Floodplain Modification Study

FOR

The Brickyard

401 PRAIRIE HAWK DRIVE
CASTLE ROCK, CO 80109
PDP22-0002

LOT 1 OF CITADEL STATION FILING NO. 2
LOT 1, BLOCK 10, CITADEL STATION FILING NO. 6
LOT 1, BLOCK 7, CITADEL STATION FILING NO. 6
AND TRACT OF LAND, COUNTY OF DOUGLAS, STATE OF COLORADO

Prepared: 08/27/2024
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for:

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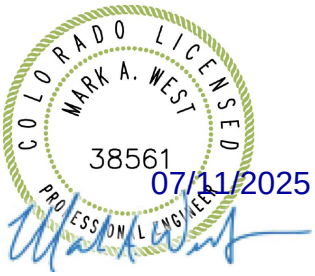
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CERTIFICATION

I hereby affirm that this Floodplain Modification Study for The Brickyard was prepared under my direct supervision in accordance with the provisions of the municipality's S*torm Drainage Criteria* for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others.



SIGNATURE: _____

Mark A. West, P.E., C.F.M.
Registered Professional Engineer State of Colorado No. 38561
On Behalf of Harris Kocher Smith

Confluence Companies LLC hereby certifies that the drainage facilities for The Brickyard shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the Town of Castle Rock reviews drainage plans pursuant to the Municipal Code; but cannot, on behalf of The Brickyard, guarantee that final drainage design review will absolve Confluence Companies LLC and/or their successors and/or assigns of future liability for improper design..

Dan Tovado
_____
Name of Developer

_____
Authorized Signature

I. GENERAL LOCATION AND DESCRIPTION

A. SITE LOCATION

The Brickyard development is located north of Plum Creek Parkway and west of I-25 in Castle Rock, Colorado on 4 parcels: Lot 1, Citadel Station Filing No. 2, County of Douglas, State of Colorado; Lot 1 of Block 10 and Lot 1 of Block 7, Citadel Station Filing No. 6, County of Douglas, State of Colorado; A tract of land situated in sections 10 and 11, Township 8 South, Range 67 West of the 6th Principal Meridian, County of Douglas, State of Colorado. The entire property is situated in the Northwest ¼ of Section 11, Township 8 South, Range 66 West of the 6th Principal Meridian, Town of Castle Rock, County of Douglas, State of Colorado. A Vicinity Map is included in **Appendix A** of this report, for reference.

The property is bounded by Prairie Hawk Drive along the east with East Plum Creek to the east of Prairie Hawk Drive as the ultimate receiving drainageway. To the north is an adjacent existing drainageway known as the Industrial Tributary Channel. On the west side of the property is a planned development project known as Millers Landing (PDP 16-0003).

This Floodplain Management Study (FMS) report documents the proposed modifications to the Industrial Tributary Channel and their impacts to existing and proposed infrastructure. Proposed channel improvements include the installation of a proposed 12-foot wide by 8-foot-tall concrete box culvert and associated wingwalls, a proposed parallel 72-inch RCP that will connect to a proposed junction structure and downstream 72-inch RCP being designed as part of Castle Rock's Industrial Tributary Trail project, low flow channel grading, and riprap at the existing Prairie Hawk Drive crossing that will be improved as part of the Brickyard development. The proposed culvert crossing will be installed per the recommendations outlined in the *Omni, Industrial and Westfield Watershed Flood Hazard Area Delineation* report by CH2MHill, dated January 2011, referred to as the Master Plan hereafter. The Master Plan provides a comprehensive drainage plan and floodplain analysis for the Omni, Industrial, and Westfield Watersheds, including providing recommendations for channel improvements, and improvements to the culvert at Prairie Hawk Drive. The Master Plan is referenced throughout this report, and reference material can be found in **Appendix E**. Additionally, the Brickyard development will incorporate a proposed pedestrian trail along Industrial Tributary that will ultimately connect to Castle Rock's proposed Industrial Tributary trail.

B. DESCRIPTION OF PROPERTY

The property is 35.25 acres. The total area to be developed and total disturbed area, including offsite area, is approximately 36.36 acres. The proposed Brickyard development area will hereby be referred to as the "Site".

The existing site consists of Type B and Type C hydrologic soil groups. The Industrial Tributary major drainageway exists adjacent to the Site to the north. There are no known irrigation facilities on, adjacent to, or otherwise impacting the Site. The Site slopes generally to the northeast towards Prairie Hawk Drive.

According to the Natural Resources Conservation Service (NRCS) – Web Soil Survey, the underlying soils are mostly Newlin gravelly sandy loam (NeE) and Fondis clay loam (FoD) which are classified as Hydrologic Groups B and C. Since most of the underlying soil is NeE, Hydrologic Soil Group B was prioritized in the Rational calculations used for the design of the storm network and inlets for the Site. Both Hydrologic Groups B and C were incorporated in the design of the detention facility for the Brickyard Development as a conservative approach in sizing. Pages from the NRCS WSS report are included in **Appendix B**. A summary of the soil types and their percentages based on area of the site follows in Table 1.

Table 1: NRCS Web Soil Survey

Map Unit Symbol	Map Unit Name	Area of Interest (AOI)	Hydrologic Soil Group	Percent of AOI
		Acres	Percent	Percent
FoD	Fondis Clay loam, 3 to 9 percent slopes	2.6	C	4.6
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	53.1	B	95.4

Most of the Site is located within an area of minimal flood hazard as shown on the FEMA Flood Insurance Rate Map (FIRM) number 08035C0301G, Panel 0301G for Douglas County, Colorado and Incorporated Areas. A small portion of the Site along Industrial Tributary is located within an area of 0.2% Annual Chance Flood Hazard (Shaded Zone X). Per the FEMA FIRM number 08035C0188G, Panel 0188G for Douglas County, Colorado and Incorporated Areas, both the existing culvert crossing of Prairie Hawk Drive and the existing BNSF 10-foot stone archway are contained within the area of 0.2% Annual Chance Flood Hazard (Shaded Zone X), with the portion of the Industrial Tributary downstream from the existing BNSF stone archway and upstream of Park Street residing in FEMA Flood Zone A. A FEMA FIRMETTE showing the Brickyard Development and an additional FIRMETTE showing the area of the existing culvert crossings can be found in **Appendix A**, for reference. While both FEMA FIRMs that show the Site and Industrial Tributary were effective as of March 16, 2016, a LOMR for Industrial Tributary became effective on June 24, 2016, that removed the regulatory floodway condition along Industrial Tributary. This is reflected on the FIRMETTEs provided in **Appendix A**.

C. PROPOSED LAND USE

The Site will be developed as mixed-use. The proposed development will potentially include a hotel, condominiums, for-rent apartments, townhomes, retail and commercial buildings, office buildings, public and private roads, landscaped areas, and an on-site water quality and detention pond. For the purposes of this report, the focus is the proposed public channel improvements to the Industrial Tributary. Additional drainage details for the proposed development can be found in the Phase III Drainage Report for the Brickyard and future conformance reports for the Castle Rock Recreation Center, and future developments Phases I, II, III and IV.

As part of the Industrial Tributary Trail improvements for the Town of Castle Rock, Wilson & Company is preparing trail plans and improvements to industrial tributary downstream of the proposed Prairie Hawk Drive culvert crossing.

II. DRAINAGE BASINS AND SUB-BASINS

A. MAJOR DRAINAGE BASINS

The Site is located within a portion of the Industrial Watershed which outfalls to East Plum Creek. The Industrial Watershed was studied as part of the *Omni, Industrial and Westfield Watershed Flood Hazard Area Delineation* report by CH2MHill in January 2011, referred to as the Master Plan hereafter. The Master Plan provides a comprehensive drainage plan and floodplain analysis for the Omni, Industrial and Westfield Watersheds, including providing recommendations for channel improvements, and improvements to the culvert at Prairie Hawk Drive. The Master Plan is referenced throughout this report; reference material can be found in **Appendix E**.

In 2019, improvements were made to the Industrial Tributary Channel including sheet pile and drop structures generally based on the recommendations in the Master Plan. As-built plans for the Industrial Tributary Stabilization Project can be found in **Appendix E**. The trail included in these plans was not constructed.

III. DRAINAGE DESIGN CRITERIA

A. REGULATIONS

The basis for design and analysis of the drainage system and drainage impacts for the Site were the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (SDDTCM), dated June 2019, and the Mile High Flood District *Urban Storm Drainage Criteria Manual* (USDCM), Volumes 1 (Revised August 2018), 2 (Revised September 2017), and 3 (Revised January 2021).

Results of the hydraulic analysis are included within the **Appendix D** of this report.

B. DRAINAGE STUDIES, MASTER PLANS, AND SITE CONSTRAINTS

The primary previous drainage study reference for the Site design is the *Omni, Industrial and Westfield Watershed Flood Hazard Area Delineation* report by CH2MHill. Additionally, the *Industrial Tributary As-Built Conditions Hydraulic Analysis Memo* and HEC-RAS version 4.1.0 hydraulic model prepared by Olsson was used as a basis of design for the proposed and existing analysis. The as-built conditions study ends just upstream of the Prairie Hawk Drive Culvert Crossing. As-such, this floodplain modification study extended the limits of the existing and proposed hydraulic analysis to include the proposed 12-foot by 8-foot concrete box culvert, and 72-inch RCP low flow crossing of Prairie Hawk Drive, as well as the existing 10-foot stone archway and proposed 72-inch RCP that crosses the existing BNSF railroad tracks to the east of the Site.

In coordination with Wilson & Company, the Town of Castle Rock, and BNSF, it was determined that the proposed 12’ x 8’ concrete box culvert crossing of Prairie Hawk Drive

constructed as part of the Brickyard development and the existing 10-foot stone archway that crosses the BNSF railroad would be used as the path of the proposed pedestrian trail as it crosses Prairie Hawk Drive and the existing BNSF railroad downstream. As such, the proposed box culvert and existing stone archway are to be kept dry during the 10-year event for pedestrian safety. To accomplish this, a low flow channel and associated floodwall will be graded upstream of the proposed Prairie Hawk Drive culvert crossing to divert 10-year event flows away from the proposed 12'x8' concrete box culvert and into a proposed 72-inch RCP that will convey 10-year event channel flows below Prairie Hawk Drive to a proposed junction structure and 72-inch RCP being constructed as part of the Industrial Tributary trail improvements by Wilson & Company. The additional 72-inch RCP will convey flows below the existing BNSF railroad and into Industrial Tributary where a floodwall will be placed along the trail to keep the downstream trail portions dry during the 10-year event.

Survey data for the existing 10-foot BNSF stone archway and channel portions downstream and upstream from the existing railroad crossing was obtained from Wilson & Company on July 31, 2024, and incorporated into both the existing and proposed conditions models to assess the impacts to the channel and existing stone archway. Proposed surface data for the portions downstream of the existing BNSF stone archway was obtained from Wilson & Company on February 26, 2025.

To provide equivalent results between studies, it was decided to use the ITT_Proposed HEC-RAS model file by Wilson & Company provided to HKS on May 15, 2025, for the purposes of this FMS and the hydraulic analysis for BNSF prepared by Wilson & Company. This model is a modified version of the model prepared by Olsson, which was previously modified by HKS with relevant existing and proposed project geometry, including the extension of the model through the existing BNSF stone archway. Boundary condition water surface elevations for the proposed and existing conditions models were derived from Wilson & Company's provided water surface elevations derived from a StormCAD model for the Park Street culvert.

Environmental studies prepared by Wilson & Company for the Industrial Tributary Trail (ITT) project are referenced to address the required environmental clearances for the Brickyard FDP. The work associated with the Brickyard FDP is included within the Study Area for the *Draft Biological Assessment (BA) for Industrial Tributary Trail Connection* prepared by Wilson & Company, dated March 2025. This assessment evaluates threatened and endangered (T&E) species impacts within the overall project. This study indicates that impacts to the Preble's meadow jumping mouse (PMJM) are anticipated in the overall ITT project; however, the Brickyard project work does not fall within conservation areas that protect PMJM. This is shown in Figure 6: Project Location with Mitigation and Conservation Areas. Per the BA, no other impacts to T&E species are anticipated.

Additionally, the work associated with this FDP is included in the Preconstruction Notification (PCN) for the overall ITT project as a presumed non-jurisdictional feature. The overall ITT project includes impacts to waters of the U.S (WOTUS), triggering the Clean Water Act (CWA) 404 permitting process through the U.S. Army Corps of Engineers (USACE). The ITT project is utilizing Nationwide Permit NWP 14 which requires the identification of all crossings associated with the overall project in the PCN. Copies of the BA and PCN are included in Appendix E, for reference.

C. HYDROLOGY

Four model plans were created for the purposes of comparison for this FMS. However, the primary models are the proposed and existing conditions models which use the Town approved 2020 Watershed Hydrology with 10-year flows from the 2025 Watershed Study prepared by Wilson & Company. Additional models include the existing and proposed conditions models which use the future 100-year flows for Industrial Tributary as outlined in the Omni, Industrial and Westfield Watershed Master Plan (2013 FHAD). As several detention facilities have been incorporated since the preparation of the Master Plan, Wilson & Company prepared a hydrologic analysis determining a more realistic flow value to use for the hydraulic modeling of Industrial Tributary. As such, the future 10-year flows for Industrial Tributary as outlined in the Industrial Tributary Low Flow/Trail Users Safety Memo prepared for BNSF by Wilson & Company were used for the primary proposed and existing conditions channel analysis. Table 2 below lists the flowrates utilized for each model.

Table 2: Flowrate Summary Table

Model Plan Title	Description	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
Existing_2013 FHAD Flows	Existing conditions geometry with 2013 FHAD future flows	318	590	1162
Proposed_2013 FHAD Flows	Proposed conditions geometry with 2013 FHAD future flows	318	590	1162
Existing_2020+2025 Low Flow	Existing conditions geometry with Town approved 2020 Watershed Hydrology and 2025 Low Flow Hydrology for 10 Year Flows	296	305	856
Proposed_2020+2025 Low Flow	Proposed conditions geometry using Town approved 2020 Watershed Hydrology and 2025 Low Flow Hydrology for 10 Year Flows	296	305	856

D. HYDRAULICS

The method used to calculate the water surface elevations in the Industrial Channel with the proposed design is HEC-RAS 4.1.0, consistent with the analysis prepared by Olsson.

Per the Omni, Industrial and Westfield Watershed Master Plan report, the existing 48-ich and 84-inch reinforced concrete pipe crossing of Prairie hawk Drive will be replaced with a 12’ x 8’ concrete box culvert with the Brickyard development. Additionally, to allow the trail and box culvert to remain dry during the 10-year event, a low flow channel and floodwall will be graded upstream of the Prairie Hawk Drive culvert crossing to divert 10-year flows to a proposed 72-inch RCP that will convey flows below Prairie Hawk Drive. This 72-inch RCP will connect to a proposed junction structure and 72-icnh RCP being designed by Wilson & Company as part of the Industrial Tributary Trail improvements that will convey 10-year flows below the existing BNSF railroad and back into Industrial Tributary.

IV. CHANNEL IMPROVEMENT DESIGN

A. EXISTING CONDITIONS MODELING

The floodplain was previously studied in December 2020 by Olsson as part of the as-built conditions analysis for the Industrial Tributary Stabilization Project completed in October 2019. The 1D HEC-RAS version 4.1.0 model prepared by Olsson was obtained from the Town and utilized as the existing conditions model for this study. The method used to study the culvert and channel impacts, and to calculate water surface elevations is HEC-RAS version 4.1.0, consistent with the previous analysis. Input parameters for the channel remain consistent with the Olsson model.

The existing model geometry was extended downstream past the previous modeling effort by Olsson to include the portion of the channel downstream of Prairie Hawk Drive, the existing 10-foot stone arch tunnel under the BNSF railroad, and a portion of the existing channel (approximately 158-feet) downstream of the existing BNSF arch tunnel to the existing Park Street culvert for both the existing and proposed conditions.

Two models were created using the existing conditions geometry. The primary model is the existing conditions model using the Town approved 2020 Watershed Study hydrology for the 2-year and 100-year profiles and the 2025 low flow hydrology prepared by Wilson & Company for the 10-year profile. The secondary model, prepared for comparison purposes, uses the future flows as outlined in the 2013 FHAD. Boundary conditions for each of the existing conditions models were derived using a StormCAD model prepared by Wilson & Company for the existing Park Street culverts using the applicable flow data for each model. Table 3 below lists the downstream boundary conditions for the existing conditions models.

Table 3: Existing Conditions Boundary Condition Summary Table

Model Plan Title	River Station	Boundary Condition known Water Surface Elevation (WSEL)		
		2-Year	10-Year	100-Year
Existing_2020+2025 Low Flow	0.00	6191.62	6191.68	6194.48
Existing_2013 FHAD Flows	0.00	6191.78	6193.45	6196.77

B. PROPOSED CONDITIONS MODELING

In the proposed conditions, the Industrial Tributary Channel will remain relatively unchanged from the as-built conditions presented in the Hydraulic Analysis Memo by Olsson. The primary construction impacts will be on the eastern boundary near Prairie Hawk Drive. Per the Omni, Industrial and Westfield Watershed Master Plan report, the existing 48-inch and 84-inch reinforced concrete pipe crossing of Prairie Hawk Drive will be replaced with a 12'x8' concrete box culvert and 72-inch RCP that will be constructed with the Brickyard development. Additionally, a small, roughly 80-foot, portion of the

channel will be regraded to provide a low flow channel, with the existing drainage and slope patterns remaining generally intact. Also incorporated into the model are the proposed 72-inch RCP being designed by Wilson & Company and the existing 10-foot stone archway that crosses the existing BNSF railroad. Further, to prevent 100-year flows from the south from entering the trail, a 12" landscape drain and associated 12" HDPE pipe is provided to route nuisance flows directly to the 72" RCP low flow culverts. As the flow anticipated to be captured is minor (Q100 < 2 CFS), the 12" HDPE system was excluded from the proposed conditions model. An exhibit showing these improvements as well as channel centerline and cross-section locations associated with the HEC-RAS analysis can be found in **Appendix C**, for reference.

As Wilson & Company is preparing a separate analysis for the improvements downstream of and including the BNSF culvert crossing, and to have one unified model between projects, it was determined that proposed model geometry updates provided by Wilson & Company would be used for the purposes of this FMS. This model is a modified version of the split flow analysis model previously prepared by HKS, which incorporates model geometry from the analysis prepared by Olsson for most of the upstream reach. The split flow model incorporates an upstream reach that drains to a junction that splits Industrial Tributary into two reaches: a Low Flow reach and a Trail reach to model the flows that are conveyed along the pedestrian trail and low flow culverts separately. These reaches are connected by lateral structures used to model the floodwalls on either side of the culvert crossings.

Like the existing conditions, two models were created using the proposed conditions geometry. The primary model is the proposed conditions model using the Town approved 2020 Watershed Study hydrology for the 2-year and 100-year profiles and the 2025 low flow hydrology prepared by Wilson & Company for the 10-year profile. The secondary model, prepared for comparison purposes, uses the future flows as outlined in the 2013 FHAD. Boundary conditions for each of the proposed conditions models were derived using a StormCAD model prepared by Wilson & Company for the existing Park Street culverts using the applicable flow data for each model. Table 4 below lists the downstream boundary conditions for the proposed conditions models.

Table 4: Proposed Conditions Boundary Condition Summary Table

Model Plan Title	River Station	Boundary Condition known Water Surface Elevation (WSEL)		
		2-Year	10-Year	100-Year
Proposed_2020+2025 Low Flow	LF 0.00	6192.76	6191.68	6194.48
Proposed_2013 FHAD Flows	LF 0.00	6191.78	6193.45	6196.77

Characteristics of the proposed channel including slope, roughness, depth, velocity, and Froude Number are included in the HEC-RAS output results in **Appendix D**.

Centerline alignment, stationing, and cross section locations, and the delineation of existing and proposed 100-year floodplain and water surface profiles for both conditions, including cross-section location, is in **Appendix C**.

C. RESULTS

It is determined that the proposed 12-foot by 8-foot concrete box culvert and 72-inch RCP crossing of Prairie Hawk Drive eliminates 100-year flood overtopping of Prairie Hawk Drive in the proposed condition. The proposed 12-foot by 8-foot concrete box culvert that will provide pedestrian passage and connect to the Industrial Trail Improvements for the Town of Castle Rock will remain dry during the 10-year event as the proposed low flow channel and trail floodwall will keep all 10-year conveyance within the main portion of the Industrial Tributary Channel. Additionally, the downstream existing 10-foot stone archway that crosses the existing BNSF railroad will remain dry during the 10-year event as all 10-year event conveyance will remain within the adjacent 72-inch RCP.

Through a comparison of the existing and proposed analysis, it was determined that there is a decrease in the future 100-year water surface at the upstream and downstream ends of the existing BNSF 10-foot stone arch way. As such, there are no adverse effects on the existing BNSF archway and railroad. In both the existing and proposed conditions, the existing archway conveys the future 100-year channel flows without overtopping the railroad.

The project will result in a significant improvement to the Industrial Tributary conveyance and will not cause any adverse impacts to adjacent or downstream properties. Exhibits of the proposed and existing conditions are included in **Appendix C**, for reference. HEC-RAS output results of proposed and existing conditions are included in **Appendix D**, for reference. Table 5 below lists and compares the Existing and Proposed Conditions model results for the 100-year event when using the Town approved 2020 Watershed hydrology. Note, only the low flow and upstream model results are listed for the proposed conditions modeling.

Table 5: Existing and Proposed 100-Year Model Results using Town Approved 2020 Watershed Study Hydrology

Hydraulic Cross Section			Base Flood Elevations		Δ
Olsson Cross Section ID	Ex River Station (RS)	Pr River Station (RS)	Existing Conditions	Proposed Conditions	Proposed vs Existing
47	1534.24	1518.60	6238.21	6238.08	-0.13
46	1485.40	1469.76	6237.48	6237.78	0.30
45	1485.20	1469.56	6236.61	6236.61	0.00
44	1460.50	1444.86	6235.57	6235.57	0.00
43	1460.40	1444.76	6235.57	6235.57	0.00
42	1447.48	1431.84	6234.65	6234.65	0.00
41	1434.04	1418.40	6234.22	6234.22	0.00
40	1433.84	1418.20	6234.16	6234.16	0.00
39	1409.14	1393.50	6234.20	6234.20	0.00
38	1409.04	1393.40	6234.10	6234.10	0.00
37	1304.87	1289.23	6232.56	6232.56	0.00
36	1207.55	1191.91	6229.50	6229.50	0.00
35	1207.35	1191.71	6229.34	6229.34	0.00
34	1182.65	1167.01	6229.32	6229.32	0.00
33	1182.55	1166.91	6229.31	6229.31	0.00
32	1136.61	1120.97	6228.20	6228.20	0.00
31	1077.55	1061.91	6226.07	6226.07	0.00
30	1077.35	1061.71	6226.07	6226.07	0.00
29	1052.65	1037.01	6225.94	6225.94	0.00
28	1052.55	1036.91	6225.93	6225.93	0.00
27	1029.49	1013.85	6224.91	6224.91	0.00
26	1002.55	986.91	6222.42	6222.42	0.00
25	1002.35	986.71	6222.41	6222.41	0.00
24	977.65	962.01	6222.54	6222.54	0.00
23	977.55	961.91	6222.53	6222.53	0.00
22	948.15	932.51	6221.28	6221.28	0.00
21	917.55	901.91	6218.76	6218.76	0.00
20	917.35	901.71	6218.47	6218.47	0.00
19	892.65	877.01	6218.79	6218.79	0.00
18	892.55	876.91	6218.79	6218.79	0.00
17	877.31	861.67	6217.95	6217.95	0.00
16	862.55	846.91	6216.34	6216.31	-0.03
15	862.34	846.70	6216.40	6216.37	-0.03
14	837.65	822.01	6215.84	6215.79	-0.05
13	837.55	821.91	6215.81	6215.76	-0.05
12	727.54	711.90	6215.40	6214.80	-0.60
11	683.64	668.00	6215.31	6214.59	-0.72
10	683.32	667.68	6215.22	6214.41	-0.81

Table 5: Existing and Proposed 100-Year Model Results using Town Approved 2020 Watershed Study Hydrology (Continued)

Hydraulic Cross Section			Base Flood Elevations		Δ
Olsson Cross Section ID	Ex River Station (RS)	Pr River Station (RS)	Existing Conditions	Proposed Conditions	Existing vs Proposed
9	665.19	649.55	6215.09	6214.17	-0.92
8	665.09	649.45	6215.09	6214.16	-0.93
7	636.90	621.26	6213.98	6213.00	-0.98
6	568.86	553.22	6211.33	6211.95	0.62
5	520.21	504.57	6211.08	6211.21	0.13
4	492.27	476.63	6211.72	6206.06	-5.66
3	462.31	-	6211.73	-	-
2	462.21	-	6211.72	-	-
-	-	449.30	-	6206.54	-
-	-	420.81	-	6206.58	-
-	-	399.84	-	6206.59	-
1	396.14	-	6211.51	-	-
-	-	395.23	-	6206.59	-
-	275.31	258.43	6202.44	6200.77	-1.67
-	261.46	248.43	6202.88	6200.76	-2.12
-	156.67	146.73	6196.88	6195.57	-1.31
-	134.36	134.20	6196.84	6195.44	-1.40
-	84.26	84.70	6195.71	6195.49	-0.22
-	54.26	52.40	6195.91	6195.49	-0.42
-	0.00	0.00	6194.48	6194.48	0.00

V. CONCLUSIONS

A. IMPACT OF IMPROVEMENTS

In the current condition, the Industrial Tributary channel includes riprap and drop structures upstream of the existing 48-inch and 84-inch reinforced concrete pipe crossings at Prairie Hawk Drive. The proposed project will provide a 12-foot by 8-foot concrete box culvert and 72-inch RCP in place of the existing culverts, with limited grading, and riprap, consistent with the recommendations in the Omni, Industrial, and Westfield Watershed Master Plan as prepared by CH2MHILL. Additionally, the project will incorporate a pedestrian trail with a 100-year flood wall along the upstream portions of Industrial Tributary. This trail will connect to the proposed 12-foot wide by 8-foot-tall pedestrian concrete box culvert and pedestrian trail that will be constructed as part of the Industrial Tributary Trail improvements prepared by Wilson & Company for the Town of Castle Rock. The proposed floodwall along the upstream portions of the pedestrian trail will eliminate any 10-year channel conveyance through the pedestrian culvert.

The proposed 12-foot by 8-foot concrete box culvert and 72-inch RCP installation and associated improvements will result in a significant improvement to the floodplain and effects of the Industrial Tributary to adjacent and downstream properties.

As Industrial Tributary is non jurisdictional, no federal 404 permits are required for the associated improvements.

B. COMPLIANCE WITH STANDARDS

The design and analysis of the Industrial Tributary floodplain improvements associated with the Brickyard development are in accordance with the SDDTCM and MHFD standards.

C. VARIANCES

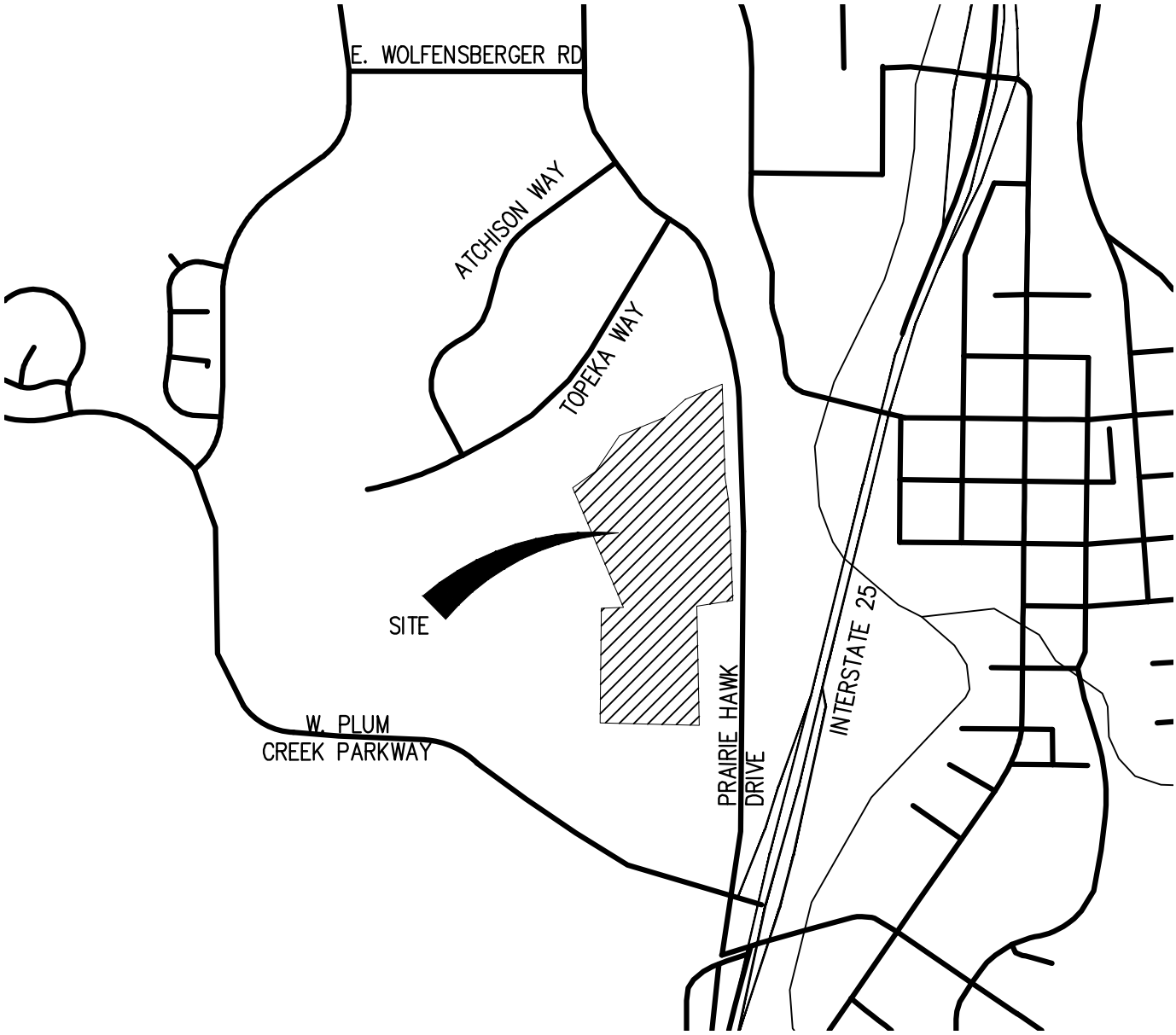
No variances from criteria are requested.

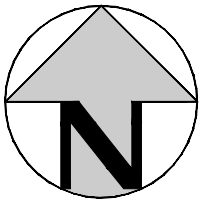
VI. REFERENCES

1. Storm Drainage Design and Technical Criteria Manual (SDDTCM), Town of Castle Rock, Colorado, updated June 2019
2. *Urban Storm Drainage Criteria Manual (USDCM)*, Mile High Flood District (MHFD, formerly known as Urban Drainage and Flood Control District, UDFCD):
    A. Volume 1, Management, Hydrology and Hydraulics, Revised August 2018.
    B. Volume 2, Structures, Storage and Recreation, Revised September 2017.
    C. Volume 3, Stormwater Quality, Updated January 2021
3. *FEMA Flood Insurance Rate Map (FIRM) No. 08035C0188G, Panel 0188G, Douglas County, Colorado and Incorporated Areas*, Federal Emergency Management Agency (FEMA), revised March 16, 2016.
4. *FEMA Flood Insurance Rate Map (FIRM) No. 08035C0301G, Panel 0301G, Douglas County, Colorado and Incorporated Areas*, Federal Emergency Management Agency (FEMA), revised March 16, 2016.
5. *Omni, Industrial and Westfield Watershed Master Plan report*, CH2MHill, January 2011.
6. *Industrial Tributary Stabilization Project Record Drawings*, Olsson, December 17, 2020.
7. *Industrial Tributary As-Built Conditions Hydraulic Analysis*, Olsson, December 2020.
8. *Industrial Tributary Low Flow/ Trial Users Safety Memo for Burlington North Santa Fe,* Wilson & Company, January 2025.
9. *Draft Biological Assessment for Industrial Tributary Trail Connection, Castle Rock, Colorado,* Wilson & Company, March 2025.

VII. APPENDICES

APPENDIX A – VICINITY MAP & FEMA FIRMette





1000 0 1000 2000

SCALE: 1" = 1000'

Plotted: THU 08/25/22 8:26:43A By: Felipe Rocha Filepath: k:\200726\engineering\xref\vicinity map.dwg Layout: layout1

HARRIS KOCHER SMITH
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Denver, Colorado 80203
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CONFLUENCE COMPANIES, L.L.C.

THE BRICKYARD VICINITY MAP

PROJECT #: 200726

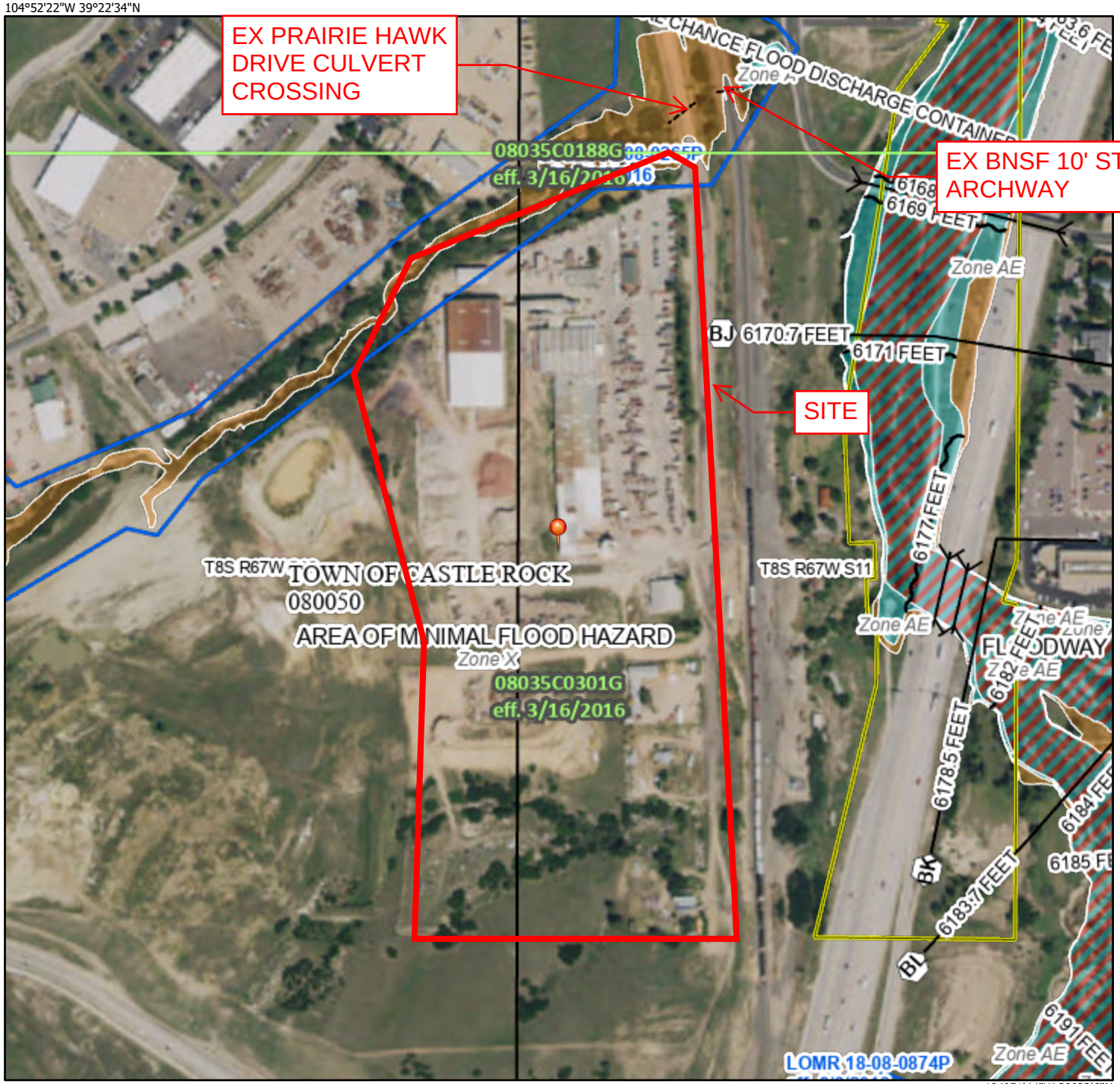
SHEET NUMBER

1

National Flood Hazard Layer FIRMette

FEMA

104°52'22"W 39°22'34"N



104°51'44"W 39°22'6"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/23/2023 at 8:55 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

104°52'22"W 39°22'54"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

104°51'45"W 39°22'26"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/26/2024 at 1:14 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B - NRCS SOILS REPORT

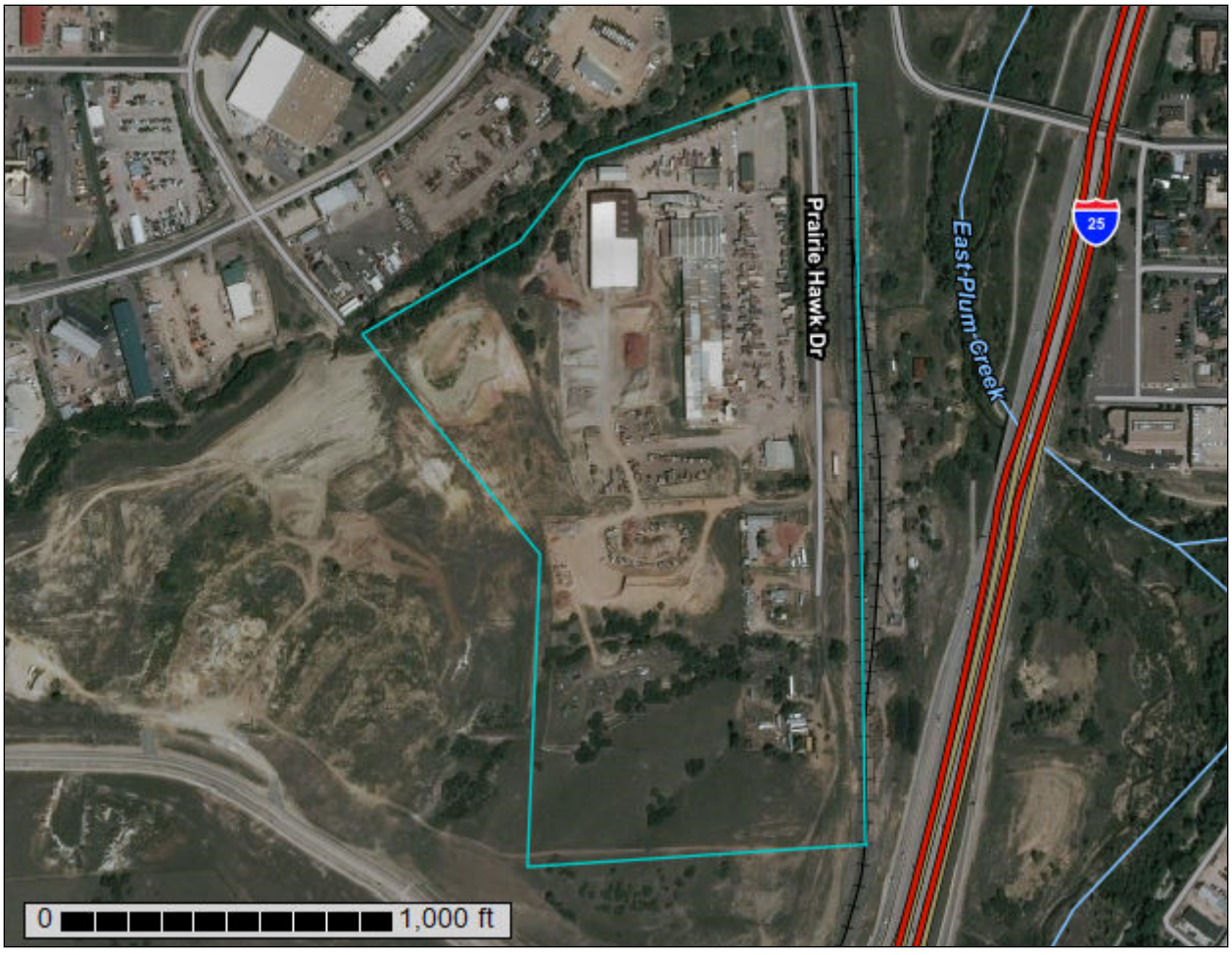
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Castle Rock Area, Colorado



October 21, 2020

Castle Rock Area, Colorado

FoD—Fondis clay loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: jqyp
Elevation: 5,500 to 6,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Fondis and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fondis

Setting

Landform: Buttes, ridges, mesas
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over coarse-silty outwash derived from arkose

Typical profile

H1 - 0 to 7 inches: clay loam
H2 - 7 to 24 inches: clay
H3 - 24 to 60 inches: sandy clay loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R049XY208CO - Clayey Foothill DRAFT (1-2018) MLRA 49
Hydric soil rating: No

Minor Components

Kutch

Percent of map unit: 5 percent
Hydric soil rating: No

Englewood
Percent of map unit: 5 percent
Hydric soil rating: No

Denver
Percent of map unit: 4 percent
Hydric soil rating: No

Aquic haplustolls
Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

NeE—Newlin gravelly sandy loam, 8 to 30 percent slopes

Map Unit Setting
National map unit symbol: jqzg
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 49 to 51 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition
Newlin and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newlin

Setting
Landform: Terraces, mesas, plateaus
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Unconformable sandy and gravelly and/or mixed source alluvium

Typical profile
H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 17 inches: gravelly sandy clay loam
H3 - 17 to 22 inches: gravelly sandy loam
H4 - 22 to 60 inches: very gravelly sand

Properties and qualities
Slope: 8 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XB215CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 5 percent
Hydric soil rating: No

Satanta

Percent of map unit: 4 percent
Hydric soil rating: No

Stapleton

Percent of map unit: 4 percent
Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

Custom Soil Resource Report
Map—Hydrologic Soil Group (ACME Hydrologic Soil Group)



Map Scale: 1:4,210 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 13, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2018—Nov 19, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group (ACME Hydrologic Soil Group)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FoD	Fondis clay loam, 3 to 9 percent slopes	C	2.6	4.6%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	B	53.1	95.4%
Totals for Area of Interest			**55.7**	**100.0%**

Rating Options—Hydrologic Soil Group (ACME Hydrologic Soil Group)

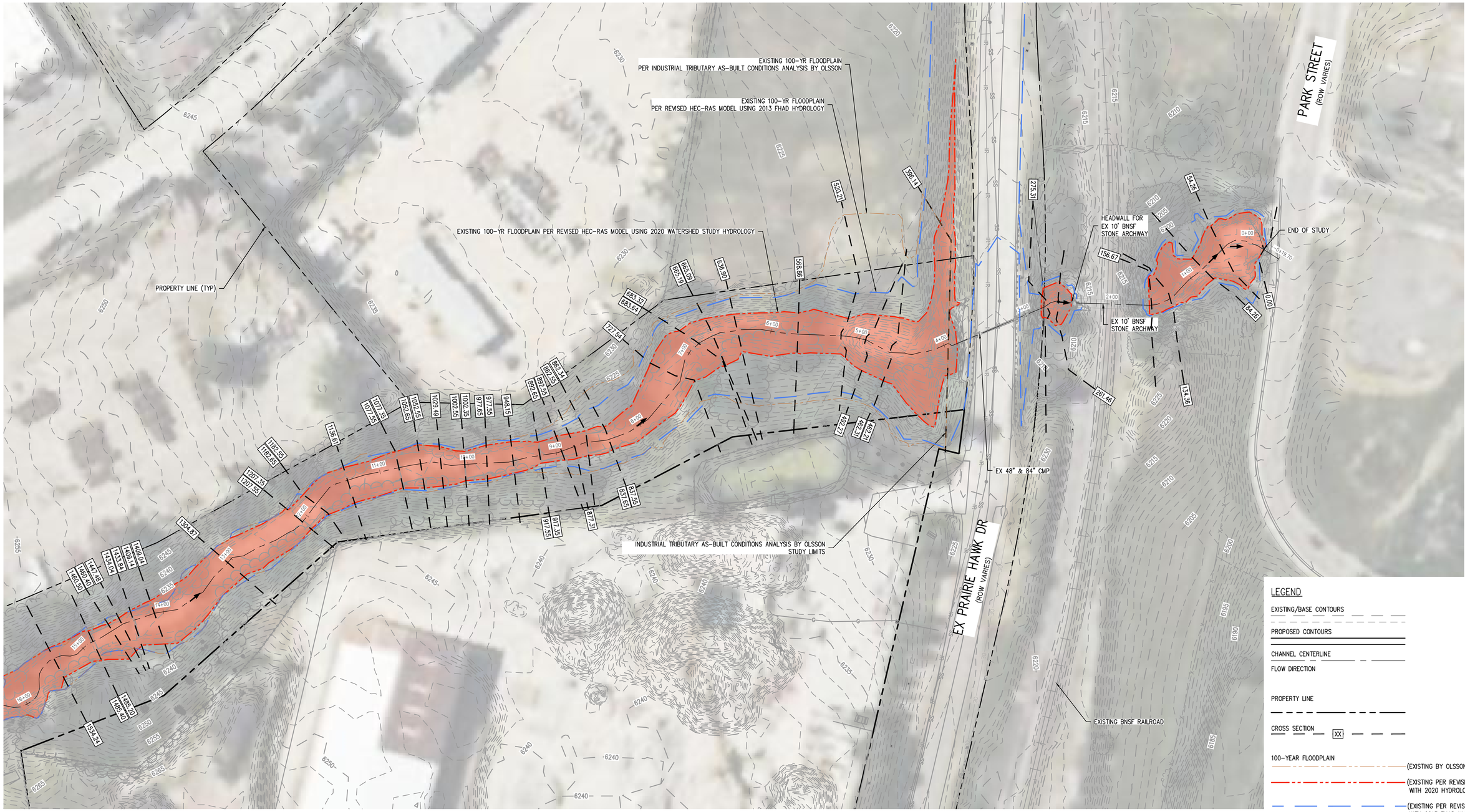
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX C – PROPOSED & EXISTING HEC-RAS ANALYSIS EXHIBITS, PRAIRIE HAWK DRIVE CULVERT CROSSING PLAN

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.



Know what's below. Call before you dig.

SCALE: 1" = 50'

DESIGNED BY: AMC
CHECKED BY: MAW
DRAWN BY: AMC

ISSUE DATE: 06-12-2024

DATE	REVISION COMMENTS

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

CONFLUENCE COMPANIES, LLC

THE BRICKYARD
EXISTING CHANNEL CONDITIONS

PROJECT #: 200726
SHEET NUMBER
1
1 OF 2

FILEPATH= P:\2020\20072605\ENGINEERING\DRAINAGE\EX CONDITIONS HEC-RAS.DWG, LAYOUT, LAYOUT1
4 XREFs: e-base, e-base-bnds-hyot-wilson, e-legal, e-util
PLOTTED: THU 05/22/25 5:00:43P BY: AMANDA CASTEEL

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.

EXISTING 100-YR FLOODPLAIN PER REVISED EXISTING CONDITIONS HEC-RAS MODEL WITH 2020 WATERSHED HYDROLOGY

EXISTING 100-YR FLOODPLAIN PER REVISED EXISTING CONDITIONS HEC-RAS MODEL WITH 2013 FHAD HYDROLOGY

EXISTING 100-YR FLOODPLAIN PER INDUSTRIAL TRIBUTARY AS-BUILT CONDITIONS ANALYSIS BY OLSSON

PROPOSED 100-YR FLOODPLAIN PER REVISED PROPOSED CONDITIONS MODEL WITH 2013 FHAD HYDROLOGY

PROPOSED 100-YR FLOODPLAIN PER REVISED PROPOSED CONDITIONS MODEL WITH 2020 WATERSHED HYDROLOGY

PROPERTY LINE (TYP)

LOW FLOW (LF) REACH

MAIN REACH

FLOOD WALL

TRAIL (TR) REACH

PR GRADING BY OTHERS

PR 72" RCP & JUNCTION STRUCTURE BY OTHERS

12" GRATE IN JUNCTION STRUCTURE 12" HDPE

PR 72" RCP

PR 12'X8' CONCRETE BOX CULVERT

EX 10' BNSF STONE ARCHWAY

HEADWALL FOR EX 10' BNSF STONE ARCHWAY

12" LANDSCAPE DRAIN

PR PEDESTRIAN TRAIL BY OTHERS

END OF STUDY

PR PEDESTRIAN TRAIL

PR DETENTION

EX PRAIRIE HAWK DR (ROW VARIES)

EXISTING BNSF RAILROAD

FF=6253.58

FF=6243.00

LF-449.30 LF-395.23 LF-399.84 LF-420.81 LF-258.43 LF-248.43 LF-134.20 LF-84.70 LF-32.40 LF-0.00 LF-146.73

TR-412.24 TR-386.77 TR-386.90 TR-443.00 TR-266.84 TR-257.31 TR-237.07 TR-246.94 TR-148.30 TR-126.23 TR-139.23 TR-104.53 TR-83.73

LEGEND

- EXISTING/BASE CONTOURS
- PROPOSED CONTOURS
- CHANNEL CENTERLINE
- FLOW DIRECTION
- PROPERTY LINE
- CROSS SECTION — XXX.XX
- LOW FLOW CROSS SECTION — LF – XXX.XX
- TRAIL CROSS SECTION — TR – XXX.XX
- 100-YEAR FLOODPLAIN
  - (EXISTING BY OLSSON)
  - (EXISTING PER REVISED MODEL WITH 2020 HYDROLOGY)
  - (EXISTING PER REVISED MODEL WITH 2013 FHAD HYDROLOGY)
  - (PROPOSED PER REVISED MODEL WITH 2020 HYDROLOGY)
  - (PROPOSED PER REVISED MODE WITH 2013 FHAD HYDROLOGY)
- PROPOSED STORM

Know what's below. Call before you dig.

50 0 50 100
SCALE: 1" = 50'

DESIGNED BY: AMC
CHECKED BY: MAW
DRAWN BY: AMC

ISSUE DATE: 06-12-2024

DATE	REVISION COMMENTS

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

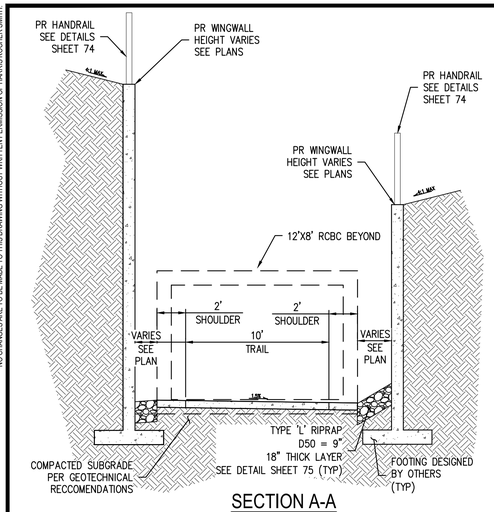
CONFLUENCE COMPANIES, LLC

THE BRICKYARD
PROPOSED CHANNEL CONDITIONS

PROJECT #: 200726
SHEET NUMBER
2
2 OF 2

FILEPATH: P:\2020\200726\ENGINEERING\DRAINAGE\PR CONDITIONS HEC-RAS.DWG, LAYOUT: LAYOUT1
13 XREFs: e-base, e-base-brbt-hyot-nilson, e-legal, e-util, p-base, p-base-brbt-hyot-nilson[U], p-base-ph1, p-base-ph2, p-base-ph3, p-base-ph4, p-legal, p-roadway, p-util
PLOTTED: WED 07/09/25 10:50:34A BY: AMANDA CASTEEL

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.

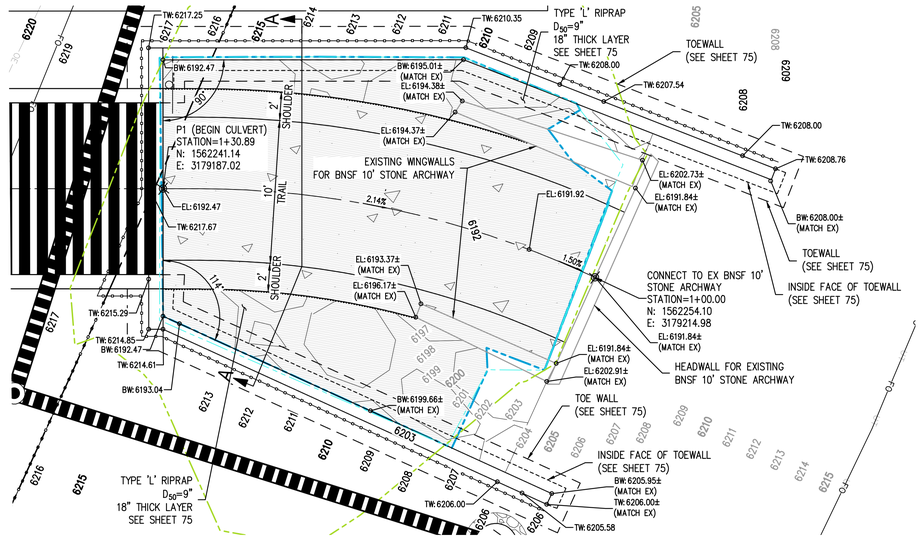


SECTION A-A
NTS

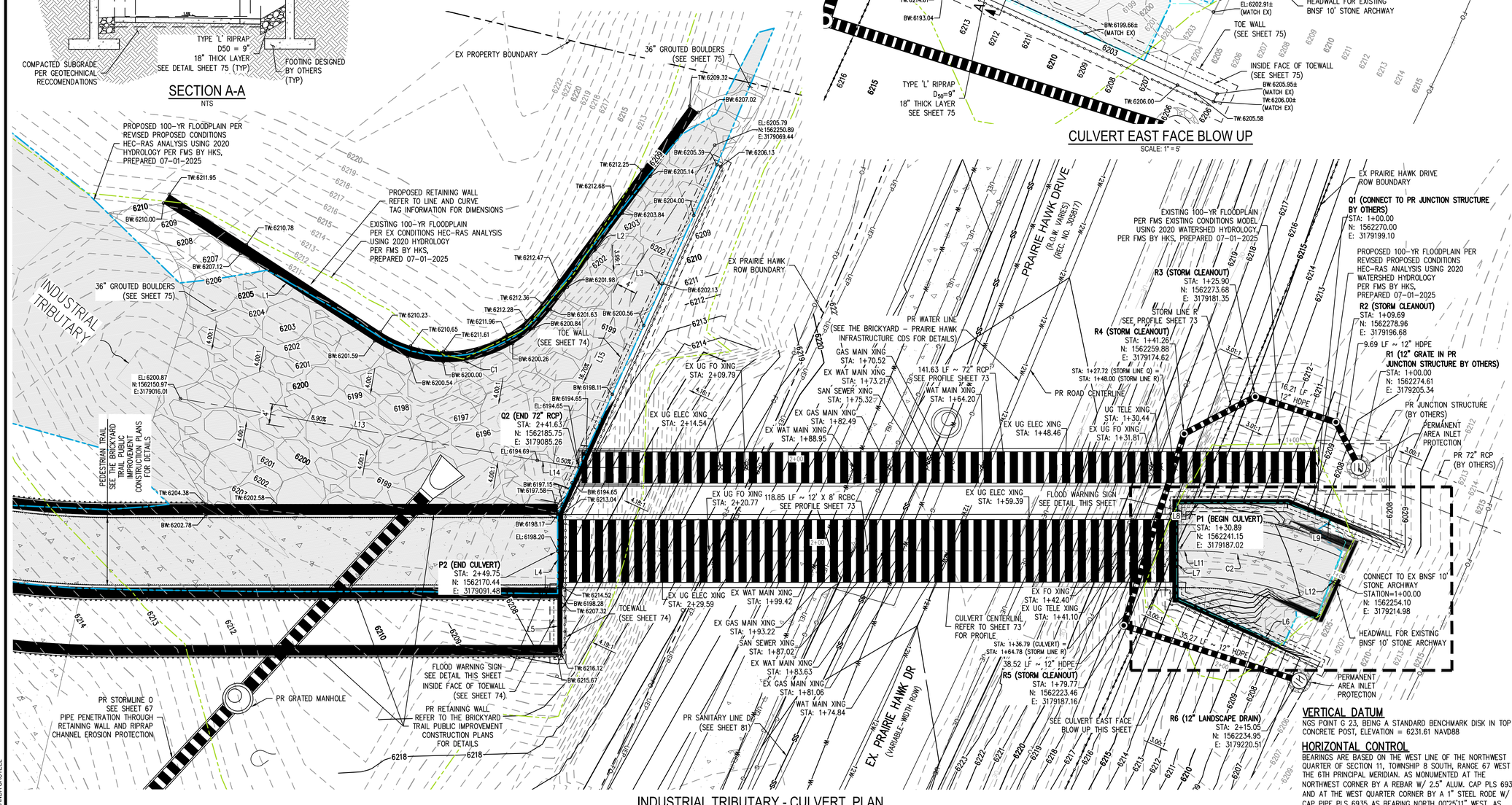
CAUTION

DO NOT
ENTER
WHEN
FLOODED

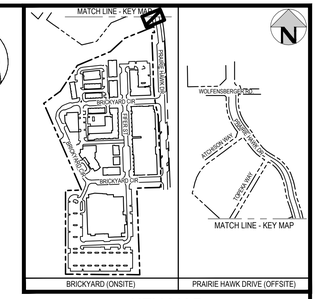
FLOOD HAZARD WARNING SIGN
NTS



CULVERT EAST FACE BLOW UP
SCALE: 1" = 5'



INDUSTRIAL TRIBUTARY - CULVERT PLAN
SCALE: 1" = 10'



KEY MAP

LINE TABLE		
LINE #	LENGTH	DIRECTION
L1	48.28'	N86° 37' 03.75"E
L2	47.21'	N0° 19' 13.94"E
L3	73.64'	S11° 59' 53.64"E
L4	14.00'	S36° 30' 08.49"E
L5	13.00'	S36° 30' 14.76"E
L6	29.85'	S78° 03' 57.44"W
L7	17.91'	N36° 30' 11.51"W
L8	21.01'	N53° 29' 48.49"E
L9	23.08'	N74° 51' 25.33"E
L11	2.43'	N53° 29' 48.49"E
L12	1.07'	N77° 49' 41.44"E
L13	69.39'	N63° 20' 23.16"E
L14	8.10'	N63° 20' 23.16"E
L15	35.68'	S11° 59' 53.65"E

CURVE TABLE			
CURVE #	LENGTH	RADIUS	DELTA
C1	37.65'	25.00'	86.30°
C2	27.60'	65.00'	24.33°

NOTES:
1. THE CONTRACTOR SHALL NOTIFY COLORADO 811 PRIOR TO EXCAVATION, IN ACCORDANCE WITH COLORADO STATE STATUTES.
2. THE LOCATION OF EXISTING UNDERGROUND UTILITIES IS APPROXIMATE AND SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE, AS SUPPLIED BY THE UTILITY OWNERS. PRIOR TO EXCAVATION, THE CONTRACTOR SHALL VERIFY EXISTENCE, SIZE, AND LOCATION OF EXISTING UTILITIES AND IMMEDIATELY NOTIFY HARRIS KOCHER SMITH OF ANY DISCREPANCIES. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING UNDERGROUND FACILITIES.
3. REFER TO CULVERT & STORM SEWER PROFILE ON SHEET 73 FOR PROFILE DETAILS.
4. REFER TO CDOT DETAILS ON SHEET 75 FOR BOX CULVERT AND WINGWALL CONSTRUCTION DETAILS.
5. CONCRETE MATERIAL PROPERTIES INDICATED IN STANDARD CDOT DETAILS ON SHEET 75.
6. GROUTED BOULDER APRONS TO MATCH PROPOSED GRADE ELEVATION AND SLOPE.
7. ALL GROUTED BOULDERS SHALL CONFORM TO MILE HIGH FLOOD DISTRICT SPECIFICATIONS.
8. BOULDER PLACEMENT SHALL BE VERIFIED BY TOWN AND OWNER REPRESENTATIVE PRIOR TO POURING GROUT.
9. TOP OF STRUCTURE ELEVATIONS ARE 6" ABOVE FINISHED GRADE.
10. HEADWALL AND WALL DIMENSIONS ARE MEASURED ALONG BOTTOM FACE OF WALL.
11. CONTRACTOR SHALL SUBMIT HANDRAIL SHOP DRAWINGS FOR REVIEW.
12. CONTRACTOR TO PROVIDE BOARD FORM FINISH.
13. STRUCTURAL DESIGN OF WINGWALLS, BOX CULVERT, AND TOE WALLS SHALL BE DESIGNED PER CDOT DETAILS ON SHEET 75. CONTRACTOR TO PROVIDE SHOP DRAWINGS PREPARED AND STAMPED BY A STRUCTRUAL ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
14. PROPOSED TRAIL TO CONNECT TO PROPOSED INDUSTRIAL TRIBUTARY TRAIL IMPROVEMENTS BEING DESIGNED BY TOCR PARKS DEPARTMENT AT EXISTING BNSF 10' STONE ARCHWAY.
15. REFER TO THE APPROVED FLOODPLAIN MODIFICATION STUDY (FMS) FOR HYDRAULIC AND CONVEYANCE DETAILS.

VERTICAL DATUM
NGS POINT G 23, BEING A STANDARD BENCHMARK DISK IN TOP OF CONCRETE POST, ELEVATION = 6231.61 NAVD88

HORIZONTAL CONTROL
BEARINGS ARE BASED ON THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH PRINCIPAL MERIDIAN. AS MONUMENTED AT THE NORTHWEST CORNER BY A REBAR W/ 2.5" ALUM. CAP PLS 6935 AND AT THE WEST QUARTER CORNER BY A 1" STEEL RODE W/ 2" CAP PIPE PLS 6935 AS BEARING NORTH 00°25'11" WEST, AS SHOWN ON THE PLAT OF CITADEL STATION FILING NO. 6.

TOWN OF CASTLE ROCK APPROVAL

PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

Approved By:

Development Services Date

Know what's below. Call before you dig.

10 0 10 20
SCALE: 1" = 10'

DESIGNED BY: AMC
CHECKED BY: MAW
DRAWN BY: AMC

ISSUE DATE: 08-07-2024

DATE	REVISION COMMENTS
10-22-2024	PRICING SET
12-06-2024	PER TOWN COMMENTS
03-21-2025	PER TOWN COMMENTS

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
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CONFLUENCE COMPANIES, LLC

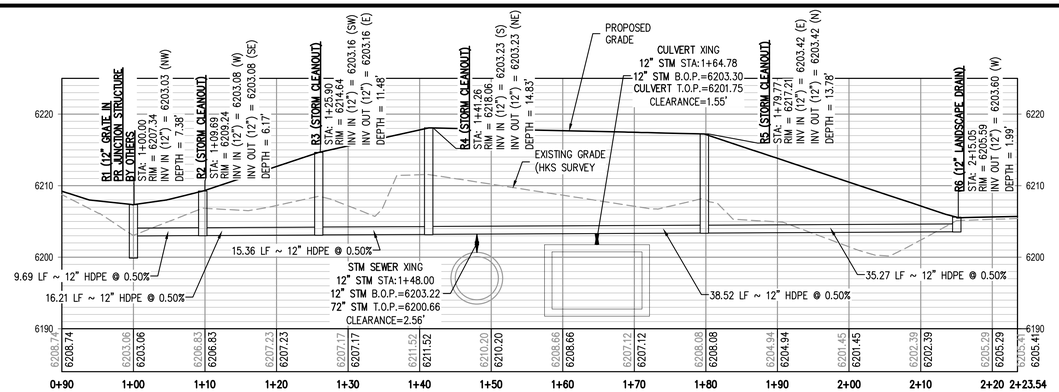
THE BRICKYARD - INFRASTRUCTURE (PHASE IA)
INDUSTRIAL TRIBUTARY CULVERT PLAN

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 200726
SHEET NUMBER
72
72 OF 206

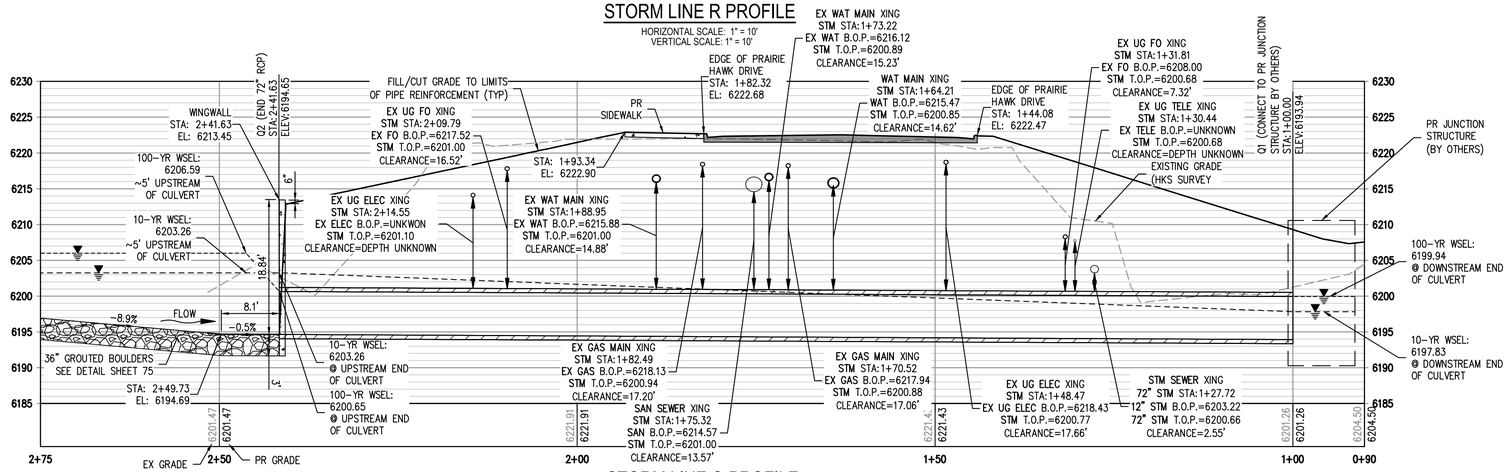
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PLOTTED: WED 07/09/25 2:14:01P BY: AMANDA CASTEEL

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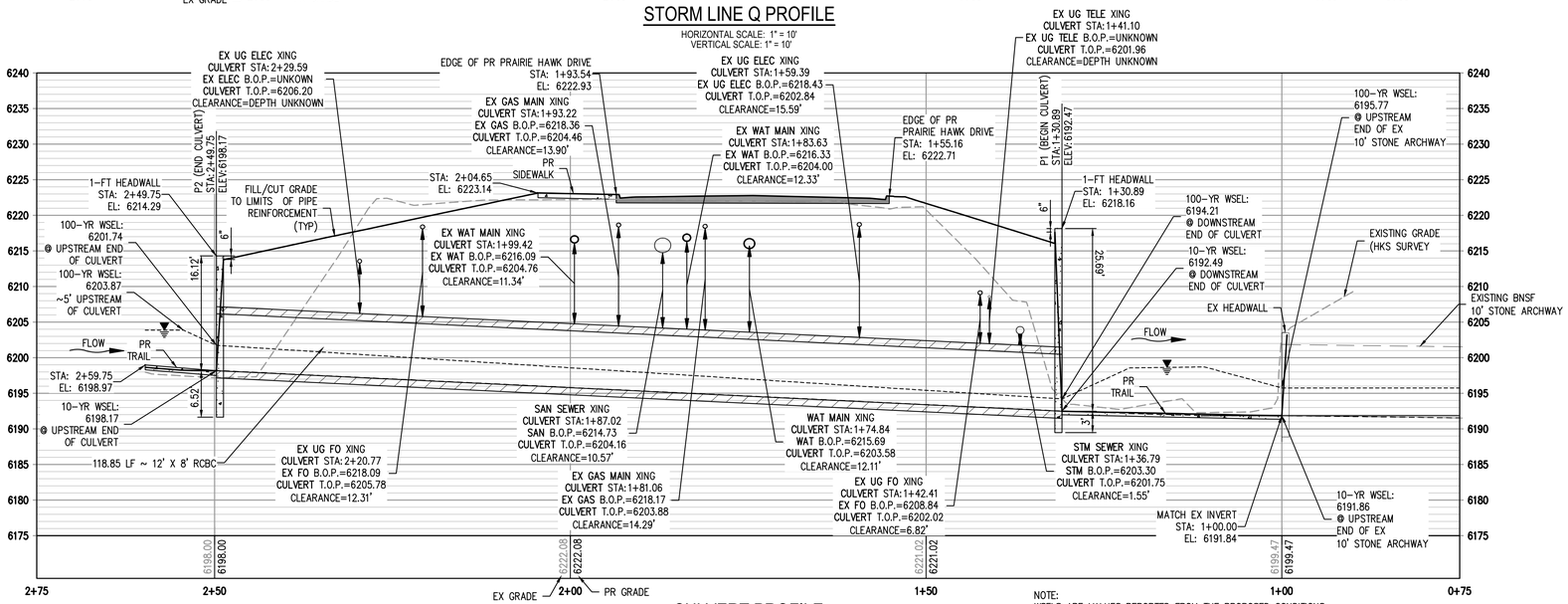
STORM LINE R PROFILE

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



STORM LINE Q PROFILE

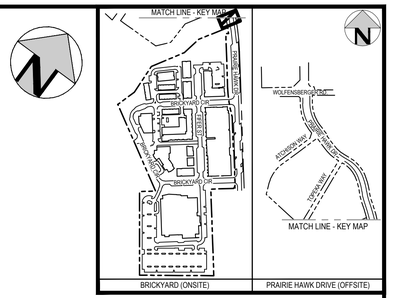
HORIZONTAL SCALE: 1" = 10'
VERTICAL SCALE: 1" = 10'



CULVERT PROFILE

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

NOTE:
WSELS ARE VALUES REPORTED FROM THE PROPOSED CONDITIONS FMS HEC-RAS MODEL.
10-YEAR MODEL FLOWS ARE 0.00 CFS AND DO NOT ENTER THE PEDESTRIAN CULVERT & EX BNSF STONE ARCHWAY.



KEY MAP

NOTES:

1. THE CONTRACTOR SHALL NOTIFY COLORADO 811 PRIOR TO EXCAVATION, IN ACCORDANCE WITH COLORADO STATE STATUTES.
2. THE LOCATION OF EXISTING UNDERGROUND UTILITIES IS APPROXIMATE AND SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE, AS SUPPLIED BY THE UTILITY OWNERS. PRIOR TO EXCAVATION, THE CONTRACTOR SHALL VERIFY EXISTENCE, SIZE, AND LOCATION OF EXISTING UTILITIES AND IMMEDIATELY NOTIFY HARRIS KOCHER SMITH OF ANY DISCREPANCIES. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING UNDERGROUND FACILITIES.
3. REFER TO CULVERT & STORM SEWER PROFILE ON SHEET 73 FOR PROFILE DETAILS.
4. REFER TO CDOT DETAILS ON SHEET 75 FOR BOX CULVERT AND WINGWALL CONSTRUCTION DETAILS.
5. CONCRETE MATERIAL PROPERTIES INDICATED IN STANDARD CDOT DETAILS ON SHEET 75.
6. GROUTED BOULDER APRONS TO MATCH PROPOSED GRADE ELEVATION AND SLOPE.
7. ALL GROUTED BOULDERS SHALL CONFORM TO MILE HIGH FLOOD DISTRICT SPECIFICATIONS.
8. BOULDER PLACEMENT SHALL BE VERIFIED BY TOWN AND OWNER REPRESENTATIVE PRIOR TO POURING GROUT.
9. TOP OF STRUCTURE ELEVATIONS ARE 6" ABOVE FINISHED GRADE.
10. HEADWALL AND WALL DIMENSIONS ARE MEASURED ALONG BOTTOM FACE OF WALL.
11. CONTRACTOR SHALL SUBMIT HANDRAIL SHOP DRAWINGS FOR REVIEW.
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14. PROPOSED TRAIL TO CONNECT TO PROPOSED INDUSTRIAL TRIBUTARY TRAIL IMPROVEMENTS BEING DESIGNED BY TOCR PARKS DEPARTMENT AT EXISTING BNSF 10' STONE ARCHWAY.
15. REFER TO THE APPROVED FLOODPLAIN MODIFICATION STUDY (FMS) FOR HYDRAULIC AND CONVEYANCE DETAILS.

VERTICAL DATUM

NGS POINT G 23, BEING A STANDARD BENCHMARK DISK IN TOP OF CONCRETE POST, ELEVATION = 6231.61 NAVD88

HORIZONTAL CONTROL

BEARINGS ARE BASED ON THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH PRINCIPAL MERIDIAN. AS MONUMENTED AT THE NORTHWEST CORNER BY A REBAR W/ 2.5" ALUM. CAP PLS 6935 AND AT THE WEST QUARTER CORNER BY A 1" STEEL RODE W/ 2" CAP PIPE PLS 6935 AS BEARING NORTH 00°25'11" WEST, AS SHOWN ON THE PLAT OF CITADEL STATION FILING NO. 6.

TOWN OF CASTLE ROCK APPROVAL
PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

Approved By:

Development Services Date

Know what's below. Call before you dig.

SCALE: 1" = 10'

DESIGNED BY: AMC
CHECKED BY: MAW
DRAWN BY: AMC

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THE BRICKYARD - INFRASTRUCTURE (PHASE IA)
INDUSTRIAL TRIBUTARY CULVERT PROFILE

PRELIMINARY NOT FOR CONSTRUCTION

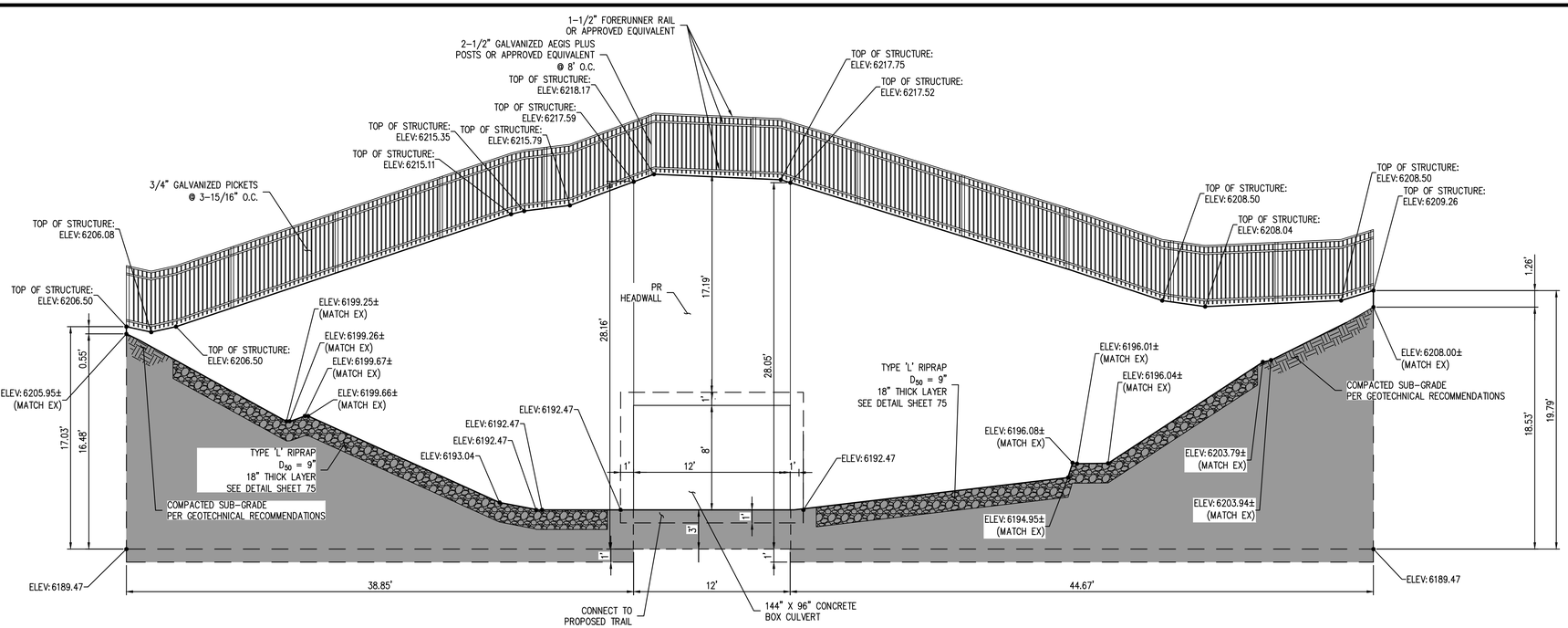
PROJECT #: 200726
SHEET NUMBER
73
73 OF 206

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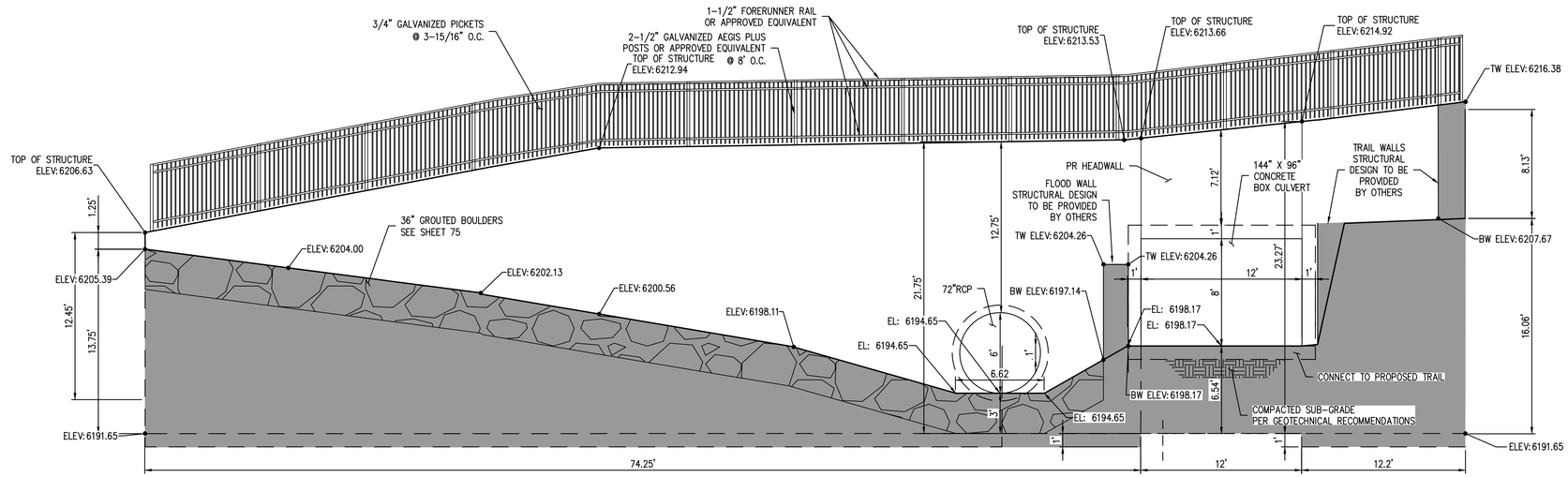
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CULVERT EAST FACE

SCALE = 1" = 5'



CULVERT WEST FACE

SCALE = 1" = 5'

VERTICAL DATUM

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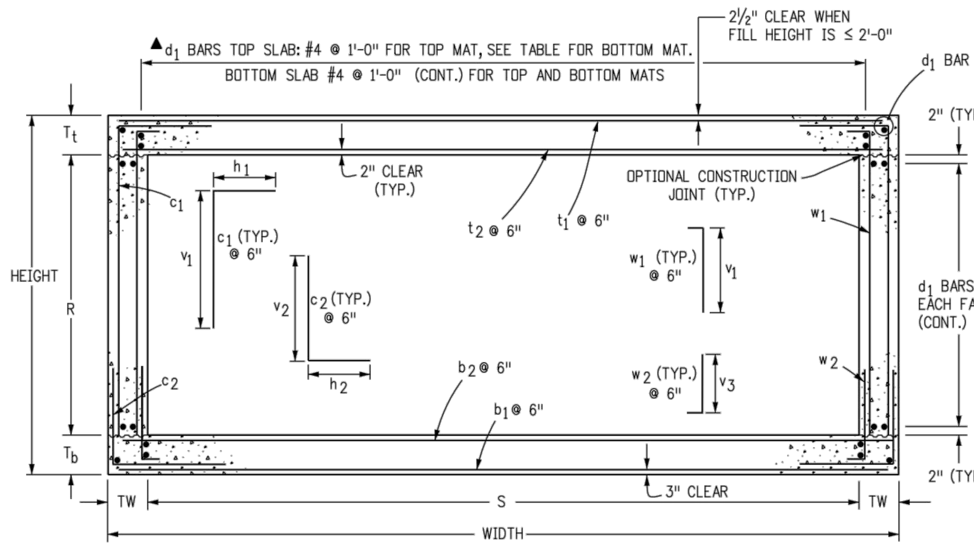
THE BRICKYARD - INFRASTRUCTURE (PHASE IA)
INDUSTRIAL TRIBUTARY CULVERT SECTION VIEWS

PRELIMINARY NOT FOR CONSTRUCTION

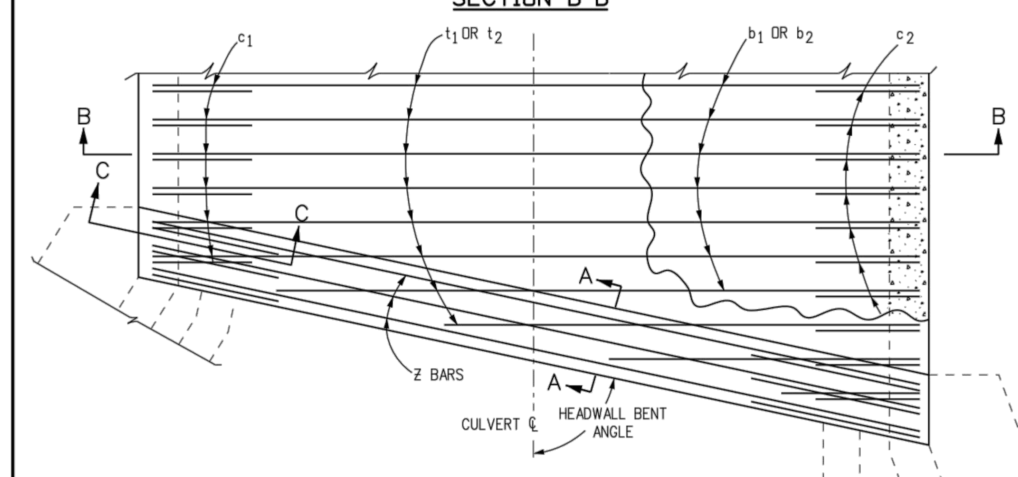
PROJECT #: 200726
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74 OF 206

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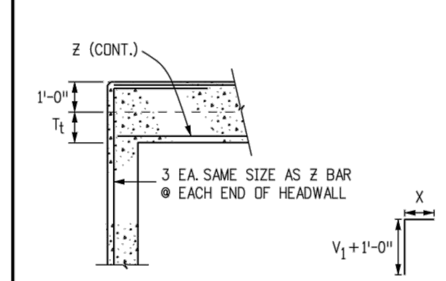


SECTION B-B



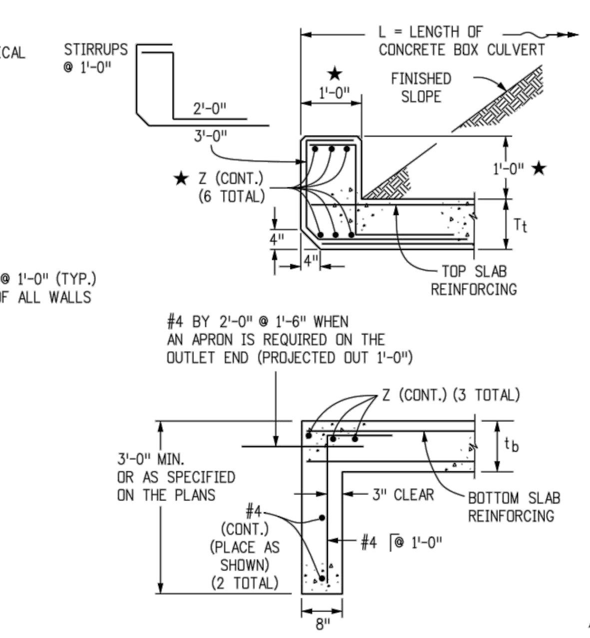
REINFORCING PLAN

BAR SIZE (#)	EPOXY X (FT.-IN.)	BLACK X (FT.-IN.)
4	2-4	1-11
5	2-10	2-4
6	3-5	2-10
7	4-1	3-3
8	5-3	4-3
9	6-8	5-5

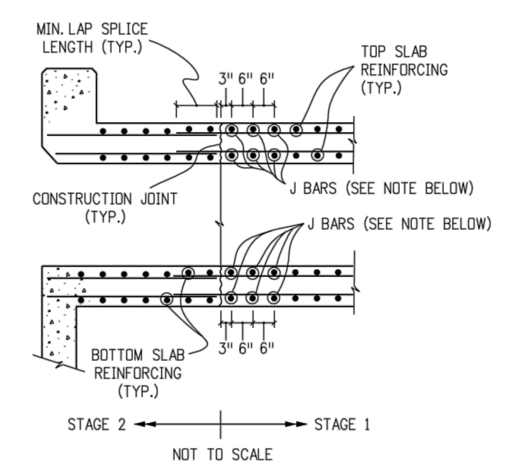


SECTION C-C

HEADWALL CORNER REINFORCING DETAIL



SECTION A-A



CONSTRUCTION JOINT DETAIL FOR STAGED CONSTRUCTION

NOTE: THIS DETAIL IS FOR CONSTRUCTION JOINTS INSTALLED PERPENDICULAR TO THE ℄ OF THE BOX ONLY. THE CONTRACTOR CAN DESIGN AND INSTALL J BARS AT HIS EXPENSE TO SUPPORT TEMPORARY LIVE LOADS DURING STAGE 1 CONSTRUCTION. J BARS SHALL BE THE SAME SIZE AS THE TOP AND BOTTOM SLAB REINFORCING WHEN THERE ARE NO TEMPORARY LIVE LOADS TO SUPPORT.

GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS D (BOX CULVERT).
2. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS PLACED.
3. ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE CONSTRUCTED ONLY IF APPROVED BY THE ENGINEER.
4. THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
5. STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH STANDARD PLAN M-206-1.
6. ANY CULVERT SPAN 20 FT. OR GREATER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED.
7. BACKFILL SHALL NOT BEGIN UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH, f'c.
8. SPLICE QUANTITIES FOR LONGITUDINAL AND TRANSVERSE BARS ARE NOT INCLUDED.
9. REINFORCING STEEL SHALL BE GRADE 60.
10. THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	3'-11"	4'-10"

THE ABOVE SPLICE LENGTHS ARE FOR CLASS B SPLICES.

11. ALL DIMENSIONS ARE PERPENDICULAR TO THE CENTERLINE OF THE BOX.
12. WINGWALLS SHALL BE TIED TO CONCRETE BOX CULVERT IN ACCORDANCE WITH STANDARD PLAN M-601-20.
13. ALL TRANSVERSE REINFORCING SHALL BE NORMAL TO THE CENTERLINE OF THE BOX.
14. THE FILL HEIGHT IS THE DISTANCE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF PAVEMENT.
15. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
16. FOR FILL HEIGHTS LESS THAN 2 FT. A WATERPROOFING MEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE TOP SLAB AND 18 INCHES DOWN FROM THE TOP OF THE EXTERIOR WALLS.
17. ▲ FOR FILL HEIGHTS LESS THAN 2 FT, THE d_1 BARS FOR THE BOTTOM MAT OF THE TOP SLAB SHALL BE AS FOLLOWS:

S	6	8	10	12, 14, 16, 18, 20
BAR SIZE:	#5	#6	#6	#5
SPACING	1'-0"	1'-0"	0'-6"	0'-6"

DESIGN DATA: 7TH EDITION, 2014, OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

RATING DATA: 2ND EDITION, 2011, OF THE AASHTO MANUAL FOR BRIDGE EVALUATION
f_y = 60,000 psi.,
f'_c = 4,500 psi.,

LOADING DATA:

LIVE LOAD = AASHTO LRFD, HL-93 TRUCK, HL-93 TANDEM, COLORADO PERMIT TRUCK, AND NRL

DEAD LOAD CASE 1: VERTICAL EARTH LOAD = 120 LBS./CU. FT.
HORIZONTAL EARTH LOAD = 30 LBS./CU.FT.

DEAD LOAD CASE 2: VERTICAL EARTH LOAD = 120 LBS./CU. FT.
HORIZONTAL EARTH LOAD = 60 LBS./CU. FT.

THRUST IS NOT CONSIDERED IN THIS STANDARD, I.E. THRUST = 0.

WEARING SURFACE - 12 INCHES THICK CONCRETE PAVEMENT.
DEAD LOAD - TYPE 7 BARRIER.
EXTREME HEADWATER TO DEPTH RATIO IS IN ACCORDANCE WITH THE CDOT DRAINAGE MANUAL.
EXTREME HEADWATER TO DEPTH RATIO WAS INCLUDED IN THE DESIGN BUT EXCLUDED FROM THE RATINGS AS PER THE AASHTO MANUAL FOR BRIDGE EVALUATION.
LIVE LOAD SURCHARGE ON EXTERIOR WALLS = 2 FT. OF EARTH

★ IF HEADWALL MOUNT GUARDRAIL IS USED (SEE STANDARD PLAN M-606-1, SHEET 19, AND THE INFORMATION BELOW):
- ALL REINFORCING STEEL SHALL BE ACCORDING TO THIS BOX CULVERT PLAN.
- ANY SPECIAL DESIGN FOR STIRRUPS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- HEADWALL DIMENSION AND CONCRETE QUANTITY SHALL BE ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
- POST ANCHORS SHALL BE PROVIDED ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
- POST ANCHORS AND CONCRETE FOR HEADWALL MOUNT OF GUARDRAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- POST ANCHORS WHEN REQUIRED AND ENCASED IN HEADWALL CONCRETE, SHALL CONFORM TO ASTM A 36 OR AASHTO M 169 STEEL.

18. SEE M-603-3 FOR PRECAST CONCRETE BOX CULVERT DETAILS.

Computer File Information		Sheet Revisions	
Creation Date: 07/31/19		Date:	Comments
Designer Initials: JBE	(R-X)		
Last Modification Date: 07/31/19	(R-X)		
Detailer Initials: LTA	(R-X)		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)		

Colorado Department of Transportation
2829 West Howard Place
CDOT HQ, 3rd Floor
Denver, CO 80204
Phone: 303-757-9021 FAX: 303-757-9868
Project Development Branch JBK

SINGLE CONCRETE BOX CULVERT (CAST-IN-PLACE)

Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
M-601-1
Standard Sheet No. 1 of 2
Project Sheet Number:

SINGLE CONCRETE BOX CULVERT DIMENSIONS, QUANTITIES & RATING FACTORS (EXCLUDING HEADWALL & TOEWALL QUANTITIES)

BOX SIZE S (FT)	R (FT)	HT. (FT-IN)	WIDTH (FT-IN)	FILL HEIGHT ALLOWED (FT-FT)	SLAB & WALL THICKNESS (INHES) Tt	Tb	TW	BAR SIZES t1* & b1 (#)	t2 (#)	b2 (#)	w1* & w2 (#)	c1* (#)	c2 (#)	d1▲ NO.	DIMENSIONS h1 (FT-IN)	h2 (FT-IN)	v1 (FT-IN)	v2 (FT-IN)	v3 (FT-IN)	QUANTITIES CONCRETE CY/LF	REBAR STL LBS/LF	WATERPROOFING SY/LF	RATING FACTORS HL-93 INVENTORY	HL-93 OPERATING	COLORADO PERMIT	NRL VEHICLE
6	7	8-8	7-8	< 2	10	10	10	4	6	6	4	5	5	64	3-5	4-4	7-7	3-1	1-11	0.905	215	1.185	1.23	1.59	2.03	2.09
		8-4.5	7-8	2 TO 8	8.5	8	10	4	5	5	4	5	5	64	3-10	4-4	7-6	2-11	1-9	0.823	199		1.67	2.17	2.51	2.58
		8-5	7-8	8 TO 15	8.5	8.5	10	4	5	5	4	5	5	64	3-8	2-4	7-6	3-0	1-9	0.834	190		◆	◆	◆	◆
		8-5	7-8	15 TO 20	8.5	8.5	10	4	5	5	4	5	5	64	3-8	2-4	7-6	3-0	1-9	0.834	190		◆	◆	◆	◆
8	6	7-9	9-8	< 2	11	10	10	4	7	7	4	5	5	68	4-9	2-4	6-8	3-1	1-11	0.997	251	1.407	1.10	1.43	1.65	1.63
		7-6	9-8	2 TO 8	8.5	9.5	10	4	6	6	4	5	5	66	4-8	2-4	6-6	3-1	1-10	0.907	220		1.59	2.07	2.39	2.46
		7-6	9-8	8 TO 15	8.5	9.5	10	4	6	6	4	5	5	66	3-7	2-4	6-6	3-1	1-10	0.907	216		◆	◆	◆	◆
		7-6	9-8	15 TO 20	8.5	9.5	10	4	6	6	4	5	5	66	3-7	2-4	6-6	3-1	1-10	0.907	216		◆	◆	◆	◆
	8	9-9.5	9-8	< 2	11.5	10	10	4	7	7	4	5	5	76	5-8	5-4	8-9	3-1	1-11	1.135	287	1.407	1.07	1.38	1.60	1.58
		9-7	9-8	2 TO 8	9	10	10	4	6	6	4	5	5	74	4-8	2-4	8-7	3-1	1-11	1.061	240		1.61	2.09	2.54	2.57
		9-7	9-8	8 TO 15	9	10	10	4	6	6	4	5	5	74	3-7	2-4	8-7	3-1	1-11	1.061	235		◆	◆	◆	◆
		9-7	9-8	15 TO 20	9	10	10	4	6	6	4	5	5	74	3-7	2-4	8-7	3-1	1-11	1.061	235		◆	◆	◆	◆
	10	11-10	9-8	< 2	11.5	10.5	10	4	7	7	4	5	5	84	3-5	2-4	10-9	3-2	2-0	1.274	285	1.407	1.12	1.46	1.69	1.66
		11-7	9-8	2 TO 8	9	10	10	4	6	6	4	5	5	82	5-6	2-4	10-7	3-1	1-11	1.184	262		1.61	2.09	2.52	2.56
		11-7	9-8	8 TO 15	9	10	10	4	6	6	4	5	5	82	4-6	2-4	10-7	3-1	1-11	1.184	258		◆	◆	◆	◆
		11-9	9-11	15 TO 20	10	11	11.5	4	6	6	4	6	6	85	4-7	2-5	10-8	3-1	1-11	1.353	302		◆	◆	◆	◆
10	6	7-11.5	11-8	< 2	12.5	11	10	4	8	8	4	5	5	87	5-8	2-7	6-10	3-2	2-0	1.217	321	1.630	1.05	1.36	1.49	1.48
		7-7	11-8	2 TO 10	9	10	10	4	6	6	4	5	5	72	5-5	2-7	6-7	3-1	1-11	1.055	246		1.25	1.62	1.88	1.84
		7-8	11-8	10 TO 15	10	10	10	4	6	6	4	5	5	72	4-2	2-7	6-8	3-1	1-11	1.091	242		◆	◆	◆	◆
		8-1	11-10	15 TO 20	13	12	11	4	6	6	4	5	5	75	4-7	2-9	6-11	3-3	2-1	1.320	251		◆	◆	◆	◆
	8	9-11.5	11-8	< 2	12.5	11	10	4	9	9	4	5	5	95	5-8	2-7	8-10	3-2	2-0	1.340	383	1.630	1.02	1.32	1.44	1.43
		9-7.5	11-8	2 TO 10	9.5	10	10	4	6	6	4	5	5	80	5-5	2-7	8-7	3-1	1-11	1.196	265		1.21	1.57	1.82	1.78
		9-8	11-8	10 TO 15	10	10	10	4	6	6	4	5	5	80	4-3	2-7	8-8	3-1	1-11	1.214	261		◆	◆	◆	◆
		10-0	12-0	15 TO 20	12	12	12	4	6	6	4	5	5	83	4-7	2-10	8-10	3-3	2-1	1.481	271		◆	◆	◆	◆
	10	12-0	11-8	< 2	12.5	11.5	10	4	9	9	4	5	5	103	6-7	6-5	10-10	3-3	2-1	1.481	423	1.630	1.07	1.39	1.51	1.50
		11-7.5	11-8	2 TO 10	9.5	10	10	4	6	6	4	5	5	88	5-5	2-7	10-7	3-1	1-11	1.319	285		1.16	1.51	1.74	1.71
		11-9	11-10	10 TO 15	10	11	11	4	6	6	4	5	5	91	4-4	2-8	10-8	3-2	1-11	1.446	285		◆	◆	◆	◆
		12-0.5	12-0	15 TO 20	12	12.5	12	4	6	6	5	5	5	91	4-7	2-10	10-10	3-4	2-6	1.648	315		◆	◆	◆	◆
12	6	8-1.5	13-8	< 2	13.5	12	10	4	9	9	4	6	6	97	5-5	3-0	6-11	3-7	2-1	1.446	433	1.852	1.03	1.33	1.42	1.39
		7-7.5	13-8	2 TO 8	9.5	10	10	4	7	7	4	6	6	78	6-4	3-0	6-7	3-5	1-11	1.193	339		1.27	1.65	1.89	1.84
		7-9	13-8	8 TO 12	9.5	11.5	10	4	7	7	4	6	6	78	5-1	3-0	6-7	3-7	2-0	1.256	333		2.28	2.95	3.25	3.54
		8-0.5	13-10	12 TO 16	12	12.5	11	4	7	7	4	6	6	81	5-0	3-1	6-10	3-7	2-0	1.453	339		◆	◆	◆	◆
		8-0.5	14-0	16 TO 20	12	12.5	12	5	7	7	5	6	6	81	5-2	3-2	6-10	3-8	2-6	1.503	361		◆	◆	◆	◆
	8	10-1.5	13-8	< 2	13.5	12	10	4	9	9	4	6	6	105	6-6	3-0	8-11	3-7	2-1	1.569	462	1.852	1.00	1.29	1.37	1.35
		9-8	13-8	2 TO 8	9.5	10.5	10	4	7	7	4	6	6	86	5-1	3-0	8-7	3-6	1-11	1.337	355		1.21	1.57	1.77	1.73
		9-9.5	13-8	8 TO 12	10	11.5	10	4	7	7	4	6	6	86	5-5	3-0	8-8	3-7	2-0	1.401	358		2.32	3.01	3.31	3.60
		9-9.5	13-10	12 TO 16	10	11.5	11	4	7	7	4	6	6	89	5-0	3-1	8-8	3-7	2-0	1.461	360		◆	◆	◆	◆
		10-0.5	14-0	16 TO 20	12	12.5	12	5	7	7	4	6	6	89	5-1	3-1	8-10	3-7	2-1	1.651	385		◆	◆	◆	◆
	10	12-2	13-8	< 2	13.5	12.5	10	4	9	9	4	6	6	113	7-10	6-3	10-11	3-8	2-2	1.714	513	1.852	1.04	1.35	1.43	1.41
		11-8	13-8	2 TO 8	9.5	10.5	10	4	7	7	4	6	6	94	6-4	3-0	10-7	3-6	1-11	1.461	385		1.15	1.50	1.69	1.65
		11-9.5	13-8	8 TO 12	10	11.5	10	4	7	7	4	6	6	94	5-1	3-0	10-8	3-7	2-0	1.524	379		2.08	2.70	2.97	3.16
		11-9.5	13-10	12 TO 16	10	11.5	11	5	7	7	4	7	7	97	5-1	3-2	10-8	4-0	2-0	1.597	456		◆	◆	◆	◆
		12-1	14-0	16 TO 20	12.5	12.5	12	5	7	7	4	7	7	97	5-2	3-3	10-10	4-0	2-1	1.821	462		◆	◆	◆	◆
14	6	8-3.5	15-8	< 2	14	13.5	10	4	9	9	4	6	6	107	5-10	3-5	6-11	3-9	2-0	1.700	479	2.074	1.10	1.43	1.48	1.41
		7-8	15-8	2 TO 6	9.5	10.5	10	4	8	8	4	7	7	84	7-3	3-5	6-7	3-11	1-11	1.337	460		1.13	1.47	1.65	1.59
		7-8.5	15-8	6 TO 8	9.5	11	10	4	8	8	4	7	7	84	5-9	3-5	6-7	3-11	2-0	1.362	448		1.67	2.16	2.50	3.01
		7-10.5	15-8	8 TO 10	10.5	12	10	4	8	8	4	7	7	84	5-9	3-5	6-8	4-0	2-1	1.458	450		2.66	3.45	3.89	4.43
		7-11.5	15-8	10 TO 12	11	12.5	10	4	8	8	4	7	7	84	5-9	3-5	6-9	4-1	2-1	1.507	452		2.65	3.44	3.79	4.11
		8-1.5	15-8	12 TO 14	12	13.5	10	4	8	8	4	7	7	84	5-9	3-5	6-10	4-2	2-2	1.603	453		3.13	4.05	4.38	4.89
		8-1.5	15-10	14 TO 18	12	13.5	11	5	8	8	5	7	7	87	5-9	3-6	6-10	4-2	2-7	1.654	500		◆	◆	◆	◆
	8	10-4	15-8	< 2	14	14	10	4	9	9	4	6	6	115	5-10	3-6	8-11	3-9	2-0	1.848	502	2.074	1.12	1.46	1.60	1.52
		9-8	15-8	2 TO 6	9.5	10.5	10	4	8	8	4	7	7	92	7-3	3-5	8-7	3-11	1-11	1.461	487		1.16	1.51	1.69	1.63
		9-9	15-8	6 TO 8	9.5	11.5	10	4	8	8	4	7	7	92	5-9	3-5	8-7	4-0	2-0	1.509	476		1.70	2.21	2.56	3.08
		9-10.5	15-8	8 TO 10	10.5	12	10	4	8	8	4	7	7	92	5-9	3-5	8-8	4-0	2-1	1.582	477		2.78	3.61	4.08	4.64
		9-11.5	15-8	10 TO 12	11	12.5	10	4	8	8	4	7	7	92	5-9	3-5	8-9	4-1	2-1	1.630	479		2.62	3.40	3.74	4.07
		10-1.5	15-8	12 TO 14	12	13.5	10	4	8	8	4	7	7	92	5-9	3-5	8-10	4-2	2-2	1.727	480		2.51	3.25	3.51	3.92
		10-1.5	15-10	14 TO 18	12	13.5	11	5	8	8	5	7	7	95	5-9	3-6	8-10	4-2	2-7	1.789	530		◆	◆	◆	◆
	10	12-4	15-8	< 2	14	14	10	4	9	9	5	6	6	123	7-4	3-6	10-11	3-9	2-3	1.971	558	2.074	1.10	1.42	1.50	1.42
		11-8.5	15-8	2 TO 6	9.5	11	10	4	8	8	5	7	7	100	7-3	3-5	10-7	3-11	2-5	1.609	538		1.17	1.51	1.67	1.63
		11-9	15-8	6 TO 8	9.5	11.5	10	4	8	8	5	7	7	100	5-9	3-5	10-7	4-0	2-3	1.633	526		1.64	2.13	2.47	2.97
		11-10.5	15-8	8 TO 10	10.5	12	10	4	8	8	5	7	7	100	5-9	3-5	10-8	4-0	2-5	1.705	528		2.53	3.28	3.71	2.77
		12-0	15-8	10 TO 12	11	13	10	4	8	8	5	7	7	100	5-9	3-5	10-9	4-1	2-6	1.778	530		2.40	3.11	3.20	2.27
		12-1.5	15-8	12 TO 14	12	13.5	10	4	8	8	5	7	7	100	5-9	3-5	10-10	4-2	2-5	1.850	531		1.78	2.31	2.23	1.58
		12-1.5	15-10	14 TO 18	12	13.5	11	5	8	8	5	7	7	103	5-9	3-6	10-10	4-2	2-7	1.925	560		◆	◆	◆	◆
16	6	8-5.5	17-8	< 2	15	14.5	10	4	9	9	5	7	7	117	6-7	3-10	7-0	4-3	2-3	1.979	596	2.296	1.11	1.44	1.46	1.37
		7-10	17-8	2 TO 6	10.5	11.5	10	4	8	8	5	7	7	90	8-3	3-10	6-8	4-0	2-3	1.570	522		1.02	1.32	1.36	1.32
		7-10.5	17-8	6 TO 8	10.5	12	10	4	8	8	5	8	8	90	6-6	3-10	6-8	4-9	2-5	1.597	569		1.78	2.32	2.63	3.15
		8-0	17-8	8 TO 10	11.5	12.5	10	4	8	8	5	8	8	90	6-6	3-10	6-9	4-10	2-4	1.679	570		2.00	2.60	2.88	3.27
	8	10-6	17-8	< 2	15	15	10	4	9	9	5	7	7	125	6-7	3-10	9-0	4-3	2-3	2.130	626	2.296	1.17	1.51	1.62	1.51
		9-10	17-8	2 TO 6	10.5	11.5	10	4	8	8	5	7	7	98	8-3	3-10	8-8	4-0	2-3	1.693	552		1.09	1.42	1.49	1.45
		9-10.5	17-8	6 TO 8	10.5	12	10	4	8	8	5	8	8	98	6-6	3-10	8-8	4-9	2-5	1.721	604		1.77	2.29	2.52	3.02
		10-0	17-8	8 TO 10	11.5	12.5	10	4	8	8	5	8	8	98	6-6	3-10	8-9	4-10	2-4	1.802	606		1.64	2.13	2.35	2.68
	10	12-6	17-8	< 2	15	15	10	4	9	9	5	7	7	133	8-3	3-10	11-0	4-3	2-3	2.253	669	2.296	1.12	1.46	1.47	1.38
		11-10	17-8	2 TO 6	10.5	11.5	10	4	8	8	5	7	7	106	8-3	3-10	10-8	4-0	2-3	1.817	582		1.04	1.35	1.43	1.38
		11-10.5	17-8	6 TO 8	10.5	12	10	4	8	8	5	8	8	106	6-6	3-10	10-8	4-9	2-5	1.844	639		1.59	2.06	2.26	2.72
		12-0.5	17-8	8 TO 10	11.5	13	10	4	8	8	5	8	8	106	6-6	3-10	10-9	4-10	2-6	1.953	641		1.47	1.91	2.11	2.40
18	8	10-8	19-8	< 2	16	16	10	4	10	10	5	8	8	135	7-3	4-3	9-1	5-1	2-3	2.436	817	2.519	1.17	1.51	1.50	1.36
		9-11	19-8	2 TO 5	10.5	12.5	10	4	9	9	5	8	8	104	9-2	4-3	8-8	4-10	2-4	1.890	724		1.12	1.45	1.43	1.37
		9-11.5	19-8	5 TO 7	11	12.5	10	4	9	9	5	8	8	104	7-3	4-3	8-9	4-10	2-4	1.920	705		1.60	2.08	2.24	2.71
	10	12-8	19-8	< 2	16	16	10	4	10	10	5	8	8	143	7-3	4-3	11-1	5-1	2-3	2.560	852	2.519	1.14	1.47	1.46	1.32
		11-11	19-8	2 TO 5	10.5	12.5	10	4	9	9	5	8	8	112	9-2	4-3	10-8	4-10	2-4	2.013	759		1.11	1.44	1.50	1.42
		12-0.5	19-8	5 TO 7	11.5	13	10	4	9	9	5	8	8	112	7-3	4-3	10-9	4-10	2-6	2.104	741		1.89	2.45	2.60	3.18
20	8	10-9.5	21-8	< 2	16.5	17	10	4	10	10	5	8	8	145	8-0	4-9	9-2	5-2	2-10	2.734	883	2.741	1.19	1.55	1.48	1.35
		10-0	21-8	2 TO 3	11.5	12.5	10	4	9	9	5	8	8	110	8-0	4-8	8-9	4-10	2-4	2.099	754		1.00	1.29	1.25	1.17
		10-2	21-8	3 TO 6	12.5	13.5	10	4	9	9	5	8	8	110	8-0	4-8	8-10	4-10	2-5	2.233	756		1.37	1.78	1.71	1.59
		10-3	21-10	6 TO 8	13	14	11	4	9	9	5	8	8	113	8-0	4-8	8-11	4-11	2-7	2.363	763		1.66	2.16	2.16	2.51
		10-5.5	22-1	8 TO 10	14	15.5	12.5	4	9	9	5	8	8	113	8-0	4-10	9-0	5-11	2-7	2.628	781		1.99	2.58	2.69	3.02
	10	12-10	21-10	< 2	17	17	11	4	10	10	5	8	8	210	8-0	4-9	11-2	5-2	2-10	2.970	980	2.759	1.14	1.48	1.41	1.29
		12-0	21-8	2 TO 3	11.5	12.5	10	4	9	9	5	8	8	118	8-0	4-8	10-9	4-10	2-4	2.222	789		1.01	1.31	1.33	1.23
		12-2	21-8	3 TO 6	12.5	13.5	10	4	9	9	5	8	8	118	8-0	4-8	10-10	4-11	2-5	2.356	792		1.30	1.69	1.74	1.58
		12-3.5	21-10	6 TO 8	13	14.5	11	4	9	9	5	8	8	121	8-0	4-10	10-11	5-10	2-7	2.532	810		1.80	2.34	2.40	2.73
		12-5.5	22-1	8 TO 10	14	15.5	12.5	4	9	9	5	8	8	121	8-0	4-10	11-0	5-11	2-7	2.782	816		2.12	2.75	2.89	3.17

HEADWALL AND TOEWALL QUANTITIES

HEADWALL BENT ANGLE	90° TO 75°			74° TO 60°			59° TO 45°		
CLEAR SPAN (S)	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.
	#	#	LBS/LF	#	#	LBS/LF	#	#	LBS/LF
6	4	4	22.8	4	4	22.2	6	4	34.6
8	4	4	23.0	5	4	28.8	7	4	44.0
10	5	4	28.5	6	4	35.1	9	4■	68.7
12	6	4	35.3	6	4	34.4	9	5■	71.7
14	6	4	34.2	7	4	41.5	★	★	★
16	6	4	33.1	8	5	54.0	★	★	★
18	7	4	39.5	9	5	63.3	★	★	★
20	7	4	39.3	★	★	★	★	★	★
CONCRETE QUANTITY = 0.086 CY/LF									

NOTES

■ 1. SIX INCH SPACING AT EACH END OF THE SPAN FOR A DISTANCE OF 1/4 OF THE SPAN LENGTH; 12 INCH SPACING ELSEWHERE.

2. QUANTITIES ARE GIVEN FOR ONE HEADWALL AND ONE TOEWALL AND ARE BASED ON PER LINEAR FOOT OF HEADWALL. STEEL QUANTITIES INCLUDE ALL REINFORCING. QUANTITIES SHALL BE PAID FOR AS SHOWN ON THE PLANS.

★ 3. SKEWED HEADWALLS ARE NOT RECOMMENDED FOR THESE SPANS. A SPECIAL DESIGN IS REQUIRED.

4. FOR HEADWALL AND TOEWALL DETAILS SEE M-601-1, SHEET 1 OF 2.

5. WHEN THE FILL HEIGHTS ARE LESS THAN OR EQUAL TO 2 FT, ALL REINFORCING BARS IN THE HEADWALL, ALL REINFORCING BARS DESIGNATED BY AN ASTERISK (*), AND THE d_1 BARS IN THE TOP MAT OF THE TOP SLAB SHALL BE EPOXY COATED.

6. REINFORCING QUANTITIES INCLUDE BOTH EPOXY-COATED AND UNCOATED BARS.

7. WHEN A (RISE) R OF LESS THAN 6 FT IS REQUIRED, USE THE BAR SIZES AND THE SLAB AND WALL THICKNESSES FOR THE 6 FT RISE (IF AVAILABLE ON THE TABLE).

▲ 8. FOR SIZE AND SPACING OF THE BOTTOM MAT BARS IN THE TOP SLAB SEE TABLE ON M-601-1, SHEET 1 OF 2. ALL OTHER d_1 BARS ARE #4's AT 1'-0" SPACING. THE NUMBER OF BARS REQUIRED IS LISTED ON THIS SHEET AND INCLUDES BOTH #4 BARS AND THOSE FROM THE TABLE.

◆ 9. LIVE LOAD IS NEGLECTED AS PER AASHTO LRFD SECTION 3.6.1.2.6. FOR THESE STRUCTURES REFER TO THE CDOT RATING MANUAL.

10. FOR ALL NEW CULVERT DESIGNS, A RATING IS REQUIRED. THE RATING SUMMARY SHEET SHOULD BE PRINTED FROM THE CDOT EXTERNAL WEBSITE AND SUBMITTED TO THE BRIDGE RATING UNIT OR INCLUDED AS PART OF A LARGER DESIGN PACKAGE. FOR ADDITIONAL INFORMATION, SEE THE CDOT RATING MANUAL.

Computer File Information		Sheet Revisions	
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Project Development Branch JBK

SINGLE CONCRETE BOX CULVERT (CAST-IN-PLACE)

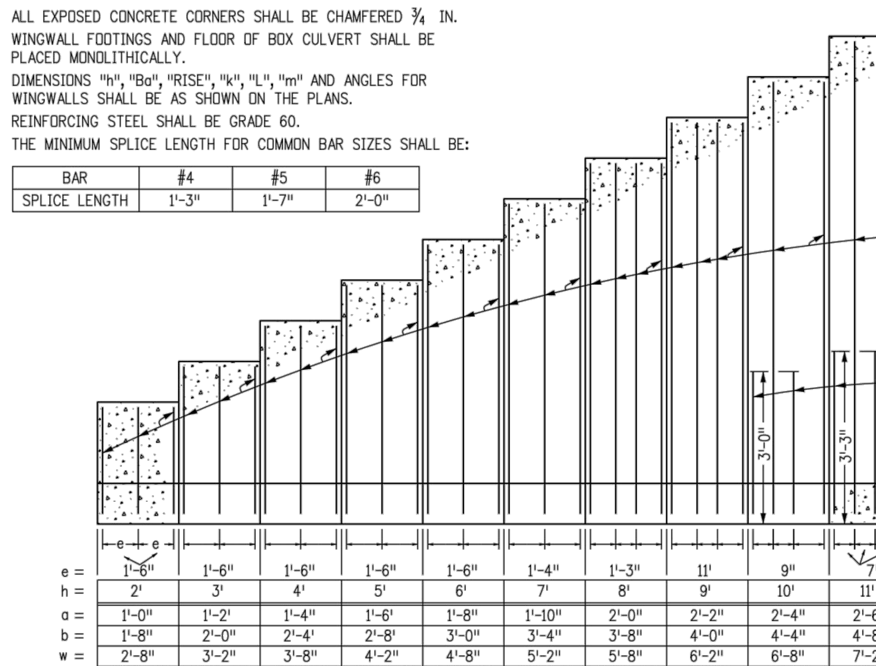
Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
M-601-1
Standard Sheet No. 2 of 2
Project Sheet Number:

GENERAL NOTES

1. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾ IN.
2. WINGWALL FOOTINGS AND FLOOR OF BOX CULVERT SHALL BE PLACED MONOLITHICALLY.
3. DIMENSIONS "h", "Ba", "RISE", "k", "L", "m" AND ANGLES FOR WINGWALLS SHALL BE AS SHOWN ON THE PLANS.
4. REINFORCING STEEL SHALL BE GRADE 60.
5. THE MINIMUM SPLICE LENGTH FOR COMMON BAR SIZES SHALL BE:

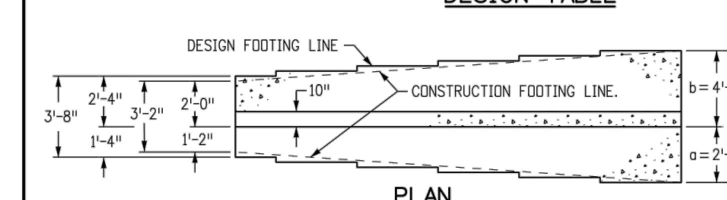
BAR	#4	#5	#6
SPLICE LENGTH	1'-3"	1'-7"	2'-0"



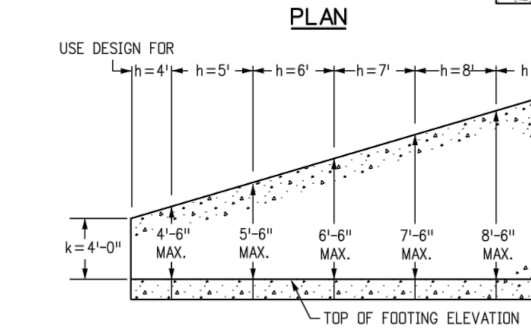
e =	1'-6"	1'-6"	1'-6"	1'-6"	1'-6"	1'-4"	1'-3"	11'	9"	7"	CTRS.
h =	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	
a =	1'-0"	1'-2'	1'-4"	1'-6'	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	
b =	1'-8"	2'-0"	2'-4'	2'-8'	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"	
w =	2'-8"	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	
c & d BARS	#4@1'-6"	#4@1'-6"	#4@1'-6"	#4@1'-6"	#4@1'-6"	#4@1'-4"	#5@1'-3"	#5@11"	#6@9"	#6@7"	CTRS.
* CONC.CU.YD./L.F.	0.161	0.210	0.259	0.308	0.358	0.407	0.457	0.506	0.556	0.604	
* REINF. LB./L.F.	8.0	9.3	10.7	12.1	14.3	16.4	23.0	28.6	41.8	54.6	

* DOES NOT INCLUDE TOE WALL QUANTITIES

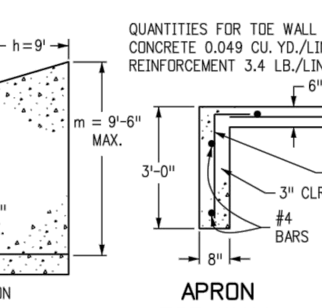
DESIGN TABLE



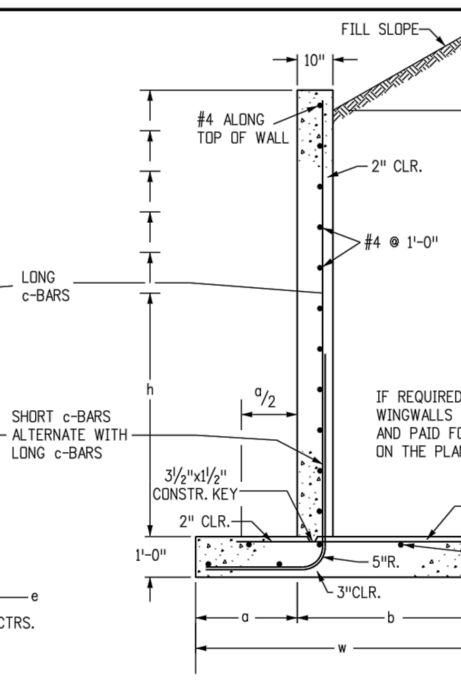
PLAN



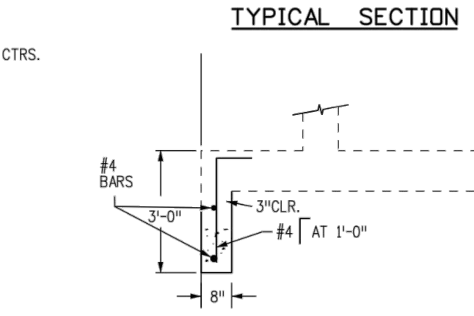
DESIGN EXAMPLE



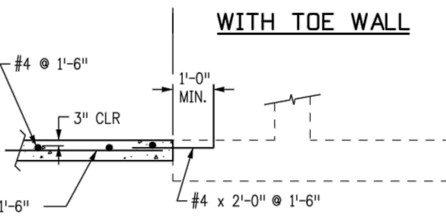
APRON TOE WALL



TYPICAL SECTION

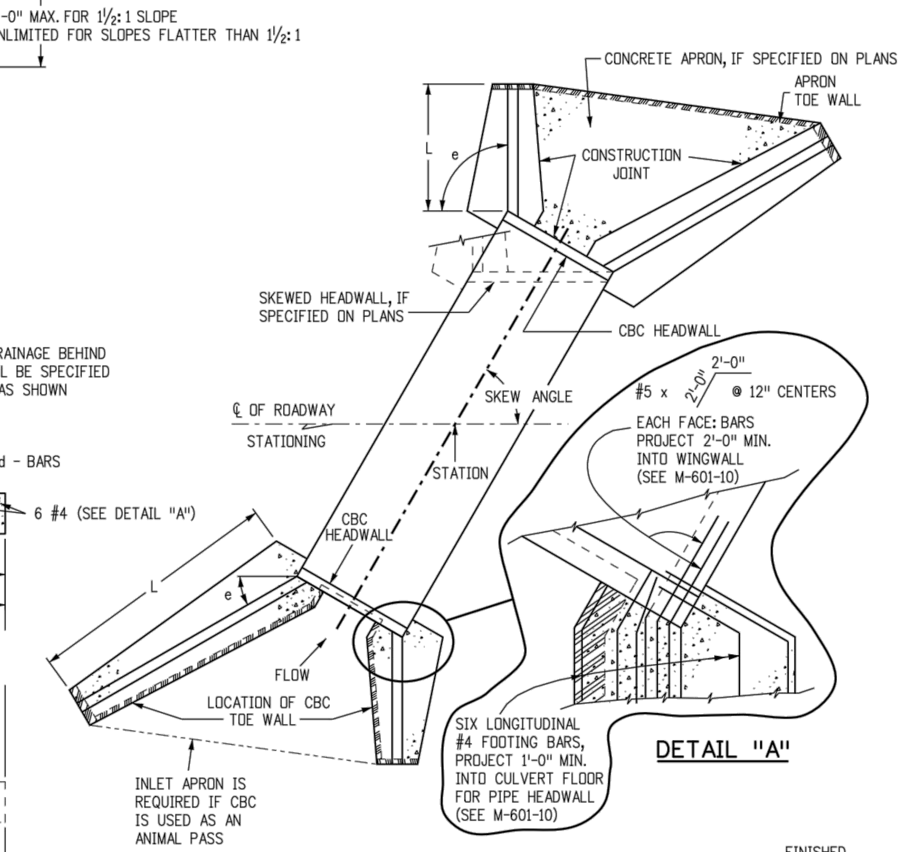


WITH TOE WALL



WITH CONCRETE APRON

REINFORCEMENT 0.89 LB./SQ. FT.

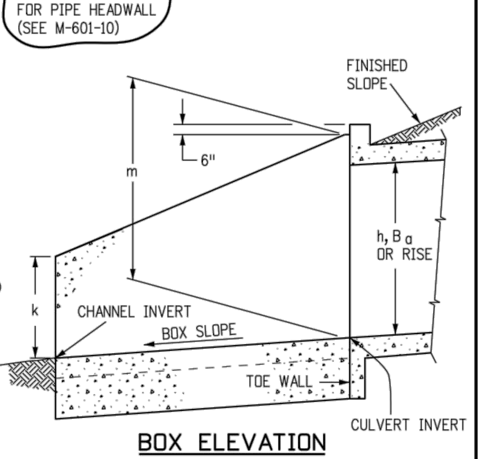


TYPICAL CULVERT LAYOUT

DESIGN DATA:

UNIT STRESSES: f_s = 24,000 PSI
f_c = 1,200 PSI
n = 9

EQUIVALENT FLUID PRESSURE = 36 LBS./CU. FT.
MAXIMUM TOE PRESSURE = 1 TON/SQ. FT.
ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE CONCRETE IS POURED.
WINGWALL AND APRON CONCRETE SHALL BE:
CONCRETE CLASS B, OR D (BOX CULVERT) FOR CBC's.
CONCRETE CLASS B, OR D (WALL) FOR PIPES.
LIVE LOAD SURCHARGE HAS NOT BEEN CONSIDERED. WALLS WITHIN h/2 OF THE EDGE OF THE ROADWAY SHOULDER WILL REQUIRE A SPECIAL DESIGN IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.



BOX ELEVATION

m = h, Ba OR RISE + (1'-4")
UNLESS OTHERWISE SHOWN ON PLANS

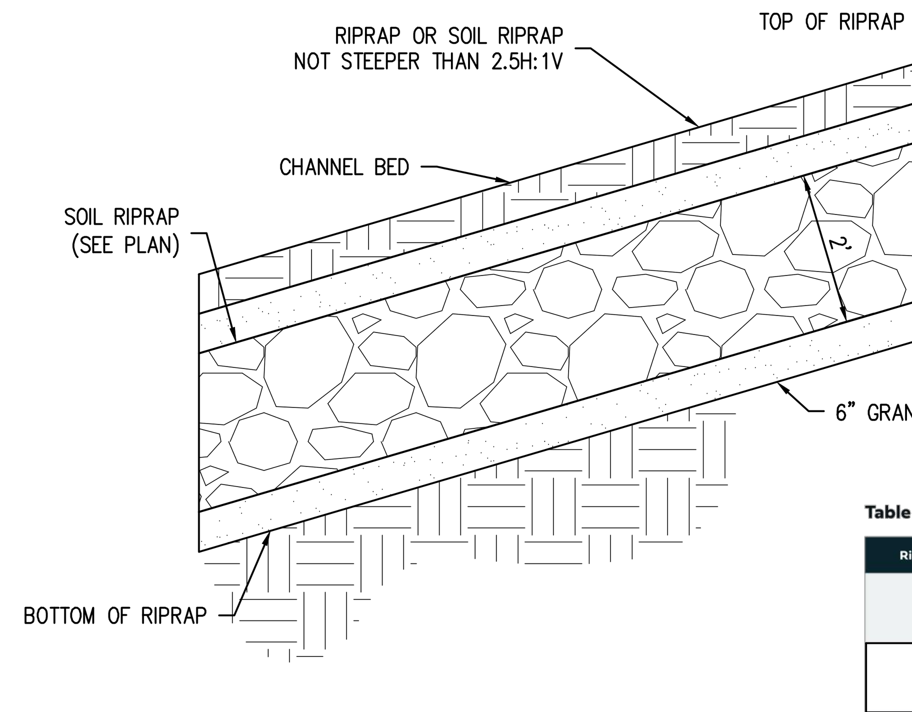
Computer File Information			Sheet Revisions	
Creation Date: 07/04/12	Initials: DD		Date:	Comments
Last Modification Date: 07/04/12	Initials: LTA	(R-X)		
Full Path: www.coloradodot.info/business/designsupport		(R-X)		
Drawing File Name: 6010200101.dgn		(R-X)		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		(R-X)		

Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-9083
Fax: (303) 757-9820
Project Development Branch DD/LTA

WINGWALLS FOR PIPE OR BOX CULVERTS

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-20
Sheet No. 1 of 1



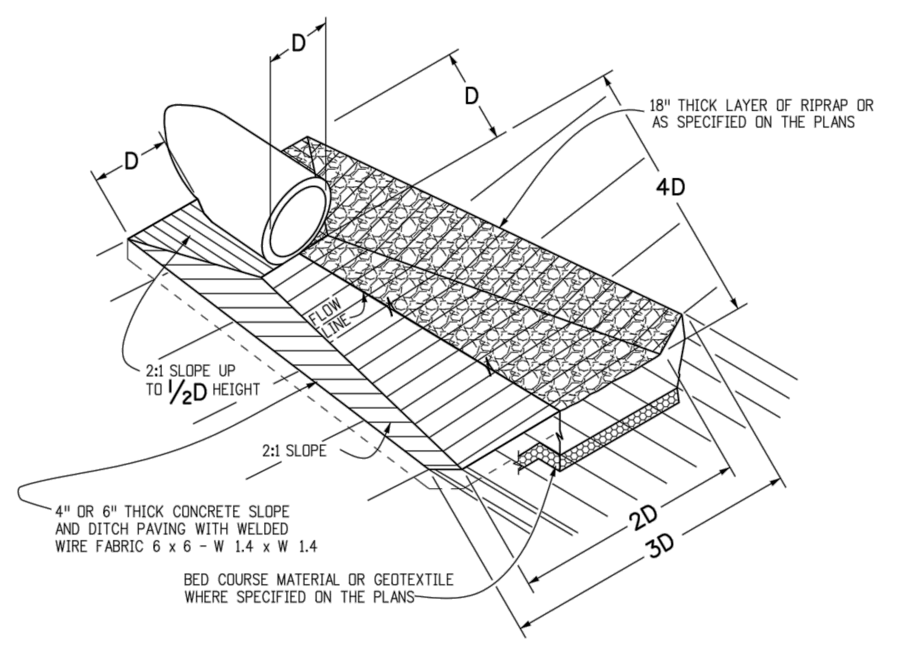
SOIL RIPRAP PLACEMENT DETAIL

NTS

Table 1: Riprap Gradation

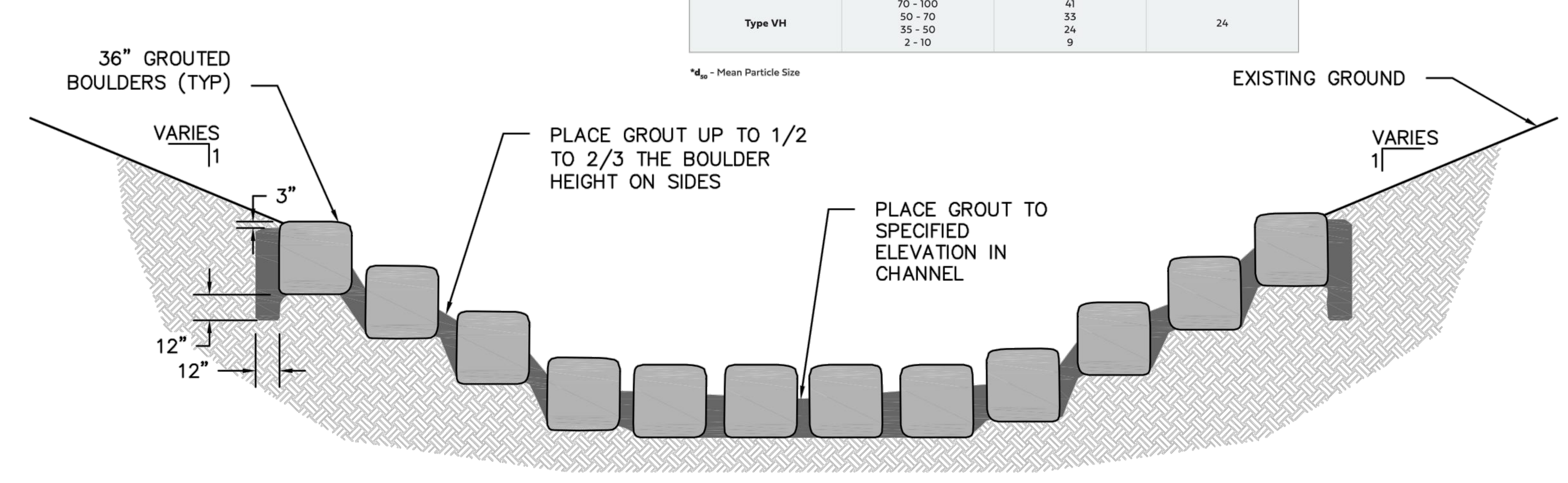
Riprap Designation	% Smaller than Given Size by Weight	Intermediate Rock Dimension (inches)	d_{50}* (inches)
Type VL	70 - 100 50 - 70 35 - 50 2 - 10	12 9 6 2	6
Type L	70 - 100 50 - 70 35 - 50 2 - 10	15 12 9 3	9
Type M	70 - 100 50 - 70 35 - 50 2 - 10	21 18 12 4	12
Type H	70 - 100 50 - 70 35 - 50 2 - 10	30 24 18 6	18
Type VH	70 - 100 50 - 70 35 - 50 2 - 10	41 33 24 9	24

*d_{50} - Mean Particle Size



PIPE OUTLET PAVING

MAY BE USED WITH MULTIPLE PIPES.



NOTE: BOULDERS SHALL BE PLACED SUCH THAT ADJACENT BOULDERS ARE 1.5" TO 3.5" AWAY ADN VOIDS DO NOT EXCEED 4".

GROUTED BOULDER DETAIL

NTS

TOWN OF CASTLE ROCK APPROVAL
PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

Approved By:

Development Services Date

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

DESIGNED BY: AMC
CHECKED BY: MAW
DRAWN BY: AMC

ISSUE DATE: 08-07-2024

DATE	REVISION COMMENTS
10-22-2024	PRICING SET
12-06-2024	PER TOWN COMMENTS
03-21-2025	PER TOWN COMMENTS

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

CONFLUENCE COMPANIES, LLC

THE BRICKYARD - INFRASTRUCTURE (PHASE IA)
INDUSTRIAL TRIBUTARY CULVERT DETAILS

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 200726
SHEET NUMBER
75
75 OF 206

FILEPATH: P:\2020\200726\ENGINEERING\DRAINAGE\CD - CULVERT PLAN & PROFILE.DWG LAYOUT: CULVERT DETAILS (2)
19 XREFs: cd - cr approval block, cd - cr pe certification block m_west, e-base, e-legal, e-util, hydraulicsbase[U], itt_design base[U], itt_tunnel base[U], keymap, p-base, p-base-ph1, p-base-ph2, p-base-ph3, p-base-ph4, p-base-prairiehawk-byot[U], p-legal, p-roadway, p-util, stamp-ph1[U]
PLOTTED: WED 07/09/25 2:14:32P BY: AMANDA CASTEEL

APPENDIX D – PRPOSED AND EXISTING HEC-RAS ANALYSIS RESULTS

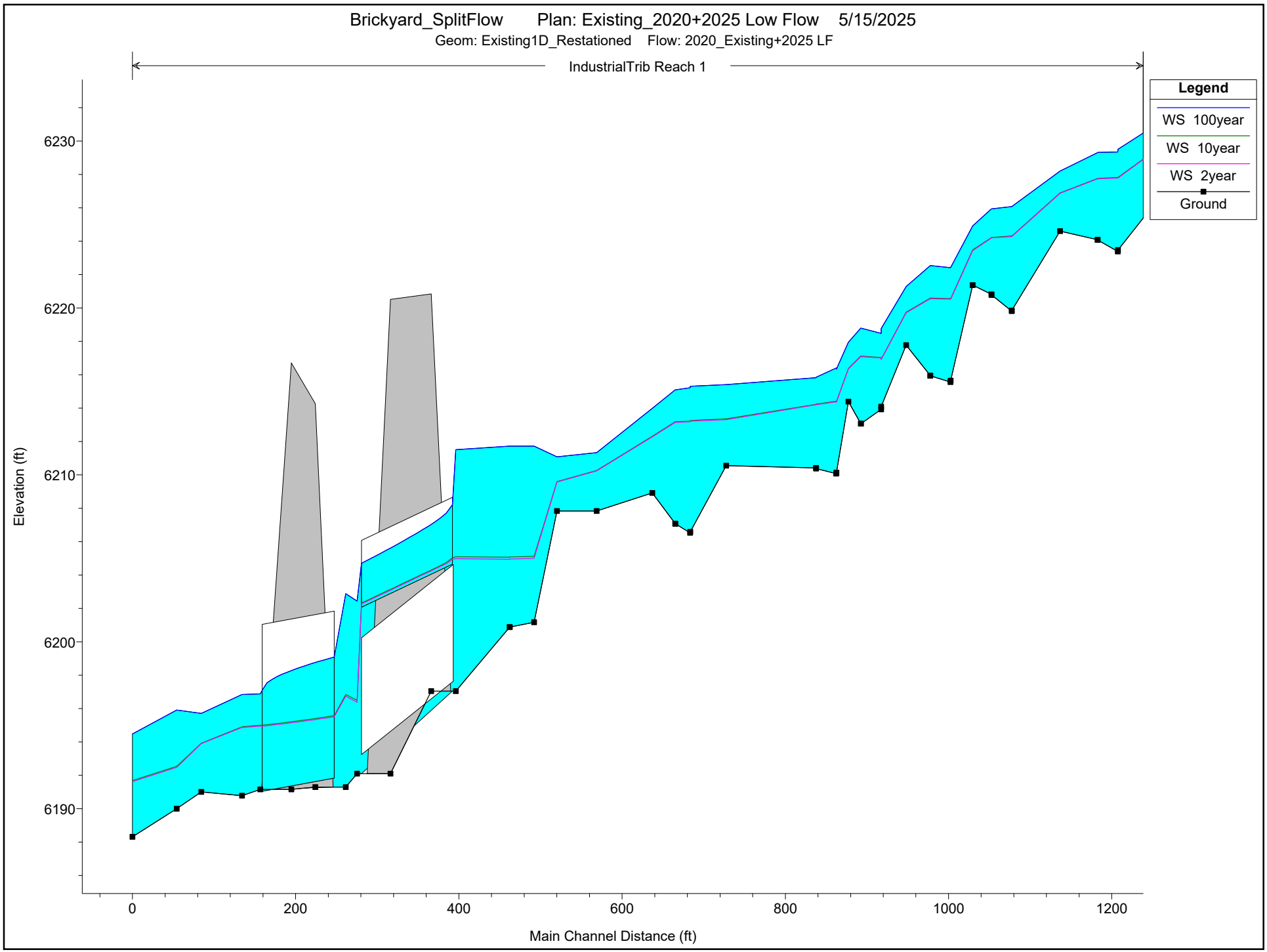
BFE Comparison Table

The Brickyard

Industrial Tributary

Prepared by: HKS

Hydraulic Cross Section					Base Flood Elevations (NAVD88)				Δ					
Olsson Cross-Section ID	EX Cross-Section ID/ RS	Ex CAD River Station (STA)	PR Cross-Section ID/ RS	Pr CAD River Station (STA)	Existing Conditions w/ FHAD Future Flow	Existing Conditions w/ 2020 Hydrology	Proposed Conditions w/ FHAD Future Flow	Proposed Conditions w/ 2020 Hydrology	Existing w/ 2020 vs. Existing w/ FHAD	Proposed w/ FHAD vs. Existing w. FHAD	Proposed w/ FHAD vs. Existing w/ 2020	Proposed w/ 2020 vs Proposed w/ FHAD	Proposed w/ 2020 vs. Existing w/ FHAD	Proposed w/ 2020 vs. Existing w/ 2020
47	1534.24	1536.29	1518.60	1523.19	6239.18	6238.21	6239.06	6238.08	-0.97	-0.12	0.85	-0.98	-1.10	-0.13
46	1485.40	1486.54	1469.76	1473.44	6238.47	6237.48	6238.79	6237.78	-0.99	0.32	1.31	-1.01	-0.69	0.30
45	1485.20	1486.34	1469.56	1473.24	6237.42	6236.61	6237.42	6236.61	-0.81	0.00	0.81	-0.81	-0.81	0.00
44	1460.50	1461.64	1444.86	1448.54	6236.21	6235.57	6236.21	6235.57	-0.64	0.00	0.64	-0.64	-0.64	0.00
43	1460.40	1461.54	1444.76	1448.44	6236.21	6235.57	6236.21	6235.57	-0.64	0.00	0.64	-0.64	-0.64	0.00
42	1447.48	1448.51	1431.84	1435.40	6235.26	6234.65	6235.26	6234.65	-0.61	0.00	0.61	-0.61	-0.61	0.00
41	1434.04	1435.13	1418.40	1422.03	6234.97	6234.22	6234.97	6234.22	-0.75	0.00	0.75	-0.75	-0.75	0.00
40	1433.84	1434.93	1418.20	1421.83	6234.84	6234.16	6234.84	6234.16	-0.68	0.00	0.68	-0.68	-0.68	0.00
39	1409.14	1410.22	1393.50	1397.12	6234.93	6234.20	6234.93	6234.20	-0.73	0.00	0.73	-0.73	-0.73	0.00
38	1409.04	1410.12	1393.40	1397.02	6234.80	6234.10	6234.80	6234.10	-0.70	0.00	0.70	-0.70	-0.70	0.00
37	1304.87	1305.87	1289.23	1292.77	6233.11	6232.56	6233.10	6232.56	-0.55	-0.01	0.54	-0.54	-0.55	0.00
36	1207.55	1208.71	1191.91	1195.60	6230.25	6229.50	6230.25	6229.50	-0.75	0.00	0.75	-0.75	-0.75	0.00
35	1207.35	1208.51	1191.71	1195.40	6229.88	6229.34	6229.88	6229.34	-0.54	0.00	0.54	-0.54	-0.54	0.00
34	1182.65	1183.68	1167.01	1170.58	6229.90	6229.32	6229.90	6229.32	-0.58	0.00	0.58	-0.58	-0.58	0.00
33	1182.55	1183.58	1166.91	1170.48	6229.88	6229.31	6229.88	6229.31	-0.57	0.00	0.57	-0.57	-0.57	0.00
32	1136.61	1137.60	1120.97	1124.50	6228.73	6228.20	6228.73	6228.20	-0.53	0.00	0.53	-0.53	-0.53	0.00
31	1077.55	1078.62	1061.91	1065.52	6226.75	6226.07	6226.75	6226.07	-0.68	0.00	0.68	-0.68	-0.68	0.00
30	1077.35	1078.42	1061.71	1065.32	6226.73	6226.07	6226.73	6226.07	-0.66	0.00	0.66	-0.66	-0.66	0.00
29	1052.65	1053.62	1037.01	1040.52	6226.59	6225.94	6226.59	6225.94	-0.65	0.00	0.65	-0.65	-0.65	0.00
28	1052.55	1053.52	1036.91	1040.42	6226.58	6225.93	6226.58	6225.93	-0.65	0.00	0.65	-0.65	-0.65	0.00
27	1029.49	1030.52	1013.85	1017.42	6225.51	6224.91	6225.51	6224.91	-0.60	0.00	0.60	-0.60	-0.60	0.00
26	1002.55	1003.79	986.91	990.69	6223.20	6222.42	6223.20	6222.42	-0.78	0.00	0.78	-0.78	-0.78	0.00
25	1002.35	1003.59	986.71	990.49	6223.10	6222.41	6223.10	6222.41	-0.69	0.00	0.69	-0.69	-0.69	0.00
24	977.65	978.80	962.01	965.70	6223.29	6222.54	6223.29	6222.54	-0.75	0.00	0.75	-0.75	-0.75	0.00
23	977.55	978.70	961.91	965.60	6223.29	6222.53	6223.29	6222.53	-0.76	0.00	0.76	-0.76	-0.76	0.00
22	948.15	949.15	932.51	936.05	6221.94	6221.28	6221.94	6221.28	-0.66	0.00	0.66	-0.66	-0.66	0.00
21	917.55	918.80	901.91	905.93	6220.91	6218.76	6220.29	6218.76	-2.15	-0.62	1.53	-1.53	-2.15	0.00
20	917.35	918.60	901.71	905.73	6220.65	6218.47	6219.41	6218.47	-2.18	-1.24	0.94	-0.94	-2.18	0.00
19	892.65	893.78	877.01	880.68	6220.95	6218.79	6219.34	6218.79	-2.16	-1.61	0.55	-0.55	-2.16	0.00
18	892.55	893.68	876.91	880.58	6220.95	6218.79	6219.34	6218.79	-2.16	-1.61	0.55	-0.55	-2.16	0.00
17	877.31	878.34	861.67	865.33	6220.96	6217.95	6218.60	6217.95	-3.01	-2.36	0.65	-0.65	-3.01	0.00
16	862.55	863.56	846.91	850.46	6221.07	6216.34	6217.15	6216.31	-4.73	-3.92	0.81	-0.84	-4.76	-0.03
15	862.34	863.35	846.70	850.25	6221.07	6216.40	6217.22	6216.37	-4.67	-3.85	0.82	-0.85	-4.70	-0.03
14	837.65	838.76	822.01	825.66	6221.04	6215.84	6216.25	6215.79	-5.20	-4.79	0.41	-0.46	-5.25	-0.05
13	837.55	838.66	821.91	825.56	6221.04	6215.81	6216.18	6215.76	-5.23	-4.86	0.37	-0.42	-5.28	-0.05
12	727.54	728.42	711.90	715.32	6221.10	6215.40	6215.64	6214.80	-5.70	-5.46	0.24	-0.84	-6.30	-0.60
11	683.64	685.06	668.00	671.51	6221.11	6215.31	6215.50	6214.59	-5.80	-5.61	0.19	-0.91	-6.52	-0.72
10	683.32	684.74	667.68	671.19	6221.10	6215.22	6215.32	6214.41	-5.88	-5.78	0.10	-0.91	-6.69	-0.81
9	665.19	666.23	649.55	653.12	6221.08	6215.09	6215.04	6214.17	-5.99	-6.04	-0.05	-0.87	-6.91	-0.92
8	665.09	666.13	649.45	653.02	6221.08	6215.09	6215.04	6214.16	-5.99	-6.04	-0.05	-0.88	-6.92	-0.93
7	636.90	637.93	621.26	624.83	6221.04	6213.98	6213.74	6213.00	-7.06	-7.30	-0.24	-0.74	-8.04	-0.98
6	568.86	569.75	553.22	556.84	6221.03	6211.33	6212.47	6211.95	-9.70	-8.56	1.14	-0.52	-9.08	0.62
5	520.21	521.25	504.57	508.15	6221.05	6211.08	6211.78	6211.21	-9.97	-9.27	0.70	-0.57	-9.84	0.13
4	492.27	493.24	476.63	480.14	6221.06	6211.72	6207.41	6206.06	-9.34	-13.65	-4.31	-1.35	-15.00	-5.66
3	462.31	462.86	-	-	6221.06	6211.73	-	-	-9.33	-	-	-	-	-
2	462.21	462.76	-	-	6221.06	6211.72	-	-	-9.34	-	-	-	-	-
-	-	-	449.30	443.81	-	-	6202.35	6206.54	-	-	-	4.19	-	-
-	-	-	420.81	415.37	-	-	6201.91	6206.58	-	-	-	4.67	-	-
-	-	-	399.84	393.75	-	-	6201.96	6206.59	-	-	-	4.63	-	-
1	396.14	394.55	-	-	6221.07	6211.51	-	-	-9.56	-	-	-	-	-
-	-	-	395.23	389.67	-	-	6201.96	6206.59	-	-	-	4.63	-	-
-	275.31	273.84	258.43	253.88	6206.45	6202.44	6199.58	6200.77	-4.01	-6.87	-2.86	1.19	-5.68	-1.67
-	261.46	259.99	248.43	243.92	6206.85	6202.88	6199.57	6200.76	-3.97	-7.28	-3.31	1.19	-6.09	-2.12
-	156.67	155.20	146.73	142.13	6197.67	6196.88	6197.56	6195.57	-0.79	-0.11	0.68	-1.99	-2.10	-1.31
-	134.36	132.90	134.20	129.63	6197.78	6196.84	6197.44	6195.44	-0.94	-0.34	0.60	-2.00	-2.34	-1.40
-	84.26	82.82	84.70	84.68	6197.32	6195.71	6197.47	6195.49	-1.61	0.15	1.76	-1.98	-1.83	-0.22
-	54.26	52.43	52.40	52.39	6197.96	6195.91	6197.48	6195.49	-2.05	-0.48	1.57	-1.99	-2.47	-0.42
-	0.00	0.00	0.00	0.00	6196.77	6194.48	6196.77	6194.48	-2.29	0.00	2.29	-2.29	-2.29	0.00


Brickyard_SplitFlow Plan: Existing_2020+2025 Low Flow 5/15/2025
Geom: Existing1D_Restationed Flow: 2020_Existing+2025 LF
IndustrialTrib Reach 1
Legend
WS 100year
WS 10year
WS 2year
Ground
Elevation (ft)
6230
6220
6210
6200
6190
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

HEC-RAS Plan: CorrectedEffecttiveTown+BNSF LF River: IndustrialTrib Reach: Reach 1

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	1534.24	100year	856.00	6226.47	6238.21		6238.64	0.003611	5.27	162.52	42.95	0.48
Reach 1	1534.24	10year	304.00	6226.47	6235.84		6236.05	0.002366	3.62	83.86	25.16	0.35
Reach 1	1534.24	2year	296.00	6226.47	6235.79		6235.99	0.002338	3.59	82.51	24.83	0.35
Reach 1	1485.4	100year	856.00	6231.47	6237.48	6236.58	6238.30	0.012827	7.27	117.77	34.39	0.69
Reach 1	1485.4	10year	304.00	6231.47	6234.68	6234.68	6235.68	0.032762	8.01	37.96	19.44	1.01
Reach 1	1485.4	2year	296.00	6231.47	6234.66	6234.66	6235.63	0.032327	7.91	37.43	19.35	1.00
Reach 1	1485.2	100year	856.00	6231.35	6236.61	6236.61	6238.21	0.022061	10.46	90.50	30.84	0.93
Reach 1	1485.2	10year	304.00	6231.35	6234.61	6234.61	6235.62	0.032595	8.07	37.66	18.92	1.01
Reach 1	1485.2	2year	296.00	6231.35	6234.58	6234.58	6235.57	0.032238	7.98	37.10	18.81	1.00
Reach 1	1460.5	100year	856.00	6230.28	6235.57	6234.21	6236.14	0.007972	6.08	140.79	38.30	0.56
Reach 1	1460.5	10year	304.00	6230.28	6233.93	6232.61	6234.14	0.004604	3.67	82.94	32.41	0.40
Reach 1	1460.5	2year	296.00	6230.28	6233.90	6232.57	6234.10	0.004532	3.62	81.88	32.30	0.40
Reach 1	1460.4	100year	856.00	6230.29	6235.57	6234.21	6236.14	0.008015	6.08	140.72	38.43	0.56
Reach 1	1460.4	10year	304.00	6230.29	6233.93	6232.63	6234.14	0.004675	3.68	82.66	32.52	0.41
Reach 1	1460.4	2year	296.00	6230.29	6233.90	6232.59	6234.10	0.004603	3.63	81.60	32.40	0.40
Reach 1	1447.48	100year	856.00	6231.06	6234.65	6234.65	6235.90	0.029001	8.96	95.57	39.10	1.01
Reach 1	1447.48	10year	304.00	6231.06	6233.26	6233.26	6233.96	0.034849	6.71	45.27	33.16	1.01
Reach 1	1447.48	2year	296.00	6231.06	6233.23	6233.23	6233.92	0.034999	6.66	44.43	33.04	1.01
Reach 1	1434.04	100year	856.00	6227.18	6234.22		6234.62	0.005230	5.09	168.33	40.84	0.44
Reach 1	1434.04	10year	304.00	6227.18	6232.33		6232.47	0.002411	3.00	101.45	29.84	0.29
Reach 1	1434.04	2year	296.00	6227.18	6232.29		6232.42	0.002346	2.95	100.29	29.54	0.28
Reach 1	1433.84	100year	856.00	6227.11	6234.16		6234.62	0.003998	5.55	168.70	40.56	0.40
Reach 1	1433.84	10year	304.00	6227.11	6232.33		6232.46	0.001839	2.96	104.36	29.92	0.25
Reach 1	1433.84	2year	296.00	6227.11	6232.29		6232.42	0.001801	2.91	103.18	29.63	0.25
Reach 1	1409.14	100year	856.00	6227.68	6234.20		6234.48	0.002944	4.24	204.82	52.55	0.35
Reach 1	1409.14	10year	304.00	6227.68	6232.31		6232.41	0.001801	2.55	119.12	39.21	0.26
Reach 1	1409.14	2year	296.00	6227.68	6232.27		6232.37	0.001769	2.52	117.55	38.96	0.26
Reach 1	1409.04	100year	856.00	6227.72	6234.10		6234.47	0.002993	5.17	199.19	51.74	0.37
Reach 1	1409.04	10year	304.00	6227.72	6232.29		6232.41	0.001497	2.87	117.68	39.11	0.25
Reach 1	1409.04	2year	296.00	6227.72	6232.25		6232.36	0.001470	2.82	116.16	38.87	0.25
Reach 1	1304.87	100year	856.00	6229.48	6232.56	6232.56	6233.67	0.029186	8.45	101.30	46.44	1.01
Reach 1	1304.87	10year	304.00	6229.48	6231.27	6231.27	6231.93	0.034622	6.47	47.00	36.76	1.01
Reach 1	1304.87	2year	296.00	6229.48	6231.25	6231.25	6231.89	0.034426	6.40	46.23	36.56	1.00
Reach 1	1207.55	100year	856.00	6223.47	6229.50		6230.23	0.010927	6.84	125.12	35.31	0.64
Reach 1	1207.55	10year	304.00	6223.47	6227.82		6228.08	0.005160	4.12	73.84	25.18	0.42
Reach 1	1207.55	2year	296.00	6223.47	6227.78		6228.04	0.005007	4.05	73.04	24.93	0.42
Reach 1	1207.35	100year	856.00	6223.38	6229.34		6230.21	0.009107	7.61	121.73	34.52	0.61
Reach 1	1207.35	10year	304.00	6223.38	6227.82		6228.08	0.004345	4.09	75.66	25.55	0.40
Reach 1	1207.35	2year	296.00	6223.38	6227.79		6228.04	0.004242	4.02	74.86	25.35	0.39
Reach 1	1182.65	100year	856.00	6224.07	6229.32		6229.95	0.006610	6.53	143.19	41.85	0.53
Reach 1	1182.65	10year	304.00	6224.07	6227.76		6227.96	0.003497	3.62	85.77	31.96	0.36
Reach 1	1182.65	2year	296.00	6224.07	6227.73		6227.93	0.003432	3.57	84.77	31.76	0.36
Reach 1	1182.55	100year	856.00	6224.09	6229.31		6229.95	0.006737	6.57	142.30	41.80	0.54
Reach 1	1182.55	10year	304.00	6224.09	6227.76		6227.96	0.003575	3.65	85.14	31.95	0.37
Reach 1	1182.55	2year	296.00	6224.09	6227.73		6227.93	0.003509	3.60	84.14	31.75	0.36
Reach 1	1136.61	100year	856.00	6224.60	6228.20	6228.20	6229.34	0.028712	8.55	100.14	44.37	1.00
Reach 1	1136.61	10year	304.00	6224.60	6226.89	6226.89	6227.54	0.034658	6.47	46.99	36.77	1.01
Reach 1	1136.61	2year	296.00	6224.60	6226.86	6226.86	6227.51	0.035195	6.44	45.96	36.62	1.01
Reach 1	1077.55	100year	856.00	6219.85	6226.07		6226.46	0.005136	5.02	170.47	42.66	0.44
Reach 1	1077.55	10year	304.00	6219.85	6224.30		6224.43	0.002206	2.89	105.27	31.79	0.28
Reach 1	1077.55	2year	296.00	6219.85	6224.27		6224.40	0.002152	2.84	104.29	31.77	0.28
Reach 1	1077.35	100year	856.00	6219.81	6226.07		6226.46	0.004093	5.03	174.51	42.61	0.40
Reach 1	1077.35	10year	304.00	6219.81	6224.31		6224.43	0.001972	2.78	109.49	31.94	0.26
Reach 1	1077.35	2year	296.00	6219.81	6224.28		6224.39	0.001922	2.73	108.49	31.91	0.26
Reach 1	1052.65	100year	856.00	6220.77	6225.94		6226.36	0.004255	5.31	176.36	49.94	0.43
Reach 1	1052.65	10year	304.00	6220.77	6224.22		6224.37	0.002667	3.10	100.34	38.49	0.32
Reach 1	1052.65	2year	296.00	6220.77	6224.19		6224.33	0.002615	3.05	99.22	38.29	0.31

HEC-RAS Plan: CorrectedEffecttiveTown+BNSF LF River: IndustrialTrib 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	1052.55	100year	856.00	6220.81	6225.93		6226.35	0.004398	5.36	174.58	49.85	0.44
Reach 1	1052.55	10year	304.00	6220.81	6224.22		6224.37	0.002799	3.15	98.84	38.46	0.32
Reach 1	1052.55	2year	296.00	6220.81	6224.19		6224.33	0.002743	3.10	97.76	38.26	0.32
Reach 1	1029.49	100year	856.00	6221.37	6224.91	6224.91	6226.07	0.027906	8.65	98.94	41.92	0.99
Reach 1	1029.49	10year	304.00	6221.37	6223.48	6223.48	6224.16	0.032153	6.60	46.05	32.79	0.98
Reach 1	1029.49	2year	296.00	6221.37	6223.43	6223.43	6224.13	0.034740	6.71	44.10	32.49	1.02
Reach 1	1002.55	100year	856.00	6215.65	6222.42		6223.11	0.009948	6.65	128.63	33.41	0.60
Reach 1	1002.55	10year	304.00	6215.65	6220.55		6220.79	0.004265	3.93	77.40	23.23	0.38
Reach 1	1002.55	2year	296.00	6215.65	6220.51		6220.75	0.004181	3.87	76.54	23.21	0.38
Reach 1	1002.35	100year	856.00	6215.56	6222.41		6223.10	0.007216	6.72	132.68	33.53	0.52
Reach 1	1002.35	10year	304.00	6215.56	6220.57		6220.78	0.003758	3.73	81.52	23.61	0.35
Reach 1	1002.35	2year	296.00	6215.56	6220.53		6220.74	0.003681	3.67	80.63	23.58	0.35
Reach 1	977.65	100year	856.00	6215.94	6222.54		6222.89	0.003002	4.84	185.00	41.41	0.36
Reach 1	977.65	10year	304.00	6215.94	6220.59		6220.69	0.001532	2.65	114.88	30.92	0.24
Reach 1	977.65	2year	296.00	6215.94	6220.55		6220.65	0.001499	2.61	113.68	30.74	0.24
Reach 1	977.55	100year	856.00	6215.95	6222.53		6222.89	0.003021	4.85	184.63	41.41	0.36
Reach 1	977.55	10year	304.00	6215.95	6220.58		6220.69	0.001546	2.66	114.52	30.94	0.24
Reach 1	977.55	2year	296.00	6215.95	6220.55		6220.65	0.001513	2.61	113.32	30.76	0.24
Reach 1	948.15	100year	856.00	6217.77	6221.28	6221.28	6222.60	0.028269	9.19	93.16	35.99	1.01
Reach 1	948.15	10year	304.00	6217.77	6219.74	6219.74	6220.51	0.032935	7.01	43.37	28.54	1.00
Reach 1	948.15	2year	296.00	6217.77	6219.71	6219.71	6220.47	0.033396	6.98	42.40	28.37	1.01
Reach 1	917.55	100year	856.00	6214.08	6218.76	6218.76	6220.38	0.030083	10.21	83.86	26.19	1.01
Reach 1	917.55	10year	304.00	6214.08	6216.93		6217.67	0.021635	6.92	43.91	19.48	0.81
Reach 1	917.55	2year	296.00	6214.08	6216.90		6217.62	0.021447	6.84	43.27	19.44	0.81
Reach 1	917.35	100year	856.00	6213.92	6218.47	6218.47	6220.28	0.027945	10.82	80.24	24.77	0.98
Reach 1	917.35	10year	304.00	6213.92	6217.03		6217.62	0.015050	6.14	49.51	19.77	0.68
Reach 1	917.35	2year	296.00	6213.92	6217.00		6217.57	0.014891	6.06	48.81	19.72	0.68
Reach 1	892.65	100year	856.00	6213.06	6218.79		6219.51	0.007708	6.83	129.35	33.91	0.55
Reach 1	892.65	10year	304.00	6213.06	6217.12		6217.34	0.003893	3.76	80.90	25.05	0.37
Reach 1	892.65	2year	296.00	6213.06	6217.08		6217.30	0.003817	3.70	79.95	24.96	0.36
Reach 1	892.55	100year	856.00	6213.06	6218.79		6219.51	0.007700	6.83	129.37	33.97	0.55
Reach 1	892.55	10year	304.00	6213.06	6217.12		6217.34	0.003895	3.76	80.86	25.06	0.37
Reach 1	892.55	2year	296.00	6213.06	6217.08		6217.30	0.003819	3.70	79.90	24.97	0.37
Reach 1	877.31	100year	856.00	6214.39	6217.95	6217.95	6219.25	0.028267	9.15	93.53	36.44	1.01
Reach 1	877.31	10year	304.00	6214.39	6216.37	6216.37	6217.15	0.033248	7.10	42.83	27.86	1.01
Reach 1	877.31	2year	296.00	6214.39	6216.35	6216.35	6217.11	0.032809	7.01	42.25	27.74	1.00
Reach 1	862.55	100year	856.00	6210.14	6216.34		6217.20	0.013208	7.45	114.82	29.00	0.66
Reach 1	862.55	10year	304.00	6210.14	6214.38		6214.71	0.006893	4.56	66.72	21.53	0.46
Reach 1	862.55	2year	296.00	6210.14	6214.35		6214.66	0.006767	4.49	65.96	21.51	0.45
Reach 1	862.34	100year	856.00	6210.07	6216.40		6217.17	0.011468	7.08	120.93	29.49	0.62
Reach 1	862.34	10year	304.00	6210.07	6214.41		6214.69	0.005594	4.25	71.53	21.56	0.41
Reach 1	862.34	2year	296.00	6210.07	6214.37		6214.65	0.005480	4.18	70.76	21.54	0.41
Reach 1	837.65	100year	856.00	6210.38	6215.84		6216.85	0.012363	8.10	107.64	28.97	0.68
Reach 1	837.65	10year	304.00	6210.38	6214.23		6214.55	0.006043	4.48	67.88	22.10	0.45
Reach 1	837.65	2year	296.00	6210.38	6214.20		6214.50	0.005906	4.41	67.17	22.04	0.45
Reach 1	837.55	100year	856.00	6210.41	6215.81		6216.85	0.012766	8.19	106.39	28.77	0.69
Reach 1	837.55	10year	304.00	6210.41	6214.23		6214.54	0.006199	4.52	67.27	22.05	0.46
Reach 1	837.55	2year	296.00	6210.41	6214.20		6214.50	0.006059	4.45	66.56	21.99	0.45
Reach 1	727.54	100year	856.00	6210.55	6215.40		6215.73	0.005830	4.57	187.29	61.85	0.46
Reach 1	727.54	10year	304.00	6210.55	6213.35		6213.62	0.011596	4.14	73.48	47.16	0.58
Reach 1	727.54	2year	296.00	6210.55	6213.31		6213.57	0.012073	4.15	71.27	46.89	0.59
Reach 1	683.64	100year	856.00	6206.59	6215.31		6215.50	0.003126	3.51	244.15	72.31	0.34
Reach 1	683.64	10year	304.00	6206.59	6213.26		6213.36	0.002608	2.56	118.94	47.43	0.28
Reach 1	683.64	2year	296.00	6206.59	6213.21		6213.31	0.002574	2.53	116.83	46.66	0.28
Reach 1	683.32	100year	856.00	6206.52	6215.22		6215.49	0.002937	4.78	238.26	71.28	0.32
Reach 1	683.32	10year	304.00	6206.52	6213.22		6213.35	0.001853	3.04	117.97	47.05	0.24
Reach 1	683.32	2year	296.00	6206.52	6213.18		6213.31	0.001823	3.00	115.96	46.31	0.24

HEC-RAS Plan: CorrectedEffecttiveTown+BNSF LF River: IndustrialTrib 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	665.19	100year	856.00	6207.07	6215.09		6215.43	0.002973	5.20	216.71	61.94	0.36
Reach 1	665.19	10year	304.00	6207.07	6213.18		6213.32	0.001677	3.11	114.38	43.35	0.25
Reach 1	665.19	2year	296.00	6207.07	6213.14		6213.28	0.001648	3.06	112.61	42.86	0.25
Reach 1	665.09	100year	856.00	6207.08	6215.09		6215.43	0.002980	5.20	216.61	61.97	0.36
Reach 1	665.09	10year	304.00	6207.08	6213.18		6213.32	0.001684	3.11	114.27	43.35	0.25
Reach 1	665.09	2year	296.00	6207.08	6213.14		6213.28	0.001655	3.07	112.48	42.86	0.25
Reach 1	636.9	100year	856.00	6208.92	6213.98	6213.98	6215.17	0.019290	9.56	111.63	47.75	0.88
Reach 1	636.9	10year	304.00	6208.92	6212.32	6212.32	6213.13	0.025668	7.40	44.84	30.83	0.91
Reach 1	636.9	2year	296.00	6208.92	6212.28	6212.28	6213.09	0.025994	7.36	43.74	30.39	0.92
Reach 1	568.86	100year	856.00	6207.84	6211.33	6211.33	6212.81	0.011478	9.99	94.22	34.66	0.97
Reach 1	568.86	10year	304.00	6207.84	6210.27		6210.71	0.005656	5.40	59.40	30.68	0.64
Reach 1	568.86	2year	296.00	6207.84	6210.24		6210.67	0.005601	5.33	58.54	30.57	0.63
Reach 1	520.21	100year	856.00	6207.84	6211.08	6210.92	6212.11	0.009716	8.40	113.34	49.62	0.88
Reach 1	520.21	10year	304.00	6207.84	6209.59	6209.59	6210.25	0.015915	6.58	47.64	38.55	0.99
Reach 1	520.21	2year	296.00	6207.84	6209.57	6209.57	6210.22	0.015808	6.50	46.93	38.41	0.99
Reach 1	492.27	100year	856.00	6201.17	6211.72		6211.81	0.000200	2.53	415.85	69.87	0.15
Reach 1	492.27	10year	304.00	6201.17	6205.12		6205.35	0.002695	3.87	78.54	32.48	0.44
Reach 1	492.27	2year	296.00	6201.17	6205.00		6205.25	0.002918	3.96	74.78	31.74	0.45
Reach 1	462.31	100year	856.00	6200.88	6211.73		6211.80	0.000171	2.42	461.33	76.78	0.14
Reach 1	462.31	10year	304.00	6200.88	6205.08		6205.27	0.001847	3.53	86.83	33.96	0.37
Reach 1	462.31	2year	296.00	6200.88	6204.96		6205.16	0.002031	3.59	82.79	33.06	0.39
Reach 1	462.21	100year	856.00	6200.88	6211.72		6211.80	0.000181	2.56	461.01	76.77	0.14
Reach 1	462.21	10year	304.00	6200.88	6205.06		6205.27	0.001705	3.68	86.26	33.89	0.37
Reach 1	462.21	2year	296.00	6200.88	6204.94		6205.16	0.001850	3.73	82.24	32.99	0.38
Reach 1	396.14	100year	856.00	6197.04	6211.51	6202.40	6211.77	0.000295	4.08	210.05	175.80	0.19
Reach 1	396.14	10year	304.00	6197.04	6205.09	6200.08	6205.20	0.000303	2.72	111.95	48.29	0.18
Reach 1	396.14	2year	296.00	6197.04	6204.98	6200.04	6205.09	0.000303	2.69	110.19	47.76	0.18
Reach 1	341.14		Culvert									
Reach 1	275.31	100year	856.00	6192.10	6202.44	6199.07	6203.53	0.002356	9.31	109.59	32.11	0.52
Reach 1	275.31	10year	304.00	6192.10	6196.48	6196.19	6197.67	0.007817	9.38	38.99	19.57	0.81
Reach 1	275.31	2year	296.00	6192.10	6196.38	6196.12	6197.58	0.008191	9.44	37.71	19.34	0.83
Reach 1	261.46	100year	856.00	6191.29	6202.88	6197.64	6203.06	0.000529	4.04	279.67	51.92	0.22
Reach 1	261.46	10year	304.00	6191.29	6196.84	6195.13	6197.19	0.002557	4.99	73.20	29.13	0.42
Reach 1	261.46	2year	296.00	6191.29	6196.73	6195.08	6197.10	0.002676	5.02	70.16	28.79	0.43
Reach 1	209.5		Culvert									
Reach 1	156.67	100year	856.00	6191.15	6196.88	6196.88	6198.56	0.011278	11.20	90.54	41.51	0.94
Reach 1	156.67	10year	304.00	6191.15	6195.00	6195.00	6195.91	0.011874	7.93	43.42	32.70	0.88
Reach 1	156.67	2year	296.00	6191.15	6194.94	6194.94	6195.86	0.012346	7.96	42.00	32.40	0.90
Reach 1	134.36	100year	856.00	6190.78	6196.84	6195.96	6197.64	0.005326	7.68	133.98	43.37	0.66
Reach 1	134.36	10year	304.00	6190.78	6194.91	6194.40	6195.35	0.006201	5.50	60.99	32.77	0.64
Reach 1	134.36	2year	296.00	6190.78	6194.87	6194.37	6195.30	0.006275	5.47	59.65	32.57	0.65
Reach 1	84.26	100year	856.00	6191.00	6195.71	6195.71	6197.18	0.012673	9.76	89.26	32.96	0.98
Reach 1	84.26	10year	304.00	6191.00	6193.93	6193.93	6194.83	0.016215	7.62	39.89	22.56	1.01
Reach 1	84.26	2year	296.00	6191.00	6193.89	6193.89	6194.78	0.016152	7.56	39.14	22.32	1.01
Reach 1	54.26	100year	856.00	6190.00	6195.91		6196.07	0.000828	3.28	283.76	83.93	0.27
Reach 1	54.26	10year	304.00	6190.00	6192.53		6192.84	0.006253	4.44	68.53	44.75	0.63
Reach 1	54.26	2year	296.00	6190.00	6192.47		6192.79	0.006677	4.50	65.77	44.16	0.65
Reach 1	0.00	100year	856.00	6188.32	6194.48	6193.36	6195.85	0.007521	9.43	94.02	19.88	0.71
Reach 1	0.00	10year	304.00	6188.32	6191.68	6191.08	6192.40	0.008914	6.79	44.77	15.74	0.71
Reach 1	0.00	2year	296.00	6188.32	6191.62	6191.03	6192.33	0.008999	6.75	43.82	15.70	0.71

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Brickyard_SplitFlow
Project File : ITT_SplitFlow.prj
Run Date and Time: 5/15/2025 3:43:11 PM

Project in English units

PLAN DATA

Plan Title: Existing_2020+2025 Low Flow
Plan File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.p05

Geometry Title: Existing1D_Restationed
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g19

Flow Title : 2020_Existing+2025 LF
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.f05

Plan Summary Information:

Number of:	Cross Sections	= 54	Multiple Openings	=	0
	Culverts	= 2	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

```
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow




FLOW DATA

Flow Title: 2020_Existing+2025 LF
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson
Models\ITT_Proposed\ITT_SplitFlow.f05

Flow Data (cfs)


  River           Reach           RS                100year          10year
 2year
  IndustrialTrib  Reach 1         1534.24               856             305
   296



Boundary Conditions


  River           Reach           Profile                       Upstream
    Downstream


  IndustrialTrib  Reach 1         100year
Known WS = 6194.48
  IndustrialTrib  Reach 1         10year
Known WS = 6191.68
  IndustrialTrib  Reach 1         2year
Known WS = 6191.62




GEOMETRY DATA
```

Geometry Title: Existing1D_Restationed
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g19

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1534.24

INPUT
Description: 47 - River STA 1536.29
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6255.7	.02	6255.7	7.14	6255.62	11.18	6255.56	13.69	6255.32
28.47	6254.59	31.35	6254.73	35.03	6252.94	40.24	6249.62	42.33	6248
50.9	6242.23	51.52	6241.8	51.84	6241.52	53.06	6240.51	57.48	6236.86
60.48	6235.36	60.84	6235.18	61.84	6234.65	62.33	6233.33	64.99	6226.47
67.4	6226.57	68.14	6226.6	68.51	6227.28	69.81	6232.67	72.48	6233.14
73.08	6233.24	75.47	6233.62	76.54	6233.86	88.19	6236.7	88.81	6236.84
90.54	6237.12	99.42	6238.29	103.93	6239.86	106.09	6240.55	106.54	6240.77
124.47	6251.85	124.58	6251.93	124.61	6251.94	124.64	6251.94	125.52	6251.98
146.84	6252.83								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	53.06	.035	106.54	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
53.06	106.54	49.2	48.84	48.48	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1485.4

INPUT
Description: 46 - River STA 1486.54
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.61	6.17	6253.44	11.35	6252.55	23.39	6245.55	27.06	6243.44
30.11	6242.22	44.06	6236.02	44.7	6235.74	46.83	6234.85	48.12	6234.82
51.32	6233.08	55.75	6232.46	57.37	6232.23	57.74	6232.18	59.24	6231.96
60.33	6231.81	62.7	6231.47	67.84	6234.7	68.39	6234.79	70.7	6234.92
79.38	6239.89	80.93	6240.76	81.72	6241.28	82	6241.47	82.11	6241.52
83.74	6242.21	84.65	6242.64	85.64	6243	87.68	6244.04	91.05	6246.45
91.97	6246.6	93.83	6247.24	97.1	6247.86	97.58	6247.89	98.01	6247.87
112.74	6244.08								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	30.11	.05	79.38	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
30.11	79.38		.2	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1485.2

INPUT
Description: 45 - River STA 1486.34
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.61	6.14	6253.44	11.41	6252.53	23.15	6245.71	27.11	6243.42
30.42	6242.11	44.43	6235.87	44.62	6235.75	44.8	6235.7	46.89	6234.82
48.34	6234.79	51.97	6232.83	56.02	6232.25	57.36	6232.07	57.85	6232
59.22	6231.8	60.22	6231.66	62.39	6231.35	67.72	6234.69	68.11	6234.76
70.64	6234.91	78.81	6239.58	80.72	6240.65	81.71	6241.31	82.06	6241.54
82.19	6241.59	84.21	6242.45	84.85	6242.75	85.54	6243	87.65	6244.08
90.88	6246.4	91.76	6246.54	93.55	6247.15	97.12	6247.83	97.51	6247.85
97.86	6247.84	112.73	6244.02						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	48.34	.05	67.72	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
48.34	67.72		22.87	24.7	26.53	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1460.5

INPUT
Description: 44 - River STA 1461.64
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6252.43	3.45	6252.29	12.65	6251.85	13.79	6251.71	16.05	6250.38
24.72	6246.77	36.12	6240.54	40.91	6236.03	46.69	6232.29	47.06	6232.09
47.18	6232.08	49.84	6231.12	50.15	6230.94	50.97	6230.83	55.27	6230.54
59.1	6230.28	59.16	6230.28	59.28	6230.3	65.58	6231.06	69.01	6231.37
71.36	6231.39	74.22	6232.84	75.19	6233.26	80.94	6236.06	88.49	6239.31
98.99	6237.21	99.68	6237	100.82	6237.04	104.64	6237.53	107.19	6237.64

```
  111.06 6237.78  112.31 6237.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.12     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.12   88.49              .09      .1     .11             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.31       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1460.4

INPUT
Description: 43 -  River STA 1461.54
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6252.43    3.68 6252.27   12.67 6251.85   13.79 6251.71      16 6250.41
    24.7 6246.79      36 6240.61    40.9    6236   46.47  6232.4   47.06 6232.08
   47.26 6232.06   49.61 6231.21   50.01 6230.98   51.08 6230.83   55.26 6230.55
   58.96  6230.3   59.18 6230.29   59.65 6230.38    65.5 6231.08   68.69 6231.38
   71.42  6231.4   74.21 6232.81   75.25 6233.26   80.81 6235.96   88.49 6239.27
   99.16 6237.13   99.69 6236.97  100.55    6237  104.67 6237.53  107.17 6237.63
  111.11 6237.78  112.31 6237.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      36     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            36   88.49             14.1   12.92   11.74             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.27       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1447.48

INPUT
Description: 42 - River STA 1448.51
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

```
       0 6251.56    11.9 6250.97   15.71 6250.01   17.78 6249.69    22.2 6248.89
   34.71 6239.62   37.97 6237.19   39.19 6236.27   42.86 6233.95   46.07 6232.22
   50.16 6231.72   58.37 6231.72   58.94 6231.61   59.29  6231.2   60.32 6231.06
   63.04  6231.7   73.31 6231.88   74.74 6232.62   76.53 6232.96   82.88 6235.44
   88.57 6236.04    88.9 6236.15   90.47 6236.48   93.34 6236.94  101.88 6237.31
  107.44 6237.51  110.57 6237.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   39.19     .05   88.57     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         39.19   88.57             15.62   13.44   11.27             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1434.04

INPUT
Description: 41 -  River STA 1435.13
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6250.39    1.48 6250.32   21.85 6248.52   22.66  6248.4   22.92 6248.35
   24.13 6247.45   31.48  6242.2   38.04  6237.5   39.36 6236.64   45.66 6232.48
   46.81 6232.15   47.91 6231.95   48.18 6231.89   49.02 6231.75   52.58 6227.98
   53.16 6227.93   61.78 6227.18   65.77 6228.34   72.17 6228.08   73.21 6231.58
   73.24 6231.65   73.26 6231.65    76.5 6232.44   76.64 6232.44   76.77 6232.48
   77.45 6232.77   84.65  6234.4   98.07 6236.81  110.17 6237.44

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   39.36     .05   98.07     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         39.36   98.07               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1433.84

INPUT
Description: 40 -  River STA 1434.93
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6250.38    1.31 6250.32   22.04 6248.49   22.71 6248.39   22.92 6248.35
   23.92  6247.6      30 6243.25   38.06 6237.48   39.68 6236.43   45.68 6232.47
```

```
   46.99 6232.08   48.24 6231.86   48.39 6231.83   48.85 6231.75   52.47 6227.93
   53.16 6227.87    61.8 6227.11   65.39 6228.16    72.1 6227.89   73.01 6230.95
    73.3 6231.65   73.55 6231.72   76.33 6232.39   76.55  6232.4   76.74 6232.46
   77.42 6232.74   84.49 6234.34    98.2 6236.81  110.15 6237.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   48.85     .05    73.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         48.85    73.3            24.56    24.7   25.32             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1409.14

INPUT
Description: 39 -  River STA 1410.22
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.43    8.02 6247.69   19.42 6246.71   21.94 6246.61   31.37 6243.23
   34.12 6241.28   38.08 6239.57    40.6 6236.68   41.52 6236.07   46.38 6233.15
   50.97 6230.01    52.6  6228.7   53.25 6228.09   54.84 6228.05   57.03    6228
   62.28 6227.68    67.7 6227.81   71.13 6227.83   74.98 6229.84   76.05 6230.04
   76.36  6230.1   77.04 6230.23   89.37 6232.85   90.87 6233.25  107.25 6235.71
   108.3 6236.08

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   46.38     .05   90.87     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         46.38   90.87              .1      .1     .12             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1409.04

INPUT
Description: 38 -  River STA 1410.12
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.42    8.29 6247.66   19.42  6246.7   21.87 6246.61   31.42 6243.18
   34.12 6241.26   38.12 6239.54    40.6  6236.7   41.54 6236.08   46.29 6233.22
      51    6230   52.54 6228.76   53.22 6228.12   54.85 6228.08   57.16 6228.02
    62.3 6227.72   67.61 6227.85   71.18 6227.86   74.96 6229.84   76.19 6230.06
```

```
   76.55 6230.13   77.33 6230.28   89.51 6232.87      91 6233.26  107.17  6235.7
   108.3 6236.09

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      51     .05   74.96     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            51   74.96             99.66  104.17  115.69             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1304.87

INPUT
Description: 37 -  River STA 1305.87
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.45    19.5 6234.33   26.36 6231.83   38.97 6229.48   44.01 6229.64
   46.14 6229.71   60.16  6229.7   61.35 6230.14   67.22 6231.54   70.71 6232.54
   75.23 6233.96   75.44 6234.41  105.01 6240.87  106.38 6241.05  107.98  6241.7
   115.4    6245

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    19.5     .05   75.44     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          19.5   75.44             91.64   97.32   94.38             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1207.55

INPUT
Description: 36 -  River STA 1208.71
Station Elevation Data    num=      37
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6243.32    4.44 6242.44   19.89 6234.98   21.22  6234.2   22.33 6233.65
   24.38 6232.13    35.5 6229.47   35.88 6229.36    37.3  6228.9   38.24 6228.54
   40.18 6228.18   40.44 6228.11   41.29 6227.85   45.69 6224.27   48.74 6223.47
    54.6 6223.48   56.27 6223.49   57.05 6223.49   64.32 6227.32   64.83 6227.37
   65.49 6227.66   67.01 6227.89   68.55 6228.61   75.21 6231.38   78.17 6232.71
   79.63 6233.35   80.07 6233.56   81.67 6234.66   84.08 6236.35   84.87  6236.7
   85.08 6236.71   86.03 6237.16   86.37 6237.58   93.83  6240.9   98.94 6241.67
  101.54  6242.6   101.7 6242.66
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   19.89     .05   81.67     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         19.89   81.67               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1207.35

INPUT
Description: 35 -  River STA 1208.51
Station Elevation Data    num=      37
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6243.38    4.31 6242.53   20.06 6234.92   21.42 6234.13   22.34 6233.67
   24.44 6232.12   35.28 6229.52   35.64 6229.42   37.32 6228.87   38.44 6228.45
   40.72 6228.03   40.87 6227.99   41.34 6227.84   45.93 6224.11    48.7 6223.38
   54.68 6223.39   56.27  6223.4   56.93  6223.4   63.62 6226.93   64.84 6227.05
   66.39 6227.73    66.9 6227.81   68.56 6228.58   74.49 6231.05   77.94  6232.6
   79.65 6233.34   80.16 6233.58    81.7 6234.65   84.04  6236.3    84.9 6236.68
   85.13 6236.69   86.17 6237.18   86.53 6237.63   93.86  6240.9   99.02 6241.67
  101.52 6242.57   101.7 6242.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   41.34     .05   63.62     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         41.34   63.62             24.08    24.7   25.32             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1182.65

INPUT
Description: 34 - River STA 1183.68
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.38    4.33 6239.32    17.4 6232.29   19.06 6231.84    19.8 6231.56
   24.89 6229.64   25.34  6229.4   25.36 6229.39   29.72 6228.27   32.79 6227.46
   33.54 6227.16   36.93 6224.64   40.52 6224.26   41.08 6224.17   43.82 6224.07
   47.99 6224.13   48.84 6224.15   52.87 6224.21   56.27 6224.81   59.15 6225.62
   60.29 6226.54   64.59 6228.12   65.79 6228.59   68.96 6229.93   72.09 6230.74
   74.51 6231.36   74.94 6231.58   76.51 6232.36   79.67 6233.16   81.57 6234.07
```

```
   83.63 6234.23   91.61 6238.41   92.17  6239.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   33.54     .05   60.29     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         33.54   60.29               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1182.55

INPUT
Description: 33 -  River STA 1183.58
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.39    4.06 6239.45   17.39 6232.29   19.08 6231.83   19.84 6231.55
   24.89 6229.64   25.36 6229.39   25.38 6229.38    29.7 6228.27   32.72 6227.47
   33.58 6227.12    36.9 6224.67    40.4  6224.3   40.98  6224.2   43.83 6224.09
   47.96 6224.16   48.74 6224.17    52.9 6224.23   56.21 6224.82   59.16 6225.65
   60.25 6226.52   64.57 6228.12   65.81  6228.6   68.88  6229.9    71.9 6230.67
   74.49 6231.34   74.95 6231.57   76.52 6232.35   79.67 6233.15   81.56 6234.06
   83.62 6234.22   91.64 6238.41   92.17 6239.16

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   33.58     .05   60.25     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         33.58   60.25             54.71   45.94   37.17             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1136.61

INPUT
Description: 32 -  River STA 1137.60
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6240.21    1.37 6239.57    3.61 6239.02   20.37 6230.23   24.82  6227.9
   25.95 6227.73   27.12 6227.53   29.61 6226.78   31.09 6226.36   36.79 6226.24
   40.11 6225.87   51.49  6224.6   56.52 6224.84   60.23  6225.5    65.8 6226.79
   71.22 6229.51   73.02 6230.21    73.7 6230.43   77.56 6230.84   86.41 6235.52
   94.53 6238.42  103.19 6239.77  106.48 6240.73     110 6242.41
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   20.37     .05    73.7     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         20.37    73.7             60.28   59.06   57.83             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1077.55

INPUT
Description: 31 -  River STA 1078.62
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6239.77     .29 6239.64    4.02 6238.47   11.47 6237.91   13.89 6237.77
   24.55 6233.58   25.51 6233.37   27.09 6232.21   28.45 6231.36   34.15 6227.78
   36.66 6226.74   38.77 6225.74   39.79 6225.82   41.39 6224.99   42.43 6224.48
   42.79 6223.62   43.92 6221.24   50.25 6220.67    53.1 6219.85   55.33 6220.37
   56.06 6220.36    66.5  6220.2   72.12 6223.32   73.95  6223.4   74.34 6224.42
   75.59 6224.59   77.33 6225.13    78.8 6225.38   84.17 6227.29   86.97 6228.04
  101.77 6233.58  108.96 6236.08  114.03 6236.83  120.11 6237.26  120.23 6237.28
  126.24 6239.18

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   25.51     .05  101.77     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.51  101.77               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1077.35

INPUT
Description: 30 -  River STA 1078.42
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6239.76     .38  6239.6    4.04 6238.45   11.38  6237.9   13.92 6237.75
   25.18 6233.32   25.63 6233.23   26.37 6232.68   28.44 6231.39   33.96 6227.92
   36.69 6226.79   38.94 6225.73    39.9  6225.8   41.73 6224.86    42.5 6224.47
   43.07 6223.12   44.03 6221.09   50.68  6220.5   53.02 6219.81   54.86 6220.25
   56.12 6220.23   66.36 6220.08    71.2 6222.76   73.97 6222.88   74.55 6224.43
   75.49 6224.55   77.37 6225.13   78.95  6225.4   84.12 6227.24   87.06 6228.02
  101.69 6233.49  109.05 6236.06  114.24 6236.83   120.2 6237.25  120.34 6237.27
```

```
   126.3 6239.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    39.9     .05   74.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          39.9   74.55            25.53    24.7   23.87             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1052.65

INPUT
Description: 29 -  River STA 1053.62
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6236.38     4.3 6236.03    6.15 6235.71    7.83 6234.91   19.89 6231.39
   20.26 6230.78   20.44 6230.88   21.24 6229.43   28.06 6226.45   35.01 6223.42
   36.84 6222.47   37.13 6222.37   37.18 6222.34   37.89 6221.82   40.23 6221.28
   45.98 6221.12   48.96 6221.03   49.12 6221.03   57.15 6220.77   63.16 6220.81
   64.81 6220.85   65.04 6221.02   67.47 6222.98   70.08 6223.74   71.53 6224.19
   74.17 6224.77   81.29 6226.43   83.72 6226.87   87.04 6228.31   98.26 6231.76
  104.25 6233.89  106.53 6234.25  111.15 6235.38  120.14 6237.92   121.9 6238.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   35.01     .05   67.47     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         35.01   67.47               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1052.55

INPUT
Description: 28 -  River STA 1053.52
Station Elevation Data    num=      34
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6236.38    4.35 6236.02    6.13 6235.71    7.75 6234.95   19.93 6231.39
   20.29 6230.79   20.47 6230.89   21.29 6229.42   27.54 6226.69   35.02 6223.42
   36.92 6222.44    37.2 6222.34   37.89 6221.84   40.05 6221.33   46.06 6221.17
   48.67 6221.09   49.11 6221.08    57.2 6220.81   62.92 6220.86   64.85  6220.9
   65.12  6221.1   67.44 6222.97    70.1 6223.75    71.5 6224.18   74.03 6224.73
   81.27 6226.43   83.73 6226.87    87.1 6228.33    98.5 6231.84  104.25 6233.88
```

```
  106.44 6234.22  110.86 6235.31   120.3 6237.98   121.9 6238.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   35.02     .05   67.44     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         35.02   67.44            23.75   23.06   22.36             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1029.49

INPUT
Description: 27 -  River STA 1030.52
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6234.96     1.6 6234.75   13.23 6232.09   23.42 6226.58   24.53 6226.12
   30.06 6227.36   30.78 6226.05   36.65 6223.45   37.89  6222.8   49.54 6222.03
   51.28 6221.92   52.52 6221.57   54.02 6221.49   61.29 6221.41   63.06 6221.37
   63.44  6221.4   68.43 6223.17   70.53 6223.88   74.83 6224.81   77.95  6225.5
   85.26 6226.84   93.91 6230.63   98.19 6232.19  105.11 6234.23  120.87 6238.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   30.06     .05   85.26     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         30.06   85.26            27.45   26.94   26.44             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0   30.06 6227.36       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1002.55

INPUT
Description: 26 -  River STA 1003.79
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6232.8    5.46  6231.2    5.62 6231.15     5.7 6231.13   15.71 6229.44
   31.21 6224.37   32.64 6224.03   38.51 6221.92   38.52 6221.91   38.56 6221.91
   41.58 6221.44   42.56  6221.1   42.73  6220.3   43.81 6220.18   49.63 6215.97
    50.8 6215.65   51.53 6215.65   58.41 6215.69   60.29 6216.21   61.89 6217.66
   64.09 6219.72   65.48 6219.63   66.13 6221.03   66.83  6221.1   68.64  6221.7
```

```
   69.16 6221.84   69.65 6221.98   71.04 6222.67   75.21 6223.53   82.86 6225.21
   85.53 6225.88   94.19 6227.89   94.56 6227.99   95.71 6228.42   111.3 6234.28
   112.8 6234.86  113.48 6235.11  119.42 6237.78  120.19 6237.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   15.71     .05   95.71     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         15.71   95.71               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1002.35

INPUT
Description: 25 -  River STA 1003.59
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6232.77    5.02 6231.31    5.54 6231.13    5.81 6231.08   15.61 6229.42
   30.78 6224.46   32.49 6224.06    38.2    6222   38.53  6221.9   39.34 6221.75
   41.72 6221.38   42.49 6221.11    42.8 6219.65   44.76 6219.44   49.75 6215.83
   50.75 6215.56   51.53 6215.56   58.49  6215.6   60.13 6216.06   61.52 6217.32
   63.44 6219.12   65.48 6218.99   66.43 6221.04   66.94 6221.08   68.92 6221.74
   69.14  6221.8   69.66 6221.95   71.13 6222.68   75.18 6223.51   82.59 6225.15
    85.5 6225.88    93.9 6227.83   94.38 6227.93   94.48 6227.96  111.05 6234.19
  112.84 6234.88  113.66 6235.18  119.43 6237.78  120.19 6237.85

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.49     .05   66.43     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.49   66.43            25.09    24.7   24.31             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 977.65

INPUT
Description: 24 -  River STA 978.80
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.78     .55 6229.56    1.75 6229.36    12.9 6226.81   24.14 6223.91
   24.79 6223.75   25.47 6223.54   36.78 6220.31   38.16 6218.74   41.87 6216.15
   48.08 6215.94   50.88 6216.03   56.12 6216.21   62.63 6216.21   64.79 6218.66
```

```
   67.14 6220.99   68.28 6221.57   70.78 6222.71   71.87 6223.14   77.18 6224.68
   86.78 6227.87   87.97 6228.12    90.8 6229.13  100.09 6232.16  103.46 6233.37
  105.98 6233.83   106.6 6234.05  115.98 6236.54  118.01 6237.27  119.64 6237.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.78     .05   67.14     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.78   67.14               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 977.55

INPUT
Description: 23 -  River STA 978.70
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.78     .57 6229.55    1.69 6229.37   12.91 6226.79   24.23 6223.88
   24.78 6223.75   25.35 6223.57   36.77  6220.3   38.07 6218.82   41.88 6216.17
   48.23 6215.95   50.88 6216.04   55.97 6216.21   62.61 6216.22    64.7 6218.58
   67.12 6220.99    68.3 6221.58   70.76 6222.71   71.88 6223.14   77.14 6224.67
    86.8 6227.89   87.96 6228.13   90.74 6229.11   99.84 6232.09   103.4 6233.36
  106.04 6233.85   106.7 6234.07  115.99 6236.54     118 6237.27  119.64 6237.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.77     .05   67.12     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.77   67.12            28.43    29.4   30.37             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 948.15

INPUT
Description: 22 -  River STA 949.15
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.82   13.45 6224.96   20.15 6223.48   21.13 6223.34    21.5 6223.07
   23.79 6222.28   29.22 6220.35   36.12 6218.05   46.64 6217.98   47.82  6217.9
   49.73 6217.87   55.54 6217.77   58.29 6219.08   65.07 6222.56   67.64 6223.25
   69.55 6224.44   69.73 6224.67   70.35 6225.33   80.59 6228.16   82.58 6228.57
   83.05 6228.79   85.79 6229.72   91.27 6231.42   92.34 6231.79   99.82 6233.25
```

```
  114.05 6236.05  114.56  6236.1  116.68 6236.87  119.43 6237.55

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   13.45     .05   70.35     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         13.45   70.35            29.94    30.6   31.27             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 917.55

INPUT
Description: 21 -  River STA 918.80
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6229.1    9.47 6225.42   15.82 6223.71   16.19 6223.75   16.62 6223.65
   16.75 6223.63   23.61 6222.43   31.18 6219.85   33.72 6219.17   36.19  6218.2
   36.37  6218.2   36.94  6217.9   40.32 6214.09   45.72 6214.08      50 6214.59
   52.48 6214.88   56.67 6215.21   57.58 6217.76   57.67 6217.79    60.8 6218.69
   61.08 6218.83   66.79 6221.71   74.44 6223.82    74.7 6223.88   75.55 6224.43
   88.37 6229.35   90.84 6228.98   96.79 6231.09  114.89 6234.36  114.94 6234.37
  115.08 6234.39  116.91 6234.62  117.22 6234.72  117.89 6234.94     120 6235.49

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    9.47     .05   75.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9.47   75.55               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 917.35

INPUT
Description: 20 -  River STA 918.60
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.06    9.26 6225.46   15.79  6223.7   16.17 6223.74   16.61 6223.64
   16.74 6223.62   23.49 6222.44   31.28 6219.79    33.7 6219.15   36.45 6218.06
   36.55 6218.06   36.85  6217.9   40.37 6213.92   46.01 6213.92      50 6214.38
   52.12 6214.63   56.65    6215   57.51 6217.39   57.59 6217.75    59.6  6218.3
   60.74 6218.63   60.82 6218.67   66.86 6221.72   74.36 6223.78   74.67 6223.86
   75.69 6224.51   88.34 6229.37   90.86 6228.99   96.72 6231.07  114.56 6234.29
```

```
   114.8 6234.33  115.39 6234.43  116.97 6234.62  117.23 6234.72   117.8  6234.9
     120 6235.48

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.85     .05   57.59     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.85   57.59             21.96    24.7   27.44             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 892.65

INPUT
Description: 19 -  River STA 893.78
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51    2.34 6228.53   20.68 6223.46   21.93  6223.6   22.22 6223.53
   28.27 6221.78   42.06 6217.21   45.29 6214.39   46.18 6213.37   52.21 6213.13
   56.69 6213.06   57.75 6213.06   62.29 6213.07   63.25 6214.03   63.28    6214
   68.09 6217.82   70.36 6218.53   72.33 6219.14   76.82  6219.8   79.14 6220.29
   79.43 6220.35   81.05 6221.36   99.29 6228.03  103.24 6228.22  111.66 6229.35
  114.57 6230.15  127.72 6232.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.06     .05   68.09     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.06   68.09               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 892.55

INPUT
Description: 18 -  River STA 893.68
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51     2.3 6228.55   20.72 6223.46   21.97 6223.59   22.24 6223.53
   27.91 6221.89   42.13 6217.19   45.45 6214.27   46.24 6213.38   52.38 6213.13
    56.6 6213.06   57.78 6213.06   62.34 6213.08    63.2 6213.93   63.22 6213.91
   68.15 6217.82   70.36 6218.51   72.38 6219.14   76.98 6219.82    79.2 6220.28
   79.48 6220.34   81.02  6221.3   99.37 6228.01  103.25 6228.19  111.75 6229.34
  114.69 6230.14  127.77  6232.7
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	42.13	.05	68.15	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
42.13	68.15		14.37	15.24	13.68	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 877.31

INPUT
Description: 17 - River STA 878.34
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.69	3.6	6227.24	14.73	6225.3	22.41	6223.17	24.18	6222.74
26.05	6222.29	38	6218.59	48.64	6215.29	49.15	6215.16	50.83	6214.59
50.87	6214.52	51.34	6214.46	52.13	6214.39	60.86	6214.44	61.68	6214.51
62.42	6214.57	64.07	6214.57	69.16	6214.6	70.01	6215.01	78.21	6218.71
78.67	6218.85	79.36	6218.96	86.12	6220.17	87.3	6220.75	87.73	6220.96
90.39	6221.59	103.41	6225.41	111.02	6227.77	120.17	6229.17	123.11	6230.04
126.11	6230.84	133.13	6232.67						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	38	.05	78.21	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
38	78.21		18.28	14.76	13.03	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 862.55

INPUT
Description: 16 - River STA 863.56
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6230.45	5.47	6227.6	9.78	6225.72	23.62	6222.39	24.13	6222.26
28.67	6221.54	36.08	6220.52	37.04	6220.28	39.88	6219.39	46.29	6218.48
58.32	6216.49	58.6	6216.34	59.01	6216.19	59.61	6215.97	61.28	6215.26
62	6215.03	62.32	6213.87	62.81	6211.01	68.36	6211.13	71.05	6210.14
71.25	6210.22	74.79	6211.49	82.39	6211.6	83.45	6212.99	83.81	6214.93
84.44	6215.01	85.82	6215.28	86.78	6216.05	89.78	6217.1	96.66	6221.06
98.57	6221.43	100.92	6221.72	101.35	6221.85	108.24	6223.34	122.62	6227.03

```
  133.65 6229.86  134.25 6230.05  134.59  6230.1  134.71 6230.14  135.79 6230.42
  141.76 6231.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   58.32     .05   89.78     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.32   89.78              .21     .21      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 862.34

INPUT
Description: 15 -  River STA 863.35
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6230.43    5.36 6227.63    9.77 6225.71   23.52  6222.4   24.13 6222.25
    29.5  6221.4   36.22 6220.47    37.1 6220.26   39.68 6219.45   45.49 6218.62
   58.29  6216.5   58.57 6216.36   59.08 6216.17   59.67 6215.95   61.51 6215.16
   62.03    6215   62.55 6213.16   62.96 6210.77   68.84  6210.9    71.1 6210.07
   71.33 6210.15   74.25 6211.21   82.55 6211.33   83.39 6212.44   83.85  6214.9
   84.06 6214.93   86.01  6215.3   86.89 6216.01   89.63 6216.97   96.81 6221.09
   98.22 6221.37  100.93 6221.71  101.42 6221.85  108.22 6223.32  122.94  6227.1
  134.22 6229.99  134.53 6230.09  134.71 6230.12  134.78 6230.14  135.35 6230.29
  141.76  6231.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   58.29     .05   89.63     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.29   89.63              21.8   24.69   27.91             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 837.65

INPUT
Description: 14 -  River STA 838.76
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.46    9.95  6225.1   15.15 6223.85   24.89 6221.38   29.15 6220.71
   56.15 6218.05   56.62 6217.98   56.63 6217.97   56.78 6217.92   57.62 6217.67
   58.78 6217.42   67.66 6215.19   68.01 6215.04   69.12 6214.57   72.04  6210.9
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   73.06 6210.38   79.92 6210.59   84.45 6210.72    85.9 6210.45   87.13 6210.74
   88.95 6211.93   89.13 6212.17   92.86 6215.43   96.31 6216.63   99.58 6218.35
  104.31 6219.74  106.61 6221.48  128.77 6228.21  132.31 6229.18  134.17 6229.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   69.12     .05   92.86     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         69.12   92.86               .1      .1     .09             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 837.55

INPUT
Description: 13 -  River STA 838.66
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.46    9.94  6225.1    15.1 6223.85   24.89 6221.38    29.1 6220.71
   56.25 6218.04   56.61 6217.98   56.62 6217.98   56.73 6217.94   57.37 6217.75
   58.26 6217.56   67.62 6215.21      68 6215.05   69.16 6214.56      72 6210.98
   73.12 6210.41   79.93 6210.61   84.35 6210.74   85.86 6210.46   87.14 6210.76
   89.03    6212   89.22 6212.25   92.84 6215.42   96.33 6216.63   99.55 6218.33
  104.31 6219.73  106.63 6221.48  128.89 6228.24  132.31 6229.18  134.13  6229.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   69.16     .05   92.84     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         69.16   92.84            98.07  110.01  124.19             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 727.54

INPUT
Description: 12 - River STA 728.42
Station Elevation Data    num=      43
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6227.72     .66 6227.43    3.91  6226.4   12.55 6224.22   13.48 6223.96
   16.71 6222.71   36.28 6217.25   39.61 6215.21   40.27 6214.82   44.33 6212.53
   45.22 6212.38   45.63 6212.29      46  6213.1    49.9 6212.34    58.4 6210.55
   63.53 6211.03   66.58 6211.22   67.72 6212.31   68.08 6212.49   70.81 6212.52
   71.66 6212.66   73.16 6212.88   73.91  6211.8   74.22 6211.28   75.36 6211.31
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   77.86  6210.6   78.04 6210.64   86.08 6212.39   91.18 6213.63   93.32 6213.91
   93.69 6213.96   99.76 6214.62     105 6217.56  108.34 6219.44  108.48  6219.5
   109.7 6220.01  111.17 6220.36   132.4 6226.23  133.89 6226.38  135.19 6226.54
  151.08 6228.11  174.11  6229.3  179.56  6229.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.28     .05     105     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.28     105            47.93    43.9   36.64             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 683.64

INPUT
Description: 11 - River STA 685.06
Station Elevation Data    num=      50
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6227.64   13.84 6221.66    16.9 6220.15   18.79 6219.48   20.21 6218.97
   23.17 6217.95   23.61 6217.83   25.32 6217.28   42.16 6213.94   46.88  6212.9
   46.95 6212.89   47.32 6213.02    50.3 6211.52    50.6 6210.78   50.92 6210.05
   51.93 6207.65   52.21 6206.83   52.52 6206.72   54.69 6206.59   62.11 6206.66
   62.56 6206.67   62.86 6206.85   64.04 6208.03   64.08 6209.72   65.12 6211.63
   67.26 6211.54   67.52  6211.5    78.2 6212.12   78.41 6212.12   78.81 6212.15
   78.95 6212.17   79.64 6212.23   93.64 6213.33   95.43 6213.48  100.12 6213.98
  103.74 6214.63  115.06 6216.65  115.83 6216.81  116.34 6218.13  123.05 6219.64
  141.68 6222.16  141.98 6222.19  142.73 6222.24  153.22 6223.94  156.36 6224.34
  163.91 6225.17  170.89 6226.05  185.46  6229.3  191.59 6229.69  194.43    6230

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   25.32     .05  115.83     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.32  115.83              .31     .32     .31             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 683.32

INPUT
Description: 10 -  River STA 684.74
Station Elevation Data    num=      48
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
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       0 6227.74   13.99 6221.69   17.21 6220.11   18.12 6219.79   19.82 6219.18
    23.4 6217.94   23.79 6217.83   25.35 6217.33   40.63  6214.3   46.91 6212.92
   47.13 6212.87   47.49    6213   50.32 6211.57   50.93 6210.07   52.36 6206.61
   54.69 6206.73   59.74 6206.52   62.13 6206.54   62.65 6206.54   62.76 6206.61
   63.16 6207.01   63.17 6207.59   65.36  6211.6   67.39 6211.52   67.64 6211.48
   77.74 6212.06   78.07 6212.06   78.69 6212.12    78.9 6212.14   79.97 6212.23
   93.58  6213.3   95.55 6213.47  100.35 6213.98  104.15 6214.66  114.77 6216.56
  115.91 6216.79   116.4 6218.08  123.34 6219.64  141.74 6222.13   142.1 6222.16
  143.01 6222.23  153.38 6223.91  156.84 6224.35  164.21 6225.15  171.03 6226.02
  185.85 6229.32  192.08 6229.71  194.64    6230

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   47.49     .05   65.36     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         47.49   65.36             25.73   18.13   16.63             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 665.19

INPUT
Description: 9 -  River STA 666.23
Station Elevation Data    num=      37
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6228.22    6.37 6228.13   12.43  6227.5   18.68 6225.07   20.15 6224.36
   30.03 6221.19   30.27    6221   34.65 6219.15   39.63 6216.92   53.16  6211.5
   55.91  6210.4   59.28 6207.36   59.47 6207.08   59.95 6207.07   64.56  6207.2
   67.56 6207.28   67.67 6207.37   67.96 6207.58   72.32    6211   74.36 6211.25
   83.82 6212.31   91.44 6213.09   99.85 6213.98  104.47  6214.8   111.3 6216.01
  114.49 6216.67  114.89 6217.74  123.45 6219.63  139.41 6221.75  140.53 6221.84
  143.44 6222.05  152.25 6223.43  160.72 6224.46   165.3 6224.94  169.24 6225.42
  189.24 6229.79   191.7 6229.95

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   53.16     .05   72.32     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.16   72.32               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 665.09
```

INPUT
Description: 8 - River STA 666.13
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.21	6.38	6228.13	12.46	6227.49	18.66	6225.08	20.12	6224.38
29.92	6221.23	30.16	6221.04	34.5	6219.21	39.44	6216.99	53.17	6211.5
55.93	6210.4	59.34	6207.32	59.5	6207.08	59.89	6207.08	64.57	6207.21
67.36	6207.29	67.59	6207.29	67.6	6207.3	67.65	6207.34	72.32	6210.99
74.55	6211.27	83.85	6212.31	91.35	6213.08	99.87	6213.98	104.55	6214.81
111.16	6215.98	114.47	6216.67	114.86	6217.73	123.49	6219.63	139.38	6221.74
140.51	6221.83	143.48	6222.05	152.25	6223.42	160.83	6224.46	165.35	6224.93
169.24	6225.41	189.32	6229.8	191.71	6229.96				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	53.17	.05	72.32	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
53.17	72.32	30.04	28.19	32.96	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 636.9

INPUT
Description: 7 - River STA 637.93
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6225.92	11.72	6225.58	13.16	6225.08	16.87	6223.52	43.24	6213.76
48.21	6211.92	56.26	6208.94	57.31	6208.93	58.61	6208.92	60.57	6209.89
64.58	6211.14	67.42	6211.35	72.35	6211.72	84.04	6212.96	86.74	6213.29
90.37	6213.97	101.66	6218.61	113.32	6218.63	117.42	6219.58	120.51	6220
125.39	6220.45	136.52	6221.39	139.86	6221.96	152.05	6223.63	159.84	6225.1
177.52	6229.13	180.93	6229.89	182.56	6229.97				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	48.21	.05	67.42	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
48.21	67.42	76.21	68.04	60.72	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 568.86

INPUT
Description: 6 - River STA 569.75
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.24	7.27	6223.18	9.42	6222.97	19.88	6219.54	31.06	6215.88
47.24	6208.55	48.18	6208.12	60.36	6207.84	61.09	6207.84	64.11	6207.85
67.78	6208.01	68.37	6208.13	71.41	6208.78	71.89	6209.04	74.89	6210.68
86.52	6219.38	94.45	6218.47	100.35	6217.47	103.36	6217.64	122.91	6219.77
136.24	6221.87	146.66	6223.91	157.31	6226.34	165.27	6228.24	169.32	6229.13
171.32	6229.24	172.51	6229.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	47.24	.035	71.89	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
47.24	71.89	54.65	48.65	54.29	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 520.21

INPUT
Description: 5 - River STA 521.25
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.67	2.93	6222.64	21.26	6222.44	37.69	6222.29	56.75	6222.17
56.95	6222.17	90	6222.06	94.67	6222.11	98.9	6221.64	101.54	6221.13
119.46	6214.56	137.46	6209.93	140.56	6209.13	140.82	6209.06	143.4	6208.56
143.63	6208.52	147.95	6208.2	152.16	6208.14	153.67	6208.04	156.16	6208.08
160.16	6208.14	160.4	6208.14	161.65	6207.84	167.17	6208.08	171.55	6208.35
171.72	6208.39	173.88	6208.62	173.94	6208.63	186.72	6212.24	189.3	6213.32
195.28	6215.55	202.57	6217.77	207.61	6218.49	208.66	6218.66	213.39	6219.24
219.65	6219.99	220.29	6220.18	229.67	6222.94	234.45	6224.09	239.7	6226.01
243.14	6226.65								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	140.56	.035	173.88	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
140.56	173.88	31.24	27.94	24.62	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 492.27

INPUT
Description: 4 - River STA 493.24
Station Elevation Data   num=   29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.06	10.02	6222.5	13.86	6222.24	17.07	6221.93	22.54	6221.47
32.61	6221.21	38.98	6221.14	54.09	6220.93	69.28	6215.67	92.11	6207.17
97.88	6205.23	109.2	6202.13	110.1	6201.82	112.14	6201.23	112.64	6201.17
112.98	6201.21	117.28	6201.37	119.05	6201.18	120.38	6201.22	120.77	6201.36
131.01	6205.21	133.88	6206.49	143.05	6209.44	172.25	6219.38	176.51	6220.96
190	6223.27	196.87	6226.38	198.41	6226.67	200.2	6227.02		

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	97.88	.035	131.01	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
97.88	131.01	13.36	29.96	26.32	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1   RS: 462.31

INPUT
Description: 3 - River STA 462.86
Station Elevation Data   num=   30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.69	9.1	6222.23	12.67	6221.98	25.14	6221.23	28.56	6220.85
45.11	6220.41	46.27	6220.27	47.08	6220.16	75.77	6209.66	84.79	6206.69
92.75	6204.84	96.45	6203.78	104.41	6201.43	105.27	6201.17	112.89	6200.88
113.62	6200.97	115.24	6201.21	120.56	6203.05	122.49	6203.88	123.51	6204.4
123.54	6204.41	148.27	6212.15	159.81	6216.08	167.75	6218.63	168.74	6219.04
171.14	6219.68	177.4	6221.44	186.43	6225.29	189.27	6226.28	193.11	6226.73

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.75	.035	123.54	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
92.75	123.54	.1	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1   RS: 462.21

INPUT

Description: 2 - River STA 462.76
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.69	9.24	6222.23	12.78	6221.98	25.13	6221.24	28.69	6220.84
45.1	6220.4	46.28	6220.26	47.11	6220.15	75.65	6209.71	84.82	6206.69
92.92	6204.8	96.49	6203.78	104.47	6201.43	105.31	6201.17	112.89	6200.88
113.6	6200.97	115.33	6201.23	120.57	6203.04	122.5	6203.87	123.52	6204.39
148.59	6212.24	160.28	6216.22	167.73	6218.61	168.66	6218.99	171.18	6219.67
177.42	6221.43	186.56	6225.32	189.31	6226.28	193.15	6226.73		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	96.49	.035	122.5	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
96.49	122.5	56.27	66.07	80.58	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 396.14

INPUT
Description: 1 - River STA 394.55
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.55	4.3	6223.66	4.86	6223.67	26.71	6217.95	39	6214.01
55.63	6207.48	65.65	6207.33	69.85	6208.37	70.21	6208.48	71.87	6208.43
73.83	6208.45	96.54	6207.45	98.99	6207.49	105.97	6208.45	109.39	6208.33
140.04	6208.17	144.29	6207.83	145.76	6206.97	146.68	6208.3	146.89	6208.37
150.59	6208.97	175.51	6198.97	182.63	6198.05	184.27	6197.09	185.64	6197.04
193.23	6198.01	211.5	6206.45	222.93	6212.43	233.37	6213.53	259	6215.6
273.8	6216.35	298.58	6219.78	300.79	6219.76	300.95	6219.76	301.01	6219.77
301.03	6219.83	301.79	6221.64	302.38	6221.66	303.91	6222.79	305.13	6223.82
305.75	6223.55	306.11	6223.84	307.58	6223.94	307.68	6223.98		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	150.59	.035	222.93	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
150.59	222.93	118.73	120.83	120.96	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	180.55	6220.74	F
195.83	307.68	6220.74	F

CULVERT

RIVER: IndustrialTrib
REACH: Reach 1 RS: 341.14

INPUT
Description: 282.06 0.4
Distance from Upstream XS = 30
Deck/Roadway Width = 50
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 7

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6220.74		55.63	6221.1		145.76	6221.5	
175.51	6221.8		182.63	6221.9		193.23	6222	
307.68	6224.19							

Upstream Bridge Cross Section Data
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.55	4.3	6223.66	4.86	6223.67	26.71	6217.95	39	6214.01
55.63	6207.48	65.65	6207.33	69.85	6208.37	70.21	6208.48	71.87	6208.43
73.83	6208.45	96.54	6207.45	98.99	6207.49	105.97	6208.45	109.39	6208.33
140.04	6208.17	144.29	6207.83	145.76	6206.97	146.68	6208.3	146.89	6208.37
150.59	6208.97	175.51	6198.97	182.63	6198.05	184.27	6197.09	185.64	6197.04
193.23	6198.01	211.5	6206.45	222.93	6212.43	233.37	6213.53	259	6215.6
273.8	6216.35	298.58	6219.78	300.79	6219.76	300.95	6219.76	301.01	6219.77
301.03	6219.83	301.79	6221.64	302.38	6221.66	303.91	6222.79	305.13	6223.82
305.75	6223.55	306.11	6223.84	307.58	6223.94	307.68	6223.98		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	150.59	.035	222.93	.05

Bank Sta: Left Right Coeff Contr. Expan.
150.59 222.93 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	180.55	6220.74	F
195.83	307.68	6220.74	F

Downstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6220.51		107.55	6221.8		264.98	6223.88	

Downstream Bridge Cross Section Data
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.28	6.64	6215.96	9.21	6215.91	9.65	6215.86	11.48	6215.84
30.6	6216.17	34.13	6216.54	62.17	6216.1	64.73	6216.28	65.91	6216.33

```
   69.01 6216.43    75.6 6216.95   78.78 6216.93   84.77 6216.49   85.75 6216.42
   87.57 6216.02    87.9 6216.89   88.19 6218.74   90.03 6219.67    90.3    6219
   91.52 6214.74   92.13 6214.44   93.61 6213.49  103.71 6207.26  109.15 6201.97
  118.08    6194  119.14  6192.1  122.43 6192.16  124.01 6192.28  125.56 6193.36
  128.97 6194.34  129.87 6194.97  133.54 6195.52  134.38    6196   142.1 6203.76
   146.1    6207  146.28  6207.1  152.77  6207.8  165.56 6208.01  174.32 6208.86
  184.53 6208.63  185.19  6208.7  185.46 6208.71  200.64  6210.3  211.16 6210.36
  214.09 6210.23  221.31 6210.95  225.92 6212.93  226.45 6213.11  226.68 6213.25
  235.41 6217.68  235.91 6217.91   236.8 6218.22  242.54 6220.15  245.68 6221.15
  247.85 6221.65  254.66 6223.66  260.08 6224.86  266.87 6226.55  269.25    6227

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  118.08    .035  125.56     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        118.08  125.56             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  119.14 6220.85       F
     131  269.25 6220.85       F

Upstream Embankment side slope              =       1 horiz. to 1.0 vertical
Downstream Embankment side slope            =       1 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         = 6218.24
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #2      Circular       4       4
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 4  111.37     .013     .013        0                   .5
      1
Upstream   Elevation =  6204.65
           Centerline Station =  188.17
Downstream Elevation =  6202.07
           Centerline Station =  128.18

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       7       7
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
```

```
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 3  112.43     .013     .013        0                   .5
      1
Upstream   Elevation =  6197.63
           Centerline Station =  188.17
Downstream Elevation =  6193.24
           Centerline Station =  124.27

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 275.31

INPUT
Description: River STA 273.84
Station Elevation Data    num=      60
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6216.28    6.64 6215.96    9.21 6215.91    9.65 6215.86   11.48 6215.84
    30.6 6216.17   34.13 6216.54   62.17  6216.1   64.73 6216.28   65.91 6216.33
   69.01 6216.43    75.6 6216.95   78.78 6216.93   84.77 6216.49   85.75 6216.42
   87.57 6216.02    87.9 6216.89   88.19 6218.74   90.03 6219.67    90.3    6219
   91.52 6214.74   92.13 6214.44   93.61 6213.49  103.71 6207.26  109.15 6201.97
  118.08    6194  119.14  6192.1  122.43 6192.16  124.01 6192.28  125.56 6193.36
  128.97 6194.34  129.87 6194.97  133.54 6195.52  134.38    6196   142.1 6203.76
   146.1    6207  146.28  6207.1  152.77  6207.8  165.56 6208.01  174.32 6208.86
  184.53 6208.63  185.19  6208.7  185.46 6208.71  200.64  6210.3  211.16 6210.36
  214.09 6210.23  221.31 6210.95  225.92 6212.93  226.45 6213.11  226.68 6213.25
  235.41 6217.68  235.91 6217.91   236.8 6218.22  242.54 6220.15  245.68 6221.15
  247.85 6221.65  254.66 6223.66  260.08 6224.86  266.87 6226.55  269.25    6227

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  118.08    .035  125.56     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        118.08  125.56            14.42   13.85   12.15             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  119.14 6220.85       F
     131  269.25 6220.85       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 261.46
```

```
INPUT
Description: River STA 259.99
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6209.55    7.08    6211    9.06 6211.41    9.22 6211.42   15.16 6211.42
   19.44 6211.43   19.59  6211.4   20.26    6211   48.05    6196   50.87 6194.49
   51.09 6194.48   52.18 6194.46   53.22 6191.29    59.1 6191.85    60.3 6192.37
   64.78 6194.79   65.01    6195   65.38 6195.32   70.75 6196.11    75.1 6196.48
   76.44 6197.39   77.87    6198   84.84 6202.03   97.08 6206.37  126.15 6208.68
   127.3 6208.81  133.03 6208.92  136.38 6209.55  150.33 6214.48  155.91 6217.15
  164.53 6217.65  167.76 6217.85  172.77  6218.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   52.18    .035   64.78     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         52.18   64.78           104.31  104.79  104.54             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   38.71  6214.8       F
   75.61  172.77  6214.8       F

CULVERT


RIVER: IndustrialTrib
REACH: Reach 1            RS: 209.5

INPUT
Description: 150.42  0.15
Distance from Upstream XS =    37.3
Deck/Roadway Width        =   29.33
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      30
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6214.99       0    7.08 6216.45       0    9.06 6216.18       0
    9.22 6216.16       0   15.16 6215.35       0   18.09 6214.97       0
   19.44 6214.86       0   19.59 6214.85       0   20.26  6214.8       0
   20.26  6214.8           22.26 6214.76           25.34 6214.75
   25.88 6214.77           39.28 6216.63           53.22 6216.63
    59.1 6216.64           65.74 6216.64           70.75  6216.1
    75.1 6215.51           76.44 6215.33           77.87 6215.14
   84.84 6214.26           97.08 6215.43          113.07    6217
  113.13    6217          126.15 6215.19           127.3 6215.37
  133.03 6216.26          136.38 6217.15          155.91 6217.15

Upstream Bridge Cross Section Data
Station Elevation Data    num=      33
```

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6209.55	7.08	6211	9.06	6211.41	9.22	6211.42	15.16	6211.42
19.44	6211.43	19.59	6211.4	20.26	6211	48.05	6196	50.87	6194.49
51.09	6194.48	52.18	6194.46	53.22	6191.29	59.1	6191.85	60.3	6192.37
64.78	6194.79	65.01	6195	65.38	6195.32	70.75	6196.11	75.1	6196.48
76.44	6197.39	77.87	6198	84.84	6202.03	97.08	6206.37	126.15	6208.68
127.3	6208.81	133.03	6208.92	136.38	6209.55	150.33	6214.48	155.91	6217.15
164.53	6217.65	167.76	6217.85	172.77	6218.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	52.18	.035	64.78	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
52.18	64.78	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	38.71	6214.8	F
75.61	172.77	6214.8	F

Downstream Deck/Roadway Coordinates
num= 46

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6216.7		14.93	6216.72		19.5	6216.72	
27.23	6216.73		34.47	6216.73		42.66	6217.17	
43.48	6217.33		52.31	6216.77		55.84	6216.82	
62.75	6216.85		65.24	6216.89		66.81	6216.91	
67.94	6216.93		68.05	6216.93		70.24	6216.96	
70.29	6216.96		73.7	6217		76.04	6217.02	
78.29	6217.04		78.61	6217.04		79.94	6217.07	
82.53	6217.09		82.56	6217.09		85.42	6217.16	
87.98	6217.2		97.36	6217.38		99.21	6217.47	
106.9	6217.57		114.91	6217.57		115.31	6217.58	
116.12	6217.58		116.45	6217.59		125.59	6217.61	
126.83	6217.61		128.22	6217.62		129.93	6217.63	
132.96	6217.67		133.29	6217.67		139.52	6217.69	
152.07	6217.69		154.98	6217.68		155.06	6217.68	
157.74	6217.66		160.98	6217.7		161.1	6217.69	
164.67	6217.7							

Downstream Bridge Cross Section Data
Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.59	4.06	6215.13	5.07	6214.79	15.14	6211.15	17.16	6210.28
18.17	6209.75	22.2	6206.69	23.2	6205.94	28.24	6202.06	29.25	6201.64
31.62	6200.82	32.47	6200.5	33.02	6200.25	34.46	6199.52	37.02	6198.66
38.09	6198.28	39.58	6197.79	43.46	6196.46	47.69	6195.11	48.55	6194.87
49.33	6194.63	49.93	6194.42	50.11	6194.37	50.6	6194.19	51	6194.1
51.67	6194.01	52.06	6193.94	52.45	6193.93	53.51	6193.85	55.25	6193.89
59.34	6194.06	60.58	6194.08	62.59	6194.15	64.92	6194.21	65.16	6194.23

```
    65.9 6194.22   66.33 6193.92   66.48 6193.79   66.97 6193.52   67.26 6193.42
   67.946193.075   68.03 6193.03   70.14 6192.49   71.27 6192.23   73.59 6191.62
   74.38 6191.44    75.4 6191.15   75.87 6191.26   75.96 6191.27   76.46 6191.47
   76.75 6191.76   77.54 6192.46   78.296193.092   78.56 6193.32   79.61 6194.19
   79.92 6194.42   81.72 6195.64   83.09  6196.5   83.83 6196.92   84.67 6197.47
   85.91 6198.19    87.2 6199.01   87.78 6199.35   88.06 6199.53   88.96 6200.01
   89.79 6200.61   90.24 6200.91   90.65 6201.22      92 6202.09   97.32 6205.79
  103.41 6209.74  104.63 6210.51   108.7 6213.16  111.87 6215.19  112.92 6215.89
   113.3 6216.01  113.98 6216.31  116.09 6216.45  117.15 6216.56  119.26 6216.71
  120.32 6216.81  122.43 6216.96  123.49 6217.06  124.55 6217.11  126.76 6217.09
  127.47 6217.11  127.72 6217.14  128.77 6217.36  130.89 6217.77  132.18 6218.06
  134.08 6218.45  135.32 6218.73  137.26 6219.12  138.45 6219.39  140.45 6219.79
  141.58 6220.05  143.63 6220.47  144.71 6220.72  146.82 6221.14  147.88 6221.39
  150.19 6221.86  152.12 6222.29  156.45 6223.34  157.43 6223.59  159.58 6224.09
  160.62 6224.36  162.74 6224.85  163.49 6225.05  164.61 6225.32

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    65.9    .035   79.92     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          65.9   79.92             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   57.07 6216.71       F
   86.94  164.61 6216.71       F

Upstream Embankment side slope              =     .95 horiz. to 1.0 vertical
Downstream Embankment side slope            =    1.43 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1          Arch      10      10
FHWA Chart # 41- Arch; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
              14.34   88.18     .012     .035        0                   .5
      1
Upstream   Elevation =  6191.84
           Centerline Station =  59.34
Downstream Elevation =  6191.048
           Centerline Station =  73.27
```

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 156.67

INPUT
Description: River STA 155.20
Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.59	4.06	6215.13	5.07	6214.79	15.14	6211.15	17.16	6210.28
18.17	6209.75	22.2	6206.69	23.2	6205.94	28.24	6202.06	29.25	6201.64
31.62	6200.82	32.47	6200.5	33.02	6200.25	34.46	6199.52	37.02	6198.66
38.09	6198.28	39.58	6197.79	43.46	6196.46	47.69	6195.11	48.55	6194.87
49.33	6194.63	49.93	6194.42	50.11	6194.37	50.6	6194.19	51	6194.1
51.67	6194.01	52.06	6193.94	52.45	6193.93	53.51	6193.85	55.25	6193.89
59.34	6194.06	60.58	6194.08	62.59	6194.15	64.92	6194.21	65.16	6194.23
65.9	6194.22	66.33	6193.92	66.48	6193.79	66.97	6193.52	67.26	6193.42
67.946	193.075	68.03	6193.03	70.14	6192.49	71.27	6192.23	73.59	6191.62
74.38	6191.44	75.4	6191.15	75.87	6191.26	75.96	6191.27	76.46	6191.47
76.75	6191.76	77.54	6192.46	78.296	193.092	78.56	6193.32	79.61	6194.19
79.92	6194.42	81.72	6195.64	83.09	6196.5	83.83	6196.92	84.67	6197.47
85.91	6198.19	87.2	6199.01	87.78	6199.35	88.06	6199.53	88.96	6200.01
89.79	6200.61	90.24	6200.91	90.65	6201.22	92	6202.09	97.32	6205.79
103.41	6209.74	104.63	6210.51	108.7	6213.16	111.87	6215.19	112.92	6215.89
113.3	6216.01	113.98	6216.31	116.09	6216.45	117.15	6216.56	119.26	6216.71
120.32	6216.81	122.43	6216.96	123.49	6217.06	124.55	6217.11	126.76	6217.09
127.47	6217.11	127.72	6217.14	128.77	6217.36	130.89	6217.77	132.18	6218.06
134.08	6218.45	135.32	6218.73	137.26	6219.12	138.45	6219.39	140.45	6219.79
141.58	6220.05	143.63	6220.47	144.71	6220.72	146.82	6221.14	147.88	6221.39
150.19	6221.86	152.12	6222.29	156.45	6223.34	157.43	6223.59	159.58	6224.09
160.62	6224.36	162.74	6224.85	163.49	6225.05	164.61	6225.32		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	65.9	.035	79.92	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
65.9	79.92	21.37	22.31	22.85	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	57.07	6216.71	F
86.94	164.61	6216.71	F

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 134.36

INPUT
Description: River STA 132.90
Station Elevation Data num= 100

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.13	.57	6216.03	1.21	6215.87	5.56	6214.17	6.29	6213.92
7.63	6213.35	8.05	6213.15	9.43	6212.59	13.54	6210.77	14.57	6210.36
16.63	6209.64	17.65	6209	20.52	6206.88	21.77	6205.94	22.79	6205.19
24.85	6203.62	26.9	6202.09	27.93	6201.46	28.96	6201.1	31.01	6200.45
32.16	6200.05	33.75	6199.53	34.26	6199.43	34.75	6199.28	35.93	6198.78
37.27	6198.17	38.06	6197.95	38.78	6197.71	40.09	6197.42	40.89	6197.21
42.05	6196.95	43.03	6196.75	44.48	6196.42	45.45	6196.23	45.92	6196.12
46.66	6195.96	47.36	6195.78	47.86	6195.69	48.8	6195.41	49.06	6195.35
50.26	6195.03	52.67	6194.33	53.13	6194.11	53.87	6193.81	55.07	6193.68
56.73	6193.65	57.46	6193.66	60.34	6193.57	61.08	6193.56	68.32	6193.24
69	6193.15	69.42	6193.07	70.58	6192.76	72.25	6192.35	78.19	6190.83
78.5	6190.78	78.69	6190.81	79.24	6191.17	79.85	6191.7	80.17	6192.1
81	6193.02	82.89	6194.48	91.22	6200.84	100.02	6207.35	101.1	6208.07
102.18	6208.73	105.41	6210.81	106.48	6211.47	110.79	6214.24	111.87	6214.9
116.17	6217.67	116.32	6217.74	116.69	6217.86	119.4	6218.31	121.136	218.583
124.73	6219.15	126.24	6219.42	127	6219.53	129.27	6219.91	131.85	6220.31
134.31	6220.54	136.88	6220.64	139.07	6220.77	144.55	6220.99	145.64	6221.05
147.83	6221.36	150.02	6221.72	152	6222	152.21	6222.02	153.3	6222.03
154.4	6221.97	155.78	6221.83	158.9	6221.57	160.96	6221.37	163.15	6221.19
164.12	6221.08	165.34	6220.98	168.66	6220.79	169.72	6220.71	172.76	6220.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	60.34	.035	82.89	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60.34	82.89	50.1	50.1	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 84.26

INPUT
Description: River STA 82.82
Station Elevation Data num= 323

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6206.85	3.5	6205.53	7.1	6204.29	8.2	6203.87	11.8	6202.61
13.6	6201.98	14	6201.88	14.2	6201.84	14.7	6201.77	15.4	6201.66
15.4	6201.65	16.6	6201.5	17.6	6201.32	17.8	6201.27	19.1	6200.99
21.4	6200.43	21.9	6200.33	22.4	6200.24	22.6	6200.19	22.7	6200.17
23.4	6200.03	23.8	6199.94	24.1	6199.88	24.5	6199.8	24.8	6199.75
25	6199.71	25.5	6199.59	25.9	6199.52	26.2	6199.45	34.2	6197.85
37.3	6197.38	37.8	6197.31	38.1	6197.27	38.5	6197.21	38.9	6197.15

39.3 6197.09	39.3 6197.08	39.8 6197.12	40 6197.14	40.5 6197.22
40.7 6197.25	40.9 6197.29	41.7 6197.44	42.1 6197.51	42.8 6197.63
42.9 6197.64	42.9 6197.65	43.6 6197.75	44.1 6197.84	44.3 6197.88
44.6 6197.93	45 6198.01	45.3 6198.06	45.8 6198.14	46.4 6198.23
46.5 6198.24	46.5 6198.25	46.7 6198.28	47.2 6198.37	47.7 6198.47
48.2 6198.56	48.6 6198.61	48.9 6198.65	49.4 6198.72	50.1 6198.83
50.1 6198.84	50.2 6198.85	53.7 6199.34	53.7 6199.35	54.4 6199.47
54.9 6199.55	55.1 6199.59	55.5 6199.67	55.9 6199.71	56.1 6199.73
56.6 6199.7	57.1 6199.57	57.3 6199.55	57.3 6199.54	57.4 6199.53
58 6199.32	58.5 6199.19	58.8 6199.1	59.2 6198.98	59.5 6198.89
59.7 6198.83	60.2 6198.67	60.6 6198.54	60.9 6198.47	60.9 6198.45
61.6 6198.23	62.1 6198.11	62.4 6198.02	62.8 6197.88	63.1 6197.8
63.3 6197.75	63.8 6197.58	64.5 6197.39	64.5 6197.36	64.9 6197.26
65.6 6197.04	66 6196.9	66.6 6196.77	66.7 6196.73	67.1 6196.59
67.4 6196.42	68 6196.29	68.2 6196.19	68.6 6196.02	68.9 6195.85
69.1 6195.79	69.6 6195.57	69.9 6195.45	70.3 6195.3	70.4 6195.26
70.5 6195.2	71.1 6194.96	71.4 6194.82	71.8 6194.65	72.5 6194.35
72.6 6194.31	72.8 6194.24	73.3 6194.03	73.8 6193.83	74 6193.71
74.5 6193.52	74.7 6193.39	74.9 6193.32	75.5 6193.09	76.2 6192.78
76.4 6192.7	76.9 6192.48	77.2 6192.35	77.7 6192.17	78.4 6191.85
78.4 6191.84	78.4 6191.83	79.1 6191.6	79.6 6191.46	79.9 6191.41
80.3 6191.33	80.6 6191.29	80.7 6191.27	81.3 6191.18	81.3 6191.17
81.9 6191.08	82 6191.05	82.3 6191.01	82.8 6191	83.5 6191.24
84.1 6191.54	84.2 6191.57	84.2 6191.58	84.3 6191.59	85 6191.56
85.7 6191.5	86.2 6191.47	86.4 6191.46	86.5 6191.45	87 6191.42
87.2 6191.4	87.9 6191.36	88.2 6191.33	88.6 6191.3	88.9 6191.28
89.4 6191.45	89.8 6191.92	90 6192.09	90.1 6192.14	90.2 6192.19
90.8 6192.39	91.2 6192.5	91.5 6192.6	92.1 6192.77	92.3 6192.83
92.7 6192.92	93 6193.02	93.5 6193.16	93.7 6193.23	94.1 6193.35
94.5 6193.46	94.7 6193.52	95.2 6193.67	95.5 6193.76	95.8 6193.85
95.9 6193.88	96.1 6193.92	96.7 6194.08	97 6194.18	97.4 6194.3
98 6194.5	98.1 6194.53	98.3 6194.6	98.8 6194.74	99.3 6194.87
99.6 6194.95	99.8 6195.02	100.1 6195.08	100.7 6195.26	101.1 6195.38
101.5 6195.51	101.9 6195.6	102.5 6195.78	102.6 6195.8	102.6 6195.81
102.7 6195.84	103.4 6196.04	103.7 6196.12	104.2 6196.25	104.8 6196.43
104.9 6196.47	105.4 6196.59	105.7 6196.68	106.2 6196.82	106.5 6196.91
106.9 6197.05	107.2 6197.12	108 6197.34	108.8 6197.52	109.1 6197.6
109.5 6197.68	109.8 6197.76	110.2 6197.83	110.3 6197.86	110.7 6197.92
111.1 6197.98	111.2 6198.02	111.6 6198.09	111.8 6198.12	112.3 6198.2
112.6 6198.25	113.3 6198.37	113.4 6198.39	113.5 6198.4	114.1 6198.5
114.5 6198.55	114.9 6198.63	115.3 6198.68	115.6 6198.72	115.7 6198.74
116 6198.79	116.4 6198.88	117.1 6198.99	117.2 6199.01	117.7 6199.09
118 6199.14	118.6 6199.24	118.7 6199.27	118.8 6199.28	118.9 6199.3
119.5 6199.4	119.9 6199.46	121 6199.64	121 6199.66	121.3 6199.7
121.8 6199.79	122.6 6199.9	123.1 6199.98	123.3 6200.02	123.9 6200.12
124.1 6200.15	124.2 6200.16	124.4 6200.21	124.9 6200.31	125.3 6200.4
125.6 6200.49	126.4 6200.66	126.4 6200.67	127.2 6200.87	127.9 6201.02
128 6201.03	128.5 6201.11	128.7 6201.12	129.2 6201.16	129.5 6201.17
129.6 6201.17	129.9 6201.14	130.2 6201.09	130.7 6201.03	131 6200.99
131.7 6200.9	131.8 6200.89	131.8 6200.88	131.9 6200.88	132.5 6200.82

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   133.3 6200.75   133.9 6200.69     134 6200.68   134.2 6200.66   134.7 6200.61
   135.2 6200.57   135.5 6200.53     136 6200.47   136.3 6200.43   136.8 6200.36
   137.7 6200.24     138 6200.19   138.4 6200.15   138.6 6200.12   139.1 6200.06
   139.4 6200.03   139.6    6200   139.8 6199.98   139.9 6199.97   140.1 6199.95
   140.6 6199.88   140.9 6199.85   141.3 6199.81   141.9 6199.75     142 6199.74
   142.1 6199.74   143.2 6199.74   143.5 6199.74   144.2 6199.74   144.3 6199.74
   144.5 6199.74     145 6199.74   145.5 6199.74   145.8 6199.74   146.5 6199.72
   146.6 6199.71   147.1 6199.66147.1755 6199.65

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    71.8    .035   100.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          71.8   100.1             35.56      30   24.13             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 54.26

INPUT
Description: River STA 52.43
Station Elevation Data    num=      92
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6203.07    9.02 6201.08    10.3 6200.77   13.07 6200.16   14.15 6199.97
   15.09 6199.76   16.26 6199.57   16.72 6199.51   17.94 6199.41   23.63 6199.09
   24.41 6199.03   25.05 6198.97   26.98  6198.7   28.26 6198.48   29.55  6198.3
   32.16 6197.87    33.4  6197.7   34.68 6197.48   35.01 6197.41   35.72 6197.33
   36.43 6197.21   37.01 6196.96   37.14 6196.91   37.85 6196.73    38.6 6196.45
   39.99 6196.03    40.2 6195.94    41.1 6195.66   41.41 6195.57   41.79 6195.44
   45.41 6194.29   46.51 6193.96   47.09 6193.74    47.6 6193.62   48.02  6193.5
   48.51 6193.28   49.22 6193.05   49.52 6192.97   50.63 6192.52   52.05 6192.08
   52.96 6191.97   53.47 6191.86   54.29 6191.74   54.88  6191.6   55.63 6191.47
   56.97 6191.16   57.72 6191.07   58.31 6190.95   59.13 6190.89   59.65 6190.84
   60.98 6190.75   63.66 6190.53      65 6190.44   66.34 6190.33   67.67 6190.24
    70.6    6190   71.11    6190   71.88    6190    72.1 6190.02    75.7 6190.35
   76.84 6190.47   79.67 6190.72   81.09 6190.87   84.14 6191.08   85.65 6191.21
   87.15 6191.32   88.17 6191.41   89.08 6191.52   90.16 6191.69   91.67 6191.96
   97.11 6192.81  102.83 6193.63     104 6193.77  106.33 6193.94  107.52 6194.06
  109.82 6194.23  110.98 6194.35  113.31 6194.53  114.48 6194.64  117.33 6195.09
  117.73 6195.14  119.28 6195.33  121.24 6195.54   127.1 6196.26  129.05 6196.47
  134.91 6197.19   136.6 6197.38  137.42 6197.59  138.916198.003  140.09 6198.33
  140.34 6198.35  140.54 6198.34

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   46.51    .035  102.83     .05
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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         46.51  102.83             54.26   54.26   54.26             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 0.00

INPUT
Description: River STA 0.00
Station Elevation Data    num=      87
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6202.5     .93 6202.47    1.87 6202.47    3.77 6202.41    6.84 6202.37
    7.84 6202.33    9.84 6202.24   11.85 6202.17   12.85 6202.11   14.85 6202.04
   15.12 6202.01   15.62    6202   16.07 6201.95   16.68 6201.92   17.01 6201.88
   17.74 6201.87   18.81 6201.79    20.8 6201.43      22 6201.24   22.69 6201.11
   23.87 6200.94   24.87 6200.75   28.88  6200.1   29.88 6199.91   30.88 6199.75
   32.15 6199.53   33.88 6199.25   34.89 6199.07   35.89 6198.91   36.67 6198.76
   38.98 6197.99   40.87 6197.25   42.11 6196.73   42.48 6196.08    42.9 6194.63
   43.15    6194   43.29 6193.36    43.46192.669   43.75 6190.47   44.09 6188.59
   44.19 6188.35   45.24 6188.32    56.7  6188.9   56.99 6189.24   57.65 6188.99
   57.74 6189.03   57.79 6189.15   57.96 6189.34    58.6 6190.46   58.78 6190.53
   59.12 6191.22    59.4 6191.96    59.66192.253   59.83 6192.59   60.21 6192.53
    60.6 6193.45   60.87 6193.71   61.02 6193.77   61.52 6193.43   61.82 6193.12
   62.07 6193.29   62.24 6193.46   62.89 6194.56   63.02 6194.67   66.46 6195.63
   67.61 6195.92   68.75 6196.24    69.9 6196.42   70.97  6196.5   72.19 6196.62
   73.34 6196.71   74.65 6196.83   75.63 6196.91   76.78 6197.02   79.07 6197.23
   81.99 6197.52   89.38 6197.96   90.08 6198.06   90.53 6198.11   91.31 6198.24
   93.36 6198.61    95.4 6198.95   98.16 6199.43   98.89 6199.51    99.5 6199.49
  100.85 6199.32  102.17 6199.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    43.4    .035    59.6     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          43.4    59.6             .3       .5



SUMMARY OF MANNING'S N VALUES

River:IndustrialTrib

      Reach          River Sta.       n1        n2        n3

 Reach 1              1534.24           .05      .035       .05
 Reach 1              1485.4            .06       .05       .06
 Reach 1              1485.2            .06       .05       .06
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Reach 1	1460.5	.06	.05	.06
Reach 1	1460.4	.06	.05	.06
Reach 1	1447.48	.06	.05	.06
Reach 1	1434.04	.06	.05	.06
Reach 1	1433.84	.06	.05	.06
Reach 1	1409.14	.06	.05	.06
Reach 1	1409.04	.06	.05	.06
Reach 1	1304.87	.06	.05	.06
Reach 1	1207.55	.06	.05	.06
Reach 1	1207.35	.06	.05	.06
Reach 1	1182.65	.06	.05	.06
Reach 1	1182.55	.06	.05	.06
Reach 1	1136.61	.06	.05	.06
Reach 1	1077.55	.06	.05	.06
Reach 1	1077.35	.06	.05	.06
Reach 1	1052.65	.06	.05	.06
Reach 1	1052.55	.06	.05	.06
Reach 1	1029.49	.06	.05	.06
Reach 1	1002.55	.06	.05	.06
Reach 1	1002.35	.06	.05	.06
Reach 1	977.65	.06	.05	.06
Reach 1	977.55	.06	.05	.06
Reach 1	948.15	.06	.05	.06
Reach 1	917.55	.06	.05	.06
Reach 1	917.35	.06	.05	.06
Reach 1	892.65	.06	.05	.06
Reach 1	892.55	.06	.05	.06
Reach 1	877.31	.06	.05	.06
Reach 1	862.55	.06	.05	.06
Reach 1	862.34	.06	.05	.06
Reach 1	837.65	.06	.05	.06
Reach 1	837.55	.06	.05	.06
Reach 1	727.54	.06	.05	.06
Reach 1	683.64	.06	.05	.06
Reach 1	683.32	.06	.05	.06
Reach 1	665.19	.06	.05	.06
Reach 1	665.09	.06	.05	.06
Reach 1	636.9	.06	.05	.06
Reach 1	568.86	.05	.035	.05
Reach 1	520.21	.05	.035	.05
Reach 1	492.27	.05	.035	.05
Reach 1	462.31	.05	.035	.05
Reach 1	462.21	.05	.035	.05
Reach 1	396.14	.05	.035	.05
Reach 1	341.14	Culvert		
Reach 1	275.31	.05	.035	.05
Reach 1	261.46	.05	.035	.05
Reach 1	209.5	Culvert		
Reach 1	156.67	.05	.035	.05
Reach 1	134.36	.05	.035	.05

Reach 1	84.26	.05	.035	.05
Reach 1	54.26	.05	.035	.05
Reach 1	0.00	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: IndustrialTrib

Reach	River Sta.	Left	Channel	Right
Reach 1	1534.24	49.2	48.84	48.48
Reach 1	1485.4	.2	.2	.2
Reach 1	1485.2	22.87	24.7	26.53
Reach 1	1460.5	.09	.1	.11
Reach 1	1460.4	14.1	12.92	11.74
Reach 1	1447.48	15.62	13.44	11.27
Reach 1	1434.04	.2	.2	.2
Reach 1	1433.84	24.56	24.7	25.32
Reach 1	1409.14	.1	.1	.12
Reach 1	1409.04	99.66	104.17	115.69
Reach 1	1304.87	91.64	97.32	94.38
Reach 1	1207.55	.2	.2	.2
Reach 1	1207.35	24.08	24.7	25.32
Reach 1	1182.65	.1	.1	.1
Reach 1	1182.55	54.71	45.94	37.17
Reach 1	1136.61	60.28	59.06	57.83
Reach 1	1077.55	.2	.2	.2
Reach 1	1077.35	25.53	24.7	23.87
Reach 1	1052.65	.1	.1	.1
Reach 1	1052.55	23.75	23.06	22.36
Reach 1	1029.49	27.45	26.94	26.44
Reach 1	1002.55	.2	.2	.2
Reach 1	1002.35	25.09	24.7	24.31
Reach 1	977.65	.1	.1	.1
Reach 1	977.55	28.43	29.4	30.37
Reach 1	948.15	29.94	30.6	31.27
Reach 1	917.55	.2	.2	.2
Reach 1	917.35	21.96	24.7	27.44
Reach 1	892.65	.1	.1	.1
Reach 1	892.55	14.37	15.24	13.68
Reach 1	877.31	18.28	14.76	13.03
Reach 1	862.55	.21	.21	.2
Reach 1	862.34	21.8	24.69	27.91
Reach 1	837.65	.1	.1	.09
Reach 1	837.55	98.07	110.01	124.19
Reach 1	727.54	47.93	43.9	36.64
Reach 1	683.64	.31	.32	.31

Reach 1	683.32	25.73	18.13	16.63
Reach 1	665.19	.1	.1	.1
Reach 1	665.09	30.04	28.19	32.96
Reach 1	636.9	76.21	68.04	60.72
Reach 1	568.86	54.65	48.65	54.29
Reach 1	520.21	31.24	27.94	24.62
Reach 1	492.27	13.36	29.96	26.32
Reach 1	462.31	.1	.1	.1
Reach 1	462.21	56.27	66.07	80.58
Reach 1	396.14	118.73	120.83	120.96
Reach 1	341.14	Culvert		
Reach 1	275.31	14.42	13.85	12.15
Reach 1	261.46	104.31	104.79	104.54
Reach 1	209.5	Culvert		
Reach 1	156.67	21.37	22.31	22.85
Reach 1	134.36	50.1	50.1	50.1
Reach 1	84.26	35.56	30	24.13
Reach 1	54.26	54.26	54.26	54.26
Reach 1	0.00			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: IndustrialTrib

Reach	River Sta.	Contr.	Expan.
Reach 1	1534.24	.1	.3
Reach 1	1485.4	.1	.3
Reach 1	1485.2	.1	.3
Reach 1	1460.5	.1	.3
Reach 1	1460.4	.1	.3
Reach 1	1447.48	.1	.3
Reach 1	1434.04	.1	.3
Reach 1	1433.84	.1	.3
Reach 1	1409.14	.1	.3
Reach 1	1409.04	.1	.3
Reach 1	1304.87	.1	.3
Reach 1	1207.55	.1	.3
Reach 1	1207.35	.1	.3
Reach 1	1182.65	.1	.3
Reach 1	1182.55	.1	.3
Reach 1	1136.61	.1	.3
Reach 1	1077.55	.1	.3
Reach 1	1077.35	.1	.3
Reach 1	1052.65	.1	.3
Reach 1	1052.55	.1	.3
Reach 1	1029.49	.1	.3

Reach 1	1002.55		.1	.3
Reach 1	1002.35		.1	.3
Reach 1	977.65		.1	.3
Reach 1	977.55		.1	.3
Reach 1	948.15		.1	.3
Reach 1	917.55		.1	.3
Reach 1	917.35		.1	.3
Reach 1	892.65		.1	.3
Reach 1	892.55		.1	.3
Reach 1	877.31		.1	.3
Reach 1	862.55		.1	.3
Reach 1	862.34		.1	.3
Reach 1	837.65		.1	.3
Reach 1	837.55		.1	.3
Reach 1	727.54		.1	.3
Reach 1	683.64		.1	.3
Reach 1	683.32		.1	.3
Reach 1	665.19		.1	.3
Reach 1	665.09		.1	.3
Reach 1	636.9		.1	.3
Reach 1	568.86		.1	.3
Reach 1	520.21		.1	.3
Reach 1	492.27		.1	.3
Reach 1	462.31		.1	.3
Reach 1	462.21		.1	.3
Reach 1	396.14		.3	.5
Reach 1	341.14	Culvert		
Reach 1	275.31		.3	.5
Reach 1	261.46		.3	.5
Reach 1	209.5	Culvert		
Reach 1	156.67		.3	.5
Reach 1	134.36		.1	.3
Reach 1	84.26		.1	.3
Reach 1	54.26		.1	.3
Reach 1	0.00		.3	.5

Profile Output Table - Standard Table 1

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/s)	(sq ft)	(ft)		
Reach 1	1534.24	100year	856.00	6226.47	6238.21		6238.64	0.003611	5.27	162.52	42.95	0.48
Reach 1	1534.24	10year	304.00	6226.47	6235.84		6236.05	0.002366	3.62	83.86	25.16	0.35

Reach 1	1534.24	2year	296.00	6226.47	6235.79	
6235.99	0.002338	3.59	82.51	24.83	0.35	
Reach 1	1485.4	100year	856.00	6231.47	6237.48	6236.58
6238.30	0.012827	7.27	117.77	34.39	0.69	
Reach 1	1485.4	10year	304.00	6231.47	6234.68	6234.68
6235.68	0.032762	8.01	37.96	19.44	1.01	
Reach 1	1485.4	2year	296.00	6231.47	6234.66	6234.66
6235.63	0.032327	7.91	37.43	19.35	1.00	
Reach 1	1485.2	100year	856.00	6231.35	6236.61	6236.61
6238.21	0.022061	10.46	90.50	30.84	0.93	
Reach 1	1485.2	10year	304.00	6231.35	6234.61	6234.61
6235.62	0.032595	8.07	37.66	18.92	1.01	
Reach 1	1485.2	2year	296.00	6231.35	6234.58	6234.58
6235.57	0.032238	7.98	37.10	18.81	1.00	
Reach 1	1460.5	100year	856.00	6230.28	6235.57	6234.21
6236.14	0.007972	6.08	140.79	38.30	0.56	
Reach 1	1460.5	10year	304.00	6230.28	6233.93	6232.61
6234.14	0.004604	3.67	82.94	32.41	0.40	
Reach 1	1460.5	2year	296.00	6230.28	6233.90	6232.57
6234.10	0.004532	3.62	81.88	32.30	0.40	
Reach 1	1460.4	100year	856.00	6230.29	6235.57	6234.21
6236.14	0.008015	6.08	140.72	38.43	0.56	
Reach 1	1460.4	10year	304.00	6230.29	6233.93	6232.63
6234.14	0.004675	3.68	82.66	32.52	0.41	
Reach 1	1460.4	2year	296.00	6230.29	6233.90	6232.59
6234.10	0.004603	3.63	81.60	32.40	0.40	
Reach 1	1447.48	100year	856.00	6231.06	6234.65	6234.65
6235.90	0.029001	8.96	95.57	39.10	1.01	
Reach 1	1447.48	10year	304.00	6231.06	6233.26	6233.26
6233.96	0.034849	6.71	45.27	33.16	1.01	
Reach 1	1447.48	2year	296.00	6231.06	6233.23	6233.23
6233.92	0.034999	6.66	44.43	33.04	1.01	
Reach 1	1434.04	100year	856.00	6227.18	6234.22	
6234.62	0.005230	5.09	168.33	40.84	0.44	
Reach 1	1434.04	10year	304.00	6227.18	6232.33	
6232.47	0.002411	3.00	101.45	29.84	0.29	
Reach 1	1434.04	2year	296.00	6227.18	6232.29	
6232.42	0.002346	2.95	100.29	29.54	0.28	

Reach 1	1433.84	100year	856.00	6227.11	6234.16	
6234.62	0.003998	5.55	168.70	40.56	0.40	
Reach 1	1433.84	10year	304.00	6227.11	6232.33	
6232.46	0.001839	2.96	104.36	29.92	0.25	
Reach 1	1433.84	2year	296.00	6227.11	6232.29	
6232.42	0.001801	2.91	103.18	29.63	0.25	
Reach 1	1409.14	100year	856.00	6227.68	6234.20	
6234.48	0.002944	4.24	204.82	52.55	0.35	
Reach 1	1409.14	10year	304.00	6227.68	6232.31	
6232.41	0.001801	2.55	119.12	39.21	0.26	
Reach 1	1409.14	2year	296.00	6227.68	6232.27	
6232.37	0.001769	2.52	117.55	38.96	0.26	
Reach 1	1409.04	100year	856.00	6227.72	6234.10	
6234.47	0.002993	5.17	199.19	51.74	0.37	
Reach 1	1409.04	10year	304.00	6227.72	6232.29	
6232.41	0.001497	2.87	117.68	39.11	0.25	
Reach 1	1409.04	2year	296.00	6227.72	6232.25	
6232.36	0.001470	2.82	116.16	38.87	0.25	
Reach 1	1304.87	100year	856.00	6229.48	6232.56	6232.56
6233.67	0.029186	8.45	101.30	46.44	1.01	
Reach 1	1304.87	10year	304.00	6229.48	6231.27	6231.27
6231.93	0.034622	6.47	47.00	36.76	1.01	
Reach 1	1304.87	2year	296.00	6229.48	6231.25	6231.25
6231.89	0.034426	6.40	46.23	36.56	1.00	
Reach 1	1207.55	100year	856.00	6223.47	6229.50	
6230.23	0.010927	6.84	125.12	35.31	0.64	
Reach 1	1207.55	10year	304.00	6223.47	6227.82	
6228.08	0.005160	4.12	73.84	25.18	0.42	
Reach 1	1207.55	2year	296.00	6223.47	6227.78	
6228.04	0.005007	4.05	73.04	24.93	0.42	
Reach 1	1207.35	100year	856.00	6223.38	6229.34	
6230.21	0.009107	7.61	121.73	34.52	0.61	
Reach 1	1207.35	10year	304.00	6223.38	6227.82	
6228.08	0.004345	4.09	75.66	25.55	0.40	
Reach 1	1207.35	2year	296.00	6223.38	6227.79	
6228.04	0.004242	4.02	74.86	25.35	0.39	

Reach 1	1182.65	100year	856.00	6224.07	6229.32	
6229.95	0.006610	6.53	143.19	41.85	0.53	
Reach 1	1182.65	10year	304.00	6224.07	6227.76	
6227.96	0.003497	3.62	85.77	31.96	0.36	
Reach 1	1182.65	2year	296.00	6224.07	6227.73	
6227.93	0.003432	3.57	84.77	31.76	0.36	
Reach 1	1182.55	100year	856.00	6224.09	6229.31	
6229.95	0.006737	6.57	142.30	41.80	0.54	
Reach 1	1182.55	10year	304.00	6224.09	6227.76	
6227.96	0.003575	3.65	85.14	31.95	0.37	
Reach 1	1182.55	2year	296.00	6224.09	6227.73	
6227.93	0.003509	3.60	84.14	31.75	0.36	
Reach 1	1136.61	100year	856.00	6224.60	6228.20	6228.20
6229.34	0.028712	8.55	100.14	44.37	1.00	
Reach 1	1136.61	10year	304.00	6224.60	6226.89	6226.89
6227.54	0.034658	6.47	46.99	36.77	1.01	
Reach 1	1136.61	2year	296.00	6224.60	6226.86	6226.86
6227.51	0.035195	6.44	45.96	36.62	1.01	
Reach 1	1077.55	100year	856.00	6219.85	6226.07	
6226.46	0.005136	5.02	170.47	42.66	0.44	
Reach 1	1077.55	10year	304.00	6219.85	6224.30	
6224.43	0.002206	2.89	105.27	31.79	0.28	
Reach 1	1077.55	2year	296.00	6219.85	6224.27	
6224.40	0.002152	2.84	104.29	31.77	0.28	
Reach 1	1077.35	100year	856.00	6219.81	6226.07	
6226.46	0.004093	5.03	174.51	42.61	0.40	
Reach 1	1077.35	10year	304.00	6219.81	6224.31	
6224.43	0.001972	2.78	109.49	31.94	0.26	
Reach 1	1077.35	2year	296.00	6219.81	6224.28	
6224.39	0.001922	2.73	108.49	31.91	0.26	
Reach 1	1052.65	100year	856.00	6220.77	6225.94	
6226.36	0.004255	5.31	176.36	49.94	0.43	
Reach 1	1052.65	10year	304.00	6220.77	6224.22	
6224.37	0.002667	3.10	100.34	38.49	0.32	
Reach 1	1052.65	2year	296.00	6220.77	6224.19	
6224.33	0.002615	3.05	99.22	38.29	0.31	
Reach 1	1052.55	100year	856.00	6220.81	6225.93	
6226.35	0.004398	5.36	174.58	49.85	0.44	

Reach 1	1052.55	10year	304.00	6220.81	6224.22	
6224.37	0.002799	3.15	98.84	38.46	0.32	
Reach 1	1052.55	2year	296.00	6220.81	6224.19	
6224.33	0.002743	3.10	97.76	38.26	0.32	
Reach 1	1029.49	100year	856.00	6221.37	6224.91	6224.91
6226.07	0.027906	8.65	98.94	41.92	0.99	
Reach 1	1029.49	10year	304.00	6221.37	6223.48	6223.48
6224.16	0.032153	6.60	46.05	32.79	0.98	
Reach 1	1029.49	2year	296.00	6221.37	6223.43	6223.43
6224.13	0.034740	6.71	44.10	32.49	1.02	
Reach 1	1002.55	100year	856.00	6215.65	6222.42	
6223.11	0.009948	6.65	128.63	33.41	0.60	
Reach 1	1002.55	10year	304.00	6215.65	6220.55	
6220.79	0.004265	3.93	77.40	23.23	0.38	
Reach 1	1002.55	2year	296.00	6215.65	6220.51	
6220.75	0.004181	3.87	76.54	23.21	0.38	
Reach 1	1002.35	100year	856.00	6215.56	6222.41	
6223.10	0.007216	6.72	132.68	33.53	0.52	
Reach 1	1002.35	10year	304.00	6215.56	6220.57	
6220.78	0.003758	3.73	81.52	23.61	0.35	
Reach 1	1002.35	2year	296.00	6215.56	6220.53	
6220.74	0.003681	3.67	80.63	23.58	0.35	
Reach 1	977.65	100year	856.00	6215.94	6222.54	
6222.89	0.003002	4.84	185.00	41.41	0.36	
Reach 1	977.65	10year	304.00	6215.94	6220.59	
6220.69	0.001532	2.65	114.88	30.92	0.24	
Reach 1	977.65	2year	296.00	6215.94	6220.55	
6220.65	0.001499	2.61	113.68	30.74	0.24	
Reach 1	977.55	100year	856.00	6215.95	6222.53	
6222.89	0.003021	4.85	184.63	41.41	0.36	
Reach 1	977.55	10year	304.00	6215.95	6220.58	
6220.69	0.001546	2.66	114.52	30.94	0.24	
Reach 1	977.55	2year	296.00	6215.95	6220.55	
6220.65	0.001513	2.61	113.32	30.76	0.24	
Reach 1	948.15	100year	856.00	6217.77	6221.28	6221.28
6222.60	0.028269	9.19	93.16	35.99	1.01	
Reach 1	948.15	10year	304.00	6217.77	6219.74	6219.74
6220.51	0.032935	7.01	43.37	28.54	1.00	

Reach 1	948.15	2year	296.00	6217.77	6219.71	6219.71
6220.47	0.033396	6.98	42.40	28.37	1.01	
Reach 1	917.55	100year	856.00	6214.08	6218.76	6218.76
6220.38	0.030083	10.21	83.86	26.19	1.01	
Reach 1	917.55	10year	304.00	6214.08	6216.93	
6217.67	0.021635	6.92	43.91	19.48	0.81	
Reach 1	917.55	2year	296.00	6214.08	6216.90	
6217.62	0.021447	6.84	43.27	19.44	0.81	
Reach 1	917.35	100year	856.00	6213.92	6218.47	6218.47
6220.28	0.027945	10.82	80.24	24.77	0.98	
Reach 1	917.35	10year	304.00	6213.92	6217.03	
6217.62	0.015050	6.14	49.51	19.77	0.68	
Reach 1	917.35	2year	296.00	6213.92	6217.00	
6217.57	0.014891	6.06	48.81	19.72	0.68	
Reach 1	892.65	100year	856.00	6213.06	6218.79	
6219.51	0.007708	6.83	129.35	33.91	0.55	
Reach 1	892.65	10year	304.00	6213.06	6217.12	
6217.34	0.003893	3.76	80.90	25.05	0.37	
Reach 1	892.65	2year	296.00	6213.06	6217.08	
6217.30	0.003817	3.70	79.95	24.96	0.36	
Reach 1	892.55	100year	856.00	6213.06	6218.79	
6219.51	0.007700	6.83	129.37	33.97	0.55	
Reach 1	892.55	10year	304.00	6213.06	6217.12	
6217.34	0.003895	3.76	80.86	25.06	0.37	
Reach 1	892.55	2year	296.00	6213.06	6217.08	
6217.30	0.003819	3.70	79.90	24.97	0.37	
Reach 1	877.31	100year	856.00	6214.39	6217.95	6217.95
6219.25	0.028267	9.15	93.53	36.44	1.01	
Reach 1	877.31	10year	304.00	6214.39	6216.37	6216.37
6217.15	0.033248	7.10	42.83	27.86	1.01	
Reach 1	877.31	2year	296.00	6214.39	6216.35	6216.35
6217.11	0.032809	7.01	42.25	27.74	1.00	
Reach 1	862.55	100year	856.00	6210.14	6216.34	
6217.20	0.013208	7.45	114.82	29.00	0.66	
Reach 1	862.55	10year	304.00	6210.14	6214.38	
6214.71	0.006893	4.56	66.72	21.53	0.46	
Reach 1	862.55	2year	296.00	6210.14	6214.35	
6214.66	0.006767	4.49	65.96	21.51	0.45	

Reach 1	862.34	100year	856.00	6210.07	6216.40
6217.17	0.011468	7.08	120.93	29.49	0.62
Reach 1	862.34	10year	304.00	6210.07	6214.41
6214.69	0.005594	4.25	71.53	21.56	0.41
Reach 1	862.34	2year	296.00	6210.07	6214.37
6214.65	0.005480	4.18	70.76	21.54	0.41
Reach 1	837.65	100year	856.00	6210.38	6215.84
6216.85	0.012363	8.10	107.64	28.97	0.68
Reach 1	837.65	10year	304.00	6210.38	6214.23
6214.55	0.006043	4.48	67.88	22.10	0.45
Reach 1	837.65	2year	296.00	6210.38	6214.20
6214.50	0.005906	4.41	67.17	22.04	0.45
Reach 1	837.55	100year	856.00	6210.41	6215.81
6216.85	0.012766	8.19	106.39	28.77	0.69
Reach 1	837.55	10year	304.00	6210.41	6214.23
6214.54	0.006199	4.52	67.27	22.05	0.46
Reach 1	837.55	2year	296.00	6210.41	6214.20
6214.50	0.006059	4.45	66.56	21.99	0.45
Reach 1	727.54	100year	856.00	6210.55	6215.40
6215.73	0.005830	4.57	187.29	61.85	0.46
Reach 1	727.54	10year	304.00	6210.55	6213.35
6213.62	0.011596	4.14	73.48	47.16	0.58
Reach 1	727.54	2year	296.00	6210.55	6213.31
6213.57	0.012073	4.15	71.27	46.89	0.59
Reach 1	683.64	100year	856.00	6206.59	6215.31
6215.50	0.003126	3.51	244.15	72.31	0.34
Reach 1	683.64	10year	304.00	6206.59	6213.26
6213.36	0.002608	2.56	118.94	47.43	0.28
Reach 1	683.64	2year	296.00	6206.59	6213.21
6213.31	0.002574	2.53	116.83	46.66	0.28
Reach 1	683.32	100year	856.00	6206.52	6215.22
6215.49	0.002937	4.78	238.26	71.28	0.32
Reach 1	683.32	10year	304.00	6206.52	6213.22
6213.35	0.001853	3.04	117.97	47.05	0.24
Reach 1	683.32	2year	296.00	6206.52	6213.18
6213.31	0.001823	3.00	115.96	46.31	0.24

Reach 1	665.19	100year	856.00	6207.07	6215.09	
6215.43	0.002973	5.20	216.71	61.94	0.36	
Reach 1	665.19	10year	304.00	6207.07	6213.18	
6213.32	0.001677	3.11	114.38	43.35	0.25	
Reach 1	665.19	2year	296.00	6207.07	6213.14	
6213.28	0.001648	3.06	112.61	42.86	0.25	
Reach 1	665.09	100year	856.00	6207.08	6215.09	
6215.43	0.002980	5.20	216.61	61.97	0.36	
Reach 1	665.09	10year	304.00	6207.08	6213.18	
6213.32	0.001684	3.11	114.27	43.35	0.25	
Reach 1	665.09	2year	296.00	6207.08	6213.14	
6213.28	0.001655	3.07	112.48	42.86	0.25	
Reach 1	636.9	100year	856.00	6208.92	6213.98	6213.98
6215.17	0.019290	9.56	111.63	47.75	0.88	
Reach 1	636.9	10year	304.00	6208.92	6212.32	6212.32
6213.13	0.025668	7.40	44.84	30.83	0.91	
Reach 1	636.9	2year	296.00	6208.92	6212.28	6212.28
6213.09	0.025994	7.36	43.74	30.39	0.92	
Reach 1	568.86	100year	856.00	6207.84	6211.33	6211.33
6212.81	0.011478	9.99	94.22	34.66	0.97	
Reach 1	568.86	10year	304.00	6207.84	6210.27	
6210.71	0.005656	5.40	59.40	30.68	0.64	
Reach 1	568.86	2year	296.00	6207.84	6210.24	
6210.67	0.005601	5.33	58.54	30.57	0.63	
Reach 1	520.21	100year	856.00	6207.84	6211.08	6210.92
6212.11	0.009716	8.40	113.34	49.62	0.88	
Reach 1	520.21	10year	304.00	6207.84	6209.59	6209.59
6210.25	0.015915	6.58	47.64	38.55	0.99	
Reach 1	520.21	2year	296.00	6207.84	6209.57	6209.57
6210.22	0.015808	6.50	46.93	38.41	0.99	
Reach 1	492.27	100year	856.00	6201.17	6211.72	
6211.81	0.000200	2.53	415.85	69.87	0.15	
Reach 1	492.27	10year	304.00	6201.17	6205.12	
6205.35	0.002695	3.87	78.54	32.48	0.44	
Reach 1	492.27	2year	296.00	6201.17	6205.00	
6205.25	0.002918	3.96	74.78	31.74	0.45	
Reach 1	462.31	100year	856.00	6200.88	6211.73	
6211.80	0.000171	2.42	461.33	76.78	0.14	

Reach 1	462.31	10year	304.00	6200.88	6205.08	
6205.27	0.001847	3.53	86.83	33.96	0.37	
Reach 1	462.31	2year	296.00	6200.88	6204.96	
6205.16	0.002031	3.59	82.79	33.06	0.39	
Reach 1	462.21	100year	856.00	6200.88	6211.72	
6211.80	0.000181	2.56	461.01	76.77	0.14	
Reach 1	462.21	10year	304.00	6200.88	6205.06	
6205.27	0.001705	3.68	86.26	33.89	0.37	
Reach 1	462.21	2year	296.00	6200.88	6204.94	
6205.16	0.001850	3.73	82.24	32.99	0.38	
Reach 1	396.14	100year	856.00	6197.04	6211.51	6202.40
6211.77	0.000295	4.08	210.05	175.80	0.19	
Reach 1	396.14	10year	304.00	6197.04	6205.09	6200.08
6205.20	0.000303	2.72	111.95	48.29	0.18	
Reach 1	396.14	2year	296.00	6197.04	6204.98	6200.04
6205.09	0.000303	2.69	110.19	47.76	0.18	
Reach 1	341.14		Culvert			
Reach 1	275.31	100year	856.00	6192.10	6202.44	6199.07
6203.53	0.002356	9.31	109.59	32.11	0.52	
Reach 1	275.31	10year	304.00	6192.10	6196.48	6196.19
6197.67	0.007817	9.38	38.99	19.57	0.81	
Reach 1	275.31	2year	296.00	6192.10	6196.38	6196.12
6197.58	0.008191	9.44	37.71	19.34	0.83	
Reach 1	261.46	100year	856.00	6191.29	6202.88	6197.64
6203.06	0.000529	4.04	279.67	51.92	0.22	
Reach 1	261.46	10year	304.00	6191.29	6196.84	6195.13
6197.19	0.002557	4.99	73.20	29.13	0.42	
Reach 1	261.46	2year	296.00	6191.29	6196.73	6195.08
6197.10	0.002676	5.02	70.16	28.79	0.43	
Reach 1	209.5		Culvert			
Reach 1	156.67	100year	856.00	6191.15	6196.88	6196.88
6198.56	0.011278	11.20	90.54	41.51	0.94	
Reach 1	156.67	10year	304.00	6191.15	6195.00	6195.00
6195.91	0.011874	7.93	43.42	32.70	0.88	

Reach 1	156.67	2year	296.00	6191.15	6194.94	6194.94
6195.86	0.012346	7.96	42.00	32.40	0.90	
Reach 1	134.36	100year	856.00	6190.78	6196.84	6195.96
6197.64	0.005326	7.68	133.98	43.37	0.66	
Reach 1	134.36	10year	304.00	6190.78	6194.91	6194.40
6195.35	0.006201	5.50	60.99	32.77	0.64	
Reach 1	134.36	2year	296.00	6190.78	6194.87	6194.37
6195.30	0.006275	5.47	59.65	32.57	0.65	
Reach 1	84.26	100year	856.00	6191.00	6195.71	6195.71
6197.18	0.012673	9.76	89.26	32.96	0.98	
Reach 1	84.26	10year	304.00	6191.00	6193.93	6193.93
6194.83	0.016215	7.62	39.89	22.56	1.01	
Reach 1	84.26	2year	296.00	6191.00	6193.89	6193.89
6194.78	0.016152	7.56	39.14	22.32	1.01	
Reach 1	54.26	100year	856.00	6190.00	6195.91	
6196.07	0.000828	3.28	283.76	83.93	0.27	
Reach 1	54.26	10year	304.00	6190.00	6192.53	
6192.84	0.006253	4.44	68.53	44.75	0.63	
Reach 1	54.26	2year	296.00	6190.00	6192.47	
6192.79	0.006677	4.50	65.77	44.16	0.65	
Reach 1	0.00	100year	856.00	6188.32	6194.48	6193.36
6195.85	0.007521	9.43	94.02	19.88	0.71	
Reach 1	0.00	10year	304.00	6188.32	6191.68	6191.08
6192.40	0.008914	6.79	44.77	15.74	0.71	
Reach 1	0.00	2year	296.00	6188.32	6191.62	6191.03
6192.33	0.008999	6.75	43.82	15.70	0.71	

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir Flow (ft)	Q Culv Group (cfs)	Q Weir (cfs)	Delta WS (ft)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)

Reach 1	341.14	Culvert #2	100year	6211.77	6211.51	6211.61	6211.75	6220.86	145.48	9.07	12.32	16.60
Reach 1	341.14	Culvert #1	100year	6211.77	6211.51	6213.13	6211.78	6220.86	710.52	9.07	18.46	18.46
Reach 1	341.14	Culvert #2	10year	6205.21	6205.09	6205.10	6205.21	6220.86	1.69	8.60	2.86	5.09
Reach 1	341.14	Culvert #1	10year	6205.21	6205.09	6204.35	6205.21	6220.86	302.31	8.60	11.34	20.76
Reach 1	341.14	Culvert #2	2year	6205.09	6204.98	6205.00	6205.09	6220.86	1.06	8.60	2.53	4.45
Reach 1	341.14	Culvert #1	2year	6205.09	6204.98	6204.24	6205.09	6220.86	294.94	8.60	11.23	20.67

Reach 1	209.5	Culvert #1	100year	6203.07	6202.88	6202.39	6203.07	6216.72	856.00	6.00	13.07	15.14
Reach 1	209.5	Culvert #1	10year	6197.19	6196.84	6196.56	6197.19	6216.72	304.00	1.84	8.35	7.90
Reach 1	209.5	Culvert #1	2year	6197.10	6196.73	6196.47	6197.10	6216.72	296.00	1.79	8.26	7.80

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : CorrectedEffecttiveTown+BNSF LF

River: IndustrialTrib Reach: Reach 1   RS: 1534.24   Profile: 100year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1534.24   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1534.24   Profile: 2year

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1485.4 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1485.4 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1485.4 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1485.2 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1485.2 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1485.2 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1460.5 Profile: 100year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.5 Profile: 10year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.5 Profile: 2year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.4 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.4 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

River: IndustrialTrib Reach: Reach 1   RS: 1460.4   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1   RS: 1447.48   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1447.48   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1447.48   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current

and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1409.04 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1409.04 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1409.04 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1304.87 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1304.87 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1304.87 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1182.55 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1182.55 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1182.55 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1136.61 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1136.61 Profile: 10year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1136.61 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1052.55 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1052.55 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1052.55 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1029.49   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1   RS: 1029.49   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1   RS: 1029.49   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1002.35 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1002.35 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1002.35 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 977.55 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 977.55 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 977.55 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 948.15 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 948.15 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 948.15 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 917.55 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 917.35 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 917.35 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 917.35 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 892.55 Profile: 100year

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 892.55 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 892.55 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 877.31 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 877.31 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 877.31 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 837.55 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 837.55 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 727.54 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 727.54 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 665.09 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 665.09 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 665.09 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 636.9   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 636.9   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 636.9   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 568.86   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that

there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 568.86 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 568.86 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 520.21 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 520.21 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 520.21 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 462.21 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

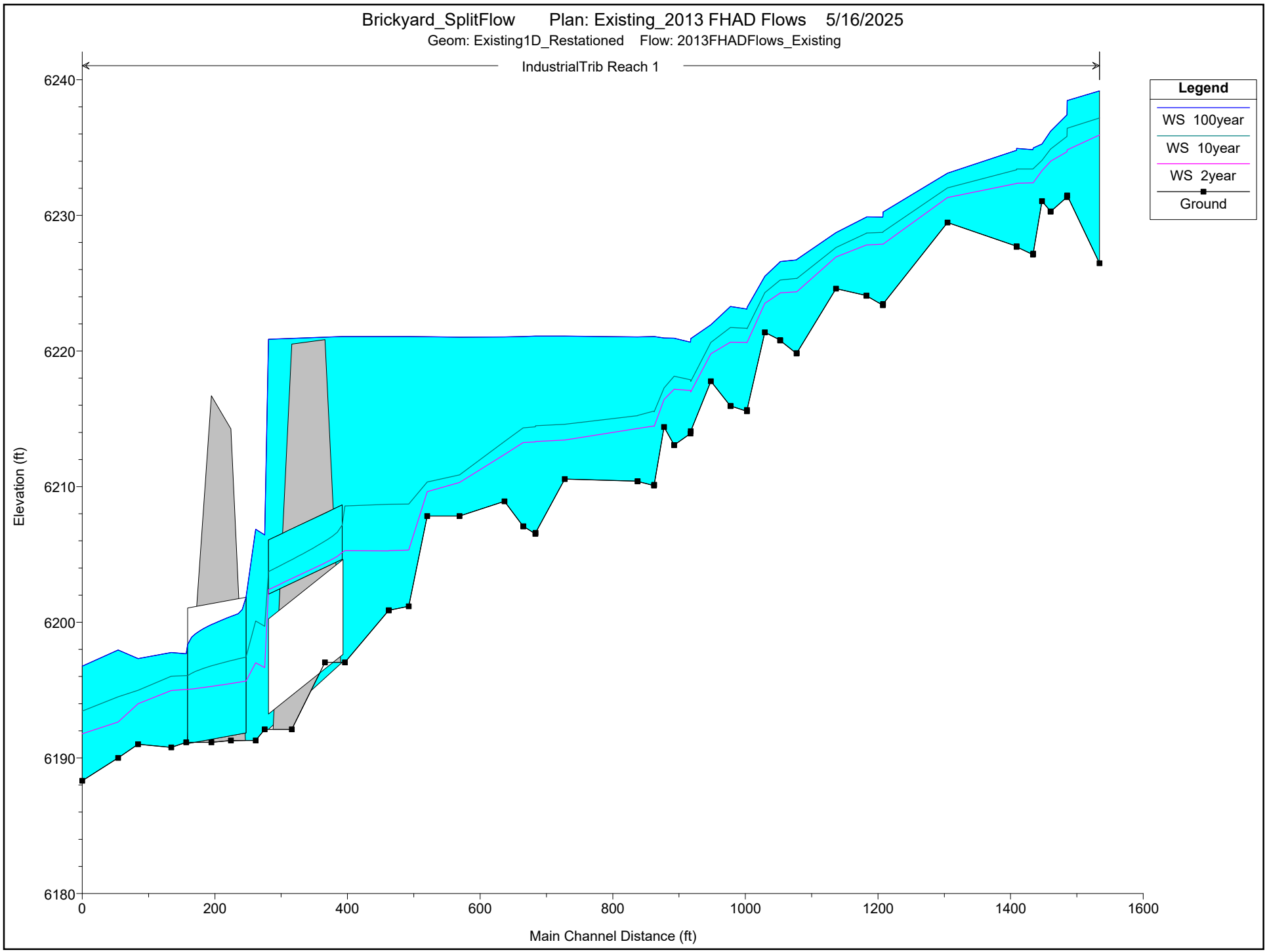
River: IndustrialTrib Reach: Reach 1   RS: 462.21   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 396.14   Profile: 100year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 396.14   Profile: 10year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 396.14   Profile: 2year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 100year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 100year   Culv: Culvert #2
     Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 100year   Culv: Culvert #1
     Note: Culvert critical depth exceeds the height of the culvert.
     Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
     Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert
             inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 10year   Culv: Culvert #2
     Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal
             depth at the outlet.
     Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 10year   Culv: Culvert #1
     Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross
             section downstream of the culvert has supercritical flow.
     Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 2year   Culv: Culvert #2
     Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal
             depth at the outlet.
     Note: The flow in the culvert is entirely supercritical.

River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 2year   Culv: Culvert #1
     Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross
             section downstream of the culvert has supercritical flow.
     Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1   RS: 275.31   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 275.31   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 275.31   Profile: 2year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 261.46   Profile: 100year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 261.46   Profile: 10year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 261.46   Profile: 2year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 156.67   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may

indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 156.67   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 156.67   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 134.36   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 134.36   Profile: 10year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 134.36   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.

River: IndustrialTrib Reach: Reach 1   RS: 84.26   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 84.26   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 84.26   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 54.26 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.


Brickyard_SplitFlow Plan: Existing_2013 FHAD Flows 5/16/2025
Geom: Existing1D_Restationed Flow: 2013FHADFlows_Existing
IndustrialTrib Reach 1
Legend
WS 100year
WS 10year
WS 2year
Ground
Elevation (ft)
6240
6230
6220
6210
6200
6190
6180
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)

HEC-RAS Plan: CorrectedEffective_EffectiveFlows River: IndustrialTrib Reach: Reach 1

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	1534.24	100year	1162.00	6226.47	6239.18		6239.67	0.003360	5.63	206.38	47.29	0.48
Reach 1	1534.24	10year	590.00	6226.47	6237.19		6237.54	0.003351	4.79	123.28	33.96	0.44
Reach 1	1534.24	2year	318.00	6226.47	6235.92		6236.14	0.002440	3.70	85.85	25.64	0.36
Reach 1	1485.4	100year	1162.00	6231.47	6238.47		6239.35	0.011309	7.56	153.68	38.33	0.67
Reach 1	1485.4	10year	590.00	6231.47	6236.42	6235.83	6237.19	0.015874	7.05	83.68	30.17	0.75
Reach 1	1485.4	2year	318.00	6231.47	6234.83	6234.83	6235.77	0.031659	7.78	40.88	21.42	0.99
Reach 1	1485.2	100year	1162.00	6231.35	6237.42	6237.42	6239.26	0.020252	11.35	116.77	34.08	0.92
Reach 1	1485.2	10year	590.00	6231.35	6235.82	6235.82	6237.14	0.023805	9.35	67.29	27.71	0.93
Reach 1	1485.2	2year	318.00	6231.35	6234.69	6234.69	6235.71	0.032026	8.13	39.13	19.18	1.00
Reach 1	1460.5	100year	1162.00	6230.28	6236.21	6234.88	6236.97	0.009183	6.99	166.22	40.57	0.61
Reach 1	1460.5	10year	590.00	6230.28	6234.89	6233.51	6235.29	0.006649	5.11	115.55	35.85	0.50
Reach 1	1460.5	2year	318.00	6230.28	6233.99	6232.65	6234.21	0.004731	3.75	84.75	32.61	0.41
Reach 1	1460.4	100year	1162.00	6230.29	6236.21	6234.89	6236.97	0.009214	6.99	166.25	40.71	0.61
Reach 1	1460.4	10year	590.00	6230.29	6234.88	6233.54	6235.29	0.006708	5.11	115.38	35.97	0.50
Reach 1	1460.4	2year	318.00	6230.29	6233.98	6232.68	6234.21	0.004801	3.76	84.47	32.72	0.41
Reach 1	1447.48	100year	1162.00	6231.06	6235.26	6235.26	6236.71	0.027304	9.68	120.06	41.62	1.00
Reach 1	1447.48	10year	590.00	6231.06	6234.06	6234.06	6235.07	0.030737	8.08	73.04	36.64	1.01
Reach 1	1447.48	2year	318.00	6231.06	6233.31	6233.31	6234.02	0.034515	6.80	46.77	33.35	1.01
Reach 1	1434.04	100year	1162.00	6227.18	6234.97		6235.49	0.006200	5.79	200.84	45.95	0.49
Reach 1	1434.04	10year	590.00	6227.18	6233.44		6233.72	0.004131	4.27	138.08	36.18	0.39
Reach 1	1434.04	2year	318.00	6227.18	6232.39		6232.54	0.002521	3.07	103.46	30.34	0.29
Reach 1	1433.84	100year	1162.00	6227.11	6234.84		6235.48	0.004904	6.60	198.04	45.19	0.45
Reach 1	1433.84	10year	590.00	6227.11	6233.42		6233.72	0.003079	4.46	140.23	36.15	0.34
Reach 1	1433.84	2year	318.00	6227.11	6232.40		6232.54	0.001907	3.04	106.36	30.52	0.26
Reach 1	1409.14	100year	1162.00	6227.68	6234.93		6235.30	0.003226	4.91	245.56	58.65	0.38
Reach 1	1409.14	10year	590.00	6227.68	6233.42		6233.61	0.002650	3.55	166.37	46.06	0.32
Reach 1	1409.14	2year	318.00	6227.68	6232.38		6232.48	0.001858	2.61	121.75	39.62	0.26
Reach 1	1409.04	100year	1162.00	6227.72	6234.80		6235.29	0.003563	6.07	237.17	57.51	0.42
Reach 1	1409.04	10year	590.00	6227.72	6233.36		6233.61	0.002366	4.21	163.09	45.60	0.32
Reach 1	1409.04	2year	318.00	6227.72	6232.35		6232.48	0.001546	2.95	120.23	39.51	0.25
Reach 1	1304.87	100year	1162.00	6229.48	6233.11	6233.11	6234.40	0.027550	9.13	127.30	49.65	1.01
Reach 1	1304.87	10year	590.00	6229.48	6232.02	6232.02	6232.93	0.031043	7.65	77.11	43.08	1.01
Reach 1	1304.87	2year	318.00	6229.48	6231.31	6231.31	6231.98	0.034683	6.56	48.46	37.14	1.01
Reach 1	1207.55	100year	1162.00	6223.47	6230.25		6231.14	0.012041	7.56	153.63	40.27	0.68
Reach 1	1207.55	10year	590.00	6223.47	6228.79		6229.31	0.008938	5.81	101.51	31.39	0.57
Reach 1	1207.55	2year	318.00	6223.47	6227.87		6228.15	0.005421	4.22	75.30	25.68	0.43
Reach 1	1207.35	100year	1162.00	6223.38	6229.88		6231.11	0.011429	9.13	140.97	37.87	0.69
Reach 1	1207.35	10year	590.00	6223.38	6228.75		6229.31	0.006958	6.09	102.06	31.30	0.52
Reach 1	1207.35	2year	318.00	6223.38	6227.88		6228.15	0.004493	4.20	77.12	25.81	0.40
Reach 1	1182.65	100year	1162.00	6224.07	6229.90		6230.76	0.007887	7.71	168.29	44.66	0.59
Reach 1	1182.65	10year	590.00	6224.07	6228.69		6229.12	0.005264	5.30	118.41	37.97	0.46
Reach 1	1182.65	2year	318.00	6224.07	6227.82		6228.03	0.003595	3.72	87.60	32.33	0.37
Reach 1	1182.55	100year	1162.00	6224.09	6229.88		6230.76	0.008040	7.77	167.21	44.59	0.60
Reach 1	1182.55	10year	590.00	6224.09	6228.69		6229.12	0.005367	5.34	117.65	37.94	0.47
Reach 1	1182.55	2year	318.00	6224.09	6227.81		6228.03	0.003673	3.75	86.97	32.32	0.37
Reach 1	1136.61	100year	1162.00	6224.60	6228.73	6228.73	6230.09	0.027658	9.36	124.10	46.43	1.01
Reach 1	1136.61	10year	590.00	6224.60	6227.64	6227.64	6228.58	0.030771	7.77	75.90	41.00	1.01
Reach 1	1136.61	2year	318.00	6224.60	6226.93	6226.93	6227.60	0.034686	6.57	48.38	36.97	1.01
Reach 1	1077.55	100year	1162.00	6219.85	6226.75		6227.27	0.006066	5.79	200.67	46.02	0.49
Reach 1	1077.55	10year	590.00	6219.85	6225.35		6225.62	0.003906	4.17	141.42	37.90	0.38
Reach 1	1077.55	2year	318.00	6219.85	6224.37		6224.50	0.002277	2.96	107.31	31.84	0.28
Reach 1	1077.35	100year	1162.00	6219.81	6226.73		6227.27	0.004848	5.96	203.51	45.85	0.45
Reach 1	1077.35	10year	590.00	6219.81	6225.35		6225.61	0.003231	4.09	145.69	37.91	0.35
Reach 1	1077.35	2year	318.00	6219.81	6224.37		6224.50	0.002038	2.85	111.55	31.99	0.27
Reach 1	1052.65	100year	1162.00	6220.77	6226.59		6227.15	0.004867	6.19	210.33	54.43	0.47
Reach 1	1052.65	10year	590.00	6220.77	6225.24		6225.53	0.003620	4.40	142.89	45.32	0.39
Reach 1	1052.65	2year	318.00	6220.77	6224.28		6224.44	0.002720	3.18	102.74	38.92	0.32

HEC-RAS Plan: CorrectedEffective_EffectiveFlows River: IndustrialTrib 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	1052.55	100year	1162.00	6220.81	6226.58		6227.15	0.005014	6.25	208.40	54.30	0.48
Reach 1	1052.55	10year	590.00	6220.81	6225.23		6225.53	0.003759	4.45	141.26	45.26	0.39
Reach 1	1052.55	2year	318.00	6220.81	6224.28		6224.44	0.002852	3.23	101.24	38.89	0.33
Reach 1	1029.49	100year	1162.00	6221.37	6225.51	6225.51	6226.85	0.026523	9.27	125.34	46.00	0.99
Reach 1	1029.49	10year	590.00	6221.37	6224.30	6224.30	6225.27	0.029384	7.90	74.65	37.74	0.99
Reach 1	1029.49	2year	318.00	6221.37	6223.51	6223.51	6224.23	0.033224	6.78	46.93	32.93	1.00
Reach 1	1002.55	100year	1162.00	6215.65	6223.20		6224.06	0.011359	7.41	156.72	38.68	0.65
Reach 1	1002.55	10year	590.00	6215.65	6221.64		6222.14	0.007707	5.65	104.42	28.20	0.52
Reach 1	1002.55	2year	318.00	6215.65	6220.62		6220.87	0.004400	4.03	78.94	23.28	0.39
Reach 1	1002.35	100year	1162.00	6215.56	6223.10		6224.05	0.008542	7.94	157.04	38.00	0.57
Reach 1	1002.35	10year	590.00	6215.56	6221.67		6222.13	0.005855	5.47	109.14	28.81	0.45
Reach 1	1002.35	2year	318.00	6215.56	6220.63		6220.86	0.003883	3.83	83.10	23.65	0.36
Reach 1	977.65	100year	1162.00	6215.94	6223.29		6223.78	0.003560	5.72	217.80	46.02	0.40
Reach 1	977.65	10year	590.00	6215.94	6221.74		6221.97	0.002410	3.92	153.67	36.85	0.31
Reach 1	977.65	2year	318.00	6215.94	6220.65		6220.77	0.001586	2.72	116.99	31.22	0.24
Reach 1	977.55	100year	1162.00	6215.95	6223.29		6223.78	0.003579	5.73	217.41	46.03	0.40
Reach 1	977.55	10year	590.00	6215.95	6221.73		6221.97	0.002428	3.93	153.29	36.87	0.31
Reach 1	977.55	2year	318.00	6215.95	6220.65		6220.77	0.001600	2.73	116.65	31.24	0.24
Reach 1	948.15	100year	1162.00	6217.77	6221.94	6221.94	6223.45	0.026717	9.86	117.86	39.12	1.00
Reach 1	948.15	10year	590.00	6217.77	6220.63	6220.63	6221.71	0.029755	8.35	70.65	32.88	1.00
Reach 1	948.15	2year	318.00	6217.77	6219.79	6219.79	6220.58	0.032775	7.10	44.78	28.78	1.00
Reach 1	917.55	100year	1162.00	6214.08	6220.91		6221.82	0.011910	7.65	151.82	37.13	0.67
Reach 1	917.55	10year	590.00	6214.08	6217.76	6217.76	6219.24	0.031527	9.76	60.43	20.51	1.00
Reach 1	917.55	2year	318.00	6214.08	6216.98		6217.76	0.022068	7.07	44.95	19.55	0.82
Reach 1	917.35	100year	1162.00	6213.92	6220.65		6221.79	0.010088	8.79	146.71	36.01	0.63
Reach 1	917.35	10year	590.00	6213.92	6217.88	6217.58	6219.10	0.023375	8.85	66.71	21.20	0.87
Reach 1	917.35	2year	318.00	6213.92	6217.09		6217.70	0.015397	6.28	50.64	19.84	0.69
Reach 1	892.65	100year	1162.00	6213.06	6220.95		6221.47	0.003590	5.98	220.97	49.61	0.40
Reach 1	892.65	10year	590.00	6213.06	6218.14		6218.61	0.006075	5.50	108.54	29.85	0.48
Reach 1	892.65	2year	318.00	6213.06	6217.18		6217.42	0.004031	3.86	82.48	25.20	0.38
Reach 1	892.55	100year	1162.00	6213.06	6220.95		6221.47	0.003580	5.98	221.20	49.70	0.40
Reach 1	892.55	10year	590.00	6213.06	6218.14		6218.61	0.006067	5.50	108.55	29.91	0.48
Reach 1	892.55	2year	318.00	6213.06	6217.18		6217.41	0.004032	3.86	82.44	25.21	0.38
Reach 1	877.31	100year	1162.00	6214.39	6220.96		6221.38	0.003569	5.27	235.21	57.41	0.40
Reach 1	877.31	10year	590.00	6214.39	6217.28	6217.28	6218.37	0.029756	8.36	70.56	32.83	1.01
Reach 1	877.31	2year	318.00	6214.39	6216.42	6216.42	6217.22	0.032900	7.17	44.33	28.15	1.01
Reach 1	862.55	100year	1162.00	6210.14	6221.07		6221.29	0.001368	3.97	338.49	64.61	0.24
Reach 1	862.55	10year	590.00	6210.14	6215.53		6216.16	0.010862	6.35	92.98	25.49	0.59
Reach 1	862.55	2year	318.00	6210.14	6214.45		6214.79	0.007086	4.67	68.12	21.56	0.46
Reach 1	862.34	100year	1162.00	6210.07	6221.07		6221.29	0.001310	3.92	343.61	64.92	0.24
Reach 1	862.34	10year	590.00	6210.07	6215.58		6216.13	0.009242	5.99	98.45	25.81	0.54
Reach 1	862.34	2year	318.00	6210.07	6214.48		6214.77	0.005768	4.36	72.97	21.59	0.42
Reach 1	837.65	100year	1162.00	6210.38	6221.04		6221.26	0.001127	4.11	373.15	79.00	0.23
Reach 1	837.65	10year	590.00	6210.38	6215.24		6215.89	0.009458	6.48	91.52	25.19	0.58
Reach 1	837.65	2year	318.00	6210.38	6214.29		6214.62	0.006256	4.60	69.20	22.22	0.46
Reach 1	837.55	100year	1162.00	6210.41	6221.04		6221.26	0.001133	4.12	372.65	79.03	0.23
Reach 1	837.55	10year	590.00	6210.41	6215.23		6215.89	0.009699	6.54	90.69	25.08	0.59
Reach 1	837.55	2year	318.00	6210.41	6214.29		6214.62	0.006421	4.64	68.57	22.17	0.46
Reach 1	727.54	100year	1162.00	6210.55	6221.10		6221.16	0.000291	1.99	611.17	91.34	0.12
Reach 1	727.54	10year	590.00	6210.55	6214.59		6214.87	0.007061	4.26	138.41	58.83	0.49
Reach 1	727.54	2year	318.00	6210.55	6213.43		6213.69	0.010902	4.12	77.20	47.63	0.57
Reach 1	683.64	100year	1162.00	6206.59	6221.11		6221.14	0.000172	1.52	798.70	118.91	0.09
Reach 1	683.64	10year	590.00	6206.59	6214.49		6214.64	0.003016	3.13	188.26	63.56	0.32
Reach 1	683.64	2year	318.00	6206.59	6213.33		6213.44	0.002662	2.59	122.63	48.75	0.29
Reach 1	683.32	100year	1162.00	6206.52	6221.10		6221.14	0.000243	2.06	798.65	118.93	0.10
Reach 1	683.32	10year	590.00	6206.52	6214.42		6214.63	0.002569	4.12	184.44	62.74	0.29
Reach 1	683.32	2year	318.00	6206.52	6213.30		6213.43	0.001903	3.11	121.51	48.33	0.24

HEC-RAS Plan: CorrectedEffective_EffectiveFlows River: IndustrialTrib 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	665.19	100year	1162.00	6207.07	6221.08		6221.13	0.000276	2.43	703.32	104.15	0.12
Reach 1	665.19	10year	590.00	6207.07	6214.33		6214.58	0.002470	4.37	171.86	55.74	0.32
Reach 1	665.19	2year	318.00	6207.07	6213.26		6213.40	0.001724	3.18	117.57	44.22	0.26
Reach 1	665.09	100year	1162.00	6207.08	6221.08		6221.13	0.000276	2.44	703.45	104.25	0.12
Reach 1	665.09	10year	590.00	6207.08	6214.33		6214.58	0.002478	4.37	171.72	55.76	0.32
Reach 1	665.09	2year	318.00	6207.08	6213.25		6213.40	0.001731	3.19	117.43	44.22	0.26
Reach 1	636.9	100year	1162.00	6208.92	6221.04		6221.12	0.000427	2.90	615.46	108.79	0.16
Reach 1	636.9	10year	590.00	6208.92	6213.33	6213.33	6214.35	0.020325	8.63	82.26	42.55	0.87
Reach 1	636.9	2year	318.00	6208.92	6212.37	6212.37	6213.21	0.025683	7.53	46.39	31.43	0.92
Reach 1	568.86	100year	1162.00	6207.84	6221.03		6221.11	0.000125	2.61	701.80	115.54	0.13
Reach 1	568.86	10year	590.00	6207.84	6210.87	6210.64	6211.85	0.009283	8.12	78.56	33.02	0.85
Reach 1	568.86	2year	318.00	6207.84	6210.31	6209.77	6210.77	0.005811	5.54	60.66	30.85	0.65
Reach 1	520.21	100year	1162.00	6207.84	6221.05		6221.09	0.000061	1.82	946.72	121.50	0.09
Reach 1	520.21	10year	590.00	6207.84	6210.35	6210.35	6211.31	0.013138	8.02	78.92	44.17	0.97
Reach 1	520.21	2year	318.00	6207.84	6209.63	6209.63	6210.31	0.015689	6.67	49.29	38.87	0.99
Reach 1	492.27	100year	1162.00	6201.17	6221.06		6221.08	0.000022	1.33	1317.05	132.54	0.05
Reach 1	492.27	10year	590.00	6201.17	6208.71		6208.83	0.000437	2.84	230.88	52.79	0.21
Reach 1	492.27	2year	318.00	6201.17	6205.32		6205.54	0.002316	3.74	85.15	33.64	0.41
Reach 1	462.31	100year	1162.00	6200.88	6221.06		6221.08	0.000020	1.29	1437.06	149.42	0.05
Reach 1	462.31	10year	590.00	6200.88	6208.71		6208.81	0.000360	2.71	256.70	58.60	0.19
Reach 1	462.31	2year	318.00	6200.88	6205.29		6205.47	0.001589	3.43	93.99	35.51	0.35
Reach 1	462.21	100year	1162.00	6200.88	6221.06		6221.08	0.000021	1.36	1437.63	149.41	0.05
Reach 1	462.21	10year	590.00	6200.88	6208.70		6208.81	0.000377	2.88	256.17	58.55	0.20
Reach 1	462.21	2year	318.00	6200.88	6205.27		6205.47	0.001496	3.59	93.38	35.43	0.35
Reach 1	396.14	100year	1162.00	6197.04	6221.07	6203.45	6221.08	0.000004	0.53	3210.63	286.77	0.02
Reach 1	396.14	10year	590.00	6197.04	6208.58	6201.38	6208.78	0.000311	3.57	165.32	159.39	0.19
Reach 1	396.14	2year	318.00	6197.04	6205.29	6200.15	6205.41	0.000303	2.77	114.95	49.21	0.18
Reach 1	341.14		Culvert									
Reach 1	275.31	100year	1162.00	6192.10	6206.45	6200.35	6207.41	0.001338	8.76	157.12	40.87	0.41
Reach 1	275.31	10year	590.00	6192.10	6199.70	6197.81	6200.77	0.003486	9.18	77.11	26.36	0.60
Reach 1	275.31	2year	318.00	6192.10	6196.66	6196.30	6197.82	0.007297	9.32	41.09	19.94	0.79
Reach 1	261.46	100year	1162.00	6191.29	6206.85	6198.50	6206.99	0.000261	3.52	426.31	75.20	0.16
Reach 1	261.46	10year	590.00	6191.29	6200.10	6196.78	6200.33	0.000936	4.37	177.94	41.04	0.28
Reach 1	261.46	2year	318.00	6191.29	6197.02	6195.22	6197.36	0.002377	4.94	78.36	29.72	0.41
Reach 1	209.5		Culvert									
Reach 1	156.67	100year	1162.00	6191.15	6197.67	6197.67	6199.70	0.011053	12.40	112.33	45.10	0.96
Reach 1	156.67	10year	590.00	6191.15	6196.07	6196.07	6197.42	0.011569	9.91	69.60	37.72	0.92
Reach 1	156.67	2year	318.00	6191.15	6195.04	6195.04	6196.00	0.012250	8.14	44.35	32.90	0.90
Reach 1	134.36	100year	1162.00	6190.78	6197.78		6198.66	0.004603	8.17	177.30	48.63	0.64
Reach 1	134.36	10year	590.00	6190.78	6196.03	6195.30	6196.67	0.005543	6.79	100.76	38.55	0.65
Reach 1	134.36	2year	318.00	6190.78	6194.97	6194.44	6195.42	0.006135	5.57	63.13	33.08	0.64
Reach 1	84.26	100year	1162.00	6191.00	6197.32		6198.39	0.005378	8.42	151.00	46.65	0.69
Reach 1	84.26	10year	590.00	6191.00	6194.99	6194.99	6196.19	0.014392	8.80	67.14	28.68	1.00
Reach 1	84.26	2year	318.00	6191.00	6193.99	6193.99	6194.91	0.016046	7.68	41.42	22.98	1.01
Reach 1	54.26	100year	1162.00	6190.00	6197.96		6198.07	0.000380	2.86	479.86	107.11	0.20
Reach 1	54.26	10year	590.00	6190.00	6194.51		6194.69	0.001471	3.40	177.21	68.28	0.34
Reach 1	54.26	2year	318.00	6190.00	6192.64		6192.93	0.005614	4.34	73.34	45.69	0.60
Reach 1	0.00	100year	1162.00	6188.32	6196.77	6194.43	6197.92	0.004114	8.78	149.54	31.98	0.55
Reach 1	0.00	10year	590.00	6188.32	6193.45	6192.37	6194.45	0.007188	8.04	74.19	18.07	0.67
Reach 1	0.00	2year	318.00	6188.32	6191.78	6191.14	6192.51	0.008814	6.86	46.34	15.79	0.71

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Brickyard_SplitFlow
Project File : ITT_SplitFlow.prj
Run Date and Time: 5/16/2025 1:48:40 PM

Project in English units

PLAN DATA

Plan Title: Existing_2013 FHAD Flows
Plan File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.p47

Geometry Title: Existing1D_Restationed
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g19

Flow Title : 2013FHADFlows_Existing
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.f03

Plan Summary Information:
Number of: Cross Sections = 54 Multiple Openings = 0
Culverts = 2 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information

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    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow




FLOW DATA

Flow Title: 2013FHADFlows_Existing
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson
Models\ITT_Proposed\ITT_SplitFlow.f03

Flow Data (cfs)


  River           Reach           RS                100year          10year
 2year
  IndustrialTrib  Reach 1         1534.24              1162             590
   318



Boundary Conditions


  River           Reach           Profile                       Upstream
    Downstream


  IndustrialTrib  Reach 1         100year
Known WS = 6196.77
  IndustrialTrib  Reach 1         10year
Known WS = 6193.45
  IndustrialTrib  Reach 1         2year
Known WS = 6191.78




GEOMETRY DATA
```

Geometry Title: Existing1D_Restationed
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g19

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1534.24

INPUT
Description: 47 - River STA 1536.29
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6255.7	.02	6255.7	7.14	6255.62	11.18	6255.56	13.69	6255.32
28.47	6254.59	31.35	6254.73	35.03	6252.94	40.24	6249.62	42.33	6248
50.9	6242.23	51.52	6241.8	51.84	6241.52	53.06	6240.51	57.48	6236.86
60.48	6235.36	60.84	6235.18	61.84	6234.65	62.33	6233.33	64.99	6226.47
67.4	6226.57	68.14	6226.6	68.51	6227.28	69.81	6232.67	72.48	6233.14
73.08	6233.24	75.47	6233.62	76.54	6233.86	88.19	6236.7	88.81	6236.84
90.54	6237.12	99.42	6238.29	103.93	6239.86	106.09	6240.55	106.54	6240.77
124.47	6251.85	124.58	6251.93	124.61	6251.94	124.64	6251.94	125.52	6251.98
146.84	6252.83								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	53.06	.035	106.54	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
53.06	106.54	49.2	48.84	48.48	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1485.4

INPUT
Description: 46 - River STA 1486.54
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.61	6.17	6253.44	11.35	6252.55	23.39	6245.55	27.06	6243.44
30.11	6242.22	44.06	6236.02	44.7	6235.74	46.83	6234.85	48.12	6234.82
51.32	6233.08	55.75	6232.46	57.37	6232.23	57.74	6232.18	59.24	6231.96
60.33	6231.81	62.7	6231.47	67.84	6234.7	68.39	6234.79	70.7	6234.92
79.38	6239.89	80.93	6240.76	81.72	6241.28	82	6241.47	82.11	6241.52
83.74	6242.21	84.65	6242.64	85.64	6243	87.68	6244.04	91.05	6246.45
91.97	6246.6	93.83	6247.24	97.1	6247.86	97.58	6247.89	98.01	6247.87
112.74	6244.08								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	30.11	.05	79.38	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
30.11	79.38		.2	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1485.2

INPUT
Description: 45 - River STA 1486.34
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.61	6.14	6253.44	11.41	6252.53	23.15	6245.71	27.11	6243.42
30.42	6242.11	44.43	6235.87	44.62	6235.75	44.8	6235.7	46.89	6234.82
48.34	6234.79	51.97	6232.83	56.02	6232.25	57.36	6232.07	57.85	6232
59.22	6231.8	60.22	6231.66	62.39	6231.35	67.72	6234.69	68.11	6234.76
70.64	6234.91	78.81	6239.58	80.72	6240.65	81.71	6241.31	82.06	6241.54
82.19	6241.59	84.21	6242.45	84.85	6242.75	85.54	6243	87.65	6244.08
90.88	6246.4	91.76	6246.54	93.55	6247.15	97.12	6247.83	97.51	6247.85
97.86	6247.84	112.73	6244.02						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	48.34	.05	67.72	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
48.34	67.72		22.87	24.7	26.53	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 1460.5

INPUT
Description: 44 - River STA 1461.64
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6252.43	3.45	6252.29	12.65	6251.85	13.79	6251.71	16.05	6250.38
24.72	6246.77	36.12	6240.54	40.91	6236.03	46.69	6232.29	47.06	6232.09
47.18	6232.08	49.84	6231.12	50.15	6230.94	50.97	6230.83	55.27	6230.54
59.1	6230.28	59.16	6230.28	59.28	6230.3	65.58	6231.06	69.01	6231.37
71.36	6231.39	74.22	6232.84	75.19	6233.26	80.94	6236.06	88.49	6239.31
98.99	6237.21	99.68	6237	100.82	6237.04	104.64	6237.53	107.19	6237.64

```
  111.06 6237.78  112.31 6237.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.12     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.12   88.49              .09      .1     .11             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.31       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1460.4

INPUT
Description: 43 -  River STA 1461.54
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6252.43    3.68 6252.27   12.67 6251.85   13.79 6251.71      16 6250.41
    24.7 6246.79      36 6240.61    40.9    6236   46.47  6232.4   47.06 6232.08
   47.26 6232.06   49.61 6231.21   50.01 6230.98   51.08 6230.83   55.26 6230.55
   58.96  6230.3   59.18 6230.29   59.65 6230.38    65.5 6231.08   68.69 6231.38
   71.42  6231.4   74.21 6232.81   75.25 6233.26   80.81 6235.96   88.49 6239.27
   99.16 6237.13   99.69 6236.97  100.55    6237  104.67 6237.53  107.17 6237.63
  111.11 6237.78  112.31 6237.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      36     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            36   88.49             14.1   12.92   11.74             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.27       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1447.48

INPUT
Description: 42 - River STA 1448.51
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

```
       0 6251.56    11.9 6250.97   15.71 6250.01   17.78 6249.69    22.2 6248.89
   34.71 6239.62   37.97 6237.19   39.19 6236.27   42.86 6233.95   46.07 6232.22
   50.16 6231.72   58.37 6231.72   58.94 6231.61   59.29  6231.2   60.32 6231.06
   63.04  6231.7   73.31 6231.88   74.74 6232.62   76.53 6232.96   82.88 6235.44
   88.57 6236.04    88.9 6236.15   90.47 6236.48   93.34 6236.94  101.88 6237.31
  107.44 6237.51  110.57 6237.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   39.19     .05   88.57     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         39.19   88.57             15.62   13.44   11.27             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1434.04

INPUT
Description: 41 -  River STA 1435.13
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6250.39    1.48 6250.32   21.85 6248.52   22.66  6248.4   22.92 6248.35
   24.13 6247.45   31.48  6242.2   38.04  6237.5   39.36 6236.64   45.66 6232.48
   46.81 6232.15   47.91 6231.95   48.18 6231.89   49.02 6231.75   52.58 6227.98
   53.16 6227.93   61.78 6227.18   65.77 6228.34   72.17 6228.08   73.21 6231.58
   73.24 6231.65   73.26 6231.65    76.5 6232.44   76.64 6232.44   76.77 6232.48
   77.45 6232.77   84.65  6234.4   98.07 6236.81  110.17 6237.44

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   39.36     .05   98.07     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         39.36   98.07               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1433.84

INPUT
Description: 40 -  River STA 1434.93
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6250.38    1.31 6250.32   22.04 6248.49   22.71 6248.39   22.92 6248.35
   23.92  6247.6      30 6243.25   38.06 6237.48   39.68 6236.43   45.68 6232.47
```

```
   46.99 6232.08   48.24 6231.86   48.39 6231.83   48.85 6231.75   52.47 6227.93
   53.16 6227.87    61.8 6227.11   65.39 6228.16    72.1 6227.89   73.01 6230.95
    73.3 6231.65   73.55 6231.72   76.33 6232.39   76.55  6232.4   76.74 6232.46
   77.42 6232.74   84.49 6234.34    98.2 6236.81  110.15 6237.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   48.85     .05    73.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         48.85    73.3            24.56    24.7   25.32             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1409.14

INPUT
Description: 39 -  River STA 1410.22
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.43    8.02 6247.69   19.42 6246.71   21.94 6246.61   31.37 6243.23
   34.12 6241.28   38.08 6239.57    40.6 6236.68   41.52 6236.07   46.38 6233.15
   50.97 6230.01    52.6  6228.7   53.25 6228.09   54.84 6228.05   57.03    6228
   62.28 6227.68    67.7 6227.81   71.13 6227.83   74.98 6229.84   76.05 6230.04
   76.36  6230.1   77.04 6230.23   89.37 6232.85   90.87 6233.25  107.25 6235.71
   108.3 6236.08

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   46.38     .05   90.87     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         46.38   90.87              .1      .1     .12             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1409.04

INPUT
Description: 38 -  River STA 1410.12
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.42    8.29 6247.66   19.42  6246.7   21.87 6246.61   31.42 6243.18
   34.12 6241.26   38.12 6239.54    40.6  6236.7   41.54 6236.08   46.29 6233.22
      51    6230   52.54 6228.76   53.22 6228.12   54.85 6228.08   57.16 6228.02
    62.3 6227.72   67.61 6227.85   71.18 6227.86   74.96 6229.84   76.19 6230.06
```

```
   76.55 6230.13   77.33 6230.28   89.51 6232.87      91 6233.26  107.17  6235.7
   108.3 6236.09

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      51     .05   74.96     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            51   74.96             99.66  104.17  115.69             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1304.87

INPUT
Description: 37 -  River STA 1305.87
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.45    19.5 6234.33   26.36 6231.83   38.97 6229.48   44.01 6229.64
   46.14 6229.71   60.16  6229.7   61.35 6230.14   67.22 6231.54   70.71 6232.54
   75.23 6233.96   75.44 6234.41  105.01 6240.87  106.38 6241.05  107.98  6241.7
   115.4    6245

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    19.5     .05   75.44     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          19.5   75.44             91.64   97.32   94.38             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1207.55

INPUT
Description: 36 -  River STA 1208.71
Station Elevation Data    num=      37
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6243.32    4.44 6242.44   19.89 6234.98   21.22  6234.2   22.33 6233.65
   24.38 6232.13    35.5 6229.47   35.88 6229.36    37.3  6228.9   38.24 6228.54
   40.18 6228.18   40.44 6228.11   41.29 6227.85   45.69 6224.27   48.74 6223.47
    54.6 6223.48   56.27 6223.49   57.05 6223.49   64.32 6227.32   64.83 6227.37
   65.49 6227.66   67.01 6227.89   68.55 6228.61   75.21 6231.38   78.17 6232.71
   79.63 6233.35   80.07 6233.56   81.67 6234.66   84.08 6236.35   84.87  6236.7
   85.08 6236.71   86.03 6237.16   86.37 6237.58   93.83  6240.9   98.94 6241.67
  101.54  6242.6   101.7 6242.66
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   19.89     .05   81.67     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         19.89   81.67               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1207.35

INPUT
Description: 35 -  River STA 1208.51
Station Elevation Data    num=      37
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6243.38    4.31 6242.53   20.06 6234.92   21.42 6234.13   22.34 6233.67
   24.44 6232.12   35.28 6229.52   35.64 6229.42   37.32 6228.87   38.44 6228.45
   40.72 6228.03   40.87 6227.99   41.34 6227.84   45.93 6224.11    48.7 6223.38
   54.68 6223.39   56.27  6223.4   56.93  6223.4   63.62 6226.93   64.84 6227.05
   66.39 6227.73    66.9 6227.81   68.56 6228.58   74.49 6231.05   77.94  6232.6
   79.65 6233.34   80.16 6233.58    81.7 6234.65   84.04  6236.3    84.9 6236.68
   85.13 6236.69   86.17 6237.18   86.53 6237.63   93.86  6240.9   99.02 6241.67
  101.52 6242.57   101.7 6242.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   41.34     .05   63.62     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         41.34   63.62             24.08    24.7   25.32             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1182.65

INPUT
Description: 34 - River STA 1183.68
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.38    4.33 6239.32    17.4 6232.29   19.06 6231.84    19.8 6231.56
   24.89 6229.64   25.34  6229.4   25.36 6229.39   29.72 6228.27   32.79 6227.46
   33.54 6227.16   36.93 6224.64   40.52 6224.26   41.08 6224.17   43.82 6224.07
   47.99 6224.13   48.84 6224.15   52.87 6224.21   56.27 6224.81   59.15 6225.62
   60.29 6226.54   64.59 6228.12   65.79 6228.59   68.96 6229.93   72.09 6230.74
   74.51 6231.36   74.94 6231.58   76.51 6232.36   79.67 6233.16   81.57 6234.07
```

```
   83.63 6234.23   91.61 6238.41   92.17  6239.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   33.54     .05   60.29     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         33.54   60.29               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1182.55

INPUT
Description: 33 -  River STA 1183.58
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.39    4.06 6239.45   17.39 6232.29   19.08 6231.83   19.84 6231.55
   24.89 6229.64   25.36 6229.39   25.38 6229.38    29.7 6228.27   32.72 6227.47
   33.58 6227.12    36.9 6224.67    40.4  6224.3   40.98  6224.2   43.83 6224.09
   47.96 6224.16   48.74 6224.17    52.9 6224.23   56.21 6224.82   59.16 6225.65
   60.25 6226.52   64.57 6228.12   65.81  6228.6   68.88  6229.9    71.9 6230.67
   74.49 6231.34   74.95 6231.57   76.52 6232.35   79.67 6233.15   81.56 6234.06
   83.62 6234.22   91.64 6238.41   92.17 6239.16

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   33.58     .05   60.25     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         33.58   60.25             54.71   45.94   37.17             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1136.61

INPUT
Description: 32 -  River STA 1137.60
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6240.21    1.37 6239.57    3.61 6239.02   20.37 6230.23   24.82  6227.9
   25.95 6227.73   27.12 6227.53   29.61 6226.78   31.09 6226.36   36.79 6226.24
   40.11 6225.87   51.49  6224.6   56.52 6224.84   60.23  6225.5    65.8 6226.79
   71.22 6229.51   73.02 6230.21    73.7 6230.43   77.56 6230.84   86.41 6235.52
   94.53 6238.42  103.19 6239.77  106.48 6240.73     110 6242.41
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   20.37     .05    73.7     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         20.37    73.7             60.28   59.06   57.83             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1077.55

INPUT
Description: 31 -  River STA 1078.62
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6239.77     .29 6239.64    4.02 6238.47   11.47 6237.91   13.89 6237.77
   24.55 6233.58   25.51 6233.37   27.09 6232.21   28.45 6231.36   34.15 6227.78
   36.66 6226.74   38.77 6225.74   39.79 6225.82   41.39 6224.99   42.43 6224.48
   42.79 6223.62   43.92 6221.24   50.25 6220.67    53.1 6219.85   55.33 6220.37
   56.06 6220.36    66.5  6220.2   72.12 6223.32   73.95  6223.4   74.34 6224.42
   75.59 6224.59   77.33 6225.13    78.8 6225.38   84.17 6227.29   86.97 6228.04
  101.77 6233.58  108.96 6236.08  114.03 6236.83  120.11 6237.26  120.23 6237.28
  126.24 6239.18

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   25.51     .05  101.77     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.51  101.77               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1077.35

INPUT
Description: 30 -  River STA 1078.42
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6239.76     .38  6239.6    4.04 6238.45   11.38  6237.9   13.92 6237.75
   25.18 6233.32   25.63 6233.23   26.37 6232.68   28.44 6231.39   33.96 6227.92
   36.69 6226.79   38.94 6225.73    39.9  6225.8   41.73 6224.86    42.5 6224.47
   43.07 6223.12   44.03 6221.09   50.68  6220.5   53.02 6219.81   54.86 6220.25
   56.12 6220.23   66.36 6220.08    71.2 6222.76   73.97 6222.88   74.55 6224.43
   75.49 6224.55   77.37 6225.13   78.95  6225.4   84.12 6227.24   87.06 6228.02
  101.69 6233.49  109.05 6236.06  114.24 6236.83   120.2 6237.25  120.34 6237.27
```

```
   126.3 6239.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    39.9     .05   74.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          39.9   74.55            25.53    24.7   23.87             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1052.65

INPUT
Description: 29 -  River STA 1053.62
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6236.38     4.3 6236.03    6.15 6235.71    7.83 6234.91   19.89 6231.39
   20.26 6230.78   20.44 6230.88   21.24 6229.43   28.06 6226.45   35.01 6223.42
   36.84 6222.47   37.13 6222.37   37.18 6222.34   37.89 6221.82   40.23 6221.28
   45.98 6221.12   48.96 6221.03   49.12 6221.03   57.15 6220.77   63.16 6220.81
   64.81 6220.85   65.04 6221.02   67.47 6222.98   70.08 6223.74   71.53 6224.19
   74.17 6224.77   81.29 6226.43   83.72 6226.87   87.04 6228.31   98.26 6231.76
  104.25 6233.89  106.53 6234.25  111.15 6235.38  120.14 6237.92   121.9 6238.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   35.01     .05   67.47     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         35.01   67.47               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1052.55

INPUT
Description: 28 -  River STA 1053.52
Station Elevation Data    num=      34
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6236.38    4.35 6236.02    6.13 6235.71    7.75 6234.95   19.93 6231.39
   20.29 6230.79   20.47 6230.89   21.29 6229.42   27.54 6226.69   35.02 6223.42
   36.92 6222.44    37.2 6222.34   37.89 6221.84   40.05 6221.33   46.06 6221.17
   48.67 6221.09   49.11 6221.08    57.2 6220.81   62.92 6220.86   64.85  6220.9
   65.12  6221.1   67.44 6222.97    70.1 6223.75    71.5 6224.18   74.03 6224.73
   81.27 6226.43   83.73 6226.87    87.1 6228.33    98.5 6231.84  104.25 6233.88
```

```
  106.44 6234.22  110.86 6235.31   120.3 6237.98   121.9 6238.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   35.02     .05   67.44     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         35.02   67.44            23.75   23.06   22.36             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1029.49

INPUT
Description: 27 -  River STA 1030.52
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6234.96     1.6 6234.75   13.23 6232.09   23.42 6226.58   24.53 6226.12
   30.06 6227.36   30.78 6226.05   36.65 6223.45   37.89  6222.8   49.54 6222.03
   51.28 6221.92   52.52 6221.57   54.02 6221.49   61.29 6221.41   63.06 6221.37
   63.44  6221.4   68.43 6223.17   70.53 6223.88   74.83 6224.81   77.95  6225.5
   85.26 6226.84   93.91 6230.63   98.19 6232.19  105.11 6234.23  120.87 6238.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   30.06     .05   85.26     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         30.06   85.26            27.45   26.94   26.44             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0   30.06 6227.36       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1002.55

INPUT
Description: 26 -  River STA 1003.79
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6232.8    5.46  6231.2    5.62 6231.15     5.7 6231.13   15.71 6229.44
   31.21 6224.37   32.64 6224.03   38.51 6221.92   38.52 6221.91   38.56 6221.91
   41.58 6221.44   42.56  6221.1   42.73  6220.3   43.81 6220.18   49.63 6215.97
    50.8 6215.65   51.53 6215.65   58.41 6215.69   60.29 6216.21   61.89 6217.66
   64.09 6219.72   65.48 6219.63   66.13 6221.03   66.83  6221.1   68.64  6221.7
```

```
   69.16 6221.84   69.65 6221.98   71.04 6222.67   75.21 6223.53   82.86 6225.21
   85.53 6225.88   94.19 6227.89   94.56 6227.99   95.71 6228.42   111.3 6234.28
   112.8 6234.86  113.48 6235.11  119.42 6237.78  120.19 6237.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   15.71     .05   95.71     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         15.71   95.71               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 1002.35

INPUT
Description: 25 -  River STA 1003.59
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6232.77    5.02 6231.31    5.54 6231.13    5.81 6231.08   15.61 6229.42
   30.78 6224.46   32.49 6224.06    38.2    6222   38.53  6221.9   39.34 6221.75
   41.72 6221.38   42.49 6221.11    42.8 6219.65   44.76 6219.44   49.75 6215.83
   50.75 6215.56   51.53 6215.56   58.49  6215.6   60.13 6216.06   61.52 6217.32
   63.44 6219.12   65.48 6218.99   66.43 6221.04   66.94 6221.08   68.92 6221.74
   69.14  6221.8   69.66 6221.95   71.13 6222.68   75.18 6223.51   82.59 6225.15
    85.5 6225.88    93.9 6227.83   94.38 6227.93   94.48 6227.96  111.05 6234.19
  112.84 6234.88  113.66 6235.18  119.43 6237.78  120.19 6237.85

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.49     .05   66.43     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.49   66.43            25.09    24.7   24.31             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 977.65

INPUT
Description: 24 -  River STA 978.80
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.78     .55 6229.56    1.75 6229.36    12.9 6226.81   24.14 6223.91
   24.79 6223.75   25.47 6223.54   36.78 6220.31   38.16 6218.74   41.87 6216.15
   48.08 6215.94   50.88 6216.03   56.12 6216.21   62.63 6216.21   64.79 6218.66
```

```
   67.14 6220.99   68.28 6221.57   70.78 6222.71   71.87 6223.14   77.18 6224.68
   86.78 6227.87   87.97 6228.12    90.8 6229.13  100.09 6232.16  103.46 6233.37
  105.98 6233.83   106.6 6234.05  115.98 6236.54  118.01 6237.27  119.64 6237.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.78     .05   67.14     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.78   67.14               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 977.55

INPUT
Description: 23 -  River STA 978.70
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.78     .57 6229.55    1.69 6229.37   12.91 6226.79   24.23 6223.88
   24.78 6223.75   25.35 6223.57   36.77  6220.3   38.07 6218.82   41.88 6216.17
   48.23 6215.95   50.88 6216.04   55.97 6216.21   62.61 6216.22    64.7 6218.58
   67.12 6220.99    68.3 6221.58   70.76 6222.71   71.88 6223.14   77.14 6224.67
    86.8 6227.89   87.96 6228.13   90.74 6229.11   99.84 6232.09   103.4 6233.36
  106.04 6233.85   106.7 6234.07  115.99 6236.54     118 6237.27  119.64 6237.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.77     .05   67.12     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.77   67.12            28.43    29.4   30.37             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 948.15

INPUT
Description: 22 -  River STA 949.15
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.82   13.45 6224.96   20.15 6223.48   21.13 6223.34    21.5 6223.07
   23.79 6222.28   29.22 6220.35   36.12 6218.05   46.64 6217.98   47.82  6217.9
   49.73 6217.87   55.54 6217.77   58.29 6219.08   65.07 6222.56   67.64 6223.25
   69.55 6224.44   69.73 6224.67   70.35 6225.33   80.59 6228.16   82.58 6228.57
   83.05 6228.79   85.79 6229.72   91.27 6231.42   92.34 6231.79   99.82 6233.25
```

```
  114.05 6236.05  114.56  6236.1  116.68 6236.87  119.43 6237.55

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   13.45     .05   70.35     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         13.45   70.35            29.94    30.6   31.27             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 917.55

INPUT
Description: 21 -  River STA 918.80
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6229.1    9.47 6225.42   15.82 6223.71   16.19 6223.75   16.62 6223.65
   16.75 6223.63   23.61 6222.43   31.18 6219.85   33.72 6219.17   36.19  6218.2
   36.37  6218.2   36.94  6217.9   40.32 6214.09   45.72 6214.08      50 6214.59
   52.48 6214.88   56.67 6215.21   57.58 6217.76   57.67 6217.79    60.8 6218.69
   61.08 6218.83   66.79 6221.71   74.44 6223.82    74.7 6223.88   75.55 6224.43
   88.37 6229.35   90.84 6228.98   96.79 6231.09  114.89 6234.36  114.94 6234.37
  115.08 6234.39  116.91 6234.62  117.22 6234.72  117.89 6234.94     120 6235.49

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    9.47     .05   75.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9.47   75.55               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 917.35

INPUT
Description: 20 -  River STA 918.60
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.06    9.26 6225.46   15.79  6223.7   16.17 6223.74   16.61 6223.64
   16.74 6223.62   23.49 6222.44   31.28 6219.79    33.7 6219.15   36.45 6218.06
   36.55 6218.06   36.85  6217.9   40.37 6213.92   46.01 6213.92      50 6214.38
   52.12 6214.63   56.65    6215   57.51 6217.39   57.59 6217.75    59.6  6218.3
   60.74 6218.63   60.82 6218.67   66.86 6221.72   74.36 6223.78   74.67 6223.86
   75.69 6224.51   88.34 6229.37   90.86 6228.99   96.72 6231.07  114.56 6234.29
```

```
   114.8 6234.33  115.39 6234.43  116.97 6234.62  117.23 6234.72   117.8  6234.9
     120 6235.48

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.85     .05   57.59     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.85   57.59             21.96    24.7   27.44             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 892.65

INPUT
Description: 19 -  River STA 893.78
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51    2.34 6228.53   20.68 6223.46   21.93  6223.6   22.22 6223.53
   28.27 6221.78   42.06 6217.21   45.29 6214.39   46.18 6213.37   52.21 6213.13
   56.69 6213.06   57.75 6213.06   62.29 6213.07   63.25 6214.03   63.28    6214
   68.09 6217.82   70.36 6218.53   72.33 6219.14   76.82  6219.8   79.14 6220.29
   79.43 6220.35   81.05 6221.36   99.29 6228.03  103.24 6228.22  111.66 6229.35
  114.57 6230.15  127.72 6232.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.06     .05   68.09     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.06   68.09               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 892.55

INPUT
Description: 18 -  River STA 893.68
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51     2.3 6228.55   20.72 6223.46   21.97 6223.59   22.24 6223.53
   27.91 6221.89   42.13 6217.19   45.45 6214.27   46.24 6213.38   52.38 6213.13
    56.6 6213.06   57.78 6213.06   62.34 6213.08    63.2 6213.93   63.22 6213.91
   68.15 6217.82   70.36 6218.51   72.38 6219.14   76.98 6219.82    79.2 6220.28
   79.48 6220.34   81.02  6221.3   99.37 6228.01  103.25 6228.19  111.75 6229.34
  114.69 6230.14  127.77  6232.7
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	42.13	.05	68.15	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
42.13	68.15		14.37	15.24	13.68	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 877.31

INPUT
Description: 17 - River STA 878.34
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.69	3.6	6227.24	14.73	6225.3	22.41	6223.17	24.18	6222.74
26.05	6222.29	38	6218.59	48.64	6215.29	49.15	6215.16	50.83	6214.59
50.87	6214.52	51.34	6214.46	52.13	6214.39	60.86	6214.44	61.68	6214.51
62.42	6214.57	64.07	6214.57	69.16	6214.6	70.01	6215.01	78.21	6218.71
78.67	6218.85	79.36	6218.96	86.12	6220.17	87.3	6220.75	87.73	6220.96
90.39	6221.59	103.41	6225.41	111.02	6227.77	120.17	6229.17	123.11	6230.04
126.11	6230.84	133.13	6232.67						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	38	.05	78.21	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
38	78.21		18.28	14.76	13.03	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 862.55

INPUT
Description: 16 - River STA 863.56
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6230.45	5.47	6227.6	9.78	6225.72	23.62	6222.39	24.13	6222.26
28.67	6221.54	36.08	6220.52	37.04	6220.28	39.88	6219.39	46.29	6218.48
58.32	6216.49	58.6	6216.34	59.01	6216.19	59.61	6215.97	61.28	6215.26
62	6215.03	62.32	6213.87	62.81	6211.01	68.36	6211.13	71.05	6210.14
71.25	6210.22	74.79	6211.49	82.39	6211.6	83.45	6212.99	83.81	6214.93
84.44	6215.01	85.82	6215.28	86.78	6216.05	89.78	6217.1	96.66	6221.06
98.57	6221.43	100.92	6221.72	101.35	6221.85	108.24	6223.34	122.62	6227.03

```
  133.65 6229.86  134.25 6230.05  134.59  6230.1  134.71 6230.14  135.79 6230.42
  141.76 6231.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   58.32     .05   89.78     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.32   89.78              .21     .21      .2             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 862.34

INPUT
Description: 15 -  River STA 863.35
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6230.43    5.36 6227.63    9.77 6225.71   23.52  6222.4   24.13 6222.25
    29.5  6221.4   36.22 6220.47    37.1 6220.26   39.68 6219.45   45.49 6218.62
   58.29  6216.5   58.57 6216.36   59.08 6216.17   59.67 6215.95   61.51 6215.16
   62.03    6215   62.55 6213.16   62.96 6210.77   68.84  6210.9    71.1 6210.07
   71.33 6210.15   74.25 6211.21   82.55 6211.33   83.39 6212.44   83.85  6214.9
   84.06 6214.93   86.01  6215.3   86.89 6216.01   89.63 6216.97   96.81 6221.09
   98.22 6221.37  100.93 6221.71  101.42 6221.85  108.22 6223.32  122.94  6227.1
  134.22 6229.99  134.53 6230.09  134.71 6230.12  134.78 6230.14  135.35 6230.29
  141.76  6231.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   58.29     .05   89.63     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.29   89.63              21.8   24.69   27.91             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 837.65

INPUT
Description: 14 -  River STA 838.76
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.46    9.95  6225.1   15.15 6223.85   24.89 6221.38   29.15 6220.71
   56.15 6218.05   56.62 6217.98   56.63 6217.97   56.78 6217.92   57.62 6217.67
   58.78 6217.42   67.66 6215.19   68.01 6215.04   69.12 6214.57   72.04  6210.9
```

```
   73.06 6210.38   79.92 6210.59   84.45 6210.72    85.9 6210.45   87.13 6210.74
   88.95 6211.93   89.13 6212.17   92.86 6215.43   96.31 6216.63   99.58 6218.35
  104.31 6219.74  106.61 6221.48  128.77 6228.21  132.31 6229.18  134.17 6229.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   69.12     .05   92.86     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         69.12   92.86               .1      .1     .09             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 837.55

INPUT
Description: 13 -  River STA 838.66
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.46    9.94  6225.1    15.1 6223.85   24.89 6221.38    29.1 6220.71
   56.25 6218.04   56.61 6217.98   56.62 6217.98   56.73 6217.94   57.37 6217.75
   58.26 6217.56   67.62 6215.21      68 6215.05   69.16 6214.56      72 6210.98
   73.12 6210.41   79.93 6210.61   84.35 6210.74   85.86 6210.46   87.14 6210.76
   89.03    6212   89.22 6212.25   92.84 6215.42   96.33 6216.63   99.55 6218.33
  104.31 6219.73  106.63 6221.48  128.89 6228.24  132.31 6229.18  134.13  6229.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   69.16     .05   92.84     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         69.16   92.84            98.07  110.01  124.19             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 727.54

INPUT
Description: 12 - River STA 728.42
Station Elevation Data    num=      43
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6227.72     .66 6227.43    3.91  6226.4   12.55 6224.22   13.48 6223.96
   16.71 6222.71   36.28 6217.25   39.61 6215.21   40.27 6214.82   44.33 6212.53
   45.22 6212.38   45.63 6212.29      46  6213.1    49.9 6212.34    58.4 6210.55
   63.53 6211.03   66.58 6211.22   67.72 6212.31   68.08 6212.49   70.81 6212.52
   71.66 6212.66   73.16 6212.88   73.91  6211.8   74.22 6211.28   75.36 6211.31
```

```
   77.86  6210.6   78.04 6210.64   86.08 6212.39   91.18 6213.63   93.32 6213.91
   93.69 6213.96   99.76 6214.62     105 6217.56  108.34 6219.44  108.48  6219.5
   109.7 6220.01  111.17 6220.36   132.4 6226.23  133.89 6226.38  135.19 6226.54
  151.08 6228.11  174.11  6229.3  179.56  6229.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.28     .05     105     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.28     105            47.93    43.9   36.64             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 683.64

INPUT
Description: 11 - River STA 685.06
Station Elevation Data    num=      50
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6227.64   13.84 6221.66    16.9 6220.15   18.79 6219.48   20.21 6218.97
   23.17 6217.95   23.61 6217.83   25.32 6217.28   42.16 6213.94   46.88  6212.9
   46.95 6212.89   47.32 6213.02    50.3 6211.52    50.6 6210.78   50.92 6210.05
   51.93 6207.65   52.21 6206.83   52.52 6206.72   54.69 6206.59   62.11 6206.66
   62.56 6206.67   62.86 6206.85   64.04 6208.03   64.08 6209.72   65.12 6211.63
   67.26 6211.54   67.52  6211.5    78.2 6212.12   78.41 6212.12   78.81 6212.15
   78.95 6212.17   79.64 6212.23   93.64 6213.33   95.43 6213.48  100.12 6213.98
  103.74 6214.63  115.06 6216.65  115.83 6216.81  116.34 6218.13  123.05 6219.64
  141.68 6222.16  141.98 6222.19  142.73 6222.24  153.22 6223.94  156.36 6224.34
  163.91 6225.17  170.89 6226.05  185.46  6229.3  191.59 6229.69  194.43    6230

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   25.32     .05  115.83     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.32  115.83              .31     .32     .31             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 683.32

INPUT
Description: 10 -  River STA 684.74
Station Elevation Data    num=      48
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

```
       0 6227.74   13.99 6221.69   17.21 6220.11   18.12 6219.79   19.82 6219.18
    23.4 6217.94   23.79 6217.83   25.35 6217.33   40.63  6214.3   46.91 6212.92
   47.13 6212.87   47.49    6213   50.32 6211.57   50.93 6210.07   52.36 6206.61
   54.69 6206.73   59.74 6206.52   62.13 6206.54   62.65 6206.54   62.76 6206.61
   63.16 6207.01   63.17 6207.59   65.36  6211.6   67.39 6211.52   67.64 6211.48
   77.74 6212.06   78.07 6212.06   78.69 6212.12    78.9 6212.14   79.97 6212.23
   93.58  6213.3   95.55 6213.47  100.35 6213.98  104.15 6214.66  114.77 6216.56
  115.91 6216.79   116.4 6218.08  123.34 6219.64  141.74 6222.13   142.1 6222.16
  143.01 6222.23  153.38 6223.91  156.84 6224.35  164.21 6225.15  171.03 6226.02
  185.85 6229.32  192.08 6229.71  194.64    6230

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   47.49     .05   65.36     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         47.49   65.36             25.73   18.13   16.63             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 665.19

INPUT
Description: 9 -  River STA 666.23
Station Elevation Data    num=      37
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6228.22    6.37 6228.13   12.43  6227.5   18.68 6225.07   20.15 6224.36
   30.03 6221.19   30.27    6221   34.65 6219.15   39.63 6216.92   53.16  6211.5
   55.91  6210.4   59.28 6207.36   59.47 6207.08   59.95 6207.07   64.56  6207.2
   67.56 6207.28   67.67 6207.37   67.96 6207.58   72.32    6211   74.36 6211.25
   83.82 6212.31   91.44 6213.09   99.85 6213.98  104.47  6214.8   111.3 6216.01
  114.49 6216.67  114.89 6217.74  123.45 6219.63  139.41 6221.75  140.53 6221.84
  143.44 6222.05  152.25 6223.43  160.72 6224.46   165.3 6224.94  169.24 6225.42
  189.24 6229.79   191.7 6229.95

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   53.16     .05   72.32     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.16   72.32               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 665.09
```

INPUT
Description: 8 - River STA 666.13
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.21	6.38	6228.13	12.46	6227.49	18.66	6225.08	20.12	6224.38
29.92	6221.23	30.16	6221.04	34.5	6219.21	39.44	6216.99	53.17	6211.5
55.93	6210.4	59.34	6207.32	59.5	6207.08	59.89	6207.08	64.57	6207.21
67.36	6207.29	67.59	6207.29	67.6	6207.3	67.65	6207.34	72.32	6210.99
74.55	6211.27	83.85	6212.31	91.35	6213.08	99.87	6213.98	104.55	6214.81
111.16	6215.98	114.47	6216.67	114.86	6217.73	123.49	6219.63	139.38	6221.74
140.51	6221.83	143.48	6222.05	152.25	6223.42	160.83	6224.46	165.35	6224.93
169.24	6225.41	189.32	6229.8	191.71	6229.96				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	53.17	.05	72.32	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
53.17	72.32	30.04	28.19	32.96	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 636.9

INPUT
Description: 7 - River STA 637.93
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6225.92	11.72	6225.58	13.16	6225.08	16.87	6223.52	43.24	6213.76
48.21	6211.92	56.26	6208.94	57.31	6208.93	58.61	6208.92	60.57	6209.89
64.58	6211.14	67.42	6211.35	72.35	6211.72	84.04	6212.96	86.74	6213.29
90.37	6213.97	101.66	6218.61	113.32	6218.63	117.42	6219.58	120.51	6220
125.39	6220.45	136.52	6221.39	139.86	6221.96	152.05	6223.63	159.84	6225.1
177.52	6229.13	180.93	6229.89	182.56	6229.97				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	48.21	.05	67.42	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
48.21	67.42	76.21	68.04	60.72	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 568.86

INPUT
Description: 6 - River STA 569.75
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.24	7.27	6223.18	9.42	6222.97	19.88	6219.54	31.06	6215.88
47.24	6208.55	48.18	6208.12	60.36	6207.84	61.09	6207.84	64.11	6207.85
67.78	6208.01	68.37	6208.13	71.41	6208.78	71.89	6209.04	74.89	6210.68
86.52	6219.38	94.45	6218.47	100.35	6217.47	103.36	6217.64	122.91	6219.77
136.24	6221.87	146.66	6223.91	157.31	6226.34	165.27	6228.24	169.32	6229.13
171.32	6229.24	172.51	6229.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	47.24	.035	71.89	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
47.24	71.89	54.65	48.65	54.29	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 520.21

INPUT
Description: 5 - River STA 521.25
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.67	2.93	6222.64	21.26	6222.44	37.69	6222.29	56.75	6222.17
56.95	6222.17	90	6222.06	94.67	6222.11	98.9	6221.64	101.54	6221.13
119.46	6214.56	137.46	6209.93	140.56	6209.13	140.82	6209.06	143.4	6208.56
143.63	6208.52	147.95	6208.2	152.16	6208.14	153.67	6208.04	156.16	6208.08
160.16	6208.14	160.4	6208.14	161.65	6207.84	167.17	6208.08	171.55	6208.35
171.72	6208.39	173.88	6208.62	173.94	6208.63	186.72	6212.24	189.3	6213.32
195.28	6215.55	202.57	6217.77	207.61	6218.49	208.66	6218.66	213.39	6219.24
219.65	6219.99	220.29	6220.18	229.67	6222.94	234.45	6224.09	239.7	6226.01
243.14	6226.65								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	140.56	.035	173.88	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
140.56	173.88	31.24	27.94	24.62	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 492.27

INPUT
Description: 4 - River STA 493.24
Station Elevation Data   num=   29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.06	10.02	6222.5	13.86	6222.24	17.07	6221.93	22.54	6221.47
32.61	6221.21	38.98	6221.14	54.09	6220.93	69.28	6215.67	92.11	6207.17
97.88	6205.23	109.2	6202.13	110.1	6201.82	112.14	6201.23	112.64	6201.17
112.98	6201.21	117.28	6201.37	119.05	6201.18	120.38	6201.22	120.77	6201.36
131.01	6205.21	133.88	6206.49	143.05	6209.44	172.25	6219.38	176.51	6220.96
190	6223.27	196.87	6226.38	198.41	6226.67	200.2	6227.02		

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	97.88	.035	131.01	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
97.88	131.01	13.36	29.96	26.32	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1   RS: 462.31

INPUT
Description: 3 - River STA 462.86
Station Elevation Data   num=   30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.69	9.1	6222.23	12.67	6221.98	25.14	6221.23	28.56	6220.85
45.11	6220.41	46.27	6220.27	47.08	6220.16	75.77	6209.66	84.79	6206.69
92.75	6204.84	96.45	6203.78	104.41	6201.43	105.27	6201.17	112.89	6200.88
113.62	6200.97	115.24	6201.21	120.56	6203.05	122.49	6203.88	123.51	6204.4
123.54	6204.41	148.27	6212.15	159.81	6216.08	167.75	6218.63	168.74	6219.04
171.14	6219.68	177.4	6221.44	186.43	6225.29	189.27	6226.28	193.11	6226.73

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.75	.035	123.54	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
92.75	123.54	.1	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1   RS: 462.21

INPUT

Description: 2 - River STA 462.76
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.69	9.24	6222.23	12.78	6221.98	25.13	6221.24	28.69	6220.84
45.1	6220.4	46.28	6220.26	47.11	6220.15	75.65	6209.71	84.82	6206.69
92.92	6204.8	96.49	6203.78	104.47	6201.43	105.31	6201.17	112.89	6200.88
113.6	6200.97	115.33	6201.23	120.57	6203.04	122.5	6203.87	123.52	6204.39
148.59	6212.24	160.28	6216.22	167.73	6218.61	168.66	6218.99	171.18	6219.67
177.42	6221.43	186.56	6225.32	189.31	6226.28	193.15	6226.73		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	96.49	.035	122.5	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
96.49	122.5	56.27	66.07	80.58	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 396.14

INPUT
Description: 1 - River STA 394.55
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.55	4.3	6223.66	4.86	6223.67	26.71	6217.95	39	6214.01
55.63	6207.48	65.65	6207.33	69.85	6208.37	70.21	6208.48	71.87	6208.43
73.83	6208.45	96.54	6207.45	98.99	6207.49	105.97	6208.45	109.39	6208.33
140.04	6208.17	144.29	6207.83	145.76	6206.97	146.68	6208.3	146.89	6208.37
150.59	6208.97	175.51	6198.97	182.63	6198.05	184.27	6197.09	185.64	6197.04
193.23	6198.01	211.5	6206.45	222.93	6212.43	233.37	6213.53	259	6215.6
273.8	6216.35	298.58	6219.78	300.79	6219.76	300.95	6219.76	301.01	6219.77
301.03	6219.83	301.79	6221.64	302.38	6221.66	303.91	6222.79	305.13	6223.82
305.75	6223.55	306.11	6223.84	307.58	6223.94	307.68	6223.98		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	150.59	.035	222.93	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
150.59	222.93	118.73	120.83	120.96	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	180.55	6220.74	F
195.83	307.68	6220.74	F

CULVERT

RIVER: IndustrialTrib
REACH: Reach 1 RS: 341.14

INPUT
Description: 282.06 0.4
Distance from Upstream XS = 30
Deck/Roadway Width = 50
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 7

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6220.74		55.63	6221.1		145.76	6221.5	
175.51	6221.8		182.63	6221.9		193.23	6222	
307.68	6224.19							

Upstream Bridge Cross Section Data
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.55	4.3	6223.66	4.86	6223.67	26.71	6217.95	39	6214.01
55.63	6207.48	65.65	6207.33	69.85	6208.37	70.21	6208.48	71.87	6208.43
73.83	6208.45	96.54	6207.45	98.99	6207.49	105.97	6208.45	109.39	6208.33
140.04	6208.17	144.29	6207.83	145.76	6206.97	146.68	6208.3	146.89	6208.37
150.59	6208.97	175.51	6198.97	182.63	6198.05	184.27	6197.09	185.64	6197.04
193.23	6198.01	211.5	6206.45	222.93	6212.43	233.37	6213.53	259	6215.6
273.8	6216.35	298.58	6219.78	300.79	6219.76	300.95	6219.76	301.01	6219.77
301.03	6219.83	301.79	6221.64	302.38	6221.66	303.91	6222.79	305.13	6223.82
305.75	6223.55	306.11	6223.84	307.58	6223.94	307.68	6223.98		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	150.59	.035	222.93	.05

Bank Sta: Left Right Coeff Contr. Expan.
150.59 222.93 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	180.55	6220.74	F
195.83	307.68	6220.74	F

Downstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6220.51		107.55	6221.8		264.98	6223.88	

Downstream Bridge Cross Section Data
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.28	6.64	6215.96	9.21	6215.91	9.65	6215.86	11.48	6215.84
30.6	6216.17	34.13	6216.54	62.17	6216.1	64.73	6216.28	65.91	6216.33

```
   69.01 6216.43    75.6 6216.95   78.78 6216.93   84.77 6216.49   85.75 6216.42
   87.57 6216.02    87.9 6216.89   88.19 6218.74   90.03 6219.67    90.3    6219
   91.52 6214.74   92.13 6214.44   93.61 6213.49  103.71 6207.26  109.15 6201.97
  118.08    6194  119.14  6192.1  122.43 6192.16  124.01 6192.28  125.56 6193.36
  128.97 6194.34  129.87 6194.97  133.54 6195.52  134.38    6196   142.1 6203.76
   146.1    6207  146.28  6207.1  152.77  6207.8  165.56 6208.01  174.32 6208.86
  184.53 6208.63  185.19  6208.7  185.46 6208.71  200.64  6210.3  211.16 6210.36
  214.09 6210.23  221.31 6210.95  225.92 6212.93  226.45 6213.11  226.68 6213.25
  235.41 6217.68  235.91 6217.91   236.8 6218.22  242.54 6220.15  245.68 6221.15
  247.85 6221.65  254.66 6223.66  260.08 6224.86  266.87 6226.55  269.25    6227

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  118.08    .035  125.56     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        118.08  125.56             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  119.14 6220.85       F
     131  269.25 6220.85       F

Upstream Embankment side slope              =       1 horiz. to 1.0 vertical
Downstream Embankment side slope            =       1 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         = 6218.24
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #2      Circular       4       4
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 4  111.37     .013     .013        0                   .5
      1
Upstream   Elevation =  6204.65
           Centerline Station =  188.17
Downstream Elevation =  6202.07
           Centerline Station =  128.18

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       7       7
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
```

```
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 3  112.43     .013     .013        0                   .5
      1
Upstream   Elevation =  6197.63
           Centerline Station =  188.17
Downstream Elevation =  6193.24
           Centerline Station =  124.27

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 275.31

INPUT
Description: River STA 273.84
Station Elevation Data    num=      60
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6216.28    6.64 6215.96    9.21 6215.91    9.65 6215.86   11.48 6215.84
    30.6 6216.17   34.13 6216.54   62.17  6216.1   64.73 6216.28   65.91 6216.33
   69.01 6216.43    75.6 6216.95   78.78 6216.93   84.77 6216.49   85.75 6216.42
   87.57 6216.02    87.9 6216.89   88.19 6218.74   90.03 6219.67    90.3    6219
   91.52 6214.74   92.13 6214.44   93.61 6213.49  103.71 6207.26  109.15 6201.97
  118.08    6194  119.14  6192.1  122.43 6192.16  124.01 6192.28  125.56 6193.36
  128.97 6194.34  129.87 6194.97  133.54 6195.52  134.38    6196   142.1 6203.76
   146.1    6207  146.28  6207.1  152.77  6207.8  165.56 6208.01  174.32 6208.86
  184.53 6208.63  185.19  6208.7  185.46 6208.71  200.64  6210.3  211.16 6210.36
  214.09 6210.23  221.31 6210.95  225.92 6212.93  226.45 6213.11  226.68 6213.25
  235.41 6217.68  235.91 6217.91   236.8 6218.22  242.54 6220.15  245.68 6221.15
  247.85 6221.65  254.66 6223.66  260.08 6224.86  266.87 6226.55  269.25    6227

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  118.08    .035  125.56     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        118.08  125.56            14.42   13.85   12.15             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  119.14 6220.85       F
     131  269.25 6220.85       F

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 261.46
```

```
INPUT
Description: River STA 259.99
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6209.55    7.08    6211    9.06 6211.41    9.22 6211.42   15.16 6211.42
   19.44 6211.43   19.59  6211.4   20.26    6211   48.05    6196   50.87 6194.49
   51.09 6194.48   52.18 6194.46   53.22 6191.29    59.1 6191.85    60.3 6192.37
   64.78 6194.79   65.01    6195   65.38 6195.32   70.75 6196.11    75.1 6196.48
   76.44 6197.39   77.87    6198   84.84 6202.03   97.08 6206.37  126.15 6208.68
   127.3 6208.81  133.03 6208.92  136.38 6209.55  150.33 6214.48  155.91 6217.15
  164.53 6217.65  167.76 6217.85  172.77  6218.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   52.18    .035   64.78     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         52.18   64.78           104.31  104.79  104.54             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   38.71  6214.8       F
   75.61  172.77  6214.8       F

CULVERT


RIVER: IndustrialTrib
REACH: Reach 1            RS: 209.5

INPUT
Description: 150.42  0.15
Distance from Upstream XS =    37.3
Deck/Roadway Width        =   29.33
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      30
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6214.99       0    7.08 6216.45       0    9.06 6216.18       0
    9.22 6216.16       0   15.16 6215.35       0   18.09 6214.97       0
   19.44 6214.86       0   19.59 6214.85       0   20.26  6214.8       0
   20.26  6214.8           22.26 6214.76           25.34 6214.75
   25.88 6214.77           39.28 6216.63           53.22 6216.63
    59.1 6216.64           65.74 6216.64           70.75  6216.1
    75.1 6215.51           76.44 6215.33           77.87 6215.14
   84.84 6214.26           97.08 6215.43          113.07    6217
  113.13    6217          126.15 6215.19           127.3 6215.37
  133.03 6216.26          136.38 6217.15          155.91 6217.15

Upstream Bridge Cross Section Data
Station Elevation Data    num=      33
```

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6209.55	7.08	6211	9.06	6211.41	9.22	6211.42	15.16	6211.42
19.44	6211.43	19.59	6211.4	20.26	6211	48.05	6196	50.87	6194.49
51.09	6194.48	52.18	6194.46	53.22	6191.29	59.1	6191.85	60.3	6192.37
64.78	6194.79	65.01	6195	65.38	6195.32	70.75	6196.11	75.1	6196.48
76.44	6197.39	77.87	6198	84.84	6202.03	97.08	6206.37	126.15	6208.68
127.3	6208.81	133.03	6208.92	136.38	6209.55	150.33	6214.48	155.91	6217.15
164.53	6217.65	167.76	6217.85	172.77	6218.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	52.18	.035	64.78	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
52.18	64.78	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	38.71	6214.8	F
75.61	172.77	6214.8	F

Downstream Deck/Roadway Coordinates
num= 46

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6216.7		14.93	6216.72		19.5	6216.72	
27.23	6216.73		34.47	6216.73		42.66	6217.17	
43.48	6217.33		52.31	6216.77		55.84	6216.82	
62.75	6216.85		65.24	6216.89		66.81	6216.91	
67.94	6216.93		68.05	6216.93		70.24	6216.96	
70.29	6216.96		73.7	6217		76.04	6217.02	
78.29	6217.04		78.61	6217.04		79.94	6217.07	
82.53	6217.09		82.56	6217.09		85.42	6217.16	
87.98	6217.2		97.36	6217.38		99.21	6217.47	
106.9	6217.57		114.91	6217.57		115.31	6217.58	
116.12	6217.58		116.45	6217.59		125.59	6217.61	
126.83	6217.61		128.22	6217.62		129.93	6217.63	
132.96	6217.67		133.29	6217.67		139.52	6217.69	
152.07	6217.69		154.98	6217.68		155.06	6217.68	
157.74	6217.66		160.98	6217.7		161.1	6217.69	
164.67	6217.7							

Downstream Bridge Cross Section Data
Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.59	4.06	6215.13	5.07	6214.79	15.14	6211.15	17.16	6210.28
18.17	6209.75	22.2	6206.69	23.2	6205.94	28.24	6202.06	29.25	6201.64
31.62	6200.82	32.47	6200.5	33.02	6200.25	34.46	6199.52	37.02	6198.66
38.09	6198.28	39.58	6197.79	43.46	6196.46	47.69	6195.11	48.55	6194.87
49.33	6194.63	49.93	6194.42	50.11	6194.37	50.6	6194.19	51	6194.1
51.67	6194.01	52.06	6193.94	52.45	6193.93	53.51	6193.85	55.25	6193.89
59.34	6194.06	60.58	6194.08	62.59	6194.15	64.92	6194.21	65.16	6194.23

```
    65.9 6194.22   66.33 6193.92   66.48 6193.79   66.97 6193.52   67.26 6193.42
   67.946193.075   68.03 6193.03   70.14 6192.49   71.27 6192.23   73.59 6191.62
   74.38 6191.44    75.4 6191.15   75.87 6191.26   75.96 6191.27   76.46 6191.47
   76.75 6191.76   77.54 6192.46   78.296193.092   78.56 6193.32   79.61 6194.19
   79.92 6194.42   81.72 6195.64   83.09  6196.5   83.83 6196.92   84.67 6197.47
   85.91 6198.19    87.2 6199.01   87.78 6199.35   88.06 6199.53   88.96 6200.01
   89.79 6200.61   90.24 6200.91   90.65 6201.22      92 6202.09   97.32 6205.79
  103.41 6209.74  104.63 6210.51   108.7 6213.16  111.87 6215.19  112.92 6215.89
   113.3 6216.01  113.98 6216.31  116.09 6216.45  117.15 6216.56  119.26 6216.71
  120.32 6216.81  122.43 6216.96  123.49 6217.06  124.55 6217.11  126.76 6217.09
  127.47 6217.11  127.72 6217.14  128.77 6217.36  130.89 6217.77  132.18 6218.06
  134.08 6218.45  135.32 6218.73  137.26 6219.12  138.45 6219.39  140.45 6219.79
  141.58 6220.05  143.63 6220.47  144.71 6220.72  146.82 6221.14  147.88 6221.39
  150.19 6221.86  152.12 6222.29  156.45 6223.34  157.43 6223.59  159.58 6224.09
  160.62 6224.36  162.74 6224.85  163.49 6225.05  164.61 6225.32

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    65.9    .035   79.92     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          65.9   79.92             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   57.07 6216.71       F
   86.94  164.61 6216.71       F

Upstream Embankment side slope              =     .95 horiz. to 1.0 vertical
Downstream Embankment side slope            =    1.43 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1          Arch      10      10
FHWA Chart # 41- Arch; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
              14.34   88.18     .012     .035        0                   .5
      1
Upstream   Elevation =  6191.84
           Centerline Station =  59.34
Downstream Elevation =  6191.048
           Centerline Station =  73.27
```

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 156.67

INPUT
Description: River STA 155.20
Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.59	4.06	6215.13	5.07	6214.79	15.14	6211.15	17.16	6210.28
18.17	6209.75	22.2	6206.69	23.2	6205.94	28.24	6202.06	29.25	6201.64
31.62	6200.82	32.47	6200.5	33.02	6200.25	34.46	6199.52	37.02	6198.66
38.09	6198.28	39.58	6197.79	43.46	6196.46	47.69	6195.11	48.55	6194.87
49.33	6194.63	49.93	6194.42	50.11	6194.37	50.6	6194.19	51	6194.1
51.67	6194.01	52.06	6193.94	52.45	6193.93	53.51	6193.85	55.25	6193.89
59.34	6194.06	60.58	6194.08	62.59	6194.15	64.92	6194.21	65.16	6194.23
65.9	6194.22	66.33	6193.92	66.48	6193.79	66.97	6193.52	67.26	6193.42
67.946	193.075	68.03	6193.03	70.14	6192.49	71.27	6192.23	73.59	6191.62
74.38	6191.44	75.4	6191.15	75.87	6191.26	75.96	6191.27	76.46	6191.47
76.75	6191.76	77.54	6192.46	78.296	193.092	78.56	6193.32	79.61	6194.19
79.92	6194.42	81.72	6195.64	83.09	6196.5	83.83	6196.92	84.67	6197.47
85.91	6198.19	87.2	6199.01	87.78	6199.35	88.06	6199.53	88.96	6200.01
89.79	6200.61	90.24	6200.91	90.65	6201.22	92	6202.09	97.32	6205.79
103.41	6209.74	104.63	6210.51	108.7	6213.16	111.87	6215.19	112.92	6215.89
113.3	6216.01	113.98	6216.31	116.09	6216.45	117.15	6216.56	119.26	6216.71
120.32	6216.81	122.43	6216.96	123.49	6217.06	124.55	6217.11	126.76	6217.09
127.47	6217.11	127.72	6217.14	128.77	6217.36	130.89	6217.77	132.18	6218.06
134.08	6218.45	135.32	6218.73	137.26	6219.12	138.45	6219.39	140.45	6219.79
141.58	6220.05	143.63	6220.47	144.71	6220.72	146.82	6221.14	147.88	6221.39
150.19	6221.86	152.12	6222.29	156.45	6223.34	157.43	6223.59	159.58	6224.09
160.62	6224.36	162.74	6224.85	163.49	6225.05	164.61	6225.32		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	65.9	.035	79.92	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
65.9	79.92	21.37	22.31	22.85	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	57.07	6216.71	F
86.94	164.61	6216.71	F

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 134.36

INPUT
Description: River STA 132.90
Station Elevation Data num= 100

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.13	.57	6216.03	1.21	6215.87	5.56	6214.17	6.29	6213.92
7.63	6213.35	8.05	6213.15	9.43	6212.59	13.54	6210.77	14.57	6210.36
16.63	6209.64	17.65	6209	20.52	6206.88	21.77	6205.94	22.79	6205.19
24.85	6203.62	26.9	6202.09	27.93	6201.46	28.96	6201.1	31.01	6200.45
32.16	6200.05	33.75	6199.53	34.26	6199.43	34.75	6199.28	35.93	6198.78
37.27	6198.17	38.06	6197.95	38.78	6197.71	40.09	6197.42	40.89	6197.21
42.05	6196.95	43.03	6196.75	44.48	6196.42	45.45	6196.23	45.92	6196.12
46.66	6195.96	47.36	6195.78	47.86	6195.69	48.8	6195.41	49.06	6195.35
50.26	6195.03	52.67	6194.33	53.13	6194.11	53.87	6193.81	55.07	6193.68
56.73	6193.65	57.46	6193.66	60.34	6193.57	61.08	6193.56	68.32	6193.24
69	6193.15	69.42	6193.07	70.58	6192.76	72.25	6192.35	78.19	6190.83
78.5	6190.78	78.69	6190.81	79.24	6191.17	79.85	6191.7	80.17	6192.1
81	6193.02	82.89	6194.48	91.22	6200.84	100.02	6207.35	101.1	6208.07
102.18	6208.73	105.41	6210.81	106.48	6211.47	110.79	6214.24	111.87	6214.9
116.17	6217.67	116.32	6217.74	116.69	6217.86	119.4	6218.31	121.136	218.583
124.73	6219.15	126.24	6219.42	127	6219.53	129.27	6219.91	131.85	6220.31
134.31	6220.54	136.88	6220.64	139.07	6220.77	144.55	6220.99	145.64	6221.05
147.83	6221.36	150.02	6221.72	152	6222	152.21	6222.02	153.3	6222.03
154.4	6221.97	155.78	6221.83	158.9	6221.57	160.96	6221.37	163.15	6221.19
164.12	6221.08	165.34	6220.98	168.66	6220.79	169.72	6220.71	172.76	6220.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	60.34	.035	82.89	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60.34	82.89	50.1	50.1	.1	.3

CROSS SECTION

RIVER: IndustrialTrib
REACH: Reach 1 RS: 84.26

INPUT
Description: River STA 82.82
Station Elevation Data num= 323

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6206.85	3.5	6205.53	7.1	6204.29	8.2	6203.87	11.8	6202.61
13.6	6201.98	14	6201.88	14.2	6201.84	14.7	6201.77	15.4	6201.66
15.4	6201.65	16.6	6201.5	17.6	6201.32	17.8	6201.27	19.1	6200.99
21.4	6200.43	21.9	6200.33	22.4	6200.24	22.6	6200.19	22.7	6200.17
23.4	6200.03	23.8	6199.94	24.1	6199.88	24.5	6199.8	24.8	6199.75
25	6199.71	25.5	6199.59	25.9	6199.52	26.2	6199.45	34.2	6197.85
37.3	6197.38	37.8	6197.31	38.1	6197.27	38.5	6197.21	38.9	6197.15

39.3 6197.09	39.3 6197.08	39.8 6197.12	40 6197.14	40.5 6197.22
40.7 6197.25	40.9 6197.29	41.7 6197.44	42.1 6197.51	42.8 6197.63
42.9 6197.64	42.9 6197.65	43.6 6197.75	44.1 6197.84	44.3 6197.88
44.6 6197.93	45 6198.01	45.3 6198.06	45.8 6198.14	46.4 6198.23
46.5 6198.24	46.5 6198.25	46.7 6198.28	47.2 6198.37	47.7 6198.47
48.2 6198.56	48.6 6198.61	48.9 6198.65	49.4 6198.72	50.1 6198.83
50.1 6198.84	50.2 6198.85	53.7 6199.34	53.7 6199.35	54.4 6199.47
54.9 6199.55	55.1 6199.59	55.5 6199.67	55.9 6199.71	56.1 6199.73
56.6 6199.7	57.1 6199.57	57.3 6199.55	57.3 6199.54	57.4 6199.53
58 6199.32	58.5 6199.19	58.8 6199.1	59.2 6198.98	59.5 6198.89
59.7 6198.83	60.2 6198.67	60.6 6198.54	60.9 6198.47	60.9 6198.45
61.6 6198.23	62.1 6198.11	62.4 6198.02	62.8 6197.88	63.1 6197.8
63.3 6197.75	63.8 6197.58	64.5 6197.39	64.5 6197.36	64.9 6197.26
65.6 6197.04	66 6196.9	66.6 6196.77	66.7 6196.73	67.1 6196.59
67.4 6196.42	68 6196.29	68.2 6196.19	68.6 6196.02	68.9 6195.85
69.1 6195.79	69.6 6195.57	69.9 6195.45	70.3 6195.3	70.4 6195.26
70.5 6195.2	71.1 6194.96	71.4 6194.82	71.8 6194.65	72.5 6194.35
72.6 6194.31	72.8 6194.24	73.3 6194.03	73.8 6193.83	74 6193.71
74.5 6193.52	74.7 6193.39	74.9 6193.32	75.5 6193.09	76.2 6192.78
76.4 6192.7	76.9 6192.48	77.2 6192.35	77.7 6192.17	78.4 6191.85
78.4 6191.84	78.4 6191.83	79.1 6191.6	79.6 6191.46	79.9 6191.41
80.3 6191.33	80.6 6191.29	80.7 6191.27	81.3 6191.18	81.3 6191.17
81.9 6191.08	82 6191.05	82.3 6191.01	82.8 6191	83.5 6191.24
84.1 6191.54	84.2 6191.57	84.2 6191.58	84.3 6191.59	85 6191.56
85.7 6191.5	86.2 6191.47	86.4 6191.46	86.5 6191.45	87 6191.42
87.2 6191.4	87.9 6191.36	88.2 6191.33	88.6 6191.3	88.9 6191.28
89.4 6191.45	89.8 6191.92	90 6192.09	90.1 6192.14	90.2 6192.19
90.8 6192.39	91.2 6192.5	91.5 6192.6	92.1 6192.77	92.3 6192.83
92.7 6192.92	93 6193.02	93.5 6193.16	93.7 6193.23	94.1 6193.35
94.5 6193.46	94.7 6193.52	95.2 6193.67	95.5 6193.76	95.8 6193.85
95.9 6193.88	96.1 6193.92	96.7 6194.08	97 6194.18	97.4 6194.3
98 6194.5	98.1 6194.53	98.3 6194.6	98.8 6194.74	99.3 6194.87
99.6 6194.95	99.8 6195.02	100.1 6195.08	100.7 6195.26	101.1 6195.38
101.5 6195.51	101.9 6195.6	102.5 6195.78	102.6 6195.8	102.6 6195.81
102.7 6195.84	103.4 6196.04	103.7 6196.12	104.2 6196.25	104.8 6196.43
104.9 6196.47	105.4 6196.59	105.7 6196.68	106.2 6196.82	106.5 6196.91
106.9 6197.05	107.2 6197.12	108 6197.34	108.8 6197.52	109.1 6197.6
109.5 6197.68	109.8 6197.76	110.2 6197.83	110.3 6197.86	110.7 6197.92
111.1 6197.98	111.2 6198.02	111.6 6198.09	111.8 6198.12	112.3 6198.2
112.6 6198.25	113.3 6198.37	113.4 6198.39	113.5 6198.4	114.1 6198.5
114.5 6198.55	114.9 6198.63	115.3 6198.68	115.6 6198.72	115.7 6198.74
116 6198.79	116.4 6198.88	117.1 6198.99	117.2 6199.01	117.7 6199.09
118 6199.14	118.6 6199.24	118.7 6199.27	118.8 6199.28	118.9 6199.3
119.5 6199.4	119.9 6199.46	121 6199.64	121 6199.66	121.3 6199.7
121.8 6199.79	122.6 6199.9	123.1 6199.98	123.3 6200.02	123.9 6200.12
124.1 6200.15	124.2 6200.16	124.4 6200.21	124.9 6200.31	125.3 6200.4
125.6 6200.49	126.4 6200.66	126.4 6200.67	127.2 6200.87	127.9 6201.02
128 6201.03	128.5 6201.11	128.7 6201.12	129.2 6201.16	129.5 6201.17
129.6 6201.17	129.9 6201.14	130.2 6201.09	130.7 6201.03	131 6200.99
131.7 6200.9	131.8 6200.89	131.8 6200.88	131.9 6200.88	132.5 6200.82

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   133.3 6200.75   133.9 6200.69     134 6200.68   134.2 6200.66   134.7 6200.61
   135.2 6200.57   135.5 6200.53     136 6200.47   136.3 6200.43   136.8 6200.36
   137.7 6200.24     138 6200.19   138.4 6200.15   138.6 6200.12   139.1 6200.06
   139.4 6200.03   139.6    6200   139.8 6199.98   139.9 6199.97   140.1 6199.95
   140.6 6199.88   140.9 6199.85   141.3 6199.81   141.9 6199.75     142 6199.74
   142.1 6199.74   143.2 6199.74   143.5 6199.74   144.2 6199.74   144.3 6199.74
   144.5 6199.74     145 6199.74   145.5 6199.74   145.8 6199.74   146.5 6199.72
   146.6 6199.71   147.1 6199.66147.1755 6199.65

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    71.8    .035   100.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          71.8   100.1             35.56      30   24.13             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 54.26

INPUT
Description: River STA 52.43
Station Elevation Data    num=      92
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6203.07    9.02 6201.08    10.3 6200.77   13.07 6200.16   14.15 6199.97
   15.09 6199.76   16.26 6199.57   16.72 6199.51   17.94 6199.41   23.63 6199.09
   24.41 6199.03   25.05 6198.97   26.98  6198.7   28.26 6198.48   29.55  6198.3
   32.16 6197.87    33.4  6197.7   34.68 6197.48   35.01 6197.41   35.72 6197.33
   36.43 6197.21   37.01 6196.96   37.14 6196.91   37.85 6196.73    38.6 6196.45
   39.99 6196.03    40.2 6195.94    41.1 6195.66   41.41 6195.57   41.79 6195.44
   45.41 6194.29   46.51 6193.96   47.09 6193.74    47.6 6193.62   48.02  6193.5
   48.51 6193.28   49.22 6193.05   49.52 6192.97   50.63 6192.52   52.05 6192.08
   52.96 6191.97   53.47 6191.86   54.29 6191.74   54.88  6191.6   55.63 6191.47
   56.97 6191.16   57.72 6191.07   58.31 6190.95   59.13 6190.89   59.65 6190.84
   60.98 6190.75   63.66 6190.53      65 6190.44   66.34 6190.33   67.67 6190.24
    70.6    6190   71.11    6190   71.88    6190    72.1 6190.02    75.7 6190.35
   76.84 6190.47   79.67 6190.72   81.09 6190.87   84.14 6191.08   85.65 6191.21
   87.15 6191.32   88.17 6191.41   89.08 6191.52   90.16 6191.69   91.67 6191.96
   97.11 6192.81  102.83 6193.63     104 6193.77  106.33 6193.94  107.52 6194.06
  109.82 6194.23  110.98 6194.35  113.31 6194.53  114.48 6194.64  117.33 6195.09
  117.73 6195.14  119.28 6195.33  121.24 6195.54   127.1 6196.26  129.05 6196.47
  134.91 6197.19   136.6 6197.38  137.42 6197.59  138.916198.003  140.09 6198.33
  140.34 6198.35  140.54 6198.34

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   46.51    .035  102.83     .05
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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         46.51  102.83             54.26   54.26   54.26             .1       .3

CROSS SECTION


RIVER: IndustrialTrib
REACH: Reach 1            RS: 0.00

INPUT
Description: River STA 0.00
Station Elevation Data    num=      87
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6202.5     .93 6202.47    1.87 6202.47    3.77 6202.41    6.84 6202.37
    7.84 6202.33    9.84 6202.24   11.85 6202.17   12.85 6202.11   14.85 6202.04
   15.12 6202.01   15.62    6202   16.07 6201.95   16.68 6201.92   17.01 6201.88
   17.74 6201.87   18.81 6201.79    20.8 6201.43      22 6201.24   22.69 6201.11
   23.87 6200.94   24.87 6200.75   28.88  6200.1   29.88 6199.91   30.88 6199.75
   32.15 6199.53   33.88 6199.25   34.89 6199.07   35.89 6198.91   36.67 6198.76
   38.98 6197.99   40.87 6197.25   42.11 6196.73   42.48 6196.08    42.9 6194.63
   43.15    6194   43.29 6193.36    43.46192.669   43.75 6190.47   44.09 6188.59
   44.19 6188.35   45.24 6188.32    56.7  6188.9   56.99 6189.24   57.65 6188.99
   57.74 6189.03   57.79 6189.15   57.96 6189.34    58.6 6190.46   58.78 6190.53
   59.12 6191.22    59.4 6191.96    59.66192.253   59.83 6192.59   60.21 6192.53
    60.6 6193.45   60.87 6193.71   61.02 6193.77   61.52 6193.43   61.82 6193.12
   62.07 6193.29   62.24 6193.46   62.89 6194.56   63.02 6194.67   66.46 6195.63
   67.61 6195.92   68.75 6196.24    69.9 6196.42   70.97  6196.5   72.19 6196.62
   73.34 6196.71   74.65 6196.83   75.63 6196.91   76.78 6197.02   79.07 6197.23
   81.99 6197.52   89.38 6197.96   90.08 6198.06   90.53 6198.11   91.31 6198.24
   93.36 6198.61    95.4 6198.95   98.16 6199.43   98.89 6199.51    99.5 6199.49
  100.85 6199.32  102.17 6199.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    43.4    .035    59.6     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          43.4    59.6             .3       .5



SUMMARY OF MANNING'S N VALUES

River:IndustrialTrib

      Reach          River Sta.       n1        n2        n3

 Reach 1              1534.24           .05      .035       .05
 Reach 1              1485.4            .06       .05       .06
 Reach 1              1485.2            .06       .05       .06
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Reach 1	1460.5	.06	.05	.06
Reach 1	1460.4	.06	.05	.06
Reach 1	1447.48	.06	.05	.06
Reach 1	1434.04	.06	.05	.06
Reach 1	1433.84	.06	.05	.06
Reach 1	1409.14	.06	.05	.06
Reach 1	1409.04	.06	.05	.06
Reach 1	1304.87	.06	.05	.06
Reach 1	1207.55	.06	.05	.06
Reach 1	1207.35	.06	.05	.06
Reach 1	1182.65	.06	.05	.06
Reach 1	1182.55	.06	.05	.06
Reach 1	1136.61	.06	.05	.06
Reach 1	1077.55	.06	.05	.06
Reach 1	1077.35	.06	.05	.06
Reach 1	1052.65	.06	.05	.06
Reach 1	1052.55	.06	.05	.06
Reach 1	1029.49	.06	.05	.06
Reach 1	1002.55	.06	.05	.06
Reach 1	1002.35	.06	.05	.06
Reach 1	977.65	.06	.05	.06
Reach 1	977.55	.06	.05	.06
Reach 1	948.15	.06	.05	.06
Reach 1	917.55	.06	.05	.06
Reach 1	917.35	.06	.05	.06
Reach 1	892.65	.06	.05	.06
Reach 1	892.55	.06	.05	.06
Reach 1	877.31	.06	.05	.06
Reach 1	862.55	.06	.05	.06
Reach 1	862.34	.06	.05	.06
Reach 1	837.65	.06	.05	.06
Reach 1	837.55	.06	.05	.06
Reach 1	727.54	.06	.05	.06
Reach 1	683.64	.06	.05	.06
Reach 1	683.32	.06	.05	.06
Reach 1	665.19	.06	.05	.06
Reach 1	665.09	.06	.05	.06
Reach 1	636.9	.06	.05	.06
Reach 1	568.86	.05	.035	.05
Reach 1	520.21	.05	.035	.05
Reach 1	492.27	.05	.035	.05
Reach 1	462.31	.05	.035	.05
Reach 1	462.21	.05	.035	.05
Reach 1	396.14	.05	.035	.05
Reach 1	341.14	Culvert		
Reach 1	275.31	.05	.035	.05
Reach 1	261.46	.05	.035	.05
Reach 1	209.5	Culvert		
Reach 1	156.67	.05	.035	.05
Reach 1	134.36	.05	.035	.05

Reach 1	84.26	.05	.035	.05
Reach 1	54.26	.05	.035	.05
Reach 1	0.00	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: IndustrialTrib

Reach	River Sta.	Left	Channel	Right
Reach 1	1534.24	49.2	48.84	48.48
Reach 1	1485.4	.2	.2	.2
Reach 1	1485.2	22.87	24.7	26.53
Reach 1	1460.5	.09	.1	.11
Reach 1	1460.4	14.1	12.92	11.74
Reach 1	1447.48	15.62	13.44	11.27
Reach 1	1434.04	.2	.2	.2
Reach 1	1433.84	24.56	24.7	25.32
Reach 1	1409.14	.1	.1	.12
Reach 1	1409.04	99.66	104.17	115.69
Reach 1	1304.87	91.64	97.32	94.38
Reach 1	1207.55	.2	.2	.2
Reach 1	1207.35	24.08	24.7	25.32
Reach 1	1182.65	.1	.1	.1
Reach 1	1182.55	54.71	45.94	37.17
Reach 1	1136.61	60.28	59.06	57.83
Reach 1	1077.55	.2	.2	.2
Reach 1	1077.35	25.53	24.7	23.87
Reach 1	1052.65	.1	.1	.1
Reach 1	1052.55	23.75	23.06	22.36
Reach 1	1029.49	27.45	26.94	26.44
Reach 1	1002.55	.2	.2	.2
Reach 1	1002.35	25.09	24.7	24.31
Reach 1	977.65	.1	.1	.1
Reach 1	977.55	28.43	29.4	30.37
Reach 1	948.15	29.94	30.6	31.27
Reach 1	917.55	.2	.2	.2
Reach 1	917.35	21.96	24.7	27.44
Reach 1	892.65	.1	.1	.1
Reach 1	892.55	14.37	15.24	13.68
Reach 1	877.31	18.28	14.76	13.03
Reach 1	862.55	.21	.21	.2
Reach 1	862.34	21.8	24.69	27.91
Reach 1	837.65	.1	.1	.09
Reach 1	837.55	98.07	110.01	124.19
Reach 1	727.54	47.93	43.9	36.64
Reach 1	683.64	.31	.32	.31

Reach 1	683.32	25.73	18.13	16.63
Reach 1	665.19	.1	.1	.1
Reach 1	665.09	30.04	28.19	32.96
Reach 1	636.9	76.21	68.04	60.72
Reach 1	568.86	54.65	48.65	54.29
Reach 1	520.21	31.24	27.94	24.62
Reach 1	492.27	13.36	29.96	26.32
Reach 1	462.31	.1	.1	.1
Reach 1	462.21	56.27	66.07	80.58
Reach 1	396.14	118.73	120.83	120.96
Reach 1	341.14	Culvert		
Reach 1	275.31	14.42	13.85	12.15
Reach 1	261.46	104.31	104.79	104.54
Reach 1	209.5	Culvert		
Reach 1	156.67	21.37	22.31	22.85
Reach 1	134.36	50.1	50.1	50.1
Reach 1	84.26	35.56	30	24.13
Reach 1	54.26	54.26	54.26	54.26
Reach 1	0.00			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: IndustrialTrib

Reach	River Sta.	Contr.	Expan.
Reach 1	1534.24	.1	.3
Reach 1	1485.4	.1	.3
Reach 1	1485.2	.1	.3
Reach 1	1460.5	.1	.3
Reach 1	1460.4	.1	.3
Reach 1	1447.48	.1	.3
Reach 1	1434.04	.1	.3
Reach 1	1433.84	.1	.3
Reach 1	1409.14	.1	.3
Reach 1	1409.04	.1	.3
Reach 1	1304.87	.1	.3
Reach 1	1207.55	.1	.3
Reach 1	1207.35	.1	.3
Reach 1	1182.65	.1	.3
Reach 1	1182.55	.1	.3
Reach 1	1136.61	.1	.3
Reach 1	1077.55	.1	.3
Reach 1	1077.35	.1	.3
Reach 1	1052.65	.1	.3
Reach 1	1052.55	.1	.3
Reach 1	1029.49	.1	.3

Reach 1	1002.55		.1	.3
Reach 1	1002.35		.1	.3
Reach 1	977.65		.1	.3
Reach 1	977.55		.1	.3
Reach 1	948.15		.1	.3
Reach 1	917.55		.1	.3
Reach 1	917.35		.1	.3
Reach 1	892.65		.1	.3
Reach 1	892.55		.1	.3
Reach 1	877.31		.1	.3
Reach 1	862.55		.1	.3
Reach 1	862.34		.1	.3
Reach 1	837.65		.1	.3
Reach 1	837.55		.1	.3
Reach 1	727.54		.1	.3
Reach 1	683.64		.1	.3
Reach 1	683.32		.1	.3
Reach 1	665.19		.1	.3
Reach 1	665.09		.1	.3
Reach 1	636.9		.1	.3
Reach 1	568.86		.1	.3
Reach 1	520.21		.1	.3
Reach 1	492.27		.1	.3
Reach 1	462.31		.1	.3
Reach 1	462.21		.1	.3
Reach 1	396.14		.3	.5
Reach 1	341.14	Culvert		
Reach 1	275.31		.3	.5
Reach 1	261.46		.3	.5
Reach 1	209.5	Culvert		
Reach 1	156.67		.3	.5
Reach 1	134.36		.1	.3
Reach 1	84.26		.1	.3
Reach 1	54.26		.1	.3
Reach 1	0.00		.3	.5

Profile Output Table - Standard Table 1

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	1534.24	100year	1162.00	6226.47	6239.18	
6239.67	0.003360	5.63	206.38	47.29	0.48	
Reach 1	1534.24	10year	590.00	6226.47	6237.19	
6237.54	0.003351	4.79	123.28	33.96	0.44	

Reach 1	1534.24	2year	318.00	6226.47	6235.92	
6236.14	0.002440	3.70	85.85	25.64	0.36	
Reach 1	1485.4	100year	1162.00	6231.47	6238.47	
6239.35	0.011309	7.56	153.68	38.33	0.67	
Reach 1	1485.4	10year	590.00	6231.47	6236.42	6235.83
6237.19	0.015874	7.05	83.68	30.17	0.75	
Reach 1	1485.4	2year	318.00	6231.47	6234.83	6234.83
6235.77	0.031659	7.78	40.88	21.42	0.99	
Reach 1	1485.2	100year	1162.00	6231.35	6237.42	6237.42
6239.26	0.020252	11.35	116.77	34.08	0.92	
Reach 1	1485.2	10year	590.00	6231.35	6235.82	6235.82
6237.14	0.023805	9.35	67.29	27.71	0.93	
Reach 1	1485.2	2year	318.00	6231.35	6234.69	6234.69
6235.71	0.032026	8.13	39.13	19.18	1.00	
Reach 1	1460.5	100year	1162.00	6230.28	6236.21	6234.88
6236.97	0.009183	6.99	166.22	40.57	0.61	
Reach 1	1460.5	10year	590.00	6230.28	6234.89	6233.51
6235.29	0.006649	5.11	115.55	35.85	0.50	
Reach 1	1460.5	2year	318.00	6230.28	6233.99	6232.65
6234.21	0.004731	3.75	84.75	32.61	0.41	
Reach 1	1460.4	100year	1162.00	6230.29	6236.21	6234.89
6236.97	0.009214	6.99	166.25	40.71	0.61	
Reach 1	1460.4	10year	590.00	6230.29	6234.88	6233.54
6235.29	0.006708	5.11	115.38	35.97	0.50	
Reach 1	1460.4	2year	318.00	6230.29	6233.98	6232.68
6234.21	0.004801	3.76	84.47	32.72	0.41	
Reach 1	1447.48	100year	1162.00	6231.06	6235.26	6235.26
6236.71	0.027304	9.68	120.06	41.62	1.00	
Reach 1	1447.48	10year	590.00	6231.06	6234.06	6234.06
6235.07	0.030737	8.08	73.04	36.64	1.01	
Reach 1	1447.48	2year	318.00	6231.06	6233.31	6233.31
6234.02	0.034515	6.80	46.77	33.35	1.01	
Reach 1	1434.04	100year	1162.00	6227.18	6234.97	
6235.49	0.006200	5.79	200.84	45.95	0.49	
Reach 1	1434.04	10year	590.00	6227.18	6233.44	
6233.72	0.004131	4.27	138.08	36.18	0.39	
Reach 1	1434.04	2year	318.00	6227.18	6232.39	
6232.54	0.002521	3.07	103.46	30.34	0.29	

Reach 1	1433.84	100year	1162.00	6227.11	6234.84	
6235.48	0.004904	6.60	198.04	45.19	0.45	
Reach 1	1433.84	10year	590.00	6227.11	6233.42	
6233.72	0.003079	4.46	140.23	36.15	0.34	
Reach 1	1433.84	2year	318.00	6227.11	6232.40	
6232.54	0.001907	3.04	106.36	30.52	0.26	
Reach 1	1409.14	100year	1162.00	6227.68	6234.93	
6235.30	0.003226	4.91	245.56	58.65	0.38	
Reach 1	1409.14	10year	590.00	6227.68	6233.42	
6233.61	0.002650	3.55	166.37	46.06	0.32	
Reach 1	1409.14	2year	318.00	6227.68	6232.38	
6232.48	0.001858	2.61	121.75	39.62	0.26	
Reach 1	1409.04	100year	1162.00	6227.72	6234.80	
6235.29	0.003563	6.07	237.17	57.51	0.42	
Reach 1	1409.04	10year	590.00	6227.72	6233.36	
6233.61	0.002366	4.21	163.09	45.60	0.32	
Reach 1	1409.04	2year	318.00	6227.72	6232.35	
6232.48	0.001546	2.95	120.23	39.51	0.25	
Reach 1	1304.87	100year	1162.00	6229.48	6233.11	6233.11
6234.40	0.027550	9.13	127.30	49.65	1.01	
Reach 1	1304.87	10year	590.00	6229.48	6232.02	6232.02
6232.93	0.031043	7.65	77.11	43.08	1.01	
Reach 1	1304.87	2year	318.00	6229.48	6231.31	6231.31
6231.98	0.034683	6.56	48.46	37.14	1.01	
Reach 1	1207.55	100year	1162.00	6223.47	6230.25	
6231.14	0.012041	7.56	153.63	40.27	0.68	
Reach 1	1207.55	10year	590.00	6223.47	6228.79	
6229.31	0.008938	5.81	101.51	31.39	0.57	
Reach 1	1207.55	2year	318.00	6223.47	6227.87	
6228.15	0.005421	4.22	75.30	25.68	0.43	
Reach 1	1207.35	100year	1162.00	6223.38	6229.88	
6231.11	0.011429	9.13	140.97	37.87	0.69	
Reach 1	1207.35	10year	590.00	6223.38	6228.75	
6229.31	0.006958	6.09	102.06	31.30	0.52	
Reach 1	1207.35	2year	318.00	6223.38	6227.88	
6228.15	0.004493	4.20	77.12	25.81	0.40	

Reach 1	1182.65	100year	1162.00	6224.07	6229.90	
6230.76	0.007887	7.71	168.29	44.66	0.59	
Reach 1	1182.65	10year	590.00	6224.07	6228.69	
6229.12	0.005264	5.30	118.41	37.97	0.46	
Reach 1	1182.65	2year	318.00	6224.07	6227.82	
6228.03	0.003595	3.72	87.60	32.33	0.37	
Reach 1	1182.55	100year	1162.00	6224.09	6229.88	
6230.76	0.008040	7.77	167.21	44.59	0.60	
Reach 1	1182.55	10year	590.00	6224.09	6228.69	
6229.12	0.005367	5.34	117.65	37.94	0.47	
Reach 1	1182.55	2year	318.00	6224.09	6227.81	
6228.03	0.003673	3.75	86.97	32.32	0.37	
Reach 1	1136.61	100year	1162.00	6224.60	6228.73	6228.73
6230.09	0.027658	9.36	124.10	46.43	1.01	
Reach 1	1136.61	10year	590.00	6224.60	6227.64	6227.64
6228.58	0.030771	7.77	75.90	41.00	1.01	
Reach 1	1136.61	2year	318.00	6224.60	6226.93	6226.93
6227.60	0.034686	6.57	48.38	36.97	1.01	
Reach 1	1077.55	100year	1162.00	6219.85	6226.75	
6227.27	0.006066	5.79	200.67	46.02	0.49	
Reach 1	1077.55	10year	590.00	6219.85	6225.35	
6225.62	0.003906	4.17	141.42	37.90	0.38	
Reach 1	1077.55	2year	318.00	6219.85	6224.37	
6224.50	0.002277	2.96	107.31	31.84	0.28	
Reach 1	1077.35	100year	1162.00	6219.81	6226.73	
6227.27	0.004848	5.96	203.51	45.85	0.45	
Reach 1	1077.35	10year	590.00	6219.81	6225.35	
6225.61	0.003231	4.09	145.69	37.91	0.35	
Reach 1	1077.35	2year	318.00	6219.81	6224.37	
6224.50	0.002038	2.85	111.55	31.99	0.27	
Reach 1	1052.65	100year	1162.00	6220.77	6226.59	
6227.15	0.004867	6.19	210.33	54.43	0.47	
Reach 1	1052.65	10year	590.00	6220.77	6225.24	
6225.53	0.003620	4.40	142.89	45.32	0.39	
Reach 1	1052.65	2year	318.00	6220.77	6224.28	
6224.44	0.002720	3.18	102.74	38.92	0.32	
Reach 1	1052.55	100year	1162.00	6220.81	6226.58	
6227.15	0.005014	6.25	208.40	54.30	0.48	

Reach 1	1052.55	10year	590.00	6220.81	6225.23	
6225.53	0.003759	4.45	141.26	45.26	0.39	
Reach 1	1052.55	2year	318.00	6220.81	6224.28	
6224.44	0.002852	3.23	101.24	38.89	0.33	
Reach 1	1029.49	100year	1162.00	6221.37	6225.51	6225.51
6226.85	0.026523	9.27	125.34	46.00	0.99	
Reach 1	1029.49	10year	590.00	6221.37	6224.30	6224.30
6225.27	0.029384	7.90	74.65	37.74	0.99	
Reach 1	1029.49	2year	318.00	6221.37	6223.51	6223.51
6224.23	0.033224	6.78	46.93	32.93	1.00	
Reach 1	1002.55	100year	1162.00	6215.65	6223.20	
6224.06	0.011359	7.41	156.72	38.68	0.65	
Reach 1	1002.55	10year	590.00	6215.65	6221.64	
6222.14	0.007707	5.65	104.42	28.20	0.52	
Reach 1	1002.55	2year	318.00	6215.65	6220.62	
6220.87	0.004400	4.03	78.94	23.28	0.39	
Reach 1	1002.35	100year	1162.00	6215.56	6223.10	
6224.05	0.008542	7.94	157.04	38.00	0.57	
Reach 1	1002.35	10year	590.00	6215.56	6221.67	
6222.13	0.005855	5.47	109.14	28.81	0.45	
Reach 1	1002.35	2year	318.00	6215.56	6220.63	
6220.86	0.003883	3.83	83.10	23.65	0.36	
Reach 1	977.65	100year	1162.00	6215.94	6223.29	
6223.78	0.003560	5.72	217.80	46.02	0.40	
Reach 1	977.65	10year	590.00	6215.94	6221.74	
6221.97	0.002410	3.92	153.67	36.85	0.31	
Reach 1	977.65	2year	318.00	6215.94	6220.65	
6220.77	0.001586	2.72	116.99	31.22	0.24	
Reach 1	977.55	100year	1162.00	6215.95	6223.29	
6223.78	0.003579	5.73	217.41	46.03	0.40	
Reach 1	977.55	10year	590.00	6215.95	6221.73	
6221.97	0.002428	3.93	153.29	36.87	0.31	
Reach 1	977.55	2year	318.00	6215.95	6220.65	
6220.77	0.001600	2.73	116.65	31.24	0.24	
Reach 1	948.15	100year	1162.00	6217.77	6221.94	6221.94
6223.45	0.026717	9.86	117.86	39.12	1.00	
Reach 1	948.15	10year	590.00	6217.77	6220.63	6220.63
6221.71	0.029755	8.35	70.65	32.88	1.00	

Reach 1	948.15	2year	318.00	6217.77	6219.79	6219.79
6220.58	0.032775	7.10	44.78	28.78	1.00	
Reach 1	917.55	100year	1162.00	6214.08	6220.91	
6221.82	0.011910	7.65	151.82	37.13	0.67	
Reach 1	917.55	10year	590.00	6214.08	6217.76	6217.76
6219.24	0.031527	9.76	60.43	20.51	1.00	
Reach 1	917.55	2year	318.00	6214.08	6216.98	
6217.76	0.022068	7.07	44.95	19.55	0.82	
Reach 1	917.35	100year	1162.00	6213.92	6220.65	
6221.79	0.010088	8.79	146.71	36.01	0.63	
Reach 1	917.35	10year	590.00	6213.92	6217.88	6217.58
6219.10	0.023375	8.85	66.71	21.20	0.87	
Reach 1	917.35	2year	318.00	6213.92	6217.09	
6217.70	0.015397	6.28	50.64	19.84	0.69	
Reach 1	892.65	100year	1162.00	6213.06	6220.95	
6221.47	0.003590	5.98	220.97	49.61	0.40	
Reach 1	892.65	10year	590.00	6213.06	6218.14	
6218.61	0.006075	5.50	108.54	29.85	0.48	
Reach 1	892.65	2year	318.00	6213.06	6217.18	
6217.42	0.004031	3.86	82.48	25.20	0.38	
Reach 1	892.55	100year	1162.00	6213.06	6220.95	
6221.47	0.003580	5.98	221.20	49.70	0.40	
Reach 1	892.55	10year	590.00	6213.06	6218.14	
6218.61	0.006067	5.50	108.55	29.91	0.48	
Reach 1	892.55	2year	318.00	6213.06	6217.18	
6217.41	0.004032	3.86	82.44	25.21	0.38	
Reach 1	877.31	100year	1162.00	6214.39	6220.96	
6221.38	0.003569	5.27	235.21	57.41	0.40	
Reach 1	877.31	10year	590.00	6214.39	6217.28	6217.28
6218.37	0.029756	8.36	70.56	32.83	1.01	
Reach 1	877.31	2year	318.00	6214.39	6216.42	6216.42
6217.22	0.032900	7.17	44.33	28.15	1.01	
Reach 1	862.55	100year	1162.00	6210.14	6221.07	
6221.29	0.001368	3.97	338.49	64.61	0.24	
Reach 1	862.55	10year	590.00	6210.14	6215.53	
6216.16	0.010862	6.35	92.98	25.49	0.59	
Reach 1	862.55	2year	318.00	6210.14	6214.45	
6214.79	0.007086	4.67	68.12	21.56	0.46	

Reach 1	862.34	100year	1162.00	6210.07	6221.07
6221.29	0.001310	3.92	343.61	64.92	0.24
Reach 1	862.34	10year	590.00	6210.07	6215.58
6216.13	0.009242	5.99	98.45	25.81	0.54
Reach 1	862.34	2year	318.00	6210.07	6214.48
6214.77	0.005768	4.36	72.97	21.59	0.42

Reach 1	837.65	100year	1162.00	6210.38	6221.04
6221.26	0.001127	4.11	373.15	79.00	0.23
Reach 1	837.65	10year	590.00	6210.38	6215.24
6215.89	0.009458	6.48	91.52	25.19	0.58
Reach 1	837.65	2year	318.00	6210.38	6214.29
6214.62	0.006256	4.60	69.20	22.22	0.46

Reach 1	837.55	100year	1162.00	6210.41	6221.04
6221.26	0.001133	4.12	372.65	79.03	0.23
Reach 1	837.55	10year	590.00	6210.41	6215.23
6215.89	0.009699	6.54	90.69	25.08	0.59
Reach 1	837.55	2year	318.00	6210.41	6214.29
6214.62	0.006421	4.64	68.57	22.17	0.46

Reach 1	727.54	100year	1162.00	6210.55	6221.10
6221.16	0.000291	1.99	611.17	91.34	0.12
Reach 1	727.54	10year	590.00	6210.55	6214.59
6214.87	0.007061	4.26	138.41	58.83	0.49
Reach 1	727.54	2year	318.00	6210.55	6213.43
6213.69	0.010902	4.12	77.20	47.63	0.57

Reach 1	683.64	100year	1162.00	6206.59	6221.11
6221.14	0.000172	1.52	798.70	118.91	0.09
Reach 1	683.64	10year	590.00	6206.59	6214.49
6214.64	0.003016	3.13	188.26	63.56	0.32
Reach 1	683.64	2year	318.00	6206.59	6213.33
6213.44	0.002662	2.59	122.63	48.75	0.29

Reach 1	683.32	100year	1162.00	6206.52	6221.10
6221.14	0.000243	2.06	798.65	118.93	0.10
Reach 1	683.32	10year	590.00	6206.52	6214.42
6214.63	0.002569	4.12	184.44	62.74	0.29
Reach 1	683.32	2year	318.00	6206.52	6213.30
6213.43	0.001903	3.11	121.51	48.33	0.24

Reach 1	665.19	100year	1162.00	6207.07	6221.08	
6221.13	0.000276	2.43	703.32	104.15	0.12	
Reach 1	665.19	10year	590.00	6207.07	6214.33	
6214.58	0.002470	4.37	171.86	55.74	0.32	
Reach 1	665.19	2year	318.00	6207.07	6213.26	
6213.40	0.001724	3.18	117.57	44.22	0.26	
Reach 1	665.09	100year	1162.00	6207.08	6221.08	
6221.13	0.000276	2.44	703.45	104.25	0.12	
Reach 1	665.09	10year	590.00	6207.08	6214.33	
6214.58	0.002478	4.37	171.72	55.76	0.32	
Reach 1	665.09	2year	318.00	6207.08	6213.25	
6213.40	0.001731	3.19	117.43	44.22	0.26	
Reach 1	636.9	100year	1162.00	6208.92	6221.04	
6221.12	0.000427	2.90	615.46	108.79	0.16	
Reach 1	636.9	10year	590.00	6208.92	6213.33	6213.33
6214.35	0.020325	8.63	82.26	42.55	0.87	
Reach 1	636.9	2year	318.00	6208.92	6212.37	6212.37
6213.21	0.025683	7.53	46.39	31.43	0.92	
Reach 1	568.86	100year	1162.00	6207.84	6221.03	
6221.11	0.000125	2.61	701.80	115.54	0.13	
Reach 1	568.86	10year	590.00	6207.84	6210.87	6210.64
6211.85	0.009283	8.12	78.56	33.02	0.85	
Reach 1	568.86	2year	318.00	6207.84	6210.31	6209.77
6210.77	0.005811	5.54	60.66	30.85	0.65	
Reach 1	520.21	100year	1162.00	6207.84	6221.05	
6221.09	0.000061	1.82	946.72	121.50	0.09	
Reach 1	520.21	10year	590.00	6207.84	6210.35	6210.35
6211.31	0.013138	8.02	78.92	44.17	0.97	
Reach 1	520.21	2year	318.00	6207.84	6209.63	6209.63
6210.31	0.015689	6.67	49.29	38.87	0.99	
Reach 1	492.27	100year	1162.00	6201.17	6221.06	
6221.08	0.000022	1.33	1317.05	132.54	0.05	
Reach 1	492.27	10year	590.00	6201.17	6208.71	
6208.83	0.000437	2.84	230.88	52.79	0.21	
Reach 1	492.27	2year	318.00	6201.17	6205.32	
6205.54	0.002316	3.74	85.15	33.64	0.41	
Reach 1	462.31	100year	1162.00	6200.88	6221.06	
6221.08	0.000020	1.29	1437.06	149.42	0.05	

Reach 1	462.31	10year	590.00	6200.88	6208.71	
6208.81	0.000360	2.71	256.70	58.60	0.19	
Reach 1	462.31	2year	318.00	6200.88	6205.29	
6205.47	0.001589	3.43	93.99	35.51	0.35	
Reach 1	462.21	100year	1162.00	6200.88	6221.06	
6221.08	0.000021	1.36	1437.63	149.41	0.05	
Reach 1	462.21	10year	590.00	6200.88	6208.70	
6208.81	0.000377	2.88	256.17	58.55	0.20	
Reach 1	462.21	2year	318.00	6200.88	6205.27	
6205.47	0.001496	3.59	93.38	35.43	0.35	
Reach 1	396.14	100year	1162.00	6197.04	6221.07	6203.45
6221.08	0.000004	0.53	3210.63	286.77	0.02	
Reach 1	396.14	10year	590.00	6197.04	6208.58	6201.38
6208.78	0.000311	3.57	165.32	159.39	0.19	
Reach 1	396.14	2year	318.00	6197.04	6205.29	6200.15
6205.41	0.000303	2.77	114.95	49.21	0.18	
Reach 1	341.14		Culvert			
Reach 1	275.31	100year	1162.00	6192.10	6206.45	6200.35
6207.41	0.001338	8.76	157.12	40.87	0.41	
Reach 1	275.31	10year	590.00	6192.10	6199.70	6197.81
6200.77	0.003486	9.18	77.11	26.36	0.60	
Reach 1	275.31	2year	318.00	6192.10	6196.66	6196.30
6197.82	0.007297	9.32	41.09	19.94	0.79	
Reach 1	261.46	100year	1162.00	6191.29	6206.85	6198.50
6206.99	0.000261	3.52	426.31	75.20	0.16	
Reach 1	261.46	10year	590.00	6191.29	6200.10	6196.78
6200.33	0.000936	4.37	177.94	41.04	0.28	
Reach 1	261.46	2year	318.00	6191.29	6197.02	6195.22
6197.36	0.002377	4.94	78.36	29.72	0.41	
Reach 1	209.5		Culvert			
Reach 1	156.67	100year	1162.00	6191.15	6197.67	6197.67
6199.70	0.011053	12.40	112.33	45.10	0.96	
Reach 1	156.67	10year	590.00	6191.15	6196.07	6196.07
6197.42	0.011569	9.91	69.60	37.72	0.92	

Reach 1	156.67	2year	318.00	6191.15	6195.04	6195.04
6196.00	0.012250	8.14	44.35	32.90	0.90	
Reach 1	134.36	100year	1162.00	6190.78	6197.78	
6198.66	0.004603	8.17	177.30	48.63	0.64	
Reach 1	134.36	10year	590.00	6190.78	6196.03	6195.30
6196.67	0.005543	6.79	100.76	38.55	0.65	
Reach 1	134.36	2year	318.00	6190.78	6194.97	6194.44
6195.42	0.006135	5.57	63.13	33.08	0.64	
Reach 1	84.26	100year	1162.00	6191.00	6197.32	
6198.39	0.005378	8.42	151.00	46.65	0.69	
Reach 1	84.26	10year	590.00	6191.00	6194.99	6194.99
6196.19	0.014392	8.80	67.14	28.68	1.00	
Reach 1	84.26	2year	318.00	6191.00	6193.99	6193.99
6194.91	0.016046	7.68	41.42	22.98	1.01	
Reach 1	54.26	100year	1162.00	6190.00	6197.96	
6198.07	0.000380	2.86	479.86	107.11	0.20	
Reach 1	54.26	10year	590.00	6190.00	6194.51	
6194.69	0.001471	3.40	177.21	68.28	0.34	
Reach 1	54.26	2year	318.00	6190.00	6192.64	
6192.93	0.005614	4.34	73.34	45.69	0.60	
Reach 1	0.00	100year	1162.00	6188.32	6196.77	6194.43
6197.92	0.004114	8.78	149.54	31.98	0.55	
Reach 1	0.00	10year	590.00	6188.32	6193.45	6192.37
6194.45	0.007188	8.04	74.19	18.07	0.67	
Reach 1	0.00	2year	318.00	6188.32	6191.78	6191.14
6192.51	0.008814	6.86	46.34	15.79	0.71	

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir Flow (ft)	Q Culv Group (cfs)	Q Weir (cfs)	Delta WS (ft)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)

Reach 1	341.14	Culvert #2	100year	6221.08	6221.07	6221.93	6221.08	6220.86	269.37	3.23	14.63	21.44	21.44
Reach 1	341.14	Culvert #1	100year	6221.08	6221.07	6219.25	6221.08	6220.86	889.40	3.23	14.63	23.11	23.11
Reach 1	341.14	Culvert #2	10year	6208.78	6208.58	6208.34	6208.79	6220.86	69.38		8.88	8.33	14.01
Reach 1	341.14	Culvert #1	10year	6208.78	6208.58	6208.13	6208.78	6220.86	520.62		8.88	14.95	23.24
Reach 1	341.14	Culvert #2	2year	6205.41	6205.29	6205.28	6205.42	6220.86	3.09		8.63	3.34	6.17
Reach 1	341.14	Culvert #1	2year	6205.41	6205.29	6204.54	6205.41	6220.86	314.91		8.63	11.54	20.92

Reach 1	209.5	Culvert #1	100year	6206.99	6206.85	6206.99	6206.35	6216.72	1162.00		9.18	14.80	17.62
Reach 1	209.5	Culvert #1	10year	6200.34	6200.10	6199.61	6200.34	6216.72	590.00		4.03	11.16	12.29
Reach 1	209.5	Culvert #1	2year	6197.36	6197.02	6196.72	6197.36	6216.72	318.00		1.97	8.54	8.19

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : CorrectedEffective_EffectiveFlows

River: IndustrialTrib Reach: Reach 1   RS: 1534.24   Profile: 100year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1534.24   Profile: 10year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1534.24   Profile: 2year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1485.4 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1485.4 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1485.4 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1485.2 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1485.2 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that

there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1485.2 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1460.5 Profile: 100year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.5 Profile: 10year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.5 Profile: 2year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.4 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.4 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1460.4 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

River: IndustrialTrib Reach: Reach 1   RS: 1447.48   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1447.48   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1447.48   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1409.04   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1409.04   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1409.04   Profile: 2year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1304.87   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1304.87   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1304.87   Profile: 2year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1182.55 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1182.55 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1182.55 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1136.61 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 1136.61 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may

indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1136.61   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 1052.55   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1052.55   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1052.55   Profile: 2year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 1029.49   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1029.49 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1029.49 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrialTrib Reach: Reach 1 RS: 1002.35 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1002.35 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 1002.35 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 977.55 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 977.55 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 977.55 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 948.15 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 948.15 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current

and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 948.15 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 917.55 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 917.35 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 917.35 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 917.35 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 892.55 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

River: IndustrialTrib Reach: Reach 1   RS: 892.55   Profile: 2year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 877.31   Profile: 100year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 877.31   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 877.31   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 837.55   Profile: 100year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 837.55   Profile: 10year
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 727.54   Profile: 10year
     Warning:The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 727.54 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 665.09 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 665.09 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 636.9 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 636.9 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 636.9 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that

there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 568.86   Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 520.21   Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 520.21   Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 520.21   Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1   RS: 462.21   Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1   RS: 462.21   Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

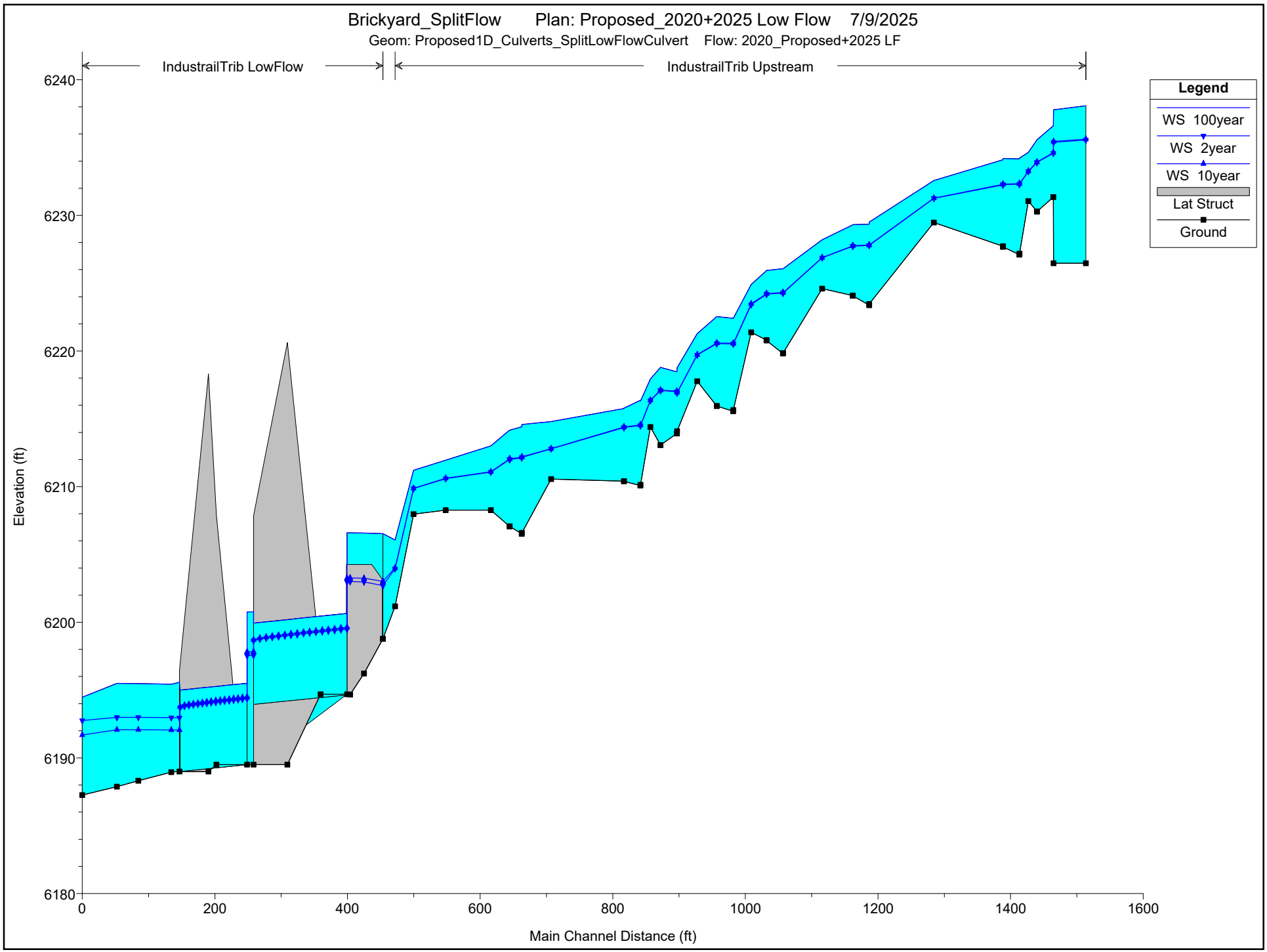
River: IndustrialTrib Reach: Reach 1   RS: 396.14   Profile: 100year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 396.14   Profile: 10year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 396.14   Profile: 2year
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
             used.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 100year   Culv: Culvert #2
     Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height
             of the culvert.
     Note: Culvert critical depth exceeds the height of the culvert.
     Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
     Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert
             inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 100year   Culv: Culvert #1
     Warning:During the supercritical analysis, the program could not balance the energy equation during the forewater
             calculations inside of the culvert. The program assumed critical depth at the outlet and continued on.
     Note: Culvert critical depth exceeds the height of the culvert.
     Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
     Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert
             inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 10year   Culv: Culvert #2
     Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 10year   Culv: Culvert #1
     Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross
             section downstream of the culvert has supercritical flow.
     Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1   RS: 341.14   Profile: 2year   Culv: Culvert #2
     Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal

depth at the outlet.
Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1 RS: 341.14 Profile: 2year Culv: Culvert #1
Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross
section downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.
River: IndustrialTrib Reach: Reach 1 RS: 275.31 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 275.31 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 275.31 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 261.46 Profile: 100year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 261.46 Profile: 10year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 261.46 Profile: 2year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 209.5 Profile: 100year Culv: Culvert #1
Note: The normal depth exceeds the height of the culvert. The program

assumes that the normal depth is equal to the height
of the culvert.
Note: During supercritical analysis, the culvert direct step method went to critical depth. The program then assumed
critical depth at the outlet.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
River: IndustrialTrib Reach: Reach 1 RS: 156.67 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 156.67 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 156.67 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was
used.
River: IndustrialTrib Reach: Reach 1 RS: 134.36 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 134.36 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 84.26 Profile: 100year
Warning:Divided flow computed for this cross-section.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 84.26 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 84.26 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrialTrib Reach: Reach 1 RS: 54.26 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 54.26 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrialTrib Reach: Reach 1 RS: 0.00 Profile: 10year
Warning:Divided flow computed for this cross-section.


Brickyard_SplitFlow Plan: Proposed_2020+2025 Low Flow 7/9/2025
Geom: Proposed1D_Culverts_SplitLowFlowCulvert Flow: 2020_Proposed+2025 LF
IndustrailTrib LowFlow
IndustrailTrib Upstream
Legend
WS 100year
WS 2year
WS 10year
Lat Struct
Ground
Elevation (ft)
6240
6230
6220
6210
6200
6190
6180
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)

HEC-RAS Plan: Proposed_202

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)	
Upstream	1518.60	100year	856.00	6226.47	6238.08		6238.54	0.003930	5.45	157.06	41.81	0.50
Upstream	1518.60	10year	305.00	6226.47	6235.62		6235.85	0.002827	3.89	78.36	23.79	0.38
Upstream	1518.60	2year	296.00	6226.47	6235.56		6235.79	0.002782	3.84	77.00	23.44	0.37
Upstream	1469.76	100year	856.00	6226.47	6237.78		6238.32	0.004788	5.91	144.92	39.17	0.54
Upstream	1469.76	10year	305.00	6226.47	6235.44		6235.70	0.003237	4.11	74.24	22.71	0.40
Upstream	1469.76	2year	296.00	6226.47	6235.39		6235.64	0.003176	4.05	73.03	22.39	0.40
Upstream	1469.56	100year	856.00	6231.35	6236.61	6236.61	6238.21	0.022061	10.46	90.50	30.84	0.93
Upstream	1469.56	10year	305.00	6231.35	6234.62	6234.62	6235.63	0.032183	8.04	37.92	18.96	1.00
Upstream	1469.56	2year	296.00	6231.35	6234.58	6234.58	6235.57	0.032260	7.98	37.09	18.81	1.00
Upstream	1444.86	100year	856.00	6230.28	6235.57	6234.21	6236.14	0.007972	6.08	140.79	38.30	0.56
Upstream	1444.86	10year	305.00	6230.28	6233.94	6232.60	6234.14	0.004614	3.67	83.06	32.43	0.40
Upstream	1444.86	2year	296.00	6230.28	6233.90	6232.57	6234.10	0.004532	3.62	81.88	32.30	0.40
Upstream	1444.76	100year	856.00	6230.29	6235.57	6234.21	6236.14	0.008015	6.08	140.72	38.43	0.56
Upstream	1444.76	10year	305.00	6230.29	6233.93	6232.63	6234.14	0.004684	3.68	82.78	32.54	0.41
Upstream	1444.76	2year	296.00	6230.29	6233.90	6232.59	6234.10	0.004603	3.63	81.60	32.40	0.40
Upstream	1431.84	100year	856.00	6231.06	6234.65	6234.65	6235.90	0.029001	8.96	95.57	39.10	1.01
Upstream	1431.84	10year	305.00	6231.06	6233.26	6233.26	6233.97	0.034849	6.72	45.37	33.17	1.01
Upstream	1431.84	2year	296.00	6231.06	6233.24	6233.24	6233.92	0.034960	6.66	44.45	33.05	1.01
Upstream	1418.40	100year	856.00	6227.18	6234.22		6234.62	0.005230	5.09	168.33	40.84	0.44
Upstream	1418.40	10year	305.00	6227.18	6232.33		6232.47	0.002420	3.00	101.56	29.87	0.29
Upstream	1418.40	2year	296.00	6227.18	6232.29		6232.42	0.002346	2.95	100.30	29.54	0.28
Upstream	1418.20	100year	856.00	6227.11	6234.16		6234.62	0.003998	5.55	168.70	40.56	0.40
Upstream	1418.20	10year	305.00	6227.11	6232.33		6232.47	0.001845	2.96	104.47	29.95	0.25
Upstream	1418.20	2year	296.00	6227.11	6232.29		6232.42	0.001800	2.91	103.19	29.63	0.25
Upstream	1393.50	100year	856.00	6227.68	6234.20		6234.48	0.002944	4.24	204.82	52.55	0.35
Upstream	1393.50	10year	305.00	6227.68	6232.31		6232.41	0.001806	2.56	119.29	39.23	0.26
Upstream	1393.50	2year	296.00	6227.68	6232.27		6232.37	0.001768	2.52	117.57	38.96	0.26
Upstream	1393.40	100year	856.00	6227.72	6234.10		6234.47	0.002993	5.17	199.19	51.74	0.37
Upstream	1393.40	10year	305.00	6227.72	6232.29		6232.41	0.001501	2.87	117.85	39.13	0.25
Upstream	1393.40	2year	296.00	6227.72	6232.25		6232.37	0.001469	2.82	116.17	38.87	0.25
Upstream	1289.23	100year	856.00	6229.48	6232.56	6232.56	6233.67	0.029186	8.45	101.30	46.44	1.01
Upstream	1289.23	10year	305.00	6229.48	6231.28	6231.28	6231.93	0.034659	6.48	47.09	36.79	1.01
Upstream	1289.23	2year	296.00	6229.48	6231.25	6231.25	6231.89	0.034580	6.41	46.16	36.55	1.01
Upstream	1191.91	100year	856.00	6223.47	6229.50		6230.23	0.010927	6.84	125.12	35.31	0.64
Upstream	1191.91	10year	305.00	6223.47	6227.82		6228.08	0.005175	4.12	73.96	25.22	0.42
Upstream	1191.91	2year	296.00	6223.47	6227.78		6228.04	0.005013	4.05	73.01	24.92	0.42
Upstream	1191.71	100year	856.00	6223.38	6229.34		6230.21	0.009107	7.61	121.73	34.52	0.61
Upstream	1191.71	10year	305.00	6223.38	6227.82		6228.08	0.004353	4.09	75.78	25.57	0.40
Upstream	1191.71	2year	296.00	6223.38	6227.79		6228.04	0.004248	4.02	74.82	25.34	0.39
Upstream	1167.01	100year	856.00	6224.07	6229.32		6229.95	0.006610	6.53	143.19	41.85	0.53
Upstream	1167.01	10year	305.00	6224.07	6227.77		6227.97	0.003503	3.63	85.91	31.99	0.36
Upstream	1167.01	2year	296.00	6224.07	6227.73		6227.93	0.003436	3.57	84.74	31.75	0.36
Upstream	1166.91	100year	856.00	6224.09	6229.31		6229.95	0.006737	6.57	142.30	41.80	0.54
Upstream	1166.91	10year	305.00	6224.09	6227.76		6227.97	0.003579	3.66	85.29	31.98	0.37
Upstream	1166.91	2year	296.00	6224.09	6227.73		6227.93	0.003511	3.60	84.12	31.75	0.36
Upstream	1120.97	100year	856.00	6224.60	6228.20	6228.20	6229.34	0.028712	8.55	100.14	44.37	1.00
Upstream	1120.97	10year	305.00	6224.60	6226.89	6226.89	6227.55	0.034723	6.48	47.07	36.78	1.01
Upstream	1120.97	2year	296.00	6224.60	6226.87	6226.87	6227.51	0.034985	6.43	46.04	36.63	1.01
Upstream	1061.91	100year	856.00	6219.85	6226.07		6226.46	0.005136	5.02	170.47	42.66	0.44
Upstream	1061.91	10year	305.00	6219.85	6224.31		6224.44	0.002210	2.89	105.44	31.79	0.28
Upstream	1061.91	2year	296.00	6219.85	6224.27		6224.40	0.002152	2.84	104.29	31.77	0.28
Upstream	1061.71	100year	856.00	6219.81	6226.07		6226.46	0.004093	5.03	174.51	42.61	0.40
Upstream	1061.71	10year	305.00	6219.81	6224.31		6224.43	0.001975	2.78	109.66	31.94	0.26
Upstream	1061.71	2year	296.00	6219.81	6224.28		6224.39	0.001922	2.73	108.49	31.91	0.26

HEC-RAS Plan: Proposed_202 (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)	
Upstream	1037.01	100year	856.00	6220.77	6225.94		6226.36	0.004255	5.31	176.36	49.94	0.43
Upstream	1037.01	10year	305.00	6220.77	6224.23		6224.37	0.002670	3.11	100.53	38.53	0.32
Upstream	1037.01	2year	296.00	6220.77	6224.19		6224.33	0.002615	3.05	99.22	38.29	0.31
Upstream	1036.91	100year	856.00	6220.81	6225.93		6226.35	0.004398	5.36	174.58	49.85	0.44
Upstream	1036.91	10year	305.00	6220.81	6224.22		6224.37	0.002802	3.16	99.03	38.49	0.32
Upstream	1036.91	2year	296.00	6220.81	6224.19		6224.33	0.002743	3.10	97.76	38.26	0.32
Upstream	1013.85	100year	856.00	6221.37	6224.91	6224.91	6226.07	0.027906	8.65	98.94	41.92	0.99
Upstream	1013.85	10year	305.00	6221.37	6223.48	6223.48	6224.17	0.032365	6.62	46.05	32.79	0.99
Upstream	1013.85	2year	296.00	6221.37	6223.43	6223.43	6224.13	0.034740	6.71	44.10	32.49	1.02
Upstream	986.91	100year	856.00	6215.65	6222.42		6223.11	0.009948	6.65	128.63	33.41	0.60
Upstream	986.91	10year	305.00	6215.65	6220.56		6220.80	0.004270	3.93	77.53	23.23	0.38
Upstream	986.91	2year	296.00	6215.65	6220.51		6220.75	0.004182	3.87	76.52	23.21	0.38
Upstream	986.71	100year	856.00	6215.56	6222.41		6223.10	0.007216	6.72	132.68	33.53	0.52
Upstream	986.71	10year	305.00	6215.56	6220.57		6220.79	0.003764	3.74	81.66	23.61	0.35
Upstream	986.71	2year	296.00	6215.56	6220.53		6220.74	0.003683	3.67	80.62	23.58	0.35
Upstream	962.01	100year	856.00	6215.94	6222.54		6222.89	0.003002	4.84	185.00	41.41	0.36
Upstream	962.01	10year	305.00	6215.94	6220.59		6220.70	0.001535	2.65	115.05	30.94	0.24
Upstream	962.01	2year	296.00	6215.94	6220.55		6220.65	0.001500	2.61	113.66	30.74	0.24
Upstream	961.91	100year	856.00	6215.95	6222.53		6222.89	0.003021	4.85	184.63	41.41	0.36
Upstream	961.91	10year	305.00	6215.95	6220.59		6220.70	0.001549	2.66	114.69	30.96	0.24
Upstream	961.91	2year	296.00	6215.95	6220.55		6220.65	0.001514	2.61	113.30	30.76	0.24
Upstream	932.51	100year	856.00	6217.77	6221.28	6221.28	6222.60	0.028269	9.19	93.16	35.99	1.01
Upstream	932.51	10year	305.00	6217.77	6219.74	6219.74	6220.51	0.033089	7.03	43.40	28.54	1.00
Upstream	932.51	2year	296.00	6217.77	6219.71	6219.71	6220.47	0.033139	6.96	42.51	28.39	1.00
Upstream	901.91	100year	856.00	6214.08	6218.76	6218.76	6220.38	0.030083	10.21	83.86	26.19	1.01
Upstream	901.91	10year	305.00	6214.08	6216.93		6217.68	0.021707	6.94	43.96	19.49	0.81
Upstream	901.91	2year	296.00	6214.08	6216.90		6217.62	0.021447	6.84	43.27	19.44	0.81
Upstream	901.71	100year	856.00	6213.92	6218.47	6218.47	6220.28	0.027945	10.82	80.24	24.77	0.98
Upstream	901.71	10year	305.00	6213.92	6217.04		6217.63	0.015106	6.15	49.56	19.77	0.69
Upstream	901.71	2year	296.00	6213.92	6217.00		6217.57	0.014891	6.06	48.81	19.72	0.68
Upstream	877.01	100year	856.00	6213.06	6218.79		6219.51	0.007708	6.83	129.35	33.91	0.55
Upstream	877.01	10year	305.00	6213.06	6217.12		6217.34	0.003907	3.77	80.98	25.06	0.37
Upstream	877.01	2year	296.00	6213.06	6217.08		6217.30	0.003817	3.70	79.95	24.96	0.36
Upstream	876.91	100year	856.00	6213.06	6218.79		6219.51	0.007700	6.83	129.37	33.97	0.55
Upstream	876.91	10year	305.00	6213.06	6217.12		6217.34	0.003909	3.77	80.94	25.07	0.37
Upstream	876.91	2year	296.00	6213.06	6217.08		6217.30	0.003819	3.70	79.90	24.97	0.37
Upstream	861.67	100year	856.00	6214.39	6217.95	6217.95	6219.25	0.028267	9.15	93.53	36.44	1.01
Upstream	861.67	10year	305.00	6214.39	6216.38	6216.38	6217.16	0.032673	7.06	43.18	27.93	1.00
Upstream	861.67	2year	296.00	6214.39	6216.35	6216.35	6217.11	0.032870	7.01	42.22	27.74	1.00
Upstream	846.91	100year	856.00	6210.14	6216.31		6217.19	0.013433	7.51	114.03	28.84	0.67
Upstream	846.91	10year	305.00	6210.14	6214.53		6214.82	0.006037	4.36	69.88	21.60	0.43
Upstream	846.91	2year	296.00	6210.14	6214.48		6214.77	0.005941	4.30	68.87	21.58	0.42
Upstream	846.70	100year	856.00	6210.07	6216.37		6217.16	0.011651	7.12	120.19	29.36	0.62
Upstream	846.70	10year	305.00	6210.07	6214.55		6214.81	0.004964	4.09	74.61	21.63	0.39
Upstream	846.70	2year	296.00	6210.07	6214.51		6214.76	0.004870	4.02	73.60	21.61	0.38
Upstream	822.01	100year	856.00	6210.38	6215.79		6216.83	0.012880	8.20	106.12	28.60	0.69
Upstream	822.01	10year	305.00	6210.38	6214.40		6214.69	0.005205	4.26	71.66	22.43	0.42
Upstream	822.01	2year	296.00	6210.38	6214.36		6214.63	0.005098	4.19	70.69	22.35	0.42
Upstream	821.91	100year	856.00	6210.41	6215.76		6216.83	0.013321	8.30	104.84	28.39	0.70
Upstream	821.91	10year	305.00	6210.41	6214.40		6214.68	0.005329	4.29	71.07	22.38	0.42
Upstream	821.91	2year	296.00	6210.41	6214.35		6214.63	0.005223	4.22	70.09	22.30	0.42
Upstream	711.90	100year	856.00	6210.55	6214.80		6215.30	0.011501	5.69	150.47	59.76	0.63
Upstream	711.90	10year	305.00	6210.55	6212.81	6212.81	6213.41	0.038176	6.22	49.01	41.82	1.01
Upstream	711.90	2year	296.00	6210.55	6212.78	6212.78	6213.38	0.038092	6.17	47.94	41.33	1.01

HEC-RAS Plan: Proposed_202 (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)	
Upstream	668.00	100year	856.00	6206.59	6214.59		6214.89	0.005794	4.40	194.68	64.62	0.45
Upstream	668.00	10year	305.00	6206.59	6212.20		6212.44	0.006312	3.89	78.37	30.35	0.43
Upstream	668.00	2year	296.00	6206.59	6212.15		6212.38	0.006222	3.86	76.76	29.71	0.42
Upstream	667.68	100year	856.00	6206.52	6214.41		6214.87	0.005426	5.99	184.16	62.70	0.42
Upstream	667.68	10year	305.00	6206.52	6212.17		6212.43	0.004202	4.15	77.78	30.08	0.35
Upstream	667.68	2year	296.00	6206.52	6212.12		6212.37	0.004103	4.09	76.30	29.42	0.34
Upstream	649.55	100year	856.00	6207.07	6214.17		6214.76	0.005917	6.63	162.75	54.39	0.49
Upstream	649.55	10year	305.00	6207.07	6212.05		6212.35	0.004865	4.40	73.15	29.73	0.41
Upstream	649.55	2year	296.00	6207.07	6212.00		6212.29	0.004825	4.34	71.67	29.16	0.41
Upstream	649.45	100year	856.00	6207.08	6214.16		6214.76	0.005945	6.64	162.52	54.40	0.49
Upstream	649.45	10year	305.00	6207.08	6212.05		6212.35	0.004902	4.41	72.99	29.73	0.41
Upstream	649.45	2year	296.00	6207.08	6212.00		6212.29	0.004864	4.35	71.49	29.15	0.41
Upstream	621.26	100year	856.00	6208.27	6213.00	6213.00	6214.40	0.019155	10.02	100.77	38.28	0.90
Upstream	621.26	10year	305.00	6208.27	6211.10	6211.10	6212.01	0.028091	7.76	41.35	24.78	0.97
Upstream	621.26	2year	296.00	6208.27	6211.07	6211.07	6211.96	0.027747	7.64	40.69	24.64	0.96
Upstream	553.22	100year	856.00	6208.27	6211.95	6211.55	6212.83	0.007340	8.02	126.74	64.28	0.78
Upstream	553.22	10year	305.00	6208.27	6210.61	6210.16	6210.99	0.005946	5.10	66.73	54.52	0.64
Upstream	553.22	2year	296.00	6208.27	6210.58	6210.11	6210.95	0.005936	5.04	65.43	54.29	0.64
Upstream	504.57	100year	856.00	6207.97	6211.21	6211.21	6212.36	0.011461	8.84	107.31	64.82	0.94
Upstream	504.57	10year	305.00	6207.97	6209.88	6209.88	6210.52	0.014981	6.47	48.76	54.46	0.97
Upstream	504.57	2year	296.00	6207.97	6209.86	6209.86	6210.48	0.014952	6.39	47.84	54.28	0.96
Upstream	476.63	100year	856.00	6201.17	6206.06	6206.06	6207.63	0.009590	11.66	105.90	50.35	0.94
Upstream	476.63	10year	305.00	6201.17	6204.01	6204.01	6204.99	0.011271	8.66	44.95	24.00	0.93
Upstream	476.63	2year	296.00	6201.17	6203.95	6203.95	6204.93	0.011475	8.62	43.65	23.70	0.94
Trail	443.00	100year	459.00	6202.29	6205.58	6205.58	6206.97	0.001550	9.73	64.76	28.30	0.96
Trail	443.00	10year	0.00	6202.29	6202.31	6202.31	6202.31	0.000000	0.00	0.01	1.30	0.00
Trail	443.00	2year	0.00	6202.29	6202.31	6202.31	6202.31	0.000000	0.00	0.01	1.30	0.00
Trail	412.24	100year	459.00	6200.18	6203.50	6203.50	6205.11	0.001678	10.18	47.43	15.56	1.00
Trail	412.24	10year	0.00	6200.18	6200.20	6200.20	6200.20	0.000000	0.00	0.02	1.55	0.00
Trail	412.24	2year	0.00	6200.18	6200.20	6200.20	6200.20	0.000000	0.00	0.02	1.55	0.00
Trail	390.71	100year	459.00	6198.46	6203.84		6204.43	0.000318	6.17	81.19	16.78	0.47
Trail	390.71	10year	0.00	6198.46	6198.48	6198.48	6198.48	0.000000	0.00	0.01	1.30	0.00
Trail	390.71	2year	0.00	6198.46	6198.48	6198.48	6198.48	0.000000	0.00	0.01	1.30	0.00
Trail	385.90	100year	459.00	6198.17	6203.87	6201.39	6204.42	0.000270	6.00	97.10	17.44	0.44
Trail	385.90	10year	0.00	6198.17	6198.17	6197.03	6198.17	0.000000		1.29	2.20	0.00
Trail	385.90	2year	0.00	6198.17	6198.17	6197.03	6198.17	0.000000		1.29	2.20	0.00
Trail	320.90		Culvert									
Trail	266.94	100year	459.00	6192.47	6198.63		6199.02	0.000178	5.13	112.19	18.46	0.36
Trail	266.94	10year	0.00	6192.47	6192.49	6192.49	6192.49	0.000000	0.00	0.43	18.00	0.00
Trail	266.94	2year	0.00	6192.47	6192.49	6192.49	6192.49	0.000000	0.00	0.43	18.00	0.00
Trail	257.31	100year	459.00	6192.16	6198.66		6199.01	0.000131	4.87	127.04	21.78	0.34
Trail	257.31	10year	0.00	6192.16	6192.18	6192.18	6192.18	0.000000	0.00	0.02	1.75	0.00
Trail	257.31	2year	0.00	6192.16	6192.18	6192.18	6192.18	0.000000	0.00	0.02	1.75	0.00
Trail	246.94	100year	459.00	6191.93	6198.52		6198.99	0.000171	5.64	113.96	19.98	0.39
Trail	246.94	10year	0.00	6191.93	6191.95	6191.95	6191.95	0.000000	0.00	0.01	0.89	0.00
Trail	246.94	2year	0.00	6191.93	6191.95	6191.95	6191.95	0.000000	0.00	0.01	0.89	0.00
Trail	237.07	100year	459.00	6191.10	6198.58	6195.10	6198.97	0.000130	5.02	99.03	15.61	0.34
Trail	237.07	10year	0.00	6191.10	6191.75	6191.12	6191.75	0.000000	0.00	0.62	2.34	0.00
Trail	237.07	2year	0.00	6191.10	6191.75	6191.12	6191.75	0.000000	0.00	0.62	2.34	0.00
Trail	194.07		Culvert									
Trail	148.30	100year	459.00	6191.05	6194.91	6194.91	6196.81	0.001381	11.33	54.54	16.38	1.02
Trail	148.30	10year	0.00	6191.05	6191.03	6191.03	6191.03	0.000000		0.01	0.96	0.00
Trail	148.30	2year	0.00	6191.05	6191.03	6191.03	6191.03	0.000000		0.01	0.96	0.00

HEC-RAS Plan: Proposed_202 (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)	
Trail	148.00		Lat Struct									
Trail	139.23	100year	459.00	6188.94	6193.76		6194.22	0.000543	6.09	119.39	26.44	0.49
Trail	139.23	10year	0.00	6188.94	6188.76		6188.76	0.000000		2.51	6.43	0.00
Trail	139.23	2year	0.00	6188.94	6188.76		6188.76	0.000000		2.51	6.43	0.00
Trail	126.23	100year	459.00	6188.66	6193.80		6194.20	0.000448	5.64	128.84	27.89	0.45
Trail	126.23	10year	0.00	6188.66	6188.76		6188.76	0.000000	0.00	4.42	16.34	0.00
Trail	126.23	2year	0.00	6188.66	6188.76		6188.76	0.000000	0.00	4.42	16.34	0.00
Trail	104.53	100year	459.00	6188.69	6193.81		6194.18	0.000332	5.50	140.78	32.96	0.43
Trail	104.53	10year	0.00	6188.69	6188.76		6188.76	0.000000	0.00	3.77	13.77	0.00
Trail	104.53	2year	0.00	6188.69	6188.76		6188.76	0.000000	0.00	3.77	13.77	0.00
Trail	83.73	100year	459.00	6189.21	6193.90	6191.67	6194.14	0.000193	4.28	194.03	62.60	0.36
Trail	83.73	10year	0.00	6189.21	6188.76	6188.76	6188.76	0.000005		0.00	0.31	0.00
Trail	83.73	2year	0.00	6189.21	6188.76	6188.76	6188.76	0.000005		0.00	0.31	0.00
LowFlow	449.30	100year	397.00	6198.78	6206.54		6206.64	0.000699	3.39	175.56	33.90	0.22
LowFlow	449.30	10year	305.00	6198.78	6203.02		6203.43	0.005573	6.39	67.90	24.66	0.55
LowFlow	449.30	2year	296.00	6198.78	6202.70		6203.19	0.007247	6.91	60.19	23.46	0.62
LowFlow	449.20		Lat Struct									
LowFlow	420.81	100year	397.00	6196.23	6206.58		6206.61	0.000123	1.57	273.69	32.04	0.09
LowFlow	420.81	10year	305.00	6196.23	6203.25		6203.30	0.000338	1.93	168.07	31.40	0.14
LowFlow	420.81	2year	296.00	6196.23	6202.98		6203.03	0.000375	1.97	159.59	31.34	0.15
LowFlow	399.84	100year	397.00	6194.67	6206.59		6206.60	0.000045	1.11	556.49	103.07	0.06
LowFlow	399.84	10year	305.00	6194.67	6203.27		6203.29	0.000106	1.36	305.77	62.31	0.08
LowFlow	399.84	2year	296.00	6194.67	6203.00		6203.02	0.000116	1.39	289.11	60.65	0.09
LowFlow	395.23	100year	397.00	6194.69	6206.59	6197.72	6206.60	0.000052	1.14	492.02	99.28	0.06
LowFlow	395.23	10year	305.00	6194.69	6203.26	6197.32	6203.29	0.000140	1.46	253.94	55.10	0.09
LowFlow	395.23	2year	296.00	6194.69	6202.99	6197.29	6203.02	0.000152	1.48	239.31	53.00	0.10
LowFlow	330.23		Culvert									
LowFlow	258.43	100year	397.00	6189.50	6200.77		6201.05	0.000319	4.27	92.99	8.30	0.22
LowFlow	258.43	10year	305.00	6189.50	6197.83		6198.13	0.000391	4.45	68.60	8.28	0.27
LowFlow	258.43	2year	296.00	6189.50	6197.56		6197.86	0.000399	4.46	66.35	8.27	0.28
LowFlow	248.43	100year	397.00	6189.50	6200.76	6193.70	6201.05	0.000334	4.34	91.57	8.17	0.23
LowFlow	248.43	10year	305.00	6189.50	6197.81	6193.02	6198.13	0.000409	4.52	67.55	8.15	0.28
LowFlow	248.43	2year	296.00	6189.50	6197.54	6192.95	6197.86	0.000417	4.53	65.34	8.15	0.28
LowFlow	196.43		Culvert									
LowFlow	146.73	100year	397.00	6189.00	6195.57		6195.62	0.000248	1.83	223.39	34.71	0.13
LowFlow	146.73	10year	305.00	6189.00	6192.06		6192.20	0.001889	3.02	102.33	34.06	0.30
LowFlow	146.73	2year	296.00	6189.00	6192.96		6193.04	0.000746	2.26	133.41	34.39	0.20
LowFlow	134.20	100year	856.00	6188.94	6195.44		6195.60	0.000523	3.38	294.31	55.78	0.23
LowFlow	134.20	10year	305.00	6188.94	6192.06		6192.17	0.000868	2.67	123.84	45.01	0.27
LowFlow	134.20	2year	296.00	6188.94	6192.97		6193.03	0.000337	1.97	166.13	48.07	0.17
LowFlow	84.70	100year	856.00	6188.31	6195.49		6195.56	0.000240	2.23	413.38	81.82	0.16
LowFlow	84.70	10year	305.00	6188.31	6192.08		6192.12	0.000428	1.78	171.73	59.79	0.18
LowFlow	84.70	2year	296.00	6188.31	6192.98		6193.01	0.000163	1.31	228.78	65.85	0.12
LowFlow	52.40	100year	856.00	6187.88	6195.49		6195.55	0.000153	1.89	491.96	95.42	0.13
LowFlow	52.40	10year	305.00	6187.88	6192.08		6192.11	0.000198	1.37	223.97	66.13	0.13
LowFlow	52.40	2year	296.00	6187.88	6192.99		6193.00	0.000086	1.05	286.37	71.65	0.09
LowFlow	0.00	100year	856.00	6187.26	6194.48	6192.22	6195.44	0.004518	7.86	112.24	19.89	0.54
LowFlow	0.00	10year	305.00	6187.26	6191.68	6189.91	6192.05	0.003472	4.86	62.73	16.13	0.43
LowFlow	0.00	2year	296.00	6187.26	6192.76	6189.86	6192.97	0.001480	3.69	80.44	16.97	0.29

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Brickyard_SplitFlow
Project File : ITT_SplitFlow.prj
Run Date and Time: 5/19/2025 5:12:22 PM

Project in English units

PLAN DATA

Plan Title: Proposed_2013 FHAD Flows
Plan File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.p46

Geometry Title: Proposed1D_Culverts_SplitLowFlowCulvert
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g20

Flow Title : 2013 FHAD Future Flows_Proposed
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.f04

Plan Summary Information:

Number of: Cross Sections	=	68	Multiple Openings	=	0
Culverts	=	4	Inline Structures	=	0
Bridges	=	0	Lateral Structures	=	2

Computational Information

```
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow




FLOW DATA

Flow Title: 2013 FHAD Future Flows_Proposed
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson
Models\ITT_Proposed\ITT_SplitFlow.f04

Flow Data (cfs)


  River           Reach           RS                100year          10year
 2year
  IndustrailTrib  Upstream        1518.60              1162             590
   318
  IndustrailTrib  Trail           443.00                757             214
.000001
  IndustrailTrib  LowFlow         449.30                405             376
   318
  IndustrailTrib  LowFlow         134.20               1162             590
   318



Boundary Conditions


  River           Reach           Profile                       Upstream
    Downstream


  IndustrailTrib  Trail           100year
Known WS = 6194.53
  IndustrailTrib  Trail           10year
Known WS = 6193.25
  IndustrailTrib  Trail           2year
Known WS = 6188.68
```

```
  IndustrailTrib  LowFlow         100year
Known WS = 6196.77
  IndustrailTrib  LowFlow         10year
Known WS = 6193.45
  IndustrailTrib  LowFlow         2year
Known WS = 6191.78
```

GEOMETRY DATA

Geometry Title: Proposed1D_Culverts_SplitLowFlowCulvert
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g20

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
IndustrailTrib	Upstream		Junction 1
IndustrailTrib	Trail	Junction 1	
IndustrailTrib	LowFlow	Junction 1	

JUNCTION INFORMATION

Name: Junction 1
Description:
Energy computation Method

Length across Junction		Tributary			
River	Reach	River	Reach	Length	Angle
IndustrailTrib	Upstream	to IndustrailTrib	Trail	40.35	0
IndustrailTrib	Upstream	to IndustrailTrib	LowFlow	18.15	0

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1518.60

INPUT
Description: 47 - River STA 1523.19
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6255.7	.02	6255.7	7.14	6255.62	11.18	6255.56	13.69	6255.32
28.47	6254.59	31.35	6254.73	35.03	6252.94	40.24	6249.62	42.33	6248
50.9	6242.23	51.52	6241.8	51.84	6241.52	53.06	6240.51	57.48	6236.86

```
   60.48 6235.36   60.84 6235.18   61.84 6234.65   62.33 6233.33   64.99 6226.47
    67.4 6226.57   68.14  6226.6   68.51 6227.28   69.81 6232.67   72.48 6233.14
   73.08 6233.24   75.47 6233.62   76.54 6233.86   88.19  6236.7   88.81 6236.84
   90.54 6237.12   99.42 6238.29  103.93 6239.86  106.09 6240.55  106.54 6240.77
  124.47 6251.85  124.58 6251.93  124.61 6251.94  124.64 6251.94  125.52 6251.98
  146.84 6252.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   53.06    .035  106.54     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.06  106.54             49.2   48.84   48.48             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1469.76

INPUT
Description: 46 - River STA 1473.44
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6255.7     .02  6255.7    7.14 6255.62   11.18 6255.56   13.69 6255.32
   28.47 6254.59   31.35 6254.73   35.03 6252.94   40.24 6249.62   42.33    6248
    50.9 6242.23   51.52  6241.8   51.84 6241.52   53.06 6240.51   57.48 6236.86
   60.48 6235.36   60.84 6235.18   61.84 6234.65   62.33 6233.33   64.99 6226.47
    67.4 6226.57   68.14  6226.6   68.51 6227.28   69.81 6232.67   72.48 6233.14
   73.08 6233.24   75.47 6233.62   76.54 6233.86   88.19  6236.7   88.81 6236.84
   90.54 6237.12   99.42 6238.29  103.93 6239.86  106.09 6240.55  106.54 6240.77
  124.47 6251.85  124.58 6251.93  124.61 6251.94  124.64 6251.94  125.52 6251.98
  146.84 6252.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   53.06    .035  106.54     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.06  106.54               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1469.56

INPUT
Description: 45 - River STA 1473.24
Station Elevation Data    num=      37
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6253.61    6.14 6253.44   11.41 6252.53   23.15 6245.71   27.11 6243.42
   30.42 6242.11   44.43 6235.87   44.62 6235.75    44.8  6235.7   46.89 6234.82
   48.34 6234.79   51.97 6232.83   56.02 6232.25   57.36 6232.07   57.85    6232
   59.22  6231.8   60.22 6231.66   62.39 6231.35   67.72 6234.69   68.11 6234.76
   70.64 6234.91   78.81 6239.58   80.72 6240.65   81.71 6241.31   82.06 6241.54
   82.19 6241.59   84.21 6242.45   84.85 6242.75   85.54    6243   87.65 6244.08
   90.88  6246.4   91.76 6246.54   93.55 6247.15   97.12 6247.83   97.51 6247.85
   97.86 6247.84  112.73 6244.02

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   48.34     .05   67.72     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         48.34   67.72            22.87    24.7   26.53             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1444.86

INPUT
Description: 44 - River STA 1448.54
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6252.43    3.45 6252.29   12.65 6251.85   13.79 6251.71   16.05 6250.38
   24.72 6246.77   36.12 6240.54   40.91 6236.03   46.69 6232.29   47.06 6232.09
   47.18 6232.08   49.84 6231.12   50.15 6230.94   50.97 6230.83   55.27 6230.54
    59.1 6230.28   59.16 6230.28   59.28  6230.3   65.58 6231.06   69.01 6231.37
   71.36 6231.39   74.22 6232.84   75.19 6233.26   80.94 6236.06   88.49 6239.31
   98.99 6237.21   99.68    6237  100.82 6237.04  104.64 6237.53  107.19 6237.64
  111.06 6237.78  112.31 6237.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.12     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.12   88.49              .09      .1     .11             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.31       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1444.76
```

```
INPUT
Description: 43 - River STA 1448.44
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6252.43    3.68 6252.27   12.67 6251.85   13.79 6251.71      16 6250.41
    24.7 6246.79      36 6240.61    40.9    6236   46.47  6232.4   47.06 6232.08
   47.26 6232.06   49.61 6231.21   50.01 6230.98   51.08 6230.83   55.26 6230.55
   58.96  6230.3   59.18 6230.29   59.65 6230.38    65.5 6231.08   68.69 6231.38
   71.42  6231.4   74.21 6232.81   75.25 6233.26   80.81 6235.96   88.49 6239.27
   99.16 6237.13   99.69 6236.97  100.55    6237  104.67 6237.53  107.17 6237.63
  111.11 6237.78  112.31 6237.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      36     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            36   88.49             14.1   12.92   11.74             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.27       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1431.84

INPUT
Description: 42 - River STA 1435.40
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6251.56    11.9 6250.97   15.71 6250.01   17.78 6249.69    22.2 6248.89
   34.71 6239.62   37.97 6237.19   39.19 6236.27   42.86 6233.95   46.07 6232.22
   50.16 6231.72   58.37 6231.72   58.94 6231.61   59.29  6231.2   60.32 6231.06
   63.04  6231.7   73.31 6231.88   74.74 6232.62   76.53 6232.96   82.88 6235.44
   88.57 6236.04    88.9 6236.15   90.47 6236.48   93.34 6236.94  101.88 6237.31
  107.44 6237.51  110.57 6237.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   39.19     .05   88.57     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         39.19   88.57            15.62   13.44   11.27             .1       .3

CROSS SECTION
```

RIVER: IndustrailTrib
REACH: Upstream RS: 1418.40

INPUT
Description: 41 - River STA 1422.03
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6250.39	1.48	6250.32	21.85	6248.52	22.66	6248.4	22.92	6248.35
24.13	6247.45	31.48	6242.2	38.04	6237.5	39.36	6236.64	45.66	6232.48
46.81	6232.15	47.91	6231.95	48.18	6231.89	49.02	6231.75	52.58	6227.98
53.16	6227.93	61.78	6227.18	65.77	6228.34	72.17	6228.08	73.21	6231.58
73.24	6231.65	73.26	6231.65	76.5	6232.44	76.64	6232.44	76.77	6232.48
77.45	6232.77	84.65	6234.4	98.07	6236.81	110.17	6237.44		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	39.36	.05	98.07	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
39.36	98.07	.2	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1418.20

INPUT
Description: 40 - River STA 1421.83
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6250.38	1.31	6250.32	22.04	6248.49	22.71	6248.39	22.92	6248.35
23.92	6247.6	30	6243.25	38.06	6237.48	39.68	6236.43	45.68	6232.47
46.99	6232.08	48.24	6231.86	48.39	6231.83	48.85	6231.75	52.47	6227.93
53.16	6227.87	61.8	6227.11	65.39	6228.16	72.1	6227.89	73.01	6230.95
73.3	6231.65	73.55	6231.72	76.33	6232.39	76.55	6232.4	76.74	6232.46
77.42	6232.74	84.49	6234.34	98.2	6236.81	110.15	6237.42		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	48.85	.05	73.3	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
48.85	73.3	24.56	24.7	25.32	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1393.50

```
INPUT
Description: 39 - River STA 1397.12
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.43    8.02 6247.69   19.42 6246.71   21.94 6246.61   31.37 6243.23
   34.12 6241.28   38.08 6239.57    40.6 6236.68   41.52 6236.07   46.38 6233.15
   50.97 6230.01    52.6  6228.7   53.25 6228.09   54.84 6228.05   57.03    6228
   62.28 6227.68    67.7 6227.81   71.13 6227.83   74.98 6229.84   76.05 6230.04
   76.36  6230.1   77.04 6230.23   89.37 6232.85   90.87 6233.25  107.25 6235.71
   108.3 6236.08

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   46.38     .05   90.87     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         46.38   90.87               .1      .1     .12             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1393.40

INPUT
Description: 38 - River STA 1397.02
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.42    8.29 6247.66   19.42  6246.7   21.87 6246.61   31.42 6243.18
   34.12 6241.26   38.12 6239.54    40.6  6236.7   41.54 6236.08   46.29 6233.22
      51    6230   52.54 6228.76   53.22 6228.12   54.85 6228.08   57.16 6228.02
    62.3 6227.72   67.61 6227.85   71.18 6227.86   74.96 6229.84   76.19 6230.06
   76.55 6230.13   77.33 6230.28   89.51 6232.87      91 6233.26  107.17  6235.7
   108.3 6236.09

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      51     .05   74.96     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            51   74.96            99.66  104.17  115.69             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1289.23

INPUT
```

Description: 37 - River STA 1292.77
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6241.45	19.5	6234.33	26.36	6231.83	38.97	6229.48	44.01	6229.64
46.14	6229.71	60.16	6229.7	61.35	6230.14	67.22	6231.54	70.71	6232.54
75.23	6233.96	75.44	6234.41	105.01	6240.87	106.38	6241.05	107.98	6241.7
115.4	6245								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	19.5	.05	75.44	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
19.5	75.44	91.64	97.32	94.38	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1191.91

INPUT
Description: 36 - River STA 1195.60
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6243.32	4.44	6242.44	19.89	6234.98	21.22	6234.2	22.33	6233.65
24.38	6232.13	35.5	6229.47	35.88	6229.36	37.3	6228.9	38.24	6228.54
40.18	6228.18	40.44	6228.11	41.29	6227.85	45.69	6224.27	48.74	6223.47
54.6	6223.48	56.27	6223.49	57.05	6223.49	64.32	6227.32	64.83	6227.37
65.49	6227.66	67.01	6227.89	68.55	6228.61	75.21	6231.38	78.17	6232.71
79.63	6233.35	80.07	6233.56	81.67	6234.66	84.08	6236.35	84.87	6236.7
85.08	6236.71	86.03	6237.16	86.37	6237.58	93.83	6240.9	98.94	6241.67
101.54	6242.6	101.7	6242.66						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	19.89	.05	81.67	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
19.89	81.67	.2	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1191.71

INPUT
Description: 35 - River STA 1195.40
Station Elevation Data num= 37

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6243.38    4.31 6242.53   20.06 6234.92   21.42 6234.13   22.34 6233.67
   24.44 6232.12   35.28 6229.52   35.64 6229.42   37.32 6228.87   38.44 6228.45
   40.72 6228.03   40.87 6227.99   41.34 6227.84   45.93 6224.11    48.7 6223.38
   54.68 6223.39   56.27  6223.4   56.93  6223.4   63.62 6226.93   64.84 6227.05
   66.39 6227.73    66.9 6227.81   68.56 6228.58   74.49 6231.05   77.94  6232.6
   79.65 6233.34   80.16 6233.58    81.7 6234.65   84.04  6236.3    84.9 6236.68
   85.13 6236.69   86.17 6237.18   86.53 6237.63   93.86  6240.9   99.02 6241.67
  101.52 6242.57   101.7 6242.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   41.34     .05   63.62     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         41.34   63.62            24.08    24.7   25.32             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1167.01

INPUT
Description: 34 - River STA 1170.58
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.38    4.33 6239.32    17.4 6232.29   19.06 6231.84    19.8 6231.56
   24.89 6229.64   25.34  6229.4   25.36 6229.39   29.72 6228.27   32.79 6227.46
   33.54 6227.16   36.93 6224.64   40.52 6224.26   41.08 6224.17   43.82 6224.07
   47.99 6224.13   48.84 6224.15   52.87 6224.21   56.27 6224.81   59.15 6225.62
   60.29 6226.54   64.59 6228.12   65.79 6228.59   68.96 6229.93   72.09 6230.74
   74.51 6231.36   74.94 6231.58   76.51 6232.36   79.67 6233.16   81.57 6234.07
   83.63 6234.23   91.61 6238.41   92.17  6239.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   33.54     .05   60.29     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         33.54   60.29               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1166.91

INPUT
Description: 33 - River STA 1170.48
```

Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6241.39	4.06	6239.45	17.39	6232.29	19.08	6231.83	19.84	6231.55
24.89	6229.64	25.36	6229.39	25.38	6229.38	29.7	6228.27	32.72	6227.47
33.58	6227.12	36.9	6224.67	40.4	6224.3	40.98	6224.2	43.83	6224.09
47.96	6224.16	48.74	6224.17	52.9	6224.23	56.21	6224.82	59.16	6225.65
60.25	6226.52	64.57	6228.12	65.81	6228.6	68.88	6229.9	71.9	6230.67
74.49	6231.34	74.95	6231.57	76.52	6232.35	79.67	6233.15	81.56	6234.06
83.62	6234.22	91.64	6238.41	92.17	6239.16				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	33.58	.05	60.25	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33.58	60.25	54.71	45.94	37.17	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1120.97

INPUT
Description: 32 - River STA 1124.50
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6240.21	1.37	6239.57	3.61	6239.02	20.37	6230.23	24.82	6227.9
25.95	6227.73	27.12	6227.53	29.61	6226.78	31.09	6226.36	36.79	6226.24
40.11	6225.87	51.49	6224.6	56.52	6224.84	60.23	6225.5	65.8	6226.79
71.22	6229.51	73.02	6230.21	73.7	6230.43	77.56	6230.84	86.41	6235.52
94.53	6238.42	103.19	6239.77	106.48	6240.73	110	6242.41		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	20.37	.05	73.7	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20.37	73.7	60.28	59.06	57.83	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1061.91

INPUT
Description: 31 - River STA 1065.52
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
       0 6239.77     .29 6239.64    4.02 6238.47   11.47 6237.91   13.89 6237.77
   24.55 6233.58   25.51 6233.37   27.09 6232.21   28.45 6231.36   34.15 6227.78
   36.66 6226.74   38.77 6225.74   39.79 6225.82   41.39 6224.99   42.43 6224.48
   42.79 6223.62   43.92 6221.24   50.25 6220.67    53.1 6219.85   55.33 6220.37
   56.06 6220.36    66.5  6220.2   72.12 6223.32   73.95  6223.4   74.34 6224.42
   75.59 6224.59   77.33 6225.13    78.8 6225.38   84.17 6227.29   86.97 6228.04
  101.77 6233.58  108.96 6236.08  114.03 6236.83  120.11 6237.26  120.23 6237.28
  126.24 6239.18

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   25.51     .05  101.77     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.51  101.77               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1061.71

INPUT
Description: 30 - River STA 1065.32
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6239.76     .38  6239.6    4.04 6238.45   11.38  6237.9   13.92 6237.75
   25.18 6233.32   25.63 6233.23   26.37 6232.68   28.44 6231.39   33.96 6227.92
   36.69 6226.79   38.94 6225.73    39.9  6225.8   41.73 6224.86    42.5 6224.47
   43.07 6223.12   44.03 6221.09   50.68  6220.5   53.02 6219.81   54.86 6220.25
   56.12 6220.23   66.36 6220.08    71.2 6222.76   73.97 6222.88   74.55 6224.43
   75.49 6224.55   77.37 6225.13   78.95  6225.4   84.12 6227.24   87.06 6228.02
  101.69 6233.49  109.05 6236.06  114.24 6236.83   120.2 6237.25  120.34 6237.27
   126.3 6239.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    39.9     .05   74.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          39.9   74.55            25.53    24.7   23.87             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1037.01

INPUT
Description: 29 - River STA 1040.52
```

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6236.38	4.3	6236.03	6.15	6235.71	7.83	6234.91	19.89	6231.39
20.26	6230.78	20.44	6230.88	21.24	6229.43	28.06	6226.45	35.01	6223.42
36.84	6222.47	37.13	6222.37	37.18	6222.34	37.89	6221.82	40.23	6221.28
45.98	6221.12	48.96	6221.03	49.12	6221.03	57.15	6220.77	63.16	6220.81
64.81	6220.85	65.04	6221.02	67.47	6222.98	70.08	6223.74	71.53	6224.19
74.17	6224.77	81.29	6226.43	83.72	6226.87	87.04	6228.31	98.26	6231.76
104.25	6233.89	106.53	6234.25	111.15	6235.38	120.14	6237.92	121.9	6238.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	35.01	.05	67.47	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.01	67.47	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1036.91

INPUT
Description: 28 - River STA 1040.42
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6236.38	4.35	6236.02	6.13	6235.71	7.75	6234.95	19.93	6231.39
20.29	6230.79	20.47	6230.89	21.29	6229.42	27.54	6226.69	35.02	6223.42
36.92	6222.44	37.2	6222.34	37.89	6221.84	40.05	6221.33	46.06	6221.17
48.67	6221.09	49.11	6221.08	57.2	6220.81	62.92	6220.86	64.85	6220.9
65.12	6221.1	67.44	6222.97	70.1	6223.75	71.5	6224.18	74.03	6224.73
81.27	6226.43	83.73	6226.87	87.1	6228.33	98.5	6231.84	104.25	6233.88
106.44	6234.22	110.86	6235.31	120.3	6237.98	121.9	6238.53		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	35.02	.05	67.44	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.02	67.44	23.75	23.06	22.36	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1013.85

INPUT
Description: 27 - River STA 1017.42

```
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6234.96     1.6 6234.75   13.23 6232.09   23.42 6226.58   24.53 6226.12
   30.06 6227.36   30.78 6226.05   36.65 6223.45   37.89  6222.8   49.54 6222.03
   51.28 6221.92   52.52 6221.57   54.02 6221.49   61.29 6221.41   63.06 6221.37
   63.44  6221.4   68.43 6223.17   70.53 6223.88   74.83 6224.81   77.95  6225.5
   85.26 6226.84   93.91 6230.63   98.19 6232.19  105.11 6234.23  120.87 6238.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   30.06     .05   85.26     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         30.06   85.26            27.45   26.94   26.44             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0   30.06 6227.36       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 986.91

INPUT
Description: 26 - River STA 990.69
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6232.8    5.46  6231.2    5.62 6231.15     5.7 6231.13   15.71 6229.44
   31.21 6224.37   32.64 6224.03   38.51 6221.92   38.52 6221.91   38.56 6221.91
   41.58 6221.44   42.56  6221.1   42.73  6220.3   43.81 6220.18   49.63 6215.97
    50.8 6215.65   51.53 6215.65   58.41 6215.69   60.29 6216.21   61.89 6217.66
   64.09 6219.72   65.48 6219.63   66.13 6221.03   66.83  6221.1   68.64  6221.7
   69.16 6221.84   69.65 6221.98   71.04 6222.67   75.21 6223.53   82.86 6225.21
   85.53 6225.88   94.19 6227.89   94.56 6227.99   95.71 6228.42   111.3 6234.28
   112.8 6234.86  113.48 6235.11  119.42 6237.78  120.19 6237.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   15.71     .05   95.71     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         15.71   95.71              .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 986.71
```

INPUT
Description: 25 - River STA 990.49
Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6232.77	5.02	6231.31	5.54	6231.13	5.81	6231.08	15.61	6229.42
30.78	6224.46	32.49	6224.06	38.2	6222	38.53	6221.9	39.34	6221.75
41.72	6221.38	42.49	6221.11	42.8	6219.65	44.76	6219.44	49.75	6215.83
50.75	6215.56	51.53	6215.56	58.49	6215.6	60.13	6216.06	61.52	6217.32
63.44	6219.12	65.48	6218.99	66.43	6221.04	66.94	6221.08	68.92	6221.74
69.14	6221.8	69.66	6221.95	71.13	6222.68	75.18	6223.51	82.59	6225.15
85.5	6225.88	93.9	6227.83	94.38	6227.93	94.48	6227.96	111.05	6234.19
112.84	6234.88	113.66	6235.18	119.43	6237.78	120.19	6237.85		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	42.49	.05	66.43	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
42.49	66.43	25.09	24.7	24.31	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 962.01

INPUT
Description: 24 - River STA 965.70
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.78	.55	6229.56	1.75	6229.36	12.9	6226.81	24.14	6223.91
24.79	6223.75	25.47	6223.54	36.78	6220.31	38.16	6218.74	41.87	6216.15
48.08	6215.94	50.88	6216.03	56.12	6216.21	62.63	6216.21	64.79	6218.66
67.14	6220.99	68.28	6221.57	70.78	6222.71	71.87	6223.14	77.18	6224.68
86.78	6227.87	87.97	6228.12	90.8	6229.13	100.09	6232.16	103.46	6233.37
105.98	6233.83	106.6	6234.05	115.98	6236.54	118.01	6237.27	119.64	6237.93

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.78	.05	67.14	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.78	67.14	.1	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 961.91

INPUT
Description: 23 - River STA 965.60
Station Elevation Data   num=   30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.78	.57	6229.55	1.69	6229.37	12.91	6226.79	24.23	6223.88
24.78	6223.75	25.35	6223.57	36.77	6220.3	38.07	6218.82	41.88	6216.17
48.23	6215.95	50.88	6216.04	55.97	6216.21	62.61	6216.22	64.7	6218.58
67.12	6220.99	68.3	6221.58	70.76	6222.71	71.88	6223.14	77.14	6224.67
86.8	6227.89	87.96	6228.13	90.74	6229.11	99.84	6232.09	103.4	6233.36
106.04	6233.85	106.7	6234.07	115.99	6236.54	118	6237.27	119.64	6237.93

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.77	.05	67.12	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.77	67.12	28.43	29.4	30.37	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream   RS: 932.51

INPUT
Description: 22 - River STA 936.05
Station Elevation Data   num=   29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.82	13.45	6224.96	20.15	6223.48	21.13	6223.34	21.5	6223.07
23.79	6222.28	29.22	6220.35	36.12	6218.05	46.64	6217.98	47.82	6217.9
49.73	6217.87	55.54	6217.77	58.29	6219.08	65.07	6222.56	67.64	6223.25
69.55	6224.44	69.73	6224.67	70.35	6225.33	80.59	6228.16	82.58	6228.57
83.05	6228.79	85.79	6229.72	91.27	6231.42	92.34	6231.79	99.82	6233.25
114.05	6236.05	114.56	6236.1	116.68	6236.87	119.43	6237.55		

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	13.45	.05	70.35	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13.45	70.35	29.94	30.6	31.27	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream   RS: 901.91

INPUT
Description: 21 - River STA 905.93

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.1	9.47	6225.42	15.82	6223.71	16.19	6223.75	16.62	6223.65
16.75	6223.63	23.61	6222.43	31.18	6219.85	33.72	6219.17	36.19	6218.2
36.37	6218.2	36.94	6217.9	40.32	6214.09	45.72	6214.08	50	6214.59
52.48	6214.88	56.67	6215.21	57.58	6217.76	57.67	6217.79	60.8	6218.69
61.08	6218.83	66.79	6221.71	74.44	6223.82	74.7	6223.88	75.55	6224.43
88.37	6229.35	90.84	6228.98	96.79	6231.09	114.89	6234.36	114.94	6234.37
115.08	6234.39	116.91	6234.62	117.22	6234.72	117.89	6234.94	120	6235.49

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	9.47	.05	75.55	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
9.47	75.55	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 901.71

INPUT
Description: 20 - River STA 905.73
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.06	9.26	6225.46	15.79	6223.7	16.17	6223.74	16.61	6223.64
16.74	6223.62	23.49	6222.44	31.28	6219.79	33.7	6219.15	36.45	6218.06
36.55	6218.06	36.85	6217.9	40.37	6213.92	46.01	6213.92	50	6214.38
52.12	6214.63	56.65	6215	57.51	6217.39	57.59	6217.75	59.6	6218.3
60.74	6218.63	60.82	6218.67	66.86	6221.72	74.36	6223.78	74.67	6223.86
75.69	6224.51	88.34	6229.37	90.86	6228.99	96.72	6231.07	114.56	6234.29
114.8	6234.33	115.39	6234.43	116.97	6234.62	117.23	6234.72	117.8	6234.9
120	6235.48								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.85	.05	57.59	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.85	57.59	21.96	24.7	27.44	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 877.01

INPUT

```
Description: 19 - River STA 880.68
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51    2.34 6228.53   20.68 6223.46   21.93  6223.6   22.22 6223.53
   28.27 6221.78   42.06 6217.21   45.29 6214.39   46.18 6213.37   52.21 6213.13
   56.69 6213.06   57.75 6213.06   62.29 6213.07   63.25 6214.03   63.28    6214
   68.09 6217.82   70.36 6218.53   72.33 6219.14   76.82  6219.8   79.14 6220.29
   79.43 6220.35   81.05 6221.36   99.29 6228.03  103.24 6228.22  111.66 6229.35
  114.57 6230.15  127.72 6232.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.06     .05   68.09     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.06   68.09               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 876.91

INPUT
Description: 18 - River STA 880.58
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51     2.3 6228.55   20.72 6223.46   21.97 6223.59   22.24 6223.53
   27.91 6221.89   42.13 6217.19   45.45 6214.27   46.24 6213.38   52.38 6213.13
    56.6 6213.06   57.78 6213.06   62.34 6213.08    63.2 6213.93   63.22 6213.91
   68.15 6217.82   70.36 6218.51   72.38 6219.14   76.98 6219.82    79.2 6220.28
   79.48 6220.34   81.02  6221.3   99.37 6228.01  103.25 6228.19  111.75 6229.34
  114.69 6230.14  127.77  6232.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.13     .05   68.15     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.13   68.15              14.37   15.24   13.68             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 861.67

INPUT
Description: 17 - River STA 865.33
Station Elevation Data    num=      32
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6228.69     3.6 6227.24   14.73  6225.3   22.41 6223.17   24.18 6222.74
   26.05 6222.29      38 6218.59   48.64 6215.29   49.15 6215.16   50.83 6214.59
   50.87 6214.52   51.34 6214.46   52.13 6214.39   60.86 6214.44   61.68 6214.51
   62.42 6214.57   64.07 6214.57   69.16  6214.6   70.01 6215.01   78.21 6218.71
   78.67 6218.85   79.36 6218.96   86.12 6220.17    87.3 6220.75   87.73 6220.96
   90.39 6221.59  103.41 6225.41  111.02 6227.77  120.17 6229.17  123.11 6230.04
  126.11 6230.84  133.13 6232.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      38     .05   78.21     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            38   78.21             18.28   14.76   13.03             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 846.91

INPUT
Description: 16 - River STA 850.46
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6230.45    5.47  6227.6    9.78 6225.72   23.62 6222.39   24.13 6222.26
   28.67 6221.54   36.08 6220.52   37.04 6220.28   39.88 6219.39   46.29 6218.48
   58.32 6216.49    58.6 6216.34   59.01 6216.19   59.61 6215.97   61.28 6215.26
      62 6215.03   62.32 6213.87   62.81 6211.01   68.36 6211.13   71.05 6210.14
   71.25 6210.22   74.79 6211.49   82.39  6211.6   83.45 6212.99   83.81 6214.93
   84.44 6215.01   85.82 6215.28   86.78 6216.05   89.78  6217.1   96.66 6221.06
   98.57 6221.43  100.92 6221.72  101.35 6221.85  108.24 6223.34  122.62 6227.03
  133.65 6229.86  134.25 6230.05  134.59  6230.1  134.71 6230.14  135.79 6230.42
  141.76 6231.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   58.32     .05   89.78     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.32   89.78              .21     .21      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 846.70

INPUT
```

Description: 15 - River STA 850.25
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6230.43	5.36	6227.63	9.77	6225.71	23.52	6222.4	24.13	6222.25
29.5	6221.4	36.22	6220.47	37.1	6220.26	39.68	6219.45	45.49	6218.62
58.29	6216.5	58.57	6216.36	59.08	6216.17	59.67	6215.95	61.51	6215.16
62.03	6215	62.55	6213.16	62.96	6210.77	68.84	6210.9	71.1	6210.07
71.33	6210.15	74.25	6211.21	82.55	6211.33	83.39	6212.44	83.85	6214.9
84.06	6214.93	86.01	6215.3	86.89	6216.01	89.63	6216.97	96.81	6221.09
98.22	6221.37	100.93	6221.71	101.42	6221.85	108.22	6223.32	122.94	6227.1
134.22	6229.99	134.53	6230.09	134.71	6230.12	134.78	6230.14	135.35	6230.29
141.76	6231.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	58.29	.05	89.63	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
58.29	89.63	21.8	24.69	27.91	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 822.01

INPUT
Description: 14 - River STA 835.56
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.46	9.95	6225.1	15.15	6223.85	24.89	6221.38	29.15	6220.71
56.15	6218.05	56.62	6217.98	56.63	6217.97	56.78	6217.92	57.62	6217.67
58.78	6217.42	67.66	6215.19	68.01	6215.04	69.12	6214.57	72.04	6210.9
73.06	6210.38	79.92	6210.59	84.45	6210.72	85.9	6210.45	87.13	6210.74
88.95	6211.93	89.13	6212.17	92.86	6215.43	96.31	6216.63	99.58	6218.35
104.31	6219.74	106.61	6221.48	128.77	6228.21	132.31	6229.18	134.17	6229.61

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	69.12	.05	92.86	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
69.12	92.86	.1	.1	.09	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 821.91

INPUT
Description: 13 - River STA 825.56
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.46	9.94	6225.1	15.1	6223.85	24.89	6221.38	29.1	6220.71
56.25	6218.04	56.61	6217.98	56.62	6217.98	56.73	6217.94	57.37	6217.75
58.26	6217.56	67.62	6215.21	68	6215.05	69.16	6214.56	72	6210.98
73.12	6210.41	79.93	6210.61	84.35	6210.74	85.86	6210.46	87.14	6210.76
89.03	6212	89.22	6212.25	92.84	6215.42	96.33	6216.63	99.55	6218.33
104.31	6219.73	106.63	6221.48	128.89	6228.24	132.31	6229.18	134.13	6229.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	69.16	.05	92.84	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
69.16	92.84	98.07	110.01	124.19	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 711.90

INPUT
Description: 12 - River STA 715.32
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6227.72	.66	6227.43	3.91	6226.4	12.55	6224.22	13.48	6223.96
16.71	6222.71	36.28	6217.25	39.61	6215.21	40.27	6214.82	44.33	6212.53
45.22	6212.38	45.63	6212.29	46	6213.1	49.9	6212.34	58.4	6210.55
63.53	6211.03	66.58	6211.22	67.72	6212.31	68.08	6212.49	70.81	6212.52
71.66	6212.66	73.16	6212.88	73.91	6211.8	74.22	6211.28	75.36	6211.31
77.86	6210.6	78.04	6210.64	86.08	6212.39	91.18	6213.63	93.32	6213.91
93.69	6213.96	99.76	6214.62	105	6217.56	108.34	6219.44	108.48	6219.5
109.7	6220.01	111.17	6220.36	132.4	6226.23	133.89	6226.38	135.19	6226.54
151.08	6228.11	174.11	6229.3	179.56	6229.9				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.28	.05	105	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.28	105	47.93	43.9	36.64	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 668.00

INPUT
Description: 11 - River STA 617.51
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6227.64	13.84	6221.66	16.9	6220.15	18.79	6219.48	20.21	6218.97
23.17	6217.95	23.61	6217.83	25.32	6217.28	42.16	6213.94	46.88	6212.9
46.95	6212.89	47.32	6213.02	50.3	6211.52	50.6	6210.78	50.92	6210.05
51.93	6207.65	52.21	6206.83	52.52	6206.72	54.69	6206.59	62.11	6206.66
62.56	6206.67	62.86	6206.85	64.04	6208.03	64.08	6209.72	65.12	6211.63
67.26	6211.54	67.52	6211.5	78.2	6212.12	78.41	6212.12	78.81	6212.15
78.95	6212.17	79.64	6212.23	93.64	6213.33	95.43	6213.48	100.12	6213.98
103.74	6214.63	115.06	6216.65	115.83	6216.81	116.34	6218.13	123.05	6219.64
141.68	6222.16	141.98	6222.19	142.73	6222.24	153.22	6223.94	156.36	6224.34
163.91	6225.17	170.89	6226.05	185.46	6229.3	191.59	6229.69	194.43	6230

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	25.32	.05	115.83	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
25.32	115.83	.31	.32	.31	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 667.68

INPUT
Description: 10 - River STA 671.19
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6227.74	13.99	6221.69	17.21	6220.11	18.12	6219.79	19.82	6219.18
23.4	6217.94	23.79	6217.83	25.35	6217.33	40.63	6214.3	46.91	6212.92
47.13	6212.87	47.49	6213	50.32	6211.57	50.93	6210.07	52.36	6206.61
54.69	6206.73	59.74	6206.52	62.13	6206.54	62.65	6206.54	62.76	6206.61
63.16	6207.01	63.17	6207.59	65.36	6211.6	67.39	6211.52	67.64	6211.48
77.74	6212.06	78.07	6212.06	78.69	6212.12	78.9	6212.14	79.97	6212.23
93.58	6213.3	95.55	6213.47	100.35	6213.98	104.15	6214.66	114.77	6216.56
115.91	6216.79	116.4	6218.08	123.34	6219.64	141.74	6222.13	142.1	6222.16
143.01	6222.23	153.38	6223.91	156.84	6224.35	164.21	6225.15	171.03	6226.02
185.85	6229.32	192.08	6229.71	194.64	6230				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	47.49	.05	65.36	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
47.49	65.36	25.73	18.13	16.63	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 649.55

INPUT
Description: 9 - River STA 653.12
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.22	6.37	6228.13	12.43	6227.5	18.68	6225.07	20.15	6224.36
30.03	6221.19	30.27	6221	34.65	6219.15	39.63	6216.92	53.16	6211.5
55.91	6210.4	59.28	6207.36	59.47	6207.08	59.95	6207.07	64.56	6207.2
67.56	6207.28	67.67	6207.37	67.96	6207.58	72.32	6211	74.36	6211.25
83.82	6212.31	91.44	6213.09	99.85	6213.98	104.47	6214.8	111.3	6216.01
114.49	6216.67	114.89	6217.74	123.45	6219.63	139.41	6221.75	140.53	6221.84
143.44	6222.05	152.25	6223.43	160.72	6224.46	165.3	6224.94	169.24	6225.42
189.24	6229.79	191.7	6229.95						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	53.16	.05	72.32	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
53.16	72.32	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 649.45

INPUT
Description: 8 - River STA 653.02
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.21	6.38	6228.13	12.46	6227.49	18.66	6225.08	20.12	6224.38
29.92	6221.23	30.16	6221.04	34.5	6219.21	39.44	6216.99	53.17	6211.5
55.93	6210.4	59.34	6207.32	59.5	6207.08	59.89	6207.08	64.57	6207.21
67.36	6207.29	67.59	6207.29	67.6	6207.3	67.65	6207.34	72.32	6210.99
74.55	6211.27	83.85	6212.31	91.35	6213.08	99.87	6213.98	104.55	6214.81
111.16	6215.98	114.47	6216.67	114.86	6217.73	123.49	6219.63	139.38	6221.74
140.51	6221.83	143.48	6222.05	152.25	6223.42	160.83	6224.46	165.35	6224.93
169.24	6225.41	189.32	6229.8	191.71	6229.96				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	53.17	.05	72.32	.06

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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.17   72.32            30.04   28.19   32.96             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream          RS: 621.26

INPUT
Description: 7 - River STA 624.83
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6223.2   16.35  6223.2   29.11 6217.52   48.21 6209.68    50.6 6209.53
   56.55  6208.7   60.52 6208.27   67.42 6210.35   70.18 6211.33   82.22 6213.77
  116.03 6217.67   129.5 6219.85  140.94 6222.53  142.65 6222.86  144.67 6213.81
  158.68 6214.07  160.68 6223.67  166.78 6223.95  168.12 6224.41  169.89 6224.44
  170.51 6224.03  171.18 6223.92   178.9 6227.75  179.34    6228

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   48.21     .05   67.42     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         48.21   67.42            76.21   68.04   60.72             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  142.61  179.34 6222.93       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream          RS: 553.22

INPUT
Description: 6 - River STA 556.84
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6215.5   27.86  6215.5    41.4 6209.47   52.63 6208.56    67.1 6208.33
   68.52  6208.3   68.81 6208.27   69.08 6208.35   69.19  6208.4  115.47 6218.58
  117.51  6210.3  131.51 6210.51  133.92 6219.43  142.78 6220.09  144.49 6221.98
  168.14  6226.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    41.4    .035   69.19     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         41.4    69.19            54.65   48.65   54.29             .1       .3
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Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  115.47  168.14 6218.61       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 504.57

INPUT
Description: 5 - River STA 508.15
Station Elevation Data    num=      38
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6223.07    3.16 6223.03   24.12 6222.87   44.13  6222.6   55.34 6222.64
   78.29 6222.84   79.08 6222.84   79.49 6222.82   90.04  6222.4  103.59 6222.02
  103.78 6222.01  105.15 6221.54  140.56 6209.24  140.78 6209.22  144.97 6209.01
  152.12 6208.27  154.15 6208.05  154.98 6207.98  155.51 6207.97  160.12 6208.15
  164.28 6208.28  164.82 6208.23   164.9 6208.22   165.2 6208.27  169.41 6208.49
  173.88 6209.01  198.91 6214.51  199.49 6214.61   201.5 6206.15  202.98 6206.18
  215.52 6206.31  216.63 6215.41  219.74 6215.58  225.61    6216   227.5 6219.91
  228.52 6219.91  257.94  6226.5  258.19  6226.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  140.56    .035  173.88     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        140.56  173.88            31.24   27.94   24.62             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  199.43  258.19 6214.61       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 476.63

INPUT
Description: 4 - River STA 480.14
Station Elevation Data    num=      53
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6222.64    1.08 6222.63   43.51 6222.39   46.59 6222.35   48.58 6222.37
   53.43 6222.41   80.61 6222.52    88.9 6222.27   90.62 6222.24   99.36    6222
  105.23 6221.75  105.54 6221.19  106.11    6221  130.34 6211.17   130.7 6211.14
  130.84    6211  132.71    6209   136.9    6208  140.35 6207.18  144.26 6206.25
  156.09 6202.13  156.99 6201.82  159.03 6201.23  159.52 6201.17  159.86 6201.21
  164.16 6201.37  165.93 6201.18  167.26 6201.22  167.66 6201.36  177.89 6205.21
  180.77 6206.39  191.24  6208.7  191.71 6207.57  192.04 6206.88  193.24 6204.28
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  194.71 6204.31  195.24 6204.31  198.96 6204.37  200.24 6204.38  204.03 6204.44
  205.24 6204.46  205.69 6204.46  207.24 6204.52   208.5 6210.18  209.24 6213.48
  214.95 6213.78  218.38 6213.97  219.53 6216.81  220.41 6218.89  220.48  6218.9
  220.98    6219  247.43 6224.22  251.77 6225.08

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  156.99    .035  167.66     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        156.99  167.66             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  191.25  251.77 6208.76       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 443.00

INPUT
Description: Trail River STA 443.73
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6204.26   12.74 6204.26   13.12 6202.58    13.4  6202.4   13.59 6202.29
   14.67 6202.31   15.59 6202.32   17.77 6202.35   20.59  6202.4   22.58 6202.43
   25.59 6202.48   26.86  6202.5   27.59 6202.51   27.67 6202.84   27.78 6203.34
   27.99 6204.22   28.19  6205.1   29.59 6211.41   29.84 6211.42   35.64 6211.65
   38.59 6211.77   39.94 6215.13   40.59 6217.75   40.84  6217.8   66.55  6222.9
   67.05    6223   68.84 6223.29   69.26 6223.36   71.51  6223.7   71.96 6223.75
   75.38 6224.12   99.49    6227

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   13.59    .013   27.59     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         13.59   27.59             27.19   30.76   42.74             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 412.24

INPUT
Description: Trail River STA 412.70
Station Elevation Data    num=      40
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
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```
       0 6204.26     .99 6204.26       2 6200.18    3.35  6200.2       4 6200.21
     5.6 6200.24       9 6200.29   10.56 6200.32      14 6200.37   15.39  6200.4
      16 6200.41   16.23 6201.42   16.48  6202.3   16.79 6203.75   16.83 6203.94
      18 6209.22   20.82 6209.34      27 6209.58   27.63 6211.16      29 6216.64
   29.25 6216.69   41.31 6219.08   41.64 6219.15   41.93 6219.21   42.02 6219.22
   42.48  6219.3   42.56 6219.31   43.22 6219.36   56.09 6220.64   56.27 6220.66
   56.28 6220.66   57.09 6220.79   77.85    6224   92.93 6226.35   96.39 6226.38
   98.55  6226.4   98.98  6226.4   99.31 6226.41  100.02 6226.41  101.41 6226.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05       2    .013      16     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             2      16             21.77   21.53   17.96             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 390.71

INPUT
Description: Trail River STA 391.14
Station Elevation Data    num=      61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6204.26     .28 6204.26    2.03 6198.46    2.23 6198.47     2.6 6198.47
    3.04 6198.48    4.03 6198.49    6.22 6198.53    7.72 6198.55    9.04 6198.57
   12.24 6198.62   12.71 6198.63   14.03 6198.65   14.57 6198.66   15.04 6198.67
   15.43 6198.67   15.89 6198.68   16.04 6198.68   17.53 6205.37   17.72 6206.24
   17.77  6206.4   17.82 6206.64   17.83  6206.7   18.05 6207.67   18.55 6207.68
   21.24 6207.76   27.07    6208   27.17 6208.25   29.07 6215.83   29.32 6215.88
   31.04 6216.22   31.13 6216.24   31.15 6216.24   31.22 6216.25   31.23 6216.25
   31.33 6216.26    33.3 6216.45   33.33 6216.46   36.77    6217   39.94  6217.5
    43.1    6218   44.98  6218.3   45.69 6218.41   47.69 6218.73   51.82 6219.38
   52.69 6219.52    54.7 6219.83   58.87 6220.49    59.7 6220.62    61.7 6220.94
   74.73    6223   86.81  6224.9   89.36 6225.26   96.94 6225.41  101.34  6225.5
  102.18 6225.52  102.82 6225.53  104.19 6225.56  107.64 6225.63  111.36  6225.7
  113.42 6225.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    2.03    .013   16.04     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          2.03   16.04             5.49    4.81    7.04             .1       .3

CROSS SECTION
```

```
RIVER: IndustrailTrib
REACH: Trail              RS: 385.90

INPUT
Description: Trail River STA 386.14
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6197     2.2 6198.17    15.2 6198.17    16.2 6198.28    18.2 6207.32
    23.2 6207.51    27.2 6207.67    29.2 6215.67   62.91    6221   80.24 6223.73
    89.6 6225.14   96.67 6225.24  100.96  6225.3   101.8 6225.31  102.44 6225.32
  103.83 6225.33  107.36 6225.38  111.29 6225.43  113.81 6225.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05     2.2    .013    15.2     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           2.2    15.2           117.95  118.96  101.52             .1       .3
Left Levee      Station=       0      Elevation= 6204.26

CULVERT


RIVER: IndustrailTrib
REACH: Trail              RS: 320.90

INPUT
Description:
Distance from Upstream XS =      43
Deck/Roadway Width        =      50
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6225.59           113.8 6225.59

Upstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6197     2.2 6198.17    15.2 6198.17    16.2 6198.28    18.2 6207.32
    23.2 6207.51    27.2 6207.67    29.2 6215.67   62.91    6221   80.24 6223.73
    89.6 6225.14   96.67 6225.24  100.96  6225.3   101.8 6225.31  102.44 6225.32
  103.83 6225.33  107.36 6225.38  111.29 6225.43  113.81 6225.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05     2.2    .013    15.2     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
           2.2    15.2             .1       .3
```

```
Left Levee      Station=       0      Elevation= 6204.26

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6220.87             127 6220.87

Downstream Bridge Cross Section Data
Station Elevation Data    num=      68
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6218.28     .08 6215.99     .09 6215.94     .43 6204.93     .83 6192.52
    2.71 6192.47    3.83 6192.47   15.83 6192.47   18.83 6192.47   19.73 6216.64
   20.54 6216.64   48.21 6216.87   49.05 6216.87   53.93 6216.66   55.92 6216.68
   63.09 6217.46   63.54 6217.46    65.7 6217.47   66.15 6217.48   67.51 6217.48
   69.06 6217.49   69.97 6217.49   70.43  6217.5   71.35  6217.5   83.53 6217.72
   84.11 6217.74    88.1 6217.76   88.62 6217.77   89.15 6217.79   89.71 6217.81
   90.28 6217.83   90.87 6217.85   91.48 6217.87    92.1 6217.89   95.76 6217.91
   96.37 6217.93      97 6217.95   97.64 6217.97   98.31 6217.99   98.99 6218.01
    99.7 6218.03  100.43 6218.05  101.19 6218.08  101.97  6218.1  104.31 6218.11
  105.01 6218.13  105.73 6218.16  106.48 6218.18  107.25 6218.21  108.05 6218.24
  108.43 6218.24  109.23 6218.27  110.06  6218.3  110.92 6218.33  111.82 6218.36
  112.51 6218.37  113.35  6218.4  114.23 6218.44  115.14 6218.47  116.09 6218.51
  117.08 6218.55  117.28 6218.55  118.21 6218.59  118.52  6218.6     119 6218.62
  119.01 6218.63  124.37 6220.14  127.45 6220.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    3.83    .013   15.83     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          3.83   15.83             .1       .3

Upstream Embankment side slope              =       4 horiz. to 1.0 vertical
Downstream Embankment side slope            =       4 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box       8      12
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                  1     117     .013     .013        0                   .5
```

```
      1
Upstream   Elevation =  6198.17
           Centerline Station =  9.17
Downstream Elevation =  6192.47
           Centerline Station =  9.81

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 266.94

INPUT
Description: Trail River STA 267.33
Station Elevation Data    num=      68
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6218.28     .08 6215.99     .09 6215.94     .43 6204.93     .83 6192.52
    2.71 6192.47    3.83 6192.47   15.83 6192.47   18.83 6192.47   19.73 6216.64
   20.54 6216.64   48.21 6216.87   49.05 6216.87   53.93 6216.66   55.92 6216.68
   63.09 6217.46   63.54 6217.46    65.7 6217.47   66.15 6217.48   67.51 6217.48
   69.06 6217.49   69.97 6217.49   70.43  6217.5   71.35  6217.5   83.53 6217.72
   84.11 6217.74    88.1 6217.76   88.62 6217.77   89.15 6217.79   89.71 6217.81
   90.28 6217.83   90.87 6217.85   91.48 6217.87    92.1 6217.89   95.76 6217.91
   96.37 6217.93      97 6217.95   97.64 6217.97   98.31 6217.99   98.99 6218.01
    99.7 6218.03  100.43 6218.05  101.19 6218.08  101.97  6218.1  104.31 6218.11
  105.01 6218.13  105.73 6218.16  106.48 6218.18  107.25 6218.21  108.05 6218.24
  108.43 6218.24  109.23 6218.27  110.06  6218.3  110.92 6218.33  111.82 6218.36
  112.51 6218.37  113.35  6218.4  114.23 6218.44  115.14 6218.47  116.09 6218.51
  117.08 6218.55  117.28 6218.55  118.21 6218.59  118.52  6218.6     119 6218.62
  119.01 6218.63  124.37 6220.14  127.45 6220.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    3.83    .013   15.83     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          3.83   15.83             11.13    9.63   10.12             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 257.31

INPUT
Description: Trail River STA 257.70
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6215.67     .69 6196.96     .84 6193.77    2.13 6192.88    3.39 6192.16
    4.38 6192.17     5.4 6192.19    8.24 6192.23    10.4 6192.27   13.78 6192.32
```

```
    15.4 6192.35   17.04 6192.38   17.45 6192.39   17.56 6192.38   19.24 6192.28
   19.71 6203.54   20.13 6214.98   27.69 6214.84   27.87 6214.84   29.38 6214.83
   30.04 6214.82   30.51 6214.82   30.84 6214.81   30.94 6214.81   52.11 6214.68
   52.71 6214.68   52.73 6214.67   58.14 6213.13   64.59  6211.3   68.21 6211.08
   80.08 6210.84   80.27 6210.84   80.86 6210.83   81.57 6210.81   92.48 6210.57
    92.7 6210.56   93.82 6210.54  103.95 6214.39  104.81 6214.63  130.27 6221.66
  130.83 6221.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    3.39    .012   19.24     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          3.39   19.24             12.41   10.37   52.82             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 246.94

INPUT
Description: Trail River STA 247.32
Station Elevation Data    num=      53
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6212.68     .22 6209.38     .83 6195.82    3.06 6195.11    3.47 6195.35
    3.48 6195.29    3.49 6195.27     4.5 6193.56    4.51 6193.56    4.52 6193.48
     4.6 6193.11    4.92 6191.93    5.61 6191.95    6.93 6191.97    9.31 6192.01
   11.93 6192.05   16.43 6192.12   16.89 6192.13    17.7 6193.18   17.75 6193.25
   18.55 6192.88   18.58 6192.15   18.93 6192.16      19 6192.15    20.5 6193.45
   20.57  6195.4   21.16 6211.11   21.33 6212.81   21.98 6212.79   22.02 6212.78
   22.98 6212.77   23.01 6212.77   24.88 6212.73   36.84 6212.39   37.25 6212.38
    40.8 6212.32   42.38 6212.29    43.5 6212.27   44.29 6212.25   44.54 6212.25
   56.45 6212.04   56.78 6212.04    56.8 6212.03   64.02 6209.91   72.76 6207.34
   73.46 6207.29   77.87 6207.14   86.42 6208.43   90.25 6208.62   90.94 6208.95
   92.63 6209.52  109.13 6216.85  126.31 6207.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    4.92    .012   16.89     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          4.92   16.89             10.99    9.87   26.73             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 237.07
```

```
INPUT
Description: Trail River STA 237.41
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6209.94     .46 6203.02    2.89 6202.12    5.29 6192.88    7.06 6191.84
   17.06 6191.84   19.59 6201.89   21.82 6203.33    22.6 6210.23   28.77 6209.59
   48.51  6209.3   50.98 6208.76   69.19 6216.53   72.08    6217   88.39    6217

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    7.06    .012   17.06     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          7.06   17.06            93.44   88.77   53.24             .1       .3

CULVERT


RIVER: IndustrailTrib
REACH: Trail              RS: 194.07

INPUT
Description:
Distance from Upstream XS =      38
Deck/Roadway Width        =      12
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.98           88.35 6218.98

Upstream Bridge Cross Section Data
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6209.94     .46 6203.02    2.89 6202.12    5.29 6192.88    7.06 6191.84
   17.06 6191.84   19.59 6201.89   21.82 6203.33    22.6 6210.23   28.77 6209.59
   48.51  6209.3   50.98 6208.76   69.19 6216.53   72.08    6217   88.39    6217

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    7.06    .012   17.06     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          7.06   17.06             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.98           97.97 6218.98
```

```
Downstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191    1.85 6191.05   11.85 6191.05   28.22    6205   42.92 6215.83
   49.98 6216.16   54.57 6216.53   70.84 6216.32   71.36 6216.43      80 6218.71
   94.54 6222.89   97.99 6223.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    1.85    .012   11.85     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          1.85   11.85             .1       .3

Upstream Embankment side slope              =       4 horiz. to 1.0 vertical
Downstream Embankment side slope            =       4 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1          Arch      10      10
FHWA Chart # 41- Arch; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 5      83     .013     .013        0                   .5
      1
Upstream   Elevation =  6191.74
           Centerline Station =  12.05
Downstream Elevation =  6191.05
           Centerline Station =  6.55

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 148.30

INPUT
Description: Trail River STA 148.62
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191    1.85 6191.05   11.85 6191.05   28.22    6205   42.92 6215.83
   49.98 6216.16   54.57 6216.53   70.84 6216.32   71.36 6216.43      80 6218.71
```

```
   94.54 6222.89   97.99 6223.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    1.85    .012   11.85     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1.85   11.85             7.57    9.07    7.65             .1       .3

LATERAL STRUCTURE


RIVER: IndustrailTrib
REACH: Trail              RS: 148.00

INPUT
Description:
Lateral structure position     = Left overbank
Distance from Upstream XS =
Deck/Roadway Width        =       2
Weir Coefficient          =     3.2
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        3
     Sta    Elev     Sta    Elev     Sta    Elev
       0    6193     .04    6193    62.4    6193

Weir crest shape                           = Broad Crested


Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       1       1
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                         2     .013     .013        0                  .5
      1
Upstream   Elevation =  6188.6
           Centerline Station =  30
Downstream Elevation =  6188.6
           Centerline Station =  30

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 139.23
```

INPUT
Description: Trail River STA 139.64
Station Elevation Data num= 196

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6193	.07	6191	.17	6188.95	1.71	6188.94	2.096	188.944
7.4	6189	9.57	6189	11.88	6189.03	12.376	189.013	13.93	6188.96
16.06	6188.43	17.13	6188.15	17.33	6188.11	18.2	6188.04	21.4	6188.82
21.99	6189.2	22.47	6189.54	23.55	6190.7	25.67	6192.93	26.73	6194.08
30.54	6197.98	32.1	6199.62	33.65	6201.18	35.27	6202.75	35.99	6203.49
38.32	6205.83	39.54	6206.98	40.61	6208.04	40.77	6206.11	41.43	6199.35
41.67	6198.29	42.21	6203.32	42.74	6207.24	42.98	6207.02	43.66	6207.33
43.8	6206.66	44.55	6204.9	44.87	6204.25	45.33	6202.85	45.93	6201.16
46.11	6200.53	46.6	6199.35	46.99	6199.73	47.22	6200.29	47.67	6200.97
48.06	6202.37	48.45	6202.26	48.88	6200.72	49.12	6200.24	49.23	6200.45
49.54	6200.24	50.01	6201.41	50.18	6201.96	51.25	6204.75	51.58	6205.28
52.21	6205.61	52.31	6205.71	52.36	6205.8	52.49	6205.81	53.14	6205.44
53.37	6205.56	53.92	6206.06	54.44	6206.68	55.43	6207.57	55.5	6207.48
55.54	6207.49	56.26	6206.88	56.56	6207.29	57.04	6207.34	57.21	6206.88
57.63	6206.27	57.82	6206.15	58.37	6207.02	58.61	6207.64	58.69	6207.75
58.87	6207.74	59.39	6207.58	59.75	6207.67	60.17	6207.58	60.54	6207.96
60.82	6208.08	60.95	6208.36	61.31	6208.76	61.73	6208.45	61.88	6207.9
62.2	6207.78	62.51	6207.44	62.94	6207.62	63.29	6207.39	63.86	6208.04
64.07	6208.1	64.26	6208.29	64.85	6208.35	65.07	6208.88	65.53	6208.76
65.64	6208.78	66.13	6208.42	66.42	6208.39	67.2	6209.53	67.98	6208.96
68.26	6207.85	68.76	6207.44	68.86	6207.85	69.32	6208.68	69.54	6208.88
70.14	6208.35	70.32	6208.07	70.39	6208.04	70.52	6208.21	71.1	6209.24
71.45	6209.47	71.88	6209.26	72.19	6209.8	72.51	6210.04	72.67	6210.17
73.09	6210.04	73.45	6209.86	73.58	6209.9	73.85	6209.82	74.23	6209.96
74.64	6209.52	75.01	6209.16	75.52	6210.27	75.7	6210.4	75.79	6210.49
76.03	6210.19	76.57	6209.27	76.77	6209.29	77.18	6209.91	77.35	6210.19
77.85	6210.87	78.1	6210.97	78.55	6210.41	78.83	6209.9	79	6209.52
79.57	6209.85	80.14	6210.31	80.3	6210.24	80.59	6210.77	81.04	6211.28
81.29	6211.84	81.77	6211.67	82.17	6211.95	82.43	6212.06	82.51	6212.03
82.64	6211.86	83.24	6210.55	83.58	6210.85	83.98	6210.74	84.69	6210.81
84.71	6210.76	84.73	6210.76	84.77	6210.8	85.45	6211.07	85.87	6211.96
86.18	6211.97	86.73	6212.16	86.92	6212.01	87.02	6212.08	87.38	6211.56
87.65	6210.85	88.16	6211.58	88.39	6211.71	88.78	6210.32	89.12	6208.47
89.31	6208.27	89.85	6211.3	89.98	6211.74	90.46	6213.69	90.59	6213.6
90.83	6213.38	91.32	6212.71	91.6	6213.16	92.06	6213.31	92.58	6214.17
92.75	6214.37	92.79	6214.35	92.88	6214.04	93.53	6211.23	93.89	6209.95
94.26	6210.24	94.92	6212.92	95	6213.02	95.04	6212.98	95.19	6212.59
95.73	6211.6	96.19	6209.54	96.47	6209.15	96.97	6210.91	97.2	6212.75
97.33	6213.35	97.79	6213.78	97.94	6213.95	98.48	6214.11	98.67	6214.26
98.91	6214.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	0	.013	12.37	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
0 12.37 13 13 13 .1 .3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Trail RS: 126.23

INPUT
Description: Trail River STA 126.75
Station Elevation Data num= 209

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6191	.7	6191	.8	6188.67	1.1	6188.66	2.5	6188.66
3.5	6188.69	4.6	6188.69	5.5	6188.72	6.7	6188.72	7.7	6188.75
8.7	6188.75	9.8	6188.78	10.8	6188.78	11.8	6188.81	12.7	6188.79
12.9	6188.79	13.9	6188.78	14.6	6188.64	15	6188.57	15.6	6188.41
16	6188.3	16.2	6188.24	17	6188.03	17.9	6187.85	18.1	6187.8
18.4	6187.87	18.7	6187.91	19.1	6188	19.5	6188.1	19.8	6188.19
21.1	6188.49	21.9	6188.72	22.2	6188.81	22.7	6189.25	22.7	6189.29
23.2	6189.74	23.6	6190.02	25.2	6191.44	27.4	6193.32	27.6	6193.53
28.4	6194.29	28.5	6194.32	29.3	6194.99	30.9	6196.33	31.3	6196.65
31.5	6196.88	31.7	6197.01	32.3	6197.52	32.5	6197.75	32.6	6197.81
33.3	6198.46	33.6	6198.72	34.1	6199.16	34.1	6199.17	35.6	6200.34
35.7	6200.44	35.8	6200.51	37.4	6201.89	37.8	6202.21	38.2	6202.59
38.4	6202.77	38.8	6203.1	39	6203.28	39.8	6203.95	39.8	6203.96
39.8	6203.97	39.8	6203.98	40.6	6204.64	40.9	6204.83	41.3	6201.92
41.5	6200.83	41.9	6197.11	42.3	6199.23	42.7	6203.14	42.9	6204.9
43.1	6205.06	43.6	6205.14	43.9	6205.13	44	6205.12	44.7	6205.11
45	6205.1	45.5	6205.1	46.3	6205.08	47	6205.09	47.2	6205.09
47.4	6205.09	48.1	6205.09	48.4	6205.02	48.8	6204.84	49.2	6204.81
49.6	6204.87	49.9	6204.93	50.2	6204.99	50.4	6205.06	51.2	6204.75
51.2	6204.73	51.2	6204.72	52	6205.21	52.3	6205.29	52.7	6205.29
52.9	6205.3	53.3	6205.28	53.7	6204.71	54.4	6203.84	54.5	6204.02
54.9	6204.24	55.4	6204.56	55.6	6204.71	56.1	6205.15	56.4	6205.41
56.9	6205.67	57	6205.68	57.5	6205.86	57.7	6205.4	58.4	6202.59
58.5	6202.37	58.5	6202.36	58.7	6202.42	59.4	6203.15	59.5	6203.39
59.9	6204.05	60.2	6204.53	60.6	6205.56	61	6205.85	61.3	6205.96
61.6	6206.15	61.8	6205.75	62.7	6202.65	62.7	6202.8	63.4	6204.47
63.7	6205.14	64.1	6205.73	64.2	6205.95	64.7	6206.25	65.1	6206.16
65.6	6206.28	65.8	6206.27	65.9	6206.3	66.3	6206.2	66.7	6206.26
67.5	6206.23	67.8	6206.28	68.3	6206.58	68.4	6206.62	68.9	6206.84
69.1	6206.7	69.9	6208.04	69.9	6208.06	69.9	6208.09	70	6207.96
70.9	6206.39	71.3	6207.06	72	6208.43	72.4	6208.16	73	6207.95
73.2	6208.07	73.8	6208.92	74.1	6209.18	74.1	6209.07	74.8	6208.39
75.1	6208	75.6	6208.15	75.6	6208.1	76.1	6208.69	76.4	6208.72
77	6208.15	77.3	6208.15	77.6	6208.01	78.1	6207.93	78.2	6207.87
78.4	6207.93	78.9	6208.32	79.2	6208.25	79.7	6208.56	79.9	6208.63
80.3	6208.86	80.5	6208.74	81.3	6210.29	81.4	6210.41	82.1	6211.21
82.4	6211.34	82.7	6211.11	83	6211.07	83.4	6210.66	83.8	6210.28

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    84.2 6209.44    84.4 6209.02    84.6 6209.09    85.2 6209.83    85.4 6210.39
    85.5 6210.47    85.6 6210.57    86.2 6211.26    86.5 6211.45      87    6211
    87.5 6210.13    87.8 6209.71    88.6 6207.97    88.9 6206.76    89.5 6205.62
    89.6 6205.62    89.9 6207.23    90.3 6210.34    90.6 6212.33    91.1 6212.48
    91.3 6212.75    91.7 6213.05    91.9 6212.9792.27757 6212.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013    12.9     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    12.9             21.7    21.7    21.7             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 104.53

INPUT
Description: Trail River STA 105.14
Station Elevation Data    num=     238
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191     1.2    6191     1.3 6188.69     3.1  6188.7     5.1 6188.74
     7.2 6188.76     9.2 6188.81    11.3 6188.82    11.7 6188.83    11.9 6188.84
    12.3 6188.84    13.1 6188.84    13.4 6188.84    13.5 6188.84    14.3 6188.81
    14.5  6188.8    15.4 6188.65    18.5 6187.87    19.5 6188.02    21.3 6188.46
    21.6 6188.52    21.8 6188.56    22.4 6188.72    22.6 6188.77    22.6 6188.79
    25.7 6190.26    25.9 6190.35    26.5 6190.69    26.7 6190.79    26.8 6190.81
    26.8 6190.85    27.8 6191.29    28.2 6191.49    28.4 6191.57    28.8 6191.78
    29.2 6191.95    29.6 6192.13    29.8 6192.25      30 6192.33    30.6 6192.64
    30.8 6192.73    30.9 6192.75      31 6192.79    31.7 6193.17    31.9 6193.29
    32.5 6193.56    32.9 6193.78    33.7 6194.12      34 6194.24    34.1 6194.31
    34.8 6194.61      35 6194.69      35 6194.71    35.1 6194.75    37.4  6195.9
    37.8 6196.09    38.1 6196.22    38.3 6196.29    38.9 6196.56    39.1 6196.63
    39.1 6196.65    39.2 6196.68    39.9 6197.04    40.2 6197.16    40.6 6197.35
    40.7 6197.43    41.2 6197.63    41.6  6197.8    41.9 6197.98    42.2 6198.11
    42.4  6198.1    43.1 6198.09    43.2 6198.08    43.2 6198.07    43.3 6198.05
      44 6197.85    44.3 6197.78    44.7 6197.75    45.3  6197.7    45.7 6197.71
    46.1 6197.73    46.3 6197.74    46.5 6197.76    47.2 6197.86    47.3 6197.89
    47.4 6197.89    47.4  6197.9    48.2 6198.03    48.4 6198.08    48.8 6198.17
      49 6198.21    49.4 6198.32    49.8 6198.41    50.2  6198.5    50.6 6198.61
    51.5 6198.83    51.5 6198.84    52.3 6198.83    52.5 6198.87    52.9  6199.1
    53.1 6199.22    53.6 6199.45    53.9 6199.57    54.6 6199.77    55.5 6200.04
    55.6 6200.08    55.6 6200.09    55.7  6200.1    56.4 6200.22    56.6 6200.28
      57 6200.45    57.2 6200.55    57.7 6200.73    58.1 6200.86    58.4 6200.97
    58.7 6201.07    58.9 6201.12    59.6 6201.28    59.7 6201.31    59.8 6201.33
    60.5  6201.6    60.8 6201.66    61.2 6201.76    61.4  6201.8    61.8 6201.92
    62.2  6202.1    62.5 6202.25    62.8 6202.38      63 6202.44    63.7 6202.65
    63.8 6202.68    63.9 6202.69    63.9  6202.7    64.7 6202.98    64.9 6203.05
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    65.3 6203.17    65.5 6203.23    65.9 6203.36    66.3 6203.49    66.6 6203.61
    66.9 6203.72    67.1 6203.78    67.9 6204.02      68 6204.05      69 6200.89
    69.4 6201.83    69.6 6202.62      70 6203.32    70.4 6203.68    70.8 6204.53
    71.1 6205.02    71.3 6204.94      72  6203.8    72.1 6203.67    72.9 6204.97
    73.1 6205.53    73.5 6204.04    73.7 6203.11    74.2 6201.48    74.6 6202.33
    74.9 6204.02    75.2 6205.07    75.4 6205.95    76.1 6206.75    76.2 6206.75
    76.2 6206.71    76.3 6206.74      77 6206.64    77.3 6207.05    77.6  6204.9
    77.9 6203.73    78.3 6201.07    78.7 6201.43      79  6202.3    79.3 6202.82
    79.5 6203.76    80.3 6207.09    80.3 6207.42    80.4 6207.34    81.2 6205.32
    81.4 6204.73    81.7 6203.56      82 6202.79    82.4 6201.45    82.8 6200.67
    83.4 6199.81    83.6 6200.55    84.4 6204.13    84.5  6204.5    84.5 6204.56
    85.3 6207.67    85.5 6207.94    86.1 6209.16    86.5 6210.14    86.9 6210.25
    87.2 6210.35    87.6 6210.45    87.8 6210.51    88.5 6210.79    88.6 6210.81
    88.6 6210.76    89.4  6207.2    89.6 6206.84      90 6207.14    90.2 6207.89
    90.7 6207.61    91.1 6206.97    91.4 6205.01    91.7 6203.85    91.9 6204.51
    92.7 6212.16    93.5 6212.43    93.7 6212.51    94.1 6212.44    94.4 6212.29
    94.8 6212.32    95.2 6208.42    95.5 6206.41    95.8 6203.59      96 6203.64
    96.8 6199.04    97.7 6201.92    97.9 6202.89    98.5 6209.97    98.9 6214.25
    99.3 6214.39    99.6  6214.5    99.9 6214.62   100.1 6214.68   100.9  6214.9
     101 6214.91   101.8 6215.18   102.3 6215.38     103 6215.63   103.4 6215.77
   103.7 6215.87     104 6215.99104.0623    6216

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013     1.2    .013    14.3     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
           1.2    14.3             20.8    20.8    20.8             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 83.73

INPUT
Description: Trail River STA 84.30
Station Elevation Data    num=     256
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191     1.1    6191     1.2 6189.82     2.1 6189.83       3 6189.82
     3.2 6189.81     3.4  6189.8     6.8 6189.21    12.9 6189.36      17 6189.51
    17.4 6189.52    18.5 6189.54    18.6 6189.54      19 6189.54    19.3 6189.54
    19.8 6189.52      20 6189.52    20.2  6189.5    21.1 6189.38    21.1 6189.37
    21.9 6189.24    22.1 6189.22    22.3 6189.17    22.8 6189.08    23.1 6189.02
    23.7 6188.94    24.1 6188.86    24.5 6188.82    24.8 6188.78    25.1 6188.74
      26 6188.86    26.1 6188.88    26.2 6188.91    26.9 6189.06    27.1 6189.11
    27.2 6189.12    27.2 6189.13      28 6189.28    28.2 6189.32    28.4 6189.38
    28.8 6189.47    29.2 6189.54    29.7 6189.65    30.2 6189.76    30.6 6189.84
    31.2 6189.97    31.4 6190.02    32.1 6190.17    32.2  6190.2    32.3 6190.21
    32.7 6190.31    33.2 6190.41    33.2 6190.42    33.4 6190.44      34 6190.57
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    34.3 6190.62    34.6 6190.67    34.9 6190.73    35.3 6190.79    35.8 6190.88
    36.3 6190.98    36.6 6191.03      37 6191.09    37.3 6191.13    37.5 6191.16
    38.3 6191.28    38.3 6191.29    38.4  6191.3    38.6 6191.33    39.2 6191.43
    39.5 6191.46    40.1 6191.53    40.3 6191.56    40.7 6191.59      41 6191.61
    41.4 6191.65    41.8 6191.69    41.9  6191.7    42.4 6191.73    42.7 6191.77
    43.2 6191.83    43.4 6191.85    43.5 6191.87    44.4 6191.94    45.3 6192.03
    45.4 6192.05    45.6 6192.07    46.1 6192.12    46.4 6192.15    46.9 6192.19
      47 6192.21    47.5 6192.25    48.1 6192.31    48.5 6192.35    48.7 6192.38
    49.5 6192.45    49.6 6192.47    50.3 6192.56    50.5 6192.58    50.5 6192.59
    51.3 6192.66    51.5 6192.68    51.8 6192.71    52.2 6192.76    52.5 6192.79
      53 6192.84    53.5  6192.9    53.9 6192.94    54.6 6193.02    54.8 6193.04
    55.7 6193.12    56.1 6193.17    56.5 6193.21    56.6 6193.22    57.4 6193.32
    57.6 6193.34    57.9 6193.38    58.3 6193.43    58.6 6193.47    59.1 6193.52
      60 6193.61    60.6 6193.68    60.8  6193.7    61.6  6193.8    61.7 6193.81
    61.7 6193.82      62 6193.85    62.6  6193.9    62.7 6193.91    63.4 6194.01
    63.7 6194.04      64 6194.08    64.3  6194.1    64.7 6194.14    65.3 6194.21
    65.7 6194.27      66 6194.31    66.5 6194.36    66.7 6194.39    67.7 6194.51
    67.8 6194.51    67.9 6194.52    68.6 6194.61    68.8 6194.62      69 6194.64
    69.5  6194.7    69.8 6194.73    70.2 6194.78    70.4 6194.81    70.8 6194.86
    71.2  6194.9    71.4 6194.92    71.8 6194.96    72.1    6195    72.6 6195.07
    72.8  6195.1      73 6195.12    73.7 6195.22    73.8 6195.23    73.9 6195.24
    74.7 6195.33    74.9 6195.35    75.1 6195.38    75.6 6195.43    76.3 6195.51
    76.4 6195.52    76.9 6195.58    77.3 6195.62    77.5 6195.65    77.9 6195.69
    78.1 6195.72    78.9 6195.81      79 6195.82    79.6  6195.9    79.9 6195.94
    79.9 6195.95      80 6195.95    80.7 6196.03    80.9 6196.05    81.2 6196.08
    81.6 6196.12      82 6196.16    82.5 6196.23      83  6196.3    83.3 6196.34
    83.7 6196.38      84 6196.42    84.9 6196.53      85 6196.54    85.1 6196.55
    85.4 6196.59    85.9 6196.64      86 6196.65    86.1 6196.66    86.8 6196.75
      87 6196.78    87.4 6196.82    87.7 6196.86      88  6196.9    88.6 6196.97
    89.1 6197.03    89.4 6197.07    89.8 6197.12    90.1 6197.16    90.3 6197.18
    91.1 6197.25    91.1 6197.26    91.3 6197.28      92 6197.39    92.1  6197.4
    92.3 6197.42    92.9 6197.49    93.1 6197.52    93.5 6197.57    93.7  6197.6
    94.1 6197.66    94.6 6197.71    95.2 6197.78    95.4 6197.81      96 6197.87
    96.3 6197.91    97.1 6198.02    97.2 6198.02      98 6198.13    98.2 6198.15
    98.4 6198.18    98.9 6198.24    99.2 6198.28    99.8 6198.35   100.2  6198.4
   100.9 6198.48   101.2 6198.52   101.5 6198.56   102.1 6198.65   102.3 6198.67
   102.4 6198.68   103.3 6198.78   103.3 6198.79   104.1 6198.89   104.3 6198.92
   104.6 6198.95     105    6199   105.3 6199.04   105.8 6199.11   105.8 6199.12
   106.3 6199.19   106.7 6199.23     107 6199.27   107.6 6199.34   108.2 6199.43
   108.3 6199.44   108.4 6199.45   109.3 6199.58   109.5  6199.6   110.2 6199.68
110.5365 6199.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013     1.2    .013    21.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           1.2    21.1             28.1    28.1    28.1             .1       .3

CROSS SECTION
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RIVER: IndustrailTrib
REACH: LowFlow RS: 449.30

INPUT
Description: River STA 443.81
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.19	3.58	6222.19	8.41	6222.19	9.03	6222.19	47.72	6221.85
51.3	6221.84	79.51	6221.87	83.92	6221.68	97.54	6221.28	106.48	6220.98
109.02	6220.05	126.95	6213.48	134.15	6210.71	134.17	6210.6	134.22	6210.6
134.5	6210.58	135.47	6208.43	135.85	6207.55	136.5	6205.38	153.19	6200.95
160.54	6199	161.44	6198.78	162.31	6198.78	163.44	6198.78	164.57	6198.78
165.44	6198.79	166.28	6199	170.04	6200	170.05	6204.26		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	160.54	.045	166.28	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
160.54	166.28	30.31	28.49	27.19	.1	.3

LATERAL STRUCTURE

RIVER: IndustrailTrib
REACH: LowFlow RS: 449.20

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 2
Weir Coefficient = 2
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 3

Sta	Elev	Sta	Elev	Sta	Elev
0	6203.18	16.5	6204.26	57.1	6204.26

Weir crest shape = Broad Crested

CROSS SECTION

RIVER: IndustrailTrib
REACH: LowFlow RS: 420.81

INPUT

Description: River STA 415.37
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.54	3.48	6223.42	19.21	6222.57	27.68	6222.18	28.04	6222.16
29.2	6222.09	47.51	6220.14	48.74	6220.1	52.52	6219.65	55.22	6219.27
66.27	6215.25	79.32	6211.03	79.34	6211.02	79.39	6211.01	79.42	6211
79.59	6210.95	79.6	6210.95	80.12	6208.1	81.6	6200.4	81.64	6200.38
84.28	6199.73	86.94	6199.05	90.53	6198.1	90.98	6197.99	95.91	6196.74
97.77	6196.26	98.09	6196.26	98.51	6196.25	99.77	6196.25	101.02	6196.24
101.78	6196.23	101.96	6196.28	107.15	6197.65	112.44	6199.06	112.45	6204.26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	86.94	.045	112.44	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
86.94	112.44	35.72	20.97	21.77	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: LowFlow RS: 399.84

INPUT
Description: River STA 399.75
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.24	4.08	6223.48	7.74	6223.6	13.12	6223.72	26.32	6220.43
33.16	6218.32	43.92	6215.35	62.16	6207.21	66.28	6207.14	68.38	6207.05
81.92	6206.28	95.75	6205.93	97.56	6205.9	99.18	6205.89	101.91	6205.79
101.98	6205.78	102.02	6205.78	120.99	6202.61	130.36	6201.04	136.63	6200
148.59	6198	162.34	6195.7	163.4	6195.52	164.64	6195.31	165.97	6195.09
166.24	6195.04	167.31	6194.86	168.24	6194.71	168.44	6194.67	168.45	6194.67
168.54	6194.67	169.67	6194.67	170.11	6194.67	170.54	6194.67	171.47	6194.67
172.54	6194.67	173.12	6194.67	175.32	6195.31	178.48	6196.28	179.49	6204.26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	162.34	.045	178.48	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
162.34	178.48	5.95	4.61	5.49	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: LowFlow RS: 395.23

INPUT
Description: River STA 389.67
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.59	.23	6223.51	23.22	6216.99	38.6	6211.73	42.76	6210.43
48.63	6207.63	51.88	6207.59	66.62	6207.18	89.03	6205.87	94.23	6205.77
100.21	6205.71	101.57	6205.91	102.55	6205.63	104.57	6205.39	114.92	6204.04
115.25	6204	121.66	6203.16	122.92	6203	129.6	6202.13	129.61	6202.04
129.87	6202	129.99	6201.98	138.42	6200.56	147.53	6199.02	152.86	6198.12
163.72	6194.69	172.12	6194.69	176.01	6197	176.02	6204		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	152.86	.045	176.01	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
152.86	176.01	141	141	.3	.5

CULVERT

RIVER: IndustrailTrib
REACH: LowFlow RS: 330.23

INPUT
Description:
Distance from Upstream XS = 40
Deck/Roadway Width = 50
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 112

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6220.62		.93	6220.62		1.45	6220.66	
2.48	6220.66		3	6220.69		4.04	6220.69	
4.52	6220.72		5.08	6220.72		5.6	6220.75	
6.64	6220.75		7.16	6220.78		8.17	6220.78	
8.72	6220.81		9.38	6220.82		9.79	6220.84	
10.8	6220.84		11.32	6220.88		12.35	6220.88	
12.87	6220.91		13.84	6220.91		14.43	6220.94	
15.05	6220.94		15.47	6220.97		16.51	6220.97	
17.03	6221		33.14	6221		33.65	6221.03	
34.17	6221.01		35.21	6221.03		41.2	6221.03	
43.05	6221.06		56.48	6221.06		56.99	6221.09	
57.5	6221.09		58.01	6221.12		58.52	6221.12	
59.03	6221.16		59.54	6221.16		60.05	6221.19	
60.57	6221.19		61.08	6221.22		63.12	6221.25	
63.63	6221.28		64.14	6221.28		64.65	6221.31	
65.17	6221.31		65.68	6221.34		66.19	6221.34	
66.7	6221.38		68.74	6221.41		69.25	6221.44	
69.76	6221.44		70.28	6221.47		70.79	6221.47	

```
    71.3  6221.5           71.81  6221.5           72.32 6221.53
   73.35 6221.53           73.77 6221.56           74.36 6221.56
   74.88 6221.59           75.39 6221.59            75.9 6221.62
   77.94 6221.66           78.41 6221.69           78.96 6221.69
   79.48 6221.72           79.99 6221.72            80.5 6221.75
   82.54 6221.78           83.05 6221.81           83.56 6221.81
   84.07 6221.84           84.59 6221.84           85.16 6221.87
   86.12 6221.88           86.63 6221.91           87.14 6221.91
   87.65 6221.94           88.16 6221.94           88.67 6221.97
   92.68 6221.97           93.27    6222          110.65    6222
     112 6222.03          125.98 6222.03          126.49 6222.06
  127.52 6222.06          128.03 6222.09          128.54 6222.09
  129.05 6222.12          129.56 6222.12          130.07 6222.16
  130.58 6222.16          131.13 6222.19          132.12 6222.19
  132.63 6222.22          133.14 6222.22          133.65 6222.25
  134.16 6222.25          134.67 6222.28          135.69 6222.28
   136.2 6222.31          136.72 6222.31          137.23 6222.34
  137.74 6222.34          138.25 6222.38          138.76 6222.38
  139.27 6222.41          140.29 6222.41          140.54 6222.42
     176 6222.42

Upstream Bridge Cross Section Data
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6223.59     .23 6223.51   23.22 6216.99    38.6 6211.73   42.76 6210.43
   48.63 6207.63   51.88 6207.59   66.62 6207.18   89.03 6205.87   94.23 6205.77
  100.21 6205.71  101.57 6205.91  102.55 6205.63  104.57 6205.39  114.92 6204.04
  115.25    6204  121.66 6203.16  122.92    6203   129.6 6202.13  129.61 6202.04
  129.87    6202  129.99 6201.98  138.42 6200.56  147.53 6199.02  152.86 6198.12
  163.72 6194.69  172.12 6194.69  176.01    6197  176.02    6204

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  152.86    .045  176.01     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        152.86  176.01             .3       .5

Downstream  Deck/Roadway Coordinates
    num=     111
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6220.62             .93 6220.62            1.45 6220.66
    2.48 6220.66               3 6220.69            4.04 6220.69
    4.52 6220.72            5.08 6220.72             5.6 6220.75
    6.64 6220.75            7.16 6220.78            8.17 6220.78
    8.72 6220.81            9.38 6220.82            9.79 6220.84
    10.8 6220.84           11.32 6220.88           12.35 6220.88
   12.87 6220.91           13.84 6220.91           14.43 6220.94
   15.05 6220.94           15.47 6220.97           16.51 6220.97
   17.03    6221           33.14    6221           33.65 6221.03
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34.17 6221.01	35.21 6221.03	41.2 6221.03
43.05 6221.06	56.48 6221.06	56.99 6221.09
57.5 6221.09	58.01 6221.12	58.52 6221.12
59.03 6221.16	59.54 6221.16	60.05 6221.19
60.57 6221.19	61.08 6221.22	63.12 6221.25
63.63 6221.28	64.14 6221.28	64.65 6221.31
65.17 6221.31	65.68 6221.34	66.19 6221.34
66.7 6221.38	68.74 6221.41	69.25 6221.44
69.76 6221.44	70.28 6221.47	70.79 6221.47
71.3 6221.5	71.81 6221.5	72.32 6221.53
73.35 6221.53	73.77 6221.56	74.36 6221.56
74.88 6221.59	75.39 6221.59	75.9 6221.62
77.94 6221.66	78.41 6221.69	78.96 6221.69
79.48 6221.72	79.99 6221.72	80.5 6221.75
82.54 6221.78	83.05 6221.81	83.56 6221.81
84.07 6221.84	84.59 6221.84	85.16 6221.87
86.12 6221.88	86.63 6221.91	87.14 6221.91
87.65 6221.94	88.16 6221.94	88.67 6221.97
92.68 6221.97	93.27 6222	110.65 6222
112 6222.03	125.98 6222.03	126.49 6222.06
127.52 6222.06	128.03 6222.09	128.54 6222.09
129.05 6222.12	129.56 6222.12	130.07 6222.16
130.58 6222.16	131.13 6222.19	132.12 6222.19
132.63 6222.22	133.14 6222.22	133.65 6222.25
134.16 6222.25	134.67 6222.28	135.69 6222.28
136.2 6222.31	136.72 6222.31	137.23 6222.34
137.74 6222.34	138.25 6222.38	138.76 6222.38
139.27 6222.41	140.29 6222.41	140.54 6222.42

Downstream Bridge Cross Section Data

Station Elevation Data num= 217

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.05	.4	6216.06	1.4	6216.01	2.1	6216.01	2.9	6215.97
3.3	6215.97	4.3	6215.93	4.8	6215.93	5.9	6215.88	6.5	6215.88
7.1	6215.85	7.2	6215.85	7.6	6215.83	7.8	6215.82	8	6215.83
8.1	6215.83	8.2	6215.83	9.5	6215.77	9.7	6215.76	9.8	6215.76
10	6215.76	10.1	6215.76	10.4	6215.76	10.5	6215.75	10.7	6215.74
10.8	6215.73	10.9	6215.73	11.1	6215.72	11.2	6215.71	11.6	6215.7
11.9	6215.71	12	6215.71	13.1	6215.65	13.2	6215.65	13.5	6215.66
13.7	6215.66	13.9	6215.65	14.2	6215.63	14.3	6215.63	14.6	6215.61
14.8	6215.6	15	6215.6	15.2	6215.6	15.3	6215.6	15.4	6215.6
15.7	6215.59	15.9	6215.58	16.1	6215.57	16.3	6215.56	16.4	6215.55
16.5	6215.55	16.6	6215.54	16.9	6215.53	17.2	6215.54	17.3	6215.53
17.5	6215.53	18.6	6215.47	19.1	6215.48	19.2	6215.48	19.4	6215.47
19.5	6215.46	19.7	6215.45	20.3	6215.42	20.4	6215.43	20.8	6215.43
21	6215.42	21.3	6215.4	21.4	6215.4	21.8	6215.38	21.9	6215.37
22.1	6215.37	22.5	6215.38	22.9	6215.36	23	6215.35	23.3	6215.34
23.5	6215.33	23.6	6215.32	23.7	6215.32	24.2	6215.31	24.4	6215.31
24.5	6215.31	24.7	6215.3	24.8	6215.3	24.9	6215.29	25.5	6215.26
25.6	6215.26	25.9	6215.25	26.1	6215.25	26.3	6215.25	26.4	6215.25

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    26.6 6215.24      27 6215.22    27.3 6215.21    27.5  6215.2    27.6 6215.19
    27.8 6215.19      28 6215.19    28.1 6215.19    28.4 6215.18    28.5 6215.18
    28.7 6215.17    28.9 6215.16    29.1 6215.15    29.6 6215.12    29.7 6215.12
      30 6215.13    30.2 6215.12    30.4 6215.12    30.7  6215.1    30.8  6215.1
    31.3 6215.07    31.5 6215.07    31.8 6215.07    31.9 6215.07      32 6215.07
    32.3 6215.05    32.4 6215.05    32.7 6215.04    32.8 6215.03      33 6215.02
    33.2 6215.01    33.4    6215    33.5    6215    33.8    6215    34.1    6215
    34.2 6214.99    34.4 6214.98    34.6 6214.97    34.9 6214.96    35.5 6214.93
    35.7 6214.92    35.9 6214.92    36.1 6214.92    36.3 6214.92    36.4 6214.91
    36.7  6214.9    36.8  6214.9    36.8 6214.89    36.9 6214.89    37.2 6214.88
    37.9 6214.84      38 6214.84    38.5 6214.83    38.7 6214.83      39 6214.82
    39.1 6214.82    39.1 6214.81    39.4  6214.8    40.1 6214.77    40.2 6214.76
    40.3 6214.76    40.6 6214.75    40.7 6214.75    40.9 6214.75    41.1 6214.74
    41.3 6214.74    41.4 6214.73    41.7 6214.72    41.8 6214.71    42.1  6214.7
    42.4 6214.69    42.4 6214.68    42.6 6214.67    42.8 6214.67    42.9 6214.67
    43.2 6214.67    43.5 6214.66    43.6 6214.66    43.8 6214.65      44 6214.64
    44.2 6214.63    44.3 6214.62    44.6 6214.61    44.7  6214.6    45.1 6214.58
    45.2 6214.58    45.5 6214.59    45.7 6214.58    45.8 6214.58    46.2 6214.56
    46.3 6214.56    46.6 6214.54    46.8 6214.53      47 6214.52    47.3 6214.51
    47.3  6214.5    47.4  6214.5    47.7 6214.51    48.1  6214.5    48.5 6214.48
    48.8 6214.46      49 6214.45    49.2 6214.44    49.4 6214.44    49.5 6214.43
    49.7 6214.42      50 6214.41    50.1 6214.41    50.3 6214.41    50.6  6214.4
    50.7  6214.4    50.9 6214.39    51.1 6214.38    51.2 6214.38    51.4 6214.36
    51.5  6189.5    55.6  6189.5    59.7  6189.5    59.8 6214.07      60 6214.07
    60.1 6214.06    60.4 6214.05    60.5 6214.04    60.6 6214.04    60.7 6214.03
    61.1 6214.0161.23009 6214.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    51.4    .013    59.8     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          51.4    59.8             .1       .3

Upstream Embankment side slope              =       4 horiz. to 1.0 vertical
Downstream Embankment side slope            =       4 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       6       6
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
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Exit Loss Coef
                  0     141     .013     .013        0                    .5
      1
Upstream   Elevation =  6194.65
           Centerline Station =  168
Downstream Elevation =  6193.94
           Centerline Station =  55.6

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 258.43

INPUT
Description: River STA 253.88
Station Elevation Data    num=     217
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6216.05      .4 6216.06     1.4 6216.01     2.1 6216.01     2.9 6215.97
     3.3 6215.97     4.3 6215.93     4.8 6215.93     5.9 6215.88     6.5 6215.88
     7.1 6215.85     7.2 6215.85     7.6 6215.83     7.8 6215.82       8 6215.83
     8.1 6215.83     8.2 6215.83     9.5 6215.77     9.7 6215.76     9.8 6215.76
      10 6215.76    10.1 6215.76    10.4 6215.76    10.5 6215.75    10.7 6215.74
    10.8 6215.73    10.9 6215.73    11.1 6215.72    11.2 6215.71    11.6  6215.7
    11.9 6215.71      12 6215.71    13.1 6215.65    13.2 6215.65    13.5 6215.66
    13.7 6215.66    13.9 6215.65    14.2 6215.63    14.3 6215.63    14.6 6215.61
    14.8  6215.6      15  6215.6    15.2  6215.6    15.3  6215.6    15.4  6215.6
    15.7 6215.59    15.9 6215.58    16.1 6215.57    16.3 6215.56    16.4 6215.55
    16.5 6215.55    16.6 6215.54    16.9 6215.53    17.2 6215.54    17.3 6215.53
    17.5 6215.53    18.6 6215.47    19.1 6215.48    19.2 6215.48    19.4 6215.47
    19.5 6215.46    19.7 6215.45    20.3 6215.42    20.4 6215.43    20.8 6215.43
      21 6215.42    21.3  6215.4    21.4  6215.4    21.8 6215.38    21.9 6215.37
    22.1 6215.37    22.5 6215.38    22.9 6215.36      23 6215.35    23.3 6215.34
    23.5 6215.33    23.6 6215.32    23.7 6215.32    24.2 6215.31    24.4 6215.31
    24.5 6215.31    24.7  6215.3    24.8  6215.3    24.9 6215.29    25.5 6215.26
    25.6 6215.26    25.9 6215.25    26.1 6215.25    26.3 6215.25    26.4 6215.25
    26.6 6215.24      27 6215.22    27.3 6215.21    27.5  6215.2    27.6 6215.19
    27.8 6215.19      28 6215.19    28.1 6215.19    28.4 6215.18    28.5 6215.18
    28.7 6215.17    28.9 6215.16    29.1 6215.15    29.6 6215.12    29.7 6215.12
      30 6215.13    30.2 6215.12    30.4 6215.12    30.7  6215.1    30.8  6215.1
    31.3 6215.07    31.5 6215.07    31.8 6215.07    31.9 6215.07      32 6215.07
    32.3 6215.05    32.4 6215.05    32.7 6215.04    32.8 6215.03      33 6215.02
    33.2 6215.01    33.4    6215    33.5    6215    33.8    6215    34.1    6215
    34.2 6214.99    34.4 6214.98    34.6 6214.97    34.9 6214.96    35.5 6214.93
    35.7 6214.92    35.9 6214.92    36.1 6214.92    36.3 6214.92    36.4 6214.91
    36.7  6214.9    36.8  6214.9    36.8 6214.89    36.9 6214.89    37.2 6214.88
    37.9 6214.84      38 6214.84    38.5 6214.83    38.7 6214.83      39 6214.82
    39.1 6214.82    39.1 6214.81    39.4  6214.8    40.1 6214.77    40.2 6214.76
    40.3 6214.76    40.6 6214.75    40.7 6214.75    40.9 6214.75    41.1 6214.74
    41.3 6214.74    41.4 6214.73    41.7 6214.72    41.8 6214.71    42.1  6214.7
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    42.4 6214.69    42.4 6214.68    42.6 6214.67    42.8 6214.67    42.9 6214.67
    43.2 6214.67    43.5 6214.66    43.6 6214.66    43.8 6214.65      44 6214.64
    44.2 6214.63    44.3 6214.62    44.6 6214.61    44.7  6214.6    45.1 6214.58
    45.2 6214.58    45.5 6214.59    45.7 6214.58    45.8 6214.58    46.2 6214.56
    46.3 6214.56    46.6 6214.54    46.8 6214.53      47 6214.52    47.3 6214.51
    47.3  6214.5    47.4  6214.5    47.7 6214.51    48.1  6214.5    48.5 6214.48
    48.8 6214.46      49 6214.45    49.2 6214.44    49.4 6214.44    49.5 6214.43
    49.7 6214.42      50 6214.41    50.1 6214.41    50.3 6214.41    50.6  6214.4
    50.7  6214.4    50.9 6214.39    51.1 6214.38    51.2 6214.38    51.4 6214.36
    51.5  6189.5    55.6  6189.5    59.7  6189.5    59.8 6214.07      60 6214.07
    60.1 6214.06    60.4 6214.05    60.5 6214.04    60.6 6214.04    60.7 6214.03
    61.1 6214.0161.23009 6214.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    51.4    .013    59.8     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          51.4    59.8               10      10      10             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 248.43

INPUT
Description: River STA 243.92
Station Elevation Data    num=     208
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6212.71       2 6212.69     3.5 6212.65       4 6212.66     5.1 6212.63
     5.2 6212.63     5.5 6212.64     5.6 6212.64     5.9 6212.64       6 6212.63
     6.2 6212.63     6.7 6212.61     7.3 6212.62     7.7 6212.61     7.8  6212.6
     7.9  6212.6     8.2 6212.59     8.3 6212.59     9.3 6212.59     9.4 6212.58
    10.5 6212.55    10.7 6212.55    10.9 6212.56      11 6212.56    12.1 6212.53
    12.5 6212.54    12.6 6212.54    12.8 6212.53    13.2 6212.52    13.4 6212.51
    13.7 6212.51    13.9  6212.5      14  6212.5    14.2 6212.51    14.4 6212.51
    14.8  6212.5    15.2 6212.49    15.3 6212.48    15.5 6212.48    15.6 6212.47
    15.8 6212.47    15.9 6212.47    16.2 6212.48    16.3 6212.48    16.4 6212.48
    17.5 6212.44    17.9 6212.44      18 6212.44    18.3 6212.44    18.5 6212.44
    18.6 6212.44    18.9 6212.43      19 6212.43    19.1 6212.42    19.2 6212.42
    19.4 6212.41    19.6 6212.41    19.8 6212.41      20 6212.42    20.1 6212.42
    20.2 6212.42    20.6 6212.41    20.7  6212.4    20.9 6212.39      21 6212.39
    21.2 6212.39    21.3 6212.38    21.7 6212.37    22.1 6212.38    22.3 6212.38
    22.5 6212.37    22.7 6212.37    22.8 6212.36    22.9 6212.36      23 6212.36
    23.3 6212.35    23.4 6212.35    23.6 6212.35    23.7 6212.34    23.9 6212.35
      24 6212.35    24.4 6212.34    24.8 6212.33      25 6212.33    25.2 6212.32
    25.5 6212.31    25.6 6212.31    25.8 6212.31      26 6212.32    26.2 6212.32
    26.4 6212.31    26.6  6212.3    26.7  6212.3    27.1 6212.29    27.2 6212.29
    27.7  6212.3    28.2 6212.28    28.3 6212.28    28.5 6212.27    28.7 6212.27
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    28.8 6212.26    29.1 6212.26    29.3 6212.26    29.4 6212.27    29.7 6212.26
    29.8 6212.26    29.9 6212.26    30.2 6212.25    30.3 6212.24    30.6 6212.23
    30.9 6212.23      31 6212.22    31.3 6212.21    31.4 6212.21    31.5 6212.21
    31.8 6212.22    31.9 6212.22    32.2 6212.22    32.4 6212.21    32.5  6212.2
    32.7  6212.2    32.9 6212.19      33 6212.19    33.2 6212.19    33.3 6212.19
    33.6 6212.19    33.7 6212.19    34.1 6212.18    34.5 6212.17    34.6 6212.17
    34.9 6212.16      35 6212.15    35.2 6212.15    35.6 6212.14    35.9 6212.14
      36 6212.13    36.4 6212.13    36.8 6212.13    37.2 6212.11    37.3 6212.11
    37.6  6212.1    37.9 6212.09    38.2 6212.08    38.3 6212.08    38.4 6212.08
    38.5 6212.08    38.7 6212.09    38.9 6212.09    39.1 6212.08    39.4 6212.07
    39.5 6212.07    39.6 6212.07      40 6212.05    40.3 6212.04    40.5 6212.04
    40.6 6212.04    40.9 6212.05      41 6212.05    41.1 6212.05    41.2 6212.05
    41.4 6212.04    41.6 6212.03    41.8 6212.03      42 6212.02    42.1 6212.01
    42.2 6212.01    42.3 6212.01    42.6    6212    42.7    6212    42.9    6212
      43    6212    43.2    6212    43.3    6212    43.7    6212    43.7 6211.99
    43.8 6211.99    44.1 6211.98    44.3 6211.98    44.5 6211.97    44.7 6211.96
    44.9 6211.96    45.1 6211.95    45.3 6211.95    45.4 6211.95    45.6 6211.95
    45.7 6211.96    45.9 6211.95      46 6211.95    46.4 6211.94    46.8 6211.92
      47 6211.92    47.2 6211.91    47.3 6211.91    47.5  6211.9    47.6  6189.5
    51.7  6189.5    55.7  6189.5    56.1 6211.75    56.5 6211.73    56.6 6211.73
    56.9 6211.72      57 6211.72    57.2 6211.71    57.4 6211.72    57.6 6211.73
    57.7 6211.73      58 6211.7158.23558 6211.71

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    47.5    .013    56.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          47.5    56.1            101.7   101.7   101.7             .1       .3

CULVERT


RIVER: IndustrailTrib
REACH: LowFlow            RS: 196.43

INPUT
Description:
Distance from Upstream XS =      46
Deck/Roadway Width        =      12
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.31            58.2    6219

Upstream Bridge Cross Section Data
Station Elevation Data    num=     208
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6212.71       2 6212.69     3.5 6212.65       4 6212.66     5.1 6212.63
```

```
     5.2 6212.63     5.5 6212.64     5.6 6212.64     5.9 6212.64       6 6212.63
     6.2 6212.63     6.7 6212.61     7.3 6212.62     7.7 6212.61     7.8  6212.6
     7.9  6212.6     8.2 6212.59     8.3 6212.59     9.3 6212.59     9.4 6212.58
    10.5 6212.55    10.7 6212.55    10.9 6212.56      11 6212.56    12.1 6212.53
    12.5 6212.54    12.6 6212.54    12.8 6212.53    13.2 6212.52    13.4 6212.51
    13.7 6212.51    13.9  6212.5      14  6212.5    14.2 6212.51    14.4 6212.51
    14.8  6212.5    15.2 6212.49    15.3 6212.48    15.5 6212.48    15.6 6212.47
    15.8 6212.47    15.9 6212.47    16.2 6212.48    16.3 6212.48    16.4 6212.48
    17.5 6212.44    17.9 6212.44      18 6212.44    18.3 6212.44    18.5 6212.44
    18.6 6212.44    18.9 6212.43      19 6212.43    19.1 6212.42    19.2 6212.42
    19.4 6212.41    19.6 6212.41    19.8 6212.41      20 6212.42    20.1 6212.42
    20.2 6212.42    20.6 6212.41    20.7  6212.4    20.9 6212.39      21 6212.39
    21.2 6212.39    21.3 6212.38    21.7 6212.37    22.1 6212.38    22.3 6212.38
    22.5 6212.37    22.7 6212.37    22.8 6212.36    22.9 6212.36      23 6212.36
    23.3 6212.35    23.4 6212.35    23.6 6212.35    23.7 6212.34    23.9 6212.35
      24 6212.35    24.4 6212.34    24.8 6212.33      25 6212.33    25.2 6212.32
    25.5 6212.31    25.6 6212.31    25.8 6212.31      26 6212.32    26.2 6212.32
    26.4 6212.31    26.6  6212.3    26.7  6212.3    27.1 6212.29    27.2 6212.29
    27.7  6212.3    28.2 6212.28    28.3 6212.28    28.5 6212.27    28.7 6212.27
    28.8 6212.26    29.1 6212.26    29.3 6212.26    29.4 6212.27    29.7 6212.26
    29.8 6212.26    29.9 6212.26    30.2 6212.25    30.3 6212.24    30.6 6212.23
    30.9 6212.23      31 6212.22    31.3 6212.21    31.4 6212.21    31.5 6212.21
    31.8 6212.22    31.9 6212.22    32.2 6212.22    32.4 6212.21    32.5  6212.2
    32.7  6212.2    32.9 6212.19      33 6212.19    33.2 6212.19    33.3 6212.19
    33.6 6212.19    33.7 6212.19    34.1 6212.18    34.5 6212.17    34.6 6212.17
    34.9 6212.16      35 6212.15    35.2 6212.15    35.6 6212.14    35.9 6212.14
      36 6212.13    36.4 6212.13    36.8 6212.13    37.2 6212.11    37.3 6212.11
    37.6  6212.1    37.9 6212.09    38.2 6212.08    38.3 6212.08    38.4 6212.08
    38.5 6212.08    38.7 6212.09    38.9 6212.09    39.1 6212.08    39.4 6212.07
    39.5 6212.07    39.6 6212.07      40 6212.05    40.3 6212.04    40.5 6212.04
    40.6 6212.04    40.9 6212.05      41 6212.05    41.1 6212.05    41.2 6212.05
    41.4 6212.04    41.6 6212.03    41.8 6212.03      42 6212.02    42.1 6212.01
    42.2 6212.01    42.3 6212.01    42.6    6212    42.7    6212    42.9    6212
      43    6212    43.2    6212    43.3    6212    43.7    6212    43.7 6211.99
    43.8 6211.99    44.1 6211.98    44.3 6211.98    44.5 6211.97    44.7 6211.96
    44.9 6211.96    45.1 6211.95    45.3 6211.95    45.4 6211.95    45.6 6211.95
    45.7 6211.96    45.9 6211.95      46 6211.95    46.4 6211.94    46.8 6211.92
      47 6211.92    47.2 6211.91    47.3 6211.91    47.5  6211.9    47.6  6189.5
    51.7  6189.5    55.7  6189.5    56.1 6211.75    56.5 6211.73    56.6 6211.73
    56.9 6211.72      57 6211.72    57.2 6211.71    57.4 6211.72    57.6 6211.73
    57.7 6211.73      58 6211.7158.23558 6211.71

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    47.5    .013    56.1     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          47.5    56.1             .1       .3

Downstream  Deck/Roadway Coordinates
```

```
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.31            74.2    6219

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6216     .34 6215.95   12.06 6210.79   16.24  6209.3    26.8 6201.36
   39.22 6197.44   40.22    6189   46.39    6189   73.15    6189   74.15    6193

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   40.22    .045   73.15     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
         40.22   73.15             .1       .3

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       6       6
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 0     101     .013     .013        0                   .5
      1
Upstream   Elevation =  6189.5
           Centerline Station =  51.7
Downstream Elevation =  6189
           Centerline Station =  46.4

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 146.73

INPUT
Description: River STA 142.13
Station Elevation Data    num=      10
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6216     .34 6215.95   12.06 6210.79   16.24  6209.3    26.8 6201.36
   39.22 6197.44   40.22    6189   46.39    6189   73.15    6189   74.15    6193

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   40.22    .045   73.15     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         40.22   73.15             38.36   12.53   14.49             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 134.20

INPUT
Description: River STA 129.63
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6213   16.35 6204.09   21.07 6203.26   33.81 6201.75   39.52    6201
   76.97    6189   88.72 6188.94   92.79 6188.94  111.65 6188.94  112.65    6193

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   76.97    .035  111.65     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         76.97  111.65             35.5    49.5   63.64             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 84.70

INPUT
Description: River STA 84.68
Station Elevation Data    num=     364
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6206.97     .61 6206.74     3.7 6205.56     7.3 6204.32     7.8 6204.15
     8.5 6203.88    12.1 6202.64    12.8 6202.37      14 6201.96    14.3 6201.88
    14.5 6201.85    15.5 6201.69    15.7 6201.66    16.9 6201.51    17.9 6201.32
    18.1 6201.28    18.6 6201.15      19 6201.08    19.3 6200.99    19.4 6200.97
    20.5 6200.71    20.8 6200.64    21.3 6200.53    21.7 6200.44    22.2 6200.33
    22.4 6200.29    22.9  6200.2      23 6200.19    23.1 6200.16    23.7 6200.03
    24.4 6199.88    24.9 6199.79    25.1 6199.75    25.3 6199.72    25.8 6199.59
    25.9 6199.57    26.5 6199.46    26.6 6199.44    26.7 6199.41    27.3  6199.3
    27.6 6199.23      28 6199.16    28.5 6199.04    28.7    6199    28.8 6198.97
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29.4 6198.87	30 6198.75	30.2 6198.72	30.4 6198.68	31.2 6198.5
32.2 6198.31	32.3 6198.28	32.4 6198.26	32.9 6198.17	33.1 6198.13
33.6 6198.03	33.8 6198	34 6197.95	34.5 6197.85	34.8 6197.8
35.2 6197.74	35.8 6197.64	35.9 6197.63	36 6197.62	36.4 6197.56
36.7 6197.52	37.2 6197.44	37.4 6197.41	38.3 6197.29	50.7 6192.91
51 6192.81	51.4 6192.68	51.5 6192.65	51.9 6192.49	52.2 6192.4
52.4 6192.34	52.9 6192.18	53 6192.13	53.4 6192.02	53.7 6191.92
53.8 6191.88	53.9 6191.86	54.3 6191.71	54.6 6191.62	54.8 6191.56
55.1 6191.46	55.3 6191.39	55.4 6191.35	55.8 6191.24	56 6191.17
56.2 6191.1	57 6190.84	57.2 6190.78	57.7 6190.64	57.8 6190.6
58.3 6190.44	58.6 6190.33	58.7 6190.31	59.1 6190.19	59.4 6190.11
59.6 6190.03	59.9 6189.93	60.1 6189.89	60.2 6189.86	60.6 6189.72
61 6189.58	61.5 6189.44	61.8 6189.37	62 6189.31	62.5 6189.15
62.6 6189.14	62.9 6189.03	63 6189	63.4 6188.83	63.6 6188.77
63.9 6188.68	64.4 6188.52	64.8 6188.41	64.9 6188.37	65.4 6188.35
65.6 6188.34	70.5 6188.34	70.7 6188.33	71 6188.33	71.2 6188.34
72.6 6188.34	73.1 6188.33	73.6 6188.33	74 6188.34	74.2 6188.34
74.6 6188.33	74.9 6188.33	75.5 6188.32	75.7 6188.32	76 6188.33
76.4 6188.34	76.6 6188.34	77 6188.33	77.5 6188.33	77.9 6188.34
78 6188.34	78.4 6188.33	78.9 6188.33	79.2 6188.32	79.5 6188.32
79.9 6188.33	80.3 6188.34	80.4 6188.34	80.9 6188.32	81.1 6188.33
81.3 6188.33	81.8 6188.31	82.3 6188.32	82.6 6188.33	82.8 6188.33
83.1 6188.32	83.8 6188.32	84.2 6188.31	84.4 6188.31	84.7 6188.32
84.9 6188.32	85.2 6188.33	85.6 6188.31	86.7 6188.31	87.2 6188.32
87.6 6188.32	88 6188.31	88.6 6188.32	88.8 6188.31	89.6 6188.31
90.1 6188.32	90.3 6188.31	92 6188.31	92.5 6188.32	93 6188.32
93.2 6188.33	93.4 6188.34	93.5 6188.34	93.9 6188.36	94.2 6188.38
94.4 6188.39	94.8 6188.41	94.9 6188.41	95.1 6188.42	95.4 6188.44
95.7 6188.46	95.9 6188.49	96.1 6188.53	96.3 6188.57	96.5 6188.59
96.8 6188.66	97 6188.68	97.2 6188.72	97.3 6188.73	97.4 6188.75
97.8 6188.81	98 6188.86	98.8 6188.97	98.9 6188.99	99.2 6189.03
99.6 6189.07	99.7 6189.11	100 6189.13	100.2 6189.16	100.3 6189.17
100.4 6189.19	100.7 6189.28	101.1 6189.35	101.7 6189.52	101.9 6189.54
102.2 6189.58	102.7 6189.69	103.1 6189.73	103.2 6189.75	103.4 6189.78
103.8 6189.85	104.6 6190.01	104.8 6190.04	105.1 6190.07	105.3 6190.09
105.4 6190.11	105.5 6190.16	105.8 6190.25	106.3 6190.36	106.7 6190.52
106.8 6190.54	107.8 6190.74	108 6190.76	108.2 6190.81	108.3 6190.83
108.6 6190.91	108.8 6190.98	108.9 6191	109.2 6191.05	109.3 6191.08
109.7 6191.16	109.9 6191.21	110.3 6191.31	110.4 6191.31	110.9 6191.45
111.1 6191.49	111.4 6191.58	111.6 6191.64	111.8 6191.7	112.1 6191.8
112.4 6191.91	112.5 6191.95	112.8 6192.03	112.9 6192.04	113.2 6192.16
113.4 6192.2	113.8 6192.26	113.9 6192.28	114 6192.32	114.4 6192.46
114.7 6192.52	114.9 6192.59	115.3 6192.7	115.4 6192.76	115.6 6192.78
115.9 6192.86	116.1 6192.91	116.5 6193.03	116.8 6193.11	117 6193.15
117.3 6193.29	117.5 6193.37	117.7 6193.42	118 6193.48	118.3 6193.58
118.9 6193.73	119.1 6193.77	119.5 6193.91	119.7 6193.96	120 6194.04
120.4 6194.14	120.5 6194.18	120.8 6194.26	121.1 6194.36	121.3 6194.41
121.5 6194.46	121.8 6194.54	122.5 6194.75	122.6 6194.75	123.1 6194.88
123.3 6194.93	123.6 6195.02	123.8 6195.08	124 6195.15	124.1 6195.17
124.3 6195.22	124.6 6195.3	124.7 6195.33	125 6195.41	125.1 6195.44

```
   125.4 6195.54   125.6 6195.59     126 6195.69   126.1 6195.72   126.2 6195.75
   126.6 6195.86   126.9 6195.94   127.1    6196   127.4 6196.08   127.6 6196.12
   127.8 6196.18   128.1 6196.29   128.3 6196.33   128.6 6196.43     129 6196.54
   129.2 6196.65   129.5 6196.94   129.7 6197.12   129.9 6197.26   130.2 6197.56
   130.4 6197.82   130.7 6198.08   131.1 6198.27   131.2  6198.3   131.5 6198.39
   132.6 6198.43   132.8 6198.36   133.3 6198.45   133.6 6198.46   133.7 6198.47
   134.5 6198.38   134.9 6198.46   135.4 6198.47   135.6 6198.45   135.7 6198.46
   136.4 6198.49   136.6 6198.49   136.8 6198.48   137.2 6198.51   137.3 6198.55
   137.9 6198.48     138 6198.49   138.2 6198.49   138.6 6198.47   138.7 6198.51
     139 6198.53   139.2 6198.54   139.4 6198.56   139.5 6198.58   139.6 6198.64
   140.2 6198.75   140.5 6198.77   140.8 6198.78   140.9 6198.78     141 6198.79
   141.7 6198.84   142.4 6198.88     143 6198.95   143.8 6199.08   143.9 6199.09
   144.5 6199.14   144.9  6199.2   145.2 6199.23   145.4 6199.34   145.9 6199.38
   146.1  6199.4   146.2 6199.41   146.8 6199.64  147.31 6199.55

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    53.7    .035   112.4     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          53.7   112.4             32.3    32.3    32.3             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 52.40

INPUT
Description: River STA 52.39
Station Elevation Data    num=     280
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6203.04    1.44 6202.73     6.6  6201.6     7.3 6201.42     7.9 6201.22
       9  6200.9    16.4 6198.44    16.6 6198.39    16.9 6198.29    17.3 6198.16
    17.4 6198.13    18.3 6197.82    18.5 6197.76    18.8 6197.68      19 6197.62
    30.1 6193.94    30.9 6193.68    31.1 6193.63    31.2 6193.58    31.5 6193.49
    31.8  6193.4      32 6193.33    32.3 6193.24    32.5 6193.18    32.6 6193.13
    32.9 6193.02    33.3 6192.89    33.4 6192.87    33.5 6192.85    33.9  6192.7
      34 6192.66    34.4 6192.51    34.8 6192.36    35.2 6192.23    35.3 6192.19
    35.5 6192.13    35.8 6192.03      36 6191.95    36.5 6191.77    36.7 6191.69
    36.9 6191.63    37.2 6191.53    38.1 6191.21    38.3 6191.13    38.6 6191.02
    39.1 6190.88    39.5 6190.72    39.7 6190.67    40.3 6190.48    40.5 6190.41
    40.7 6190.32      41 6190.24    41.1 6190.18    41.4 6190.07    41.8 6189.94
    41.9 6189.91      42 6189.88    42.7 6189.65    42.8 6189.59    42.9 6189.59
    43.3 6189.44    43.7 6189.32    43.8 6189.28    43.9 6189.24    44.3 6189.12
    44.5 6189.04    44.7 6188.97      45 6188.89    45.2 6188.81    45.4 6188.72
    45.7 6188.64      46 6188.54    46.1 6188.49    46.3 6188.45    46.6 6188.33
      47 6188.21    47.1 6188.16    47.5 6188.04      48 6187.94      52 6187.94
    52.2 6187.93    52.5 6187.94      53 6187.94    53.2 6187.93    53.4 6187.94
    55.1 6187.94    55.1 6187.93    55.5 6187.93      56 6187.94    56.2 6187.93
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    56.5 6187.93    56.9 6187.94      57 6187.94    57.4 6187.93    57.8 6187.94
      58 6187.94    58.3 6187.93    58.7 6187.94      59 6187.94    59.3 6187.93
    59.6 6187.92      60 6187.92    60.2 6187.93    60.4 6187.92    60.7 6187.92
      61 6187.93    61.3 6187.93    61.6 6187.92    62.1 6187.93    63.1 6187.93
    63.5 6187.92      64 6187.91      65 6187.91    65.4 6187.92    65.8 6187.91
      66 6187.91    66.3 6187.92    66.6 6187.92    66.8 6187.91      67 6187.92
    67.7 6187.91    83.9 6187.91    84.2  6187.9    84.4 6187.89    84.6 6187.89
    85.1  6187.9    85.3  6187.9    85.6 6187.89    85.9  6187.9    86.2  6187.9
    86.9 6187.88    88.9 6187.88    89.7    6188    89.8 6188.04    89.9 6188.09
    90.3 6188.22    90.6 6188.33    90.7 6188.39    90.9 6188.45    91.2 6188.54
    91.5 6188.63    91.7  6188.7    91.9 6188.79    92.2 6188.86    92.4 6188.93
    92.6 6189.02    92.9 6189.12    93.1 6189.18    93.2 6189.23    93.6 6189.34
      94 6189.52    94.1 6189.56    94.5 6189.68      95 6189.85    95.7 6190.08
    95.9 6190.16    96.4 6190.31    96.8 6190.45    96.9 6190.47    97.3 6190.64
    97.7 6190.75    97.8 6190.79    97.9 6190.83    98.3 6190.95    98.6 6191.05
    98.7  6191.1    99.2 6191.26    99.4 6191.35    99.7 6191.41    99.9 6191.46
   100.6 6191.72   101.1 6191.85   101.4 6191.95   101.6 6192.02   101.9 6192.12
   102.1 6192.16   102.2 6192.19   102.5  6192.3     103 6192.44   103.1 6192.47
   103.2 6192.52   103.5 6192.62   103.7 6192.69     104 6192.78   104.5 6192.94
   105.3 6193.17   105.8 6193.32   106.1 6193.41   106.4 6193.54   106.5 6193.55
   106.8 6193.67   107.1 6193.73   107.6  6193.9   107.9 6193.99     108 6194.02
   108.6 6194.15   108.9 6194.17   109.3 6194.21   109.6 6194.23   109.7 6194.24
   110.3  6194.3   110.4 6194.31   110.9 6194.36     111 6194.37   111.3 6194.38
   111.8 6194.42   112.1 6194.45   112.5 6194.48   113.2 6194.53   113.3 6194.53
   113.4 6194.55   114.4 6194.65   114.7 6194.69   115.1 6194.76   115.4 6194.81
   115.6 6194.84   116.1 6194.92   116.3 6194.95   116.8 6195.02   116.9 6195.03
     117 6195.06   117.6 6195.13   117.9 6195.17   118.3 6195.22     119 6195.31
   119.1 6195.31   119.3 6195.33   120.3 6195.44   120.5 6195.46   120.9  6195.5
   121.2 6195.55   121.4 6195.57     122 6195.64   122.3 6195.67   122.6 6195.72
   122.7 6195.73   122.8 6195.74   123.4 6195.81   124.1  6195.9   124.8 6195.98
   124.9    6196   125.2 6196.04   125.6 6196.08   126.1 6196.15   126.3 6196.17
   126.7 6196.22   127.1 6196.26   128.5 6196.41   128.6 6196.42   129.2  6196.5
   129.6 6196.55     130 6196.59   130.5 6196.66   130.7 6196.68   130.8 6196.69
   131.2 6196.74   131.4 6196.77     132 6196.84   132.2 6196.86   132.5  6196.9
   132.9 6196.95   133.1 6196.98   134.1  6197.1   134.3 6197.13   134.4 6197.14
   135.1 6197.21   135.5 6197.25   135.8 6197.29   136.3 6197.34   136.5 6197.37
   136.6 6197.38   137.1  6197.5   137.3 6197.54     138 6197.75   138.7 6197.94
   139.4 6198.14   140.1 6198.34   140.2 6198.34   140.9 6198.28  140.95 6198.27

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    36.7    .035    99.9     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          36.7    99.9             52.4    52.4    52.4              .1       .3

CROSS SECTION


RIVER: IndustrailTrib
```

REACH: LowFlow RS: 0.00

INPUT
Description: River STA 0.00
Station Elevation Data num= 250

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6202.5	.9	6202.47	1.8	6202.47	3.8	6202.41	4.8	6202.4
6	6202.37	6.8	6202.37	7.8	6202.33	9.8	6202.24	11.8	6202.17
12.3	6202.14	12.4	6202.13	12.8	6202.11	14.9	6202.04	15.6	6202
15.9	6201.98	16.1	6201.95	16.7	6201.92	16.9	6201.9	17	6201.88
17.7	6201.87	17.9	6201.86	18	6201.85	18.8	6201.79	20.8	6201.43
20.9	6201.41	21.7	6201.28	21.9	6201.26	22	6201.24	22.7	6201.11
22.9	6201.09	23.1	6201.06	23.6	6200.97	23.9	6200.94	24.1	6200.89
24.6	6200.81	24.9	6200.75	26.9	6200.43	27.3	6200.35	27.4	6200.33
27.9	6200.25	28.4	6200.17	28.9	6200.1	29.9	6199.91	30.3	6199.85
30.5	6199.81	30.9	6199.75	31.2	6199.7	31.6	6199.63	31.9	6199.58
32.2	6199.53	32.6	6199.45	32.9	6199.41	33.1	6199.38	33.9	6199.25
34	6199.22	34.8	6199.09	34.9	6199.07	35	6199.05	35.8	6198.92
35.9	6198.9	36.7	6198.76	36.8	6198.7	36.9	6198.68	37	6198.65
37.6	6198.43	37.9	6198.34	38.5	6198.16	39	6197.99	39.3	6197.89
40	6197.59	40.2	6197.52	40.9	6197.25	41.1	6197.17	41.4	6197.02
41.7	6196.91	42.1	6196.73	42.5	6196.08	42.9	6194.63	43.2	6194
43.4	6192.06	43.8	6187.61	44.3	6187.63	44.4	6187.64	44.8	6187.66
44.9	6187.67	45	6187.67	45.4	6187.69	45.7	6187.7	46	6187.7
46.3	6187.71	46.5	6187.69	47	6187.72	47.1	6187.72	47.6	6187.63
47.7	6187.62	48	6187.6	48.1	6187.58	48.4	6187.54	48.7	6187.52
49	6187.49	49.1	6187.47	49.2	6187.46	49.5	6187.42	49.7	6187.38
49.8	6187.37	49.9	6187.35	50.3	6187.31	50.5	6187.28	50.8	6187.27
50.9	6187.28	51.2	6187.27	51.3	6187.27	51.8	6187.28	51.9	6187.28
52.4	6187.26	52.9	6187.26	53.3	6187.27	53.5	6187.27	53.9	6187.28
54	6187.28	54.5	6187.26	55.1	6187.26	55.3	6187.27	56	6187.27
56.1	6187.28	56.8	6187.28	57.2	6187.26	57.4	6187.26	57.7	6189.03
57.8	6189.15	58	6189.34	58.4	6189.27	58.8	6190.38	59	6190.39
59.6	6191.77	59.8	6192.59	60.2	6192.53	60.6	6193.45	60.9	6193.71
61	6193.77	61.5	6193.43	61.8	6193.12	61.9	6193.19	62.1	6193.29
62.2	6193.46	62.7	6194.17	62.9	6194.56	63	6194.67	63.6	6194.84
64.4	6195.04	64.7	6195.14	65.1	6195.25	65.3	6195.31	65.8	6195.45
66.1	6195.53	66.5	6195.63	66.6	6195.66	66.8	6195.7	67.3	6195.84
67.6	6195.92	68.8	6196.25	69.5	6196.36	69.9	6196.42	70.2	6196.45
70.8	6196.49	71	6196.51	71.3	6196.54	71.7	6196.58	72.2	6196.62
72.4	6196.64	72.9	6196.67	73.2	6196.7	73.3	6196.71	73.9	6196.76
74.5	6196.82	74.6	6196.83	74.9	6196.86	75.4	6196.89	75.6	6196.91
76.1	6196.96	76.5	6197	76.8	6197.02	76.9	6197.03	77	6197.04
77.6	6197.09	77.9	6197.12	78.3	6197.17	79	6197.22	79.1	6197.22
80.5	6197.37	81.1	6197.43	81.4	6197.46	81.7	6197.49	82	6197.52
82.5	6197.55	82.7	6197.57	83.5	6197.61	83.7	6197.62	84.2	6197.65
84.3	6197.66	84.8	6197.69	84.9	6197.7	85.2	6197.71	85.7	6197.74
86.4	6197.78	86.9	6197.81	87.1	6197.82	87.2	6197.83	87.9	6197.87
88.2	6197.89	88.6	6197.92	89.3	6197.96	89.4	6197.96	89.5	6197.98
90.1	6198.06	90.5	6198.11	90.8	6198.16	91.5	6198.28	91.7	6198.31

92.1	6198.39	92.3	6198.41	92.8	6198.51	93.4	6198.61	93.7	6198.67
94	6198.71	94.5	6198.79	94.7	6198.84	95.1	6198.9	95.2	6198.92
95.4	6198.95	96	6199.04	96.3	6199.1	96.7	6199.18	97.4	6199.31
97.5	6199.31	98.2	6199.43	98.6	6199.48	98.9	6199.51	99.5	6199.49
99.6	6199.47	99.7	6199.47	100	6199.43	100.4	6199.38	100.8	6199.32
101.1	6199.3	101.5	6199.26	101.8	6199.23	102	6199.21	102.17	6199.19

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	43.4	.035	59.6	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
43.4	59.6	.1	.3

SUMMARY OF MANNING'S N VALUES

River:IndustrailTrib

Reach	River Sta.	n1	n2	n3
Upstream	1518.60	.05	.035	.05
Upstream	1469.76	.05	.035	.05
Upstream	1469.56	.06	.05	.06
Upstream	1444.86	.06	.05	.06
Upstream	1444.76	.06	.05	.06
Upstream	1431.84	.06	.05	.06
Upstream	1418.40	.06	.05	.06
Upstream	1418.20	.06	.05	.06
Upstream	1393.50	.06	.05	.06
Upstream	1393.40	.06	.05	.06
Upstream	1289.23	.06	.05	.06
Upstream	1191.91	.06	.05	.06
Upstream	1191.71	.06	.05	.06
Upstream	1167.01	.06	.05	.06
Upstream	1166.91	.06	.05	.06
Upstream	1120.97	.06	.05	.06
Upstream	1061.91	.06	.05	.06
Upstream	1061.71	.06	.05	.06
Upstream	1037.01	.06	.05	.06
Upstream	1036.91	.06	.05	.06
Upstream	1013.85	.06	.05	.06
Upstream	986.91	.06	.05	.06
Upstream	986.71	.06	.05	.06
Upstream	962.01	.06	.05	.06
Upstream	961.91	.06	.05	.06
Upstream	932.51	.06	.05	.06
Upstream	901.91	.06	.05	.06
Upstream	901.71	.06	.05	.06

Upstream	877.01	.06	.05	.06
Upstream	876.91	.06	.05	.06
Upstream	861.67	.06	.05	.06
Upstream	846.91	.06	.05	.06
Upstream	846.70	.06	.05	.06
Upstream	822.01	.06	.05	.06
Upstream	821.91	.06	.05	.06
Upstream	711.90	.06	.05	.06
Upstream	668.00	.06	.05	.06
Upstream	667.68	.06	.05	.06
Upstream	649.55	.06	.05	.06
Upstream	649.45	.06	.05	.06
Upstream	621.26	.06	.05	.06
Upstream	553.22	.05	.035	.05
Upstream	504.57	.05	.035	.05
Upstream	476.63	.05	.035	.05
Trail	443.00	.05	.013	.05
Trail	412.24	.05	.013	.05
Trail	390.71	.05	.013	.05
Trail	385.90	.05	.013	.05
Trail	320.90	Culvert		
Trail	266.94	.05	.013	.05
Trail	257.31	.05	.012	.05
Trail	246.94	.05	.012	.05
Trail	237.07	.05	.012	.05
Trail	194.07	Culvert		
Trail	148.30	.05	.012	.05
Trail	148.00	Lat Struct		
Trail	139.23	.05	.013	.05
Trail	126.23	.013	.013	.05
Trail	104.53	.013	.013	.05
Trail	83.73	.013	.013	.05
LowFlow	449.30	.05	.045	.05
LowFlow	449.20	Lat Struct		
LowFlow	420.81	.05	.045	.05
LowFlow	399.84	.05	.045	.05
LowFlow	395.23	.05	.045	.05
LowFlow	330.23	Culvert		
LowFlow	258.43	.05	.013	.05
LowFlow	248.43	.05	.013	.05
LowFlow	196.43	Culvert		
LowFlow	146.73	.05	.045	.05
LowFlow	134.20	.05	.035	.05
LowFlow	84.70	.05	.035	.05
LowFlow	52.40	.05	.035	.05
LowFlow	0.00	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: IndustrailTrib

Reach	River Sta.	Left	Channel	Right
Upstream	1518.60	49.2	48.84	48.48
Upstream	1469.76	.2	.2	.2
Upstream	1469.56	22.87	24.7	26.53
Upstream	1444.86	.09	.1	.11
Upstream	1444.76	14.1	12.92	11.74
Upstream	1431.84	15.62	13.44	11.27
Upstream	1418.40	.2	.2	.2
Upstream	1418.20	24.56	24.7	25.32
Upstream	1393.50	.1	.1	.12
Upstream	1393.40	99.66	104.17	115.69
Upstream	1289.23	91.64	97.32	94.38
Upstream	1191.91	.2	.2	.2
Upstream	1191.71	24.08	24.7	25.32
Upstream	1167.01	.1	.1	.1
Upstream	1166.91	54.71	45.94	37.17
Upstream	1120.97	60.28	59.06	57.83
Upstream	1061.91	.2	.2	.2
Upstream	1061.71	25.53	24.7	23.87
Upstream	1037.01	.1	.1	.1
Upstream	1036.91	23.75	23.06	22.36
Upstream	1013.85	27.45	26.94	26.44
Upstream	986.91	.2	.2	.2
Upstream	986.71	25.09	24.7	24.31
Upstream	962.01	.1	.1	.1
Upstream	961.91	28.43	29.4	30.37
Upstream	932.51	29.94	30.6	31.27
Upstream	901.91	.2	.2	.2
Upstream	901.71	21.96	24.7	27.44
Upstream	877.01	.1	.1	.1
Upstream	876.91	14.37	15.24	13.68
Upstream	861.67	18.28	14.76	13.03
Upstream	846.91	.21	.21	.2
Upstream	846.70	21.8	24.69	27.91
Upstream	822.01	.1	.1	.09
Upstream	821.91	98.07	110.01	124.19
Upstream	711.90	47.93	43.9	36.64
Upstream	668.00	.31	.32	.31
Upstream	667.68	25.73	18.13	16.63
Upstream	649.55	.1	.1	.1
Upstream	649.45	30.04	28.19	32.96
Upstream	621.26	76.21	68.04	60.72
Upstream	553.22	54.65	48.65	54.29
Upstream	504.57	31.24	27.94	24.62
Upstream	476.63			

Trail	443.00	27.19	30.76	42.74
Trail	412.24	21.77	21.53	17.96
Trail	390.71	5.49	4.81	7.04
Trail	385.90	117.95	118.96	101.52
Trail	320.90	Culvert		
Trail	266.94	11.13	9.63	10.12
Trail	257.31	12.41	10.37	52.82
Trail	246.94	10.99	9.87	26.73
Trail	237.07	93.44	88.77	53.24
Trail	194.07	Culvert		
Trail	148.30	7.57	9.07	7.65
Trail	148.00	Lat Struct		
Trail	139.23	13	13	13
Trail	126.23	21.7	21.7	21.7
Trail	104.53	20.8	20.8	20.8
Trail	83.73	28.1	28.1	28.1
LowFlow	449.30	30.31	28.49	27.19
LowFlow	449.20	Lat Struct		
LowFlow	420.81	35.72	20.97	21.77
LowFlow	399.84	5.95	4.61	5.49
LowFlow	395.23	141	141	141
LowFlow	330.23	Culvert		
LowFlow	258.43	10	10	10
LowFlow	248.43	101.7	101.7	101.7
LowFlow	196.43	Culvert		
LowFlow	146.73	38.36	12.53	14.49
LowFlow	134.20	35.5	49.5	63.64
LowFlow	84.70	32.3	32.3	32.3
LowFlow	52.40	52.4	52.4	52.4
LowFlow	0.00			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: IndustrailTrib

Reach	River Sta.	Contr.	Expan.
Upstream	1518.60	.1	.3
Upstream	1469.76	.1	.3
Upstream	1469.56	.1	.3
Upstream	1444.86	.1	.3
Upstream	1444.76	.1	.3
Upstream	1431.84	.1	.3
Upstream	1418.40	.1	.3
Upstream	1418.20	.1	.3
Upstream	1393.50	.1	.3
Upstream	1393.40	.1	.3

Upstream	1289.23	.1	.3
Upstream	1191.91	.1	.3
Upstream	1191.71	.1	.3
Upstream	1167.01	.1	.3
Upstream	1166.91	.1	.3
Upstream	1120.97	.1	.3
Upstream	1061.91	.1	.3
Upstream	1061.71	.1	.3
Upstream	1037.01	.1	.3
Upstream	1036.91	.1	.3
Upstream	1013.85	.1	.3
Upstream	986.91	.1	.3
Upstream	986.71	.1	.3
Upstream	962.01	.1	.3
Upstream	961.91	.1	.3
Upstream	932.51	.1	.3
Upstream	901.91	.1	.3
Upstream	901.71	.1	.3
Upstream	877.01	.1	.3
Upstream	876.91	.1	.3
Upstream	861.67	.1	.3
Upstream	846.91	.1	.3
Upstream	846.70	.1	.3
Upstream	822.01	.1	.3
Upstream	821.91	.1	.3
Upstream	711.90	.1	.3
Upstream	668.00	.1	.3
Upstream	667.68	.1	.3
Upstream	649.55	.1	.3
Upstream	649.45	.1	.3
Upstream	621.26	.1	.3
Upstream	553.22	.1	.3
Upstream	504.57	.1	.3
Upstream	476.63	.1	.3
Trail	443.00	.1	.3
Trail	412.24	.1	.3
Trail	390.71	.1	.3
Trail	385.90	.1	.3
Trail	320.90	Culvert	
Trail	266.94	.1	.3
Trail	257.31	.1	.3
Trail	246.94	.1	.3
Trail	237.07	.1	.3
Trail	194.07	Culvert	
Trail	148.30	.1	.3
Trail	148.00	Lat Struct	
Trail	139.23	.1	.3
Trail	126.23	.1	.3
Trail	104.53	.1	.3
Trail	83.73	.1	.3

LowFlow	449.30		.1	.3
LowFlow	449.20	Lat Struct		
LowFlow	420.81		.1	.3
LowFlow	399.84		.1	.3
LowFlow	395.23		.3	.5
LowFlow	330.23	Culvert		
LowFlow	258.43		.1	.3
LowFlow	248.43		.1	.3
LowFlow	196.43	Culvert		
LowFlow	146.73		.1	.3
LowFlow	134.20		.1	.3
LowFlow	84.70		.1	.3
LowFlow	52.40		.1	.3
LowFlow	0.00		.1	.3

Profile Output Table - Standard Table 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
Upstream	1518.60	100year	1162.00	6226.47	6239.06	6239.58	0.003624	5.78	201.02	46.82	0.49	
Upstream	1518.60	10year	590.00	6226.47	6237.04	6237.43	0.003692	4.98	118.44	32.80	0.46	
Upstream	1518.60	2year	318.00	6226.47	6235.70	6235.94	0.002889	3.96	80.31	24.29	0.38	
Upstream	1469.76	100year	1162.00	6226.47	6238.79	6239.38	0.004373	6.17	188.37	45.71	0.54	
Upstream	1469.76	10year	590.00	6226.47	6236.78	6237.22	0.004437	5.36	110.00	30.88	0.50	
Upstream	1469.76	2year	318.00	6226.47	6235.52	6235.79	0.003321	4.19	75.98	23.17	0.41	
Upstream	1469.56	100year	1162.00	6231.35	6237.42	6237.42	6239.26	0.020252	11.35	116.77	34.08	0.92
Upstream	1469.56	10year	590.00	6231.35	6235.82	6235.82	6237.14	0.023805	9.35	67.29	27.71	0.93
Upstream	1469.56	2year	318.00	6231.35	6234.69	6234.69	6235.71	0.032026	8.13	39.13	19.18	1.00
Upstream	1444.86	100year	1162.00	6230.28	6236.21							

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6234.88     6236.97     0.009183       6.99       166.22       40.57           0.61
  Upstream      1444.86       10year        590.00     6230.28     6234.89
6233.51     6235.29     0.006649       5.11       115.55       35.85           0.50
  Upstream      1444.86       2year         318.00     6230.28     6233.98
6232.65     6234.20     0.004744       3.76        84.67       32.60           0.41


  Upstream      1444.76       100year      1162.00     6230.29     6236.21
6234.89     6236.97     0.009214       6.99       166.25       40.71           0.61
  Upstream      1444.76       10year        590.00     6230.29     6234.88
6233.54     6235.29     0.006708       5.11       115.38       35.97           0.50
  Upstream      1444.76       2year         318.00     6230.29     6233.98
6232.68     6234.20     0.004814       3.77        84.39       32.71           0.41


  Upstream      1431.84       100year      1162.00     6231.06     6235.26
6235.26     6236.71     0.027331       9.68       120.02       41.61           1.01
  Upstream      1431.84       10year        590.00     6231.06     6234.06
6234.06     6235.07     0.030737       8.08        73.04       36.64           1.01
  Upstream      1431.84       2year         318.00     6231.06     6233.32
6233.32     6234.02     0.033752       6.75        47.11       33.40           1.00


  Upstream      1418.40       100year      1162.00     6227.18     6234.97
      6235.49     0.006197       5.78      200.88       45.95           0.49
  Upstream      1418.40       10year        590.00     6227.18     6233.44
      6233.72     0.004131       4.27      138.08       36.18           0.39
  Upstream      1418.40       2year         318.00     6227.18     6232.39
      6232.54     0.002521       3.07      103.46       30.34           0.29


  Upstream      1418.20       100year      1162.00     6227.11     6234.84
      6235.48     0.004900       6.60      198.10       45.20           0.45
  Upstream      1418.20       10year        590.00     6227.11     6233.42
      6233.72     0.003079       4.46      140.23       36.15           0.34
  Upstream      1418.20       2year         318.00     6227.11     6232.40
      6232.54     0.001907       3.04      106.36       30.52           0.26


  Upstream      1393.50       100year      1162.00     6227.68     6234.93
      6235.30     0.003222       4.91      245.68       58.67           0.38
  Upstream      1393.50       10year        590.00     6227.68     6233.42
      6233.61     0.002650       3.55      166.37       46.06           0.32
  Upstream      1393.50       2year         318.00     6227.68     6232.38
      6232.48     0.001858       2.61      121.75       39.62           0.26


  Upstream      1393.40       100year      1162.00     6227.72     6234.80
      6235.29     0.003559       6.07      237.28       57.52           0.41
  Upstream      1393.40       10year        590.00     6227.72     6233.36
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      6233.61     0.002366       4.21      163.09       45.60           0.32
  Upstream      1393.40       2year         318.00     6227.72     6232.35
      6232.48     0.001546       2.95      120.23       39.51           0.25


  Upstream      1289.23       100year      1162.00     6229.48     6233.10
6233.10     6234.40     0.027734       9.15      127.01       49.61           1.01
  Upstream      1289.23       10year        590.00     6229.48     6232.02
6232.02     6232.93     0.031043       7.65       77.11       43.08           1.01
  Upstream      1289.23       2year         318.00     6229.48     6231.31
6231.31     6231.98     0.034646       6.56       48.48       37.15           1.01


  Upstream      1191.91       100year      1162.00     6223.47     6230.25
      6231.14     0.012049       7.57      153.59       40.27           0.68
  Upstream      1191.91       10year        590.00     6223.47     6228.79
      6229.31     0.008938       5.81      101.51       31.39           0.57
  Upstream      1191.91       2year         318.00     6223.47     6227.87
      6228.15     0.005421       4.22       75.30       25.68           0.43


  Upstream      1191.71       100year      1162.00     6223.38     6229.88
      6231.11     0.011436       9.14      140.93       37.87           0.69
  Upstream      1191.71       10year        590.00     6223.38     6228.75
      6229.31     0.006958       6.09      102.06       31.30           0.52
  Upstream      1191.71       2year         318.00     6223.38     6227.88
      6228.15     0.004493       4.20       77.12       25.81           0.40


  Upstream      1167.01       100year      1162.00     6224.07     6229.90
      6230.76     0.007890       7.71      168.27       44.66           0.59
  Upstream      1167.01       10year        590.00     6224.07     6228.69
      6229.12     0.005264       5.30      118.41       37.97           0.46
  Upstream      1167.01       2year         318.00     6224.07     6227.82
      6228.03     0.003595       3.72       87.60       32.33           0.37


  Upstream      1166.91       100year      1162.00     6224.09     6229.88
      6230.76     0.008049       7.77      167.15       44.58           0.60
  Upstream      1166.91       10year        590.00     6224.09     6228.69
      6229.12     0.005367       5.34      117.65       37.94           0.47
  Upstream      1166.91       2year         318.00     6224.09     6227.81
      6228.03     0.003673       3.75       86.97       32.32           0.37


  Upstream      1120.97       100year      1162.00     6224.60     6228.73
6228.73     6230.09     0.027522       9.35      124.31       46.45           1.01
  Upstream      1120.97       10year        590.00     6224.60     6227.64
6227.64     6228.58     0.030771       7.77       75.90       41.00           1.01
  Upstream      1120.97       2year         318.00     6224.60     6226.93
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6226.93 6227.60 0.034646 6.57 48.40 36.97 1.01

Upstream 1061.91 100year 1162.00 6219.85 6226.75
6227.27 0.006066 5.79 200.67 46.02 0.49
Upstream 1061.91 10year 590.00 6219.85 6225.35
6225.62 0.003906 4.17 141.42 37.90 0.38
Upstream 1061.91 2year 318.00 6219.85 6224.37
6224.50 0.002277 2.96 107.31 31.84 0.28

Upstream 1061.71 100year 1162.00 6219.81 6226.73
6227.27 0.004848 5.96 203.51 45.85 0.45
Upstream 1061.71 10year 590.00 6219.81 6225.35
6225.61 0.003231 4.09 145.69 37.91 0.35
Upstream 1061.71 2year 318.00 6219.81 6224.37
6224.50 0.002038 2.85 111.55 31.99 0.27

Upstream 1037.01 100year 1162.00 6220.77 6226.59
6227.15 0.004867 6.19 210.33 54.43 0.47
Upstream 1037.01 10year 590.00 6220.77 6225.24
6225.53 0.003620 4.40 142.89 45.32 0.39
Upstream 1037.01 2year 318.00 6220.77 6224.28
6224.44 0.002720 3.18 102.74 38.92 0.32

Upstream 1036.91 100year 1162.00 6220.81 6226.58
6227.15 0.005014 6.25 208.40 54.30 0.48
Upstream 1036.91 10year 590.00 6220.81 6225.23
6225.53 0.003759 4.45 141.26 45.26 0.39
Upstream 1036.91 2year 318.00 6220.81 6224.28
6224.44 0.002852 3.23 101.24 38.89 0.33

Upstream 1013.85 100year 1162.00 6221.37 6225.51
6225.51 6226.85 0.026523 9.27 125.34 46.00 0.99
Upstream 1013.85 10year 590.00 6221.37 6224.30
6224.30 6225.27 0.029384 7.90 74.65 37.74 0.99
Upstream 1013.85 2year 318.00 6221.37 6223.51
6223.51 6224.23 0.033224 6.78 46.93 32.93 1.00

Upstream 986.91 100year 1162.00 6215.65 6223.20
6224.06 0.011359 7.41 156.72 38.68 0.65
Upstream 986.91 10year 590.00 6215.65 6221.64
6222.14 0.007707 5.65 104.42 28.20 0.52
Upstream 986.91 2year 318.00 6215.65 6220.62
6220.87 0.004398 4.03 78.95 23.28 0.39

Upstream	986.71	100year	1162.00	6215.56	6223.10	6224.05	0.008542	7.94	157.04	38.00	0.57
Upstream	986.71	10year	590.00	6215.56	6221.67	6222.13	0.005855	5.47	109.14	28.81	0.45
Upstream	986.71	2year	318.00	6215.56	6220.63	6220.86	0.003882	3.83	83.11	23.65	0.36
Upstream	962.01	100year	1162.00	6215.94	6223.29	6223.78	0.003560	5.72	217.80	46.02	0.40
Upstream	962.01	10year	590.00	6215.94	6221.74	6221.97	0.002410	3.92	153.67	36.85	0.31
Upstream	962.01	2year	318.00	6215.94	6220.65	6220.77	0.001586	2.72	117.01	31.22	0.24
Upstream	961.91	100year	1162.00	6215.95	6223.29	6223.78	0.003579	5.73	217.41	46.03	0.40
Upstream	961.91	10year	590.00	6215.95	6221.73	6221.97	0.002428	3.93	153.29	36.87	0.31
Upstream	961.91	2year	318.00	6215.95	6220.65	6220.77	0.001599	2.73	116.66	31.25	0.24
Upstream	932.51	100year	1162.00	6217.77	6221.94	6221.94	6223.45	0.026741	9.86	117.83	39.12	1.00
Upstream	932.51	10year	590.00	6217.77	6220.63	6220.63	6221.71	0.029755	8.35	70.65	32.88	1.00
Upstream	932.51	2year	318.00	6217.77	6219.79	6219.79	6220.58	0.032866	7.11	44.74	28.78	1.00
Upstream	901.91	100year	1162.00	6214.08	6220.29	6219.63	6221.54	0.018019	8.95	129.76	34.08	0.81
Upstream	901.91	10year	590.00	6214.08	6217.76	6217.76	6219.24	0.031527	9.76	60.43	20.51	1.00
Upstream	901.91	2year	318.00	6214.08	6216.98	6217.76	0.022139	7.08	44.90	19.55	0.82
Upstream	901.71	100year	1162.00	6213.92	6219.41	6219.41	6221.45	0.023865	11.57	105.64	29.54	0.94
Upstream	901.71	10year	590.00	6213.92	6217.88	6217.58	6219.10	0.023375	8.85	66.71	21.20	0.87
Upstream	901.71	2year	318.00	6213.92	6217.09	6217.70	0.015423	6.28	50.61	19.83	0.69
Upstream	877.01	100year	1162.00	6213.06	6219.34						

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      6220.37     0.009691       8.23      148.88       38.03           0.63
  Upstream      877.01        10year        590.00     6213.06     6218.14
      6218.61     0.006075       5.50      108.54       29.85           0.48
  Upstream      877.01        2year         318.00     6213.06     6217.18
      6217.41     0.004037       3.86       82.43       25.19           0.38


  Upstream      876.91        100year      1162.00     6213.06     6219.34
      6220.37     0.009676       8.23      148.95       38.07           0.63
  Upstream      876.91        10year        590.00     6213.06     6218.14
      6218.61     0.006067       5.50      108.55       29.91           0.48
  Upstream      876.91        2year         318.00     6213.06     6217.18
      6217.41     0.004038       3.86       82.40       25.20           0.38


  Upstream      861.67        100year      1162.00     6214.39     6218.60
6218.60     6220.09     0.026928       9.81      118.42       39.98           1.00
  Upstream      861.67        10year        590.00     6214.39     6217.28
6217.28     6218.37     0.029756       8.36       70.56       32.83           1.01
  Upstream      861.67        2year         318.00     6214.39     6216.43
6216.43     6217.22     0.032546       7.15       44.50       28.18           1.00


  Upstream      846.91        100year      1162.00     6210.14     6217.15
      6218.22     0.013917       8.31      140.90       35.55           0.70
  Upstream      846.91        10year        590.00     6210.14     6215.52
      6216.15     0.010941       6.36       92.74       25.45           0.59
  Upstream      846.91        2year         318.00     6210.14     6214.59
      6214.90     0.006188       4.46       71.26       21.63           0.43


  Upstream      846.70        100year      1162.00     6210.07     6217.22
      6218.19     0.012001       7.93      147.81       36.09           0.65
  Upstream      846.70        10year        590.00     6210.07     6215.57
      6216.13     0.009300       6.01       98.22       25.78           0.54
  Upstream      846.70        2year         318.00     6210.07     6214.62
      6214.89     0.005101       4.18       76.03       21.66           0.39


  Upstream      822.01        100year      1162.00     6210.38     6216.25
6215.66     6217.79     0.016797      10.01      120.00       31.76           0.80
  Upstream      822.01        10year        590.00     6210.38     6215.23
      6215.89     0.009557       6.50       91.19       25.13           0.58
  Upstream      822.01        2year         318.00     6210.38     6214.46
      6214.76     0.005359       4.35       73.04       22.55           0.43


  Upstream      821.91        100year      1162.00     6210.41     6216.18
6215.68     6217.79     0.017809      10.21      117.44       31.29           0.82
  Upstream      821.91        10year        590.00     6210.41     6215.22
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      6215.88     0.009806       6.56       90.35       25.01           0.59
  Upstream      821.91        2year         318.00     6210.41     6214.46
      6214.76     0.005486       4.39       72.43       22.50           0.43


  Upstream      711.90        100year      1162.00     6210.55     6215.64
      6216.15     0.008469       5.74      202.31       62.68           0.56
  Upstream      711.90        10year        590.00     6210.55     6213.89
      6214.43     0.017494       5.90       99.93       51.27           0.75
  Upstream      711.90        2year         318.00     6210.55     6212.85
6212.85     6213.46     0.037835       6.26       50.79       42.62           1.01


  Upstream      668.00        100year      1162.00     6206.59     6215.50
      6215.82     0.004958       4.50      258.01       74.32           0.43
  Upstream      668.00        10year        590.00     6206.59     6213.60
      6213.90     0.007071       4.32      136.45       52.91           0.47
  Upstream      668.00        2year         318.00     6206.59     6212.27
      6212.51     0.006489       3.95       80.59       31.37           0.43


  Upstream      667.68        100year      1162.00     6206.52     6215.32
      6215.80     0.005027       6.31      245.66       72.38           0.42
  Upstream      667.68        10year        590.00     6206.52     6213.46
      6213.88     0.005703       5.50      129.53       50.94           0.42
  Upstream      667.68        2year         318.00     6206.52     6212.23
      6212.51     0.004355       4.25       79.80       31.00           0.35


  Upstream      649.55        100year      1162.00     6207.07     6215.04
      6215.68     0.005701       7.16      213.19       61.48           0.49
  Upstream      649.55        10year        590.00     6207.07     6213.28
      6213.77     0.005827       5.87      118.50       44.47           0.47
  Upstream      649.55        2year         318.00     6207.07     6212.11
      6212.42     0.004972       4.50       74.99       30.43           0.42


  Upstream      649.45        100year      1162.00     6207.08     6215.04
      6215.68     0.005720       7.17      213.02       61.49           0.49
  Upstream      649.45        10year        590.00     6207.08     6213.27
      6213.77     0.005861       5.88      118.28       44.45           0.48
  Upstream      649.45        2year         318.00     6207.08     6212.11
      6212.42     0.005010       4.51       74.81       30.43           0.42


  Upstream      621.26        100year      1162.00     6208.27     6213.74
6213.74     6215.32     0.017785      10.86      131.34       43.77           0.89
  Upstream      621.26        10year        590.00     6208.27     6212.21
6212.21     6213.41     0.021420       9.11       72.89       32.47           0.91
  Upstream      621.26        2year         318.00     6208.27     6211.18
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6211.18 6212.09 0.026563 7.75 43.37 25.20 0.95

Upstream 553.22 100year 1162.00 6208.27 6212.47
6212.14 6213.61 0.007887 9.18 153.68 68.12 0.83
Upstream 553.22 10year 590.00 6208.27 6211.39
6210.94 6212.04 0.006806 6.82 100.18 60.20 0.73
Upstream 553.22 2year 318.00 6208.27 6210.66
6210.19 6211.04 0.005989 5.19 68.47 54.84 0.65

Upstream 504.57 100year 1162.00 6207.97 6211.78
6211.78 6213.14 0.010730 9.71 136.31 69.24 0.94
Upstream 504.57 10year 590.00 6207.97 6210.64
6210.64 6211.57 0.012421 7.88 80.69 60.39 0.95
Upstream 504.57 2year 318.00 6207.97 6209.92
6209.92 6210.58 0.014885 6.56 50.21 54.75 0.97

Upstream 476.63 100year 1162.00 6201.17 6207.41
6206.85 6208.79 0.006490 11.33 160.15 62.13 0.81
Upstream 476.63 10year 590.00 6201.17 6205.21
6205.21 6206.54 0.010066 10.47 77.85 45.24 0.93
Upstream 476.63 2year 318.00 6201.17 6204.08
6204.08 6205.08 0.011160 8.76 46.57 24.37 0.93

Trail 443.00 100year 757.00 6202.29 6206.68
6206.68 6208.60 0.001483 11.60 95.94 28.54 0.99
Trail 443.00 10year 214.00 6202.29 6204.39
6204.39 6205.29 0.001767 7.61 31.33 28.03 0.95
Trail 443.00 2year 0.00 6202.29 6202.31
6202.31 6202.31 0.000000 0.00 0.01 1.30 0.00

Trail 412.24 100year 757.00 6200.18 6206.03
6207.38 0.000653 9.36 89.58 17.29 0.69
Trail 412.24 10year 214.00 6200.18 6202.22
6202.22 6203.19 0.001997 7.91 27.90 14.96 1.00
Trail 412.24 2year 0.00 6200.18 6200.20
6200.20 6200.20 0.000000 0.00 0.02 1.55 0.00

Trail 390.71 100year 757.00 6198.46 6206.47
6207.17 0.000224 6.78 126.91 17.78 0.43
Trail 390.71 10year 214.00 6198.46 6201.89
6202.22 0.000324 4.58 49.47 15.76 0.44
Trail 390.71 2year 0.00 6198.46 6198.48
6198.48 6198.48 0.000000 0.00 0.01 1.30 0.00

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  Trail         385.90        100year       911.22     6198.17     6205.98
6203.36     6207.13     0.000376       8.72      134.31       17.90           0.55
  Trail         385.90        10year        239.11     6198.17     6201.87
6200.25     6202.21     0.000307       4.79       62.58       16.99           0.44
  Trail         385.90        2year           0.59     6198.17     6198.24
6197.48     6198.24     0.000200       0.28        2.42       15.87           0.18


  Trail         320.90                    Culvert


  Trail         266.94        100year       911.22     6192.47     6203.16
      6203.83     0.000148       6.75      196.31       18.74           0.36
  Trail         266.94        10year        239.11     6192.47     6196.06
      6196.44     0.000369       5.15       64.94       18.25           0.48
  Trail         266.94        2year           0.59     6192.47     6192.51
6192.51     6192.53     0.006827       1.11        0.68       17.65           0.98


  Trail         257.31        100year       911.22     6192.16     6203.35
      6203.75     0.000069       5.12      206.56       19.25           0.27
  Trail         257.31        10year        239.11     6192.16     6196.17
      6196.39     0.000155       3.81       70.36       18.67           0.34
  Trail         257.31        2year           0.59     6192.16     6192.27
6192.27     6192.30     0.006573       1.49        0.41        7.09           1.10


  Trail         246.94        100year       911.22     6191.93     6203.09
      6203.73     0.000114       6.56      206.06       20.36           0.35
  Trail         246.94        10year        239.11     6191.93     6196.02
      6196.37     0.000240       4.82       64.30       19.77           0.43
  Trail         246.94        2year           0.59     6191.93     6192.05
6192.05     6192.09     0.006275       1.45        0.41        7.23           1.07


  Trail         237.07        100year       911.22     6191.84     6202.70
6198.04     6203.69     0.000179       8.13      155.02       19.50           0.43
  Trail         237.07        10year        239.11     6191.84     6195.84
6194.39     6196.35     0.000351       5.84       49.25       13.54           0.51
  Trail         237.07        2year           0.59     6191.84     6191.90
6191.90     6191.91     0.003708       1.09        0.55       10.11           0.82


  Trail         194.07                    Culvert


  Trail         148.30        100year       911.22     6191.05     6197.13
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6197.13     6200.05     0.001169      14.11       93.83       18.99           1.01
  Trail         148.30        10year        239.11     6191.05     6193.55
6193.55     6194.80     0.001609       9.15       33.37       14.79           1.02
  Trail         148.30        2year           0.59     6191.05     6191.08
6191.08     6191.12     0.014500       1.57        0.45       11.89           1.50


  Trail         148.00                  Lat Struct



  Trail         139.23        100year       911.22     6188.94     6193.85
6193.37     6195.60     0.002032      11.88      121.63       26.52           0.95
  Trail         139.23        10year        239.11     6188.94     6193.21
      6193.37     0.000214       3.60      104.91       25.93           0.31
  Trail         139.23        2year           0.59     6188.94     6189.01
      6189.01     0.000053       0.09        4.72       19.49           0.08


  Trail         126.23        100year       911.22     6188.66     6194.08
      6195.47     0.001501      10.58      136.50       28.18           0.82
  Trail         126.23        10year        239.11     6188.66     6193.22
      6193.36     0.000178       3.34      112.83       27.29           0.28
  Trail         126.23        2year           0.59     6188.66     6189.01
      6189.01     0.000004       0.09        9.68       21.64           0.03


  Trail         104.53        100year       911.22     6188.69     6194.09
      6195.42     0.001084      10.32      150.29       33.63           0.79
  Trail         104.53        10year        239.11     6188.69     6193.23
      6193.36     0.000137       3.26      121.95       31.79           0.27
  Trail         104.53        2year           0.59     6188.69     6189.01
      6189.01     0.000005       0.10        8.76       21.78           0.04


  Trail         83.73         100year       911.22     6189.21     6194.53
6192.99     6195.21     0.000472       7.32      235.12       67.98           0.57
  Trail         83.73         10year        239.11     6189.21     6193.25
6190.87     6193.34     0.000092       2.66      155.27       56.84           0.24
  Trail         83.73         2year           0.59     6189.21     6188.94
6188.94     6189.00     0.088195                0.29        2.65           0.00


  LowFlow       449.30        100year       405.00     6198.78     6202.35
6202.35     6203.56     0.019842      10.74       52.24       22.14           1.01
  LowFlow       449.30        10year        376.00     6198.78     6204.64
      6204.87     0.002204       4.99      112.59       30.75           0.36
  LowFlow       449.30        2year         318.00     6198.78     6203.46
      6203.79     0.004040       5.81       79.03       26.31           0.48
```

LowFlow	449.20			Lat Struct							
LowFlow	420.81	100year	324.48	6196.23	6201.96	6202.06	0.000907	2.67	127.73	31.14	0.22
LowFlow	420.81	10year	350.89	6196.23	6204.75	6204.80	0.000204	1.75	215.55	31.69	0.11
LowFlow	420.81	2year	317.41	6196.23	6203.63	6203.69	0.000293	1.88	180.23	31.47	0.13
LowFlow	399.84	100year	265.64	6194.67	6202.01	6202.03	0.000166	1.52	231.96	54.60	0.10
LowFlow	399.84	10year	350.89	6194.67	6204.77	6204.79	0.000067	1.21	406.31	71.43	0.07
LowFlow	399.84	2year	317.41	6194.67	6203.65	6203.67	0.000094	1.32	330.23	64.66	0.08
LowFlow	395.23	100year	250.78	6194.69	6202.00	6197.07	6202.03	0.000195	1.52	190.56	46.13	0.11
LowFlow	395.23	10year	350.89	6194.69	6204.76	6197.53	6204.79	0.000087	1.29	345.59	66.64	0.08
LowFlow	395.23	2year	317.41	6194.69	6203.64	6197.38	6203.67	0.000123	1.41	275.82	58.05	0.09
LowFlow	330.23			Culvert							
LowFlow	258.43	100year	250.78	6189.50	6199.61	6199.75	0.000165	3.01	83.31	8.28	0.17
LowFlow	258.43	10year	350.89	6189.50	6199.34	6199.63	0.000345	4.33	81.11	8.28	0.24
LowFlow	258.43	2year	317.41	6189.50	6198.22	6198.52	0.000379	4.42	71.78	8.27	0.26
LowFlow	248.43	100year	250.78	6189.50	6199.61	6192.58	6199.75	0.000167	3.02	83.00	8.33	0.17
LowFlow	248.43	10year	350.89	6189.50	6199.34	6193.37	6199.63	0.000348	4.34	80.76	8.32	0.25
LowFlow	248.43	2year	317.41	6189.50	6198.21	6193.11	6198.52	0.000384	4.45	71.39	8.30	0.27
LowFlow	196.43			Culvert							

LowFlow	146.73	100year	250.78	6189.00	6197.56	
6197.57	0.000041	0.88	292.81	35.31	0.05	
LowFlow	146.73	10year	350.89	6189.00	6194.11	
6194.18	0.000448	2.07	173.01	34.54	0.16	
LowFlow	146.73	2year	317.41	6189.00	6192.16	
6192.31	0.001822	3.04	106.00	34.10	0.30	
LowFlow	134.20	100year	1007.78	6188.94	6197.44	
6197.56	0.000277	2.94	412.05	62.02	0.18	
LowFlow	134.20	10year	564.89	6188.94	6194.04	
6194.17	0.000537	2.91	219.45	51.42	0.23	
LowFlow	134.20	2year	317.41	6188.94	6192.17	
6192.28	0.000834	2.68	128.78	45.38	0.26	
LowFlow	84.70	100year	1007.78	6188.31	6197.48	
6197.53	0.000125	1.93	588.13	93.15	0.12	
LowFlow	84.70	10year	564.89	6188.31	6194.07	
6194.13	0.000252	1.93	304.26	72.72	0.15	
LowFlow	84.70	2year	317.41	6188.31	6192.19	
6192.23	0.000410	1.78	178.36	60.44	0.18	
LowFlow	52.40	100year	1007.78	6187.88	6197.48	
6197.52	0.000085	1.66	704.14	117.62	0.10	
LowFlow	52.40	10year	564.89	6187.88	6194.08	
6194.12	0.000148	1.59	368.49	78.59	0.12	
LowFlow	52.40	2year	317.41	6187.88	6192.19	
6192.22	0.000193	1.38	231.34	66.90	0.13	
LowFlow	0.00	100year	1007.78	6187.26	6196.77	
6192.74	6197.45	0.002219	6.71	167.73	31.99	0.40
LowFlow	0.00	10year	564.89	6187.26	6193.45	
6191.12	6194.04	0.003481	6.17	92.42	18.07	0.46
LowFlow	0.00	2year	317.41	6187.26	6191.78	
6189.97	6192.16	0.003495	4.93	64.33	16.18	0.44

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US.	W.S. US.	E.G. IC	E.G. OC	Min El Weir Flow	Q Culv Group	Q Weir	Delta WS	Culv Vel US	Culv

Vel DS										
						(ft)	(ft)	(ft)		
(ft)	(ft)		(cfs)	(cfs)		(ft)	(ft/s)			
(ft/s)										
Trail	320.90	Culvert #1	100year	6207.13	6205.98	6207.13	6208.04	6225.47	911.22	2.82
13.47	9.49									
Trail	320.90	Culvert #1	10year	6202.21	6201.87	6201.63	6202.21	6225.47	239.11	5.81
8.62	19.18									
Trail	320.90	Culvert #1	2year	6198.24	6198.24	6198.04	6198.24	6225.47	0.59	5.73
1.17	1.81									
Trail	194.07	Culvert #1	100year	6203.69	6202.70	6203.16	6203.69	6218.99	911.22	5.56
15.57	17.32									
Trail	194.07	Culvert #1	10year	6196.35	6195.84	6195.72	6196.35	6218.99	239.11	2.28
9.27	11.71									
Trail	194.07	Culvert #1	2year	6191.82	6191.90	6191.77	6191.82	6218.99	0.59	0.81
1.23	1.44									
LowFlow	330.23	Culvert #1	100year	6202.03	6202.00	6201.78	6202.03	6220.63	250.78	2.39
9.56	9.07									
LowFlow	330.23	Culvert #1	10year	6204.79	6204.76	6204.79	6204.08	6220.63	350.89	5.42
12.41	15.67									
LowFlow	330.23	Culvert #1	2year	6203.67	6203.64	6203.67	6203.32	6220.63	317.41	5.43
11.23	14.36									
LowFlow	196.43	Culvert #1	100year	6199.75	6199.61	6196.63	6199.75	6218.32	250.78	2.05
8.87	8.87									
LowFlow	196.43	Culvert #1	10year	6199.64	6199.34	6199.64	6198.90	6218.32	350.89	5.22
12.41	16.30									
LowFlow	196.43	Culvert #1	2year	6198.52	6198.21	6198.52				

6198.17 6218.32 317.41 6.04 11.23
14.89

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed_EffectiveFlows

River: IndustrailTrib Reach: Upstream RS: 1469.76 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1469.76 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1469.76 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1469.56 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1469.56 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
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the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1469.56 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1444.86 Profile: 100year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.86 Profile: 10year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.86 Profile: 2year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.76 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.76 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.76 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1431.84 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1431.84 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1431.84 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may

indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 1393.40   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 1393.40   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 1393.40   Profile: 2year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 1289.23   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 1289.23   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1289.23 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1166.91 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1166.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1166.91 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1120.97 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1120.97 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1120.97 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1036.91 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1036.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1036.91 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1013.85 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1013.85 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1013.85 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current

and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 986.71 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 986.71 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 986.71 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 961.91 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 961.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 961.91 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 932.51 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 932.51   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
program defaulted to critical depth.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 932.51   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 901.91   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 901.91   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 901.71   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was

set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 901.71 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 901.71 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 876.91 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 876.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 876.91 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 861.67 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 861.67 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current

and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 861.67 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 846.70 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 821.91 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 821.91 Profile: 10year
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 821.91 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 711.90 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 711.90 Profile: 2year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:Divided flow computed for this cross-section.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 649.45 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 649.45 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 649.45 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 621.26 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 621.26 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 621.26 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 553.22 Profile: 100year
Warning:Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 553.22 Profile: 10year
Warning:Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 553.22 Profile: 2year
Warning:Divided flow computed for this cross-section.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

River: IndustrailTrib Reach: Upstream   RS: 504.57   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream   RS: 504.57   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream   RS: 504.57   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream   RS: 476.63   Profile: 100year
     Warning:Divided flow computed for this cross-section.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:A flow split was encountered. The program first calculated the

momentum of both channels below the junction. An
energy balance was performed across the junction from the stream with the highest momentum downstream to the section
upstream.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 476.63 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:Divided flow computed for this cross-section.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:A flow split was encountered. The program first calculated the momentum of both channels below the junction. An
energy balance was performed across the junction from the stream with the highest momentum downstream to the section
upstream.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 476.63 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:A flow split was encountered. The program first calculated the momentum of both channels below the junction. An
energy balance was performed across the junction from the stream with the highest momentum downstream to the section
upstream.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Trail RS: 443.00 Profile: 100year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 443.00 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 443.00 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 412.24 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 412.24 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 412.24 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 390.71 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 390.71 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 385.90 Profile: 100year

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: IndustrailTrib Reach: Trail RS: 385.90 Profile: 10year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: IndustrailTrib Reach: Trail RS: 385.90 Profile: 2year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: IndustrailTrib Reach: Trail RS: 320.90 Profile: 100year Culv: Culvert #1
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
River: IndustrailTrib Reach: Trail RS: 320.90 Profile: 10year Culv: Culvert #1
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 320.90 Profile: 2year Culv: Culvert #1
Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 266.94 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 266.94 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 266.94 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 257.31 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

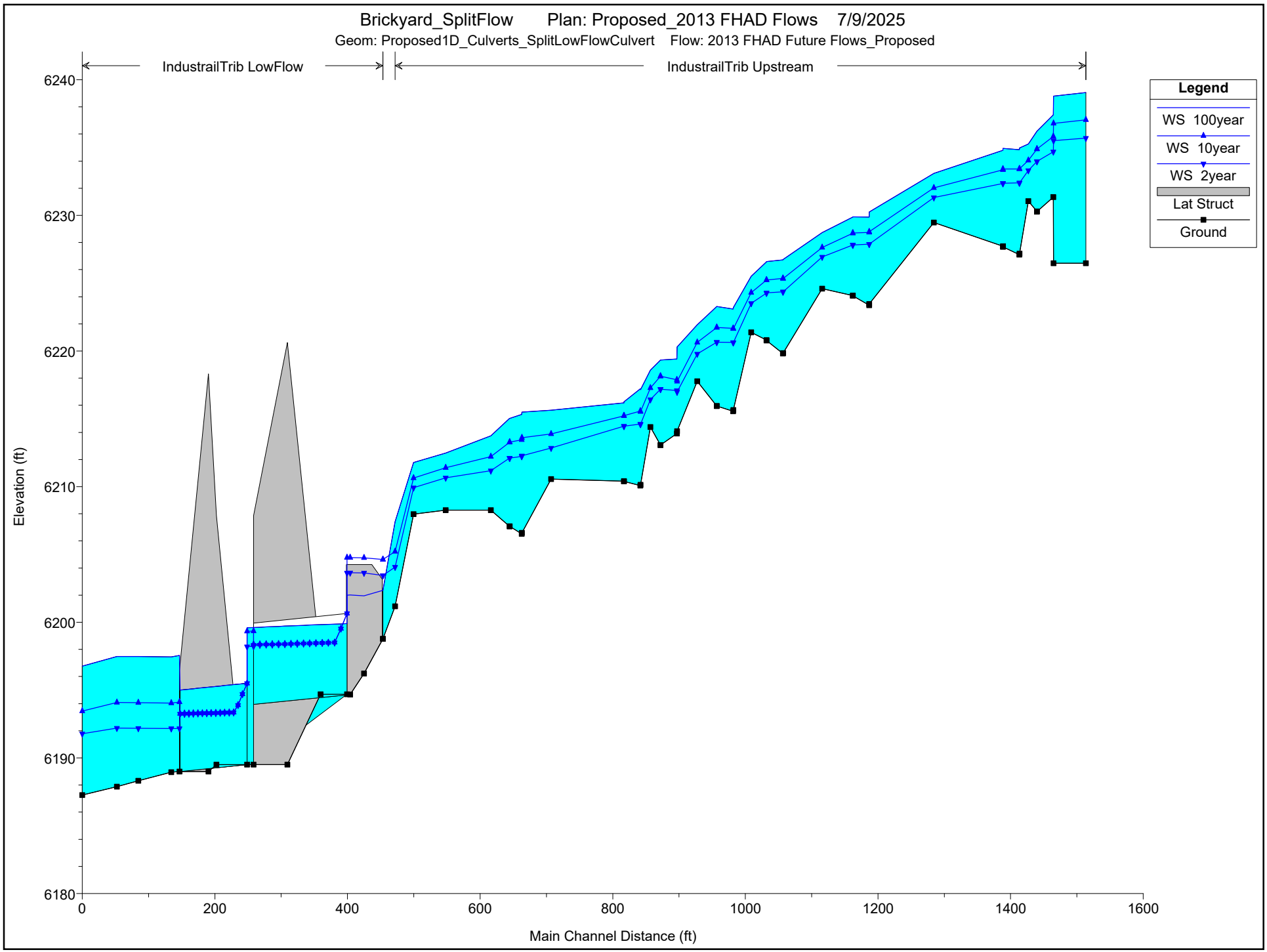
River: IndustrailTrib Reach: Trail RS: 246.94 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 237.07 Profile: 2year
Warning:During subcritical analysis, the water surface upstream of culvert went to critical depth.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 100year Culv: Culvert #1
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 10year Culv: Culvert #1
Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross
section downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 2year
Warning:During subcritical analysis, the water surface upstream of culvert went to critical depth.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 2year Culv: Culvert #1
Note: During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth. Therefore,
the outlet will be at normal depth.
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 148.30 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 148.30 Profile: 10year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 148.30 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 148.00 Profile: 100year
Warning:The split flow optimization for the lateral structure failed to converge within the maximum number of iterations.
The results from the final iteration were used.
River: IndustrailTrib Reach: Trail RS: 148.00 Profile: 10year
Warning:The split flow optimization for the lateral structure failed to converge within the maximum number of iterations.
The results from the final iteration were used.
River: IndustrailTrib Reach: Trail RS: 139.23 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 139.23 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 139.23 Profile: 2year

Warning:Divided flow computed for this cross-section.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 126.23 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 126.23 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 104.53 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 104.53 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 104.53 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 83.73 Profile: 2year
Warning:There is no flow in the channel. Check that the channel stations are correctly coded. To force flow into the
channel, a levee or ineffective flow may have to be added or the Manning's n of the overbank could be increased.
River: IndustrailTrib Reach: LowFlow RS: 449.30 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: LowFlow RS: 449.30 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.

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     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 449.30     Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 449.20     Profile: 100year
     Warning:The split flow optimization for the lateral structure failed to
converge within the maximum number of iterations.
             The results from the final iteration were used.
River: IndustrailTrib  Reach: LowFlow     RS: 449.20     Profile: 10year
     Warning:The split flow optimization for the lateral structure failed to
converge within the maximum number of iterations.
             The results from the final iteration were used.
River: IndustrailTrib  Reach: LowFlow     RS: 420.81     Profile: 100year
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 420.81     Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the
computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 420.81     Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 399.84     Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the
computed water surface.
River: IndustrailTrib  Reach: LowFlow     RS: 330.23     Profile: 10year     Culv:
Culvert #1
     Note:   The normal depth exceeds the height of the culvert.  The program
assumes that the normal depth is equal to the height
             of the culvert.
     Note:   The flow in the culvert is entirely supercritical.
River: IndustrailTrib  Reach: LowFlow     RS: 330.23     Profile: 2year     Culv:
Culvert #1
     Note:   The flow in the culvert is entirely supercritical.
River: IndustrailTrib  Reach: LowFlow     RS: 196.43     Profile: 10year     Culv:
Culvert #1
     Note:   The normal depth exceeds the height of the culvert.  The program
assumes that the normal depth is equal to the height
             of the culvert.
     Note:   The flow in the culvert is entirely supercritical.
River: IndustrailTrib  Reach: LowFlow     RS: 196.43     Profile: 2year     Culv:
Culvert #1
     Note:   The flow in the culvert is entirely supercritical.
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River: IndustrailTrib Reach: LowFlow   RS: 146.73   Profile: 100year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 146.73   Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 146.73   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 134.20   Profile: 100year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 134.20   Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 84.70   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 52.40   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 52.40   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 52.40   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 0.00   Profile: 10year
     Warning:Divided flow computed for this cross-section.


Brickyard_SplitFlow Plan: Proposed_2013 FHAD Flows 7/9/2025
Geom: Proposed1D_Culverts_SplitLowFlowCulvert Flow: 2013 FHAD Future Flows_Proposed
IndustrailTrib LowFlow
IndustrailTrib Upstream
Legend
WS 100year
WS 10year
WS 2year
Lat Struct
Ground
Elevation (ft)
6240
6230
6220
6210
6200
6190
6180
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)

HEC-RAS Plan: Proposed_FHADFlows

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)	
Upstream	1518.60	100year	1162.00	6226.47	6239.06		6239.58	0.003624	5.78	201.02	46.82	0.49
Upstream	1518.60	10year	590.00	6226.47	6237.04		6237.43	0.003692	4.98	118.44	32.80	0.46
Upstream	1518.60	2year	318.00	6226.47	6235.70		6235.94	0.002889	3.96	80.31	24.29	0.38
Upstream	1469.76	100year	1162.00	6226.47	6238.79		6239.38	0.004373	6.17	188.37	45.71	0.54
Upstream	1469.76	10year	590.00	6226.47	6236.78		6237.22	0.004437	5.36	110.00	30.88	0.50
Upstream	1469.76	2year	318.00	6226.47	6235.52		6235.79	0.003321	4.19	75.98	23.17	0.41
Upstream	1469.56	100year	1162.00	6231.35	6237.42	6237.42	6239.26	0.020252	11.35	116.77	34.08	0.92
Upstream	1469.56	10year	590.00	6231.35	6235.82	6235.82	6237.14	0.023805	9.35	67.29	27.71	0.93
Upstream	1469.56	2year	318.00	6231.35	6234.69	6234.69	6235.71	0.032026	8.13	39.13	19.18	1.00
Upstream	1444.86	100year	1162.00	6230.28	6236.21	6234.88	6236.97	0.009183	6.99	166.22	40.57	0.61
Upstream	1444.86	10year	590.00	6230.28	6234.89	6233.51	6235.29	0.006649	5.11	115.55	35.85	0.50
Upstream	1444.86	2year	318.00	6230.28	6233.98	6232.65	6234.20	0.004744	3.76	84.67	32.60	0.41
Upstream	1444.76	100year	1162.00	6230.29	6236.21	6234.89	6236.97	0.009214	6.99	166.25	40.71	0.61
Upstream	1444.76	10year	590.00	6230.29	6234.88	6233.54	6235.29	0.006708	5.11	115.38	35.97	0.50
Upstream	1444.76	2year	318.00	6230.29	6233.98	6232.68	6234.20	0.004814	3.77	84.39	32.71	0.41
Upstream	1431.84	100year	1162.00	6231.06	6235.26	6235.26	6236.71	0.027331	9.68	120.02	41.61	1.01
Upstream	1431.84	10year	590.00	6231.06	6234.06	6234.06	6235.07	0.030737	8.08	73.04	36.64	1.01
Upstream	1431.84	2year	318.00	6231.06	6233.32	6233.32	6234.02	0.033752	6.75	47.11	33.40	1.00
Upstream	1418.40	100year	1162.00	6227.18	6234.97		6235.49	0.006197	5.78	200.88	45.95	0.49
Upstream	1418.40	10year	590.00	6227.18	6233.44		6233.72	0.004131	4.27	138.08	36.18	0.39
Upstream	1418.40	2year	318.00	6227.18	6232.39		6232.54	0.002521	3.07	103.46	30.34	0.29
Upstream	1418.20	100year	1162.00	6227.11	6234.84		6235.48	0.004900	6.60	198.10	45.20	0.45
Upstream	1418.20	10year	590.00	6227.11	6233.42		6233.72	0.003079	4.46	140.23	36.15	0.34
Upstream	1418.20	2year	318.00	6227.11	6232.40		6232.54	0.001907	3.04	106.36	30.52	0.26
Upstream	1393.50	100year	1162.00	6227.68	6234.93		6235.30	0.003222	4.91	245.68	58.67	0.38
Upstream	1393.50	10year	590.00	6227.68	6233.42		6233.61	0.002650	3.55	166.37	46.06	0.32
Upstream	1393.50	2year	318.00	6227.68	6232.38		6232.48	0.001858	2.61	121.75	39.62	0.26
Upstream	1393.40	100year	1162.00	6227.72	6234.80		6235.29	0.003559	6.07	237.28	57.52	0.41
Upstream	1393.40	10year	590.00	6227.72	6233.36		6233.61	0.002366	4.21	163.09	45.60	0.32
Upstream	1393.40	2year	318.00	6227.72	6232.35		6232.48	0.001546	2.95	120.23	39.51	0.25
Upstream	1289.23	100year	1162.00	6229.48	6233.10	6233.10	6234.40	0.027734	9.15	127.01	49.61	1.01
Upstream	1289.23	10year	590.00	6229.48	6232.02	6232.02	6232.93	0.031043	7.65	77.11	43.08	1.01
Upstream	1289.23	2year	318.00	6229.48	6231.31	6231.31	6231.98	0.034646	6.56	48.48	37.15	1.01
Upstream	1191.91	100year	1162.00	6223.47	6230.25		6231.14	0.012049	7.57	153.59	40.27	0.68
Upstream	1191.91	10year	590.00	6223.47	6228.79		6229.31	0.008938	5.81	101.51	31.39	0.57
Upstream	1191.91	2year	318.00	6223.47	6227.87		6228.15	0.005421	4.22	75.30	25.68	0.43
Upstream	1191.71	100year	1162.00	6223.38	6229.88		6231.11	0.011436	9.14	140.93	37.87	0.69
Upstream	1191.71	10year	590.00	6223.38	6228.75		6229.31	0.006958	6.09	102.06	31.30	0.52
Upstream	1191.71	2year	318.00	6223.38	6227.88		6228.15	0.004493	4.20	77.12	25.81	0.40
Upstream	1167.01	100year	1162.00	6224.07	6229.90		6230.76	0.007890	7.71	168.27	44.66	0.59
Upstream	1167.01	10year	590.00	6224.07	6228.69		6229.12	0.005264	5.30	118.41	37.97	0.46
Upstream	1167.01	2year	318.00	6224.07	6227.82		6228.03	0.003595	3.72	87.60	32.33	0.37
Upstream	1166.91	100year	1162.00	6224.09	6229.88		6230.76	0.008049	7.77	167.15	44.58	0.60
Upstream	1166.91	10year	590.00	6224.09	6228.69		6229.12	0.005367	5.34	117.65	37.94	0.47
Upstream	1166.91	2year	318.00	6224.09	6227.81		6228.03	0.003673	3.75	86.97	32.32	0.37
Upstream	1120.97	100year	1162.00	6224.60	6228.73	6228.73	6230.09	0.027522	9.35	124.31	46.45	1.01
Upstream	1120.97	10year	590.00	6224.60	6227.64	6227.64	6228.58	0.030771	7.77	75.90	41.00	1.01
Upstream	1120.97	2year	318.00	6224.60	6226.93	6226.93	6227.60	0.034646	6.57	48.40	36.97	1.01
Upstream	1061.91	100year	1162.00	6219.85	6226.75		6227.27	0.006066	5.79	200.67	46.02	0.49
Upstream	1061.91	10year	590.00	6219.85	6225.35		6225.62	0.003906	4.17	141.42	37.90	0.38
Upstream	1061.91	2year	318.00	6219.85	6224.37		6224.50	0.002277	2.96	107.31	31.84	0.28
Upstream	1061.71	100year	1162.00	6219.81	6226.73		6227.27	0.004848	5.96	203.51	45.85	0.45
Upstream	1061.71	10year	590.00	6219.81	6225.35		6225.61	0.003231	4.09	145.69	37.91	0.35
Upstream	1061.71	2year	318.00	6219.81	6224.37		6224.50	0.002038	2.85	111.55	31.99	0.27

HEC-RAS Plan: Proposed_FHADFlows (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)	
Upstream	1037.01	100year	1162.00	6220.77	6226.59		6227.15	0.004867	6.19	210.33	54.43	0.47
Upstream	1037.01	10year	590.00	6220.77	6225.24		6225.53	0.003620	4.40	142.89	45.32	0.39
Upstream	1037.01	2year	318.00	6220.77	6224.28		6224.44	0.002720	3.18	102.74	38.92	0.32
Upstream	1036.91	100year	1162.00	6220.81	6226.58		6227.15	0.005014	6.25	208.40	54.30	0.48
Upstream	1036.91	10year	590.00	6220.81	6225.23		6225.53	0.003759	4.45	141.26	45.26	0.39
Upstream	1036.91	2year	318.00	6220.81	6224.28		6224.44	0.002852	3.23	101.24	38.89	0.33
Upstream	1013.85	100year	1162.00	6221.37	6225.51	6225.51	6226.85	0.026523	9.27	125.34	46.00	0.99
Upstream	1013.85	10year	590.00	6221.37	6224.30	6224.30	6225.27	0.029384	7.90	74.65	37.74	0.99
Upstream	1013.85	2year	318.00	6221.37	6223.51	6223.51	6224.23	0.033224	6.78	46.93	32.93	1.00
Upstream	986.91	100year	1162.00	6215.65	6223.20		6224.06	0.011359	7.41	156.72	38.68	0.65
Upstream	986.91	10year	590.00	6215.65	6221.64		6222.14	0.007707	5.65	104.42	28.20	0.52
Upstream	986.91	2year	318.00	6215.65	6220.62		6220.87	0.004398	4.03	78.95	23.28	0.39
Upstream	986.71	100year	1162.00	6215.56	6223.10		6224.05	0.008542	7.94	157.04	38.00	0.57
Upstream	986.71	10year	590.00	6215.56	6221.67		6222.13	0.005855	5.47	109.14	28.81	0.45
Upstream	986.71	2year	318.00	6215.56	6220.63		6220.86	0.003882	3.83	83.11	23.65	0.36
Upstream	962.01	100year	1162.00	6215.94	6223.29		6223.78	0.003560	5.72	217.80	46.02	0.40
Upstream	962.01	10year	590.00	6215.94	6221.74		6221.97	0.002410	3.92	153.67	36.85	0.31
Upstream	962.01	2year	318.00	6215.94	6220.65		6220.77	0.001586	2.72	117.01	31.22	0.24
Upstream	961.91	100year	1162.00	6215.95	6223.29		6223.78	0.003579	5.73	217.41	46.03	0.40
Upstream	961.91	10year	590.00	6215.95	6221.73		6221.97	0.002428	3.93	153.29	36.87	0.31
Upstream	961.91	2year	318.00	6215.95	6220.65		6220.77	0.001599	2.73	116.66	31.25	0.24
Upstream	932.51	100year	1162.00	6217.77	6221.94	6221.94	6223.45	0.026741	9.86	117.83	39.12	1.00
Upstream	932.51	10year	590.00	6217.77	6220.63	6220.63	6221.71	0.029755	8.35	70.65	32.88	1.00
Upstream	932.51	2year	318.00	6217.77	6219.79	6219.79	6220.58	0.032866	7.11	44.74	28.78	1.00
Upstream	901.91	100year	1162.00	6214.08	6220.29	6219.63	6221.54	0.018019	8.95	129.76	34.08	0.81
Upstream	901.91	10year	590.00	6214.08	6217.76	6217.76	6219.24	0.031527	9.76	60.43	20.51	1.00
Upstream	901.91	2year	318.00	6214.08	6216.98		6217.76	0.022139	7.08	44.90	19.55	0.82
Upstream	901.71	100year	1162.00	6213.92	6219.41	6219.41	6221.45	0.023865	11.57	105.64	29.54	0.94
Upstream	901.71	10year	590.00	6213.92	6217.88	6217.58	6219.10	0.023375	8.85	66.71	21.20	0.87
Upstream	901.71	2year	318.00	6213.92	6217.09		6217.70	0.015423	6.28	50.61	19.83	0.69
Upstream	877.01	100year	1162.00	6213.06	6219.34		6220.37	0.009691	8.23	148.88	38.03	0.63
Upstream	877.01	10year	590.00	6213.06	6218.14		6218.61	0.006075	5.50	108.54	29.85	0.48
Upstream	877.01	2year	318.00	6213.06	6217.18		6217.41	0.004037	3.86	82.43	25.19	0.38
Upstream	876.91	100year	1162.00	6213.06	6219.34		6220.37	0.009676	8.23	148.95	38.07	0.63
Upstream	876.91	10year	590.00	6213.06	6218.14		6218.61	0.006067	5.50	108.55	29.91	0.48
Upstream	876.91	2year	318.00	6213.06	6217.18		6217.41	0.004038	3.86	82.40	25.20	0.38
Upstream	861.67	100year	1162.00	6214.39	6218.60	6218.60	6220.09	0.026928	9.81	118.42	39.98	1.00
Upstream	861.67	10year	590.00	6214.39	6217.28	6217.28	6218.37	0.029756	8.36	70.56	32.83	1.01
Upstream	861.67	2year	318.00	6214.39	6216.43	6216.43	6217.22	0.032546	7.15	44.50	28.18	1.00
Upstream	846.91	100year	1162.00	6210.14	6217.15		6218.22	0.013917	8.31	140.90	35.55	0.70
Upstream	846.91	10year	590.00	6210.14	6215.52		6216.15	0.010941	6.36	92.74	25.45	0.59
Upstream	846.91	2year	318.00	6210.14	6214.59		6214.90	0.006188	4.46	71.26	21.63	0.43
Upstream	846.70	100year	1162.00	6210.07	6217.22		6218.19	0.012001	7.93	147.81	36.09	0.65
Upstream	846.70	10year	590.00	6210.07	6215.57		6216.13	0.009300	6.01	98.22	25.78	0.54
Upstream	846.70	2year	318.00	6210.07	6214.62		6214.89	0.005101	4.18	76.03	21.66	0.39
Upstream	822.01	100year	1162.00	6210.38	6216.25	6215.66	6217.79	0.016797	10.01	120.00	31.76	0.80
Upstream	822.01	10year	590.00	6210.38	6215.23		6215.89	0.009557	6.50	91.19	25.13	0.58
Upstream	822.01	2year	318.00	6210.38	6214.46		6214.76	0.005359	4.35	73.04	22.55	0.43
Upstream	821.91	100year	1162.00	6210.41	6216.18	6215.68	6217.79	0.017809	10.21	117.44	31.29	0.82
Upstream	821.91	10year	590.00	6210.41	6215.22		6215.88	0.009806	6.56	90.35	25.01	0.59
Upstream	821.91	2year	318.00	6210.41	6214.46		6214.76	0.005486	4.39	72.43	22.50	0.43
Upstream	711.90	100year	1162.00	6210.55	6215.64		6216.15	0.008469	5.74	202.31	62.68	0.56
Upstream	711.90	10year	590.00	6210.55	6213.89		6214.43	0.017494	5.90	99.93	51.27	0.75
Upstream	711.90	2year	318.00	6210.55	6212.85	6212.85	6213.46	0.037835	6.26	50.79	42.62	1.01

HEC-RAS Plan: Proposed_FHADFlows (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)	
Upstream	668.00	100year	1162.00	6206.59	6215.50		6215.82	0.004958	4.50	258.01	74.32	0.43
Upstream	668.00	10year	590.00	6206.59	6213.60		6213.90	0.007071	4.32	136.45	52.91	0.47
Upstream	668.00	2year	318.00	6206.59	6212.27		6212.51	0.006489	3.95	80.59	31.37	0.43
Upstream	667.68	100year	1162.00	6206.52	6215.32		6215.80	0.005027	6.31	245.66	72.38	0.42
Upstream	667.68	10year	590.00	6206.52	6213.46		6213.88	0.005703	5.50	129.53	50.94	0.42
Upstream	667.68	2year	318.00	6206.52	6212.23		6212.51	0.004355	4.25	79.80	31.00	0.35
Upstream	649.55	100year	1162.00	6207.07	6215.04		6215.68	0.005701	7.16	213.19	61.48	0.49
Upstream	649.55	10year	590.00	6207.07	6213.28		6213.77	0.005827	5.87	118.50	44.47	0.47
Upstream	649.55	2year	318.00	6207.07	6212.11		6212.42	0.004972	4.50	74.99	30.43	0.42
Upstream	649.45	100year	1162.00	6207.08	6215.04		6215.68	0.005720	7.17	213.02	61.49	0.49
Upstream	649.45	10year	590.00	6207.08	6213.27		6213.77	0.005861	5.88	118.28	44.45	0.48
Upstream	649.45	2year	318.00	6207.08	6212.11		6212.42	0.005010	4.51	74.81	30.43	0.42
Upstream	621.26	100year	1162.00	6208.27	6213.74	6213.74	6215.32	0.017785	10.86	131.34	43.77	0.89
Upstream	621.26	10year	590.00	6208.27	6212.21	6212.21	6213.41	0.021420	9.11	72.89	32.47	0.91
Upstream	621.26	2year	318.00	6208.27	6211.18	6211.18	6212.09	0.026563	7.75	43.37	25.20	0.95
Upstream	553.22	100year	1162.00	6208.27	6212.47	6212.14	6213.61	0.007887	9.18	153.68	68.12	0.83
Upstream	553.22	10year	590.00	6208.27	6211.39	6210.94	6212.04	0.006806	6.82	100.18	60.20	0.73
Upstream	553.22	2year	318.00	6208.27	6210.66	6210.19	6211.04	0.005989	5.19	68.47	54.84	0.65
Upstream	504.57	100year	1162.00	6207.97	6211.78	6211.78	6213.14	0.010730	9.71	136.31	69.24	0.94
Upstream	504.57	10year	590.00	6207.97	6210.64	6210.64	6211.57	0.012421	7.88	80.69	60.39	0.95
Upstream	504.57	2year	318.00	6207.97	6209.92	6209.92	6210.58	0.014885	6.56	50.21	54.75	0.97
Upstream	476.63	100year	1162.00	6201.17	6207.41	6206.85	6208.79	0.006490	11.33	160.15	62.13	0.81
Upstream	476.63	10year	590.00	6201.17	6205.21	6205.21	6206.54	0.010066	10.47	77.85	45.24	0.93
Upstream	476.63	2year	318.00	6201.17	6204.08	6204.08	6205.08	0.011160	8.76	46.57	24.37	0.93
Trail	443.00	100year	757.00	6202.29	6206.68	6206.68	6208.60	0.001483	11.60	95.94	28.54	0.99
Trail	443.00	10year	214.00	6202.29	6204.39	6204.39	6205.29	0.001767	7.61	31.33	28.03	0.95
Trail	443.00	2year	0.00	6202.29	6202.31	6202.31	6202.31	0.000000	0.00	0.01	1.30	0.00
Trail	412.24	100year	757.00	6200.18	6206.03		6207.38	0.000653	9.36	89.58	17.29	0.69
Trail	412.24	10year	214.00	6200.18	6202.22	6202.22	6203.19	0.001997	7.91	27.90	14.96	1.00
Trail	412.24	2year	0.00	6200.18	6200.20	6200.20	6200.20	0.000000	0.00	0.02	1.55	0.00
Trail	390.71	100year	757.00	6198.46	6206.47		6207.17	0.000224	6.78	126.91	17.78	0.43
Trail	390.71	10year	214.00	6198.46	6201.89		6202.22	0.000324	4.58	49.47	15.76	0.44
Trail	390.71	2year	0.00	6198.46	6198.48	6198.48	6198.48	0.000000	0.00	0.01	1.30	0.00
Trail	385.90	100year	911.22	6198.17	6205.98	6203.36	6207.13	0.000376	8.72	134.31	17.90	0.55
Trail	385.90	10year	239.11	6198.17	6201.87	6200.25	6202.21	0.000307	4.79	62.58	16.99	0.44
Trail	385.90	2year	0.59	6198.17	6198.24	6197.48	6198.24	0.000200	0.28	2.42	15.87	0.18
Trail	320.90		Culvert									
Trail	266.94	100year	911.22	6192.47	6203.23		6203.75	0.000110	5.86	198.00	18.80	0.31
Trail	266.94	10year	239.11	6192.47	6196.10		6196.40	0.000277	4.50	65.82	18.27	0.42
Trail	266.94	2year	0.59	6192.47	6192.51	6192.51	6192.52	0.006369	1.03	0.69	18.00	0.93
Trail	257.31	100year	911.22	6192.16	6203.27		6203.74	0.000084	5.63	228.29	22.14	0.30
Trail	257.31	10year	239.11	6192.16	6196.12		6196.39	0.000193	4.23	72.17	21.56	0.38
Trail	257.31	2year	0.59	6192.16	6192.28	6192.28	6192.30	0.004556	1.30	0.47	7.64	0.92
Trail	246.94	100year	911.22	6191.93	6203.08		6203.72	0.000114	6.56	205.91	20.36	0.35
Trail	246.94	10year	239.11	6191.93	6196.03		6196.38	0.000238	4.81	64.48	19.77	0.42
Trail	246.94	2year	0.59	6191.93	6192.06	6192.06	6192.09	0.005361	1.37	0.44	7.45	1.00
Trail	237.07	100year	911.22	6191.10	6203.15	6196.99	6203.69	0.000091	5.94	175.04	20.38	0.31
Trail	237.07	10year	239.11	6191.10	6196.09	6193.93	6196.35	0.000162	4.13	61.10	14.86	0.35
Trail	237.07	2year	0.59	6191.10	6191.82	6191.51	6191.82	0.000419	0.74	0.84	5.05	0.32
Trail	194.07		Culvert									
Trail	148.30	100year	911.22	6191.05	6197.13	6197.13	6200.05	0.001169	14.11	93.83	18.99	1.01
Trail	148.30	10year	239.11	6191.05	6193.55	6193.55	6194.80	0.001609	9.15	33.37	14.79	1.02
Trail	148.30	2year	0.59	6191.05	6191.08	6191.08	6191.12	0.014500	1.57	0.45	11.89	1.50

HEC-RAS Plan: Proposed_FHADFlows (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)	
Trail	148.00		Lat Struct									
Trail	139.23	100year	911.22	6188.94	6193.85	6193.37	6195.60	0.002032	11.88	121.63	26.52	0.95
Trail	139.23	10year	239.11	6188.94	6193.21		6193.37	0.000214	3.60	104.91	25.93	0.31
Trail	139.23	2year	0.59	6188.94	6189.01		6189.01	0.000053	0.09	4.72	19.49	0.08
Trail	126.23	100year	911.22	6188.66	6194.08		6195.47	0.001501	10.58	136.50	28.18	0.82
Trail	126.23	10year	239.11	6188.66	6193.22		6193.36	0.000178	3.34	112.83	27.29	0.28
Trail	126.23	2year	0.59	6188.66	6189.01		6189.01	0.000004	0.09	9.68	21.64	0.03
Trail	104.53	100year	911.22	6188.69	6194.09		6195.42	0.001084	10.32	150.29	33.63	0.79
Trail	104.53	10year	239.11	6188.69	6193.23		6193.36	0.000137	3.26	121.95	31.79	0.27
Trail	104.53	2year	0.59	6188.69	6189.01		6189.01	0.000005	0.10	8.76	21.78	0.04
Trail	83.73	100year	911.22	6189.21	6194.53	6192.99	6195.21	0.000472	7.32	235.12	67.98	0.57
Trail	83.73	10year	239.11	6189.21	6193.25	6190.87	6193.34	0.000092	2.66	155.27	56.84	0.24
Trail	83.73	2year	0.59	6189.21	6188.94	6188.94	6189.00	0.088195		0.29	2.65	0.00
LowFlow	449.30	100year	405.00	6198.78	6202.35	6202.35	6203.56	0.019842	10.74	52.24	22.14	1.01
LowFlow	449.30	10year	376.00	6198.78	6204.64		6204.87	0.002204	4.99	112.59	30.75	0.36
LowFlow	449.30	2year	318.00	6198.78	6203.46		6203.79	0.004040	5.81	79.03	26.31	0.48
LowFlow	449.20		Lat Struct									
LowFlow	420.81	100year	324.48	6196.23	6201.96		6202.06	0.000907	2.67	127.73	31.14	0.22
LowFlow	420.81	10year	350.89	6196.23	6204.75		6204.80	0.000204	1.75	215.55	31.69	0.11
LowFlow	420.81	2year	317.41	6196.23	6203.63		6203.69	0.000293	1.88	180.23	31.47	0.13
LowFlow	399.84	100year	265.64	6194.67	6202.01		6202.03	0.000166	1.52	231.96	54.60	0.10
LowFlow	399.84	10year	350.89	6194.67	6204.77		6204.79	0.000067	1.21	406.31	71.43	0.07
LowFlow	399.84	2year	317.41	6194.67	6203.65		6203.67	0.000094	1.32	330.23	64.66	0.08
LowFlow	395.23	100year	250.78	6194.69	6202.00	6197.07	6202.03	0.000195	1.52	190.56	46.13	0.11
LowFlow	395.23	10year	350.89	6194.69	6204.76	6197.53	6204.79	0.000087	1.29	345.59	66.64	0.08
LowFlow	395.23	2year	317.41	6194.69	6203.64	6197.38	6203.67	0.000123	1.41	275.82	58.05	0.09
LowFlow	330.23		Culvert									
LowFlow	258.43	100year	250.78	6189.50	6199.61		6199.75	0.000165	3.01	83.37	8.29	0.17
LowFlow	258.43	10year	350.89	6189.50	6199.34		6199.63	0.000344	4.32	81.16	8.29	0.24
LowFlow	258.43	2year	317.41	6189.50	6198.22		6198.52	0.000378	4.42	71.82	8.28	0.26
LowFlow	248.43	100year	250.78	6189.50	6199.60	6192.59	6199.75	0.000172	3.05	82.16	8.16	0.17
LowFlow	248.43	10year	350.89	6189.50	6199.33	6193.37	6199.63	0.000360	4.39	79.93	8.16	0.25
LowFlow	248.43	2year	317.41	6189.50	6198.20	6193.12	6198.52	0.000396	4.49	70.72	8.16	0.27
LowFlow	196.43		Culvert									
LowFlow	146.73	100year	250.78	6189.00	6197.56		6197.57	0.000041	0.88	292.81	35.31	0.05
LowFlow	146.73	10year	350.89	6189.00	6194.11		6194.18	0.000448	2.07	173.01	34.54	0.16
LowFlow	146.73	2year	317.41	6189.00	6192.16		6192.31	0.001822	3.04	106.00	34.10	0.30
LowFlow	134.20	100year	1007.78	6188.94	6197.44		6197.56	0.000277	2.94	412.05	62.02	0.18
LowFlow	134.20	10year	564.89	6188.94	6194.04		6194.17	0.000537	2.91	219.45	51.42	0.23
LowFlow	134.20	2year	317.41	6188.94	6192.17		6192.28	0.000834	2.68	128.78	45.38	0.26
LowFlow	84.70	100year	1007.78	6188.31	6197.48		6197.53	0.000125	1.93	588.13	93.15	0.12
LowFlow	84.70	10year	564.89	6188.31	6194.07		6194.13	0.000252	1.93	304.26	72.72	0.15
LowFlow	84.70	2year	317.41	6188.31	6192.19		6192.23	0.000410	1.78	178.36	60.44	0.18
LowFlow	52.40	100year	1007.78	6187.88	6197.48		6197.52	0.000085	1.66	704.14	117.62	0.10
LowFlow	52.40	10year	564.89	6187.88	6194.08		6194.12	0.000148	1.59	368.49	78.59	0.12
LowFlow	52.40	2year	317.41	6187.88	6192.19		6192.22	0.000193	1.38	231.34	66.90	0.13
LowFlow	0.00	100year	1007.78	6187.26	6196.77	6192.74	6197.45	0.002219	6.71	167.73	31.99	0.40
LowFlow	0.00	10year	564.89	6187.26	6193.45	6191.12	6194.04	0.003481	6.17	92.42	18.07	0.46
LowFlow	0.00	2year	317.41	6187.26	6191.78	6189.97	6192.16	0.003495	4.93	64.33	16.18	0.44

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Brickyard_SplitFlow
Project File : ITT_SplitFlow.prj
Run Date and Time: 5/19/2025 5:12:22 PM

Project in English units

PLAN DATA

Plan Title: Proposed_2013 FHAD Flows
Plan File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.p46

Geometry Title: Proposed1D_Culverts_SplitLowFlowCulvert
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g20

Flow Title : 2013 FHAD Future Flows_Proposed
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.f04

Plan Summary Information:

Number of: Cross Sections	=	68	Multiple Openings	=	0
Culverts	=	4	Inline Structures	=	0
Bridges	=	0	Lateral Structures	=	2

Computational Information

```
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow




FLOW DATA

Flow Title: 2013 FHAD Future Flows_Proposed
Flow File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson
Models\ITT_Proposed\ITT_SplitFlow.f04

Flow Data (cfs)


  River           Reach           RS                100year          10year
 2year
  IndustrailTrib  Upstream        1518.60              1162             590
   318
  IndustrailTrib  Trail           443.00                757             214
.000001
  IndustrailTrib  LowFlow         449.30                405             376
   318
  IndustrailTrib  LowFlow         134.20               1162             590
   318



Boundary Conditions


  River           Reach           Profile                       Upstream
    Downstream


  IndustrailTrib  Trail           100year
Known WS = 6194.53
  IndustrailTrib  Trail           10year
Known WS = 6193.25
  IndustrailTrib  Trail           2year
Known WS = 6188.68
```

```
  IndustrailTrib  LowFlow         100year
Known WS = 6196.77
  IndustrailTrib  LowFlow         10year
Known WS = 6193.45
  IndustrailTrib  LowFlow         2year
Known WS = 6191.78
```

GEOMETRY DATA

Geometry Title: Proposed1D_Culverts_SplitLowFlowCulvert
Geometry File : p:\2020\200726\Documents\Drainage\Calculations\Hec-Ras\Modified Wilson Models\ITT_Proposed\ITT_SplitFlow.g20

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
IndustrailTrib	Upstream		Junction 1
IndustrailTrib	Trail	Junction 1	
IndustrailTrib	LowFlow	Junction 1	

JUNCTION INFORMATION

Name: Junction 1
Description:
Energy computation Method

Length across Junction		Tributary			
River	Reach	River	Reach	Length	Angle
IndustrailTrib	Upstream	to IndustrailTrib	Trail	40.35	0
IndustrailTrib	Upstream	to IndustrailTrib	LowFlow	18.15	0

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1518.60

INPUT
Description: 47 - River STA 1523.19
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6255.7	.02	6255.7	7.14	6255.62	11.18	6255.56	13.69	6255.32
28.47	6254.59	31.35	6254.73	35.03	6252.94	40.24	6249.62	42.33	6248
50.9	6242.23	51.52	6241.8	51.84	6241.52	53.06	6240.51	57.48	6236.86

```
   60.48 6235.36   60.84 6235.18   61.84 6234.65   62.33 6233.33   64.99 6226.47
    67.4 6226.57   68.14  6226.6   68.51 6227.28   69.81 6232.67   72.48 6233.14
   73.08 6233.24   75.47 6233.62   76.54 6233.86   88.19  6236.7   88.81 6236.84
   90.54 6237.12   99.42 6238.29  103.93 6239.86  106.09 6240.55  106.54 6240.77
  124.47 6251.85  124.58 6251.93  124.61 6251.94  124.64 6251.94  125.52 6251.98
  146.84 6252.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   53.06    .035  106.54     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.06  106.54             49.2   48.84   48.48             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1469.76

INPUT
Description: 46 - River STA 1473.44
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6255.7     .02  6255.7    7.14 6255.62   11.18 6255.56   13.69 6255.32
   28.47 6254.59   31.35 6254.73   35.03 6252.94   40.24 6249.62   42.33    6248
    50.9 6242.23   51.52  6241.8   51.84 6241.52   53.06 6240.51   57.48 6236.86
   60.48 6235.36   60.84 6235.18   61.84 6234.65   62.33 6233.33   64.99 6226.47
    67.4 6226.57   68.14  6226.6   68.51 6227.28   69.81 6232.67   72.48 6233.14
   73.08 6233.24   75.47 6233.62   76.54 6233.86   88.19  6236.7   88.81 6236.84
   90.54 6237.12   99.42 6238.29  103.93 6239.86  106.09 6240.55  106.54 6240.77
  124.47 6251.85  124.58 6251.93  124.61 6251.94  124.64 6251.94  125.52 6251.98
  146.84 6252.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   53.06    .035  106.54     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.06  106.54               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1469.56

INPUT
Description: 45 - River STA 1473.24
Station Elevation Data    num=      37
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```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6253.61    6.14 6253.44   11.41 6252.53   23.15 6245.71   27.11 6243.42
   30.42 6242.11   44.43 6235.87   44.62 6235.75    44.8  6235.7   46.89 6234.82
   48.34 6234.79   51.97 6232.83   56.02 6232.25   57.36 6232.07   57.85    6232
   59.22  6231.8   60.22 6231.66   62.39 6231.35   67.72 6234.69   68.11 6234.76
   70.64 6234.91   78.81 6239.58   80.72 6240.65   81.71 6241.31   82.06 6241.54
   82.19 6241.59   84.21 6242.45   84.85 6242.75   85.54    6243   87.65 6244.08
   90.88  6246.4   91.76 6246.54   93.55 6247.15   97.12 6247.83   97.51 6247.85
   97.86 6247.84  112.73 6244.02

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   48.34     .05   67.72     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         48.34   67.72            22.87    24.7   26.53             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1444.86

INPUT
Description: 44 - River STA 1448.54
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6252.43    3.45 6252.29   12.65 6251.85   13.79 6251.71   16.05 6250.38
   24.72 6246.77   36.12 6240.54   40.91 6236.03   46.69 6232.29   47.06 6232.09
   47.18 6232.08   49.84 6231.12   50.15 6230.94   50.97 6230.83   55.27 6230.54
    59.1 6230.28   59.16 6230.28   59.28  6230.3   65.58 6231.06   69.01 6231.37
   71.36 6231.39   74.22 6232.84   75.19 6233.26   80.94 6236.06   88.49 6239.31
   98.99 6237.21   99.68    6237  100.82 6237.04  104.64 6237.53  107.19 6237.64
  111.06 6237.78  112.31 6237.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.12     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.12   88.49              .09      .1     .11             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.31       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1444.76
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```
INPUT
Description: 43 - River STA 1448.44
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6252.43    3.68 6252.27   12.67 6251.85   13.79 6251.71      16 6250.41
    24.7 6246.79      36 6240.61    40.9    6236   46.47  6232.4   47.06 6232.08
   47.26 6232.06   49.61 6231.21   50.01 6230.98   51.08 6230.83   55.26 6230.55
   58.96  6230.3   59.18 6230.29   59.65 6230.38    65.5 6231.08   68.69 6231.38
   71.42  6231.4   74.21 6232.81   75.25 6233.26   80.81 6235.96   88.49 6239.27
   99.16 6237.13   99.69 6236.97  100.55    6237  104.67 6237.53  107.17 6237.63
  111.11 6237.78  112.31 6237.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      36     .05   88.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            36   88.49             14.1   12.92   11.74             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   88.49  112.31 6239.27       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1431.84

INPUT
Description: 42 - River STA 1435.40
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6251.56    11.9 6250.97   15.71 6250.01   17.78 6249.69    22.2 6248.89
   34.71 6239.62   37.97 6237.19   39.19 6236.27   42.86 6233.95   46.07 6232.22
   50.16 6231.72   58.37 6231.72   58.94 6231.61   59.29  6231.2   60.32 6231.06
   63.04  6231.7   73.31 6231.88   74.74 6232.62   76.53 6232.96   82.88 6235.44
   88.57 6236.04    88.9 6236.15   90.47 6236.48   93.34 6236.94  101.88 6237.31
  107.44 6237.51  110.57 6237.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   39.19     .05   88.57     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         39.19   88.57            15.62   13.44   11.27             .1       .3

CROSS SECTION
```

RIVER: IndustrailTrib
REACH: Upstream RS: 1418.40

INPUT
Description: 41 - River STA 1422.03
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6250.39	1.48	6250.32	21.85	6248.52	22.66	6248.4	22.92	6248.35
24.13	6247.45	31.48	6242.2	38.04	6237.5	39.36	6236.64	45.66	6232.48
46.81	6232.15	47.91	6231.95	48.18	6231.89	49.02	6231.75	52.58	6227.98
53.16	6227.93	61.78	6227.18	65.77	6228.34	72.17	6228.08	73.21	6231.58
73.24	6231.65	73.26	6231.65	76.5	6232.44	76.64	6232.44	76.77	6232.48
77.45	6232.77	84.65	6234.4	98.07	6236.81	110.17	6237.44		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	39.36	.05	98.07	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
39.36	98.07	.2	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1418.20

INPUT
Description: 40 - River STA 1421.83
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6250.38	1.31	6250.32	22.04	6248.49	22.71	6248.39	22.92	6248.35
23.92	6247.6	30	6243.25	38.06	6237.48	39.68	6236.43	45.68	6232.47
46.99	6232.08	48.24	6231.86	48.39	6231.83	48.85	6231.75	52.47	6227.93
53.16	6227.87	61.8	6227.11	65.39	6228.16	72.1	6227.89	73.01	6230.95
73.3	6231.65	73.55	6231.72	76.33	6232.39	76.55	6232.4	76.74	6232.46
77.42	6232.74	84.49	6234.34	98.2	6236.81	110.15	6237.42		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	48.85	.05	73.3	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
48.85	73.3	24.56	24.7	25.32	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1393.50

```
INPUT
Description: 39 - River STA 1397.12
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.43    8.02 6247.69   19.42 6246.71   21.94 6246.61   31.37 6243.23
   34.12 6241.28   38.08 6239.57    40.6 6236.68   41.52 6236.07   46.38 6233.15
   50.97 6230.01    52.6  6228.7   53.25 6228.09   54.84 6228.05   57.03    6228
   62.28 6227.68    67.7 6227.81   71.13 6227.83   74.98 6229.84   76.05 6230.04
   76.36  6230.1   77.04 6230.23   89.37 6232.85   90.87 6233.25  107.25 6235.71
   108.3 6236.08

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   46.38     .05   90.87     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         46.38   90.87               .1      .1     .12             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1393.40

INPUT
Description: 38 - River STA 1397.02
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6248.42    8.29 6247.66   19.42  6246.7   21.87 6246.61   31.42 6243.18
   34.12 6241.26   38.12 6239.54    40.6  6236.7   41.54 6236.08   46.29 6233.22
      51    6230   52.54 6228.76   53.22 6228.12   54.85 6228.08   57.16 6228.02
    62.3 6227.72   67.61 6227.85   71.18 6227.86   74.96 6229.84   76.19 6230.06
   76.55 6230.13   77.33 6230.28   89.51 6232.87      91 6233.26  107.17  6235.7
   108.3 6236.09

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      51     .05   74.96     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            51   74.96            99.66  104.17  115.69             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1289.23

INPUT
```

Description: 37 - River STA 1292.77
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6241.45	19.5	6234.33	26.36	6231.83	38.97	6229.48	44.01	6229.64
46.14	6229.71	60.16	6229.7	61.35	6230.14	67.22	6231.54	70.71	6232.54
75.23	6233.96	75.44	6234.41	105.01	6240.87	106.38	6241.05	107.98	6241.7
115.4	6245								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	19.5	.05	75.44	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
19.5	75.44	91.64	97.32	94.38	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1191.91

INPUT
Description: 36 - River STA 1195.60
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6243.32	4.44	6242.44	19.89	6234.98	21.22	6234.2	22.33	6233.65
24.38	6232.13	35.5	6229.47	35.88	6229.36	37.3	6228.9	38.24	6228.54
40.18	6228.18	40.44	6228.11	41.29	6227.85	45.69	6224.27	48.74	6223.47
54.6	6223.48	56.27	6223.49	57.05	6223.49	64.32	6227.32	64.83	6227.37
65.49	6227.66	67.01	6227.89	68.55	6228.61	75.21	6231.38	78.17	6232.71
79.63	6233.35	80.07	6233.56	81.67	6234.66	84.08	6236.35	84.87	6236.7
85.08	6236.71	86.03	6237.16	86.37	6237.58	93.83	6240.9	98.94	6241.67
101.54	6242.6	101.7	6242.66						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	19.89	.05	81.67	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
19.89	81.67	.2	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1191.71

INPUT
Description: 35 - River STA 1195.40
Station Elevation Data num= 37

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6243.38    4.31 6242.53   20.06 6234.92   21.42 6234.13   22.34 6233.67
   24.44 6232.12   35.28 6229.52   35.64 6229.42   37.32 6228.87   38.44 6228.45
   40.72 6228.03   40.87 6227.99   41.34 6227.84   45.93 6224.11    48.7 6223.38
   54.68 6223.39   56.27  6223.4   56.93  6223.4   63.62 6226.93   64.84 6227.05
   66.39 6227.73    66.9 6227.81   68.56 6228.58   74.49 6231.05   77.94  6232.6
   79.65 6233.34   80.16 6233.58    81.7 6234.65   84.04  6236.3    84.9 6236.68
   85.13 6236.69   86.17 6237.18   86.53 6237.63   93.86  6240.9   99.02 6241.67
  101.52 6242.57   101.7 6242.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   41.34     .05   63.62     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         41.34   63.62            24.08    24.7   25.32             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1167.01

INPUT
Description: 34 - River STA 1170.58
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6241.38    4.33 6239.32    17.4 6232.29   19.06 6231.84    19.8 6231.56
   24.89 6229.64   25.34  6229.4   25.36 6229.39   29.72 6228.27   32.79 6227.46
   33.54 6227.16   36.93 6224.64   40.52 6224.26   41.08 6224.17   43.82 6224.07
   47.99 6224.13   48.84 6224.15   52.87 6224.21   56.27 6224.81   59.15 6225.62
   60.29 6226.54   64.59 6228.12   65.79 6228.59   68.96 6229.93   72.09 6230.74
   74.51 6231.36   74.94 6231.58   76.51 6232.36   79.67 6233.16   81.57 6234.07
   83.63 6234.23   91.61 6238.41   92.17  6239.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   33.54     .05   60.29     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         33.54   60.29               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1166.91

INPUT
Description: 33 - River STA 1170.48
```

Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6241.39	4.06	6239.45	17.39	6232.29	19.08	6231.83	19.84	6231.55
24.89	6229.64	25.36	6229.39	25.38	6229.38	29.7	6228.27	32.72	6227.47
33.58	6227.12	36.9	6224.67	40.4	6224.3	40.98	6224.2	43.83	6224.09
47.96	6224.16	48.74	6224.17	52.9	6224.23	56.21	6224.82	59.16	6225.65
60.25	6226.52	64.57	6228.12	65.81	6228.6	68.88	6229.9	71.9	6230.67
74.49	6231.34	74.95	6231.57	76.52	6232.35	79.67	6233.15	81.56	6234.06
83.62	6234.22	91.64	6238.41	92.17	6239.16				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	33.58	.05	60.25	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33.58	60.25	54.71	45.94	37.17	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1120.97

INPUT
Description: 32 - River STA 1124.50
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6240.21	1.37	6239.57	3.61	6239.02	20.37	6230.23	24.82	6227.9
25.95	6227.73	27.12	6227.53	29.61	6226.78	31.09	6226.36	36.79	6226.24
40.11	6225.87	51.49	6224.6	56.52	6224.84	60.23	6225.5	65.8	6226.79
71.22	6229.51	73.02	6230.21	73.7	6230.43	77.56	6230.84	86.41	6235.52
94.53	6238.42	103.19	6239.77	106.48	6240.73	110	6242.41		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	20.37	.05	73.7	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20.37	73.7	60.28	59.06	57.83	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1061.91

INPUT
Description: 31 - River STA 1065.52
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
       0 6239.77     .29 6239.64    4.02 6238.47   11.47 6237.91   13.89 6237.77
   24.55 6233.58   25.51 6233.37   27.09 6232.21   28.45 6231.36   34.15 6227.78
   36.66 6226.74   38.77 6225.74   39.79 6225.82   41.39 6224.99   42.43 6224.48
   42.79 6223.62   43.92 6221.24   50.25 6220.67    53.1 6219.85   55.33 6220.37
   56.06 6220.36    66.5  6220.2   72.12 6223.32   73.95  6223.4   74.34 6224.42
   75.59 6224.59   77.33 6225.13    78.8 6225.38   84.17 6227.29   86.97 6228.04
  101.77 6233.58  108.96 6236.08  114.03 6236.83  120.11 6237.26  120.23 6237.28
  126.24 6239.18

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   25.51     .05  101.77     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.51  101.77               .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1061.71

INPUT
Description: 30 - River STA 1065.32
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6239.76     .38  6239.6    4.04 6238.45   11.38  6237.9   13.92 6237.75
   25.18 6233.32   25.63 6233.23   26.37 6232.68   28.44 6231.39   33.96 6227.92
   36.69 6226.79   38.94 6225.73    39.9  6225.8   41.73 6224.86    42.5 6224.47
   43.07 6223.12   44.03 6221.09   50.68  6220.5   53.02 6219.81   54.86 6220.25
   56.12 6220.23   66.36 6220.08    71.2 6222.76   73.97 6222.88   74.55 6224.43
   75.49 6224.55   77.37 6225.13   78.95  6225.4   84.12 6227.24   87.06 6228.02
  101.69 6233.49  109.05 6236.06  114.24 6236.83   120.2 6237.25  120.34 6237.27
   126.3 6239.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    39.9     .05   74.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          39.9   74.55            25.53    24.7   23.87             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 1037.01

INPUT
Description: 29 - River STA 1040.52
```

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6236.38	4.3	6236.03	6.15	6235.71	7.83	6234.91	19.89	6231.39
20.26	6230.78	20.44	6230.88	21.24	6229.43	28.06	6226.45	35.01	6223.42
36.84	6222.47	37.13	6222.37	37.18	6222.34	37.89	6221.82	40.23	6221.28
45.98	6221.12	48.96	6221.03	49.12	6221.03	57.15	6220.77	63.16	6220.81
64.81	6220.85	65.04	6221.02	67.47	6222.98	70.08	6223.74	71.53	6224.19
74.17	6224.77	81.29	6226.43	83.72	6226.87	87.04	6228.31	98.26	6231.76
104.25	6233.89	106.53	6234.25	111.15	6235.38	120.14	6237.92	121.9	6238.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	35.01	.05	67.47	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.01	67.47	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1036.91

INPUT
Description: 28 - River STA 1040.42
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6236.38	4.35	6236.02	6.13	6235.71	7.75	6234.95	19.93	6231.39
20.29	6230.79	20.47	6230.89	21.29	6229.42	27.54	6226.69	35.02	6223.42
36.92	6222.44	37.2	6222.34	37.89	6221.84	40.05	6221.33	46.06	6221.17
48.67	6221.09	49.11	6221.08	57.2	6220.81	62.92	6220.86	64.85	6220.9
65.12	6221.1	67.44	6222.97	70.1	6223.75	71.5	6224.18	74.03	6224.73
81.27	6226.43	83.73	6226.87	87.1	6228.33	98.5	6231.84	104.25	6233.88
106.44	6234.22	110.86	6235.31	120.3	6237.98	121.9	6238.53		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	35.02	.05	67.44	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.02	67.44	23.75	23.06	22.36	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 1013.85

INPUT
Description: 27 - River STA 1017.42

```
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6234.96     1.6 6234.75   13.23 6232.09   23.42 6226.58   24.53 6226.12
   30.06 6227.36   30.78 6226.05   36.65 6223.45   37.89  6222.8   49.54 6222.03
   51.28 6221.92   52.52 6221.57   54.02 6221.49   61.29 6221.41   63.06 6221.37
   63.44  6221.4   68.43 6223.17   70.53 6223.88   74.83 6224.81   77.95  6225.5
   85.26 6226.84   93.91 6230.63   98.19 6232.19  105.11 6234.23  120.87 6238.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   30.06     .05   85.26     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         30.06   85.26            27.45   26.94   26.44             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0   30.06 6227.36       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 986.91

INPUT
Description: 26 - River STA 990.69
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6232.8    5.46  6231.2    5.62 6231.15     5.7 6231.13   15.71 6229.44
   31.21 6224.37   32.64 6224.03   38.51 6221.92   38.52 6221.91   38.56 6221.91
   41.58 6221.44   42.56  6221.1   42.73  6220.3   43.81 6220.18   49.63 6215.97
    50.8 6215.65   51.53 6215.65   58.41 6215.69   60.29 6216.21   61.89 6217.66
   64.09 6219.72   65.48 6219.63   66.13 6221.03   66.83  6221.1   68.64  6221.7
   69.16 6221.84   69.65 6221.98   71.04 6222.67   75.21 6223.53   82.86 6225.21
   85.53 6225.88   94.19 6227.89   94.56 6227.99   95.71 6228.42   111.3 6234.28
   112.8 6234.86  113.48 6235.11  119.42 6237.78  120.19 6237.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   15.71     .05   95.71     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         15.71   95.71              .2      .2      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 986.71
```

INPUT
Description: 25 - River STA 990.49
Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6232.77	5.02	6231.31	5.54	6231.13	5.81	6231.08	15.61	6229.42
30.78	6224.46	32.49	6224.06	38.2	6222	38.53	6221.9	39.34	6221.75
41.72	6221.38	42.49	6221.11	42.8	6219.65	44.76	6219.44	49.75	6215.83
50.75	6215.56	51.53	6215.56	58.49	6215.6	60.13	6216.06	61.52	6217.32
63.44	6219.12	65.48	6218.99	66.43	6221.04	66.94	6221.08	68.92	6221.74
69.14	6221.8	69.66	6221.95	71.13	6222.68	75.18	6223.51	82.59	6225.15
85.5	6225.88	93.9	6227.83	94.38	6227.93	94.48	6227.96	111.05	6234.19
112.84	6234.88	113.66	6235.18	119.43	6237.78	120.19	6237.85		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	42.49	.05	66.43	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
42.49	66.43	25.09	24.7	24.31	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 962.01

INPUT
Description: 24 - River STA 965.70
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.78	.55	6229.56	1.75	6229.36	12.9	6226.81	24.14	6223.91
24.79	6223.75	25.47	6223.54	36.78	6220.31	38.16	6218.74	41.87	6216.15
48.08	6215.94	50.88	6216.03	56.12	6216.21	62.63	6216.21	64.79	6218.66
67.14	6220.99	68.28	6221.57	70.78	6222.71	71.87	6223.14	77.18	6224.68
86.78	6227.87	87.97	6228.12	90.8	6229.13	100.09	6232.16	103.46	6233.37
105.98	6233.83	106.6	6234.05	115.98	6236.54	118.01	6237.27	119.64	6237.93

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.78	.05	67.14	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.78	67.14	.1	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 961.91

INPUT
Description: 23 - River STA 965.60
Station Elevation Data   num=   30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.78	.57	6229.55	1.69	6229.37	12.91	6226.79	24.23	6223.88
24.78	6223.75	25.35	6223.57	36.77	6220.3	38.07	6218.82	41.88	6216.17
48.23	6215.95	50.88	6216.04	55.97	6216.21	62.61	6216.22	64.7	6218.58
67.12	6220.99	68.3	6221.58	70.76	6222.71	71.88	6223.14	77.14	6224.67
86.8	6227.89	87.96	6228.13	90.74	6229.11	99.84	6232.09	103.4	6233.36
106.04	6233.85	106.7	6234.07	115.99	6236.54	118	6237.27	119.64	6237.93

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.77	.05	67.12	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.77	67.12	28.43	29.4	30.37	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream   RS: 932.51

INPUT
Description: 22 - River STA 936.05
Station Elevation Data   num=   29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.82	13.45	6224.96	20.15	6223.48	21.13	6223.34	21.5	6223.07
23.79	6222.28	29.22	6220.35	36.12	6218.05	46.64	6217.98	47.82	6217.9
49.73	6217.87	55.54	6217.77	58.29	6219.08	65.07	6222.56	67.64	6223.25
69.55	6224.44	69.73	6224.67	70.35	6225.33	80.59	6228.16	82.58	6228.57
83.05	6228.79	85.79	6229.72	91.27	6231.42	92.34	6231.79	99.82	6233.25
114.05	6236.05	114.56	6236.1	116.68	6236.87	119.43	6237.55		

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	13.45	.05	70.35	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13.45	70.35	29.94	30.6	31.27	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream   RS: 901.91

INPUT
Description: 21 - River STA 905.93

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.1	9.47	6225.42	15.82	6223.71	16.19	6223.75	16.62	6223.65
16.75	6223.63	23.61	6222.43	31.18	6219.85	33.72	6219.17	36.19	6218.2
36.37	6218.2	36.94	6217.9	40.32	6214.09	45.72	6214.08	50	6214.59
52.48	6214.88	56.67	6215.21	57.58	6217.76	57.67	6217.79	60.8	6218.69
61.08	6218.83	66.79	6221.71	74.44	6223.82	74.7	6223.88	75.55	6224.43
88.37	6229.35	90.84	6228.98	96.79	6231.09	114.89	6234.36	114.94	6234.37
115.08	6234.39	116.91	6234.62	117.22	6234.72	117.89	6234.94	120	6235.49

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	9.47	.05	75.55	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
9.47	75.55	.2	.2	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 901.71

INPUT
Description: 20 - River STA 905.73
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.06	9.26	6225.46	15.79	6223.7	16.17	6223.74	16.61	6223.64
16.74	6223.62	23.49	6222.44	31.28	6219.79	33.7	6219.15	36.45	6218.06
36.55	6218.06	36.85	6217.9	40.37	6213.92	46.01	6213.92	50	6214.38
52.12	6214.63	56.65	6215	57.51	6217.39	57.59	6217.75	59.6	6218.3
60.74	6218.63	60.82	6218.67	66.86	6221.72	74.36	6223.78	74.67	6223.86
75.69	6224.51	88.34	6229.37	90.86	6228.99	96.72	6231.07	114.56	6234.29
114.8	6234.33	115.39	6234.43	116.97	6234.62	117.23	6234.72	117.8	6234.9
120	6235.48								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.85	.05	57.59	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.85	57.59	21.96	24.7	27.44	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 877.01

INPUT

```
Description: 19 - River STA 880.68
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51    2.34 6228.53   20.68 6223.46   21.93  6223.6   22.22 6223.53
   28.27 6221.78   42.06 6217.21   45.29 6214.39   46.18 6213.37   52.21 6213.13
   56.69 6213.06   57.75 6213.06   62.29 6213.07   63.25 6214.03   63.28    6214
   68.09 6217.82   70.36 6218.53   72.33 6219.14   76.82  6219.8   79.14 6220.29
   79.43 6220.35   81.05 6221.36   99.29 6228.03  103.24 6228.22  111.66 6229.35
  114.57 6230.15  127.72 6232.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.06     .05   68.09     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.06   68.09               .1      .1      .1             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 876.91

INPUT
Description: 18 - River STA 880.58
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6229.51     2.3 6228.55   20.72 6223.46   21.97 6223.59   22.24 6223.53
   27.91 6221.89   42.13 6217.19   45.45 6214.27   46.24 6213.38   52.38 6213.13
    56.6 6213.06   57.78 6213.06   62.34 6213.08    63.2 6213.93   63.22 6213.91
   68.15 6217.82   70.36 6218.51   72.38 6219.14   76.98 6219.82    79.2 6220.28
   79.48 6220.34   81.02  6221.3   99.37 6228.01  103.25 6228.19  111.75 6229.34
  114.69 6230.14  127.77  6232.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   42.13     .05   68.15     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         42.13   68.15              14.37   15.24   13.68             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 861.67

INPUT
Description: 17 - River STA 865.33
Station Elevation Data    num=      32
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6228.69     3.6 6227.24   14.73  6225.3   22.41 6223.17   24.18 6222.74
   26.05 6222.29      38 6218.59   48.64 6215.29   49.15 6215.16   50.83 6214.59
   50.87 6214.52   51.34 6214.46   52.13 6214.39   60.86 6214.44   61.68 6214.51
   62.42 6214.57   64.07 6214.57   69.16  6214.6   70.01 6215.01   78.21 6218.71
   78.67 6218.85   79.36 6218.96   86.12 6220.17    87.3 6220.75   87.73 6220.96
   90.39 6221.59  103.41 6225.41  111.02 6227.77  120.17 6229.17  123.11 6230.04
  126.11 6230.84  133.13 6232.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      38     .05   78.21     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            38   78.21             18.28   14.76   13.03             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 846.91

INPUT
Description: 16 - River STA 850.46
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6230.45    5.47  6227.6    9.78 6225.72   23.62 6222.39   24.13 6222.26
   28.67 6221.54   36.08 6220.52   37.04 6220.28   39.88 6219.39   46.29 6218.48
   58.32 6216.49    58.6 6216.34   59.01 6216.19   59.61 6215.97   61.28 6215.26
      62 6215.03   62.32 6213.87   62.81 6211.01   68.36 6211.13   71.05 6210.14
   71.25 6210.22   74.79 6211.49   82.39  6211.6   83.45 6212.99   83.81 6214.93
   84.44 6215.01   85.82 6215.28   86.78 6216.05   89.78  6217.1   96.66 6221.06
   98.57 6221.43  100.92 6221.72  101.35 6221.85  108.24 6223.34  122.62 6227.03
  133.65 6229.86  134.25 6230.05  134.59  6230.1  134.71 6230.14  135.79 6230.42
  141.76 6231.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   58.32     .05   89.78     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.32   89.78              .21     .21      .2             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 846.70

INPUT
```

Description: 15 - River STA 850.25
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6230.43	5.36	6227.63	9.77	6225.71	23.52	6222.4	24.13	6222.25
29.5	6221.4	36.22	6220.47	37.1	6220.26	39.68	6219.45	45.49	6218.62
58.29	6216.5	58.57	6216.36	59.08	6216.17	59.67	6215.95	61.51	6215.16
62.03	6215	62.55	6213.16	62.96	6210.77	68.84	6210.9	71.1	6210.07
71.33	6210.15	74.25	6211.21	82.55	6211.33	83.39	6212.44	83.85	6214.9
84.06	6214.93	86.01	6215.3	86.89	6216.01	89.63	6216.97	96.81	6221.09
98.22	6221.37	100.93	6221.71	101.42	6221.85	108.22	6223.32	122.94	6227.1
134.22	6229.99	134.53	6230.09	134.71	6230.12	134.78	6230.14	135.35	6230.29
141.76	6231.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	58.29	.05	89.63	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
58.29	89.63	21.8	24.69	27.91	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 822.01

INPUT
Description: 14 - River STA 835.56
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.46	9.95	6225.1	15.15	6223.85	24.89	6221.38	29.15	6220.71
56.15	6218.05	56.62	6217.98	56.63	6217.97	56.78	6217.92	57.62	6217.67
58.78	6217.42	67.66	6215.19	68.01	6215.04	69.12	6214.57	72.04	6210.9
73.06	6210.38	79.92	6210.59	84.45	6210.72	85.9	6210.45	87.13	6210.74
88.95	6211.93	89.13	6212.17	92.86	6215.43	96.31	6216.63	99.58	6218.35
104.31	6219.74	106.61	6221.48	128.77	6228.21	132.31	6229.18	134.17	6229.61

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	69.12	.05	92.86	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
69.12	92.86	.1	.1	.09	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 821.91

INPUT
Description: 13 - River STA 825.56
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6229.46	9.94	6225.1	15.1	6223.85	24.89	6221.38	29.1	6220.71
56.25	6218.04	56.61	6217.98	56.62	6217.98	56.73	6217.94	57.37	6217.75
58.26	6217.56	67.62	6215.21	68	6215.05	69.16	6214.56	72	6210.98
73.12	6210.41	79.93	6210.61	84.35	6210.74	85.86	6210.46	87.14	6210.76
89.03	6212	89.22	6212.25	92.84	6215.42	96.33	6216.63	99.55	6218.33
104.31	6219.73	106.63	6221.48	128.89	6228.24	132.31	6229.18	134.13	6229.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	69.16	.05	92.84	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
69.16	92.84	98.07	110.01	124.19	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 711.90

INPUT
Description: 12 - River STA 715.32
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6227.72	.66	6227.43	3.91	6226.4	12.55	6224.22	13.48	6223.96
16.71	6222.71	36.28	6217.25	39.61	6215.21	40.27	6214.82	44.33	6212.53
45.22	6212.38	45.63	6212.29	46	6213.1	49.9	6212.34	58.4	6210.55
63.53	6211.03	66.58	6211.22	67.72	6212.31	68.08	6212.49	70.81	6212.52
71.66	6212.66	73.16	6212.88	73.91	6211.8	74.22	6211.28	75.36	6211.31
77.86	6210.6	78.04	6210.64	86.08	6212.39	91.18	6213.63	93.32	6213.91
93.69	6213.96	99.76	6214.62	105	6217.56	108.34	6219.44	108.48	6219.5
109.7	6220.01	111.17	6220.36	132.4	6226.23	133.89	6226.38	135.19	6226.54
151.08	6228.11	174.11	6229.3	179.56	6229.9				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.28	.05	105	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36.28	105	47.93	43.9	36.64	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 668.00

INPUT
Description: 11 - River STA 617.51
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6227.64	13.84	6221.66	16.9	6220.15	18.79	6219.48	20.21	6218.97
23.17	6217.95	23.61	6217.83	25.32	6217.28	42.16	6213.94	46.88	6212.9
46.95	6212.89	47.32	6213.02	50.3	6211.52	50.6	6210.78	50.92	6210.05
51.93	6207.65	52.21	6206.83	52.52	6206.72	54.69	6206.59	62.11	6206.66
62.56	6206.67	62.86	6206.85	64.04	6208.03	64.08	6209.72	65.12	6211.63
67.26	6211.54	67.52	6211.5	78.2	6212.12	78.41	6212.12	78.81	6212.15
78.95	6212.17	79.64	6212.23	93.64	6213.33	95.43	6213.48	100.12	6213.98
103.74	6214.63	115.06	6216.65	115.83	6216.81	116.34	6218.13	123.05	6219.64
141.68	6222.16	141.98	6222.19	142.73	6222.24	153.22	6223.94	156.36	6224.34
163.91	6225.17	170.89	6226.05	185.46	6229.3	191.59	6229.69	194.43	6230

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	25.32	.05	115.83	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
25.32	115.83	.31	.32	.31	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 667.68

INPUT
Description: 10 - River STA 671.19
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6227.74	13.99	6221.69	17.21	6220.11	18.12	6219.79	19.82	6219.18
23.4	6217.94	23.79	6217.83	25.35	6217.33	40.63	6214.3	46.91	6212.92
47.13	6212.87	47.49	6213	50.32	6211.57	50.93	6210.07	52.36	6206.61
54.69	6206.73	59.74	6206.52	62.13	6206.54	62.65	6206.54	62.76	6206.61
63.16	6207.01	63.17	6207.59	65.36	6211.6	67.39	6211.52	67.64	6211.48
77.74	6212.06	78.07	6212.06	78.69	6212.12	78.9	6212.14	79.97	6212.23
93.58	6213.3	95.55	6213.47	100.35	6213.98	104.15	6214.66	114.77	6216.56
115.91	6216.79	116.4	6218.08	123.34	6219.64	141.74	6222.13	142.1	6222.16
143.01	6222.23	153.38	6223.91	156.84	6224.35	164.21	6225.15	171.03	6226.02
185.85	6229.32	192.08	6229.71	194.64	6230				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	47.49	.05	65.36	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
47.49	65.36	25.73	18.13	16.63	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 649.55

INPUT
Description: 9 - River STA 653.12
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.22	6.37	6228.13	12.43	6227.5	18.68	6225.07	20.15	6224.36
30.03	6221.19	30.27	6221	34.65	6219.15	39.63	6216.92	53.16	6211.5
55.91	6210.4	59.28	6207.36	59.47	6207.08	59.95	6207.07	64.56	6207.2
67.56	6207.28	67.67	6207.37	67.96	6207.58	72.32	6211	74.36	6211.25
83.82	6212.31	91.44	6213.09	99.85	6213.98	104.47	6214.8	111.3	6216.01
114.49	6216.67	114.89	6217.74	123.45	6219.63	139.41	6221.75	140.53	6221.84
143.44	6222.05	152.25	6223.43	160.72	6224.46	165.3	6224.94	169.24	6225.42
189.24	6229.79	191.7	6229.95						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	53.16	.05	72.32	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
53.16	72.32	.1	.1	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Upstream RS: 649.45

INPUT
Description: 8 - River STA 653.02
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6228.21	6.38	6228.13	12.46	6227.49	18.66	6225.08	20.12	6224.38
29.92	6221.23	30.16	6221.04	34.5	6219.21	39.44	6216.99	53.17	6211.5
55.93	6210.4	59.34	6207.32	59.5	6207.08	59.89	6207.08	64.57	6207.21
67.36	6207.29	67.59	6207.29	67.6	6207.3	67.65	6207.34	72.32	6210.99
74.55	6211.27	83.85	6212.31	91.35	6213.08	99.87	6213.98	104.55	6214.81
111.16	6215.98	114.47	6216.67	114.86	6217.73	123.49	6219.63	139.38	6221.74
140.51	6221.83	143.48	6222.05	152.25	6223.42	160.83	6224.46	165.35	6224.93
169.24	6225.41	189.32	6229.8	191.71	6229.96				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	53.17	.05	72.32	.06

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.17   72.32            30.04   28.19   32.96             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream          RS: 621.26

INPUT
Description: 7 - River STA 624.83
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6223.2   16.35  6223.2   29.11 6217.52   48.21 6209.68    50.6 6209.53
   56.55  6208.7   60.52 6208.27   67.42 6210.35   70.18 6211.33   82.22 6213.77
  116.03 6217.67   129.5 6219.85  140.94 6222.53  142.65 6222.86  144.67 6213.81
  158.68 6214.07  160.68 6223.67  166.78 6223.95  168.12 6224.41  169.89 6224.44
  170.51 6224.03  171.18 6223.92   178.9 6227.75  179.34    6228

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   48.21     .05   67.42     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         48.21   67.42            76.21   68.04   60.72             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  142.61  179.34 6222.93       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream          RS: 553.22

INPUT
Description: 6 - River STA 556.84
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6215.5   27.86  6215.5    41.4 6209.47   52.63 6208.56    67.1 6208.33
   68.52  6208.3   68.81 6208.27   69.08 6208.35   69.19  6208.4  115.47 6218.58
  117.51  6210.3  131.51 6210.51  133.92 6219.43  142.78 6220.09  144.49 6221.98
  168.14  6226.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    41.4    .035   69.19     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         41.4    69.19            54.65   48.65   54.29             .1       .3
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Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  115.47  168.14 6218.61       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 504.57

INPUT
Description: 5 - River STA 508.15
Station Elevation Data    num=      38
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6223.07    3.16 6223.03   24.12 6222.87   44.13  6222.6   55.34 6222.64
   78.29 6222.84   79.08 6222.84   79.49 6222.82   90.04  6222.4  103.59 6222.02
  103.78 6222.01  105.15 6221.54  140.56 6209.24  140.78 6209.22  144.97 6209.01
  152.12 6208.27  154.15 6208.05  154.98 6207.98  155.51 6207.97  160.12 6208.15
  164.28 6208.28  164.82 6208.23   164.9 6208.22   165.2 6208.27  169.41 6208.49
  173.88 6209.01  198.91 6214.51  199.49 6214.61   201.5 6206.15  202.98 6206.18
  215.52 6206.31  216.63 6215.41  219.74 6215.58  225.61    6216   227.5 6219.91
  228.52 6219.91  257.94  6226.5  258.19  6226.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  140.56    .035  173.88     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        140.56  173.88            31.24   27.94   24.62             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  199.43  258.19 6214.61       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Upstream           RS: 476.63

INPUT
Description: 4 - River STA 480.14
Station Elevation Data    num=      53
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6222.64    1.08 6222.63   43.51 6222.39   46.59 6222.35   48.58 6222.37
   53.43 6222.41   80.61 6222.52    88.9 6222.27   90.62 6222.24   99.36    6222
  105.23 6221.75  105.54 6221.19  106.11    6221  130.34 6211.17   130.7 6211.14
  130.84    6211  132.71    6209   136.9    6208  140.35 6207.18  144.26 6206.25
  156.09 6202.13  156.99 6201.82  159.03 6201.23  159.52 6201.17  159.86 6201.21
  164.16 6201.37  165.93 6201.18  167.26 6201.22  167.66 6201.36  177.89 6205.21
  180.77 6206.39  191.24  6208.7  191.71 6207.57  192.04 6206.88  193.24 6204.28
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  194.71 6204.31  195.24 6204.31  198.96 6204.37  200.24 6204.38  204.03 6204.44
  205.24 6204.46  205.69 6204.46  207.24 6204.52   208.5 6210.18  209.24 6213.48
  214.95 6213.78  218.38 6213.97  219.53 6216.81  220.41 6218.89  220.48  6218.9
  220.98    6219  247.43 6224.22  251.77 6225.08

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  156.99    .035  167.66     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        156.99  167.66             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  191.25  251.77 6208.76       F

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 443.00

INPUT
Description: Trail River STA 443.73
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6204.26   12.74 6204.26   13.12 6202.58    13.4  6202.4   13.59 6202.29
   14.67 6202.31   15.59 6202.32   17.77 6202.35   20.59  6202.4   22.58 6202.43
   25.59 6202.48   26.86  6202.5   27.59 6202.51   27.67 6202.84   27.78 6203.34
   27.99 6204.22   28.19  6205.1   29.59 6211.41   29.84 6211.42   35.64 6211.65
   38.59 6211.77   39.94 6215.13   40.59 6217.75   40.84  6217.8   66.55  6222.9
   67.05    6223   68.84 6223.29   69.26 6223.36   71.51  6223.7   71.96 6223.75
   75.38 6224.12   99.49    6227

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   13.59    .013   27.59     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         13.59   27.59             27.19   30.76   42.74             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 412.24

INPUT
Description: Trail River STA 412.70
Station Elevation Data    num=      40
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
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```
       0 6204.26     .99 6204.26       2 6200.18    3.35  6200.2       4 6200.21
     5.6 6200.24       9 6200.29   10.56 6200.32      14 6200.37   15.39  6200.4
      16 6200.41   16.23 6201.42   16.48  6202.3   16.79 6203.75   16.83 6203.94
      18 6209.22   20.82 6209.34      27 6209.58   27.63 6211.16      29 6216.64
   29.25 6216.69   41.31 6219.08   41.64 6219.15   41.93 6219.21   42.02 6219.22
   42.48  6219.3   42.56 6219.31   43.22 6219.36   56.09 6220.64   56.27 6220.66
   56.28 6220.66   57.09 6220.79   77.85    6224   92.93 6226.35   96.39 6226.38
   98.55  6226.4   98.98  6226.4   99.31 6226.41  100.02 6226.41  101.41 6226.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05       2    .013      16     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             2      16             21.77   21.53   17.96             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 390.71

INPUT
Description: Trail River STA 391.14
Station Elevation Data    num=      61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6204.26     .28 6204.26    2.03 6198.46    2.23 6198.47     2.6 6198.47
    3.04 6198.48    4.03 6198.49    6.22 6198.53    7.72 6198.55    9.04 6198.57
   12.24 6198.62   12.71 6198.63   14.03 6198.65   14.57 6198.66   15.04 6198.67
   15.43 6198.67   15.89 6198.68   16.04 6198.68   17.53 6205.37   17.72 6206.24
   17.77  6206.4   17.82 6206.64   17.83  6206.7   18.05 6207.67   18.55 6207.68
   21.24 6207.76   27.07    6208   27.17 6208.25   29.07 6215.83   29.32 6215.88
   31.04 6216.22   31.13 6216.24   31.15 6216.24   31.22 6216.25   31.23 6216.25
   31.33 6216.26    33.3 6216.45   33.33 6216.46   36.77    6217   39.94  6217.5
    43.1    6218   44.98  6218.3   45.69 6218.41   47.69 6218.73   51.82 6219.38
   52.69 6219.52    54.7 6219.83   58.87 6220.49    59.7 6220.62    61.7 6220.94
   74.73    6223   86.81  6224.9   89.36 6225.26   96.94 6225.41  101.34  6225.5
  102.18 6225.52  102.82 6225.53  104.19 6225.56  107.64 6225.63  111.36  6225.7
  113.42 6225.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    2.03    .013   16.04     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          2.03   16.04             5.49    4.81    7.04             .1       .3

CROSS SECTION
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RIVER: IndustrailTrib
REACH: Trail              RS: 385.90

INPUT
Description: Trail River STA 386.14
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6197     2.2 6198.17    15.2 6198.17    16.2 6198.28    18.2 6207.32
    23.2 6207.51    27.2 6207.67    29.2 6215.67   62.91    6221   80.24 6223.73
    89.6 6225.14   96.67 6225.24  100.96  6225.3   101.8 6225.31  102.44 6225.32
  103.83 6225.33  107.36 6225.38  111.29 6225.43  113.81 6225.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05     2.2    .013    15.2     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           2.2    15.2           117.95  118.96  101.52             .1       .3
Left Levee      Station=       0      Elevation= 6204.26

CULVERT


RIVER: IndustrailTrib
REACH: Trail              RS: 320.90

INPUT
Description:
Distance from Upstream XS =      43
Deck/Roadway Width        =      50
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6225.59           113.8 6225.59

Upstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6197     2.2 6198.17    15.2 6198.17    16.2 6198.28    18.2 6207.32
    23.2 6207.51    27.2 6207.67    29.2 6215.67   62.91    6221   80.24 6223.73
    89.6 6225.14   96.67 6225.24  100.96  6225.3   101.8 6225.31  102.44 6225.32
  103.83 6225.33  107.36 6225.38  111.29 6225.43  113.81 6225.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05     2.2    .013    15.2     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
           2.2    15.2             .1       .3
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```
Left Levee      Station=       0      Elevation= 6204.26

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6220.87             127 6220.87

Downstream Bridge Cross Section Data
Station Elevation Data    num=      68
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6218.28     .08 6215.99     .09 6215.94     .43 6204.93     .83 6192.52
    2.71 6192.47    3.83 6192.47   15.83 6192.47   18.83 6192.47   19.73 6216.64
   20.54 6216.64   48.21 6216.87   49.05 6216.87   53.93 6216.66   55.92 6216.68
   63.09 6217.46   63.54 6217.46    65.7 6217.47   66.15 6217.48   67.51 6217.48
   69.06 6217.49   69.97 6217.49   70.43  6217.5   71.35  6217.5   83.53 6217.72
   84.11 6217.74    88.1 6217.76   88.62 6217.77   89.15 6217.79   89.71 6217.81
   90.28 6217.83   90.87 6217.85   91.48 6217.87    92.1 6217.89   95.76 6217.91
   96.37 6217.93      97 6217.95   97.64 6217.97   98.31 6217.99   98.99 6218.01
    99.7 6218.03  100.43 6218.05  101.19 6218.08  101.97  6218.1  104.31 6218.11
  105.01 6218.13  105.73 6218.16  106.48 6218.18  107.25 6218.21  108.05 6218.24
  108.43 6218.24  109.23 6218.27  110.06  6218.3  110.92 6218.33  111.82 6218.36
  112.51 6218.37  113.35  6218.4  114.23 6218.44  115.14 6218.47  116.09 6218.51
  117.08 6218.55  117.28 6218.55  118.21 6218.59  118.52  6218.6     119 6218.62
  119.01 6218.63  124.37 6220.14  127.45 6220.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    3.83    .013   15.83     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          3.83   15.83             .1       .3

Upstream Embankment side slope              =       4 horiz. to 1.0 vertical
Downstream Embankment side slope            =       4 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box       8      12
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                  1     117     .013     .013        0                   .5
```

```
      1
Upstream   Elevation =  6198.17
           Centerline Station =  9.17
Downstream Elevation =  6192.47
           Centerline Station =  9.81

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 266.94

INPUT
Description: Trail River STA 267.33
Station Elevation Data    num=      68
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6218.28     .08 6215.99     .09 6215.94     .43 6204.93     .83 6192.52
    2.71 6192.47    3.83 6192.47   15.83 6192.47   18.83 6192.47   19.73 6216.64
   20.54 6216.64   48.21 6216.87   49.05 6216.87   53.93 6216.66   55.92 6216.68
   63.09 6217.46   63.54 6217.46    65.7 6217.47   66.15 6217.48   67.51 6217.48
   69.06 6217.49   69.97 6217.49   70.43  6217.5   71.35  6217.5   83.53 6217.72
   84.11 6217.74    88.1 6217.76   88.62 6217.77   89.15 6217.79   89.71 6217.81
   90.28 6217.83   90.87 6217.85   91.48 6217.87    92.1 6217.89   95.76 6217.91
   96.37 6217.93      97 6217.95   97.64 6217.97   98.31 6217.99   98.99 6218.01
    99.7 6218.03  100.43 6218.05  101.19 6218.08  101.97  6218.1  104.31 6218.11
  105.01 6218.13  105.73 6218.16  106.48 6218.18  107.25 6218.21  108.05 6218.24
  108.43 6218.24  109.23 6218.27  110.06  6218.3  110.92 6218.33  111.82 6218.36
  112.51 6218.37  113.35  6218.4  114.23 6218.44  115.14 6218.47  116.09 6218.51
  117.08 6218.55  117.28 6218.55  118.21 6218.59  118.52  6218.6     119 6218.62
  119.01 6218.63  124.37 6220.14  127.45 6220.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    3.83    .013   15.83     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          3.83   15.83             11.13    9.63   10.12             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 257.31

INPUT
Description: Trail River STA 257.70
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6215.67     .69 6196.96     .84 6193.77    2.13 6192.88    3.39 6192.16
    4.38 6192.17     5.4 6192.19    8.24 6192.23    10.4 6192.27   13.78 6192.32
```

```
    15.4 6192.35   17.04 6192.38   17.45 6192.39   17.56 6192.38   19.24 6192.28
   19.71 6203.54   20.13 6214.98   27.69 6214.84   27.87 6214.84   29.38 6214.83
   30.04 6214.82   30.51 6214.82   30.84 6214.81   30.94 6214.81   52.11 6214.68
   52.71 6214.68   52.73 6214.67   58.14 6213.13   64.59  6211.3   68.21 6211.08
   80.08 6210.84   80.27 6210.84   80.86 6210.83   81.57 6210.81   92.48 6210.57
    92.7 6210.56   93.82 6210.54  103.95 6214.39  104.81 6214.63  130.27 6221.66
  130.83 6221.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    3.39    .012   19.24     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          3.39   19.24             12.41   10.37   52.82             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 246.94

INPUT
Description: Trail River STA 247.32
Station Elevation Data    num=      53
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6212.68     .22 6209.38     .83 6195.82    3.06 6195.11    3.47 6195.35
    3.48 6195.29    3.49 6195.27     4.5 6193.56    4.51 6193.56    4.52 6193.48
     4.6 6193.11    4.92 6191.93    5.61 6191.95    6.93 6191.97    9.31 6192.01
   11.93 6192.05   16.43 6192.12   16.89 6192.13    17.7 6193.18   17.75 6193.25
   18.55 6192.88   18.58 6192.15   18.93 6192.16      19 6192.15    20.5 6193.45
   20.57  6195.4   21.16 6211.11   21.33 6212.81   21.98 6212.79   22.02 6212.78
   22.98 6212.77   23.01 6212.77   24.88 6212.73   36.84 6212.39   37.25 6212.38
    40.8 6212.32   42.38 6212.29    43.5 6212.27   44.29 6212.25   44.54 6212.25
   56.45 6212.04   56.78 6212.04    56.8 6212.03   64.02 6209.91   72.76 6207.34
   73.46 6207.29   77.87 6207.14   86.42 6208.43   90.25 6208.62   90.94 6208.95
   92.63 6209.52  109.13 6216.85  126.31 6207.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    4.92    .012   16.89     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          4.92   16.89             10.99    9.87   26.73             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 237.07
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```
INPUT
Description: Trail River STA 237.41
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6209.94     .46 6203.02    2.89 6202.12    5.29 6192.88    7.06 6191.84
   17.06 6191.84   19.59 6201.89   21.82 6203.33    22.6 6210.23   28.77 6209.59
   48.51  6209.3   50.98 6208.76   69.19 6216.53   72.08    6217   88.39    6217

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    7.06    .012   17.06     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          7.06   17.06            93.44   88.77   53.24             .1       .3

CULVERT


RIVER: IndustrailTrib
REACH: Trail              RS: 194.07

INPUT
Description:
Distance from Upstream XS =      38
Deck/Roadway Width        =      12
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.98           88.35 6218.98

Upstream Bridge Cross Section Data
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6209.94     .46 6203.02    2.89 6202.12    5.29 6192.88    7.06 6191.84
   17.06 6191.84   19.59 6201.89   21.82 6203.33    22.6 6210.23   28.77 6209.59
   48.51  6209.3   50.98 6208.76   69.19 6216.53   72.08    6217   88.39    6217

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    7.06    .012   17.06     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          7.06   17.06             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.98           97.97 6218.98
```

```
Downstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191    1.85 6191.05   11.85 6191.05   28.22    6205   42.92 6215.83
   49.98 6216.16   54.57 6216.53   70.84 6216.32   71.36 6216.43      80 6218.71
   94.54 6222.89   97.99 6223.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    1.85    .012   11.85     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          1.85   11.85             .1       .3

Upstream Embankment side slope              =       4 horiz. to 1.0 vertical
Downstream Embankment side slope            =       4 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1          Arch      10      10
FHWA Chart # 41- Arch; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 5      83     .013     .013        0                   .5
      1
Upstream   Elevation =  6191.74
           Centerline Station =  12.05
Downstream Elevation =  6191.05
           Centerline Station =  6.55

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 148.30

INPUT
Description: Trail River STA 148.62
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191    1.85 6191.05   11.85 6191.05   28.22    6205   42.92 6215.83
   49.98 6216.16   54.57 6216.53   70.84 6216.32   71.36 6216.43      80 6218.71
```

```
   94.54 6222.89   97.99 6223.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    1.85    .012   11.85     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1.85   11.85             7.57    9.07    7.65             .1       .3

LATERAL STRUCTURE


RIVER: IndustrailTrib
REACH: Trail              RS: 148.00

INPUT
Description:
Lateral structure position     = Left overbank
Distance from Upstream XS =
Deck/Roadway Width        =       2
Weir Coefficient          =     3.2
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        3
     Sta    Elev     Sta    Elev     Sta    Elev
       0    6193     .04    6193    62.4    6193

Weir crest shape                           = Broad Crested


Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       1       1
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                         2     .013     .013        0                  .5
      1
Upstream   Elevation =  6188.6
           Centerline Station =  30
Downstream Elevation =  6188.6
           Centerline Station =  30

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 139.23
```

INPUT
Description: Trail River STA 139.64
Station Elevation Data num= 196

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6193	.07	6191	.17	6188.95	1.71	6188.94	2.096	188.944
7.4	6189	9.57	6189	11.88	6189.03	12.376	189.013	13.93	6188.96
16.06	6188.43	17.13	6188.15	17.33	6188.11	18.2	6188.04	21.4	6188.82
21.99	6189.2	22.47	6189.54	23.55	6190.7	25.67	6192.93	26.73	6194.08
30.54	6197.98	32.1	6199.62	33.65	6201.18	35.27	6202.75	35.99	6203.49
38.32	6205.83	39.54	6206.98	40.61	6208.04	40.77	6206.11	41.43	6199.35
41.67	6198.29	42.21	6203.32	42.74	6207.24	42.98	6207.02	43.66	6207.33
43.8	6206.66	44.55	6204.9	44.87	6204.25	45.33	6202.85	45.93	6201.16
46.11	6200.53	46.6	6199.35	46.99	6199.73	47.22	6200.29	47.67	6200.97
48.06	6202.37	48.45	6202.26	48.88	6200.72	49.12	6200.24	49.23	6200.45
49.54	6200.24	50.01	6201.41	50.18	6201.96	51.25	6204.75	51.58	6205.28
52.21	6205.61	52.31	6205.71	52.36	6205.8	52.49	6205.81	53.14	6205.44
53.37	6205.56	53.92	6206.06	54.44	6206.68	55.43	6207.57	55.5	6207.48
55.54	6207.49	56.26	6206.88	56.56	6207.29	57.04	6207.34	57.21	6206.88
57.63	6206.27	57.82	6206.15	58.37	6207.02	58.61	6207.64	58.69	6207.75
58.87	6207.74	59.39	6207.58	59.75	6207.67	60.17	6207.58	60.54	6207.96
60.82	6208.08	60.95	6208.36	61.31	6208.76	61.73	6208.45	61.88	6207.9
62.2	6207.78	62.51	6207.44	62.94	6207.62	63.29	6207.39	63.86	6208.04
64.07	6208.1	64.26	6208.29	64.85	6208.35	65.07	6208.88	65.53	6208.76
65.64	6208.78	66.13	6208.42	66.42	6208.39	67.2	6209.53	67.98	6208.96
68.26	6207.85	68.76	6207.44	68.86	6207.85	69.32	6208.68	69.54	6208.88
70.14	6208.35	70.32	6208.07	70.39	6208.04	70.52	6208.21	71.1	6209.24
71.45	6209.47	71.88	6209.26	72.19	6209.8	72.51	6210.04	72.67	6210.17
73.09	6210.04	73.45	6209.86	73.58	6209.9	73.85	6209.82	74.23	6209.96
74.64	6209.52	75.01	6209.16	75.52	6210.27	75.7	6210.4	75.79	6210.49
76.03	6210.19	76.57	6209.27	76.77	6209.29	77.18	6209.91	77.35	6210.19
77.85	6210.87	78.1	6210.97	78.55	6210.41	78.83	6209.9	79	6209.52
79.57	6209.85	80.14	6210.31	80.3	6210.24	80.59	6210.77	81.04	6211.28
81.29	6211.84	81.77	6211.67	82.17	6211.95	82.43	6212.06	82.51	6212.03
82.64	6211.86	83.24	6210.55	83.58	6210.85	83.98	6210.74	84.69	6210.81
84.71	6210.76	84.73	6210.76	84.77	6210.8	85.45	6211.07	85.87	6211.96
86.18	6211.97	86.73	6212.16	86.92	6212.01	87.02	6212.08	87.38	6211.56
87.65	6210.85	88.16	6211.58	88.39	6211.71	88.78	6210.32	89.12	6208.47
89.31	6208.27	89.85	6211.3	89.98	6211.74	90.46	6213.69	90.59	6213.6
90.83	6213.38	91.32	6212.71	91.6	6213.16	92.06	6213.31	92.58	6214.17
92.75	6214.37	92.79	6214.35	92.88	6214.04	93.53	6211.23	93.89	6209.95
94.26	6210.24	94.92	6212.92	95	6213.02	95.04	6212.98	95.19	6212.59
95.73	6211.6	96.19	6209.54	96.47	6209.15	96.97	6210.91	97.2	6212.75
97.33	6213.35	97.79	6213.78	97.94	6213.95	98.48	6214.11	98.67	6214.26
98.91	6214.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	0	.013	12.37	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
0 12.37 13 13 13 .1 .3

CROSS SECTION

RIVER: IndustrailTrib
REACH: Trail RS: 126.23

INPUT
Description: Trail River STA 126.75
Station Elevation Data num= 209

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6191	.7	6191	.8	6188.67	1.1	6188.66	2.5	6188.66
3.5	6188.69	4.6	6188.69	5.5	6188.72	6.7	6188.72	7.7	6188.75
8.7	6188.75	9.8	6188.78	10.8	6188.78	11.8	6188.81	12.7	6188.79
12.9	6188.79	13.9	6188.78	14.6	6188.64	15	6188.57	15.6	6188.41
16	6188.3	16.2	6188.24	17	6188.03	17.9	6187.85	18.1	6187.8
18.4	6187.87	18.7	6187.91	19.1	6188	19.5	6188.1	19.8	6188.19
21.1	6188.49	21.9	6188.72	22.2	6188.81	22.7	6189.25	22.7	6189.29
23.2	6189.74	23.6	6190.02	25.2	6191.44	27.4	6193.32	27.6	6193.53
28.4	6194.29	28.5	6194.32	29.3	6194.99	30.9	6196.33	31.3	6196.65
31.5	6196.88	31.7	6197.01	32.3	6197.52	32.5	6197.75	32.6	6197.81
33.3	6198.46	33.6	6198.72	34.1	6199.16	34.1	6199.17	35.6	6200.34
35.7	6200.44	35.8	6200.51	37.4	6201.89	37.8	6202.21	38.2	6202.59
38.4	6202.77	38.8	6203.1	39	6203.28	39.8	6203.95	39.8	6203.96
39.8	6203.97	39.8	6203.98	40.6	6204.64	40.9	6204.83	41.3	6201.92
41.5	6200.83	41.9	6197.11	42.3	6199.23	42.7	6203.14	42.9	6204.9
43.1	6205.06	43.6	6205.14	43.9	6205.13	44	6205.12	44.7	6205.11
45	6205.1	45.5	6205.1	46.3	6205.08	47	6205.09	47.2	6205.09
47.4	6205.09	48.1	6205.09	48.4	6205.02	48.8	6204.84	49.2	6204.81
49.6	6204.87	49.9	6204.93	50.2	6204.99	50.4	6205.06	51.2	6204.75
51.2	6204.73	51.2	6204.72	52	6205.21	52.3	6205.29	52.7	6205.29
52.9	6205.3	53.3	6205.28	53.7	6204.71	54.4	6203.84	54.5	6204.02
54.9	6204.24	55.4	6204.56	55.6	6204.71	56.1	6205.15	56.4	6205.41
56.9	6205.67	57	6205.68	57.5	6205.86	57.7	6205.4	58.4	6202.59
58.5	6202.37	58.5	6202.36	58.7	6202.42	59.4	6203.15	59.5	6203.39
59.9	6204.05	60.2	6204.53	60.6	6205.56	61	6205.85	61.3	6205.96
61.6	6206.15	61.8	6205.75	62.7	6202.65	62.7	6202.8	63.4	6204.47
63.7	6205.14	64.1	6205.73	64.2	6205.95	64.7	6206.25	65.1	6206.16
65.6	6206.28	65.8	6206.27	65.9	6206.3	66.3	6206.2	66.7	6206.26
67.5	6206.23	67.8	6206.28	68.3	6206.58	68.4	6206.62	68.9	6206.84
69.1	6206.7	69.9	6208.04	69.9	6208.06	69.9	6208.09	70	6207.96
70.9	6206.39	71.3	6207.06	72	6208.43	72.4	6208.16	73	6207.95
73.2	6208.07	73.8	6208.92	74.1	6209.18	74.1	6209.07	74.8	6208.39
75.1	6208	75.6	6208.15	75.6	6208.1	76.1	6208.69	76.4	6208.72
77	6208.15	77.3	6208.15	77.6	6208.01	78.1	6207.93	78.2	6207.87
78.4	6207.93	78.9	6208.32	79.2	6208.25	79.7	6208.56	79.9	6208.63
80.3	6208.86	80.5	6208.74	81.3	6210.29	81.4	6210.41	82.1	6211.21
82.4	6211.34	82.7	6211.11	83	6211.07	83.4	6210.66	83.8	6210.28

```
    84.2 6209.44    84.4 6209.02    84.6 6209.09    85.2 6209.83    85.4 6210.39
    85.5 6210.47    85.6 6210.57    86.2 6211.26    86.5 6211.45      87    6211
    87.5 6210.13    87.8 6209.71    88.6 6207.97    88.9 6206.76    89.5 6205.62
    89.6 6205.62    89.9 6207.23    90.3 6210.34    90.6 6212.33    91.1 6212.48
    91.3 6212.75    91.7 6213.05    91.9 6212.9792.27757 6212.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013    12.9     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    12.9             21.7    21.7    21.7             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 104.53

INPUT
Description: Trail River STA 105.14
Station Elevation Data    num=     238
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191     1.2    6191     1.3 6188.69     3.1  6188.7     5.1 6188.74
     7.2 6188.76     9.2 6188.81    11.3 6188.82    11.7 6188.83    11.9 6188.84
    12.3 6188.84    13.1 6188.84    13.4 6188.84    13.5 6188.84    14.3 6188.81
    14.5  6188.8    15.4 6188.65    18.5 6187.87    19.5 6188.02    21.3 6188.46
    21.6 6188.52    21.8 6188.56    22.4 6188.72    22.6 6188.77    22.6 6188.79
    25.7 6190.26    25.9 6190.35    26.5 6190.69    26.7 6190.79    26.8 6190.81
    26.8 6190.85    27.8 6191.29    28.2 6191.49    28.4 6191.57    28.8 6191.78
    29.2 6191.95    29.6 6192.13    29.8 6192.25      30 6192.33    30.6 6192.64
    30.8 6192.73    30.9 6192.75      31 6192.79    31.7 6193.17    31.9 6193.29
    32.5 6193.56    32.9 6193.78    33.7 6194.12      34 6194.24    34.1 6194.31
    34.8 6194.61      35 6194.69      35 6194.71    35.1 6194.75    37.4  6195.9
    37.8 6196.09    38.1 6196.22    38.3 6196.29    38.9 6196.56    39.1 6196.63
    39.1 6196.65    39.2 6196.68    39.9 6197.04    40.2 6197.16    40.6 6197.35
    40.7 6197.43    41.2 6197.63    41.6  6197.8    41.9 6197.98    42.2 6198.11
    42.4  6198.1    43.1 6198.09    43.2 6198.08    43.2 6198.07    43.3 6198.05
      44 6197.85    44.3 6197.78    44.7 6197.75    45.3  6197.7    45.7 6197.71
    46.1 6197.73    46.3 6197.74    46.5 6197.76    47.2 6197.86    47.3 6197.89
    47.4 6197.89    47.4  6197.9    48.2 6198.03    48.4 6198.08    48.8 6198.17
      49 6198.21    49.4 6198.32    49.8 6198.41    50.2  6198.5    50.6 6198.61
    51.5 6198.83    51.5 6198.84    52.3 6198.83    52.5 6198.87    52.9  6199.1
    53.1 6199.22    53.6 6199.45    53.9 6199.57    54.6 6199.77    55.5 6200.04
    55.6 6200.08    55.6 6200.09    55.7  6200.1    56.4 6200.22    56.6 6200.28
      57 6200.45    57.2 6200.55    57.7 6200.73    58.1 6200.86    58.4 6200.97
    58.7 6201.07    58.9 6201.12    59.6 6201.28    59.7 6201.31    59.8 6201.33
    60.5  6201.6    60.8 6201.66    61.2 6201.76    61.4  6201.8    61.8 6201.92
    62.2  6202.1    62.5 6202.25    62.8 6202.38      63 6202.44    63.7 6202.65
    63.8 6202.68    63.9 6202.69    63.9  6202.7    64.7 6202.98    64.9 6203.05
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    65.3 6203.17    65.5 6203.23    65.9 6203.36    66.3 6203.49    66.6 6203.61
    66.9 6203.72    67.1 6203.78    67.9 6204.02      68 6204.05      69 6200.89
    69.4 6201.83    69.6 6202.62      70 6203.32    70.4 6203.68    70.8 6204.53
    71.1 6205.02    71.3 6204.94      72  6203.8    72.1 6203.67    72.9 6204.97
    73.1 6205.53    73.5 6204.04    73.7 6203.11    74.2 6201.48    74.6 6202.33
    74.9 6204.02    75.2 6205.07    75.4 6205.95    76.1 6206.75    76.2 6206.75
    76.2 6206.71    76.3 6206.74      77 6206.64    77.3 6207.05    77.6  6204.9
    77.9 6203.73    78.3 6201.07    78.7 6201.43      79  6202.3    79.3 6202.82
    79.5 6203.76    80.3 6207.09    80.3 6207.42    80.4 6207.34    81.2 6205.32
    81.4 6204.73    81.7 6203.56      82 6202.79    82.4 6201.45    82.8 6200.67
    83.4 6199.81    83.6 6200.55    84.4 6204.13    84.5  6204.5    84.5 6204.56
    85.3 6207.67    85.5 6207.94    86.1 6209.16    86.5 6210.14    86.9 6210.25
    87.2 6210.35    87.6 6210.45    87.8 6210.51    88.5 6210.79    88.6 6210.81
    88.6 6210.76    89.4  6207.2    89.6 6206.84      90 6207.14    90.2 6207.89
    90.7 6207.61    91.1 6206.97    91.4 6205.01    91.7 6203.85    91.9 6204.51
    92.7 6212.16    93.5 6212.43    93.7 6212.51    94.1 6212.44    94.4 6212.29
    94.8 6212.32    95.2 6208.42    95.5 6206.41    95.8 6203.59      96 6203.64
    96.8 6199.04    97.7 6201.92    97.9 6202.89    98.5 6209.97    98.9 6214.25
    99.3 6214.39    99.6  6214.5    99.9 6214.62   100.1 6214.68   100.9  6214.9
     101 6214.91   101.8 6215.18   102.3 6215.38     103 6215.63   103.4 6215.77
   103.7 6215.87     104 6215.99104.0623    6216

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013     1.2    .013    14.3     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
           1.2    14.3             20.8    20.8    20.8             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: Trail              RS: 83.73

INPUT
Description: Trail River STA 84.30
Station Elevation Data    num=     256
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6191     1.1    6191     1.2 6189.82     2.1 6189.83       3 6189.82
     3.2 6189.81     3.4  6189.8     6.8 6189.21    12.9 6189.36      17 6189.51
    17.4 6189.52    18.5 6189.54    18.6 6189.54      19 6189.54    19.3 6189.54
    19.8 6189.52      20 6189.52    20.2  6189.5    21.1 6189.38    21.1 6189.37
    21.9 6189.24    22.1 6189.22    22.3 6189.17    22.8 6189.08    23.1 6189.02
    23.7 6188.94    24.1 6188.86    24.5 6188.82    24.8 6188.78    25.1 6188.74
      26 6188.86    26.1 6188.88    26.2 6188.91    26.9 6189.06    27.1 6189.11
    27.2 6189.12    27.2 6189.13      28 6189.28    28.2 6189.32    28.4 6189.38
    28.8 6189.47    29.2 6189.54    29.7 6189.65    30.2 6189.76    30.6 6189.84
    31.2 6189.97    31.4 6190.02    32.1 6190.17    32.2  6190.2    32.3 6190.21
    32.7 6190.31    33.2 6190.41    33.2 6190.42    33.4 6190.44      34 6190.57
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    34.3 6190.62    34.6 6190.67    34.9 6190.73    35.3 6190.79    35.8 6190.88
    36.3 6190.98    36.6 6191.03      37 6191.09    37.3 6191.13    37.5 6191.16
    38.3 6191.28    38.3 6191.29    38.4  6191.3    38.6 6191.33    39.2 6191.43
    39.5 6191.46    40.1 6191.53    40.3 6191.56    40.7 6191.59      41 6191.61
    41.4 6191.65    41.8 6191.69    41.9  6191.7    42.4 6191.73    42.7 6191.77
    43.2 6191.83    43.4 6191.85    43.5 6191.87    44.4 6191.94    45.3 6192.03
    45.4 6192.05    45.6 6192.07    46.1 6192.12    46.4 6192.15    46.9 6192.19
      47 6192.21    47.5 6192.25    48.1 6192.31    48.5 6192.35    48.7 6192.38
    49.5 6192.45    49.6 6192.47    50.3 6192.56    50.5 6192.58    50.5 6192.59
    51.3 6192.66    51.5 6192.68    51.8 6192.71    52.2 6192.76    52.5 6192.79
      53 6192.84    53.5  6192.9    53.9 6192.94    54.6 6193.02    54.8 6193.04
    55.7 6193.12    56.1 6193.17    56.5 6193.21    56.6 6193.22    57.4 6193.32
    57.6 6193.34    57.9 6193.38    58.3 6193.43    58.6 6193.47    59.1 6193.52
      60 6193.61    60.6 6193.68    60.8  6193.7    61.6  6193.8    61.7 6193.81
    61.7 6193.82      62 6193.85    62.6  6193.9    62.7 6193.91    63.4 6194.01
    63.7 6194.04      64 6194.08    64.3  6194.1    64.7 6194.14    65.3 6194.21
    65.7 6194.27      66 6194.31    66.5 6194.36    66.7 6194.39    67.7 6194.51
    67.8 6194.51    67.9 6194.52    68.6 6194.61    68.8 6194.62      69 6194.64
    69.5  6194.7    69.8 6194.73    70.2 6194.78    70.4 6194.81    70.8 6194.86
    71.2  6194.9    71.4 6194.92    71.8 6194.96    72.1    6195    72.6 6195.07
    72.8  6195.1      73 6195.12    73.7 6195.22    73.8 6195.23    73.9 6195.24
    74.7 6195.33    74.9 6195.35    75.1 6195.38    75.6 6195.43    76.3 6195.51
    76.4 6195.52    76.9 6195.58    77.3 6195.62    77.5 6195.65    77.9 6195.69
    78.1 6195.72    78.9 6195.81      79 6195.82    79.6  6195.9    79.9 6195.94
    79.9 6195.95      80 6195.95    80.7 6196.03    80.9 6196.05    81.2 6196.08
    81.6 6196.12      82 6196.16    82.5 6196.23      83  6196.3    83.3 6196.34
    83.7 6196.38      84 6196.42    84.9 6196.53      85 6196.54    85.1 6196.55
    85.4 6196.59    85.9 6196.64      86 6196.65    86.1 6196.66    86.8 6196.75
      87 6196.78    87.4 6196.82    87.7 6196.86      88  6196.9    88.6 6196.97
    89.1 6197.03    89.4 6197.07    89.8 6197.12    90.1 6197.16    90.3 6197.18
    91.1 6197.25    91.1 6197.26    91.3 6197.28      92 6197.39    92.1  6197.4
    92.3 6197.42    92.9 6197.49    93.1 6197.52    93.5 6197.57    93.7  6197.6
    94.1 6197.66    94.6 6197.71    95.2 6197.78    95.4 6197.81      96 6197.87
    96.3 6197.91    97.1 6198.02    97.2 6198.02      98 6198.13    98.2 6198.15
    98.4 6198.18    98.9 6198.24    99.2 6198.28    99.8 6198.35   100.2  6198.4
   100.9 6198.48   101.2 6198.52   101.5 6198.56   102.1 6198.65   102.3 6198.67
   102.4 6198.68   103.3 6198.78   103.3 6198.79   104.1 6198.89   104.3 6198.92
   104.6 6198.95     105    6199   105.3 6199.04   105.8 6199.11   105.8 6199.12
   106.3 6199.19   106.7 6199.23     107 6199.27   107.6 6199.34   108.2 6199.43
   108.3 6199.44   108.4 6199.45   109.3 6199.58   109.5  6199.6   110.2 6199.68
110.5365 6199.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013     1.2    .013    21.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           1.2    21.1             28.1    28.1    28.1             .1       .3

CROSS SECTION
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RIVER: IndustrailTrib
REACH: LowFlow RS: 449.30

INPUT
Description: River STA 443.81
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6222.19	3.58	6222.19	8.41	6222.19	9.03	6222.19	47.72	6221.85
51.3	6221.84	79.51	6221.87	83.92	6221.68	97.54	6221.28	106.48	6220.98
109.02	6220.05	126.95	6213.48	134.15	6210.71	134.17	6210.6	134.22	6210.6
134.5	6210.58	135.47	6208.43	135.85	6207.55	136.5	6205.38	153.19	6200.95
160.54	6199	161.44	6198.78	162.31	6198.78	163.44	6198.78	164.57	6198.78
165.44	6198.79	166.28	6199	170.04	6200	170.05	6204.26		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	160.54	.045	166.28	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
160.54	166.28	30.31	28.49	27.19	.1	.3

LATERAL STRUCTURE

RIVER: IndustrailTrib
REACH: LowFlow RS: 449.20

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 2
Weir Coefficient = 2
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 3

Sta	Elev	Sta	Elev	Sta	Elev
0	6203.18	16.5	6204.26	57.1	6204.26

Weir crest shape = Broad Crested

CROSS SECTION

RIVER: IndustrailTrib
REACH: LowFlow RS: 420.81

INPUT

Description: River STA 415.37
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.54	3.48	6223.42	19.21	6222.57	27.68	6222.18	28.04	6222.16
29.2	6222.09	47.51	6220.14	48.74	6220.1	52.52	6219.65	55.22	6219.27
66.27	6215.25	79.32	6211.03	79.34	6211.02	79.39	6211.01	79.42	6211
79.59	6210.95	79.6	6210.95	80.12	6208.1	81.6	6200.4	81.64	6200.38
84.28	6199.73	86.94	6199.05	90.53	6198.1	90.98	6197.99	95.91	6196.74
97.77	6196.26	98.09	6196.26	98.51	6196.25	99.77	6196.25	101.02	6196.24
101.78	6196.23	101.96	6196.28	107.15	6197.65	112.44	6199.06	112.45	6204.26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	86.94	.045	112.44	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
86.94	112.44	35.72	20.97	21.77	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: LowFlow RS: 399.84

INPUT
Description: River STA 399.75
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.24	4.08	6223.48	7.74	6223.6	13.12	6223.72	26.32	6220.43
33.16	6218.32	43.92	6215.35	62.16	6207.21	66.28	6207.14	68.38	6207.05
81.92	6206.28	95.75	6205.93	97.56	6205.9	99.18	6205.89	101.91	6205.79
101.98	6205.78	102.02	6205.78	120.99	6202.61	130.36	6201.04	136.63	6200
148.59	6198	162.34	6195.7	163.4	6195.52	164.64	6195.31	165.97	6195.09
166.24	6195.04	167.31	6194.86	168.24	6194.71	168.44	6194.67	168.45	6194.67
168.54	6194.67	169.67	6194.67	170.11	6194.67	170.54	6194.67	171.47	6194.67
172.54	6194.67	173.12	6194.67	175.32	6195.31	178.48	6196.28	179.49	6204.26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	162.34	.045	178.48	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
162.34	178.48	5.95	4.61	5.49	.1	.3

CROSS SECTION

RIVER: IndustrailTrib
REACH: LowFlow RS: 395.23

INPUT
Description: River STA 389.67
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6223.59	.23	6223.51	23.22	6216.99	38.6	6211.73	42.76	6210.43
48.63	6207.63	51.88	6207.59	66.62	6207.18	89.03	6205.87	94.23	6205.77
100.21	6205.71	101.57	6205.91	102.55	6205.63	104.57	6205.39	114.92	6204.04
115.25	6204	121.66	6203.16	122.92	6203	129.6	6202.13	129.61	6202.04
129.87	6202	129.99	6201.98	138.42	6200.56	147.53	6199.02	152.86	6198.12
163.72	6194.69	172.12	6194.69	176.01	6197	176.02	6204		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	152.86	.045	176.01	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
152.86	176.01	141	141	.3	.5

CULVERT

RIVER: IndustrailTrib
REACH: LowFlow RS: 330.23

INPUT
Description:
Distance from Upstream XS = 40
Deck/Roadway Width = 50
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 112

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	6220.62		.93	6220.62		1.45	6220.66	
2.48	6220.66		3	6220.69		4.04	6220.69	
4.52	6220.72		5.08	6220.72		5.6	6220.75	
6.64	6220.75		7.16	6220.78		8.17	6220.78	
8.72	6220.81		9.38	6220.82		9.79	6220.84	
10.8	6220.84		11.32	6220.88		12.35	6220.88	
12.87	6220.91		13.84	6220.91		14.43	6220.94	
15.05	6220.94		15.47	6220.97		16.51	6220.97	
17.03	6221		33.14	6221		33.65	6221.03	
34.17	6221.01		35.21	6221.03		41.2	6221.03	
43.05	6221.06		56.48	6221.06		56.99	6221.09	
57.5	6221.09		58.01	6221.12		58.52	6221.12	
59.03	6221.16		59.54	6221.16		60.05	6221.19	
60.57	6221.19		61.08	6221.22		63.12	6221.25	
63.63	6221.28		64.14	6221.28		64.65	6221.31	
65.17	6221.31		65.68	6221.34		66.19	6221.34	
66.7	6221.38		68.74	6221.41		69.25	6221.44	
69.76	6221.44		70.28	6221.47		70.79	6221.47	

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    71.3  6221.5           71.81  6221.5           72.32 6221.53
   73.35 6221.53           73.77 6221.56           74.36 6221.56
   74.88 6221.59           75.39 6221.59            75.9 6221.62
   77.94 6221.66           78.41 6221.69           78.96 6221.69
   79.48 6221.72           79.99 6221.72            80.5 6221.75
   82.54 6221.78           83.05 6221.81           83.56 6221.81
   84.07 6221.84           84.59 6221.84           85.16 6221.87
   86.12 6221.88           86.63 6221.91           87.14 6221.91
   87.65 6221.94           88.16 6221.94           88.67 6221.97
   92.68 6221.97           93.27    6222          110.65    6222
     112 6222.03          125.98 6222.03          126.49 6222.06
  127.52 6222.06          128.03 6222.09          128.54 6222.09
  129.05 6222.12          129.56 6222.12          130.07 6222.16
  130.58 6222.16          131.13 6222.19          132.12 6222.19
  132.63 6222.22          133.14 6222.22          133.65 6222.25
  134.16 6222.25          134.67 6222.28          135.69 6222.28
   136.2 6222.31          136.72 6222.31          137.23 6222.34
  137.74 6222.34          138.25 6222.38          138.76 6222.38
  139.27 6222.41          140.29 6222.41          140.54 6222.42
     176 6222.42

Upstream Bridge Cross Section Data
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6223.59     .23 6223.51   23.22 6216.99    38.6 6211.73   42.76 6210.43
   48.63 6207.63   51.88 6207.59   66.62 6207.18   89.03 6205.87   94.23 6205.77
  100.21 6205.71  101.57 6205.91  102.55 6205.63  104.57 6205.39  114.92 6204.04
  115.25    6204  121.66 6203.16  122.92    6203   129.6 6202.13  129.61 6202.04
  129.87    6202  129.99 6201.98  138.42 6200.56  147.53 6199.02  152.86 6198.12
  163.72 6194.69  172.12 6194.69  176.01    6197  176.02    6204

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05  152.86    .045  176.01     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        152.86  176.01             .3       .5

Downstream  Deck/Roadway Coordinates
    num=     111
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6220.62             .93 6220.62            1.45 6220.66
    2.48 6220.66               3 6220.69            4.04 6220.69
    4.52 6220.72            5.08 6220.72             5.6 6220.75
    6.64 6220.75            7.16 6220.78            8.17 6220.78
    8.72 6220.81            9.38 6220.82            9.79 6220.84
    10.8 6220.84           11.32 6220.88           12.35 6220.88
   12.87 6220.91           13.84 6220.91           14.43 6220.94
   15.05 6220.94           15.47 6220.97           16.51 6220.97
   17.03    6221           33.14    6221           33.65 6221.03
```

34.17 6221.01	35.21 6221.03	41.2 6221.03
43.05 6221.06	56.48 6221.06	56.99 6221.09
57.5 6221.09	58.01 6221.12	58.52 6221.12
59.03 6221.16	59.54 6221.16	60.05 6221.19
60.57 6221.19	61.08 6221.22	63.12 6221.25
63.63 6221.28	64.14 6221.28	64.65 6221.31
65.17 6221.31	65.68 6221.34	66.19 6221.34
66.7 6221.38	68.74 6221.41	69.25 6221.44
69.76 6221.44	70.28 6221.47	70.79 6221.47
71.3 6221.5	71.81 6221.5	72.32 6221.53
73.35 6221.53	73.77 6221.56	74.36 6221.56
74.88 6221.59	75.39 6221.59	75.9 6221.62
77.94 6221.66	78.41 6221.69	78.96 6221.69
79.48 6221.72	79.99 6221.72	80.5 6221.75
82.54 6221.78	83.05 6221.81	83.56 6221.81
84.07 6221.84	84.59 6221.84	85.16 6221.87
86.12 6221.88	86.63 6221.91	87.14 6221.91
87.65 6221.94	88.16 6221.94	88.67 6221.97
92.68 6221.97	93.27 6222	110.65 6222
112 6222.03	125.98 6222.03	126.49 6222.06
127.52 6222.06	128.03 6222.09	128.54 6222.09
129.05 6222.12	129.56 6222.12	130.07 6222.16
130.58 6222.16	131.13 6222.19	132.12 6222.19
132.63 6222.22	133.14 6222.22	133.65 6222.25
134.16 6222.25	134.67 6222.28	135.69 6222.28
136.2 6222.31	136.72 6222.31	137.23 6222.34
137.74 6222.34	138.25 6222.38	138.76 6222.38
139.27 6222.41	140.29 6222.41	140.54 6222.42

Downstream Bridge Cross Section Data

Station Elevation Data num= 217

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6216.05	.4	6216.06	1.4	6216.01	2.1	6216.01	2.9	6215.97
3.3	6215.97	4.3	6215.93	4.8	6215.93	5.9	6215.88	6.5	6215.88
7.1	6215.85	7.2	6215.85	7.6	6215.83	7.8	6215.82	8	6215.83
8.1	6215.83	8.2	6215.83	9.5	6215.77	9.7	6215.76	9.8	6215.76
10	6215.76	10.1	6215.76	10.4	6215.76	10.5	6215.75	10.7	6215.74
10.8	6215.73	10.9	6215.73	11.1	6215.72	11.2	6215.71	11.6	6215.7
11.9	6215.71	12	6215.71	13.1	6215.65	13.2	6215.65	13.5	6215.66
13.7	6215.66	13.9	6215.65	14.2	6215.63	14.3	6215.63	14.6	6215.61
14.8	6215.6	15	6215.6	15.2	6215.6	15.3	6215.6	15.4	6215.6
15.7	6215.59	15.9	6215.58	16.1	6215.57	16.3	6215.56	16.4	6215.55
16.5	6215.55	16.6	6215.54	16.9	6215.53	17.2	6215.54	17.3	6215.53
17.5	6215.53	18.6	6215.47	19.1	6215.48	19.2	6215.48	19.4	6215.47
19.5	6215.46	19.7	6215.45	20.3	6215.42	20.4	6215.43	20.8	6215.43
21	6215.42	21.3	6215.4	21.4	6215.4	21.8	6215.38	21.9	6215.37
22.1	6215.37	22.5	6215.38	22.9	6215.36	23	6215.35	23.3	6215.34
23.5	6215.33	23.6	6215.32	23.7	6215.32	24.2	6215.31	24.4	6215.31
24.5	6215.31	24.7	6215.3	24.8	6215.3	24.9	6215.29	25.5	6215.26
25.6	6215.26	25.9	6215.25	26.1	6215.25	26.3	6215.25	26.4	6215.25

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    26.6 6215.24      27 6215.22    27.3 6215.21    27.5  6215.2    27.6 6215.19
    27.8 6215.19      28 6215.19    28.1 6215.19    28.4 6215.18    28.5 6215.18
    28.7 6215.17    28.9 6215.16    29.1 6215.15    29.6 6215.12    29.7 6215.12
      30 6215.13    30.2 6215.12    30.4 6215.12    30.7  6215.1    30.8  6215.1
    31.3 6215.07    31.5 6215.07    31.8 6215.07    31.9 6215.07      32 6215.07
    32.3 6215.05    32.4 6215.05    32.7 6215.04    32.8 6215.03      33 6215.02
    33.2 6215.01    33.4    6215    33.5    6215    33.8    6215    34.1    6215
    34.2 6214.99    34.4 6214.98    34.6 6214.97    34.9 6214.96    35.5 6214.93
    35.7 6214.92    35.9 6214.92    36.1 6214.92    36.3 6214.92    36.4 6214.91
    36.7  6214.9    36.8  6214.9    36.8 6214.89    36.9 6214.89    37.2 6214.88
    37.9 6214.84      38 6214.84    38.5 6214.83    38.7 6214.83      39 6214.82
    39.1 6214.82    39.1 6214.81    39.4  6214.8    40.1 6214.77    40.2 6214.76
    40.3 6214.76    40.6 6214.75    40.7 6214.75    40.9 6214.75    41.1 6214.74
    41.3 6214.74    41.4 6214.73    41.7 6214.72    41.8 6214.71    42.1  6214.7
    42.4 6214.69    42.4 6214.68    42.6 6214.67    42.8 6214.67    42.9 6214.67
    43.2 6214.67    43.5 6214.66    43.6 6214.66    43.8 6214.65      44 6214.64
    44.2 6214.63    44.3 6214.62    44.6 6214.61    44.7  6214.6    45.1 6214.58
    45.2 6214.58    45.5 6214.59    45.7 6214.58    45.8 6214.58    46.2 6214.56
    46.3 6214.56    46.6 6214.54    46.8 6214.53      47 6214.52    47.3 6214.51
    47.3  6214.5    47.4  6214.5    47.7 6214.51    48.1  6214.5    48.5 6214.48
    48.8 6214.46      49 6214.45    49.2 6214.44    49.4 6214.44    49.5 6214.43
    49.7 6214.42      50 6214.41    50.1 6214.41    50.3 6214.41    50.6  6214.4
    50.7  6214.4    50.9 6214.39    51.1 6214.38    51.2 6214.38    51.4 6214.36
    51.5  6189.5    55.6  6189.5    59.7  6189.5    59.8 6214.07      60 6214.07
    60.1 6214.06    60.4 6214.05    60.5 6214.04    60.6 6214.04    60.7 6214.03
    61.1 6214.0161.23009 6214.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    51.4    .013    59.8     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          51.4    59.8             .1       .3

Upstream Embankment side slope              =       4 horiz. to 1.0 vertical
Downstream Embankment side slope            =       4 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       6       6
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
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Exit Loss Coef
                  0     141     .013     .013        0                    .5
      1
Upstream   Elevation =  6194.65
           Centerline Station =  168
Downstream Elevation =  6193.94
           Centerline Station =  55.6

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 258.43

INPUT
Description: River STA 253.88
Station Elevation Data    num=     217
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6216.05      .4 6216.06     1.4 6216.01     2.1 6216.01     2.9 6215.97
     3.3 6215.97     4.3 6215.93     4.8 6215.93     5.9 6215.88     6.5 6215.88
     7.1 6215.85     7.2 6215.85     7.6 6215.83     7.8 6215.82       8 6215.83
     8.1 6215.83     8.2 6215.83     9.5 6215.77     9.7 6215.76     9.8 6215.76
      10 6215.76    10.1 6215.76    10.4 6215.76    10.5 6215.75    10.7 6215.74
    10.8 6215.73    10.9 6215.73    11.1 6215.72    11.2 6215.71    11.6  6215.7
    11.9 6215.71      12 6215.71    13.1 6215.65    13.2 6215.65    13.5 6215.66
    13.7 6215.66    13.9 6215.65    14.2 6215.63    14.3 6215.63    14.6 6215.61
    14.8  6215.6      15  6215.6    15.2  6215.6    15.3  6215.6    15.4  6215.6
    15.7 6215.59    15.9 6215.58    16.1 6215.57    16.3 6215.56    16.4 6215.55
    16.5 6215.55    16.6 6215.54    16.9 6215.53    17.2 6215.54    17.3 6215.53
    17.5 6215.53    18.6 6215.47    19.1 6215.48    19.2 6215.48    19.4 6215.47
    19.5 6215.46    19.7 6215.45    20.3 6215.42    20.4 6215.43    20.8 6215.43
      21 6215.42    21.3  6215.4    21.4  6215.4    21.8 6215.38    21.9 6215.37
    22.1 6215.37    22.5 6215.38    22.9 6215.36      23 6215.35    23.3 6215.34
    23.5 6215.33    23.6 6215.32    23.7 6215.32    24.2 6215.31    24.4 6215.31
    24.5 6215.31    24.7  6215.3    24.8  6215.3    24.9 6215.29    25.5 6215.26
    25.6 6215.26    25.9 6215.25    26.1 6215.25    26.3 6215.25    26.4 6215.25
    26.6 6215.24      27 6215.22    27.3 6215.21    27.5  6215.2    27.6 6215.19
    27.8 6215.19      28 6215.19    28.1 6215.19    28.4 6215.18    28.5 6215.18
    28.7 6215.17    28.9 6215.16    29.1 6215.15    29.6 6215.12    29.7 6215.12
      30 6215.13    30.2 6215.12    30.4 6215.12    30.7  6215.1    30.8  6215.1
    31.3 6215.07    31.5 6215.07    31.8 6215.07    31.9 6215.07      32 6215.07
    32.3 6215.05    32.4 6215.05    32.7 6215.04    32.8 6215.03      33 6215.02
    33.2 6215.01    33.4    6215    33.5    6215    33.8    6215    34.1    6215
    34.2 6214.99    34.4 6214.98    34.6 6214.97    34.9 6214.96    35.5 6214.93
    35.7 6214.92    35.9 6214.92    36.1 6214.92    36.3 6214.92    36.4 6214.91
    36.7  6214.9    36.8  6214.9    36.8 6214.89    36.9 6214.89    37.2 6214.88
    37.9 6214.84      38 6214.84    38.5 6214.83    38.7 6214.83      39 6214.82
    39.1 6214.82    39.1 6214.81    39.4  6214.8    40.1 6214.77    40.2 6214.76
    40.3 6214.76    40.6 6214.75    40.7 6214.75    40.9 6214.75    41.1 6214.74
    41.3 6214.74    41.4 6214.73    41.7 6214.72    41.8 6214.71    42.1  6214.7
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    42.4 6214.69    42.4 6214.68    42.6 6214.67    42.8 6214.67    42.9 6214.67
    43.2 6214.67    43.5 6214.66    43.6 6214.66    43.8 6214.65      44 6214.64
    44.2 6214.63    44.3 6214.62    44.6 6214.61    44.7  6214.6    45.1 6214.58
    45.2 6214.58    45.5 6214.59    45.7 6214.58    45.8 6214.58    46.2 6214.56
    46.3 6214.56    46.6 6214.54    46.8 6214.53      47 6214.52    47.3 6214.51
    47.3  6214.5    47.4  6214.5    47.7 6214.51    48.1  6214.5    48.5 6214.48
    48.8 6214.46      49 6214.45    49.2 6214.44    49.4 6214.44    49.5 6214.43
    49.7 6214.42      50 6214.41    50.1 6214.41    50.3 6214.41    50.6  6214.4
    50.7  6214.4    50.9 6214.39    51.1 6214.38    51.2 6214.38    51.4 6214.36
    51.5  6189.5    55.6  6189.5    59.7  6189.5    59.8 6214.07      60 6214.07
    60.1 6214.06    60.4 6214.05    60.5 6214.04    60.6 6214.04    60.7 6214.03
    61.1 6214.0161.23009 6214.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    51.4    .013    59.8     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          51.4    59.8               10      10      10             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 248.43

INPUT
Description: River STA 243.92
Station Elevation Data    num=     208
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6212.71       2 6212.69     3.5 6212.65       4 6212.66     5.1 6212.63
     5.2 6212.63     5.5 6212.64     5.6 6212.64     5.9 6212.64       6 6212.63
     6.2 6212.63     6.7 6212.61     7.3 6212.62     7.7 6212.61     7.8  6212.6
     7.9  6212.6     8.2 6212.59     8.3 6212.59     9.3 6212.59     9.4 6212.58
    10.5 6212.55    10.7 6212.55    10.9 6212.56      11 6212.56    12.1 6212.53
    12.5 6212.54    12.6 6212.54    12.8 6212.53    13.2 6212.52    13.4 6212.51
    13.7 6212.51    13.9  6212.5      14  6212.5    14.2 6212.51    14.4 6212.51
    14.8  6212.5    15.2 6212.49    15.3 6212.48    15.5 6212.48    15.6 6212.47
    15.8 6212.47    15.9 6212.47    16.2 6212.48    16.3 6212.48    16.4 6212.48
    17.5 6212.44    17.9 6212.44      18 6212.44    18.3 6212.44    18.5 6212.44
    18.6 6212.44    18.9 6212.43      19 6212.43    19.1 6212.42    19.2 6212.42
    19.4 6212.41    19.6 6212.41    19.8 6212.41      20 6212.42    20.1 6212.42
    20.2 6212.42    20.6 6212.41    20.7  6212.4    20.9 6212.39      21 6212.39
    21.2 6212.39    21.3 6212.38    21.7 6212.37    22.1 6212.38    22.3 6212.38
    22.5 6212.37    22.7 6212.37    22.8 6212.36    22.9 6212.36      23 6212.36
    23.3 6212.35    23.4 6212.35    23.6 6212.35    23.7 6212.34    23.9 6212.35
      24 6212.35    24.4 6212.34    24.8 6212.33      25 6212.33    25.2 6212.32
    25.5 6212.31    25.6 6212.31    25.8 6212.31      26 6212.32    26.2 6212.32
    26.4 6212.31    26.6  6212.3    26.7  6212.3    27.1 6212.29    27.2 6212.29
    27.7  6212.3    28.2 6212.28    28.3 6212.28    28.5 6212.27    28.7 6212.27
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    28.8 6212.26    29.1 6212.26    29.3 6212.26    29.4 6212.27    29.7 6212.26
    29.8 6212.26    29.9 6212.26    30.2 6212.25    30.3 6212.24    30.6 6212.23
    30.9 6212.23      31 6212.22    31.3 6212.21    31.4 6212.21    31.5 6212.21
    31.8 6212.22    31.9 6212.22    32.2 6212.22    32.4 6212.21    32.5  6212.2
    32.7  6212.2    32.9 6212.19      33 6212.19    33.2 6212.19    33.3 6212.19
    33.6 6212.19    33.7 6212.19    34.1 6212.18    34.5 6212.17    34.6 6212.17
    34.9 6212.16      35 6212.15    35.2 6212.15    35.6 6212.14    35.9 6212.14
      36 6212.13    36.4 6212.13    36.8 6212.13    37.2 6212.11    37.3 6212.11
    37.6  6212.1    37.9 6212.09    38.2 6212.08    38.3 6212.08    38.4 6212.08
    38.5 6212.08    38.7 6212.09    38.9 6212.09    39.1 6212.08    39.4 6212.07
    39.5 6212.07    39.6 6212.07      40 6212.05    40.3 6212.04    40.5 6212.04
    40.6 6212.04    40.9 6212.05      41 6212.05    41.1 6212.05    41.2 6212.05
    41.4 6212.04    41.6 6212.03    41.8 6212.03      42 6212.02    42.1 6212.01
    42.2 6212.01    42.3 6212.01    42.6    6212    42.7    6212    42.9    6212
      43    6212    43.2    6212    43.3    6212    43.7    6212    43.7 6211.99
    43.8 6211.99    44.1 6211.98    44.3 6211.98    44.5 6211.97    44.7 6211.96
    44.9 6211.96    45.1 6211.95    45.3 6211.95    45.4 6211.95    45.6 6211.95
    45.7 6211.96    45.9 6211.95      46 6211.95    46.4 6211.94    46.8 6211.92
      47 6211.92    47.2 6211.91    47.3 6211.91    47.5  6211.9    47.6  6189.5
    51.7  6189.5    55.7  6189.5    56.1 6211.75    56.5 6211.73    56.6 6211.73
    56.9 6211.72      57 6211.72    57.2 6211.71    57.4 6211.72    57.6 6211.73
    57.7 6211.73      58 6211.7158.23558 6211.71

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    47.5    .013    56.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          47.5    56.1            101.7   101.7   101.7             .1       .3

CULVERT


RIVER: IndustrailTrib
REACH: LowFlow            RS: 196.43

INPUT
Description:
Distance from Upstream XS =      46
Deck/Roadway Width        =      12
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.31            58.2    6219

Upstream Bridge Cross Section Data
Station Elevation Data    num=     208
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6212.71       2 6212.69     3.5 6212.65       4 6212.66     5.1 6212.63
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     5.2 6212.63     5.5 6212.64     5.6 6212.64     5.9 6212.64       6 6212.63
     6.2 6212.63     6.7 6212.61     7.3 6212.62     7.7 6212.61     7.8  6212.6
     7.9  6212.6     8.2 6212.59     8.3 6212.59     9.3 6212.59     9.4 6212.58
    10.5 6212.55    10.7 6212.55    10.9 6212.56      11 6212.56    12.1 6212.53
    12.5 6212.54    12.6 6212.54    12.8 6212.53    13.2 6212.52    13.4 6212.51
    13.7 6212.51    13.9  6212.5      14  6212.5    14.2 6212.51    14.4 6212.51
    14.8  6212.5    15.2 6212.49    15.3 6212.48    15.5 6212.48    15.6 6212.47
    15.8 6212.47    15.9 6212.47    16.2 6212.48    16.3 6212.48    16.4 6212.48
    17.5 6212.44    17.9 6212.44      18 6212.44    18.3 6212.44    18.5 6212.44
    18.6 6212.44    18.9 6212.43      19 6212.43    19.1 6212.42    19.2 6212.42
    19.4 6212.41    19.6 6212.41    19.8 6212.41      20 6212.42    20.1 6212.42
    20.2 6212.42    20.6 6212.41    20.7  6212.4    20.9 6212.39      21 6212.39
    21.2 6212.39    21.3 6212.38    21.7 6212.37    22.1 6212.38    22.3 6212.38
    22.5 6212.37    22.7 6212.37    22.8 6212.36    22.9 6212.36      23 6212.36
    23.3 6212.35    23.4 6212.35    23.6 6212.35    23.7 6212.34    23.9 6212.35
      24 6212.35    24.4 6212.34    24.8 6212.33      25 6212.33    25.2 6212.32
    25.5 6212.31    25.6 6212.31    25.8 6212.31      26 6212.32    26.2 6212.32
    26.4 6212.31    26.6  6212.3    26.7  6212.3    27.1 6212.29    27.2 6212.29
    27.7  6212.3    28.2 6212.28    28.3 6212.28    28.5 6212.27    28.7 6212.27
    28.8 6212.26    29.1 6212.26    29.3 6212.26    29.4 6212.27    29.7 6212.26
    29.8 6212.26    29.9 6212.26    30.2 6212.25    30.3 6212.24    30.6 6212.23
    30.9 6212.23      31 6212.22    31.3 6212.21    31.4 6212.21    31.5 6212.21
    31.8 6212.22    31.9 6212.22    32.2 6212.22    32.4 6212.21    32.5  6212.2
    32.7  6212.2    32.9 6212.19      33 6212.19    33.2 6212.19    33.3 6212.19
    33.6 6212.19    33.7 6212.19    34.1 6212.18    34.5 6212.17    34.6 6212.17
    34.9 6212.16      35 6212.15    35.2 6212.15    35.6 6212.14    35.9 6212.14
      36 6212.13    36.4 6212.13    36.8 6212.13    37.2 6212.11    37.3 6212.11
    37.6  6212.1    37.9 6212.09    38.2 6212.08    38.3 6212.08    38.4 6212.08
    38.5 6212.08    38.7 6212.09    38.9 6212.09    39.1 6212.08    39.4 6212.07
    39.5 6212.07    39.6 6212.07      40 6212.05    40.3 6212.04    40.5 6212.04
    40.6 6212.04    40.9 6212.05      41 6212.05    41.1 6212.05    41.2 6212.05
    41.4 6212.04    41.6 6212.03    41.8 6212.03      42 6212.02    42.1 6212.01
    42.2 6212.01    42.3 6212.01    42.6    6212    42.7    6212    42.9    6212
      43    6212    43.2    6212    43.3    6212    43.7    6212    43.7 6211.99
    43.8 6211.99    44.1 6211.98    44.3 6211.98    44.5 6211.97    44.7 6211.96
    44.9 6211.96    45.1 6211.95    45.3 6211.95    45.4 6211.95    45.6 6211.95
    45.7 6211.96    45.9 6211.95      46 6211.95    46.4 6211.94    46.8 6211.92
      47 6211.92    47.2 6211.91    47.3 6211.91    47.5  6211.9    47.6  6189.5
    51.7  6189.5    55.7  6189.5    56.1 6211.75    56.5 6211.73    56.6 6211.73
    56.9 6211.72      57 6211.72    57.2 6211.71    57.4 6211.72    57.6 6211.73
    57.7 6211.73      58 6211.7158.23558 6211.71

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    47.5    .013    56.1     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          47.5    56.1             .1       .3

Downstream  Deck/Roadway Coordinates
```

```
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 6218.31            74.2    6219

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6216     .34 6215.95   12.06 6210.79   16.24  6209.3    26.8 6201.36
   39.22 6197.44   40.22    6189   46.39    6189   73.15    6189   74.15    6193

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   40.22    .045   73.15     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
         40.22   73.15             .1       .3

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       6       6
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 0     101     .013     .013        0                   .5
      1
Upstream   Elevation =  6189.5
           Centerline Station =  51.7
Downstream Elevation =  6189
           Centerline Station =  46.4

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 146.73

INPUT
Description: River STA 142.13
Station Elevation Data    num=      10
```

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     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6216     .34 6215.95   12.06 6210.79   16.24  6209.3    26.8 6201.36
   39.22 6197.44   40.22    6189   46.39    6189   73.15    6189   74.15    6193

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   40.22    .045   73.15     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         40.22   73.15             38.36   12.53   14.49             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 134.20

INPUT
Description: River STA 129.63
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6213   16.35 6204.09   21.07 6203.26   33.81 6201.75   39.52    6201
   76.97    6189   88.72 6188.94   92.79 6188.94  111.65 6188.94  112.65    6193

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   76.97    .035  111.65     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         76.97  111.65             35.5    49.5   63.64             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 84.70

INPUT
Description: River STA 84.68
Station Elevation Data    num=     364
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6206.97     .61 6206.74     3.7 6205.56     7.3 6204.32     7.8 6204.15
     8.5 6203.88    12.1 6202.64    12.8 6202.37      14 6201.96    14.3 6201.88
    14.5 6201.85    15.5 6201.69    15.7 6201.66    16.9 6201.51    17.9 6201.32
    18.1 6201.28    18.6 6201.15      19 6201.08    19.3 6200.99    19.4 6200.97
    20.5 6200.71    20.8 6200.64    21.3 6200.53    21.7 6200.44    22.2 6200.33
    22.4 6200.29    22.9  6200.2      23 6200.19    23.1 6200.16    23.7 6200.03
    24.4 6199.88    24.9 6199.79    25.1 6199.75    25.3 6199.72    25.8 6199.59
    25.9 6199.57    26.5 6199.46    26.6 6199.44    26.7 6199.41    27.3  6199.3
    27.6 6199.23      28 6199.16    28.5 6199.04    28.7    6199    28.8 6198.97
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29.4 6198.87	30 6198.75	30.2 6198.72	30.4 6198.68	31.2 6198.5
32.2 6198.31	32.3 6198.28	32.4 6198.26	32.9 6198.17	33.1 6198.13
33.6 6198.03	33.8 6198	34 6197.95	34.5 6197.85	34.8 6197.8
35.2 6197.74	35.8 6197.64	35.9 6197.63	36 6197.62	36.4 6197.56
36.7 6197.52	37.2 6197.44	37.4 6197.41	38.3 6197.29	50.7 6192.91
51 6192.81	51.4 6192.68	51.5 6192.65	51.9 6192.49	52.2 6192.4
52.4 6192.34	52.9 6192.18	53 6192.13	53.4 6192.02	53.7 6191.92
53.8 6191.88	53.9 6191.86	54.3 6191.71	54.6 6191.62	54.8 6191.56
55.1 6191.46	55.3 6191.39	55.4 6191.35	55.8 6191.24	56 6191.17
56.2 6191.1	57 6190.84	57.2 6190.78	57.7 6190.64	57.8 6190.6
58.3 6190.44	58.6 6190.33	58.7 6190.31	59.1 6190.19	59.4 6190.11
59.6 6190.03	59.9 6189.93	60.1 6189.89	60.2 6189.86	60.6 6189.72
61 6189.58	61.5 6189.44	61.8 6189.37	62 6189.31	62.5 6189.15
62.6 6189.14	62.9 6189.03	63 6189	63.4 6188.83	63.6 6188.77
63.9 6188.68	64.4 6188.52	64.8 6188.41	64.9 6188.37	65.4 6188.35
65.6 6188.34	70.5 6188.34	70.7 6188.33	71 6188.33	71.2 6188.34
72.6 6188.34	73.1 6188.33	73.6 6188.33	74 6188.34	74.2 6188.34
74.6 6188.33	74.9 6188.33	75.5 6188.32	75.7 6188.32	76 6188.33
76.4 6188.34	76.6 6188.34	77 6188.33	77.5 6188.33	77.9 6188.34
78 6188.34	78.4 6188.33	78.9 6188.33	79.2 6188.32	79.5 6188.32
79.9 6188.33	80.3 6188.34	80.4 6188.34	80.9 6188.32	81.1 6188.33
81.3 6188.33	81.8 6188.31	82.3 6188.32	82.6 6188.33	82.8 6188.33
83.1 6188.32	83.8 6188.32	84.2 6188.31	84.4 6188.31	84.7 6188.32
84.9 6188.32	85.2 6188.33	85.6 6188.31	86.7 6188.31	87.2 6188.32
87.6 6188.32	88 6188.31	88.6 6188.32	88.8 6188.31	89.6 6188.31
90.1 6188.32	90.3 6188.31	92 6188.31	92.5 6188.32	93 6188.32
93.2 6188.33	93.4 6188.34	93.5 6188.34	93.9 6188.36	94.2 6188.38
94.4 6188.39	94.8 6188.41	94.9 6188.41	95.1 6188.42	95.4 6188.44
95.7 6188.46	95.9 6188.49	96.1 6188.53	96.3 6188.57	96.5 6188.59
96.8 6188.66	97 6188.68	97.2 6188.72	97.3 6188.73	97.4 6188.75
97.8 6188.81	98 6188.86	98.8 6188.97	98.9 6188.99	99.2 6189.03
99.6 6189.07	99.7 6189.11	100 6189.13	100.2 6189.16	100.3 6189.17
100.4 6189.19	100.7 6189.28	101.1 6189.35	101.7 6189.52	101.9 6189.54
102.2 6189.58	102.7 6189.69	103.1 6189.73	103.2 6189.75	103.4 6189.78
103.8 6189.85	104.6 6190.01	104.8 6190.04	105.1 6190.07	105.3 6190.09
105.4 6190.11	105.5 6190.16	105.8 6190.25	106.3 6190.36	106.7 6190.52
106.8 6190.54	107.8 6190.74	108 6190.76	108.2 6190.81	108.3 6190.83
108.6 6190.91	108.8 6190.98	108.9 6191	109.2 6191.05	109.3 6191.08
109.7 6191.16	109.9 6191.21	110.3 6191.31	110.4 6191.31	110.9 6191.45
111.1 6191.49	111.4 6191.58	111.6 6191.64	111.8 6191.7	112.1 6191.8
112.4 6191.91	112.5 6191.95	112.8 6192.03	112.9 6192.04	113.2 6192.16
113.4 6192.2	113.8 6192.26	113.9 6192.28	114 6192.32	114.4 6192.46
114.7 6192.52	114.9 6192.59	115.3 6192.7	115.4 6192.76	115.6 6192.78
115.9 6192.86	116.1 6192.91	116.5 6193.03	116.8 6193.11	117 6193.15
117.3 6193.29	117.5 6193.37	117.7 6193.42	118 6193.48	118.3 6193.58
118.9 6193.73	119.1 6193.77	119.5 6193.91	119.7 6193.96	120 6194.04
120.4 6194.14	120.5 6194.18	120.8 6194.26	121.1 6194.36	121.3 6194.41
121.5 6194.46	121.8 6194.54	122.5 6194.75	122.6 6194.75	123.1 6194.88
123.3 6194.93	123.6 6195.02	123.8 6195.08	124 6195.15	124.1 6195.17
124.3 6195.22	124.6 6195.3	124.7 6195.33	125 6195.41	125.1 6195.44

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   125.4 6195.54   125.6 6195.59     126 6195.69   126.1 6195.72   126.2 6195.75
   126.6 6195.86   126.9 6195.94   127.1    6196   127.4 6196.08   127.6 6196.12
   127.8 6196.18   128.1 6196.29   128.3 6196.33   128.6 6196.43     129 6196.54
   129.2 6196.65   129.5 6196.94   129.7 6197.12   129.9 6197.26   130.2 6197.56
   130.4 6197.82   130.7 6198.08   131.1 6198.27   131.2  6198.3   131.5 6198.39
   132.6 6198.43   132.8 6198.36   133.3 6198.45   133.6 6198.46   133.7 6198.47
   134.5 6198.38   134.9 6198.46   135.4 6198.47   135.6 6198.45   135.7 6198.46
   136.4 6198.49   136.6 6198.49   136.8 6198.48   137.2 6198.51   137.3 6198.55
   137.9 6198.48     138 6198.49   138.2 6198.49   138.6 6198.47   138.7 6198.51
     139 6198.53   139.2 6198.54   139.4 6198.56   139.5 6198.58   139.6 6198.64
   140.2 6198.75   140.5 6198.77   140.8 6198.78   140.9 6198.78     141 6198.79
   141.7 6198.84   142.4 6198.88     143 6198.95   143.8 6199.08   143.9 6199.09
   144.5 6199.14   144.9  6199.2   145.2 6199.23   145.4 6199.34   145.9 6199.38
   146.1  6199.4   146.2 6199.41   146.8 6199.64  147.31 6199.55

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    53.7    .035   112.4     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          53.7   112.4             32.3    32.3    32.3             .1       .3

CROSS SECTION


RIVER: IndustrailTrib
REACH: LowFlow            RS: 52.40

INPUT
Description: River STA 52.39
Station Elevation Data    num=     280
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 6203.04    1.44 6202.73     6.6  6201.6     7.3 6201.42     7.9 6201.22
       9  6200.9    16.4 6198.44    16.6 6198.39    16.9 6198.29    17.3 6198.16
    17.4 6198.13    18.3 6197.82    18.5 6197.76    18.8 6197.68      19 6197.62
    30.1 6193.94    30.9 6193.68    31.1 6193.63    31.2 6193.58    31.5 6193.49
    31.8  6193.4      32 6193.33    32.3 6193.24    32.5 6193.18    32.6 6193.13
    32.9 6193.02    33.3 6192.89    33.4 6192.87    33.5 6192.85    33.9  6192.7
      34 6192.66    34.4 6192.51    34.8 6192.36    35.2 6192.23    35.3 6192.19
    35.5 6192.13    35.8 6192.03      36 6191.95    36.5 6191.77    36.7 6191.69
    36.9 6191.63    37.2 6191.53    38.1 6191.21    38.3 6191.13    38.6 6191.02
    39.1 6190.88    39.5 6190.72    39.7 6190.67    40.3 6190.48    40.5 6190.41
    40.7 6190.32      41 6190.24    41.1 6190.18    41.4 6190.07    41.8 6189.94
    41.9 6189.91      42 6189.88    42.7 6189.65    42.8 6189.59    42.9 6189.59
    43.3 6189.44    43.7 6189.32    43.8 6189.28    43.9 6189.24    44.3 6189.12
    44.5 6189.04    44.7 6188.97      45 6188.89    45.2 6188.81    45.4 6188.72
    45.7 6188.64      46 6188.54    46.1 6188.49    46.3 6188.45    46.6 6188.33
      47 6188.21    47.1 6188.16    47.5 6188.04      48 6187.94      52 6187.94
    52.2 6187.93    52.5 6187.94      53 6187.94    53.2 6187.93    53.4 6187.94
    55.1 6187.94    55.1 6187.93    55.5 6187.93      56 6187.94    56.2 6187.93
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    56.5 6187.93    56.9 6187.94      57 6187.94    57.4 6187.93    57.8 6187.94
      58 6187.94    58.3 6187.93    58.7 6187.94      59 6187.94    59.3 6187.93
    59.6 6187.92      60 6187.92    60.2 6187.93    60.4 6187.92    60.7 6187.92
      61 6187.93    61.3 6187.93    61.6 6187.92    62.1 6187.93    63.1 6187.93
    63.5 6187.92      64 6187.91      65 6187.91    65.4 6187.92    65.8 6187.91
      66 6187.91    66.3 6187.92    66.6 6187.92    66.8 6187.91      67 6187.92
    67.7 6187.91    83.9 6187.91    84.2  6187.9    84.4 6187.89    84.6 6187.89
    85.1  6187.9    85.3  6187.9    85.6 6187.89    85.9  6187.9    86.2  6187.9
    86.9 6187.88    88.9 6187.88    89.7    6188    89.8 6188.04    89.9 6188.09
    90.3 6188.22    90.6 6188.33    90.7 6188.39    90.9 6188.45    91.2 6188.54
    91.5 6188.63    91.7  6188.7    91.9 6188.79    92.2 6188.86    92.4 6188.93
    92.6 6189.02    92.9 6189.12    93.1 6189.18    93.2 6189.23    93.6 6189.34
      94 6189.52    94.1 6189.56    94.5 6189.68      95 6189.85    95.7 6190.08
    95.9 6190.16    96.4 6190.31    96.8 6190.45    96.9 6190.47    97.3 6190.64
    97.7 6190.75    97.8 6190.79    97.9 6190.83    98.3 6190.95    98.6 6191.05
    98.7  6191.1    99.2 6191.26    99.4 6191.35    99.7 6191.41    99.9 6191.46
   100.6 6191.72   101.1 6191.85   101.4 6191.95   101.6 6192.02   101.9 6192.12
   102.1 6192.16   102.2 6192.19   102.5  6192.3     103 6192.44   103.1 6192.47
   103.2 6192.52   103.5 6192.62   103.7 6192.69     104 6192.78   104.5 6192.94
   105.3 6193.17   105.8 6193.32   106.1 6193.41   106.4 6193.54   106.5 6193.55
   106.8 6193.67   107.1 6193.73   107.6  6193.9   107.9 6193.99     108 6194.02
   108.6 6194.15   108.9 6194.17   109.3 6194.21   109.6 6194.23   109.7 6194.24
   110.3  6194.3   110.4 6194.31   110.9 6194.36     111 6194.37   111.3 6194.38
   111.8 6194.42   112.1 6194.45   112.5 6194.48   113.2 6194.53   113.3 6194.53
   113.4 6194.55   114.4 6194.65   114.7 6194.69   115.1 6194.76   115.4 6194.81
   115.6 6194.84   116.1 6194.92   116.3 6194.95   116.8 6195.02   116.9 6195.03
     117 6195.06   117.6 6195.13   117.9 6195.17   118.3 6195.22     119 6195.31
   119.1 6195.31   119.3 6195.33   120.3 6195.44   120.5 6195.46   120.9  6195.5
   121.2 6195.55   121.4 6195.57     122 6195.64   122.3 6195.67   122.6 6195.72
   122.7 6195.73   122.8 6195.74   123.4 6195.81   124.1  6195.9   124.8 6195.98
   124.9    6196   125.2 6196.04   125.6 6196.08   126.1 6196.15   126.3 6196.17
   126.7 6196.22   127.1 6196.26   128.5 6196.41   128.6 6196.42   129.2  6196.5
   129.6 6196.55     130 6196.59   130.5 6196.66   130.7 6196.68   130.8 6196.69
   131.2 6196.74   131.4 6196.77     132 6196.84   132.2 6196.86   132.5  6196.9
   132.9 6196.95   133.1 6196.98   134.1  6197.1   134.3 6197.13   134.4 6197.14
   135.1 6197.21   135.5 6197.25   135.8 6197.29   136.3 6197.34   136.5 6197.37
   136.6 6197.38   137.1  6197.5   137.3 6197.54     138 6197.75   138.7 6197.94
   139.4 6198.14   140.1 6198.34   140.2 6198.34   140.9 6198.28  140.95 6198.27

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    36.7    .035    99.9     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          36.7    99.9             52.4    52.4    52.4              .1       .3

CROSS SECTION


RIVER: IndustrailTrib
```

REACH: LowFlow RS: 0.00

INPUT
Description: River STA 0.00
Station Elevation Data num= 250

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6202.5	.9	6202.47	1.8	6202.47	3.8	6202.41	4.8	6202.4
6	6202.37	6.8	6202.37	7.8	6202.33	9.8	6202.24	11.8	6202.17
12.3	6202.14	12.4	6202.13	12.8	6202.11	14.9	6202.04	15.6	6202
15.9	6201.98	16.1	6201.95	16.7	6201.92	16.9	6201.9	17	6201.88
17.7	6201.87	17.9	6201.86	18	6201.85	18.8	6201.79	20.8	6201.43
20.9	6201.41	21.7	6201.28	21.9	6201.26	22	6201.24	22.7	6201.11
22.9	6201.09	23.1	6201.06	23.6	6200.97	23.9	6200.94	24.1	6200.89
24.6	6200.81	24.9	6200.75	26.9	6200.43	27.3	6200.35	27.4	6200.33
27.9	6200.25	28.4	6200.17	28.9	6200.1	29.9	6199.91	30.3	6199.85
30.5	6199.81	30.9	6199.75	31.2	6199.7	31.6	6199.63	31.9	6199.58
32.2	6199.53	32.6	6199.45	32.9	6199.41	33.1	6199.38	33.9	6199.25
34	6199.22	34.8	6199.09	34.9	6199.07	35	6199.05	35.8	6198.92
35.9	6198.9	36.7	6198.76	36.8	6198.7	36.9	6198.68	37	6198.65
37.6	6198.43	37.9	6198.34	38.5	6198.16	39	6197.99	39.3	6197.89
40	6197.59	40.2	6197.52	40.9	6197.25	41.1	6197.17	41.4	6197.02
41.7	6196.91	42.1	6196.73	42.5	6196.08	42.9	6194.63	43.2	6194
43.4	6192.06	43.8	6187.61	44.3	6187.63	44.4	6187.64	44.8	6187.66
44.9	6187.67	45	6187.67	45.4	6187.69	45.7	6187.7	46	6187.7
46.3	6187.71	46.5	6187.69	47	6187.72	47.1	6187.72	47.6	6187.63
47.7	6187.62	48	6187.6	48.1	6187.58	48.4	6187.54	48.7	6187.52
49	6187.49	49.1	6187.47	49.2	6187.46	49.5	6187.42	49.7	6187.38
49.8	6187.37	49.9	6187.35	50.3	6187.31	50.5	6187.28	50.8	6187.27
50.9	6187.28	51.2	6187.27	51.3	6187.27	51.8	6187.28	51.9	6187.28
52.4	6187.26	52.9	6187.26	53.3	6187.27	53.5	6187.27	53.9	6187.28
54	6187.28	54.5	6187.26	55.1	6187.26	55.3	6187.27	56	6187.27
56.1	6187.28	56.8	6187.28	57.2	6187.26	57.4	6187.26	57.7	6189.03
57.8	6189.15	58	6189.34	58.4	6189.27	58.8	6190.38	59	6190.39
59.6	6191.77	59.8	6192.59	60.2	6192.53	60.6	6193.45	60.9	6193.71
61	6193.77	61.5	6193.43	61.8	6193.12	61.9	6193.19	62.1	6193.29
62.2	6193.46	62.7	6194.17	62.9	6194.56	63	6194.67	63.6	6194.84
64.4	6195.04	64.7	6195.14	65.1	6195.25	65.3	6195.31	65.8	6195.45
66.1	6195.53	66.5	6195.63	66.6	6195.66	66.8	6195.7	67.3	6195.84
67.6	6195.92	68.8	6196.25	69.5	6196.36	69.9	6196.42	70.2	6196.45
70.8	6196.49	71	6196.51	71.3	6196.54	71.7	6196.58	72.2	6196.62
72.4	6196.64	72.9	6196.67	73.2	6196.7	73.3	6196.71	73.9	6196.76
74.5	6196.82	74.6	6196.83	74.9	6196.86	75.4	6196.89	75.6	6196.91
76.1	6196.96	76.5	6197	76.8	6197.02	76.9	6197.03	77	6197.04
77.6	6197.09	77.9	6197.12	78.3	6197.17	79	6197.22	79.1	6197.22
80.5	6197.37	81.1	6197.43	81.4	6197.46	81.7	6197.49	82	6197.52
82.5	6197.55	82.7	6197.57	83.5	6197.61	83.7	6197.62	84.2	6197.65
84.3	6197.66	84.8	6197.69	84.9	6197.7	85.2	6197.71	85.7	6197.74
86.4	6197.78	86.9	6197.81	87.1	6197.82	87.2	6197.83	87.9	6197.87
88.2	6197.89	88.6	6197.92	89.3	6197.96	89.4	6197.96	89.5	6197.98
90.1	6198.06	90.5	6198.11	90.8	6198.16	91.5	6198.28	91.7	6198.31

92.1	6198.39	92.3	6198.41	92.8	6198.51	93.4	6198.61	93.7	6198.67
94	6198.71	94.5	6198.79	94.7	6198.84	95.1	6198.9	95.2	6198.92
95.4	6198.95	96	6199.04	96.3	6199.1	96.7	6199.18	97.4	6199.31
97.5	6199.31	98.2	6199.43	98.6	6199.48	98.9	6199.51	99.5	6199.49
99.6	6199.47	99.7	6199.47	100	6199.43	100.4	6199.38	100.8	6199.32
101.1	6199.3	101.5	6199.26	101.8	6199.23	102	6199.21	102.17	6199.19

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	43.4	.035	59.6	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
43.4	59.6	.1	.3

SUMMARY OF MANNING'S N VALUES

River:IndustrailTrib

Reach	River Sta.	n1	n2	n3
Upstream	1518.60	.05	.035	.05
Upstream	1469.76	.05	.035	.05
Upstream	1469.56	.06	.05	.06
Upstream	1444.86	.06	.05	.06
Upstream	1444.76	.06	.05	.06
Upstream	1431.84	.06	.05	.06
Upstream	1418.40	.06	.05	.06
Upstream	1418.20	.06	.05	.06
Upstream	1393.50	.06	.05	.06
Upstream	1393.40	.06	.05	.06
Upstream	1289.23	.06	.05	.06
Upstream	1191.91	.06	.05	.06
Upstream	1191.71	.06	.05	.06
Upstream	1167.01	.06	.05	.06
Upstream	1166.91	.06	.05	.06
Upstream	1120.97	.06	.05	.06
Upstream	1061.91	.06	.05	.06
Upstream	1061.71	.06	.05	.06
Upstream	1037.01	.06	.05	.06
Upstream	1036.91	.06	.05	.06
Upstream	1013.85	.06	.05	.06
Upstream	986.91	.06	.05	.06
Upstream	986.71	.06	.05	.06
Upstream	962.01	.06	.05	.06
Upstream	961.91	.06	.05	.06
Upstream	932.51	.06	.05	.06
Upstream	901.91	.06	.05	.06
Upstream	901.71	.06	.05	.06

Upstream	877.01	.06	.05	.06
Upstream	876.91	.06	.05	.06
Upstream	861.67	.06	.05	.06
Upstream	846.91	.06	.05	.06
Upstream	846.70	.06	.05	.06
Upstream	822.01	.06	.05	.06
Upstream	821.91	.06	.05	.06
Upstream	711.90	.06	.05	.06
Upstream	668.00	.06	.05	.06
Upstream	667.68	.06	.05	.06
Upstream	649.55	.06	.05	.06
Upstream	649.45	.06	.05	.06
Upstream	621.26	.06	.05	.06
Upstream	553.22	.05	.035	.05
Upstream	504.57	.05	.035	.05
Upstream	476.63	.05	.035	.05
Trail	443.00	.05	.013	.05
Trail	412.24	.05	.013	.05
Trail	390.71	.05	.013	.05
Trail	385.90	.05	.013	.05
Trail	320.90	Culvert		
Trail	266.94	.05	.013	.05
Trail	257.31	.05	.012	.05
Trail	246.94	.05	.012	.05
Trail	237.07	.05	.012	.05
Trail	194.07	Culvert		
Trail	148.30	.05	.012	.05
Trail	148.00	Lat Struct		
Trail	139.23	.05	.013	.05
Trail	126.23	.013	.013	.05
Trail	104.53	.013	.013	.05
Trail	83.73	.013	.013	.05
LowFlow	449.30	.05	.045	.05
LowFlow	449.20	Lat Struct		
LowFlow	420.81	.05	.045	.05
LowFlow	399.84	.05	.045	.05
LowFlow	395.23	.05	.045	.05
LowFlow	330.23	Culvert		
LowFlow	258.43	.05	.013	.05
LowFlow	248.43	.05	.013	.05
LowFlow	196.43	Culvert		
LowFlow	146.73	.05	.045	.05
LowFlow	134.20	.05	.035	.05
LowFlow	84.70	.05	.035	.05
LowFlow	52.40	.05	.035	.05
LowFlow	0.00	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: IndustrailTrib

Reach	River Sta.	Left	Channel	Right
Upstream	1518.60	49.2	48.84	48.48
Upstream	1469.76	.2	.2	.2
Upstream	1469.56	22.87	24.7	26.53
Upstream	1444.86	.09	.1	.11
Upstream	1444.76	14.1	12.92	11.74
Upstream	1431.84	15.62	13.44	11.27
Upstream	1418.40	.2	.2	.2
Upstream	1418.20	24.56	24.7	25.32
Upstream	1393.50	.1	.1	.12
Upstream	1393.40	99.66	104.17	115.69
Upstream	1289.23	91.64	97.32	94.38
Upstream	1191.91	.2	.2	.2
Upstream	1191.71	24.08	24.7	25.32
Upstream	1167.01	.1	.1	.1
Upstream	1166.91	54.71	45.94	37.17
Upstream	1120.97	60.28	59.06	57.83
Upstream	1061.91	.2	.2	.2
Upstream	1061.71	25.53	24.7	23.87
Upstream	1037.01	.1	.1	.1
Upstream	1036.91	23.75	23.06	22.36
Upstream	1013.85	27.45	26.94	26.44
Upstream	986.91	.2	.2	.2
Upstream	986.71	25.09	24.7	24.31
Upstream	962.01	.1	.1	.1
Upstream	961.91	28.43	29.4	30.37
Upstream	932.51	29.94	30.6	31.27
Upstream	901.91	.2	.2	.2
Upstream	901.71	21.96	24.7	27.44
Upstream	877.01	.1	.1	.1
Upstream	876.91	14.37	15.24	13.68
Upstream	861.67	18.28	14.76	13.03
Upstream	846.91	.21	.21	.2
Upstream	846.70	21.8	24.69	27.91
Upstream	822.01	.1	.1	.09
Upstream	821.91	98.07	110.01	124.19
Upstream	711.90	47.93	43.9	36.64
Upstream	668.00	.31	.32	.31
Upstream	667.68	25.73	18.13	16.63
Upstream	649.55	.1	.1	.1
Upstream	649.45	30.04	28.19	32.96
Upstream	621.26	76.21	68.04	60.72
Upstream	553.22	54.65	48.65	54.29
Upstream	504.57	31.24	27.94	24.62
Upstream	476.63			

Trail	443.00	27.19	30.76	42.74
Trail	412.24	21.77	21.53	17.96
Trail	390.71	5.49	4.81	7.04
Trail	385.90	117.95	118.96	101.52
Trail	320.90	Culvert		
Trail	266.94	11.13	9.63	10.12
Trail	257.31	12.41	10.37	52.82
Trail	246.94	10.99	9.87	26.73
Trail	237.07	93.44	88.77	53.24
Trail	194.07	Culvert		
Trail	148.30	7.57	9.07	7.65
Trail	148.00	Lat Struct		
Trail	139.23	13	13	13
Trail	126.23	21.7	21.7	21.7
Trail	104.53	20.8	20.8	20.8
Trail	83.73	28.1	28.1	28.1
LowFlow	449.30	30.31	28.49	27.19
LowFlow	449.20	Lat Struct		
LowFlow	420.81	35.72	20.97	21.77
LowFlow	399.84	5.95	4.61	5.49
LowFlow	395.23	141	141	141
LowFlow	330.23	Culvert		
LowFlow	258.43	10	10	10
LowFlow	248.43	101.7	101.7	101.7
LowFlow	196.43	Culvert		
LowFlow	146.73	38.36	12.53	14.49
LowFlow	134.20	35.5	49.5	63.64
LowFlow	84.70	32.3	32.3	32.3
LowFlow	52.40	52.4	52.4	52.4
LowFlow	0.00			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: IndustrailTrib

Reach	River Sta.	Contr.	Expan.
Upstream	1518.60	.1	.3
Upstream	1469.76	.1	.3
Upstream	1469.56	.1	.3
Upstream	1444.86	.1	.3
Upstream	1444.76	.1	.3
Upstream	1431.84	.1	.3
Upstream	1418.40	.1	.3
Upstream	1418.20	.1	.3
Upstream	1393.50	.1	.3
Upstream	1393.40	.1	.3

Upstream	1289.23	.1	.3
Upstream	1191.91	.1	.3
Upstream	1191.71	.1	.3
Upstream	1167.01	.1	.3
Upstream	1166.91	.1	.3
Upstream	1120.97	.1	.3
Upstream	1061.91	.1	.3
Upstream	1061.71	.1	.3
Upstream	1037.01	.1	.3
Upstream	1036.91	.1	.3
Upstream	1013.85	.1	.3
Upstream	986.91	.1	.3
Upstream	986.71	.1	.3
Upstream	962.01	.1	.3
Upstream	961.91	.1	.3
Upstream	932.51	.1	.3
Upstream	901.91	.1	.3
Upstream	901.71	.1	.3
Upstream	877.01	.1	.3
Upstream	876.91	.1	.3
Upstream	861.67	.1	.3
Upstream	846.91	.1	.3
Upstream	846.70	.1	.3
Upstream	822.01	.1	.3
Upstream	821.91	.1	.3
Upstream	711.90	.1	.3
Upstream	668.00	.1	.3
Upstream	667.68	.1	.3
Upstream	649.55	.1	.3
Upstream	649.45	.1	.3
Upstream	621.26	.1	.3
Upstream	553.22	.1	.3
Upstream	504.57	.1	.3
Upstream	476.63	.1	.3
Trail	443.00	.1	.3
Trail	412.24	.1	.3
Trail	390.71	.1	.3
Trail	385.90	.1	.3
Trail	320.90	Culvert	
Trail	266.94	.1	.3
Trail	257.31	.1	.3
Trail	246.94	.1	.3
Trail	237.07	.1	.3
Trail	194.07	Culvert	
Trail	148.30	.1	.3
Trail	148.00	Lat Struct	
Trail	139.23	.1	.3
Trail	126.23	.1	.3
Trail	104.53	.1	.3
Trail	83.73	.1	.3

LowFlow	449.30		.1	.3
LowFlow	449.20	Lat Struct		
LowFlow	420.81		.1	.3
LowFlow	399.84		.1	.3
LowFlow	395.23		.3	.5
LowFlow	330.23	Culvert		
LowFlow	258.43		.1	.3
LowFlow	248.43		.1	.3
LowFlow	196.43	Culvert		
LowFlow	146.73		.1	.3
LowFlow	134.20		.1	.3
LowFlow	84.70		.1	.3
LowFlow	52.40		.1	.3
LowFlow	0.00		.1	.3

Profile Output Table - Standard Table 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
Upstream	1518.60	100year	1162.00	6226.47	6239.06	6239.58	0.003624	5.78	201.02	46.82	0.49	
Upstream	1518.60	10year	590.00	6226.47	6237.04	6237.43	0.003692	4.98	118.44	32.80	0.46	
Upstream	1518.60	2year	318.00	6226.47	6235.70	6235.94	0.002889	3.96	80.31	24.29	0.38	
Upstream	1469.76	100year	1162.00	6226.47	6238.79	6239.38	0.004373	6.17	188.37	45.71	0.54	
Upstream	1469.76	10year	590.00	6226.47	6236.78	6237.22	0.004437	5.36	110.00	30.88	0.50	
Upstream	1469.76	2year	318.00	6226.47	6235.52	6235.79	0.003321	4.19	75.98	23.17	0.41	
Upstream	1469.56	100year	1162.00	6231.35	6237.42	6237.42	6239.26	0.020252	11.35	116.77	34.08	0.92
Upstream	1469.56	10year	590.00	6231.35	6235.82	6235.82	6237.14	0.023805	9.35	67.29	27.71	0.93
Upstream	1469.56	2year	318.00	6231.35	6234.69	6234.69	6235.71	0.032026	8.13	39.13	19.18	1.00
Upstream	1444.86	100year	1162.00	6230.28	6236.21							

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6234.88     6236.97     0.009183       6.99       166.22       40.57           0.61
  Upstream      1444.86       10year        590.00     6230.28     6234.89
6233.51     6235.29     0.006649       5.11       115.55       35.85           0.50
  Upstream      1444.86       2year         318.00     6230.28     6233.98
6232.65     6234.20     0.004744       3.76        84.67       32.60           0.41


  Upstream      1444.76       100year      1162.00     6230.29     6236.21
6234.89     6236.97     0.009214       6.99       166.25       40.71           0.61
  Upstream      1444.76       10year        590.00     6230.29     6234.88
6233.54     6235.29     0.006708       5.11       115.38       35.97           0.50
  Upstream      1444.76       2year         318.00     6230.29     6233.98
6232.68     6234.20     0.004814       3.77        84.39       32.71           0.41


  Upstream      1431.84       100year      1162.00     6231.06     6235.26
6235.26     6236.71     0.027331       9.68       120.02       41.61           1.01
  Upstream      1431.84       10year        590.00     6231.06     6234.06
6234.06     6235.07     0.030737       8.08        73.04       36.64           1.01
  Upstream      1431.84       2year         318.00     6231.06     6233.32
6233.32     6234.02     0.033752       6.75        47.11       33.40           1.00


  Upstream      1418.40       100year      1162.00     6227.18     6234.97
      6235.49     0.006197       5.78      200.88       45.95           0.49
  Upstream      1418.40       10year        590.00     6227.18     6233.44
      6233.72     0.004131       4.27      138.08       36.18           0.39
  Upstream      1418.40       2year         318.00     6227.18     6232.39
      6232.54     0.002521       3.07      103.46       30.34           0.29


  Upstream      1418.20       100year      1162.00     6227.11     6234.84
      6235.48     0.004900       6.60      198.10       45.20           0.45
  Upstream      1418.20       10year        590.00     6227.11     6233.42
      6233.72     0.003079       4.46      140.23       36.15           0.34
  Upstream      1418.20       2year         318.00     6227.11     6232.40
      6232.54     0.001907       3.04      106.36       30.52           0.26


  Upstream      1393.50       100year      1162.00     6227.68     6234.93
      6235.30     0.003222       4.91      245.68       58.67           0.38
  Upstream      1393.50       10year        590.00     6227.68     6233.42
      6233.61     0.002650       3.55      166.37       46.06           0.32
  Upstream      1393.50       2year         318.00     6227.68     6232.38
      6232.48     0.001858       2.61      121.75       39.62           0.26


  Upstream      1393.40       100year      1162.00     6227.72     6234.80
      6235.29     0.003559       6.07      237.28       57.52           0.41
  Upstream      1393.40       10year        590.00     6227.72     6233.36
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      6233.61     0.002366       4.21      163.09       45.60           0.32
  Upstream      1393.40       2year         318.00     6227.72     6232.35
      6232.48     0.001546       2.95      120.23       39.51           0.25


  Upstream      1289.23       100year      1162.00     6229.48     6233.10
6233.10     6234.40     0.027734       9.15      127.01       49.61           1.01
  Upstream      1289.23       10year        590.00     6229.48     6232.02
6232.02     6232.93     0.031043       7.65       77.11       43.08           1.01
  Upstream      1289.23       2year         318.00     6229.48     6231.31
6231.31     6231.98     0.034646       6.56       48.48       37.15           1.01


  Upstream      1191.91       100year      1162.00     6223.47     6230.25
      6231.14     0.012049       7.57      153.59       40.27           0.68
  Upstream      1191.91       10year        590.00     6223.47     6228.79
      6229.31     0.008938       5.81      101.51       31.39           0.57
  Upstream      1191.91       2year         318.00     6223.47     6227.87
      6228.15     0.005421       4.22       75.30       25.68           0.43


  Upstream      1191.71       100year      1162.00     6223.38     6229.88
      6231.11     0.011436       9.14      140.93       37.87           0.69
  Upstream      1191.71       10year        590.00     6223.38     6228.75
      6229.31     0.006958       6.09      102.06       31.30           0.52
  Upstream      1191.71       2year         318.00     6223.38     6227.88
      6228.15     0.004493       4.20       77.12       25.81           0.40


  Upstream      1167.01       100year      1162.00     6224.07     6229.90
      6230.76     0.007890       7.71      168.27       44.66           0.59
  Upstream      1167.01       10year        590.00     6224.07     6228.69
      6229.12     0.005264       5.30      118.41       37.97           0.46
  Upstream      1167.01       2year         318.00     6224.07     6227.82
      6228.03     0.003595       3.72       87.60       32.33           0.37


  Upstream      1166.91       100year      1162.00     6224.09     6229.88
      6230.76     0.008049       7.77      167.15       44.58           0.60
  Upstream      1166.91       10year        590.00     6224.09     6228.69
      6229.12     0.005367       5.34      117.65       37.94           0.47
  Upstream      1166.91       2year         318.00     6224.09     6227.81
      6228.03     0.003673       3.75       86.97       32.32           0.37


  Upstream      1120.97       100year      1162.00     6224.60     6228.73
6228.73     6230.09     0.027522       9.35      124.31       46.45           1.01
  Upstream      1120.97       10year        590.00     6224.60     6227.64
6227.64     6228.58     0.030771       7.77       75.90       41.00           1.01
  Upstream      1120.97       2year         318.00     6224.60     6226.93
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6226.93 6227.60 0.034646 6.57 48.40 36.97 1.01

Upstream 1061.91 100year 1162.00 6219.85 6226.75
6227.27 0.006066 5.79 200.67 46.02 0.49
Upstream 1061.91 10year 590.00 6219.85 6225.35
6225.62 0.003906 4.17 141.42 37.90 0.38
Upstream 1061.91 2year 318.00 6219.85 6224.37
6224.50 0.002277 2.96 107.31 31.84 0.28

Upstream 1061.71 100year 1162.00 6219.81 6226.73
6227.27 0.004848 5.96 203.51 45.85 0.45
Upstream 1061.71 10year 590.00 6219.81 6225.35
6225.61 0.003231 4.09 145.69 37.91 0.35
Upstream 1061.71 2year 318.00 6219.81 6224.37
6224.50 0.002038 2.85 111.55 31.99 0.27

Upstream 1037.01 100year 1162.00 6220.77 6226.59
6227.15 0.004867 6.19 210.33 54.43 0.47
Upstream 1037.01 10year 590.00 6220.77 6225.24
6225.53 0.003620 4.40 142.89 45.32 0.39
Upstream 1037.01 2year 318.00 6220.77 6224.28
6224.44 0.002720 3.18 102.74 38.92 0.32

Upstream 1036.91 100year 1162.00 6220.81 6226.58
6227.15 0.005014 6.25 208.40 54.30 0.48
Upstream 1036.91 10year 590.00 6220.81 6225.23
6225.53 0.003759 4.45 141.26 45.26 0.39
Upstream 1036.91 2year 318.00 6220.81 6224.28
6224.44 0.002852 3.23 101.24 38.89 0.33

Upstream 1013.85 100year 1162.00 6221.37 6225.51
6225.51 6226.85 0.026523 9.27 125.34 46.00 0.99
Upstream 1013.85 10year 590.00 6221.37 6224.30
6224.30 6225.27 0.029384 7.90 74.65 37.74 0.99
Upstream 1013.85 2year 318.00 6221.37 6223.51
6223.51 6224.23 0.033224 6.78 46.93 32.93 1.00

Upstream 986.91 100year 1162.00 6215.65 6223.20
6224.06 0.011359 7.41 156.72 38.68 0.65
Upstream 986.91 10year 590.00 6215.65 6221.64
6222.14 0.007707 5.65 104.42 28.20 0.52
Upstream 986.91 2year 318.00 6215.65 6220.62
6220.87 0.004398 4.03 78.95 23.28 0.39

Upstream	986.71	100year	1162.00	6215.56	6223.10	6224.05	0.008542	7.94	157.04	38.00	0.57
Upstream	986.71	10year	590.00	6215.56	6221.67	6222.13	0.005855	5.47	109.14	28.81	0.45
Upstream	986.71	2year	318.00	6215.56	6220.63	6220.86	0.003882	3.83	83.11	23.65	0.36
Upstream	962.01	100year	1162.00	6215.94	6223.29	6223.78	0.003560	5.72	217.80	46.02	0.40
Upstream	962.01	10year	590.00	6215.94	6221.74	6221.97	0.002410	3.92	153.67	36.85	0.31
Upstream	962.01	2year	318.00	6215.94	6220.65	6220.77	0.001586	2.72	117.01	31.22	0.24
Upstream	961.91	100year	1162.00	6215.95	6223.29	6223.78	0.003579	5.73	217.41	46.03	0.40
Upstream	961.91	10year	590.00	6215.95	6221.73	6221.97	0.002428	3.93	153.29	36.87	0.31
Upstream	961.91	2year	318.00	6215.95	6220.65	6220.77	0.001599	2.73	116.66	31.25	0.24
Upstream	932.51	100year	1162.00	6217.77	6221.94	6221.94	6223.45	0.026741	9.86	117.83	39.12	1.00
Upstream	932.51	10year	590.00	6217.77	6220.63	6220.63	6221.71	0.029755	8.35	70.65	32.88	1.00
Upstream	932.51	2year	318.00	6217.77	6219.79	6219.79	6220.58	0.032866	7.11	44.74	28.78	1.00
Upstream	901.91	100year	1162.00	6214.08	6220.29	6219.63	6221.54	0.018019	8.95	129.76	34.08	0.81
Upstream	901.91	10year	590.00	6214.08	6217.76	6217.76	6219.24	0.031527	9.76	60.43	20.51	1.00
Upstream	901.91	2year	318.00	6214.08	6216.98	6217.76	0.022139	7.08	44.90	19.55	0.82
Upstream	901.71	100year	1162.00	6213.92	6219.41	6219.41	6221.45	0.023865	11.57	105.64	29.54	0.94
Upstream	901.71	10year	590.00	6213.92	6217.88	6217.58	6219.10	0.023375	8.85	66.71	21.20	0.87
Upstream	901.71	2year	318.00	6213.92	6217.09	6217.70	0.015423	6.28	50.61	19.83	0.69
Upstream	877.01	100year	1162.00	6213.06	6219.34						

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      6220.37     0.009691       8.23      148.88       38.03           0.63
  Upstream      877.01        10year        590.00     6213.06     6218.14
      6218.61     0.006075       5.50      108.54       29.85           0.48
  Upstream      877.01        2year         318.00     6213.06     6217.18
      6217.41     0.004037       3.86       82.43       25.19           0.38


  Upstream      876.91        100year      1162.00     6213.06     6219.34
      6220.37     0.009676       8.23      148.95       38.07           0.63
  Upstream      876.91        10year        590.00     6213.06     6218.14
      6218.61     0.006067       5.50      108.55       29.91           0.48
  Upstream      876.91        2year         318.00     6213.06     6217.18
      6217.41     0.004038       3.86       82.40       25.20           0.38


  Upstream      861.67        100year      1162.00     6214.39     6218.60
6218.60     6220.09     0.026928       9.81      118.42       39.98           1.00
  Upstream      861.67        10year        590.00     6214.39     6217.28
6217.28     6218.37     0.029756       8.36       70.56       32.83           1.01
  Upstream      861.67        2year         318.00     6214.39     6216.43
6216.43     6217.22     0.032546       7.15       44.50       28.18           1.00


  Upstream      846.91        100year      1162.00     6210.14     6217.15
      6218.22     0.013917       8.31      140.90       35.55           0.70
  Upstream      846.91        10year        590.00     6210.14     6215.52
      6216.15     0.010941       6.36       92.74       25.45           0.59
  Upstream      846.91        2year         318.00     6210.14     6214.59
      6214.90     0.006188       4.46       71.26       21.63           0.43


  Upstream      846.70        100year      1162.00     6210.07     6217.22
      6218.19     0.012001       7.93      147.81       36.09           0.65
  Upstream      846.70        10year        590.00     6210.07     6215.57
      6216.13     0.009300       6.01       98.22       25.78           0.54
  Upstream      846.70        2year         318.00     6210.07     6214.62
      6214.89     0.005101       4.18       76.03       21.66           0.39


  Upstream      822.01        100year      1162.00     6210.38     6216.25
6215.66     6217.79     0.016797      10.01      120.00       31.76           0.80
  Upstream      822.01        10year        590.00     6210.38     6215.23
      6215.89     0.009557       6.50       91.19       25.13           0.58
  Upstream      822.01        2year         318.00     6210.38     6214.46
      6214.76     0.005359       4.35       73.04       22.55           0.43


  Upstream      821.91        100year      1162.00     6210.41     6216.18
6215.68     6217.79     0.017809      10.21      117.44       31.29           0.82
  Upstream      821.91        10year        590.00     6210.41     6215.22
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      6215.88     0.009806       6.56       90.35       25.01           0.59
  Upstream      821.91        2year         318.00     6210.41     6214.46
      6214.76     0.005486       4.39       72.43       22.50           0.43


  Upstream      711.90        100year      1162.00     6210.55     6215.64
      6216.15     0.008469       5.74      202.31       62.68           0.56
  Upstream      711.90        10year        590.00     6210.55     6213.89
      6214.43     0.017494       5.90       99.93       51.27           0.75
  Upstream      711.90        2year         318.00     6210.55     6212.85
6212.85     6213.46     0.037835       6.26       50.79       42.62           1.01


  Upstream      668.00        100year      1162.00     6206.59     6215.50
      6215.82     0.004958       4.50      258.01       74.32           0.43
  Upstream      668.00        10year        590.00     6206.59     6213.60
      6213.90     0.007071       4.32      136.45       52.91           0.47
  Upstream      668.00        2year         318.00     6206.59     6212.27
      6212.51     0.006489       3.95       80.59       31.37           0.43


  Upstream      667.68        100year      1162.00     6206.52     6215.32
      6215.80     0.005027       6.31      245.66       72.38           0.42
  Upstream      667.68        10year        590.00     6206.52     6213.46
      6213.88     0.005703       5.50      129.53       50.94           0.42
  Upstream      667.68        2year         318.00     6206.52     6212.23
      6212.51     0.004355       4.25       79.80       31.00           0.35


  Upstream      649.55        100year      1162.00     6207.07     6215.04
      6215.68     0.005701       7.16      213.19       61.48           0.49
  Upstream      649.55        10year        590.00     6207.07     6213.28
      6213.77     0.005827       5.87      118.50       44.47           0.47
  Upstream      649.55        2year         318.00     6207.07     6212.11
      6212.42     0.004972       4.50       74.99       30.43           0.42


  Upstream      649.45        100year      1162.00     6207.08     6215.04
      6215.68     0.005720       7.17      213.02       61.49           0.49
  Upstream      649.45        10year        590.00     6207.08     6213.27
      6213.77     0.005861       5.88      118.28       44.45           0.48
  Upstream      649.45        2year         318.00     6207.08     6212.11
      6212.42     0.005010       4.51       74.81       30.43           0.42


  Upstream      621.26        100year      1162.00     6208.27     6213.74
6213.74     6215.32     0.017785      10.86      131.34       43.77           0.89
  Upstream      621.26        10year        590.00     6208.27     6212.21
6212.21     6213.41     0.021420       9.11       72.89       32.47           0.91
  Upstream      621.26        2year         318.00     6208.27     6211.18
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6211.18 6212.09 0.026563 7.75 43.37 25.20 0.95

Upstream 553.22 100year 1162.00 6208.27 6212.47
6212.14 6213.61 0.007887 9.18 153.68 68.12 0.83
Upstream 553.22 10year 590.00 6208.27 6211.39
6210.94 6212.04 0.006806 6.82 100.18 60.20 0.73
Upstream 553.22 2year 318.00 6208.27 6210.66
6210.19 6211.04 0.005989 5.19 68.47 54.84 0.65

Upstream 504.57 100year 1162.00 6207.97 6211.78
6211.78 6213.14 0.010730 9.71 136.31 69.24 0.94
Upstream 504.57 10year 590.00 6207.97 6210.64
6210.64 6211.57 0.012421 7.88 80.69 60.39 0.95
Upstream 504.57 2year 318.00 6207.97 6209.92
6209.92 6210.58 0.014885 6.56 50.21 54.75 0.97

Upstream 476.63 100year 1162.00 6201.17 6207.41
6206.85 6208.79 0.006490 11.33 160.15 62.13 0.81
Upstream 476.63 10year 590.00 6201.17 6205.21
6205.21 6206.54 0.010066 10.47 77.85 45.24 0.93
Upstream 476.63 2year 318.00 6201.17 6204.08
6204.08 6205.08 0.011160 8.76 46.57 24.37 0.93

Trail 443.00 100year 757.00 6202.29 6206.68
6206.68 6208.60 0.001483 11.60 95.94 28.54 0.99
Trail 443.00 10year 214.00 6202.29 6204.39
6204.39 6205.29 0.001767 7.61 31.33 28.03 0.95
Trail 443.00 2year 0.00 6202.29 6202.31
6202.31 6202.31 0.000000 0.00 0.01 1.30 0.00

Trail 412.24 100year 757.00 6200.18 6206.03
6207.38 0.000653 9.36 89.58 17.29 0.69
Trail 412.24 10year 214.00 6200.18 6202.22
6202.22 6203.19 0.001997 7.91 27.90 14.96 1.00
Trail 412.24 2year 0.00 6200.18 6200.20
6200.20 6200.20 0.000000 0.00 0.02 1.55 0.00

Trail 390.71 100year 757.00 6198.46 6206.47
6207.17 0.000224 6.78 126.91 17.78 0.43
Trail 390.71 10year 214.00 6198.46 6201.89
6202.22 0.000324 4.58 49.47 15.76 0.44
Trail 390.71 2year 0.00 6198.46 6198.48
6198.48 6198.48 0.000000 0.00 0.01 1.30 0.00

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  Trail         385.90        100year       911.22     6198.17     6205.98
6203.36     6207.13     0.000376       8.72      134.31       17.90           0.55
  Trail         385.90        10year        239.11     6198.17     6201.87
6200.25     6202.21     0.000307       4.79       62.58       16.99           0.44
  Trail         385.90        2year           0.59     6198.17     6198.24
6197.48     6198.24     0.000200       0.28        2.42       15.87           0.18


  Trail         320.90                    Culvert


  Trail         266.94        100year       911.22     6192.47     6203.16
      6203.83     0.000148       6.75      196.31       18.74           0.36
  Trail         266.94        10year        239.11     6192.47     6196.06
      6196.44     0.000369       5.15       64.94       18.25           0.48
  Trail         266.94        2year           0.59     6192.47     6192.51
6192.51     6192.53     0.006827       1.11        0.68       17.65           0.98


  Trail         257.31        100year       911.22     6192.16     6203.35
      6203.75     0.000069       5.12      206.56       19.25           0.27
  Trail         257.31        10year        239.11     6192.16     6196.17
      6196.39     0.000155       3.81       70.36       18.67           0.34
  Trail         257.31        2year           0.59     6192.16     6192.27
6192.27     6192.30     0.006573       1.49        0.41        7.09           1.10


  Trail         246.94        100year       911.22     6191.93     6203.09
      6203.73     0.000114       6.56      206.06       20.36           0.35
  Trail         246.94        10year        239.11     6191.93     6196.02
      6196.37     0.000240       4.82       64.30       19.77           0.43
  Trail         246.94        2year           0.59     6191.93     6192.05
6192.05     6192.09     0.006275       1.45        0.41        7.23           1.07


  Trail         237.07        100year       911.22     6191.84     6202.70
6198.04     6203.69     0.000179       8.13      155.02       19.50           0.43
  Trail         237.07        10year        239.11     6191.84     6195.84
6194.39     6196.35     0.000351       5.84       49.25       13.54           0.51
  Trail         237.07        2year           0.59     6191.84     6191.90
6191.90     6191.91     0.003708       1.09        0.55       10.11           0.82


  Trail         194.07                    Culvert


  Trail         148.30        100year       911.22     6191.05     6197.13
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6197.13     6200.05     0.001169      14.11       93.83       18.99           1.01
  Trail         148.30        10year        239.11     6191.05     6193.55
6193.55     6194.80     0.001609       9.15       33.37       14.79           1.02
  Trail         148.30        2year           0.59     6191.05     6191.08
6191.08     6191.12     0.014500       1.57        0.45       11.89           1.50


  Trail         148.00                  Lat Struct



  Trail         139.23        100year       911.22     6188.94     6193.85
6193.37     6195.60     0.002032      11.88      121.63       26.52           0.95
  Trail         139.23        10year        239.11     6188.94     6193.21
      6193.37     0.000214       3.60      104.91       25.93           0.31
  Trail         139.23        2year           0.59     6188.94     6189.01
      6189.01     0.000053       0.09        4.72       19.49           0.08


  Trail         126.23        100year       911.22     6188.66     6194.08
      6195.47     0.001501      10.58      136.50       28.18           0.82
  Trail         126.23        10year        239.11     6188.66     6193.22
      6193.36     0.000178       3.34      112.83       27.29           0.28
  Trail         126.23        2year           0.59     6188.66     6189.01
      6189.01     0.000004       0.09        9.68       21.64           0.03


  Trail         104.53        100year       911.22     6188.69     6194.09
      6195.42     0.001084      10.32      150.29       33.63           0.79
  Trail         104.53        10year        239.11     6188.69     6193.23
      6193.36     0.000137       3.26      121.95       31.79           0.27
  Trail         104.53        2year           0.59     6188.69     6189.01
      6189.01     0.000005       0.10        8.76       21.78           0.04


  Trail         83.73         100year       911.22     6189.21     6194.53
6192.99     6195.21     0.000472       7.32      235.12       67.98           0.57
  Trail         83.73         10year        239.11     6189.21     6193.25
6190.87     6193.34     0.000092       2.66      155.27       56.84           0.24
  Trail         83.73         2year           0.59     6189.21     6188.94
6188.94     6189.00     0.088195                0.29        2.65           0.00


  LowFlow       449.30        100year       405.00     6198.78     6202.35
6202.35     6203.56     0.019842      10.74       52.24       22.14           1.01
  LowFlow       449.30        10year        376.00     6198.78     6204.64
      6204.87     0.002204       4.99      112.59       30.75           0.36
  LowFlow       449.30        2year         318.00     6198.78     6203.46
      6203.79     0.004040       5.81       79.03       26.31           0.48
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LowFlow	449.20			Lat Struct							
LowFlow	420.81	100year	324.48	6196.23	6201.96	6202.06	0.000907	2.67	127.73	31.14	0.22
LowFlow	420.81	10year	350.89	6196.23	6204.75	6204.80	0.000204	1.75	215.55	31.69	0.11
LowFlow	420.81	2year	317.41	6196.23	6203.63	6203.69	0.000293	1.88	180.23	31.47	0.13
LowFlow	399.84	100year	265.64	6194.67	6202.01	6202.03	0.000166	1.52	231.96	54.60	0.10
LowFlow	399.84	10year	350.89	6194.67	6204.77	6204.79	0.000067	1.21	406.31	71.43	0.07
LowFlow	399.84	2year	317.41	6194.67	6203.65	6203.67	0.000094	1.32	330.23	64.66	0.08
LowFlow	395.23	100year	250.78	6194.69	6202.00	6197.07	6202.03	0.000195	1.52	190.56	46.13	0.11
LowFlow	395.23	10year	350.89	6194.69	6204.76	6197.53	6204.79	0.000087	1.29	345.59	66.64	0.08
LowFlow	395.23	2year	317.41	6194.69	6203.64	6197.38	6203.67	0.000123	1.41	275.82	58.05	0.09
LowFlow	330.23			Culvert							
LowFlow	258.43	100year	250.78	6189.50	6199.61	6199.75	0.000165	3.01	83.31	8.28	0.17
LowFlow	258.43	10year	350.89	6189.50	6199.34	6199.63	0.000345	4.33	81.11	8.28	0.24
LowFlow	258.43	2year	317.41	6189.50	6198.22	6198.52	0.000379	4.42	71.78	8.27	0.26
LowFlow	248.43	100year	250.78	6189.50	6199.61	6192.58	6199.75	0.000167	3.02	83.00	8.33	0.17
LowFlow	248.43	10year	350.89	6189.50	6199.34	6193.37	6199.63	0.000348	4.34	80.76	8.32	0.25
LowFlow	248.43	2year	317.41	6189.50	6198.21	6193.11	6198.52	0.000384	4.45	71.39	8.30	0.27
LowFlow	196.43			Culvert							

LowFlow	146.73	100year	250.78	6189.00	6197.56	
6197.57	0.000041	0.88	292.81	35.31	0.05	
LowFlow	146.73	10year	350.89	6189.00	6194.11	
6194.18	0.000448	2.07	173.01	34.54	0.16	
LowFlow	146.73	2year	317.41	6189.00	6192.16	
6192.31	0.001822	3.04	106.00	34.10	0.30	
LowFlow	134.20	100year	1007.78	6188.94	6197.44	
6197.56	0.000277	2.94	412.05	62.02	0.18	
LowFlow	134.20	10year	564.89	6188.94	6194.04	
6194.17	0.000537	2.91	219.45	51.42	0.23	
LowFlow	134.20	2year	317.41	6188.94	6192.17	
6192.28	0.000834	2.68	128.78	45.38	0.26	
LowFlow	84.70	100year	1007.78	6188.31	6197.48	
6197.53	0.000125	1.93	588.13	93.15	0.12	
LowFlow	84.70	10year	564.89	6188.31	6194.07	
6194.13	0.000252	1.93	304.26	72.72	0.15	
LowFlow	84.70	2year	317.41	6188.31	6192.19	
6192.23	0.000410	1.78	178.36	60.44	0.18	
LowFlow	52.40	100year	1007.78	6187.88	6197.48	
6197.52	0.000085	1.66	704.14	117.62	0.10	
LowFlow	52.40	10year	564.89	6187.88	6194.08	
6194.12	0.000148	1.59	368.49	78.59	0.12	
LowFlow	52.40	2year	317.41	6187.88	6192.19	
6192.22	0.000193	1.38	231.34	66.90	0.13	
LowFlow	0.00	100year	1007.78	6187.26	6196.77	
6192.74	6197.45	0.002219	6.71	167.73	31.99	0.40
LowFlow	0.00	10year	564.89	6187.26	6193.45	
6191.12	6194.04	0.003481	6.17	92.42	18.07	0.46
LowFlow	0.00	2year	317.41	6187.26	6191.78	
6189.97	6192.16	0.003495	4.93	64.33	16.18	0.44

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US.	W.S. US.	E.G. IC	E.G. OC	Min El Weir Flow	Q Culv Group	Q Weir	Delta WS	Culv Vel US	Culv

Vel DS										
						(ft)	(ft)	(ft)		
(ft)	(ft)		(cfs)	(cfs)		(ft)	(ft/s)			
(ft/s)										
Trail	320.90	Culvert #1	100year	6207.13	6205.98	6207.13	6208.04	6225.47	911.22	2.82
13.47	9.49									
Trail	320.90	Culvert #1	10year	6202.21	6201.87	6201.63	6202.21	6225.47	239.11	5.81
8.62	19.18									
Trail	320.90	Culvert #1	2year	6198.24	6198.24	6198.04	6198.24	6225.47	0.59	5.73
1.17	1.81									
Trail	194.07	Culvert #1	100year	6203.69	6202.70	6203.16	6203.69	6218.99	911.22	5.56
15.57	17.32									
Trail	194.07	Culvert #1	10year	6196.35	6195.84	6195.72	6196.35	6218.99	239.11	2.28
9.27	11.71									
Trail	194.07	Culvert #1	2year	6191.82	6191.90	6191.77	6191.82	6218.99	0.59	0.81
1.23	1.44									
LowFlow	330.23	Culvert #1	100year	6202.03	6202.00	6201.78	6202.03	6220.63	250.78	2.39
9.56	9.07									
LowFlow	330.23	Culvert #1	10year	6204.79	6204.76	6204.79	6204.08	6220.63	350.89	5.42
12.41	15.67									
LowFlow	330.23	Culvert #1	2year	6203.67	6203.64	6203.67	6203.32	6220.63	317.41	5.43
11.23	14.36									
LowFlow	196.43	Culvert #1	100year	6199.75	6199.61	6196.63	6199.75	6218.32	250.78	2.05
8.87	8.87									
LowFlow	196.43	Culvert #1	10year	6199.64	6199.34	6199.64	6198.90	6218.32	350.89	5.22
12.41	16.30									
LowFlow	196.43	Culvert #1	2year	6198.52	6198.21	6198.52				

6198.17 6218.32 317.41 6.04 11.23
14.89

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed_EffectiveFlows

River: IndustrailTrib Reach: Upstream RS: 1469.76 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1469.76 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1469.76 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1469.56 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1469.56 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
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the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1469.56 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1444.86 Profile: 100year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.86 Profile: 10year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.86 Profile: 2year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.76 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.76 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1444.76 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1431.84 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1431.84 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1431.84 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may

indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 1393.40   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 1393.40   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 1393.40   Profile: 2year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 1289.23   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 1289.23   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1289.23 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1166.91 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1166.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1166.91 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1120.97 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1120.97 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1120.97 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 1036.91 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1036.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1036.91 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 1013.85 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1013.85 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 1013.85 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current

and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 986.71 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 986.71 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 986.71 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 961.91 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 961.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 961.91 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 932.51 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 932.51   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
program defaulted to critical depth.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 932.51   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 901.91   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream   RS: 901.91   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream   RS: 901.71   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was

set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 901.71 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 901.71 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 876.91 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 876.91 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 876.91 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 861.67 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 861.67 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current

and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 861.67 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 846.70 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 821.91 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 821.91 Profile: 10year
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 821.91 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 711.90 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 711.90 Profile: 2year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:Divided flow computed for this cross-section.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Upstream RS: 649.45 Profile: 100year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 649.45 Profile: 10year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 649.45 Profile: 2year
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Upstream RS: 621.26 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 621.26 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 621.26 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 553.22 Profile: 100year
Warning:Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 553.22 Profile: 10year
Warning:Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 553.22 Profile: 2year
Warning:Divided flow computed for this cross-section.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

River: IndustrailTrib Reach: Upstream   RS: 504.57   Profile: 100year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream   RS: 504.57   Profile: 10year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream   RS: 504.57   Profile: 2year
     Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
             program defaulted to critical depth.
     Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream   RS: 476.63   Profile: 100year
     Warning:Divided flow computed for this cross-section.
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:A flow split was encountered. The program first calculated the

momentum of both channels below the junction. An
energy balance was performed across the junction from the stream with the highest momentum downstream to the section
upstream.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 476.63 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:Divided flow computed for this cross-section.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:A flow split was encountered. The program first calculated the momentum of both channels below the junction. An
energy balance was performed across the junction from the stream with the highest momentum downstream to the section
upstream.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Upstream RS: 476.63 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:A flow split was encountered. The program first calculated the momentum of both channels below the junction. An
energy balance was performed across the junction from the stream with the highest momentum downstream to the section
upstream.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: IndustrailTrib Reach: Trail RS: 443.00 Profile: 100year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 443.00 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 443.00 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 412.24 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 412.24 Profile: 10year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 412.24 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 390.71 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 390.71 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 385.90 Profile: 100year

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: IndustrailTrib Reach: Trail RS: 385.90 Profile: 10year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: IndustrailTrib Reach: Trail RS: 385.90 Profile: 2year
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: IndustrailTrib Reach: Trail RS: 320.90 Profile: 100year Culv: Culvert #1
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
River: IndustrailTrib Reach: Trail RS: 320.90 Profile: 10year Culv: Culvert #1
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 320.90 Profile: 2year Culv: Culvert #1
Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 266.94 Profile: 100year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 266.94 Profile: 10year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 266.94 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 257.31 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

River: IndustrailTrib Reach: Trail RS: 246.94 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 237.07 Profile: 2year
Warning:During subcritical analysis, the water surface upstream of culvert went to critical depth.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 100year Culv: Culvert #1
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 10year Culv: Culvert #1
Warning:Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross
section downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 2year
Warning:During subcritical analysis, the water surface upstream of culvert went to critical depth.
River: IndustrailTrib Reach: Trail RS: 194.07 Profile: 2year Culv: Culvert #1
Note: During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth. Therefore,
the outlet will be at normal depth.
Note: The flow in the culvert is entirely supercritical.
River: IndustrailTrib Reach: Trail RS: 148.30 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 148.30 Profile: 10year

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 148.30 Profile: 2year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: Trail RS: 148.00 Profile: 100year
Warning:The split flow optimization for the lateral structure failed to converge within the maximum number of iterations.
The results from the final iteration were used.
River: IndustrailTrib Reach: Trail RS: 148.00 Profile: 10year
Warning:The split flow optimization for the lateral structure failed to converge within the maximum number of iterations.
The results from the final iteration were used.
River: IndustrailTrib Reach: Trail RS: 139.23 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 139.23 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 139.23 Profile: 2year

Warning:Divided flow computed for this cross-section.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 126.23 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 126.23 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 104.53 Profile: 100year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 104.53 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: IndustrailTrib Reach: Trail RS: 104.53 Profile: 2year
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: Trail RS: 83.73 Profile: 2year
Warning:There is no flow in the channel. Check that the channel stations are correctly coded. To force flow into the
channel, a levee or ineffective flow may have to be added or the Manning's n of the overbank could be increased.
River: IndustrailTrib Reach: LowFlow RS: 449.30 Profile: 100year
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: IndustrailTrib Reach: LowFlow RS: 449.30 Profile: 10year
Warning:The cross-section end points had to be extended vertically for the computed water surface.

```
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 449.30     Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 449.20     Profile: 100year
     Warning:The split flow optimization for the lateral structure failed to
converge within the maximum number of iterations.
             The results from the final iteration were used.
River: IndustrailTrib  Reach: LowFlow     RS: 449.20     Profile: 10year
     Warning:The split flow optimization for the lateral structure failed to
converge within the maximum number of iterations.
             The results from the final iteration were used.
River: IndustrailTrib  Reach: LowFlow     RS: 420.81     Profile: 100year
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 420.81     Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the
computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 420.81     Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib  Reach: LowFlow     RS: 399.84     Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the
computed water surface.
River: IndustrailTrib  Reach: LowFlow     RS: 330.23     Profile: 10year     Culv:
Culvert #1
     Note:   The normal depth exceeds the height of the culvert.  The program
assumes that the normal depth is equal to the height
             of the culvert.
     Note:   The flow in the culvert is entirely supercritical.
River: IndustrailTrib  Reach: LowFlow     RS: 330.23     Profile: 2year     Culv:
Culvert #1
     Note:   The flow in the culvert is entirely supercritical.
River: IndustrailTrib  Reach: LowFlow     RS: 196.43     Profile: 10year     Culv:
Culvert #1
     Note:   The normal depth exceeds the height of the culvert.  The program
assumes that the normal depth is equal to the height
             of the culvert.
     Note:   The flow in the culvert is entirely supercritical.
River: IndustrailTrib  Reach: LowFlow     RS: 196.43     Profile: 2year     Culv:
Culvert #1
     Note:   The flow in the culvert is entirely supercritical.
```

River: IndustrailTrib Reach: LowFlow   RS: 146.73   Profile: 100year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 146.73   Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 146.73   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 134.20   Profile: 100year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 134.20   Profile: 10year
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 84.70   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 52.40   Profile: 100year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 52.40   Profile: 10year
     Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 52.40   Profile: 2year
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: IndustrailTrib Reach: LowFlow   RS: 0.00   Profile: 10year
     Warning:Divided flow computed for this cross-section.

APPENDIX E – EXERCEPTS OF STUDIES BY OTHERS

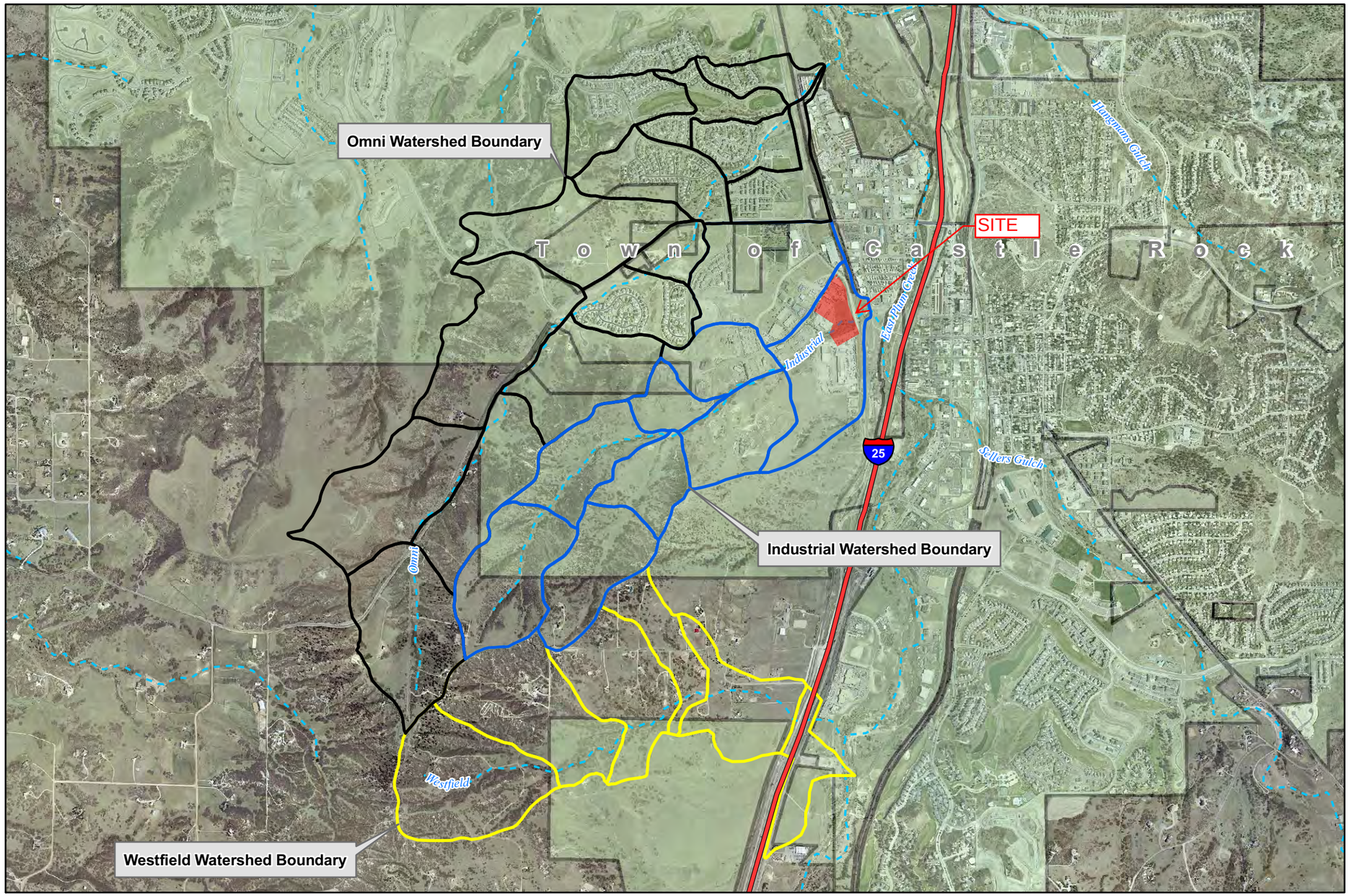
OMNI, INDUSTRIAL AND WESTFIELD WATERSHEDS
FLOOD HAZARD AREA DELINEATION
APRIL 2013

PREPARED FOR:

TOWN OF CASTLE ROCK COLORADO

PREPARED BY:

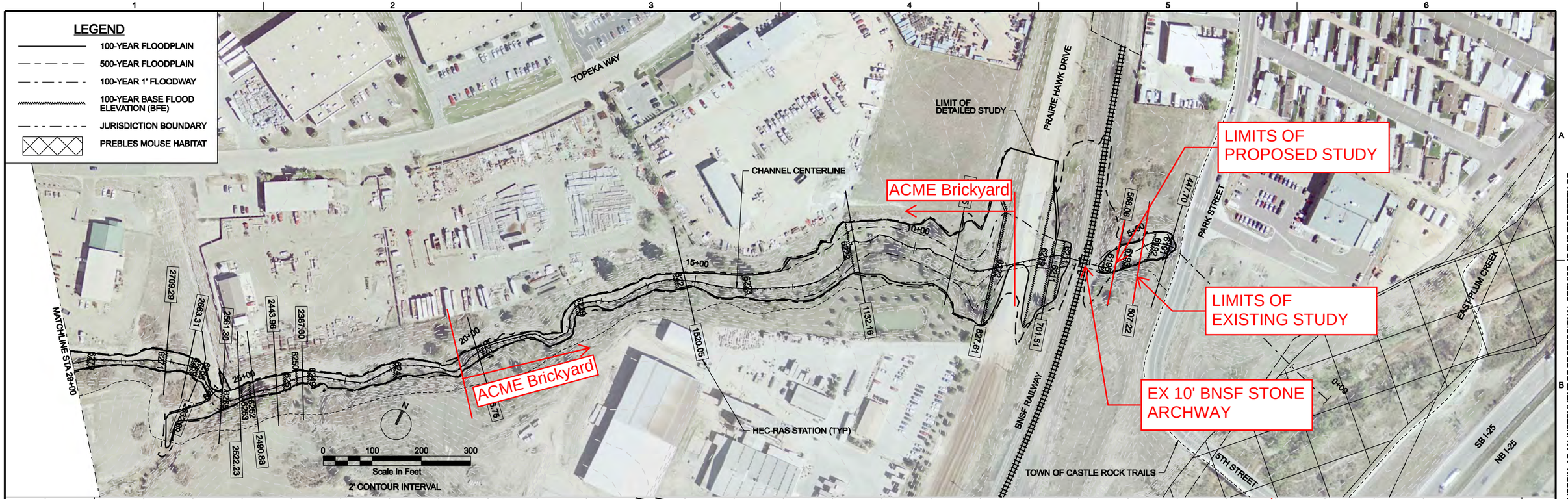
CH2MHILL











NOTE:
TOPOGRAPHY FROM TOWN OF CASTLE ROCK (2006), NAVD 88 VERTICAL DATUM,
NAD 83 STATE PLANE COLORADO CONTROL HORIZONTAL DATUM
AERIAL MAPPING FROM TOWN OF CASTLE ROCK (2006)

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	A COOK
DR	C SCHNEE
CHK	A TURNER
APVD	M GLIDDEN

NO	DATE	DESCRIPTION	APVR	N
NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

TOWN OF CASTLE ROCK COLORADO

INDUSTRIAL
PLAN AND PROFILE
STA 29+00 TO STA 0+00

SHEET	11
DWG	PP-4
DATE	DECEMBER 2011
PROJ	381198

FILENAME: Industrial_PP04.dgn PLOT DATE: 2/6/2012 PLOT TIME: 11:33:27 AM

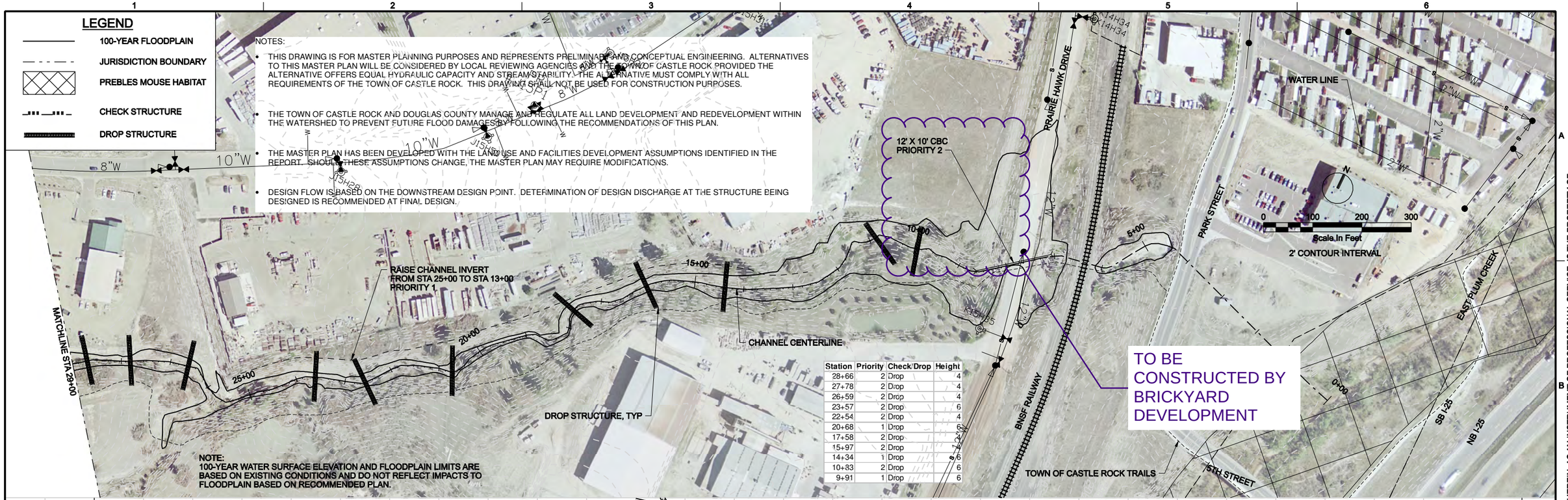
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LEGEND

- 100-YEAR FLOODPLAIN
- JURISDICTION BOUNDARY
- PREBLES MOUSE HABITAT
- CHECK STRUCTURE
- DROP STRUCTURE

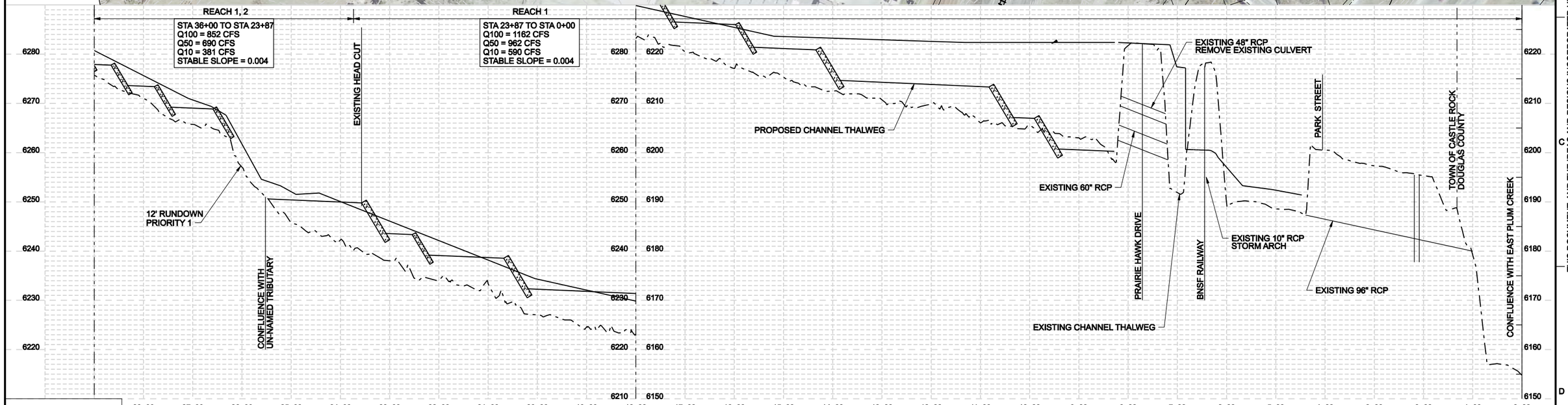
NOTES:

- THIS DRAWING IS FOR MASTER PLANNING PURPOSES AND REPRESENTS PRELIMINARY AND CONCEPTUAL ENGINEERING. ALTERNATIVES TO THIS MASTER PLAN WILL BE CONSIDERED BY LOCAL REVIEWING AGENCIES AND THE TOWN OF CASTLE ROCK PROVIDED THE ALTERNATIVE OFFERS EQUAL HYDRAULIC CAPACITY AND STREAM STABILITY. THE ALTERNATIVE MUST COMPLY WITH ALL REQUIREMENTS OF THE TOWN OF CASTLE ROCK. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES.
- THE TOWN OF CASTLE ROCK AND DOUGLAS COUNTY MANAGE AND REGULATE ALL LAND DEVELOPMENT AND REDEVELOPMENT WITHIN THE WATERSHED TO PREVENT FUTURE FLOOD DAMAGES BY FOLLOWING THE RECOMMENDATIONS OF THIS PLAN.
- THE MASTER PLAN HAS BEEN DEVELOPED WITH THE LAND USE AND FACILITIES DEVELOPMENT ASSUMPTIONS IDENTIFIED IN THE REPORT. SHOULD THESE ASSUMPTIONS CHANGE, THE MASTER PLAN MAY REQUIRE MODIFICATIONS.
- DESIGN FLOW IS BASED ON THE DOWNSTREAM DESIGN POINT. DETERMINATION OF DESIGN DISCHARGE AT THE STRUCTURE BEING DESIGNED IS RECOMMENDED AT FINAL DESIGN.



Station	Priority	Check/Drop	Height
28+66	2	Drop	4
27+78	2	Drop	4
26+59	2	Drop	4
23+57	2	Drop	6
22+54	2	Drop	4
20+68	1	Drop	6
17+58	2	Drop	4
15+97	2	Drop	4
14+34	1	Drop	6
10+83	2	Drop	6
9+91	1	Drop	6

NOTE:
100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN LIMITS ARE BASED ON EXISTING CONDITIONS AND DO NOT REFLECT IMPACTS TO FLOODPLAIN BASED ON RECOMMENDED PLAN.



NOTE:
TOPOGRAPHY FROM TOWN OF CASTLE ROCK (2006), NAVD 88 VERTICAL DATUM,
NAD 83 STATE PLANE COLORADO CONTROL HORIZONTAL DATUM
AERIAL MAPPING FROM TOWN OF CASTLE ROCK (2006)

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	A COOK						VERIFY SCALE
DR	C SCHNEE						BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
CHK	A TURNER	NO	DATE	DESCRIPTION	APVR	N	IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
APVD	M GLIDDEN	NO.	DATE	REVISION	BY	APVD	

CH2MHILL

TOWN OF CASTLE ROCK COLORADO

INDUSTRIAL
PLAN AND PROFILE
STA 29+00 TO STA 0+00

SHEET	11
DWG	PP-4
DATE	JULY 2010
PROJ	381198

FILENAME: MP_Industrial_PP04.dgr PLOT DATE: 11/8/2010 PLOT TIME: 3:27:01 PM

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Commentary Sheet 11

Industrial Tributary - Reach 1, 2

Station 29+00 to Station 0+00

Existing Conditions: Upstream of Station 25+22, the channel is a deeply incised v-ditch with short native grasses and scrub oaks on both the channel bottoms and banks. At Station 25+22, which is the confluence of the Industrial Tributary with a small un-named tributary coming from Topeka Way, is a large (approximately 20 foot) head cut. A culvert outfall within this reach has been undercut by approximately 15 feet. Downstream of the head cut the channel is incised between 2 and 10 feet with little channel bottom vegetation and near vertical banks. Overbank vegetation includes a mixture of native grasses, scrub oak, and cottonwood trees. The channel bottom throughout this reach is approximately 10 feet wide. The culvert through Prairie Hawk Drive is undersized for 100-year future flows. The outfall to the Industrial Tributary is a 96-inch RCP owned by CDOT with two drops that is undersized for 100-year future flows.

Preliminary Design Cost Estimate

Item	Priority	Unit	Quantity	Unit cost	Total Cost	Assumed Cost Breakdown: Castle Rock Utilities	Douglas County	Other
6' Drop Structure at Station 20+68	1	Each	1	$75,000	$75,000	x		
6' Drop Structure at Station 14+34	1	Each	1	$75,000	$75,000	x		
6' Drop Structure at Station 9+91	1	Each	1	$75,000	$75,000	x		
Raise Channel Invert from Station 25+00 to Station 13+00	1	CY	2890	$8	$23,120	x		
Bank Stabilization from Station 25+00 to Station 13+00	1	CY	500	$100	$50,000	x		
4' Drop Structure at Station 28+66	2	Each	1	$75,000	$75,000			x
4' Drop Structure at Station 27+78	2	Each	1	$75,000	$75,000			x
4' Drop Structure at Station 26+59	2	Each	1	$75,000	$75,000			x
6' Drop Structure at Station 23+57	2	Each	1	$75,000	$75,000	x		
4' Drop Structure at Station 22+54	2	Each	1	$75,000	$75,000	x		
4' Drop Structure at Station 17+58	2	Each	1	$75,000	$75,000	x		
4' Drop Structure at Station 15+97	2	Each	1	$75,000	$75,000	x		
6' Drop Structure at Station 10+83	2	Each	1	$75,000	$75,000	x		
12' Grouted Boulder Rundown at Station 26+24	2	Each	1	$150,000	$150,000			x
Replace existing culvert at Prairie Hawk Drive with 12' x 10' CBC	2	LF	105	$1,500	$157,500			x

Proposed Priority 1 Improvements: Priority 1 improvements for this sheet are 3 drop structures to stabilize the channel grade and raising the channel invert from Station 25+00 to Station 13+00. Each drop structure is recommended to be 6 feet. From Station 25+00 to Station 13+00, the channel is deeply incised and the drop structures combined with raising the channel invert will stabilize the channel.

Drainageway Costs (Priority 1)	$298,120	$298,120	$0	$0
Contingency and Unscoped Items (30% of Drainageway Costs)	$89,400	$89,436	$0	$0
Construction Access (5% of Drainageway Costs)	$14,900	$14,906	$0	$0
Subtotal (Priority 1)	**$402,400**	**$402,462**	**$0**	**$0**
Mobilization and Permitting Requirements (15% of Subtotal)	$60,400	$60,369	$0	$0
Construction Total (Priority 1)	**$462,800**	**$462,831**	**$0**	**$0**
Administration and Engineering (20% of Construction Total)	$92,600	$92,566	$0	$0
Total (Priority 1)	**$555,400**	**$555,398**	**$0**	**$0**

Proposed Priority 2 Improvements: Priority 2 improvements for this sheet are 8 drop structures designed to stabilize the channel grade. The drop structures vary from 4 feet high to 6 feet high. Other Priority 2 improvements are the construction of a 12 foot grouted boulder rundown at the location of the large head cut and replacing the existing culvert through Prairie Hawk Drive with a 12' x 10' CBC with trail crossing. The existing culverts through Prairie Hawk Drive are undersized for 100-year future flows.

Drainageway Costs (Priority 2)	$907,500	$375,000	$0	$307,500
Contingency and Unscoped Items (30% of Drainageway Costs)	$272,300	$112,500	$0	$92,250
Construction Access (5% of Drainageway Costs)	$45,400	$18,750	$0	$15,375
Subtotal (Priority 2)	**$1,225,200**	**$506,250**	**$0**	**$415,125**
Mobilization and Permitting Requirements (15% of Subtotal)	$183,800	$75,938	$0	$62,269
Construction Total (Priority 2)	**$1,409,000**	**$582,188**	**$0**	**$477,394**
Administration and Engineering (20% of Construction Total)	$281,800	$116,438	$0	$95,479
Total (Priority 2)	**$1,690,800**	**$698,625**	**$0**	**$572,873**

Proposed Priority 3 Improvements: There are no Priority 3 improvements on this sheet.

Drainageway Costs (Priority 3)	$0	$0	$0	$0
Contingency and Unscoped Items (30% of Drainageway Costs)	$0	$0	$0	$0
Construction Access (5% of Drainageway Costs)	$0	$0	$0	$0
Subtotal (Priority 3)	**$0**	**$0**	**$0**	**$0**
Mobilization and Permitting Requirements (15% of Subtotal)	$0	$0	$0	$0
Construction Total (Priority 3)	**$0**	**$0**	**$0**	**$0**
Administration and Engineering (20% of Construction Total)	$0	$0	$0	$0
Total (Priority 3)	**$0**	**$0**	**$0**	**$0**
Total Cost of Improvements	***$2,246,200***	***$1,254,023***	***$0***	***$572,873***

PUBLIC IMPROVEMENT CONSTRUCTION PLANS

FOR

INDUSTRIAL TRIBUTARY STABILIZATION PROJECT



VICINITY MAP
1" = 1500'

NORTHEAST QUARTER OF SECTION 10 AND NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE 6TH P.M. DOUGLAS COUNTY, COLORADO

PREPARED FOR:

TOWN OF CASTLE ROCK
175 KELLOGG COURT
CASTLE ROCK, COLORADO 80109

INDEMNIFICATION AND ADHERENCE TO STANDARDS

THESE PLANS HAVE BEEN REVIEWED BY THE TOWN OF CASTLE ROCK FOR CONCEPT ONLY. THE REVIEW DOES NOT IMPLY RESPONSIBILITY BY THE REVIEWING DEPARTMENT, THE TOWN ENGINEER, OR THE TOWN OF CASTLE ROCK FOR ACCURACY AND CORRECTNESS OF THE CALCULATIONS. FURTHERMORE, THE REVIEW DOES NOT IMPLY THAT QUANTITIES OF ITEMS ON THE PLANS ARE THE FINAL QUANTITIES REQUIRED. THE REVIEW SHALL NOT BE CONSTRUED FOR ANY REASON AS ACCEPTANCE OF FINANCIAL RESPONSIBILITY BY THE TOWN FOR ADDITIONAL QUANTITIES OF ITEMS SHOWN THAT MAY BE REQUIRED DURING THE CONSTRUCTION PHASE.

ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE TOWN OF CASTLE ROCK MUNICIPAL CODE, TECHNICAL MANUALS AND/OR OTHER TOWN-APPROVED APPLICABLE STANDARDS.

FOR CONSTRUCTION
October 29, 2019
DATE PRINTED
OLSSON

CALL UTILITY NOTIFICATION CENTER OF COLORADO
811
CALL 3-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



Certification Block

RECORD DRAWINGS
Town of Castle Rock Construction Permit No. CIP20-0001

BASED UPON REVIEW OF AND RELIANCE ON THE FIELD SURVEY DATA AND OTHER PERTINENET DATA PROVIED BY: OLSSON, INC.

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, FACILITIES SHOWN ON THESE DRAWINGS WERE CONSTRUCTED IN SUBSTANTIAL CONFORMANCE WITH THE APPROVED CONSTRUCTION DRAWINGS. THIS STATEMENT IS BASED ONLY ON REVIEW OF FIELD SURVEY DATA AND A FINAL SITE INVESTIGATION. I ALSO UNDERSTAND THAT THE TOWN OF CASTLE ROCK HAS NOT VERIFIED THE ACCURACY OF THIS INFORMATION AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED INTO THESE RECORD DRAWINGS.



DEBRA L. OHLINGER, PE, 37936, PROJECT MANAGER 12/17/2020
(Civil Engineer Signature & Seal) Date

PROFESSIONAL ENGINEER CERTIFICATION

olsson
1525 Raleigh St
Suite 400
Denver, CO 80204
TEL 303.237.2072
FAX 303.237.2659

I HEREBY AFFIRM THAT THESE FINAL PUBLIC IMPROVEMENT CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY; AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.



DEBRA L. OHLINGER, PE, 37936, PROJECT MANAGER DATE

INDEX OF DRAWINGS

SHEET NAME	SHEET NUMBER	SHEET DESCRIPTION
G1	1	COVER SHEET
G2	2	GENERAL NOTES AND LEGEND
SC1	3	SURVEY CONTROL PLAN

INDUSTRIAL TRIBUTARY IMPROVEMENTS

PPC1	4	KEY MAP
PPC2-PPC3	5-6	PLAN AND PROFILE, SPLIT FLOW LINE AND CURVE TABLES
PPR1-PPR3	7-9	ACCESS ROAD PLAN AND PROFILE
PPR4	10	ACCESS ROAD LINE AND CURVE TABLES
DDT1-DDT6	11-16	DROP STRUCTURE DETAILS
DDT7	17	TYPICAL DROP DETAILS
DDT8	18	SHEET PILE DETAILS

TOWN OF CASTLE ROCK APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY: TOWN OF CASTLE ROCK COLORADO — DEVELOPMENT SERVICES APPROVED
By tkucewesky
on 01/03/2020
Approved CIP20-0001 Plans.pdf
Record Document on File

DEVELOPMENT SERVICES DATE

olsson
1525 Raleigh Street
Suite 400
Denver, CO 80204
TEL 303.237.2072
www.olsson.com

OLSSON ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL OR VERTICAL). THE EXISTING UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS HOWEVER THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

REV. NO.	DATE	REVISIONS DESCRIPTION
1	2019.10.29	ADDENDUM 2 - REVISED ACCESS

REVISIONS

COVER SHEET

INDUSTRIAL TRIBUTARY STABILIZATION PROJECT
FOR CONSTRUCTION

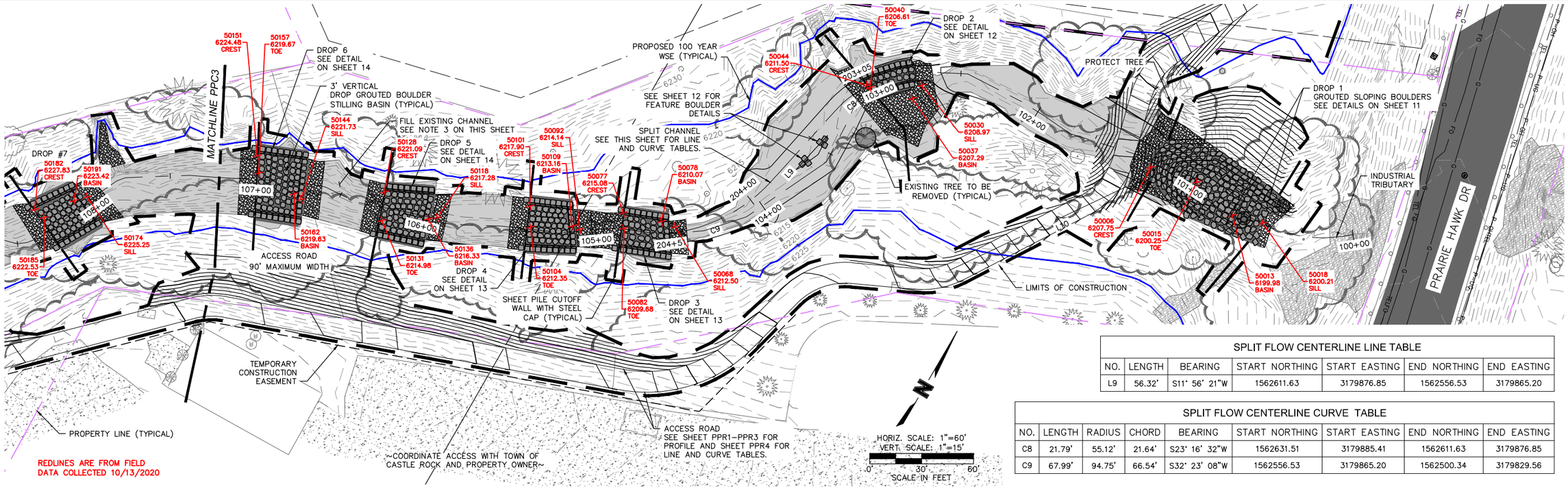
CASTLE ROCK, COLORADO

2019

drawn by:	CAU
checked by:	DPK
approved by:	DLO
CA/QC by:	DPK
project no.:	018-1719
drawing no.:	-
date:	2019.10.10

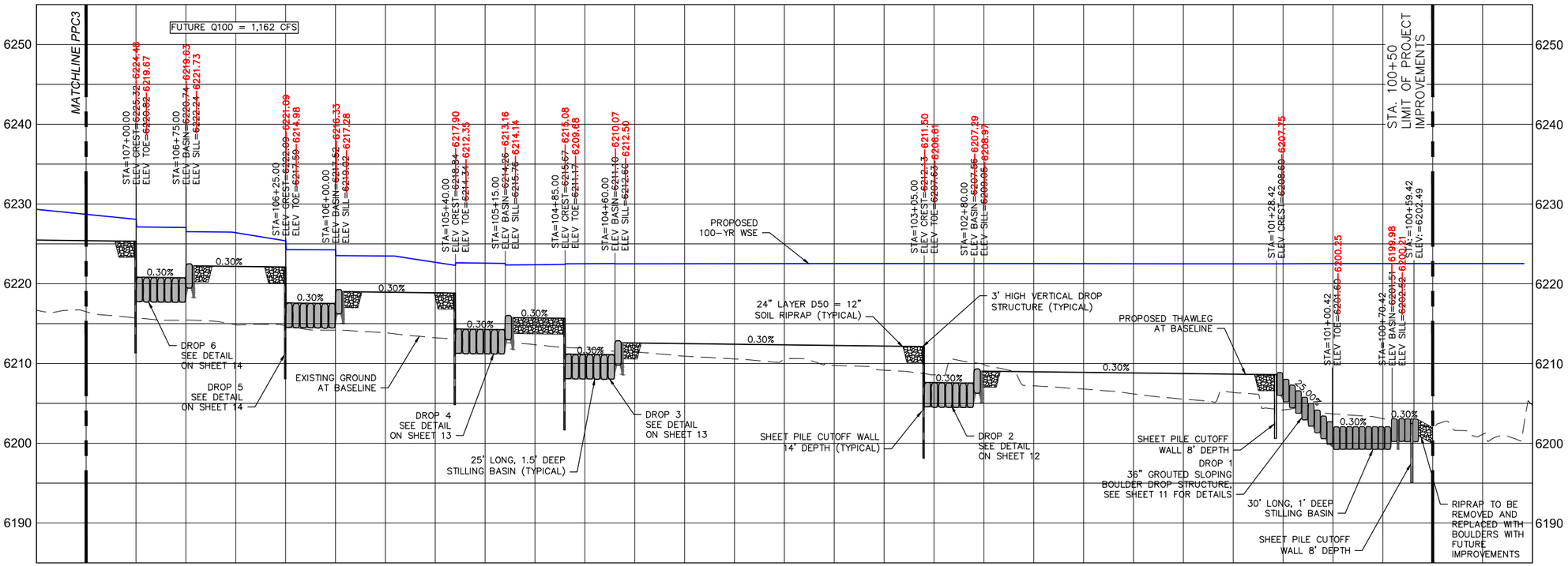
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SHEET 1 OF 18

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DATE: Oct 29, 2019 1:15pm XREFS: 181719_TBLK_11x17
USER: cuhrich



SPLIT FLOW CENTERLINE LINE TABLE						
NO.	LENGTH	BEARING	START NORTHING	START EASTING	END NORTHING	END EASTING
L9	56.32'	S11° 56' 21"W	1562611.63	3179876.85	1562556.53	3179865.20

SPLIT FLOW CENTERLINE CURVE TABLE								
NO.	LENGTH	RADIUS	CHORD	BEARING	START NORTHING	START EASTING	END NORTHING	END EASTING
C8	21.79'	55.12'	21.64'	S23° 16' 32"W	1562631.51	3179885.41	1562611.63	3179876.85
C9	67.99'	94.75'	66.54'	S32° 23' 08"W	1562556.53	3179865.20	1562500.34	3179829.56



NOTES:
1) ALL TREES TO BE PROTECTED (EXCEPT AS NOTED). EXISTING TREES DAMAGED BY CONTRACTOR SHALL BE REPLACED AT CONTRACTOR COST.
2) ANY TREE TO BE REMOVED SHALL BE APPROVED BY THE TOWN PRIOR TO REMOVAL.
3) CHANNEL FILL MATERIAL SHALL MEET THE REQUIREMENTS OF CDOT CLASS 2 BACKFILL WITH THE ADDITION THAT THERE SHALL BE A MINIMUM OF 50% PASSING THE NO. 200 SIEVE.

COLORADO LICENSED
CEBRAL OLLINGER
37936
10/10/2019
PROFESSIONAL ENGINEER

RECORD DRAWINGS
December 22, 2020
DATE PRINTED
OLSSON

TOWN OF CASTLE ROCK APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY:

DEVELOPMENT SERVICES DATE

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1525 Raleigh Street
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REVISIONS		
REV. NO.	DATE	REVISIONS DESCRIPTION
1	2019.10.29	ADDENDUM 2 - REVISED ACCESS

PLAN AND PROFILE
STA. 85+00 TO 107+25
INDUSTRIAL TRIBUTARY STABILIZATION PROJECT
FOR CONSTRUCTION
CASTLE ROCK, COLORADO
2019

drawn by:	CAU
checked by:	DPK
approved by:	DLO
QA/QC by:	DPK
project no.:	018-1719
drawing no.:	-
date:	2019.10.10

PPC2
SHEET 5 OF 18

DWG: F:\2018\1501-2000\018-1719\40-Design\AutoCAD\Final Plans\Sheets\WTRS\DWG\181719_PP_CHNL_ASBT.dwg USER: mstewart
DATE: Dec 22, 2020 11:06am XREFS: 131661_TBLK_11x17_Industrial Trib 131661_XBASE_50SCALE 131661_XMAP 131661_XUTIL_60SCALE 131661_XTOPO_SURFACE 181719_TBLK_11x17 181719_PBASE 181719_PTOPO 181719_PMAP

MEMO

☐	Overnight
☐	Regular Mail
☐	Hand Delivery
☒	Other: E-mail

TO:	Town of Castle Rock Attn: Barbara Horton 175 Kellogg Court Castle Rock, CO 80109
FROM:	Madison Stewart, EI and Deb Ohlinger, PE, CFM
RE:	Industrial Tributary As-Built Conditions Hydraulic Analysis
DATE:	December 16, 2020
PROJECT #:	A18-1719
PHASE:	400
TASK:	400100

This memorandum documents a summary of the findings from the hydraulic analysis of Industrial Tributary Improvements as-built conditions in Castle Rock, Colorado. As part of this project, Olsson was retained by The Town of Castle Rock to conduct a topographic survey of the post-project conditions of the Industrial Tributary improvements and to perform a hydraulic analysis.

In December 2015, Olsson prepared a Phase III Drainage Report for the Prairie Hawk Extension Drainage and Industrial Tributary Channel Improvement Project. The report included hydraulic analysis of the existing and proposed conditions using a HEC-RAS model, version 4.1.0. This model served as the basis for comparison for the post-project conditions analysis, which was also run in version 4.1.0.

Olsson prepared final construction documents for the Industrial Tributary Stabilization Project in October 2019. An as-built topographic survey was completed in November 2020 and was combined with the December 2014 topographic survey that was used for design.

As anticipated, the water surface elevations mostly increased along the project reach due to raising the channel bottom. A summary of findings and HEC-RAS output tables for the 100-year storm event are attached. A figure depicting the pre-project, proposed, and post-project floodplains is also attached.

1525 Raleigh Street / Suite 400 / Denver, CO 80204
O 303.237.2072 / **olsson.com**

BFE Comparison Table

Project Name :	**Industrial Tributary Improvements**
Flooding Source:	**Industrial Tributary**
Company:	**Olsson**
Completed By:	**Madison Stewart**

SOURCE DATA					COMPARISONS		
HYDRAULIC CROSS-SECTION INFO.		BASE FLOOD ELEVATIONS (NAVD88)					
Cross-Section ID	Proposed River Station	Pre-Project	Proposed	Post-Project	Proposed vs Pre-Project	Post-Project vs Proposed	Post-Project vs Pre-Project
		BFE	BFE	BFE	BFE	BFE	BFE
61	12163.65	6284.45	6284.45	6284.45	0.00	0.00	0.00
60	11934.12	6273.93	6271.74	6273.93	-2.19	2.19	0.00
59	11908.54	6270.42	6265.34	6270.42	-5.08	5.08	0.00
58	11878.54	6269.76	6264.68	6269.76	-5.08	5.08	0.00
57	11854.54	6268.64	6262.69	6268.64	-5.95	5.95	0.00
56	11659.99	6250.84	6259.46	6250.84	8.62	-8.62	0.00
55	11635.99	6250.23	6253.45	6250.21	3.22	-3.24	-0.02
54	11605.99	6248.08	6252.79	6248.07	4.71	-4.72	-0.01
53	11581.99	6247.11	6248.29	6247.09	1.18	-1.20	-0.02
52	11551.99	6246.31	6247.2	6246.32	0.89	-0.88	0.01
51	11524.60	6244.73	6245.1	6245.03	0.37	-0.07	0.30
50	11489.70	--	6244.58	6244.36	--	-0.22	--
49	11489.60	6244.28	6244.29	6244.28	0.01	-0.01	0.00
48	11369.99	6240.7	6241.94	6240.71	1.24	-1.23	0.01
47	11191.23	6236.71	6241.08	6239.18	4.37	-1.90	2.47
46	11141.39	6234.9	6239.38	6238.46	4.48	-0.92	3.56
45	11141.19	--	6237.66	6237.42	--	-0.24	--
44	11116.49	--	6237.82	6236.21	--	-1.61	--
43	11116.39	6233.83	6236.86	6236.21	3.03	-0.65	2.38
42	11103.47	6233.31	6236.4	6235.26	3.09	-1.14	1.95
41	11090.03	6231.83	6235.8	6234.97	3.97	-0.83	3.14
40	11089.83	--	6235.06	6234.84	--	-0.22	--
39	11065.13	--	6234.97	6234.93	--	-0.04	--
38	11065.03	6231.52	6234.5	6234.8	2.98	0.30	3.28
37	10937.21	6229.99	6233.96	6233.11	3.97	-0.85	3.12
36	10830.00	6225.84	6231.89	6230.25	6.05	-1.64	4.41
35	10829.80	--	6231.38	6229.88	--	-1.50	--
34	10805.10	--	6231.23	6229.89	--	-1.34	--
33	10805.00	6225.3	6230.19	6229.88	4.89	-0.31	4.58
32	10759.06	6223.2	6229.54	6228.73	6.34	-0.81	5.53

SOURCE DATA					COMPARISONS		
HYDRAULIC CROSS-SECTION INFO.		BASE FLOOD ELEVATIONS (NAVD88)					
Cross-Section ID	Proposed River Station	Pre-Project	Proposed	Post-Project	Proposed vs Pre-Project	Post-Project vs Proposed	Post-Project vs Pre-Project
		BFE	BFE	BFE	BFE	BFE	BFE
31	10700.00	6222.57	6228.06	6226.75	5.49	-1.31	4.18
30	10699.80	--	6227.12	6226.73	--	-0.39	--
29	10675.10	--	6227.04	6226.59	--	-0.45	--
28	10675.00	6222.71	6226.52	6226.58	3.81	0.06	3.87
27	10651.94	6222.8	6226.48	6225.51	3.68	-0.97	2.71
26	10625.00	6221.99	6225.37	6223.19	3.38	-2.18	1.20
25	10624.80	--	6224.28	6223.08	--	-1.20	--
24	10600.10	--	6224.25	6223.27	--	-0.98	--
23	10600.00	6222.26	6223.51	6223.27	1.25	-0.24	1.01
22	10570.60	6222.4	6223.48	6222.07	1.08	-1.41	-0.33
21	10540.00	6222.37	6222.3	6222.44	-0.07	0.14	0.07
20	10539.80	--	6222.62	6222.29	--	-0.33	--
19	10515.10	--	6222.55	6222.43	--	-0.12	--
18	10515.00	6222.33	6222.34	6222.43	0.01	0.09	0.10
17	10499.76	6222.35	6222.37	6222.46	0.02	0.09	0.11
16	10485.00	6222.4	6222.42	6222.5	0.02	0.08	0.10
15	10484.79	--	6222.49	6222.51	--	0.02	--
14	10460.10	--	6222.52	6222.5	--	-0.02	--
13	10460.00	6222.47	6222.5	6222.5	0.03	0.00	0.03
12	10349.99	6222.52	6222.52	6222.53	0.00	0.01	0.01
11	10305.03	6222.53	6222.53	6222.53	0.00	0.00	0.00
10	10304.71	--	6222.54	6222.53	--	-0.01	--
9	10280.11	--	6222.52	6222.51	--	-0.01	--
8	10280.01	6222.52	6222.52	6222.51	0.00	-0.01	-0.01
7	10250.00	6222.51	6222.51	6222.5	0.00	-0.01	-0.01
6	10177.07	6222.5	6222.49	6222.5	-0.01	0.01	0.00
5	10128.42	6222.51	6222.51	6222.51	0.00	0.00	0.00
4	10100.48	--	6222.51	6222.51	--	0.00	--
3	10070.52	--	6222.52	6222.52	--	0.00	--
2	10070.42	6222.52	6222.52	6222.52	0.00	0.00	0.00
1	10004.35	6222.52	6222.52	6222.52	0.00	0.00	0.00

HEC-RAS Plan: PRE Ex DS River: Industrial Trib Reach: 1 Profile: 100-YR Future

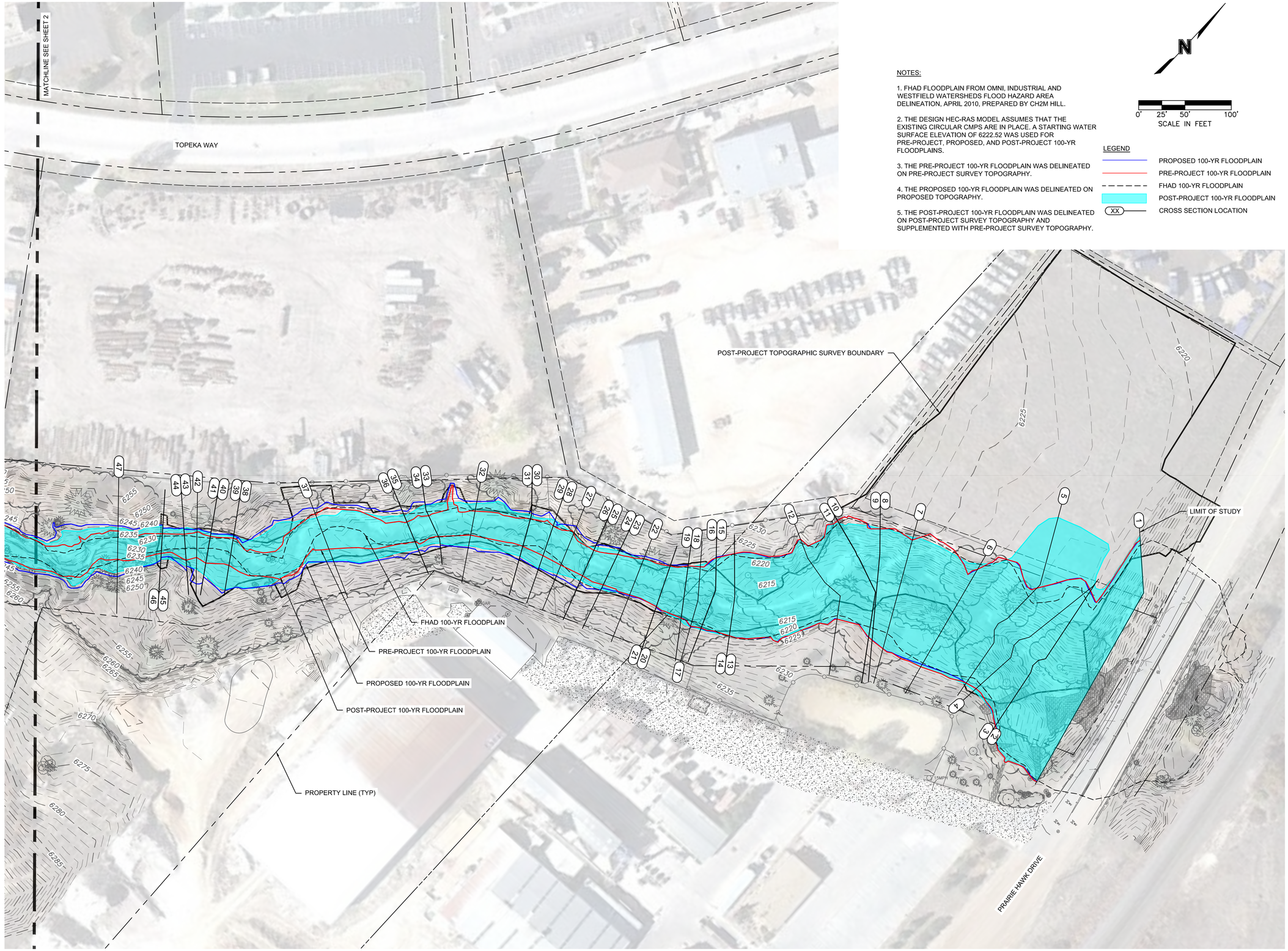
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	61	100-YR Future	852.00	6280.82	6284.45	6284.45	6285.67	0.013985	8.88	95.92	39.68	1.01
1	60	100-YR Future	852.00	6267.71	6273.93	6273.93	6275.60	0.014225	10.39	82.01	24.65	1.00
1	59	100-YR Future	852.00	6266.92	6270.42	6270.42	6271.66	0.013740	8.94	95.31	38.49	1.00
1	58	100-YR Future	852.00	6265.05	6269.76	6269.76	6271.13	0.014477	9.38	90.80	33.93	1.01
1	57	100-YR Future	852.00	6265.15	6268.64	6268.64	6270.00	0.013675	9.34	91.24	33.80	1.00
1	56	100-YR Future	1162.00	6243.73	6250.84	6250.84	6252.77	0.014026	11.13	104.45	27.21	1.00
1	55	100-YR Future	1162.00	6241.67	6250.23	6250.23	6252.32	0.016821	11.60	100.19	24.36	1.01
1	54	100-YR Future	1162.00	6239.25	6248.08		6249.37	0.007482	9.15	127.06	24.31	0.70
1	53	100-YR Future	1162.00	6238.29	6247.11	6246.76	6249.06	0.013162	11.19	103.84	22.38	0.92
1	52	100-YR Future	1162.00	6237.86	6246.31	6246.31	6248.58	0.016963	12.11	95.99	21.32	1.01
1	51	100-YR Future	1162.00	6236.91	6244.73	6244.73	6247.14	0.016399	12.45	93.35	19.87	1.01
1	49	100-YR Future	1162.00	6235.95	6244.28	6244.28	6246.32	0.016181	11.44	101.56	25.27	1.01
1	48	100-YR Future	1162.00	6231.82	6240.70	6240.70	6242.44	0.016484	10.59	109.76	32.10	1.01
1	47	100-YR Future	1162.00	6226.47	6236.71	6236.71	6238.51	0.018057	10.76	107.97	30.46	1.01
1	46	100-YR Future	1162.00	6225.16	6234.90	6234.90	6237.16	0.018832	12.07	96.27	21.36	1.00
1	43	100-YR Future	1162.00	6224.74	6233.83	6233.83	6235.75	0.017049	11.13	104.38	28.11	1.01
1	42	100-YR Future	1162.00	6224.54	6233.31	6233.31	6235.33	0.015888	11.39	102.13	27.25	1.01
1	41	100-YR Future	1162.00	6224.31	6231.83	6231.83	6233.67	0.014850	10.87	106.88	29.21	1.00
1	38	100-YR Future	1162.00	6223.77	6231.52		6232.71	0.006138	8.82	135.90	29.49	0.67
1	37	100-YR Future	1162.00	6220.79	6229.99	6229.99	6231.51	0.015109	9.93	118.11	40.12	1.00
1	36	100-YR Future	1162.00	6218.51	6225.84	6225.59	6227.79	0.013343	11.21	103.65	23.23	0.94
1	33	100-YR Future	1162.00	6218.08	6225.30	6225.30	6227.41	0.014684	11.66	99.92	24.82	1.00
1	32	100-YR Future	1162.00	6216.79	6223.20	6223.20	6225.18	0.014028	11.30	102.81	26.37	1.01
1	31	100-YR Future	1162.00	6215.69	6222.57	6222.24	6224.11	0.010904	9.96	116.66	30.68	0.90
1	28	100-YR Future	1162.00	6215.27	6222.71		6223.73	0.006210	8.09	143.70	33.97	0.69
1	27	100-YR Future	1162.00	6214.90	6222.80		6223.54	0.004015	6.90	168.41	36.59	0.57
1	26	100-YR Future	1162.00	6214.53	6221.99		6223.33	0.008817	9.27	125.31	30.15	0.80
1	23	100-YR Future	1162.00	6214.07	6222.26		6222.99	0.004040	6.86	169.36	36.56	0.56
1	22	100-YR Future	1162.00	6213.54	6222.40		6222.82	0.001797	5.19	224.21	41.67	0.39
1	21	100-YR Future	1162.00	6212.98	6222.37		6222.76	0.001681	5.01	233.61	46.11	0.38
1	18	100-YR Future	1162.00	6212.50	6222.33		6222.72	0.001325	5.10	252.43	56.66	0.34
1	17	100-YR Future	1162.00	6212.25	6222.35		6222.69	0.001139	4.84	278.96	65.36	0.32
1	16	100-YR Future	1162.00	6211.91	6222.40		6222.65	0.000767	4.13	332.97	78.45	0.27
1	13	100-YR Future	1162.00	6211.40	6222.47		6222.60	0.000360	3.07	454.51	89.26	0.19
1	12	100-YR Future	1162.00	6209.64	6222.52		6222.56	0.000072	1.68	767.30	101.56	0.09
1	11	100-YR Future	1162.00	6208.63	6222.53		6222.55	0.000035	1.12	1088.35	136.66	0.06
1	8	100-YR Future	1162.00	6207.87	6222.52		6222.55	0.000044	1.41	951.87	120.89	0.07
1	7	100-YR Future	1162.00	6207.11	6222.51		6222.54	0.000060	1.43	886.53	121.74	0.08
1	6	100-YR Future	1162.00	6205.51	6222.50		6222.54	0.000073	1.69	821.73	121.73	0.09
1	5	100-YR Future	1162.00	6204.23	6222.51		6222.53	0.000024	1.02	1176.68	131.82	0.05
1	2	100-YR Future	1162.00	6202.75	6222.52		6222.53	0.000013	0.90	1528.15	181.11	0.04
1	1	100-YR Future	1162.00	6200.35	6222.52	6206.22	6222.52	0.000004	0.59	3288.09	291.22	0.02

HEC-RAS Plan: PROTOPO Ex DS River: Industrial Trib Reach: 1 Profile: 100-YR Future

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)	
1	61	100-YR Future	852.00	6280.82	6284.45	6284.45	6285.68	0.028550	8.90	95.69	39.45	1.01
1	60	100-YR Future	852.00	6267.88	6271.74	6271.74	6272.98	0.028561	8.93	95.42	39.26	1.01
1	59	100-YR Future	852.00	6261.38	6265.34	6265.34	6266.67	0.026965	9.26	92.33	36.38	0.99
1	58	100-YR Future	852.00	6261.39	6264.68	6264.68	6265.73	0.022517	8.65	113.75	57.84	0.92
1	57	100-YR Future	852.00	6255.35	6262.69	6259.21	6262.89	0.002041	3.55	239.88	50.02	0.29
1	56.5		Culvert									
1	56	100-YR Future	1162.00	6254.81	6259.46	6259.46	6261.08	0.025960	10.22	113.70	47.00	1.01
1	55	100-YR Future	1162.00	6248.81	6253.45	6253.35	6254.89	0.024637	9.64	120.59	39.68	0.97
1	54	100-YR Future	1162.00	6248.71	6252.79	6252.79	6254.13	0.023886	9.41	130.64	52.81	0.96
1	53	100-YR Future	1162.00	6242.70	6248.29	6247.28	6249.16	0.008903	7.73	169.15	49.71	0.63
1	52	100-YR Future	1162.00	6242.46	6247.20	6247.20	6248.70	0.020829	10.40	129.60	45.02	0.91
1	51	100-YR Future	1162.00	6235.78	6245.10		6245.55	0.003452	5.32	218.96	35.38	0.32
1	50	100-YR Future	1162.00	6235.68	6244.58		6245.34	0.007411	7.00	166.10	20.79	0.44
1	49	100-YR Future	1162.00	6236.69	6244.29		6245.32	0.010655	8.11	143.21	20.75	0.54
1	48	100-YR Future	1162.00	6236.32	6241.94	6241.77	6243.46	0.023244	10.82	124.35	36.40	0.91
1	47	100-YR Future	1162.00	6235.78	6241.08		6241.51	0.004776	5.29	221.37	54.67	0.45
1	46	100-YR Future	1162.00	6235.64	6239.38	6239.38	6240.93	0.027088	9.97	116.50	38.06	1.00
1	45	100-YR Future	1162.00	6231.14	6237.66		6238.83	0.012609	8.85	140.69	31.65	0.61
1	44	100-YR Future	1162.00	6231.07	6237.82	6235.90	6238.42	0.007506	6.19	187.60	59.88	0.52
1	43	100-YR Future	1162.00	6232.57	6236.86	6236.86	6238.33	0.028607	9.74	119.29	39.68	0.99
1	42	100-YR Future	1162.00	6232.53	6236.40	6236.12	6237.35	0.021277	7.83	148.43	59.16	0.87
1	41	100-YR Future	1162.00	6232.49	6235.80	6235.80	6237.00	0.028468	8.79	132.16	55.15	1.00
1	40	100-YR Future	1162.00	6227.99	6235.06		6235.63	0.004964	6.16	205.39	47.21	0.41
1	39	100-YR Future	1162.00	6227.91	6234.97		6235.49	0.005113	6.25	229.65	61.59	0.42
1	38	100-YR Future	1162.00	6229.41	6234.50		6235.45	0.012565	8.49	170.28	59.67	0.67
1	37	100-YR Future	1162.00	6229.03	6233.96		6234.33	0.004811	4.92	236.26	62.06	0.44
1	36	100-YR Future	1162.00	6228.71	6231.89	6231.89	6233.21	0.027613	9.21	126.18	48.33	1.00
1	35	100-YR Future	1162.00	6224.21	6231.38		6231.92	0.004730	6.05	210.96	45.95	0.40
1	34	100-YR Future	1162.00	6224.13	6231.23		6231.79	0.005381	6.31	212.89	52.07	0.42
1	33	100-YR Future	1162.00	6225.63	6230.19	6230.19	6231.70	0.021643	10.13	128.92	47.27	0.84
1	32	100-YR Future	1162.00	6225.49	6229.54	6228.62	6230.28	0.010639	6.94	169.26	50.61	0.65
1	31	100-YR Future	1162.00	6225.32	6228.06	6228.06	6229.27	0.028156	8.84	131.44	54.29	1.00
1	30	100-YR Future	1162.00	6220.82	6227.12		6227.53	0.003766	5.22	234.01	50.47	0.37
1	29	100-YR Future	1162.00	6220.74	6227.04		6227.44	0.003630	5.14	241.01	56.12	0.36
1	28	100-YR Future	1162.00	6222.24	6226.52		6227.39	0.011768	7.54	162.21	54.00	0.65
1	27	100-YR Future	1162.00	6222.16	6226.48		6227.07	0.009192	6.16	188.77	57.50	0.60
1	26	100-YR Future	1162.00	6222.09	6225.37	6225.37	6226.60	0.028272	8.91	130.36	53.54	1.01
1	25	100-YR Future	1162.00	6217.59	6224.28		6224.97	0.006532	6.76	185.06	43.74	0.47
1	24	100-YR Future	1162.00	6217.52	6224.25		6224.78	0.004744	5.92	213.81	49.99	0.41
1	23	100-YR Future	1162.00	6219.02	6223.51	6222.94	6224.71	0.016208	8.90	139.20	44.29	0.74
1	22	100-YR Future	1162.00	6218.92	6223.48		6224.20	0.009874	6.82	170.37	45.92	0.62
1	21	100-YR Future	1162.00	6218.84	6222.30	6222.30	6223.66	0.027831	9.36	124.11	46.01	1.00
1	20	100-YR Future	1162.00	6214.34	6222.62		6223.03	0.002990	5.29	245.97	48.58	0.33
1	19	100-YR Future	1162.00	6214.26	6222.55		6222.95	0.003078	5.31	257.42	57.73	0.33
1	18	100-YR Future	1162.00	6215.76	6222.34		6222.93	0.005411	6.49	212.80	56.23	0.45
1	17	100-YR Future	1162.00	6215.71	6222.37		6222.82	0.003746	5.62	241.34	65.52	0.41
1	16	100-YR Future	1162.00	6215.67	6222.42		6222.73	0.002418	4.68	293.94	79.31	0.33
1	15	100-YR Future	1162.00	6211.17	6222.49		6222.70	0.001283	4.06	382.14	80.18	0.21
1	14	100-YR Future	1162.00	6211.10	6222.52		6222.65	0.000870	3.39	466.83	89.16	0.18
1	13	100-YR Future	1162.00	6212.60	6222.50		6222.65	0.001055	3.67	438.12	89.06	0.21
1	12	100-YR Future	1162.00	6212.27	6222.52		6222.58	0.000224	1.90	679.05	101.61	0.11
1	11	100-YR Future	1162.00	6212.13	6222.53		6222.56	0.000132	1.51	932.12	137.03	0.09
1	10	100-YR Future	1162.00	6207.63	6222.54		6222.56	0.000174	1.55	980.63	137.52	0.07
1	9	100-YR Future	1162.00	6207.56	6222.52		6222.55	0.000249	1.83	835.11	120.14	0.08
1	8	100-YR Future	1162.00	6209.05	6222.52		6222.55	0.000255	1.92	822.81	120.18	0.09
1	7	100-YR Future	1162.00	6208.96	6222.51		6222.55	0.000142	1.59	867.83	121.72	0.09
1	6	100-YR Future	1162.00	6208.75	6222.49		6222.54	0.000087	1.79	777.30	118.77	0.10
1	5	100-YR Future	1162.00	6208.60	6222.51		6222.53	0.000032	1.12	1072.59	131.76	0.06
1	4	100-YR Future	1162.00	6201.60	6222.51		6222.53	0.000013	0.94	1525.18	165.70	0.04
1	3	100-YR Future	1162.00	6201.51	6222.52		6222.53	0.000009	0.83	1750.30	180.83	0.04
1	2	100-YR Future	1162.00	6202.52	6222.52		6222.52	0.000009	0.72	1735.45	180.85	0.03
1	1	100-YR Future	1162.00	6200.35	6222.52	6206.19	6222.52	0.000004	0.48	3294.56	291.46	0.02

HEC-RAS Plan: POST River: Industrial Trib Reach: 1 Profile: 100-YR Future

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)	
1	61	100-YR Future	852.00	6280.82	6284.45	6284.45	6285.67	0.013985	8.88	95.92	39.68	1.01
1	60	100-YR Future	852.00	6267.71	6273.93	6273.93	6275.60	0.014225	10.39	82.01	24.65	1.00
1	59	100-YR Future	852.00	6266.92	6270.42	6270.42	6271.66	0.013740	8.94	95.31	38.49	1.00
1	58	100-YR Future	852.00	6265.05	6269.76	6269.76	6271.13	0.014477	9.38	90.80	33.93	1.01
1	57	100-YR Future	852.00	6265.15	6268.64	6268.64	6270.00	0.013675	9.34	91.24	33.80	1.00
1	56	100-YR Future	1162.00	6243.73	6250.84	6250.84	6252.77	0.014031	11.13	104.43	27.20	1.00
1	55	100-YR Future	1162.00	6241.67	6250.21	6250.21	6252.32	0.016996	11.64	99.82	24.33	1.01
1	54	100-YR Future	1162.00	6239.25	6248.07		6249.37	0.007500	9.15	126.94	24.29	0.71
1	53	100-YR Future	1162.00	6238.29	6247.09	6246.77	6249.05	0.013326	11.24	103.37	22.34	0.92
1	52	100-YR Future	1162.00	6237.86	6246.32	6246.32	6248.58	0.016856	12.07	96.25	21.37	1.00
1	51	100-YR Future	1162.00	6236.91	6245.03	6244.74	6247.15	0.014312	11.69	99.36	21.08	0.95
1	50	100-YR Future	1162.00	6235.95	6244.36	6244.36	6246.38	0.033014	11.40	101.89	25.53	1.01
1	49	100-YR Future	1162.00	6235.95	6244.28	6244.28	6246.32	0.016195	11.45	101.52	25.26	1.01
1	48	100-YR Future	1162.00	6231.82	6240.71	6240.71	6242.44	0.016425	10.57	109.90	32.12	1.01
1	47	100-YR Future	1162.00	6226.47	6239.18		6239.67	0.003362	5.63	206.33	47.29	0.48
1	46	100-YR Future	1162.00	6231.47	6238.46		6239.35	0.011324	7.56	153.61	38.33	0.67
1	45	100-YR Future	1162.00	6231.35	6237.42	6237.42	6239.25	0.020252	11.35	116.77	34.08	0.92
1	44	100-YR Future	1162.00	6230.28	6236.21	6234.87	6236.97	0.009186	6.99	166.20	40.57	0.61
1	43	100-YR Future	1162.00	6230.29	6236.21	6234.88	6236.97	0.009217	6.99	166.23	40.71	0.61
1	42	100-YR Future	1162.00	6231.06	6235.26	6235.26	6236.71	0.027344	9.68	120.00	41.61	1.00
1	41	100-YR Future	1162.00	6227.18	6234.97		6235.49	0.006204	5.79	200.79	45.94	0.49
1	40	100-YR Future	1162.00	6227.11	6234.84		6235.48	0.004906	6.60	198.01	45.19	0.45
1	39	100-YR Future	1162.00	6227.68	6234.93		6235.30	0.003227	4.91	245.54	58.64	0.38
1	38	100-YR Future	1162.00	6227.72	6234.80		6235.29	0.003564	6.07	237.14	57.50	0.42
1	37	100-YR Future	1162.00	6229.48	6233.11	6233.11	6234.40	0.027550	9.13	127.30	49.65	1.00
1	36	100-YR Future	1162.00	6223.47	6230.25		6231.14	0.012045	7.56	153.61	40.27	0.68
1	35	100-YR Future	1162.00	6223.38	6229.88		6231.11	0.011433	9.13	140.95	37.87	0.69
1	34	100-YR Future	1162.00	6224.07	6229.89		6230.76	0.007893	7.71	168.25	44.66	0.59
1	33	100-YR Future	1162.00	6224.09	6229.88		6230.76	0.008049	7.77	167.15	44.58	0.60
1	32	100-YR Future	1162.00	6224.60	6228.73	6228.73	6230.09	0.027567	9.35	124.24	46.44	1.01
1	31	100-YR Future	1162.00	6219.85	6226.75		6227.27	0.006068	5.79	200.65	46.02	0.49
1	30	100-YR Future	1162.00	6219.81	6226.73		6227.27	0.004851	5.96	203.47	45.84	0.45
1	29	100-YR Future	1162.00	6220.77	6226.59		6227.15	0.004872	6.19	210.25	54.42	0.47
1	28	100-YR Future	1162.00	6220.81	6226.58		6227.15	0.005019	6.25	208.32	54.29	0.48
1	27	100-YR Future	1162.00	6221.37	6225.51	6225.51	6226.84	0.026407	9.26	125.54	46.04	0.99
1	26	100-YR Future	1162.00	6215.65	6223.19		6224.05	0.011473	7.45	156.06	38.55	0.65
1	25	100-YR Future	1162.00	6215.56	6223.08		6224.04	0.008630	7.96	156.41	37.88	0.58
1	24	100-YR Future	1162.00	6215.94	6223.27		6223.77	0.003591	5.73	217.08	45.91	0.40
1	23	100-YR Future	1162.00	6215.95	6223.27		6223.77	0.003610	5.75	216.69	45.92	0.40
1	22	100-YR Future	1162.00	6217.77	6222.07	6221.93	6223.46	0.023834	9.47	122.73	39.71	0.95
1	21	100-YR Future	1162.00	6214.08	6222.44		6222.89	0.004894	5.41	214.77	45.86	0.44
1	20	100-YR Future	1162.00	6213.92	6222.29		6222.88	0.003954	6.47	212.57	45.02	0.41
1	19	100-YR Future	1162.00	6213.06	6222.43		6222.73	0.001662	4.63	300.41	57.97	0.28
1	18	100-YR Future	1162.00	6213.06	6222.43		6222.73	0.001657	4.63	300.83	58.08	0.28
1	17	100-YR Future	1162.00	6214.39	6222.46		6222.69	0.001443	3.95	328.92	67.99	0.27
1	16	100-YR Future	1162.00	6210.14	6222.50		6222.64	0.000718	3.20	444.03	81.23	0.18
1	15	100-YR Future	1162.00	6210.07	6222.51		6222.64	0.000695	3.16	449.28	81.38	0.18
1	14	100-YR Future	1162.00	6210.38	6222.50		6222.62	0.000576	3.22	495.79	89.48	0.17
1	13	100-YR Future	1162.00	6210.41	6222.50		6222.62	0.000578	3.23	495.36	89.52	0.17
1	12	100-YR Future	1162.00	6210.55	6222.53		6222.57	0.000165	1.67	749.02	101.63	0.09
1	11	100-YR Future	1162.00	6206.59	6222.53		6222.56	0.000098	1.27	978.22	132.71	0.07
1	10	100-YR Future	1162.00	6206.52	6222.53		6222.56	0.000146	1.71	978.60	132.81	0.08
1	9	100-YR Future	1162.00	6207.07	6222.51		6222.55	0.000169	2.05	864.69	120.48	0.10
1	8	100-YR Future	1162.00	6207.08	6222.51		6222.55	0.000169	2.05	864.88	120.51	0.10
1	7	100-YR Future	1162.00	6208.92	6222.50		6222.55	0.000182	1.96	786.19	124.16	0.10
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1	2	100-YR Future	1162.00	6199.99	6222.52		6222.52	0.000009	0.71	1764.28	188.47	0.03
1	1	100-YR Future	1162.00	6197.22	6222.52	6205.61	6222.52	0.000004	0.47	3318.46	295.26	0.02



NOTES:

1. FHAD FLOODPLAIN FROM OMNI, INDUSTRIAL AND WESTFIELD WATERSHEDS FLOOD HAZARD AREA DELINEATION, APRIL 2010, PREPARED BY CH2M HILL.

2. THE DESIGN HEC-RAS MODEL ASSUMES THAT THE EXISTING CIRCULAR CMPS ARE IN PLACE. A STARTING WATER SURFACE ELEVATION OF 6222.52 WAS USED FOR PRE-PROJECT, PROPOSED, AND POST-PROJECT 100-YR FLOODPLAINS.

3. THE PRE-PROJECT 100-YR FLOODPLAIN WAS DELINEATED ON PRE-PROJECT SURVEY TOPOGRAPHY.

4. THE PROPOSED 100-YR FLOODPLAIN WAS DELINEATED ON PROPOSED TOPOGRAPHY.

5. THE POST-PROJECT 100-YR FLOODPLAIN WAS DELINEATED ON POST-PROJECT SURVEY TOPOGRAPHY AND SUPPLEMENTED WITH PRE-PROJECT SURVEY TOPOGRAPHY.

N

0' 25' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED 100-YR FLOODPLAIN
- PRE-PROJECT 100-YR FLOODPLAIN
- FHAD 100-YR FLOODPLAIN
- POST-PROJECT 100-YR FLOODPLAIN
- XX — CROSS SECTION LOCATION

olsson
1525 Raleigh Street
Suite 400
Denver, CO 80204
TEL 303.237.2072
www.olsson.com

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REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

POST-PROJECT FLOODPLAIN FIGURE

INDUSTRIAL TRIBUTARY STABILIZATION
POST-PROJECT HYDRAULIC ANALYSIS

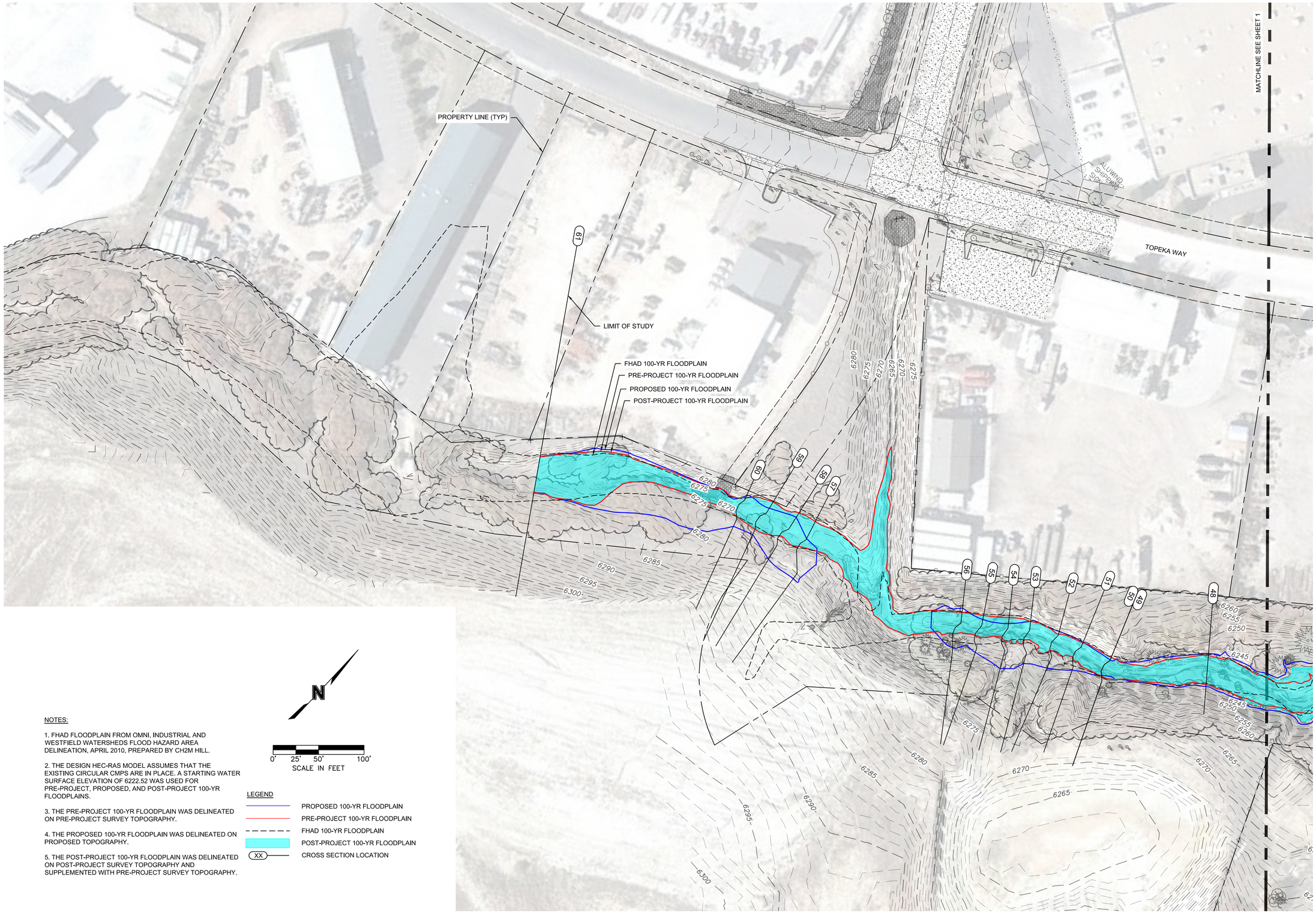
CASTLE ROCK, COLORADO

2020

drawn by:	MS
checked by:	DO
approved by:	DO
QA/QC by:	DO
project no.:	A18-1719
drawing no.:	
date:	12.15.2020

SHEET
1 of 2

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NOTES:

1. FHAD FLOODPLAIN FROM OMNI, INDUSTRIAL AND WESTFIELD WATERSHEDS FLOOD HAZARD AREA DELINEATION, APRIL 2010, PREPARED BY CH2M HILL.

2. THE DESIGN HEC-RAS MODEL ASSUMES THAT THE EXISTING CIRCULAR CMPS ARE IN PLACE. A STARTING WATER SURFACE ELEVATION OF 6222.52 WAS USED FOR PRE-PROJECT, PROPOSED, AND POST-PROJECT 100-YR FLOODPLAINS.

3. THE PRE-PROJECT 100-YR FLOODPLAIN WAS DELINEATED ON PRE-PROJECT SURVEY TOPOGRAPHY.

4. THE PROPOSED 100-YR FLOODPLAIN WAS DELINEATED ON PROPOSED TOPOGRAPHY.

5. THE POST-PROJECT 100-YR FLOODPLAIN WAS DELINEATED ON POST-PROJECT SURVEY TOPOGRAPHY AND SUPPLEMENTED WITH PRE-PROJECT SURVEY TOPOGRAPHY.

LEGEND

- PROPOSED 100-YR FLOODPLAIN
- PRE-PROJECT 100-YR FLOODPLAIN
- FHAD 100-YR FLOODPLAIN
- POST-PROJECT 100-YR FLOODPLAIN
- XX — CROSS SECTION LOCATION

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REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

POST-PROJECT FLOODPLAIN FIGURE

INDUSTRIAL TRIBUTARY STABILIZATION
POST-PROJECT HYDRAULIC ANALYSIS

CASTLE ROCK, COLORADO

2020

drawn by:	MS
checked by:	DO
approved by:	DO
QA/QC by:	DO
project no.:	A18-1719
drawing no.:	
date:	12.15.2020

SHEET
2 of 2

Industrial Tributary Low Flow/Trail Users Safety Memo

Burlington Northern Santa Fe

Industrial Tributary Trail
Castle Rock, CO
23-100-04200
1/27/2025

Industrial Tributary Low Flow/Trail Users Safety Memo

Prepared for

Burlington Northern Santa Fe

Industrial Tributary Trail
Castle Rock, CO
23-100-04200

January 2025

Prepared by

WILSON & COMPANY
HIGHER RELATIONSHIPS

990 S Broadway #220
Denver, CO 80209
303-297-2976

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Purpose

This memo aims to demonstrate that the proposed trail through the BNSF culvert and the proposed culvert under Prairie Hawk Drive will remain safe for trail users. BNSF requirements state that the trail through the main conveyance culverts shall remain dry in flooding events below and including the 10-year flooding event. The development of the nearby Brickyard site West of Prairie Hawk Drive and the Industrial Tributary Trail Project achieves this. These projects include replacing the culverts under Prairie Hawk Drive and connecting a trail between Philip S. Miller Park and the East Plum Creek Trail. The Brickyard Development upstream is constructing a portion of the trail, and the Industrial Tributary Trail Project is constructing the segment below the Brickyard section through BNSF ROW and connecting to the East Plum Creek Trail. Figure 1 shows the overall plan for the Town of Castle Rock to connect trail users.

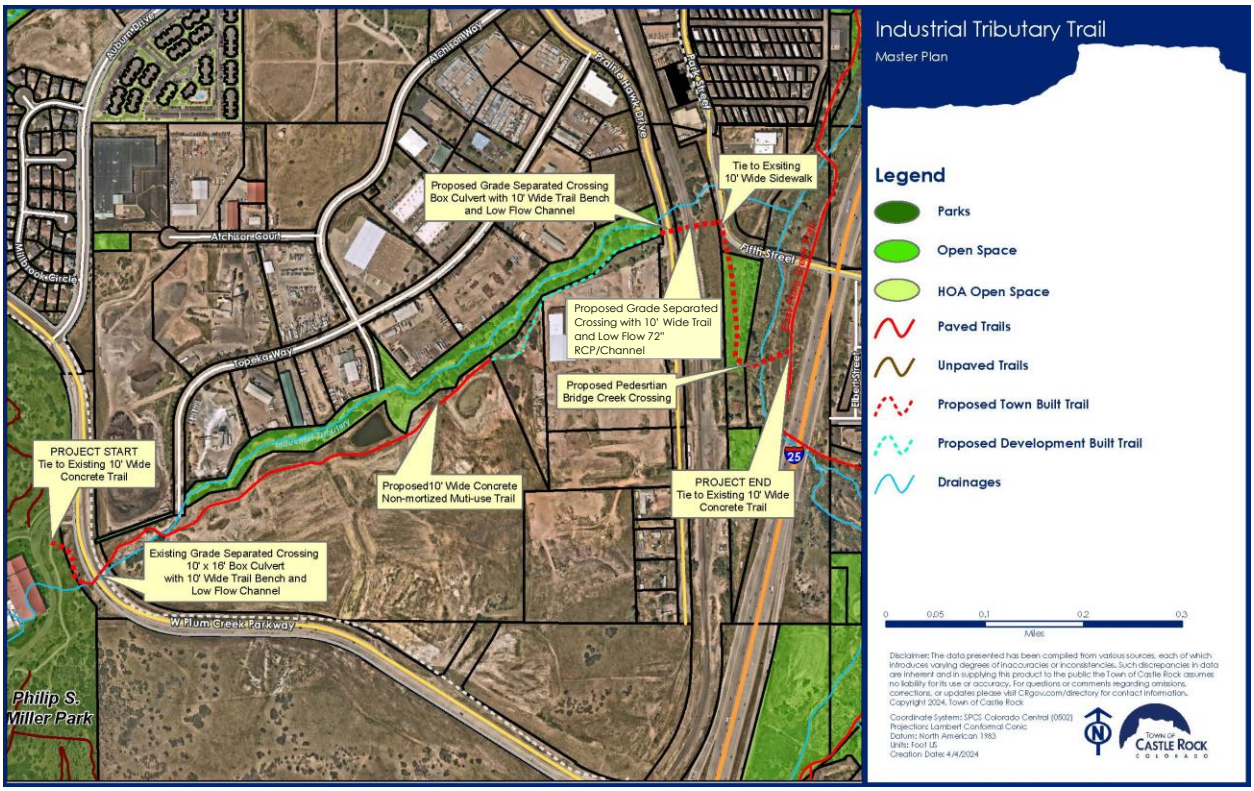


Figure 1 - Town of Castle Rock's Proposed Trail Plan

History

The Industrial Tributary watershed was first studied in 2013 through a Flood Hazard Area Delineation (FHAD) process, and effective flow was set. Since then, there has been development with the Philip S. Miller Park, which added detention upstream of Plum Creek Parkway as well as other localized development within the basin. The watershed was restudied in 2020 to incorporate the constructed detention, thus reducing the overall flows downstream. Since that study, there has been multiple approved plans for development in the lower portions of the watershed. All of the developments have proposed detention basins. In 2025, the watershed was restudied again to incorporate the proposed detention design into the watershed to reflect the actual hydrology conditions of build out.

Updated Hydrology

Wilson & Company, Inc., Engineers & Architects was tasked with restudying the hydrology for the Industrial Tributary Watershed, including incorporating existing and proposed detention facilities. The results of this study indicated that the flows for Industrial Tributary have overall been reduced due to the addition of detention within the basin. Table 1 shows the lineage of flows for each return event calculated at Park Street. The 2025 10-year flooding event is approximately the same as the 2013 FHAD 2-year event, mainly due to detention.

Table 1 - Industrial Tributary Flows Comparison at Park Street.

Industrial Tributary Watershed Flow Comparisons			
	FHAD 2013	Watershed Study 2020	Watershed Study 2025
2yr	318	296	132
5yr	485	405	227
10yr	590	465	304
25yr	783	572	443
50yr	962	665	581
100yr	1162	856	751
500yr	1540	1063	935

The 2025 Industrial Tributary Hydrology memo is included in Appendix A

Proposed Hydraulic Design

The proposed design for the trail connects the existing trail just west of I-25 across East Plum Creek, then through the BNSF Culvert for Industrial Tributary, then through a proposed culvert under Prairie Hawk Drive.

In order to keep the trail dry through the BNSF and Prairie Hawk Drive culverts, a low flow channel and pipe conveyance system will be installed north of the main conveyance tributary culverts to divert low flows away from the trail ensuring the trail stays dry below and including the 10-year flood event. The low flow channel and culverts will convey the water and drop the elevation below the invert elevation of the proposed culvert under Prairie Hawk Drive. Low flows will enter a 72" RCP culvert and be conveyed parallel to the high flow culverts containing the trail. To ensure that the water surface elevation (WSEL) does not overtop onto the trail through the 10-year flooding event, a series of hydraulic walls will be designed with freeboard to keep the trail dry for trail users during the more frequent events. Once the water is in the low flow system, it will then outfall just north of the existing downstream end of the BNSF culvert and a channel will be regraded to join the flows from both culverts together before entering the Park Street Culvert. The trail on the downstream end of the BNSF culvert will also have a series of hydraulic walls to ensure that any backwater for low flow events at the Park Street Culvert will not overtop back on to the trail. When higher events occur, and the main conveyance culverts are utilized, a series of flap gates will be installed on the hydraulic wall to allow the water on the trail downstream of BNSF to drain back to Industrial Tributary. An overall draft concept plan is included in Appendix B.

A combination of Bentley Flowmaster and HEC-RAS model were developed to design the low flow channel and 72" pipe as well as the hydraulic wall height needed to ensure the trail will stay dry through the 10-year flood event. The HEC-RAS model utilized Lids to be able to create a split flow and model the low flow pipe through Prairie Hawk Drive and BNSF. The results of the HEC-RAS model show that the trail will be kept

dry due to the hydraulic wall in the 10-year event. Copies of the hydraulic calculations are included in Appendix C.

Impacts on BNSF ROW

The work that will be performed in BNSF Right of Way (ROW) will include installation of a 72" RCP that will be jacked under the rail. The purposed of this pipe is to connect to the low flow conveyance system upstream of Prairie Hawk Drive. The pipe under Prairie Hawk Drive and BNSF will be installed parallel to the main conveyance culvert, which due to their angles will need a custom junction structure designed and installed on BNSF ROW to connect the two low flow pipes. Small grading work will also be performed on the area between Prairie Hawk Drive and BNSF to ensure that any local rain will be captured and routed to ensure trail user safety while adhering to BNSF requirements. There will also be a channel graded in on the downstream side of BNSF to allow the low flow pipe to join back to Industrial Tributary before Park Avenue. The BNSF culvert will be left as is and the trail will be installed through the culvert. A hydraulic wall will be installed on the downstream end of the BNSF culvert along the trail to ensure any backwater effects do not flow back onto the trail.

Flows entering the BNSF ROW will remain unchanged, however, they will be split into two crossings. A no-rise is being developed for the small zone A area below the BNSF culvert above the Park Street Culvert. With the grading of the new channel and removal of sediment deposition in this area, no expansion of the Zone A floodplain is anticipated.

Maintenance

To ensure that the proposed culvert design operates as designed, routine maintenance will be needed to ensure that the low-flow channel and pipe are clear of debris or other obstructions that would impact their capacity. This includes debris trapped upstream of the culvert, which would raise the WSEL and divert more flow into the high-flow culvert. Removing sediment in and around the low-flow culvert will also be crucial to maintaining culvert capacity.

Conclusion

The updated hydrology study and the proposed low flow design under Prairie Hawk Drive and BNSF show that the trail through the BNSF arch culvert and proposed Prairie Hawk Drive Culvert will be kept dry through the 10-year flooding event. Maintenance will need to be performed at regular intervals to ensure that the flow channel is operating as designed and debris is removed. Maintenance will also need to ensure, after higher flooding events, that there is no debris trapped on the trail in the culverts and causing safety concerns.

Appendix A – 2025 Industrial Tributary Watershed Study

Industrial Tributary Watershed Study

Town of Castle Rock

Industrial Tributary Watershed Study
Castle Rock
2310004200
1/24/2025

Industrial Tributary Watershed Study

Prepared for

Town of Castle Rock

Industrial Tributary Watershed Study
Castle Rock
2310004200

January 2025

Prepared by

WILSON & COMPANY
HIGHER RELATIONSHIPS

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Denver, CO 80209
303-297-2976

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Purpose

Wilson & Company, Inc., Engineers & Architects was requested by The Town of Castle Rock to reassess peak flow discharges in the Industrial Tributary Watershed located in Castle Rock, Colorado. There have been multiple approved plans for development in the lower portions of the watershed which have detention pond planned with some already having been built. Because of the number of detention ponds that are constructed/will be built, a re-baseline of what the hydrology would be in the watershed was appropriate.

Methods

Following Chapter 6 of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (2019) an existing CUHP/SWMM model provided by the Town, was modified to reflect these additional detention ponds and the resulting change in imperviousness from the developments.

Previous Studies

The following studies were used as a reference for the development of the Watershed Study.

- Omni, Industrial and West field Watersheds Flood Hazard Area Delineation, April 2013
- Phase III Drainage Report for Philip S. Miller Park and Field House, May 2013
- Phase III Drainage Report for Miller's Landing Phase I 2020
- Industrial Tributary Watershed Study Technical Memorandum 2020
- Phase III Drainage Report for Miller's Landing Phase I 2022
- Phase III Drainage Report for Prairie Hawk Drive Roadway Improvements Phase I 2023
- Phase III Drainage Report for The Brickyard 2024
- Phase III Drainage Report for Praxis Street Off Site Improvements 2025

Colorado Urban Hydrograph Procedure

The Colorado Urban Hydrograph Procedure (CUHP) version 2.0.1 was used to calculate storm hydrographs for the study area.

Precipitation

The 1-hour point rainfall value of 2.60 inches listed in the Town of Castle Rock Manual (Manual) was used in the CUHP software for the 100-Year event. For other frequencies the Manual is used to determine 1-hour point rainfall depths.

Drainage Basin Delineation

The watersheds were delineated by modifying the Industrial Tributary Watershed Study Technical Memorandum based on recent development on the southeast portions of the watershed. The revised study Basin ID and basin areas roughly correspond to the existing Flood Hazard Area Delineation (FHAD) Study as presented in Table 1.

Table 1 - Area Comparison

Industrial Tributary Watershed Study 2025		Industrial Tributary Watershed Study 2020		FHAD Watershed Study 2013	
Study Basin ID	Study Basin Area (ac)	Study Basin ID	Study Basin Area (ac)	FHAD Basin ID	FHAD Basin Area (ac)
I1	74.1	I1	74.1	Sub Basin 12	73.86
I2	92.5	I2	92.5	Sub Basin 13	92.31
I3	32.5	I3	32.5	Sub Basin 10	44.61
I4	75.4	I4	75.4	Sub Basin 11	63.84
I5	26.2	I5	26.2	Sub Basin 9	26.99
I6	41.2	I6	41.2	Sub Basin 7	65.79
I7	52.1	I7	52.1	Sub Basin 8	45.8
I8	35.2	I8	105.7	Sub Basin 6	94.21
I8.1	34.7				
I8.2	11.2				
I8.3	24.6				

Drainage Basins I8 and I6 were modified to reflect the changes due to the proposed development and the proposed detention ponds. Drainage basin I8 was divided up to 4 separate subbasins to show how water in the proposed condition would flow to 3 separate detention ponds. Basin I6 was updated with the proposed imperviousness and routed to a proposed detention pond along Industrial Tributary. The area was divided up to match the acreage and imperviousness based on the drainage plan sheets and the detention pond spreadsheets in the drainage calculations. The proposed watershed delineation used in this revised hydrologic analysis is shown in Figure 1.



Figure 1 - Watershed Delineation

Drainage Basin Characteristics

Drainage basin characteristics required to run CUHP include length, length to centroid, slope, percent impervious, depression storage based on land coverage, and infiltration loss based on Horton's infiltration equation, and hydrologic soils group.

Length to Centroid/Slope Adjustments

Original lengths were determined from the Town of Castle Rock contour information combined with development information from Philip S. Miller Park. The updated sub watersheds' lengths were updated using the calculated proposed length being directed to the proposed detention pond.

Percent Imperviousness Adjustments

Based on the previous hydrology study, the percent imperviousness for Drainage Basins I1-5 were delineated based on the Town of Castle Rock GIS layers; Parking Lots, Pavement Edge, and Building Footprints. Updated percent imperviousness for Drainage Basins I6 and I8 were based on the proposed drawings that were received. Drainage Basin I7 is still determined to have an Industrial Land Use with a corresponding percent impervious of 80-percent.

The various proposed projects' imperviousness plans can be seen in Figure 2.

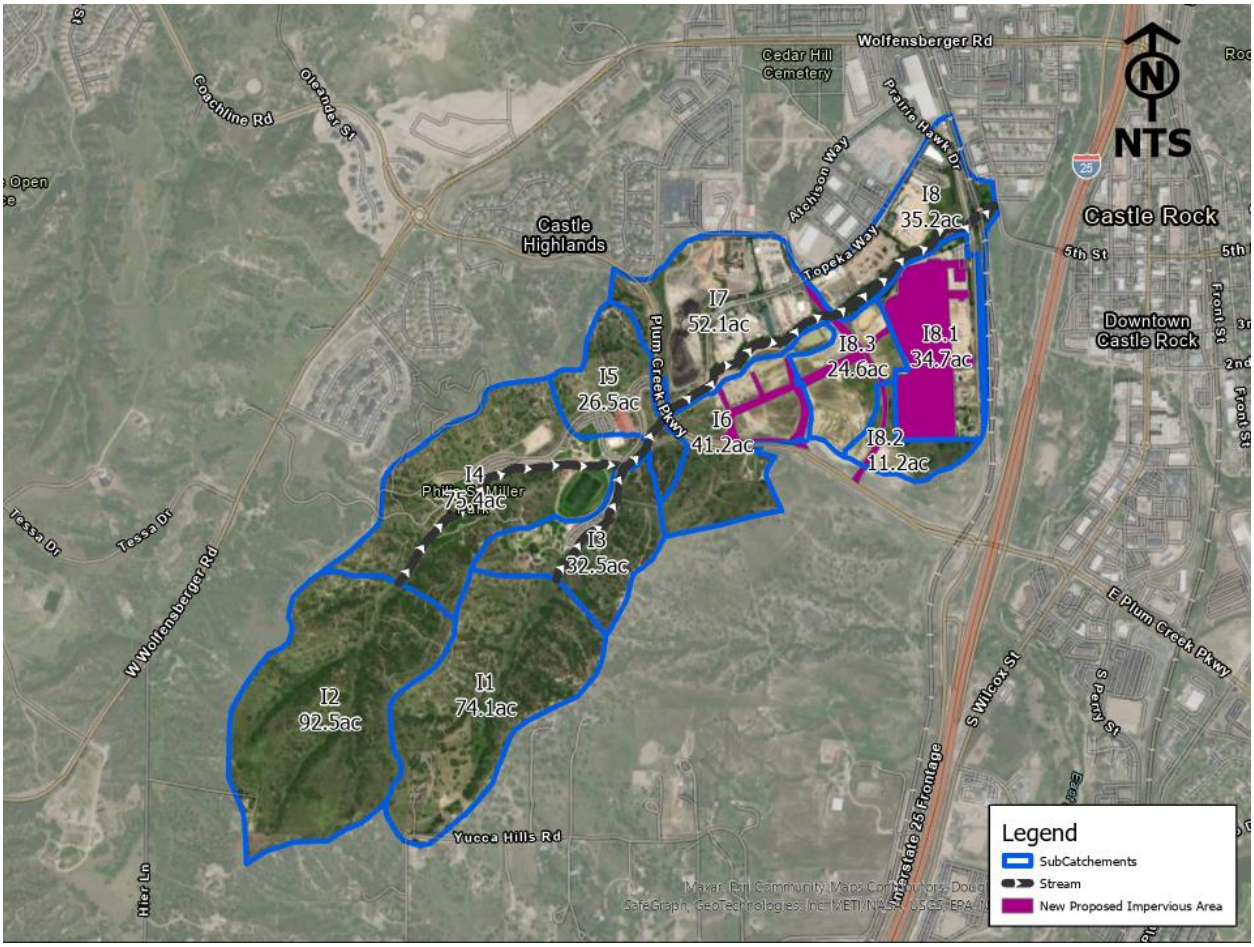


Figure 2 - Proposed Imperviousness

Depression Storage Adjustments

Inputs for Depression Storage parameters were left the same as the previous study. The sub watersheds I8 and I6 were recalculated due to the splitting of the original watersheds and the overlapping of the hydraulic soil groups.

Infiltration Adjustments

Inputs for Hortons' infiltration parameters were left the same as the previous study. The sub watersheds I8 and I6 were recalculated due to the splitting of the original watersheds and the overlapping of the hydraulic soil groups.

Hydrologic Soils Group Adjustments

Inputs for the hydrologic soils group were left the same as the previous study. The sub watersheds I8 and I6 were recalculated due to the splitting of the original watersheds and the overlapping of the hydraulic soil groups.

Results

Peak discharges from the analysis compared to the FHAD discharges are shown in Table 2. The lower return events were reduced more (~30%), which is mostly due to the updated detention basins holding more water

and slower release rates for the lower return events. The higher return events were reduced slightly (~10%) which is mostly due to the detention ponds releasing more water at these higher events, but still holding back the peak flow. Overall, the updated peak flow hydrology was reduced.

Table 2 - Runoff per Unit Area

	Industrial Tributary Watershed Study 2025			Industrial Tributary Watershed Study 2020			FHAD Watershed Study 2013
Study Basin ID	Study Basin Area (acre)	Peak Flow (cfs)	Runoff per Unit Area (cfs/acre)	Study Basin Area (acre)	Peak Flow (cfs)	Runoff per Unit Area (cfs/acre)	FHAD Peak Flow (cfs)
I1	74.1	146	1.98	74.1	146	1.97	117
I2	92.5	187	2.02	92.5	187	2.02	147
I3	32.5	70	2.16	32.5	70	2.15	149
I4	75.4	135	1.78	75.4	135	1.79	144
I5	26.2	68	2.60	26.2	68	2.60	52
I6	41.2	105	2.55	41.2	161	3.91	302
I7	52.1	203	3.90	52.1	203	3.90	196
I8	35.2	131	3.71	105.7	427	4.04	447
I8.1	34.7	134	3.87				
I8.2	11.2	22	1.96				
I8.3	24.6	106	4.32				

SWMM

EPA SWMM was used to route the updated CUHP storm hydrographs. Storm hydrographs were directly imported into the SWMM nodes and routed.

Updated routing elements include:

- Detention basins
- Outlet pipes/weirs from detention basins
- Prairie Hawk Drive and BNSF culverts based on survey

The updated detention basins data was pulled from the proposed phase III drainage reports provided by the Town of Castle Rock. All the proposed detention basins were designed using MHFD's extended detention basin spreadsheet. This spreadsheet uses CUHP to calculate the inflow hydrograph and then calculates the outflow hydrograph based on the design of the outlet structure.

The detention basin stage storage curves were input into the SWMM model and the CUHP subcatchments were connected to the detention basin. Because the stage discharge curve was not included in the drainage report, a different SWMM model scenario was created for each return event. The outlet pipe was entered into the model for each return event to match the design outlet discharge rate. These flows were calculated using the latest version of the MHFD Extended Detention Basin Spreadsheet and the outlet pipe sizes from the various drainage reports. They are as follows:

Outlet Pipe Sizing

- Pond A from CD19-0019 Phase III Drainage Report page 92
- Pond E from 1-CD23-0001 PH III Drainage Report page 113
- Off-Site South Pond 1-CD24-0040 PH III Drn Rpt page 59
- Brickyard Pond 2-CD24-0030 PH III Drainage page 176

Conclusion

Based on this re-evaluation of the peak flow discharges within the Industrial Tributary Watershed, the proposed peak discharges for the Industrial Tributary FMS and Natural Channel Design are shown on Table 3. The reduction in peak flows is primarily due to the addition of the detention basins for the proposed development. It should be noted that if any of the proposed plans change or new developments not analyzed in this study are approved, the hydrology should be reevaluated.

Table 3 - Peak Flow at Design Points

	Base Condition		
	Design Point 1	Design Point 2	Design Point 3
2yr	98	111	132
5yr	171	193	227
10yr	227	262	305
25yr	336	386	443
50yr	418	493	581
100yr	532	629	751
500yr	657	783	935

Design points are located at:

1. Downstream of Plum Creek Parkway
2. Atchison Way and Topeka Way
3. Outfall at Park Ave

Design points are shown in Figure 3.

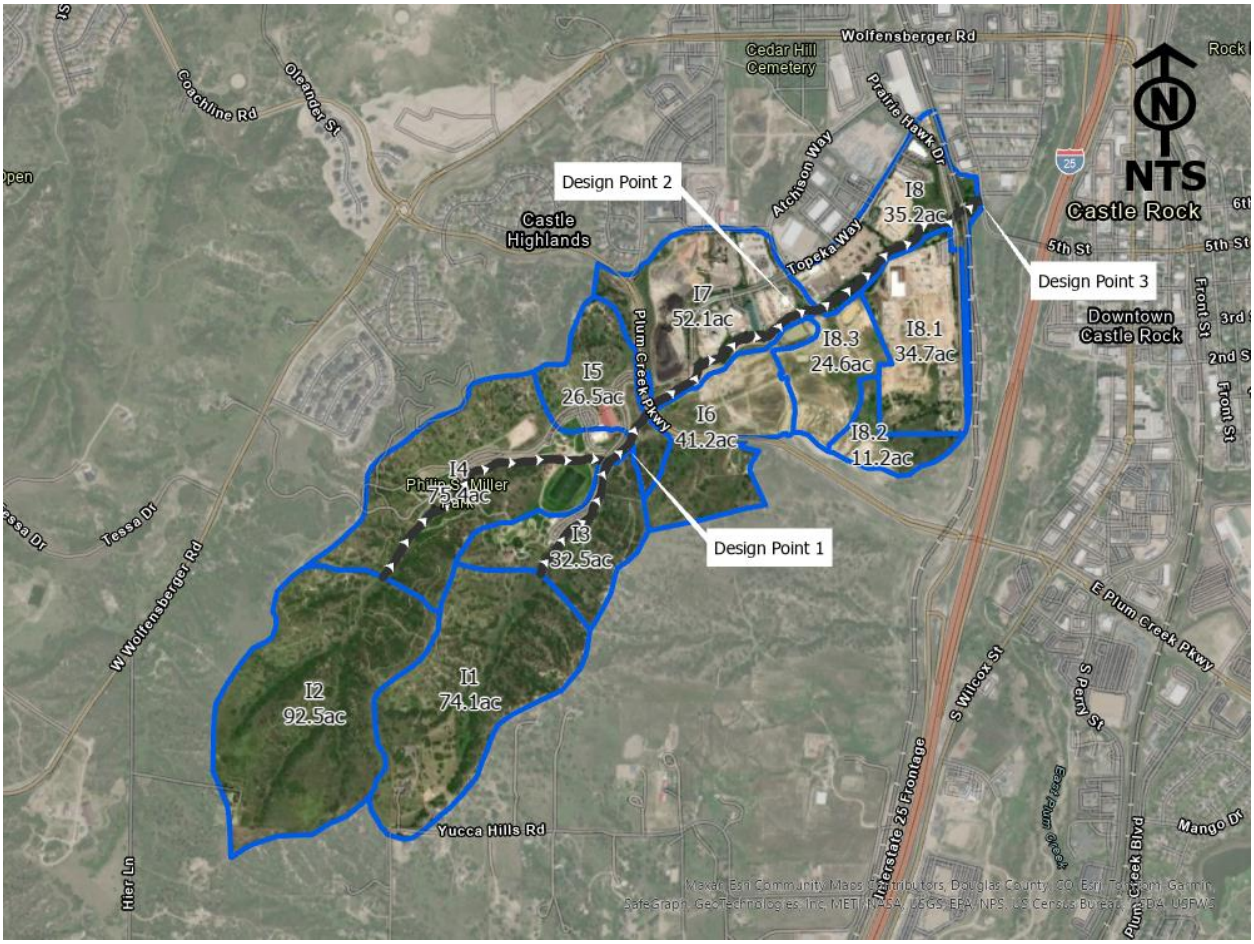


Figure 3 - Design Points

The updated flows were compared to the past watershed studies at the same design points. Table 4 shows the comparison of flows over the studies. It should be noted that the proposed improvements to the most recent hydrology model were in the lower portions of the watershed thus leaving Design Point 1 the same compared to the 2020 study to the 2025 study.

Table 4 - Watershed Study Flow Comparison

Industrial Tributary Watershed Flow Comparions									
	FHAD 2013			Watershed Study 2020			Watershed Study 2025		
	Design Point 1	Design Point 2	Design Point 3	Design Point 1	Design Point 2	Design Point 3	Design Point 1	Design Point 2	Design Point 3
2yr	51	194	318	98	137	296	98	111	132
5yr	139	306	485	171	206	405	171	193	227
10yr	196	381	590	228	275	465	227	262	305
25yr	330	546	783	336	408	572	336	386	443
50yr	460	690	962	419	523	665	418	493	581
100yr	540	852	1162	532	677	856	532	629	751
500yr	733	1145	1540	657	836	1063	657	783	935

References

Colorado Urban Hydrograph Procedure Version 2.0.1 10/31/2019

Industrial Tributary Watershed Study Technical Memorandum 2020

Omni, Industrial and West field Watersheds Flood Hazard Area Delineation, April 2013

PCSWMM v7.5.3406

Phase III Drainage Report for Miller's Landing Phase I 2020

Phase III Drainage Report for Miller's Landing Phase I 2022

Phase III Drainage Report for Philip S. Miller Park and Field House, May 2013

Phase III Drainage Report for Prairie Hawk Drive Roadway Improvements Phase I 2023

Phase III Drainage Report for Praxis Street Off Site Improvements 2025

Phase III Drainage Report for The Brickyard 2024

Town of Castle Rock Storm Drainage Design and Technical Criteria Manual

Appendix A – CUHP Base Conditions

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
I1		0.150	0.170	36.0	6.22	18.7	4.39	10.4	96	268,983	2.58	694,689	45.0	146	694,185	1.98
I2		0.160	0.200	35.0	6.89	18.2	4.87	11.5	124	335,775	2.58	865,508	45.0	187	864,468	2.02
I3		0.126	0.101	30.9	3.90	16.1	2.76	6.5	49	117,975	2.59	306,083	40.0	70	304,848	2.16
I4		0.121	0.144	42.0	6.14	21.8	4.34	10.2	84	273,702	2.60	711,686	50.0	135	711,832	1.78
I5		0.119	0.089	23.1	3.07	12.0	2.17	5.1	53	95,106	2.60	247,482	40.0	68	243,993	2.60
I6		0.089	0.156	26.2	4.65	13.6	3.28	7.7	74	149,556	2.69	402,468	40.0	105	401,260	2.55
I7		0.077	0.207	13.3	3.62	6.9	2.56	6.0	183	189,123	2.73	516,965	35.0	203	508,901	3.90
I8		0.088	0.148	13.9	3.08	7.2	2.17	5.1	119	127,776	2.69	344,131	35.0	131	335,958	3.71
I8.1		0.077	0.173	13.0	3.23	6.8	2.28	5.4	125	125,961	2.73	344,313	35.0	134	335,243	3.87
I8.2		0.123	0.062	36.5	3.23	19.0	2.28	5.4	14	40,547	2.64	107,105	45.0	22	106,545	1.96
I8.3		0.075	0.150	10.0	2.65	5.2	1.88	4.4	116	89,407	2.74	245,268	30.0	106	235,315	4.32

Summary of CUHP Input Parameters (Version 2.0.1)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
I1	I1	100-YEAR	0.116	0.288	0.576	0.048	3.5	0.40	0.10	3.37	0.0018	0.5200	0.00	0.07	0.04	3.53
I2	I2	100-YEAR	0.145	0.314	0.627	0.051	0.8	0.40	0.10	3.00	0.0018	0.5000	0.00	0.02	0.01	0.81
I3	I3	100-YEAR	0.051	0.170	0.341	0.048	10.0	0.40	0.10	3.27	0.0018	0.5200	0.00	0.20	0.10	9.95
I4	I3	100-YEAR	0.118	0.364	0.727	0.053	13.1	0.40	0.10	3.03	0.0018	0.5000	0.00	0.26	0.11	13.07
I5	I5	100-YEAR	0.041	0.132	0.264	0.079	14.1	0.40	0.10	3.50	0.0018	0.5300	0.00	0.28	0.11	14.13
I6	I6	100-YEAR	0.064	0.277	0.549	0.025	48.4	0.35	0.10	3.80	0.0018	0.5500	0.00	0.84	0.23	48.40
I7	I7	100-YEAR	0.081	0.263	0.527	0.059	80.0	0.35	0.10	4.45	0.0018	0.6000	0.00	0.94	0.33	80.00
I8	I8	100-YEAR	0.055	0.106	0.398	0.033	50.0	0.35	0.10	4.50	0.0018	0.6000	0.00	0.85	0.23	50.00
I8.1	I8.1	100-YEAR	0.054	0.180	0.359	0.030	80.0	0.35	0.10	4.42	0.0018	0.5950	0.00	0.94	0.33	80.00
I8.2	I8.2	100-YEAR	0.017	0.115	0.229	0.035	11.4	0.35	0.10	4.30	0.0018	0.5870	0.00	0.23	0.10	11.43
I8.3	I8.3	100-YEAR	0.038	0.133	0.271	0.045	87.3	0.35	0.10	3.56	0.0018	0.5370	0.00	0.95	0.36	87.30

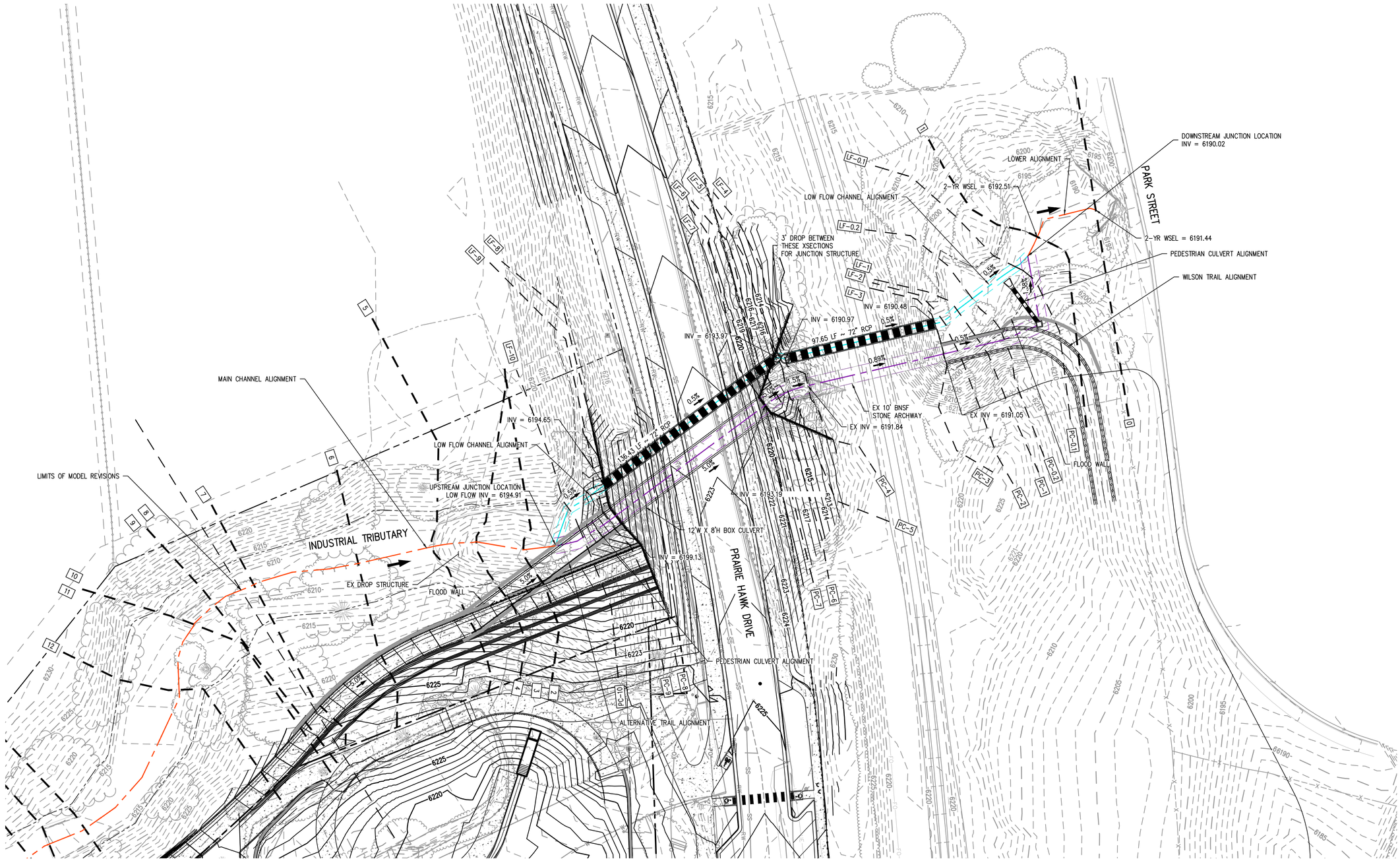
Appendix B – Hydrologic Model (Provided Separately)

Prepared by

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Appendix B – Draft Proposed Design



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Denver, Colorado 80203
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HarrisKocherSmith.com

INDUSTRIAL TRIBUTARY TRAIL ALTERNATIVE EXHIBIT
SCALE: 1"=30'

30 0 30 60
SCALE: 1" = 30'

Filepath: P:\2020\20076\ENGINEERING\EXHIBIT\INDUSTRIAL TRIBUTARY ALTERNATIVE HEC-RAS-2.DWG Layout: LAYOUT1
Plotted: WED 11/06/24 9:26:28A By: Amanda Casteel

Appendix C – Hydraulic Results

Worksheet for Circular Pipe - 1

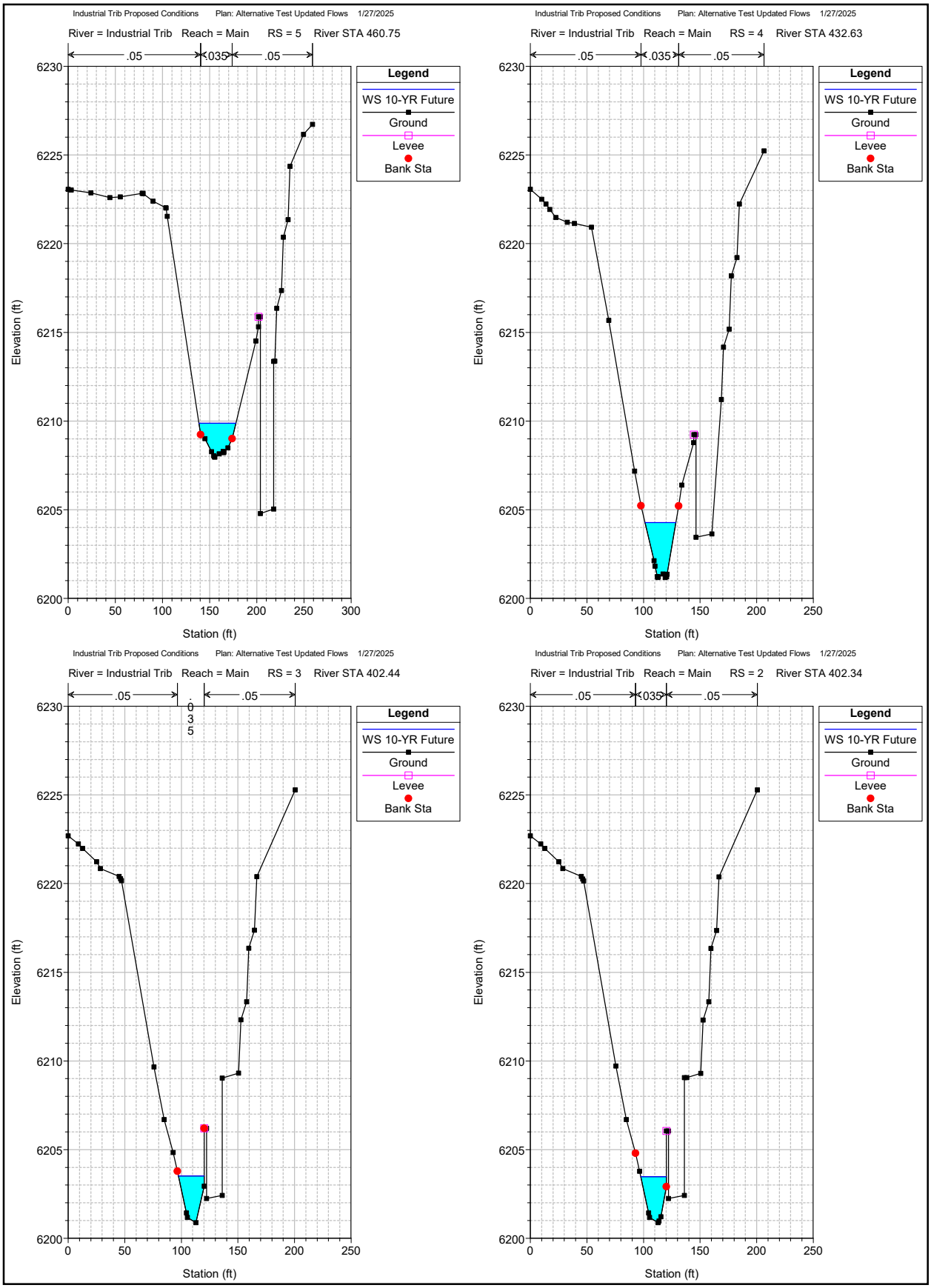
Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

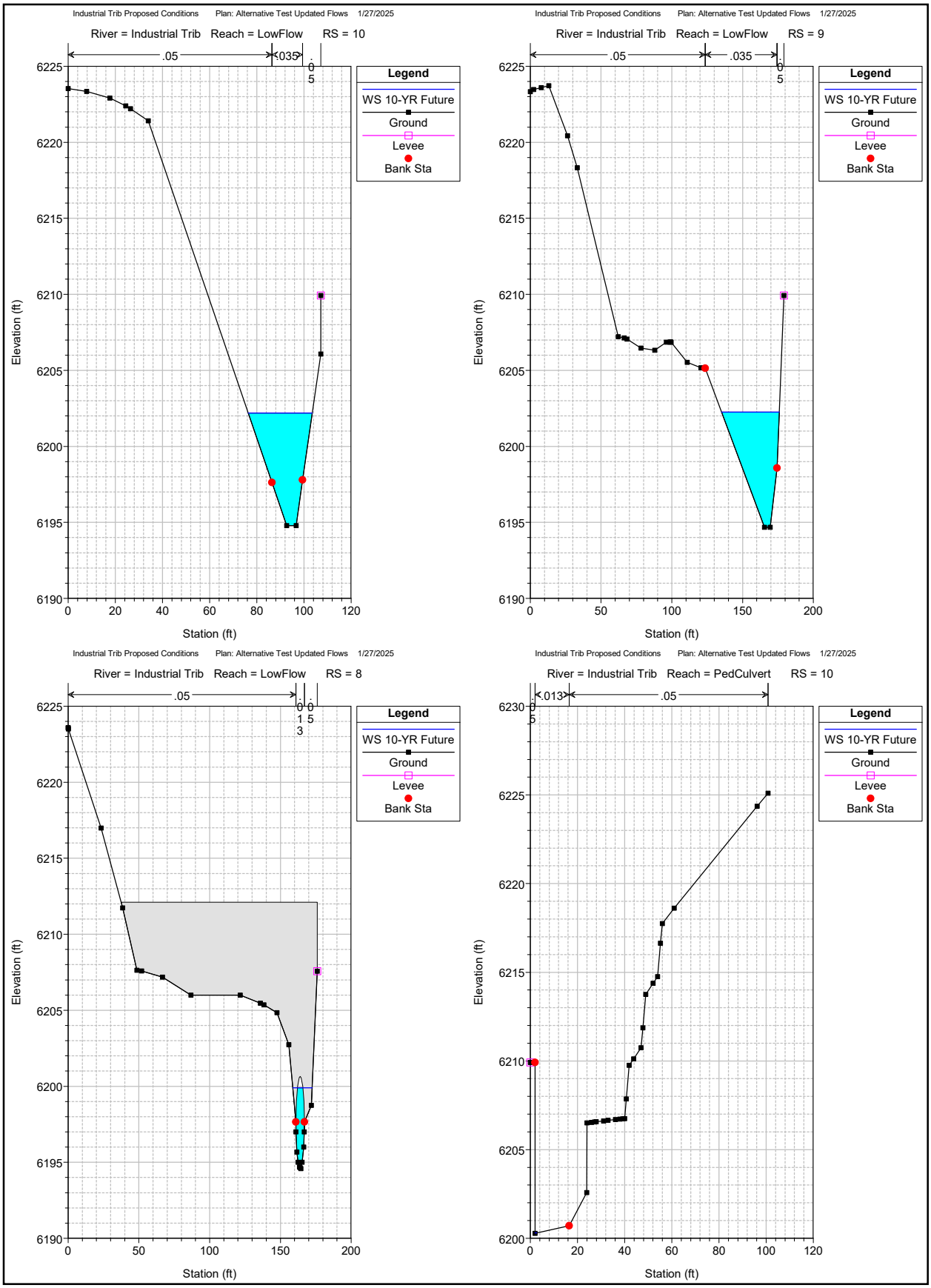
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	72.0 in
Discharge	304.00 cfs

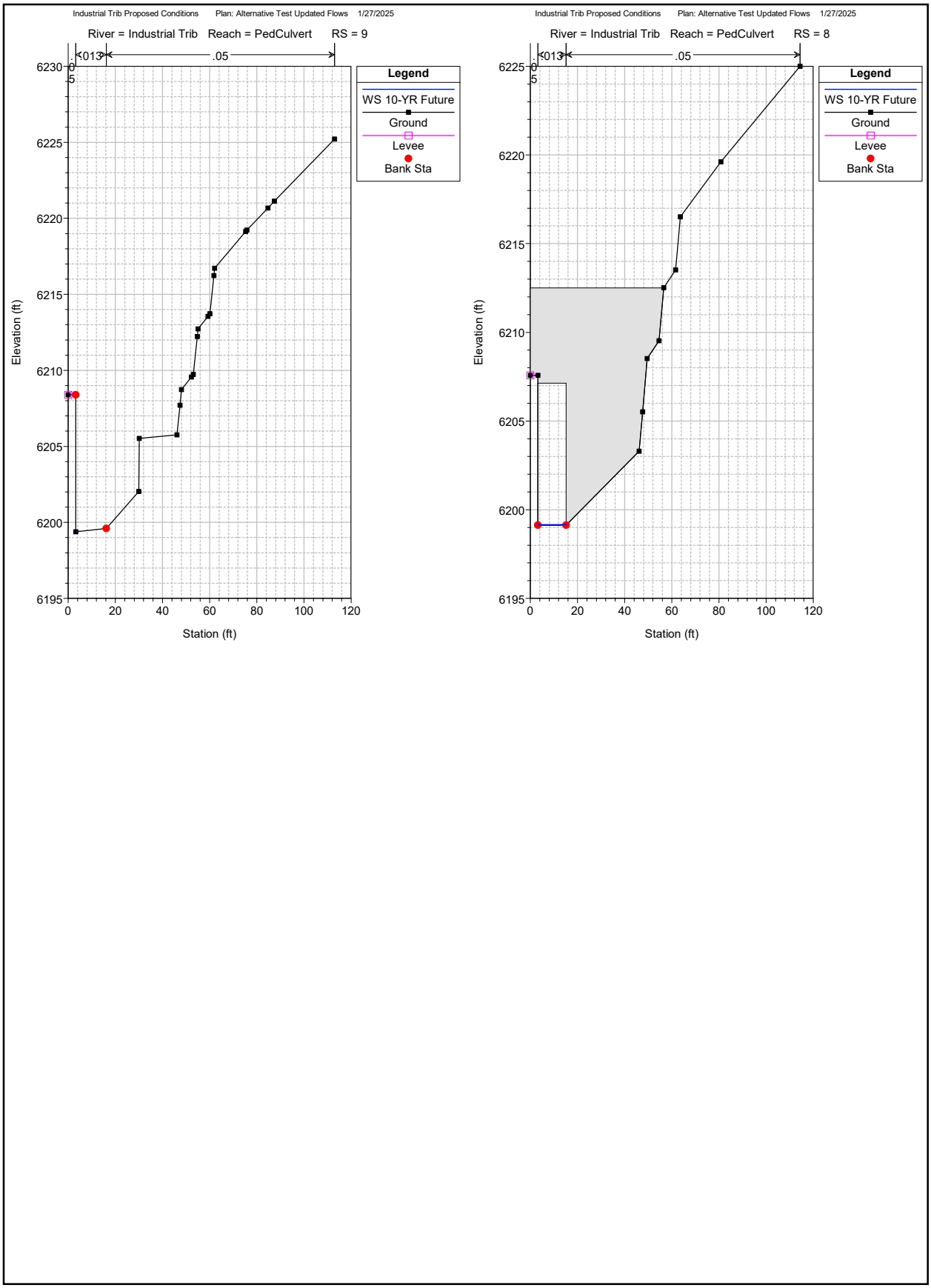
Results	
Normal Depth	60.1 in
Flow Area	25.2 ft²
Wetted Perimeter	13.8 ft
Hydraulic Radius	21.9 in
Top Width	4.46 ft
Critical Depth	57.2 in
Percent Full	83.4 %
Critical Slope	0.005 ft/ft
Velocity	12.07 ft/s
Velocity Head	2.26 ft
Specific Energy	7.27 ft
Froude Number	0.895
Maximum Discharge	322.12 cfs
Discharge Full	299.45 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	60.1 in
Critical Depth	57.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft


Industrial Trib Proposed Conditions Plan: Alternative Test Updated Flows 1/27/2025
River = Industrial Trib Reach = Main RS = 5 River STA 460.75
.05
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Legend
WS 10-YR Future
Ground
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Bank Sta
Elevation (ft)
Station (ft)
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Legend
WS 10-YR Future
Ground
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Station (ft)
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WS 10-YR Future
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Station (ft)
Industrial Trib Proposed Conditions Plan: Alternative Test Updated Flows 1/27/2025
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Legend
WS 10-YR Future
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Elevation (ft)
Station (ft)


Industrial Trib Proposed Conditions Plan: Alternative Test Updated Flows 1/27/2025
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Legend
WS 10-YR Future
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Elevation (ft)
Station (ft)
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River = Industrial Trib Reach = LowFlow RS = 9
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Legend
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Station (ft)
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River = Industrial Trib Reach = PedCulvert RS = 10
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Industrial Trib Proposed Conditions Plan: Alternative Test Updated Flows 1/27/2025
River = Industrial Trib Reach = PedCulvert RS = 9
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Industrial Trib Proposed Conditions Plan: Alternative Test Updated Flows 1/27/2025
River = Industrial Trib Reach = PedCulvert RS = 8
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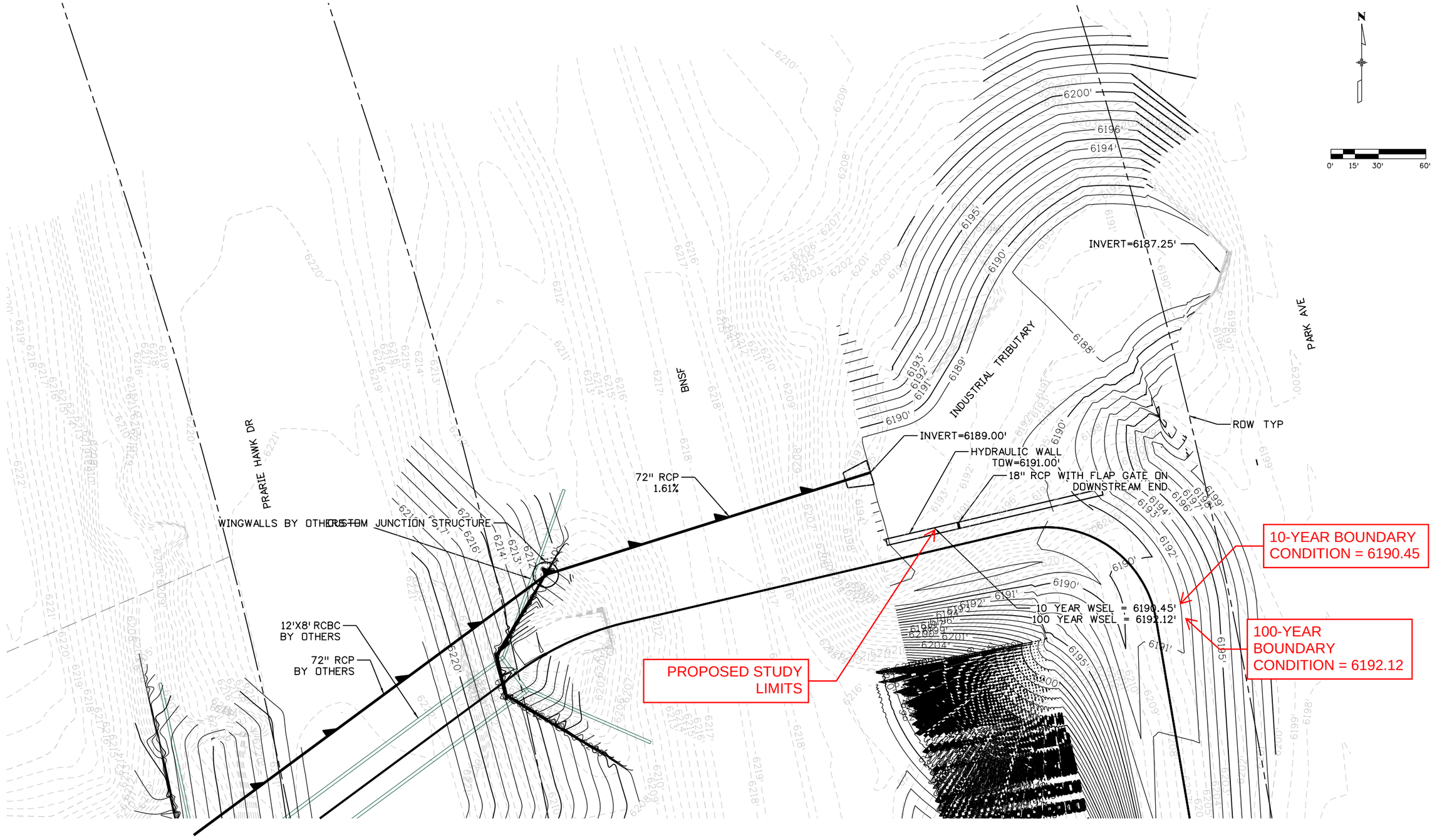
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Biological Assessment

Industrial Tributary Trail Connection
Castle Rock, Colorado

CDOT Project No. 25392
Wilson & Company 23-100-042-00
3/5/2025

DRAFT

Biological Assessment

for Industrial Tributary Trail Connection

Castle Rock, Colorado

Prepared for

United States Fish and Wildlife Service (USFWS)

On behalf of

Town of Castle Rock

CDOT Project No. 25392
Wilson & Company # 23-100-042-00

DRAFT

March 2025

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List of Abbreviations

Abbreviation	Term/Phrase/Name
ADA	Americans with Disabilities Act
BA	Biological assessment
BMPs	Best Management Practices
BNSF	BNSF Railway
CDOT	Colorado Department of Transportation
CDA	Colorado Department of Agriculture
CFR	Code of Federal Regulations
CPW	Colorado Parks and Wildlife
CWA	Clean Water Act
DCHCP	Douglas County Habitat Conservation Plan
ESA	Endangered Species Act
FHWA	Federal Highway Administration
GESC	Grading, Erosion and Sediment Control
I-25	Interstate highway 25
IPaC	Information for Planning and Consultation
MCS	Mature canopy spread
MSL	Mean sea level
PMJM, or PMJM	Preble's meadow jumping mouse
RCZ	Riparian Conservation Zone
Section 7	Section 7 of the Endangered Species Act (consultation requirements)
SPWRAP	South Platte Water Related Activities Program
T&E	Threatened and endangered
USACE	United States Army Corps of Engineers
USC	United States Code
USFWS	United States Fish and Wildlife Service
Wilson & Company	Wilson & Company, Inc., Engineers and Architects
WOTUS	Waters of the United States

1 Introduction

The Town of Castle Rock has proposed the construction of the Industrial Tributary Trail connection (project) which will cross East Plum Creek, through known habitat of the Preble's meadow jumping mouse (*Zapus hudsonius preblei*), a federally listed threatened species. This project is part of a larger effort with the goal of connecting Philip S. Miller Park to the downtown area of Castle Rock, in Douglas County, Colorado.

Philip S. Miller Park is a major recreational facility that includes a hiking area, concert venue, and multiple sporting complexes. This project will help provide a safe and reliable connection for active, non-motorized travel between the downtown section of the quickly growing Town of Castle Rock and the popular park.

On behalf of the Town of Castle Rock, Wilson & Company, Inc., Engineers & Architects (Wilson & Company) has prepared this Biological Assessment (BA) reviewing the project to determine to what extent it would affect any threatened, endangered, proposed, or sensitive species defined by the United States Fish and Wildlife Service (USFWS). This BA was prepared in accordance with legal precedents set forth under Section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1537(c)).

Section 7 ESA consultation with USFWS has been triggered through the use of federal funding for the project. The Town of Castle Rock is receiving Congestion Mitigation and Air Quality funds from the Federal Highway Administration (FHWA). FHWA will be the lead federal agency for compliance with the National Environmental Policy Act and Endangered Species Act, in coordination with the Colorado Department of Transportation (CDOT). This project is included in the CDOT's current, approved State Transportation Improvement Project as project ID number 2022-068.

Additionally, the proposed project involves potential impacts to waters of the U.S (WOTUS), triggering the Clean Water Act (CWA) 404 permitting process through the U.S. Army Corps of Engineers (USACE).

1.1 U.S Fish and Wildlife Service IPaC List

Wilson & Company requested and received a threatened and endangered (T&E) species list using the Information for Planning and Consultation (IPaC) website maintained by USFWS. The list identifies seven threatened, endangered, proposed, or sensitive species which may be present in Douglas County or may be affected by the proposed project. The complete IPaC list can be found in **Appendix A.**

Table 1 below addresses the nine IPaC identified species and provides information regarding their listing status, preferred habitat, and recommended determination of effect based on the proposed project.

Table 1 USFWS Threatened and Endangered Species List

Species	Status	Preferred Habitat[1]	Determination
Mammals			
Preble's meadow jumping mouse/PMJM (Preble's) (*Zapus hudsonius preblei*)	Threatened	PMJM inhabits well developed riparian habitat with adjacent, undisturbed grassland communities, and a nearby water source. A well-developed riparian habitat includes a dense combination of grasses, forbs, and shrubs; a taller shrub and tree canopy may be present. PMJM has been found to regularly use uplands at least as far out as 100 meters beyond the 100-year flood plain. An individual mouse can have multiple day nests in both riparian and grassland communities and may abandon a nest after only one week of use. Hibernation nests occur underground both within and outside of the 100-year floodplain.	May affect – Likely to adversely affect
Birds			
Piping Plover (*Charadrius melodus*)[2]	Threatened	In the Northern Great Plains, Piping Plovers nest on the unvegetated shorelines of alkaline lakes, reservoirs, or river sandbars.	Addressed through South Platte water consultation
Whooping Crane (*Grus americana*)[2]	Endangered	The Whooping Crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. Whooping Cranes breed and nest in wetland habitat in Wood-Buffalo National Park, Canada. During migration, Whooping Cranes use a variety of habitats; however, wetland mosaics appear to be the most suitable. In Nebraska, Whooping Cranes also often use riverine habitats.	Addressed through South Plate water consultation

Species	Status	Preferred Habitat[1]	Determination
Fishes			
Pallid sturgeon (*Scaphirhynchus albus*)[2]	Endangered	Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters formed the large-river ecosystem that met the habitat and life history requirements of pallid sturgeon and other native large-river fishes. Substrate. During winter and spring, a mixture of sand, gravel and rock substrates are used and during the summer and fall, sand substrate is most often used. Pallid sturgeon evolved in the diverse environments of the Missouri and Mississippi river systems. Water depletion in Colorado's South Platte River basin can affect the species downstream in Nebraska and elsewhere.	Addressed through South Platte water consultation
Insects			
Monarch butterfly (*Danaus plexippus*)	Proposed Threatened	The monarch butterfly is a migratory species whose movements in the midwestern U.S. are not well known. A suitable breeding habitat has host plants (milkweeds) where eggs are laid and larvae feed upon the leaves and stems. Showy milkweeds (*Asclepias speciosa*) are present in the Action Area.	No effect – minimal milkweed present in the Action Area. Impacts will not jeopardize the continued existence of species.
Suckley's cuckoo bumble bee (*Bombus suckleyi*)	Proposed Endangered	Opportunistic, parasitic bees that can live in a variety of habitats ranging from urban areas to meadows, grasslands, and forests. Suckley's bumble bee depends on other bumble bees for survival and raising young.	**Low** – No bees, nests, or burrows observed in the project area. Species not previously reported or known to occur within 1-3 miles of the project area.
Flowering Plants			

Species	Status	Preferred Habitat[1]	Determination
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Threatened, Proposed delisted	Primarily from moist meadows associated with perennial stream terraces, floodplains, and oxbows, seasonally flooded river terraces, sub-irrigated or spring-fed abandoned stream channels and valleys, and lakeshores.	No effect – Suitable habitat, but Action Area is mostly disturbed social trails; outside of documented range.
Western prairie Fringed orchid (*Platanthera praeclara*)[2]	Threatened	Tall grass prairie and is found most often on unplowed, calcareous prairies and sedge meadows. Soil moisture is a critical determinant of growth, flowering, and distribution. The persistence of western prairie fringed orchid is dependent on periodic disturbance by fire, mowing, or grazing, but these practices may also cause adverse effects and must be carefully implemented. Water depletion in Colorado's South Platte River basin may affect the species downstream in Nebraska and elsewhere.	Addressed through South Platte water consultation

[1]Preferred habitat descriptions from USFWS Environmental Conservation Online System (ECOS) Species Profile (USFWS 2021)

[2] Water-related activities/use in the South Platte River basin may affect listed species in Nebraska (SPWRAP 2021)

1.2 Species Eliminated from Further Discussion

The listed species were evaluated to determine the likelihood of their presence in the Action Area, and their potential to be affected by the proposed project activities. Based on these considerations, Wilson & Company concluded that one species, the Preble's meadow jumping mouse (*Zapus hudsonius preblei),* has the potential to be affected. The proposed project would have no effect on the remaining listed species, for the reasons that are explained below. Per CDOT convention, all words in the common names of bird species are capitalized, while this approach is not applied to non-avian species.

1.2.1 South Platte Water Related Activities Program (SPWRAP)

To address the effects that water depletions from the South Platte River Basin will have on federally listed species downstream that depend on the river for their survival, CDOT, as a state agency, is participating in the South Platte Water Related Activities Program (SPWRAP). CDOT is cooperating with the FHWA which provides a federal nexus for the project. In response to the need for formal consultation for the water used from the South Platte basin, FHWA has prepared a Programmatic Biological Assessment (PBA) that estimates total water usage from 2012 through 2019. The PBA has since been extended through 2032 and addresses the pallid sturgeon, Piping Plover, western prairie fringed orchid, and the Whooping Crane.

On April 4, 2012, the USFWS signed a Biological Opinion which concurs with this approach and requires a yearly reporting of water usage. The extension, which has the same reporting requirements, was signed by the USFWS on March 29, 2019. The water used for this project will be reported to the USFWS at the year's end after the completion of the project as per the consultation. As water depletion impacts to the four downstream species have already undergone consultation with the USFWS under the PBA, these four species are not discussed further in this report.

1.2.4 Monarch butterfly (*Danaus plexippus*)

The monarch butterfly has a wide range of habitats across North America. Milkweeds (*Asclepias spp.*) and other flowering plants are indicative of the monarch's habitat. Monarch butterfly adults feed on nectar from flowering plants and require milkweeds to lay their eggs. Showy milkweeds (*A. speciosa*) were identified in the pedestrian survey conducted by Wilson. Some milkweed plants will be removed during the construction process, however, the Town of Castle Rock plans to revegetate the area post construction according Douglas County's Habitat Conservation Plan Revegetation Plan (Appendix D) with a native seed mix containing milkweeds. Impacts will be temporary, as the native seed mix will include several native milkweed species to help boost biodiversity in the area. These temporary impacts will not adversely affect or jeopardize the continued existence of the species.

1.2.5 Ute ladies' tresses orchid (*Spiranthes diluvialis*)

Ute ladies'-tresses orchid (*Spiranthes diluvialis*) is generally found along perennial streams in alkaline wetlands, floodplains, terraces, and oxbows. The Action Area does cross East Plum Creek, a perennial stream. The Action Area is within a floodplain; however, the species does not have any documented occurrences in Douglas County. During the pedestrian survey conducted by Wilson & Company, no Ute ladies-tresses were identified. Additionally, multiple social trails are present that limit habitat quality. Therefore, the project would have no effect on this species. As of January 7, 2025, Ute ladies'-tresses orchid has been proposed for delisting and is undergoing a 60-day public comment period.

1.3 Species Considered for Further Evaluation

After reviewing the best available information from USFWS, the Town of Castle Rock, and CDOT, in conjunction with site observations, Preble's meadow jumping mouse (*Zapus hudsonius preblei*),

abbreviated as Preble's or PMJM, is the only listed threatened or endangered species that has the potential to be affected from the project. The remainder of this biological assessment will review potential effects to this species.

2 Project Description

The section of the BA describes the Project location, the purpose and need of the project, and the proposed actions involved with the project.

2.1 Location

The Action Area consists of a trail that will begin with a connection to the East Plum Creek Trail on the east side of East Plum Creek at approximately 39.373254°N, -104.863911°W (latitude, longitude) with an approximate elevation of 6,170 feet above mean sea level (MSL). The trail will cross East Plum Creek and terminate on the west side of Prairie Hawk Drive at approximately 39.375142°N, -104.866598°W with an approximate elevation of 6,210 feet above MSL. The trail will be ten feet wide, with an additional two feet on each side to account for permanently mowed areas and will be 1,310 feet long. The Action Area includes areas where we can expect indirect effects (e.g., noise, vibration, spread of invasive species, etc.), so a 0.5-mile buffer will be applied around the project area to analyze these effects. This creates a total of 100,188 square feet of total Action Area. The entire project length falls within Section 11, Township 8 south, Range 67 west of the 6th Principal Meridian.

The Project crosses through conservation areas that protect PMJM. Specifically, the trail crosses a CDOT East Plum Creek Conservation Bank, a Douglas County Habitat Conservation Plan (DCHCP) protected property, and the Riparian Conservation Zone (RCZ) as outlined in the Douglas County Habitat Conservation Plan. In some sections, the project area within the CDOT mitigation bank and DCHCP protected property overlap the RCZ. The trail would cross through a mix of upland and riparian habitat, including the crossing of East Plum Creek and its surrounding floodplain.

2.2 Action Area

Federal regulations (50 CFR § 402.02) define the Action Area as "all areas to be affected directly or indirectly by the federal Proposed Action and not merely the immediate area involved in the action" (USFWS 1998). **Figure 1** illustrates the disturbance limits for the proposed Project, which consists of 1.70 acres stretching from the existing pedestrian trail to the east side of Prairie Hawk Drive and moves upland to an open field south of Park Street.

The direct effects buffers are outlined in **Figure 1** as temporary and permanent. These impacts include grading, construction of a permanent, paved trail, and vegetation clearing. The indirect effects buffer is intended to address potential disturbances within PMJM habitat. A 0.5-mile buffer is being utilized to reduce indirect effects and prevent degradation of PMJM habitat. Trail construction projects, particularly those involving upland and riparian habitats and conservation easements, require an adequately sized buffer to account for all impacts. Ensuring a sufficient buffer reduces edge effects

and maintains suitable riparian corridors. Conservation easements suggest prior efforts to protect the habitat, reinforcing the need for a proactive buffer approach (DCHCP 2006).

The U.S. Fish and Wildlife Service (USFWS) has recommended 300 feet as a minimum avoidance buffer for PMJM habitat in some cases (UFWS 2018). Colorado PMJM Conservation Plans often suggest wider buffers (0.25-0.5 mile) for high-disturbance projects, especially those involving long-term human activity and construction (DCHCP 2006; USFWS 2019). Given that the trail's construction has both upland and riparian impacts, a 0.5-mile buffer aligns with the upper range of protective measures. A 0.5-mile buffer is a conservative and justifiable choice, especially given PMJM's habitat requirements and the potential for long-term trail use disturbances. The mitigation measures suggested in section 7 will help minimize direct and indirect effects.

2.3 Proposed Action

The project will construct a paved trail connecting the existing East Plum Creek Trail to the planned Industrial Tributary Trail that will serve Philip S. Miller Park. The new 10-foot-wide paved trail will cross Plum Creek and climb the western slope of its floodplain. It will connect to the existing sidewalk along Park Street, then head west underneath the BNSF railroad and Prairie Hawk Drive. Several design alternatives were considered when designing the project, including different path layouts, stream crossings, and boring techniques.

A low water crossing was determined to be the preferred alternative when designing the proposed project by installing a quad 8'x8' box culvert designed to keep the trail dry in a 2-year flooding event. Previous trail projects which have crossed East Plum Creek successfully implemented a low water crossing, which will additionally benefit the local floodplain by having a reduced impact in comparison to a traditional bridge crossing. Construction equipment will access the site directly and install a staging area from Park Street, alongside the trail in upland grasslands, outside of mitigation areas.

The project will be constructed predominantly in uplands; however, some impacts will occur within riparian/PMJM habitat in the RCZ. The trail will also pass through the CDOT mitigation bank and DCHCP protected property. Impacts are detailed below in Section 6 of this BA. Conservation measures will be implemented to avoid, minimize, and mitigate adverse effects to PMJM and are detailed in Section 7.

Localized stormwater mitigation for the rest of the project includes sloping the trail to one side and stormwater will be conveyed in a ditch along the trail directed back to East Plum Creek. Any minor flow that comes through the drainage culverts under Prairie Hawk Drive and BNSF will be captured in an inlet and piped back to Industrial Tributary.

3 Consultation

The submittal of this BA is part of the formal ESA Section 7 consultation between USFWS and FWHA. Correspondence between Wilson & Company and USFWS has been conducted through

virtual meetings, emails, and phone calls, in coordination with staff from the Town of Castle Rock and CDOT.

An online virtual meeting was conducted on February 7, 2024, which included staff from CDOT, the Town of Castle Rock, Wilson & Company, and Kristin Salamack from USFWS. PMJM RCZ, CDOT mitigation bank, and DCHCP protected property were discussed. It was determined that the permanent impacts for this project on PMJM habitat would exceed the common threshold (400 square feet) for being considered an adverse effect. This BA concludes that the permanent impacts would be 0.92 acre cumulative to the RCZ, CDOT mitigation bank, and DCHCP protected property, with 0.17 acre of permanent impacts occurring within the RCZ, or approximately seventeen times the common threshold.

4 Preble's meadow jumping mouse

As discussed in Section 1, PMJM is the only listed species with the potential to be affected by the proposed project. No other suitable habitat was observed for any other listed species. **Figure 2** from the DCHCP (2006) shows known locations of PMJM in Douglas County. These findings are based on trapping efforts conducted between 1994 and 2004. CDOT also conducted successful live trapping in their mitigation bank in June 2013. Consistent with USFWS guidelines, the Action Area is assumed to be occupied by the species based on the presence of suitable habitat occurring in the trapping site and the Action Area.

4.1 Description of Species

The PMJM meadow jumping mouse is a diminutive mouse with an extremely long tail, large hind feet, and long hind legs, allowing the mouse to make tremendous leaps. Their long tails are lightly furred and twice as long as the body. The PMJM's large hind feet are three times as long as those of other species of mice with a similar body size. Adult PMJM are seven to ten inches long, which includes their tails at four to six inches long. On average, an adult PMJM weighs 0.6 ounce (USFWS).

4.2 Range

The PMJM Meadow Jumping mouse's range extends from the foothills of southeastern Wyoming to the Front Range of Colorado and into Colorado Springs, El Paso County. **Figure 3** indicates the 0.5-mile buffer applied to the project area to account for indirect effects. General topography of the project area is indicated in **Figure 4**. PMJM has a USFWS Critical Habitat along East Plum Creek (**Figure 5**), but this Critical Habitat does not cross into the Action Area.

4.3 Habitat

The Action Area consists of riparian and upland woody vegetation that is suitable habitat for PMJM. PMJM need a reliable water source and are typically found in perennial stream corridors with multi-

story dense vegetation. The most common riparian shrub community where PMJM occur is coyote willow (*Salix exigua*). Other commonly occurring plains woody riparian vegetation includes snowberry (*Symphoricarpos* spp.), alder (*Alnus incana*), river birch (*Betula fontinalis),* dogwood (*Cornus sericea*), hawthorn (*Crataegus macracantha*), peach-leaved willow (*Salix amygdaloides*), Russian olive (*Elaeagnus angustifolia*), and cottonwood (*Populus deltoides* and *P. angustifolia*).

Upland shrub and/or woodland communities often occur adjacent to the plains riparian communities and can include the following shrubs and trees: Gambel oak (*Quercus gambelli*), chokecherry (*Prunus virginiana*), wild plum (*Prunus americana*), hawthorn (*Crataegus* spp.), skunkbrush (*Rhus trilobata*), snowberry, and ponderosa pine (*Pinus ponderosa*).

PMJM construct day nests composed of grasses, forbs, sedges, rushes, and other available plant materials. They are typically found under debris at the base of shrubs and trees, or in open grasslands, but also can be found below ground. Individuals may have multiple nests that are used during activities such as foraging, nesting, hibernation, and reproduction. The PMJM diet changes seasonally, and they feed on available fungi, seeds, and pollen found along riparian corridors (USFWS).

PMJM typically enter hibernation in September or October through May and persist on fat reserves. The Hibernacula of the PMJM have been located both within and outside of the 100-year flood plain of streams (Shenk and Sivert 1999; Schorr 2001). The Action Area is composed of the above plains woody riparian vegetation and graminoids. There is a 100-year flood plain which extends west from the creek and along the path of the proposed trail.

The DCHCP started in response to the listing of PMJM after it was placed on the Endangered Species List in 1998. DCHCP was created to prepare a county-wide conservation plan which followed guidelines outlined by the USFWS to provide protection measures for PMJM. The DCHCP was created to authorize the limited and unintentional take of PMJM and provide long-term benefits to the species and it's habitat. For the Industrial Tributary Trail project, temporary impacts will be restored in place, but there will also be additional mitigation needed for temporary impacts since a greater than 1:1 mitigation ratio is being applied. While there is no USFWS-designated critical habitat in the Action Area, the DCHCP ensures the long-term survival and protection of PMJM within Douglas County.

The Action Area lies within the Douglas County RCZ that encompasses 283 stream miles and covers over 18,800 acres (DCHCP 2006). The RCZ in the Action Area is a part of the Plum Creek watershed. This watershed is composed of East and West Plum Creeks, and numerous smaller, perennial, and intermittent tributaries. Plum Creek flows northward into the South Platte River at Chatfield Reservoir. East Plum Creek was designated as a conservation macrosite by CNHP (Colorado Natural Heritage Program) as it provides habitat for species of concern such as the Iowa darter, common shiner, and northern leopard frog (DCHCP 2006).

The DCHCP outlines Best Management Practices (BMPs) and mitigation guidelines for direct and indirect impacts affecting Douglas County RCZs and mitigation areas and will be used to help determine appropriate mitigation for this project.

4.4 Threats to Species

Modification of riparian corridors through landscape development and urbanization has led to habitat loss, degradation, and fragmentation affecting PMJM. There are currently no indications of prime habitat loss due to local developments within Plum Creek watershed. Specifically, the DCHCP (2006) mentions that the broad distribution of PMJM throughout the County suggests that the cumulative effects associated with human activities on land use and management has had minimal impacts on the presence and distribution of PMJM.

5 Environmental Baseline

The project is located outside of USFWS-designated Critical Habitat; however, sections of the project are located within a CDOT Mitigation Bank, DCHCP protected property, and the RCZ (**Figure 6**). Per the DCHCP's Guidelines for Covered Activities, in order to quantify impacts to PMJM, a habitat quality assessment was performed by Barbara Spagnuolo, Natural Resource Specialist for the Town of Castle Rock and Tiffany Martin, Biologist for Wilson & Company, on August 12, 2024.

Areas of low-, moderate-, and high-quality PMJM habitat were identified in the CDOT Mitigation Bank and RCZ. Habitat qualities were not assessed for the portions of the project area outside the RCZ because those areas are covered by the DCHCP and therefore, already have approved compensatory mitigation under Section 10 of the ESA. Habitat qualities were assessed using ocular estimates of shrub cover, grass and forb cover, shrub vigor, and structural layers as outlined in the Habitat Scorecard for PMJM from the Colorado Natural Heritage Program (Colorado Parks and Wildlife (CPW) 2016, **Appendix C**). The habitat quality for PMJM increases in a gradient from low to high approaching East Plum Creek from both sides of the Action Area. An exception to this gradient is one area of low-, moderate-, and low-quality to the east of the creek.

High-quality PMJM habitat is often defined as a riparian habitat with high shrub (e.g., coyote willow [*Salix exigua*]) cover and a dense graminoid understory. High-quality habitats include areas consisting of >80% dense woody/shrub cover and >40% grass cover, moderate-quality habitats were between >50-80% shrub cover and 20-40% grass cover, and low-quality habitats were 5-50% shrub cover and 10-20% grass cover. Low-quality habitats include upland habitats that were heavily disturbed or dominated by weedy species.

The topography of the Action Area ranges from flat to steep slopes. Vegetation found along the upland areas was heavily disturbed. The upland section just south of Park Street contains both native and introduced species, including the Colorado Department of Agriculture (CDA) List B noxious weeds leafy spurge (*Euphorbia esula*), diffuse knapweed (*Centaurea diffusa*), and CDA List C species common mullein (*Verbascum thapsus).* Other vegetation observed in the upland area included hoary alyssum (*Beteroa incana),* smooth brome *(Bromus inermis),* plains cottonwood *(Populus deltoides),* yellow clover *(Melilotus officinalis),* Plains pricklypear *(Opuntia polyacantha),* western aster *(Symphyotrichum ascendens),* horseweed *(Erigeron canadensis),* hairy false goldenaster *(Heterotheca villosa),* showy milkweed

(Asclepias speciosa), curly cup gumweed *(Grindelia squarrosa),* kochia *(Bassia scoparia)*, and scotch thistle (*Onopordum acanthium*). The upland area was lined with plains cottonwoods (*Populus deltoides*).

Wetlands in the action area were previously delineated by Wilson & Company biologists Nick Kronshage and Tiffany Martin during a separate field investigation on December 15, 2023. (**Figure 7**). Wetlands have been evaluated to establish baseline conditions in anticipation of a separate request for project authorization from the USACE, under the CWA (Section 404).

A total of five areas meeting all three criteria for wetland classification were identified during the site visits. The identified wetlands were primarily located in the roadside ditches and along streams. Two of the wetlands were identified as palustrine emergent temporarily/seasonally flooded (PEMA/PEMC), one wetland was identified as palustrine unconsolidated bottom (PUB), two wetlands were identified as palustrine scrub-shrub temporarily flooded (PSSA), and one wetland was identified as a freshwater pond (PUB). In addition, one stream channel was identified during the site visit. Common herbaceous species observed in the wetlands included arctic rush (*Juncus arcticus*), broadleaf cattail (*Typha latifolia*), and *Carex* sp. Observed tree and shrub species included coyote willow (*Salix exigua*), plains cottonwood (*Populus deltoides*), crack willow (*Salix fragilis*), and Rocky Mountain juniper (*Juniperus scopulorum*).

6 Effects of the Proposed Action

Direct and indirect effects to PMJM are likely to occur as part of the project. The following subsections describe the direct effects, including both temporary and permanent impacts, and indirect effects.

6.1 Direct Effects

The proposed action has the potential to have adverse effects on PMJM. Adverse effects may result from habitat disturbances caused by construction activities. All efforts will be made to avoid causing harm or injury to PMJM. Staging areas will be located only in uplands and low-quality habitat. The loss of available forage may result in a reduction to PMJM reproductive productivity and/or survivorship. If hibernaculum is destroyed or disturbed, this may impact the number of PMJM able to survive over winter.

The proposed action will require vegetation removal, temporary and permanent erosion control measures, reseeding, and planting of trees and shrubs. A section of upland habitat and potential hibernaculum would be destroyed to accommodate necessary grading to make the proposed trail ADA compliant. Work would begin on the upland slope in late summer of 2025 and be constructed over five months to avoid disturbing hibernating PMJM. Woody vegetation would be mowed down and trimmed prior to construction at the end of the PMJM active season in August to deter the mice from hibernating in mowed areas. Trimming will also preserve root stock and allow regeneration of riparian vegetation. Remaining work in the riparian/lowland habitat would be completed in fall/winter of

2025. Unavoidable direct effects would occur to PMJM habitat during construction as these effects would reduce the available habitat for PMJM in the Action Area.

Direct effects to PMJM habitat would include both permanent and temporary impacts to construct the Industrial Tributary Trail and associated features. **Figure 8** outlines all permanent and temporary disturbances within the Action Area. Permanent and temporary disturbances are indicated within the RCZ by habitat type (riparian versus upland) for CDOT's mitigation bank and the DCHCP protected property that the Project and proposed activities will impact (**Figures 9, 10**). Project activities will include temporary access from existing roadways/trails to the construction area; grading (excavation and embankment); construction of culverts in the channel with associated improvements (rip rap, wing walls); concrete trail construction; tunnel construction; miscellaneous drainage pipes and utility management.

Project activities would result in permanent impacts to 0.30 acre of PMJM habitat in the DCHCP protected property and 0.16 acre of habitat in the CDOT mitigation bank. The project would result in temporary impacts to 0.49 acre of PMJM habitat within the DCHCP protected property and 0.19 acre of habitat in the CDOT mitigation bank. Potential direct effects to PMJM resulting from the permanent impacts would include loss of habitat and disruption of PMJM dispersal behavior in the vicinity of the project due to initial project construction, long-term maintenance, and daily use of the trail. Construction activities will be implemented in different sections of the Action Area during different times of year. Temporary impacts to PMJM habitat would include other activities such as re-grading along the slope east of the creek, staging, construction access, and material stockpiles that may overlap a portion of PMJM habitat.

Restoration of these areas would include replanting woody vegetation with live willow stakes and nursey stock for non-willows prior to construction. Salvageable shrubs would be saved and transplanted post construction. Protective, temporary matting will be used during the staging process to protect existing vegetation. These areas would also be revegetated with a native seed mix following construction. Only impacts occurring within the RCZ require mitigation. The DCHCP protected property has acres set aside for an allowed amount of disturbance, per their habitat conservation plan agreement with USFWS. Project activities would result in 0.37 acre of impacts to the RCZ, of which 0.20 acre would be temporary and 0.17 acre would be permanent.

Table 2. PMJM Habitat Impacts (Acres)

Habitat (in RCZ)	Permanent Impacts	Temporary Impacts	Total
DCHCP Riparian	0.01	0.01	0.02
DCHCP Upland	0.00	0.00	0.00
CDOT Riparian	0.14	0.18	0.32
CDOT Upland	0.02	0.01	0.03

6.2 Indirect Effects

Indirect adverse effects to PMJM may include increased noise, dust, vibrations, and lighting associated with construction and increased human activity along the trail. The Industrial Tributary Trail will connect downtown Castle Rock to Philip S. Miller park and serve as a commuter path. An increase in social trails is possible with the increased use of the path. Social trails could result in trampling and disruption of riparian vegetation. Additionally, PMJM may be less inclined to cross East Plum Creek on paved sidewalk. This may disrupt their movement and affect their ability to relocate for mating, foraging, or hibernation.

This 0.5-mile buffer is being applied to the Action Area to account for indirect effects caused from noise and vibration, including activities associated with trail construction and subsequent usage that could affect PMJM. Research indicates PMJM rely on riparian and adjacent upland habitats, making them vulnerable to habitat fragmentation, increased human activity, and noise disturbances (USFWS 2018).

Increased noise and vibration are anticipated from the use of construction equipment, although background noise from I-25 is already present. The presence of highway traffic noise may partially habituate PMJM to sound, but construction noise will have different intensity and frequency, making it important to maintain an adequate buffer. Studies on small mammals suggest that chronic noise disturbance can alter foraging and breeding behavior (Arcangeli et al. 2023), making the assigned buffer critical.

The indirect effects buffer also accounts for the spread of invasive species. The clearing of vegetation and human activity could inadvertently contribute to the spread of non-native species, which could displace native plants and disrupt PMJM habitat. Disturbances within the riparian areas may indirectly affect water quality, habitat integrity, and species movement as floodplains provide crucial habitat for species like PMJM.

The following conservation measures aim to enhance PMJM habitat quality and improve connectivity within and around the RCZ. According to the DCHCP (2006) indirect effects from covered activities generally have minor to moderate localized impacts. The DCHCP also states that these indirect effects are unlikely to cause secondary impacts on the RCZ or alter adjacent lands. RCZ areas have been strategically established throughout Douglas County to disperse projects, preventing high concentrations in any single area. Additionally, projects are scheduled at different times of the year to help mitigate potential impacts.

6.3 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area of the federal Proposed Action subject to consultation (USFWS 1998). There are no future activities planned at this time.

7 Conservation Measures

Conservation measures will be implemented to avoid, minimize, and mitigate adverse effects to habitat and to further the recovery of PMJM. Avoidance of all impacts to PMJM habitat is not feasible on this project due to the final trail design. The trail has been carefully designed to enhance connectivity and meet compliance and safety standards, while minimizing impacts on high-quality PMJM habitat and the surrounding floodplain. Several alternatives were considered prior to selecting the proposed box culvert design. A full-span bridge, 3–10-year bridge, and single precast bridge were all considered. Each of these alternatives would have resulted in substantial rises in the 100-year floodplain and caused subsequent overtopping onto I-25. The box culvert design minimizes obstructions to the floodplain and allows faster-moving water to overtop the structure during larger storm events, such as the 100-year event.

Additionally, an alternative design that located the bridge further downstream was considered. This design would place the trail moving northward through more of the RCZ before spanning East Plum Creek immediately upstream of Park Street. This alternative would result in less grading and gentler slopes but would have traveled farther through riparian areas (high-quality PMJM habitat) than the box culvert alternative. The CLOMR with alternatives analyses will be included as a separate attachment for reference.

The 30% design plans place the Industrial Tributary Trail through a DCHCP protected property, the RCZ, and a CDOT mitigation bank. These zones surround East Plum Creek on all sides and were unavoidable in the design of the trail. The current trail design does, however, minimize permanent, direct impacts. This design also shortens the trail length traveling through the riparian corridor.

Conservation measures that will be implemented include impact minimization during final design planning, construction phase access limitations, seasonal constraints, no night-time work, the use of BMPs, and habitat restoration and enhancement for areas where direct effects to PMJM habitat are anticipated both as temporary and/or permanent impacts. The spread of invasive species will also be carefully monitored as Class B and Class C noxious weeds are present in the upland area, south of Park Street.

The Town of Castle Rock (Douglas County) and CDOT will utilize the following BMPs for covered activities in the RCZ under Appendix 3 of the DCHCP for the proposed project:

- CDOT mitigation bank signage will be posted for informational and off trail use restrictions.
- A PMJM habitat connectivity ledge will be constructed in the culvert/low water crossing (i.e. crossing ledge).
- Mitigation for impacts to PMJM habitat within the DCHCP/RCZ and CDOT mitigation bank/RCZ protected areas will be established within each respective area, as designated by CDOT and USFWS.
- Mitigation does not need to occur in the DCHCP protected property in areas outside the RCZ.
    - Those areas are covered by the DCHCP and therefore already have approved compensatory mitigation under Section 10 of the ESA.

- Compensatory mitigation at a ratio of 2:1 will be provided for the temporary loss of PMJM habitat within the DCHCP protected property that overlaps the RCZ.
- Compensatory mitigation at a ratio of 4:1 will be provided for the permanent loss of PMJM habitat within the DCHCP protected property that overlaps the RCZ.
    - The habitat for enhancement must be preserved prior to the impacts occurring
- Riparian vegetation in temporary and permanent areas of impact will be mowed or cut to a height of four to six inches above the ground during the active season, while PMJM are still active and can move away (May-August). This will create a less desirable habitat for hibernation, which usually starts by late September.
- All areas of temporary disturbance within the RCZ will be restored to pre-disturbance contours and will be revegetated per the DCHCP revegetation guidelines. Changes to the pre-disturbance contours are acceptable if they can be demonstrated to be beneficial to the RCZ and PMJM habitat, or if the intention of the work is to return the area or facility to designed grades (e.g., the removal of sediment from man-made drainage channels, ditches, storm outfalls, and detention ponds). Excess material will be disposed of at a location outside the RCZ approved by the County of Towns.
    - Returning to pre-disturbance grades is not feasible for this project due to the need for new construction that is compliant with the Americans with Disabilities Act (ADA). Wilson & Company and the Town of Castle Rock will consult with qualified ecologists from Pinyon Environmental to establish a more robust and diverse vegetative community post-disturbance.
- Disturbance to the RCZ will be limited to the minimum amount necessary and the minimum duration possible to accomplish the work.
- Topsoil depths will be identified, and topsoil will be salvaged from areas within the RCZ to be excavated or graded then revegetated. Salvaged topsoil will be stockpiled outside the RCZ and not mixed with non-topsoil. The salvaged topsoil will be placed in the same relative position as it was excavated. If the soil is not returned within 30 days, the stockpiles should be temporarily seeded with a sterile cover crop, or the seed mix listed in Table 4-A of Appendix 4 (DCHCP 2006).
- Stockpiled materials will be placed outside the RCZ and the stream channel and protected from transport from stream flows or runoff by using erosion and sediment controls.
- Temporary construction fence will be used to deter unauthorized access to portions of the RCZ that will not be disturbed but lie within or adjacent to the work area.
- Revegetation will occur as soon as practicable after the activity (or each phase of a multiphase activity) has been completed in accordance with the recommended seasons for revegetation and with practices conducive to success. Disturbed areas will have sediment and erosion control devices installed and maintained in accordance with the Douglas County Grading, Erosion and Sediment Control (GESC) Manual until revegetation has been completed and determined successful by Douglas County/Town. Revegetation will meet the success criteria for revegetation listed at the beginning of Appendix 4.

- Trees and shrubs removed from the RCZ due to temporary impacts will be replaced as practicable according to the Woody Riparian Vegetation Guidelines (DCHCP 2006; Appendix 5).
- All practicable measures will be taken to avoid excess application and introduction of chemicals into aquatic ecosystems. Use of chemicals such as soil stabilizers, dust palliatives, sterilant, growth inhibitors, fertilizers, deicing salts, etc., during construction and maintenance operations will be limited to application rates recommended by the manufacturer or County- or Town-approved rates.
- Measures will be taken to prevent spilled fuels, lubricants, or other toxic materials from entering the RCZ and will follow the general construction practices of the GESC Manual (DCHCP 2006; Section 5).
- Measures will be taken to minimize temporary and permanent loss of woody vegetation within the RCZ in accordance with the DCHCP (2006) - Appendix 5. In all cases, blading and grubbing of woody vegetation will be avoided in areas of temporary disturbance. Woody vegetation within the RCZ will be cut to ground level in areas of temporary disturbance without removing the root mass.
- When temporary crossings or work areas occur in wetlands and riparian areas, especially in willows, the construction area will be prepared so that impacts are limited and temporary. In such cases, the vegetation will be cut down to a two-inch stubble height, geotextile fabric will be laid down, and a layer of certified weed-free hay or straw will be laid on top. Thereafter, a soil layer at least two feet thick can be applied on which construction equipment can move. After construction is complete, the layer of dirt will be removed until the layer of hay or straw is encountered. This layer signifies that the geotextile fabric layer is near, and more careful excavation is necessary. Last, the layer of geotextile fabric will be removed.
- Staging areas will not be placed within the RCZ. Measures will be taken to minimize surface runoff from the staging areas into the RCZ according to the Douglas County GESC Manual.
- Emergency repairs and cleanups within the RCZ will limit disturbance to the area necessary to accomplish the repair or cleanup.
- The activity will not form a permanent barrier to species' movements within the RCZ.
- All construction area supervisors will be given a standard informational packet regarding construction activities within the RCZ and compliance with the DCHCP.

7.1 Habitat Restoration and Enhancement

Because both temporary and permanent impacts to PMJM 's habitat are anticipated, mitigation measures in the form of habitat restoration and enhancement will be implemented. Habitat restoration mitigation would be implemented with the aim of returning degraded or damaged ecosystem to its natural state by fixing disturbance caused as a result of temporary impacts. Similarly, habitat enhancement mitigation focusing on improving the quality of existing habitat and optimizing PMJM habitat would be implemented for permanent impacts. Although temporary impacts would be restored

in place, additional mitigation would be required for temporary impacts since a greater than 1:1 mitigation ratio is being applied in both the CDOT mitigation bank and DCHCP/RCZ.

Details of the mitigation plan such as planting lists, restoration locations/enhancement associated with permanent impacts, methods, etc. will be provided in a BA addendum. This addendum will be approved by CDOT and USFWS for the impacts to the CDOT mitigation bank. Trees and shrubs that are lost within the CDOT mitigation bank/RCZ/DCHCP protected property will be replaced according to SB-40 and the DCHCP's Woody Riparian Vegetation Guidelines (2006, Appendix 5). Replacement of trees and shrubs shall occur as follows:

- As per SB-40, if native and non-native trees and woody shrubs are removed from the riparian areas, they will be replanted on a 1:1 basis with species from Table 3-A of the DCHCP.
- Shrubs will be replaced/replanted based on aerial coverage.
- The entire area of disturbed woody vegetation shall be replanted at the following density: shrub willow cuttings will be planted on a one foot spacing in highly erodible areas and three-foot spacing in other areas. Tree type willow pole cuttings (e.g., peachleaf willow) shall be planted six to twelve feet apart. All other shrubs and trees shall be spaced at ¾ of their maximum mature spread when planted adjacent to another of the same species, of ¾ of the average of the maximum mature spread between adjacent plants of different species.
- If a shrub is to be an understory plant, its spacing can be superimposed on canopy species in the vicinity. Openings or grass/herbaceous strips may be created in the woody revegetation areas to create diversity or a mosaic effect. Spacing may be decreased (planted more closely) to create clumps or thickets, or to ensure adequate plant survival to meet the success criteria outlined in this appendix.

7.1.2 CDOT Mitigation Bank

All temporarily impacted areas within the CDOT mitigation bank and RCZ would be restored in-place to pre-construction conditions to the maximum extent possible. Mitigation for impacts would be completed onsite within the CDOT mitigation bank/RCZ, depending on the impact area. Any impacts in the CDOT mitigation bank would be mitigated within the CDOT mitigation bank, with specified mitigation and locations to be designated in coordination with CDOT and approved by CDOT.

To compensate for the permanent impacts 0.16 acre of PMJM habitat and temporary impacted to 0.19 acre of habitat within the CDOT mitigation bank/RCZ, enhancement and restoration mitigation at ratios of 4:1 and 3:1 would be utilized, respectively. Based on these ratios, 0.64 acre would be the total required acreage for enhancement mitigation and 0.38 would be the total required acreage of restoration mitigation. The exact amount of compensatory mitigation would be determined in coordination with the USFWS, based on existing conditions and restoration potential at the mitigation site.

PMJM impacts will be mitigated through habitat improvement activities that include restoration, rehabilitation, enhancement, and maintenance of wildlife habitat within the designated RCZ that results in a net benefit to the RCZ and PMJM habitat (DCHCP 2006). These improvements may include streambank stabilization, bioengineering, planting, seed bed preparation, weed control, recontouring, and seeding. In addition, transplanting salvaged shrubs and planting cuttings/poles, willow brush mattresses, soil lifts, willow trenches, beaver dam analogs and/or post assisted log structures would be included. An emphasis would be placed on reestablishing hydrology; loosening/amending compacted and degraded soils and planting those areas.

Connectivity ledges would be installed in culverts below the paved crossing over East Plum Creek to help encourage the movement of PMJM across East Plum Creek post construction. Such structures have proven successful in encouraging the movement of small mammals, including PMJM, in Colorado (Meaney et al. 2007).

To be considered an improvement to PMJM habitat, the activity must result in a net benefit to the RCZ, which is defined as an increase in native woody vegetation cover and/or diversity, a reduction in undesirable non-native species and/or weedy species, or in the case of existing grasslands that adjoin riparian areas, an increase in vegetation cover and/or diversity of native grassland species.

7.2.2 DCHCP Protected Property

Mitigation measures are only applicable to those areas of the DCHCP which overlap the RCZ. For all areas outside the RCZ, those areas are covered by the DCHCP and therefore, already have approved compensatory mitigation under Section 10 of the ESA. To compensate for the permanently impacted 0.04 acre and temporarily impacted 0.11 acre of disturbance within DCHCP protected property overlapping the RCZ, enhancement and restoration mitigation ratios of 4:1 and 2:1 will be utilized, respectively. Using the aforementioned ratios, 0.16 acre will be the total required acreage for enhancement mitigation and 0.22 will be the total required acreage of restoration mitigation. The exact amount of compensatory mitigation will be determined in coordination with the USFWS, based on existing conditions and restoration potential at the mitigation site.

Mitigation for impacts will be completed onsite within the DCHCP/RCZ. The exact amount of compensatory mitigation will be determined in coordination with the USFWS, based on existing conditions and restoration potential at the mitigation site.

The proposed mitigation ratios are weighted based on the type of impact (temporary or permanent) and the category of PMJM habitat (riparian versus upland) that will be impacted. These ratios are shown in **Table 3** below. Preferred mitigation for permanent impacts will occur within the Action Area to restore PMJM habitat near to areas that will be directly impacted by the Project.

Table 3. Proposed Mitigation Ratios

Mitigation	Habitat		Total (Acre)	Mitigation Acreage		Total Mitigation (Acre)
	Riparian	**Upland**	**All**	**Riparian**	**Upland**	**All**
Enhancement for CDOT Permanent (4:1)	**0.14**	**0.02**	**0.16**	**0.56**	**0.08**	**0.64**
Restoration for CDOT Temporary (2:1)	**0.18**	**0.01**	**0.19**	**0.36**	**0.02**	**0.38**
Enhancement for DCHCP Permanent (4:1)	**0.04**	**0.00**	**0.04**	**0.16**	**0.00**	**0.16**
Restoration for DCHCP Temporary (2:1)	**0.11**	**0.00**	**0.11**	**0.22**	**0.00**	**0.22**
Totals	**0.47**	**0.03**	**0.40**	**1.48**	**.11**	**1.59**

As stated above, restoration of disturbed areas will involve using vegetation communities that provide a net benefit to the RCZ and PMJM habitat. Restoring and enhancing habitat through seeding and noxious weed control will increase PMJM habitat cover, hibernation areas, and foraging opportunities as well as increase PMJM habitat connectivity.

7.2 Performance and Monitoring Standards

The following performance and monitoring standards will be followed during mitigation activities.

7.2.1 Success Criteria

7.2.1.1 CDOT MITIGATION BANK

Restoration of temporary impacts will be considered successful when:

- Herbaceous vegetation along transects in riparian areas must equal or exceed 80% of the foliar cover on undisturbed riparian areas immediately surrounding the project site (expressed as relative cover), and vegetation shall not show signs of stress or continued need for vegetative management (irrigation or herbivory protection, weed management, etc.).
- Herbaceous vegetation along transects in upland areas must equal or exceed 70 percent of the foliar cover on undisturbed upland areas immediately surrounding the project site (expressed as relative cover), and vegetation shall not show signs of significant stress or continued need for vegetative management.
- Woody vegetation along transects in riparian areas must equal or exceed 80% of the canopy cover on undisturbed neighboring riparian areas, and vegetation layer does not show signs of significant stress or continued need for vegetative management.
- Native vegetation across all strata shall be ≥50%.
- In all PMJM mitigation areas, state listed noxious weeds will be controlled. List A weeds shall not be present. Foliar cover of List B and C weeds shall be no greater than 5%

7.2.1.2 DCHCP PROTECTED PROPERTY

Areas of temporarily disturbed woody vegetation must be revegetated with appropriate woody vegetation (DCHCP 2006; Table 3A). Minimum success criteria as outlined in the DCHCP (2006) are as follows.

- The area replanted should generally be the same area that was disturbed. Expanding the area to be planted is generally acceptable, unless grassy or herbaceous vegetation is limited in the area. Increasing the area to be replanted is generally encouraged to both increase habitat quality and to ensure that sufficient area is restored to prevent the delays and additional costs associated with replanting and remediation.
- To be considered successfully revegetated, the disturbed area must be revegetated to a density of woody vegetation like the disturbed area prior to the disturbance. The density shall be calculated based on the surface area covered by tree and/or shrub canopy. For this calculation, the area covered by a tree or shrub is ¾ of its mature canopy spread (MCS), not the current cover of the newly planted immature vegetation. Table 3A of the DCHCP lists ¾ MCS for each species.

The following minimum standards must be met at the end of two growing seasons for woody revegetation to be considered successful and to be released from monitoring efforts.

- All transplants (bare-root, potted and balled-and-burlapped) must survive to at least 80 percent canopy density, based on ¾ MCS.
- Pole plantings must survive to at least 70 percent canopy density, based on ¾ MCS.
- Woody material used in bioengineering techniques must survive at reasonable rates to ensure the success of the technique.

Aerial imagery and pre-construction vegetation surveys will be conducted in the spring for ground cover estimates which will then be used to compare revegetation success post-construction.

7.2.2 Performance Monitoring

FHWA, CDOT, and Douglas County recognize the importance of a performance monitoring program that evaluates both the habitat restoration and effects of that restoration on PMJM. The performance monitoring program will evaluate the success of habitat restoration efforts by tracking the actions of project-related activities, associated conservation actions, and recording any adverse effects. The effectiveness of all implemented avoidance, minimization, and conservation measures will also be evaluated. Effectiveness monitoring determines if the anticipated impacts stated in this BA and permitted in the BO are occurring, and if the success criteria objectives of this BA are met.

Effectiveness monitoring will involve assessing the disturbed area **(Table 2)** and documenting revegetation efforts. This monitoring includes overseeing the revegetation contract, selecting suitable plant species, ensuring correct planting methods, and applying best management practices (BMPs). Following planting, revegetated areas will be surveyed for a minimum of three years on CDOT mitigation sites and RCZ, until the success criteria outlined in the Biological Opinion (BO) are met. The results of these monitoring activities will be reported to the U.S. Fish and Wildlife Service (USFWS) in an annual report. Both the Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) will submit a joint annual report to USFWS detailing the progress of all activities addressed in the BA and BO. Additionally, CDOT will provide a separate report to USFWS outlining any actions taken, any additional impacts (if applicable), and an updated project database.

Additional performance monitoring for the RCZ includes the following parameters:

- All plantings must be monitored for a minimum of three years. An inspector designated by the appropriate local jurisdiction and experienced in native plant material shall conduct inspections. Verification of appropriate coverage/density shall be based on a visual inspection for sufficient density without counting or measures.

8 Conclusion and Effects Determination

The proposed Project would create a pedestrian trail connecting East Plum Creek to the Miller Park connection. This work would directly affect PMJM habitat by permanently reducing or temporarily disturbing a total of 0.31 acre of PMJM habitat between initial disturbance and mitigation establishment. Construction may result in unintentional injury or mortality to one or more individuals or a reduction in productivity of the species. For these reasons, it is recommended that USFWS determine that the Project ***may affect, and is likely to adversely affect, PMJM*** and that the Project would have **no effect on designated critical habitat for PMJM.**

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10 Appendices

Appendix A USFWS List of Threatened and Endangered Species (IPaC)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Colorado Ecological Services Field Office
Denver Federal Center
P.O. Box 25486
Denver, CO 80225-0486
Phone: (303) 236-4773 Fax: (303) 236-4005

In Reply Refer To: 02/14/2025 22:54:50 UTC
Project Code: 2024-0019841
Project Name: Castle Rock Industrial Trail

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

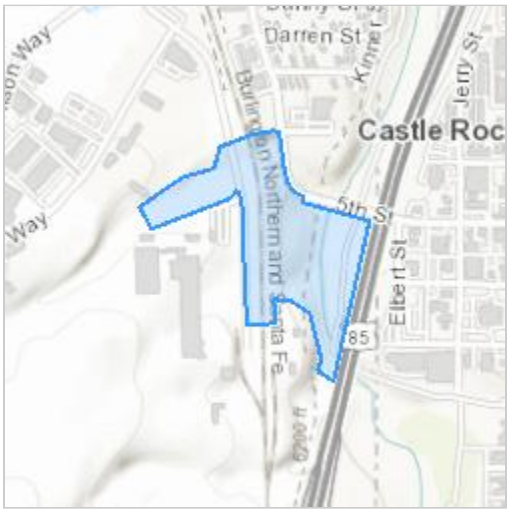
This species list is provided by:

Colorado Ecological Services Field Office
Denver Federal Center
P.O. Box 25486
Denver, CO 80225-0486
(303) 236-4773

PROJECT SUMMARY

Project Code: 2024-0019841
Project Name: Castle Rock Industrial Trail
Project Type: Bridge - New Construction
Project Description: Construction of bicycle and pedestrian lanes, paths, and facilities
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.3738018,-104.8647797636975,14z



Counties: Douglas County, Colorado

ENDANGERED SPECIES ACT SPECIES

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Preble's Meadow Jumping Mouse *Zapus hudsonius preblei*	Threatened

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/4090
General project design guidelines:
https://ipac.ecosphere.fws.gov/project/E4KZVMNXO5AG3LGBQEYHRKDQYY/documents/generated/6861.pdf

BIRDS

NAME	STATUS
Piping Plover *Charadrius melodus*	Threatened

Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.
There is **final** critical habitat for this species. Your location does not overlap the critical habitat.
This species only needs to be considered under the following conditions:
- Project includes water-related activities and/or use in the N. Platte, S. Platte, and Laramie River Basins which may affect listed species in Nebraska.

Species profile: https://ecos.fws.gov/ecp/species/6039

Whooping Crane *Grus americana*	Endangered

Population: Wherever found, except where listed as an experimental population
There is **final** critical habitat for this species. Your location does not overlap the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/758

FISHES

NAME	STATUS
Pallid Sturgeon *Scaphirhynchus albus*	Endangered

No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:
- Water use or contamination may adversely affect the species. Within the Platte River basin, depletions may adversely affect the species. These affects must be considered even outside occupied range. See local FWS office for more information.

Species profile: https://ecos.fws.gov/ecp/species/7162

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Proposed Threatened

There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/9743

Suckley's Cuckoo Bumble Bee *Bombus suckleyi*	Proposed Endangered

Population:
No critical habitat has been designated for this species.

NAME	STATUS

Species profile: https://ecos.fws.gov/ecp/species/10885

FLOWERING PLANTS

NAME	STATUS
Ute Ladies'-tresses *Spiranthes diluvialis*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/2159

Western Prairie Fringed Orchid *Platanthera praeclara*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1669

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency:	Private Entity
Name:	Tiffany Gentry
Address:	990 S Broadway St.
Address Line 2:	Suite 220
City:	Denver
State:	CO
Zip:	80209
Email	tiffany.gentry@wilsonco.com
Phone:	3034063947

Appendix B Site Photos



Photo 1: Low-quality PMJM habitat on top of hill to the west side of the creek, outside of the RCZ.



Photo 2: Far right, on top of hill to the west of East Plum Creek.



Photo 3: RCZ limit slope on the west side of East Plum Creek.



Photo 4: RCZ cuts through dense cottonwoods and leaf litter on slope to the right of East Plum Creek



Photo 5: Moderate-quality PMJM habitat; cottonwoods and dense shrubs on slope near RCZ.



Photo 6: High-quality habitat of riparian shrubs approaching East Plum Creek from the west.



Photo 7: Approaching East Plum Creek from the east and current trail; low- to moderate-quality PMJM habitat.

Appendix C CPW PMJM Habitat Scorecard

Preble's Meadow Jumping Mouse

ASSESSING HABITAT QUALITY FOR PRIORITY WILDLIFE SPECIES IN COLORADO WETLANDS



© ROB SCHORR, CNHP

Preble's meadow jumping mouse *(Zapus hudsonius preblei,* Family *Dipodidae)* is a rare small mammal that lives in dense riparian vegetation along the Front Range.

Species Description

Identification

Preble's meadow jumping mice grow to approximately nine inches in length, including their five and a half-inch tails. They are mostly nocturnal and hibernate in upland areas for eight months of the year, making them difficult to observe.

Preferred Habitats

During summer months, the most important wetland types occupied by Preble's meadow jumping mice include riparian areas and adjacent wet meadows. During the summer, they prefer dense shrub, grass and forb ground cover along creeks, rivers, and associated waterbodies. From early fall through the spring, they hibernate underground in burrows that are typically at the base of vegetation and have a northerly aspect.

Diet

The diet of Preble's meadow jumping mice includes, but is probably not limited to, grass seeds, invertebrates, fungi, and insect larvae.

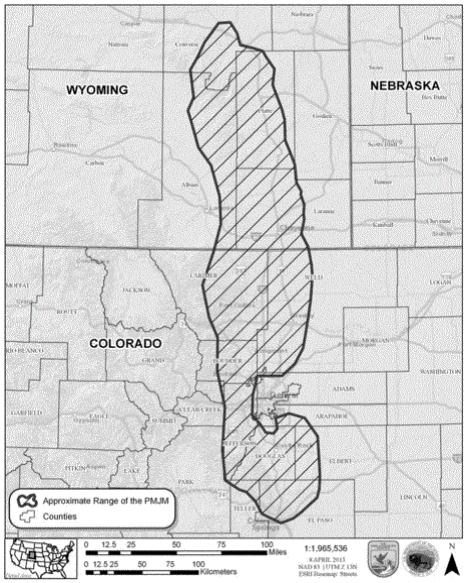
Conservation Status

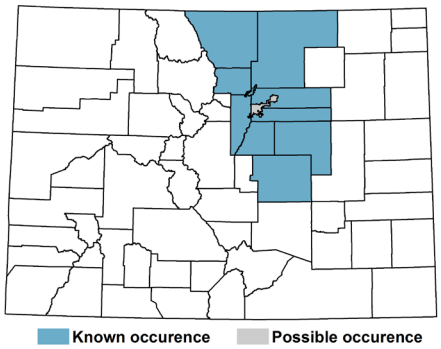
The Preble's meadow jumping mouse is listed as threatened by the U.S. Fish and Wildlife Service (USFWS 1998). In Colorado, they are listed as a threatened, Tier 1, Species of Greatest Conservation Need (CPW 2015). The Colorado Natural Heritage Program considers the subspecies to be globally-imperiled (G5 T2) and critically-imperiled with the state (S1).

Species Distribution

Range

Preble's meadow jumping mice occur only in Colorado and Wyoming. In Colorado, they are known to occupy the counties along the Front Range from the Wyoming border through El Paso County.





Full species range map from USFWS (2004). Colorado map based on Grunau et al. (1999), and Schorr (2001).

Preferred Habitat Conditions

Distance from riparian habitat patch to water	<10 yards
Dominant vegetation	a combination of grasses, shrubs, forbs, and trees
Habitat size	>60 acres
Herbaceous vegetation height	>20–40 inches
Landscape context	ungrazed
Percent ground cover	densely vegetated; between grasses, forbs, and shrubs, close to 100%
Species richness	>20 plant species

Management Recommendations

This fact sheet contains easy-to-use guidelines for understanding habitat needs of Colorado Parks and Wildlife priority wetland-dependent wildlife. A number of practical steps can be taken to improve habitat for Preble's meadow jumping mouse.

Hydrology

- Maintain or restore natural regime.
- Control erosion within stream corridor.

Vegetation

- Provide, restore, and enhance riparian vegetation.
- Provide, restore, and enhance upland shrub.
- Provide, restore, and enhance grassland habitat.
- Control noxious weeds, avoiding May through October.
- Consider providing woody debris.

Conservation

- Use best strategies to minimize disturbance.



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Acknowledgements
Robert Schorr (Colorado Natural Heritage Program) reviewed an earlier version and provided input on preferred habitat conditions.

Suggested Reading and Citations

CPW (Colorado Parks and Wildlife). 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Denver, Colorado.

Grunau, L., R. Schorr, D. Green, B. Rosenlund, C. Pague, and J. Armstrong. 1999. Conservation and management plan for the Preble's meadow jumping mouse on the U. S. Air Force Academy. Colorado Natural Heritage Program unpublished report to the Natural Resources Branch, U.S. Air Force Academy.

Meaney, C. A., A. K. Ruggles, B. C. Lubow, N. W. Clippinger. 2003. Abundance, survival, and hibernation of Preble's meadow jumping mice (*Zapus hudsonius preblei*) in Boulder County, Colorado. *Southwestern Naturalist* 48: 610-623.

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Trainor, A. M, T. M. Shenk, and K. R. Wilson. 2007. Microhabitat characteristics of Preble's meadow jumping mouse high-use areas. *Journal of Wildlife Management* 71: 469-477.

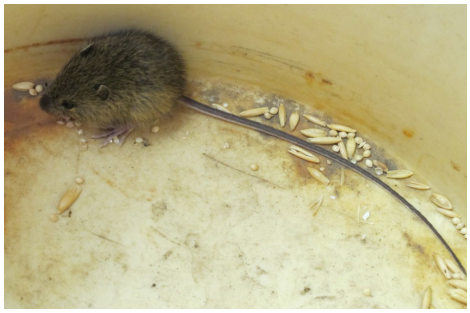
Trainor, A. M., T. M. Shenk, and K. R. Wilson. 2012. Spatial, temporal, and biological factors associated with Preble's meadow jumping mouse (*Zapus hudsonius preblei*) home range. *Journal of Mammalogy* 93: 429-438.

U.S. Fish and Wildlife Service (USFWS). 2013. Endangered and threatened wildlife and plants: 12-month finding on two petitions to delist the Preble's meadow jumping mouse. *Federal Register* 78: 31680-31712.

USFWS. 2015. Draft recovery plan Preble's meadow jumping mouse (*Zapus hudsonius preblei*). U.S. Fish and Wildlife Service, Region 6, Lakewood, Colorado.



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Habitat Scorecard for Preble's Meadow Jumping Mouse (v. Jan 2016)

Assessment of habitat before and after restoration or management actions

Project Name:_____ Date(s) of Assessment: _____

Instructions: Enter one value that best describes early to mid-summer conditions of each habitat variable, using the numbers in the value column. Habitat variables are in shaded boxes; ranges of condition are directly below each variable. If condition is outside range or is not described, enter a zero.

Key habitat variable and conditions	Value	Before	After
Dominant vegetation			
Combination of sedges, grasses, annual and perennial forbs and dense shrubs	13.2		
Combination of sedges, grasses, and dense shrubs	8.8		
Combination of sedges, grasses, and more open shrubs	4.4		
Percent grass cover			
>40%	13.2		
>20 – 40%	8.8		
10 – 20%	4.4		
Percent shrub cover			
>80%	13.2		
>50 – 80%	8.8		
5 – 50%	4.4		
Distance from habitat patch to water			
<10 yards	12.5		
10 – 20 yards	8.4		
>20 – 40 yards	4.2		
Species richness (number of species in vegetation community)			
>20 species	11.9		
10 – 20 species	7.9		
<10 species	4.0		
Habitat size			
>60 acres	10.6		
50 – 60 acres	7.0		
<50 acres	3.5		
Percent forb cover			
>35 – 50%	10.4		
>15 – 35%	6.9		
5 – 15%	3.5		
Height of herbaceous vegetation (grasses and forbs)			
>20 – 40 inches	9.9		
8 – 20 inches	6.6		
<8 inches	3.3		
Land use within 100 yards			
Ungrazed	5.1		
Grazed lightly	3.4		
Grazed moderately	1.7		
Total (of 100 possible): add all numbers in before or after columns			

Appendix D DCHCP Appendix 4; Revegetation Guidelines

Appendix 4:
Revegetation Guidelines

Introduction

The general Best Management Practices for all covered activities require that all temporary disturbances associated with covered activities within the RCZ be revegetated. Appendix 4 presents the revegetation guidelines for areas that do not have woody vegetation. Additional guidance and requirements to avoid, minimize, and replace lost woody vegetation within the RCZ is presented in Appendix 5.

This appendix provides recommendations to establish herbaceous vegetation within the RCZ following temporary disturbances. It contains seeding and planting recommendations, including species appropriate for riparian, upland, and wetland areas in Douglas County.

All revegetation plans will be written or verified by a person familiar with plant ecology. Reseeding will be conducted in accordance with such plans. Inspections to verify plant survival will be conducted or verified by a person with similar knowledge.

Seeding

The seed mixes listed in Tables 4-A and 4-B are appropriate for seeding areas of temporary disturbance within the RCZ. The seed mixes are designed to accommodate all soil types. The following guidelines are applicable to seeding:

- Order seed early because native seed may be in short supply.
- All temporarily disturbed areas within the RCZ shall be reseeded using a sterile cover crop or the appropriate seed mix listed in this appendix. The mixes may be modified due to lack of seed availability; development of new seed/plant varieties; new seed or plant materials becoming commercially available; adjustments of the mix to the specific site conditions; habitat requirements or due to field experience proving success or failure of specific species, varieties or techniques. All plant species used must be beneficial and native to the County.
- Seeding must occur within 3 days of topsoil placement unless delayed by weather conditions improper for seeding or crimp mulching. Seeding will not occur when the ground is frozen.
- Once construction and ground disturbing activities have been completed, the site must be seeded as conditions and season allow. If seeding must occur between May 2 and September 30, disturbed areas may be seeded with a sterile cover crop such as Quickguard or Regreen, or a crop that will be killed by frost before going to seed. The cover crop shall not be cut. The permanent native seed mix shall be seeded into the standing cover crop during the first dormant period suitable for seeding (October 1 through May 1) after planting the cover crop unless the cover crop was planted late in the previous growing season, was not winterkilled and will continue to grow as a winter-wheat type crop for part of the following growing season. In that case, the permanent mix shall be planted a year later during the dormant period (October 1 through May 1) to allow the cover crop

time to come to maturity and die, avoiding competition with seeded species. Wetland seeding and plantings can be excepted from the additional year delay if it is likely that the area will become inundated and kill the cover crop.

- Planting a cover crop as specified above and seeding the native grass mix into the cover crop the second year can increase the successful establishment of grasses in most instances.
- A properly prepared seedbed is critical for a successful restoration site. Seeds may not grow or may grow slowly in soils that are too compacted, and soils that are too loose may lead to erosion and poor germination. After grading, rip soil to a minimum of 12 inches. Avoid or minimize compaction associated with vehicles driving over ripped soil.
- Add fertilizer only if the soil is deficient in a particular nutrient (such as nitrogen). If used, select a slow release fertilizer or organic fertilizers such as Biosol™. In general, native plants do not need much nitrogen, and too much nitrogen can "burn" young native seedlings and encourage heavy weed growth.
- Mycorrhizal and/or beneficial bacterial inocula may aid revegetation efforts and should be considered where topsoil is lacking or deficient in microbial flora, in soils recently subjected to heavy disturbance, and in burned areas.
- The environmental contractor shall supply the County or Town with all seed bag tags and a certification from the supplier stating that the seed complies with the Federal Seed Act. All seed must be guaranteed for purity and germination, free of noxious weed seeds, and supplied on a pure live seed (PLS) basis. Using the seed species name listed on the "Certified Seed Blue Tag," verify that the seed received is the seed specified prior to seeding.
- Seed shall be drilled where appropriate, but may be broadcast in areas that cannot be accessed using a drill seeder. **Double rates for broadcast seeding.** Seeding equipment used for applying grass seed shall be designed, modified, or equipped to regulate the application rate of native grass seed. Seed shall be distributed uniformly in the broadcasting device, and seed shall be distributed evenly throughout the revegetation site.
  - The most effective seeding equipment is a grass drill with 7- to 12-inch spacing and capable of planting fluffy seeds, equipped with a seedbox agitator, small seedbox, double disc furrow openers with depth bands, and packer wheels. Drills used shall be capable of dropping the seed between the double disk openers and not behind them when planting light fluffy seed. Grass seed shall be planted directly into the cover crop residue without additional seedbed preparation if a cover crop is used. The grass drill shall be operated as near to the contour as practical. To accurately maintain seeding depth, drilling speed is limited to 4 to 4.5 mph.
  - Drag chains may be used in place of packer wheels only on deep sand and similar range sites to prevent seeding too deep.
  - Any modified equipment such as air seeders and drills that control seeding depth with packer wheels must be able to insure proper seeding depth, uniform seed distribution, and firm seed-soil contact. Ground speed shall not

exceed 4 to 4.5 mph so that proper seeding depth can be maintained.

- In small areas or sites where drill seeding is not practicable, seed shall be broadcast and lightly raked to cover the applied seed with a soil thickness no greater than 0.5 inches in depth. A spike-toothed harrow pulled behind a tractor or ATV may be used to cover the seed in this application, or the seed may be raked lightly into the soil by hand.
- Hydroseeding may only occur on slopes that are too steep for drill seeding equipment to be safely or effectively operated.
- A straw mulch shall be applied at a rate of 4,000 lbs/acre, and crimped into the soil surface. If seed is planted into a standing cover crop, mulch shall not be applied. Wheat straw free of noxious weed seed and undesirable plant seed shall be used. Mulch shall be applied to seeded areas no more than 24 hours after seeding; however, mulching shall not take place during adverse weather conditions or when wind prevents uniform distribution and must be postponed until adverse weather conditions subside. Mulch shall be applied in a manner that does not compact the seedbed.
- Noxious and undesirable weeds shall be controlled within RCZ revegetation areas. Control shall start as soon as possible, preferably prior to ground disturbance. Herbicides may injure young grass seedlings during their first growing season and shall be applied during the first season only after grasses have matured beyond their susceptible stage for the selected herbicide if practicable. Mowing and other Integrated Pest Management (IPM) techniques shall be employed as appropriate to control weeds, and especially to keep them from going to seed. Mowing may be especially important during the first growing season because some herbicides may not be able to be used in that timeframe.
- Revegetation must meet GESC Manual criteria for approval of vegetation coverage and control of noxious weeds (GESC Manual Sections 6.3 and 6.4).

Transplants — Herbaceous

Herbaceous plantings can be an effective way to revegetate temporarily disturbed wetland areas. All species used for herbaceous transplants shall be beneficial species native to Douglas County. The following guidelines are applicable to the herbaceous wetland transplants (Table 4-C):

- Transplants grown from locally collected plants or seeds have the greatest chance for long-term establishment and survival.
- Herbaceous nursery container stock comes in a variety of sizes. Transplants with well-developed root systems have the greatest potential for successful establishment. Typically, tubelings (also labeled as supercells or 3 cubic inch containers) have the most extensive root development. Small transplants (2.5-inch containers) are acceptable, but may establish more slowly than deeper-rooted transplants.

- Securely anchoring plants in inundated areas is difficult; therefore, plant emergent areas before the site is inundated. The ability to control inundation and saturation of the wetland or riparian areas will increase the potential for successful plant establishment. Sites shall be moist when planted. Increase inundation in marshes or seasonally inundated wetlands as the plants become established.
- Transplants shall be planted on approximate 3-foot centers. The density of plantings may be varied to result in a more naturalized pattern.
- After planting, the transplants shall be watered unless the soil is already saturated. Saturated conditions shall be maintained during the growing season with supplemental irrigation as needed.
- Combining wetland seeding (Table 4-B) with herbaceous wetland plantings can speed wetland vegetation establishment and increase successful revegetation of disturbed wetlands.

Table 4-A. Riparian/Upland Seed Mix.

Species	Scientific Name	Variety	Notes	% in Mix	PLS#/AC
Big Bluestem	*Andropogon gerardii*	Bonilla, Kaw, Champ, Bison	PNWS	8	0.9
Little Bluestem	*Schizachyrium scoparium*	Pastura	PNWB	8	0.6
Yellow Indiangrass	*Sorghastrum nutans*	Cheyenne, Holt, Llano	PNWS	8	0.8
Switchgrass	*Panicum virgatum*	NE28, Greenville, Blackwell	PNWS	15	0.6
Sideoats Grama	*Bouteloua curtipendula*	Vaughn	PNWB	10	0.9
Western Wheat	*Agropyron smithii*	Arriba, Rosanna	PNCS	9	1.5
Blue Grama	*Bouteloua gracilis*	Hachita	PNWB	8	0.3
Indian Ricegrass	*Achnatherum hymenoides*	Paloma, Nez Par, Rimrock	PNCB	8	1.0
Prairie Sandreed	*Calamovilfa longifolia*	Goshen/Pronghorn	PNWS	8	0.5
Green Needlegrass	*Nassella viridula*	Lodorm	PNCB	8	0.8
Slender Wheatgrass	*Agropyron trachycaulum*	Pryor, San Luis	PNCB	5	0.6
TOTAL PLS/ACRE					8.5

Notes: P=Perennial; A=Annual; N=Native; C=Cool Season; W=Warm Season; B=Bunchgrass; S=Sod former.

Table 4-B. Wetland Seeding Mix for RCZ Wetland Areas.

Common Name	Genus/Species	Variety	% in Mix	PLS#/AC
Switchgrass	*Panicum virgatum*	NE28, Greenville	10	0.4
Canada Wildrye	*Elymus canadensis*		5	0.5
Prairie Cordgrass	*Spartina pectinata*		8	0.6
Fowl Mannagrass	*Glyceria striata*		5	0.5
American Sloughgrass	*Beckmannia syzigachne*	Egan	4	0.04
Western Wheat	*Pascopyrum smithii*	Arriba/Rosana	4	0.6
Yellow Indiangrass	*Sorghastrum nutans*	Cheyenne/ Holt/ Llano	3	0.3

Big Bluestem	*Andropogon gerardii*	Bonilla/Kaw/Champ/Bison	5	0.5
Common Spike-rush	*Eleocharis palustris*		10	0.3
Arctic (Baltic) Rush	*Juncus balticus*		10	0.1
Hardstem Bulrush	*Schoenoplectus acutus*		6	0.5
Softstem Bulrush	*Schoenoplectus tabernaemontani*		6	0.2
Three Square Bulrush	*Schoenoplectus pungens*		15	1.0
Wooly Sedge	*Carex pelita (lanuginose)*		5	0.1
Nebraska Sedge	*Carex nebrascensis*		2	0.04
Water Sedge	*Carex aquatilis*		2	0.03
TOTAL PLS/ACRE				5.71

Table 4-C. Transplant species commercially available and appropriate for use in wetlands.*

Common Name	Scientific Name	Depth to Plant (Inches of Standing Water)
Woolly sedge	*Carex lanuginosa*	3" under to 3" above
Nebraska sedge	*Carex nebrascensis*	0-6" below water
Fox sedge	*Carex vulpinoidea*	0-6" below water
Creeping spikerush	*Eleocharis palustris*	0-6" below water
Baltic rush	*Juncus balticus*	0-3" above water
Torrey's rush	*Juncus torreyi*	0-3" above water
Arrowhead	*Sagittaria latifolia*	0-6" below water
Threesquare bulrush	*Scirpus americanus*	3" under to 3" above
Alkali bulrush	*Scirpus maritimus*	0-6" below water
Softstem bulrush	*Scirpus tabernaemontani*	0-6" below water
Giant burreed	*Sparganium eurycarpum*	0-6" below water
Prairie cordgrass	*Spartina pectinata*	0-3" above water

*This is not an exhaustive list of plants that may be transplanted or otherwise used in wetlands in the RCZ. These wetland species are available commercially from nurseries.

Success Criteria for Seeding and Herbaceous Planting

The GESC Manual establishes the following success criteria:

- **Herbaceous Cover** — At least three plants per square foot with a minimum height of 3 inches. The three plants per square foot shall be beneficial native grasses or forbs.
- **Bare Spots** — No bare spots larger than 100 square feet.
- **Erosion** — No eroded areas as determined by County or Town staff qualified to inspect erosion.

Appendix E DCHCP Appendix 5; Woody Riparian Vegetation Guidelines

Appendix 5:
Woody Riparian Vegetation Guidelines

Introduction

The general Best Management Practices for all covered activities require that activities within the RCZ minimize temporary disturbance to and permanent loss of woody vegetation within the RCZ.[1] These BMPs further require that trees and shrubs removed from the RCZ associated with temporary impacts shall be replaced per these Woody Riparian Vegetation Guidelines.

Trees, and particularly shrubs, provide an important potential habitat component for Preble's and woody vegetation can be slow to recover from impacts or re-establish in a disturbed area. Impacts to trees and shrubs within the RCZ should be avoided and minimized to the extent practicable. Unavoidable losses of trees and shrubs associated with temporary impacts shall be mitigated through replacement.[2]

The objectives of these guidelines are to provide:

- Measures to avoid and minimize impacts to woody vegetation within the RCZ
- Methods to speed recovery to woody vegetation disturbed by covered activities within the RCZ
- Criteria for the replacement of necessary losses of woody vegetation within the RCZ associated with temporary impacts

This document contains best management practices to avoid and minimize impacts to woody vegetation. In addition, it contains planting recommendations, including species appropriate for streamside and upland areas within the RCZ in the plains, foothills, and montane environments of Douglas County.

These guidelines may be modified periodically to ensure the recommendations reflect advances in revegetation technology and experience in Douglas County.

Best Management Practices to Avoid and Minimize Impacts to Woody Vegetation

The best management practices presented here are designed to avoid and minimize impacts to woody vegetation in the RCZ. In general, however, impacts to all vegetation types within the RCZ, not just woody vegetation, shall be avoided and minimized to the

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[1] These guidelines focus on woody vegetation within the RCZ. There is no attempt to distinguish between trees and shrubs that are obligate riparian species and upland trees and shrubs that occur within the RCZ. All trees and shrubs within the RCZ provide potential habitat for Preble's.

[2] Losses of the RCZ, including woody vegetation, associated with permanent impacts that replace the RCZ with non-habitat are mitigated through habitat preservation associated with the DCHCP's mitigation program.

maximum extent practicable. Additional site-specific opportunities for avoidance and minimization may be available, and project designers and engineers shall incorporate opportunities to avoid and minimize impacts to woody vegetation within the RCZ to the greatest extent practical. Best management practices for avoiding impacts to woody vegetation include:

- Plan and adjust site grading so that impacts to woody vegetation can be avoided. It is recommended that engineers visit a site frequently during the design, grading, and construction phases of a project so that adjustments can be made that limit impacts to woody vegetation. Minor adjustments to alignments and footprints, road and building elevations, and slope steepness can significantly diminish impacts to woody vegetation within the RCZ.
- Avoid clearing and grubbing woody vegetation in areas of temporary impacts. If necessary, prune woody vegetation to ground level so that it may grow back following construction.
- Avoid the unnecessary removal of trees or shrubs; for example, prune the aerial portions of trees and shrubs that hang over a project area and interfere with equipment.
- When it is necessary to clear woody vegetation, leave at least a quarter of the trunks and branches greater than 2 inch in diameter piled in windrows on the project site. The dead woody vegetation can provide cover for Preble's.
- Temporary fencing should be erected at the limits of all construction sites so that vegetation not to be disturbed is not inadvertently impacted during construction.

Replacement of Woody Vegetation

Losses of woody vegetation (trees and shrubs) in the RCZ associated with temporary impacts shall be mitigated. All trees that are removed by activities with temporary impacts other than Russian olive (*Eleagnus angustifolia*), Siberian elm (*Ulmus pumila*), crack willow (*Salix fragilis*), white willow (*Salix alba* var. *vitellina*), buckthorn (*Frangula alnus*), or salt cedar (*Tamarix* spp.) shall be replaced. Replacement of trees and shrubs shall occur as follows:

1. Trees or shrubs removed from areas of temporary disturbance within the RCZ shall be replaced on a 1:1 basis with appropriate species from Table 3-A.
2. The entire area of disturbed woody vegetation shall be replanted at the following density: shrub willow cuttings shall be planted 1 to 3 feet apart, 1 foot apart in areas of higher erosion. Tree type willow pole cuttings (e.g., peachleaf willows) shall be planted 6 to 12 feet apart. All other shrubs and trees shall be spaced at ¾ of their maximum mature spread when planted adjacent to another of the same species, or ¾ of the average of the maximum mature spread between adjacent plants of different species (see Table 3-A). If a shrub is to be an understory plant, its spacing can be superimposed on canopy species in the vicinity. Openings or grass/herbaceous strips may be created in the woody revegetation areas to create diversity or a mosaic effect. Spacing may be decreased (planted more closely) to create clumps or thickets, or to ensure adequate plant survival to meet the success

criteria outlined in this appendix.

Woody vegetation can be replaced using transplants from nurseries or willow stakes and cottonwood pole cuttings. The trees and shrubs lost shall be replaced with appropriate species from Table 3-A. These trees and shrubs are native to Douglas County.

Transplants — Woody

Woody species appropriate for transplanting in Douglas County are listed in Table 3-A. The following recommendations will increase the survival and establishment of woody transplants:

- The soil shall be prepared—either disked, tilled or a hole dug twice the diameter of the root ball of the tree/shrub. Soil preparation reduces compaction and competitive vegetation.
- Transplants shall be inoculated with appropriate mycorrhizae if there is not a reasonable expectation of a sufficient quantity of *appropriate* mycorrhizal propagules in the soil. Previously inoculated nursery stock is available; the roots or root zones of transplants may be inoculated at the time of planting.
- Leguminous shrub/tree transplants (e.g., leadplant) shall be inoculated with an appropriate rhizobium unless the stock was previously inoculated or is now likely to be colonized.
- If the soil is likely to be deficient in natural microflora other than mycorrhizae, the appropriate local jurisdiction may require an appropriate inoculum or addition of "live" topsoil from an appropriate area.
- The addition of organic matter to soils deficient in humus may be necessary unless the transplants are adapted to deficient soils.
- Water retention polymer (i.e., polyacrylamide or PAM) and slow-release fertilizer tab(s) sufficient for the specific transplant shall be placed in its root zone.
- Weed barrier or mulch shall be used whenever practicable around each planted shrub or tree to protect from competition and to moderate soil temperatures. This requirement may be eliminated if grasses or forbs are to be planted in close proximity to the shrub or the barrier/mulch would otherwise be counter-productive.
- For optimal survival, trees and shrubs should be transplanted in early spring prior to May 1. Trees and shrubs shall not be transplanted from May 1 through October 15 unless potted or balled and burlapped plants are used ***and*** are watered by an automatic drip irrigation system or consistently watered with a portable tank or by hand. No woody transplants should be planted between October 15 and ground thaw in the spring.
- If browsing from beaver, deer, elk, etc. is a concern, each shrub shall be encircled by a protective cage and each tree trunk protected with wire mesh. Alternatively, rabbit guards secured with bamboo poles may be used for smaller stock in some cases.

- The root ball shall be moist when planted. After planting, each planting shall be watered to ensure good soil to root contact and minimize air pockets.
- In areas where soils are not saturated or constantly moist, supplemental irrigation shall be provided as needed to ensure the transplants' long-term survival. Irrigation shall be applied as needed for at least the first two growing seasons.

Bare Root Whips or Tubeling Potted Trees and Shrubs

If bare root whips or tubeling potted trees or shrubs are planted, the following protocol will help to ensure success.

- The ground shall be disked or worked thoroughly to prepare it to receive the trees and reduce undesirable vegetation.
- The roots/root zones of transplants shall generally be inoculated with an appropriate mycorrhizal inoculum if there is not a reasonable expectation of a sufficient quantity of appropriate mycorrhizal propagules in the soil.
- Other inocula may be required for leguminous transplants (rhizobium) or for soils deficient in beneficial natural microflora.
- If the soil is likely to be deficient in natural microflora other than mycorrhizae, the appropriate local jurisdiction may require an appropriate inoculum or addition of "live" topsoil from an appropriate area.
- The addition of organic matter to soils deficient in humus may be necessary unless the transplants are adapted to deficient soils.
- Whips shall be planted using a tree-planting implement with a spade to open a furrow and packer wheels to firm the soil around the roots of transplanted trees, or hand dug.
- Whips shall be spaced within rows based on ¾ of their mature spread (Table 3-A). Under-story plants may be planted more densely or superimposed on the spacing of the over-story shrubs/trees. To establish clumps or thickets or to ensure adequate survival, trees/shrubs may be planted more densely.
- Rows should generally be spaced a minimum of six feet apart (to accommodate weed barrier), but may be varied to provide adequate spacing to accommodate the mature spreads of the species involved. Rows may be spaced farther apart to allow for a grass/herbaceous strip between rows of shrubs/trees. Row spacing may be tightened to accomplish a thicket or clump planting effect, especially with smaller shrubs or to ensure enough plant survival to meet performance specifications.
- A slow release fertilizer tab (or tabs) and hydrated water-retention polymer (PAM) shall be applied to the root-zone of whips and tubelings.
- Weed barrier shall be placed over the rows of whips with a weed-barrier implement. The location of each tree should be marked with spray paint at the time of installation and later slit and the tree stem pulled through. The weed barrier must be anchored with soil on the edges, and staked with landscape staples periodically and beside openings for trees. Weed barrier squares may be placed by hand. Organic mulch may be applied in lieu of weed barrier.

- If browsing from beaver, deer, elk, etc. is a concern, each shrub shall be encircled by a protective cage and each tree trunk protected with wire mesh. Alternatively, rabbit guards secured with bamboo poles may be used for smaller stock in some cases.
- Plantings shall be irrigated to ensure their survival. Local experience suggests that during the months of May – August, one gallon of water per shrub applied bi-weekly is probably adequate for bare-root stock planted per this protocol on clay or loam soils. Irrigation shall occur for at least the first two seasons after planting.

Willow Stakes and Cottonwood Pole Cuttings

Willows and cottonwoods can be obtained from nurseries as bare root, container, or balled and burlapped stock or can be established from stakes and poles in the spring. Willow stakes and cottonwood pole cuttings are appropriate for use in wetland and riparian areas with ground water levels within 2.5 feet of the surface for willow shrubs and 4 feet for pole cuttings during the growing season. The willow and cottonwood species listed in Table 3-A can be used for cuttings as follows.

- Cuttings should be taken from live wood that is at least 2 years old.
- Willows and cottonwoods should be cut in the spring while plants are dormant (before the leaves appear). This is typically prior to April 15.
- Optimally, live cuttings should be taken from willow and cottonwoods found on or near the site. The trees and shrubs should be cut a minimum of 8 to 10 inches from the ground with loppers or handsaws. Cuts should be at a 45º angle.
- Never harvest more than 60 percent of any one plant; if there is an abundant resource, harvest no more than 30 percent of individual plants.
- Willow shrub cuttings should be approximately 2 to 3 feet long and greater than ½ inch in diameter.
- Cottonwood or willow tree pole cuttings should be 4 to 20 feet in length and 3 inches or greater in diameter.
- All side branches and the terminal bud shall be trimmed off.
- Willow and cottonwood cuttings shall be long enough so that the bottom ⅓ of the stake or pole reaches soil that will remain saturated throughout the growing season, and at least the upper ⅓ of the stake remains above the soil surface. **It is important to plant willow stakes and cottonwood poles deep enough so that the bottom of the cutting reaches saturated soil throughout the growing season.**
- Immediately after cutting, all live stakes shall be placed in water so that the cut ends are covered with water. The cuttings shall be soaked in water for 5 to 7 days prior to planting but removed from soaking and planted before root tips appear. They shall be stored in a cool, humid, dark place until planting time. Cuttings may be stored for up to 6 months in a cool, dark, moist environment that maintains the cuttings dormancy.

- Willow stakes shall be planted using a piece of rebar to create a vertical hole approximately 1 to 2 feet deep. Alternatively, a narrow hole for the cutting may be dug with a shovel or auger. Approximately ⅔ of the stake shall be inserted into the hole so that the stake is in contact with the water table. After the willow cutting is inserted, the hole shall be backfilled with native soils and lightly tamped to prevent air pockets. The stake shall then be watered to help fill in the air pockets.
- To plant cottonwood or willow tree poles, a shovel or an auger shall be used to dig a hole to the ground water table (usually within 1 to 4 feet deep; if the water table is deeper, then the location may not be appropriate for cottonwoods). After the cottonwood pole cutting is inserted, the hole shall be backfilled with native soils and lightly tamped to prevent air pockets. The cottonwood poles shall then be watered to help fill in the air pockets.
- Willow stakes and poles shall be planted with the leaf buds pointing up (i.e., the stakes and poles need to be oriented in the same direction they were growing when cut).
- There should be at least two lateral buds and/or a terminal scar above ground on the cuttings (cuttings put out the largest number and strongest shoots just below a terminal bud scar).
- Alternatively, willow stakes may be planted in groups of ten or more stakes in the same manner as discussed for individual stakes. Planting several willow stakes together increases the likelihood of at least one of the stakes surviving.

Willow Bundles

Willow bundles are buried horizontally and are commonly used along streambanks to help establish streambank vegetation and as a biotechnical means to stabilize soil. The following guidelines apply to construction and placement of willow bundles:

- Willow bundles shall be installed while dormant, usually in the spring before April 15.
- Willow cuttings shall be collected using guidelines presented for willow stakes above.
- Bundles should be composed of about 8 to 12 dormant shrub branches in cross section, ranging ¼ to ½ inch in diameter, and 3 to 4 feet in length. Fascines may be lengthened as necessary for a particular application. The completed bundles should be 6 to 8 inches in diameter. Stagger the cuttings in the bundles so that the tops of the cuttings are evenly distributed throughout the length of the uniformly sized live fascine.
- Using cotton or other biodegradable string, the willow cuttings shall be tied together in bundles about 6 to 8 inches in diameter.
- About half the thickness of the bundles shall be buried in a shallow trench horizontally along the streambanks with some overlap of bundles. Stakes shall be driven (wood or if possible, willow cuttings) through the bundle, and two stakes at the ends of the bundle to help stabilize it. Willow bundles must be buried so that a portion of the bundle is in saturated soil during the growing season.

- Avoid using gravel, cobbles, or rocks (i.e., gravelly material 4.75 mm in diameter or larger) as fill around willow bundles.

Willow Transplants

Live willows can be transplanted on site. If willows grow in areas that will be disturbed during construction, willows can be salvaged from the area to be disturbed and transplanted by pruning, excavating, and replanting following site grading. The following specifications apply to transplanting willows:

- Willows shall be transplanted using an excavator, backhoe, or tree spade.
- The amount of pruning necessary will depend on the size of the root ball that can be obtained. Generally excavators and tree spades can acquire larger root balls, so less pruning is necessary. If it is possible to transplant only small root balls, it may be necessary to prune willows to within 8 inches of the ground level.
- Efforts shall be made to excavate as much of the willow root ball as possible, keeping it intact as it is lifted out of the ground and transported.
- If possible, willow should be transplanted immediately after excavation, as this increases survival rates.
- If it is not possible to transplant willows immediately, willows shall be temporarily heeled in, or placed in large groups so that the roots are not exposed to air. Willows shall be watered frequently to make sure that the roots do not dry out.
- When planting, a hole large enough for the entire root ball shall be excavated, so that the top of the root ball is flush with the adjacent soil surface. The root ball shall be placed gently into the hole, making sure that there are no air pockets and watered following planting.
- Willow transplants shall be located so that the lower portion of the root ball encounters the groundwater table. The root ball shall not be placed in an area where the entire root ball is permanently saturated.
- Transplant success can be increased by transplanting the willows in early spring while the willows are dormant (typically prior to April 15).

Maintenance

- Trees and shrubs shall be irrigated for a minimum of 2 years as needed to ensure the planting's survival and vigor. Any type of transplant, cutting, fascine, etc. that is planted in soil that is saturated during the growing season is exempt from watering requirements.
- Hand watering or spraying from a tank mounted on a cart, ATV or other vehicle is appropriate if an automatic drip irrigation system cannot be practicably installed. Impacts to vegetation and habitat shall be kept to a minimum. Staging water tanks and vehicles from trails, roads, other hardened areas, or areas outside the RCZ is required if practicable; if not, the smallest cart/vehicle feasible (that will minimize impacts to the RCZ) shall be utilized. Long hoses or hand carried buckets shall be used to further minimize impacts whenever possible.

Alternatively, tank driven solar-powered automatic drip irrigation systems are encouraged where water is otherwise unavailable. The tank and controls shall be located outside the RCZ if practicable; if not, they shall be placed in an area where refilling the tank and system maintenance will impact the RCZ least. The appropriate local jurisdiction shall approve the irrigation plan, and may monitor it as appropriate.

- Weed control is critical for the success of a revegetation project. Control efforts should focus on noxious weeds listed on the State and County Noxious Weed Lists[3] because these species are the most serious threat to habitat and the most difficult to control. The sooner control methods are started, the easier to control or eliminate weeds; otherwise the infestation may become impossible to control.
  - If noxious weeds are found at a site before grading, areas to be disturbed shall be pre-treated with either an approved herbicide or mowing before grading. Mowing is acceptable only if mowing is an effective management against that particular weed *and* if it is the appropriate season/timing to mow. Mowing can be an effective technique to prevent weeds from going to seed.
  - After planting, the site shall be monitored for weeds. If noxious weeds occur, they shall be controlled using an Integrated Weed Management Plan targeted for the specific species involved/infesting the area. An Integrated Weed Management Plan combines several methods (mechanical, biological, and herbicides) in the most effective and least environmentally damaging way to control a weed species.
- The site shall be continually checked for erosion and the erosion concerns remediated as soon as possible to prevent further damage.

Success Criteria

Minimum success criteria are as follows. Areas of temporarily disturbed woody vegetation must be revegetated with appropriate woody vegetation (Table 3A). The area replanted should generally be the same area that was disturbed. Expanding the area to be planted is generally acceptable, unless grassy or herbaceous vegetation is limited in the area. Increasing the area to be replanted is generally encouraged to both increase habitat quality and to ensure that sufficient area is restored to prevent the delays and additional costs associated with replanting and remediation.

Planting Density

To be considered successfully revegetated, the disturbed area must be revegetated to a density of woody vegetation similar to the disturbed area prior to the disturbance. The density shall be calculated based on the surface area covered by tree and/or shrub canopy. For this calculation, the area covered by a tree or shrub is considered to be ¾ of its mature canopy spread (MCS), not the current cover of the newly planted immature vegetation. Table 3A lists ¾ MCS for each species, which also may be calculated as shown in the example below based on the formula for the area of a circle (πr^2).

[3] www.douglas.co.us/publicworks/weeds/weed_home.htm

The following minimum standards must be met at the end of two growing seasons for woody revegetation to be considered successful, and hence, to be released from monitoring requirements:

- All transplants (bare-root, potted and balled-and-burlapped) must survive to at least 80 percent canopy density, based on ¾ MCS.
- Pole plantings must survive to at least 70 percent canopy density, based on ¾ MCS.
- Woody material used in bioengineering techniques must survive at reasonable rates to ensure the success of the technique (i.e., bank stabilization and recolonization with willows).

The target density and coverage is appropriate for the following reasons. Many species will spread vegetatively or by seed and fill in gaps over time. The ¾ MCS is conservative; in many cases the trees and shrubs will continue to grow to full canopy spread. In most cases, a mosaic of woody and herbaceous vegetation is more beneficial to wildlife than a large uninterrupted stand of woody vegetation.

Monitoring

All plantings shall be monitored (to ensure a sufficient revegetation of the site and plant survival) for a minimum of 2 years. An inspector designated by the appropriate local jurisdiction and experienced in native plant material shall conduct inspections. Generally, verification of appropriate coverage/density shall be based on a visual inspection for sufficient density without counting or measuring. If a dispute arises as to sufficiency, individual plantings can be counted and the approximate surface area calculated using the following method.

Count the number of the living individuals of each planted species and multiply each sum by the surface area of ¾ MCS of each species. These products shall be added together to get a total woody vegetation coverage figure. If the total woody vegetation coverage area equals or exceeds that required for woody revegetation, the effort shall be considered adequate. The surface area required for woody revegetation shall be calculated by measuring the surface area of the woody vegetation temporarily impacted and multiplying it by the minimum percentage density required for the planting method employed.

Example: A covered activity temporarily impacts 1,000 square feet of woody vegetation within the RCZ. 1,000 square feet of woody vegetation impacted x 80 percent density required for potted transplants = 800 square feet of coverage required.

Determine ¾ MCS from Table 3A or calculate (spread in feet x 0.75 x 0.5)^2 x 3.14 = ¾ MCS in square feet. If spread is a range, take the average.

Total surface coverage for 10 chokecherries and 43 golden currants would be calculated as follows, regardless of their current canopy size: [10 chokecherries x 44 square feet (surface area of ¾ MCS) = 440 square feet] + [43 golden currants x 11 square feet (surface area of ¾ MCS) = 473 square feet] = 913 square feet restored into woody vegetation.

913 square feet restored is greater than the 800 square feet required. Therefore, the planting is accepted as successful and monitoring may end as long as plants have survived two seasons for initial planting or two seasons for replacements.

All dead plantings shall be replaced in years 1 and 2. At the end of year 2, the total surface coverage (see example above) of the planted woody material must be 80 percent or greater for all nursery stock and transplants, and 70 percent or greater for all willow and cottonwood cuttings and pole plantings, or monitoring and plant replacement shall continue. Replacements shall not be considered "proven" until they have remained viable for two full growing seasons. Ultimately, it must be demonstrated that 100 percent of the temporarily impacted woody vegetation area has been revegetated to woody cover per the success criteria.

Table 3-A. Woody Transplant Species for use in Douglas County.

Scientific Name†	Common Name	Wetland, Riparian, Upland‡	Notes	Height (ft)	Spread (ft)	Surface Area of ¾ of Mature Canopy Spread (MCS) (ft^2)
Shrubs						
Amelanchier alnifolia	Saskatoon serviceberry	R, U	5000-10,900 ft	15	8-10	36
Amorpha canescens	Leadplant	U	3500-7600 ft	2-4	2-4	4
Atriplex canescens	Fourwing saltbush	R, U	3900-8600 ft	3-6	2-4	4
Betula nana	Bog birch	W, R	6000-11,500 ft	3	3	4
Cercocarpus montanus	Mountain mahogany	R, U	4000-8500 ft	2-4	2-4	4
Chrysothamnus nauseosus	Rubber rabbitbrush	U	various	2-6	2-4	4
Cornus sericea	Red-Osier dogwood	W, R	4500-10,000 ft	4-6'	4-6	11
Crataegus erythropoda (rivularis)	Red hawthorn	R, U		15	10	44
Crataegus macracantha	Big-thorned hawthorne	R, U	4500-7500 ft	15	10	44
Fallugia paradoxa	Apacheplume	U	3500-8000 ft	3-5	3-5	7
Juniperus communis	Common juniper	U	5000-7500 ft	2-3	3-6	9
Krascheninnikovia lanata	Winterfat	U	2500-8000 ft	1-3	1-3	2
Lonicera involucrate	Twinberry honeysuckle	R, U	6000-11,500 ft	2-7	2-7	9
Purshia tridentata	Antelope bitterbrush	U	4500-8000 ft	4	5	11
Prunus americana	Wild plum	R, U	3500-6000 ft	10-20	8-12	44

Scientific Name†	Common Name	Wetland, Riparian, Upland‡	Notes	Height (ft)	Spread (ft)	Surface Area of ¾ of Mature Canopy Spread (MCS) (ft^2)
Prunus virginiana	Chokecherry	R, U	4500-9000 ft	8-20	8-12	44
Quercus gambelii	Gambel oak	R, U	4500-8500 ft Container plant from seed only	5-15	10-15	69
Rhus glabra	Smooth Sumac	R, U		6-12	6-12	36
Rhus typhina (hirta)	Staghorn Sumac	R, U		10-20	12-20	113
Rhus trilobata	Skunkbrush sumac	R, U	4000-9000 ft	3-6	3-6	9
Ribes aureum	Golden currant	R, U	3000-9000 ft	4-6	4-6	11
Ribes cereum	Wax currant	R, U	4000-11,400 ft	2-4	2-4	4
Rosa woodsii	Wood's rose	R, U	3000-11,500 ft	3-6	3-6	9
Rubus deliciosus	Boulder raspberry	R, U	4500-9000 ft	3-6	3-6	9
Salix bebbiana	Bebb willow	W, R	5000-9000 ft	10	8-10	36
Salix boothii	Booth's willow	W, R	5000-10,300 ft	10	8-10	36
Salix drummondiana	Drummond willow	W, R	6000-11,000 ft	12	8-12	44
Salix eriocephala var. ligulifolia	Strapleaf willow	W, R	5000-9000 ft.	10-15	10-14	64
Salix exigua	Sandbar willow	W, R	3500-9200 ft	6-12	4-8	16
Salix geyeriana	Geyer's willow	W, R	> 6000 ft	15	10-14	64
Salix irrorata	Bluestem Willow	W, R	5500-7500 ft	8	8-10	36
Salix lasiandra	Whiplash willow	W, R	4100-10,000 ft	10	8-10	36
Salix monticola	Mountain willow	W, R	5700-12,500 ft	15	10-14	64
Salix planifolia	Planeleaf willow	W, R	7000-12,000 ft	5	4-6	11
Salix scouleriana	Scouler willow	R, U	8000-10,000 ft	5-12	8-12	44
Sambucus nigra Canadensis	Common elderberry	R, U		8-12	8-12	44
Sambucus nigra cerulea	Blue elderberry	W, R, U	5500-8500 ft	10	8-12	44
Sambucus racemosa (microbotrys)	Red elderberry	R, U		8-10	8-10	36
Shepherdia argentea	Silver buffaloberry	U	3800-7500 ft	10	6-12	36
Symphoricarpos albus, occidentalis or oreophilus	Snowberry	R, U	4000-11,500 ft (albus: 5500-7500 ft)	2-4	2-4	4
Trees						
Acer glabrum	Rocky mountain maple	W, R, U	6500-10,000 ft	10-20	10-15	69

Scientific Name[†]	Common Name	Wetland, Riparian, Upland[‡]	Notes	Height (ft)	Spread (ft)	Surface Area of ¾ of Mature Canopy Spread (MCS) (ft^2)
Acer negundo	Boxelder	R, U	4500-7600 ft	25-30	20-25	224
Alnus incana (tenuifolia)	Thin leaf alder	W, R	4500-11,500 ft	15-30	15-20	135
Betula occidentalis (fontinalis)	Water birch	W, R	4500-11,500 ft	15	10	44
Celtis occidentalis	Hackberry	W, R, U	3500-7200 ft	40-50	35-40	621
Juniperus scopulorum	Rocky Mountain juniper	U	5000-9000 ft	15-30	15-20	135
Picea pungens	Colorado blue spruce	R, U	7000-9500 ft	50-100	15-20	135
Pinus contorta	Lodgepole pine	U	>8000 ft	20-80	15-25	177
Pinus flexilis	Limber pine	U	5000-9000 ft	30-40	12-15	80
Pinus ponderosa	Ponderosa pine	U	5000-9000 ft	40-100	25-40	466
Populus angustifolia	Narrow-leaved cottonwood	W, R	3000-11,500 ft	50	40	706
Populus deltoides monilifera	Plains cottonwood	W, R	3000-6000 ft	75	40	706
Populus tremuloides	Quaking Aspen	R, U	6000-10,000 ft	30-40	12-15	80
Pseudotsuga menziesii	Douglas fir	R, U	4000-11,000 ft	50-60	20-25	224
Robinia neomexicana	New Mexico Locust	R, U		10-20	10-20	99
Salix amygdaloides	Peachleaf willow	W, R	3000-9000 ft	30-40	25-30	334

[†]Some of these species may not be commercially available.

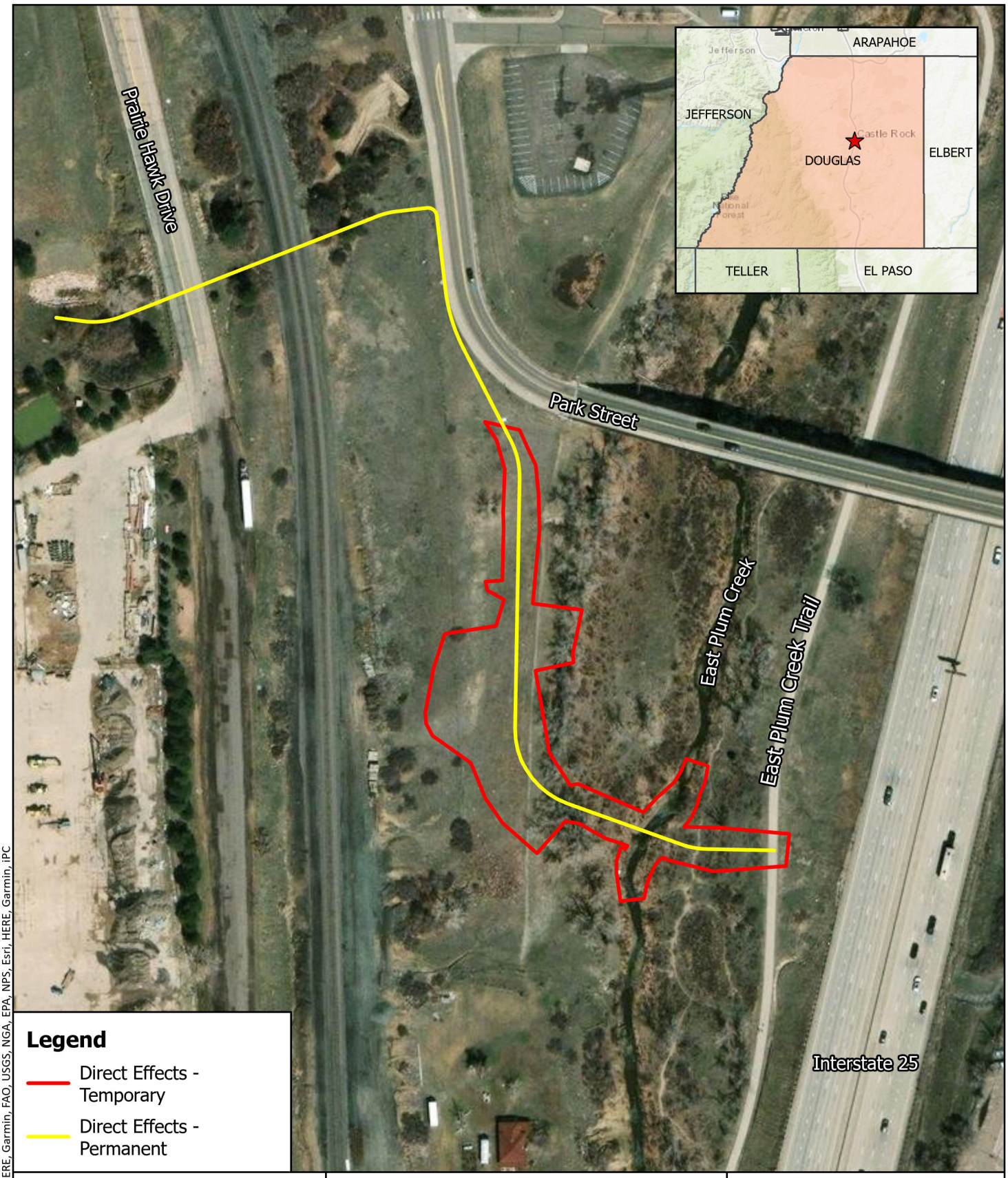
[‡]W=Wetland, R=Riparian, U=Upland.

11 Tables

Table 4. Impact Summary by Habitat Type in Square Feet

Habitat Type	Permanent Impact (sqFt)	Temporary Impact (sqFt)	Total Impact per Habitat Type (sqFt)
DCHCP Riparian	435.6	435.6	871.2
DCHCP Upland	0	0	0
CDOT Riparian	6098.4	7840.8	13939.2
CDOT Upland	871.2	435.6	1306.8

12 Figures



Maxar, Microsoft, Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS, Esri, HERE, Garmin, iPC

Figure 1. Aerial Image of Project Location with Disturbance Limits

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 1/14/2025
Reviewed by: Nick Kronshage 1/14/2025

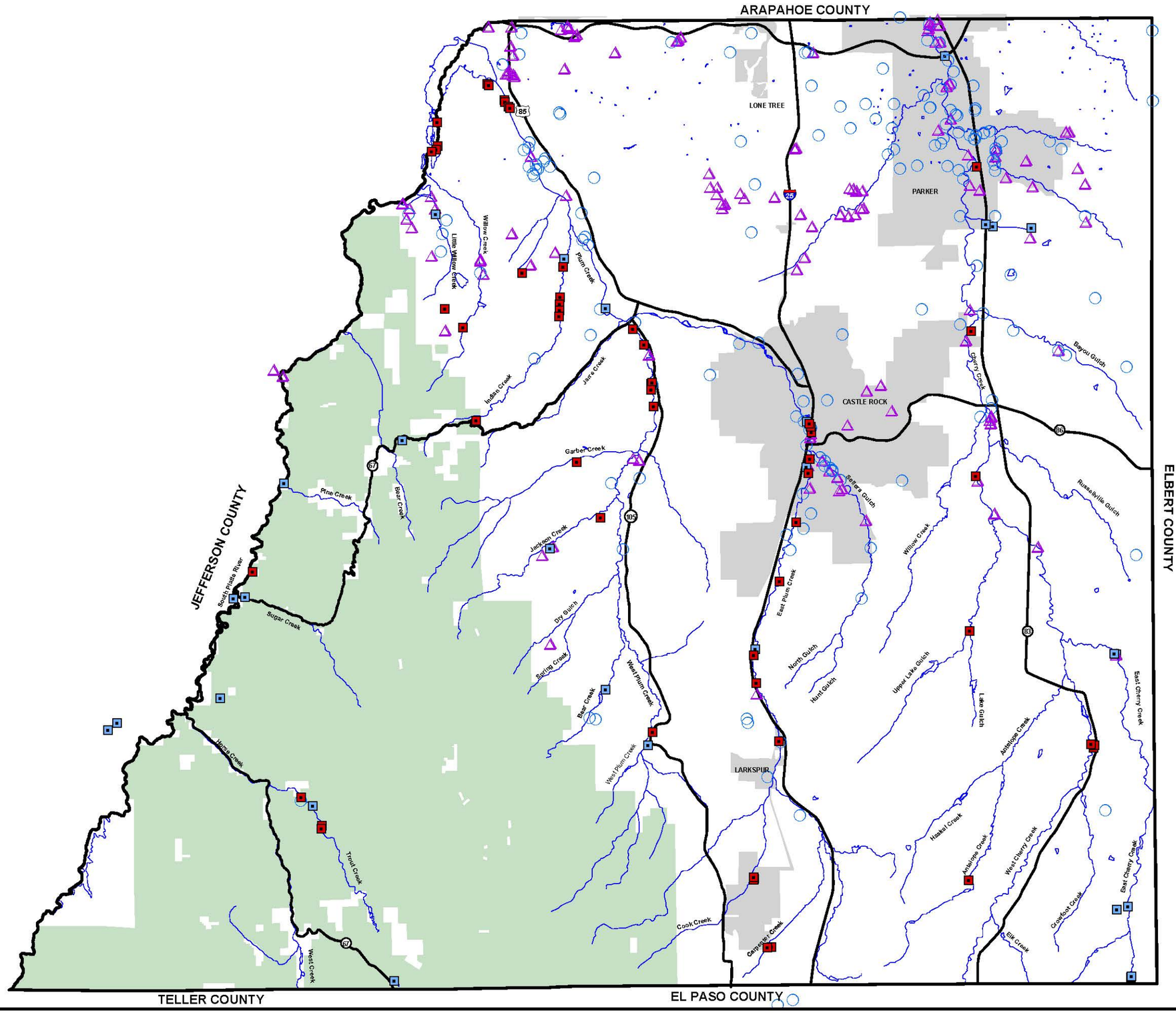


Figure 2
Known Locations of Preble's Meadow Jumping Mouse in Douglas County
Douglas County Habitat Conservation Plan

DRAFT

- Trapped and Found (2000 through 2004)
- Trapped and Found (1994 through 1999)
- Trapped and Not Found
- Evaluated - Not Trapped
- Stream
- Highway
- Incorporated Towns
- Douglas County Boundary
- Pike National Forest

0 1 2 Miles

N

Prepared for:
Douglas County
100 Third Street
Castle Rock, CO 80104
(303) 660-7495

Prepared by:
ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218

Disclaimer:

All data and information ("Products") contained herein are for information purposes only. Douglas County and ERO Resources Corp. provide these Products on an "as is" basis without warranties of any kind. The user acknowledges and agrees that the use of such Products is at the sole risk of the user.

Draft map created 10/17/2005
File: 328-EA-fig2_trapping.mxd (SR)

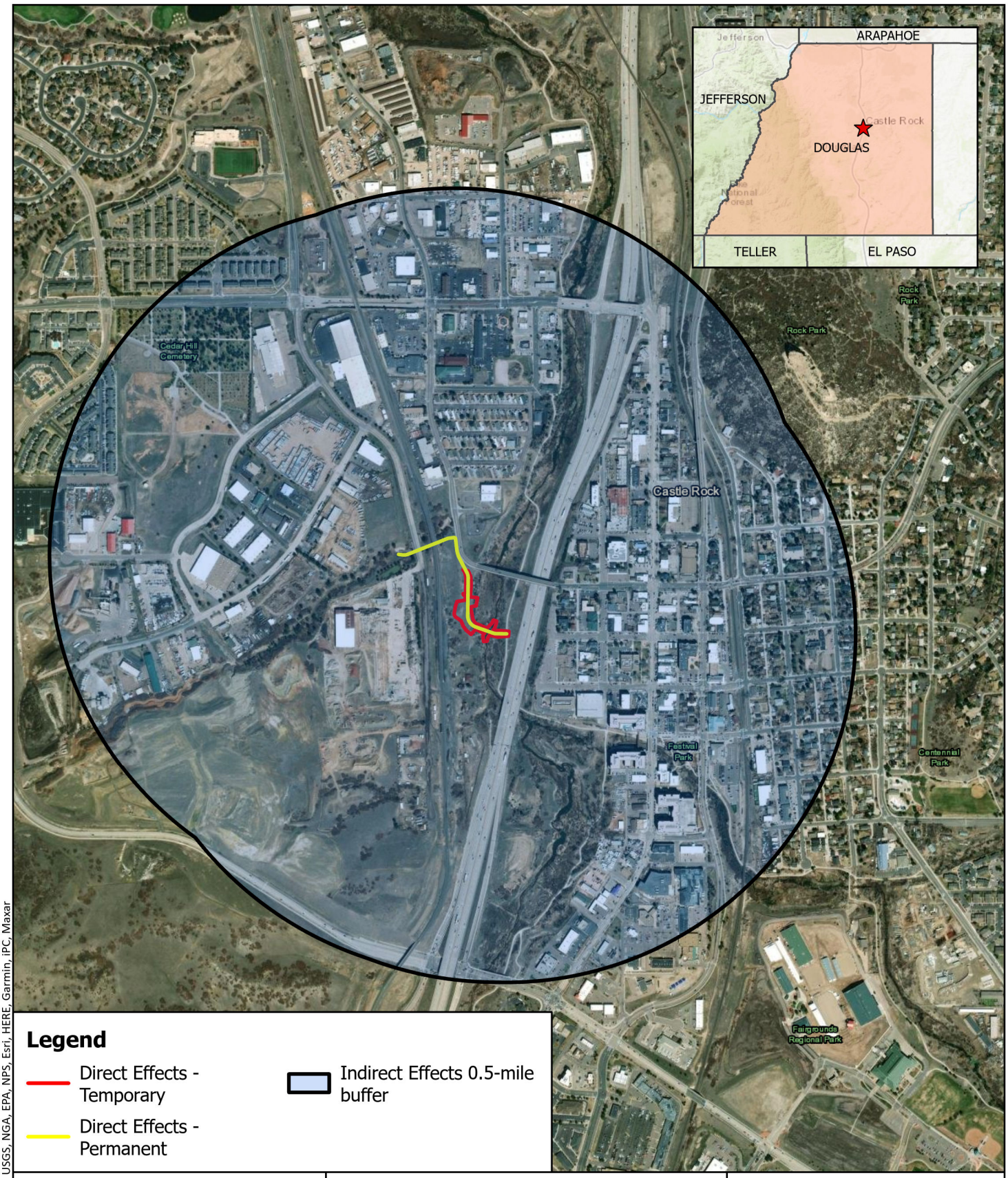


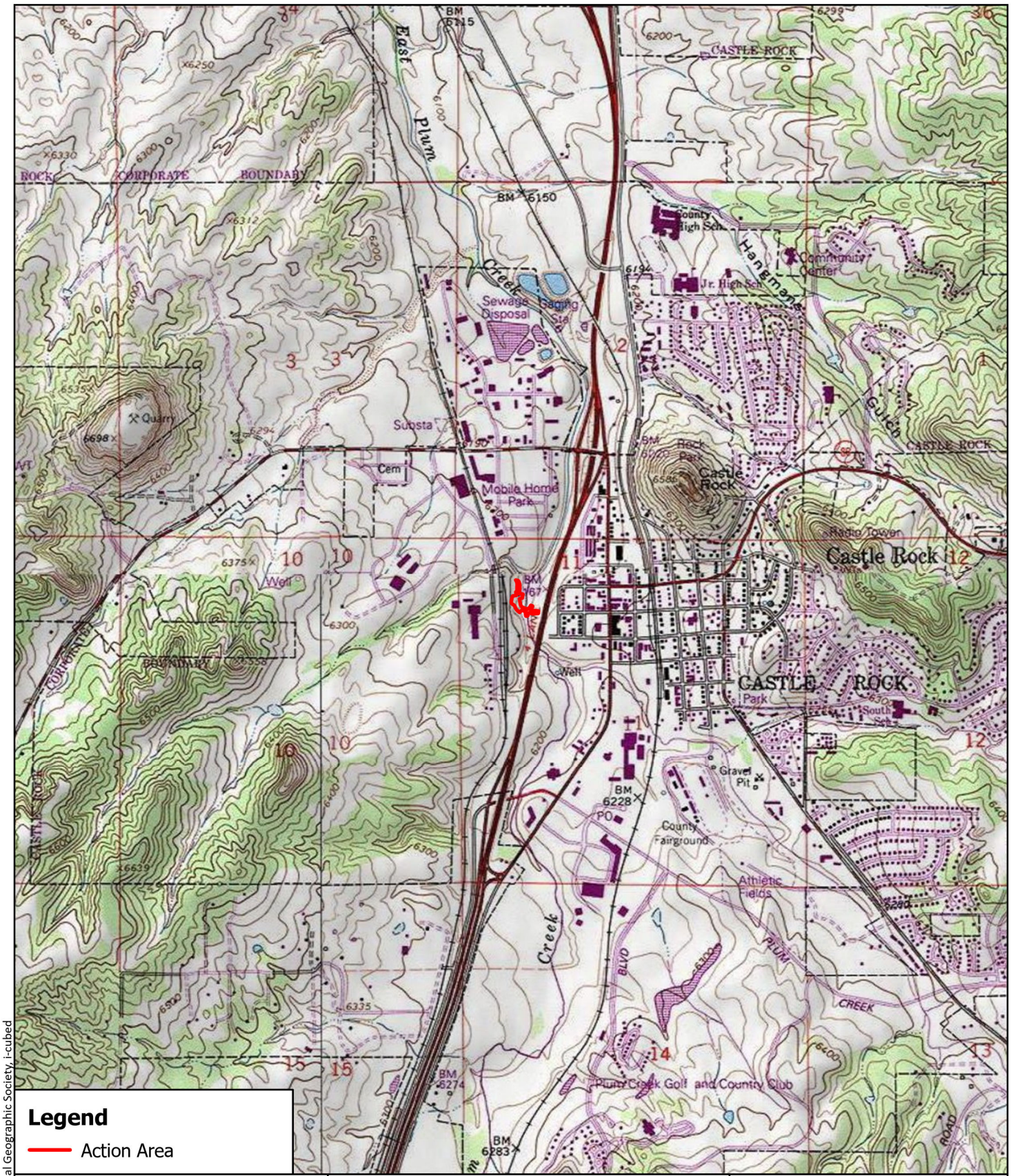
Figure 3. Aerial Image of Project Location with Indirect Effects Buffer

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 1/14/2025
Reviewed by: Nick Kronshage 1/14/2025



Legend

Action Area

0 1,000 2,000 Feet

1 inch = 2,000 feet

N

Figure 4. Topo Image of Project Location

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 1/14/2025
Reviewed by: Nick Kronshage 1/14/2025

Copyright:© 2013 National Geographic Society, i-cubed

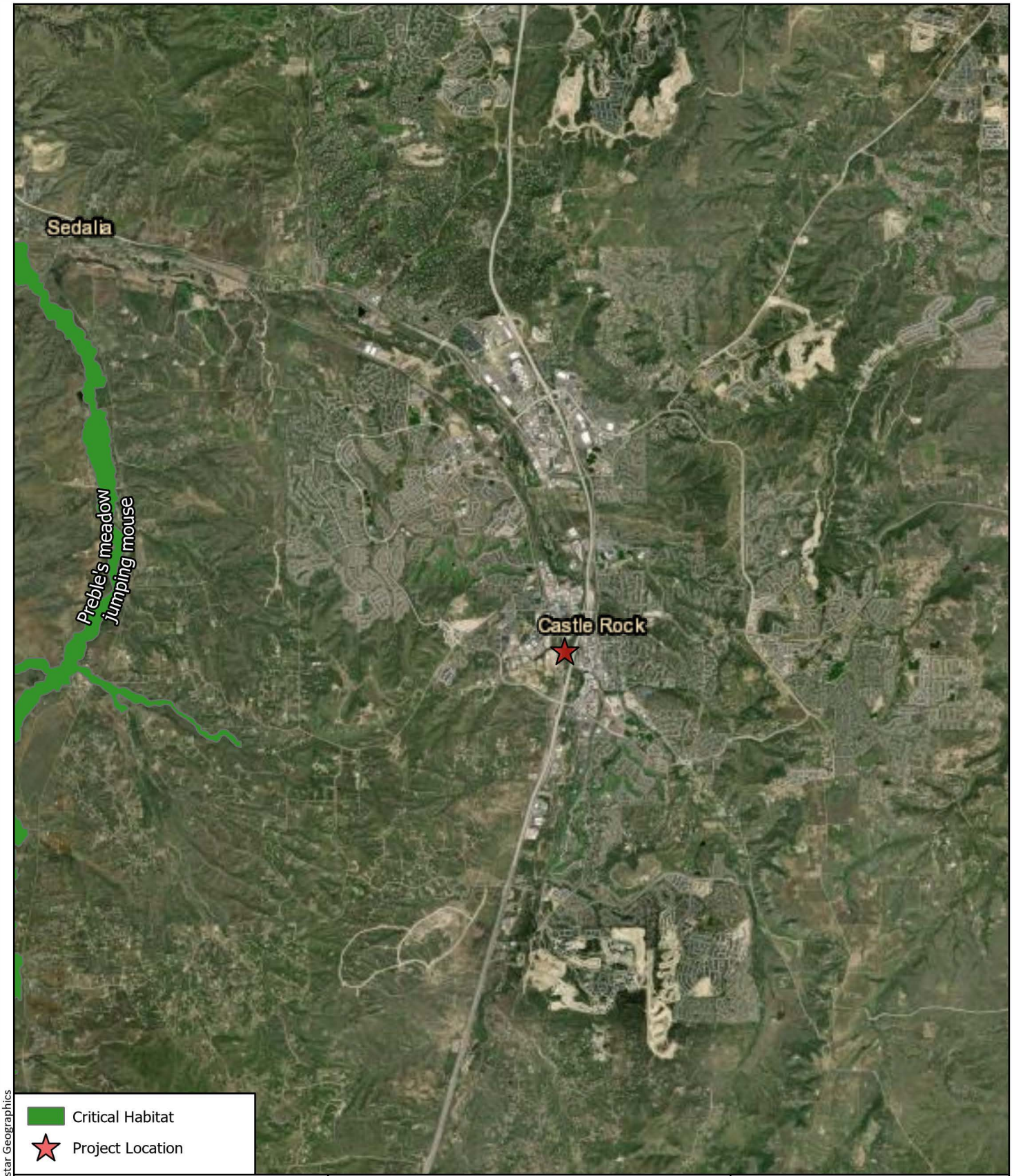


Figure 5. Aerial Image of USFWS Critical Habitat

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 10/10/24
Reviewed by: Nick Kronshage 1/22/25



Figure 6. Project Location with Mitigation and Conservation Areas

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 1/14/2025
Reviewed by: Nick Kronshage 1/14/2025

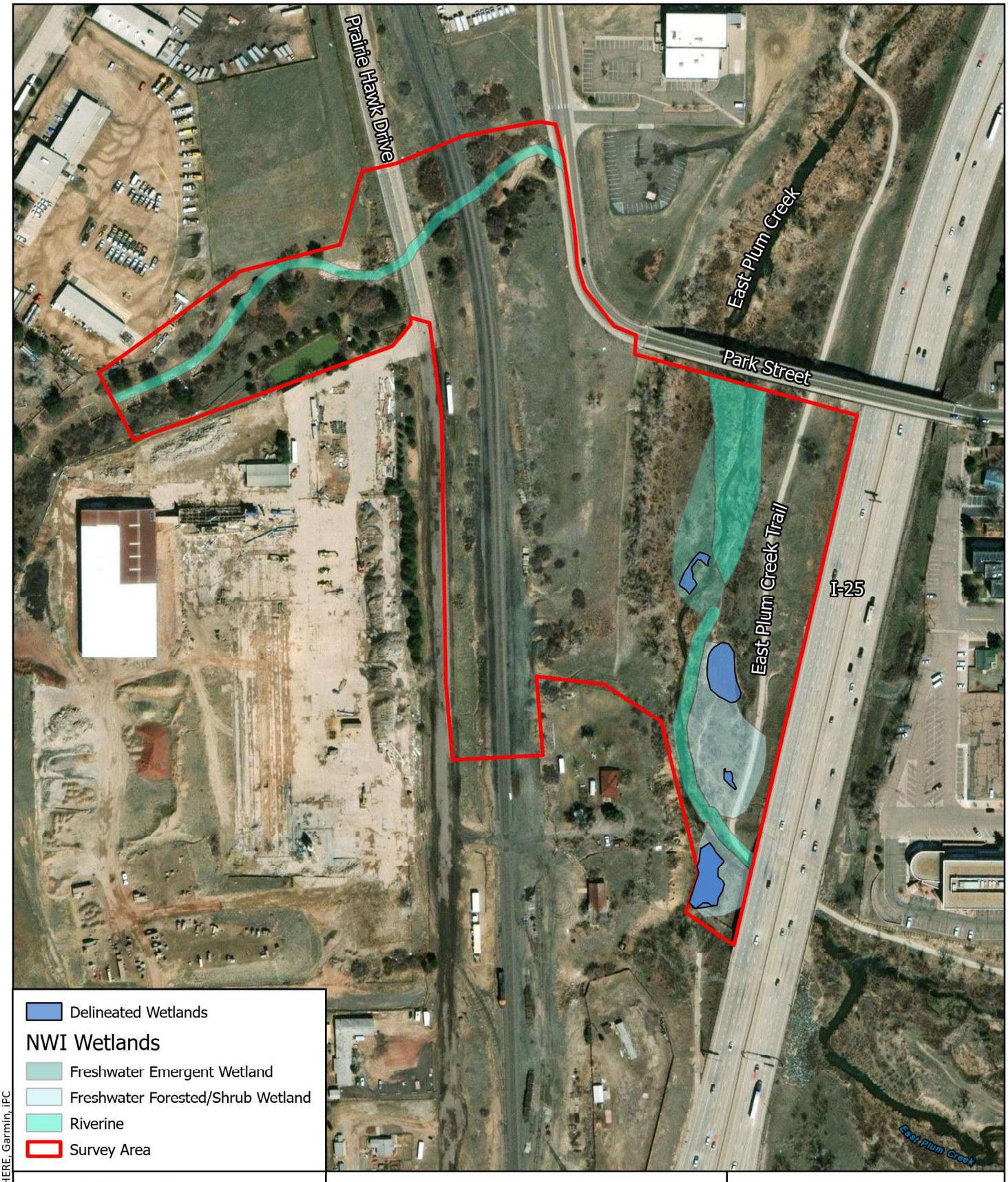


Figure 6. Topo Image with Delineated Wetlands and NWI Dataset

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 10/10/24

Reviewed by: Nick Kronshage 1/22/25

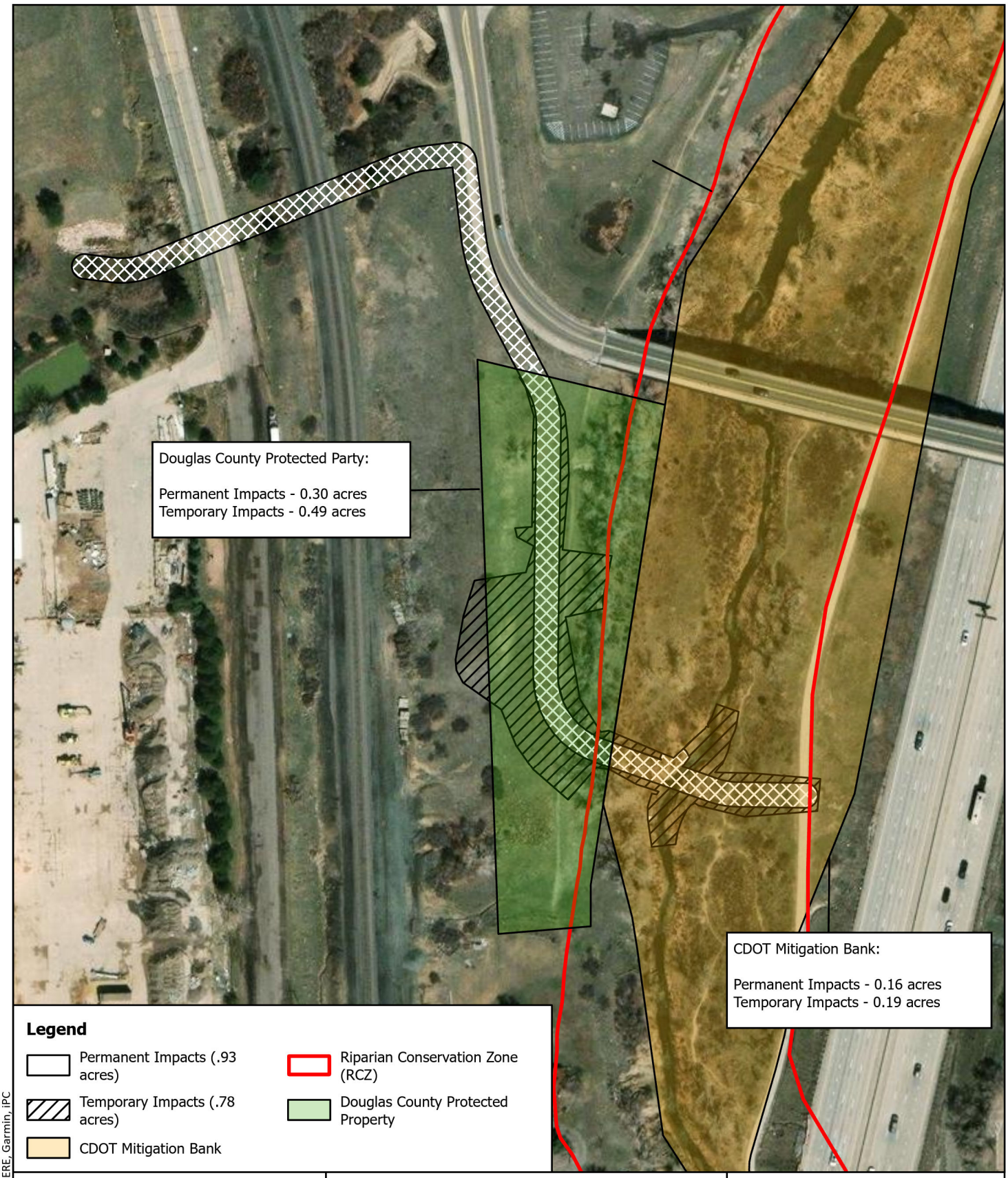


Figure 8. Project Impacts (in acres) per Mitigation Area

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 1/14/2025
Reviewed by: Nick Kronshage 1/14/2025

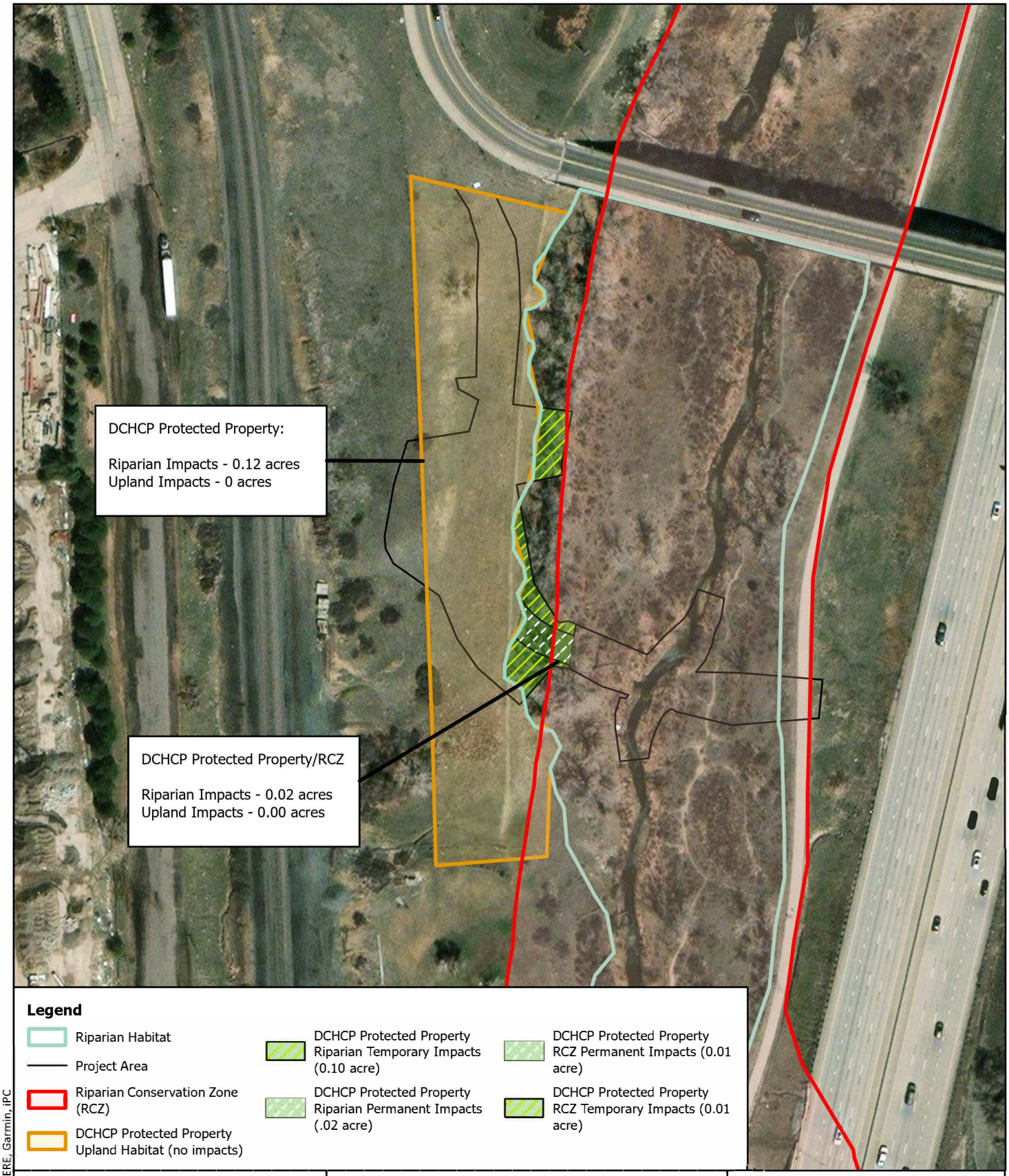


Figure 9. DCHCP Protected Property Impacts in RCZ **&** Riparian Areas

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 1/14/2025
Reviewed by: Nick Kronshage 1/14/2025

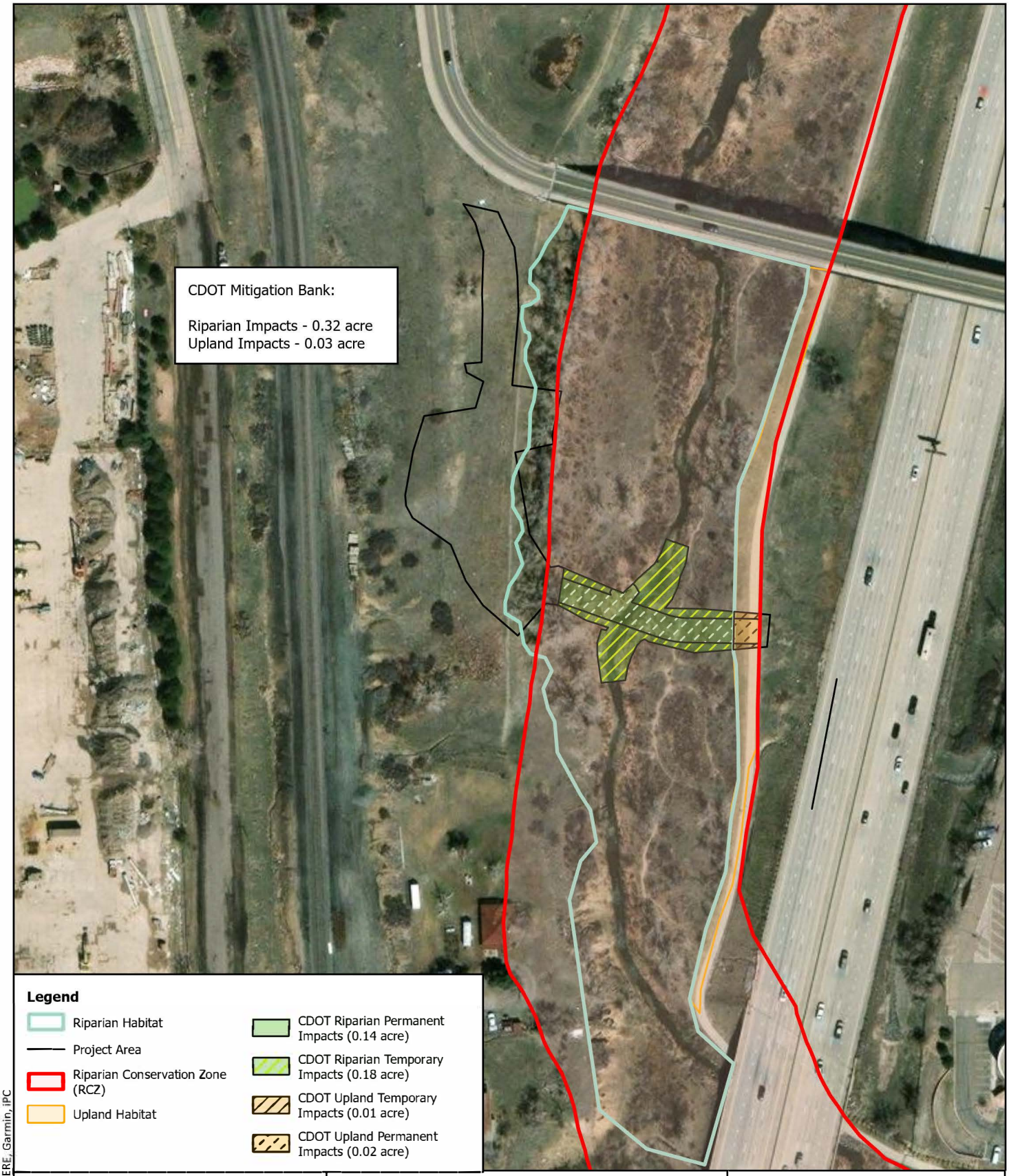


Figure 10 CDOT Mitigation Bank Impacts within RCZ & Riparian Areas

Industrial Tributary Trail

Douglas County, CO

WILSON & COMPANY

Created by: Tiffany Martin 1/14/2025
Reviewed by: Nick Kronshage 1/14/2025

U.S. Army Corps of Engineers (USACE)

NATIONWIDE PERMIT PRE-CONSTRUCTION NOTIFICATION (PCN)

For use of this form, see 33 CFR 330; the proponent agency is CECW-CO-R.

Form Approved - OMB No. 0710-0003

Expires: 2027-10-31

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Program of the Corps of Engineers (Corps); Final Rule 33 CFR 320-332.

Principal Purpose Information provided on this form will be used in evaluating the nationwide permit pre-construction notification.

Routine Uses This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of the agency coordination process.

Disclosure Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can

The public reporting burden for this collection of information, 0710-0003, is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR RESPONSE TO THE ABOVE EMAIL.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (*see sample drawings and/or instructions*) and be submitted to the district engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME

First – Rich Middle – Last – Havel

Company – Town of Castle Rock, Parks and Recreation Department

Company Title –

E-mail Address – RHavel@crgov.com

8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)

First – Joshua Middle – G Last – Carpenter

Company – Wilson & Company, Inc., Engineers & Architects

E-mail Address – joshua.carpenter@wilsonco.com

6. APPLICANT'S ADDRESS

Address – 1375 Plum Creek Pkwy
Town of Castle Rock

City – Castle Rock State – CO ZIP – 80109 Country – US

9. AGENT'S ADDRESS

Address – 5755 Mark Dabling Blvd
Ste 100

City – Colorado Spgs State – CO ZIP – 80919 Country – US

7. APPLICANT'S PHONE NOs. with AREA CODE

a. Business b. c. Fax

+17207334482

10. AGENT'S PHONE NOs. with AREA CODE

a. Primary b. c. Fax

+17193026724

Draft

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Joshua G Carpenter to act in my behalf as my agent in the processing of this nationwide permit pre-construction notification and to furnish, upon request, supplemental information in support of this nationwide permit pre-construction notification.

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

Industrial Tributary Trail (ITT) Connection

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)

East Plum Creek

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)

Address: I-25 S

City: Castle Rock State: CO Zip: 80104

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)

Latitude: 39.3734482 °N Longitude: -104.8644295 °W

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID:

Municipality

Section: 11 Township: 008 S Range: 067 W

17. DIRECTIONS TO THE SITE

18. IDENTIFY THE SPECIFIC NATIONWIDE PERMIT(S) YOU PROPOSE TO USE

NWP 14 Linear Transportation Projects

19. DESCRIPTION OF PROPOSED NATIONWIDE PERMIT ACTIVITY (*see instructions*)

The proposed activity involves constructing a paved trail connection between the existing East Plum Creek Trail and the planned Industrial Tributary Trail serving Philip S. Miller Park in Castle Rock, Colorado. The 10-foot-wide trail will cross East Plum Creek, climb the western slope of its floodplain, connect to the existing sidewalk along Park Street, and continue west beneath the BNSF railroad and Prairie Hawk Drive.

At the Plum Creek crossing, the trail will incorporate a 4-bay 8'x8' concrete box culvert (CBC), totaling 32 feet wide, designed to convey the 2-year flood event and minimize floodplain impacts. This low-water crossing will allow overtopping during larger flood events, reducing permanent impacts to the stream, adjacent wetlands, and riparian areas compared to bridge alternatives evaluated during project design.

The project also includes culvert replacements and limited channel improvements along the Industrial Tributary to East Plum Creek, a non-jurisdictional ephemeral or seasonal non-RPW channel. Improvements will include low flow channel grading including the placement of retaining and wing walls and grouted boulder riprap, replacement of the existing culverts beneath Prairie Hawk Drive with a single bay 12x8 concrete box culvert (CBC), designed for trail passage and to conveyance of

Draft

events greater than the 10-year flood event and a 72-inch RCP low flow culvert designed to convey the 10-year flood event, and construction of a trail through the modified reach that connects to and utilizes the existing 10 stone archway that traverses below the BNSF railroad. The open channel segment between the roadway and railroad will be converted to a trail that traverses between wingwalls supporting the proposed 12x8 CBC and connects to the existing 10-foot stone archway crossing beneath the BNSF railroad, and the roadway embankment will be widened to the east. A junction structure will be installed that connects the 72-inch RCP low flow culvert that crosses beneath Prairie Hawk Drive with an additional 72-inch RCP low flow culvert that crosses beneath the BNSF railroad and discharges to the remaining segment of Industrial Tributary upstream of Park Street. Impacts to the Industrial Tributary are not subject to Department of the Army authorization but are described herein for transparency.

Trail construction will result in work within aquatic resources at two locations. At East Plum Creek, the project includes placement of the CBC and stabilization of approximately 50 feet of stream channel downstream. Riprap will be used to stabilize the channel, with the downstream portion buried to the greatest extent practicable to preserve natural form and function.

The second area of work occurs along the Industrial Tributary, an ephemeral or seasonal intermittent drainage feature that does not exhibit characteristics of a relatively permanent water (RPW) and is therefore not subject to regulation under the Clean Water Act. Low flow channel improvements, culvert replacements at Prairie Hawk Drive, and low flow culvert placement through Prairie Hawk Drive and the BNSF railroad will allow trail passage while maintaining stream conveyance. Between the two crossings, the stream will traverse between wingwalls supporting a new CBC structure and connect to the existing 10-foot stone archway crossing below the BNSF railroad. Additional fill will occur upstream and downstream of the crossings to support trail and embankment construction.

The tributary has been heavily modified and contains over 100 linear feet of existing culvert, limited evidence of flow, and no established ordinary high water mark (OHWM) beyond the outfall. Based on field conditions and the lack of continuous surface connection to East Plum Creek, this feature is considered a non-jurisdictional seasonal non-RPW.

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

Several design alternatives were evaluated to avoid and minimize impacts to waters of the United States, including bridge crossings and various culvert configurations. The selected low-water crossing with a 4-bay 8'x8' CBC at East Plum Creek was chosen because it conveys the 2-year flood event while allowing overtopping during larger events, significantly reducing the overall footprint and minimizing hydraulic disruption compared to other alternatives.

Minimization measures include burying riprap downstream of the culvert to the greatest extent practicable in order to maintain natural channel form and function and reduce permanent loss of stream bed. Temporarily disturbed areas will be restored to preconstruction contours and revegetated with native species.

The tributary channel is non-jurisdictional and highly disturbed, with over 100 feet of culverts, limited flow, no OHWM, and minimal aquatic habitat function. As such, no Clean Water Act authorization is required for impacts to this feature, and no mitigation is proposed.

Compensatory mitigation is not proposed for the East Plum Creek crossing because permanent impacts remain below the U.S. Army Corps of Engineers standard thresholds for triggering mitigation under Nationwide Permit General Condition 23. Specifically, permanent stream bed loss totals approximately 980 square feet (0.022 acre), and wetland loss totals approximately 90 square feet (0.002 acre). These impacts are minor, localized, and further minimized by design and restoration measures incorporated into the project. As such, the activity is expected to result in no more than minimal adverse environmental effects.

21. PURPOSE OF NATIONWIDE PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

The purpose of the project is to provide a safe, reliable pedestrian and cyclist connection between Castle Rock's existing East Plum Creek Trail and the planned Industrial Tributary Trail serving Philip S. Miller Park.

22. QUANTITY OF WETLANDS, STREAMS, OR OTHER TYPES OF WATERS DIRECTLY AFFECTED BY PROPOSED NATIONWIDE PERMIT ACTIVITY (*see instructions*)

Acres	Linear Feet	Cubic Yards Dredged or Discharged

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. (*see instructions*)

Draft

24. If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and/or the loss of greater than 3/100-acre of stream bed and requires pre-construction notification, explain how the compensatory mitigation requirement in paragraph (c) and/or paragraph (d) of general condition 23 will be satisfied, or explain why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required for the proposed activity.

25. Is any portion of the nationwide permit activity already complete? ☐ Yes ☑ No

If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed NWP activity or utilize the designated critical habitat that might be affected by the proposed NWP activity. (*see instructions*)

Preble's meadow jumping mouse

ADDITIONAL AFFECTED SPECIES:

Wilson & Company evaluated federally listed species for their potential presence in the Action Area and the likelihood of effects resulting from the proposed activities. Based on this review, we concluded that only one species, Preble's meadow jumping mouse (Zapus hudsonius preblei; PMJM), has the potential to be affected. As proposed, the project would directly impact PMJM habitat by permanently or temporarily disturbing a total of approximately 0.39 acre during construction and prior to establishment of mitigation. Project construction may unintentionally result in injury or mortality to individual PMJM or reduce their productivity.

Based on the Biological Assessment (BA), Wilson & Company recommended a determination of may affect, likely to adversely affect (LAA) for PMJM. The Colorado Department of Transportation (CDOT) has initiated consultation with the U.S. Fish & Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA). In coordination with USFWS, the Town of Castle Rock has included conservation measures and compensatory mitigation to offset impacts to PMJM habitat. The Town anticipates that the USFWS will issue a Biological Opinion concurring with the LAA effects determination.

The project would have no effect on other listed species. For detailed analysis and supporting information, please refer to the attached BA.

27. List any historic properties that have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic property or properties. (*see instructions*)

CDOT has determined that the project would have no effect on historic properties and has initiated consultation with the State Historic Preservation Office (SHPO) under Section 106 of the National Historic Preservation Act. The SHPO concurrence letter will be provided upon receipt. Refer to the attached cultural resource documentation for additional details.

28. For a proposed NWP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

29. If the proposed NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the Corps district having jurisdiction over that project? ☐ Yes ☑ No

If "yes", please provide the date your request was submitted to the Corps district:

30. If the terms of the NWP(s) you want to use require additional information to be included in the PCN, please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

Draft

N/A

31. Pre-construction notification is hereby made for one or more nationwide permit(s) to authorize the work described in this notification. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Joshua G Carpenter

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The pre-construction notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in Block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Draft

Instructions for Preparing a

Department of the Army

Nationwide Permit (NWP) Pre-Construction Notification (PCN)

Blocks 1 through 4. To be completed by the Corps of Engineers.

Block 5. Applicant's Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the preconstruction notification, please attach a sheet of paper with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the PCN. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant's Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where he / she can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by the applicant, if an agent is to be employed.

Block 12. Proposed Nationwide Permit Activity Name or Title. Please provide a name identifying the proposed NWP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 13. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the NWP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Activity Street Address. If the proposed NWP activity is located at a site having a street address (not a box number), please enter it in Block 14.

Block 15. Location of Proposed Activity. Enter the latitude and longitude of where the proposed NWP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area requiring evaluation. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality where the site is located.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide a description of the location of the proposed NWP activity, such as lot numbers, tract numbers, or you may choose to locate the proposed NWP activity site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed NWP activity site if known. If there are multiple locations, please indicate directions to each location on a separate sheet of paper and mark as Block 17.

Block 18. Identify the Specific Nationwide Permit(s) You Propose to Use. List the number(s) of the Nationwide Permit(s) you want to use to authorize the proposed activity (e.g., NWP 29).

Block 19. Description of the Proposed Nationwide Permit Activity. Describe the proposed NWP activity, including the direct and indirect adverse environmental effects the activity would cause. The description of the proposed activity should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal. Identify the materials to be used in construction, as well as the methods by which the work is to be done.

Provide sketches when necessary to show that the proposed NWP activity complies with the terms of the applicable NWP(s). Sketches usually clarify the activity and result in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed NWP activity (e.g.,a conceptual plan), but do not need to be detailed engineering plans.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 19.

Draft

Block 20. Description of Proposed Mitigation Measures. Describe any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed NWP activity. The description of any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or additional mitigation measures.

Block 21. Purpose of Nationwide Permit Activity. Describe the purpose and need for the proposed NWP activity. What will it be used for and why? Also include a brief description of any related activities associated with the proposed project. Provide the approximate dates you plan to begin and complete all work.

Block 22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by the Proposed Nationwide Permit Activity. For discharges of dredged or fill material into waters of the United States, provide the amount of wetlands, streams, or other types of waters filled, flooded, excavated, or drained by the proposed NWP activity. For structures or work in navigable waters of the United States subject to Section 10 of the Rivers and Harbors Act of 1899, provide the amount of navigable waters filled, dredged, or occupied by one or more structures (e.g., aids to navigation, mooring buoys) by the proposed NWP activity.

For multiple NWPs, or for separate and distant crossings of waters of the United States authorized by NWPs 12 or 14, attach an extra sheet of paper marked Block 21 to provide the quantities of wetlands, streams, or other types of waters filled, flooded, excavated, or drained (or dredged or occupied by structures, if in waters subject to Section 10 of the Rivers and Harbors Act of 1899) for each NWP. For NWPs 12 and 14, include the amount of wetlands, streams, or other types of waters filled, flooded, excavated, or drained for each separate and distant crossing of waters or wetlands. If more space is needed, attach an extra sheet of paper marked Block 22.

Block 23. Identify Any Other Nationwide Permit(s), Regional General Permit(s), or Individual Permit(s) Used to Authorize Any Part of Proposed Activity or Any Related Activity. List any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. For linear projects, list other separate and distant crossings of waters and wetlands authorized by NWPs 12 or 14 that do not require PCNs. If more space is needed, attach an extra sheet of paper marked Block 23.

Block 24. Compensatory Mitigation Statement for Losses of Greater Than 1/10-Acre of Wetlands and/or of Greater Than 3/100-Acre of Stream Bed When Pre-Construction Notification is Required. Paragraphs (c) and (d) of NWP general condition 23 require compensatory mitigation at a minimum one-for-one replacement ratio for all wetland losses that exceed 1/10-acre and/or for all losses of stream bed that exceed 3/100-acre, unless the district engineer determines in writing that either some other form of mitigation is more environmentally appropriate or the adverse environmental effects of the proposed NWP activity are no more than minimal without compensatory mitigation, and provides an activity-specific waiver of this requirement. Describe the proposed compensatory mitigation for wetland losses greater than 1/10 acre and/or for losses of stream bed that exceed 3/100-acre, or provide an explanation of why the district engineer should not require wetland and/or stream compensatory mitigation for the proposed NWP activity. If more space is needed, attach an extra sheet of paper marked Block 24.

Block 25. Is Any Portion of the Nationwide Permit Activity Already Complete? Describe any work that has already been completed for the NWP activity.

Block 26. List the Name(s) of Any Species Listed As Endangered or Threatened under the Endangered Species Act that Might be Affected by the Nationwide Permit Activity. If you are not a federal agency, and if any listed species or designated critical habitat might be affected or is in the vicinity of the proposed NWP activity, or if the proposed NWP activity is located in designated critical habitat, list the name(s) of those endangered or threatened species that might be affected by the proposed NWP activity or utilize the designated critical habitat that might be affected by the proposed NWP activity. If you are a Federal agency, and the proposed NWP activity requires a PCN, you must provide documentation demonstrating compliance with Section 7 of the Endangered Species Act.

Block 27. List Any Historic Properties that Have the Potential to be Affected by the Nationwide Permit Activity. If you are not a Federal agency, and if any historic properties have the potential to be affected by the proposed NWP activity, list the name(s) of those historic properties that have the potential to be affected by the proposed NWP activity. If you are a Federal agency, and the proposed NWP activity requires a PCN, you must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

Draft

Block 28. List the Wild and Scenic River or Congressionally Designated Study River if the Nationwide Permit Activity Would Occur in such a River. If the proposed NWP activity will occur in a river in the National Wild and Scenic River System or in a river officially designated by Congress as a "study river" under the Wild and Scenic Rivers Act, provide the name of the river. For a list of Wild and Scenic Rivers and study rivers, please visit http://www.rivers.gov/.

Block 29. Nationwide Permit Activities that also Require Permission from the Corps Under 33 U.S.C. 408. If the proposed NWP activity also requires permission from the Corps under 33 U.S.C. 408 because it will temporarily or permanently alter, occupy, or use a Corps federal authorized civil works project, indicate whether you have submitted a written request for section 408 permission from the Corps district having jurisdiction over that project.

Block 30. Other Information Required For Nationwide Permit Pre Construction Notifications. The terms of some of the Nationwide Permits include additional information requirements for preconstruction notifications:

* NWP 3, Maintenance –information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals.
* NWP 31, Maintenance of Existing Flood Control Facilities –a description of the maintenance baseline and the dredged material disposal site.
* NWP 33, Temporary Construction, Access, and Dewatering –a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre project conditions.
* NWP 44, Mining Activities –if reclamation is required by other statutes, then a copy of the final reclamation plan must be submitted with the pre construction notification.
* NWP 45, Repair of Uplands Damaged by Discrete Events –documentation, such as a recent topographic survey or photographs, to justify the extent of the proposed restoration.
* NWP 48, Commercial Shellfish Aquaculture Activities –(1) a map showing the boundaries of the project area, with latitude and longitude coordinates for each corner of the project area; (2) the name(s) of the species that will be cultivated during the period this NWP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area (a detailed survey is not required).
* NWP 49, Coal Remining Activities –a document describing how the overall mining plan will result in a net increase in aquatic resource functions must be submitted to the district engineer and receive written authorization prior to commencing the activity.
* NWP 50, Underground Coal Mining Activities –if reclamation is required by other statutes, then a copy of the reclamation plan must be submitted with the pre construction notification.

If more space is needed, attach an extra sheet of paper marked Block 30.

Block 31. Signature of Applicant or Agent. The PCN must be signed by the person proposing to undertake the NWP activity, and if applicable, the authorized party (agent) that prepared the PCN. The signature of the person proposing to undertake the NWP activity shall be an affirmation that the party submitting the PCN possesses the requisite property rights to undertake the NWP activity (including compliance with special conditions, mitigation, etc.).

DELINEATION OF WETLANDS, OTHER SPECIAL AQUATIC SITES, AND OTHER WATERS

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. The 45 day PCN review period will not start until the delineation is submitted or has been completed by the Corps.

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross Section Map. Identify each illustration with a figure or attachment number. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient

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drawings should also be included. Please submit one original, or good quality copy, of all drawings on 8½x11 inch plain white paper (electronic media may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

ADDITIONAL INFORMATION AND REQUIREMENTS

For proposed NWP activities that involve discharges into waters of the United States, water quality certification from the State, Tribe, or EPA must be obtained or waived (see NWP general condition 25). Some States, Tribes, or EPA have issued water quality certification for one or more NWPs. Please check the appropriate Corps district web site to see if water quality certification has already been issued for the NWP(s) you wish to use. For proposed NWP activities in coastal states, state Coastal Zone Management Act consistency concurrence must be obtained, or a presumption of concurrence must occur (see NWP general condition 26). Some States have issued Coastal Zone Management Act consistency concurrences for one or more NWPs. Please check the appropriate Corps district web site to see if Coastal Zone Management Act consistency concurrence has already been issued for the NWP(s) you wish to use.

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Appendix B. Aquatic Resource Inventory:

Aquatic Resource Name	*State*	*Cowardin System*	*Cowardin Class*	*HGM Class*	*Local Waterway Name*	*Measurement Type*	*Measurement Amount*	*Measurement Units*	*Waters Type*	*Latitude*	*Longitude*
Stream 1	COLORADO	RIVERINE	R2-RIVERINE, LOWER PERENNIAL	RIVERINE	East Plum Creek	Area	3580	SQ_FT	DELIN.NOJD-404.10	39.37344	-104.86444
Wetland 4	COLORADO	PALUSTRINE	PSS-PALUSTRINE, SCRUB-SHRUB	RIVERINE	East Plum Creek	Area	2600	SQ_FT	DELIN.NOJD-404.10	39.37344	-104.86444
Stream 2	COLORADO	RIVERINE	R4SB-RIVERINE, INTERMIT, STREAMBED	RIVERINE	Industrial Tributary	Area	18220	SQ_FT	DELIN.NOJD-404	39.37515	-104.86671

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Appendix C. Impact Inventory:

Water Name	*Impact Name*	*Activity*	*Type of Material Being Discharged*	*Resource Type*	*Permanent Loss (Y/N)*	*Impact Duration*	*Amount Type*	*Proposed Length*	*Proposed Width*	*Proposed Amount*	*Amount Units*
Stream 1	CBC	Discharge of fill material	Concrete box culvert	River/Stream	Yes	Permanent	Fill Area	24	20	480	Square Feet
Stream 1	Exposed riprap	Discharge of fill material	Rock	River/Stream	Yes	Permanent	Fill Area	25	20	500	Square Feet
Stream 1	Buried riprap	Discharge of dredged material	Rock	River/Stream	No	Permanent	Fill Area	21.5	20	430	Square Feet
Stream 1	Temporary disturbance	Discharge of dredged material	Stream bed substrate	River/Stream	No	Temporary	Fill Area	37.5	20	750	Square Feet
Wetland 4	Trail embankment	Discharge of fill material	Earthen fill	Non-Tidal Wetland	Yes	Permanent	Fill Area	11.5	20	230	Square Feet

Provide any additional information you may have about the proposed quantity of wetlands, streams, or other types of waters directly affected by the proposed activity. This level of detail is helpful to better understand the type of impacts that are proposed for your project.

The project will result in both temporary and permanent impacts to aquatic resources; however, all impacts are small in scale, localized, and will not result in more than minimal adverse effects to the aquatic environment.

At East Plum Creek, the installation of the CBC and one wingwall will result in the permanent loss of approximately 480 square feet of stream bed. Placement of exposed riprap downstream will permanently impact an additional 500 square feet of stream bed. Construction of the trail embankment will result in the fill of approximately 90 square feet of wetland. Approximately 430 square feet of stream bed will be impacted by buried riprap but restored to preconstruction contours and therefore not considered a permanent loss of WOTUS. In addition, construction access, grading, and riprap installation will temporarily disturb approximately 750 square feet of stream bed. These temporarily disturbed areas will be restored and stabilized with native vegetation upon completion.

The project will also result in approximately 2,330 square feet of permanent fill within the Industrial Tributary, including 1,170 square feet of permanent stream bed loss associated with trail construction and 1,160 square feet of fill within existing culvert footprints. These impacts are located entirely within a non-jurisdictional seasonal non-RPW and are not regulated under Section 404 of the Clean Water Act. They are disclosed here solely for completeness and transparency.

The nature, extent, and location of the jurisdictional impacts ensure the proposed activity will result in no more than minimal adverse effects to aquatic resources, qualifying for Nationwide Permit authorization.

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Definitions and help text

Water Name: The name of the wetland, stream, or other type of water that would be impacted.

Impact Name: Useful if entering more than one impact for the same or multiple waters (e.g., linear projects) and name accordingly. This may be different than the Water Name; keep it short and simple. For example, if Stream-1 is the water, the impact name could be “Crossing-1,” “Crossing-2,” “Crossing-3.” A short name helps describe the impact and is useful when looking at a list of impacts.

Activity: Options are:

- Conversion of waters type (forested wetland to emergent wetland, stream to lake)
- Discharge of dredged material
- Discharge of fill material
- Dredging (Section 10)
- Ecological restoration
- Other (Aquaculture, Work, Aerial or Submarine cable crossings)
- Removal (Sec 10 structures)
- Structure (Sec 10 only)
- Transport of dredged material (Sec 103)

Type of Material Being Discharged: Describe the material to be discharged within USACE jurisdiction. Make sure this description is consistent with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

Resource Type: Options are Harbor/Ocean, Lake, Non-Tidal wetland, Other, Pond, River/Stream, and Tidal wetland.

Permanent Loss (Y/N): Only enter “YES” when the ‘discharge of dredged or fill material’ activity types are chosen. A permanent loss means the conversion of an aquatic resource to dry land.

Impact Duration: Options are Permanent or Temporary. An example of a temporary impact is the discharge of fill for temporary access roads that are later removed and returned to pre-construction contours.

Amount Type: Options are Area or Volume.

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Amount Units: Options are Acre or Square Feet if Amount Type=Area, Cubic Yards if Amount Type=Volume.

Proposed Length and Proposed Width: Unit is linear feet.

Proposed Amount: Unit is square feet.

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Appendix H. Supporting Information:

Document Type	*Document Created Date (YYYY-MM-DD)*	*Document Label*	*Information Source/Citation*	*Uploaded file name*
Endangered Threatened Species Information	2025-05-09	Biological Assessment	Wilson	25392_BA CR Industrial.pdf

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