

PRELIMINARY DRAINAGE REPORT
FOR
RIVERWALK - VESTING
TENTATIVE MAP NO. 2213361
(PTS NO. 581984)

April 7, 2020



A handwritten signature in black ink, appearing to read "Wayne W. Chang", written over a horizontal line.

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INTRODUCTION

The Riverwalk project (see the Vicinity Map) proposes an amendment to the existing Levi-Cushman Specific Plan to replace the 195-acre Riverwalk property with the Riverwalk Specific Plan and redevelop the existing golf course as a walkable, transit-centric, and modern live-work-play mixed-use neighborhood that features an expansive River Park along the San Diego River. The mix and quantity of land uses would change from what is approved in the existing Levi-Cushman Specific Plan to include 4,300 multi-family residential dwelling units; 152,000 square feet of commercial retail space; 1,000,000 square feet of office and non-retail commercial; approximately 95 acres of park, open space, and trails; adaptive reuse of the existing golf clubhouse into a community amenity; and a new Green Line Trolley stop within the development. Improvements to surrounding public infrastructure and roadways would be implemented as part of the Riverwalk project, including improvements to the Fashion Valley Road crossing of the San Diego River as a 10- to 15-year storm event crossing. The project would also include a habitat restoration effort on-site to create and/or enhance 25.16 acres of native habitats along the San Diego River, within and adjacent to the MHPA, and setting aside area for establishing a future wetland habitat mitigation bank.

The project would establish Irrevocable Offers of Dedication (IODs) for two Community Plan Circulation Element roadways envisioned in the Mission Valley Community Plan Update: future Riverwalk Street “J,” which would cross the San Diego River in a north-south direction; and future Riverwalk Street “U,” which would travel approximately east-west along the southern project site boundary and connect to future Street “J.” Street “J” would be an elevated roadway crossing the river valley. Per the City’s Planning Department, these roads are regional facilities with uncertain funding, design, and construction timing. While these improvements would not be constructed as part of the project, the project would grant the City IODs for the required rights-of-way to construct these roads in the future.

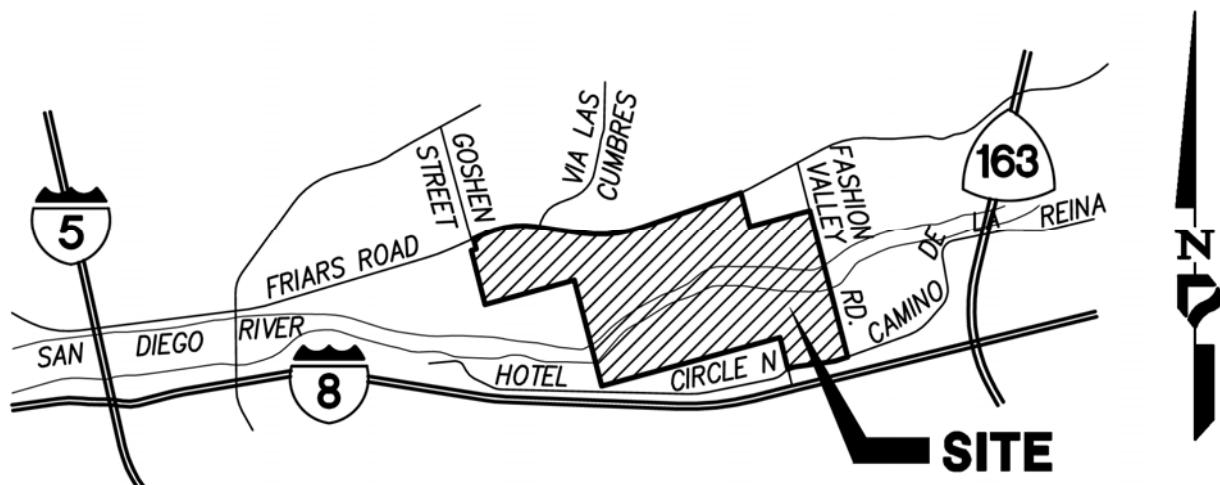


Figure 1. Vicinity Map

Surrounding uses include commercial retail (Fashion Valley Mall) and hotel (Town & Country Resort) east of Fashion Valley Road. Single- and multi-family residential and commercial office developments are located on the north side of Friars Road within the Linda Vista Community

Plan area. The properties west of the site include residential development in the form of condominium complexes and the Mission Valley YMCA. A mix of office, residential, hotel, and Interstate 8 (I-8) are located south of the project site.

Under existing conditions, a large portion of the site is within the San Diego River floodplain and floodway, which is mapped on FEMA's May 16, 2012, Flood Insurance Rate Map No. 06073C1618G (see Figure 2 after this report text). The floodplain and floodway flow in a westerly direction and are primarily south of the trolley. An off-site natural hillside area to north conveys flows to the site via storm drain facilities along Friars Road. The on- and off-site runoff are ultimately conveyed to the San Diego River.

The proposed project will include drainage facilities and water quality best management practices. The facilities will convey the off-site runoff through the site to the river. The off-site runoff will not commingle with the on-site runoff until the on-site runoff is treated. A dual storm drain system will be constructed on-site. One system will primarily convey storm runoff from the development pads, while the other will primarily convey street and adjacent runoff. The project runoff will be treated by biofiltration basins or compact biofiltration BMPs (e.g., Modular Wetland System Linear or equivalent) before discharging towards the river.

The project will impact jurisdictional Waters of the State and Waters of the US, which will require permitting from the US Army Corps of Engineers (Corps), California Dept. of Fish and Wildlife (CDFW), and Regional Water Quality Control Board (RWQCB). The impacts would result from filling of a small drainage in the northeast portion of the site, as well as at the location where improvements to Fashion Valley Road would occur. These impacts are considered unavoidable and have been minimized to the extent practicable. Unavoidable impacts include those necessary to allow reasonable use of a parcel entirely constrained by wetlands, roads where the only access to the developable portion of a site results in impacts to wetlands, and essential public facilities (essential roads like Fashion Valley Road, sewer, water lines, etc.) where no feasible alternative exists. Based on initial communication with the regulatory agencies, it is anticipated that a Federal Clean Water Act Section 404 Nationwide Permit will be required by the Corps, a Section 401 Water Quality Certification by the RWQCB, and a Streambed Alteration Agreement by the CDFW. The actual permitting requirements will be determined through consultation with the regulatory agencies

This preliminary drainage report has been prepared in support of the Vesting Tentative Map by Project Design Consultants. This report provides hydrologic and hydraulic analyses in order to determine preliminary flow rates, analyze the adjacent San Diego River, and demonstrate feasibility as well as compliance with drainage regulations.

HYDROLOGIC RESULTS

The overall proposed condition study area covers just over 306 acres, so the City of San Diego's 2017 *Drainage Design Manual's* rational method procedure was the basis for the proposed condition hydrologic analyses. The CivilDesign Rational Method Hydrology Program is based on the City criteria and was used for the 100-year analyses. Since the project discharges to the

San Diego River, City staff has indicated that detention analyses are not required. As a result, this report only contains proposed condition analyses. The rational method input parameters are summarized below, and the supporting data is included in Appendix A:

- Intensity-Duration-Frequency: The City’s 100-year Intensity-Duration-Frequency curve from the *Drainage Design Manual* was used.
- Drainage area: The proposed condition drainage basins were delineated from the Vesting Tentative Map grading and storm drain layout. The drainage basin boundaries and grading are shown on the Rational Method and HEC-RAS Work Map in the map pocket. The tributary off-site area north of Friars Road was previously analyzed by William A. Steen and Associates. Their analyses are included in Appendix A and were used for the off-site data, which was entered as user-specified input. The off-site analyses shall be confirmed during final engineering. The site was divided into five major basins, 100 to 500, which reflect the five primary discharge areas.
- Hydrologic soil groups: The soil group within the site is entirely ‘D’ according to City criteria.
- Runoff coefficients: Under proposed conditions, the northerly project area will primarily support multi-family residential development, so the so the multi-unit land use was assumed (C=0.70). The southeasterly area will primarily support office uses, so the commercial land use was assumed (C=0.85).
- Flow lengths and elevations: The flow lengths and elevations were obtained from the topographic mapping and grading plan.

The overall 100-year rational method results are included in Appendix A and summarized in Table 1. The results indicate that the flow rates are of a magnitude that can be conveyed by standard drainage facilities. For proposed conditions, the overall flow rates from each of the five major basins was also confluenced. The confluencing will adjust for differences in time of concentration from the five locations.

Major Drainage Basin	Tributary Area, ac	100-Year Flow Rate, cfs
100	121.01	208
200	48.81	70
300	116.14	166
400	6.42	12
500	14.60	43
All	306.98	499

Table 1. Rational Method Summary

HYDRAULIC RESULTS

The project proposes a portion of the mixed-use development and a park site within portions of the floodplain and floodway. A park concept has been developed and the grading is included on the map pocket. The City of San Diego and FEMA's floodplain and floodway regulations apply for floodplain and floodway encroachments. The City's *Municipal Code* outlines the local regulations. The *Municipal Code* generally reflects the FEMA regulations provided in the *Code of Federal Regulations*, although the City can adopt more stringent criteria where they deem necessary. Relevant regulations are as follows:

- *Municipal Code* Section 143.0146(a)(7) states that floodway encroachments including fill, new construction, modifications, and other development are prohibited unless a registered engineer certifies that the encroachments will not increase the base flood (100-year water surface) levels.
- *Municipal Code* Section 143.0146(c)(6) requires new construction or substantial improvement of any structure to have the lower floor elevated at least 2 feet above the base flood elevation, i.e., 2 feet of freeboard over the 100-year water surface elevations.

The project will offset water surface impacts from the floodplain and floodway encroachments by increasing conveyance within the proposed park, i.e., the park area will be widened and/or lowered to provide the offset. Existing and proposed hydraulic analyses were performed using HEC-RAS to estimate the associated water surface elevations. The intent is to show that a concept is feasible that will not increase the 100-year water surface elevations. The existing condition HEC-RAS cross-sections were created from the project's topographic mapping supplemented with SANGIS mapping, while the proposed condition cross-sections were based on the tentative map grading. The cross-section locations, proposed 100-year floodplain, and proposed regulatory floodway are included on the Rational Method and HEC-RAS Work Map in the map pocket.

The additional HEC-RAS parameters are as follows. The FEMA 100-year flow rate of 36,000 cfs was used. The channel roughness was based on current conditions estimated from a site visit and aerial photography as well as potential proposed conditions. The project proposes to increase conveyance at Fashion Valley Road. The current crossing contains six 60-inch reinforced concrete pipes. The current vesting tentative map proposes to replace these with an arch culvert with a 56-foot span (CON/SPAN O-Series 01056 culvert), which will increase capacity.

The HEC-RAS results are included in Appendix B and summarized in Table 2. Comparison of the existing and proposed condition results shows that the grading will not increase the 100-year water surface elevations, so a no-rise condition is feasible. In addition, the water surface elevations upstream of Fashion Valley Road are lowered due to the proposed arch culvert. Since the San Diego River is under subcritical flow, changes at a given location will only impact upstream water surface elevations, not downstream. As a result, the off-site water surface elevations downstream of the project will not be altered or impacted by the project. On the other hand, Table 2 shows that the upstream water surface elevations will be benefited (lowered) by the project since the project causes a decrease just upstream of Fashion Valley Road. Ultimately,

the upstream water surface elevations resulting from the project will match existing conditions. Above this, the project will not alter the off-site water surface elevations.

The current site contains two golf cart/pedestrian crossings (cross-section 24797 and 26944). As mentioned above, the Fashion Valley Road crossing (cross-section 28300) is also being improved with an arch culvert. Additional hydraulic analyses were performed to estimate the capacity of these three crossings. The results are included in Appendix B. They show that westerly golf course bridge can convey about 10,000 cfs under proposed conditions before water reaches the low end of the bridge or just over the 30-year event. The easterly golf course bridge can convey about 20,000 cfs under proposed conditions before water reaches the low end of the bridge or about the 60-year event. The proposed Fashion Valley Road culvert can convey about 4,000 cfs before overtopping the road or about the 12-year event.

CONCLUSION

This preliminary drainage report shows that the project flows are of a magnitude that can be conveyed by typical drainage facilities. Since the project outlets into the San Diego River detention is not required. The timing of flow increases at the site will occur before peak flow in the river. A portion of the golf course within the floodplain and floodway will be redeveloped with the multi-use project and contain a park. Since the project will encroach within the floodway, a no-rise will be met (i.e., no increase in the 100-year water surface elevations downstream of the site, within the site, nor upstream of the site). Hydraulic analyses demonstrate feasibility of developing a park concept that will achieve a no-rise. In addition, improvements to the Fashion Valley Road culverts will increase flow conveyance at the crossing. Finally, the work map delineates the updated 100-year floodplain and floodway. The proposed insurable structures will not be within the revised floodway. The revised floodway will be along the park site, which is allowed. Where the proposed 100-year floodplain and floodway lines are coincident, only the floodplain is delineated. A Conditional Letter of Map Revision and Letter of Map Revision will be prepared and processed through the city of San Diego and FEMA in order to modify the floodplain and floodway.

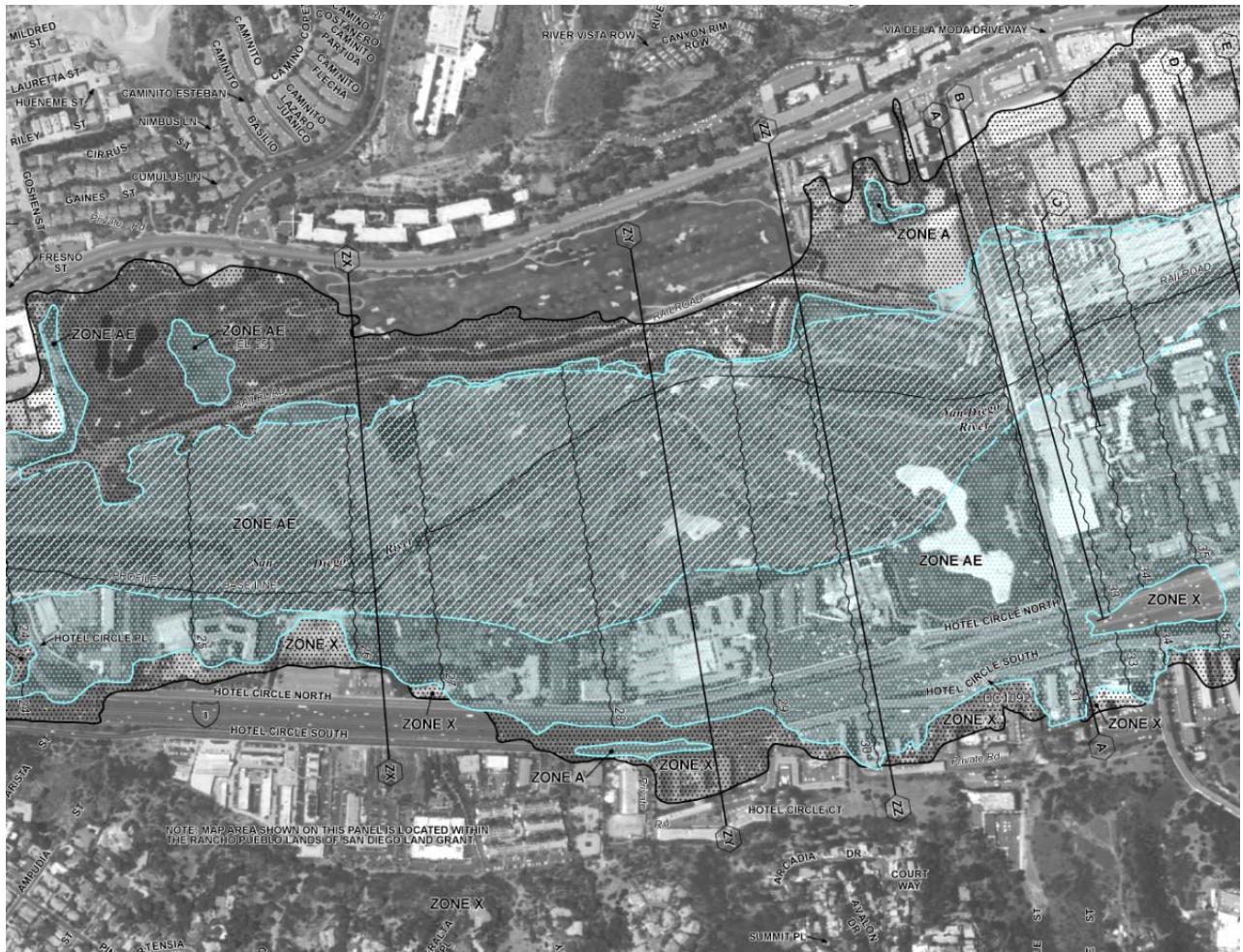


Figure 2. FEMA 100-Year Floodplain and Floodway

River Station	Exist. 100-Year Water Surface Elevations, feet	Prop. Concept 100-Year Water Surface Elevations, feet	Prop. – Exist., feet
28331	30.79	30.46	-0.33
28300	Fashion Valley Road		
28269	29.64	29.18	-0.46
28244	29.74	29.31	-0.43
28164	28.77	28.65	-0.12
28064	28.80	28.44	-0.36
27929	28.75	28.25	-0.50
27759	28.63	27.97	-0.66
27589	28.51	27.98	-0.53
27429	28.33	27.96	-0.37
27259	28.25	27.89	-0.36
27069	28.02	27.60	-0.42
26951	27.96	27.36	-0.60
26944	Easterly Golf Course Bridge		
26937	27.95	27.33	-0.62
26799	27.70	27.16	-0.54
26614	27.50	26.94	-0.56
26379	27.06	26.56	-0.50
26174	26.92	26.34	-0.58
25914	26.78	26.26	-0.52
25654	26.47	26.20	-0.27
25354	26.37	26.14	-0.23
25181	26.27	26.09	-0.18
25001	26.14	26.01	-0.13
24804	26.06	25.97	-0.09
24797	Westerly Golf Course Bridge		
24790	26.03	25.96	-0.07
24581	25.75	25.73	-0.02
24401	25.31	25.28	-0.03
24226	24.98	24.98	0.00
24019	24.62	24.62	0.00
23800	24.21	24.21	0.00
23796	24.13	24.13	0.00
23650	24.17	24.17	0.00
23636	24.05	24.05	0.00
23470	23.78	23.78	0.00
23461	23.76	23.76	0.00
23220	23.60	23.60	0.00
23210	23.17	23.17	0.00
23200	23.00	23.00	0.00
23171	22.60	22.60	0.00
22880	22.36	22.36	0.00
22870	22.53	22.53	0.00
22860	22.08	22.08	0.00
22850	22.15	22.15	0.00

Table 2. Comparison of 100-Year Water Surface Elevations

APPENDIX A

RATIONAL METHOD DATA AND RESULTS

HYDROLOGY AND HYDRAULIC CALCULATIONS

FOR

STARDUST GOLF COURSE


W.O. NO. 950613

DWG. NO. 28076-D

C.U.P. 94-0563

REV. 10-20-97 ADD SHEETS 9a THRU 9e, DELETE SHEET 10
REV. 10-6-97 ADD SHEETS 10a AND 10b, REVISE SHEETS 10 AND 12
REV. 9-16-97 ADD SHEETS 12a THRU 12e


TIGER REPROGRAPHICS 153744

SCALE:	PROJ. ENGR. WILLIAM A. STEEN	 WILLIAM A. STEEN & ASSOCIATES CONSULTING CIVIL ENGINEERS LAND SURVEYING & PLANNING		
DATE 7-11-97	RCE: 18136			
SHEET 1 OF 21	JOB NO. 6000	DR. BY K.A.M.	CK. BY: ZLS.	8580 LA MESA BLVD., SUITE 102, LA MESA, CALIFORNIA 91941 ■ (619) 460-9000 ■ FAX (619) 460-9005 ■

THESE CALCULATIONS WERE PREPARED TO ADDRESS THE OFFSITE DRAINAGE THAT ENTERS THE GOLF COURSE FROM THE DRAINAGE BASINS NORTH OF FRIARS ROAD, CROSSES THE NORTHERLY PORTION OF THE GOLF COURSE, AND IS TRANSMITTED UNDER THE MTDB MISSION VALLEY WEST LRT EXTENSION THROUGH THE PROPOSED STORM DRAIN CULVERTS. THE PROPOSED STORM DRAIN CULVERTS WERE SIZED TO ACCOMODATE THIS OFFSITE DRAINAGE PLUS THE DRAINAGE FROM A COMMERCIAALLY DEVELOPED SITE, IN THE EVENT THAT THE NORTHERLY PORTION OF THE GOLF COURSE IS SO DEVELOPED IN THE FUTURE.

THE MAJORITY OF THE GOLF COURSE IS INUNDATED BY THE SAN DIEGO RIVER DURING MAJOR STORM EVENTS. THEREFORE, NO CALCULATIONS WERE PREPARED FOR THE OTHER PRIVATE STORM DRAINS AS THEIR PRIMARY FUNCTION IS TO FACILITATE THE DRAINAGE OF THE GOLF COURSE AFTER THESE MAJOR STORM EVENTS AND TO ELIMINATE PONDING DURING SMALL LOCAL STORM EVENTS.

TIGER REPROGRAPHICS 145492

SCALE:	PROJ. ENGR.			 WILLIAM A. STEEN & ASSOCIATES <small>CONSULTING CIVIL ENGINEERS LAND SURVEYING & PLANNING</small>
DATE 7-11-97	RCE:			
SHEET 2 OF 21	JOB NO. 0600	DR. BY K.A.M.	CK. BY: Z.L.S.	<small>8580 LA MESA BLVD., SUITE 102, LA MESA, CALIFORNIA 92041 ■ (619) 460-9000 ■ FAX (619) 460-9005 ■</small>

WEST BASIN:

DESTINATION: PROPOSED STORM DRAIN CULVERT NEAR HOLE 3V TEES
AND EXISTING 24" RCP CULVERT NEAR HOLE 2V
TURNING POINT NUMBER 1

BASIN W-1:

DESTINATION: EXISTING 24" RCP CULVERT IN FRIARS ROAD THEN
PROPOSED STORM DRAIN CULVERT NEAR HOLE 3V
TEES

$A_T = 18.6 \text{ AC}$, $C_T = 0.55$ (USE FOR LARGE UNDEVELOPED AREAS)

URBAN OVERLAND FLOW:

$L = 440'$, $S = (247 - 245) / 440 = 0.5\%$

USE: $C = 0.85$

$T_c \approx 1.8(1.1 - C)D^{1/2} / S^{1/3} = 11.9 \text{ MIN}$

$I_{100} = 3.2 \text{ IN/HR}$

$A = 0.9 \text{ AC}$

$Q_{100} = CI_{100}A = 2.4 \text{ CFS}$

CHANNEL FLOW:

$L = 220'$, $S = (245 - 188) / 220 = 25.9\%$

ASSUME: TRAPEZOIDAL SECTION, 5' BOTTOM WIDTH, 4:1 SIDE SLOPES,
 $n = 0.040$

$b^{8/3} = 73.10$, $S^{1/2} = 0.5089$, $K' = Qn / b^{8/3} S^{1/2} = 0.00258$

$D/b = 0.0215$, $D = 0.11'$

$A = bD + 2D^2 = 0.57 \text{ SF}$

$V = Q/A = 4.2 \text{ FPS}$


$T_c = 11.9 + 220 / 4.2(60) = 12.8 \text{ MIN}$

$I_{100} = 3.1 \text{ IN/HR}$

$A = 0.2 \text{ AC}$

USE: $C = 0.45$

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BASIN W-1 (CONT.):

$$Q_{100} = 3.1(2.4)/3.2 + 0.3 = 2.6 \text{ CFS}$$

GUTTER FLOW:

$$L = 1405', \quad S = (188 - 37)/1405 = 10.7\%$$

ASSUME: $Q_{AV} = 10 \text{ CFS}$

$$V = 7.8 \text{ FPS}$$

$$T_c = 12.8 + 1405/7.8(60) = 15.8 \text{ MIN}$$

$$I_{100} = 2.8 \text{ IN/HR}$$

$$A = 17.5 \text{ AC}$$

$$Q_{100} = 2.8(2.6)/3.1 + 27.0 = 29.3 \text{ CFS}$$

PIPE FLOW (SEE DWG. 13095-D AND 17923-D):

$$L = 936', \quad S = 0.46\%$$

24" RCP, $n = 0.013$

$$d^{8/3} = 6.350, \quad S^{1/2} = 0.0678, \quad K' = Qn/d^{8/3} S^{1/2} = 0.885$$

$K'_{max} = 0.498 < K' = 0.885 \therefore Q_{100} = 29.3 \text{ CFS}$ IS GREATER THAN THE CAPACITY OF A 24" RCP CULVERT WITHOUT ENTRANCE HEAD

AVAILABLE HEAD = 3.5' ±, $HW/D = 2.75$

$$Q_{max} = 36 \text{ CFS} > Q_{100} = 29.3 \text{ CFS} \therefore \text{OK}$$

$$A = \pi D^2/4 = 3.14 \text{ SF}$$

$$V = Q/A = 9.3 \text{ FPS}$$

$$T_c = 15.8 + 936/9.3(60) = 17.5 \text{ MIN}$$

$$I_{100} = 2.7 \text{ IN/HR}$$

$$Q_{100} = 2.7(29.3)/2.8 = 28.3 \text{ CFS}$$

PIPE FLOW (PROPOSED):

$$L = 75', \quad S = (17 - 13.7)/75 = 4.4\%$$

ASSUME: 24" RCP CULVERT, $n = 0.013$

$$d^{8/3} = 6.350, \quad S^{1/2} = 0.2098, \quad K' = 0.276$$

$$D/d = 0.5563, \quad D = 1.11'$$

SCALE:	PROJ. ENGR.		
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SHEET 4 OF 21	JOB NO. 6600	DR. BY K.D.M.	CK. BY: ZLS.



BASIN W-1 (CONT.):

$V = 15.8 \text{ FPS}$

$T_c = 17.5 + 75/15.8(60) = 17.6 \text{ MIN}$

$I_{100} = 2.7 \text{ IN/HR}$

$Q_{100} = 2.7(28.3)/2.7 = 28.3 \text{ CFS}$

BASIN W-2:

DESTINATION: EXISTING 12" ACP CULVERT ALONG COURTYARD
CONDOMINIUM EASTERLY PROPERTY LINE THEN PROPOSED
STORM DRAIN CULVERT NEAR HOVE 3V TEES

$A_T = 0.6 \text{ AC}, C_T = 0.70$

URBAN OVERLAND FLOW:

$L = 435', S = (29 - 24)/435 = 1.17\%$

$T_c = 14.5 \text{ MIN}$

$I_{100} = 2.95 \text{ IN/HR}$

$Q_{100} = 1.2 \text{ CFS}$

PIPE FLOW (SEE DWG. 17923-D):

$L = 348', S = 1.047\%$

12" ACP, $n = 0.013$

$d^{8/3} = 1.000, S^{1/2} = 0.1020, K' = 0.1529$

$D/d = 0.3955, D = 0.40'$

$V = 4.2 \text{ FPS}$

$T_c = 14.5 + 348/4.2(60) = 15.9 \text{ MIN}$

$I_{100} = 2.8 \text{ IN/HR}$

$Q_{100} = 2.8(1.2)/2.95 = 1.1 \text{ CFS}$


PIPE FLOW (PROPOSED):

$L = 65', S = (17 - 13.7)/65 = 5.17\%$

ASSUME: 12" PVC CULVERT, $n = 0.013$

$d^{8/3} = 1.000, S^{1/2} = 0.2258, K' = 0.0633$

TIGER REPROGRAPHICS 145492

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BASIN W-2 (CONT.):

$$D/d = 0.2498, \quad D = 0.25'$$

$$V = 7.2 \text{ FPS}$$

$$T_c = 15.9 + 65/7.2(60) = 16.1 \text{ MIN}$$

$$I_{100} = 2.8 \text{ IN/HR}$$

$$Q_{100} = 2.8(1.1)/2.8 = 1.1 \text{ CFS}$$

BASIN W-3:

DESTINATION: EXISTING 42" RCP CULVERT IN FRIARS ROAD THEN

PROPOSED STORM DRAIN CULVERT NEAR HOLE 3V TEES
 $A_T = 77.4 \text{ AC}, \quad C_T = 0.55$ (USE FOR LARGE UNDEVELOPED AREAS)

URBAN OVERLAND FLOW:

$$L = 215', \quad S = (271 - 265)/215 = 2.8\%$$

$$\text{USE: } C = 0.85$$

$$T_c = 4.7 \text{ MIN} \therefore \text{USE } T_c = 5 \text{ MIN}$$

$$I_{100} = 4.4 \text{ IN/HR}$$

$$A = 0.8 \text{ AC}$$

$$Q_{100} = 3.0 \text{ CFS}$$

GUTTER FLOW:

$$L = 1600', \quad S = (265 - 114)/1600 = 9.4\%$$

ASSUME: $Q_{RT} = 10 \text{ CFS}$

$$V = 7.3 \text{ FPS}$$

$$T_c = 5 + 1600/7.3(60) = 8.7 \text{ MIN}$$

$$I_{100} = 3.65 \text{ IN/HR}$$

$$A = 9.5 \text{ AC}$$

$$Q_{100} = 3.65(3.0)/4.4 + 19.1 = 21.6 \text{ CFS}$$

PIPE FLOW (SEE DWG. 14044-D):

$$L = 195', \quad S = (114 - 77)/195 = 19.0\%$$

$$18" \text{ RCP}, \quad n = 0.013$$

BASIN W-3 (CONT.):

$$d^{8/3} = 2.948, S^{1/2} = 0.4359, K' = 0.2185$$

$$D/d = 0.4832, D = 0.72'$$

$$V = 25.5 \text{ FPS}$$

$$T_c = 8.7 + 195/25.5(60) = 8.8 \text{ MIN}$$

$$I_{100} = 3.6 \text{ IN/HR}$$

$$A = 0.1 \text{ AC}$$

$$\text{USE: } C = 0.45$$

$$Q_{100} = 3.6(21.6)/3.65 + 0.2 = 21.5 \text{ CFS}$$

BROW DITCH FLOW:

$$L = 90', S = (77 - 65)/90 = 13.3\%$$

ASSUME: CIRCULAR SECTION, 2' TOP WIDTH, $n = 0.018$

$$d^{8/3} = 6.350, S^{1/2} = 0.3647, K' = 0.1671$$

$$D/d = 0.4152, D = 0.83'$$

$$V = 17.4 \text{ FPS}$$

$$T_c = 8.8 + 90/17.4(60) = 8.9 \text{ MIN}$$

$$I_{100} = 3.6 \text{ IN/HR}$$

$$A = 0.1 \text{ AC}$$

$$\text{USE: } C = 0.45$$

$$Q_{100} = 3.6(21.5)/3.6 + 0.2 = 21.7 \text{ CFS}$$

PIPE FLOW (SEE DWG. 14003-D AND 13095-D):

$$L = 1195', S = (65 - 35)/1195 = 2.5\%$$

USE: 24" RCP, $n = 0.013$

$$d^{8/3} = 6.350, S^{1/2} = 0.1581, K' = 0.281$$

$$D/d = 0.5625, D = 1.13'$$

$$V = 11.9 \text{ FPS}$$

$$T_c = 8.9 + 1195/11.9(60) = 10.6 \text{ MIN}$$

$$I_{100} = 3.35 \text{ IN/HR}$$

TIGER REPROGRAPHICS 145492

SCALE:	PROJ. ENGR.		
DATE 7-11-97	RCE:		
SHEET 7 OF 21	JOB NO. 6000	DR. BY K.O.M.	CK. BY: Z.L.S.



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BASIN W-3 (CONT.):

$$A = 60.9 \text{ AC}$$

$$Q_{100} = 3.35(21.7)/3.0 + 123.3 = 143.5 \text{ CFS}$$

PIPE FLOW (FUTURE WITH COMMERCIALY DEVELOPED SITE):

$$L = 1350', \quad S = (30 - 13.7)/1350 = 1.27$$

ASSUME: 48" RCP CULVERT, $n = 0.013$

$$d^{8/3} = 40.317, \quad s^{1/2} = 0.1095, \quad K' = 0.423$$

$$D/d = 0.7514, \quad D = 3.01'$$

$$V = 14.2 \text{ FPS}$$

$$T_c = 10.6 + 1350/14.2(60) = 12.2 \text{ MIN}$$

$$I_{100} = 3.2 \text{ IN/HR}$$

$$Q_{100} = 3.2(143.5)/3.35 = 137.1 \text{ CFS}$$

BASIN W-4:

DESTINATION: PROPOSED STORM DRAIN CULVERT NEAR HOLE 3V TEES
AND EXISTING 24" RCP CULVERT NEAR HOLE 2V
TURNING POINT NUMBER 1

ASSUME: - NORTHERLY PORTION OF THE GOLF COURSE IS DIVIDED INTO
THREE BASINS BASED UPON PROPORTIONING THE FRIARS
ROAD FRONTAGE INTO APPROXIMATELY EQUAL THIRDS.
- BASIN WILL BE DEVELOPED AS A COMMERCIAL SITE.
- LONGEST TIME OF CONCENTRATION WILL BE FROM AN
OFFSITE DRAINAGE BASIN.
- EXISTING 24" RCP CULVERT AT 0.746% PER MTDB MISSION
VALLEY WEST LTR, EXTENSION PLANS IS INEFFICIENT AND
WILL BE USED FOR NUISANCE FLOW ONLY AND THEREFORE,
IGNORED FOR THESE CALCULATIONS.

$$A_T = 25.3 \text{ AC}, \quad C_T = 0.85$$

SCALE:	PROJ. ENGR.		
DATE 7-11-97	RCE:		
SHEET 8 OF 21	JOB NO. 0600	DR. BY K.M.	CK. BY Z.L.S.



MIDDLE BASIN:

DESTINATION: PROPOSED STORM DRAIN CULVERT APPROXIMATELY
310' SOUTHEASTERLY OF HOLE IN GREEN

BASIN M-1:

DESTINATION: EXISTING 24" RCP CULVERT IN FRIARS ROAD THEN
PROPOSED STORM DRAIN CULVERT APPROXIMATELY
310' SOUTHEASTERLY OF HOLE IN GREEN

$A_T = 26.6 \text{ AC}$, $C_T = 0.55$ (USE FOR LARGE UNDEVELOPED AREAS)

URBAN OVERLAND FLOW:

$L = 410'$, $S = (279 - 274) / 410 = 1.2\%$

$T_c = 18.9 \text{ MIN}$

$I_{100} = 2.5 \text{ IN/HR}$

$A = 1.5 \text{ AC}$

$Q_{100} = 2.1 \text{ CFS}$

CHANNEL FLOW:

$L = 1200'$, $S = (274 - 80) / 1200 = 16.2\%$

ASSUME: TRAPEZOIDAL SECTION, 5' BOTTOM WIDTH, 2:1 SIDE SLOPES,

$n = 0.04$, $Q_{AV} = 10 \text{ CFS}$

$b^{8/15} = 73.10$, $S^{1/2} = 0.4025$, $K' = 0.01359$

$D/b = 0.0586$, $D = 0.29'$

$A = 1.62 \text{ SF}$

$V = 6.2 \text{ FPS}$

$T_c = 18.9 + 1200 / 6.2(60) = 22.1 \text{ MIN}$

$I_{100} = 2.35 \text{ IN/HR}$

$A = 16.2 \text{ AC}$

$Q_{100} = 2.35(2.1) / 2.5 + 20.9 = 22.9 \text{ CFS}$

PIPE FLOW (SEE DWG. 14003-D AND 13095-D):

$L = 945'$, $S = (80 - 50) / 945 = 3.2\%$

TIGER REPROGRAPHICS 145492

SCALE:	PROJ. ENGR.			
DATE 7-11-97	RCE:			
SHEET 13 OF 21	JOB NO. 6600	DR. BY K.O.M.	CK. BY: Z.C.S.	



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BASIN M-1 (CONT.):

USE: 24" RCP, $n=0.013$

$$d^{8/3} = 6.350, S^{1/2} = 0.1789, K' = 0.262$$

$$D/d = 0.5388, D = 1.08'$$

$$V = 13.3 \text{ FPS}$$

$$T_c = 22.1 + 945/13.3(60) = 23.3 \text{ min}$$

$$I_{100} = 2.3 \text{ IN/HR}$$

$$A = 8.9 \text{ AC}$$

$$Q_{100} = 2.3(22.9)/2.35 + 11.3 = 33.7 \text{ CFS}$$

PIPE FLOW (FUTURE WITH COMMERCIALY DEVELOPED SITE):

$$L = 445', S = (50 - 23.3)/445 = 6.0\%$$

ASSUME: 36" RCP CULVERT, $n=0.013$

$$d^{8/3} = 18.721, S^{1/2} = 0.2449, K' = 0.0956$$

$$D/d = 0.3083, D = 0.92'$$

$$V = 18.2 \text{ FPS}$$

$$T_c = 23.3 + 445/18.2(60) = 23.7 \text{ min}$$

$$I_{100} = 2.3 \text{ IN/HR}$$

$$Q_{100} = 2.3(33.7)/2.3 = 33.7 \text{ CFS}$$

BASIN M-2:

DESTINATION: PROPOSED STORM DRAIN CULVERT APPROXIMATELY

310' SOUTHEASTERLY OF HOLE IN GREEN

ASSUME: - NORTHERLY PORTION OF THE GOLF COURSE IS DIVIDED INTO THREE BASINS BASED UPON PROPORTIONING THE FRIARS ROAD FRONTAGE INTO APPROXIMATELY EQUAL THIRDS.

- BASIN WILL BE DEVELOPED AS A COMMERCIAL SITE.

- LONGEST TIME OF CONCENTRATION WILL BE FROM THE OFFSITE DRAINAGE BASIN.

$$A_T = 20.5 \text{ AC}, C_T = 0.85$$

EAST BASIN:

DESTINATION: PROPOSED STORM DRAIN CULVERT NEAR HOLE 9V TEES

BASIN E-1:

DESTINATION: EXISTING 36" RCP CULVERT IN FRIARS ROAD THEN
PROPOSED STORM DRAIN CULVERT NEAR HOLE 9V TEES

$A_T = 89.0 \text{ AC}, C_T = 0.55$

URBAN OVERLAND FLOW:

$L = 120', S = 1\%$

$T_c = 10.8 \text{ min}$

$I_{100} = 3.35 \text{ IN/HR}$

$A = 0.1 \text{ AC}$

$Q_{100} = 0.2 \text{ CFS}$

GUTTER FLOW:

$L = 2575', S = (327 - 215) / 2575 = 4.3\%$

ASSUME: $Q_{AV} = 10 \text{ CFS}$

$V = 5.4 \text{ FPS}$

$T_c = 10.8 + 2575 / 5.4(60) = 18.7 \text{ min}$

$I_{100} = 2.6 \text{ IN/HR}$

$A = 14.5 \text{ AC}$

$Q_{100} = 2.6(0.2) / 3.35 + 20.7 = 20.9 \text{ CFS}$

PIPE FLOW (SEE DWG. 15418-D, 24523-D, 14408-D, AND 13095-D):

$L = 1690', S = (215 - 55) / 1690 = 9.5\%$

USE: 30" RCP, $n = 0.013$, $Q_{AV} = 60 \text{ CFS}$

$d^{8/5} = 11.513$, $S^{1/2} = 0.3082$, $K_1 = 0.2198$


$D/d = 0.4849$, $D = 1.21'$

$V = 25.4 \text{ FPS}$

$T_c = 18.7 + 1690 / 25.4(60) = 19.8 \text{ min}$

$I_{100} = 2.5 \text{ IN/HR}$

TIGER REPROGRAPHICS 145482

SCALE:	PROJ. ENGR.	 WILLIAM A. STEEN & ASSOCIATES CONSULTING CIVIL ENGINEERS LAND SURVEYING & PLANNING		
DATE 7-11-97	RCE:			
SHEET 18 OF 21	JOB NO. 6600	DR. BY K.A.M.	CK. BY Z.L.S.	8580 LA MESA BLVD., SUITE 102, LA MESA, CALIFORNIA 92041 ■ (619) 460-9000 ■ FAX (619) 460-9005 ■

BASIN E-1 (CONT.):

$$A = 74.4 \text{ AC}$$

$$Q_{100} = 2.5(20.9)/2.6 + 102.3 = 122.4 \text{ CFS}$$

PIPE FLOW (FUTURE WITH COMMERCIALY DEVELOPED SITE):

$$L = 775', \quad S = (50 - 26.5)/775 = 3.0\%$$

ASSUME: 42" RCP CULVERT, $n = 0.013$

$$d^{8/3} = 28.239, \quad S^{1/2} = 0.1732, \quad K' = 0.325$$

$$D/d = 0.6175, \quad D = 2.16'$$

$$V = 19.6 \text{ FPS}$$

$$T_c = 19.8 + 775/19.6(60) = 20.5 \text{ MIN}$$

$$I_{100} = 2.45 \text{ IN/HR}$$

$$Q_{100} = 2.45(122.4)/2.5 = 120.0 \text{ CFS}$$

BASIN E-2:

DESTINATION: PROPOSED STORM DRAIN CULVERT NEAR HOLE 9V TEES

ASSUME: - NORTHERLY PORTION OF GOLF COURSE IS DIVIDED INTO

THREE BASINS BASED UPON PROPORTIONING THE FRIARS ROAD FRONTAGE INTO APPROXIMATELY EQUAL THIRDS.

- BASIN WILL BE DEVELOPED AS A COMMERCIAL SITE.

- LONGEST TIME OF CONCENTRATION WILL BE FROM THE OFFSITE DRAINAGE BASIN.

$$A_T = 14.9 \text{ AC}, \quad C_T = 0.85$$

BASIN E-1:

$$T_c = 20.5 \text{ MIN}, \quad I_{100} = 2.45 \text{ IN/HR}, \quad Q_{100} = 120.0 \text{ CFS}$$

$$Q_{100} = Q_{E-1} + Q_{E-2}$$

$$= 120.0 + 0.85(2.45)(14.9)$$

$$Q_{100} = 151.0 \text{ CFS}$$

SCALE:	PROJ. ENGR.		
DATE 7-11-97	RCE:		
SHEET 19 OF 21	JOB NO. 6600	DR. BY K.O.M.	CK. BY Z.L.S.

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type ⁽¹⁾
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than 1/2 acre)	0.45
Commercial ⁽²⁾	
80% Impervious	0.85
Industrial ⁽²⁾	
90% Impervious	0.95

Note:

⁽¹⁾ Type D soil to be used for all areas.

⁽²⁾ Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

$$\begin{aligned}
 \text{Actual imperviousness} &= 50\% \\
 \text{Tabulated imperviousness} &= 80\% \\
 \text{Revised C} &= (50/80) \times 0.85 = 0.53
 \end{aligned}$$

The values in Table A-1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_c for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_c calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).



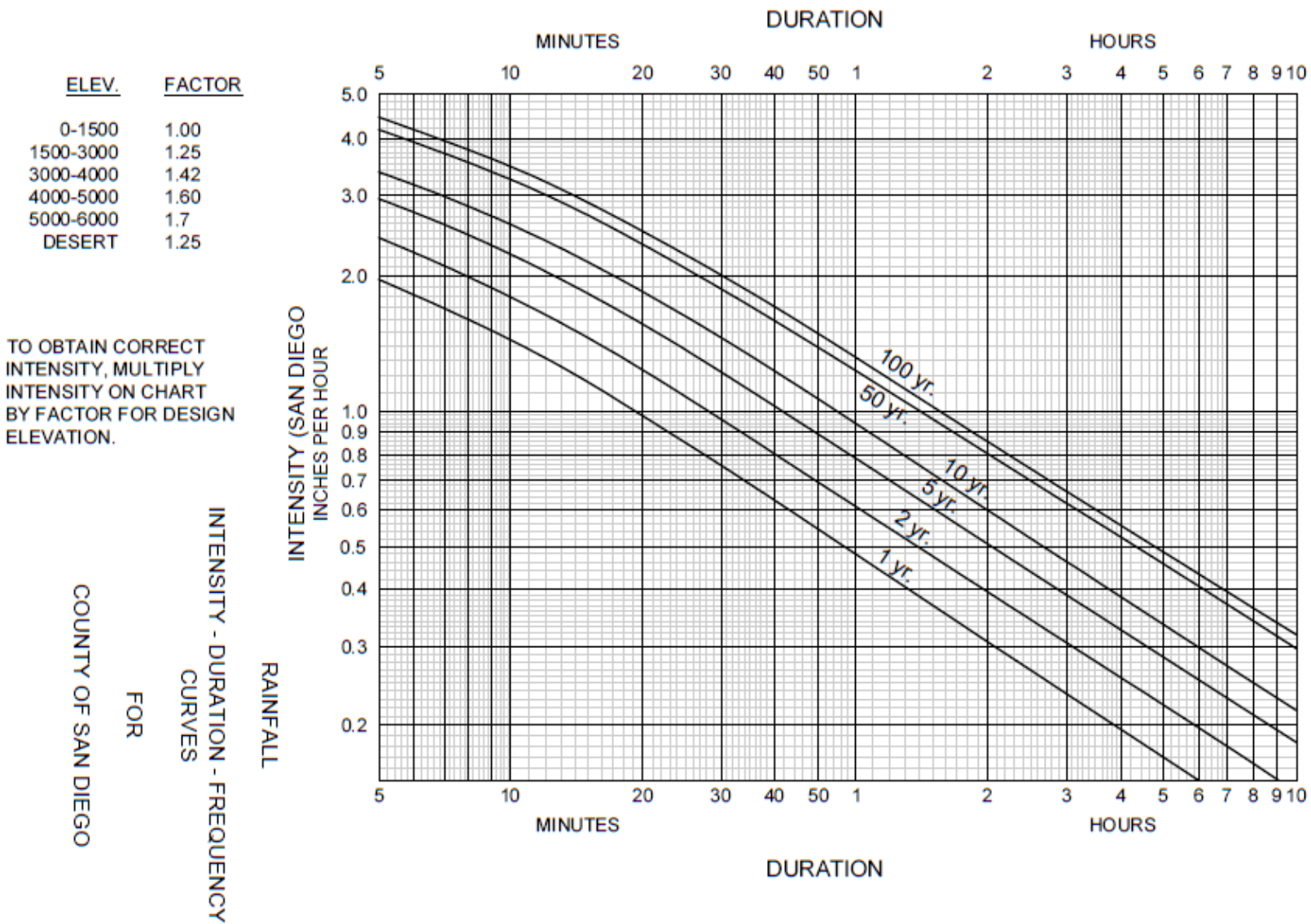


Figure A-1. Intensity-Duration-Frequency Design Chart



APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD

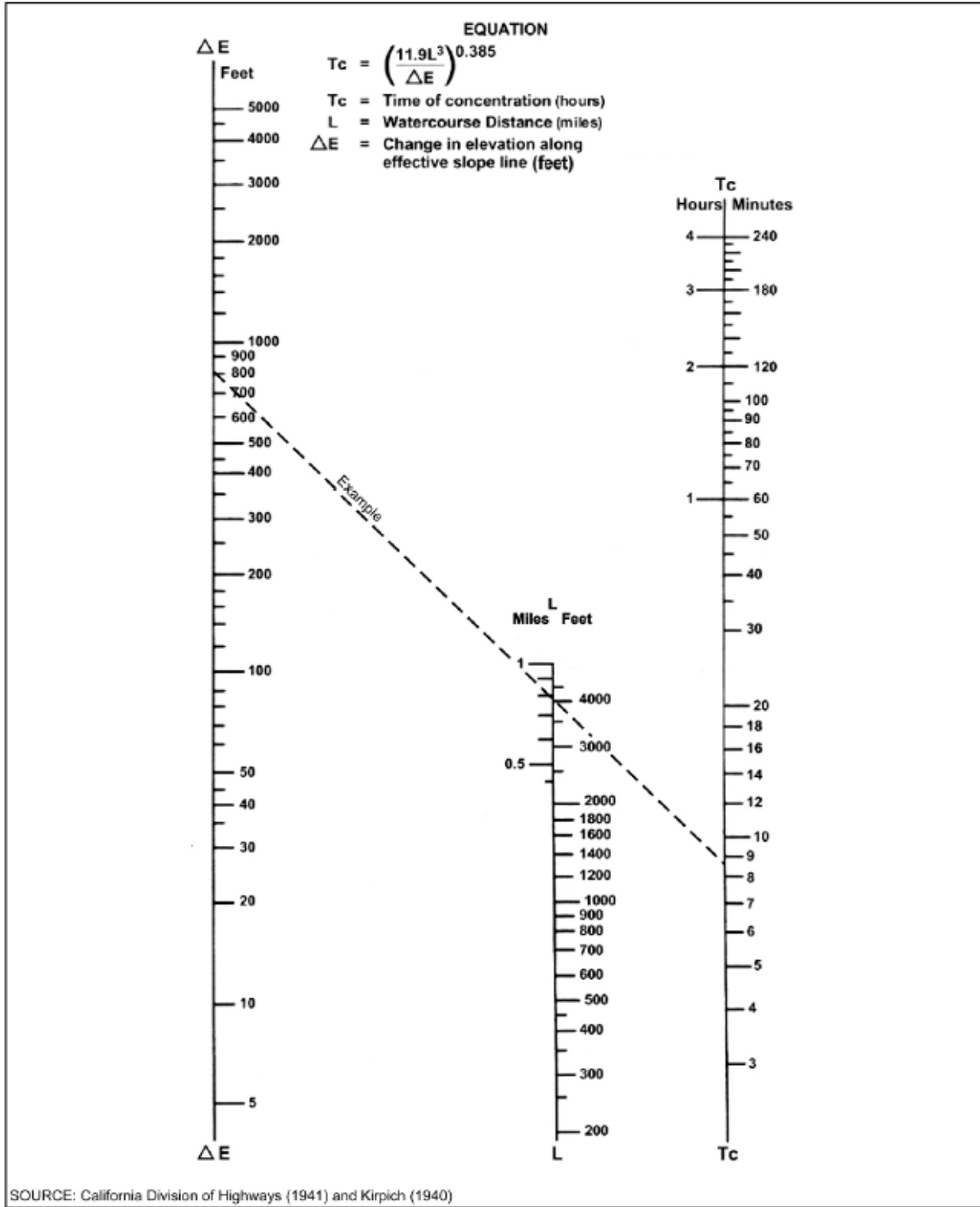


Figure A-2. Nomograph for Determination of T_c for Natural Watersheds

Note: Add ten minutes to the computed time of concentration from Figure A-2.



APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD

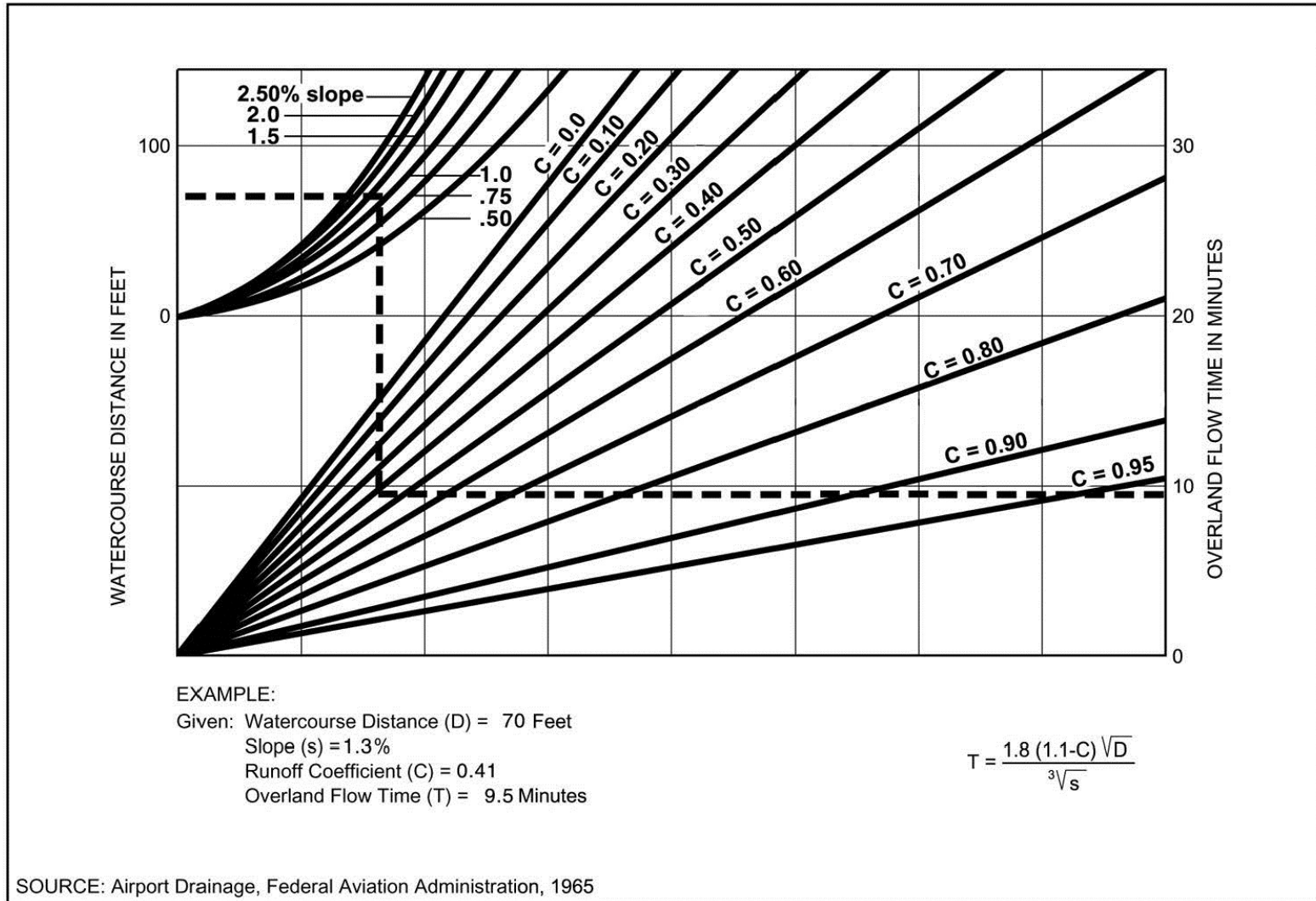


Figure A-4. Rational Formula - Overland Time of Flow Nomograph

Note: Use formula for watercourse distances in excess of 100 feet.

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 04/03/20

Riverwalk
Tentative Map
Proposed Conditions
100-Year Storm Event

***** Hydrology Study Control Information *****

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

Process from Point/Station 100.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 248.000(Ft.)
Highest elevation = 47.000(Ft.)
Lowest elevation = 44.500(Ft.)
Elevation difference = 2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 11.31 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*(248.000^0.5)/(1.008^(1/3))]= 11.31
Rainfall intensity (I) = 3.227(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700

Subarea runoff = 1.739(CFS)
Total initial stream area = 0.770(Ac.)

Process from Point/Station 102.000 to Point/Station 104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 33.400(Ft.)
Downstream point/station elevation = 31.900(Ft.)
Pipe length = 152.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.739(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 1.739(CFS)
Normal flow depth in pipe = 5.94(In.)
Flow top width inside pipe = 12.00(In.)
Critical Depth = 6.73(In.)
Pipe flow velocity = 4.49(Ft/s)
Travel time through pipe = 0.56 min.
Time of concentration (TC) = 11.87 min.

Process from Point/Station 106.000 to Point/Station 104.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 11.87 min.
Rainfall intensity = 3.170(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.329(CFS) for 1.500(Ac.)
Total runoff = 5.068(CFS) Total area = 2.27(Ac.)

Process from Point/Station 104.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 31.900(Ft.)
Downstream point/station elevation = 29.900(Ft.)
Pipe length = 198.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.068(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 5.068(CFS)
Normal flow depth in pipe = 9.97(In.)
Flow top width inside pipe = 14.16(In.)
Critical Depth = 10.96(In.)
Pipe flow velocity = 5.85(Ft/s)

Travel time through pipe = 0.56 min.
Time of concentration (TC) = 12.44 min.

++++
Process from Point/Station 110.000 to Point/Station 108.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 12.44 min.
Rainfall intensity = 3.117(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 4.102(CFS) for 1.880(Ac.)
Total runoff = 9.170(CFS) Total area = 4.15(Ac.)

++++
Process from Point/Station 108.000 to Point/Station 112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 29.900(Ft.)
Downstream point/station elevation = 28.700(Ft.)
Pipe length = 112.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.170(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 9.170(CFS)
Normal flow depth in pipe = 12.68(In.)
Flow top width inside pipe = 16.43(In.)
Critical Depth = 14.05(In.)
Pipe flow velocity = 6.90(Ft/s)
Travel time through pipe = 0.27 min.
Time of concentration (TC) = 12.71 min.

++++
Process from Point/Station 114.000 to Point/Station 112.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 12.71 min.
Rainfall intensity = 3.092(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 2.727(CFS) for 1.260(Ac.)
Total runoff = 11.898(CFS) Total area = 5.41(Ac.)

+++++
Process from Point/Station 112.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 28.700(Ft.)
Downstream point/station elevation = 27.200(Ft.)
Pipe length = 106.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.898(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 11.898(CFS)
Normal flow depth in pipe = 14.04(In.)
Flow top width inside pipe = 14.91(In.)
Critical Depth = 15.72(In.)
Pipe flow velocity = 8.05(Ft/s)
Travel time through pipe = 0.22 min.
Time of concentration (TC) = 12.93 min.

+++++
Process from Point/Station 118.000 to Point/Station 116.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 12.93 min.
Rainfall intensity = 3.073(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.635(CFS) for 1.690(Ac.)
Total runoff = 15.533(CFS) Total area = 7.10(Ac.)

+++++
Process from Point/Station 116.000 to Point/Station 120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 27.200(Ft.)
Downstream point/station elevation = 25.800(Ft.)
Pipe length = 138.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 15.533(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 15.533(CFS)
Normal flow depth in pipe = 16.73(In.)
Flow top width inside pipe = 16.90(In.)
Critical Depth = 17.47(In.)
Pipe flow velocity = 7.56(Ft/s)
Travel time through pipe = 0.30 min.
Time of concentration (TC) = 13.23 min.

+++++
Process from Point/Station 122.000 to Point/Station 120.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.23 min.
Rainfall intensity = 3.046(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 0.277(CFS) for 0.130(Ac.)
Total runoff = 15.810(CFS) Total area = 7.23(Ac.)

+++++
Process from Point/Station 120.000 to Point/Station 124.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 25.800(Ft.)
Downstream point/station elevation = 24.400(Ft.)
Pipe length = 131.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 15.810(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 15.810(CFS)
Normal flow depth in pipe = 16.59(In.)
Flow top width inside pipe = 17.10(In.)
Critical Depth = 17.60(In.)
Pipe flow velocity = 7.76(Ft/s)
Travel time through pipe = 0.28 min.
Time of concentration (TC) = 13.51 min.

+++++
Process from Point/Station 126.000 to Point/Station 124.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.51 min.
Rainfall intensity = 3.023(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.279(CFS) for 1.550(Ac.)
Total runoff = 19.090(CFS) Total area = 8.78(Ac.)

+++++
Process from Point/Station 124.000 to Point/Station 128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 24.400(Ft.)
Downstream point/station elevation = 21.900(Ft.)
Pipe length = 241.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.090(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 19.090(CFS)
Normal flow depth in pipe = 16.66(In.)
Flow top width inside pipe = 22.11(In.)
Critical Depth = 18.86(In.)
Pipe flow velocity = 8.20(Ft/s)
Travel time through pipe = 0.49 min.
Time of concentration (TC) = 14.00 min.

+++++
Process from Point/Station 124.000 to Point/Station 128.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 8.780(Ac.)
Runoff from this stream = 19.090(CFS)
Time of concentration = 14.00 min.
Rainfall intensity = 2.982(In/Hr)

+++++
Process from Point/Station 130.000 to Point/Station 130.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.550 given for subarea
Rainfall intensity (I) = 3.139(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 12.20 min. Rain intensity = 3.14(In/Hr)
Total area = 77.400(Ac.) Total runoff = 137.100(CFS)

+++++
Process from Point/Station 130.000 to Point/Station 132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 26.990(Ft.)
Downstream point/station elevation = 23.300(Ft.)
Pipe length = 434.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 137.100(CFS)
Nearest computed pipe diameter = 48.00(In.)
Calculated individual pipe flow = 137.100(CFS)
Normal flow depth in pipe = 41.06(In.)
Flow top width inside pipe = 33.76(In.)

Critical Depth = 41.81(In.)
Pipe flow velocity = 11.98(Ft/s)
Travel time through pipe = 0.60 min.
Time of concentration (TC) = 12.80 min.

Process from Point/Station 134.000 to Point/Station 132.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 12.80 min.
Rainfall intensity = 3.084(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.475(CFS) for 1.610(Ac.)
Total runoff = 140.575(CFS) Total area = 79.01(Ac.)

Process from Point/Station 136.000 to Point/Station 132.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 12.80 min.
Rainfall intensity = 3.084(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.691(CFS) for 1.710(Ac.)
Total runoff = 144.267(CFS) Total area = 80.72(Ac.)

Process from Point/Station 132.000 to Point/Station 128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 23.200(Ft.)
Downstream point/station elevation = 22.000(Ft.)
Pipe length = 156.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 144.267(CFS)
Nearest computed pipe diameter = 51.00(In.)
Calculated individual pipe flow = 144.267(CFS)
Normal flow depth in pipe = 40.69(In.)
Flow top width inside pipe = 40.97(In.)
Critical Depth = 42.67(In.)
Pipe flow velocity = 11.90(Ft/s)

Travel time through pipe = 0.22 min.
 Time of concentration (TC) = 13.02 min.

++++
 Process from Point/Station 132.000 to Point/Station 128.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 80.720(Ac.)
 Runoff from this stream = 144.267(CFS)
 Time of concentration = 13.02 min.
 Rainfall intensity = 3.064(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	19.090	14.00	2.982
2	144.267	13.02	3.064
Qmax(1) =			
	1.000 *	1.000 *	19.090) +
	0.973 *	1.000 *	144.267) + = 159.491
Qmax(2) =			
	1.000 *	0.930 *	19.090) +
	1.000 *	1.000 *	144.267) + = 162.020

Total of 2 streams to confluence:
 Flow rates before confluence point:
 19.090 144.267
 Maximum flow rates at confluence using above data:
 159.491 162.020
 Area of streams before confluence:
 8.780 80.720
 Results of confluence:
 Total flow rate = 162.020(CFS)
 Time of concentration = 13.022 min.
 Effective stream area after confluence = 89.500(Ac.)

++++
 Process from Point/Station 128.000 to Point/Station 138.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 21.900(Ft.)
 Downstream point/station elevation = 21.500(Ft.)
 Pipe length = 50.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 162.020(CFS)
 Nearest computed pipe diameter = 54.00(In.)
 Calculated individual pipe flow = 162.020(CFS)
 Normal flow depth in pipe = 40.88(In.)

Flow top width inside pipe = 46.32(In.)
Critical Depth = 44.63(In.)
Pipe flow velocity = 12.55(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 13.09 min.

Process from Point/Station 140.000 to Point/Station 138.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.09 min.
Rainfall intensity = 3.059(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.927(CFS) for 0.900(Ac.)
Total runoff = 163.947(CFS) Total area = 90.40(Ac.)

Process from Point/Station 138.000 to Point/Station 142.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 21.500(Ft.)
Downstream point/station elevation = 21.200(Ft.)
Pipe length = 48.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 163.947(CFS)
Nearest computed pipe diameter = 54.00(In.)
Calculated individual pipe flow = 163.947(CFS)
Normal flow depth in pipe = 47.63(In.)
Flow top width inside pipe = 34.85(In.)
Critical Depth = 44.85(In.)
Pipe flow velocity = 11.05(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 13.16 min.

Process from Point/Station 144.000 to Point/Station 142.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.16 min.
Rainfall intensity = 3.052(In/Hr) for a 100.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.077(CFS) for 1.440(Ac.)
Total runoff = 167.024(CFS) Total area = 91.84(Ac.)

Process from Point/Station 146.000 to Point/Station 142.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.16 min.
Rainfall intensity = 3.052(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 7.137(CFS) for 3.340(Ac.)
Total runoff = 174.161(CFS) Total area = 95.18(Ac.)

Process from Point/Station 142.000 to Point/Station 148.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 21.200(Ft.)
Downstream point/station elevation = 19.500(Ft.)
Pipe length = 193.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 174.161(CFS)
Nearest computed pipe diameter = 54.00(In.)
Calculated individual pipe flow = 174.161(CFS)
Normal flow depth in pipe = 41.72(In.)
Flow top width inside pipe = 45.27(In.)
Critical Depth = 46.03(In.)
Pipe flow velocity = 13.20(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 13.40 min.

Process from Point/Station 150.000 to Point/Station 148.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.40 min.
Rainfall intensity = 3.032(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.311(CFS) for 1.560(Ac.)

Total runoff = 177.471(CFS) Total area = 96.74(Ac.)

++++
Process from Point/Station 148.000 to Point/Station 152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 19.400(Ft.)
Downstream point/station elevation = 14.100(Ft.)
Pipe length = 566.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 177.471(CFS)
Nearest computed pipe diameter = 54.00(In.)
Calculated individual pipe flow = 177.471(CFS)
Normal flow depth in pipe = 41.34(In.)
Flow top width inside pipe = 45.75(In.)
Critical Depth = 46.36(In.)
Pipe flow velocity = 13.60(Ft/s)
Travel time through pipe = 0.69 min.
Time of concentration (TC) = 14.10 min.

++++
Process from Point/Station 148.000 to Point/Station 152.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 96.740(Ac.)
Runoff from this stream = 177.471(CFS)
Time of concentration = 14.10 min.
Rainfall intensity = 2.975(In/Hr)

++++
Process from Point/Station 160.000 to Point/Station 162.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 517.000(Ft.)
Highest elevation = 44.000(Ft.)
Lowest elevation = 38.200(Ft.)
Elevation difference = 5.800(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 15.76 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*(517.000^0.5)/(1.122^(1/3))]= 15.76
Rainfall intensity (I) = 2.850(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 2.115(CFS)

Total initial stream area = 1.060(Ac.)

++++
Process from Point/Station 162.000 to Point/Station 164.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 31.500(Ft.)
Downstream point/station elevation = 30.700(Ft.)
Pipe length = 108.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.115(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.115(CFS)
Normal flow depth in pipe = 7.32(In.)
Flow top width inside pipe = 11.70(In.)
Critical Depth = 7.45(In.)
Pipe flow velocity = 4.21(Ft/s)
Travel time through pipe = 0.43 min.
Time of concentration (TC) = 16.18 min.

++++
Process from Point/Station 166.000 to Point/Station 164.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 16.18 min.
Rainfall intensity = 2.820(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.638(CFS) for 0.830(Ac.)
Total runoff = 3.753(CFS) Total area = 1.89(Ac.)

++++
Process from Point/Station 164.000 to Point/Station 168.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 30.200(Ft.)
Downstream point/station elevation = 26.300(Ft.)
Pipe length = 465.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.753(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.753(CFS)
Normal flow depth in pipe = 8.67(In.)
Flow top width inside pipe = 14.82(In.)
Critical Depth = 9.39(In.)
Pipe flow velocity = 5.10(Ft/s)
Travel time through pipe = 1.52 min.

Time of concentration (TC) = 17.70 min.

++++
Process from Point/Station 170.000 to Point/Station 168.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 17.70 min.
Rainfall intensity = 2.719(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 5.006(CFS) for 2.630(Ac.)
Total runoff = 8.759(CFS) Total area = 4.52(Ac.)

++++
Process from Point/Station 168.000 to Point/Station 172.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 26.200(Ft.)
Downstream point/station elevation = 17.800(Ft.)
Pipe length = 581.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.759(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 8.759(CFS)
Normal flow depth in pipe = 11.03(In.)
Flow top width inside pipe = 17.54(In.)
Critical Depth = 13.74(In.)
Pipe flow velocity = 7.72(Ft/s)
Travel time through pipe = 1.25 min.
Time of concentration (TC) = 18.96 min.

++++
Process from Point/Station 172.000 to Point/Station 172.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration = 18.96 min.
Rainfall intensity = 2.642(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450
Subarea runoff = 0.654(CFS) for 0.550(Ac.)
Total runoff = 9.412(CFS) Total area = 5.07(Ac.)

Process from Point/Station 172.000 to Point/Station 152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 15.100(Ft.)
Downstream point/station elevation = 14.100(Ft.)
Pipe length = 43.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.412(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 9.412(CFS)
Normal flow depth in pipe = 11.74(In.)
Flow top width inside pipe = 12.37(In.)
Critical Depth = 14.02(In.)
Pipe flow velocity = 9.14(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 19.03 min.

Process from Point/Station 172.000 to Point/Station 152.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 5.070(Ac.)
Runoff from this stream = 9.412(CFS)
Time of concentration = 19.03 min.
Rainfall intensity = 2.637(In/Hr)

Process from Point/Station 173.000 to Point/Station 152.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.550 given for subarea
Rainfall intensity (I) = 2.700(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 18.00 min. Rain intensity = 2.70(In/Hr)
Total area = 19.200(Ac.) Total runoff = 29.400(CFS)

Process from Point/Station 173.000 to Point/Station 152.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 19.200(Ac.)
Runoff from this stream = 29.400(CFS)
Time of concentration = 18.00 min.
Rainfall intensity = 2.700(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	177.471	14.10	2.975
2	9.412	19.03	2.637
3	29.400	18.00	2.700

Qmax(1) =
 1.000 * 1.000 * 177.471) +
 1.000 * 0.741 * 9.412) +
 1.000 * 0.783 * 29.400) + = 207.471

Qmax(2) =
 0.886 * 1.000 * 177.471) +
 1.000 * 1.000 * 9.412) +
 0.977 * 1.000 * 29.400) + = 195.442

Qmax(3) =
 0.908 * 1.000 * 177.471) +
 1.000 * 0.946 * 9.412) +
 1.000 * 1.000 * 29.400) + = 199.397

Total of 3 streams to confluence:

Flow rates before confluence point:

177.471 9.412 29.400

Maximum flow rates at confluence using above data:

207.471 195.442 199.397

Area of streams before confluence:

96.740 5.070 19.200

Results of confluence:

Total flow rate = 207.471(CFS)

Time of concentration = 14.099 min.

Effective stream area after confluence = 121.010(Ac.)

 Process from Point/Station 152.000 to Point/Station 174.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 14.100(Ft.)
 Downstream point/station elevation = 12.000(Ft.)
 Pipe length = 153.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 207.471(CFS)
 Nearest computed pipe diameter = 51.00(In.)
 Calculated individual pipe flow = 207.471(CFS)
 Normal flow depth in pipe = 44.44(In.)
 Flow top width inside pipe = 34.15(In.)
 Critical Depth = 48.01(In.)
 Pipe flow velocity = 15.80(Ft/s)
 Travel time through pipe = 0.16 min.
 Time of concentration (TC) = 14.26 min.

Process from Point/Station 200.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 320.000(Ft.)
Highest elevation = 52.000(Ft.)
Lowest elevation = 48.800(Ft.)
Elevation difference = 3.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 12.88 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*(320.000^0.5)/(1.000^(1/3))]= 12.88
Rainfall intensity (I) = 3.077(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 2.412(CFS)
Total initial stream area = 1.120(Ac.)

Process from Point/Station 202.000 to Point/Station 204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 42.900(Ft.)
Downstream point/station elevation = 41.100(Ft.)
Pipe length = 182.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.412(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.412(CFS)
Normal flow depth in pipe = 7.27(In.)
Flow top width inside pipe = 11.73(In.)
Critical Depth = 7.98(In.)
Pipe flow velocity = 4.85(Ft/s)
Travel time through pipe = 0.63 min.
Time of concentration (TC) = 13.50 min.

Process from Point/Station 206.000 to Point/Station 204.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.50 min.
Rainfall intensity = 3.023(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700

Subarea runoff = 3.428(CFS) for 1.620(Ac.)
Total runoff = 5.841(CFS) Total area = 2.74(Ac.)

Process from Point/Station 204.000 to Point/Station 208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 41.100(Ft.)
Downstream point/station elevation = 40.600(Ft.)
Pipe length = 43.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.841(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 5.841(CFS)
Normal flow depth in pipe = 10.51(In.)
Flow top width inside pipe = 13.74(In.)
Critical Depth = 11.73(In.)
Pipe flow velocity = 6.36(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 13.62 min.

Process from Point/Station 210.000 to Point/Station 208.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.62 min.
Rainfall intensity = 3.014(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.667(CFS) for 0.790(Ac.)
Total runoff = 7.507(CFS) Total area = 3.53(Ac.)

Process from Point/Station 208.000 to Point/Station 212.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 40.600(Ft.)
Downstream point/station elevation = 38.700(Ft.)
Pipe length = 139.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.507(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 7.507(CFS)
Normal flow depth in pipe = 12.21(In.)
Flow top width inside pipe = 11.67(In.)
Critical Depth = 13.08(In.)
Pipe flow velocity = 7.02(Ft/s)

Travel time through pipe = 0.33 min.
Time of concentration (TC) = 13.95 min.

++++
Process from Point/Station 214.000 to Point/Station 212.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.95 min.
Rainfall intensity = 2.987(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.589(CFS) for 0.760(Ac.)
Total runoff = 9.096(CFS) Total area = 4.29(Ac.)

++++
Process from Point/Station 212.000 to Point/Station 216.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 38.700(Ft.)
Downstream point/station elevation = 24.800(Ft.)
Pipe length = 81.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.096(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 9.096(CFS)
Normal flow depth in pipe = 6.81(In.)
Flow top width inside pipe = 11.89(In.)
Critical depth could not be calculated.
Pipe flow velocity = 19.77(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 14.02 min.

++++
Process from Point/Station 212.000 to Point/Station 216.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 4.290(Ac.)
Runoff from this stream = 9.096(CFS)
Time of concentration = 14.02 min.
Rainfall intensity = 2.981(In/Hr)

++++
Process from Point/Station 218.000 to Point/Station 218.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.550 given for subarea
Rainfall intensity (I) = 2.383(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 23.70 min. Rain intensity = 2.38(In/Hr)
Total area = 26.600(Ac.) Total runoff = 33.700(CFS)

Process from Point/Station 218.000 to Point/Station 220.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 40.550(Ft.)
Downstream point/station elevation = 35.750(Ft.)
Pipe length = 447.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 33.700(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 33.700(CFS)
Normal flow depth in pipe = 23.63(In.)
Flow top width inside pipe = 17.86(In.)
Critical Depth = 23.81(In.)
Pipe flow velocity = 9.14(Ft/s)
Travel time through pipe = 0.82 min.
Time of concentration (TC) = 24.52 min.

Process from Point/Station 222.000 to Point/Station 220.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 24.52 min.
Rainfall intensity = 2.343(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.772(CFS) for 1.080(Ac.)
Total runoff = 35.472(CFS) Total area = 27.68(Ac.)

Process from Point/Station 224.000 to Point/Station 220.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 24.52 min.

Rainfall intensity = 2.343(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.444(CFS) for 0.880(Ac.)
Total runoff = 36.915(CFS) Total area = 28.56(Ac.)

Process from Point/Station 220.000 to Point/Station 216.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 35.250(Ft.)
Downstream point/station elevation = 24.300(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 36.915(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 36.915(CFS)
Normal flow depth in pipe = 11.31(In.)
Flow top width inside pipe = 17.40(In.)
Critical depth could not be calculated.
Pipe flow velocity = 31.57(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 24.54 min.

Process from Point/Station 220.000 to Point/Station 216.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 28.560(Ac.)
Runoff from this stream = 36.915(CFS)
Time of concentration = 24.54 min.
Rainfall intensity = 2.342(In/Hr)

Process from Point/Station 226.000 to Point/Station 228.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 265.000(Ft.)
Highest elevation = 47.000(Ft.)
Lowest elevation = 44.350(Ft.)
Elevation difference = 2.650(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 11.72 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*(265.000^0.5)/(1.000^(1/3))]= 11.72

Rainfall intensity (I) = 3.185(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 1.918(CFS)
Total initial stream area = 0.860(Ac.)

Process from Point/Station 228.000 to Point/Station 230.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 39.000(Ft.)
Downstream point/station elevation = 36.300(Ft.)
Pipe length = 274.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.918(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 1.918(CFS)
Normal flow depth in pipe = 6.29(In.)
Flow top width inside pipe = 11.99(In.)
Critical Depth = 7.08(In.)
Pipe flow velocity = 4.59(Ft/s)
Travel time through pipe = 0.99 min.
Time of concentration (TC) = 12.72 min.

Process from Point/Station 232.000 to Point/Station 230.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 12.72 min.
Rainfall intensity = 3.092(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 2.510(CFS) for 1.160(Ac.)
Total runoff = 4.428(CFS) Total area = 2.02(Ac.)

Process from Point/Station 230.000 to Point/Station 216.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 36.300(Ft.)
Downstream point/station elevation = 25.300(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.428(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 4.428(CFS)
Normal flow depth in pipe = 4.87(In.)
Flow top width inside pipe = 8.97(In.)

Critical depth could not be calculated.
 Pipe flow velocity = 18.14(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 12.76 min.

 Process from Point/Station 230.000 to Point/Station 216.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
 Stream flow area = 2.020(Ac.)
 Runoff from this stream = 4.428(CFS)
 Time of concentration = 12.76 min.
 Rainfall intensity = 3.088(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.096	14.02	2.981
2	36.915	24.54	2.342
3	4.428	12.76	3.088
Qmax(1) =			
	1.000 *	1.000 *	9.096) +
	1.000 *	0.571 *	36.915) +
	0.966 *	1.000 *	4.428) + = 34.457
Qmax(2) =			
	0.786 *	1.000 *	9.096) +
	1.000 *	1.000 *	36.915) +
	0.759 *	1.000 *	4.428) + = 47.421
Qmax(3) =			
	1.000 *	0.910 *	9.096) +
	1.000 *	0.520 *	36.915) +
	1.000 *	1.000 *	4.428) + = 31.906

Total of 3 streams to confluence:
 Flow rates before confluence point:
 9.096 36.915 4.428
 Maximum flow rates at confluence using above data:
 34.457 47.421 31.906
 Area of streams before confluence:
 4.290 28.560 2.020
 Results of confluence:
 Total flow rate = 47.421(CFS)
 Time of concentration = 24.539 min.
 Effective stream area after confluence = 34.870(Ac.)

 Process from Point/Station 216.000 to Point/Station 234.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 23.800(Ft.)
Downstream point/station elevation = 13.500(Ft.)
Pipe length = 622.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 47.421(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 47.421(CFS)
Normal flow depth in pipe = 22.22(In.)
Flow top width inside pipe = 26.30(In.)
Critical Depth = 27.16(In.)
Pipe flow velocity = 12.17(Ft/s)
Travel time through pipe = 0.85 min.
Time of concentration (TC) = 25.39 min.

++++
Process from Point/Station 216.000 to Point/Station 234.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 34.870(Ac.)
Runoff from this stream = 47.421(CFS)
Time of concentration = 25.39 min.
Rainfall intensity = 2.302(In/Hr)

++++
Process from Point/Station 236.000 to Point/Station 238.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 306.000(Ft.)
Highest elevation = 34.000(Ft.)
Lowest elevation = 31.000(Ft.)
Elevation difference = 3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 12.68 min.
TC = $[1.8*(1.1-C)*\text{distance}(\text{Ft.})^{.5}/(\% \text{ slope}^{(1/3)})]$
TC = $[1.8*(1.1-0.7000)*(306.000^{.5})/(0.980^{(1/3)})]= 12.68$
Rainfall intensity (I) = 3.095(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 3.401(CFS)
Total initial stream area = 1.570(Ac.)

++++
Process from Point/Station 238.000 to Point/Station 240.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 31.000(Ft.)
Downstream point/station elevation = 29.000(Ft.)
Pipe length = 165.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.401(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 3.401(CFS)
Normal flow depth in pipe = 8.64(In.)
Flow top width inside pipe = 10.78(In.)
Critical Depth = 9.46(In.)
Pipe flow velocity = 5.62(Ft/s)
Travel time through pipe = 0.49 min.
Time of concentration (TC) = 13.17 min.

+++++
Process from Point/Station 240.000 to Point/Station 240.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.17 min.
Rainfall intensity = 3.052(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.696(CFS) for 1.730(Ac.)
Total runoff = 7.097(CFS) Total area = 3.30(Ac.)

+++++
Process from Point/Station 240.000 to Point/Station 234.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 24.000(Ft.)
Downstream point/station elevation = 13.500(Ft.)
Pipe length = 41.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.097(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 7.097(CFS)
Normal flow depth in pipe = 6.36(In.)
Flow top width inside pipe = 8.19(In.)
Critical depth could not be calculated.
Pipe flow velocity = 21.26(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 13.20 min.

+++++
Process from Point/Station 240.000 to Point/Station 234.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 3.300(Ac.)
 Runoff from this stream = 7.097(CFS)
 Time of concentration = 13.20 min.
 Rainfall intensity = 3.049(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	47.421	25.39	2.302
2	7.097	13.20	3.049
Qmax(1) =			
	1.000 *	1.000 *	47.421) +
	0.755 *	1.000 *	7.097) + = 52.778
Qmax(2) =			
	1.000 *	0.520 *	47.421) +
	1.000 *	1.000 *	7.097) + = 31.748

Total of 2 streams to confluence:
 Flow rates before confluence point:
 47.421 7.097
 Maximum flow rates at confluence using above data:
 52.778 31.748
 Area of streams before confluence:
 34.870 3.300
 Results of confluence:
 Total flow rate = 52.778(CFS)
 Time of concentration = 25.391 min.
 Effective stream area after confluence = 38.170(Ac.)

 Process from Point/Station 234.000 to Point/Station 242.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 13.500(Ft.)
 Downstream point/station elevation = 11.000(Ft.)
 Pipe length = 248.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 52.778(CFS)
 Nearest computed pipe diameter = 33.00(In.)
 Calculated individual pipe flow = 52.778(CFS)
 Normal flow depth in pipe = 26.86(In.)
 Flow top width inside pipe = 25.69(In.)
 Critical Depth = 28.54(In.)
 Pipe flow velocity = 10.19(Ft/s)
 Travel time through pipe = 0.41 min.
 Time of concentration (TC) = 25.80 min.

+++++
Process from Point/Station 234.000 to Point/Station 242.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 38.170(Ac.)
Runoff from this stream = 52.778(CFS)
Time of concentration = 25.80 min.
Rainfall intensity = 2.283(In/Hr)

+++++
Process from Point/Station 244.000 to Point/Station 246.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 617.000(Ft.)
Highest elevation = 53.500(Ft.)
Lowest elevation = 47.500(Ft.)
Elevation difference = 6.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 18.05 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*(617.000^0.5)/(0.972^(1/3))]= 18.05
Rainfall intensity (I) = 2.697(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 1.699(CFS)
Total initial stream area = 0.900(Ac.)

+++++
Process from Point/Station 246.000 to Point/Station 248.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 41.800(Ft.)
Downstream point/station elevation = 29.000(Ft.)
Pipe length = 84.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.699(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 1.699(CFS)
Normal flow depth in pipe = 3.97(In.)
Flow top width inside pipe = 5.68(In.)
Critical depth could not be calculated.
Pipe flow velocity = 12.33(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 18.17 min.

+++++
Process from Point/Station 248.000 to Point/Station 250.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 18.17 min.
Rainfall intensity = 2.690(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 0.245(CFS) for 0.130(Ac.)
Total runoff = 1.944(CFS) Total area = 1.03(Ac.)

+++++
Process from Point/Station 250.000 to Point/Station 252.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 24.000(Ft.)
Downstream point/station elevation = 21.800(Ft.)
Pipe length = 220.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.944(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 1.944(CFS)
Normal flow depth in pipe = 6.32(In.)
Flow top width inside pipe = 11.98(In.)
Critical Depth = 7.13(In.)
Pipe flow velocity = 4.64(Ft/s)
Travel time through pipe = 0.79 min.
Time of concentration (TC) = 18.96 min.

+++++
Process from Point/Station 254.000 to Point/Station 252.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 18.96 min.
Rainfall intensity = 2.642(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.627(CFS) for 0.880(Ac.)
Total runoff = 3.571(CFS) Total area = 1.91(Ac.)

+++++

Process from Point/Station 252.000 to Point/Station 256.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 21.700(Ft.)
Downstream point/station elevation = 20.100(Ft.)
Pipe length = 158.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.571(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 3.571(CFS)
Normal flow depth in pipe = 9.80(In.)
Flow top width inside pipe = 9.29(In.)
Critical Depth = 9.68(In.)
Pipe flow velocity = 5.20(Ft/s)
Travel time through pipe = 0.51 min.
Time of concentration (TC) = 19.46 min.

++++
Process from Point/Station 258.000 to Point/Station 256.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 19.46 min.
Rainfall intensity = 2.612(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.792(CFS) for 0.980(Ac.)
Total runoff = 5.363(CFS) Total area = 2.89(Ac.)

++++
Process from Point/Station 256.000 to Point/Station 260.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 20.000(Ft.)
Downstream point/station elevation = 17.600(Ft.)
Pipe length = 241.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.363(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 5.363(CFS)
Normal flow depth in pipe = 10.45(In.)
Flow top width inside pipe = 13.79(In.)
Critical Depth = 11.26(In.)
Pipe flow velocity = 5.88(Ft/s)
Travel time through pipe = 0.68 min.
Time of concentration (TC) = 20.15 min.

++++

Process from Point/Station 262.000 to Point/Station 260.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 20.15 min.
Rainfall intensity = 2.572(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.909(CFS) for 1.060(Ac.)
Total runoff = 7.271(CFS) Total area = 3.95(Ac.)

+++++
Process from Point/Station 260.000 to Point/Station 264.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 17.500(Ft.)
Downstream point/station elevation = 15.400(Ft.)
Pipe length = 214.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.271(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 7.271(CFS)
Normal flow depth in pipe = 11.09(In.)
Flow top width inside pipe = 17.51(In.)
Critical Depth = 12.53(In.)
Pipe flow velocity = 6.37(Ft/s)
Travel time through pipe = 0.56 min.
Time of concentration (TC) = 20.71 min.

+++++
Process from Point/Station 266.000 to Point/Station 264.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 20.71 min.
Rainfall intensity = 2.541(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.903(CFS) for 1.070(Ac.)
Total runoff = 9.174(CFS) Total area = 5.02(Ac.)

+++++
Process from Point/Station 264.000 to Point/Station 242.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 15.300(Ft.)
 Downstream point/station elevation = 11.000(Ft.)
 Pipe length = 153.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 9.174(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 9.174(CFS)
 Normal flow depth in pipe = 10.59(In.)
 Flow top width inside pipe = 13.66(In.)
 Critical Depth = 13.93(In.)
 Pipe flow velocity = 9.90(Ft/s)
 Travel time through pipe = 0.26 min.
 Time of concentration (TC) = 20.96 min.

++++++
 Process from Point/Station 264.000 to Point/Station 242.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 5.020(Ac.)
 Runoff from this stream = 9.174(CFS)
 Time of concentration = 20.96 min.
 Rainfall intensity = 2.526(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	52.778	25.80	2.283
2	9.174	20.96	2.526
Qmax(1) =			
	1.000 *	1.000 *	52.778) +
	0.904 *	1.000 *	9.174) + = 61.067
Qmax(2) =			
	1.000 *	0.813 *	52.778) +
	1.000 *	1.000 *	9.174) + = 52.063

Total of 2 streams to confluence:
 Flow rates before confluence point:
 52.778 9.174
 Maximum flow rates at confluence using above data:
 61.067 52.063
 Area of streams before confluence:
 38.170 5.020
 Results of confluence:
 Total flow rate = 61.067(CFS)
 Time of concentration = 25.797 min.
 Effective stream area after confluence = 43.190(Ac.)

+++++
Process from Point/Station 242.000 to Point/Station 268.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 10.800(Ft.)
Downstream point/station elevation = 10.000(Ft.)
Pipe length = 103.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 61.067(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 61.067(CFS)
Normal flow depth in pipe = 30.94(In.)
Flow top width inside pipe = 25.03(In.)
Critical Depth = 30.23(In.)
Pipe flow velocity = 9.45(Ft/s)
Travel time through pipe = 0.18 min.
Time of concentration (TC) = 25.98 min.

+++++
Process from Point/Station 242.000 to Point/Station 268.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 43.190(Ac.)
Runoff from this stream = 61.067(CFS)
Time of concentration = 25.98 min.
Rainfall intensity = 2.274(In/Hr)
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 270.000 to Point/Station 272.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 546.000(Ft.)
Highest elevation = 65.500(Ft.)
Lowest elevation = 50.000(Ft.)
Elevation difference = 15.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 11.88 min.
TC = $[1.8*(1.1-C)*distance(Ft.)^{.5}/(%\ slope^{(1/3)})]$
TC = $[1.8*(1.1-0.7000)*(546.000^{.5})/(2.839^{(1/3)})]= 11.88$
Rainfall intensity (I) = 3.170(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 2.396(CFS)
Total initial stream area = 1.080(Ac.)

+++++
Process from Point/Station 272.000 to Point/Station 274.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 35.500(Ft.)
Downstream point/station elevation = 32.300(Ft.)
Pipe length = 268.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.396(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.396(CFS)
Normal flow depth in pipe = 6.81(In.)
Flow top width inside pipe = 11.89(In.)
Critical Depth = 7.96(In.)
Pipe flow velocity = 5.21(Ft/s)
Travel time through pipe = 0.86 min.
Time of concentration (TC) = 12.74 min.

+++++
Process from Point/Station 276.000 to Point/Station 274.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 12.74 min.
Rainfall intensity = 3.090(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.341(CFS) for 0.620(Ac.)
Total runoff = 3.737(CFS) Total area = 1.70(Ac.)

+++++
Process from Point/Station 274.000 to Point/Station 278.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 32.300(Ft.)
Downstream point/station elevation = 31.060(Ft.)
Pipe length = 90.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.737(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 3.737(CFS)
Normal flow depth in pipe = 8.85(In.)
Flow top width inside pipe = 10.56(In.)
Critical Depth = 9.87(In.)
Pipe flow velocity = 6.02(Ft/s)
Travel time through pipe = 0.25 min.
Time of concentration (TC) = 12.99 min.

Process from Point/Station 274.000 to Point/Station 278.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.700(Ac.)
Runoff from this stream = 3.737(CFS)
Time of concentration = 12.99 min.
Rainfall intensity = 3.067(In/Hr)

Process from Point/Station 280.000 to Point/Station 282.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 331.000(Ft.)
Highest elevation = 48.100(Ft.)
Lowest elevation = 43.300(Ft.)
Elevation difference = 4.800(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 11.57 min.
TC = $[1.8*(1.1-C)*distance(Ft.)^0.5]/(%\ slope^{1/3})]$
TC = $[1.8*(1.1-0.7000)*(331.000^0.5)/(1.450^{1/3})]= 11.57$
Rainfall intensity (I) = 3.200(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 1.613(CFS)
Total initial stream area = 0.720(Ac.)

Process from Point/Station 282.000 to Point/Station 278.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 36.900(Ft.)
Downstream point/station elevation = 31.560(Ft.)
Pipe length = 419.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.613(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.613(CFS)
Normal flow depth in pipe = 6.46(In.)
Flow top width inside pipe = 8.10(In.)
Critical Depth = 7.01(In.)
Pipe flow velocity = 4.76(Ft/s)
Travel time through pipe = 1.47 min.
Time of concentration (TC) = 13.04 min.

++++++
 Process from Point/Station 282.000 to Point/Station 278.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.720(Ac.)
 Runoff from this stream = 1.613(CFS)
 Time of concentration = 13.04 min.
 Rainfall intensity = 3.063(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.737	12.99	3.067
2	1.613	13.04	3.063
Qmax(1) =			
	1.000 *	1.000 *	3.737) +
	1.000 *	0.996 *	1.613) + = 5.343
Qmax(2) =			
	0.998 *	1.000 *	3.737) +
	1.000 *	1.000 *	1.613) + = 5.344

Total of 2 streams to confluence:
 Flow rates before confluence point:
 3.737 1.613
 Maximum flow rates at confluence using above data:
 5.343 5.344
 Area of streams before confluence:
 1.700 0.720
 Results of confluence:
 Total flow rate = 5.344(CFS)
 Time of concentration = 13.041 min.
 Effective stream area after confluence = 2.420(Ac.)

++++++
 Process from Point/Station 278.000 to Point/Station 284.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 30.960(Ft.)
 Downstream point/station elevation = 27.800(Ft.)
 Pipe length = 77.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.344(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 5.344(CFS)
 Normal flow depth in pipe = 7.69(In.)
 Flow top width inside pipe = 11.52(In.)
 Critical Depth = 11.20(In.)

Pipe flow velocity = 10.06(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 13.17 min.

Process from Point/Station 286.000 to Point/Station 284.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.17 min.
Rainfall intensity = 3.052(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.859(CFS) for 0.870(Ac.)
Total runoff = 7.203(CFS) Total area = 3.29(Ac.)

Process from Point/Station 284.000 to Point/Station 288.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 27.800(Ft.)
Downstream point/station elevation = 22.300(Ft.)
Pipe length = 255.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.203(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 7.203(CFS)
Normal flow depth in pipe = 9.77(In.)
Flow top width inside pipe = 14.29(In.)
Critical Depth = 12.87(In.)
Pipe flow velocity = 8.50(Ft/s)
Travel time through pipe = 0.50 min.
Time of concentration (TC) = 13.67 min.

Process from Point/Station 290.000 to Point/Station 288.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.67 min.
Rainfall intensity = 3.010(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.813(CFS) for 1.810(Ac.)

Total runoff = 11.016(CFS) Total area = 5.10(Ac.)

++++
Process from Point/Station 292.000 to Point/Station 288.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 13.67 min.
Rainfall intensity = 3.010(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.096(CFS) for 0.520(Ac.)
Total runoff = 12.112(CFS) Total area = 5.62(Ac.)

++++
Process from Point/Station 288.000 to Point/Station 294.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 21.200(Ft.)
Downstream point/station elevation = 15.800(Ft.)
Pipe length = 485.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 12.112(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 12.112(CFS)
Normal flow depth in pipe = 13.24(In.)
Flow top width inside pipe = 20.27(In.)
Critical Depth = 15.57(In.)
Pipe flow velocity = 7.57(Ft/s)
Travel time through pipe = 1.07 min.
Time of concentration (TC) = 14.74 min.

++++
Process from Point/Station 294.000 to Point/Station 268.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 5.620(Ac.)
Runoff from this stream = 12.112(CFS)
Time of concentration = 14.74 min.
Rainfall intensity = 2.925(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	61.067	25.98	2.274	
2	12.112	14.74	2.925	
Qmax(1) =				
	1.000 *	1.000 *	61.067) +	
	0.778 *	1.000 *	12.112) + =	70.484
Qmax(2) =				
	1.000 *	0.567 *	61.067) +	
	1.000 *	1.000 *	12.112) + =	46.749

Total of 2 main streams to confluence:

Flow rates before confluence point:

61.067 12.112

Maximum flow rates at confluence using above data:

70.484 46.749

Area of streams before confluence:

43.190 5.620

Results of confluence:

Total flow rate = 70.484(CFS)

Time of concentration = 25.979 min.

Effective stream area after confluence = 48.810(Ac.)

 Process from Point/Station 268.000 to Point/Station 296.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 10.000(Ft.)
 Downstream point/station elevation = 8.000(Ft.)
 Pipe length = 245.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 70.484(CFS)
 Nearest computed pipe diameter = 39.00(In.)
 Calculated individual pipe flow = 70.484(CFS)
 Normal flow depth in pipe = 30.19(In.)
 Flow top width inside pipe = 32.62(In.)
 Critical Depth = 31.96(In.)
 Pipe flow velocity = 10.23(Ft/s)
 Travel time through pipe = 0.40 min.
 Time of concentration (TC) = 26.38 min.

 Process from Point/Station 300.000 to Point/Station 302.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]

Initial subarea flow distance = 272.000(Ft.)
 Highest elevation = 66.500(Ft.)
 Lowest elevation = 53.000(Ft.)
 Elevation difference = 13.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 6.96 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^{.5}/(%\ slope^{(1/3)})]$
 $TC = [1.8*(1.1-0.7000)*(272.000^{.5})/(4.963^{(1/3)})] = 6.96$
 Rainfall intensity (I) = 3.854(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 2.833(CFS)
 Total initial stream area = 1.050(Ac.)

++++++
 Process from Point/Station 302.000 to Point/Station 304.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 41.600(Ft.)
 Downstream point/station elevation = 41.100(Ft.)
 Pipe length = 50.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.833(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 2.833(CFS)
 Normal flow depth in pipe = 8.09(In.)
 Flow top width inside pipe = 11.25(In.)
 Critical Depth = 8.65(In.)
 Pipe flow velocity = 5.03(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 7.13 min.

++++++
 Process from Point/Station 306.000 to Point/Station 304.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 7.13 min.
 Rainfall intensity = 3.820(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
 Subarea runoff = 2.460(CFS) for 0.920(Ac.)
 Total runoff = 5.293(CFS) Total area = 1.97(Ac.)

++++++
 Process from Point/Station 304.000 to Point/Station 308.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 41.100(Ft.)
 Downstream point/station elevation = 39.500(Ft.)
 Pipe length = 166.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.293(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 5.293(CFS)
 Normal flow depth in pipe = 10.48(In.)
 Flow top width inside pipe = 13.77(In.)
 Critical Depth = 11.19(In.)
 Pipe flow velocity = 5.78(Ft/s)
 Travel time through pipe = 0.48 min.
 Time of concentration (TC) = 7.61 min.

++++++
 Process from Point/Station 310.000 to Point/Station 312.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 7.61 min.
 Rainfall intensity = 3.729(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
 Subarea runoff = 2.767(CFS) for 1.060(Ac.)
 Total runoff = 8.060(CFS) Total area = 3.03(Ac.)

++++++
 Process from Point/Station 312.000 to Point/Station 308.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 7.61 min.
 Rainfall intensity = 3.729(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
 Subarea runoff = 2.375(CFS) for 0.910(Ac.)
 Total runoff = 10.435(CFS) Total area = 3.94(Ac.)

++++++
 Process from Point/Station 308.000 to Point/Station 314.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 39.000(Ft.)
 Downstream point/station elevation = 37.900(Ft.)

Pipe length = 112.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 10.435(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 10.435(CFS)
Normal flow depth in pipe = 14.79(In.)
Flow top width inside pipe = 13.78(In.)
Critical Depth = 14.91(In.)
Pipe flow velocity = 6.72(Ft/s)
Travel time through pipe = 0.28 min.
Time of concentration (TC) = 7.88 min.

Process from Point/Station 316.000 to Point/Station 314.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 7.88 min.
Rainfall intensity = 3.680(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 1.494(CFS) for 0.580(Ac.)
Total runoff = 11.929(CFS) Total area = 4.52(Ac.)

Process from Point/Station 314.000 to Point/Station 318.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 37.400(Ft.)
Downstream point/station elevation = 35.700(Ft.)
Pipe length = 176.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.929(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 11.929(CFS)
Normal flow depth in pipe = 13.78(In.)
Flow top width inside pipe = 19.95(In.)
Critical Depth = 15.44(In.)
Pipe flow velocity = 7.14(Ft/s)
Travel time through pipe = 0.41 min.
Time of concentration (TC) = 8.29 min.

Process from Point/Station 320.000 to Point/Station 318.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 8.29 min.
Rainfall intensity = 3.611(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff = 2.503(CFS) for 0.990(Ac.)
Total runoff = 14.432(CFS) Total area = 5.51(Ac.)

+++++
Process from Point/Station 322.000 to Point/Station 318.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 8.29 min.
Rainfall intensity = 3.611(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff = 2.073(CFS) for 0.820(Ac.)
Total runoff = 16.505(CFS) Total area = 6.33(Ac.)

+++++
Process from Point/Station 318.000 to Point/Station 324.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 35.200(Ft.)
Downstream point/station elevation = 33.700(Ft.)
Pipe length = 149.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 16.505(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 16.505(CFS)
Normal flow depth in pipe = 15.19(In.)
Flow top width inside pipe = 23.14(In.)
Critical Depth = 17.57(In.)
Pipe flow velocity = 7.88(Ft/s)
Travel time through pipe = 0.32 min.
Time of concentration (TC) = 8.61 min.

+++++
Process from Point/Station 326.000 to Point/Station 324.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000

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[MULTI - UNITS area type ]
Time of concentration =      8.61 min.
Rainfall intensity =      3.563(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      2.594(CFS) for 1.040(Ac.)
Total runoff =      19.098(CFS) Total area =      7.37(Ac.)

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Process from Point/Station      328.000 to Point/Station      324.000
**** SUBAREA FLOW ADDITION ****

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000

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[MULTI - UNITS area type ]
Time of concentration =      8.61 min.
Rainfall intensity =      3.563(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      1.845(CFS) for 0.740(Ac.)
Total runoff =      20.944(CFS) Total area =      8.11(Ac.)

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+++++
Process from Point/Station      324.000 to Point/Station      330.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

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Upstream point/station elevation = 33.200(Ft.)
Downstream point/station elevation = 28.400(Ft.)
Pipe length = 430.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 20.944(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 20.944(CFS)
Normal flow depth in pipe = 17.41(In.)
Flow top width inside pipe = 21.42(In.)
Critical Depth = 19.67(In.)
Pipe flow velocity = 8.58(Ft/s)
Travel time through pipe = 0.84 min.
Time of concentration (TC) = 9.44 min.

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+++++
Process from Point/Station      332.000 to Point/Station      330.000
**** SUBAREA FLOW ADDITION ****

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000

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[MULTI - UNITS area type ]
Time of concentration =      9.44 min.

```

Rainfall intensity = 3.445(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff = 1.760(CFS) for 0.730(Ac.)
Total runoff = 22.704(CFS) Total area = 8.84(Ac.)

Process from Point/Station 334.000 to Point/Station 330.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 9.44 min.
Rainfall intensity = 3.445(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff = 2.242(CFS) for 0.930(Ac.)
Total runoff = 24.946(CFS) Total area = 9.77(Ac.)

Process from Point/Station 336.000 to Point/Station 336.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 9.44 min.
Rainfall intensity = 3.445(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff = 5.763(CFS) for 2.390(Ac.)
Total runoff = 30.709(CFS) Total area = 12.16(Ac.)

Process from Point/Station 330.000 to Point/Station 336.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 28.300(Ft.)
Downstream point/station elevation = 27.800(Ft.)
Pipe length = 48.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 30.709(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 30.709(CFS)
Normal flow depth in pipe = 21.47(In.)
Flow top width inside pipe = 21.79(In.)
Critical Depth = 22.97(In.)
Pipe flow velocity = 9.06(Ft/s)

Travel time through pipe = 0.09 min.
Time of concentration (TC) = 9.53 min.

++++
Process from Point/Station 338.000 to Point/Station 336.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 9.53 min.
Rainfall intensity = 3.433(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 0.673(CFS) for 0.280(Ac.)
Total runoff = 31.382(CFS) Total area = 12.44(Ac.)

++++
Process from Point/Station 336.000 to Point/Station 340.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 27.700(Ft.)
Downstream point/station elevation = 26.300(Ft.)
Pipe length = 139.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 31.382(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 31.382(CFS)
Normal flow depth in pipe = 22.36(In.)
Flow top width inside pipe = 20.37(In.)
Critical Depth = 23.18(In.)
Pipe flow velocity = 8.91(Ft/s)
Travel time through pipe = 0.26 min.
Time of concentration (TC) = 9.79 min.

++++
Process from Point/Station 336.000 to Point/Station 340.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 12.440(Ac.)
Runoff from this stream = 31.382(CFS)
Time of concentration = 9.79 min.
Rainfall intensity = 3.400(In/Hr)

++++
Process from Point/Station 342.000 to Point/Station 344.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Initial subarea flow distance = 345.000(Ft.)
 Highest elevation = 53.700(Ft.)
 Lowest elevation = 49.900(Ft.)
 Elevation difference = 3.800(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.95 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^{.5}/(%\ slope^{(1/3)})]$
 $TC = [1.8*(1.1-0.7000)*(345.000^{.5})/(1.101^{(1/3)})] = 12.95$
 Rainfall intensity (I) = 3.071(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 1.505(CFS)
 Total initial stream area = 0.700(Ac.)

++++++
 Process from Point/Station 344.000 to Point/Station 346.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 42.600(Ft.)
 Downstream point/station elevation = 38.300(Ft.)
 Pipe length = 433.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.505(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 1.505(CFS)
 Normal flow depth in pipe = 6.75(In.)
 Flow top width inside pipe = 7.79(In.)
 Critical Depth = 6.78(In.)
 Pipe flow velocity = 4.23(Ft/s)
 Travel time through pipe = 1.71 min.
 Time of concentration (TC) = 14.66 min.

++++++
 Process from Point/Station 348.000 to Point/Station 346.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 14.66 min.
 Rainfall intensity = 2.931(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
 Subarea runoff = 2.749(CFS) for 1.340(Ac.)
 Total runoff = 4.254(CFS) Total area = 2.04(Ac.)

++++
Process from Point/Station 346.000 to Point/Station 350.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 38.200(Ft.)
Downstream point/station elevation = 36.200(Ft.)
Pipe length = 192.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.254(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.254(CFS)
Normal flow depth in pipe = 8.77(In.)
Flow top width inside pipe = 14.78(In.)
Critical Depth = 10.02(In.)
Pipe flow velocity = 5.71(Ft/s)
Travel time through pipe = 0.56 min.
Time of concentration (TC) = 15.22 min.

++++
Process from Point/Station 352.000 to Point/Station 350.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 15.22 min.
Rainfall intensity = 2.889(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 3.964(CFS) for 1.960(Ac.)
Total runoff = 8.218(CFS) Total area = 4.00(Ac.)

++++
Process from Point/Station 350.000 to Point/Station 354.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 36.100(Ft.)
Downstream point/station elevation = 33.000(Ft.)
Pipe length = 308.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.218(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 8.218(CFS)
Normal flow depth in pipe = 11.95(In.)
Flow top width inside pipe = 17.00(In.)
Critical Depth = 13.32(In.)
Pipe flow velocity = 6.59(Ft/s)
Travel time through pipe = 0.78 min.
Time of concentration (TC) = 15.99 min.

2 10.578 16.05 2.829
 Qmax(1) =
 1.000 * 1.000 * 31.382) +
 1.000 * 0.610 * 10.578) + = 37.837
 Qmax(2) =
 0.832 * 1.000 * 31.382) +
 1.000 * 1.000 * 10.578) + = 36.693

Total of 2 streams to confluence:
 Flow rates before confluence point:
 31.382 10.578
 Maximum flow rates at confluence using above data:
 37.837 36.693
 Area of streams before confluence:
 12.440 5.190
 Results of confluence:
 Total flow rate = 37.837(CFS)
 Time of concentration = 9.793 min.
 Effective stream area after confluence = 17.630(Ac.)

 Process from Point/Station 340.000 to Point/Station 358.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 26.200(Ft.)
 Downstream point/station elevation = 24.800(Ft.)
 Pipe length = 191.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 37.837(CFS)
 Nearest computed pipe diameter = 33.00(In.)
 Calculated individual pipe flow = 37.837(CFS)
 Normal flow depth in pipe = 23.06(In.)
 Flow top width inside pipe = 30.28(In.)
 Critical Depth = 24.57(In.)
 Pipe flow velocity = 8.53(Ft/s)
 Travel time through pipe = 0.37 min.
 Time of concentration (TC) = 10.17 min.

 Process from Point/Station 340.000 to Point/Station 358.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 17.630(Ac.)
 Runoff from this stream = 37.837(CFS)
 Time of concentration = 10.17 min.
 Rainfall intensity = 3.354(In/Hr)

 Process from Point/Station 360.000 to Point/Station 360.000

**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.550 given for subarea
 Rainfall intensity (I) = 2.552(In/Hr) for a 100.0 year storm
 User specified values are as follows:
 TC = 20.50 min. Rain intensity = 2.55(In/Hr)
 Total area = 89.000(Ac.) Total runoff = 120.000(CFS)

+++++
 Process from Point/Station 360.000 to Point/Station 358.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 89.000(Ac.)
 Runoff from this stream = 120.000(CFS)
 Time of concentration = 20.50 min.
 Rainfall intensity = 2.552(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	37.837	10.17	3.354
2	120.000	20.50	2.552
Qmax(1) =			
	1.000 *	1.000 *	37.837) +
	1.000 *	0.496 *	120.000) + = 97.346
Qmax(2) =			
	0.761 *	1.000 *	37.837) +
	1.000 *	1.000 *	120.000) + = 148.790

Total of 2 streams to confluence:
 Flow rates before confluence point:
 37.837 120.000
 Maximum flow rates at confluence using above data:
 97.346 148.790
 Area of streams before confluence:
 17.630 89.000
 Results of confluence:
 Total flow rate = 148.790(CFS)
 Time of concentration = 20.500 min.
 Effective stream area after confluence = 106.630(Ac.)

+++++
 Process from Point/Station 358.000 to Point/Station 362.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 24.800(Ft.)
 Downstream point/station elevation = 24.600(Ft.)

Pipe length = 32.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 148.790(CFS)
Nearest computed pipe diameter = 54.00(In.)
Calculated individual pipe flow = 148.790(CFS)
Normal flow depth in pipe = 42.28(In.)
Flow top width inside pipe = 44.52(In.)
Critical Depth = 42.95(In.)
Pipe flow velocity = 11.13(Ft/s)
Travel time through pipe = 0.05 min.
Time of concentration (TC) = 20.55 min.

Process from Point/Station 364.000 to Point/Station 362.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 20.55 min.
Rainfall intensity = 2.549(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 4.551(CFS) for 2.550(Ac.)
Total runoff = 153.340(CFS) Total area = 109.18(Ac.)

Process from Point/Station 362.000 to Point/Station 366.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 24.600(Ft.)
Downstream point/station elevation = 21.400(Ft.)
Pipe length = 134.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 153.340(CFS)
Nearest computed pipe diameter = 42.00(In.)
Calculated individual pipe flow = 153.340(CFS)
Normal flow depth in pipe = 33.94(In.)
Flow top width inside pipe = 33.08(In.)
Critical depth could not be calculated.
Pipe flow velocity = 18.42(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 20.67 min.

Process from Point/Station 368.000 to Point/Station 366.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 20.67 min.
Rainfall intensity = 2.543(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff = 4.930(CFS) for 2.770(Ac.)
Total runoff = 158.271(CFS) Total area = 111.95(Ac.)

Process from Point/Station 366.000 to Point/Station 370.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 21.400(Ft.)
Downstream point/station elevation = 15.900(Ft.)
Pipe length = 534.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 158.271(CFS)
Nearest computed pipe diameter = 51.00(In.)
Calculated individual pipe flow = 158.271(CFS)
Normal flow depth in pipe = 38.67(In.)
Flow top width inside pipe = 43.67(In.)
Critical Depth = 44.27(In.)
Pipe flow velocity = 13.71(Ft/s)
Travel time through pipe = 0.65 min.
Time of concentration (TC) = 21.32 min.

Process from Point/Station 372.000 to Point/Station 370.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 21.32 min.
Rainfall intensity = 2.507(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff = 2.088(CFS) for 1.190(Ac.)
Total runoff = 160.359(CFS) Total area = 113.14(Ac.)

Process from Point/Station 370.000 to Point/Station 374.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 15.900(Ft.)
Downstream point/station elevation = 15.090(Ft.)
Pipe length = 73.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 160.359(CFS)

Nearest computed pipe diameter = 48.00(In.)
Calculated individual pipe flow = 160.359(CFS)
Normal flow depth in pipe = 42.75(In.)
Flow top width inside pipe = 29.96(In.)
Critical Depth = 44.04(In.)
Pipe flow velocity = 13.58(Ft/s)
Travel time through pipe = 0.09 min.
Time of concentration (TC) = 21.41 min.

Process from Point/Station 370.000 to Point/Station 374.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 113.140(Ac.)
Runoff from this stream = 160.359(CFS)
Time of concentration = 21.41 min.
Rainfall intensity = 2.502(In/Hr)

Process from Point/Station 376.000 to Point/Station 378.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 542.000(Ft.)
Highest elevation = 49.200(Ft.)
Lowest elevation = 40.000(Ft.)
Elevation difference = 9.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 14.05 min.
TC = $[1.8*(1.1-C)*distance(Ft.)^{.5}/(%\ slope^{(1/3)})]$
TC = $[1.8*(1.1-0.7000)*(542.000^{.5})/(1.697^{(1/3)})]= 14.05$
Rainfall intensity (I) = 2.978(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 2.127(CFS)
Total initial stream area = 1.020(Ac.)

Process from Point/Station 380.000 to Point/Station 378.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000

[MULTI - UNITS area type]
 Time of concentration = 14.05 min.
 Rainfall intensity = 2.978(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
 Subarea runoff = 1.355(CFS) for 0.650(Ac.)
 Total runoff = 3.482(CFS) Total area = 1.67(Ac.)

 Process from Point/Station 378.000 to Point/Station 382.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 40.000(Ft.)
 Downstream point/station elevation = 32.000(Ft.)
 Pipe length = 142.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.482(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 3.482(CFS)
 Normal flow depth in pipe = 6.60(In.)
 Flow top width inside pipe = 7.96(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 10.04(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 14.29 min.

 Process from Point/Station 384.000 to Point/Station 382.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000

[MULTI - UNITS area type]
 Time of concentration = 14.29 min.
 Rainfall intensity = 2.960(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
 Subarea runoff = 2.755(CFS) for 1.330(Ac.)
 Total runoff = 6.237(CFS) Total area = 3.00(Ac.)

 Process from Point/Station 382.000 to Point/Station 374.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 25.000(Ft.)
 Downstream point/station elevation = 15.090(Ft.)
 Pipe length = 170.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.237(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 6.237(CFS)

Normal flow depth in pipe = 7.57(In.)
 Flow top width inside pipe = 11.58(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 11.94(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 14.53 min.

 Process from Point/Station 382.000 to Point/Station 374.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 3.000(Ac.)
 Runoff from this stream = 6.237(CFS)
 Time of concentration = 14.53 min.
 Rainfall intensity = 2.941(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	160.359	21.41	2.502
2	6.237	14.53	2.941
Qmax(1) =			
	1.000 *	1.000 *	160.359) +
	0.851 *	1.000 *	6.237) + = 165.665
Qmax(2) =			
	1.000 *	0.678 *	160.359) +
	1.000 *	1.000 *	6.237) + = 115.039

Total of 2 streams to confluence:
 Flow rates before confluence point:
 160.359 6.237
 Maximum flow rates at confluence using above data:
 165.665 115.039
 Area of streams before confluence:
 113.140 3.000
 Results of confluence:
 Total flow rate = 165.665(CFS)
 Time of concentration = 21.408 min.
 Effective stream area after confluence = 116.140(Ac.)

 Process from Point/Station 374.000 to Point/Station 386.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 15.090(Ft.)
 Downstream point/station elevation = 10.000(Ft.)
 Pipe length = 59.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 165.665(CFS)
 Nearest computed pipe diameter = 33.00(In.)
 Calculated individual pipe flow = 165.665(CFS)
 Normal flow depth in pipe = 29.70(In.)
 Flow top width inside pipe = 19.80(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 29.40(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 21.44 min.

++++++
 Process from Point/Station 400.000 to Point/Station 402.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Initial subarea flow distance = 336.000(Ft.)
 Highest elevation = 33.500(Ft.)
 Lowest elevation = 30.500(Ft.)
 Elevation difference = 3.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 13.71 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7000) * (336.000^{.5}) / (0.893^{(1/3)})] = 13.71$
 Rainfall intensity (I) = 3.006(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 1.031(CFS)
 Total initial stream area = 0.490(Ac.)

++++++
 Process from Point/Station 402.000 to Point/Station 404.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 30.500(Ft.)
 Downstream point/station elevation = 30.000(Ft.)
 Pipe length = 48.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.031(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 1.031(CFS)
 Normal flow depth in pipe = 5.08(In.)
 Flow top width inside pipe = 8.92(In.)
 Critical Depth = 5.59(In.)
 Pipe flow velocity = 4.01(Ft/s)
 Travel time through pipe = 0.20 min.
 Time of concentration (TC) = 13.91 min.

+++++
Process from Point/Station 402.000 to Point/Station 404.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 0.490(Ac.)
Runoff from this stream = 1.031(CFS)
Time of concentration = 13.91 min.
Rainfall intensity = 2.990(In/Hr)

+++++
Process from Point/Station 410.000 to Point/Station 412.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 357.000(Ft.)
Highest elevation = 33.500(Ft.)
Lowest elevation = 30.000(Ft.)
Elevation difference = 3.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 13.69 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*(357.000^0.5)/(0.980^(1/3))]= 13.69
Rainfall intensity (I) = 3.007(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 1.221(CFS)
Total initial stream area = 0.580(Ac.)

+++++
Process from Point/Station 412.000 to Point/Station 414.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 25.700(Ft.)
Downstream point/station elevation = 24.500(Ft.)
Pipe length = 229.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.221(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 1.221(CFS)
Normal flow depth in pipe = 5.81(In.)
Flow top width inside pipe = 11.99(In.)
Critical Depth = 5.60(In.)
Pipe flow velocity = 3.24(Ft/s)
Travel time through pipe = 1.18 min.
Time of concentration (TC) = 14.87 min.

+++++
Process from Point/Station 414.000 to Point/Station 414.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 14.87 min.
Rainfall intensity = 2.915(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 0.816(CFS) for 0.400(Ac.)
Total runoff = 2.037(CFS) Total area = 0.98(Ac.)

+++++
Process from Point/Station 414.000 to Point/Station 416.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 24.500(Ft.)
Downstream point/station elevation = 23.700(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.037(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.037(CFS)
Normal flow depth in pipe = 6.49(In.)
Flow top width inside pipe = 8.07(In.)
Critical Depth = 7.76(In.)
Pipe flow velocity = 5.97(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 14.98 min.

+++++
Process from Point/Station 418.000 to Point/Station 416.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 14.98 min.
Rainfall intensity = 2.906(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.700
Subarea runoff = 4.537(CFS) for 2.230(Ac.)
Total runoff = 6.574(CFS) Total area = 3.21(Ac.)

+++++
Process from Point/Station 418.000 to Point/Station 416.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 3.210(Ac.)
Runoff from this stream = 6.574(CFS)
Time of concentration = 14.98 min.
Rainfall intensity = 2.906(In/Hr)

Process from Point/Station 420.000 to Point/Station 422.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 883.000(Ft.)
Highest elevation = 40.500(Ft.)
Lowest elevation = 23.500(Ft.)
Elevation difference = 17.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 17.20 min.
TC = $[1.8*(1.1-C)*distance(Ft.)^{.5}/(%\ slope^{(1/3)})]$
TC = $[1.8*(1.1-0.7000)*(883.000^{.5})/(1.925^{(1/3)})]= 17.20$
Rainfall intensity (I) = 2.752(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 5.239(CFS)
Total initial stream area = 2.720(Ac.)

Process from Point/Station 422.000 to Point/Station 424.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 17.600(Ft.)
Downstream point/station elevation = 17.000(Ft.)
Pipe length = 119.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.239(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 5.239(CFS)
Normal flow depth in pipe = 11.12(In.)
Flow top width inside pipe = 17.49(In.)
Critical Depth = 10.57(In.)
Pipe flow velocity = 4.57(Ft/s)
Travel time through pipe = 0.43 min.
Time of concentration (TC) = 17.63 min.

Process from Point/Station 422.000 to Point/Station 424.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
 Stream flow area = 2.720(Ac.)
 Runoff from this stream = 5.239(CFS)
 Time of concentration = 17.63 min.
 Rainfall intensity = 2.723(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.031	13.91	2.990
2	6.574	14.98	2.906
3	5.239	17.63	2.723
Qmax(1) =			
	1.000 *	1.000 *	1.031) +
	1.000 *	0.928 *	6.574) +
	1.000 *	0.789 *	5.239) + = 11.263
Qmax(2) =			
	0.972 *	1.000 *	1.031) +
	1.000 *	1.000 *	6.574) +
	1.000 *	0.850 *	5.239) + = 12.028
Qmax(3) =			
	0.911 *	1.000 *	1.031) +
	0.937 *	1.000 *	6.574) +
	1.000 *	1.000 *	5.239) + = 12.338

Total of 3 streams to confluence:
 Flow rates before confluence point:
 1.031 6.574 5.239
 Maximum flow rates at confluence using above data:
 11.263 12.028 12.338
 Area of streams before confluence:
 0.490 3.210 2.720
 Results of confluence:
 Total flow rate = 12.338(CFS)
 Time of concentration = 17.632 min.
 Effective stream area after confluence = 6.420(Ac.)

 Process from Point/Station 500.000 to Point/Station 502.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Initial subarea flow distance = 320.000(Ft.)

Highest elevation = 33.000(Ft.)
 Lowest elevation = 29.800(Ft.)
 Elevation difference = 3.200(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 8.05 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(\% slope^{(1/3)})]$
 $TC = [1.8*(1.1-0.8500)*(320.000^0.5)/(1.000^{(1/3)})] = 8.05$
 Rainfall intensity (I) = 3.651(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
 Subarea runoff = 4.035(CFS)
 Total initial stream area = 1.300(Ac.)

 Process from Point/Station 502.000 to Point/Station 504.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 33.000(Ft.)
 Downstream point/station elevation = 31.700(Ft.)
 Pipe length = 130.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.035(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 4.035(CFS)
 Normal flow depth in pipe = 8.59(In.)
 Flow top width inside pipe = 14.84(In.)
 Critical Depth = 9.76(In.)
 Pipe flow velocity = 5.55(Ft/s)
 Travel time through pipe = 0.39 min.
 Time of concentration (TC) = 8.44 min.

 Process from Point/Station 504.000 to Point/Station 504.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Time of concentration = 8.44 min.
 Rainfall intensity = 3.588(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850
 Subarea runoff = 4.972(CFS) for 1.630(Ac.)
 Total runoff = 9.007(CFS) Total area = 2.93(Ac.)

 Process from Point/Station 520.000 to Point/Station 504.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Time of concentration = 8.44 min.
Rainfall intensity = 3.588(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff = 2.166(CFS) for 0.710(Ac.)
Total runoff = 11.172(CFS) Total area = 3.64(Ac.)

Process from Point/Station 522.000 to Point/Station 504.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Time of concentration = 8.44 min.
Rainfall intensity = 3.588(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff = 3.996(CFS) for 1.310(Ac.)
Total runoff = 15.168(CFS) Total area = 4.95(Ac.)

Process from Point/Station 504.000 to Point/Station 506.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 21.800(Ft.)
Downstream point/station elevation = 20.600(Ft.)
Pipe length = 120.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 15.168(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 15.168(CFS)
Normal flow depth in pipe = 16.45(In.)
Flow top width inside pipe = 17.30(In.)
Critical Depth = 17.31(In.)
Pipe flow velocity = 7.50(Ft/s)
Travel time through pipe = 0.27 min.
Time of concentration (TC) = 8.71 min.

Process from Point/Station 508.000 to Point/Station 506.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Time of concentration = 8.71 min.
Rainfall intensity = 3.548(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850
Subarea runoff = 1.990(CFS) for 0.660(Ac.)
Total runoff = 17.158(CFS) Total area = 5.61(Ac.)

Process from Point/Station 506.000 to Point/Station 510.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 20.600(Ft.)
Downstream point/station elevation = 19.800(Ft.)
Pipe length = 152.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 17.158(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 17.158(CFS)
Normal flow depth in pipe = 20.81(In.)
Flow top width inside pipe = 16.29(In.)
Critical Depth = 17.91(In.)
Pipe flow velocity = 5.93(Ft/s)
Travel time through pipe = 0.43 min.
Time of concentration (TC) = 9.13 min.

Process from Point/Station 524.000 to Point/Station 510.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Time of concentration = 9.13 min.
Rainfall intensity = 3.487(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850
Subarea runoff = 3.438(CFS) for 1.160(Ac.)
Total runoff = 20.596(CFS) Total area = 6.77(Ac.)

Process from Point/Station 506.000 to Point/Station 510.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 6.770(Ac.)
Runoff from this stream = 20.596(CFS)
Time of concentration = 9.13 min.
Rainfall intensity = 3.487(In/Hr)

Process from Point/Station 530.000 to Point/Station 532.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Initial subarea flow distance = 230.000(Ft.)
Highest elevation = 34.000(Ft.)
Lowest elevation = 31.700(Ft.)
Elevation difference = 2.300(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 6.82 min.
TC = $[1.8*(1.1-C)*distance(Ft.)^0.5]/(\% slope^{(1/3)}]$
TC = $[1.8*(1.1-0.8500)*(230.000^0.5)/(1.000^{(1/3)})] = 6.82$
Rainfall intensity (I) = 3.883(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff = 2.674(CFS)
Total initial stream area = 0.810(Ac.)

Process from Point/Station 532.000 to Point/Station 534.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 25.000(Ft.)
Downstream point/station elevation = 20.000(Ft.)
Pipe length = 240.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.674(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.674(CFS)
Normal flow depth in pipe = 6.14(In.)
Flow top width inside pipe = 12.00(In.)
Critical Depth = 8.41(In.)
Pipe flow velocity = 6.61(Ft/s)
Travel time through pipe = 0.60 min.
Time of concentration (TC) = 7.43 min.

Process from Point/Station 534.000 to Point/Station 534.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]

Time of concentration = 7.43 min.
 Rainfall intensity = 3.761(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850
 Subarea runoff = 4.924(CFS) for 1.540(Ac.)
 Total runoff = 7.597(CFS) Total area = 2.35(Ac.)

 Process from Point/Station 534.000 to Point/Station 510.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 20.000(Ft.)
 Downstream point/station elevation = 18.100(Ft.)
 Pipe length = 51.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.597(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 7.597(CFS)
 Normal flow depth in pipe = 8.46(In.)
 Flow top width inside pipe = 14.88(In.)
 Critical Depth = 13.14(In.)
 Pipe flow velocity = 10.66(Ft/s)
 Travel time through pipe = 0.08 min.
 Time of concentration (TC) = 7.51 min.

 Process from Point/Station 534.000 to Point/Station 510.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 2.350(Ac.)
 Runoff from this stream = 7.597(CFS)
 Time of concentration = 7.51 min.
 Rainfall intensity = 3.746(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	20.596	9.13	3.487
2	7.597	7.51	3.746
Qmax(1) =			
	1.000 *	1.000 *	20.596) +
	0.931 *	1.000 *	7.597) + = 27.667
Qmax(2) =			
	1.000 *	0.822 *	20.596) +
	1.000 *	1.000 *	7.597) + = 24.530

Total of 2 streams to confluence:
 Flow rates before confluence point:
 20.596 7.597

Maximum flow rates at confluence using above data:

27.667 24.530

Area of streams before confluence:

6.770 2.350

Results of confluence:

Total flow rate = 27.667(CFS)

Time of concentration = 9.134 min.

Effective stream area after confluence = 9.120(Ac.)

Process from Point/Station 510.000 to Point/Station 510.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[COMMERCIAL area type]

Time of concentration = 9.13 min.

Rainfall intensity = 3.487(In/Hr) for a 100.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850

Subarea runoff = 0.830(CFS) for 0.280(Ac.)

Total runoff = 28.496(CFS) Total area = 9.40(Ac.)

Process from Point/Station 510.000 to Point/Station 536.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 15.600(Ft.)

Downstream point/station elevation = 14.400(Ft.)

Pipe length = 318.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 28.496(CFS)

Nearest computed pipe diameter = 33.00(In.)

Calculated individual pipe flow = 28.496(CFS)

Normal flow depth in pipe = 23.95(In.)

Flow top width inside pipe = 29.44(In.)

Critical Depth = 21.27(In.)

Pipe flow velocity = 6.17(Ft/s)

Travel time through pipe = 0.86 min.

Time of concentration (TC) = 9.99 min.

Process from Point/Station 538.000 to Point/Station 536.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[COMMERCIAL area type]
 Time of concentration = 9.99 min.
 Rainfall intensity = 3.375(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850
 Subarea runoff = 1.205(CFS) for 0.420(Ac.)
 Total runoff = 29.701(CFS) Total area = 9.82(Ac.)

 Process from Point/Station 536.000 to Point/Station 540.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 14.400(Ft.)
 Downstream point/station elevation = 14.000(Ft.)
 Pipe length = 47.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 29.701(CFS)
 Nearest computed pipe diameter = 27.00(In.)
 Calculated individual pipe flow = 29.701(CFS)
 Normal flow depth in pipe = 23.25(In.)
 Flow top width inside pipe = 18.67(In.)
 Critical Depth = 22.68(In.)
 Pipe flow velocity = 8.16(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 10.09 min.

 Process from Point/Station 536.000 to Point/Station 540.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 9.820(Ac.)
 Runoff from this stream = 29.701(CFS)
 Time of concentration = 10.09 min.
 Rainfall intensity = 3.363(In/Hr)

 Process from Point/Station 550.000 to Point/Station 552.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Initial subarea flow distance = 263.000(Ft.)
 Highest elevation = 32.000(Ft.)
 Lowest elevation = 29.400(Ft.)
 Elevation difference = 2.600(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 7.33 min.

$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.8500) * (263.000^{.5}) / (0.989^{(1/3)})] = 7.33$
 Rainfall intensity (I) = 3.781(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
 Subarea runoff = 2.603(CFS)
 Total initial stream area = 0.810(Ac.)

++++++
 Process from Point/Station 552.000 to Point/Station 554.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 25.000(Ft.)
 Downstream point/station elevation = 24.200(Ft.)
 Pipe length = 76.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.603(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 2.603(CFS)
 Normal flow depth in pipe = 7.49(In.)
 Flow top width inside pipe = 11.62(In.)
 Critical Depth = 8.30(In.)
 Pipe flow velocity = 5.05(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 7.58 min.

++++++
 Process from Point/Station 556.000 to Point/Station 554.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Time of concentration = 7.58 min.
 Rainfall intensity = 3.734(In/Hr) for a 100.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850
 Subarea runoff = 2.920(CFS) for 0.920(Ac.)
 Total runoff = 5.523(CFS) Total area = 1.73(Ac.)

++++++
 Process from Point/Station 554.000 to Point/Station 540.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 24.200(Ft.)
 Downstream point/station elevation = 14.000(Ft.)
 Pipe length = 104.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.523(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 5.523(CFS)

Normal flow depth in pipe = 8.10(In.)
 Flow top width inside pipe = 5.40(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.18(Ft/s)
 Travel time through pipe = 0.13 min.
 Time of concentration (TC) = 7.71 min.

 Process from Point/Station 554.000 to Point/Station 540.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.730(Ac.)
 Runoff from this stream = 5.523(CFS)
 Time of concentration = 7.71 min.
 Rainfall intensity = 3.710(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	29.701	10.09	3.363
2	5.523	7.71	3.710
Qmax(1) =			
	1.000 *	1.000 *	29.701) +
	0.906 *	1.000 *	5.523) + = 34.708
Qmax(2) =			
	1.000 *	0.764 *	29.701) +
	1.000 *	1.000 *	5.523) + = 28.214

Total of 2 streams to confluence:
 Flow rates before confluence point:
 29.701 5.523
 Maximum flow rates at confluence using above data:
 34.708 28.214
 Area of streams before confluence:
 9.820 1.730
 Results of confluence:
 Total flow rate = 34.708(CFS)
 Time of concentration = 10.089 min.
 Effective stream area after confluence = 11.550(Ac.)

 Process from Point/Station 540.000 to Point/Station 558.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 14.000(Ft.)
 Downstream point/station elevation = 13.000(Ft.)
 Pipe length = 200.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 34.708(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 34.708(CFS)
Normal flow depth in pipe = 25.13(In.)
Flow top width inside pipe = 28.13(In.)
Critical Depth = 23.54(In.)
Pipe flow velocity = 7.15(Ft/s)
Travel time through pipe = 0.47 min.
Time of concentration (TC) = 10.56 min.

Process from Point/Station 560.000 to Point/Station 558.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Time of concentration = 10.56 min.
Rainfall intensity = 3.309(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.850
Subarea runoff = 4.725(CFS) for 1.680(Ac.)
Total runoff = 39.433(CFS) Total area = 13.23(Ac.)

Process from Point/Station 558.000 to Point/Station 562.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 13.000(Ft.)
Downstream point/station elevation = 12.000(Ft.)
Pipe length = 89.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 39.433(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 39.433(CFS)
Normal flow depth in pipe = 22.41(In.)
Flow top width inside pipe = 26.09(In.)
Critical Depth = 25.38(In.)
Pipe flow velocity = 10.03(Ft/s)
Travel time through pipe = 0.15 min.
Time of concentration (TC) = 10.70 min.

Process from Point/Station 558.000 to Point/Station 562.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 13.230(Ac.)
Runoff from this stream = 39.433(CFS)

Time of concentration = 10.70 min.
Rainfall intensity = 3.292(In/Hr)

Process from Point/Station 570.000 to Point/Station 572.000

**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Initial subarea flow distance = 271.000(Ft.)
Highest elevation = 32.000(Ft.)
Lowest elevation = 27.800(Ft.)
Elevation difference = 4.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 6.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.8500)*(271.000^0.5)/(1.550^(1/3))]= 6.40
Rainfall intensity (I) = 3.980(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff = 2.503(CFS)
Total initial stream area = 0.740(Ac.)

Process from Point/Station 572.000 to Point/Station 574.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 23.000(Ft.)
Downstream point/station elevation = 20.200(Ft.)
Pipe length = 448.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.503(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.503(CFS)
Normal flow depth in pipe = 8.81(In.)
Flow top width inside pipe = 10.60(In.)
Critical Depth = 8.13(In.)
Pipe flow velocity = 4.05(Ft/s)
Travel time through pipe = 1.84 min.
Time of concentration (TC) = 8.24 min.

Process from Point/Station 572.000 to Point/Station 574.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.740(Ac.)
Runoff from this stream = 2.503(CFS)

Time of concentration = 8.24 min.
 Rainfall intensity = 3.620(In/Hr)

 Process from Point/Station 580.000 to Point/Station 582.000

**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Initial subarea flow distance = 270.000(Ft.)
 Highest elevation = 30.200(Ft.)
 Lowest elevation = 23.000(Ft.)
 Elevation difference = 7.200(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 8.53 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7000) * (270.000^{.5}) / (2.667^{(1/3)})] = 8.53$
 Rainfall intensity (I) = 3.574(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 1.576(CFS)
 Total initial stream area = 0.630(Ac.)

 Process from Point/Station 580.000 to Point/Station 582.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
 Stream flow area = 0.630(Ac.)
 Runoff from this stream = 1.576(CFS)
 Time of concentration = 8.53 min.
 Rainfall intensity = 3.574(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	39.433	10.70	3.292
2	2.503	8.24	3.620
3	1.576	8.53	3.574
Qmax(1) =			
	1.000 *	1.000 *	39.433) +
	0.910 *	1.000 *	2.503) +
	0.921 *	1.000 *	1.576) + = 43.162
Qmax(2) =			
	1.000 *	0.770 *	39.433) +
	1.000 *	1.000 *	2.503) +

	1.000 *	0.966 *	1.576) + =	34.398
Qmax(3) =	1.000 *	0.797 *	39.433) +	
	0.988 *	1.000 *	2.503) +	
	1.000 *	1.000 *	1.576) + =	35.480

Total of 3 streams to confluence:

Flow rates before confluence point:

39.433	2.503	1.576
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Maximum flow rates at confluence using above data:

43.162	34.398	35.480
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Area of streams before confluence:

13.230	0.740	0.630
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Results of confluence:

Total flow rate = 43.162(CFS)

Time of concentration = 10.703 min.

Effective stream area after confluence = 14.600(Ac.)

End of computations, total study area = 306.980 (Ac.)

APPENDIX B

HEC-RAS RESULTS

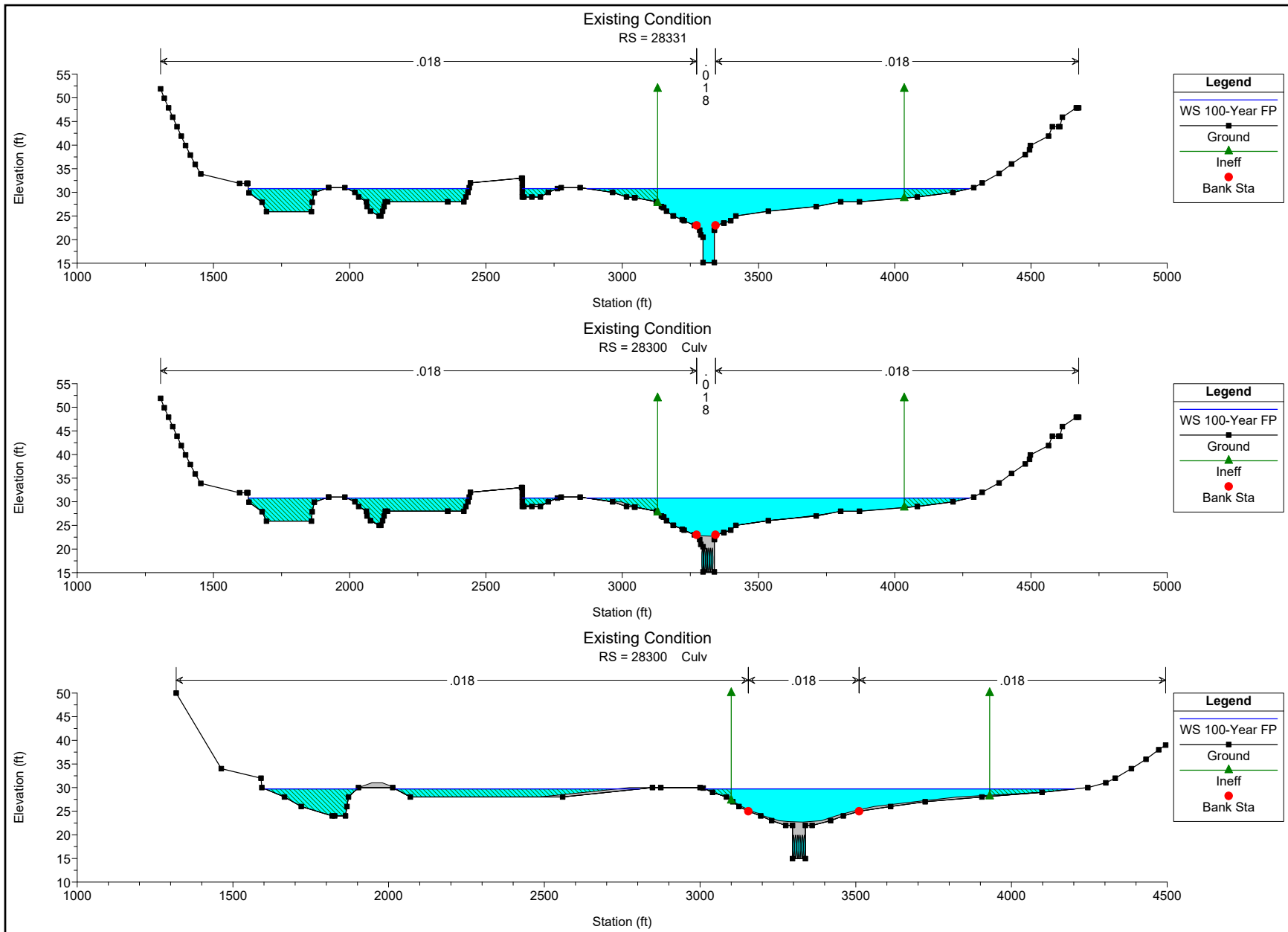
Existing Condition 100-Year Floodplain

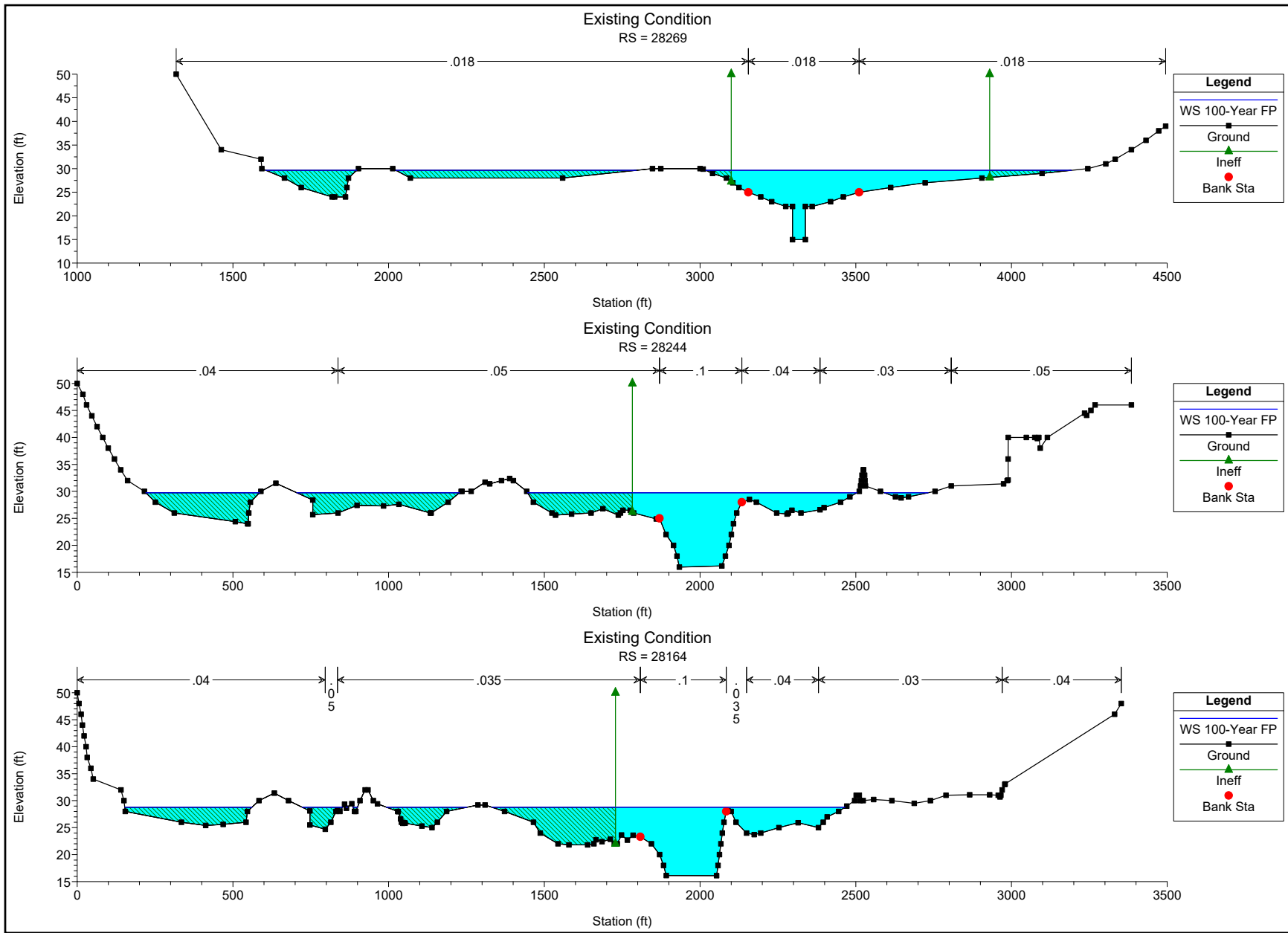
HEC-RAS Plan: Existing Con River: RIVER-1 Reach: Reach-1 Profile: 100-Year FP

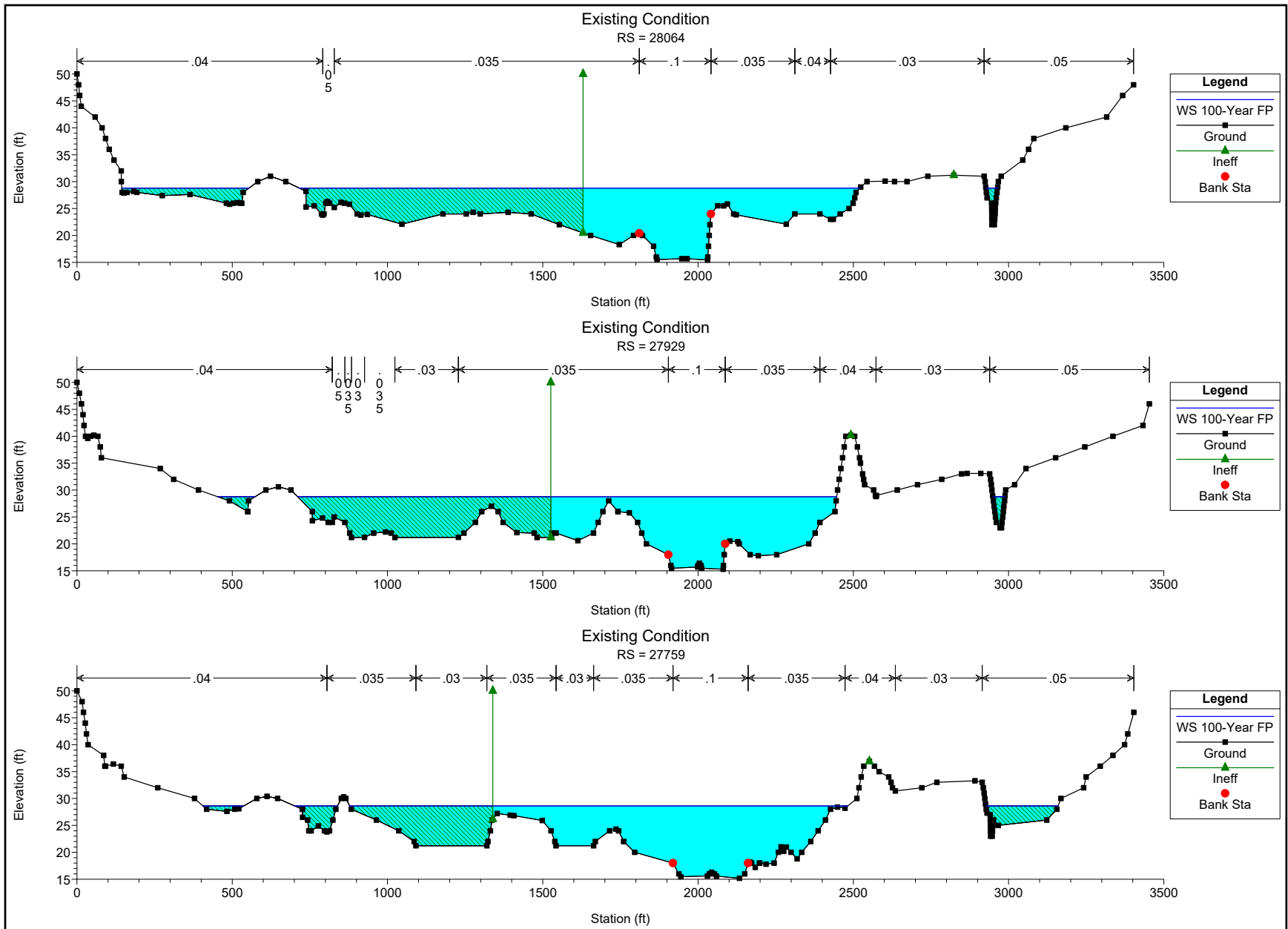
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	28331	100-Year FP	36000.00	15.14	30.79	30.20	32.06	0.000933	12.46	4537.27	2263.72	0.61
Reach-1	28300		Culvert									
Reach-1	28269	100-Year FP	36000.00	14.97	29.64		31.11	0.001213	10.59	4012.61	2236.61	0.69
Reach-1	28244	100-Year FP	36000.00	15.96	29.74		30.83	0.013101	8.35	4290.53	2085.01	0.44
Reach-1	28164	100-Year FP	36000.00	16.10	28.77		29.94	0.009489	6.88	4537.66	1947.47	0.37
Reach-1	28064	100-Year FP	36000.00	15.45	28.80	25.28	29.41	0.001906	3.41	6848.76	2252.34	0.17
Reach-1	27929	100-Year FP	36000.00	15.28	28.75	23.34	29.17	0.001076	2.68	7818.35	1894.80	0.13
Reach-1	27759	100-Year FP	36000.00	15.18	28.63	22.93	28.95	0.001018	2.61	8686.16	2108.05	0.13
Reach-1	27589	100-Year FP	36000.00	15.18	28.51	23.54	28.78	0.000723	2.15	9624.37	1808.95	0.11
Reach-1	27429	100-Year FP	36000.00	14.80	28.33	23.09	28.63	0.001256	2.91	8900.63	1508.38	0.14
Reach-1	27259	100-Year FP	36000.00	14.78	28.25	23.15	28.44	0.000685	2.17	11149.14	1922.99	0.11
Reach-1	27069	100-Year FP	36000.00	14.80	28.02	23.89	28.27	0.001042	3.37	9080.30	1699.76	0.17
Reach-1	26951	100-Year FP	36000.00	14.66	27.96	23.84	28.17	0.000774	4.02	9651.02	1660.01	0.21
Reach-1	26944		Bridge									
Reach-1	26937	100-Year FP	36000.00	14.66	27.95	23.59	28.15	0.000680	3.87	10011.45	1663.69	0.20
Reach-1	26799	100-Year FP	36000.00	14.74	27.70	24.13	28.02	0.001063	5.43	8379.40	1540.03	0.30
Reach-1	26614	100-Year FP	36000.00	14.60	27.50	23.71	27.83	0.000946	5.45	8126.55	1378.24	0.29
Reach-1	26379	100-Year FP	36000.00	14.45	27.06	24.08	27.54	0.001599	6.01	6504.08	1250.87	0.31
Reach-1	26174	100-Year FP	36000.00	14.24	26.92	23.59	27.21	0.001065	5.04	8541.02	1610.84	0.26
Reach-1	25914	100-Year FP	36000.00	13.93	26.78	22.72	26.97	0.000634	3.88	10691.21	1877.86	0.20
Reach-1	25654	100-Year FP	36000.00	13.50	26.47	23.52	26.74	0.001080	5.02	8857.46	1752.00	0.26
Reach-1	25354	100-Year FP	36000.00	13.31	26.37	20.98	26.52	0.000397	3.19	11833.85	1665.36	0.16
Reach-1	25181	100-Year FP	36000.00	13.20	26.27	21.13	26.45	0.000463	3.40	11041.38	1658.93	0.17
Reach-1	25001	100-Year FP	36000.00	12.69	26.14	21.12	26.35	0.000581	3.95	10067.91	1489.26	0.19
Reach-1	24804	100-Year FP	36000.00	12.52	26.06	21.96	26.28	0.000735	4.17	9565.97	1532.01	0.21
Reach-1	24797		Bridge									
Reach-1	24790	100-Year FP	36000.00	12.51	26.03	21.93	26.26	0.000761	4.24	9500.73	1522.56	0.21
Reach-1	24581	100-Year FP	36000.00	12.60	25.75	21.59	26.05	0.001201	6.68	9805.50	1306.15	0.33
Reach-1	24401	100-Year FP	36000.00	10.30	25.31	21.76	25.74	0.002967	5.29	7168.12	1333.64	0.26
Reach-1	24226	100-Year FP	36000.00	9.09	24.98	19.11	25.30	0.001771	3.36	8744.82	1343.58	0.17
Reach-1	24019	100-Year FP	36000.00	8.90	24.62	19.72	24.92	0.001816	3.32	8635.15	1602.77	0.17
Reach-1	23800	100-Year FP	36000.00	8.99	24.21	18.86	24.65	0.004053	4.85	6863.03	1424.58	0.25
Reach-1	23796	100-Year FP	36000.00	8.21	24.13	16.83	24.51	0.000485	5.62	8734.85	1502.47	0.26
Reach-1	23650	100-Year FP	36000.00	8.20	24.17	17.49	24.47	0.000415	5.11	9395.73	1489.04	0.24
Reach-1	23636	100-Year FP	36000.00	8.21	24.05	17.79	24.39	0.001535	4.94	7954.38	1475.97	0.23
Reach-1	23470	100-Year FP	36000.00	8.21	23.78	17.90	24.14	0.001817	5.08	7592.02	1373.19	0.25
Reach-1	23461	100-Year FP	36000.00	8.21	23.76	17.60	24.09	0.001291	4.93	8027.36	1399.39	0.23
Reach-1	23220	100-Year FP	36000.00	8.20	23.60	17.27	24.00	0.001312	5.71	7553.63	1612.72	0.27

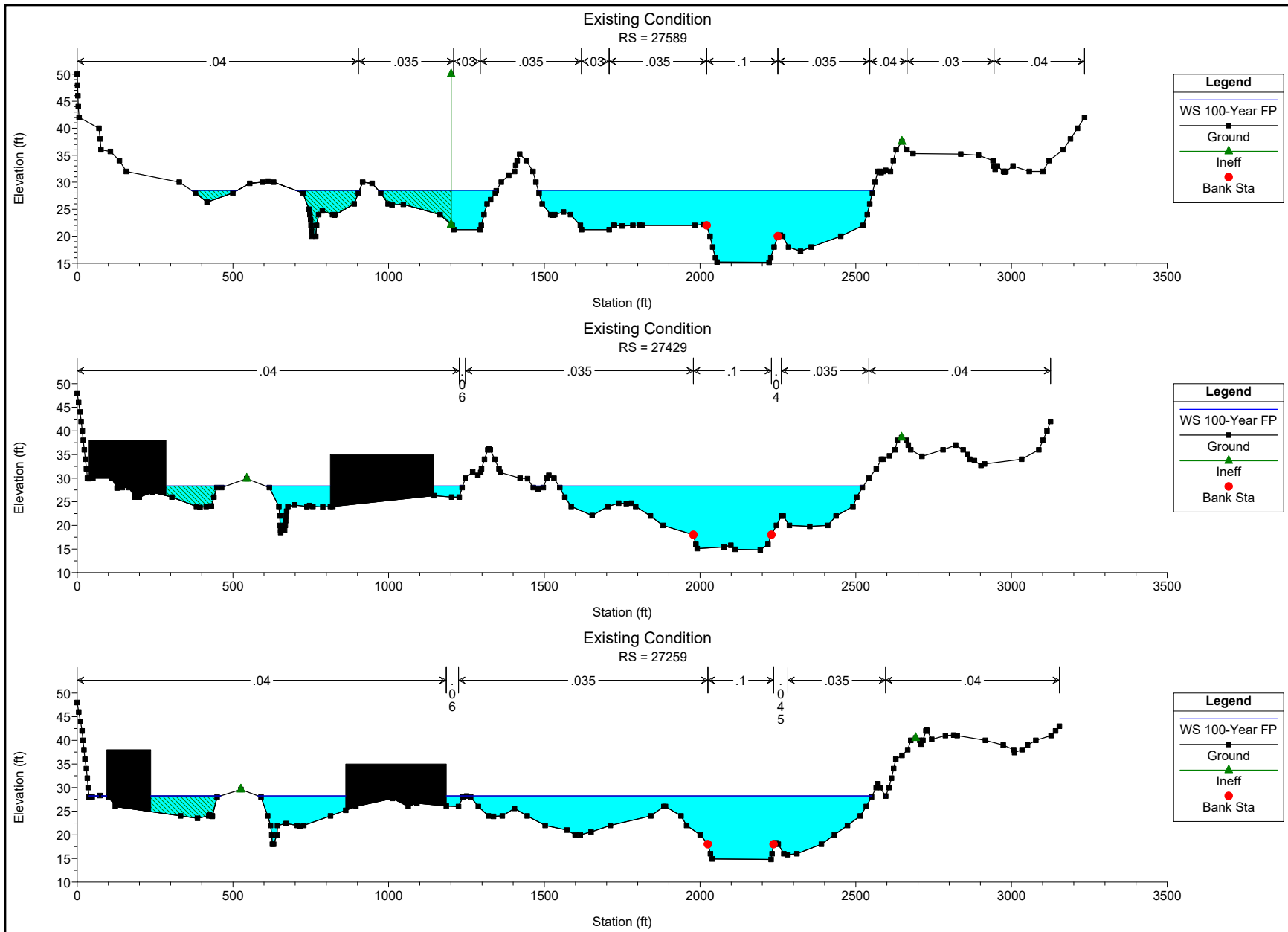
HEC-RAS Plan: Existing Con River: RIVER-1 Reach: Reach-1 Profile: 100-Year FP (Continued)

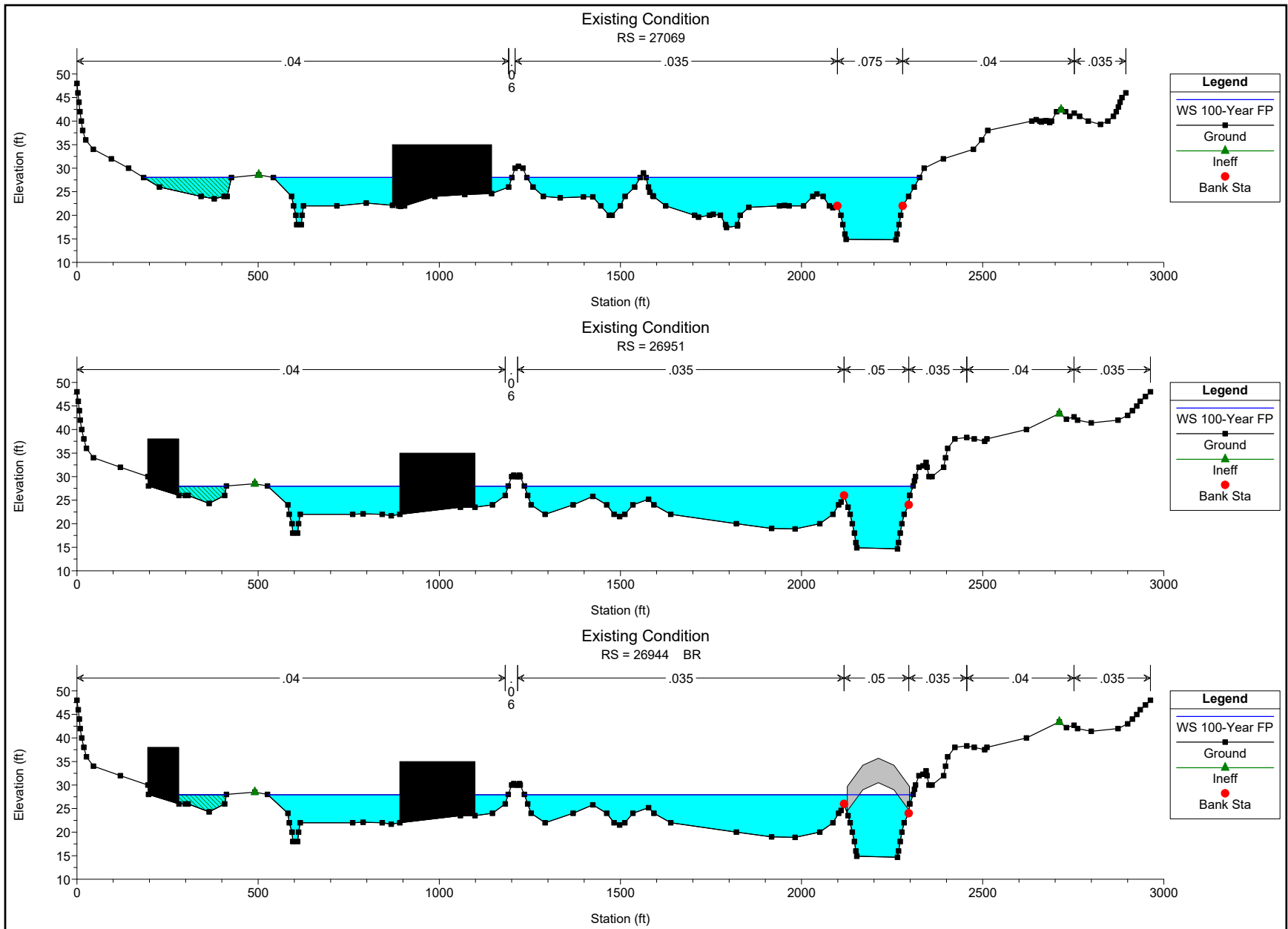
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	23210	100-Year FP	36000.00	8.21	23.17	17.03	23.83	0.002213	7.03	6055.21	1194.05	0.34
Reach-1	23200	100-Year FP	36000.00	8.21	23.00	17.16	23.75	0.002466	7.48	5762.65	1136.57	0.36
Reach-1	23171	100-Year FP	36000.00	8.20	22.60	17.87	23.37	0.005478	7.58	5285.13	1266.44	0.39
Reach-1	22880	100-Year FP	36000.00	8.20	22.36	18.74	23.06	0.004647	7.46	5745.10	1268.35	0.38
Reach-1	22870	100-Year FP	36000.00	8.20	22.53	16.36	22.84	0.002048	5.62	8961.97	1837.95	0.28
Reach-1	22860	100-Year FP	36000.00	-1.00	22.08		22.68	0.001153	6.62	6103.01	682.64	0.28
Reach-1	22850	100-Year FP	36000.00	-1.00	22.15	13.10	22.64	0.000303	5.74	6451.27	727.71	0.24

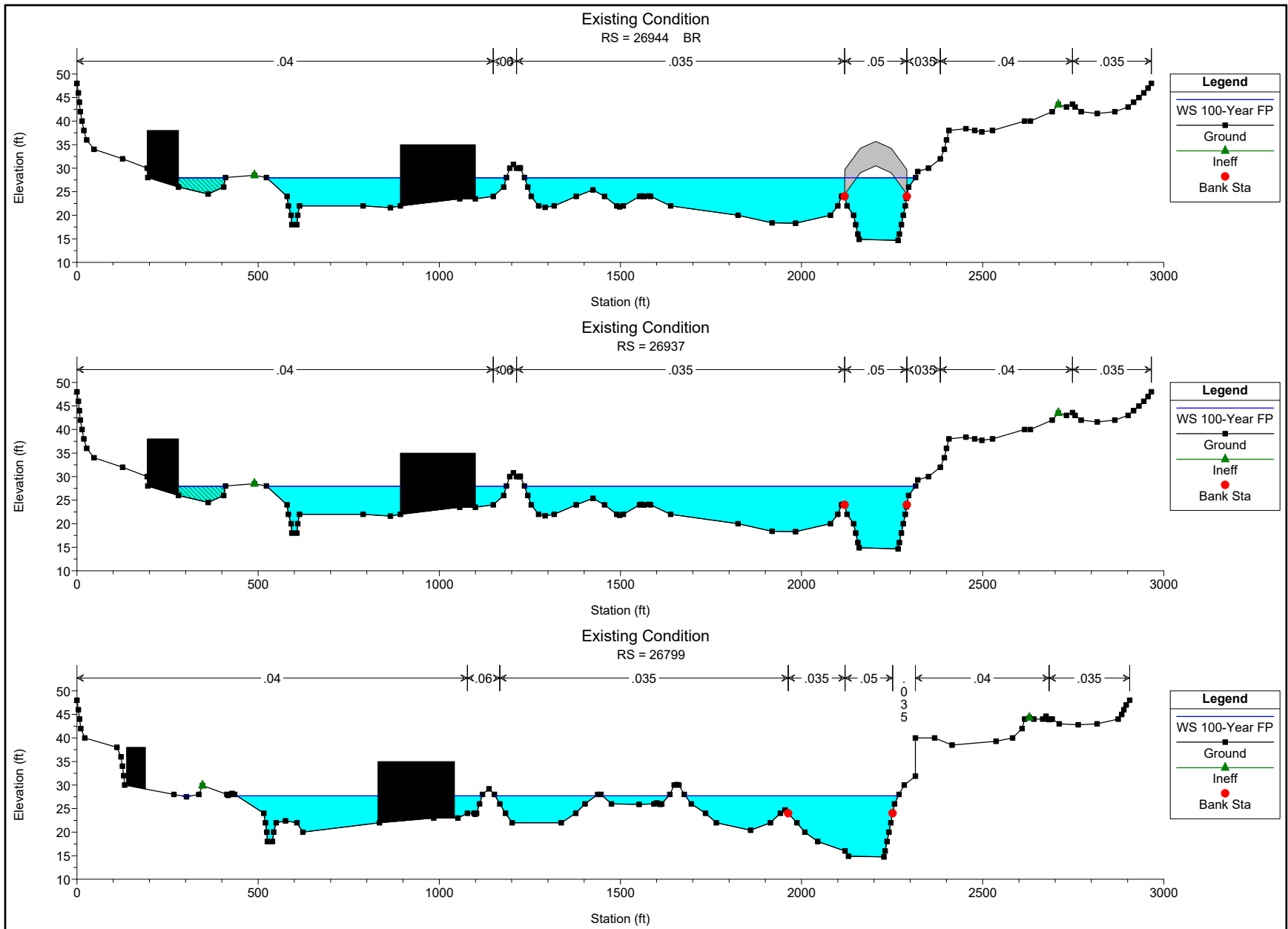


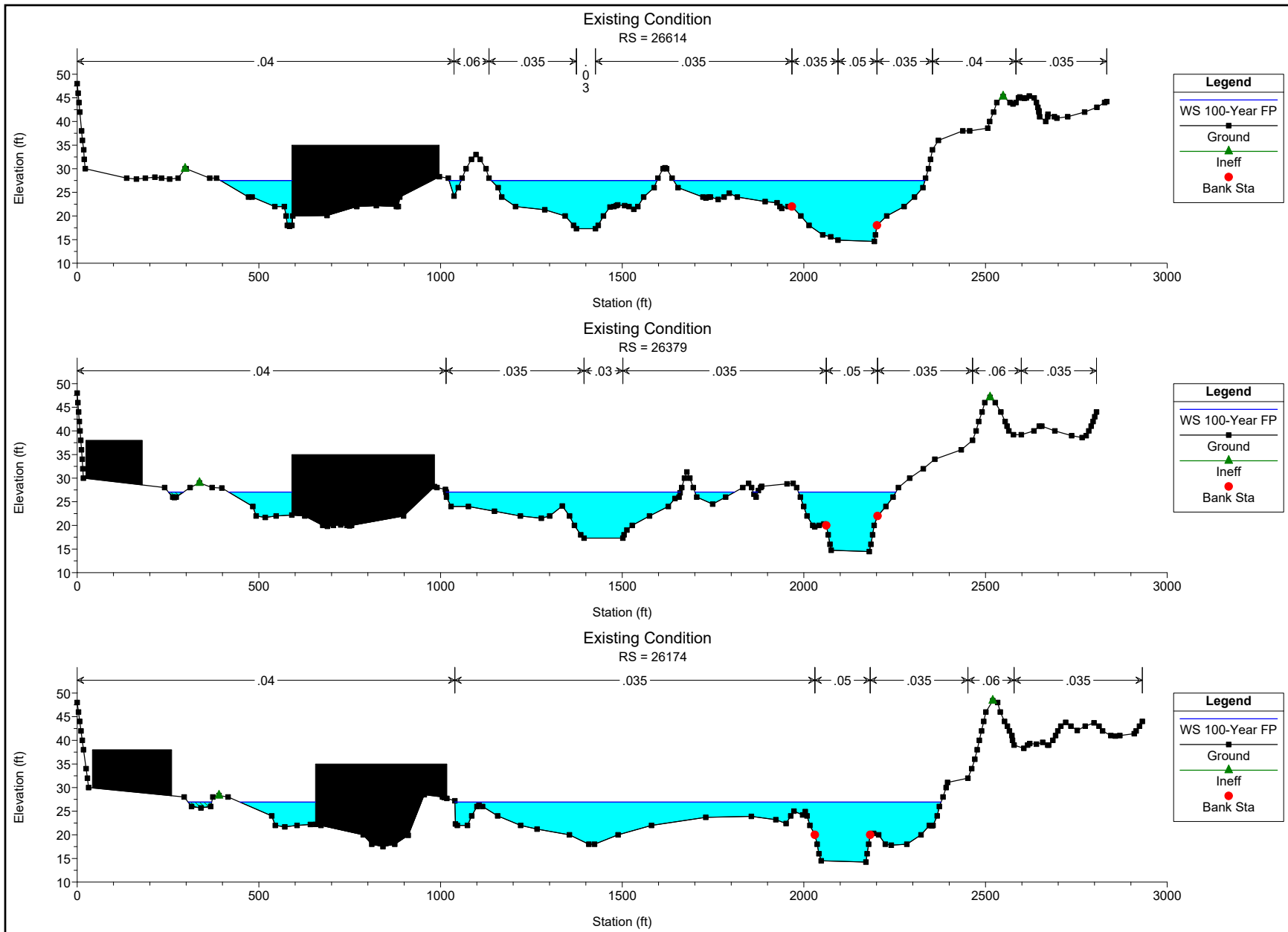


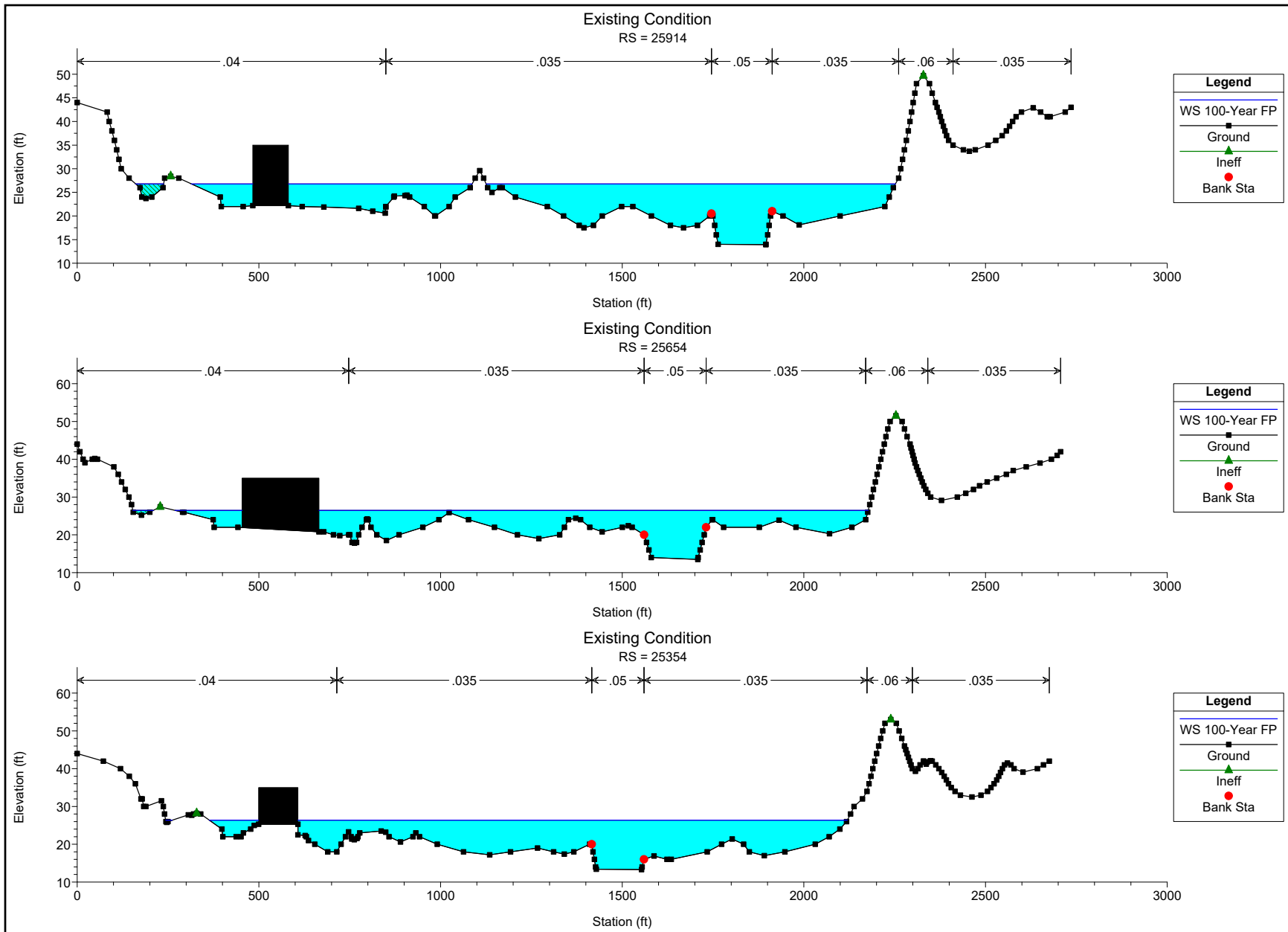


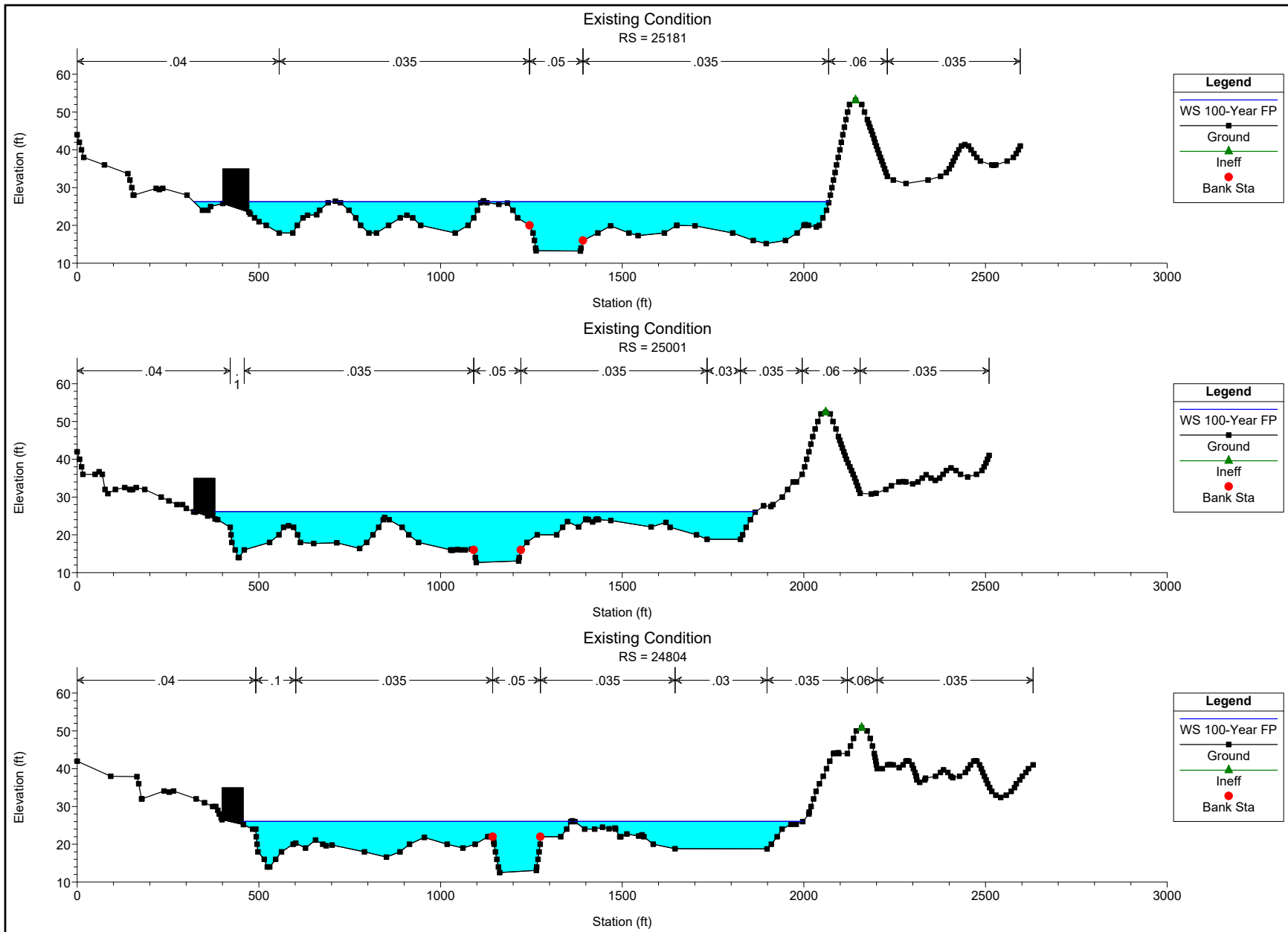


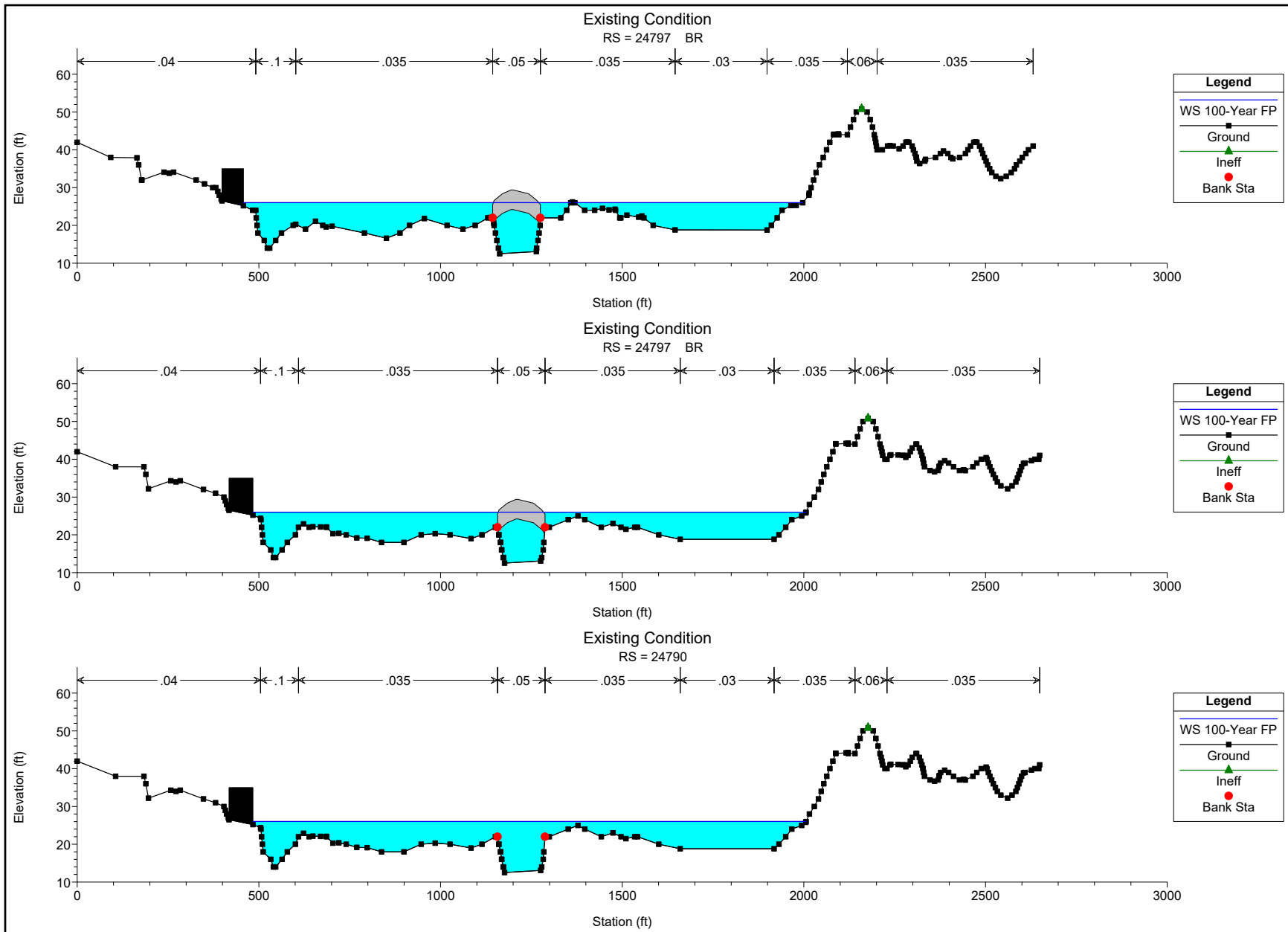


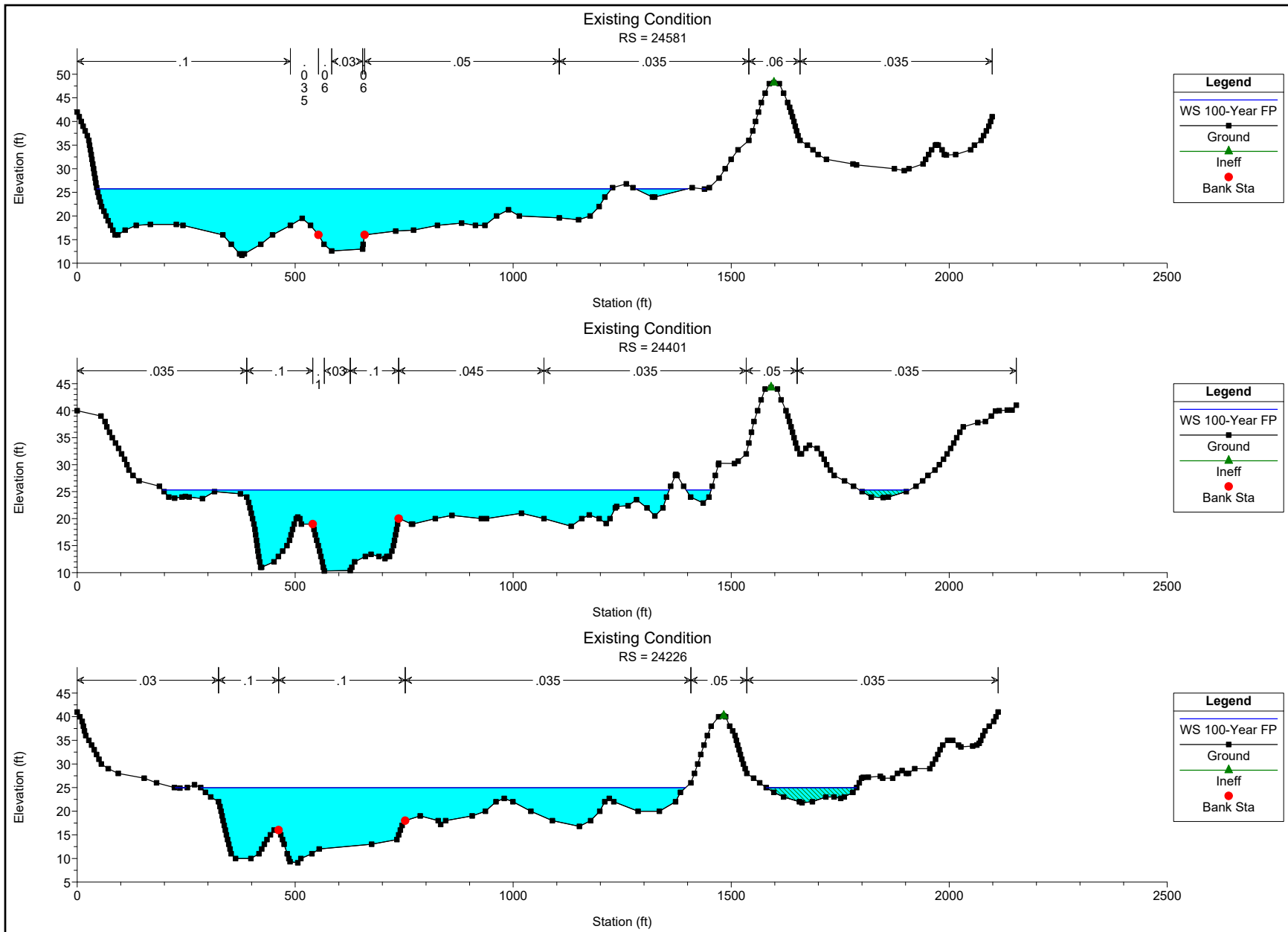


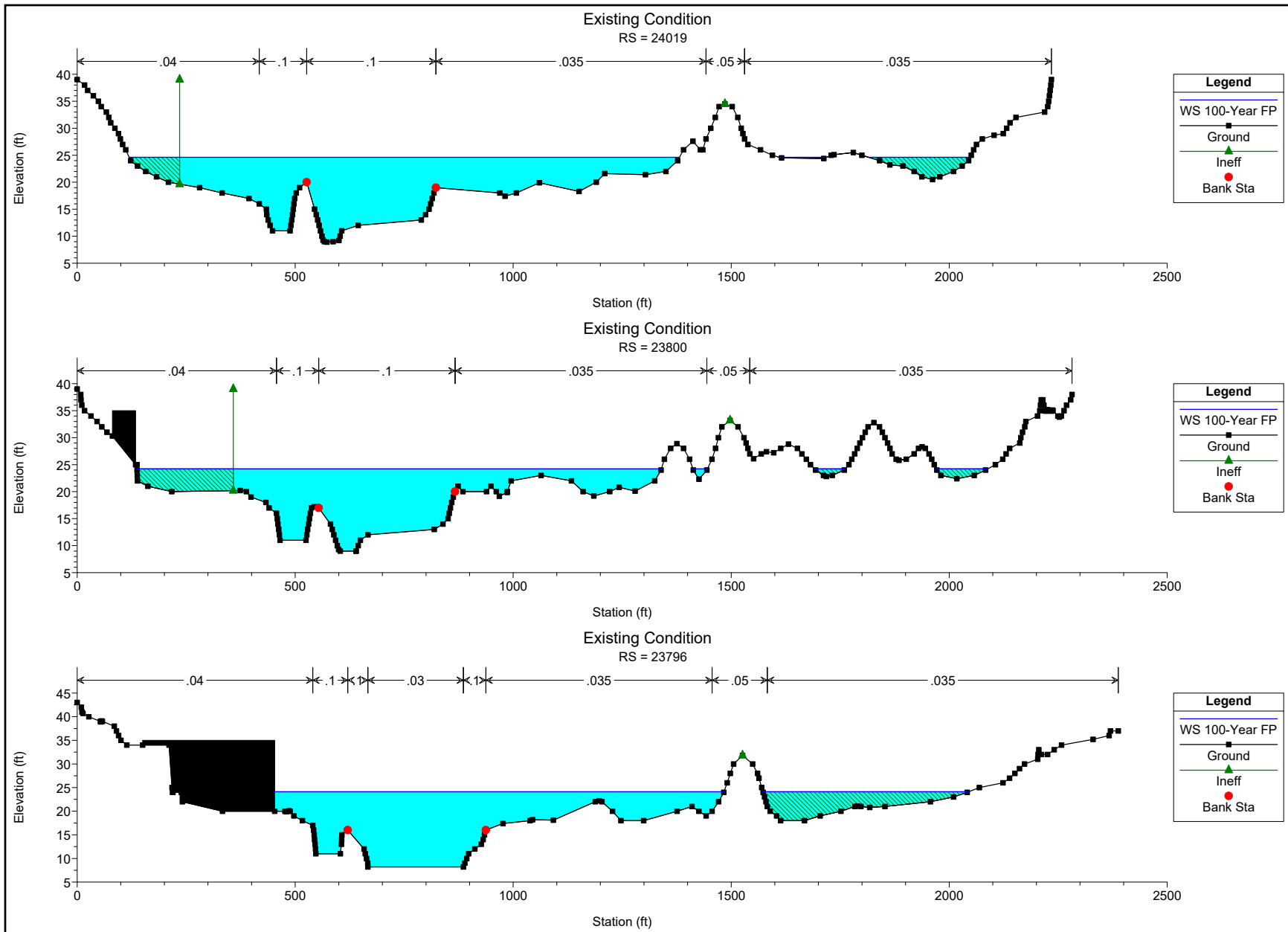


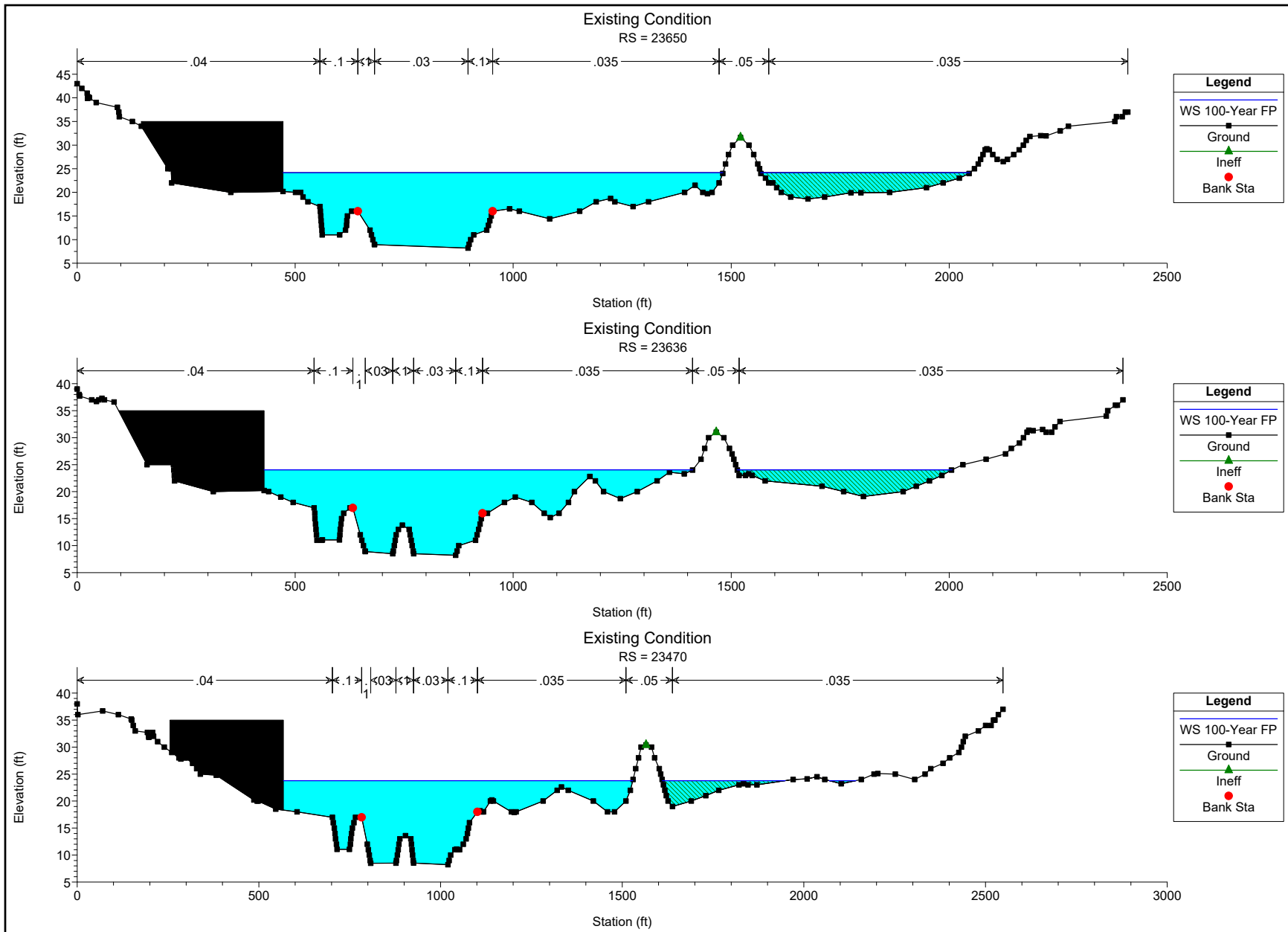


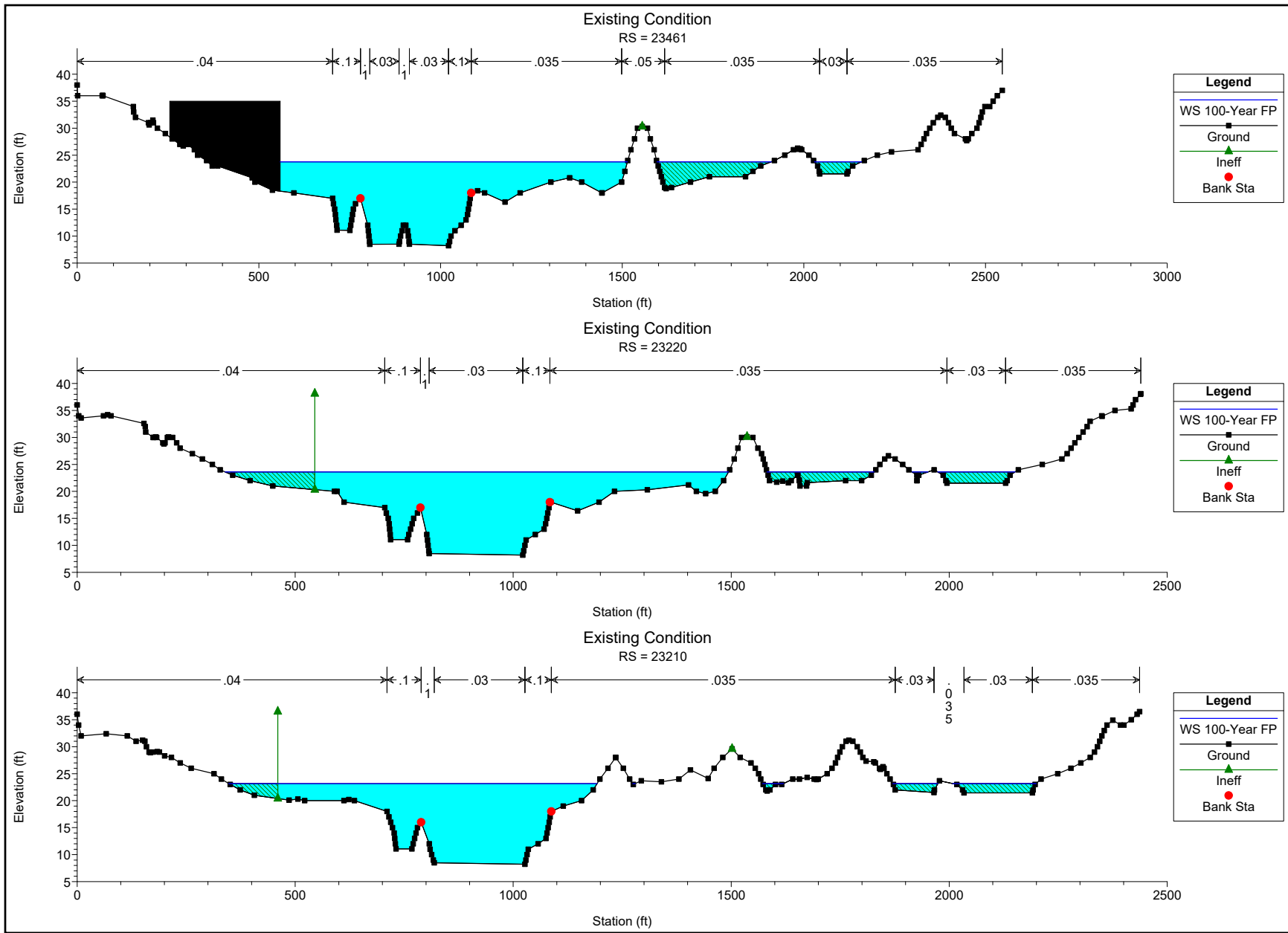


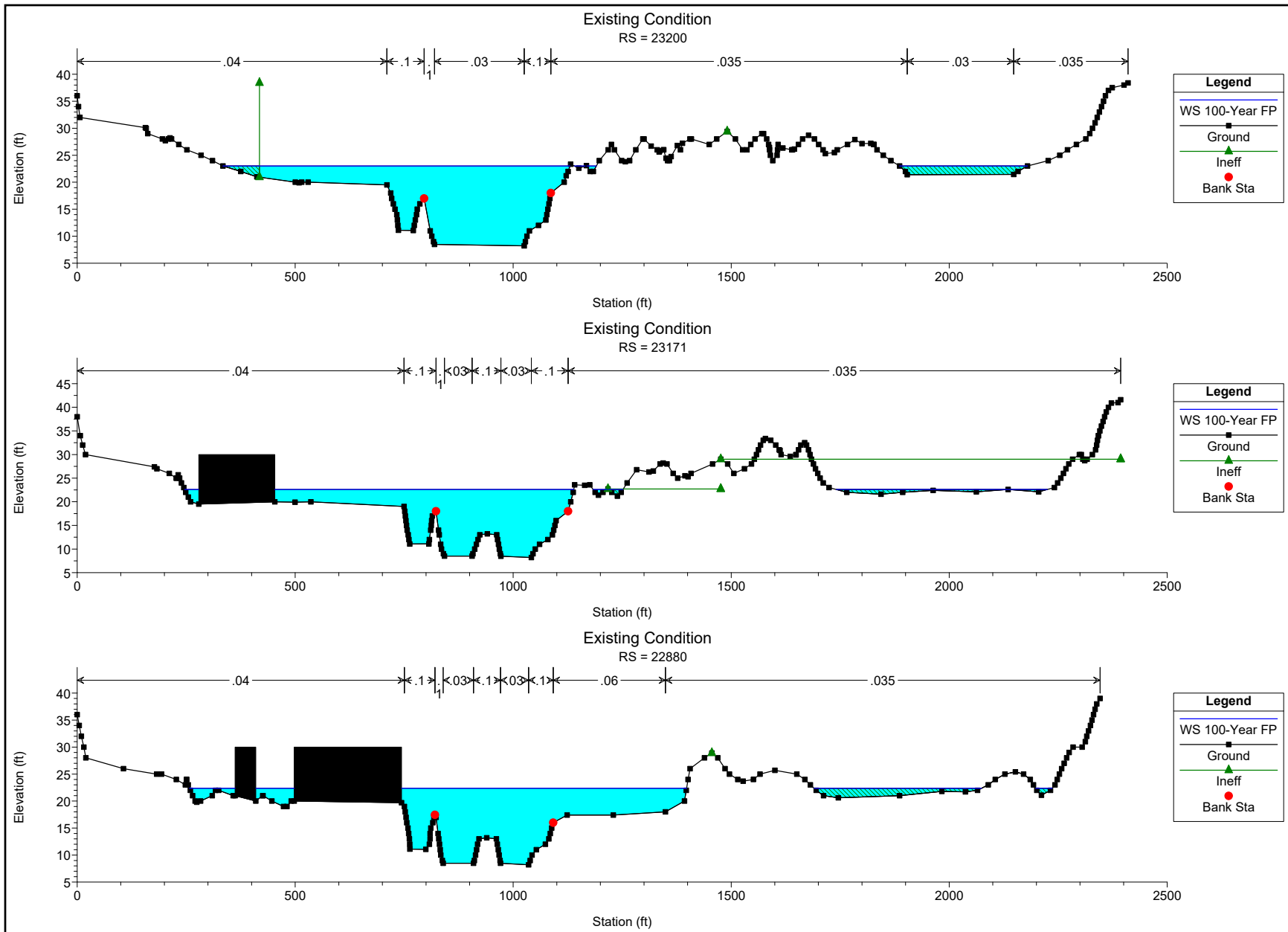


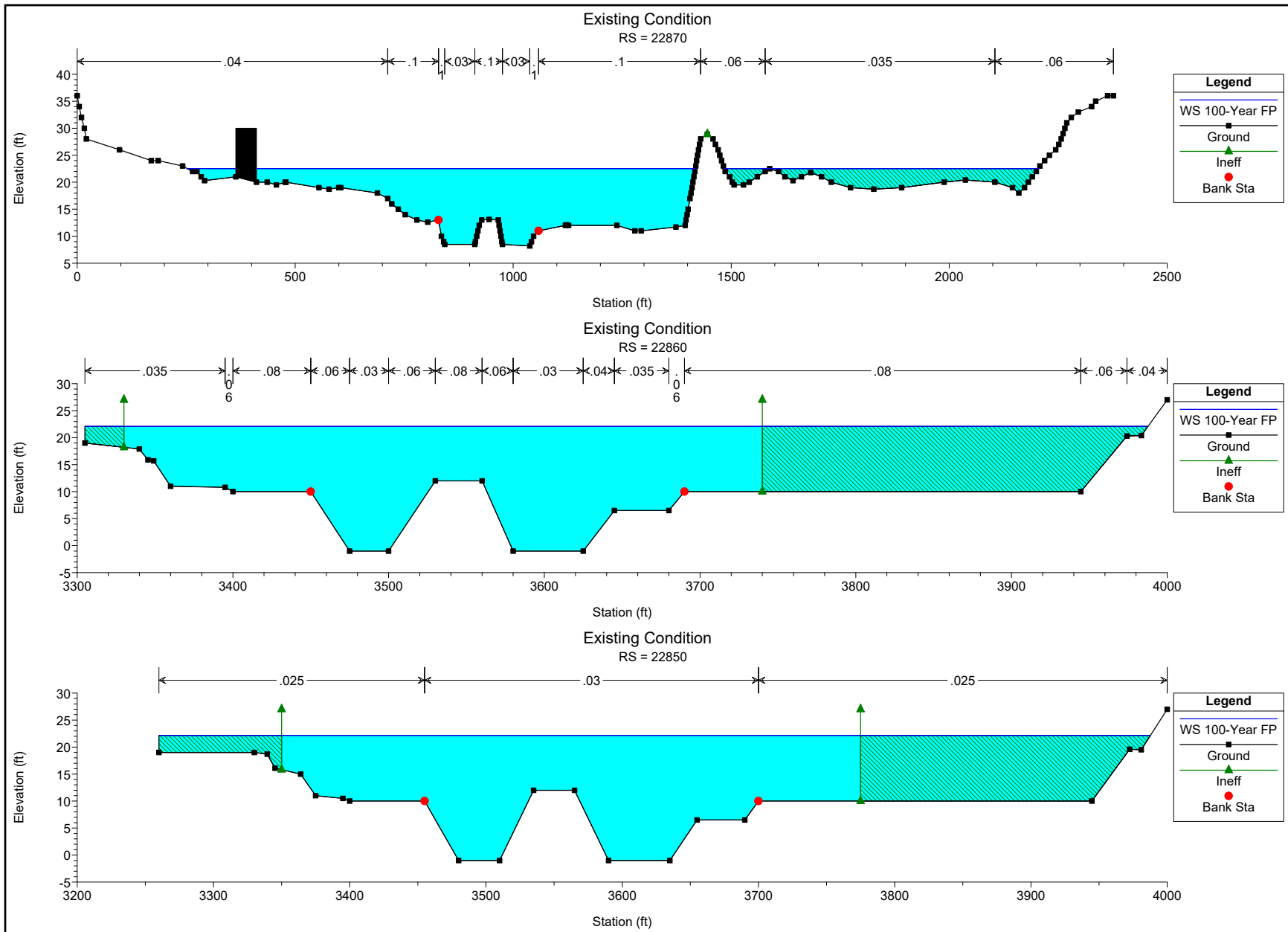












Proposed Condition 100-Year Floodplain and Floodway

HEC-RAS Plan: PC Schmidt 6-20-19 River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Wdth Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
Reach-1	28331	100-Year FP	30.46		31.98	905.00	6612.86	13374.20	16012.94		3273.16	3345.51	
Reach-1	28331	100-Year FW	30.46	0.00	31.98	905.00	6612.88	13378.35	16008.77		3273.16	3345.51	
Reach-1	28300 BR U	100-Year FP	30.59		31.85	905.00	8287.95	6098.95	21613.10		3273.16	3345.51	
Reach-1	28300 BR U	100-Year FW	30.59	0.00	31.85	905.00	8287.95	6098.95	21613.10		3273.16	3345.51	
Reach-1	28300 BR D	100-Year FP	29.65		31.54	830.00	1763.72	26047.16	8189.12		3155.00	3511.00	
Reach-1	28300 BR D	100-Year FW	29.65	0.00	31.54	830.00	1763.72	26047.16	8189.12		3155.00	3511.00	
Reach-1	28269	100-Year FP	29.18		30.92	830.00	1182.52	29170.04	5647.44		3155.00	3511.00	
Reach-1	28269	100-Year FW	29.38	0.19	30.96	830.00	1229.61	28713.35	6057.04		3155.00	3511.00	
Reach-1	28244	100-Year FP	29.31		30.58	715.35	3209.97	25469.48	7320.56		1869.78	2134.20	
Reach-1	28244	100-Year FW	29.47	0.16	30.67	715.67	3279.18	24920.82	7800.01		1869.78	2134.20	
Reach-1	28164	100-Year FP	28.65		29.47	801.07	7875.39	14229.80	13894.81		1864.66	2084.05	
Reach-1	28164	100-Year FW	28.92	0.27	29.68	802.45	7848.74	13890.91	14260.36		1864.66	2084.05	
Reach-1	28064	100-Year FP	28.44		28.95	833.08	14012.49	8666.79	13320.72		1856.85	2041.57	
Reach-1	28064	100-Year FW	28.73	0.29	29.20	851.13	13878.76	8566.42	13554.82		1856.85	2041.57	
Reach-1	27929	100-Year FP	28.25		28.71	752.73	14880.81	6355.39	14763.79		1897.84	2087.62	
Reach-1	27929	100-Year FW	28.56	0.31	28.99	754.22	14726.39	6321.69	14951.92		1897.84	2087.62	
Reach-1	27759	100-Year FP	27.97		28.52	754.89	22535.65	6187.59	7276.76		1919.43	2161.10	
Reach-1	27759	100-Year FW	28.26	0.28	28.81	805.62	23130.37	6380.47	6489.16		1919.43	2161.10	
Reach-1	27589	100-Year FP	27.98		28.36	840.28	26359.24	4263.20	5377.56		2021.36	2249.97	
Reach-1	27589	100-Year FW	28.29	0.30	28.65	844.29	26275.32	4280.23	5444.45		2021.36	2249.97	
Reach-1	27429	100-Year FP	27.96		28.25	831.45	26602.67	5642.21	3755.12		1978.79	2229.17	
Reach-1	27429	100-Year FW	28.27	0.31	28.54	833.03	26536.28	5652.01	3811.71		1978.79	2229.17	
Reach-1	27259	100-Year FP	27.89		28.13	820.84	29713.86	4909.97	1376.17		2025.15	2236.10	
Reach-1	27259	100-Year FW	28.21	0.31	28.43	822.51	29655.11	4929.89	1415.01		2025.15	2236.10	
Reach-1	27069	100-Year FP	27.60		27.94	927.54	23414.77	12262.36	322.87		2099.20	2279.39	
Reach-1	27069	100-Year FW	27.95	0.35	28.26	930.30	23541.19	12105.96	352.85		2099.20	2279.39	
Reach-1	26951	100-Year FP	27.36		27.76	1024.48	24343.00	11642.74	14.26		2117.58	2296.08	
Reach-1	26951	100-Year FW	27.74	0.38	28.10	1027.33	24570.19	11410.09	19.72		2117.58	2296.08	
Reach-1	26944 BR U	100-Year FP	27.37		27.74	969.84	26232.55	9761.70	5.75		2117.58	2296.08	
Reach-1	26944 BR U	100-Year FW	27.75	0.38	28.09	965.40	26703.50	9286.89	9.61		2117.58	2296.08	
Reach-1	26944 BR D	100-Year FP	27.36		27.71	981.73	26543.31	9425.02	31.67		2119.16	2290.79	

HEC-RAS Plan: PC Schmidt 6-20-19 River: RIVER-1 Reach: Reach-1 (Continued)

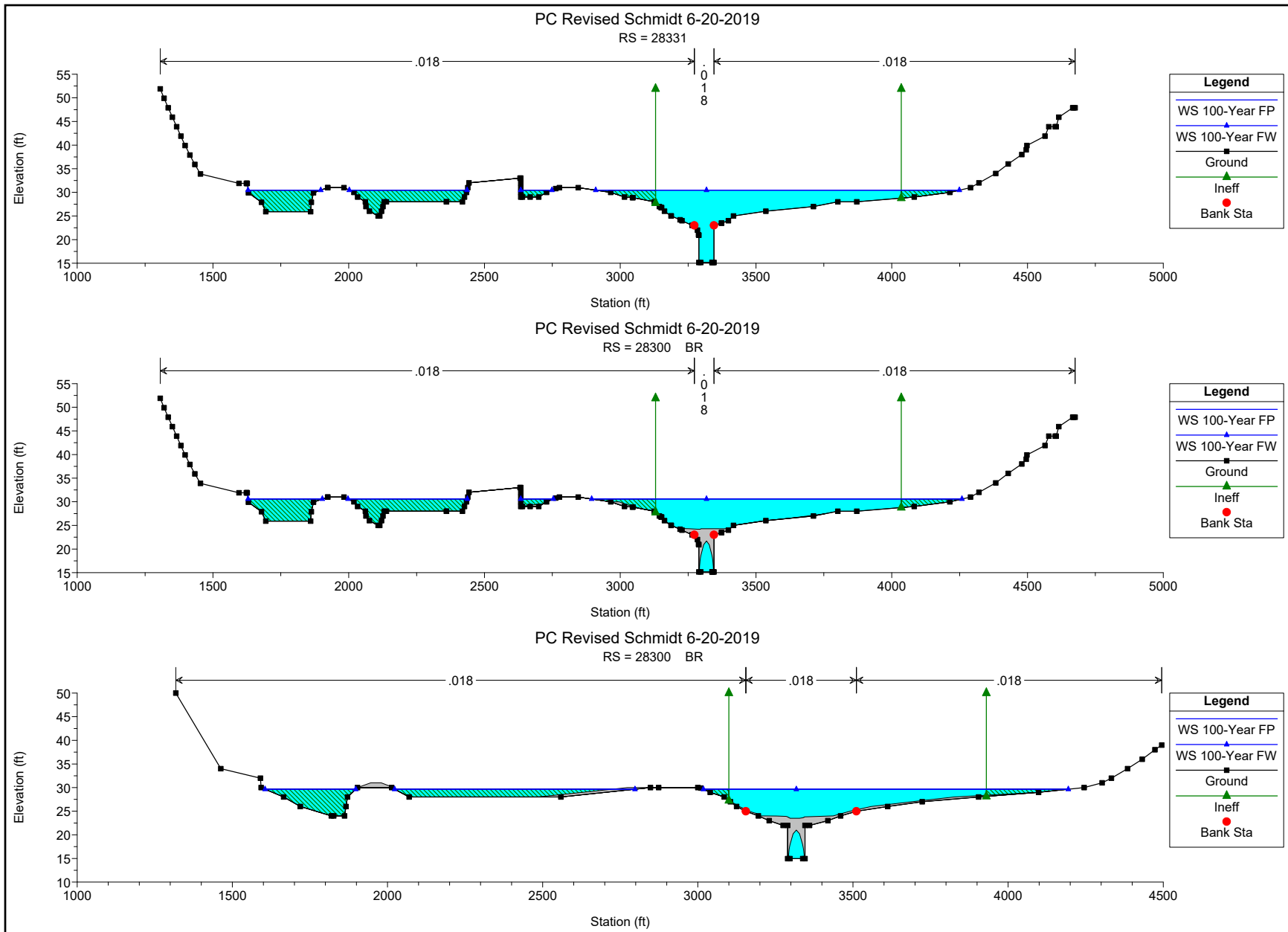
Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Wdth Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
Reach-1	26944 BR D	100-Year FW	27.74	0.38	28.06	985.37	27009.43	8947.21	43.36		2119.16	2290.79	
Reach-1	26937	100-Year FP	27.33		27.71	1035.67	24505.88	11465.28	28.84		2119.16	2290.79	
Reach-1	26937	100-Year FW	27.72	0.39	28.06	1046.45	24728.41	11232.36	39.23		2119.16	2290.79	
Reach-1	26799	100-Year FP	27.16		27.44	1112.90	27641.88	8339.56	18.56		2120.03	2251.44	
Reach-1	26799	100-Year FW	27.57	0.41	27.83	1067.40	27674.89	8299.29	25.82	1182.43	2120.03	2251.44	
Reach-1	26614	100-Year FP	26.94		27.21	1107.84	27623.22	7157.32	1219.47		2088.81	2201.24	
Reach-1	26614	100-Year FW	27.38	0.44	27.62	1100.71	27722.83	7030.69	1246.48	1156.65	2088.81	2201.24	
Reach-1	26379	100-Year FP	26.56		26.89	1141.33	26505.90	9269.97	224.13		2061.91	2202.88	
Reach-1	26379	100-Year FW	27.06	0.50	27.35	1052.16	26674.20	9069.17	256.64	1183.49	2061.91	2202.88	
Reach-1	26174	100-Year FP	26.34		26.58	1188.18	26342.04	8634.28	1023.68		2030.20	2182.66	
Reach-1	26174	100-Year FW	26.84	0.50	27.09	930.60	25964.32	8917.18	1118.50	1313.31	2030.20	2182.66	
Reach-1	25914	100-Year FP	26.26		26.39	1543.72	29302.98	5547.72	1149.30		1745.88	1912.86	
Reach-1	25914	100-Year FW	26.73	0.47	26.92	849.05	28593.16	6100.50	1306.34	1146.70	1745.88	1912.86	
Reach-1	25654	100-Year FP	26.20		26.31	1399.21	30340.95	4267.81	1391.25		1560.52	1723.66	
Reach-1	25654	100-Year FW	26.71	0.50	26.82	1128.68	29994.14	4483.40	1522.46	764.60	1560.52	1723.66	
Reach-1	25354	100-Year FP	26.14		26.23	1370.40	23427.16	4865.29	7707.55		1416.29	1560.15	
Reach-1	25354	100-Year FW	26.62	0.48	26.74	988.03	21656.77	5562.95	8780.27	858.78	1416.29	1560.15	
Reach-1	25181	100-Year FP	26.09		26.18	1358.22	22058.79	4941.77	8999.44		1245.02	1392.26	
Reach-1	25181	100-Year FW	26.55	0.46	26.68	964.39	18241.39	6283.97	11474.64	789.86	1245.02	1392.26	
Reach-1	25001	100-Year FP	26.01		26.12	1196.28	24323.25	5036.68	6640.07		1091.45	1221.27	
Reach-1	25001	100-Year FW	26.39	0.38	26.58	850.97	20145.11	6786.71	9068.18	727.71	1091.45	1221.27	
Reach-1	24804	100-Year FP	25.97		26.09	1234.84	21877.61	5044.42	9077.97		1143.55	1274.88	
Reach-1	24804	100-Year FW	26.33	0.35	26.52	869.87	16780.38	6779.67	12439.95	823.33	1143.55	1274.88	
Reach-1	24797 BR U	100-Year FP	25.96		26.09	1109.25	23913.98	2170.30	9915.72		1143.55	1274.88	
Reach-1	24797 BR U	100-Year FW	26.30	0.33	26.52	748.27	19042.33	2874.31	14083.36	823.33	1143.55	1274.88	
Reach-1	24797 BR D	100-Year FP	25.95		26.08	1100.42	24285.48	2126.08	9588.44		1156.87	1287.61	
Reach-1	24797 BR D	100-Year FW	26.29	0.33	26.51	746.72	19122.95	2891.95	13985.10	841.99	1156.87	1287.61	
Reach-1	24790	100-Year FP	25.96		26.08	1225.76	22277.02	4923.38	8799.60		1156.87	1287.61	
Reach-1	24790	100-Year FW	26.30	0.34	26.50	868.25	16867.78	6779.45	12352.77	841.99	1156.87	1287.61	
Reach-1	24581	100-Year FP	25.73		25.98	1069.19	7594.06	5234.72	23171.22		557.01	659.35	
Reach-1	24581	100-Year FW	26.09	0.36	26.38	798.65	5505.99	5618.08	24875.93	316.92	557.01	659.35	

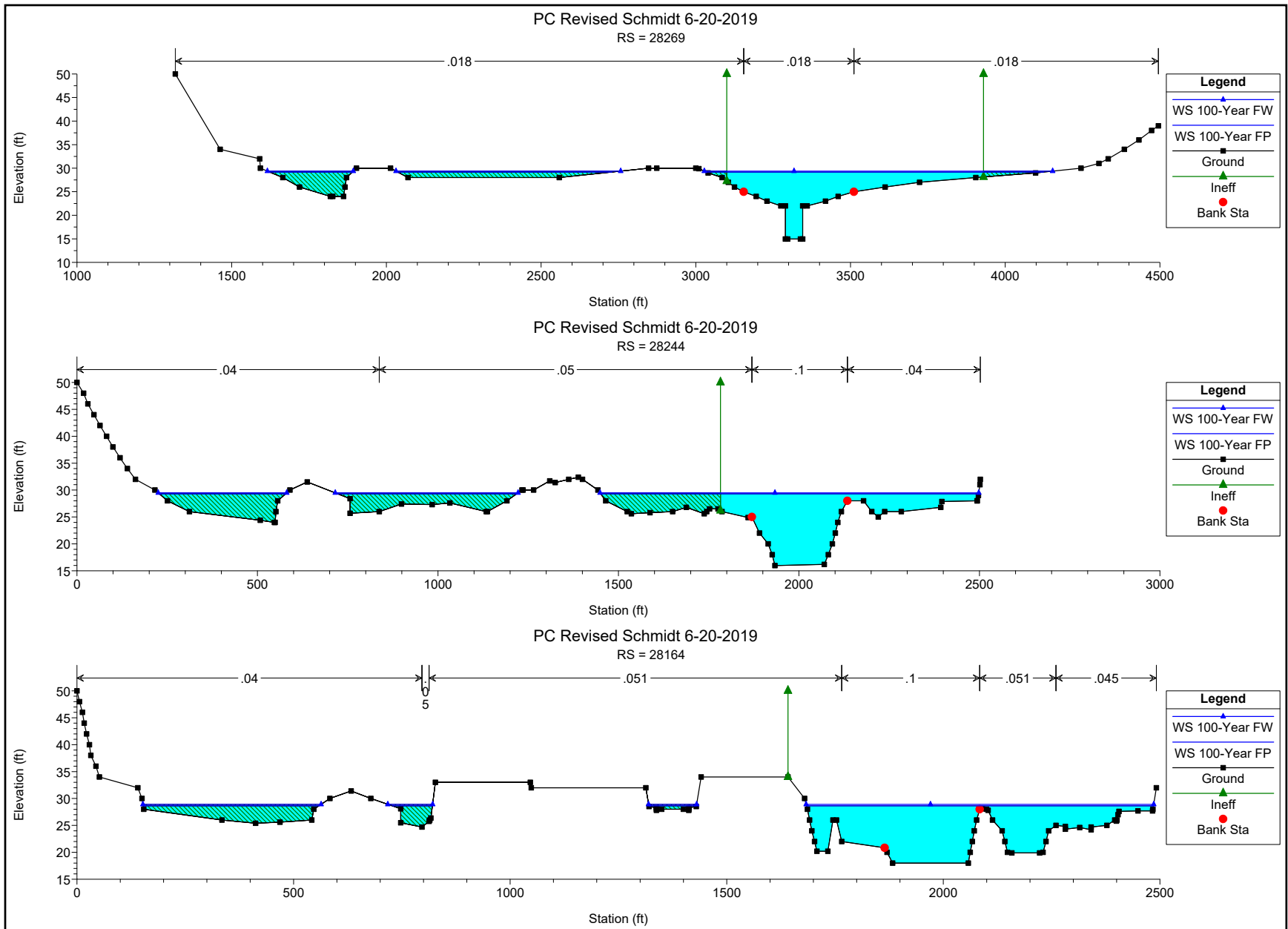
HEC-RAS Plan: PC Schmidt 6-20-19 River: RIVER-1 Reach: Reach-1 (Continued)

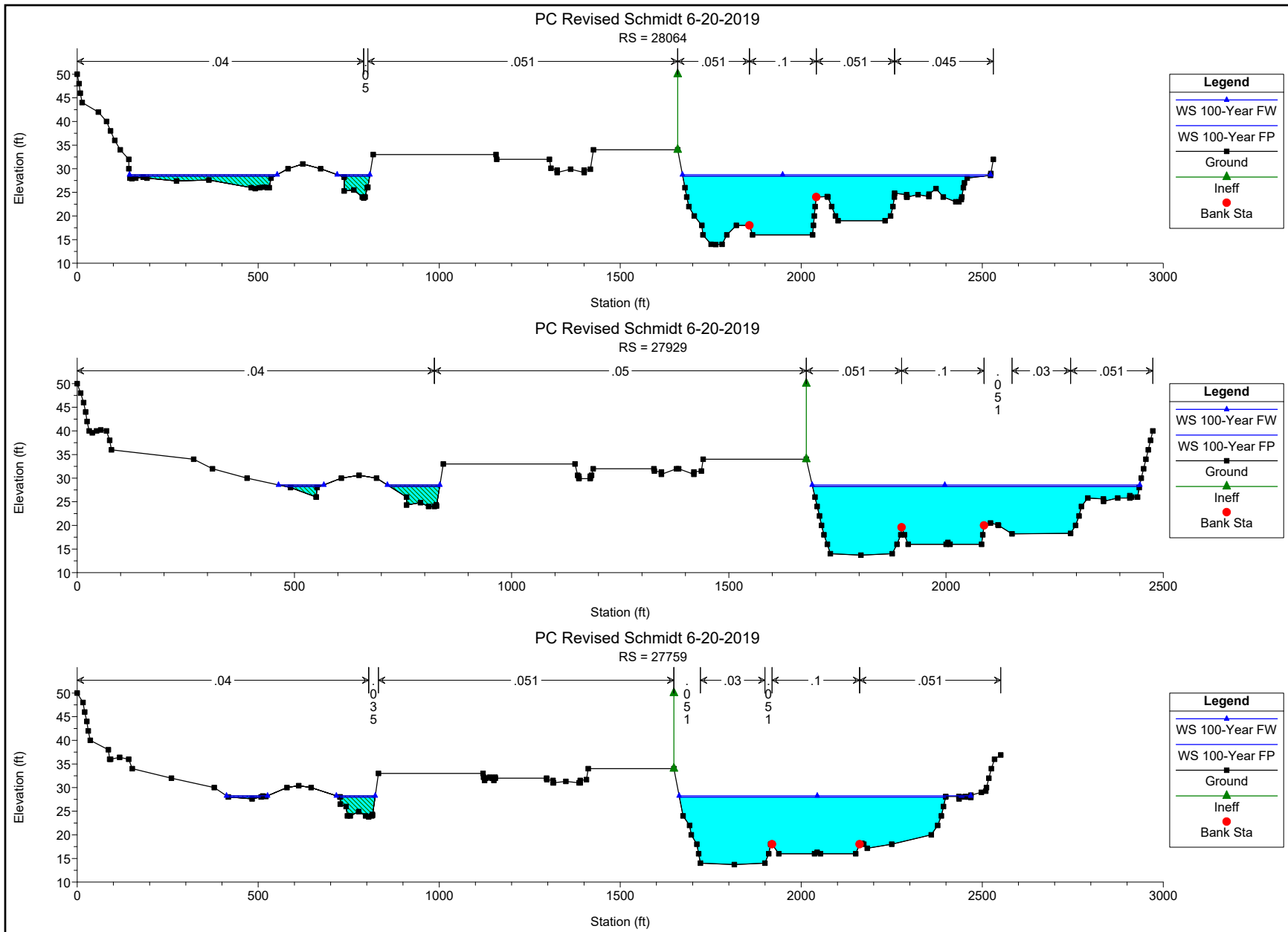
Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Width Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
Reach-1	24401	100-Year FP	25.28		25.79	1055.92	5725.04	14388.17	15886.80		540.23	737.32	
Reach-1	24401	100-Year FW	25.74	0.46	26.21	902.19	5337.37	13951.73	16710.90	355.35	540.23	737.32	
Reach-1	24226	100-Year FP	24.98		25.30	1136.75	5657.45	12215.75	18126.80		461.93	752.35	
Reach-1	24226	100-Year FW	25.52	0.53	25.80	1105.24	5480.13	11661.02	18858.85	296.55	461.93	752.35	
Reach-1	24019	100-Year FP	24.62		24.92	1146.40	9938.22	11912.92	14148.86		526.41	822.79	
Reach-1	24019	100-Year FW	25.08	0.47	25.44	998.88	5425.71	13323.58	17250.70	385.63	526.41	822.79	
Reach-1	23800	100-Year FP	24.21		24.65	1015.36	9342.75	17723.89	8933.36		554.02	866.71	
Reach-1	23800	100-Year FW	24.79	0.58	25.18	992.33	8410.85	17073.32	10515.83	389.04	554.02	866.71	
Reach-1	23796	100-Year FP	24.13		24.51	1030.53	2674.65	25947.32	7378.03		620.44	937.35	
Reach-1	23796	100-Year FW	24.72	0.59	25.07	962.60	1905.11	25805.81	8289.07	523.23	620.44	937.35	
Reach-1	23650	100-Year FP	24.17		24.47	1009.04	2452.49	22884.38	10663.13		643.67	953.07	
Reach-1	23650	100-Year FW	24.75	0.58	25.04	926.18	1444.42	22989.16	11566.42	556.82	643.67	953.07	
Reach-1	23636	100-Year FP	24.05		24.39	983.15	5644.14	20588.06	9767.81		632.41	929.84	
Reach-1	23636	100-Year FW	24.61	0.56	24.96	882.19	3142.49	21332.33	11525.19	535.11	632.41	929.84	
Reach-1	23470	100-Year FP	23.78		24.14	961.52	6654.86	21472.79	7872.35		783.13	1101.53	
Reach-1	23470	100-Year FW	24.33	0.55	24.72	852.48	3474.34	22857.53	9668.13	678.61	783.13	1101.53	
Reach-1	23461	100-Year FP	23.76		24.09	955.66	5871.45	20896.93	9231.62		779.72	1084.50	
Reach-1	23461	100-Year FW	24.31	0.55	24.67	834.02	2828.09	22212.69	10959.22	682.52	779.72	1084.50	
Reach-1	23220	100-Year FP	23.60		24.00	948.81	5488.50	23841.56	6669.94		787.22	1084.14	
Reach-1	23220	100-Year FW	24.15	0.55	24.58	807.18	2797.27	25118.59	8084.15	690.22	787.22	1084.14	
Reach-1	23210	100-Year FP	23.17		23.83	738.53	5956.99	28518.99	1524.02		788.88	1087.42	
Reach-1	23210	100-Year FW	23.62	0.45	24.39	548.05	2943.08	31136.13	1920.79	706.15	788.88	1087.42	
Reach-1	23200	100-Year FP	23.00		23.75	759.24	5897.64	29429.48	672.87		795.69	1086.53	
Reach-1	23200	100-Year FW	23.37	0.37	24.30	482.10	2725.43	32609.85	664.72	711.06	795.69	1086.53	
Reach-1	23171	100-Year FP	22.60		23.37	750.60	8765.04	27019.83	215.13		822.96	1126.04	
Reach-1	23171	100-Year FW	22.72	0.13	23.84	457.15	3909.35	31717.36	373.28	752.46	822.96	1126.04	
Reach-1	22880	100-Year FP	22.36		23.06	846.48	4415.59	24475.28	7109.13		820.50	1091.75	
Reach-1	22880	100-Year FW	22.67	0.30	23.41	639.88	2784.28	25356.45	7859.27	758.47	820.50	1091.75	
Reach-1	22870	100-Year FP	22.53		22.84	1117.78	7301.00	16525.34	12173.66		828.78	1058.18	
Reach-1	22870	100-Year FW	22.75	0.22	23.20	659.35	2217.47	19409.57	14372.96	758.82	828.78	1058.18	

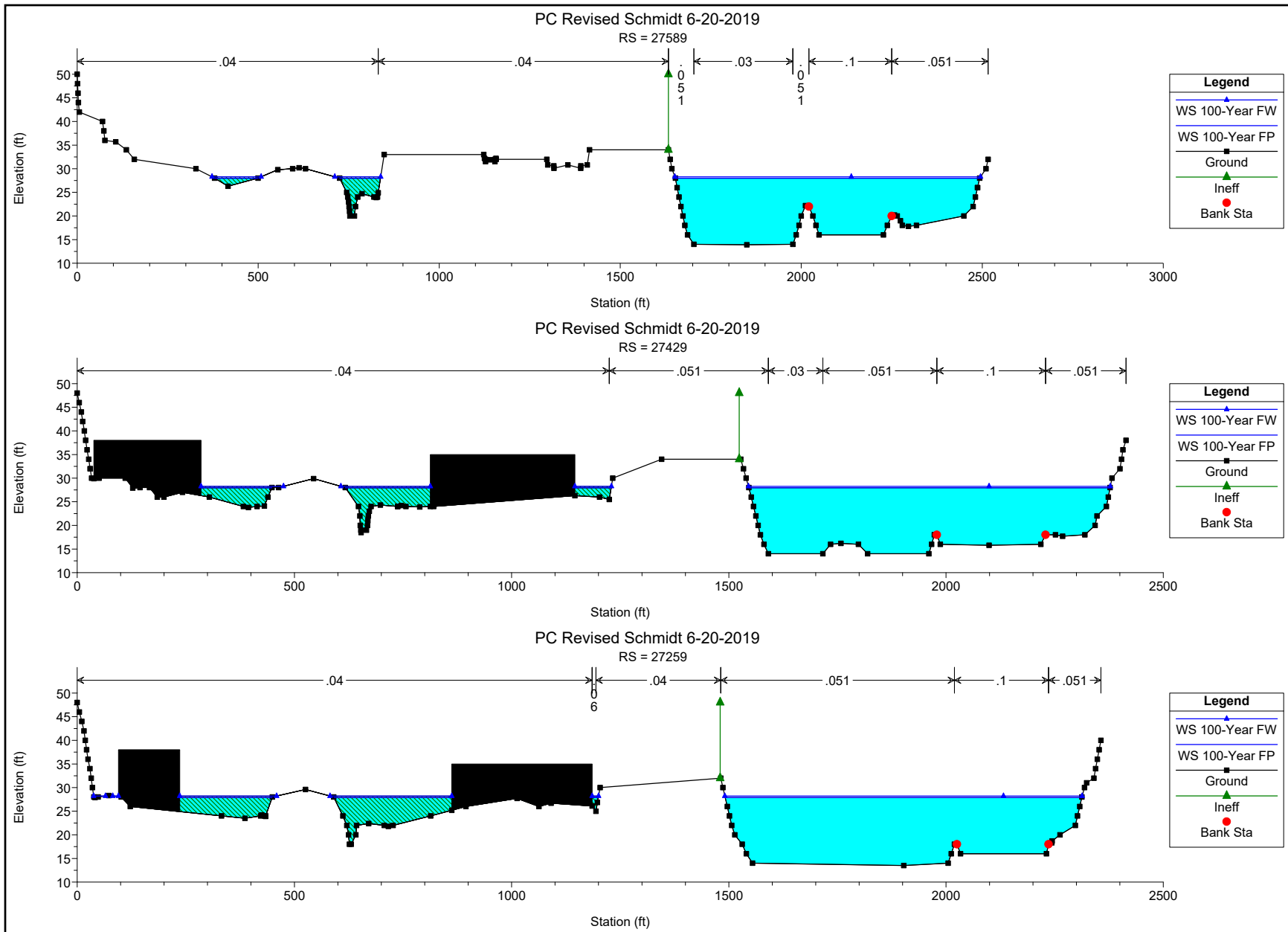
HEC-RAS Plan: PC Schmidt 6-20-19 River: RIVER-1 Reach: Reach-1 (Continued)

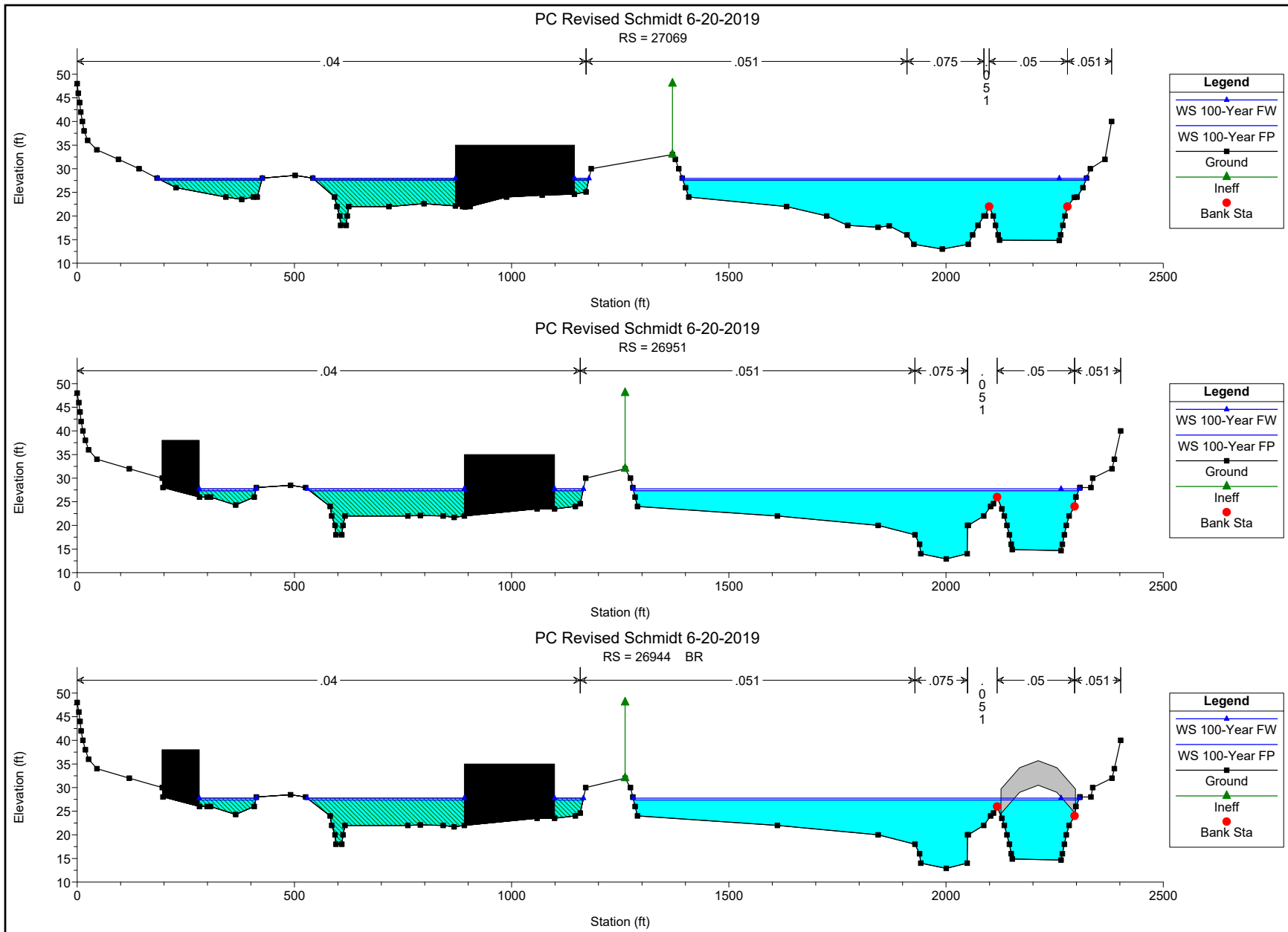
Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Wdth Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
Reach-1	22860	100-Year FP	22.08		22.68	410.00	5788.93	28204.05	2007.02		3450.00	3690.00	
Reach-1	22860	100-Year FW	22.48	0.39	23.05	410.00	5922.85	28047.32	2029.83	3275.00	3450.00	3690.00	3960.00
Reach-1	22850	100-Year FP	22.15		22.64	425.00	5843.61	25175.90	4980.49		3455.00	3700.00	
Reach-1	22850	100-Year FW	22.54	0.39	23.00	425.00	5940.17	25025.41	5034.41	3275.00	3455.00	3700.00	3960.00

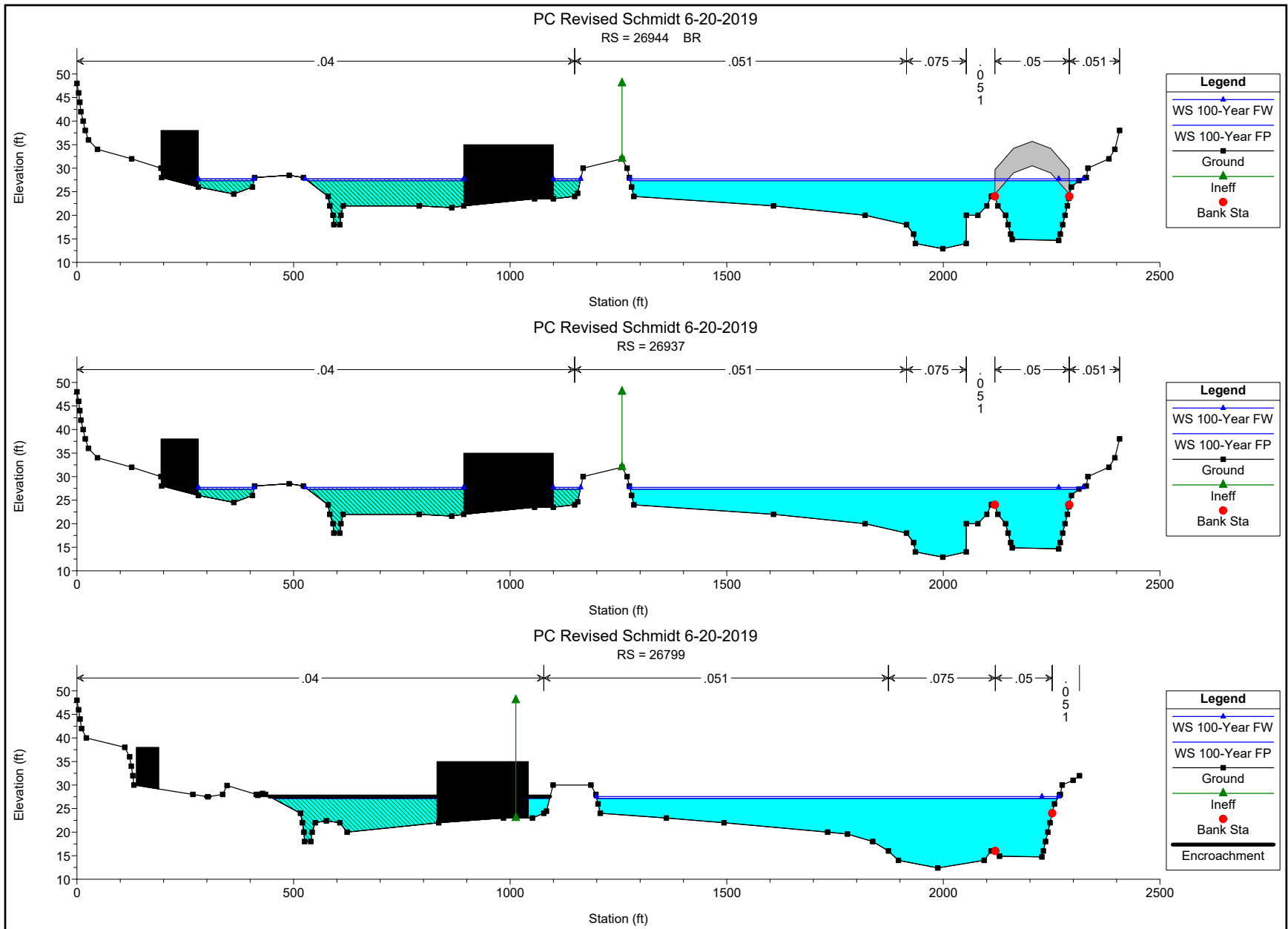


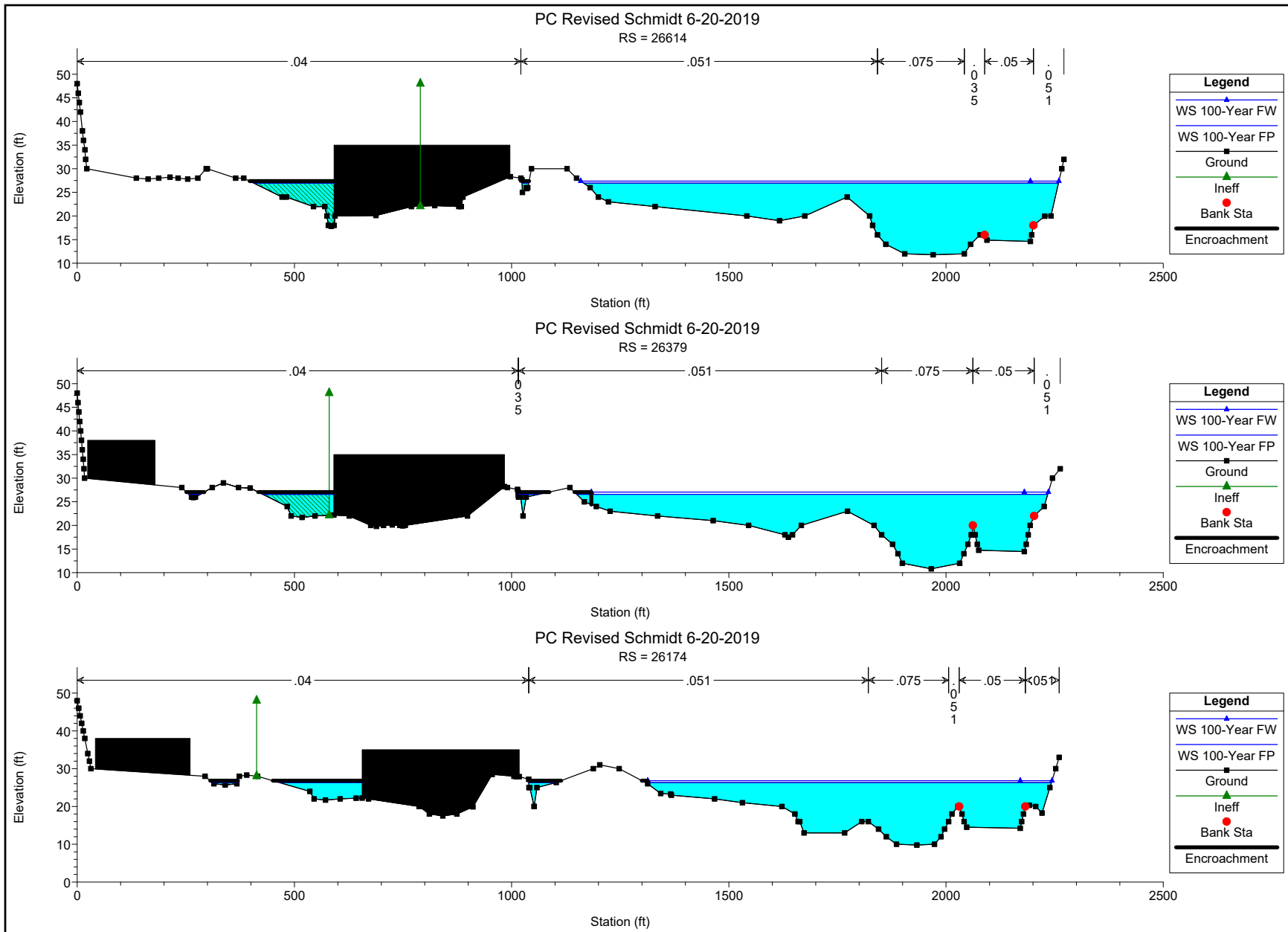


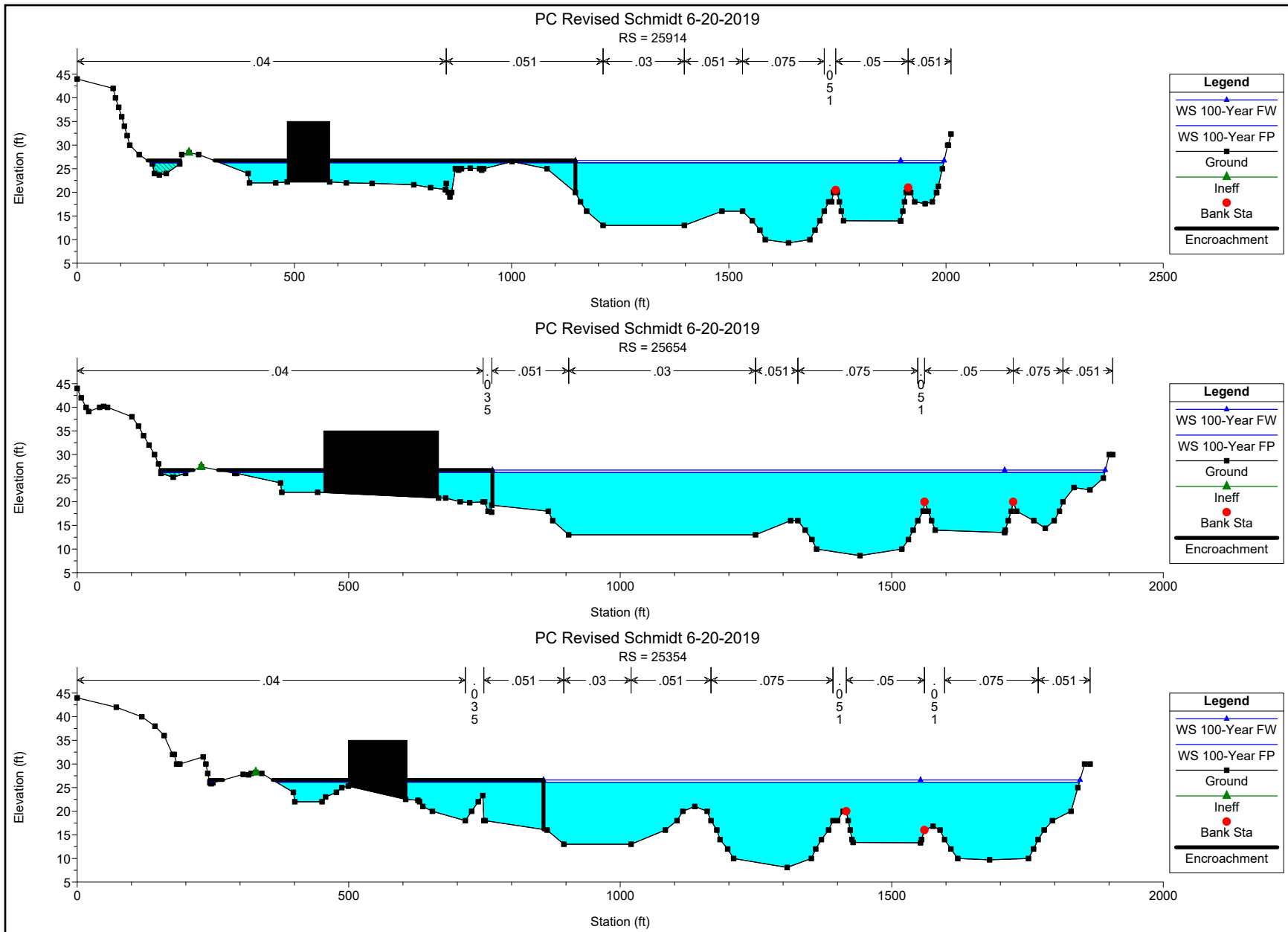


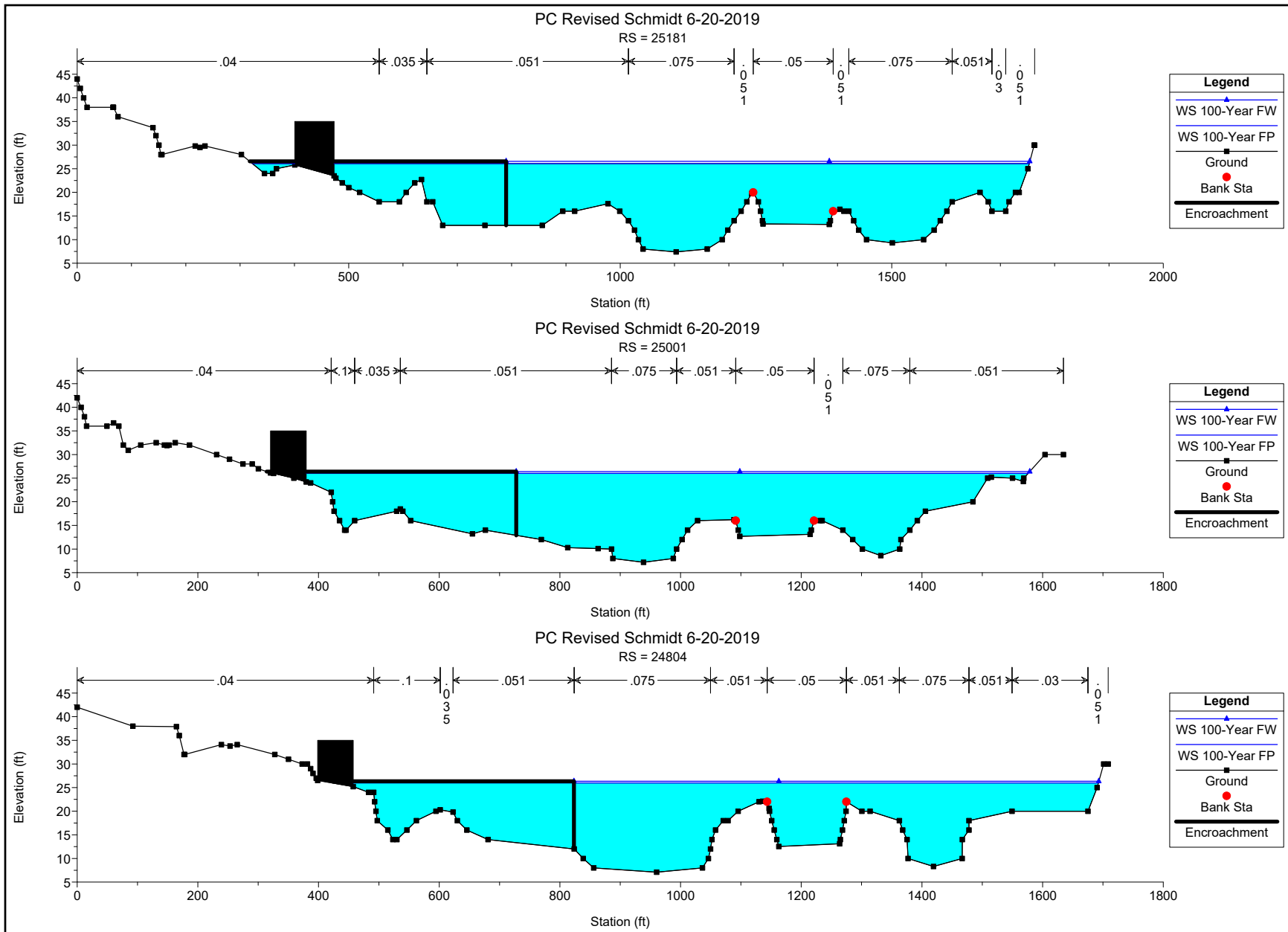


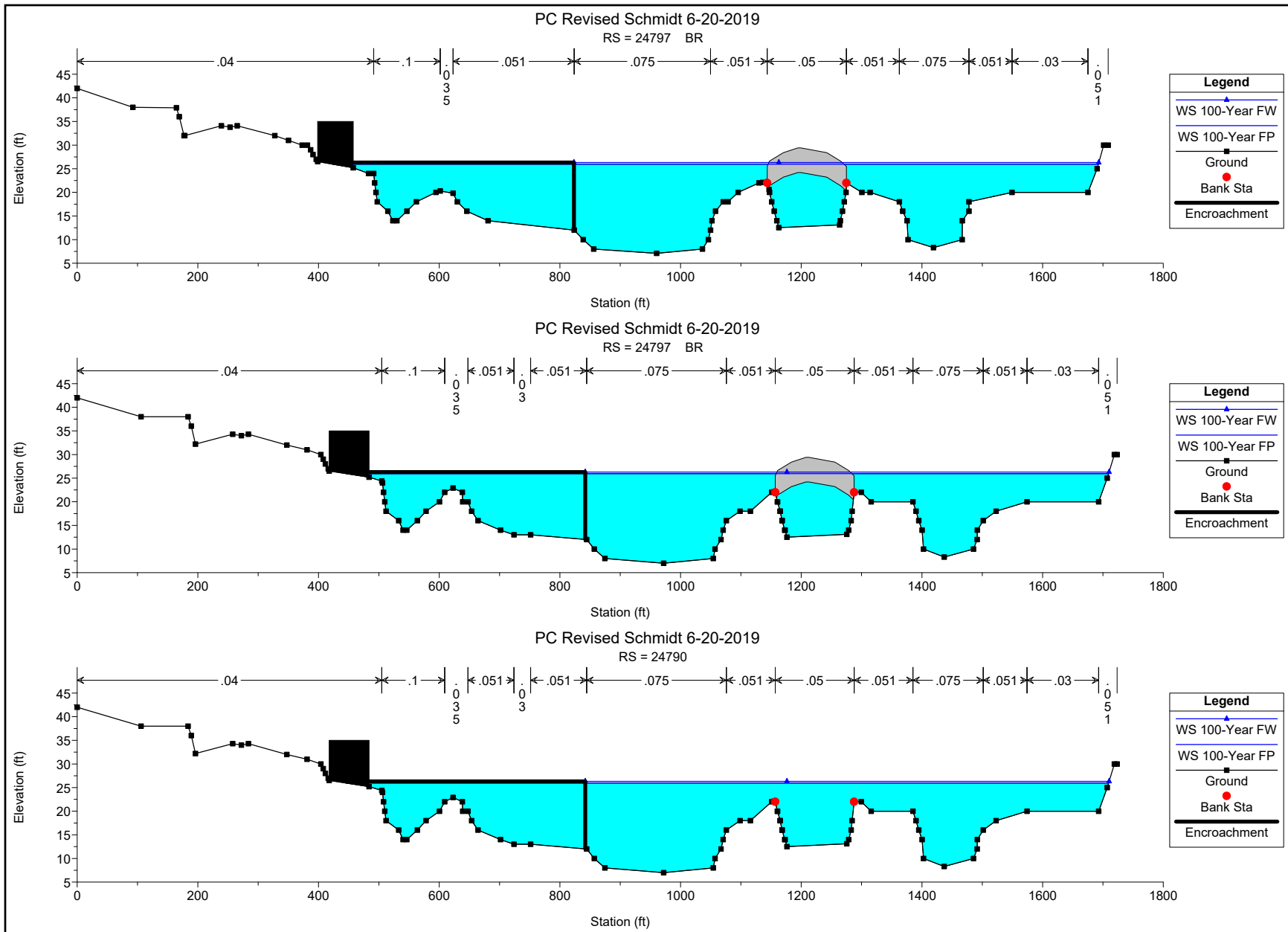


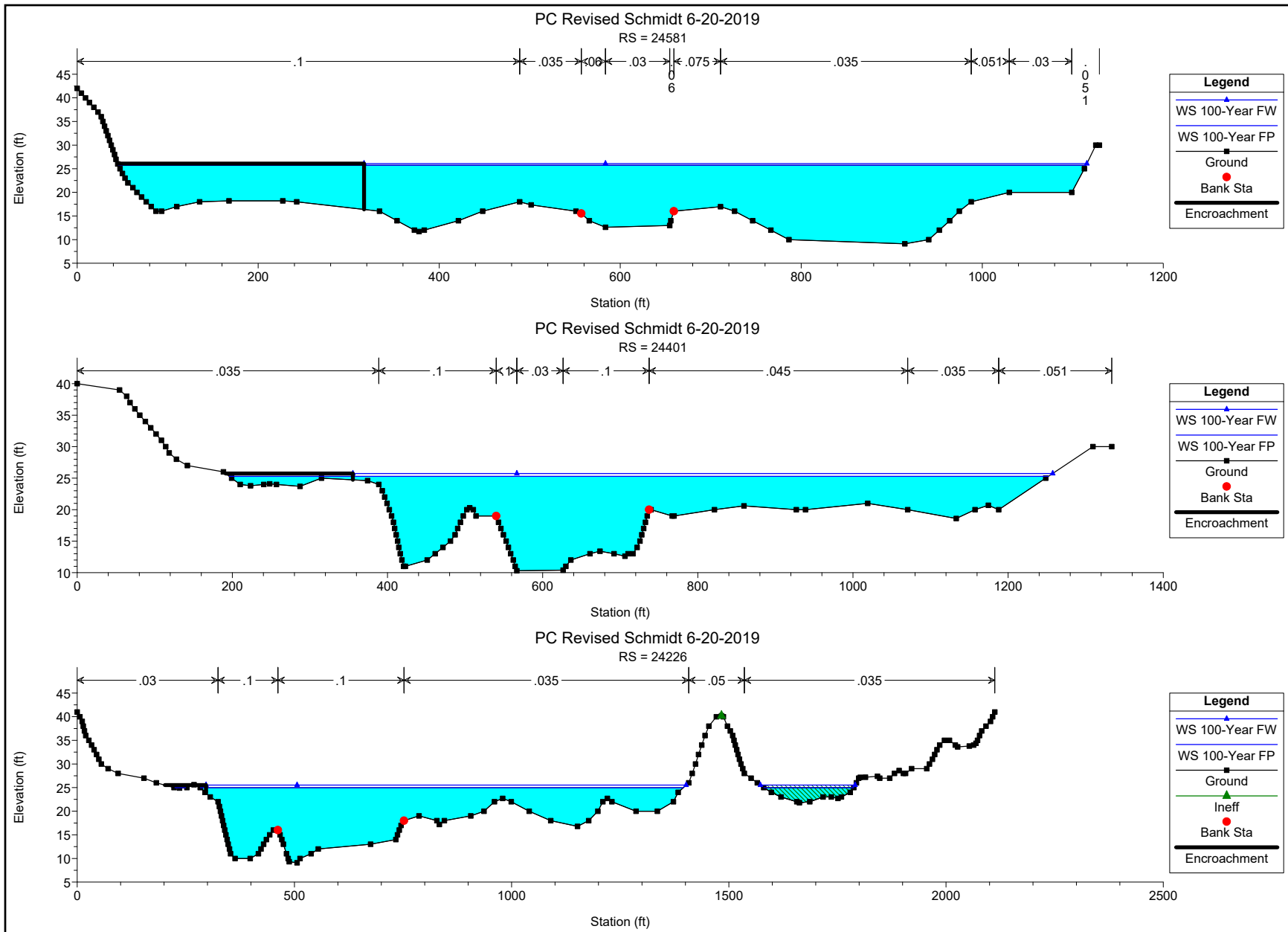


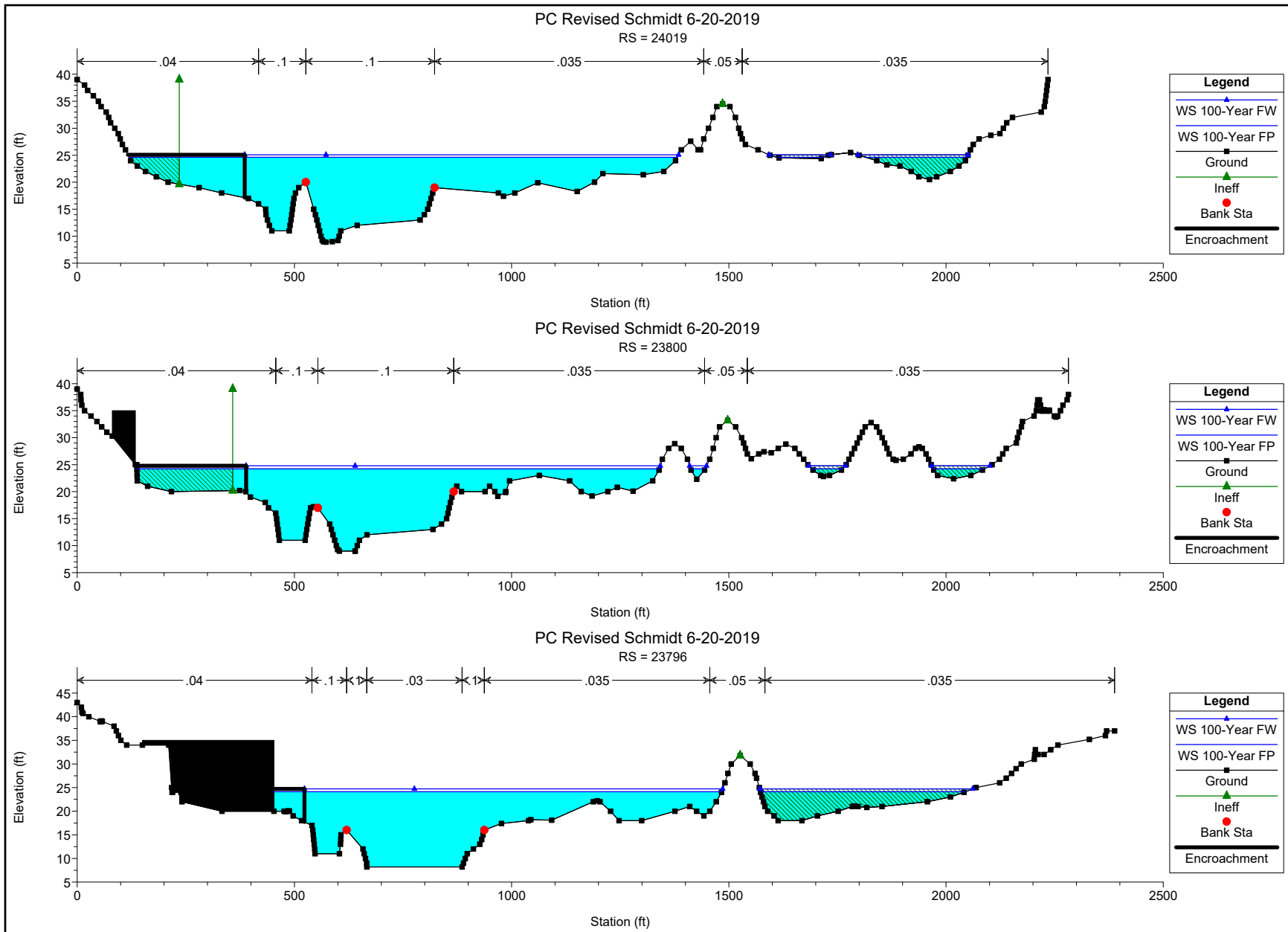


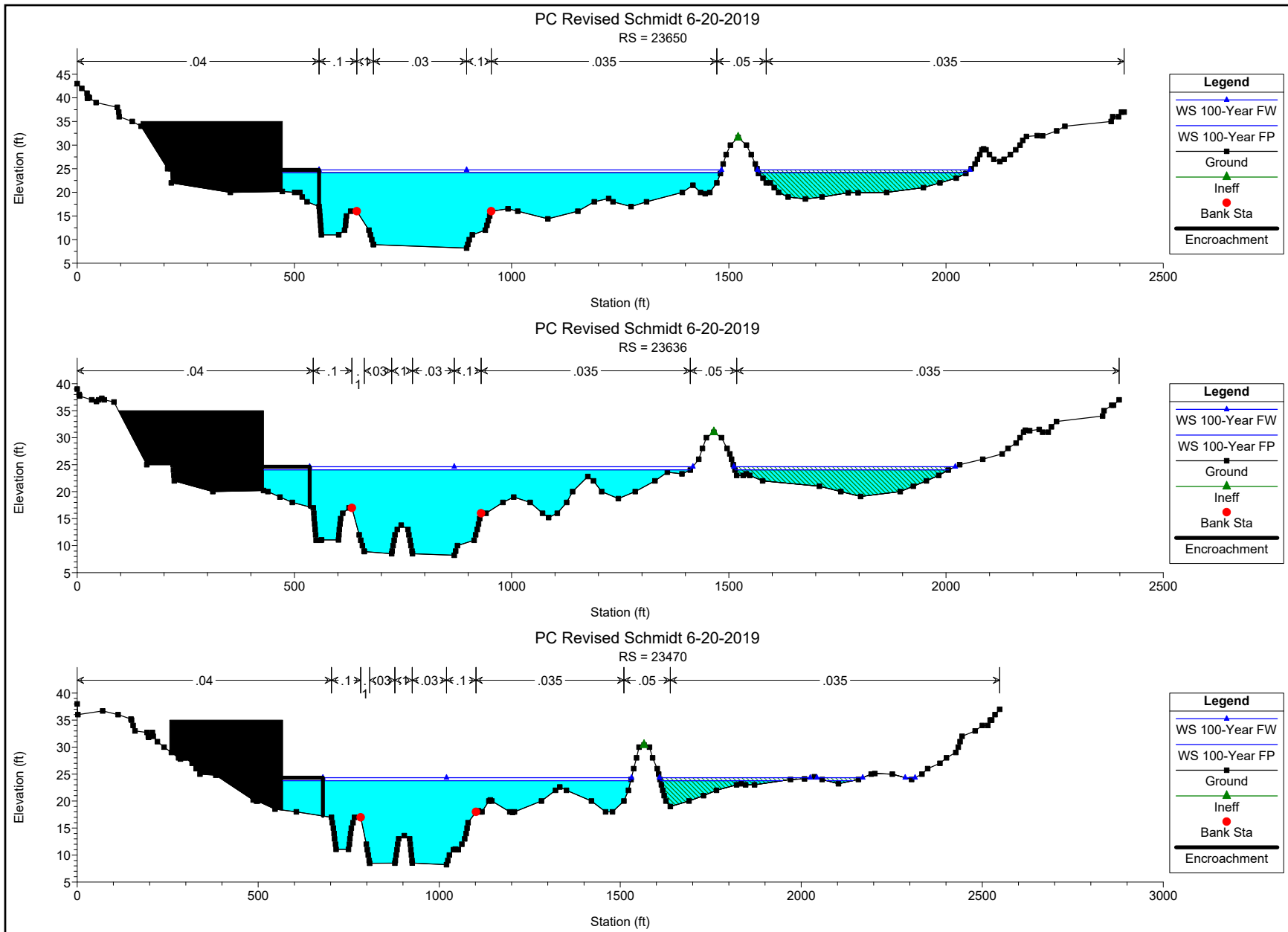


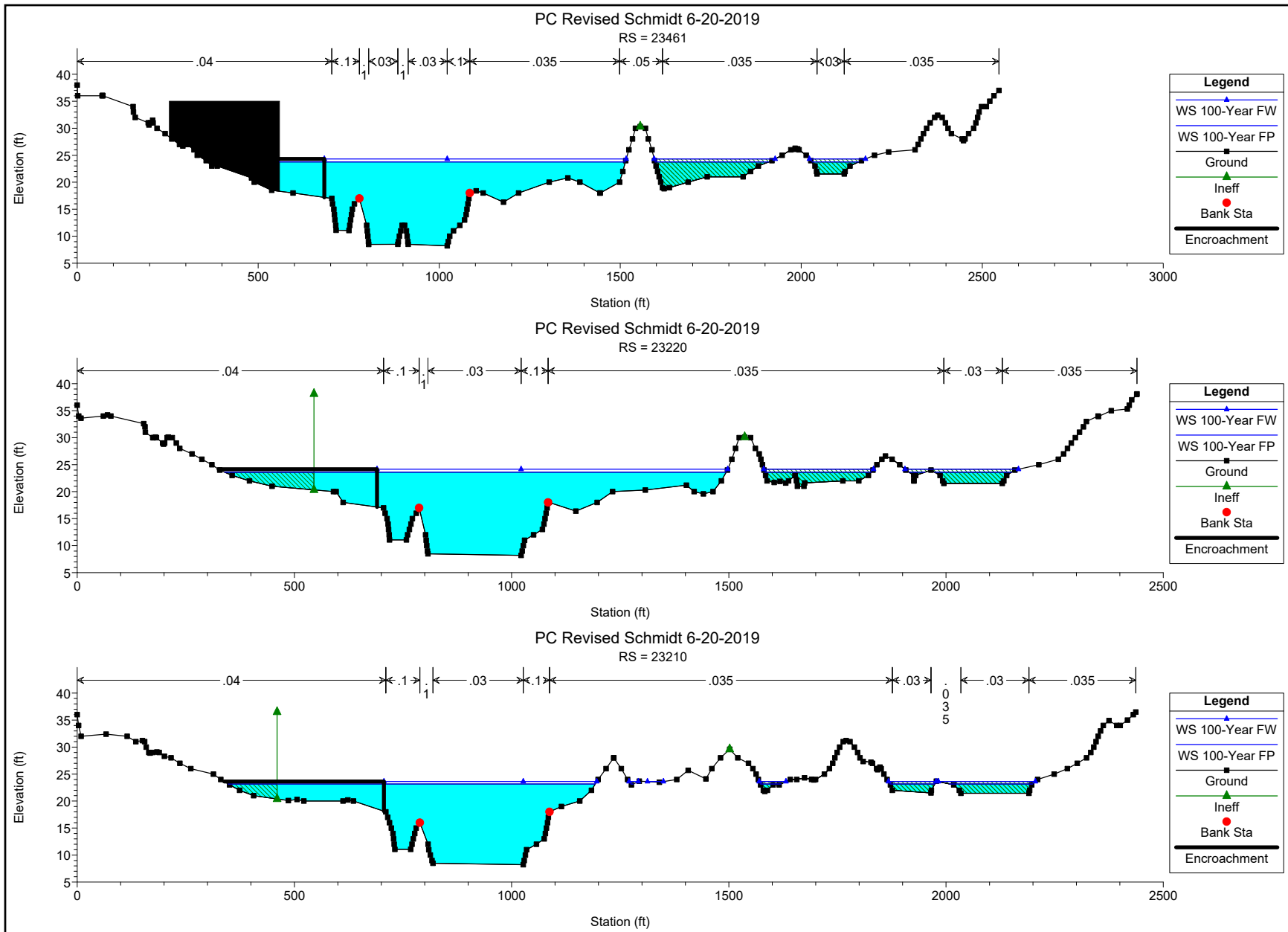


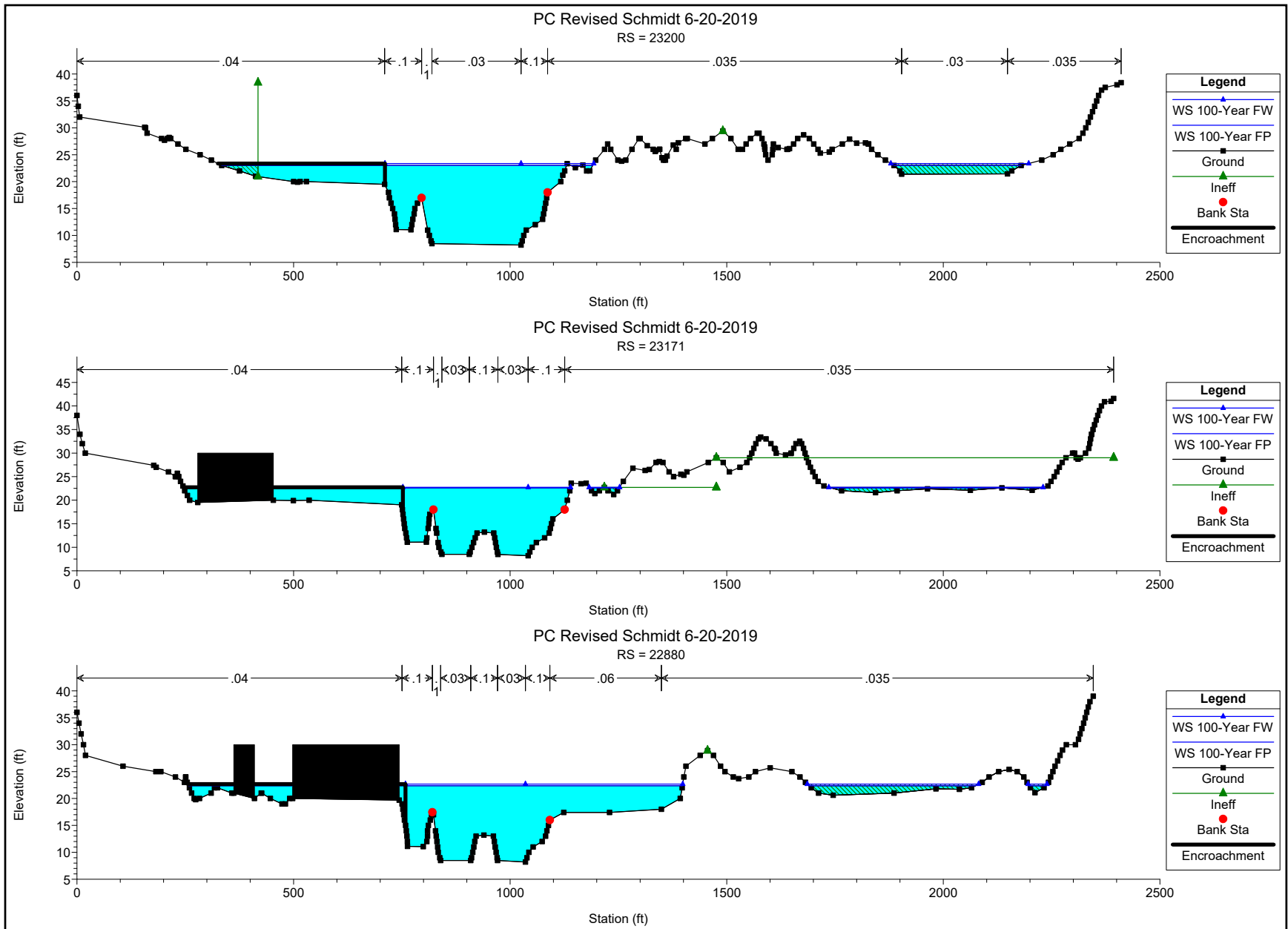


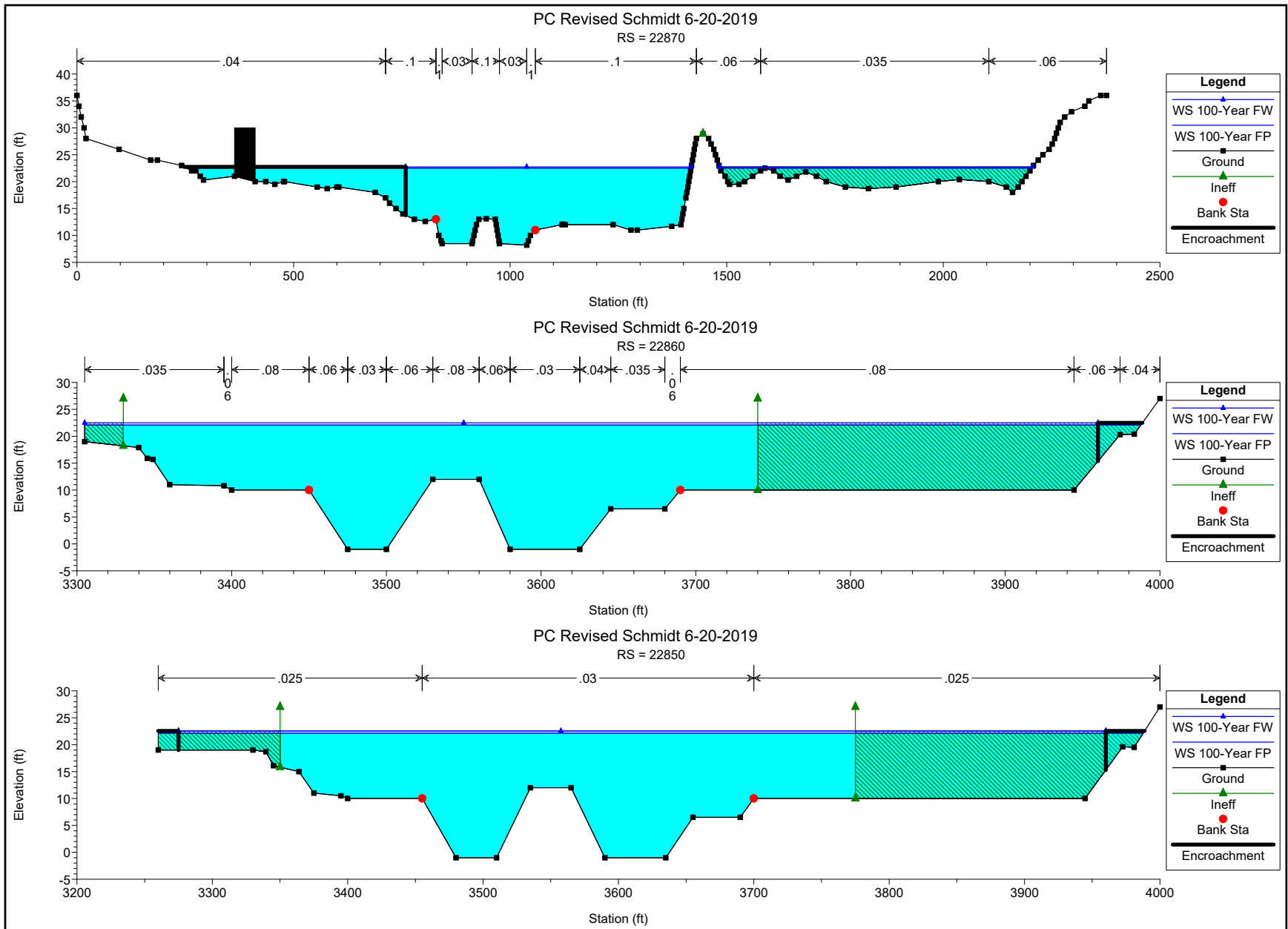












BRIDGE/CULVERT CAPACITY ANALYSES

HEC-RAS Plan: PC bridge capacity River: RIVER-1 Reach: Reach-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
Reach-1	28331	PF 1	4000.00	15.14	28.14	20.55	28.23	0.000061	2.91	2277.10	1340.81	0.15
Reach-1	28331	PF 2	10000.00	15.14	27.57	26.29	28.34	0.000538	8.35	1893.16	876.92	0.45
Reach-1	28331	PF 3	20000.00	15.14	28.87	28.82	30.20	0.000934	11.87	2892.66	1606.65	0.60
Reach-1	28300		Bridge	Fashion Valley Road arch culvert								
Reach-1	28269	PF 1	4000.00	14.97	21.92	20.38	23.56	0.001572	10.28	389.05	56.02	0.69
Reach-1	28269	PF 2	10000.00	14.97	24.86	24.86	26.36	0.003480	9.80	1020.73	431.15	1.00
Reach-1	28269	PF 3	20000.00	14.97	26.84	26.84	28.69	0.002327	11.11	1947.13	769.00	0.89
Reach-1	28244	PF 1	4000.00	15.96	22.55		22.75	0.006485	3.57	1119.52	215.78	0.28
Reach-1	28244	PF 2	10000.00	15.96	24.63		25.25	0.014374	6.29	1590.98	308.83	0.43
Reach-1	28244	PF 3	20000.00	15.96	26.80		27.97	0.021165	8.86	2376.49	1280.92	0.54
Reach-1	28164	PF 1	4000.00	18.00	20.58	20.58	21.43	0.079207	7.54	545.22	310.46	0.85
Reach-1	28164	PF 2	10000.00	18.00	23.02		23.78	0.023699	6.44	1509.76	447.92	0.52
Reach-1	28164	PF 3	20000.00	18.00	25.75		26.49	0.013760	6.51	2957.22	844.37	0.43
Reach-1	28064	PF 1	4000.00	16.00	19.77		19.98	0.004610	2.39	1273.40	476.22	0.22
Reach-1	28064	PF 2	10000.00	16.00	22.79		23.04	0.002613	2.64	2797.66	527.24	0.18
Reach-1	28064	PF 3	20000.00	16.00	25.51		25.87	0.002583	3.29	4544.33	820.96	0.19
Reach-1	27929	PF 1	4000.00	16.00	19.56		19.67	0.001247	1.17	1775.65	539.02	0.11
Reach-1	27929	PF 2	10000.00	16.00	22.67		22.82	0.000906	1.54	3588.07	601.06	0.11
Reach-1	27929	PF 3	20000.00	16.00	25.35		25.64	0.001078	2.12	5228.87	705.82	0.12
Reach-1	27759	PF 1	4000.00	16.00	19.44		19.55	0.000421	0.68	2116.37	627.74	0.07
Reach-1	27759	PF 2	10000.00	16.00	22.53		22.71	0.000425	1.06	4196.30	692.91	0.07
Reach-1	27759	PF 3	20000.00	16.00	25.19		25.50	0.000579	1.55	6077.66	793.69	0.09
Reach-1	27589	PF 1	4000.00	16.00	19.41		19.48	0.000229	0.48	2448.53	676.03	0.05
Reach-1	27589	PF 2	10000.00	16.00	22.52		22.64	0.000253	0.77	4815.59	830.23	0.06
Reach-1	27589	PF 3	20000.00	16.00	25.18		25.39	0.000348	1.16	6990.03	914.00	0.07
Reach-1	27429	PF 1	4000.00	15.80	19.39		19.43	0.000287	0.57	2935.30	781.25	0.05
Reach-1	27429	PF 2	10000.00	15.80	22.50		22.58	0.000296	0.89	5362.03	813.56	0.06
Reach-1	27429	PF 3	20000.00	15.80	25.16		25.31	0.000420	1.33	7507.51	1090.36	0.08

HEC-RAS Plan: PC bridge capacity River: RIVER-1 Reach: Reach-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	
Reach-1	27259	PF 1	4000.00	16.00	19.36		19.38	0.000237	0.51	3381.08	746.75	0.05	
Reach-1	27259	PF 2	10000.00	16.00	22.47		22.52	0.000295	0.88	5765.56	922.11	0.06	
Reach-1	27259	PF 3	20000.00	16.00	25.11		25.23	0.000447	1.36	7879.38	1262.74	0.08	
Reach-1	27069	PF 1	4000.00	14.80	19.20		19.29	0.001391	2.79	1749.99	513.78	0.25	
Reach-1	27069	PF 2	10000.00	14.80	22.27		22.41	0.001211	3.58	3518.12	860.74	0.25	
Reach-1	27069	PF 3	20000.00	14.80	24.85		25.08	0.001352	4.73	5638.75	1328.86	0.28	
Reach-1	26951	PF 1	4000.00	14.66	18.85	16.28	19.06	0.003252	4.08	1119.60	303.42	0.37	
Reach-1	26951	PF 2	10000.00	14.66	21.89	18.13	22.20	0.002943	5.37	2381.66	668.89	0.38	
Reach-1	26951	PF 3	20000.00	14.66	24.52	20.75	24.87	0.002675	5.97	4572.73	1379.82	0.38	
Reach-1	26944		Bridge	Easterly golf cart/pedestrian bridge									
Reach-1	26937	PF 1	4000.00	14.66	18.82		19.01	0.003098	3.92	1173.33	323.02	0.36	
Reach-1	26937	PF 2	10000.00	14.66	21.88		22.15	0.002714	4.94	2547.62	739.96	0.36	
Reach-1	26937	PF 3	20000.00	14.66	24.51		24.82	0.002405	5.72	4782.59	1383.07	0.36	
Reach-1	26799	PF 1	4000.00	14.74	18.57		18.66	0.001551	2.71	1708.44	437.09	0.25	
Reach-1	26799	PF 2	10000.00	14.74	21.68		21.83	0.001432	3.82	3382.82	713.87	0.27	
Reach-1	26799	PF 3	20000.00	14.74	24.30		24.51	0.001534	4.85	5749.12	1405.34	0.29	
Reach-1	26614	PF 1	4000.00	14.60	18.34		18.42	0.001088	2.24	1762.56	389.45	0.21	
Reach-1	26614	PF 2	10000.00	14.60	21.46		21.60	0.001095	3.44	3434.81	763.18	0.24	
Reach-1	26614	PF 3	20000.00	14.60	24.07		24.26	0.001189	4.47	5873.03	1173.78	0.26	
Reach-1	26379	PF 1	4000.00	14.45	17.97		18.08	0.002122	2.92	1448.08	343.95	0.29	
Reach-1	26379	PF 2	10000.00	14.45	21.07		21.26	0.001993	4.21	2882.53	635.68	0.31	
Reach-1	26379	PF 3	20000.00	14.45	23.64		23.91	0.002013	5.33	5117.61	1126.17	0.33	
Reach-1	26174	PF 1	4000.00	14.24	17.78		17.83	0.000673	1.67	2272.89	500.59	0.16	
Reach-1	26174	PF 2	10000.00	14.24	20.88		20.97	0.000834	2.80	4020.63	685.37	0.20	
Reach-1	26174	PF 3	20000.00	14.24	23.39		23.57	0.001134	4.12	6173.61	1013.62	0.25	
Reach-1	25914	PF 1	4000.00	13.93	17.70	13.47	17.73	0.000222	1.02	3113.50	726.49	0.10	
Reach-1	25914	PF 2	10000.00	13.93	20.80	14.89	20.85	0.000235	1.50	5577.73	832.28	0.11	
Reach-1	25914	PF 3	20000.00	13.93	23.30	16.25	23.40	0.000325	2.21	8347.88	1258.78	0.13	

HEC-RAS Plan: PC bridge capacity River: RIVER-1 Reach: Reach-1 (Continued)

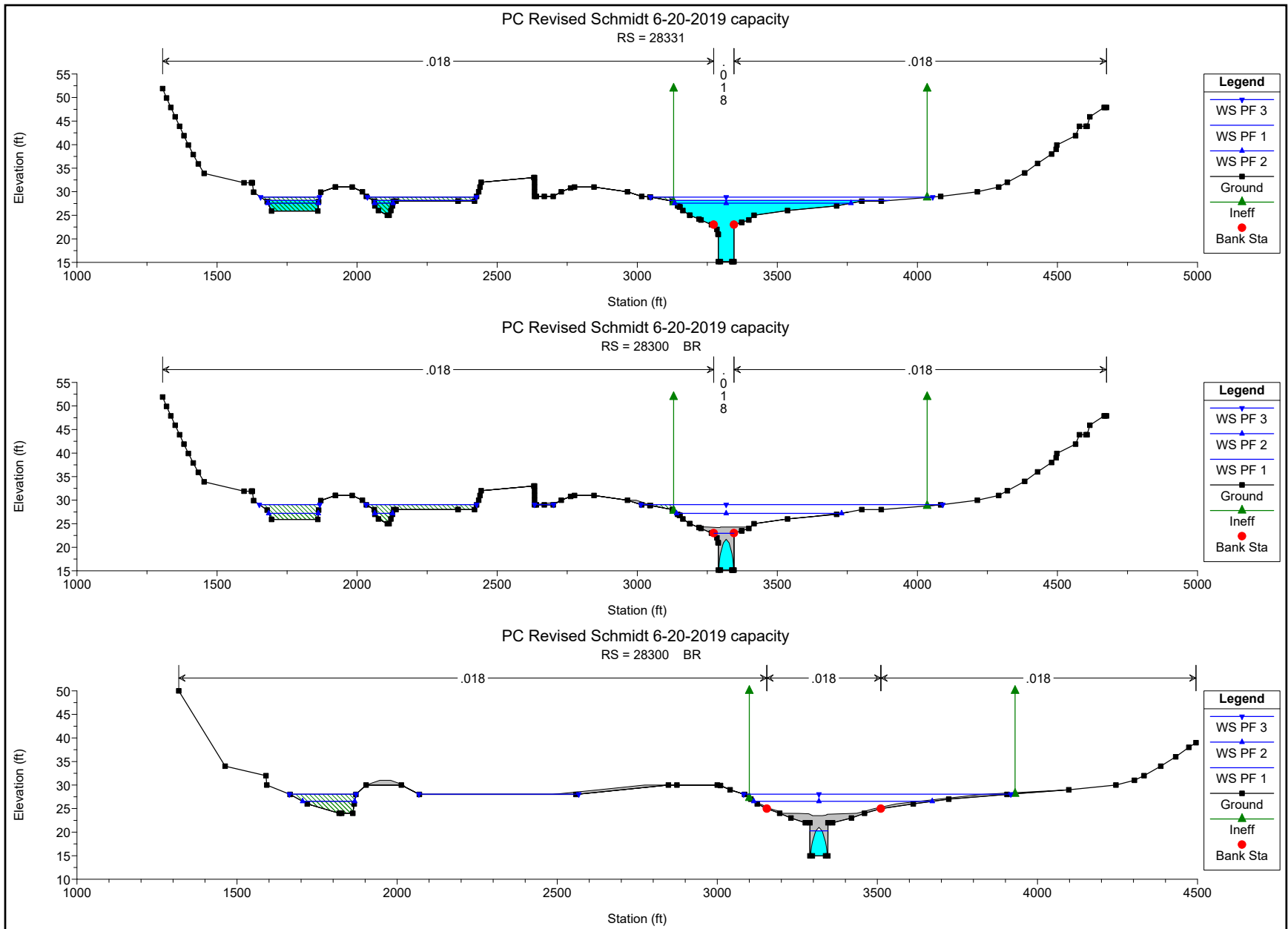
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	25654	PF 1	4000.00	13.50	17.67	12.00	17.69	0.000099	0.69	4218.92	910.08	0.06
Reach-1	25654	PF 2	10000.00	13.50	20.77	14.12	20.81	0.000114	1.08	7344.94	1055.85	0.08
Reach-1	25654	PF 3	20000.00	13.50	23.26	15.29	23.33	0.000166	1.62	10439.80	1285.54	0.10
Reach-1	25354	PF 1	4000.00	13.31	17.64	11.36	17.65	0.000133	0.87	4416.07	922.62	0.08
Reach-1	25354	PF 2	10000.00	13.31	20.73	13.28	20.76	0.000177	1.44	7118.94	961.27	0.10
Reach-1	25354	PF 3	20000.00	13.31	23.21	14.66	23.27	0.000238	2.04	10695.93	1292.82	0.12
Reach-1	25181	PF 1	4000.00	13.20	17.62		17.63	0.000131	0.87	4777.90	965.33	0.08
Reach-1	25181	PF 2	10000.00	13.20	20.70		20.73	0.000229	1.61	6952.81	947.00	0.11
Reach-1	25181	PF 3	20000.00	13.20	23.18		23.23	0.000240	2.03	11242.62	1269.64	0.12
Reach-1	25001	PF 1	4000.00	12.69	17.60		17.61	0.000123	0.90	4588.62	948.52	0.07
Reach-1	25001	PF 2	10000.00	12.69	20.64		20.69	0.000242	1.77	6053.85	759.93	0.11
Reach-1	25001	PF 3	20000.00	12.69	23.12		23.18	0.000246	2.16	10364.97	1097.80	0.12
Reach-1	24804	PF 1	4000.00	12.52	17.58	10.00	17.60	0.000130	0.90	4404.93	725.61	0.08
Reach-1	24804	PF 2	10000.00	12.52	20.60	11.53	20.66	0.000368	2.05	5339.95	794.61	0.14
Reach-1	24804	PF 3	20000.00	12.52	23.09	13.79	23.15	0.000335	2.34	9964.41	1192.40	0.14
Reach-1	24797		Bridge	Westerly golf cart/pedestrian bridge								
Reach-1	24790	PF 1	4000.00	12.51	17.58		17.59	0.000123	0.88	4415.58	742.55	0.07
Reach-1	24790	PF 2	10000.00	12.51	20.60		20.65	0.000373	2.06	5348.23	807.28	0.14
Reach-1	24790	PF 3	20000.00	12.51	23.08		23.15	0.000319	2.28	9912.80	1194.92	0.13
Reach-1	24581	PF 1	4000.00	12.60	17.51		17.56	0.000179	1.30	2780.51	744.83	0.11
Reach-1	24581	PF 2	10000.00	12.60	20.50		20.59	0.000236	2.11	4811.40	783.43	0.14
Reach-1	24581	PF 3	20000.00	12.60	22.93		23.07	0.000327	3.01	8069.22	1053.96	0.17
Reach-1	24401	PF 1	4000.00	10.30	17.31		17.47	0.003981	3.37	1286.74	268.66	0.26
Reach-1	24401	PF 2	10000.00	10.30	20.11		20.45	0.005577	5.10	2235.99	551.52	0.33
Reach-1	24401	PF 3	20000.00	10.30	22.50		22.91	0.004857	5.73	4081.36	823.43	0.32
Reach-1	24226	PF 1	4000.00	9.09	16.75	13.33	16.83	0.002956	2.17	1826.62	406.59	0.18
Reach-1	24226	PF 2	10000.00	9.09	19.55	14.82	19.68	0.002940	2.96	3398.76	733.61	0.20
Reach-1	24226	PF 3	20000.00	9.09	22.02	16.48	22.24	0.002520	3.35	5565.75	1022.89	0.19

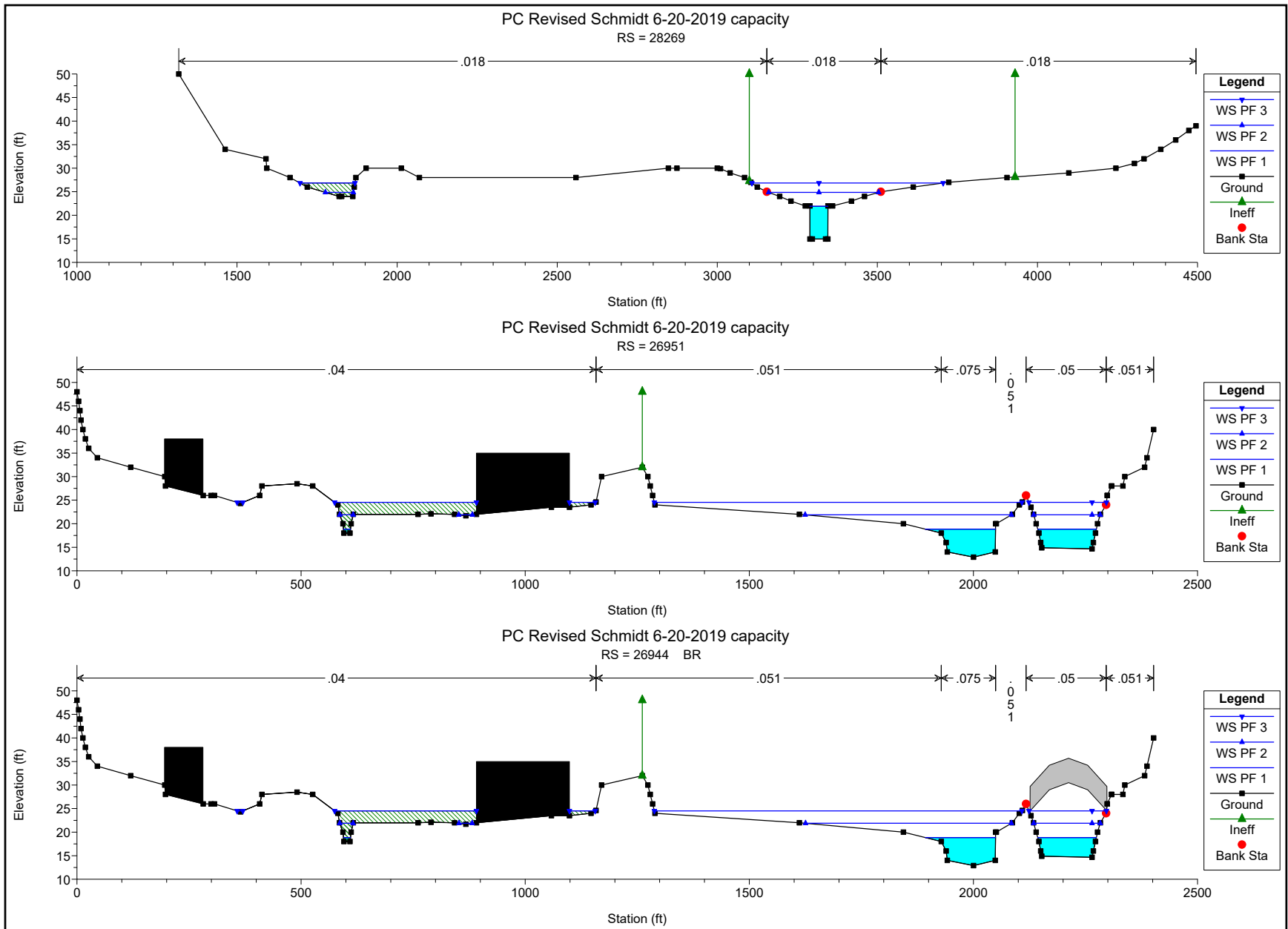
HEC-RAS Plan: PC bridge capacity River: RIVER-1 Reach: Reach-1 (Continued)

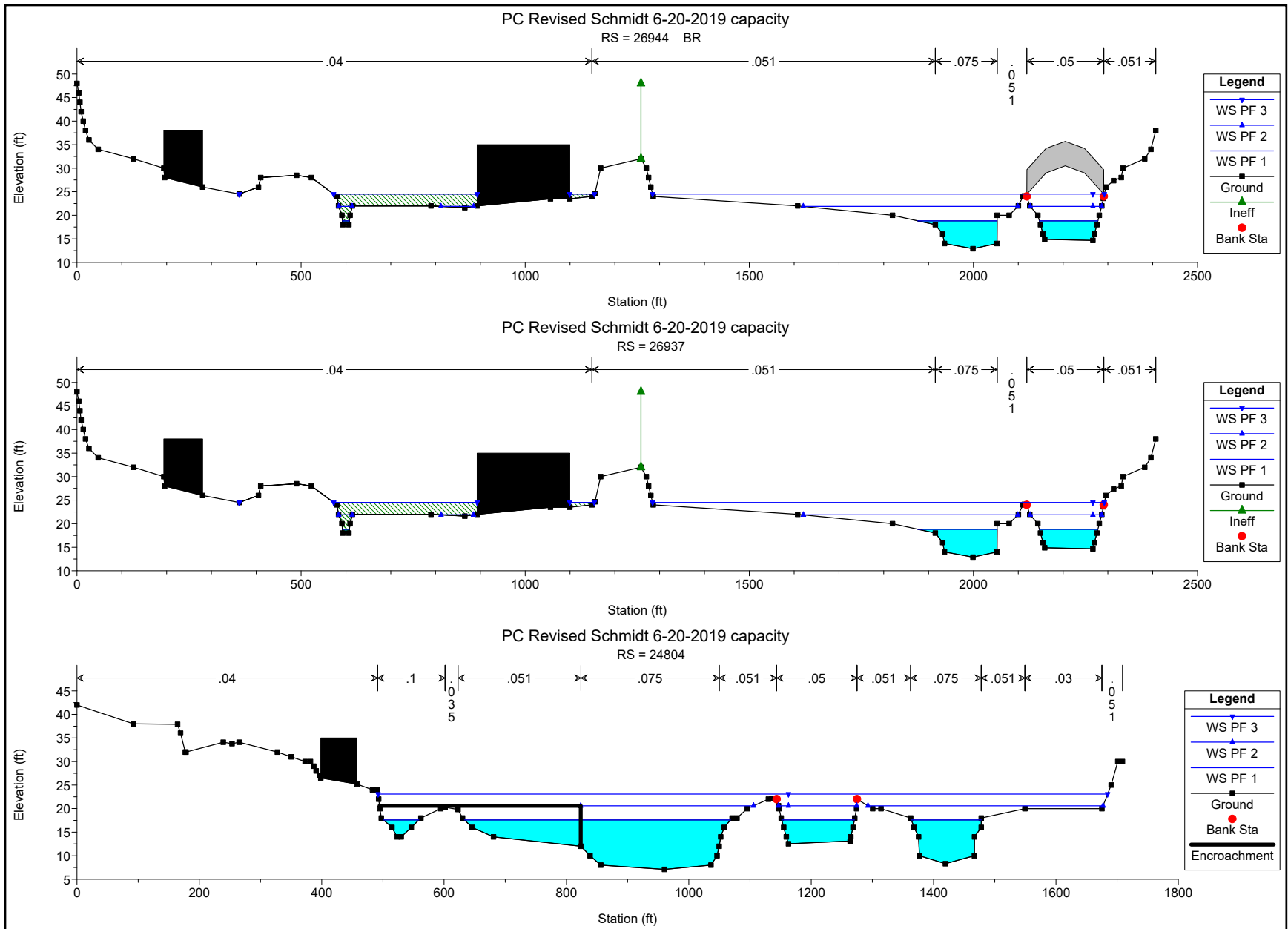
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	24019	PF 1	4000.00	8.90	15.70	13.42	15.86	0.008071	3.21	1261.91	341.81	0.29
Reach-1	24019	PF 2	10000.00	8.90	18.42	14.92	18.71	0.007875	4.38	2341.57	529.96	0.31
Reach-1	24019	PF 3	20000.00	8.90	21.35	16.85	21.60	0.003579	3.78	4976.78	1091.78	0.22
Reach-1	23800	PF 1	4000.00	8.99	14.55	13.32	14.83	0.020982	4.10	944.80	341.40	0.45
Reach-1	23800	PF 2	10000.00	8.99	17.54	14.80	17.90	0.012213	4.91	2068.08	421.45	0.38
Reach-1	23800	PF 3	20000.00	8.99	20.64	16.61	21.11	0.008832	5.61	3655.39	921.21	0.35
Reach-1	23796	PF 1	4000.00	8.21	14.59	10.37	14.68	0.000254	2.42	1818.87	362.37	0.18
Reach-1	23796	PF 2	10000.00	8.21	17.50	12.22	17.71	0.000424	3.81	2978.72	457.84	0.24
Reach-1	23796	PF 3	20000.00	8.21	20.56	14.32	20.91	0.000529	5.03	5163.57	1101.44	0.27
Reach-1	23650	PF 1	4000.00	8.20	14.56	10.75	14.66	0.000319	2.56	1713.77	368.64	0.20
Reach-1	23650	PF 2	10000.00	8.20	17.49	12.57	17.69	0.000445	3.77	3250.54	661.54	0.24
Reach-1	23650	PF 3	20000.00	8.20	20.60	14.58	20.87	0.000464	4.60	5836.82	1269.33	0.25
Reach-1	23636	PF 1	4000.00	8.21	14.47	11.15	14.59	0.002030	2.81	1518.22	344.05	0.23
Reach-1	23636	PF 2	10000.00	8.21	17.34	12.94	17.58	0.002570	4.14	2673.75	499.54	0.27
Reach-1	23636	PF 3	20000.00	8.21	20.46	14.92	20.76	0.002120	4.77	4747.86	982.41	0.26
Reach-1	23470	PF 1	4000.00	8.21	14.10	11.02	14.25	0.002686	3.13	1343.25	328.48	0.27
Reach-1	23470	PF 2	10000.00	8.21	16.81	12.95	17.13	0.003713	4.66	2277.81	367.08	0.32
Reach-1	23470	PF 3	20000.00	8.21	19.96	15.00	20.37	0.003356	5.51	4128.30	852.85	0.32
Reach-1	23461	PF 1	4000.00	8.21	14.05	10.79	14.18	0.001737	2.93	1441.48	330.41	0.24
Reach-1	23461	PF 2	10000.00	8.21	16.73	12.69	17.03	0.002657	4.52	2380.51	397.21	0.30
Reach-1	23461	PF 3	20000.00	8.21	19.90	14.68	20.28	0.002310	5.31	4411.28	915.73	0.29
Reach-1	23220	PF 1	4000.00	8.20	13.97	10.53	14.09	0.001177	2.87	1481.22	330.51	0.23
Reach-1	23220	PF 2	10000.00	8.20	16.59	12.45	16.90	0.001967	4.54	2397.80	383.31	0.30
Reach-1	23220	PF 3	20000.00	8.20	19.69	14.49	20.14	0.002013	5.69	4089.90	638.79	0.31
Reach-1	23210	PF 1	4000.00	8.21	13.84	10.58	13.97	0.001414	2.98	1422.59	327.72	0.24
Reach-1	23210	PF 2	10000.00	8.21	16.37	12.50	16.70	0.002368	4.69	2302.10	365.85	0.32
Reach-1	23210	PF 3	20000.00	8.21	19.31	14.53	19.91	0.002861	6.40	3457.85	466.55	0.36
Reach-1	23200	PF 1	4000.00	8.21	13.79	10.59	13.93	0.001431	3.03	1393.64	318.19	0.25
Reach-1	23200	PF 2	10000.00	8.21	16.28	12.49	16.63	0.002408	4.84	2218.83	349.93	0.32

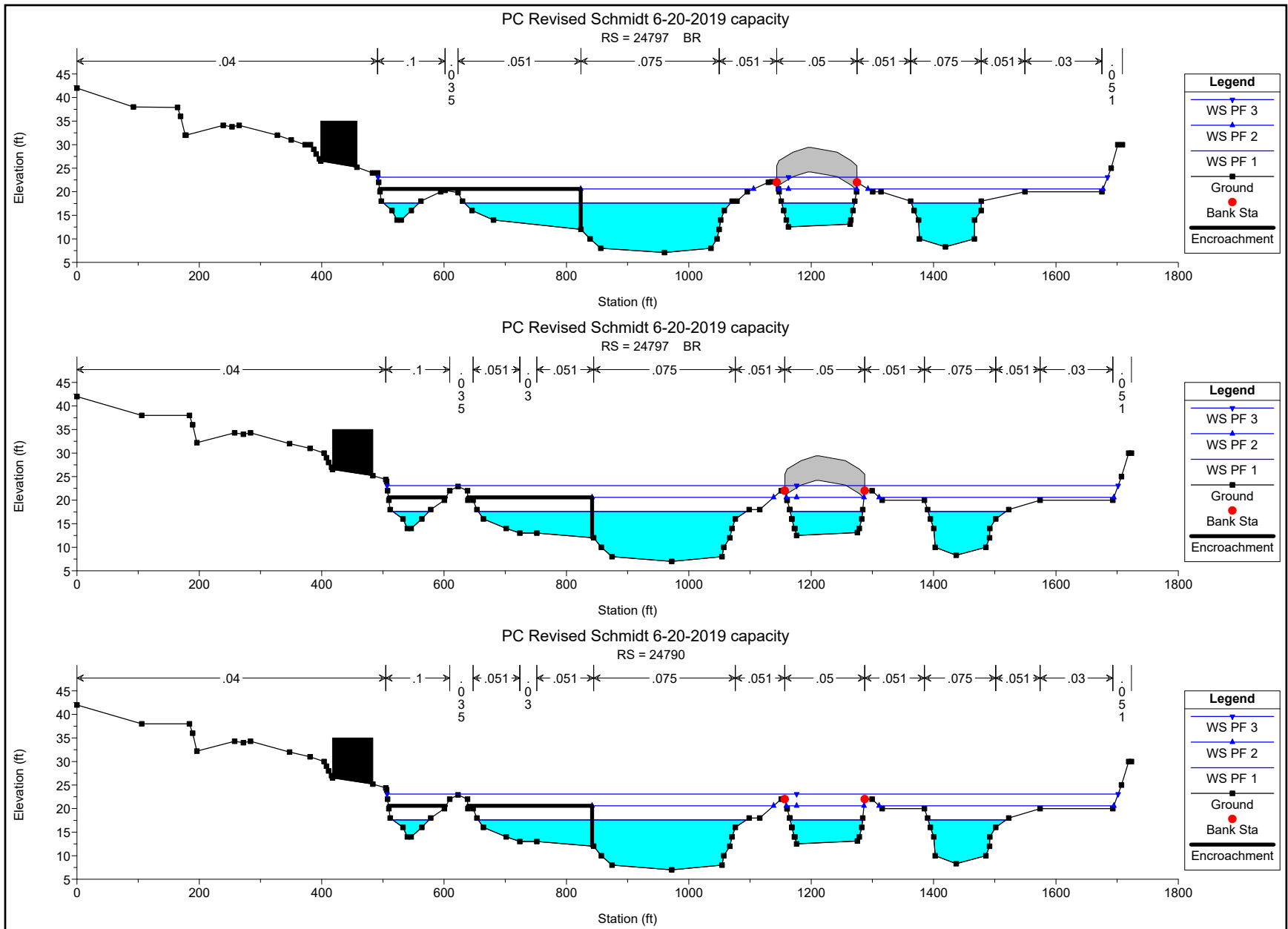
HEC-RAS Plan: PC bridge capacity River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	23200	PF 3	20000.00	8.21	19.16	14.52	19.82	0.003081	6.69	3281.54	391.86	0.38
Reach-1	23171	PF 1	4000.00	8.20	13.35	11.34	13.62	0.007805	4.24	996.83	312.60	0.41
Reach-1	23171	PF 2	10000.00	8.20	15.60	13.41	16.16	0.009146	6.18	1719.03	329.14	0.47
Reach-1	23171	PF 3	20000.00	8.20	18.30	15.34	19.23	0.011130	7.99	2667.82	376.17	0.52
Reach-1	22880	PF 1	4000.00	8.20	12.69	11.36	13.13	0.009367	5.39	787.27	254.74	0.51
Reach-1	22880	PF 2	10000.00	8.20	14.34	13.47	15.37	0.021662	8.34	1270.53	309.14	0.71
Reach-1	22880	PF 3	20000.00	8.20	15.44	15.44	18.00	0.042008	13.17	1614.73	319.99	1.01
Reach-1	22870	PF 1	4000.00	8.20	11.36	11.36	12.54	0.027579	8.73	475.46	269.06	0.96
Reach-1	22870	PF 2	10000.00	8.20	13.33	13.33	14.46	0.031229	9.44	1427.75	627.03	0.87
Reach-1	22870	PF 3	20000.00	8.20	14.70	14.70	16.37	0.032728	11.97	2312.54	659.12	0.94
Reach-1	22860	PF 1	4000.00	-1.00	5.29		5.95	0.004387	6.52	613.58	125.22	0.52
Reach-1	22860	PF 2	10000.00	-1.00	9.25		10.20	0.004786	7.84	1275.53	195.55	0.54
Reach-1	22860	PF 3	20000.00	-1.00	12.49		13.89	0.007009	9.72	2271.02	595.11	0.60
Reach-1	22850	PF 1	4000.00	-1.00	5.25	3.09	5.86	0.002001	6.24	640.72	129.94	0.50
Reach-1	22850	PF 2	10000.00	-1.00	9.22	6.08	10.11	0.002000	7.57	1321.46	200.32	0.52
Reach-1	22850	PF 3	20000.00	-1.00	12.58	9.41	13.72	0.002003	8.87	2432.66	581.53	0.54





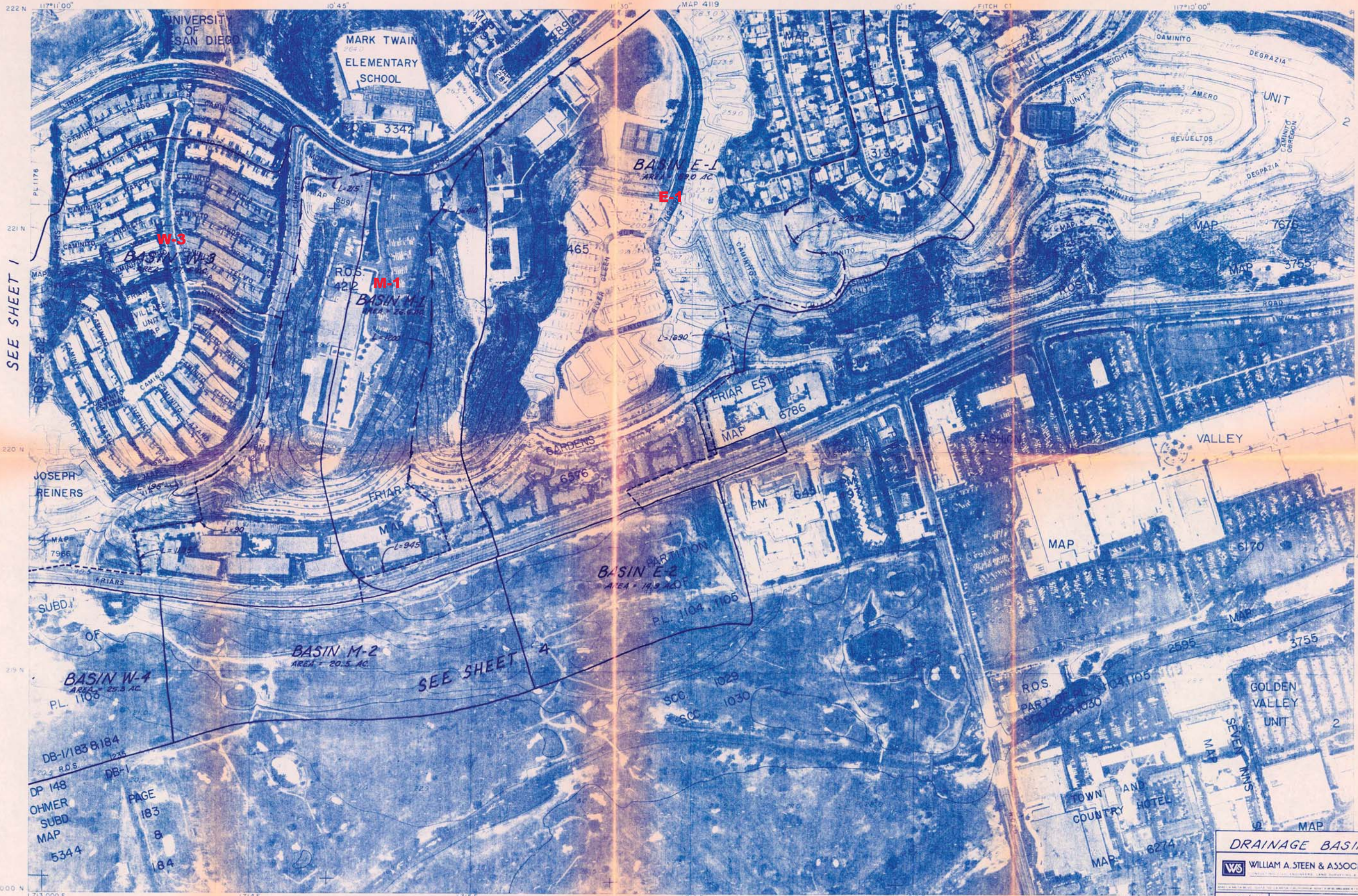




- LEGEND -

Topographic Control Monument
Second Order or Better

Geographic Tie



CITY OF SAN DIEGO
Boundary Line
Topographic Control Monument
Second Order or Better
Geographic Tie
City Boundary Line
Topographic Control Monument
Second Order or Better
Geographic Tie

PREPARED UNDER THE DIRECTION OF
THE CITY ENGINEER OF THE CITY
OF SAN DIEGO, CALIFORNIA

MAP CONTROL DATA FURNISHED
BY THE CITY OF SAN DIEGO

HORIZONTAL CONTROL IS BASED
ON NORTH AMERICAN 1927 DATUM

LAND LINES SHOWN ARE APPROXIMATE

TOPOGRAPHY COMPILED BY PHOTO
GRAMMETRIC METHODS FROM PHOTO
GRAPHY DATED 8-1-78
**WESTERN AERIAL
SURVEYS**
RIVERVIEW

ORTHOPHOTO IMAGE PREPARED FROM
PHOTOGRAPHY DATED 8-1-78

SEE SHEET 1

SEE SHEET 4

DRAINAGE BASINS
WAS WILLIAM A. STEEN & ASSOCIATES
ENGINEERS, ARCHITECTS, AND SURVEYORS & PLANNERS
BY: DJ/MM PHD ENGR WILLIAM A. STEEN
CHK BY: WAS WES 1813G
DATE: 8-18-97 JOB NO: 6600 SHEET 2 OF 4 SHEETS

222-1713	218-1719
218-1707	214-1713

218-1713

CITY OF SAN DIEGO
TOPOGRAPHIC SURVEY

- LEGEND -

- Boundary Line
- Subdivision Parcel Map Boundary Line
- Fence Boundary Line
- Property Line of Section

PREPARED UNDER THE DIRECTION OF
THE CITY ENGINEER OF THE CITY
OF SAN DIEGO, CALIFORNIA

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RIVERSIDE CALIFORNIA

ORTHO PHOTO IMAGE PREPARED FROM
PHOTOGRAPHY DATED 8-1-78



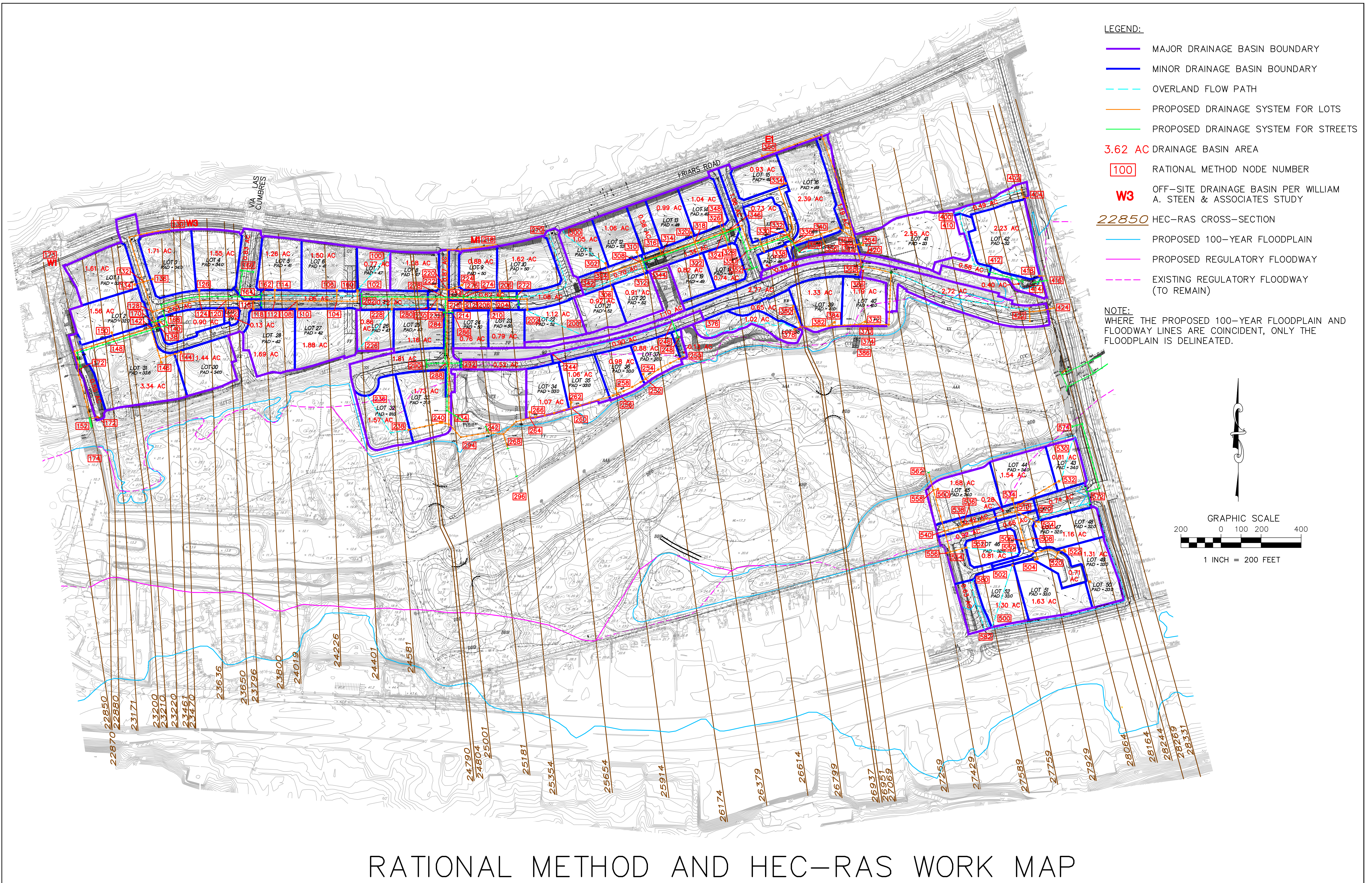
CITY OF SAN DIEGO, CALIFORNIA
SCALE 1 INCH = 200 FEET
DATUM IS MEAN SEA LEVEL
SEE SHEET 2

226-1713	222-1713
222-1707	222-1719
218-1713	

DRAINAGE BASINS

WS WILLIAM A. STEEN & ASSOCIATES
CONSULTING CIVIL ENGINEERS, LAND SURVEYING & PLANNING

DESIGNED BY **DJ/MM** **WAS** **WILLIAM A. STEEN**
CHECKED BY **WAS** **WAS** **WAS**
DATE **8-18-97** JOB NO. **6600** SHEET **3** OF **4**



RATIONAL METHOD AND HEC-RAS WORK MAP