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In the Matter of:	CROW BUTTE RESOURCES, INC. (Marsland Expansion Area)
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NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of
CROW BUTTE RESOURCES, INC.
(Marsland Expansion Area)

Docket No. 40-8943-MLA-2

ASLBP No. 13-926-01-MLA-BD01

Hearing Exhibit

Exhibit Number:

Exhibit Title:



**Hydrologic and Flood Study
Marsland Expansion Area**

May 2013



Hydrologic and Flood Study

Marsland Expansion Area

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1. Introduction

This report presents the hydrologic and flood analyses for the Marsland Expansion Area (MEA). In 2012, ARCADIS conducted a related study that characterized MEA topography and drainage characteristics to identify areas at risk of sheet and channel (rill) erosion during storm events (ARCADIS 2012). However, the previous study did not quantify discharge rates or velocity during storm-induced concentrated channel flow, which can cause significant erosion. The results of this study supplement those presented in ARCADIS (2012).

The objectives of both analyses are to determine the potential flooding hazard at the MEA due to concentrated channel flow and to determine if special design considerations may be required or if additional mitigation measures may need to be implemented.

The analysis presented here estimates the peak discharge rate and maximum velocity for several storm return periods in the flood zone. The flood estimates were developed with standard hydrologic and hydraulic models, and the analysis has been performed in accordance with the guidance provided in NUREG-1569 for addressing surface water flooding at a proposed uranium in-situ facility. An overview of the MEA and of the proposed license boundary, mine units, and hydrologic units is shown on **Figure 1**.

The MEA flood analysis consists of two components; a hydrologic analysis (including catchment and watershed delineation, derivation of hydrologic characteristics, and computation of rainfall and runoff volumes) and a hydraulic analysis (including construction of a riverine flow routing model for steady flow analysis). The comprehensive hydrologic and hydraulic analysis is sub-divided into four primary tasks:

- 1) Data collection and analysis: Rainfall, digital elevation, soil, and land use data were assembled.
- 2) Watershed delineation: The project area was sub-divided into watersheds or sub-basins, and physical characteristics were derived for each of the sub-basins.
- 3) Hydrologic analysis: Flood routing characteristics of the watersheds were computed, and a comprehensive stream network map was developed using hydrologic data collected for Task 1. The peak flow volume was calculated for the 10-, 25-, 50-, and 100-year flood events.
- 4) Hydraulic analysis: A hydraulic model was constructed using hydraulic cross section elevations and floodplain geometry extracted from the digital elevation

data. The hydraulic model was used to calculate the flow velocity in the minor tributaries in the stream system near the flood zone.

2. Data Collection

Some data have been collected for a previous erosion study of the MEA site; those data sources are documented in the erosion study report (ARCADIS 2012). These data were reviewed and, supplemented with additional precipitation frequency data, are required for the rainfall-runoff model. The rainfall data were collected from the National Oceanic and Atmospheric Administration (NOAA) TP40 (Rainfall Frequency Atlas of The United States - for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years), pages 50 through 56, and is presented here in **Table 1**. There are no United States Geological Survey (USGS) gage stations in the project area; the nearest gage is USGS 06454500 (Niobrara River above Box Butte Reservoir, NE) southeast of the project boundary.

3. Watershed Delineation and Basin Characteristics

The U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center Geospatial Hydrologic Modeling System Extension (HEC-GeoHMS) software (USACE 2009) was used to delineate the watershed within the project area and to obtain the sub-basin characteristics and hydraulic parameters. HEC-GeoHMS creates the map, basin, and parameter input files required for developing a hydrologic model. The basin model files contain hydrologic elements (sub-basins) and hydrologic connectivity (drainage line network). The procedures for defining the terrain, basin, and hydrologic processing were described previously in the MEA erosion study report (ARCADIS 2012).

The project areas were divided into 107 sub-basins and drainage line networks over the study area. The curve numbers (CNs) were calculated by hydrologic soil group, information in the land use map, and area-weighting averaged for each basin. A dominant watershed divide extends throughout the study area which provides for a separation into two main hydrologic regimes named Hydrologic Project South and Hydrologic Project East. Hydrologic Project South has 15 sub-basins, and Hydrologic Project East contains 23 sub-basins. The two hydrologic regimes are displayed on **Figure 1**.

4. Hydrologic Analysis

HEC-HMS was used to approximate the rainfall-runoff volumes in order to estimate the potential peak flows through the region under several storm events of different return periods.

The sub-basin characteristics and the peak discharge for both of the hydrologic regimes and their multiple sub-basins were obtained using HEC-GeoHMS and USACE Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS), respectively. The rainfall data were used to define the precipitation intensity for a 24-hour storm event for 10-, 25-, 50-, and 100-year return period events. The depth-duration-frequency function is shown in **Table 1**. The simulation time of 36 hours was selected to fully account for the travel time of runoff across the entire watershed. The simulation time step is 5 minutes. **Figures 2** and **3** present the hydrologic elements (sub-basins and stream reaches) for Hydrologic Project South and Hydrologic Project East, respectively. Peak discharge rates are presented as cubic meters per second (m^3/s) and cubic feet per second (ft^3/s) in **Tables 2** and **3**.

5. Hydraulic Analysis

The USACE Hydrologic Engineering Center Geospatial River Analysis System (HEC-GeoRAS) was used to extract the cross sections from the digital elevation data and construct a USACE Hydrologic Engineering Center River Analysis System (HEC-RAS) hydraulic model to calculate the flow velocity through the region. Using the peak discharge rates calculated with the HEC-HMS model, the HEC-RAS model computations were used to determine flood velocities for each of the 10-, 25-, 50-, and 100-year storm return periods. The channel and overbank roughness (Manning's Coefficient) of 0.035 used in the model is the typical value used for vegetated channels (Chow 1959).

HEC-RAS cross section locations in Hydrologic Project South are presented on **Figures 4-1** through **4-3**, and the corresponding results of the hydraulic analysis of the 100-year storm are shown in **Tables 4-1** through **4-3**. Estimated flow velocities for a 100-year storm within Hydrologic Project South range from 0.9 to 6.5 feet per second (ft/s). For the western tributary (R80 and upstream) within Hydrologic Project South, the maximum flow velocity is estimated to be 5.8 ft/s . For the main stem drainage within Hydrologic Project South, the maximum flow velocity is estimated to be 6.3 ft/s upstream of the confluence with the western tributary and 6.5 ft/s downstream of the confluence. **Tables 5-1** through **5-3**, **6-1** through **6-3**, and **7-1** through **7-3** show the

results for 50-year, 25-year, and 10-year storm events within Hydrologic Project South, respectively.

HEC-RAS cross section locations in Hydrologic Project East are presented on **Figures 5-1** through **5-6**, and the corresponding results of the hydraulic analysis are shown in **Tables 8-1** through **8-9**. Estimated flow velocities for the main stem drainage in Hydrologic Project East range from 1.1 to 8.9 ft/s for the 100-year storm. **Tables 9-1** through **9-9**, **10-1** through **10-9**, and **11-1** through **11-9** show the results for 50-year, 25-year, and 10-year storm events within Hydrologic Project East, respectively. **Figures 6-1** and **6-2** show examples of HEC-RAS cross sections for Hydrologic Project South and Hydrologic Project East, respectively.

The inundation area predicted using the HEC-RAS was qualitatively verified by comparing the HEC-RAS 100-year storm flood area for Hydrologic Project South to the Federal Emergency Management Agency (FEMA) 100-year flood zones.

The aerial extent of the estimated floodplain compares very well with the FEMA floodplain, with the exception that the approximated floodplain contains several discontinuities. The discontinuities in the model result are due to the relatively low resolution of HEC-RAS model. The resolution of the HEC-RAS model developed here is appropriate for computing flow velocities, but not for a complete mapping of the flood plain. Full delineation of the flood plain was not the objective of this effort, and was only used as a comparative check of the model results.

It is recommended as a general practice to avoid placing project facilities, such as roads, processing equipment, storage tanks, or wells, within the FEMA flood zone. For activities within the FEMA flood zone, mitigation measures may be needed to avoid impacts to project components due to inundation or erosion. The results of this analysis (e.g., peak discharge rates, flood velocity) can be used to help guide design of mitigation measures for project facilities that may be placed within the FEMA flood zone. The FEMA-designated flood zones supersede any estimated flood widths presented in this report.

Similarly, although not within FEMA-designated flood zones, portions of the MEA may be subject to concentrated water flow during storm runoff and may also be at risk of damage. For locations within or adjacent to the drainages assessed in this study, but beyond the FEMA flood zones, model results can be used as described below to estimate areas potentially affected under these circumstances, in addition to peak discharge rates and flood velocity.

For locations outside the FEMA flood zone, but near a drainage line/stream, the top width values provided in **Tables 4-1** through **4-3** and **11-1** through **11-9** can be used to estimate the potential area affected for different storm return periods. Based on the top widths calculated for the cross sections located upstream and downstream of the location of interest, if the distance between the location and stream thalweg (lowest point along the length of the stream) is greater than half of the top width, then it is within the potential non-FEMA-designated flood area. For these locations, and locations within the FEMA-designated flood zones, **Tables 4-1** through **4-3** and **11-1** through **11-9** likewise present the flow velocity for each storm return period, which can be used for erosion protection design.

6. Conclusion

ARCADIS used HEC-HMS and HEC-RAS to conduct hydrologic and hydraulic modeling to estimate peak discharge, flow velocity, and potential inundation areas beyond the FEMA-designated flood zones for sub-basins within the MEA. The models were used to evaluate storms with 10-, 25-, 50-, and 100-year return periods. Model results can be used in planning mine unit layout and to identify the potential needs for the protection of wells and other MEA facilities against erosion. Model results presented in this report are preliminary, and additional detailed study may be needed for final engineering design.

7. References

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Tables

Table 1 Depth-Duration Data (inches) for the Project Area in Dawes County, NE

Event	HYDRO 35			Technical Paper 40					Technical Paper 49		
	5 min	15 min	60 min	2 hr	3 hr	6 hr	12 hr	24 hr	2 day	4 day	7 day
2-yr	0.4	0.7	1.2	1.2	1.3	1.5	1.6	2.0	2.1	2.5	2.9
5-yr	0.4	0.9	1.6	1.6	1.7	2.0	2.3	2.6	2.8	3.2	3.7
10-yr	0.5	1.1	1.9	2.0	2.1	2.4	2.7	3.1	3.3	3.8	4.2
25-yr	0.6	1.3	2.4	2.4	2.5	2.8	3.2	3.6	4.0	4.5	5.2
50-yr	0.7	1.4	2.7	2.7	2.8	3.2	3.5	4.1	4.6	5.1	6.0
100-yr	0.8	1.6	3.0	3.0	3.2	3.6	4.1	4.6	5.0	5.7	6.6

Table 2 The Peak Flow for Hydrologic Project South

Return Periods		100-year		50-year		25-year		10-year	
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)
W310	0.65	2.5	88	2.1	74	1.7	60	1.2	42
W300	0.45	2.9	102	2.5	88	2.1	74	1.6	57
W290	0.36	2.5	88	2.1	74	1.7	60	1.2	42
W280	0.49	2.1	74	1.8	64	1.4	49	1.1	39
W270	1.50	4.9	173	4.1	145	3.4	120	2.5	88
W260	1.20	4.5	159	3.8	134	3.1	109	2.2	78
W250	0.87	4.0	141	3.4	120	2.8	99	2.0	71
W240	1.94	8.3	293	7.0	247	5.7	201	4.2	148
W230	0.78	5.8	205	5.0	177	4.2	148	3.2	113
W220	0.66	6.4	226	5.5	194	4.6	162	3.5	124
W210	4.18	10.9	385	9.1	321	7.5	265	5.7	201
W200	0.74	6.2	219	5.3	187	4.4	155	3.3	117
W190	1.39	8.9	314	7.6	268	6.4	226	4.8	170
W180	0.48	4.8	170	4.1	145	3.4	120	2.5	88
W170	2.12	12.0	424	10.2	360	8.5	300	6.4	226
Outlet S	17.82	41.7	1473	34.8	1229	28.8	1017	22.1	780
R40	2.60	12.6	445	10.7	378	9.0	318	6.8	240
R80	1.44	8.9	314	7.6	268	6.4	226	4.9	173
R90	4.73	17.3	611	14.6	516	12.2	431	9.3	328
R110	12.29	38.1	1345	31.9	1127	26.6	939	20.3	717
R120	14.36	38.9	1374	32.5	1148	27.0	953	20.6	727
R140	16.35	41.6	1469	34.8	1229	28.7	1014	22.0	777
R160	17.16	41.2	1455	34.4	1215	28.5	1006	21.9	773

Table 3 The Peak Flow for Hydrologic Project East

Return Periods		100-year		50-year		25-year		10-year	
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)
W127490	3.01	7.4	261	6.1	215	5.0	177	3.8	134
W127480	0.03	0.2	7	0.2	7	0.1	4	0.1	4
W127470	0.99	4.7	166	4.0	141	3.3	117	2.5	88
W127460	0.06	0.3	11	0.2	7	0.2	7	0.1	4
W127450	1.40	10.4	367	8.9	314	7.5	265	5.7	201
W127440	0.70	3.7	131	3.1	109	2.6	92	1.9	67
W127430	1.23	6.4	226	5.4	191	4.6	162	3.4	120
W127420	0.70	5.7	201	4.8	170	4.0	141	3.0	106
W127410	0.28	2.3	81	1.9	67	1.6	57	1.1	39
W127400	1.50	5.7	201	4.8	170	4.0	141	3.1	109
W127390	1.52	10.0	353	8.6	304	7.2	254	5.5	194
W127380	1.19	8.6	304	7.3	258	6.2	219	4.6	162
W127370	1.38	9.2	325	7.9	279	6.7	237	5.0	177
W127360	1.87	11.1	392	9.4	332	7.9	279	5.9	208
W127350	3.24	17.7	625	15.0	530	12.6	445	9.4	332
W127340	0.79	5.8	205	4.9	173	4.1	145	3.0	106
W127330	1.79	10.1	357	8.6	304	7.2	254	5.4	191
W127320	0.45	3.3	117	2.8	99	2.3	81	1.7	60
W127310	0.59	4.1	145	3.5	124	2.9	102	2.2	78
W127300	2.13	11.2	396	9.5	335	7.9	279	5.9	208
W127290	1.17	9.6	339	8.1	286	6.8	240	5.1	180
W127280	2.21	11.5	406	9.7	343	8.1	286	6.1	215
W127270	2.18	13.1	463	11.1	392	9.3	328	7.0	247
Outlet E	30.42	75.3	2659	63.2	2232	52.7	1861	40.9	1444
R127080	4.34	20.2	713	17.1	604	14.3	505	10.8	381
R127100	3.35	18.1	639	15.4	544	12.9	456	9.7	343
R127110	6.58	28.4	1003	24.0	848	20.1	710	15.2	537
R127120	11.31	45.0	1589	38.0	1342	31.7	1119	24.2	855
R127140	16.42	59.9	2115	50.4	1780	42.1	1487	32.3	1141
R127160	18.99	66.1	2334	55.6	1963	46.5	1642	35.8	1264
R127180	20.79	69.4	2451	58.5	2066	48.8	1723	37.7	1331

Table 3 The Peak Flow for Hydrologic Project East

Return Periods		100-year		50-year		25-year		10-year	
Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)	Peak Discharge (M3/S)	Peak Discharge (FT3/S)
R127200	22.99	72.6	2564	61.1	2158	51.0	1801	39.4	1391
R127220	24.92	75.4	2663	63.5	2242	52.9	1868	41.0	1448
R127240	25.97	76.9	2716	64.8	2288	54.0	1907	41.8	1476
R127260	27.41	71.3	2518	59.9	2115	50.0	1766	38.8	1370

Table 4-1 HEC-RAS Results for Hydrologic Project South (100 year)

River	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
tribS	R80	13237.87	100-year	314	4297.97	4299.19	4299.19	4299.57	0.02000	4.98	63.01	83.28	1.01
tribS	R80	12367.97	100-year	314	4282.37	4283.48	4283.48	4283.72	0.01443	4.16	87.21	178.31	0.85
tribS	R80	10069.63	100-year	314	4260.38	4261.65		4261.70	0.00215	1.91	164.82	173.11	0.34
tribS	R80	9142.42	100-year	314	4257.64	4258.91		4259.00	0.00416	2.42	132.14	164.34	0.47
tribS	R80	6860.113	100-year	314	4240.19	4240.60	4240.60	4240.80	0.02309	3.32	88.71	220.44	0.96
tribS	R80	5571.463	100-year	314	4223.14	4224.39	4224.03	4224.50	0.00446	2.83	119.61	139.07	0.50
tribS	R80	4317.986	100-year	314	4211.97	4213.89	4213.89	4214.41	0.01831	5.78	54.33	53.68	1.01
tribS	R80	3159.554	100-year	314	4201.53	4203.67	4202.87	4203.76	0.00238	2.47	127.23	97.77	0.38
tribS	R80	2375.76	100-year	314	4199.05	4199.35	4199.35	4199.72	0.01813	1.61	65.77	94.99	0.73
tribS	R80	1261.941	100-year	314	4182.12	4184.29		4184.36	0.00124	2.21	146.46	89.89	0.29
tribS	R80	728.8653	100-year	314	4182.21	4183.51		4183.57	0.00187	1.64	164.06	157.45	0.31
tribS	R80	327.2511	100-year	314	4180.31	4181.45	4181.45	4181.87	0.01628	4.06	64.23	78.66	0.89

Table 4-2 HEC-RAS Results for Hydrologic Project South (100 year)

River	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
mainS	R40	55159.7	100-year	445	4535.2	4539.47		4539.48	0.00011	0.94	474.00	154.81	0.09
mainS	R40	54564.41	100-year	445	4533.59	4535.80		4535.88	0.00181	2.29	194.08	135.74	0.34
mainS	R40	53570.84	100-year	445	4495.29	4497.32	4496.89	4497.59	0.00619	4.14	107.56	77.79	0.62
mainS	R40	52734.87	100-year	445	4477.14	4480.03		4480.07	0.00059	1.72	259.12	120.34	0.21
mainS	R40	51840.37	100-year	445	4456.78	4458.62	4458.56	4459.23	0.01467	6.30	70.69	51.83	0.95
mainS	R40	49963.12	100-year	445	4436.17	4438.65		4438.68	0.00058	1.57	289.54	184.36	0.20
mainS	R40	48852.87	100-year	445	4415.7	4417.05	4417.05	4417.54	0.01863	5.62	79.19	82.84	1.01
mainS	R40	47023.76	100-year	445	4378.57	4382.35	4380.21	4382.41	0.00061	1.94	229.27	90.81	0.22
mainS	R40	44780.42	100-year	445	4358.28	4359.55	4359.55	4359.97	0.01917	5.23	85.04	101.18	1.01
mainS	R40	42644.33	100-year	445	4344.72	4349.63	4346.74	4349.65	0.00019	1.06	418.91	170.19	0.12
mainS	R40	41498.49	100-year	611	4337.59	4338.75	4338.75	4339.11	0.02059	4.81	127.12	181.35	1.01
mainS	R40	39650.54	100-year	611	4318.87	4320.66	4320.06	4320.73	0.00248	2.16	283.30	274.44	0.37
mainS	R40	35808.85	100-year	611	4297.36	4298.92	4298.92	4299.21	0.02275	4.31	141.87	257.11	1.02
mainS	R40	33797.05	100-year	611	4276.45	4278.80	4278.27	4279.06	0.00556	4.07	150.05	102.72	0.59
mainS	R40	32094.08	100-year	611	4261.34	4262.55	4262.55	4262.98	0.01937	5.25	116.29	138.57	1.01
mainS	R40	29220.37	100-year	611	4238.41	4242.65		4242.69	0.00043	1.64	373.47	145.77	0.18
mainS	R40	27527.81	100-year	611	4238.28	4239.92	4239.92	4240.48	0.01787	5.97	102.30	94.70	1.01
mainS	R40	25758.22	100-year	611	4223.04	4225.24		4225.35	0.00228	2.62	233.28	158.94	0.38
mainS	R40	24567.67	100-year	611	4218.11	4218.84	4218.84	4219.15	0.02128	4.44	137.50	226.19	1.00
mainS	R40	22820.49	100-year	611	4197.48	4199.23	4198.68	4199.40	0.00417	3.26	187.49	144.70	0.50
mainS	R40	21420.75	100-year	611	4186.77	4187.69	4187.69	4187.98	0.02247	4.32	141.46	252.98	1.02
mainS	R40	19966.98	100-year	611	4181.31	4183.98		4183.99	0.00025	0.95	645.59	395.70	0.13
mainS	R40	18733.99	100-year	611	4180.84	4182.41	4182.41	4182.97	0.01809	6.01	101.61	92.38	1.01

Table 4-3 HEC-RAS Results for Hydrologic Project South (100 year)

River	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
mainS	R160	17991.6	100-year	1345	4170.62	4173.05	4172.60	4173.36	0.00651	4.48	300.13	200.41	0.65
mainS	R160	16986.9	100-year	1345	4161.09	4162.67	4162.67	4163.17	0.01789	5.67	238.58	251.96	1.00
mainS	R160	16073.27	100-year	1345	4151.12	4154.26		4154.41	0.00186	3.12	430.48	192.89	0.37
mainS	R160	15302.72	100-year	1345	4149.49	4151.54	4151.20	4151.83	0.00761	4.27	314.78	254.02	0.68
mainS	R160	14572	100-year	1345	4141.49	4143.21	4143.21	4143.84	0.01684	6.37	211.09	169.64	1.01
mainS	R160	13156.7	100-year	1374	4132.67	4136.68		4136.81	0.00220	2.93	468.33	262.00	0.39
mainS	R160	11961.96	100-year	1374	4131.52	4133.23		4133.36	0.00395	2.90	472.99	416.23	0.48
mainS	R160	10675.47	100-year	1374	4121.25	4123.44	4123.44	4124.09	0.01689	6.47	212.23	166.80	1.01
mainS	R160	8609.744	100-year	1374	4108.48	4111.91		4112.07	0.00220	3.22	426.48	207.05	0.40
mainS	R160	7825.95	100-year	1374	4106.32	4109.87	4109.04	4110.04	0.00308	3.40	404.62	233.49	0.45
mainS	R160	6366.906	100-year	1374	4098.17	4100.50	4100.50	4101.10	0.01741	6.19	221.84	190.75	1.01
mainS	R160	5314.815	100-year	1469	4092.15	4094.71		4094.76	0.00081	1.75	839.84	481.23	0.23
mainS	R160	3875.797	100-year	1469	4089.21	4091.02	4091.02	4091.53	0.01857	5.75	255.65	258.20	1.02
mainS	R160	3478.258	100-year	1571	4081.33	4085.96		4086.15	0.00151	3.50	448.35	144.65	0.35
mainS	R160	2579.745	100-year	1571	4080.23	4082.97		4083.39	0.00911	5.16	304.28	211.51	0.76
mainS	R160	1394.252	100-year	1571	4071.78	4075.22	4074.45	4075.60	0.00495	4.95	317.54	148.73	0.60
mainS	R160	712.8439	100-year	1571	4069.65	4071.93	4071.41	4072.16	0.00501	3.84	409.60	283.79	0.56

Table 5-1 HEC-RAS Results for Hydrologic Project South (50 year)

River	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
tribS	R80	13237.87	50-year	268	4297.97	4299.10	4299.10	4299.46	0.02058	4.80	55.88	79.91	1.01
tribS	R80	12367.97	50-year	268	4282.37	4283.43	4283.43	4283.65	0.01442	3.97	77.47	174.84	0.84
tribS	R80	10069.63	50-year	268	4260.38	4261.54		4261.59	0.00222	1.83	146.87	168.55	0.34
tribS	R80	9142.42	50-year	268	4257.64	4258.85	4258.48	4258.92	0.00388	2.26	121.37	160.14	0.45
tribS	R80	6860.113	50-year	268	4240.19	4240.55	4240.55	4240.74	0.02486	3.16	78.62	219.10	0.98
tribS	R80	5571.463	50-year	268	4223.14	4224.30	4223.96	4224.40	0.00443	2.68	107.64	134.80	0.49
tribS	R80	4317.986	50-year	268	4211.97	4213.77	4213.77	4214.25	0.01904	5.58	47.99	51.41	1.02
tribS	R80	3159.554	50-year	268	4201.53	4203.54	4202.77	4203.62	0.00230	2.33	114.86	93.51	0.37
tribS	R80	2375.76	50-year	268	4199.05	4199.26	4199.26	4199.61	0.01946	1.33	57.54	89.39	0.72
tribS	R80	1261.941	50-year	268	4182.12	4184.16		4184.22	0.00115	2.05	134.67	87.64	0.28
tribS	R80	728.8653	50-year	268	4182.21	4183.41		4183.46	0.00188	1.55	147.70	154.05	0.31
tribS	R80	327.2511	50-year	268	4180.31	4181.36	4181.36	4181.74	0.01661	3.87	56.91	75.02	0.88

Table 5-2 HEC-RAS Results for Hydrologic Project South (50 year)

River	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
mainS	R40	55159.7	50-year	378	4535.2	4539.18		4539.19	0.00011	0.88	430.20	150.27	0.09
mainS	R40	54564.41	50-year	378	4533.59	4535.66		4535.74	0.00176	2.14	176.35	133.17	0.33
mainS	R40	53570.84	50-year	378	4495.29	4497.16	4496.78	4497.41	0.00641	3.97	95.29	75.41	0.62
mainS	R40	52734.87	50-year	378	4477.14	4479.81		4479.85	0.00059	1.62	232.76	116.97	0.20
mainS	R40	51840.37	50-year	378	4456.78	4458.45	4458.40	4459.02	0.01514	6.06	62.41	49.67	0.95
mainS	R40	49963.12	50-year	378	4436.17	4438.45		4438.49	0.00057	1.49	256.16	163.53	0.20
mainS	R40	48852.87	50-year	378	4415.7	4416.95	4416.95	4417.39	0.01885	5.35	70.67	80.30	1.00
mainS	R40	47023.76	50-year	378	4378.57	4382.08	4380.07	4382.13	0.00061	1.84	205.08	87.06	0.21
mainS	R40	44780.42	50-year	378	4358.28	4359.45	4359.45	4359.84	0.01940	5.00	75.55	97.03	1.00
mainS	R40	42644.33	50-year	378	4344.72	4349.36	4346.61	4349.38	0.00019	1.01	374.65	162.45	0.12
mainS	R40	41498.49	50-year	516	4337.59	4338.67	4338.67	4339.00	0.02152	4.61	111.95	175.81	1.02
mainS	R40	39650.54	50-year	516	4318.87	4320.55	4319.97	4320.62	0.00243	2.03	253.67	264.60	0.37
mainS	R40	35808.85	50-year	516	4297.36	4298.82	4298.82	4299.11	0.02394	4.31	119.84	225.77	1.04
mainS	R40	33797.05	50-year	516	4276.45	4278.65	4278.13	4278.88	0.00538	3.84	134.46	98.18	0.58
mainS	R40	32094.08	50-year	516	4261.34	4262.45	4262.45	4262.84	0.02044	5.02	102.79	136.57	1.02
mainS	R40	29220.37	50-year	516	4238.41	4242.40		4242.43	0.00041	1.53	336.71	140.47	0.17
mainS	R40	27527.81	50-year	516	4238.28	4239.80	4239.80	4240.30	0.01807	5.70	90.58	90.74	1.00
mainS	R40	25758.22	50-year	516	4223.04	4225.08		4225.18	0.00223	2.47	208.85	152.77	0.37
mainS	R40	24567.67	50-year	516	4218.11	4218.77	4218.77	4219.05	0.02201	4.25	121.31	218.61	1.01
mainS	R40	22820.49	50-year	516	4197.48	4199.10	4198.57	4199.25	0.00409	3.06	168.54	140.77	0.49
mainS	R40	21420.75	50-year	516	4186.77	4187.63	4187.63	4187.89	0.02301	4.09	126.24	249.65	1.01
mainS	R40	19966.98	50-year	516	4181.31	4183.81		4183.82	0.00025	0.90	577.73	385.05	0.13
mainS	R40	18733.99	50-year	516	4180.84	4182.28	4182.28	4182.79	0.01861	5.70	90.49	91.15	1.01

Table 5-3 HEC-RAS Results for Hydrologic Project South (50 year)

River	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
mainS	R160	17991.6	50-year	1127	4170.62	4172.89	4172.45	4173.16	0.00634	4.21	267.71	192.46	0.63
mainS	R160	16986.9	50-year	1127	4161.09	4162.55	4162.55	4163.00	0.01855	5.42	208.24	235.39	1.00
mainS	R160	16073.27	50-year	1127	4151.12	4154.02		4154.16	0.00179	2.92	385.67	185.55	0.36
mainS	R160	15302.72	50-year	1127	4149.49	4151.40	4151.07	4151.65	0.00753	4.04	278.77	242.54	0.66
mainS	R160	14572	50-year	1127	4141.49	4143.05	4143.05	4143.62	0.01735	6.10	184.70	161.96	1.01
mainS	R160	13156.7	50-year	1148	4132.67	4136.48		4136.59	0.00213	2.75	417.35	250.85	0.38
mainS	R160	11961.96	50-year	1148	4131.52	4133.11		4133.23	0.00391	2.71	423.01	409.10	0.47
mainS	R160	10675.47	50-year	1148	4121.25	4123.28	4123.28	4123.87	0.01766	6.17	185.96	162.36	1.02
mainS	R160	8609.744	50-year	1148	4108.48	4111.67		4111.81	0.00213	3.04	377.33	194.74	0.39
mainS	R160	7825.95	50-year	1148	4106.32	4109.66	4108.88	4109.82	0.00307	3.20	358.38	225.12	0.45
mainS	R160	6366.906	50-year	1148	4098.17	4100.36	4100.36	4100.90	0.01750	5.91	194.40	180.22	1.00
mainS	R160	5314.815	50-year	1229	4092.15	4094.53		4094.57	0.00080	1.63	752.47	472.94	0.23
mainS	R160	3875.797	50-year	1229	4089.21	4090.90	4090.90	4091.37	0.01930	5.46	225.25	253.09	1.02
mainS	R160	3478.258	50-year	1309	4081.33	4085.66		4085.82	0.00140	3.23	405.11	139.36	0.33
mainS	R160	2579.745	50-year	1309	4080.23	4082.74		4083.14	0.00986	5.09	256.98	193.37	0.78
mainS	R160	1394.252	50-year	1309	4071.78	4074.98	4074.23	4075.31	0.00471	4.61	283.64	142.06	0.58
mainS	R160	712.8439	50-year	1309	4069.65	4071.76	4071.28	4071.97	0.00501	3.61	362.94	275.93	0.55

Table 6-1 HEC-RAS Results for Hydrologic Project South (25 year)

River	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
tribS	R80	13237.87	25-year	226	4297.97	4299.01	4299.01	4299.34	0.02130	4.60	49.08	76.57	1.01
tribS	R80	12367.97	25-year	226	4282.37	4283.36	4283.36	4283.58	0.01531	3.87	65.85	165.10	0.86
tribS	R80	10069.63	25-year	226	4260.38	4261.46		4261.50	0.00214	1.71	132.66	163.99	0.33
tribS	R80	9142.42	25-year	226	4257.64	4258.75		4258.82	0.00413	2.19	105.73	153.84	0.46
tribS	R80	6860.113	25-year	226	4240.19	4240.52	4240.52	4240.68	0.02128	2.76	72.43	217.31	0.89
tribS	R80	5571.463	25-year	226	4223.14	4224.21	4223.90	4224.30	0.00440	2.53	96.05	130.53	0.48
tribS	R80	4317.986	25-year	226	4211.97	4213.65	4213.65	4214.10	0.01960	5.35	42.21	49.25	1.02
tribS	R80	3159.554	25-year	226	4201.53	4203.40	4202.67	4203.48	0.00224	2.20	102.56	89.07	0.36
tribS	R80	2375.76	25-year	226	4199.05	4199.18	4199.18	4199.50	0.02057	0.98	50.33	84.24	0.68
tribS	R80	1261.941	25-year	226	4182.12	4184.02		4184.08	0.00107	1.88	123.30	85.42	0.26
tribS	R80	728.8653	25-year	226	4182.21	4183.30		4183.35	0.00190	1.46	131.64	150.63	0.31
tribS	R80	327.2511	25-year	226	4180.31	4181.27	4181.27	4181.62	0.01689	3.67	50.08	71.44	0.88

Table 6-2 HEC-RAS Results for Hydrologic Project South (25 year)

River	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
mainS	R40	55159.7	25-year	318	4535.2	4538.90		4538.91	0.00010	0.82	388.99	145.87	0.09
mainS	R40	54564.41	25-year	318	4533.59	4535.52		4535.58	0.00176	2.02	157.50	130.38	0.32
mainS	R40	53570.84	25-year	318	4495.29	4497.01	4496.66	4497.23	0.00664	3.79	83.98	73.15	0.62
mainS	R40	52734.87	25-year	318	4477.14	4479.59		4479.63	0.00058	1.53	207.87	113.68	0.20
mainS	R40	51840.37	25-year	318	4456.78	4458.30	4458.25	4458.82	0.01564	5.81	54.76	47.60	0.95
mainS	R40	49963.12	25-year	318	4436.17	4438.26		4438.29	0.00057	1.40	227.15	141.87	0.19
mainS	R40	48852.87	25-year	318	4415.7	4416.84	4416.84	4417.25	0.01930	5.09	62.45	77.77	1.00
mainS	R40	47023.76	25-year	318	4378.57	4381.81	4379.93	4381.86	0.00060	1.74	182.65	83.45	0.21
mainS	R40	44780.42	25-year	318	4358.28	4359.35	4359.35	4359.71	0.02066	4.85	65.56	92.46	1.02
mainS	R40	42644.33	25-year	318	4344.72	4349.10	4346.48	4349.11	0.00018	0.96	332.37	154.70	0.12
mainS	R40	41498.49	25-year	431	4337.59	4338.59	4338.59	4338.89	0.02196	4.36	98.75	170.85	1.01
mainS	R40	39650.54	25-year	431	4318.87	4320.43	4319.89	4320.49	0.00250	1.94	221.82	253.10	0.37
mainS	R40	35808.85	25-year	431	4297.36	4298.71	4298.71	4299.01	0.02208	4.44	97.12	164.52	1.02
mainS	R40	33797.05	25-year	431	4276.45	4278.48	4278.00	4278.69	0.00532	3.63	118.74	93.38	0.57
mainS	R40	32094.08	25-year	431	4261.34	4262.37	4262.37	4262.71	0.02066	4.71	91.52	134.88	1.01
mainS	R40	29220.37	25-year	431	4238.41	4242.15		4242.18	0.00039	1.42	302.50	135.35	0.17
mainS	R40	27527.81	25-year	431	4238.28	4239.67	4239.67	4240.13	0.01869	5.45	79.01	86.67	1.01
mainS	R40	25758.22	25-year	431	4223.04	4224.93		4225.02	0.00217	2.32	186.18	146.84	0.36
mainS	R40	24567.67	25-year	431	4218.11	4218.70	4218.70	4218.96	0.02291	4.05	106.29	212.03	1.01
mainS	R40	22820.49	25-year	431	4197.48	4198.97	4198.46	4199.10	0.00400	2.87	150.32	136.21	0.48
mainS	R40	21420.75	25-year	431	4186.77	4187.57	4187.57	4187.80	0.02396	3.87	111.35	246.33	1.01
mainS	R40	19966.98	25-year	431	4181.31	4183.65		4183.66	0.00025	0.83	516.66	375.22	0.12
mainS	R40	18733.99	25-year	431	4180.84	4182.17	4182.17	4182.62	0.01934	5.40	79.84	89.95	1.01

Table 6-3 HEC-RAS Results for Hydrologic Project South (25 year)

River	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
mainS	R160	17991.6	25-year	939	4170.62	4172.71	4172.30	4172.96	0.00638	3.99	235.25	184.10	0.62
mainS	R160	16986.9	25-year	939	4161.09	4162.40	4162.40	4162.84	0.01810	5.35	175.59	193.77	0.99
mainS	R160	16073.27	25-year	939	4151.12	4153.80		4153.91	0.00172	2.73	344.51	178.55	0.35
mainS	R160	15302.72	25-year	939	4149.49	4151.26	4150.95	4151.49	0.00744	3.81	246.24	231.65	0.65
mainS	R160	14572	25-year	939	4141.49	4142.90	4142.90	4143.42	0.01785	5.83	161.19	154.80	1.01
mainS	R160	13156.7	25-year	953	4132.67	4136.29		4136.39	0.00205	2.57	370.91	239.41	0.36
mainS	R160	11961.96	25-year	953	4131.52	4132.99		4133.09	0.00391	2.54	375.67	402.22	0.46
mainS	R160	10675.47	25-year	953	4121.25	4123.13	4123.13	4123.66	0.01821	5.84	163.17	158.41	1.01
mainS	R160	8609.744	25-year	953	4108.48	4111.43		4111.56	0.00208	2.86	332.78	184.65	0.38
mainS	R160	7825.95	25-year	953	4106.32	4109.48	4108.76	4109.62	0.00299	2.99	318.71	217.69	0.44
mainS	R160	6366.906	25-year	953	4098.17	4100.20	4100.20	4100.70	0.01855	5.73	166.45	168.83	1.02
mainS	R160	5314.815	25-year	1014	4092.15	4094.34		4094.37	0.00080	1.53	663.93	460.57	0.22
mainS	R160	3875.797	25-year	1014	4089.21	4090.75	4090.75	4091.20	0.01855	5.36	189.35	212.35	1.00
mainS	R160	3478.258	25-year	1088	4081.33	4085.37		4085.51	0.00130	2.98	365.52	134.32	0.32
mainS	R160	2579.745	25-year	1088	4080.23	4082.53		4082.91	0.01070	5.00	217.57	179.00	0.80
mainS	R160	1394.252	25-year	1088	4071.78	4074.76	4074.02	4075.05	0.00449	4.30	252.88	135.73	0.56
mainS	R160	712.8439	25-year	1088	4069.65	4071.61	4071.15	4071.79	0.00500	3.39	321.20	267.98	0.55

Table 7-1 HEC-RAS Results for Hydrologic Project South (10 year)

River	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
tribS	R80	13237.87	10-year	173	4297.97	4298.89	4298.89	4299.18	0.02205	4.30	40.24	71.42	1.01
tribS	R80	12367.97	10-year	173	4282.37	4283.27	4283.27	4283.47	0.01558	3.61	51.97	152.49	0.85
tribS	R80	10069.63	10-year	173	4260.38	4261.32		4261.36	0.00211	1.55	111.43	156.91	0.32
tribS	R80	9142.42	10-year	173	4257.64	4258.63		4258.69	0.00410	2.02	88.02	145.25	0.44
tribS	R80	6860.113	10-year	173	4240.19	4240.47	4240.47	4240.61	0.02139	2.40	60.01	206.79	0.86
tribS	R80	5571.463	10-year	173	4223.14	4224.09	4223.80	4224.16	0.00443	2.32	79.99	124.38	0.47
tribS	R80	4317.986	10-year	173	4211.97	4213.50	4213.50	4213.88	0.01986	4.99	34.69	45.46	1.01
tribS	R80	3159.554	10-year	173	4201.53	4203.21	4202.53	4203.27	0.00214	2.01	85.99	82.72	0.35
tribS	R80	2375.76	10-year	173	4199.05	4199.06	4199.06	4199.34	0.02262	0.23	41.03	77.09	0.49
tribS	R80	1261.941	10-year	173	4182.12	4183.84		4183.88	0.00094	1.64	107.46	82.22	0.24
tribS	R80	728.8653	10-year	173	4182.21	4183.15		4183.19	0.00190	1.31	109.99	144.36	0.30
tribS	R80	327.2511	10-year	173	4180.31	4181.13	4181.13	4181.44	0.01773	3.40	40.70	66.23	0.88

Table 7-2 HEC-RAS Results for Hydrologic Project South (10 year)

River	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
mainS	R40	55159.7	10-year	240	4535.2	4538.48		4538.49	0.00009	0.73	328.92	139.21	0.08
mainS	R40	54564.41	10-year	240	4533.59	4535.35		4535.40	0.00160	1.77	135.50	127.04	0.30
mainS	R40	53570.84	10-year	240	4495.29	4496.79	4496.50	4496.98	0.00701	3.50	68.53	69.95	0.62
mainS	R40	52734.87	10-year	240	4477.14	4479.28		4479.31	0.00058	1.39	173.14	108.94	0.19
mainS	R40	51840.37	10-year	240	4456.78	4458.06	4458.04	4458.52	0.01691	5.46	43.97	44.50	0.97
mainS	R40	49963.12	10-year	240	4436.17	4437.99		4438.01	0.00056	1.27	189.56	134.14	0.19
mainS	R40	48852.87	10-year	240	4415.7	4416.69	4416.69	4417.04	0.02052	4.73	50.77	74.02	1.01
mainS	R40	47023.76	10-year	240	4378.57	4381.41	4379.72	4381.45	0.00059	1.60	150.10	77.05	0.20
mainS	R40	44780.42	10-year	240	4358.28	4359.21	4359.21	4359.52	0.02105	4.47	53.66	86.70	1.00
mainS	R40	42644.33	10-year	240	4344.72	4348.69	4346.29	4348.70	0.00018	0.88	272.57	139.17	0.11
mainS	R40	41498.49	10-year	328	4337.59	4338.49	4338.49	4338.74	0.02266	4.01	81.73	164.23	1.00
mainS	R40	39650.54	10-year	328	4318.87	4320.28	4319.78	4320.33	0.00245	1.77	185.17	239.19	0.35
mainS	R40	35808.85	10-year	328	4297.36	4298.46	4298.46	4298.83	0.02040	4.90	66.95	92.16	1.01
mainS	R40	33797.05	10-year	328	4276.45	4278.26	4277.80	4278.43	0.00520	3.33	98.55	86.83	0.55
mainS	R40	32094.08	10-year	328	4261.34	4262.26	4262.26	4262.54	0.02131	4.29	76.44	132.58	1.00
mainS	R40	29220.37	10-year	328	4238.41	4241.80		4241.82	0.00036	1.28	256.50	128.14	0.16
mainS	R40	27527.81	10-year	328	4238.28	4239.49	4239.49	4239.90	0.01990	5.12	64.10	81.11	1.01
mainS	R40	25758.22	10-year	328	4223.04	4224.72		4224.79	0.00210	2.10	156.01	138.55	0.35
mainS	R40	24567.67	10-year	328	4218.11	4218.61	4218.61	4218.83	0.02389	3.73	87.87	204.82	1.00
mainS	R40	22820.49	10-year	328	4197.48	4198.79	4198.33	4198.89	0.00384	2.60	126.38	128.89	0.46
mainS	R40	21420.75	10-year	328	4186.77	4187.49	4187.49	4187.69	0.02581	3.60	91.03	237.02	1.02
mainS	R40	19966.98	10-year	328	4181.31	4183.42		4183.43	0.00025	0.76	432.61	357.75	0.12
mainS	R40	18733.99	10-year	328	4180.84	4182.01	4182.01	4182.40	0.02068	4.98	65.91	88.36	1.02

Table 7-3 HEC-RAS Results for Hydrologic Project South (10 year)

River	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
mainS	R160	17991.6	10-year	717	4170.62	4172.51	4172.11	4172.71	0.00606	3.61	198.77	174.24	0.60
mainS	R160	16986.9	10-year	717	4161.09	4162.21	4162.21	4162.61	0.01968	5.11	140.26	176.34	1.01
mainS	R160	16073.27	10-year	717	4151.12	4153.50		4153.59	0.00162	2.45	292.46	169.97	0.33
mainS	R160	15302.72	10-year	717	4149.49	4151.08	4150.79	4151.27	0.00734	3.50	204.84	217.01	0.63
mainS	R160	14572	10-year	717	4141.49	4142.71	4142.71	4143.16	0.01851	5.42	132.30	145.51	1.00
mainS	R160	13156.7	10-year	727	4132.67	4136.03		4136.11	0.00196	2.34	310.75	223.73	0.35
mainS	R160	11961.96	10-year	727	4131.52	4132.85		4132.93	0.00383	2.28	318.54	393.75	0.45
mainS	R160	10675.47	10-year	727	4121.25	4122.95	4122.95	4123.40	0.01930	5.42	134.14	152.22	1.02
mainS	R160	8609.744	10-year	727	4108.48	4111.14		4111.24	0.00198	2.60	280.10	173.82	0.36
mainS	R160	7825.95	10-year	727	4106.32	4109.23	4108.58	4109.35	0.00300	2.75	264.61	205.86	0.43
mainS	R160	6366.906	10-year	727	4098.17	4099.95	4099.95	4100.44	0.01834	5.64	128.92	132.65	1.01
mainS	R160	5314.815	10-year	777	4092.15	4094.11		4094.14	0.00078	1.39	559.88	443.45	0.22
mainS	R160	3875.797	10-year	777	4089.21	4090.55	4090.55	4090.97	0.01932	5.17	150.38	183.46	1.01
mainS	R160	3478.258	10-year	834	4081.33	4084.98		4085.09	0.00117	2.65	314.67	127.51	0.30
mainS	R160	2579.745	10-year	834	4080.23	4082.22		4082.61	0.01202	5.00	166.78	149.71	0.83
mainS	R160	1394.252	10-year	834	4071.78	4074.47	4073.75	4074.70	0.00420	3.89	214.44	127.38	0.53
mainS	R160	712.8439	10-year	834	4069.65	4071.41	4071.00	4071.56	0.00500	3.10	268.67	255.56	0.53

Table 8-1 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
trib 127250	R127250	6170.037	100-year	367	4297.82	4300.63		4300.83	0.00377	3.59	102.16	62.85	0.50
trib 127250	R127250	5576.299	100-year	367	4294.21	4296.07	4296.07	4296.56	0.01834	5.64	65.02	66.75	1.01
trib 127250	R127250	4957.121	100-year	367	4277.29	4279.15	4279.15	4279.70	0.01838	5.93	61.89	59.03	1.02
trib 127250	R127250	4436.674	100-year	367	4259.43	4260.77	4260.77	4261.23	0.01906	5.41	67.81	76.36	1.01
trib 127250	R127250	3809.693	100-year	367	4239.3	4241.74	4240.95	4241.89	0.00306	3.12	117.77	76.83	0.44
trib 127250	R127250	3121.598	100-year	367	4235.9	4237.15	4237.15	4237.51	0.01998	4.86	75.49	103.49	1.00
trib 127250	R127250	2360.425	100-year	367	4220.14	4221.71		4221.75	0.00137	1.65	223.02	208.10	0.28
trib 127250	R127250	1759.534	100-year	367	4218.02	4219.24	4219.24	4219.65	0.01957	5.17	70.92	87.15	1.01
trib 127250	R127250	1321.822	100-year	367	4208.03	4209.86	4209.86	4210.45	0.01715	6.14	59.77	51.30	1.00
trib 127250	R127250	980.0942	100-year	367	4200.18	4202.72	4201.52	4202.78	0.00111	2.00	183.63	108.82	0.27
trib 127250	R127250	622.0686	100-year	367	4200.25	4201.34	4201.34	4201.71	0.01974	4.86	75.54	102.74	1.00
trib 127220	R127220	5083.328	100-year	166	4297.58	4298.41	4298.41	4298.64	0.02457	3.89	42.71	95.63	1.03
trib 127220	R127220	4579.815	100-year	166	4279.41	4280.72	4280.72	4281.01	0.02285	4.33	38.30	68.93	1.02
trib 127220	R127220	4071.373	100-year	166	4260.34	4261.17	4261.17	4261.42	0.02227	4.08	40.69	78.71	1.00
trib 127220	R127220	3515.454	100-year	166	4250.52	4252.31	4252.12	4252.57	0.01087	4.10	40.49	45.27	0.76
trib 127220	R127220	2942.958	100-year	166	4242.16	4242.42	4242.42	4242.55	0.03244	2.88	57.68	249.86	1.06
trib 127220	R127220	2310.17	100-year	166	4223.46	4224.36	4224.36	4224.62	0.02250	4.11	40.40	77.93	1.01
trib 127220	R127220	1830.441	100-year	166	4217.29	4219.35		4219.37	0.00058	1.23	135.40	102.81	0.19
trib 127220	R127220	1306.478	100-year	166	4217.22	4218.14	4218.14	4218.44	0.02209	4.36	38.04	66.10	1.01
trib 127220	R127220	901.6307	100-year	166	4196.98	4199.52		4199.54	0.00029	1.07	155.70	87.64	0.14
trib 127220	R127220	532.2559	100-year	166	4197.71	4198.82	4198.82	4199.16	0.02077	4.66	35.61	53.49	1.01

Table 8-2 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
trib 127210	R127210	9394.83	100-year	226	4395.11	4389.94	4387.46	4390.05	0.00120		84.87	28.12	0.00
trib 127210	R127210	8847.6	100-year	226	4359.79	4360.86	4360.86	4361.17	0.01703	4.68	52.98	85.60	0.94
trib 127210	R127210	8245.5	100-year	226	4334.11	4336.57		4336.60	0.00085	1.44	156.67	123.82	0.23
trib 127210	R127210	7771.55	100-year	226	4327.79	4330.38	4328.90	4330.41	0.00051	1.27	177.53	115.50	0.18
trib 127210	R127210	7293.97	100-year	226	4314.67	4315.62	4315.62	4315.98	0.02061	4.80	47.08	67.25	1.01
trib 127210	R127210	6719.49	100-year	226	4300.05	4303.83		4303.84	0.00017	0.98	230.05	95.68	0.11
trib 127210	R127210	6098.19	100-year	226	4297.32	4298.07	4298.07	4298.37	0.02206	4.39	51.50	88.70	1.01
trib 127210	R127210	5500.89	100-year	226	4279.11	4282.42		4282.43	0.00010	0.73	309.22	132.66	0.08
trib 127210	R127210	4916.21	100-year	226	4278.11	4278.86	4278.86	4279.15	0.02141	4.34	52.07	89.16	1.00
trib 127210	R127210	4170.26	100-year	226	4262.16	4264.53		4264.53	0.00008	0.53	428.37	254.81	0.07
trib 127210	R127210	3708.24	100-year	226	4261.17	4262.67		4262.70	0.00101	1.37	167.12	181.72	0.24
trib 127210	R127210	3209.62	100-year	226	4254.37	4256.35	4255.33	4256.36	0.00046	0.88	256.30	269.45	0.16
trib 127210	R127210	2737.21	100-year	226	4241.84	4242.62	4242.62	4242.85	0.02388	3.83	59.06	132.56	1.01
trib 127210	R127210	1799.17	100-year	226	4222.09	4224.91		4224.92	0.00020	0.93	244.31	128.42	0.12
trib 127210	R127210	1238.15	100-year	226	4219.52	4221.66		4221.69	0.00068	1.27	177.51	143.10	0.20
trib 127210	R127210	901.045	100-year	226	4215.62	4217.68		4217.69	0.00028	0.87	237.79	153.92	0.13
trib 127210	R127210	501.377	100-year	226	4209.66	4208.54	4208.54	4208.98	0.02044		42.31	49.46	0.00
trib 127210	R127210	221.027	100-year	226	4201.46	4207.07		4207.07	0.00001	0.34	675.12	170.71	0.03

Table 8-3 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
trib 127190	R127190	7863.1	100-year	201	4372.81	4374.12	4374.12	4374.49	0.02063	4.86	41.32	57.91	1.02
trib 127190	R127190	7209.54	100-year	201	4354.09	4355.32	4355.32	4355.68	0.02092	4.78	42.03	61.10	1.02
trib 127190	R127190	6713.41	100-year	201	4339.59	4341.12		4341.29	0.00677	3.30	60.98	66.45	0.61
trib 127190	R127190	6070.03	100-year	201	4332.66	4333.90	4333.90	4334.25	0.02052	4.75	42.34	61.33	1.01
trib 127190	R127190	5601.88	100-year	201	4318.42	4319.58	4319.58	4319.98	0.01963	5.12	39.27	49.07	1.01
trib 127190	R127190	4959.66	100-year	201	4303.36	4304.92	4304.92	4305.34	0.01945	5.21	38.62	46.66	1.01
trib 127190	R127190	3720.6	100-year	201	4280.18	4282.06		4282.10	0.00114	1.67	120.21	95.26	0.26
trib 127190	R127190	3182.55	100-year	201	4279.31	4280.17	4280.17	4280.45	0.02209	4.28	47.00	84.23	1.01
trib 127190	R127190	2710.71	100-year	201	4259.61	4261.50	4261.50	4261.97	0.01861	5.55	36.23	38.43	1.01
trib 127190	R127190	2270.98	100-year	201	4255.56	4258.22		4258.23	0.00011	0.72	283.09	144.05	0.09
trib 127190	R127190	1616.56	100-year	201	4256.61	4257.61	4257.61	4257.94	0.02068	4.65	43.19	64.82	1.00
trib 127190	R127190	1116.45	100-year	201	4249.84	4252.23		4252.28	0.00145	1.80	111.51	94.72	0.29
trib 127190	R127190	732.633	100-year	201	4249.41	4250.52	4250.52	4250.85	0.02095	4.65	43.20	65.53	1.01
trib 127190	R127190	488.211	100-year	201	4243.27	4244.22	4244.22	4244.52	0.02174	4.39	45.76	77.83	1.01
trib 127170	R127170	7007.88	100-year	353	4375.3	4376.51	4376.51	4376.97	0.01866	5.42	65.08	71.83	1.00
trib 127170	R127170	6163.87	100-year	353	4353.05	4354.37	4354.37	4354.77	0.01962	5.05	69.87	89.16	1.01
trib 127170	R127170	5493.49	100-year	353	4335.46	4336.79	4336.79	4337.24	0.01870	5.35	65.92	74.31	1.00
trib 127170	R127170	4884.09	100-year	353	4321.14	4323.43		4323.53	0.00201	2.57	137.27	87.34	0.36
trib 127170	R127170	3864.9	100-year	353	4317.37	4318.88	4318.88	4319.20	0.01405	4.73	84.69	136.40	0.87
trib 127170	R127170	3261.66	100-year	353	4304.09	4304.92	4304.92	4305.22	0.02184	4.42	79.89	135.12	1.01
trib 127170	R127170	2329.98	100-year	353	4280.73	4282.63		4282.72	0.00215	2.42	146.11	107.21	0.36
trib 127170	R127170	1380.96	100-year	353	4276.3	4277.67	4277.67	4278.04	0.02036	4.88	72.40	100.04	1.01
trib 127170	R127170	695.251	100-year	353	4259.97	4261.50		4261.74	0.00875	3.94	89.51	90.40	0.70
trib 127170	R127170	452.208	100-year	353	4256.74	4258.22	4258.22	4258.65	0.01969	5.29	66.72	79.66	1.02

Table 8-4 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
trib 127150	R127150	7036.32	100-year	392	4398.34	4399.47	4399.47	4399.85	0.01986	4.93	79.56	106.42	1.00
trib 127150	R127150	6411.32	100-year	392	4385.86	4387.50	4387.28	4387.83	0.00991	4.62	84.82	74.03	0.76
trib 127150	R127150	5741.18	100-year	392	4376.83	4378.44	4378.44	4378.89	0.01890	5.38	72.89	82.32	1.01
trib 127150	R127150	4988.15	100-year	392	4358.2	4359.80	4359.80	4360.27	0.01899	5.46	71.75	79.45	1.01
trib 127150	R127150	3938.85	100-year	392	4338.18	4339.01	4339.01	4339.32	0.02113	4.51	86.90	139.03	1.01
trib 127150	R127150	3434.18	100-year	392	4321.04	4322.26	4322.26	4322.67	0.01911	5.10	76.89	94.92	1.00
trib 127150	R127150	2855.16	100-year	392	4309.36	4310.77	4310.77	4311.26	0.01816	5.60	69.99	72.15	1.00
trib 127150	R127150	2457.59	100-year	392	4297.28	4300.59		4300.64	0.00068	1.85	212.04	98.01	0.22
trib 127150	R127150	1978.71	100-year	392	4297.85	4299.26	4299.26	4299.68	0.01971	5.19	75.56	92.98	1.01
trib 127150	R127150	1185.05	100-year	392	4282.71	4285.24	4284.96	4285.61	0.00944	4.90	80.00	61.57	0.76
trib 127150	R127150	801.862	100-year	392	4279.17	4280.14	4280.14	4280.50	0.02025	4.80	81.66	115.23	1.00
trib 127130	R127130	9244.79	100-year	392	4446.8	4448.67	4448.67	4449.32	0.01681	6.44	60.85	47.80	1.01
trib 127130	R127130	8454.54	100-year	392	4425.2	4427.28	4427.00	4427.60	0.00861	4.55	86.10	69.15	0.72
trib 127130	R127130	7672.11	100-year	392	4416.2	4417.32	4417.32	4417.72	0.02025	5.07	77.35	100.62	1.02
trib 127130	R127130	6893.12	100-year	392	4396.52	4398.03	4398.03	4398.50	0.01865	5.51	71.09	76.55	1.01
trib 127130	R127130	6173.93	100-year	392	4379.19	4379.89	4379.89	4380.16	0.02233	4.21	93.13	172.30	1.01
trib 127130	R127130	5033.69	100-year	392	4360.76	4362.14	4362.14	4362.46	0.02184	4.57	85.80	137.97	1.02
trib 127130	R127130	4112.69	100-year	392	4340.96	4342.35	4342.35	4342.81	0.01879	5.44	72.06	79.64	1.01
trib 127130	R127130	3127.74	100-year	392	4324.04	4325.73		4326.07	0.01253	4.69	83.57	85.15	0.83
trib 127130	R127130	2574.56	100-year	392	4322.19	4323.50		4323.56	0.00222	1.98	198.16	201.14	0.35
trib 127130	R127130	1643.37	100-year	392	4317.18	4318.47	4318.47	4318.83	0.02116	4.79	81.79	119.59	1.02
trib 127130	R127130	880.67	100-year	392	4295.29	4297.86		4297.90	0.00055	1.40	279.35	167.52	0.19
trib 127130	R127130	374.145	100-year	392	4294.32	4296.39	4296.39	4297.03	0.01686	6.43	60.98	48.16	1.01

Table 8-5 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
trib 127100 up	R127150	3240.72	100-year	339	4462.58	4464.03	4464.03	4464.53	0.01818	5.66	59.86	60.70	1.01
trib 127100 up	R127150	2493.53	100-year	339	4434.71	4438.04		4438.08	0.00034	1.44	235.61	94.55	0.16
trib 127100 up	R127150	1717.92	100-year	339	4434.43	4436.63	4436.63	4437.20	0.01785	6.05	56.04	50.71	1.01
trib 127100 up	R127150	1363.45	100-year	339	4420.17	4422.15		4422.32	0.00424	3.36	100.86	74.93	0.51
trib 127100 up	R127150	634.665	100-year	339	4416.19	4417.20		4417.40	0.01250	3.57	94.93	145.43	0.78
trib 127100 up	R127150	253.963	100-year	339	4409.03	4411.13	4411.13	4411.68	0.01820	5.94	57.08	53.88	1.02
trib 127100 dn	R127100	2841.86	100-year	639	4395.63	4398.84		4399.07	0.00322	3.81	167.57	83.77	0.48
trib 127100 dn	R127100	2261.31	100-year	639	4394.37	4398.15		4398.22	0.00077	2.09	306.20	129.44	0.24
trib 127100 dn	R127100	1757.18	100-year	639	4394.86	4396.63	4396.63	4397.10	0.01892	5.48	116.56	127.96	1.01
trib 127100 dn	R127100	1219.69	100-year	639	4379.83	4382.51		4382.74	0.00366	3.82	167.32	92.11	0.50
trib 127100 dn	R127100	671.984	100-year	639	4378.48	4381.78		4381.85	0.00085	2.12	301.56	133.91	0.25
trib 127090	R127090	8835.46	100-year	357	4558.4	4559.92	4559.92	4560.49	0.01784	6.03	59.19	53.76	1.01
trib 127090	R127090	8034.38	100-year	357	4521.98	4524.10	4523.58	4524.38	0.00570	4.23	84.39	55.37	0.60
trib 127090	R127090	7216.3	100-year	357	4514.31	4516.16	4516.16	4516.69	0.01813	5.89	60.63	57.85	1.01
trib 127090	R127090	6388.22	100-year	357	4494.58	4496.44	4496.31	4496.84	0.01301	5.08	70.27	65.26	0.86
trib 127090	R127090	5427	100-year	357	4480.28	4481.73	4481.73	4482.23	0.01797	5.65	63.18	63.75	1.00
trib 127090	R127090	4649.02	100-year	357	4457.45	4459.26		4459.61	0.00889	4.77	74.83	57.05	0.73
trib 127090	R127090	3827.59	100-year	357	4446.91	4449.05	4449.05	4449.64	0.01750	6.19	57.66	49.59	1.01
trib 127090	R127090	3016.23	100-year	357	4435.39	4438.26		4438.35	0.00128	2.33	153.03	80.27	0.30
trib 127090	R127090	2407.04	100-year	357	4434.45	4435.87	4435.87	4436.34	0.01900	5.48	65.14	71.79	1.01
trib 127090	R127090	1693.37	100-year	357	4417.79	4419.59	4419.59	4420.10	0.01853	5.75	62.14	62.56	1.02
trib 127090	R127090	702.786	100-year	357	4400.97	4402.58	4402.18	4402.71	0.00468	2.89	123.68	124.73	0.51

Table 8-6 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
trib 127070	R127070	9203.06	100-year	406	4557.13	4558.23	4558.23	4558.62	0.02034	4.98	81.58	109.42	1.02
trib 127070	R127070	8362.75	100-year	406	4536.64	4538.68	4538.67	4539.21	0.01791	5.87	69.18	65.75	1.01
trib 127070	R127070	7167.83	100-year	406	4515.75	4517.12	4517.12	4517.61	0.01823	5.62	72.20	74.16	1.00
trib 127070	R127070	6233.33	100-year	406	4494.23	4495.74	4495.53	4496.01	0.01020	4.23	95.90	97.68	0.75
trib 127070	R127070	5153.96	100-year	406	4479.53	4481.05	4481.05	4481.56	0.01826	5.73	70.87	70.93	1.01
trib 127070	R127070	3782.05	100-year	406	4457.27	4460.23		4460.31	0.00123	2.25	180.73	97.39	0.29
trib 127070	R127070	2748.72	100-year	406	4455.1	4456.65	4456.65	4456.98	0.02137	4.64	87.53	135.22	1.02
trib 127070	R127070	1868.73	100-year	406	4438.26	4439.97		4440.07	0.00258	2.46	164.81	134.98	0.39
trib 127070	R127070	916.133	100-year	406	4431.26	4434.26	4434.26	4435.01	0.01589	6.95	58.39	38.97	1.00
trib 127040	R127040	7829.84	100-year	463	4540.1	4542.11	4542.11	4542.70	0.01724	6.18	74.92	64.02	1.01
trib 127040	R127040	6996.95	100-year	463	4520.2	4521.82	4521.82	4522.33	0.01854	5.70	81.18	82.74	1.01
trib 127040	R127040	6206.44	100-year	463	4498.51	4500.81		4500.95	0.00264	3.01	153.82	94.56	0.42
trib 127040	R127040	5389.83	100-year	463	4494.3	4495.90	4495.90	4496.41	0.01799	5.71	81.10	80.69	1.00
trib 127040	R127040	4494.38	100-year	463	4474.62	4476.25	4476.25	4476.83	0.01749	6.11	75.75	66.56	1.01
trib 127040	R127040	3460.9	100-year	463	4435.66	4438.99		4439.07	0.00099	2.29	201.94	89.13	0.27
trib 127040	R127040	2118.25	100-year	463	4433.25	4435.05	4435.05	4435.48	0.01991	5.28	87.75	106.04	1.02
trib 127040	R127040	1589.52	100-year	463	4415.75	4417.82		4418.02	0.00700	3.58	129.37	127.82	0.63
trib 127040	R127040	930.411	100-year	463	4408.55	4410.50	4410.50	4411.17	0.01667	6.58	70.38	53.26	1.01
trib 127040	R127040	547.956	100-year	463	4396.22	4400.01		4400.09	0.00102	2.24	207.02	97.33	0.27

Table 8-7 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
main 127260	R127260	15447.8	100-year	2977	4182.08	4188.49		4188.59	0.00045	2.56	1164.46	244.09	0.21
main 127260	R127260	14584.5	100-year	2977	4182.53	4186.75		4187.55	0.00627	7.15	416.13	133.43	0.71
main 127260	R127260	13903.3	100-year	2977	4180.25	4184.68		4184.92	0.00235	4.21	803.37	359.45	0.43
main 127260	R127260	13059.1	100-year	2977	4180.37	4181.14	4180.85	4181.53	0.00827	2.11	603.84	463.27	0.59
main 127260	R127260	12450.1	100-year	2977	4172.14	4173.95	4173.95	4174.53	0.01748	6.26	487.83	431.24	1.02
main 127260	R127260	10552.2	100-year	2977	4161.51	4167.73		4167.92	0.00107	3.43	866.71	222.83	0.31
main 127260	R127260	9541.53	100-year	2977	4161.31	4164.18	4164.18	4165.14	0.01487	7.84	379.95	203.95	1.01
main 127260	R127260	8010.83	100-year	2977	4152.14	4156.58		4156.72	0.00115	3.01	1002.68	368.51	0.31
main 127260	R127260	7404.42	100-year	2977	4151.25	4155.58	4154.28	4155.76	0.00232	3.40	882.22	448.10	0.41
main 127260	R127260	6131.95	100-year	2977	4146.83	4149.34	4149.23	4149.90	0.01284	6.00	496.52	356.80	0.90
main 127260	R127260	4838.21	100-year	2977	4142.12	4145.98		4146.07	0.00122	2.53	1211.88	639.90	0.30
main 127260	R127260	3924.55	100-year	2977	4141.14	4144.25		4144.46	0.00279	3.64	816.77	393.75	0.45
main 127260	R127260	3386.09	100-year	2977	4138.03	4140.81	4140.81	4141.35	0.01766	5.88	506.61	476.44	1.00
main 127260	R127260	2972.86	100-year	2977	4134.46	4138.61		4138.67	0.00075	1.93	1541.92	719.02	0.23
main 127260	R127260	1024.29	100-year	2977	4131.32	4135.77		4136.08	0.00292	4.44	669.85	248.33	0.48
main 127260	R127260	417.007	100-year	2977	4129.39	4133.88	4132.75	4134.19	0.00330	4.46	668.06	270.29	0.50
main 127240	R127240	266.929	100-year	7	4192.15	4197.48		4197.48	0.00000	0.01	727.98	334.09	0.00
main 127240	R127240	246.929	100-year	2716	4192.15	4196.07	4196.07	4197.07	0.01142	8.10	352.99	196.12	0.92
main 127220	R127220	742.265	100-year	2663	4198.19	4203.43		4203.59	0.00107	3.17	844.47	259.01	0.30
main 127220	R127220	472.924	100-year	2663	4198.65	4201.94	4201.94	4202.81	0.01440	7.53	358.97	212.67	0.99

Table 8-8 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
main 127200	R127200	4628.15	100-year	2564	4223.56	4228.48		4228.70	0.00172	3.76	683.48	234.96	0.38
main 127200	R127200	4272.16	100-year	2564	4223.49	4227.51		4227.85	0.00338	4.70	545.39	207.34	0.51
main 127200	R127200	3803.81	100-year	2564	4222.47	4226.84		4226.96	0.00108	2.75	933.59	337.69	0.29
main 127200	R127200	3094.52	100-year	2564	4222.36	4224.32	4224.32	4224.96	0.01677	6.43	398.92	315.49	1.01
main 127200	R127200	2548.44	100-year	2564	4216.15	4220.18		4220.30	0.00124	2.80	916.11	357.22	0.31
main 127200	R127200	1875.09	100-year	2564	4215.25	4217.54	4217.54	4218.18	0.01717	6.39	401.36	325.98	1.01
main 127200	R127200	1102.17	100-year	2564	4199.63	4204.96		4205.26	0.00210	4.45	585.39	179.82	0.42
main 127200	R127200	675.183	100-year	2564	4198.67	4204.50		4204.68	0.00087	3.36	800.08	220.80	0.28
main 127200	R127200	324.455	100-year	2564	4198.43	4203.81		4204.17	0.00265	4.86	543.82	182.69	0.47
main 127180	R127180	3750.56	100-year	2451	4241.17	4246.09		4246.36	0.00169	4.18	586.50	157.21	0.38
main 127180	R127180	2979.42	100-year	2451	4238.83	4242.68	4242.39	4243.70	0.00969	8.08	303.18	112.02	0.87
main 127180	R127180	2238.88	100-year	2451	4234.57	4241.99		4242.15	0.00070	3.21	764.68	157.72	0.26
main 127180	R127180	1720.4	100-year	2451	4234.42	4241.61		4241.77	0.00079	3.20	765.02	173.81	0.27
main 127180	R127180	1196.01	100-year	2451	4234.75	4240.68		4241.04	0.00283	4.81	509.61	163.31	0.48
main 127180	R127180	649.58	100-year	2451	4232.15	4236.81	4236.81	4238.04	0.01351	8.89	275.81	113.61	1.01
main 127180	R127180	358.895	100-year	2451	4224.83	4229.18		4229.46	0.00253	4.20	583.54	211.25	0.45
main 127160	R127160	1984.28	100-year	2334	4257.96	4264.19		4264.43	0.00128	3.96	589.80	139.27	0.34
main 127160	R127160	1618.49	100-year	2334	4257.82	4264.05		4264.13	0.00042	2.30	1013.26	233.74	0.19
main 127160	R127160	1226.33	100-year	2334	4257.23	4263.93		4263.99	0.00030	2.13	1213.41	326.78	0.17
main 127160	R127160	733.245	100-year	2334	4258.74	4263.68		4263.77	0.00075	2.41	969.01	325.52	0.25
main 127160	R127160	206.901	100-year	2334	4257.96	4261.73	4261.73	4262.63	0.01519	7.62	306.20	173.88	1.01
main 127140	R127140	3507.04	100-year	2115	4280.55	4285.56		4285.84	0.00245	4.25	498.16	172.84	0.44
main 127140	R127140	2428.51	100-year	2115	4277.63	4282.45		4282.87	0.00311	5.16	409.87	126.90	0.51
main 127140	R127140	1777.2	100-year	2115	4276.22	4279.41		4279.94	0.00696	5.85	361.71	170.22	0.71
main 127140	R127140	1022.1	100-year	2115	4268.38	4271.54	4271.54	4272.58	0.01441	8.17	258.73	127.16	1.01
main 127140	R127140	173.595	100-year	2115	4258.63	4264.40		4264.65	0.00125	3.98	530.76	121.85	0.34

Table 8-9 HEC-RAS Results for Hydrologic Project East (100 year)

River	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
main 127120	R127120	9039.38	100-year	1589	4374.59	4378.11	4378.11	4379.04	0.01492	7.76	204.78	111.61	1.01
main 127120	R127120	8306.5	100-year	1589	4358.19	4362.49		4362.67	0.00171	3.38	470.50	175.72	0.36
main 127120	R127120	7648.6	100-year	1589	4356.75	4359.46	4359.46	4360.02	0.01782	5.97	266.02	245.61	1.01
main 127120	R127120	6584.41	100-year	1589	4340.32	4343.53		4343.69	0.00238	3.33	506.81	279.67	0.41
main 127120	R127120	5913.86	100-year	1589	4335.93	4339.33	4339.33	4340.40	0.01399	8.30	191.56	89.91	1.00
main 127120	R127120	4570.29	100-year	1589	4318.46	4322.84		4322.98	0.00116	3.07	517.42	166.98	0.31
main 127120	R127120	3816.8	100-year	1589	4316.75	4322.33		4322.41	0.00050	2.25	705.49	192.49	0.21
main 127120	R127120	3102.71	100-year	1589	4316.3	4320.29	4320.29	4321.30	0.01431	8.08	196.55	97.53	1.00
main 127120	R127120	1898.95	100-year	1589	4299.37	4304.46		4304.58	0.00087	2.79	577.71	189.38	0.27
main 127120	R127120	1159.3	100-year	1589	4299.63	4303.47		4303.66	0.00188	3.54	448.45	167.71	0.38
main 127120	R127120	269.281	100-year	1589	4295.68	4299.11	4299.11	4299.94	0.01515	7.31	217.28	131.07	1.00
main 127110	R127110	2295.38	100-year	1003	4392.33	4394.37	4394.37	4395.08	0.01617	6.74	148.76	106.44	1.01
main 127110	R127110	1751.28	100-year	1003	4379.24	4382.94	4381.13	4383.04	0.00099	2.55	394.06	149.65	0.28
main 127110	R127110	966.973	100-year	1003	4378.58	4380.44	4380.44	4380.94	0.01838	5.68	176.70	180.35	1.01
main 127110	R127110	274.019	100-year	1003	4374.22	4379.28		4379.29	0.00011	1.08	925.89	250.51	0.10
main 127080	R127080	1403.77	100-year	713	4413.62	4416.17	4416.17	4416.91	0.01610	6.91	103.18	70.77	1.01
main 127080	R127080	956.72	100-year	713	4397.53	4399.66	4399.66	4400.28	0.01739	6.31	112.96	94.24	1.02
main 127080	R127080	549.597	100-year	713	4394.21	4398.00		4398.14	0.00159	3.04	234.66	97.31	0.34
main 127080	R127080	228.146	100-year	713	4394.02	4396.91		4397.27	0.00531	4.78	149.13	77.28	0.61
main 127060	R127060	8344.52	100-year	396	4579.95	4581.55	4581.55	4582.16	0.01703	6.27	63.15	52.23	1.00
main 127060	R127060	7413.37	100-year	396	4537.37	4539.18	4539.18	4539.72	0.01813	5.91	67.00	63.61	1.01
main 127060	R127060	6524.28	100-year	396	4519.2	4520.25	4520.25	4520.65	0.01957	5.14	77.11	95.84	1.01
main 127060	R127060	5487.78	100-year	396	4494.7	4496.21	4496.21	4496.64	0.01942	5.27	75.07	89.11	1.01
main 127060	R127060	4405.53	100-year	396	4474.45	4475.63	4475.62	4476.02	0.01927	5.02	78.95	100.51	1.00
main 127060	R127060	3497.38	100-year	396	4456.99	4458.73	4458.73	4459.33	0.01749	6.20	63.86	54.85	1.01
main 127060	R127060	2311.34	100-year	396	4435.34	4439.33		4439.39	0.00078	2.05	193.58	84.96	0.24
main 127060	R127060	1438.26	100-year	396	4435.01	4436.87	4436.87	4437.48	0.01716	6.30	62.83	51.88	1.01
main 127060	R127060	782.931	100-year	396	4414.31	4418.27		4418.31	0.00034	1.50	263.83	99.61	0.16

Table 9-1 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
trib 127250	R127250	6170.037	50-year	314	4297.82	4300.47		4300.65	0.00373	3.40	92.25	61.00	0.49
trib 127250	R127250	5576.299	50-year	314	4294.21	4295.96	4295.96	4296.42	0.01838	5.42	57.97	63.39	1.00
trib 127250	R127250	4957.121	50-year	314	4277.29	4279.04	4279.04	4279.54	0.01873	5.69	55.19	56.80	1.02
trib 127250	R127250	4436.674	50-year	314	4259.43	4260.67	4260.67	4261.09	0.01920	5.20	60.33	72.45	1.00
trib 127250	R127250	3809.693	50-year	314	4239.3	4241.60	4240.83	4241.73	0.00299	2.94	106.75	74.62	0.43
trib 127250	R127250	3121.598	50-year	314	4235.9	4237.04	4237.04	4237.40	0.02032	4.84	64.92	90.80	1.01
trib 127250	R127250	2360.425	50-year	314	4220.14	4221.60		4221.64	0.00139	1.56	200.70	203.68	0.28
trib 127250	R127250	1759.534	50-year	314	4218.02	4219.15	4219.15	4219.53	0.01962	4.95	63.46	83.55	1.00
trib 127250	R127250	1321.822	50-year	314	4208.03	4209.73	4209.73	4210.27	0.01758	5.91	53.16	49.29	1.00
trib 127250	R127250	980.0942	50-year	314	4200.18	4202.57	4201.42	4202.63	0.00105	1.87	168.36	106.09	0.26
trib 127250	R127250	622.0686	50-year	314	4200.25	4201.26	4201.26	4201.60	0.02068	4.70	66.79	98.79	1.01
trib 127220	R127220	5083.328	50-year	141	4297.58	4298.35	4298.35	4298.57	0.02514	3.72	37.93	92.40	1.02
trib 127220	R127220	4579.815	50-year	141	4279.41	4280.65	4280.65	4280.92	0.02256	4.19	33.65	63.13	1.01
trib 127220	R127220	4071.373	50-year	141	4260.34	4261.10	4261.10	4261.34	0.02328	3.96	35.57	74.27	1.01
trib 127220	R127220	3515.454	50-year	141	4250.52	4252.19	4252.02	4252.44	0.01133	4.00	35.27	42.26	0.77
trib 127220	R127220	2942.958	50-year	141	4242.16	4242.40	4242.40	4242.51	0.02954	2.65	53.13	242.30	1.00
trib 127220	R127220	2310.17	50-year	141	4223.46	4224.30	4224.30	4224.54	0.02354	3.97	35.55	74.81	1.01
trib 127220	R127220	1830.441	50-year	141	4217.29	4219.22		4219.24	0.00056	1.15	122.22	98.72	0.18
trib 127220	R127220	1306.478	50-year	141	4217.22	4218.08	4218.08	4218.35	0.02230	4.16	33.86	63.59	1.01
trib 127220	R127220	901.6307	50-year	141	4196.98	4199.39		4199.41	0.00027	0.98	144.21	85.47	0.13
trib 127220	R127220	532.2559	50-year	141	4197.71	4198.74	4198.74	4199.06	0.02185	4.52	31.22	51.08	1.02

Table 9-2 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
trib 127210	R127210	9394.83	50-year	191	4395.11	4389.58	4387.24	4389.68	0.00119		75.00	26.43	0.00
trib 127210	R127210	8847.6	50-year	191	4359.79	4360.79	4360.79	4361.07	0.01673	4.45	47.00	82.10	0.92
trib 127210	R127210	8245.5	50-year	191	4334.11	4336.29	4335.22	4336.33	0.00083	1.51	126.71	92.58	0.23
trib 127210	R127210	7771.55	50-year	191	4327.79	4330.23	4328.81	4330.25	0.00050	1.19	160.07	113.06	0.18
trib 127210	R127210	7293.97	50-year	191	4314.67	4315.54	4315.54	4315.86	0.02135	4.58	41.72	65.73	1.01
trib 127210	R127210	6719.49	50-year	191	4300.05	4303.56		4303.57	0.00016	0.93	205.14	90.21	0.11
trib 127210	R127210	6098.19	50-year	191	4297.32	4298.01	4298.01	4298.28	0.02206	4.16	45.96	85.88	1.00
trib 127210	R127210	5500.89	50-year	191	4279.11	4282.20		4282.21	0.00009	0.68	280.53	129.68	0.08
trib 127210	R127210	4916.21	50-year	191	4278.11	4278.79	4278.79	4279.06	0.02228	4.16	45.87	86.10	1.01
trib 127210	R127210	4170.26	50-year	191	4262.16	4264.36		4264.37	0.00007	0.49	387.67	247.36	0.07
trib 127210	R127210	3708.24	50-year	191	4261.17	4262.57		4262.59	0.00105	1.30	148.33	172.78	0.24
trib 127210	R127210	3209.62	50-year	191	4254.37	4256.25	4255.26	4256.26	0.00045	0.83	229.79	260.11	0.16
trib 127210	R127210	2737.21	50-year	191	4241.84	4242.57	4242.57	4242.77	0.02435	3.65	52.37	128.23	1.01
trib 127210	R127210	1799.17	50-year	191	4222.09	4224.72		4224.73	0.00020	0.87	219.87	124.33	0.12
trib 127210	R127210	1238.15	50-year	191	4219.52	4221.51		4221.53	0.00068	1.22	156.18	134.79	0.20
trib 127210	R127210	901.045	50-year	191	4215.62	4217.52		4217.53	0.00028	0.82	213.15	150.15	0.13
trib 127210	R127210	501.377	50-year	191	4209.66	4208.43	4208.43	4208.84	0.02058		37.16	46.28	0.00
trib 127210	R127210	221.027	50-year	191	4201.46	4206.61		4206.61	0.00001	0.32	599.45	162.20	0.03

Table 9-3 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
trib 127190	R127190	7863.1	50-year	170	4372.81	4374.03	4374.03	4374.37	0.02141	4.68	36.36	55.60	1.02
trib 127190	R127190	7209.54	50-year	170	4354.09	4355.24	4355.24	4355.57	0.02108	4.58	37.12	57.91	1.01
trib 127190	R127190	6713.41	50-year	170	4339.59	4341.03	4340.74	4341.18	0.00660	3.09	55.05	64.88	0.59
trib 127190	R127190	6070.03	50-year	170	4332.66	4333.81	4333.81	4334.14	0.02146	4.60	36.95	58.01	1.02
trib 127190	R127190	5601.88	50-year	170	4318.42	4319.48	4319.48	4319.85	0.02017	4.91	34.64	47.08	1.01
trib 127190	R127190	4959.66	50-year	170	4303.36	4304.81	4304.81	4305.21	0.02024	5.04	33.72	44.05	1.02
trib 127190	R127190	3720.6	50-year	170	4280.18	4281.94		4281.97	0.00110	1.57	108.57	92.23	0.25
trib 127190	R127190	3182.55	50-year	170	4279.31	4280.10	4280.10	4280.36	0.02336	4.13	41.12	80.84	1.02
trib 127190	R127190	2710.71	50-year	170	4259.61	4261.37	4261.37	4261.82	0.01939	5.40	31.46	35.81	1.02
trib 127190	R127190	2270.98	50-year	170	4255.56	4258.08		4258.09	0.00010	0.65	263.81	141.11	0.08
trib 127190	R127190	1616.56	50-year	170	4256.61	4257.52	4257.52	4257.84	0.02153	4.50	37.82	61.64	1.01
trib 127190	R127190	1116.45	50-year	170	4249.84	4252.09		4252.14	0.00139	1.72	98.66	86.82	0.28
trib 127190	R127190	732.633	50-year	170	4249.41	4250.44	4250.44	4250.75	0.02148	4.47	38.02	62.37	1.01
trib 127190	R127190	488.211	50-year	170	4243.27	4244.15	4244.15	4244.42	0.02210	4.22	40.29	73.67	1.01
trib 127170	R127170	7007.88	50-year	304	4375.3	4376.42	4376.42	4376.84	0.01938	5.21	58.32	70.29	1.01
trib 127170	R127170	6163.87	50-year	304	4353.05	4354.29	4354.29	4354.66	0.02023	4.88	62.28	85.62	1.01
trib 127170	R127170	5493.49	50-year	304	4335.46	4336.69	4336.69	4337.11	0.01938	5.18	58.67	71.36	1.01
trib 127170	R127170	4884.09	50-year	304	4321.14	4323.28		4323.37	0.00197	2.44	124.71	84.64	0.35
trib 127170	R127170	3864.9	50-year	304	4317.37	4318.81	4318.81	4319.11	0.01402	4.57	74.88	129.06	0.86
trib 127170	R127170	3261.66	50-year	304	4304.09	4304.86	4304.86	4305.13	0.02168	4.21	72.28	130.99	1.00
trib 127170	R127170	2329.98	50-year	304	4280.73	4282.51		4282.59	0.00211	2.28	133.21	105.01	0.36
trib 127170	R127170	1380.96	50-year	304	4276.3	4277.59	4277.59	4277.94	0.02120	4.76	63.90	94.45	1.02
trib 127170	R127170	695.251	50-year	304	4259.97	4261.40		4261.62	0.00870	3.78	80.45	86.20	0.69
trib 127170	R127170	452.208	50-year	304	4256.74	4258.13	4258.13	4258.53	0.01987	5.08	59.85	76.49	1.01

Table 9-4 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
trib 127150	R127150	7036.32	50-year	279	4398.34	4399.31	4399.31	4399.62	0.02097	4.47	62.38	100.51	1.00
trib 127150	R127150	6411.32	50-year	279	4385.86	4387.27	4387.06	4387.53	0.00949	4.07	68.62	70.26	0.73
trib 127150	R127150	5741.18	50-year	279	4376.83	4378.19	4378.19	4378.60	0.02000	5.12	54.45	69.01	1.02
trib 127150	R127150	4988.15	50-year	279	4358.2	4359.62	4359.58	4359.98	0.01705	4.79	58.22	72.37	0.94
trib 127150	R127150	3938.85	50-year	279	4338.18	4338.86	4338.86	4339.13	0.02339	4.14	67.37	132.23	1.02
trib 127150	R127150	3434.18	50-year	279	4321.04	4322.07	4322.07	4322.42	0.02039	4.70	59.36	86.90	1.00
trib 127150	R127150	2855.16	50-year	279	4309.36	4310.55	4310.55	4310.96	0.01979	5.13	54.37	68.17	1.01
trib 127150	R127150	2457.59	50-year	279	4297.28	4300.22		4300.26	0.00057	1.57	177.33	91.79	0.20
trib 127150	R127150	1978.71	50-year	279	4297.85	4299.06	4299.06	4299.42	0.02081	4.84	57.62	81.92	1.02
trib 127150	R127150	1185.05	50-year	279	4282.71	4284.97	4284.68	4285.26	0.00874	4.34	64.27	56.01	0.71
trib 127150	R127150	801.862	50-year	279	4279.17	4279.98	4279.98	4280.28	0.02129	4.36	63.94	108.10	1.00
trib 127130	R127130	9244.79	50-year	332	4446.8	4448.52	4448.52	4449.11	0.01750	6.20	53.59	46.01	1.01
trib 127130	R127130	8454.54	50-year	332	4425.2	4427.15		4427.44	0.00847	4.28	77.56	67.50	0.70
trib 127130	R127130	7672.11	50-year	332	4416.2	4417.23	4417.23	4417.59	0.02051	4.83	68.75	97.10	1.01
trib 127130	R127130	6893.12	50-year	332	4396.52	4397.91	4397.91	4398.35	0.01926	5.33	62.29	72.34	1.01
trib 127130	R127130	6173.93	50-year	332	4379.19	4379.95	4379.83	4380.11	0.01140	3.18	104.30	177.23	0.73
trib 127130	R127130	5033.69	50-year	332	4360.76	4362.06	4362.06	4362.36	0.02247	4.40	75.43	131.03	1.02
trib 127130	R127130	4112.69	50-year	332	4340.96	4342.24	4342.24	4342.67	0.01972	5.24	63.39	76.90	1.02
trib 127130	R127130	3127.74	50-year	332	4324.04	4325.63		4325.93	0.01231	4.44	74.84	81.81	0.82
trib 127130	R127130	2574.56	50-year	332	4322.19	4323.39		4323.44	0.00222	1.89	176.07	192.26	0.35
trib 127130	R127130	1643.37	50-year	332	4317.18	4318.39	4318.39	4318.72	0.02104	4.57	72.70	113.83	1.01
trib 127130	R127130	880.67	50-year	332	4295.29	4297.68		4297.71	0.00057	1.33	249.12	164.46	0.19
trib 127130	R127130	374.145	50-year	332	4294.32	4296.24	4296.24	4296.83	0.01742	6.17	53.83	46.37	1.01

Table 9-5 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
trib 127100 up	R127150	3240.72	50-year	286	4462.58	4463.91	4463.91	4464.37	0.01893	5.46	52.34	57.74	1.01
trib 127100 up	R127150	2493.53	50-year	286	4434.71	4437.82		4437.85	0.00032	1.33	214.54	91.86	0.15
trib 127100 up	R127150	1717.92	50-year	286	4434.43	4436.49	4436.49	4437.02	0.01820	5.83	49.05	47.58	1.01
trib 127100 up	R127150	1363.45	50-year	286	4420.17	4422.02		4422.17	0.00409	3.13	91.26	73.38	0.50
trib 127100 up	R127150	634.665	50-year	286	4416.19	4417.13		4417.30	0.01277	3.37	84.95	144.47	0.77
trib 127100 up	R127150	253.963	50-year	286	4409.03	4411.00	4411.00	4411.50	0.01827	5.68	50.33	50.91	1.01
trib 127100 dn	R127100	2841.86	50-year	544	4395.63	4398.61		4398.82	0.00329	3.66	148.60	80.18	0.47
trib 127100 dn	R127100	2261.31	50-year	544	4394.37	4397.95		4398.01	0.00071	1.94	280.92	124.98	0.23
trib 127100 dn	R127100	1757.18	50-year	544	4394.86	4396.50	4396.50	4396.96	0.01927	5.39	100.89	115.12	1.01
trib 127100 dn	R127100	1219.69	50-year	544	4379.83	4382.30		4382.51	0.00380	3.68	147.72	88.33	0.50
trib 127100 dn	R127100	671.984	50-year	544	4378.48	4381.53		4381.59	0.00087	2.03	268.17	130.17	0.25
trib 127090	R127090	8835.46	50-year	304	4558.4	4559.80	4559.80	4560.32	0.01814	5.77	52.66	51.69	1.01
trib 127090	R127090	8034.38	50-year	304	4521.98	4523.94	4523.44	4524.19	0.00564	4.02	75.69	53.26	0.59
trib 127090	R127090	7216.3	50-year	304	4514.31	4516.04	4516.04	4516.53	0.01837	5.63	53.98	55.60	1.01
trib 127090	R127090	6388.22	50-year	304	4494.58	4496.34	4496.21	4496.69	0.01267	4.77	63.78	63.91	0.84
trib 127090	R127090	5427	50-year	304	4480.28	4481.61	4481.61	4482.07	0.01855	5.45	55.73	60.72	1.00
trib 127090	R127090	4649.02	50-year	304	4457.45	4459.12		4459.44	0.00875	4.52	67.18	54.81	0.72
trib 127090	R127090	3827.59	50-year	304	4446.91	4448.91	4448.91	4449.46	0.01792	5.94	51.18	47.69	1.01
trib 127090	R127090	3016.23	50-year	304	4435.39	4438.08		4438.16	0.00125	2.19	138.65	78.03	0.29
trib 127090	R127090	2407.04	50-year	304	4434.45	4435.77	4435.77	4436.20	0.01930	5.27	57.69	68.24	1.01
trib 127090	R127090	1693.37	50-year	304	4417.79	4419.47	4419.47	4419.95	0.01894	5.53	54.98	59.62	1.01
trib 127090	R127090	702.786	50-year	304	4400.97	4402.49		4402.60	0.00457	2.70	112.49	123.00	0.50

Table 9-6 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
trib 127070	R127070	9203.06	50-year	343	4557.13	4558.15	4558.15	4558.50	0.02108	4.75	72.15	106.46	1.02
trib 127070	R127070	8362.75	50-year	343	4536.64	4538.53	4538.53	4539.04	0.01872	5.71	60.10	61.58	1.02
trib 127070	R127070	7167.83	50-year	343	4515.75	4517.00	4517.00	4517.46	0.01897	5.40	63.50	71.40	1.01
trib 127070	R127070	6233.33	50-year	343	4494.23	4495.63		4495.88	0.01004	4.00	85.67	93.75	0.74
trib 127070	R127070	5153.96	50-year	343	4479.53	4480.93	4480.93	4481.40	0.01888	5.48	62.59	68.64	1.01
trib 127070	R127070	3782.05	50-year	343	4457.27	4460.04		4460.11	0.00119	2.11	162.55	93.52	0.28
trib 127070	R127070	2748.72	50-year	343	4455.1	4456.56	4456.56	4456.87	0.02160	4.51	75.98	123.24	1.01
trib 127070	R127070	1868.73	50-year	343	4438.26	4439.84		4439.92	0.00260	2.34	146.83	130.91	0.39
trib 127070	R127070	916.133	50-year	343	4431.26	4434.05	4434.05	4434.76	0.01658	6.77	50.64	36.29	1.01
trib 127040	R127040	7829.84	50-year	392	4540.1	4541.97	4541.97	4542.52	0.01810	5.93	66.15	62.44	1.01
trib 127040	R127040	6996.95	50-year	392	4520.2	4521.71	4521.71	4522.17	0.01875	5.44	72.07	79.54	1.01
trib 127040	R127040	6206.44	50-year	392	4498.51	4500.65		4500.77	0.00259	2.82	138.87	92.73	0.41
trib 127040	R127040	5389.83	50-year	392	4494.3	4495.78	4495.78	4496.25	0.01859	5.48	71.49	77.45	1.01
trib 127040	R127040	4494.38	50-year	392	4474.62	4476.12	4476.12	4476.65	0.01781	5.86	66.84	63.33	1.01
trib 127040	R127040	3460.9	50-year	392	4435.66	4438.77		4438.84	0.00095	2.15	182.06	86.01	0.26
trib 127040	R127040	2118.25	50-year	392	4433.25	4434.96	4434.96	4435.35	0.02052	5.02	78.15	104.24	1.02
trib 127040	R127040	1589.52	50-year	392	4415.75	4417.72		4417.89	0.00704	3.38	116.07	125.61	0.62
trib 127040	R127040	930.411	50-year	392	4408.55	4410.34	4410.34	4410.96	0.01715	6.31	62.07	51.05	1.01
trib 127040	R127040	547.956	50-year	392	4396.22	4399.78		4399.85	0.00103	2.12	184.57	94.25	0.27

Table 9-7 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
main 127260	R127260	15447.8	50-year	2503	4182.08	4188.04		4188.13	0.00043	2.37	1056.15	239.17	0.20
main 127260	R127260	14584.5	50-year	2503	4182.53	4186.47		4187.15	0.00579	6.60	379.47	129.50	0.68
main 127260	R127260	13903.3	50-year	2503	4180.25	4184.45		4184.65	0.00230	3.93	719.87	348.65	0.42
main 127260	R127260	13059.1	50-year	2503	4180.37	4180.98	4180.67	4181.34	0.00816	1.77	532.00	433.92	0.56
main 127260	R127260	12450.1	50-year	2503	4172.14	4173.81	4173.81	4174.34	0.01778	5.98	428.86	410.45	1.01
main 127260	R127260	10552.2	50-year	2503	4161.51	4167.35		4167.51	0.00102	3.20	781.95	214.95	0.30
main 127260	R127260	9541.53	50-year	2503	4161.31	4163.96	4163.96	4164.82	0.01526	7.47	335.28	197.30	1.01
main 127260	R127260	8010.83	50-year	2503	4152.14	4156.34		4156.45	0.00108	2.76	913.28	356.61	0.29
main 127260	R127260	7404.42	50-year	2503	4151.25	4155.37	4154.06	4155.53	0.00229	3.17	792.98	434.88	0.40
main 127260	R127260	6131.95	50-year	2503	4146.83	4149.18	4149.07	4149.68	0.01331	5.70	438.79	349.03	0.90
main 127260	R127260	4838.21	50-year	2503	4142.12	4145.73		4145.82	0.00123	2.40	1061.64	594.60	0.30
main 127260	R127260	3924.55	50-year	2503	4141.14	4144.04		4144.22	0.00269	3.41	733.74	380.76	0.43
main 127260	R127260	3386.09	50-year	2503	4138.03	4140.69	4140.69	4141.17	0.01796	5.54	452.03	470.80	1.00
main 127260	R127260	2972.86	50-year	2503	4134.46	4138.35		4138.40	0.00079	1.84	1357.97	705.26	0.23
main 127260	R127260	1024.29	50-year	2503	4131.32	4135.46		4135.74	0.00288	4.21	595.07	237.07	0.47
main 127260	R127260	417.007	50-year	2503	4129.39	4133.59	4132.52	4133.87	0.00330	4.25	589.60	256.58	0.49
main 127240	R127240	266.929	50-year	7	4192.15	4197.16		4197.16	0.00000	0.01	624.60	312.60	0.00
main 127240	R127240	246.929	50-year	2288	4192.15	4195.74	4195.74	4196.73	0.01223	8.01	293.06	169.54	0.94
main 127220	R127220	742.265	50-year	2242	4198.19	4203.14		4203.27	0.00100	2.92	769.82	250.19	0.29
main 127220	R127220	472.924	50-year	2242	4198.65	4201.71	4201.71	4202.52	0.01491	7.26	312.49	199.41	0.99

Table 9-8 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
main 127200	R127200	4628.15	50-year	2158	4223.56	4228.14		4228.34	0.00171	3.55	608.06	211.40	0.37
main 127200	R127200	4272.16	50-year	2158	4223.49	4227.15		4227.47	0.00357	4.56	472.79	195.57	0.52
main 127200	R127200	3803.81	50-year	2158	4222.47	4226.51		4226.62	0.00098	2.60	829.53	302.97	0.28
main 127200	R127200	3094.52	50-year	2158	4222.36	4224.15	4224.15	4224.75	0.01759	6.19	348.42	301.92	1.02
main 127200	R127200	2548.44	50-year	2158	4216.15	4219.91		4220.02	0.00119	2.62	824.24	343.53	0.30
main 127200	R127200	1875.09	50-year	2158	4215.25	4217.38	4217.38	4217.97	0.01711	6.18	349.43	297.81	1.00
main 127200	R127200	1102.17	50-year	2158	4199.63	4204.59		4204.86	0.00210	4.19	520.78	173.50	0.41
main 127200	R127200	675.183	50-year	2158	4198.67	4204.15		4204.29	0.00083	3.10	722.64	212.57	0.27
main 127200	R127200	324.455	50-year	2158	4198.43	4203.50		4203.81	0.00249	4.53	488.96	172.91	0.45
main 127180	R127180	3750.56	50-year	2066	4241.17	4245.76		4245.99	0.00157	3.86	534.87	152.85	0.36
main 127180	R127180	2979.42	50-year	2066	4238.83	4242.17	4242.10	4243.26	0.01261	8.36	247.11	105.87	0.96
main 127180	R127180	2238.88	50-year	2066	4234.57	4241.53		4241.67	0.00066	2.98	692.78	152.95	0.25
main 127180	R127180	1720.4	50-year	2066	4234.42	4241.17		4241.30	0.00075	2.99	690.06	165.44	0.26
main 127180	R127180	1196.01	50-year	2066	4234.75	4240.27		4240.61	0.00279	4.62	446.77	150.18	0.47
main 127180	R127180	649.58	50-year	2066	4232.15	4236.47	4236.47	4237.63	0.01369	8.64	239.01	103.66	1.00
main 127180	R127180	358.895	50-year	2066	4224.83	4228.85		4229.10	0.00261	4.02	514.27	203.57	0.45
main 127160	R127160	1984.28	50-year	1963	4257.96	4263.85		4264.05	0.00115	3.61	543.59	135.81	0.32
main 127160	R127160	1618.49	50-year	1963	4257.82	4263.72		4263.79	0.00037	2.09	937.79	228.32	0.18
main 127160	R127160	1226.33	50-year	1963	4257.23	4263.61		4263.67	0.00027	1.95	1110.83	320.62	0.16
main 127160	R127160	733.245	50-year	1963	4258.74	4263.38		4263.45	0.00075	2.25	871.03	320.78	0.24
main 127160	R127160	206.901	50-year	1963	4257.96	4261.46	4261.46	4262.33	0.01490	7.48	262.36	150.98	1.00
main 127140	R127140	3507.04	50-year	1780	4280.55	4285.23		4285.48	0.00256	4.04	440.69	170.26	0.44
main 127140	R127140	2428.51	50-year	1780	4277.63	4282.12		4282.49	0.00299	4.82	368.96	122.51	0.49
main 127140	R127140	1777.2	50-year	1780	4276.22	4279.17		4279.64	0.00688	5.54	321.46	162.85	0.69
main 127140	R127140	1022.1	50-year	1780	4268.38	4271.30	4271.30	4272.24	0.01481	7.79	228.42	123.10	1.01
main 127140	R127140	173.595	50-year	1780	4258.63	4264.05		4264.25	0.00114	3.65	487.69	118.81	0.32

Table 9-9 HEC-RAS Results for Hydrologic Project East (50 year)

River	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
main 127120	R127120	9039.38	50-year	1342	4374.59	4377.88	4377.88	4378.74	0.01504	7.44	180.37	105.35	1.00
main 127120	R127120	8306.5	50-year	1342	4358.19	4362.23		4362.39	0.00161	3.15	425.41	168.84	0.35
main 127120	R127120	7648.6	50-year	1342	4356.75	4359.34	4359.34	4359.84	0.01778	5.68	236.13	234.58	1.00
main 127120	R127120	6584.41	50-year	1342	4340.32	4343.31		4343.46	0.00247	3.19	445.92	269.71	0.41
main 127120	R127120	5913.86	50-year	1342	4335.93	4339.06	4339.06	4340.06	0.01454	8.00	167.78	85.61	1.01
main 127120	R127120	4570.29	50-year	1342	4318.46	4322.48		4322.61	0.00120	2.93	458.25	162.72	0.31
main 127120	R127120	3816.8	50-year	1342	4316.75	4321.98		4322.05	0.00048	2.10	638.10	187.72	0.20
main 127120	R127120	3102.71	50-year	1342	4316.3	4320.02	4320.02	4320.97	0.01459	7.82	171.63	90.84	1.00
main 127120	R127120	1898.95	50-year	1342	4299.37	4304.16		4304.27	0.00085	2.60	522.21	180.87	0.26
main 127120	R127120	1159.3	50-year	1342	4299.63	4303.20		4303.37	0.00183	3.32	403.67	162.99	0.37
main 127120	R127120	269.281	50-year	1342	4295.68	4298.87	4298.87	4299.67	0.01587	7.15	187.59	121.09	1.01
main 127110	R127110	2295.38	50-year	848	4392.33	4394.19	4394.19	4394.85	0.01693	6.51	130.21	101.64	1.01
main 127110	R127110	1751.28	50-year	848	4379.24	4382.70	4380.98	4382.79	0.00093	2.36	358.83	145.41	0.27
main 127110	R127110	966.973	50-year	848	4378.58	4380.31	4380.31	4380.78	0.01889	5.49	154.43	169.11	1.01
main 127110	R127110	274.019	50-year	848	4374.22	4378.96		4378.98	0.00011	1.00	847.82	244.47	0.09
main 127080	R127080	1403.77	50-year	604	4413.62	4415.99	4415.99	4416.68	0.01658	6.68	90.46	66.78	1.01
main 127080	R127080	956.72	50-year	604	4397.53	4399.52	4399.52	4400.09	0.01756	6.06	99.75	89.21	1.01
main 127080	R127080	549.597	50-year	604	4394.21	4397.75		4397.87	0.00155	2.87	210.63	93.47	0.34
main 127080	R127080	228.146	50-year	604	4394.02	4396.71	4396.04	4397.03	0.00507	4.49	134.37	73.84	0.59
main 127060	R127060	8344.52	50-year	335	4579.95	4581.41	4581.41	4581.97	0.01748	6.01	55.71	50.06	1.00
main 127060	R127060	7413.37	50-year	335	4537.37	4539.05	4539.05	4539.55	0.01843	5.66	59.20	60.73	1.01
main 127060	R127060	6524.28	50-year	335	4519.2	4520.16	4520.16	4520.53	0.02005	4.87	68.84	94.45	1.00
main 127060	R127060	5487.78	50-year	335	4494.7	4496.12	4496.11	4496.50	0.01891	4.96	67.48	86.00	0.99
main 127060	R127060	4405.53	50-year	335	4474.45	4475.55	4475.53	4475.89	0.01915	4.72	70.94	98.38	0.98
main 127060	R127060	3497.38	50-year	335	4456.99	4458.60	4458.60	4459.14	0.01774	5.93	56.52	52.50	1.01
main 127060	R127060	2311.34	50-year	335	4435.34	4439.09		4439.14	0.00075	1.93	173.58	80.87	0.23
main 127060	R127060	1438.26	50-year	335	4435.01	4436.72	4436.72	4437.29	0.01761	6.04	55.44	49.73	1.01
main 127060	R127060	782.931	50-year	335	4414.31	4418.01		4418.04	0.00033	1.41	238.32	96.84	0.16

Table 10-1 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
trib 127250	R127250	6170.037	25-year	265	4297.82	4300.31		4300.47	0.00362	3.20	82.78	58.76	0.48
trib 127250	R127250	5576.299	25-year	265	4294.21	4295.84	4295.84	4296.27	0.01917	5.25	50.43	59.58	1.01
trib 127250	R127250	4957.121	25-year	265	4277.29	4278.92	4278.92	4279.38	0.01912	5.44	48.74	54.57	1.01
trib 127250	R127250	4436.674	25-year	265	4259.43	4260.57	4260.57	4260.96	0.01973	5.01	52.89	68.63	1.01
trib 127250	R127250	3809.693	25-year	265	4239.3	4241.44	4240.71	4241.56	0.00291	2.77	95.60	71.62	0.42
trib 127250	R127250	3121.598	25-year	265	4235.9	4236.94	4236.94	4237.28	0.02093	4.69	56.52	84.71	1.01
trib 127250	R127250	2360.425	25-year	265	4220.14	4221.50		4221.53	0.00138	1.47	180.12	199.52	0.27
trib 127250	R127250	1759.534	25-year	265	4218.02	4219.05	4219.05	4219.41	0.02058	4.79	55.38	79.48	1.01
trib 127250	R127250	1321.822	25-year	265	4208.03	4209.60	4209.60	4210.10	0.01816	5.67	46.75	47.25	1.00
trib 127250	R127250	980.0942	25-year	265	4200.18	4202.43	4201.32	4202.48	0.00099	1.73	153.13	103.30	0.25
trib 127250	R127250	622.0686	25-year	265	4200.25	4201.18	4201.18	4201.49	0.02130	4.50	58.88	95.08	1.01
trib 127220	R127220	5083.328	25-year	117	4297.58	4298.31	4298.31	4298.50	0.02513	3.50	33.45	89.26	1.01
trib 127220	R127220	4579.815	25-year	117	4279.41	4280.56	4280.56	4280.82	0.02288	4.09	28.59	56.12	1.01
trib 127220	R127220	4071.373	25-year	117	4260.34	4261.03	4261.03	4261.26	0.02399	3.81	30.75	69.83	1.01
trib 127220	R127220	3515.454	25-year	117	4250.52	4252.09	4251.91	4252.31	0.01079	3.75	31.23	39.76	0.74
trib 127220	R127220	2942.958	25-year	117	4242.16	4242.37	4242.37	4242.47	0.03125	2.52	46.34	237.52	1.01
trib 127220	R127220	2310.17	25-year	117	4223.46	4224.24	4224.24	4224.46	0.02387	3.76	31.15	71.86	1.01
trib 127220	R127220	1830.441	25-year	117	4217.29	4219.08		4219.10	0.00053	1.07	109.29	94.54	0.18
trib 127220	R127220	1306.478	25-year	117	4217.22	4218.01	4218.01	4218.25	0.02244	3.94	29.67	60.73	0.99
trib 127220	R127220	901.6307	25-year	117	4196.98	4199.25		4199.26	0.00024	0.89	132.15	83.13	0.12
trib 127220	R127220	532.2559	25-year	117	4197.71	4198.66	4198.66	4198.95	0.02223	4.29	27.27	48.81	1.01

Table 10-2 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
trib 127210	R127210	9394.83	25-year	162	4395.11	4389.25	4387.03	4389.35	0.00117		66.77	24.94	0.00
trib 127210	R127210	8847.6	25-year	162	4359.79	4360.71	4360.71	4360.98	0.01732	4.32	40.87	77.37	0.92
trib 127210	R127210	8245.5	25-year	162	4334.11	4336.14		4336.17	0.00083	1.43	113.02	88.95	0.22
trib 127210	R127210	7771.55	25-year	162	4327.79	4330.09	4328.73	4330.11	0.00050	1.13	143.95	110.76	0.17
trib 127210	R127210	7293.97	25-year	162	4314.67	4315.47	4315.47	4315.76	0.02145	4.32	37.46	64.50	1.00
trib 127210	R127210	6719.49	25-year	162	4300.05	4303.32	4300.97	4303.33	0.00016	0.88	183.72	85.22	0.11
trib 127210	R127210	6098.19	25-year	162	4297.32	4297.95	4297.95	4298.19	0.02281	3.98	40.68	83.10	1.00
trib 127210	R127210	5500.89	25-year	162	4279.11	4282.00		4282.01	0.00009	0.63	255.15	126.98	0.08
trib 127210	R127210	4916.21	25-year	162	4278.11	4278.73	4278.73	4278.97	0.02271	3.97	40.82	83.53	1.00
trib 127210	R127210	4170.26	25-year	162	4262.16	4264.21		4264.22	0.00007	0.46	350.97	238.15	0.07
trib 127210	R127210	3708.24	25-year	162	4261.17	4262.48		4262.50	0.00104	1.22	133.39	165.33	0.23
trib 127210	R127210	3209.62	25-year	162	4254.37	4256.16	4255.19	4256.17	0.00045	0.79	205.33	251.19	0.15
trib 127210	R127210	2737.21	25-year	162	4241.84	4242.53	4242.53	4242.71	0.02382	3.43	47.25	124.81	0.98
trib 127210	R127210	1799.17	25-year	162	4222.09	4224.54		4224.55	0.00019	0.82	198.23	120.59	0.11
trib 127210	R127210	1238.15	25-year	162	4219.52	4221.37		4221.39	0.00069	1.17	138.22	128.00	0.20
trib 127210	R127210	901.045	25-year	162	4215.62	4217.37		4217.38	0.00028	0.78	191.54	146.77	0.13
trib 127210	R127210	501.377	25-year	162	4209.66	4208.33	4208.33	4208.72	0.02103		32.55	43.23	0.00
trib 127210	R127210	221.027	25-year	162	4201.46	4206.17	4202.51	4206.17	0.00001	0.31	529.53	153.91	0.03

Table 10-3 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
trib 127190	R127190	7863.1	25-year	141	4372.81	4373.95	4373.95	4374.25	0.02190	4.44	31.75	53.37	1.01
trib 127190	R127190	7209.54	25-year	141	4354.09	4355.15	4355.15	4355.45	0.02184	4.40	32.02	54.40	1.01
trib 127190	R127190	6713.41	25-year	141	4339.59	4340.93	4340.65	4341.06	0.00660	2.91	48.49	62.60	0.58
trib 127190	R127190	6070.03	25-year	141	4332.66	4333.73	4333.73	4334.02	0.02144	4.36	32.34	55.01	1.00
trib 127190	R127190	5601.88	25-year	141	4318.42	4319.38	4319.38	4319.72	0.02081	4.68	30.14	45.07	1.01
trib 127190	R127190	4959.66	25-year	141	4303.36	4304.71	4304.71	4305.07	0.02051	4.81	29.33	41.56	1.01
trib 127190	R127190	3720.6	25-year	141	4280.18	4281.80		4281.83	0.00106	1.46	96.43	88.56	0.25
trib 127190	R127190	3182.55	25-year	141	4279.31	4280.04	4280.04	4280.27	0.02282	3.86	36.50	78.08	1.00
trib 127190	R127190	2710.71	25-year	141	4259.61	4261.24	4261.24	4261.66	0.01981	5.20	27.13	33.25	1.01
trib 127190	R127190	2270.98	25-year	141	4255.56	4257.94		4257.95	0.00008	0.58	244.31	138.07	0.08
trib 127190	R127190	1616.56	25-year	141	4256.61	4257.44	4257.44	4257.73	0.02209	4.29	32.86	58.55	1.01
trib 127190	R127190	1116.45	25-year	141	4249.84	4251.93		4251.98	0.00133	1.64	85.73	78.09	0.28
trib 127190	R127190	732.633	25-year	141	4249.41	4250.35	4250.35	4250.64	0.02273	4.32	32.66	58.93	1.02
trib 127190	R127190	488.211	25-year	141	4243.27	4244.07	4244.07	4244.33	0.02249	4.03	34.98	69.40	1.00
trib 127170	R127170	7007.88	25-year	254	4375.3	4376.32	4376.32	4376.70	0.01994	4.94	51.43	68.69	1.01
trib 127170	R127170	6163.87	25-year	254	4353.05	4354.19	4354.19	4354.53	0.02145	4.71	53.87	81.53	1.02
trib 127170	R127170	5493.49	25-year	254	4335.46	4336.58	4336.58	4336.97	0.02014	4.98	51.04	67.91	1.01
trib 127170	R127170	4884.09	25-year	254	4321.14	4323.13	4322.30	4323.21	0.00189	2.27	111.88	81.77	0.34
trib 127170	R127170	3864.9	25-year	254	4317.37	4318.71	4318.71	4319.00	0.01486	4.47	62.58	116.20	0.88
trib 127170	R127170	3261.66	25-year	254	4304.09	4304.79	4304.79	4305.04	0.02273	4.04	62.95	125.74	1.01
trib 127170	R127170	2329.98	25-year	254	4280.73	4282.37		4282.44	0.00209	2.14	118.77	102.49	0.35
trib 127170	R127170	1380.96	25-year	254	4276.3	4277.50	4277.50	4277.82	0.02146	4.56	55.76	88.76	1.01
trib 127170	R127170	695.251	25-year	254	4259.97	4261.28		4261.48	0.00863	3.59	70.79	81.49	0.68
trib 127170	R127170	452.208	25-year	254	4256.74	4258.03	4258.03	4258.40	0.02021	4.84	52.45	72.93	1.01

Table 10-4 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
trib 127150	R127150	7036.32	25-year	237	4398.34	4399.23	4399.23	4399.52	0.02214	4.30	55.07	97.89	1.01
trib 127150	R127150	6411.32	25-year	237	4385.86	4387.18		4387.40	0.00940	3.83	61.80	68.61	0.71
trib 127150	R127150	5741.18	25-year	237	4376.83	4378.10	4378.10	4378.48	0.02030	4.92	48.17	65.62	1.01
trib 127150	R127150	4988.15	25-year	237	4358.2	4359.49	4359.49	4359.86	0.02007	4.86	48.73	66.97	1.00
trib 127150	R127150	3938.85	25-year	237	4338.18	4338.82	4338.82	4339.05	0.02300	3.89	60.97	129.93	1.00
trib 127150	R127150	3434.18	25-year	237	4321.04	4322.01	4321.99	4322.31	0.01953	4.40	53.84	84.22	0.97
trib 127150	R127150	2855.16	25-year	237	4309.36	4310.46	4310.46	4310.83	0.02012	4.88	48.61	66.65	1.01
trib 127150	R127150	2457.59	25-year	237	4297.28	4300.06		4300.09	0.00053	1.46	162.80	89.06	0.19
trib 127150	R127150	1978.71	25-year	237	4297.85	4298.97	4298.97	4299.31	0.02096	4.65	50.97	77.43	1.01
trib 127150	R127150	1185.05	25-year	237	4282.71	4284.85	4284.55	4285.12	0.00842	4.09	57.90	53.60	0.69
trib 127150	R127150	801.862	25-year	237	4279.17	4279.92	4279.92	4280.19	0.02206	4.18	56.70	105.06	1.00
trib 127130	R127130	9244.79	25-year	279	4446.8	4448.38	4448.38	4448.92	0.01787	5.90	47.30	44.41	1.01
trib 127130	R127130	8454.54	25-year	279	4425.2	4427.03		4427.28	0.00833	4.01	69.54	65.91	0.69
trib 127130	R127130	7672.11	25-year	279	4416.2	4417.15	4417.15	4417.47	0.02090	4.60	60.65	93.46	1.01
trib 127130	R127130	6893.12	25-year	279	4396.52	4397.80	4397.80	4398.21	0.01972	5.12	54.49	68.39	1.01
trib 127130	R127130	6173.93	25-year	279	4379.19	4379.77	4379.77	4380.00	0.02321	3.80	73.46	163.26	1.00
trib 127130	R127130	5033.69	25-year	279	4360.76	4361.99	4361.99	4362.27	0.02256	4.19	66.56	124.79	1.01
trib 127130	R127130	4112.69	25-year	279	4340.96	4342.14	4342.14	4342.53	0.02038	5.00	55.81	74.43	1.02
trib 127130	R127130	3127.74	25-year	279	4324.04	4325.52		4325.79	0.01227	4.22	66.18	77.86	0.81
trib 127130	R127130	2574.56	25-year	279	4322.19	4323.28		4323.33	0.00219	1.78	156.50	184.04	0.34
trib 127130	R127130	1643.37	25-year	279	4317.18	4318.31	4318.31	4318.61	0.02177	4.42	63.13	106.47	1.01
trib 127130	R127130	880.67	25-year	279	4295.29	4297.51		4297.53	0.00058	1.26	221.02	161.57	0.19
trib 127130	R127130	374.145	25-year	279	4294.32	4296.10	4296.10	4296.64	0.01784	5.88	47.44	44.72	1.01

Table 10-5 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
trib 127100 up	R127150	3240.72	25-year	240	4462.58	4463.80	4463.80	4464.22	0.01904	5.20	46.19	55.20	1.00
trib 127100 up	R127150	2493.53	25-year	240	4434.71	4437.60		4437.62	0.00030	1.23	194.82	89.28	0.15
trib 127100 up	R127150	1717.92	25-year	240	4434.43	4436.35	4436.35	4436.85	0.01875	5.64	42.53	44.30	1.02
trib 127100 up	R127150	1363.45	25-year	240	4420.17	4421.89		4422.02	0.00400	2.93	81.97	71.84	0.48
trib 127100 up	R127150	634.665	25-year	240	4416.19	4417.07		4417.22	0.01273	3.14	76.37	143.64	0.76
trib 127100 up	R127150	253.963	25-year	240	4409.03	4410.86	4410.86	4411.33	0.01905	5.51	43.54	47.57	1.02
trib 127100 dn	R127100	2841.86	25-year	456	4395.63	4398.37		4398.56	0.00340	3.51	129.83	76.46	0.48
trib 127100 dn	R127100	2261.31	25-year	456	4394.37	4397.74		4397.79	0.00065	1.79	255.11	120.26	0.22
trib 127100 dn	R127100	1757.18	25-year	456	4394.86	4396.38	4396.38	4396.80	0.01953	5.23	87.13	105.03	1.01
trib 127100 dn	R127100	1219.69	25-year	456	4379.83	4382.08		4382.28	0.00394	3.53	129.22	84.61	0.50
trib 127100 dn	R127100	671.984	25-year	456	4378.48	4381.29		4381.34	0.00089	1.92	237.32	126.61	0.25
trib 127090	R127090	8835.46	25-year	254	4558.4	4559.67	4559.67	4560.14	0.01871	5.52	46.03	49.52	1.01
trib 127090	R127090	8034.38	25-year	254	4521.98	4523.78		4524.00	0.00547	3.76	67.48	51.19	0.58
trib 127090	R127090	7216.3	25-year	254	4514.31	4515.91	4515.91	4516.36	0.01921	5.41	46.95	53.12	1.01
trib 127090	R127090	6388.22	25-year	254	4494.58	4496.23	4496.10	4496.54	0.01226	4.43	57.33	62.54	0.82
trib 127090	R127090	5427	25-year	254	4480.28	4481.48	4481.48	4481.91	0.01937	5.25	48.34	57.55	1.01
trib 127090	R127090	4649.02	25-year	254	4457.45	4458.99		4459.27	0.00851	4.25	59.79	52.56	0.70
trib 127090	R127090	3827.59	25-year	254	4446.91	4448.77	4448.77	4449.27	0.01871	5.70	44.57	45.67	1.02
trib 127090	R127090	3016.23	25-year	254	4435.39	4437.90		4437.96	0.00119	2.04	124.61	75.78	0.28
trib 127090	R127090	2407.04	25-year	254	4434.45	4435.65	4435.65	4436.05	0.01993	5.07	50.14	64.46	1.01
trib 127090	R127090	1693.37	25-year	254	4417.79	4419.35	4419.35	4419.79	0.01943	5.29	47.97	56.59	1.01
trib 127090	R127090	702.786	25-year	254	4400.97	4402.38		4402.49	0.00467	2.55	99.52	120.54	0.49

Table 10-6 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
trib 127070	R127070	9203.06	25-year	286	4557.13	4558.06	4558.06	4558.38	0.02167	4.51	63.48	103.67	1.01
trib 127070	R127070	8362.75	25-year	286	4536.64	4538.45	4538.40	4538.87	0.01668	5.21	54.86	59.04	0.95
trib 127070	R127070	7167.83	25-year	286	4515.75	4516.89	4516.89	4517.30	0.01959	5.15	55.56	68.78	1.01
trib 127070	R127070	6233.33	25-year	286	4494.23	4495.52		4495.74	0.00992	3.77	75.76	89.79	0.72
trib 127070	R127070	5153.96	25-year	286	4479.53	4480.82	4480.82	4481.24	0.01917	5.18	55.17	66.52	1.00
trib 127070	R127070	3782.05	25-year	286	4457.27	4459.85		4459.91	0.00114	1.97	145.07	89.64	0.27
trib 127070	R127070	2748.72	25-year	286	4455.1	4456.46	4456.46	4456.76	0.02223	4.43	64.59	110.14	1.02
trib 127070	R127070	1868.73	25-year	286	4438.26	4439.70	4439.16	4439.78	0.00265	2.21	129.27	126.81	0.39
trib 127070	R127070	916.133	25-year	286	4431.26	4433.85	4433.85	4434.52	0.01706	6.54	43.72	33.72	1.01
trib 127040	R127040	7829.84	25-year	328	4540.1	4541.85	4541.85	4542.34	0.01869	5.62	58.32	60.99	1.01
trib 127040	R127040	6996.95	25-year	328	4520.2	4521.59	4521.59	4522.01	0.01967	5.23	62.72	76.12	1.02
trib 127040	R127040	6206.44	25-year	328	4498.51	4500.49		4500.60	0.00255	2.64	124.39	90.92	0.40
trib 127040	R127040	5389.83	25-year	328	4494.3	4495.66	4495.66	4496.09	0.01941	5.26	62.34	74.23	1.01
trib 127040	R127040	4494.38	25-year	328	4474.62	4475.98	4475.98	4476.47	0.01837	5.63	58.25	60.06	1.01
trib 127040	R127040	3460.9	25-year	328	4435.66	4438.54		4438.60	0.00093	2.02	162.60	82.85	0.25
trib 127040	R127040	2118.25	25-year	328	4433.25	4434.75	4434.75	4435.20	0.01969	5.38	60.96	70.93	1.02
trib 127040	R127040	1589.52	25-year	328	4415.75	4417.62	4417.35	4417.77	0.00706	3.17	103.48	123.48	0.61
trib 127040	R127040	930.411	25-year	328	4408.55	4410.19	4410.19	4410.75	0.01762	6.03	54.39	48.92	1.01
trib 127040	R127040	547.956	25-year	328	4396.22	4399.55		4399.61	0.00103	2.01	163.33	91.23	0.26

Table 10-7 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
main 127260	R127260	15447.8	25-year	2084	4182.08	4187.61		4187.68	0.00041	2.18	954.22	233.65	0.19
main 127260	R127260	14584.5	25-year	2084	4182.53	4186.20		4186.77	0.00531	6.05	344.65	125.65	0.64
main 127260	R127260	13903.3	25-year	2084	4180.25	4184.22		4184.40	0.00226	3.67	640.38	338.33	0.41
main 127260	R127260	13059.1	25-year	2084	4180.37	4180.82	4180.51	4181.14	0.00800	1.40	466.84	404.36	0.52
main 127260	R127260	12450.1	25-year	2084	4172.14	4173.67	4173.67	4174.15	0.01824	5.71	373.56	389.95	1.01
main 127260	R127260	10552.2	25-year	2084	4161.51	4166.97		4167.10	0.00097	2.97	701.66	207.22	0.28
main 127260	R127260	9541.53	25-year	2084	4161.31	4163.74	4163.74	4164.53	0.01584	7.11	293.12	190.81	1.01
main 127260	R127260	8010.83	25-year	2084	4152.14	4156.06		4156.16	0.00106	2.56	816.51	339.35	0.28
main 127260	R127260	7404.42	25-year	2084	4151.25	4155.11	4153.85	4155.26	0.00221	3.04	686.54	365.72	0.39
main 127260	R127260	6131.95	25-year	2084	4146.83	4149.02	4148.93	4149.48	0.01397	5.43	384.01	341.36	0.90
main 127260	R127260	4838.21	25-year	2084	4142.12	4145.49		4145.57	0.00124	2.27	923.56	542.64	0.29
main 127260	R127260	3924.55	25-year	2084	4141.14	4143.84		4143.99	0.00255	3.16	658.49	367.39	0.42
main 127260	R127260	3386.09	25-year	2084	4138.03	4140.57	4140.57	4141.01	0.01913	5.27	395.38	464.88	1.01
main 127260	R127260	2972.86	25-year	2084	4134.46	4138.10		4138.15	0.00083	1.76	1186.43	690.71	0.24
main 127260	R127260	1024.29	25-year	2084	4131.32	4135.16		4135.41	0.00284	3.97	525.41	226.08	0.46
main 127260	R127260	417.007	25-year	2084	4129.39	4133.30	4132.31	4133.55	0.00330	4.03	517.00	243.20	0.49
main 127240	R127240	266.929	25-year	4	4192.15	4196.81		4196.81	0.00000	0.01	523.50	263.81	0.00
main 127240	R127240	246.929	25-year	1907	4192.15	4195.36	4195.36	4196.37	0.01422	8.06	236.61	117.53	1.00
main 127220	R127220	742.265	25-year	1868	4198.19	4202.85		4202.96	0.00095	2.68	698.26	242.44	0.28
main 127220	R127220	472.924	25-year	1868	4198.65	4201.49	4201.49	4202.24	0.01555	6.99	269.55	186.33	1.00

Table 10-8 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
main 127200	R127200	4628.15	25-year	1801	4223.56	4227.81		4227.98	0.00163	3.33	540.28	199.32	0.36
main 127200	R127200	4272.16	25-year	1801	4223.49	4226.85		4227.14	0.00356	4.33	415.72	185.79	0.51
main 127200	R127200	3803.81	25-year	1801	4222.47	4226.23		4226.32	0.00092	2.41	746.07	291.52	0.27
main 127200	R127200	3094.52	25-year	1801	4222.36	4223.97	4223.97	4224.54	0.01735	6.07	296.78	262.50	1.01
main 127200	R127200	2548.44	25-year	1801	4216.15	4219.66		4219.75	0.00113	2.44	738.05	330.17	0.29
main 127200	R127200	1875.09	25-year	1801	4215.25	4217.20	4217.20	4217.76	0.01775	6.03	298.56	270.96	1.01
main 127200	R127200	1102.17	25-year	1801	4199.63	4204.24		4204.48	0.00212	3.95	459.79	167.31	0.41
main 127200	R127200	675.183	25-year	1801	4198.67	4203.80		4203.92	0.00079	2.86	649.43	204.49	0.26
main 127200	R127200	324.455	25-year	1801	4198.43	4203.19		4203.46	0.00233	4.20	437.74	163.26	0.43
main 127180	R127180	3750.56	25-year	1723	4241.17	4245.39		4245.59	0.00151	3.60	479.13	148.00	0.35
main 127180	R127180	2979.42	25-year	1723	4238.83	4241.81	4241.81	4242.86	0.01426	8.20	210.08	101.61	1.01
main 127180	R127180	2238.88	25-year	1723	4234.57	4241.07		4241.18	0.00063	2.77	622.79	148.16	0.24
main 127180	R127180	1720.4	25-year	1723	4234.42	4240.72		4240.84	0.00070	2.79	618.27	157.00	0.25
main 127180	R127180	1196.01	25-year	1723	4234.75	4239.88		4240.18	0.00271	4.42	389.40	137.10	0.46
main 127180	R127180	649.58	25-year	1723	4232.15	4236.14	4236.14	4237.23	0.01424	8.36	206.13	96.81	1.01
main 127180	R127180	358.895	25-year	1723	4224.83	4228.52		4228.75	0.00274	3.85	447.27	195.86	0.45
main 127160	R127160	1984.28	25-year	1642	4257.96	4263.52		4263.69	0.00103	3.29	499.46	132.41	0.30
main 127160	R127160	1618.49	25-year	1642	4257.82	4263.40		4263.46	0.00033	1.90	865.40	223.00	0.17
main 127160	R127160	1226.33	25-year	1642	4257.23	4263.30		4263.35	0.00025	1.78	1012.53	311.31	0.15
main 127160	R127160	733.245	25-year	1642	4258.74	4263.08		4263.15	0.00075	2.12	776.17	316.13	0.24
main 127160	R127160	206.901	25-year	1642	4257.96	4261.14	4261.14	4262.02	0.01519	7.52	218.38	126.52	1.01
main 127140	R127140	3507.04	25-year	1487	4280.55	4284.91		4285.14	0.00271	3.85	386.72	167.79	0.45
main 127140	R127140	2428.51	25-year	1487	4277.63	4281.81		4282.12	0.00286	4.50	330.75	118.26	0.47
main 127140	R127140	1777.2	25-year	1487	4276.22	4278.93		4279.35	0.00687	5.24	283.52	155.59	0.68
main 127140	R127140	1022.1	25-year	1487	4268.38	4271.08	4271.08	4271.92	0.01507	7.38	201.48	119.39	1.00
main 127140	R127140	173.595	25-year	1487	4258.63	4263.70		4263.87	0.00103	3.33	446.78	115.85	0.30

Table 10-9 HEC-RAS Results for Hydrologic Project East (25 year)

River	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
main 127120	R127120	9039.38	25-year	1119	4374.59	4377.63	4377.63	4378.44	0.01558	7.23	154.83	97.01	1.01
main 127120	R127120	8306.5	25-year	1119	4358.19	4361.97		4362.10	0.00152	2.93	381.65	161.88	0.34
main 127120	R127120	7648.6	25-year	1119	4356.75	4359.21	4359.21	4359.66	0.01824	5.44	205.87	222.85	1.00
main 127120	R127120	6584.41	25-year	1119	4340.32	4343.10		4343.23	0.00256	3.05	389.26	260.10	0.41
main 127120	R127120	5913.86	25-year	1119	4335.93	4338.80	4338.80	4339.71	0.01500	7.66	146.12	81.48	1.01
main 127120	R127120	4570.29	25-year	1119	4318.46	4322.12		4322.24	0.00124	2.79	401.40	157.57	0.31
main 127120	R127120	3816.8	25-year	1119	4316.75	4321.63		4321.69	0.00046	1.95	573.02	183.00	0.19
main 127120	R127120	3102.71	25-year	1119	4316.3	4319.74	4319.74	4320.64	0.01524	7.61	147.00	83.70	1.01
main 127120	R127120	1898.95	25-year	1119	4299.37	4303.84		4303.93	0.00081	2.42	465.39	171.72	0.25
main 127120	R127120	1159.3	25-year	1119	4299.63	4302.91		4303.06	0.00181	3.13	357.83	156.88	0.36
main 127120	R127120	269.281	25-year	1119	4295.68	4298.65	4298.65	4299.39	0.01607	6.89	162.30	111.75	1.01
main 127110	R127110	2295.38	25-year	710	4392.33	4394.04	4394.04	4394.63	0.01708	6.19	114.64	97.10	1.00
main 127110	R127110	1751.28	25-year	710	4379.24	4382.46	4380.83	4382.53	0.00088	2.19	323.93	141.08	0.25
main 127110	R127110	966.973	25-year	710	4378.58	4380.12	4380.12	4380.62	0.01897	5.66	125.41	131.56	1.02
main 127110	R127110	274.019	25-year	710	4374.22	4378.65		4378.66	0.00010	0.92	772.24	238.48	0.09
main 127080	R127080	1403.77	25-year	505	4413.62	4415.80	4415.80	4416.45	0.01710	6.43	78.56	62.82	1.01
main 127080	R127080	956.72	25-year	505	4397.53	4399.37	4399.37	4399.90	0.01804	5.82	86.73	83.96	1.01
main 127080	R127080	549.597	25-year	505	4394.21	4397.49		4397.60	0.00152	2.70	187.34	89.60	0.33
main 127080	R127080	228.146	25-year	505	4394.02	4396.50	4395.86	4396.78	0.00494	4.24	119.22	70.21	0.57
main 127060	R127060	8344.52	25-year	279	4579.95	4581.27	4581.27	4581.77	0.01786	5.72	48.75	47.94	1.00
main 127060	R127060	7413.37	25-year	279	4537.37	4538.92	4538.92	4539.38	0.01919	5.43	51.34	57.69	1.02
main 127060	R127060	6524.28	25-year	279	4519.2	4520.07	4520.07	4520.40	0.02079	4.60	60.65	93.06	1.00
main 127060	R127060	5487.78	25-year	279	4494.7	4496.01	4496.00	4496.36	0.01960	4.79	58.22	80.36	0.99
main 127060	R127060	4405.53	25-year	279	4474.45	4475.47	4475.44	4475.77	0.01846	4.38	63.75	96.43	0.95
main 127060	R127060	3497.38	25-year	279	4456.99	4458.45	4458.45	4458.95	0.01852	5.69	49.02	49.98	1.01
main 127060	R127060	2311.34	25-year	279	4435.34	4438.84		4438.89	0.00072	1.81	154.41	76.75	0.22
main 127060	R127060	1438.26	25-year	279	4435.01	4436.57	4436.57	4437.09	0.01852	5.81	48.04	47.48	1.02
main 127060	R127060	782.931	25-year	279	4414.31	4417.75		4417.78	0.00032	1.31	213.52	94.07	0.15

Table 11-1 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
trib 127250	R127250	6170.037	10-year	201	4297.82	4300.07		4300.21	0.00351	2.91	69.15	55.39	0.46
trib 127250	R127250	5576.299	10-year	201	4294.21	4295.67	4295.67	4296.05	0.02000	4.95	40.63	54.22	1.01
trib 127250	R127250	4957.121	10-year	201	4277.29	4278.75	4278.75	4279.15	0.01991	5.05	39.80	51.31	1.01
trib 127250	R127250	4436.674	10-year	201	4259.43	4260.41	4260.41	4260.76	0.02052	4.69	42.83	63.11	1.00
trib 127250	R127250	3809.693	10-year	201	4239.3	4241.21	4240.54	4241.31	0.00283	2.54	79.23	66.33	0.41
trib 127250	R127250	3121.598	10-year	201	4235.9	4236.81	4236.81	4237.11	0.02122	4.35	46.18	78.17	1.00
trib 127250	R127250	2360.425	10-year	201	4220.14	4221.35	4220.84	4221.37	0.00139	1.34	150.30	193.33	0.27
trib 127250	R127250	1759.534	10-year	201	4218.02	4218.91	4218.91	4219.23	0.02173	4.49	44.79	73.72	1.01
trib 127250	R127250	1321.822	10-year	201	4208.03	4209.41	4209.41	4209.84	0.01919	5.29	37.97	44.31	1.01
trib 127250	R127250	980.0942	10-year	201	4200.18	4202.21	4201.18	4202.25	0.00090	1.53	131.33	99.17	0.23
trib 127250	R127250	622.0686	10-year	201	4200.25	4201.05	4201.05	4201.33	0.02274	4.22	47.66	89.13	1.02
trib 127220	R127220	5083.328	10-year	88	4297.58	4298.23	4298.23	4298.40	0.02626	3.23	27.25	84.72	1.00
trib 127220	R127220	4579.815	10-year	88	4279.41	4280.44	4280.44	4280.68	0.02308	3.98	22.13	45.65	1.01
trib 127220	R127220	4071.373	10-year	88	4260.34	4260.94	4260.94	4261.14	0.02459	3.54	24.84	63.96	1.00
trib 127220	R127220	3515.454	10-year	88	4250.52	4251.95	4251.76	4252.13	0.00998	3.39	25.98	36.26	0.71
trib 127220	R127220	2942.958	10-year	88	4242.16	4242.34	4242.34	4242.42	0.03477	2.35	37.42	231.09	1.03
trib 127220	R127220	2310.17	10-year	88	4223.46	4224.15	4224.15	4224.34	0.02606	3.53	24.92	67.38	1.02
trib 127220	R127220	1830.441	10-year	88	4217.29	4218.90		4218.91	0.00048	0.95	92.41	88.79	0.16
trib 127220	R127220	1306.478	10-year	88	4217.22	4217.91	4217.91	4218.12	0.02464	3.74	23.54	56.02	1.02
trib 127220	R127220	901.6307	10-year	88	4196.98	4199.05		4199.06	0.00019	0.76	116.26	79.94	0.11
trib 127220	R127220	532.2559	10-year	88	4197.71	4198.55	4198.55	4198.80	0.02339	3.99	22.03	45.63	1.01

Table 11-2 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
trib 127210	R127210	9394.83	10-year	120	4395.11	4388.72	4386.67	4388.79	0.00113		53.99	22.43	0.00
trib 127210	R127210	8847.6	10-year	120	4359.79	4360.58	4360.58	4360.82	0.01841	4.06	31.58	67.21	0.93
trib 127210	R127210	8245.5	10-year	120	4334.11	4335.88		4335.91	0.00086	1.32	90.80	82.71	0.22
trib 127210	R127210	7771.55	10-year	120	4327.79	4329.81	4328.59	4329.83	0.00049	1.04	115.03	97.61	0.17
trib 127210	R127210	7293.97	10-year	120	4314.67	4315.35	4315.35	4315.60	0.02307	4.02	29.86	60.64	1.01
trib 127210	R127210	6719.49	10-year	120	4300.05	4302.90	4300.82	4302.91	0.00015	0.80	150.14	77.02	0.10
trib 127210	R127210	6098.19	10-year	120	4297.32	4297.85	4297.85	4298.06	0.02385	3.66	32.82	78.78	1.00
trib 127210	R127210	5500.89	10-year	120	4279.11	4281.68		4281.68	0.00008	0.56	214.30	121.99	0.07
trib 127210	R127210	4916.21	10-year	120	4278.11	4278.63	4278.63	4278.84	0.02378	3.64	32.94	79.35	1.00
trib 127210	R127210	4170.26	10-year	120	4262.16	4263.95		4263.95	0.00007	0.41	290.99	219.34	0.06
trib 127210	R127210	3708.24	10-year	120	4261.17	4262.32		4262.34	0.00107	1.11	108.38	151.63	0.23
trib 127210	R127210	3209.62	10-year	120	4254.37	4256.01	4255.08	4256.02	0.00044	0.71	169.31	240.06	0.15
trib 127210	R127210	2737.21	10-year	120	4241.84	4242.44	4242.44	4242.61	0.02647	3.23	37.19	116.49	1.01
trib 127210	R127210	1799.17	10-year	120	4222.09	4224.24		4224.25	0.00018	0.73	163.51	113.18	0.11
trib 127210	R127210	1238.15	10-year	120	4219.52	4221.14		4221.16	0.00070	1.09	110.55	116.76	0.20
trib 127210	R127210	901.045	10-year	120	4215.62	4217.14		4217.15	0.00028	0.71	157.91	140.81	0.12
trib 127210	R127210	501.377	10-year	120	4209.66	4208.16	4208.16	4208.50	0.02199		25.50	38.09	0.00
trib 127210	R127210	221.027	10-year	120	4201.46	4205.59	4202.37	4205.59	0.00001	0.27	443.48	144.13	0.03

Table 11-3 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
trib 127190	R127190	7863.1	10-year	109	4372.81	4373.84	4373.84	4374.11	0.02330	4.17	26.12	50.51	1.02
trib 127190	R127190	7209.54	10-year	109	4354.09	4355.04	4355.04	4355.31	0.02246	4.14	26.35	50.22	1.01
trib 127190	R127190	6713.41	10-year	109	4339.59	4340.81		4340.92	0.00635	2.66	41.05	58.93	0.56
trib 127190	R127190	6070.03	10-year	109	4332.66	4333.61	4333.61	4333.88	0.02309	4.15	26.25	50.77	1.02
trib 127190	R127190	5601.88	10-year	109	4318.42	4319.26	4319.26	4319.56	0.02225	4.41	24.73	42.53	1.02
trib 127190	R127190	4959.66	10-year	109	4303.36	4304.57	4304.57	4304.90	0.02193	4.58	23.82	38.22	1.02
trib 127190	R127190	3720.6	10-year	109	4280.18	4281.64		4281.66	0.00101	1.33	82.19	84.04	0.24
trib 127190	R127190	3182.55	10-year	109	4279.31	4279.95	4279.95	4280.16	0.02427	3.66	29.82	72.57	1.00
trib 127190	R127190	2710.71	10-year	109	4259.61	4261.08	4261.08	4261.46	0.02032	4.92	22.16	30.05	1.01
trib 127190	R127190	2270.98	10-year	109	4255.56	4257.77		4257.77	0.00007	0.50	220.77	134.31	0.07
trib 127190	R127190	1616.56	10-year	109	4256.61	4257.34	4257.34	4257.59	0.02274	4.01	27.19	54.80	1.00
trib 127190	R127190	1116.45	10-year	109	4249.84	4251.73		4251.76	0.00122	1.54	70.73	66.52	0.26
trib 127190	R127190	732.633	10-year	109	4249.41	4250.25	4250.25	4250.50	0.02338	4.04	27.01	55.07	1.02
trib 127190	R127190	488.211	10-year	109	4243.27	4243.98	4243.98	4244.20	0.02347	3.81	28.63	63.92	1.00
trib 127170	R127170	7007.88	10-year	194	4375.3	4376.18	4376.18	4376.51	0.02149	4.59	42.22	66.48	1.02
trib 127170	R127170	6163.87	10-year	194	4353.05	4354.07	4354.07	4354.36	0.02194	4.37	44.41	76.66	1.01
trib 127170	R127170	5493.49	10-year	194	4335.46	4336.44	4336.44	4336.78	0.02071	4.66	41.65	62.50	1.01
trib 127170	R127170	4884.09	10-year	194	4321.14	4322.92	4322.16	4322.98	0.00176	2.03	95.38	77.94	0.32
trib 127170	R127170	3864.9	10-year	194	4317.37	4318.55	4318.55	4318.84	0.01721	4.39	46.34	90.27	0.92
trib 127170	R127170	3261.66	10-year	194	4304.09	4304.70	4304.70	4304.91	0.02384	3.76	51.65	119.07	1.01
trib 127170	R127170	2329.98	10-year	194	4280.73	4282.19		4282.25	0.00204	1.93	100.40	99.20	0.34
trib 127170	R127170	1380.96	10-year	194	4276.3	4277.37	4277.37	4277.66	0.02228	4.30	45.16	80.76	1.01
trib 127170	R127170	695.251	10-year	194	4259.97	4261.13		4261.30	0.00834	3.29	58.96	75.33	0.66
trib 127170	R127170	452.208	10-year	194	4256.74	4257.89	4257.89	4258.21	0.02156	4.56	42.52	67.85	1.02

Table 11-4 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
trib 127150	R127150	7036.32	10-year	177	4398.34	4399.12	4399.12	4399.37	0.02337	3.95	44.76	94.07	1.01
trib 127150	R127150	6411.32	10-year	177	4385.86	4387.01		4387.20	0.00922	3.50	50.63	63.70	0.69
trib 127150	R127150	5741.18	10-year	177	4376.83	4377.95	4377.95	4378.27	0.02085	4.57	38.74	60.17	1.00
trib 127150	R127150	4988.15	10-year	177	4358.2	4359.40	4359.33	4359.66	0.01588	4.12	42.94	63.44	0.88
trib 127150	R127150	3938.85	10-year	177	4338.18	4338.72	4338.72	4338.92	0.02519	3.60	49.12	125.55	1.02
trib 127150	R127150	3434.18	10-year	177	4321.04	4321.90	4321.86	4322.14	0.01824	3.92	45.15	79.82	0.92
trib 127150	R127150	2855.16	10-year	177	4309.36	4310.32	4310.32	4310.64	0.02171	4.51	39.26	64.09	1.02
trib 127150	R127150	2457.59	10-year	177	4297.28	4299.80		4299.82	0.00046	1.27	139.91	84.58	0.17
trib 127150	R127150	1978.71	10-year	177	4297.85	4298.83	4298.83	4299.13	0.02178	4.36	40.58	69.82	1.01
trib 127150	R127150	1185.05	10-year	177	4282.71	4284.66	4284.35	4284.87	0.00787	3.70	47.90	49.12	0.66
trib 127150	R127150	801.862	10-year	177	4279.17	4279.81	4279.81	4280.04	0.02346	3.86	45.87	100.32	1.01
trib 127130	R127130	9244.79	10-year	208	4446.8	4448.16	4448.16	4448.63	0.01899	5.47	38.04	41.93	1.01
trib 127130	R127130	8454.54	10-year	208	4425.2	4426.57	4426.57	4426.96	0.02049	5.02	41.43	55.09	1.02
trib 127130	R127130	7672.11	10-year	208	4416.2	4417.01	4417.01	4417.30	0.02202	4.27	48.77	87.52	1.01
trib 127130	R127130	6893.12	10-year	208	4396.52	4397.64	4397.64	4397.99	0.02030	4.76	43.69	62.51	1.00
trib 127130	R127130	6173.93	10-year	208	4379.19	4379.80	4379.70	4379.91	0.01080	2.67	77.88	165.33	0.69
trib 127130	R127130	5033.69	10-year	208	4360.76	4361.88	4361.88	4362.12	0.02443	3.95	52.61	114.29	1.03
trib 127130	R127130	4112.69	10-year	208	4340.96	4342.00	4342.00	4342.32	0.02120	4.59	45.35	70.88	1.01
trib 127130	R127130	3127.74	10-year	208	4324.04	4325.35		4325.58	0.01203	3.87	53.78	70.99	0.78
trib 127130	R127130	2574.56	10-year	208	4322.19	4323.13		4323.17	0.00217	1.62	128.55	173.54	0.33
trib 127130	R127130	1643.37	10-year	208	4317.18	4318.18	4318.18	4318.45	0.02250	4.14	50.20	95.61	1.01
trib 127130	R127130	880.67	10-year	208	4295.29	4297.26		4297.28	0.00061	1.15	180.54	157.31	0.19
trib 127130	R127130	374.145	10-year	208	4294.32	4295.88	4295.88	4296.35	0.01903	5.46	38.11	42.18	1.01

Table 11-5 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
trib 127100 up	R127150	3240.72	10-year	180	4462.58	4463.63	4463.63	4463.99	0.02035	4.87	36.95	51.14	1.01
trib 127100 up	R127150	2493.53	10-year	180	4434.71	4437.27		4437.29	0.00027	1.08	165.99	85.36	0.14
trib 127100 up	R127150	1717.92	10-year	180	4434.43	4436.14	4436.14	4436.58	0.01933	5.31	33.89	39.55	1.01
trib 127100 up	R127150	1363.45	10-year	180	4420.17	4421.70	4421.26	4421.81	0.00387	2.62	68.78	69.60	0.46
trib 127100 up	R127150	634.665	10-year	180	4416.19	4416.98		4417.11	0.01284	2.82	63.87	142.43	0.74
trib 127100 up	R127150	253.963	10-year	180	4409.03	4410.66	4410.66	4411.08	0.01981	5.21	34.58	42.39	1.02
trib 127100 dn	R127100	2841.86	10-year	343	4395.63	4398.02		4398.19	0.00370	3.32	103.46	70.90	0.48
trib 127100 dn	R127100	2261.31	10-year	343	4394.37	4397.42		4397.46	0.00058	1.57	217.91	113.10	0.20
trib 127100 dn	R127100	1757.18	10-year	343	4394.86	4396.20	4396.20	4396.58	0.01993	4.95	69.35	92.39	1.01
trib 127100 dn	R127100	1219.69	10-year	343	4379.83	4381.78		4381.95	0.00413	3.28	104.72	79.40	0.50
trib 127100 dn	R127100	671.984	10-year	343	4378.48	4380.96		4381.01	0.00089	1.74	196.99	121.81	0.24
trib 127090	R127090	8835.46	10-year	191	4558.4	4559.49	4559.49	4559.89	0.01937	5.10	37.45	46.54	1.00
trib 127090	R127090	8034.38	10-year	191	4521.98	4523.55		4523.73	0.00532	3.41	55.94	48.12	0.56
trib 127090	R127090	7216.3	10-year	191	4514.31	4515.74	4515.74	4516.13	0.01996	5.01	38.12	49.84	1.01
trib 127090	R127090	6388.22	10-year	191	4494.58	4496.08	4495.95	4496.33	0.01209	3.99	47.87	60.47	0.79
trib 127090	R127090	5427	10-year	191	4480.28	4481.32	4481.32	4481.69	0.01974	4.86	39.32	53.42	1.00
trib 127090	R127090	4649.02	10-year	191	4457.45	4458.79		4459.02	0.00818	3.84	49.72	49.33	0.67
trib 127090	R127090	3827.59	10-year	191	4446.91	4448.58	4448.58	4449.01	0.01995	5.32	35.92	42.88	1.02
trib 127090	R127090	3016.23	10-year	191	4435.39	4437.63		4437.68	0.00113	1.82	104.88	72.51	0.27
trib 127090	R127090	2407.04	10-year	191	4434.45	4435.49	4435.49	4435.84	0.02117	4.77	40.07	59.05	1.02
trib 127090	R127090	1693.37	10-year	191	4417.79	4419.18	4419.18	4419.56	0.02056	4.96	38.49	52.22	1.02
trib 127090	R127090	702.786	10-year	191	4400.97	4402.25		4402.33	0.00449	2.28	83.91	117.17	0.47

Table 11-6 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
trib 127070	R127070	9203.06	10-year	215	4557.13	4557.95	4557.95	4558.22	0.02251	4.13	52.10	99.88	1.01
trib 127070	R127070	8362.75	10-year	215	4536.64	4538.21	4538.21	4538.62	0.02007	5.17	41.57	52.04	1.02
trib 127070	R127070	7167.83	10-year	215	4515.75	4516.74	4516.74	4517.09	0.02030	4.74	45.35	65.25	1.00
trib 127070	R127070	6233.33	10-year	215	4494.23	4495.37		4495.55	0.00955	3.41	63.01	84.42	0.70
trib 127070	R127070	5153.96	10-year	215	4479.53	4480.65	4480.65	4481.02	0.02031	4.87	44.19	61.21	1.01
trib 127070	R127070	3782.05	10-year	215	4457.27	4459.57		4459.62	0.00108	1.78	121.03	84.01	0.26
trib 127070	R127070	2748.72	10-year	215	4455.1	4456.31	4456.31	4456.60	0.02268	4.29	50.07	90.76	1.02
trib 127070	R127070	1868.73	10-year	215	4438.26	4439.51	4439.05	4439.58	0.00274	2.03	105.91	121.13	0.38
trib 127070	R127070	916.133	10-year	215	4431.26	4433.57	4433.57	4434.17	0.01772	6.18	34.79	30.08	1.01
trib 127040	R127040	7829.84	10-year	247	4540.1	4541.66	4541.66	4542.08	0.01981	5.21	47.37	58.02	1.02
trib 127040	R127040	6996.95	10-year	247	4520.2	4521.43	4521.43	4521.79	0.02053	4.85	50.96	71.59	1.01
trib 127040	R127040	6206.44	10-year	247	4498.51	4500.27		4500.36	0.00248	2.36	104.60	88.40	0.38
trib 127040	R127040	5389.83	10-year	247	4494.3	4495.50	4495.50	4495.87	0.02053	4.90	50.45	69.83	1.01
trib 127040	R127040	4494.38	10-year	247	4474.62	4475.78	4475.78	4476.21	0.01925	5.26	46.92	55.44	1.01
trib 127040	R127040	3460.9	10-year	247	4435.66	4438.20		4438.25	0.00089	1.82	135.62	78.25	0.24
trib 127040	R127040	2118.25	10-year	247	4433.25	4434.58	4434.58	4434.97	0.01976	4.99	49.51	64.69	1.01
trib 127040	R127040	1589.52	10-year	247	4415.75	4417.48	4417.14	4417.60	0.00706	2.86	86.44	120.53	0.59
trib 127040	R127040	930.411	10-year	247	4408.55	4409.97	4409.97	4410.46	0.01845	5.60	44.11	45.91	1.01
trib 127040	R127040	547.956	10-year	247	4396.22	4399.21		4399.27	0.00103	1.84	133.93	84.71	0.26

Table 11-7 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
main 127260	R127260	15447.8	10-year	1610	4182.08	4187.06		4187.11	0.00038	1.95	827.58	226.60	0.18
main 127260	R127260	14584.5	10-year	1610	4182.53	4185.84		4186.29	0.00474	5.36	300.47	120.58	0.60
main 127260	R127260	13903.3	10-year	1610	4180.25	4183.91		4184.06	0.00223	3.36	539.80	322.72	0.40
main 127260	R127260	13059.1	10-year	1610	4180.37	4180.62	4180.30	4180.89	0.00774	0.93	388.96	358.28	0.46
main 127260	R127260	12450.1	10-year	1610	4172.14	4173.49	4173.49	4173.92	0.01902	5.38	306.70	362.05	1.01
main 127260	R127260	10552.2	10-year	1610	4161.51	4166.48		4166.59	0.00090	2.67	602.71	197.28	0.27
main 127260	R127260	9541.53	10-year	1610	4161.31	4163.48	4163.48	4164.16	0.01649	6.62	243.26	181.76	1.01
main 127260	R127260	8010.83	10-year	1610	4152.14	4155.68		4155.77	0.00105	2.32	693.38	316.85	0.28
main 127260	R127260	7404.42	10-year	1610	4151.25	4154.77	4153.60	4154.90	0.00205	2.82	571.32	321.24	0.37
main 127260	R127260	6131.95	10-year	1610	4146.83	4148.80	4148.75	4149.22	0.01602	5.16	311.79	330.96	0.94
main 127260	R127260	4838.21	10-year	1610	4142.12	4145.15		4145.23	0.00122	2.12	757.80	442.28	0.29
main 127260	R127260	3924.55	10-year	1610	4141.14	4143.57		4143.70	0.00241	2.86	562.57	349.56	0.40
main 127260	R127260	3386.09	10-year	1610	4138.03	4140.43	4140.43	4140.80	0.02047	4.88	329.60	456.99	1.01
main 127260	R127260	2972.86	10-year	1610	4134.46	4137.60		4137.65	0.00080	1.81	887.19	479.06	0.23
main 127260	R127260	1024.29	10-year	1610	4131.32	4134.78		4134.99	0.00278	3.64	441.72	212.45	0.45
main 127260	R127260	417.007	10-year	1610	4129.39	4132.93	4132.01	4133.15	0.00330	3.73	431.68	228.22	0.48
main 127240	R127240	266.929	10-year	4	4192.15	4196.35		4196.35	0.00000	0.01	410.37	220.63	0.00
main 127240	R127240	246.929	10-year	1476	4192.15	4194.97	4194.97	4195.88	0.01503	7.65	192.85	107.96	1.01
main 127220	R127220	742.265	10-year	1448	4198.19	4202.47		4202.56	0.00087	2.38	608.77	232.36	0.26
main 127220	R127220	472.924	10-year	1448	4198.65	4201.20	4201.20	4201.88	0.01627	6.64	218.78	166.02	1.00

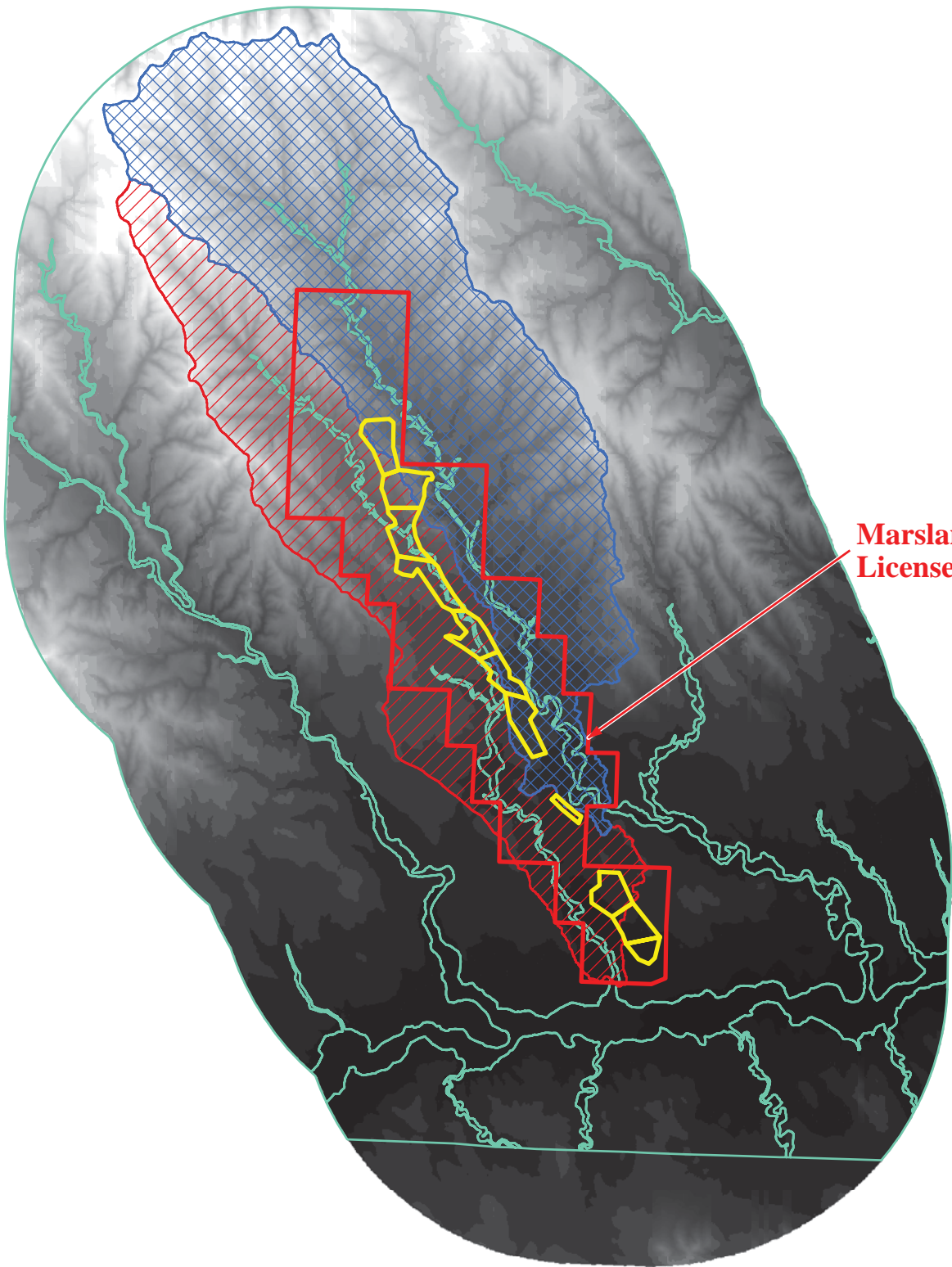
Table 11-8 HEC-RAS Results for Hydrologic Project East (10 year)

River	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
main 127200	R127200	4628.15	10-year	1391	4223.56	4227.38		4227.53	0.00155	3.04	457.95	186.63	0.34
main 127200	R127200	4272.16	10-year	1391	4223.49	4226.47		4226.72	0.00354	4.01	346.97	173.51	0.50
main 127200	R127200	3803.81	10-year	1391	4222.47	4225.87		4225.94	0.00086	2.16	642.54	280.02	0.25
main 127200	R127200	3094.52	10-year	1391	4222.36	4223.77	4223.77	4224.27	0.01802	5.68	245.05	246.46	1.00
main 127200	R127200	2548.44	10-year	1391	4216.15	4219.32		4219.40	0.00106	2.21	630.48	313.08	0.27
main 127200	R127200	1875.09	10-year	1391	4215.25	4216.99	4216.99	4217.49	0.01836	5.67	245.22	250.40	1.01
main 127200	R127200	1102.17	10-year	1391	4199.63	4203.77		4203.98	0.00218	3.64	383.81	159.26	0.41
main 127200	R127200	675.183	10-year	1391	4198.67	4203.34		4203.44	0.00075	2.54	558.09	193.93	0.25
main 127200	R127200	324.455	10-year	1391	4198.43	4202.80		4203.01	0.00210	3.76	375.57	150.72	0.40
main 127180	R127180	3750.56	10-year	1331	4241.17	4244.89		4245.05	0.00146	3.27	406.83	141.45	0.34
main 127180	R127180	2979.42	10-year	1331	4238.83	4241.45	4241.45	4242.36	0.01511	7.66	173.71	97.25	1.01
main 127180	R127180	2238.88	10-year	1331	4234.57	4240.46		4240.55	0.00059	2.49	534.69	141.91	0.23
main 127180	R127180	1720.4	10-year	1331	4234.42	4240.14		4240.24	0.00064	2.51	530.15	147.04	0.23
main 127180	R127180	1196.01	10-year	1331	4234.75	4239.36		4239.62	0.00263	4.13	322.63	123.09	0.45
main 127180	R127180	649.58	10-year	1331	4232.15	4235.73	4235.73	4236.71	0.01480	7.92	168.13	88.23	1.01
main 127180	R127180	358.895	10-year	1331	4224.83	4228.09		4228.29	0.00299	3.64	365.69	186.04	0.46
main 127160	R127160	1984.28	10-year	1264	4257.96	4263.08		4263.21	0.00087	2.86	441.91	127.15	0.27
main 127160	R127160	1618.49	10-year	1264	4257.82	4262.97		4263.02	0.00027	1.64	771.11	215.85	0.15
main 127160	R127160	1226.33	10-year	1264	4257.23	4262.89		4262.92	0.00021	1.55	886.35	296.70	0.14
main 127160	R127160	733.245	10-year	1264	4258.74	4262.68		4262.74	0.00078	1.94	652.06	309.93	0.24
main 127160	R127160	206.901	10-year	1264	4257.96	4260.73	4260.73	4261.57	0.01526	7.36	171.82	103.23	1.00
main 127140	R127140	3507.04	10-year	1141	4280.55	4284.49		4284.69	0.00294	3.60	317.23	161.84	0.45
main 127140	R127140	2428.51	10-year	1141	4277.63	4281.38		4281.63	0.00272	4.06	280.90	112.48	0.45
main 127140	R127140	1777.2	10-year	1141	4276.22	4278.63		4278.98	0.00667	4.79	238.42	146.92	0.66
main 127140	R127140	1022.1	10-year	1141	4268.38	4270.75	4270.75	4271.51	0.01599	6.96	164.05	111.14	1.01
main 127140	R127140	173.595	10-year	1141	4258.63	4263.23		4263.36	0.00088	2.90	393.30	111.85	0.27

Table 11-9 HEC-RAS Results for Hydrologic Project East (10 year)






River	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
main 127120	R127120	9039.38	10-year	855	4374.59	4377.29	4377.29	4378.03	0.01627	6.91	123.82	85.80	1.01
main 127120	R127120	8306.5	10-year	855	4358.19	4361.61		4361.72	0.00139	2.62	325.94	152.33	0.32
main 127120	R127120	7648.6	10-year	855	4356.75	4359.03	4359.03	4359.43	0.01869	5.06	169.07	207.71	0.99
main 127120	R127120	6584.41	10-year	855	4340.32	4342.82		4342.94	0.00269	2.85	318.85	247.68	0.41
main 127120	R127120	5913.86	10-year	855	4335.93	4338.46	4338.46	4339.26	0.01578	7.18	119.08	76.03	1.01
main 127120	R127120	4570.29	10-year	855	4318.46	4321.65		4321.75	0.00132	2.61	327.97	149.33	0.31
main 127120	R127120	3816.8	10-year	855	4316.75	4321.15		4321.20	0.00044	1.76	486.91	176.56	0.19
main 127120	R127120	3102.71	10-year	855	4316.3	4319.38	4319.38	4320.19	0.01573	7.23	118.29	74.53	1.01
main 127120	R127120	1898.95	10-year	855	4299.37	4303.41		4303.48	0.00076	2.18	393.84	159.44	0.24
main 127120	R127120	1159.3	10-year	855	4299.63	4302.53		4302.66	0.00177	2.85	300.06	148.82	0.35
main 127120	R127120	269.281	10-year	855	4295.68	4298.35	4298.35	4299.02	0.01676	6.58	130.01	99.20	1.01
main 127110	R127110	2295.38	10-year	537	4392.33	4393.80	4393.80	4394.33	0.01814	5.81	92.46	90.23	1.01
main 127110	R127110	1751.28	10-year	537	4379.24	4382.11	4380.61	4382.17	0.00081	1.95	275.56	134.86	0.24
main 127110	R127110	966.973	10-year	537	4378.58	4379.93	4379.93	4380.37	0.01949	5.27	101.87	121.41	1.01
main 127110	R127110	274.019	10-year	537	4374.22	4378.22		4378.23	0.00009	0.80	671.99	230.26	0.08
main 127080	R127080	1403.77	10-year	381	4413.62	4415.55	4415.55	4416.11	0.01778	6.03	63.19	57.31	1.01
main 127080	R127080	956.72	10-year	381	4397.53	4399.16	4399.16	4399.62	0.01868	5.45	69.87	76.62	1.01
main 127080	R127080	549.597	10-year	381	4394.21	4397.13		4397.22	0.00146	2.44	155.84	84.08	0.32
main 127080	R127080	228.146	10-year	381	4394.02	4396.22	4395.59	4396.44	0.00461	3.82	99.86	65.29	0.54
main 127060	R127060	8344.52	10-year	208	4579.95	4581.06	4581.06	4581.50	0.01890	5.32	39.12	44.85	1.00
main 127060	R127060	7413.37	10-year	208	4537.37	4538.74	4538.74	4539.13	0.02018	5.06	41.13	53.48	1.02
main 127060	R127060	6524.28	10-year	208	4519.2	4519.95	4519.95	4520.22	0.02189	4.21	49.35	89.75	1.00
main 127060	R127060	5487.78	10-year	208	4494.7	4495.84	4495.84	4496.17	0.02125	4.56	45.58	71.94	1.01
main 127060	R127060	4405.53	10-year	208	4474.45	4475.35	4475.31	4475.60	0.01812	3.96	52.47	90.80	0.92
main 127060	R127060	3497.38	10-year	208	4456.99	4458.25	4458.25	4458.68	0.01912	5.25	39.59	46.62	1.00
main 127060	R127060	2311.34	10-year	208	4435.34	4438.48		4438.52	0.00067	1.63	127.79	70.62	0.21
main 127060	R127060	1438.26	10-year	208	4435.01	4436.37	4436.37	4436.82	0.01913	5.35	38.87	44.53	1.01
main 127060	R127060	782.931	10-year	208	4414.31	4417.38		4417.40	0.00030	1.16	179.13	90.09	0.15

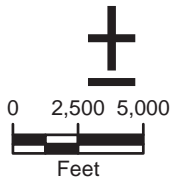
Figures



**Marsland
License Boundary**

Legend

-  Project Permit Boundary
-  Mine Unit
-  Hydrologic Project East
-  Hydrologic Project South
-  FEMA 100-year Flood Zone

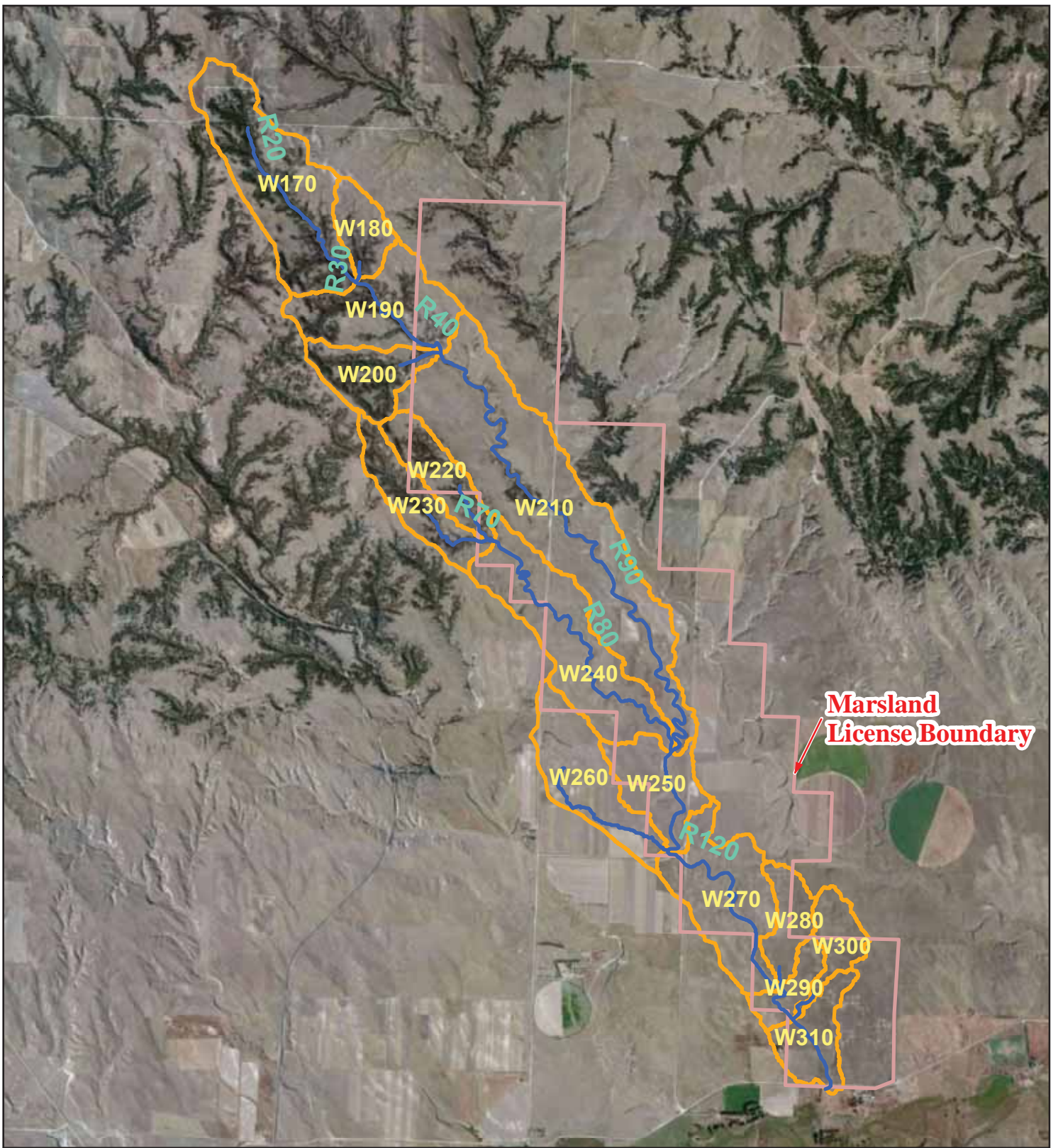


PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

**FIGURE 1
DEM AND HYDROLOGIC REGIMES IN
MEA LICENSE BOUNDARY LOCATIONS**

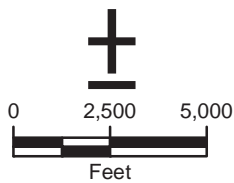
PROJECT: CO001636 MAPPED BY: S. Zou CHECKED BY: J. CEARLEY

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Legend

- Project Permit Boundary
- Drainage Lines
- Subbasin

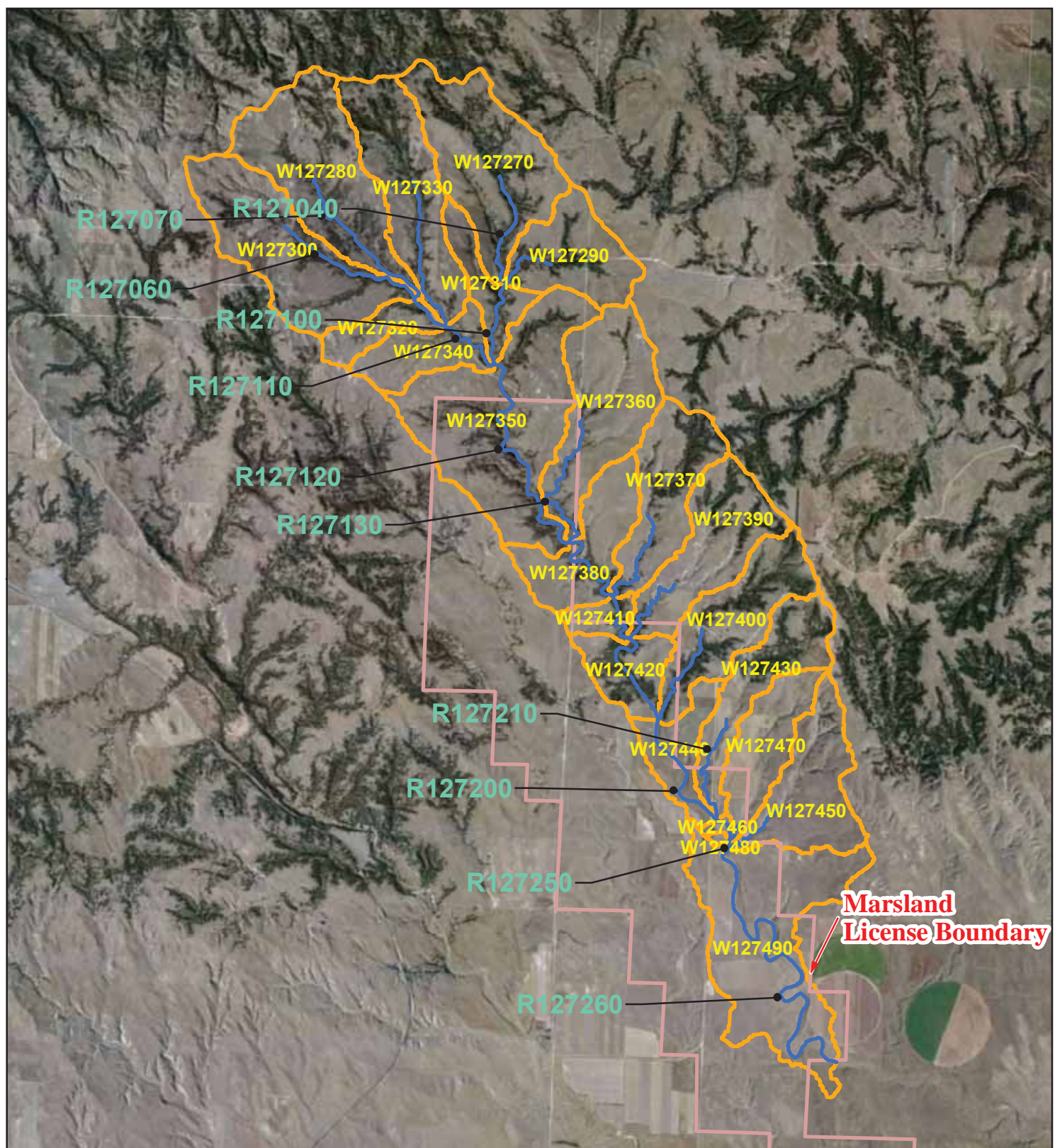


PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

**FIGURE 2
HYDROLOGIC ELEMENTS IN
HYDROLOGIC PROJECT SOUTH**

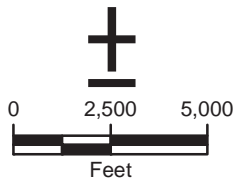
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Legend

- Project Permit Boundary
- Drainage Lines East
- Subbasin East

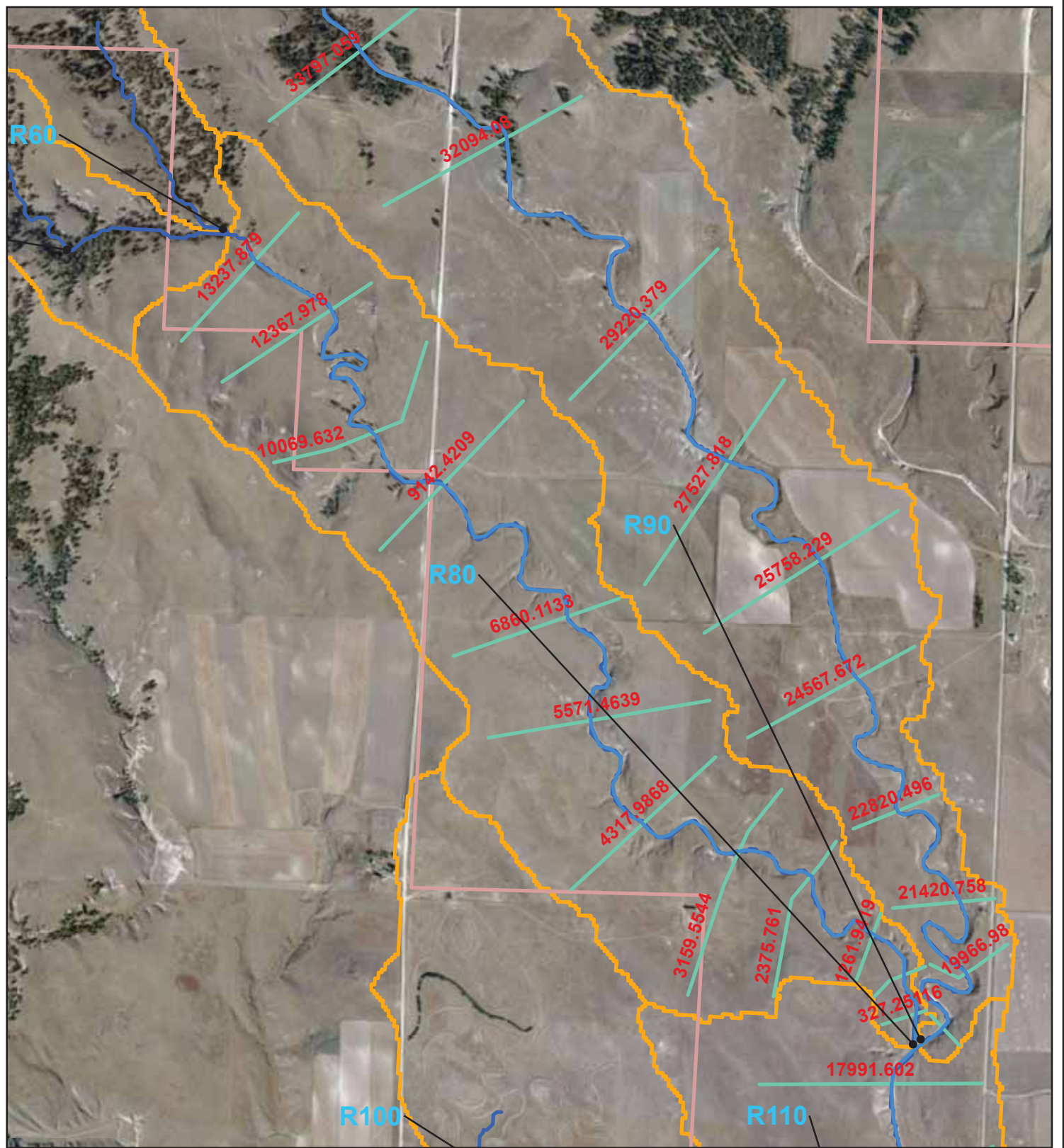


PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

**FIGURE 3
HYDROLOGIC ELEMENTS IN
HYDROLOGIC PROJECT EAST**

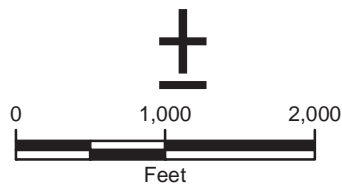
PROJECT: CO001636 MAPPED BY: S. Zou CHECKED BY: J. CEARLEY

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Legend

- Project Permit Boundary
- Stream South
- XSCutLines South
- Drainage Lines South
- Subbasin South

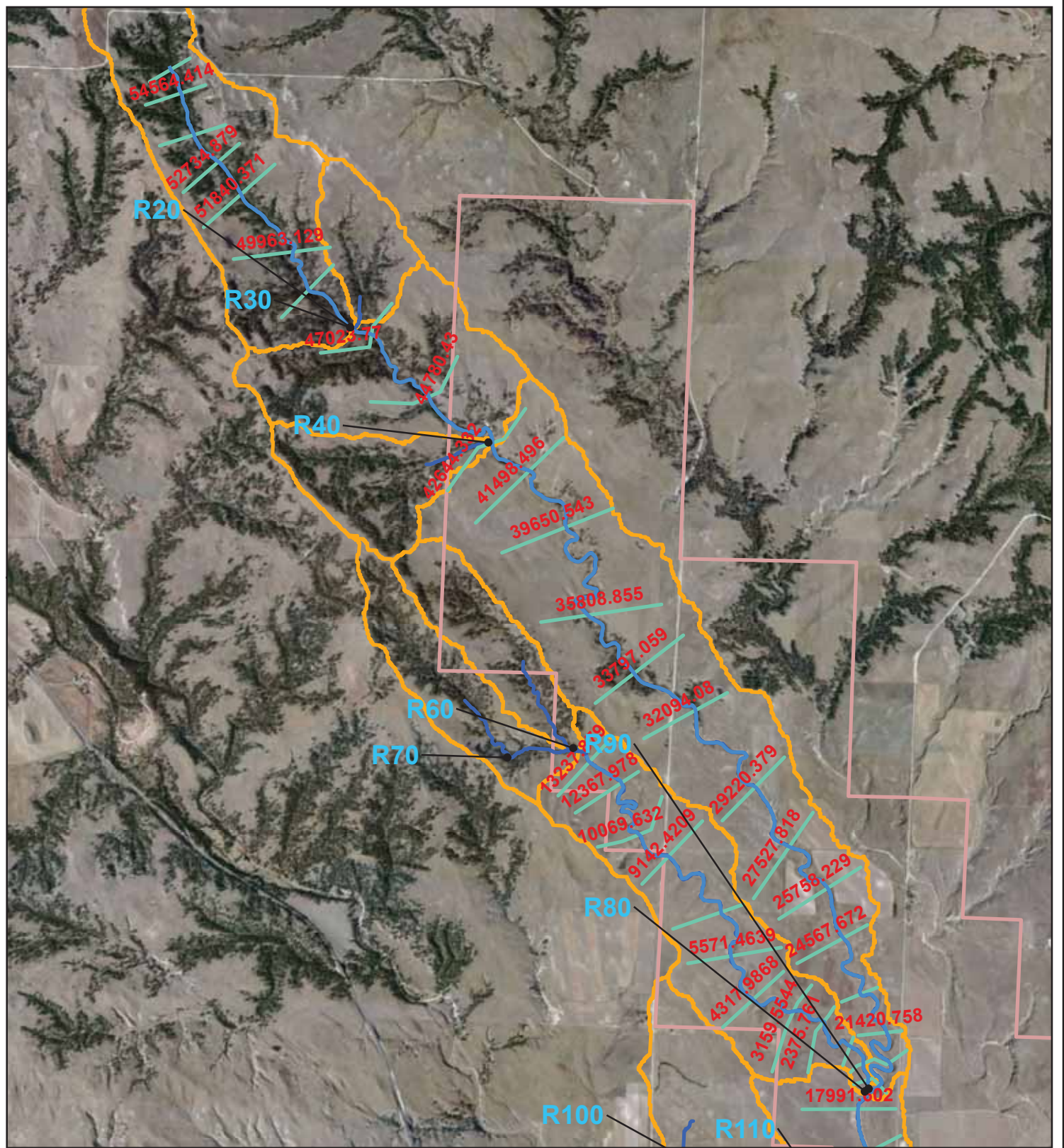


PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

**FIGURE 4-1
HEC-RAS CROSS SECTIONS
IN REACH 80 (TABLE 4-1)
HYDROLOGIC PROJECT SOUTH**

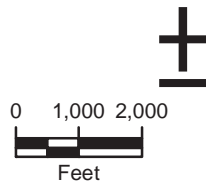
PROJECT: CO001636 MAPPED BY: S. Zou CHECKED BY: J. CEARLEY

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Legend

- Project Permit Boundary
- Stream South
- XSCutLines South
- Drainage Lines South
- Subbasin South

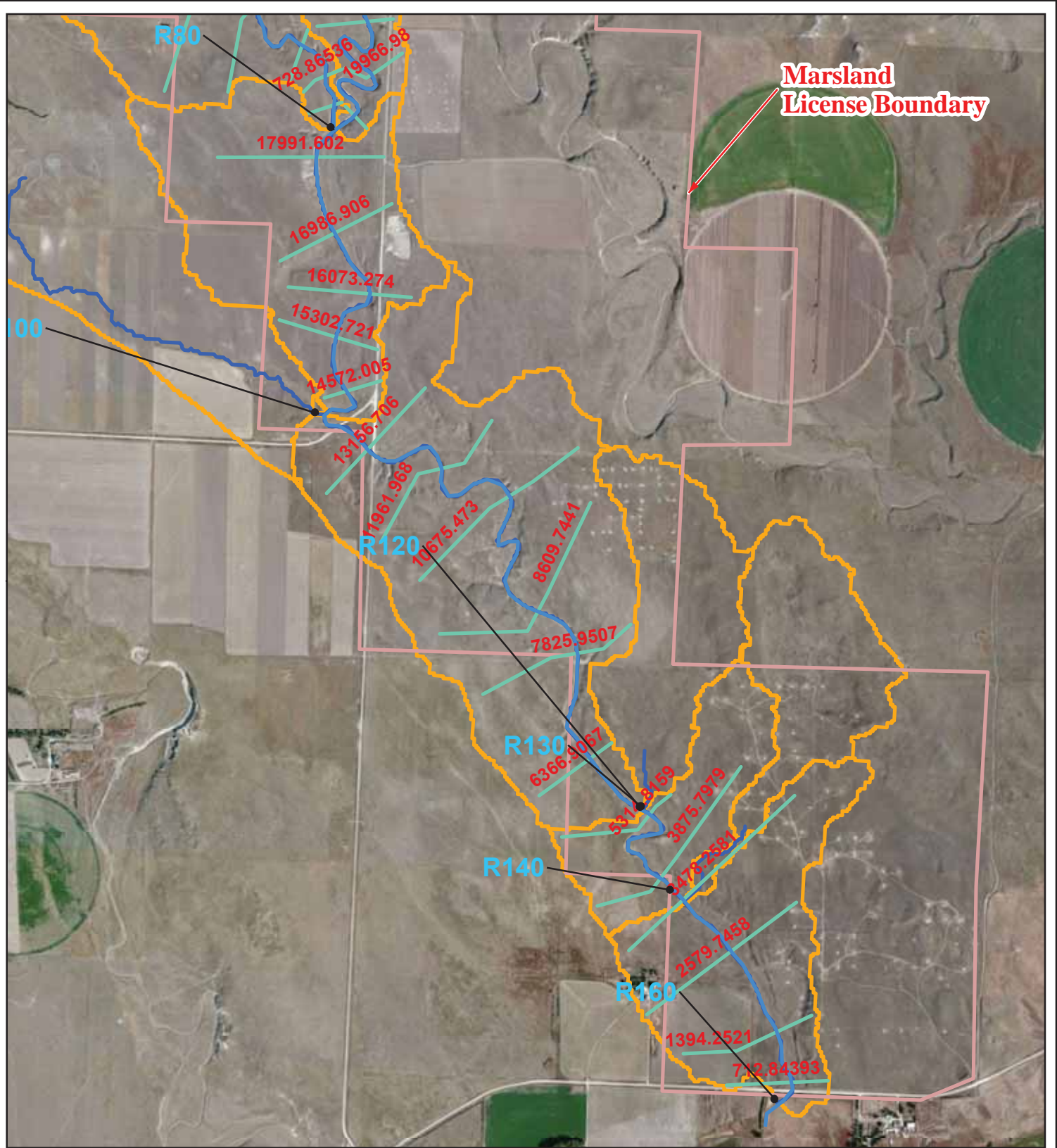


PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

**FIGURE 4-2
HEC-RAS CROSS SECTIONS
IN REACH 40 AND R90 (TABLE 4-2)
HYDROLOGIC PROJECT SOUTH**

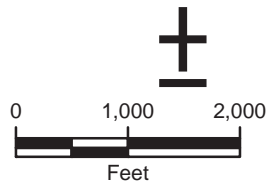
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Legend

- Project Permit Boundary
- Stream South
- XSCutLines South
- Drainage Lines South
- Subbasin South

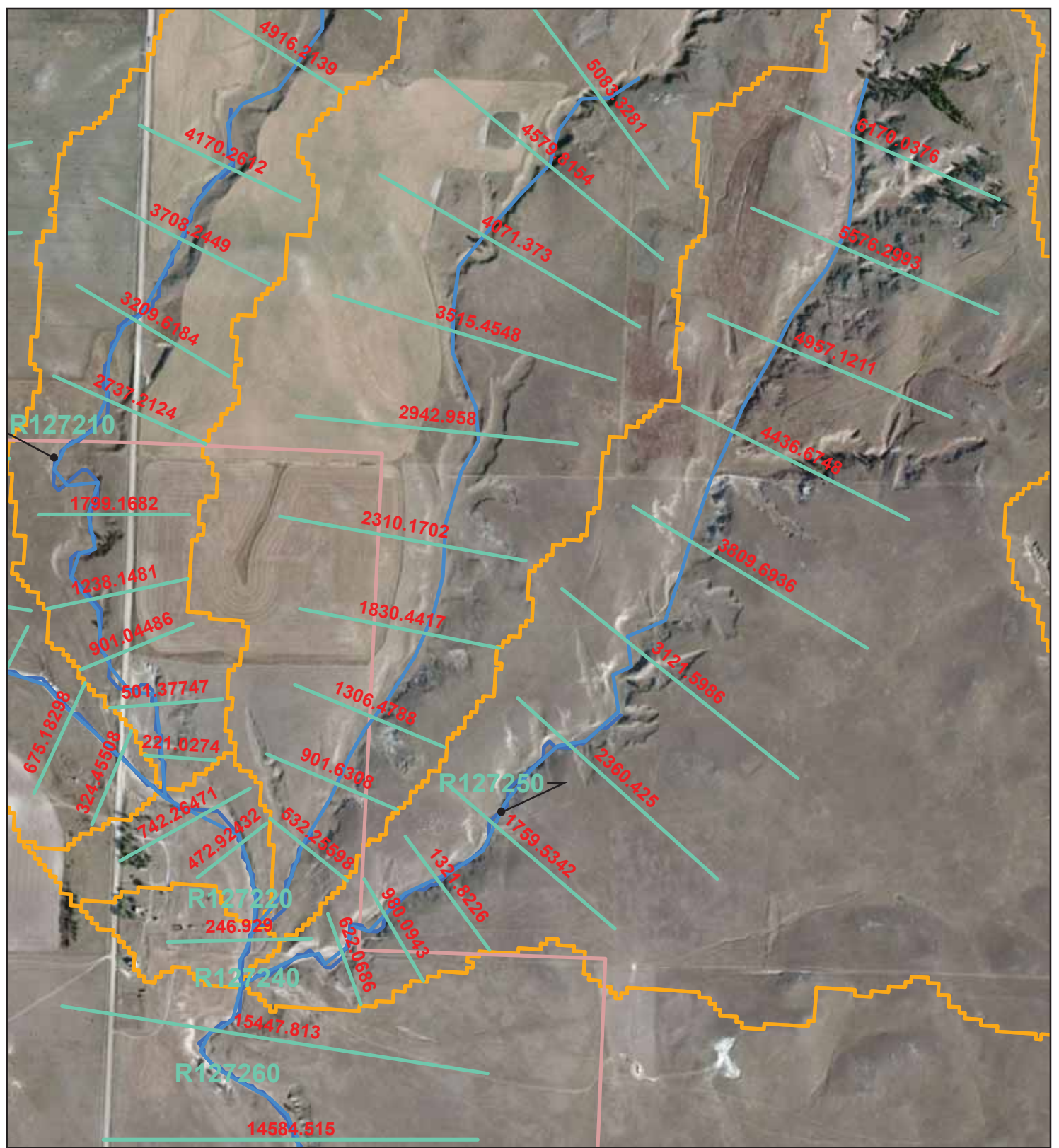


PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

**FIGURE 4-3
HEC-RAS CROSS SECTIONS
IN REACH 110 TO 160 (TABLE 4-3)
HYDROLOGIC PROJECT SOUTH**

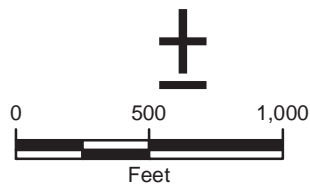
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Legend

- Project Permit Boundary
- XSCutLines East
- Stream East
- Drainage Lines East
- Subbasin East

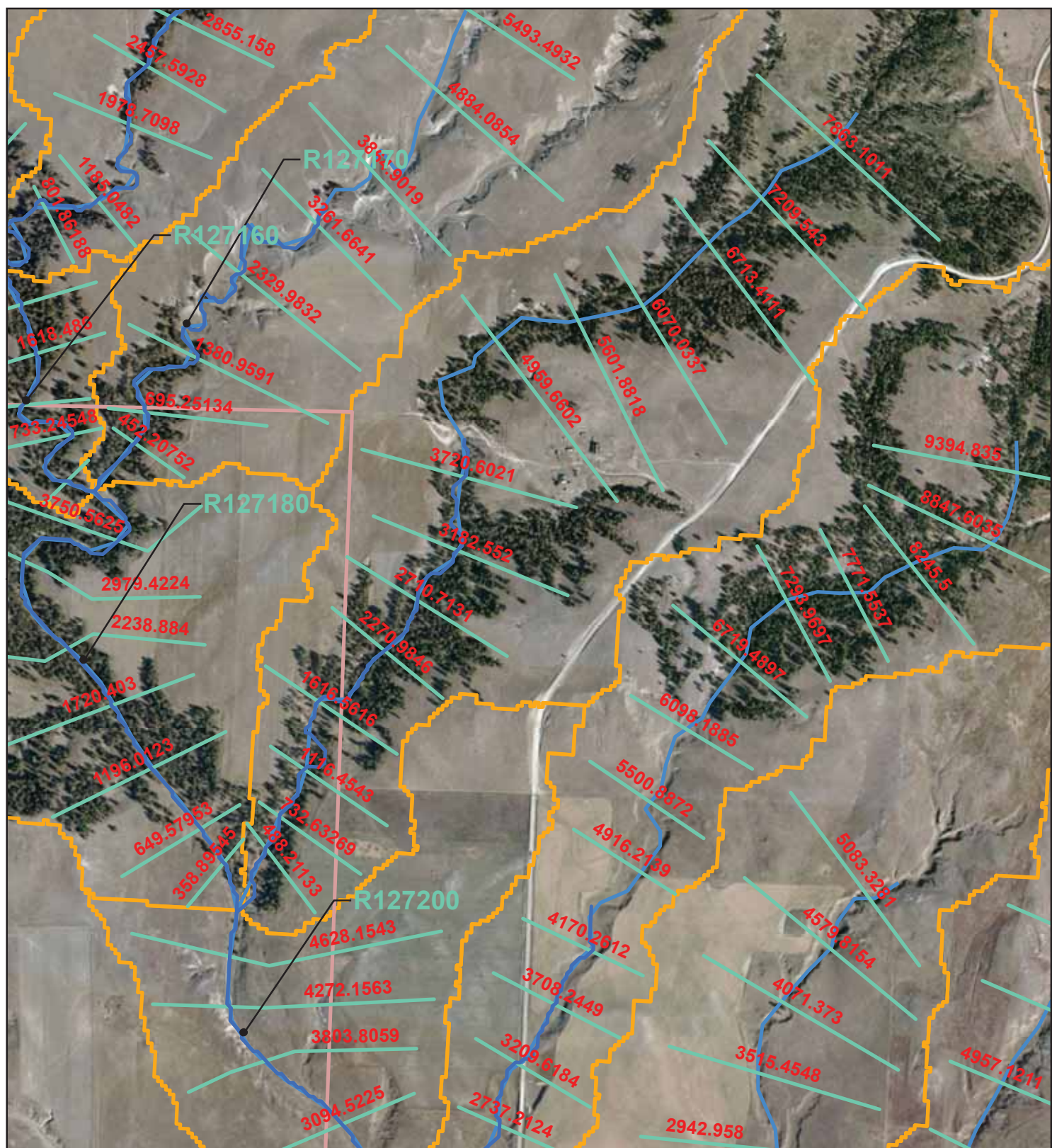


PROJECTION: NAD1927,
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SOURCES: USDA NAIP IMAGERY 2010

FIGURE 5-1
HEC-RAS CROSS SECTIONS
IN REACH 127250 AND 127220 (TABLE 8-1)
HYDROLOGIC PROJECT EAST

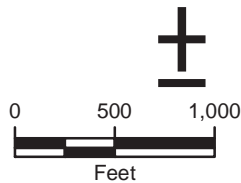
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Legend

- Project Permit Boundary
- Drainage Lines East
- XSCutLines East
- Stream East
- Subbasin East

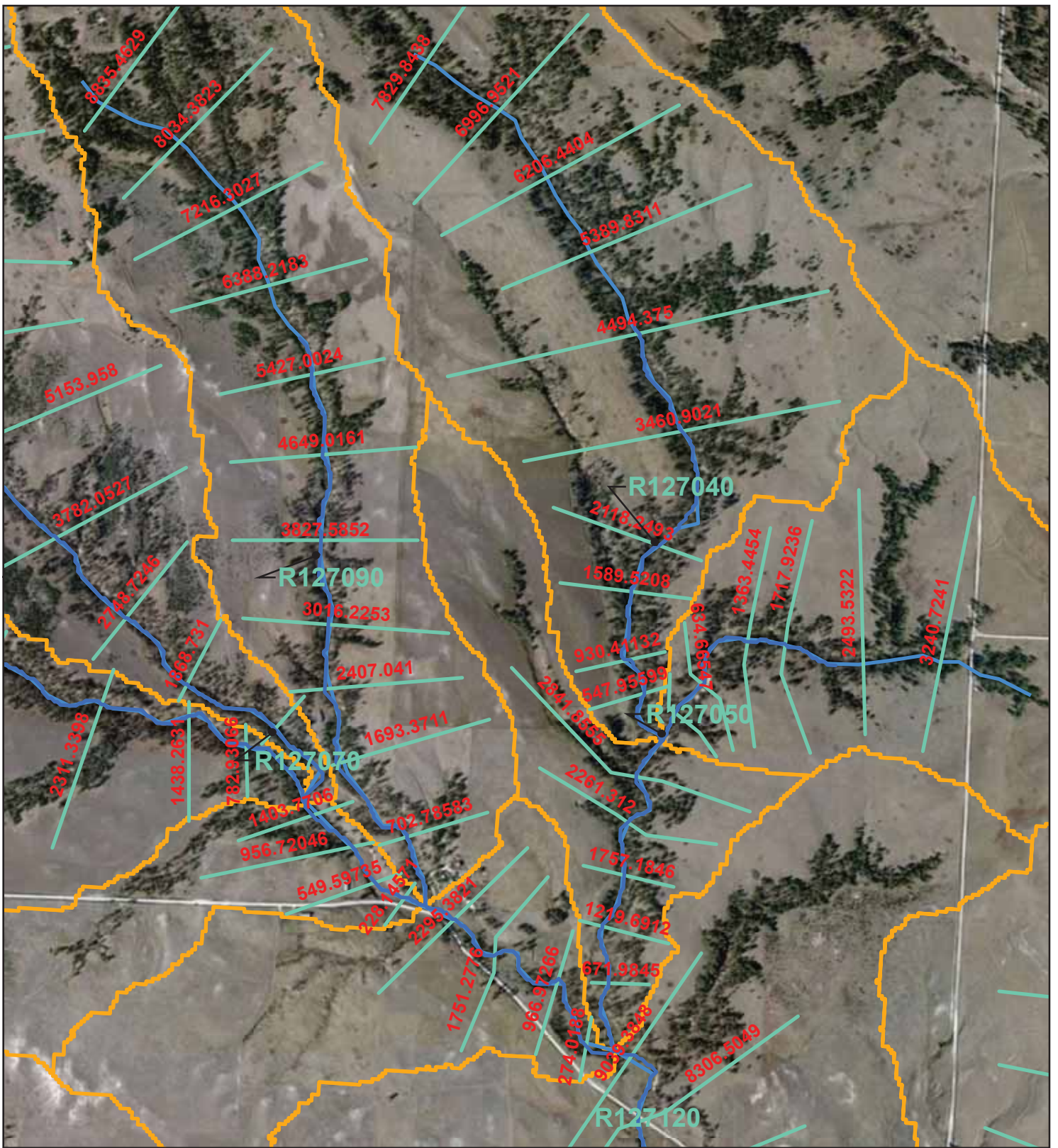


PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

FIGURE 5-2
HEC-RAS CROSS SECTIONS IN REACH
127210, 127190 AND 127170 (TABLE
8-2, 8-3) HYDROLOGIC PROJECT EAST

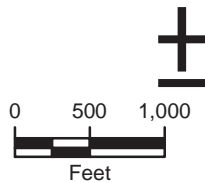
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Legend

- Project Permit Boundary
- Drainage Lines East
- XSCutLines East
- Stream East
- Subbasin East



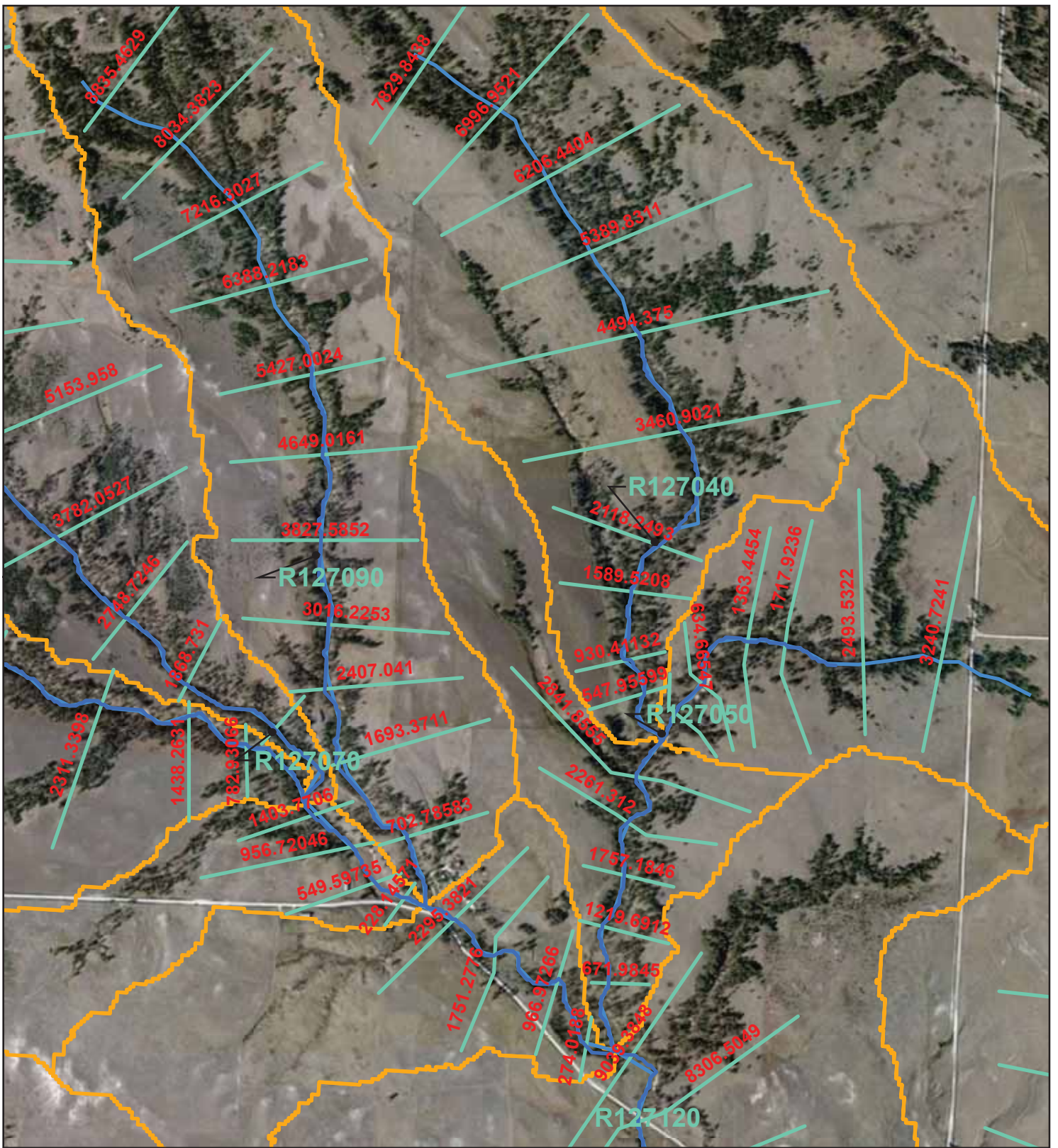
PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

FIGURE 5-3
HEC-RAS CROSS SECTIONS IN REACH
127150, 127130 AND 127120 (TABLE
8-4, 8-9) HYDROLOGIC PROJECT EAST

PROJECT: CO001636

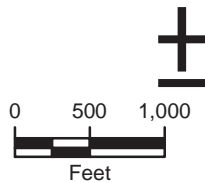
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Legend

- Project Permit Boundary
- Drainage Lines East
- XSCutLines East
- Stream East
- Subbasin East



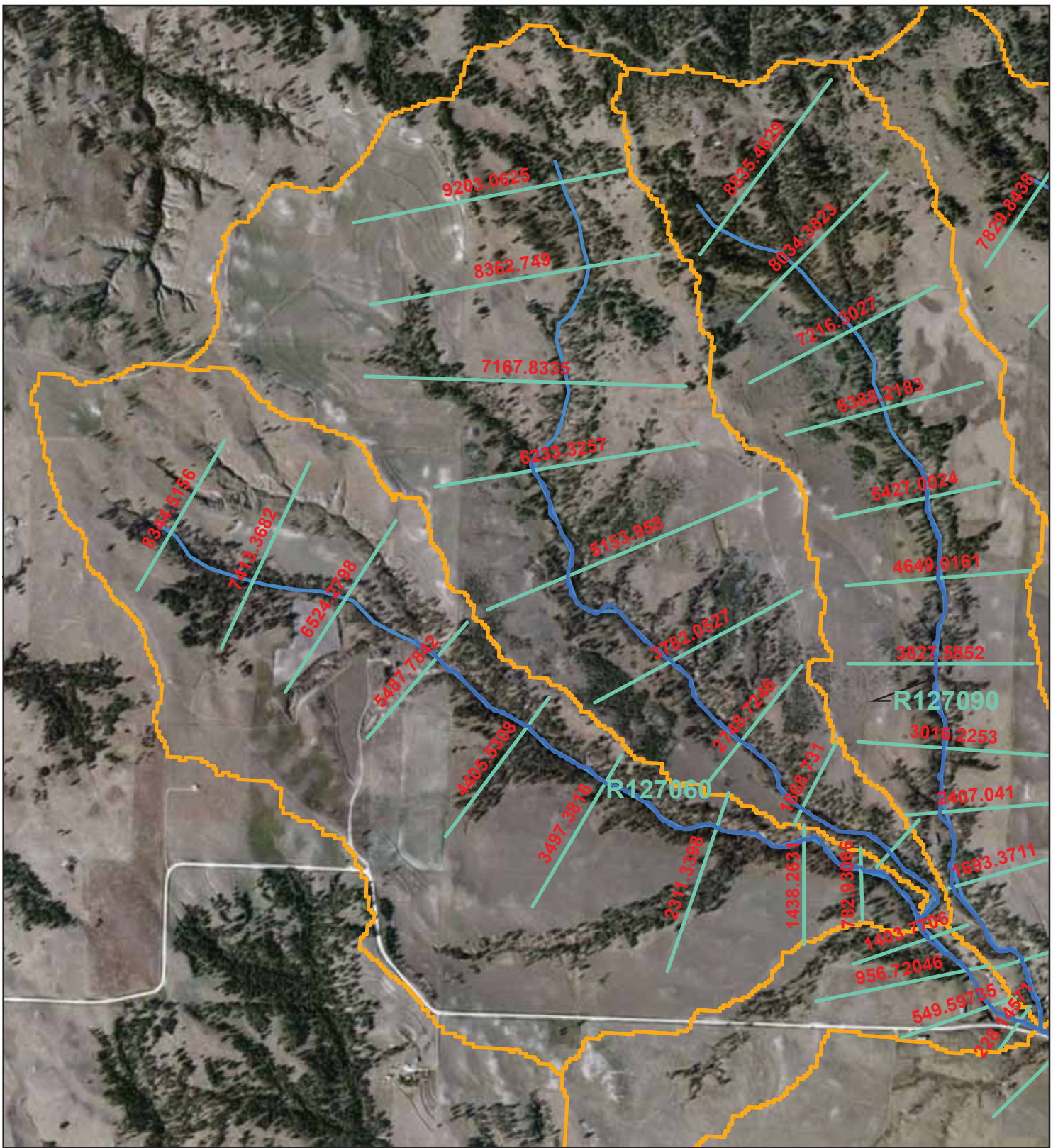
PROJECTION: NAD1927,
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SOURCES: USDA NAIP IMAGERY 2010

FIGURE 5-4
HEC-RAS CROSS SECTIONS IN REACH
127090, 127150 AND 127100 (TABLE
8-5, 8-9) HYDROLOGIC PROJECT EAST

PROJECT: CO001636

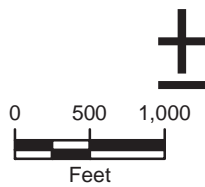
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Legend

- Project Permit Boundary
- Drainage Lines East
- XSCutLines East
- Stream East
- Subbasin East



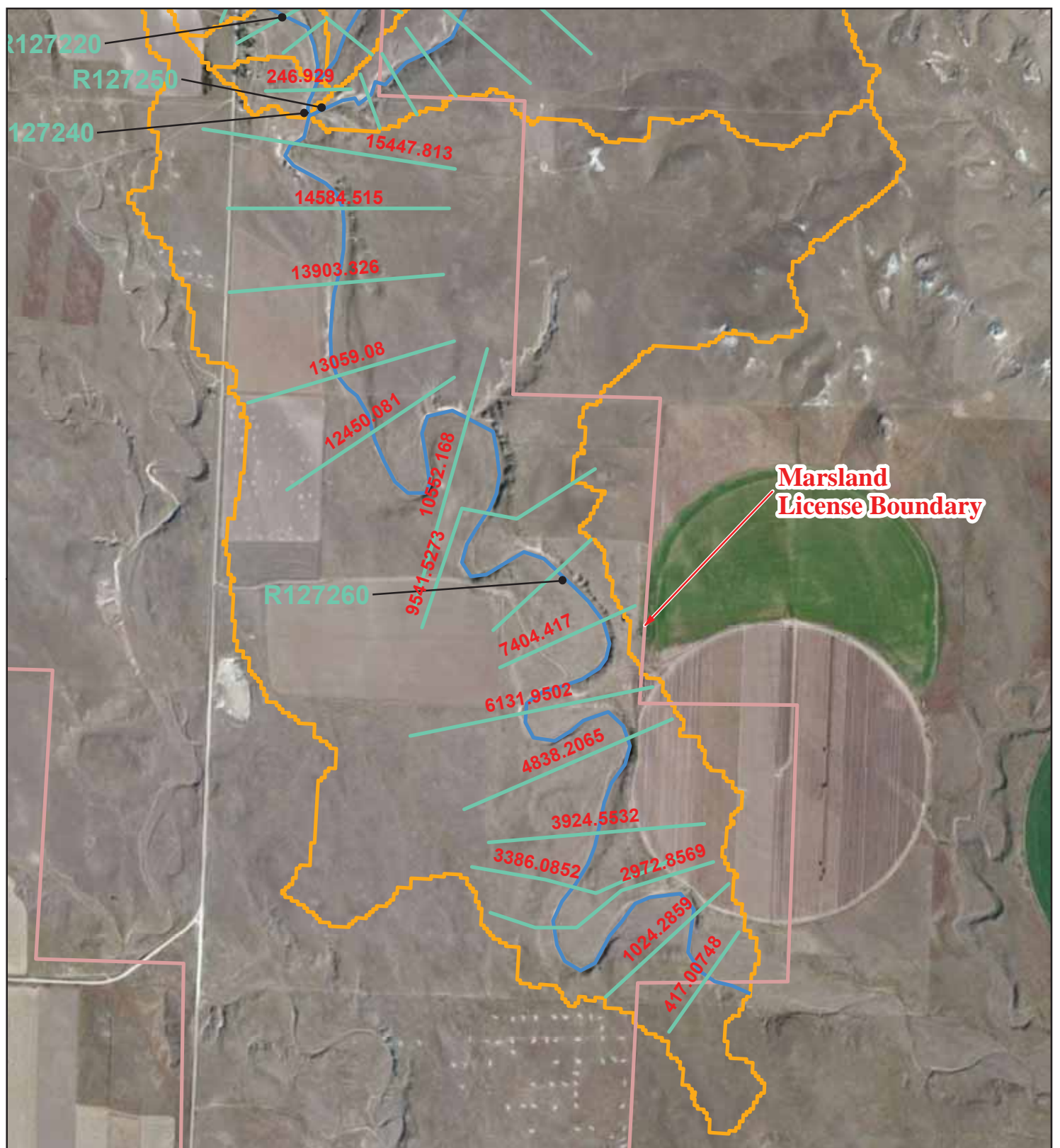
PROJECTION: NAD1927,
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SOURCES: USDA NAIP IMAGERY 2010

FIGURE 5-5
HEC-RAS CROSS SECTIONS IN REACH
127060, 127070 AND 127090 (TABLE
8-6, 8-9) HYDROLOGIC PROJECT EAST

PROJECT: CO001636

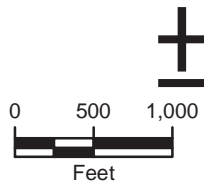
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Legend

- Project Permit Boundary
- Drainage Lines East
- XSCutLines East
- Stream East
- Subbasin East



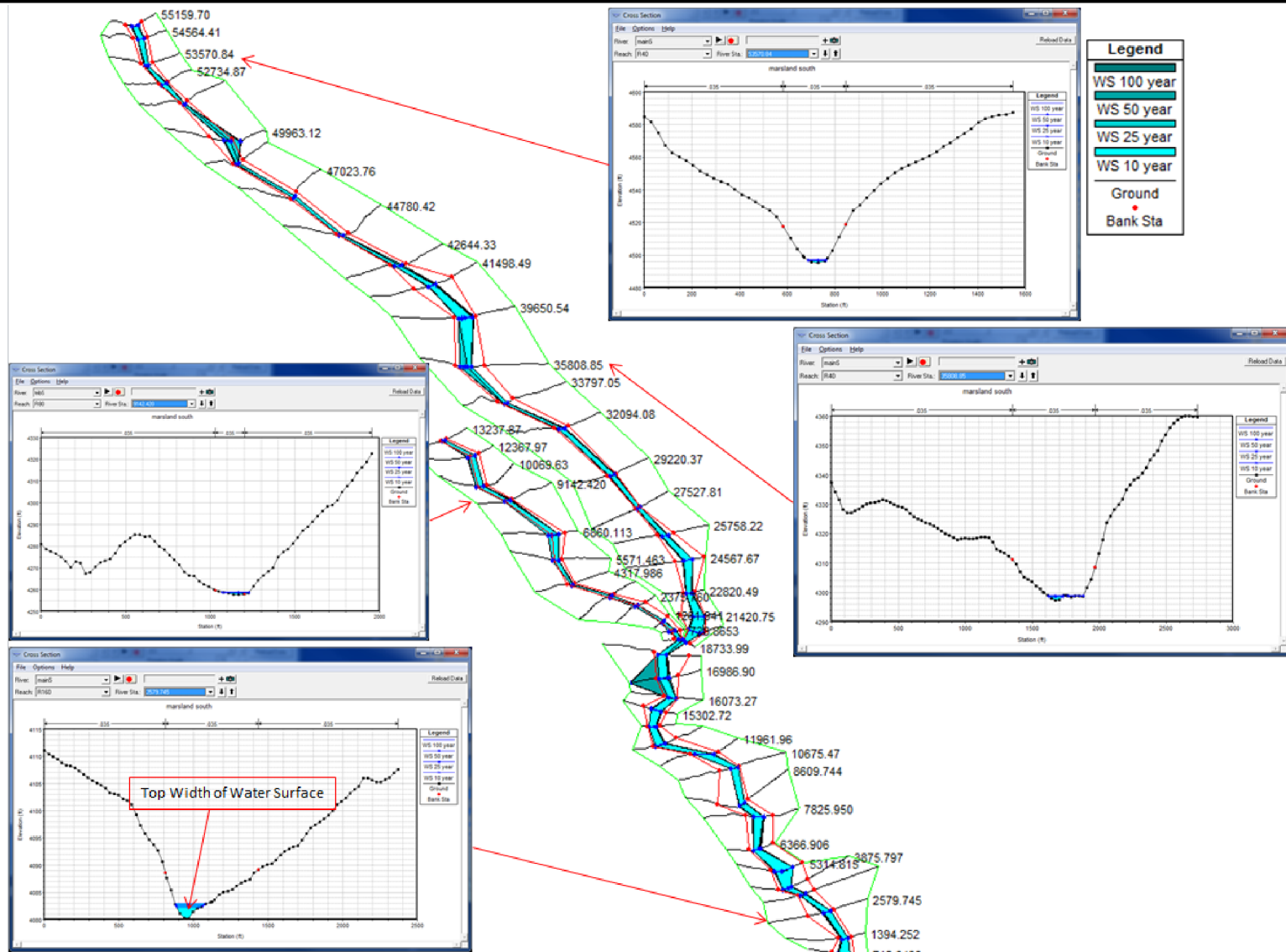
PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010

**FIGURE 5-6
HEC-RAS CROSS SECTIONS IN REACH
127260, AND 127240 (TABLE
8-7) HYDROLOGIC PROJECT EAST**

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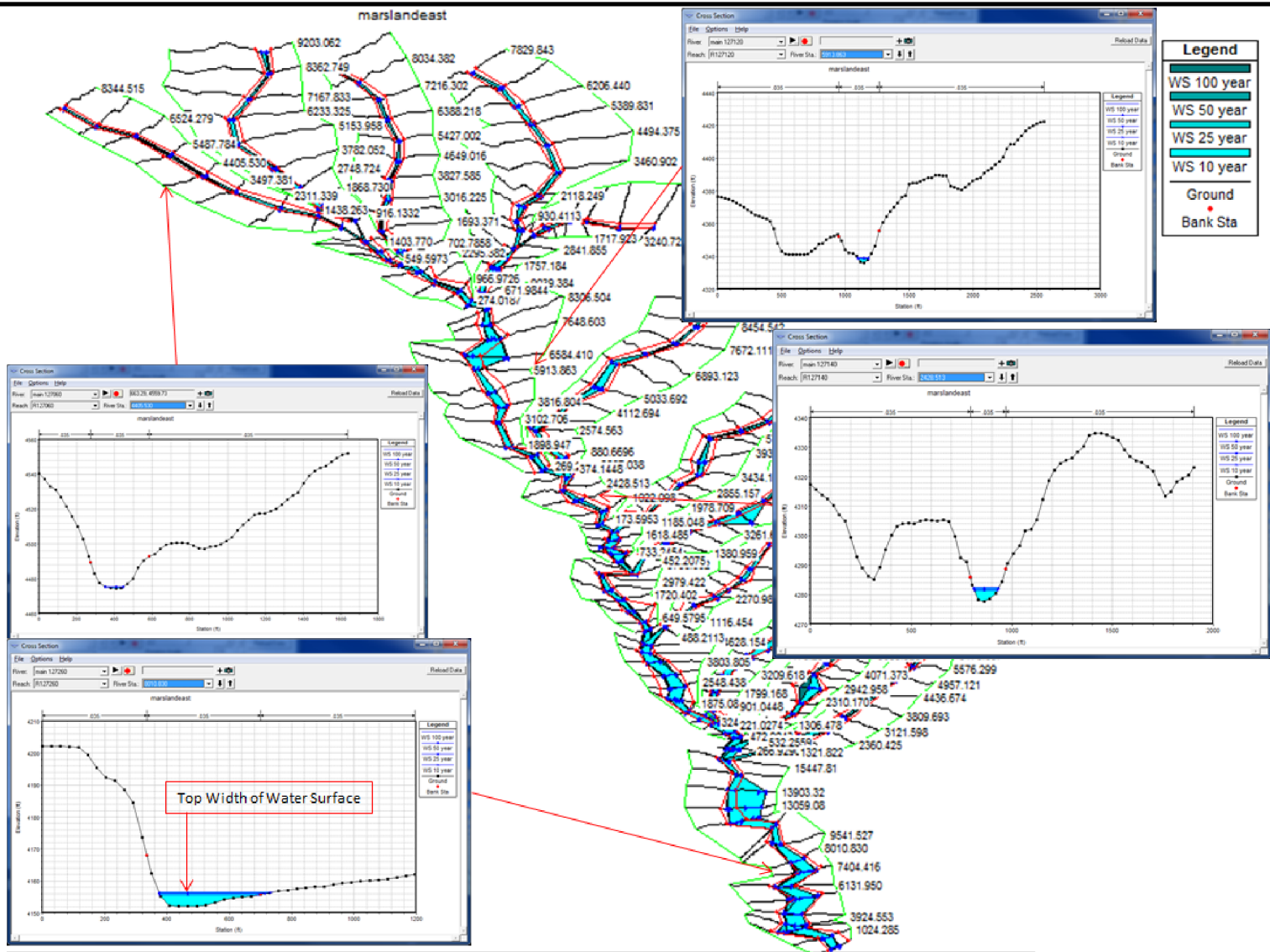


PROJECTION:
 NAD 1927, STATE PLANE
 NEBRASKA NORTH FIPS 2601
 ALL ELEVATIONS ARE IN FT-AMSL

FIGURE 6-1
HEC-RAS CROSS SECTION EXAMPLES
FOR HYDROLOGIC PROJECT SOUTH

PROJECT: CO001396.0003 MAPPED BY: S. Zou CHECKED BY: J. Cearly

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**FIGURE 6-2
HEC-RAS CROSS SECTION EXAMPLES
FOR HYDROLOGIC PROJECT EAST**

PROJECTION:
NAD 1927, STATE PLANE
NEBRASKA NORTH FIPS 2601
ALL ELEVATIONS ARE IN FT-AMSL

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