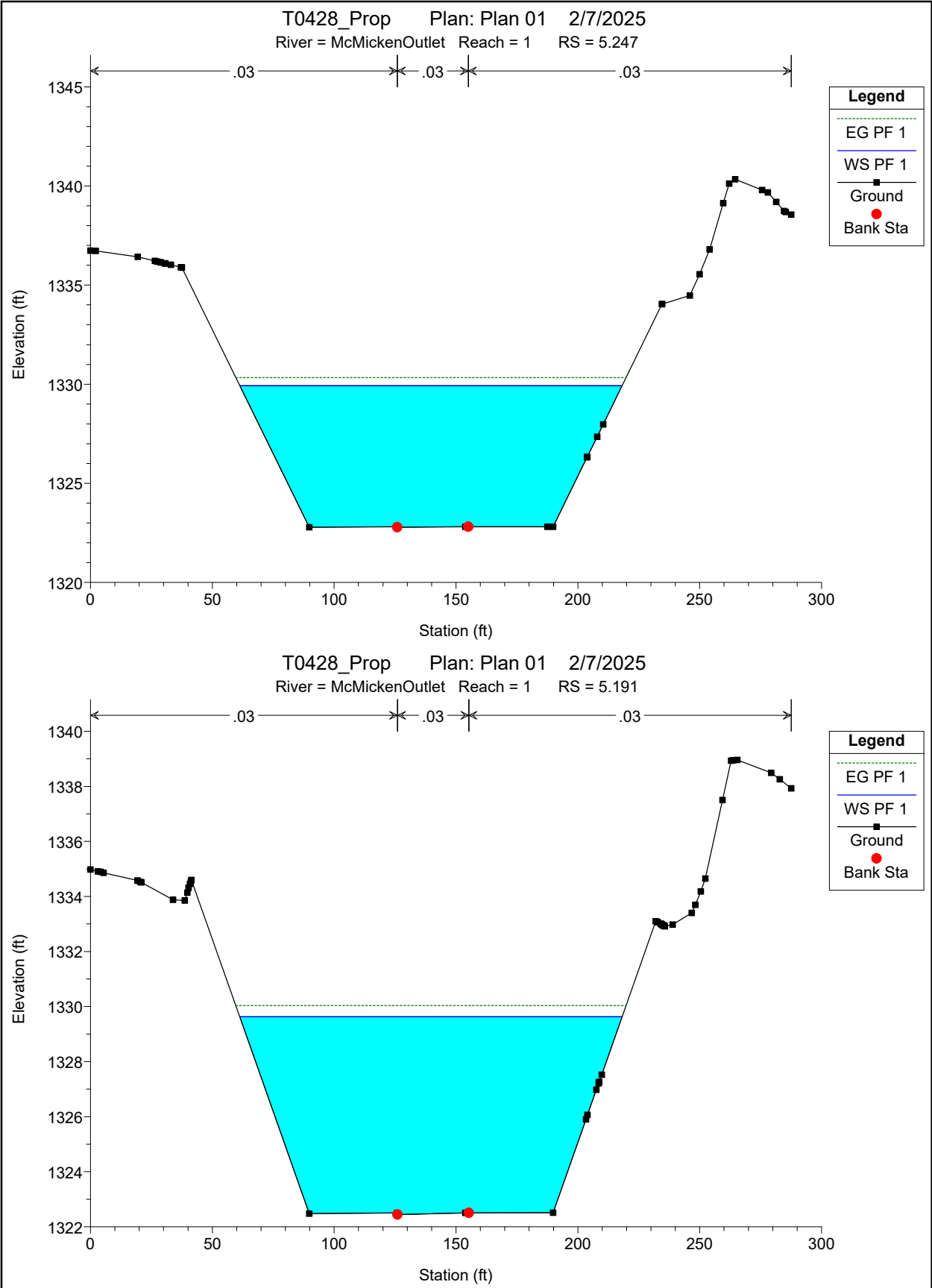
HEC-RAS Plan: Plan 01 River: McMickenOutlet Reach: 1 Profile: PF 1 (Continued)

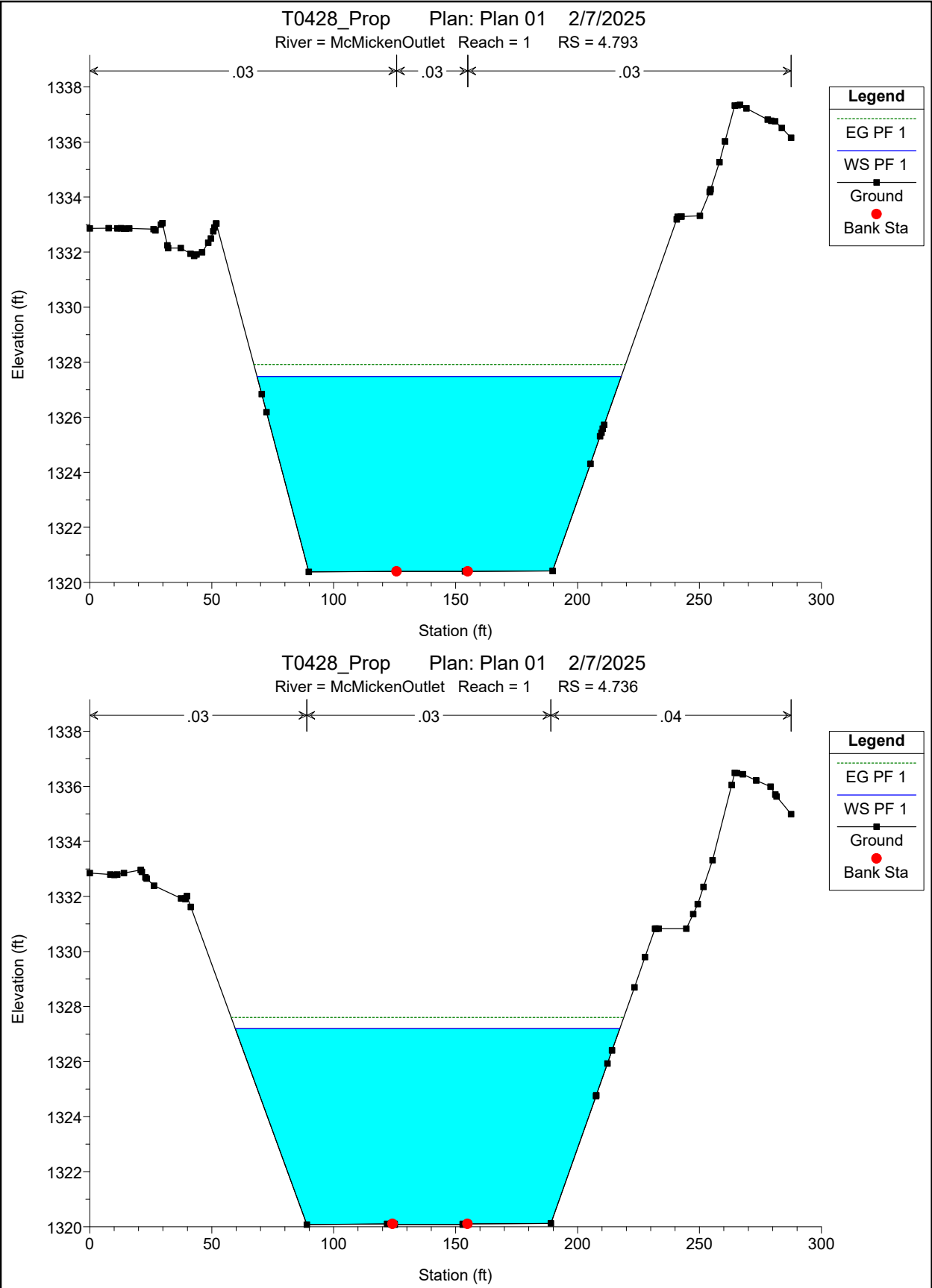
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	1.329	PF 1	6550.00	1302.10	1309.62		1309.77	0.000459	3.49	2087.97	325.71	0.22
1	1.274	PF 1	8800.00	1301.81	1309.30		1309.58	0.000824	4.67	2107.57	332.16	0.30
1	1.219	PF 1	8800.00	1301.52	1309.07	1304.96	1309.34	0.000797	4.62	2133.12	334.01	0.30
1	1.164	PF 1	8800.00	1301.23	1308.85	1304.67	1309.11	0.000769	4.56	2160.93	335.93	0.29
1	1.108	PF 1	8800.00	1300.92	1308.63		1308.88	0.000743	4.52	2183.03	335.52	0.29
1	1.051	PF 1	8800.00	1300.62	1308.42		1308.66	0.000713	4.46	2215.38	337.66	0.28
1	0.995	PF 1	8800.00	1300.32	1308.21		1308.45	0.000682	4.39	2251.85	340.07	0.28
1	0.936	PF 1	8800.00	1300.03	1308.02		1308.25	0.000630	4.26	2302.01	345.74	0.27
1	0.874	PF 1	8800.00	1299.71	1307.82		1308.05	0.000601	4.20	2332.13	343.93	0.26
1	0.813	PF 1	8800.00	1299.36	1307.65		1307.86	0.000564	4.12	2381.19	345.62	0.25
1	0.750	PF 1	8800.00	1299.03	1307.46	1302.55	1307.68	0.000553	4.13	2384.97	342.39	0.25
1	0.706	PF 1	8800.00	1298.82	1307.33		1307.55	0.000579	4.26	2349.68	349.86	0.26
1	0.649	PF 1	8800.00	1298.57	1307.15		1307.30	0.000352	3.34	2892.77	398.91	0.20
1	0.589	PF 1	8800.00	1298.24	1306.64		1307.06	0.001157	5.95	1703.56	253.25	0.36
1	0.547	PF 1	8800.00	1297.42	1306.33		1306.79	0.001285	5.40	1633.14	328.81	0.42
1	0.493	PF 1	8800.00	1295.99	1305.52	1301.31	1306.36	0.001473	7.33	1201.24	346.66	0.42
1	0.4785		Culvert									
1	0.464	PF 1	8800.00	1295.35	1304.74		1305.60	0.001548	7.44	1183.51	386.04	0.43
1	0.447	PF 1	8800.00	1294.84	1304.74		1305.32	0.001631	6.29	1579.73	406.13	0.40
1	0.401	PF 1	8800.00	1293.83	1304.34		1304.92	0.001669	6.64	1864.52	813.21	0.40
1	0.353	PF 1	8800.00	1293.17	1303.39	1303.39	1304.25	0.004469	10.11	1604.93	789.83	0.62
1	0.308	PF 1	8800.00	1292.53	1301.84	1301.84	1302.81	0.004392	10.26	1522.35	736.70	0.64
1	0.236	PF 1	8800.00	1290.52	1300.11	1300.11	1300.94	0.003903	10.82	1654.31	802.85	0.63
1	0.163	PF 1	8800.00	1288.36	1297.63	1297.39	1298.72	0.004896	10.00	1335.75	569.05	0.69
1	0.083	PF 1	8800.00	1285.44	1295.92	1295.70	1296.83	0.003989	11.11	1353.83	558.63	0.64
1	0.000	PF 1	8800.00	1283.64	1294.04	1294.04	1295.16	0.003556	11.47	1464.41	688.24	0.65

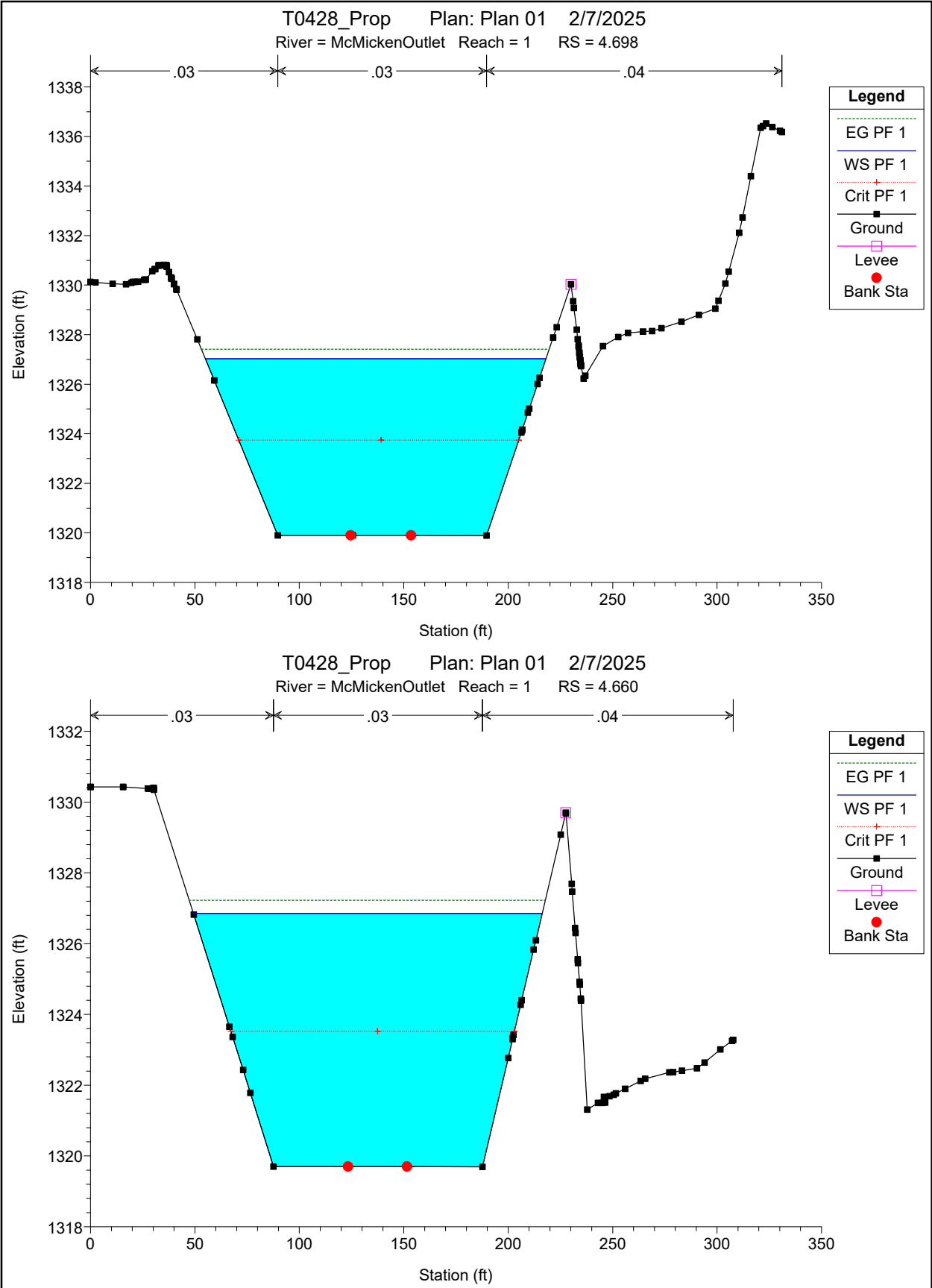


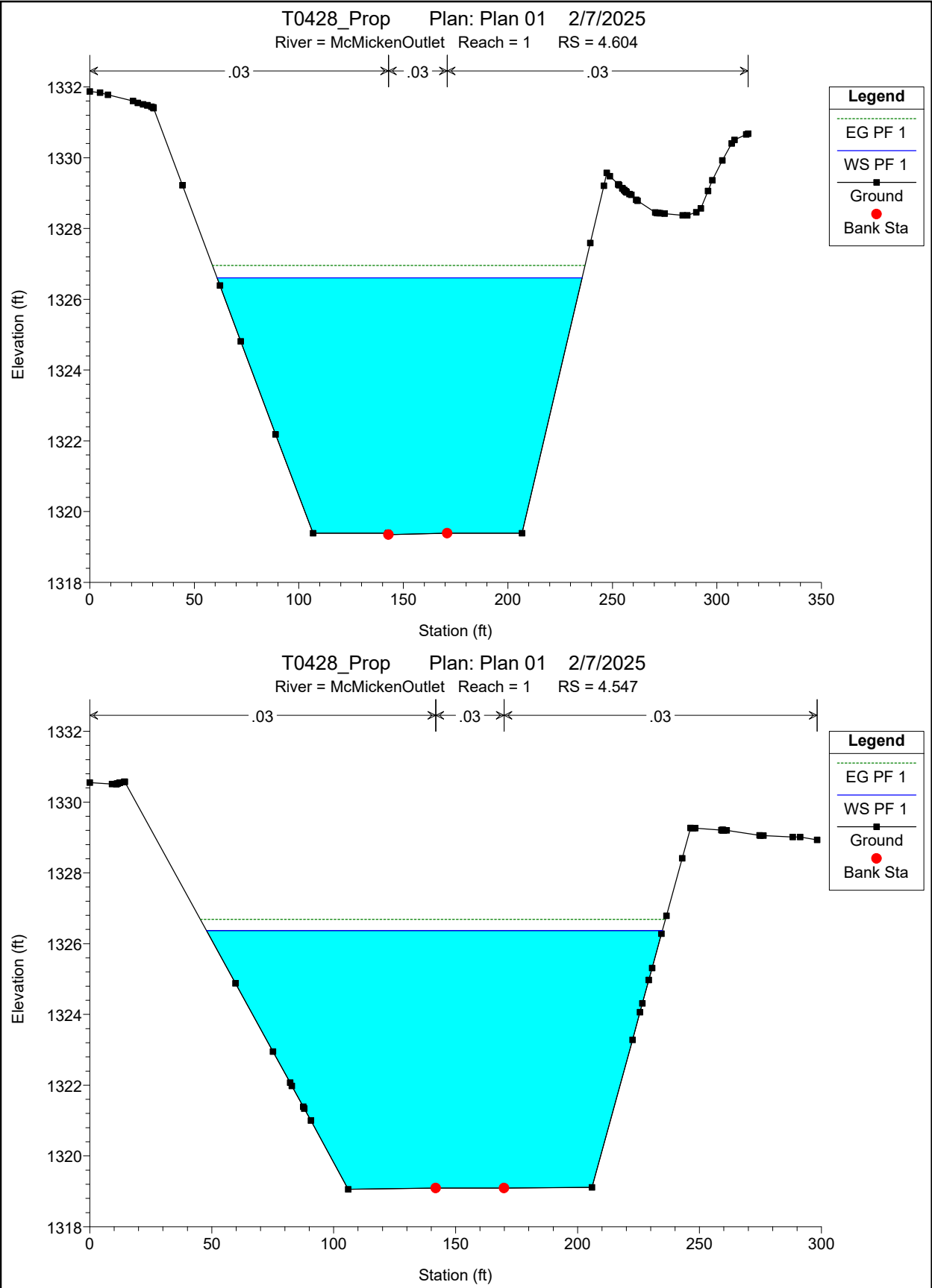


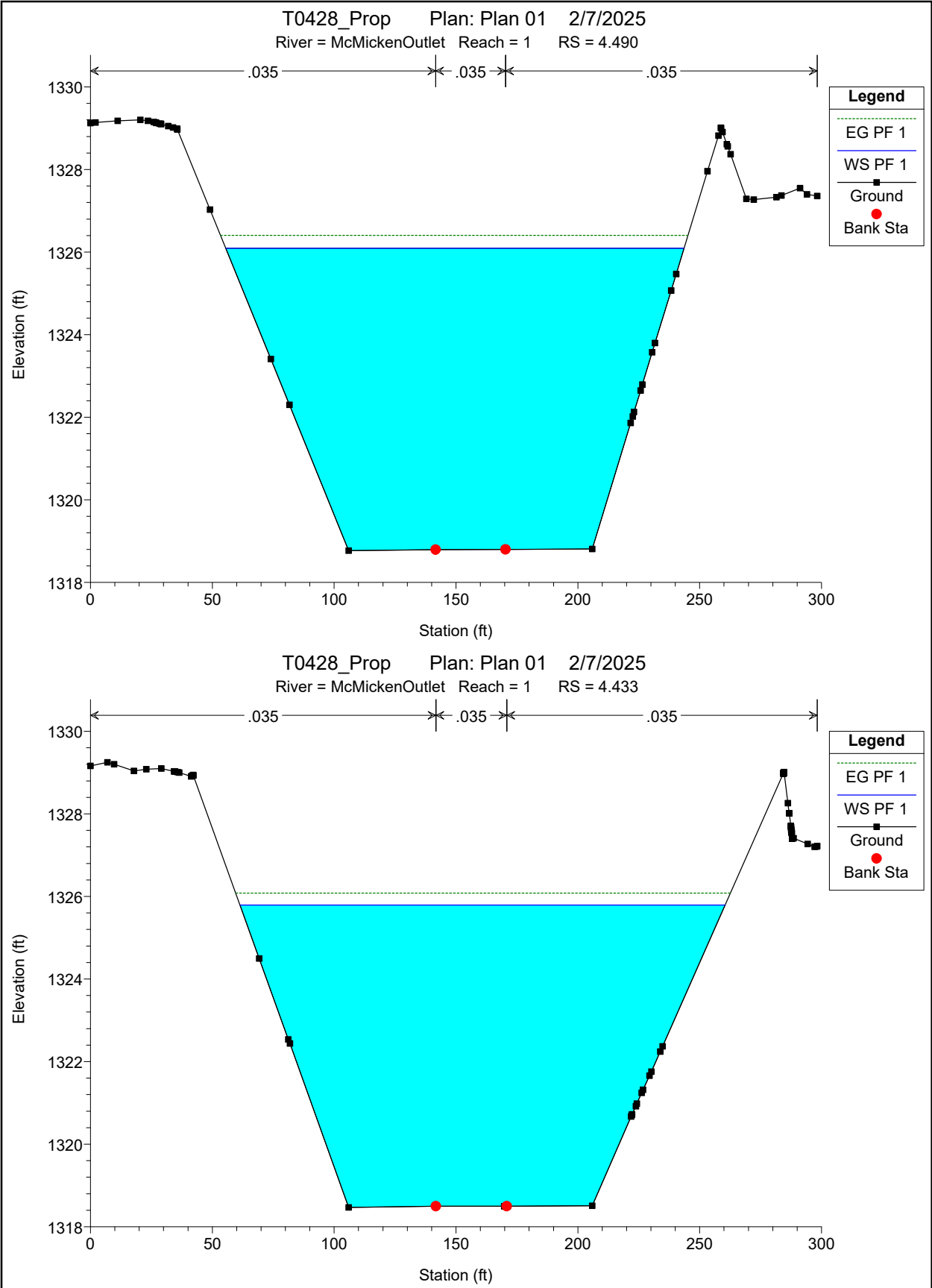


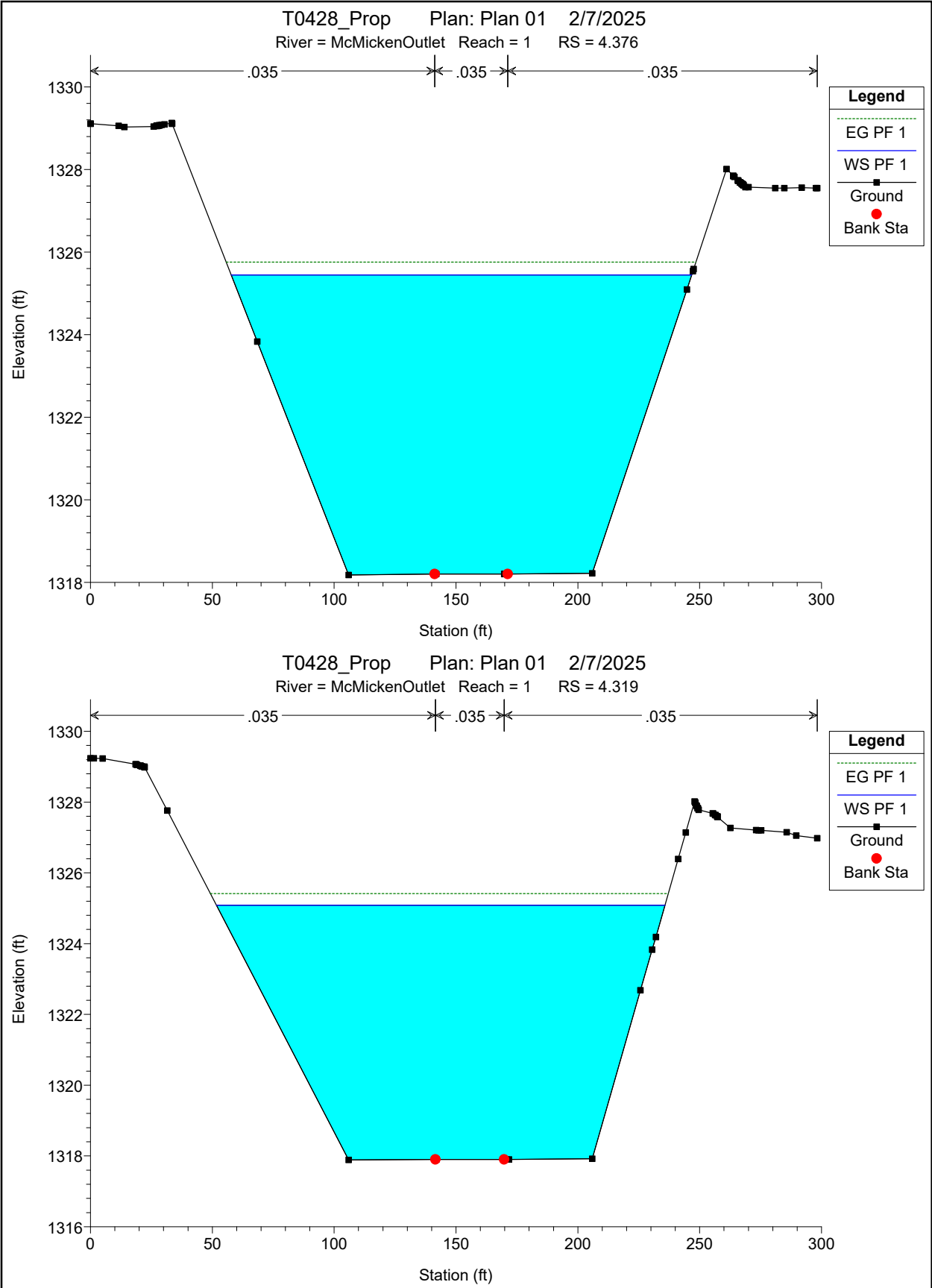


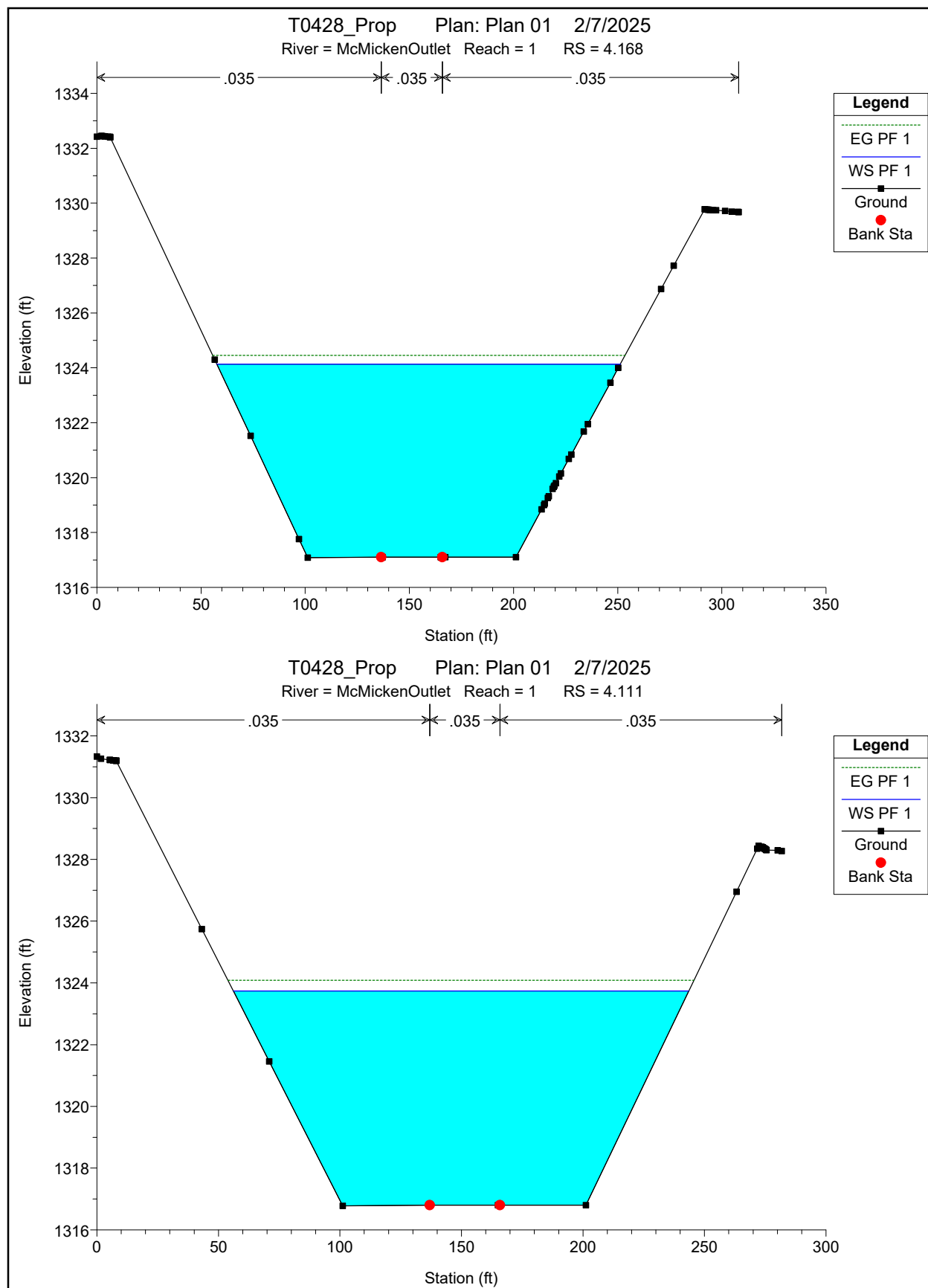


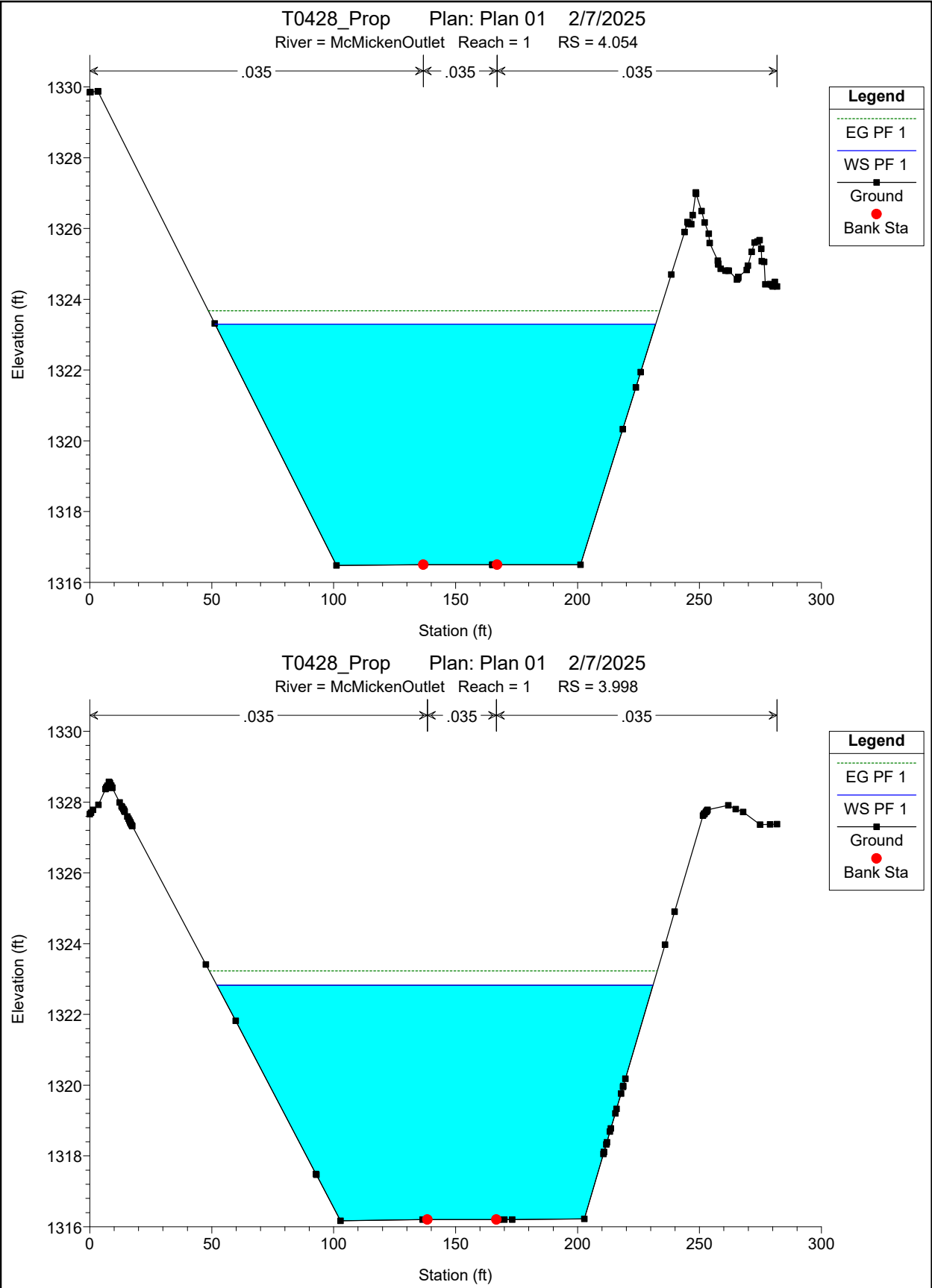


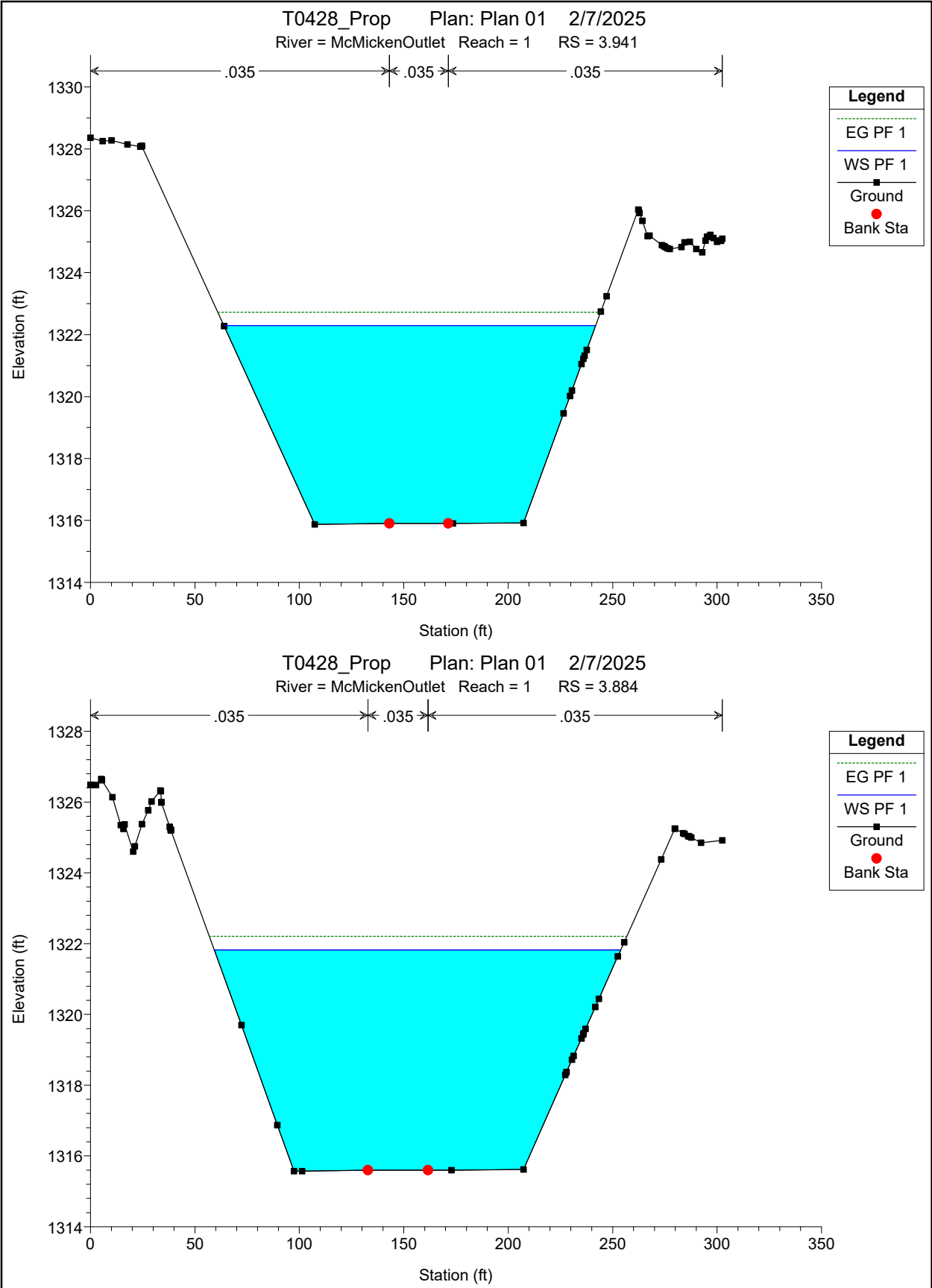


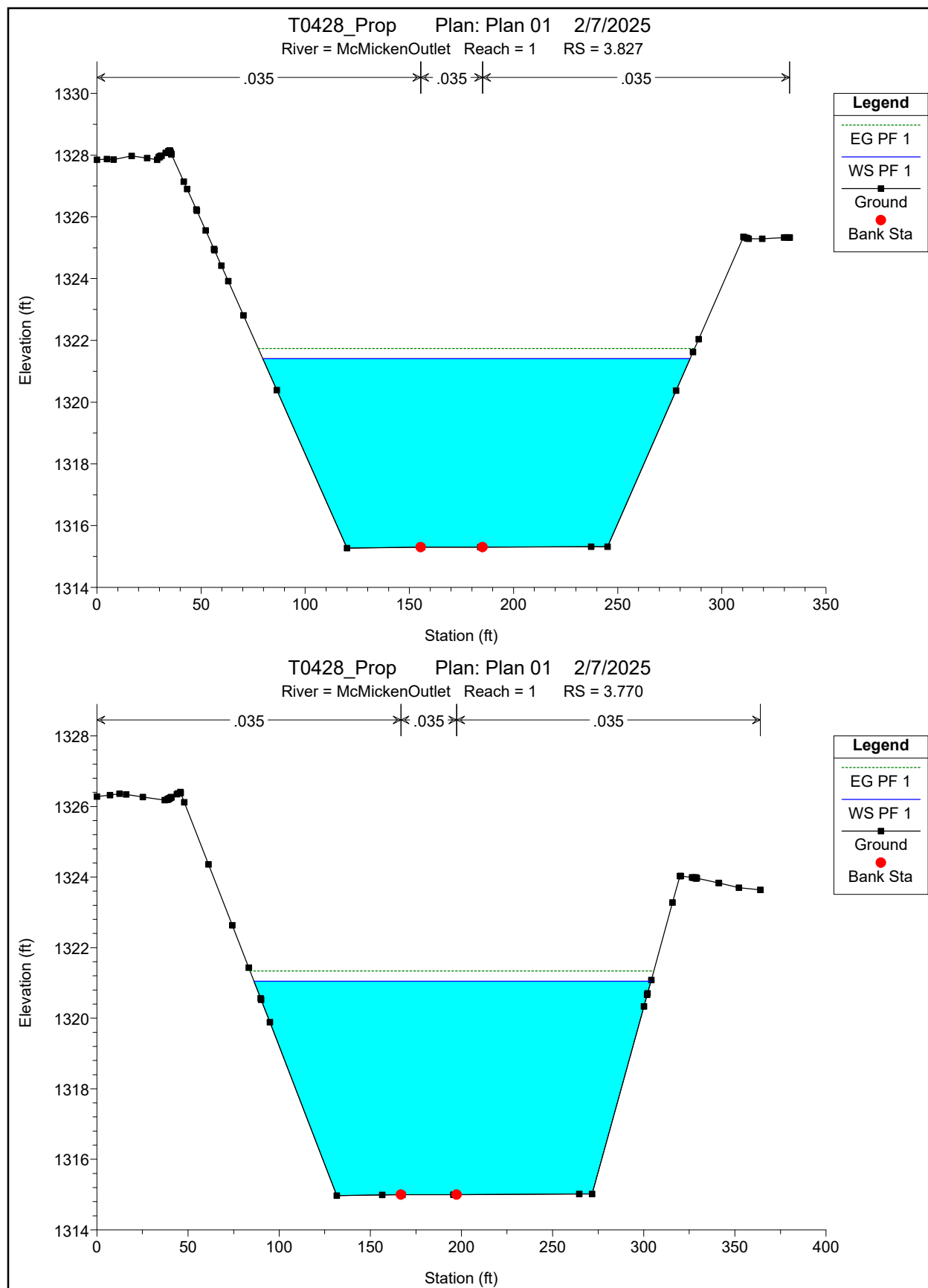


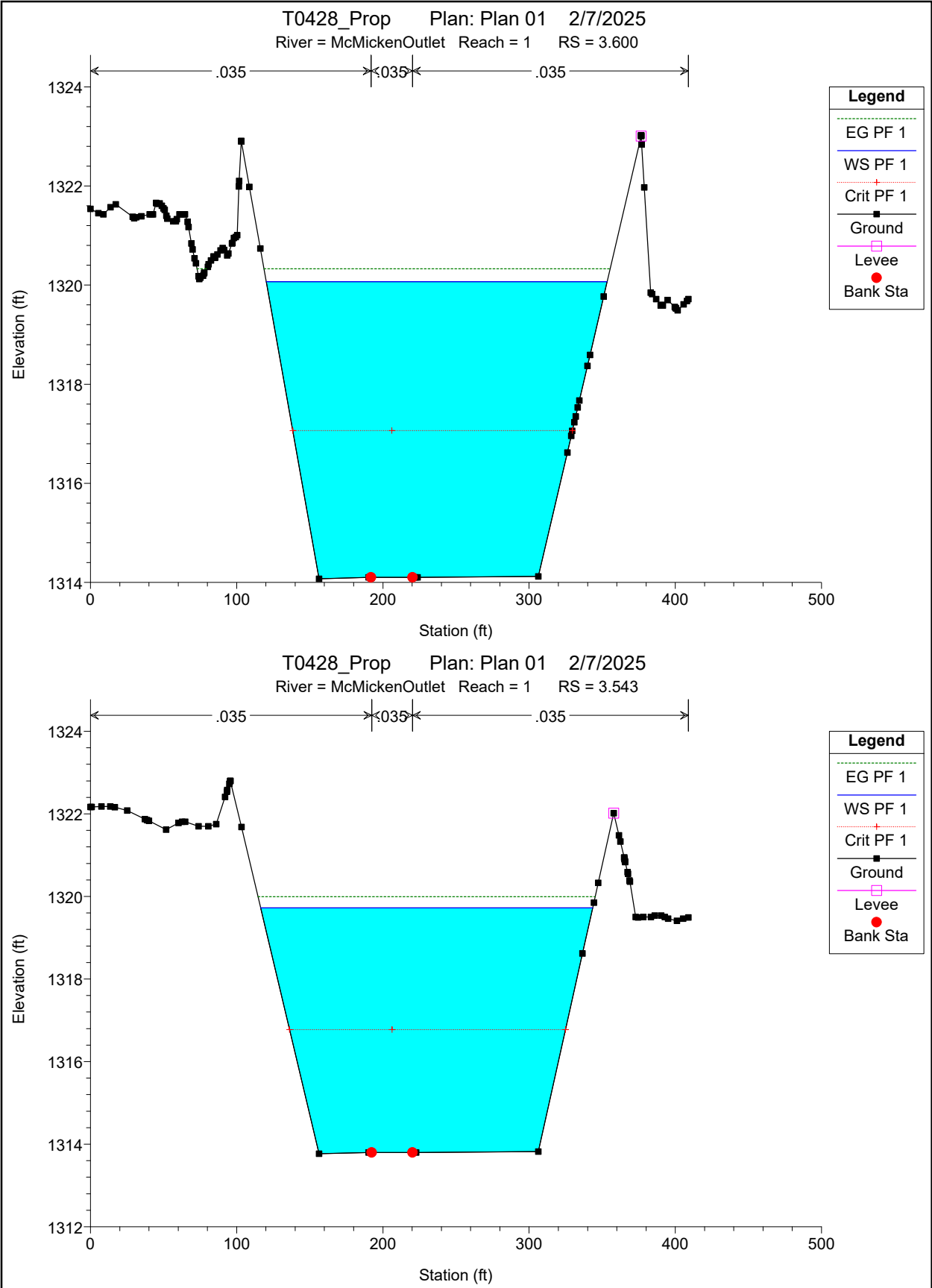


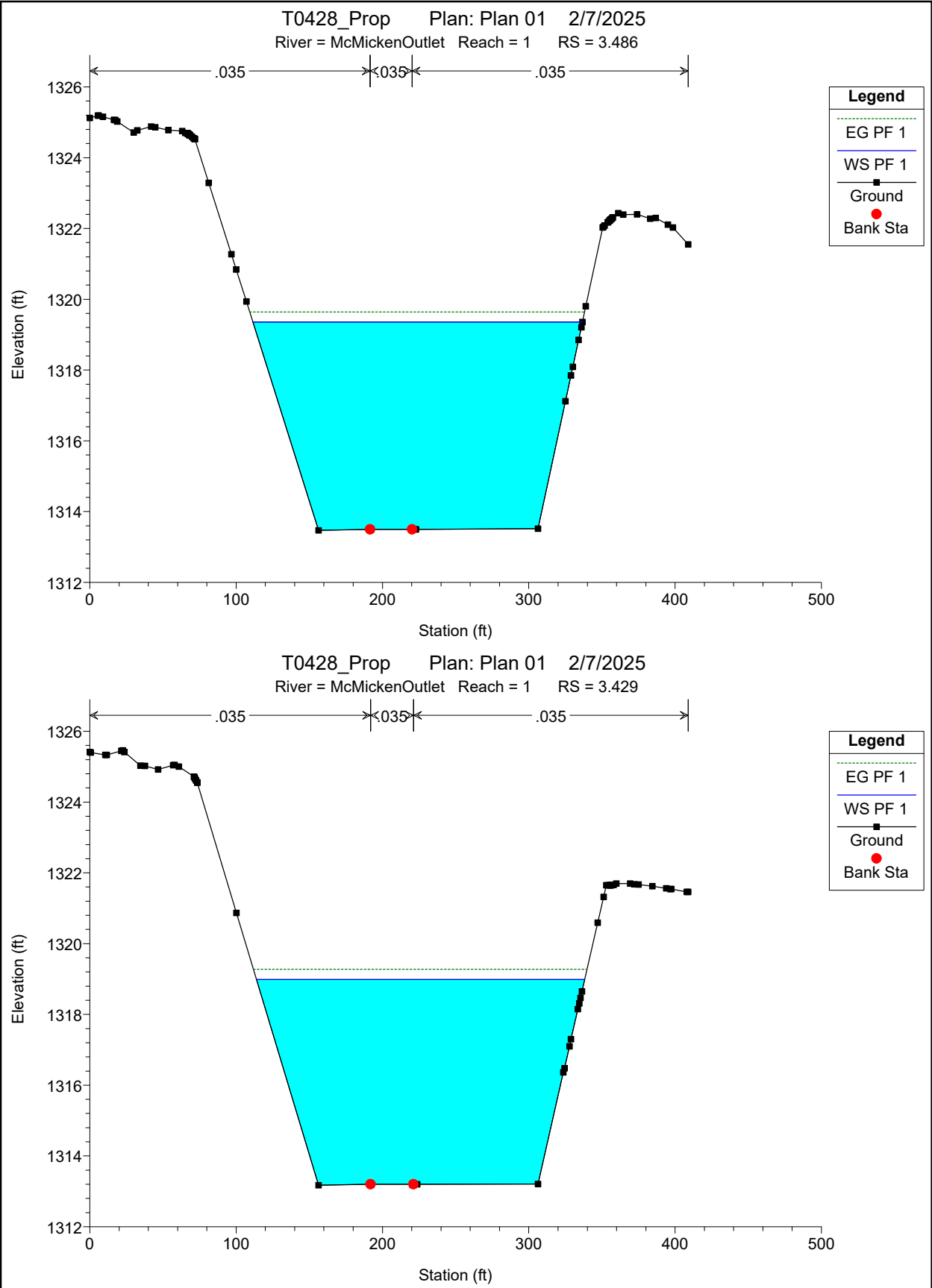


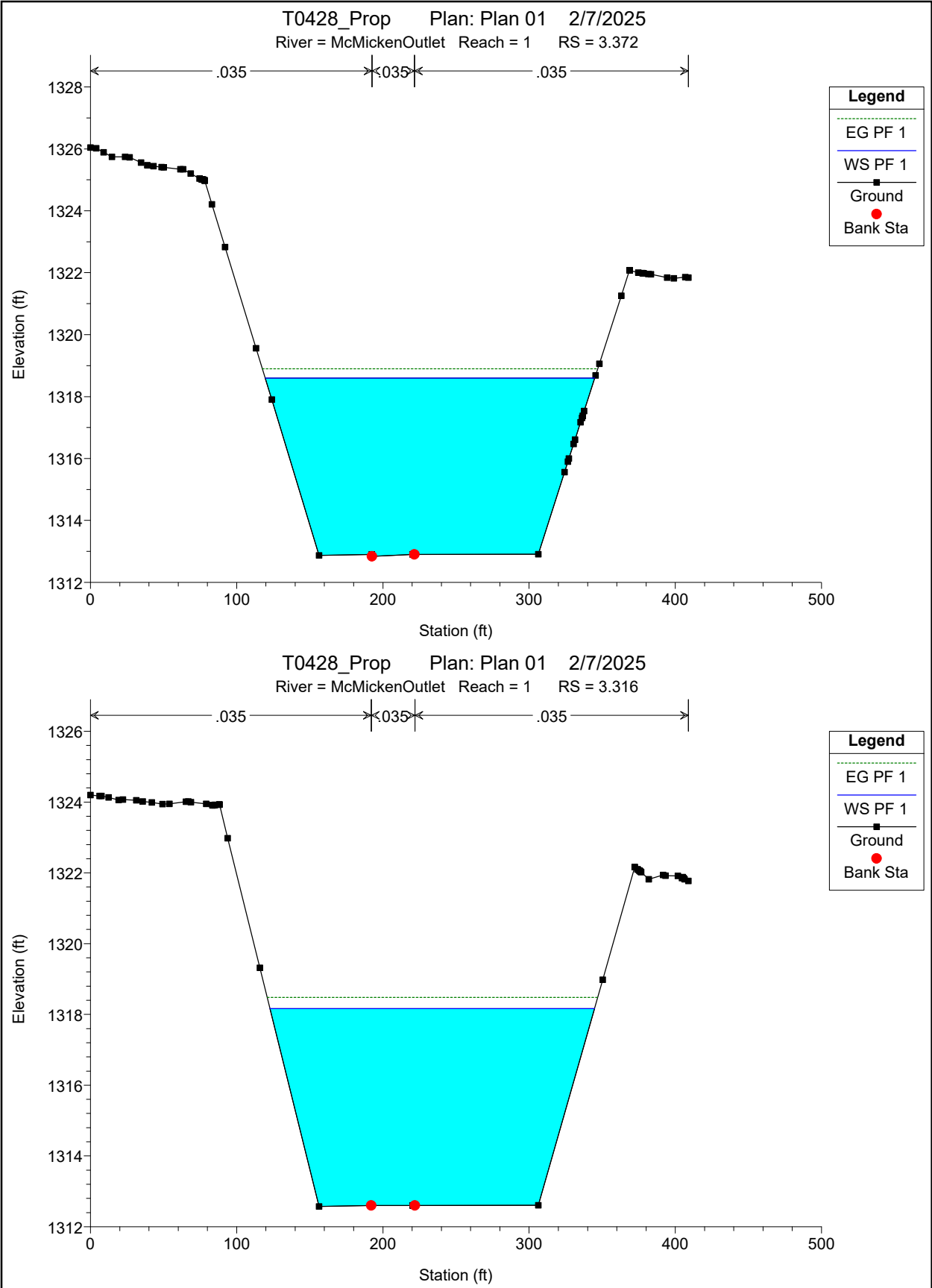


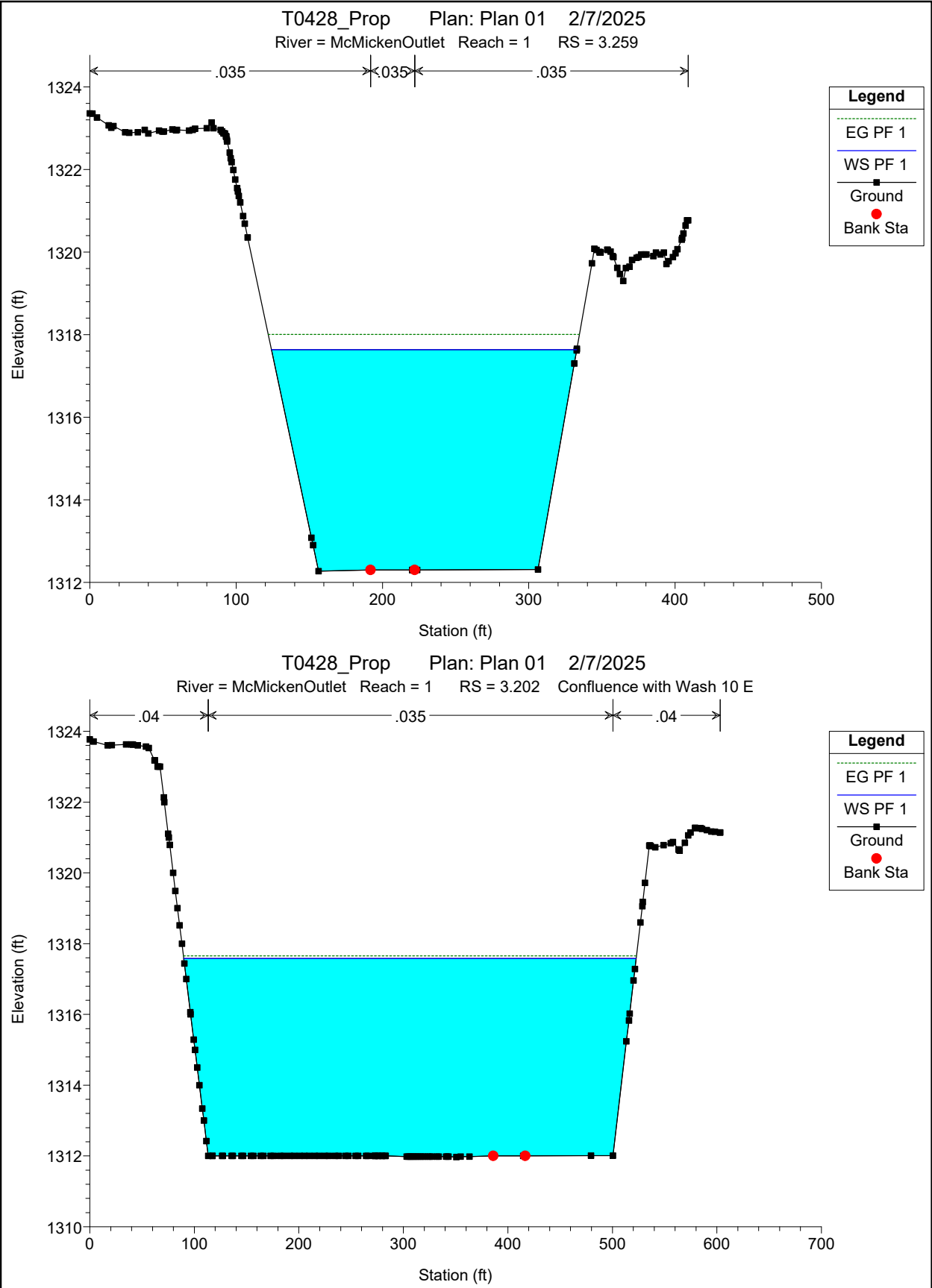


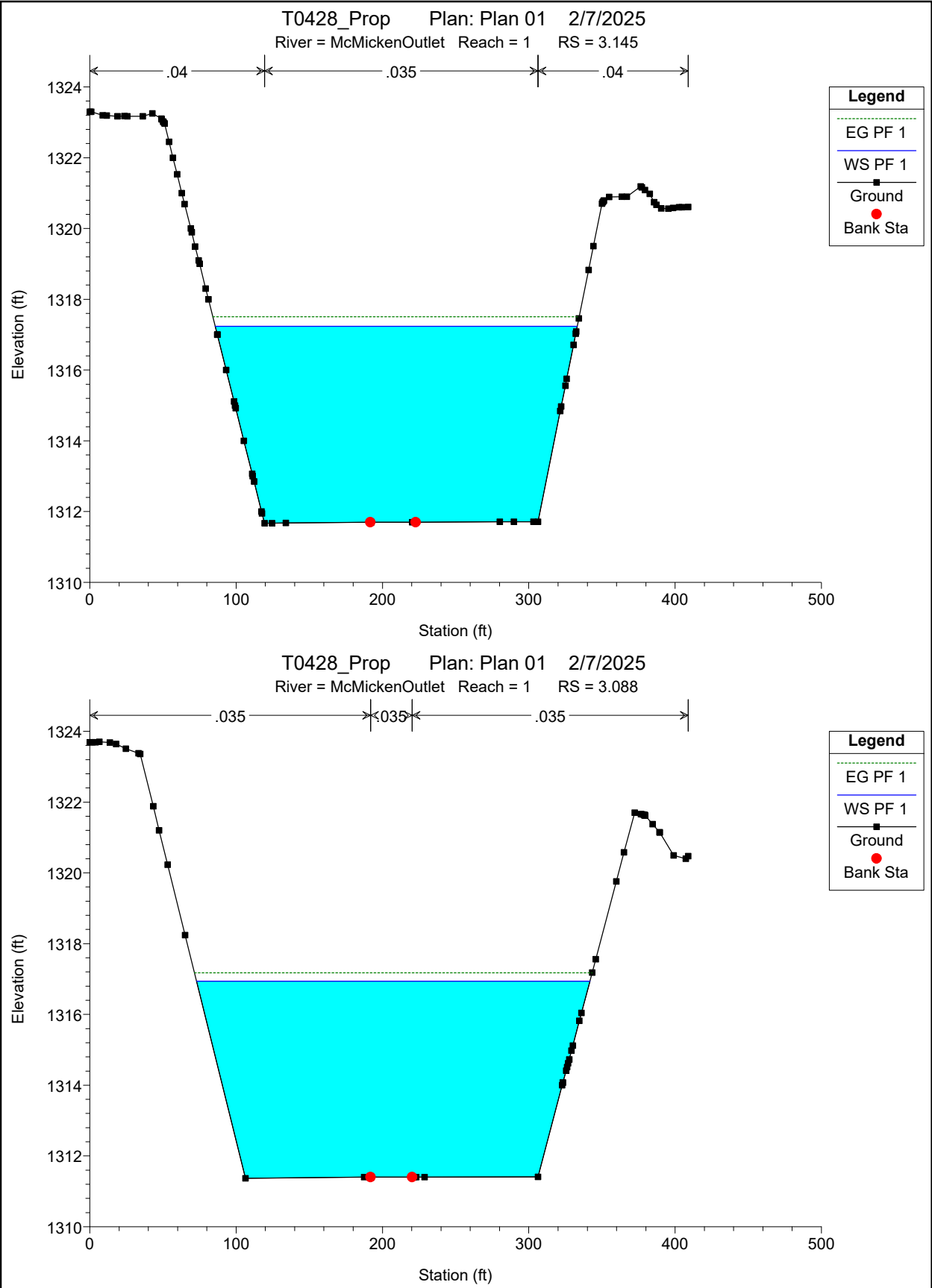


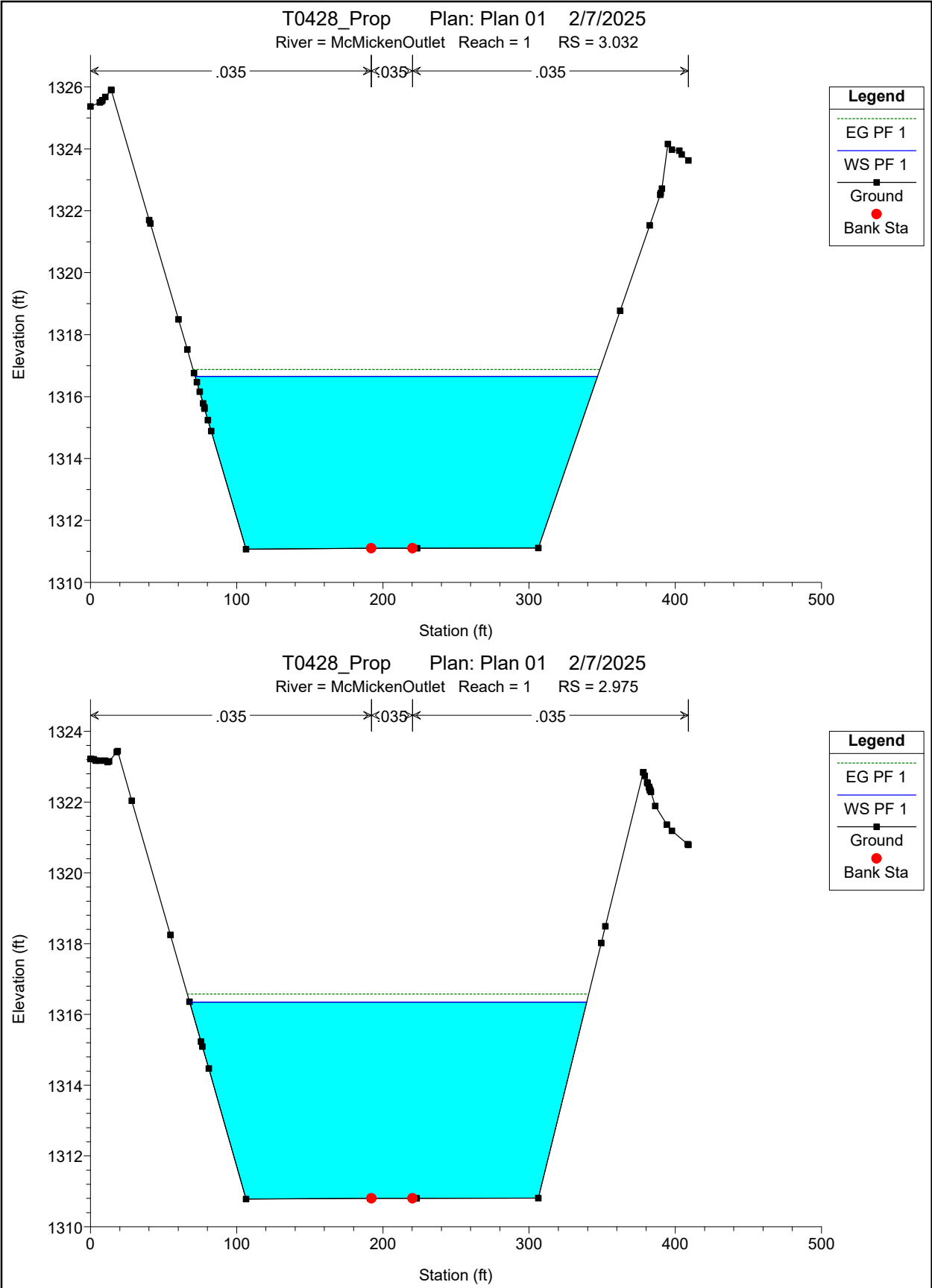


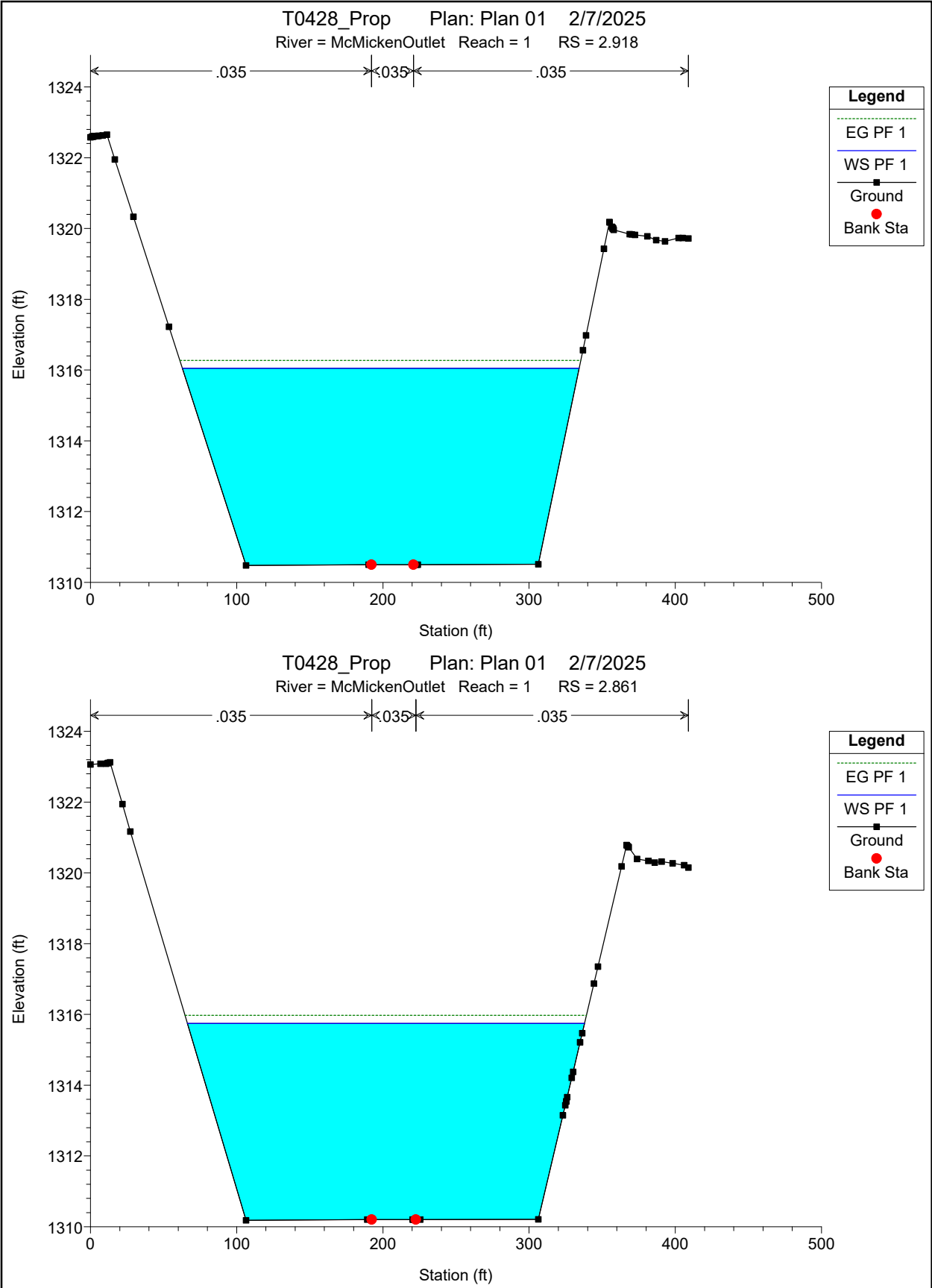


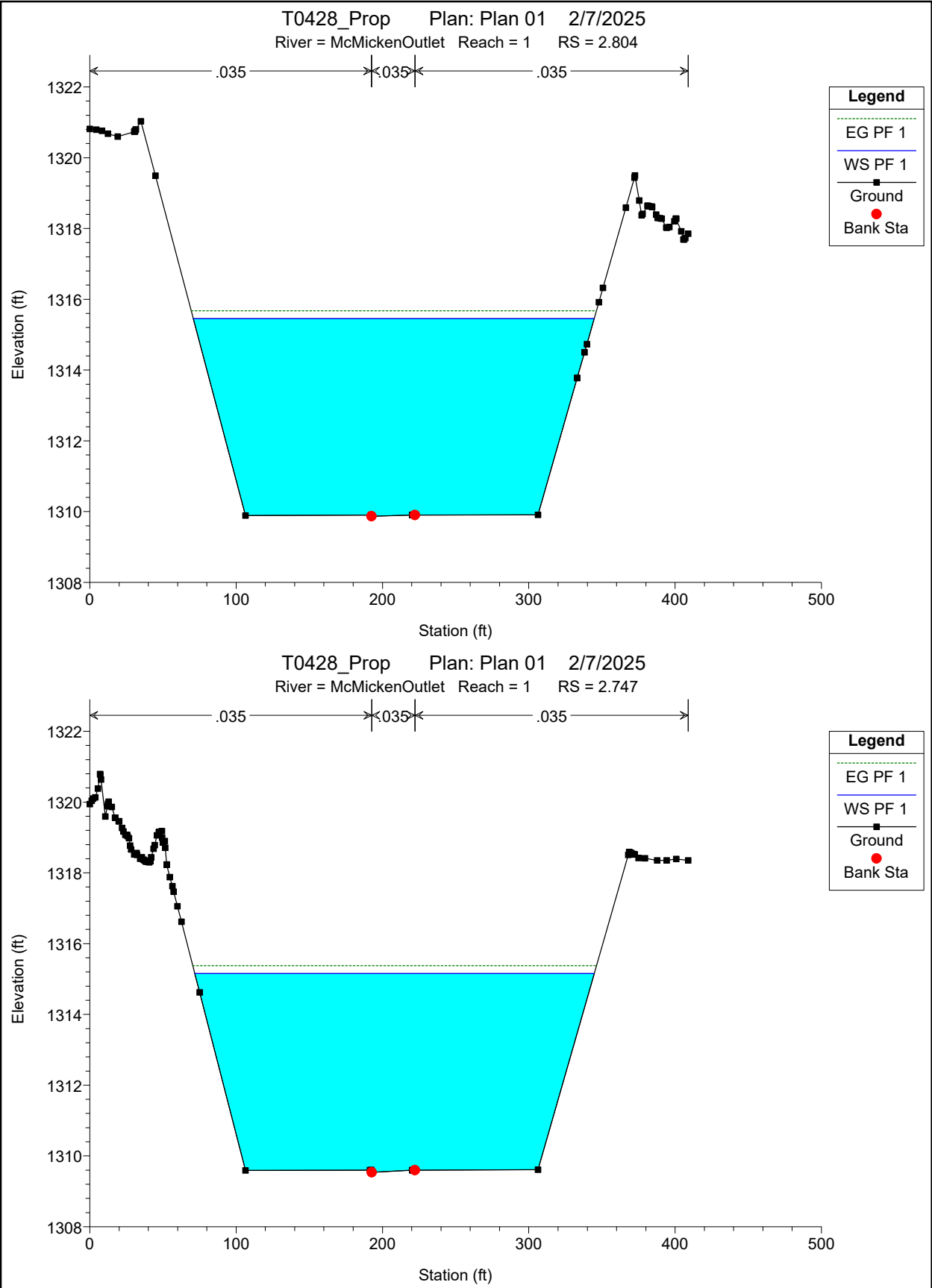


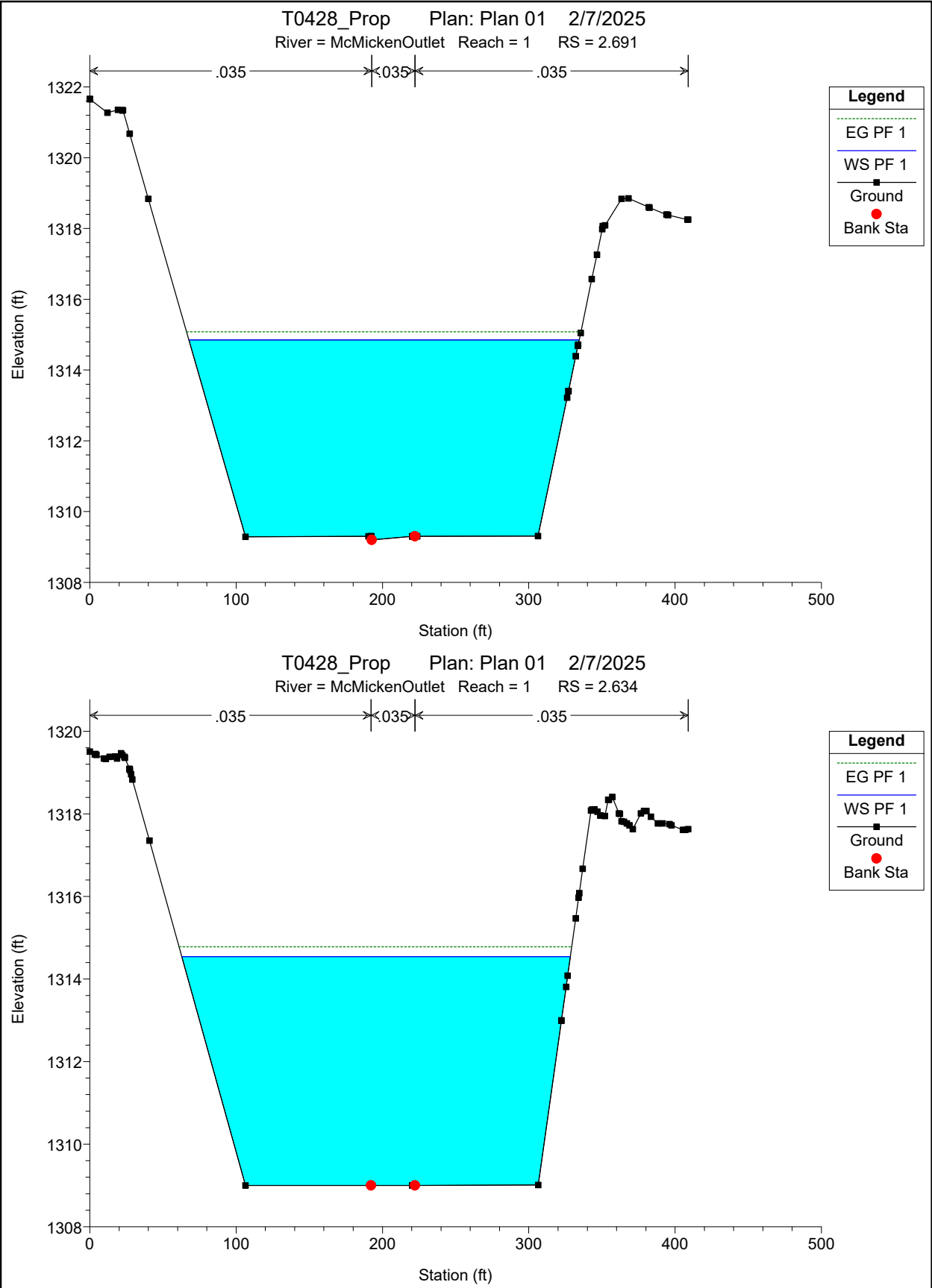


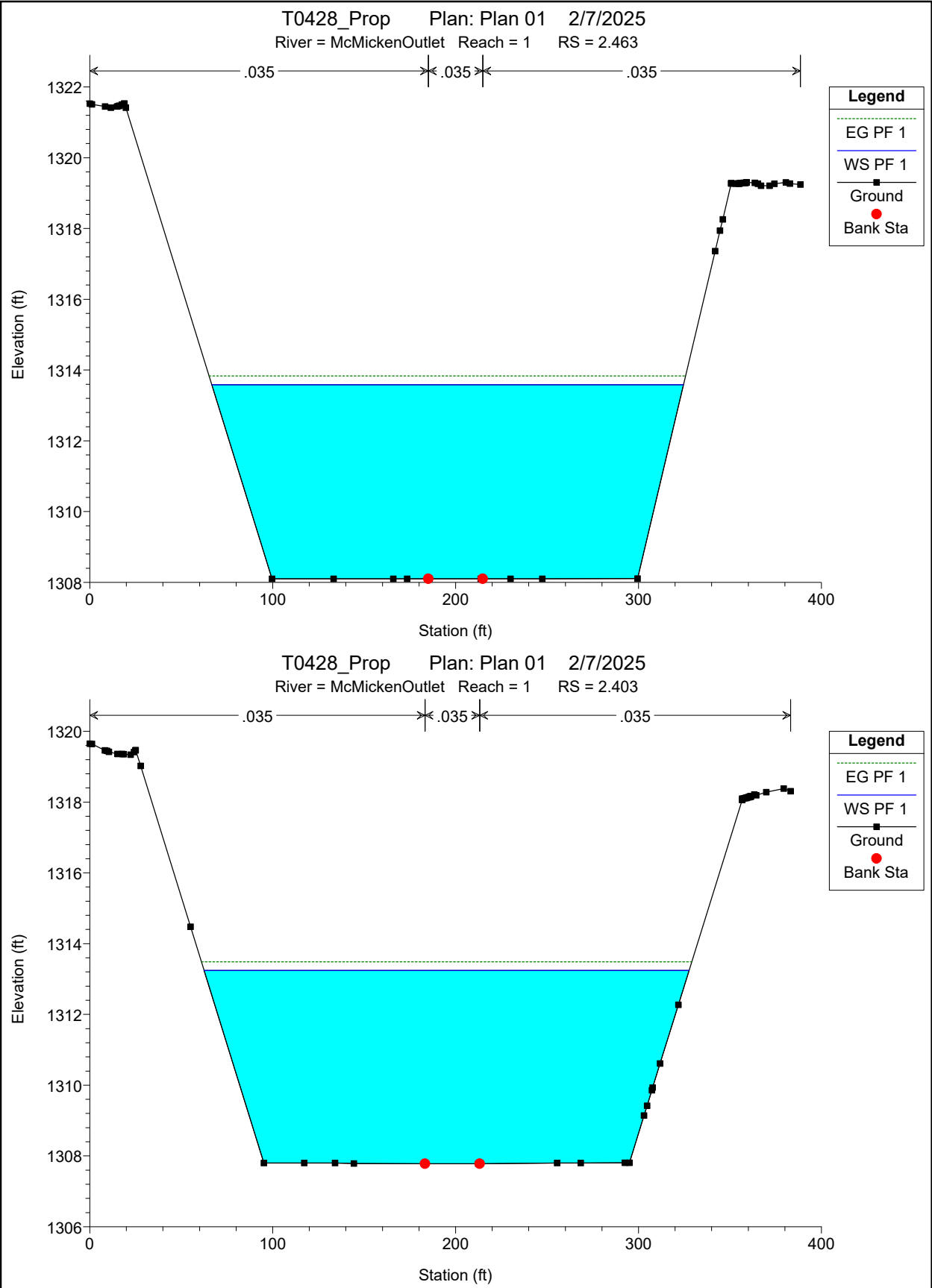


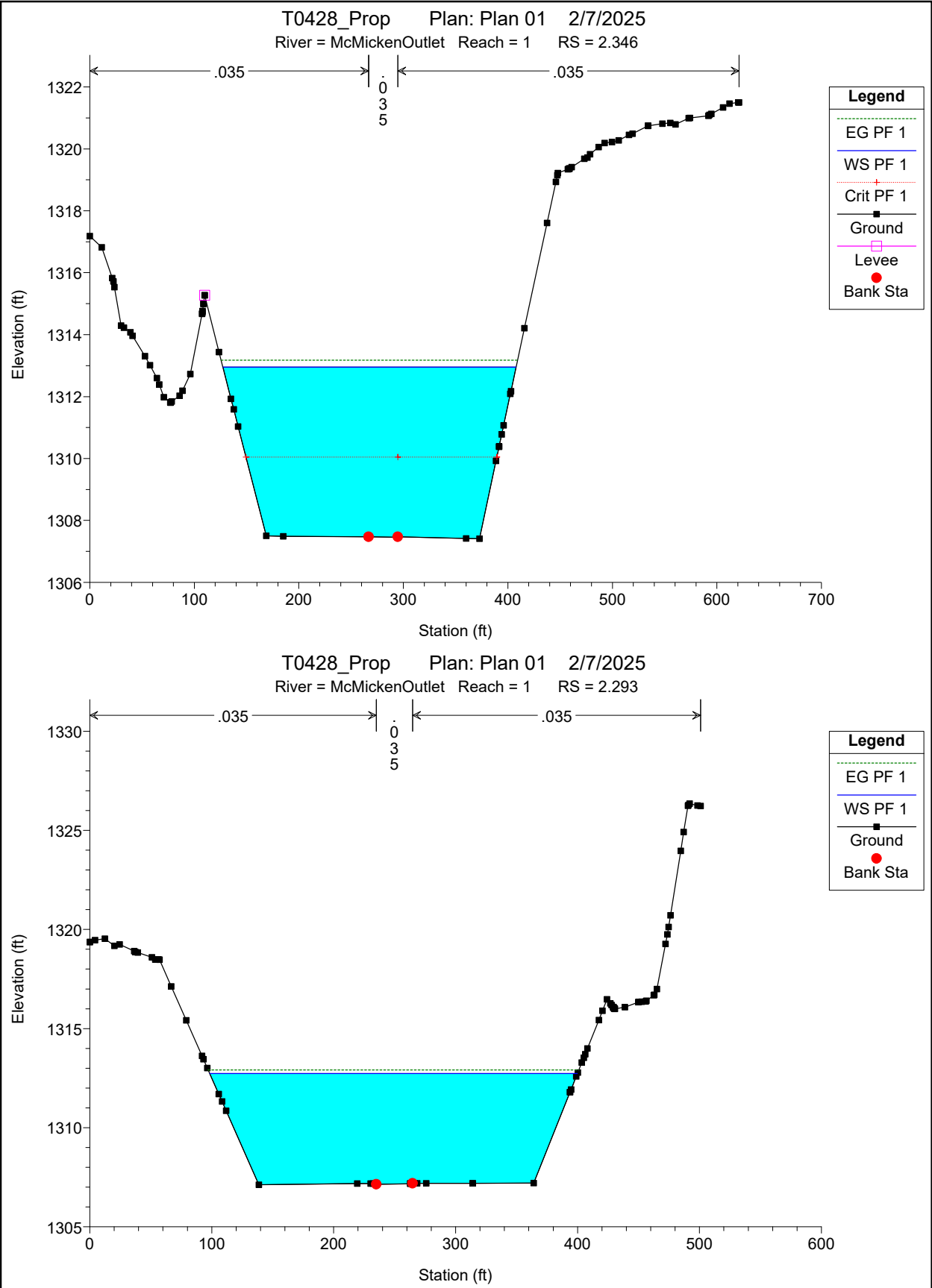


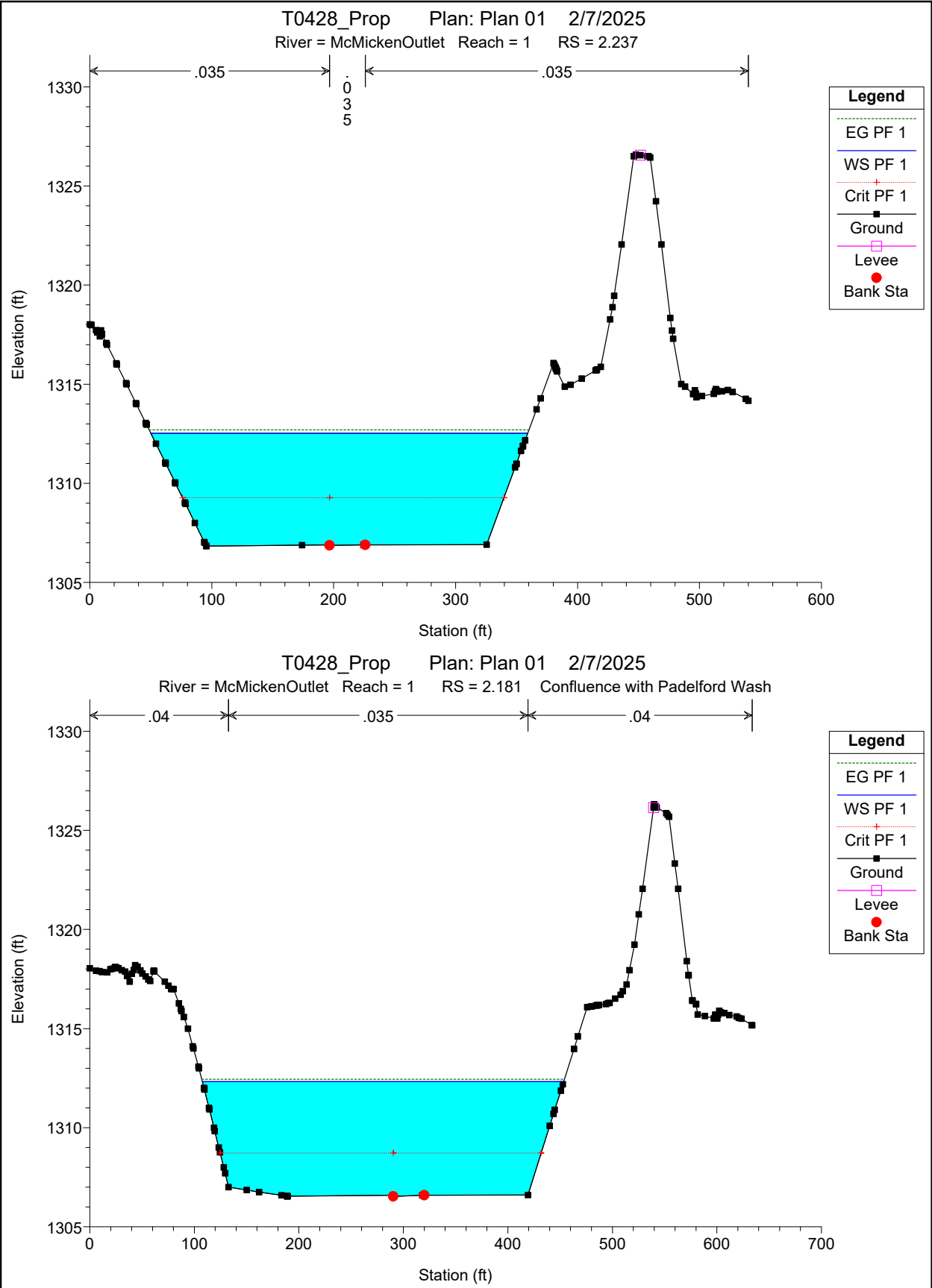


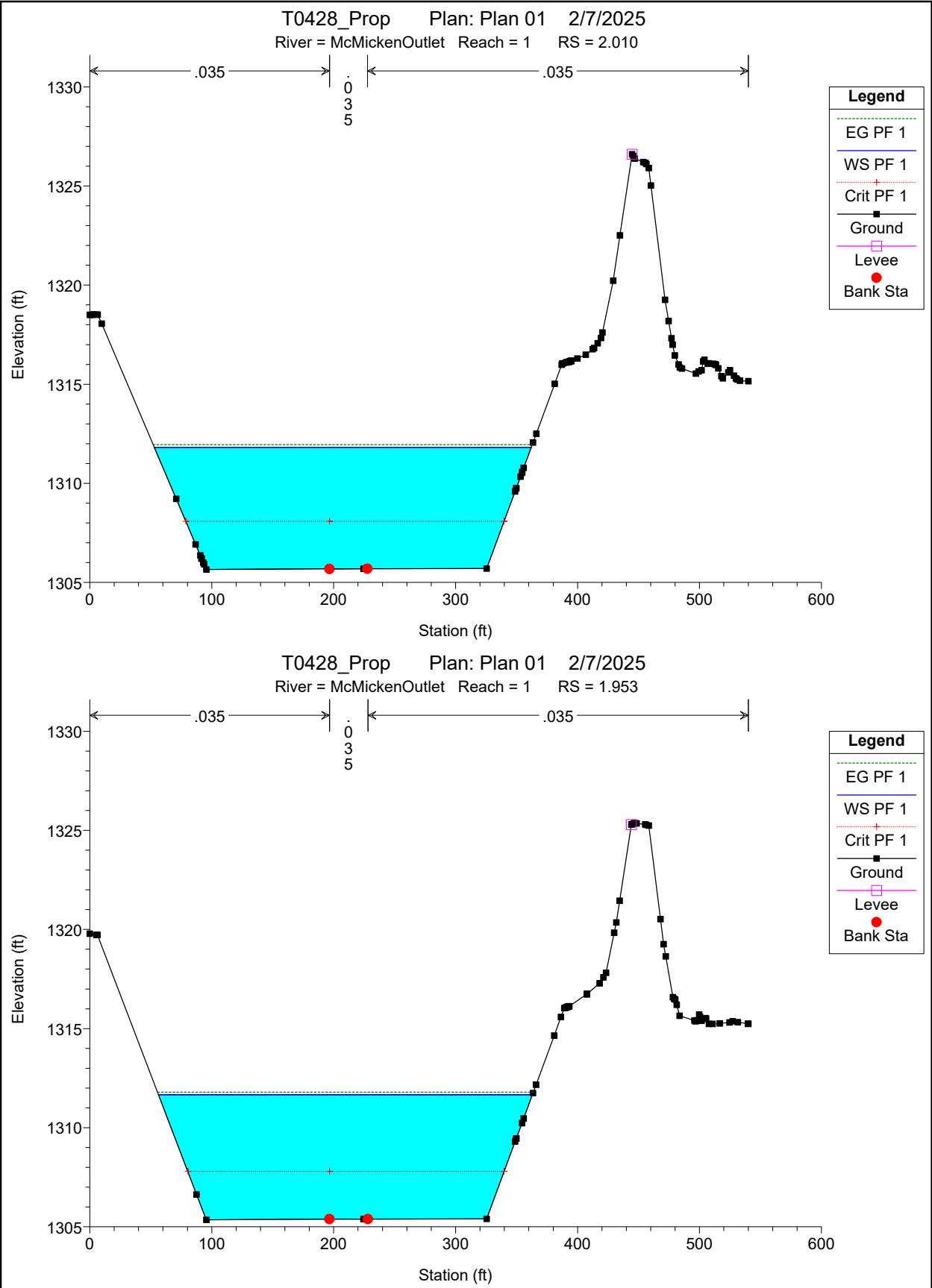


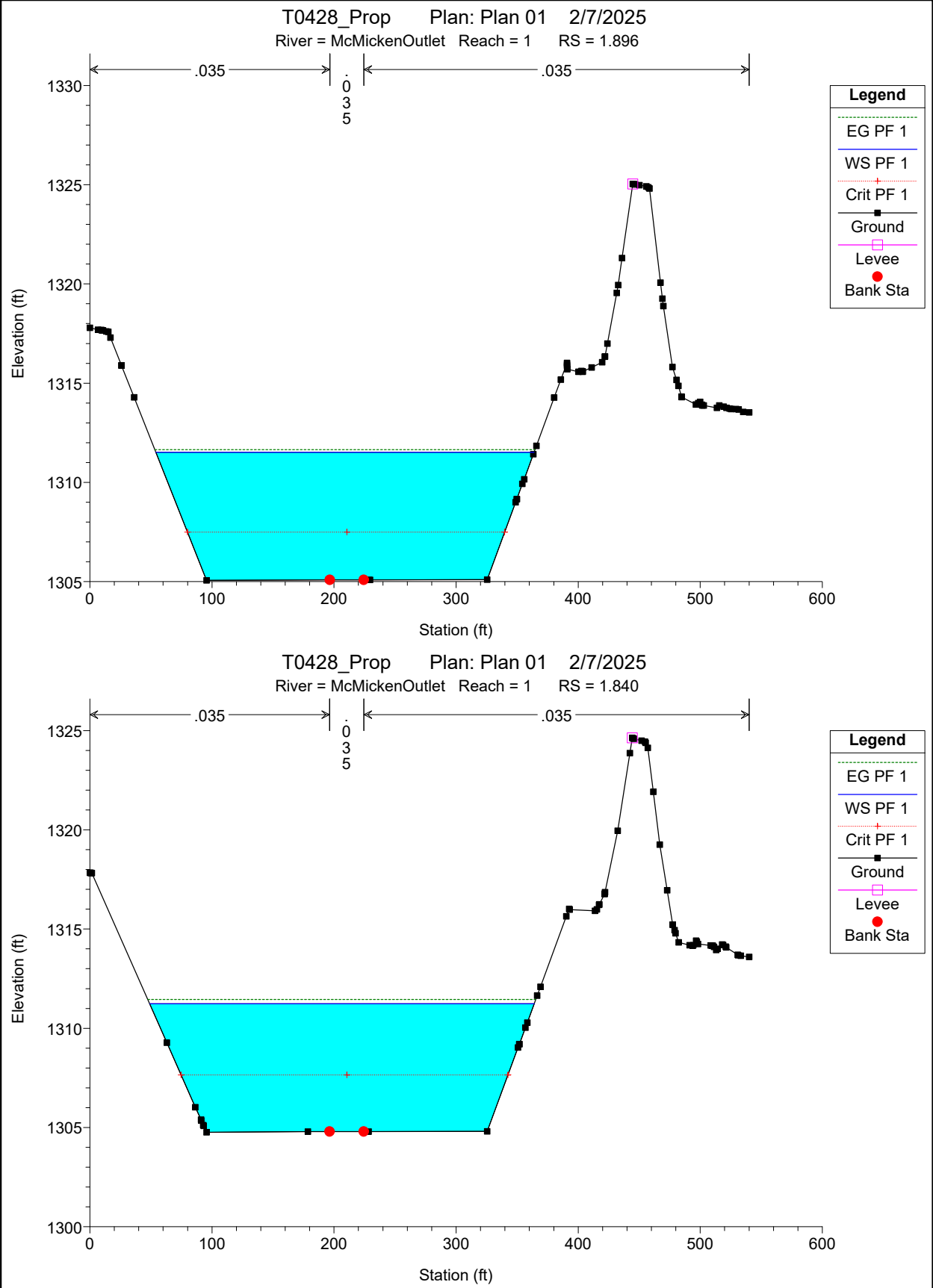


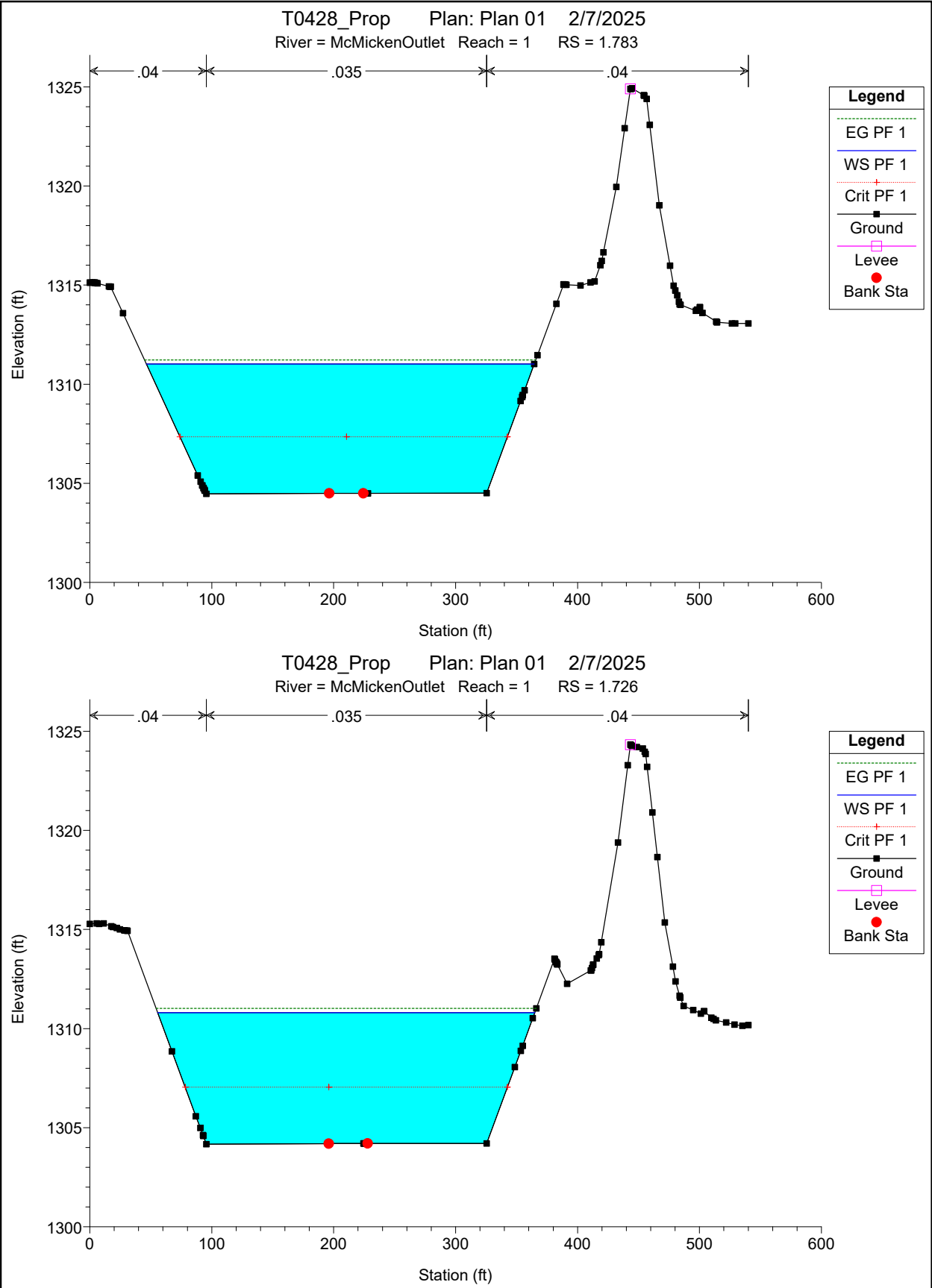


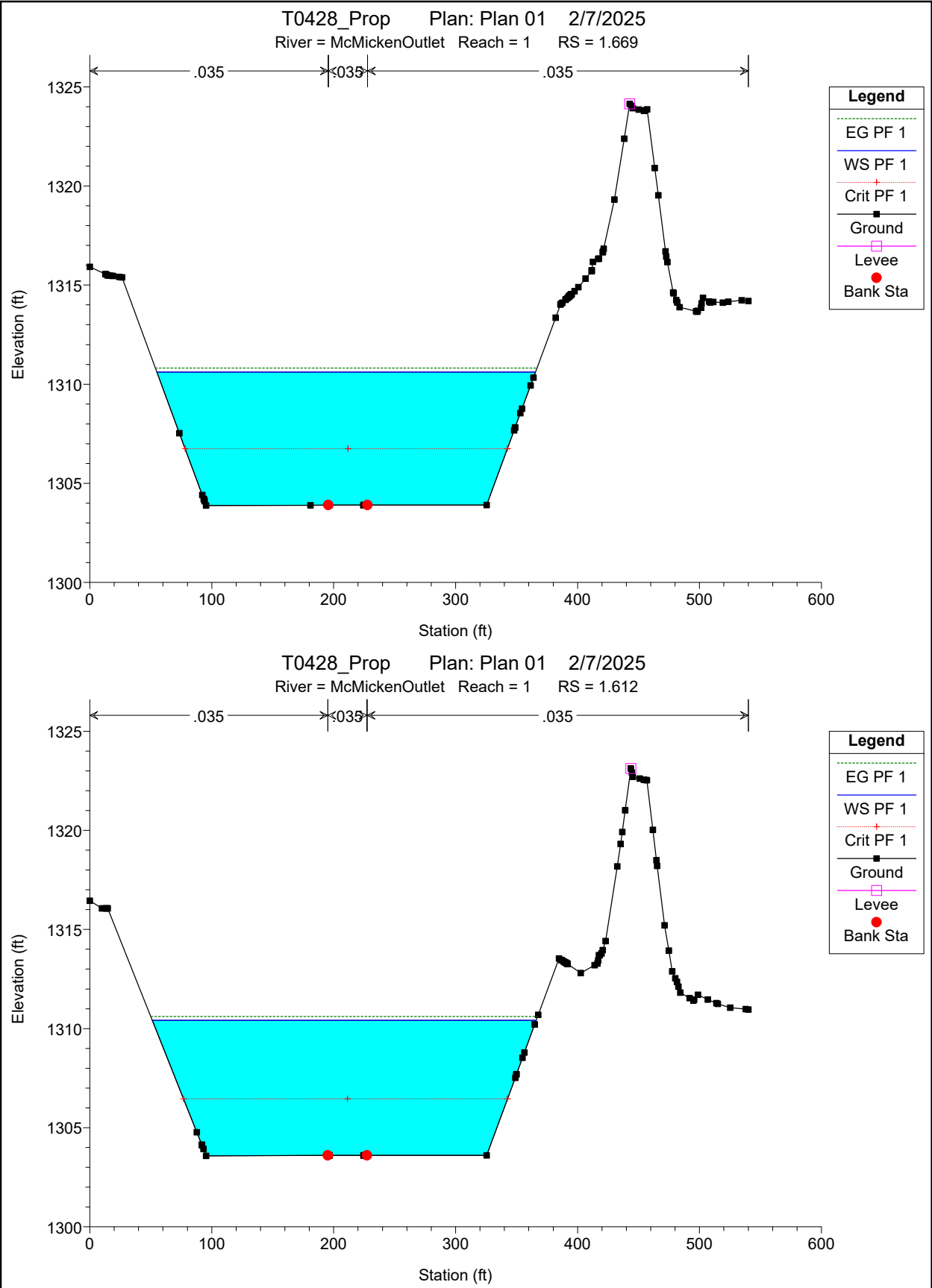


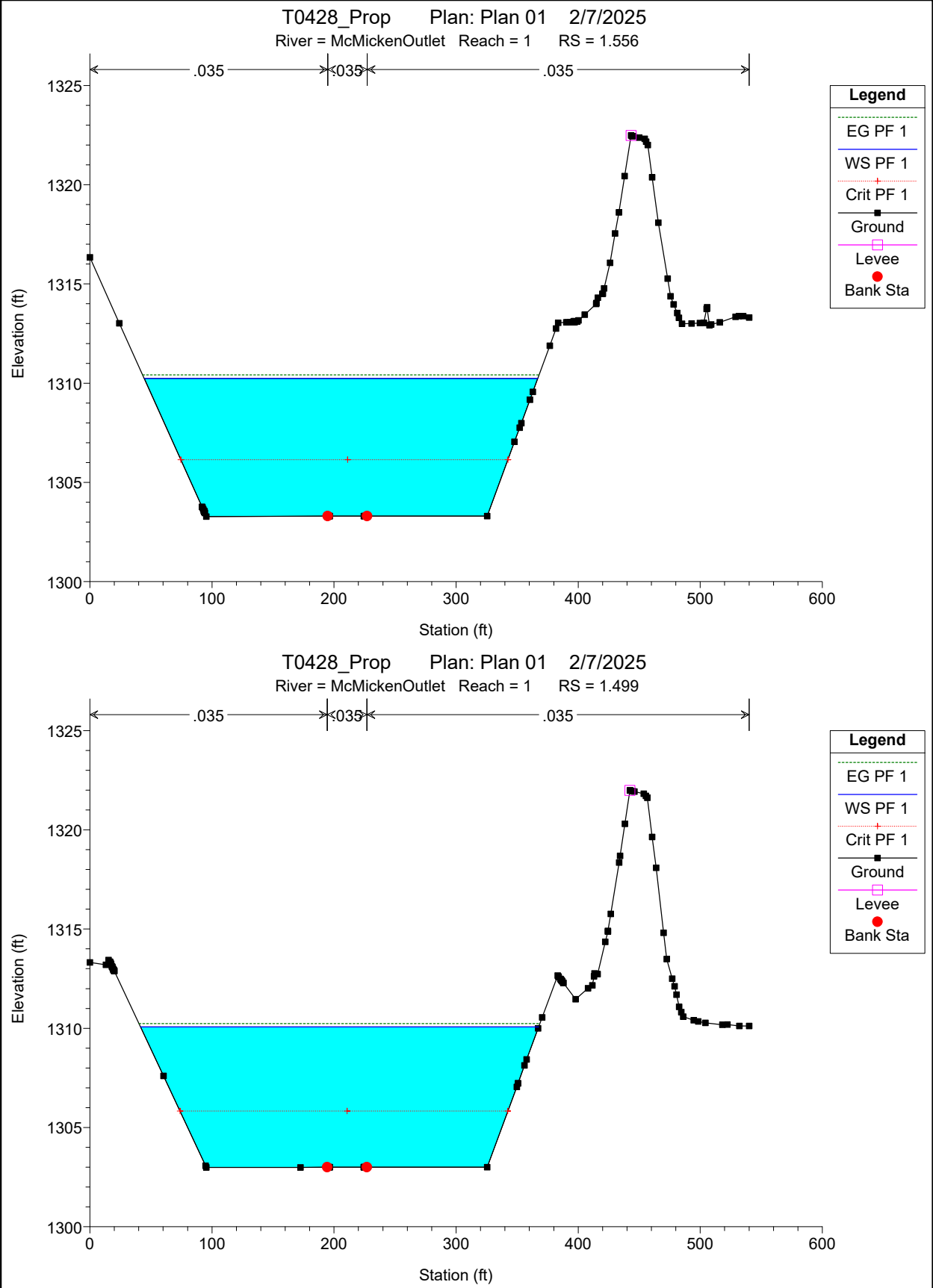


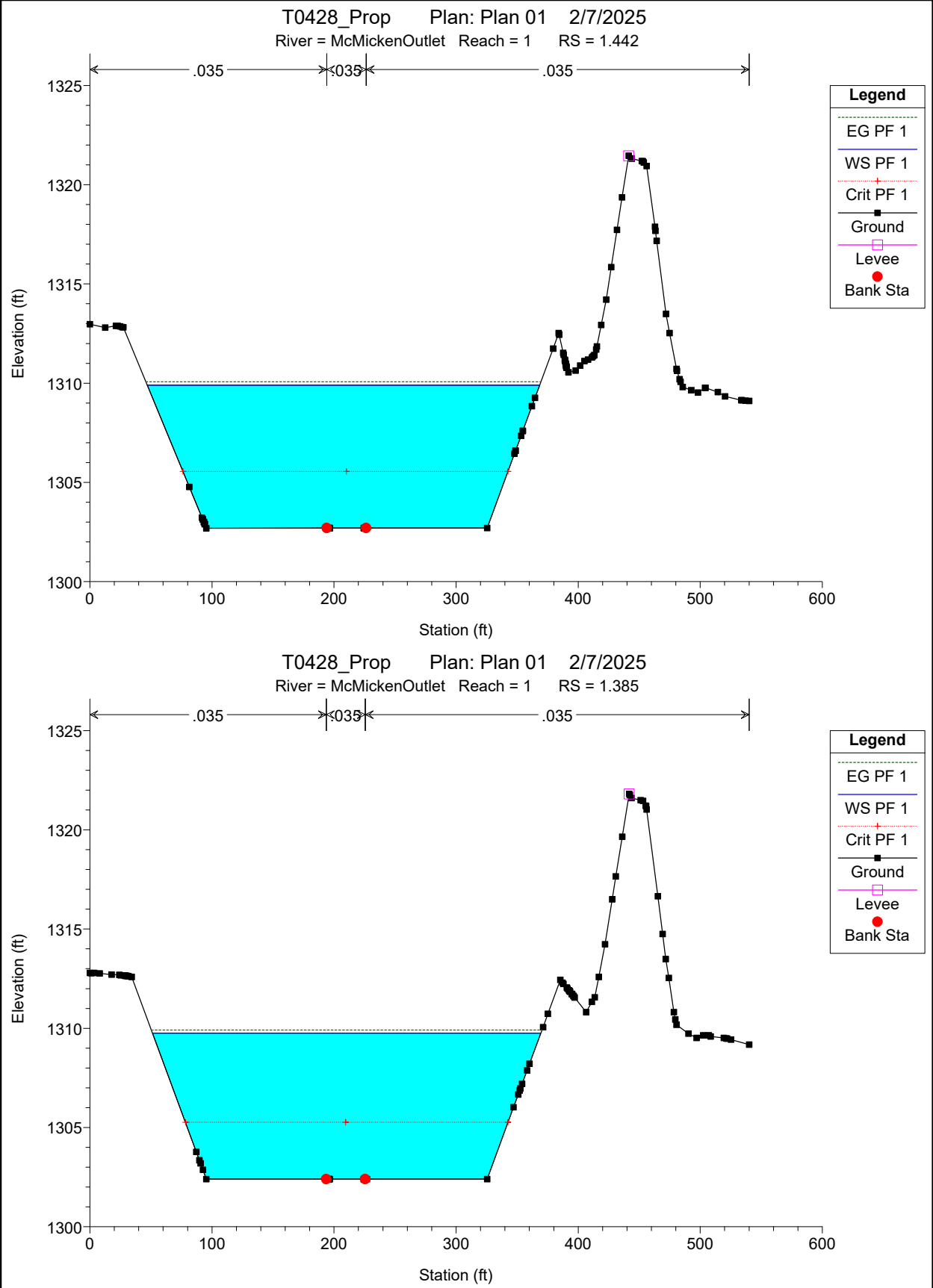


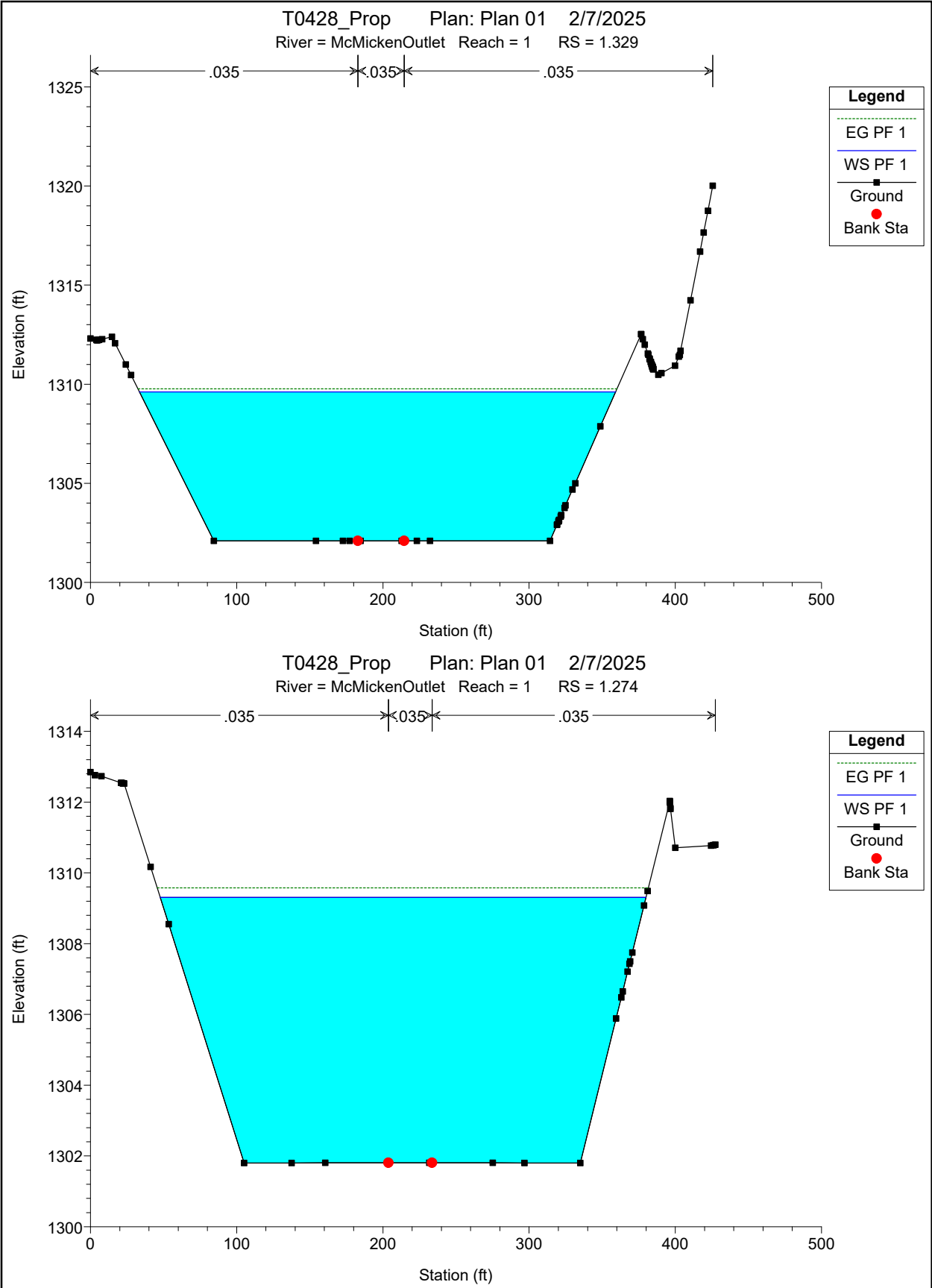


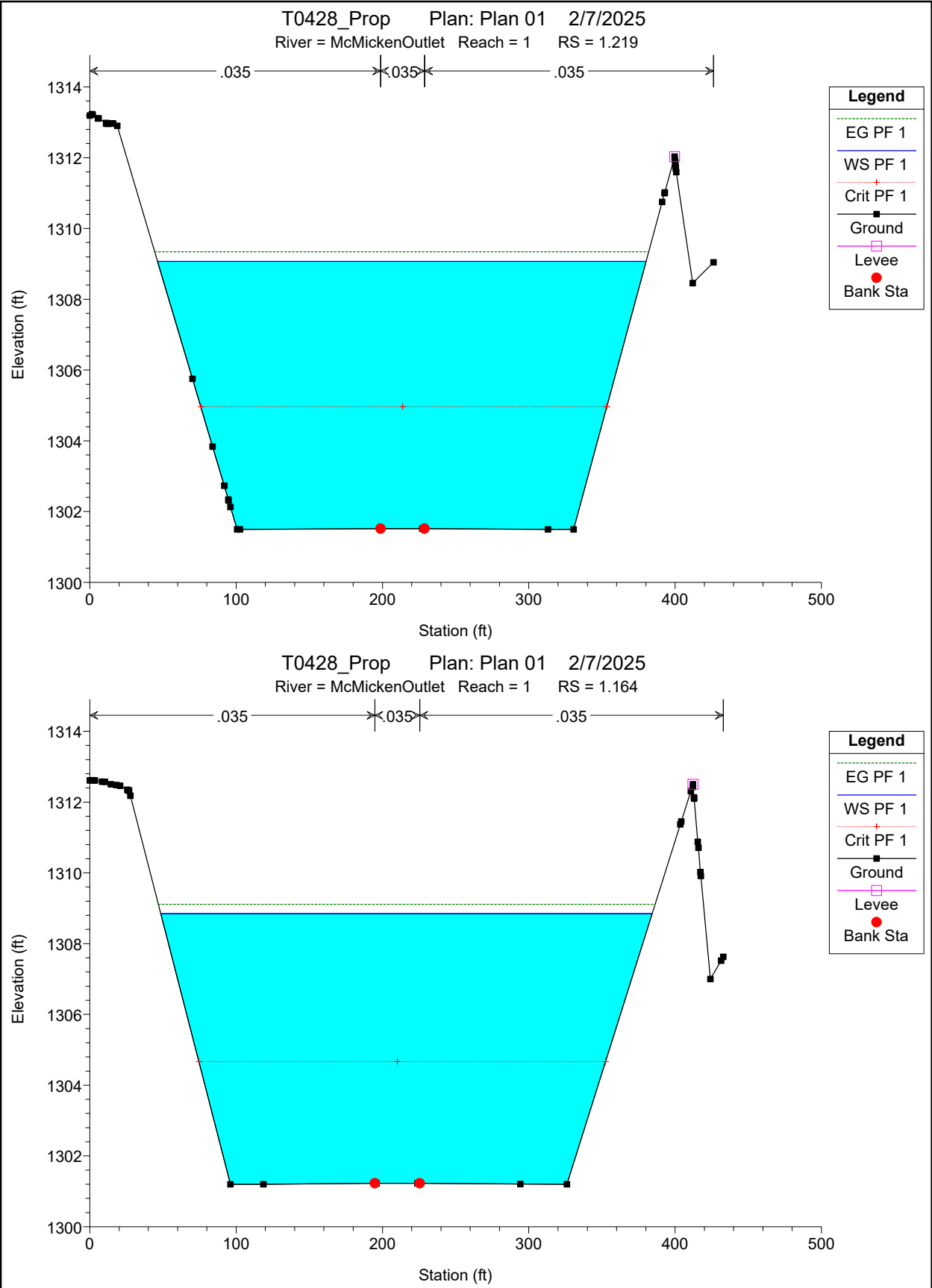


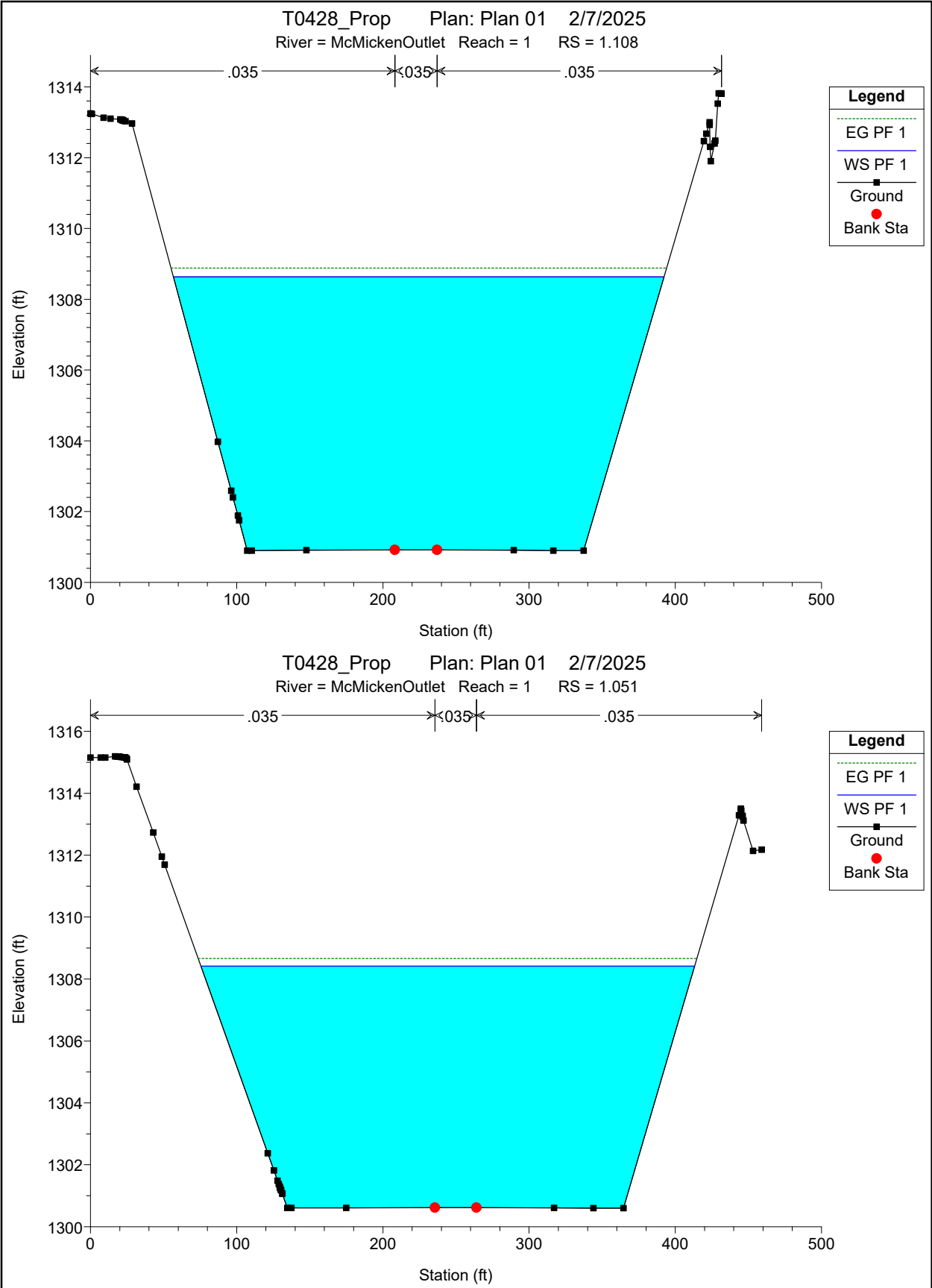


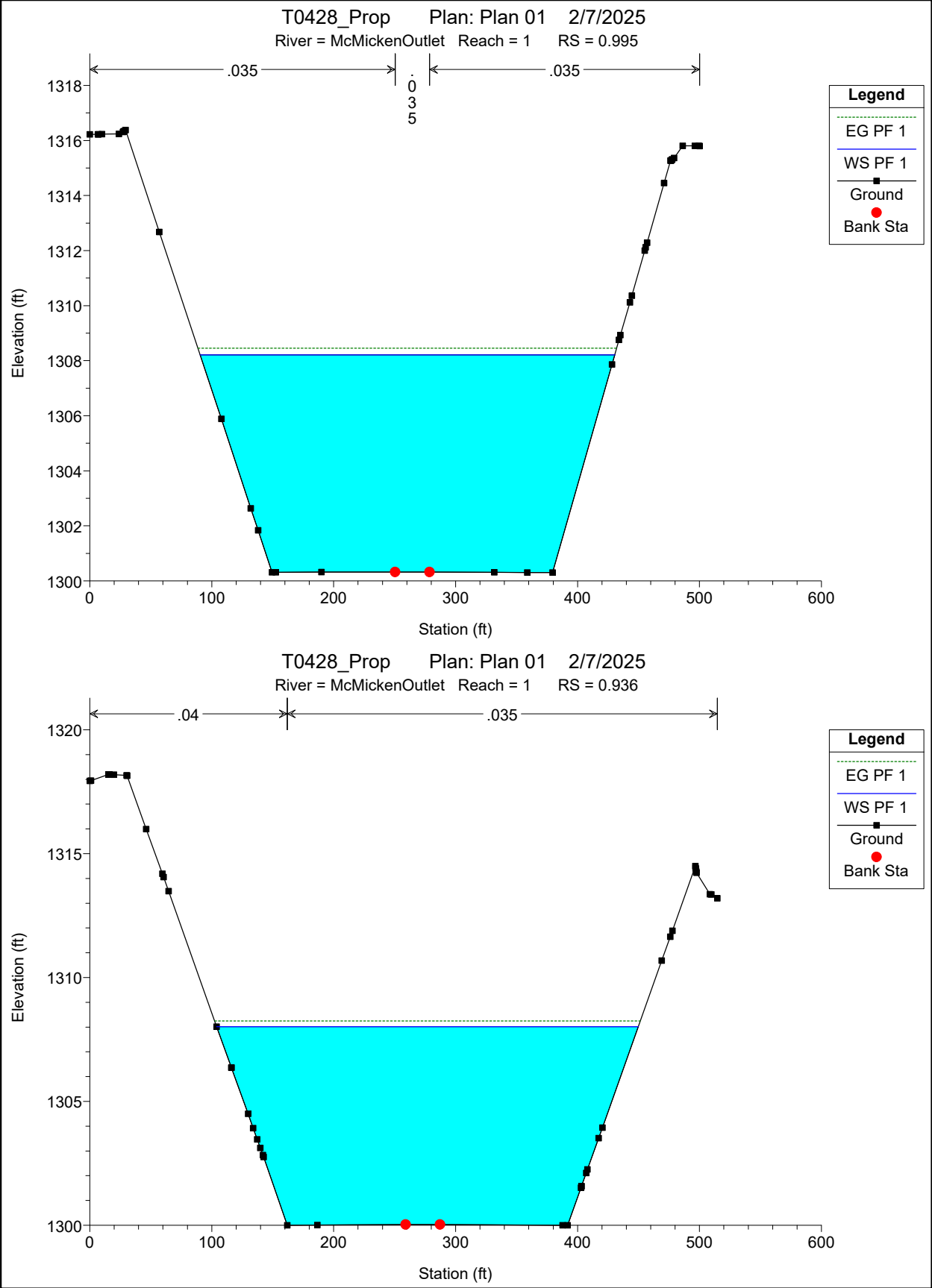


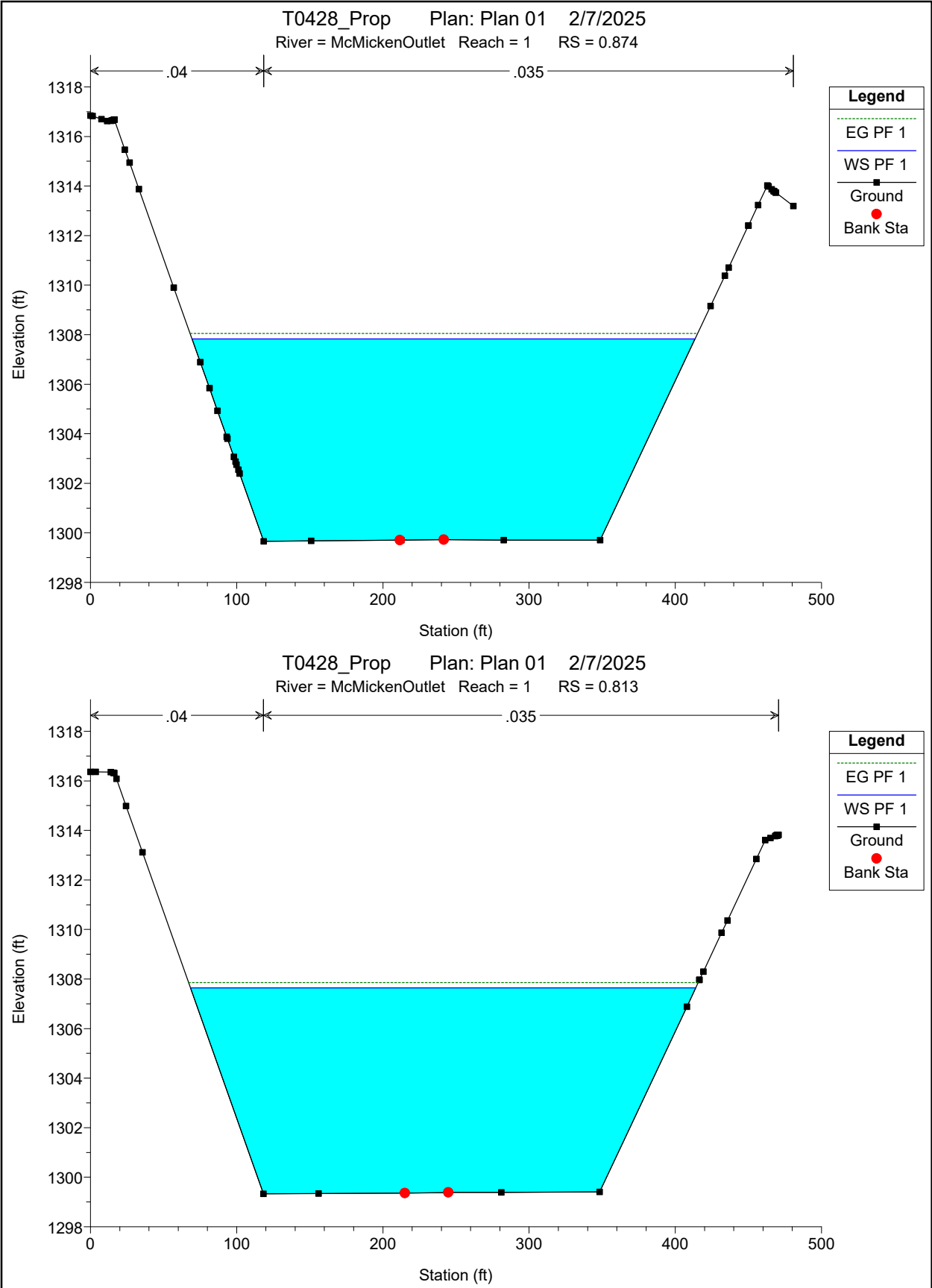


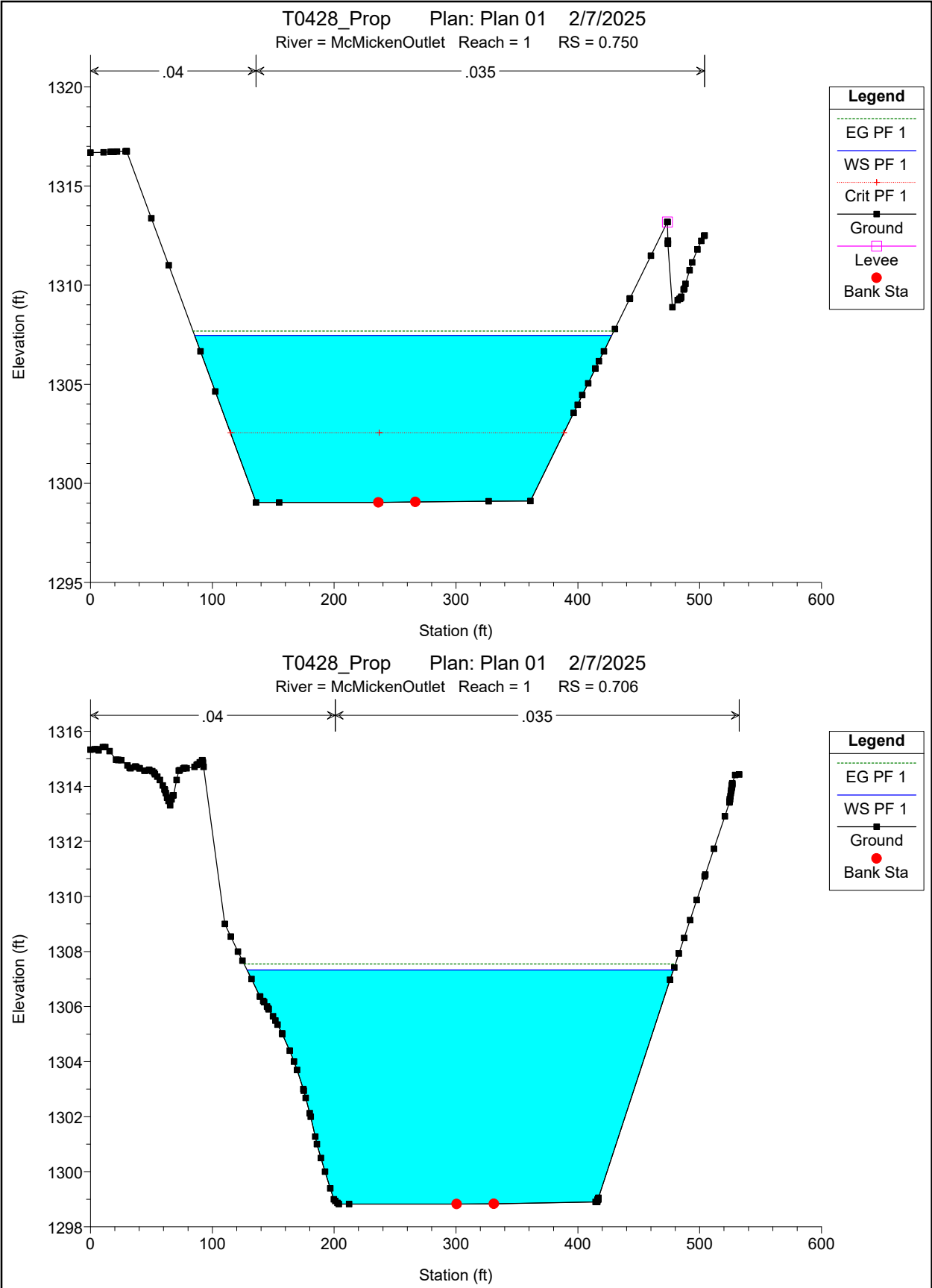


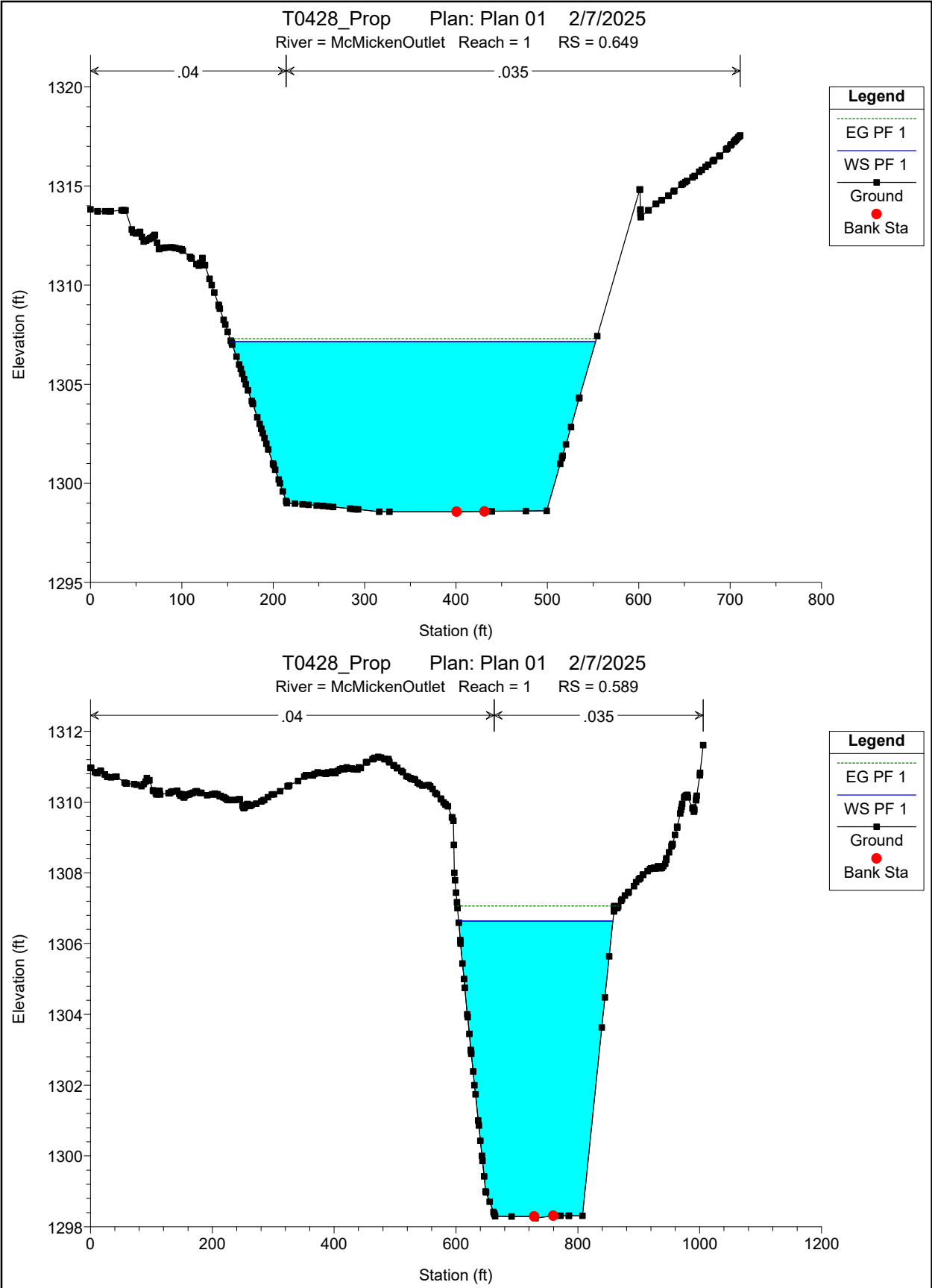


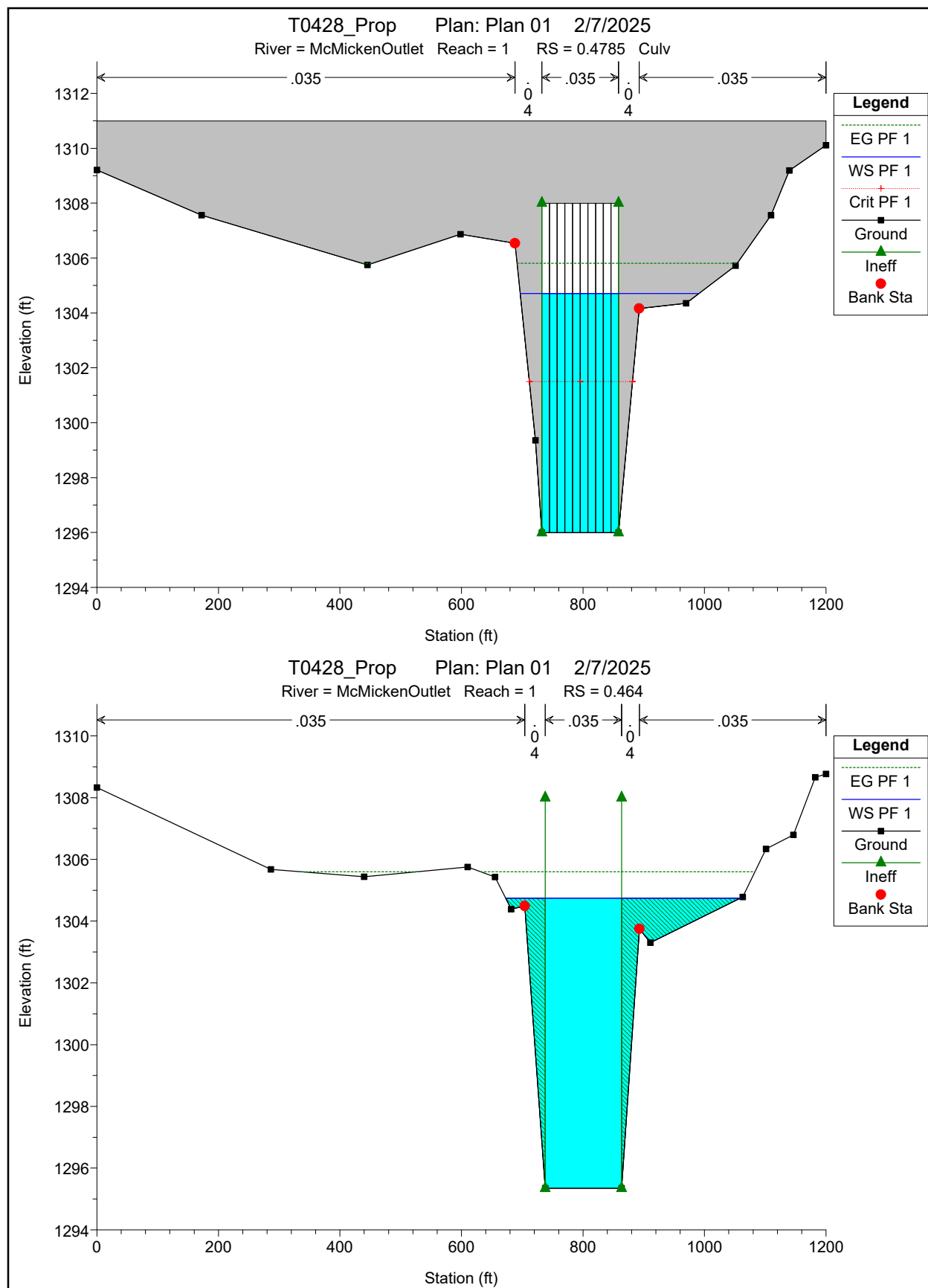


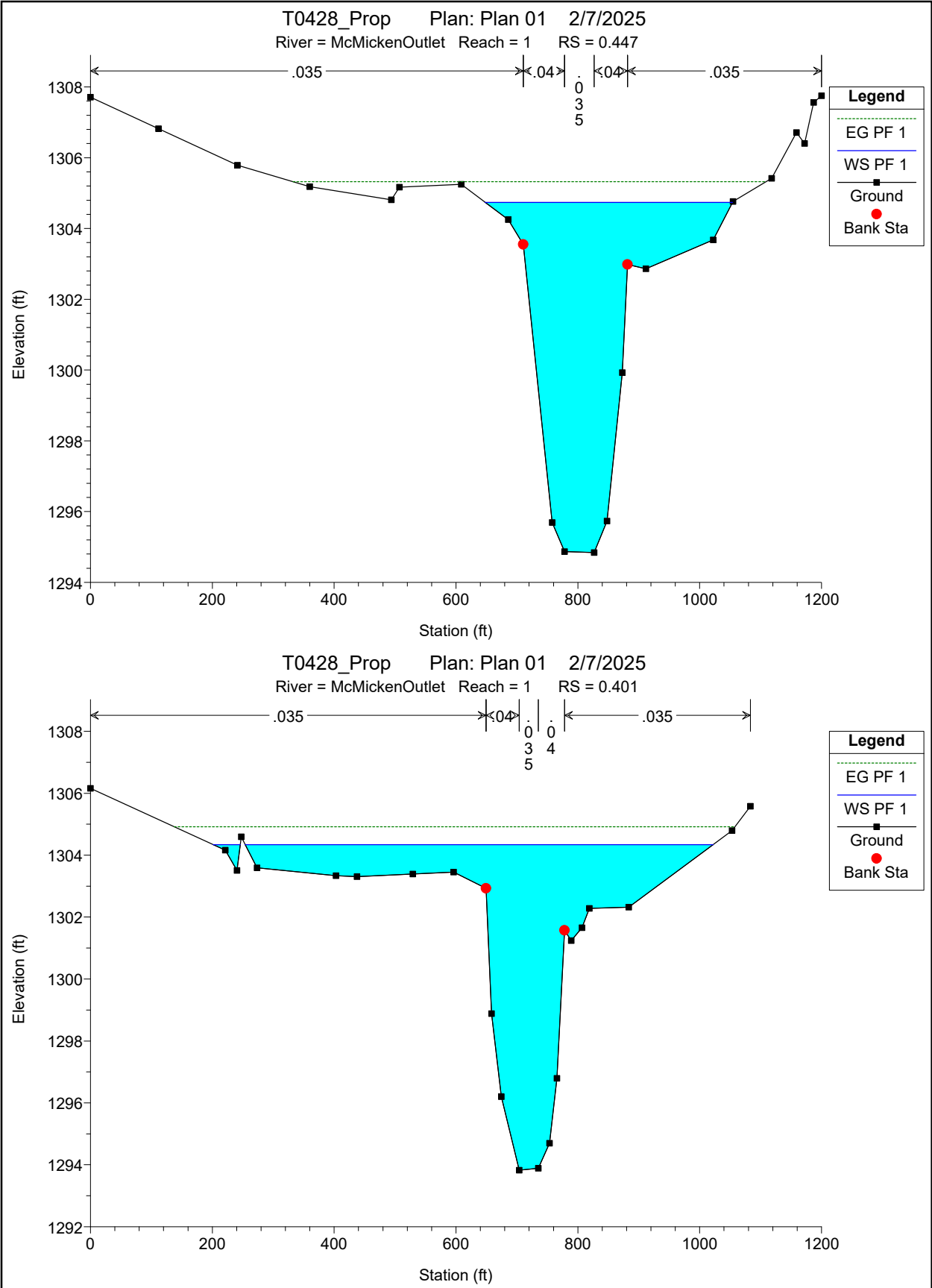


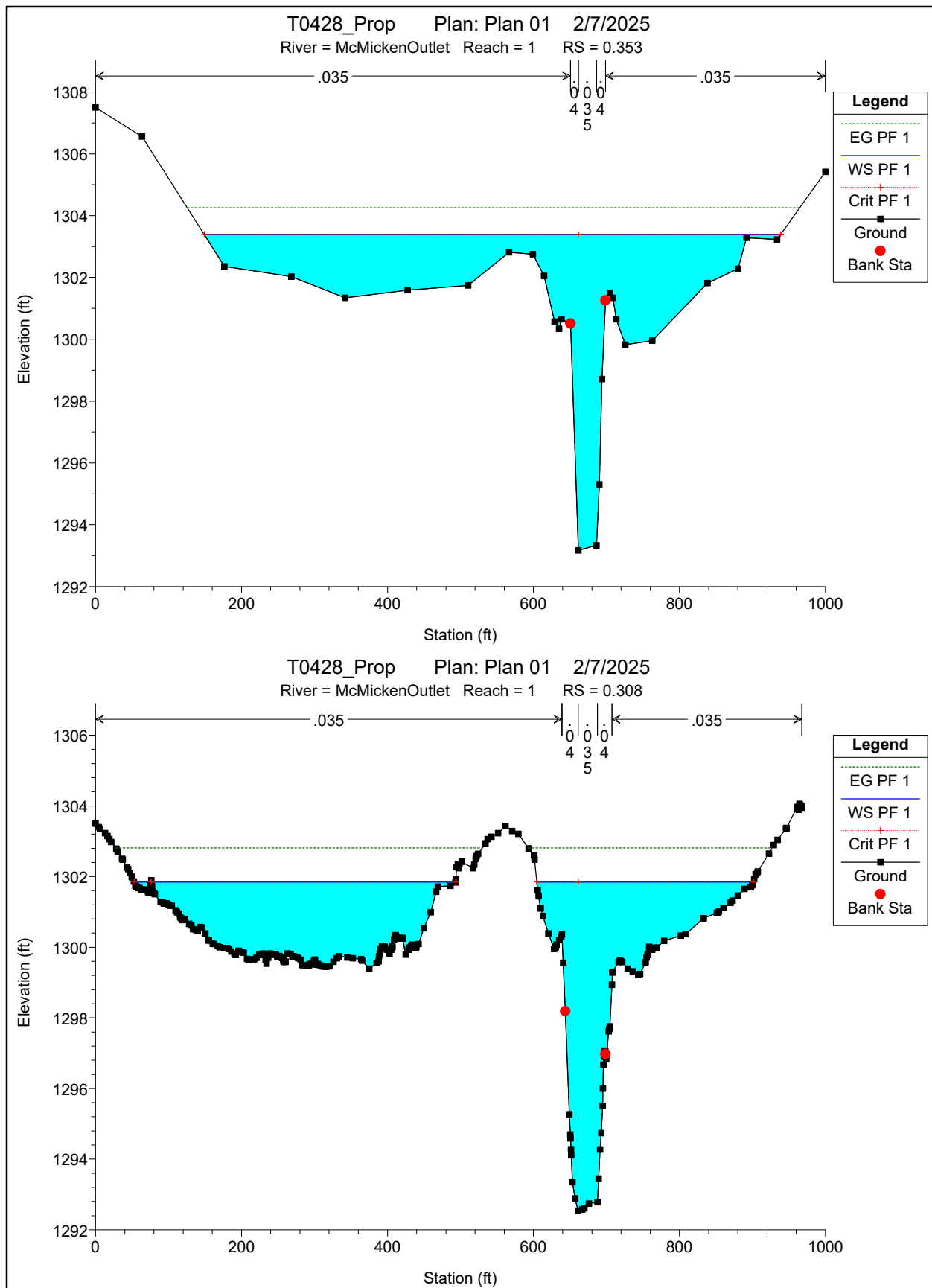


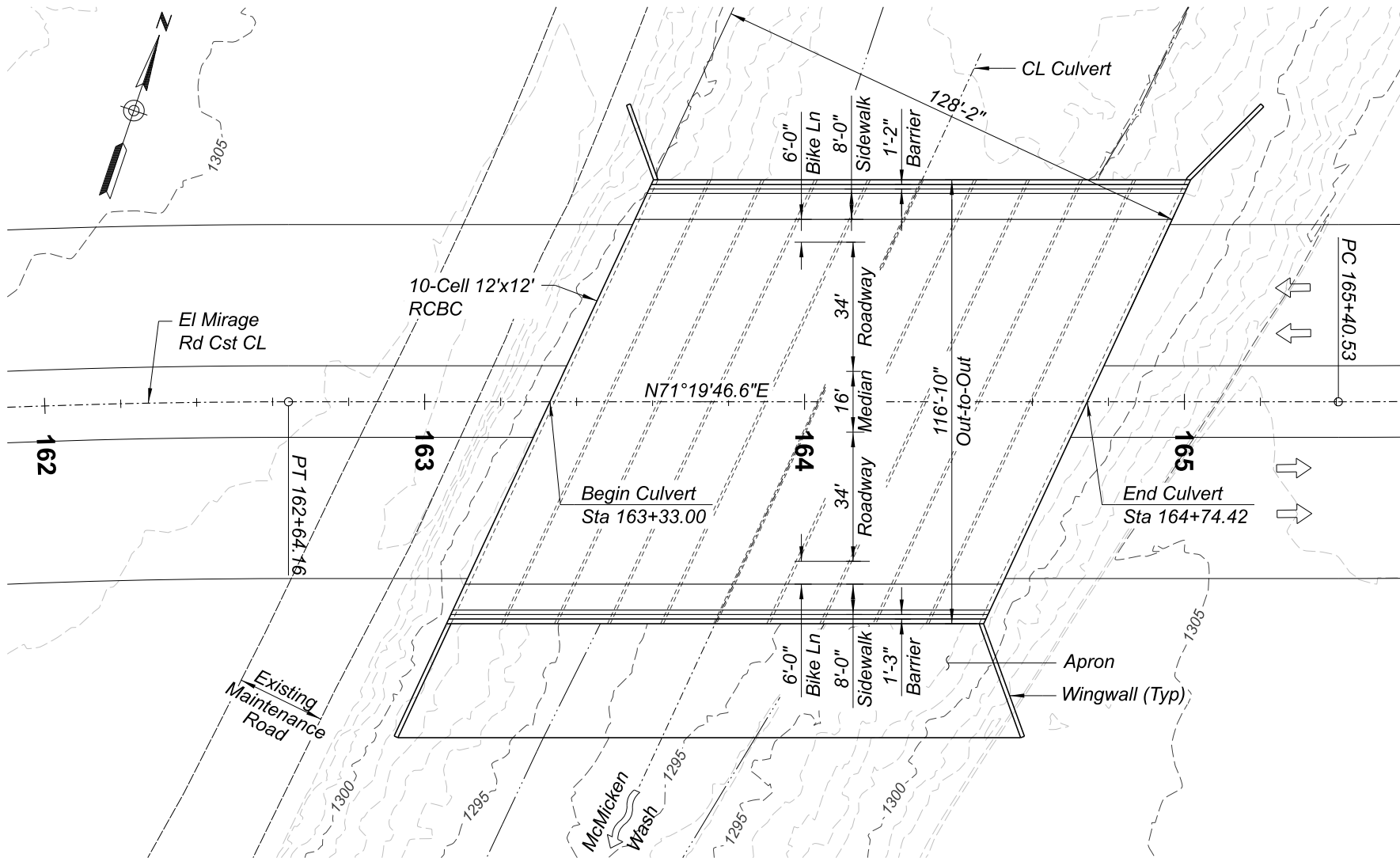




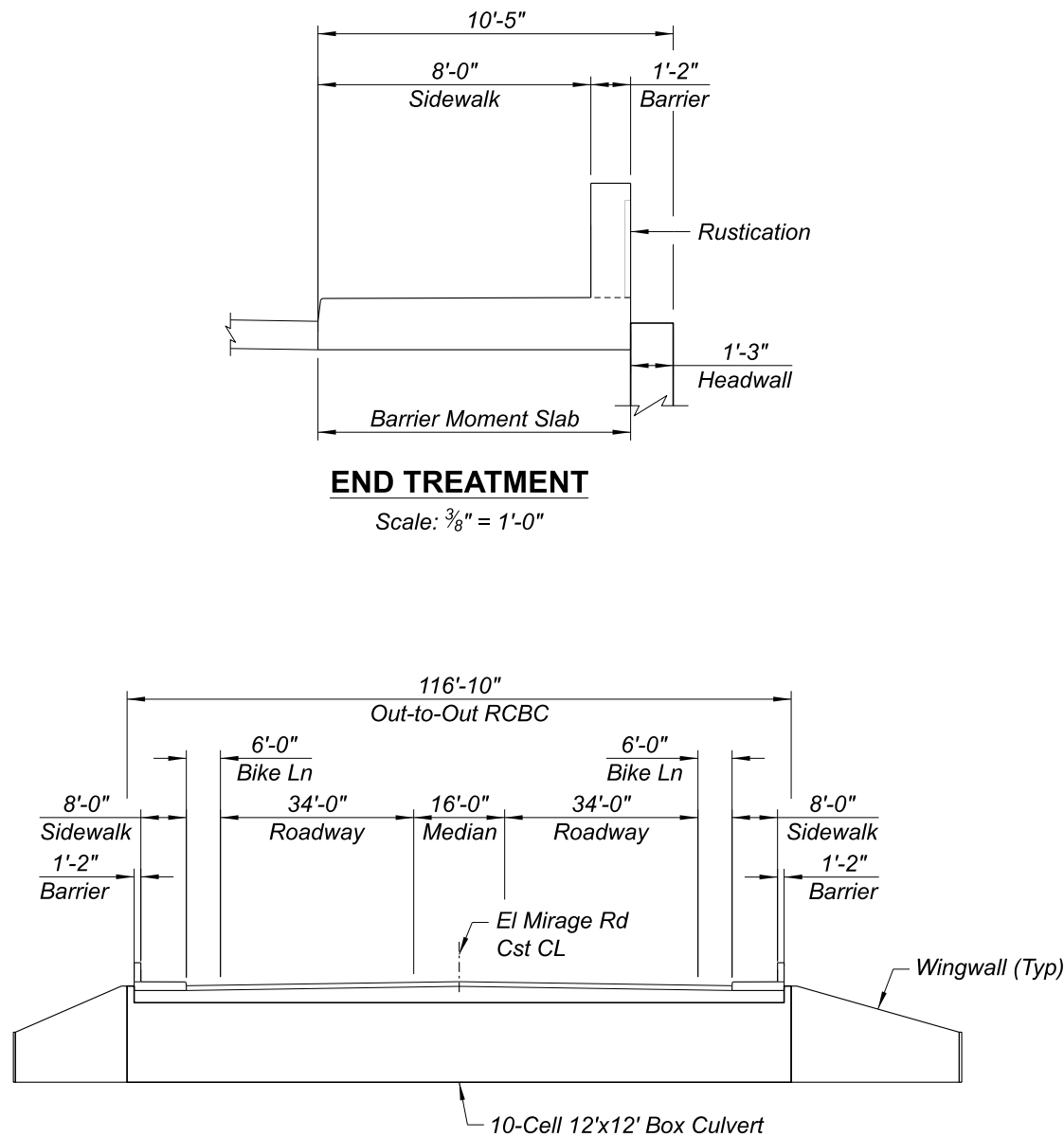




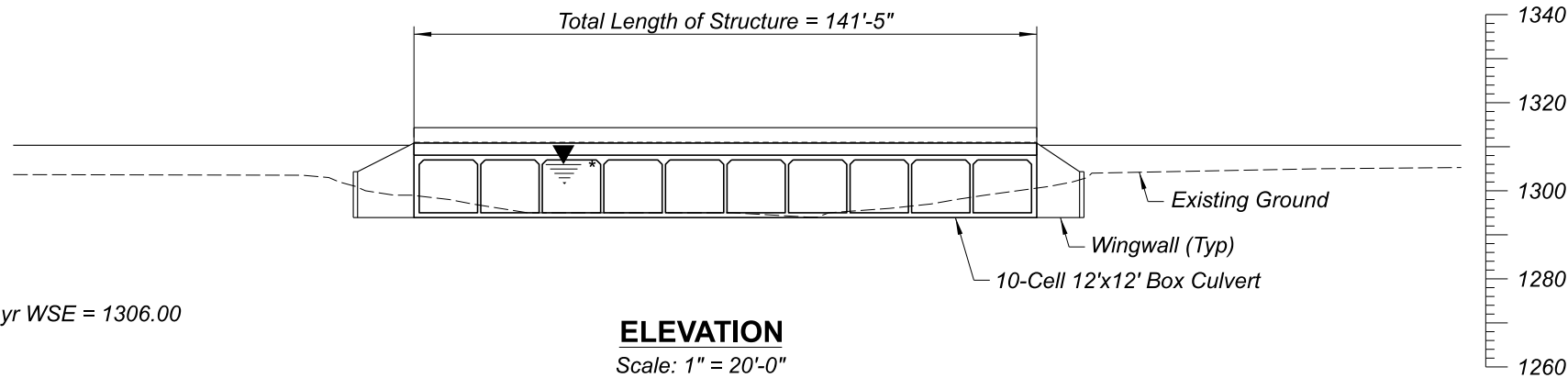




PLAN
Concrete Box Culvert
Skew = 25°00'00" Rt
1' Contour Interval
Scale: 1" = 20'-0"



TYPICAL SECTION
Scale: 1/16" = 1'-0"



ELEVATION
Scale: 1" = 20'-0"

* 100 yr WSE = 1306.00

DESIGN CONCEPT Review NOT FOR CONSTRUCTION OR RECORDING		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION BRIDGE GROUP	ROUTE	F.H.W.A. Arizona Division	STATE ARIZ.	PROJECT NO.	FEDERAL AID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	DESIGN	GTK	8/24		MILEPOST N/A			XXXX	XXXX			
	DRAWN	JKP	8/24					LOCATION				
	CHECKED	GTK	8/24	TRACS NO.		XXXX	ADOT		___ OF ___			
	Jacobs WWW.JACOBS.COM			EL MIRAGE RD - SR303L TO JOMAX RD McMICKEN WASH CULVERT ALTERNATIVE GENERAL PLAN, ELEVATION, TYPICAL SECTION	STRUCTURE NO. N/A							



Appendix K - Westwing Business Park Paving Plans

N. EL MIRAGE ROAD PAVING PLAN - MCDOT
FOR
WESTWING BUSINESS PARK

12300 W. MARIPOSA GRANDE
SUN CITY, ARIZONA 85373

A PORTION OF THE SOUTH HALF OF SECTION 12, TOWNSHIP 4 NORTH, RANGE 1 WEST OF
THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION (MCDOT)
GENERAL NOTES FOR RIGHT-OF-WAY PERMITS

- ALL WORK SHALL CONFORM TO THE REVISED EDITION OF THE UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION PUBLISHED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) AS AUTHORIZED AND MODIFIED BY THE MOST CURRENT MCDOT SUPPLEMENT TO THE MAG UNIFORM STANDARD SPECIFICATIONS AND DETAILS AND NON-CONFLICTING PROJECT SPECIAL PROVISIONS. ALL WORK MUST ALSO COMPLY WITH RESOLUTION 2001-01 MARICOPA COUNTY RESOLUTION FOR PERMITS TO WORK IN DEDICATED RIGHT-OF-WAY AND RESOLUTION 2001-02 MARICOPA COUNTY RESOLUTION FOR STREET IMPROVEMENTS, INSTALLATION OF UTILITIES AND TRAFFIC CONTROL. ANY EXCEPTIONS MUST RECEIVE EXPLICIT APPROVAL FROM MCDOT AND SHALL BE IDENTIFIED ON THE PLANS AS HAVING EXPLICIT APPROVAL FROM MCDOT. ALL CLEAR ZONE HAZARDS SHALL BE MITIGATED IN A MANOR APPROVED BY MCDOT AT NO COST TO THE COUNTY.
- THE ENGINEERING DESIGNS ON THESE PLANS ARE ONLY APPROVED BY MCDOT IN CONCEPT AND NOT IN DETAIL. CONSTRUCTION QUANTITIES ON THESE PLANS ARE NOT VERIFIED BY MCDOT. APPROVAL OF THESE PLANS ARE FOR PERMIT PURPOSES ONLY AND SHALL NOT PREVENT MCDOT FROM REQUIRING CORRECTION OF ERRORS IN THE PLANS WHERE SUCH ERRORS ARE SUBSEQUENTLY FOUND TO BE IN VIOLATION OF ANY LAW, ORDINANCE, HEALTH, SAFETY, THE MCDOT ROADWAY DESIGN MANUAL, OR OTHER DESIGN ISSUES.
- AN APPROVED SET OF PLANS SHALL BE ON THE SITE DURING CONSTRUCTION AND AVAILABLE TO MCDOT AND OTHER INSPECTORS.
- ALL BOX CULVERTS CONSTRUCTED IN THE PUBLIC RIGHT-OF-WAY SHALL COMPLY WITH ARIZONA DEPARTMENT OF TRANSPORTATION (ADOT) LATEST DESIGN SPECIFICATIONS AND STANDARDS. MINIMUM CLEAR HEIGHT OF BOX CULVERT SHALL BE 4 FEET.
- CONTRACTOR TO OBTAIN MCDOT PERMITS PRIOR TO CONSTRUCTION WITHIN COUNTY RIGHT-OF-WAY, AND ALL NECESSARY PERMITS FROM OTHER AGENCIES AND FROM LOCAL GOVERNMENTS FOR WORK WITHIN THEIR JURISDICTION.
- CONTRACTOR SHALL NOTIFY THE MCDOT INSPECTION DEPT. AT LEAST 24 HOURS IN ADVANCE OF ANY CONSTRUCTION AT (602) 506-8606.
- CONTRACTOR PERFORMING CONSTRUCTION OR EXCAVATING OPERATIONS IS RESPONSIBLE FOR LOCATING AND RELOCATING AT 'BLUE STAKE' ALL UTILITIES IN CONFLICT AT NO EXPENSE TO MARICOPA COUNTY. THE CONTRACTOR SHALL CONTACT (602) 263-1100 PRIOR TO BEGINNING CONSTRUCTION.
- THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY REQUIRED PERMITS FOR EARTH MOVING FROM MARICOPA COUNTY DUST COMPLIANCE DIVISION (602) 506-6010 PRIOR TO CONDUCTING EXCAVATION OPERATIONS. A COPY OF THE PERMIT AND DUST CONTROL PLAN SHALL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO COMMENCEMENT OF ANY EARTHMOVING ACTIVITIES.
- PRIOR TO CONDUCTING EXCAVATION OPERATIONS, THE CONTRACTOR SHALL OBTAIN FROM THE ARIZONA STATE HISTORICAL PRESERVATION OFFICER (602) 542-4009, RECOMMENDATIONS REGARDING THE NEED FOR CULTURAL RESOURCES (ARCHAEOLOGICAL) CLEARANCE. ALL DISCOVERIES OF HUMAN REMAINS, CULTURAL ARTIFACTS, OR PALEONTOLOGICAL REMAINS SHALL BE REPORTED TO THE ARIZONA STATE MUSEUM AND MCDOT. UPON DISCOVERY, CONTRACTOR SHALL CEASE OPERATIONS IN THE VICINITY OF THE FIND AND PROTECT THE DISCOVERY AREA FROM FURTHER DISTURBANCE UNTIL THE FIND CAN BE PROFESSIONALLY INVESTIGATED BY THE ARIZONA STATE MUSEUM AND MCDOT.
- EXCEPT UNDER EMERGENCY CONDITIONS, ROADS SHALL NOT BE CLOSED FOR CONSTRUCTION ACTIVITY UNLESS PRIOR APPROVAL IS OBTAINED FROM THE MCDOT TRANSPORTATION DIRECTOR OR HIS REPRESENTATIVE.
- PRIOR TO MOVING OR DESTROYING PROTECTED NATIVE PLANT SPECIES, THE CONTRACTOR SHALL FILE A FORMAL NOTICE OF INTENT WITH THE ARIZONA DEPARTMENT OF AGRICULTURE NATIVE PLANTS (602) 542-6408.
- PRIOR TO INSTALLATION OF CURB, GUTTER, SIDEWALK, BASE COURSE AND WEARING SURFACE, SUBMIT SOIL TEST(S) OF SUBGRADE AND REVISED PAVEMENT DESIGN/CALCULATIONS TO MCDOT FOR REVIEW AND APPROVAL. IF SUBGRADE STABILIZATION IS REQUIRED, THE AREA STABILIZED SHALL BE FROM BACK OF SIDEWALK TO BACK OF SIDEWALK AND MATCH THE STABILIZATION DEPTH OF THE PAVEMENT STRUCTURE.
- ASPHALT MIX DESIGN SHALL BE SUBMITTED TO MCDOT A MINIMUM OF 48 HOURS PRIOR TO PLACING ANY ASPHALT COURSES. (TRENCH WORK EXCLUDED.) ALL PAVED TURNOUTS SHALL HAVE THE SAME ASPHALT AND BASE REQUIREMENTS AS THE ADJACENT ROADWAY UNLESS NOTED OTHERWISE.
- ALL COMPACTION AND BACKFILL WITHIN COUNTY RIGHT-OF-WAY SHALL CONFORM TO THE MCDOT SUPPLEMENT TO MAG SPECIFICATION SECTION 601. BACKFILL UNDER EXISTING PAVEMENT, CURB AND GUTTER, ROADWAY SHOULDERS, AND UNPAVED ROADWAYS SHALL CONSIST OF ONE-HALF (1/2) OR ONE SACK CLSM. UNPAVED ROADWAY AREAS INCLUDE THE TRAVELED WAY PLUS FIVE FEET BEYOND THE TRAVELED WAY.
- ALL STRUCTURES, SUCH AS MANHOLES, VALVE BOX & COVERS, AND MONITORING WELLS MUST BE MARKED WITH AT LEAST TWO REFLECTIVE YELLOW FLEX POSTS WHEN STRUCTURES ARE LOCATED OUTSIDE THE TRAVELED WAY AND WITHIN THE RIGHT-OF-WAY. (APPLIES ONLY WHEN THERE IS NO CURB).
- PAVEMENT WIDENING AND PAVEMENT REPLACEMENT SHALL CONFORM TO REQUIREMENTS OF SPECIFICATION SECTION 336. PAVEMENT CUTS SHALL NOT BE LOCATED WITHIN A LANE WHEEL PATH. THE LANE WHEEL PATH IS THE ENTIRE LANE WIDTH EXCEPT THE AREA WITHIN ONE FOOT OF A LANE LINE STRIPE AND EXCEPT THE CENTER TWO FEET OF THE TRAVEL LANE.
- ALL EXISTING PAVEMENT MARKINGS, TRAFFIC SIGNS AND SIGNAL EQUIPMENT THAT NEED TO BE REMOVED, REPLACED, WORK WILL BE DONE BY THE CONTRACTOR AT HIS EXPENSE. ALL RELOCATED OR REPAIRED BECAUSE OF CONTRACTOR SALVAGED SIGNS SHALL BE DELIVERED TO THE TRAFFIC OPS BUILDING AT 2909 W. DURANGO ST. ARRANGEMENTS CAN BE MADE FOR DELIVERY BY CALLING (602) 506-8662. ALL NEW STREET NAME SIGNS SHALL BE PROVIDED AND INSTALLED BY PERMITTEE AT NO EXPENSE TO MARICOPA COUNTY.
- PAVEMENT MARKING, SIGNING AND SIGNAL WORK WILL BE INSPECTED AND SHALL MEET COUNTY STANDARDS BEFORE RELEASE OF BOND.
- THE CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITHIN THE RIGHT-OF-WAY TO A CONDITION EQUAL TO OR BETTER THAN PRIOR EXISTING CONDITIONS OF ALL WASTE MATERIAL WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. OF ALL WASTE MATERIAL WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

FEMA CLASSIFICATION

THE CURRENT FEMA FLOOD INSURANCE RATE MAP (FIRM) FOR THIS AREA, MAP NUMBER 04013C 1230L (EFFECTIVE REVISED DATE OCTOBER 16, 2013), DESIGNATES THE PROPERTY WITHIN FLOOD HAZARD ZONE X (SHADED) AND ZONE AE.

ZONE: X (SHADED) IS DEFINED AS 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.

ZONE: AE IS DEFINED AS SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD, BASE FLOOD ELEVATIONS DETERMINED.

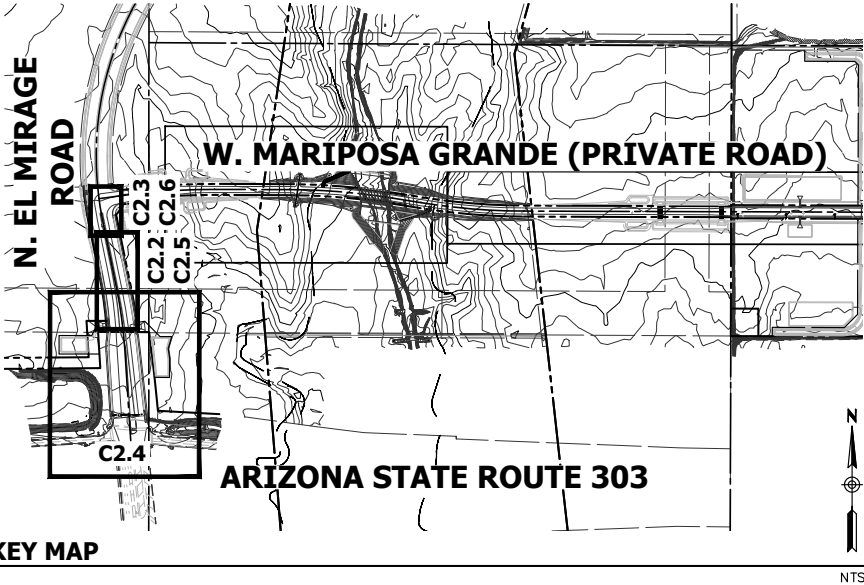
ABBREVIATIONS

APN	ASSESSOR PARCEL NUMBER	F/C	FACE OF CURB	PAE	PUBLIC ACCESS EASEMENT	TEL	TELEPHONE
B/C	BACK OF CURB	FF	FINISH FLOOR	PDE	PUBLIC DRAINAGE EASEMENT	TS	TRAFFIC SIGNAL
BOT	BOTTOM	FG	FINISH GRADE	R	PROPERTY LINE	TW	TOP OF WALL
C	CONCRETE	FL	FLOWLINE	PUE	PUBLIC UTILITY EASEMENT	UGFO	UNDERGROUND FIBER OPTIC
CL	CENTERLINE	FT/FT	FOOT PER FOOT	PUEF	PUBLIC UTILITY FACILITIES EASEMENT	UGE	UNDERGROUND ELECTRIC
CFS	CUBIC FEET	G	GUTTER	PVMT	PAVEMENT	UGT	UNDERGROUND TELEPHONE
CY	CUBIC YARD	GB	GRADE BREAK	P/C	PAVEMENT/CONCRETE	UTS	UNDERGROUND TRAFFIC SIGNAL
DE	DRAINAGE EASEMENT	OR	GRATE	RCW	RECLAIMED WATER	VCP	VITRIFIED CLAY PIPE
DW	DRYWELL	HP	HIGH POINT	R/W	RIGHT OF WAY	VG	VALLEY GUTTER
EA	EACH	HW	HIGH WATER	SD	STORM DRAIN	VNAE	VEHICULAR NON-ACCESS EASEMENT
EL	ELEVATION	IE	INVERT ELEVATION	SF	SQUARE FEET	VOL	VOLUME
EP	EDGE OF PAVEMENT	IRR	IRRIGATION	SS	SANITARY SEWER	VP	VOLUME PROVIDED
ESMT	EASEMENT	LF	LINEAR FEET	S/W	SIDEWALK	VR	VOLUME REQUIRED
EX	EXISTING	ML	MATCH LINE	STA	STATION	W	WATER
EG	EXISTING GRADE	NTS	NOT TO SCALE	SY	SQUARE YARDS		
		P	PAVEMENT	TC	TOP OF CURB		

UTILITY REVIEW

- THESE PLANS HAVE BEEN SUBMITTED TO THE FOLLOWING UTILITY COMPANIES. WHERE THE WORK TO BE DONE CONFLICTS WITH ANY OF THESE UTILITIES, THE CONFLICTS SHALL BE RESOLVED AS SPECIFIED IN THE SPECIAL PROVISIONS AND/OR AS OTHERWISE NOTED ON THESE PLANS. CONFLICTS ARISING DURING THE COURSE OF CONSTRUCTION FROM UNFORESEEN CIRCUMSTANCES SHALL BE REPORTED TO THE INTERESTED UTILITY COMPANY AND BE RESOLVED BY THEM AND THE DESIGN ENGINEER.
- THE CITY WILL NOT PARTICIPATE IN THE COST OF CONSTRUCTION OR UTILITY RELOCATION.

UTILITY	UTILITY COMPANY	NAME OF COMPANY REPRESENTATIVE	PHONE NUMBER	DATE SENT	DATE SIGNED
CATV, FIBER	COX COMMUNICATIONS	KIRSTEN VELDMAN	800-778-9140	03-03-22	05-02-22
COAX, FIBER	CENTURYLINK	CONFLICT LIAISON	815-245-9640	03-03-22	03-24-22
ELECTRIC	APS	CONTROL DESK	623-975-5757	03-03-22	03-21-22
GAS	TRANSWESTERN PIPELINE	JOHN STEVENSON	713-989-2833	03-03-22	PENDING



KEY MAP

SHEET INDEX

	SHEET
COVER SHEET,	C2.0
DETAILS AND TYPICAL SECTIONS,	C2.1
PAVING PLAN & PROFILE,	C2.2-C2.3
GRADING AND DRAINAGE PLAN,	C2.4
SIGNING AND STRIPING PLAN,	C2.5-C2.6

EXISTING LEGEND

MONUMENT LINE	---
PROPERTY LINE	---
EASEMENT LINE	---
RIGHT-OF-WAY LINE	---
SANITARY SEWER LINE	--8" PVC SS--
WATER LINE	--8" DIP W--
MAJOR CONTOUR	-1134-
MINOR CONTOUR	-1132-
OVERHEAD ELECTRICAL	---OHE---
SPOT ELEVATION	34.00P
FIRE HYDRANT	34.00P
WATER VALVE	34.00P
WATER METER BOX	34.00P
TELEPHONE RISER	34.00P
ELECTRICAL RISER	34.00P
LIGHT POLE	34.00P
SANITARY SEWER MANHOLE	34.00P
BACKFLOW PREVENTOR	34.00P
SIGN	34.00P
POWER POLE	34.00P

PROPOSED LEGEND

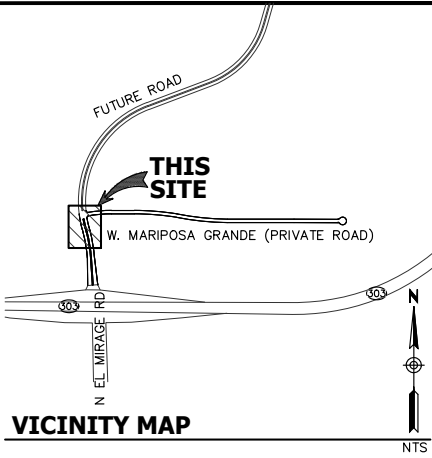
SAWCUT LINE	34.00P
GRADE BREAK	34.00P
CONTOUR	34.00P
SEWER LINE	34.00P
WATER LINE	34.00P
STORM LINE	34.00P
DIRECTION OF SLOPE	34.00P
CATCH BASIN	34.00P
SPOT ELEVATION	34.00P
SECTION CALLOUT	34.00P
FIRE DEPARTMENT CONNECTION	34.00P
DRYWELL PLUS	34.00P
WATER VALVE	34.00P
WATER METER	34.00P
BACKFLOW PREVENTOR	34.00P
CONCRETE	34.00P
LIGHT PAVEMENT SECTION (AUTOMOBILE PARKING)	34.00P
HEAVY PAVEMENT SECTION	34.00P

MCDOT R/W QUANTITIES

STREET IMPROVEMENT PERMIT FEE (PAVING)	
ASPHALT PAVING 5" AC ON 8" ABC	3,000 SY
18" RGRCP CLASS V STORM PIPE	83 LF
TYPE "U" HEADWALL	1 EA
RIP RAP D50=6"	2 CY
MAG 535 CATCH BASIN	1 EA

N. EL MIRAGE ROAD (MCDOT)

ROADWAY CLASSIFICATION:	PRINCIPLE ARTERIAL
POSTED SPEED:	45 MPH
ADT:	5011 VEHICLES
CLEAR ZONE:	17 FEET



VICINITY MAP

TOTAL SITE AREA : 75.758 AC

APN #: 503-53-045C

BASIS OF BEARING

BASIS OF BEARING FOR THIS SURVEY IS A BEARING OF SOUTH 89°55'48" EAST, ALONG THE SOUTH LINE OF THE SOUTHWEST QUARTER OF SECTION 12, TOWNSHIP 4 NORTH, RANGE 1 WEST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

BENCHMARK

EAST QUARTER CORNER S.11.T.4N.R.1W., FOUND STONE 0.2' UP MARKED 'X' ON TOP 1/4 ON WEST. ELEVATION 1307.674 (NAVD88).

OWNER/DEVELOPER

WESTWING BUSINESS PARK, LLC

P.O. BOX 7670
SURPRISE, AZ 85374
PHONE: (623) 910-4365
CONTACT: SILAS ECK
EMAIL: SILAS.ECK@CAXINVESTMENTS.COM

CIVIL ENGINEER

HUNTER ENGINEERING, INC.

10450 N. 74TH STREET, SUITE #200
SCOTTSDALE, ARIZONA 85258
EMAIL: DLEONE@HUNTERENGINEERINGPC.COM
PHONE: (480) 991-3985
CONTACT: DAN LEONE

EARTHWORK QUANTITIES

FILL: 294 CY
CUT: 1,596 CY
NET: 1,302 CY (CUT)
EARTHWORK PROVIDED FOR PERMITTING PURPOSES ONLY
CONTRACTOR TO PROVIDE OWN CALCULATIONS FOR CONSTRUCTION PURPOSES.
EARTHWORK ESTIMATE TAKES NO SHRINKAGE OR SWELL INTO ACCOUNT.

CERTIFICATION:

"I HEREBY CERTIFY THAT THIS DESIGN IS BASED ON ACCURATE FIELD DATA WHICH HAS BEEN CHECKED IN THE FIELD WITHIN 180 DAYS PRIOR TO SUBMISSION FOR CITY APPROVAL."

BY: _____ DATE _____

ENGINEER'S DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISE RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION R4-30-301 OF THE RULES OF ARIZONA STATE BOARD OF TECHNICAL REGISTRATION, AND THAT THE DESIGN IS CONSISTED WITH THE CURRENT STANDARDS. I UNDERSTAND THAT THE CHECK OF THE PROJECT DRAWINGS AND SPECIFICATIONS BY MARICOPA COUNTY IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR THE PROJECT DESIGN

RECORD DRAWING

I CERTIFY THAT THE LOCATIONS, ELEVATIONS, DEPTHS, AND RECORD DRAWING COMMENTS ACCURATELY REFLECT THE EXISTING FIELD CONDITIONS AND MATERIALS ACTUALLY USED DURING CONSTRUCTION. THIS CERTIFICATION IS BASED ON INFORMATION OBTAINED UNDER MY DIRECT SUPERVISION AND IS CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME _____ DATE _____

REGISTRATION NO. _____ EXP. DATE _____

REVD. BY: _____
ENGINEERING DEPARTMENT

MCDOT

THE AGENCIES LISTED BELOW APPROVE THESE PLANS IN CONCEPT ONLY AND ACCEPT NO LIABILITY FOR THE ERRORS OR OMISSIONS.

APPROVAL:
BY LETTER
MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

AS-BUILT STATEMENTS:

I HEREBY CERTIFY THAT I HAVE REVIEWED THE "AS-BUILT" FOR THE ABOVE REFERENCED PROJECT AND CERTIFY THAT THE PROJECT HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED IMPROVEMENT PLANS AND REVISIONS THAT IT WILL FUNCTION AS DESIGNED AND PERMITTED.

REGISTERED CIVIL ENGINEER _____ DATE _____

I HEREBY CERTIFY THAT THE "RECORD DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED ARE CORRECT TO THE BEST OF MY KNOWLEDGE.

REGISTERED SURVEYOR _____ DATE _____

NO.	DATE	REVISION	BY

DESIGN BY: DJL
DRAWN BY: DHK
CHECKED BY: DJL

HUNTER ENGINEERING CIVIL AND SURVEY

10450 NORTH 74TH STREET, SUITE #200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

Professional Engineer
54944
DANIEL J. LEONE
7/6/22
ARIZONA

COVER SHEET
FOR
WESTWING BUSINESS PARK
12300 W. MARIPOSA GRANDE
SUN CITY, ARIZONA 85373

ARIZONA 811 AT LEAST 2 FULL WORKING DAYS BEFORE YOU BEGIN EXCAVATION
CALL 811 OR CLICK ARIZONA811.COM

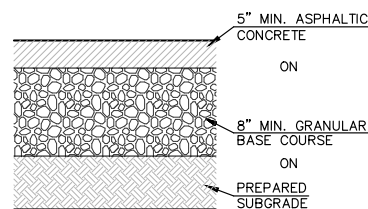
THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

PROJECT NAME:
WESTWING BUSINESS PARK

HE NO.: SILA001
SCALE: NTS

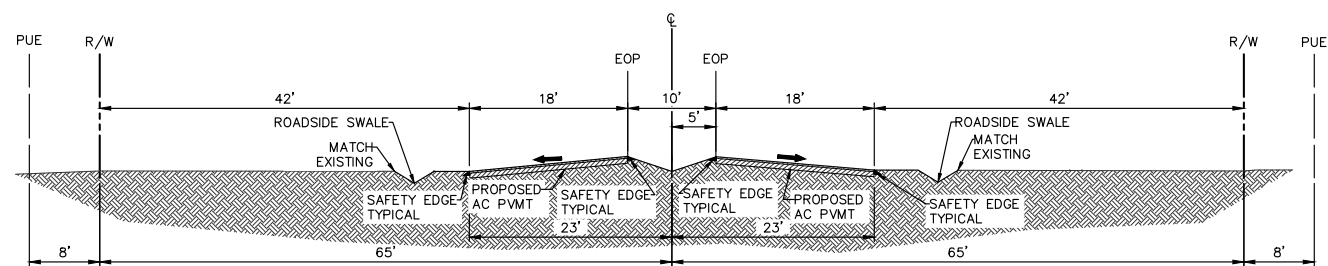
SHEET:
C2.0

MARICOPA COUNTY CASE NO: Z2020029

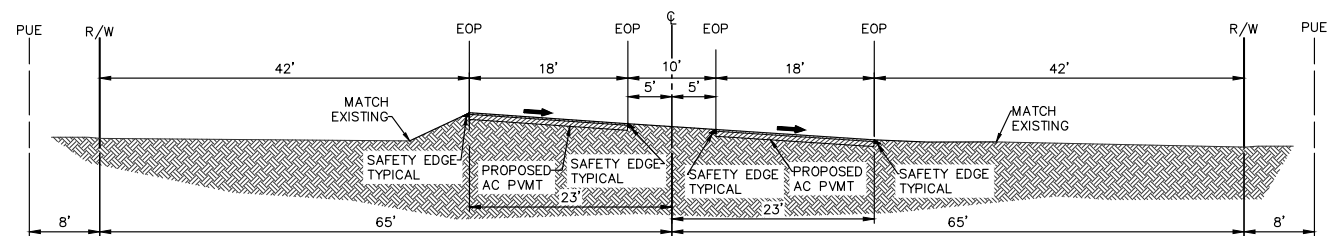


NOTE:
ALL PAVEMENT CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE GEOTECHNICAL REPORT
PREPARED BY: RAMM ENGINEERING, INC., PROJECT# G27322, DATED 09/02/21. SEE GEOTECH REPORT FOR
COMPACTION AND SUBGRADE SPECIFICATIONS.

1 PAVEMENT SECTION N.T.S



2 N. EL MIRAGE ROAD CROSS SECTION N.T.S



3 N. EL MIRAGE ROAD CROSS SECTION N.T.S

NO.	DATE	REVISION	BY

DESIGN BY: DJL
DRAWN BY: DHK
CHECKED BY: DJL

HUNTER

ENGINEERING

10450 NORTH 74TH STREET,
SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

CIVIL AND SURVEY



N. EL MIRAGE ROAD PAVING PLAN - MCDOT
FOR
WESTWING BUSINESS PARK
12300 W. MARIPOSA GRANDE
SUN CITY, ARIZONA 85373

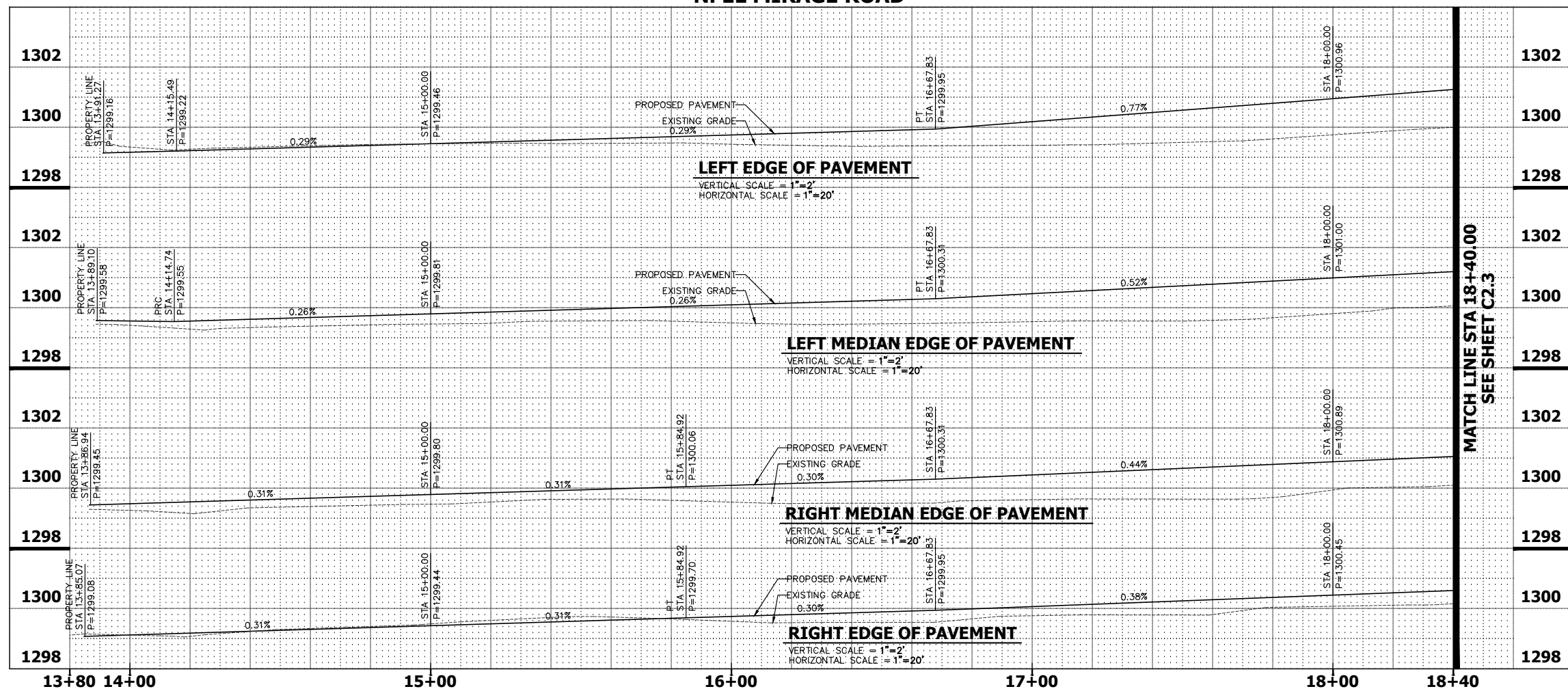
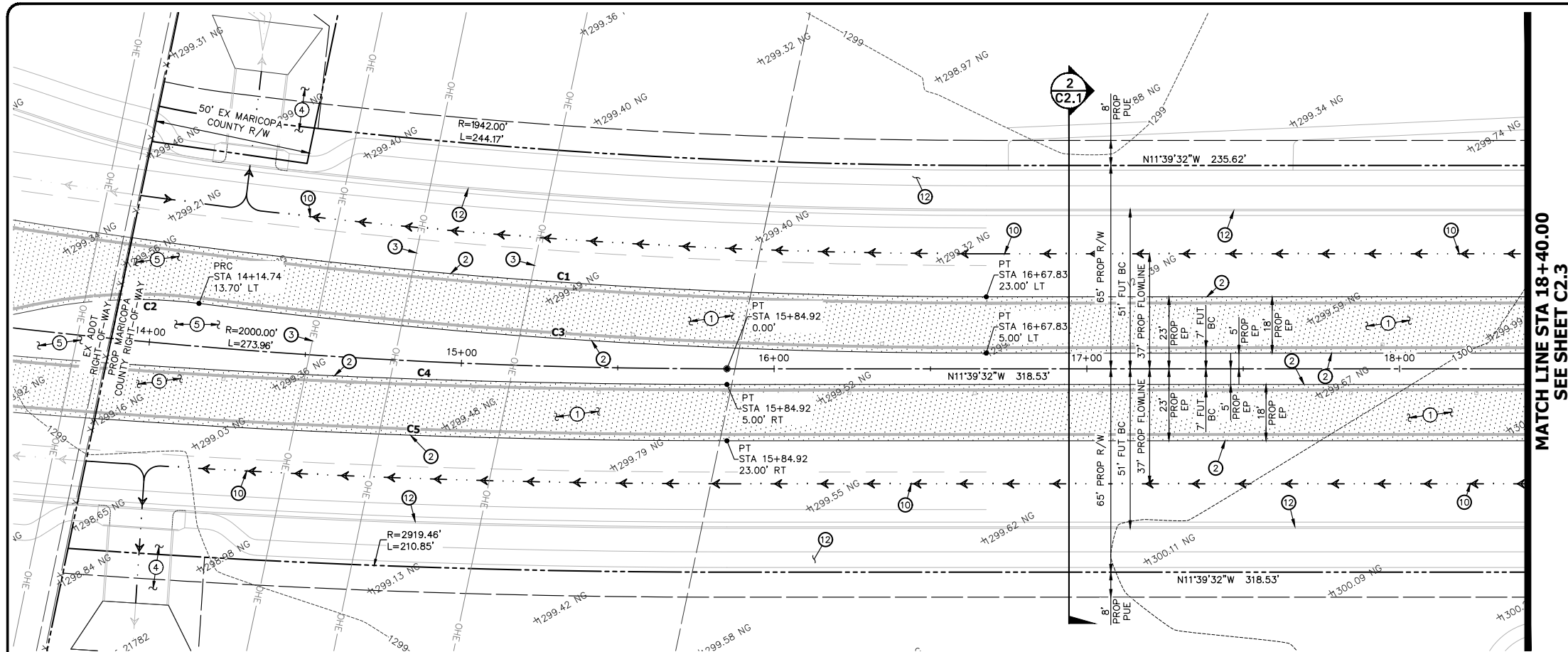


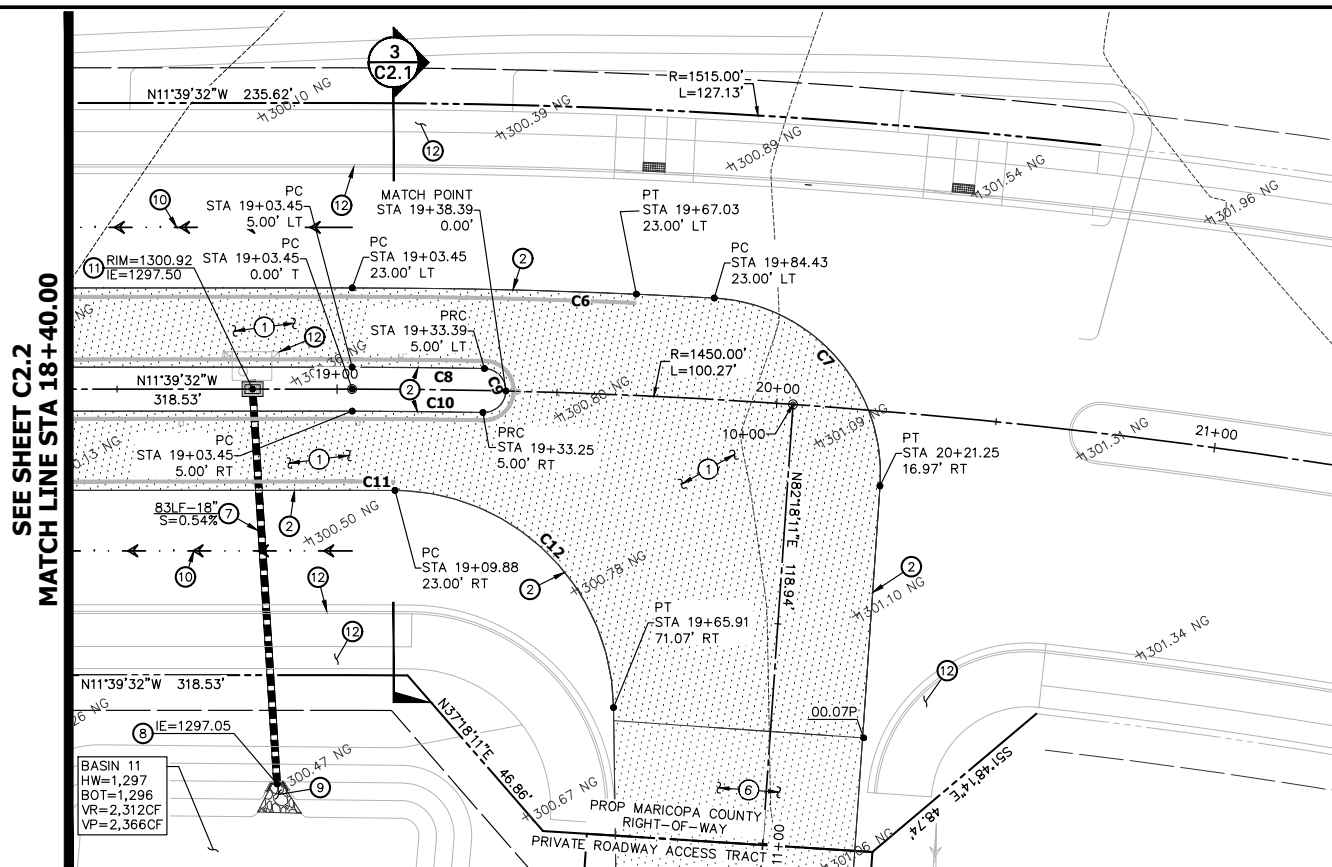
THESE PLANS ARE
NOT APPROVED FOR
CONSTRUCTION
WITHOUT AN
APPROVED SIGNATURE
FROM THE GOVERNING
MUNICIPALITY.

PROJECT NAME:
WESTWING
BUSINESS
PARK

HE. NO.: SILA001
SCALE: NTS

SHEET:
C2.1

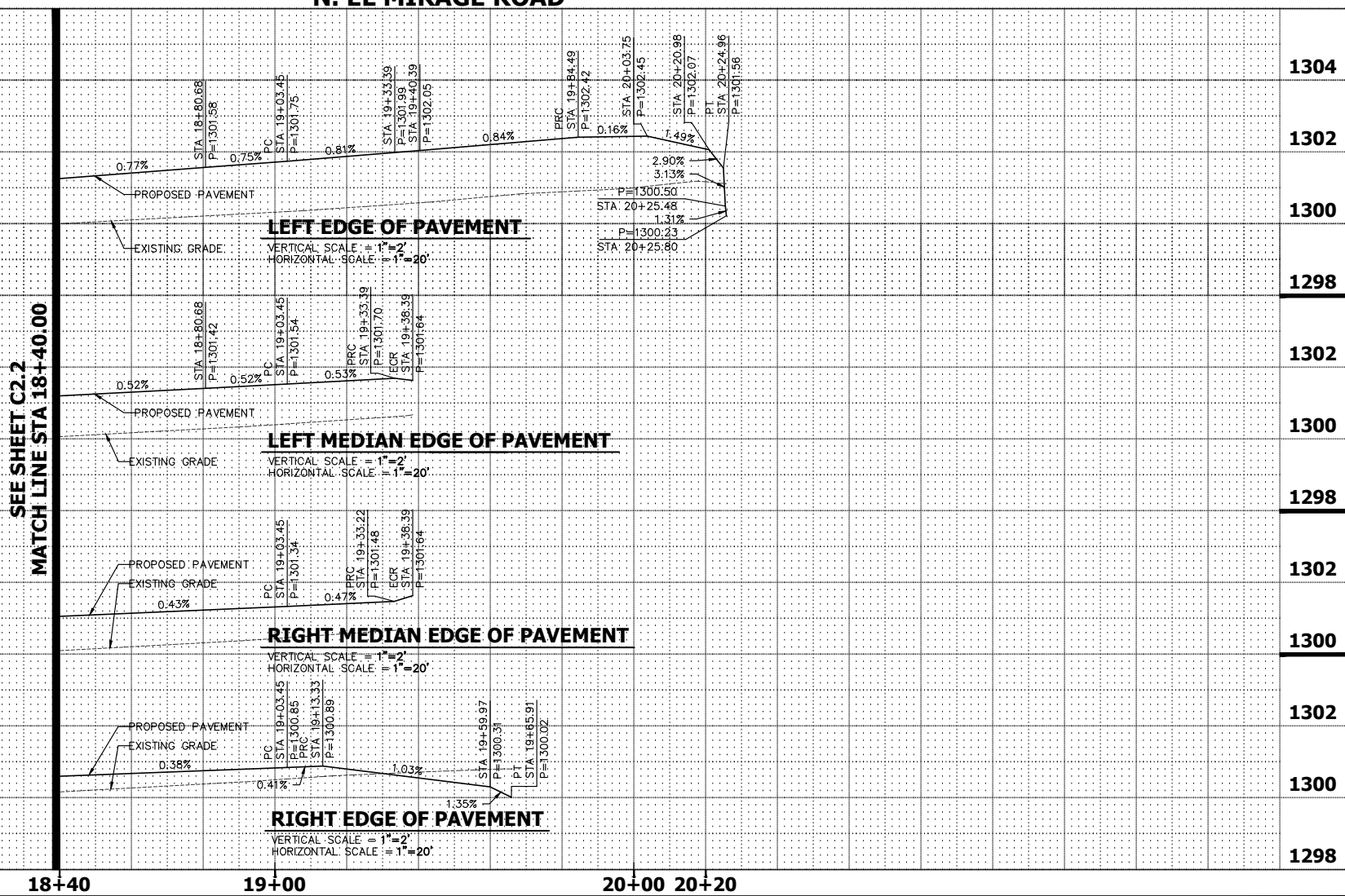




- CONSTRUCTION NOTES**
1. CONSTRUCT PAVEMENT SECTION MIN. 5" AC ON 8" ABC PER RECOMMENDATION BY THE GEOTECH REPORT PREPARED BY RAMM ENGINEERING, DATED 9/2/21, PROJECT# G27322. SEE DETAIL 1 ON SHEET C2.1.
 2. CONSTRUCT ASPHALT PAVEMENT SAFETY EDGE PER MAG STD DTL 201.
 3. PROTECT EXISTING OVERHEAD ELECTRICAL LINES IN PLACE DURING CONSTRUCTION.
 4. SEE SHEET C2.4 FOR GRADING AND DRAINAGE CONSTRUCTION DETAILS.
 5. FOR CONTINUATION, SEE N. EL MIRAGE ROAD PAVING PLAN - ADOT SHEETS C1.0-C1.4.
 6. FOR CONTINUATION, SEE COLLECTOR ROAD PAVING PLAN SHEETS C3.0-C3.16.
 7. INSTALL RGRCP CLASS V STORM PIPE PER MAG STD SPECIFICATIONS WITH FITTINGS PER PLAN. LENGTH, SLOPE, FITTING AND SIZE PER PLAN. BACKFILL PER PIPE MANUFACTURER'S SPECIFICATIONS.
 8. CONSTRUCT HEADWALL TYPE "U" PER MAG STD DTL 501-1, MODIFIED PER PLAN.
 9. PROVIDE INDIGENOUS STONE RIP RAP PER PLAN. RIP RAP SHALL BE D50=6", THICKNESS=20".
 10. CONSTRUCT ROADSIDE SWALE PER PLAN.
 11. CONSTRUCT CATCH BASIN PER MAG STD DTL 535, TYPE F. RIM AND INVERT PER PLAN.
 12. FUTURE ROADWAY IMPROVEMENTS TO BE CONSTRUCTED BY OTHERS.
- LEGEND**
- SEE SHEET C3.0
- GENERAL NOTES**
- SEE SHEET C3.1
- NOTES**
1. NOT ALL NOTES ARE USED ON THIS SHEET.
 2. CURB DATA IS MEASURED FROM THE BACK OF THE CURB.

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA
C6	1473.00'	82.32'	3°12'08"
C7	40.00'	63.36'	90°45'35"
C8	1454.38'	30.05'	1°11'01"
C9	5.00'	15.83'	181°19'38"
C10	1445.00'	29.67'	1°10'35"
C11	1427.00'	9.72'	0°23'25"
C12	50.00'	77.51'	88°49'18"



REVISION

NO.	DATE	REVISION

PURPOSE:
3RD SUBMITTAL

DESIGN BY: DJL
DRAWN BY: DHK
CHECKED BY: DJL

HUNTER
ENGINEERING
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986



PAVING PLAN AND PROFILE
N. EL MIRAGE ROAD STA 18+40.00 TO END
WESTWING BUSINESS PARK
12300 W. MARIPOSA GRANDE
SUN CITY, ARIZONA 85373



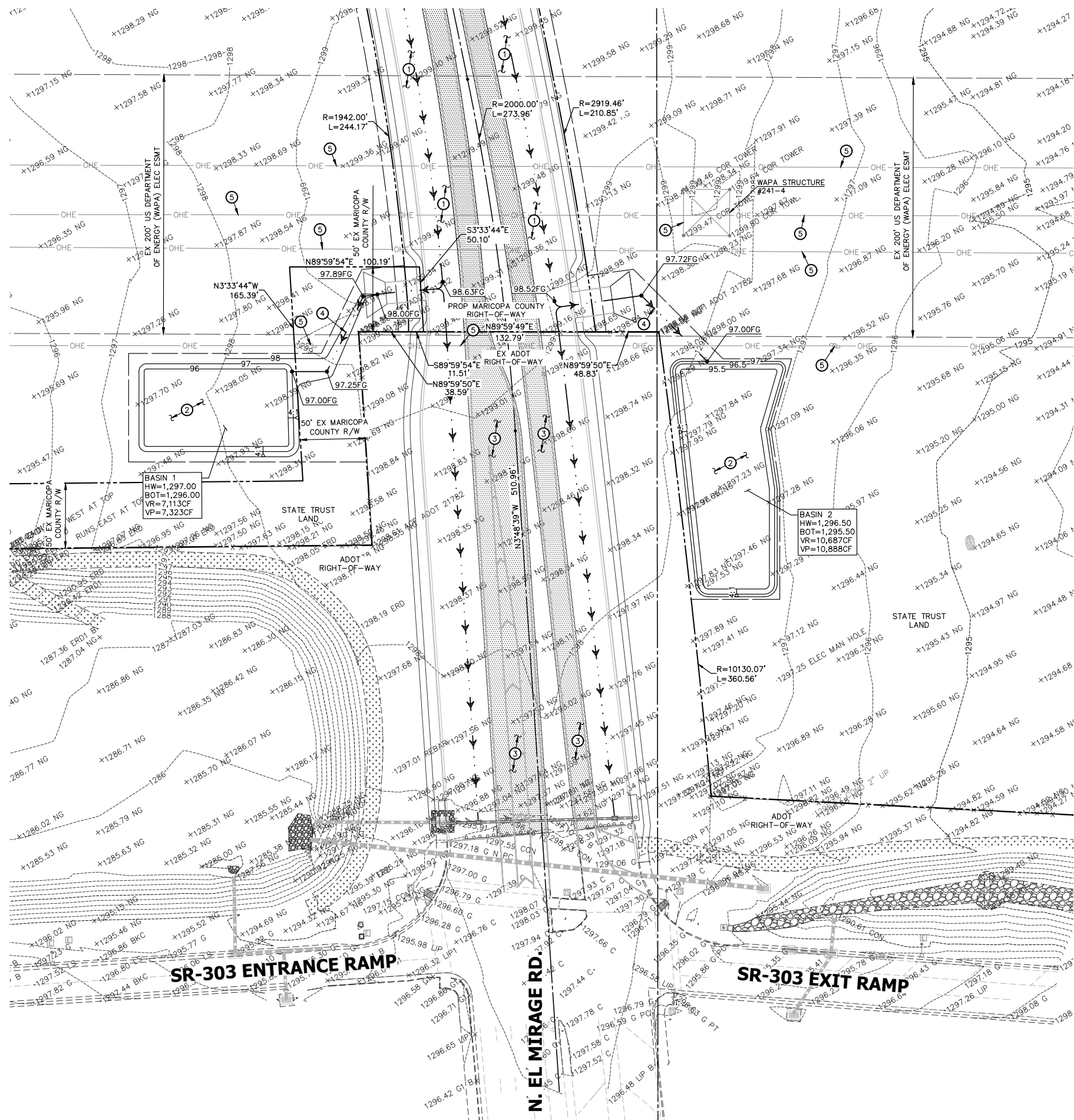
THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

PROJECT NAME:
WESTWING BUSINESS PARK

HE NO.: SILA001
SCALE: 1"=20'

SHEET:
C2.3

MARICOPA COUNTY CASE NO: Z2020029



CONSTRUCTION NOTES

1. SEE PAVING PLAN AND PROFILE ON SHEETS C2.1 AND C2.2 FOR DETAIL.
2. CONSTRUCT RETENTION BASIN WITH 4:1 MAX SIDE SLOPES PER PLAN.
3. SEE N. EL MIRAGE ROAD PAVING PLAN - ADOT SHEETS C1.0-C1.4.
4. CONSTRUCT GRADED SWALE PER PLAN.
5. PROTECT EXISTING UTILITY LINE AND/OR APPURTENANCES IN PLACE DURING CONSTRUCTION.

LEGEND

SEE SHEET C1.0

GENERAL NOTES

SEE SHEET C1.0

NO.	DATE	REVISION	BY

DESIGN BY: DJL
DRAWN BY: DHK
CHECKED BY: DJL

HUNTER
ENGINEERING
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480.991.3985
F 480.991.3986



**GRADING AND DRAINAGE PLAN
FOR
WESTWING BUSINESS PARK
12300 W. MARIPOSA GRANDE
SUN CITY, ARIZONA 85373**



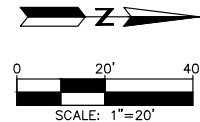
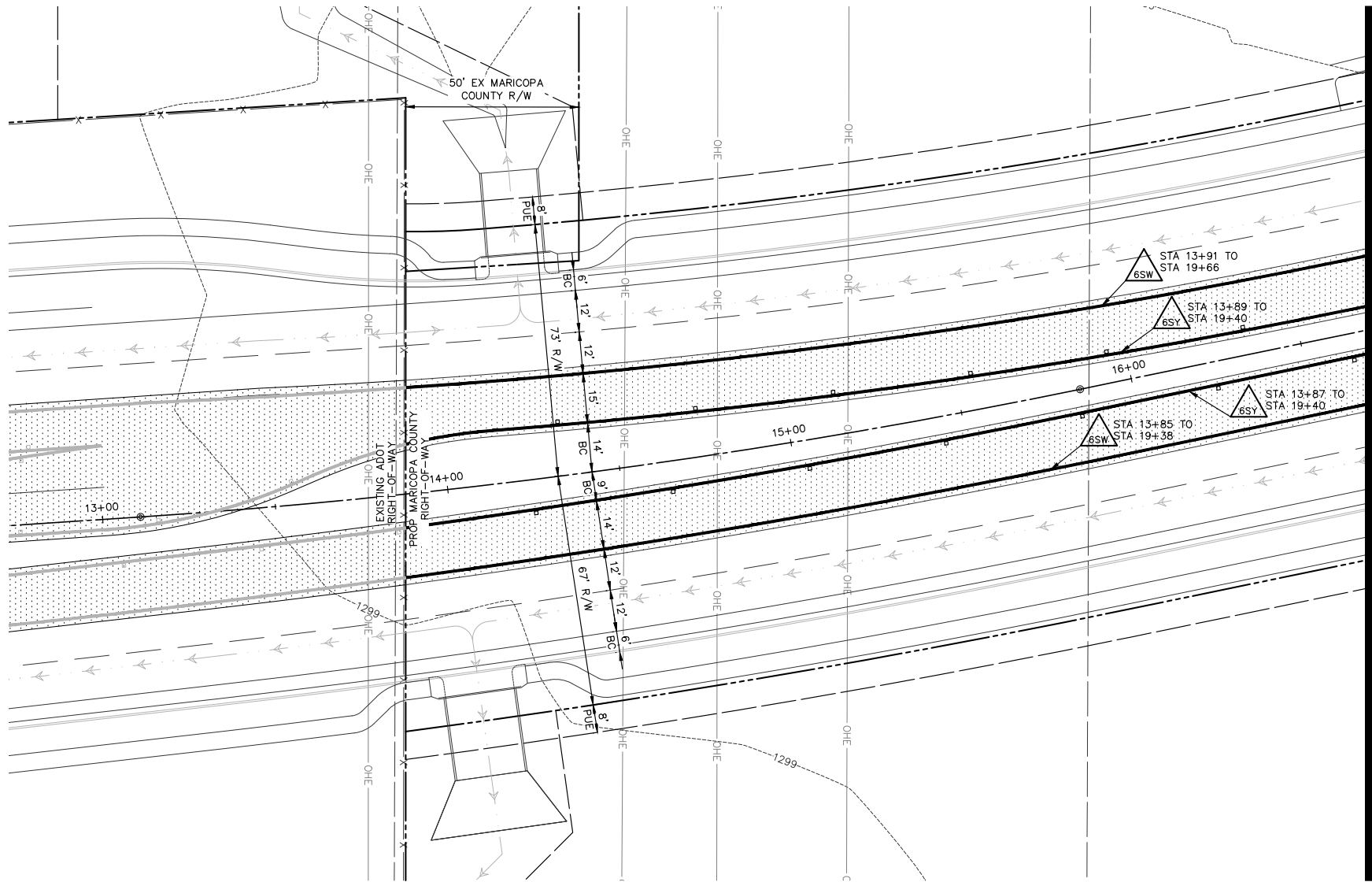
THESE PLANS ARE
NOT APPROVED FOR
CONSTRUCTION
WITHOUT AN
APPROVED SIGNATURE
FROM THE GOVERNING
MUNICIPALITY.

PROJECT NAME:
WESTWING
BUSINESS
PARK

HE NO.: SILA001
SCALE: 1"=40'

SHEET:
C2.4

MARICOPA COUNTY CASE NO: Z2020029



PAVEMENT NOTES:

1. ALL PAVEMENT MARKING AND CONSTRUCTION SHALL CONFORM TO THE LATEST EDITIONS OF THE ADOT STANDARD DRAWINGS AND SPECIFICATIONS, ADOT SIGNING AND MARKING STANDARD DRAWINGS AND THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), INCLUDING THE ARIZONA SUPPLEMENT.
2. THE PAVEMENT MARKING DRAWINGS ARE SCHEMATIC ONLY AND NOT TO SCALE. THE CONTRACTOR SHALL FOLLOW ALL DIMENSIONS, DETAILS AND STANDARDS WHEN INSTALLING PAVEMENT MARKINGS.
3. THE DIMENSIONS SHOWN TO PAVEMENT MARKINGS ARE TO THE CENTER OF THE STRIPING OR IN THE CASE OF DOUBLE STRIPING, TO THE CENTER OF THE DOUBLE STRIPING AND ARE TO THE FACE OF CURB, FACE OF BARRIER, OR EDGE OF PAVEMENT, UNLESS OTHERWISE NOTED.
4. THE PAVEMENT MARKING PLANS MAY BE MODIFIED AS DIRECTED BY THE ENGINEER.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT THE FINAL SURFACE COURSE IS PLACED SO THAT THE STRIPING IS OFFSET ONE FOOT (1'-0") CLEAR OF ANY CONSTRUCTION JOINT, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
6. THE CONTRACTOR SHALL CLEAN THE ROADWAY SURFACE TO THE SATISFACTION OF THE ENGINEER, BY SWEEPING AND AIR-JET BLOWING, IMMEDIATELY PRIOR TO THE PLACEMENT OF ALL PAVEMENT MARKINGS. THE ROADWAY SURFACE SHALL BE DRY AND THE AIR AND PAVEMENT TEMPERATURES SHALL BE A MINIMUM OF 55 DEGREE F AND RISING FOR THE PLACEMENT OF THERMOPLASTIC STRIPING. THE ROADWAY SURFACE SHALL BE DRY AND THE AIR AND PAVEMENT TEMPERATURES SHALL NOT BE LESS THAN 60 DEGREES F FOR THE INSTALLATION OF TYPE I, II, OR III PAVEMENT MARKING TAPE. TYPE I TAPE SHALL NOT BE INSTALLED IF RAIN IS ANTICIPATED 48 HOURS PRIOR TO OR AFTER INTENDED INSTALLATION DATE.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LAYOUT AND INSTALLATION OF PERMANENT PAVEMENT MARKINGS ON THE FINAL SURFACE COURSE FOLLOWING CONTROL POINTS THAT HAVE BEEN SET NO MORE THAN 50 FEET APART ALONG THE LINES TO BE STRIPED.
8. WHEN STRIPE OBLITERATION IS NECESSARY, IF SHALL BE ACCOMPLISHED BY APPROVED METHODS AS INDICATED IN THE STANDARD SPECIFICATIONS. PAINTING OVER STRIPING, REMOVAL OF PAVEMENT AND OVERLAYING PAVEMENT DOES NOT CONSTITUTE STRIPE OBLITERATION.
9. PERMANENT STRIPING SHALL BE 90 MIL (0.090 INCH) THICK EXTRUDED THERMOPLASTIC IN ACCORDANCE WITH SECTION 704 OF THE STANDARD SPECIFICATIONS.
10. TEMPORARY STRIPING SHALL BE TYPE II PREFORMED TAPE IN ACCORDANCE WITH SECTION 705 OF THE STANDARD SPECIFICATIONS.
11. ALL REFLECTIVE RAISED PAVEMENT MARKERS SHALL HAVE AN ABRASION-RESISTANT COATING ON THE FACE OF THE PRISMATIC REFLECTORS AND SHALL CONFORM TO THE DETAILS OF ADOT STD. DWG. M-19. THEY SHALL BE INSTALLED WITH A BITUMINOUS ADHESIVE WHICH IS ON THE ADOT APPROVED PRODUCTS LIST.
12. ALL REFLECTIVE RAISED PAVEMENT MARKERS SHALL BE INSTALLED SO THAT THE REFLECTIVE FACE OF EACH MARKER IS FACING THE DIRECTION OF TRAFFIC AND IS PERPENDICULAR TO THE DIRECTION OF TRAFFIC FLOW.
13. WHERE RAISED/RECESSED PAVEMENT MARKERS ARE PLACED ALONG SOLID STRIPING, THE NEAREST EDGE OF EACH MARKER SHALL BE OFFSET TWO INCHES FROM THE NEAREST EDGE OF THE STRIPE.
14. THE CONTRACTOR SHALL PRESERVE ALL EXISTING PAVEMENT MARKINGS AND RAISED REFLECTIVE PAVEMENT MARKERS THAT ARE TO REMAIN EXCEPT WHERE NOTED OTHERWISE, AND SHALL REPLACE ANY DAMAGED MARKINGS AND PAVEMENT MARKERS AS A RESULT OF THE CONSTRUCTION AT THE CONTRACTOR'S EXPENSE.

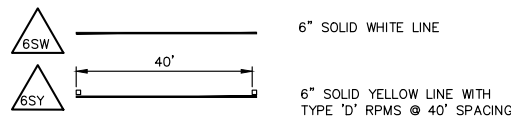
SIGNING NOTES:

1. ALL SIGNS SHALL BE IN COMPLIANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) 2009 EDITION, THE ARIZONA SUPPLEMENT TO THE 2009 MUTCD, THE ADOT SIGNING AND MARKING STANDARD DRAWINGS, JUNE 2014, WITH CURRENT AMENDMENTS AND THE ARIZONA MANUAL OF APPROVED SIGNS.
2. ALL SIGN LOCATIONS AND POST LENGTHS ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY THE SIGN LOCATIONS AND ACTUAL POST LENGTHS WITH THE ENGINEER PRIOR TO INSTALLING SIGNS.
3. THE BOTTOM OF EACH SIGN SHALL BE AT LEAST 7 FEET ABOVE THE NEAREST EDGE OF PAVEMENT AND AT LEAST 7 FEET ABOVE THE GROUND UNDER THE SIGN.
4. THE OFFSET FOR ALL SIGNS SHALL BE IN ACCORDANCE WITH ADOT STANDARD DRAWING S-3 UNLESS NOTED OTHERWISE ON THE SIGNING SUMMARY. OFFSETS FOR ALL SIGNS SHALL BE MEASURED FROM THE EDGE OF ROADWAY TO THE NEAREST EDGE OF THE SIGN.
5. GROUND MOUNTED SIGN SUPPORTS SHOWN IN ADOT'S SIGNING AND MARKING STANDARD DRAWINGS SHALL BE USED.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL UNDERGROUND UTILITY LOCATIONS WHERE SIGN FOUNDATIONS ARE INSTALLED. UTILITY LOCATIONS ARE NOT SHOWN ON THE SIGNING AND PAVEMENT MARKING PLANS.
7. THE CONTRACTOR SHALL REMOVE EXISTING SIGNING WHERE INDICATED ON THE SIGN SUMMARY. EXISTING SIGNS NOT INDICATED ON THE SIGN SUMMARY SHALL BE REMOVED, RELOCATED, OR PROTECTED IN PLACE, AS DIRECTED BY THE ENGINEER. WHERE SIGNS ARE BEING REMOVED OR REPLACED, THE FOUNDATIONS SHALL BE REMOVED ENTIRELY OR THE FOUNDATION SHALL BE REMOVED A MINIMUM OF TWO FEET BELOW FINISHED GRADE, AS DIRECTED BY THE ENGINEER.
8. THE CONTRACTOR SHALL INVENTORY ALL SIGNS TO BE REMOVED OR COVERED AND NOTE DAMAGED SIGNS TO THE ENGINEER AT THE TIME OF COVERING OR REMOVAL. ALL SIGNS DAMAGED BY COVERING OR REMOVAL SHALL BE REPLACED BY THE CONTRACTOR AT THE CONTRACTORS EXPENSE.
9. THE CONTRACTOR SHALL REPLACE ANY SIGNS, OBJECT MARKERS AND DELINEATORS DAMAGED AS A RESULT OF THE CONSTRUCTION ACTIVITIES AT THE CONTRACTOR'S EXPENSE.
10. ALL OVERHEAD SIGN PANELS AND ANY GROUND MOUNTED SIGN PANELS GREATER THAN 48 INCHES IN THE SMALLEST DIMENSION SHALL BE EXTRUDED ALUMINUM PER ADOT STANDARD SPECIFICATIONS.
11. THE RETROREFLECTIVE SHEETING ON ALL NEW SIGNS SHALL MEET CRITERIA ESTABLISHED IN SECTION 1007 OF THE STANDARD SPECIFICATIONS AND IN SECTION 380 OF ADOT'S TRAFFIC POLICIES, GUIDELINES AND PROCEDURES.
12. ALL NEW SIGNS SHALL BE INSTALLED ON NEW SQUARE TUBE POSTS WITH FOUNDATIONS AS INDICATED IN ADOT STANDARD DRAWINGS.
13. SIGNING MAY BE MODIFIED AS DIRECTED BY THE ENGINEER.
14. SHOP DRAWINGS SHALL BE REQUIRED FOR ALL GUIDE SIGNS.

STRIPING CONSTRUCTION NOTES

1. INSTALL (PERMANENT) PREFORMED THERMOPLASTIC TRAFFIC ARROW PER PLAN AND PER MCDOT PAVEMENT MARKING MANUAL.

STRIPING LEGEND



NO.	DATE	REVISION	BY

PURPOSE:
3RD SUBMITTAL

DESIGN BY:	DJL
DRAWN BY:	DHK
CHECKED BY:	DJL

HUNTER
ENGINEERING
10450 NORTH 74TH STREET,
SUITE 200
SCOTTSDALE, AZ 85258
P 480 991 3985
F 480 991 3986

CIVIL AND SURVEY



SIGNING AND STRIPING PLAN
N. EL MIRAGE ROAD
WESTWING BUSINESS PARK
12300 W. MARIPOSA GRANDE
SUN CITY, ARIZONA 85373



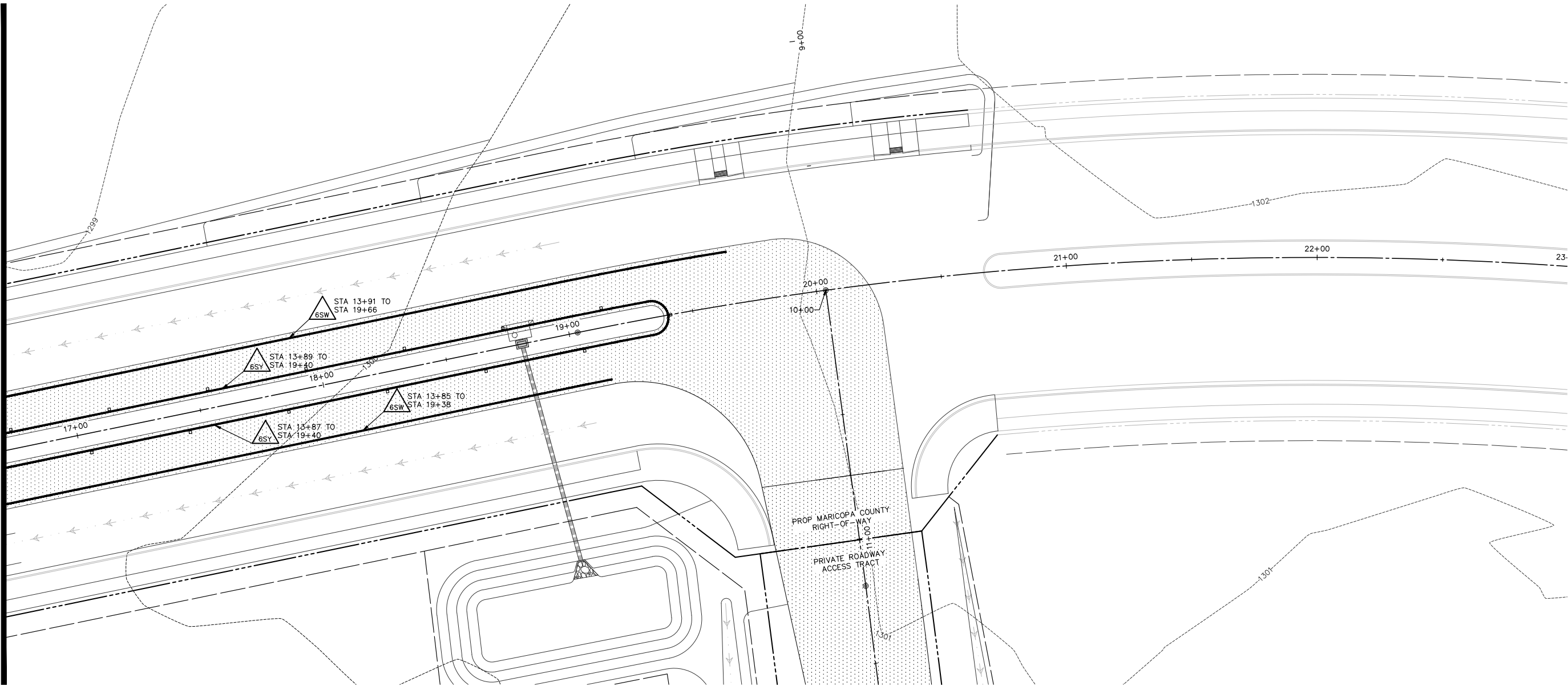
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PROJECT NAME:
WESTWING BUSINESS PARK

HE NO.: SILA001
SCALE: 1"=20'

SHEET:
C2.5

MATCH LINE SEE SHEET C2.5

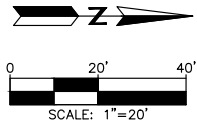


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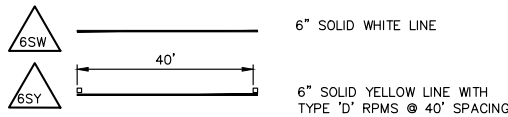
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STRIPING LEGEND



NO.	DATE	REVISION	BY

PURPOSE:
3RD SUBMITTAL

DESIGN BY: DJL
DRAWN BY: DHK
CHECKED BY: DJL

HUNTER
ENGINEERING
10450 NORTH 74TH STREET,
SUITE 200
SCOTTSDALE, AZ 85258
P 480 981 3986
F 480 981 3986

CIVIL AND SURVEY



SIGNING AND STRIPING PLAN
N. EL MIRAGE ROAD
WESTWING BUSINESS PARK
12300 W. MARIPOSA GRANDE
SUN CITY, ARIZONA 85373



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WESTWING
BUSINESS
PARK

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SCALE: 1"=20'

SHEET:
C2.6