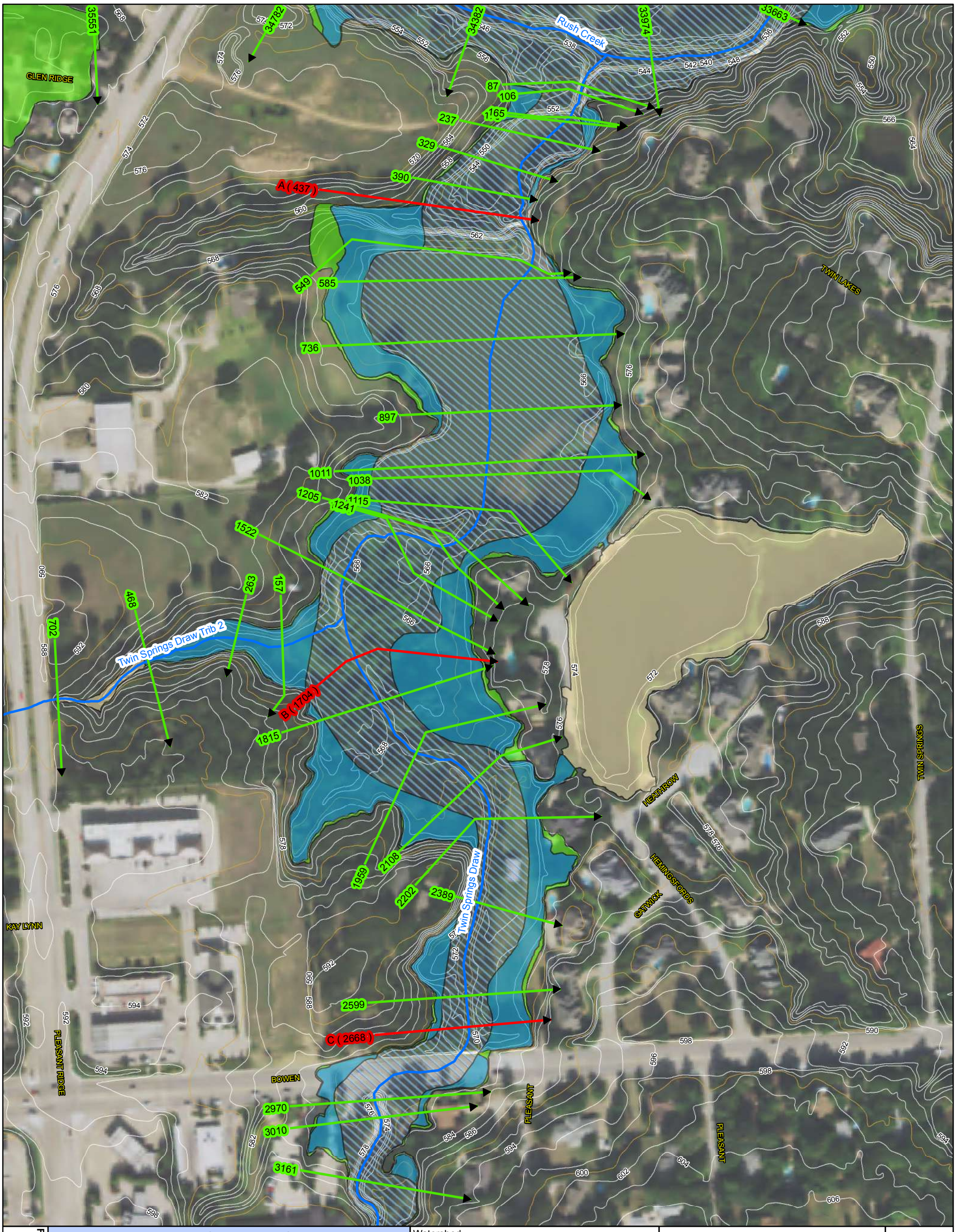
Appendix F
CD-ROM



Figure

Map 96

KEY TO FEATURES

- Cross Section
- Cross Section - Lettered
- Stream Centerline

Proposed Mapping

- Floodway
- 1% Annual Chance Floodplain (Zone AE)
- 1% Annual Chance Floodplain (Zone A)
- 0.2% Annual Chance Floodplain
- Contour - 2'
- Index Contour - 10'

Watershed

Twin Springs Draw

Title

Hydraulic Work Maps

Panel

1 of 2

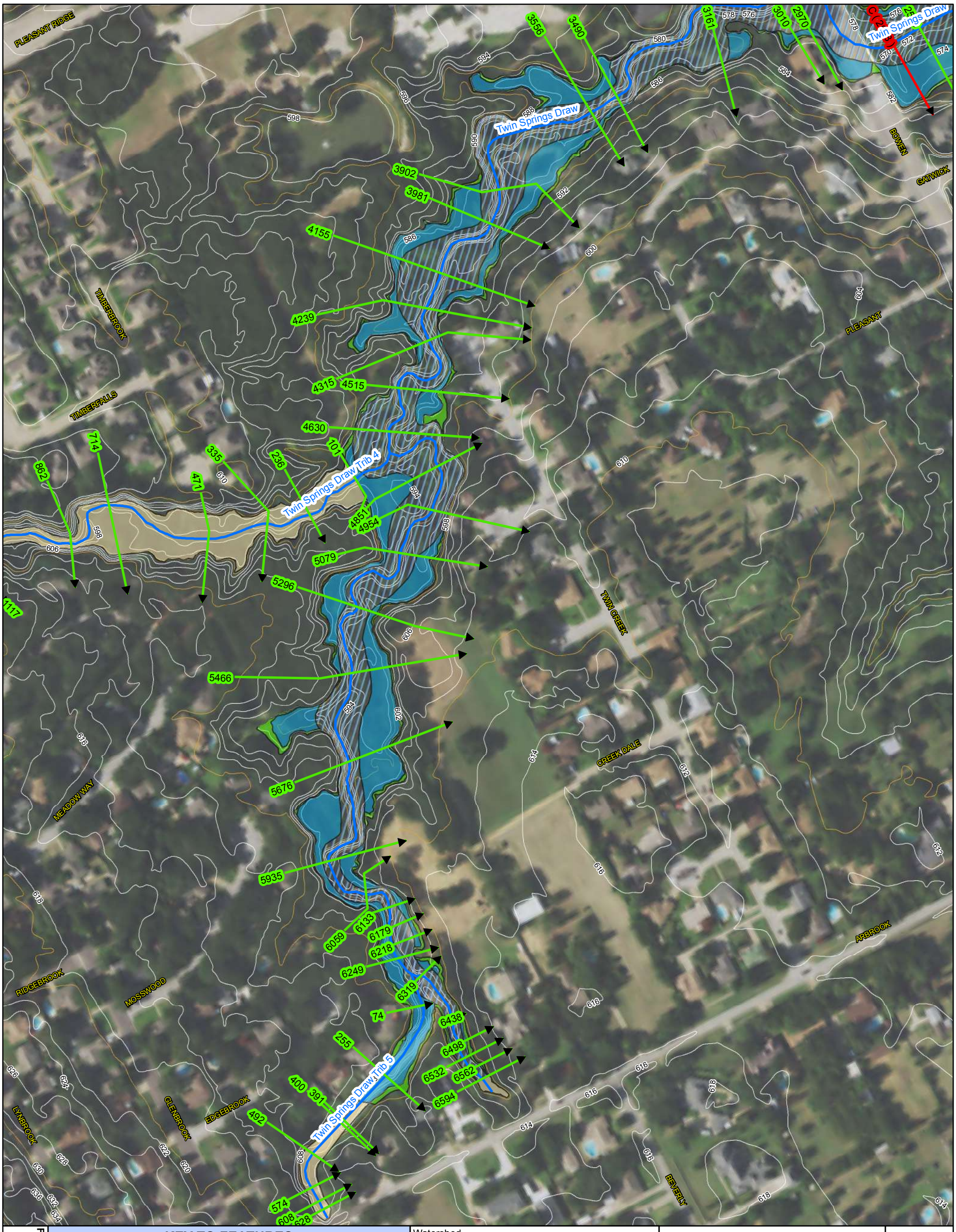
0 200 400

Scale in Feet

FEMA

HALFF

ARLINGTON
THE AMERICAN DREAM CITY



Figure

Map 97

KEY TO FEATURES

- Cross Section
- Cross Section - Lettered
- Stream Centerline

Proposed Mapping

- Floodway
- 1% Annual Chance Floodplain (Zone AE)
- 1% Annual Chance Floodplain (Zone A)
- 0.2% Annual Chance Floodplain
- Contour - 2'
- Index Contour - 10'

Watershed

Twin Springs Draw

Title

Hydraulic Work Maps

Panel

2 of 2

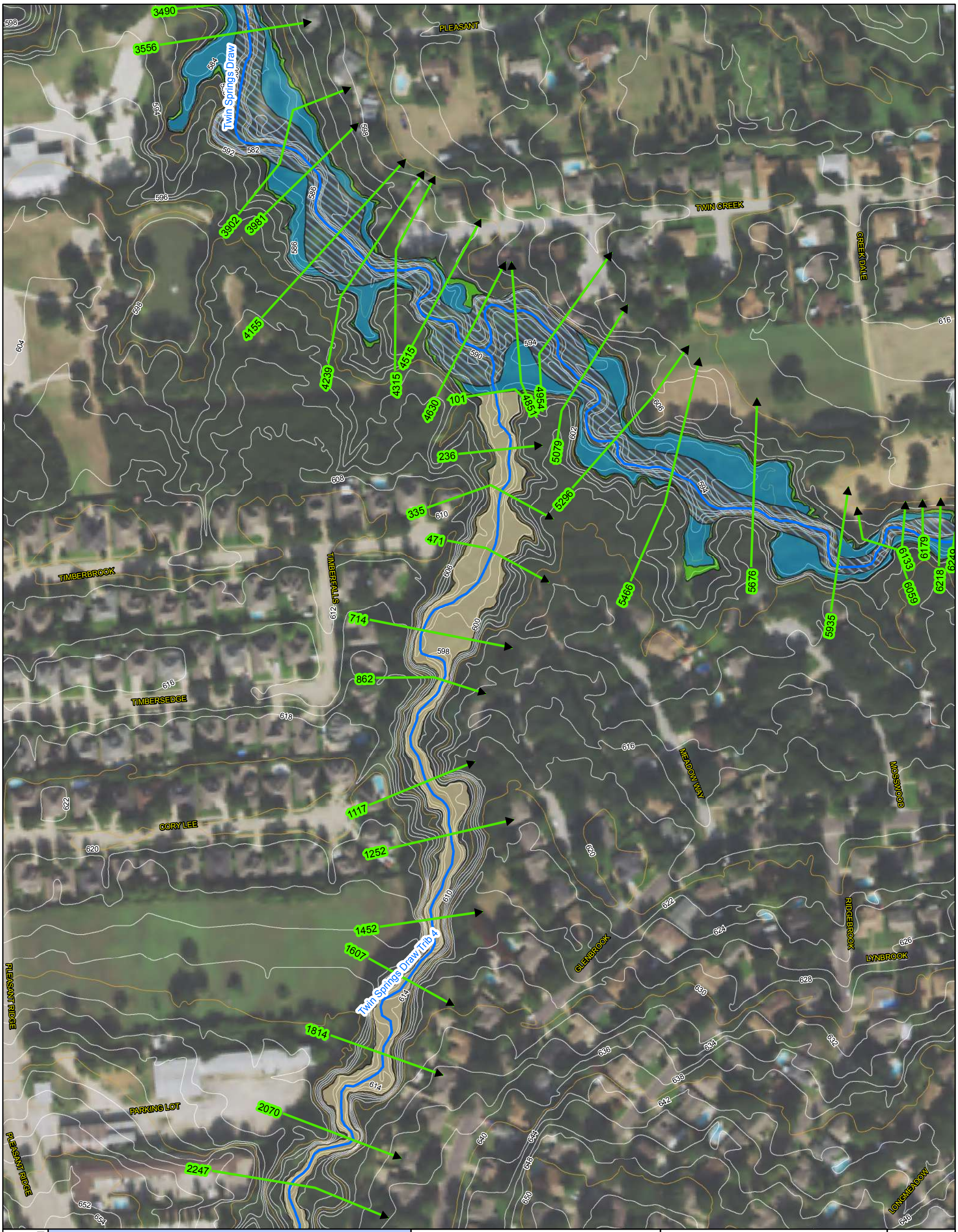
0 200 400

Scale in Feet

FEMA

HALFF

ARLINGTON
THE AMERICAN DREAM CITY



Figure

Map 98

KEY TO FEATURES

- Cross Section
- Stream Centerline

Proposed Mapping

- Floodway
- 1% Annual Chance Floodplain (Zone AE)
- 1% Annual Chance Floodplain (Zone A)
- 0.2% Annual Chance Floodplain
- Contour - 2'
- Index Contour - 10'

Watershed

Twin Springs Draw Trib 4

Title

Hydraulic Work Maps

Panel

1 of 2

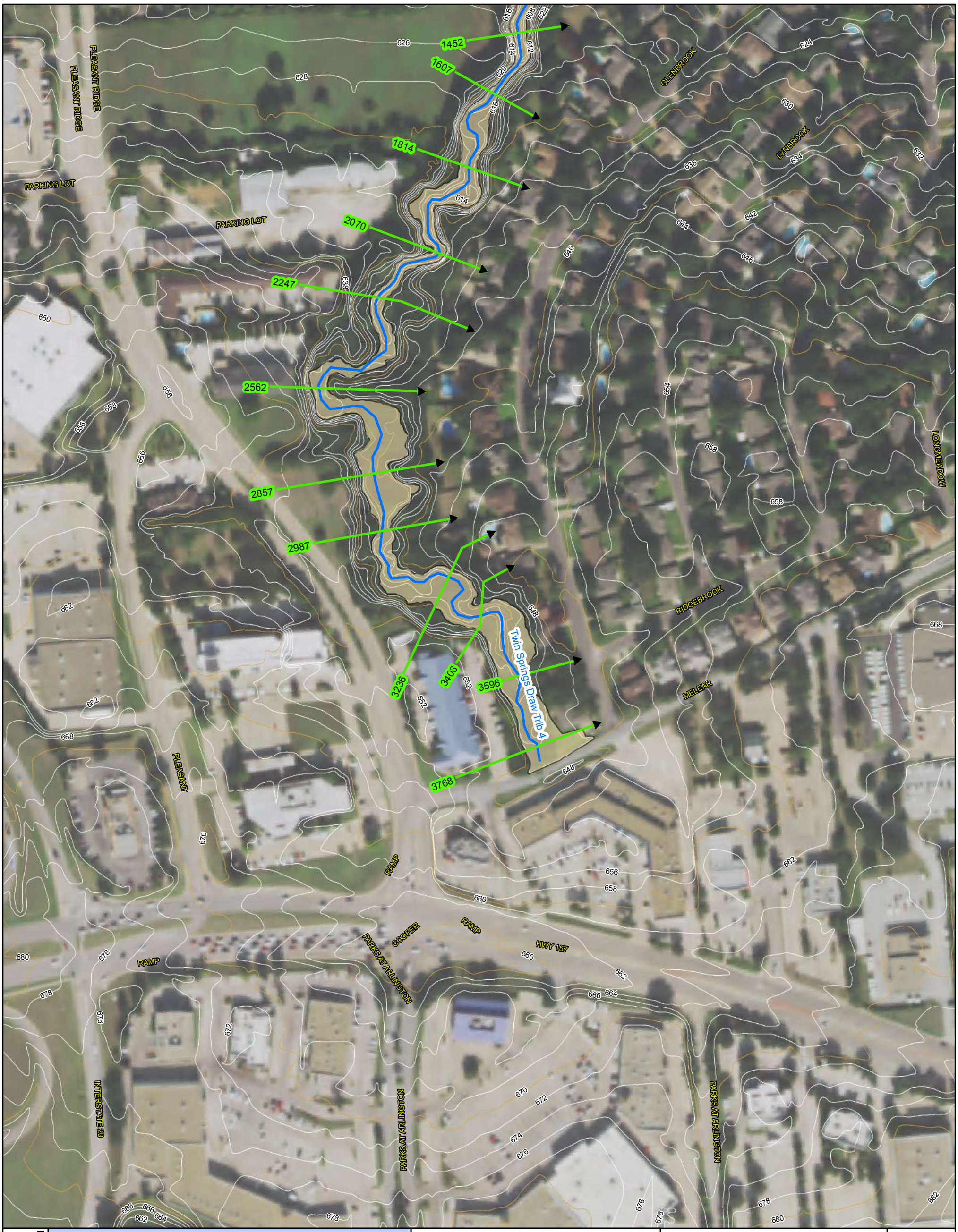
0 200 400

Scale in Feet

FEMA

HALFF

ARLINGTON
THE AMERICAN DREAM CITY



Figure

Map 99

KEY TO FEATURES

- Cross Section
- Stream Centerline

Proposed Mapping

- 1% Annual Chance Floodplain (Zone A)
- Contour - 2'
- Index Contour - 10'

Watershed

Twin Springs Draw Trib 4

Title

Hydraulic Work Maps

Panel

2 of 2

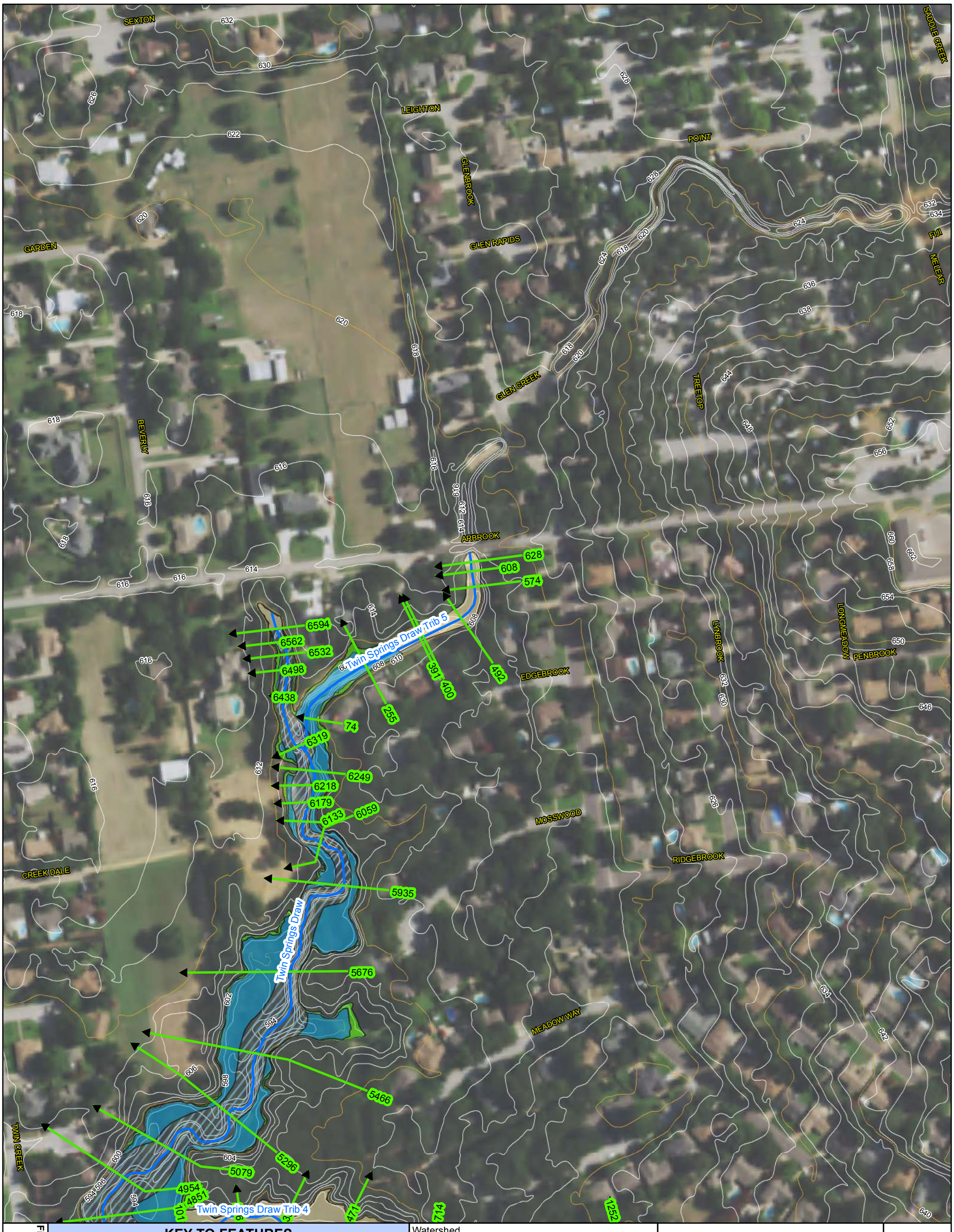
0 200 400

Scale in Feet

FEMA

HALFF

ARLINGTON
THE AMERICAN DREAM CITY



Figure

Map 100

KEY TO FEATURES

- Cross Section
- Stream Centerline

Proposed Mapping

- Floodway
- 1% Annual Chance Floodplain (Zone AE)
- 1% Annual Chance Floodplain (Zone A)
- 0.2% Annual Chance Floodplain
- Contour - 2'
- Index Contour - 10'

Watershed

Twin Springs Draw Trib 5

Title

Hydraulic Work Maps

Panel

1 of 1

0 200 400

Scale in Feet

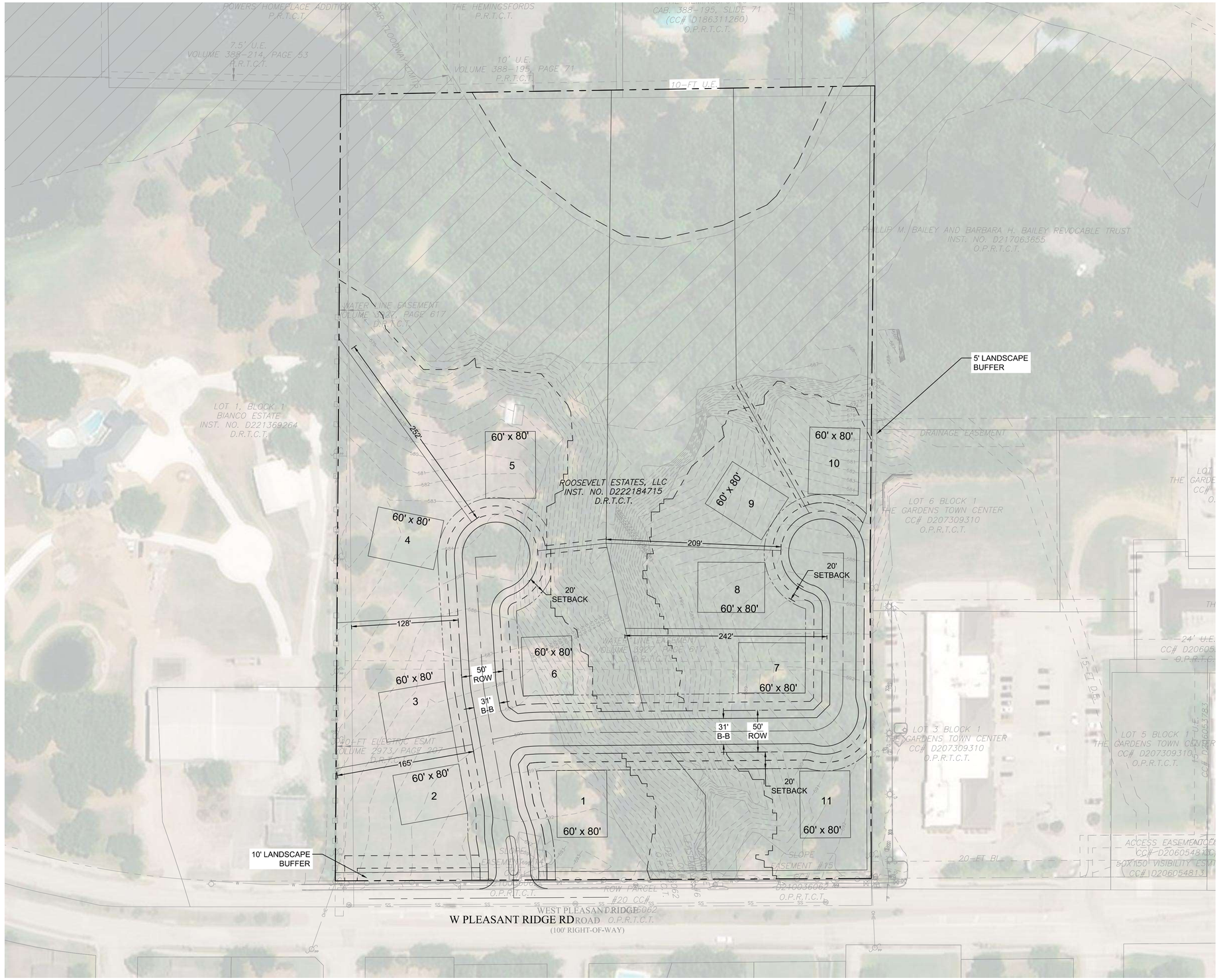
FEMA

HALFF

ARLINGTON THE AMERICAN DREAM CITY

SHIELD
ENGINEERING GROUP

APPENDIX D: PROJECT LAYOUT SHEETS



LEGEND

- FLOODPLAIN
- OPEN SPACE
- PROJECT LOCATION

SHIELD ENGINEERING GROUP

TBPE FIRM #F-11039 · TBPLS FIRM #10193890

N

0 60 120 180

GRAPHIC SCALE IN FEET

CITY OF
DALWORTHINGTON GARDENS, TEXAS

ROOSEVELT ESTATES

LAND PLAN
June 2, 2023

DESIGNED: JGD	SCALE:	DATE:	SHEET:
DRAWN: JGD	1" = 60'	JUN 2023	1 OF 1

2023\06\02 JOSE.DELEON L:\JOBS\2021\105.01 ROOSEVELT ESTATES\EXHIBITS\20230602 DRAINAGE STUDY EXHIBIT\LAND PLAN.DWG

SHIELD
ENGINEERING GROUP

APPENDIX E: DIGITAL DATA

SHIELD
ENGINEERING GROUP

APPENDIX F: HEC-RAS OUTPUT

1600 W. 7th Street, Suite 400, Fort Worth, Texas 76102 | 817.810.0696
Shield Engineering Group, PLLC

info@shield-engineering.com | www.SHIELDENGINEERINGGROUP.com
TBPE FIRM #F-11039 | TBPLS FIRM #10193890

SHIELD
ENGINEERING GROUP

TWIN SPRINGS DRAW

(HEC-RAS VERSION 4.1)

1600 W. 7th Street, Suite 400, Fort Worth, Texas 76102 | 817.810.0696
Shield Engineering Group, PLLC

info@shield-engineering.com | www.SHIELDENGINEERINGGROUP.com
TBPE FIRM #F-11039 | TBPLS FIRM #10193890

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	6594	Max WS	154.68	607.99	609.43	609.43	609.93	0.036313	5.73	27.87	31.12	1.00
TWI000A	6594	31DEC2011 2400	10.00	607.99	608.41	608.42	608.55	0.071014	3.01	3.32	14.13	1.09
TWI000A	6594	01JAN2012 0100	10.00	607.99	608.41	608.42	608.55	0.068809	2.98	3.36	14.20	1.08
TWI000A	6594	01JAN2012 0200	10.00	607.99	608.41	608.42	608.55	0.068570	2.97	3.36	14.21	1.08
TWI000A	6594	01JAN2012 0300	10.00	607.99	608.41	608.42	608.55	0.068331	2.97	3.37	14.22	1.07
TWI000A	6594	01JAN2012 0400	10.00	607.99	608.41	608.42	608.55	0.068093	2.96	3.37	14.23	1.07
TWI000A	6594	01JAN2012 0500	10.00	607.99	608.41	608.42	608.55	0.067856	2.96	3.38	14.24	1.07
TWI000A	6594	01JAN2012 0600	10.00	607.99	608.41	608.42	608.55	0.067526	2.96	3.38	14.25	1.07
TWI000A	6594	01JAN2012 0700	10.00	607.99	608.41	608.42	608.55	0.066225	2.93	3.41	14.30	1.06
TWI000A	6594	01JAN2012 0800	10.00	607.99	608.42	608.42	608.55	0.065586	2.92	3.42	14.32	1.05
TWI000A	6594	01JAN2012 0900	10.00	607.99	608.42	608.42	608.55	0.064820	2.91	3.43	14.35	1.05
TWI000A	6594	01JAN2012 1000	10.00	607.99	608.42	608.42	608.55	0.064820	2.91	3.43	14.35	1.05
TWI000A	6594	01JAN2012 1100	10.00	607.99	608.41	608.42	608.55	0.066042	2.93	3.41	14.30	1.06
TWI000A	6594	01JAN2012 1200	57.91	607.99	608.92	608.93	609.20	0.046347	4.24	13.67	25.26	1.01
TWI000A	6594	01JAN2012 1300	19.16	607.99	608.56	608.57	608.73	0.056993	3.33	5.75	17.77	1.03
TWI000A	6594	01JAN2012 1400	10.00	607.99	608.41	608.42	608.55	0.066686	2.94	3.40	14.28	1.06
TWI000A	6594	01JAN2012 1500	10.00	607.99	608.42	608.42	608.55	0.065496	2.92	3.42	14.33	1.05
TWI000A	6594	01JAN2012 1600	10.00	607.99	608.42	608.42	608.55	0.064686	2.91	3.44	14.36	1.05
TWI000A	6594	01JAN2012 1700	10.00	607.99	608.42	608.42	608.55	0.064776	2.91	3.44	14.35	1.05
TWI000A	6594	01JAN2012 1800	10.00	607.99	608.42	608.42	608.55	0.065000	2.91	3.43	14.34	1.05
TWI000A	6594	01JAN2012 1900	10.00	607.99	608.41	608.42	608.55	0.066317	2.94	3.41	14.29	1.06
TWI000A	6594	01JAN2012 2000	10.00	607.99	608.41	608.42	608.55	0.066686	2.94	3.40	14.28	1.06
TWI000A	6594	01JAN2012 2100	10.00	607.99	608.41	608.42	608.55	0.067011	2.95	3.39	14.27	1.07
TWI000A	6594	01JAN2012 2200	10.00	607.99	608.41	608.42	608.55	0.067245	2.95	3.39	14.26	1.07
TWI000A	6594	01JAN2012 2300	10.00	607.99	608.41	608.42	608.55	0.067479	2.95	3.38	14.25	1.07
TWI000A	6594	01JAN2012 2400	10.00	607.99	608.41	608.42	608.55	0.067620	2.96	3.38	14.25	1.07
TWI000A	6562	Max WS	154.62	606.81	608.63		608.92	0.014204	4.31	37.48	32.94	0.65
TWI000A	6562	31DEC2011 2400	10.00	606.81	607.38		607.42	0.011509	1.64	6.11	16.59	0.47
TWI000A	6562	01JAN2012 0100	10.00	606.81	607.34		607.39	0.015620	1.82	5.49	15.93	0.55
TWI000A	6562	01JAN2012 0200	10.00	606.81	607.34		607.39	0.015888	1.83	5.46	15.90	0.55
TWI000A	6562	01JAN2012 0300	10.00	606.81	607.34		607.39	0.016136	1.84	5.43	15.87	0.56
TWI000A	6562	01JAN2012 0400	10.00	606.81	607.33		607.39	0.016423	1.85	5.39	15.83	0.56
TWI000A	6562	01JAN2012 0500	10.00	606.81	607.33		607.38	0.016732	1.87	5.36	15.79	0.56
TWI000A	6562	01JAN2012 0600	10.00	606.81	607.33		607.38	0.017094	1.88	5.32	15.75	0.57
TWI000A	6562	01JAN2012 0700	10.00	606.81	607.32		607.38	0.018297	1.93	5.19	15.61	0.59
TWI000A	6562	01JAN2012 0800	10.00	606.81	607.32		607.37	0.018993	1.95	5.12	15.54	0.60
TWI000A	6562	01JAN2012 0900	10.00	606.81	607.31		607.37	0.019562	1.97	5.07	15.48	0.61
TWI000A	6562	01JAN2012 1000	10.00	606.81	607.31		607.37	0.019541	1.97	5.07	15.48	0.61
TWI000A	6562	01JAN2012 1100	10.00	606.81	607.32		607.38	0.018534	1.93	5.17	15.59	0.59
TWI000A	6562	01JAN2012 1200	57.33	606.81	607.94		608.11	0.018095	3.22	17.81	24.50	0.67
TWI000A	6562	01JAN2012 1300	19.23	606.81	607.53		607.60	0.015210	2.20	8.75	18.79	0.57
TWI000A	6562	01JAN2012 1400	10.00	606.81	607.32		607.38	0.017884	1.91	5.23	15.66	0.58
TWI000A	6562	01JAN2012 1500	10.00	606.81	607.32		607.37	0.019024	1.95	5.12	15.53	0.60
TWI000A	6562	01JAN2012 1600	10.00	606.81	607.31		607.37	0.019657	1.98	5.06	15.47	0.61
TWI000A	6562	01JAN2012 1700	10.00	606.81	607.31		607.37	0.019621	1.97	5.07	15.47	0.61
TWI000A	6562	01JAN2012 1800	10.00	606.81	607.31		607.37	0.019427	1.97	5.08	15.49	0.61
TWI000A	6562	01JAN2012 1900	10.00	606.81	607.32		607.38	0.018285	1.93	5.19	15.61	0.59
TWI000A	6562	01JAN2012 2000	10.00	606.81	607.32		607.38	0.017871	1.91	5.24	15.66	0.58
TWI000A	6562	01JAN2012 2100	10.00	606.81	607.32		607.38	0.017615	1.90	5.26	15.69	0.58
TWI000A	6562	01JAN2012 2200	10.00	606.81	607.33		607.38	0.017403	1.89	5.28	15.71	0.58
TWI000A	6562	01JAN2012 2300	10.00	606.81	607.33		607.38	0.017187	1.88	5.31	15.74	0.57
TWI000A	6562	01JAN2012 2400	10.00	606.81	607.33		607.38	0.016979	1.88	5.33	15.76	0.57
TWI000A	6532	Max WS	152.46	605.86	608.26		608.53	0.011083	4.14	37.37	27.73	0.59
TWI000A	6532	31DEC2011 2400	10.00	605.86	607.24		607.25	0.000749	0.70	14.37	17.90	0.14
TWI000A	6532	01JAN2012 0100	10.00	605.86	607.14		607.15	0.001072	0.79	12.61	16.91	0.16
TWI000A	6532	01JAN2012 0200	10.00	605.86	607.13		607.14	0.001097	0.80	12.50	16.85	0.16
TWI000A	6532	01JAN2012 0300	10.00	605.86	607.13		607.14	0.001123	0.81	12.40	16.79	0.17
TWI000A	6532	01JAN2012 0400	10.00	605.86	607.12		607.13	0.001151	0.81	12.28	16.72	0.17
TWI000A	6532	01JAN2012 0500	10.00	605.86	607.11		607.12	0.001186	0.82	12.15	16.64	0.17
TWI000A	6532	01JAN2012 0600	10.00	605.86	607.10		607.11	0.001226	0.83	12.01	16.56	0.17
TWI000A	6532	01JAN2012 0700	10.00	605.86	607.07		607.08	0.001376	0.87	11.52	16.26	0.18
TWI000A	6532	01JAN2012 0800	10.00	605.86	607.05		607.07	0.001477	0.89	11.22	16.09	0.19
TWI000A	6532	01JAN2012 0900	10.00	605.86	607.04		607.05	0.001566	0.91	10.99	15.94	0.19
TWI000A	6532	01JAN2012 1000	10.00	605.86	607.04		607.05	0.001563	0.91	10.99	15.94	0.19
TWI000A	6532	01JAN2012 1100	10.00	605.86	607.07		607.08	0.001408	0.88	11.42	16.20	0.18
TWI000A	6532	01JAN2012 1200	56.98	605.86	607.63		607.73	0.007474	2.58	22.10	21.65	0.45
TWI000A	6532	01JAN2012 1300	19.30	605.86	607.32		607.35	0.002110	1.21	15.91	18.74	0.23
TWI000A	6532	01JAN2012 1400	10.00	605.86	607.08		607.09	0.001324	0.86	11.68	16.36	0.18
TWI000A	6532	01JAN2012 1500	10.00	605.86	607.05		607.07	0.001482	0.89	11.21	16.08	0.19
TWI000A	6532	01JAN2012 1600	10.00	605.86	607.04		607.05	0.001584	0.91	10.94	15.91	0.19
TWI000A	6532	01JAN2012 1700	10.00	605.86	607.04		607.05	0.001578	0.91	10.96	15.92	0.19
TWI000A	6532	01JAN2012 1800	10.00	605.86	607.04		607.06	0.001542	0.90	11.05	15.98	0.19
TWI000A	6532	01JAN2012 1900	10.00	605.86	607.07		607.08	0.001374	0.87	11.52	16.27	0.18
TWI000A	6532	01JAN2012 2000	10.00	605.86	607.08		607.09	0.001319	0.86	11.69	16.37	0.18
TWI000A	6532	01JAN2012 2100	10.00	605.86	607.09		607.10	0.001288	0.85	11.79	16.43	0.18
TWI000A	6532	01JAN2012 2200	10.00	605.86	607.09		607.11	0.001261	0.84	11.89	16.48	0.17
TWI000A	6532	01JAN2012 2300	10.00	605.86	607.10		607.11	0.001236	0.84	11.97	16.54	0.17
TWI000A	6532	01JAN2012 2400	10.00	605.86	607.10		607.12	0.001213	0.83	12.05	16.58	0.17
TWI000A	6498	Max WS	152.02	605.51	608.08		608.25	0.005177	3.27	52.29	36.18	0.42
TWI000A	6498	31DEC2011 2400	10.00	605.51	605.97	606.01	606.17	0.083179	3.64	2.75	9.88	1.22
TWI000A	6498	01JAN2012 0100	10.00	605.51	605.98	606.01	606.17	0.072589	3.47	2.88	10.07	1.14

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	6498	01JAN2012 0200	10.00	605.51	605.98	606.01	606.17	0.071986	3.46	2.89	10.08	1.14
TWI000A	6498	01JAN2012 0300	10.00	605.51	605.98	606.01	606.17	0.071263	3.45	2.90	10.09	1.13
TWI000A	6498	01JAN2012 0400	10.00	605.51	605.98	606.01	606.17	0.070580	3.43	2.91	10.10	1.13
TWI000A	6498	01JAN2012 0500	10.00	605.51	605.98	606.01	606.17	0.069707	3.42	2.93	10.12	1.12
TWI000A	6498	01JAN2012 0600	10.00	605.51	605.99	606.01	606.17	0.068780	3.40	2.94	10.14	1.11
TWI000A	6498	01JAN2012 0700	10.00	605.51	605.99	606.01	606.16	0.065559	3.34	2.99	10.21	1.09
TWI000A	6498	01JAN2012 0800	10.00	605.51	605.99	606.01	606.16	0.063570	3.31	3.02	10.26	1.07
TWI000A	6498	01JAN2012 0900	10.00	605.51	606.00	606.01	606.16	0.062022	3.28	3.05	10.29	1.06
TWI000A	6498	01JAN2012 1000	10.00	605.51	606.00	606.01	606.16	0.062074	3.28	3.05	10.29	1.06
TWI000A	6498	01JAN2012 1100	10.00	605.51	605.99	606.01	606.16	0.065004	3.33	3.00	10.22	1.08
TWI000A	6498	01JAN2012 1200	56.58	605.51	606.57	606.63	606.98	0.056873	5.16	10.96	17.48	1.15
TWI000A	6498	01JAN2012 1300	19.36	605.51	606.13	606.19	606.41	0.076250	4.27	4.53	11.98	1.22
TWI000A	6498	01JAN2012 1400	10.01	605.51	605.99	606.01	606.17	0.066626	3.36	2.97	10.19	1.10
TWI000A	6498	01JAN2012 1500	10.00	605.51	605.99	606.01	606.16	0.063543	3.31	3.02	10.26	1.07
TWI000A	6498	01JAN2012 1600	10.00	605.51	606.00	606.01	606.16	0.061732	3.27	3.06	10.30	1.06
TWI000A	6498	01JAN2012 1700	10.00	605.51	606.00	606.01	606.16	0.061823	3.27	3.05	10.30	1.06
TWI000A	6498	01JAN2012 1800	10.00	605.51	606.00	606.01	606.16	0.062455	3.29	3.04	10.28	1.06
TWI000A	6498	01JAN2012 1900	10.00	605.51	605.99	606.01	606.16	0.065675	3.35	2.99	10.21	1.09
TWI000A	6498	01JAN2012 2000	10.00	605.51	605.99	606.01	606.17	0.066774	3.37	2.97	10.18	1.10
TWI000A	6498	01JAN2012 2100	10.00	605.51	605.99	606.01	606.17	0.067423	3.38	2.96	10.17	1.10
TWI000A	6498	01JAN2012 2200	10.00	605.51	605.99	606.01	606.17	0.068012	3.39	2.95	10.16	1.11
TWI000A	6498	01JAN2012 2300	10.00	605.51	605.99	606.01	606.17	0.068594	3.40	2.94	10.15	1.11
TWI000A	6498	01JAN2012 2400	10.00	605.51	605.99	606.01	606.17	0.069146	3.41	2.93	10.13	1.12
TWI000A	6438	Max WS	151.98	602.48	607.99		608.05	0.001016	1.82	86.57	36.15	0.19
TWI000A	6438	31DEC2011 2400	10.00	602.48	602.87	603.06	603.52	0.296380	6.46	1.55	5.99	2.24
TWI000A	6438	01JAN2012 0100	10.00	602.48	602.82	603.06	603.82	0.587827	8.02	1.25	5.88	3.07
TWI000A	6438	01JAN2012 0200	10.00	602.48	602.82	603.06	603.84	0.610553	8.11	1.23	5.88	3.12
TWI000A	6438	01JAN2012 0300	10.00	602.48	602.82	603.06	603.86	0.633750	8.21	1.22	5.87	3.18
TWI000A	6438	01JAN2012 0400	10.00	602.48	602.82	603.06	603.89	0.658254	8.31	1.20	5.87	3.23
TWI000A	6438	01JAN2012 0500	10.00	602.48	602.81	603.06	603.92	0.690472	8.43	1.19	5.86	3.30
TWI000A	6438	01JAN2012 0600	10.00	602.48	602.81	603.06	603.95	0.725084	8.56	1.17	5.85	3.38
TWI000A	6438	01JAN2012 0700	10.00	602.48	602.80	603.06	604.06	0.859460	9.03	1.11	5.83	3.65
TWI000A	6438	01JAN2012 0800	10.00	602.48	602.79	603.06	604.14	0.948194	9.31	1.07	5.82	3.82
TWI000A	6438	01JAN2012 0900	10.00	602.48	602.79	603.06	604.20	1.027305	9.54	1.05	5.81	3.96
TWI000A	6438	01JAN2012 1000	10.00	602.48	602.79	603.06	604.20	1.026504	9.54	1.05	5.81	3.96
TWI000A	6438	01JAN2012 1100	10.00	602.48	602.80	603.06	604.09	0.889926	9.12	1.10	5.83	3.71
TWI000A	6438	01JAN2012 1200	54.99	602.48	604.61		604.82	0.009968	3.63	15.14	9.65	0.51
TWI000A	6438	01JAN2012 1300	19.48	602.48	603.27	603.30	603.62	0.054435	4.74	4.11	6.83	1.08
TWI000A	6438	01JAN2012 1400	10.01	602.48	602.80	603.06	604.02	0.811544	8.87	1.13	5.84	3.56
TWI000A	6438	01JAN2012 1500	10.00	602.48	602.79	603.06	604.14	0.952329	9.32	1.07	5.82	3.82
TWI000A	6438	01JAN2012 1600	10.00	602.48	602.79	603.06	604.22	1.044279	9.59	1.04	5.81	3.99
TWI000A	6438	01JAN2012 1700	10.00	602.48	602.79	603.06	604.21	1.038303	9.57	1.04	5.81	3.98
TWI000A	6438	01JAN2012 1800	10.00	602.48	602.79	603.06	604.18	1.004769	9.48	1.06	5.81	3.92
TWI000A	6438	01JAN2012 1900	10.00	602.48	602.80	603.06	604.06	0.858432	9.02	1.11	5.83	3.65
TWI000A	6438	01JAN2012 2000	10.00	602.48	602.80	603.06	604.02	0.808430	8.86	1.13	5.84	3.55
TWI000A	6438	01JAN2012 2100	10.00	602.48	602.80	603.06	604.00	0.781924	8.76	1.14	5.84	3.50
TWI000A	6438	01JAN2012 2200	10.00	602.48	602.81	603.06	603.98	0.757514	8.68	1.15	5.85	3.44
TWI000A	6438	01JAN2012 2300	10.00	602.48	602.81	603.06	603.96	0.735410	8.60	1.16	5.85	3.40
TWI000A	6438	01JAN2012 2400	10.00	602.48	602.81	603.06	603.94	0.714693	8.52	1.17	5.86	3.35
TWI000A	6319	Max WS	151.73	598.58	607.96		607.96	0.000028	0.49	341.45	85.74	0.04
TWI000A	6319	31DEC2011 2400	10.00	598.58	599.01	599.36	600.94	1.043292	11.16	0.90	3.89	4.10
TWI000A	6319	01JAN2012 0100	10.00	598.58	599.08	599.36	600.14	0.453688	8.26	1.21	4.42	2.78
TWI000A	6319	01JAN2012 0200	10.00	598.58	599.09	599.36	600.09	0.420232	8.03	1.25	4.47	2.68
TWI000A	6319	01JAN2012 0300	10.00	598.58	599.10	599.36	600.04	0.386957	7.79	1.28	4.53	2.58
TWI000A	6319	01JAN2012 0400	10.00	598.58	599.11	599.36	599.99	0.350496	7.52	1.33	4.60	2.46
TWI000A	6319	01JAN2012 0500	10.00	598.58	599.12	599.36	599.92	0.309761	7.19	1.39	4.70	2.33
TWI000A	6319	01JAN2012 0600	10.00	598.58	599.14	599.36	599.85	0.263454	6.77	1.48	4.82	2.16
TWI000A	6319	01JAN2012 0700	10.00	598.58	599.22	599.36	599.65	0.133615	5.28	1.89	5.39	1.57
TWI000A	6319	01JAN2012 0800	10.00	598.58	599.29	599.36	599.59	0.082283	4.42	2.26	5.85	1.25
TWI000A	6319	01JAN2012 0900	9.99	598.58	599.39		599.57	0.041078	3.42	2.92	6.59	0.90
TWI000A	6319	01JAN2012 1000	9.97	598.58	599.64		599.71	0.011349	2.08	4.79	8.67	0.49
TWI000A	6319	01JAN2012 1100	9.91	598.58	599.99		600.01	0.002661	1.19	8.35	11.87	0.25
TWI000A	6319	01JAN2012 1200	40.08	598.58	604.10		604.11	0.000045	0.37	108.50	41.17	0.04
TWI000A	6319	01JAN2012 1300	21.25	598.58	601.74		601.75	0.000177	0.55	38.95	22.90	0.07
TWI000A	6319	01JAN2012 1400	10.08	598.58	600.14		600.15	0.001576	0.99	10.20	12.85	0.20
TWI000A	6319	01JAN2012 1500	10.03	598.58	599.80		599.84	0.005705	1.60	6.28	10.14	0.36
TWI000A	6319	01JAN2012 1600	10.02	598.58	599.55		599.64	0.017570	2.47	4.05	7.84	0.61
TWI000A	6319	01JAN2012 1700	10.01	598.58	599.43		599.58	0.033169	3.16	3.17	6.84	0.82
TWI000A	6319	01JAN2012 1800	10.00	598.58	599.36	599.36	599.57	0.052162	3.73	2.68	6.32	1.01
TWI000A	6319	01JAN2012 1900	10.00	598.58	599.22	599.36	599.66	0.134620	5.30	1.89	5.38	1.58
TWI000A	6319	01JAN2012 2000	10.00	598.58	599.19	599.36	599.70	0.167547	5.74	1.74	5.19	1.75
TWI000A	6319	01JAN2012 2100	10.00	598.58	599.17	599.36	599.75	0.197986	6.10	1.64	5.05	1.89
TWI000A	6319	01JAN2012 2200	10.00	598.58	599.16	599.36	599.79	0.226330	6.41	1.56	4.94	2.01
TWI000A	6319	01JAN2012 2300	10.00	598.58	599.14	599.36	599.83	0.252657	6.67	1.50	4.85	2.12
TWI000A	6319	01JAN2012 2400	10.00	598.58	599.13	599.36	599.87	0.278052	6.91	1.45	4.78	2.21
TWI000A	6249	Max WS	1760.53	597.08	605.74	604.13	607.43	0.018074	10.66	210.56	66.08	0.68
TWI000A	6249	31DEC2011 2400	10.00	597.08	597.78		597.80	0.002601	0.99	10.08	15.60	0.22
TWI000A	6249	01JAN2012 0100	22.06	597.08	598.07		598.10	0.003922	1.52	14.54	15.82	0.28
TWI000A	6249	01JAN2012 0200	23.08	597.08	598.09		598.12	0.003987	1.55	14.88	15.83	0.28
TWI000A	6249	01JAN2012 0300	24.17	597.08	598.11		598.15	0.004060	1.59	15.23	15.85	0.29
TWI000A	6249	01JAN2012 0400	25.50	597.08	598.13		598.18	0.004154	1.63	15.64	15.87	0.29

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	6249	01JAN2012 0500	27.15	597.08	598.17		598.21	0.004269	1.68	16.13	15.89	0.29
TWI000A	6249	01JAN2012 0600	29.31	597.08	598.20		598.25	0.004416	1.75	16.75	15.92	0.30
TWI000A	6249	01JAN2012 0700	39.19	597.08	598.37		598.43	0.005039	2.03	19.32	16.05	0.33
TWI000A	6249	01JAN2012 0800	45.99	597.08	598.48		598.55	0.005261	2.18	21.10	16.13	0.34
TWI000A	6249	01JAN2012 0900	56.16	597.08	598.59		598.69	0.006016	2.44	22.98	16.22	0.36
TWI000A	6249	01JAN2012 1000	75.92	597.08	598.84		598.96	0.006695	2.81	26.97	16.40	0.39
TWI000A	6249	01JAN2012 1100	104.08	597.08	599.17		599.33	0.007155	3.21	32.42	16.65	0.41
TWI000A	6249	01JAN2012 1200	598.46	597.08	602.54		603.19	0.010760	6.44	92.97	19.21	0.52
TWI000A	6249	01JAN2012 1300	263.27	597.08	600.78		601.08	0.007186	4.36	60.33	17.88	0.42
TWI000A	6249	01JAN2012 1400	116.51	597.08	599.32		599.49	0.007124	3.33	34.97	16.77	0.41
TWI000A	6249	01JAN2012 1500	88.02	597.08	598.99		599.13	0.006790	2.98	29.56	16.52	0.39
TWI000A	6249	01JAN2012 1600	69.00	597.08	598.75		598.86	0.006540	2.70	25.54	16.34	0.38
TWI000A	6249	01JAN2012 1700	59.29	597.08	598.63		598.73	0.006188	2.51	23.58	16.25	0.37
TWI000A	6249	01JAN2012 1800	52.68	597.08	598.55		598.64	0.005784	2.36	22.34	16.19	0.35
TWI000A	6249	01JAN2012 1900	39.09	597.08	598.36		598.43	0.005030	2.03	19.30	16.04	0.33
TWI000A	6249	01JAN2012 2000	35.96	597.08	598.31		598.37	0.004871	1.94	18.49	16.01	0.32
TWI000A	6249	01JAN2012 2100	33.53	597.08	598.27		598.33	0.004723	1.88	17.86	15.98	0.31
TWI000A	6249	01JAN2012 2200	31.57	597.08	598.24		598.29	0.004585	1.82	17.35	15.95	0.31
TWI000A	6249	01JAN2012 2300	29.94	597.08	598.22		598.26	0.004463	1.77	16.92	15.93	0.30
TWI000A	6249	01JAN2012 2400	28.57	597.08	598.19		598.24	0.004362	1.73	16.55	15.91	0.30
TWI000A	6218	Max WS	1759.68	597.00	606.05		606.59	0.004965	6.03	359.51	90.92	0.43
TWI000A	6218	31DEC2011 2400	10.00	597.00	597.56		597.60	0.012780	1.59	6.27	16.40	0.45
TWI000A	6218	01JAN2012 0100	22.06	597.00	597.72		597.81	0.019616	2.45	9.01	17.01	0.59
TWI000A	6218	01JAN2012 0200	23.08	597.00	597.73		597.83	0.019997	2.50	9.21	17.05	0.60
TWI000A	6218	01JAN2012 0300	24.17	597.00	597.75		597.85	0.020246	2.56	9.45	17.11	0.61
TWI000A	6218	01JAN2012 0400	25.50	597.00	597.77		597.87	0.020312	2.61	9.77	17.17	0.61
TWI000A	6218	01JAN2012 0500	27.14	597.00	597.79		597.90	0.020250	2.67	10.17	17.26	0.61
TWI000A	6218	01JAN2012 0600	29.30	597.00	597.82		597.94	0.019923	2.73	10.74	17.38	0.61
TWI000A	6218	01JAN2012 0700	39.18	597.00	597.99		598.12	0.016604	2.86	13.71	18.01	0.58
TWI000A	6218	01JAN2012 0800	45.98	597.00	598.11		598.24	0.014389	2.89	15.93	18.46	0.55
TWI000A	6218	01JAN2012 0900	56.14	597.00	598.24		598.38	0.014090	3.07	18.27	18.93	0.55
TWI000A	6218	01JAN2012 1000	75.86	597.00	598.53		598.68	0.011388	3.17	23.91	20.00	0.51
TWI000A	6218	01JAN2012 1100	104.00	597.00	598.91		599.08	0.009102	3.27	31.85	21.43	0.47
TWI000A	6218	01JAN2012 1200	594.47	597.00	602.63		602.92	0.004635	4.33	137.38	35.27	0.39
TWI000A	6218	01JAN2012 1300	264.08	597.00	600.70		600.89	0.004723	3.46	76.23	28.09	0.37
TWI000A	6218	01JAN2012 1400	116.57	597.00	599.09		599.25	0.008116	3.26	35.77	22.10	0.45
TWI000A	6218	01JAN2012 1500	88.06	597.00	598.71		598.87	0.009966	3.19	27.62	20.68	0.49
TWI000A	6218	01JAN2012 1600	69.03	597.00	598.43		598.58	0.012199	3.14	21.95	19.64	0.52
TWI000A	6218	01JAN2012 1700	59.31	597.00	598.28		598.43	0.013641	3.10	19.15	19.10	0.55
TWI000A	6218	01JAN2012 1800	52.70	597.00	598.19		598.34	0.014282	3.02	17.45	18.77	0.55
TWI000A	6218	01JAN2012 1900	39.10	597.00	597.99		598.12	0.016565	2.85	13.71	18.01	0.58
TWI000A	6218	01JAN2012 2000	35.96	597.00	597.93		598.06	0.017836	2.84	12.68	17.79	0.59
TWI000A	6218	01JAN2012 2100	33.54	597.00	597.89		598.01	0.018740	2.81	11.94	17.64	0.60
TWI000A	6218	01JAN2012 2200	31.57	597.00	597.86		597.98	0.019377	2.78	11.36	17.52	0.61
TWI000A	6218	01JAN2012 2300	29.94	597.00	597.83		597.95	0.019801	2.75	10.91	17.42	0.61
TWI000A	6218	01JAN2012 2400	28.58	597.00	597.81		597.92	0.020072	2.71	10.54	17.34	0.61
TWI000A	6179	Max WS	1759.58	596.45	605.86		606.39	0.004426	5.91	317.56	61.43	0.41
TWI000A	6179	31DEC2011 2400	10.00	596.45	596.80		596.91	0.054201	2.65	3.78	13.72	0.89
TWI000A	6179	01JAN2012 0100	22.06	596.45	597.11		597.22	0.021671	2.65	8.33	15.06	0.63
TWI000A	6179	01JAN2012 0200	23.07	596.45	597.14		597.25	0.020768	2.65	8.69	15.16	0.62
TWI000A	6179	01JAN2012 0300	24.17	596.45	597.16		597.27	0.019864	2.66	9.09	15.27	0.61
TWI000A	6179	01JAN2012 0400	25.49	596.45	597.19		597.30	0.019026	2.67	9.54	15.40	0.60
TWI000A	6179	01JAN2012 0500	27.14	596.45	597.23		597.34	0.017961	2.68	10.12	15.56	0.59
TWI000A	6179	01JAN2012 0600	29.29	596.45	597.28		597.39	0.016639	2.69	10.91	15.77	0.57
TWI000A	6179	01JAN2012 0700	39.16	596.45	597.52		597.63	0.011642	2.64	14.85	16.80	0.49
TWI000A	6179	01JAN2012 0800	45.95	596.45	597.68		597.79	0.009709	2.62	17.55	17.47	0.46
TWI000A	6179	01JAN2012 0900	56.10	596.45	597.87		597.98	0.008554	2.68	20.95	18.28	0.44
TWI000A	6179	01JAN2012 1000	75.78	596.45	598.24		598.35	0.006685	2.71	27.99	19.85	0.40
TWI000A	6179	01JAN2012 1100	103.87	596.45	598.69		598.81	0.005494	2.79	37.28	21.75	0.37
TWI000A	6179	01JAN2012 1200	587.94	596.45	602.54		602.77	0.003516	3.86	152.42	38.10	0.34
TWI000A	6179	01JAN2012 1300	265.37	596.45	600.59		600.74	0.003399	3.07	86.32	29.83	0.32
TWI000A	6179	01JAN2012 1400	116.66	596.45	598.89		599.01	0.004998	2.79	41.81	22.61	0.36
TWI000A	6179	01JAN2012 1500	88.11	596.45	598.45		598.57	0.005980	2.73	32.28	20.74	0.39
TWI000A	6179	01JAN2012 1600	69.07	596.45	598.13		598.24	0.007066	2.68	25.76	19.36	0.41
TWI000A	6179	01JAN2012 1700	59.33	596.45	597.94		598.05	0.008069	2.67	22.20	18.57	0.43
TWI000A	6179	01JAN2012 1800	52.71	596.45	597.81		597.92	0.008839	2.65	19.87	18.02	0.45
TWI000A	6179	01JAN2012 1900	39.12	596.45	597.53		597.63	0.011514	2.63	14.89	16.81	0.49
TWI000A	6179	01JAN2012 2000	35.97	596.45	597.45		597.56	0.012813	2.65	13.60	16.48	0.51
TWI000A	6179	01JAN2012 2100	33.55	596.45	597.39		597.50	0.014019	2.66	12.61	16.22	0.53
TWI000A	6179	01JAN2012 2200	31.58	596.45	597.34		597.45	0.015139	2.67	11.81	16.01	0.55
TWI000A	6179	01JAN2012 2300	29.95	596.45	597.30		597.41	0.016113	2.68	11.18	15.84	0.56
TWI000A	6179	01JAN2012 2400	28.58	596.45	597.27		597.38	0.016961	2.68	10.67	15.71	0.57
TWI000A	6133	Max WS	1758.85	595.31	605.47		606.21	0.004881	7.04	295.54	57.44	0.44
TWI000A	6133	31DEC2011 2400	10.01	595.31	596.18		596.20	0.002758	1.09	9.17	13.12	0.23
TWI000A	6133	01JAN2012 0100	22.04	595.31	596.75		596.78	0.001986	1.28	17.22	14.91	0.21
TWI000A	6133	01JAN2012 0200	23.07	595.31	596.79		596.82	0.001949	1.29	17.86	15.05	0.21
TWI000A	6133	01JAN2012 0300	24.16	595.31	596.84		596.86	0.001921	1.30	18.52	15.18	0.21
TWI000A	6133	01JAN2012 0400	25.48	595.31	596.88		596.91	0.001925	1.33	19.19	15.32	0.21
TWI000A	6133	01JAN2012 0500	27.13	595.31	596.94		596.96	0.001929	1.36	20.01	15.48	0.21
TWI000A	6133	01JAN2012 0600	29.28	595.31	597.00		597.03	0.001934	1.39	21.06	15.69	0.21
TWI000A	6133	01JAN2012 0700	39.13	595.31	597.30		597.33	0.001914	1.52	25.78	16.60	0.21

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	6133	01JAN2012 0800	45.90	595.31	597.48		597.52	0.001900	1.59	28.87	17.17	0.22
TWI000A	6133	01JAN2012 0900	56.04	595.31	597.70		597.75	0.001961	1.71	32.80	17.87	0.22
TWI000A	6133	01JAN2012 1000	75.67	595.31	598.10		598.15	0.002017	1.89	40.11	19.10	0.23
TWI000A	6133	01JAN2012 1100	103.71	595.31	598.56		598.63	0.002110	2.10	49.37	20.56	0.24
TWI000A	6133	01JAN2012 1200	579.70	595.31	602.38		602.62	0.002811	3.87	152.19	35.72	0.31
TWI000A	6133	01JAN2012 1300	266.93	595.31	600.48		600.60	0.002322	2.83	94.43	26.52	0.26
TWI000A	6133	01JAN2012 1400	116.77	595.31	598.77		598.85	0.002110	2.17	53.74	21.21	0.24
TWI000A	6133	01JAN2012 1500	88.19	595.31	598.32		598.38	0.002049	1.98	44.45	19.80	0.23
TWI000A	6133	01JAN2012 1600	69.13	595.31	597.98		598.03	0.001979	1.82	37.89	18.74	0.23
TWI000A	6133	01JAN2012 1700	59.37	595.31	597.78		597.83	0.001957	1.74	34.18	18.11	0.22
TWI000A	6133	01JAN2012 1800	52.74	595.31	597.64		597.68	0.001929	1.67	31.62	17.67	0.22
TWI000A	6133	01JAN2012 1900	39.14	595.31	597.30		597.34	0.001897	1.51	25.86	16.62	0.21
TWI000A	6133	01JAN2012 2000	35.99	595.31	597.21		597.24	0.001903	1.48	24.38	16.34	0.21
TWI000A	6133	01JAN2012 2100	33.56	595.31	597.14		597.17	0.001909	1.45	23.22	16.12	0.21
TWI000A	6133	01JAN2012 2200	31.59	595.31	597.08		597.11	0.001917	1.42	22.24	15.93	0.21
TWI000A	6133	01JAN2012 2300	29.96	595.31	597.03		597.06	0.001921	1.40	21.44	15.77	0.21
TWI000A	6133	01JAN2012 2400	28.59	595.31	596.98		597.01	0.001922	1.38	20.76	15.63	0.21
TWI000A	6059	Max WS	1758.08	594.03	604.92		605.81	0.006873	7.72	269.50	56.43	0.49
TWI000A	6059	31DEC2011 2400	10.04	594.03	596.10		596.10	0.000277	0.55	18.39	12.41	0.08
TWI000A	6059	01JAN2012 0100	22.02	594.03	596.68		596.69	0.000500	0.85	26.04	13.98	0.11
TWI000A	6059	01JAN2012 0200	23.05	594.03	596.72		596.73	0.000514	0.86	26.66	14.10	0.11
TWI000A	6059	01JAN2012 0300	24.15	594.03	596.77		596.78	0.000529	0.89	27.28	14.22	0.11
TWI000A	6059	01JAN2012 0400	25.47	594.03	596.81		596.82	0.000553	0.91	27.88	14.33	0.12
TWI000A	6059	01JAN2012 0500	27.11	594.03	596.86		596.87	0.000582	0.95	28.63	14.47	0.12
TWI000A	6059	01JAN2012 0600	29.25	594.03	596.93		596.94	0.000618	0.99	29.58	14.65	0.12
TWI000A	6059	01JAN2012 0700	39.08	594.03	597.21		597.23	0.000758	1.15	33.89	15.42	0.14
TWI000A	6059	01JAN2012 0800	45.83	594.03	597.39		597.42	0.000834	1.25	36.73	15.91	0.14
TWI000A	6059	01JAN2012 0900	55.94	594.03	597.61		597.64	0.000967	1.39	40.24	16.50	0.16
TWI000A	6059	01JAN2012 1000	75.49	594.03	598.00		598.04	0.001164	1.61	46.81	17.54	0.17
TWI000A	6059	01JAN2012 1100	103.47	594.03	598.45		598.50	0.001407	1.88	55.01	18.76	0.19
TWI000A	6059	01JAN2012 1200	567.71	594.03	602.15		602.40	0.003014	3.99	145.80	34.12	0.31
TWI000A	6059	01JAN2012 1300	269.06	594.03	600.31		600.44	0.002189	2.84	94.71	23.81	0.25
TWI000A	6059	01JAN2012 1400	116.93	594.03	598.65		598.72	0.001490	1.98	58.93	19.32	0.20
TWI000A	6059	01JAN2012 1500	88.30	594.03	598.21		598.26	0.001281	1.74	50.68	18.13	0.18
TWI000A	6059	01JAN2012 1600	69.22	594.03	597.88		597.92	0.001102	1.54	44.81	17.23	0.17
TWI000A	6059	01JAN2012 1700	59.43	594.03	597.69		597.72	0.001003	1.43	41.49	16.70	0.16
TWI000A	6059	01JAN2012 1800	52.78	594.03	597.55		597.58	0.000925	1.35	39.21	16.33	0.15
TWI000A	6059	01JAN2012 1900	39.18	594.03	597.22		597.24	0.000756	1.15	33.97	15.44	0.14
TWI000A	6059	01JAN2012 2000	36.01	594.03	597.13		597.15	0.000716	1.10	32.61	15.20	0.13
TWI000A	6059	01JAN2012 2100	33.58	594.03	597.06		597.08	0.000681	1.06	31.56	15.01	0.13
TWI000A	6059	01JAN2012 2200	31.60	594.03	597.00		597.02	0.000653	1.03	30.67	14.85	0.13
TWI000A	6059	01JAN2012 2300	29.97	594.03	596.95		596.97	0.000628	1.00	29.94	14.71	0.12
TWI000A	6059	01JAN2012 2400	28.60	594.03	596.91		596.92	0.000606	0.98	29.32	14.60	0.12
TWI000A	5935	Max WS	1758.16	594.37	604.04		604.82	0.009381	7.47	290.63	95.85	0.57
TWI000A	5935	31DEC2011 2400	10.11	594.37	595.79		595.82	0.004541	1.53	6.60	7.99	0.30
TWI000A	5935	01JAN2012 0100	21.99	594.37	596.30		596.36	0.004970	1.96	11.25	9.99	0.32
TWI000A	5935	01JAN2012 0200	23.04	594.37	596.34		596.40	0.005010	1.99	11.60	10.12	0.33
TWI000A	5935	01JAN2012 0300	24.13	594.37	596.38		596.44	0.005062	2.02	11.96	10.26	0.33
TWI000A	5935	01JAN2012 0400	25.45	594.37	596.41		596.48	0.005191	2.07	12.32	10.39	0.33
TWI000A	5935	01JAN2012 0500	27.08	594.37	596.45		596.52	0.005336	2.12	12.77	10.56	0.34
TWI000A	5935	01JAN2012 0600	29.21	594.37	596.51		596.58	0.005510	2.19	13.34	10.77	0.35
TWI000A	5935	01JAN2012 0700	39.01	594.37	596.73		596.83	0.006135	2.46	15.87	11.64	0.37
TWI000A	5935	01JAN2012 0800	45.74	594.37	596.87		596.97	0.006460	2.62	17.48	12.10	0.38
TWI000A	5935	01JAN2012 0900	55.82	594.37	597.04		597.17	0.006948	2.84	19.66	12.67	0.40
TWI000A	5935	01JAN2012 1000	75.27	594.37	597.36		597.51	0.007457	3.16	23.79	13.66	0.42
TWI000A	5935	01JAN2012 1100	103.13	594.37	597.77		597.96	0.007621	3.47	29.69	14.96	0.43
TWI000A	5935	01JAN2012 1200	551.10	594.37	601.11		601.61	0.009652	5.67	97.12	27.57	0.53
TWI000A	5935	01JAN2012 1300	272.09	594.37	599.54		599.85	0.007464	4.47	60.88	20.24	0.45
TWI000A	5935	01JAN2012 1400	117.17	594.37	597.98		598.17	0.007449	3.57	32.86	15.61	0.43
TWI000A	5935	01JAN2012 1500	88.46	594.37	597.56		597.73	0.007597	3.33	26.57	14.29	0.43
TWI000A	5935	01JAN2012 1600	69.34	594.37	597.27		597.41	0.007337	3.08	22.55	13.37	0.42
TWI000A	5935	01JAN2012 1700	59.51	594.37	597.11		597.24	0.007053	2.91	20.48	12.87	0.41
TWI000A	5935	01JAN2012 1800	52.84	594.37	597.00		597.11	0.006797	2.77	19.05	12.52	0.40
TWI000A	5935	01JAN2012 1900	39.23	594.37	596.74		596.83	0.006155	2.46	15.92	11.65	0.37
TWI000A	5935	01JAN2012 2000	36.05	594.37	596.67		596.76	0.005913	2.37	15.18	11.41	0.36
TWI000A	5935	01JAN2012 2100	33.61	594.37	596.62		596.70	0.005709	2.30	14.60	11.21	0.36
TWI000A	5935	01JAN2012 2200	31.63	594.37	596.57		596.65	0.005624	2.25	14.04	11.01	0.35
TWI000A	5935	01JAN2012 2300	29.99	594.37	596.53		596.60	0.005532	2.21	13.58	10.85	0.35
TWI000A	5935	01JAN2012 2400	28.62	594.37	596.49		596.57	0.005438	2.17	13.20	10.72	0.34
TWI000A	5676	Max WS	1885.86	592.61	602.50		602.96	0.004499	6.11	507.99	111.14	0.42
TWI000A	5676	31DEC2011 2400	10.55	592.61	595.24		595.24	0.000122	0.40	26.34	15.87	0.05
TWI000A	5676	01JAN2012 0100	22.76	592.61	595.68		595.69	0.000287	0.67	33.73	17.60	0.09
TWI000A	5676	01JAN2012 0200	23.90	592.61	595.70		595.71	0.000307	0.70	34.12	17.68	0.09
TWI000A	5676	01JAN2012 0300	25.07	592.61	595.72		595.73	0.000328	0.73	34.50	17.77	0.09
TWI000A	5676	01JAN2012 0400	26.47	592.61	595.75		595.76	0.000353	0.76	34.95	17.87	0.10
TWI000A	5676	01JAN2012 0500	28.21	592.61	595.78		595.79	0.000384	0.79	35.49	17.99	0.10
TWI000A	5676	01JAN2012 0600	30.47	592.61	595.81		595.83	0.000426	0.84	36.15	18.13	0.11
TWI000A	5676	01JAN2012 0700	40.89	592.61	595.94		595.96	0.000647	1.06	38.50	18.64	0.13
TWI000A	5676	01JAN2012 0800	47.90	592.61	596.00		596.02	0.000827	1.21	39.51	18.85	0.15
TWI000A	5676	01JAN2012 0900	58.66	592.61	596.11		596.14	0.001079	1.41	41.59	19.29	0.17
TWI000A	5676	01JAN2012 1000	79.53	592.61	596.28		596.33	0.001600	1.77	45.03	19.98	0.21

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	5676	01JAN2012 1100	109.41	592.61	596.63		596.70	0.002019	2.09	52.31	21.40	0.24
TWI000A	5676	01JAN2012 1200	573.98	592.61	599.56		599.78	0.003801	3.87	207.06	94.79	0.35
TWI000A	5676	01JAN2012 1300	297.95	592.61	598.35		598.49	0.002913	3.04	113.02	57.10	0.30
TWI000A	5676	01JAN2012 1400	126.11	592.61	596.85		596.93	0.002124	2.21	57.12	22.36	0.24
TWI000A	5676	01JAN2012 1500	94.99	592.61	596.44		596.50	0.001884	1.97	48.33	20.64	0.23
TWI000A	5676	01JAN2012 1600	74.29	592.61	596.22		596.27	0.001493	1.69	43.92	19.76	0.20
TWI000A	5676	01JAN2012 1700	63.62	592.61	596.14		596.18	0.001214	1.50	42.28	19.43	0.18
TWI000A	5676	01JAN2012 1800	56.43	592.61	596.07		596.10	0.001038	1.38	41.00	19.17	0.17
TWI000A	5676	01JAN2012 1900	41.67	592.61	595.94		595.96	0.000674	1.08	38.45	18.63	0.13
TWI000A	5676	01JAN2012 2000	38.22	592.61	595.92		595.93	0.000583	1.00	38.07	18.55	0.12
TWI000A	5676	01JAN2012 2100	35.61	592.61	595.90		595.91	0.000519	0.94	37.72	18.47	0.12
TWI000A	5676	01JAN2012 2200	33.46	592.61	595.86		595.88	0.000481	0.90	37.04	18.33	0.11
TWI000A	5676	01JAN2012 2300	31.68	592.61	595.83		595.84	0.000449	0.87	36.49	18.21	0.11
TWI000A	5676	01JAN2012 2400	30.19	592.61	595.81		595.82	0.000422	0.84	36.04	18.11	0.10
TWI000A	5466	Max WS	1992.81	592.59	600.79		601.61	0.009668	8.32	422.74	110.10	0.60
TWI000A	5466	31DEC2011 2400	10.91	592.59	593.44		593.53	0.021662	2.38	4.58	9.70	0.61
TWI000A	5466	01JAN2012 0100	23.41	592.59	593.76		593.90	0.019245	2.93	7.98	11.20	0.61
TWI000A	5466	01JAN2012 0200	24.62	592.59	593.79		593.93	0.019156	2.98	8.27	11.32	0.61
TWI000A	5466	01JAN2012 0300	25.85	592.59	593.82		593.96	0.019014	3.01	8.58	11.44	0.61
TWI000A	5466	01JAN2012 0400	27.33	592.59	593.85		593.99	0.018768	3.05	8.95	11.59	0.61
TWI000A	5466	01JAN2012 0500	29.16	592.59	593.89		594.04	0.018383	3.09	9.43	11.78	0.61
TWI000A	5466	01JAN2012 0600	31.53	592.59	593.94		594.09	0.017757	3.13	10.07	12.03	0.60
TWI000A	5466	01JAN2012 0700	42.47	592.59	594.17		594.34	0.015719	3.28	12.94	13.08	0.58
TWI000A	5466	01JAN2012 0800	49.72	592.59	594.30		594.48	0.014957	3.38	14.72	13.69	0.57
TWI000A	5466	01JAN2012 0900	61.01	592.59	594.53		594.71	0.012969	3.41	17.87	14.64	0.54
TWI000A	5466	01JAN2012 1000	83.05	592.59	594.93		595.11	0.010312	3.45	24.08	16.25	0.50
TWI000A	5466	01JAN2012 1100	114.70	592.59	595.42		595.61	0.008471	3.53	32.48	18.11	0.46
TWI000A	5466	01JAN2012 1200	584.06	592.59	598.02		598.42	0.009640	5.45	156.28	78.94	0.54
TWI000A	5466	01JAN2012 1300	321.29	592.59	596.99		597.31	0.008731	4.65	86.27	53.16	0.50
TWI000A	5466	01JAN2012 1400	133.72	592.59	595.65		595.85	0.008162	3.64	36.86	21.39	0.46
TWI000A	5466	01JAN2012 1500	100.50	592.59	595.25		595.43	0.008476	3.40	29.55	17.48	0.46
TWI000A	5466	01JAN2012 1600	78.49	592.59	594.85		595.04	0.010680	3.43	22.86	15.96	0.51
TWI000A	5466	01JAN2012 1700	67.10	592.59	594.65		594.83	0.011946	3.41	19.67	15.13	0.53
TWI000A	5466	01JAN2012 1800	59.47	592.59	594.50		594.68	0.013055	3.40	17.52	14.54	0.55
TWI000A	5466	01JAN2012 1900	43.73	592.59	594.20		594.37	0.015507	3.29	13.28	13.20	0.58
TWI000A	5466	01JAN2012 2000	40.06	592.59	594.13		594.29	0.015747	3.23	12.42	12.89	0.58
TWI000A	5466	01JAN2012 2100	37.29	592.59	594.08		594.24	0.015915	3.17	11.76	12.66	0.58
TWI000A	5466	01JAN2012 2200	35.00	592.59	594.03		594.18	0.016631	3.16	11.08	12.41	0.59
TWI000A	5466	01JAN2012 2300	33.11	592.59	593.98		594.13	0.017207	3.14	10.54	12.20	0.60
TWI000A	5466	01JAN2012 2400	31.52	592.59	593.94		594.10	0.017671	3.12	10.09	12.03	0.60
TWI000A	5296	Max WS	2071.95	590.93	599.18		600.05	0.009483	8.36	425.59	125.88	0.60
TWI000A	5296	31DEC2011 2400	11.03	590.93	591.25	591.68	596.79	5.725938	18.88	0.58	3.64	8.30
TWI000A	5296	01JAN2012 0100	23.89	590.93	591.68	591.95	592.60	0.296603	7.69	3.11	8.06	2.18
TWI000A	5296	01JAN2012 0200	25.17	590.93	591.72	591.97	592.54	0.244421	7.28	3.46	8.43	2.00
TWI000A	5296	01JAN2012 0300	26.44	590.93	591.76	591.99	592.51	0.202024	6.92	3.82	8.69	1.84
TWI000A	5296	01JAN2012 0400	27.98	590.93	591.81	592.02	592.48	0.164120	6.56	4.27	9.00	1.68
TWI000A	5296	01JAN2012 0500	29.88	590.93	591.87	592.05	592.47	0.130646	6.18	4.83	9.38	1.52
TWI000A	5296	01JAN2012 0600	32.32	590.93	591.95	592.08	592.48	0.104439	5.86	5.52	9.81	1.38
TWI000A	5296	01JAN2012 0700	43.62	590.93	592.27	592.24	592.64	0.046249	4.87	8.96	11.31	0.96
TWI000A	5296	01JAN2012 0800	51.05	590.93	592.47		592.79	0.032095	4.51	11.33	12.14	0.82
TWI000A	5296	01JAN2012 0900	62.76	590.93	592.76		593.03	0.021878	4.19	14.96	13.32	0.70
TWI000A	5296	01JAN2012 1000	85.66	590.93	593.27		593.50	0.013065	3.83	22.37	15.36	0.56
TWI000A	5296	01JAN2012 1100	118.68	590.93	593.82		594.04	0.009943	3.78	31.42	17.82	0.50
TWI000A	5296	01JAN2012 1200	597.62	590.93	596.57		596.96	0.007682	5.12	149.06	68.36	0.49
TWI000A	5296	01JAN2012 1300	338.10	590.93	595.63		595.90	0.008008	4.20	92.19	53.81	0.48
TWI000A	5296	01JAN2012 1400	139.48	590.93	594.08		594.31	0.009904	3.84	36.34	20.12	0.50
TWI000A	5296	01JAN2012 1500	104.65	590.93	593.65		593.86	0.010002	3.68	28.42	16.83	0.50
TWI000A	5296	01JAN2012 1600	81.68	590.93	593.20		593.43	0.013727	3.84	21.25	15.07	0.57
TWI000A	5296	01JAN2012 1700	69.76	590.93	592.93		593.18	0.017753	4.02	17.35	14.02	0.64
TWI000A	5296	01JAN2012 1800	61.78	590.93	592.74		593.01	0.022016	4.18	14.77	13.26	0.70
TWI000A	5296	01JAN2012 1900	45.30	590.93	592.32		592.67	0.041195	4.73	9.57	11.53	0.92
TWI000A	5296	01JAN2012 2000	41.46	590.93	592.21	592.21	592.60	0.051399	4.97	8.35	11.09	1.01
TWI000A	5296	01JAN2012 2100	38.56	590.93	592.13	592.18	592.55	0.062723	5.19	7.43	10.74	1.10
TWI000A	5296	01JAN2012 2200	36.17	590.93	592.06	592.14	592.51	0.075050	5.40	6.70	10.46	1.19
TWI000A	5296	01JAN2012 2300	34.18	590.93	592.00	592.11	592.49	0.087925	5.60	6.10	10.17	1.28
TWI000A	5296	01JAN2012 2400	32.52	590.93	591.95	592.09	592.48	0.101001	5.80	5.61	9.87	1.36
TWI000A	5079	Max WS	2149.10	588.81	597.37		598.20	0.008699	8.39	401.57	115.90	0.62
TWI000A	5079	31DEC2011 2400	11.34	588.81	590.16		590.19	0.003367	1.41	8.03	10.43	0.28
TWI000A	5079	01JAN2012 0100	24.44	588.81	590.64		590.69	0.003562	1.82	13.40	12.22	0.31
TWI000A	5079	01JAN2012 0200	25.80	588.81	590.68		590.73	0.003534	1.85	13.96	12.39	0.31
TWI000A	5079	01JAN2012 0300	27.13	588.81	590.72		590.77	0.003559	1.88	14.43	12.53	0.31
TWI000A	5079	01JAN2012 0400	28.73	588.81	590.76		590.82	0.003589	1.92	14.98	12.69	0.31
TWI000A	5079	01JAN2012 0500	30.70	588.81	590.81		590.87	0.003626	1.96	15.64	12.89	0.31
TWI000A	5079	01JAN2012 0600	33.24	588.81	590.87		590.94	0.003706	2.02	16.42	13.12	0.32
TWI000A	5079	01JAN2012 0700	44.97	588.81	591.15		591.23	0.003807	2.23	20.17	14.14	0.33
TWI000A	5079	01JAN2012 0800	52.60	588.81	591.29		591.38	0.003988	2.37	22.20	14.66	0.34
TWI000A	5079	01JAN2012 0900	64.80	588.81	591.49		591.59	0.004280	2.58	25.14	15.39	0.36
TWI000A	5079	01JAN2012 1000	88.75	588.81	591.85		591.97	0.004518	2.87	30.95	16.73	0.37
TWI000A	5079	01JAN2012 1100	123.32	588.81	592.26		592.42	0.004908	3.23	38.21	18.33	0.39
TWI000A	5079	01JAN2012 1200	613.15	588.81	594.86		595.30	0.008086	5.47	142.17	89.70	0.54
TWI000A	5079	01JAN2012 1300	359.23	588.81	594.04		594.36	0.006542	4.56	84.48	46.58	0.48

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	5079	01JAN2012 1400	146.22	588.81	592.51		592.69	0.005082	3.42	42.80	19.32	0.40
TWI000A	5079	01JAN2012 1500	109.57	588.81	592.11		592.26	0.004728	3.08	35.52	17.75	0.38
TWI000A	5079	01JAN2012 1600	85.42	588.81	591.81		591.94	0.004406	2.81	30.38	16.60	0.37
TWI000A	5079	01JAN2012 1700	72.89	588.81	591.64		591.75	0.004192	2.64	27.57	15.96	0.35
TWI000A	5079	01JAN2012 1800	64.49	588.81	591.49		591.59	0.004218	2.56	25.18	15.40	0.35
TWI000A	5079	01JAN2012 1900	47.17	588.81	591.20		591.28	0.003817	2.26	20.85	14.32	0.33
TWI000A	5079	01JAN2012 2000	43.11	588.81	591.12		591.19	0.003696	2.18	19.78	14.04	0.32
TWI000A	5079	01JAN2012 2100	40.06	588.81	591.04		591.11	0.003798	2.15	18.59	13.72	0.33
TWI000A	5079	01JAN2012 2200	37.54	588.81	590.98		591.05	0.003755	2.11	17.82	13.51	0.32
TWI000A	5079	01JAN2012 2300	35.45	588.81	590.93		591.00	0.003718	2.06	17.17	13.33	0.32
TWI000A	5079	01JAN2012 2400	33.70	588.81	590.89		590.95	0.003678	2.03	16.63	13.17	0.32
TWI000A	4954	Max WS	2184.96	588.24	596.64		597.24	0.005837	7.13	495.75	146.84	0.52
TWI000A	4954	31DEC2011 2400	11.65	588.24	589.95		589.96	0.000571	0.74	15.79	14.40	0.12
TWI000A	4954	01JAN2012 0100	24.76	588.24	590.39		590.41	0.000956	1.09	22.61	16.70	0.17
TWI000A	4954	01JAN2012 0200	26.19	588.24	590.43		590.45	0.000980	1.12	23.36	16.94	0.17
TWI000A	4954	01JAN2012 0300	27.55	588.24	590.47		590.49	0.001017	1.15	23.91	17.11	0.17
TWI000A	4954	01JAN2012 0400	29.19	588.24	590.50		590.53	0.001063	1.19	24.54	17.31	0.18
TWI000A	4954	01JAN2012 0500	31.21	588.24	590.55		590.57	0.001116	1.23	25.33	17.56	0.18
TWI000A	4954	01JAN2012 0600	33.81	588.24	590.61		590.63	0.001179	1.28	26.32	17.86	0.19
TWI000A	4954	01JAN2012 0700	45.80	588.24	590.87		590.90	0.001352	1.47	31.24	19.23	0.20
TWI000A	4954	01JAN2012 0800	53.56	588.24	590.99		591.03	0.001521	1.60	33.51	19.77	0.22
TWI000A	4954	01JAN2012 0900	66.06	588.24	591.16		591.21	0.001757	1.79	37.00	20.57	0.23
TWI000A	4954	01JAN2012 1000	90.65	588.24	591.49		591.56	0.002042	2.06	44.06	22.10	0.26
TWI000A	4954	01JAN2012 1100	126.19	588.24	591.87		591.95	0.002439	2.40	52.68	23.99	0.28
TWI000A	4954	01JAN2012 1200	618.77	588.24	594.08		594.41	0.005618	4.74	162.25	110.51	0.46
TWI000A	4954	01JAN2012 1300	372.18	588.24	593.43		593.65	0.004515	3.72	102.43	59.57	0.40
TWI000A	4954	01JAN2012 1400	150.39	588.24	592.09		592.19	0.002657	2.58	58.22	25.23	0.30
TWI000A	4954	01JAN2012 1500	112.60	588.24	591.74		591.82	0.002280	2.27	49.61	23.30	0.27
TWI000A	4954	01JAN2012 1600	87.73	588.24	591.46		591.53	0.001983	2.02	43.48	21.98	0.25
TWI000A	4954	01JAN2012 1700	74.83	588.24	591.32		591.37	0.001774	1.85	40.34	21.31	0.24
TWI000A	4954	01JAN2012 1800	66.16	588.24	591.17		591.21	0.001746	1.78	37.12	20.60	0.23
TWI000A	4954	01JAN2012 1900	48.32	588.24	590.91		590.95	0.001398	1.51	32.07	19.43	0.21
TWI000A	4954	01JAN2012 2000	44.13	588.24	590.85		590.88	0.001296	1.43	30.88	19.15	0.20
TWI000A	4954	01JAN2012 2100	40.99	588.24	590.76		590.79	0.001315	1.41	29.13	18.69	0.20
TWI000A	4954	01JAN2012 2200	38.39	588.24	590.71		590.74	0.001265	1.36	28.15	18.41	0.19
TWI000A	4954	01JAN2012 2300	36.24	588.24	590.66		590.69	0.001223	1.33	27.33	18.16	0.19
TWI000A	4954	01JAN2012 2400	34.44	588.24	590.62		590.65	0.001184	1.29	26.63	17.96	0.19
TWI000A	4851	Max WS	2183.75	588.32	596.45		596.72	0.003233	5.14	717.98	207.64	0.39
TWI000A	4851	31DEC2011 2400	11.86	588.32	589.44		589.50	0.009085	1.94	6.11	10.51	0.45
TWI000A	4851	01JAN2012 0100	24.72	588.32	589.79		589.88	0.009728	2.41	10.25	13.40	0.49
TWI000A	4851	01JAN2012 0200	26.18	588.32	589.82		589.91	0.009792	2.45	10.67	13.66	0.49
TWI000A	4851	01JAN2012 0300	27.54	588.32	589.84		589.94	0.009969	2.50	11.00	13.86	0.50
TWI000A	4851	01JAN2012 0400	29.17	588.32	589.87		589.97	0.010106	2.56	11.40	14.04	0.50
TWI000A	4851	01JAN2012 0500	31.19	588.32	589.91		590.01	0.010224	2.62	11.90	14.26	0.51
TWI000A	4851	01JAN2012 0600	33.78	588.32	589.95		590.06	0.010302	2.69	12.56	14.54	0.51
TWI000A	4851	01JAN2012 0700	45.75	588.32	590.11		590.25	0.011666	3.07	14.90	15.50	0.55
TWI000A	4851	01JAN2012 0800	53.49	588.32	590.23		590.39	0.011335	3.18	16.84	16.25	0.55
TWI000A	4851	01JAN2012 0900	65.95	588.32	590.42		590.58	0.010714	3.30	19.97	17.40	0.54
TWI000A	4851	01JAN2012 1000	90.46	588.32	590.66		590.87	0.011569	3.71	24.41	18.90	0.57
TWI000A	4851	01JAN2012 1100	125.92	588.32	591.00		591.26	0.011429	4.02	31.29	21.17	0.58
TWI000A	4851	01JAN2012 1200	593.86	588.32	593.08		593.53	0.013383	5.68	141.54	128.91	0.68
TWI000A	4851	01JAN2012 1300	376.32	588.32	592.39		592.84	0.012995	5.45	74.32	62.51	0.66
TWI000A	4851	01JAN2012 1400	150.59	588.32	591.21		591.48	0.011465	4.22	35.70	22.55	0.59
TWI000A	4851	01JAN2012 1500	112.75	588.32	590.88		591.12	0.011580	3.93	28.68	20.31	0.58
TWI000A	4851	01JAN2012 1600	87.84	588.32	590.62		590.84	0.011778	3.70	23.74	18.68	0.58
TWI000A	4851	01JAN2012 1700	74.90	588.32	590.46		590.66	0.012569	3.62	20.66	17.64	0.59
TWI000A	4851	01JAN2012 1800	66.21	588.32	590.41		590.58	0.010855	3.32	19.93	17.38	0.55
TWI000A	4851	01JAN2012 1900	48.36	588.32	590.14		590.30	0.011757	3.13	15.46	15.72	0.56
TWI000A	4851	01JAN2012 2000	44.15	588.32	590.08		590.22	0.011868	3.06	14.44	15.32	0.55
TWI000A	4851	01JAN2012 2100	41.01	588.32	590.07		590.20	0.010365	2.85	14.38	15.29	0.52
TWI000A	4851	01JAN2012 2200	38.41	588.32	590.03		590.15	0.010442	2.81	13.69	15.01	0.52
TWI000A	4851	01JAN2012 2300	36.26	588.32	589.99		590.11	0.010465	2.76	13.13	14.78	0.52
TWI000A	4851	01JAN2012 2400	34.45	588.32	589.96		590.07	0.010456	2.72	12.67	14.58	0.51
TWI000A	4630	Max WS	2181.47	585.93	596.26		596.37	0.001015	2.99	897.87	190.87	0.20
TWI000A	4630	31DEC2011 2400	11.85	585.93	588.68		588.68	0.000106	0.33	39.63	35.67	0.05
TWI000A	4630	01JAN2012 0100	24.68	585.93	588.95		588.95	0.000250	0.55	49.90	39.97	0.08
TWI000A	4630	01JAN2012 0200	26.15	585.93	588.96		588.97	0.000272	0.58	50.51	40.12	0.08
TWI000A	4630	01JAN2012 0300	27.51	585.93	588.98		588.99	0.000288	0.60	51.29	40.30	0.08
TWI000A	4630	01JAN2012 0400	29.13	585.93	589.01		589.01	0.000306	0.62	52.27	40.53	0.09
TWI000A	4630	01JAN2012 0500	31.14	585.93	589.04		589.04	0.000327	0.65	53.53	40.83	0.09
TWI000A	4630	01JAN2012 0600	33.71	585.93	589.08		589.08	0.000351	0.68	55.23	41.22	0.09
TWI000A	4630	01JAN2012 0700	45.53	585.93	589.10		589.11	0.000617	0.90	55.95	41.39	0.12
TWI000A	4630	01JAN2012 0800	53.24	585.93	589.27		589.28	0.000601	0.93	63.09	43.00	0.12
TWI000A	4630	01JAN2012 0900	65.48	585.93	589.52		589.54	0.000591	0.97	75.12	48.55	0.12
TWI000A	4630	01JAN2012 1000	89.64	585.93	589.70		589.72	0.000808	1.18	84.01	50.22	0.15
TWI000A	4630	01JAN2012 1100	125.17	585.93	590.08		590.11	0.000890	1.33	103.87	55.35	0.16
TWI000A	4630	01JAN2012 1200	554.40	585.93	592.12		592.19	0.001631	2.02	264.94	110.13	0.22
TWI000A	4630	01JAN2012 1300	384.30	585.93	591.33		591.40	0.001784	2.08	188.50	82.59	0.23
TWI000A	4630	01JAN2012 1400	151.14	585.93	590.30		590.32	0.001023	1.48	116.37	62.58	0.17
TWI000A	4630	01JAN2012 1500	113.28	585.93	589.93		589.95	0.000891	1.29	95.75	52.34	0.15
TWI000A	4630	01JAN2012 1600	88.30	585.93	589.64		589.66	0.000875	1.21	80.79	49.62	0.15

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	4630	01JAN2012 1700	75.05	585.93	589.37		589.39	0.001025	1.24	68.01	47.03	0.16
TWI000A	4630	01JAN2012 1800	66.43	585.93	589.51		589.52	0.000628	1.00	74.28	48.39	0.13
TWI000A	4630	01JAN2012 1900	48.54	585.93	589.13		589.14	0.000653	0.93	57.36	41.71	0.13
TWI000A	4630	01JAN2012 2000	44.26	585.93	589.03		589.04	0.000668	0.92	53.33	40.78	0.13
TWI000A	4630	01JAN2012 2100	41.08	585.93	589.18		589.19	0.000423	0.76	59.46	42.19	0.10
TWI000A	4630	01JAN2012 2200	38.47	585.93	589.14		589.14	0.000406	0.74	57.58	41.76	0.10
TWI000A	4630	01JAN2012 2300	36.30	585.93	589.10		589.11	0.000389	0.72	56.11	41.42	0.10
TWI000A	4630	01JAN2012 2400	34.49	585.93	589.07		589.08	0.000373	0.70	54.92	41.15	0.10
TWI000A	4515	Max WS	3183.51	585.61	595.53		595.98	0.003687	5.76	605.03	102.41	0.37
TWI000A	4515	31DEC2011 2400	11.78	585.61	586.50		586.68	0.047664	3.36	3.51	7.87	0.89
TWI000A	4515	01JAN2012 0100	32.34	585.61	586.97		587.23	0.034321	4.08	7.93	10.20	0.81
TWI000A	4515	01JAN2012 0200	34.77	585.61	587.01		587.28	0.034355	4.18	8.32	10.30	0.82
TWI000A	4515	01JAN2012 0300	36.83	585.61	587.04		587.32	0.034335	4.26	8.65	10.39	0.82
TWI000A	4515	01JAN2012 0400	39.36	585.61	587.08		587.37	0.034152	4.34	9.06	10.50	0.82
TWI000A	4515	01JAN2012 0500	42.44	585.61	587.13		587.43	0.033721	4.43	9.57	10.63	0.82
TWI000A	4515	01JAN2012 0600	46.37	585.61	587.19		587.51	0.032917	4.53	10.24	10.81	0.82
TWI000A	4515	01JAN2012 0700	64.36	585.61	587.49		587.84	0.027936	4.73	13.62	11.78	0.77
TWI000A	4515	01JAN2012 0800	75.87	585.61	587.63		588.01	0.027808	4.93	15.47	14.26	0.78
TWI000A	4515	01JAN2012 0900	93.88	585.61	587.84		588.25	0.026798	5.14	18.89	17.99	0.78
TWI000A	4515	01JAN2012 1000	129.78	585.61	588.17		588.61	0.025613	5.45	25.58	23.50	0.77
TWI000A	4515	01JAN2012 1100	182.00	585.61	588.54		588.99	0.023603	5.66	36.70	33.27	0.76
TWI000A	4515	01JAN2012 1200	856.41	585.61	591.07		591.42	0.010337	5.38	186.35	86.13	0.54
TWI000A	4515	01JAN2012 1300	537.43	585.61	590.23		590.58	0.012568	5.41	119.59	69.07	0.59
TWI000A	4515	01JAN2012 1400	216.58	585.61	588.74		589.19	0.022667	5.76	43.43	36.35	0.75
TWI000A	4515	01JAN2012 1500	161.06	585.61	588.43		588.87	0.023216	5.49	33.17	31.64	0.75
TWI000A	4515	01JAN2012 1600	124.59	585.61	588.13		588.57	0.025485	5.39	24.73	22.22	0.77
TWI000A	4515	01JAN2012 1700	105.24	585.61	587.99		588.39	0.024644	5.11	21.65	20.06	0.75
TWI000A	4515	01JAN2012 1800	92.70	585.61	587.83		588.23	0.026847	5.12	18.66	17.82	0.78
TWI000A	4515	01JAN2012 1900	66.50	585.61	587.52		587.87	0.027939	4.77	13.94	11.90	0.78
TWI000A	4515	01JAN2012 2000	60.25	585.61	587.44		587.77	0.027571	4.62	13.04	11.57	0.77
TWI000A	4515	01JAN2012 2100	55.57	585.61	587.34		587.68	0.030319	4.67	11.91	11.22	0.80
TWI000A	4515	01JAN2012 2200	51.74	585.61	587.28		587.61	0.031434	4.62	11.21	11.05	0.81
TWI000A	4515	01JAN2012 2300	48.56	585.61	587.23		587.55	0.032301	4.57	10.64	10.91	0.81
TWI000A	4515	01JAN2012 2400	45.90	585.61	587.18		587.50	0.032951	4.51	10.17	10.79	0.82
TWI000A	4315	Max WS	3181.45	581.62	592.87		594.94	0.013915	11.64	292.48	54.85	0.72
TWI000A	4315	31DEC2011 2400	12.05	581.62	582.62		582.79	0.036508	3.25	3.71	7.12	0.79
TWI000A	4315	01JAN2012 0100	32.21	581.62	583.53		583.64	0.009666	2.63	12.26	11.69	0.45
TWI000A	4315	01JAN2012 0200	34.74	581.62	583.62		583.72	0.009067	2.62	13.27	12.12	0.44
TWI000A	4315	01JAN2012 0300	36.80	581.62	583.67		583.78	0.008891	2.64	13.95	12.40	0.44
TWI000A	4315	01JAN2012 0400	39.33	581.62	583.74		583.85	0.008657	2.66	14.80	12.74	0.43
TWI000A	4315	01JAN2012 0500	42.40	581.62	583.82		583.93	0.008351	2.67	15.86	13.15	0.43
TWI000A	4315	01JAN2012 0600	46.32	581.62	583.92		584.04	0.007976	2.69	17.22	13.66	0.42
TWI000A	4315	01JAN2012 0700	64.26	581.62	584.34		584.46	0.006783	2.75	23.40	15.87	0.40
TWI000A	4315	01JAN2012 0800	75.73	581.62	584.58		584.70	0.006279	2.78	27.28	17.18	0.39
TWI000A	4315	01JAN2012 0900	93.60	581.62	584.87		585.00	0.005817	2.88	32.50	18.18	0.38
TWI000A	4315	01JAN2012 1000	129.24	581.62	585.36		585.51	0.005561	3.07	42.04	20.54	0.38
TWI000A	4315	01JAN2012 1100	181.36	581.62	585.97		586.13	0.005259	3.28	55.34	23.52	0.38
TWI000A	4315	01JAN2012 1200	828.67	581.62	589.48		589.92	0.005774	5.34	155.31	32.39	0.43
TWI000A	4315	01JAN2012 1300	546.73	581.62	588.78		589.04	0.003888	4.11	133.15	30.85	0.35
TWI000A	4315	01JAN2012 1400	217.14	581.62	586.34		586.52	0.005035	3.37	64.39	25.34	0.37
TWI000A	4315	01JAN2012 1500	161.54	581.62	585.77		585.93	0.005255	3.18	50.75	22.53	0.37
TWI000A	4315	01JAN2012 1600	124.90	581.62	585.32		585.46	0.005487	3.03	41.18	20.34	0.38
TWI000A	4315	01JAN2012 1700	105.43	581.62	585.06		585.19	0.005625	2.93	35.93	19.03	0.38
TWI000A	4315	01JAN2012 1800	92.84	581.62	584.87		585.00	0.005731	2.86	32.49	18.18	0.38
TWI000A	4315	01JAN2012 1900	66.60	581.62	584.40		584.52	0.006558	2.74	24.35	16.20	0.39
TWI000A	4315	01JAN2012 2000	60.30	581.62	584.27		584.38	0.006858	2.72	22.20	15.45	0.40
TWI000A	4315	01JAN2012 2100	55.62	581.62	584.16		584.27	0.007075	2.70	20.63	14.87	0.40
TWI000A	4315	01JAN2012 2200	51.78	581.62	584.07		584.18	0.007359	2.69	19.28	14.40	0.41
TWI000A	4315	01JAN2012 2300	48.60	581.62	583.99		584.10	0.007658	2.68	18.12	13.98	0.42
TWI000A	4315	01JAN2012 2400	45.93	581.62	583.92		584.03	0.007909	2.68	17.17	13.64	0.42
TWI000A	4239	Max WS	3191.92	581.19	592.38		593.86	0.010851	10.59	480.26	105.24	0.65
TWI000A	4239	31DEC2011 2400	12.19	581.19	582.40		582.46	0.008551	1.94	6.30	8.84	0.40
TWI000A	4239	01JAN2012 0100	32.22	581.19	583.21		583.28	0.005511	2.17	14.87	12.46	0.35
TWI000A	4239	01JAN2012 0200	34.83	581.19	583.29		583.36	0.005361	2.19	15.90	12.82	0.35
TWI000A	4239	01JAN2012 0300	36.90	581.19	583.34		583.42	0.005341	2.22	16.61	13.07	0.35
TWI000A	4239	01JAN2012 0400	39.43	581.19	583.41		583.49	0.005308	2.26	17.46	13.33	0.35
TWI000A	4239	01JAN2012 0500	42.51	581.19	583.49		583.57	0.005243	2.30	18.51	13.63	0.35
TWI000A	4239	01JAN2012 0600	46.45	581.19	583.58		583.67	0.005185	2.34	19.81	14.00	0.35
TWI000A	4239	01JAN2012 0700	64.42	581.19	583.97		584.07	0.004979	2.52	25.53	15.60	0.35
TWI000A	4239	01JAN2012 0800	75.95	581.19	584.18		584.28	0.004933	2.63	28.91	16.47	0.35
TWI000A	4239	01JAN2012 0900	93.86	581.19	584.48		584.60	0.004750	2.75	34.09	17.50	0.35
TWI000A	4239	01JAN2012 1000	129.62	581.19	584.99		585.12	0.004694	2.99	43.42	19.48	0.35
TWI000A	4239	01JAN2012 1100	182.04	581.19	585.60		585.76	0.004637	3.25	56.02	21.82	0.36
TWI000A	4239	01JAN2012 1200	825.20	581.19	589.02		589.48	0.005842	5.47	170.73	71.60	0.44
TWI000A	4239	01JAN2012 1300	553.45	581.19	588.48		588.75	0.003918	4.18	135.19	57.34	0.35
TWI000A	4239	01JAN2012 1400	218.71	581.19	585.98		586.15	0.004559	3.39	64.56	23.27	0.36
TWI000A	4239	01JAN2012 1500	162.72	581.19	585.40		585.55	0.004575	3.14	51.82	21.07	0.35
TWI000A	4239	01JAN2012 1600	125.77	581.19	584.95		585.08	0.004627	2.95	42.70	19.34	0.35
TWI000A	4239	01JAN2012 1700	106.13	581.19	584.67		584.80	0.004679	2.83	37.53	18.27	0.35
TWI000A	4239	01JAN2012 1800	93.44	581.19	584.49		584.60	0.004677	2.73	34.17	17.52	0.35
TWI000A	4239	01JAN2012 1900	67.01	581.19	584.03		584.13	0.004881	2.53	26.47	15.85	0.35

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	4239	01JAN2012 2000	60.66	581.19	583.90		584.00	0.004931	2.47	24.52	15.33	0.34
TWI000A	4239	01JAN2012 2100	55.94	581.19	583.80		583.89	0.004974	2.43	23.03	14.92	0.34
TWI000A	4239	01JAN2012 2200	52.07	581.19	583.72		583.81	0.005026	2.39	21.78	14.57	0.34
TWI000A	4239	01JAN2012 2300	48.87	581.19	583.64		583.73	0.005088	2.36	20.70	14.26	0.35
TWI000A	4239	01JAN2012 2400	46.18	581.19	583.58		583.66	0.005127	2.33	19.81	14.00	0.35
TWI000A	4155	Max WS	3214.31	580.71	592.43		592.75	0.003311	5.52	1059.63	217.96	0.36
TWI000A	4155	31DEC2011 2400	12.35	580.71	582.14		582.16	0.002685	1.29	9.59	10.37	0.24
TWI000A	4155	01JAN2012 0100	32.20	580.71	582.89		582.94	0.002895	1.74	18.54	13.32	0.26
TWI000A	4155	01JAN2012 0200	34.93	580.71	582.97		583.02	0.002882	1.77	19.68	13.61	0.26
TWI000A	4155	01JAN2012 0300	37.00	580.71	583.03		583.08	0.002895	1.81	20.47	13.81	0.26
TWI000A	4155	01JAN2012 0400	39.55	580.71	583.10		583.15	0.002926	1.85	21.39	14.04	0.26
TWI000A	4155	01JAN2012 0500	42.64	580.71	583.17		583.23	0.002952	1.89	22.50	14.31	0.27
TWI000A	4155	01JAN2012 0600	46.58	580.71	583.27		583.33	0.002990	1.95	23.87	14.64	0.27
TWI000A	4155	01JAN2012 0700	64.60	580.71	583.66		583.73	0.003109	2.17	29.81	15.98	0.28
TWI000A	4155	01JAN2012 0800	76.18	580.71	583.86		583.95	0.003215	2.29	33.20	16.70	0.29
TWI000A	4155	01JAN2012 0900	94.17	580.71	584.17		584.26	0.003280	2.45	38.47	17.76	0.29
TWI000A	4155	01JAN2012 1000	130.07	580.71	584.67		584.78	0.003465	2.73	47.72	19.42	0.31
TWI000A	4155	01JAN2012 1100	182.77	580.71	585.27		585.41	0.003658	3.05	60.74	28.32	0.32
TWI000A	4155	01JAN2012 1200	811.39	580.71	588.83		589.01	0.003700	3.71	332.30	129.47	0.34
TWI000A	4155	01JAN2012 1300	566.71	580.71	588.29		588.42	0.003237	3.17	263.03	126.67	0.31
TWI000A	4155	01JAN2012 1400	220.53	580.71	585.65		585.81	0.003687	3.20	73.28	36.73	0.33
TWI000A	4155	01JAN2012 1500	164.06	580.71	585.08		585.21	0.003560	2.93	56.00	20.77	0.31
TWI000A	4155	01JAN2012 1600	126.76	580.71	584.64		584.75	0.003414	2.69	47.08	19.32	0.30
TWI000A	4155	01JAN2012 1700	106.93	580.71	584.36		584.46	0.003337	2.55	41.95	18.42	0.30
TWI000A	4155	01JAN2012 1800	94.12	580.71	584.18		584.27	0.003244	2.44	38.61	17.79	0.29
TWI000A	4155	01JAN2012 1900	67.49	580.71	583.72		583.79	0.003098	2.19	30.81	16.20	0.28
TWI000A	4155	01JAN2012 2000	61.07	580.71	583.60		583.67	0.003044	2.12	28.84	15.77	0.28
TWI000A	4155	01JAN2012 2100	56.31	580.71	583.50		583.56	0.003020	2.06	27.27	15.42	0.27
TWI000A	4155	01JAN2012 2200	52.41	580.71	583.41		583.47	0.002993	2.02	25.98	15.13	0.27
TWI000A	4155	01JAN2012 2300	49.18	580.71	583.34		583.40	0.002980	1.98	24.85	14.87	0.27
TWI000A	4155	01JAN2012 2400	46.46	580.71	583.27		583.33	0.002961	1.94	23.91	14.65	0.27
TWI000A	3981	Max WS	3248.08	579.93	590.75		591.85	0.010748	9.01	532.10	134.29	0.64
TWI000A	3981	31DEC2011 2400	12.72	579.93	581.77		581.79	0.001743	1.14	11.19	10.36	0.19
TWI000A	3981	01JAN2012 0100	32.15	579.93	582.40		582.45	0.002822	1.74	18.50	12.88	0.26
TWI000A	3981	01JAN2012 0200	35.12	579.93	582.47		582.52	0.002955	1.81	19.39	13.13	0.26
TWI000A	3981	01JAN2012 0300	37.21	579.93	582.52		582.57	0.003046	1.86	20.00	13.29	0.27
TWI000A	3981	01JAN2012 0400	39.77	579.93	582.57		582.63	0.003155	1.92	20.72	13.49	0.27
TWI000A	3981	01JAN2012 0500	42.87	579.93	582.64		582.70	0.003271	1.98	21.60	13.72	0.28
TWI000A	3981	01JAN2012 0600	46.84	579.93	582.72		582.78	0.003387	2.06	22.74	13.99	0.28
TWI000A	3981	01JAN2012 0700	64.94	579.93	583.04		583.12	0.003895	2.37	27.35	15.01	0.31
TWI000A	3981	01JAN2012 0800	76.62	579.93	583.21		583.31	0.004201	2.55	29.99	15.57	0.32
TWI000A	3981	01JAN2012 0900	94.77	579.93	583.47		583.59	0.004503	2.78	34.12	16.40	0.34
TWI000A	3981	01JAN2012 1000	130.95	579.93	583.87		584.03	0.005201	3.19	41.09	17.82	0.37
TWI000A	3981	01JAN2012 1100	184.16	579.93	584.38		584.58	0.005896	3.65	50.51	19.59	0.40
TWI000A	3981	01JAN2012 1200	773.55	579.93	587.60		587.99	0.008800	5.04	167.37	87.88	0.51
TWI000A	3981	01JAN2012 1300	594.06	579.93	586.97		587.35	0.009948	4.90	122.41	58.10	0.53
TWI000A	3981	01JAN2012 1400	223.96	579.93	584.71		584.95	0.006262	3.92	57.17	20.79	0.42
TWI000A	3981	01JAN2012 1500	166.58	579.93	584.22		584.41	0.005690	3.51	47.51	19.05	0.39
TWI000A	3981	01JAN2012 1600	128.62	579.93	583.85		584.01	0.005158	3.16	40.67	17.74	0.37
TWI000A	3981	01JAN2012 1700	108.44	579.93	583.62		583.76	0.004825	2.95	36.73	16.94	0.35
TWI000A	3981	01JAN2012 1800	95.40	579.93	583.47		583.60	0.004515	2.79	34.25	16.42	0.34
TWI000A	3981	01JAN2012 1900	68.41	579.93	583.09		583.18	0.003991	2.43	28.15	15.18	0.31
TWI000A	3981	01JAN2012 2000	61.85	579.93	582.99		583.07	0.003791	2.32	26.66	14.87	0.31
TWI000A	3981	01JAN2012 2100	57.00	579.93	582.91		582.99	0.003629	2.23	25.54	14.62	0.30
TWI000A	3981	01JAN2012 2200	53.05	579.93	582.85		582.92	0.003500	2.16	24.57	14.41	0.29
TWI000A	3981	01JAN2012 2300	49.77	579.93	582.78		582.85	0.003445	2.11	23.60	14.19	0.29
TWI000A	3981	01JAN2012 2400	47.01	579.93	582.72		582.79	0.003386	2.06	22.80	14.01	0.28
TWI000A	3902	Max WS	3265.49	579.57	589.82		591.04	0.011771	10.36	584.25	188.04	0.73
TWI000A	3902	31DEC2011 2400	12.86	579.57	580.66		580.83	0.026369	3.30	3.89	6.48	0.75
TWI000A	3902	01JAN2012 0100	32.17	579.57	581.16		581.43	0.025344	4.17	7.72	8.72	0.78
TWI000A	3902	01JAN2012 0200	35.22	579.57	581.22		581.50	0.025691	4.29	8.21	8.96	0.79
TWI000A	3902	01JAN2012 0300	37.31	579.57	581.26		581.55	0.025791	4.36	8.55	9.13	0.79
TWI000A	3902	01JAN2012 0400	39.88	579.57	581.30		581.61	0.025759	4.44	8.98	9.33	0.80
TWI000A	3902	01JAN2012 0500	43.00	579.57	581.36		581.68	0.025553	4.52	9.52	9.58	0.80
TWI000A	3902	01JAN2012 0600	46.97	579.57	581.43		581.76	0.025106	4.59	10.23	9.90	0.80
TWI000A	3902	01JAN2012 0700	65.14	579.57	581.71		582.09	0.024395	4.98	13.09	10.92	0.80
TWI000A	3902	01JAN2012 0800	76.88	579.57	581.86		582.28	0.024277	5.20	14.78	11.48	0.81
TWI000A	3902	01JAN2012 0900	95.13	579.57	582.09		582.55	0.023295	5.43	17.52	12.32	0.80
TWI000A	3902	01JAN2012 1000	131.47	579.57	582.45		582.99	0.023143	5.91	22.23	13.60	0.82
TWI000A	3902	01JAN2012 1100	185.02	579.57	582.91		583.55	0.022455	6.44	28.74	15.02	0.82
TWI000A	3902	01JAN2012 1200	764.80	579.57	585.89		587.05	0.019435	8.62	88.71	26.49	0.83
TWI000A	3902	01JAN2012 1300	601.86	579.57	585.24		586.31	0.019740	8.30	72.55	23.11	0.82
TWI000A	3902	01JAN2012 1400	225.55	579.57	583.21		583.92	0.021918	6.74	33.48	15.97	0.82
TWI000A	3902	01JAN2012 1500	167.77	579.57	582.77		583.38	0.022579	6.28	26.73	14.59	0.82
TWI000A	3902	01JAN2012 1600	129.51	579.57	582.43		582.97	0.023106	5.89	22.00	13.55	0.81
TWI000A	3902	01JAN2012 1700	109.17	579.57	582.23		582.73	0.023486	5.65	19.32	12.84	0.81
TWI000A	3902	01JAN2012 1800	96.03	579.57	582.10		582.56	0.023238	5.44	17.66	12.36	0.80
TWI000A	3902	01JAN2012 1900	68.85	579.57	581.76		582.15	0.024338	5.05	13.64	11.10	0.80
TWI000A	3902	01JAN2012 2000	62.22	579.57	581.67		582.04	0.024204	4.90	12.70	10.79	0.80
TWI000A	3902	01JAN2012 2100	57.34	579.57	581.61		581.96	0.023907	4.77	12.02	10.56	0.79
TWI000A	3902	01JAN2012 2200	53.37	579.57	581.55		581.89	0.023870	4.67	11.43	10.35	0.78

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	3902	01JAN2012 2300	50.05	579.57	581.49		581.82	0.024518	4.63	10.81	10.13	0.79
TWI000A	3902	01JAN2012 2400	47.28	579.57	581.44		581.77	0.024966	4.59	10.30	9.93	0.79
TWI000A	3556	Max WS	3333.62	574.86	585.68		587.21	0.011314	10.51	418.98	113.63	0.72
TWI000A	3556	31DEC2011 2400	13.70	574.86	576.60		576.61	0.000530	0.78	17.67	13.91	0.12
TWI000A	3556	01JAN2012 0100	32.23	574.86	576.94		576.97	0.001424	1.42	22.67	14.93	0.20
TWI000A	3556	01JAN2012 0200	35.61	574.86	576.99		577.02	0.001601	1.53	23.32	15.06	0.22
TWI000A	3556	01JAN2012 0300	37.73	574.86	577.02		577.06	0.001697	1.59	23.79	15.15	0.22
TWI000A	3556	01JAN2012 0400	40.33	574.86	577.06		577.11	0.001784	1.65	24.49	15.28	0.23
TWI000A	3556	01JAN2012 0500	43.48	574.86	577.12		577.17	0.001867	1.71	25.41	15.46	0.24
TWI000A	3556	01JAN2012 0600	47.52	574.86	577.19		577.24	0.001978	1.79	26.50	15.66	0.24
TWI000A	3556	01JAN2012 0700	65.88	574.86	577.44		577.51	0.002556	2.16	30.46	16.39	0.28
TWI000A	3556	01JAN2012 0800	77.84	574.86	577.58		577.67	0.002883	2.37	32.82	16.77	0.30
TWI000A	3556	01JAN2012 0900	96.44	574.86	577.79		577.90	0.003330	2.66	36.26	17.30	0.32
TWI000A	3556	01JAN2012 1000	133.45	574.86	578.16		578.31	0.003935	3.10	43.01	18.29	0.36
TWI000A	3556	01JAN2012 1100	188.28	574.86	578.63		578.83	0.004651	3.63	51.80	19.52	0.39
TWI000A	3556	01JAN2012 1200	759.30	574.86	581.47		582.11	0.008021	6.41	118.45	27.87	0.55
TWI000A	3556	01JAN2012 1300	628.65	574.86	581.06		581.59	0.007129	5.86	107.25	26.44	0.51
TWI000A	3556	01JAN2012 1400	231.78	574.86	578.98		579.22	0.004975	3.95	58.73	20.46	0.41
TWI000A	3556	01JAN2012 1500	172.43	574.86	578.51		578.70	0.004416	3.48	49.55	19.21	0.38
TWI000A	3556	01JAN2012 1600	132.97	574.86	578.17		578.32	0.003886	3.09	43.10	18.31	0.35
TWI000A	3556	01JAN2012 1700	112.01	574.86	577.97		578.09	0.003534	2.84	39.47	17.78	0.34
TWI000A	3556	01JAN2012 1800	98.45	574.86	577.82		577.93	0.003322	2.67	36.83	17.38	0.32
TWI000A	3556	01JAN2012 1900	70.55	574.86	577.51		577.58	0.002657	2.24	31.53	16.56	0.29
TWI000A	3556	01JAN2012 2000	63.68	574.86	577.42		577.49	0.002450	2.11	30.19	16.34	0.27
TWI000A	3556	01JAN2012 2100	58.66	574.86	577.36		577.42	0.002300	2.01	29.13	16.15	0.26
TWI000A	3556	01JAN2012 2200	54.57	574.86	577.30		577.36	0.002182	1.93	28.21	15.98	0.26
TWI000A	3556	01JAN2012 2300	51.16	574.86	577.25		577.31	0.002074	1.86	27.44	15.84	0.25
TWI000A	3556	01JAN2012 2400	48.31	574.86	577.21		577.26	0.001976	1.80	26.81	15.72	0.24
TWI000A	3490	Max WS	3347.91	574.69	584.86		586.47	0.010429	10.43	378.99	100.66	0.71
TWI000A	3490	31DEC2011 2400	13.94	574.69	576.55		576.56	0.000793	0.84	16.64	16.13	0.15
TWI000A	3490	01JAN2012 0100	32.25	574.69	576.82		576.86	0.002161	1.52	21.21	17.83	0.25
TWI000A	3490	01JAN2012 0200	35.69	574.69	576.85		576.89	0.002485	1.64	21.70	18.00	0.26
TWI000A	3490	01JAN2012 0300	37.82	574.69	576.87		576.92	0.002652	1.71	22.11	18.14	0.27
TWI000A	3490	01JAN2012 0400	40.42	574.69	576.91		576.96	0.002773	1.77	22.83	18.39	0.28
TWI000A	3490	01JAN2012 0500	43.58	574.69	576.97		577.02	0.002866	1.83	23.82	18.73	0.29
TWI000A	3490	01JAN2012 0600	47.64	574.69	577.03		577.08	0.003006	1.91	24.98	19.11	0.29
TWI000A	3490	01JAN2012 0700	66.03	574.69	577.22		577.30	0.003914	2.29	28.79	20.33	0.34
TWI000A	3490	01JAN2012 0800	78.04	574.69	577.34		577.44	0.004325	2.49	31.30	21.01	0.36
TWI000A	3490	01JAN2012 0900	96.70	574.69	577.51		577.63	0.004864	2.77	34.91	21.81	0.39
TWI000A	3490	01JAN2012 1000	133.84	574.69	577.87		578.02	0.005170	3.11	42.97	23.49	0.41
TWI000A	3490	01JAN2012 1100	188.94	574.69	578.31		578.50	0.005447	3.50	53.93	25.60	0.43
TWI000A	3490	01JAN2012 1200	758.36	574.69	581.23		581.65	0.005405	5.19	146.12	37.43	0.46
TWI000A	3490	01JAN2012 1300	634.86	574.69	580.82		581.18	0.005108	4.84	131.07	35.77	0.45
TWI000A	3490	01JAN2012 1400	233.13	574.69	578.67		578.88	0.005283	3.68	63.32	27.19	0.43
TWI000A	3490	01JAN2012 1500	173.45	574.69	578.20		578.38	0.005350	3.40	51.06	25.07	0.42
TWI000A	3490	01JAN2012 1600	133.72	574.69	577.88		578.02	0.005087	3.10	43.19	23.54	0.40
TWI000A	3490	01JAN2012 1700	112.62	574.69	577.68		577.81	0.004899	2.91	38.76	22.63	0.39
TWI000A	3490	01JAN2012 1800	98.96	574.69	577.55		577.66	0.004788	2.77	35.68	21.98	0.38
TWI000A	3490	01JAN2012 1900	70.91	574.69	577.28		577.37	0.004020	2.36	30.03	20.71	0.35
TWI000A	3490	01JAN2012 2000	63.99	574.69	577.21		577.29	0.003725	2.23	28.65	20.29	0.33
TWI000A	3490	01JAN2012 2100	58.94	574.69	577.16		577.23	0.003504	2.14	27.58	19.95	0.32
TWI000A	3490	01JAN2012 2200	54.83	574.69	577.11		577.18	0.003321	2.05	26.68	19.67	0.31
TWI000A	3490	01JAN2012 2300	51.40	574.69	577.08		577.14	0.003148	1.98	25.96	19.44	0.30
TWI000A	3490	01JAN2012 2400	48.52	574.69	577.05		577.10	0.002988	1.91	25.37	19.24	0.29
TWI000A	3161	Max WS	3415.00	572.39	582.35		583.48	0.007306	9.52	531.85	153.01	0.65
TWI000A	3161	31DEC2011 2400	14.88	572.39	573.31		573.44	0.023169	2.88	5.17	11.71	0.76
TWI000A	3161	01JAN2012 0100	32.19	572.39	573.64		573.82	0.019021	3.47	9.29	13.63	0.74
TWI000A	3161	01JAN2012 0200	36.05	572.39	573.71		573.90	0.017894	3.52	10.24	14.03	0.73
TWI000A	3161	01JAN2012 0300	38.20	572.39	573.74		573.94	0.017262	3.54	10.79	14.25	0.72
TWI000A	3161	01JAN2012 0400	40.82	572.39	573.79		573.99	0.016666	3.57	11.43	14.50	0.71
TWI000A	3161	01JAN2012 0500	44.01	572.39	573.84		574.04	0.016002	3.61	12.21	14.81	0.70
TWI000A	3161	01JAN2012 0600	48.14	572.39	573.90		574.11	0.015479	3.66	13.14	15.16	0.69
TWI000A	3161	01JAN2012 0700	66.68	572.39	574.12		574.37	0.015143	4.02	16.58	16.33	0.70
TWI000A	3161	01JAN2012 0800	78.88	572.39	574.27		574.54	0.014140	4.15	19.00	16.87	0.69
TWI000A	3161	01JAN2012 0900	97.83	572.39	574.48		574.77	0.013023	4.33	22.60	17.65	0.67
TWI000A	3161	01JAN2012 1000	135.49	572.39	574.80		575.15	0.012600	4.74	28.58	18.87	0.68
TWI000A	3161	01JAN2012 1100	191.79	572.39	575.22		575.64	0.012310	5.23	36.69	20.44	0.69
TWI000A	3161	01JAN2012 1200	751.44	572.39	577.51		578.50	0.014065	8.02	93.73	29.75	0.80
TWI000A	3161	01JAN2012 1300	663.28	572.39	577.24		578.16	0.013730	7.71	86.02	28.45	0.78
TWI000A	3161	01JAN2012 1400	239.02	572.39	575.50		575.99	0.012549	5.62	42.55	21.50	0.70
TWI000A	3161	01JAN2012 1500	177.93	572.39	575.12		575.53	0.012310	5.11	34.81	20.09	0.68
TWI000A	3161	01JAN2012 1600	137.04	572.39	574.81		575.17	0.012627	4.76	28.78	18.91	0.68
TWI000A	3161	01JAN2012 1700	115.30	572.39	574.63		574.95	0.013038	4.56	25.28	18.21	0.68
TWI000A	3161	01JAN2012 1800	101.24	572.39	574.50		574.80	0.013141	4.39	23.06	17.75	0.68
TWI000A	3161	01JAN2012 1900	72.53	572.39	574.19		574.45	0.014844	4.11	17.66	16.57	0.70
TWI000A	3161	01JAN2012 2000	65.36	572.39	574.10		574.35	0.015430	4.02	16.26	16.25	0.71
TWI000A	3161	01JAN2012 2100	60.16	572.39	574.04		574.28	0.015692	3.94	15.27	15.95	0.71
TWI000A	3161	01JAN2012 2200	55.95	572.39	573.99		574.22	0.015763	3.86	14.50	15.67	0.71
TWI000A	3161	01JAN2012 2300	52.43	572.39	573.95		574.17	0.015736	3.78	13.86	15.43	0.70
TWI000A	3161	01JAN2012 2400	49.48	572.39	573.92		574.13	0.015647	3.71	13.34	15.24	0.70

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	3010	Max WS	3394.40	570.55	581.16	581.11	582.41	0.007648	9.50	487.75	240.05	0.66
TWI000A	3010	31DEC2011 2400	15.15	570.55	571.68		571.73	0.004371	1.68	9.00	13.03	0.36
TWI000A	3010	01JAN2012 0100	31.97	570.55	571.97		572.06	0.006828	2.46	13.00	14.83	0.46
TWI000A	3010	01JAN2012 0200	36.03	570.55	572.02		572.12	0.007473	2.63	13.71	15.12	0.49
TWI000A	3010	01JAN2012 0300	38.18	570.55	572.04		572.16	0.007771	2.71	14.08	15.28	0.50
TWI000A	3010	01JAN2012 0400	40.79	570.55	572.07		572.19	0.008174	2.81	14.50	15.45	0.51
TWI000A	3010	01JAN2012 0500	43.98	570.55	572.10		572.23	0.008659	2.93	14.99	15.64	0.53
TWI000A	3010	01JAN2012 0600	48.10	570.55	572.14		572.29	0.009226	3.08	15.62	15.89	0.55
TWI000A	3010	01JAN2012 0700	66.60	570.55	572.31		572.51	0.011118	3.61	18.44	16.96	0.61
TWI000A	3010	01JAN2012 0800	78.77	570.55	572.43		572.66	0.011704	3.86	20.42	17.67	0.63
TWI000A	3010	01JAN2012 0900	97.67	570.55	572.58		572.85	0.012727	4.22	23.14	18.60	0.67
TWI000A	3010	01JAN2012 1000	135.21	570.55	572.83		573.19	0.014223	4.81	28.14	20.19	0.72
TWI000A	3010	01JAN2012 1100	191.52	570.55	573.17		573.63	0.014798	5.43	35.26	21.57	0.75
TWI000A	3010	01JAN2012 1200	739.56	570.55	575.57		576.51	0.012241	7.76	95.34	28.45	0.75
TWI000A	3010	01JAN2012 1300	669.42	570.55	575.39		576.25	0.011733	7.42	90.21	27.94	0.73
TWI000A	3010	01JAN2012 1400	239.29	570.55	573.45		573.97	0.014520	5.80	41.23	22.39	0.75
TWI000A	3010	01JAN2012 1500	178.18	570.55	573.11		573.54	0.014476	5.27	33.83	21.35	0.74
TWI000A	3010	01JAN2012 1600	137.21	570.55	572.85		573.21	0.014080	4.81	28.54	20.32	0.71
TWI000A	3010	01JAN2012 1700	115.41	570.55	572.71		573.02	0.013451	4.51	25.59	19.40	0.69
TWI000A	3010	01JAN2012 1800	101.32	570.55	572.61		572.89	0.012753	4.27	23.74	18.80	0.67
TWI000A	3010	01JAN2012 1900	72.62	570.55	572.38		572.59	0.011104	3.70	19.63	17.39	0.61
TWI000A	3010	01JAN2012 2000	65.40	570.55	572.31		572.51	0.010664	3.54	18.47	16.97	0.60
TWI000A	3010	01JAN2012 2100	60.19	570.55	572.27		572.45	0.010259	3.41	17.65	16.67	0.58
TWI000A	3010	01JAN2012 2200	55.98	570.55	572.23		572.39	0.009875	3.30	16.99	16.42	0.57
TWI000A	3010	01JAN2012 2300	52.45	570.55	572.19		572.35	0.009510	3.19	16.43	16.21	0.56
TWI000A	3010	01JAN2012 2400	49.50	570.55	572.16		572.31	0.009175	3.10	15.97	16.03	0.55
TWI000A	2970	Max WS	3887.54	571.22	580.97		581.86	0.001601	7.71	663.51	220.61	0.47
TWI000A	2970	31DEC2011 2400	15.26	571.22	571.57		571.60	0.004628	1.43	10.68	38.52	0.48
TWI000A	2970	01JAN2012 0100	35.87	571.22	571.79		571.84	0.003850	1.89	18.99	39.10	0.48
TWI000A	2970	01JAN2012 0200	40.46	571.22	571.83		571.89	0.003649	1.95	20.78	39.23	0.47
TWI000A	2970	01JAN2012 0300	42.98	571.22	571.85		571.91	0.003642	1.99	21.57	39.28	0.47
TWI000A	2970	01JAN2012 0400	46.03	571.22	571.87		571.94	0.003659	2.05	22.47	39.34	0.48
TWI000A	2970	01JAN2012 0500	49.78	571.22	571.90		571.97	0.003660	2.11	23.57	39.42	0.48
TWI000A	2970	01JAN2012 0600	54.61	571.22	571.94		572.01	0.003640	2.19	24.99	39.52	0.48
TWI000A	2970	01JAN2012 0700	76.15	571.22	572.10		572.19	0.003381	2.43	31.35	39.96	0.48
TWI000A	2970	01JAN2012 0800	90.93	571.22	572.21		572.31	0.003146	2.54	35.77	40.26	0.48
TWI000A	2970	01JAN2012 0900	113.68	571.22	572.36		572.47	0.002983	2.72	41.76	40.66	0.47
TWI000A	2970	01JAN2012 1000	158.62	571.22	572.63		572.77	0.002723	3.00	52.87	41.40	0.47
TWI000A	2970	01JAN2012 1100	225.59	571.22	572.99		573.16	0.002448	3.31	68.22	42.41	0.46
TWI000A	2970	01JAN2012 1200	886.34	571.22	575.61		575.95	0.001637	4.70	188.39	49.56	0.43
TWI000A	2970	01JAN2012 1300	821.10	571.22	575.38		575.71	0.001688	4.63	177.25	48.94	0.43
TWI000A	2970	01JAN2012 1400	285.05	571.22	573.29		573.48	0.002286	3.53	80.86	43.21	0.45
TWI000A	2970	01JAN2012 1500	211.10	571.22	572.91		573.08	0.002511	3.25	64.90	42.19	0.46
TWI000A	2970	01JAN2012 1600	161.93	571.22	572.65		572.79	0.002700	3.02	53.70	41.46	0.47
TWI000A	2970	01JAN2012 1700	135.96	571.22	572.49		572.62	0.002870	2.88	47.24	41.03	0.47
TWI000A	2970	01JAN2012 1800	119.08	571.22	572.39		572.51	0.002960	2.76	43.08	40.75	0.47
TWI000A	2970	01JAN2012 1900	84.83	571.22	572.16		572.26	0.003244	2.50	33.94	40.13	0.48
TWI000A	2970	01JAN2012 2000	76.18	571.22	572.10		572.19	0.003379	2.43	31.37	39.96	0.48
TWI000A	2970	01JAN2012 2100	69.95	571.22	572.05		572.14	0.003472	2.37	29.52	39.83	0.49
TWI000A	2970	01JAN2012 2200	64.92	571.22	572.01		572.10	0.003540	2.32	28.02	39.73	0.49
TWI000A	2970	01JAN2012 2300	60.71	571.22	571.98		572.06	0.003588	2.27	26.78	39.64	0.49
TWI000A	2970	01JAN2012 2400	57.19	571.22	571.96		572.03	0.003619	2.22	25.75	39.57	0.49
TWI000A	2820 Bowen Rd		Culvert									
TWI000A	2668	Max WS	3942.57	566.85	578.08		578.64	0.005953	7.71	859.35	224.81	0.48
TWI000A	2668	31DEC2011 2400	15.26	566.85	569.35		569.35	0.000251	0.60	25.50	13.81	0.08
TWI000A	2668	01JAN2012 0100	35.87	566.85	569.91		569.93	0.000635	1.07	33.63	15.08	0.13
TWI000A	2668	01JAN2012 0200	40.46	566.85	569.99		570.02	0.000725	1.16	34.94	15.27	0.13
TWI000A	2668	01JAN2012 0300	42.98	566.85	570.04		570.07	0.000771	1.20	35.68	15.38	0.14
TWI000A	2668	01JAN2012 0400	46.03	566.85	570.10		570.13	0.000825	1.26	36.59	15.51	0.14
TWI000A	2668	01JAN2012 0500	49.78	566.85	570.17		570.20	0.000887	1.32	37.71	15.69	0.15
TWI000A	2668	01JAN2012 0600	54.61	566.85	570.27		570.30	0.000982	1.39	39.19	16.26	0.16
TWI000A	2668	01JAN2012 0700	76.15	566.85	570.59		570.64	0.001412	1.70	44.87	18.29	0.19
TWI000A	2668	01JAN2012 0800	90.93	566.85	570.81		570.86	0.001651	1.86	48.88	19.60	0.21
TWI000A	2668	01JAN2012 0900	113.68	566.85	571.07		571.14	0.002012	2.09	54.33	21.24	0.23
TWI000A	2668	01JAN2012 1000	158.62	566.85	571.54		571.64	0.002390	2.46	64.57	22.42	0.26
TWI000A	2668	01JAN2012 1100	225.59	566.85	572.13		572.26	0.002857	2.89	78.14	24.24	0.28
TWI000A	2668	01JAN2012 1200	886.34	566.85	574.55		574.96	0.006410	5.42	214.36	120.52	0.45
TWI000A	2668	01JAN2012 1300	821.10	566.85	574.49		574.86	0.005853	5.13	207.27	116.72	0.43
TWI000A	2668	01JAN2012 1400	285.05	566.85	572.54		572.70	0.003314	3.22	88.54	26.12	0.31
TWI000A	2668	01JAN2012 1500	211.10	566.85	572.03		572.15	0.002713	2.79	75.69	23.77	0.28
TWI000A	2668	01JAN2012 1600	161.93	566.85	571.58		571.68	0.002395	2.47	65.46	22.52	0.26
TWI000A	2668	01JAN2012 1700	135.96	566.85	571.33		571.41	0.002175	2.27	59.92	21.91	0.24
TWI000A	2668	01JAN2012 1800	119.08	566.85	571.14		571.21	0.002043	2.13	55.83	21.44	0.23
TWI000A	2668	01JAN2012 1900	84.83	566.85	570.72		570.77	0.001555	1.80	47.25	19.08	0.20
TWI000A	2668	01JAN2012 2000	76.18	566.85	570.60		570.64	0.001411	1.70	44.90	18.30	0.19
TWI000A	2668	01JAN2012 2100	69.95	566.85	570.51		570.55	0.001294	1.62	43.26	17.74	0.18
TWI000A	2668	01JAN2012 2200	64.92	566.85	570.43		570.47	0.001193	1.55	41.97	17.28	0.17
TWI000A	2668	01JAN2012 2300	60.71	566.85	570.37		570.40	0.001104	1.48	40.92	16.90	0.17
TWI000A	2668	01JAN2012 2400	57.19	566.85	570.32		570.35	0.001027	1.43	40.06	16.58	0.16
TWI000A	2599	Max WS	3936.53	567.91	577.31		578.21	0.008932	8.90	671.64	189.45	0.61

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	2599	31DEC2011 2400	15.54	567.91	569.03		569.09	0.008675	1.94	7.99	11.49	0.41
TWI000A	2599	01JAN2012 0100	35.69	567.91	569.48		569.58	0.010215	2.59	13.80	14.55	0.47
TWI000A	2599	01JAN2012 0200	40.44	567.91	569.59		569.69	0.009638	2.62	15.43	15.27	0.46
TWI000A	2599	01JAN2012 0300	42.96	567.91	569.63		569.74	0.009626	2.66	16.14	15.57	0.46
TWI000A	2599	01JAN2012 0400	46.01	567.91	569.69		569.80	0.009511	2.70	17.04	15.95	0.46
TWI000A	2599	01JAN2012 0500	49.75	567.91	569.76		569.87	0.009308	2.74	18.19	16.41	0.46
TWI000A	2599	01JAN2012 0600	54.57	567.91	569.85		569.97	0.008987	2.77	19.71	17.01	0.45
TWI000A	2599	01JAN2012 0700	76.09	567.91	570.19		570.32	0.008342	2.95	25.83	19.16	0.45
TWI000A	2599	01JAN2012 0800	90.83	567.91	570.39		570.54	0.007956	3.04	29.87	20.36	0.44
TWI000A	2599	01JAN2012 0900	113.54	567.91	570.66		570.82	0.007661	3.19	35.61	21.96	0.44
TWI000A	2599	01JAN2012 1000	158.37	567.91	571.13		571.31	0.007190	3.40	46.61	24.85	0.44
TWI000A	2599	01JAN2012 1100	225.34	567.91	571.73		571.93	0.006646	3.60	62.67	28.93	0.43
TWI000A	2599	01JAN2012 1200	872.56	567.91	574.02		574.46	0.008301	5.46	186.19	98.85	0.52
TWI000A	2599	01JAN2012 1300	828.95	567.91	573.99		574.40	0.007722	5.24	183.51	97.45	0.50
TWI000A	2599	01JAN2012 1400	285.32	567.91	572.13		572.35	0.006927	3.81	74.82	32.67	0.44
TWI000A	2599	01JAN2012 1500	211.35	567.91	571.64		571.83	0.006565	3.52	59.99	28.29	0.43
TWI000A	2599	01JAN2012 1600	162.08	567.91	571.18		571.36	0.007058	3.39	47.76	25.17	0.43
TWI000A	2599	01JAN2012 1700	136.05	567.91	570.93		571.09	0.007193	3.27	41.59	23.51	0.43
TWI000A	2599	01JAN2012 1800	119.15	567.91	570.74		570.90	0.007394	3.19	37.37	22.43	0.44
TWI000A	2599	01JAN2012 1900	84.90	567.91	570.31		570.45	0.008090	3.00	28.27	19.90	0.44
TWI000A	2599	01JAN2012 2000	76.22	567.91	570.19		570.33	0.008323	2.95	25.88	19.18	0.45
TWI000A	2599	01JAN2012 2100	69.98	567.91	570.10		570.23	0.008445	2.89	24.20	18.64	0.45
TWI000A	2599	01JAN2012 2200	64.95	567.91	570.03		570.15	0.008510	2.84	22.84	18.17	0.45
TWI000A	2599	01JAN2012 2300	60.73	567.91	569.96		570.08	0.008593	2.80	21.67	17.74	0.45
TWI000A	2599	01JAN2012 2400	57.21	567.91	569.91		570.03	0.008629	2.76	20.71	17.39	0.45
TWI000A	2389	Max WS	3939.07	565.02	576.00		576.55	0.005881	7.67	758.73	172.22	0.47
TWI000A	2389	31DEC2011 2400	17.84	565.02	568.22		568.23	0.000178	0.55	32.57	14.73	0.06
TWI000A	2389	01JAN2012 0100	34.96	565.02	568.46		568.47	0.000515	0.97	36.07	15.37	0.11
TWI000A	2389	01JAN2012 0200	40.57	565.02	568.64		568.66	0.000565	1.04	39.04	16.09	0.12
TWI000A	2389	01JAN2012 0300	43.08	565.02	568.69		568.71	0.000607	1.08	39.78	16.27	0.12
TWI000A	2389	01JAN2012 0400	46.14	565.02	568.75		568.77	0.000652	1.13	40.81	16.50	0.13
TWI000A	2389	01JAN2012 0500	49.88	565.02	568.83		568.85	0.000703	1.19	42.08	16.79	0.13
TWI000A	2389	01JAN2012 0600	54.70	565.02	568.93		568.95	0.000766	1.25	43.72	17.16	0.14
TWI000A	2389	01JAN2012 0700	76.33	565.02	569.33		569.36	0.001000	1.50	50.94	18.70	0.16
TWI000A	2389	01JAN2012 0800	91.07	565.02	569.53		569.57	0.001180	1.66	54.74	19.45	0.17
TWI000A	2389	01JAN2012 0900	113.82	565.02	569.83		569.88	0.001403	1.87	60.73	20.59	0.19
TWI000A	2389	01JAN2012 1000	158.88	565.02	570.29		570.37	0.001827	2.24	70.79	22.38	0.22
TWI000A	2389	01JAN2012 1100	226.54	565.02	570.88		570.99	0.002328	2.68	84.52	24.60	0.25
TWI000A	2389	01JAN2012 1200	854.74	565.02	572.59		572.97	0.005905	5.41	225.68	125.83	0.43
TWI000A	2389	01JAN2012 1300	858.45	565.02	572.74		573.07	0.005082	5.12	244.38	131.18	0.40
TWI000A	2389	01JAN2012 1400	288.88	565.02	571.17		571.32	0.002978	3.14	93.37	41.32	0.29
TWI000A	2389	01JAN2012 1500	214.00	565.02	570.81		570.91	0.002189	2.58	82.86	24.34	0.25
TWI000A	2389	01JAN2012 1600	163.96	565.02	570.35		570.43	0.001860	2.28	72.02	22.58	0.22
TWI000A	2389	01JAN2012 1700	137.55	565.02	570.10		570.16	0.001619	2.07	66.43	21.62	0.21
TWI000A	2389	01JAN2012 1800	120.39	565.02	569.92		569.98	0.001440	1.92	62.76	20.97	0.20
TWI000A	2389	01JAN2012 1900	85.85	565.02	569.45		569.49	0.001125	1.61	53.29	19.17	0.17
TWI000A	2389	01JAN2012 2000	76.97	565.02	569.33		569.37	0.001015	1.51	50.99	18.70	0.16
TWI000A	2389	01JAN2012 2100	70.65	565.02	569.24		569.27	0.000935	1.43	49.28	18.35	0.15
TWI000A	2389	01JAN2012 2200	65.57	565.02	569.16		569.18	0.000874	1.37	47.77	18.04	0.15
TWI000A	2389	01JAN2012 2300	61.31	565.02	569.07		569.10	0.000830	1.33	46.26	17.72	0.14
TWI000A	2389	01JAN2012 2400	57.74	565.02	569.00		569.02	0.000792	1.28	44.99	17.44	0.14
TWI000A	2202	Max WS	3928.78	565.73	575.10		575.57	0.004659	6.78	958.90	204.60	0.44
TWI000A	2202	31DEC2011 2400	21.93	565.73	568.19		568.19	0.000222	0.54	40.95	26.07	0.08
TWI000A	2202	01JAN2012 0100	33.65	565.73	568.38		568.39	0.000374	0.73	46.06	27.19	0.10
TWI000A	2202	01JAN2012 0200	40.67	565.73	568.56		568.57	0.000407	0.80	51.12	28.25	0.10
TWI000A	2202	01JAN2012 0300	43.17	565.73	568.60		568.61	0.000431	0.83	52.27	28.48	0.11
TWI000A	2202	01JAN2012 0400	46.24	565.73	568.66		568.67	0.000453	0.86	53.90	28.81	0.11
TWI000A	2202	01JAN2012 0500	49.97	565.73	568.73		568.74	0.000477	0.89	55.93	29.22	0.11
TWI000A	2202	01JAN2012 0600	54.79	565.73	568.82		568.83	0.000504	0.94	58.58	29.74	0.12
TWI000A	2202	01JAN2012 0700	76.57	565.73	569.20		569.21	0.000595	1.09	70.24	32.06	0.13
TWI000A	2202	01JAN2012 0800	91.21	565.73	569.37		569.40	0.000679	1.20	76.05	33.19	0.14
TWI000A	2202	01JAN2012 0900	113.96	565.73	569.65		569.68	0.000773	1.33	85.46	35.02	0.15
TWI000A	2202	01JAN2012 1000	159.19	565.73	570.07		570.11	0.000968	1.58	102.03	45.13	0.17
TWI000A	2202	01JAN2012 1100	227.20	565.73	570.61		570.66	0.001222	1.82	132.82	95.27	0.19
TWI000A	2202	01JAN2012 1200	838.65	565.73	571.89		572.07	0.003038	3.71	342.52	181.31	0.32
TWI000A	2202	01JAN2012 1300	892.44	565.73	572.15		572.30	0.002574	3.55	388.51	183.02	0.30
TWI000A	2202	01JAN2012 1400	293.45	565.73	570.83		570.90	0.001532	2.15	159.10	141.22	0.22
TWI000A	2202	01JAN2012 1500	216.95	565.73	570.55		570.60	0.001193	1.78	127.93	83.96	0.19
TWI000A	2202	01JAN2012 1600	165.75	565.73	570.12		570.16	0.001003	1.61	104.29	46.26	0.17
TWI000A	2202	01JAN2012 1700	138.99	565.73	569.89		569.93	0.000886	1.47	94.46	40.11	0.16
TWI000A	2202	01JAN2012 1800	121.56	565.73	569.74		569.77	0.000796	1.37	88.74	35.68	0.15
TWI000A	2202	01JAN2012 1900	86.78	565.73	569.30		569.33	0.000669	1.18	73.73	32.74	0.14
TWI000A	2202	01JAN2012 2000	77.66	565.73	569.20		569.21	0.000613	1.11	70.22	32.05	0.13
TWI000A	2202	01JAN2012 2100	71.28	565.73	569.11		569.13	0.000573	1.05	67.61	31.53	0.13
TWI000A	2202	01JAN2012 2200	66.17	565.73	569.04		569.05	0.000545	1.01	65.23	31.05	0.12
TWI000A	2202	01JAN2012 2300	61.86	565.73	568.96		568.97	0.000529	0.99	62.76	30.54	0.12
TWI000A	2202	01JAN2012 2400	58.23	565.73	568.89		568.90	0.000515	0.96	60.69	30.15	0.12
TWI000A	2201		Lat Struct									
TWI000A	2108	Max WS	3910.41	566.08	574.56		575.06	0.006241	7.31	1208.96	298.88	0.51
TWI000A	2108	31DEC2011 2400	24.60	566.08	568.15		568.16	0.000503	0.73	33.92	25.46	0.11

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	2108	01JAN2012 0100	32.78	566.08	568.33		568.34	0.000623	0.85	38.62	26.84	0.12
TWI000A	2108	01JAN2012 0200	40.73	566.08	568.51		568.52	0.000693	0.94	43.47	28.20	0.13
TWI000A	2108	01JAN2012 0300	43.22	566.08	568.54		568.56	0.000730	0.97	44.53	28.49	0.14
TWI000A	2108	01JAN2012 0400	46.28	566.08	568.60		568.61	0.000762	1.00	46.08	28.90	0.14
TWI000A	2108	01JAN2012 0500	50.01	566.08	568.66		568.68	0.000792	1.04	48.05	29.42	0.14
TWI000A	2108	01JAN2012 0600	54.82	566.08	568.75		568.77	0.000824	1.08	50.65	30.10	0.15
TWI000A	2108	01JAN2012 0700	76.70	566.08	569.12		569.14	0.000914	1.23	62.22	32.83	0.16
TWI000A	2108	01JAN2012 0800	91.25	566.08	569.29		569.32	0.001018	1.34	67.88	34.08	0.17
TWI000A	2108	01JAN2012 0900	113.94	566.08	569.55		569.59	0.001123	1.48	77.19	71.50	0.18
TWI000A	2108	01JAN2012 1000	158.91	566.08	569.96		570.00	0.001321	1.68	106.80	115.97	0.20
TWI000A	2108	01JAN2012 1100	226.79	566.08	570.49		570.54	0.001400	1.88	147.27	174.48	0.21
TWI000A	2108	01JAN2012 1200	833.29	566.08	571.56		571.74	0.003872	3.80	423.52	229.63	0.36
TWI000A	2108	01JAN2012 1300	914.58	566.08	571.87		572.03	0.003209	3.66	495.40	233.76	0.33
TWI000A	2108	01JAN2012 1400	296.92	566.08	570.67		570.74	0.002016	2.26	162.55	195.93	0.25
TWI000A	2108	01JAN2012 1500	219.35	566.08	570.43		570.48	0.001391	1.86	142.95	167.83	0.20
TWI000A	2108	01JAN2012 1600	166.95	566.08	570.01		570.05	0.001372	1.73	110.07	121.91	0.20
TWI000A	2108	01JAN2012 1700	139.92	566.08	569.79		569.83	0.001291	1.63	86.01	91.06	0.19
TWI000A	2108	01JAN2012 1800	122.28	566.08	569.65		569.68	0.001159	1.52	80.53	78.85	0.18
TWI000A	2108	01JAN2012 1900	87.28	566.08	569.22		569.25	0.001027	1.33	65.49	33.56	0.17
TWI000A	2108	01JAN2012 2000	78.04	566.08	569.12		569.14	0.000951	1.26	62.10	32.80	0.16
TWI000A	2108	01JAN2012 2100	71.60	566.08	569.04		569.06	0.000897	1.20	59.60	32.23	0.16
TWI000A	2108	01JAN2012 2200	66.49	566.08	568.97		568.99	0.000863	1.16	57.28	31.70	0.15
TWI000A	2108	01JAN2012 2300	62.14	566.08	568.89		568.91	0.000851	1.13	54.81	31.12	0.15
TWI000A	2108	01JAN2012 2400	58.50	566.08	568.82		568.84	0.000839	1.11	52.74	30.63	0.15
TWI000A	1959	Max WS	3883.78	565.50	573.97		574.22	0.003874	5.78	1464.31	347.20	0.43
TWI000A	1959	31DEC2011 2400	27.52	565.50	567.35		567.46	0.010342	2.57	10.73	13.07	0.50
TWI000A	1959	01JAN2012 0100	31.93	565.50	567.43		567.54	0.011145	2.73	11.69	13.73	0.52
TWI000A	1959	01JAN2012 0200	40.80	565.50	567.60		567.73	0.010963	2.87	14.21	15.33	0.53
TWI000A	1959	01JAN2012 0300	43.29	565.50	567.64		567.77	0.010919	2.91	14.90	15.74	0.53
TWI000A	1959	01JAN2012 0400	46.34	565.50	567.69		567.83	0.010996	2.96	15.65	16.18	0.53
TWI000A	1959	01JAN2012 0500	50.08	565.50	567.75		567.89	0.011094	3.03	16.55	16.88	0.54
TWI000A	1959	01JAN2012 0600	54.88	565.50	567.81		567.96	0.011155	3.10	17.71	19.84	0.54
TWI000A	1959	01JAN2012 0700	76.87	565.50	568.06		568.25	0.011899	3.44	22.32	28.85	0.57
TWI000A	1959	01JAN2012 0800	91.34	565.50	568.20		568.41	0.012315	3.63	25.13	33.43	0.58
TWI000A	1959	01JAN2012 0900	113.97	565.50	568.40		568.64	0.012541	3.86	29.53	38.53	0.60
TWI000A	1959	01JAN2012 1000	158.53	565.50	568.70		568.99	0.013663	4.32	36.68	46.89	0.63
TWI000A	1959	01JAN2012 1100	226.19	565.50	569.12		569.46	0.013787	4.70	48.13	68.21	0.65
TWI000A	1959	01JAN2012 1200	809.87	565.50	570.55		570.82	0.009771	4.94	339.50	311.10	0.58
TWI000A	1959	01JAN2012 1300	959.21	565.50	571.48		571.58	0.002714	3.28	633.62	321.13	0.33
TWI000A	1959	01JAN2012 1400	301.63	565.50	569.66		569.96	0.012385	4.33	70.23	126.84	0.62
TWI000A	1959	01JAN2012 1500	222.85	565.50	569.17		569.48	0.012352	4.49	49.65	71.86	0.62
TWI000A	1959	01JAN2012 1600	168.71	565.50	568.81		569.09	0.012689	4.26	39.61	51.34	0.62
TWI000A	1959	01JAN2012 1700	141.27	565.50	568.62		568.88	0.012524	4.07	34.75	44.34	0.61
TWI000A	1959	01JAN2012 1800	123.34	565.50	568.50		568.73	0.012120	3.88	31.76	41.05	0.59
TWI000A	1959	01JAN2012 1900	88.04	565.50	568.20		568.39	0.011430	3.50	25.14	33.44	0.56
TWI000A	1959	01JAN2012 2000	78.58	565.50	568.10		568.28	0.011456	3.41	23.03	30.08	0.56
TWI000A	1959	01JAN2012 2100	72.08	565.50	568.03		568.20	0.011208	3.32	21.74	27.83	0.55
TWI000A	1959	01JAN2012 2200	66.93	565.50	567.98		568.14	0.011054	3.24	20.66	25.90	0.54
TWI000A	1959	01JAN2012 2300	62.54	565.50	567.92		568.08	0.011086	3.19	19.60	24.03	0.54
TWI000A	1959	01JAN2012 2400	58.87	565.50	567.87		568.03	0.011071	3.14	18.73	22.36	0.54
TWI000A	1815	Max WS	3868.34	564.98	573.70		573.78	0.001340	3.99	2044.31	381.82	0.25
TWI000A	1815	31DEC2011 2400	29.40	564.98	566.69		566.71	0.000931	1.07	28.54	26.47	0.16
TWI000A	1815	01JAN2012 0100	31.35	564.98	566.67		566.69	0.001107	1.16	28.05	26.23	0.18
TWI000A	1815	01JAN2012 0200	40.74	564.98	566.85		566.88	0.001235	1.31	33.58	42.48	0.19
TWI000A	1815	01JAN2012 0300	43.25	564.98	566.91		566.93	0.001232	1.34	36.19	51.52	0.19
TWI000A	1815	01JAN2012 0400	46.30	564.98	566.95		566.98	0.001280	1.38	38.54	55.37	0.19
TWI000A	1815	01JAN2012 0500	49.92	564.98	567.00		567.03	0.001342	1.44	41.31	65.93	0.20
TWI000A	1815	01JAN2012 0600	54.68	564.98	567.05		567.09	0.001419	1.51	45.41	78.87	0.20
TWI000A	1815	01JAN2012 0700	76.55	564.98	567.21		567.26	0.001953	1.85	60.39	123.68	0.24
TWI000A	1815	01JAN2012 0800	90.87	564.98	567.33		567.38	0.002014	1.95	78.93	163.88	0.25
TWI000A	1815	01JAN2012 0900	113.11	564.98	567.50		567.55	0.001995	2.03	107.69	182.32	0.25
TWI000A	1815	01JAN2012 1000	157.00	564.98	567.75		567.80	0.001957	2.13	155.77	194.42	0.25
TWI000A	1815	01JAN2012 1100	224.04	564.98	568.12		568.16	0.001701	2.14	229.64	217.99	0.23
TWI000A	1815	01JAN2012 1200	737.01	564.98	569.91		569.94	0.000967	2.24	741.52	310.44	0.19
TWI000A	1815	01JAN2012 1300	1012.76	564.98	571.30		571.31	0.000456	1.85	1187.10	333.38	0.14
TWI000A	1815	01JAN2012 1400	307.18	564.98	568.77		568.79	0.000947	1.82	398.14	290.07	0.18
TWI000A	1815	01JAN2012 1500	225.15	564.98	568.26		568.30	0.001259	1.90	263.48	236.82	0.20
TWI000A	1815	01JAN2012 1600	170.00	564.98	567.95		567.99	0.001416	1.89	195.38	202.02	0.21
TWI000A	1815	01JAN2012 1700	142.03	564.98	567.76		567.80	0.001573	1.92	157.15	194.69	0.22
TWI000A	1815	01JAN2012 1800	123.82	564.98	567.63		567.67	0.001667	1.91	132.44	188.94	0.23
TWI000A	1815	01JAN2012 1900	88.70	564.98	567.41		567.45	0.001575	1.76	91.43	175.69	0.22
TWI000A	1815	01JAN2012 2000	78.82	564.98	567.29		567.33	0.001688	1.77	72.20	154.64	0.22
TWI000A	1815	01JAN2012 2100	72.25	564.98	567.23		567.27	0.001655	1.72	63.06	132.40	0.22
TWI000A	1815	01JAN2012 2200	67.06	564.98	567.18		567.22	0.001602	1.67	57.13	113.19	0.22
TWI000A	1815	01JAN2012 2300	62.66	564.98	567.14		567.18	0.001539	1.61	52.87	98.28	0.21
TWI000A	1815	01JAN2012 2400	58.96	564.98	567.10		567.14	0.001472	1.56	49.78	89.20	0.21
TWI000A	1704	Max WS	3923.64	565.00	573.60		573.66	0.000885	3.43	2453.17	412.00	0.22
TWI000A	1704	31DEC2011 2400	34.01	565.00	566.55		566.57	0.002511	1.35	40.91	101.91	0.25
TWI000A	1704	01JAN2012 0100	31.29	565.00	566.53		566.55	0.002297	1.29	38.81	98.78	0.24
TWI000A	1704	01JAN2012 0200	41.92	565.00	566.73		566.75	0.001882	1.22	65.58	188.67	0.22
TWI000A	1704	01JAN2012 0300	44.62	565.00	566.79		566.81	0.001534	1.15	77.50	208.80	0.20

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	1704	01JAN2012 0400	47.79	565.00	566.84		566.85	0.001420	1.14	86.41	222.96	0.20
TWI000A	1704	01JAN2012 0500	51.55	565.00	566.88		566.89	0.001333	1.13	96.01	231.79	0.19
TWI000A	1704	01JAN2012 0600	56.62	565.00	566.93		566.94	0.001244	1.13	108.51	242.89	0.19
TWI000A	1704	01JAN2012 0700	79.28	565.00	567.08		567.09	0.001241	1.22	146.31	266.46	0.19
TWI000A	1704	01JAN2012 0800	94.50	565.00	567.21		567.22	0.001024	1.19	182.01	275.69	0.18
TWI000A	1704	01JAN2012 0900	117.70	565.00	567.37		567.38	0.000890	1.19	226.63	282.77	0.17
TWI000A	1704	01JAN2012 1000	163.35	565.00	567.64		567.65	0.000766	1.22	303.81	295.70	0.16
TWI000A	1704	01JAN2012 1100	233.70	565.00	568.02		568.03	0.000628	1.25	417.56	304.90	0.15
TWI000A	1704	01JAN2012 1200	821.80	565.00	569.84		569.85	0.000548	1.74	1019.70	349.50	0.15
TWI000A	1704	01JAN2012 1300	1075.02	565.00	571.26		571.28	0.000271	1.50	1536.37	374.51	0.11
TWI000A	1704	01JAN2012 1400	325.61	565.00	568.71		568.72	0.000355	1.13	637.86	327.71	0.12
TWI000A	1704	01JAN2012 1500	236.26	565.00	568.19		568.20	0.000449	1.11	471.64	309.54	0.13
TWI000A	1704	01JAN2012 1600	178.27	565.00	567.87		567.87	0.000509	1.08	372.37	300.98	0.13
TWI000A	1704	01JAN2012 1700	148.52	565.00	567.67		567.68	0.000581	1.08	313.13	296.36	0.14
TWI000A	1704	01JAN2012 1800	129.23	565.00	567.53		567.54	0.000643	1.08	273.18	290.23	0.14
TWI000A	1704	01JAN2012 1900	93.13	565.00	567.31		567.32	0.000681	1.01	210.22	280.23	0.14
TWI000A	1704	01JAN2012 2000	82.14	565.00	567.19		567.20	0.000837	1.06	176.50	274.55	0.16
TWI000A	1704	01JAN2012 2100	75.15	565.00	567.13		567.14	0.000911	1.07	158.96	270.09	0.16
TWI000A	1704	01JAN2012 2200	69.72	565.00	567.08		567.09	0.000971	1.08	145.61	266.26	0.17
TWI000A	1704	01JAN2012 2300	65.09	565.00	567.03		567.04	0.001018	1.08	134.61	260.56	0.17
TWI000A	1704	01JAN2012 2400	61.23	565.00	567.00		567.01	0.001056	1.08	125.60	252.31	0.17
TWI000A	1522	Max WS	3917.53	564.01	573.45		573.51	0.000714	3.07	2157.35	367.42	0.19
TWI000A	1522	31DEC2011 2400	43.43	564.01	566.33		566.34	0.000806	1.11	57.45	103.01	0.15
TWI000A	1522	01JAN2012 0100	28.43	564.01	566.36		566.36	0.000315	0.70	60.83	106.16	0.10
TWI000A	1522	01JAN2012 0200	41.18	564.01	566.60		566.61	0.000335	0.77	89.18	131.01	0.10
TWI000A	1522	01JAN2012 0300	44.28	564.01	566.67		566.67	0.000322	0.77	98.59	139.24	0.10
TWI000A	1522	01JAN2012 0400	47.50	564.01	566.71		566.71	0.000335	0.79	104.21	148.68	0.10
TWI000A	1522	01JAN2012 0500	51.24	564.01	566.74		566.75	0.000354	0.82	109.97	158.04	0.10
TWI000A	1522	01JAN2012 0600	56.16	564.01	566.79		566.80	0.000387	0.86	117.45	167.51	0.11
TWI000A	1522	01JAN2012 0700	77.50	564.01	566.94		566.95	0.000487	1.00	144.07	184.37	0.12
TWI000A	1522	01JAN2012 0800	92.79	564.01	567.09		567.10	0.000479	1.02	172.51	202.47	0.12
TWI000A	1522	01JAN2012 0900	115.42	564.01	567.25		567.26	0.000493	1.07	207.17	219.87	0.13
TWI000A	1522	01JAN2012 1000	158.96	564.01	567.53		567.54	0.000491	1.12	271.17	242.76	0.13
TWI000A	1522	01JAN2012 1100	228.60	564.01	567.92		567.93	0.000436	1.16	370.66	259.20	0.12
TWI000A	1522	01JAN2012 1200	703.92	564.01	569.76		569.77	0.000316	1.38	898.52	307.03	0.11
TWI000A	1522	01JAN2012 1300	1148.64	564.01	571.22		571.23	0.000243	1.45	1369.87	338.20	0.10
TWI000A	1522	01JAN2012 1400	338.39	564.01	568.66		568.66	0.000282	1.09	570.62	285.14	0.10
TWI000A	1522	01JAN2012 1500	241.43	564.01	568.12		568.13	0.000334	1.06	423.13	265.12	0.11
TWI000A	1522	01JAN2012 1600	182.00	564.01	567.79		567.80	0.000362	1.02	336.72	255.32	0.11
TWI000A	1522	01JAN2012 1700	150.73	564.01	567.58		567.59	0.000388	1.01	285.06	246.14	0.11
TWI000A	1522	01JAN2012 1800	130.60	564.01	567.44		567.45	0.000404	1.00	250.50	237.20	0.11
TWI000A	1522	01JAN2012 1900	95.82	564.01	567.22		567.23	0.000364	0.91	201.10	217.18	0.11
TWI000A	1522	01JAN2012 2000	83.10	564.01	567.09		567.10	0.000381	0.91	173.22	202.93	0.11
TWI000A	1522	01JAN2012 2100	75.81	564.01	567.02		567.03	0.000378	0.90	159.29	194.07	0.11
TWI000A	1522	01JAN2012 2200	70.23	564.01	566.97		566.98	0.000372	0.88	149.15	187.67	0.11
TWI000A	1522	01JAN2012 2300	65.51	564.01	566.92		566.93	0.000365	0.86	140.92	182.51	0.11
TWI000A	1522	01JAN2012 2400	61.58	564.01	566.89		566.89	0.000358	0.85	133.90	178.33	0.11
TWI000A	1354	Max WS	3947.86	563.89	573.30		573.39	0.000991	3.69	1830.60	382.98	0.23
TWI000A	1354	31DEC2011 2400	47.53	563.89	566.22		566.24	0.000655	1.07	66.92	107.53	0.14
TWI000A	1354	01JAN2012 0100	27.18	563.89	566.32		566.33	0.000162	0.55	78.27	113.36	0.07
TWI000A	1354	01JAN2012 0200	40.86	563.89	566.56		566.56	0.000237	0.61	106.76	132.08	0.08
TWI000A	1354	01JAN2012 0300	44.49	563.89	566.63		566.63	0.000244	0.60	116.56	139.24	0.09
TWI000A	1354	01JAN2012 0400	47.78	563.89	566.67		566.67	0.000258	0.62	121.91	142.44	0.09
TWI000A	1354	01JAN2012 0500	51.58	563.89	566.70		566.71	0.000269	0.64	126.98	143.25	0.09
TWI000A	1354	01JAN2012 0600	56.52	563.89	566.75		566.75	0.000283	0.67	133.15	144.22	0.09
TWI000A	1354	01JAN2012 0700	77.33	563.89	566.88		566.89	0.000362	0.80	152.84	147.45	0.11
TWI000A	1354	01JAN2012 0800	93.13	563.89	567.03		567.03	0.000362	0.84	174.61	151.60	0.11
TWI000A	1354	01JAN2012 0900	115.92	563.89	567.19		567.20	0.000386	0.92	199.42	156.18	0.11
TWI000A	1354	01JAN2012 1000	159.21	563.89	567.46		567.47	0.000421	1.04	242.44	169.58	0.12
TWI000A	1354	01JAN2012 1100	229.90	563.89	567.85		567.87	0.000443	1.18	312.74	180.34	0.13
TWI000A	1354	01JAN2012 1200	676.53	563.89	569.70		569.72	0.000410	1.61	684.54	225.66	0.13
TWI000A	1354	01JAN2012 1300	1216.66	563.89	571.16		571.19	0.000391	1.89	1071.08	321.05	0.14
TWI000A	1354	01JAN2012 1400	352.71	563.89	568.60		568.62	0.000355	1.25	452.73	194.83	0.12
TWI000A	1354	01JAN2012 1500	248.97	563.89	568.07		568.08	0.000369	1.14	351.46	183.76	0.12
TWI000A	1354	01JAN2012 1600	187.58	563.89	567.73		567.74	0.000362	1.04	291.41	178.43	0.11
TWI000A	1354	01JAN2012 1700	154.78	563.89	567.53		567.54	0.000365	0.99	254.65	175.09	0.11
TWI000A	1354	01JAN2012 1800	133.69	563.89	567.38		567.39	0.000341	0.92	230.70	161.42	0.11
TWI000A	1354	01JAN2012 1900	99.16	563.89	567.18		567.18	0.000290	0.79	197.68	155.87	0.10
TWI000A	1354	01JAN2012 2000	85.17	563.89	567.04		567.05	0.000292	0.76	177.00	152.04	0.10
TWI000A	1354	01JAN2012 2100	77.56	563.89	566.97		566.98	0.000287	0.73	166.46	150.06	0.10
TWI000A	1354	01JAN2012 2200	71.67	563.89	566.92		566.93	0.000279	0.71	158.84	148.61	0.09
TWI000A	1354	01JAN2012 2300	66.88	563.89	566.88		566.88	0.000272	0.69	152.58	147.40	0.09
TWI000A	1354	01JAN2012 2400	62.80	563.89	566.84		566.85	0.000265	0.67	147.15	146.40	0.09
TWI000A	1241	Max WS	3956.10	563.81	572.63		573.26	0.006068	8.84	874.51	324.46	0.55
TWI000A	1241	31DEC2011 2400	52.95	563.81	566.12		566.14	0.001042	1.35	39.21	21.92	0.18
TWI000A	1241	01JAN2012 0100	30.98	563.81	566.29		566.30	0.000269	0.72	43.16	22.47	0.09
TWI000A	1241	01JAN2012 0200	45.02	563.81	566.51		566.53	0.000420	0.93	48.21	23.59	0.12
TWI000A	1241	01JAN2012 0300	48.80	563.81	566.58		566.60	0.000450	0.98	49.89	23.95	0.12
TWI000A	1241	01JAN2012 0400	52.13	563.81	566.62		566.63	0.000490	1.03	50.72	24.13	0.12
TWI000A	1241	01JAN2012 0500	55.93	563.81	566.65		566.67	0.000542	1.09	51.47	24.29	0.13
TWI000A	1241	01JAN2012 0600	60.83	563.81	566.69		566.71	0.000612	1.16	52.37	24.48	0.14

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	1241	01JAN2012 0700	81.30	563.81	566.79		566.83	0.000944	1.48	54.96	25.11	0.17
TWI000A	1241	01JAN2012 0800	97.21	563.81	566.92		566.96	0.001124	1.67	58.27	26.06	0.19
TWI000A	1241	01JAN2012 0900	119.88	563.81	567.06		567.12	0.001415	1.95	61.89	27.27	0.22
TWI000A	1241	01JAN2012 1000	162.75	563.81	567.28		567.37	0.001955	2.42	68.12	29.23	0.26
TWI000A	1241	01JAN2012 1100	233.22	563.81	567.61		567.75	0.002699	3.07	78.27	32.17	0.31
TWI000A	1241	01JAN2012 1200	738.71	563.81	569.08		569.63	0.006329	6.13	143.81	62.78	0.51
TWI000A	1241	01JAN2012 1300	1253.51	563.81	570.69		571.18	0.004521	6.35	294.14	205.79	0.45
TWI000A	1241	01JAN2012 1400	360.15	563.81	568.31		568.53	0.003054	3.76	103.64	42.78	0.34
TWI000A	1241	01JAN2012 1500	254.54	563.81	567.84		567.98	0.002496	3.10	85.82	34.32	0.30
TWI000A	1241	01JAN2012 1600	192.83	563.81	567.55		567.66	0.001965	2.59	76.54	31.68	0.26
TWI000A	1241	01JAN2012 1700	159.67	563.81	567.37		567.45	0.001673	2.29	70.93	30.07	0.24
TWI000A	1241	01JAN2012 1800	138.42	563.81	567.25		567.32	0.001465	2.08	67.31	28.98	0.22
TWI000A	1241	01JAN2012 1900	104.20	563.81	567.08		567.12	0.001036	1.68	62.52	27.47	0.19
TWI000A	1241	01JAN2012 2000	89.82	563.81	566.96		566.99	0.000913	1.52	59.19	26.37	0.17
TWI000A	1241	01JAN2012 2100	82.13	563.81	566.89		566.93	0.000834	1.43	57.57	25.82	0.17
TWI000A	1241	01JAN2012 2200	76.23	563.81	566.85		566.88	0.000766	1.35	56.42	25.48	0.16
TWI000A	1241	01JAN2012 2300	71.41	563.81	566.81		566.84	0.000708	1.29	55.47	25.24	0.15
TWI000A	1241	01JAN2012 2400	67.32	563.81	566.78		566.80	0.000658	1.23	54.66	25.03	0.15
TWI000A	1205	Max WS	3898.20	563.78	572.00	572.21	573.23	0.012260	11.79	656.99	310.23	0.76
TWI000A	1205	31DEC2011 2400	54.14	563.78	566.07		566.10	0.001217	1.45	37.36	20.63	0.19
TWI000A	1205	01JAN2012 0100	32.16	563.78	566.28		566.29	0.000308	0.77	41.76	21.14	0.10
TWI000A	1205	01JAN2012 0200	46.24	563.78	566.49		566.51	0.000469	1.00	46.33	21.71	0.12
TWI000A	1205	01JAN2012 0300	50.04	563.78	566.56		566.58	0.000500	1.05	47.84	21.90	0.12
TWI000A	1205	01JAN2012 0400	53.37	563.78	566.60		566.62	0.000545	1.10	48.55	21.99	0.13
TWI000A	1205	01JAN2012 0500	57.17	563.78	566.63		566.65	0.000602	1.16	49.19	22.07	0.14
TWI000A	1205	01JAN2012 0600	62.06	563.78	566.66		566.68	0.000679	1.24	49.94	22.16	0.15
TWI000A	1205	01JAN2012 0700	82.51	563.78	566.75		566.79	0.001068	1.59	51.93	22.52	0.18
TWI000A	1205	01JAN2012 0800	98.42	563.78	566.87		566.92	0.001297	1.80	54.69	23.38	0.20
TWI000A	1205	01JAN2012 0900	121.08	563.78	566.99		567.06	0.001684	2.11	57.56	24.68	0.23
TWI000A	1205	01JAN2012 1000	163.92	563.78	567.18		567.29	0.002416	2.65	62.80	30.48	0.28
TWI000A	1205	01JAN2012 1100	234.35	563.78	567.47		567.64	0.003456	3.39	72.87	39.12	0.34
TWI000A	1205	01JAN2012 1200	761.55	563.78	568.58		569.34	0.010567	7.32	122.34	49.80	0.64
TWI000A	1205	01JAN2012 1300	1260.78	563.78	570.41		571.06	0.006127	7.12	237.31	123.20	0.51
TWI000A	1205	01JAN2012 1400	361.73	563.78	568.18		568.42	0.003594	3.99	103.34	45.99	0.36
TWI000A	1205	01JAN2012 1500	255.89	563.78	567.72		567.89	0.003055	3.36	82.85	41.49	0.33
TWI000A	1205	01JAN2012 1600	194.15	563.78	567.46		567.58	0.002404	2.82	72.45	38.95	0.29
TWI000A	1205	01JAN2012 1700	160.95	563.78	567.29		567.39	0.002028	2.50	66.36	33.85	0.26
TWI000A	1205	01JAN2012 1800	139.69	563.78	567.18		567.26	0.001757	2.26	62.77	30.44	0.24
TWI000A	1205	01JAN2012 1900	105.49	563.78	567.03		567.08	0.001210	1.81	58.62	25.96	0.20
TWI000A	1205	01JAN2012 2000	91.08	563.78	566.91		566.96	0.001049	1.64	55.75	23.69	0.18
TWI000A	1205	01JAN2012 2100	83.38	563.78	566.86		566.89	0.000947	1.53	54.38	23.28	0.17
TWI000A	1205	01JAN2012 2200	77.48	563.78	566.81		566.85	0.000863	1.45	53.42	22.99	0.17
TWI000A	1205	01JAN2012 2300	72.66	563.78	566.78		566.81	0.000795	1.38	52.63	22.74	0.16
TWI000A	1205	01JAN2012 2400	68.57	563.78	566.75		566.78	0.000737	1.32	51.95	22.53	0.15
TWI000A	1115	Max WS	3884.53	564.00	571.83		571.86	0.000109	1.33	3243.89	521.43	0.09
TWI000A	1115	31DEC2011 2400	54.52	564.00	566.03		566.03	0.000015	0.20	278.77	359.76	0.03
TWI000A	1115	01JAN2012 0100	35.26	564.00	566.27		566.27	0.000004	0.11	316.13	378.04	0.01
TWI000A	1115	01JAN2012 0200	49.96	564.00	566.48		566.48	0.000006	0.14	348.70	381.53	0.02
TWI000A	1115	01JAN2012 0300	54.15	564.00	566.55		566.55	0.000007	0.15	359.45	382.68	0.02
TWI000A	1115	01JAN2012 0400	57.55	564.00	566.58		566.58	0.000007	0.16	364.41	383.21	0.02
TWI000A	1115	01JAN2012 0500	61.35	564.00	566.61		566.61	0.000008	0.17	368.66	383.66	0.02
TWI000A	1115	01JAN2012 0600	66.21	564.00	566.64		566.64	0.000009	0.18	373.63	384.19	0.02
TWI000A	1115	01JAN2012 0700	86.04	564.00	566.72		566.72	0.000014	0.22	385.95	385.49	0.02
TWI000A	1115	01JAN2012 0800	102.22	564.00	566.83		566.83	0.000017	0.25	404.04	387.41	0.03
TWI000A	1115	01JAN2012 0900	124.73	564.00	566.94		566.94	0.000021	0.30	421.69	389.27	0.03
TWI000A	1115	01JAN2012 1000	167.02	564.00	567.11		567.12	0.000031	0.38	449.34	392.55	0.04
TWI000A	1115	01JAN2012 1100	236.98	564.00	567.38		567.39	0.000047	0.49	493.71	401.70	0.05
TWI000A	1115	01JAN2012 1200	824.82	564.00	568.40		568.42	0.000222	1.27	679.25	439.08	0.11
TWI000A	1115	01JAN2012 1300	1296.82	564.00	570.27		570.28	0.000027	0.57	2455.25	478.00	0.04
TWI000A	1115	01JAN2012 1400	371.40	564.00	568.12		568.12	0.000057	0.62	625.08	432.17	0.06
TWI000A	1115	01JAN2012 1500	261.94	564.00	567.65		567.65	0.000044	0.50	538.81	411.99	0.05
TWI000A	1115	01JAN2012 1600	199.70	564.00	567.40		567.40	0.000033	0.41	496.16	402.19	0.04
TWI000A	1115	01JAN2012 1700	165.91	564.00	567.24		567.24	0.000027	0.36	469.42	396.73	0.04
TWI000A	1115	01JAN2012 1800	144.51	564.00	567.13		567.13	0.000023	0.32	452.06	393.12	0.03
TWI000A	1115	01JAN2012 1900	110.77	564.00	567.00		567.00	0.000016	0.26	430.63	390.14	0.03
TWI000A	1115	01JAN2012 2000	95.77	564.00	566.88		566.88	0.000014	0.23	412.49	388.30	0.03
TWI000A	1115	01JAN2012 2100	87.92	564.00	566.83		566.83	0.000012	0.22	403.59	387.36	0.02
TWI000A	1115	01JAN2012 2200	82.01	564.00	566.79		566.79	0.000011	0.21	397.38	386.70	0.02
TWI000A	1115	01JAN2012 2300	77.14	564.00	566.76		566.76	0.000010	0.20	392.21	386.16	0.02
TWI000A	1115	01JAN2012 2400	72.99	564.00	566.73		566.73	0.000010	0.19	387.72	385.68	0.02
TWI000A	1076.5		Lat Struct									
TWI000A	1038	Max WS	4334.44	564.00	571.83		571.85	0.000049	1.16	4085.73	636.63	0.07
TWI000A	1038	31DEC2011 2400	49.23	564.00	566.03		566.03	0.000002	0.09	528.91	464.71	0.01
TWI000A	1038	01JAN2012 0100	35.19	564.00	566.27		566.27	0.000001	0.06	592.92	470.72	0.01
TWI000A	1038	01JAN2012 0200	51.54	564.00	566.48		566.48	0.000001	0.08	648.51	478.46	0.01
TWI000A	1038	01JAN2012 0300	56.97	564.00	566.55		566.55	0.000001	0.09	666.87	480.95	0.01
TWI000A	1038	01JAN2012 0400	60.82	564.00	566.58		566.58	0.000001	0.09	675.35	482.10	0.01
TWI000A	1038	01JAN2012 0500	65.01	564.00	566.61		566.61	0.000001	0.10	682.64	483.09	0.01
TWI000A	1038	01JAN2012 0600	70.52	564.00	566.64		566.64	0.000002	0.10	691.14	484.24	0.01
TWI000A	1038	01JAN2012 0700	90.30	564.00	566.72		566.72	0.000002	0.13	712.18	485.71	0.01

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	1038	01JAN2012 0800	108.55	564.00	566.83		566.83	0.000003	0.15	743.15	487.48	0.02
TWI000A	1038	01JAN2012 0900	133.07	564.00	566.94		566.94	0.000004	0.17	773.41	489.21	0.02
TWI000A	1038	01JAN2012 1000	179.58	564.00	567.11		567.11	0.000006	0.22	820.79	491.89	0.02
TWI000A	1038	01JAN2012 1100	257.93	564.00	567.38		567.38	0.000009	0.29	895.49	496.09	0.03
TWI000A	1038	01JAN2012 1200	865.22	564.00	568.40		568.41	0.000043	0.75	1192.04	526.79	0.06
TWI000A	1038	01JAN2012 1300	1560.36	564.00	570.27		570.27	0.000014	0.53	3124.38	576.20	0.04
TWI000A	1038	01JAN2012 1400	449.10	564.00	568.11		568.12	0.000015	0.41	1106.84	519.08	0.04
TWI000A	1038	01JAN2012 1500	306.39	564.00	567.65		567.65	0.000010	0.32	969.33	502.77	0.03
TWI000A	1038	01JAN2012 1600	232.13	564.00	567.40		567.40	0.000007	0.26	899.51	496.31	0.02
TWI000A	1038	01JAN2012 1700	191.66	564.00	567.24		567.24	0.000006	0.23	854.80	493.81	0.02
TWI000A	1038	01JAN2012 1800	166.13	564.00	567.13		567.13	0.000005	0.20	825.37	492.15	0.02
TWI000A	1038	01JAN2012 1900	128.35	564.00	567.00		567.00	0.000003	0.16	788.71	490.08	0.02
TWI000A	1038	01JAN2012 2000	109.39	564.00	566.88		566.88	0.000003	0.14	757.61	488.31	0.02
TWI000A	1038	01JAN2012 2100	99.80	564.00	566.83		566.83	0.000003	0.13	742.37	487.44	0.01
TWI000A	1038	01JAN2012 2200	92.77	564.00	566.79		566.79	0.000002	0.13	731.76	486.83	0.01
TWI000A	1038	01JAN2012 2300	87.01	564.00	566.75		566.76	0.000002	0.12	722.91	486.32	0.01
TWI000A	1038	01JAN2012 2400	82.12	564.00	566.73		566.73	0.000002	0.12	715.22	485.88	0.01
TWI000A	1011	Max WS	4334.02	564.00	571.83		571.85	0.000052	1.17	4072.91	643.67	0.08
TWI000A	1011	31DEC2011 2400	46.47	564.00	566.03		566.03	0.000003	0.10	443.56	466.30	0.01
TWI000A	1011	01JAN2012 0100	34.34	564.00	566.27		566.27	0.000001	0.07	513.60	483.87	0.01
TWI000A	1011	01JAN2012 0200	51.13	564.00	566.48		566.48	0.000002	0.09	575.67	490.26	0.01
TWI000A	1011	01JAN2012 0300	56.82	564.00	566.55		566.55	0.000002	0.10	596.20	492.36	0.01
TWI000A	1011	01JAN2012 0400	60.72	564.00	566.58		566.58	0.000002	0.10	605.69	493.32	0.01
TWI000A	1011	01JAN2012 0500	64.92	564.00	566.61		566.61	0.000002	0.11	613.84	494.15	0.01
TWI000A	1011	01JAN2012 0600	70.39	564.00	566.64		566.64	0.000003	0.11	623.37	495.12	0.01
TWI000A	1011	01JAN2012 0700	89.73	564.00	566.72		566.72	0.000004	0.14	646.97	497.50	0.02
TWI000A	1011	01JAN2012 0800	108.18	564.00	566.83		566.83	0.000005	0.16	681.81	500.96	0.02
TWI000A	1011	01JAN2012 0900	132.59	564.00	566.94		566.94	0.000006	0.19	715.86	503.95	0.02
TWI000A	1011	01JAN2012 1000	178.75	564.00	567.11		567.11	0.000009	0.24	769.35	509.72	0.03
TWI000A	1011	01JAN2012 1100	256.80	564.00	567.38		567.38	0.000013	0.31	853.75	522.48	0.03
TWI000A	1011	01JAN2012 1200	849.55	564.00	568.40		568.40	0.000050	0.75	1181.81	550.48	0.07
TWI000A	1011	01JAN2012 1300	1576.20	564.00	570.27		570.27	0.000015	0.55	3106.52	600.02	0.04
TWI000A	1011	01JAN2012 1400	452.47	564.00	568.11		568.12	0.000018	0.43	1089.26	544.46	0.04
TWI000A	1011	01JAN2012 1500	307.49	564.00	567.64		567.65	0.000014	0.34	937.37	533.56	0.03
TWI000A	1011	01JAN2012 1600	232.93	564.00	567.40		567.40	0.000010	0.28	858.36	524.68	0.03
TWI000A	1011	01JAN2012 1700	192.14	564.00	567.24		567.24	0.000008	0.24	807.77	514.52	0.03
TWI000A	1011	01JAN2012 1800	166.42	564.00	567.13		567.13	0.000007	0.22	774.54	510.37	0.02
TWI000A	1011	01JAN2012 1900	129.01	564.00	567.00		567.00	0.000005	0.18	733.16	505.46	0.02
TWI000A	1011	01JAN2012 2000	109.67	564.00	566.88		566.88	0.000004	0.16	698.08	502.39	0.02
TWI000A	1011	01JAN2012 2100	99.96	564.00	566.83		566.83	0.000004	0.15	680.95	500.89	0.02
TWI000A	1011	01JAN2012 2200	92.89	564.00	566.79		566.79	0.000004	0.14	668.97	499.71	0.02
TWI000A	1011	01JAN2012 2300	87.11	564.00	566.75		566.75	0.000003	0.13	659.01	498.71	0.02
TWI000A	1011	01JAN2012 2400	82.22	564.00	566.73		566.73	0.000003	0.13	650.41	497.85	0.02
TWI000A	897	Max WS	4332.24	564.00	571.80		571.84	0.000105	1.67	2721.65	408.45	0.11
TWI000A	897	31DEC2011 2400	36.27	564.00	566.03		566.03	0.000001	0.06	594.41	340.31	0.01
TWI000A	897	01JAN2012 0100	31.26	564.00	566.27		566.27	0.000000	0.05	676.80	341.62	0.01
TWI000A	897	01JAN2012 0200	49.65	564.00	566.48		566.48	0.000001	0.07	748.11	342.75	0.01
TWI000A	897	01JAN2012 0300	56.24	564.00	566.55		566.55	0.000001	0.07	771.57	343.12	0.01
TWI000A	897	01JAN2012 0400	60.37	564.00	566.58		566.58	0.000001	0.08	782.38	343.29	0.01
TWI000A	897	01JAN2012 0500	64.56	564.00	566.61		566.61	0.000001	0.08	791.64	343.44	0.01
TWI000A	897	01JAN2012 0600	69.92	564.00	566.64		566.64	0.000001	0.09	802.48	343.61	0.01
TWI000A	897	01JAN2012 0700	87.68	564.00	566.71		566.72	0.000002	0.11	829.15	344.05	0.01
TWI000A	897	01JAN2012 0800	106.82	564.00	566.83		566.83	0.000002	0.12	868.42	344.75	0.01
TWI000A	897	01JAN2012 0900	130.92	564.00	566.94		566.94	0.000003	0.14	906.59	345.42	0.02
TWI000A	897	01JAN2012 1000	175.77	564.00	567.11		567.11	0.000005	0.18	966.21	346.47	0.02
TWI000A	897	01JAN2012 1100	252.75	564.00	567.38		567.38	0.000007	0.24	1060.29	352.18	0.02
TWI000A	897	01JAN2012 1200	792.59	564.00	568.39		568.40	0.000027	0.57	1421.72	361.38	0.05
TWI000A	897	01JAN2012 1300	1633.70	564.00	570.26		570.27	0.000032	0.80	2116.42	383.37	0.06
TWI000A	897	01JAN2012 1400	464.76	564.00	568.11		568.12	0.000012	0.36	1320.99	358.92	0.03
TWI000A	897	01JAN2012 1500	311.65	564.00	567.64		567.65	0.000008	0.27	1153.39	355.22	0.03
TWI000A	897	01JAN2012 1600	235.88	564.00	567.40		567.40	0.000006	0.22	1065.52	352.33	0.02
TWI000A	897	01JAN2012 1700	193.87	564.00	567.24		567.24	0.000005	0.19	1009.07	349.44	0.02
TWI000A	897	01JAN2012 1800	167.66	564.00	567.13		567.13	0.000004	0.17	972.05	346.58	0.02
TWI000A	897	01JAN2012 1900	131.39	564.00	567.00		567.00	0.000003	0.14	925.93	345.76	0.02
TWI000A	897	01JAN2012 2000	110.67	564.00	566.88		566.88	0.000002	0.13	886.69	345.07	0.01
TWI000A	897	01JAN2012 2100	100.53	564.00	566.83		566.83	0.000002	0.12	867.41	344.73	0.01
TWI000A	897	01JAN2012 2200	93.29	564.00	566.79		566.79	0.000002	0.11	853.97	344.49	0.01
TWI000A	897	01JAN2012 2300	87.49	564.00	566.75		566.75	0.000002	0.10	842.79	344.29	0.01
TWI000A	897	01JAN2012 2400	82.54	564.00	566.73		566.73	0.000002	0.10	833.04	344.12	0.01
TWI000A	736	Max WS	4325.60	564.00	571.80		571.83	0.000053	1.21	3888.84	601.31	0.08
TWI000A	736	31DEC2011 2400	22.80	564.00	566.03		566.03	0.000000	0.03	886.58	445.40	0.00
TWI000A	736	01JAN2012 0100	27.18	564.00	566.27		566.27	0.000000	0.03	994.48	447.93	0.00
TWI000A	736	01JAN2012 0200	47.63	564.00	566.48		566.48	0.000000	0.04	1088.10	450.12	0.00
TWI000A	736	01JAN2012 0300	55.55	564.00	566.55		566.55	0.000000	0.05	1118.87	450.84	0.01
TWI000A	736	01JAN2012 0400	59.94	564.00	566.58		566.58	0.000000	0.05	1133.07	451.17	0.01
TWI000A	736	01JAN2012 0500	64.02	564.00	566.61		566.61	0.000000	0.06	1145.28	451.45	0.01
TWI000A	736	01JAN2012 0600	69.30	564.00	566.64		566.64	0.000001	0.06	1159.44	451.81	0.01
TWI000A	736	01JAN2012 0700	84.99	564.00	566.71		566.71	0.000001	0.07	1194.56	452.88	0.01
TWI000A	736	01JAN2012 0800	105.01	564.00	566.83		566.83	0.000001	0.08	1246.26	454.43	0.01
TWI000A	736	01JAN2012 0900	128.71	564.00	566.94		566.94	0.000001	0.10	1296.60	455.94	0.01
TWI000A	736	01JAN2012 1000	171.81	564.00	567.11		567.11	0.000002	0.13	1375.36	458.29	0.01

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	736	01JAN2012 1100	247.30	564.00	567.38		567.38	0.000003	0.17	1501.00	473.22	0.02
TWI000A	736	01JAN2012 1200	717.89	564.00	568.39		568.39	0.000011	0.37	1991.64	497.15	0.03
TWI000A	736	01JAN2012 1300	1711.40	564.00	570.26		570.27	0.000018	0.61	2989.09	568.42	0.04
TWI000A	736	01JAN2012 1400	480.87	564.00	568.11		568.11	0.000006	0.26	1853.99	490.69	0.02
TWI000A	736	01JAN2012 1500	316.96	564.00	567.64		567.64	0.000004	0.20	1626.40	479.50	0.02
TWI000A	736	01JAN2012 1600	239.79	564.00	567.40		567.40	0.000003	0.16	1507.96	473.57	0.02
TWI000A	736	01JAN2012 1700	196.12	564.00	567.23		567.24	0.000002	0.14	1432.49	466.70	0.01
TWI000A	736	01JAN2012 1800	169.10	564.00	567.13		567.13	0.000002	0.12	1383.11	458.52	0.01
TWI000A	736	01JAN2012 1900	134.55	564.00	567.00		567.00	0.000001	0.10	1322.22	456.71	0.01
TWI000A	736	01JAN2012 2000	111.87	564.00	566.88		566.88	0.000001	0.09	1270.41	455.16	0.01
TWI000A	736	01JAN2012 2100	101.23	564.00	566.83		566.83	0.000001	0.08	1245.01	454.40	0.01
TWI000A	736	01JAN2012 2200	93.93	564.00	566.79		566.79	0.000001	0.08	1227.30	453.86	0.01
TWI000A	736	01JAN2012 2300	88.04	564.00	566.75		566.75	0.000001	0.07	1212.49	453.42	0.01
TWI000A	736	01JAN2012 2400	83.04	564.00	566.73		566.73	0.000001	0.07	1199.71	453.03	0.01
TWI000A	585	Max WS	4324.58	564.00	571.79		571.82	0.000060	1.29	3515.73	515.79	0.08
TWI000A	585	31DEC2011 2400	8.80	564.00	566.03		566.03	0.000000	0.01	846.75	425.53	0.00
TWI000A	585	01JAN2012 0100	22.92	564.00	566.27		566.27	0.000000	0.02	949.89	428.27	0.00
TWI000A	585	01JAN2012 0200	45.52	564.00	566.48		566.48	0.000000	0.04	1039.38	430.35	0.00
TWI000A	585	01JAN2012 0300	54.76	564.00	566.55		566.55	0.000000	0.05	1068.82	431.04	0.01
TWI000A	585	01JAN2012 0400	59.43	564.00	566.58		566.58	0.000000	0.05	1082.40	431.35	0.01
TWI000A	585	01JAN2012 0500	63.56	564.00	566.61		566.61	0.000001	0.06	1094.01	431.62	0.01
TWI000A	585	01JAN2012 0600	68.64	564.00	566.64		566.64	0.000001	0.06	1107.61	431.93	0.01
TWI000A	585	01JAN2012 0700	82.14	564.00	566.71		566.71	0.000001	0.07	1141.12	432.71	0.01
TWI000A	585	01JAN2012 0800	103.14	564.00	566.83		566.83	0.000001	0.09	1190.47	433.84	0.01
TWI000A	585	01JAN2012 0900	126.32	564.00	566.94		566.94	0.000001	0.10	1238.48	434.95	0.01
TWI000A	585	01JAN2012 1000	167.63	564.00	567.11		567.11	0.000002	0.13	1313.52	436.66	0.01
TWI000A	585	01JAN2012 1100	241.64	564.00	567.38		567.38	0.000003	0.17	1431.22	438.33	0.02
TWI000A	585	01JAN2012 1200	640.52	564.00	568.39		568.39	0.000009	0.34	1876.20	444.16	0.03
TWI000A	585	01JAN2012 1300	1792.78	564.00	570.26		570.27	0.000022	0.67	2744.35	489.08	0.05
TWI000A	585	01JAN2012 1400	497.69	564.00	568.11		568.11	0.000007	0.29	1753.34	442.01	0.03
TWI000A	585	01JAN2012 1500	322.51	564.00	567.64		567.64	0.000004	0.21	1546.68	439.54	0.02
TWI000A	585	01JAN2012 1600	243.84	564.00	567.40		567.40	0.000003	0.17	1437.75	438.39	0.02
TWI000A	585	01JAN2012 1700	198.50	564.00	567.23		567.23	0.000003	0.15	1367.43	437.75	0.01
TWI000A	585	01JAN2012 1800	170.65	564.00	567.13		567.13	0.000002	0.13	1320.93	436.83	0.01
TWI000A	585	01JAN2012 1900	137.88	564.00	567.00		567.00	0.000002	0.11	1262.92	435.51	0.01
TWI000A	585	01JAN2012 2000	113.19	564.00	566.88		566.88	0.000001	0.09	1213.52	434.37	0.01
TWI000A	585	01JAN2012 2100	102.06	564.00	566.83		566.83	0.000001	0.09	1189.25	433.81	0.01
TWI000A	585	01JAN2012 2200	94.59	564.00	566.79		566.79	0.000001	0.08	1172.34	433.43	0.01
TWI000A	585	01JAN2012 2300	88.55	564.00	566.75		566.75	0.000001	0.08	1158.27	433.10	0.01
TWI000A	585	01JAN2012 2400	83.50	564.00	566.73		566.73	0.000001	0.07	1146.06	432.82	0.01
TWI000A	549	Max WS	4324.16	564.00	571.51	568.32	571.94	0.002724	5.47	977.38	492.93	0.49
TWI000A	549	31DEC2011 2400	6.39	564.00	566.03	564.06	566.03	0.000000	0.04	169.94	205.55	0.00
TWI000A	549	01JAN2012 0100	22.18	564.00	566.27	564.15	566.27	0.000003	0.12	191.29	220.64	0.01
TWI000A	549	01JAN2012 0200	45.13	564.00	566.48	564.22	566.48	0.000008	0.22	209.98	224.75	0.02
TWI000A	549	01JAN2012 0300	54.64	564.00	566.55	564.24	566.55	0.000011	0.25	216.17	226.09	0.03
TWI000A	549	01JAN2012 0400	59.33	564.00	566.58	564.26	566.58	0.000012	0.27	219.03	226.64	0.03
TWI000A	549	01JAN2012 0500	63.48	564.00	566.60	564.27	566.61	0.000014	0.29	221.48	227.06	0.03
TWI000A	549	01JAN2012 0600	68.50	564.00	566.64	564.28	566.64	0.000015	0.31	224.35	227.56	0.03
TWI000A	549	01JAN2012 0700	81.66	564.00	566.71	564.32	566.72	0.000019	0.35	231.41	228.77	0.04
TWI000A	549	01JAN2012 0800	102.83	564.00	566.83	564.37	566.83	0.000027	0.43	241.83	230.55	0.05
TWI000A	549	01JAN2012 0900	125.91	564.00	566.94	564.43	566.94	0.000035	0.50	251.96	232.28	0.05
TWI000A	549	01JAN2012 1000	166.91	564.00	567.11	564.51	567.11	0.000051	0.63	267.80	234.96	0.06
TWI000A	549	01JAN2012 1100	240.65	564.00	567.37	564.65	567.38	0.000080	0.83	292.65	242.40	0.08
TWI000A	549	01JAN2012 1200	626.77	564.00	568.36	565.23	568.40	0.000222	1.66	388.04	276.04	0.14
TWI000A	549	01JAN2012 1300	1807.76	564.00	570.16	566.45	570.33	0.000562	3.34	570.10	355.32	0.24
TWI000A	549	01JAN2012 1400	500.63	564.00	568.09	565.06	568.12	0.000177	1.41	361.50	259.74	0.12
TWI000A	549	01JAN2012 1500	323.49	564.00	567.63	564.79	567.65	0.000111	1.03	317.12	248.08	0.10
TWI000A	549	01JAN2012 1600	244.56	564.00	567.39	564.66	567.40	0.000081	0.84	294.03	242.72	0.08
TWI000A	549	01JAN2012 1700	198.91	564.00	567.23	564.57	567.24	0.000063	0.72	279.17	237.98	0.07
TWI000A	549	01JAN2012 1800	170.95	564.00	567.12	564.52	567.13	0.000052	0.64	269.36	235.22	0.06
TWI000A	549	01JAN2012 1900	138.48	564.00	566.99	564.45	567.00	0.000040	0.54	257.11	233.15	0.06
TWI000A	549	01JAN2012 2000	113.40	564.00	566.88	564.40	566.88	0.000031	0.46	246.70	231.38	0.05
TWI000A	549	01JAN2012 2100	102.22	564.00	566.82	564.37	566.83	0.000027	0.43	241.58	230.51	0.05
TWI000A	549	01JAN2012 2200	94.71	564.00	566.79	564.35	566.79	0.000024	0.40	238.01	229.90	0.04
TWI000A	549	01JAN2012 2300	88.66	564.00	566.75	564.34	566.75	0.000022	0.38	235.04	229.39	0.04
TWI000A	549	01JAN2012 2400	83.58	564.00	566.72	564.32	566.73	0.000020	0.36	232.46	228.95	0.04
TWI000A	544		Inl Struct									
TWI000A	437	Max WS	4321.40	543.21	555.94		556.10	0.000344	3.77	1910.85	233.77	0.20
TWI000A	437	31DEC2011 2400	6.39	543.21	544.22		544.22	0.000275	0.42	15.28	32.80	0.11
TWI000A	437	01JAN2012 0100	22.18	543.21	545.00		545.00	0.000126	0.47	47.06	46.54	0.08
TWI000A	437	01JAN2012 0200	45.13	543.21	545.45		545.45	0.000164	0.65	68.91	50.26	0.10
TWI000A	437	01JAN2012 0300	54.64	543.21	545.63		545.64	0.000162	0.70	78.30	51.48	0.10
TWI000A	437	01JAN2012 0400	59.33	543.21	545.71		545.72	0.000165	0.72	82.18	51.98	0.10
TWI000A	437	01JAN2012 0500	63.48	543.21	545.77		545.78	0.000169	0.74	85.26	52.36	0.10
TWI000A	437	01JAN2012 0600	68.50	543.21	545.83		545.84	0.000174	0.77	88.76	52.80	0.10
TWI000A	437	01JAN2012 0700	81.66	543.21	545.97		545.99	0.000193	0.85	96.28	53.73	0.11
TWI000A	437	01JAN2012 0800	102.83	543.21	546.22		546.24	0.000208	0.94	109.94	64.66	0.12
TWI000A	437	01JAN2012 0900	125.91	543.21	546.46		546.48	0.000243	1.02	123.93	76.26	0.13
TWI000A	437	01JAN2012 1000	166.91	543.21	546.83		546.85	0.000263	1.12	148.51	89.57	0.13
TWI000A	437	01JAN2012 1100	240.65	543.21	547.42		547.45	0.000253	1.27	189.66	103.66	0.14

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

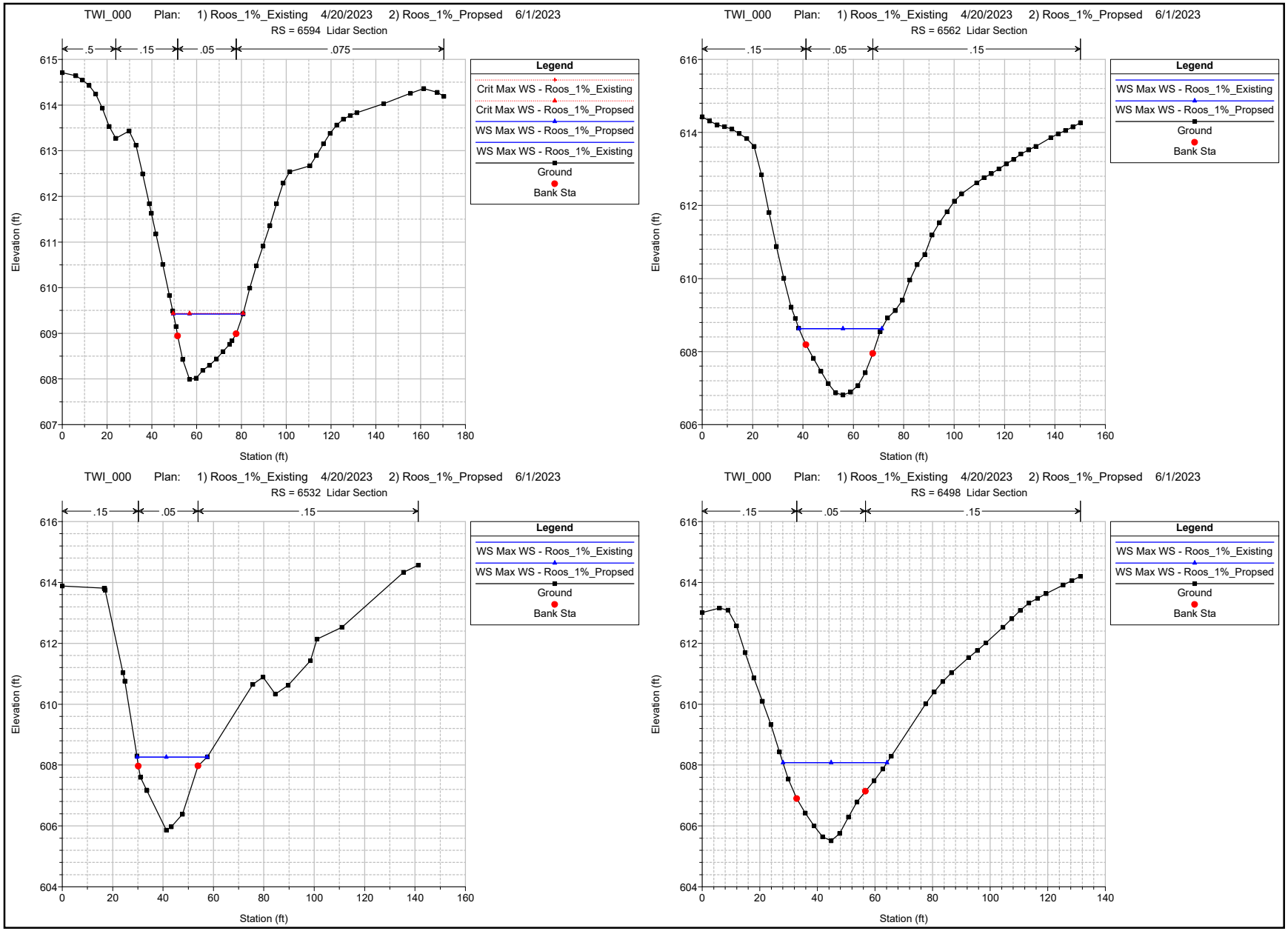
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	437	01JAN2012 1200	626.77	543.21	549.57		549.63	0.000247	1.81	351.72	186.44	0.15
TWI000A	437	01JAN2012 1300	1807.76	543.21	553.50		553.62	0.000267	2.81	675.72	219.12	0.17
TWI000A	437	01JAN2012 1400	500.63	543.21	549.30		549.34	0.000193	1.54	329.62	179.47	0.13
TWI000A	437	01JAN2012 1500	323.49	543.21	548.13		548.15	0.000221	1.35	239.67	132.38	0.13
TWI000A	437	01JAN2012 1600	244.56	543.21	547.56		547.58	0.000225	1.23	198.94	106.70	0.13
TWI000A	437	01JAN2012 1700	198.91	543.21	547.18		547.20	0.000232	1.15	172.75	97.92	0.13
TWI000A	437	01JAN2012 1800	170.95	543.21	546.93		546.95	0.000237	1.10	155.71	92.00	0.13
TWI000A	437	01JAN2012 1900	138.48	543.21	546.66		546.67	0.000236	1.01	136.81	85.72	0.13
TWI000A	437	01JAN2012 2000	113.40	543.21	546.38		546.40	0.000216	0.95	119.07	72.69	0.12
TWI000A	437	01JAN2012 2100	102.22	543.21	546.25		546.27	0.000200	0.92	111.61	66.26	0.12
TWI000A	437	01JAN2012 2200	94.71	543.21	546.17		546.18	0.000190	0.89	106.89	62.78	0.11
TWI000A	437	01JAN2012 2300	88.66	543.21	546.10		546.11	0.000186	0.86	103.07	60.89	0.11
TWI000A	437	01JAN2012 2400	83.58	543.21	546.04		546.05	0.000182	0.84	99.81	56.99	0.11
TWI000A	390	Max WS	4342.35	540.00	555.99		556.05	0.000076	2.13	2482.46	226.77	0.10
TWI000A	390	31DEC2011 2400	6.79	540.00	544.21		544.21	0.000000	0.02	288.92	127.66	0.00
TWI000A	390	01JAN2012 0100	23.54	540.00	545.00		545.00	0.000000	0.06	399.42	144.97	0.01
TWI000A	390	01JAN2012 0200	46.59	540.00	545.45		545.45	0.000001	0.10	465.18	148.00	0.01
TWI000A	390	01JAN2012 0300	56.38	540.00	545.63		545.63	0.000001	0.12	492.70	149.43	0.01
TWI000A	390	01JAN2012 0400	61.11	540.00	545.71		545.71	0.000002	0.12	503.99	150.41	0.01
TWI000A	390	01JAN2012 0500	65.27	540.00	545.77		545.77	0.000002	0.13	512.90	151.18	0.01
TWI000A	390	01JAN2012 0600	70.28	540.00	545.83		545.83	0.000002	0.14	523.04	152.05	0.01
TWI000A	390	01JAN2012 0700	83.16	540.00	545.98		545.98	0.000002	0.16	544.73	153.90	0.01
TWI000A	390	01JAN2012 0800	104.40	540.00	546.23		546.23	0.000003	0.18	583.81	157.04	0.02
TWI000A	390	01JAN2012 0900	127.37	540.00	546.46		546.46	0.000004	0.21	621.21	159.31	0.02
TWI000A	390	01JAN2012 1000	167.98	540.00	546.83		546.83	0.000005	0.26	680.93	162.86	0.02
TWI000A	390	01JAN2012 1100	241.31	540.00	547.43		547.43	0.000006	0.33	780.10	168.07	0.03
TWI000A	390	01JAN2012 1200	620.76	540.00	549.60		549.60	0.000013	0.59	1168.50	187.41	0.04
TWI000A	390	01JAN2012 1300	1827.11	540.00	553.57		553.59	0.000026	1.10	1953.75	207.49	0.06
TWI000A	390	01JAN2012 1400	508.50	540.00	549.32		549.32	0.000010	0.50	1115.89	185.54	0.03
TWI000A	390	01JAN2012 1500	326.82	540.00	548.14		548.14	0.000008	0.39	901.44	176.89	0.03
TWI000A	390	01JAN2012 1600	247.33	540.00	547.56		547.57	0.000006	0.33	802.34	169.38	0.02
TWI000A	390	01JAN2012 1700	201.28	540.00	547.19		547.19	0.000005	0.29	739.23	166.04	0.02
TWI000A	390	01JAN2012 1800	173.15	540.00	546.94		546.94	0.000005	0.26	698.18	163.87	0.02
TWI000A	390	01JAN2012 1900	141.01	540.00	546.66		546.66	0.000004	0.22	652.85	161.20	0.02
TWI000A	390	01JAN2012 2000	115.51	540.00	546.38		546.38	0.000003	0.20	608.57	158.55	0.02
TWI000A	390	01JAN2012 2100	104.23	540.00	546.26		546.26	0.000003	0.18	588.46	157.33	0.02
TWI000A	390	01JAN2012 2200	96.68	540.00	546.17		546.17	0.000003	0.17	575.13	156.45	0.02
TWI000A	390	01JAN2012 2300	90.62	540.00	546.10		546.10	0.000002	0.17	564.21	155.54	0.01
TWI000A	390	01JAN2012 2400	85.52	540.00	546.04		546.04	0.000002	0.16	554.86	154.75	0.01
TWI000A	329	Max WS	4368.50	540.00	555.96		556.05	0.000080	2.34	2085.01	180.15	0.10
TWI000A	329	31DEC2011 2400	6.22	540.00	544.21		544.21	0.000000	0.01	436.88	118.30	0.00
TWI000A	329	01JAN2012 0100	24.95	540.00	545.00		545.00	0.000000	0.05	531.26	121.25	0.00
TWI000A	329	01JAN2012 0200	48.18	540.00	545.45		545.45	0.000000	0.08	586.09	122.93	0.01
TWI000A	329	01JAN2012 0300	58.49	540.00	545.63		545.63	0.000001	0.10	608.94	123.62	0.01
TWI000A	329	01JAN2012 0400	63.31	540.00	545.71		545.71	0.000001	0.10	618.26	123.83	0.01
TWI000A	329	01JAN2012 0500	67.46	540.00	545.77		545.77	0.000001	0.11	625.58	124.00	0.01
TWI000A	329	01JAN2012 0600	72.43	540.00	545.83		545.83	0.000001	0.12	633.87	124.18	0.01
TWI000A	329	01JAN2012 0700	84.83	540.00	545.98		545.98	0.000001	0.13	651.51	124.58	0.01
TWI000A	329	01JAN2012 0800	106.23	540.00	546.23		546.23	0.000001	0.16	682.90	125.28	0.01
TWI000A	329	01JAN2012 0900	129.04	540.00	546.46		546.46	0.000002	0.18	712.60	125.94	0.01
TWI000A	329	01JAN2012 1000	169.13	540.00	546.83		546.83	0.000002	0.23	759.48	126.97	0.02
TWI000A	329	01JAN2012 1100	241.92	540.00	547.43		547.43	0.000004	0.30	836.26	129.59	0.02
TWI000A	329	01JAN2012 1200	615.87	540.00	549.60		549.60	0.000010	0.57	1123.12	135.01	0.03
TWI000A	329	01JAN2012 1300	1849.17	540.00	553.56		553.59	0.000025	1.18	1686.87	150.88	0.06
TWI000A	329	01JAN2012 1400	517.71	540.00	549.32		549.32	0.000008	0.50	1085.22	134.35	0.03
TWI000A	329	01JAN2012 1500	331.02	540.00	548.14		548.14	0.000005	0.37	928.32	131.58	0.02
TWI000A	329	01JAN2012 1600	250.91	540.00	547.56		547.57	0.000004	0.30	853.38	130.18	0.02
TWI000A	329	01JAN2012 1700	204.33	540.00	547.19		547.19	0.000003	0.26	804.71	128.44	0.02
TWI000A	329	01JAN2012 1800	175.99	540.00	546.94		546.94	0.000003	0.23	772.91	127.28	0.02
TWI000A	329	01JAN2012 1900	144.33	540.00	546.66		546.66	0.000002	0.20	737.52	126.49	0.01
TWI000A	329	01JAN2012 2000	118.24	540.00	546.38		546.38	0.000002	0.17	702.59	125.72	0.01
TWI000A	329	01JAN2012 2100	106.78	540.00	546.26		546.26	0.000001	0.16	686.61	125.36	0.01
TWI000A	329	01JAN2012 2200	99.19	540.00	546.17		546.17	0.000001	0.15	675.97	125.12	0.01
TWI000A	329	01JAN2012 2300	93.12	540.00	546.10		546.10	0.000001	0.14	667.20	124.93	0.01
TWI000A	329	01JAN2012 2400	87.98	540.00	546.04		546.04	0.000001	0.13	659.69	124.76	0.01
TWI000A	237	Max WS	4408.75	540.00	555.99		556.04	0.000044	1.76	2783.48	219.82	0.08
TWI000A	237	31DEC2011 2400	4.81	540.00	544.21		544.21	0.000000	0.01	596.92	156.15	0.00
TWI000A	237	01JAN2012 0100	27.13	540.00	545.00		545.00	0.000000	0.04	721.28	159.88	0.00
TWI000A	237	01JAN2012 0200	50.62	540.00	545.45		545.45	0.000000	0.06	793.77	163.19	0.01
TWI000A	237	01JAN2012 0300	61.69	540.00	545.63		545.63	0.000000	0.08	824.14	164.48	0.01
TWI000A	237	01JAN2012 0400	66.69	540.00	545.71		545.71	0.000000	0.08	836.52	164.82	0.01
TWI000A	237	01JAN2012 0500	70.85	540.00	545.77		545.77	0.000000	0.08	846.29	165.10	0.01
TWI000A	237	01JAN2012 0600	75.76	540.00	545.83		545.83	0.000000	0.09	857.33	165.29	0.01
TWI000A	237	01JAN2012 0700	87.36	540.00	545.98		545.98	0.000001	0.10	880.79	165.67	0.01
TWI000A	237	01JAN2012 0800	109.04	540.00	546.23		546.23	0.000001	0.12	922.51	166.36	0.01
TWI000A	237	01JAN2012 0900	131.63	540.00	546.46		546.46	0.000001	0.14	961.92	167.00	0.01
TWI000A	237	01JAN2012 1000	170.91	540.00	546.83		546.83	0.000001	0.17	1024.05	168.17	0.01
TWI000A	237	01JAN2012 1100	242.94	540.00	547.43		547.43	0.000002	0.22	1125.52	170.61	0.01
TWI000A	237	01JAN2012 1200	609.54	540.00	549.60		549.60	0.000005	0.42	1505.93	181.37	0.02
TWI000A	237	01JAN2012 1300	1882.77	540.00	553.57		553.58	0.000014	0.90	2267.98	205.22	0.04
TWI000A	237	01JAN2012 1400	531.63	540.00	549.32		549.32	0.000004	0.38	1455.28	179.37	0.02

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	237	01JAN2012 1500	337.45	540.00	548.14		548.14	0.000003	0.28	1246.80	173.78	0.02
TWI000A	237	01JAN2012 1600	256.40	540.00	547.56		547.57	0.000002	0.23	1148.08	171.15	0.02
TWI000A	237	01JAN2012 1700	209.05	540.00	547.19		547.19	0.000002	0.20	1083.91	169.61	0.01
TWI000A	237	01JAN2012 1800	180.39	540.00	546.94		546.94	0.000001	0.18	1041.83	168.60	0.01
TWI000A	237	01JAN2012 1900	149.44	540.00	546.66		546.66	0.000001	0.15	994.99	167.54	0.01
TWI000A	237	01JAN2012 2000	122.46	540.00	546.38		546.38	0.000001	0.13	948.67	166.79	0.01
TWI000A	237	01JAN2012 2100	110.75	540.00	546.26		546.26	0.000001	0.12	927.44	166.44	0.01
TWI000A	237	01JAN2012 2200	103.09	540.00	546.17		546.17	0.000001	0.11	913.30	166.21	0.01
TWI000A	237	01JAN2012 2300	96.97	540.00	546.10		546.10	0.000001	0.11	901.68	166.02	0.01
TWI000A	237	01JAN2012 2400	91.81	540.00	546.04		546.04	0.000001	0.10	891.68	165.85	0.01
TWI000A	179	Max WS	4432.28	540.00	555.96		556.04	0.000074	2.24	2376.57	215.10	0.10
TWI000A	179	31DEC2011 2400	3.79	540.00	544.21		544.21	0.000000	0.01	425.23	122.71	0.00
TWI000A	179	01JAN2012 0100	28.37	540.00	545.00		545.00	0.000000	0.05	526.61	133.08	0.00
TWI000A	179	01JAN2012 0200	52.02	540.00	545.45		545.45	0.000001	0.09	587.39	137.53	0.01
TWI000A	179	01JAN2012 0300	63.63	540.00	545.63		545.63	0.000001	0.11	613.03	139.11	0.01
TWI000A	179	01JAN2012 0400	68.73	540.00	545.71		545.71	0.000001	0.11	623.52	139.74	0.01
TWI000A	179	01JAN2012 0500	72.88	540.00	545.77		545.77	0.000001	0.12	631.80	140.33	0.01
TWI000A	179	01JAN2012 0600	77.74	540.00	545.83		545.83	0.000001	0.12	641.20	140.99	0.01
TWI000A	179	01JAN2012 0700	88.84	540.00	545.97		545.98	0.000001	0.14	661.28	142.41	0.01
TWI000A	179	01JAN2012 0800	110.68	540.00	546.23		546.23	0.000002	0.16	697.36	144.76	0.01
TWI000A	179	01JAN2012 0900	133.11	540.00	546.46		546.46	0.000002	0.19	731.83	146.96	0.01
TWI000A	179	01JAN2012 1000	171.86	540.00	546.83		546.83	0.000003	0.23	786.82	149.04	0.02
TWI000A	179	01JAN2012 1100	243.36	540.00	547.43		547.43	0.000004	0.29	876.50	150.48	0.02
TWI000A	179	01JAN2012 1200	603.55	540.00	549.60		549.60	0.000009	0.54	1208.93	156.98	0.03
TWI000A	179	01JAN2012 1300	1905.10	540.00	553.56		553.58	0.000025	1.16	1884.06	193.09	0.06
TWI000A	179	01JAN2012 1400	540.60	540.00	549.32		549.32	0.000008	0.50	1165.09	156.09	0.03
TWI000A	179	01JAN2012 1500	341.53	540.00	548.14		548.14	0.000005	0.37	983.06	152.17	0.02
TWI000A	179	01JAN2012 1600	259.82	540.00	547.56		547.57	0.000004	0.31	896.37	150.80	0.02
TWI000A	179	01JAN2012 1700	211.98	540.00	547.19		547.19	0.000003	0.27	839.79	149.89	0.02
TWI000A	179	01JAN2012 1800	183.07	540.00	546.94		546.94	0.000003	0.24	802.57	149.30	0.02
TWI000A	179	01JAN2012 1900	152.62	540.00	546.66		546.66	0.000002	0.21	761.06	148.59	0.02
TWI000A	179	01JAN2012 2000	125.05	540.00	546.38		546.38	0.000002	0.18	720.19	146.22	0.01
TWI000A	179	01JAN2012 2100	113.15	540.00	546.26		546.26	0.000002	0.17	701.65	145.04	0.01
TWI000A	179	01JAN2012 2200	105.46	540.00	546.17		546.17	0.000001	0.16	689.35	144.25	0.01
TWI000A	179	01JAN2012 2300	99.30	540.00	546.10		546.10	0.000001	0.15	679.29	143.60	0.01
TWI000A	179	01JAN2012 2400	94.13	540.00	546.04		546.04	0.000001	0.14	670.65	143.04	0.01
TWI000A	165	Max WS	4432.25	540.00	555.70	551.20	556.16	0.002470	6.25	1003.13	217.24	0.49
TWI000A	165	31DEC2011 2400	3.24	540.00	544.21	540.19	544.21	0.000000	0.05	62.98	97.25	0.01
TWI000A	165	01JAN2012 0100	28.20	540.00	545.00	540.77	545.00	0.000014	0.34	84.35	107.90	0.03
TWI000A	165	01JAN2012 0200	51.88	540.00	545.44	541.11	545.45	0.000030	0.55	98.62	113.29	0.05
TWI000A	165	01JAN2012 0300	63.60	540.00	545.63	541.26	545.64	0.000038	0.64	104.94	115.18	0.06
TWI000A	165	01JAN2012 0400	68.71	540.00	545.70	541.31	545.71	0.000041	0.68	107.59	116.06	0.06
TWI000A	165	01JAN2012 0500	72.86	540.00	545.76	541.36	545.77	0.000044	0.71	109.86	122.16	0.06
TWI000A	165	01JAN2012 0600	77.70	540.00	545.83	541.41	545.84	0.000048	0.74	112.64	122.68	0.06
TWI000A	165	01JAN2012 0700	88.72	540.00	545.97	541.52	545.98	0.000055	0.82	118.55	123.77	0.07
TWI000A	165	01JAN2012 0800	110.58	540.00	546.22	541.73	546.23	0.000070	0.95	129.03	125.70	0.08
TWI000A	165	01JAN2012 0900	132.99	540.00	546.45	541.92	546.47	0.000084	1.08	138.87	127.50	0.09
TWI000A	165	01JAN2012 1000	171.64	540.00	546.82	542.21	546.85	0.000107	1.28	154.30	130.29	0.10
TWI000A	165	01JAN2012 1100	243.04	540.00	547.41	542.67	547.45	0.000144	1.60	179.17	134.79	0.12
TWI000A	165	01JAN2012 1200	599.42	540.00	549.54	544.29	549.65	0.000335	2.69	278.66	148.33	0.19
TWI000A	165	01JAN2012 1300	1907.98	540.00	553.41	547.40	553.71	0.000584	4.84	586.74	190.80	0.26
TWI000A	165	01JAN2012 1400	541.68	540.00	549.27	544.08	549.36	0.000320	2.55	260.86	146.14	0.18
TWI000A	165	01JAN2012 1500	341.86	540.00	548.11	543.19	548.16	0.000188	1.98	208.35	139.44	0.14
TWI000A	165	01JAN2012 1600	260.05	540.00	547.54	542.76	547.58	0.000152	1.67	184.64	135.79	0.12
TWI000A	165	01JAN2012 1700	212.12	540.00	547.17	542.48	547.20	0.000129	1.47	169.03	132.95	0.11
TWI000A	165	01JAN2012 1800	183.16	540.00	546.93	542.29	546.95	0.000113	1.34	158.69	131.08	0.10
TWI000A	165	01JAN2012 1900	152.80	540.00	546.65	542.07	546.67	0.000096	1.19	147.10	128.98	0.09
TWI000A	165	01JAN2012 2000	125.12	540.00	546.37	541.85	546.39	0.000079	1.04	135.57	126.90	0.08
TWI000A	165	01JAN2012 2100	113.19	540.00	546.25	541.75	546.26	0.000071	0.97	130.26	125.93	0.08
TWI000A	165	01JAN2012 2200	105.50	540.00	546.16	541.68	546.18	0.000066	0.92	126.72	125.27	0.08
TWI000A	165	01JAN2012 2300	99.33	540.00	546.09	541.63	546.11	0.000062	0.88	123.80	124.74	0.07
TWI000A	165	01JAN2012 2400	94.16	540.00	546.04	541.58	546.05	0.000059	0.85	121.29	124.27	0.07
TWI000A	143		Inl Struct									
TWI000A	106	Max WS	4432.25	537.10	550.79	548.90	553.07	0.008250	13.03	479.64	143.92	0.66
TWI000A	106	31DEC2011 2400	3.24	537.10	537.76		537.82	0.020018	1.97	1.64	4.95	0.60
TWI000A	106	01JAN2012 0100	28.20	537.10	538.69		538.81	0.014543	2.86	9.85	13.20	0.58
TWI000A	106	01JAN2012 0200	51.88	537.10	539.17		539.31	0.011071	3.01	17.24	17.43	0.53
TWI000A	106	01JAN2012 0300	63.60	537.10	539.36		539.51	0.009608	3.08	20.67	18.06	0.51
TWI000A	106	01JAN2012 0400	68.71	537.10	539.44		539.59	0.009139	3.11	22.09	18.24	0.50
TWI000A	106	01JAN2012 0500	72.86	537.10	539.50		539.65	0.008833	3.14	23.20	18.38	0.49
TWI000A	106	01JAN2012 0600	77.70	537.10	539.57		539.73	0.008475	3.17	24.53	18.55	0.49
TWI000A	106	01JAN2012 0700	88.72	537.10	539.72		539.88	0.007950	3.25	27.32	18.89	0.48
TWI000A	106	01JAN2012 0800	110.58	537.10	539.99		540.17	0.007252	3.39	32.58	19.52	0.46
TWI000A	106	01JAN2012 0900	132.99	537.10	540.23		540.43	0.006994	3.56	37.32	20.09	0.46
TWI000A	106	01JAN2012 1000	171.64	537.10	540.60		540.83	0.006777	3.83	44.84	20.97	0.46
TWI000A	106	01JAN2012 1100	243.04	537.10	541.19		541.46	0.006560	4.22	57.58	22.39	0.46
TWI000A	106	01JAN2012 1200	599.42	537.10	543.12		543.63	0.006321	5.75	105.52	27.24	0.49
TWI000A	106	01JAN2012 1300	1907.98	537.10	547.21		548.36	0.006093	8.83	233.26	34.66	0.54
TWI000A	106	01JAN2012 1400	541.68	537.10	542.88		543.35	0.006304	5.52	98.94	26.61	0.48
TWI000A	106	01JAN2012 1500	341.86	537.10	541.88		542.21	0.006405	4.64	73.64	24.05	0.47

HEC-RAS Plan: Roos_1%_Propsed River: TSD Reach: TWI000A (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
TWI000A	106	01JAN2012 1600	260.05	537.10	541.31		541.60	0.006518	4.30	60.47	22.70	0.46
TWI000A	106	01JAN2012 1700	212.12	537.10	540.94		541.20	0.006627	4.06	52.23	21.81	0.46
TWI000A	106	01JAN2012 1800	183.16	537.10	540.70		540.94	0.006729	3.90	46.99	21.22	0.46
TWI000A	106	01JAN2012 1900	152.80	537.10	540.43		540.64	0.006863	3.70	41.26	20.56	0.46
TWI000A	106	01JAN2012 2000	125.12	537.10	540.15		540.34	0.007044	3.50	35.74	19.90	0.46
TWI000A	106	01JAN2012 2100	113.19	537.10	540.02		540.20	0.007217	3.41	33.15	19.59	0.46
TWI000A	106	01JAN2012 2200	105.50	537.10	539.93		540.11	0.007375	3.36	31.40	19.38	0.47
TWI000A	106	01JAN2012 2300	99.33	537.10	539.86		540.03	0.007559	3.32	29.93	19.20	0.47
TWI000A	106	01JAN2012 2400	94.16	537.10	539.79		539.96	0.007705	3.28	28.71	19.06	0.47
TWI000A	87	Max WS	4432.39	536.80	551.12	549.27	552.45	0.004988	10.47	735.89	189.58	0.52
TWI000A	87	31DEC2011 2400	3.17	536.80	537.57	537.29	537.59	0.005357	1.14	2.79	7.21	0.32
TWI000A	87	01JAN2012 0100	28.17	536.80	538.56	537.98	538.63	0.005046	2.04	13.78	13.88	0.36
TWI000A	87	01JAN2012 0200	51.85	536.80	539.06	538.28	539.15	0.005018	2.43	21.31	16.25	0.37
TWI000A	87	01JAN2012 0300	63.59	536.80	539.26	538.41	539.37	0.005016	2.58	24.68	17.21	0.38
TWI000A	87	01JAN2012 0400	68.70	536.80	539.35	538.46	539.45	0.005018	2.63	26.10	17.59	0.38
TWI000A	87	01JAN2012 0500	72.85	536.80	539.41	538.51	539.52	0.005023	2.68	27.22	17.89	0.38
TWI000A	87	01JAN2012 0600	77.70	536.80	539.48	538.55	539.60	0.005008	2.72	28.55	18.24	0.38
TWI000A	87	01JAN2012 0700	88.69	536.80	539.64	538.65	539.76	0.005018	2.82	31.41	18.97	0.39
TWI000A	87	01JAN2012 0800	110.56	536.80	539.92	538.84	540.06	0.005011	3.00	36.91	20.30	0.39
TWI000A	87	01JAN2012 0900	132.96	536.80	540.16	539.01	540.32	0.005012	3.17	41.97	21.13	0.40
TWI000A	87	01JAN2012 1000	171.59	536.80	540.53	539.28	540.71	0.005006	3.43	50.00	22.14	0.40
TWI000A	87	01JAN2012 1100	242.96	536.80	541.13	539.70	541.35	0.005005	3.82	63.66	23.74	0.41
TWI000A	87	01JAN2012 1200	598.36	536.80	543.10	541.13	543.52	0.005001	5.23	115.15	28.01	0.44
TWI000A	87	01JAN2012 1300	1909.71	536.80	547.25	544.26	548.24	0.005003	8.17	269.10	67.35	0.49
TWI000A	87	01JAN2012 1400	541.95	536.80	542.85	540.95	543.24	0.005004	5.03	108.18	27.57	0.44
TWI000A	87	01JAN2012 1500	341.95	536.80	541.83	540.17	542.10	0.005006	4.22	80.95	25.64	0.42
TWI000A	87	01JAN2012 1600	260.11	536.80	541.26	539.79	541.49	0.005006	3.90	66.77	24.09	0.41
TWI000A	87	01JAN2012 1700	212.15	536.80	540.88	539.53	541.09	0.005004	3.66	57.92	23.08	0.41
TWI000A	87	01JAN2012 1800	183.18	536.80	540.63	539.35	540.83	0.005009	3.50	52.30	22.42	0.40
TWI000A	87	01JAN2012 1900	152.85	536.80	540.36	539.15	540.53	0.005010	3.31	46.17	21.66	0.40
TWI000A	87	01JAN2012 2000	125.14	536.80	540.08	538.96	540.23	0.005011	3.11	40.28	20.92	0.39
TWI000A	87	01JAN2012 2100	113.21	536.80	539.95	538.86	540.09	0.005026	3.02	37.51	20.44	0.39
TWI000A	87	01JAN2012 2200	105.51	536.80	539.85	538.80	539.99	0.005012	2.96	35.66	20.01	0.39
TWI000A	87	01JAN2012 2300	99.33	536.80	539.78	538.75	539.91	0.005017	2.91	34.12	19.64	0.39
TWI000A	87	01JAN2012 2400	94.16	536.80	539.71	538.70	539.84	0.005005	2.87	32.84	19.33	0.39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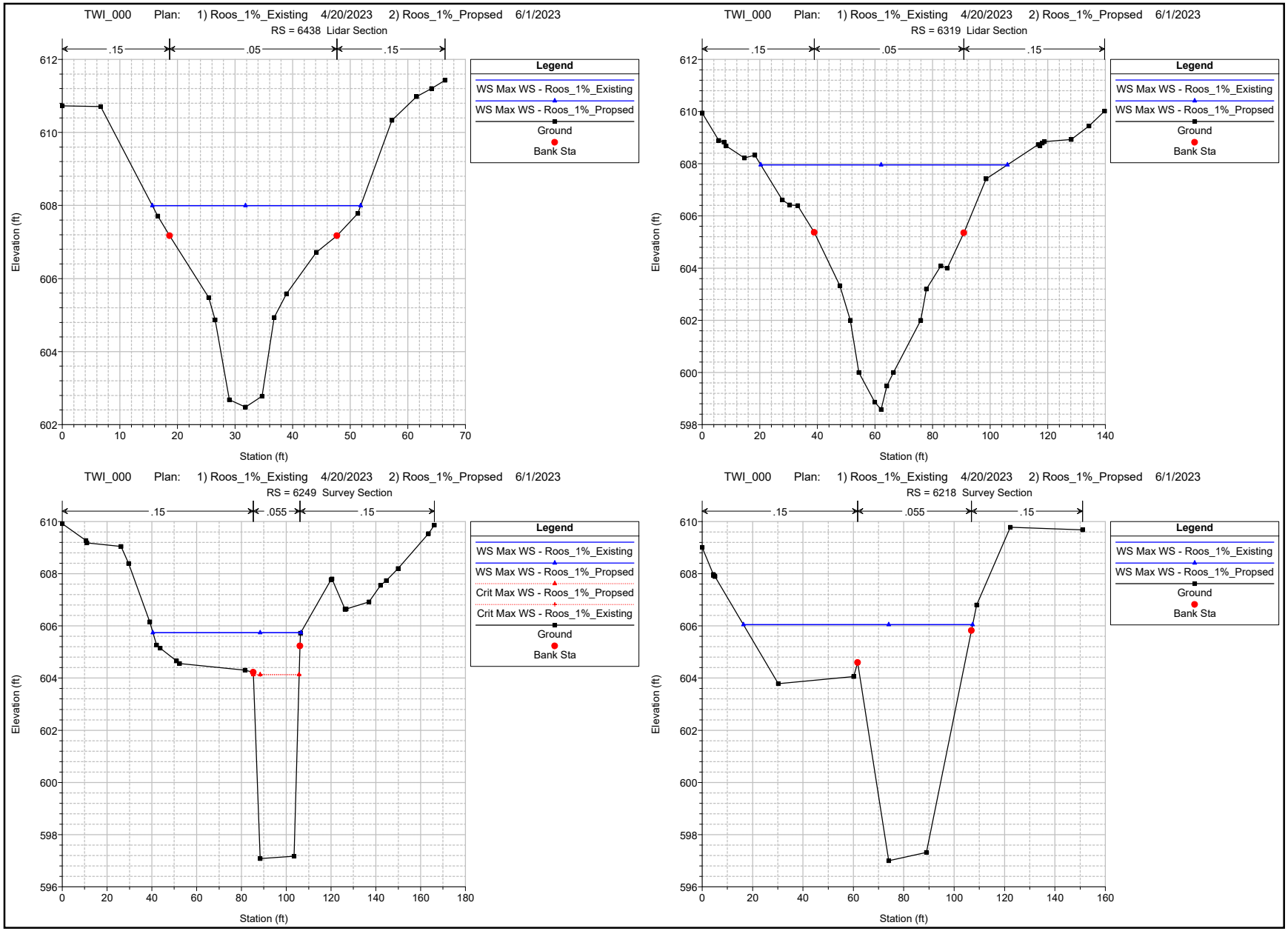
RS = 6594 Lidar Section
.5
.15
.05
.075
Legend
Crit Max WS - Roos_1%_Existing
Crit Max WS - Roos_1%_Propsed
WS Max WS - Roos_1%_Propsed
WS Max WS - Roos_1%_Existing
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6562 Lidar Section
.15
.05
.15
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6532 Lidar Section
.15
.05
.15
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6498 Lidar Section
.15
.05
.15
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)


TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6438 Lidar Section
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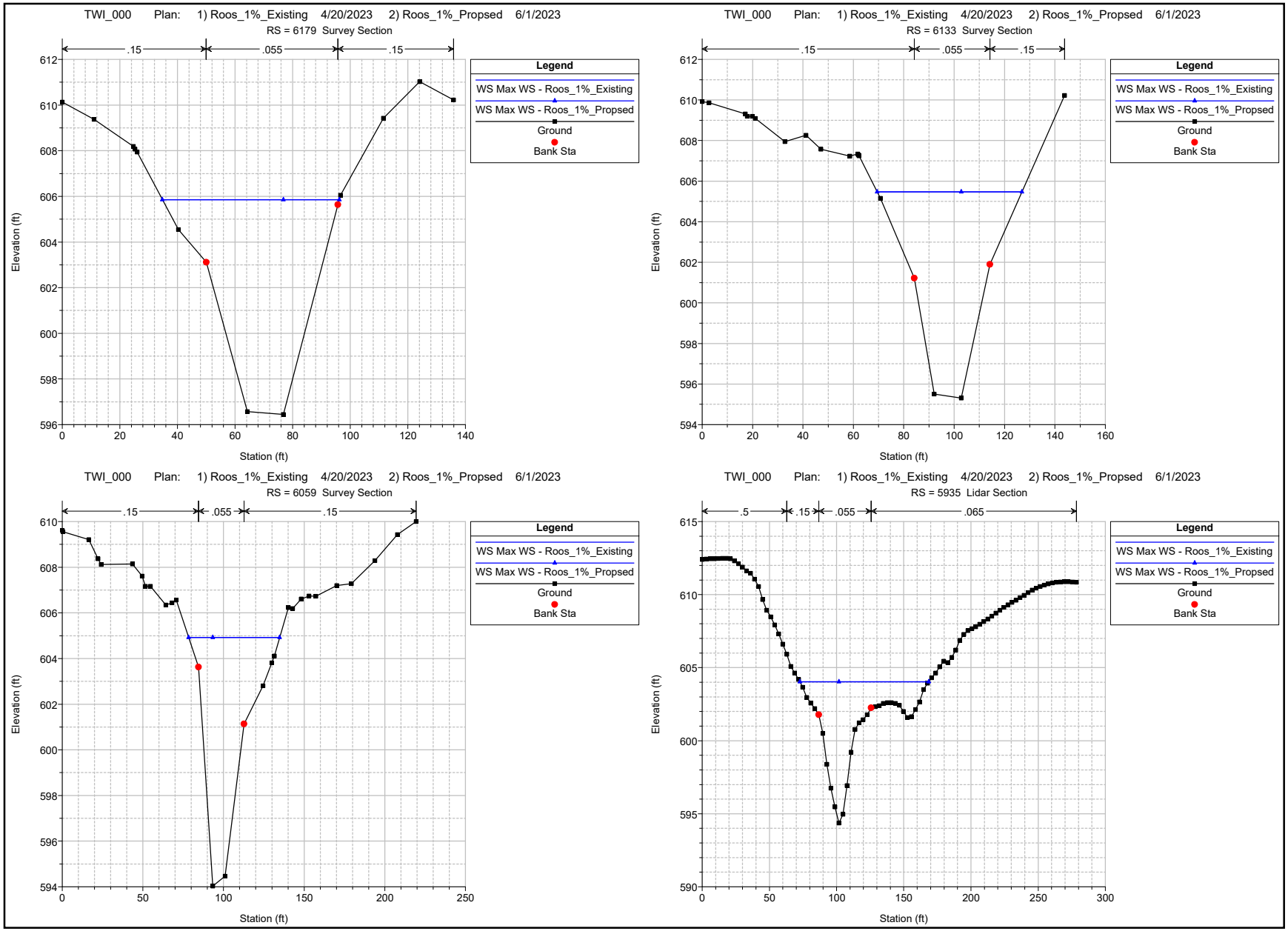
.05
.15
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6319 Lidar Section
.15
.05
.15
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6249 Survey Section
.15
.055
.15
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6218 Survey Section
.15
.055
.15
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta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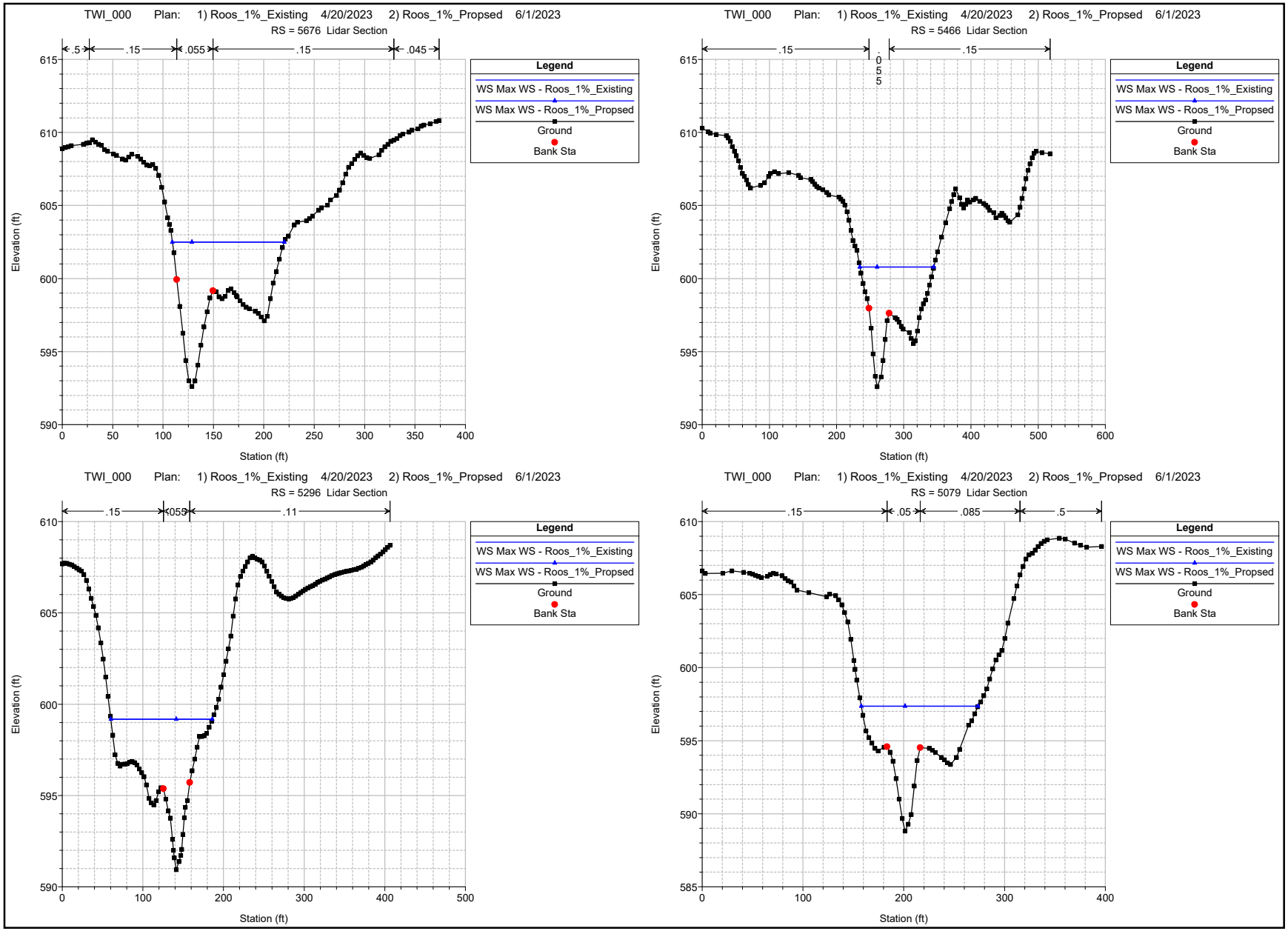
.15
.055
.15
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6133 Survey Section
.15
.055
.15
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 6059 Survey Section
.15
.055
.15
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 5935 Lidar Section
.5
.15
.055
.065
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)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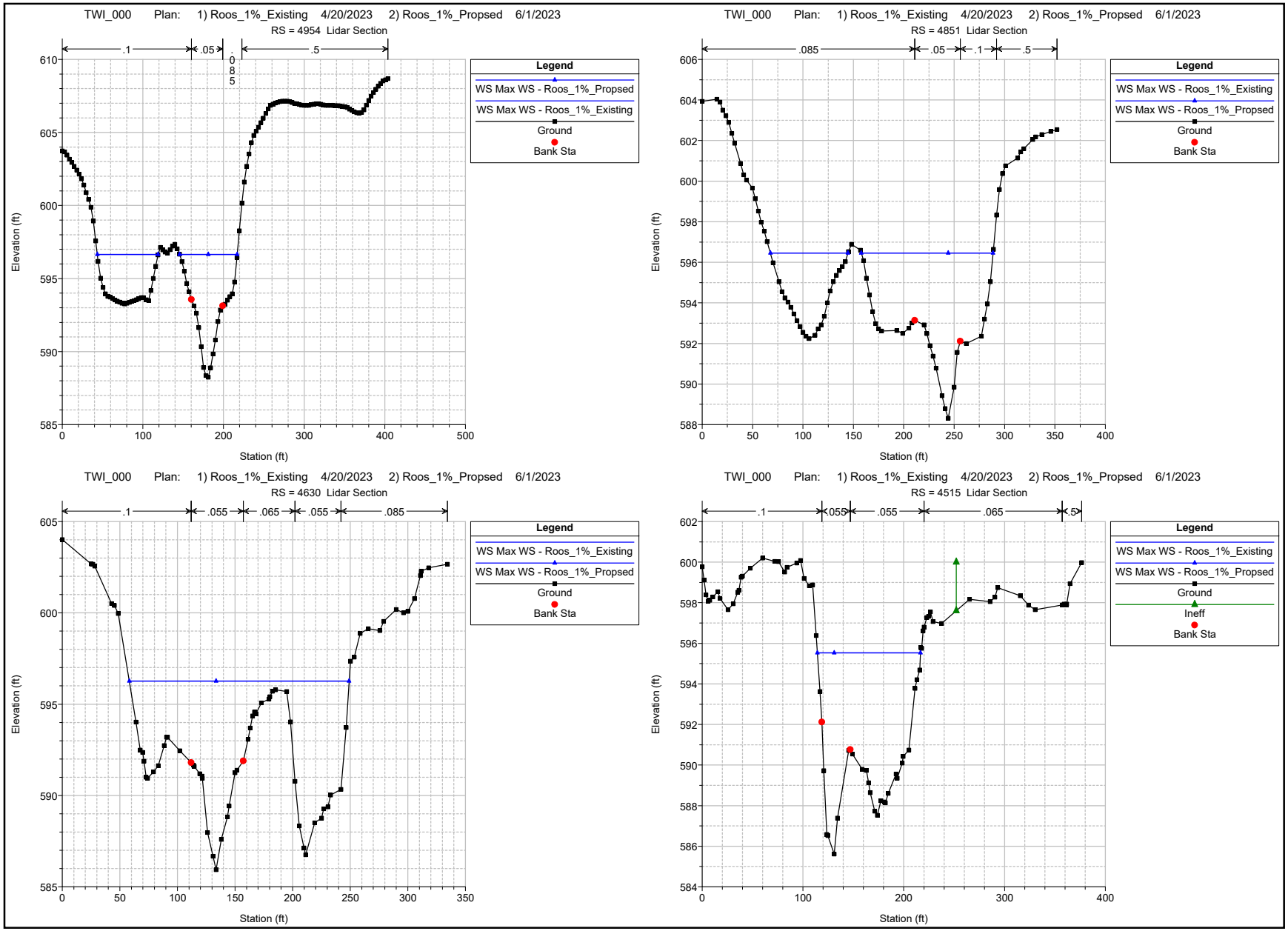
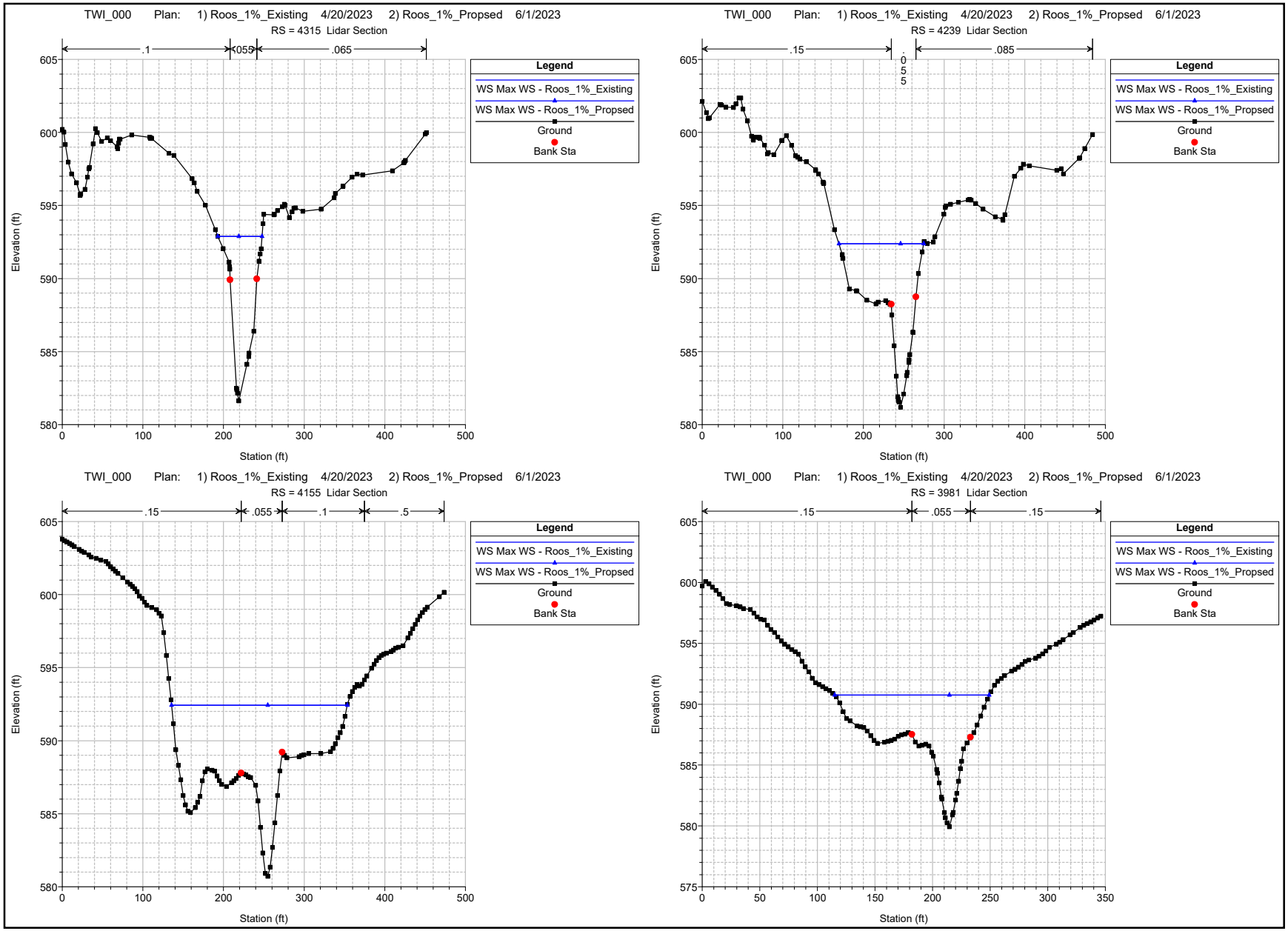
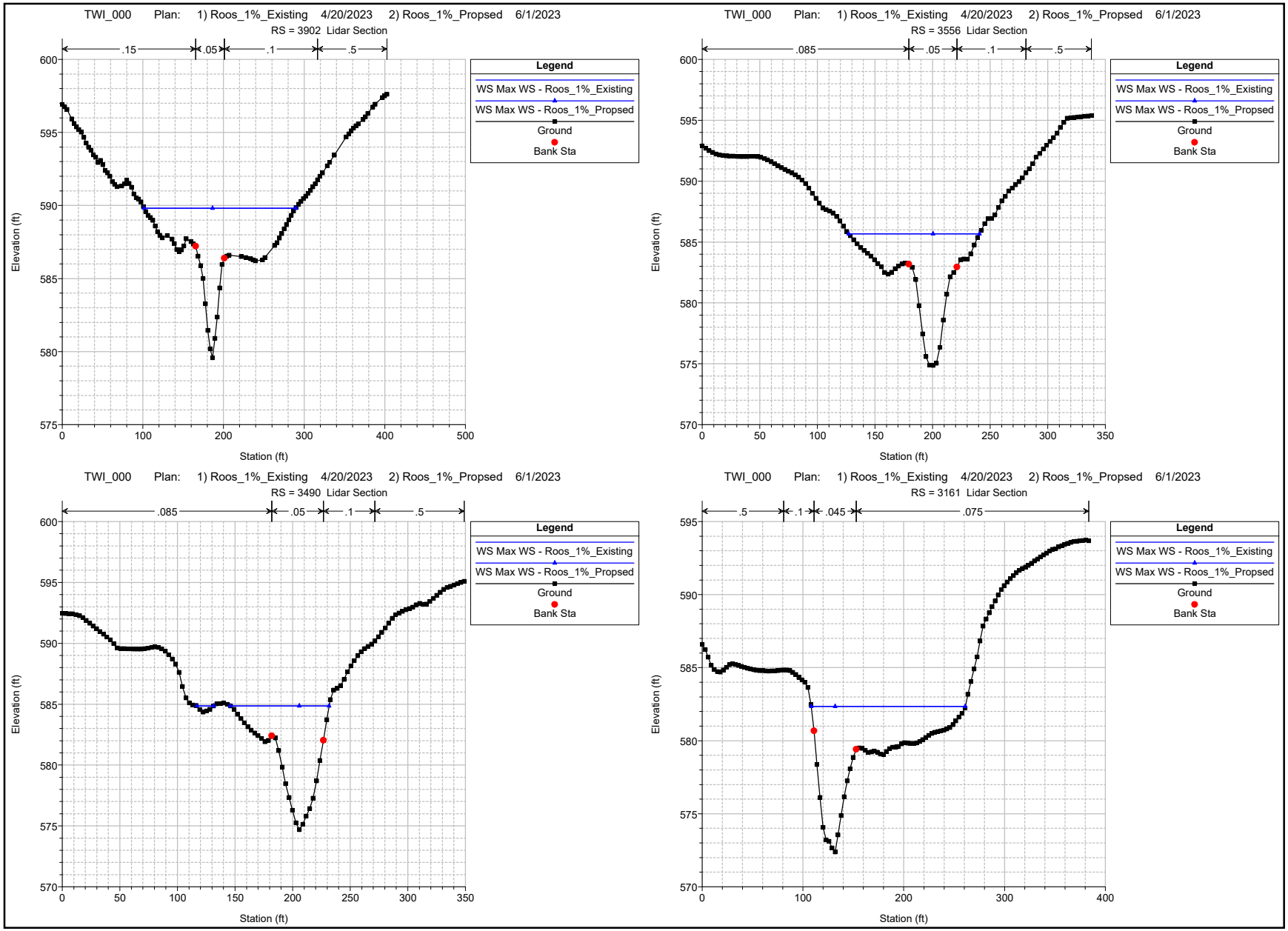
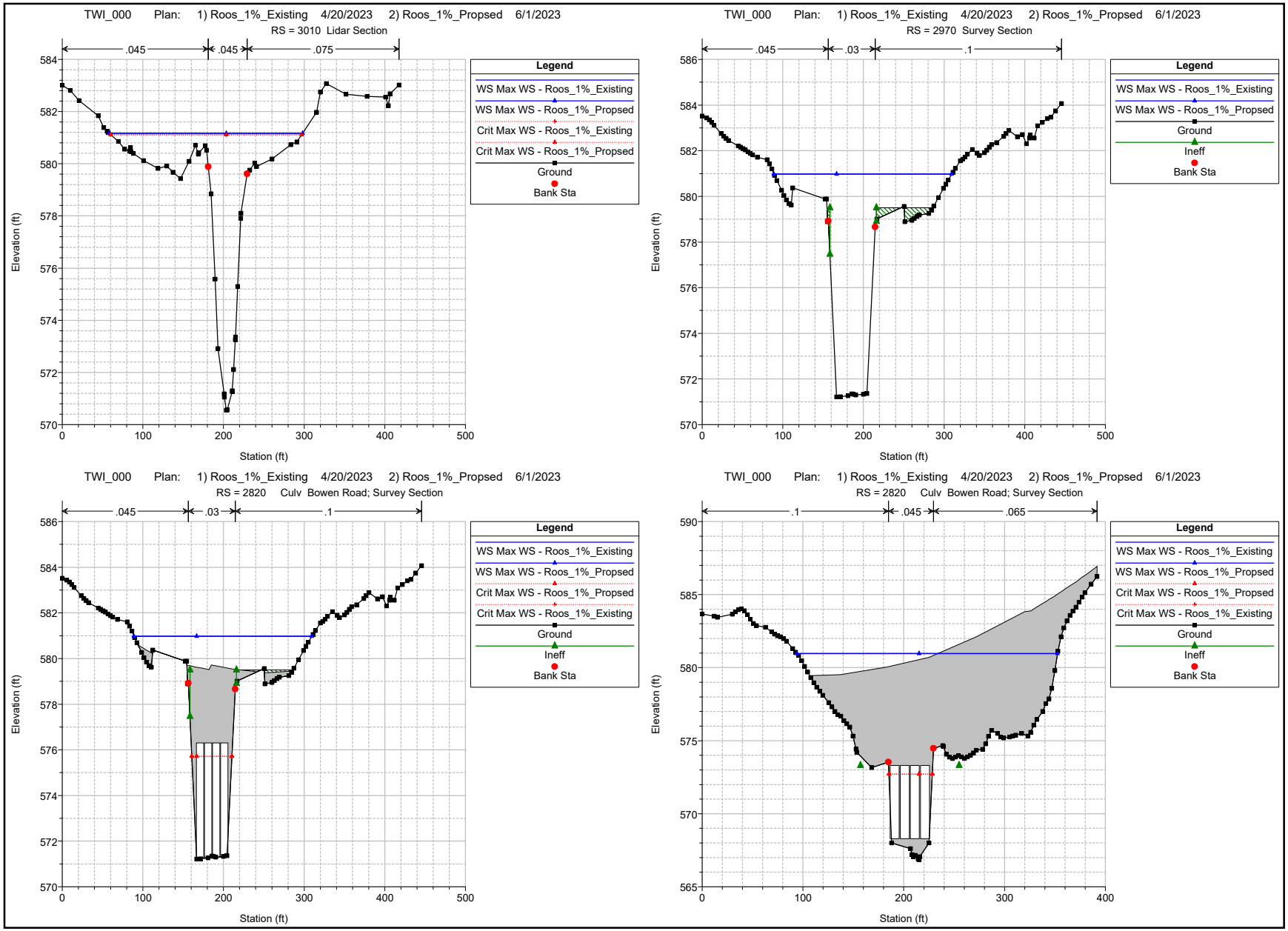
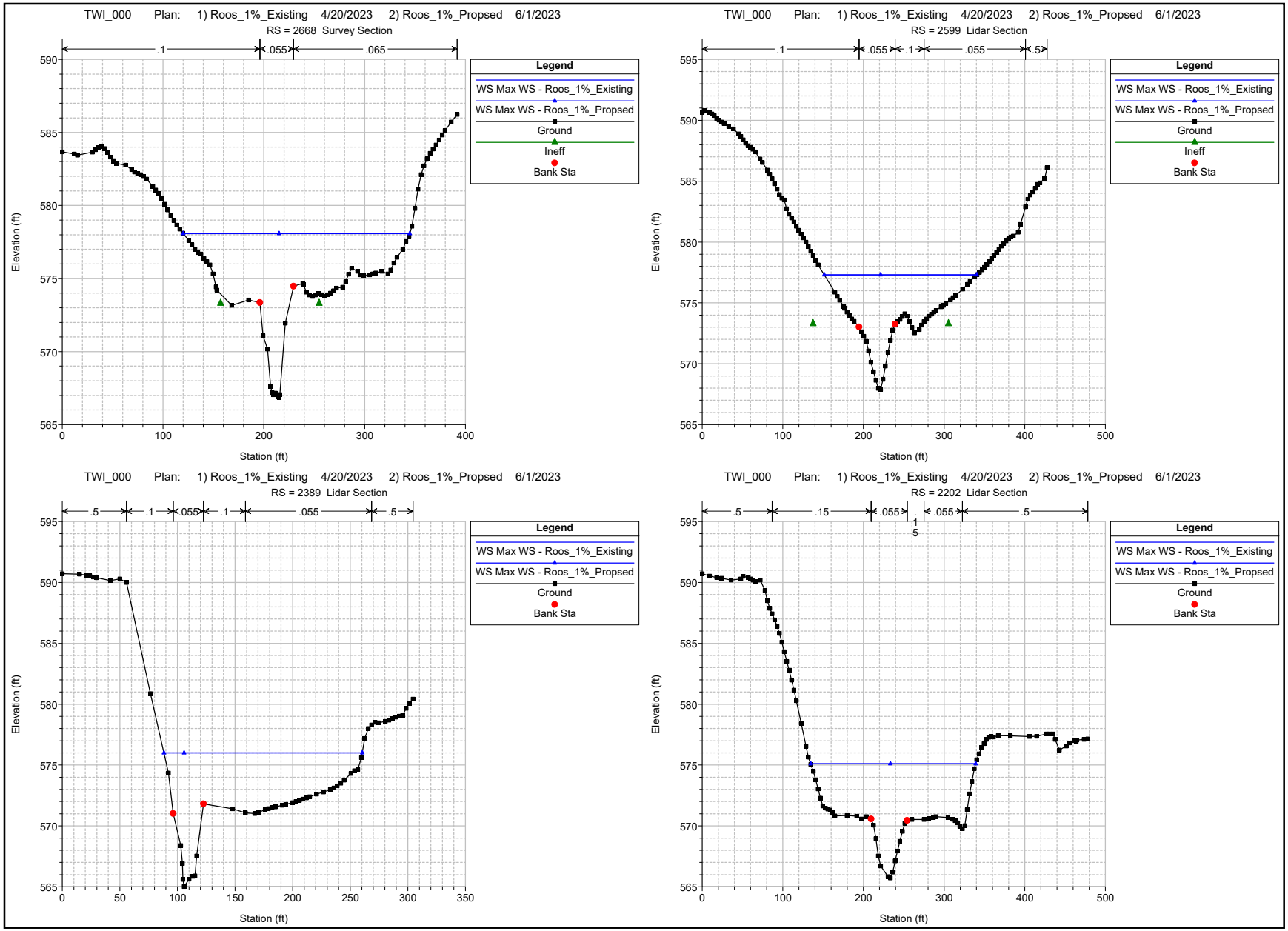
RS = 5676 Lidar Section
.5
.15
.055
.15
.045
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 5466 Lidar Section
.15
.055
.15
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 5296 Lidar Section
.15
.055
.11
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 5079 Lidar Section
.15
.05
.085
.5
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta

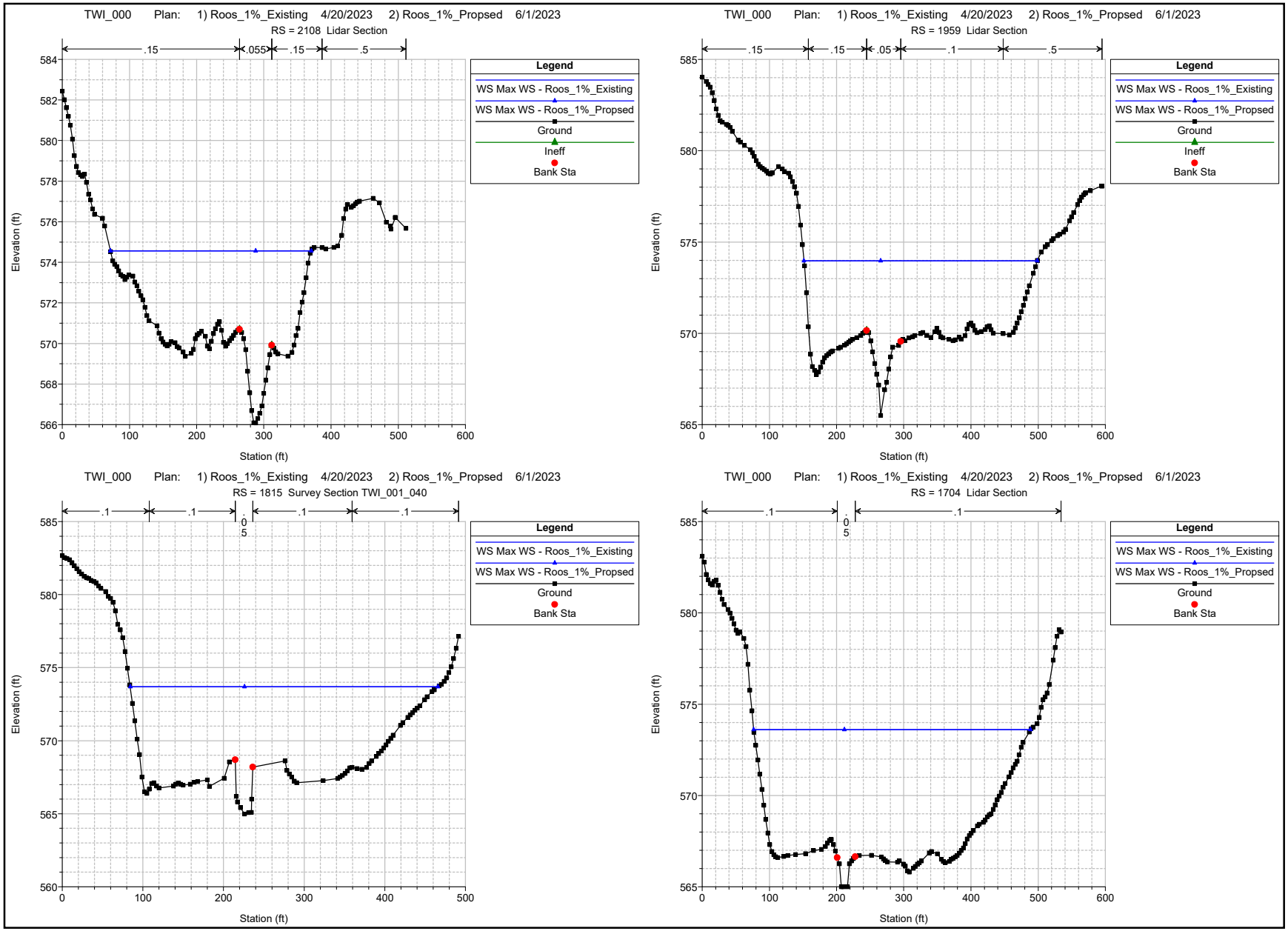

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 4954 Lidar Section
.1
.05
.085
.5
Legend
WS Max WS - Roos_1%_Propsed
WS Max WS - Roos_1%_Existing
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 4851 Lidar Section
.085
.05
.1
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 4630 Lidar Section
.1
.055
.065
.055
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 4515 Lidar Section
.1
.055
.055
.065
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

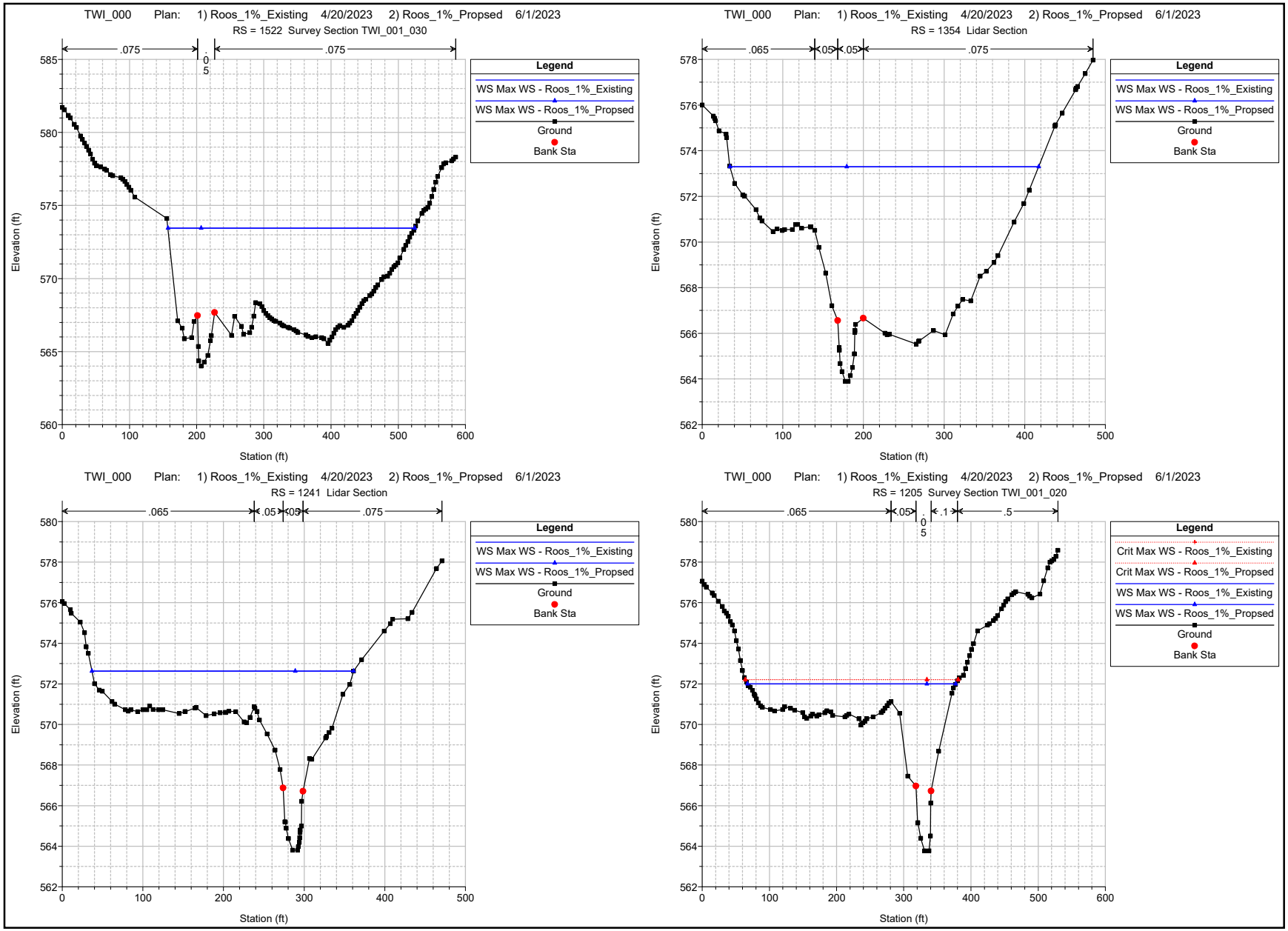

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 4315 Lidar Section
.1
.055
.065
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 4239 Lidar Section
.15
.055
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 4155 Lidar Section
.15
.055
.1
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 3981 Lidar Section
.15
.055
.15
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)

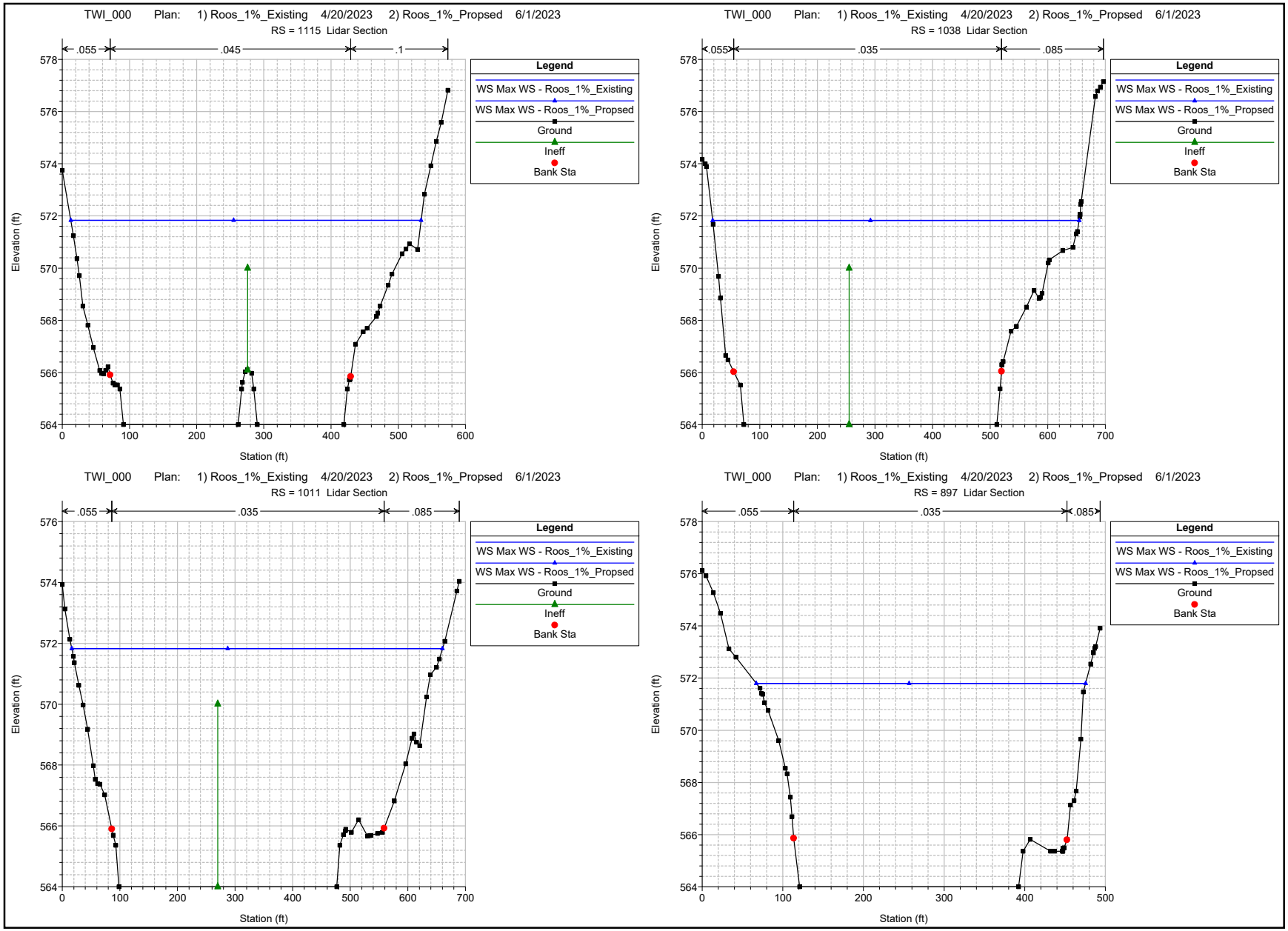

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 3902 Lidar Section
.15
.05
.1
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 3556 Lidar Section
.085
.05
.1
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 3490 Lidar Section
.085
.05
.1
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 3161 Lidar Section
.5
.1
.045
.075
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)

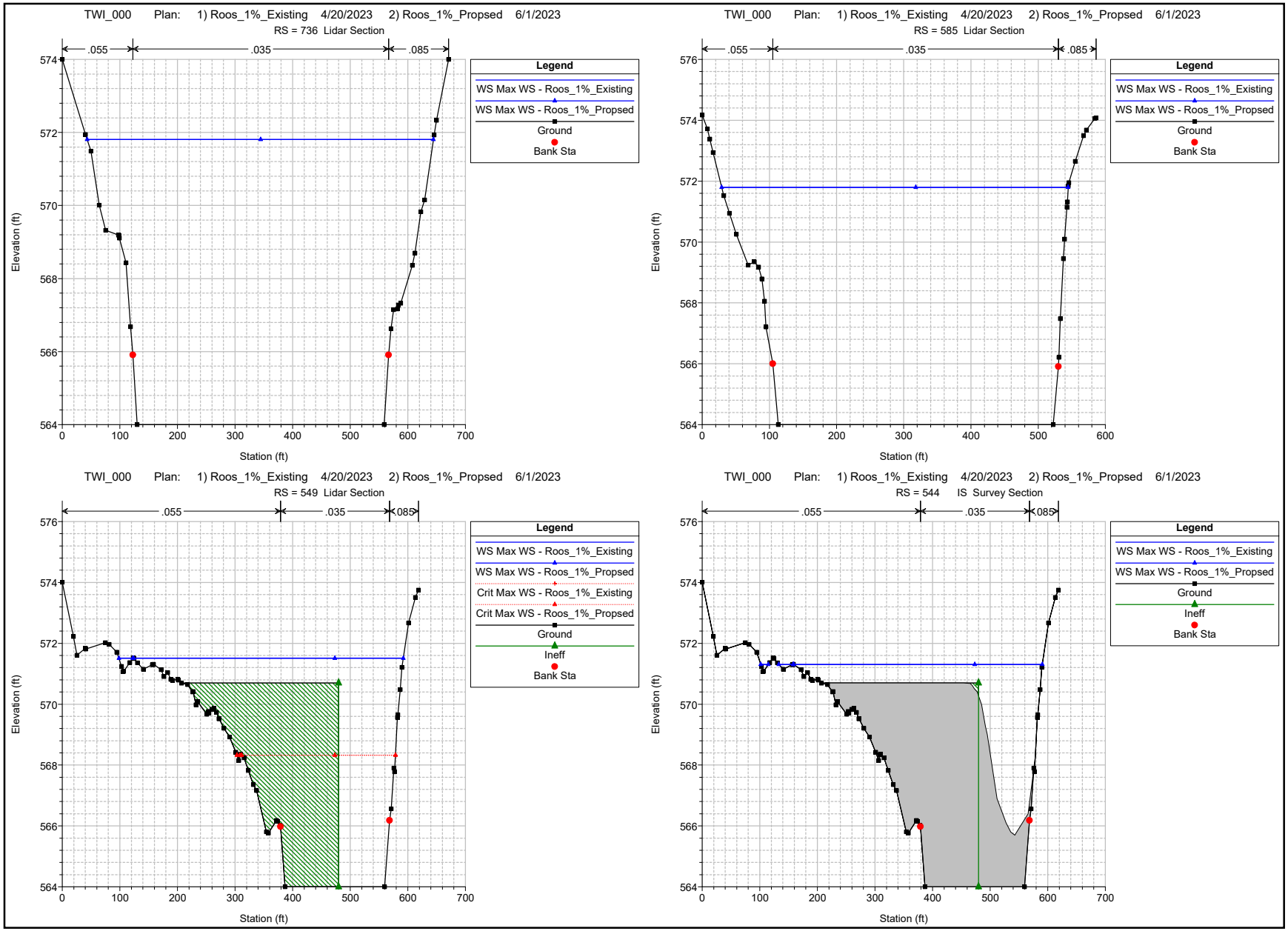

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 3010 Lidar Section
.045
.045
.075
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Crit Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2970 Survey Section
.045
.03
.1
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2820 Culv Bowen Road; Survey Section
.045
.03
.1
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2820 Culv Bowen Road; Survey Section
.1
.045
.065
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

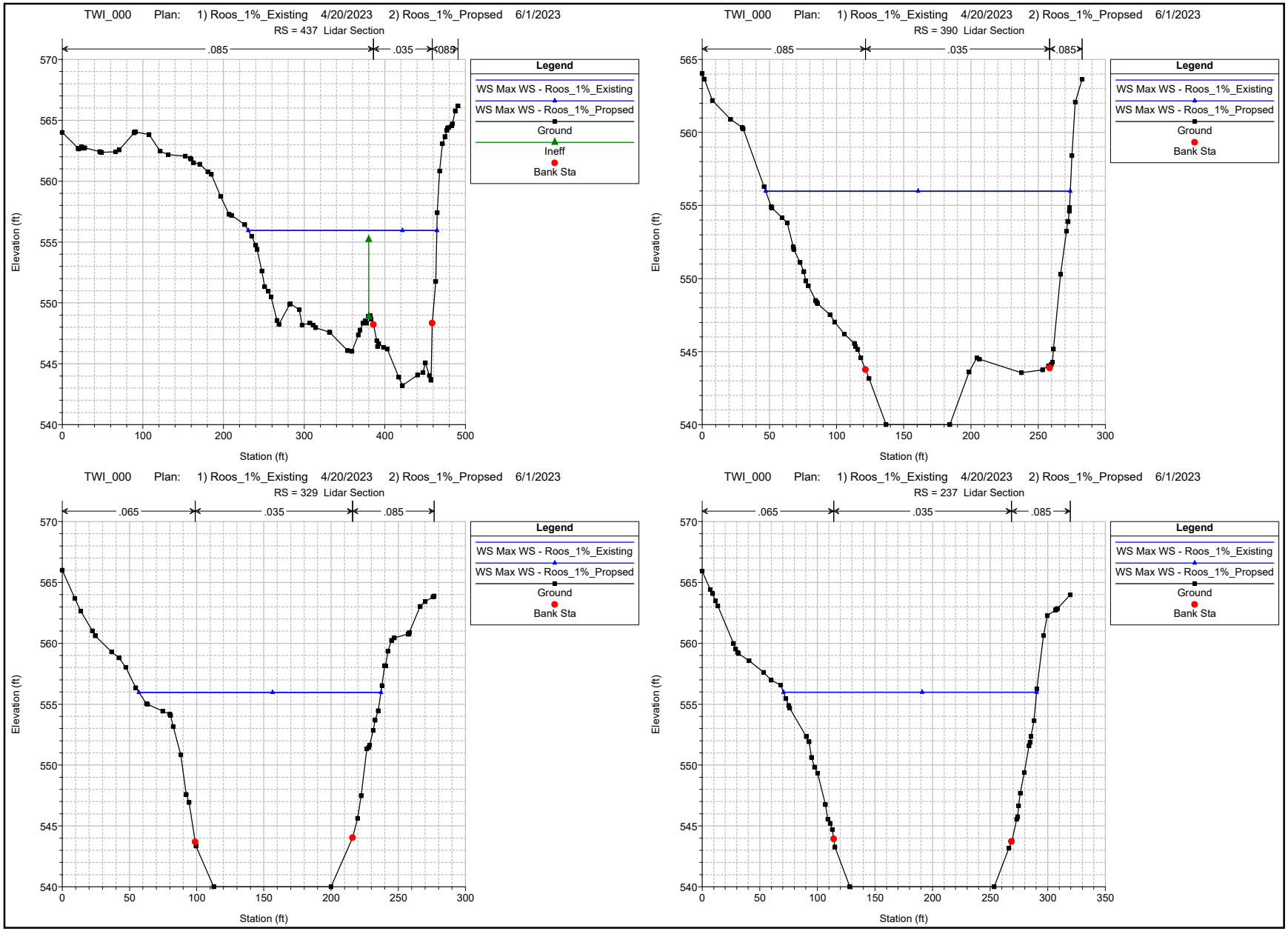

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2668 Survey Section
.1
.055
.065
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2599 Lidar Section
.1
.055
.1
.055
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2389 Lidar Section
.5
.1
.055
.1
.055
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2202 Lidar Section
.5
.15
.055
.1
.055
.5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)

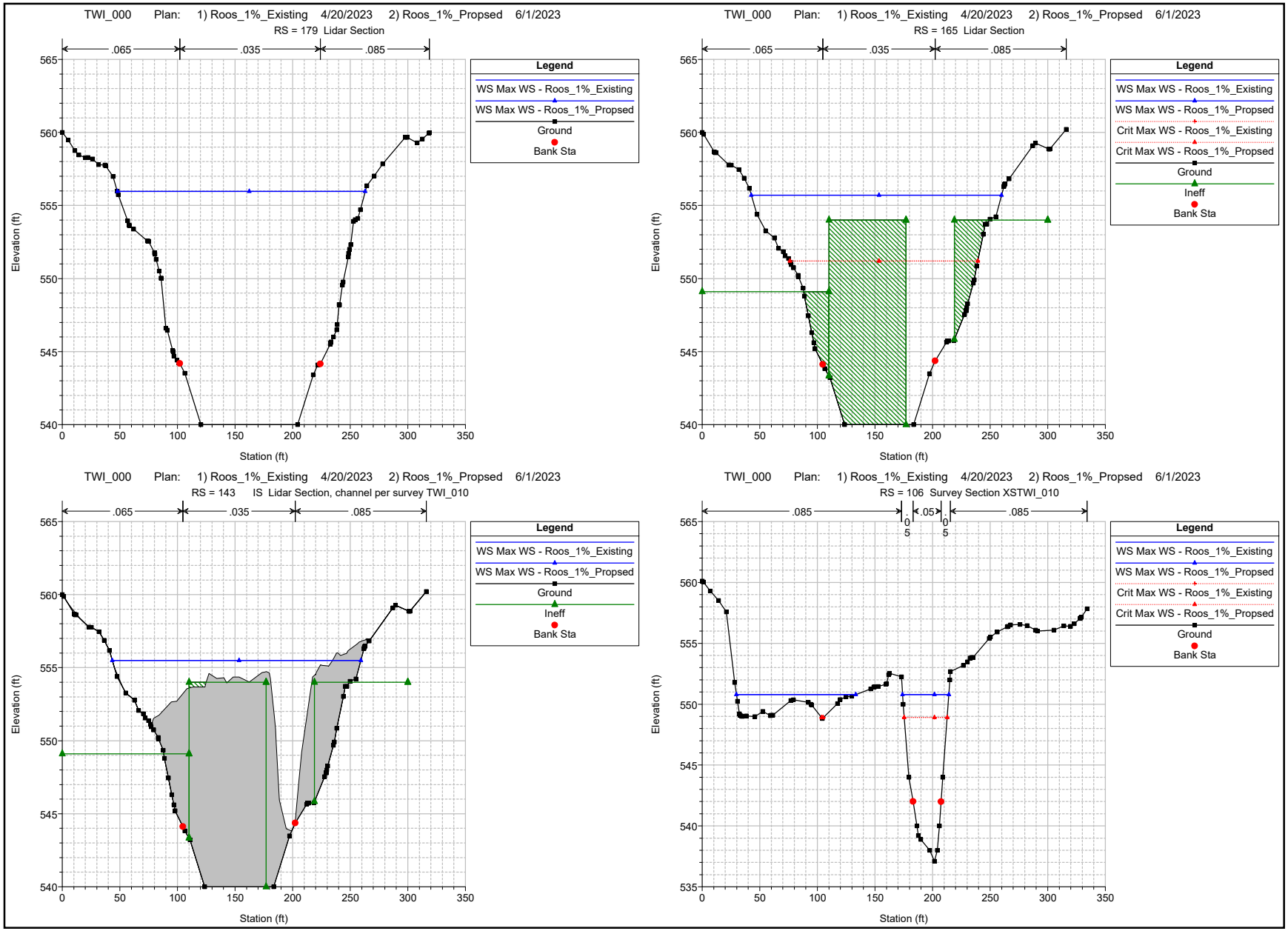

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 2108 Lidar Section
.15 .055 .15 .5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1959 Lidar Section
.15 .15 .05 .1 .5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1815 Survey Section TWI_001_040
.1 .1 .05 .1 .1
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1704 Lidar Section
.1 .05 .1
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)

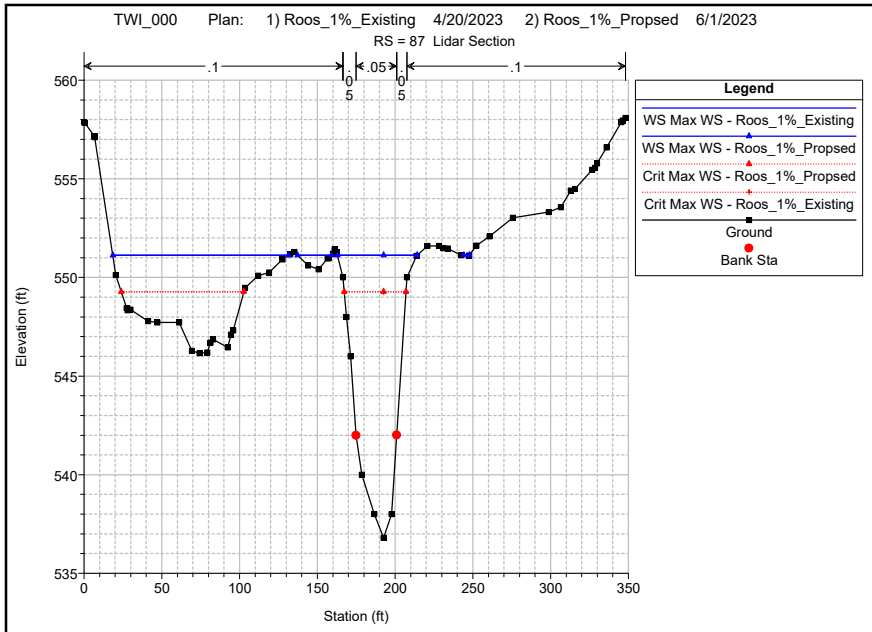

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1522 Survey Section TWI_001_030
.075
.075
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1354 Lidar Section
.065
.05
.05
.075
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1241 Lidar Section
.065
.05
.05
.075
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1205 Survey Section TWI_001_020
.065
.05
.1
.5
Legend
Crit Max WS - Roos_1%_Existing
Crit Max WS - Roos_1%_Propsed
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)

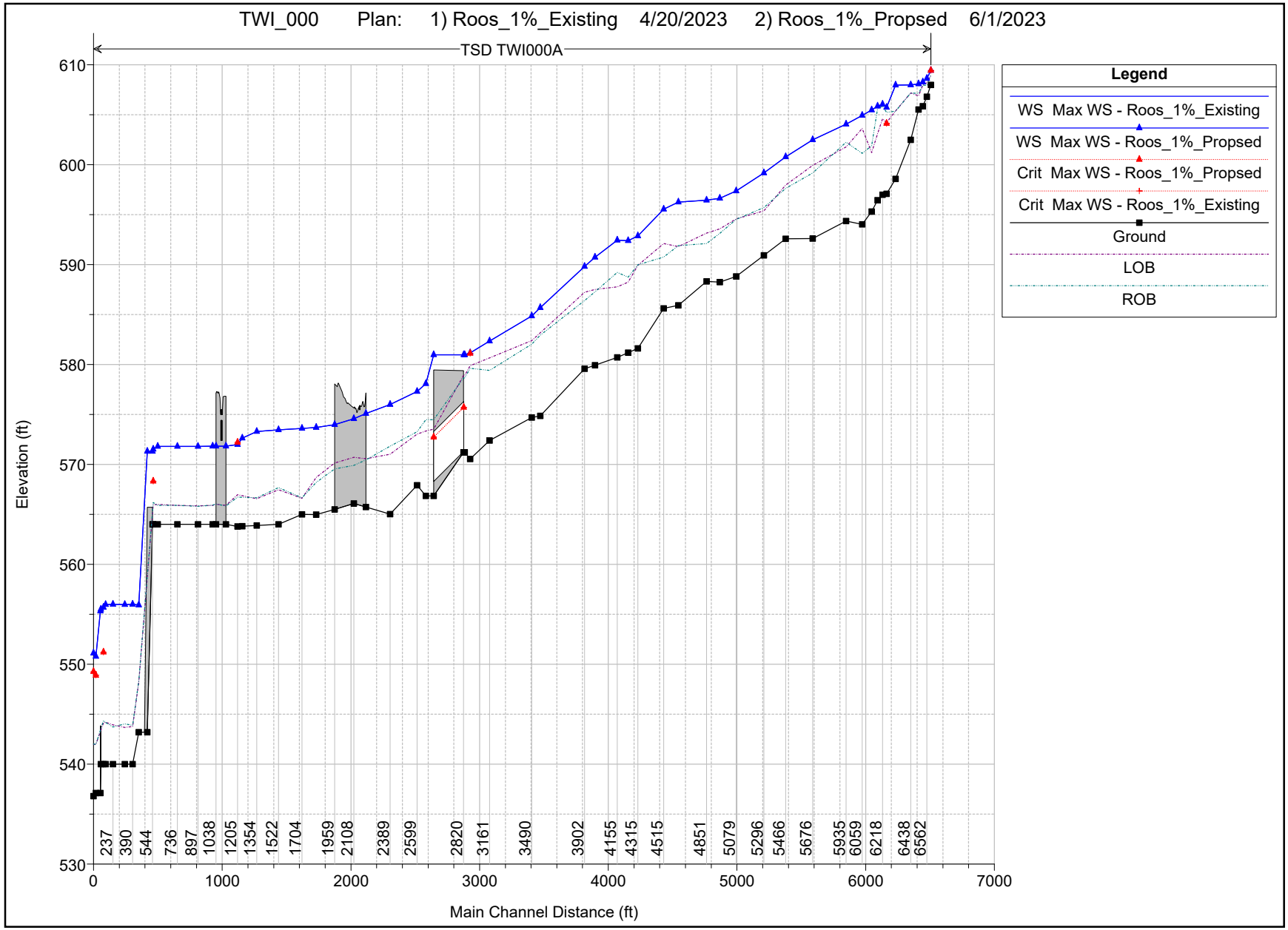

TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1115 Lidar Section
.055
.045
.1
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1038 Lidar Section
.055
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 1011 Lidar Section
.055
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 897 Lidar Section
.055
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)


TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 736 Lidar Section
.055
.035
.085
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 585 Lidar Section
.055
.035
.085
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 549 Lidar Section
.055
.035
.085
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Crit Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 544 IS Survey Section
.055
.035
.085
Elevation (ft)
Station (ft)
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta


TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 437 Lidar Section
.085
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 390 Lidar Section
.085
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 329 Lidar Section
.065
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 237 Lidar Section
.065
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)


TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 179 Lidar Section
.065
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 165 Lidar Section
.065
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Crit Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 143 IS Lidar Section, channel per survey TWI_010
.065
.035
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 106 Survey Section XSTWI_010
.085
.05
.085
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Crit Max WS - Roos_1%_Propsed
Ground
Bank Sta
Elevation (ft)
Station (ft)


TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
RS = 87 Lidar Section
.1
.05
.1
0
5
0
5
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Ground
Bank Sta
Elevation (ft)
560
555
550
545
540
535
0
50
100
150
200
250
300
350
Station (ft)


TWI_000 Plan: 1) Roos_1%_Existing 4/20/2023 2) Roos_1%_Propsed 6/1/2023
TSD TWI000A
Legend
WS Max WS - Roos_1%_Existing
WS Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Propsed
Crit Max WS - Roos_1%_Existing
Ground
LOB
ROB
Elevation (ft)
610
600
590
580
570
560
550
540
530
237 390 544 736 897 1038 1205 1354 1522 1704 1959 2108 2389 2599 2820 3161 3490 3902 4155 4315 4515 4851 5079 5296 5466 5676 5935 6059 6218 6438 6562
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

SHIELD
ENGINEERING GROUP

TWIN SPRINGS DRAW TRIBUTARY 2

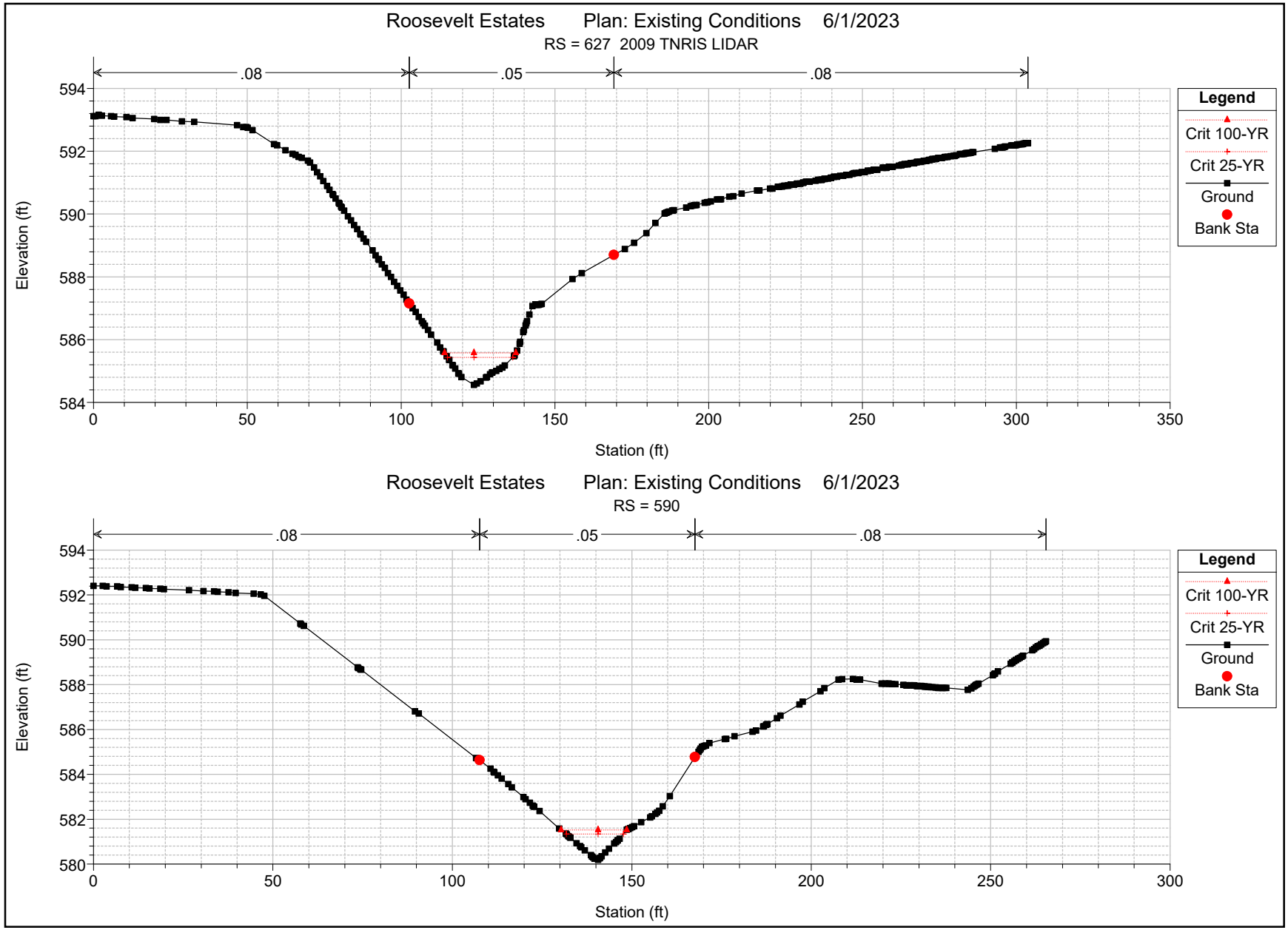
(HEC-RAS VERSION 6.3)

1600 W. 7th Street, Suite 400, Fort Worth, Texas 76102 | 817.810.0696
Shield Engineering Group, PLLC

info@shield-engineering.com | www.SHIELDENGINEERINGGROUP.com
TBPE FIRM #F-11039 | TBPLS FIRM #10193890

HEC-RAS Plan: Exist River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	627	25-YR	42.44	584.56	585.43	585.43	585.69	0.047281	4.03	10.52	21.24	1.01
Reach 1	627	100-YR	60.37	584.56	585.57	585.57	585.88	0.044966	4.42	13.67	23.19	1.01
Reach 1	590	25-YR	42.44	580.19	581.34	581.34	581.65	0.045034	4.46	9.53	15.87	1.01
Reach 1	590	100-YR	60.37	580.19	581.52	581.52	581.87	0.042768	4.77	12.64	18.26	1.01
Reach 1	544	25-YR	42.44	576.74	577.67	577.67	577.97	0.044905	4.38	9.69	16.51	1.01
Reach 1	544	100-YR	60.37	576.74	577.84	577.84	578.19	0.043284	4.75	12.71	18.65	1.01
Reach 1	517	25-YR	42.44	575.02	575.90		575.99	0.011576	2.37	17.92	27.99	0.52
Reach 1	517	100-YR	60.37	575.02	576.07		576.18	0.011699	2.66	22.68	29.95	0.54
Reach 1	407	25-YR	42.44	572.57	573.52	573.52	573.79	0.046624	4.19	10.12	19.03	1.01
Reach 1	407	100-YR	60.37	572.57	573.68	573.68	574.00	0.043963	4.55	13.25	21.07	1.01
Reach 1	379	25-YR	42.44	571.61	572.90		573.03	0.014118	2.83	15.00	20.73	0.59
Reach 1	379	100-YR	60.37	571.61	573.53		573.59	0.004152	1.98	30.48	28.70	0.34
Reach 1	336	25-YR	42.44	571.12	572.82		572.85	0.001497	1.24	34.32	30.46	0.21
Reach 1	336	100-YR	60.37	571.12	573.50		573.51	0.000735	1.05	57.33	37.93	0.15
Reach 1	273	25-YR	42.44	569.67	572.83		572.83	0.000053	0.36	118.99	55.18	0.04
Reach 1	273	100-YR	60.37	569.67	573.50		573.50	0.000048	0.38	158.32	62.22	0.04
Reach 1	208	25-YR	42.44	566.34	572.83		572.83	0.000005	0.16	264.01	67.02	0.01
Reach 1	208	100-YR	60.37	566.34	573.50		573.50	0.000006	0.19	310.81	72.35	0.02
Reach 1	150	25-YR	42.44	565.88	572.83		572.83	0.000002	0.11	383.25	89.83	0.01
Reach 1	150	100-YR	60.37	565.88	573.50		573.50	0.000002	0.14	445.73	96.72	0.01
Reach 1	89	25-YR	42.44	566.08	572.83		572.83	0.000000	0.06	659.92	122.63	0.00
Reach 1	89	100-YR	60.37	566.08	573.50		573.50	0.000001	0.08	743.85	127.93	0.01
Reach 1	57	25-YR	42.44	565.97	572.83	566.27	572.83	0.000000	0.05	896.35	159.58	0.00
Reach 1	57	100-YR	60.37	565.97	573.50	566.31	573.50	0.000000	0.06	1005.18	165.22	0.00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RS = 627 2009 TNRIS LIDAR
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Elevation (ft)
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Crit 25-YR
Ground
Bank Sta
Roosevelt Estates Plan: Existing Conditions 6/1/2023
RS = 590
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Elevation (ft)
Station (ft)
Legend
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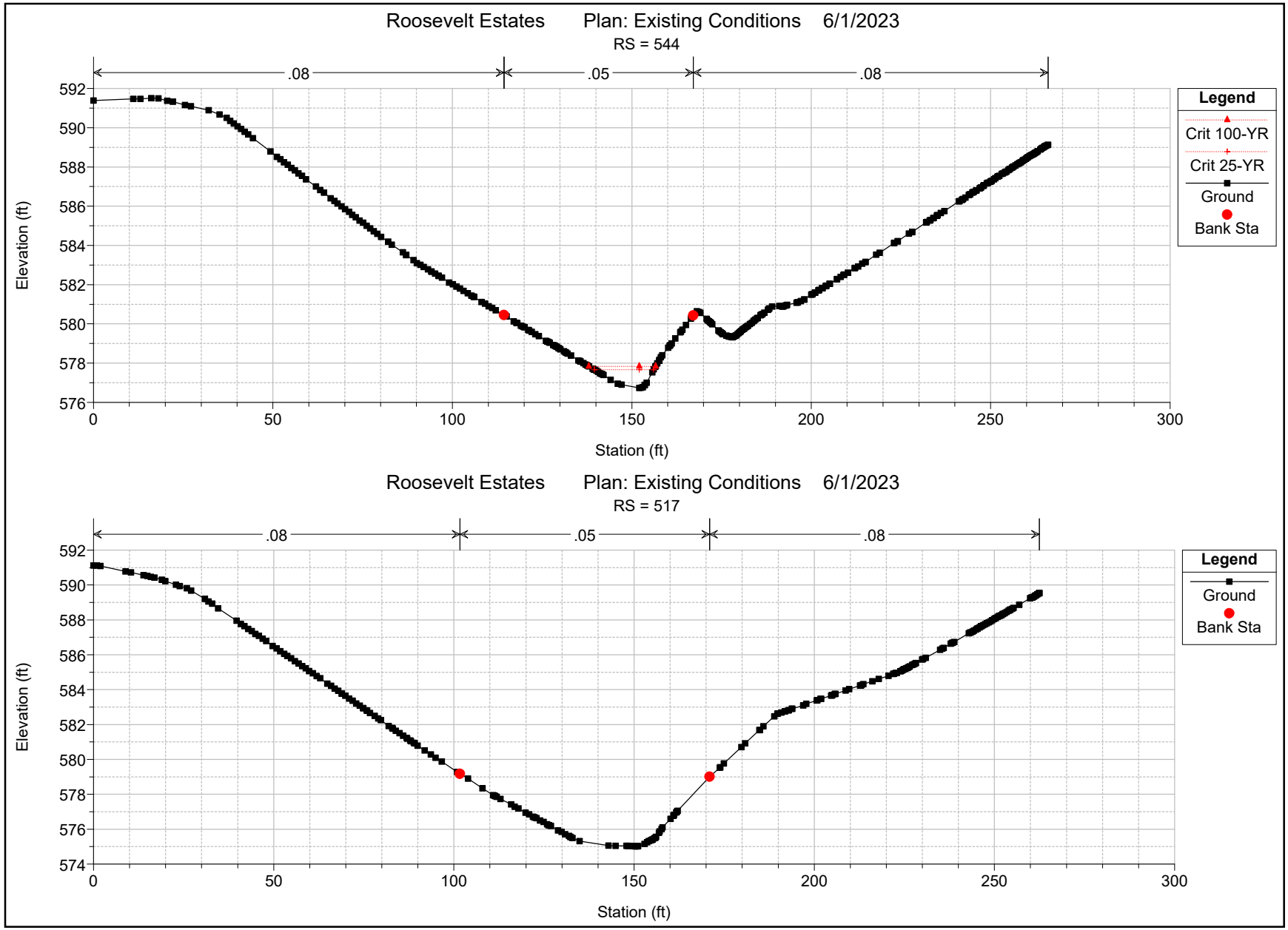
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RS = 544
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Elevation (ft)
Station (ft)
Legend
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Crit 25-YR
Ground
Bank Sta
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Elevation (ft)
Station (ft)
Legend
Ground
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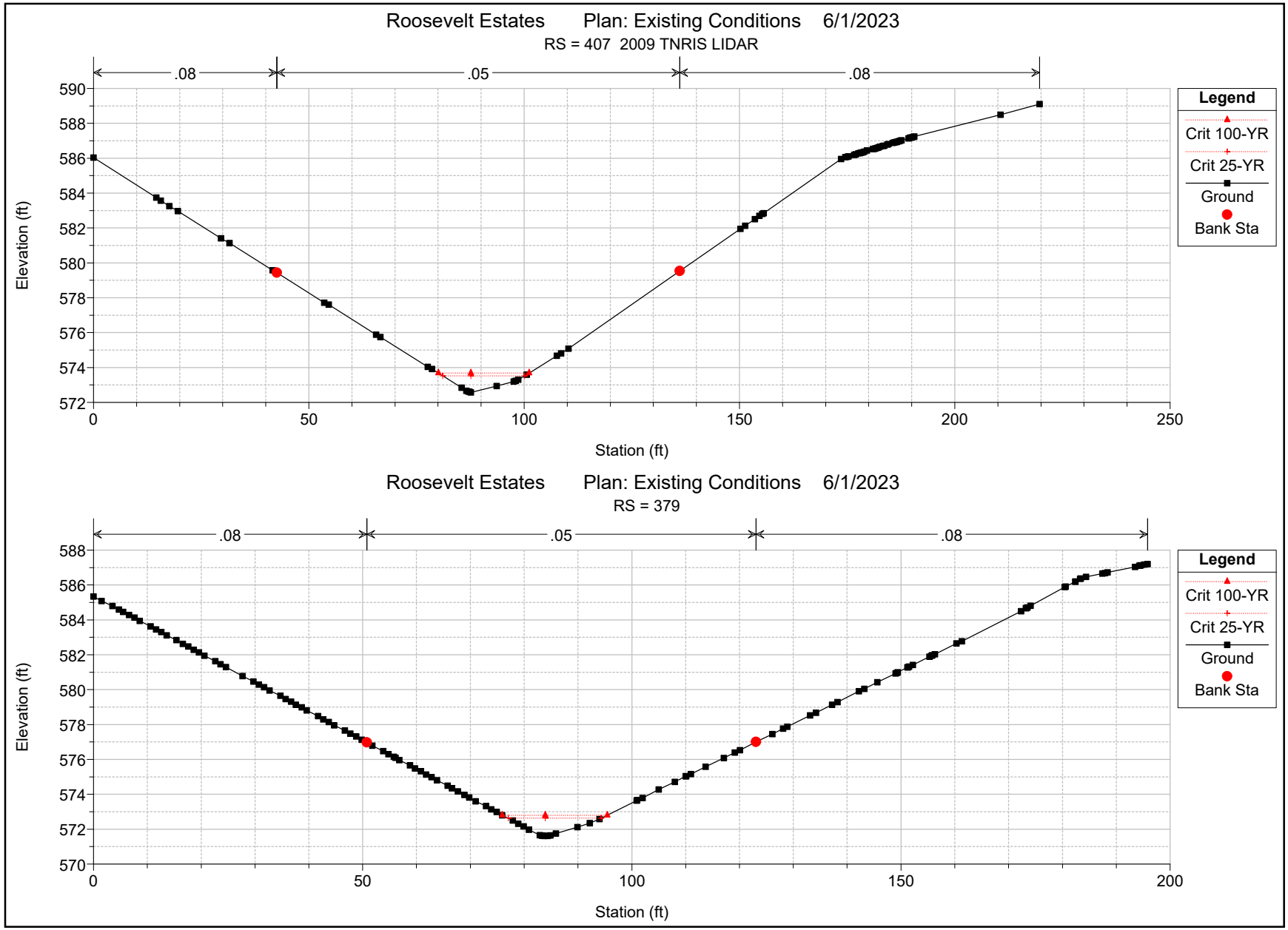
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Roosevelt Estates Plan: Existing Conditions 6/1/2023
RS = 379
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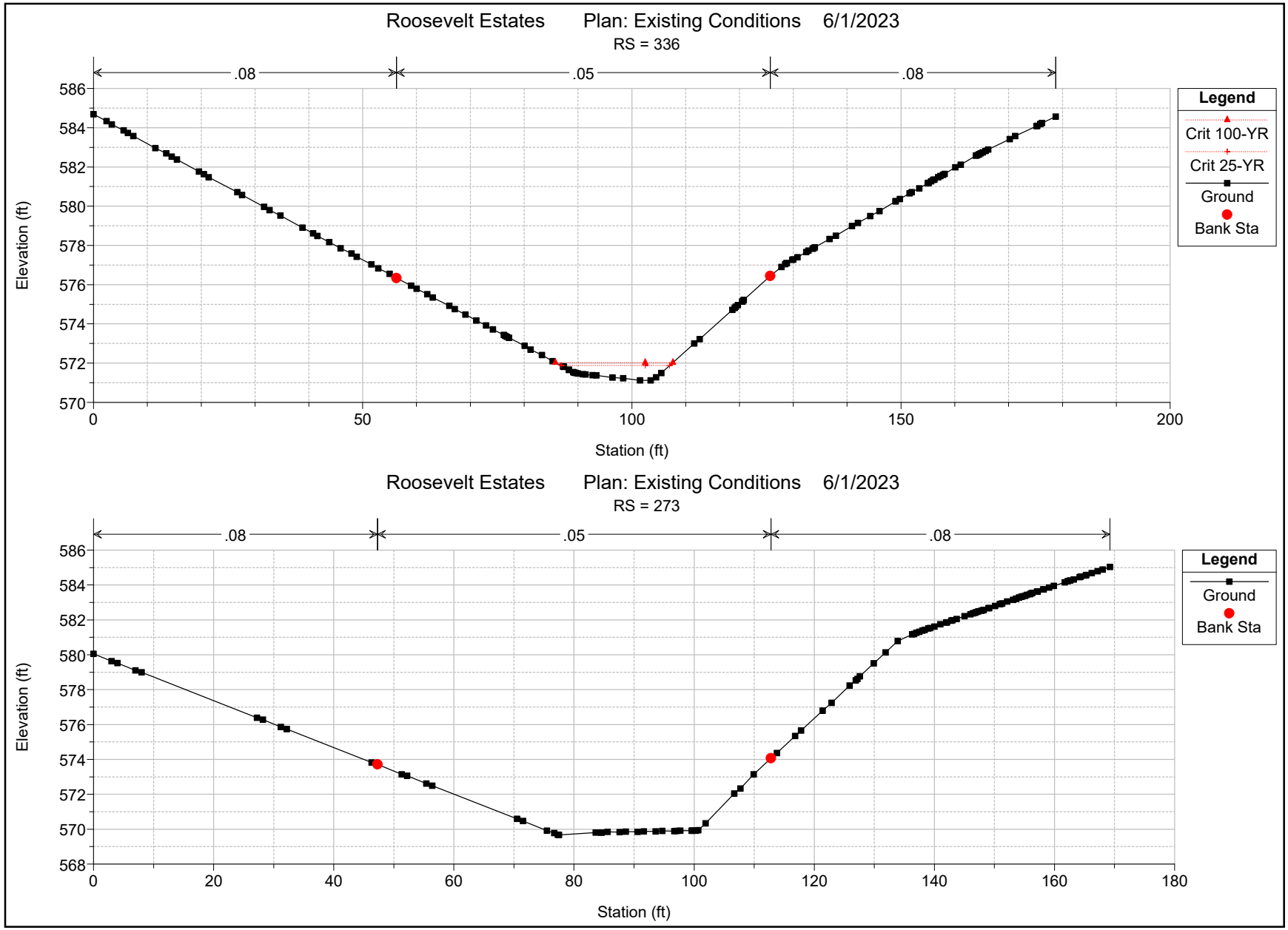
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Elevation (ft)
Station (ft)
Legend
Crit 100-YR
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Ground
Bank Sta
Roosevelt Estates Plan: Existing Conditions 6/1/2023
RS = 273
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Elevation (ft)
Station (ft)
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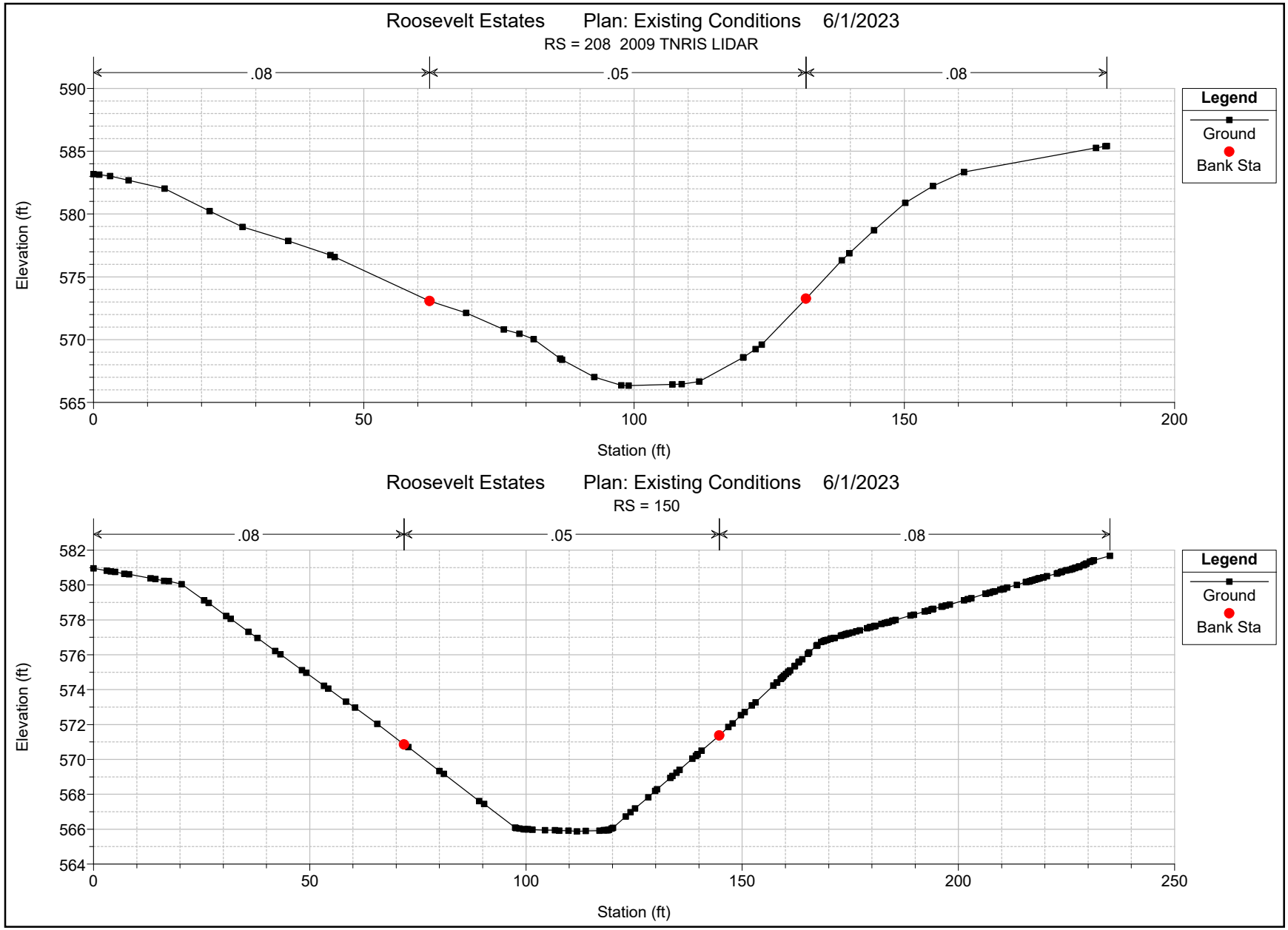
Ground
Bank Sta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Elevation (ft)
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Station (ft)
Legend
Ground
Bank Sta
Roosevelt Estates Plan: Existing Conditions 6/1/2023
RS = 150
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Station (ft)
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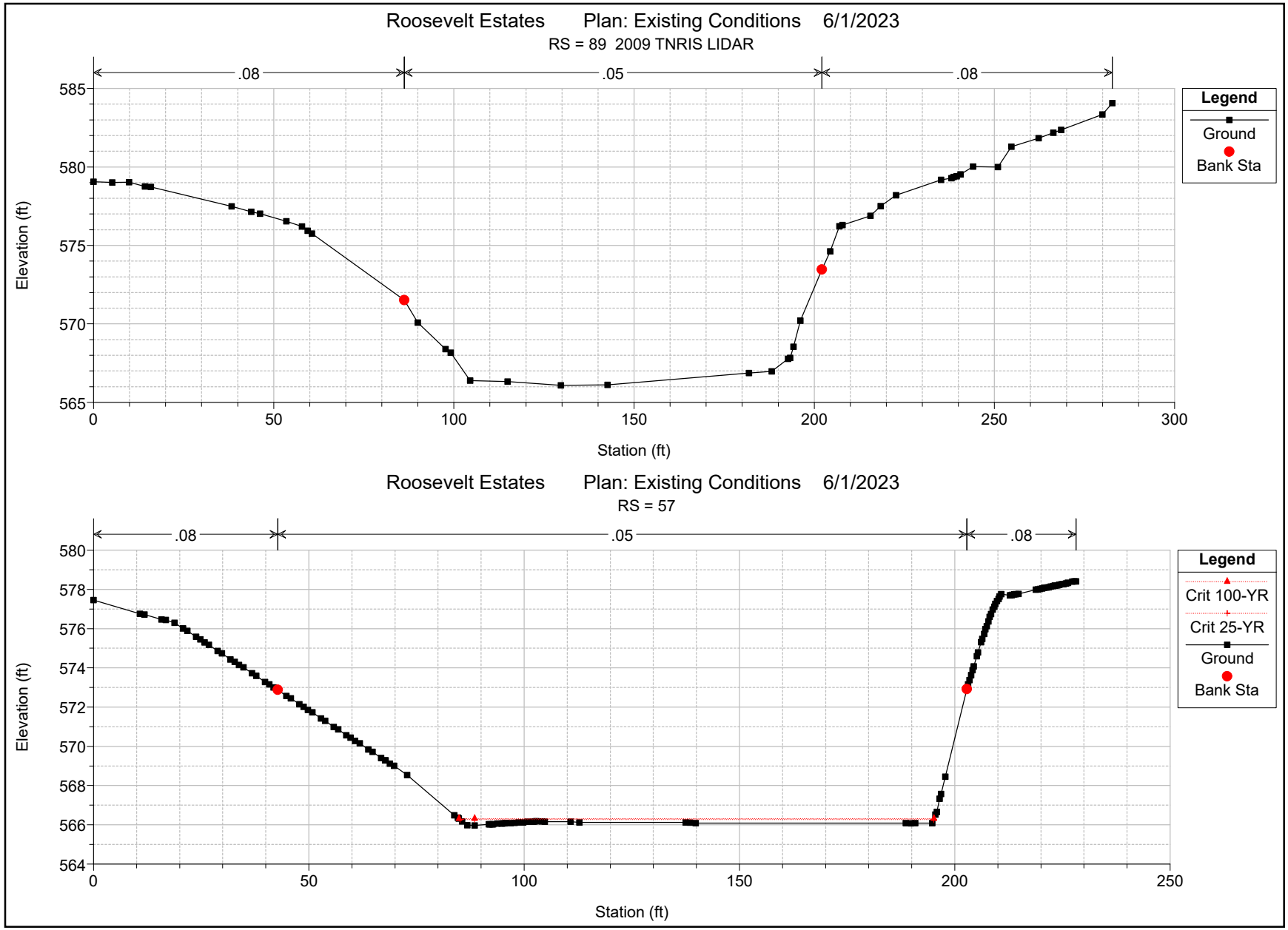
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RS = 89 2009 TNRIS LIDAR
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Elevation (ft)
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Roosevelt Estates Plan: Existing Conditions 6/1/2023
RS = 57
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Elevation (ft)
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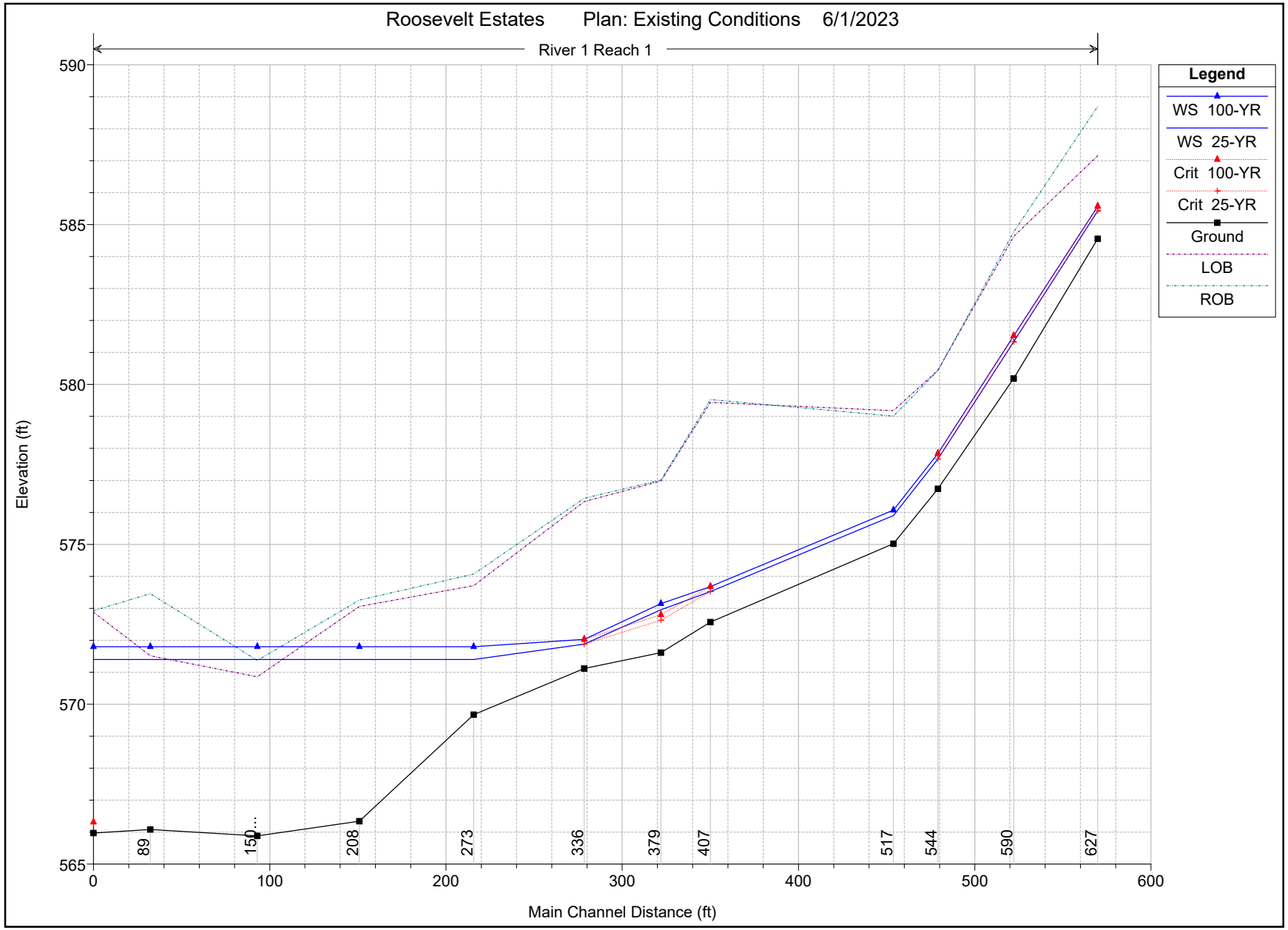
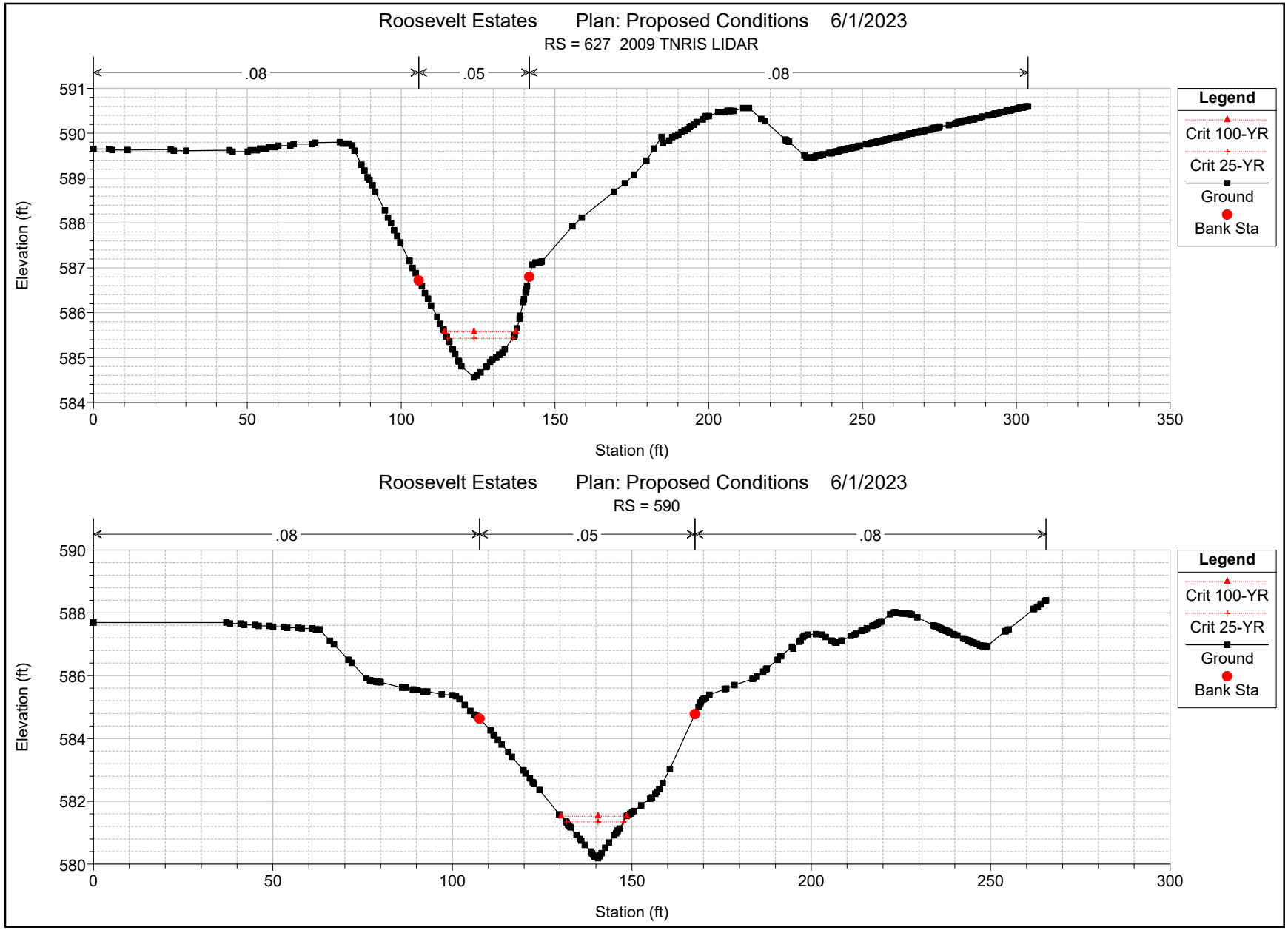
Legend
Crit 100-YR
Crit 25-YR
Ground
Bank Sta


Roosevelt Estates Plan: Existing Conditions 6/1/2023
River 1 Reach 1
Legend
WS 100-YR
WS 25-YR
Crit 100-YR
Crit 25-YR
Ground
LOB
ROB
Elevation (ft)
590
585
580
575
570
565
0
100
200
300
400
500
600
Main Channel Distance (ft)
89
150
208
273
336
379
407
517
544
590
627

HEC-RAS Plan: Prop River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	627	25-YR	42.44	584.56	585.43	585.43	585.69	0.047265	4.03	10.52	21.24	1.01
Reach 1	627	100-YR	60.37	584.56	585.57	585.57	585.88	0.044993	4.42	13.66	23.18	1.01
Reach 1	590	25-YR	42.44	580.19	581.34	581.34	581.65	0.044336	4.43	9.58	15.91	1.01
Reach 1	590	100-YR	60.37	580.19	581.52	581.52	581.87	0.042607	4.77	12.66	18.28	1.01
Reach 1	544	25-YR	42.44	576.74	577.90		578.05	0.016735	3.05	13.92	19.47	0.64
Reach 1	544	100-YR	60.37	576.74	578.98		579.01	0.001739	1.43	42.07	33.33	0.23
Reach 1	517	25-YR	42.44	575.02	577.50	576.56	577.79	0.006338	4.31	9.85	48.94	0.48
Reach 1	517	100-YR	60.37	575.02	578.65	576.97	578.92	0.003554	4.17	14.47	63.66	0.39
Reach 1	454 Culvert Crossing		Culvert									
Reach 1	407	25-YR	42.44	572.57	573.53	573.53	573.86	0.041888	4.60	9.23	19.13	1.00
Reach 1	407	100-YR	60.37	572.57	573.70	573.70	574.12	0.039525	5.20	11.61	21.34	1.01
Reach 1	379	25-YR	42.44	571.61	572.96	572.63	573.07	0.011269	2.61	16.28	21.48	0.53
Reach 1	379	100-YR	60.37	571.61	573.16	572.81	573.29	0.011769	2.91	20.77	24.04	0.55
Reach 1	336	25-YR	42.44	571.12	571.88	571.88	572.14	0.046726	4.10	10.35	20.18	1.01
Reach 1	336	100-YR	60.37	571.12	572.03	572.03	572.34	0.043965	4.49	13.44	21.81	1.01
Reach 1	273	25-YR	65.36	569.67	571.39		571.42	0.001437	1.30	50.31	40.27	0.20
Reach 1	273	100-YR	92.98	569.67	571.79		571.82	0.001259	1.38	67.26	44.36	0.20
Reach 1	208	25-YR	65.36	566.34	571.40		571.40	0.000033	0.37	177.32	54.92	0.04
Reach 1	208	100-YR	92.98	566.34	571.80		571.80	0.000049	0.47	199.88	57.93	0.04
Reach 1	150	25-YR	65.36	565.88	571.40		571.40	0.000013	0.25	264.82	75.89	0.02
Reach 1	150	100-YR	92.98	565.88	571.80		571.80	0.000018	0.32	295.92	79.72	0.03
Reach 1	89	25-YR	65.36	566.08	571.40		571.40	0.000003	0.13	492.48	111.49	0.01
Reach 1	89	100-YR	92.98	566.08	571.80		571.80	0.000004	0.17	537.81	116.09	0.01
Reach 1	57	25-YR	65.36	565.97	571.40	566.32	571.40	0.000001	0.10	676.47	147.74	0.01
Reach 1	57	100-YR	92.98	565.97	571.80	566.38	571.80	0.000002	0.13	736.01	150.02	0.01


Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 627 2009 TNRIS LIDAR
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Elevation (ft)
Station (ft)
Legend
Crit 100-YR
Crit 25-YR
Ground
Bank Sta
Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 590
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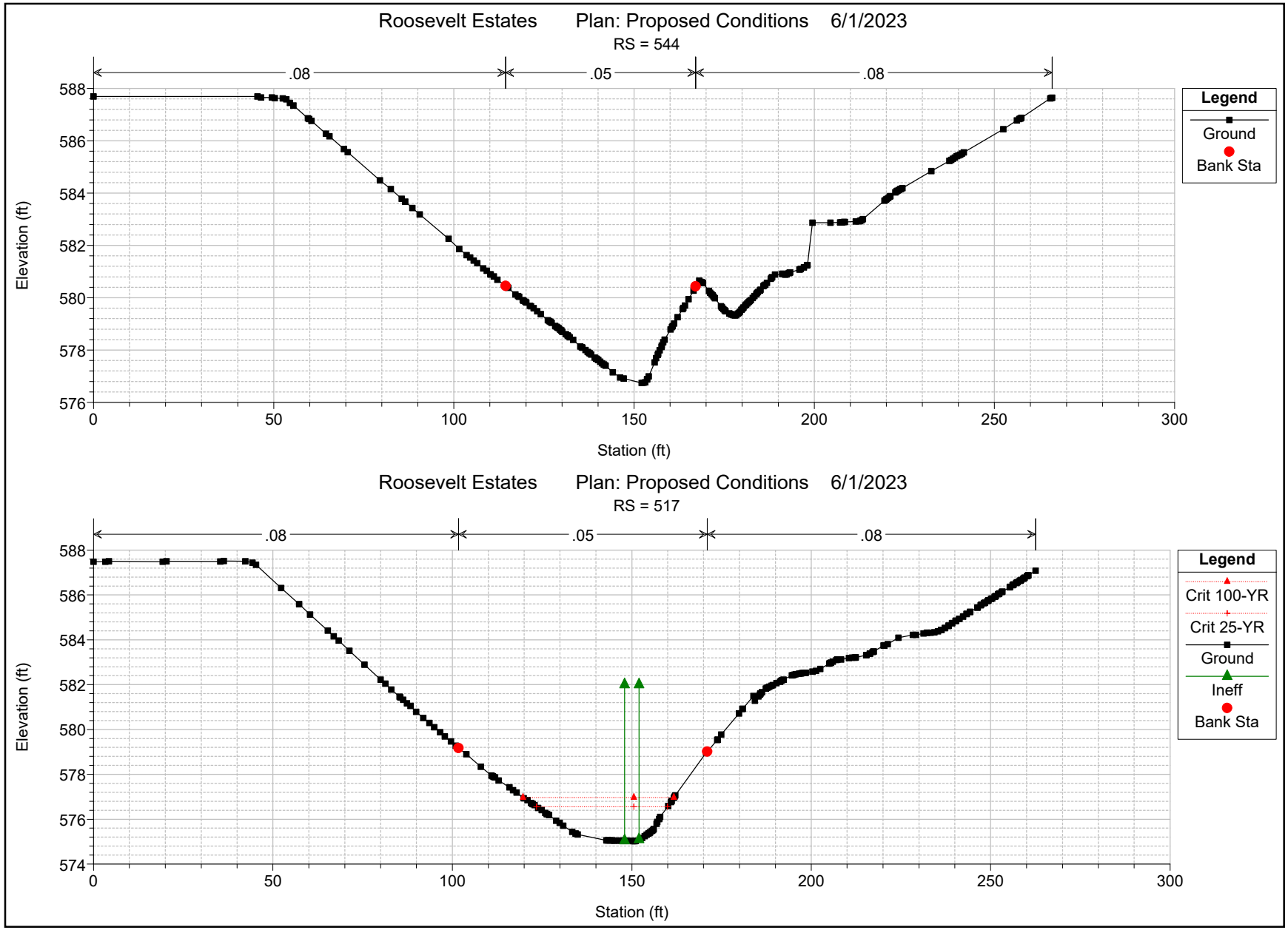
Elevation (ft)
Station (ft)
Legend
Crit 100-YR
Crit 25-YR
Ground
Bank Sta


Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 544
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Elevation (ft)
Station (ft)
Legend
Ground
Bank Sta
Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 517
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Elevation (ft)
Station (ft)
Legend
Crit 100-YR
Crit 25-YR
Ground
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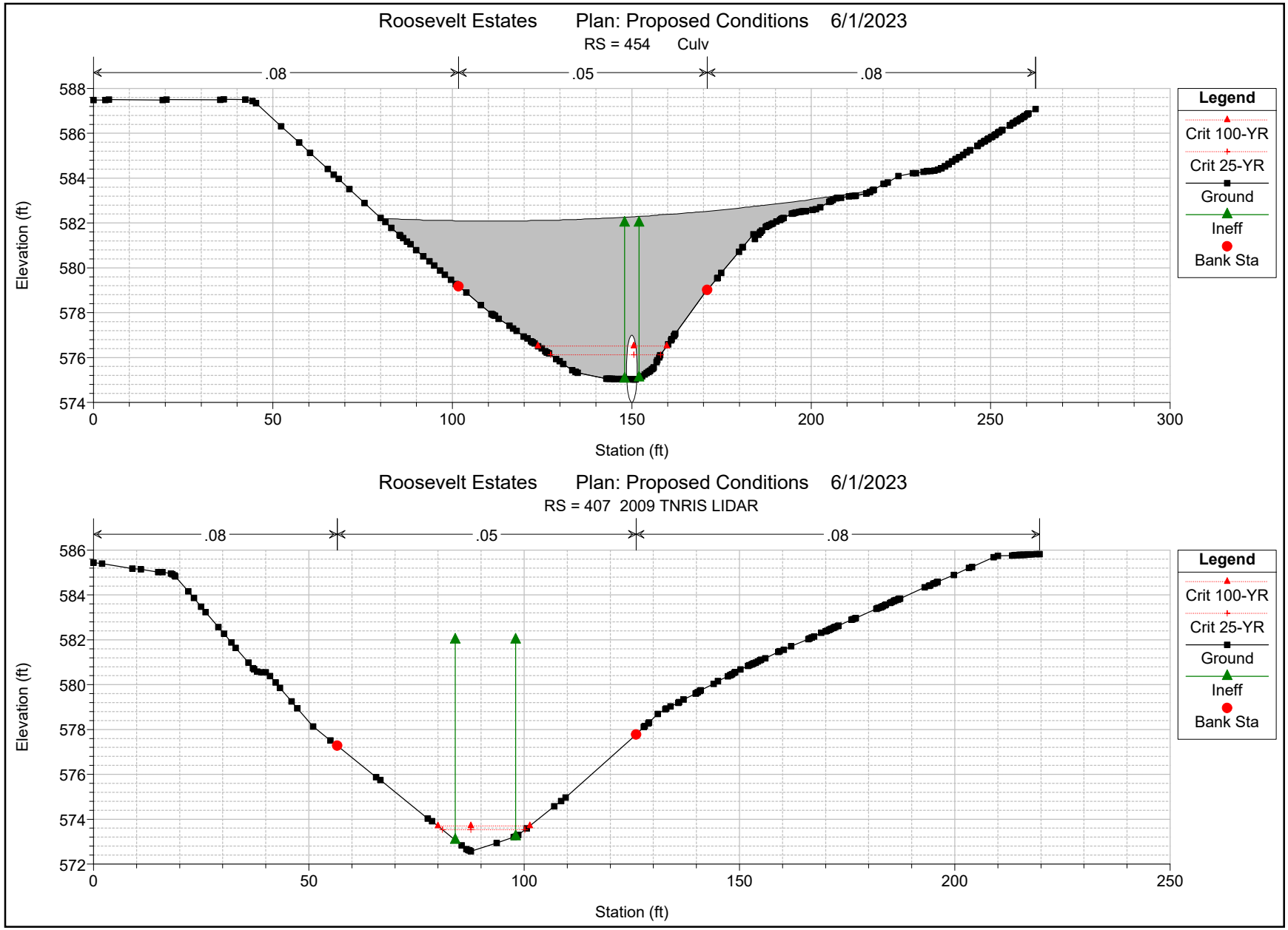
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Elevation (ft)
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Station (ft)
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Ground
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Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 407 2009 TNRIS LIDAR
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Elevation (ft)
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Station (ft)
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Ground
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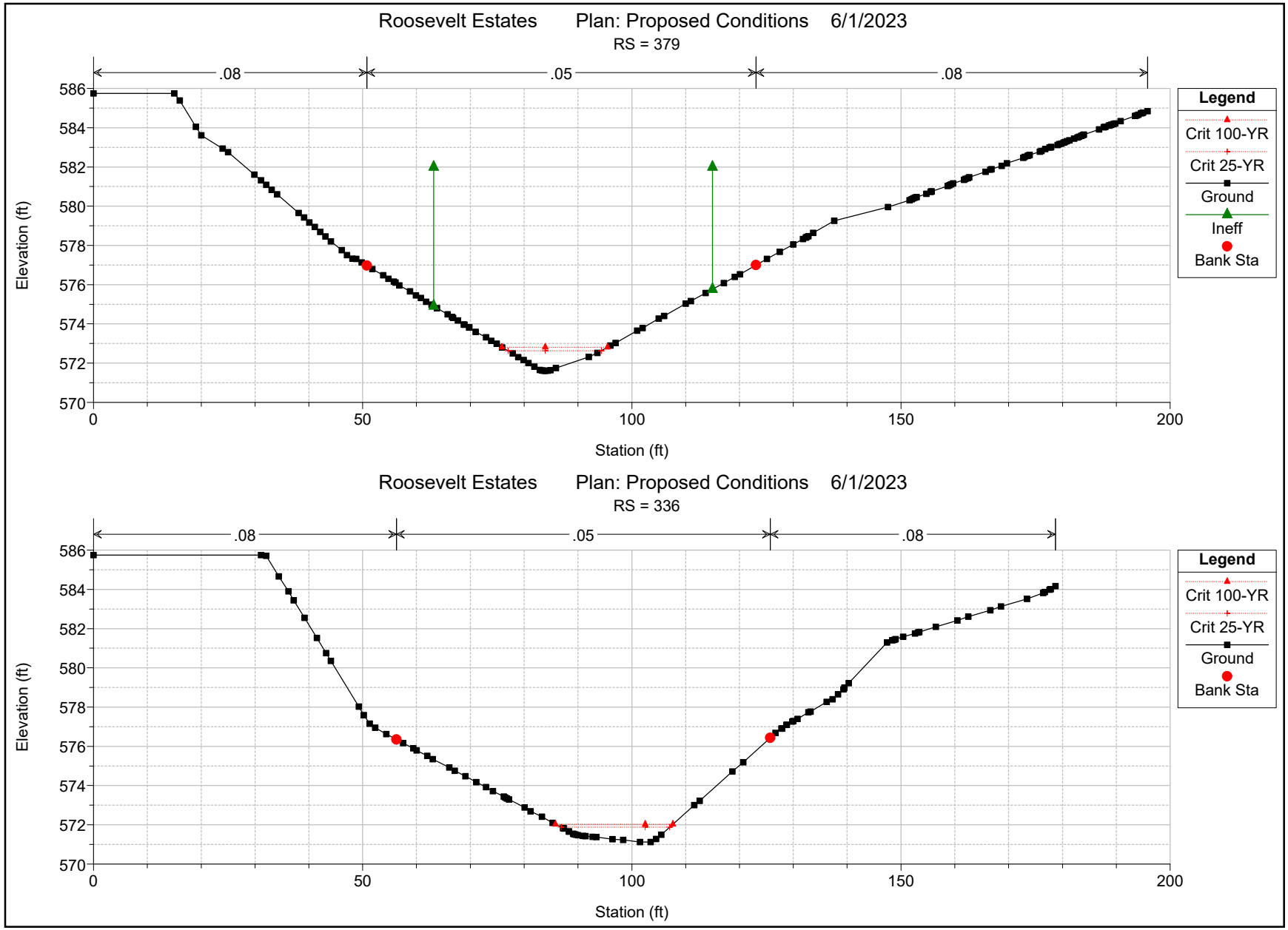
Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 379
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Elevation (ft)
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Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 336
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Elevation (ft)
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Station (ft)
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Ground
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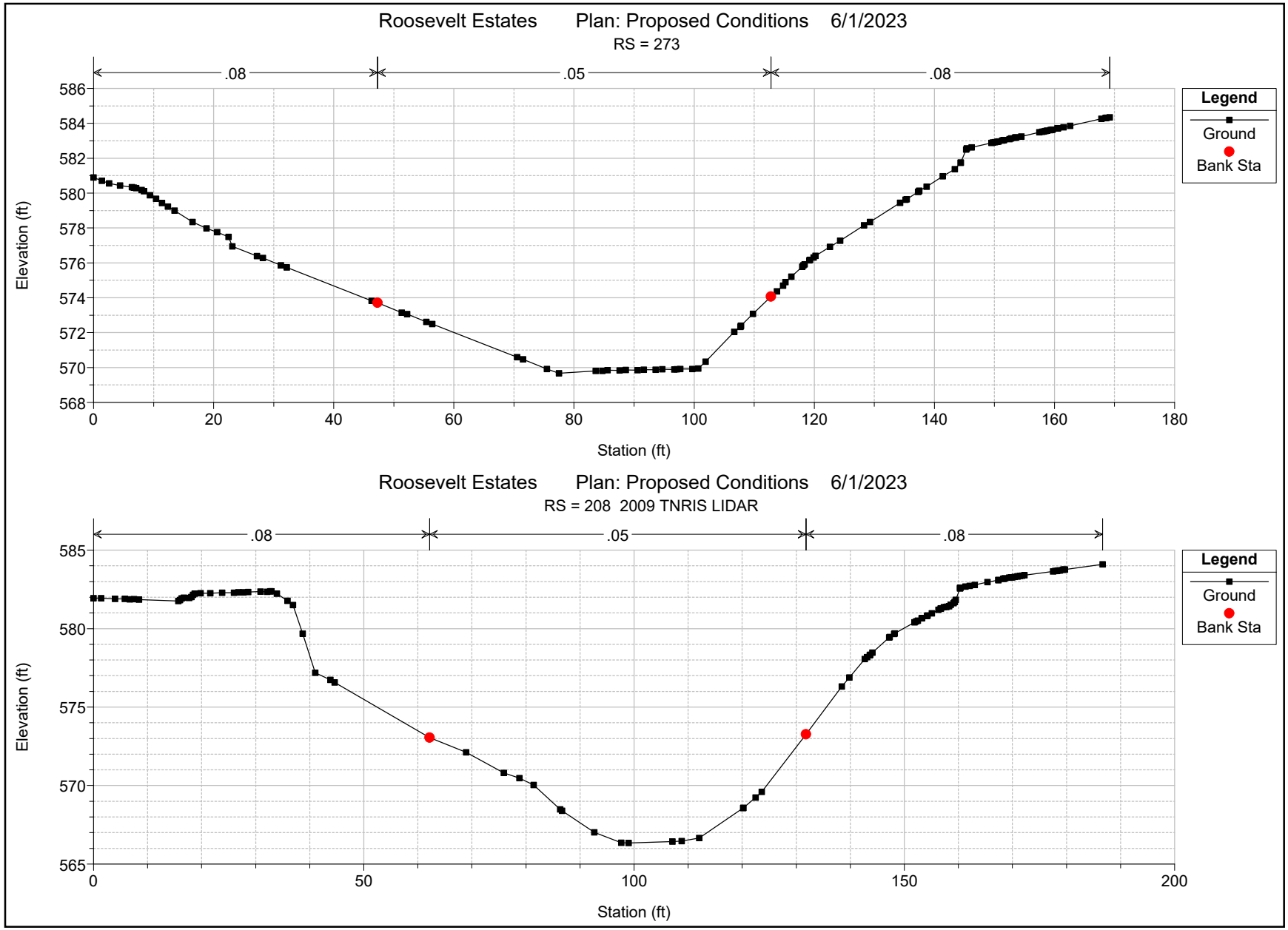
Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 273
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Elevation (ft)
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Station (ft)
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Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 208 2009 TNRIS LIDAR
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Elevation (ft)
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Station (ft)
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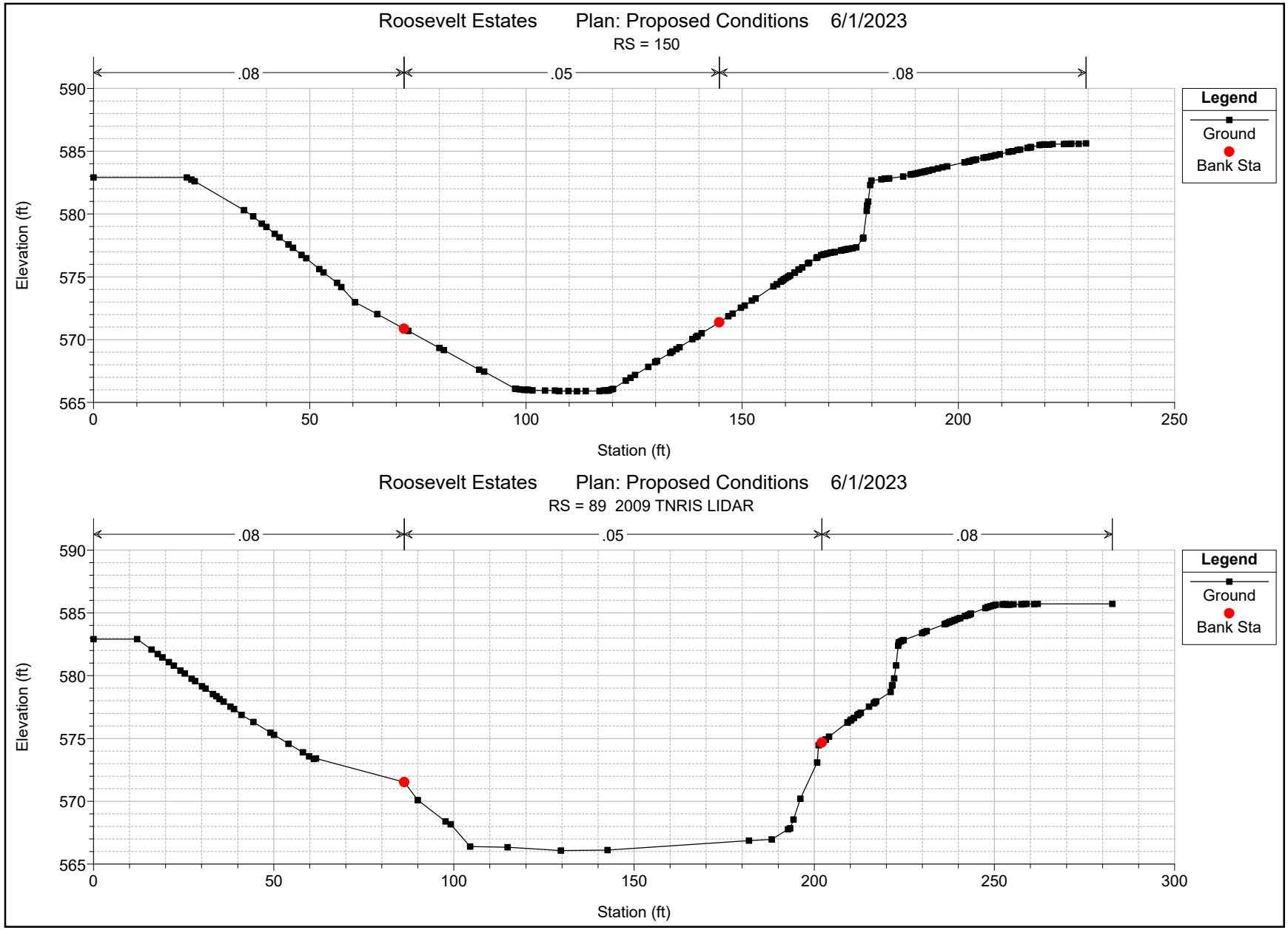
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Elevation (ft)
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Station (ft)
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Roosevelt Estates Plan: Proposed Conditions 6/1/2023
RS = 89 2009 TNRIS LIDAR
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Elevation (ft)
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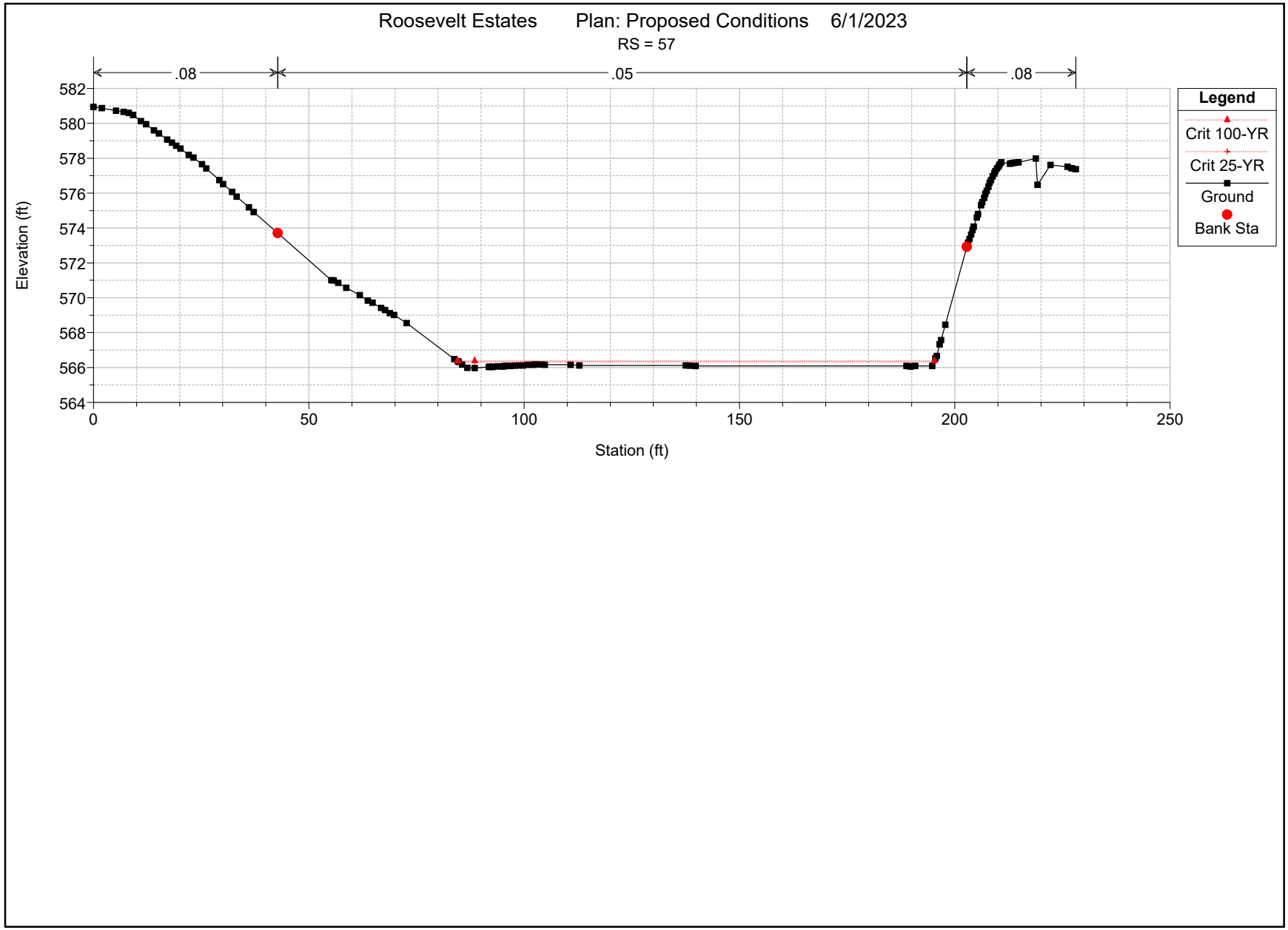
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Elevation (ft)
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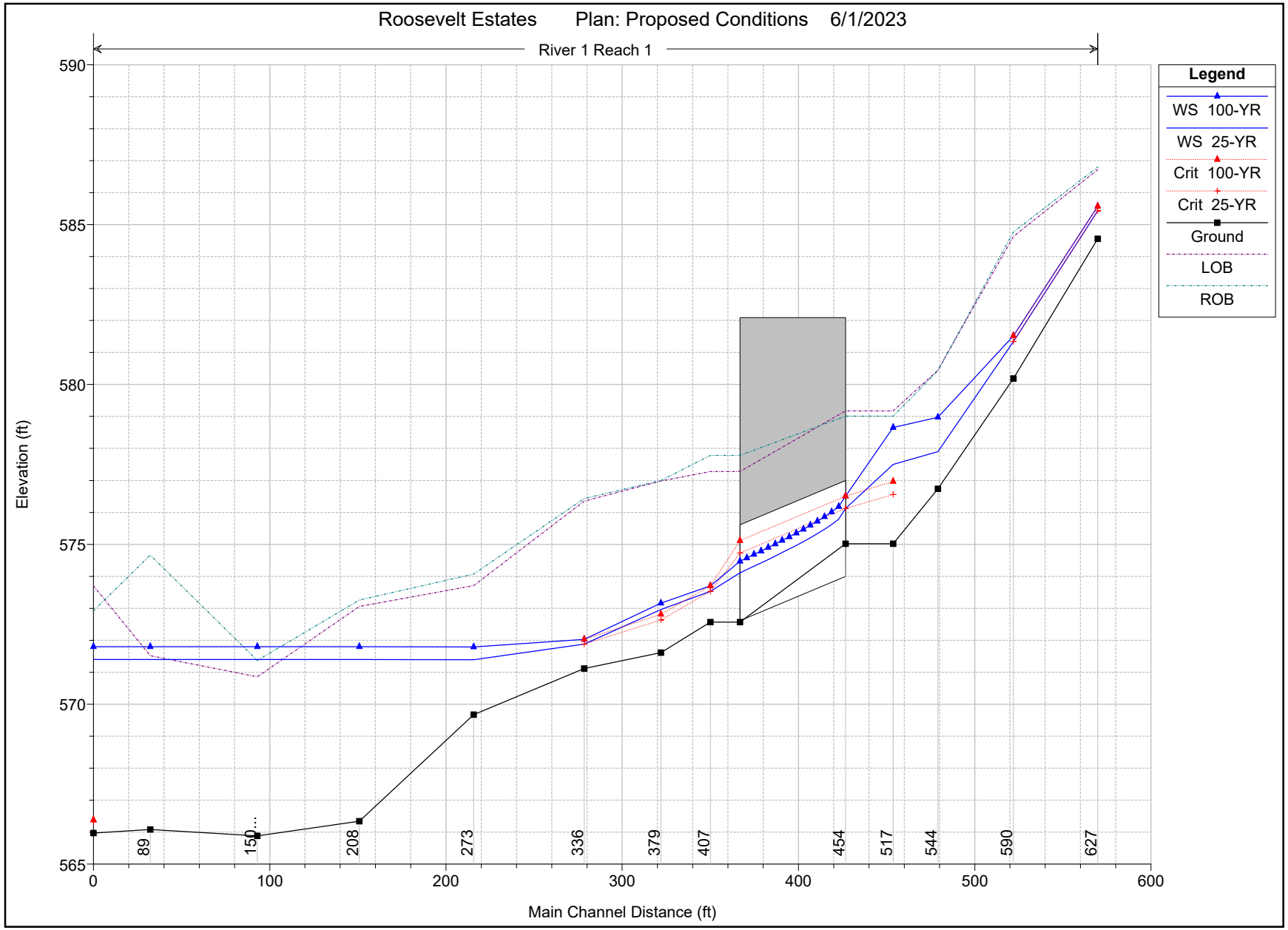
Roosevelt Estates Plan: Proposed Conditions 6/1/2023
River 1 Reach 1
Legend
WS 100-YR
WS 25-YR
Crit 100-YR
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Ground
LOB
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Elevation (ft)
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Main Channel Distance (ft)
89
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208
273
336
379
407
454
517
544
590
627

Kimley»Horn

January 23, 2024

Sandra Ma
Interim City Secretary
City of Dalworthington Gardens
2600 Roosevelt Drive
Dalworthington Gardens, TX 76016

RE: Fourth Final Plan Submittal Review
Roosevelt Estates
KHA No. 068302505

Dear Sandra:

We have completed our review of the fourth submittal of the Final Plan for the above referenced project. The Final Plan was received via email for review on January 22, 2024.

All previous comments have been adequately addressed. Conformity of the Final Plan submitted is contingent on Dalworthington Gardens City Council's approval of the zoning change application for the subject property.

If council approves the zoning change application, the Final Plan as submitted conforms to the technical requirements listed in the Dalworthington Gardens Code of Ordinances and we recommend approval.

If council denies the zoning change application, the Final Plan as submitted would not comply with an approved concept plan and we therefore recommend denial.

Please remember that the adequacy of the design work reflected in the plans reviewed and the responsibility to adhere to all applicable ordinances and codes remains with the design engineer.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Brandon Bell, P.E.

Brandon Bell, P.E.

Staff Agenda Report

Agenda Subject: Discussion and possible recommendation regarding Preliminary Plat application for property located at 2611 W. Pleasant Ridge Road, Dalworthington Gardens, Texas to be known as Roosevelt Estates Lots 1 – 11, 1X, and 11X of Block A an addition to the City of Dalworthington Gardens, Tarrant County, Texas.

Background Information: A Preliminary Plat was submitted by Jose De Leon with Shield Engineering on January 22, 2024.

Typically the Preliminary Plat for a development within the Planned Development zoning district does not come before the Commission until City Council has approved the zoning change and the Concept Plan. In this case, because the Preliminary Plat is being presented to the Commission prior to Council's decision, if a recommendation of approval is to be provided, it shall be contingent on City Council's approval of the zoning change from Single Family to Planned Development.

The Preliminary Plat was forwarded to the city engineer for review. On January 23, 2024 the city engineer conducted his final review and determined that if City Council approves the proposed zoning change, the Preliminary Plat conforms with the City's ordinance and therefore recommends approval.

City staff also recommends approval.

Recommended Action/Motion: Motion to recommend approval of the Preliminary Plat for the property located at 2611 W. Pleasant Ridge Road contingent on City Council's approval of the proposed zoning change of the property from Single Family to Planned Development.

Attachments:

Preliminary Plat
Preliminary Drainage Study
Proposed Water & Sewer Layout
Letter of Recommendation

ABBREVIATION LEGEND:
DE = INDICATES A DRAINAGE EASEMENT

SSE = INDICATES A SANITARY SEWER EASEMENT

UE = INDICATES A UTILITY EASEMENT

BL = INDICATES A BUILDING LINE

XCF = INDICATES "X" CUT IN CONCRETE; FOUND

XCS = INDICATES "X" CUT IN CONCRETE SET

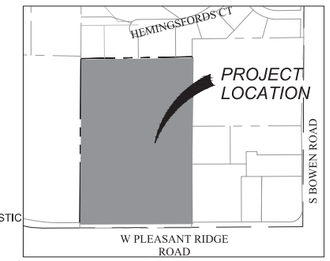
IRF = INDICATES 5/8-INCH IRON ROD FOUND WITH PLASTIC CAP STAMPED "SHIELD ENGINEERING"

IRS = INDICATES 5/8-INCH IRON ROD SET WITH PLASTIC CAP STAMPED "SHIELD ENGINEERING"

CM = INDICATES A CONTROLLING MONUMENT

O.P.R.T.C.T. = OFFICIAL PUBLIC RECORDS, TARRANT COUNTY, TEXAS

P.R.T.C.T.= PLAT RECORDS, TARRANT COUNTY, TEXAS



VICINITY MAP
NOT TO SCALE

0 50 100 150
GRAPHIC SCALE IN FEET
1" = 50'

NOTES:
1. NOTICE: SELLING A PORTION OF THIS ADDITION BY METES AND BOUNDS IS A VIOLATION OF CITY SUBDIVISION ORDINANCE AND STATE PLATTING STATUTES AND IS SUBJECT TO FINES AND WITHHOLDING OF UTILITIES AND BUILDING PERMITS.
2. ALL OPEN SPACE WILL BE PRIVATE HOA/DEVELOPER OWNED AND MAINTAINED OPEN SPACE.
3. COORDINATES REFERENCED TO TEXAS PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD-83. (VERTICAL DATUM: NAVD88).

LINE TABLE		
LINE #	BEARING	LENGTH
L1	N00°29'13"W	19.62'
L2	N86°28'27"E	25.00'
L3	S80°00'37"W	12.29'
L4	S89°42'02"E	25.00'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C1	58.05'	350.00'	9°30'10"	N05°14'18"W	57.98'
C2	39.49'	350.00'	6°27'51"	N06°45'28"W	39.47'
C3	58.04'	350.00'	9°30'07"	S84°45'40"W	57.98'
C4	61.50'	39.50'	89°12'50"	S44°54'22"W	55.48'

BLOCK LENGTH TABLE			
BLOCK	STREET(S)	LOTS	LENGTH
A	ELKHOM DR	1-4, 1X	765.38
A	DELANO CT	5-11, 11X	724.9

LOT AREA TABLE			
BLOCK	LOTS	AREA (SF)	AREA (AC)
A	1	24,393.60	0.56
A	2	25,264.80	0.58
A	3	34,412.40	0.79
A	4	150,282.00	3.45
A	5	27,007.20	0.62
A	6	21,780.00	0.5
A	7	21,780.00	0.5
A	8	92,347.20	2.12
A	9	74,923.20	1.72
A	10	28,749.60	0.66
A	11	28,749.60	0.66
A	1X	1,742.40	0.04
A	11X	9,147.60	0.21

DEVELOPMENT YIELD

GROSS SITE AREA (ACRES): 13.825		TOTAL NUMBER LOTS: 13	
RESIDENTIAL LOTS: 11		TOTAL NUMBER OF DWELLING UNITS: 11	
ACREAGE: SINGLE FAMILY DETACHED 12.142	SINGLE FAMILY ATTACHED 0	TWO FAMILY 0	MULTIFAMILY 0
COMMERCIAL LOTS: 0		OPEN SPACE LOTS: 2	PARKS LOTS: 0
ACREAGE: COMMERCIAL LOTS 0 • INDUSTRIAL LOTS 0		OPEN SPACE LOTS 0.241	RIGHT-OF-WAY 1.442 PARK 0.000

PRELIMINARY PLAT OF ROOSEVELT ESTATES

LOTS 1-11, 1X, 11X BLOCK A
AN ADDITION TO
THE CITY OF DALWORTHINGTON GARDENS,
TARRANT COUNTY, TEXAS
BEING 13.825 ACRES OF LAND
SITUATED IN THE HALE, J W SURVEY,
ABSTRACT NO. 802, TRACT 1E & 1E1.
CITY OF DALWORTHINGTON GARDENS, TARRANT COUNTY, TEXAS

PREPARED Jan. 2024

SHIELD ENGINEERING GROUP
TBPE FIRM #F-11039 • TBLS FIRM #10193890
1600 West 7th Street, Suite 400, Fort Worth, TX 76102 • 817.810.0696

BENCHMARK DESCRIPTION
CONTROL PT. #50
"X" CUT SET IN A SIDEWALK IN THE NORTH RIGHT-OFWAY OF PLESANT RIDGE ROAD ±7 FEET SOUTHEAST OF THE SOUTHEAST FENCE CORNER AND BEING ±1 FOOT NORTH OF AN ELECTRIC BOX.
CONTROL PT. #51
"X" CUT SET IN A SIDEWALK IN THE NORTH RIGHT-OFWAY OF PLESANT RIDGE ROAD ±5 FEET EAST OF A DRIVEWAY AND BEING ±23 FEET SOUTHWEST OF A WATER VALVE .
CONTROL PT #53
"X" CUT SET IN A SIDEWALK IN THE NORTH RIGHT-OFWAY OF PLESANT RIDGE ROAD ±22 FEET NORTHEASTOF A SANITARY SEWER MANHOLE AND BEING ±13 FEET SOUTHEAST OF A TELEPHONE POLE FOUND IN THE SOUTHWEST CORNER OF THE SUBJECT TRACT.

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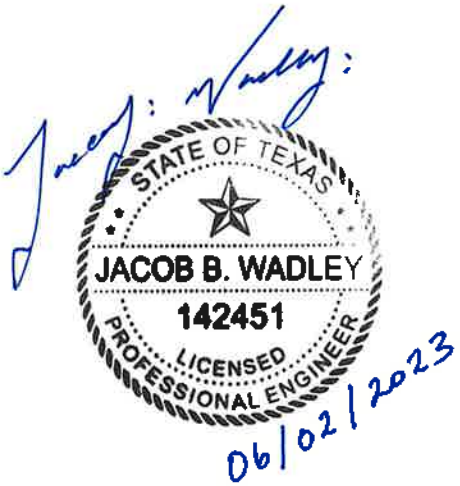
TECHNICAL MEMORANDUM

Roosevelt Estates Preliminary Drainage Study

Dalworthington Gardens, Texas

June 2023



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Introduction

The purpose of this Preliminary Drainage Study Technical Memorandum is to support the Roosevelt Estates Project. This Preliminary Drainage Study Technical Memorandum includes a downstream assessment and culvert design narrative. The proposed ±14-acre single-family residential development includes 1-acre single family lots with associated improvements (see project layout sheets in Appendix D). The project is located northwest of the West Pleasant Ridge Road and Bowen Road intersection in Dalworthington Gardens, Texas (see Exhibit B-1 in Appendix B). The property is north of West Pleasant Ridge Road and is bound by existing developments on the west, east, and north. Twin Springs Draw, a tributary to Rush Creek, runs through the northern portion of the property. Twin Springs Draw Tributary 2 runs through the center of the property and proposed project layout. The project is located approximately 1600 ft upstream of the Twin Springs Draw and Rush Creek confluence. The following describes the approach, methodology, and results to establish the impacts of the proposed development and provide preliminary sizing of a culvert system.

Previous Study

The Downstream Assessment portion of this study was based on the Rush Creek Watershed Study prepared by Halff Associates, Inc. in 2012 and includes hydrology and hydraulic modeling. This study is categorized as preliminary data and not within FEMA's effective database. The City of Arlington provided the Rush Creek study, as well as associated models and supplemental files to Shield Engineering, PLLC on March 31st, 2023 (see Appendix C for Rush Creek Watershed Study report). See Exhibit B-2 for the Twin Springs Draw watershed delineation.

Downstream Assessment

Hydrology Design Methodology

The modeling approach for the downstream assessment was kept consistent with the Rush Creek Watershed Study. The Rush Creek Watershed Study hydrology was developed using the following methodology and assumptions:

- SCS methodology was used to determine flow rates throughout the watershed.
- Hydrology Analysis was performed using USACE Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS version 3.5)
- The Natural Resource Conservation Services (NRCS) Soil Survey was used to evaluate hydrologic soil groups. Good condition soil was used to determine curve numbers throughout the watershed.
- Percent Impervious values were calculated based on watershed conditions. Percent Impervious values were calculated assuming existing conditions.
- Time of concentration and lag time calculations were performed using NRCS TR-55 methodology.
- Rainfall data was obtained from TP-40 (Hershfield, 1961) for the 24-hour events.

The total watershed square mileage at the project outfall is 1.17 square miles. The project area contributes 2% to the total watershed. Analysis points were defined by junctions along Twin

Springs Draw and all project boundary outfalls. Existing and Proposed conditions analyses were performed for the 10%, 4%, and 1% annual chance events to confirm no adverse impacts (see Tables A1 and A2 for a summary of hydrologic parameters).

Analysis Point Summary	
Junction	Description
C_TWI_000_002	Project outfall at Twin Springs Draw
J_B1	Project outfall along western property boundary
C_TWI_000_003	Confluence along Twin Springs Draw upstream of project
J_B_TWI_000_100_B1	Confluence between Twin Springs Draw and Rush Creek

For existing conditions, drainage area delineations and parameters were updated based on topographic data and 2019 TNRIS LiDAR to basins B_TWI_000_100, B_TWI_000_090, and B_TWI_003_010. Drainage area B_TW_002_010 was split into EX-A1, OS-A1, and EX-B1 to accurately model flow through the project site (see Exhibit B-3 for the existing conditions drainage area map). Hydrologic parameters were updated assuming good condition soil and open space land use (see Tables A3, A4, and A5 for hydrologic parameter calculations). See Exhibits B-5 and B-6 for the soils map and existing land use coverage, respectively.

The proposed development comprises basins PR-A1, PR-A2, and PR-B1 (see Exhibit B-4 for the proposed conditions drainage area map). From existing to proposed conditions, the percent impervious increased from approximately 5% to 25% (see Exhibit B-7 for the proposed conditions land use coverage). The hydrologic study demonstrated an increase in flow at C_TWI_000_002, the confluence with Twin Springs Draw (see Tables A6 and A7 for a summary of discharges and comparison at project outfalls). This comparison was made assuming offsite areas were unchanged between existing and proposed conditions.

Hydraulics Design Methodology

Due to the minimal contribution of the project area to the total watershed and proximity to Twin Springs Draw, a hydraulic comparison was performed to show no increases in water surface elevation along Twin Springs Draw. The Twin Springs Draw Hydraulic Model developed with the Rush Creek Watershed Study was used for the comparison and was developed using the following methodology and assumptions:

1. Hydraulic Analysis was performed using USACE Hydrologic Engineering Center River Analysis System (HEC-RAS version 4.1).
2. The HEC-RAS analysis utilized unsteady flow computations.

The Rush Creek HEC-HMS model did not utilize routing reaches along Twin Springs Draw Mainstem. Uniform Hydrograph and Lateral Inflow Hydrograph flow data was updated in the HEC-RAS model based on hydrology updates for existing and proposed conditions. The hydraulic study comparison demonstrated no rises in water surface elevation from the project outfall to the Tributary Springs Draw to the confluence with Rush Creek (See Table A-8 for a comparison of water surface elevations).

Culvert Design

Hydrology Design Methodology

The proposed project includes a culvert and roadway crossing along Tributary Springs Draw Tributary 2. Design flow rates were determined using rational method in accordance with Chapter 10 Section 10.02.274 of Dalworthington Garden's City Ordinances. See Tables A9 and A10 for rational method and weighted runoff coefficient calculations.

Hydraulics Design Methodology

The USACE HEC-River Analysis System (HEC-RAS version 6.3) was used for hydraulic modeling of the stream and proposed culvert (see Exhibit B-8 for a hydraulic workmap). Rational method discharges for the 1% annual chance event were used as steady flow data in the hydraulic analysis. Topography collected in 2022 by Shield Engineering Group surveying was used in conjunction with Texas Natural Resources Information System (TNRIS) LiDAR 2019 to generate cross section data and map floodplains. A Manning's roughness coefficient of 0.05 was used to represent natural channel areas with light brush. A Manning's roughness coefficient of 0.08 was used to represent natural channel areas with heavy brush and tree growth. Bank stations were set to represent the change in the channel from light brush to heavy tree growth.

The preliminary culvert size was determined to be 36". The preliminary design provides more than 1' of freeboard to the proposed roadway and doesn't impact existing upstream storm drain infrastructure. See Table A11 for a comparison of existing and proposed water surface elevations along Twin Springs Draw Tributary 2. See Table A12 for a comparison between the proposed 100-year water surface elevation and top of bank/roadway.

Conclusion

The goal of this report was to demonstrate no adverse impacts downstream of the project site to adjacent properties and Twin Springs Draw due to the proposed development and provide preliminary sizing of a culvert system. The hydrology study determined that the proposed development increased the percent impervious value of the onsite drainage area from approximately 5% to 25%. This resulted in a discharge increase at the project outfall along Twin Springs Draw and no increase in water surface elevation along Twin Springs Draw to the confluence with Rush Creek. No increases in discharge were observed at project outfalls draining to adjacent properties. Results from the preliminary hydraulic study indicate that a 36" culvert will convey onsite and offsite flow with adequate freeboard and cause no adverse impacts to upstream storm drain infrastructure.

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APPENDIX A: TABLES AND CALCULATIONS

Roosevelt Estates Downstream Assessment					
Table A1 - Sumary of Parameters - Existing Conditions					
Basin	Acres	SQ Mile	CN	Percent Impervious	Lag Time
EX-A1	5.075	0.008	77	3	7.0
EX-B1	1.758	0.003	61	8	9.5
OS-A1	6.499	0.010	76	50	5.9
TWI_003_010	27.259	0.043	80	55	Previous Study
TWI_000_090	20.735	0.032	80	35	Previous Study
TWI_000_100	33.076	0.052	68	34	Previous Study

Table A2 - Sumary of Parameters - Proposed Conditions					
Basin	Acres	SQ Mile	CN	Percent Impervious	Lag Time
PR-A1	2.007	0.003	76	25	4.5
PR-A2	4.464	0.007	73	25	5.0
PR-B1	0.683	0.001	61	31	4.1
OS-A1	6.499	0.010	76	50	5.9
TWI_003_010	26.525	0.041	80	57	Previous Study
TWI_000_090	21.147	0.033	81	36	2.0
TWI_000_100	33.076	0.052	68	34	Previous Study

ROOSEVELT ESTATES DOWNSTREAM ASSESSMENT

TABLE A3 - TIME OF CONCENTRATION CALCULATIONS

1	2					3				4								5	6
	SHEET FLOW					SHALLOW CONCENTRATED FLOW				CHANNEL / PIPE FLOW									
Drainage Area ID	Sheet Flow Length (ft)	P_2 (in)	Land Slope (ft/ft)	n	t_{sheet} (min)	Shallow Flow Length (ft)	Shallow Flow Slope (ft/ft)	Average Velocity (ft/sec)	$t_{shallow}$ (min)	Channel Length (ft)	Channel Slope (ft/ft)	n	Cross Sectional Area (sf)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	Average Velocity (ft/sec)	$t_{channel}$ (min)	SCS Method T_c (min)	SCS Method t_{lag} (min)
Existing Conditions																			
EX-A1	100	3.95	0.0237	0.15	8.24	-	-	-	-	655.6	-	-	-	-	-	3.20	3.41	11.65	6.99
EX-B1	100	3.95	0.0065	0.15	13.82	333	0.0278	2.69	2.07	-	-	-	-	-	-	-	-	15.89	9.53
OS-A1	100	3.95	0.0589	0.15	5.73	697	0.0359	3.05	3.80	106	0.0040	0.013	-	-	-	6.00	0.29	9.82	5.89
Proposed Conditions																			
PR-A1	100	3.95	0.0465	0.15	6.29	-	-	-	-	230.09	-	-	-	-	-	3.20	1.20	7.49	4.49
PR-A2	69.44	3.95	0.0163	0.15	7.15	527	0.0127	2.29	3.83	210.58	-	-	-	-	-	3.20	1.10	8.25	4.95
PR-B1	100	3.95	0.0437	0.15	6.45	16	0.0019	0.70	0.37	-	-	-	-	-	-	-	-	6.82	4.09
TWI_000_090	50	3.95	0.0050	0.011	1.09	353	0.0374	3.93	1.50	-	-	-	-	-	-	-	-	3.41	2.05
						149	0.0351	3.02	0.82	-	-	-	-	-	-	-	-		

NOTE: CITE SOURCE OF MANNING'S N VALUES USED.

ROOSEVELT ESTATES DOWNSTREAM ASSESSMENT				
TABLE A4 - CURVE NUMBER AND PERCENT IMPERVIOUS CALCULATION EXISTING CONDITIONS				
Basin	Total Area (Acres)	Total Area (sq. mi)	[1]Weighted CN	[1]Weighted / Percent Impervious
EX-A1	5.08	0.0079	77	3
EX-B1	1.76	0.0027	61	8
OS-A1	6.50	0.0102	76	50
TWI_000_090	20.74	0.0324	80	35
TWI_000_100	33.08	0.0517	68	34
TWI_003_010	27.26	0.0426	80	55
TWI_000_070	96.93	0.1515	-	57
TWI_000_030	67.34	0.1052	-	51

ROOSEVELT ESTATES DOWNSTREAM ASSESSMENT				
TABLE A5 - CURVE NUMBER AND PERCENT IMPERVIOUS CALCULATION PROPOSED CONDITIONS				
Basin	Total Area (Acres)	Total Area (sq. mi)	[1]Weighted CN	[1]Weighted / Percent Impervious
PR-A1	2.01	0.0031	76	25
PR-A2	4.46	0.0070	73	25
PR-B1	0.68	0.0011	61	31
OS-A1	6.50	0.0102	76	50
TWI_000_090	21.15	0.0330	81	36
TWI_000_100	33.08	0.0517	68	34
TWI_003_010	26.53	0.0414	80	57
TWI_000_070	96.93	0.1515	-	57
TWI_000_030	67.34	0.1052	-	51

Notes:

1. Weighted CN and Percent Impervious values calculated using Intersect and Dissolve Geoprocessing Tools in ArcPro

Roosevelt Estates Downstream Assessment						
Table A6 - Summary of Discharges						
Junction	10% ACE		4% ACE		1% ACE	
	Existing Flow	Proposed Flow	Existing Flow	Proposed Flow	Existing Flow	Proposed Flow
Project Site Junction Outfalls						
C_TWI_000_002	60.8	68.7	75.5	85.1	101	114.2
J_B1	5.2	2.8	7.1	3.6	10.6	5
Junctions Downstream through ZOI						
C_TWI_000_003	168.8	161.8	204.4	195.7	265.5	253.9
J_B_TWI_000_100_B1	127.5	123.9	161	156	220.9	213.4

Roosevelt Estates Downstream Assessment			
Table A7 - Discharge Impacts			
Basin	1-yr Comparison	5-yr Comparison	100-yr Comparison
Project Site Junction Outfalls			
C_TWI_000_002	7.9	9.6	13.2
J_B1	-2.4	-3.5	-5.6
Junctions Downstream through ZOI			
C_TWI_000_003	-7	-8.7	-11.6
J_B_TWI_000_100_B1	-3.6	-5	-7.5

Roosevelt Estates Downstream Assessment											
Table A8 - Twin Springs Draw Water Surface Elevation Comparison											
Reach	River	Cross Section	10% ACE Event			4% ACE Event			1% ACE Event		
			Existing	Proposed	Difference	Existing	Proposed	Difference	Existing	Proposed	Difference
Twin Springs Draw											
TWI000A	TSD	6594	609.14	609.14	0	609.25	609.25	0	609.43	609.43	0
TWI000A	TSD	6562	608.23	608.23	0	608.38	608.38	0	608.63	608.63	0
TWI000A	TSD	6532	607.8	607.8	0	607.9	607.9	0	608.26	608.26	0
TWI000A	TSD	6498	607.09	607.09	0	607.33	607.33	0	608.08	608.08	0
TWI000A	TSD	6438	606.49	606.49	0	606.95	606.95	0	607.99	607.99	0
TWI000A	TSD	6319	606.38	606.38	0	606.85	606.85	0	607.96	607.96	0
TWI000A	TSD	6249	604.34	604.34	0	605	605	0	605.74	605.74	0
TWI000A	TSD	6218	604.63	604.63	0	605.18	605.18	0	606.05	606.05	0
TWI000A	TSD	6179	604.53	604.53	0	605.05	605.05	0	605.86	605.86	0
TWI000A	TSD	6133	604.29	604.29	0	604.75	604.75	0	605.47	605.47	0
TWI000A	TSD	6059	603.95	603.95	0	604.34	604.34	0	604.92	604.92	0
TWI000A	TSD	5935	602.83	602.83	0	603.3	603.3	0	604.04	604.04	0
TWI000A	TSD	5676	601.16	601.16	0	601.69	601.69	0	602.5	602.5	0
TWI000A	TSD	5466	599.57	599.57	0	600.05	600.05	0	600.79	600.79	0
TWI000A	TSD	5296	598.02	598.02	0	598.48	598.48	0	599.18	599.18	0
TWI000A	TSD	5079	596.18	596.18	0	596.61	596.61	0	597.37	597.37	0
TWI000A	TSD	4954	595.18	595.18	0	595.71	595.71	0	596.64	596.64	0
TWI000A	TSD	4851	594.72	594.72	0	595.39	595.39	0	596.45	596.45	0
TWI000A	TSD	4630	594.32	594.32	0	595.1	595.1	0	596.26	596.26	0
TWI000A	TSD	4515	593.61	593.61	0	594.4	594.4	0	595.53	595.53	0
TWI000A	TSD	4315	591.53	591.53	0	592.04	592.04	0	592.87	592.87	0
TWI000A	TSD	4239	591.04	591.04	0	591.57	591.57	0	592.38	592.38	0
TWI000A	TSD	4155	590.98	590.98	0	591.55	591.55	0	592.43	592.43	0
TWI000A	TSD	3981	589.62	589.62	0	590.07	590.07	0	590.75	590.75	0
TWI000A	TSD	3902	588.54	588.54	0	589.05	589.05	0	589.82	589.82	0
TWI000A	TSD	3556	584.09	584.09	0	584.68	584.68	0	585.68	585.68	0
TWI000A	TSD	3490	583.5	583.5	0	584.02	584.02	0	584.86	584.86	0
TWI000A	TSD	3161	581.24	581.24	0	581.72	581.72	0	582.35	582.35	0
TWI000A	TSD	3010	580.32	580.32	0	580.72	580.72	0	581.16	581.16	0
TWI000A	TSD	2970	580.3	580.3	0	580.65	580.65	0	580.97	580.97	0
TWI000A	TSD	2668	576.75	576.75	0	577.28	577.28	0	578.08	578.08	0
TWI000A	TSD	2599	576.04	576.04	0	576.54	576.54	0	577.31	577.31	0
TWI000A	TSD	2389	574.65	574.65	0	575.18	575.18	0	576	576	0
TWI000A	TSD	2202	573.77	573.77	0	574.31	574.31	0	575.1	575.1	0
TWI000A	TSD	2201	0	0	0	0	0	0	0	0	0
TWI000A	TSD	2108	573.28	573.28	0	573.79	573.79	0	574.56	574.56	0
TWI000A	TSD	1959	572.69	572.69	0	573.22	573.22	0	573.97	573.97	0
TWI000A	TSD	1815	572.42	572.42	0	572.96	572.96	0	573.7	573.7	0
TWI000A	TSD	1704	572.36	572.35	-0.01	572.89	572.88	-0.01	573.6	573.6	0
TWI000A	TSD	1522	572.26	572.26	0	572.78	572.77	-0.01	573.45	573.45	0
TWI000A	TSD	1354	572.16	572.16	0	572.66	572.66	0	573.3	573.3	0
TWI000A	TSD	1241	571.58	571.57	-0.01	572.06	572.06	0	572.63	572.63	0
TWI000A	TSD	1205	571.07	571.07	0	571.46	571.46	0	572	572	0
TWI000A	TSD	1115	570.82	570.82	0	571.26	571.26	0	571.83	571.83	0
TWI000A	TSD	1076.5	0	0	0	0	0	0	0	0	0
TWI000A	TSD	1038	570.82	570.82	0	571.26	571.26	0	571.83	571.83	0
TWI000A	TSD	1011	570.82	570.82	0	571.26	571.26	0	571.83	571.83	0
TWI000A	TSD	897	570.81	570.81	0	571.24	571.24	0	571.8	571.8	0
TWI000A	TSD	736	570.81	570.81	0	571.25	571.24	-0.01	571.81	571.8	-0.01
TWI000A	TSD	585	570.8	570.8	0	571.24	571.24	0	571.79	571.79	0
TWI000A	TSD	549	570.66	570.66	0	571.04	571.03	-0.01	571.51	571.51	0
TWI000A	TSD	544	0	0	0	0	0	0	0	0	0
TWI000A	TSD	437	554.15	554.15	0	554.85	554.85	0	555.94	555.94	0
TWI000A	TSD	390	554.25	554.24	-0.01	554.99	554.99	0	555.99	555.99	0
TWI000A	TSD	329	554.24	554.24	0	554.98	554.98	0	555.97	555.96	-0.01
TWI000A	TSD	237	554.25	554.25	0	555	554.99	-0.01	555.99	555.99	0
TWI000A	TSD	179	554.24	554.23	-0.01	554.98	554.98	0	555.97	555.96	-0.01
TWI000A	TSD	165	554.05	554.05	0	554.78	554.77	-0.01	555.7	555.7	0
TWI000A	TSD	143	0	0	0	0	0	0	0	0	0
TWI000A	TSD	106	548.07	548.06	-0.01	548.93	548.93	0	550.79	550.79	0
TWI000A	TSD	87	548.24	548.24	0	549.44	549.43	-0.01	551.13	551.12	-0.01

ROOSEVELT ESTATES DOWNSTREAM ASSESSMENT										
Table A9 - Culvert Design Rational Method Calculations										
25 and 100-Year Design Frequency										
1	2	3	4	5	6	7	8	9	10	11
Drainage Area ID	Area (ac)	Land Use Description	Runoff Coefficient C	CA	Total Tc (Min)	I25	Runoff Q25 (cfs)	I100	Runoff Q100 (cfs)	Outfall DesignPoint #
PR-A1	2.007	Residential	0.56	1.13	7.49	8.75	10.84	10.95	15.42	1
PR-A2	4.464	Residential	0.55	2.47	8.25	8.45	22.92	10.58	32.61	1
OS-A1	6.499	Residential	0.56	3.63	9.82	7.91	31.61	9.89	44.94	1
NOTE: TABLE 10.02.274-2. RUNOFF COEFFICIENT - DWG DRAINAGE ORDINANCE										
Q25 AND Q100 INCLUDE ANTECEDENT PRECIPITATION FACTORS OF 1.1 AND 1.25, RESPECTIVELY.										

ROOSEVELT ESTATES DOWNSTREAM ASSESSMENT								
TABLE A10 - COMPOSITE RUNOFF COEFFICIENT CALCULATIONS								
Drainage Area ID	Total Area (ac)	Residnetial - Type B Soil		Residnetial - Type C Soil		Residnetial - Type D Soil		Composite C
		C	Area (ac)	C	Area (ac)	C	Area (ac)	
PR-A1	2.007	0.52	0.234	0.55	0.806	0.58	0.968	0.56
PR-A2	4.464	0.52	1.527	0.55	1.046	0.58	1.89	0.55
OS-A1	6.499	0.52	0	0.55	4.445	0.58	2.05	0.56
NOTE: TABLE 10.02.274-2. RUNOFF COEFFICIENT - DWG DRAINAGE ORDINANCE								

Roosevelt Estates Downstream Assessment														
Table A11 - Water Surface Elevation Comparison														
Reach	River	Cross Section	Water Surface Elevation Comparison						Velocity Comparison					
			4% ACE Event			1% ACE Event			4% ACE Event			1% ACE Event		
			Existing	Proposed	Difference	Existing	Proposed	Difference	Existing	Proposed	Difference	Existing	Proposed	Difference
Twin Springs Draw 2														
Reach 1	1	627	585.43	585.43	0	585.57	585.57	0	4.03	4.03	0	4.42	4.42	0
Reach 1	1	590	581.34	581.34	0	581.52	581.52	0	4.46	4.43	-0.03	4.77	4.77	0
Reach 1	1	544	577.67	577.9	0.23	577.84	578.98	1.14	4.38	3.05	-1.33	4.75	1.43	-3.32
Reach 1	1	517	575.9	577.5	1.6	576.07	578.65	2.58	2.37	4.31	1.94	2.66	4.17	1.51
Reach 1	1	407	573.52	573.53	0.01	573.68	573.7	0.02	4.19	4.6	0.41	4.55	5.2	0.65
Reach 1	1	379	572.95	572.96	0.01	573.15	573.16	0.01	2.65	2.61	-0.04	2.96	2.91	-0.05
Reach 1	1	336	571.88	571.88	0	572.03	572.03	0	4.1	4.1	0	4.49	4.49	0
Reach 1	1	273	571.4	571.39	-0.01	571.8	571.79	-0.01	0.84	1.3	0.46	0.89	1.38	0.49
Reach 1	1	208	571.4	571.4	0	571.8	571.8	0	0.24	0.37	0.13	0.3	0.47	0.17
Reach 1	1	150	571.4	571.4	0	571.8	571.8	0	0.16	0.25	0.09	0.21	0.32	0.11
Reach 1	1	89	571.4	571.4	0	571.8	571.8	0	0.09	0.13	0.04	0.11	0.17	0.06
Reach 1	1	57	571.4	571.4	0	571.8	571.8	0	0.06	0.1	0.04	0.08	0.13	0.05

Roosevelt Estates Downstream Assesment					
Table A12 Twin Springs Draw Tributary 2 Freeboard					
Reach	River	Cross Section	Proposed 100-Yr WSEL (ft)	Bank Station Elevation (ft)	Freeboard (ft)
Reach 1	1	627	585.57	589.77	4.2
Reach 1	1	590	581.52	585.39	3.87
Reach 1	1	544	578.98	582.87	3.89
Reach 1	1	517	578.65	582.15	3.5
Reach 1	1	407	573.7	582.15	8.45
Reach 1	1	379	573.16	582.61	9.45
Reach 1	1	336	572.03	581.29	9.26
Reach 1	1	273	571.79	580.89	9.1
Reach 1	1	208	571.8	582.37	10.57
Reach 1	1	150	571.8	582.67	10.87
Reach 1	1	89	571.8	582.59	10.79
Reach 1	1	57	571.8	577.76	5.96

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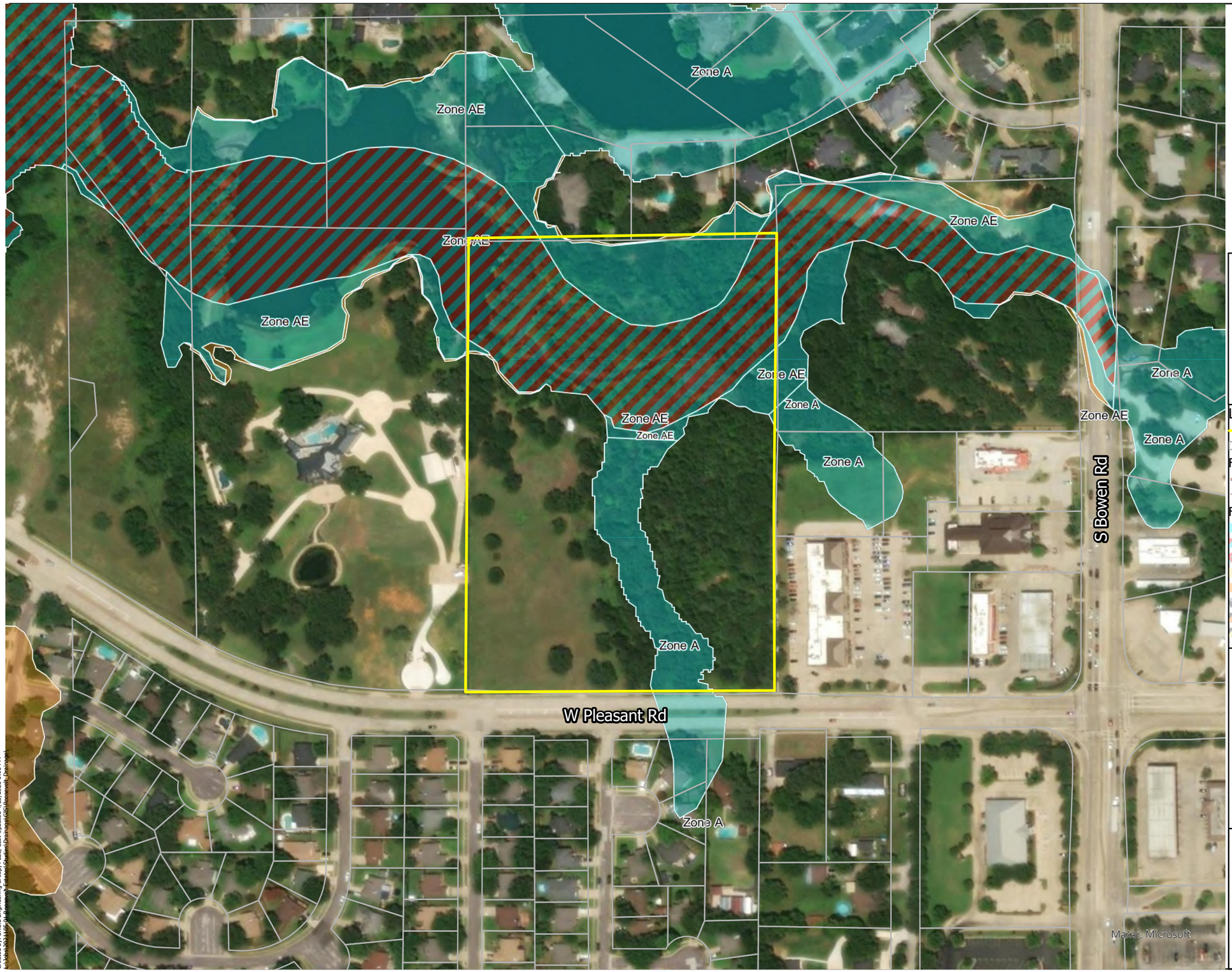
APPENDIX B: EXHIBITS AND WORKMAPS



SHIELD ENGINEERING GROUP

Legend

- Project Location
- Parcels

Flood Hazard Boundaries

- Limit Lines
- SFHA / Flood Zone Boundary

Flood Hazard Zones

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Area with Risk Due to Levee

N

200 100 0 200

US Feet

Scale: 1":200'

Exhibit B-1
Project Location Map

Created by: Shield Engineering Group, PLLC, Last Updated 4/25/2023 5:05 PM
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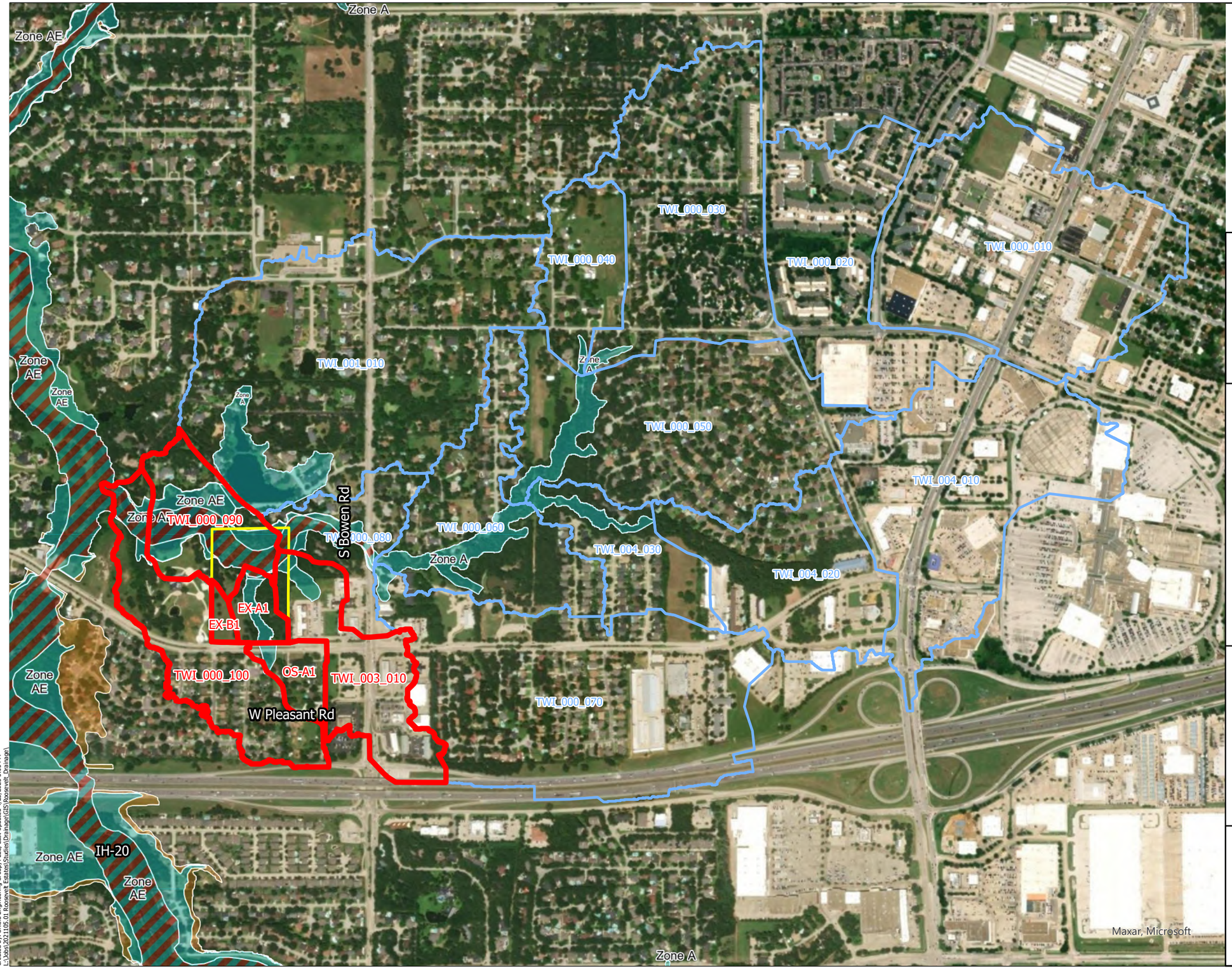

SHIELD ENGINEERING GROUP

Legend

- Project Location
- Existing Drainage Areas
- Twin Springs Draw Drainage Areas

Flood Hazard Boundaries

- Limit Lines
- SFHA / Flood Zone Boundary

Flood Hazard Zones

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Area with Risk Due to Levee

N

800 400 0 800

US Feet

Scale: 1":800'

Exhibit B-2
Overall Watershed

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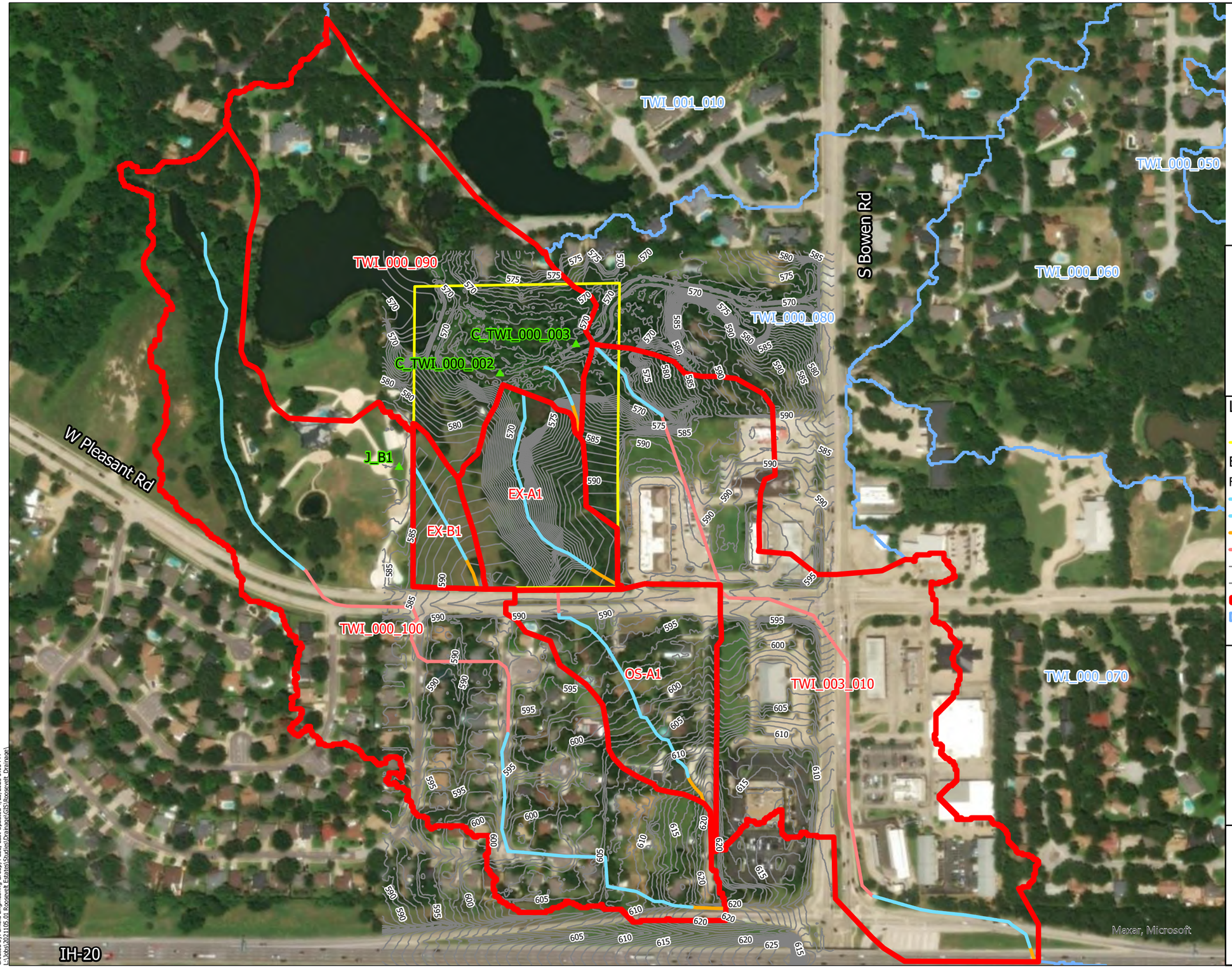

SHIELD ENGINEERING GROUP

Legend

- Junction
- Project Location

Existing Longest Flowpath

FlowType

- Channel Flow
- Shallow Concentrated Flow
- Overland Flow
- Pipe Flow
- LiDAR
- Survey_Contours
- Existing Drainage Areas
- Twin Springs Draw Drainage Areas

N

300 150 0 300

US Feet

Scale: 1":300'

Exhibit B-3
Existing Drainage Area Map

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SHIELD ENGINEERING GROUP

Legend

- Layout
- Project Location
- Proposed Drianage Areas
- Twin Springs Draw Drainage Areas

Proposed Longest Flowpath

FlowType

- Channel Flow
- Shallow Concentrated Flow
- Overland Flow
- Pipe Flow
- Preliminary Grading
- LiDAR
- Junction

N

300 150 0 300

US Feet

Scale: 1":300'

Exhibit B-4
Proposed Drainage Area Map

Created by: Shield Engineering Group, PLLC. Last Updated 4/25/2023 5:14 PM
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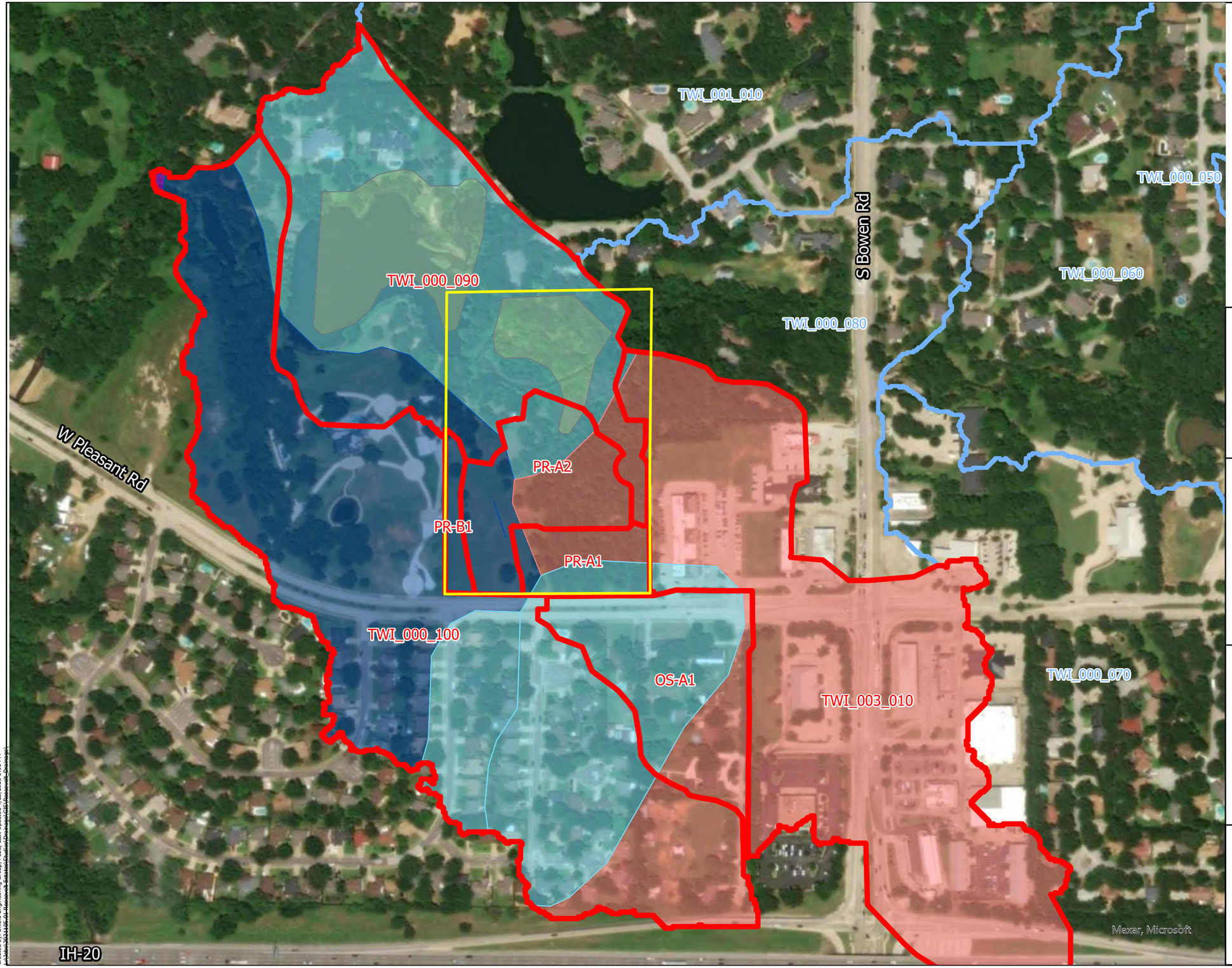


SHIELD ENGINEERING GROUP

Legend

Project Location

Soil Type

HSG

- A
- B
- C
- D
- Water
- Twin Springs Draw Drainage Areas
- Proposed Drianage Areas

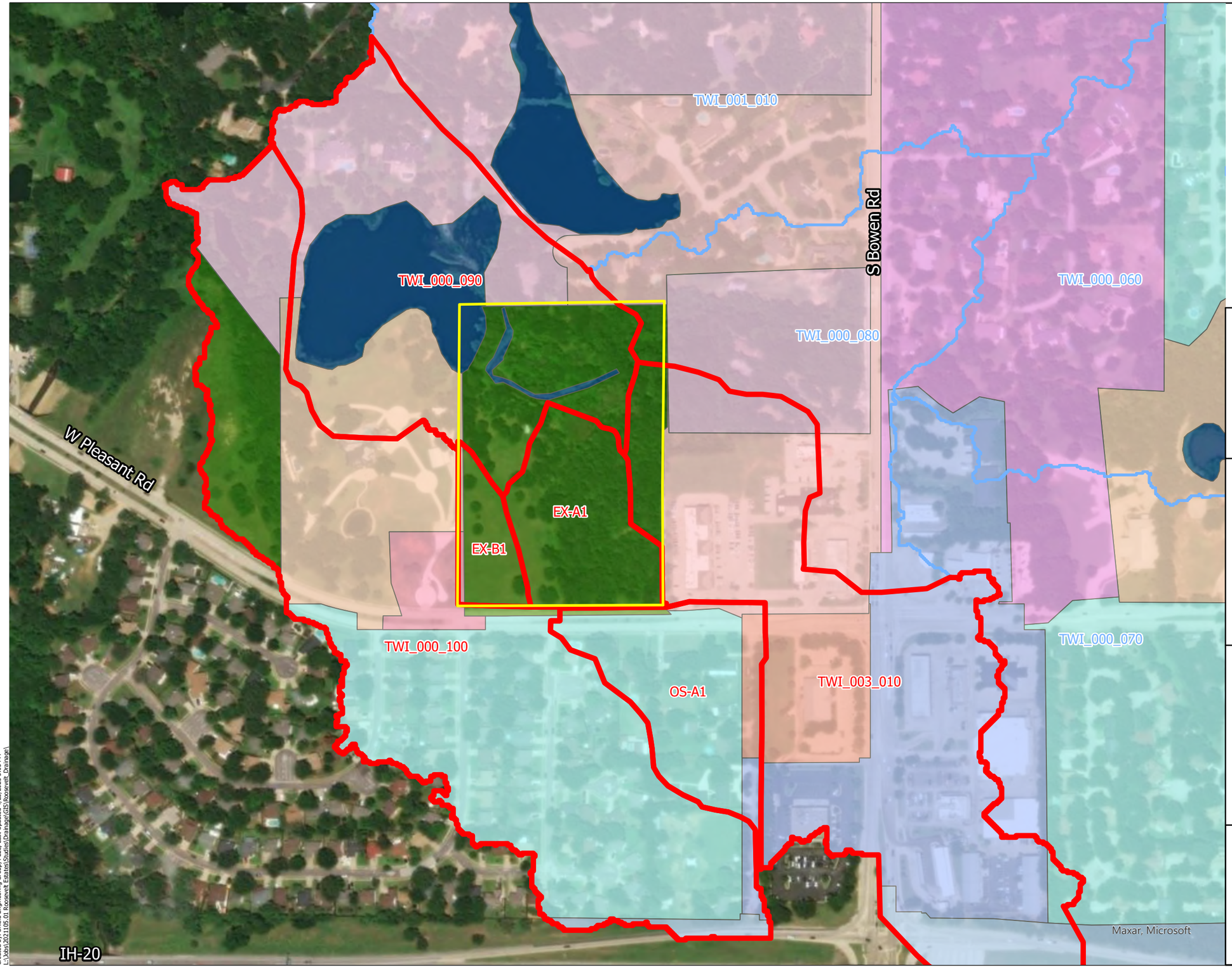
N

300 150 0 300 US Feet

Scale: 1":300'

Exhibit B-5
Soils Map

Created by: Shield Engineering Group, PLLC. Last Updated 4/25/2023 5:05 PM



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Legend

Project Location

Existing Land Use Type

- Extremely Low Density
- Group Quarters
- High Density Residential
- Hotel/Motel
- Industrial
- Institutional
- Low Density Residential
- Major Roads
- Medium Density Residential
- Mobile Home
- Multi Family
- Office
- Parks/Recreation
- Retail
- Under Construction
- Utilities
- Vacant
- Very Low Density Residential
- Water
- Existing Drainage Areas
- Twin Springs Draw Drainage Areas

N

300 150 0 300

US Feet

Scale: 1":300'

Exhibit B-6
Existing Land Use Map

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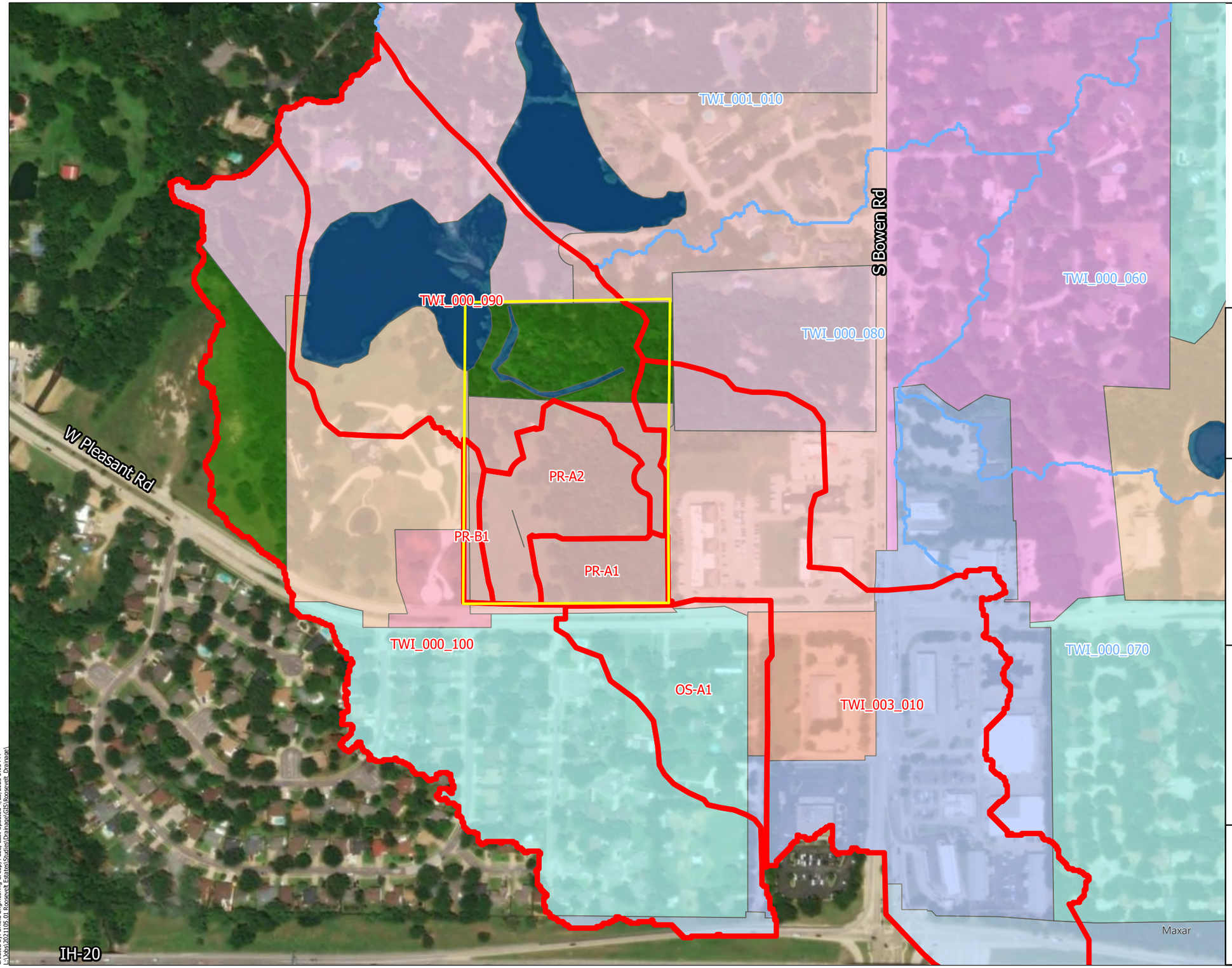

SHIELD ENGINEERING GROUP

Legend

- Project Location

Proposed Land Use Type

- Extremely Low Density
- Group Quarters
- High Density Residential
- Hotel/Motel
- Industrial
- Institutional
- Low Density Residential
- Major Roads
- Medium Density Residential
- Mobile Home
- Multi Family
- Office
- Parks/Recreation
- Retail
- Under Construction
- Utilities
- Vacant
- Very Low Density Residential
- Water
- Proposed Drianage Areas
- Twin Springs Draw Drainage Areas

N

300 150 0 300 US Feet

Scale: 1":300'

Exhibit B-7
Proposed Land Use Map

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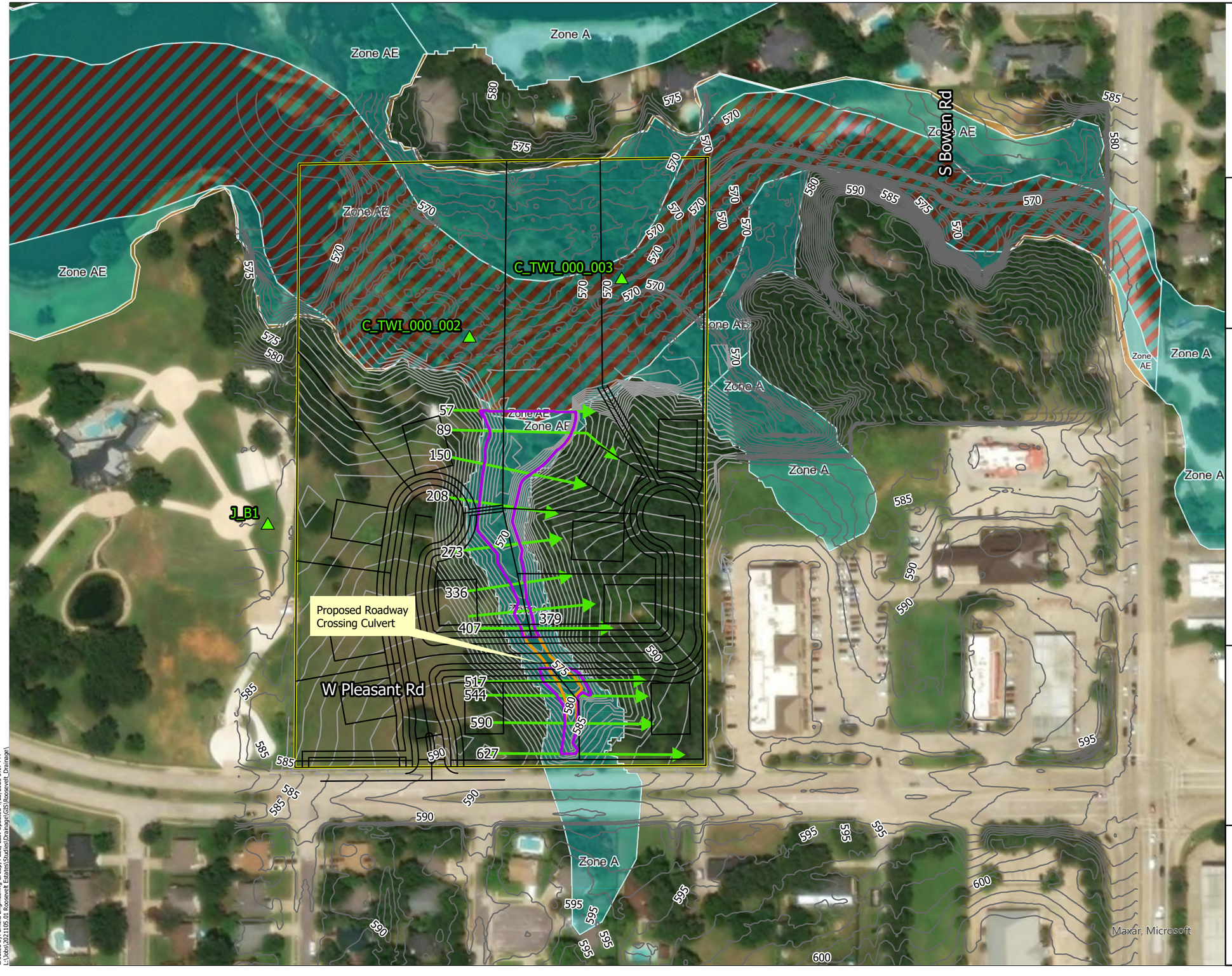

SHIELD ENGINEERING GROUP

Legend

- Layout
- Project Location
- LiDAR
- Survey_Contours
- Existing 100-yr Inundation
- Proposed 100-yr Inundation
- HEC-RAS Cross Sections

Flood Hazard Boundaries

- Limit Lines
- SFHA / Flood Zone Boundary

Flood Hazard Zones

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Area with Risk Due to Levee
- Junction

N

150 75 0 150

US Feet

Scale: 1":150'

Exhibit 8
Hydraulic Workmap

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APPENDIX C: PREVIOUS STUDY (2012 RUSH CREEK STUDY)

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RUSH CREEK
City of Arlington
Watershed Study

Rush Creek Watershed Study Hydrology Report

July 2012

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5/15/2013
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1. Executive Summary

1. Executive Summary

The Rush Creek watershed is the largest watershed in Arlington and includes portions of Kennedale, Mansfield, and Fort Worth and the entirety of Pantego and Dalworthington Gardens. The watershed encompasses approximately 35 square miles of contributing drainage area. It has developed significantly over the past 40 years from the time when the original floodplain mapping was produced by the Federal Emergency Management Agency (FEMA) and this development has had a significant impact on floodplains and creeks.

The City of Arlington has undertaken a comprehensive watershed study to update information regarding flooding characteristics and flows in Rush Creek. The purpose of the watershed study is to 1) update the FEMA flood maps so that flooding risk is better defined for Arlington residents; 2) reduce risks by formulating flood management projects; and 3) assess channel erosion risks.

This report summarizes the study methods and results of the hydrologic modeling effort performed by Halff Associates, Inc. As part of this effort, the Rush Creek watershed was divided into the following major sub-watersheds: Kee Branch, Lower Rush Creek, Middle Rush Creek, Stream RC-1, and Upper Rush Creek. HEC-HMS v3.5 was utilized to create hydrologic models for each sub-watershed. The results of this modeling effort will be utilized to develop unsteady hydraulic models to determine flood elevations corresponding to the 50, 20, 10, 4, 2, 1 and 0.2%-annual-chance (2-, 5-, 10-, 25-, 50-, 100- and 500-year) storm events. Figure 1-1 is a map of the Rush Creek study area.

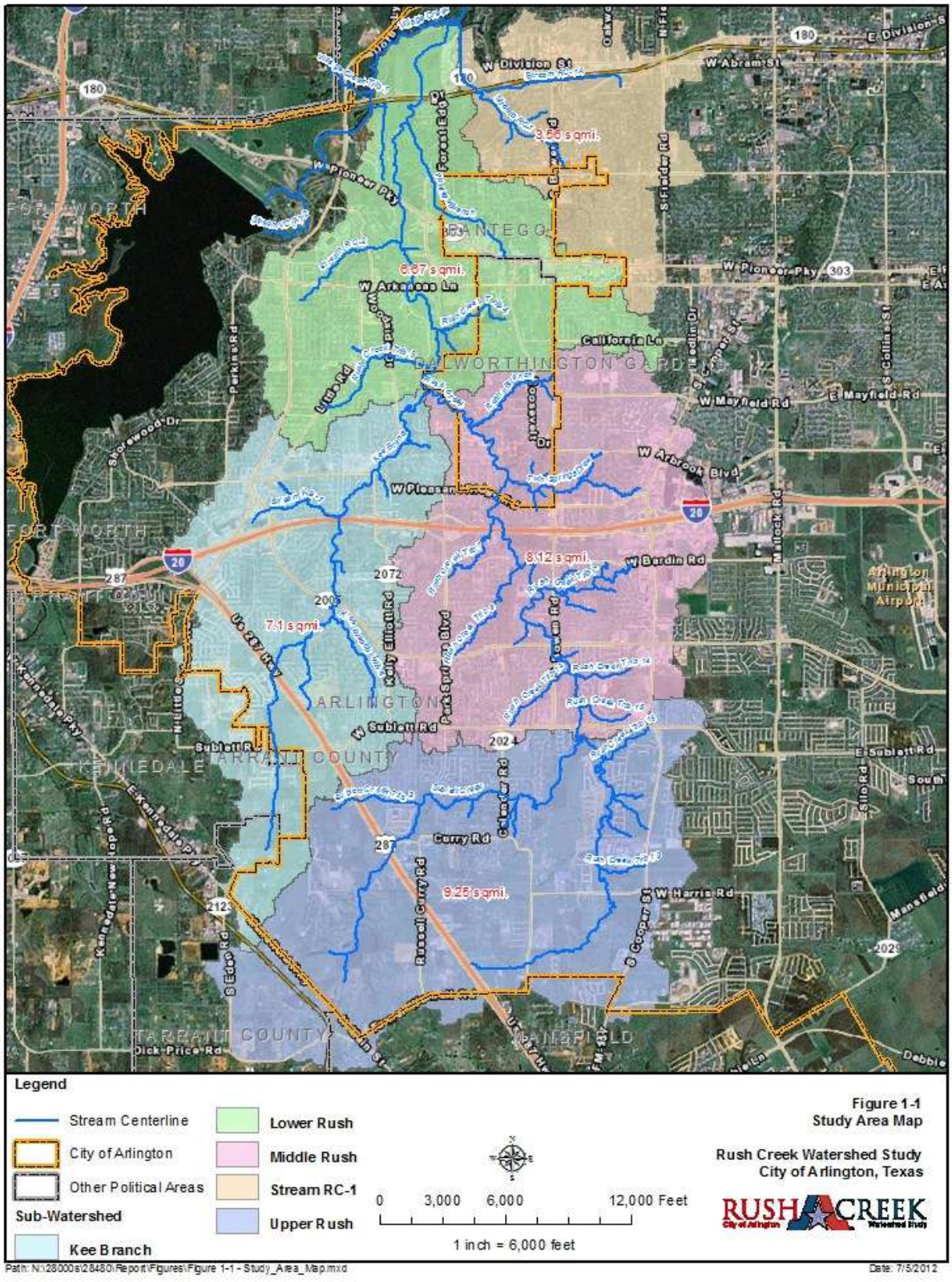


Figure 1-1. Study Area Map

2. Hydrologic Study

2. Hydrologic Study

2.1 Study Area Characteristics

2.1.1 Hydrologic Region

The Rush Creek watershed is located in the Lower West Fork Trinity hydrologic region and is bordered by the Village Creek watershed to the west, the Walnut Creek watershed to the southeast, Fish Creek watershed to the east, Johnson Creek watershed to the northeast. The characteristics of the Lower West Fork Trinity hydrologic region include generally flat terrain and impermeable soils.

2.1.2 Watershed Size

At its outlet, the Rush Creek watershed drainage area measures 34.69 square miles. The Rush Creek watershed was divided into the following five major sub-watersheds:

- *Kee Branch*
- *Lower Rush Creek*
- *Middle Rush Creek*
- *Stream RC-1*
- *Upper Rush Creek*

Figure A-1, Vicinity Map, shows the Rush Creek watershed boundary and the surrounding area.

2.1.3 Soils

The Natural Resource Conservation Service (NRCS) Soil Survey of Tarrant County (2009) was used to evaluate the hydrologic soils in the Rush Creek watershed. The most prevalent soil type in the watershed is Group D which consists of clayey soils with slow infiltration rates and high potential for runoff. The second most prevalent soil type is Group B which consists of soils characterized as having some content of gravelly sand with moderate infiltration rates and low/moderate runoff potential. The third most prevalent soil type in the watershed is Group C which indicates soils having moderately fine to fine texture and slow infiltration rates. A small percentage of soils in the watershed are identified as Group A which indicates soils having high infiltration rates and low runoff potential. Table 2.1 includes a list of the NRCS Soil Survey Geographic Database (SSURGO) Hydrologic Soil Group (HSG) classifications for each Rush Creek sub-watershed.

The hydrologic soils for the Rush Creek watershed are illustrated in Figure A-2, Soils Map.

The antecedent moisture condition (AMC) defines the soil moisture condition prior to a storm. AMC-II, average soil moisture conditions, was used for the watershed study.

Table 2.1 - Watershed Soil Classification				
SSURGO Database Classification	Hydrologic Soil Type Percentage			
	A	B	C	D
Kee Branch	3%	38%	29%	30%
Lower Rush Creek	13%	43%	18%	26%
Middle Rush Creek	4%	25%	18%	53%
Stream RC-1	2%	41%	28%	28%
Upper Rush Creek	3%	29%	17%	50%

2.1.4 Land Use

Land use for the Rush Creek watershed has been determined for both existing and ultimate conditions. Table 2.2 shows the land use categories and corresponding impervious percentages used for this study. Refer to the Technical Standards (May 21, 2012) developed by CDM Smith for sources of these impervious area percentages. Watershed conditions dictated that the recommended percent impervious values provided in the Technical Guidelines be revised to the values shown in Table 2.2 for Extremely Low Density Residential, Very Low Density Residential, Major Transportation, Institutional, and Mobile Home land use categories. A composite percentage of impervious area was computed for each sub-basin for both existing and ultimate land use conditions.

Table 2.2 - Land Use and Percent Impervious	
Land Use Description	Impervious (%) Condition
Extremely Low Density Res (2+ac lots)	15
Very Low Density Res (1 ac lots)	25
Low Density Res (1/2 ac lots)	40
Medium Density Res (1/3 ac lots)	45
High Density Res (1/4 ac lots)	50
Major Transportation	50
Industrial	72
Institutional	50
Group Quarters	40
Hotel/Motel	85
Mobile Home	35
Multi Family	65
Office	85
Parks/Recreation	6
Retail	85
Under Construction	50
Utilities	60
Vacant	3
Water	100

2.1.4.1 *Existing Conditions Land Use*

The existing land use conditions were based on 2005 North Central Texas Council of Governments (NCTCOG) existing land use data provided in shapefile format. The land use shapefile was updated to reflect current development conditions shown on the City of Arlington aerial photography (2011). The existing conditions land use for the Rush Creek watershed is illustrated in Figure A-3, Existing Land Use Map.

2.1.4.2 *Ultimate Conditions Land Use*

Ultimate conditions land use data was not available for the project area. Based on discussion with the project team and the City of Arlington, an impervious area value of 75 percent was applied to all vacant and extremely low density residential land use to estimate the ultimate build out conditions of the watershed. All other land use remained consistent with the existing land use conditions.

2.1.5 Sub-basins

Sub-basin delineations were generated in ESRI's ArcGIS Version 10.0 based on the Texas Natural Resource Information Systems (TNRIS) 2009 Light Detection And Ranging (LiDAR) Terrain Data. Digital storm sewer lines supplied by the City of Arlington, supported by current aerial photography, aided in the sub-basin delineation process. See Figure A-4, Sub-basin Workmap, for sub-basin delineations.

2.1.5.1 *Topographic Data Acquisition and Evaluation*

Topographic data covering the project extent was obtained from the TNRIS 2009 LiDAR acquisition project. This data was available as LiDAR point clouds in the American Society of Photogrammetry and Remote Sensing (ASPRS) common LiDAR Data Exchange Format (LAS 1.1) with 1.0 meter post spacing.

Data was acquired in March 2009 by Fugro Earth Data, Inc. The LiDAR QA Report provided by Dewberry is included in Appendix E of this report. This data was acquired and processed to meet 0.185 meter Root Mean Square Error (RMSEz) vertical accuracy and was tested to have an RMSEz of 0.040 meters using National Standards for Spatial Data Accuracy (NSSDA) and FEMA methodology (see Table 1 of the LiDAR QA Report).

2.1.5.2 *Terrain Processing*

The LiDAR data was processed with Esri's ArcGIS software. The LiDAR data was acquired in Universal Transverse Mercator (UTM), North American Datum of 1983, (NAD83 Meters) with heights in the 1988 North American Vertical Datum (NAVD88 Meters). Each LiDAR tile was projected to Stateplane NAD83, Texas North Central zone with horizontal units of feet and the vertical units were also converted from meters to feet. The projected LiDAR point clouds were then processed in ArcGIS and the ground points were placed into a multipoint feature class within a file geodatabase. The multipoint feature class was then used to generate a seamless terrain dataset within the same file geodatabase. From the terrain dataset, a ground surface Digital Elevation Model (DEM) was generated to support basin delineations and hydrologic modeling.

2.2 Approach and Methodology

2.2.1 Methodology

Hydrologic analyses have been conducted for the Rush Creek watershed as part of the comprehensive watershed study and model updates. The entire watershed has been analyzed for the following hydrologic scenarios:

- *Existing Land Use Conditions*
- *Ultimate Land Use Conditions*

Significant rainfall events considered for the hydrologic models were the 2-, 5-, 10-, 25-, 50-, 100- and 500-year frequency floods. Detailed watershed delineations, existing and ultimate land use determinations, and the hydrologic soil coverage were used to develop HEC-HMS hydrologic computer models for the respective tributaries' watershed. The Rush Creek Watershed Technical Standards (May 21, 2012) along with Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55) Second Edition were used as guidelines for the new 2012 hydrologic analyses.

2.2.1.1 *Rainfall*

Rainfall data was obtained from TP-40 (Hershfield, 1961) for the 24-hour storm events corresponding to the 50, 20, 10, 4, 2, 1 and 0.2%-annual-chance (2-, 5-, 10-, 25-, 50-, 100- and 500-year) storm events.

The rainfall data is summarized below in Table 2.3

Table 2.3 - Rainfall Data (inches)

Recurrence Interval (Percent Annual Chance)	Storm Duration							
	5 Min	15 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
50%	0.40	1.02	1.77	2.15	2.37	2.86	3.43	3.95
20%	0.54	1.38	2.39	2.90	3.19	3.86	4.63	5.33
10%	0.64	1.64	2.84	3.44	3.79	4.58	5.49	6.32
4%	0.76	1.94	3.35	4.06	4.48	5.41	6.49	7.47
2%	0.86	2.19	3.79	4.59	5.06	6.12	7.34	8.45
1%	0.96	2.46	4.25	5.15	5.67	6.86	8.23	9.47
0.2%	1.16	2.98	5.15	6.24	6.87	8.31	9.96	11.47

2.2.1.2 *Rainfall Losses*

The loss rate of rainfall, caused by evaporation, interception, depression, storage, and infiltration, is typically evaluated and subtracted from the rainfall to determine rainfall excess for each time increment of a storm. For this study, the SCS Curve Number Method, developed by the Natural Resources Conservation Service (NRCS), was used to develop flood hydrographs based on land use, soil classification, and antecedent moisture conditions. Baseline Curve Numbers were obtained from TR-55, Table 2.2c, for pasture, grassland, or range for AMC-II, average soil moisture conditions. Curve Numbers (CN) were computed

based on a composite percentage of soil types within each sub-basin. Group A soils were defined as having a CN of 39, Group B soils were defined as having CN as 61, Group C soils were defined as having CN as 74, and Group D soils were defined as having CN as 80.

The initial abstraction (I.A.) for all watersheds was computed for AMC-II, average soil conditions using the following equation from TR-55:

$$IA = 0.2\left(\frac{1000}{CN} - 10\right)$$

2.2.1.3 Sub-basin Response

The SCS Dimensionless Unit Hydrograph method was used and SCS lag times were computed for each sub-basin to generate runoff hydrographs. A different time of concentration was computed for existing and ultimate conditions. Both were based on the NRCS TR-55 methodology for overland (sheet) flow, shallow concentrated flow, and channel flow. Overland flow length was limited to a maximum of 100 feet for unpaved surfaces and 50 feet for paved surfaces.

Travel times for channel flow were based on velocities from the HEC-RAS routing models, where available. Channel flows for non-routed reaches were estimated based on Manning's equation, assuming a bankfull depth that was selected based on the channel geometry and the elevation corresponding to the natural channel banks. For improved channels, it was often difficult to estimate the bankfull depth from the channel geometry and some consideration was given to the expected bankfull (2-year) discharges and anticipated velocities associated with bankfull flow. Storm drain velocities were assumed to be 6 feet per second for the purposes of this study.

Based on the recommendation of the project team, the stream channels being modeled using unsteady HEC-RAS were removed from the time of concentration calculations. A memorandum, entitled “Flow paths for estimating Basin Lag Time”, supporting this decision is provided in Appendix D.

The time of concentration is the summation of these phases, where:

$$T_c = t_{sheet} + t_{shallow\ concentrated} + t_{storm\ drain} + t_{channel}$$

Lag times were computed using the following equation:

$$T_p = 0.6 * T_c$$

The Ultimate Conditions times of concentration were estimated by changing overland flow located in vacant land use to be a maximum of 50 feet and paved. All shallow concentrated flow was changed to paved for ultimate conditions. These two changes were intended to estimate the impacts of future development to times of concentration.

Studies have shown that the square root of area can provide a good prediction of time of concentration. Graphs showing the comparison of the estimated times of concentration to the sub-basin area are included in Appendix B of this report.

2.2.1.4 *Routing*

Channel reaches for which there will be no new unsteady hydraulic study were routed in the hydrologic model. The Modified Puls method was used for open channel reaches. HEC-RAS v4.1 was used to develop elevation-storage-discharge relationships for these reaches to route flows in the HEC-HMS model. The HEC-RAS models were generated using cross sections based on the TNRIS LiDAR data. The subreaches (routing step) calculations are provided in Appendix B of this report.

The Muskingum-Cunge method was used to route flows through storm drain reaches outside of the new unsteady hydraulic study reaches. An equivalent pipe diameter size was calculated for most reaches based on a weighted average of the pipe size and length through the reach. The equivalent pipe diameter was input in the HEC-HMS models and a note was added in the description of these routing reaches to specify when this method was applied.

2.2.1.5 *External Input Hydrographs*

There were no external input hydrographs entered into the Rush Creek Hydrology models.

2.2.1.6 *Reservoir Storage*

Two ponds were modeled as reservoirs in HEC-HMS for the Rush Creek watershed. The first is near the intersection of Briarwood Blvd and Winewood Ln in the RC-1 sub-watershed. The second is west of Green Oaks Blvd near the intersection of Fireside Drive in the Lower Rush sub-watershed. The elevation-area-discharge method was used to model these reservoirs in HEC-HMS. Record drawings received from the City of Arlington were utilized to develop elevation-discharge ratings for the outlet structures of these reservoirs. The TNRIS LiDAR data was used to develop the elevation-area tables for each reservoir.

2.2.2 Stream Gages

There are no stream gages in the Rush Creek watershed.

2.2.3 Calibration

Rainfall data was obtained from the National Weather Service (NWS) for the following historical storms:

- *January 24-25, 2012*
- *September 7-9, 2010 (Tropical Storm Hermine)*

Multisensory precipitation estimator (MPE) rainfall data was used to generate the historical rainfall data. This rainfall data is a mosaic of radar, satellite imagery, and rainfall gauge data that is generated on an hourly time-step by the National Weather Service (NWS). The data is available on a 4km x 4km grid (HRAP grid) and provides high-quality temporal and spatial distribution of the rainfall during each storm event. The gridded rainfall product was distributed to the sub-basins by calculating a weighted average for each grid cell and corresponding rainfall depth within each sub-basin. Figure 2.1 below shows the precipitation map of total rainfall from Tropical Storm Hermine courtesy of the NWS.

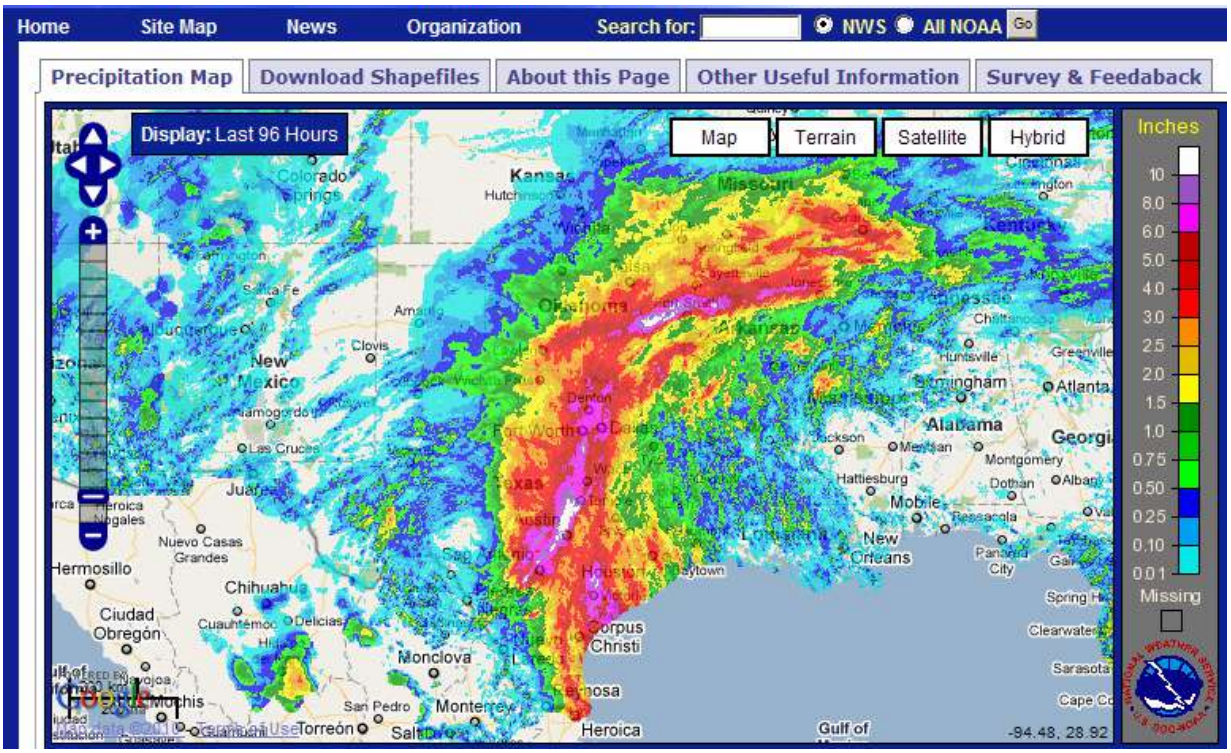


Figure 2-1. Tropical Storm Hermine Total Rainfall

In the absence of stream gage data and watershed wide routing data, the HEC-HMS models have not been calibrated to either storm event at this point. It is anticipated highwater marks documented during these storm events will be used to confirm study results following the completion of the unsteady hydraulic modeling.

2.3 Discharge Comparison

2.3.1 Computed Discharges

Computed discharges will be compared to the effective discharges following the development of the unsteady hydraulic models for the Rush Creek watershed. Previous studies with comparable hydrologic conditions were used to validate the results of the hydrologic models. Discharge comparison graphs are included in Appendix B of this report. The comparison is only conceptually applicable since travel time through unsteady modeled streams was omitted for many of the Rush Creek sub-basins resulting in calculated peak discharges that were higher compared to other sub-basins of similar size. It is anticipated that these discharges will compare favorably after the unsteady routing is utilized to route the hydrographs through the studied reaches. Refer to Appendix D for correspondence documenting technical support for the time of concentration methodology.

2.3.2 Effective Discharges

The current FEMA effective discharges from the September 25, 2009 FEMA Flood Insurance Study (FIS) for Tarrant County are listed in Table 2.4 below.

Table 2.4 - FEMA Effective Discharges

Flooding Source and Approximate Location	Basin Area (sq. mi.)	Peak Discharge (cfs)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
KEE BRANCH					
At confluence with Rush Creek	7.23	6,810	9,490	10,920	13,900
Downstream of confluence of Stream KB-1	6.96	6,210	8,720	9,970	12,470
At Interstate Route 20	4.44	4,360	6,400	7,300	9,070
Downstream of confluence of Tributary K-2	3.55	3,680	4,660	6,420	7,880
Upstream of confluence of Tributary K-2	2.85	2,980	4,400	5,020	6,190
Downstream of confluence of Tributary K-3	1.4	1,340	1,880	2,140	2,650
At U. S. Route 287	1.09	1,030	1,450	1,640	2,020
At Kennenda1e Sublett Road	0.89	1,230	1,650	1,840	2,230
STREAM KB-1					
At confluence with Kee Branch	1.52	2,500	3,310	3,670	4,440
At Oak Springs Road	1.26	2,160	2,890	3,120	3,750
PANTEGO BRANCH					
At confluence with Rush Creek	1.68	2,460	3,320	3,710	4,490
At West Park Row	1.43	2,190	2,940	3,310	4,030
At Smith-Barry Road	0.94	1,550	2,070	2,290	2,840
RUSH CREEK					
At confluence of Pantego Branch	29.01	3,670	4,233	4,704	5,799
At State Route 303	28.77	15,400	23,280	27,060	34,770
At Woodland Park Boulevard	27.59	15,240	22,990	26,670	34,170
At Arkansas Lane	27.17	15,540	23,460	27,180	34,770
Below confluence of Kee Branch	25.24	14,680	21,904	25,280	32,290
At confluence of Kee Branch	18.01	9,920	14,550	16,850	21,650
Below confluence of Tributary R-8	17.83	9,980	14,690	16,950	21,730
Above Kee Branch	17.52	9,600	15,000	17,600	25,000
At confluence of Tributary R-8	16.57	9,710	14,150	16,350	20,900
Below confluence of Tributary R-7	16.3	9,770	14,140	16,340	20,800
At confluence of Tributary R-7	15.16	9,350	13,590	15,700	19,980

Table 2.4 - FEMA Effective Discharges

Flooding Source and Approximate Location	Basin Area (sq. mi.)	Peak Discharge (cfs)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Downstream of confluence of Tributary R-5 and R-6	14.74	9,400	13,670	15,780	20,010
At Interstate Route 20	13.07	8,860	12,820	14,770	18,680
Downstream of confluence of Tributary R-4	12.78	9,000	13,170	15,190	19,130
At confluence of Tributary R-4	11.51	8,380	12,250	14,010	17,510
At Green Oaks Boulevard	10.82	8,350	12,179	13,890	17,260
Downstream of confluence of Sublett Creek	9.51	8,210	11,620	13,179	16,340
At confluence of Sublett Creek	4.22	4,000	5,560	6,270	7,740
Downstream of confluence of Tributary R-11	3.04	3,520	4,880	5,490	6,820
At confluence of Tributary R-11	2.54	2,990	4,120	4,610	5,690
Below confluence with Tributary R-10	1.9	2,520	3,440	3,850	4,720
At confluence of Tributary R-I	1	1,290	1,770	1,980	2,450
FOREST PARK TRIBUTARY OF RUSH CREEK					
At confluence with Rush Creek	0.18	**	**	610	**
NORTHEAST TRIBUTARY OF RUSH CREEK					
At confluence with Rush Creek	0.11	**	**	361	**
RUSH CREEK RELIEF CHANNEL					
Upstream of convergence with Village Creek	**	15,728	25,147	30,374	40,972
STREAM RC-1					
At confluence with Rush Creek	3.56	4,810	6,220	6,850	8,130
Immediately upstream of Union Pacific Railroad	1.95	2,640	3,310	3,630	4,280
STREAM RC-1(A)					
At confluence with Stream RC-I	1.36	2,210	2,870	3,180	3,810
At headwaters	0.93	1,710	2,240	2,480	3,010
STREAM RC-2					
At confluence with Rush Creek	1.18	1,970	2,520	2,790	3,370
At headwaters	0.64	1,350	1,750	1,930	2,410
RYAN'S BRANCH					

Table 2.4 - FEMA Effective Discharges					
Flooding Source and Approximate Location	Basin Area (sq. mi.)	Peak Discharge (cfs)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
At confluence with Rush Creek	1.29	2,000	2,750	3,100	3,900
At Roosevelt Drive	0.99	1,850	2,500	2,800	3,550
SUBLETT CREEK					
At confluence with Rush Creek	5.29	4,620	6,630	7,500	9,100
At Calendar Road	4.57	4,520	6,310	7,060	8,320
SUBLETT CREEK					
Downstream of U.S. Route 287	3.66	3,790	5,230	5,790	6,620
At U.S. Route 287	2.99	3,520	4,790	5,170	5,790
Downstream of Tributary 1	1.83	2,510	3,400	3,800	4,610
TWIN SPRINGS DRAW					
At confluence with Rush Creek	1.17	1,850	2,550	2,850	3,550

3. Exceptions

3. Exceptions

3.1 Explanation of Deviations from the Standard Procedures

This section documents exceptions to the FEMA study standards, FEMA Guidelines and Specifications, or to the procedures described above.

3.1.1 Data Capture Standards (DCS) Submittal

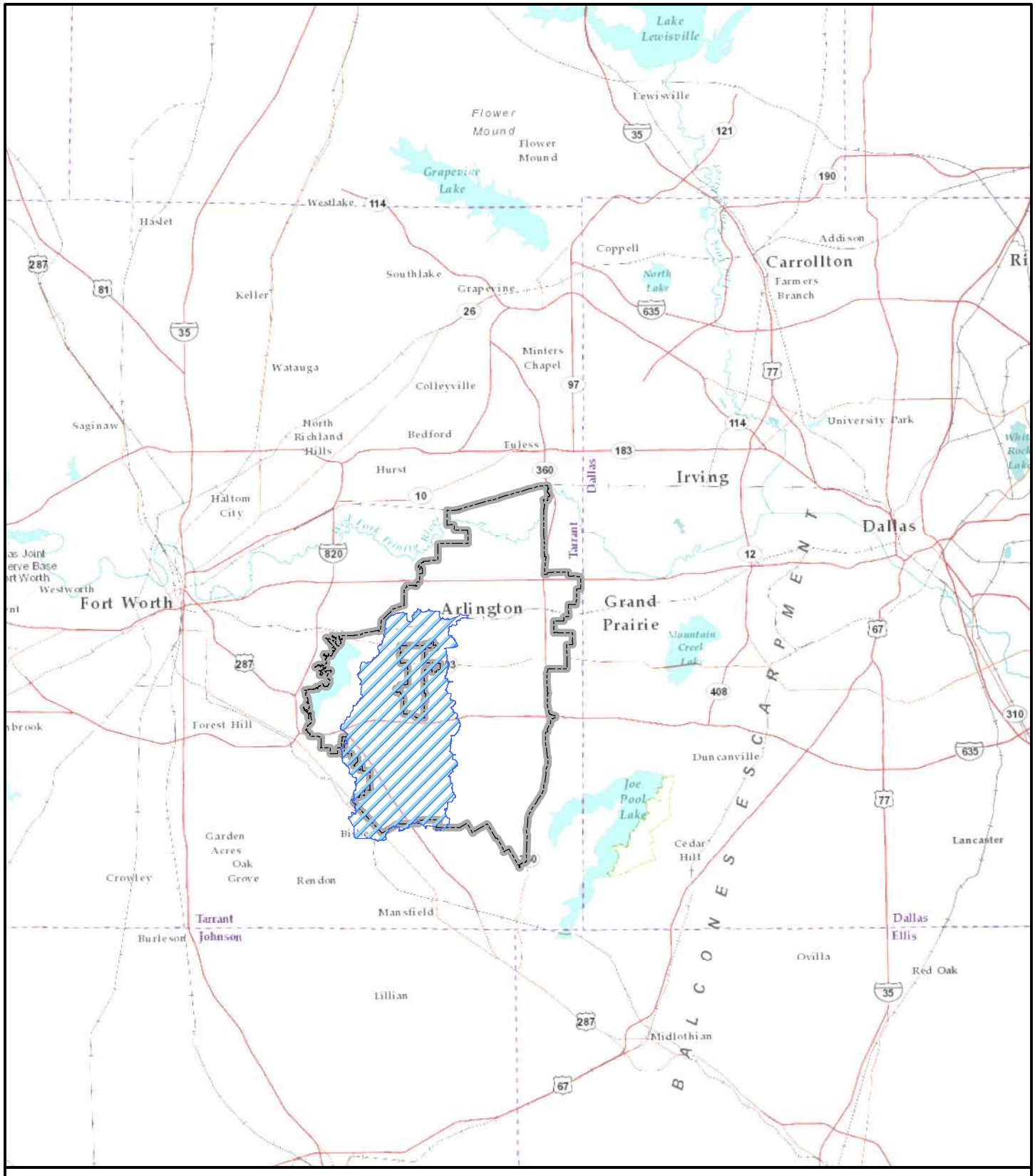
The data submitted for this study follows the FEMA Appendix M Data Capture Standards dated March 2009. All required spatial files and tables, as listed in the Mapping Information Index in Appendix A, will be submitted with this report with the exception of those listed in Table 3.1 below.

Table 3.1 DCS Omitted Digital Files

DCS Feature or Table	Exception
L_Summary_Elevations	This table was not populated because there are no summary elevations associated with any lakes in this watershed.
L_Summary_Discharges	This table was not populated because the data is not yet available. Data will be available in final submittal when unsteady hydraulic models are complete.
S_Nodes	This layer was not populated because routing for unsteady modeling is still in progress and will be populated when finalized.

Appendix A
Figures

Figure A-1 - Vicinity Map



Legend

Rush Creek Watershed

City of Arlington

N W E S

0 15,000 30,000 60,000 Feet

1 inch = 30,000 feet

Figure A-1
Vicinity Map

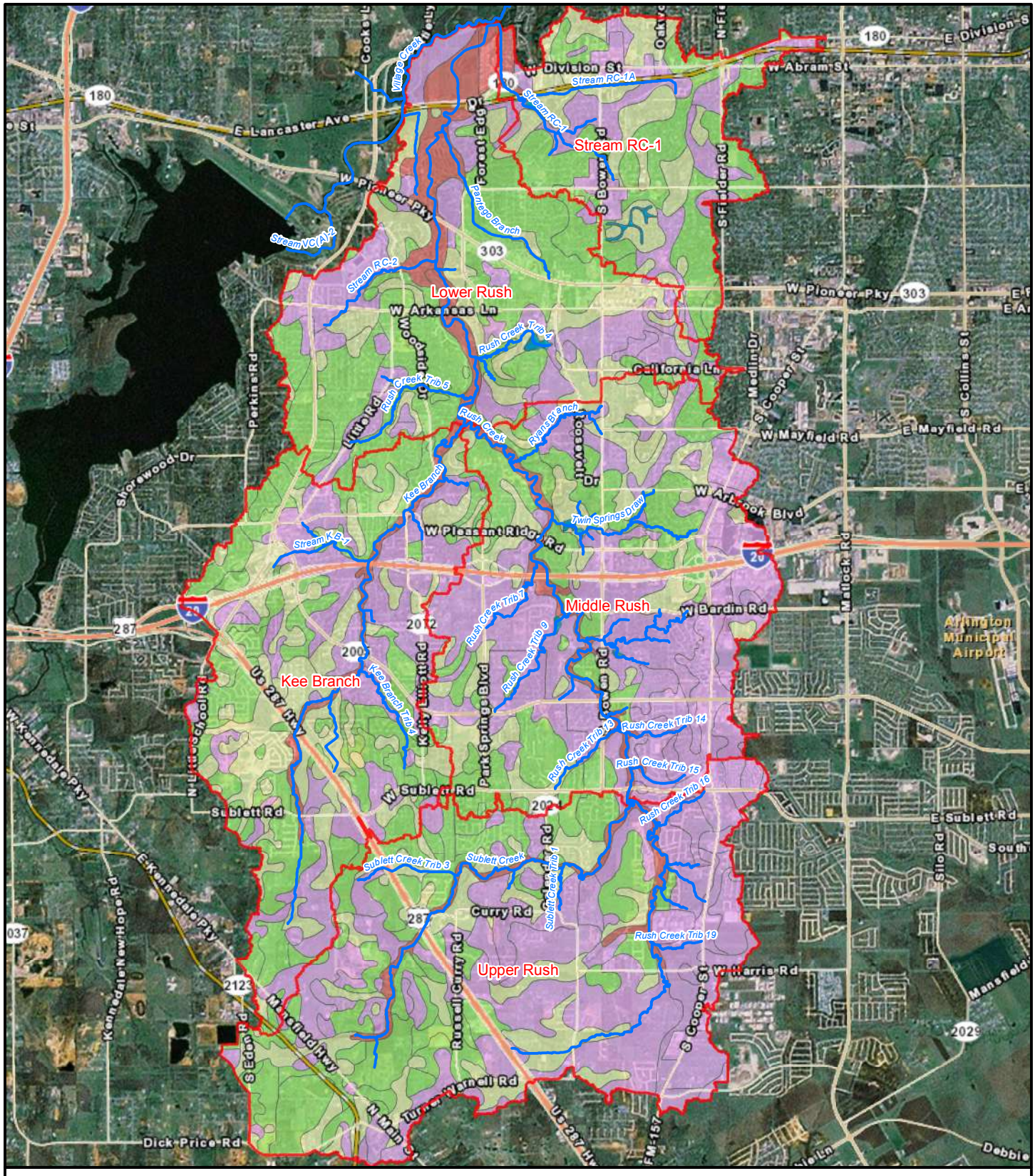
Rush Creek Watershed Study
City of Arlington, Texas

RUSH CREEK City of Arlington Watershed Study

Path: N:\28000s\28480\Report\Figures\Figure A-1 - Vicinity_Map.mxd

Date: 5/31/2012

Figure A-2 - Soils Map



Legend

- Stream Centerline
- Sub-Watershed

HSG

- A
- B
- C
- D
- Water

N W E S

0 3,000 6,000 12,000 Feet

1 inch = 6,000 feet

Figure A-2
Soils Map

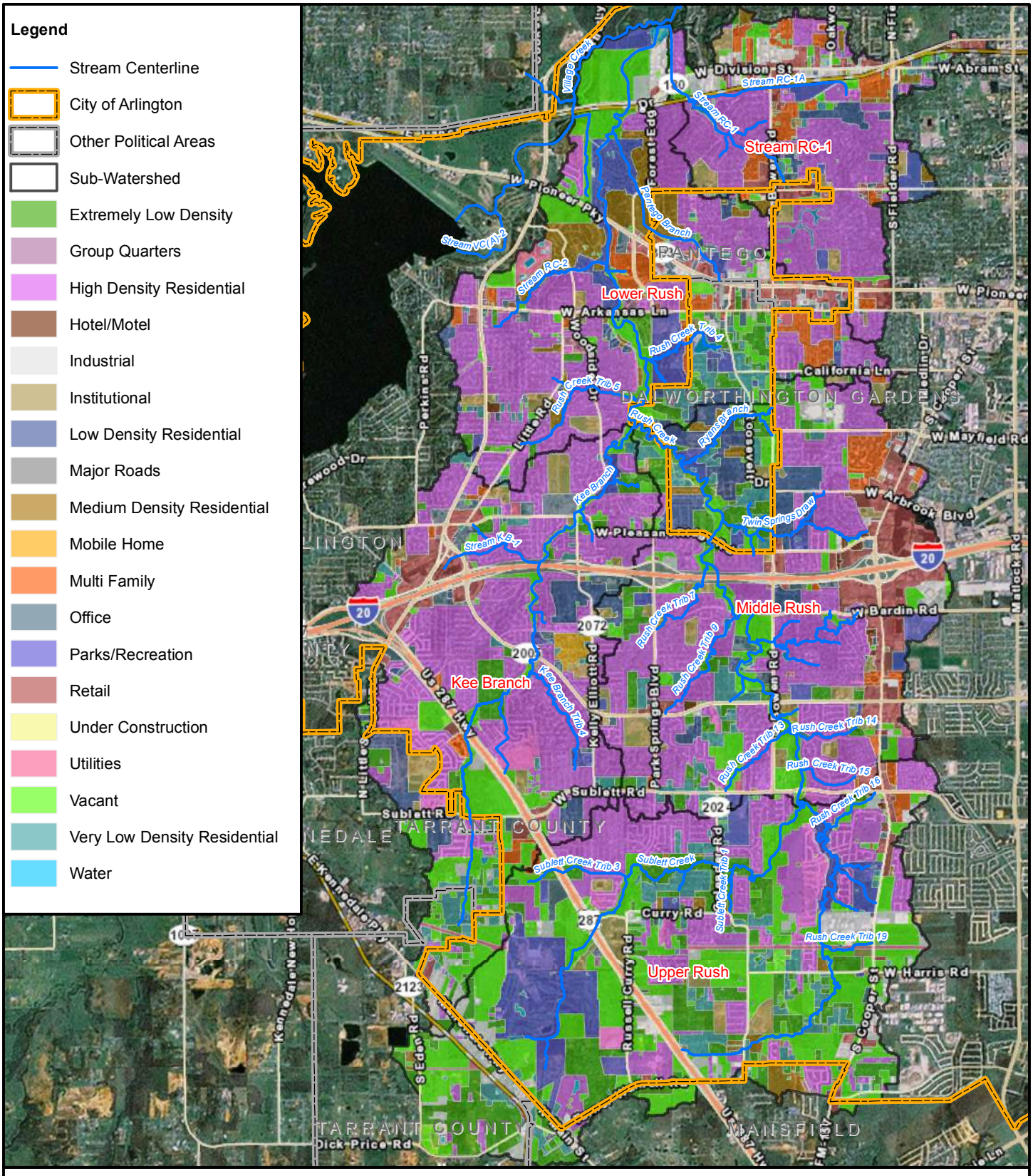
Rush Creek Watershed Study
City of Arlington, Texas

RUSH CREEK City of Arlington Watershed Study

Path: N:\28000s\28480\Report\Figures\Figure A-2 - Hydrologic_Soils_Map.mxd

Date: 6/1/2012

Figure A-3 - Existing Land Use Map



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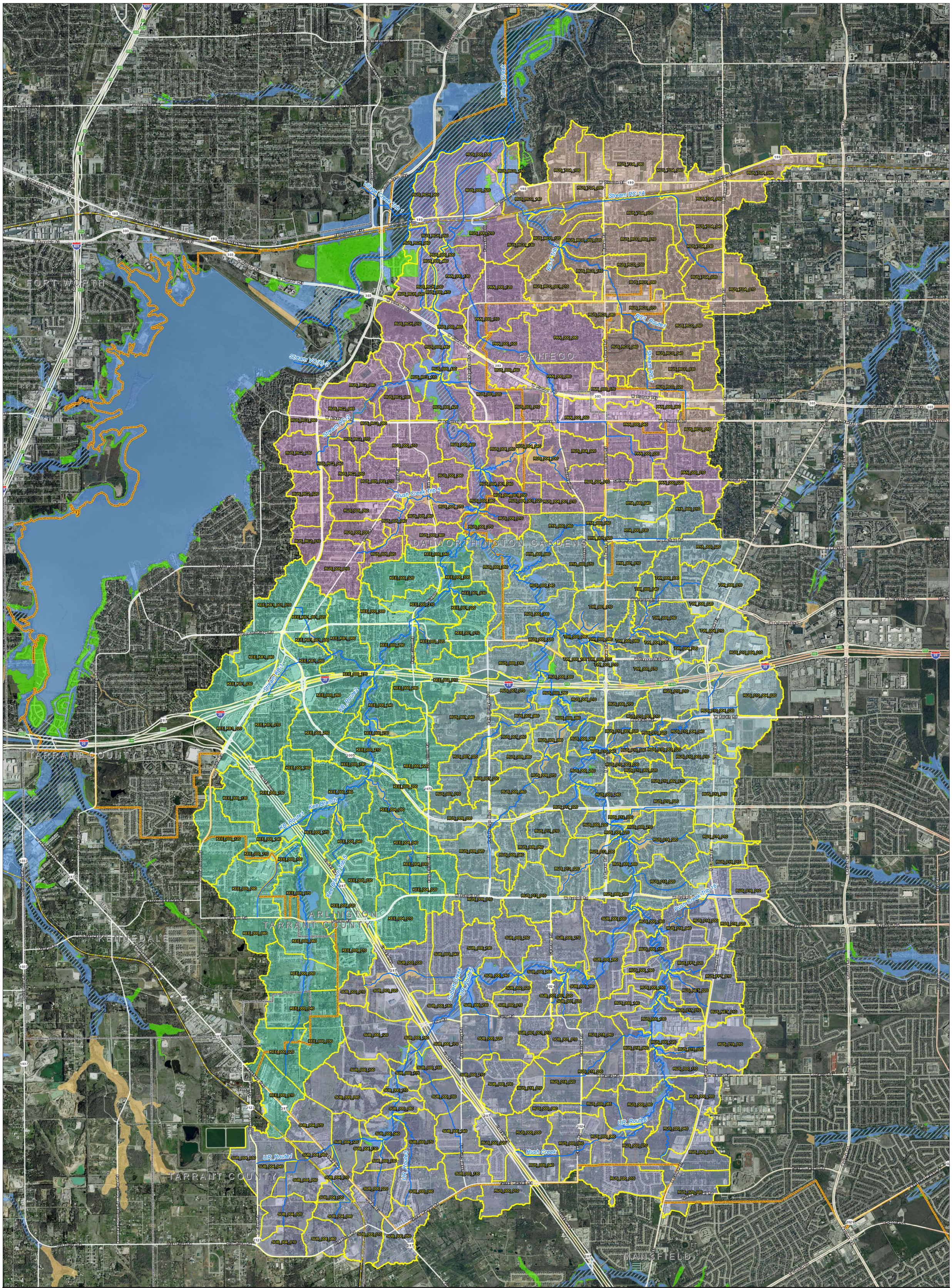
Date: 6/1/2012



Legend

- City of Arlington
- Other Political Areas
- Stream Centerline
- SUBWTRSHD

FLOOD ZONE

- A
- AE
- FLOODWAY
- X500

SUBWTRSHD

- KB
- LR
- MR
- RC1
- UR

N W E S

0 2,000 4,000 8,000 Feet

Figure A-4
Sub-basin Workmap

Rush Creek Watershed Study
City of Arlington, Texas

RUSH CREEK
City of Arlington Watershed Study

Appendix B
Hydrologic Data

Appendix B-1
Sub-basin Summary

Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
KEE_000_010	KB	105.24	0.164	0	0%	59	56%	14	13%	32	30%	0	0%	68	51	68	18	26	25	-1
KEE_000_020	KB	90.75	0.142	0	0%	58	64%	3	4%	30	33%	0	0%	68	26	66	39	21	20	-1
KEE_000_030	KB	83.06	0.130	0	0%	11	14%	17	21%	54	65%	0	0%	76	20	67	47	12	12	0
KEE_000_040	KB	101.65	0.159	0	0%	27	27%	18	18%	56	56%	0	0%	74	18	59	40	8	3	-5
KEE_000_050	KB	114.66	0.179	0	0%	67	58%	30	26%	18	16%	0	0%	67	22	64	42	10	8	-2
KEE_000_060	KB	93.74	0.147	6	6%	51	55%	22	23%	15	16%	0	0%	66	41	51	10	17	15	-2
KEE_000_070	KB	138.70	0.217	23	17%	33	24%	57	41%	24	18%	0	0%	66	19	69	51	17	14	-3
KEE_000_080	KB	52.05	0.081	0	0%	23	44%	15	30%	14	26%	0	0%	70	18	63	46	18	17	-1
KEE_000_090	KB	137.00	0.214	0	0%	49	35%	73	54%	15	11%	0	0%	70	45	45	0	13	13	0
KEE_000_100	KB	22.51	0.035	3	16%	0	0%	19	84%	0	0%	0	0%	69	56	56	0	7	7	0
KEE_000_110	KB	30.05	0.047	1	3%	3	10%	26	85%	0	2%	0	0%	72	51	51	0	13	11	-2
KEE_000_120	KB	141.48	0.221	0	0%	60	43%	41	29%	40	29%	0	0%	70	36	54	18	13	13	0
KEE_000_130	KB	80.53	0.126	0	0%	65	81%	14	18%	1	1%	0	0%	64	47	52	4	11	10	-1
KEE_000_140	KB	24.43	0.038	0	0%	6	25%	18	75%	0	0%	0	0%	71	52	62	9	13	13	0
KEE_000_150	KB	123.70	0.193	0	0%	41	33%	73	59%	10	8%	0	0%	70	39	57	18	10	10	0
KEE_000_160	KB	85.00	0.133	1	1%	14	16%	65	76%	6	7%	0	0%	72	47	51	4	12	12	0
KEE_000_170	KB	71.26	0.111	13	19%	11	15%	41	58%	6	9%	0	0%	66	35	60	26	13	13	0
KEE_000_180	KB	111.92	0.175	12	11%	7	6%	61	54%	33	29%	0	0%	71	33	61	28	17	16	-1
KEE_000_190	KB	35.25	0.055	3	10%	0	0%	6	18%	25	72%	0	0%	75	38	57	19	8	8	0
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KEE_000_290	KB	100.62	0.157	16	16%	39	39%	8	8%	37	37%	0	0%	66	40	53	13	14	13	-1
KEE_000_300	KB	52.46	0.082	1	3%	37	70%	14	27%	0	0%	0	0%	64	69	69	1	10	10	0
KEE_000_310	KB	80.84	0.126	16	20%	24	29%	25	31%	16	19%	0	0%	64	47	53	6	9	9	0
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KEE_000_340	KB	61.30	0.096	15	24%	34	56%	12	20%	0	0%	0	0%	58	36	54	18	8	8	0
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KEE_001_020	KB	13.08	0.020	0	0%	0	0%	4	28%	9	72%	0	0%	78	43	55	12	8	8	0
KEE_001_030	KB	28.66	0.045	0	0%	11	40%	1	3%	16	57%	0	0%	72	17	73	57	7	7	0
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KEE_004_010	KB	116.35	0.182	0	0%	37	32%	41	35%	38	33%	0	0%	72	42	52	10	13	13	0
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KEE_005_020	KB	64.52	0.101	0	0%	1	2%	36	56%	27	42%	0	0%	76	29	63	35	8	8	0

Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
KEE_005_030	KB	85.63	0.134	0	0%	48	55%	28	32%	10	12%	0	0%	68	40	56	16	11	10	-1
KEE_005_040	KB	62.15	0.097	0	1%	23	38%	38	62%	0	0%	0	0%	69	47	52	4	4	4	0
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KEE_KB1_020	KB	103.66	0.162	0	0%	42	41%	38	37%	23	23%	0	0%	70	62	63	1	14	10	-4
KEE_KB1_030	KB	115.86	0.181	0	0%	70	60%	46	40%	0	0%	0	0%	66	56	66	10	13	13	0
KEE_KB1_040	KB	98.82	0.154	0	0%	54	54%	32	33%	13	13%	0	0%	68	67	67	0	8	8	0
KEE_KB1_050	KB	57.20	0.089	0	0%	5	9%	3	5%	49	86%	0	0%	78	53	61	8	5	5	0
KEE_KB1_060	KB	128.10	0.200	0	0%	33	26%	25	19%	70	55%	0	0%	74	46	51	5	9	9	0
PAN_000_010	LR	114.57	0.179	0	0%	39	34%	23	20%	52	46%	0	0%	72	50	51	1	15	15	0
PAN_000_020	LR	34.76	0.054	0	0%	15	42%	11	31%	9	27%	0	0%	70	45	55	10	13	12	-1
PAN_000_030	LR	68.21	0.107	0	0%	8	12%	1	2%	59	86%	0	0%	78	59	61	2	12	12	0
PAN_000_040	LR	89.71	0.140	0	0%	0	0%	46	51%	44	49%	0	0%	77	66	69	3	13	13	0
PAN_000_050	LR	94.42	0.148	0	0%	54	58%	35	37%	5	6%	0	0%	67	61	80	19	11	11	0
PAN_000_060	LR	55.37	0.087	0	0%	10	18%	30	54%	16	28%	0	0%	73	72	74	2	14	14	0
PAN_000_070	LR	57.09	0.089	0	0%	42	74%	12	21%	3	5%	0	0%	65	63	67	4	11	11	0
PAN_000_080	LR	80.19	0.125	0	0%	75	94%	5	6%	0	0%	0	0%	62	41	50	9	12	12	0
PAN_000_090	LR	163.11	0.255	0	0%	146	89%	8	5%	9	6%	0	0%	63	46	51	4	14	14	0
PAN_000_100	LR	79.18	0.124	0	0%	74	93%	5	7%	0	0%	0	0%	62	46	50	5	15	15	0
PAN_000_110	LR	81.57	0.127	0	0%	79	97%	0	0%	3	3%	0	0%	62	47	48	1	12	12	0
PAN_000_120	LR	90.84	0.142	1	1%	76	84%	7	7%	7	8%	0	0%	63	47	47	0	11	11	0
PAN_000_130	LR	107.77	0.168	59	55%	5	5%	0	0%	44	41%	0	0%	57	19	20	2	18	18	0
RUS_000_360	LR	51.18	0.080	1	2%	32	62%	6	12%	12	23%	0	0%	67	50	50	0	8	8	0
RUS_000_370	LR	39.84	0.062	15	38%	13	32%	4	11%	8	19%	0	0%	58	11	67	56	9	8	-1
RUS_000_380	LR	36.94	0.058	16	44%	12	33%	2	4%	7	19%	0	0%	55	20	60	40	5	5	0
RUS_000_390	LR	46.87	0.073	0	1%	47	99%	0	0%	0	0%	0	0%	61	49	50	1	11	11	0
RUS_000_400	LR	82.33	0.129	37	45%	27	33%	18	22%	0	0%	0	0%	54	18	65	47	3	3	0
RUS_000_410	LR	131.27	0.205	0	0%	113	86%	10	7%	8	6%	0	0%	63	42	54	12	13	13	0
RUS_000_420	LR	99.02	0.155	41	41%	23	24%	35	35%	0	0%	0	0%	56	30	40	11	9	9	0
RUS_000_430	LR	30.15	0.047	16	52%	2	8%	12	38%	1	2%	0	0%	55	45	49	3	4	4	0
RUS_000_440	LR	27.73	0.043	17	61%	0	0%	11	38%	0	1%	0	0%	53	33	33	0	5	5	0
RUS_000_450	LR	77.92	0.122	6	8%	57	73%	0	0%	15	20%	0	0%	63	70	73	3	21	14	-7
RUS_000_460	LR	36.80	0.058	8	21%	3	9%	0	0%	26	69%	0	0%	70	44	45	1	8	8	0
RUS_000_470	LR	4.34	0.007	4	100%	0	0%	0	0%	0	0%	0	0%	39	48	48	0	6	6	0
RUS_000_480	LR	1.31	0.002	1	100%	0	0%	0	0%	0	0%	0	0%	39	66	66	0	6	6	0
RUS_000_500	LR	2.62	0.004	3	100%	0	0%	0	0%	0	0%	0	0%	39	32	53	22	6	6	0
RUS_000_510	LR	134.12	0.210	38	29%	28	21%	28	21%	39	29%	0	0%	63	42	56	15	11	11	0
RUS_000_520	LR	97.04	0.152	93	96%	2	2%	0	0%	2	2%	0	0%	40	38	73	35	8	8	0
RUS_000_530	LR	110.22	0.172	66	60%	0	0%	0	0%	44	40%	0	0%	55	21	55	34	41	35	-6
RUS_003_010	LR	51.93	0.081	0	0%	45	86%	0	0%	7	14%	0	0%	64	47	65	18	6	6	0
RUS_003_020	LR	98.45	0.154	1	1%	66	67%	24	24%	8	8%	0	0%	65	57	61	3	8	8	0
RUS_004_001_010	LR	42.36	0.066	0	0%	2	5%	8	18%	33	77%	0	0%	78	31	46	15	15	15	0
RUS_004_001_020	LR	25.87	0.040	0	0%	12	48%	4	16%	9	36%	0	0%	70	19	58	38	9	8	-1
RUS_004_001_030	LR	28.87	0.045	0	0%	12	41%	17	59%	0	0%	0	0%	69	17	22	5	5	5	0

Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
RUS_004_001_040	LR	14.64	0.023	0	0%	8	53%	7	46%	0	0%	0	0%	67	7	10	4	5	4	-1
RUS_004_010	LR	111.14	0.174	0	0%	4	3%	68	61%	40	36%	0	0%	76	30	55	24	15	15	0
RUS_004_020	LR	56.31	0.088	0	0%	0	0%	9	16%	47	84%	0	0%	79	20	69	49	20	18	-2
RUS_004_030	LR	74.01	0.116	0	0%	17	23%	15	21%	30	40%	11	15%	77	40	54	14	12	7	-5
RUS_004_040	LR	37.24	0.058	0	0%	15	42%	16	43%	6	16%	0	0%	70	35	46	11	14	13	-1
RUS_004_050	LR	82.61	0.129	0	0%	37	45%	23	28%	21	26%	1	1%	70	11	18	7	9	5	-4
RUS_005_002_010	LR	87.86	0.137	0	0%	58	66%	5	5%	26	29%	0	0%	67	49	49	0	9	9	0
RUS_005_010	LR	108.52	0.170	0	0%	74	68%	1	1%	34	32%	0	0%	67	45	53	8	10	10	0
RUS_005_020	LR	41.86	0.065	0	0%	31	74%	4	9%	7	17%	0	0%	65	46	53	7	6	6	0
RUS_005_030	LR	54.13	0.085	0	0%	27	50%	0	0%	27	50%	0	0%	70	44	50	6	13	13	0
RUS_005_040	LR	34.25	0.054	0	0%	19	55%	5	14%	11	31%	0	0%	69	46	47	1	8	8	0
RUS_005_050	LR	49.69	0.078	0	0%	39	78%	1	1%	10	21%	0	0%	65	49	52	3	14	14	0
RUS_005_060	LR	57.28	0.090	0	0%	42	74%	7	13%	8	13%	0	0%	65	50	50	0	12	12	0
RUS_005_070	LR	56.21	0.088	4	6%	53	94%	0	0%	0	0%	0	0%	60	44	53	9	3	3	0
RUS_006_010	LR	39.55	0.062	0	1%	5	14%	8	21%	25	64%	0	0%	76	21	58	37	7	6	-1
RUS_RC2_010	LR	70.41	0.110	0	0%	64	92%	6	8%	0	0%	0	0%	62	44	51	6	14	13	-1
RUS_RC2_020	LR	68.02	0.106	0	0%	61	90%	7	10%	0	0%	0	0%	62	47	49	2	10	10	0
RUS_RC2_030	LR	65.28	0.102	0	0%	46	71%	2	4%	16	25%	0	0%	66	46	50	4	12	12	0
RUS_RC2_040	LR	35.40	0.055	0	0%	8	23%	6	16%	22	61%	0	0%	75	50	51	1	9	9	0
RUS_RC2_050	LR	58.41	0.091	0	0%	40	69%	8	14%	10	18%	0	0%	66	50	50	0	13	13	0
RUS_RC2_060	LR	74.27	0.116	0	0%	4	6%	9	12%	61	82%	0	0%	78	54	59	5	8	8	0
RUS_RC2_070	LR	33.18	0.052	0	0%	0	0%	24	72%	2	7%	0	0%	75	58	59	1	6	6	0
RUS_RC2_080	LR	30.18	0.047	0	0%	2	6%	15	49%	14	45%	0	0%	76	48	54	6	7	6	-1
RUS_RC2_085	LR	35.52	0.056	0	0%	0	0%	0	0%	43	120%	0	0%	80	58	61	3	6	6	0
RUS_RC2_090	LR	97.48	0.152	0	0%	11	11%	7	7%	80	82%	0	0%	77	44	61	17	14	14	0
RUS_RC2_100	LR	97.10	0.152	2	2%	38	39%	28	29%	29	30%	0	0%	70	47	47	0	7	7	0
RUS_RC2_110	LR	45.47	0.071	24	52%	11	23%	11	25%	0	0%	0	0%	53	34	34	0	5	5	0
RUS_RCH_010	LR	93.98	0.147	18	19%	10	11%	49	52%	16	17%	0	0%	67	17	61	44	9	6	-3
RUS_RCH_020	LR	66.07	0.103	24	37%	0	0%	28	43%	14	21%	0	0%	62	29	59	30	12	7	-5
RUS_RCH_030	LR	15.41	0.024	15	100%	0	0%	0	0%	0	0%	0	0%	39	12	18	7	6	6	0
RUS_RCH_040	LR	26.39	0.041	0	0%	0	0%	26	98%	0	2%	0	0%	74	23	70	47	14	13	-1
RUS_RCH_050	LR	29.52	0.046	17	57%	0	0%	9	32%	3	11%	0	0%	55	9	66	56	6	6	0
RUS_RCH_060	LR	50.04	0.078	7	14%	0	0%	0	0%	43	86%	0	0%	74	4	74	71	9	8	-1
RUS_000_190	MR	66.36	0.104	8	12%	19	29%	0	0%	39	59%	0	0%	69	31	61	30	11	11	0
RUS_000_200	MR	44.34	0.069	13	30%	5	12%	0	0%	26	58%	0	0%	65	19	67	48	11	4	-7
RUS_000_210	MR	26.71	0.042	3	12%	4	14%	0	0%	20	74%	0	0%	73	40	54	14	8	8	0
RUS_000_220	MR	8.79	0.014	8	89%	1	10%	0	0%	0	1%	0	0%	42	8	72	64	10	3	-7
RUS_000_230	MR	34.22	0.053	5	14%	0	1%	0	0%	29	85%	0	0%	74	45	52	7	7	7	0
RUS_000_240	MR	75.76	0.118	11	14%	27	35%	16	22%	22	29%	0	0%	66	34	52	18	9	9	0
RUS_000_250	MR	64.17	0.100	16	25%	21	33%	5	7%	23	35%	0	0%	63	34	63	29	5	5	0
RUS_000_260	MR	34.97	0.055	8	22%	15	42%	1	4%	11	32%	0	0%	63	23	77	54	5	3	-2
RUS_000_270	MR	50.28	0.079	0	0%	8	15%	2	3%	41	82%	0	0%	77	48	52	5	18	17	-1
RUS_000_280	MR	33.76	0.053	12	37%	5	14%	3	9%	13	40%	0	0%	62	26	63	36	7	6	-1
RUS_000_290	MR	28.42	0.044	12	41%	5	17%	2	8%	10	34%	0	0%	59	42	54	12	8	8	0
RUS_000_300	MR	45.92	0.072	8	17%	26	58%	5	12%	6	13%	0	0%	61	48	51	3	4	4	0
RUS_000_310	MR	107.92	0.169	11	10%	13	12%	42	39%	42	39%	0	0%	71	40	58	17	18	18	0

Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
RUS_000_320	MR	49.32	0.077	5	9%	17	35%	27	54%	1	1%	0	0%	66	27	61	35	11	7	-4
RUS_000_330	MR	102.55	0.160	12	12%	39	38%	43	42%	8	8%	0	0%	65	28	54	25	16	16	0
RUS_000_340	MR	88.59	0.138	17	19%	60	68%	11	13%	0	0%	0	0%	58	30	42	12	12	10	-2
RUS_000_350	MR	128.31	0.201	25	20%	83	65%	20	16%	0	0%	0	0%	59	23	56	33	22	19	-3
RUS_007_010	MR	47.38	0.074	0	0%	16	34%	16	34%	15	32%	0	0%	71	42	50	8	11	11	0
RUS_007_020	MR	68.53	0.107	0	0%	14	21%	12	17%	43	62%	0	0%	75	48	51	3	11	11	0
RUS_007_030	MR	47.96	0.075	0	0%	7	14%	33	68%	9	18%	0	0%	73	41	49	8	21	20	-1
RUS_007_040	MR	129.96	0.203	0	0%	0	0%	3	2%	127	98%	0	0%	80	30	56	26	11	11	0
RUS_007_050	MR	43.72	0.068	0	0%	0	0%	3	6%	41	94%	0	0%	80	50	50	0	7	7	0
RUS_007_060	MR	35.77	0.056	0	0%	0	0%	0	0%	36	100%	0	0%	80	50	50	0	5	5	0
RUS_007_070	MR	68.39	0.107	10	15%	0	0%	14	20%	45	66%	0	0%	73	41	55	14	13	13	0
RUS_008_010	MR	49.96	0.078	4	8%	8	16%	3	7%	34	69%	0	0%	73	50	53	3	17	17	0
RUS_009_010	MR	96.57	0.151	0	0%	90	94%	5	6%	1	1%	0	0%	62	44	50	7	7	7	0
RUS_009_020	MR	104.43	0.163	0	0%	32	31%	65	62%	8	7%	0	0%	70	50	50	0	13	13	0
RUS_009_030	MR	83.53	0.131	0	0%	20	24%	11	14%	52	62%	0	0%	75	53	56	3	9	9	0
RUS_009_040	MR	55.65	0.087	0	0%	10	17%	16	29%	30	54%	0	0%	75	50	50	0	15	15	0
RUS_009_050	MR	45.15	0.071	0	0%	28	62%	11	24%	6	14%	0	0%	67	43	50	7	11	11	0
RUS_009_060	MR	93.54	0.146	0	0%	21	22%	4	4%	69	73%	0	0%	76	48	55	7	4	4	0
RUS_009_070	MR	45.12	0.071	0	0%	0	0%	0	0%	45	100%	0	0%	80	33	56	23	7	7	0
RUS_009_080	MR	38.66	0.060	0	0%	1	3%	2	4%	36	93%	0	0%	79	50	50	1	8	8	0
RUS_009_090	MR	49.83	0.078	0	0%	2	5%	0	0%	43	87%	4	8%	81	54	56	2	2	2	0
RUS_010_001_010	MR	28.33	0.044	0	0%	0	0%	11	37%	18	63%	0	0%	78	50	50	1	7	7	0
RUS_010_001_020	MR	28.06	0.044	0	0%	0	0%	0	0%	28	100%	0	0%	80	48	48	0	10	10	0
RUS_010_002_010	MR	51.39	0.080	0	0%	0	1%	1	1%	50	98%	0	0%	80	49	49	0	8	8	0
RUS_010_002_020	MR	17.95	0.028	0	0%	0	0%	3	14%	15	86%	0	0%	79	50	50	0	3	3	0
RUS_010_002_030	MR	12.72	0.020	0	0%	0	0%	0	0%	10	80%	3	20%	84	59	59	0	4	4	0
RUS_010_003_010	MR	81.10	0.127	0	0%	0	0%	0	0%	81	100%	0	0%	80	66	67	1	8	8	0
RUS_010_003_020	MR	13.03	0.020	0	0%	0	0%	0	0%	13	100%	0	0%	80	50	50	0	2	2	0
RUS_010_004_010	MR	76.27	0.119	0	0%	0	0%	1	1%	76	99%	0	0%	80	79	79	0	13	13	0
RUS_010_004_020	MR	79.94	0.125	0	0%	0	0%	1	1%	79	99%	0	0%	80	59	77	18	11	11	0
RUS_010_004_030	MR	149.77	0.234	0	0%	11	7%	21	14%	118	79%	0	0%	78	57	57	0	23	23	0
RUS_010_004_040	MR	56.79	0.089	0	0%	0	0%	1	2%	56	98%	0	0%	80	55	60	5	6	6	0
RUS_010_010	MR	109.01	0.170	0	0%	34	32%	54	50%	20	19%	0	0%	71	64	64	0	19	19	0
RUS_010_020	MR	13.63	0.021	0	0%	0	0%	0	0%	14	100%	0	0%	80	38	56	18	10	1	-9
RUS_010_030	MR	36.73	0.057	0	0%	0	0%	0	0%	37	100%	0	0%	80	50	50	0	5	5	0
RUS_010_040	MR	29.72	0.046	2	7%	8	26%	0	1%	20	66%	0	0%	72	30	60	30	8	8	0
RUS_011_010	MR	56.26	0.088	0	0%	29	51%	0	0%	28	49%	0	0%	70	27	56	30	11	10	-1
RUS_011_020	MR	51.86	0.081	0	1%	1	1%	7	13%	44	84%	0	0%	79	32	48	16	8	8	0
RUS_012_010	MR	105.30	0.165	0	0%	0	0%	0	0%	105	100%	0	0%	80	68	68	0	11	10	-1
RUS_012_020	MR	60.58	0.095	0	0%	4	6%	0	0%	57	94%	0	0%	79	37	53	16	17	16	-1
RUS_012_030	MR	12.97	0.020	5	36%	8	64%	0	0%	0	0%	0	0%	53	32	60	28	1	1	0
RUS_013_010	MR	122.21	0.191	0	0%	72	59%	42	34%	9	7%	0	0%	67	31	46	15	11	11	0
RUS_013_020	MR	92.60	0.145	0	0%	53	57%	15	16%	25	27%	0	0%	68	28	63	35	16	14	-2
RUS_013_030	MR	55.42	0.087	3	6%	23	41%	0	0%	29	53%	0	0%	70	43	54	11	4	4	0
RUS_014_010	MR	46.82	0.073	0	0%	0	0%	0	0%	47	100%	0	0%	80	51	70	20	13	13	0
RUS_014_020	MR	119.19	0.186	3	3%	0	0%	0	0%	116	97%	0	0%	79	48	50	2	11	11	0

Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
RUS_015_010	MR	67.74	0.106	0	0%	0	0%	0	0%	68	100%	0	0%	80	48	63	16	15	15	0
RUS_015_020	MR	80.60	0.126	4	5%	0	0%	0	0%	77	95%	0	0%	78	53	54	1	10	10	0
RYA_000_010	MR	66.67	0.104	0	0%	32	48%	8	12%	27	41%	0	0%	70	53	53	0	10	10	0
RYA_000_020	MR	99.78	0.156	0	0%	46	46%	21	21%	32	32%	0	0%	70	58	60	1	20	19	-1
RYA_000_030	MR	63.29	0.099	0	0%	11	17%	36	57%	16	26%	0	0%	73	41	62	21	16	15	-1
RYA_000_040	MR	92.99	0.145	0	0%	23	25%	68	74%	1	1%	0	0%	71	39	67	29	9	9	0
RYA_000_050	MR	5.45	0.009	0	0%	0	0%	2	34%	4	66%	0	0%	78	3	75	72	6	1	-5
RYA_000_060	MR	81.23	0.127	0	0%	5	6%	21	25%	56	68%	0	0%	77	29	51	22	11	5	-6
RYA_000_070	MR	77.62	0.121	0	0%	36	46%	0	0%	42	54%	0	0%	71	34	47	13	14	7	-7
RYA_000_080	MR	52.02	0.081	3	6%	21	41%	6	12%	21	41%	0	0%	69	30	34	4	8	8	0
RYA_001_010	MR	77.35	0.121	0	0%	4	5%	43	55%	31	40%	0	0%	76	42	53	11	11	11	0
RYA_001_020	MR	12.94	0.020	0	0%	1	5%	7	51%	6	44%	0	0%	76	10	75	65	8	3	-5
TWI_000_010	MR	87.86	0.137	0	0%	0	0%	14	16%	73	84%	0	0%	79	76	76	0	12	12	0
TWI_000_020	MR	55.13	0.086	0	0%	8	15%	26	48%	20	37%	0	0%	74	68	72	4	5	5	0
TWI_000_030	MR	67.34	0.105	0	0%	22	33%	20	29%	25	38%	0	0%	72	48	52	4	14	14	0
TWI_000_040	MR	20.95	0.033	0	0%	1	7%	11	51%	9	42%	0	0%	76	41	41	0	12	10	-2
TWI_000_050	MR	75.53	0.118	0	0%	53	70%	5	7%	18	24%	0	0%	66	47	47	0	9	9	0
TWI_000_060	MR	43.53	0.068	0	0%	18	42%	10	23%	15	35%	0	0%	71	37	37	0	16	15	-1
TWI_000_070	MR	96.93	0.151	0	0%	32	33%	9	9%	56	58%	0	0%	73	51	57	6	21	21	0
TWI_000_080	MR	18.60	0.029	0	0%	6	30%	6	33%	7	37%	0	0%	72	28	52	24	9	9	0
TWI_000_090	MR	20.73	0.032	0	0%	3	15%	11	54%	0	0%	6	30%	80	35	70	35	3	1	-2
TWI_000_100	MR	34.00	0.053	0	0%	20	58%	10	30%	4	12%	0	0%	67	32	50	18	13	13	0
TWI_001_010	MR	111.24	0.174	0	0%	72	65%	29	26%	7	7%	3	2%	67	33	47	15	15	15	0
TWI_002_010	MR	12.24	0.019	0	0%	0	3%	7	59%	4	37%	0	1%	76	30	60	30	8	7	-1
TWI_003_010	MR	27.44	0.043	0	0%	0	0%	0	2%	27	98%	0	0%	80	56	65	9	6	6	0
TWI_004_010	MR	77.75	0.122	0	0%	8	11%	10	13%	60	77%	0	0%	77	80	80	0	10	10	0
TWI_004_020	MR	42.92	0.067	0	0%	34	80%	4	10%	4	10%	0	0%	64	63	69	7	7	7	0
TWI_004_030	MR	21.68	0.034	0	0%	10	48%	2	10%	9	42%	0	0%	70	35	50	15	4	4	0
RUS_RCO_001_010	RC1	101.70	0.159	0	0%	88	87%	0	0%	13	13%	0	0%	63	54	55	1	19	18	-1
RUS_RCO_002_010	RC1	111.56	0.174	0	0%	42	38%	44	39%	26	23%	0	0%	70	52	53	1	19	19	0
RUS_RCO_002_020	RC1	57.70	0.090	0	0%	15	25%	3	6%	40	69%	0	0%	75	50	50	0	12	12	0
RUS_RCO_010	RC1	69.60	0.109	0	0%	45	65%	8	11%	16	23%	0	0%	67	56	57	1	17	17	0
RUS_RCO_020	RC1	90.89	0.142	0	0%	48	53%	23	25%	20	22%	0	0%	68	59	65	5	11	11	0
RUS_RCO_030	RC1	82.01	0.128	0	0%	57	70%	8	10%	17	20%	0	0%	66	44	46	2	14	14	0
RUS_RCO_040	RC1	36.63	0.057	0	0%	16	42%	14	37%	8	21%	0	0%	70	50	50	0	11	11	0
RUS_RCO_050	RC1	84.98	0.133	0	0%	33	39%	21	25%	30	36%	0	0%	71	52	52	0	18	18	0
RUS_RCO_060	RC1	123.32	0.193	0	0%	49	39%	54	43%	7	6%	14	11%	72	53	55	2	20	19	-1
RUS_RCO_070	RC1	55.66	0.087	0	0%	34	61%	11	20%	10	18%	0	0%	67	62	67	6	9	9	0
RUS_RCO_080	RC1	48.51	0.076	0	0%	17	36%	2	5%	29	59%	0	0%	73	59	64	5	11	11	0
RUS_RCO_090	RC1	109.44	0.171	0	0%	55	50%	41	37%	14	13%	0	0%	68	57	59	2	21	21	0
RUS_RCO_100	RC1	34.89	0.055	0	0%	18	53%	16	45%	1	2%	0	0%	67	51	54	3	14	14	0
RUS_RCO_110	RC1	54.88	0.086	0	0%	32	59%	0	0%	23	41%	0	0%	69	63	63	0	12	12	0
RUS_RCO_120	RC1	109.92	0.172	0	0%	32	29%	51	46%	20	18%	7	6%	73	51	51	0	14	14	0
RUS_RCO_130	RC1	24.94	0.039	1	2%	1	3%	10	39%	14	56%	0	0%	76	46	47	1	12	12	0
RUS_RCO_140	RC1	46.75	0.073	8	17%	8	18%	15	31%	16	34%	0	0%	68	52	71	18	12	7	-5
RUS_RCO_150	RC1	39.91	0.062	35	87%	0	0%	0	0%	5	13%	0	0%	44	45	58	12	10	7	-3

Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
RUS_TOA_010	RC1	105.76	0.165	0	0%	76	72%	2	2%	28	27%	0	0%	66	35	36	1	20	19	-1
RUS_TOA_020	RC1	74.43	0.116	0	0%	21	28%	17	23%	36	49%	0	0%	73	50	50	0	8	8	0
RUS_TOA_030	RC1	45.81	0.072	0	0%	22	49%	13	29%	10	22%	0	0%	69	48	48	0	15	15	0
RUS_TOA_040	RC1	39.09	0.061	0	0%	18	45%	7	18%	14	37%	0	0%	70	46	47	0	13	12	-1
RUS_TOA_050	RC1	107.96	0.169	0	0%	56	52%	0	0%	52	48%	0	0%	70	51	59	7	21	21	0
RUS_TOA_055	RC1	107.75	0.168	0	0%	53	49%	4	4%	51	47%	0	0%	70	65	74	9	31	29	-2
RUS_TOA_060	RC1	52.45	0.082	0	0%	21	41%	24	46%	7	13%	0	0%	69	47	61	14	19	18	-1
RUS_TOA_070	RC1	95.18	0.149	0	0%	5	5%	57	60%	33	35%	0	0%	75	39	46	7	18	18	0
RUS_TOA_080	RC1	156.21	0.244	0	0%	3	2%	76	49%	77	49%	0	0%	77	62	67	5	15	15	0
RUS_TOA_090	RC1	100.69	0.157	0	0%	18	18%	57	57%	25	25%	0	0%	73	51	68	16	14	9	-5
RUS_TOA_100	RC1	109.41	0.171	1	1%	43	40%	61	55%	4	4%	0	0%	69	54	63	9	10	10	0
RUS_000_010	UR	84.84	0.133	0	0%	0	0%	45	53%	40	47%	0	0%	77	12	72	60	29	20	-9
RUS_000_020	UR	78.66	0.123	0	0%	36	45%	2	2%	41	53%	0	0%	71	44	59	15	7	7	0
RUS_000_030	UR	70.31	0.110	0	0%	2	3%	30	42%	38	55%	0	0%	77	22	58	36	27	24	-3
RUS_000_040	UR	51.38	0.080	0	0%	0	0%	32	63%	19	37%	0	0%	76	35	66	30	12	10	-2
RUS_000_050	UR	87.61	0.137	0	0%	0	0%	48	55%	40	45%	0	0%	77	40	52	11	13	13	0
RUS_000_060	UR	76.71	0.120	0	0%	0	0%	19	25%	57	75%	0	0%	78	34	56	21	12	5	-7
RUS_000_070	UR	38.12	0.060	0	0%	0	0%	2	5%	36	95%	0	0%	80	9	67	58	20	18	-2
RUS_000_080	UR	24.57	0.038	0	0%	0	0%	4	17%	20	83%	0	0%	79	39	49	10	17	16	-1
RUS_000_085	UR	52.59	0.082	0	0%	4	7%	1	3%	47	90%	0	0%	79	17	68	51	21	12	-9
RUS_000_090	UR	81.90	0.128	0	0%	2	3%	5	6%	75	92%	0	0%	79	12	66	54	19	17	-2
RUS_000_100	UR	71.48	0.112	0	0%	0	0%	0	0%	71	100%	0	0%	80	36	72	36	16	15	-1
RUS_000_110	UR	90.67	0.142	7	8%	13	14%	8	9%	63	69%	0	0%	74	20	66	46	16	14	-2
RUS_000_120	UR	16.75	0.026	3	17%	1	6%	0	0%	13	77%	0	0%	72	33	72	40	6	5	-1
RUS_000_130	UR	76.02	0.119	9	12%	16	22%	12	16%	39	51%	0	0%	70	54	60	7	12	12	0
RUS_000_140	UR	49.17	0.077	4	8%	29	59%	13	27%	3	7%	0	0%	64	34	53	20	14	13	-1
RUS_000_150	UR	45.29	0.071	10	22%	28	61%	0	0%	8	17%	0	0%	59	38	39	1	11	10	-1
RUS_000_160	UR	40.00	0.063	9	23%	12	29%	0	0%	19	48%	0	0%	65	40	40	0	6	6	0
RUS_000_170	UR	43.90	0.069	10	22%	18	40%	0	0%	16	37%	0	0%	63	38	38	0	11	11	0
RUS_000_180	UR	26.37	0.041	9	33%	0	0%	0	0%	18	67%	0	0%	67	21	44	22	9	9	0
RUS_016_010	UR	64.82	0.101	0	0%	0	0%	0	0%	65	100%	0	0%	80	48	55	7	11	11	0
RUS_016_020	UR	63.32	0.099	0	0%	0	0%	0	0%	63	100%	0	0%	80	73	73	0	12	12	0
RUS_016_030	UR	62.11	0.097	0	0%	0	0%	0	0%	62	100%	0	0%	80	49	68	19	6	6	0
RUS_016_040	UR	66.48	0.104	1	1%	0	0%	0	0%	66	99%	0	0%	79	41	53	12	5	5	0
RUS_017_010	UR	22.61	0.035	0	1%	6	24%	0	0%	17	75%	0	0%	75	27	38	12	9	9	0
RUS_018_010	UR	48.17	0.075	0	0%	0	0%	20	42%	28	58%	0	0%	78	24	61	37	15	14	-1
RUS_018_020	UR	83.21	0.130	0	0%	0	0%	34	41%	49	59%	0	0%	78	10	72	61	21	20	-1
RUS_018_030	UR	34.02	0.053	0	0%	6	18%	8	23%	20	59%	0	0%	75	20	60	39	15	7	-8
RUS_018_040	UR	104.39	0.163	7	6%	18	17%	6	6%	74	71%	0	0%	74	21	64	44	19	10	-9
RUS_018_050	UR	58.72	0.092	9	15%	29	50%	3	6%	17	29%	0	0%	64	38	54	16	15	15	0
RUS_019_010	UR	97.54	0.152	0	0%	0	0%	0	0%	98	100%	0	0%	80	25	74	49	19	17	-2
RUS_019_020	UR	42.19	0.066	1	3%	0	0%	0	0%	41	97%	0	0%	79	39	69	30	7	7	0
RUS_020_010	UR	102.82	0.161	0	0%	0	0%	27	27%	75	73%	0	0%	78	36	56	20	25	23	-2
RUS_020_020	UR	115.59	0.181	0	0%	0	0%	0	0%	116	100%	0	0%	80	29	71	42	29	26	-3
RUS_020_030	UR	71.22	0.111	0	0%	0	0%	0	0%	71	100%	0	0%	80	38	72	35	24	22	-2
RUS_020_040	UR	94.50	0.148	0	0%	0	0%	0	0%	95	100%	0	0%	80	20	69	49	19	18	-1

Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
RUS_FPT_010	UR	73.59	0.115	0	0%	0	0%	0	0%	74	100%	0	0%	80	41	58	17	8	8	0
RUS_FPT_020	UR	42.95	0.067	0	1%	0	0%	0	0%	43	99%	0	0%	80	37	43	5	8	7	-1
RUS_NET_010	UR	29.41	0.046	0	0%	0	0%	0	0%	29	100%	0	0%	80	42	65	23	6	6	0
RUS_NET_020	UR	46.69	0.073	1	2%	5	10%	0	0%	41	89%	0	0%	78	18	20	2	3	3	0
SUB_000_010	UR	80.66	0.126	0	0%	9	11%	34	43%	37	46%	0	0%	75	39	66	27	21	19	-2
SUB_000_020	UR	57.96	0.091	0	0%	54	92%	3	5%	2	3%	0	0%	62	15	41	26	11	10	-1
SUB_000_030	UR	22.77	0.036	0	1%	23	99%	0	0%	0	0%	0	0%	61	6	12	6	3	2	-1
SUB_000_040	UR	48.35	0.076	9	18%	25	51%	1	2%	14	28%	0	0%	63	6	24	18	12	12	0
SUB_000_050	UR	92.01	0.144	0	0%	7	7%	23	25%	62	67%	0	0%	77	33	66	33	25	22	-3
SUB_000_060	UR	100.61	0.157	0	0%	50	50%	23	22%	28	28%	0	0%	69	28	61	34	18	17	-1
SUB_000_070	UR	90.86	0.142	1	1%	70	77%	6	7%	14	15%	0	0%	64	10	54	44	19	17	-2
SUB_000_080	UR	24.34	0.038	4	16%	6	27%	2	7%	12	49%	0	0%	68	8	8	0	8	7	-1
SUB_000_090	UR	119.82	0.187	2	1%	19	16%	23	20%	76	63%	0	0%	75	8	39	31	26	23	-3
SUB_000_100	UR	81.51	0.127	1	1%	28	35%	0	0%	52	64%	0	0%	73	8	19	11	13	8	-5
SUB_000_110	UR	25.10	0.039	12	46%	6	26%	0	0%	7	29%	0	0%	56	6	6	0	8	8	0
SUB_000_115	UR	33.57	0.052	9	26%	16	47%	0	0%	9	27%	0	0%	60	9	32	23	10	9	-1
SUB_000_120	UR	131.30	0.205	1	1%	41	32%	24	18%	65	49%	0	0%	73	17	44	26	19	17	-2
SUB_000_130	UR	83.72	0.131	0	0%	39	47%	15	18%	29	35%	0	0%	70	26	55	28	17	16	-1
SUB_000_140	UR	84.94	0.133	0	0%	74	88%	8	9%	3	3%	0	0%	63	22	67	45	14	13	-1
SUB_000_150	UR	59.59	0.093	0	0%	20	34%	20	34%	19	32%	0	0%	72	6	57	50	13	6	-7
SUB_000_155	UR	37.43	0.058	1	3%	20	53%	0	1%	16	43%	0	0%	69	23	59	36	12	7	-5
SUB_000_160	UR	21.05	0.033	4	18%	14	64%	2	11%	1	7%	0	0%	60	6	73	67	9	4	-5
SUB_000_170	UR	92.62	0.145	4	4%	28	31%	23	25%	37	40%	0	0%	71	50	50	1	16	16	0
SUB_000_180	UR	54.74	0.086	11	20%	26	47%	18	33%	0	0%	0	0%	61	29	61	33	7	7	0
SUB_000_190	UR	73.49	0.115	5	7%	63	86%	2	3%	3	5%	0	0%	61	41	55	13	10	10	0
SUB_000_200	UR	82.97	0.130	0	0%	4	4%	12	15%	67	81%	0	0%	78	41	62	21	19	17	-2
SUB_000_210	UR	34.11	0.053	0	0%	16	46%	0	0%	18	54%	0	0%	71	14	71	57	9	8	-1
SUB_000_220	UR	118.42	0.185	0	0%	10	8%	23	20%	86	72%	0	0%	77	32	65	32	22	13	-9
SUB_000_230	UR	44.83	0.070	2	5%	0	0%	29	64%	14	31%	0	0%	74	14	65	50	11	11	0
SUB_000_240	UR	55.81	0.087	13	23%	2	3%	22	39%	20	35%	0	0%	68	21	63	42	7	7	0
SUB_000_250	UR	76.62	0.120	1	1%	48	63%	9	11%	19	25%	0	0%	67	44	50	6	13	13	0
SUB_000_260	UR	98.56	0.154	7	7%	19	19%	28	28%	45	46%	0	0%	72	27	55	27	11	11	0
SUB_000_270	UR	83.06	0.130	0	0%	48	57%	35	42%	1	1%	0	0%	66	24	27	3	15	13	-2
SUB_000_280	UR	55.00	0.086	7	13%	5	9%	11	19%	32	59%	0	0%	72	24	68	45	10	9	-1
SUB_000_290	UR	100.99	0.158	15	15%	23	23%	26	25%	38	37%	0	0%	68	25	64	39	8	8	0
SUB_000_300	UR	79.88	0.125	10	12%	56	70%	0	0%	14	18%	0	0%	62	35	57	21	11	11	0
SUB_001_001_010	UR	50.71	0.079	0	0%	0	0%	7	13%	44	87%	0	0%	79	46	53	7	16	8	-8
SUB_001_001_020	UR	13.14	0.021	0	0%	3	26%	9	66%	1	9%	0	0%	71	22	68	46	6	6	0
SUB_001_010	UR	65.94	0.103	0	0%	0	0%	0	0%	66	100%	0	0%	80	33	61	28	13	8	-5
SUB_001_020	UR	25.67	0.040	0	0%	0	0%	6	23%	20	77%	0	0%	79	37	58	21	4	4	0
SUB_002_010	UR	31.92	0.050	0	0%	1	2%	10	31%	21	67%	0	0%	78	23	39	16	6	5	-1
SUB_002_020	UR	18.11	0.028	0	1%	4	24%	5	29%	8	46%	0	0%	73	25	35	10	10	9	-1
SUB_003_010	UR	34.69	0.054	0	0%	23	67%	1	3%	11	30%	0	0%	67	33	60	27	10	10	0
SUB_003_020	UR	101.45	0.159	0	0%	57	56%	16	16%	28	28%	0	0%	68	36	64	29	13	12	-1
SUB_003_030	UR	96.22	0.150	0	0%	55	57%	34	35%	7	7%	0	0%	67	42	55	13	10	10	0
SUB_003_040	UR	107.96	0.169	0	0%	79	73%	11	11%	18	17%	0	0%	66	50	50	0	16	16	0

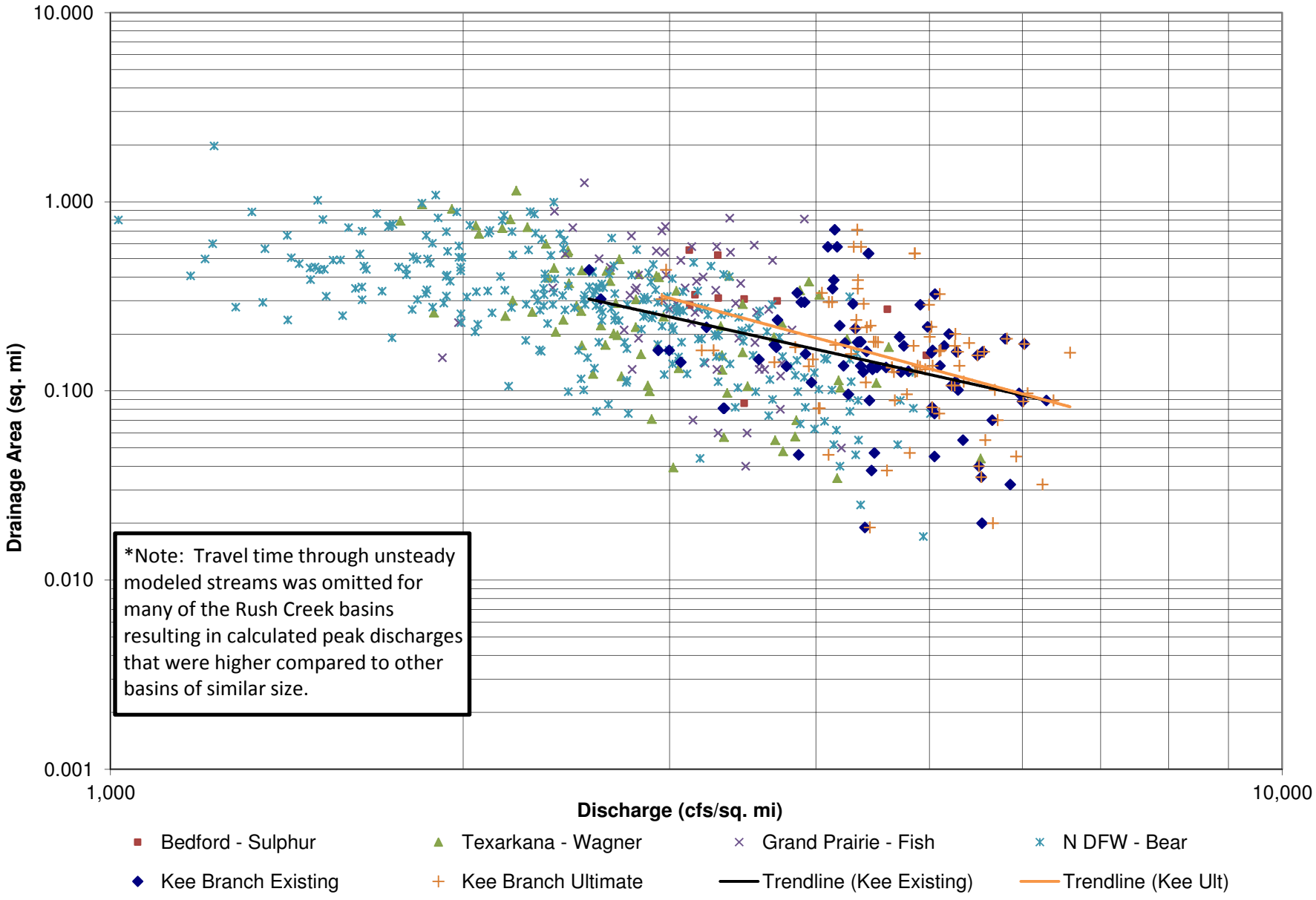
Rush Creek Sub-basin Summary

NAME	SUBWTRSHD	AREA	AREA	Area_A	Percent_A	Area_B	Percent_B	Area_C	Percent_C	Area_D	Percent_D	Area_Water	Percent_Wa	CN	EX_IMP	ULT_IMP	Difference	Existing Lag Time	Ultimate Lag Time	Difference
		Ac	SQ. MI.	Ac		Ac		Ac		Ac		Ac			%	%	%	Min	Min	Min
SUB_004_010	UR	50.88	0.080	0	0%	44	87%	6	12%	1	1%	0	0%	63	19	70	51	24	21	-3
SUB_004_020	UR	74.87	0.117	0	0%	68	91%	2	3%	4	5%	0	0%	62	22	74	52	15	14	-1
SUB_004_030	UR	42.07	0.066	0	0%	16	37%	14	34%	12	28%	0	0%	71	18	68	51	13	7	-6
SUB_004_040	UR	90.58	0.142	0	0%	57	63%	33	36%	1	1%	0	0%	66	11	74	64	23	21	-2
SUB_004_050	UR	72.87	0.114	0	0%	54	75%	11	15%	7	10%	0	0%	65	19	71	52	16	11	-5
SUB_004_060	UR	26.26	0.041	0	0%	5	20%	8	30%	13	50%	0	0%	74	68	72	4	13	12	-1
SUB_004_070	UR	83.44	0.130	0	0%	26	32%	3	3%	54	65%	0	0%	74	46	71	25	16	16	0
SUB_004_080	UR	60.12	0.094	0	0%	28	47%	32	52%	1	1%	0	0%	68	23	71	47	8	7	-1
SUB_004_090	UR	51.19	0.080	0	0%	32	63%	16	31%	3	5%	0	0%	66	21	69	48	13	10	-3
SUB_004_100	UR	21.95	0.034	0	0%	19	88%	3	12%	0	0%	0	0%	63	35	46	12	14	7	-7
SUB_004_110	UR	26.34	0.041	0	0%	20	75%	6	22%	1	3%	0	0%	64	49	67	17	24	22	-2
SUB_004_120	UR	62.68	0.098	1	1%	24	39%	27	44%	10	17%	0	0%	70	9	47	38	19	17	-2
SUB_004_130	UR	32.38	0.051	6	19%	22	67%	4	13%	0	0%	0	0%	59	5	48	43	13	8	-5

Appendix B-2
Discharge Comparisons

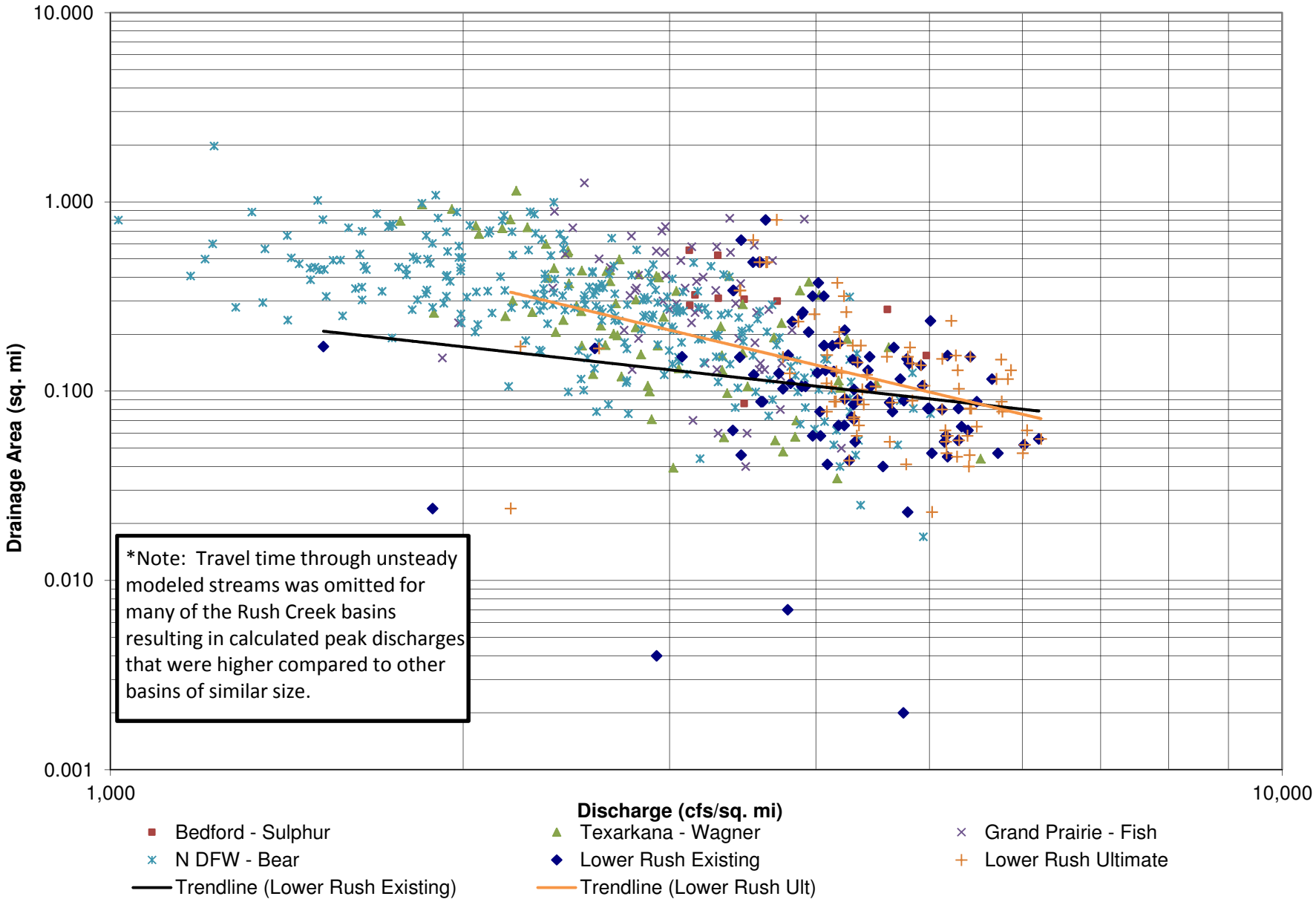
Discharge Comparison

100-Year Flood Peak with Regression Equation for Kee Branch



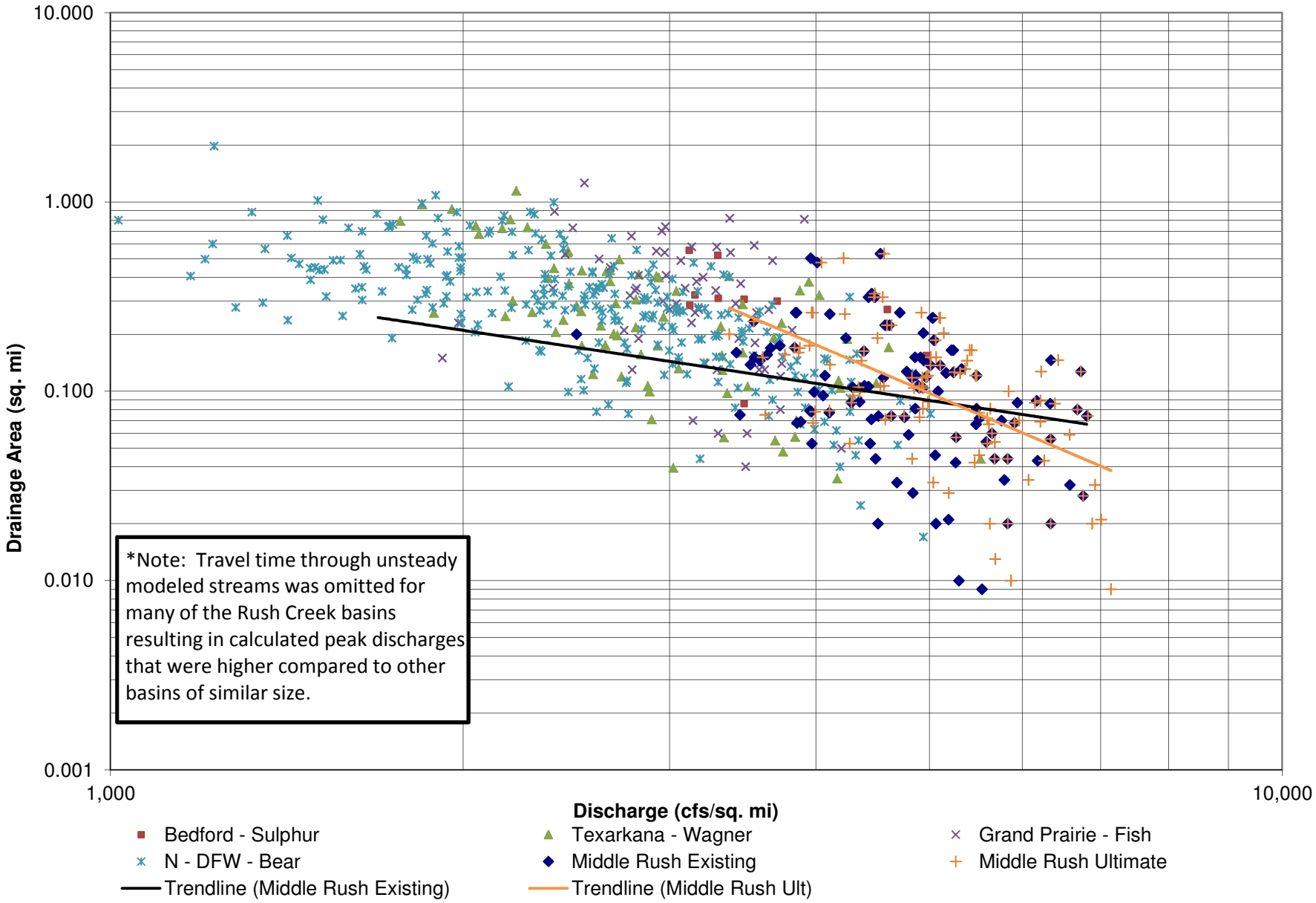
Discharge Comparison

100-Year Flood Peak with Regression Equation for Lower Rush



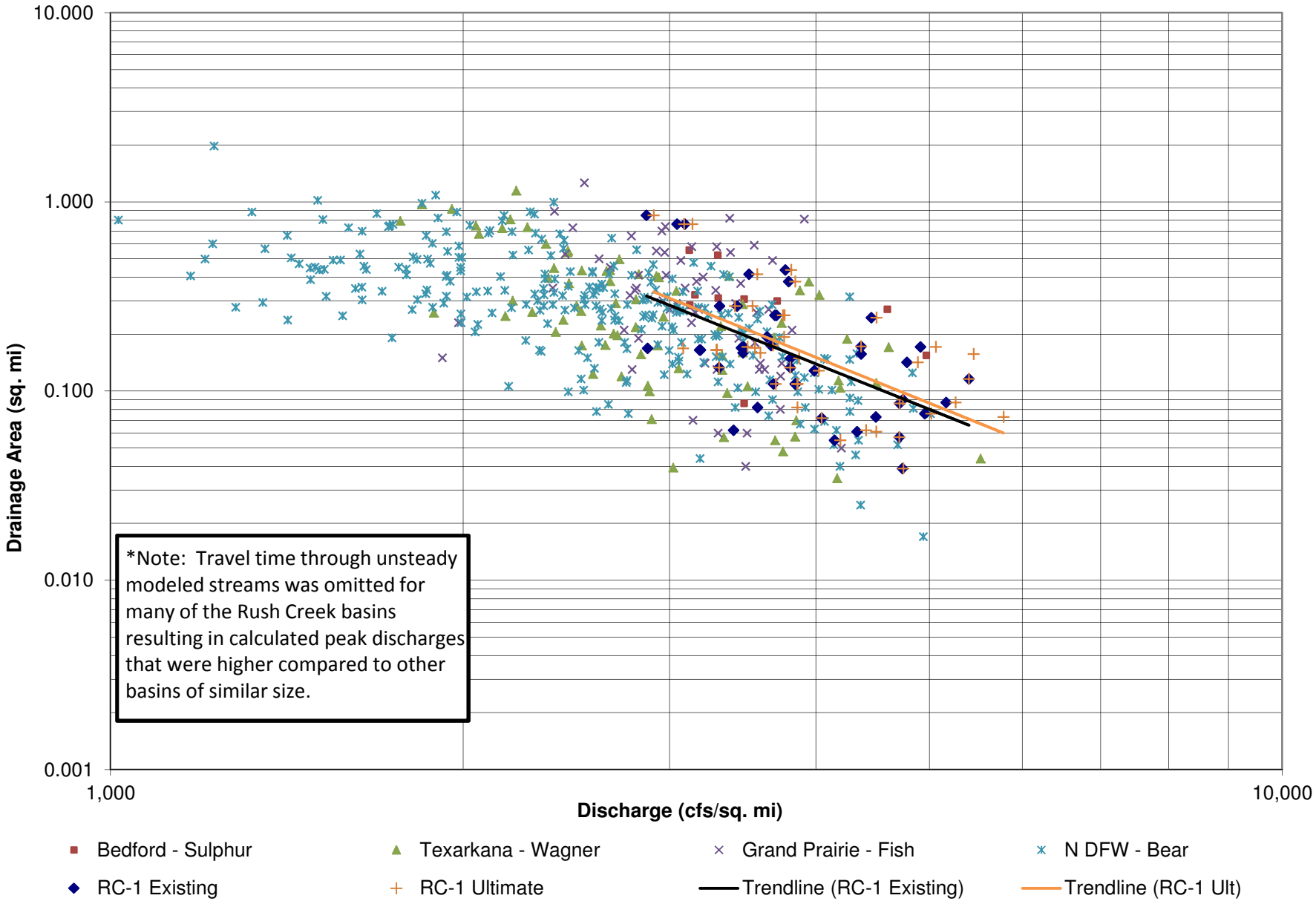
Discharge Comparison

100-Year Flood Peak with Regression Equation for Middle Rush



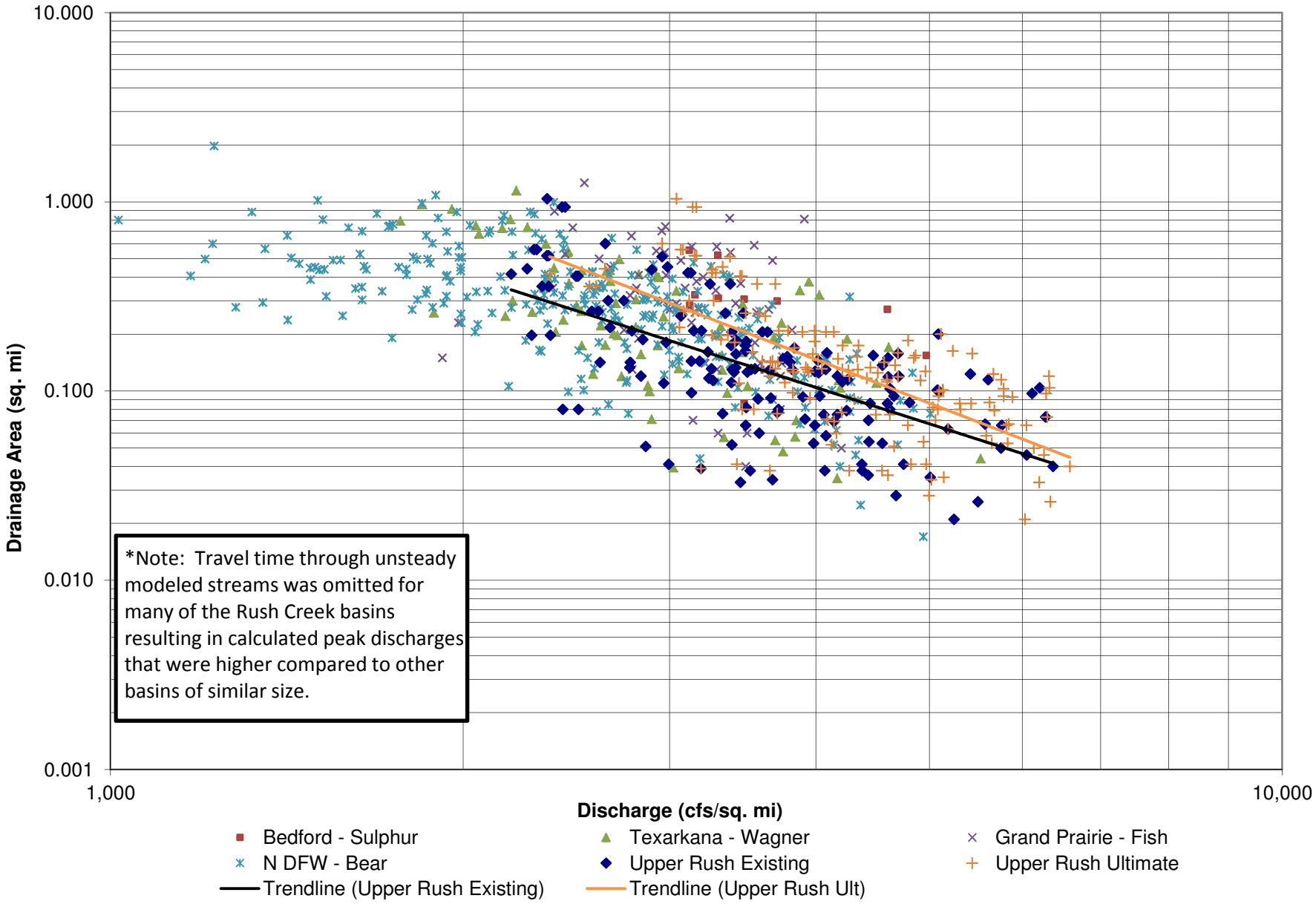
Discharge Comparison

100-Year Flood Peak with Regression Equation for RC-1



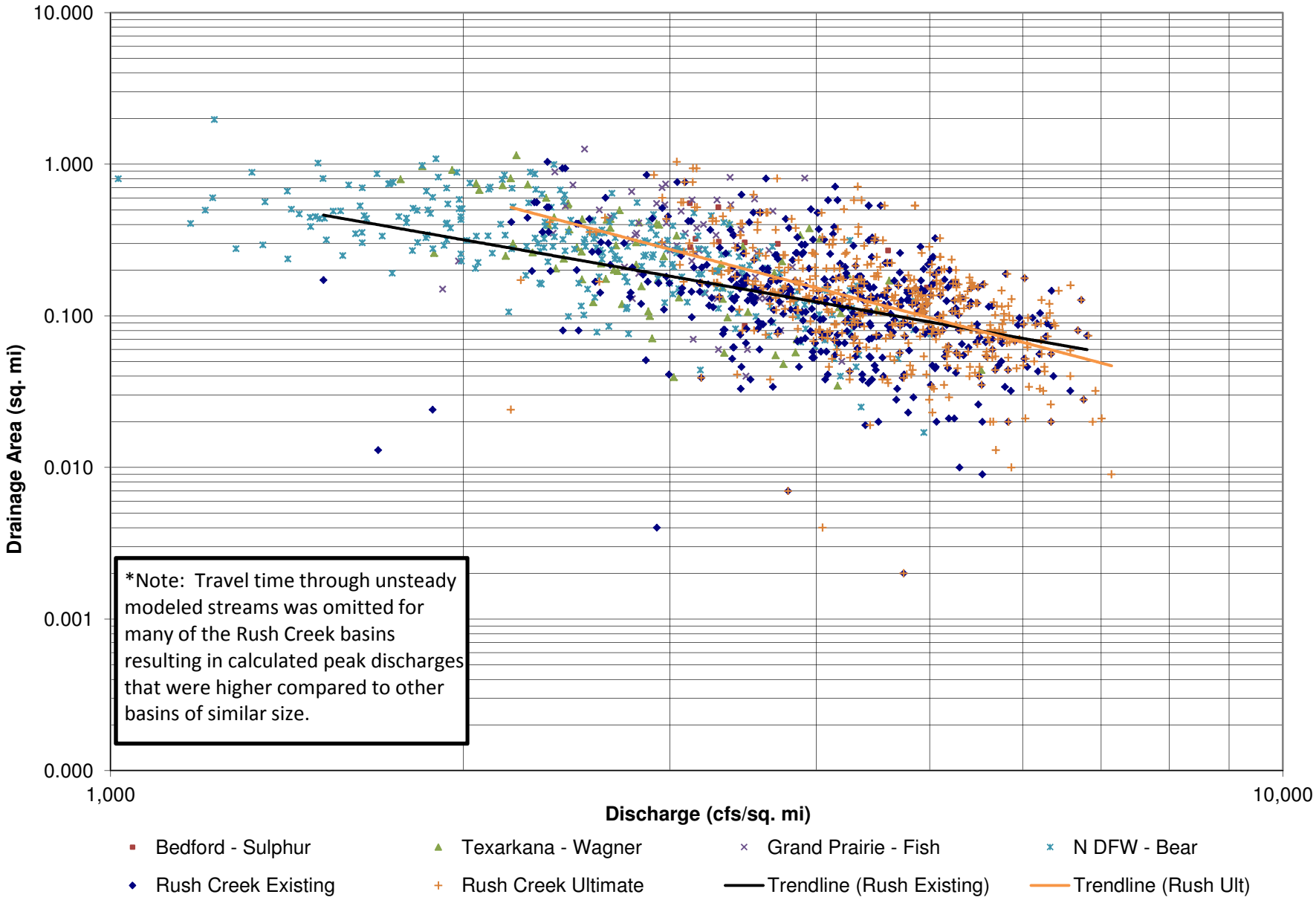
Discharge Comparison

100-Year Flood Peak with Regression Equation for Upper Rush



Discharge Comparison

100-Year Flood Peak with Regression Equation for Rush Creek



Appendix B-3
Time of Concentration Calculations

Kee Branch Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
KEE_000_010		3,087	100	0.150	Grass-Short Grass Prairie	4.900	3.95	6.2																		KEE_000_010	6.2	**25.9**	**0.43**
									832	0.921	1.55	Unpaved	8.96														9.0		
														2,155	0.675	4.8	15.0	0.045	1.28		1.28	28.11						28.1		
KEE_000_020		4,034	100	0.150	Grass-Short Grass Prairie	0.690	3.95	13.5																		KEE_000_020	13.5	**21.0**	**0.35**
									663	1.437	1.93	Unpaved	5.71														5.7		
														1,092	2.116	5.9	10.7	0.045	3.24		3.24	5.62						5.6		
														2,179	0.588				3.58	3.58	3.58	10.14						10.1		
KEE_000_030		2,234	54	0.150	Grass-Short Grass Prairie	2.034	3.95	5.4																		KEE_000_030	5.4	**12.3**	**0.21**
									641	0.772	1.79	Paved	5.98														6.0		
														1,538	1.048	5.5	7.4	0.045	2.78		2.78	9.23						9.2		
KEE_000_040		1,299	100	0.150	Grass-Short Grass Prairie	3.510	3.95	7.0																		KEE_000_040	7.0	**7.6**	**0.13**
									572	2.811	2.71	Unpaved	3.52														3.5		
														628	2.524	17.4	19.3	0.045	4.92		4.92	2.13						2.1		
KEE_000_050		1,757	100	0.150	Grass-Short Grass Prairie	2.962	3.95	7.5																		KEE_000_050	7.5	**9.7**	**0.16**
									417	2.557	2.58	Unpaved	2.69														2.7		
														1,241	2.807	5.4	10.7	0.045	3.52		3.52	5.87						5.9		
KEE_000_060		3,065	100	0.150	Grass-Short Grass Prairie	2.965	3.95	7.5																		KEE_000_060	7.5	**16.8**	**0.28**
									487	3.404	2.98	Unpaved	2.73														2.7		
									2,268	1.273	2.29	Paved	16.48														16.5		
														210	1.455	7.7	13.8	0.045	2.70		2.70	1.30						1.3		
KEE_000_070		3,566	100	0.150	Grass-Short Grass Prairie	11.424	3.95	4.4																		KEE_000_070	4.4	**16.9**	**0.28**
									2,853	1.794	2.16	Unpaved	22.00														22.0		
														613	1.330	17.9	5.4	0.065	5.89		5.89	1.73						1.7		
KEE_000_080		2,338	100	0.150	Grass-Short Grass Prairie	2.610	3.95	7.9																		KEE_000_080	7.9	**18.0**	**0.30**
									1,517	2.118	2.35	Unpaved	10.77														10.8		
														721	0.552	13.0	45.9	0.045	1.06		1.06	11.33						11.3		
KEE_000_090		3,947	100	0.150	Grass-Short Grass Prairie	2.650	3.95	7.9																		KEE_000_090	7.9	**13.5**	**0.22**
									60	5.609	3.82	Unpaved	0.26														0.3		
									742	3.436	3.77	Paved	3.28														3.3		
														1,214	1.388	8.5	10.4	0.045	3.42		3.42	5.92						5.9		
																							1,831	6	6.00	5.1		5.1		
KEE_000_100		1,777	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.017	3.95	0.8																		KEE_000_100	0.8	**6.6**	**0.11**
									695	0.674	1.67	Paved	6.94														6.9		
																							862	6	6.00	2.4		2.4		
														170	0.631	33.7	11.6	0.065	3.72		3.72	0.76						0.8		
KEE_000_110		3,519	100	0.150	Grass-Short Grass Prairie	5.080	3.95	6.1																		KEE_000_110	6.1	**12.5**	**0.21**
									1,546	2.758	2.68	Unpaved	9.62														9.6		
																							1,874	6	6.00	5.2		5.2		
KEE_000_120		4,341	100	0.150	Grass-Short Grass Prairie	2.208	3.95	8.5																		KEE_000_120	8.5	**13.0**	**0.22**
									94	3.605	3.06	Unpaved	0.51														0.5		
									818	2.235	3.04	Paved	4.49														4.5		
																							1,289	6	6.00	3.6		3.6		
														2,040	1.426	5.6	11.7	0.015	7.29		7.29	4.66						4.7		
KEE_000_130		3,538	100	0.150	Grass-Short Grass Prairie	6.001	3.95	5.7																		KEE_000_130	5.7	**10.9**	**0.18**
									627	3.096	2.84	Unpaved	3.68														3.7		
									459	2.576	3.26	Paved	2.34														2.3		
																							2,351	6	6.00	6.5		6.5		
KEE_000_140		1,799	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		KEE_000_140	15.4	**12.8**	**0.21**
									344	1.009	2.04	Paved	2.81														2.8		
																							552	6	6.00	1.5		1.5		
														803	0.768				8.33	8.33	8.33	1.61						1.6		
KEE_000_150		4,517	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	7.139	3.95	0.4																		KEE_000_150	0.4	**10.2**	**0.17**
									1,044	2.939	3.49	Paved	4.99														5.0		
																							1,498	6	6.00	4.2		4.2		
														443	0.875	6.0	10.5	0.015	6.37		6.37	1.16						1.2		
														1,482	1.334	17.1	16.4	0.045	3.93		3.93	6.28						6.3		
KEE_000_160		4,517	60	0.150	Grass-Short Grass Prairie	5.796	3.95	3.8																		KEE_000_160	3.8	**11.6**	**0.19**
									1,732	3.077	3.57	Paved	8.10														8.1		
																							2,518	6	6.00	7.0		7.0		
														208	0.525				7.26	7.26	7.26	0.48						0.5		
KEE_000_170		2,524	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	6.440	3.95	0.4																		KEE_000_170	0.4	**13.0**	**0.22**
														2,474	0.860	11.8	23.5	0.045	1.94		1.94	21.25						21.3		
KEE_000_180		2,661	100	0.150	Grass-Short Grass Prairie	1.856	3.95	9.1																		KEE_000_180	9.1	**17.5**	**0.29**
									1,466	1.436	1.93	Unpaved	12.64														12.6		
														1,095	1.316	7.7	14.7	0.045	2.47		2.47	7.39						7.4		
KEE_000_190		2,588	100	0.150	Grass-Short Grass Prairie	7.600	3.95	5.2																		KEE_000_190	5.2	**7.9**	**0.13**
									993	4.530	4.33	Paved	3.83														3.8		
																							1,495	6	6.00	4.2		4.2		
KEE_000_200		3,249	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.191	3.95	0.8																		KEE_000_200	0.8	**6.6**	**0.11**
									398	1.732	2.68	Paved	2.48														2.5		
																							2,801	6	6.00	7.8		7.8		
KEE_000_210		1,254	100	0.150	Grass-Short Grass Prairie	4.450	3.95	6.4																		KEE_000_210	6.4	**6.5**	**0.11**
									1,023	4.303	4.22	Paved	4.04														4.0		
																							131	6	6.00	0.4		0.4		
KEE_000_220		5,107	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.505	3.95	1.1																		KEE_000_220	1.1	**9.6**	**0.16**
									325	2.255	3.05	Paved	1.77														1.8		
																							2,301	6	6.00	6.4		6.4		
														530	0.952	22.7	11.2	0.050	4.67		4.67	1.89						1.9		
														310	2.812	2.7	4.6	0.015	11.70		11.70	0.44						0.4		
																							1,592	6	6.00	4.4		4.4		
KEE_000_230		3,201	100	0.150	Grass-Short Grass Prairie	5.898	3.95	5.7																		KEE_000_230	5.7	**10.2**	**0.17**
									279	2.645	3.31	Paved	1.41														1.4		
														1,817	2.361	1.3	7.3	0.015	4.89		4.89	6.20						6.2		

Kee Branch Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
																							286	6	6.00	0.8		0.8		
																												2.9		
KEE_000_240		2,832	100	0.150	Grass-Short Grass Prairie	4.426	3.95	6.4						720	1.506	16.8	9.2	0.065	4.19		4.19	2.87					KEE_000_240	6.4	**12.3**	**0.20**
									756	3.744	3.12	Unpaved	4.04														4.0		
									1,590	2.170	2.99	Paved	8.85														8.8		
																							109	6	6.00	0.3		0.3		
														277	2.964	23.3	14.1	0.065	5.52		5.52	0.84						0.8		
KEE_000_250		3,233	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	7.220	3.95	0.4																			KEE_000_250	0.4	**6.6**	**0.11**
									1,454	4.093	4.11	Paved	5.89														5.9		
																							1,729	6	6.00	4.8		4.8		
KEE_000_260		4,376	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	5.026	3.95	0.4																			KEE_000_260	0.4	**9.9**	**0.16**
									2,638	3.363	3.73	Paved	11.79														11.8		
																							144	6	6.00	0.4		0.4		
														1,545	1.122				6.71	6.71	6.71	3.84						3.8		
KEE_000_270		3,616	50	0.150	Grass-Short Grass Prairie	0.500	3.95	8.8																			KEE_000_270	8.8	**12.7**	**0.21**
														3,313	2.212	15.0	16.0	0.045	4.71		4.71	11.72						11.7		
																							253	6	6.00	0.7		0.7		
KEE_000_280		3,496	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.999	3.95	0.8																			KEE_000_280	0.8	**6.4**	**0.11**
									69	0.795	1.81	Paved	0.63														0.6		
																							1,688	6	6.00	4.7		4.7		
														452	2.424	1.5	3.5	0.015	8.72		8.72	0.86						0.9		
																							678	6	6.00	1.9		1.9		
														558	2.041	7.7	5.5	0.050	5.33		5.33	1.75						1.7		
KEE_000_290		2,617	100	0.150	Grass-Short Grass Prairie	1.000	3.95	11.6																			KEE_000_290	11.6	**14.1**	**0.24**
									733	1.173	1.75	Unpaved	6.99														7.0		
																							1,784	6	6.00	5.0		5.0		
KEE_000_300		3,375	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.367	3.95	0.6																			KEE_000_300	0.6	**9.7**	**0.16**
									780	1.743	2.68	Paved	4.84														4.8		
																							505	6	6.00	1.4		1.4		
									1,065	1.768	2.70	Paved	6.57														6.6		
																							976	6	6.00	2.7		2.7		
KEE_000_310		2,056	100	0.150	Grass-Short Grass Prairie	10.600	3.95	4.5																			KEE_000_310	4.5	**8.5**	**0.14**
									1,744	2.453	3.18	Paved	9.13														9.1		
																							212	6	6.00	0.6		0.6		
KEE_000_320		5,147	60	0.150	Grass-Short Grass Prairie	7.099	3.95	3.5																			KEE_000_320	3.5	**16.4**	**0.27**
									1,321	1.910	2.81	Paved	7.84														7.8		
									1,642	1.903	2.23	Unpaved	12.30														12.3		
														1,946	2.147	1.0	1.8	0.015	9.78		9.78	3.32						3.3		
														177	2.605	56.7	16.6	0.065	8.38		8.38	0.35						0.4		
KEE_000_330		1,743	100	0.150	Grass-Short Grass Prairie	1.485	3.95	9.9																			KEE_000_330	9.9	**9.4**	**0.16**
														1,643	3.018	8.0	10.5	0.045	4.79		4.79	5.71						5.7		
KEE_000_340		2,174	30	0.150	Grass-Short Grass Prairie	2.694	3.95	3.0																			KEE_000_340	3.0	**7.7**	**0.13**
									738	1.273	2.29	Paved	5.36														5.4		
														1,228	3.625	4.1	6.6	0.045	4.62		4.62	4.43						4.4		
KEE_001_010		3,375	100	0.150	Grass-Short Grass Prairie	6.151	3.95	5.6						178	11.612	16.9	6.3	0.065									KEE_001_010	5.6	**10.4**	**0.17**
									1,063	3.256	3.67	Paved	4.83														4.8		
														218	1.637	1.5	4.7	0.045	1.99		1.99	1.83						1.8		
														526	0.799	7.8	7.9	0.015	8.81		8.81	1.00						1.0		
																							1,468	6	6.00	4.1		4.1		
KEE_001_020		1,554	100	0.150	Grass-Short Grass Prairie	3.210	3.95	7.3																			KEE_001_020	7.3	**7.7**	**0.13**
									867	3.248	3.66	Paved	3.94														3.9		
																							100	6	6.00	0.3		0.3		
														486	2.993	54.2	30.5	0.065	5.82		5.82	1.39						1.4		
KEE_001_030		1,340	100	0.150	Grass-Short Grass Prairie	4.670	3.95	6.3																			KEE_001_030	6.3	**7.4**	**0.12**
									634	2.329	2.46	Unpaved	4.29														4.3		
														606	1.393	15.4	8.3	0.045	5.92		5.92	1.71						1.7		
KEE_002_010		2,469	100	0.150	Grass-Short Grass Prairie	1.870	3.95	9.1																			KEE_002_010	9.1	**10.7**	**0.18**
									626	3.214	2.89	Unpaved	3.61														3.6		
														655	3.682	12.2	9.4	0.065	5.22		5.22	2.09						2.1		
																							1,088	6	6.00	3.0		3.0		
KEE_002_020		1,349	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			KEE_002_020	15.4	**12.9**	**0.22**
									179	1.891	2.22	Unpaved	1.34														1.3		
									465	1.488	2.48	Paved	3.13														3.1		
																							605	6	6.00	1.7		1.7		
KEE_004_010		3,383	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.300	3.95	0.7																			KEE_004_010	0.7	**13.5**	**0.22**
									2,242	1.156	2.19	Paved	17.10														17.1		
														314	1.003	3.9	5.6	0.015	7.88		7.88	0.66						0.7		
									311	0.665	1.66	Paved	3.13														3.1		
														466	1.303	4.5	6.3	0.015	9.02		9.02	0.86						0.9		
KEE_004_020		3,028	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.630	3.95	0.7																			KEE_004_020	0.7	**6.9**	**0.12**
									1,199	2.240	3.04	Paved	6.57														6.6		
																							1,066	6	6.00	3.0		3.0		
														713	0.635				9.01	9.01	9.01	1.32						1.3		
KEE_004_030		3,428	100	0.150	Grass-Short Grass Prairie	1.682	3.95	9.5																			KEE_004_030	9.5	**15.6**	**0.26**
									546	2.474	2.54	Unpaved	3.59														3.6		
									1,024	1.090	2.12	Paved	8.04														8.0		
																							1,757	6	6.00	4.9		4.9		
KEE_004_040		1,473	87	0.150	Grass-Short Grass Prairie	3.045	3.95	6.7																			KEE_004_040	6.7	**7.1**	**0.12**
									138	2.116	2.35	Unpaved	0.98														1.0		
									170	1.563	2.54	Paved	1.11														1.1		
																							1,078	6	6.00	3.0		3.0		
KEE_004_050		1,412	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.520	3.95	0.7																			KEE_004_050	0.7	**3.9**	**0.06**
									894	2.662	3.32	Paved	4.49														4.5		
																							468	6	6.00	1.3		1.3		
KEE_005_010		3,260	100	0.150	Grass-Short Grass Prairie	2.370	3.95	8.2																			KEE_005_010	8.2	**11.7**	**0.20**
									404	1.556	2.01	Unpaved	3.35														3.3		
														483	2.007	58.5	23.7	0.065	5.94		5.94	1.36						1.4		
														463	0.970	84.0	38.7	0.050	4.93		4.93	1.57						1.6		
																							1,811	6	6.00	5.0		5.0		

Kee Branch Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Perl (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
KEE_005_020		3,664	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.000	3.95	0.8																		KEE_005_020	0.8	**7.9**	**0.13**
														906	1.467	29.3	31.9	0.045	3.80		3.80	3.98						4.0		
																							867	6	6.00	2.4		2.4		
														1,840	1.124	30.1	17.2	0.045	5.09		5.09	6.03						6.0		
KEE_005_030		3,020	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.980	3.95	0.5																		KEE_005_030	0.5	**10.5**	**0.18**
									305	1.304	2.32	Paved	2.19														2.2		
									774	1.280	1.83	Unpaved	7.07														7.1		
																							589	6	6.00	1.6		1.6		
														802	0.753	10.3	6.1	0.065	2.83		2.83	4.72						4.7		
																							500	6	6.00	1.4		1.4		
KEE_005_040		1,614	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.500	3.95	0.7																		KEE_005_040	0.7	**3.7**	**0.06**
									1,171	4.716	4.41	Paved	4.42														4.4		
																							393	6	6.00	1.1		1.1		
KEE_KB1_001_010		2,967	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.847	3.95	0.6																		KEE_KB1_001_010	0.6	**5.9**	**0.10**
									453	2.351	3.12	Paved	2.42														2.4		
																							2,464	6	6.00	6.8		6.8		
KEE_KB1_001_020		2,885	100	0.150	Grass-Short Grass Prairie	4.280	3.95	6.5																		KEE_KB1_001_020	6.5	**10.1**	**0.17**
									94	4.891	3.57	Unpaved	0.44														0.4		
									629	1.486	2.48	Paved	4.23														4.2		
														97	1.107	5.9	10.5	0.015	7.14		7.14	0.23						0.2		
																							237	6	6.00	0.7		0.7		
														451	0.747	2.9	3.5	0.015	7.46		7.46	1.01						1.0		
														532	1.340				5.50	5.50	5.50	1.61						1.6		
														426	1.319				9.20	9.20	9.20	0.77						0.8		
														318	1.195				3.90	3.90	3.90	1.36						1.4		
KEE_KB1_001_030		696	100	0.150	Grass-Short Grass Prairie	3.406	3.95	7.1																		KEE_KB1_001_030	7.1	**5.9**	**0.10**
									596	5.342	3.73	Unpaved	2.66														2.7		
KEE_KB1_010		3,559	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.067	3.95	0.8																		KEE_KB1_010	0.8	**6.2**	**0.10**
									647	5.107	4.59	Paved	2.35														2.3		
																							703	6	6.00	2.0		2.0		
														1,234	1.280	3.5	6.3	0.015	7.61		7.61	2.70						2.7		
																							925	6	6.00	2.6		2.6		
KEE_KB1_020		4,817	85	0.150	Grass-Short Grass Prairie	2.810	3.95	6.8																		KEE_KB1_020	6.8	**13.6**	**0.23**
									734	1.529	2.51	Paved	4.87														4.9		
																							3,998	6	6.00	11.1		11.1		
KEE_KB1_030		4,936	50	0.150	Grass-Short Grass Prairie	4.172	3.95	3.8																		KEE_KB1_030	3.8	**13.1**	**0.22**
									810	2.627	3.29	Paved	4.10														4.1		
																							129	6	6.00	0.4		0.4		
														2,566	1.746	8.7	9.0	0.045	4.26		4.26	10.03						10.0		
														232	1.415	1.6	2.7	0.015	8.34		8.34	0.46						0.5		
																							1,149	6	6.00	3.2		3.2		
KEE_KB1_040		3,426	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.843	3.95	0.9																		KEE_KB1_040	0.9	**7.9**	**0.13**
									1,487	3.011	3.53	Paved	7.03														7.0		
																							1,890	6	6.00	5.3		5.3		
KEE_KB1_050		2,596	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.620	3.95	1.0																		KEE_KB1_050	1.0	**5.3**	**0.09**
														872	2.111	17.5	18.4	0.045	4.66		4.66	3.12						3.1		
																							1,674	6	6.00	4.7		4.7		
KEE_KB1_060		3,711	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.080	3.95	0.5																		KEE_KB1_060	0.5	**9.5**	**0.16**
									231	0.917	1.95	Paved	1.98														2.0		
									149	5.852	3.90	Unpaved	0.64														0.6		
														493	0.637	1.8	5.9	0.015	3.57		3.57	2.30						2.3		
														1,246	1.791	4.8	6.5	0.045	3.63		3.63	5.72						5.7		
														371	2.868	4.0	3.4	0.065	4.35		4.35	1.42						1.4		
																							1,171	6	6.00	3.3		3.3		

Lower Rush Existing Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
PAN_000_010		4,143	100	0.150	Grass-Short Grass Prairie	3.879	3.95	6.8																		PAN_000_010	6.8	**15.2**	**0.25**
									702	2.327	2.46	Unpaved	4.75														4.8		
									804	0.925	1.96	Paved	6.85														6.9		
																							2,535	6.00	6.00	7.0		7.0		
PAN_000_020		2,536	100	0.150	Grass-Short Grass Prairie	1.424	3.95	10.1																		PAN_000_020	10.1	**13.0**	**0.22**
									962	1.806	2.17	Unpaved	7.39														7.4		
																							1,474	6.00	6.00	4.1		4.1		
PAN_000_030		4,382	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.843	3.95	0.9																		PAN_000_030	0.9	**11.6**	**0.19**
									1,377	0.938	1.97	Paved	11.66														11.7		
														2,352	0.667			0.015	7.63	7.63	7.63	5.14						5.1		
																							604	6.00	6.00	1.7		1.7		
PAN_000_040		4,196	100	0.150	Grass-Short Grass Prairie	6.914	3.95	5.4																		PAN_000_040	5.4	**12.9**	**0.22**
									113	8.527	4.71	Unpaved	0.40														0.4		
									1,282	1.628	2.59	Paved	8.24														8.2		
																							2,698	6.00	6.00	7.5		7.5		
PAN_000_050		4,121	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.571	3.95	1.0																		PAN_000_050	1.0	**10.5**	**0.18**
									491	0.544	1.50	Paved	5.46														5.5		
																							2,846	6.00	6.00	7.9		7.9		
														734	0.704			0.065	3.86	3.86	3.86	3.17						3.2		
PAN_000_060		6,759	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.284	3.95	0.5																		PAN_000_060	0.5	**14.4**	**0.24**
									1,691	2.112	2.95	Paved	9.54														9.5		
																							5,018	6.00	6.00	13.9		13.9		
PAN_000_070		5,912	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.579	3.95	1.0																		PAN_000_070	1.0	**11.4**	**0.19**
									732	2.560	3.25	Paved	3.75														3.8		
																							5,130	6.00	6.00	14.3		14.3		
PAN_000_080		2,612	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		PAN_000_080	1.1	**11.8**	**0.20**
									2,221	1.112	2.14	Paved	17.27														17.3		
														341	4.360	16.3	17.5	0.065	4.57		4.57	1.24						1.2		
PAN_000_090		5,232	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.011	3.95	0.6																		PAN_000_090	0.6	**13.5**	**0.23**
									854	0.500	1.44	Paved	9.90														9.9		
																							4,328	6.00	6.00	12.0		12.0		
PAN_000_100		2,042	100	0.150	Grass-Short Grass Prairie	0.748	3.95	13.1																		PAN_000_100	13.1	**15.4**	**0.26**
									258	0.786	1.43	Unpaved	3.01														3.0		
									1,685	2.054	2.91	Paved	9.64														9.6		
PAN_000_110		2,848	100	0.150	Grass-Short Grass Prairie	2.376	3.95	8.2																		PAN_000_110	8.2	**12.3**	**0.20**
									958	1.160	2.19	Paved	7.29														7.3		
																							1,790	6.00	6.00	5.0		5.0		
PAN_000_120		2,917	100	0.150	Grass-Short Grass Prairie	2.420	3.95	8.2																		PAN_000_120	8.2	**10.9**	**0.18**
									228	3.247	2.91	Unpaved	1.31														1.3		
									714	2.717	3.35	Paved	3.55														3.6		
																							1,876	6.00	6.00	5.2		5.2		
PAN_000_130		3,301	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.457	3.95	0.7																		PAN_000_130	0.7	**18.4**	**0.31**
									601	3.667	3.89	Paved	2.57														2.6		
														2,650	0.886	10.4	27.8	0.045	1.61		1.61	27.39						27.4		
RUS_000_360		3,176	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_000_360	1.1	**8.0**	**0.13**
									1,427	2.340	3.11	Paved	7.65														7.6		
																							1,497	6.00	6.00	4.2		4.2		
														202	8.113	17.4	14.8	0.065	7.28		7.28	0.46						0.5		
RUS_000_370		2,146	100	0.150	Grass-Short Grass Prairie	3.750	3.95	6.9																		RUS_000_370	6.9	**9.5**	**0.16**
									121	8.763	4.78	Unpaved	0.42														0.4		
														1,927	3.223	6.1	12.1	0.045	3.77		3.77	8.53						8.5		
RUS_000_380		674	100	0.150	Grass-Short Grass Prairie	4.730	3.95	6.2																		RUS_000_380	6.2	**5.0**	**0.08**
									573	7.984	4.56	Unpaved	2.09														2.1		
RUS_000_390		2,658	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.672	3.95	1.0																		RUS_000_390	1.0	**11.0**	**0.18**
									1,257	0.579	1.55	Paved	13.54														13.5		
																							1,352	6.00	6.00	3.8		3.8		
RUS_000_400		1,435	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.646	3.95	1.0																		RUS_000_400	1.0	**3.1**	**0.05**
									478	5.274	4.67	Paved	1.71														1.7		
																							907	6.00	6.00	2.5		2.5		
RUS_000_410		4,837	100	0.150	Grass-Short Grass Prairie	3.876	3.95	6.8																		RUS_000_410	6.8	**12.9**	**0.22**
									1,216	3.291	3.69	Paved	5.50														5.5		
																							508	6.00	6.00	1.4		1.4		
														2,220	1.962	1.7	5.2	0.015	6.48		6.48	5.71						5.7		
																							791	6.00	6.00	2.2		2.2		
RUS_000_420		2,655	50	0.150	Grass-Short Grass Prairie	1.100	3.95	6.4																		RUS_000_420	6.4	**8.8**	**0.15**
									375	2.429	3.17	Paved	1.97														2.0		
																							2,231	6.00	6.00	6.2		6.2		
RUS_000_430		1,770	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.928	3.95	0.4																		RUS_000_430	0.4	**4.3**	**0.07**
									1,220	3.529	3.82	Paved	5.32														5.3		
																							501	6.00	6.00	1.4		1.4		
RUS_000_440		391	100	0.150	Grass-Short Grass Prairie	3.155	3.95	7.3																		RUS_000_440	7.3	**5.5**	**0.09**
									287	2.680	2.64	Unpaved	1.81														1.8		
RUS_000_450		5,802	100	0.150	Grass-Short Grass Prairie	1.109	3.95	11.2																		RUS_000_450	11.2	**21.1**	**0.35**
									879	0.722	1.37	Unpaved	10.69														10.7		
																							4,822	6.00	6.00	13.4		13.4		
RUS_000_460		2,409	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.526	3.95	1.1																		RUS_000_460	1.1	**7.6**	**0.13**
									653	0.621	1.60	Paved	6.79														6.8		
																							1,707	6.00	6.00	4.7		4.7		

Lower Rush Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_000_470														1,965	0.500	100.4	58.2	0.050	3.03		3.03	10.80					RUS_000_470	10.8	**6.5**	**0.11**
RUS_000_480														297	0.500	104.1	60.6	0.065	2.32		2.32	2.13					RUS_000_480	10.0	**6.0**	**0.10**
RUS_000_500		856												856	1.719	140.3	36.4	0.065	7.39		7.39	1.93					RUS_000_500	10.0	**6.0**	**0.10**
RUS_000_510		3,401	50	0.150	Grass-Short Grass Prairie	3.981	3.95	3.8																			RUS_000_510	3.8	**10.5**	**0.18**
									1,647	4.446	4.29	Paved	6.40															6.4		
														1,704	1.624	2.5	2.8	0.045	3.89		3.89	7.30						7.3		
RUS_000_520		689	100	0.150	Grass-Short Grass Prairie	1.650	3.95	9.5																			RUS_000_520	9.5	**8.0**	**0.13**
									589	2.603	2.60	Unpaved	3.77															3.8		
RUS_000_530		5,641	100	0.150	Grass-Short Grass Prairie	7.835	3.95	5.1																			RUS_000_530	5.1	**40.9**	**0.68**
									3,227	0.500	1.14	Unpaved	47.14															47.1		
														2,315	0.500	105.9	58.3	0.065	2.41		2.41	15.99						16.0		
RUS_003_010		2,458	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.628	3.95	1.0																			RUS_003_010	1.0	**5.7**	**0.10**
									731	2.369	3.13	Paved	3.89															3.9		
																							1,676	6.00	6.00	4.7		4.7		
RUS_003_020		3,664	98	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.191	3.95	1.0																			RUS_003_020	1.0	**7.8**	**0.13**
									740	2.179	3.00	Paved	4.11															4.1		
																							2,826	6.00	6.00	7.9		7.9		
RUS_004_001_010		2,717	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.713	3.95	0.9																			RUS_004_001_010	0.9	**14.8**	**0.25**
														2,666	0.585	9.2	14.4	0.045	1.88		1.88	23.68						23.7		
RUS_004_001_020		2,250	100	0.150	Grass-Short Grass Prairie	5.307	3.95	6.0																			RUS_004_001_020	6.0	**8.7**	**0.14**
									560	2.970	2.78	Unpaved	3.36															3.4		
														455	1.358	8.0	10.2	0.045	3.27		3.27	2.32						2.3		
														1,135	0.777			0.065	6.66	6.66	6.66	2.84						2.8		
RUS_004_001_030		2,222	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.375	3.95	0.7																			RUS_004_001_030	0.7	**5.1**	**0.09**
														891	3.344	5.5	13.7	0.045	3.29		3.29	4.52						4.5		
														1,278	2.228			0.065	6.43	6.43	6.43	3.31						3.3		
RUS_004_001_040		592	100	0.150	Grass-Short Grass Prairie	5.366	3.95	5.9																			RUS_004_001_040	5.9	**4.5**	**0.08**
									494	10.075	5.12	Unpaved	1.61															1.6		
RUS_004_010		3,537	77	0.150	Grass-Short Grass Prairie	3.850	3.95	5.5																			RUS_004_010	5.5	**15.3**	**0.26**
									100	2.405	2.50	Unpaved	0.67															0.7		
									614	0.914	1.94	Paved	5.27															5.3		
																							515	6.00	6.00	1.4		1.4		
RUS_004_020		2,424	100	0.150	Grass-Short Grass Prairie	1.256	3.95	10.6						2,231	0.537	23.8	17.9	0.045	2.94		2.94	12.65					RUS_004_020	12.7		
									1,076	0.506	1.15	Unpaved	15.63															15.6		
														1,246	0.850	8.3	9.0	0.045	2.89		2.89	7.19						7.2		
RUS_004_030		1,793	49	0.150	Grass-Short Grass Prairie	1.391	3.95	5.8																			RUS_004_030	5.8	**11.5**	**0.19**
									1,188	1.434	1.93	Unpaved	10.25															10.2		
														556	0.500			0.055	2.87	2.87	2.87	3.23						3.2		
RUS_004_040		1,909	100	0.150	Grass-Short Grass Prairie	2.384	3.95	8.2																			RUS_004_040	8.2	**14.2**	**0.24**
									726	0.500	1.14	Unpaved	10.61															10.6		
														1,084	3.061			0.045	3.73	3.73	3.73	4.84						4.8		
RUS_004_050		2,011	100	0.150	Grass-Short Grass Prairie	3.174	3.95	7.3																			RUS_004_050	7.3	**8.9**	**0.15**
									596	3.614	3.07	Unpaved	3.24															3.2		
									638	1.985	2.86	Paved	3.71															3.7		
														677	2.910	311.4	137.2	0.024	18.29		18.29	0.62						0.6		
RUS_005_002_010		3,287	60	0.150	Grass-Short Grass Prairie	9.203	3.95	3.2																			RUS_005_002_010	3.2	**8.9**	**0.15**
									1,438	3.112	3.59	Paved	6.68															6.7		
																							1,789	6.00	6.00	5.0		5.0		
RUS_005_010		3,228	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.900	3.95	0.6																			RUS_005_010	0.6	**9.7**	**0.16**
									1,760	1.571	2.55	Paved	11.51															11.5		
																							1,417	6.00	6.00	3.9		3.9		
RUS_005_020		1,426	56	0.150	Grass-Short Grass Prairie	8.478	3.95	3.1																			RUS_005_020	3.1	**6.5**	**0.11**
									755	2.282	3.07	Paved	4.10															4.1		
									615	3.197	2.88	Unpaved	3.55															3.6		
RUS_005_030		3,299	81	0.150	Grass-Short Grass Prairie	1.329	3.95	8.8																			RUS_005_030	8.8	**13.4**	**0.22**
									1,672	2.126	2.96	Paved	9.40															9.4		
																							1,257	6.00	6.00	3.5		3.5		
														289	2.204	1.4	3.6	0.015	7.83		7.83	0.62						0.6		
RUS_005_040		1,121	100	0.150	Grass-Short Grass Prairie	4.480	3.95	6.4																			RUS_005_040	6.4	**7.7**	**0.13**
									804	1.240	2.26	Paved	5.92															5.9		
																							217	6.00	6.00	0.6		0.6		
RUS_005_050		4,115	100	0.150	Grass-Short Grass Prairie	5.308	3.95	6.0																			RUS_005_050	6.0	**14.4**	**0.24**
														2,095	1.936	1.9	4.0	0.045	2.76		2.76	12.67						12.7		
																							1,921	6.00	6.00	5.3		5.3		
RUS_005_060		1,894	100	0.150	Grass-Short Grass Prairie	3.446	3.95	7.1																			RUS_005_060	7.1	**12.3**	**0.20**
									1,441	0.916	1.95	Paved	12.34															12.3		
																							354	6.00	6.00	1.0		1.0		
RUS_005_070		671	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.864	3.95	0.9																			RUS_005_070	0.9	**2.6**	**0.04**
									621	2.199	3.01	Paved	3.43															3.4		
RUS_006_010		2,750	38	0.150	Grass-Short Grass Prairie	5.841	3.95	2.6																			RUS_006_010	2.6	**7.3**	**0.12**
									677	3.792	3.96	Paved	2.85															2.9		
														2,035	2.914	45.5	30.9	0.065	5.06		5.06	6.70						6.7		
RUS_RC2_010		4,624	100	0.150	Grass-Short Grass Prairie	5.259	3.95	6.0																			RUS_RC2_010	6.0	**13.6**	**0.23**
									1,085	2.477	2.54	Unpaved	7.12															7.1		
																							3,440	6.00	6.00	9.6		9.6		
RUS_RC2_020		3,281	49	0.150	Grass-Short Grass Prairie	3.496	3.95	4.0																			RUS_RC2_020	4.0	**10.0**	**0.17**
														1,238	2.750	3.3	8.5	0.045	2.90		2.90	7.11						7.1		
																							1,994	6.00	6.00	5.5		5.5		
RUS_RC2_030		2,943	100	0.150	Grass-Short Grass Prairie	3.122	3.95	7.4																			RUS_RC2_030	7.4	**11.5**	**0.19**
														1,631	1.945	4.2	7.2	0.045	3.21		3.21	8.46						8.5		
																							1,212	6.00	6.00	3.4		3.4		

Lower Rush Existing Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_RC2_040		2,905	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_RC2_040	1.1	**9.0**	**0.15**
									1,470	1.426	2.43	Paved	10.09														10.1		
																							1,385	6.00	6.00	3.8		3.8		
RUS_RC2_050		3,579	100	0.150	Grass-Short Grass Prairie	4.446	3.95	6.4																			RUS_RC2_050	6.4	**13.2**	**0.22**
									398	2.553	2.58	Unpaved	2.57														2.6		
									963	1.234	2.26	Paved	7.11														7.1		
																							2,117	6.00	6.00	5.9		5.9		
RUS_RC2_060		3,143	65	0.150	Grass-Short Grass Prairie	8.975	3.95	3.4																			RUS_RC2_060	3.4	**8.3**	**0.14**
									860	4.128	4.13	Paved	3.47														3.5		
																							1,110	6.00	6.00	3.1		3.1		
														740	2.606	14.8	11.5	0.065	4.39		4.39	2.81						2.8		
																							369	6.00	6.00	1.0		1.0		
RUS_RC2_070		2,142	42	0.150	Grass-Short Grass Prairie	20.469	3.95	1.7																			RUS_RC2_070	1.7	**6.4**	**0.11**
									1,843	3.404	3.75	Paved	8.19														8.2		
																							257	6.00	6.00	0.7		0.7		
RUS_RC2_080		1,482	100	0.150	Grass-Short Grass Prairie	7.150	3.95	5.3																			RUS_RC2_080	5.3	**6.6**	**0.11**
									418	5.026	3.62	Unpaved	1.93														1.9		
									612	2.960	3.50	Paved	2.92														2.9		
														353	6.538	10.7	7.9	0.065	7.17		7.17	0.82						0.8		
RUS_RC2_085		2,259	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			RUS_RC2_085	1.1	**6.0**	**0.10**
									762	1.644	2.61	Paved	4.87														4.9		
																							1,448	6.00	6.00	4.0		4.0		
RUS_RC2_090		3,894	83	0.150	Grass-Short Grass Prairie	8.486	3.95	4.3																			RUS_RC2_090	4.3	**13.6**	**0.23**
									1,159	3.169	3.62	Paved	5.34														5.3		
																							238	6.00	6.00	0.7		0.7		
														1,893	1.779	19.5	21.2	0.065	2.90		2.90	10.89						10.9		
																							522	6.00	6.00	1.5		1.5		
RUS_RC2_100		2,889	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.922	3.95	0.6																			RUS_RC2_100	0.6	**6.9**	**0.12**
									1,351	2.673	3.32	Paved	6.77														6.8		
																							1,489	6.00	6.00	4.1		4.1		
RUS_RC2_110		1,928	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			RUS_RC2_110	1.1	**4.8**	**0.08**
									1,114	3.655	3.89	Paved	4.78														4.8		
																							764	6.00	6.00	2.1		2.1		
RUS_RCH_010		3,584	100	0.150	Grass-Short Grass Prairie	7.263	3.95	5.3																			RUS_RCH_010	5.3	**9.0**	**0.15**
														1,730	4.622	19.8	14.9	0.065	5.95		5.95	4.84						4.8		
																							1,755	6.00	6.00	4.9		4.9		
RUS_RCH_020		1,780	100	0.150	Grass-Short Grass Prairie	2.105	3.95	8.6																			RUS_RCH_020	8.6	**12.0**	**0.20**
									64	4.464	3.41	Unpaved	0.31														0.3		
									759	0.523	1.47	Paved	8.60														8.6		
																							855	6.00	6.00	2.4		2.4		
RUS_RCH_030		0		0.150	Grass-Short Grass Prairie	0.500																					RUS_RCH_030	10.0	**6.0**	**0.10**
RUS_RCH_040		1,724	100	0.150	Grass-Short Grass Prairie	1.610	3.95	9.6																			RUS_RCH_040	9.6	**13.7**	**0.23**
									798	0.721	1.73	Paved	7.71														7.7		
									826	2.342	2.47	Unpaved	5.57														5.6		
RUS_RCH_050		0		0.150	Grass-Short Grass Prairie	0.500																					RUS_RCH_050	10.0	**6.0**	**0.10**
RUS_RCH_060		2,902	100	0.150	Grass-Short Grass Prairie	10.150	3.95	4.6																			RUS_RCH_060	4.6	**8.5**	**0.14**
									471	3.547	3.04	Unpaved	2.58														2.6		
														2,331	0.500	1224.8	249.1	0.055	5.54		5.54	7.01						7.0		

Middle Rush Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_000_190		3,167	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.910	3.95	0.6																		RUS_000_190	0.6	**10.7**	**0.18**
									1,512	0.949	1.98	Paved	12.73														12.7		
																						1,605	6.00	6.00	4.5		4.5		
RUS_000_200		1,447	100	0.150	Grass-Short Grass Prairie	1.039	3.95	11.5																		RUS_000_200	11.5	**10.8**	**0.18**
									1,348	4.474	3.41	Unpaved	6.58														6.6		
RUS_000_210		2,148	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.878	3.95	0.9																		RUS_000_210	0.9	**8.4**	**0.14**
									1,259	0.960	1.99	Paved	10.54														10.5		
																						420	6.00	6.00	1.2		1.2		
														417	3.442	31.0	24.1	0.065	5.03		5.03	1.38					1.4		
RUS_000_220		845	100	0.150	Grass-Short Grass Prairie	1.137	3.95	11.1																		RUS_000_220	11.1	**9.8**	**0.16**
									748	2.197	2.39	Unpaved	5.21														5.2		
RUS_000_230		1,908	45	0.150	Grass-Short Grass Prairie	3.872	3.95	3.6																		RUS_000_230	3.6	**6.8**	**0.11**
									1,391	3.055	3.55	Paved	6.52														6.5		
																						471	6.00	6.00	1.3		1.3		
RUS_000_240		1,677	100	0.150	Grass-Short Grass Prairie	1.499	3.95	9.9																		RUS_000_240	9.9	**9.5**	**0.16**
									205	3.455	3.00	Unpaved	1.14														1.1		
									221	1.293	2.31	Paved	1.59														1.6		
																						1,150	6.00	6.00	3.2		3.2		
RUS_000_250		754	100	0.150	Grass-Short Grass Prairie	5.941	3.95	5.7																		RUS_000_250	5.7	**4.9**	**0.08**
									655	7.526	4.43	Unpaved	2.47														2.5		
RUS_000_260		514	100	0.150	Grass-Short Grass Prairie	5.690	3.95	5.8																		RUS_000_260	5.8	**4.6**	**0.08**
									414	5.398	3.75	Unpaved	1.84														1.8		
RUS_000_270		3,893	100	0.150	Grass-Short Grass Prairie	1.409	3.95	10.1																		RUS_000_270	10.1	**18.2**	**0.30**
									752	1.894	2.22	Unpaved	5.64														5.6		
														1,417	2.138	10.5	18.3	0.065	2.31		2.31	10.22					10.2		
																						1,381	6.00	6.00	3.8		3.8		
														243	9.110	11.9	8.3	0.065	8.85		8.85	0.46					0.5		
RUS_000_280		1,435	50	0.150	Grass-Short Grass Prairie	10.595	3.95	2.6																		RUS_000_280	2.6	**6.6**	**0.11**
									1,004	1.550	2.53	Paved	6.61														6.6		
									380	4.793	3.53	Unpaved	1.79														1.8		
RUS_000_290		1,931	100	0.150	Grass-Short Grass Prairie	8.438	3.95	5.0																		RUS_000_290	5.0	**8.4**	**0.14**
									157	1.504	1.98	Unpaved	1.32														1.3		
														1,673	3.209	2.0	4.1	0.045	3.64		3.64	7.65					7.7		
RUS_000_300		2,275	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.076	3.95	0.6																		RUS_000_300	0.6	**4.4**	**0.07**
									37	3.386	3.74	Paved	0.16														0.2		
									118	3.832	3.16	Unpaved	0.62														0.6		
														2,068	3.722	1.3	7.4	0.015	5.86		5.86	5.89					5.9		
RUS_000_310		3,314	100	0.150	Grass-Short Grass Prairie	0.624	3.95	14.1																		RUS_000_310	14.1	**17.6**	**0.29**
														1,362	1.210	19.7	28.6	0.045	2.84		2.84	8.01					8.0		
																						407	6.00	6.00	1.1		1.1		
														1,142	1.393	62.0	39.7	0.065	3.64		3.64	5.23					5.2		
																						301	6.00	6.00	0.8		0.8		
RUS_000_320		3,334	100	0.150	Grass-Short Grass Prairie	4.808	3.95	6.2																		RUS_000_320	6.2	**10.7**	**0.18**
									193	8.064	4.58	Unpaved	0.70														0.7		
									538	1.977	2.86	Paved	3.14														3.1		
														328	1.141	6.8	7.9	0.045	3.23		3.23	1.69					1.7		
																						2,174	6.00	6.00	6.0		6.0		
RUS_000_330		3,501	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.668	3.95	0.6																		RUS_000_330	0.6	**16.2**	**0.27**
									1,910	0.530	1.48	Paved	21.51														21.5		
																						847	6.00	6.00	2.4		2.4		
														694	0.500	152.2	33.1	0.065	4.49		4.49	2.58					2.6		
RUS_000_340		2,466	100	0.150	Grass-Short Grass Prairie	5.297	3.95	6.0																		RUS_000_340	6.0	**11.6**	**0.19**
									861	4.878	3.56	Unpaved	4.03														4.0		
									691	3.183	3.63	Paved	3.18														3.2		
									814	1.818	2.18	Unpaved	6.24														6.2		
RUS_000_350		3,685	100	0.150	Grass-Short Grass Prairie	6.822	3.95	5.4																		RUS_000_350	5.4	**22.3**	**0.37**
									1,104	2.368	2.48	Unpaved	7.41														7.4		
														1,357	0.659	0.7	2.9	0.045	1.03		1.03	21.97					22.0		
																						590	6.00	6.00	1.6		1.6		
														535	4.495	70.0	89.0	0.024	11.21		11.21	0.80					0.8		
RUS_007_010		2,493	100	0.150	Grass-Short Grass Prairie	2.146	3.95	8.6																		RUS_007_010	8.6	**11.3**	**0.19**
									807	2.173	2.38	Unpaved	5.66														5.7		
														138	0.547	4.1	10.1	0.015	4.00		4.00	0.58					0.6		
																						1,448	6.00	6.00	4.0		4.0		
RUS_007_020		3,709	28	0.150	Grass-Short Grass Prairie	1.228	3.95	3.9																		RUS_007_020	3.9	**11.0**	**0.18**
									1,293	1.397	2.40	Paved	8.97														9.0		
																						171	6.00	6.00	0.5		0.5		
														1,837	1.419			0.015	7.83	7.83	7.83	3.91					3.9		
																						380	6.00	6.00	1.1		1.1		

Middle Rush Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_007_030		3,847	100	0.150	Grass-Short Grass Prairie	1.065	3.95	11.3																		RUS_007_030	11.3	**21.3**	**0.35**
									1,090	0.691	1.34	Unpaved	13.55														13.5		
									791	1.474	2.47	Paved	5.34														5.3		
																						1,867	6.00	6.00	5.2		5.2		
RUS_007_040		3,613	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.497	3.95	0.5																		RUS_007_040	0.5	**10.7**	**0.18**
									273	0.714	1.72	Paved	2.65														2.6		
														1,182	2.760	4.7	11.2	0.045	3.09		3.09	6.38						6.4		
														2,106	1.153	80.2	35.5	0.065	4.24		4.24	8.28						8.3		
RUS_007_050		2,081	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_007_050	1.1	**6.6**	**0.11**
									1,310	1.877	2.79	Paved	7.84														7.8		
																						722	6.00	6.00	2.0		2.0		
RUS_007_060		972	53	0.150	Grass-Short Grass Prairie	3.873	3.95	4.1																		RUS_007_060	4.1	**5.1**	**0.09**
									777	2.448	3.18	Paved	4.07														4.1		
																						142	6.00	6.00	0.4		0.4		
RUS_007_070		3,594	100	0.150	Grass-Short Grass Prairie	5.870	3.95	5.7																		RUS_007_070	5.7	**13.2**	**0.22**
														2,102	1.452	15.5	27.5	0.045	2.73		2.73	12.85						12.9		
																						767	6.00	6.00	2.1		2.1		
														625	3.995	36.3	15.3	0.065	8.17		8.17	1.28						1.3		
RUS_008_010		4,459	100	0.150	Grass-Short Grass Prairie	0.755	3.95	13.0																		RUS_008_010	13.0	**17.4**	**0.29**
														1,283	1.961	2.4	4.6	0.045	3.03		3.03	7.07						7.1		
																						2,450	6.00	6.00	6.8		6.8		
														620	2.319	13.9	8.6	0.065	4.83		4.83	2.14						2.1		
RUS_009_010		3,279	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_009_010	1.1	**7.1**	**0.12**
									471	1.550	2.53	Paved	3.10														3.1		
																						2,758	6.00	6.00	7.7		7.7		
RUS_009_020		3,793	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.672	3.95	1.0																		RUS_009_020	1.0	**13.0**	**0.22**
									1,970	1.058	2.09	Paved	15.70														15.7		
																						1,774	6.00	6.00	4.9		4.9		
RUS_009_030		3,660	51	0.150	Grass-Short Grass Prairie	5.576	3.95	3.4																		RUS_009_030	3.4	**9.2**	**0.15**
									223	0.526	1.47	Paved	2.52														2.5		
																						3,387	6.00	6.00	9.4		9.4		
RUS_009_040		3,486	49	0.150	Grass-Short Grass Prairie	2.375	3.95	4.7																		RUS_009_040	4.7	**14.5**	**0.24**
									1,374	0.886	1.91	Paved	11.97														12.0		
														751	2.041	1.3	2.7	0.045	2.89		2.89	4.33						4.3		
																						435	6.00	6.00	1.2		1.2		
														878	1.504	1.4	3.3	0.015	7.01		7.01	2.09						2.1		
RUS_009_050		3,246	32	0.150	Grass-Short Grass Prairie	4.626	3.95	2.5																		RUS_009_050	2.5	**11.1**	**0.19**
									601	0.863	1.89	Paved	5.30														5.3		
																						409	6.00	6.00	1.1		1.1		
														1,290	1.118	38.9	52.1	0.045	2.88		2.88	7.46						7.5		
														914	1.796	1.1	2.8	0.015	7.24		7.24	2.11						2.1		
RUS_009_060		517	50	0.150	Grass-Short Grass Prairie	2.845	3.95	4.4																		RUS_009_060	4.4	**4.1**	**0.07**
									467	2.501	3.21	Paved	2.42														2.4		
RUS_009_070		1,305	100	0.150	Grass-Short Grass Prairie	3.928	3.95	6.7																		RUS_009_070	6.7	**6.5**	**0.11**
														1,205	2.904	11.8	14.8	0.045	4.85		4.85	4.14						4.1		
RUS_009_080		2,650	44	0.150	Grass-Short Grass Prairie	9.012	3.95	2.5																		RUS_009_080	2.5	**8.3**	**0.14**
									1,042	1.494	2.48	Paved	6.99														7.0		
																						1,563	6.00	6.00	4.3		4.3		
RUS_009_090		762	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_009_090	1.1	**2.3**	**0.04**
									712	4.332	4.23	Paved	2.80														2.8		
RUS_010_001_010		2,007	31	0.150	Grass-Short Grass Prairie	8.518	3.95	1.9																		RUS_010_001_010	1.9	**6.7**	**0.11**
									1,076	1.754	2.69	Paved	6.66														6.7		
																						900	6.00	6.00	2.5		2.5		
RUS_010_001_020		1,631	100	0.150	Grass-Short Grass Prairie	2.568	3.95	8.0																		RUS_010_001_020	8.0	**10.0**	**0.17**
									329	1.345	1.87	Unpaved	2.93														2.9		
									656	1.566	2.54	Paved	4.30														4.3		
																						546	6.00	6.00	1.5		1.5		
RUS_010_002_010		3,151	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.478	3.95	0.7																		RUS_010_002_010	0.7	**7.8**	**0.13**
									1,207	2.020	2.89	Paved	6.96														7.0		
																						1,892	6.00	6.00	5.3		5.3		
RUS_010_002_020		729	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.895	3.95	0.5																		RUS_010_002_020	0.5	**2.7**	**0.05**
									489	1.276	2.30	Paved	3.55														3.5		
																						185	6.00	6.00	0.5		0.5		
RUS_010_002_030		268	100	0.150	Grass-Short Grass Prairie	3.992	3.95	6.7																		RUS_010_002_030	6.7	**4.4**	**0.07**
									169	7.631	4.46	Unpaved	0.63														0.6		
RUS_010_003_010		3,676	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_010_003_010	1.1	**8.0**	**0.13**
									332	0.979	2.01	Paved	2.75														2.8		
																						2,801	6.00	6.00	7.8		7.8		
														493	2.674	8.4	5.6	0.065	4.95		4.95	1.66						1.7		
RUS_010_003_020		782	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.740	3.95	0.9																		RUS_010_003_020	0.9	**2.3**	**0.04**
									732	4.394	4.26	Paved	2.86														2.9		
RUS_010_004_010		3,696	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.845	3.95	0.6																		RUS_010_004_010	0.6	**13.0**	**0.22**
									2,116	1.071	2.10	Paved	16.76														16.8		
																						1,530	6.00	6.00	4.3		4.3		
RUS_010_004_020		2,840	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_010_004_020	1.1	**10.7**	**0.18**
									1,248	0.837	1.86	Paved	11.18														11.2		
														695	0.500	87.1	32.9	0.055	3.67		3.67	3.16						3.2		
																						846	6.00	6.00	2.4		2.4		
RUS_010_004_030		5,070	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RUS_010_004_030	15.4	**23.5**	**0.39**
														2,154	0.945	13.7	23.5	0.045	2.25		2.25	15.95						15.9		
																						2,815	6.00	6.00	7.8		7.8		

Middle Rush Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_010_004_040		1,541	41	0.150	Grass-Short Grass Prairie	2.765	3.95	3.8																		RUS_010_004_040	3.8	**6.1**	**0.10**
									977	2.681	3.33	Paved	4.89														4.9		
																							523	6.00	6.00	1.5		1.5		
RUS_010_010		4,841	100	0.150	Grass-Short Grass Prairie	4.537	3.95	6.4																		RUS_010_010	6.4	**19.4**	**0.32**
									213	3.976	3.22	Unpaved	1.10														1.1		
														2,090	1.163	3.5	9.2	0.045	1.89		1.89	18.47						18.5		
																							1,312	6.00	6.00	3.6		3.6		
														646	1.756	0.7	1.6	0.015	7.25		7.25	1.49						1.5		
																							480	6.00	6.00	1.3		1.3		
RUS_010_020		343	100	0.150	Grass-Short Grass Prairie	0.525	3.95	15.1																		RUS_010_020	15.1	**9.6**	**0.16**
									241	6.397	4.08	Unpaved	0.98														1.0		
RUS_010_030		1,321	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.663	3.95	0.6																		RUS_010_030	0.6	**4.5**	**0.08**
									1,271	2.209	3.02	Paved	7.01														7.0		
RUS_010_040		1,759	100	0.150	Grass-Short Grass Prairie	4.802	3.95	6.2																		RUS_010_040	6.2	**7.7**	**0.13**
									602	1.730	2.67	Paved	3.75														3.8		
																							1,059	6.00	6.00	2.9		2.9		
RUS_011_010		2,319	100	0.150	Grass-Short Grass Prairie	2.369	3.95	8.2																		RUS_011_010	8.2	**11.0**	**0.18**
									789	2.589	2.60	Unpaved	5.07														5.1		
														1,432	1.614	56.0	26.8	0.065	4.76		4.76	5.02						5.0		
RUS_011_020		1,738	71	0.150	Grass-Short Grass Prairie	3.175	3.95	5.6																		RUS_011_020	5.6	**8.0**	**0.13**
														1,299	3.035	3.9	9.5	0.045	3.18		3.18	6.80						6.8		
																							368	6.00	6.00	1.0		1.0		
RUS_012_010		4,330	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.660	3.95	0.7																		RUS_012_010	0.7	**11.2**	**0.19**
									219	1.260	2.28	Paved	1.60														1.6		
									927	1.540	2.00	Unpaved	7.72														7.7		
																							3,133	6.00	6.00	8.7		8.7		
RUS_012_020		4,124	100	0.150	Grass-Short Grass Prairie	0.813	3.95	12.6																		RUS_012_020	12.6	**16.8**	**0.28**
									540	1.611	2.05	Unpaved	4.39														4.4		
									464	2.235	3.04	Paved	2.54														2.5		
																							3,020	6.00	6.00	8.4		8.4		
RUS_012_030		423	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.381	3.95	0.5																		RUS_012_030	0.5	**1.3**	**0.02**
									375	3.338	3.71	Paved	1.68														1.7		
RUS_013_010		2,469	100	0.150	Grass-Short Grass Prairie	1.827	3.95	9.1																		RUS_013_010	9.1	**11.5**	**0.19**
									743	1.962	2.26	Unpaved	5.48														5.5		
																							1,625	6.00	6.00	4.5		4.5		
RUS_013_020		1,511	100	0.150	Grass-Short Grass Prairie	0.590	3.95	14.4																		RUS_013_020	14.4	**15.5**	**0.26**
									1,410	1.593	2.04	Unpaved	11.54														11.5		
RUS_013_030		1,261	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_013_030	1.1	**4.0**	**0.07**
									1,212	3.168	3.62	Paved	5.58														5.6		
RUS_014_010		3,428	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.947	3.95	0.5																		RUS_014_010	0.5	**12.6**	**0.21**
														1,756	0.732	14.4	21.2	0.045	2.19		2.19	13.37						13.4		
																							528	6.00	6.00	1.5		1.5		
														1,099	1.577	11.1	16.0	0.045	3.26		3.26	5.62						5.6		
RUS_014_020		2,053	100	0.150	Grass-Short Grass Prairie	4.554	3.95	6.3																		RUS_014_020	6.3	**11.4**	**0.19**
									131	5.140	3.66	Unpaved	0.60														0.6		
									475	1.609	2.58	Paved	3.07														3.1		
									467	0.546	1.19	Unpaved	6.53														6.5		
																							882	6.00	6.00	2.5		2.5		
RUS_015_010		3,692	100	0.150	Grass-Short Grass Prairie	2.397	3.95	8.2																		RUS_015_010	8.2	**15.5**	**0.26**
									432	0.582	1.55	Paved	4.64														4.6		
																							638	6.00	6.00	1.8		1.8		
														889	1.588	22.2	56.4	0.045	2.24		2.24	6.61						6.6		
																							1,634	6.00	6.00	4.5		4.5		
RUS_015_020		2,629	100	0.150	Grass-Short Grass Prairie	2.181	3.95	8.5																		RUS_015_020	8.5	**10.2**	**0.17**
									56	2.495	2.55	Unpaved	0.37														0.4		
									388	1.870	2.78	Paved	2.33														2.3		
																							2,085	6.00	6.00	5.8		5.8		
RYA_000_010		2,853	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RYA_000_010	1.1	**10.0**	**0.17**
									1,121	0.714	1.72	Paved	10.88														10.9		
																							1,681	6.00	6.00	4.7		4.7		
RYA_000_020		5,389	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RYA_000_020	15.4	**19.6**	**0.33**
									709	2.571	2.59	Unpaved	4.57														4.6		
																							4,581	6.00	6.00	12.7		12.7		
RYA_000_030		4,581	100	0.150	Grass-Short Grass Prairie	2.566	3.95	8.0																		RYA_000_030	8.0	**16.4**	**0.27**
									1,191	1.453	1.94	Unpaved	10.21														10.2		
																							3,290	6.00	6.00	9.1		9.1		
RYA_000_040		4,283	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.387	3.95	0.7																		RYA_000_040	0.7	**8.7**	**0.14**
									575	1.727	2.67	Paved	3.59														3.6		
																							3,657	6.00	6.00	10.2		10.2		
RYA_000_050		456	100	0.150	Grass-Short Grass Prairie	2.022	3.95	8.8																		RYA_000_050	8.8	**6.5**	**0.11**
									357	3.319	2.94	Unpaved	2.02														2.0		
RYA_000_060		1,480	100	0.150	Grass-Short Grass Prairie	1.520	3.95	9.8																		RYA_000_060	9.8	**11.3**	**0.19**
									1,000	2.134	2.36	Unpaved	7.07														7.1		
									381	4.080	3.26	Unpaved	1.95														1.9		
RYA_000_070		3,198	100	0.150	Grass-Short Grass Prairie	1.235	3.95	10.7																		RYA_000_070	10.7	**14.0**	**0.23**
									937	2.236	2.41	Unpaved	6.47														6.5		
														416	2.751	23.4	15.2	0.065	5.06		5.06	1.37						1.4		
																							1,744	6.00	6.00	4.8		4.8		
RYA_000_080		1,688	100	0.150	Grass-Short Grass Prairie	2.993	3.95	7.5																		RYA_000_080	7.5	**8.3**	**0.14**
									614	3.984	4.06	Paved	2.52														2.5		
														668	1.829	1.1	7.3	0.015	3.85		3.85	2.89						2.9		
																							301	6.00	6.00	0.8		0.8		
RYA_001_010		3,045	47	0.150	Grass-Short Grass Prairie	4.536	3.95	3.5																		RYA_001_010	3.5	**11.1**	**0.18**
									1,943	1.879	2.79	Paved	11.62														11.6		
																							428	6.00	6.00	1.2		1.2		

Middle Rush Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
														628	0.866	91.4	26.9	0.065	4.83		4.83	2.17						2.2		
RYA_001_020		1,206	100	0.150	Grass-Short Grass Prairie	1.416	3.95	10.1																			RYA_001_020	10.1	**8.5**	**0.14**
									272	2.860	2.73	Unpaved	1.66															1.7		
																							834	6.00	6.00	2.3		2.3		
TWI_000_010		3,106	35	0.150	Grass-Short Grass Prairie	5.166	3.95	2.6																			TWI_000_010	2.6	**12.0**	**0.20**
									1,530	0.931	1.96	Paved	13.00															13.0		
																							294	6.00	6.00	0.8		0.8		
														334	1.700	28.3	16.5	0.065	4.28		4.28	1.30						1.3		
																							528	6.00	6.00	1.5		1.5		
														385	1.504	6.0	10.7	0.015	8.26		8.26	0.78						0.8		
TWI_000_020		2,662	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.476	3.95	0.6																			TWI_000_020	0.6	**5.3**	**0.09**
									613	3.063	3.56	Paved	2.87															2.9		
																							1,169	6.00	6.00	3.2		3.2		
														831	1.287			0.065	6.27	6.27	6.27	2.21						2.2		
TWI_000_030		3,151	81	0.150	Grass-Short Grass Prairie	3.009	3.95	6.3																			TWI_000_030	6.3	**13.7**	**0.23**
									1,162	0.675	1.67	Paved	11.60															11.6		
																							1,294	6.00	6.00	3.6		3.6		
														613	0.900			0.065	8.10	8.10	8.10	1.26						1.3		
TWI_000_040		1,403	100	0.150	Grass-Short Grass Prairie	2.163	3.95	8.5																			TWI_000_040	8.5	**11.7**	**0.20**
									1,302	1.493	1.97	Unpaved	11.01															11.0		
TWI_000_050		3,239	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.756	3.95	0.7																			TWI_000_050	0.7	**8.7**	**0.15**
									1,619	1.929	2.82	Paved	9.56															9.6		
																							1,570	6.00	6.00	4.4		4.4		
TWI_000_060		1,818	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			TWI_000_060	15.4	**15.6**	**0.26**
									123	1.082	1.68	Unpaved	1.22															1.2		
									1,596	1.899	2.80	Paved	9.50															9.5		
TWI_000_070		4,548	100	0.150	Grass-Short Grass Prairie	0.846	3.95	12.4																			TWI_000_070	12.4	**20.9**	**0.35**
														1,040	0.500	16.7	29.1	0.045	1.61		1.61	10.73						10.7		
														350	3.561	2.7	5.1	0.015	12.41		12.41	0.47						0.5		
									689	1.863	2.77	Paved	4.14															4.1		
																							1,544	6.00	6.00	4.3		4.3		
														825	1.486	87.4	36.7	0.065	4.98		4.98	2.76						2.8		
TWI_000_080		1,292	100	0.150	Grass-Short Grass Prairie	1.766	3.95	9.3																			TWI_000_080	9.3	**9.1**	**0.15**
									348	2.510	2.56	Unpaved	2.27															2.3		
									626	2.994	3.52	Paved	2.97															3.0		
																							219	6.00	6.00	0.6		0.6		
TWI_000_090		248	100	0.150	Grass-Short Grass Prairie	12.420	3.95	4.2																			TWI_000_090	4.2	**3.0**	**0.05**
									149	3.507	3.02	Unpaved	0.82															0.8		
TWI_000_100		3,353	100	0.150	Grass-Short Grass Prairie	2.027	3.95	8.8																			TWI_000_100	8.8	**12.9**	**0.22**
									371	3.046	2.82	Unpaved	2.20															2.2		
									675	1.958	2.84	Paved	3.96															4.0		
																							1,054	6.00	6.00	2.9		2.9		
														1,154	2.465	88.5	50.1	0.065	5.25		5.25	3.66						3.7		
TWI_001_010		3,147	100	0.150	Grass-Short Grass Prairie	2.091	3.95	8.7																			TWI_001_010	8.7	**14.7**	**0.25**
														1,404	0.664	16.2	21.9	0.045	2.21		2.21	10.58						10.6		
																							1,266	6.00	6.00	3.5		3.5		
														378	0.703	50.4	25.4	0.055	3.59		3.59	1.76						1.8		
TWI_002_010		1,046	100	0.150	Grass-Short Grass Prairie	3.380	3.95	7.1																			TWI_002_010	7.1	**7.6**	**0.13**
									491	4.489	3.42	Unpaved	2.39															2.4		
									456	1.497	2.49	Paved	3.06															3.1		
TWI_003_010		2,713	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.596	3.95	0.5																			TWI_003_010	0.5	**6.2**	**0.10**
									536	4.721	4.42	Paved	2.02															2.0		
																							1,811	6.00	6.00	5.0		5.0		
														318	0.500	15.5	12.2	0.065	1.90		1.90	2.79						2.8		
TWI_004_010		3,365	26	0.150	Grass-Short Grass Prairie	6.863	3.95	1.8																			TWI_004_010	1.8	**9.6**	**0.16**
									1,111	1.285	2.30	Paved	8.04															8.0		
																							2,228	6.00	6.00	6.2		6.2		
TWI_004_020		1,374	100	0.150	Grass-Short Grass Prairie	3.757	3.95	6.9																			TWI_004_020	6.9	**7.3**	**0.12**
									678	2.389	3.14	Paved	3.60															3.6		
																							597	6.00	6.00	1.7		1.7		
TWI_004_030		1,291	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.534	3.95	0.5																			TWI_004_030	0.5	**4.2**	**0.07**
									70	4.908	4.50	Paved	0.26															0.3		
									779	2.512	2.56	Unpaved	5.08															5.1		
																							394	6.00	6.00	1.1		1.1		

Stream RC-1 Existing Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel Flow	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_RCO_001_010		2,640	100	0.150	Grass-Short Grass Prairie	0.880	3.95	12.2																		RUS_RCO_001_010	12.2	**18.7**	**0.31**
									1,101	1.360	1.88	Unpaved	9.75														9.8		
									1,270	1.419	2.42	Paved	8.74														8.7		
																						169	6	6.00	0.5		0.5		
RUS_RCO_002_010		4,461	76	0.150	Grass-Short Grass Prairie	2.473	3.95	6.5																		RUS_RCO_002_010	6.5	**18.8**	**0.31**
									1,586	0.597	1.57	Paved	16.83														16.8		
														633	0.500	9.7	14.5	0.015	5.40		5.40	1.95						2.0		
																							2,166	6	6.00	6.0		6.0		
RUS_RCO_002_020		938	100	0.150	Grass-Short Grass Prairie	1.260	3.95	10.6																		RUS_RCO_002_020	10.6	**11.8**	**0.20**
									37	8.935	4.82	Unpaved	0.13														0.1		
									761	0.500	1.44	Paved	8.82														8.8		
																						40	6	6.00	0.1		0.1		
RUS_RCO_010		3,067	44	0.150	Grass-Short Grass Prairie	0.500	3.95	8.0																		RUS_RCO_010	8.0	**17.0**	**0.28**
									1,226	0.500	1.44	Paved	14.22														14.2		
																						1,267	6	6.00	3.5		3.5		
														530	0.604	111.4	42.6	0.065	3.38		3.38	2.61						2.6		
RUS_RCO_020		5,143	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.260	3.95	0.6																		RUS_RCO_020	0.6	**10.8**	**0.18**
									623	0.894	1.92	Paved	5.40														5.4		
																						3,093	6	6.00	8.6		8.6		
														1,377	0.566					6.81	6.81	3.37						3.4		
RUS_RCO_030		4,440	43	0.150	Grass-Short Grass Prairie	2.596	3.95	4.0																		RUS_RCO_030	4.0	**14.0**	**0.23**
									2,084	1.737	2.68	Paved	12.96														13.0		
																						2,239	6	6.00	6.2		6.2		
														74	0.701	15.0	17.0	0.015	7.65		7.65	0.16						0.2		
RUS_RCO_040		2,647	100	0.150	Grass-Short Grass Prairie	2.280	3.95	8.4																		RUS_RCO_040	8.4	**11.1**	**0.18**
									159	8.315	4.65	Unpaved	0.57														0.6		
									993	2.107	2.95	Paved	5.61														5.6		
																						1,396	6	6.00	3.9		3.9		
RUS_RCO_050		3,439	100	0.150	Grass-Short Grass Prairie	0.540	3.95	14.9																		RUS_RCO_050	14.9	**18.5**	**0.31**
									82	2.425	2.51	Unpaved	0.54														0.5		
									2,551	2.552	3.25	Paved	13.09														13.1		
																						280	6	6.00	0.8		0.8		
RUS_RCO_060		2,387	100	0.150	Grass-Short Grass Prairie	1.550	3.95	9.8						426	0.501	5.0	9.1	0.015	4.71		4.71	1.51						1.5		
									526	0.547	1.19	Unpaved	7.35													RUS_RCO_060	9.8	**19.8**	**0.33**
									1,273	0.510	1.45	Paved	14.61														7.3		
																						488	6	6.00	1.4		14.6		
RUS_RCO_070		4,161	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.740	3.95	0.4																		RUS_RCO_070	1.4	**9.1**	**0.15**
									2,074	3.498	3.80	Paved	9.09														0.4		
																						2,037	6	6.00	5.7		9.1		
RUS_RCO_080		2,228	100	0.150	Grass-Short Grass Prairie	2.225	3.95	8.5																		RUS_RCO_080	5.7	**10.5**	**0.18**
									1,001	1.922	2.82	Paved	5.92														8.5		
																						1,128	6	6.00	3.1		5.9		
RUS_RCO_090		4,509	87	0.150	Grass-Short Grass Prairie	2.008	3.95	7.9																		RUS_RCO_090	3.1	**20.7**	**0.35**
									3,099	1.224	2.25	Paved	22.97														7.9		
																						1,324	6	6.00	3.7		23.0		
RUS_RCO_100		2,499	49	0.150	Grass-Short Grass Prairie	0.500	3.95	8.7																		RUS_RCO_100	3.7	**13.7**	**0.23**
									1,120	0.782	1.80	Paved	10.38														8.7		
																						1,330	6	6.00	3.7		10.4		
RUS_RCO_110		2,443	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.700	3.95	1.0																		RUS_RCO_110	3.7	**11.7**	**0.20**
									1,940	0.845	1.87	Paved	17.30														1.0		
																						453	6	6.00	1.3		17.3		
RUS_RCO_120		2,934	100	0.150	Grass-Short Grass Prairie	2.150	3.95	8.6																		RUS_RCO_120	1.3	**14.3**	**0.24**
									25	9.370	4.94	Unpaved	0.08														8.6		
									2,810	2.300	3.08	Paved	15.19														0.1		
RUS_RCO_130		2,380	100	0.150	Grass-Short Grass Prairie	2.210	3.95	8.5																		RUS_RCO_130	15.2	**11.7**	**0.19**
									41	7.259	4.35	Unpaved	0.16														8.5		
									2,128	2.748	3.37	Paved	10.52														0.2		
																						111	6	6.00	0.3		10.5		
RUS_RCO_140		2,218	100	0.150	Grass-Short Grass Prairie	2.020	3.95	8.8																		RUS_RCO_140	0.3	**12.1**	**0.20**
									83	2.624	2.61	Unpaved	0.53														8.8		
									844	0.807	1.83	Paved	7.70														0.5		
									109	10.417	5.21	Unpaved	0.35														7.7		
														1,082	4.248	87.8	54.3	0.065	6.51		6.51	2.77						0.3		
RUS_RCO_150		1,740	100	0.150	Grass-Short Grass Prairie	5.250	3.95	6.0																		RUS_RCO_150	2.8	**10.2**	**0.17**
									696	5.939	3.93	Unpaved	2.95														6.0		
									812	0.761	1.77	Paved	7.63														3.0		
																						132	6	6.00	0.4		7.6		
RUS_TOA_010		3,284	100	0.150	Grass-Short Grass Prairie	0.990	3.95	11.7																		RUS_TOA_010	0.4	**19.5**	**0.33**
									101	1.302	1.84	Unpaved	0.91														11.7		
									1,287	0.500	1.44	Paved	14.92														0.9		
																						1,795	6	6.00	5.0		14.9		
RUS_TOA_020		2,315	100	0.150	Grass-Short Grass Prairie	4.880	3.95	6.2																		RUS_TOA_020	5.0	**7.6**	**0.13**
									131	3.939	3.20	Unpaved	0.68														6.2		
														346	4.051	37.2	51.7	0.045	5.35		5.35	1.08						0.7		
														114	2.516	12.4	36.3	0.015	7.70		7.70	0.25						1.1		
																						1,624	6	6.00	4.5		0.2		
RUS_TOA_030		3,613	100	0.150	Grass-Short Grass Prairie	0.830	3.95	12.5																		RUS_TOA_030	4.5		
																											12.5	**14.9**	**0.25**

Stream RC-1 Existing Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel Flow	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
									46	8.211	4.62	Unpaved	0.17														0.2		
									1,353	3.017	3.53	Paved	6.39														6.4		
																						240	6	6.00	0.7		0.7		
														1,874	0.970	0.6	2.1	0.015	4.25	6.09	6.09	5.13					5.1		
RUS_TOA_040		2,776	100	0.150	Grass-Short Grass Prairie	1.170	3.95	10.9																			RUS_TOA_040	10.9	**12.5**	**0.21**
									192	3.440	2.99	Unpaved	1.07														1.1		
									785	2.437	3.17	Paved	4.12														4.1		
																						1,698	6	6.00	4.7		4.7		
RUS_TOA_050		4,900	100	0.150	Grass-Short Grass Prairie	0.860	3.95	12.4																			RUS_TOA_050	12.4	**21.3**	**0.36**
									34	7.690	4.47	Unpaved	0.13														0.1		
									1,787	0.985	2.02	Paved	14.76														14.8		
																						2,979	6	6.00	8.3		8.3		
RUS_TOA_055		7,994	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.820	3.95	0.9																			RUS_TOA_055	0.9	**30.8**	**0.51**
									1,191	0.825	1.47	Unpaved	13.54														13.5		
														6,753	0.908	27.9	21.8	0.055	3.05		3.05	36.92					36.9		
RUS_TOA_060		2,926	100	0.150	Grass-Short Grass Prairie	3.350	3.95	7.2																			RUS_TOA_060	7.2	**19.4**	**0.32**
									651	0.500	1.14	Unpaved	9.51														9.5		
									2,175	1.286	2.30	Paved	15.73														15.7		
RUS_TOA_070		2,587	100	0.150	Grass-Short Grass Prairie	1.070	3.95	11.3																			RUS_TOA_070	11.3	**18.1**	**0.30**
									1,500	0.584	1.55	Paved	16.09														16.1		
																						987	6	6.00	2.7		2.7		
RUS_TOA_080		5,019	100	0.150	Grass-Short Grass Prairie	3.001	3.95	7.5																			RUS_TOA_080	7.5	**14.8**	**0.25**
									1,098	1.873	2.78	Paved	6.58														6.6		
																						3,623	6	6.00	10.1		10.1		
														204	3.945	24.7	13.3	0.065	6.88		6.88	0.49					0.5		
RUS_TOA_090		3,864	100	0.150	Grass-Short Grass Prairie	1.660	3.95	9.5																			RUS_TOA_090	9.5	**14.2**	**0.24**
									608	4.924	3.58	Unpaved	2.83														2.8		
									41	0.879	1.91	Paved	0.36														0.4		
														398	2.856	4.6	6.4	0.045	4.49		4.49	1.48					1.5		
																						303	6	6.00	0.8		0.8		
														504	1.092	6.2	12.1	0.045	2.21		2.21	3.80					3.8		
																						1,202	6	6.00	3.3		3.3		
														709	2.154	134.2	35.6	0.065	8.15		8.15	1.45					1.4		
RUS_TOA_100		4,958	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.980	3.95	0.6																			RUS_TOA_100	0.6	**9.8**	**0.16**
									713	2.022	2.89	Paved	4.11														4.1		
																						2,960	6	6.00	8.2		8.2		
														542	1.081	17.8	8.5	0.045	5.63		5.63	1.60					1.6		
														693	3.696	42.8	24.6	0.065	6.38		6.38	1.81					1.8		

Upper Rush Existing Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_000_010		3,581	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			RUS_000_010	49	**29.5**	**0.49**
									1,480	0.697	1.35	Unpaved	18.31																
														2,001	0.981	55.2	88.3	0.050	2.16		2.16	15.45							
RUS_000_020		2,722	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.320	3.95	0.7																			RUS_000_020	12	**7.4**	**0.12**
														2,672	0.964	27.0	21.0	0.045	3.84		3.84	11.58							
RUS_000_030		3,258	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			RUS_000_030	45	**27.0**	**0.45**
									2,660	1.091	1.69	Unpaved	26.30																
														498	0.500	121.5	110.5	0.045	2.49		2.49	3.33							
RUS_000_040		1,419	100	0.150	Grass-Short Grass Prairie	1.970	3.95	8.9																			RUS_000_040	19	**11.5**	**0.19**
									1,031	1.437	1.93	Unpaved	8.88																
														288	0.625	53.4	22.5	0.065	3.22		3.22	1.49							
RUS_000_050		2,882	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.276	3.95	0.7																			RUS_000_050	21	**12.5**	**0.21**
									1,679	0.864	1.89	Paved	14.81																
																							375	6	6.00	1.0			
														778	0.966	52.9	59.3	0.045	3.02		3.02	4.30							
RUS_000_060		2,425	100	0.150	Grass-Short Grass Prairie	1.115	3.95	11.1																			RUS_000_060	19	**11.6**	**0.19**
									594	2.216	2.40	Unpaved	4.12																
																							1,053	6	6.00	2.9			
														678	1.563	115.4	87.2	0.024	9.36		9.36	1.21							
RUS_000_070		2,113	100	0.150	Grass-Short Grass Prairie	0.505	3.95	15.3																			RUS_000_070	33	**20.1**	**0.33**
									2,013	1.313	1.85	Unpaved	18.15																
RUS_000_080		2,523	100	0.150	Grass-Short Grass Prairie	0.540	3.95	14.9																			RUS_000_080	28	**16.8**	**0.28**
									673	1.797	2.16	Unpaved	5.19																
														1,749	0.692	5.7	3.7	0.045	3.70		3.70	7.89							
RUS_000_085		3,636	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			RUS_000_085	35	**20.7**	**0.35**
									574	2.162	2.37	Unpaved	4.03																
														2,962	0.935					3.26	3.26	15.14								
RUS_000_090		2,192	100	0.150	Grass-Short Grass Prairie	0.564	3.95	14.6																			RUS_000_090	32	**19.5**	**0.32**
									2,092	1.468	1.96	Unpaved	17.83																
RUS_000_100		4,764	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.820	3.95	0.9																			RUS_000_100	26	**15.8**	**0.26**
									831	1.203	1.77	Unpaved	7.83																
																							1,845	6	6.00	5.1			
														2,037	1.009	131.6	131.6	0.055	2.72		2.72	12.48							
RUS_000_110		3,764	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.540	3.95	1.1																			RUS_000_110	26	**15.7**	**0.26**
									1,699	1.018	1.63	Unpaved	17.39																
																							262	6	6.00	0.7			
														1,753	1.778	40.8	44.7	0.045	4.15		4.15	7.03							
RUS_000_120		1,360	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.060	3.95	0.6																			RUS_000_120	10	**5.9**	**0.10**
									1,310	2.172	2.38	Unpaved	9.18																
RUS_000_130		2,066	100.0	0.150	Grass-Short Grass Prairie	0.760	3.95	13.0																			RUS_000_130	20	**12.0**	**0.20**
														1,966	2.272	6.7	7.4	0.045	4.65		4.65	7.04							
RUS_000_140		2,863	100.0	0.150	Grass-Short Grass Prairie	1.270	3.95	10.6																			RUS_000_140	23	**14.0**	**0.23**
									928	1.585	2.03	Unpaved	7.61																
																							1,835	6	6.00	5.1			
RUS_000_150		2,761	100.0	0.150	Grass-Short Grass Prairie	2.107	3.95	8.6																			RUS_000_150	18	**10.5**	**0.18**
									446	1.850	2.77	Paved	2.69																
																							2,001	6	6.00	5.6			
														214	5.486	31.9	29.5	0.065	5.66		5.66	0.63							
RUS_000_160		1,865	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.940	3.95	0.8																			RUS_000_160	11	**6.4**	**0.11**
									1,089	1.328	2.34	Paved	7.75																
																							726	6	6.00	2.0			
RUS_000_170		1,952	100.0	0.150	Grass-Short Grass Prairie	0.810	3.95	12.7																			RUS_000_170	19	**11.4**	**0.19**
									383	2.035	2.90	Paved	2.20																
																							1,469	6	6.00	4.1			
RUS_000_180		747	100.0	0.150	Grass-Short Grass Prairie	0.940	3.95	11.9																			RUS_000_180	16	**9.4**	**0.16**
									647	3.321	2.94	Unpaved	3.67																
RUS_016_010		2,662	100.0	0.150	Grass-Short Grass Prairie	2.835	3.95	7.7																			RUS_016_010	18	**11.0**	**0.18**
									693	1.080	2.11	Paved	5.47																
																							1,869	6	6.00	5.2			
RUS_016_020		3,161	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.705	3.95	1.0																			RUS_016_020	20	**12.2**	**0.20**
									2,082	1.064	2.10	Paved	16.55																
																							1,030	6	6.00	2.9			
RUS_016_030		2,587	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.680	3.95	1.0																			RUS_016_030	9	**5.6**	**0.09**
									504	2.282	3.07	Paved	2.74																
																							2,033	6	6.00	5.6			
RUS_016_040		2,434	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	6.328	3.95	0.4																			RUS_016_040	9	**5.2**	**0.09**
									707	3.158	3.61	Paved	3.26																
																							1,199	6	6.00	3.3			
														477	2.307	57.3	35.8	0.065	4.77		4.77	1.67							
RUS_017_010		677	100.0	0.150	Grass-Short Grass Prairie	0.940	3.95	11.9																			RUS_017_010	15	**8.8**	**0.15**
									145	2.091	2.33	Unpaved	1.04																
														432	1.238	115.9	65.0	0.055	4.43		4.43	1.62							
RUS_018_010		2,702	100.0	0.150	Grass-Short Grass Prairie	1.611	3.95	9.6																			RUS_018_010	25	**15.2**	**0.25**
									1,064	1.266	1.82	Unpaved	9.77																
														884	0.500	70.0	37.8	0.045	3.53		3.53	4.17							
RUS_018_020		2,891	100.0	0.150	Grass-Short Grass Prairie	0.970	3.95	11.8																			RUS_018_020	35	**21.2**	**0.35**
									1,383	1.595	2.04	Unpaved	11.31																
														1,408	0.795	49.3	81.0	0.050	1.91		1.91	12.29							
RUS_018_030		2,585	100.0	0.150	Grass-Short Grass Prairie	0.742	3.95	13.1																			RUS_018_030	25	**14.7**	**0.25**
									851	2.307	2.45	Unpaved	5.79																
														1,634	1.004					4.86	4.86	5.60								
RUS_018_040		2,976	100.0	0.150	Grass-Short Grass Prairie	0.730	3.95	13.2																			RUS_018_040	31	**18.8**	**0.31**
									1,774	1.860	2.20	Unpaved	13.44																
														1,102	0.645					3.96	3.96	4.64								

Upper Rush Existing Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_018_050		3,423	100.0	0.150	Grass-Short Grass Prairie	2.870	3.95	7.6																		RUS_018_050	25	**14.7**	**0.25**
									1,647	1.569	2.55	Paved	10.78																
																						585	6	6.00	1.6				
														1,091	0.806					4.07	4.07	4.47							
RUS_019_010		2,630	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RUS_019_010	31	**18.7**	**0.31**
									1,333	1.403	1.91	Unpaved	11.63																
														1,197	1.247	208.7	106.6	0.055	4.73		4.73	4.21							
RUS_019_020		1,706	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.399	3.95	0.6																		RUS_019_020	11	**6.9**	**0.11**
									1,313	1.153	2.18	Paved	10.03																
														343	3.086	46.1	28.9	0.055	6.49		6.49	0.88							
RUS_020_010		4,272	100.0	0.150	Grass-Short Grass Prairie	0.540	3.95	14.9																		RUS_020_010	42	**25.0**	**0.42**
									1,285	0.500	1.14	Unpaved	18.77																
																						2,887	6	6.00	8.0				
RUS_020_020		4,387	100.0	0.150	Grass-Short Grass Prairie	0.671	3.95	13.7																		RUS_020_020	49	**29.4**	**0.49**
									2,493	0.784	1.43	Unpaved	29.08																
																						692	6	6.00	1.9				
														535	0.778	29.9	18.9	0.045	3.96		3.96	2.25							
														350	0.500	30.1	23.2	0.015	8.34		8.34	0.70							
														217	0.500	52.3	45.4	0.045	2.57		2.57	1.41							
RUS_020_030		3,118	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RUS_020_030	40	**23.8**	**0.40**
									1,974	1.221	1.78	Unpaved	18.46																
																						175	6	6.00	0.5				
														870	0.500	81.3	67.1	0.045	2.66		2.66	5.45							
RUS_020_040		4,060	100.0	0.150	Grass-Short Grass Prairie	1.630	3.95	9.6																		RUS_020_040	31	**18.8**	**0.31**
									545	2.494	2.55	Unpaved	3.56																
														3,415	0.621					3.13	3.13	18.18							
RUS_FPT_010		3,184	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.720	3.95	0.9																		RUS_FPT_010	13	**7.9**	**0.13**
									990	1.628	2.59	Paved	6.36																
																						1,560	6	6.00	4.3				
														585	0.500	141.8	78.1	0.024	6.54		6.54	1.49							
RUS_FPT_020		2,432	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_FPT_020	13	**7.7**	**0.13**
									1,403	2.614	2.61	Unpaved	8.96																
																						979	6	6.00	2.7				
RUS_NET_010		2,119	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_NET_010	10	**6.2**	**0.10**
									396	0.500	1.44	Paved	4.59																
																						1,673	6	6.00	4.6				
RUS_NET_020		710	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	6.380	3.95	0.4																		RUS_NET_020	5	**3.3**	**0.05**
									660	1.809	2.17	Unpaved	5.07																
SUB_000_010		2,952	100.0	0.150	Grass-Short Grass Prairie	0.624	3.95	14.1																		SUB_000_010	36	**21.3**	**0.36**
									1,990	1.658	2.08	Unpaved	15.96																
														862	0.500	54.1	34.2	0.055	2.60		2.60	5.53							
SUB_000_020		2,349	100.0	0.150	Grass-Short Grass Prairie	2.216	3.95	8.5																		SUB_000_020	18	**10.6**	**0.18**
									669	3.707	3.11	Unpaved	3.59																
														1,579	0.699					4.71	4.71	5.59							
SUB_000_030		751	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.084	3.95	0.5																		SUB_000_030	5	**2.8**	**0.05**
									701	3.020	2.80	Unpaved	4.17																
SUB_000_040		1,108	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		SUB_000_040	21	**12.4**	**0.21**
									1,008	3.731	3.12	Unpaved	5.39																
SUB_000_050		3,726	100.0	0.150	Grass-Short Grass Prairie	0.861	3.95	12.4																		SUB_000_050	42	**25.2**	**0.42**
									2,717	1.114	1.70	Unpaved	26.59																
														909	1.239	27.8	17.5	0.045	5.02		5.02	3.02							
SUB_000_060		3,046	100.0	0.150	Grass-Short Grass Prairie	0.725	3.95	13.2																		SUB_000_060	30	**18.1**	**0.30**
									388	1.749	2.13	Unpaved	3.03																
														1,609	1.009	30.0	30.0	0.055	2.72		2.72	9.85							
																						371	6	6.00	1.0				
														577	0.500					3.13	3.13	3.07							
SUB_000_070		4,044	100.0	0.150	Grass-Short Grass Prairie	2.269	3.95	8.4																		SUB_000_070	31	**18.8**	**0.31**
									1,623	2.069	2.32	Unpaved	11.66																
														2,321	0.688					3.45	3.45	11.21							
SUB_000_080		1,251	100.0	0.150	Grass-Short Grass Prairie	4.950	3.95	6.1																		SUB_000_080	13	**7.9**	**0.13**
									1,151	2.888	2.74	Unpaved	7.00																
SUB_000_090		4,935	100.0	0.150	Grass-Short Grass Prairie	2.225	3.95	8.5																		SUB_000_090	44	**26.3**	**0.44**
									2,607	1.188	1.76	Unpaved	24.70																
														2,228	1.010	117.4	81.9	0.055	3.46		3.46	10.72							
SUB_000_100		3,603	100.0	0.150	Grass-Short Grass Prairie	1.862	3.95	9.1																		SUB_000_100	22	**13.4**	**0.22**
									853	2.248	2.42	Unpaved	5.88																
																						2,650	6	6.00	7.4				
SUB_000_110		1,188	100.0	0.150	Grass-Short Grass Prairie	5.241	3.95	6.0																		SUB_000_110	13	**7.7**	**0.13**
									1,088	2.712	2.66	Unpaved	6.82																
SUB_000_115		1,627	100.0	0.150	Grass-Short Grass Prairie	4.390	3.95	6.4																		SUB_000_115	17	**10.2**	**0.17**
									1,527	2.211	2.40	Unpaved	10.61																
SUB_000_120		4,452	100.0	0.150	Grass-Short Grass Prairie	1.910	3.95	9.0																		SUB_000_120	31	**18.7**	**0.31**
									1,388	1.701	2.10	Unpaved	10.99																
														2,964	1.129	52.1	27.2	0.055	4.44		4.44	11.12							
SUB_000_130		2,603	100.0	0.150	Grass-Short Grass Prairie	0.558	3.95	14.7																		SUB_000_130	28	**17.0**	**0.28**
									1,125	1.420	1.92	Unpaved	9.75																
																						1,378	6	6.00	3.8				
SUB_000_140		2,769	100.0	0.150	Grass-Short Grass Prairie	1.720	3.95	9.4																		SUB_000_140	23	**13.8**	**0.23**
									795	2.961	2.78	Unpaved	4.77																
														1,873	0.500					3.52	3.52	8.87							
SUB_000_150		2,065	100.0	0.150	Grass-Short Grass Prairie	1.166	3.95	10.9																		SUB_000_150	22	**13.1**	**0.22**
									858	2.360	2.48	Unpaved	5.77																
														1,107	0.961					3.65	3.65	5.05							
SUB_000_155		2,374	100.0	0.150	Grass-Short Grass Prairie	1.673	3.95	9.5																		SUB_000_155	21	**12.4**	**0.21**
									979	2.472	2.54	Unpaved	6.43																
														1,296	1.214					4.50	4.50	4.80							

Upper Rush Existing Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
SUB_000_160		1,428	100.0	0.150	Grass-Short Grass Prairie	5.050	3.95	6.1																			SUB_000_160	14	**8.6**	**0.14**
									1,328	2.789	2.69	Unpaved	8.21																
SUB_000_170		4,539	100.0	0.150	Grass-Short Grass Prairie	0.760	3.95	13.0																			SUB_000_170	27	**16.5**	**0.27**
														4,057	1.095	60.1	34.1	0.045	5.05		5.05	13.38							
																							382	6	6.00	1.1				
SUB_000_180		2,240	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.639	3.95	1.0																			SUB_000_180	12	**7.3**	**0.12**
									768	0.976	2.01	Paved	6.38																
																							713	6	6.00	2.0				
														709	3.297	40.2	39.5	0.065	4.21		4.21	2.80							
SUB_000_190		3,147	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.975	3.95	0.8																			SUB_000_190	16	**9.8**	**0.16**
									2,056	1.796	2.72	Paved	12.58																
																							1,041	6	6.00	2.9				
SUB_000_200		3,651	100.0	0.150	Grass-Short Grass Prairie	1.627	3.95	9.6																			SUB_000_200	32	**19.0**	**0.32**
									1,716	1.266	1.82	Unpaved	15.75																
																							719	6	6.00	2.0				
														798	0.717	14.7	9.3	0.015	11.40		11.40	1.17							
														318	0.500	32.8	39.8	0.055	1.68		1.68	3.15							
SUB_000_210		2,926	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.600	3.95	0.7																			SUB_000_210	15	**8.7**	**0.15**
									1,139	2.044	2.31	Unpaved	8.23																
														1,737	1.113	23.7	9.7	0.055	5.17		5.17	5.60							
SUB_000_220		3,608	100.0	0.150	Grass-Short Grass Prairie	0.970	3.95	11.8																			SUB_000_220	37	**22.0**	**0.37**
									2,227	1.681	2.09	Unpaved	17.74																
														1,281	0.500			0.055		3.01	3.01	7.09							
SUB_000_230		3,351	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.382	3.95	0.5																			SUB_000_230	18	**11.0**	**0.18**
									499	1.903	2.80	Paved	2.97																
														1,659	0.930			0.055		3.15	3.15	8.78							
														1,143	0.764			0.024		3.15	3.15	6.05							
SUB_000_240		808	100.0	0.150	Grass-Short Grass Prairie	2.188	3.95	8.5																			SUB_000_240	12	**7.3**	**0.12**
									199	2.898	2.75	Unpaved	1.21																
									510	2.798	3.40	Paved	2.50																
SUB_000_250		4,052	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.954	3.95	0.8																			SUB_000_250	22	**13.3**	**0.22**
									1,369	0.907	1.94	Paved	11.79																
																							1,947	6	6.00	5.4				
														686	0.500	25.1	19.5	0.045	2.77		2.77	4.13							
SUB_000_260		3,034	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			SUB_000_260	18	**11.0**	**0.18**
									1,007	0.500	1.44	Paved	11.68																
																							1,977	6	6.00	5.5				
SUB_000_270		3,885	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.059	3.95	0.5																			SUB_000_270	25	**14.8**	**0.25**
									427	0.668	1.66	Paved	4.28																
									1,399	0.940	1.56	Unpaved	14.90																
														585	0.500	32.1	19.5	0.015	9.80		9.80	0.99							
																							1,423	6	6.00	4.0				
SUB_000_280		904	100.0	0.150	Grass-Short Grass Prairie	1.560	3.95	9.7																			SUB_000_280	16	**9.8**	**0.16**
									804	1.604	2.04	Unpaved	6.56																
SUB_000_290		2,946	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			SUB_000_290	14	**8.4**	**0.14**
									1,206	1.448	2.45	Paved	8.22																
																							1,690	6	6.00	4.7				
SUB_000_300		2,628	100.0	0.150	Grass-Short Grass Prairie	2.520	3.95	8.0																			SUB_000_300	18	**10.8**	**0.18**
									775	1.557	2.54	Paved	5.09																
																							1,752	6	6.00	4.9				
SUB_001_001_010		3,113	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			SUB_001_001_010	27	**16.5**	**0.27**
									1,389	2.257	3.05	Paved	7.58																
																							1,624	6	6.00	4.5				
SUB_001_001_020		651	100.0	0.150	Grass-Short Grass Prairie	4.907	3.95	6.2																			SUB_001_001_020	10	**6.0**	**0.10**
									551	2.216	2.40	Unpaved	3.82																
SUB_001_010		3,004	100.0	0.150	Grass-Short Grass Prairie	2.600	3.95	7.9																			SUB_001_010	21	**12.6**	**0.21**
									1,073	2.633	2.62	Unpaved	6.83																
																							826	6	6.00	2.3				
														1,005	0.701	155.8	61.4	0.055	4.22		4.22	3.97							
SUB_001_020		1,504	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.060	3.95	0.8																			SUB_001_020	6	**3.8**	**0.06**
									656	2.658	3.31	Paved	3.30																
																							798	6	6.00	2.2				
SUB_002_010		1,878	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.000	3.95	0.5																			SUB_002_010	10	**5.9**	**0.10**
									1,004	3.108	2.84	Unpaved	5.88																
														824	1.055	36.3	21.2	0.055	3.98		3.98	3.45							
SUB_002_020		876	100.0	0.150	Grass-Short Grass Prairie	1.160	3.95	11.0																			SUB_002_020	16	**9.8**	**0.16**
									776	2.300	2.45	Unpaved	5.29																
SUB_003_010		1,857	100.0	0.150	Grass-Short Grass Prairie	1.299	3.95	10.5																			SUB_003_010	17	**10.0**	**0.17**
									326	1.666	2.62	Paved	2.07																
																							503	6	6.00	1.4				
														928	1.088	15.3	5.4	0.055	5.66		5.66	2.73							
SUB_003_020		3,531	100.0	0.150	Grass-Short Grass Prairie	2.835	3.95	7.7																			SUB_003_020	22	**13.1**	**0.22**
									756	1.938	2.25	Unpaved	5.61																
																							1,941	6	6.00	5.4				
														735	0.872	17.7	12.7	0.045	3.86		3.86	3.17							
SUB_003_030		2,118	54.0	0.150	Grass-Short Grass Prairie	1.130	3.95	6.8																			SUB_003_030	17	**10.1**	**0.17**
														2,064	1.087	25.7	26.0	0.045	3.43		3.43	10.03							
SUB_003_040		3,148	100.0	0.150	Grass-Short Grass Prairie	1.235	3.95	10.7																			SUB_003_040	26	**15.6**	**0.26**
									1,344	1.078	2.11	Paved	10.61																
																							1,704	6	6.00	4.7				
SUB_004_010		2,840	100.0	0.150	Grass-Short Grass Prairie	2.056	3.95	8.7																			SUB_004_010	40	**24.2**	**0.40**
									1,389	1.503	1.98	Unpaved	11.70																
														1,351	0.500	17.7	38.9	0.055	1.13		1.13	19.89							
SUB_004_020		2,607	100.0	0.150	Grass-Short Grass Prairie	1.223	3.95	10.7																			SUB_004_020	25	**15.1**	**0.25**
									1,471	2.471	2.54	Unpaved	9.67																

Upper Rush Existing Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
														1,037	0.692					3.63	3.63	4.76								
SUB_004_030		1,858	100.0	0.150	Grass-Short Grass Prairie	1.710	3.95	9.4																			SUB_004_030	21	**12.9**	**0.21**
									1,247	1.819	2.18	Unpaved	9.55																
														511	0.535	17.2	10.6	0.045	3.34		3.34	2.55								
SUB_004_040		3,401	100.0	0.150	Grass-Short Grass Prairie	0.770	3.95	12.9																			SUB_004_040	39	**23.4**	**0.39**
									2,165	1.524	1.99	Unpaved	18.11																
														1,136	0.500					2.36	2.36	8.02								
SUB_004_050		2,930	100.0	0.150	Grass-Short Grass Prairie	3.040	3.95	7.5																			SUB_004_050	27	**16.4**	**0.27**
									1,202	0.887	1.52	Unpaved	13.19																
														1,628	1.014					4.03	4.03	6.73								
SUB_004_060		1,854	100.0	0.150	Grass-Short Grass Prairie	5.133	3.95	6.0																			SUB_004_060	21	**12.8**	**0.21**
									1,023	1.224	1.79	Unpaved	9.55																
														730	0.594					2.15	2.15	5.66								
SUB_004_070		2,708	100.0	0.150	Grass-Short Grass Prairie	2.518	3.95	8.0																			SUB_004_070	26	**15.7**	**0.26**
									2,111	1.351	2.36	Paved	14.89																
														497	1.657					2.54	2.54	3.26								
SUB_004_080		2,193	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.160	3.95	0.8																			SUB_004_080	14	**8.3**	**0.14**
									980	1.330	1.86	Unpaved	8.78																
														1,163	1.518	38.9	24.6	0.055	4.53		4.53	4.28								
SUB_004_090		2,238	100.0	0.150	Grass-Short Grass Prairie	1.645	3.95	9.5																			SUB_004_090	22	**13.2**	**0.22**
									1,034	3.480	3.01	Unpaved	5.73																
														1,104	0.500					2.71	2.71	6.79								
SUB_004_100		1,932	100.0	0.150	Grass-Short Grass Prairie	1.507	3.95	9.9																			SUB_004_100	23	**13.9**	**0.23**
									1,832	2.006	2.29	Unpaved	13.36																
SUB_004_110		3,333	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			SUB_004_110	40	**24.3**	**0.40**
									1,518	0.807	1.45	Unpaved	17.45																
														1,716	0.734					3.72	3.72	7.69								
SUB_004_120		3,147	100.0	0.150	Grass-Short Grass Prairie	3.897	3.95	6.8																			SUB_004_120	31	**18.8**	**0.31**
									2,122	1.617	2.05	Unpaved	17.24																
														925	0.500					2.09	2.09	7.38								
SUB_004_130		1,986	100.0	0.150	Grass-Short Grass Prairie	2.640	3.95	7.9																			SUB_004_130	21	**12.7**	**0.21**
									1,140	2.854	2.73	Unpaved	6.97																
														746	1.432	24.8	52.8	0.055	1.96		1.96	6.34								

Kee Branch Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Perl (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
KEE_000_010		3,087	100	0.150	Grass-Short Grass Prairie	4.900	3.95	6.2																		KEE_000_010	6.2	**24.8**	**0.41**
									832	0.921	1.95	Paved	7.11														7.1		
														2,155	0.675	4.8	15.0	0.045	1.28		1.28	28.11					28.1		
KEE_000_020		4,034	100	0.150	Grass-Short Grass Prairie	0.690	3.95	13.5																		KEE_000_020	13.5	**20.3**	**0.34**
									663	1.437	2.44	Paved	4.54														4.5		
														1,092	2.116	5.9	10.7	0.045	3.24		3.24	5.62					5.6		
														2,179	0.588				3.58	3.58	3.58	10.14					10.1		
KEE_000_030		2,234	54	0.150	Grass-Short Grass Prairie	2.034	3.95	5.4																		KEE_000_030	5.4	**12.3**	**0.21**
									641	0.772	1.79	Paved	5.98														6.0		
														1,538	1.048	5.5	7.4	0.045	2.78		2.78	9.23					9.2		
KEE_000_040		1,299	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.510	3.95	0.5																		KEE_000_040	0.5	**3.4**	**0.06**
									622	2.811	3.41	Paved	3.04														3.0		
														628	2.524	17.4	19.3	0.045	4.92		4.92	2.13					2.1		
KEE_000_050		1,757	50	0.150	Grass-Short Grass Prairie	2.962	3.95	4.3																		KEE_000_050	4.3	**7.6**	**0.13**
									467	2.557	3.25	Paved	2.39														2.4		
														1,241	2.807	5.4	10.7	0.045	3.52		3.52	5.87					5.9		
KEE_000_060		3,065	50	0.150	Grass-Short Grass Prairie	2.965	3.95	4.3																		KEE_000_060	4.3	**14.7**	**0.24**
									537	3.404	3.75	Paved	2.39														2.4		
									2,268	1.273	2.29	Paved	16.48														16.5		
														210	1.455	7.7	13.8	0.045	2.70		2.70	1.30					1.3		
KEE_000_070		3,566	100	0.150	Grass-Short Grass Prairie	11.424	3.95	4.4																		KEE_000_070	4.4	**14.2**	**0.24**
									2,853	1.794	2.72	Paved	17.46														17.5		
														613	1.330	17.9	5.4	0.065	5.89		5.89	1.73					1.7		
KEE_000_080		2,338	100	0.150	Grass-Short Grass Prairie	2.610	3.95	7.9																		KEE_000_080	7.9	**16.7**	**0.28**
									1,517	2.118	2.96	Paved	8.55														8.5		
														721	0.552	13.0	45.9	0.045	1.06		1.06	11.33					11.3		
KEE_000_090		3,947	100	0.150	Grass-Short Grass Prairie	2.650	3.95	7.9																		KEE_000_090	7.9	**13.4**	**0.22**
									60	5.609	4.81	Paved	0.21														0.2		
									742	3.436	3.77	Paved	3.28														3.3		
														1,214	1.388	8.5	10.4	0.045	3.42		3.42	5.92					5.9		
																							1,831	6	6.00	5.1		5.1		
KEE_000_100		1,777	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.017	3.95	0.8																		KEE_000_100	0.8	**6.6**	**0.11**
									695	0.674	1.67	Paved	6.94														6.9		
																							862	6	6.00	2.4		2.4		
														170	0.631	33.7	11.6	0.065	3.72		3.72	0.76					0.8		
KEE_000_110		3,519	100	0.150	Grass-Short Grass Prairie	5.080	3.95	6.1																		KEE_000_110	6.1	**11.3**	**0.19**
									1,546	2.758	3.38	Paved	7.63														7.6		
																							1,874	6	6.00	5.2		5.2		
KEE_000_120		4,341	100	0.150	Grass-Short Grass Prairie	2.208	3.95	8.5																		KEE_000_120	8.5	**13.0**	**0.22**
									94	3.605	3.86	Paved	0.41														0.4		
									818	2.235	3.04	Paved	4.49														4.5		
																							1,289	6	6.00	3.6		3.6		
														2,040	1.426	5.6	11.7	0.015	7.29		7.29	4.66					4.7		
KEE_000_130		3,538	100	0.150	Grass-Short Grass Prairie	6.001	3.95	5.7																		KEE_000_130	5.7	**10.5**	**0.17**
									627	3.096	3.58	Paved	2.92														2.9		
									459	2.576	3.26	Paved	2.34														2.3		
																							2,351	6	6.00	6.5		6.5		
KEE_000_140		1,799	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		KEE_000_140	15.4	**12.8**	**0.21**
									344	1.009	2.04	Paved	2.81														2.8		
																							552	6	6.00	1.5		1.5		
														803	0.768				8.33	8.33	8.33	1.61					1.6		
KEE_000_150		4,517	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	7.139	3.95	0.4																		KEE_000_150	0.4	**10.2**	**0.17**
									1,044	2.939	3.49	Paved	4.99														5.0		
																							1,498	6	6.00	4.2		4.2		
														443	0.875	6.0	10.5	0.015	6.37		6.37	1.16					1.2		
														1,482	1.334	17.1	16.4	0.045	3.93		3.93	6.28					6.3		
KEE_000_160		4,517	60	0.150	Grass-Short Grass Prairie	5.796	3.95	3.8																		KEE_000_160	3.8	**11.6**	**0.19**
									1,732	3.077	3.57	Paved	8.10														8.1		
																							2,518	6	6.00	7.0		7.0		
														208	0.525				7.26	7.26	7.26	0.48					0.5		
KEE_000_170		2,524	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	6.440	3.95	0.4																		KEE_000_170	0.4	**13.0**	**0.22**
														2,474	0.860	11.8	23.5	0.045	1.94		1.94	21.25					21.3		
KEE_000_180		2,661	100	0.150	Grass-Short Grass Prairie	1.856	3.95	9.1																		KEE_000_180	9.1	**15.9**	**0.27**
									1,466	1.436	2.44	Paved	10.03														10.0		
														1,095	1.316	7.7	14.7	0.045	2.47		2.47	7.39					7.4		
KEE_000_190		2,588	100	0.150	Grass-Short Grass Prairie	7.600	3.95	5.2																		KEE_000_190	5.2	**7.9**	**0.13**
									993	4.530	4.33	Paved	3.83														3.8		
																							1,495	6	6.00	4.2		4.2		
KEE_000_200		3,249	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.191	3.95	0.8																		KEE_000_200	0.8	**6.6**	**0.11**
									398	1.732	2.68	Paved	2.48														2.5		
																							2,801	6	6.00	7.8		7.8		
KEE_000_210		1,254	100	0.150	Grass-Short Grass Prairie	4.450	3.95	6.4																		KEE_000_210	6.4	**6.5**	**0.11**
									1,023	4.303	4.22	Paved	4.04														4.0		
																							131	6	6.00	0.4		0.4		
KEE_000_220		5,107	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.505	3.95	1.1																		KEE_000_220	1.1	**9.6**	**0.16**
									325	2.255	3.05	Paved	1.77														1.8		
																							2,301	6	6.00	6.4		6.4		
														530	0.952	22.7	11.2	0.050	4.67		4.67	1.89					1.9		
														310	2.812	2.7	4.6	0.015	11.70		11.70	0.44					0.4		
																							1,592	6	6.00	4.4		4.4		
KEE_000_230		3,201	100	0.150	Grass-Short Grass Prairie	5.898	3.95	5.7																		KEE_000_230	5.7	**10.2**	**0.17**
									279	2.645	3.31	Paved	1.41														1.4		
														1,817	2.361	1.3	7.3	0.015	4.89		4.89	6.20					6.2		

Kee Branch Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
																							286	6	6.00	0.8		0.8		
																												2.9		
KEE_000_240		2,832	100	0.150	Grass-Short Grass Prairie	4.426	3.95	6.4						720	1.506	16.8	9.2	0.065	4.19		4.19	2.87					KEE_000_240	6.4	**11.8**	**0.20**
									756	3.744	3.93	Paved	3.20														3.2		
									1,590	2.170	2.99	Paved	8.85														8.8		
																							109	6	6.00	0.3		0.3		
														277	2.964	23.3	14.1	0.065	5.52		5.52	0.84						0.8		
KEE_000_250		3,233	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	7.220	3.95	0.4																			KEE_000_250	0.4	**6.6**	**0.11**
									1,454	4.093	4.11	Paved	5.89														5.9		
																							1,729	6	6.00	4.8		4.8		
KEE_000_260		4,376	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	5.026	3.95	0.4																			KEE_000_260	0.4	**9.9**	**0.16**
									2,638	3.363	3.73	Paved	11.79														11.8		
																							144	6	6.00	0.4		0.4		
														1,545	1.122				6.71	6.71	6.71	3.84						3.8		
KEE_000_270		3,616	50	0.150	Grass-Short Grass Prairie	0.500	3.95	8.8																			KEE_000_270	8.8	**12.7**	**0.21**
														3,313	2.212	15.0	16.0	0.045	4.71		4.71	11.72						11.7		
																							253	6	6.00	0.7		0.7		
KEE_000_280		3,496	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.999	3.95	0.8																			KEE_000_280	0.8	**6.4**	**0.11**
									69	0.795	1.81	Paved	0.63														0.6		
																							1,688	6	6.00	4.7		4.7		
														452	2.424	1.5	3.5	0.015	8.72		8.72	0.86						0.9		
																							678	6	6.00	1.9		1.9		
														558	2.041	7.7	5.5	0.050	5.33		5.33	1.75						1.7		
KEE_000_290		2,617	100	0.150	Grass-Short Grass Prairie	1.000	3.95	11.6																			KEE_000_290	11.6	**13.3**	**0.22**
									733	1.173	2.20	Paved	5.55														5.5		
																							1,784	6	6.00	5.0		5.0		
KEE_000_300		3,375	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.367	3.95	0.6																			KEE_000_300	0.6	**9.7**	**0.16**
									780	1.743	2.68	Paved	4.84														4.8		
																							505	6	6.00	1.4		1.4		
									1,065	1.768	2.70	Paved	6.57														6.6		
																							976	6	6.00	2.7		2.7		
KEE_000_310		2,056	100	0.150	Grass-Short Grass Prairie	10.600	3.95	4.5																			KEE_000_310	4.5	**8.5**	**0.14**
									1,744	2.453	3.18	Paved	9.13														9.1		
																							212	6	6.00	0.6		0.6		
KEE_000_320		5,147	60	0.150	Grass-Short Grass Prairie	7.099	3.95	3.5																			KEE_000_320	3.5	**14.9**	**0.25**
									1,321	1.910	2.81	Paved	7.84														7.8		
									1,642	1.903	2.80	Paved	9.76														9.8		
														1,946	2.147	1.0	1.8	0.015	9.78		9.78	3.32						3.3		
														177	2.605	56.7	16.6	0.065	8.38		8.38	0.35						0.4		
KEE_000_330		1,743	100	0.150	Grass-Short Grass Prairie	1.485	3.95	9.9																			KEE_000_330	9.9	**9.4**	**0.16**
														1,643	3.018	8.0	10.5	0.045	4.79		4.79	5.71						5.7		
KEE_000_340		2,174	30	0.150	Grass-Short Grass Prairie	2.694	3.95	3.0																			KEE_000_340	3.0	**7.8**	**0.13**
									738	1.273	2.29	Paved	5.36														5.4		
														1,228	3.625	4.1	6.6	0.045	4.62		4.62	4.43						4.4		
														178	11.612	16.9	6.3	0.065	15.05		15.05	0.20						0.2		
KEE_001_010		3,375	100	0.150	Grass-Short Grass Prairie	6.151	3.95	5.6																			KEE_001_010	5.6	**10.4**	**0.17**
									1,063	3.256	3.67	Paved	4.83														4.8		
														218	1.637	1.5	4.7	0.045	1.99		1.99	1.83						1.8		
														526	0.799	7.8	7.9	0.015	8.81		8.81	1.00						1.0		
																							1,468	6	6.00	4.1		4.1		
KEE_001_020		1,554	100	0.150	Grass-Short Grass Prairie	3.210	3.95	7.3																			KEE_001_020	7.3	**7.7**	**0.13**
									867	3.248	3.66	Paved	3.94														3.9		
																							100	6	6.00	0.3		0.3		
														486	2.993	54.2	30.5	0.065	5.82		5.82	1.39						1.4		
KEE_001_030		1,340	100	0.150	Grass-Short Grass Prairie	4.670	3.95	6.3																			KEE_001_030	6.3	**6.8**	**0.11**
									634	2.329	3.10	Paved	3.41														3.4		
														606	1.393	15.4	8.3	0.045	5.92		5.92	1.71						1.7		
KEE_002_010		2,469	100	0.150	Grass-Short Grass Prairie	1.870	3.95	9.1																			KEE_002_010	9.1	**10.2**	**0.17**
									626	3.214	3.64	Paved	2.86														2.9		
														655	3.682	12.2	9.4	0.065	5.22		5.22	2.09						2.1		
																							1,088	6	6.00	3.0		3.0		
KEE_002_020		1,349	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			KEE_002_020	15.4	**12.7**	**0.21**
									179	1.891	2.80	Paved	1.07														1.1		
									465	1.488	2.48	Paved	3.13														3.1		
																							605	6	6.00	1.7		1.7		
KEE_004_010		3,383	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.300	3.95	0.7																			KEE_004_010	0.7	**13.5**	**0.22**
									2,242	1.156	2.19	Paved	17.10														17.1		
														314	1.003	3.9	5.6	0.015	7.88		7.88	0.66						0.7		
									311	0.665	1.66	Paved	3.13														3.1		
														466	1.303	4.5	6.3	0.015	9.02		9.02	0.86						0.9		
KEE_004_020		3,028	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.630	3.95	0.7																			KEE_004_020	0.7	**6.9**	**0.12**
									1,199	2.240	3.04	Paved	6.57														6.6		
																							1,066	6	6.00	3.0		3.0		
														713	0.635				9.01	9.01	9.01	1.32						1.3		
KEE_004_030		3,428	100	0.150	Grass-Short Grass Prairie	1.682	3.95	9.5																			KEE_004_030	9.5	**15.1**	**0.25**
									546	2.474	3.20	Paved	2.85														2.8		
									1,024	1.090	2.12	Paved	8.04														8.0		
																							1,757	6	6.00	4.9		4.9		
KEE_004_040		1,473	87	0.150	Grass-Short Grass Prairie	3.045	3.95	6.7																			KEE_004_040	6.7	**6.9**	**0.12**
									138	2.116	2.96	Paved	0.78														0.8		
									170	1.563	2.54	Paved	1.11														1.1		
																							1,078	6	6.00	3.0		3.0		
KEE_004_050		1,412	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.520	3.95	0.7																			KEE_004_050	0.7	**3.9**	**0.06**
									894	2.662	3.32	Paved	4.49														4.5		
																							468	6	6.00	1.3		1.3		
KEE_005_010		3,260	100	0.150	Grass-Short Grass Prairie	2.370	3.95	8.2																			KEE_005_010	8.2	**11.3**	**0.19**
									404	1.556	2.54	Paved	2.66														2.7		
														483	2.007	58.5	23.7	0.065	5.94		5.94	1.36						1.4		
														463	0.970	84.0	38.7	0.050	4.93		4.93	1.57						1.6		
																							1,811	6	6.00	5.0		5.0		

Kee Branch Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Perl (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
KEE_005_020		3,664	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.000	3.95	0.8																		KEE_005_020	0.8	**7.9**	**0.13**
														906	1.467	29.3	31.9	0.045	3.80		3.80	3.98						4.0		
																							867	6	6.00	2.4		2.4		
														1,840	1.124	30.1	17.2	0.045	5.09		5.09	6.03						6.0		
KEE_005_030		3,020	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.980	3.95	0.5																		KEE_005_030	0.5	**9.6**	**0.16**
									305	1.304	2.32	Paved	2.19														2.2		
									774	1.280	2.30	Paved	5.61														5.6		
																							589	6	6.00	1.6		1.6		
														802	0.753	10.3	6.1	0.065	2.83		2.83	4.72						4.7		
																							500	6	6.00	1.4		1.4		
KEE_005_040		1,614	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.500	3.95	0.7																		KEE_005_040	0.7	**3.7**	**0.06**
									1,171	4.716	4.41	Paved	4.42														4.4		
																							393	6	6.00	1.1		1.1		
KEE_KB1_001_010		2,967	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.847	3.95	0.6																		KEE_KB1_001_010	0.6	**5.9**	**0.10**
									453	2.351	3.12	Paved	2.42														2.4		
																							2,464	6	6.00	6.8		6.8		
KEE_KB1_001_020		2,885	100	0.150	Grass-Short Grass Prairie	4.280	3.95	6.5																		KEE_KB1_001_020	6.5	**10.0**	**0.17**
									94	4.891	4.50	Paved	0.35														0.3		
									629	1.486	2.48	Paved	4.23														4.2		
														97	1.107	5.9	10.5	0.015	7.14		7.14	0.23						0.2		
																							237	6	6.00	0.7		0.7		
														451	0.747	2.9	3.5	0.015	7.46		7.46	1.01						1.0		
														532	1.340				5.50	5.50	5.50	1.61						1.6		
														426	1.319				9.20	9.20	9.20	0.77						0.8		
														318	1.195				3.90	3.90	3.90	1.36						1.4		
KEE_KB1_001_030		696	100	0.150	Grass-Short Grass Prairie	3.406	3.95	7.1																		KEE_KB1_001_030	7.1	**5.5**	**0.09**
									596	5.342	4.70	Paved	2.11														2.1		
KEE_KB1_010		3,559	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.067	3.95	0.8																		KEE_KB1_010	0.8	**6.2**	**0.10**
									647	5.107	4.59	Paved	2.35														2.3		
																							703	6	6.00	2.0		2.0		
														1,234	1.280	3.5	6.3	0.015	7.61		7.61	2.70						2.7		
																							925	6	6.00	2.6		2.6		
KEE_KB1_020		4,817	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.810	3.95	0.5																		KEE_KB1_020	0.5	**10.1**	**0.17**
									770	1.529	2.51	Paved	5.11														5.1		
																							3,998	6	6.00	11.1		11.1		
KEE_KB1_030		4,936	50	0.150	Grass-Short Grass Prairie	4.172	3.95	3.8																		KEE_KB1_030	3.8	**13.1**	**0.22**
									810	2.627	3.29	Paved	4.10														4.1		
																							129	6	6.00	0.4		0.4		
														2,566	1.746	8.7	9.0	0.045	4.26		4.26	10.03						10.0		
														232	1.415	1.6	2.7	0.015	8.34		8.34	0.46						0.5		
																							1,149	6	6.00	3.2		3.2		
KEE_KB1_040		3,426	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.843	3.95	0.9																		KEE_KB1_040	0.9	**7.9**	**0.13**
									1,487	3.011	3.53	Paved	7.03														7.0		
																							1,890	6	6.00	5.3		5.3		
KEE_KB1_050		2,596	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.620	3.95	1.0																		KEE_KB1_050	1.0	**5.3**	**0.09**
														872	2.111	17.5	18.4	0.045	4.66		4.66	3.12						3.1		
																							1,674	6	6.00	4.7		4.7		
KEE_KB1_060		3,711	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.080	3.95	0.5																		KEE_KB1_060	0.5	**9.4**	**0.16**
									231	0.917	1.95	Paved	1.98														2.0		
									149	5.852	4.92	Paved	0.51														0.5		
														493	0.637	1.8	5.9	0.015	3.57		3.57	2.30						2.3		
														1,246	1.791	4.8	6.5	0.045	3.63		3.63	5.72						5.7		
														371	2.868	4.0	3.4	0.065	4.35		4.35	1.42						1.4		
																							1,171	6	6.00	3.3		3.3		

Lower Rush Ultimate Time of Concentration Calculations

			Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
PAN_000_010		4,143	100	0.150	Grass-Short Grass Prairie	3.879	3.95	6.8																		PAN_000_010	6.8	**14.7**	**0.24**
									702	2.327	3.10	Paved	3.77														3.8		
									804	0.925	1.96	Paved	6.85														6.9		
																						2,535	6.00	6.00	7.0		7.0		
PAN_000_020		2,536	100	0.150	Grass-Short Grass Prairie	1.424	3.95	10.1																		PAN_000_020	10.1	**12.0**	**0.20**
									962	1.806	2.73	Paved	5.87														5.9		
																						1,474	6.00	6.00	4.1		4.1		
PAN_000_030		4,382	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.843	3.95	0.9																		PAN_000_030	0.9	**11.6**	**0.19**
									1,377	0.938	1.97	Paved	11.66														11.7		
														2,352	0.667			0.015	7.63	7.63	7.63	5.14						5.1		
																							604	6.00	6.00	1.7		1.7		
PAN_000_040		4,196	100	0.150	Grass-Short Grass Prairie	6.914	3.95	5.4																		PAN_000_040	5.4	**12.9**	**0.21**
									113	8.527	5.94	Paved	0.32														0.3		
									1,282	1.628	2.59	Paved	8.24														8.2		
																							2,698	6.00	6.00	7.5		7.5		
PAN_000_050		4,121	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.571	3.95	1.0																		PAN_000_050	1.0	**10.5**	**0.18**
									491	0.544	1.50	Paved	5.46														5.5		
																							2,846	6.00	6.00	7.9		7.9		
														734	0.704			0.065	3.86	3.86	3.86	3.17						3.2		
PAN_000_060		6,759	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.284	3.95	0.5																		PAN_000_060	0.5	**14.4**	**0.24**
									1,691	2.112	2.95	Paved	9.54														9.5		
																							5,018	6.00	6.00	13.9		13.9		
PAN_000_070		5,912	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.579	3.95	1.0																		PAN_000_070	1.0	**11.4**	**0.19**
									732	2.560	3.25	Paved	3.75														3.8		
																							5,130	6.00	6.00	14.3		14.3		
PAN_000_080		2,612	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		PAN_000_080	1.1	**11.8**	**0.20**
									2,221	1.112	2.14	Paved	17.27														17.3		
														341	4.360	16.3	17.5	0.065	4.57		4.57	1.24						1.2		
PAN_000_090		5,232	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.011	3.95	0.6																		PAN_000_090	0.6	**13.5**	**0.23**
									854	0.500	1.44	Paved	9.90														9.9		
																							4,328	6.00	6.00	12.0		12.0		
PAN_000_100		2,042	100	0.150	Grass-Short Grass Prairie	0.748	3.95	13.1																		PAN_000_100	13.1	**15.1**	**0.25**
									258	0.786	1.80	Paved	2.39														2.4		
									1,685	2.054	2.91	Paved	9.64														9.6		
PAN_000_110		2,848	100	0.150	Grass-Short Grass Prairie	2.376	3.95	8.2																		PAN_000_110	8.2	**12.3**	**0.20**
									958	1.160	2.19	Paved	7.29														7.3		
																							1,790	6.00	6.00	5.0		5.0		
PAN_000_120		2,917	100	0.150	Grass-Short Grass Prairie	2.420	3.95	8.2																		PAN_000_120	8.2	**10.8**	**0.18**
									228	3.247	3.66	Paved	1.04														1.0		
									714	2.717	3.35	Paved	3.55														3.6		
																							1,876	6.00	6.00	5.2		5.2		
PAN_000_130		3,301	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.457	3.95	0.7																		PAN_000_130	0.7	**18.4**	**0.31**
									601	3.667	3.89	Paved	2.57														2.6		
														2,650	0.886	10.4	27.8	0.045	1.61		1.61	27.39						27.4		
RUS_000_360		3,176	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_000_360	1.1	**8.0**	**0.13**
									1,427	2.340	3.11	Paved	7.65														7.6		
																							1,497	6.00	6.00	4.2		4.2		
														202	8.113	17.4	14.8	0.065	7.28		7.28	0.46						0.5		
RUS_000_370		2,146	50	0.150	Grass-Short Grass Prairie	3.750	3.95	3.9																		RUS_000_370	3.9	**7.8**	**0.13**
									171	8.763	6.02	Paved	0.47														0.5		
														1,927	3.223	6.1	12.1	0.045	3.77		3.77	8.53						8.5		
RUS_000_380		674	100	0.150	Grass-Short Grass Prairie	4.730	3.95	6.2																		RUS_000_380	6.2	**4.7**	**0.08**
									573	7.984	5.74	Paved	1.66														1.7		
RUS_000_390		2,658	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.672	3.95	1.0																		RUS_000_390	1.0	**11.0**	**0.18**
									1,257	0.579	1.55	Paved	13.54														13.5		
																							1,352	6.00	6.00	3.8		3.8		
RUS_000_400		1,435	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.646	3.95	1.0																		RUS_000_400	1.0	**3.1**	**0.05**
									478	5.274	4.67	Paved	1.71														1.7		
																							907	6.00	6.00	2.5		2.5		
RUS_000_410		4,837	100	0.150	Grass-Short Grass Prairie	3.876	3.95	6.8																		RUS_000_410	6.8	**12.9**	**0.22**
									1,216	3.291	3.69	Paved	5.50														5.5		
																							508	6.00	6.00	1.4		1.4		
														2,220	1.962	1.7	5.2	0.015	6.48		6.48	5.71						5.7		
																							791	6.00	6.00	2.2		2.2		
RUS_000_420		2,655	50	0.150	Grass-Short Grass Prairie	1.100	3.95	6.4																		RUS_000_420	6.4	**8.8**	**0.15**
									375	2.429	3.17	Paved	1.97														2.0		
																							2,231	6.00	6.00	6.2		6.2		
RUS_000_430		1,770	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.928	3.95	0.4																		RUS_000_430	0.4	**4.3**	**0.07**
									1,220	3.529	3.82	Paved	5.32														5.3		
																							501	6.00	6.00	1.4		1.4		
RUS_000_440		391	100	0.150	Grass-Short Grass Prairie	3.155	3.95	7.3																		RUS_000_440	7.3	**5.5**	**0.09**
									287	2.680	2.64	Unpaved	1.81														1.8		
RUS_000_450		5,802	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.109	3.95	0.8																		RUS_000_450	0.8	**13.9**	**0.23**
									929	0.722	1.73	Paved	8.96														9.0		
																							4,822	6.00	6.00	13.4		13.4		
RUS_000_460		2,409	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.526	3.95	1.1																		RUS_000_460	1.1	**7.6**	**0.13**
									653	0.621	1.60	Paved	6.79														6.8		
																							1,707	6.00	6.00	4.7		4.7		

Lower Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_000_470														1,965	0.500	100.4	58.2	0.050	3.03		3.03	10.80					RUS_000_470	10.8	**6.5**	**0.11**
RUS_000_480														297	0.500	104.1	60.6	0.065	2.32		2.32	2.13					RUS_000_480	10.0	**6.0**	**0.10**
RUS_000_500		856												856	1.719	140.3	36.4	0.065	7.39		7.39	1.93					RUS_000_500	10.0	**6.0**	**0.10**
RUS_000_510		3,401	50	0.150	Grass-Short Grass Prairie	3.981	3.95	3.8																			RUS_000_510	3.8	**10.5**	**0.18**
									1,647	4.446	4.29	Paved	6.40															6.4		
														1,704	1.624	2.5	2.8	0.045	3.89		3.89	7.30						7.3		
RUS_000_520		689	100	0.150	Grass-Short Grass Prairie	1.650	3.95	9.5																			RUS_000_520	9.5	**7.5**	**0.13**
									589	2.603	3.28	Paved	2.99															3.0		
RUS_000_530		5,641	100	0.150	Grass-Short Grass Prairie	7.835	3.95	5.1																			RUS_000_530	5.1	**35.1**	**0.59**
									3,227	0.500	1.44	Paved	37.42															37.4		
														2,315	0.500	105.9	58.3	0.065	2.41		2.41	15.99						16.0		
RUS_003_010		2,458	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.628	3.95	1.0																			RUS_003_010	1.0	**5.7**	**0.10**
									731	2.369	3.13	Paved	3.89															3.9		
																							1,676	6.00	6.00	4.7		4.7		
RUS_003_020		3,664	98	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.191	3.95	1.0																			RUS_003_020	1.0	**7.8**	**0.13**
									740	2.179	3.00	Paved	4.11															4.1		
																							2,826	6.00	6.00	7.9		7.9		
RUS_004_001_010		2,717	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.713	3.95	0.9																			RUS_004_001_010	0.9	**14.8**	**0.25**
														2,666	0.585	9.2	14.4	0.045	1.88		1.88	23.68						23.7		
RUS_004_001_020		2,250	100	0.150	Grass-Short Grass Prairie	5.307	3.95	6.0																			RUS_004_001_020	6.0	**8.3**	**0.14**
									560	2.970	3.50	Paved	2.66															2.7		
														455	1.358	8.0	10.2	0.045	3.27		3.27	2.32						2.3		
														1,135	0.777			0.065	6.66	6.66	6.66	2.84						2.8		
RUS_004_001_030		2,222	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.375	3.95	0.7																			RUS_004_001_030	0.7	**5.1**	**0.09**
														891	3.344	5.5	13.7	0.045	3.29		3.29	4.52						4.5		
														1,278	2.228			0.065	6.43	6.43	6.43	3.31						3.3		
RUS_004_001_040		592	100	0.150	Grass-Short Grass Prairie	5.366	3.95	5.9																			RUS_004_001_040	5.9	**4.3**	**0.07**
									494	10.075	6.45	Paved	1.28															1.3		
RUS_004_010		3,537	77	0.150	Grass-Short Grass Prairie	3.850	3.95	5.5																			RUS_004_010	5.5	**15.2**	**0.25**
									100	2.405	3.15	Paved	0.53															0.5		
									614	0.914	1.94	Paved	5.27															5.3		
																							515	6.00	6.00	1.4		1.4		
														2,231	0.537	23.8	17.9	0.045	2.94		2.94	12.65						12.7		
RUS_004_020		2,424	100	0.150	Grass-Short Grass Prairie	1.256	3.95	10.6																			RUS_004_020	10.6	**18.1**	**0.30**
									1,076	0.506	1.45	Paved	12.40															12.4		
														1,246	0.850	8.3	9.0	0.045	2.89		2.89	7.19						7.2		
RUS_004_030		1,793	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.391	3.95	0.7																			RUS_004_030	0.7	**7.3**	**0.12**
									1,188	1.434	2.43	Paved	8.13															8.1		
														556	0.500			0.055	2.87	2.87	2.87	3.23						3.2		
RUS_004_040		1,909	100	0.150	Grass-Short Grass Prairie	2.384	3.95	8.2																			RUS_004_040	8.2	**12.9**	**0.21**
									726	0.500	1.44	Paved	8.42															8.4		
														1,084	3.061			0.045	3.73	3.73	3.73	4.84						4.8		
RUS_004_050		2,011	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.174	3.95	0.5																			RUS_004_050	0.5	**4.6**	**0.08**
									646	3.614	3.86	Paved	2.79															2.8		
									638	1.985	2.86	Paved	3.71															3.7		
														677	2.910	311.4	137.2	0.024	18.29		18.29	0.62						0.6		
RUS_005_002_010		3,287	60	0.150	Grass-Short Grass Prairie	9.203	3.95	3.2																			RUS_005_002_010	3.2	**8.9**	**0.15**
									1,438	3.112	3.59	Paved	6.68															6.7		
																							1,789	6.00	6.00	5.0		5.0		
RUS_005_010		3,228	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.900	3.95	0.6																			RUS_005_010	0.6	**9.7**	**0.16**
									1,760	1.571	2.55	Paved	11.51															11.5		
																							1,417	6.00	6.00	3.9		3.9		
RUS_005_020		1,426	56	0.150	Grass-Short Grass Prairie	8.478	3.95	3.1																			RUS_005_020	3.1	**6.0**	**0.10**
									755	2.282	3.07	Paved	4.10															4.1		
									615	3.197	3.63	Paved	2.82															2.8		
RUS_005_030		3,299	81	0.150	Grass-Short Grass Prairie	1.329	3.95	8.8																			RUS_005_030	8.8	**13.4**	**0.22**
									1,672	2.126	2.96	Paved	9.40															9.4		
																							1,257	6.00	6.00	3.5		3.5		
														289	2.204	1.4	3.6	0.015	7.83		7.83	0.62						0.6		
RUS_005_040		1,121	100	0.150	Grass-Short Grass Prairie	4.480	3.95	6.4																			RUS_005_040	6.4	**7.7**	**0.13**
									804	1.240	2.26	Paved	5.92															5.9		
																							217	6.00	6.00	0.6		0.6		
RUS_005_050		4,115	100	0.150	Grass-Short Grass Prairie	5.308	3.95	6.0																			RUS_005_050	6.0	**14.4**	**0.24**
														2,095	1.936	1.9	4.0	0.045	2.76		2.76	12.67						12.7		
																							1,921	6.00	6.00	5.3		5.3		
RUS_005_060		1,894	100	0.150	Grass-Short Grass Prairie	3.446	3.95	7.1																			RUS_005_060	7.1	**12.3**	**0.20**
									1,441	0.916	1.95	Paved	12.34															12.3		
																							354	6.00	6.00	1.0		1.0		
RUS_005_070		671	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.864	3.95	0.9																			RUS_005_070	0.9	**2.6**	**0.04**
									621	2.199	3.01	Paved	3.43															3.4		
RUS_006_010		2,750	38	0.011	Smooth Surface (concrete, asphalt, bare earth)	5.841	3.95	0.3																			RUS_006_010	0.3	**5.9**	**0.10**
									677	3.792	3.96	Paved	2.85															2.9		
														2,035	2.914	45.5	30.9	0.065	5.06		5.06	6.70						6.7		
RUS_RC2_010		4,624	100	0.150	Grass-Short Grass Prairie	5.259	3.95	6.0																			RUS_RC2_010	6.0	**12.7**	**0.21**
									1,085	2.477	3.20	Paved	5.65															5.7		
																							3,440	6.00	6.00	9.6		9.6		
RUS_RC2_020		3,281	49	0.150	Grass-Short Grass Prairie	3.496	3.95	4.0																			RUS_RC2_020	4.0	**10.0**	**0.17**
														1,238	2.750	3.3	8.5	0.045	2.90		2.90	7.11						7.1		
																							1,994	6.00	6.00	5.5		5.5		
RUS_RC2_030		2,943	100	0.150	Grass-Short Grass Prairie	3.122	3.95	7.4																			RUS_RC2_030	7.4	**11.5**	**0.19**
														1,631	1.945	4.2	7.2	0.045	3.21		3.21	8.46						8.5		

Lower Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
																							1,212	6.00	6.00	3.4		3.4		
RUS_RC2_040		2,905	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			RUS_RC2_040	1.1	**9.0**	**0.15**
									1,470	1.426	2.43	Paved	10.09														10.1		
																							1,385	6.00	6.00	3.8		3.8		
RUS_RC2_050		3,579	100	0.150	Grass-Short Grass Prairie	4.446	3.95	6.4																			RUS_RC2_050	6.4	**12.9**	**0.21**
									398	2.553	3.25	Paved	2.04														2.0		
									963	1.234	2.26	Paved	7.11														7.1		
																							2,117	6.00	6.00	5.9		5.9		
RUS_RC2_060		3,143	65	0.150	Grass-Short Grass Prairie	8.975	3.95	3.4																			RUS_RC2_060	3.4	**8.3**	**0.14**
									860	4.128	4.13	Paved	3.47														3.5		
																							1,110	6.00	6.00	3.1		3.1		
														740	2.606	14.8	11.5	0.065	4.39		4.39	2.81						2.8		
																							369	6.00	6.00	1.0		1.0		
RUS_RC2_070		2,142	42	0.150	Grass-Short Grass Prairie	20.469	3.95	1.7																			RUS_RC2_070	1.7	**6.4**	**0.11**
									1,843	3.404	3.75	Paved	8.19														8.2		
																							257	6.00	6.00	0.7		0.7		
RUS_RC2_080		1,482	100	0.150	Grass-Short Grass Prairie	7.150	3.95	5.3																			RUS_RC2_080	5.3	**6.3**	**0.11**
									418	5.026	4.56	Paved	1.53														1.5		
									612	2.960	3.50	Paved	2.92														2.9		
														353	6.538	10.7	7.9	0.065	7.17		7.17	0.82						0.8		
RUS_RC2_085		2,259	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			RUS_RC2_085	1.1	**6.0**	**0.10**
									762	1.644	2.61	Paved	4.87														4.9		
																							1,448	6.00	6.00	4.0		4.0		
RUS_RC2_090		3,894	83	0.150	Grass-Short Grass Prairie	8.486	3.95	4.3																			RUS_RC2_090	4.3	**13.6**	**0.23**
									1,159	3.169	3.62	Paved	5.34														5.3		
																							238	6.00	6.00	0.7		0.7		
														1,893	1.779	19.5	21.2	0.065	2.90		2.90	10.89						10.9		
																							522	6.00	6.00	1.5		1.5		
RUS_RC2_100		2,889	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.922	3.95	0.6																			RUS_RC2_100	0.6	**6.9**	**0.12**
									1,351	2.673	3.32	Paved	6.77														6.8		
																							1,489	6.00	6.00	4.1		4.1		
RUS_RC2_110		1,928	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			RUS_RC2_110	1.1	**4.8**	**0.08**
									1,114	3.655	3.89	Paved	4.78														4.8		
																							764	6.00	6.00	2.1		2.1		
RUS_RCH_010		3,584	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	7.263	3.95	0.4																			RUS_RCH_010	0.4	**6.1**	**0.10**
														1,780	4.622	19.8	14.9	0.065	5.95		5.95	4.98						5.0		
																							1,755	6.00	6.00	4.9		4.9		
RUS_RCH_020		1,780	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.105	3.95	0.6																			RUS_RCH_020	0.6	**7.2**	**0.12**
									114	4.464	4.29	Paved	0.44														0.4		
									759	0.523	1.47	Paved	8.60														8.6		

Middle Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_000_190		3,167	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.916	3.95	0.6																		RUS_000_190	0.6	**10.7**	**0.18**
									1,512	0.949	1.98	Paved	12.73														12.7		
																						1,605	6.00	6.00	4.5		4.5		
RUS_000_200		1,447	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.039	3.95	0.8																		RUS_000_200	0.8	**3.7**	**0.06**
									1,398	4.474	4.30	Paved	5.42														5.4		
RUS_000_210		2,148	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.882	3.95	0.9																		RUS_000_210	0.9	**8.4**	**0.14**
									1,259	0.960	1.99	Paved	10.54														10.5		
																						420	6.00	6.00	1.2		1.2		
														417	3.444	31.0	24.1	0.065	5.03		5.03	1.38						1.4		
RUS_000_220		845	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.145	3.95	0.8																		RUS_000_220	0.8	**3.1**	**0.05**
									798	2.196	3.01	Paved	4.42														4.4		
RUS_000_230		1,908	45	0.150	Grass-Short Grass Prairie	3.872	3.95	3.6																		RUS_000_230	3.6	**6.8**	**0.11**
									1,391	3.055	3.55	Paved	6.52														6.5		
																						471	6.00	6.00	1.3		1.3		
RUS_000_240		1,677	100	0.150	Grass-Short Grass Prairie	1.500	3.95	9.9																		RUS_000_240	9.9	**9.4**	**0.16**
									205	3.455	3.78	Paved	0.90														0.9		
									221	1.290	2.31	Paved	1.60														1.6		
																						1,150	6.00	6.00	3.2		3.2		
RUS_000_250		754	100	0.150	Grass-Short Grass Prairie	5.942	3.95	5.7																		RUS_000_250	5.7	**4.6**	**0.08**
									655	7.526	5.58	Paved	1.96														2.0		
RUS_000_260		514	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	5.690	3.95	0.4																		RUS_000_260	0.4	**3.2**	**0.05**
									1,414	5.398	4.72	Paved	4.99														5.0		
RUS_000_270		3,893	100	0.150	Grass-Short Grass Prairie	1.409	3.95	10.1																		RUS_000_270	10.1	**17.4**	**0.29**
									752	1.895	2.80	Paved	4.48														4.5		
														1,417	2.138	10.5	18.3	0.065	2.31		2.31	10.22						10.2		
																						1,381	6.00	6.00	3.8		3.8		
														243	13.051	11.9	8.3	0.065	10.59		10.59	0.38						0.4		
RUS_000_280		1,435	50	0.150	Grass-Short Grass Prairie	10.597	3.95	2.6																		RUS_000_280	2.6	**6.4**	**0.11**
									1,004	1.551	2.53	Paved	6.61														6.6		
									380	4.792	4.45	Paved	1.42														1.4		
RUS_000_290		1,931	100	0.150	Grass-Short Grass Prairie	8.440	3.95	5.0																		RUS_000_290	5.0	**8.2**	**0.14**
									157	1.502	2.49	Paved	1.05														1.1		
														1,673	3.209	2.0	4.1	0.045	3.64		3.64	7.65						7.7		
RUS_000_300		2,275	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.074	3.95	0.6																		RUS_000_300	0.6	**4.3**	**0.07**
									37	3.377	3.74	Paved	0.17														0.2		
									118	3.837	3.98	Paved	0.49														0.5		
														2,068	3.722	1.3	7.4	0.015	5.86		5.86	5.89						5.9		
RUS_000_310		3,314	100	0.150	Grass-Short Grass Prairie	0.621	3.95	14.1																		RUS_000_310	14.1	**17.6**	**0.29**
														1,362	1.210	19.7	28.6	0.045	2.84		2.84	8.01						8.0		
																						407	6.00	6.00	1.1		1.1		
														1,142	1.393	62.0	39.7	0.065	3.64		3.64	5.23						5.2		
																						301	6.00	6.00	0.8		0.8		
RUS_000_320		3,334	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.801	3.95	0.4																		RUS_000_320	0.4	**7.2**	**0.12**
									243	8.064	5.77	Paved	0.70														0.7		
									538	1.979	2.86	Paved	3.14														3.1		
														328	1.140	6.8	7.9	0.045	3.23		3.23	1.70						1.7		
																						2,174	6.00	6.00	6.0		6.0		
RUS_000_330		3,501	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.676	3.95	0.6																		RUS_000_330	0.6	**16.2**	**0.27**
									1,910	0.530	1.48	Paved	21.51														21.5		
																						847	6.00	6.00	2.4		2.4		
														694	0.500	152.2	33.1	0.065	4.49		4.49	2.58						2.6		
RUS_000_340		2,466	100	0.150	Grass-Short Grass Prairie	5.295	3.95	6.0																		RUS_000_340	6.0	**10.4**	**0.17**
									861	4.877	4.49	Paved	3.20														3.2		
									691	3.183	3.63	Paved	3.18														3.2		
									814	1.818	2.74	Paved	4.95														4.9		
RUS_000_350		3,685	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	6.820	3.95	0.4																		RUS_000_350	0.4	**18.6**	**0.31**
									1,154	2.369	3.13	Paved	6.15														6.1		
														1,357	0.659	0.7	2.9	0.045	1.03		1.03	21.97						22.0		
																						590	6.00	6.00	1.6		1.6		
														535	4.495	70.0	89.0	0.024	11.21		11.21	0.80						0.8		
RUS_007_010		2,493	100	0.150	Grass-Short Grass Prairie	2.155	3.95	8.6																		RUS_007_010	8.6	**10.6**	**0.18**
									807	2.173	3.00	Paved	4.49														4.5		
														138	0.543	4.1	10.1	0.015	3.98		3.98	0.58						0.6		
																						1,448	6.00	6.00	4.0		4.0		
RUS_007_020		3,709	28	0.150	Grass-Short Grass Prairie	1.232	3.95	3.9																		RUS_007_020	3.9	**11.0**	**0.18**
									1,293	1.397	2.40	Paved	8.97														9.0		
																						171	6.00	6.00	0.5		0.5		
														1,837	1.419			0.015	7.83	7.83	7.83	3.91						3.9		
																						380	6.00	6.00	1.1		1.1		

Middle Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_007_030		3,847	100	0.150	Grass-Short Grass Prairie	1.067	3.95	11.3																		RUS_007_030	11.3	**19.6**	**0.33**
									1,090	0.691	1.69	Paved	10.75														10.8		
									791	1.475	2.47	Paved	5.34														5.3		
																						1,867	6.00	6.00	5.2		5.2		
RUS_007_040		3,613	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.499	3.95	0.5																		RUS_007_040	0.5	**10.7**	**0.18**
									273	0.712	1.72	Paved	2.65														2.7		
														1,182	2.761	4.7	11.2	0.045	3.09		3.09	6.38						6.4		
														2,106	1.153	80.2	35.5	0.065	4.24		4.24	8.28						8.3		
RUS_007_050		2,081	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_007_050	1.1	**6.6**	**0.11**
									1,310	1.878	2.79	Paved	7.84														7.8		
																						722	6.00	6.00	2.0		2.0		
RUS_007_060		972	53	0.150	Grass-Short Grass Prairie	3.872	3.95	4.1																		RUS_007_060	4.1	**5.1**	**0.09**
									777	2.448	3.18	Paved	4.07														4.1		
																						142	6.00	6.00	0.4		0.4		
RUS_007_070		3,594	100	0.150	Grass-Short Grass Prairie	5.870	3.95	5.7																		RUS_007_070	5.7	**13.2**	**0.22**
														2,102	1.452	15.5	27.5	0.045	2.73		2.73	12.85						12.9		
																						767	6.00	6.00	2.1		2.1		
														625	3.995	36.3	15.3	0.065	8.17		8.17	1.28						1.3		
RUS_008_010		4,459	100	0.150	Grass-Short Grass Prairie	0.750	3.95	13.1																		RUS_008_010	13.1	**17.4**	**0.29**
														1,283	1.961	2.4	4.6	0.045	3.03		3.03	7.07						7.1		
																						2,450	6.00	6.00	6.8		6.8		
														620	2.319	13.9	8.6	0.065	4.83		4.83	2.14						2.1		
RUS_009_010		3,279	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_009_010	1.1	**7.1**	**0.12**
									471	1.549	2.53	Paved	3.10														3.1		
																						2,758	6.00	6.00	7.7		7.7		
RUS_009_020		3,793	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.675	3.95	1.0																		RUS_009_020	1.0	**13.0**	**0.22**
									1,970	1.058	2.09	Paved	15.70														15.7		
																						1,774	6.00	6.00	4.9		4.9		
RUS_009_030		3,660	51	0.150	Grass-Short Grass Prairie	5.583	3.95	3.4																		RUS_009_030	3.4	**9.2**	**0.15**
									223	0.525	1.47	Paved	2.52														2.5		
																						3,387	6.00	6.00	9.4		9.4		
RUS_009_040		3,486	49	0.150	Grass-Short Grass Prairie	2.355	3.95	4.7																		RUS_009_040	4.7	**14.6**	**0.24**
									1,374	0.886	1.91	Paved	11.97														12.0		
														751	2.041	1.3	2.7	0.045	2.89		2.89	4.33						4.3		
																						435	6.00	6.00	1.2		1.2		
														878	1.504	1.4	3.3	0.015	7.01		7.01	2.09						2.1		
RUS_009_050		3,246	32	0.150	Grass-Short Grass Prairie	4.626	3.95	2.5																		RUS_009_050	2.5	**11.1**	**0.19**
									601	0.863	1.89	Paved	5.30														5.3		
																						409	6.00	6.00	1.1		1.1		
														1,290	1.118	38.9	52.1	0.045	2.88		2.88	7.46						7.5		
														914	1.797	1.1	2.8	0.015	7.24		7.24	2.10						2.1		
RUS_009_060		517	50	0.150	Grass-Short Grass Prairie	2.840	3.95	4.4																		RUS_009_060	4.4	**4.1**	**0.07**
									467	2.501	3.21	Paved	2.42														2.4		
RUS_009_070		1,305	100	0.150	Grass-Short Grass Prairie	3.928	3.95	6.7																		RUS_009_070	6.7	**6.5**	**0.11**
														1,205	2.903	11.8	14.8	0.045	4.85		4.85	4.14						4.1		
RUS_009_080		2,650	44	0.150	Grass-Short Grass Prairie	9.014	3.95	2.5																		RUS_009_080	2.5	**8.3**	**0.14**
									1,042	1.494	2.48	Paved	6.99														7.0		
																						1,563	6.00	6.00	4.3		4.3		
RUS_009_090		762	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_009_090	1.1	**2.3**	**0.04**
									712	4.333	4.23	Paved	2.80														2.8		
RUS_010_001_010		2,007	31	0.150	Grass-Short Grass Prairie	8.520	3.95	1.9																		RUS_010_001_010	1.9	**6.7**	**0.11**
									1,076	1.754	2.69	Paved	6.66														6.7		
																						900	6.00	6.00	2.5		2.5		
RUS_010_001_020		1,631	100	0.150	Grass-Short Grass Prairie	2.562	3.95	8.0																		RUS_010_001_020	8.0	**9.7**	**0.16**
									329	1.347	2.36	Paved	2.32														2.3		
									656	1.565	2.54	Paved	4.30														4.3		
																						546	6.00	6.00	1.5		1.5		
RUS_010_002_010		3,151	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.465	3.95	0.7																		RUS_010_002_010	0.7	**7.8**	**0.13**
									1,207	2.020	2.89	Paved	6.96														7.0		
																						1,892	6.00	6.00	5.3		5.3		
RUS_010_002_020		729	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.894	3.95	0.5																		RUS_010_002_020	0.5	**2.7**	**0.05**
									489	1.275	2.30	Paved	3.55														3.6		
																						185	6.00	6.00	0.5		0.5		
RUS_010_002_030		268	100	0.150	Grass-Short Grass Prairie	3.989	3.95	6.7																		RUS_010_002_030	6.7	**4.3**	**0.07**
									169	7.628	5.61	Paved	0.50														0.5		
RUS_010_003_010		3,676	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_010_003_010	1.1	**8.0**	**0.13**
									332	0.978	2.01	Paved	2.75														2.8		
																						2,801	6.00	6.00	7.8		7.8		
														493	2.675	8.4	5.6	0.065	4.95		4.95	1.66						1.7		
RUS_010_003_020		782	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.729	3.95	0.9																		RUS_010_003_020	0.9	**2.3**	**0.04**
									732	4.395	4.26	Paved	2.86														2.9		
RUS_010_004_010		3,696	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.845	3.95	0.6																		RUS_010_004_010	0.6	**13.0**	**0.22**
									2,116	1.071	2.10	Paved	16.76														16.8		
																						1,530	6.00	6.00	4.3		4.3		
RUS_010_004_020		2,840	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_010_004_020	1.1	**10.7**	**0.18**
									1,248	0.837	1.86	Paved	11.18														11.2		
														695	0.500	87.1	32.9	0.055	3.67		3.67	3.16						3.2		
																						846	6.00	6.00	2.4		2.4		
RUS_010_004_030		5,070	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RUS_010_004_030	15.4	**23.5**	**0.39**
														2,154	0.945	13.7	23.5	0.045	2.25		2.25	15.95						15.9		
																						2,815	6.00	6.00	7.8		7.8		

Middle Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_010_004_040		1,541	41	0.150	Grass-Short Grass Prairie	2.760	3.95	3.8																		RUS_010_004_040	3.8	**6.1**	**0.10**
									977	2.681	3.33	Paved	4.89														4.9		
																						523	6.00	6.00	1.5		1.5		
RUS_010_010		4,841	100	0.150	Grass-Short Grass Prairie	4.538	3.95	6.4																		RUS_010_010	6.4	**19.3**	**0.32**
									213	3.979	4.05	Paved	0.88														0.9		
														2,090	1.163	3.5	9.2	0.045	1.89		1.89	18.47						18.5		
																						1,312	6.00	6.00	3.6		3.6		
														646	1.756	0.7	1.6	0.015	7.25		7.25	1.49						1.5		
																						480	6.00	6.00	1.3		1.3		
RUS_010_020		343	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.520	3.95	1.1																		RUS_010_020	1.1	**1.2**	**0.02**
									291	6.399	5.14	Paved	0.94														0.9		
RUS_010_030		1,321	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.650	3.95	0.6																		RUS_010_030	0.6	**4.5**	**0.08**
									1,271	2.210	3.02	Paved	7.01														7.0		
RUS_010_040		1,759	100	0.150	Grass-Short Grass Prairie	4.801	3.95	6.2																		RUS_010_040	6.2	**7.7**	**0.13**
									602	1.729	2.67	Paved	3.75														3.8		
																						1,059	6.00	6.00	2.9		2.9		
RUS_011_010		2,319	100	0.150	Grass-Short Grass Prairie	2.375	3.95	8.2																		RUS_011_010	8.2	**10.4**	**0.17**
									789	2.588	3.27	Paved	4.02														4.0		
														1,432	1.614	56.0	26.8	0.065	4.76		4.76	5.02						5.0		
RUS_011_020		1,738	71	0.150	Grass-Short Grass Prairie	3.174	3.95	5.6																		RUS_011_020	5.6	**8.0**	**0.13**
														1,299	3.035	3.9	9.5	0.045	3.18		3.18	6.80						6.8		
																						368	6.00	6.00	1.0		1.0		
RUS_012_010		4,330	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.659	3.95	0.7																		RUS_012_010	0.7	**10.3**	**0.17**
									219	1.259	2.28	Paved	1.60														1.6		
									927	1.540	2.52	Paved	6.12														6.1		
																						3,133	6.00	6.00	8.7		8.7		
RUS_012_020		4,124	100	0.150	Grass-Short Grass Prairie	0.808	3.95	12.7																		RUS_012_020	12.7	**16.3**	**0.27**
									540	1.612	2.58	Paved	3.49														3.5		
									464	2.235	3.04	Paved	2.54														2.5		
																						3,020	6.00	6.00	8.4		8.4		
RUS_012_030		423	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.373	3.95	0.5																		RUS_012_030	0.5	**1.3**	**0.02**
									375	3.337	3.71	Paved	1.68														1.7		
RUS_013_010		2,469	100	0.150	Grass-Short Grass Prairie	1.822	3.95	9.2																		RUS_013_010	9.2	**10.8**	**0.18**
									743	1.961	2.85	Paved	4.35														4.4		
																						1,625	6.00	6.00	4.5		4.5		
RUS_013_020		1,511	100	0.150	Grass-Short Grass Prairie	0.587	3.95	14.4																		RUS_013_020	14.4	**14.1**	**0.24**
									1,410	1.594	2.57	Paved	9.16														9.2		
RUS_013_030		1,261	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_013_030	1.1	**4.0**	**0.07**
									1,212	3.168	3.62	Paved	5.58														5.6		
RUS_014_010		3,428	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.951	3.95	0.5																		RUS_014_010	0.5	**12.6**	**0.21**
														1,756	0.731	14.4	21.2	0.045	2.19		2.19	13.38						13.4		
																						528	6.00	6.00	1.5		1.5		
														1,099	1.577	11.1	16.0	0.045	3.26		3.26	5.62						5.6		
RUS_014_020		2,053	100	0.150	Grass-Short Grass Prairie	4.552	3.95	6.3																		RUS_014_020	6.3	**10.5**	**0.18**
									131	5.141	4.61	Paved	0.47														0.5		
									475	1.609	2.58	Paved	3.07														3.1		
									467	0.546	1.50	Paved	5.18														5.2		
																						882	6.00	6.00	2.5		2.5		
RUS_015_010		3,692	100	0.150	Grass-Short Grass Prairie	2.398	3.95	8.2																		RUS_015_010	8.2	**15.5**	**0.26**
									432	0.584	1.55	Paved	4.63														4.6		
																						638	6.00	6.00	1.8		1.8		
														889	1.588	22.2	56.4	0.045	2.24		2.24	6.61						6.6		
																						1,634	6.00	6.00	4.5		4.5		
RUS_015_020		2,629	100	0.150	Grass-Short Grass Prairie	2.179	3.95	8.5																		RUS_015_020	8.5	**10.2**	**0.17**
									56	2.488	3.21	Paved	0.29														0.3		
									388	1.870	2.78	Paved	2.33														2.3		
																						2,085	6.00	6.00	5.8		5.8		
RYA_000_010		2,853	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RYA_000_010	1.1	**10.0**	**0.17**
									1,121	0.715	1.72	Paved	10.87														10.9		
																						1,681	6.00	6.00	4.7		4.7		
RYA_000_020		5,389	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RYA_000_020	15.4	**19.0**	**0.32**
									709	2.572	3.26	Paved	3.62														3.6		
																						4,581	6.00	6.00	12.7		12.7		
RYA_000_030		4,581	100	0.150	Grass-Short Grass Prairie	2.571	3.95	8.0																		RYA_000_030	8.0	**15.1**	**0.25**
									1,191	1.453	2.45	Paved	8.10														8.1		
																						3,290	6.00	6.00	9.1		9.1		
RYA_000_040		4,283	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.398	3.95	0.7																		RYA_000_040	0.7	**8.7**	**0.14**
									575	1.726	2.67	Paved	3.59														3.6		
																						3,657	6.00	6.00	10.2		10.2		
RYA_000_050		456	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.020	3.95	0.6																		RYA_000_050	0.6	**1.5**	**0.02**
									407	3.320	3.70	Paved	1.83														1.8		
RYA_000_060		1,480	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.517	3.95	0.7																		RYA_000_060	0.7	**4.9**	**0.08**
									1,050	2.133	2.97	Paved	5.89														5.9		
									381	4.081	4.11	Paved	1.55														1.5		
RYA_000_070		3,198	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.228	3.95	0.8																		RYA_000_070	0.8	**7.4**	**0.12**
									987	2.236	3.04	Paved	5.41														5.4		
														416	2.752	23.4	15.2	0.065	5.06		5.06	1.37						1.4		
																						1,744	6.00	6.00	4.8		4.8		
RYA_000_080		1,688	100	0.150	Grass-Short Grass Prairie	2.998	3.95	7.5																		RYA_000_080	7.5	**8.2**	**0.14**
									614	3.984	4.06	Paved	2.52														2.5		
														668	1.829	1.1	7.3	0.015	3.85		3.85	2.89						2.9		
																						301	6.00	6.00	0.8		0.8		
RYA_001_010		3,045	47	0.150	Grass-Short Grass Prairie	4.536	3.95	3.5																		RYA_001_010	3.5	**11.1**	**0.18**
									1,943	1.879	2.79	Paved	11.62														11.6		

Middle Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
																							428	6.00	6.00	1.2		1.2		
														628	0.867	91.4	26.9	0.065	4.83		4.83	2.17						2.2		
RYA_001_020		1,206	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.413	3.95	0.7																			RYA_001_020	0.7	**2.8**	**0.05**
									322	2.861	3.44	Paved	1.56															1.6		
																							834	6.00	6.00	2.3		2.3		
TWI_000_010		3,106	35	0.150	Grass-Short Grass Prairie	5.162	3.95	2.6																			TWI_000_010	2.6	**12.0**	**0.20**
									1,530	0.931	1.96	Paved	13.00															13.0		
																							294	6.00	6.00	0.8		0.8		
														334	1.700	28.3	16.5	0.065	4.28		4.28	1.30						1.3		
																							528	6.00	6.00	1.5		1.5		
														385	1.506	6.0	10.7	0.015	8.26		8.26	0.78						0.8		
TWI_000_020		2,662	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.470	3.95	0.6																			TWI_000_020	0.6	**5.3**	**0.09**
									613	3.063	3.56	Paved	2.87															2.9		
																							1,169	6.00	6.00	3.2		3.2		
														831	1.287			0.065	6.27	6.27	6.27	2.21						2.2		
TWI_000_030		3,151	81	0.150	Grass-Short Grass Prairie	3.007	3.95	6.3																			TWI_000_030	6.3	**13.7**	**0.23**
									1,162	0.675	1.67	Paved	11.60															11.6		
																							1,294	6.00	6.00	3.6		3.6		
														613	0.900			0.065	8.10	8.10	8.10	1.26						1.3		
TWI_000_040		1,403	100	0.150	Grass-Short Grass Prairie	2.161	3.95	8.5																			TWI_000_040	8.5	**10.4**	**0.17**
									1,302	1.493	2.48	Paved	8.74															8.7		
TWI_000_050		3,239	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.753	3.95	0.7																			TWI_000_050	0.7	**8.7**	**0.15**
									1,619	1.929	2.82	Paved	9.56															9.6		
																							1,570	6.00	6.00	4.4		4.4		
TWI_000_060		1,818	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			TWI_000_060	15.4	**15.5**	**0.26**
									123	1.085	2.12	Paved	0.97															1.0		
									1,596	1.899	2.80	Paved	9.50															9.5		
TWI_000_070		4,548	100	0.150	Grass-Short Grass Prairie	0.854	3.95	12.4																			TWI_000_070	12.4	**20.9**	**0.35**
														1,040	0.500	16.7	29.1	0.045	1.61		1.61	10.73						10.7		
														350	3.562	2.7	5.1	0.015	12.41		12.41	0.47						0.5		
									689	1.862	2.77	Paved	4.14															4.1		
																							1,544	6.00	6.00	4.3		4.3		
														825	1.487	87.4	36.7	0.065	4.98		4.98	2.76						2.8		
TWI_000_080		1,292	100	0.150	Grass-Short Grass Prairie	1.770	3.95	9.3																			TWI_000_080	9.3	**8.8**	**0.15**
									348	2.511	3.22	Paved	1.80															1.8		
									626	2.993	3.52	Paved	2.97															3.0		
																							219	6.00	6.00	0.6		0.6		
TWI_000_090		248	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	12.423	3.95	0.3																			TWI_000_090	0.3	**0.7**	**0.01**
									199	3.506	3.81	Paved	0.87															0.9		
TWI_000_100		3,353	100	0.150	Grass-Short Grass Prairie	2.026	3.95	8.8																			TWI_000_100	8.8	**12.6**	**0.21**
									371	3.047	3.55	Paved	1.74															1.7		
									675	1.959	2.85	Paved	3.95															4.0		
																							1,054	6.00	6.00	2.9		2.9		
														1,154	2.465	88.5	50.1	0.065	5.25		5.25	3.66						3.7		
TWI_001_010		3,147	100	0.150	Grass-Short Grass Prairie	2.089	3.95	8.7																			TWI_001_010	8.7	**14.7**	**0.25**
														1,404	0.664	16.2	21.9	0.045	2.21		2.21	10.58						10.6		
																							1,266	6.00	6.00	3.5		3.5		
														378	0.703	50.4	25.4	0.055	3.59		3.59	1.76						1.8		
TWI_002_010		1,046	100	0.150	Grass-Short Grass Prairie	3.373	3.95	7.2																			TWI_002_010	7.2	**7.3**	**0.12**
									491	4.489	4.31	Paved	1.90															1.9		
									456	1.497	2.49	Paved	3.06															3.1		
TWI_003_010		2,713	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.591	3.95	0.5																			TWI_003_010	0.5	**6.2**	**0.10**
									536	4.720	4.42	Paved	2.02															2.0		
																							1,811	6.00	6.00	5.0		5.0		
														318	0.500	15.5	12.2	0.065	1.90		1.90	2.79						2.8		
TWI_004_010		3,365	26	0.150	Grass-Short Grass Prairie	6.863	3.95	1.8																			TWI_004_010	1.8	**9.6**	**0.16**
									1,111	1.285	2.30	Paved	8.04															8.0		
																							2,228	6.00	6.00	6.2		6.2		
TWI_004_020		1,374	100	0.150	Grass-Short Grass Prairie	3.762	3.95	6.8																			TWI_004_020	6.8	**7.3**	**0.12**
									678	2.388	3.14	Paved	3.60															3.6		
																							597	6.00	6.00	1.7		1.7		
TWI_004_030		1,291	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.544	3.95	0.5																			TWI_004_030	0.5	**3.5**	**0.06**
									70	4.900	4.50	Paved	0.26															0.3		
									779	2.512	3.22	Paved	4.03															4.0		
																							394	6.00	6.00	1.1		1.1		

Stream RC-1 Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel Flow	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_RCO_001_010		2,640	100	0.150	Grass-Short Grass Prairie	0.880	3.95	12.2																		RUS_RCO_001_010	12.2	**17.5**	**0.29**
									1,101	1.360	2.37	Paved	7.74														7.7		
									1,270	1.419	2.42	Paved	8.74														8.7		
																						169	6	6.00	0.5		0.5		
RUS_RCO_002_010		4,461	76	0.150	Grass-Short Grass Prairie	2.473	3.95	6.5																		RUS_RCO_002_010	6.5	**18.8**	**0.31**
									1,586	0.597	1.57	Paved	16.83														16.8		
														633	0.500	9.7	14.5	0.015	5.40		5.40	1.95						2.0		
																						2,166	6	6.00	6.0		6.0		
RUS_RCO_002_020		938	100	0.150	Grass-Short Grass Prairie	1.260	3.95	10.6																		RUS_RCO_002_020	10.6	**11.8**	**0.20**
									37	8.935	6.08	Paved	0.10														0.1		
									761	0.500	1.44	Paved	8.82														8.8		
																						40	6	6.00	0.1		0.1		
RUS_RCO_010		3,067	44	0.150	Grass-Short Grass Prairie	0.500	3.95	8.0																		RUS_RCO_010	8.0	**17.0**	**0.28**
									1,226	0.500	1.44	Paved	14.22														14.2		
																						1,267	6	6.00	3.5		3.5		
														530	0.604	111.4	42.6	0.065	3.38		3.38	2.61						2.6		
RUS_RCO_020		5,143	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.260	3.95	0.6																		RUS_RCO_020	0.6	**10.8**	**0.18**
									623	0.894	1.92	Paved	5.40														5.4		
																						3,093	6	6.00	8.6		8.6		
														1,377	0.566					6.81	6.81	3.37						3.4		
RUS_RCO_030		4,440	43	0.150	Grass-Short Grass Prairie	2.596	3.95	4.0																		RUS_RCO_030	4.0	**14.0**	**0.23**
									2,084	1.737	2.68	Paved	12.96														13.0		
																						2,239	6	6.00	6.2		6.2		
														74	0.701	15.0	17.0	0.015	7.65		7.65	0.16						0.2		
RUS_RCO_040		2,647	100	0.150	Grass-Short Grass Prairie	2.280	3.95	8.4																		RUS_RCO_040	8.4	**11.0**	**0.18**
									159	8.315	5.86	Paved	0.45														0.5		
									993	2.107	2.95	Paved	5.61														5.6		
																						1,396	6	6.00	3.9		3.9		
RUS_RCO_050		3,439	100	0.150	Grass-Short Grass Prairie	0.540	3.95	14.9																		RUS_RCO_050	14.9	**18.4**	**0.31**
									82	2.425	3.17	Paved	0.43														0.4		
									2,551	2.552	3.25	Paved	13.09														13.1		
																						280	6	6.00	0.8		0.8		
														426	0.501	5.0	9.1	0.015	4.71		4.71	1.51						1.5		
RUS_RCO_060		2,387	100	0.150	Grass-Short Grass Prairie	1.550	3.95	9.8																		RUS_RCO_060	9.8	**18.9**	**0.32**
									526	0.547	1.50	Paved	5.83														5.8		
									1,273	0.510	1.45	Paved	14.61														14.6		
																						488	6	6.00	1.4		1.4		
RUS_RCO_070		4,161	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	4.740	3.95	0.4																		RUS_RCO_070	0.4	**9.1**	**0.15**
									2,074	3.498	3.80	Paved	9.09														9.1		
																						2,037	6	6.00	5.7		5.7		
RUS_RCO_080		2,228	100	0.150	Grass-Short Grass Prairie	2.225	3.95	8.5																		RUS_RCO_080	8.5	**10.5**	**0.18**
									1,001	1.922	2.82	Paved	5.92														5.9		
																						1,128	6	6.00	3.1		3.1		
RUS_RCO_090		4,509	87	0.150	Grass-Short Grass Prairie	2.008	3.95	7.9																		RUS_RCO_090	7.9	**20.7**	**0.35**
									3,099	1.224	2.25	Paved	22.97														23.0		
																						1,324	6	6.00	3.7		3.7		
RUS_RCO_100		2,499	49	0.150	Grass-Short Grass Prairie	0.500	3.95	8.7																		RUS_RCO_100	8.7	**13.7**	**0.23**
									1,120	0.782	1.80	Paved	10.38														10.4		
																						1,330	6	6.00	3.7		3.7		
RUS_RCO_110		2,443	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.700	3.95	1.0																		RUS_RCO_110	1.0	**11.7**	**0.20**
									1,940	0.845	1.87	Paved	17.30														17.3		
																						453	6	6.00	1.3		1.3		
RUS_RCO_120		2,934	100	0.150	Grass-Short Grass Prairie	2.150	3.95	8.6																		RUS_RCO_120	8.6	**14.3**	**0.24**
									25	9.370	6.22	Paved	0.07														0.1		
									2,810	2.300	3.08	Paved	15.19														15.2		
RUS_RCO_130		2,380	100	0.150	Grass-Short Grass Prairie	2.210	3.95	8.5																		RUS_RCO_130	8.5	**11.7**	**0.19**
									41	7.259	5.48	Paved	0.12														0.1		
									2,128	2.748	3.37	Paved	10.52														10.5		
																						111	6	6.00	0.3		0.3		
RUS_RCO_140		2,218	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.020	3.95	0.6																		RUS_RCO_140	0.6	**7.2**	**0.12**
									133	2.624	3.29	Paved	0.67														0.7		
									844	0.807	1.83	Paved	7.70														7.7		
									109	10.417	6.56	Paved	0.28														0.3		
														1,082	4.248	87.8	54.3	0.065	6.51		6.51	2.77						2.8		
RUS_RCO_150		1,740	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	5.250	3.95	0.4																		RUS_RCO_150	0.4	**6.6**	**0.11**
									746	5.939	4.95	Paved	2.51														2.5		
									812	0.761	1.77	Paved	7.63														7.6		
																						132	6	6.00	0.4		0.4		
RUS_TOA_010		3,284	100	0.150	Grass-Short Grass Prairie	0.990	3.95	11.7																		RUS_TOA_010	11.7	**19.4**	**0.32**
									101	1.302	2.32	Paved	0.73														0.7		
									1,287	0.500	1.44	Paved	14.92														14.9		
																						1,795	6	6.00	5.0		5.0		
RUS_TOA_020		2,315	100	0.150	Grass-Short Grass Prairie	4.880	3.95	6.2																		RUS_TOA_020	6.2	**7.5**	**0.13**
									131	3.939	4.03	Paved	0.54														0.5		
														346	4.051	37.2	51.7	0.045	5.35		5.35	1.08						1.1		
														114	2.516	12.4	36.3	0.015	7.70		7.70	0.25						0.2		
																						1,624	6	6.00	4.5		4.5		
RUS_TOA_030		3,613	100	0.150	Grass-Short Grass Prairie	0.830	3.95	12.5																		RUS_TOA_030	12.5	**14.9**	**0.25**

Stream RC-1 Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel Flow	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
									46	8.211	5.83	Paved	0.13														0.1		
									1,353	3.017	3.53	Paved	6.39														6.4		
																						240	6	6.00	0.7		0.7		
														1,874	0.970	0.6	2.1	0.015	4.25	6.09	6.09	5.13						5.1		
RUS_TOA_040		2,776	100	0.150	Grass-Short Grass Prairie	1.170	3.95	10.9																			RUS_TOA_040	10.9	**12.4**	**0.21**
									192	3.440	3.77	Paved	0.85														0.8		
									785	2.437	3.17	Paved	4.12														4.1		
																						1,698	6	6.00	4.7		4.7		
RUS_TOA_050		4,900	100	0.150	Grass-Short Grass Prairie	0.860	3.95	12.4																			RUS_TOA_050	12.4	**21.3**	**0.35**
									34	7.690	5.64	Paved	0.10														0.1		
									1,787	0.985	2.02	Paved	14.76														14.8		
																						2,979	6	6.00	8.3		8.3		
RUS_TOA_055		7,994	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.820	3.95	0.9																			RUS_TOA_055	0.9	**29.1**	**0.49**
									1,191	0.825	1.85	Paved	10.75														10.8		
														6,753	0.908	27.9	21.8	0.055	3.05		3.05	36.92						36.9		
RUS_TOA_060		2,926	100	0.150	Grass-Short Grass Prairie	3.350	3.95	7.2																			RUS_TOA_060	7.2	**18.3**	**0.30**
									651	0.500	1.44	Paved	7.55														7.5		
									2,175	1.286	2.30	Paved	15.73														15.7		
RUS_TOA_070		2,587	100	0.150	Grass-Short Grass Prairie	1.070	3.95	11.3																			RUS_TOA_070	11.3	**18.1**	**0.30**
									1,500	0.584	1.55	Paved	16.09														16.1		
																						987	6	6.00	2.7		2.7		
RUS_TOA_080		5,019	100	0.150	Grass-Short Grass Prairie	3.001	3.95	7.5																			RUS_TOA_080	7.5	**14.8**	**0.25**
									1,098	1.873	2.78	Paved	6.58														6.6		
																						3,623	6	6.00	10.1		10.1		
														204	3.945	24.7	13.3	0.065	6.88		6.88	0.49						0.5		
RUS_TOA_090		3,864	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.660	3.95	0.7																			RUS_TOA_090	0.7	**8.6**	**0.14**
									658	4.924	4.51	Paved	2.43														2.4		
									41	0.879	1.91	Paved	0.36														0.4		
														398	2.856	4.6	6.4	0.045	4.49		4.49	1.48						1.5		
																						303	6	6.00	0.8		0.8		
														504	1.092	6.2	12.1	0.045	2.21		2.21	3.80						3.8		
																						1,202	6	6.00	3.3		3.3		
														709	2.154	134.2	35.6	0.065	8.15		8.15	1.45						1.4		
RUS_TOA_100		4,958	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.980	3.95	0.6																			RUS_TOA_100	0.6	**9.8**	**0.16**
									713	2.022	2.89	Paved	4.11														4.1		
																						2,960	6	6.00	8.2		8.2		
														542	1.081	17.8	8.5	0.045	5.63		5.63	1.60						1.6		
														693	3.696	42.8	24.6	0.065	6.38		6.38	1.81						1.8		

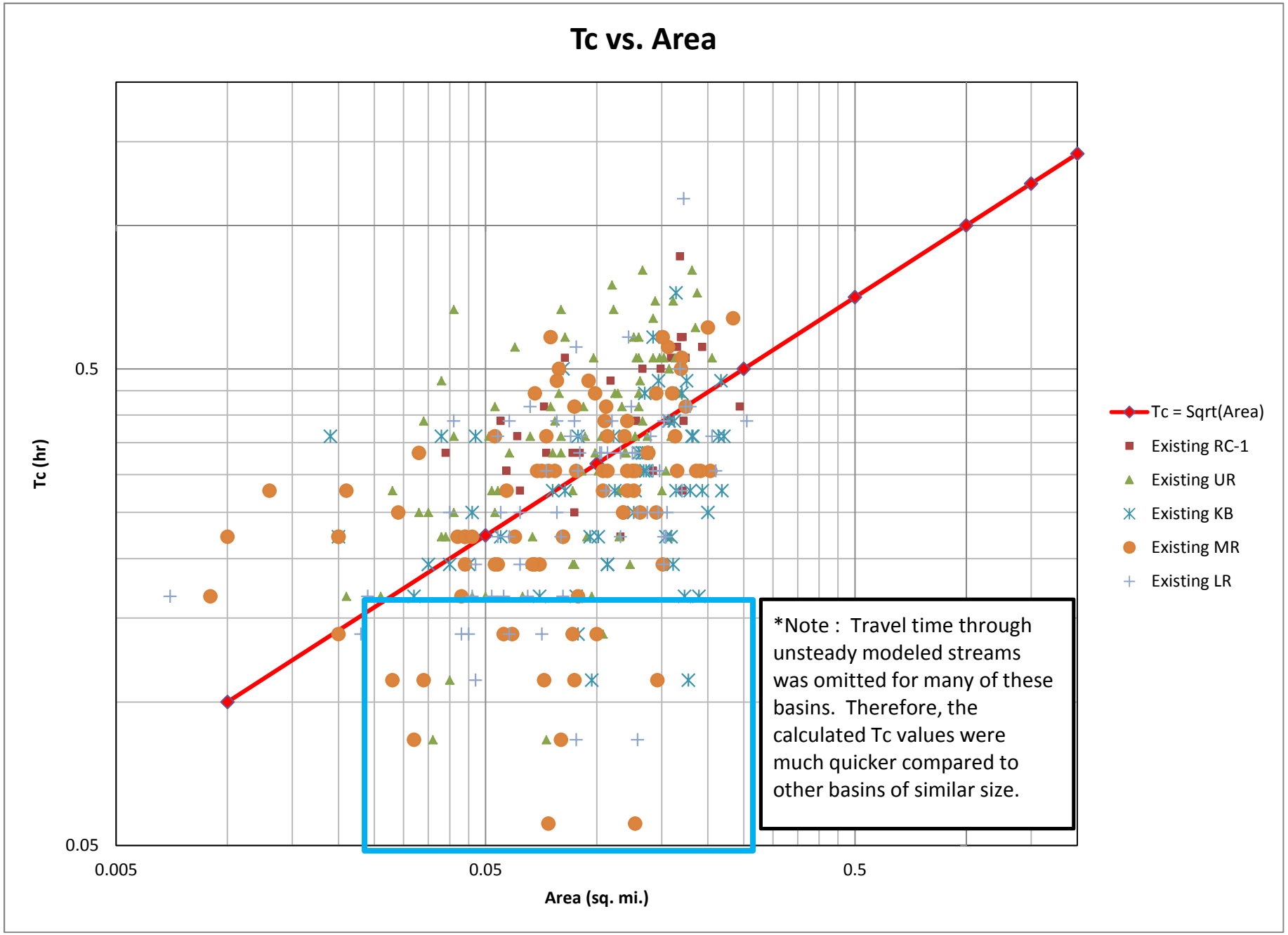
Upper Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow								Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_000_010		3,581	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																		RUS_000_010	33	**19.9**	**0.33**
									1,530	0.700	1.70	Paved	14.99																
														2,001	0.980	55.2	88.3	0.055	1.96		1.96	17.01							
RUS_000_020		2,722	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.320	3.95	0.7																		RUS_000_020	12	**7.4**	**0.12**
														2,672	0.960	27.0	21.0	0.045	3.84		3.84	11.61							
RUS_000_030		3,258	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RUS_000_030	40	**24.2**	**0.40**
									2,660	1.090	2.12	Paved	20.89																
														498	0.500	121.5	110.5	0.055	2.04		2.04	4.07							
RUS_000_040		1,419	100	0.150	Grass-Short Grass Prairie	1.970	3.95	8.9																		RUS_000_040	17	**10.4**	**0.17**
									1,031	1.440	2.44	Paved	7.04																
														288	0.630	53.4	22.5	0.065	3.23		3.23	1.48							
RUS_000_050		2,882	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.280	3.95	0.7																		RUS_000_050	21	**12.6**	**0.21**
									1,679	0.860	1.89	Paved	14.84																
																							375	6	6.00	1.0				
														778	0.970	52.9	59.3	0.045	3.02		3.02	4.29							
RUS_000_060		2,425	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	1.120	3.95	0.8																		RUS_000_060	8	**5.1**	**0.08**
									644	2.210	3.02	Paved	3.55																
																							1,053	6	6.00	2.9				
														678	1.563	115.4	87.2	0.024	9.36		9.36	1.21							
RUS_000_070		2,113	100	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																		RUS_000_070	30	**17.9**	**0.30**
									2,013	1.310	2.33	Paved	14.42																
RUS_000_080		2,523	100	0.150	Grass-Short Grass Prairie	0.540	3.95	14.9																		RUS_000_080	27	**16.1**	**0.27**
									673	1.800	2.73	Paved	4.11																
														1,750	0.690	5.7	3.7	0.045	3.69		3.69	7.90							
RUS_000_085		3,636	100	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.9																		RUS_000_085	20	**12.1**	**0.20**
									574	2.162	2.99	Paved	3.20																
														2,962	0.935					3.26	3.26	15.14								
RUS_000_090		2,192	100	0.150	Grass-Short Grass Prairie	0.570	3.95	14.6																		RUS_000_090	29	**17.2**	**0.29**
									2,092	1.470	2.46	Paved	14.15																
RUS_000_100		4,764	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.820	3.95	0.9																		RUS_000_100	25	**14.8**	**0.25**
									831	1.200	2.23	Paved	6.22																
																							1,845	6	6.00	5.1				
														2,037	1.010	131.6	131.6	0.055	2.72		2.72	12.47							
RUS_000_110		3,764	50	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.540	3.95	1.1																		RUS_000_110	23	**13.6**	**0.23**
									1,699	1.020	2.05	Paved	13.79																
																							262	6	6.00	0.7				
														1,753	1.780	40.8	44.7	0.045	4.16		4.16	7.03							
RUS_000_120		1,360	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.060	3.95	0.6																		RUS_000_120	8	**4.7**	**0.08**
									1,310	2.170	2.99	Paved	7.29																
RUS_000_130		2,066	100.1	0.150	Grass-Short Grass Prairie	0.760	3.95	13.0																		RUS_000_130	20	**12.0**	**0.20**
														1,966	2.270	6.7	7.4	0.045	4.65		4.65	7.05							
RUS_000_140		2,863	100.0	0.150	Grass-Short Grass Prairie	1.270	3.95	10.6																		RUS_000_140	22	**13.0**	**0.22**
									928	1.580	2.56	Paved	6.05																
																							1,835	6	6.00	5.1				
RUS_000_150		2,761	100.0	0.150	Grass-Short Grass Prairie	2.100	3.95	8.6																		RUS_000_150	17	**10.5**	**0.17**
									446	1.850	2.76	Paved	2.69																
																							2,001	6	6.00	5.6				
														214	5.486	31.9	29.5	0.055	6.69		6.69	0.53							
RUS_000_160		1,865	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.940	3.95	0.8																		RUS_000_160	11	**6.4**	**0.11**
									1,089	1.330	2.34	Paved	7.74																
																							726	6	6.00	2.0				
RUS_000_170		1,952	100.0	0.150	Grass-Short Grass Prairie	0.810	3.95	12.7																		RUS_000_170	19	**11.4**	**0.19**
									383	2.040	2.90	Paved	2.20																
																							1,469	6	6.00	4.1				
RUS_000_180		747	100.0	0.150	Grass-Short Grass Prairie	0.940	3.95	11.9																		RUS_000_180	15	**8.9**	**0.15**
									647	3.320	3.70	Paved	2.91																
RUS_016_010		2,662	100.0	0.150	Grass-Short Grass Prairie	2.830	3.95	7.7																		RUS_016_010	18	**11.0**	**0.18**
									693	1.080	2.11	Paved	5.47																
																							1,869	6	6.00	5.2				
RUS_016_020		3,161	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.700	3.95	1.0																		RUS_016_020	20	**12.2**	**0.20**
									2,082	1.060	2.09	Paved	16.58																
																							1,030	6	6.00	2.9				
RUS_016_030		2,587	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.680	3.95	1.0																		RUS_016_030	9	**5.6**	**0.09**
									504	2.280	3.07	Paved	2.74																
																							2,033	6	6.00	5.6				
RUS_016_040		2,434	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	6.320	3.95	0.4																		RUS_016_040	9	**5.2**	**0.09**
									707	3.160	3.61	Paved	3.26																
																							1,199	6	6.00	3.3				
														477	2.310	57.3	35.8	0.065	4.77		4.77	1.67							
RUS_017_010		678	100.8	0.150	Grass-Short Grass Prairie	0.900	3.95	12.2																		RUS_017_010	15	**8.8**	**0.15**
									145	2.090	2.94	Paved	0.82																
														432	1.240	115.9	65.0	0.055	4.44		4.44	1.62							
RUS_018_010		2,702	100.0	0.150	Grass-Short Grass Prairie	1.610	3.95	9.6																		RUS_018_010	23	**14.0**	**0.23**
									1,064	1.270	2.29	Paved	7.74																
														884	0.500	70.0	37.8	0.045	3.53		3.53	4.17							
RUS_018_020		2,891	100.0	0.150	Grass-Short Grass Prairie	0.970	3.95	11.8																		RUS_018_020	33	**19.8**	**0.33**
									1,383	1.600	2.57	Paved	8.96																
														1,408	0.800	49.3	81.0	0.050	1.91		1.91	12.26							
RUS_018_030		2,585	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.740	3.95	0.9																		RUS_018_030	11	**6.8**	**0.11**
									901	2.310	3.09	Paved	4.86																
														1,634	1.000					4.86	4.86	5.60								
RUS_018_040		2,976	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.730	3.95	0.9																		RUS_018_040	17	**9.9**	**0.17**
									1,824	1.860	2.77	Paved	10.97																
														1,102	0.640					3.96	3.96	4.64								

Upper Rush Ultimate Time of Concentration Calculations

HMS Program Basin Name	Notes	Longest Flowpath (ft) (1)	Overland Flow						Shallow Concentrated Flow					Channel Flow									Pipe Flow				Totals			
			Length (ft) (2)	n-Value (3)	Land Use/Surface Description (4)	Slope (%) (5)	Rainfall (in) (6b)	TcOverland (min) (7)	Length 1 (ft) (8)	Slope 1 (%) (9)	V1 (ft/s) (10)	Assumption for V1 (Paved/Unpaved) (11)	Tc Shallow Concentrated (min) (12)	Length 2 (ft) (13)	Slope 2 (%) (14)	Bankfull Area (ft^2) (15)	Bankfull Wet Peri (ft) (16)	Channel n-Value (17)	V2 (ft/s) Manning's (18)	V2 (ft/s) from RAS Model (19)	Selected Velocity (ft/s) (20)	Tc Channel (min) (21)	Pipe Length (ft) (23)	Pipe Velocity Other Source (ft/s) (26)	Selected Velocity (ft/s) (27)	Tc Pipe (min) (28)	Sub-basin	Final Tc (min) (29)	Tlag (min) (30)	Tlag (hr)
RUS_018_050		3,423	100.0	0.150	Grass-Short Grass Prairie	2.870	3.95	7.6																			RUS_018_050	25	**14.7**	**0.25**
									1,647	1,570	2.55	Paved	10.78																
																						585	6	6.00	1.6				
														1,091	0.810					4.07	4.07	4.47								
RUS_019_010		2,630	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			RUS_019_010	29	**17.3**	**0.29**
									1,333	1,400	2.41	Paved	9.24																
														1,197	1,250	208.7	106.6	0.055	4.74		4.74	4.21								
RUS_019_020		1,706	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	2.400	3.95	0.6																			RUS_019_020	12	**6.9**	**0.12**
									1,313	1,150	2.18	Paved	10.04																
														343	3.086	46.1	28.9	0.055	6.49		6.49	0.88								
RUS_020_010		4,272	100.0	0.150	Grass-Short Grass Prairie	0.540	3.95	14.9																			RUS_020_010	38	**22.7**	**0.38**
									1,285	0.500	1.44	Paved	14.90																
																						2,887	6	6.00	8.0				
RUS_020_020		4,387	100.0	0.150	Grass-Short Grass Prairie	0.670	3.95	13.7																			RUS_020_020	43	**25.8**	**0.43**
									2,493	0.780	1.80	Paved	23.14																
																						692	6	6.00	1.9				
														535	0.780	29.9	18.9	0.045	3.97		3.97	2.25								
														350	0.500	30.1	23.2	0.015	8.34		8.34	0.70								
														217	0.500	52.3	45.4	0.045	2.57		2.57	1.41								
RUS_020_030		3,118	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			RUS_020_030	36	**21.6**	**0.36**
									1,974	1,220	2.25	Paved	14.65																
																						175	6	6.00	0.5				
														870	0.500	81.3	67.1	0.045	2.66		2.66	5.45								
RUS_020_040		4,060	100.0	0.150	Grass-Short Grass Prairie	1.630	3.95	9.6																			RUS_020_040	31	**18.4**	**0.31**
									545	2.490	3.21	Paved	2.83																
														3,415	0.620					3.13	3.13	18.18								
RUS_FPT_010		3,184	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.720	3.95	0.9																			RUS_FPT_010	13	**7.9**	**0.13**
									990	1.630	2.60	Paved	6.36																
																						1,560	6	6.00	4.3				
														585	0.500	141.8	78.1	0.024	6.54		6.54	1.49								
RUS_FPT_020		2,432	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			RUS_FPT_020	11	**6.6**	**0.11**
									1,403	2.610	3.28	Paved	7.12																
																						979	6	6.00	2.7				
RUS_NET_010		2,119	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	0.500	3.95	1.1																			RUS_NET_010	10	**6.2**	**0.10**
									396	0.500	1.44	Paved	4.59																
																						1,673	6	6.00	4.6				
RUS_NET_020		710	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	6.380	3.95	0.4																			RUS_NET_020	4	**2.6**	**0.04**
									660	1.810	2.73	Paved	4.02																
SUB_000_010		2,952	100.0	0.150	Grass-Short Grass Prairie	0.620	3.95	14.1																			SUB_000_010	31	**18.8**	**0.31**
									1,990	1.660	2.62	Paved	12.66																
														862	0.500	54.1	34.2	0.045	3.18		3.18	4.52								
SUB_000_020		2,349	100.0	0.150	Grass-Short Grass Prairie	2.220	3.95	8.5																			SUB_000_020	17	**10.1**	**0.17**
									669	3.710	3.92	Paved	2.85																
														1,579	0.700					4.71	4.71	5.59								
SUB_000_030		751	50.0	0.011	Smooth Surface (concrete, asphalt, bare earth)	3.100	3.95	0.5																			SUB_000_030	4	**2.3**	**0.04**
									701	3.020	3.53	Paved	3.31																
SUB_000_040		1,108	100.0	0.150	Grass-Short Grass Prairie	0.500	3.95	15.4																			SUB_000_040	20	**11.8**	**0.20**
									1,008	3.730	3.93	Paved	4.28																
SUB_000_050		3,726	100.0	0.150	Grass-Short Grass Prairie	0.860	3.95	12.4																			SUB_000_050	37	**22.3**	**0.37**
									2,717	1.110	2.14	Paved	21.14																
														909	1.240	27.8	17.5	0.055	4.11		4.11	3.69								
SUB_000_060		3,046	100.0	0.150	Grass-Short Grass Prairie	0.720	3.95	13.3																			SUB_000_060	28	**16.7**	**0.28**
									388	1.750	2.69	Paved	2.40																
														1,609	1.010	30.0	30.0	0.045	3.33		3.33	8.06								
																						371	6	6.00	1.0				
														577	0.500					3.13	3.13	3.07								
SUB_000_070		4,044	100.0	0.150	Grass-Short Grass Prairie	2.260	3.95	8.4																			SUB_000_070	29	**17.3**	**0.29**
									1,623	2.070	2.92	Paved	9.25																
														2,321	0.690					3.45	3.45	11.21								
SUB_000_080		1,251	100.0	0.150	Grass-Short Grass Prairie	4.950	3.95	6.1																			SUB_000_080	12	**7.0**	**0.12**
									1,151	2.890	3.46	Paved	5.55																

Appendix B-4
Time of Concentration Graphs


Tc vs. Area
Tc (hr)
0.5
0.05
0.005
0.05
0.5
Area (sq. mi.)
Tc = Sqrt(Area)
Existing RC-1
Existing UR
Existing KB
Existing MR
Existing LR
*Note : Travel time through unsteady modeled streams was omitted for many of these basins. Therefore, the calculated Tc values were much quicker compared to other basins of similar size.